SEAFISH

Fishing UK:

past, present and future

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1. Introduction

This note aims to help readers to better understand what's happening in the UK fishing industry. This is to reassure buyers that UK-caught fish can, and should, be a component of the supply chain. The various sections here describe the modern catching sector, explain how the industry is coming to terms with new responsibilities and shows how it's playing its part in the stewardship of the marine environment.

Fishermen are some of the most resourceful individuals around. From the earliest times they have had to deduce what's happening under the water and find ways of making a living out of our fish resources. Historically this was without much knowledge or understanding of the impacts that fishing might be having on fish stocks or the wider marine environment. Towards the latter part of the last century the information base improved and our understanding increased dramatically. Fishing now has to take account of new knowledge and the interests of other stakeholders.

Understanding how and where different fish species live was the basis for the evolution of several broad categories of fishing gear:

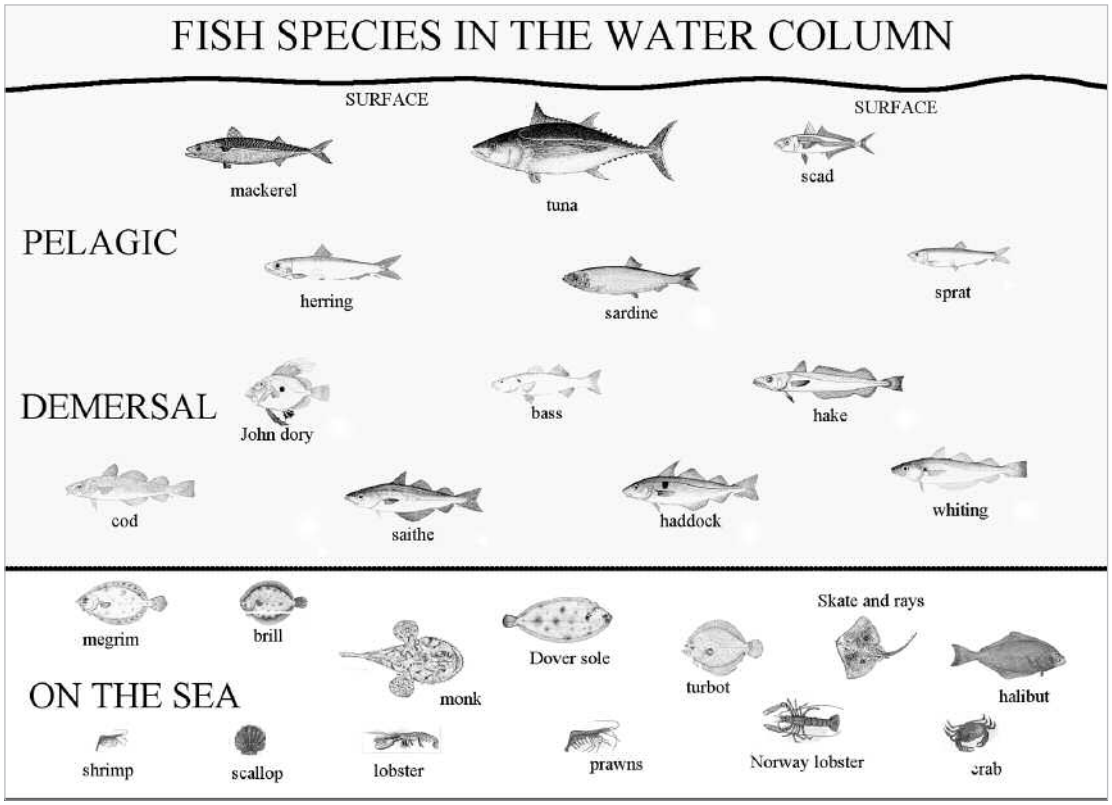
- pelagic fish swim freely in the water column, often forming dense shoals;
- demersal fish live close to the seabed. Some do shoal but many do not; and
- benthic species, including many shellfish, live on or in the seabed.

