8 USE OF LIVING MARINE RESOURCES



Fishing pressure continues to have a considerable impact on marine ecosystems and many problems remain despite efforts to improve management. Exploitation of many stocks continues to be beyond the levels they can sustain, while the status of a large number of stocks cannot be fully assessed due to poor data. Habitat destruction and the depletion of key predator and prey species and consequent food web effects are of concern. Mariculture is a growing activity which needs careful management to minimise potential impacts. Hunting of marine mammals is managed so that there is a low risk of depleting populations.

OSPAR Contracting Parties should cooperate

- → to achieve further reductions in fishing pressure and ensure that priority action is taken to address discarding practices, which remain a key issue, especially in EU waters;
- → to ensure that deep-water fisheries take into account the special vulnerability of both the species exploited and their habitats;
- → to keep as low as possible, and preferably eliminate, the by-catch of marine mammals, sharks, seabirds and turtles;
- \rightarrow to encourage developments in scientific support for fisheries management;
- → to integrate fisheries management with wider maritime management, promoting consistency and synergy between fisheries policies and the policies regulating other maritime uses.

Key assessments

- \rightarrow OSPAR assessment of the environmental impact of fishing
- ightarrow ICES assessment of the environmental impact of fishing
- ightarrow OSPAR assessment of the environmental impact of mariculture

Human use of living marine resources provides a wide range of goods and services of economic value to OSPAR countries. However, these uses exert pressure on the coastal and offshore environment which can have a wide range of impacts on marine ecosystems. Use of living marine resources covers the exploitation of marine species by man for food, feed, fertilizer or the production of other products of value or use, and includes activities such as fishing, mariculture and hunting. These activities are of high economic significance in some OSPAR countries and in some regions within countries. The QSR 2000 concluded that resolving questions on fisheries, which OSPAR recognises are most appropriately regulated through relevant international and regional agreements, was the most important issue concerned with human uses of the sea across all five OSPAR Regions.

OSPAR's Biodiversity and Ecosystems Strategy addresses both the protection of species, habitats and ecosystem processes and the management of human uses of the sea. Chapter 10 reports on progress in protecting and conserving species and habitats. This chapter, and Chapter 9, report on OSPAR's work on assessing the impacts of each human use of the sea, the action taken to reduce their impacts and the progress being made. **OSPAR Strategy objective for biodiversity and ecosystems** To protect and conserve the ecosystems and the biological diversity of the maritime area which are, or could be, affected as a result of human activities, and to restore, where practicable, marine areas which have been adversely affected.

The Strategy includes the following actions:

- → Assessment of the impact of human activities on the marine environment.
- → Drawing up of programmes and measures for controlling human activities that have an adverse impact on species and habitats that need to be protected and conserved, where this is necessary.
- → Drawing the attention of fisheries management authorities to questions where OSPAR considers that action is desirable. For this purpose, OSPAR considers the management of fisheries to include management of marine mammals.



Vigo fish market, Spain

FISHING



The OSPAR area contributes around 10% of global fisheries yields. Fishing pressure continues to have a considerable impact on marine ecosystems and many problems remain despite efforts to improve management.

Key assessments

OSPAR assessment of the environmental impact of fishing ICES assessment of the environmental impact of fishing

Fishing is of high economic significance for some OSPAR countries. Iceland, Norway and the Russian Federation are among the world's most important fishing nations. Fisheries products represent 20% of national GDP for the Faroe Islands and Greenland and over 90% of their exports. In the EU, fishing accounts for less than 1% of total GDP but is highly significant in some regions; Denmark, Spain, France and the UK are responsible for nearly 60% of the total EU commercial fisheries production.

Fisheries in the OSPAR area are regulated through a combination of different arrangements → FIGURE 8.1. These include national policies and regulations, the EU Common Fisheries Policy, bilateral and multilateral agreements between countries with shared stocks, and measures adopted by the three regional fisheries management organisations: the North East Atlantic Fisheries Commission (NEAFC), the International Commission for Conservation of Atlantic Tunas (ICCAT), and the North Atlantic Salmon Conservation Organization (NASCO) → TABLE 8.1.



FIGURE 8.1 Fisheries management zones in the OSPAR area. Ice-bound areas beyond national jurisdiction are shown in white. High Seas waters are shown in yellow.

The OSPAR Convention fully recognises the competence of these authorities to regulate fisheries. OSPAR informs these fisheries authorities when it considers that there are questions where action is needed to protect and conserve the North-East Atlantic in relation to fisheries. In 2008, OSPAR and NEAFC adopted a memorandum of understanding that detailed their roles in conserving marine biodiversity within their respective areas.

What are the problems? A range of direct and indirect effects

Fisheries have a range of direct and indirect effects on marine ecosystems. Fishing causes the death of many species including those being targeted and a range of other species such as non-targeted invertebrates and fish (including sharks), seabirds, turtles and marine mammals (seals and small cetaceans). Excessive fishing pressure on targeted species may lead to impaired reproductive capacity and a risk of stock collapse. Deep-water species have been shown to be particularly sensitive to fishing pressure. Some unwanted by-catch is discarded at sea. Discard rates have been high in some North-East Atlantic fisheries and were estimated to amount to 1.4 million tonnes in the early 2000s. Discards have been shown to affect the structure of biological communities. Fish are discarded for a variety of reasons. There are strong economic incentives in many fisheries to discard fish to maximise the value of the landing ('high-grading'). This is illegal under all fisheries policies.

Certain types of fishing gear physically disturb or damage the seabed and so affect benthic habitats and communities, including those which OSPAR has listed as threatened and/or declining, such as seamounts and cold-water coral reefs.

Fishing causes changes in community structure and marine food webs, which may be irreversible. The depletion of larger predatory species has strong effects on fish community structure. Recent research has shown that impacts from fishing on the abundance of fish can be transmitted into deep offshore areas below the maximum depth of commercial operations. While certain impacts of fishing are inevitable, one longstanding challenge of sustainable fisheries management is to minimise long-term negative effects on ecosystems while seeking longterm economic and social viability of the fisheries.
 TABLE 8.1
 Bilateral and multilateral fisheries management arrangements in the OSPAR area.

| Organisation | Contracting Parties | Objective and fisheries |
|--|---|--|
| North East Atlantic Fisheries Commission (NEAFC) | EU, Faroe Islands, Greenland, Iceland, Norway, Russian Federation | <i>Objective:</i> long-term conservation and optimum utilization of fishery resources in order to provide sustainable economic, environmental and social benefits <i>Stocks:</i> Atlanto-Scandian herring, mackerel, blue whiting, redfish, Rockall haddock and deep-sea fisheries in the Atlantic and Arctic Oceans |
| International Commis- sion for Conservation of Atlantic Tunas (ICCAT) | 46, including EU, Iceland, Norway, Russia and several states whose High Seas fleets fish in the ICCAT Area | <i>Objective:</i> conservation of tunas and tuna-like species to permit the maximum sustainable catch for food and other purposes <i>Stocks:</i> ~30 High Seas species – tunas, billfish, mackerel and shark 'by-catch' in Atlantic and adjacent seas |
| North Atlantic Salmon Conservation Organi- zation (NASCO) | Canada, EU, Faroe Islands, Greenland, Iceland, Norway, Russian Federation and the USA | <i>Objective:</i> to promote the conservation, restoration, enhancement and rational management of salmon stocks in the North Atlantic Ocean through international cooperation <i>Stocks:</i> Faroe Islands and Greenland High Seas salmon fisheries |
| The International Whaling Commission (IWC) | At present 88 Contracting Parties | Objective: global conservation and management of whale stocks |
| The North Atlantic Marine Mammal Com- mission (NAMMCO) | Faroe Islands, Greenland, Iceland, Norway | <i>Objective:</i> conservation and management of marine mammals in the North Atlantic |
| Bilateral Coastal States Consultations | EU, Norway Norway, Russian Federation | <i>Objective:</i> management of joint stocks in the North Sea, including the Skagerrak, and other management issues <i>Objective:</i> joint management of cod, haddock and capelin in the Barents Sea and other management issues |
| Various bilateral agreements between parties in the North- East Atlantic | EU, Faroe Islands, Greenland, Iceland, Norway, Russian Federation | <i>Objective:</i> exchange of quotas in each other's waters; other management issues |
| Coastal state coopera- tion on stocks that straddle into interna- tional waters (coastal state groups) | Various depending on species | Blue whiting: EU, Faroe Islands, Iceland, Norway Mackerel: EU, Faroe Islands, Norway Norwegian spring spawning (Atlanto-Scandian) herring: EU, Faroe Islands, Iceland, Norway, Russian Federation Redfish in the Irminger Sea: Faroe Islands, Greenland, Iceland |

