Presentation Summaries

Symposium on Cod Recovery
9-10 March, 2007

Scotland

Status of cod stocks in the Northeast Atlantic

Martin Pastoors[1]
Chair of the ICES Advisory Committee on Fisheries Management (ACFM)
ICES provides advice on the status of around 150 fish stocks in the Northeast Atlantic. Among these are 14 cod stocks. In this contribution, an overview is presented of the stock status of cod stocks in the Northeast Atlantic which shows that some cod stocks are doing relatively well, while others are severely depleted. After a general overview, there will be a focus on the cod stocks in the North Sea, Western Waters and Baltic Sea, where we will examine the factors that have contributed to the decline of those stocks. This will be contrasted with the advice that has been presented in the past. The potential for recovery will be addressed in general terms based on modelling studies.

HOW CAN WE REDUCE UNWANTED MORTALITY OF COD?

by Peter Gullestad, Director General of Fisheries, Norway

If we define 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 is how we can minimize this mortality. A practical approach to this problem is to examine each fishery/fleet group with regard to all possible sources to unwanted mortality. Based on such an investigation you may identify both small and big problems, some of them easy to solve, others more challenging and maybe nearly impossible. Possible solutions may be found at local, national or EU level. Don't wait, solve the easy problems without delay and then give priority to the bigger and more complicated ones!

Unwanted mortality may be grouped in three categories according to where they occur. Fish may die already in the sea never touching deck. Selection mortality and ghost fishing are examples of this category. Solutions to for example ghost fishing are improved technical regulations and retrieval programs.

On board the vessel discarding for a variety of reasons is the source to unwanted mortality. The elements of the Norwegian policy to minimize discard are presented. One of these elements could be the allocation to fleet groups of national quotas. For example, the reduction of potential discard is a crucial element when distributing the Norwegian allocation of North Sea Cod.

The third category of unwanted mortality occurs at landing. Black and grey landings come in many forms. Compulsory weighing of all landings and correct conversion factors are a prerequisite of any efficient control and enforcement regime. "A kilo must become a kilo!" Efficient physical quayside control of all landings is in most cases not possible. The legal authority of the fisheries inspection service to inspect and to collect information all along the value chain should therefore be emphasized. Experience shows that post sales audit of buyers of fish can be a very effective tool to uncover gross misreporting of landings. Last December the EU decided to introduce compulsory electronic logbook and reporting, and the Commission is now preparing the implementation regulation. A harmonized approach to this issue is of vital importance to fishers fishing in more than one area of jurisdiction. Norway will therefore cooperate closely with the EU on the implementation. Properly done electronic reporting should improve transparency and control efficiency greatly, and at the same time considerably simplify the bookkeeping and reporting procedures of fishers.

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Hazel Curtis, BSc (Hons), MSc, MBA

Chief Economist, Sea Fish Industry Authority, UK

Synopsis for Socio-Economic context talk:

1. What is economic and social impact analysis?
2. Volumetric implications of CRP **so far** (cod & other species)
3. Socio- Economic implications to date
4. Potential volumetric implications of CRP **next few years** (cod & other species)
5. Potential socio-economic implications next few years
6. Is Cod Recovery worth the cost?

Barrie Deas
Cod Recovery: An Industry Perspective

My presentation will briefly summarise the recovery measures that have been put in place since 1999. It will comment on the degree to which these have achieved their objectives. Lessons learned will be outlined, particularly the need to understand the dynamics of different fisheries; the implications of environmental change for recovery measures; and the shortcomings of the existing system of fisheries governance. The underpinning rationale and impact of effort control will also be discussed.

The presentation will outline some elements of an alternative cod recovery plan. The need for recovery measures to be understood and supported by fishing vessel operators is stressed, along with the need for the cod recovery plan to take into account that cod stocks have entered a period of low productivity. This will have implications for the setting of realistic targets. The short, sharp, shock, approach has not been noticeably successful. The presentation argues that it should be replaced by a gradualist approach in which the principal criteria is movement in the right direction

Robin Cook
Talk synopsis

In order to carry out a management strategy a manager must have a set of tools or controls which can be deployed to achieve the required objective. In general these tools try to modify the rate at which the stock biomass is exploited. Available tools fall roughly into three categories;

a) Input controls such as effort measures and decommissioning
b) Output controls such as catch limits
c) Technical measures such as area closures and modifications to gears

These measures are briefly reviewed to summarise their strengths and weaknesses.

