Symposium on Cod Recovery
9th and 10th of March 2007
Edinburgh, Scotland

Summary

The *Symposium on Cod Recovery,* held near Edinburgh on 9th and 10th of March 2007, brought together more than 190 of the world's scientists, environmentalists, senior officials, parliamentarians, fishermen and other stakeholders to discuss cod recovery in the North Sea and North Western Atlantic Waters. This summary has been prepared by the rapporteur and does not necessarily reflect a common view from all participants.

The common thread to emerge from the symposium was that cod stocks can be rebuilt if conditions are favourable and all parties work together. The new Regional Advisory Councils should seize the initiative and work with the European Commission to decide upon measures which would rebuild the stocks.

There has been a decline in cod, and there is a consensus that it has been caused by heavy fishing over a period when the recruitment of young cod to the stocks was poor as a result of environmental factors. **There is little point in trying to separate the effects of fishing from the effects of environmental change. It is now clear that they can act together to damage cod stocks.**

Although it is agreed that cod stocks are currently in poor shape, radically different opinions have been expressed about their current state of recovery. Some have concluded firmly that cod are not showing any signs of recovery and that the cod recovery plan has therefore failed. Others believe there is evidence that cod are recovering in some areas and not others. Recent recruitment has been better in some regions, and the cod recovery plan is therefore beginning to work. **Differences of opinion on whether cod stocks are recovering must be resolved.**

The European Commission is suggesting that the *overall* reduction in fishing effort required by the cod recovery plan has not been achieved and that this may offer an explanation for the failure to detect a clear reduction in fishing mortality on cod. The cod recovery plan must therefore be revised. Others maintain that fishing effort has been substantially reduced in some areas, and that a reduction in fishing mortality will be observed in due course. The full effects of the recent effort management regime have yet to be assessed and after only three years of the cod recovery plan it may be premature to claim that it has been a complete failure. **Differences of opinion on the levels of effort reduction which have already been achieved must be resolved.**

There is an issue over 'missing' cod. Discrepancies in the stock assessments have indicated that there have been large landings and discards which were not reported. However, there is no clear understanding of the causes of these unaccounted losses of cod. Changes in natural mortality, including predation by seals, may have played a part. Or the discrepancies might simply have been the result of poor and variable data. **Discrepancies in the stock assessments must be resolved.**

One problem with the scientific advisory process is that assessments of the state of cod stocks are poor and retrospective. The scientific assessments are based on data collected two years ago. The data on which the assessments are based are uncertain. S**cientific advice on the**

fish stocks must be of the highest quality and improvements are needed. It is especially important to improve the quality of data on landings, catches and discards. The better the data the less cautious the scientific advice will have to be. **Strong partnerships between scientists and fishermen will improve the quality of data on fish stocks and promote better understanding between the two groups.** Initiatives are needed to promote closer cooperation. The advisory system itself needs reform, as the advice emerging from ICES is limited in scope, and not always able to meet management requirements. ICES representatives accept the need for closer engagement of stakeholders in the advisory process, provided undue pressure is not placed upon scientists.

It has become especially evident that better methods are needed for judging the current state of stocks. **Methods of assessment are required which provide information on the state of fish stocks in real-time.** Additional surveys are required and the assistance of fishermen will be needed to develop new methodologies and present new indices of the health of fish stocks. The practice developed in Canada, following the collapse of their cod stocks, of making greater use of surveys conducted by fishermen themselves to follow changes in stock abundance should be followed. Greater confidence in the scientific assessments is required by all parties. At the moment fishermen are sceptical of the scientific assessments and the advice stemming from them. **Stakeholder acceptance of the scientific advice is essential if progress it to be made and a consensus reached.**

Cod can recover. The high fecundity and rapid growth of cod in our waters will enable stocks to recover quickly if the environmental conditions are right and if fishing pressure remains low. However, stocks might not recover to previous levels. They might also respond differently in different areas. **It is better to think in terms of rebuilding cod stocks, rather than recovery to an earlier state.**

It is evident that changes in ocean climate are taking place. There has recently been a regime shift which may continue into the future. The sea and its ecosystems can change, and we are limited in what we can do to compensate. In these circumstances every management measure is an experiment, and management needs to be truly adaptive – we must learn from earlier mistakes.

Conditions prevailing in different sea areas vary, with a different mix of species and different ecosystems. The fisheries themselves differ. **It is evident that the measures to rebuild cod stocks will need to be specifically tailored to conditions in the different regional seas. One size will not fit all.**

In the past the impact of management measures has not always been monitored or audited. New methods and new forms of data are required to enable evaluations to be carried out speedily and efficaciously. Measures should not be imposed unless they have been properly thought out and their impact considered. Assessing the impact of proposals will require additional economic and social data to be collected from fishers and their communities.

Fishing mortality upon cod must be kept low. Precise biomass targets should not be set for cod stocks; especially old and inappropriate targets. **To rebuild cod stocks it is sufficient to go in the right direction, at an appropriate rate, and to make steady, cumulative progress.** If there are indications that stocks are moving in the right direction then it may not be necessary to adopt more drastic measures.

It may be preferable to use fishing mortality, rather than spawning stock biomass as a benchmark for judging progress with the fishery. We have little control over the biomass, which is largely determined by recruitment, but we can change the catch and exploitation rate. It is especially important to modify fishing mortality if the fishery is going through a period of environmental change, and to aim for a value which is appropriate to the prevailing level of

production. However fishing mortality itself is difficult to measure. **A range of alternative and complementary indicators of the state of cod stocks are required to enable progress in rebuilding stocks to be monitored.**

Many directed cod fisheries have now disappeared as a result of low TACs. Most cod are now taken in mixed fisheries, or as a by-catch in fisheries aimed at other species. **Recovery plans must strike a balance between rebuilding cod stocks and allowing legitimate fisheries for more abundant species to take place.**

Discarding of cod is a particular problem in some fisheries. A combination of reduced TACs and a good emerging year class might well result in very high levels of discarding, which must be anticipated and guarded against. There is a strong consensus that wasteful, unwanted mortalities of cod must be avoided. However, data on the capture and discarding of cod in different fisheries is inadequate and uneven. **Scientists need support in their requests for better information on discarding.**

The main aim is to keep fishing mortality at a level which will allow cod stocks to rebuild. How can this be achieved in different sea areas? The current mix of TACs and effort controls may be appropriate in some circumstances but not in others. There is undoubtedly a role for technical measures, whether these are more selective gears or spatial restrictions. **The use of more selective fishing gears will allow the continued harvesting of more abundant stocks, while minimising the impact upon cod. If this is to work, tangible incentives to adopt more selective gears will be required, bringing benefits to fishermen in terms of effort allocation or access to fisheries.** However, there is recognition that selective gears might not be sufficient by themselves to rebuild cod stocks.

Closure of areas to protect spawning fish or juveniles offers some advantages, but spatial proposals need careful evaluation to assess their benefits and disadvantages. If they are carefully designed, they can achieve conservation objectives with minimal impact on fishing. If they are not, their imposition may transfer effort to other more sensitive areas. Real time area closures, which are triggered when large numbers of juveniles are caught, may have a valuable role to play. However, within the European Union there are institutional obstacles standing in the way of rapid closure of fishing grounds. **The RACs might play an important role in identifying and agreeing areas where temporary closures can be agreed rapidly by Member States and the Commission.**

The effort management regime has become increasingly complex and opaque. The burden has not been shared fairly between the different fleets which capture cod. There are a number of reasons for this including the fact that information on catches and discards has been poor. It will be necessary to improve the information available; perhaps through observer programmes and sampling by fishers themselves. One solution to the over-complexity may be to provide more flexibility to national authorities in managing effort reductions.

A revision of the technical conservation regulation is required but there is a conflict between the wish to simplify the regulations and also meet regional and sectoral needs. A balance has to be struck which is sensitive to local problems but avoids too many complex derogations. The Commission sees the striking of this balance as an exercise to be shared fully with others.

The view was expressed that the current system of governance of fisheries is flawed. It is not serving us well. The RACs should not simply be asked to comment on proposals from the Commission; they need to be at the very heart of the process for rebuilding cod stocks. This symposium has shown that stakeholders are willing to contribute their ideas. There are real benefits to be gained from bringing different sectors and interests together within a forum where people know their views will receive careful attention. **Stakeholder participation is essential if we are to rebuild cod stocks successfully.**

In his video message at the beginning of the symposium Commissioner Joe Borg said that the best way to tackle the common problem of cod recovery is for us to work together in understanding the causes and to discuss possible solutions. Our common aim is to make the cod recovery plan effective. By combining the expertise of the fisheries sector with scientists' knowledge and fisheries managers' experience we can provide valuable understanding of how to progress on recovery of cod.

In his summing up of the symposium Ambassador Steffen Smidt pointed out that the RACs represented a move towards a more systematic involvement of stakeholders in policy development and management. The Commission will retain its central responsibility, but **a significant level of responsibility for resolving the issues of the Common Fisheries Policy has now passed to the RACs.**

At the conclusion, Sam Lambourn, the chairman of the North Western Waters RAC, thanked the Commission for its active participation in the symposium. He encouraged the Commission to establish small, *ad hoc*, regional groups which would bring together the Commission, Member States, RAC members, ICES scientists and other experts including economists. Each group would be given the task of finding regional solutions to the problem of rebuilding cod stocks. Hugo Andersson, the chairman of the North Sea RAC, concluded that further consultation between all the interested parties would be the key to making further progress. Each of the RACs will now engage with the Commission and Member States to extend and continue the dialogue begun at the symposium.

Table of Contents

Meeting Proceedings

Introduction

Hugo Andersson

The symposium began with an introduction by Hugo Andersson, chairman of the Executive Committee of the North Sea Regional Advisory Council.

Regional Advisory Councils had originally been suggested in the European Commission's Green Paper on the reform of the Common Fisheries Policy. Now that they had been established, their role was to prepare and provide advice on the management of fisheries on behalf of stakeholders.

We all knew there was a problem with cod. New ideas were needed to make the fisheries for cod more sustainable. The North Sea RAC had originally decided to hold a symposium to bring interested parties together and had asked the North West Waters RAC to join with it. This symposium was the result. In preparing for the meeting the two RACs had involved fishermen as both participants and speakers. More than 65% of those present were fishermen. Their knowledge and experience was very important and the RACs needed their help in deciding what to do about cod.

The RACs also required the help and experience of scientists, environmentalist and fisheries managers. It was a pleasure to see so many different groups taking part in the symposium. It was especially good to see the Commission and Member States so well represented. The Commission had made it clear that they were here to listen, but of course we were also interested in what the Commission had to say in setting the scene for us.

A steering group had been set in place to organise the symposium. It had included representatives of the two RACs and the Commission and had received support from ICES. The RACs were especially grateful to the Scottish Executive and the *Bord Iascaigh Mhara* (BIM) for their support.

Why arrange a cod symposium now? The main reason was that the Commission had announced that the present cod recovery plan would be evaluated and reviewed during 2007. Special measures had been in place to conserve cod since 2003, and a recovery plan had been adopted in 2004. However, the Commission's targets for the recovery of cod had not been achieved. Why? The different measures put place had been difficult for fishermen to accept. It was now time to re-evaluate those measures.

This symposium was bringing together all stakeholders - fishermen, environmentalists, scientists, managers and others, in order to have different viewpoints highlighted. The RACs had invited presentations from all these different groups. The RACs needed to have the best knowledge and experience available to help the working sessions which would form the main part of the symposium.

The RACs wanted to have an open and constructive debate. It was important for everyone to get their message across. There were two things which were essential to make the dialogue a success. First, we needed to recognise that we were in this together. We needed to build on the tradition developing within the RACs of leaving at home our Member State allegiances. This was about the future of cod and of the EU fishing sector as a whole; it was not about particular Member State interests. Second, we had to keep our discussions real. We had to address the important issues raised by participants.

Those of us who had organised this symposium hoped that the work during the next two days would yield results that could be used by the RACs, the Commission and the Member States in reviewing the cod recovery plan, and that as a result we would see the rebuilding of cod stocks.

Commissioner Joe Borg

In a video message, Dr Joe Borg, European Commissioner for Fisheries and Maritime Affairs wished a good morning to all those taking part in this important meeting on the recovery of cod stocks. He believed that the best way to tackle this common problem was for us to work together in understanding the causes and to discuss possible solutions. Here, our common aim was to make the cod recovery plan effective. He warmly welcomed the RACs' initiative in organising this symposium, bringing together representatives all the parties concerned. Indeed, by combining the expertise of the sector in the fisheries concerned, with the scientists' overview and knowledge of the context, and the fisheries managers' experience, this symposium should provide valuable understanding of how to progress on recovery of cod.

There was no denying that despite the cod recovery plan European cod stocks were still threatened with collapse. Our common responsibility was therefore to ensure that we take the necessary action not only to prevent such a collapse but also to turn the trend around towards the rebuilding of those precious stocks. This would take courage on the part of all of us but inaction was not an acceptable option for those committed to the sustainability of the cod fisheries. The task ahead of us was a tough one, but it was essential. He looked forward to hearing the outcome of our discussions which would feed into the Commission's reflections exercise on reviewing the cod recovery plan. There was no doubt that the more solid the recommendations and advice from the RACs the more useful it would be in this exercise. For all these reasons He wished us productive and successful discussions in the next two days.

Reinhard Priebe

The keynote speech of the symposium was given by Mr Reinhard Priebe, of the Directorate General of Fisheries of the European Commission.

The Commission welcomed the initiative taken by the two RACs in organising the symposium. The Commission was about to revise the 2004 cod recovery plan, and wanted advice from stakeholders on measures that would make the plan work better. The Commission had come to the symposium with its own experts and wished to listen carefully. We all needed to reach a common understanding of the current situation, based on the best available knowledge. It was a legal requirement in the Common Fisheries Policy that proposals should be based on the best available science.

The Commission was committed to ensuring the long-term social, economic and ecological sustainability of fisheries. To achieve this we must recover stocks in peril and move to sensible and long-term management of the industry. Cod stocks remained in bad shape. We needed to restore cod not just for conservation reasons but to secure jobs and markets. Today, the North Sea cod stock produced only on tenth of what it produced in the 1980s. Any delay in taking measures to ensure recovery would make losses worse in the longer term.

There was increasing evidence that the 2004 cod recovery plan was not working. The effects had been much less than expected. Fishing mortality on cod has been reduced much less than required. The core of the matter was that the effort management scheme had not been

effective in reducing either fishing effort or fishing mortality. We should discuss why this had been so.

We could not give up on cod. The question was not whether cod was recoverable but how we should recover the stocks. The Commission had some ideas. It was not right to say that we did not need to protect cod as the stock was affected by environmental change. Even with poor recruitment the stocks could rebound if fishing pressure was reduced to sustainable levels. If stocks were affected by environmental change it meant that stocks were more fragile and needed to be exploited even more carefully.

The Commission did not believe that there was much to be gained by adjusting technical measures alone. We needed to fish less. However, if there were simple, acceptable and effective additional measures then we should know about them. We might also wish to discuss the criticism that we had created a 'negative incentive' by giving more days at sea for smaller mesh sizes.

It was a Commission priority to propose a revised recovery plan for cod stocks this year. It wanted to draw lessons from what had not worked in the past, to get the plan right and make it work now, so that we passed on to the next generation a sustainable fishery for cod. We should leave this symposium with a better basis for providing advice, which would lead to improved measures for cod recovery.

Session 1: Examination of the Current Position

Chair: **Paul Connolly**: Director - Marine Fisheries Services Division, The Marine Institute of Ireland

Paul Connolly opened the first session by drawing attention to the two questions we were asking:

> Can cod stocks be recovered?
>
> What is our strategy for achieving recovery?

Mark Kurlansky had said in his popular book on cod:

> *'Wars have been fought over it, revolutions have been triggered by it, national diets have been based on it, economies and livelihoods have depended on it. If ever there was a fish made to endure, it is Atlantic cod – the common fish. It was the perfect commercial fish. It should have lasted forever, and for a long time it was assumed that it would'.*

We would now look more closely at the cod stocks, and at economic and environmental aspects of the cod fisheries. In trying to solve the problems with cod we needed a shared understanding. And we must learn from the lessons of the past.

Status of Cod Stocks in the Northeast Atlantic

Martin Pastoors: Chair of the ICES Advisory Committee on Fisheries Management (ACFM)

There were many cod stocks which were of interest to us. ICES provided advice on the status of around 150 fish stocks in the Northeast Atlantic. Among these were 14 cod stocks. Some of those cod stocks were doing relatively well, while others were severely depleted. Cod stocks in the North Sea, Western Waters and Baltic Sea were declining. Others, such as the North East Arctic cod were doing relatively well. What was driving the decline of some cod stocks?

