

TURNING THE TIDE

Addressing the Impact of Fisheries
on the Marine Environment

**SUMMARY OF THE ROYAL COMMISSION
ON ENVIRONMENTAL POLLUTION'S REPORT**



About this study by the Royal Commission on Environmental Pollution

In preparing this report, the Royal Commission has studied a wide range of environmental impacts associated with a variety of commercial fishing activities including trawling, drift netting, industrial fishing and fish farming. We have examined regulatory and management practices, the institutional and legal framework and the state of marine science and data. We have also taken account of the social and economic dimensions.

Over 90 organisations and individuals submitted evidence for our study or provided information on request. We hosted a seminar at the University of Edinburgh to review evidence on the environmental damage caused by fishing. And we commissioned consultants' reports on aquaculture, the environmental impacts of fishing gear and marine protected areas.

Members of the Commission and its Secretariat made visits to Stirling, Grangemouth, Fleetwood and Lowestoft in the UK as well as Brussels, Norway, Washington DC and Florida. We gathered additional evidence from Australia, Italy, New Zealand and Japan.

Our study focuses on the impacts of fishing in the region covered by the OSPAR treaty – the Convention for the Protection of the Marine Environment of the North East Atlantic (figure 1).

We pay particular attention to the fisheries regulated by the European Community's Common Fisheries Policy and to the waters around the UK.

Figure 1 OSPAR area of the north-east Atlantic¹



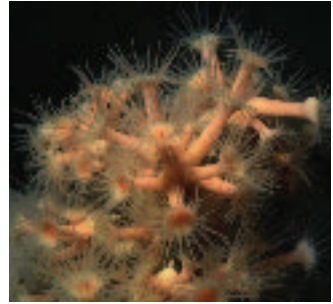
Overview

Society has given much lower priority to protecting the seas compared with protecting the land. This needs to change – urgently.

Overfishing is a growing global problem that has caused serious, enduring damage to the marine environment and led to the collapse of fisheries in many areas. Past fisheries policies have failed, and incremental improvements will not deliver a sustainable future. We face further decline unless there is significant and urgent action. This is particularly important at a time when climate change is likely to put extra stress on the marine environment.

We therefore call for radical change to increase protection for the marine environment. In the short-term this will be painful to those in the fishing industry, but government must look at the wider picture, including society's stewardship of the environment. The industry will need support to adjust, but in the longer term the changes we call for will be in its own best interest. A continued regime of too little, too late will ultimately leave many sectors of the industry without a future.

The UK government will need to apply pressure at the European level to implement many of the changes suggested in this report. However, the UK



has a large and productive marine area and it has an important opportunity to demonstrate leadership by improving the marine environment for the benefit of this country and the other nations with which we share it.

Key recommendations

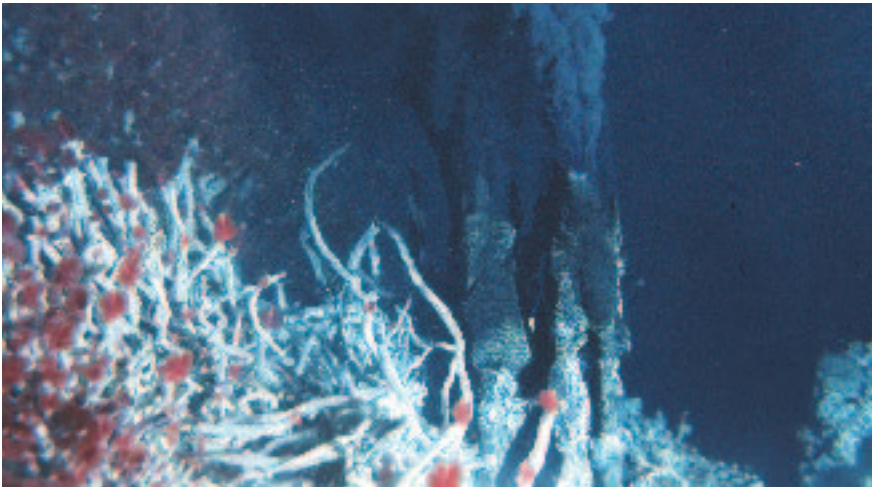
We make the following key recommendations:

- **human impacts on the marine environment should be managed in a fully precautionary manner. Fishing should be permitted only where it can be shown to be compatible with the framework of protection set out in this report.**
- **the UK government should establish a large-scale network of marine protected areas. This should lead to 30% of the UK's exclusive economic zone being established as marine reserves closed to commercial fishing.**
- **the UK government should develop a statutory system of marine spatial planning that covers all major uses of the sea including fishing.**
- **the UK government and the devolved administrations of Scotland, Wales and Northern Ireland should introduce Marine Acts to set out the long-term goals for protecting the marine environment and to provide the necessary statutory underpinning for a marine planning system and marine reserves.**
- **the UK government and fisheries departments should initiate a decommissioning scheme to reduce the capacity of the UK fishing fleet to an environmentally sustainable level and move towards managing fisheries on the basis of controlling fishing effort – the overall amount of fishing activity – rather than the quantity of fish landed. It should take steps to ensure such measures are also introduced at the European level.**
- **the UK government should review the funding available to promote economic diversification in fisheries dependent areas.**
- **the UK government should immediately halt any deep-sea trawling taking place in UK waters or being carried out by UK vessels. We also recommend that the UK government should press the European Commission for a ban on the use of bottom trawling, gillnetting and long-lining for deep-sea species in EU waters.**

The Challenge

Over 70% of the planet is covered by sea and it plays a critical role in determining conditions on the land. The oceans teem with a myriad of life forms in complex relationships. It is often said that more is known about the surface of the moon than the bottom of the deep ocean. Many deep-sea species, possibly running into the millions, remain unstudied. Seabed features such as hydrothermal vents have only been discovered in the last few decades (figure 2). Cold-water corals and seamounts are in danger of being destroyed just as we are becoming aware of their existence.