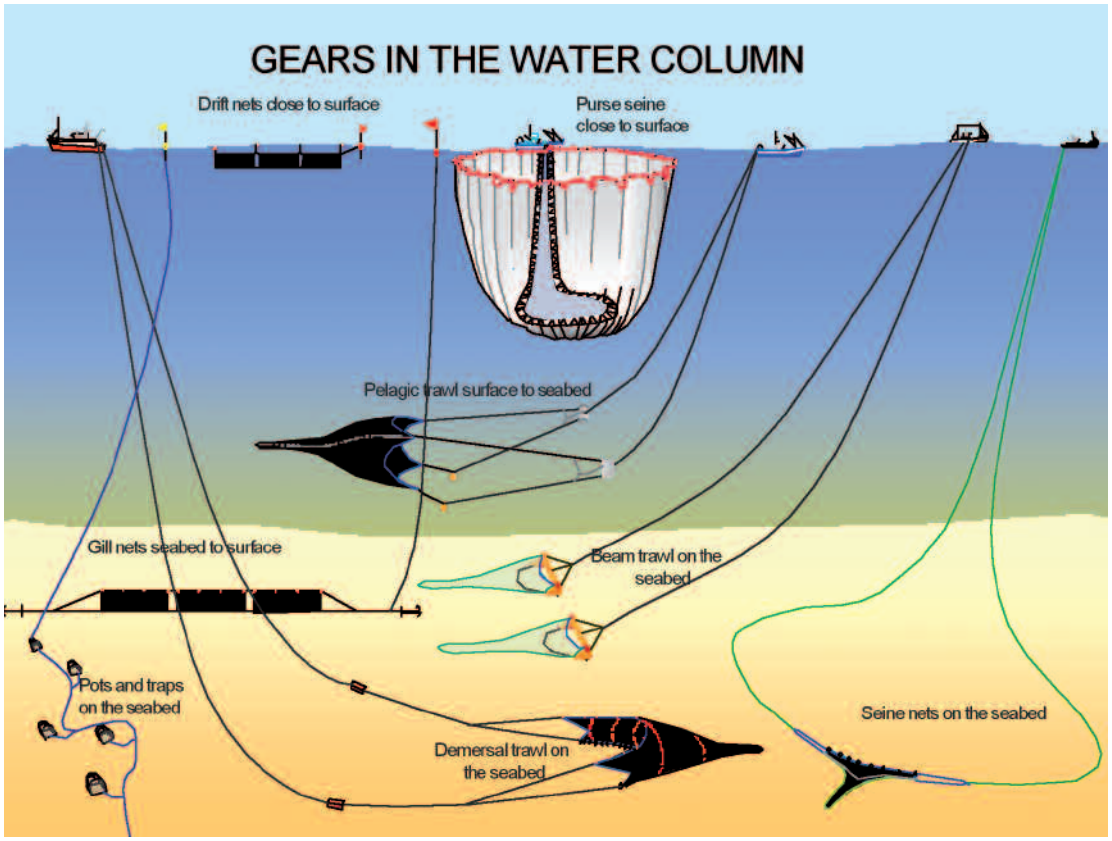
Capturing fish can be by:

- active gears that are used to chase and often concentrate fish. The development of fish finding technology made active gears much more effective from the 1950s onwards;
- encircling gears that herd and surround fish;
- passive gears that can either entice fish with bait, or be placed in their path; and
- other methods that may target individuals or groups of fish, for example lift nets and harpoons.

Compared to active gears, passive fishing methods generally use less energy, are more selective in what they catch and have less unwanted environmental impacts.

Fish distribution and gear types are shown in figures 1 and 2.





Figures 1 & 2: The distribution of fish species in the water column and the corresponding designs of fishing gears

2. Fishing and the environment

Many people don't realise how dynamic the marine environment is. Within the food web species are constantly competing with each other, eating others, becoming food and so on. Slight changes in environmental conditions often favour one species over others and its population can increase several-fold. One of the most extreme examples is haddock. The breeding success – and survival of juveniles – can easily vary 10-1000 fold from one year to the next. The problem is that we can't easily predict what's likely to happen in the future and this can make fisheries management a very uncertain process.

Fishery managers try to adjust a factor called 'F', or fishing mortality, so that the fleet takes an appropriate proportion of the stock of each species each year. Of course there's a difference between setting a target and knowing whether on not it's been met. Fishing can result in discards, or some other 'unaccounted mortality', that isn't taken into account. Where this does happen it's important to involve fishermen in the process so that 'F' can be counted as accurately as possible.

3. Fishing profiles

Active gears, also known as towed gears, are typified by trawls. They also include dredges and some other gears. The first reference to trawling is from a petition to Edward III in 1376 complaining of the "subtlety contrived instrument called the wondyrchoum". The development of steam, then diesel, engines followed by position fixing, acoustics and hydraulics resulted in a huge build up of effort through the 20th century. This was recognised as a problem in Europe in the 1980s and effort levels have now reduced very substantially. Figure 3 shows how the number of vessels has changed over the last few years.

A typical bottom trawl is shown in figure 4. This trawl system has several components, each of which can affect the catch composition and other impacts of the gear:

- the warps can influence fish as they transmit ship noise and vibrate;
- the otter boards start the process of 'herding' fish in towards the trawl path. They do this by generating a 'sand cloud' that runs down the sweeps and looks to fish like a barrier;
- the sweeps and bridles continue herding fish towards the mouth of the net;
- the wings and ground gear then minimise the escape opportunities for fish and, usually after they have tired, they drop back into the body of the net; and
- fish pass through the extension piece and into the cod end. Devices to vary the selection of fish – by size or species – are most commonly placed in this part of the net. Some of these are described in section 5 below.

