

Marine Fisheries  
Science Yearbook  
2008/2009



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Department for Environment  
Food and Rural Affairs

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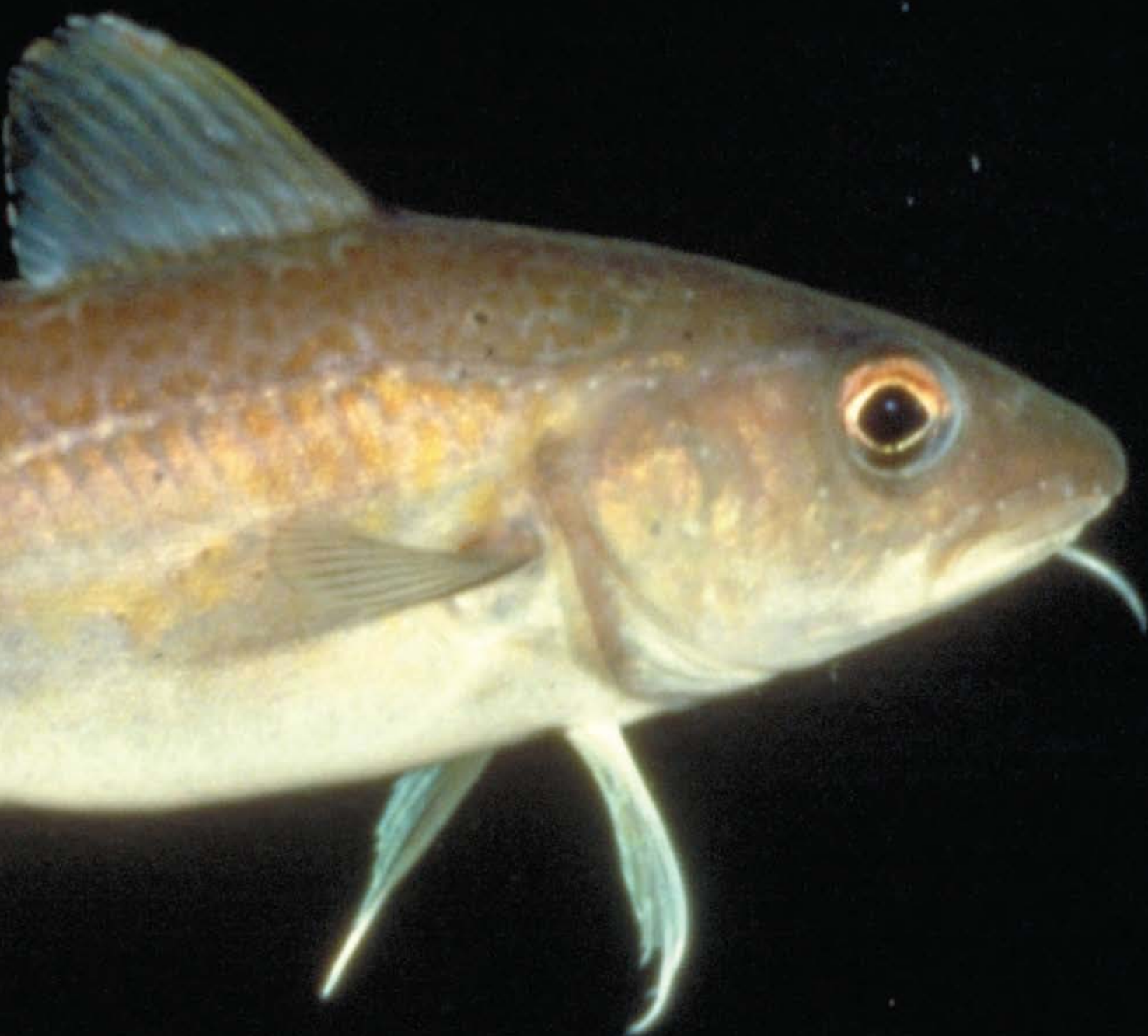
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# Contents

- 4** Introduction
- 6** Fish stock monitoring and assessments
- 8** Sustainable marine fisheries research
  - 9** Impact of fishing on the marine ecosystem
  - 11** Effects of the environment on fish stocks
  - 13** Fisheries management tools
- 18** The Fisheries Science Partnership
- 26** The Fisheries Challenge Fund
- 32** List of current and recent marine fisheries science projects
  - 33** Sustainable marine fisheries research projects
  - 40** Fisheries Science Partnership projects
  - 44** Fisheries Challenge Fund projects
- 48** Appendix 1: Fish stock monitoring and assessments – more information

# Introduction



Defra funds science projects to improve our knowledge and understanding of marine fisheries. We use the scientific information from the projects to develop soundly based policies for managing fisheries in our waters and to help us to negotiate effectively in the European Union (EU).

This is our third Yearbook; it reports on a selection of marine fisheries science projects to illustrate the work funded from April 2008 to March 2009. We publish Yearbooks to increase understanding of what fisheries scientists do and to help people interested in fisheries to give us ideas for future scientific work, which will build on existing work or fill gaps. A list of marine fisheries science projects we have funded recently, including all 2008/2009 projects, is at the end of the Yearbook.

You can read our Marine Fisheries Science Yearbooks for 2006/07 and 2007/08 at: [www.defra.gov.uk/marine/science/yearbook.htm](http://www.defra.gov.uk/marine/science/yearbook.htm)

We fund four types of marine fisheries scientific work:

- **Fish stock monitoring and assessments** provide annual information about the state of fish stocks, which feeds into international scientific advice (pages 6-7).
- **Sustainable marine fisheries research** includes long-term research into issues such as the status and structure of fish stocks around our coast and the impact of climate change on them (pages 8-17).
- **The Fisheries Science Partnership**, which started in 2003, charters commercial fishing vessels to do surveys of particular fish stocks or other investigations using scientific techniques. These are carried out on the normal commercial fishing grounds and using the normal gear of the chartered vessels (pages 18-25).
- **The Fisheries Challenge Fund** supports short-term scientific projects, as well as economic and social projects, suggested by organisations with an interest in fisheries (pages 26-31).



# Fish stock monitoring and assessments



Stock monitoring work involves market sampling, fishing surveys and discard sampling. It is organised by national laboratories, such as Cefas (Centre for Environment, Fisheries and Aquaculture Science). Monitoring provides the basic information used by international working groups within the International Council for the Exploration of the Seas (ICES) and the EU's Scientific Technical and Economic Committee for Fisheries (STECF) to assess the status of stocks. Their advice feeds directly into policy decisions on the management of fisheries in UK and international waters. Commercial finfish and shellfish stocks are assessed by international scientific working groups organised by ICES, which meet each year.

We explained in our first Yearbook – the Marine Fisheries Science Yearbook 2006/2007 – why we need to sample catches, why we need to conduct research surveys and why we sample discards each year. We also explained stock assessments. We have included this information in Appendix 1 of this Yearbook. Below, we report on the data collected in 2008.

### **What market sampling data were collected in 2008?**

A total of 231,707 length measurements and 28,140 samples for age determination were collected from finfish landings and 80,441 length measurements from shellfish. All the main fleets and gear types which contribute significantly to the English and Welsh landings were sampled during the year.

### **What data were collected in 2008 from fishing surveys?**

A total of 127 ship-days were devoted to six research vessel monitoring surveys in the North Sea, the Channel, Celtic Sea, Irish Sea and Bristol Channel. A further 52 days of fishing were undertaken on chartered commercial vessels surveying for bass in the Solent and Thames, herring in the Thames, flatfish in the western Channel, and juvenile flatfish along the North Sea coast from the Humber to the Thames.



**Figure 1: Cefas scientist at work.**



# Sustainable marine fisheries research





Defra is committed to the protection and sustainable use of our marine resources and ensuring that management decisions are based as far as possible on sound scientific information. We therefore need a range of information on the fish stocks around our coast. For example, we need to know about populations of fish, how climate change affects important commercial fish and shellfish stocks and how to reduce bycatch in fishing gear.

Defra funds the following sustainable marine fisheries research:

- **Impact of fishing on the marine ecosystem** – to understand how fishing affects the productivity of the fish and shellfish resource and other vulnerable species and habitats in the ecosystem.
- **Effects of the environment on fish stocks** – to understand how changes in environmental conditions affect fisheries' productivity.
- **Fisheries management tools** – to provide the tools for better fisheries management including improved understanding of the status of fish and shellfish stocks.

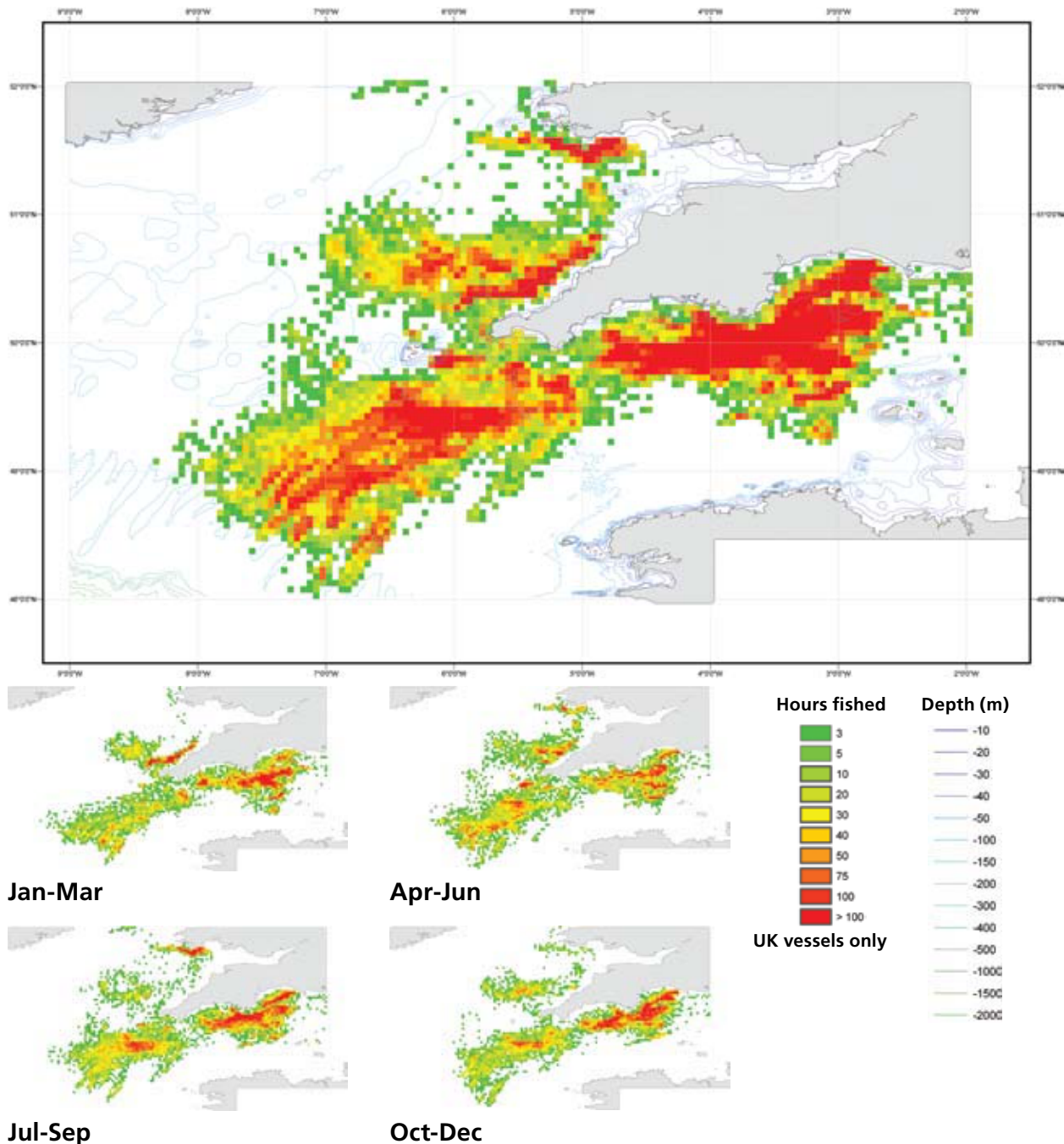
This work is carried out by Cefas, universities and research centres, often working together. The research supports international work carried out through ICES and the STECF, as well as linking with EU-funded research programmes.