Figure 2 Marine hydrothermal vents with thriving tubeworms²



But despite the vast size of the oceans, humanity has the power to make damaging global changes to the marine environment. Significant impacts include nutrient pollution, chemical pollution, dumping of rubbish and waste and climate change. However, OSPAR has identified fishing as the cause of three of the most important threats to the North Sea – the removal of target species, seabed disturbance and effects of discards and mortality of non-target species (figure 3).

Figure 3 Dolphins are at risk from fishing³



Overfishing of commercial species

Although the seas seem boundless and fishing vessels small in comparison, their nets can be very large. A net with a mouth of the size of 50 football fields has recently been introduced.⁴ The relentless pressure of fishing has meant that the deep ocean and the seas around our coast are being depleted of fish and other living creatures at an alarming, completely unsustainable rate.

It is estimated that half of the fish landed by the UK fleet under the current quota-management system come from sources that are unsustainable or borderline.⁵ The proportion of north-east Atlantic fish stocks within safe biological limits fell from 26% to 16% between 1996 and 2001, according to the International Council for the Exploration of the Seas.

Fishing down the food chain

Killing all these fish has a wide range of effects. As well as pushing some local fish populations close to the edge of commercial extinction – the point at which it is no longer worth attempting to catch them – it removes important components of the food web, particularly larger, older fish at the top of the food chain (figure 4). Globally, over 90% of larger predatory fish may have been lost since the pre-industrial era.⁷ This can affect predator-prey relationships, genetic diversity and breeding ability as well as resulting in catches of smaller, younger fish and creatures at lower trophic levels – a phenomenon known as fishing down the food chain.

Damage to the seabed

Bottom trawling can plough furrows up to 6m wide and 0.15m deep, for many kilometres across the seabed. Some areas are trawled this way five times a

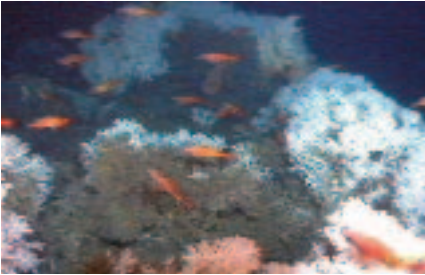
Figure 4 The average size of cod has fallen over the last fifty years⁶



year; they are turned over much more often than arable fields. This has had a disastrous effect on the habitat that extends from below to the seabed to a short distance above it, and for the species living there (figure 5a/b).

Figure 5 Fishing impacts in a deep-sea area with low natural disturbance⁸

(a) Before trawling



(b) After trawling



Discards and bycatch

Many more fish are caught at sea than are actually landed. Huge quantities are discarded because they are too small, or are the wrong species, or are over the fishing vessel’s catch quota. Large numbers of birds, sea mammals and other species are also caught in nets and trawls – this is known as bycatch (figure 6). Both discards and bycatch have important environmental effects on the species concerned and on the wider environment.

Aquaculture

While global landings of fish are no longer rising – a sign of overfishing – the aquaculture or fish farming sector is expanding rapidly. As consumption continues to increase, aquaculture will provide a larger share of humanity’s fish and seafood. But this does not imply a straightforward substitution of wild fish for farmed ones. A large part of north-west Europe’s aquaculture industry relies on industrial fishing to supply huge volumes of fishmeal and fish oil for feed. This has endangered some fish populations and removes food for other species.

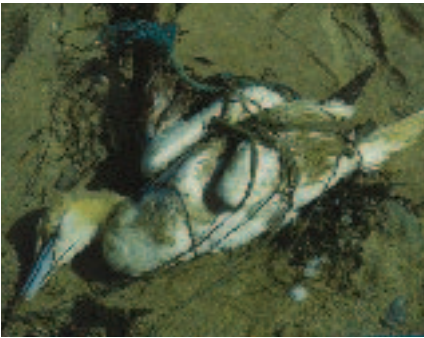
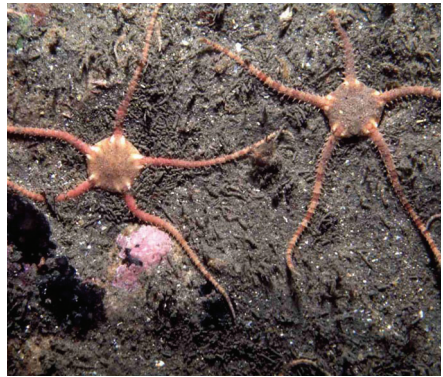


Figure 6 A gannet caught in a fishing line⁹

Marine ecosystems

The damage caused by fishing is not confined to commercial fish populations. It also affects the wider ecosystem – habitats, plants, non-target fish, birds and mammals. So solutions to current problems need to take a broad environmental approach. Our report recommends a package of measures to enable future generations to enjoy a diverse,



healthy marine environment and to continue to have fish to eat. Without radical change we will lose the first and have very much less of the second.