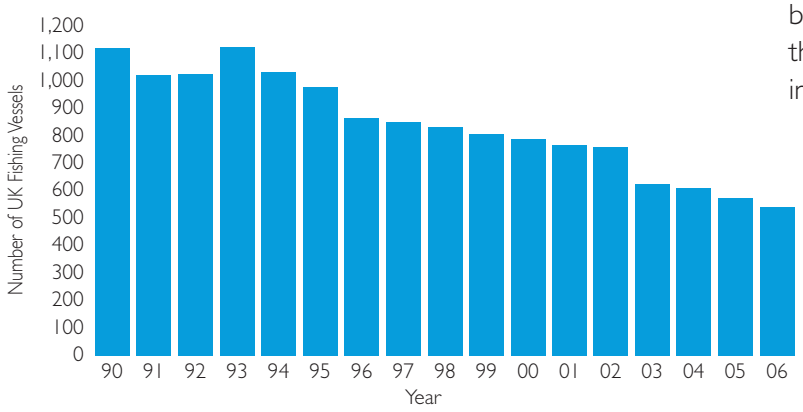


Figure 3: The evolution of the UK fishing fleet since 1990 *(Source: Defra Fisheries Statistics Unit)*

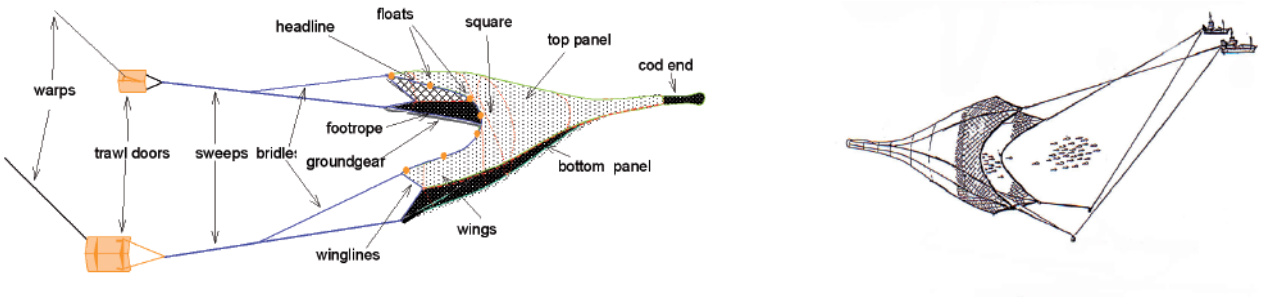


Figure 4: A typical bottom trawl and, right, a pelagic trawl

The illustration of the trawl shows that some parts will normally be in contact with the sea bed – particularly the otter boards, sweeps and ground gear. They will usually have some impacts on the non-target creatures in their path and on the physical structure of the sea bed. This aspect is also explained in section 5.

There are other types of mobile gears that work on the seabed. Beam trawls are designed to catch flatfish species that may be partially buried, usually in sandy ground. Dredges are used to collect bivalve shellfish like scallops and mussels that are on, or partially buried in, the seabed.

Trawls are also used in midwater for pelagic species like mackerel and herring. Here, apart from removing the target species, their impacts are generally restricted to some bycatch species (see section 5, below).
A pelagic trawl is included in figure 4 above.

Concerns about the impacts of beam trawls and dredges are often based on the assertion that they are very damaging to the seabed and wreck one area then move to another. The reality is that each of these methods is only used on specific types of seabed. Figure 5 shows where beam trawlers work off SW England and in the southern North Sea. The maps are based on around ten years of data and show that these boats work the same grounds, year after year, and that those grounds remain productive – there would be no point in returning to catch no fish.

Encircling gears are mainly used in midwater but some types are also used on the seabed. The purse seine shown in figure 6 is the most sophisticated version of a family of gear types that have evolved over more than 50 years.

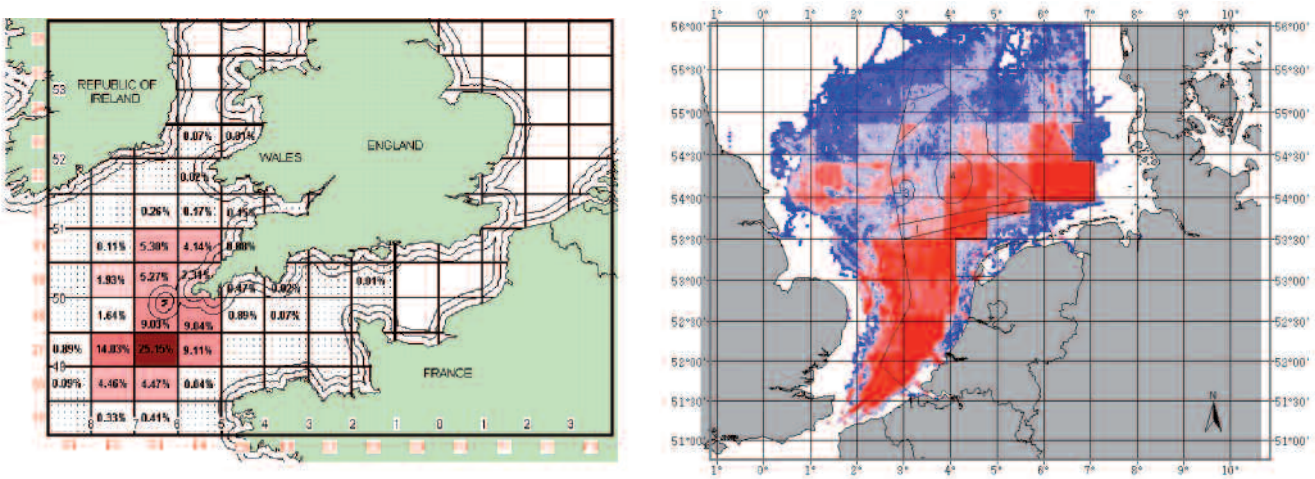


Figure 5: The historical distribution of beam trawling effort in the Celtic and North Seas