Most fisheries are fully exploited

Most traditional fish stocks in the OSPAR area, and indeed globally, are fully exploited, overexploited or depleted \rightarrow FIGURE 8.2. Of the 600 global marine fish stocks monitored by the UN Food and Agriculture Organization (FAO), 3% are underexploited, 20% are moderately exploited, 52% are fully exploited, 17% are overexploited, 7% are depleted and 1% are recovering from depletion.

North-East Atlantic fisheries peaked at 13 million tonnes in 1976 and have since fallen to around 10 million tonnes a year. Higher yields, more security of supply and lower environmental impacts would follow from reductions in fishing effort. All OSPAR countries are committed to implementing an ecosystem-based approach to fisheries management and use of the precautionary approach.



FIGURE 8.2 Status of fish stocks assessed by the International Council for the Exploration of the Sea (ICES) for which maximum sustainable yield (MSY) is defined. This equates to 32 to 35 stocks over the period 2005 to 2009, except for 2006 when 23 stocks were assessed on this basis. MSY was not used in fisheries advice before 2005. ICES advice covers over 135 separate fish and shellfish stocks. Source: ICES data.

Constant change makes management challenging

Fisheries management is challenging because fisheries are constantly changing. There may be changes in the availability of commercial species, changes in the market price, changes in capital and fuel costs, or changes in the regulatory regime. New fisheries develop to meet market demand or when effort is diverted from other fisheries. Areas fished change, for example, as fish stocks and migration patterns respond to environmental change, when technical developments allow new areas to be exploited or as a result of management, such as closed areas. Management of deep-sea fisheries is difficult due to a lack of data underpinning stock assessments.

Fishing may increase the vulnerability of ecosystems

Fish stocks are an integral part of ecosystems and, as such, are both strongly dependent on, and support, the good health of the ecosystem. Altered community structure and marine food webs therefore affect commercial fish stocks, particularly during periods of environmental change. In combination with other environmental impacts, such as pollution, climate change and ocean acidification, the effects of fishing may increase the vulnerability of ecosystems.

What has been done?

Important developments in fisheries management

At the World Summit on Sustainable Development in 2002, OSPAR countries committed to maintain or restore stocks to levels that can produce the maximum sustainable yield (MSY), with the aim of achieving these goals for depleted stocks on an urgent basis, and where possible not later than 2015. All fisheries management regimes in the OSPAR area recognise the need for sustainable harvest rates and that fleet overcapacity needs to be addressed,

Pelagic mid-water trawl, typically used in herring and mackerel fisheries



in particular when stocks are outside safe biological limits. Some of the main developments in fisheries management in the OSPAR area since the QSR 2000 have been as follows:

- The adoption of long-term management plans for several commercial fish stocks. In EU waters, these include recovery plans for cod in the North Sea, Irish Sea and Celtic Sea; plaice and sole in the North Sea; and the northern stock of hake. Long-term management plans for mackerel, blue whiting and Norwegian spring spawning (Atlanto-Scandian) herring have been adopted by coastal states and NEAFC. All these plans include targets for fish stocks to be harvested at fishing mortalities that correspond to MSY.
- The continued management of fisheries in Region I through quota-based systems allocating either a share of the total allowable catch (TAC) or fishing days. This has been complemented by increased use of closed areas both for stock recovery and protection of vulnerable marine ecosystems (VMEs).
- Abolition of some of the financial subsidies that previously promoted excess fishing capacity.
- Increased attention to the management of deepsea fish species. This has included controls on deep-sea fishing effort managed by the EU and NEAFC, including quotas and temporary and seasonal closure of some fisheries, for example NEAFC measures on the pelagic redfish. In 2009, the UN FAO published a set of technical guidelines aimed at helping the fisheries sector reduce its impacts on deep-sea fish species and ecosystems.
- Initiation of a new EU policy on discards in 2007 to reduce unwanted by-catch and progressively eliminate discards in European fisheries. This has included a ban on high-grading in the North Sea from 1 January 2009, which has been extended to other parts of the Atlantic in 2010. Discards have also been banned in NEAFC High Seas fisheries from 2009. These actions will complement the bans on discards that have been in place in fisheries in Region I since the 1990s, in Faroese, Icelandic, Norwegian and Russian waters.
- Steps to address by-catch of marine mammals through the EU Common Fisheries Policy with measures such as acoustic deterrents (pingers) required in certain fisheries. The pelagic driftnet fishery for albacore tuna was banned in 2002 because of high cetacean by-catch. Driftnets are now banned in all EU waters. The EU is developing a policy on by-catch of seabirds and sharks.
- A reform of the ICES system for providing scientific advice on fisheries management. Within the EU, data for management advice are now provided through the new EU framework for data collection and Regional Advisory Councils have been set up to involve fishing industry stakeholders more closely in the decision-making process.

- The call of the UN General Assembly on states and regional fisheries management organisations to take measures to protect VMEs in the High Seas from the adverse impacts of bottom fisheries and to ensure the long-term sustainability of deep-sea fish stocks. In response, several large areas of the High Seas have been closed to bottom fishing by NEAFC for the purpose of protecting VMEs.
- Introduction of various area-based measures across the OSPAR area including closed areas, marine protected areas (MPAs) and gear management areas. Specific examples include closures for the protection of VMEs, such as cold-water corals; implementation of fisheries measures within MPAs; restrictions on the use of bottom gear in certain areas; and bans on the use of gillnets in the deep seas.
- Targeting of illegal, unregulated and unreported (IUU) fishing by sharing of blacklists between regional fisheries management authorities and port states, and improved port state control.
- The emergence of ecolabelling and certification for sustainable fisheries as market-driven initiatives toward sustainable fisheries.

Did it work?

Reductions in fishing fleet offset by increased efficiency

The fishing fleet capacity in the OSPAR area has been reduced. The quota systems used in Region I have helped to cut fleet size and fishing effort. The number of Icelandic demersal trawlers and trawling effort has almost halved since 1990, with a 25% decline in engine power and an equivalent decrease in gross tonnage. In the same period the number of fishing vessels in Norway has reduced by 43%, and fishing fleet tonnage and engine power have decreased by 10%. Efforts to reduce fleet capacity in EU waters have seen a total decrease in vessel numbers of 26.7% in the period 1995 to 2009. Tonnage and power have fallen correspondingly. Reductions in vessel numbers, size and engine power have, however, tended to be offset by technological advancements allowing improved fishing efficiency.

