



DEEPFISHMAN

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Review of policy drivers impacting on deep-water fisheries in the NE Atlantic

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Introduction

This review refers to policy drivers applying to or impacting upon deep-water fisheries and ecosystems in the NE Atlantic. The definition of “deep-water” varies between organisations and countries. The Food and Agriculture Organisation of the United Nations (FAO) criterion is beyond the continental shelf/slope break, typically occurring at about 200 m, whereas the International Council for the Exploration of the Sea (ICES) defines the deep water as depths greater than 400 m, although this is an arbitrary boundary since many species have depth ranges that extend from the continental shelf into the deep water. In the NE Atlantic these include ling (*Molva molva*), tusk (*Brosme brosme*), anglerfish (*Lophius* spp.), deep-water redfish (*Sebastes* spp.) and Greenland halibut (*Rheinhardtius hippoglossoides*) (Gordon *et al.*, 2003). However, many of the policy-drivers described here are not deep-water specific, so there is no strong requirement to define deep water rigorously.

Many marine living resources exploited by deep-water fisheries (DWFs) have biological characteristics that create specific challenges for their sustainable utilization and exploitation. These include: (i) maturation at relatively old ages; (ii) slow growth; (iii) long life expectancies; (iv) low natural mortality rates; (v) intermittent recruitment of successful year classes; and (vi) spawning that may not occur every year. As a result, many deep-water marine living resources have low productivity and are only able to sustain very low exploitation rates. Also, when these resources are depleted, recovery is expected to be long and is not assured. The great depths at which marine living resources are caught by DWFs on the high seas pose additional scientific and technical challenges in providing scientific support for management. Together these factors mean that assessment and management have higher costs and are subject to greater uncertainty (FAO, 2009). In most cases, reliable information on stock status and fisheries production potential has lagged considerably behind exploitation.

In the NE Atlantic this has been exacerbated by the fact that until 2003 most fisheries were completely unregulated, in spite of concerns regarding declining deep-water stocks expressed by ICES from the mid-1990s onwards (ICES, 1994; 1996). This concern, coupled with pressure from Non-Governmental Organisations (NGOs), resulted in 2002 in the introduction of specific European Union (EU) deep-water fisheries management measures. Prior to 2003 there was largely a policy vacuum but since then policy, both internally within the EU and externally in bodies such as the United Nations General Assembly (UNGA), has developed considerably as concerns regarding the sustainability of deep-water fisheries and the impact of fisheries on the deep-water ecosystem have intensified.

The deep-water fisheries in the NE Atlantic fall under the management policy remit of the Northeast Atlantic Fisheries Commission (NEAFC) for international waters and sovereign states within their national exclusive economic zones (EEZs). In the NE Atlantic the latter include:-

- the EU Common Fisheries Policy for EU waters;
- Faroese national fisheries policy and regulation within Faroese waters;
- Greenlandic national fisheries policy and regulation for waters around east Greenland;

- Icelandic national fisheries policy and regulation within Icelandic waters;
- Norwegian national fisheries policy and regulation within Norwegian Waters;

The OSPAR Convention is the current legal instrument guiding international cooperation on the protection of the marine environment of the NE Atlantic.

It is not possible here to review all policy drivers relevant to the deep sea in the NE Atlantic, as much of the national state policy is not readily available in English. So here I focus on, firstly, presenting the salient features relevant to DEEPFISHMAN of recent World Summits, UNGA resolutions, FAO guidelines and Plans of Action (POA), EU (including communications from the Commission on future policy) and OSPAR policy drivers. This, I hope will be useful to DEEFISHMAN participants who may not be fully conversant with the details of policy. However, there are inherent dangers when summarizing complex policy documents, so I present them in abbreviated form leaving the subtle checks and balances (bearing in mind that much of policy is drafted by lawyers) intact. Policy regarding sovereignty (Law of the Sea etc), deep-water mining and oil exploration, some of which is relatively new, is not addressed as it is considered to be outside the remit of DEEPFISHMAN. Management and monitoring measures introduced in response to policy drivers, by NEAFC, for example, and Commission discussion documents regarding the impending review of the EU Deep-water access regime are also not described. These are addressed in the DEEPFISHMAN review of monitoring, assessment and management of deep-water stocks/fisheries in the north Atlantic.

Secondly, I give an overview and discussion of the likely issues arising from policy drivers that we may have to address in DEEPFISHMAN. Please note this should be treated by all as a starting point for further discussions as the project progresses.

Summary of the salient features of the main policy drivers

World Summit Resolutions

These apply universally to all fisheries including deep-water fisheries and are as follows:-

Extract of the Implementation Plan adopted at the World Summit on Sustainable Development (WSSD), Johannesburg (2002) states that to achieve sustainable fisheries, the following actions are required at all levels:

- (a) Maintain or restore stocks to levels that can produce maximum sustainable yield (MSY) with the aim of achieving these goals for depleted stocks on an urgent basis and where possible not later than 2015;
- (b) Ratify or accede to and effectively implement the relevant UN and associated regional fisheries agreements, noting United Nations Convention on the Law of the Sea (UNCLOS) (1982) relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks and the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993);

- (c) Implement the 1995 Code of Conduct for Responsible Fisheries (1995), taking note of the relevant international POA and FAO technical guidelines;
- (d) Urgently develop and implement national and appropriate regional POAs, to put into effect the international FAO POAs, in particular the International POA for the Management of Fishing Capacity by 2005 and the International POA to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing by 2004. Establish effective monitoring, reporting and enforcement, and control of fishing vessels, including by flag States;
- (e) Eliminate subsidies that contribute to illegal, unreported and unregulated fishing and to over-capacity, while completing the efforts undertaken at the World Trade Organization (WTO) to clarify and improve its disciplines on fisheries subsidies, taking into account the importance of this sector to developing countries.

United Nations General Assembly Resolutions

The UNGA resolutions relating to deep-water fisheries in the main apply to international waters, which in the NE Atlantic are managed by NEAFC. However, these resolutions do influence policy in national EEZs.

UNGA Resolution 61/222, Oceans and the Law of the Sea (March 2007) calls upon States that have not done so to become parties to the Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (“the Fish Stocks Agreement”). It reaffirms the need for States and Regional Fisheries Management Organisations (RFMOs) to urgently consider ways to integrate and improve the management of risks to the marine biodiversity of seamounts, cold water corals, hydrothermal vents and certain other underwater features. This resolution also reaffirms the need for States to continue their efforts to develop and facilitate the use of diverse approaches and tools for conserving and managing vulnerable marine ecosystems (VMEs), including the possible establishment of marine protected areas (MPAs), and the development of representative networks of any such MPAs by 2012. Noting the Convention on Biological Diversity, States and RFMOs are encouraged to assess scientific information on, and compile ecological criteria for the identification of marine areas that require protection, in light of the objective of the World Summit on Sustainable Development. This resolution also calls upon States and RFMOs to urgently take action to address destructive practices that have adverse impacts on marine biodiversity and ecosystems, including seamounts, hydrothermal vents and cold water corals. States, individually or in collaboration with each other or with relevant international organizations and bodies, are encouraged to improve their understanding and knowledge of the oceans and the deep sea, including, in particular, the extent and vulnerability of deep sea biodiversity and ecosystems, by increasing their marine scientific research activities.

*UNGA Resolution 61/105, deep-water high seas fisheries (March 2007)*¹, requires States to make available through the FAO a list of those vessels flying their flag authorized to conduct

¹ There is some overlap between Resolutions 61/222 and 61/105 particularly in relation to VMEs, however the former encourages the use of MPAs as measure to protect VMEs and specifically calls for increased marine scientific research into, and actions to address, destructive practises on deep-water biodiversity and ecosystems

bottom fisheries in areas beyond national jurisdiction². In addition, RFMOs are required to implement measures to regulate bottom fisheries in accordance with the Precautionary Approach (PA), the Ecosystem Approach (EA) and international law, not later than 31 December 2008, involving:

- (a) To assess whether individual bottom fishing activities would have serious adverse impacts (SAIs) on VMEs, and to ensure that if it is assessed that these activities would have SAIs, they are managed to prevent such impacts, or not authorized to proceed;
- (b) To identify VMEs and determine whether bottom fishing activities would cause SAIs to such ecosystems and the long-term sustainability of deep sea fish stocks, by improving scientific research and data collection and through new and exploratory fisheries;
- (c) Where VMEs, including seamounts, hydrothermal vents and cold water corals, are known to occur or are likely to occur, to close such areas to bottom fishing and ensure that such activities do not proceed unless conservation and management measures have been established to prevent SAIs on VMEs;
- (d) Requires members of RFMOs to require vessels flying their flag to cease bottom fishing activities in areas where, in the course of fishing operations, VMEs are encountered, and to report the encounter so that appropriate measures can be adopted in respect of the relevant site.