## Impact of fishing on the marine ecosystem

### Ecosystem approach to fisheries

The Government and the European Commission are committed to adopting an ecosystem approach to fisheries which aims to plan, develop and manage fisheries in a way that meets the needs of fishermen and society more widely, but without jeopardising the options for future generations to benefit from the full range of goods and services provided by marine ecosystems. However it is challenging to translate high level policy commitments into an effective management system. Cefas scientists are trying to address this challenge by developing and piloting an ecosystem approach to fisheries, supported by indicators and management tools. They are specifically developing, testing and reporting indicators that allow managers and stakeholders to assess the status of the ecosystem and the impacts of fishing, and they are developing decision tables that allow managers and stakeholders to see the effects of different management options and to choose among them. For example, a decision table might show how different rates of fishing would affect the profitability of the fishery, the abundance of a species of conservation concern and the status of marine habitats.

To date, the project has identified management objectives for the Celtic Sea and western Channel fisheries, classified 'fishery units' and started to assess the extent to which objectives are or are not met. An overall objective that meets the need of many stakeholders can be summarised as 'profitably sustainable and environmentally responsible'. While the statement is open to some interpretation, detailed analysis of the different aspects of sustainability and environmental responsibility suggest the objective is not met by all fisheries. To assess the impacts and scale of fisheries the project has also developed data handling systems to help analyse and present effort data, and to characterise the activities of the fleets. Analyses of satellite vessel monitoring system (VMS) data have provided insight into the interactions and behaviour of fleets in location and time (Figure 2).



**Figure 2:** Fishing effort by UK over 15 metre beam trawlers in south-west waters during 2007 based on satellite vessel monitoring system data. Outputs such as this have been reviewed by industry representatives on the project user steering group.

Experience gained during the project should help support the development of an ecosystem approach to fisheries in the Celtic Sea and western Channel and hopefully inform developments in other Regional Advisory Council areas. A steering group of users, including fisheries managers, is informing and guiding the project. The results will allow the UK to provide evidence-based scientific advice on the development and application of the ecosystem approach to fisheries, and places us in a strong position to lead and inform discussion on these issues both nationally and internationally.

# Effects of the environment on fish stocks

## Edible crabs in the English Channel

Previous tagging studies, 40 years ago, demonstrated that edible crabs can undertake substantial movements, but uncertainties in understanding of crab stock structure and poor data on crab migrations hamper effective management of the stocks.

Cefas scientists are investigating the growth, movements and exploitation of the crab stocks in the English Channel, including areas in the eastern Channel and into the Celtic Sea, where crab fisheries have expanded since previous tagging studies took place. To date they have tagged over 10,000 crabs, mostly females, in the eastern Channel and off Portland (autumn 2007), off Salcombe and Lands End (summer 2008) and on the Trevoise and Lands End grounds (autumn 2008). They have also used electronic data storage tags on 61 crabs – the first time Cefas scientists have used this technology on crabs. So far 1632 recaptures have been reported, including 11 of the data storage tags. These have confirmed that the crabs move in a generally south-westerly direction, which is against the strongest tidal currents, and females tend to migrate longer distances than males. Some fishermen have suggested that crabs may move eastward in the early part of the season but this has not yet been confirmed by the tagging. Scientists are planning further tagging in these areas in 2009.

The results of the tagging and sampling programmes will be used to model the movement, exploitation and growth rates which will provide a sounder basis for future management of the stocks. The study will also be used to undertake large-scale blood-screening to investigate the numbers of crabs with the parasitic *dinoflagellate Hematodinium sp.*, which is potentially a major cause of crab deaths.



**Figure 3:** Edible or brown crab with tag.



## Managing scallops

Scallops supported the highest value fishery in England and Wales in 2007. Scallops are largely sedentary except for their larval phase which lasts about one month. It is this dispersal phase which is crucial in determining where future generations of scallops will be available to the fishery. This is particularly relevant where changes to temperatures and marine currents may be experienced as part of global climate change.

Cefas scientists are investigating the spawning periods for different sizes and ages of scallops by collecting regular samples from south-west England, particularly from Cornish waters. This has shown that different sized scallops have different patterns of spawning activity, with larger individuals tending to be ready to spawn at different times from the smaller individuals. This work will be followed up by research vessel surveys to locate scallop settlement sites and chart the progress of settlement to recruitment into the fishery. Scientists are also doing detailed modelling of these processes, including predicting how scallops will react to different possible changes in climate.

The results of this work will be built into a model which can be used to test management proposals on real stocks and fisheries at a local scale. This will let managers and stakeholders more accurately estimate the costs and benefits of management proposals, including taking account of the effects of climate change.

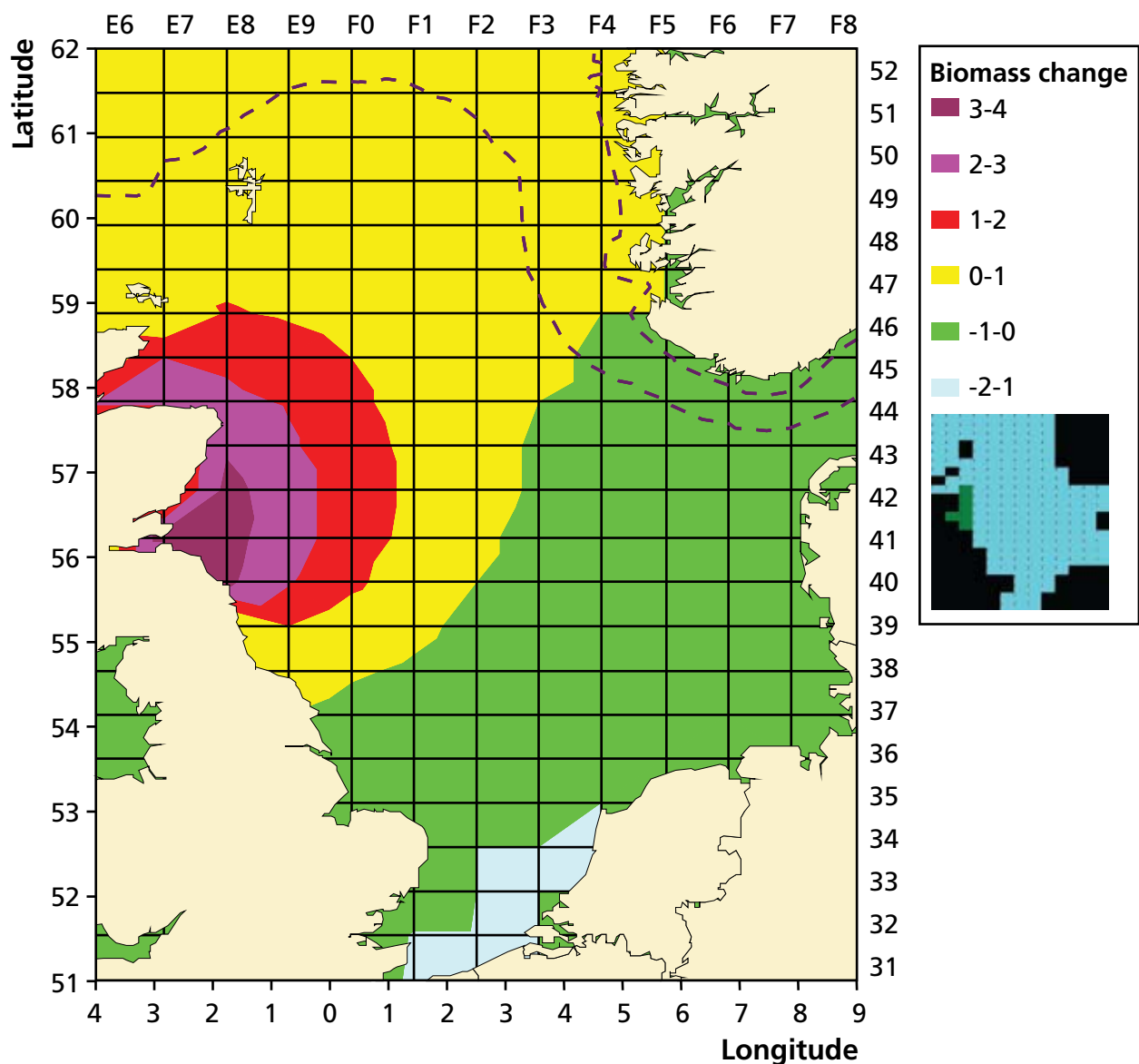


**Figure 4:** An opened scallop *Pecten maximus* showing gonad condition during spawning.

# Fisheries management tools

## Ecosystem models to support fisheries management

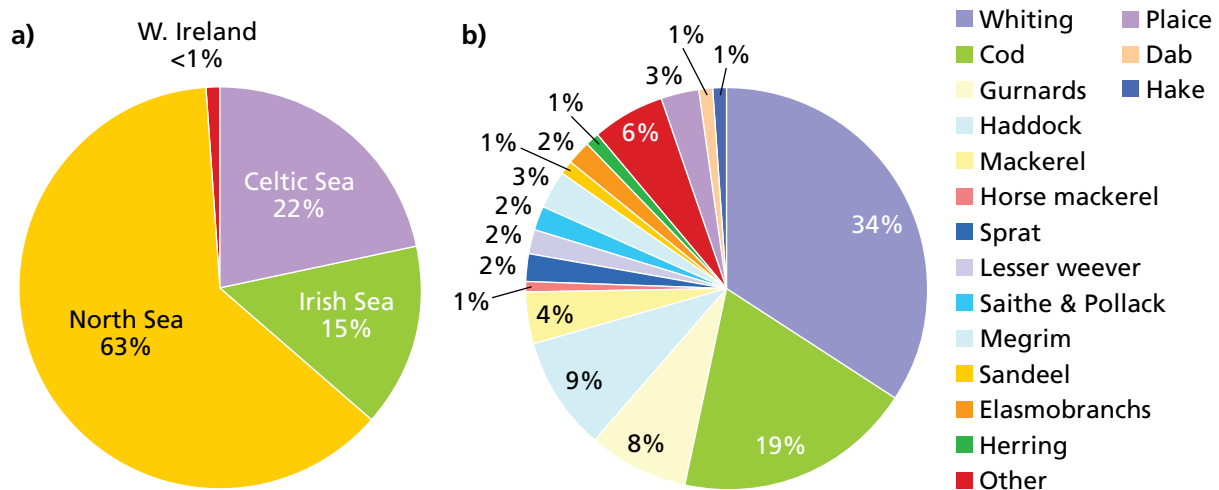
Many people believe that better fish stock assessment will require multispecies fisheries models that take into account the complex food-web that exists in the ocean, since it is known that fishing for one species can have wider implications for other species that are prey, predators or competitors. The past three decades have witnessed explosive growth in the number and type of multispecies models directed at answering fisheries questions and Cefas scientists are currently working on a three year project to evaluate the usefulness of different modelling approaches and to investigate predator-prey linkages in the North and Celtic Seas.



**Figure 5:** Predicted effects of banning sand-eel fishing in an area on the Scottish east coast (the Firth of Forth 'sandeel box') on the biomass (tonnes) of seabirds throughout the North Sea, as determined by a complex ecosystem model of the region. The 'sandeel box' is shown in green on the inset map. Biomass change is the predicted change in the biomass of seabirds in tonnes per 100,000 square kilometres following a ban on sand-eel fishing.

In the first year of this project, research has focused on the North Sea, and has included both size-based and species-based models, encompassing all parts of the ecosystem from minute plankton up to whales and seals. Scientists have begun to evaluate the potential implications of proposed and existing Marine Protected Areas (MPAs) for all species in the food-web, as well as the possible influence of long-term climate change. Figure 5 shows the predicted increases in seabirds from a ban on sand-eel fishing. They have set up an online database of fish feeding data (Figure 6). This database ([www.cefas.co.uk/dapstom](http://www.cefas.co.uk/dapstom)) includes information on 82 species of fish sampled throughout the UK shelf seas between 1903 and 2009. Thus, for example, records of 12 wolf-fish (Figure 7) examined by scientists between 1903 and 1990 reveal that this species' diet is made up of 32% hermit crabs, 28% bivalve molluscs, 15% whelks, 13% crabs, 5% worms and 3% gastropods.

The implication of this complex project for fishermen and policy makers is a realisation of how difficult it can be to predict the likely indirect consequences of exploitation or new management measures in the oceans. Species can be impacted far beyond those actually being targeted. Fisheries targeting one commercial species can have far-reaching and unexpected consequences, which may affect other commercial fleets. In addition, we should not expect high yields of all species simultaneously because a high biomass of one species might well suppress populations of competitors or prey animals.



**Figure 6:** The geographic (a) and taxonomic (b) composition of the fish feeding preference data included in the online 'Dapstom' database.



**Figure 7:** Wolf-fish *Anarhichas lupus*, one of the 82 species for which data on feeding preferences are available in the 'Dapstom' online database.