Fishing effort is falling in some areas but increasing in others

In Region I, the closure of large areas in Norwegian waters to fisheries has contributed to a reduction of effort. In the Faroe Islands, the number of fishing days allocated has been cut by 33% since 1996.

Overall fishing effort in Region II fell by about 25% between 2000 and 2006. In the North Sea, beam and otter trawl fishing effort decreased by 31% and 44% respectively between 1997 and 2004, although Nephrops trawl effort grew by 65%. Beam trawling has been increasingly replaced by twin-rigging and



flyshooting, which require less fuel. In the western Channel, fishing effort increased over the period 2000 to 2007, mainly driven by the use of gears that are not covered by effort limitations, and trawl effort is high.

In Region III, there has been a fall in trawl effort in the Irish Sea and to the west of Scotland, but overall fishing effort has stayed high. Some beam trawlers have switched to otter trawling or to scallop dredging, a non-quota fishery.

In Region IV, the number of French vessels fishing in the Bay of Biscay fell between 2000 and 2006, with the exception of liners and gillnetters. However, the fishing effort increased or remained stable for each sector, apart from the anchovy fishery, which was closed from 2005 to 2009. This stability in effort contrasts with an observed decrease in fishing mortality for most fish stocks in the Bay of Biscay. This may be a result of more stocks that are not assessed being targeted or a decrease in fishing efficiency from use of more selective gear.

Management measures for deep-sea fishing effort were first introduced in 2004, including a deepwater licence scheme and TACs. Effort reductions have been in place since 2005. Effort reduction on deep-sea species should lead to a fishing effort level in 2009 which is 65% of the ceiling defined in 2003.

EU effort management regimes cover the major part of the OSPAR area. An assessment of the effectiveness of these regimes is underway. Small beam trawler, typically fishing in sandy areas for flatfish and other demersal species



Landings have fallen overall but trends vary

The total landings of demersal fish, pelagic fish, and shellfish fell between 1998 and 2008 \rightarrow FIGURE 8.3. However, a progressive decrease is only observed after 2002. Between 1998 and 2002 the total catch was more variable with a moderate increase observed between 1999 and 2002. Only in Region V were more fish and shellfish landed in 2008 relative to 1998.

One of the reasons for the overall decline in landings is the definition of more restrictive catch limits. There has, however, been considerable variation across the Regions. In Region I, demersal landings were relatively stable over the period, while landings of pelagic fish and shellfish declined. In Region II, demersal landings continued to increase until 2005, but have since declined such that in 2008 the catch was lower than in 1998. Pelagic catch has decreased throughout the decade. In Region III, pelagic landings fell to a minimum in 2002. Since then there has been a slight increase, but the landings of pelagic fish in 2008 remain lower than in 1998. Demersal landings in Region III have remained relatively constant. In Region IV, landings showed little change. The greatest increase in landings occurred in Region V, with pelagic landings rising from around 0.2 million tonnes in 1998 to over 0.6 million tonnes in 2005. However, since then pelagic landings have fallen to around 0.39 million tonnes. These trends have been mainly due to the development of the blue whiting fishery for which a TAC was agreed in 2005.

Controls on discards are tightening

It is too early to assess the effect of recent action in EU waters on discards, and discard rates have remained high in some EU fisheries until very recently, with, for example, extensive discarding having been reported in many roundfish, flatfish, and Nephrops fisheries in the North Sea and some similar fisheries in Regions III and IV. There are indications that discard rates may have increased where stocks comprise a high proportion of juvenile fish. There has been some success in reducing discard rates in EU Crangon trawl fisheries as a result of measures requiring the use of sorting devices.

In Region I, discard bans have been in place in Norwegian, Faroese and Icelandic fisheries since the 1990s with side-measures that discourage high-grading. Sorting grids have become widely used in demersal fisheries in Region I to limit the catch of juvenile or other stocks. The most successful programmes for reducing discards have been those developed in close collaboration with industry. For example, in the blue whiting fishery around the Faroe Islands, use of sorting grids became mandatory in 2007 to avoid by-catch of saithe and cod. This measure was developed in collaboration with the fishing industry



FIGURE 8.3 Landings from the North-East Atlantic of demersal fish, pelagic fish, and shellfish over the period 1998–2008. Source: ICES Statlant database. and supported by education programmes and grants for equipment. Monitoring suggests that the bycatch has been reduced successfully. Also, OSPAR countries are using surveillance programmes aimed at monitoring the proportion of undersized fish in catches. When the proportion exceeds a certain limit, fishing areas are closed for some time with immediate effect.

Further efforts are needed to reduce by-catch of marine mammals

Despite many efforts to reduce the by-catch of noncommercial species, including sharks and marine mammals, not all measures are efficient. More must be done to reduce mortality and improved observer programmes are needed. Some threatened shark species have a zero TAC in EU waters, but awareness and catch identification can be poor. Some species that were previously fished commercially and which are now seriously depleted, such as common skate in Region III, have become by-catch in fisheries targeting more abundant species. In some cases, markets have developed for former by-catch species (e.g. blue shark in oceanic pelagic fisheries); these species are now considered part of the target catch and are mostly retained.

Harbour porpoises, dolphins and seals are still commonly entangled in fishing gear. Mortality rates for harbour porpoises caught in gillnets, and common dolphins caught in pelagic trawl nets continue to cause concern. Cetacean by-catch rates in the driftnet fishery for albacore tuna were addressed when it was banned in 2002 and driftnets were later banned in all EU waters. However, as a consequence pair trawling has developed in some areas, which also has by-catch implications. Research into mitigation measures is ongoing. Results from the use of acoustic deterrents (pingers) have been mixed \rightarrow BOX 8.1.

Success in reducing IUU fishing in some areas

NEAFC initiatives have enabled fisheries monitoring centres to improve the planning of inspections at sea, and its blacklists and port state control system are efficient tools for combating IUU fishing. Other enforcement initiatives have contributed to combating IUU fishing. Increased cooperation between Iceland, Norway, the Russian Federation, the EU and EU Member States, helped by the NEAFC Scheme of Control and Enforcement, resulted in a large fall in illegal fishing of cod in the Barents Sea from around 100 000 tonnes in 2005 to about 15000 tonnes in 2008 → Box 8.2. Nevertheless, IUU fishing is still known to be taking place in other parts of the OSPAR area, with substantial under-reporting of catches from the southern stock of hake and the southern component of the combined stock of mackerel suspected.

BOX 8.1 Minimising by-catch of harbour porpoises

North Sea EcoQO: Annual by-catch of harbour porpoises should be reduced to below 1.7% of the best population estimate.

Harbour porpoises are small cetaceans found in coastal waters throughout most of the OSPAR area. This species is occasionally by-caught by several types of fisheries, especially those using bottom-set gill- and tangle nets. These nets are otherwise considered to be relatively selective and environmentally friendly and their use is increasing.

There is no reliable information on by-catch numbers in the North Sea, as monitoring programmes are lacking in most gillnet fisheries. In the southern North Sea, up to half of stranded porpoises have been killed incidentally in fishing gear, a rate that justifies concern. The harbour porpoise is an important top predator in the North-East Atlantic and there have been historical declines in some areas. The species is protected under the EU Habitats Directive. The OSPAR EcoQO aims to reduce by-catch in the North Sea to a level that would allow the population to recover to at least 80% of the ecosystem's long-term carrying capacity for this species.

There are two challenges in evaluating whether the EcoQO is met. First, the status and inter-relationships of the North Sea harbour porpoise population units are not well understood; accurate estimates of the porpoise population and abundance numbers are required for all areas in which they occur. Second, further independent monitoring of by-catch must be implemented. Compulsory observer schemes with good coverage and including the use of cameras may be the only way to ensure effective monitoring. Observation should continue after the introduction of mitigation measures.