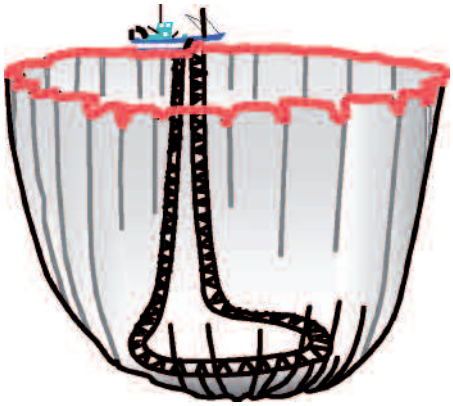


Figure 6: Purse seine

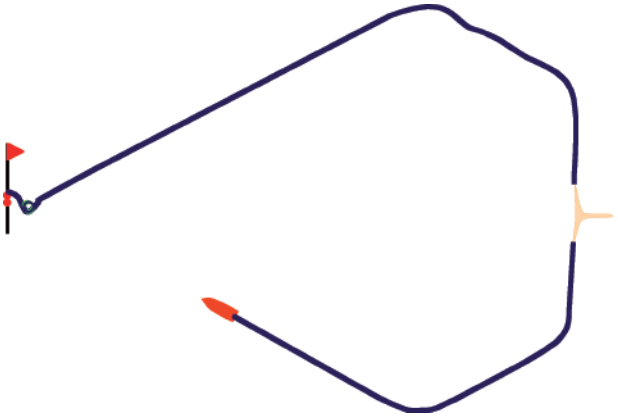


Figure 7: Scottish seine

The purse seine is used to surround a shoal of midwater fish with a curtain of netting. The ends and bottom of the net are then drawn in using a pursing wire so that the fish are confined in a smaller and smaller volume. When the purse seine is fully 'dried up' the fish are transferred to the catching vessel.

The seabed version of this gear type is the Scottish seine shown in figure 7. This fishing gear is regaining its popularity for catching some species because it can produce very high quality fish and has quite low seabed impacts.

Passive gears comprise three main types. 'Gill net' is the generic term for fixed nets that can be deployed on or off the bottom; for trammel and tangle nets that are anchored on the seabed; and for drift nets that are generally used somewhere near the surface. Baited traps are mainly used in the UK to catch shellfish such as crabs and lobsters but can also be used for fish. In the UK baited hooks on longlines are used, mainly on the seabed, to catch fish like cod, haddock and dogfish. Elsewhere they may be used for a wider variety of species both on the seabed and in midwater.

Each of these is shown in figure 2 and the Seafish website can provide more details. For those wanting a better understanding of fishing gear technology see pages on the Seafish B2B website: http://www.seafish.org/b2b/info.asp?p=173

These passive gears are also known as 'static gears'. They rely on fish encountering them as they move across their range or being attracted to them by the use of bait. They generally have a minimal impact on the physical environment but may take non-target species.

In some fisheries passive gears can become lost and then continue to fish. This phenomenon is known as 'ghost fishing' but it occurs only rarely. Seafish has led many years of research into this issue and found that the only serious problems occur when gill nets are lost in deep water fisheries – generally fishing at depths greater than 200m. The Seafish report on ghost fishing can be found here: http://www.seafish.org/pdf.pl?file=seafish/Documents/FANTARED%202%20COMPLETE.pdf

Other commercial fishing gears don't fit easily within these three categories. These include hook and line methods that are either towed through the water (trolls) or actively 'jigged' vertically by mechanical or human effort. Divers may hand gather shellfish like scallops and there are also many intertidal shellfish fisheries that involve hand gathering.

Trolling and jigging are shown in figure 8.