Fishing mortality, the rate at which cod were removed by fishing, was high for the declining stocks. It was well above the precautionary level which had been set to achieve sustainability. Recruitment of young cod was also low, although it differed greatly between stocks and was very variable.

Landings had generally decreased. However, the quality of landings/catch data was often uncertain because of unaccounted removals and black landings. If the decrease in landings was slower than the decrease in the stock then fishing mortality remained high. That was the position for cod.

The scientific basis of the assessments and advice was described. The assessments took the best possible evidence on the basis of existing data. The evidence included:

- Stock history and status (biomass, recruitment and exploitation)
- Predictions and longer term scenario evaluation

The data included:

- Catches (landings, sometimes discards, sometimes black landings)
- Catch per Unit Effort (from the commercial fishery)
- Surveys with research vessels

The assessments involved the use of analytical models to estimate the state of the stock and provide a basis for prediction.

The status of the stocks was referred to biological reference points as part of the precautionary approach. A limit value was placed on biomass, below which recruitment would be poor. An upper limit was placed on fishing mortality. To take account of uncertainty, precautionary thresholds were also set for both biomass and fishing mortality to take the stock away from the danger zone. The quality of the assessment depended upon both the models used and the data available. Catch data were problematic for a number of cod stocks (because of unreported landings, and unaccounted removals). Moreover, recruitment was difficult to estimate. The fishery was catching newly recruited fish, and the spawning stock now consisted only of young individuals. Assessment had been easier in the past when stocks were made up of fish from a wider age range.

There were a number of ecosystem factors affecting cod. One was an increase in natural mortality through predation by seals. The biomass of grey seals in the North Sea had increased from 27 000 tonnes in 1985 to 67 000 tonnes in 2002. The consumption of cod was estimated to have increased from 4 000 to 8 300 tonnes over the same period. The ICES Multi-species Working Group was currently reviewing the information available on natural mortality of cod. There was evidence that the growth of cod in the North Sea had been affected by temperature, with a recent decline in mean length at age.

What were the causes of the decline in cod stocks? There had been high fishing mortality as a result of a high and sustained level of fishing, at a time when recruitment had been low. Environmental conditions had perhaps been suppressing recruitment. The age composition of the stocks had changed dramatically, with a decrease in the number of older fish. Younger fish might not reproduce so well.

The advice from ICES on many cod stocks had been to reduce fishing mortality. That advice had been given over many years since the 1990s. The level of fishing effort had continued to increase although recently it had decreased in some areas. Recovery plans had been agreed for a number of cod stocks and had been based on age-based stock assessments. However, signs of recovery had not been evident and fishing mortality appeared to have remained high. Data for the stock assessments had not been reliable, and it had not been possible to give quantitative forecasts to aid the cod recovery plans. There was, however, still potential for the cod to recover. The northern cod stock in Canadian waters, which was also very low, did not grow well and had not recovered. North Sea cod in contrast could grow quickly and if fishing mortality was reduced the biomass could increase rapidly. The advice from ICES had been that fishing on cod should cease. Very light levels of fishing mortality would also allow cod to recover.

In conclusion, cod stocks differed. Some were in a poor state but a few were in good condition. The more southern cod stocks were in especially poor shape. Fishing mortality was too high for those stocks. There was a good prospect for their recovery, however, if fishing mortality could be reduced. Under conditions of low recruitment, larger reductions in fishing mortality would be necessary.

The Common Fisheries Policy and the Revision of the Cod Recovery Plan

Ernesto Penas Lado: European Commission, DG Fisheries

In 2006, the Commission had presented a working document analysing the application of the cod recovery plan and drawing conclusions on how well or badly it had worked. The conclusions of the working paper had been that the reduction of effort that had been achieved by the plan was lower than intended. Any reduction of cod mortality was almost non detectable. The annual objective of a 30% increase in biomass of cod had not been achieved. The complexity of Annex II of the technical conservation regulation had been a barrier to sound management. The scientific advisory process was not providing numerical estimates of spawning stock biomass and fishing mortality to enable the recovery plan to be applied. STECF had analysed the working of the effort management plan and had found that the real reductions of fishing effort had been lower than intended. Reductions in effort by some segments had been offset by effort increases in other segments. Many fishing fleets were contributing to cod mortality, including fisheries not targeting cod. Significant discards of cod were occurring in a number of fleet segments.

Thus, the reasons for the failure of the cod recovery plan could be attributed to lower reductions of effort and TACs than were necessary to recover cod. There had been no effort cap on fleet segments and effort had been displaced to lower mesh sizes. Large mesh size fisheries had now been replaced by small mesh fisheries. Control of catch composition was needed but had been insufficient and was more difficult to achieve than controlling effort. It had proved especially difficult to decouple species associated with cod (haddock, *Nephrops*) from the restrictions placed on cod. A problem of 'missing fish' had arisen; the level of unaccounted removals was high and inexplicable. These problems had made it difficult to obtain good, quantitative, scientific advice.

The Commission had come to the symposium with an open mind about cod recovery. However it had some initial ideas. Any revised plan had to be legally compatible with the objectives of the CFP. It had to be based on parameters scientists could estimate reliably. There was a need to simplify Annex II. The plan needed to be predictable and fair. The measures had to be easy to enforce. The role which could be played by technical measures needed to be clarified. There had to be agreement with Norway on the measures for North Sea cod. The Common Fisheries Policy was not isolated but had to be integrated with environmental objectives. The long term objective for the cod fisheries should be around Maximum Sustainable Yields, as that was a political commitment for all states. The legitimate right and interest of fishers to catch other more abundant species should not compromise cod recovery. On the question of the environment, adverse environmental conditions meant that more restrictions were needed, not less.

The long term objective was to increase cod biomass. However, the failure to estimate that biomass reliably posed a problem which had to be dealt with. Fishing mortality objectives might be better. There was a problem in knowing what to do if scientists could not estimate these parameters. We had to consider what to do in the event of failure by the scientific community to estimate them. Every year since 2003 we had lacked quantitative advice on cod, and this had led to *ad hoc* rather than long-term decisions.

Simplification of Annex II was a major issue. We needed either to harmonise the system or regionalize it. It is difficult to combine both of these. Simplification leads to harmonised ('one-size-fits-all') systems. Area-specific approaches do not contribute to simplification. Did we want simplification for fishers or simplification for National or Community Administrations?

The North Sea RAC was interested in developing an effort management regime for the Kattegat. The Commission was continuing to discuss that pilot scheme but had to find a way to make such a scheme compatible with the cod recovery plan elsewhere.

There was a need for predictability, fairness and transparency. We should have formulae, in the form of harvest control rules, which were easy to apply. Every year the debate on cod was re-opened. If we had better science, the harvest control rules laid down in advance could be respected, and there would be no need for further discussion of who should reduce their fishing days. We needed to avoid further political discussion. Clear criteria were required on how to share the burden of recovery among fleet segments. There would be a long term plan for flatfish applicable from 2008. What would that plan contribute to cod recovery? We had to avoid derogations for particular fleets being adopted for political reasons.

The revised recovery plan had to be enforceable. Effort control was easier to control than catch composition. Steaming time was difficult to enforce. The control measures had to be cost effective and should not place too great a burden on national control and enforcement systems. Could the industry itself contribute to enforcement by exerting peer pressure?

Technical measures had an important role to play but they were not a substitute for effort reduction. Technical measures were required to de-couple the capture of cod from the capture of more abundant species like haddock and *Nephrops*. Closed areas might also play a role in this process of disassociation.

The Commission had not yet prepared new plans. Following this symposium, and after taking further scientific advice, the Commission would produce a non-paper setting out ideas. Those ideas would then be discussed with Norway. By the 3rd Quarter of 2007 the Commission intended to propose amendments to the Regulation establishing measures for the recovery of cod stocks. These would be discussed by the European Parliament leading to a Council Decision, perhaps by mid 2008. Specific modifications to Annex II would be discussed in the near future, and would hopefully lead in the direction of greater simplification. The TACs and quotas for 2008 would still be based on the current cod recovery plan, but would take account of any changes to Annex II.

At this stage, the Commission did not wish to dictate what changes should be introduced to the system. Rather, it wished to develop a series of principles and conditions that any future revision of the plan should respect, in terms of objectives and legal or substantive requirements. There were choices on certain issues, for example between simplification and regionalisation in relation to Annex II.

The European Marine Strategy and Fisheries

José Rizo Martin: European Commission, DG Environment

For marine ecosystems to be healthy, the status of commercial stocks had to be good. Any environmental policy aimed at protecting and conserving the marine environment had to take fish stocks into consideration. Fishing was probably the most important pressure exerted upon marine biodiversity. However, existing legal and institutional arrangements put the management of fisheries in the hands of the Common Fisheries Policy. The reform of the policy in 2002 had offered many opportunities to incorporate environmental concerns into the management of fishery resources. The policy aimed to reduce fishing pressure (catches, mortality and effort) and therefore improve the status of stocks; to improve fishing methods and therefore diminish by-catch and physical destruction; to eliminate incentives to overcapacity and therefore improve profitability and compliance. In addition, the policy had to contribute to implementing any relevant environmental policy. Long term recovery plans

like those for cod made much more sense than annual decisions. However, there was a need to assess whether recovery plans were delivering.

According to IUCN, cod stocks were facing a high risk of extinction in the wild in the medium-term future, as defined by population reduction, occurrence, number of individuals and probability of disappearance. OSPAR had said that cod stocks were threatened or in decline in the Greater North Sea and the Celtic Seas. If the status of cod was not improving then the possible causes should be analysed.

The European Marine Strategy was a new policy. Under this policy measures to protect and conserve the environment would be well founded, proportional to the desired effect and easy to implement. Marine environmental policies would be integrated and would not only consider fisheries but also the many other pressures on the marine environment. There was a clear understanding of the need to avoid 'pathologies'. However, it was recognised that the problems were not well bounded or simple. It was not possible to control nature or to manage ecosystems in a way which would establish highly predictable outcomes.

A new Directive was planned, aimed at achieving or maintaining good environmental status in the marine environment by the year 2021 at the latest. Applying an Ecosystem Approach would be a key part of the directive. It would aim to carry out an initial assessment of the current environmental status of community waters and would establish environmental targets. It would also aim to implement monitoring programmes and develop a programme of measures to protect the environment. In considering fisheries the strategy would require the status of fish stocks to be defined and to decide whether they were inside safe biological limits. The Directive would be applied on a regional scale and Member States would be required to act jointly. If there were problems with the fisheries, then Member States would have to take these into account in formulating their environmental plans.

Two different legal frameworks, the CFP and the EMS, would have to be merged and would need to be consistent with one another. There would be two different 'traditions' with regard to fixing objectives, and in terms of factors which could be taken into account. In defining strict protection for the environment the European Court of Justice had decided that the only information to be considered was the scientific position. Social and economic concerns were not important. The principle of adaptive management would also need to be introduced.

The Commission was not trying to close down all human activities in the sea. However, it wished to ensure that all those activities were carried out in a sustainable manner - to make our seas clean, healthy and productive.

The Socio-Economic Context of Cod Recovery

Hazel Curtis: Chief Economist, Sea Fish Industry Authority; European Association of Fisheries Economists

What did economics contribute to the debate on cod recovery? Economists used objective scientific assessments to illustrate the implications of choices about the distribution of resources. Their assessments allowed society to better understand impacts of options and to choose between different options.

Socio-economic impact assessment was about people, their choices and actions. It was a tool to aid the understanding of the range of direct and indirect impacts of a policy and to estimate the scale of those impacts.

The fish in the sea were caught by vessel businesses, which then brought a new, valuable raw

material into the economy. The vessels spent money on their supplies, which helped support other businesses and jobs. The crew earned wages, which supported their families and they spent those wages in the economy. The fish were processed and then sold in restaurants, retail outlets or exported to customers, all of which added further value into the economy and created more jobs. All of these effects of fishing would be affected if less cod were caught in the short term or long term.

There had been no published work on the socio economic impacts of the CRP to date, which detailed what the impacts had been or might be in the next few years. However, we could take a look at what might be included in such impact assessments and, as illustrations, show some partial pieces of information which could be included.

The recovery plan had resulted in large reductions in quotas, the decommissioning of many fishing vessels, restrictions on fishing in certain areas, restrictions on days at sea, and the imposition of technical measures relating to mesh size. Impacts of the cod recovery had affected the volume and characteristics of the fish landed, prices, total revenues, costs and profits of vessels.

To find the economic cost of the plan to date we would want to know what volume and value of fish (not just cod) would have been landed since the start of the plan if the plan had not been in place. We could know for sure what this would have been, so we had to make assumptions or estimates and our impact assessment could only be based on those.

Since 2002 the quantities of cod landed had diminished, but perhaps the volume of haddock & *Nephrops* were now greater than they would have been had the cod recovery plan not been in place.

Different groups of people might think certain levels of quota or landings might have been more likely than others, but for illustration purposes, we should assume that there would have been no major drop in the volume of landings since 2002.

Using those volumes, average UK prices had been applied to each of four main species, just to illustrate how we would go about making an assessment of the initial impact of foregone revenues resulting from the cod recovery plan. To estimate the overall economic impact we needed to consider the direct, indirect and induced effects of a drop in revenues on output and employment. The UK output multiplier for the demersal species catching sector was 3.91 which meant that for a change of £1 in output from catching demersal species in the UK there would be a change of £3.91 of output in the wider economy (including, direct, indirect and induced effects). So, using the UK multiplier as indicative for the North Sea countries, if there was a reduction of £100m in EU demersal fish landings, then that might have caused a reduction in EU output (GDP) of around £390m. Clearly, a study of this nature carried out using correct data for every country would take some time.

The plan required a substantial reduction in the number of vessels, so it had had an impact on costs per vessel and profits per vessel.

Immediately after the 2003 decommissioning, the remaining UK vessels had to pay to catch the quota which had previously been allocated to the decommissioned vessels, so their profit was affected by a new cost which resulted from the way Member States implemented decommissioning. The plan also led to the need for many vessels to purchase days at sea.

What might the costs and benefits of the plan be in future years? The same principle held: that we first had to decide what we thought the future will look like in terms of landings of fish under the plan or without the plan. People had to make up their own minds about what was likely to happen with and without the plan. Economists could then assess the impact of

the chosen scenarios, using fleet financial models as an initial step.

Economists at FOI in Denmark had applied a model used for STECF advice to illustrate impact on fleet segments under a baseline scenario, with steady landings, compared to a management plan scenario, in which the cod TAC continues to fall for another few years and then begins to increase again. The SSB recovered significantly, but by 2014, the financial benefits of the plan were barely higher for these fleet segments than if baseline level landings had continued. Of course, it might be that without the plan, landings would fall and stay down if the stock collapsed completely. Then, having the plan would look more beneficial than not having the plan.

Was cod recovery worth the cost? In considering this question there were some important questions to ask. Whose costs were we considering? Former vessel owners? Current vessel owners? The cost to the wider economy? Cost to the Euro taxpayer? If we let cod go, would other stocks grow and be worth more revenue and profit? Could they be caught at lower cost? Was cod recovery the same as the recovery of all species? Would the fleet lose all revenues due to stock collapse if we did not have a cod recovery plan which limited inputs and mixed species outputs?

We could ask the Canadians if they would rather have started a cod recovery plan sooner. Their landings were now much more valuable without cod – there had been a benefit to current businesses. But what about the cost to the economy and society overall? There had been tremendous social upheaval and a heavy cost from business failures.

The Commission had said that not only would the cod recovery plan prevent the collapse of cod stocks, it would also bring economic and social benefits. Was cod recovery really the best way to maximise the social and economic benefits from fishing in northern Europe? If there were benefits expected, it was reasonable to ask when the benefits of the cod recovery plan would exceed the costs.

It was fair to ask whether cod in the sea gave a benefit to wider society. If it did, what was that benefit to society? Who would be willing to pay to keep it? Who should pay, and how much should they pay?

Whose fish were they anyway?

Sustainability of Northeast Atlantic fisheries and Climate Change

Chris Reid: Sir Alistair Hardy Foundation for Ocean Science

Plankton, the small plants and animals which lived in the sea, played an important role in fisheries. Information on historical changes in the ocean plankton was available from the continuous plankton recorder survey, which first began in 1931. The survey was now funded by eight countries. A series of tows of the recorder took place every month along standard routes using vessels of opportunity.

