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Report of the Thirteenth ICES Dialogue Meeting:
**Advancing scientific advice for an ecosystem approach to
management: collaboration amongst managers,
scientists, and other stakeholders**

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International Council for the Exploration of the Sea
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H. C. Andersens Boulevard 44–46 · DK-1553 Copenhagen V · Denmark
Telephone + 45 33 38 67 00 · Telefax +45 33 93 42 15
www.ices.dk · info@ices.dk

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1 Venue, participation, and Terms of Reference

The Thirteenth ICES Dialogue Meeting “Advancing scientific advice for an ecosystem approach to management: Collaboration amongst managers, scientists, and other stakeholders” was held at Dublin Castle, Dublin, Ireland, on 26 and 27 April 2004. The meeting was one of the significant government-sponsored events held under the Irish Presidency of the European Union and was opened by Ireland’s Minister for Communications, Marine and Natural Resources, Mr Dermot Ahern, TD. The Marine Institute hosted the meeting. Participation is listed in Annex 1. The programme is presented in Annex 2.

Since 1980, ICES has been organizing Dialogue Meetings to provide a forum at which scientists and managers can come together to discuss matters of mutual importance in relation to the provision of scientific advice. The overall objective of Dialogue Meetings is for ICES to communicate with its partners to ensure that there is good understanding of mutual requirements in relation to the formulation and provision of advice. While early Dialogue Meetings were held with groups of fishermen, this later evolved to dialogues more with the management organizations, principally the Commissions. The Thirteenth Dialogue Meeting, with its broad and complex topic, brought together higher-level government administrators at the national and international level, scientists involved in the process of developing scientific advice in relation to an ecosystem approach, and a range of stakeholders from industries such as fishing, chemicals, and shipping.

The aim of the Thirteenth Dialogue Meeting was to debate and discuss the scientific advisory process in support of management in relation to an ecosystem approach. The meeting considered this scientific advisory process from three aspects:

- 1) Making it coherent across management of human activities that impact on marine ecosystems;
- 2) Making it operational;
- 3) Making it more credible (involves research resources, transparency, clear and effective communication, quality assurance, and inclusiveness of decision-making process).

2 Welcome addresses

Mr Dermot Ahern, TD, Ireland’s Minister for Communications, Marine and Natural Resources, opened the meeting on 26 April and welcomed the participants to this Dialogue Meeting.

“I would like to welcome all delegates to this important scientific meeting in Dublin for the 13th ICES Dialogue Meeting. I hope that your stay in Dublin will prove to be a pleasant, enjoyable and rewarding experience.

ICES is the organizers for this meeting and of course last year ICES celebrated 100 years in existence. It is therefore a seasoned, long-established organization with a lengthy and distinguished record of scientific achievement in marine science. Accordingly, policy-makers and stakeholders alike will eagerly await the outcome of this major conference. In fact, Ireland’s association with ICES is especially noteworthy because it was one of the first international organizations that Ireland joined in the 1920s, very shortly after the foundation of the State.

I would also like to pay tribute to the Marine Institute for its efforts in organizing this event. In recognition of the importance of our oceans, the Irish Government has invested heavily in marine science infrastructure. Last year, the Marine Institute took delivery of a state-of-the-art research vessel ‘the Celtic Explorer’ which will act as a platform for collaborative marine science programmes with many of our ICES partners. Also, a new headquarters for the Marine Institute is being built in Galway,

a gateway to the North Atlantic. These investments reflect our commitment to making Ireland a centre of excellence in Marine Science.

Over the 100 years of ICES' existence, we can truly say that marine scientists have never had an easy task. Your work takes you into unknown and uncertain territory almost as a matter of routine; you are required to undertake and interpret a huge number of analyses and studies. You are, of course, dealing with a very large marine area across the entire Northeast Atlantic. Better than anybody else, you appreciate the vast differences across the Northeast Atlantic—different fish stocks, different ecosystems and habitats and, of course, different backgrounds and disciplines of the scientists from the nineteen member countries that make up ICES. Perhaps it is this very diversity of skills and expertise that is one of the great strengths of ICES and equips you particularly well to meet the challenges posed by the ecosystem issue, which is so complex. In addition, the renowned impartiality of ICES will also be a critical strength in the challenge ahead.

