Sea fisheries:

steps to sustainability

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Key facts from this report

- Fish and shellfish provide around 15% of the world's protein supply.
- In 2008, consumers in Great Britain bought 385,000 tonnes of seafood from retail outlets.
- Imports of fish into the UK increased by 46% from 1998 to 2008.
- In 2007, 19,000 tonnes of cod were landed into the UK, with a further 115,000 tonnes being imported.
- In order to meet consumer demand, imports of fish to Europe will need to increase by 15% (or 1.6 million tonnes) by 2030.
- In the UK, the percentage of fish stocks harvested sustainably and at full reproductive capacity has increased since the 1990s, but remains low at only 25%.
- All member states at the 2002 World Summit on Sustainable Development undertook to meet Maximum Sustainable Yield (MSY) for fisheries by 2015.
- In the North Sea, nearly a third of the total catch is discarded annually.
- 90% of consumers are more likely to buy seafood that is labelled as 'environmentally responsible'.
- 46 fisheries worldwide have Marine Stewardship Council certification (6 of these are in England).

Contents

Executive summary

This report examines how sustainable fishing methods and management can contribute to the health of England's seas and secure a profitable fishing industry.

Fishing is an essential contributor to global food security. However, the evidence indicates that, despite local successes, continued, persistent and widespread overfishing in England's seas is damaging our marine ecosystem.

Our fishing industry, coastal communities and the environment will all suffer if we do not take action to conserve fish stocks and marine habitats.

It is not too late to restore both our fishing industry and the marine environment. This report looks at some of the positive steps already taken by the fishing industry to increase sustainability. More needs to be done to allow fishermen to engage and participate in decisions taken on the management of fisheries. At the moment too many fishermen feel that fisheries management is something which is done to them rather than shaped by them.

We examine the advantages of new fishing methods and the new types of gear which reduce the negative impacts of fishing. More needs to be done to develop further innovations and provide incentives to ensure these methods become industry standard.

Consumer demand exists for sustainably sourced fish. We review the contribution of the Marine Stewardship Council's certification scheme and the *Seafish* Responsible Fishing Scheme. These types of initiatives help to develop the market for sustainably sourced fish and should be progressed. They must provide a secure future for fishermen and ensure the highest standards of environmental protection.

Marine Protected Areas (MPAs) are now being developed around our seas. The report examines how MPAs improve the health of our marine environment and offer benefits to the fishing industry.

The report calls for radical reform of the Common Fisheries Policy (CFP). The current poor strategic management of fisheries, such as the compulsory discard of fish, needs to be tackled. Without an effective management framework fishermen cannot be expected to achieve sustainable fishing on a comprehensive scale. A reformed CFP must ensure that: 1) ecological objectives are at its heart; 2) governance of our fisheries is devolved to the appropriate level; and 3) that capacity of the fleet is proportionate to the size of the fish stock.

Environmental, social and economic costs will increase if we delay these reforms. If action is taken now, there is still a future for a profitable fishing industry alongside a healthy marine environment.

Introduction

It is clear to all parties – fishermen, consumers, fish processors, retailers, conservation organisations and government – that reported declines of fish, particularly of iconic species such as cod, sharks and tuna, must be reversed, in order to protect the marine environment and to utilise its resources sustainably in the future.

Although fishing is inherently an extractive use of the marine environment, the purpose of this report is to identify examples of well managed UK fisheries. This involves sustainable fishing methods which can greatly reduce impact upon marine habitats and species whilst still supporting productive fisheries.

This report will examine how sustainable fishing methods can be the means by which fishermen and conservationists can achieve real consensus in pursuit of a healthy and productive marine environment, in balance with a profitable and successful catching sector.

Crab fishermen shooting away a string of inkwell pots

A typical fishmonger s slab, Northwich, Cheshire

The need for sustainable fishing

Consumer demand for fish

Globally, fish and shellfish provide around 15% of the world's protein supply[1]. Fish, particularly the polyunsaturated fatty acids (eg omega-3 oils) they contain, are an important component of a healthy diet. In 2008 consumers in Great Britain (at retail outlets only) bought over 385,000 tonnes of seafood[2].

With the global human population growing at around 78 million per year, fish consumption is set to increase. Per capita consumption will also increase as consumers become more health conscious. Although two portions of fish a week are recommended[3], on average adults in the UK eat only a third of a portion a week[4]. Given these projected increases the Food and Agriculture Organisation predicts that by 2030, in order to meet demand, imports of fish for Europe will need to increase by 15% (or 1.6 million tonnes). This will lead to greater dependency on fish stocks largely beyond the control of European fisheries management regimes[5].

English fishermen play a vital role in supplying the demand for fish within and outside the UK. Total UK vessel landings in 2007 were 610,000 tonnes of fish (including shellfish) with a value of £645 million[6]. The fishing industry also has a significant role to play in the social and economic welfare of coastal communities and in national food security. However, there is a mismatch between the need to satisfy the current demand for fish and the degradation of marine habitats and species that result from some forms of fishing.

Impacts of fisheries

Removal of biomass

The role of fishing in reducing the sustainability of fish populations and its effects on the wider marine environment, has been exhaustively documented in scientific[7] and popular literature[8] and in the media[9].

It is widely accepted that there are fewer fish in the sea than 100 years ago. One controversial study found that only 10% of the historic weight of top predators (eg sharks) and large fish species (eg tuna and grouper) remain worldwide[10]. Commercial fishing has led to drastically impoverished fish populations. Examples include the collapse of the North Sea herring population in the 1970s[11] and the effective disappearance of the common skate from the Irish Sea[12]. In the Baltic, collapse of the cod population has resulted in an abundance of plankton-eating species such as sprat and herring which were previously predated by the cod. The current abundance of these species may hinder cod recovery as they consume large numbers of cod eggs[13].