Catches of marine mammals in the North Sea are now always incidental. Most fishermen do not want such by-catch, not least because of gear damage and slower fishing operations. However, individual fishermen rarely catch a harbour porpoise and so may not consider this a significant environmental problem.

Fishermen have little to gain in providing information on by-catch. Killing and landing of harbour porpoises are forbidden under several jurisdictions. Widespread observations suggest efforts by fishermen to actively conceal by-catch, for example by opening body cavities to sink the carcass. Along the coast of the Netherlands, mutilated carcasses of porpoises are periodically washed ashore, raising public and political concern.

Pingers (acoustic alarms) have been seen as one of the most promising prevention measures. EU Regulation 812/2004 makes these compulsory for bottom-set gill- and tangle nets operated from vessels of 12 m length or over, excluding many smaller vessels. Pingers have been applied under Danish law in cod wreck net fisheries since 2000 and are being trialled elsewhere in the North Sea. However, there are still concerns about their practicality and effectiveness over the long term, about negative impacts from the noise they emit and about the best means of enforcing their use. Designing effective measures must take account of local conditions and fishing practices, and must use the expertise and experience of fishermen.



BOX 8.2 Illegal, unregulated and unreported fishing of cod in the Barents Sea

During 2001, the transfer of cod and haddock from fishing vessels to transport vessels (trans-shipment), which forms part of Russian fishing operations in the Barents Sea (see photo), became subject to a joint Norwegian-Russian operational risk assessment. This concluded that only 45% of all identified cases of trans-shipment were reported to Russian Fisheries Control Authorities. The absence at that time of control agreements between Russia and countries where trans-shipped fish were typically landed (mostly EU countries) left the door wide open for IUU fishing on a massive scale.

Realising that the scale of IUU fishing in the Barents Sea was potentially serious, Norwegian and Russian Fisheries Control Authorities agreed to work jointly towards the prosecution of well-documented cases of landing of unreported catch. Between 2005 and 2007, the Norwegian Directorate of Fisheries submitted 53 such cases to its Russian counterparts, comprising a total of 20 000 tonnes of cod and haddock landed in EU countries, but not reported to Russian Authorities for registering against the quota. Prosecution in Russia led to an impressive number of convictions resulting in several fishing companies going bankrupt or otherwise being dissolved, thereby rendering some 26 fishing and transport vessels passive by the quayside.

In 2005, Norway and Russia agreed to prohibit trans-shipments other than to vessels flying the flag of either NEAFC Contracting Parties or Cooperating Non-Contracting Parties. This frustrated operations by convenience-flagged vessels to the extent that since 2007 illegal trans-shipment has not occurred. In close cooperation with the EU, a port state control scheme has been introduced in the NEAFC framework which enables landings by Russian vessels in EU countries to be closely monitored by the Russian Fisheries Control Authorities. Implementation of this scheme has made a significant contribution to the decline in illegal fishing of cod in the Barents Sea.





How does this affect the quality status? Too many fish stocks are still outside safe biological limits

The status of around 130 commercial fish stocks in the OSPAR area is assessed annually by ICES as a basis for advice to fisheries authorities on the management of fishing. The approach used is to assess individual fish stocks in terms of spawning stock biomass (SSB), representing the total weight of fish in the stock able to spawn, and fishing mortality (F), representing the fishing pressure on the stock. An analysis of 37 stocks covered by ICES in the OSPAR area for which there was an agreed assessment in 2008 showed that around 45% of these stocks had a significantly higher level of SSB in 2007 compared with 1997, while around 60% of stocks had a significantly lower fishing mortality \rightarrow FIGURE 8.4. This analysis shows that the key stock parameters have been moving in the right direction for many stocks suggesting that recent efforts in fisheries management are having the desired effect of pushing exploitation rates downwards. However, a number of the fish stocks considered by this analysis remain beyond safe biological limits according to the ICES precautionary approach.

Within the fisheries management framework the use of SSB and F is guided by defined reference points. These provide an expression of the status of the stock. For SSB, these reference points include a limit reference point (B_{lim}) below which reproductive capacity is considered to be impaired and there is a probability of stock collapse, and a precautionary limit reference point (B_{pa}) which, traditionally, has been the reference point below which stocks are described as being outside safe biological limits. Since 2004, stocks with an SSB below B_{na} but greater than B_{lim} have been described as being at risk of suffering reduced reproductive capacity. Reference points for fishing mortality (F_{lim} and F_{pa}) define whether harvest rates are sustainable; when the fishing mortality of a stock is greater than F_{lim} the stock is being harvested unsustainably. If SSB is kept above the agreed precautionary limit (B_{pa}) it is likely that the point at which there is a serious stock collapse will never be reached. The safest way to achieve this is to keep fishing mortality below the levels that would in the long term result in SSB below the agreed precautionary limit. Over the period 2003 to 2009 the number of stocks assessed by ICES as being outside safe biological limits (i.e. below the precautionary limit B_{pa}) varied from 23 to 28 while



FIGURE 8.4 Proportion of stocks where (A) spawning stock biomass and (B) fishing mortality are significantly different in 2007 compared with 1997 for OSPAR Regions I to IV and for the OSPAR area as a whole. No data for Region V.

8 to 11 stocks were assessed as being within safe biological limits \rightarrow FIGURE 8.5. In 2006, around 20% of fish taken from EU-managed waters was taken from stocks outside safe biological limits.

Improved management of stocks depends on developments in science and data quality

A key limitation in ICES stock assessments is that reference points have been defined only for stocks for which sufficient data are available. Some 48 to 56 stocks were designated as being of unknown status between 2003 and 2009 due to poor data → FIGURE 8.5. Reforms under the EU Common Fisheries Policy have allowed the systems for providing fisheries management advice to become more transparent, to involve stakeholders, and to take into account ecosystem aspects. These are positive developments, but place increasing demands on the fisheries science for information and improved accuracy. ICES advice on these topics is generally followed when setting the TACs for the following year. For many stocks advice is based on weaker scientific evidence and historic catch figures, which give some indication of how the stock develops.

Status of stocks and assessment capacities varies between Regions

In the North Sea, OSPAR has established an Ecological Quality Objective (EcoQO) on commercial fish stocks based on the reference points for SSB. These have been defined for 15 stocks accounting for roughly 20% of total landings in the Region \rightarrow BOX 8.3.



Saithe, Loch Carron, Scotland



FIGURE 8.5 Status of ICES assessed stocks (excluding those in the Baltic Sea) for the period 2003 to 2009. Data source: ICES.

North Sea EcoQO: Maintain the spawning stock biomass above precautionary reference points for commercial fish stocks where those have been agreed by the competent authority for fisheries management.

The OSPAR EcoQO for commercial fish species aims to maintain safe levels of fish species by management of fisheries based on the precautionary principle. The EcoQO is based on evaluations of the status of commercial fish stocks prepared by ICES and used in fisheries management.

The status of SSB in relation to the EcoQO for the stocks for which reference points have been defined is shown below for the period 1998 to 2009. Evaluations of fishing mortality are also shown. Since 1998, there has been an improvement in the status of several fish stocks in Region II, including plaice and hake, which have both been the subject of recovery plans under the EU Common Fisheries Policy.