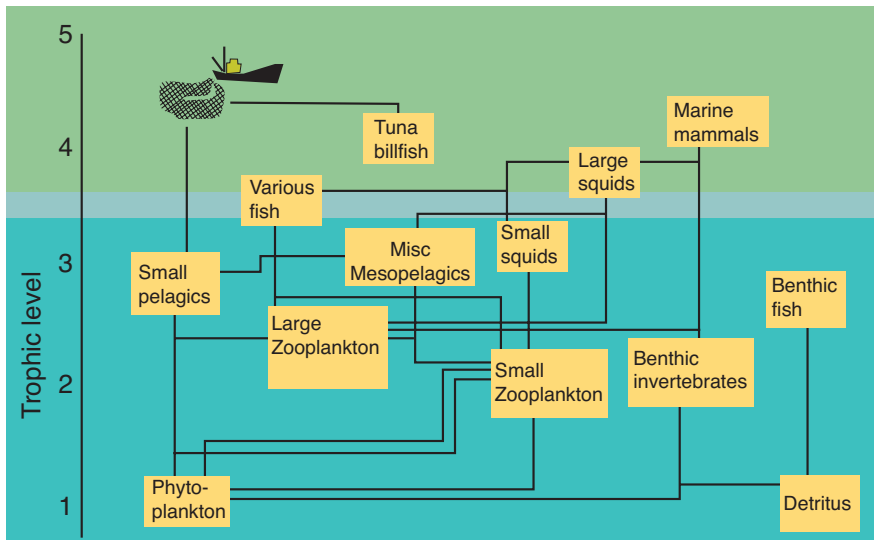
“The oceans are the planet’s last great living wilderness, man’s only remaining frontier on Earth, and perhaps his last chance to prove himself a rational species.”¹⁰



The Marine Environment

The seas are home to a stunning array of plants and animals. Up to half of the UK's biodiversity may be found in its surrounding seas. The survival of individual species depends on complex relationships with other species, habitats and environmental conditions. Some of these are reflected in the 'food web' that indicates how predators and prey are linked (figure 7).

Figure 7 A simplified marine food web, showing the trophic level in the food web occupied by various organisms. This is determined by the number of steps between the lowest levels (e.g. primary producers such as plankton) and the highest levels (e.g. carnivores)¹¹



Most marine life derives its energy from sunlight and/or nutrients and is abundant where these are present (box A). This means that many plants and animals are found in the shallow water of the continental shelves, and around ocean upwellings where deep ocean currents bring nutrients to the surface.



BOX A

EXAMPLES OF MARINE SPECIES FOUND IN UK WATERS

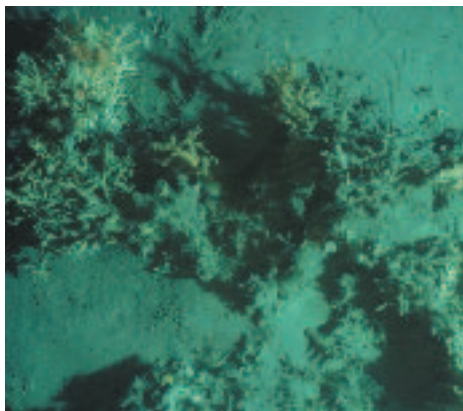
Over 44,000 species are found in UK waters.¹² These include:

- Microscopic plants and animals (known as plankton) that form the basis of the marine food chain;
- Over 330 species of fish;
- A total of 16 species of whales, dolphins, seals and porpoises. The UK has 95% of the EU's population of grey seals; and
- Twenty-five breeding seabird species with 8 million coastal birds. This includes 90% of the global population of Manx shearwaters.

The deep seas are not devoid of life. Deep-water cold coral reefs are widely distributed across the Atlantic at depths ranging from many hundreds to thousands of metres. They can be thousands of years old and are thought to sustain hundreds of associated species – despite the lack of sunlight (figure 8). In the seismically active mid-ocean ridges, where new oceanic crust is formed, there are seamounts of volcanic origin rising up from the seabed which act as oases for marine life. The ridges are also home to carbonate mounds that support rich communities of coral and filter feeders, sponges and many types of fish.

All the marine species living in an area of deep ocean or continental shelf, together with the physical, chemical and structural features of their shared environment, comprise a marine ecosystem. These ecosystems are affected by long-term environmental processes such as climate change over thousands of years. They are also affected by medium-term climate variations, such as the North Atlantic Oscillation, that can last from a few weeks to a decade, and other physical changes such as tides and daylight that occur on daily, seasonal, or annual cycles.

Figure 8 Live coral at the Darwin Mounds¹³



Ecosystems are generally able to cope with short-term, limited environmental fluctuations, but when there are strong longer-term trends in the environment species may change their geographical distribution and become locally extinct or more abundant.