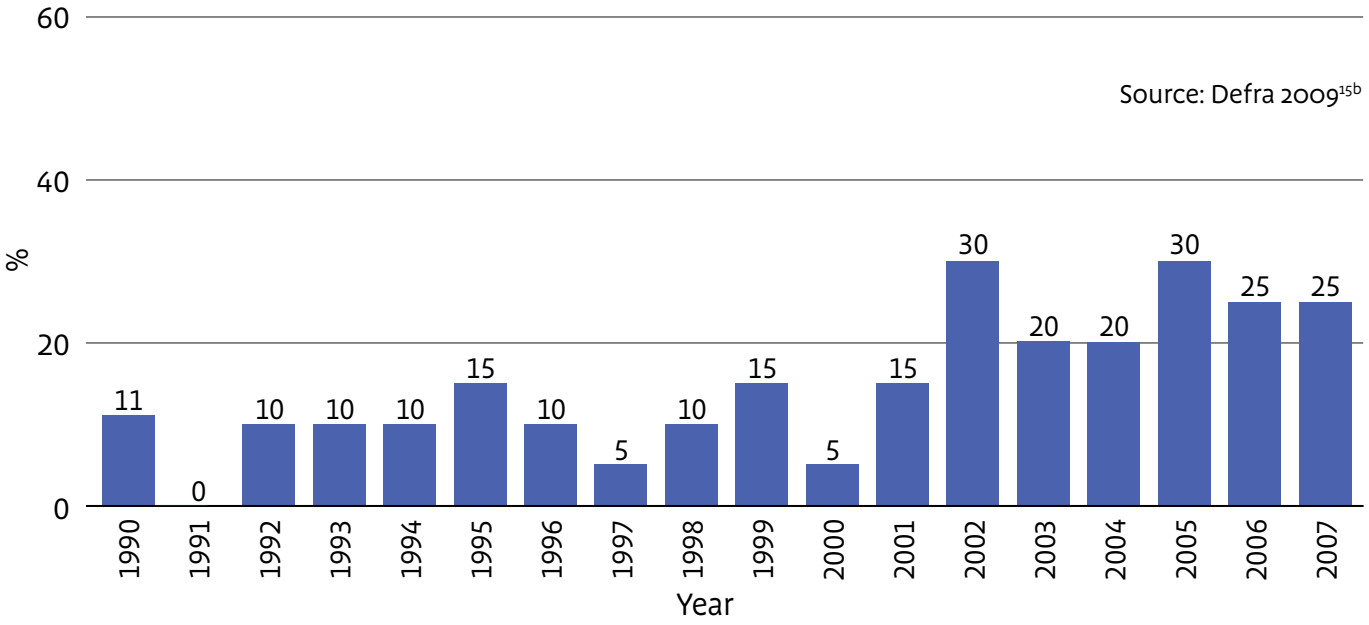
Within populations of exploited fish there are also fewer large individuals. These larger and older individuals are critical to population stability because they make a disproportionately large contribution to the total pool of eggs each breeding season[14], hence their loss may further contribute to reduced stocks through recruitment failure.

Other ecosystem effects have been observed, including decreases in size at maturation of fish, reported from stocks of Atlantic cod and North Sea plaice. This is caused by selective extraction of the larger individuals[15]. In addition, there is evidence of inbreeding occurring as the result dwindling population numbers.

Fish stocks

Fish stock trends is one of a number of indicators which the UK Government uses to determine the status of biodiversity. These indicators inform our progress towards the objectives of the Convention on Biological Diversity (CBD). Reports from 2007 showed that only a quarter of the 20 UK fish stocks assessed were at full reproductive capacity and harvested sustainably. Although, this was an improvement on recent years (the figure was between 0% and 15% in the 1990s – see Figure 1 below), the harvesting of most stocks is judged to be unsustainable.

Figure 1
Percentage of fish stocks harvested sustainably and at full reproductive capacity, 1990 to 2007



Note: Based on 20 stocks for which accurate time series are available, derived from stock assessment reports.

Table 1 below shows the current status of some major UK commercial fish stocks. Assessments are carried out by international working groups compiling fisheries data, biological data and survey data for use in fisheries science models. These assessments inform the International Council for the Exploration of the Sea (ICES) advice which allows the EU council of ministers to set the **Total Allowable Catch**. (See later section on the Common Fisheries Policy)

Table 1 The current status of some major UK commercial fish stocks

Regional Sea	Species	Status
Irish Sea	Cod	Overfished
	Whiting	Unknown
	Haddock	Undefined
	Sole	Overfished
	Plaice	Underfished
	Nephrops	Stable
North Sea	Cod	Overfished
	Whiting	Overfished
	Haddock	Overfished
	Sole	Overfished
	Plaice	Overexploited
	Herring	Overfished
	Mackerel	Overfished[1]
	Nephrops	Reduced
Eastern English Channel	Cod	Overfished
	Sole	Overfished
	Plaice	Unknown
Western English Channel	Sole	Overfished
	Plaice	Overexploited
South West	Cod	Overexploited

Source: CEFAS 2009[15c]

[1] This assessment related to stock in the North East Atlantic.

Habitat loss and damage
Fishing gear can also impact significantly upon marine habitats. For example, cold water corals and reef-forming species can be severely damaged if heavy gear is towed across them[16,17].

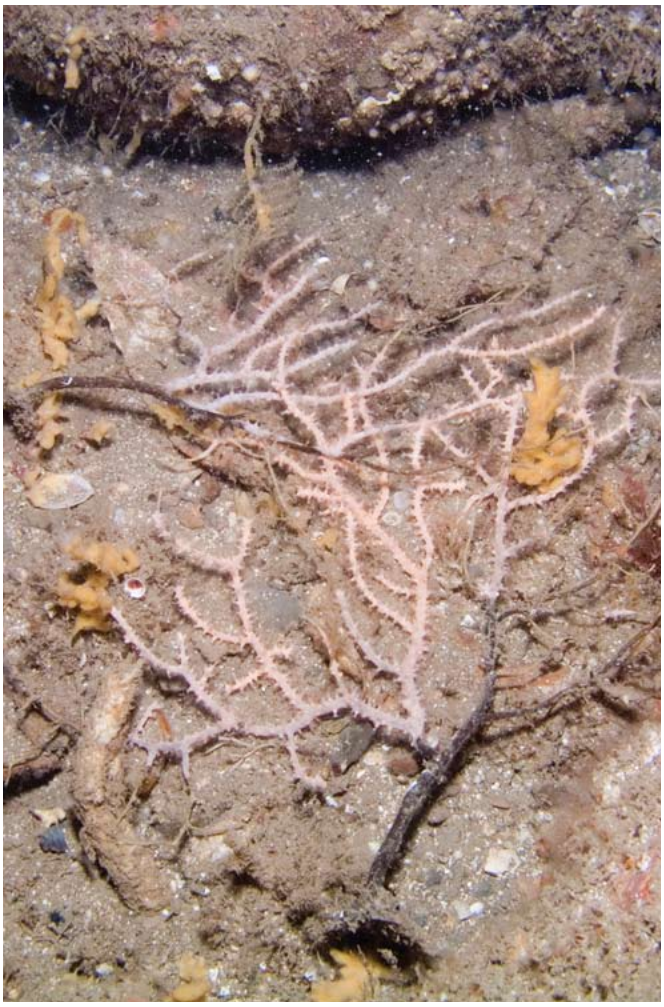
There has been extensive work analysing gear impacts to a range of habitats. Actual damage varies greatly according to the nature and location of activity. Table 2 provides a simplified, comparative assessment of the potential impacts of broad gear types.