However, the status of cod stocks throughout the North Sea continues to be of concern, as both SSB and fishing mortality are still on the wrong side of the limits for sustainability. In 2009, SSB for North Sea herring was below the precautionary limit, although fishing pressure has been reduced. Excessive fishing pressure on mackerel (combined stock) increases the risk of SSB moving below the precautionary limit. The North Sea mackerel stock for EU waters, which is assessed within a combined stock, has been considered to be depleted since the 1970s. Herring and mackerel populations play a major role in the structure and function of the North Sea ecosystem. The North Sea and Eastern Channel stock of whiting is among the further eleven stocks in Region II whose status is uncertain either due to a lack of defined reference points or inadequate data.



| Species | Stock | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|--|---|--|--|--|--|----------|----------------------|--|--|--|--|--|--|
| Cod | North Sea, Eastern Channel, Skagerrak | 1 | 1 | 1 | 1 | 1 | ! | 1 | 1 | 1 | Δ | 1 | 1 |
| Cod | Kattegat | 1 | . <u>I</u> | 1 | 1 | 1 | ! | 1 | ? | ? | ? | ? | ? |
| Haddock | North Sea, Eastern Channel, Skagerrak | Δ | Δ | 1 | Δ | ~ | | Image: A second s | Image: A second s | Image: A second s | Image: A second s | Image: A second s | Image: A second s |
| Saithe | North Sea, Skagerrak, west of Scotland | ¥ | Image: A second s | ~ | | ¥ | | Image: A second s | Image: A second s | Image: A second s | Image: A second s | Image: A second s | Image: A second s |
| Hake | Northern stock | Δ | Δ | Δ | | ~ | Δ | Δ | Image: A second s | | | Image: A second s | ¥ |
| Plaice | North Sea | 1 | Δ | | Δ | Δ | Δ | Δ | ~ | ~ | ~ | Image: A second s | Image: A second s |
| Plaice | Skagerrak, Kattegat | Δ | Δ | Δ | | Δ | Δ | Δ | ? | ? | ? | ? | ? |
| Plaice | Eastern Channel | ! | <u>!</u> | ! | ! | ! | Δ | Δ | ? | ? | ? | ? | ? |
| Sole | North Sea | Δ | Δ | Δ | Δ | Δ | Δ | Δ | Δ | Δ | ~ | Δ | Image: A second s |
| Sole | Eastern Channel | Δ | Δ | Δ | Image: A second s | ~ | ~ | Image: A second s | Image: A second s | Image: A second s | Image: A second s | Δ | Δ |
| Herring | North Sea, Eastern Channel, Skagerrak | 1 | Δ | Δ | Δ | Δ | Δ | Δ | Δ | Δ | Δ | Δ | ~ |
| Mackerel | Combined (Western, Southern, North Sea) | 1 | 1 | . <u>I</u> | ! | 1 | ! | ! | <u>!</u> | Δ | ! | Δ | Δ |
| Norway pout | North Sea and Skagerrak | Image: A second s | Image: A second s | Image: A second s | Image: A second s | ~ | ~ | 1 | 1 | ? | ? | ? | ? |
| Blue whiting | Portugal to Norway | Δ | Δ | ! | Δ | Δ | ! | ! | ! | ! | Δ | Δ | Image: A second s |
| Spawning stock biomass Fishing mortality | | | | | | | | | | | | | |
| <b<sub>lim</b<sub> | Reduced reproductive capacity < B _{lim} Harvested unsustainably | | | | | | | | | | | | |
| $>B_{lim}$ and $$ | Risk of reduced reproductive capacity Δ <f<sub>lim and >F_{pa} At risk of being harvested unsustainably</f<sub> | | | | | | | | | | | | |
| >B _{pa} | B_{pa} Full reproductive capacity \checkmark $< F_{pa}$ Harveste | | | arvested s | d sustainably | | | | | | | | |
| | No assessment | | | | ? | | N | o assessm | nent | | | | |

For other Regions, the availability of reference points varies → TABLE 8.2. In Region I, a large proportion of landings are from stocks with defined reference points and only two stocks were not at safe levels in 2009 according to ICES. For Regions III and IV, reference points have been defined for relatively few stocks and other criteria are used to assess a large proportion of the stocks. For example, the stocks of whiting to the west of Scotland and in the Irish Sea are considered to be depleted on the basis of historic catch and landing information. Likewise no assessments of the herring stock to the west of Ireland and in the Celtic Sea have been made in relation to the reference points since 2003, but ICES has recommended either that a rebuilding plan is put in place or that there is no fishing. In 2009, a management plan was put in place for Celtic Sea herring. Some of the recovery plans in these Regions have started to show a positive effect, for example, the status of the northern stock of hake has improved in Regions III and IV, but the poor status of cod in Regions II and III is a continuing concern \rightarrow BOX 8.4.

Most deep-sea stocks in Region V are data poor and analytical assessments cannot be undertaken. Many deep-sea species are particularly sensitive to exploitation as they are slow-growing and slow to reproduce. Some species aggregate around specific



Orange roughy

features, such as seamounts, which make them vulnerable to exploitation. OSPAR has included the orange roughy in its list of threatened and/or declining species. There is strong evidence that some deep-sea fish have been depleted around the continental slope in Region V. Current ICES advice for a number of deep-sea stocks emphasises their continued vulnerability. For example, ICES advised that there should be no direct fishing for blue ling during 2009 and 2010, while fisheries for greater forkbeard, blackscabbard fish and greater silver smelt should not be allowed to expand unless it can be shown that it is sustainable. Long-line fisheries appear to have depleted populations of giant redfish on seamounts of the northern Mid-Atlantic Ridge.

TABLE 8.2 Status of spawning stock biomass for stocks in Regions I, III and IV and widely distributed stocks for which reference points are available based upon 2009 ICES advice.

| | Region I | Region III | Region IV | Widely distributed stocks |
|---|---|---|-----------------------|--|
| Number of stocks where reference points are currently defined | 9 ^a | 8 ^b | 3 | 3 |
| % of landings accounted for by these stocks | 50 | 7 | 20 | |
| Stocks suffering reduced reproductive capacity in 2009 which have had this status for more than three years (SSB <b<sub>iim)</b<sub> | Cod (Faroe Plateau) | Cod (west of Scotland) Sole (Irish Sea) Cod (Irish Sea) | Hake (southern stock) | |
| Other stocks at risk of suffering reduced reproductive capacity in 2009 (SSB <b<sub>pa)</b<sub> | Haddock (Faroe Plateau) | Cod (Celtic Sea) ^c Haddock (west of Scotland) Plaice (Celtic Sea) | Anchovy (Biscay) | |
| Stocks at full reproductive capacity in 2009 (SSB >B _{pa}) | Cod (North-East Arctic) Haddock (North-East Arctic) Saithe (North-East Arctic) Herring (Norwegian spring-spawning) Herring (Icelandic) Capelin (Barents Sea) | Haddock (Rockall) | Sole (Biscay) | Blue whiting (combined stock in Regions I and V) Hake (northern stock) Mackerel |

^a The status of the Faroe stock of saithe in 2009 was unknown.

^bNo assessment of herring stock to west of Ireland and in Celtic Sea since 2003.

^cOn the basis of ICES assessment in 2008. No assessment was possible in 2009.

In 1999, ICES stated that Irish Sea cod and northern hake stocks were outside safe biological limits. ICES advised that fishing mortality should be reduced and that recovery plans should be developed and implemented as soon as practicable for both species. This began the era of recovery plans which were implemented with stakeholder engagement. Stocks are currently managed through a combination of TACs, area closures, technical measures and effort restrictions.