FAO Guidelines

The FAO, in response to requests for guidance on the application of above UNGA resolutions, published in 2009 the *FAO International Guidelines for the Management of Deep-water Fisheries (DWFs) in the High Seas*. These provide guidance on management factors ranging from an appropriate regulatory framework to the components of a good data collection programme. They identify key management considerations and measures necessary to ensure the conservation of target and non-target species, as well as affected habitats. The guidelines are voluntary and have been developed for fisheries that occur in areas beyond national jurisdiction where the total catch includes species that can only sustain low exploitation rates and the fishing gear is likely to contact the seafloor during the normal course of fishing operations. States and RFMOs should consider, as appropriate, the application of elements of the Guidelines to fisheries targeting medium productivity species. Coastal States (CSs) may apply these Guidelines within their national jurisdiction, as appropriate. The main objectives of the management of DWFs are to promote responsible fisheries that provide economic opportunities while ensuring the conservation of marine living resources and the protection of marine biodiversity, by ensuring the long-term conservation and sustainable use of marine living resources in the deep seas and preventing SAIs on VMEs. In order to achieve these objectives, States and RFMOs should adopt and implement measures in accordance with (i) the PA, (ii) an EA to Fisheries (EAF) and (iii) in conformity with the relevant rules of international law. States and RFMOs should also recognise the need, in managing DWFs, to:

² The primary outcome arising from this was an FAO “Worldwide review of bottom fisheries on the high seas” (Bensch *et al*, 2008).

- (a) adopt measures necessary to ensure the conservation of target and non-target species, including relevant reference points, as well as measures for the prevention of SAIs on VMEs and the protection of the marine biodiversity that these ecosystems contain;
- (b) identify areas or features where VMEs are known or likely to occur, and the location of fisheries in relation to these areas and features;
- (c) develop data collection and research programmes to assess the impact of fishing on target and non-target species and their environment;
- (d) base the management of DWFs on the best scientific and technical information available taking into account fishers knowledge, where appropriate;
- (e) develop and use selective and cost-effective fishing methods and promote efforts to further improve such selectivity, recognizing the difficulties of managing fisheries with mixed species or high bycatch;
- (f) implement and enforce conservation and management measures through effective monitoring, control and surveillance (MCS);
- (g) take appropriate measures to address the problems of overcapacity, overfishing and IUU fishing, and
- (h) ensure transparency and public dissemination of information, in accordance with appropriate standards for confidentiality, as well as enable participation of relevant stakeholders.

The risks to a marine ecosystem are determined by its vulnerability, the probability of a threat occurring and the mitigation means applied to the threat. The vulnerability of marine ecosystems is related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame. The most vulnerable ecosystems are those that are both easily disturbed and very slow to recover, or may never recover. The vulnerability of populations, communities and habitats must be assessed relative to specific threats. Some features, particularly those that are physically fragile or inherently rare, may be vulnerable to most forms of disturbance, but the vulnerability of some populations, communities and habitats may vary greatly depending on the type of fishing gear used or the kind of disturbance experienced.

SAIs are those that compromise ecosystem integrity (i.e. ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts should be evaluated individually, in combination and cumulatively. Temporary impacts are those that are limited in duration and that allow the particular ecosystem to recover over an acceptable time frame. Such time frames should be decided on a case-by-case basis and should be in the order of 5-20 years, taking into account the specific features of the populations and ecosystems. In determining whether an impact is temporary, both the duration and the frequency at which an impact is repeated should be considered. If the

interval between the expected disturbances of a habitat is shorter than the recovery time, the impact should be considered more than temporary. In circumstances of limited information, States and RFMOs should apply the PA in their determinations regarding the nature and duration of impacts.

Regarding stock assessment, appropriate monitoring and assessment techniques are needed to reliably determine the status of stocks of low-productivity species. Considering the data limitations regarding many deep-water species, lower cost or innovative methods based on simpler forms of monitoring and assessment need to be developed. Such techniques should quantify uncertainty in stock assessments, including that resulting from such data limitations and simplified approaches.

National or international cooperative observer programmes should be implemented for all DWFs. Observer coverage for established fisheries, at levels adequate to ensure effective monitoring and assessment and in combination with other MCS tools, should be determined by RFMOs with competence over those fisheries. Higher levels of coverage are required, in particular for experimental and exploratory stages of a fishery's development under a RFMO. In the latter case, levels of coverage should remain high until measures in place to manage these fisheries and prevent significant adverse impacts are evaluated and determined to be effective.

Precautionary conservation and management measures, including catch and effort controls, are essential during the exploratory phase of a DWF, and should be a major component of the management of an established DWF. They should include measures to manage the impact of the fishery on low-productivity species, non-target species and sensitive habitat features. Implementation of a PA to sustainable exploitation of DWFs should include the following measures:

- (a) precautionary effort limits, particularly where reliable assessments of sustainable exploitation rates of target and main bycatch species are not available;
- (b) precautionary measures, including precautionary spatial catch limits where appropriate, to prevent serial depletion of low productivity stocks;
- (c) regular review of appropriate indices of stock status and revision downwards of the limits listed above when significant declines are detected;
- (d) measures to prevent SAIs on VMEs; and
- (e) comprehensive monitoring of all fishing effort, capture of all species and interactions with VMEs.

States and RFMOs should develop and adopt fishery management plans for specific DWFs, including a set of measures with defined long-term/multi-annual management objectives. Such plans should be tailored to the characteristics of each fishery and should include biological reference points (BRPs) set at levels that ensure, at a minimum, that fish stocks are harvested at levels that are sustainable in the long term. Appropriate BRPs for stock assessment and management need to be set in a precautionary manner and determined on a case-by-case basis, taking into account the different target stocks, fishery characteristics, and

the state of knowledge about the species and fishery. In general, for low-productivity species, fishing mortality (F) should not exceed the estimated or inferred natural mortality (M). Sustainable management strategies that would be robust to uncertainties are likely to require low exploitation rates. Appropriate procedures should be put in place to verify that fishery management plans achieve sustainable fisheries and protect VMEs and the marine biodiversity that these ecosystems contain.

FAO International Plans of Action

The FAO International Plan of Action (IPOA) for reducing incidental catch of Seabirds in longline fisheries (IPOA-SEABIRDS, 1998), states that seabirds can be caught incidentally in various commercial longline fisheries in the world, including those for Greenland halibut, tusk and ling in the northern Atlantic, where the main seabird bycatch is northern fulmar. The IPOA-SEABIRDS is voluntary and applies to the waters of RFMOs and States where longline fisheries are being conducted. States/RFMOs should determine if a problem exists with respect to incidental catch of seabirds and adopt a POA for reducing the incidental catch of seabirds in longline fisheries. States/RFMOs which determine that a POA is not necessary should review that decision on a regular basis, particularly taking into account changes in their fisheries, such as the expansion of existing fisheries and/or the development of new longline fisheries. If, based on a subsequent assessment, States determine that a problem exists, they should follow the recommended procedures outlined in IPOA-SEABIRDS within two years. States/RFMOs should start the implementation of the IPOA-SEABIRDS no later than 2001.

The FAO International Plan of Action for the conservation and management of sharks (IPOA-SHARKS) (1998) states that for centuries artisanal fishermen have conducted sustainable fishing for sharks in coastal waters, and some still do. However, during recent decades modern technology in combination with access to distant markets have caused an increase in effort and yield of shark catches, as well as an expansion of the areas fished. There is concern over the increase of shark catches and the consequences which this has for the populations of some shark species in several areas of the world's oceans. This is because sharks often have a strong stock and recruitment relationship, long recovery times in response to over-fishing (low biological productivity because of late sexual maturity; few off-spring, albeit with low M) and complex spatial structures (size/sex segregation and seasonal migration).

The current state of knowledge of sharks and the practices employed in shark fisheries cause problems in the conservation and management of sharks due to lack of available catch, effort, landings and trade data, as well as limited information on the biological parameters of many species and their identification. It is necessary to better manage directed shark catches and certain multispecies fisheries in which sharks constitute a significant bycatch. In some cases the need for management may be urgent. A few countries have specific management plans for their shark catches and their plans include control of access, technical measures including strategies for reduction of shark bycatches and support for full use of sharks. However, given the wide-ranging distribution of sharks, including on the high seas, and the long migration of many species, it is increasingly important to have international cooperation and coordination of shark management plans. At the present time (1998) there are few international management mechanisms effectively addressing the capture of sharks.

The FAO IPOA-SHARKS is voluntary and has been developed within the framework of the Code of Conduct for Responsible Fisheries. All concerned RFMOs/States are encouraged to implement it. The term “shark” is taken to include all species of sharks, skates, rays and chimaeras (Class *Chondrichthyes*), and the term “shark catch” is taken to include directed, bycatch, commercial, recreational and other forms of taking sharks. The IPOA-SHARKS encompasses both target and non-target catches.

Management and conservation strategies should aim to keep total F for each stock within sustainable levels by applying the PA. Management and conservation objectives and strategies should recognize that in some low-income food-deficit regions and/or countries, shark catches are a traditional and important source of food, employment and/or income. Such catches should be managed on a sustainable basis to provide a continued source of food, employment and income to local communities. The objective of the IPOA-SHARKS is to ensure the conservation and management of sharks and their long-term sustainable use.

RFMOs/States should adopt a plan of action for conservation and management of shark stocks (*Shark-plan*) by 2001 if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries. RFMOs/States should carry out a regular assessment of the status of shark stocks subject to fishing so as to determine if there is a need for development of a shark plan. The assessment would necessitate consistent collection of data, including commercial data and data leading to improved species identification and, ultimately, the establishment of abundance indices.