Table 2 Potential impacts of fishing gear types

Gear type	Potential impacts
Dredge	Towed dredges (eg scallop dredges) can remove or significantly damage erect, sessile species in the dredge path. Habitat structure can be significantly altered with some components physically broken down or sediments winnowed. **Target species include:** shellfish such as scallops.
Trawl (demersal; eg beam, otter, rockhopper)	Beam trawls can penetrate sediment to alter seabed structure and remove and damage sessile species. Impacts can be reduced if trawling occurs over less sensitive habitats or where benthic contact is reduced (eg demersal otter trawl). Bycatch of non-target species may be high. **Target species include:** cod, whiting, lemon sole and plaice.
Trawl (pelagic; eg pair, otter) and long-line.	Benthic habitats are not directly affected. Impacts are largely confined to removal of target and non-target species. **Target species include:** mackerel, herring and sprat.
Net (eg fixed or drift, trammel and gill)	Seabed contact is limited or nil so impacts to benthic habitats are minimal. Bycatch of birds may be problematic. Ghost fishing[2] may exacerbate impacts. **Target species include:** Dover sole, salmon, bass and mullet.
Pot	Static gear in general has a lesser potential to impact marine habitats. Sessile species may be impacted where fishing is intensive. **Target species include:** lobster, crab and whelks.

[2] Ghost fishing is where fishing gear has been lost, but continues to catch or snag target and non-target species.

There is a clear imperative to reduce destructive fishing practices to protect sensitive habitats composed of delicate, long-lived species and to allow space for recovery of rich, complex and diverse undersea landscapes. The need to prevent further loss of habitats is set out in the Convention on Biological Diversity[18] and is a UK commitment.



The picture on the right shows the damage that bottom trawling can potentially have on slow-growing species such as the pink sea-fan *Eunicella verrucosa*

Reconciling conflict

From the evidence presented thus far, it would seem that the fishing industry and conservationists are firmly opposed. However, both sectors have shared objectives; both want to see a greater diversity and availability of fish; a productive and healthy marine environment; and a sustainable industry. These joint goals provide the foundations for future action to reduce or mitigate detrimental environmental impacts. The fact that many European fisheries are now compromised by reliance on a depleted resource, to the extent that they may no longer be economically viable, underlines the overwhelming need for change. At present there are simply not enough fish to adequately support the number of fishermen in Europe. Most of Europe's fishing fleet are either running losses or returning low profits[19].

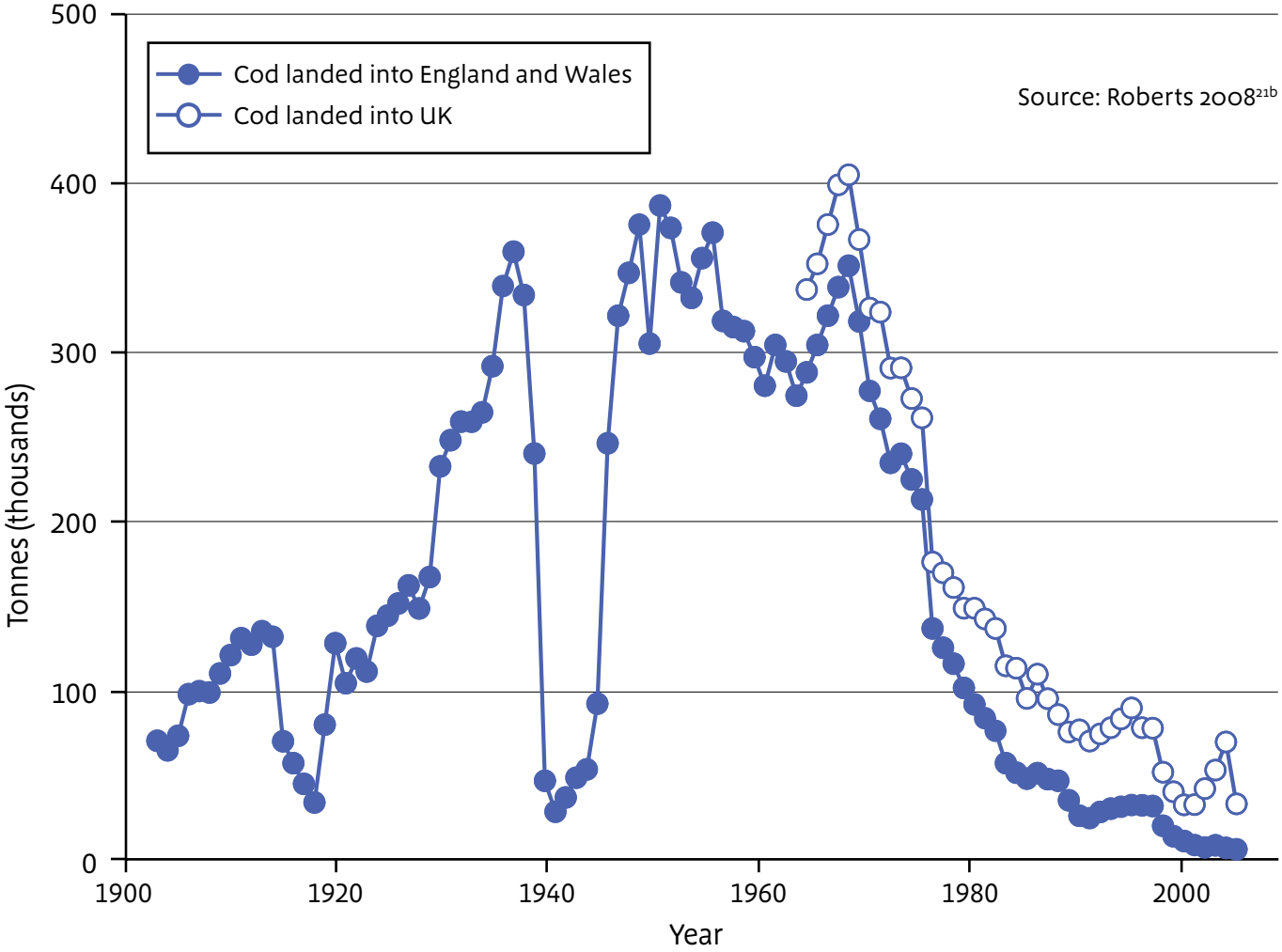
Overview of the English fishing industry

In England, drastic decommissioning schemes have significantly reduced the size of the fleet in order to improve viability and decrease capacity. The number of fishermen in England has decreased by nearly a third since 1997 to stand at 5,589 in 2007. Similar or larger declines have occurred in the rest of the UK. The number of UK fishing vessels decreased by 20% between 1997 and 2007; England currently has 3,307 boats[6].

Despite these reductions, improvements in technological efficiency to maximise yield, such as improvements in detection and capture, have opened up previously inaccessible areas. Such advances mean that for fishing mortality[i] to have remained the same, 30-40% of vessels per decade would need to have been removed. The reduction in the fleet has been less than this[20] and many stocks have not yet recovered[21] (see Table 1).