Marine scientists have had to contend with this difficult and complex environment and I suggest that you have responded remarkably well to the challenge. ICES has made a very real and valuable contribution to our knowledge of fish stocks and the marine environment. There are clear problems with the state of certain fish stocks, but these can be solved if we re-energize and refocus our approaches to fisheries management under the improved framework for management in the new CFP which was agreed in December 2002. Judging from the themes to be discussed at this conference over the next two days, you clearly intend to move ahead in this way and that is very welcome.

More than ever before, those of us who deal with marine matters are in the proverbial goldfish bowl. People from all over Europe, from backgrounds far removed from the marine sector, are showing an increasing interest in the welfare of marine life and habitats. Of course, the headline interest will tend to be in well-known fish stocks, but people are also concerned about, for instance, coral reefs and incidental by-catches of cetaceans.

During the first few months of Ireland's Presidency, we have steered through new legislation on the protection of coral reefs in the Darwin Mounds and we have also secured agreement on a major plan to deal with unacceptably high by-catches of small cetaceans in certain fisheries.

Both of these initiatives came directly from scientific advice, so it is quite appropriate that I should publicly applaud the role played by ICES in these ecosystem-based initiatives.

In placing these two initiatives high on our Presidency priorities, we were in many ways acknowledging the new reality in Europe that marine issues are about more than fish stocks. Of course, the status of fish stocks and the impact of fishing is a critical concern and likely to remain so for the foreseeable future. But there is a clear need to begin to systematically consider the impact on the marine oceans that is arising because of the increasing intensity of fishing throughout the world.

Over and above the by-catch issues and the impact of towed fishing gears on benthic animals and habitats, to which I have already referred, we know that fishing also has effects on populations of scavenging birds and fish. Fishing can also affect food webs by removing predators such as fish that eat other fish, or prey, such as small shoaling fish that are eaten by seabirds and marine mammals. These impacts may be known, but it is doubtful that we are bringing them sufficiently into focus in fisheries management at the present time.

In my view, it is urgent that we bring this new focus into fisheries management. I am aware that the ecosystem approach to fisheries management has been around for quite a few years, but that it is only now becoming a major force in influencing thinking on fisheries management.

Coming from the political wing of fisheries management, I very much welcome this movement towards the ecosystem approach and I think that this conference can significantly progress the debate. Nobody can dispute that this will be a complex and difficult task, but that must not act as a deterrent to action at this point.

I think it is also important to recognize that a move towards an ecosystem approach does not mean a complete replacement of the existing system, which does have sound points. It is in my view a question of building new elements and I have a particular belief that more environmentally friendly

methods of fishing need to be found. Far too many fish are being discarded and we have to develop gears that will achieve the necessary reduction.

This meeting is attended by scientists, fisheries managers, fishing industry, and also other marine stakeholders such as those involved in shipping, tourism, and leisure. It seems to me that this kind of gathering is ideally placed to consider issues related to the use and management of the oceans and I look forward to hearing its results.

Finally, there is no doubt that the ecosystem approach will shape future exploitation and management of EU fisheries. This will demand a greater insight into how fishing impacts on all the animals of the ocean, the seabed, and the environment. The substance of many recent international agreements, the state of many fish stocks and an increasing awareness and concern among the public on the state of the marine ecosystem are now major drivers for change.

In order to ensure sustainable fisheries in an ecosystem context, the need for scientists, managers, and industry to continue to work closely together is greater than ever. In that respect, it is a major priority for me, as President of the EU Fisheries Council, to get agreement on the establishment of the proposed Regional Advisory Councils within the Common Fisheries Policy. It is vital that fishermen and other stakeholders have an opportunity for structured input to our fisheries management systems. It is only through these types of close collaboration that we can build fisheries management systems which all parties can take ownership of and respect. While environmental protection and sustainability are ever more critical objectives, we must not forget that fishing is also a very important socio-economic activity with a long-term sustainable future. There is a common interest between all stakeholders in ensuring that sustainability is achieved and I hope that the work of the conference helps in advancing the achievement of that shared objective.

I wish you every success today and tomorrow and I formally declare this conference open. Thank you.”

Dr Mike Sissenwine, ICES President, introduced the topics to be discussed during the two days and stressed their importance.

Peter Heffernan, Chief Executive, Marine Institute, then welcomed the participants to Dublin.