A *Shark-plan* should aim to:

- Ensure that shark catches from directed and non-directed fisheries are sustainable;
- Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;
- Identify and provide special attention, in particular to vulnerable or threatened shark stocks;
- Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives;
- Minimize unutilized incidental catches of sharks;
- Contribute to the protection of biodiversity and ecosystem structure and function;
- Minimize waste and discards from shark catches (for example, requiring the retention of sharks from which fins are removed);
- Encourage full use of dead sharks;
- Facilitate improved species-specific catch/landings data and monitoring of shark catches;

- Facilitate the identification and reporting of species-specific biological and trade data.

RFMOs/States which implement a *Shark-plan* should regularly, at least every four years, assess its implementation for the purpose of identifying cost-effective strategies for increasing its effectiveness. The *Shark-plan* should contain a description of the prevailing state of shark stocks, populations, associated fisheries and the monitoring and management framework and its enforcement.

EU Policy

EU policy relating to fisheries, ecosystems and the environment is evolving on an ongoing basis, and I think it is useful to summarise policy drivers in chronological order so that the reader can follow how policy has evolved.

The Habitats Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC 1992) states that in the European territory of Member States (MSs) natural habitats are continuing to deteriorate and an increasing number of wild species are seriously threatened. In order to ensure the restoration or maintenance of natural habitats and species of Community interest at a favourable conservation status, it is necessary to create a coherent European ecological network of special areas of conservation (SACs) under the title Natura 2000. This network, composed of sites hosting specified natural habitat types and habitats of specified species, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.

On the basis of specified criteria and relevant scientific information, each MS shall propose a list of sites indicating which natural habitat types and which species in that are native to its territory the sites host. For aquatic species which range over wide areas, such sites will be proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction.

For SACs, MSs shall establish the necessary conservation measures involving, if required, appropriate management plans specifically designed for the sites or integrated into other development plans. MSs shall take appropriate steps to avoid, in the SACs, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated³.

Implementing sustainability in EU fisheries through maximum sustainable yield – Communication from the Commission to the Council and the European Parliament (EP) COM (2006): The Community and its MSs have subscribed to a commitment at the WSSD at Johannesburg (2002) to maintain or restore stocks to levels that can produce the MSY, with the aim of achieving these goals for depleted stocks on an urgent basis, and where possible not later than 2015. MSY is characterized by a level of F that will, on average, result in a stock size that produces the MSY.

³ There are currently no deep-water species listed. Of the natural habitat types of community interest which may require designation of SACs, in deep-water these comprise reefs and submarine structures made by leaking gases.

This accelerates a move towards a longer-term management system that focuses on obtaining the best from the productive potential of Europe's living marine resources, without compromising its use by future generations. This is fully consistent with the broader objective of the CFP. This movement should be also seen in the context of the gradual implementation of the EAFM, which is also an objective of the CFP.

Financial assistance, such as that foreseen under the proposal for a European Fisheries Fund (EFF), would help mitigate the social and economic repercussions of such restraint and will need to be delivered during the transitional phase before the full economic benefits are achieved.

Catches of many bottom-living European fish stocks have declined dramatically in recent decades. There has simply been too much fishing in relation to the productive potential of the stocks. The Commission considers that implementing fish stocks management systems based on the MSY will contribute to reverse this situation. In addition to ensuring that stocks would not collapse, it would allow the development of larger fish stocks, leading to more fishing possibilities at lower cost and with a higher unit value, providing a greater guarantee of wealth. Fishing at MSY levels would reduce costs and increase profits for the fishing industry, as the amount of effort (and associated costs, such as fuel) required per tonne of fish caught decreases. Larger fish stocks will also provide a buffer against changes in the number of young fish that join the stock each year that occur due to environmental factors. Fish from stocks managed at near-MSY levels benefit from competitive advantages of stable supply and high quality (because investment in product handling is worthwhile since long-term prospects are more stable).

Reducing F is the best single solution to the discard problem. Fish are discarded because they have been brought on board a fishing vessel when they are too small, of too low value or else are not caught within the available quota. When fishing at MSY levels, the proportion of large and high value fish in the catch is greater. For each tonne of marketable fish landed there will be less fish that must be discarded.

Fishing for commercial species can often also disturb habitats and harm non-commercial species, including dolphins and porpoises. Reducing F from current levels towards MSY levels will reduce the by-catch of such non-target species.

In order to allow fish to grow more, and achieve a higher value and yield when they are caught, there is a need to reduce the proportion of fish that are captured from the sea. Initially this would mean reducing catches, but as stocks become healthier, catches will increase to higher levels in a sustainable manner.

In order to enable fishermen to take the MSY from a stock it is necessary to define which target rate of fishing is appropriate for each stock on the basis of the best available scientific advice. There is also need to decide on the rate at which annual adjustments will be made to reach this target. These decisions should be implemented through long term plans as foreseen under the framework regulation of the CFP.

It is highly uncertain how marine ecosystems will develop in relation to changes in climate and weather. Exploiting fish stocks at a lower rate of fishing will make stocks more robust to ecological changes. As F s are reduced and stocks rebuilt, more knowledge will be gained

and the targets for long-term management must be adjusted to take account of new knowledge that is gained about ecosystems and their productive potential.

It is important to keep marine ecosystems in balance. Fishing down one species in order to favour the yield of another would be a high-risk approach where economic activity would depend on fewer resources and be more vulnerable to stock depletions.

Fishing on all species in an ecosystem should normally take place at a rate that is less than the rate of fishing that corresponds to obtaining a MSY in the long run.

Long-term plans should be the prime instrument to implement this new approach. The Commission considers that plans should be prepared in the following way:-

- in consultation with concerned sectors, fishermen, consumers and other stakeholders.
- economic, social and environmental impacts of proposed measures be taken into account;
- they should define a target rate of fishing, and a means to reach that target gradually and not seek to manage biomass levels;
- the plans should also aim at diminishing any harmful impact of fishing on the ecosystem;
- where different stocks are normally caught together, the plans should include technical measures to ensure fishing of all the stocks in compatibility with their respective targets;
- the plans may also cover the possibility of exploiting some stocks more lightly than at MSY levels in order to achieve some gain in productivity of other species;
- the plans should establish targets irrespective of the biological condition of the stock when the plans enter into force, though the plans may require stronger conservation measures in the event that a resource is more depleted;
- where, due to lack of data or other circumstances, scientific advice cannot quantify the actions needed to reach MSY conditions, the plans should specify appropriate guidelines;
- the plans, and their targets, must be subject to periodic review.

Once long term plans establishing adequate stock targets are adopted, MSs will have to decide on the pace of change to reach these objectives, and how to manage the transition. There are two broad approaches for managing this change:-

- (1) by reducing fishing capacity, investment and employment to no more than what is needed to fish at the MSY rate. Catches would be larger, fishing fleets would be smaller, fewer fishermen would be employed (although onshore processing employment might increase), fishing would be more profitable and fisheries regulation simpler and less burdensome.
- (2) by maintaining the size of the fleet but reducing the efficiency of fishing, by limiting the vessels' capacity to catch fish (e.g. by limiting its size, power or fishing gear) or imposing

limitations on days-at-sea. Compared with present conditions, overall catches would be larger, fishing fleets would be subject to more restrictive regulations, employment and vessel activity would be more part-time, but fishing would be more profitable because catches would be maintained but variable costs (e.g. fuel costs) would be reduced. Changing to smaller-scale fisheries with lower levels of fishing efficiency could also bring increased yields while having less direct effect on employment at sea. Maintaining employment can be compatible with reducing rates of fishing by moving to less capital intensive forms of fishing.

The former implies reducing the capacity of national fleets, which the Commission considers is the most easily controllable fisheries management measure. Under either approach, change can be managed more easily if it occurs gradually. The choice of economic strategy for the fisheries sector is a national decision. The main role of the Community in this context is to provide the management framework for phasing out overfishing. The Community could also support structural change in the fisheries sector through the current Financial Instrument for Fisheries Guidance (FIFG) and the proposed EFF.

Analyses of the economic and social effects of significant changes in fisheries management are obviously necessary before such changes are made. However, the specifics of each fleet can vary greatly between the MSs and between different fisheries. Because of this diversity, a general social and economic impact evaluation is not feasible. Instead the Commission proposes to follow a regional and fishery-specific approach. The Council will have an opportunity to consider the strategy for each fishery in the light of the Commission's impact analysis and the opinion of the Regional Advisory Councils (RACs).

Over the coming years the Commission will propose long-term plans with the aim of bringing all major fish stocks in Community waters to rates of fishing at which MSYs can be achieved. For stocks jointly managed with third countries, the Community will seek to develop joint management arrangements with the same objective. The plans will be fishery-based, addressing groups of fish stocks that are caught together. The main guiding principles for their development will be the following:

- (a) the long-term plans will include programmed reductions in fishing rates, effected principally through adjustments to Total Allowable Catches (TACs) and effort management, but also incorporating technical measures where appropriate;
- (b) the plans could include elements such as limits on the extent to which fishing opportunities can change from one year to the next;
- (c) long-term plans should be updated at intervals of around 5 years;
- (d) long-term plans will where appropriate include milestones to be used to measure the progress of the plan towards the achievement of MSY.