Between 1997 and 2007, landings of demersal fish, particularly cod and haddock, have fallen by more than 50%, since the introduction of quotas to help stocks recover. The high demand for the most popular fish in the UK cannot currently be fulfilled by the national fleet. In 2007 19,000 tonnes of cod were landed into the UK (a quarter of the amount of cod landed in 1997), but an additional 115,000 tonnes of cod were imported[6]. The Seafish Industry Authority (*Seafish*) noted that imports of fish into the UK increased by 46% from 1998 to 2008[2]. Figure 2 below illustrates the fortunes of England's fishing industry over the course of the 20th century.

Figure 2 Cod landings by British and Foreign vessels into the UK.
(After 1990, landings shown are by UK vessels only).



[i] Fishing mortality refers to all fish which are killed as the result of fishing activity.

While overall landings have decreased over the last 10 years, catch value has recently increased. This is largely a result of a rise in the value and proportion of shellfish landed. In 1997 shellfish accounted for 27% of the total catch. Whereas in 2007, shellfish constituted 43% of total landings. For example, 45,000 tonnes of *Nephrops*[ii] were landed in 2007; an increase of 60% in four years. Landings of crabs have increased by 44%, since 2005, to 33,000 tonnes[6]. Such changes in catch composition are likely to be a consequence of the smaller quotas for demersal and pelagic species, as most shellfish species are not currently subject to quota restrictions.

The wider implications of reduced landings include potential limitations on consumer choice. If populations of fish at high trophic levels (eg swordfish and tuna) are fished out, only species at lower trophic levels (eg *Nephrops* and sprats) are available at commercially exploitable levels. This is described as 'fishing down the food chain'[22].

Reduced landings may also negatively impact on processing plants and other affiliated industries causing financial and job losses. This threatens the c.£800-£1,200 million of associated economic activity which occurred in 2007[13].

The industry may be further negatively affected when the reduced European catch is exported outside Europe for processing. For example, in 2007 China was the single biggest source (27%) of UK cod fillet imports. The majority of these 'Chinese' cod are Norwegian, Icelandic, and Faeroese fish. Despite this, it is cheaper to export the fish to the east for filleting and then import them to markets in the UK and Europe[23]. This increases food miles, and where transport is by air, this increases the carbon footprint of the fishing industry.

In this context:

- **Fishing must be managed appropriately to protect marine biodiversity for its own inherent value**

and

- **For fishing to be economically and socially sustainable, marine habitats and species must be in a healthy condition to fully support the range of potential fisheries and to realise their full productive potential.**

[ii] *Nephrops* is the generic name for Dublin Bay prawns, scampi, or langoustine.

Dover sole *Solea solea*

Managing fisheries under existing frameworks

Maximum Sustainable Yield

The need to manage and protect stocks of commercial species is not new. Historically Maximum Sustainable Yield (MSY) – simplistically the largest catch that can theoretically be taken over an unlimited period – was relied upon to inform fisheries management, peaking in popularity in the 1950s[24].

MSY is a concept to be used with caution[25]. The basic theory has limitations. Most notably, it does not account for environmental variability; for differences in age and sex in a population; or for bycatch. This has implications for simultaneously managing fisheries for several species, each on a single-species basis, as has been done in European fisheries[26]. For example, where a number of species are caught together, it is very difficult to manage fishing so that all species are simultaneously exploited at MSY. If mixed fisheries are managed for MSY, it is likely that some of the least productive species will be overexploited unless other means can be found to avoid their capture.

Insufficient biological information on species has resulted in overexploitation in the past. For example, the New Zealand orange roughy fisheries were still depleted despite being fished at what was believed to be MSY. Assumptions made regarding the productivity of the fishery were incorrect.

In spite of its limitations, MSY can be a useful reference point in the sustainable management and recovery of **some** fish stocks for which we have adequate scientific information. This change is reflected in the modern interpretation of MSY where the upper limit of exploitation is a mortality rate which takes into account natural sources of mortality as well as fishing mortality. The UK and the EU have made a legal commitment to meet MSY by ratifying the 1995 UN Fish Stocks Agreement[iii]. All Member States at the 2002 World Summit on Sustainable Development also undertook to meet MSY by 2015.

The UN Fish Stocks Agreement provides further qualification of the target of MSY, stating: 'the fishing mortality rate which generates MSY should be regarded as a **minimum** standard for limit reference points'[27]. By using MSY as an **upper limit** to exploitation rather than as a **target**, this provides headroom should fishing targets be exceeded due to inherent uncertainties in fish stock assessment. MSY therefore has merit as the most basic aspiration for sustainable management. However, given the mobility of most species exploited in English waters, implementing management measures to deliver MSY objectives successfully requires a high-level fisheries management framework. For the UK, this is currently the Common Fisheries Policy.

The role of the Common Fisheries Policy (CFP)

The current CFP regulation states that "the CFP shall ensure the sustainable exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions"[28]. However, today 88% of European quota stocks are overfished and may be in danger of stock collapse and recruitment failure[29]. In the UK in 2007, according to the International Council for the Exploration of the Seas' (ICES) assessment of quota stocks, only 25% of stocks were at full reproductive capacity and harvested sustainably. This means that for 75% of stocks spawning levels were insufficient to guarantee stock replenishment[21]. (See Figure 1).

Under the CFP a number of tools are used to manage the fisheries. These include minimum landing sizes; mesh sizes; effort control (limiting days at sea, or power of vessels); area closures; technical measures specifying aspects of the design of the gear; and landing restrictions. The primary means of controlling the amount of fish removed from a stock is by the setting of a Total Allowable Catch (TAC).

The EC receives advice from ICES as to the estimated size of the stock (determined by scientific surveys, landings and market sampling) and the size of the catch that could be taken without placing the stock outside safe biological limits[iv]. This advice is used to set the TAC.

The CFP also enshrines a principle of relative stability. If a fishery for a species in a particular region had historically (prior to CFP) taken 90% by country A, 9% by country B and 1% by country C then the Total Allowable Catch is similarly converted to national quotas. Country A receives 90%, B 9% and C 1%. The CFP contains provisions so that a country can negotiate to ensure that the quota will support the fleet or at least some managed contraction of the fleet. In some cases a Member State with a small quota can argue to increase their allocation. If this is agreed, under the principle of relative stability the quotas for the other Member States also

[iii] The objective of the UN Fish Stocks Agreement is to ensure the long-term conservation and sustainable use of straddling and highly migratory fish stocks.