SELECTIVE FISHING GEARS – CAN THEY CONTRIBUTE TO COD RECOVERY?

Dominic Rihan, Chairman ICES-FAO WGFTFB

Potentially the current effort control measures provide a real opportunity to encourage fishermen to use more selective gears and the Commission acknowledges this to a limited extent in the non-paper of July 2006 in that the use of species selective gears (e.g. rigid grids) that lead to a lower impact on cod are encouraged. On the other hand the Commission conclude that there are only limited opportunities for providing incentives for size selective gears (e.g. increased codend mesh size) given that current codend mesh sizes used are recognised to have poor size selectivity for cod. In reality, though, given the idiosyncrasies of the current recovery plans, since their inception there has been an underlying trend by fishermen to reduce mesh size and by design, the selectivity of their gear to maximise their effort entitlements. This has hindered the work of gear technologists to encourage the use of more selective gears developed either directly or indirectly and subsequently uptake of such gears has remained relatively low.

Recognising the importance of cod recovery a number of selective devices, developed under EU and nationally funded projects that can reduce the by-catch of spawning and juvenile cod along with other associated by-catch species have been successfully tested but it is clear there is no “one gear fits all” solution. Gears need to be divided into devices or modifications that are designed to protect spawning and juvenile cod and can be used in fisheries where cod is an important component of the catch and other devices that protect important by-catch species such as haddock and whiting in fisheries with lower cod catches.

Much of the research has focused on *nephrops* fisheries with small mesh codends as these fisheries seem to have discarding problems albeit not of cod in some cases and also have seen widespread displacement of effort from directed whitefish fisheries given the increased effort entitlements for these gears. Thus far, the Commission have identified the Swedish grid as the most effective device for release of cod in *nephrops* trawls. While there is no doubt that this device is effective, it was developed for a specific inshore *nephrops* fishery and in a different regulatory environment to that which pertains in the majority of other fisheries in the North Sea, West of Scotland and the Irish Sea. It should be remembered that in Sweden this grid is used in conjunction with a 70mm square mesh codend. The grid sorts the fish catch, while the square mesh codend size selects for *nephrops* and fish. This is appropriate in this fishery where the mls for *nephrops* is 40mm and the catch of marketable fish is negligible and as a result, the uptake in Sweden has been high but in other fisheries with a mls for *nephrops* of 25mm, the potential losses of marketable catch would not be acceptable. The net result has been that uptake of this device outside Sweden has been zero.

Other gear modifications such as inclined or horizontal separator panels, tested in the Irish Sea and North Sea have also been demonstrated to be effective at sorting cod across all size ranges from other species such as *nephrops* and also in directed whitefish fisheries. Additionally, the “coverless” trawl, which research has shown, while not effective for cod, can release almost 75% of haddock and whiting from *nephrops* trawls has potential. Both of these gear modifications, along with the

Swedish grid in fact, are well suited to directed *nephrops* fisheries e.g. Farne Deeps, Irish Sea or Clyde but less so for mixed *nephrops*/whitefish fisheries e.g. Fladens.

It should also be recognised that significant improvements can be achieved in size selection for cod, haddock and whiting in *nephrops* fisheries through the use of other devices. For example research has shown that the fine-tuning of square mesh panels using relatively low diameter twines and more stable mesh constructions, can increase the L50 for whitefish species including cod significantly provided they are constructed with a mesh size of 120mm or more and positioned close to the codend. This seems a simple, yet effective measure and some recognition has been given in the 2007 effort allocations, although the incentives are modest and only apply in some areas.