As a first step in this process, the Community should, with effect from 2007, adopt management decisions that ensure that there is no increase in the fishing rate for any stock that is already overfished. This process will be without prejudice to other measures, such as recovery plans, taken in accordance with the PA to reduce risks of stock depletions in the short term.

A policy to reduce unwanted by-catches and eliminate discards in European fisheries COM (March 2007): Discarding is a serious problem in European fisheries and one which, in the view of the Commission, must be addressed as a high priority. The objective of this Communication is to initiate a policy which will reduce unwanted by-catches and progressively eliminate discards in European fisheries.

A new discard policy will reduce unwanted by-catches by encouraging behaviour and technologies which avoid unwanted by-catches. The instruments are a progressive introduction of a discard ban – where all finfish and crustaceans caught will have to be landed – and supplementary measures such as encouragement to improve the selectivity of fishing gear, requirements to change fishing ground and real time closures.

The basic implementation principle is to regulate what is caught in the first place rather than to regulate landings. Such results-based management will, wherever possible, will be left to the industry to identify technical solutions which are economically and practically feasible and produce the required results.

The FAO defines discards as “that proportion of the total organic material of animal origin in the catch, which is thrown away, or dumped at sea for whatever reason. It does not include plant material and post harvest waste such as offal. The discards may be dead or alive”. Discards may consist of species which are commercially exploited but which, due to market considerations, quota restrictions or minimum landing sizes, are not taken ashore. Discards may, according to this definition, also be any other organism which is caught incidentally such as non-target finfish, crustaceans, molluscs, sea mammals and seabirds.

The capture of unwanted by-catches and their subsequent discarding has several negative consequences. The capture of juvenile individuals of target species results in lower catch opportunities for those species in the future and a reduction in the spawning biomass for the future. Discarding of mature individuals of target species represents a waste and immediately reduces the spawning biomass of that stock.

The capture and discard of fish, crustacean, seabird or sea mammal species which are not targeted by fisheries, is an unnecessary negative impact on the marine ecosystem as it affects the functioning of the ecosystem and its biodiversity negatively without providing any benefits to society. Certain marine organisms including some species of sharks and rays are very sensitive to fishing and may as a result be reduced to very low levels even when they are only caught as unwanted by-catch. In such cases the incidental killing of even a few individuals may be critical from a biodiversity perspective. Returning unwanted by-catches back into the sea does not reduce the problem because most species of fish and crustaceans will be dead or have low survival in the sea after having been caught and then discarded.

There are strong economic incentives in many fisheries to discard fish to maximise the value of the landing, so called 'high-grading', in particular when different sizes or qualities of fish command different market prices or when species with very different market value are caught together. Furthermore, the value of some organisms may be low or non-existent because they do not have a market.

Some regulatory instruments which are currently used lead inevitably to discards. The reliance on TACs as the main management instrument in mixed fisheries leads to discards when above-quota quantities of some species are taken while there is still quota left over for others. The use of minimum landing sizes also leads to discards, especially in mixed fisheries where species of different adult size are caught together.

A policy to reduce unwanted by-catches through a discard ban on commercial species has been introduced in some fisheries in Norway, Iceland, Canada and New Zealand. The experiences from these cases largely relate to fisheries which are able to target one species at a time and the complications arising in fisheries which catch a mixture of species are not encountered.

In the Community there are many demersal fisheries that catch several species simultaneously. The reduction of unwanted by-catches and progressive elimination of discards in European fisheries will therefore require a combination of several instruments. A new discard policy aims to remove the practice of discarding. This will be achieved in EU waters on a fishery by fishery basis through tailored plans that could include discard bans and other supplementary measures to reduce by-catch. At the same time, the Community will promote initiatives for elimination of discards in RFMOs.

Discard bans would apply to all finfish and crustaceans. Exceptions may be made where high long-term survival of specific species discarded from specific fisheries has been clearly demonstrated.

Existing management measures which presently encourage discarding in mixed fisheries must be reviewed and their use revised in order to reduce or remove such encouragement. The use of TACs in mixed fisheries without measures to control effort will encourage continued catch of species, for which a vessel has exhausted its quota, as long as there are species left for which it has a quota. TACs must therefore be combined with measures to keep effort within limits which will stop the fisheries when there are only quotas on a few species left for which to fish. In addition, in mixed fisheries there may be a need to develop mechanisms for some flexibility and transfer of quotas.

Minimum landing sizes presently require vessels to discard undersized fish. If a requirement to land all fish is introduced, juvenile fish should be protected against targeted fisheries by making the marketing rather than the landing of such fish illegal by introducing minimum marketing sizes for human consumption instead.

Other existing CFP instruments and supplementary measures may be used to reduce unwanted by-catches and eliminate discards. Such instruments include encouragement to develop and use selective gears, real-time area closures, an obligation to switch fishing grounds (move-on rules), quota flexibility, fees on unwanted by-catches and expropriation of unwanted by-catches.

Instead of introducing an extended set of technical regulations, an approach based on maximum acceptable impacts of fisheries operations will be used. The negative impact of fisheries to be reduced as a result of this policy is the unnecessary killing of marine organisms by fishing. Standards for maximum acceptable by-catch of non-marketable, juvenile or above-quota organisms will thus be defined on a fishery-by-fishery basis. These

standards will initially be based on a reduction relative to the present situation and will be progressively reduced further in order to encourage technological developments and adaptations of fishing practices which will avoid such by-catches.

In this approach extensive micromanagement specifications of fishing gear and fishing practices are replaced by requirements for specific results (maximum acceptable by-catch) and the industry is then left free to choose those solutions which are most compatible with the practical and economic realities of the fisheries. The approach will thus rely extensively on initiative from the industry to identify technical solutions and resolve other implementation issues.

A requirement to land all fish will mean that occasionally fish above the quota or below minimum market size will be landed. It is necessary to consider whether these landed by-catches should be counted against quotas and whether the quota system should be modified to include by-catches. The disposal of these by-catches needs to be considered – whether they will be sold through normal market systems, for human consumption (if above minimum market size), for reduction to fish meal and oil or otherwise. It has to be decided if and how a part of the proceeds of such sales could be dedicated to cover the new expenses brought in by the implementation of no discards measures, either those incurred by public authorities or by fishermen themselves.

Given the strong economic incentives for discarding it must be expected that when a by-catch reduction policy including a discard ban is imposed, discarding may still take place under circumstances where enforcement is weak or the legal consequences do not match the immediate economic benefits from discarding. For the Commission enforcement is thus a primary concern for implementation. Observer schemes will play a major role in enforcement. They can not by themselves however be a universal solution as such schemes are costly, especially when a large number of small or medium size vessels are involved. As confirmed by the experience gained in countries which have implemented discard bans, observer schemes must be part of an overall enforcement regime which must include at least:

- a careful monitoring of the landings of individual vessels combined with a systematic analysis of detailed catch and landings figures which are compared with data from observers on board;
- electronic log book schemes with almost real time reporting of the catch composition, especially when real time closure of some areas are considered;
- monitoring and control of the fishing gears;
- stakeholders' involvement and cooperation.

The monitoring and analysis of by-catches in order to implement real time closures will require that data from all fleets are compiled and analysed on an ongoing basis and that a mechanism is established whereby a Community body can communicate with the relevant MS about the need to implement closures.

The economic and social impacts of the new policy will be highly variable dependent on the specific structure and economic situation of each fishery and the dependent coastal communities. Economic and social impact assessments will therefore be made on the level of regulations for specific fisheries.

On a very general level, the progressive implementation of a policy to eliminate discards could result in net short-term cost increases and losses in income. Handling and storing by-catch of lower value has a cost and the income from the overall landing will be lower. The use of closed areas and requirements to move to other fishing grounds may imply longer distances to the fishing grounds and thus increased cruise time and fuel costs. The compulsory use of selective gears could similarly reduce short term profitability. Further impacts are to be expected further down the marketing and distribution chain, resulting from the landing and handling of fish that was so far discarded.

In the longer term there will be economic benefits as a reduction of by-catches of juvenile fish and fish above quota will result in larger and healthier stocks and thus increased fishing opportunities. Furthermore, additional markets could be created for products derived from catches which have been discarded in the past.

A possible encouragement is to introduce a preferential status such as preferential access to fisheries on the basis of track records of low by-catches.

It could be considered whether the development of changes in technology and practices which are required may be supported by the EFF. Assistance may also be given to develop alternatives for the use of previously discarded fish, in particular unavoidable by-catches of species of low or no commercial value. Assistance could be considered for the development of advanced fishing tactics on the basis of information systems to inform fleets about areas with high risk of unacceptable bycatch.

The Integrated Maritime Policy (IMP) for the European Union (COM, Oct. 2007) states that Fisheries management must take more into account the welfare of coastal communities, the marine environment and the interaction of fishing with other activities. The recovery of fish stocks will be energetically pursued, requiring sound scientific information and reinforcement of the shift to multi-annual planning. The Commission will take action to ensure that the CFP reflects the EA of the Strategy for the Marine Environment, and will work to eliminate IUU fishing in its waters and on the high seas.

Managing fish stocks at MSY will provide a better future for the European fishing community and ensure its contribution to Europe's food security; this should be achieved by 2015 in line with international commitments.

The Commission will take firm action (i) towards the elimination of discards and of destructive fishing practices such as high seas bottom trawling in sensitive habitats and (ii) to eliminate IUU fisheries.