[iv] 'Safe biological limits' are defined by a minimum safe stock size and a maximum exploitation rate. These are known as reference points. The stock size is measured in terms of 'spawning stock biomass (SSB)' which represents the total weight of spawning fish each year. The exploitation rate is called the 'fishing mortality (F)' which measures the rate at which fish are removed from the stock by fishing. If the stock is either below the minimum safe SSB or above the maximum safe F, the stock is said to be outside safe biological limits.

have to increase to maintain the ratio. This leads to total fishing beyond the original TAC, and measures to ensure economic sustainability are given priority, to the detriment of environmental stability[30].

CFP reform is due by December 2012. This provides the opportunity to develop a robust framework to implement the fisheries management measures required to achieve even a minimum degree of sustainability. There is an overwhelming consensus that root and branch reform is urgently needed. We believe the following objectives will ensure the new CFP is focused on outcomes that will lead to a viable fishing sector and a healthy marine environment.

Natural England's objectives for the Common Fisheries Policy

1 Focus on ecological objectives:
The European Commission has already recognised that it is essential to achieve ecological sustainability in order to secure economic and social sustainability. Decisions regarding TACs and quotas must not be manipulated by political and economic concerns but should be determined by biological advice.

2 Improved governance:
The ability of the CFP to effectively manage stocks is compromised by the fact that all decisions are taken by the Council of Fisheries Ministers. A more appropriate scale of management would help eliminate unwieldy and unnecessary application of regulations. For example, if high level objectives were set by the Commission, determination of how to meet objectives could be devolved to lower tiers of governance at regional and local levels.

3 Overcapacity:
The size of the fleet should be proportionate to the available fish stocks. This will prevent the incentive to overfish and ensure profitability for the fleet.

4 Differentiated regime for an inshore fishing fleet:
Segregating the fleet effectively into offshore and inshore components, if correctly defined, could reduce the environmental impact of fishing in the inshore area and bring benefits to the local coastal community.

5 Integration with other policies:
The CFP will need to be a key mechanism to help deliver the aims of the EC Marine Strategy Framework Directive including meeting objectives for all types of Marine Protected Areas. This must be achieved in a non-discriminatory manner ie to no disadvantage of any particular fishery or member state.

An RFS certified fishing boat operating out of Newlyn, Cornwall

Steps to sustainability

MSY and Safe Biological Limits provide the basic measures and targets for a strategic framework of managing sustainable fishing. Irrespective of these, many individuals and organisations are independently engaged in fishing activities that achieve sustainable use of fish and shellfish resources[31]. Motivations to achieve 'sustainability' (in its widest sense) can often be broader than solely seeking to achieve **environmental protection**. For example, protection of traditional fishing methods; promoting 'gastro-tourism'[32]; and animal welfare may make a significant contribution to sustainability. Regardless of the motivation, such schemes, ranging from fishery certification to fishing-gear adaptation, can make an important contribution to achieving sustainability. We believe their importance will increase in the future. Such efforts would benefit by support from processors, retailers and consumers. This would provide both the financial incentive to those involved and the impetus to adopt further measures to achieve wholly sustainable fisheries. The measures, or the 'steps to sustainability', needed to ensure sustainable use of the marine environment are considered below.

Sourcing sustainable seafood

Supermarkets control a large proportion of the UK market for fish and are increasingly aware of the environmental importance of sourcing fish sustainably[33]. Consumer awareness and choice can strongly influence which fish are sold. Research carried out in 2007 by the Seafood Choices Alliance found that 74% of UK consumers believed environmental considerations to be important, and 90% would be more likely to buy seafood that is labelled as 'environmentally responsible'. Most significantly, over 50% would pay 5-10% more for **sustainable** seafood[34].

Those fisheries that can demonstrate their environmental credentials through transparency in the supply chain, will attract customers confident in the knowledge that these products are verifiably sustainable. Good examples of such practice already exist in the UK, such as the South-West Handline Fishermen's Association. Here, a tagging system enables customers to identify which fisherman and boat caught the fish; when it was landed; and how it was caught[35]. This and other similar initiatives provide customers with sustainable, seasonal, fresh, locally produced fish.

Supermarkets wishing to demonstrate their environmental credentials have responded to growing concerns by stopping the sale of some species[36] or by preferentially sourcing eco-labelled products[37]. This was partly in response to a high-profile challenge made by Greenpeace, in 2005, regarding the sustainability of fish sold.

Marks and Spencer ensure that 'all seafood must be traceable back to the vessel that caught it, with evidence that the catch was within quota where applicable'. Fish from undeclared (illegal) landings are prohibited'[33]. Waitrose 'does not take any flatfish caught from beam trawlers, which are inefficient in terms of fuel consumption and potentially damaging to the marine environment'[38].

Sainsbury's, one of the biggest retailers of fresh fish with a 21.4% share in the market, initially pledged to sell only Marine Stewardship Council (MSC) certified fish by 2010. However, this goal was dropped after the supermarket realised supply could not match demand. Instead, Sainsbury's have a colour-coded plan to indicate which fish were sustainably sourced. Sainsbury's have now pledged to stock only green- or amber-rated fish by the end of December, costing it £1.5m in lost sales[39].

Demand from consumers for these products is high, and in the 2007 survey 95% of respondents agreed that labelling is the most effective way to communicate which products are sustainable.

Fishermen themselves are acutely aware of such public demand for certified products and in seeking to meet this demand developed the Responsible Fishing Scheme (RFS) together with *Seafish*[40] in 2006.

Fishermen on RFS certified vessels have signed a commitment to fish responsibly. This includes specifically minimising discarding of non-target species; minimising unnecessary impact of fishing gear; ensuring fishing operations do not result in the bycatch of dolphins and seabirds; and aiming to retrieve lost gear, where feasible. These measures, which deliver limited environmental benefits, are an important step forward. However, they are only part of the mix of measures required to deliver longer term environmentally sustainable fishing.

Further value could be gained from this scheme if environmental organisations and *Seafish* work together to derive quantifiable environmental benefits. This could include the development of success indicators for protecting species and habitats.

Responsible Fishing Scheme

Seafish's Responsible Fishing Scheme (RFS) provides certification to boats that agree to take a 'responsible approach to fishing and operate to good practice guidelines'. This includes ensuring health and safety aboard and quality of catch[41]. Since establishment, uptake of the scheme has been very successful and 600 UK fishing vessels are now either certified or progressing through the assessment process[42]. This represents 41% of the overall registered tonnage of the UK fishing fleet. The entire Shetland fleet and the Scottish pelagic fleet are both RFS certified. Benefits to the industry include demonstrating their 'green credentials' to assure the continuity of supply in future markets. Tesco recently committed to source all sprats, sardines and scallops sold in the south-west of England from RFS certified boats[43].

Gurnard caught by a fisherman on an RFS certified vessel

Eco-labelling

The RFS requires fishermen to submit detailed catch returns and encourages making information on catches more available. This scheme may therefore offer fishermen a path towards more stringent certification schemes. Currently the most environmentally robust certification scheme is overseen by the Marine Stewardship Council (MSC). As MSC certification relies on the provision of similar data, it is possible that this RFS catch information could be used during the MSC initial pre-assessment. This would help more fishermen progress towards a higher level of certification.