There had been profound changes in the phytoplankton, which provided the primary source of food in the sea, in the North Sea and other areas of the North Atlantic. Since 1987, phytoplankton growth had taken place throughout the year. There had been an overall increase in the abundance of phytoplankton, which indicated an overall regime shift not just in the North Sea and adjacent areas but also in the Eastern Atlantic including the Grand Banks and Nova Scotia, since the late 1980s.

Changes had also been evident in the zooplankton, including species which formed the food

of young cod. *Calanus finmarchicus,* a copepod, was once dominant but it had now been replaced by a related species, *Calanus helgolandicus.* Indeed the regime shift had been observed at all levels of the ecosystem. Some fish species, including the horse mackerel, had become more abundant. Others, like the cod were now much less abundant in some areas. There was a close relationship between a marked decline in the size and numbers of all copepods in the North Sea and a similar decline in cod.

This was not to say that environmental change was the only factor affecting cod abundance. It was also apparent that heavy fishing pressure had also played a part in the decline of cod. Fishing was selective, and it tended to remove the largest (and oldest) individuals and species. The cod stock was now made up predominantly of younger individuals, which might yield poorer spawning success. It had been shown that cod recruitment was strongly affected by climate, especially when spawning stock biomass was low.

Superimposed on a northerly bio-geographic movement of plankton was a shift in fish species. The warm water pipefish was becoming more abundant in the North Sea and mackerel were now appearing in the Barents Sea.

Were the observed changes in plankton and fish stocks linked to global warming? It would seem that they were. Sea temperatures were increasing in the northern hemisphere. There had been a very large reduction of ice in the Arctic Ocean, and if this trend continued for a further decade then the Arctic Ocean would be ice free in summer. Ocean temperature and circulation were changing rapidly. Indeed, observed and predicted climate changes might be accelerating.

It was important to take these environmental changes into account in fishery management. We must try to maintain the age structure of fish stocks to ensure their sustainability. We must also expect changes to the distribution of existing species and the opening up of fisheries for new species in some areas.

Discussion & Summing-up of Session 1

Fishers' representatives were disappointed in the Commission's approach. They believed that Commission representatives had come to the symposium with a predetermined position, despite their protestations to the contrary. The assumption that cod was not recovering and that cod recovery measures were not working was quite wrong. Cod was recovering in some parts of the North Sea.

In summing up, Paul Connolly thanked all five speakers for updating the symposium on the current position and providing fuel for the workshops. It was clear that fishing mortality on cod was high and that the species was showing a reduced range of year classes. Older cod were absent from the stocks. It was evident that there had been changes to the ecosystem, and that we would need in future to adopt a more adaptive approach to management. Cod recovery implied that we could go back to where we were before. Could we really do that in a changing environment? Mark Kurlansky had pointed out that in many ways the high fecundity and growth rate of cod in some regions made it an ideal species for recovery. We needed now to consider:

> What we had to do to rebuild cod stocks.
>
> And whether we were willing to take the necessary steps!

Session 2: Examination of Experiences Outside the EU

Chair: **Ann Kristin Westberg**, Norwegian Ministry of Fisheries

Rebuilding Cod Stocks: Lessons from the Northwest Atlantic

George Rose: Fisheries Conservation Group, Memorial University, St. Johns, Newfoundland, Canada

The Newfoundland and Labrador cod fishery began in the 15th century and was once the largest in the world. After World War II the build-up of the trans-Atlantic fleet from the Soviet Union and Europe heavily exploited many stocks. Continued over-fishing and reduced stock capacity during a period of poor climate after the imposition of the 200 mile EEZ by Canada in 1997 led to a complete collapse of most stocks by the early 1990s, and a moratorium on cod fishing in 1992-93. The collapse of cod was but the last in a series of collapses, the first being the Grand Banks haddock, which had not recovered in 50 years.

The cod stocks had been large: perhaps 6 to 7 million tonnes overall in the various stocks. By far the largest was what is called the northern cod – whose range was off the NE coast of the Island of Newfoundland and off Labrador. On the Grand Banks the cod were large – but overall these were coldwater stocks which had very high abundance levels but relatively slow growth and small size for the species. For hundreds of years, there were no long term stock collapses, although there were good and bad years, good and bad decades, and even centuries – the 19th century was characterized by the climax of the Little Ice Age and all indications are that the cod fishery suffered. But still, throughout all this time, harvest rates were low – in most years much less than 10%.

In the dominant northern cod stock, the increase in large foreign vessels had an almost immediate impact on the more traditional small boat Newfoundland fishery. This impact was predicted in the 1950s and well known by the 1960s. But nothing was done, or as some would argue, nothing could be done.

The question as to whether the declines in cod were caused entirely by over-fishing was simplistic. There was no doubt that major changes in the ecosystem had taken place during the tertiary period of decline. In particular, the main prey of cod, the capelin, shifted distribution and declined throughout the prime northern range just prior to the tertiary decline. The main predators of cod, the harp and hooded seals, increased dramatically over the same period. Other demonstrated changes included massive increases in invertebrates, with snow crab and pandalid shrimps becoming of greater commercial importance.

The most recent period of decline in the cod stocks had paralleled a cooling of the oceans in Newfoundland and Labrador waters related to the North Atlantic Oscillation. The years when the cod finally almost disappeared, from 1990-1992, were some of the coldest on record. There were many changes in the ocean ecosystems during these years that were clearly related to climate and not to fishing.

The extraordinary decline in cod led to extraordinary measures; moratoria on all fishing, protecting spawning and juveniles, and the creation of fishing reserves. Fishing reserves, where fishing was highly restricted and some gear types such as trawling were prohibited where cod tend to aggregate, had proven successful in at least 3 areas of Newfoundland and Labrador. Two of these were in near-shore waters but a large one in the Hawke Channel off Labrador was 50 by 50 nautical miles, and was put in place beginning in 2002 largely to protect snow crab from shrimp trawling. But this area was also an historically important area

for cod. Protecting spawning cod did appear to bring benefits.

In terms of rebuilding, not all stocks had performed the same (a common misconception), nor could blanket solutions be recommended. Whether changes observed in the stocks were longer term genetic responses to over-fishing, or more dynamic responses to a changed environment, remained key questions. Whatever the cause, radical life history changes were evident in some but not all stocks. Simply reducing fishing mortality had not in all cases resulted in increasing stocks, but it had in some. Where cod had recovered the fish now had different characteristics. They were now smaller fish which matured more quickly. Climatic change and changed feeding patterns were clearly an important part of the equation, and there was also the shadow of genetic changes taking place within cod populations. Seal predation was now a major problem with seal populations now forming some of the largest herds of mammals on the planet.

How can we Reduce Unwanted Mortality of Cod?

Peter Gullestad: Director General of Fisheries, Norway

If we defined unwanted mortality as all dead fish caused by fisheries in excess of agreed quotas, then one of the most important challenges to industry and management was how we could minimize this mortality. A practical approach to this problem was to examine each fishery/fleet with regard to all possible sources to unwanted mortality. Based on such an investigation it was possible to identify both small and big problems, some of them easy to solve, others more challenging. Possible solutions might be found at local, national or the EU level. It was important not to wait, but to solve the easier problems without delay and then give priority to the larger and more complicated ones!

Unwanted mortality could be grouped into three categories according to where they occurred. Fish could die in the sea, never touching the deck. Selection mortality and 'ghost' fishing were examples of this category. Solutions to the problems of ghost fishing had been provided through technical regulations and net retrieval programs.

Discarding on board the vessel was a major source of unwanted mortality. The main elements of the Norwegian discard policy were:

- A ban on the discarding of commercial important species
- A requirement to change fishing ground to avoid discards
- Temporary closure of fishing grounds
- Special regulatory measures for certain fisheries
- Development of selective gear technology

One of these elements was the allocation to fleet sectors of national quotas. For example, the reduction of potential discards was a crucial element when distributing the Norwegian allocation of North Sea cod. The first priority was to allocate unavoidable by-catch to fisheries for other species to minimise discards. There were fleet-specific by-catch rules. The quantity necessary to cover unavoidable by-catch needs was calculated annually for each fleet. Small coastal boats had a 'ceiling' on their annual individual catches. The rest (if any) of the national allocation was distributed as individual quotas to a limited number of vessels (gill-netters and danish seiners) in the directed fishery.

The third category of unwanted mortality occured at landing. Black and grey landings came in many forms. Compulsory weighing of all landings and correct conversion factors were a prerequisite for an efficient control and enforcement regime. "A kilo had to be a kilo!"

Efficient physical control of all landings at the quayside was in most cases not possible. The legal authority of the fisheries inspection service to inspect and to collect information all along the value chain had therefore to be emphasised. Experience showed that post-sales audit of buyers of fish could be a very effective tool in uncovering gross misreporting of landings. Last December the EU decided to introduce compulsory electronic logbook and reporting, and the Commission was now preparing the implementation regulation. A harmonized approach to this issue was of vital importance to fishers fishing in more than one area of jurisdiction. Norway would therefore cooperate closely with the EU on the implementation. Properly done, electronic reporting would improve transparency and control efficiency greatly, and at the same time considerably simplify the bookkeeping and reporting procedures of fishers.

Session 3: Stakeholders' Reflections

Chair: **Hugo Andersson**

Cod Recovery: An Environmentalist's Perspective

Niki Sporrong: The Fisheries Secretariat, Sweden

Two things had become apparent from the presentations so far. It had been said that we were facing major changes in the environment and that these might accelerate. Things are no longer what they were. Perhaps there had never been a *status quo*. It had also been emphasised that economic and other societal factors were important, but these had largely been ignored in the past. Perhaps we should think in terms of rebuilding rather than recovery. We would also need to adopt an adaptive style of management, working together to do what we could.

Cod stocks in the European Community waters had declined dramatically in the last two decades. The situation and pattern varied slightly from stock to stock but the overall pattern was the same. The main reason for this decline was over-fishing. Other factors, such as climate change and seal predation, affected the stocks but fishing mortality was estimated to be around five times the mortality rate from all other causes combined. The state of cod stocks was a stark message to all involved in management. The decline in cod stocks had been closely followed and documented, and warnings about an impending collapse were already being given in 2000, as the Community was discussing CFP reform. Some measures had been taken, but they were neither sustained nor joined-up. They had not prevented displacement of fishing effort to other fisheries. In 2002, political agreement was reached on a new, more long-term management approach through multi-annual recovery and management plans, setting out specific targets to reach within a given timeframe. A recovery plan for the severely depleted cod stocks of the North Sea, Kattegat, the West of Scotland and the Irish Sea was finally agreed in 2004. To date, the application of the plan had not led to significant recovery of the stocks. This was disheartening for everyone involved.

We could not give up on cod. It was one of the top predators in the ecosystem, with a key role in the food web. And who in their right mind would give up on a renewable natural resource, popular with consumers, with a potential value of €243 million a year? According to STECF the cod recovery plan had failed in its objectives because the reductions in catch and effort had been smaller than those required for recovery. Cod mortality was simply still too high for any recovery plan to succeed. Some important steps had been taken. Fleet capacity had decreased and compliance in the sector had improved. It was time to assess how we could reduce the mortality of cod further, in the most painless way possible. High levels of by-catch and discarding were a major cause of mortality in these stocks. According to ICES, half of the mortality was caused by 'unallocated removals' or missing fish. If we could find a way to reduce discards by, say, 80 per cent, cod stocks would stand a fair chance of recovery. Scientists had noted that minimum safe stock levels in the North Sea could be reached within a year at the current TAC, if unallocated removals were reduced from 50% to 10%. This would not be easy, and we would need the help and cooperation of fishers. They knew their fishing gear, its potential and which modifications would work. In addition to by-catch mitigation measures, other actions would need to be taken and fishers would need positive incentives and directed support throughout this change.

In addition to tracking down the 'missing' fish other steps would also have to be taken. Retailers could help by paying a premium for sustainably-fished fish. Governments could also help by providing incentives to encourage fishers to fish more sustainably.

Cod Recovery: An Industry Perspective

Barrie Deas: National Federation of Fishermen's Organisations, UK.

Was cod recoverable? And did we have the right plan? A whole raft of measures had been adopted to protect cod since 1999. They had included technical measures such as mesh size changes, the introduction of square meshes and gear configuration rules. Closure of spawning areas had been imposed, TACs had been reduced, effort control introduced, capacity reductions had taken place, there had been controls on landings. Finally a Cod Recovery Plan, requiring a 30% increase in spawning stock biomass annually, had been imposed.

What had these restrictive measures delivered? We did not know! Almost all had been introduced without prior or post evaluation. Some measures contradicted and undermined others. There were difficulties in assessing cod biomass. But the measures had been crippling in economic terms and traumatic for the industry. There had been a diversion of effort away from directed cod fisheries, and a significant reduction in capacity and effort (mainly through decommissioning).

Had the stocks responded to the recovery measures? There were signs of recovery in the North Sea. In the Irish Sea the decline may have been arrested. However, there appeared to have been no recovery in waters to the West of Scotland and there the decline may even have steepened. In the Celtic Sea, outside the cod recovery zone, a different approach had been taken with the introduction of a closed area. However, there had not yet been a proper evaluation of this measure.

It was evident that we would need to understand the different dynamics at work in each of the fisheries if we were to rebuild cod stocks. Different management responses might be required in different circumstances. We had learned that fishing takes place within a fluctuating environment, with periods of high productivity and periods of low productivity. It would be sterile to argue whether fishing or environmental change had been responsible for the decline in cod stocks. However, the fact that environmental change was occurring had implications for our targets and timescales. Good recruitment and the availability of prey species were critical for the recovery of cod. Sea water temperatures were pivotal, and predator /prey relationships, although imperfectly understood, could be decisive.

There were lessons to be learned from other stocks. Whilst cod stocks had been low, other commercial stocks had been highly successfully within the same ecosystem. Prawns, haddock, monkfish, saithe, and whiting were all in a good state. An important policy objective should be to maintain viable fisheries on these stocks whilst rebuilding cod stocks.

So far, the management response had been blunt and had lacked understanding of either biological processes or the economics of the fleet. That lack of understanding had affected the degree to which implementation had been successful. Cod recovery had been politically driven by fear of a repeat of the Canadian experience and a "not on my watch" mentality. The process each December within the Fisheries Council had produced flawed fisheries regulation, driven by crisis management and a "we have to been seen to be doing something" syndrome. There had been many mistakes, including the seasonal closure of part of the North Sea in 2001, an unrealistic harvest control rule requiring a 30% increase in biomass annually, an 8% margin of tolerance for the weight of catches, the "haddock box", the confusion over Annex V, and the perverse incentive to move to smaller meshes. There had been a repeated gulf between policy and successful implementation!

Overall, the cod recovery plan had delivered much less than hoped for.

In retrospect, the plan looked confused. It had been poorly constructed on weak foundations. Poor governance had been a major issue. Without more participative and inclusive governance we could achieve very little. Effort control had been the centre-piece of the cod recovery plan. It had had profound economic and operational consequences. It had raised the cost of fishing, but had achieved little in terms of conservation. The main purpose had been to serve as a backstop for TACs. Other more direct measures had been more effective – such as vessel decommissioning and controls on landings and the supply chain. We should now be asking whether effort reduction had become a permanent feature of the cod recovery plan, despite its lack of success in reducing fishing mortality.

It was doubtful whether a successful cod recovery plan would be possible if fishermen did not believe in it or support it. Cod stocks had now entered a period of low productivity. This would have implications for the setting of realistic targets and for timescale of recovery. Movement in the right direction was more important than defining a specific destination. It might be better to target fishing mortality rather than biomass, as Ernesto Penas had suggested. A wider range of indicators should be used to determine the state of the stocks, including qualitative data and the data generated by fisheries/science partnerships. Fishing was inherently unpredictable but we could achieve some stability in the rules by moving away from the repeated year on year changes which undermined coherence, understanding and acceptance. We must aim in the future to work with the grain of natural change. We had to evaluate everything that had been done in the name of cod recovery and learn the lessons. Much could be achieved in improving species selectivity if fishermen's support could be harnessed and the potential of real time closures to protect aggregations of juveniles had to be explored.

There seemed to be a consensus that cod stocks could recover if the conditions were right. However, recovery would be as much about changes in the system of governance as about the recovery measures themselves. The next phase should be to move the cod recovery plan to a more incremental approach, where we would aim to husband the signs of recovery as they appeared.

Cod Recovery: The Supply Chain Perspective

Guus Pastoor: The EU Fish Processors' Association, AIPCE

AIPCE had been carrying out its own research into the availability of cod supplies in the context of the overall EU market. The study had focused on a number of fish species and had analysed trends in supply, the countries of origin, and the degree of self sufficiency within the EU. In fact no more than ten percent of cod were supplied by the EU fleet. Although the EU was a very big market for cod, it was not a large primary producer. Also, about 80 percent of the supply was of processed fish, so the EU was not a large processor of cod either. The supply of fresh cod within the EU was essentially supplying a niche market. And that market had to be treated very carefully.