Human activities, principally commercial fishing, are now having a larger impact on marine ecosystems than any natural variations have had for thousands of years. This is causing species to decline or become extinct, impoverishing ecosystems and reducing their robustness in the face of natural or human-induced change (box B).

BOX B COLLAPSE OF COD ON THE GRAND BANKS, CANADA¹⁴

Cod have been caught off Newfoundland's Grand Banks since the early 1500s, but they have recently been fished to commercial extinction. Until the early 1900s, cod were mainly caught with hook and line but in later years, much more effective fishing techniques began to be used such as bottom trawling, traps and gill nets. Landings of northern cod increased from 100,000-150,000 tonnes per year between 1805-1850 to a peak of 810,000 tonnes in 1968 when factory freezer trawlers from Europe fished these waters.

By 1992 the six Canadian populations of Atlantic Cod had collapsed and the fishery was closed. The size of the spawning stock had fallen from an estimated 1.6 million tonnes in 1962 to 22,000 tonnes in 1992. The collapse was a direct result of setting excessive quota levels and overfishing. This had a wide range of subsequent effects on the cod's breeding success that exacerbated the decline and impeded any recovery. The size of the stock has now risen but the fishery remains closed. There has also been a change in the ecosystem that may be irreversible.



Bringing about Radical Change

Policies need to change to protect the long-term future of the marine environment and promote a sustainable fishing industry. As with the challenge of climate change, a major shift in thinking is required to respond to the scale and urgency of the problem.

Reversing the burden of justification for the fishing industry

The precautionary approach needs to be applied comprehensively to fisheries management. Currently, the marine environment is regulated on the basis of a presumption in favour of fishing. Unless harm to ecosystems or habitats can be demonstrated by whatever organisation regulates fisheries, then it is usually acceptable for activities to continue. This approach has not prevented marine ecosystems from being severely damaged.

Therefore, we recommend that the presumption should be reversed; applicants for fishing rights (or aquaculture operations in the marine environment) should have to demonstrate that the effects of their activity will not harm the sea's long-term environmental sustainability. This change would place the burden of justification on those seeking fishing rights and make both the industry and its regulator focus much more on the biological state of the marine environment. The new approach could operate through a system of licensing and marine planning. There will be areas that need to be entirely protected in order to fulfil the precautionary principle and achieve recovery of ecosystems.

Implementing the ecosystem approach

A new, more holistic view is beginning to be adopted for fisheries management that moves away from a focus on individual fish populations towards the 'ecosystem approach to fisheries'.¹⁵ This more precautionary approach recognises the interdependence of predator and prey species within the food chain. International agreements are now beginning to establish the ecosystem approach as the basis for managing human activities in the marine environment.

Implementing the ecosystem approach will require new science to guide management. But, it will also require pragmatic new policy measures which we examine in the following section, beginning with marine protected areas.

Marine Protected Areas and Reserves

Any area that receives some kind of special protection may be called a marine protected area (MPA). We have examined the effectiveness of a subset of more highly protected MPAs known as marine reserves, where fishing is usually prohibited.

Unlike other management options, marine protected areas and reserves can protect the entire ecosystem, from spawning fish, to the organisms living in the ocean depths, to the seabed itself. Designed in the right way, they can protect commercial fish, non-commercial species and features of the seabed that might be damaged by trawling. This makes them one of the most simple, straightforward means for implementing the ecosystem approach.

Presently, less than 0.5% of the world's oceans are protected. But the situation is changing. Recent international commitments on protected areas are summarised in table 1. Individual countries are also taking action; New Zealand and South Africa have targets to designate between 10 and 20% of their territorial waters as marine reserves, and in 2004, Australia created marine reserves that protect 33% of the Great Barrier Reef from fishing.

Table 1 Summary of some international commitments on marine protected areas

Organisation	Commitment
World Parks Congress (2003)	Global system of protected areas by 2012. There should be strict protection for at least 20-30% of each habitat.
OSPAR, Bremen Statement (2003)	A well-managed, ecologically coherent network of marine protected areas by 2010.
World Summit on Sustainable Development (2002)	A representative network of marine and coastal protected areas by 2012.
UN Convention on Biological Diversity (2004)	Work to establish a representative system of marine protected areas by 2012.