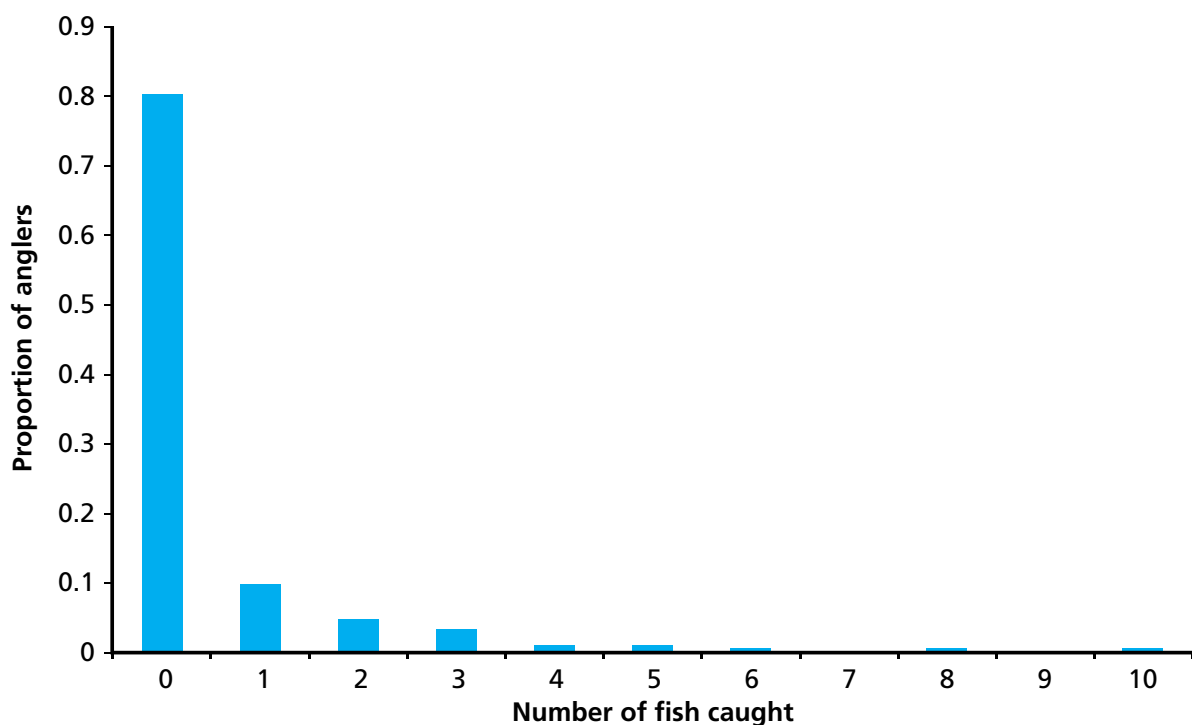
## Managing recreational sea angling

Recreational sea angling is widely carried out around the UK coast, but received little attention until recently, when its profile was raised by a number of Government reports. There is very little formal information available on sea angling activity and limited past experience of managing sea fisheries in the face of competing interests from the commercial and recreational fishing sectors.

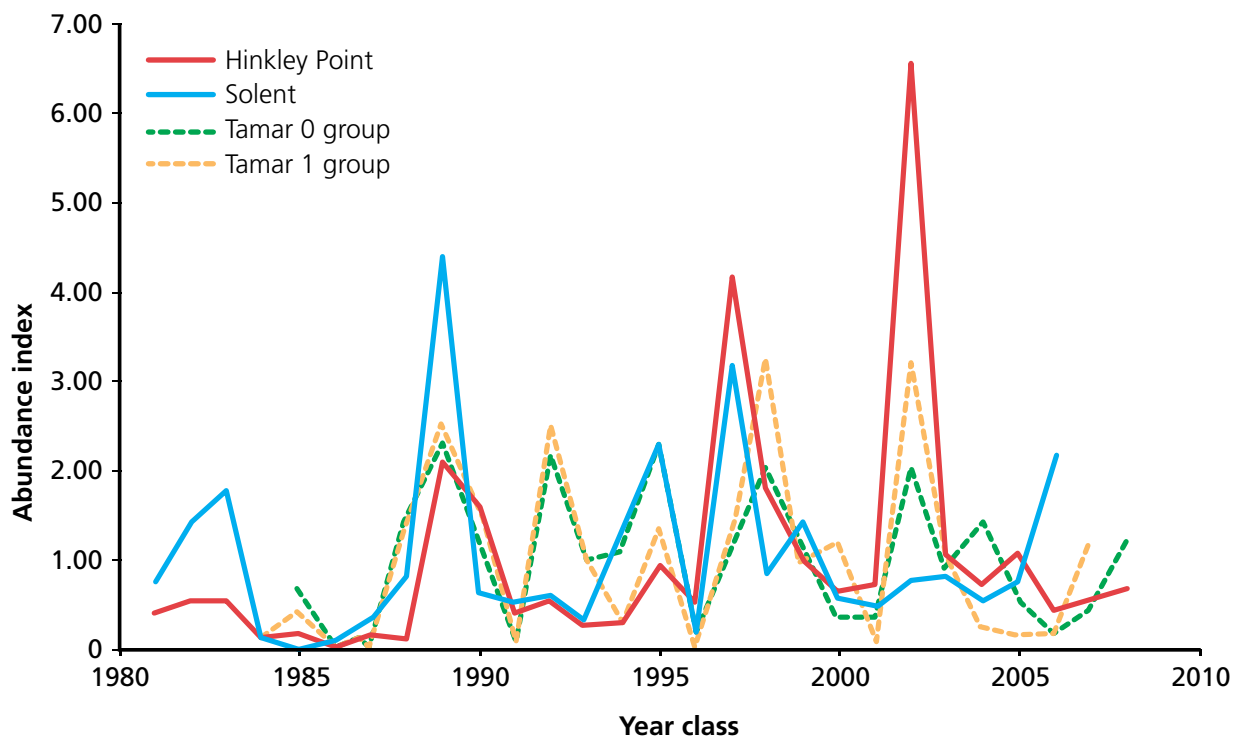
Cefas scientists have recently begun a project to improve understanding and management of species of interest to sea angling such as bass, cod, tope, grey mullet and flounder. They will be examining past management experience in relation to the status of these species, and will be collecting detailed catch and effort data from a sample of anglers, as well as historic data from angling clubs and competitions. The results of competitions held by sea angling clubs may provide local figures for fish abundance, and information on the distribution of anglers' catch rates and average fish size (Figure 8). These data will be used to help quantify the extent and catch rates of sea angling and its potential impact on commonly caught species of sea fish.

The project will also include an economic study to quantify costs and benefits that might result from potential management changes for commercial and recreational bass fisheries using valuation techniques that are comparable between fisheries sectors.

Information on the production of young bass has been extended into the Celtic Sea by obtaining a new dataset for the numbers of these fish trapped by the Hinkley Point power station cooling system (Figure 9). Preliminary examination of these data indicates broadly similar fluctuations as seen in Cefas data for other regions. This will inform scientists and managers about the potential availability of bass to important bass fisheries in this area.



**Figure 8:** Distribution of anglers' catches (number of fish) in a major sea angling competition. Average number of fish caught per angler by those weighing in was 2, but this fell to 0.4 if those not weighing were assumed not to have caught any fish.



**Figure 9:** Comparison of existing indices of production of young bass with new (provisional) data for the Celtic Sea from the Hinkley Point power station (data kindly supplied by P. Henderson, Pisces Ltd.).



**Figure 10:** Sea angling.

## Tools for estimating stock status under uncertainty

Fisheries stock assessment and advice relies on the data collected from fisheries and through research surveys. However, the results of current assessment methods are open to uncertainty when the available data on stocks and fisheries are poor. In turn, existing information may be inadequate to answer the questions posed by global initiatives, such as the World Summit on Sustainable Development. Adopting an ecosystem approach to fisheries management also means that it will become increasingly important to understand the impacts of fishing on species not formally assessed by ICES (e.g. sharks, skates and rays). This is hindered due to a limited understanding of the biology and catch rates of these species.

Cefas scientists are developing and examining alternative methods to assess stocks, in particular those where data commonly used for assessment are lacking or uncertain. They have examined methods for assessment and management decision-making around the world, and will be testing these against species and situations of relevance to stocks of key and increasing interest in the waters of England and Wales. These stocks include deep water species, and sharks and rays.

Possible future changes in the targeting of commercial fisheries from one species to another may result from external factors such as global warming, as well as from management decisions and the consumer demand for particular species. This project aims to develop approaches that can provide advice to the fishing industry on appropriate levels of fishing. Under the precautionary approach, management of all these stocks would require minimal catches in the face of a lack of scientific evidence, to the detriment of fishermen's livelihoods. By developing approaches to evaluate the status of species which cannot usually be assessed through current assessment methods, and adapting approaches for managing those species, the research will also aim to improve the overall management of the seas' resources, moving towards the ecosystem approach.



**Figure 11:** Measuring an electric ray *Torpedo nobiliana* caught in the Celtic Sea by the Cefas *Endeavour* research vessel.

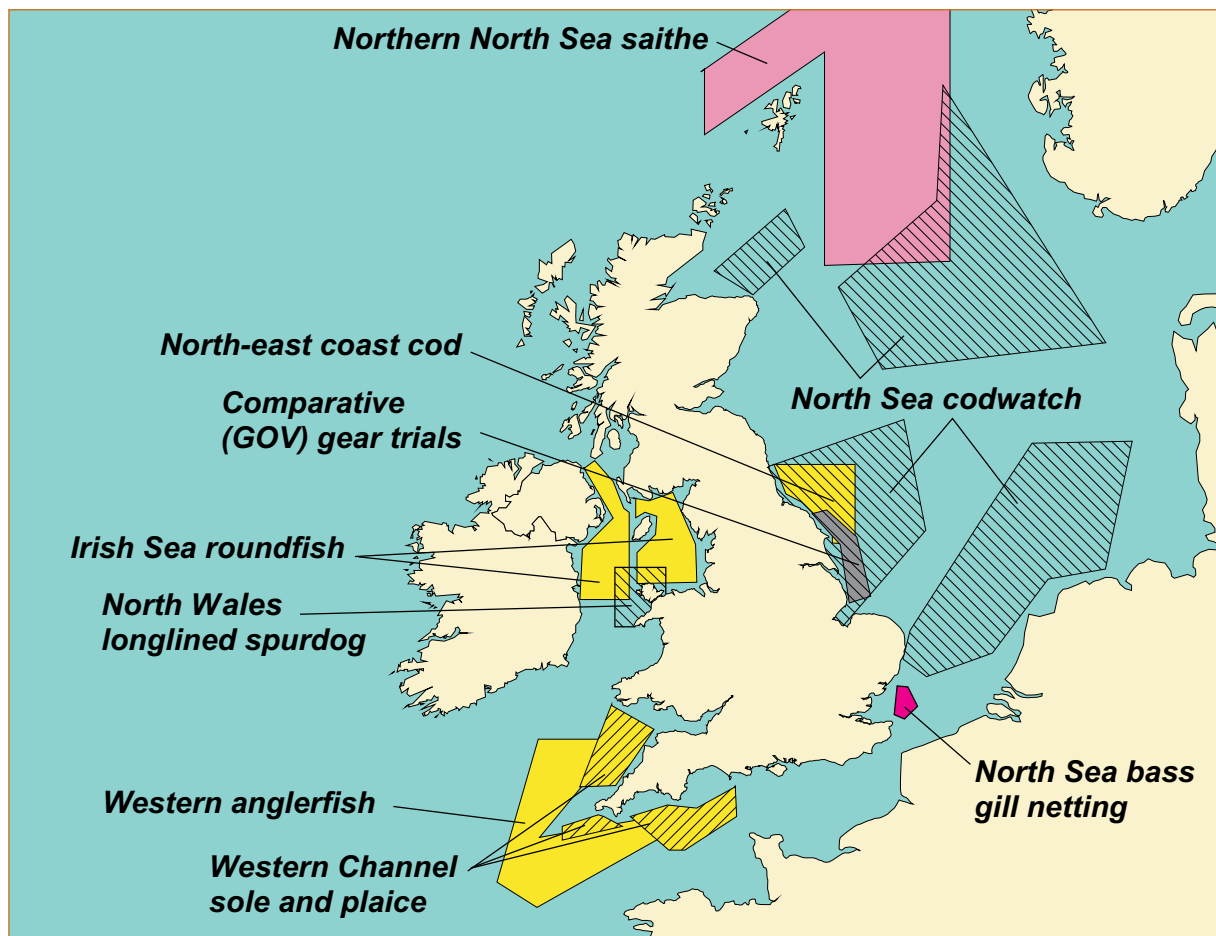


# The Fisheries Science Partnership



The Fisheries Science Partnership (FSP) encourages fishermen and Cefas scientists to work together. It also involves fishermen in planning scientific studies. It has been running since 2003 to:

- provide information from commercial fishing operations on key stocks, to supplement the data used in ICES assessments;
- address issues raised by fishermen on scientific assessments or on stocks not currently assessed; and
- investigate new scientific methods and more environmentally friendly or selective fishing methods.