3 Embedding the ecosystem approach into marine strategies—issues to be addressed

The Keynote Address for management was presented by Bob Dekker, Chairman of the OSPAR Commission. He provided a brief review of the early efforts to develop international cooperation on some aspects of managing human activities that impact the marine environment. Until the early 1990s, such international cooperation was sectoral, involving particular ministries in each government working with their opposite numbers in other governments, and in dialogue with the relevant industries. By the Rio Summit in 1992, it was realized that this sectoral approach was not effective and needed to be replaced by a holistic approach to management in relation to the marine environment.

Without attempting to define this holistic ecosystem approach, he cited relevant texts from recent meetings, including the Stakeholders Conference on the European Marine Strategy (Køge, December 2002) and the Ministerial Declaration from the First Joint Ministerial Meeting of OSPAR and HELCOM (Bremen, June 2003) that provide the basis for this work in the Northeast Atlantic. Furthermore, Ministers at the Fifth North Sea Conference (Bergen, March 2002) agreed that better integration of environmental objectives with economic and social goals is a basic requirement for advancing and strengthening these pillars of sustainable development.

He noted that there are five main fields between which this new form of inter-sectoral cooperation needs to be developed: pollution prevention, fisheries management, shipping management, nature protection, and the management of offshore industries. There are three challenges in developing this work:

- Challenge 1: to find the detailed ways to achieve this integration at the policy level, including to agree a set of coherent, consistent operational objectives addressing economic, environmental, and social issues for each of the policy fields at regional and local scales;
- Challenge 2: to develop a means of measuring progress towards meeting these objectives in all three fields;
- Challenge 3: to develop the ecosystem approach through an inclusive consultative process while remaining firmly based on sound science.

The third challenge, developing an ecosystem approach, must be carried out on a scientifically sound basis. This will involve understanding the complexities of ecosystem structure and function and the ways that human activities may affect them. It will also require establishing a clear and legitimate role for special interest groups to participate in setting objectives, as part of the inclusive governance that characterizes an ecosystem approach.

In tackling these challenges, Mr Dekker noted that there are at least four major areas of interaction that need to be addressed:

- 1) The spatial distribution of activities in the maritime area and their overlaps;
- 2) Breeding and the protection of breeding grounds, including from such impacts as endocrine-disrupting chemicals;
- 3) Growing up, including the protection of marine organisms during their pre-mature phases from a variety of human-mediated stressors;
- 4) Food-webs, including issues such as nutrient enrichment from land-based sources and overfishing.

In closing, Mr Dekker posed a number of questions that need to be addressed in developing and implementing an ecosystem approach. His complete presentation is attached as Annex 3.

4 Panel 1: Perspectives of managers and their stakeholders

4.1 Fishery commission perspective

The perspective of fisheries managers regarding the ecosystem approach to marine management was presented by Jørn Krog, Fisheries Ministry Permanent Secretary, Norway. He emphasized the importance of obtaining a healthy, well-functioning, and productive ecosystem that will provide optimal levels of production for harvesting. The ambition of fisheries management is to obtain the maximum benefit from our harvesting without reducing the future value of the resources and the marine environment in general. Accordingly, the goals for ecosystem-based fisheries management would be: healthy marine ecosystems; healthy, productive fish stocks; balanced harvest at different trophic levels from plankton feeders to top predators; a healthy fishing industry and coastal communities; and healthy seafood.

Thus, ecosystem-based advice for fisheries management should focus on: 1) advice for “healthy” oceans as a sound basis for marine life and seafood production; 2) improved scientific management advice by incorporating ecosystem information in fish stock assessments and forecasts; and 3) advice on improved fish capture methods in order to reduce ecosystem effects of fishing.

He emphasized the need for more knowledge about species interactions, natural fluctuations, and the impacts of fishing. However, he also noted the need to consider the economic and social implications of fisheries when harvesting strategies are being developed. Realistic catch options for individual stocks must be balanced against the impact they would have on fisheries for other species as well as on other animals, such as marine mammals. His full presentation is contained in Annex 4.

4.2 Environmental management perspective

The perspective of environmental managers regarding the ecosystem approach to marine management was presented by Fritz Holzwarth, Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany. Taking as his basis

the definition of an ecosystem approach agreed by the Helsinki Commission and the OSPAR Commission, Dr Holzwarth posed a number of questions concerning what is meant by an ecosystem, and what impacts should be considered along with the human activities that result in such impacts. He noted that there are a number of hurdles to surmount in developing an ecosystem approach: 1) the difficulty in thinking in networks; 2) limitations in scientific knowledge; 3) imbalanced development among social progress, economic growth, and environmental protection (usually environmental protection is under-emphasized); and 4) lack of, or inappropriate, action.