There was now a public perception that cod is not a product we should be buying any more. Although consumers loved the product there was a problem in marketing cod. Consumers lacked objective information on cod, they had a moral dilemma, and they were confused about cod coming from different areas. The image of cod originating in the EU was under severe fire, and so was the credibility of the Common Fisheries Policy.

Under the CFP, cod recovery had not been achieved. We had to ask whether our goals were realistic, whether the instruments selected had been effective, and whether our knowledge of cod was sufficient. The concept of sustainability within the cod recovery plan was not shared

by all stakeholders. As a result, mixed information was reaching the market. Buyers had started looking for their own concept. Clear and authoritative communication about cod recovery was missing.

The Regional Advisory Councils were the only places where we could define common goals. The RACs could provide a forum for scientists, businessmen and NGO's to share relevant information and develop a common view on sustainable cod fisheries. The RACs could also formulate what scientific data were needed for different recovery scenarios. We now needed a cod *image* recovery plan, and at the moment it looked as if only the RACs could provide this.

From a market standpoint, cod was a niche market product. We had to avoid catching small cod and ban discards from the fishery. We had to communicate how we were working to improve the state of cod stocks. There had to be cooperation between fishermen and buyers. We should avoid ill-founded multiple label and certification schemes, invest in research, and be realistic and open about our aims.

Policy makers had now to set realistic TACs which took uncertainty into account. They had to simplify the rules and introduce greater flexibility. More responsibility had to be passed on to stakeholders. Managers had to implement a discard ban. There had to be a central information and communications authority to provide accurate information on the cod fisheries. Progress had to be communicated to the consumers in a realistic and open way.

Session 4: Working Groups

A series of Working Groups, took place to address the questions:

- Can cod recover?
- If so, what kinds of action need to be taken to help cod recover?

Each concurrent Session was addressed at the beginning by a scientific expert and an industry expert.

North Sea/Kattegat 1

Chair: Niels Wichman
Rapporteur: Jenny Hatchard
Scientist: Coby Needle
Industry: Willem de Boer

Scientist's Presentation

Coby Needle of the FRS Marine Laboratory Aberdeen briefly outlined the current state of science on North Sea cod. He described the most recent assessments, forecasts and advice for North Sea cod, and explored issues related to reference points and existing management measures. Simulation analyses were presented which indicated the likelihood and timescale of cod recovery under different management scenarios. Some of the latest thinking on biological issues was discussed. He concluded with a brief resumé of the potential advantages and disadvantages of a range of alternative management approaches, as seen from a scientific perspective.

Fisher's Presentation

Willem de Boer summarised the concerns of fishermen over the cod recovery measures.

North Sea/Kattegat Workshop 1, Summary; Jenny Hatchard

The science:

> Current advice in the North Sea was that there were indications that fishing mortality had declined in recent years, although it was still too high according to ICES reference points. The year 2005 appeared to have provided a more substantial year class than previous years. Localised stock improvements were being observed, but there were declines elsewhere. Growth problems had not been observed. There was evidence that fishing mortality was higher in the southern North Sea.

Other Observations:

> There was some evidence that cod formed genetic subpopulations. A wide range of factors were affecting stock distribution but were poorly understood. Unaccounted landings were declining – but we might still be missing the impact of natural mortality and discards.

So…

There were some grounds for optimism for North Sea cod. It did seem that a fishing mortality of 0.4 F was robust under conditions of low productivity

The industry viewpoint:

The cod fishery had historically been very profitable. There was strong concern that fleets were being destroyed and fishermen put out of business for no benefit. There was interest in looking at other causes of stock decline. There was a view that different areas of the North Sea should be managed separately.

Could cod recover?

Yes, but it might be slow, especially if high discards continued, There was already evidence of cod recovery in some areas. However, should we focus solely on cod and not other species/fisheries? Who should bear the burden of cod recovery? It was vital that we define recovery – we needed to define what we were trying to achieve. There was concern that cod recovery was dependent upon successive good year classes. If bad year classes continued cod would go down very quickly

Actions to help cod recovery:

- Fishing mortality should be reduced to 0.4 across the North Sea
- There should be a move away from biomass objectives
- Measures should be tailored to both fisheries directed at cod and fisheries which were not directed at cod
- Quota measures – stop reducing quotas, revert to a quota system, turnover quota
- Just have an effort system
- Address discards and knowledge of discards – consider a discard ban
- The management system was working, so continue with it (Shetland fishermen)
- A large number of vessels had been scrapped in the Scottish industry
- There was a perception that recovery had not been given long enough to work
- The advisory structure prevented us from knowing what the impact of cod recovery measures had been

Problem with discards would persist

Obtaining better knowledge:

Sound science was needed. Partnerships between fishermen and scientists should be extended. The NSRAC fishermen's data project had been a success. Science should be extended beyond fisheries to investigate other factors influencing the stocks – eg. phytoplankton, predation, the state of the ecosystem. Fishermen needed to be involved in the process of collecting the data.

Governance issues:

Industry acceptance of the policy was vital. The Cod Recovery Plan was not well regarded by the industry. Management policies were a problem: eg. those outside the industry were not aware of the difficulties experienced within the effort management system on a day-to-day basis. The 2006 effort regime had not been finalised until December 2006. Industry had been running after the decisions.

North Sea/Kattegat 2

Chair: Hansen Black
Rapporteur: Michael Andersen
Scientist: Stephen Holmes
Industry: Michael Park

Scientist's Presentation

Stephen Holmes of the FRS Marine Laboratory Aberdeen briefly outlined the current state of science on North Sea cod. He described the most recent assessments, forecasts and advice for North Sea cod, and explored issues related to reference points and existing management measures. Simulation analyses were presented which indicated the likelihood and timescale of cod recovery under different management scenarios. Some of the latest thinking on biological issues was discussed. He concluded with a brief resumé of the potential advantages and disadvantages of a range of alternative management approaches, as seen from a scientific perspective.

Fisher's Presentation

Michael Park, Executive Chairman Scottish White Fish Producer's Organisation, pointed out that the decline of North Sea Cod was well documented; the lack of robust science on the stock due to its low biomass levels had led to repeated calls for a moratorium. The Cod Recovery Plan agreed by the Council of Ministers in 2003 had set out to aid recovery by restricting the number of days that vessels could spend at sea, coupled in some cases, with major reductions in Total Allowable Catches (TAC's).

The Scottish catching sector believed that the plan had lost its way. The lack of sophistication in the plan left it blatantly exposed to needless waste during stock recovery. Those inherent faults were exaggerated by the time lag of the science coupled with the reality that although cod could be caught and marketed at around one year old, they did not enter the spawning stock until their third year.

Adequate action to save cod had already been taken; the introduction of emergency measures and the move to more selective gears in 2002 were both actions to enhance stock recovery. A decision taken by the Scottish Parliament to decommission fishing vessels in 2001and 2003 had reduced the effort on cod by the whitefish sector to around 40% of its pre 2003 levels, in line with the Commissions own guidelines. The Scottish fleets were proud of their recent green credentials; they felt however that the present system of fisheries management was failing both fishermen and the stocks.

North Sea/Kattegat Workshop 2, Summary: Michael Andersen

- Cod recovery was possible. Indeed it was already happening in some areas
- There was general agreement that fishing mortality was still too high, and that there would be benefits if it were to be reduced further
- Targets were not necessary. It was important to move in the right direction. The stocks would not improve year on year and it would take time for the effects of measures to appear in the stock assessments

- A collaborative framework was required before fisheries management would improve. We also needed more concrete management proposals

- There was no unanimous support for a discard ban.

- Better data were required. Collaborative action was necessary to find measures to reduce discards and catches of under-sized fish

- There had to be a regional approach. One size did not fit all.

West of Scotland

Chair: Helen McLachlan
Rapporteur: Bertie Armstrong
Scientist: Norman Graham
Industry: Sean O'Donoghue

Scientist's Presentation

Norman Graham, pointed out that historically the northern part of VIa had supported a substantial mixed fishery for cod and haddock. Cod had also been taken as a by-catch in a number of other fisheries. Catch rates in the 1970's and early 1980s had been fairly stable at around 20,000 tonnes per year. However, by the late 1980s the stock had begun to show signs of over exploitation. Fishing effort and mortality had increased substantially, in part due to improvements in catching efficiency. Increasing levels of fishing mortality, particularly on older fish, had resulted in more stringent scientific advice being given, starting in the late 1980s. Unfortunately, this advice was not heeded and TACs were often set above scientific recommendations. By the late 1980s and early 1990s the cod stock was experiencing a rapid and dramatic decline in biomass. The decline led to increasingly severe scientific advice and from 2003 onwards; ICES had recommended a closure of all fisheries where cod was taken.

This symposium posed two fundamental questions. Could cod recover and what actions were needed to achieve this? The system we dealt with was uncertain and unpredictable. Stock size was estimated to be at its lowest level ever. Commercial catch data and survey results all pointed in the same direction. Our inability to determine the level of spawning stock biomass had important implications for the current management target of increasing SSB by 30% year on year. Currently we tried to predict the degree and rate of rebuilding within pre-defined time windows and adjusted fishing opportunities to achieve these predicted levels of stock growth. The models used to make these predictions were based on several assumptions and were dependent on the level of spawning stock biomass; the historic relationship between stock size and recruitment – together with estimate of fishing mortality assumed (fixed) natural mortality. At best, most of these input parameters were imprecise. It was difficult to say with any confidence that the stock would respond as we thought it should –because we were outside the area of historic knowledge. There was also a growing body of evidence that that rebuilding of the stock might be further hampered by a range of other 'non-fishing' issues. Mortality caused by seals might be a particular problem for the West of Scotland cod stock. There were suggestions that with a stock composed predominately of young fish recruitment would be lower. To rebuild the cod stock a more pragmatic approach was required, which was not led by the outcomes of predictive models. The best way to rebuild cod was not to catch it in the first place – or to minimise its capture to levels that were feasible. This could be achieved by the implementation of technical conservation measures. Those measures should focus on the avoidance of targeted fisheries for cod and the

elimination of the capture of cod as a by-catch. A range of indicators needed to be put in place that could tell us if there was any movement in the stock status. Those indicators should be evaluated periodically and the necessary actions decided upon.

Fisher's Presentation

Sean O'Donoghue reviewed the cod fishery in Area VI, pointing out that cod stocks were now in a poor state and there was no longer a directed cod fishery in the area. There had been a huge decline in landings and effort. Cod landings had declined steadily since the early 1990s. There had been a reduction in landings of 84 percent over the last 6 years. Effort had also declined with a reduction of 73 percent over the same period. Over the last 8 years the TACs had been reduced by 93 percent.

The current cod recovery arrangements for Area VI were described. Fishing effort restrictions had been put in place for cod in area VIa under Council Regulation 41/2007 Annex IIA. A closed area had been introduced in the northern part of VIa. In 2007, days at sea restrictions had been introduced in area VIa for certain types of gear. Vessels over 10m were now required to carry satellite monitoring (VMS) within a defined area. A spawning stock biomass target of 22,000 tonnes had been set.

However, these arrangements were not working and the cod stock was not recovering. Part of the problem was that the measures were not specific to Area VIa. The measures had a negative effect on mesh size and a negative effect on the catch of other species. The arrangements were complex, ineffective and in some cases contradictory. Fishermen were looking for a new way forward. Specific measures were required, tailored to area VIa. The area itself should be redefined. A lower target level should be set. A lower minimum TAC level was required. The area should be deleted from the fishing effort regulation. It was also important to identify all juvenile cod areas in area VIa and to introduce a system of time-limited juvenile closures, similar to the Greencastle codling protection area. There should be no directed cod fishery until the target level of spawning stock biomass was reached. It would also be necessary to improve and increase the scientific surveys, and to simplify the technical conservation rules.

West of Scotland Workshop Summary: Bertie Armstrong

Discussion

- Effort had decreased, there was a strong message from fishermen that no effort was now directed at cod
- Landings had been greatly reduced; proper valid data will be available shortly, following one year of the Registration of Buyers and Sellers
- There was no large discard problem in this area but this required to be verified
- There were signs of recovery of cod, north of 57 degrees
- The area was not well served by scientific information – data were poor.
- Fishing mortality on a very small stock was very sensitive to small movements
- A by-catch of cod, particularly juveniles, in the static gear fisheries was suspected to be significant, and should be investigated
- Seal predation was seen as significant, data were not clear enough and further work should be done to determine the significance of seal predation on cod.

Could cod recover in this area?

- A qualified yes, if the conditions, not just fishing removals, were right.

If so, what could be done?

- Closed areas should be investigated for protection of spawning and juveniles. Identification of the areas must involve fishermen and there should be 'no-take' zones to avoid dilution of the effect by derogations
- The present closed area, the 'windsock', should be assessed for benefits
- An industrial fishery in the area should not be permitted to resume

Irish Sea

Chair: Lorcan O'Cinneide
Rapporteur: Tom Pickerell
Scientist: Ciaran Kelly
Industry: Alan McCulla

Scientist's Presentation

Ciaran Kelly emphasised the high level of uncertainty about cod. Did fishing affect the cod stock? Yes! Was it the cause of the current low stock size? Well it was at least a contributory factor. Could the cod stock recover? If the system was elastic and if the factors which caused the decline were removed, then yes. However there were two important things we did not know. We did not know how elastic the system was. And we did not know all the factors which had caused the decline, their interactions, and whether we could reverse them.

The science assessment told us that the actual size of the stock was uncertain, but that cod had been overexploited and the stock was likely to be at very low level. At very low levels of stock size any capture of cod would have an adverse effect on the stock, and we needed at least to do something to prevent the situation from getting worse. Currently the plan we were using tried to predict the recovery of cod. The measures adopted were based on these predictions (which were at best imprecise) and we were trying to evaluate the success of the measures with a level of precision we could not achieve. An alternative approach would be to take action to minimize the capture of cod (e.g. technical conservation measures) and set targets which were large enough to be measured (given the precision of our measurement of stock size). We should evaluate the plan by our achievement of measurable targets in the adopted timeframe. If we could not measure any change in the stock then we should incrementally increase the actions taken to avoid cod capture until we measured an improvement. The question we had to answer now was whether we could avoid the capture of cod and still have viable fisheries for other species.

Fisher's Presentation

Alan McCulla reminded the workshop that Europe's Cod Recovery programme had begun in the Irish Sea at the beginning of the new Millennium. Fishermen from the Irish Sea were now in the midst of the eighth year of cod recovery. At the outset of the programme, the fishing industry had been proactive in proposing conservation measures. However, fishers had become increasingly disillusioned with the process, challenging the orthodox science with alternative and more recently additional science. There had been dramatic changes in the numbers and composition of the fishing fleet, with a severe impact upon the onshore sector.

Irish Sea Workshop Summary; Tom Pickerell

Can Cod recover?

- The answer had to be yes but we had to acknowledge that there would be pain.
- We needed to move on and develop a new recovery plan.
- The principles of a successful recovery plan would include:
    - Admitting there was a problem
    - Achieving buy-in from everyone involved in the solution
    - Having a long-term plan but be willing to adapt it continually
- There were no guarantees that cod could be recovered in the Irish Sea – Professor Reid had said cod would move north. More work should be commissioned to explore the position in the Irish Sea.
- There might be less cod but other species were more abundant (haddock, *Nephrops*, plaice)
- Other studies had shown that with current Climate Change extrapolations the cod could be harvested at high levels (if managed properly) for 50 years.
- Perhaps the 'recovery' would be a less steep decline – the 30% increase in biomass required under the cod recovery plan would not be achievable.
- Letting cod go was not an option due to wider environmental strategies (European Marine Strategy etc).

If so, what kinds of action needed to be taken to help cod recover?