In conclusion gear technology is an important component of cod recovery. Any review, though, in the first instance 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 this process should be carried out in projects to develop and fine tune gears appropriate to the specific fisheries with industry participation but also partially funded by industry. Using this approach, after the basic research, gear technologists should act as facilitators to demonstrate to fishermen how to rig the gears. Through the provision of workshops and also by encouraging fishermen to "self-sample", the benefits of using selective gears can be demonstrated to outweigh any economic losses while technical or practical issues associated with new gears would be highlighted. It is also felt that it would be appropriate in future legislation that rather than providing detailed technical annexes describing construction and rigging, that a toolbox approach be taken allowing the use of different gears depending on the fishery. This would obviously require good control and enforcement to prevent circumvention of the measures but if the benefits of using selective gears are sufficient, self-regulation will play a key part in compliance. Fundamental to this, though is that there is a commitment by managers in the future to provide incentives for fishermen to use proven gears and fishermen be pro-active in adopting them. Such incentives must be real and tangible in terms of effort or access to fisheries and suitably above baseline levels, otherwise uptake will continue to be low and an opportunity will be lost.

Alain Biseau – IFREMER

Summary of Presentation:

Here are the main points of my presentation:

- general presentation of the Celtic Sea Cod fishery (trends in landings, contribution of each country...)
- Data used to assess the stock (landings, age composition, CPUE, Surveys...)
- (very briefly) Assessment methodology
- State of the stock and Advice (ICES)
- Discussion on the assumptions / simulations
    - Is there any future of the stock?

Nikki Sporrong
Summary of Presentation:
STAKEHOLDER'S REFLECTIONS: ENVIRONMENTALIST PERSPECTIVE

Cod stocks in the European Community waters have declined dramatically in the last two decades. The situation and pattern vary slightly from stock to stock but the overall pattern is the same. The main reason for this decline is overfishing. Other factors, such as climate change and seal predation, affect the stocks but fishing mortality is estimated to be around five times the mortality rate from all other causes combined.

The state of cod stocks is a stark message to all involved in management. The decline of stocks has been followed and documented, and warnings about an impending collapse came already in 2000, as the Community was discussing CFP reform. Some measures were taken, but they were not sustained nor joined-up to prevent 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 this date, the application of the plan has not led to significant recovery of the stocks. According to STECF, "the cod recovery plan has failed in its objectives because the reductions in catch and effort have been smaller than those required for recovery". Cod mortality is simply still too high for any recovery plan to succeed.

This is disheartening for everyone involved. But we cannot give up on cod. It is 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 with a potential value of €243 million a year?

Some important steps have been taken. Fleet capacity has decreased and compliance in the sector has improved. It is time to assess how we can reduce the mortality of cod further, in the most painless way possible. High levels of bycatch and discarding are a major cause of mortality in these stocks. According to ICES, half of the mortality is caused by "unallocated removals".

If we could find a way to reduce discards by, say, 80 per cent, cod stocks would stand a fair chance at recovery. Scientists have noted that miniumum safe stock levels in the North Sea could be reached within a year at the current TAC, if unallocated removals are reduced from 50% to 10%.

This will not be easy, and we will need the help and cooperation of the sector. They know their gear, its potential and which modifications could work. In addition to bycatch mitigation measures, other actions will need to be taken and the sector will need positive incentives and directed support throughout this change.

Michel J. Kaiser
Summary of Presentation:
Cod Recovery: Alternative Management Measures
School of Ocean Sciences, College of Natural Sciences, University of Wales-Bangor, Menai Bridge, Anglesey, LL59 5AB, U.K.

A variety of spatial management measures can be applied to limit the effects of fishing activities on either the cod themselves or on key habitat features upon which they depend. In order to determine whether spatial management measures are likely to be effective, it is necessary to determine whether key 'bottlenecks' in the life-history of cod can be affected by the introduction of areas from which different amounts or types of fishing activity are excluded. Here, I address the potential positive and negative outcomes of different management approaches aimed at different life-history stages.
Spawning aggregations of cod could usefully be protected through exclusion of some types of fishing activity that catch cod as a target or by-catch species. As cod eggs are released directly into the water column, conservation of seabed habitat is not an important issue in this context [unlike for herring]. Such a measure would be temporary for the duration of the spawning period. A negative outcome of such a measure might be the additional effort [and hence additional associated environmental impacts] required to catch the same amount of fish once they have dispersed from the spawning ground.

Cod eggs and larvae are not amenable to conservation through spatial management as these life-history stages are influenced primarily by oceanographic factors and changes in plankton composition that are impossible to influence through management of fisheries. Management of fishing effort can only adjust human behaviour to taken into account the consequences of these environmental factors for cod populations.