Dr Holzwarth pointed out that implementing an ecosystem approach will be an iterative process. The current sectoral approach will need to change focus to an ecosystem approach, and responsibility will need to be recognized on a local, regional, and global level. Furthermore, resources (man-power, existing management measures, research capacities, etc.) need to be considered and distributed without duplicating efforts. The ecosystem approach will also pose a societal challenge. In particular, policies for the protection of the marine environment will only be effective if other policy sectors recognize the importance of their contribution, so that an appropriate level of integration can be attained for implementing an ecosystem approach to the management of human activities that impact on the marine environment. The full text of this presentation is contained in Annex 4.

4.3 Fishing industry perspective

Niels Wichmann, Danish Fishermen's Association, presented the perspective of the Danish fishing industry on the ecosystem approach to marine management. He noted that there has often been the situation that there has been a confrontation between the fishing industry and "The System", which includes the scientific advisers. Although fishermen understand and accept the concept of sustainability in fisheries management, they have had more difficulty with understanding the Precautionary Principle, mainly owing to uncertainty on the choice of reference points.

Now that ecosystem-based management will be introduced, he stated that the fishermen in Denmark have developed plans to work more closely with scientists to ensure that the appropriate information is collected. In addition, a committee has been established in Denmark to consider a number of other issues relating to the application of an ecosystem-based approach to marine management, including interactions between marine species, climate changes, eutrophication, pesticides and other harmful substances, habitat effects, and aquaculture.

Finally, Mr Wichmann stated that fishermen are part of "The System" and intend to be stakeholders in the development and implementation of an ecosystem-based approach to management. The full text of his presentation is contained in Annex 4.

4.4 Environmental NGO

One perspective of an environmental NGO was presented by Stephan Lutter, WWF. He stated that WWF considers the application of the ecosystem approach, incorporating the precautionary principle, as fundamental to achieving the sustainable use of the seas, and in seeking truly comprehensive and integrated governance. However, the challenge central to the ecosystem approach is the holistic assessment of the impacts of human activities on the marine ecosystem and the development of integrated management measures. He identified six points as critical for the development and implementation of a holistic ecosystem approach, with scientific advice playing its role in each of these areas: 1) the setting of a vision and environmental goals with stakeholder engagement; 2) developing an integrated marine policy; 3) assessing the resource and status of the resource (including the use of biodiversity, socio-economic and risk assessments, and threats analysis); 4) establishing a spatial planning system, incorporating mapping activities and a decision-making process to identify what activities can take place where; 5) identification of delivery tools, such as consents, permits, and economic tools; and 6) developing a strategy for delivery incorporating a legislative framework for an ecosystem approach.

Recognizing that it is human activities that we aim to manage not ecosystems, he pointed out that there are only a limited number of tools available for marine management, which can broadly be divided into assessment tools and delivery tools. The latter tools can largely be grouped under three headings: 1) spatial controls; 2) controls on levels; and 3) best practice including appropriate technological advances, etc. Regional management is required for the development of practical marine management measures, and for biological monitoring and evaluation at an appropriate level, as well as to address social and economic realities in different regions, and to facilitate decision-making frameworks that include representatives of all legitimate interests in a region. Scientific advice is central to identifying the appropriate scale of management regimes, based on ecosystem features and properties. The full text of this presentation is contained in Annex 4.

4.5 Other industry stakeholders

Some views of another industry stakeholder, the offshore oil and gas industry, were presented by Fergus Cahill, Chairman of the Irish Offshore Operator's Association. He provided examples of three "embryonic" ecosystem approaches to integrated management of the marine environment in the context of the oil industry in Ireland. The first example covered activities in relation to the reactivation of the Whiddy Island Oil Terminal in Bantry Bay, which, after a over decade of disuse owing to a tanker explosion, now needed to take account of mussel farming and inshore fishing as well as tourism, which had developed during that period.

The second example concerned the Petroleum Infrastructure Programme, which is funded and managed by the exploration and production sector of the industry, and aims to strengthen local support structures, fund data gathering, and provide a forum for cooperation. More than ninety projects have been completed or are in progress, providing data and information for development and management of offshore projects.