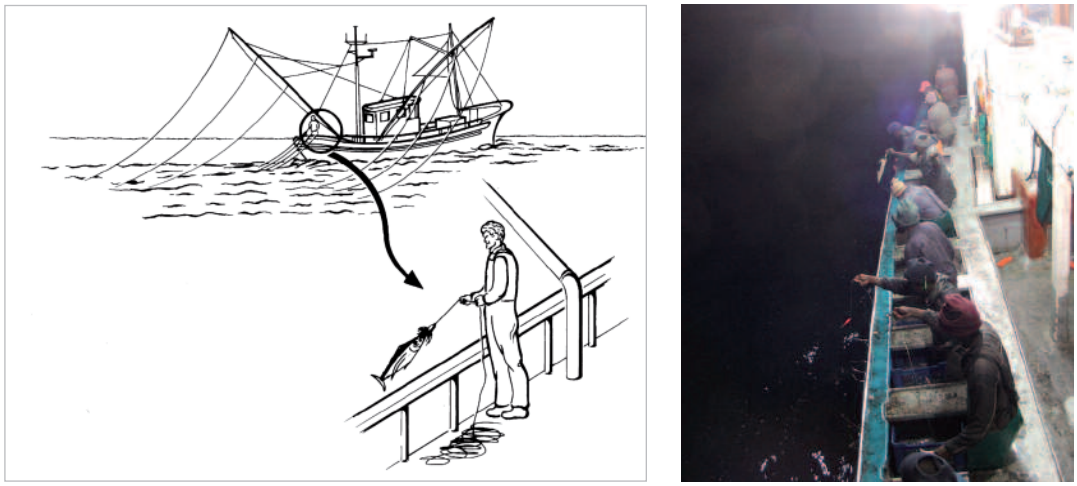


Figure 8: Trolling and jigging

Recreational fishing is also worth mentioning here, for two reasons. Firstly it can have a significant impact on overall fishing mortality; secondly there are many unregistered operators who claim to be 'recreational' but who, in fact, sell their catches illegally. Gears used by this sector are predominantly the hooks and lines of anglers but some recreational fishing involves the use of static gears like gill nets and traps.

The impacts of all these methods vary widely but they fall quite easily into two main categories. Firstly, as noted above, active gears can impact on the physical nature of the seabed and the communities of species that grow or live in or on it. The extent of these impacts is related to the nature of the seabed and the energy levels that normally affect it. For example in relatively shallow areas of 'clean' ground where tidal currents or wave action are strong, fishing impacts may be very similar to these natural disturbances. On more rocky 'hard' grounds that may also provide more sheltered conditions, seabed communities become more complex and more vulnerable to disturbance from towed fishing gears.

The major impacts occur when the seabed is first exposed to towed gears. Most of our inshore areas have been subject to fishing impacts for many decades, or even centuries. This is similar to the situation on the land where there are very few areas where pristine conditions still prevail. If fishing effort is controlled at a level agreed to be appropriate, then the same criteria can be used in the marine environment as have been applied ashore for many decades.

The second major type of impact from fishing is on the various species that are caught or otherwise affected by fishing operations. As well as the target catch these may include:

- the 'bycatch' of creatures that have been caught unintentionally. These may or may not have some commercial value and may include 'charismatic' species like dolphins and porpoises, birds and turtles. It may also include undersized commercial species;
- discarding of species that may be taken in fishing gear but that have little or no commercial value to the fishing operation. It's worth noting though that discarding has actually increased the food supply for some bird species – to the extent that reduced fishing activity may have resulted in some increases in bird mortality. It's a complex situation;
- the mortality of species that may escape from the gear but be damaged or traumatised in some way and so be more vulnerable to predation or disease; and
- more general changes to the marine ecosystem. Catching fish generally removes many more of the larger individuals in a population than the small fish. This leads to changes in the age structure of the population, as shown in figure 9. The population is weakened by this process because the larger, older fish are more successful at breeding. Taking out target species can also change the relationship between them and other species.

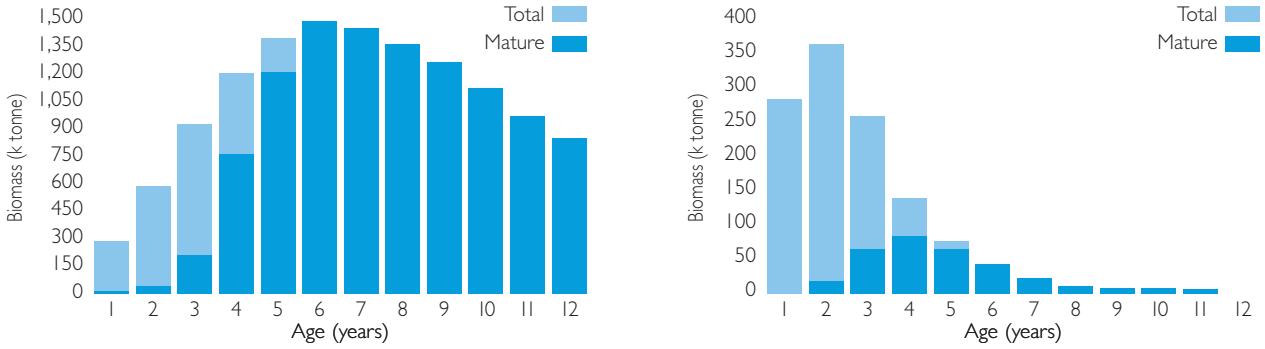


Figure 9: The age structure of unfished (left) and fished (right) stocks of cod

Much of the current debate over fishing impacts focuses on these aspects but we have to bear in mind that all human activity disturbs natural systems to some extent. On the land we accept a relatively high level of disturbance. At sea we still have to agree what is acceptable whilst maintaining the availability of seafood as a very healthy source of nutrition.