Studies undertaken to date suggest that the early settlement stages [up to 1 year old] of cod are highly dependent on seabed habitats for protection from predators and for their food resources. Understanding the location of these areas is important as fisheries and other human activities can lead to the degradation of such habitats. In this instance spatial management of all such activities is an effective mechanism to preserve such habitats and hence their early life-history stage. However, it remains a challenging scientific task to identify the location of such areas in the North Sea. Particle tracking models that can predict the movement of eggs and larvae from spawning grounds would inform the search for such key areas. Inshore coastal areas are often important nursery grounds, and currently these might be affected negatively by inshore fisheries such as scallop dredging that occurs in complex seabed habitats. Potential offshore locations of cod nursery areas in the North Sea are uncertain.

As cod grow, they change their feeding habits from eating worms and shellfish to a diet dominated by fish. These dietary changes occur as the adult cod recruit to specific areas of the North Sea. We are now beginning to understand that there is considerable population structure within cod populations in the North Sea. These sub-populations exhibit different types of behaviour and migrations such that those sub-populations with restricted movement will be amenable to conservation through the use of closed area restriction. However, while such measures may accrue benefit for cod and other species within those areas, the displacement of fishing activity may put additional pressure on other species or cod elsewhere, and may lead to further seabed degradation through bottom fishing disturbance. It is important to understand the

consequences of changing fishing behaviour as this can have unforeseen [and undesirable] consequences as has occurred with the 'plaice box'. Furthermore, modelling studies show that there is an inevitable immediate loss of income that will persist for at least 3 – 5 years before any financial benefits are likely to become apparent from the conservation value of the closed area.

While the exclusion of fishing activities that negatively impact upon cod might achieve some management and conservation objectives for cod recovery, it remains possible to exploit other species within such areas using fishing techniques that are 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 [traps]. *Nephrops* creels have minimal impact on the seabed environment and do not interact with cod. The use of spatial management that permits the use of some gears but not others is a highly effective way to achieve some conservation/management objectives while maintaining output from sustainable fisheries.

José Rizo Martin
Summary of Presentation:
Cod recovery from an environmental perspective

It is not possible to consider that marine ecosystems are in a healthy status unless commercial stocks are in good status too. Any environmental policy aimed at protecting and conserving the marine environment has to take them into consideration.

(Over)fishing is probably the most important pressure exerted over the marine biodiversity and this is per se an environmental problem. However, existing legal and institutional arrangements put the management of fishing resources in the hands of fisheries policies. The reformed Common Fisheries Policy offers many possibilities to incorporate environmental concerns into the management of fishing resources. The actual use of these possibilities will be revised.

Measures to protect and conserve the environment in general are supposed to be well founded, proportional to the desired effect and somehow easy to implement. From this point of view, long term recovery plans like those for cod make much more sense than annual decisions. There is a need to assess whether recovery plans are delivering; if cod status is not improving the possible causes should be analysed. A comparison will be made between the protection of cod through recovery plans and the protection that environmental policies could give to it.

Marine environment policies, that evolve to integrated approaches, not only cover fisheries but many other pressures. Special attention will be paid to the European Marine Strategy, the role it may play as regards fisheries and the general process it is intended to trigger.

Finally, we will address some misunderstandings as regards the vision that environmental policies have on the marine environment. In fact, the fishing sector should be strongly in favour of well designed and implemented environmental policies.

Ciaran Kelly
Summary of Presentation:
Cod recovery? A scientist's point of view

If nobody knew anything about cod stock assessment would we be able to come up with a plan to improve the current situation? One of the problems we currently face is that, what we know (or think we know) is uncertain. There are 2 ways you can deal with this uncertainty; the first way is to gather more data and refine the model which describes how we think things work, so that we can work out what we need to do to improve the situation, the second is to accept the limitations in modelling the cod stock in its current state, and to take a step back and take actions to try and make things better even though we can't predict how effective our actions will be. I think that if nobody knew anything about cod stock assessment we could easily have ended up with a plan to make things better, rather than the current approach.