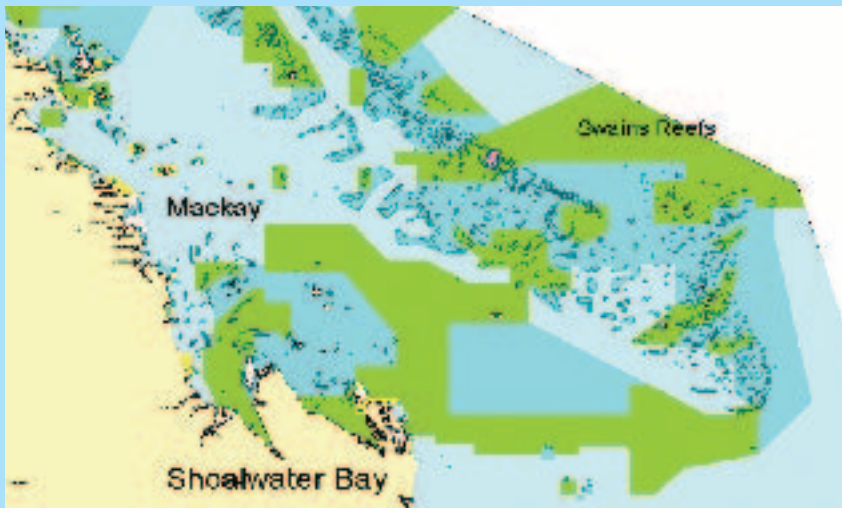
BOX C

GREAT BARRIER REEF MARINE PARK

The Great Barrier Reef Marine Park is the largest World Heritage Site protecting one of the richest, most complex and diverse ecosystems in the world. It covers an area larger than the UK, the Netherlands and Switzerland combined, and is home to 1,500 species of fish, over 5,000 species of molluscs, 350 kinds of hard corals and 30 species of cetaceans. It has an estimated economic worth of more than £470 million a year from tourism, commercial fishing, recreational fishing and boating.¹⁶

To ensure the park is preserved for the future, an extensive modelling and consultation exercise was carried out to identify areas where greater protection was needed. Seventy different habitats were identified within the park and eight different types of management zone designed (figure 9). The zoning process enables highly protected areas to exist within an integrated management plan that allows for other uses of the park, such as recreation and limited fishing activities.¹⁷

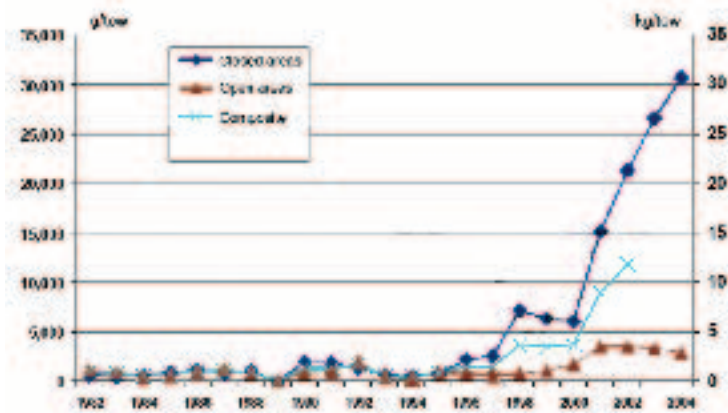
Figure 9 A section of the Great Barrier Reef Marine Park. Marine reserves are shown in green¹⁸



There is good evidence from around the world that reserves benefit habitats and a wide range of organisms, including commercially valuable fish. One of the best documented examples of reserves in colder, temperate zone waters are the closed areas established on Georges Bank, off the north-east coast of the US. In 1994, a number of areas were closed to mobile fishing gears as part of a comprehensive management plan (which included major reductions in fishing effort) aimed at allowing severely depleted stocks to recover. The resulting reserves now cover an area of about 20,000 km² and are among the largest closures in the world.

As a result of the measures, there have been increases in species living close to the seabed such as haddock, yellowtail and witch flounders. The density of scallops has increased up to 14-fold within five years, with a corresponding increase in numbers of scallop larvae drifting out of the reserve into adjacent fished areas (figure 10). The Georges Bank closures have brought the scallop fishery back from the verge of collapse and show that reserves can work at large scales and for commercial fisheries.

Figure 10 Recovery of scallops following the closures on the Georges Banks, US¹⁹



Similar protected areas and reserves could be widely introduced in the waters around the UK, Europe and the OSPAR region to benefit the marine ecosystem and help stocks recover. Area closures already form part of the measures available under the Common Fisheries Policy, but they have not always been implemented effectively and provide only limited protection for a few commercial species.

Research indicates that, in general, about 10–40% of the sea should be protected to yield biodiversity benefits, while 20–50% may need to be protected to help some fish species recover.²⁰ Given the heavy overexploitation of the OSPAR region and the need to help both fish and ecosystems recover in a time of environmental change we recommend that the UK should be aiming to protect 30% of its waters.

Research has already begun to identify large-scale networks of protected areas. Building on work by the UK's Joint Nature Conservation Committee,²¹ we commissioned further research to investigate what extensive reserve networks could look like in the North and Irish Seas.²² These were designed to cover around 30% of both seas. Maps were drawn up using a computer model, known as *Marxan*, that reflects a range of habitat attributes and uses a mathematical procedure to identify near optimal protected area networks that meet conservation targets (indicated by these attributes) while minimising some measure of costs.

This *Marxan* model was used to examine two types of scenario. The first were *Biodiversity Only* scenarios whose primary objective was conservation. In the second set of *Fishery + Biodiversity* scenarios, the needs of commercially valuable mobile and migratory fish species were incorporated by identifying their spawning and nursery sites and assigning these high priority for protection. Such reserves could help improve catches of species such as cod, whiting, haddock, hake, plaice and sole as well as scallops, lobsters and crabs. An example of possible networks in the North Sea is shown in figure 11. These are illustrative only, but they show that there is a great deal of flexibility in the management options available, as relatively few places are irreplaceable.

Cost of marine reserves

A recent survey found that running a global system of marine protected areas covering 30% of the oceans would cost between £6.5 and £7.5 billion a year. This is less than the £8 to £16 billion spent globally each year on subsidies to commercial fisheries.