4. The recent evolution of the industry

Section 3 and figure 3 showed how fishing effort has changed over the last few years. Many technical developments took place in an era when fisheries management wasn't a well-developed discipline. And many countries subsidised the expansion of their fleets. Much of this occurred in the 1970s and 80s. In our Northeast Atlantic region this also coincided with a period when the stocks of cod and related species were at an exceptionally high level. This combination of factors resulted in an excess of fishing capacity targeting stocks that were reducing to a more 'normal' level. The result, for these and other, 'bycaught' stocks, was over-exploitation and their falling to historically low levels.

During the 1970s the United Nations also agreed the validity of 200 nautical mile fishery limits. The result was that ports like Hull, Fleetwood and Aberdeen, that had relied almost exclusively on distant fishing grounds, almost collapsed. Their vessels had nowhere else to fish. From this point on the structure of the UK fleet started to change. This process accelerated as the UK joined the European Union and had to comply with the imperatives of the Common Fisheries Policy.

The impact of these changes on the UK fleet structure was substantial. The Government's strategy was to build capacity in the inshore and middle water fisheries to maintain supplies of UK-caught whitefish. Most subsidies went into building a specialised whitefish fleet operating in the sea areas within what were now European waters.

The increasing capacity of these fleet sectors was matched by technical developments that meant that previously unfished areas could be exploited. This, and the availability of grants and cheap loans meant that catch rates and profitability could be maintained, even as overall stock levels were falling.

Finally, from the late 1980s, it was accepted that there was overcapacity throughout the European fleet. There was a need to improve selectivity and to reduce wastage through discarding. Awareness of environmental issues was on the increase along with a major re-think of fisheries management.

All of these aspects have been addressed in the UK both unilaterally and within the framework of European shemes. Vessel decommissioning in particular has had a massive effect on fishing capacity. For example the Scottish whitefish fleet alone contracted by 65% between 2000 and 2004 and this was on top of previous effort reduction.

The onshore sector was also changing rapidly. Ownership within the supply chain was consolidating, imports were increasing rapidly, and the multiples were replacing small fishmongers as the major retailers of wet fish as well as frozen.

A smaller fleet and consolidation of the onshore businesses, combined with greater awareness of environmental issues, made it possible for market feedback to influence the whole supply chain much more easlily. As a result, the rate of change in the seafood industry has increased rapidly.

1960s 50 foot seine net vessel

1970s 55 foot seiner/trawler

1980s 65 foot seiner/trawler

1990s 60 foot steel, fully shelter-decked trawler

Figure 9: Graphics showing the evolution of vessels

5. The changing face of fishing

Environmental concerns are part of all our lives now and fisheries are no different. Fishermen understand very well that they have to be a part of the movement to manage marine resources better; they have both to act responsibly and to be able to demonstrate that this is happening.

As noted above levels of fishing effort have fallen dramatically over the last 15 years. Management is also becoming far more sensitive to the needs of each fishery so that the most appropriate conservation measures can be used.

Technical conservation measures is the term used to describe the various ways of controlling fishing effort – so called 'input measures'. These measures are usually aimed at reducing bycatch.

Bycatch can be regarded simply as the unintended catch in any fishery. It is the capture of species other than those for which the gear was intended. It includes economic and regulatory discards, ie those that have no commercial/market value and those that are prohibited from being landed/retained as a consequence of fisheries rules and regulations. However, in some fisheries the bycatch may have commercial value.

Technical measures can range from closing areas to fishing, either very short term, seasonally or long term; through modifying fishing gears to be more selective, avoiding or releasing non-target fish; to regulating vessels' size, power or how many days they are allowed to fish.

For many years minimum mesh and landing size (MMS and MLS) regulations and some zoning of fishing areas were almost the only means of managing fisheries. The use of MMS and MLS were fine when fisheries predominantly caught one species but they have been problematic in mixed fisheries. One mesh size cannot retain fish of a number of different species over their respective MLSs. This is a major reason why discarding is more common in mixed fisheries than from those targeting just one or two species.

As a result of this Seafish and others in fisheries research institutes throughout the world have been developing technical measures for several decades aimed at reducing bycatch. With all types of gears, active and passive, there are many ways of achieving this but they all fall into two main categories:

- excluding devices, that avoid the capture of certain species; and
- helping unwanted catch to escape alive once it has been caught.

Some examples of the technical measures developed to achieve these benefits are shown below in figures 10 to 13.