- We needed to know the causes of decline (i.e. the high cod mortality)
- We needed co-ordinated development of any plan so that the science function could take place (i.e. capacity, funding etc)
- However we could be clever in our use of limited science – i.e. low stock levels could be assumed but the actual numbers could only be estimated with very high uncertainty.
- We needed to move in the right direction
- We needed to rebuild the stocks rather than get hung up on targets related to restoration to previous levels
- Timescales were important – we needed to understand all the 'bottlenecks' in cod life-history to develop an effective plan.
- We needed to establish industry/science partnerships to obtain more satisfactory data.
- Cod mortality was too high.
- It was high not just because of fisheries targeting cod but because of effort increases in fisheries exploiting other species.
- Would further effort reduction help?
- The presentations from Commission and from Industry both suggested a move to fishing mortality rather than biomass targets.
- Why hadn't natural mortality of cod ever changed from a value of 20%? – The multi-species model for the North Sea used 20% but it had been suggested that the West of Scotland figure should be increased because of larger seal numbers; a similar position may prevail in the Irish Sea.
- Area closures in Norway followed the life-history stages of cod – this was better than choosing static areas.
- Bringing in mitigating measures to reduce the capture of cod would help, such as selective gear.
- The Irish Sea was the only area where additional surveys (the egg programme) were taking place.

Celtic Sea

Chair: Sam Lambourn
Rapporteur: Jason Whooley
Scientist: Alain Biseau
Industry: Jacques Pichon

Scientist's Presentation

Alain Biseau of IFREMER gave a general presentation of the Celtic Sea cod fishery including the trends in landings, and the contribution of each country. He described the data used to assess the stock (landings, age composition, CPUE, surveys) and briefly outlined the assessment methodology. The current state of the stock was described and the advice from ICES considered.

There were only four Member States involved in the fishery but the main input to the scientific data had been the French landings since 1971. In fact more than 70% of the total landings were French. It was pointed out that, unlike other cod stocks, 50% of Celtic Sea fish matured at 2 yrs of age. All scientific scenarios were very dependent on recruitment. Some key statistics emerged from the scientific presentation:

- Fishing mortality had decreased by 30% since 1999
- French effort in area VIIfg had reduced by 40%

Scientifically, it was accepted that the closed box had a positive effect but it was difficult to measure its impact exactly. The bottom line was that we needed further reduction in fishing mortality.

Fisher's Presentation

Jacques Pichon from the French fishing industry expressed concern at attempts to link Celtic Sea cod with other cod recovery plans. The clear message from the industry was that our cod was different! The TACs from 1997-2007 had seen a reduction from 20,000 tonnes to 4,473 tonnes. Four years of work had been carried out at the industry level in conjunction with scientists culminating in 2004 with a fishing industry driven plan validated by scientists. As a result of the area closure, Ifremer had estimated a 13% reduction in cod catches. The majority (40%) of cod catches had historically, been taken in the 1st quarter. Since the introduction of the closure, 1st quarter global effort had been reduced but had remained static for those vessels that remained in the fishery. Indeed in some cases, the closure had meant vessels changing metier completely. It was very encouraging that in 2006 ICES had highlighted good compliance with the closure. Unfortunately, the quality of catch data was poor, especially on discards. In summary, the industry view was that the closure was working and any future cod recovery plan should build on that experience.

Celtic Sea Workshop Summary; JasonWhooley

In discussion it emerged that participants were disappointed that the Commission had prejudged the process for achieving cod recovery. The Commission had stated that technical measures, alone, would not be enough. Individual effort limits for vessels were not favoured by the workshop: any effort limits for this fishery should be global. When questioned on the

issue of a discard ban, those present felt that it would be difficult to implement a ban in the context of a mixed fishery. Thus far, recovery plans had been imposed without stakeholder involvement. It was agreed that plans tailored to the Celtic Sea were needed.

There was a major discussion on how to reduce fishing mortality in the Celtic Sea cod fishery. It was asked whether the closed area could be extended. It was agreed that before doing anything, previous measures required full evaluation. There should be no closed area extension without prior evaluation. It was stressed that any future plan should take account of withdrawn vessels: i.e. decommissioned vessels and vessels that had moved métiers. It was emphasised that the closed box had benefits for other species also.

In conclusion, it was felt that cod should only form part of a mixed management model. Under the present management plan, fishermen were economically affected but their 'buy-in' was critical. Anecdotal information on cod recovery in the area was positive. Consensus was needed on the way forward. Stakeholders were prepared to move forward in developing plans but not in a reactive way. Those present were adamant that the current plan was working and had fishermen's support. It was not appropriate to introduce change just for the sake of doing so.

Summing up; An Emerging Strategy

Iain McSween: Chairman of the Pelagic RAC

There were many parallels between the current position for cod and the problems that had occurred in the past with herring. There had been a reduction in the spawning stock biomass, as there had for herring. Herring had recovered, however, and this might happen with cod too, although whether it would recover to the extent required was less clear.

The message from the Commission was that there would be a new cod recovery plan whether you liked it or not. The Commission had acknowledged that the current plan has not worked – they had taken the first step towards resolution of the problem. One of their conclusions was that effort has not been reduced sufficiently. However, looking at the Scottish fleet it was evident that that it had been reduced by a 341 vessels – some of them large. The Dutch fleet too had been reduced by 125 vessels, and French fishing effort in the Celtic Sea had been reduced by about 40 percent. How much further did the industry need to go in reducing effort? Would there be any fishers left to harvest the reconstructed cod stocks?

Change was taking place in the environment. There was now strong evidence of climate change affecting plankton and the whole ecosystem. However, the sea was always changing. There used to be a shrimp fishery on the Fladen. Now there was a large *Nephrops* fishery there.

When the RACs were formed, some people thought there would be a revolution. In fact, policies were evolving gradually. The RACs could play an important part in moving towards cod recovery. Cod stocks could recover, but the process of recovery would be painful. Dialogue would be required to get things right. It would be important to target fishing mortality, not spawning stock biomass. We should move away from fixed target setting towards a more realistic aim of moving in the right direction. The industry needed the confidence to build new boats and to process fish more effectively, while recognising that fish stocks had to be harvested in a sustainable way.

The symposium had made a good start on its first day and we could look forward to more progress tomorrow, on its second day.

Session 5: Summary

Sam Lambourn, chairman of the North West Waters RAC opened the second day of the symposium.

The Workshop Proceedings

Tony Hawkins: Rapporteur for the North Sea Regional Advisory Council

What were the essential points that could be drawn from the first day of discussions? Iain McSween had mentioned some of them in his concluding speech. We would now go over some of them again; to set the scene for further discussion.

It had been generally agreed that the decline we had seen in cod had been caused by very heavy fishing pressure at a time when the recruitment of cod had been poor, probably because of environmental change. There seemed little point in drawing a distinction between the effects of fishing and the effects of environmental change because they were linked with one another. They could act simultaneously.

The Area Working Groups had concluded that cod in their waters could recover. The characteristics of cod stocks were such that they could recover quite quickly given the right environmental conditions and provided fishing pressure was low. However, stocks might not recover to previous levels, and they might respond differently in different areas.

We did not need to set precise targets for cod stocks. We especially did not want to use old and inappropriate targets. It was sufficient to go in the right direction, and to continue to make progress. If stocks were moving in the right direction then we did not need to adopt more drastic measures.

It would be preferable to use fishing mortality, rather than spawning stock biomass for judging progress with cod recovery. Fishing mortality was less dependent on recruitment, and reflected features of the fishery and not just the fish stock. It was especially important to use fishing mortality if the fishery was going through a period of environmental change, as a value could be chosen which was appropriate for the prevailing level of production of cod.

Radically different opinions had been expressed about the recovery of cod stocks. Some people had concluding firmly that cod were showing no signs of recovery, and that the cod recovery plan had failed. Others had concluding that in some areas at least cod were recovering, with good recruitment during 2005. For them, the cod recovery plan was beginning to work.

It was a feature of the advisory process that we had very little information on the current state of cod stocks. The scientific assessments were based on data collected two years ago. After only three years of the cod recovery plan it was perhaps premature to decide that it had been a failure.

It had become evident that better ways were needed for judging the current state of stocks. Methods of assessment were required which could provide up to date information on the state of stocks. More surveys were needed and perhaps new methodologies; and the assistance of fishermen would be necessary to assist with that task. New thinking and the expertise of fishermen would be necessary in moving forward.

Discarding of cod was a particular problem. However, the data on discarding in different fisheries was poor and unequal. There was very little information on the discarding of cod in some fisheries. It really was time that support was given by the Commission, Member States and the fishing industry to requests from scientists for better information on discards.

There was a general consensus that there was a role for technical measures, whether these were spatial measures or more selective gears. There was acceptance that such measures might not be sufficient by themselves. But they could make a significant difference.

The issue of 'missing cod' had come up. Discrepancies in the assessments had somehow been translated into large unreported landings and discards, and interpreted as a failure to reduce fishing effort. There did not appear to be clear understanding of the causes of these discrepancies. Predation or other changes in natural mortality might play a role. Or the discrepancies might simply be the result of very poor data.

More partnerships between scientists and fishermen were needed, both to improve the quality of the data and to promote better understanding between the two groups. The North Sea Commission Fisheries Partnership had been of great value and had led directly to the setting up of the North Sea RAC. However, with the success of the RACs, and with the inclusion of a wider range of stakeholders, the great importance of getting fishermen and scientists to work together had been neglected. There should be further initiatives to promote closer engagement.

There was a feeling that despite the setting up of the RACs our system of governance was still flawed. That the rebuilding of cod stocks could not readily be achieved under the old, top-down system of management, which many people believed still existed. No support had been expressed for the view that the current problems could be resolved by leaving them in the hands of the Commission.

It had been quite remarkable how participants in the symposium, and at other meetings held by the RACs, had been willing to contribute their ideas. The RACs were a new venture, but it was already clear that there were real benefits from bringing different sectors together. Co-operation was the only way of getting the rebuilding of cod stocks properly underway. This process had to be extended, however, and it should be more efficient. A mechanism was needed - perhaps in the form of small, *ad hoc*, regional groups bringing together the Commission, the Member States, the RAC membership, and ICES scientists to discuss measures for achieving cod recovery. And of course STECF should be involved in that process and must play a stronger role. It was only through STECF that we could bring in the economic expertise which was so badly needed. From some points of view, cod recovery was an investment decision.

It had been implied by the Commission that perhaps there was insufficient will to bring about cod recovery. A system was needed which accepted the scientific advice and used it to trigger automatic management measures, almost without human intervention. There was perhaps a wish to exclude politicians from the process, as they lacked the will to take difficult decisions. Was that really the way to operate? There was a grave risk that such a mechanism would introduce a draconian system of management, controlled and triggered by poor and uncertain assessments, as a substitute for measured judgement.

Where did the symposium go from here? There were two aspects we had to look at more closely.

The first of these was to look in more detail at the management measures which might promote the rebuilding of cod stocks to new and better levels. Several speakers today might help us to do this.

However, we also needed to look at the processes we were engaged in. How could we promote better contact between scientists and fishermen, so that they really did work together? And how could we bring together all those different interests who should be involved in cod recovery? Almost everyone at the symposium had something to contribute. How could we harness all this experience and energy to steer the Commission in the right direction to achieve cod recovery? It was already clear that the Commission could not and should not manage the fisheries on its own. It needed help.

Session 6: Future Management Objectives & Measures

Chair: **Robin Cook,** Fishery Research Services

Management Measures

Robin Cook: Chief Executive, Fisheries Research Services, Scotland

What was the problem with cod?

Cod stocks were not in good shape. Cod stock biomass was too small and below safe levels as a result of the combined effects of fishing, predation and climate change. We needed to develop new, more achievable targets if we were to restore cod stocks. The old targets had been based on the stock dynamics that prevailed ten years ago and they needed to be changed. The advisory process also had to be reformed. If the industry did not have confidence in the advisory system then it would not buy into management measures. ICES, in particular, should look more broadly at the scope for reforming the preparation of its scientific advice. Managers and fishers both had problems with the current stock assessments. Managers were trying to follow the advice, but it was often inappropriate. ICES had to engage more closely with stakeholders.

What did we need to do now?

Catch = exploitation rate x stock biomass

We had to recognise that biomass was determined mostly by recruitment which could be controlled. Only catch and exploitation rate could be manipulated. If the catch was fixed and the exploitation rate was modified then the biomass would respond.

Exploitation rate ~ catchability x fishing effort

Fishing effort was determined by the number and activity of fishing vessels. Catchability was related to the type of gear used, area fishing etc and would depend on the size of the fish. Either of these could be modified.

Looking at output controls: TACs were output controls and were an indirect way of controlling exploitation rate (catch = exploitation rate x biomass). TACs had to be calculated with high precision if the target fishing mortality was to be achieved. This was difficult if stock size could not be estimated adequately. Enforcement was also a major problem, especially in mixed fisheries. Catches were often misreported or went unreported. If discarding was permitted to allow fishers to remain within a TAC, then conservation might not be achieved.

Looking at input controls: effort control through limiting days at sea provided direct control of fishing mortality (F = catchability x effort). However effort reduction under-utilised capital investment, and did not address the problem of over-capacity. It was possible to limit fleet capacity, but it was difficult to measure capacity and there was the issue of who will pay for de-commissioning.

Technical measures such as modifications to mesh size or shape in fishing gears could play a role. Closed areas could protect juvenile concentrations and spawning fish aggregated on spawning grounds. Closed areas could also be used to exclude gears which were damaging to certain stocks. Changes in minimum landing size might discourage the catch of small fish and reinforce mesh regulations but it could result in discarding.

All these measures had their strengths and weaknesses, which would be considered further in the following presentations.

STECF and the Development of Advice on Cod Recovery Plans

John Casey: CEFAS; Chairman of STECF.

To provide advice on cod, it was first necessary to collate fisheries data and information, mainly through the national institutes. The actual stock assessments were then performed by ICES, which offered advice on the state of the stocks and the exploitation rate through its Advisory Committee on Fisheries Management (ACFM). Management proposals came forward from the Commission, which also had powers to implement some management measures, including emergency measures. The Commission consulted a number of organisations including the RACs, STECF, ICES, Members States and others. Management decisions were primarily the responsibility of the Council of Ministers (in some cases following negotiations between the EU and Norway.

The Scientific Technical and Economic Committee for Fisheries had initially been established by the Commission in November 1993, and subsequently by a Decision of August 2005. It was intended that the STECF should be consulted at regular intervals on matters pertaining to the conservation and management of living aquatic resources, including biological, economic, environmental, social and technical considerations. The Commission had to take into account the advice from the STECF when presenting proposals on fisheries management under the 2002 Regulation which reformed the CFP.

Thus, STECF (like ICES and the RACs) primarily responded to requests from the Commission. STECF had repeatedly responded to requests for advice on different aspects of cod recovery. STECF had emphasised that recovery plans should include a measure of the status of the stock with respect to biological reference points, a target recovery period, a target recovery trajectory for interim stock status relative to the reference points, and a transition from a recovery strategy to one which fulfilled wider management objectives. STECF had also advised that recovery plans should include assessment of the economic and socio-economic effects of recovery plans. It had pointed out that scenarios with major short-term impacts should be avoided unless they had an extremely high probability of success.

Further, STECF had suggested that monitoring and evaluation of the stock should be carried out throughout the predicted recovery period. Success would depend on the ability to monitor landings and discards, to adhere to the catch limit and effort reduction schemes, and to achieve reductions in fishing mortality.

STECF had advised that reductions in fishing mortality on cod stocks were essential to achieve recovery. Recovery was unlikely to be achieved by TACs alone and/or by technical measures. Complementary effort restrictions would be required. The 'days at sea' scheme was one of several instruments available to reduce fishing effort and hence fishing mortality. The Commission originally proposed effort restrictions for towed gears based on kW days. However, that proposal was not accepted by the Council. An alternative method was agreed based on simple days at sea allocations. However, the basis for that alternative was not documented and received no formal scientific scrutiny.

The days at sea scheme did not seem to have delivered the required reductions in either effort or mortality. Why? Firstly, the Council did not adhere to the TAC and effort reductions implied under the plan. It had also allowed a transfer of effort from one segment to another, thereby cancelling out some of the reductions in effort achieved for those fleets that

traditionally landed cod. Derogations from the basic days at sea reduction for some fleets also reduced the intended effect. It was also likely that the baseline levels of effort for some fleets were set too high.

There was undoubtedly a need to restrict fishing effort to achieve reductions in fishing mortality for cod. Days at sea restrictions provided a potential means for achieving this. However, the way that days at sea restrictions were managed would influence the success of such measures. There might be more effective alternatives which could be considered by this symposium.

Days at sea and TACs: Consequences from a Stakeholders' Point of View

Ole Lundberg Larsen, Danish Fishermen's Association

One of the main intentions of the reform of the Common Fisheries Policy had been to introduce long term management. This had been welcomed by the fishing industry as it was important to plan or at least to have a knowledge of the main conditions affecting the sector for the next 2-5 years.