Finally, the Marine License Vetting Committee provides a process by which potential environmental impacts of a proposed offshore development are evaluated by the Committee, and also considered in a consultative process involving the public, before a decision is made on the proposed project. The full text of this presentation is contained in Annex 4.

5 Moderator's summary of morning discussion

This summary attempts to capture the main points common to the various presentations and interventions made in the session on perspectives of managers and other stakeholders.

The debate has been about decision-making under uncertainty: we will never know enough to be sure beyond doubt about our decisions—but we must decide. It is therefore a question of decision-making which is evolutionary, incremental, and iterative. Three main aspects can be distinguished. These are linked like the three sides of an equilateral triangle. They are: 1) the vision and objectives; 2) the substantive questions; and 3) the questions of procedure and organization.

Vision and objectives

We need a shared vision of what we are trying to achieve. Such a vision can be common to different regions and different topics. It has to be spelled out into specific objectives, which need to cover economic, environmental, and social aspects. These objectives may differ between regions. What regions are appropriate may depend on the subject matter of the objective in question. The objectives need to be capable of being quantified, so that we can see whether they are being achieved. For the same reason, we need to have a feedback system to show whether the objectives are, in fact, being achieved.

Substantive issues

There are many fields of human activities that can affect the marine environment. To name only a few, there are fisheries, shipping, land-based discharges, mineral extraction, offshore industries, and recreation and tourism. An ecosystem approach needs to be concerned with the ways in which these many different activities can affect the marine environment, both directly and through their interactions.

Since there are a very large number of potential interactions, and since resources are inevitably limited, we need to concentrate on those which are most significant. This requires us to prioritize the interactions and to select the ones that we need to focus on.

Prioritization requires the collection of information and its assessment. We need to consider whether there are sources of information that we are not fully exploiting. One possibility is "ships of opportunity" – the UK Continuous Plankton Survey has successfully exploited the low-cost possibilities of getting ships on regular routes to tow recording devices. Possibilities need to be explored of using other ships (such as fishing vessels) to collect samples or take readings.

Assessment of what are the significant issues needs to involve all stakeholders and to be carried out in a way that is transparent and well documented.

Identification of the key interactions then requires an equally transparent and well-documented assessment of the problems that arise from them and of the possible responses and the choice between them.

Procedure and organization

The third aspect, in turn, has three interrelated aspects, forming another triangle.

Science and policy

We need to establish the issues on which we need scientific advice—and we need to obtain advice covering environmental, economic, and social aspects. Advice on all three aspects will not necessarily come from a single source.

Where adequate information on any aspect of any issue is not available, we need to establish means to capture and evaluate the necessary information.

We need to present the information thus captured, and its interpretation, so that it is clear, scientifically rigorous, and well documented.

Involvement of stakeholders

We need to establish who are the stakeholders for each human activity that affects the marine environment. Stakeholders will certainly include those whose economic interests are directly involved in the activity, but may also include a wider range of people. Where effective organizations representing stakeholders do not exist, their creation needs to be encouraged, together with the development of people capable of speaking effectively on their behalf.

There needs to be a recognized, clear framework for the involvement of stakeholders. This needs to involve, in addition, senior people who are seen as being able to affect the decisions, so that the stakeholders can feel that their representations are being taken into account by those who are in charge.

There need to be clear protocols for the way in which the issues are discussed in these frameworks, so that the factors that are relevant to the eventual decision are brought out and there are no surprises.

Implementation and organization

Many authorities will inevitably be involved in resolving some issues. There needs to be a clear understanding of their respective roles.

The scale on which different human activities are managed will vary—no single size of regions is likely to be appropriate for all human-activity management.

There need to be clear protocols for the way in which the different authorities and the different spatial scales work together. The development of the European Marine Strategy offers an opportunity to achieve this.

6 The role of ICES in providing advice

The keynote address on the scientific side was presented by Dr Jake Rice, Chair of the ICES Consultative Committee. He noted that there are two parts to this title: “What is advice?”, and “What is ICES role in providing it?”, and we cannot answer the second until we all have the same understanding of the first.