The role of the CFP in implementing an ecosystem approach to marine management COM (April 2008): One of the operational objectives of the CFP is the progressive implementation of an Ecosystem Approach to Fisheries Management (EAFM). The IMP constitutes the overall framework for integrated action in the maritime field, and the Marine Strategy Framework

Directive (MSFD), forms the basis for implementing an EA to the marine environment. Specifically for fisheries, the FAO states that the purpose is “to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options of future generations to benefit from the full range of goods and services provided by marine ecosystems”. The EA is defined by the Commission as one that “strives to balance diverse social objectives, by taking into account knowledge and uncertainty about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries”.

Based on more general definitions of the CBD and of ICES, these definitions make it clear that an EA is an instrument to pursue sustainable development in its three dimensions, which also form part of the objectives of the EU Sustainable Development Strategy, namely environmental protection, social equity and cohesion and economic prosperity, and which are enshrined in the CFP.

The Commission’s understanding is that an EAFM is about ensuring goods and services from living aquatic resources for present and future generations within meaningful ecological boundaries. Such fisheries management will strive to ensure that benefits from living marine resources are high while the direct and indirect impacts of fishing operations on marine ecosystems are low and not detrimental to the future functioning, diversity and integrity of these ecosystems.

An EA therefore continues from the earlier “paradigm of limits” of traditional fisheries management focusing on the target resource. However, the concept of “limits” no longer considers only the impacts on a target population, but rather the fact that all ecosystems have limits which, when exceeded, can result in major ecosystem change. Boundaries for impacts from fishing are ecologically meaningful if harvested populations are kept within ecologically viable levels, if biological diversity is maintained and if impacts on the structure, processes and functions of the ecosystem are kept at acceptable level. In addition, since fishing interacts with other human activities and their consequences relating to the seas, these interactions must also be considered.

The task of fisheries management within an EA in an EU context is to:

- (1) keep direct and indirect impacts of fisheries on marine ecosystems within bounds in relation to healthy marine ecosystems and ecologically viable fish populations by including all the knowledge available about the interactions between fisheries and marine ecosystems in decisions under the CFP, and
- (2) ensure that actions taken in fisheries are consistent with and supportive of actions taken under the cross-sectoral Marine Strategy and Habitats Directive

Within the overall objective of the EA, specific objectives need to be defined regarding ecosystem services (i.e. the social and economic benefits from fisheries) and meaningful ecological boundaries for fisheries impacts (i.e. keeping populations within viable levels, maintaining biological diversity and keeping impacts on the structure, processes and functions of the ecosystem at acceptable levels).

A starting point for action is the description of ecosystems and their structure, processes and functions using all available knowledge. An important part will also be continuing and expanding the current assessment of the status and trends of fish stocks and of the impact of fishing on ecosystems. These assessments need to be updated all the time as more information becomes available. The scientific bodies consulted for advice in the preparation of fisheries management measures build on long time series of relevant knowledge about stock development and effects of management measures and they are already considering ecosystem-relevant information in their assessments.

Most European fishing fleets have a fishing activity which exceeds the activity required for fisheries to be sustainable even if sustainability is only considered from the limited perspective of the single stocks of fish which are targeted by the fleets. The main instruments to act on the overall fishing pressure are long-term management plans building on the WSSD requirement to rebuild fish stocks to MSY levels.

Beyond such a general reduction of fisheries impacts on the ecosystem the following specific issues need to be addressed:

There is a need to protect sensitive marine habitats. All habitats which are in physical contact with fishing gear are affected. While some bottom types and the organisms dependent on them may be robust to such impacts, there are also habitats where the impacts of contact with fishing gear may be very significant and long-lasting. The Natura 2000 network of marine protected areas will provide protection for representative habitats. The coordinated use of CFP instruments such as closures for specific fisheries or no-take zones will be implemented as required to achieve the objectives of the specific Natura 2000 sites.

Beyond that, specific measures are taken to reduce the mechanical impacts of fishing gear also outside such protected areas, and further measures will be taken to protect sensitive habitats when awareness of such habitats and threats to them emerge.

There is also a need to protect sensitive species killed incidentally in fishing operations and species targeted by fisheries that have been reduced to below safe biological limits.

The recovery plans are the main instrument for rebuilding stocks that are below safe limits and the new discards policy will contribute to protecting sensitive species from incidental by-catch.

Other instruments for the protection of sensitive species are regulations on the shape and use of fishing gear which diminishes incidental by-catches of such species and closures of areas where such by-catches are likely.

Lower fishing pressure and specific protection of sensitive species and habitats will diminish the impact of fisheries on ecosystem structure, diversity and functioning. There are, however, cases where specific measures may needed to be taken to prevent distortions in the food web and ensure that natural ecosystem processes are not disrupted.

Environmental drivers impact marine ecosystems and the fish stocks. Fishing may in some cases exacerbate the negative impacts of such drivers. The Intergovernmental Panel on Climate Change states that this may be the case regarding some impacts of climate on fish

stocks. It is an integral aspect of a PA that fisheries should be conducted in a way which is robust to environmental change and thus that fish stocks should never be exploited to a point where they are not resilient to environmental change. The Commission has specifically requested Scientific, Technical and Economic Committee for Fisheries (STECF) and ICES to incorporate any existing knowledge about environmental drivers in the assessments of the ecosystems and fisheries and in the advice.

An EA to marine management implies that multiple and often conflicting interests need to be reconciled in the process. While there may be short-term contradictions between social objectives and the requirement to conduct fisheries within meaningful ecological boundaries, such contradictions largely disappear in the long term because healthy ecosystems are a prerequisite for the continued existence of a fishing industry.

EU DIRECTIVE 2008/56/EC June 2008 - establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive (MSFD)) applies to MS national waters including deep-water areas within national EEZs, and comprises a thematic strategy for the protection and conservation of the marine environment with the overall aim of promoting sustainable use of the seas and conserving marine ecosystems. The Directive addresses all human activities that have an impact on the marine environment. The establishment of MPAs, including areas already designated or to be designated under the Habitats Directive and the Birds Directive, and under international or regional agreements to which the EC or MSs are Parties, is an important contribution to the achievement of good environmental status under the Directive. Establishing such protected areas under this Directive is an important step towards fulfilling the commitments undertaken at the WSSD and in the CBD, and will contribute to the creation of coherent and representative networks of such areas. By applying an ecosystem-based approach to the management of human activities while enabling a sustainable use of marine goods and services, priority should be given to achieving or maintaining good environmental status in the Community's marine environment.

This Directive should contribute to the fulfilment of the obligations and important commitments of the Community and MSs under several relevant international agreements relating to the protection of the marine environment from pollution, including the Conventions for the Protection of the Marine Environment of the NE Atlantic (Council Decision 98/249/EC) and the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area (Council Decision 2000/340/EC). Importantly, the achievement of the objectives of this Directive should ensure the integration of conservation objectives, management measures and monitoring and assessment activities set up for spatial protection measures such as special areas of conservation (SACs), special protection areas (SPAs) or MPAs. Account should also be taken of biodiversity and the potential for marine research associated with deep-water environments.

The Directive establishes a framework within which MSs shall take the necessary measures to achieve or maintain good environmental status in the marine environment by the year 2020 at the latest. Marine strategies shall be developed and implemented in order to:

- (a) protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected;

- (b) prevent and reduce inputs in the marine environment, with a view to phasing out pollution, so as to ensure that there are no significant impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea.

Marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations.

For the NE Atlantic (along with other designated areas), MSs shall make an initial assessment of their marine waters by 15 July 2012, taking account of existing data where available and comprising the following:

- (a) an analysis of the essential features and characteristics, and current environmental status of those waters and covering the physical and chemical features, the habitat types, the biological features and the hydro-morphology;
- (b) an analysis of the predominant pressures and impacts, including human activity, on the environmental status of those waters which:
 - (i) is based on an indicative lists of elements and covers the qualitative and quantitative mix of the various pressures, as well as discernible trends;
 - (ii) covers the main cumulative and synergetic effects; and
 - (iii) takes account of the relevant assessments which have been made pursuant to existing Community legislation;
- (c) an economic and social analysis of the use of those waters and of the cost of degradation of the marine environment.

The qualitative descriptors for determining good environmental status are that:-

- (1) Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions;
- (2) Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems;
- (3) Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock;
- (4) All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity;

- (5) Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters;
- (6) Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected;
- (7) Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems;
- (8) Concentrations of contaminants are at levels not giving rise to pollution effects;
- (9) Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards;
- (10) Properties and quantities of marine litter do not cause harm to the coastal and marine environment;
- (11) Introduction of energy, including underwater noise, is at levels that does not adversely affect the marine environment.

The time frame of MSFD is as follows:

To be completed by 15 July 2012:-

- completion of an initial assessment of the waters concerned;
- a determination of good environmental status (GES);
- establishment of environmental targets and associated indicators.

To establish and implement by 15 July 2014 a monitoring programme for ongoing assessments and regular updating of the targets

To develop by 2015 at latest a programme of measures designed to achieve or maintain GES and to put in operation the programme of measures by 2016 at latest

EC GREEN PAPER Reform of the Common Fisheries Policy April 2009 states that European fish stocks have been over-fished for decades and the fishing fleets remain too large for the available resources. The outcome has been a continuous decrease in the amounts of seafood fished from Europe's waters: more than half of the fish consumed on the European market is now imported. The high volatility of oil prices and the financial crisis have exacerbated the low economic resilience of fishing.