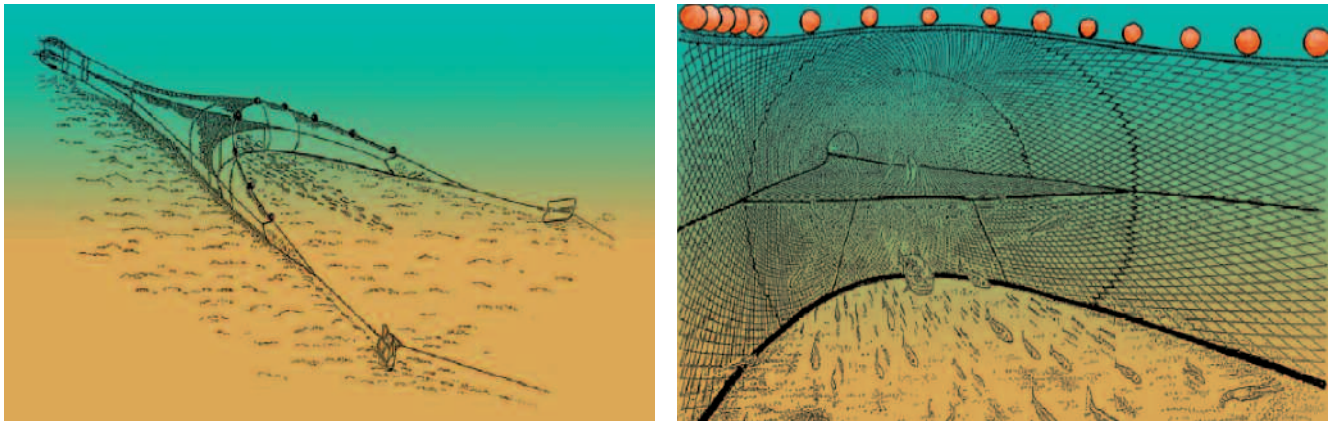


Figure 10: Views of a separator trawl. Some species rise up ahead of the panel

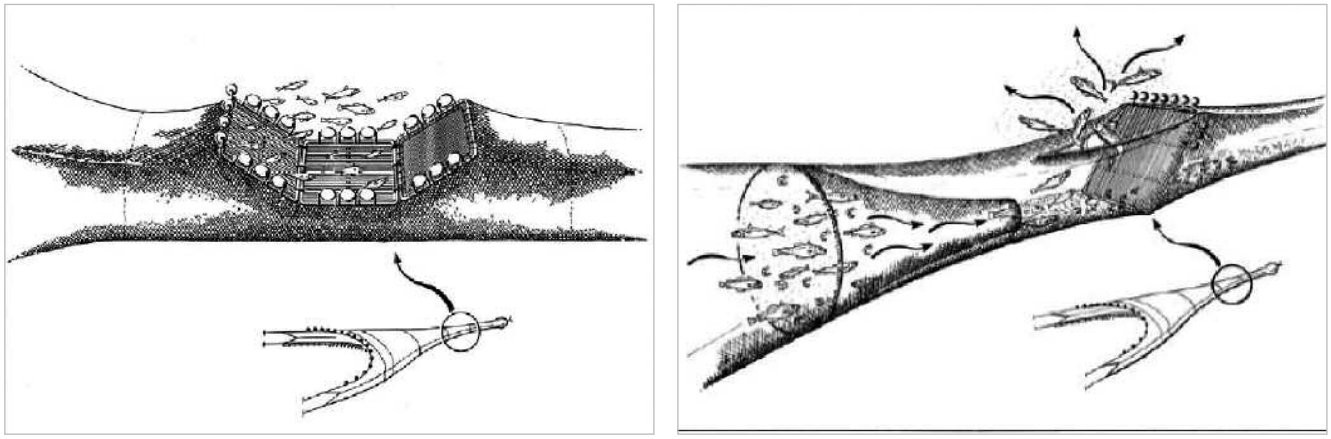


Figure 11: Schematics of 'Sort-X' and 'Nordmore' selection grids for releasing either small or large fish

Figure 12: The 'coverless' *Nephrops* trawl showing a haul with almost no fish catch

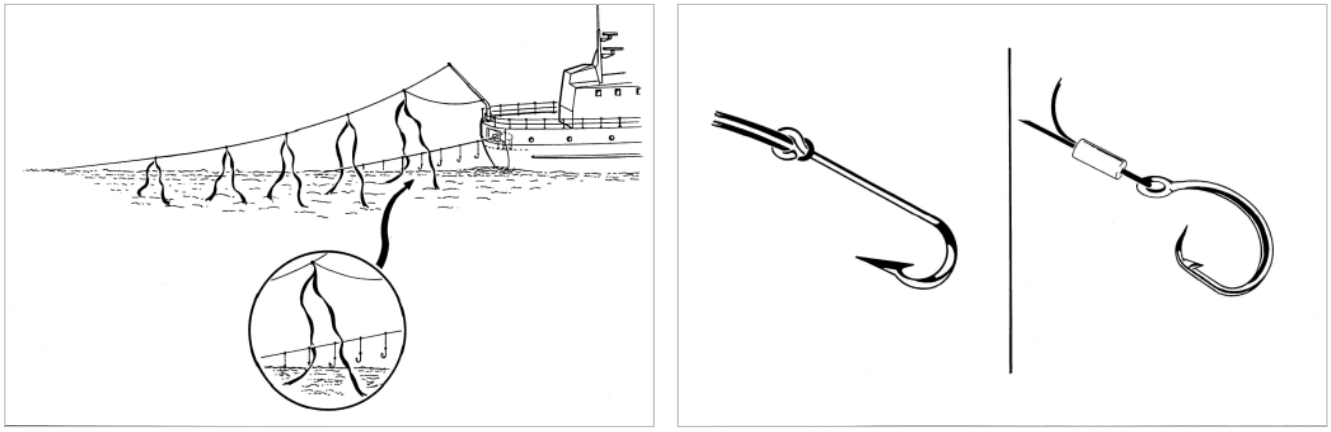


Figure 13: Bird-scaring 'tori' lines and a circle hook that reduces catches of birds and turtles

A more complete description of technical measures can be found on the Seafish website at: http://www.seafish.org/b2b/info.asp?p=172 .