Marine Stewardship Council certification

The intention of the MSC is to positively identify, and certify, those fish that have been caught sustainably. Importantly, rather than certifying only the boat the MSC certifies the fishery (or part thereof)[44]. The advantage of this approach is that the biological status of the fish populations is the most important aspect of the assessment. Only fish from those populations able to support a commercial fishery can be certified.

The South-West mackerel handline fishery

The MSC certified the South-West mackerel handline fishery in 2001.

The fishery supports around 150 small vessels which fish around the coasts of Devon and Cornwall. In 2007, 841 tonnes of mackerel were landed.

This fishery is exemplary in minimising a wide range of environmental impacts. Specifically, handlining is a comparatively low intensity fishing method as each fisherman operates only one line with usually 20-35 unbaited hooks. As this technique is selective, bycatch of other species is minimised and often species such as pollack, bass, whiting and herring can be returned alive. Although juvenile mackerel are caught infrequently, where this occurs, discarding is eliminated as these individuals are landed and used as pot bait. There are also spatial closures to protect the spawning population of mackerel, specifically a seasonally closed area known as the Mackerel Box, designated in 1981. This fishery also only takes less than 1% of the UK quota for mackerel. When the mackerel stock as a whole (ie North-East Atlantic population) declined, the South-West mackerel handliners wrote to the Fisheries Minister seeking further management measures to recover the stock to within safe biological limits[45].

Mackerel being caught using a handline

Consumers can therefore be confident that MSC certified fish are from stocks that are not overfished. MSC certification brings the same benefits to fishermen as RFS – greater economic stability and potential price premiums. MSC fish however, can command a greater premium and better security of market access as certified stocks must meet more stringent environmental criteria.

Globally 46 fisheries are now MSC certified, including six in England:

- The Hastings fleet Dover sole, pelagic herring, and pelagic mackerel;
- North Eastern Sea Fisheries Committee seabass;
- Thames Blackwater herring drift-net;
- South-West mackerel handline fisheries.

Sussex Sea Fisheries Committee are also proposing all fisheries in their District undergo MSC pre-assessment[46]. The adoption of MSC by retailers has been at a global scale with both USA superstore Wal-Mart[47] and the Dutch Association of Food Retail (potentially 16 million customers) committing to sourcing 100% MSC certified fish by 2011[48].

However, maintaining sustainable stocks of target fish is only one element of achieving comprehensive sustainability. Assessing a fish population, without consideration of the quality of the wider environment upon which it depends, is short-sighted. For instance, a fish stock may be in a relatively healthy state today, but may not remain so in the future if its habitat is being impacted or put at risk.

The MSC offers the best certification that is currently available. In addition to assessment of fish stock status, it is the only eco-label to use FAO guidelines[49] to set stringent criteria requiring that environmental damage is limited[50]. MSC's third-party assessors are required to review fisheries to ascertain there are 'no unacceptable environmental effects' which includes impact to habitats from fishing gear.

There are concerns however, that the term 'unacceptable' as used in the MSC certification process has been subject to variable interpretation. To give consumers total confidence that **one** badge can assure comprehensive sustainability – an aim we strongly support – caution must be applied to those assessments made on short timescales. To assume, for example, that fisheries which currently appear to be having little impact on marine habitats are sustainable **without considering the condition of the habitat before the fishery commenced**, would be naive. The management of a fishery certified on such a basis (without consideration of spatial restriction of impact) cannot contribute to the recovery of the marine ecosystem.

Gear adaptations

Detrimental impacts to marine habitats and non-target species are not inevitable. Sustainability can and has been achieved by a range of spatial and temporal adaptations to types of fishing gear used or the level of activity pursued. Good examples are highlighted below.

Minimising discards and habitat impacts

Discarding has been referred to as the 'scourge of fishing[51]. Fish weighing 7.3 million tonnes, representing 8% of the total world catches, are discarded every year. Fish are thrown back, usually dead or dying, because they are unwanted species, under-size or over-quota[52]. **In the North Sea (a mixed fishery), nearly a third of the total catch is discarded annually[53]. This represents a loss of 10% of this sea's total biomass every year**. Discarding is a particular problem for small mesh fisheries. For example in the North Sea *Nephrops* and shrimp trawls have discards ranging from 43% to 83%[54].

This waste benefits no-one except scavenging seabirds like fulmars and seagulls or benthic feeders such as crabs. There are, however, a range of mechanisms to counter this. Square mesh panels can be inserted into the codend of *Nephrops* trawls to facilitate the escape of juvenile and non-target fish[55]. The insertion of one square mesh panel in North Sea *Nephrops* fisheries has been a basic legislative requirement since 2002. Yet, if a second panel is inserted, bycatch of undersize finfish can be reduced by a further 42%[56].

Competitions to challenge fishermen to innovate gear modifications which reduce damage to the environment have resulted in other beneficial advances. For example, the winning entry in the 2007 'Clean Fishing'[57] competition proposed a modified trawl net. This consisted of a benthic release panel together with a secondary weed release panel and a square mesh codend. The Centre for Environment, Fish and Aquaculture Science (CEFAS) scientific assessment of these modifications concludes that they reduce finfish discards by up to 63% compared with both standard trawls and trawls with a square mesh codend. And uniquely, this trawl also reduced discards of benthic invertebrates by up to 45%[58]. It is now being used in South-West England.

A 'Swedish grid'. This separator panel can be inserted into a *Nephrops* trawl to minimise bycatch of fish

Another example of successful gear modification is the use of creels to catch *Nephrops*. This has markedly reduced the effect on sensitive species such as sea pens[59] compared with trawling which has both acute[60] and chronic impacts[61] on marine biodiversity. *Fishing News* recently reported a new method of benthic otter trawling where the trawl doors are 'flown' without any contact with the seabed thereby reducing the ground contact of the gear[62]. Such innovations have the potential to significantly reduce disturbance to marine habitats.

Potential rewards
The environmental benefits of gear adaptation and diversification are clear. However, unless such measures are undertaken as part of a MSC or otherwise certified fishery, direct **benefits to fishermen** employing such techniques appear to be limited in the short-term. Uptake is therefore economically constrained[63]. In the long-term however, the potential financial benefits are huge.

For example:

- UK North Sea whitefish trawlers discarded cod, haddock and whiting (due to lack of available quota in a mixed fishery) worth €75 million in 1999, equivalent to 42% of the value of their landings in the same year[64].
- Creel-caught *Nephrops* are of superior quality to trawl-caught because they are undamaged[65]. These are predominantly sold to Spanish and French markets who are willing to pay a premium of four to five times the price of trawled *Nephrops*[66].
- Otter-trawling with the trawl doors off the sea floor can save 10% in fuel costs in some demersal fisheries[62].