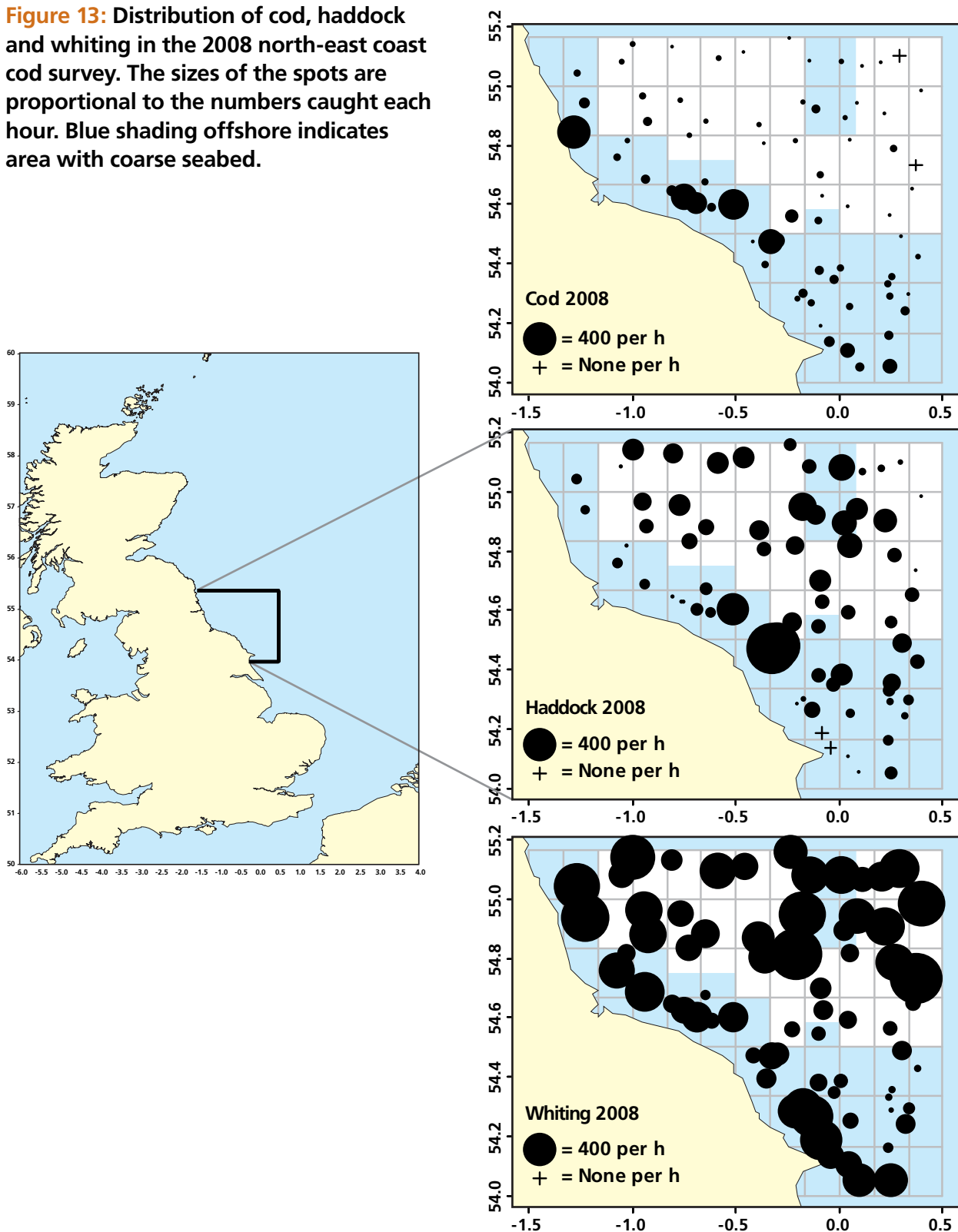


**Figure 12:** Location of 2008/09 projects. The four time-series projects are shown in yellow. Maps of FSP projects up to 2006/07 and in 2007/08 are in the Marine Fisheries Science Yearbooks for 2006/07 and 2007/08.

## North-east coast cod

The North-east coast cod time-series survey continues to provide the most comprehensive data so far on the abundance, distribution, size/age structure and species mixing of demersal fish on the fishing grounds for cod off the north-east coast of England during autumn. It also provides information on haddock and whiting. The first four years of the survey were reported in the Marine Fisheries Science Yearbook 2006/2007.

**Figure 13: Distribution of cod, haddock and whiting in the 2008 north-east coast cod survey. The sizes of the spots are proportional to the numbers caught each hour. Blue shading offshore indicates area with coarse seabed.**



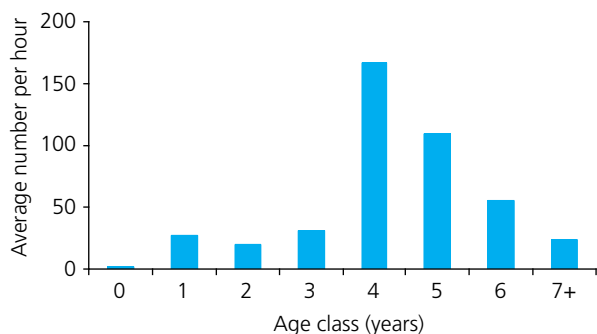
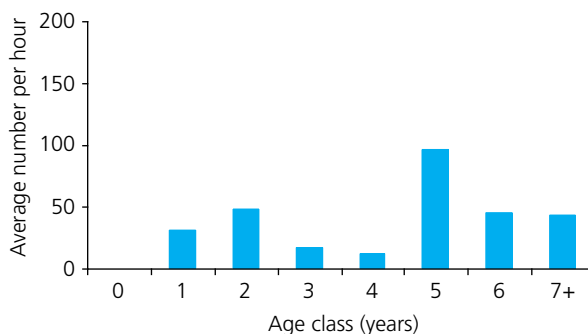
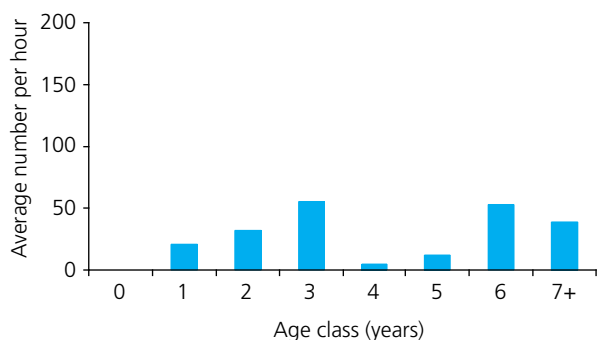
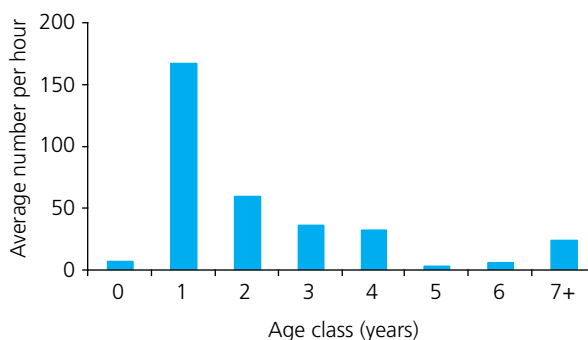




**Figure 14: Cefas scientist with cod.**

In October/November 2008, the sixth in the series of annual surveys was conducted. The first two surveys (2003 and 2004) were largely exploratory, examining factors such as effect of gear type and time of day on catch rates, but later surveys have been conducted according to a specified survey design using specific gear in order to build up a consistent time-series. The survey design aims for broad coverage over a range of seabed types, but with extra catches on the hard ground where cod tend to be more abundant.

The results confirm that cod tend to be more abundant on or near areas of coarser seabed, whereas haddock prefer softer seabed sediments offshore (Figure 13). Whiting do not have any clear preference for seabed type. The results of the surveys have also supported the ICES analyses for the whole North Sea showing a relatively abundant 2005 year class of cod (Figure 14) and haddock; a large but declining contribution to catches of the 1999 haddock year class since 2004; and a relatively strong 2007 year class of whiting. Indications of very poor recruitment of whiting aged one year from 2003 to 2007 are given by the dominance of older whiting in the catches up to 2007 (Figure 15). The increased abundance of these older whiting in the survey area since 2005 possibly reflects their localised aggregation along the north-east coast of England, despite their apparent decline in abundance throughout the North Sea as a whole.

**Whiting 2005 survey****Whiting 2006 survey****Whiting 2007 survey****Whiting 2008 survey**

**Figure 15: Average catch rates of whiting by age during the 2005–2008 surveys.**

Given this information, it is unsurprising that demersal trawlers operating in the area covered by the survey have been taking large bycatches of whiting and have had quota-uptake problems since 2005. Matching quotas for the different whitefish species is always difficult, but when one or more species is as available as whiting has been recently, the difficulty in managing separate quotas at sea becomes particularly challenging. The managers ashore have similar difficulty in ensuring optimal take-up of quotas across their fleets.

### Northern North Sea saithe and cod

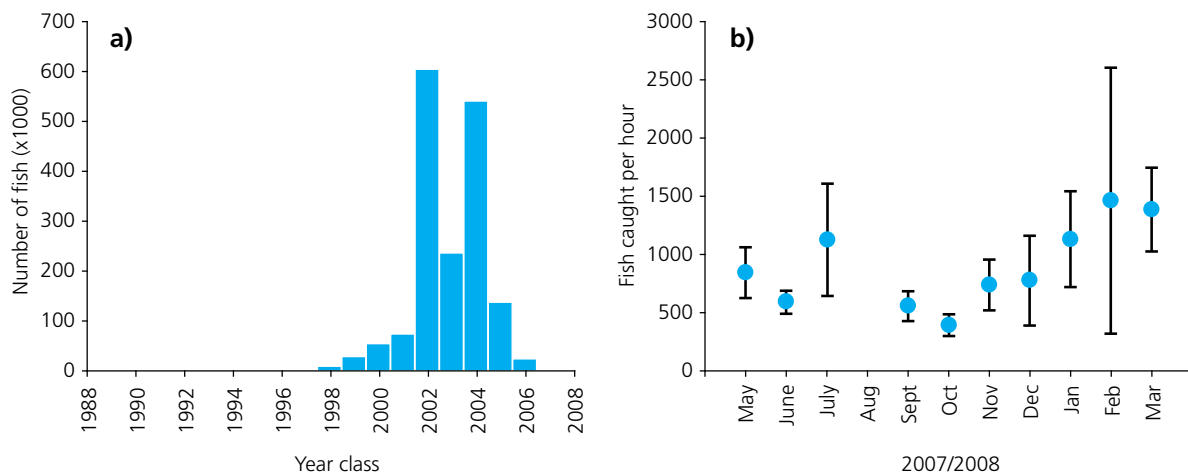
This two-year project aimed to provide monthly data on the catch composition of saithe and cod in the northern North Sea. It was set up in response to fishermen's concerns about whether there were realistic data on the 2004 and 2005 year classes of saithe and also on the 2005 and 2006 year classes of cod. Saithe four and five years old (2005 and 2004 year classes) were of particular interest because they are predicted to have contributed significantly to landings in 2008, and the balance is expected to dominate the spawning-stock biomass of the species in 2009.

The project used data collected by fishermen aboard the *Farnella*. The skipper, crew and vessel owners were trained in sampling techniques by Cefas scientists before collecting the data.



**Figure 16: Map of the North Sea showing *Farnella* haul locations (red) and the 200m bathycline (blue).**

In the first year of the programme, The *Farnella* made 24 commercial fishing trips in the northern North Sea (Figure 16), hauled 492 times, and caught 1.7 million saithe and 19,000 Atlantic cod. Discarding of both species was minimal (less than 1% by weight and number), highlighting the northern North Sea saithe fishery as an example of a virtually single-species fishery. The study also showed that sampling by fishermen can provide good information on North Sea cod and saithe stocks. However, suggestions by fishermen at the start of the project that there would be large stock sizes of certain year classes of saithe have not all been supported by the project's findings.



**Figure 17:** Numbers of saithe caught by year class (a) and fish caught per hour by month (b) between May 2007 and March 2008 aboard FV *Farnella*.