In 2000, the cod spawning grounds in the Irish Sea were closed for ten weeks from mid-February, in order to maximise the reproductive output. Subsequent changes between 2001 and 2003 reduced the closures to the western Irish Sea only, coupled with changes in trawl design to improve selectivity. In 2004 and again in 2008, the EU introduced a new cod recovery plan which established rules for determining TACs and a fishing effort regime. These measures were not effective in rebuilding the cod stock and in 2009 it was still classified by ICES as suffering reduced reproductive capacity and as being harvested unsustainably.

In June 2001, an EU Emergency Plan was implemented for the northern hake stock. Two areas were defined, south-west of Ireland and in the Bay of Biscay, where 100 mm mesh sizes had to be used by all otter trawlers. In addition, a Biologically Sensitive Area was established off the south-west of Ireland where fishing effort was controlled. The recovery plan adopted in 2005, where a target fishing mortality of 0.25 was set, allowed setting of catch limits consistent with stock rebuilding. Recruitment of the northern hake stock has been relatively stable over the past decade, and since 2006, ICES has classified the northern hake stock as being at full reproductive capacity and stated that the fishery was sustainable.

Atlantic cod (upper); northern hake (lower)







Bluefin tuna

Several commercially important pelagic stocks straddle more than one Region. These include blue whiting, mackerel, herring and northern bluefin tuna. Of most concern is the status of northern bluefin tuna in the East Atlantic and the Mediterranean, for which, based on 2008 estimates, SSB has declined by 70% since 1950 with the bulk of this decline having occurred in the past ten years. In 2006, fishing mortality was estimated to be more than three times the level the stock could sustain. It is estimated that catches have been reduced to a level within the TAC set for 2008 following intense verification within EU waters in the Mediterranean. ICCAT has adopted TACs for the period 2009–2011 which continuously decrease, but substantial further reductions are needed to move towards sustainable levels. The distribution of mackerel has changed dramatically in recent years with a northward and westward movement of both immature and mature fish corresponding to changes in sea surface temperature. This presents challenges for allocation of quotas and supporting science.

Some improvements in demersal fish community structure

The structure of fish communities has been affected by fishing, with size composition altered and certain species no longer being found in some areas because mortality rates were unsustainable (e.g. common skate in Region II). Several characteristics of the fish community can be used to indicate its general health, for example, abundance/biomass/productivity, size composition, species richness, species evenness, and average life-history traits (such as age or length at maturity, growth rate or ultimate body length). OSPAR has set an EcoQO to indicate the general health of the demersal fish community in Region II based upon its size composition \rightarrow BOX 8.5. An assessment of bottom trawl data for this QSR shows that - although size composition in the North Sea has not yet reached the level of the EcoQO measurements of the other characteristics suggest that overall the general health of the demersal fish community in the North Sea has improved since 2000.

In Region III, nearly all aspects of the demersal fish community have improved over the past decade, particularly in the north, to the extent that the community is now in a similar state to that observed when data were first available in the early 1980s. The size composition and the abundance/biomass/productivity of the community are, however, still of concern. In the pelagic community in Region III, there has been an increase in smaller pelagic fish as a result of fishing pressure on their predators.

In Region IV, bottom trawl data were only available for the French continental shelf. Most aspects of the fish community are in a poorer state than in the mid-1980s. There have been improvements in lifehistory trait composition and species richness over the past decade, but little change in other indicators.

In Region V, bottom trawl data were only available for the Rockall Bank Plateau area. Species diversity and the size composition of the demersal fish community have improved over the past decade, while the abundance/biomass/productivity has changed little.

Over the past decade the size composition, species richness and species evenness aspects of the demersal fish community have all improved in Regions II,



Mixed demersal trawl ready for sorting

III and V, while only species richness has improved in Region IV. There has been little change in the abundance/biomass/productivity aspects, while Regions III and IV showed an improvement in life-history trait composition. Currently four of the five aspects are generally on parity with the situation prevailing when data in each Region were first available; the exception being the size composition of the community. Here the assessment indicates that, despite recent improvements, a full recovery to earlier conditions has yet to be achieved.

BOX 8.5 OSPAR EcoQO for size composition of fish communities



North Sea EcoQO: At least 30% of fish (by weight) should be greater than 40 cm in length.

The average length of fish in a community can be used to indicate the impact of fishing. This is because larger species of fish and larger and older individuals are more likely to be caught by fisheries than smaller species and individuals. This means that the relative abundance of small and early maturing species increases as a result of overfishing. This effect can be monitored through changes in the average length of fish in the catch per year, using species from the International Bottom Trawl Survey (IBTS) coordinated each year by ICES in the North Sea. The reference period for the OSPAR EcoQO is the early 1980s, a period when stock assessments suggested that stocks were not being overexploited and that fishing was at sustainable levels. Analysis of the Scottish August Groundfish Survey (SAGFS), a long-running survey which ended in 1997, confirmed that 30% of fish at greater than 40 cm in length is an appropriate management target. From the early 1980s, the proportion of demersal fish in the North Sea greater than 40 cm fell from around 30% to its lowest point of less than 5% in 2001. The proportion of large demersal fish has subsequently recovered to around 22% in 2008. This is an improvement, but there is still some way to go to reach the EcoQO.



Physical disturbance has increased in some areas and reduced in others

Heavy towed demersal fishing gears (e.g. beam trawls, otter trawls, scallop dredges) cause considerable physical damage to seabed habitats and communities. They are a major source of disturbance on the continental shelf to habitats such as horse mussel beds, sea-pen and burrowing megafauna communities and Sabellaria spinulosa reefs. Considerable damage has been caused to cold-water corals and seamounts in deep waters with an estimated 30% to 50% of coldwater coral areas impacted in the Norwegian Sea. On the shelf in Region II, beam trawling is reported to have reduced benthic biomass by 56% and benthic production by 21% compared to an unfished situation \rightarrow FIGURE 8.6. Set nets and longlines also affect fragile ecosystems that can take many decades to recover. Some of the remaining fragile habitats have been protected by closing fishing grounds. Although shallower, coarser and higher energy sediments in general recover faster than deeper water muds, trawling on sandbanks has also caused long-term changes.



FIGURE 8.6 Estimated recovery time (years) for southern and central North Sea benthic communities following one pass of a beam trawl (from Hiddink et al., 2006). Recovery is a measure of the time required for benthic production to return to 90% of the production in the absence of trawling disturbance. Impacts of trawling are greatest in areas with low levels of natural disturbance, while the impact of trawling is relatively low in areas with high rates of natural disturbance.



Trawl marks on a Lophelia pertusa reef, Norway

The area disturbed by fisheries has increased in some Regions. This is the case for the Great Mud Bank (Grande Vasière) in the Bay of Biscay (Region IV). In the North Sea (Region II), although there has been a decline in overall hours fished, fishing effort has moved to areas that were previously lightly fished due to closures elsewhere. Nephrops trawling has increased by 65% in some areas. Displacement and changes in the distribution of fishing effort can have significant impacts due to local variations in the sensitivity of seabed habitats to disturbance. This has to be accounted for if large declines in previously heavily fished areas are offset by even slight increases in previously unfished or lightly fished areas.

Fishing activity affects the food web

Changes in fishing activity, discards and fish community structure affect the food web and in turn populations of predators and scavengers. These relationships are complex and often linked to other factors. In Region I, there is a close link in the population dynamics of cod, herring and capelin in the Barents Sea and hence overfishing of one species can have a strong effect on the food web. Currently the management of these stocks is well balanced. The increase in smaller pelagic fish in Region III, as a result of fishing pressure on their predators, has been linked to a decline in abundance of *Calanus* zooplankton. Climate factors are also implicated with an overall decline in zooplankton abundance of 70% in the North-East Atlantic since the 1960s.