The fisheries sector can no longer be seen in isolation from its broader maritime environment and from other policies dealing with marine activities. Fisheries are heavily dependent on access to maritime space and to healthy marine ecosystems. Climate change is

already having an impact on Europe's seas and is triggering changes to the abundance and distribution of fish stocks. Competition for maritime space is also on the rise as ever larger parts of our seas and coasts are dedicated to other uses. Fishing economies are heavily influenced by broader trends of employment and development in coastal communities, including the emergence of new sectors offering opportunities for conversion or income diversification.

It is argued, therefore, that the proposed reform of the CFP must not be yet another piecemeal, incremental reform but a sea change addressing the core reasons behind the vicious circle in which Europe's fisheries have been trapped in recent decades. Rethinking the CFP therefore requires a fresh look at the broader maritime picture as advocated by the IMP, the MSFD and the WSSD requirement to restore fish stocks to MSY. Important steps have also been taken in the UN to limit the impact of fisheries in the high seas. Consumers, processing and retail sectors increasingly share these concerns and require guarantees that the fish they consume and sell originates from well-managed and sustainable fisheries.

European fishing activities must be clearly based on economically rational principles. Fleets must improve their economic resilience and adapt to changes in the environment and markets. Some steps are being taken to adapt including voluntary laying-off of vessels and a move towards less fuel-intensive fishing practices. Some initiatives have been undertaken to improve quality, consumer information and the match between supply and demand in order to increase economic viability. These steps, however, fall far short of what is necessary to adapt to change and restore the economic viability of the sector.

While a few EU fleets are profitable with no public support, most of Europe's fishing fleets are either running losses or returning low profits. Overall poor performance is due to chronic overcapacity. Capacity reductions in recent years have not been sufficient to prevent this. Another important consequence of overfishing, overcapacity and low economic resilience is high political pressure to increase short-term fishing opportunities at the expense of the future sustainability of the industry. Sustained political and economic pressure has led industry and MSs to request numerous derogations, exceptions and specific measures. In many cases, the industry has found ways to counteract the short-term negative economic effects of these measures, leading to the need for even more detailed measures. Documenting, deciding, implementing and controlling the vast and diverse European fisheries through such micromanagement is increasingly complex, difficult to understand and very costly to manage and control.

This situation has arisen in a context of heavy public financial support given to the fishing industry, one of the results being to artificially maintaining excess fishing capacity. On top of direct aid from the EFF and similar national aid schemes, the industry benefits from a number of indirect subsidies, the most important of which is the overall exemption from fuel taxes.

Unlike other industries, fishing also benefits from free access to the natural resource it exploits and does not have to contribute to the public management costs associated with its activities e.g. control and safety at sea. In several MSs, it has been estimated that the cost of fishing to the public budgets exceeds the total value of the catches.

Regarding overcapacity, the EU has repeatedly tried to implement structural measures aimed at reducing its fishing fleet, including funding for vessel scrapping schemes. However, experience shows that permanent support for scrapping does not effectively reduce capacity, as operators simply factor the scrapping premium into future investment decisions. One-off scrapping schemes are more likely to be efficient.

Use of market instruments such as transferable rights to fishing may be a more efficient and less expensive way to reduce overcapacity, and one for which the industry has to take more responsibility. Several MSs have taken steps in recent years towards using such instruments. This has generally led to more rational investment decisions and to reductions in capacity, as the operators adapt their fleet to their fishing rights in order to achieve economic efficiency. Such systems can be complemented with proper safeguard clauses to avoid excessive concentration of ownership or negative effects on smaller-scale fisheries and coastal communities.

Regarding policy objectives, the current CFP regulation states that "it shall ensure exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions". No priority is set for these objectives and, while direct references are made to adopting a PA and an EA, it is not clear how this relates to economic and social conditions. There are no clear indicators and yardsticks that could provide more concrete guidance or to help measure policy achievements. Economic and social sustainability require productive fish stocks and healthy marine ecosystems. The economic and social viability of fisheries can only result from restoring the productivity of fish stocks.

There is, therefore, no conflict between ecological, economic and social objectives in the long term. However, these objectives clash in the short term, especially when fishing opportunities have to be temporarily reduced in order to rebuild overexploited fish stocks. Social objectives such as employment have often been invoked to advocate more generous short-term fishing opportunities: the result has always been to further jeopardise the state of the stocks and the future of the fishermen who make a living out of them. It is therefore crucial that any compromises made to cushion the immediate economic and social effects of reductions in fishing opportunities remain compatible with long-term ecological sustainability, including a move to fishing within MSY, eliminating discards and ensuring a low ecological impact of fisheries. Ecological sustainability is therefore a basic premise for the economic and social future of European fisheries.

Regarding encouraging the industry to take more responsibility in implementing the CFP, there are two closely linked aspects to involving the industry more closely: responsibilities and rights.

The industry can be given more responsibility through self-management. Results-based management could be a move in this direction: instead of establishing rules about how to fish, the rules focus on the outcome and the more detailed implementation decisions would be left to the industry. Public authorities would set the limits within which the industry must operate, such as a maximum catch or maximum by-catch of young fish, and then give industry the authority to develop the best solutions economically and technically, subject to central auditing of outcomes.

Results-based management would relieve both the industry and policy-makers of part of the burden of detailed management of technical issues. It would have to be linked to a reversal of the burden of proof: it would be up to the industry to demonstrate that it operates responsibly in return for access to fishing. This would contribute to better management by making the policy considerably simpler and removing the current incentives for providing false or incomplete information.

There are already many examples of such self-management through bottom-up initiatives in the European catching sector. Some Producer Organisations (POs) manage the quota uptake of their members and provide for private penalties against those who overshoot their individual quota at the expense of others. There are examples of groups of vessels that have taken on the burden of proof by providing full documentation of their catches, often as a response to processors' and retailers' pressure to improve traceability. These initiatives could be generalised by turning the POs into bodies through which the industry takes responsibility for documentation and quota/effort management.

Giving the industry more responsibility requires that safeguard mechanisms are in place and implemented by the Community. In the context of a CFP which gives more rights to the catching sector and relieves the industry the burden of the micro-management, it will be relevant to raise the issue of sharing the costs of fisheries management. So far the fishing industry has been given free access to a public resource and management costs have been largely incurred by taxpayers.

Fisheries with their large share of small- and medium-sized companies play an important role in the social fabric and the cultural identity of many of Europe's coastal regions. Many coastal communities remain dependent on fisheries for their income, some of them with limited potential for economic diversification. It is therefore essential to secure a future for coastal, small-scale, and recreational fishermen taking fully into account the particular situation of the small- and medium-sized enterprises.

Bringing and keeping the capacity of the fishing fleets in line with fishing opportunities will inevitably lead to less overall employment in the catching sector. There is a legitimate social objective in trying to protect the most fragile coastal communities from this trend. These social concerns must be addressed in a way which does not prevent larger fleets from undergoing the necessary adaptations.

Regarding input/output management controls, most EC fisheries outside the Mediterranean are managed by setting TACs of which each MS gets a national quota. This system of management by landing quotas seems relatively simple but it has also proven suboptimal in several ways. In mixed fisheries targeting several species of fish, it creates unwanted by-catches when the quota of one species is exhausted while quotas for other species remain, which leaves fishermen with no choice but to discard the fish which they are no longer allowed to land. In addition to being a waste of precious resource, discarding has prevented several stocks from recovering in spite of low quotas. The future CFP should ensure that discarding no longer takes place. Management based on fishing effort such as limiting the days a fishing vessel can go to sea would remove this problem but it may not be sufficient to achieve the objectives of the CFP.

Regarding integrating the CFP in the broader maritime policy context, the IMP addresses interactions between all EU policies and maritime affairs. The future CFP must take this a step further with an EA to marine management, covering all sectors, as implemented through the MSFD, which sets the obligation for MSs to achieve Good Environmental Status in 2020.

Climate change will impact severely on the marine environment. Marine ecosystems and biodiversity, already under pressure from pollution and overfishing, will be further affected by warmer temperatures and acidification, with changes in species reproduction and abundance, changes in distributions of marine organisms and shifts in plankton communities. The new CFP has to play a role in facilitating climate change adaptation efforts concerning impacts in the marine environment. Climate change is an added stress on marine ecosystems which makes a reduction of fishing pressure to sustainable level even more urgent. Sustainable fishing therefore has to replace overfishing which has rendered marine ecosystems more vulnerable to climate change and thus less capable of adapting.

Birds Directive on the conservation of wild birds (Directive 2009/147/EC): A large number of species of wild birds naturally occurring in the European territory and waters of MSs are declining in number, very rapidly in some cases. This decline represents a serious threat to the conservation of the natural environment, particularly because of the biological balances threatened thereby. The species of wild birds naturally occurring in MSs are mainly migratory species. Such species constitute a common heritage and effective bird protection is typically a trans-frontier environment problem entailing common responsibilities.