Lets go back to some of the fundamental questions of this meeting: Does fishing affect the cod stock? Yes. Is it the cause of the current low stock size? Well it is at least a contributory factor. Can the cod stock recover? Well if the system is elastic[1] and you remove the factors which caused the decline, then yes. However there are 2 important things we don't know for sure a) whether the system is elastic b) All the factors which caused the decline, their interaction, and whether we can reverse them. So we are in an uncertain situation. However if the question is can we do anything to improve the situation? Then the answer is yes.

The role of science in this debate should be to understand and inform but unfortunately in the North-east Atlantic we use science primarily for judgement. This would be okay if we were within the "normal operating conditions" of the science system, but in the case of cod we[2] have tried to apply scientific judgement in a system which has moved beyond our window of understanding. In this situation, the predictive capacity of the science is compromised; however it can still provide a useful framework for decision making.

If we want to project the stock into the future we use a relationship called the stock recruitment relationship to predict recruitment. This relationship (which can take many forms) is based in part on logic evidence an d assumption: It is logical to believe that there can be no recruitment without a stock to create it, and we have some evidence that the amount of recruitment produced by very high stock levels is somewhat depressed by an effect called density dependence. But what happens in the intervening range is subject to assumption. What happens to recruitment at low levels of stock size has a relatively large effect on the stock and this is where we are dependent on assumptions. This means that when we try and predict the future state of the stock, we can't be very certain about how something important like recruitment turns out. This in turn means that there is uncertainty about the future state of the stock.

The science assessment tells us that the actual size of the stock (in tonnes) is uncertain, but that it has been overexploited and at is very likely to be at low level. This conclusion is not uncertain. At very low levels of stock size any capture of cod can have an adverse effect on the stock, and thus it is widely accepted that we need at least to do something to prevent the situation from getting worse. Whether you believe that something can be done to return the situation to the way it was before the decline, depends on what you believe about the cause of the stock decline and the effect of fishing, but we will park that issue for the time being. Any plan we employ

to try and make things better should incorporate the fact that we are in a situation where we are uncertain about the actual size of the stock and that we can't with precision, predict how the stock will develop in the medium term.

Currently the plan we are using tries to *predict* the recovery of cod. The measures adopted are based on these predictions (which we are at best imprecise) and we are trying to evaluate the success of the measures with a level of precision we can't achieve. An alternative approach would be to take actions to minimise the capture of cod (e.g. technical conservation measures) and set ourselves targets which are large enough that we can measure (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 determine that the plan was a success we should maintain the measures we have taken until effectiveness of the measures

Elastic meaning that cause and effect are entirely reversible, such that the removal of the cause will always reverse the effect [2] We here refers to the system, that involves, politicians, managers, scientists and the fishing industry

diminishes (or are no longer needed), and if we can't measure any change in the stock then we should incrementally increase the actions taken to avoid cod capture until we measure an improvement. This (i.e. efforts to minimise the effect of fishing on cod), can be done up to a point, and this point needs to be clearly defined and agreed by all stakeholders. We need to acknowledge the dilemma that arriving at this point poses for the different stakeholders . Thus the question we must now answer is how much can you avoid the capture of cod and still have a viable fishery for other species, while sufficiently protecting the remaining cod stock?

The situation is not ideal, but we have to realistically deal with our limitations in order to devise a new way forward.

Alan McCulla

Talk Synopsis

Many people tend to forget that Europe's Cod Recovery programme began in the Irish Sea at the beginning of the new millenium. Alan McCulla will relay the observations and experiences of fishermen from the Irish Sea who are now in the midst of the 8th year of cod recovery. He will chart how, at the outset of the programme, the fishing industry were proactive in proposing conservation measures and then how they became increasingly disillusioned with the process, challenging the orthodox science with alternative and more recently additional science. He will describe the dramatic changes there have been in the numbers and composition of the fishing fleet and how this has impacted upon the onshore sector.