He stated that management and policy-makers need advice on three levels:

- 1) Level One is the infrequent but truly “Big Conceptual Questions” – what should be the policy objectives? ICES role there is to provide advice on appropriate objectives from biological/ecological/health perspectives. There are social and economic objectives as well, but advice on those aspects of policy comes from economic and social advisors.
- 2) Level Two advice concerns the “Big Technical Question” – how can progress towards achieving the policy objective best be made and measured? Managers need performance measures for their policies of known accuracy, precision, sensitivity, specificity, cost-effectiveness, etc.
- 3) Level Three comprises recurrent advice on “Operational Questions” – what do the measures say about the effectiveness of pursuing the objective, and what, if anything, should be done to improve the situation? A large portion of ICES advice is just feedback on whether management policies and measures that have already been adopted are leading to the desired outcomes, as reflected in pre-selected performance measures.

Whatever the “advice” may look like, it is always one of those three tasks. Any one of them skipped, or done poorly, and both credibility (science advisors) and effectiveness (policy and management officers) suffer.

Conceptually, ICES has the same role in all three levels of advice. It is the source of impartial, objective and, increasingly, integrated advice on the natural and physical science aspects of whatever question is posed. Particularly for Levels One and Two, ICES also has an important role in engaging in dialogue with clients about what questions are posed to it.

Dr Rice noted that managers and ICES rarely think of the nature of advice in these levels from the conceptual to the operational. Instead, both tend to think thematically—fisheries advice, environmental advice, and ecosystem advice. This has led to misunderstandings and even some distrust among those working thematically.

Fisheries advice operates within a very mature advisory framework, so most advice is at Level Three. However, when adjustments are needed on Level Two advice, for example, setting up Limit and Precautionary Reference Points, these more fundamental questions are challenging for both science advisors and their clients. Because most fisheries advice is at Level Three, it looks really a lot like “advice”. It advises exactly where current stock status lies relative to Level Two reference points, and exactly what managers should do to correct discrepancies. Nonetheless, the Level Three advisory tasks of estimating the current status of SSB and F are analytically very complex.

In many environmental areas, the technically sophisticated tasks are at Level Two: in selecting the measures and implementing them. Moreover, the environmental challenges are continually changing, so new Level One and Two questions keep emerging. Just as science had to take on the challenge of developing fisheries reference points, before managers began to ask for them, science advisors have had to be proactive in highlighting where new environmental challenges lie and what to do about them. ICES has provided pro-active Level Two advice on a number of topics (e.g., introductions and transfers of marine organisms, marine aggregate extraction), creating the tools which allow environmental health to be monitored and managed.

Dr Rice noted that there is much less environmental advice at Level Three because 1) for many factors, as long as monitoring programmes are based on sound science (Level Two), managers can often interpret the trends without needing scientists to undertake technically complex modelling efforts; 2) feedback to detect ineffective management measures and provide guidance on necessary adjustments accumulates much more slowly, so advice on changes to management is reasonable only periodically rather than, e.g., annual TAC adjustments; and 3) there is inadequate knowledge to set science-based limit levels for many contaminants, so there is no starting point for advice relative to limit reference points.

Dr Rice stated that the role of ICES in providing scientific advice follows directly from the very special position of science advice in government decision-making. Science advisors are not just one more partisan advocacy group; they provide objective, impartial, policy- and value-neutral information which should form the common starting point for dialogue among all the value-laden social, economic, and cultural interests. ICES has the independence and culture to uniquely fill that role. ICES also has a history of credibility in providing advice, even though this is now being challenged, because society is changing and demanding more participation in this work.

The growing interest in an “ecosystem approach” presents another set of significant challenges. The ecosystem approach necessarily drives the work back up to Level One questions. ICES has been very proactive through ACE, ACME, and WGECC both in laying out the higher level conceptual objectives (Level One), and trying to operationalize them (Level Two). However, this necessarily creates discrepancies with Level Three work for old fisheries objectives, and Level Two work for old environmental issues. There are bound to be discrepancies between the preliminary Level

One advice on integrated ecosystem issues and the very mature Level Three advice on detailed fisheries problems. In fact, there is no reason why the two types of advice should not have big discrepancies. Managing fisheries in an ecosystem context will not be business as usual, nor will actions on environmental quality. Furthermore, while uncertainties may be better explained and perhaps even better quantified; they will not be *reduced*. They will be larger. However, the ecosystem approach did not *create* these new uncertainties, it only forced us all to address them directly for the first time.