How had the 'days at sea' scheme performed, with respect to the objective of long-term management? Quotas for cod had progressively been reduced. There had also been major reductions in the numbers of days fishermen could fish each year. There had been major changes in the rules for implementation each year and a rising bureaucracy. There had been direct extra costs for vessels. In 2004 the vessels impacted by days at sea lost between 41-100 million DKK (5.5-13.5 million EURO) in the value of their catches. The fishery had been forced to concentrate on fishing close to the coast to save days at sea. What had gone wrong?

The Commission had never really discussed "the scheme" with stakeholders. It had tried to invent a single system which would work in different fisheries (and in different countries). Neither the Commission nor others had succeeded in convincing the fishermen of necessity of the effort reduction scheme.

How could we get back on track? We should strengthen the dialogue between the Commission, public authorities and the fishermen. We should also strengthen the interaction between the advisory service ("the biologists") and the fishermen. We should adopt a more balanced, long-term approach, with careful preparation through biological, social and economic analyses, and then commit ourselves to realistic objectives.

Selective Fishing Gears – Can They Contribute to Cod Recovery?

Dominic Rihan: Chairman ICES-FAO WGFTFB

Potentially the current effort control measures provided a real opportunity to encourage fishermen to use more selective gears. The Commission acknowledged this in the non-paper of July 2006 by encouraging the use of species selective gears (e.g. rigid grids) that led to a lower impact on cod. On the other hand, the Commission had concluded that there were only limited opportunities for providing incentives for size selective gears given that current codend mesh sizes had poor size selectivity for cod. In reality, there had been an underlying trend by fishermen to reduce mesh size and, by design, the selectivity of their gear to maximise their effort entitlements. This had hindered the work of gear technologists, who had been encouraging the use of more selective gears.

A number of selective devices had been developed under EU and nationally funded projects to reduce the by-catch of spawning and juvenile cod. It was clear, however, that there was no "one gear fits all" solution. Gears needed to be divided into those that were designed to protect spawning and juvenile cod in fisheries which took cod, and those which protected important by-catch species such as haddock and whiting in fisheries with cod by-catches. Much of the research had focused on those *Nephrops* fisheries using small mesh codends, as these fisheries seemed to have discarding problems. The Commission had identified the Swedish grid as the most effective device for release of cod in *Nephrops* trawls. While there was no doubt that this device was effective, it was developed for a specific inshore *Nephrops* fishery operating under a different regulatory regime to that in the North Sea, West of Scotland and Irish Sea. In Sweden the grid was used in conjunction with a 70mm square mesh codend. The grid sorted the fish catch, while the square mesh codend selected for *Nephrops* and fish. This was appropriate in that fishery where the minimum landing size for *Nephrops* was 40mm and the catch of marketable fish was negligible. Uptake of the device outside Sweden had been zero.

Other gear modifications, such as inclined or horizontal separator panels, had also been shown to be effective at sorting cod across all size ranges. Additionally, the "coverless" trawl, which although not effective for cod, could release almost 75% of haddock and whiting from *Nephrops* trawls. Such gear modifications were well suited to directed *Nephrops* fisheries. Research had also shown that the fine-tuning of square mesh panels using relatively low diameter twines and more stable mesh constructions, could increase the release of whitefish including cod provided they were constructed with a large enough mesh size and were positioned close to the codend. Some recognition of these gears had been given in the 2007 effort allocations, but the incentives were modest and only applied in some areas.

Gear technology was an important component of cod recovery. However, any review of the value of selective gears should include a "fisheries audit" carried out by scientists, managers and fishermen. Collectively the characteristics of each fishery should be defined, the problems identified and possible solutions agreed. Any further gear research identified in the process should be carried out in projects to develop and fine tune gears appropriate to the specific fisheries with industry participation. With this approach, gear technologists could act as facilitators. Through workshops, and by encouraging fishermen to "self-sample", the benefits of selective gears could be demonstrated and any technical issues identified.

In future legislation, rather than providing detailed technical annexes, a toolbox approach should be taken - allowing the use of different gears depending on the fishery. Good control and enforcement would be required to prevent circumvention of the measures but self-regulation would also play a key part in compliance. However, there had to be a commitment by managers to providing incentives for fishermen to use proven gears. Moreover, fishermen had to be pro-active in adopting them. The incentives had to be real and tangible in terms of effort allocations or access to fisheries, otherwise uptake would continue to be low and opportunities would be lost. Selective gears could contribute to cod recovery!

Spatial Management and Cod Recovery

Michel J. Kaiser: School of Ocean Sciences, College of Natural Sciences, University of Wales-Bangor, UK

A variety of spatial management measures could be applied to limit the effects of fishing activities on either cod themselves or key habitat features. To determine whether spatial management measures were likely to be effective, it was necessary to examine whether 'bottlenecks' in the life history of cod could be affected by excluding fishing from some areas.

As cod eggs are released directly into the water column, conservation of seabed habitat was not an important issue in this context. However, spawning aggregations of cod could be protected by excluding some types of fishing activity that catch cod. Such a measure might be temporary for the duration of the spawning period. A negative outcome of such a measure might be the additional effort required to catch the same amount of fish once they have dispersed from the spawning ground.

Research suggested that the early settlement stages of cod (up to 1 year old) of cod were highly dependent on seabed habitats for protection from predators and for their food resources. Locating these areas was important, as fisheries and other human activities could lead to the degradation of such habitats. In this instance spatial management of all such activities was an effective mechanism to preserve these habitats and hence the early life-history stages of cod. However, it remained a challenging scientific task to find such areas in the North Sea. Particle tracking models that could predict the movement of eggs and larvae from spawning grounds would inform the search. Inshore coastal areas were often important nursery grounds, and currently these might be affected negatively by inshore fisheries such as scallop dredging. More offshore locations of cod nursery areas in the North Sea were uncertain. As cod grew, they changed their feeding habits from eating worms and shellfish to a diet dominated by fish and the young cod might move to other areas of the North Sea. We were now beginning to understand that there was considerable population structure within cod populations in the North Sea. These sub-populations exhibited different types of behaviour and migrations.

While the exclusion of fishing from some areas might bring benefits for cod, the displacement of fishing activity might put additional pressure on other species or other cod, and might lead to further seabed degradation. It was important to understand the consequences of changing fishing behaviour as this could have unforeseen consequences as had occurred with the 'plaice box'. Furthermore, modelling studies showed that there was an inevitable immediate loss of income by fishers that would persist for at least 3 – 5 years before any financial benefits were likely to become apparent. It might be possible to continue to fish in some areas by using fishing techniques that were highly selective against cod. A good example would be the exclusion of towed fishing gear from *Nephrops* grounds as a cod conservation tool, while continuing to fish for *Nephrops* using creels. Spatial management that permits the use of some gears but not others was a highly effective way to achieve some conservation/management objectives while maintaining output from sustainable fisheries.

It might be possible to use spatial management to mitigate the effects of fishing on habitat critical to particular life-history stages. However, was spatial management better than effort reduction? Fishing could reduce the carrying capacity for fish but the destructive effects of fishing gears were very habitat specific. Some habitats were damaged much more readily than others. There might be a consistent decrease in the abundance of permanently attached biota and filter feeders in areas which were fished. Fishing could create a complete regime change in some areas, from which recovery was only very slow once the impact of fishing had been reduced.

It was necessary to examine the wider implications of spatial management. Closed areas might result in a redistribution of fishing effort with adverse effects on benthic biomass and production in other areas. Without accompanying effort reductions, marine protected areas might only have a minor impact on overall benthic ecosystems. However, some areas were very important to fisheries, while others were not. Where marine protected areas were imposed for conservation purposes it might be possible to designate areas which would have minimal impact upon the fishing industry. For this to be successful it was important both to map habitats and fishing activities on a very fine scale.

Science Partnerships

Eskild Kirkegaard; DIFRES, Denmark

Back in the 1980s, the ICES stock assessments were not recognised by the industry. Essentially, the whole process was closed to the industry in order to protect the independence of the science. More recently, in the 1990s, there was increased pressure for collaboration in the collection of data from the fisheries – especially the collection of discard data. However, there was no involvement of fishermen in the advisory process, and little dialogue took place on the management advice.

There were two developments which had brought change. Firstly, the formation of the North Sea Commission Fisheries Partnership resulted in earlier and more open discussion of the state of stocks between scientists and fishermen, closer consultations with ICES, and the beginnings of a dialogue on management issues. Secondly, at a national level fishermen began to collaborate with scientists over the collection of a wider range of data on the stocks. Experience had shown that the scientific and technical basis for fisheries management could be improved greatly by closer collaboration between the fishing industry and scientific organisations.

Cod recovery was possible. Why hadn't cod already recovered? Fishing mortality was declining for saithe and for haddock, but it had not fallen for cod or for plaice. We were still catching cod at quite a high rate at a time when stocks were especially low. To tackle this problem we needed a better understanding of where we were. Which fleets were catching cod, and where were they catching them? There was a need for dialogue with stakeholders to answer these questions, and this could only take place through partnerships and other groupings where the interested parties trusted one another and could exchange information freely.

General Discussion

It was pointed out from the floor that although it had been said that STECF took account of economic and social factors in fact adequate data on socio-economic factors often did not exist. The Commission should be reminded that there was a need for good socio-economic data.

There had been concerns expressed about the very wide range of gear types now being considered under the regulations. On the other hand, concern had also been expressed about one size not fitting all. There was a real problem in being able to seek regional and gear-specific solutions whilst avoiding a system which was costly and unmanageable.

There had been mention of a displacement of effort from one gear type to another. How had this been allowed to happen? The transfer was detrimental to the recording of data. Fair play was needed in the targeting of different fleets by management measures.

Session 7: Workshops on Management Measures

North Sea/Kattegat 1

Chair: **Nathalie Steins**

Rapporteur: **Frank Strang**

We were now going from 'whether' cod was recoverable to the 'what' and the 'how'.

How could we improve inputs from the industry into the assessments?

> Any solutions would have to be based on a good knowledge of what was happening in the stocks. Differences of opinion in the group on the real extent of the reduction in effort illustrated the critical need for better knowledge. Closer working between fishermen and scientists had to be part of the answer, leading to analyses which were more accurate, more up to date and more widely accepted.
>
> There were many examples of cooperation working well already in different Members States but the real challenge was to bring this material together. There was recent news of an EU FP7 project which would bring together such data into the advisory process.
>
> Past experience suggested that the problem did not lie at the regional level but at the ICES level. It was very difficult to ensure that the results of industry science/partnerships were *used* in the advisory process. It was important that fishermen were involved in every state of the process, including interpretation of the data. There was a role for the NGOs too.
>
> Message for ICES:– please try to find ways of incorporating these data (even if they might require changes in scientific models or processes). Message for the Commission – you could facilitate this by funding and by pressing ICES to take account of industry data.
>
> Other benefits of greater involvement with the fleets by scientists and policy makers included a better awareness of the real impact of regulation. There were opportunities this year to use observers to demonstrate low catches of cod and thereby gain extra days at sea.
>
> It was especially important to come to common agreement about the contributions of different fleets to fishing mortality of cod

How could we reduce fishing mortality?

> It was important to look at a range of measures from the perspective of both effectiveness and impact. The key issue was to provide ways in which fishermen could avoid catching cod. It was essential to draw on fishers' knowledge in coming to conclusions.
>
> Some in the group argued that the current regime was working and should be given time to take full effect.
>
> Effort

- Any more reduction in days at sea was likely to make much of the fleet unviable, primarily because of the impact on fishing for associated stocks.
- It was incorrect in principle to imply a correlation between KW days and cod mortality.
- The days at sea regime had unintended consequences, eg. it pushed fishers to maximise economic return from each day (and therefore target cod); avoiding juvenile areas would require *more* not less days.
- There was a consensus that we needed to tackle the perverse incentive to use smaller meshes.

Technical Measures

- Some members of the group were optimistic that gear solutions could be found, provided there were adequate incentives.
- Others were more sceptical. In particular, we had to avoid overstating the selectivity achieved in the past on the basis of a small number of trials or understating the economic losses incurred.
- Closed areas might be of interest, perhaps on a temporary or real-time basis for juvenile fish but much more thought was needed before going any further.

Controls

- Controls were an important part of the solution. There was a general sense that current controls were biting and having a beneficial effect.
- There were mixed views on the consistency between EU and Norwegian controls.
- It was important to avoid rules which were either unnecessarily complex or over-rigid in their application (the one net rule was quoted as an example).

Conclusion

The current cod recovery measures did not satisfactorily achieve the objective of encouraging fishermen away from cod. Indeed, in some respects they might have made matters worse. The group identified some possible avenues for improvement. In order to find best solutions it would be important to differentiate better between different fisheries, but perhaps on the basis of the kind of fisheries audit noted during the symposium. The RACs would have an important role in working up such tailor-made solutions. Their stakeholder role underlined the importance of the first issue: ie close involvement of fishermen in scientific data collection and stock assessment.

North Sea/Kattegat 2

Chair: **Lachlan Stuart**

Rapporteur: **Eskild Kirkegaard**

- If we could not agree on the problem we could not solve the problem
    - we needed common understanding on the state of the stocks and the current trends
    - we needed a clear vision of where we are going. Some thought we do not need precise targets but a general direction
    - the sea had changed

- Sector involvement was required at all stages:
    - Was the current advisory system delivering?
    - there was a long time lag in producing assessments
    - it was possible to develop real time information/management systems to speed up the process;
    - steps were to be taken by ICES to enhance the advisory process – advice would be delivered earlier leaving more time for consultation;
    - were the right questions being asked of scientists?
    - fishers felt that if they provided better information they might be penalised
    - opening up of the scientific process was needed
- RACs: needed information - increased participation of scientists was required
- RACs: if they wanted to be heard they had to have information
- Data collection:
    - fisheries data – increased use of logbook data was required
    - there should be increased use of fishers' knowledge
- What worked?
    - the view that the cod plan hadn't worked was extreme
    - we didn't know if it had succeeded, there had been no time and resources to assess it
    - we were imposing new rules before existing rules had been evaluated
    - some of the measures already taken may have been counterproductive – we needed impact assessment of measures
- Incentives
    - There was a perverse incentive to use small meshes when we should be encouraging use of large meshes
- Stability
    - We were in a phase of crisis management – dominated by short-term rather than long-term thinking. The stability promised by reform of the Common Fisheries Policy had not been achieved
    - We needed to study the implications of introducing new measures

West of Scotland

Chair: **Kara Brydson**

Rapporteur: **Dominic Rihan**

The second session of the West of Scotland workshop attempted to identify practical measures to develop an improved recovery programme. There was a general consensus that the fisheries in the West of Scotland were unique in comparison to other areas such as the North Sea and therefore needed specific management measures. In this respect the following

points were agreed:

- There was concern about poor accuracy of historic catch reports in this area, with a consequent lack of scientific assessments for many of the important stocks. Recent improvements in control measures (the "buyers and sellers") regulation should have addressed this, but it was important to avoid sliding back into previous practices. The early introduction of electronic log-books would contribute to improved monitoring of catches and, therefore, to good management of resources in the area.

- It was agreed that an *ad hoc* group should be formed in conjunction with the NWWRAC existing sub-group. This sub-group should comprise scientists, stakeholders and managers and should:
    - Carry out an audit of the fisheries;
    - Map the fisheries – VMS data should be able to identify the different fisheries;
    - Define targets for the fisheries;
    - Decide on appropriate indicators e.g., Fishing mortality, SSB

- With respect to the use of closed areas, it was agreed that while they could bring benefits, they needed to be well defined. The use of real-time closures was an option but the complexities of the EU decision-making process made their implementation potentially difficult.

- Different perceptions of the trends in effort appeared in data presented by the industry and by STECF. This issue was important but was not resolved in the discussions in the time available. As an alternative to the current effort management system, there was a general consensus that a global cap on effort by area/fleet type/Member State may be more appropriate. There was support for this approach from the EU.

- Seal predation in the West of Scotland area was a factor that needed to be looked at in the context of cod recovery

- Control and enforcement in the area has improved in the last few years and it was felt this was important for the success of any recovery plan.

- It was necessary to look at the justification and position of the line demarcating the western margin of the cod recovery zone, because substantial quantities of cod were caught outside the cod recovery area

- The technical measures regulations affecting fisheries in the area were too complicated. In particular, it was questioned whether there was a need to allow fishing with smaller meshes in the southern part of VIa..

- There needed to be more use of fishermen's information. Two possible sources were identified:
    - Self-sampling by fishers.
    - The use of fishermen's surveys would provide valuable data; e.g. the monkfish tallybook scheme run by FRS.

- There was a need for real time scientific information. Currently there was a time lag in compiling the data underpinning the assessments that resulted in an unclear or misleading picture.