Based on work carried out for the Royal Commission, the running costs of reserves to protect both the North and Irish Seas would be around £9 to £15 million a year. For comparison, the National Parks in England and Wales cost around £35 million a year to run. The marine reserves would also protect a much larger total area than their onshore counterparts and be cheaper on an area basis.

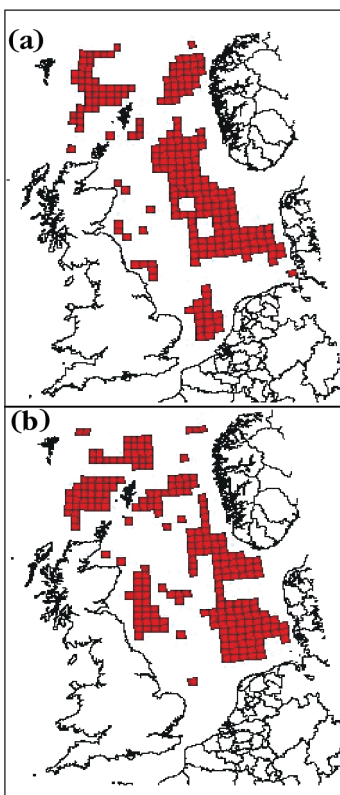


Figure 11 Two of the ten best North Sea reserve network configurations based on 10,000 runs of the Marxan model for the *Fisheries + Biodiversity* scenario.²³ Area coverage = 29 to 32%

Their costs are also small compared to the potential benefits. Fisheries in the Irish Sea were worth £60 million in 2002, and those in the North Sea were worth £226 million (for the UK fleet only). Theoretical work and evidence from field studies and existing marine reserves elsewhere suggests that reserve networks will increase revenues from many fisheries. A 10% uplift in fishery productivity in the Irish Sea and a 2-3% uplift in the North Sea would pay for the running costs of a network of reserves, and these would also provide further benefits – increased tourism and recreation opportunities²⁴ and wider protection of ecosystems.²⁵

While reserves should benefit fish populations and the fishing industry in the medium- and long-term, there is a justified concern about the short-term impact on the industry during the period between the implementation of a reserve network and the beginning of ecosystem recovery. In Australia, a structural adjustment package is on offer following the rezoning of the Great Barrier Reef Marine Park. This includes restructuring grants, business advice and assistance to leave the fishing industry, as well as aid to employees and communities.²⁶ It may be appropriate to consider ways of assisting the fishing industry through the transition to protected areas and reserves in the UK.

Conclusions on marine protected areas

Progress towards existing commitments on marine protected areas is too tentative and slow (table 1). Few of the commitments have resulted in practical measures and plans and the current area protected is very small, often focusing on the ‘crown jewels’ of the marine environment rather than

the wider ecosystem. The present regulatory system appears to offer limited scope to protect such areas from fishing.

Yet firm evidence exists that marine reserves can provide habitat protection and form part of an effective response to the effects of over-fishing.²⁷ We already have sufficient information to identify some of the most vulnerable sites that could form the basis of future networks. **We recommend that the UK government should develop selection criteria for establishing a network of marine protected areas (MPAs) so that, within five years, a large-scale, ecologically coherent network of marine protected areas is implemented within UK waters. This should lead to 30% of the UK's exclusive economic zone being established as marine reserves closed to commercial fishing. These proposals should be developed in consultation with the public and stakeholders.**

To be most effective, **we recommend that the MPAs and reserves should be implemented as part of a balanced package of measures to improve the management of human impacts on the marine environment and to reduce fishing effort.**

Changes are also needed at the European level where the government should be prepared to make the case for a new EC Directive for the designation of the large-scale MPA networks protected from the effects of fishing.



Sustainable Fisheries Management

Overcapacity in the European fishing fleet leads to unsustainable pressures on fish populations, making them more difficult to manage. It also reduces the profitability and stability of the industry by leaving it highly exposed to short-term fluctuations in price.

Decommissioning

Past estimates from the European Commission, reflected in the Green Paper on Common Fisheries Policy reform, suggested the European fleet might need to be reduced by 40%.^{28,29} A more recent study by the Prime Minister's Strategy Unit recommended that the UK whitefish fleet should be cut by 13% with the possibility of a tie-up scheme for a further 30% of boats. However, more pessimistic scenarios contained within the study suggested that the whitefish fleet would have to be cut back by more than 50% to ensure the industry remained viable and fish populations recovered.

We are certain that further efforts are needed to reduce fishing pressure in EU waters. **We recommend that the UK government and fisheries departments should initiate a decommissioning scheme to reduce the capacity of the UK fishing fleet to an environmentally sustainable level, and ensure similar reductions are made in EU fleets that fish in UK waters.**

The aim should be to match the overall fishing effort – the total amount of fishing activity – to fish populations that can be sustained in the long term. The degree of decommissioning required will vary between the various fisheries sectors and areas, but is likely to be largest for the whitefish (demersal) fleet.³⁰ Efforts should also be made to help the industry to adjust to the establishment of a network of marine reserves, which we recommend should cover 30% of the UK's exclusive economic zone. Fishing effort must be reduced during this period to avoid large-scale displacement of activity from these areas. **We recommend that funds be made available to help the transition of the industry during the establishment of the UK network of marine protected areas and no-fishing reserves. In addition, the UK government should review arrangements for EU Structural Funds and other funds to promote economic diversification in fisheries dependent areas.**

Effort control

Current fisheries management is based on total allowable quotas that set limits on the amount of individual fish species that can be landed. Their ability to manage fish populations can be severely undercut if there are high levels of misreporting or illegal fishing, since this reduces the quality of the data on which quotas are based. Quotas also encourage practices such as high grading (throwing away low value fish) and discarding of unwanted fish. Again, this increases the uncertainty over the total catch of all kinds of fish, and tends to push actual levels of mortality well above precautionary limits.