George Rose

Summary of Presentation:

Rebuilding Cod Stocks: lessons from the NW Atlantic

George Rose, Fisheries Conservation Group, Memorial University of Newfoundland, St. John's, NL Canada A1C5R3 grose@mi.mun.ca

The Newfoundland and Labrador cod fishery began in the 15th century and were once the largest in the world. After World War II the buildup of the trans-Atlantic fleet from the Soviet Union and Europe decimated many stocks, and continued overfishing

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 has not recovered in 50 years. The question as to whether the declines in cod were caused entirely by overfishing is simplistic, because there is no doubt major changes in the ecosystem which likely influenced the cod stocks took place during the tertiary period of decline. In particular, their main prey, the capelin, shifted distribution and declined throughout the prime northern range just prior to the tertiary decline. Their main predators, the harp and hooded seals, have increased dramatically over the same period. Other demonstrated changes include massive increases in invertebrates, with snow crab and pandalid shrimps of commercial importance, and recently documented changes in capelin diet of euphasiids and other plankton. For rebuilding, all stocks have not performed the same (a common misconception), nor can blanket solutions be recommended. Whether stock performance changes are longer term genetic responses to overfishing, or more dynamic responses to a changed environment, remains a key question. Whatever the cause, radical life history changes are evident in some but not all stocks. Simply reducing fishing mortality has not in all cases resulted in increasing stocks, but has in some. One strategy that appears to have been widely beneficial is the protection of spawning stocks. Examples will be given and discussed.

Ole Lundberg Larsen
Summary of Presentation:
Days at sea and TACs: Consequences from a stakeholders point of view

Synopsis
The intension with the contribution is to highlight how the “days at sea regulation” in the cod recovery plan has affected fishermen and the fishing industry.
As an introduction I have recalled one of the main intensions with the New Common Fisheries Policy – to introduce long term management! How has the days at sea scheme performed, if we compare with the objective of long term Management?

I will illustrate some of the main contradictions between the days at sea scheme and long term management. Important issues are:

- major changes in the amount of days each year
- major changes in rules for implementation each year
- limitations for other fisheries

The discussion leads to the conclusion that if the intension was to introduce a regulation for fishing with an element of long term management – the days at sea scheme has failed!

At the end of the presentation, I want to discuss what went wrong? For example the problem of no influence for stakeholders. And I will ask if we can do better? And the answer is yes, we can! But it is necessary to strengthen the dialog between the Commission, the member countries’ authorities and stakeholders in the management of fisheries.

Norman Graham
Synopsis of Presentation:

Historically, the Northern part of VIa, supported a substantial mixed fishery for cod and haddock, principally in grounds off the Butt of Lewis, Cape Wrath and around the Islands of Rona and Sulisker and also in localised fisheries such as the codling fishery off Greencastle. Cod has also been taken as a by-catch in a number of other fisheries e.g. the Stanton bank fishery for hake, monk and megrim. Catches rates in the 1970's and early 1980's were fairly stable at around 20,000 tonnes per year.

However, by the late 1980's the stock began to show signs of over exploitation. Fishing effort and mortality increased substantially, in part due to improvements catching efficiency such as the introduction of larger vessels fitted with shelter decks, enabling boats to work in weather that would have stopped fishing previously and the introduction of the pair trawl and seine. Increasing levels of fishing mortality, particularly on older fish, possible as a result of fishing on spawning aggregations, resulted in more stringent scientific advice being given, starting in the late 1980's. Unfortunately, this was not heeded and TACs were often set above scientific recommendations.

By the late 1980's and early 1990's the stock was experiencing a rapid and dramatic decline in biomass. This is reflected by similar reductions in reported landings. Average catches had fallen from ~20,000 tonnes to ~7,000 tonnes per years in the 1990's to the present day situation where catches don't even exceed 500 tonnes. The decline in stock size has led to increasingly severe scientific advice and from 2003 onwards, ICES has recommended a closure of all fisheries where cod is taken.

However, it is not the intention of this presentation to apportion blame to any one group or effect for this demise - that is an easy exercise with the benefit of hindsight. Suffice to say that improper management of the fishery coupled with unforeseen advances in catching efficiency and the failure of the TAC system to adequately control fishing mortality were all major contributing factors. The cold fact remains that the stock is at its lowest ever recorded there is no getting away from this fact – the question is what we do about it?

Unfortunately the situation we face today presents us with a significant obstacle. Our inability to accept modest reductions in catches in the late 1980' and early 1990's has now resulted in the situation where, if we are to give cod any possibility of rebuilding to some resemblance of its former stock size, the modest reductions of the 1980's are now translated into severe and long term restrictions. Collectively, as fishermen, scientists and managers, we must now try to determine what actions must be taken.