If we want new, integrated, ecosystem-aware policy frameworks, the overall patterns are already obvious. We should put more effort on both sides into Level One and Level Two advisory questions about the ecosystem approach, and get them right, and get a new approach off to a reasonable start. Here again, ICES has a more important role than ever. Not only does it maintain its value as a source of arm's-length, impartial, and credible advice, it is the one place which consistently attracts the necessary breadth of expertise to provide advice in an integrated ecosystem context and has made the proactive changes to promote this work. The full presentation is contained in Annex 5.

7 Panel 2: Scientific advice for an ecosystem approach to management

7.1 Making it coherent across management of human activities that impact on marine ecosystems

Dr Hein Rune Skjoldal, Institute of Marine Research, Norway, gave a presentation on the scientific aspects associated with making the ecosystem approach coherent across the management of human activities that impact on the marine ecosystem, based on recent work on the development of Ecological Quality Objectives. Dr Skjoldal reviewed the background to the development of a set of Ecological Quality Objectives (EcoQOs) under ICES and OSPAR. This process began in 1990 and OSPAR will, in 2005, review the proposed set of EcoQ elements and EcoQOs, based on extensive work by ICES as well as by several OSPAR groups. The EcoQOs one tool in the development of an ecosystem approach to marine management.

An EcoQO expresses the desired level of ecological quality relative to a reference level. The proposed set to be reviewed by OSPAR in 2005 includes 21 EcoQ elements associated with ten issues: 1) commercial fish species; 2) threatened and declining species; 3) sea mammals; 4) seabirds; 5) fish communities; 6) benthic communities; 7) plankton communities; 8) habitats; 9) nutrient budgets and production; and 10) oxygen consumption. They thus cover a wide range of ecosystem concerns.

Dr Skjoldal considered that the development of the set of EcoQOs is a major step forward towards establishing a coherent, systematic, and analytical approach to science-based management on the ecosystem level. He also noted a number of outstanding problems related to our understanding of natural variability, which must be clearly understood to allow identification of the ecosystem effects of human activities. In that context, he noted that climate variability and change is causing major forcing of ecosystem dynamics, affecting stock dynamics and having effects on contaminant pathways; this is a particular area where science should provide a stronger focus to better understand these impacts and thus assist in the further development of an ecosystem approach to marine management.

A more detailed version of Dr Skjoldal's presentation is provided in Annex 6.

An overview of the policy side of coherence was presented by Ms Hermien Busschbach, Ministry of Transport, Public Works and Water Management, The Netherlands. Ms Busschbach spoke about the policy aspects associated with making the ecosystem approach coherent across the management of human activities that impact on the marine ecosystem. She reviewed issues related to coherence at three levels of management, from the global level through the regional level to the national level.

At the global level, the Convention on Biological Diversity (CBD) provides a global framework for the ecosystem approach. Under the CBD, the twelve Malawi principles serve as the overarching principles that form a primary framework for action on an ecosystem approach. Many of these principles are also being applied in the development of an ecosystem approach to marine management at the regional level, with OSPAR as an example. The regional level is the most appropriate level for implementing an ecosystem approach in relation to the marine environment. Under the OSPAR framework, work is in progress for making the ecosystem approach operational using three means: 1) the

development of a list of threatened and declining species and habitats based on agreed criteria; 2) the designation of Marine Protected Areas; and 3) the development of a set of Ecological Quality Objectives.

Under the EU framework, there are several current policies that can be used in implementing an ecosystem approach to marine management, but the overall policy instrument for the development of an ecosystem approach will be the European Marine Strategy. This is currently under preparation, and ICES is playing a key role in relation to the incorporation of the ecosystem approach in this strategy by preparing a Road Map that provides guidance on how to develop an ecosystem approach to managing human activities impacting the marine environment. There are significant challenges to implementing a true ecosystem approach under this strategy; however, the Marine Strategy will promote the development of a coherent policy to promote sustainable use and to protect the ecosystems of the European Seas. It should also improve coherence within the EU framework as well as improve the coherence of activities of European national authorities.

In relation to the need for implementing an ecosystem approach at the national level, Ms Busschbach described the ecosystem problems arising from decisions made several decades ago based on a sectoral water-system approach to the regulation of flooding in the Oosterschelde area of southwestern Netherlands. This approach resulted in the construction of a storm-surge barrier, which has subsequently been shown to have a negative impact on wading birds foraging in the mudflats of this area owing to the decreasing exposure time of the mudflats, thus decreasing the amount of time that the birds can forage for food on the mudflats. This emphasizes both the need for an ecosystem approach as well as a requirement for adaptive management: making adjustments based on feedback from the initial regulatory action.