- In the West of Scotland area there should be no ambiguity in differentiating *Nephrops* from whitefish boats, as these fisheries are well-known in this area.

- There were two Industrial fisheries in the area and while there had been only limited effort in these fisheries, it was agreed that given the poor state of stocks these fisheries should be closed permanently.

Irish Sea

Chair: **Barrie Deas**

Rapporteur: **Lindsay Harris**

The nature of the problem

> The measures to be taken depended on the nature of the problem. There was much uncertainty over the data for the Irish Sea – did we understand it? Proper evaluation of the current situation was required – there was no evidence that current measures had had any positive effect. There was a new collaborative project to deliver enhanced data on Irish Sea fisheries and on discarding. This was an important starting point for obtaining better information – involving collaboration between the fishing industry, scientists and managers (but the project only addressed fisheries impacts not wider ecosystem impacts). One size did not fit all – we needed an 'Irish Sea cod audit' to synthesize existing knowledge and experience, including the ecosystem and downstream sectors such as processing and consumers. Such an audit could be done relatively quickly by getting experts together to brainstorm the key issues, consider what their impact was on cod, and what the mitigating measures were. This audit could be done in a matter of months. One advantage was the limited number of member states involved – it made it do-able. There had been a past history of rushed measures – there was a need to take the time to develop measures properly and get them right. There was a question of what happened if we put in place a range of measures to give the best chance of recovery, but it still did not happen – the reality was that there would be an upper limit to the price that we would all be prepared to pay

Closed areas

> There were issues around the current closed area in Western Irish Sea. There were mixed views on whether it had had any positive effect. One view was that it was not effective because of too many derogations – the closure was not giving spawning cod sufficient protection. There was a counter-view that spawning cod had left the area, and that the prawn fishery could not live with complete closure of the current area/time. Closure would lead to undesirable displacement, e.g. to the Clyde. It was difficult to separate out the impact of different management measures which had been superimposed over time

Other measures

> We needed to bear in mind the possibility of gear selectivity measures adapted to Irish Sea fisheries, but a cod audit would provide evidence of the nature of the problems that more selective gears might help address.

Celtic Sea

Chair: **Jacques Pichon**

Rapporteur: **Carl O'Brien**

The second session of the Celtic Sea workshop addressed two main questions. Firstly, how did we deliver a cod recovery plan in practice and secondly, what practical measures needed to be taken to deliver the actions identified during the previous day's working session. The workshop concluded:

How did we deliver a cod recovery plan in practice?

- Celtic Sea cod were different from cod in other sea areas!
- The current estimate of fishing mortality on cod was too high.
- It was essential that the Symposium placed cod in its wider context of member states' responsibilities to harvest fish stocks sustainably. A long-term target for fishing mortality was needed that was compatible with the WSSD objectives.
- What was the appropriate time-scale to achieve reductions in fishing mortality?
- Views were open on the range of tools and techniques needed to deliver a revised plan.
- A regional approach was necessary.

What practical measures needed to be taken?

The discussions on this second question were structured around five sub-themes – i) the need for measures that were deliverable in practice; ii) the need to take account of the economic position; iii) the need for closer cooperation between fishers and scientists; iv) the need to avoid inefficiency in the management regime; and v) the role that RACs could play in any new cod recovery plan. Addressing each of these in turn, the discussions were summarised as follows.

i) The need for measures that were deliverable in practice:

- The current 1st quarter Trevose closure was built upon consensus and collaboration between stakeholders, scientists and managers. Four nations prosecuted the cod fishery - France (with ~72% of the annual quota), Ireland (with ~15% of the annual quota), UK (with ~8% of the annual quota) and Belgium (with ~4% of the annual quota).
- There was a need to place increased emphasis on the value of moving in the right direction as opposed to relying solely on rigid targets; it was especially important to move away from the current *short-sharp-shock* approach.
- Cod were now mainly caught in mixed fisheries. There was a responsibility to harvest all fish stocks sustainably.
- The impact of the current management measures on the state of the cod stock in the Celtic Sea needed evaluation to ensure buy-in from fishermen for any future management measures.

ii) The need to take account of the economic position:

- There was a need to evaluate and assess the economic impact on individual vessels and fishermen of the current cod management measures.
- Cost-benefit analysis was needed to assess the cost to the industry of lost revenues, and to evaluate short-term losses versus long-term gains.
- Risk assessment of the current situation was needed to consider whether cod recovery measures could undermine other viable and sustainable fisheries.
- The issue of gear configuration (and technical measures, in general) and the extent to which these could affect the economic viability of the fishing industry by influencing the catch composition needed to be addressed.

iii) The need for closer cooperation between fishers and scientists:

- There was good cooperation amongst fishers and scientists! It was important to continue to build upon this and for potential management measures to be proposed and evaluated jointly.
- Science partnerships were needed to continue to improve the quality of catch and discard data. Data might be collected through on-board observer and self-sampling schemes.
- Evaluation of current scientific research and the validity of data were needed and should include closed areas, displacement issues, the gear use in specific areas, and differing impacts of classes of vessels etc.

iv) The need to avoid inefficiency in the management regime:

- There was a need for a regional/area co-ordinated approach to the analysis of the state of the cod stock because there were recognized regional differences in biology, and regional differences in the mixed fisheries and métiers.
- Evaluation of current measures should take place before the imposition of alternatives/amendments. The ICES WGSSDS would meet in June/July 2007 and should undertake the evaluation.
- Measures were needed to limit the catch of small fish. Recruiting year-classes should be protected through specific area/season/gear measures.

v) The role that RACs may play in any new cod recovery plan:

- Fishermen needed to be closely involved so that they could embrace the review of the cod management measures and identify with any emerging issues, in order to be able to contribute to, and shape, the review at EU level.
- Involvement should include the Commission and non-fishing sectors.
- Tailored plans needed to be developed jointly. Cod was one component of a mixed fishery. We needed a plan for mixed fisheries not cod.
- There was an important information gathering role For the RACs
- The RACs should take the initiative with scientists, within ICES & STECF, to put forward ways of managing the mixed fisheries.

Session 8: Reflections

Summing Up: Ambassador Steffen Smidt

Yesterday, we had heard lots of questions, but we had heard very few answers. Today it had become clear that the answers depended on where we wanted to go. He recalled all the resistance there had been to the setting up of the RACs. He was very happy to see the RACs now in action, discussing cod recovery and generating contributions of outstanding quality. Six years ago, no-one would have dreamed that this was possible.

Fisheries management was difficult, and it was especially difficult within Europe. People forgot the way responsibilities were allocated in the EU. Member States carried responsibilities as well as the Commission. RACs were about confidence and common understanding. We could not agree upon everything, but the RACs had shown that they were able to debate very controversial issues. The RACs had asked the Commission for simplification of the regulations; but at the same time they were seeking complexity. The RACs should not blame the Commission if they found it difficult to respond!

To the Commission, he had to say that the world was changing rapidly. The RACs represented a move towards a more systematic involvement of stakeholders in policy development and management. Problems with enlargement would also create challenges which would have to be faced – probably with existing resources.

Now, the Commission would still be holding central responsibility, but greater responsibility was being handed to the regions. Member States and the RACs would have to pick up the ball. The Commission might still disagree with stakeholders; but the disagreement would be at a much higher level now!

Ole Poulsen: Danish Ministry of Food

It was possible to recover the cod stocks. Climate changes or ecosystem constraints were no excuse for not taking action. However, there would be no quick fix. We needed to be patient and follow an adaptive approach (moving step-by-step). The direction was more important than the final destination.

It was too early to conclude that the recovery plans for cod had failed. Continued reductions of fishing mortality would have positive effects in the mid-term and definitely in the long-term. Fishermen believed there were already small positive indications of a reduction in fishing mortality and improved recruitment in some areas (North Sea and the Skagerrak) but it was too early to draw firm conclusions.

Fishing mortality on cod was far too high and should be reduced gradually towards MSY. Emphasis should be put on fishing mortality objectives and not on the more uncertain levels of spawning stock biomass. Reference points should be evaluated in the light of the present productivity of the ecosystem and the recent findings of scientists.

Industry, environmentalists, scientists and administrators would have to work closely together. Without the support of stakeholders and in particular the support of fishermen, the recovery plans would not be successful. Further TAC-reductions or a ban on direct fishing for cod were not options, since they would have fatal effects on coastal communities. There was scope for improving technical conservation measures. There should be incentives for fishermen to use more selective gears.

It was important to focus on the implementation of enforcement provisions rather than the introduction of additional control measures (there were budgetary constraints). The existing days-at-sea system (Annex II) was too complex, not transparent and did not share the burden equally. Allocation of days-at-sea should take into account the fishing mortality generated by discards in order to reflect the total fishing mortality imposed by different gear categories.

There was a need for more flexibility and subsidiarity in the management of fishing effort, offering better compatibility with national management models. Further refinement was required of Annex II or a Kw-day model must be introduced or some other alternative system.

Poul Degnbol: European Commission

No proposal for a replacement cod recovery plan from the Commission currently existed. However, any new proposal had to be developed within the legal and policy context of the CFP. RAC advice would have most impact if it related to that context. We all had to be realistic.

On the question of whether the recovery plan had worked, the Commission believed that the indications of fishing mortality and effort it had received were correct and that there had been less reduction in effort than expected. There was disagreement on how far we were from achieving targets. The Commission accepted that there were complaints about complexities. We had to ask what was good, what had worked? And we had to ask what was bad, and then change it.

There had to be a revision of the plan considering the indications and complaints. Recovery was possible, but we could not predict exactly to what level because of the unknown response of the stock and factors like climate change. The present indications were that the stocks could be recovered to present biomass targets within the present regime – but there was uncertainty over the future. The new plan had to be robust to limited predictability and a changing world. In rebuilding the stocks we should move to fishing mortality targets rather than biomass targets. We had to adopt an adaptive approach, and all stocks had to be managed responsibly (ecologically, economically and socially).

In terms of tools, we would probably need a mix of TACs and effort controls. We would need to make those controls effective without making them complex. We should share the responsibility of finding the right balance between simplicity and sensitivity to the specifics of the fisheries.

Technical measures could play an important role but they could not do the job alone. Their main role would be to allow the harvesting of other species. Real time closures were a possibility but there were complications in implementing these within the CFP. The incentives for fishers had to be right. We must not force fishers into the wrong métiers.

Mechanisms for fully evaluating measures (including economic and social impacts) had not been in place in the past. This could not be a reason for delay – but we had to ensure that such mechanisms were developed. There was a serious need for new data. There had been promising initiatives with partnerships and a call for proposals for the North Sea had already been launched and a further call would be issued for Western Waters soon.

Good governance was crucial to ensure the quality of information and to enable us to take the right decisions. It was also important for legitimacy. There had been criticism that the Commission was making things too complex. Yet it was fishers and Member States that were asking for derogations. There had to be a balance between simplicity and complexity, but this

was a shared problem. We needed to decide between a regional approach or a fleet-specific approach, and we needed also to discuss the role of technical measures.

Policy now had to be based on a long term approach; one which provided greater stability for the fishing industry. We had to move away from crisis management at each December Council towards policy decisions based on plans and principles. We needed to mobilise all the experience available. The Commission looked forward to receiving good advice from the RACs and anticipated taking part in further fruitful discussions as the ideas presented at this symposium were taken forward.

Elspeth Attwooll MEP: Vice President of the Fisheries Committee of the European Parliament.

Everyone knew - but it would bear repeating - that the European Parliament had no vote in the setting of TACs and quotas and was only consulted on matters like the Cod Recovery Plan and any proposal to revise it. But this did not mean that they could not have a considerable influence on outcomes.

The message which had emerged from the symposium, and which would be taken back to other members of the Fisheries Committee was as follows:

- The Cod Recovery Plan has not done what it set out to do, perhaps because the targets for increase in biomass were unrealistic in the first place. But "ratcheting it up" did not seem to be an appropriate solution.
- Cod stocks remained below desirable levels but there was variation between areas. There was evidence of improvements in at least some of them.
- This suggested that we should be thinking in terms of a number of different cod recovery plans instead of just one of them.
- If so, we needed much more detailed and localised data in order to reach an agreed understanding on the status of stocks in different areas.
- However, the data collected should cover socio-economic factors as well as environmental ones. It was a strong view on the part of the Fisheries Committee that we needed to establish a proper balance between the sustainability of fish stocks and the sustainability of the fishing industry.
- There was general agreement on the need to reduce fishing mortality for cod, possibly to different levels in different areas. A whole raft of possible approaches had been suggested, including better gear selectivity, real time closures and other measures, with a particular view to protecting juveniles and avoiding discards. All of these, though, needed some kind of cost benefit analysis, including the effects of displacing activity.
- Here there were two personal thoughts
    1. Was there any method, even in a mixed fishery, of decoupling decisions for different species in a way that would not affect cod recovery?
    2. Beyond what had already been noted in relation to selective gear, could we think of new and imaginative ways of using incentives for those engaged in fishing rather than simply employing "the big stick"?
- A great deal needed to be done if stakeholders were to have a real influence on the Commission proposal. So the suggestions that had been made for the establishment of working groups were excellent ones.
- The Commission needed to be active in producing impact assessments, both environmental and socio-economic.
- The last points, however, led her to a third thought. If the evidence of actual improvements in cod stocks could be scientifically verified, then might there not be

an argument for dealing with the issue in two stages: first, interim measures to deal with the counter-productive effects of the current Cod Recovery Plan; and second, the development of a fully considered long term approach?

- Even though the Parliament was unlikely to be processing its opinion until 2008, we should begin thinking about cod in some detail before then. People should come out from the RACs to give the fisheries committee a presentation on the way ideas are developing. For it was important that we all worked together on the issue, for the sake of the future of both fish stocks and the fishing industry.

Ann Kristen Westberg: Norwegian Ministry of Fisheries

The symposium had been a very fruitful experience. There were divergent views, but we had found some common ground. One important question was whether the current climate was favourable for cod to return to former levels. It was evident that fishing mortality had to be reduced in one way or another to achieve recovery. Wasteful, unwanted mortalities of cod had especially to be avoided. There was a need to look closely at technical measures and to introduce a ban on discards. Temporary closures –real-time area closures– offered a good solution, but there were institutional obstacles to such closures within the EU. These obstacles would need to be tackled.

Norway believed that it was important to involve stakeholders in management, and that incentives should be provided to encourage conservation measures. We had not really had enough time to go into these incentives in enough detail.

Gerd Hubold: General Secretary of ICES

The symposium had been excellent. The invited scientists had been given a full opportunity to present their science to the end users. The divergence in perceptions on the state of cod stocks needed further investigation to uncover where the problem lay. However, there was common agreement that we needed the best possible science. Eskild Kirkegaard had pointed out that for many years the science had been a closed shop. This had reflected concern on the part of clients that opening up the process would result in undue pressure being placed upon scientists. However, ICES was continuing to open up its advisory process to allow for new data, and was now allowing observers to attend some of its advisory committees.

The fishers' own stock survey, carried out in the North Sea, had been a success. The trends seen by fishers were being noted by ACFM, and this was an important first step, although the data could not yet be used in models. Data quality was critical for the quality of the science, especially when we were within the envelope of a precautionary approach. The better the data, the less cautious the advice would be.

There was a continuing need for dialogue, which ICES would take forward. Much effort already went into the stock assessments but the scientific capacity available to ICES had not increased, despite the additional effort that would be necessary to integrate stakeholders' views and to move towards an ecosystem approach. More funding would be required if the work was to be carried out properly, and if the best possible science was to be provided.

Michael Park; Scottish White Fish Producer's Association

It had become apparent during the symposium that movement in the right direction was more important for restoring cod than setting targets. Due consideration also had to be given to periods of low productivity. It may not be possible to restore cod to previous levels of

abundance. It was important to manage risk and to manage ambitions. Protection of juvenile cod scored high on the list of priorities.

There was a need to break out of the cycle of failure. There was a clear need for proper evaluation of the current position, and a clear need for a common language between industry, green NGOs and managers.

Measures had to be tailored to specific fisheries: no one size fitted all! In going forward collaboration offered the key. There had to be a basis for the fishing industry to buy in to management proposals. Trust needed to be created between the different parties. Industry/science partnerships were especially important for generating that trust. We had to find ways for dealing with uncertainty. The RACs had a unique role to play here, and the Commission had to be congratulated for having the foresight to establish the RACs.

Tom Pickerell: World Wide Fund for Nature

There was a problem with cod from an environmentalist's perspective. Cod stocks were very low. It was possible that cod could recover, but the current level of fishing mortality was too high.