This symposium presents two fundamental questions which are at the core of its objectives. Firstly, can cod recover and secondly, if the answer to the first question is 'yes', or more likely – 'there's a fair chance' – then what actions are needed to achieve this?

However, first we need to make clear that the system we deal with is uncertain and unpredictable. This needs further explanation and consideration. With regards the health of the stock and its ability to replenish itself, we are in un-chartered territory. The stock size is estimated to be at its lowest level ever, quite what this level is, is itself uncertain, but all indications – commercial catch data and survey results – all

point in the same direction. Our inability to adequately determine the level of spawning stock biomass has important implications for the current management targets of increasing SSB by 30% year on year.

Currently we try to predict the degree and rate of rebuilding within pre-defined time windows and adjust fishing opportunities to achieve these predicted levels of stock growth. The models used to make these predictions are based on several (key) assumptions and are dependant 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 are imprecise, largely due to the assumptions made and the poor quality and reliability of official catch statistics. Similarly, due to very low levels of spawning stock, and the resultant trend in low recruitment, it is difficult to say with any high degree of confidence that the stock will respond as we think it should – basically because we are outside the area of historic knowledge. There is also a growing body of evidence that shows that rebuilding of the stock may be further hampered by a range of other 'non-fishing' issues. Recent studies suggest that mortality caused by seals may be a particular problem for the West of Scotland cod stock. The low level of the stock and the increase in seal population may have resulted in an increase in natural mortality; the extent of this is uncertain and needs more detailed study. There are also suggestions that a cod stock which comprises of predominately young fish, such as the West of Scotland, that recruitment is lower in comparison to older fish.

To offer any chance of rebuilding the stock, I personally believe that a more pragmatic approach, which is not led by the outcomes of predictive models which are based on uncertainly, is required. We know that the best way to help cod rebuild is not to catch it in the first place – or at least minimize its capture to levels that are feasible. This can be achieved by the use and correct implementation of technical conservation measures which are agreed by all concerned. These should focus on the avoidance of targeted fisheries for cod (such as the Greencastle closed area) and the elimination of the capture of cod as a by-catch. Unfortunately, the current level of stock size is such that even a low scale removal of cod represents significant fishing mortality.

A range of measurable indicators need to be put in place that can tell us if there is any movement in the stock status and to inform the (collective) decision process on what actions may be required. These should be evaluated periodically and the necessary actions decided upon. One key to any rebuilding of the stock is to ensure that the information made available is as precise as possible otherwise we will remain in the state of 'uncertainty'. Forums such as this symposium provide an excellent framework for the choice of indicators and what actions are realistic to avoid the capture of cod while maintaining viable fisheries.

Eskild Kirkegaard

Science Partnerships - Brief synopsis:

Recent years experiences have shown that the scientific and technical basis for fisheries management can be improved by close collaboration between the fishing industry and scientific organisations. The development from use of information from the industry in scientific analysis to collaborative research and data collection is briefly described and the use of the partnership in developing long-term management plan is discussed.

Coby Needle and Steven Holmes, FRS Marine Laboratory, Aberdeen

Synopsis

North Sea cod: summary of current science

In this brief talk, we outline the current state of science on North Sea cod, and introduce ideas for future directions to stimulate discussion. Following a short description of the most recent assessments, forecasts and advice for North Sea cod, we explore issues related to reference points and existing management measures. We summarise simulation analyses undertaken to indicate the likelihood and timescale of cod recovery, under different management scenarios. We present some of the latest thinking on biological issues that potentially impact North Sea cod and the way we need to assess this species. We conclude with a brief resumé of the potential advantages and disadvantages of a range of alternative management approaches, as seen from the scientific perspective.

Synopsis of presentation- Ernesto Penas

In 2006, the Commission presented a working document analysing the application of the cod recovery plan and drawing some conclusions on the questions to improve. The intervention does not try to dictate what changes should be introduced in the system. Rather, it lays down a series of principles and conditions that any future revision of the plan should respect, in terms of objectives, and legal or substantial requirements. The intervention also brings up for discussion the need for clear choices on certain issues, such as that between simplification and regionalisation. It finally provides a calendar for the implementation of the revision.