The measures to be taken must apply to the various factors impacting on the abundance of birds, such as the repercussions of man's activities and in particular the destruction and pollution of their habitats, capture and killing by man and the trade resulting from such practices.

The species listed in this Directive shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. In this connection, account shall be taken of:

- (a) species in danger of extinction;
- (b) species vulnerable to specific changes in their habitat;
- (c) species considered rare because of small populations or restricted local distribution;
- (d) other species requiring particular attention for reasons of the specific nature of their habitat.

MSs shall take the requisite measures to establish a general system of protection for all species of birds listed in this Directive.

The *OSPAR Convention for the protection of the marine environment of the NE Atlantic* states that questions relating to the management of fisheries should be regulated under international

and regional agreements dealing specifically with such questions. Where OSPAR considers that action for the protection and conservation of the NE Atlantic, is desirable in relation to a question relating to the management of fisheries, it acts to draw that question to the attention of the authority or international body competent for that question. Where action within the competence of the OSPAR Commission is desirable to complement or support action by those authorities or bodies, the OSPAR shall endeavour to cooperate with them.

OSPAR Commission's Biological Diversity and Ecosystems Strategy has a very broad focus, since it is concerned with all human activities (excluding those which may cause pollution), which can have an adverse effect on the protection and conservation of the ecosystems and the biological diversity of the NE Atlantic (human activities with the potential to cause pollution are addressed by the other strategies). In addition to protecting and conserving ecosystems, the OSPAR Convention makes provision to restore, where practicable, marine areas that have been adversely affected.

The Strategy has four elements:

- Ecological quality objectives in support of the EA⁴;
- Species and habitats: assessments are made of species and habitats that are threatened or in decline and programmes and measures are developed for their protection;
- MPAs: an ecologically coherent network of well-managed MPAs is being created, including MPAs in Areas Beyond National Jurisdiction;
- Human activities: the human activities in the OSPAR maritime area which may adversely affect it are being assessed and programmes and measures to safeguard against such harm are being developed.

Fishing is an important economic activity in the OSPAR area, often being highly significant as a source of employment in areas where there are few alternatives. The impacts of fisheries on the marine environment can be profound. OSPAR's Quality Status Report 2000 identified fisheries as one of the human activities with the highest impact on the marine environment. The impacts can include:

- exploitation of stocks beyond safe biological limits;
- alteration of community and trophic structure;
- disturbance to sea bed communities and habitats by fishing gears;
- by-catch and discard of undersized fish;

⁴ A pilot study on ecological quality objectives for the North Sea has been undertaken. Consideration is now being given to extending ecological quality objectives to other OSPAR sub-regions;

- by-catch of non-target species including benthic animals, marine mammals or commercially unwanted species.

OSPAR List of Threatened and/or Declining Species and Habitats: the OSPAR Biological Diversity and Ecosystems Strategy sets out that the OSPAR Commission will assess which species and habitats need to be protected. The OSPAR List of Threatened and/or Declining Species and Habitats has been developed to fulfil this commitment. The inclusion of a species or of a type of habitat on this list has no other significance. It is based upon nominations by CPs and observers (mostly NGOs) to the Commission, of species and habitats that they consider to be priorities for protection. The evidence in support of those nominations is collectively examined by the OSPAR Commission and its subordinate bodies on the basis of the relevant Texel/Faial criteria for the identification of species in need of protection. The data used has been reviewed by ICES, in order to give assurance that its quality is suitable for the purpose for which it has been used.

Fish species affected by fishing in this list are subject to management by an international or national fisheries authority or body. Where the OSPAR Commission considers that action is desirable, it draws the issue to the attention of the relevant authority or international body. The OSPAR strategy makes clear that it may be necessary to consider separate populations of species for the purposes of the strategy. The list therefore specifies certain populations of species where separate treatment is justified, because the different populations are subject to differing pressures. Where this is done, there is no implication that other populations of the same species may be threatened and/or declining. The list is subject to ongoing development and species and habitats are added or removed, in the light of changes to their conservation status and to the threats they face and in the light of the latest scientific assessments.

Discussion

I propose here to outline some of the issues and the questions arising from policy, which we may/will have to address as DEEPFISHMAN progresses.

Firstly, we will have to review the current definition of deep-water and deep-water fishing (this task is documented in the DOW). Any new definition of deep-water could again be based on depth, if underpinned by available hydrographical, ecosystem and fish distribution data. Deep-water fishing again could likewise be defined by depth or could be based on species composition in commercial landings (but preferably catches) either at the trip level but, more preferable, at the individual haul level. In developing a definition we will have to review the definitions currently used by ICES, the FAO, the EU (in the Deep-water Licensing Regulation), the DCF, those recently developed by STECF (to develop time-series deep-water effort data) and also any definitions used elsewhere in the world.

In a wider sense, we are likely to have to review the deep-water species listed in Annex I and II of the EU Licensing Regulation (taking into account recent recommendations on this by STECF) and, possibly, the species remit of ICES WGDEEP.

To address the primary aim of DEEPFISHMAN (to develop short- and long-term monitoring and management frameworks for deep-water fisheries and stocks in the NE

Atlantic) we will have to develop a meaningful definition of short- and long-term. One approach may be to define short-term as a monitoring and management framework that can be introduced within a short period (1-2 years) of DEEPFISHMAN finishing. This would be consistent with, firstly, the Commission's decision to postpone a review of the Deep-water Access Regime until the outcomes of DEEPFISHMAN are available, and, secondly, the need to make progress so that F on deep-water stocks in 2015 should be at, and in the case of depleted stocks, below F_{msy} . Long-term may be more difficult to define, but given that many marine living resources exploited by DWFs have biological characteristics that create specific challenges for their sustainable utilization and exploitation, that some fishing methods can have SAIs on unprotected VMEs, that DWFs can have had an impact on biodiversity (reference), and given the need to take into account uncertainty regarding the status of stocks, there may be strong argument that long-term should be sooner rather than later.

From EU policy drivers it is clear that a holistic approach to monitoring and management of fisheries (including DWFs) is required, to ensure that populations are maintained within viable levels, biodiversity is maintained and impacts on the structure, processes and functions of ecosystems are maintained at viable levels. Policy indicates that to reinforce these objectives it is necessary to ensure that F is at or below F_{msy} levels, management/recovery plans are in place for stocks that are depleted, and measures are taken to progressively eliminate discards. There is also a need to ensure exploitation of living aquatic resources provides sustainable economic, environmental and social conditions. The welfare of coastal communities, the marine environment and the interaction of fishing with other maritime activities should be taken into account. It is recognised that financial assistance may be required to mitigate the social and economic repercussions of such restraint (of fishing at or below F_{msy} levels) during the transitional phase before the full economic benefits are achieved.

Here, for discussion purposes only, I will focus on specific topics within this broader holistic approach. These are presented in no particular order.

Vulnerable Marine Ecosystems

EU MSs and NEAFC have made considerable progress in introducing management measures to protect known concentrations of cold-water corals, however these are only one indicator of VMEs and in DEEPFISHMAN there may/will be a need to address the following questions:-

- Are management measures (closed areas, MPAs) required to protect other types of VME such as seamounts, hydrothermal vents and other under-water features, and also other types of VME indicator species e.g. sponges? In addressing this we will need to review the progress made on this issue by ICES WGDEC and NEAFC.
- Regarding closed areas already in place to protect cold-water corals, is the availability and information content of VMS data sufficient to allow real-time monitoring of these closures in EU waters by MSs and in international waters by NEAFC (and also MSs)? If not, how can this be achieved?

- Given the introduction of electronic logbooks, are mechanisms in place for linking VMS and catch records at the individual fishing operation level? If not, how can this be achieved?
- In DWFs (in both EU and international waters), is observer coverage sufficient to provide adequate spatial information on encountered VMEs? Are the appropriate data available and the mechanisms in place to facilitate the real-time introduction and monitoring of temporary closure areas, both in EU waters and in international waters? If not, how can these objectives be achieved?
- Regarding destructive fishing practices that can have SAIs on VMEs, is there anything further that can be done in terms of gear design to mitigate impacts (gear design, break-away lines etc)?
- NEAFC has introduced measures to regulate bottom fishing activities in accordance with UNGA 61/105, a fundamental component of which is a VME encounter protocol based on VME indicator (corals and sponges) thresholds and a move-on rule. Common thresholds are applied to all types of fishing gear and DEEPFISHMAN may need to scrutinise if observer coverage (and the information collected) is sufficient to facilitate the development of meaningful threshold values for different types of fishing gear and that take into account retention rates. There may also be a need to evaluate if the move-on rule adequately takes into account differences in fishing practices between gears.
- Bottom fisheries in new fishing areas in international waters can only commence when a harvesting plan, a SAI mitigation plan, a catch monitoring plan and a data collection plan has been submitted to NEAFC for scrutiny and agreement by NEAFC. NEAFC has requested ICES to produce guidelines for observers onboard fishing vessels that might be authorised to fish in the so-called "new" bottom fishing areas. DEEPFISHMAN may/will review and comment on the guidance given and the protocol eventually adopted by NEAFC.
- Would an EU GIS database of VME interactions, maintained real-time, be useful in facilitating the introduction of real-time and future management measures? If so how could these be developed? The ICES Working Group on Deep-water Ecology (WGDEC) holds a database on vulnerable deep-water habitats which from next year will be held and administered by the ICES data centre, but this will not be maintained on a real-time basis.