There are also the so-called 'output measures' that determine how much fish can be held and landed. Measures like Total Allowable Catch (TAC) and the quotas into which they are divided are the main output measures used. The main shortcoming of this approach is that it simply doesn't take account of how many fish are killed by fishing operations. Without knowing the total fishing mortality it's difficult to manage fish stocks appropriately.

Making technology produce conservation is more than just designing input or output measures. Whilst minimum mesh size regulations are very simple to define in law, some of the more complex technical measures are correspondingly difficult to define. They may also be easier to circumvent by fishermen who wish to evade their responsibilities.

In the last few years we have seen the emergence of a number of schemes through which fishermen, scientists and others co-operate to make the fishing process deliver better conservation outcomes. Some of these are 'industry-science partnership' schemes whereby science and technology are used to find solutions that work well and are acceptable in a commercial environment. Fishermen are helping with stock assessment work and starting to provide information that can help with the 'real-time' management of stocks.

Projects initiated by the main fishermen's federations are showing the benefits of this approach – see, for example the Scottish Fishermen's Federation http://www.sff.co.uk/ and the National Federation of Fishermen's Organisations http://www.nffo.org.uk/.

Within Europe new bodies – the Regional Advisory Councils – have brought fishermen and conservationists together to become an important source of management advice. They comprise representatives from all nations fishing in a particular region and have helped to defuse the less constructive aspects of competition between national fleets. Councils have now been established to cover all European sea fisheries.

Retailers and processors are also becoming involved more directly with the catching sector. Where consumers have concerns over issues like discards, a co-operative approach through the supply chain can often find solutions that are workable for all sides. Market feedback and increasing professionalism have reulted in great increases in catch quality, presentation and shelf life. Fishermen are finding that reducing wastage can compensate for the impact of declining quotas and other management measures. Improved conservation performance and catch handling are boosting the market image and customer perception of seafood.

Certification of fishing operations or fishery products is also becoming a potent force for conservation. The Marine Stewardship Council (MSC, http://www.msc.org/html/content_458.htm) certifies fisheries that are proven to be managed sustainably whilst, at a less demanding level, Seafish and the British Standards Institute (BSI) have set up the Responsible Fishing Scheme http://rfs.seafish.org/about. This sets standards with which certified vessels must comply and covers conservation and environmental protection as well as all aspects of catch quality.

In all these ways the face of the UK – and European – industry is changing beyond all recognition compared with only a few years ago. Conservation and the environment – along with profitable operations – are key to the modern fleet. Fishermen and the broader seafood industry are developing a stewardship role that makes them very obviously 'a part of the solution'; a real turnaround from some of the lurid and negative imagery that has been promoted recently.

6. Our stakeholders: rights and responsibilities

A curious change in public opinion started to take place during the end of the story outlined earlier in these notes. The image, and reputation, of fishermen was being manipulated. Despite having behaved entirely 'normally' as small business entrepreneurs, and being the victims of a management system that didn't serve them particularly well, fishermen were no longer being seen as brave hunters risking their lives to put food on the national table. Instead they were being characterised as greedy vandals, wilfully damaging a beautiful pristine environment.

These perceptions were propagated by the radical element of the environmental movement. They were, and to some extent still are, intent on undermining the commercial fishing industry. Much of the imagery used has been inaccurate and has often been based on very old information.

Fishermen have accepted the challenge of becoming stewards of the marine environment in response to many influences, not least pressure from environmental NGOs. What the industry is now seeking is assurances that, where these other stakeholders have exerted their rights to influence events, they also accept their responsibilities and the industry's right to a secure future.

The industry accepts the need for Marine Conservation Zones to protect valuable habitats and species; the conservation lobby has to accept that fishing does change the environment but tries to keep this disturbance to a minimum. Our seas are becoming increasingly busy and pressured places. All stakeholders in the marine environment have to find ways of living together so that all can reap the benefits that they most value.

The story here is a positive one. Decommissioning, changed attitudes, better operating practices and a host of other factors are resulting in the emergence of a modern and responsible fishing industry. The seafood industry communicates better, builds consensus with other stakeholders and is showing a new confidence. The UK industry, in many respects, leads Europe in its progressive approach to the exploitation of fish stocks.

7. Further information

- Department for Environment, Food and Rural Affairs (DEFRA – http://www.defra.gov.uk/marine/index.htm)
- The Scottish Government Marine Directorate (http://www.scotland.gov.uk/Topics/Fisheries)
- Centre for Environment, Fisheries & Aquaculture Science (CEFAS - http://www.cefas.co.uk/)
- Fisheries Research Services (FRS – http://www.marlab.ac.uk/)
- Marine Conservation Society (MCS – http://www.mcsuk.org/)
- Responsible Fishing Scheme (RFS – http://rfs.seafish.org/)
- Marine Stewardship Council (MSC – http://www.msc.org/)

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