The economic premium associated with gear adaptations may therefore offer significant financial rewards for fishermen, in addition to environmental benefit. The availability of these financial rewards is, however, entirely dependent on the choices made by consumers and retailers. Where consumers are sufficiently informed of the environmental benefits of such methods, purchases made on this basis could help sustainable fisheries become financially viable.

For consumers to be able to make an informed choice the availability of pertinent information about **specific** fisheries is fundamental. The Marine Conservation Society for example, provide detailed information on sustainable sourcing and online guidance at www.fishonline.org. They also produce a *Pocket Good Fish Guide* indicating those species or stocks/fisheries that they believe are the most sustainable.

Spatial management measures

The best examples of where benefits to the marine environment **and** to fishermen are realised are where measures undertaken to protect the environment are implemented within a strategic management framework where sustainability is inbuilt. For example, in some cases, gear adaptations and/or diversification may be insufficient to adequately protect either fish stocks or the marine environment. Restrictions that stop fishing altogether for defined periods, such as limitations to days-at-sea or spatial closures, may prove to be more effective[53].

The fishing industry has already implemented such measures in England through the Voluntary Real Time Closure Scheme. Under the scheme, a combination of fisheries protection officers, onboard observers, and skippers, seek to identify areas where demersal trawls are catching more than 40 undersized cod per hour of trawl[67]. Where positive records are made, an area of 7.5 miles radius is then closed for 21 days (subject to a maximum of nine areas being closed at any one time)[68]. *Seafish* noted that compliance was excellent, and the scheme protected the large 2005 year class which subsequently contributed towards recovery of the stock. This led to a 30% increase in the total allowable catch (TAC) for North Sea Eastern Channel cod for 2009[69]. Such measures will be most effective if they are implemented within a framework of **marine spatial planning**. For example, fishermen affected by a closure in 2001 (to protect spawning cod) moved to new fishing areas. Unfortunately, these contained high concentrations of juvenile haddock resulting in a very high bycatch of up to 95%[70]. Implementing such closures in a planned manner would serve to prevent such unintended consequences.

Alaskan scallop fishery

The Alaskan scallop fishery harvests weathervane scallops *Patinopecten caurinus*, (the biggest scallops in the world), mainly for the domestic US market. Officially opened in 1967 on a very small scale (with just two boats fishing), variable productivity of the beds in subsequent years eventually attracted up to 19 boats. The fishery also changed from a 'short-trip' fishery where products were iced (and required frequent landings), to a 'long-trip' fishery (where boats were able to process and freeze catches at sea[71]). By 1996, all boats participating were catcher-processors and as a result harvest levels had nearly tripled from those in the years prior to 1990.

In 1993, concern relating to scallop overharvesting and the level of crab bycatch led to the classification of the fishery as a 'high-impact emerging fishery'. This precautionary classification required the implementation of a Fisheries Management Plan (FMP) under the US **Magnuson-Stevens Act**[72] which aims to ensure sustainability of catch. From a fishery point of view, catches were also unpredictable and analysis indicates that in the 1999/2000 season there were insufficient landings to allow all boats in the state fishery to break-even[71]. Some fishermen consequently set up a co-operative to reduce harvesting capacity on the basis of revenue-sharing with those not using their boats.

The Fisheries Management Plan implemented in 2001 reduced effort levels through a variety of means including limiting permits to nine vessels, 100% observer coverage, limiting dredge number and size, a ban on automatic shucking machines, introduction of crab bycatch limits, and no-dredge areas to protect important fish habitats and sensitive species.

Fishermen report that this has given them an advantage as quotas fluctuate less and earnings are more predictable. The fishery has made between 1.8 and 4.4 million dollars annually since 1997. According to an assessment made by an independent industry economist, it is likely that such changes have 'resulted in a more efficient fleet with lower operating costs; potentially greater average crew wages; and improved returns to owned capital'[73].

Marine Protected Areas

Marine Protected Areas (MPAs) are zones of the ocean and/or shores where species and habitats are protected from damage or disturbance. The following pages highlight examples of how MPAs have provided benefits to fishermen.

Examples of MPA related benefits to fishermen

Torre Guaceto Marine Reserve
The small Torre Guaceto Marine Reserve (5 km long, 1 km wide) was established on the eastern coast of Italy in 1992. Within a decade it contained twice the number of sea bream, a highly sought after commercial fish in this region. By 2004, evidence of 'spill-over' of eight commercially important fish species into the unprotected area was found. Working with scientists, fishermen decided to use low-impact gear in the fished area around the reserve to protect the marine habitats. In addition they restricted fishing in this area, which was four times that of the core reserve, to one day a week. Since 2004, the commercial catch from this area has been four times higher than in the unprotected area and the management plan has much local support[74].

King scallop *Pecten maximus* fished from the waters off the Isle of Man

Scalloping around the Isle of Man
The Isle of Man Government has established a protected area off their south-west coast which is closed to scallop dredging and mobile trawling. The main aim of the MPA is to protect a spawning population of scallops which produce larvae that seed the wider commercial fishery. Another aim was to provide a research control area to better understand the impacts of scallop dredging on the marine environment. This has been so successful that the majority of fishermen are now convinced of the benefits. A Vessel Monitoring System has been put in place to help with enforcement and good liaison between managers, fishermen, and fishermen's organisations has minimised the likelihood of intrusion on the reserve[75]. Following this success, the Government has established a second protected area on the east coast of the island. This provides an additional protected source of scallop recruitment to other parts of the seas around the Isle of Man.

Marine Protected Areas currently protect 8% of territorial waters around the English coast. The vast majority of this area comprises 45 European Marine Sites which are designated either for the protection of habitats of international conservation importance such as reefs or for internationally important bird populations[v].

These internationally designated sites offer a unique advantage – they are protected by law. This means that when a fishery is proposed within a European Marine Site there is a legal obligation to demonstrate through an environmental assessment[76] that the fishery will **not** have an adverse effect on the features of conservation interest. Only then can fishing commence. The stringency of this test means that a fishery which has passed this assessment has achieved, in the context of the site objectives[vi], environmental sustainability.

[v] European Marine Sites are defined in The Conservation (Natural Habitats &c.) Regulations 1994 (as marine areas of both Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), which are protected under the EC Habitats and Birds Directives. Marine areas are habitats which are intermittently or continuously covered by seawater.

[vi] While in many EMSs the interest features include the target species of the fishery, this assessment is limited where this is not the case. Where the target species is not an interest feature, although the impacts of the fishery on the wider habitat can be considered as sustainable, the assessment cannot give equal confidence that the target species is fished sustainably.