The numbers of saithe caught each month varied considerably throughout the study period, ranging from 100,000 (December) to 300,000 (March). Catch rates also varied a lot, with averages of 400 fish an hour caught in October and 1500 fish an hour in March (Figure 17). During the project two strong year classes seemed to have been in the fishery: 2002 (seven year-olds) and 2004 (five year-olds), together making up two-thirds of the 1.7 million saithe caught during the study. Therefore, although there seems to be some justification for assuming that the 2004 year class of saithe (Figure 18) is strong, the same cannot be said for the 2005 year class on the basis of the results so far (Figure 17).

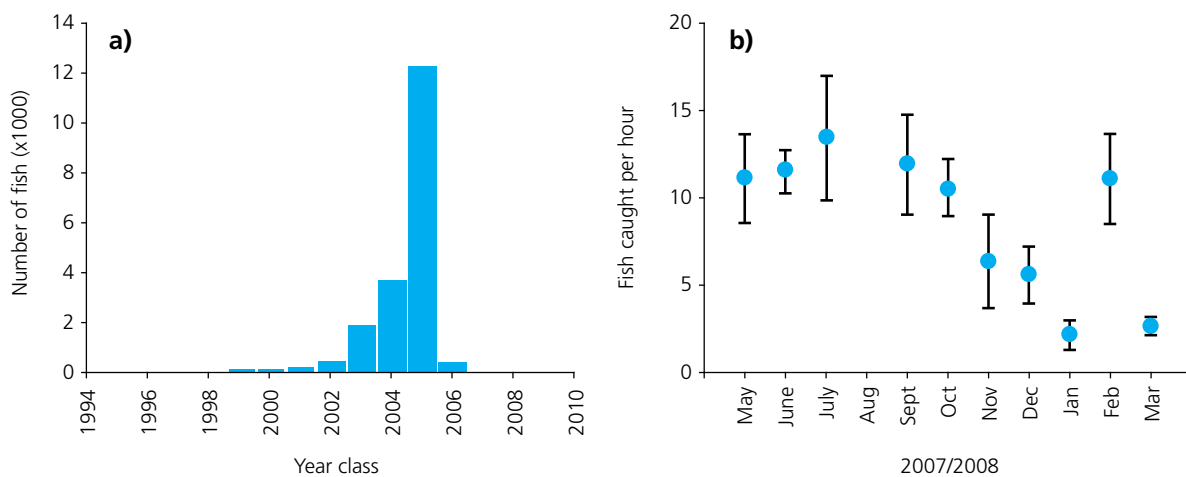


**Figure 18:** Saithe.



**Figure 19:** Cod being measured.





**Figure 20:** Numbers of cod caught by year class (a) and fish caught per hour by month (b) between May 2007 and March 2008 aboard FV *Farnella*.

The number of cod (Figure 19) caught each month ranged from 500 (January) to 4500 (June), with catch rates peaking at thirteen fish an hour in July and bottoming out at two fish an hour in January (Figure 20). Cod catch rates, which were less than 2% by weight of the whole catch, seemed to be lower when saithe catch rates were at their peak. However, of the approximately 19,000 cod caught during the study about 12,000 (64%) were aged four (2005 year class), so there seems to be some justification for the widespread belief that the 2005 year class is stronger than the recent average. In contrast, the 2004 year class of cod (five year-olds) was less abundant (20% of the catch), and older cod were extremely scarce (Figure 20).

### North Sea bass gillnetting

Accurate information on the relationship between gillnet mesh size and fish selectivity is important if managers are to set appropriate net mesh sizes. Such knowledge allows managers to establish regulations that can help to minimise wasteful or unsustainable fishing practices, for example by reducing the likelihood of undersized fish being caught in the gillnets.



**Figure 21:** The European seabass (*Dicentrarchus labrax*).

This study provided new selectivity data on European seabass (Figure 21), a species of interest to recreational sea anglers for many years and of increasing interest to commercial fishermen. It compared the catches of bass in gillnets of mesh size 90, 100, 108 and 120 mm deployed simultaneously on fishing grounds in the southern North Sea. The work was carried out during October and November 2008 on the *Rachael S* (Figure 22). Three replicate trials were conducted and all produced consistent and comparable results.

The analysis of catch data indicated that bass selectivity peaked at 41-44 cm in gillnets with a mesh size of 90 cm. This peak increased with larger mesh sizes, reaching 54-58 cm with 120 mm gillnets. To quality-control these seabass selectivity trials, the selectivity of Dover sole (*Solea solea*) was also checked over the same range of gillnet mesh sizes. The results were compared with previous estimates from Danish trials (1999) and were totally comparable (i.e. within 1-2 cm).

The results provide new information which can help future decision-making on the management of this fish species of commercial and recreational value. It is important that the effort of the commercial fishermen is managed in the best way for the sustainability of the stock. Using knowledge of selectivity patterns is one way to ensure this.



**Figure 22:** The *Rachael S* docking in Lowestoft.



# The Fisheries Challenge Fund



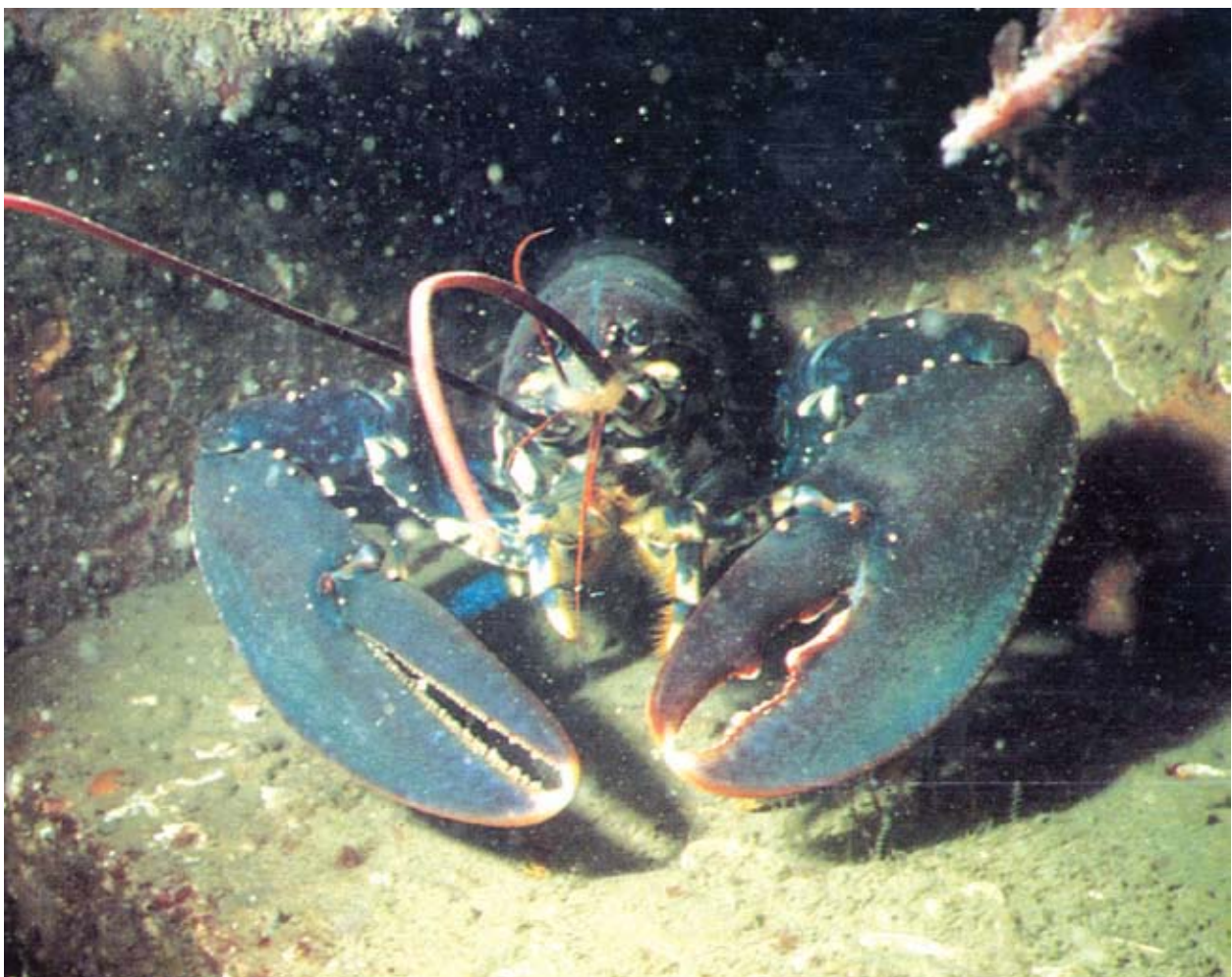


The Fisheries Challenge Fund was introduced in 2005 in response to the *Net Benefits* report by the Prime Minister's Strategy Unit. It funds short-term scientific projects, as well as economic and social projects, suggested by organisations with an interest in fisheries.

### **Fisheries Strategic Environmental Assessment**

In 2001 the European Commission adopted the Strategic Environmental Assessment (SEA) Directive to ensure that the environmental effects of plans and programmes are identified and assessed during their preparation. The SEA process allows everyone with an interest to give their views and for all findings to be integrated and taken into account in the decision-making process. In 2004, the Prime Minister's Strategy Unit recommended that Fisheries Administrations introduce SEAs of inshore and offshore fisheries as the first stage of establishing a comprehensive environmental management system. A pilot study was needed because the SEA process had not been applied to fisheries management anywhere in Europe.

The North Eastern Sea Fisheries Committee commissioned a pilot SEA of shellfish fisheries under its management and the development of a general fisheries SEA framework which could be used as guidance for other projects. The SEA focused on ten shellfish species. Objectives were set for a wide range of topics such as harvesting fish stocks sustainably and maintaining fishing communities. Current fisheries management and the implementation of each of the principal European, national and local fisheries management measures were assessed against each objective.



**Figure 23: Lobster.**

The SEA showed that with the current fisheries management (following a traditional approach of focusing on single species fisheries to maximise catches) there was a significant negative impact on objectives relating to biodiversity for most of the fisheries in the Sea Fisheries Committee district. For sustainability the interactions between habitat, target species, predators and prey, and other ecosystem components needed to be considered. An unsustainable fishery regime would have a negative effect on the fishing communities and local economy. The pilot study recommended an ecosystem-based approach to fisheries management, which would reverse the order of management priorities to start with the ecosystem rather than the target species enabling the North Eastern Sea Fisheries Committee to reduce the impact of fishing on the marine environment, while having regard for the economic development of the fisheries sector, to ensure sustainable fisheries for future generations. The report includes recommendations for moving towards ecosystem-based fisheries management in the Sea Fisheries Committee district and for monitoring. This pilot SEA shows how the framework can be applied to fisheries management in other areas.

### Measuring the effect of Marine Protected Areas on finfish

With the current UK commitment to create a network of Marine Protected Areas (MPAs), we need mechanisms in place to assess effectively whether MPAs are meeting their objectives to protect biodiversity. This is especially important because much of the current applied knowledge comes from tropical reef systems that are very different from those of the North Sea. This project for the North Eastern Sea Fisheries Committee aimed to improve understanding of how local changes in the abundance of mobile finfish in small MPAs might be assessed in the North Sea. Scientists from Newcastle University tested four methods for measuring the abundance, sizes and variety of finfish in the Filey prohibited trawl area and surrounding areas off the north Yorkshire coast.



**Figure 24:** a) The fish trap extended into upper and lower parlours as it would sit on the seabed. b) Trap with the upper parlour collapsed showing the support frames added to hold the entrance open in the strong tidal currents experienced along the north Yorkshire coast.





**Figure 25:** a) Six fleets of trammel net ready to deploy on the aft deck of *North Eastern Guardian III*. b) Deploying a fleet of trammel net. c) The construction of a trammel net.

The gears used were acoustic devices, fish traps (Figure 24), trammel nets (Figure 25) and baited video traps (Figure 26). Comparisons of data from the different gears show how best to assess changes in finfish in ways that are least environmentally damaging. The project revealed strengths and weaknesses of the different methods, including detailed set-up and deployment costs. Acoustic surveys were a cost effective way of measuring biomass (total amount of living material in a habitat), but provided little species specific information. Trammel nets proved best for measuring biodiversity because they caught the widest range of species. Fish traps and baited video traps both sampled a limited range of scavenging (but commercially important) species. Baited video traps, while expensive, had an added advantage of providing habitat information and sampling small or elongate species not captured by other gears.