There was no single reason for the failure of cod to recover to date. Rather than dwell on that we now had to move forward and consider where we now had to go in the future. There was a real need for improved data, especially on catch composition in the different fisheries. Priority should be given to auditing the cod fisheries; to reconsider existing knowledge and experience. We had to identify the sources of high fishing mortality upon cod and then to take action to reduce it where possible. Timing was now critical. The cod recovery plan was due for review in April.

Tailor-made solutions to the problem were required. We had to adopt a regional approach, with an enhanced governance framework. Closed areas would be a necessary tool. We needed to avoid derogations from the various measures as these had created problems in the past. There was a meaningful role for gear selectivity. There was also merit in moving from biomass targets to fishing mortality, providing data were sufficient. Stakeholder buy-in was essential if we were to be successful in rebuilding cod stocks.

In summary, cod could recover. We had to go forward as a matter of urgency. We were all willing to work together within the RACs to make things happen.

George Rose: Memorial University, Newfoundland

The meeting had been very impressive. Much passion had been shown by all the participants and he shared their passion for rebuilding cod stocks. Attendance at the meeting had been wide, reflecting all the different perspectives. He thought we would be able to make good on all the promises that had been made. However, he stood in awe of the complexity of the EU bureaucracy!

He had a few criticisms. Recovery was not the right word. Recovery was almost impossible to define, especially during a period of climate change. He preferred to refer to 'rebuilding' cod stocks. It was important to think in terms of trends rather than absolutes.

The bad boy was not spawning stock biomass. Fishing mortality itself was difficult to measure. We had to think of developing other indices. Indeed, the fishing industry could develop its own, which could be qualitative as well as quantitative. In Canada, the industry

carried out its own surveys, which were tightly controlled, and the results were used in the stock assessments. Originally, scientists had thought the idea of fishers carrying out their own surveys was ridiculous. Now they anxiously awaited the results.

It was too early to tell whether the cod recovery plan had been successful. There was a danger in over-reacting to a perceived failure. A slow and steady approach was required.

Any new plan should aim for simplicity. As much decision-taking as possible should be moved to the local level. At the moment, management decisions may be too closely linked to the stock assessments, which could be highly variable from year to year. The fishing industry wanted stability, and this could not be achieved if we were chasing the dynamic estimates of fishing mortality which were the outputs of the models.

It was important to take account of the socio-economic side of things.

We could develop a strategy for rebuilding, but we were limited in what we could do. It was important to do the least harm, and fishermen often knew what was least harmful. Every management measure put in place was an experiment, which needed evaluation. Adaptive management was important. Fundamental to such a strategy was agreement on the state of stocks. The current disagreement was a fundamental rift. The industry needed to be involved right through the system so that there was agreement on what the problem was.

The RACs should be putting pressure upon ICES and the Commission to change the current system.

Closing Remarks

The joint chairs of the symposium, Hugo Andersson of the North Sea RAC and Sam Lambourn of the North West Waters RAC, congratulated everyone for taking part. The quality of the presentations had been high and we had experienced a good debate. There had been common threads coming from all the Working Groups

The next step was for each RAC to take its views to the Commission. The initiative lay with the RACs, which would also need to take forward initiatives through ICES, STECF and the Member States. The Commission was challenged to set up an *ad hoc* Working Group for each sea area, to be attended by members of the RACs, scientists and economists, to work together to find regional solutions to the problem of rebuilding cod stocks.

This symposium had been the first of its kind. It was the start of a new process. Consultation of all the interested parties was the key. We had to mobilise all experience to take matters forward.

Thanks were given to the interpreters, the Scottish Executive and BIM for their support, the secretariats from the two RACs and all those who had taken part in the symposium.

Those Attending the Symposium

FULL NAME	ORGANISATION
Ms Christine Absil	Seas at Risk
Mr Michael Andersen	Senior Consultant, Danish Fishermen's Association
Mr Svend Erik Andersen	Vice-President, Danish Fishermen's Association
Mr Donald Anderson	North East Scotland Fishermen's Organisation - Glenugie
Mr James Anderson	Shetland Fishermen's Association
Mr Hugo Andersson	NSRAC Chairman
Mr Bertie Armstrong	Scottish Fishermen's Federation
Mrs Elspeth Attwooll MEP	VP. European Parliament Fisheries Committee
Mr Toon Baaij	Visserbond - Netherlands
Mr Nick Bailey	FRS Marine Laboratory
Mr Quentin Bates	Fishing News
Ms Ann Bell	Executive Secretary - NSRAC
Mr Doug Beveridge	Assistant CE - National Federation of Fishermen's Organisations
Mr Jacques Bigot	CRPMEM, France
Mr Kurt Birk	President, Northeast Fishermen's Association
Mr Alain Biseau	IFREMER, France
Mr Raymond Bisset	Provost, Aberdeenshire Council
Mr Hansen Black	Shetland Fishermen's Association
Mr Cathal Boyle	Killybegs Fishermen's Organisation Ltd
Mr Emiel Brouckaert	Rederscentrale, Belgium
Ms Kara Brydson	Birdlife International
Mr Allan Buch	President, Baelternes Fishermen's Association
Mr John Buchan	Scottish Whitefish Producers Association - Atlantic Challenge
Mr John Buchan	Scottish Whitefish Producers Association - Ocean Venture
Mr John Buchan	North East Scotland Fishermen's Organisation - Fairline
Mr Tony Byrne	Killybegs Fishermen's Organisation Ltd
Ms Andrea Carew	WWF Canada
Mr Orjan Carlsson	Verband der Deutschen Kutter und Kustenfischer
Mr John Casey	STECF
Mr Alan Coghill	Orkney Fishermen's Association
Ms Patricia Comiskey	Secretariat - NWWRAC
Mr Paul Connolly	Director of Marine Institute, Ireland
Prof Robin Cook	Director of Fisheries Research Services, Scotland
Mr Simon Coote	Scottish Executive
Mr Luc Corbisier	SDVO Rederscentrale
Mr Danny Couper	Scottish Seafood Processors Federation
Ms Hazel Curtis	Seafish Industry Authority, UK
Mr Ben Daalder	Federatie van Visserijverengingen, Netherlands
Mr Pierre-Georges Dachicourt	CNPMEM, France
Mr Patrick Daniel	DG Fisheries & Maritime Affairs
Mr Chris Darby	CEFAS, UK
Mr William Davies	MFV Golden Isles (poss Mallaig)
Mr Willem de Boer	Federatie van Visserijverengingen - Netherlands
Mr Diego de la Hoz	Edinburgh University
Mr Jose De Oliveira	CEFAS, UK
Dr Barrie Deas	Chief Executive NFFO, UK
Mr Poul Degnbol	DG Fisheries & Maritime Affairs

Ms Alyne Delaney	**Institute for Fisheries Management, Denmark**
Mr Alistair Dillon	**EU Select Committee - House of Lords**
Dr Hendrik Doerner	**STECF Secretariat**
Mr Mark Dougal	**CE - North East Scotland Fishermen's Organisation**
Mr Simon Dryden	**Scottish Executive**
Mr Paul du Vivier	**Scottish Fisheries Protection Agency**
Mr Bengt-Olof Eliasson	**Swedish Fishermen's Federation**
Mr Iver Enevoldsen	**President, Hvide Sande Fishermen's Association**
Mr Michael F Cavanagh	**Killybegs Fishermen's Organisation Ltd**
Mr Ketil Falch	**Norwegian Press**
Mr Jean-Yves Fournier	**CRPMEM, France**
Dr Clive Fox	**Scottish Association for Marine Science**
Mr Ian Gatt	**Scottish Whitefish Producers Association - Solstice**
Mr Marc Ghiglia	**UAPF, France**
Mr Allan Gibb	**Scottish Executive**
Dr Michel Goujon	**CNPMEM, France**
Dr Norman Graham	**Marine Institute, Galway**
Mr Peter Gullestad	**Norwegian Fisheries Directorate**
Mr Lasse Gustavson	**WWF Sweden**
Mr Henning Gyldenlev	**Director Danish Fishermen's Association**
Mr Olle Hagstrom	**DG Fisheries & Maritime Affairs**
Mrs Dolores Hanratty	**Secretariat - NWWRAC**
Mr Jan Hansen	**President, Hanstholm Fishermen's Association**
Mr Ola Hansen	**Verband der Deutschen Kutter und Kustenfischer**
Mr Lindsay Harris	**DEFRA, UK**
Ms Jenny Hatchard	**JH Fishery Management Services**
Prof Tony Hawkins	**Symposium Rapporteur / NSRAC**
Mr Henk Heesen	**PO Texel, Netherlands**
Dr Sheila Heymans	**Scottish Association for Marine Science**
Steven Holmes	**Fisheries research Services, Scotland**
Ms Nicki Holmyard	**North Sea Women's Network**
Mr Gerd Hubold	**General Secretary - ICES**
Mr Danny Huyghebaert	**SDVO Rederscentrale, Belgium**
Mr Morten Imer Møller	**Danish Ministry**
Mr Gordon Ingram	**Scottish Fishermen's Organisation**
Mr Brian Isbister	**Shetland Fishermen's Association**
Mr Richard James	**Northern Ireland Fish Producers Organisation**
Mr Derk Jan Berends	**Visserbond - Netherlands**
Mr Carl Jesper Hermansen	**President, Skagen Fishermen's Association**
Mr Arne Johannessen	**Fisheries Consultant, Danish Fishermen's Association**
Dr Paul Johnston	**Greenpeace International**
Mr Jesper Juul Larsen	**President, Esbjerg Fishermen's Association**
Mr Michel Kaiser	**University of Bangor**
Mr Michael Keatinge	**Executive Secretary - NWWRAC**
Mr Ciaran Kelly	**Marine Institute, Ireland**
Mr Edward Kelly	**Killybegs Fishermen's Organisation Ltd**
Mr Bob Kennedy	**Fish Update**
Mr Anthony Kenning	**Mallaig & North West Fishermen's Assoc**
Mr Eskild Kirkegaard	**Danish Institute for Fisheries Research**
Mr Paul Knapman	**Baltic RAC**
Mr Flemming Kristensen	**President, Danish Fishermen's Association**

Mr Jon Kristjansson	**Scientific Advisor, the Fishermens Association Ltd, Scotland**
Mr Sam Lambourn	**NWWRAC - Chairman**
Dr Chevonne Laurenson	**NAFC Marine Centre, Shetland**
Mr Patrice Leduc	**UAPF, France**
Mr Thierry Lepretre	**CRPMEM, France**
Mr Fredrik Lindberg	**Swedish Fishermen's Federation**
Mr Arnold Locker	**National Federation of Fishermen's Organisations, UK**
Mr Ole Lundberg Larsen	**Danish Fishermen's Association**
Mr Iain MacSween	**Scottish Fishermen's Organisation**
Mr Joe Maddock	**Irish Fishermen's Organisation**
Mr Kurt Madsen	**Chairman, Danish Fishermen's Producer Association**
Mr Christoph Mathiesen	**WWF, Denmark**
Mr Patrick McClenaghan	**Killybegs Fishermen's Organisation Ltd**
Mr Alan McCulla	**Anglo-North Irish Fish Production Organisation**
Ms Helen McLachlan	**WWF, Scotland**
Mr Sandy McLeman	**Mallaig & North West Fishermen's Association**
Mr Phil McMullen	**Seafish Industry Authority, UK**
Mr Jelle Meindert Romkes	**Federatie van Visserijverengingen, Netherlands**
Mr Luc Mellaerts	**SDVO, Belgium**
Mr Geert Meun	**Federatie van Visserijverengingen, Netherlands**
Mr Coilin Minto	**BIM, Ireland**
Mr Neil Mitchison	**European Commission in Scotland**
Mr Cliff Morrison	**Food and Drink Federation**
Mr Malcolm Morrison	**Aberdeenshire Council**
Mr Coby Needle	**Fisheries Research Services, Scotland**
Mr Johan Nooitgedagt	**Visserbon,- Netherlands**
Mr Fred Normandale	**Chairman - National Federation of Fishermen's Organisations**
Dr Carl O'Brien	**CEFAS, UK**
Mr Lorcan O'Cinneide	**Irish Fish Producers' Organisation**
Mr Sean O'Donoghue	**NWWRAC**
Mr Christian Olesen	**Chief Executive, Danish Fishermen's Producer Association**
Mr Tim Oliver	**Fishing News**
Dr Peter D O'Neill	**Third World / EEC / World Fishing**
Ms Sheila O'Neill	**DMCNR, Irish Government Representative**
Mr Michael Park	**Vice-Chair - NSRAC**
Mr Steven Park	**Food and Drink Federation**
Mr Guus Pastoor	**AIPCE**
Mr Martin Pastoors	**Chairman ACFM - ICES**
Mr Sandy Patience	**Vice-Chair, the Fishermens Association Ltd, Scotland**
Mr Kenneth Patterson	**DG Fisheries & Maritime Affairs**
Mr Henning Pedersen	**Board Member, Danish Fishermen's Producer Association**
Mr Ernesto Penas Lado	**DG Fisheries & Maritime Affairs**
Mr Jorg Petersen	**Verband der Deutschen Kutter und Kustenfischer**
Mr Jacques Pichon	**ANOP , France**
Dr Tom Pickerell	**WWF, UK**
Mr Ole Poulson	**Danish Ministry**
Mr Reinhard Priebe	**Director-General – Conservation, DG Fisheries & Maritime Affairs**
Dr Hans-Joachim Raetz	**Federal Research Centre for Fisheries, Germany**
Mr Robert Rangeley	**WWF Canada**
Mr Birgir Rasmussen	**President, Bornholm and Christiansoe Fishermen's Association**
Mr Chris Reid	**Sir Alistair Hardy Foundation for Ocean Science, UK**

Ms Julie Rigaud	**FEDOPA, France**
Mr Dominic Rihan	**BIM, Ireland**
Mr Jose Rizo	**DG Environment**
Mr Albert Romkes	**Federatie van Visserijverenginge, Netherlands**
Dr George Rose	**Marine Instute of Memorial University, St Johns, Newfoundland, Canada**
Mr John Rutherford	**Seafish Industry Authority, UK**
Mr Kai-Arne Schmidt	**Verband der Deutschen Kutter und Kustenfischer**
Mr Pieter-Jan Schon	**DAR, Northern Ireland**
Mr Robert Scott	**CEFAS, UK**
Mr Ross Skinner	**Mallaig & North West Fishermen's Association**
Ambassador Steffen Smidt	**Danish Delegation to the OECD**
Mr Morten Soerensen	**President, Hirtshal's Fishermen's Association**
Ms Niki Sporrong	**The Fisheries Secretariat, Sweden**
Ms Heather Squires	**Invest in Fish, UK**
Mrs Nathalie Steins	**Dutch Fish Product Board**
Mr James Stephen	**North East Scotland Fishermen's Organisation - Harvest Hope**
Mr Robert Stevenson	**West of Scotland Fish Producer's Organisation Ltd**
Mr Frank Strang	**Scottish Executive**
Mr Lachlan Stuart	**Scottish Executive**
Ms Helene Syndique	**Ministry of Agriculture and Fishing - France**
Mr Leslie Tait	**Shetland Fishermen's Association**
Mrs Fenneke Tjallingii-Brocken	**Dutch Fish Product Board**
Mr Ole Toft	**President, Thyboroen Fishermen's Association**
Mr Michael Topping	**Committee on Fisheries, European Parliament**
Mr Ole Tougaard	**European Commission**
Mr Marco Traa	**Dutch Ministry - Dept of Fisheries**
Mr Paul Trebilcock	**Cornish Fish Producers' Organisation**
Mr Emiel Uterwulghe	**Rederscentrale, Belgium**
Mr Albert van Urk	**Federatie van Visserijverengingen, Netherlands**
Mr Kim Vejrup	**Head of Communications, Danish Fishermen's Association**
Mr Pim Visser	**Visafslag, Netherlands**
Mr Jean Marie Wacogne	**CRPMEM, France**
Mrs Joyce Walker	**Secretariat - NSRAC**
Mr Simon Waterfield	**DEFRA, UK**
Mr John Watt	**Scottish Whitefish Producers Organisation**
Mr George West	**Scottish Whitefish Producers organisation- Bountiful**
Ms Ann Kristin Westberg	**Norwegian Ministry**
Mr Jason Whooley	**Irish South & West Fish Producers' Organisation**
Mr Niels Wichmann	**Danish Fishermen's Association**
Mr Jan Willem Wijnstroom	**European Anglers' Association**
Mr Doug Wilson	**Institute for Fisheries Management, Denmark**
Mr David Wilson	**Scottish Executive**
Mr Urbain Wintein	**Rederscentrale, Belgium**