In the northern North Sea, there is evidence that the regime shift in the composition and breeding cycle of *Calanus* zooplankton in the 1980s (*C. finmarchicus* progressively replaced by *C. helgolandicus*) has depressed the productivity of lesser sandeel. The breeding success of black-legged kittiwake in the northern part of Region II appears to be linked to variation in local sandeel abundance, and is susceptible to being depressed as a result of industrial fishing activities.



The distribution of seabirds at sea is influenced considerably by the supply of discards that are used as food for some scavenging species. In Region IV, a strong link has been shown between the demersal fishing fleet in the Gulf of Cadiz and the Cantabrian Sea and the distribution of scavenging seabirds.

There are indications that fishing has affected the genetic evolution of a number of fish species in the OSPAR area, particularly with regard to the onset of sexual maturation (cod in the North-East Arctic and cod, haddock and plaice in the North Sea), but there is no overall assessment of the effect on all exploited stocks.

What happens next?

Further efforts are needed to address the many problems that remain

Since the QSR 2000, the fishing industry, governments and marine organisations have made considerable efforts to move towards a sustainable fishing industry, both at a local scale and at an OSPAR-wide scale. Improved fisheries management for some stocks has resulted in improvements in spawning stock biomass (SSB) and lower fishing mortality for some stocks, especially in Regions I and II. Nevertheless, commercial fishing is still exploiting stocks that are outside precautionary limits for SSB and there has been little or no change in the number of stocks whose status cannot be assessed due to poor data. Fishing mortality continues to exert excessive pressure on marine ecosystems through the removal of non-commercial species, discards and physical disturbance of the seabed. In the North Sea, the size composition of fish communities has improved, but still remains below the target value set by the North Sea EcoQO.

OSPAR is committed to supporting improvements in fisheries management

Fisheries management must continue to improve. This can only be achieved through continued cooperation between the regulatory bodies, advisory organisations, the fishing industry and other stakeholders. OSPAR is committed to promoting and facilitating cooperation between itself and the competent authorities for fisheries management in the OSPAR area, namely, the EU, NEAFC, ICCAT, the Faroe Islands, Greenland, Iceland, Norway, and the Russian Federation. This will include sharing information and work towards each organisation's respective aims. These aims will then become more closely related through the use of an ecosystembased approach to management, including fisheries.

OSPAR and OSPAR countries should cooperate with the relevant fisheries management authorities with the following aims:

- Promote further the mutual integration of fisheries management with ecosystem-based management of the North-East Atlantic by its implementation being made compatible with the broader integrated management tools also applicable to a wider set of human activities in the OSPAR area.
- Promote consistency, where applicable, between current EU, Faroese, Greenlandic, Icelandic, Norwegian and Russian Federation fisheries legislation and long-term management plans with OSPAR EcoQOs and the developing descriptors of good environmental status under the EU Marine Strategy Framework Directive.
- Ensure that fisheries are managed in a sustainable manner in the context of the EU Common Fisheries Policy, so as to underpin OSPAR's long-term aims for protecting and conserving biodiversity and ecosystem functioning in the North-East Atlantic.



 Collaborate on the development of management regimes that meet fisheries management, nature conservation and environmental objectives and the objective of the EU Marine Strategy Framework Directive to take measures to reach good environmental status in EU waters by 2020.

OSPAR countries should cooperate in working towards improved assessment of the effects of fishing on the marine ecosystems of the OSPAR area, with a view to supporting improved fisheries measures which will contribute to the good environmental status of the marine environment across the OSPAR area. This will require collaborative efforts with the competent authorities for fisheries management and the fishing industry. Key issues on which OSPAR needs to support the work of fisheries management bodies include the following:

 Reductions in fishing pressure that allow the most depleted stocks to recover and slow the rate of fisheries-induced evolution. These should take full account of technological improvements.

- Developments in scientific support for fisheries management including methods for assessing a greater range of single stocks, including where appropriate reference points, and multi-species interactions.
- Further development of policy on discards and supportive measures on selective gears and new fishing techniques.
- Effective minimisation of by-catch, including of threatened and/or declining sharks, seabirds and marine mammals.
- Improved information on deep-sea species, so that the management of these species takes into account the special vulnerability of both the species exploited and their habitats.
- Development of fishing techniques and approaches that prevent negative impacts on vulnerable habitats and allow recovery of these habitats where possible. This should include consideration of the use of environmental impact assessment approaches to identify and mitigate possible impacts arising from the expansion of fishing into new areas.

→ LEGEND: BACK-COVER FOLD-OUT

| OSPAR Region | Status of commercial fish stocks | Fishing pressure 1998–2008 | Outlook for pressures | Key issues |
|-----------------|----------------------------------|-------------------------------|--------------------------|---|
| Region I | Some problems * * * | Ŷ | Ť | Damage to seabed habitats Deep-sea species |
| Region II | Many problems * * * | Ţ | Ţ | Status of cod stocks Improved assessment of whiting and other stocks needed Discards Damage to seabed habitats By-catch of marine mammals |
| Region III | Many problems * * * | Ţ | Ţ | Status of cod and sole stocks (Irish Sea) Improved assessment of herring and other stocks needed Discards Damage to seabed habitats By-catch of marine mammals |
| Region IV | Many problems * * * | Ŷ | Ţ | Status of bluefin tuna and anchovy stocks Improved assessment of several stocks and mixed fisheries needed Discards Damage to seabed habitats By-catch of marine mammals IUU fishing |
| Region V | Some problems ★ | ſ | ? | Status of bluefin tuna stocks and deep-sea species Damage to deep seabed habitats Discards |

Regional summary of environmental impacts from fishing

MARICULTURE

Mariculture is a growing activity with potential to cause substantial environmental damage if not properly managed. OSPAR Contracting Parties should cooperate to keep broader scale effects under review as the industry develops.

Key OSPAR assessment

→ Environmental impact of mariculture

Mariculture is the cultivation of marine organisms such as fish and shellfish for food and other products. In 2006, almost 1.5 million tonnes of farmed fish and shellfish were produced in the OSPAR area representing 4.2% of world mariculture production \rightarrow FIGURE 8.7. Since 1998, production of finfish in the OSPAR area has increased by 57% mainly due to increased production in Regions I and II \rightarrow FIGURE 8.8. Shellfish farming, which is most intensive to the south of Region II and in Region IV, remained stable over the same period.

There are many concerns linked to mariculture, both in relation to rearing practices and to the widespread exchange and movement of eggs, embryos and seed, especially when different eco-regions are involved. Examples of these concerns include genetic interaction between farmed fish and wild stocks, transfer of parasites and diseases, spread of nonindigenous species, and dependence on industrial catches of wild fish to feed fish in mariculture. There are also concerns over a number of site-specific impacts from mariculture facilities, including:

- Eutrophication as a result of nutrient enrichment from feeds and effluents.
- Competition between escaped farmed fish and wild stocks for spawning grounds in freshwater habitats.
- Release of chemicals used to prevent fouling of equipment or to treat parasites and diseases.
- Displacement of bird and seal populations as a result of the use of scaring devices to discourage predation of farmed fish.
- Impacts from the harvesting of shellfish and from seed collection for mussel farming.

Measures are in place to reduce impacts

OSPAR recommends best environmental practice (BEP) to reduce inputs of potentially toxic chemicals from aquaculture use. In addition, measures under OSPAR's Eutrophication, Hazardous Substances and Biodiversity and Ecosystems Strategies provide a means to monitor, assess and regulate the impacts of mariculture. Various national and EU measures address the pollution and biodiversity impacts of mariculture. There are also international risk assessment protocols developed by ICES for assessing the risks of using non-indigenous species in aquaculture.