In contrast, effort control system set limits for the amount of time vessels can be at sea, which is a more accurate reflection of actual commercial fishing activity. **We therefore recommend that the UK government should move towards managing fisheries on the basis of effort controls (in terms of the fleet's total kilowatt-hours at sea) within the next three to five years, and that it should take steps to ensure that appropriate effort controls are introduced throughout EU waters in the shortest possible time frame.**

Gear restrictions

Some gear types are particularly destructive because they damage seabed habitats or result in a high rate of by-catch.

Detailed measures to limit the 'how, when and where' of fishing can provide the spatial sensitivity and flexibility needed to meet specific biological and conservation goals for a given species or habitat. In particular, gear regulations in tandem with spatial planning provide the key to protecting sensitive habitat types. **We therefore recommend that the UK government should use renewable fishing licences to regulate all UK fisheries by linking licensing to marine spatial plans, reductions in fishing effort and improvements in vessel monitoring technology. Global Positioning Satellite (GPS) technology is now widely available and should be fitted to all fishing vessels over 8 metres in length within the next 3 to 5 years.**

Deep-sea fisheries

Deep-sea fisheries target bottom-dwelling species below 200 metres. Deep-sea fishing has been expanding as a result of changes in technology, falling catch rates elsewhere and tighter regulations on fishing closer to shore. World-wide only around 300 boats operate in this sector but their environmental impact is large; causing overfishing, damage to the seabed and bycatch of other species.

Deep-sea fish are long lived, late to mature, slow growing, of low fecundity and prone to congregating together for spawning and feeding which makes them easy to catch. Their low reproductive rates make them highly vulnerable to overfishing and slower to recover than the more resilient inshore species. As a result, high seas bottom trawl fishing has often led to the serial depletion of targeted deep-sea fish stocks.

Quota schemes and effort controls are unlikely to control deep-sea fisheries adequately, because fishing pressure can deplete fish populations faster than control measures can take effect. There are also significant shortcomings in our knowledge of deep-sea species and habitats, which makes it difficult to set quotas. Monitoring and enforcement pose additional problems on the high seas beyond nations' exclusive economic zones. It has been suggested that "there is probably no such thing as an economically viable deep-water fishery that is also sustainable."³¹ **We recommend that the UK government should immediately halt any deep-sea trawling taking place in UK waters or being carried out by UK vessels. We also recommend that the UK government should press the European Commission to ban bottom trawling, gillnetting and long-lining for deep-sea species in EU waters.**

We recommend that the UK government should promote measures to prohibit destructive deep-sea fishing practices and should promote the establishment of a system of marine protected areas on the high seas. In addition, it should press for international controls on high seas bottom-trawling, and their proper control through monitoring and enforcement, for example, under the UN Straddling Stocks Agreement and Convention on the Law of the Sea (UNCLOS).



Figure 12 Deep-sea species such as the orange roughy can be fished out in a few years³²

Framework for Reform

We cannot continue with the present ad-hoc approach to protecting the marine environment. The problem is too urgent and important for that. A new framework needs to be put in place that provides the proper legal and institutional context for measures to secure environmental improvements.

Within the UK, there are over a hundred Acts of Parliament³³ governing the marine environment with often confusing, sometimes overlapping, jurisdictions covering the seas and coast around the UK. Despite this web of legislation, there is no spatial vision for UK waters that sets out the top-level objectives for the management of the marine environment, the principles that should guide its use, or how to integrate the demands of different groups. This makes it difficult to find a rational basis for the day-to-day management of competing uses and more likely that the environment will not receive adequate priority or protection. It also represents a missed opportunity to set out long-term goals for the protection of the marine environment and measures to deliver them.

We recommend that the UK government should develop a comprehensive system of marine spatial planning that sets out the principles and long-term goals for protecting the marine environment and promoting the sustainable use of the sea. This should involve the development of integrated regional management plans to guide all major uses of the sea, including fishing. These should ensure high standards of marine protection, and be subject to strategic environmental assessment. The system should have a statutory basis and a clear framework for public participation.

We recommend that the UK government and the devolved administrations should introduce Marine Acts in their areas that set out the principles for managing human impacts on the marine environment, with the primary objective of the enhancement and long term protection of the environment. These acts should also provide statutory underpinning for a system of marine spatial planning, as well as targets for marine protected areas and no-fishing reserves.

The transition to a healthier marine environment requires a coherent approach that delivers both environmental and fisheries objectives. A first step to ending the division between the two, and signalling a change in priorities in favour of greater sustainability would be to bring together

Ministerial responsibilities for fishing and marine environment within the UK, and changing the way such portfolios are described.