Deep-water ecosystems and biodiversity

Information to allow a description of the ecosystem(s) present in the deep sea, their structure and processes, and how they function is sparse. DEEPFISHMAN may/will have to:-

- Collate all available baseline data and information and identify criteria that can be used to monitor ecosystem health.
- Develop a monitoring framework to improve knowledge and understanding of deep-water ecosystems structure, processes and functions.

- Consider if fisheries monitoring can contribute to knowledge of deep-water ecosystems and if so how?
- Consider if fisheries-independent surveys provide the most scientifically robust method of developing this knowledge and understanding, and if so, taking into account progress by the ICES Working Group of the North-east Atlantic Continental Slope Survey (WGNEACS), make recommendations.
- Review if current monitoring and management measures to conserve rare and endangered species, sharks, seabirds, marine mammals etc are fit for purpose, and if not suggest improvements.
- Develop a framework for monitoring contaminants and fish diseases in deep-water fish and crustacean species.
- Review current monitoring of the environmental parameters such pH, temperature, salinity etc and evaluate if it is sufficient to facilitate understanding of ecosystem processes and functions and the effects of climate change. If not, are there areas where fisheries monitoring can contribute?

Maintaining biodiversity is a fundamental component of the EA and is an area that has been significantly neglected in the current management and monitoring regimes for DWFs in the NE Atlantic. Recent studies suggest that DWFs can impact on deep-water fish assemblages (Basson *et al.*, 2002; Bailey *et al.*, 2009), however the effects of these impacts on ecosystem integrity and functioning are not known. Questions that DEEPFISHMAN may/will have to address are:-

- What are the most appropriate indicators of biodiversity?
- Is information collected by observers adequate in terms of species coverage to facilitate monitoring of trends in biodiversity? If not are there any improvements that can be made or is this an ecosystem attribute that only be addressed by structured fisheries-independent surveys?
- If the latter, then is it necessary to urgently commence monitoring to supplement available baseline information, which for most areas is sparse?
- Such monitoring may initially be on an annual basis to establish rates of change, but in the longer term will periodic monitoring (every 3 or 5 years) suffice?

Discards

Discarding is an assessment (unaccounted mortality) and management issue in most EU fisheries, however it is particularly important in deep-water fisheries because all discards die as a result of bathymetric shock. Until recently the approach (not just in deep-water fisheries) has been to collate available discard data and to try and take account of mortality due to discarding in stock assessments.

The EU is committed to progressively reducing and eliminating discards in EU fisheries, however standards for maximum acceptable by-catch of non-marketable, juvenile or above-quota organisms will need to be defined on a fishery-by-fishery basis. These standards will initially be based on a reduction relative to the present situation and will be progressively reduced further in order to encourage technological developments and adaptations of fishing practices which will avoid such by-catches.

Discard related issues we may have to address are:-

- Are all historical discard data available to ICES? If not should this be a priority in DEEPFISHMAN frameworks?
- Regarding deep-water fisheries is there anything that can be done to increase selectivity? For example, larger mesh sizes in trawl and gillnet fisheries and larger hooks in long-line fisheries. Can innovative net designs reduce discards in deep-water trawl fisheries? Or is this likely to hide the problem of unaccounted mortality given that many deep-waters fish species lack a mucous covering and are vulnerable to abrasion when escaping through meshes?
- In which fisheries is it feasible to land the entire catch and what would be the socio-economic impact?
- Assuming that discarding continues in some DWFs, albeit at a reduced level, have current discarding sampling protocols (DCF, EU Licensing Regulation (Council Regulation (EC) No 2347/2002) for DWFs been statistically evaluated at the national fleet level to ensure that estimates of fleet discards are representative and statistically robust? Landings from DWFs are relatively small compared with those from fisheries on the shelf. Does the DCR allow for this in terms of sampling levels?
- For mixed fisheries or fisheries which take a bycatch of a rare or severely depleted species, DEEPFISHMAN may have to consider bycatch mapping, identifying bycatch thresholds, developing move-on rules and putting mechanisms in place at the EU and MS level to facilitate real-time/seasonal closures.
- DEEPFISHMAN may have to consider recommending elevated observer coverage in such fisheries.
- If previously discarded fish and crustaceans have to be landed, mechanisms may have to be developed to ensure that such landings are put to environmentally sound use which will give some financial return to fishers.

Implementation of the MSY Approach

In compliance with the WSSD at Johannesburg (2002), the EU has agreed to maintain or restore stocks to levels that can produce the MSY, with the aim of achieving these goals for depleted stocks on an urgent basis, and where possible not later than 2015. MSY is characterized by a level of fishing mortality (F) that will, on average, result in a stock size that produces the MSY. There should be no attempt to manage biomass levels.

DEEFISHMAN may have to consider/address the following issues/questions:-

- We need to define F_{msy} (or proxies e.g. M , $F_{0.1}$ etc) for all commercial stocks, possibly using the methods outlined by ICES WKFRAME for applying the MSY approach to data-poor stocks.
- Consistent with an EA, the overall F_{msy} across a range of stocks fished at the same time will not be a simple summation of single stock F_{msy} – it will be lower. How will we develop such estimates of overall F_{msy} ?
- We need to determine where current F is in relation to F_{msy} /proxy values.
- We need to review the time-series effort data recently collated by STECF and we may have to encourage the development of similar time-series for non-EU countries.
- If current levels of fishing are too high we may have to develop long-term management plans to gradually reduce F , noting that MSs have responsibility for determining the pace of change and management mechanisms used (reductions in fishing capacity vs effort limitations reductions).
- Will plans have to be fishery based in mixed fisheries?
- We need to review the current EC guidelines on TAC changes to evaluate if these are fit for purpose for DWFs and deep-stocks.
- We may have to develop a framework for evaluating the socio-economic impact assessment of applying the MSY Approach, and for evaluating the level of subsidy that may be required from the EFF and FIFG. Given concerns that general impact evaluation may not be possible, if assessments are attempted they may have to be at the national fleet level.
- We may have to incorporate technical measures to ensure compatibility of management plans in mixed fisheries.

Reform of the CFP

The Commission states that European fish stocks have been overfished for decades and the fishing fleets remain too large for the available resources.

DEEPPFISHMAN may have to:-

- Evaluate if this statement applies to deep-water fishing fleets.
- Evaluate the level of subsidies currently provided by MSs to their fleets.
- Review the outcomes of the forthcoming ICES Symposium (Session P – “Reversing the burden of proof: results-based management of fisheries”) and consider their relevance to developing short- and long-term monitoring and management regime for deep-water fisheries.

- Evaluate the need for fishers to pay a licence fee to offset the costs of any additional monitoring required to implement the EAFM and to ensure the sustainability of deep-water fishing.
- Review the appropriateness of right-based management for deep-water fisheries and evaluate if greater emphasis should be placed on effort management, particularly in mixed fisheries.
- Determine how fragile coastal communities (particularly those dependent on artisanal fisheries) should be treated if levels of fishing are reduced

Management and monitoring of DWFs in general

The main objectives of the management of DWFs are to promote responsible fisheries that provide economic opportunities while ensuring the conservation of marine living resources and the protection of marine biodiversity, by ensuring the long-term conservation and sustainable use of marine living resources in the deep seas and preventing SAIs on VMEs. Many of the issues that DEEPFISHMAN may have to address are described above, but there are also some additional issues which include:-

- Are there ways that fishers can contribute to monitoring (sentinel fishers)?
- We need to develop meaningful criteria that can be used by managers for identifying mixed, target and bycatch fisheries.
- The development of meaningful BRPs for both target and non-target species, taking into account species vulnerability and uncertainty, and in data-poor situations, the PA, set at levels that ensure, at a minimum, that fish stocks are harvested at levels that are sustainable in the long term and robust to uncertainties.
- The development of low cost or innovative methods based on simpler forms of monitoring and assessment, but to evaluate any additional uncertainty arising from the use of such approaches and likely impact on reliance on the PA.
- The need for international (through NEAFC) as well as national observer schemes.
- The need for higher levels of observer coverage in experimental /exploratory/mixed fisheries.
- Given the cost of deep-water observer schemes we may have to consider if observers can take on both enforcement and scientific duties, and if so what measures should be in place to ensure that observers can carry out their work safely.
- The need for precautionary effort limits, particularly where reliable assessments of sustainable exploitation rates are not available, and spatial catch limits for stocks where sequential depletion may be an issue.

- When we have developed the monitoring and management frameworks it may be appropriate to carry out cost/benefit analyses for particular fleet/fisheries.

In documenting the above I may have overlooked some important issues, identified some issues that may be contentious, and broached issues which may to some appear to be unrealistic or inappropriate (for whatever reason). However, given that the track record of monitoring and managing deep-water fisheries around the world (including the NE Atlantic) is hardly a success story, I think we should consider all options so that we can develop an effective monitoring and management framework which, consistent with the policy drivers described above, should ensure there is sustainable deep-water fishing in the long-term, where ecosystem integrity is maintained, where catch-rates are higher, discards are banned or much reduced, the profitability of fishing is improved, livelihoods throughout all levels of fishing industry are more secure, and where artisanal fishing communities are protected.

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