The Wash European Marine Site

Overfishing in The Wash contributed to a collapse in shellfish stocks in the early 1990s. Over the next ten years there were few signs of recovery. The number of mussel beds fell from over 30 in peak years to just one recorded bed in 1997. Cockles stocks also reached record lows. This had disastrous effects both on the fishing industry and on shellfish-eating birds. The Wash, designated as a European Marine Site for (among other reasons) the protection of intertidal flats, shellfish and birds, experienced major die-offs of oystercatcher during three winters in the 1990s. Thousands of birds were found dead. Knot counts fell by tens of thousands as a result of suspected emigration from The Wash. The cockle fishery was closed in 1997 due to lack of stock and the harvesting of mussels from the natural beds remained at an unprecedented low between 1993 and 1998.

Following the classification of nearly half of The Wash's intertidal mud and sandflats as in the poorest condition, research was commissioned to investigate the factors inhibiting the site's recovery. Eastern Sea Fishery Joint Committee made immediate changes to the management of the fisheries introducing a TAC for cockles in 1998. In 2007, with a management plan in place based on this catch, cockle stocks reached their second highest level since records began. Mussel stocks reached levels not recorded since the late 1980s. Actions taken as a result of the management plan ensured a successful commercial fishery and started to restore the wildlife interests of the site.

This success represents the culmination of nearly ten years of research and dialogue between Natural England, the fishing industry, fisheries managers and Eastern Sea Fisheries Joint Committee.

Wash mussel bed

Conclusion

This report examines how sustainable fishing methods can reduce environmental harm and support a successful fishing industry.

The economic and environmental imperative for sustainable fishing is clear. Achieving sustainable fisheries is complicated however, by lack of consensus on what is and should be considered 'sustainable'.

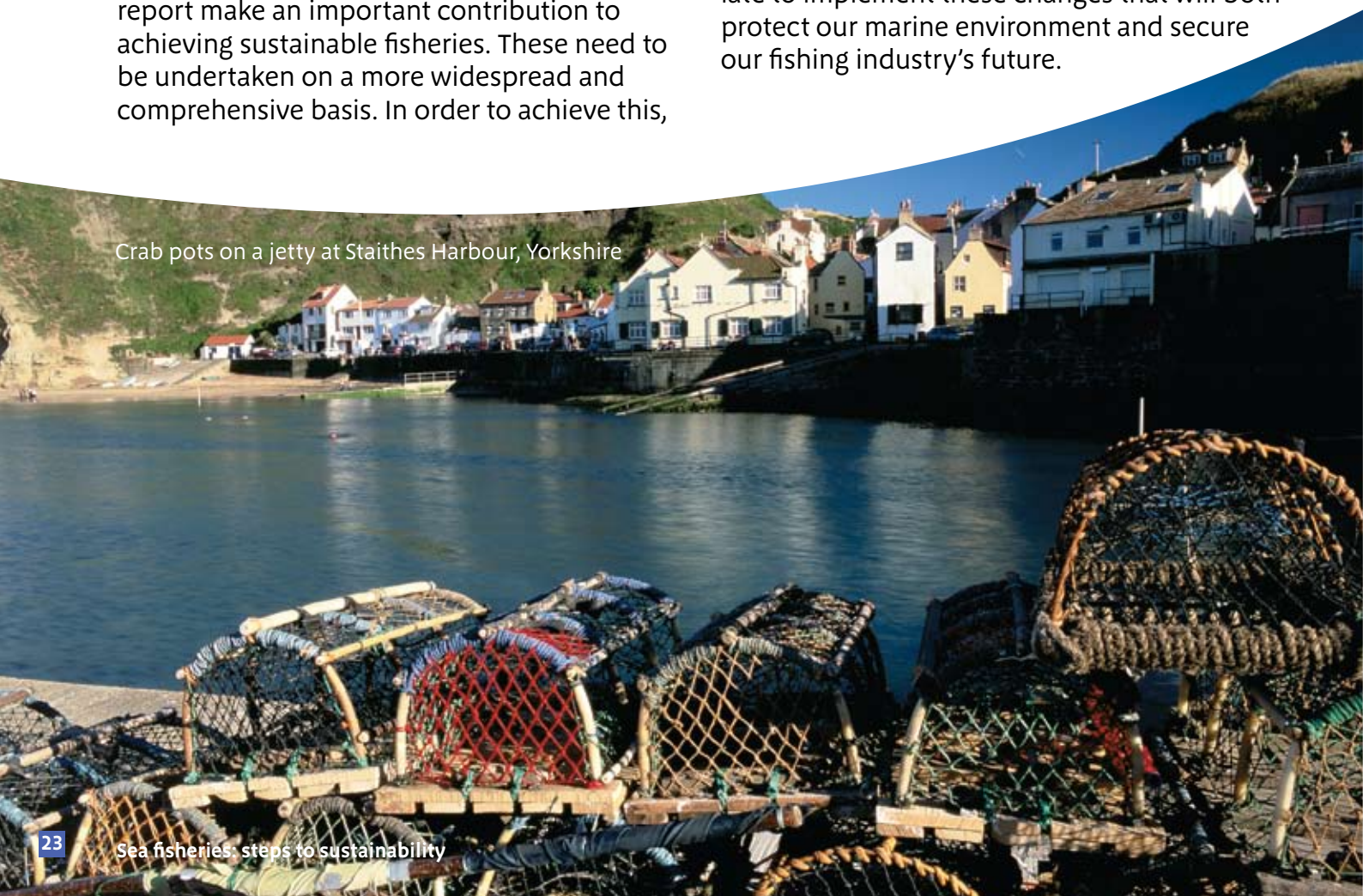
We argue that ecological sustainability needs to be the keystone of fisheries management. This is the only way to guarantee economic and social sustainability. An appropriate, strategic framework must be in place to deliver this. A reformed, modernised and effective CFP is the obvious choice. This CFP needs to ensure that fish stocks can support a productive fishery and fulfil their biological role in marine ecosystems.

Existing initiatives, especially those led by fishermen to achieve sustainability deserve greater recognition. Examples detailed in this report make an important contribution to achieving sustainable fisheries. These need to be undertaken on a more widespread and comprehensive basis. In order to achieve this, communication between all parties involved in sustainable fishing must be improved.

Natural England believes that:

- Fish caught sustainably should be linked to a price premium to provide better economic returns to fishermen.
- Certification should be used to improve the environmental standards within industry.
- Better engagement with fishermen must be pursued to ensure that fisheries management is not simply imposed on but is informed by industry; including for example, harnessing innovative gear adaptations.
- Marine planning is an essential tool in assuring security of access for fishermen, well-managed fisheries and a healthy marine environment.

We remain utterly convinced that it is not too late to implement these changes that will both protect our marine environment and secure our fishing industry's future.



Crab pots on a jetty at Staithes Harbour, Yorkshire

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Fisherman operating a gill net in Bridlington, Yorkshire

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