This project forms part of a larger study by Newcastle University, funded by the Esmée Fairbairn Foundation and a Natural Environment Research Council quota studentship, which is due for completion in Autumn 2009. This larger study is assessing the Yorkshire prohibited trawl areas (Whitby, Filey and Holderness coast) including fishermen's views and perceptions of the prohibited trawl areas; distribution of fishing activities and compliance with the prohibited trawl areas; and effects of the prohibited trawl areas on finfish populations.





**Figure 26: Baited video trap.**

### Cornish beam trawl diversification

In 2008 the beam trawl fleet in south-west England was suffering from higher fuel prices and was coming under increasing pressure from environmental interests about its impact on the seabed and its high level of discards. The Cornish Fish Producers Organisation worked with Seafish to explore ways in which monkfish and megrim, the main target species of the Cornish beam trawl fleet, could be targeted in a more cost effective and environmentally friendly way on the traditional beam trawl fishing grounds.

Monkfish and megrim have been targeted successfully by vessels using twin-rig trawling off the north coast of Scotland. The project aimed to assess the potential and highlight any problems of introducing twin-rig demersal trawling similar to that used by the Scottish fleet to the south-west beam trawl grounds. The *Alison Kay 57* from Shetland was chartered and made two fishing trips, using twin-rig gear, and with the skipper of the *Billy Rowney* providing local knowledge.

The trials indicated that the twin-rig trawl was more suitable than the beam trawl for catching a mix of species. In addition to megrim, monkfish and Dover sole, the twin-rig gave opportunities to catch haddock, cod and John Dory. Figures 27 and 28 compare the catch by weight and value of the twin-rig trawler and a beam trawler operating in a similar area at the same time. The catch rates in the trials were lower with a twin-rig trawl than a beam trawl but this was almost certainly because of lack of experience of using demersal trawls in the area. The discard rate for the twin-rig trawl was very variable depending on the ground over which the gear was towed.

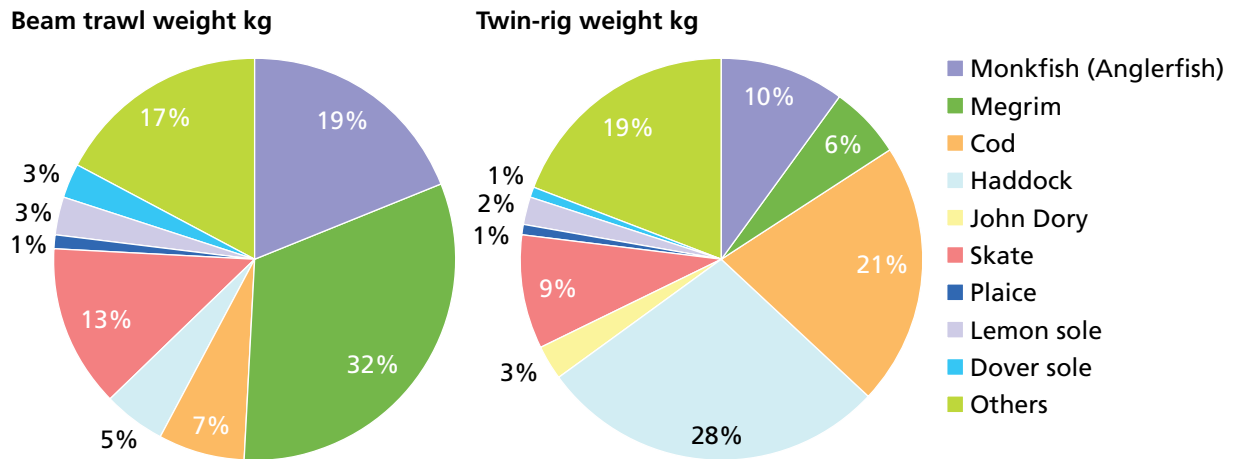


Figure 27: Catch composition by weight for twin-rig and beam trawlers.

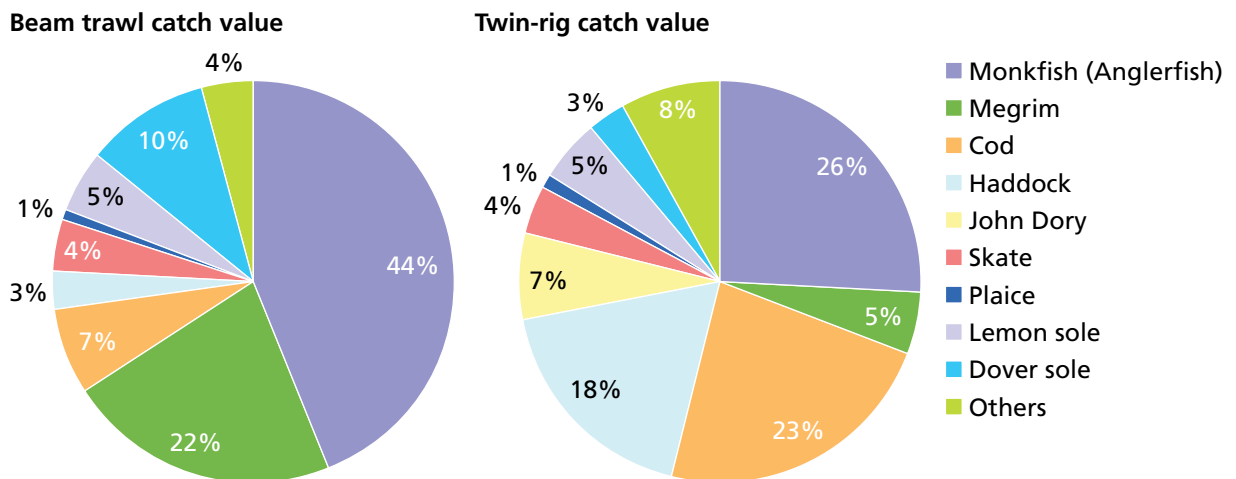


Figure 28: Catch composition by value for twin-rig and beam trawlers.



# List of current and recent marine fisheries science projects





## Sustainable marine fisheries research projects

This list includes projects started in 2008/09 and also projects started or completed in 2006/07 and 2007/08, plus a few projects from previous years which were reported in our first yearbook to illustrate the breadth of the research programme.

### Impact of fishing on the marine ecosystem

#### **Fishing impact on benthic communities – phase 2 (MF0729) Completion date: 31/03/2007**

***Reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Impacts of bottom trawling'***

To provide advice on the validity of listings of marine fish and invertebrates as vulnerable, endangered or critically endangered by fishing. To test the effectiveness of existing fishing surveys to provide information on these existing species.

#### **Development and testing of ecological indicators and models to monitor and predict the ecosystem effects of fishing (MF0731) Completion date: 31/03/2007**

***Reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Developing indicators for fisheries management'***

To provide a basis for selecting indicators of the ecological effects of fishing, for advice on the usefulness of indicators proposed by other groups, and to establish an ecosystem-based approach to fisheries management.

#### **Monitoring, impact and mitigation of marine mammal bycatch (MF0736) Completion date: 31/03/2008**

***Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Reducing marine mammal bycatch'***

#### **Development of methods to minimise bycatch**

**(MF1003) Started: 2008/09 Completion date: 31/03/2011**

This project continues the earlier project. To develop a greater understanding of the extent of bycatch and its impact on marine mammal populations in order to provide better information for management strategies. To develop and test mitigating measures to reduce or eliminate marine mammal bycatch.

#### **Gear technology, discard reduction, and environmentally friendly fishing studies**

**(MF0738) Completion date: 31/03/2008**

***Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Reducing discards by modifying fishing gears'***

***The first and second years of the project were reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Reducing bycatch in fishing gear'***

To evaluate the effectiveness of mandatory technical measures in the brown shrimp fishery. To analyse further the discard database, providing tools which will enable identification of discarding 'hotspots' (concentrations in space or time or associated with particular types of gear). To maintain updated knowledge on global developments in the field of environmentally-friendly fishing methods.

**Ecosystem approach to fisheries  
(MF1001) Completion date: 31/03/2012  
*Reported in this Yearbook***

To develop, test and report on indicators that allow managers and stakeholders to assess the status of the ecosystem and the impacts of fishing, and to develop decision tables that allow managers and stakeholders to see the effects of different management options and to choose from among them. The project will pilot the ecosystem approach to fishing in the south-west of England.

**Practical steps towards reducing discards and developing more environmentally responsible fisheries  
(MF1002) Started: 2008/09 Completion date: 31/03/2013**

To develop technologies which minimise discarding (and therefore environmental impact) to the practicable minimum across all English and Welsh fishing fleets.

**Effects of the environment on fish stocks**

**Validation and testing of biologically-based movement models for North Sea plaice and implementation in management and assessment  
(MF0152) Completion date: 30/06/2007  
*Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Movements of North Sea plaice stocks'***

To develop spatially-structured stock assessment models for plaice in the North Sea that take account of seasonal changes in its geographical distribution, its availability to fishing gear, and fishing effort in order to provide better advice on management options for fish stocks and fisheries.

**Linking the behaviour, spatial dynamics and the environment of cod and ray populations to evaluate fisheries scenarios  
(MF0154) Completion date: 31/03/2009  
*The first three years of the project were reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Cod stock structure in the North Sea and English Channel'***

To incorporate environmental and biological datasets into a computer-based model of fish migration in order to develop a more comprehensive understanding of the response of cod and ray stocks to changes in the environment and fisheries.

**Electronic telemetry tags: development of behaviour sensors for fish  
(MF0155) Completion date: 31/03/2009  
*The first three years of the project were reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Tools for studying fish in the wild'***

To provide information about the feeding behaviour of marine fish in relation to the environment and to use this to improve multi-species and ecosystem computer-based models. To identify the location of spawning that is necessary for understanding stock identity and dynamics.

**Spatial and temporal genetic structuring of edible crab populations  
(MF0230) Completion date: 31/03/2008**

*The first 18 months of the project were reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Brown crab populations'*

To provide important genetic information on crab stock structure in the English Channel in order to improve crab stock assessment and management advice.

**The Continuous Plankton Recorder Survey: fisheries investigations  
(MF0430) Completion date: 31/03/2007**

*Reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Plankton fluctuations and their effect on fish stocks; the role of the Continuous Plankton Recorder Survey'*

To provide plankton data over about a 70-year time period in the north Atlantic to monitor responses to hydroclimatic change and pollution. To explore with computer-based modelling techniques and other numerical tools relationships between Continuous Plankton Recorder (CPR) data and fisheries statistics.

**Impacts of environmental change on the recruitment of commercial fish stocks  
(MF0431) Completion date: 30/06/2007**

*Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Effects of climate change on the growth of larval cod'*

To examine effects of sea temperature change on egg and larval growth and survival, maturation and fertility of adult fish, and changes in abundance and distribution of prey in order to discover their impact on the recruitment success of cod and plaice around the UK.

**Detecting predation of fish eggs and larvae  
(MF0432) Completion date: 30/06/2009**

To investigate post-settlement mortality (deaths of fish recently developed from larvae) due to predation by commercial fish species, such as cod and plaice. Changes in the abundance and distribution of predators, possibly linked to processes of climate change, have the potential to inflict increased mortality on the early life history stages of commercial fish species and thus can damage stock viability or limit stock recovery.

**Changes in growth in cod as an indicator of climate change  
(MF0433) Completion date: 30/06/2007**

*Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Impacts of climate change on the growth of adult cod'*

To obtain time trends in the start of growth in cod in the spring and autumn each year using historical collections of otoliths from the southern North Sea and Norwegian coastal waters. To allow predictions of the impact of climate change on growth of cod populations in the North Sea.

**ICES/GLOBEC project office  
(MF0434) Completion date: 31/12/2009**

To support the ICES/GLOBEC (Global Ocean Ecosystem Dynamics) project office which exists to help with implementing the cod and climate change programme strategic plan, and other co-operative international studies on the effects of climate change on the marine ecosystem.



### **Evaluating shelf-wide spatial and temporal changes in fish larval distribution over the last half century in relation to environmental factors and adult distributions**

**(MF1101) Completion date: 31/03/2011**

To analyse Sir Alister Hardy Foundation for Ocean Science (SAHFOS) Continuous Plankton Recorder (CPR) fish larval samples from UK Shelf Seas from 1948 to the present day and explore changes in larval abundance, distribution, timing and size in relation to environment, plankton and adult fish. To assess how different species of fish have responded to past environmental changes at the critically-important larval stage.

### **Macro-ecology of marine fish in UK waters**

**(MF1102) Completion date: 31/03/2012**

To improve our understanding of population biology and ecology for key species of commercial fish (e.g. cod, plaice, sole), fish valued by recreational anglers (e.g. bass) and fish of conservation interest (e.g. skates and rays). To study relationships between fish population sub-units in spawning areas, on nursery grounds and on feeding grounds, how these vary year-on-year, and the contribution of the environment to such variation.