The principal objective of UK policy in this area should be to protect the marine environment. The protection of ecosystems is ultimately the only route to overall sustainability. Fisheries management should therefore focus on fostering the long-term sustainability of fish populations, and thereby the future of the fishing industry.³⁴ **We recommend that the allocation of resources should reflect these new policy priorities and that the UK government should encourage the European Commission and European Council of Ministers to co-operate in the development of joint environment and fishery objectives.**

As environmental standards are raised in Europe there may be a temptation to transfer unsustainable practices and pressures outside of European Union waters – to the seas around developing countries, through poorly regulated access agreements, or to high seas fisheries. **We recommend that the UK government should strongly promote action at the European level to ensure that, outside its home waters, the European fleet does not fish to standards that would be unacceptable within the EU.**



Other Recommendations

This section describes some of our other main recommendations. The full list is provided in chapter 11 of our main report.

Greater protection for the marine environment

We recommend that the UK government should:

- amend UK legislation to allow Marine Nature Reserves to be designated even where there are objections;
- introduce measures to protect all designated sites (such as Natura 2000 sites) from the adverse effects of fishing. If such measures cannot be agreed under the Common Fisheries Policy, the UK should introduce unilateral measures;
- consider how the EC Habitats Directive could be amended, and better operated, in order to protect the wider marine environment, important marine habitats and species;
- use the findings of the above review to press the EU to amend the Habitats Directive; and
- apply strategic environmental assessment and environmental impact assessment to fishing, amending the legislation where necessary.

Sustainable fisheries management

We recommend that the UK government should:

- negotiate at EU level for a mandatory full catch reporting scheme and that the data should be published;
- negotiate for the introduction of an EU-wide discard ban;
- keep under review the activities of smaller vessels that are not covered by the full range of fishing controls; and
- promote efforts at the European and international levels to bring emissions of greenhouse gases from shipping within international agreements and to tackle other air pollution from shipping.

Public participation

We recommend that the UK government and the devolved administrations should:

- establish a process that will provide an opportunity for a broad cross-section of the public and civil society to engage in informed debate about managing the marine environment; and
- use this process to inform, from an early stage, the development of policy on the marine environment and fisheries.

We recommend that within the next two years the UK government and devolved administrations work with producers, retailers and caterers to produce a strategy to:

- increase the proportion of seafood and aquaculture products produced under environmentally-accredited schemes;
- improve the quantity and quality of environmental information available to seafood consumers through labelling and awareness schemes; and
- ensure the reliability of such schemes by developing standards and auditing procedures.

Fish and human health

Some of the fatty acids found in fish have important health benefits. However, we are concerned about the sustainability of fish production and are aware of problems due to environmental contaminants found in fish. We recommend that:

- every effort is made to seek alternative sources of long-chain n-3 polyunsaturated fatty acids;
- an urgent effort is made to discover efficient chemical synthetic pathways to generate specific fatty acids, known as EPA and DHA;
- further consideration is given to providing advice to the public about adding long chain n-3 polyunsaturated fatty acids as dietary supplements rather than relying on an increase in fish consumption; and
- further research is undertaken to discover how long chain n-3 polyunsaturated fatty acids benefit human development and health.

Reducing the environmental impact of aquaculture (fish farming)

We recommend that the UK government and the Scottish Executive should promote a strategy to improve the sustainability of fishmeal and fish oils supplies. This should include steps to:

- increase the efficiency of fishmeal and fish oil use within the aquaculture industry;
- encourage the trend away from the use of fishmeal and oil in the livestock industry, giving the aquaculture industry preference of supply;
- accelerate the development and use of viable feed alternatives for aquaculture, including research into the feasibility of substituting fishmeal and fish oil with alternatives, and the farming of non-carnivorous fish; and
- Consider a tax or other economic instrument for the use of fishmeal and fish oil.

Protecting genetic diversity in wild fish populations

We recommend that:

- the UK government and the Scottish Executive should publish an action plan on how they will meet their obligations under the North Atlantic Salmon Conservation Organization's (NASCO) Williamsburg Resolution;
- the Scottish Executive and the Scottish Environmental Protection Agency (SEPA) should fund research into the design of protection zones to separate cage farms from salmon rivers, including cage location based away from migratory routes of wild salmon, and apply the findings;
- the Scottish Executive should continue to work with the fish farming industry to strengthen its Code of Containment and to make the Code mandatory. Guidelines on the Containment of Farmed Salmon developed by NASCO should be reflected in the minimum standard for the construction and operation of fish farms;
- SEPA and the fish farming industry should collaborate to carry out further research on reducing escapes from fish farms. Their research findings should be reflected in the Code of Containment; and
- the Scottish Executive should introduce regulations to prevent the outflow from smolt rearing units flowing into salmon rivers.

Members

Members of the Royal Commission on Environmental Pollution are drawn from a variety of backgrounds in academia, industry and public life.

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The Royal Commission's full report (Turning the Tide – Addressing the Impact of Fisheries on the Marine Environment) is available from The Stationery Office (Cm 6392, ISBN 0 10 163922 8). Alternatively the full report and this summary are available on the Royal Commission's website (<http://www.rcep.org.uk>).

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