FIGURE 8.7 Finfish and shellfish production in the OSPAR area in 2006.



FIGURE 8.8 Finfish production in the OSPAR Regions (1998-2006).



Bouchots for mussel culture



Finfish farming cages



Oyster trestle culture

Use of hazardous substances has been reduced

Although OSPAR's recommendations on BEP for the reduction of inputs of potentially toxic chemicals from aquaculture use are not fully implemented in national legislation, the aims do seem to have been taken up by national or EU legislation. Increased use and development of vaccines has considerably reduced the application of antibiotics in mariculture. Tributyltin (TBT) in anti-fouling agents for mariculture equipment has been replaced by copper-based substances. Concern has been raised about possible increases in the release of copper, especially in Regions I and II. It is likely, however, that apparent increases are actually an artefact of better monitoring and reporting and that the actual usage of copper may have even reduced.

Effects on wild populations need better understanding

Lice from farmed salmon have been linked to the decline in wild salmon and sea trout near salmon farms, but further evidence is needed to make a direct association. In 2007, the contribution of escaped salmon from mariculture to national catches in the North-East Atlantic was around 15% in Norway, but less than 2% in most other OSPAR countries. The main risks associated with escape of farmed fish are the displacement of wild fish and genetic interactions. An expansion of mariculture with a focus on carnivorous fish species is likely to increase demand for feed derived from industrial fishing of wild stocks. These issues show the need for a better understanding of interactions between fish farming and wild fish stocks.

Climate change may increase introduction of non-indigenous species

Increased sea temperatures have the potential to change the areas where introduced species can become established. Pacific oysters, introduced into the OSPAR area as a mariculture species, have established wild populations in France and as far north as Denmark and Sweden – areas previously thought too cold for them to reproduce. These introductions can lead to displacement of indigenous species with consequences for associated fauna.

Wider impacts should be kept under review

Mariculture activities are very diverse and impacts are site-specific. Regulation and control therefore need to be focused on a case-by-case approach. OSPAR countries should continue to implement the measures that are already in place to mitigate impacts from mariculture. OSPAR needs to keep under review the wider impacts, such as nonindigenous species, impacts of sea lice, escaped fish and increased demand for industrial fisheries, especially in the event of substantial increases in mariculture activities. If necessary, coordinated management may then be required. The need to adapt mariculture management approaches to climate change should also be reviewed.

→ LEGEND: BACK-COVER FOLD-OUT

Regional summary of past trends and outlook for mariculture

Change of activity in 1998-2008 Outlook for change in activity Main pressures П Ш IV Ш Ш IV Υ T Υ ተ ↑ Introduction/spread of non-indigenous species, genetic modification, habitat damage, habitat loss, contamination

HUNTING OF MARINE MAMMALS

Hunting of marine mammals is carried out only by northern OSPAR countries (Norway, Iceland, Faroe Islands, Greenland) and the Russian Federation, and is subject to management measures and monitoring. There is no evidence of major environmental problems, if these activities are properly carried out within the relevant management plans.

Local subsistence hunting as well as commercial whaling and sealing have a long history in the OSPAR area, especially in Region I. In the 17th century, hunting for bowhead and northern right whales brought these species to very depleted levels, with only occasional bowhead whales now being seen east of Cape Farewell in Greenland. Modern whaling, which began off the coasts of northern Norway during the 1860s targeting fast-swimming fin whales, was based on bringing killed animals to land stations for processing. This industry declined at the beginning of the 20th century as stocks of the large whales, and in particular the blue whales, in the OSPAR area were depleted and the focus on large whaling moved to the Southern Hemisphere.

Management aims at a sustainable yield

Today's hunting for marine mammals in the North-East Atlantic is limited to participation by Norway, Iceland, Faroe Islands, Greenland, and the Russian Federation. National monitoring programmes are in place for most hunted populations. Results from these programmes are reviewed by international bodies which recommend quotas and management actions as appropriate: the International Whaling Commission (IWC) for large whales, the North Atlantic Marine Mammal Commission (NAMMCO) for cetaceans and seals, and ICES for the ice-breeding seal species, harp and hooded seals. All current commercial hunting of marine mammals within the OSPAR area is under a management scheme which aims at sustainability and low risk of depletion of populations. Species for which no quotas are set are protected. Current hunting practices are therefore not thought to be a threat to marine mammal populations in the area, however, environmental problems such as by-catch in fishing gear, pollution and disappearing habitats may be a challenge for future management.

Commercial sealing is well within quota

Commercial sealing is carried out by Norway and the Russian Federation in the Jan Mayen area of the Greenland Sea (the West Ice) and in the south-eastern Barents Sea (the East Ice), including the White Sea. These areas play important roles in the breeding and moulting annual cycle of harp seals (both areas) and hooded seals (West Ice only). Stocks are subject to monitoring programmes and recommended catch quotas are based on advice provided by ICES. Currently, the harp seal stock in the West Ice is increasing, while the East Ice harp seals have shown a decrease in pup production since 2003. Actual catches taken from these stocks in recent years are only 3% to 7% of the recommended quotas, indicating a decreased interest in participation. The West Ice stock of hooded seals has experienced a continuous decline in abundance since the Second World War, and from 2007 onwards the commercial catch quota for this species has been zero. A small number have been taken for scientific purposes. Harbour seals and grey seals are exploited on the Norwegian and Icelandic coasts (Regions I and II) by local hunters. In Norway, quotas are set by national authorities, usually at 5% of the current abundance estimates.



Commercial whaling is carefully managed

Minke whales and fin whales have been harvested in Regions I and II by Norway and Iceland for many decades. After the IWC introduction of a moratorium (zero catch quota) on all commercial whaling after 1985, a period of high research activity followed to develop management procedures and monitoring programmes to establish a common basis for management decisions. The Scientific Committee of the IWC has developed a Revised Management Procedure (RMP) which is designed to balance long-term yield with an acceptable risk of depletion, combined with a protection level below which all quotas are set to



Fin whale alongside catcher boat, Hvalfjordur, Iceland

zero. The RMP has been implemented for North Atlantic minke whales and used for quota calculations since Norway resumed minke whaling in 1994 and Iceland in 2006. A survey programme ensures that the North-East Atlantic is covered by partial surveys over a six-year period, thus supplying abundance estimates of minke whales for use in RMP catch quotas on a regular basis. The most recent abundance estimate (survey period 2002–2007) in the areas harvested by Norway is 108 000 minke whales, which is similar to previous estimates (1995: 118 000; 1996–2001: 107 000). The RMP catch quota for 2009 was set at 885 minke whales. Iceland has set a catch quota of 150 fin whales each year for the period 2009–2013.

Local hunting in Greenland and the Faroe Islands

In addition to the commercial hunting activities described above, there is also traditional or local hunting in some parts of the OSPAR area. This is of particular importance off East Greenland where subsistence hunting for ringed, harp and bearded seals, walruses and small cetaceans takes place. Catch and species are monitored and minke whales are managed under the aboriginal subsistence scheme of the IWC. On the Faroe Islands, long-finned pilot whales have been caught in a traditional drive fishery for centuries, with annual catch records dating back to around 1600. The Faroe Islands are at the northern range of long-finned pilot whales, and the catch statistics indicate widely fluctuating availability with a long-term mean annual catch of around 900 animals. A best estimate of the North Atlantic stock of pilot whales is 778000 animals and is based on survey data from around 1990.