### **Spatial dynamics of edible crabs in the English Channel in relation to management**

**(MF1103) Completion date: 31/03/2011**

***Reported in this Yearbook as 'Edible crabs in the English Channel'***

To provide improved knowledge of the movements of edible crabs (*Cancer pagurus*) in the English Channel at local and regional scales, as the basis for giving better quality advice on management of crab stocks.

### **Spatial and temporal patterns in scallop recruitment and their implications for management**

**(MF1104) Completion date: 31/03/2012**

***Reported in this Yearbook as 'Managing scallops'***

To find out the key biological and hydrographical processes governing the recruitment of scallops in the English Channel, and the possible effects of climate change on these processes. To develop a computer-based forecasting model for scallop populations which includes information on where scallops are at different stages in their lifecycle based on new insights into scallop recruitment gained during the research.

### **The Continuous Plankton Recorder Survey: fisheries investigations (CPR VI)**

**(MF1105) Completion date: 31/03/2012**

To monitor and analyse the changes in plankton production and biodiversity associated with hydroclimatic changes in the north Atlantic over about 70 years. To further investigate links between plankton data and long-term changes in fish stocks over the North West European shelf and in the north-east Atlantic in order to develop new approaches to fisheries management and conservation strategies. This is a continuation of Project MF0430.

## Fisheries management

### **Movements of rays in ICES Sub-area IV in relation to special protected areas (MF0148) Completion date: 30/09/2004**

***Reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Management of thornback rays in the southern North Sea'***

To describe the movement of individual rays in the Thames Estuary by using electronic tags and to relate ray movement and distribution to patterns across time and place of fishing effort. To use the combined data to assess the effect of closing particular areas to fishing.

### **Field trial of genetic probes for the identification of gadoid eggs**

**(MF0151) Completion date: 31/03/2004**

***Reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Impacts of climate change on fish recruitment'***

To field test a semi-automated, genetically-based egg identification method developed under former project MF0146 'Genetic identification of fish eggs by species specific DNA markers for use in stock biomass assessment'.

### **Genetic structure of cod (*Gadus morhua*) populations in the southern North Sea and English Channel**

**(MF0159) Completion date: 31/08/2007**

***Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'English Channel and North Sea cod stocks'***

To conduct a programme of genetic sampling of cod in the eastern English Channel and southern North Sea to find out whether the stocks are separate during the spawning season and the feeding season. This allowed identification of the extent of biologically-significant mixing between stocks as well as mixing between stocks managed as separate fisheries.

### **Pilot study for fishery-independent monitoring of cod recovery in the Irish Sea by means of egg production surveys**

**(MF0160) Completion date: 31/03/2011**

***The first year of the project was reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Impacts of climate change on fish recruitment'***

To assess the application of genetic egg identification methods within a full annual survey of gadoid (e.g. cod, haddock and whiting group of fish) spawning. To provide high-resolution data on the distribution of spawning by cod and other species in 2006.

### **Development of integrated systems for shellfish data collection, assessment and management**

**(MF0229) Completion date: 31/03/2007**

***Reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Management approaches for shellfish stocks'***

To develop frameworks for the provision of advice on shellfish stocks, integrating the processes of data collection, assessment and management.

**Fisheries interactions****(MF0322) Completion date: 31/03/2007*****Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Testing fisheries management strategies'***

To improve the understanding of the impact of current and alternative management strategies on mixed fisheries, and to provide a robust range of strategies for possible management objectives, consistent with the precautionary approach.

**Multi-species fisheries management: a comprehensive impact assessment of the sandeel fishery along the English east coast****(MF0323) Completion date: 31/03/2007*****Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Effects of sandeel fisheries on predator species'***

To produce a spatially explicit multi-species model in which the dynamics of sandeels and their predators can be explored in relation to a range of local management options.

**A risk analysis framework for fisheries management****(MF1201) Completion date: 31/03/2012**

To review international best practice and knowledge and implement appropriate tools in a common framework. To apply this to selected case studies working with others including Defra and EU project teams, ICES and Regional Management Organisations (RMOs), and Regional Advisory Councils (RACs).

**Improved understanding and management of shellfish fisheries****(MF1204) Completion date: 31/03/2012**

To model the possible responses of shellfish stocks and shellfish fishing fleets to different management options. To do this by computer-based life history modelling and analysis of satellite monitoring data, as well as catch and effort returns from the shellfish licensing scheme. To evaluate relationships between inshore and offshore shellfish populations and their response to exploitation, and assess the impact on the breeding potential of crustacean stocks of exploitation patterns which differ between sexes.

**A strategic evaluation of ecosystem models in support of fisheries management (STEEM)****(MF1202) Started: 2008/09 Completion date: 31/03/2011*****Reported in this Yearbook as 'Ecosystem models to support fisheries management'***

To test and evaluate the usefulness of different modelling approaches for exploring wider ecosystem considerations of fisheries in the marine environment. To assess how important the interactions are between predators and their prey in comparison with other sources of uncertainty in fisheries models, and help to predict knock-on, ecosystem implications of future management actions.



**Improved understanding and management of recreational sea angling (MF1203) Started: 2008/09 Completion date: 31/03/2011**  
***Reported in this Yearbook as 'Managing recreational sea angling'***

To analyse and evaluate existing management measures and current recreational activity through case studies of species (bass, cod, tope, grey mullet and salmon), both in the UK and elsewhere (e.g. striped bass in the U.S.A.).

**Development of tools for estimation of stock status under uncertainty (MF1205) Started: 2008/09 Completion date: 31/03/2012**  
***Reported in this Yearbook as 'Tools for estimating stock status under uncertainty'***

To develop and evaluate alternative methods for stock assessment and management focussing on stocks with limited data available and to develop approaches for the generation of robust management and assessment of a wide variety of stocks, fisheries and management regimes.

**Management of marine finfish fisheries and monitoring under the EU data collection regulation**

**Cefas Fish stock monitoring contract – ongoing**

***Part of this work was reported in the Marine Fisheries Science Yearbook 2006/2007 as 'Changes in the distribution of cod'***

To provide the best scientific advice on the status of finfish stocks of interest to the UK, through monitoring and assessment of the most important commercial stocks.

**Details of sustainable marine fisheries research projects are at [www.defra.gov.uk/science/default.htm](http://www.defra.gov.uk/science/default.htm)**

## Fisheries Science Partnership projects

There are two types of Fisheries Science Partnership project. Time-series projects involve fishing surveys which are repeated in the same area with the same fishing gear and the same towing practices for three or more years. Time-series projects running in 2008/09 are listed followed by the shorter-term projects that are started each year. Those that started in 2005/06, 2006/07, 2007/08 and 2008/09 are listed.

### Time-series projects

#### **Western Channel sole and plaice**

**Started 2003/04. Sixth survey completed in 2008/09**

***Reported in the Marine Fisheries Science Yearbook 2007/2008***

To produce a time-series of surveys in the western English Channel to provide information on distribution patterns of sole, plaice and other commercial bycatch species, trends in numbers and age composition of sole and plaice, and information on the bycatch of species such as cod.

#### **Western anglerfish**

**Started 2003/04. Sixth survey completed in 2008/09**

***Reported in the Marine Fisheries Science Yearbook 2006/2007***

To produce a time-series of surveys to provide data on the distribution, catch rates and length distribution of anglerfish and lemon sole, sole and cod caught at the same time using commercial gear off south-west England.

#### **Irish Sea roundfish**

**Started 2003/04. Sixth survey completed in 2008/09**

***Reported in the Marine Fisheries Science Yearbook 2006/2007***

To carry out fishing surveys to assess the abundance of various year classes of cod, haddock and whiting in the western and eastern Irish Sea.

#### **North-east coast cod**

**Started 2003/04. Sixth survey completed in 2008/09**

***Reported in the Marine Fisheries Science Yearbook 2006/2007, and updated in this Yearbook***

To construct a time-series of surveys, to provide annual comparative information on the distribution, relative abundance and size/age composition of cod and also whiting and haddock off the north-east coast of the UK.

### Projects started in 2005/06

#### **North Sea lemon sole**

**Completed: 2005/06**

To examine the catch composition of the June/July flatfish fishery off the north-east coast of England sampling in detail lemon sole, plaice and cod.

**Western Edge ghost nets and lines****Completed: 2005/06**

To conduct a retrieval survey for, and to attempt to determine the impact of, lost and abandoned 'ghost' nets and lines in deep water, including at and around Rosemary Bank, west of Scotland.

**East Greenland cod****Completed: 2005/06**

To carry out a trawl survey of cod in selected areas to the east of Greenland.

**Selectivity of hake gill nets in the south-west fishery****Completed: 2005/06*****Reported as 'Hake selectivity' in the Marine Fisheries Science Yearbook 2006/2007***

To examine the catch composition and selectivity of a range of static gears for hake in south-west UK fisheries.

**Western cod****Completed: 2005/06**

A one-off survey of western cod, to determine whether it was feasible to build a time-series of catches.

**Projects started in 2006/07****North Sea lemon sole and plaice****Completed: 2006/07**

To assess the composition of catches across the North Sea lemon sole and plaice fishing grounds in summer, and in particular to examine the linkage with cod in relation to the cod recovery plan and associated effort control.

**Gillnet retrieval survey****Completed: 2006/07**

To determine the extent and impact of ghost nets at and around the Porcupine Bank, south-west of Ireland.

**North Sea whiting****Completed: 2006/07*****Reported in the Marine Fisheries Science Yearbook 2006/2007***

To analyse the stomach contents of North Sea whiting to find out about their diet, and to see if there have been any changes to their diet since the last large-scale stomach survey in 1991. The project looked at whether whiting prey extensively on cod, which, if they do, may have adverse effects on cod recovery.



**Yorkshire coast crustaceans****Completed: 2006/07*****Reported in the Marine Fisheries Science Yearbook 2006/2007***

To analyse variations in the catch rates of velvet swimming crab (*Necora puber*) and other commercially important crustaceans in the Bridlington Bay area, using commercial traps.

**Eastern Channel cod****Completed: 2006/07 (with tag recoveries up to March 2008)**

To identify and map spawning aggregations of cod in the eastern English Channel and to tag mature, spawning fish in these groups by traditional, non-electronic means.

**North-east coast squid fishery****Completed: 2007/08**

To map the distribution of squid caught by trawl, and the catches and bycatches taken during a night-time experimental jig fishery, over two seasons.

**Western English Channel squid fishery****Completed: 2007/08**

To map the distribution of squid catches and to record catches and bycatches in the English Channel using lures, jigs, gurdies and dedicated lighting.

**Projects started in 2007/08****Thames ray tagging and survival****Completed: 2007/08*****Reported in the Marine Fisheries Science Yearbook 2007/2008***

To examine, mainly through traditional tagging methods, the survival rates of released rays of a range of sizes by vessels under 10 metres in the otter trawl sector, the netting sector and liners.

**Skate and ray discard survival****Completed: 2007/08*****Reported in the Marine Fisheries Science Yearbook 2007/2008***

To investigate discard survival rates in trawl fisheries to find out the survival rate for skates and rays that would be discarded with the introduction of a maximum landing length. Also to develop species identification on-board and contribute to improved data collection.

**Benthic release panels****Completed: 2007/08**

To investigate the effects of introducing benthic release panels with square-mesh codends in the Cornish beam trawl fleet.

**North-east coast crab biology****Completed: 2007/08*****Reported in the Marine Fisheries Science Yearbook 2007/2008***

To assess the impact of increased minimum landing sizes for edible crab by investigating the growth rate/biology of resident edible crab populations, mapping the extent of suitable crab habitat in the region and determining whether the habitat restricts crab growth.

**Comparative GOV fishing trials****Completed: 2008/09*****First phase reported in the Marine Fisheries Science Yearbook 2007/2008 as 'GOV gear trials'***

To examine the nature of catches of the major commercial whitefish species on the *Cefas Endeavour* using the GOV trawl and those of commercial whitefish trawlers fishing alongside the *Cefas Endeavour* to compare catch rates and size compositions of fish caught in commercial and research operations.

**Northern North Sea saithe and cod****Completed: 2008/09*****Reported in this Yearbook***

Phase 1 in 2007/08 observed and recorded the incidence and abundance of saithe and cod in commercial catches to develop management measures to minimise bycatch of cod in the saithe fishery. Phase 2 was a follow-up during 2008/09, and specifically targeted information on the 2005 and 2006 year classes of saithe, and the 2006 and 2007 year classes of cod.

**North Sea codwatch****Completed: 2008/09*****Reported in the Marine Fisheries Science Yearbook 2007/2008***

Phase 1 of the project in 2007/08 involved fishermen in reporting the incidence, distribution and abundance of the 2005 and 2006 year classes of North Sea cod in commercial catches, in a form that allowed the data to be analysed by location and time of year. Phase 2 in 2008/09 assessed the distribution and abundance by location and time of year of the 2006 year class as two year-olds, and the 2007 year class as one year-olds in 2008 and two-year olds in 2009, to increase understanding of cod year class strength.

**Projects started in 2008/09****North Sea bass gillnetting****Completed: 2008/09*****Reported in this Yearbook***

To assess the selective properties of gillnets (over a range of mesh sizes) in an emergent bass fishery in the central and southern North Sea and to evaluate the survival rates of discarded bass caught in the gillnets.

**North Wales spurdog longline fishery****To be completed: 2009/10**

To evaluate the role of spurdog in longline fisheries and examine the catch rates and sizes of fish taken in a longline fishery, to provide biological samples so that more recent data on the length at maturity and time of breeding can be calculated, and to tag and release a number of individuals to find out about the potential discard survivorship from longline fisheries.

**Details and reports for all completed FSP projects are at [www.cefas.co.uk/FSP](http://www.cefas.co.uk/FSP)**

## Fisheries Challenge Fund projects

Projects started in 2005/06, 2006/07, 2007/08 and 2008/09 are listed below.

### 2005/06 projects

#### **Investigation of potential fisheries for razorfish and other bivalves in the eastern Irish Sea**

To identify any potential future fishery for bivalves in the eastern Irish Sea. The project involved a review of available information and vessel-based surveys of the fishery areas.

#### **Desk study of possible long-term management approaches to North Sea fisheries which reflect stakeholder objectives**

Regional Advisory Councils have used the information from this desk study to help develop long-term management plans for key commercial stocks in the North Sea.

#### **Feasibility study of mapping key fishing areas in the North Sea**

Consultation exercise to help the North Sea Regional Advisory Council to collect information that helped fishermen to take a strategic approach to spatial planning.

#### **Margin of tolerance: the accuracy of on board catch estimates**

To investigate the feasibility of complying with an 8% margin of tolerance rule. The weight of fish estimated by observers was compared with that estimated by the skipper of the vessel to assess whether the margin of tolerance allowed between the logbook entry and landing declaration was realistic.

#### **Trans-national albacore tuna trolling pilot project phase 1**

To investigate the feasibility of traditional trolling for albacore tuna for Cornish vessels. The research aimed to identify a viable alternative and sustainable fishery that will result in a reduction of fishing effort on pressured fish stocks.

### 2006/07 projects

#### **UK observer trips in the westerly gillnet fishery for anglerfish**

To investigate whether the ban on deep sea gillnets should apply to all deep sea gillnetting. The project involved observer trips in the anglerfish fishery in ICES Subarea VI.

#### **Model showing the vessel-level financial and economic impacts of restrictions on the whitefish fleet fishing in the north-east of England**

To create a model to analyse the behaviour of fishermen with limited quota and days at sea.

#### **Exploration of harvesting strategies for achieving long-term sustainability for the North Sea mixed demersal roundfish fisheries**

#### ***Reported in the Marine Fisheries Science Yearbook 2006/2007***

To adapt a model to investigate harvesting strategies for cod, haddock and whiting. The project assisted the North Sea Regional Advisory Council to develop long-term management objectives for these stocks.



**Feasibility study into inshore potting for fish**

To investigate alternative designs for pots to increase the proportion of finfish caught. Designs may aid diversification of fisheries and reduce costs compared with netting for finfish.

**Cornish fishing activity mapping project**

To prepare a baseline study of fishing activity in Cornwall to help the Cornish Fish Producers Organisation with strategic spatial planning.

**Definition of fisheries groupings for the development of long-term management plans for the demersal fisheries in ICES Subarea VII  
*Reported in the Marine Fisheries Science Yearbook 2006/2007***

To develop matrices of stocks and fishing activity to identify key fishing links in ICES Subarea VII, to help the North Western Waters Regional Advisory Council to prepare long-term management objectives in Subarea VII.

**Socio-economic study of North Sea fisheries and fishing communities**

To help identify key factors that determine resilience and vulnerability of communities to changes in fishing legislation. A framework of socio-economic information was created to help the North Sea Regional Advisory Council to assess the social and economic effects of the European Commission proposals on North Sea fishing communities.

**Diffuse source pollution trial, Fal, Cornwall*****Reported in the Marine Fisheries Science Yearbook 2006/2007***

To use a new DNA technique to trace the sources of pollution in the River Fal, Cornwall to help mussel and oyster fishermen to address pollution issues.

**Feasibility study into the development of open water shellfish farming; a case study of Lyme Bay, South Devon*****Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Open sea shellfish farming'***

To determine the legal and regulatory framework, the technical and economic feasibility, and the environmental and socio-economic effects of developing large-scale shellfish farming operations in open sea coastal waters, using Lyme Bay as a case study.

**Use of lobster/crab pots as a resource by other shellfish: scoping study for methodology and viability**

To involve fishermen in investigating the effect of laying bait on juvenile lobsters and crabs. The results could help to determine management strategies such as pot density.

**West of Scotland long-term management plans: definition of fishing activity by area, species and nationality**

To help the North Western Waters Regional Advisory Council to develop long-term management proposals for its area on a fishery and area basis. The project provided descriptions for fisheries in ICES Subarea VI.

**Developing stakeholder participation in lobster stock enhancement projects  
*Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Involving fishermen in improving lobster stocks'***

To enable the National Lobster Hatchery to develop a system to let fishermen release juvenile lobsters as a part of their normal fishing activities.

**Trans-national albacore tuna trolling phase 3  
*Reported in the Marine Fisheries Science Yearbook 2007/2008 as 'Tuna fishing'***

To test the viability of tuna trolling as a sustainable alternative fishery for Cornish vessels, using a low-impact fishing method of poles and lures which is highly selective with no bycatch of non-target species.

## **2007/08 projects**

**Fisheries Strategic Environmental Assessment  
*Reported in this Yearbook***

To deliver: a general framework for undertaking a fisheries specific Strategic Environmental Assessment (SEA) in the UK and to use the general model to pilot a fisheries specific SEA in the North Eastern Sea Fisheries Committee District, providing a point of reference and guidance for other organisations wishing to undertake a fisheries related SEA.

**The economic, environmental and social aspects of the inshore fishing fleet of the Greater Thames Estuary with special reference to quota species**

To provide an objective analysis of the economic, environmental and social aspects of the inshore fleet operating in the greater Thames estuary (between Yarmouth and Ramsgate), including an assessment of the benefits and viability of the inshore sector operating in this region.

**Fishermap – mapping the activity and knowledge of fishermen around the coasts and offshore areas of Devon, Dorset and Somerset**

To map the activities and knowledge of fishermen across Devon, Dorset and Somerset. This large scale pilot project has been carried out as part of Finding Sanctuary, a project that will plan and identify a network of Marine Protected Areas (MPAs) around the coasts and seas of south-west England.

**Spatial variability in velvet crab populations – a possible candidate for real-time fisheries management**

To assess the variability of the moult cycle in velvet crabs to inform the management of the fishery in Shetland. This will lead to the application of appropriate management measures to maintain both environmental and economic sustainability of Shetland's fragile fishing communities.

**NFFO Annual Fisheries Reports  
*Reported in the Marine Fisheries Science Yearbook 2007/2008***

The National Federation of Fishermen's Organisations (NFFO), working with Cefas, producer organisations and fishermen's associations, has set up arrangements for the preparation of annual reports on fishing fleets and their activities.

## **Using restricted-catch areas to benefit recreational sea bass angling**

**Completion date: 31/03/10**

To evaluate whether closing coastal areas to extractive fishing with nets and lines (and catch and release, with strict bag limits for anglers, if necessary) would enhance survival and enable more sea bass within local populations to grow bigger.

## **2008/09 projects**

### **Biology of mussel seed beds**

**Completion date: 31/05/09**

To improve understanding of the biology of mussel seed beds by surveying the mussel beds in the Kent and Essex Sea Fisheries Committee district to assess stocks; and identify the yearly growth and reproductive cycle of mussels. It is also researching and implementing best management practice used by other seed mussel stock managers.

### **Survey of lobster stocks**

**Completion date: 30/04/09**

To conduct tagging work, estimate pot densities and landings; and examine the effects of an increase in minimum landing size on future catch rates of lobster stocks in the Northumberland Sea Fisheries Committee district.

### **Measuring the effect of Marine Protected Areas on finfish** *Reported in this Yearbook*

To work out how to assess the effectiveness of small Marine Protected Areas for conserving mobile finfish. Local vessels measured the abundance, size and diversity of finfish, including commercially important species, in the Yorkshire prohibited trawl area.

### **Skates and rays identification guide**

Working with the commercial sector, Cefas and interested groups, the Shark Trust prepared detailed species-specific information cards for use particularly by the skate and ray supply chain, Wildlife Officers and recreational anglers.

### **Cornish beam trawl diversification**

*Reported in this Yearbook*

To explore ways of catching the main target species of the Cornish beam trawler fleet (monkfish and megrim) on the same grounds in a more economic way. The Cornish Fish Producers Organisation employed a Scottish skipper with a twin-rig trawler for a one month trial to help to assess the viability of this fishing method in the south-west approaches.

### **Guidelines for best practice in stocking eel**

To develop best practice guidelines for improving eel stocks in river basins and to identify gaps in our knowledge of eel production for stocking and recommend ways of addressing the gaps.

**You can find out more about Fisheries Challenge Fund projects at [www.defra.gov.uk/marine/science/challenge.htm](http://www.defra.gov.uk/marine/science/challenge.htm) and at [www.mfa.gov.uk/grants/fcf.htm](http://www.mfa.gov.uk/grants/fcf.htm)**



# Appendix 1: Fish stock monitoring and assessments – more information



## Stock monitoring

### Market sampling

#### ***Why do we need to sample catches?***

Each year, Cefas organises a large programme to sample fish caught in commercial fisheries around England and Wales as part of the UK's commitment to monitor fish stocks under the European Data Collection Regulation. The main purpose of this programme is to estimate the age composition of the catches. This information is an important part of the stock assessment calculations performed by the ICES' Stock Assessment Working Groups. The sampling involves measuring the length of a large number of fish and also taking the small ear stones, or 'otoliths', from about one in ten of the fish measured. By examining the otoliths under a microscope it is possible to read the fish's age.

### Fishing surveys

#### ***Why do we conduct research surveys?***

In recent years, as some commercial catches have declined, ICES has had to rely more heavily on research vessel surveys for estimating the abundance of commercially exploited stocks. Cefas contributes towards this process through a number of annual surveys carried out on its own research vessel, *Cefas Endeavour*, and on chartered fishing vessels. The main purpose of the surveys is to maintain long-term data series on distribution and abundance of commercial species. They also provide useful data on species that do not have a commercial value. Research vessel surveys allow additional biological information, such as stomach contents, to be collected on fish which cannot be obtained from commercial surveys or market sampling.

### Discard sampling

#### ***Why do we sample discards?***

We need to gain as complete a picture as possible of the fish killed by commercial fisheries, so we sample the fish discarded by fishermen. Fish may be discarded because they are too small to be landed or because the fisherman does not have a quota for that species. The current discard sampling programme is designed to obtain information on the numbers and size of fish discarded, but the programme also provides more detailed data on catch rates to improve the current assessments of fishery performance. This programme is also part of the European Commission Data Collection Regulation, and there is therefore a statutory requirement for regular sampling of all segments of the fishing fleet in England and Wales.

#### ***What sampling is done?***

Industry Liaison Officers (ILOs) from Cefas carry out the current discard sampling programme, sailing with a selection of fishing vessels and measuring the discarded and retained portions of the catch. The ILOs travel as guests of the industry and the aim is to



observe normal fishing activities. They aim to sample 600 fishing days per year, and this is spread between all the major fleet types within UK waters under the jurisdiction of Defra (excluding Scottish waters). As part of this programme, Cefas also carries out observer trips on vessels fishing for deep water species to the west of the British Isles.

## Stock assessments

### ***What are stock assessments?***

Commercial finfish and shellfish stocks are assessed by international scientific working groups organised by ICES, which meet each year. Assessments involve estimating the size and composition of the stock and providing options for the future management of the fisheries. The main data used to assess the status of the stock are the estimated numbers of fish of each age group caught by the commercial fleets. These data are obtained from the sampling programmes and provided by each country represented on each working group. Additional data, such as more detailed, catch-per-unit-effort information obtained from research vessel catches, may be used to improve the understanding of the results of the assessment.

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