A more detailed version of this presentation is found in Annex 6.

7.2 Making it operational

Serge Garcia, FAO, presented the views of management concerning making the ecosystem approach operational. He noted that while there is consensus that fisheries have no alternative but to be both socially and ecologically viable, there is much less consensus yet as to what the ecosystem approach to fisheries management (EAF) really entails and how it is to be implemented in practice. The EAF is considered an extension of conventional fisheries management and will require the adaptation of existing institutional infrastructures, staff, laws, regulations, research programmes, etc., at a rate deemed acceptable by society. Managers, scientists, and stakeholders together will need to determine how to turn a set of ethically and politically correct, but fuzzy, principles into operational objectives dealing with more ecosystem components than fishers and stocks and with a broader range of ecosystem services than just seafood and fisheries livelihoods. This process needs to include the participation of stakeholders to ensure its acceptance and implementation.

However, the scientific, administrative, and institutional capacity is currently insufficient to implement the complex ecosystem approach. Efforts are needed to increase capacity in areas such as: the modernization and creation of new institutions, including processes of interaction between Ministries and between regional organizations dealing respectively with the environment, fisheries, and other competing uses; the further development of human resources such as scientists, observers, information specialists, managers and advisers, industry representatives, etc.; the development of targeted research and integrated information management systems to support interdisciplinary research, community understanding, and public scrutiny. The development and implementation of an ecosystem approach implies a strong need for a participatory framework involving the main stakeholders and the need for the development of a comprehensive information management system.

The science in support of EAF must be an extension of the science in support of conventional management. It will need to focus on better understanding of ecosystem functioning, variability and change; uncertainty and risk assessment and management; improvement of forecasting capacity; identification and elaboration of key indicators; provision of assessments of policy and management options. It also needs to integrate social sciences much more effectively and develop broader and more effective communication with society

Many of the elements needed are already available. The use of indicators and of the precautionary approach, including their combination in decision rules, is already current in a few places, even if still at an embryonic level and with significant improvements needed. Predator-prey relationships, natural climatic variations, and habitat degradation studies, for example, are already part of the current fishery research agenda. Interaction of fisheries with other sectors and pollution impacts on fisheries, however, are still poorly addressed. The full text of the presentation is contained in Annex 6.

7.3 Making it more credible

John Farnell, EC DG Fisheries, presented a detailed overview of issues relevant to making ecosystem advice credible. He noted that since the decisions taken in December 2002 to reform the Common Fisheries Policy have placed sustainability, based on scientific advice, at the centre of European fisheries management, it has become even more important for scientific advice to be credible to all parties concerned. This is not a task for just the scientific community, but will require cooperation and participation by the other parties in the process: managers, the fisheries sector, and other stakeholders.

He stated that there are two main areas that need to be addressed to enhance the credibility of scientific advice for fisheries management: 1) the form in which the advice is delivered (or the type of advice that is offered); and 2) the processes and procedures to be followed.

In terms of the type of advice needed, the current fisheries management advice from ICES is based on a number of assumptions including: 1) we know how much fish is being caught; 2) stock size, fishing mortality, and future catches can all be forecast accurately; and 3) we can best assess the state of the fish stocks individually rather than as part of a larger system. However, these assumptions are all open to question, thus challenging the credibility of this advice.

Mr Farnell stated that scientists must recognize the precariousness of their assumptions and change the form of advice to take account of that, while fisheries managers and the fishing industry need to change their behaviour and expectations to make the task of fisheries scientists easier. There are three aspects to this process: 1) improving catch and effort data; 2) dealing with uncertainty; and 3) widening the context of assessments. With regard to improving the data, he noted that this includes both improving the accuracy of the data as well as ensuring that the scientists obtain access to these data. On the issue of uncertainty, he stated that, in the Commission's view, ICES should move away from advice based on short-term forecasts with spurious accuracy to advice that is less sensitive to error, preferably "harvest-rule based advice". Widening the context of assessments includes not only moving away from standard assessments of an individual stock, treated in isolation from the other stocks with which it is fished, but also explicitly taking account of the wider ecosystem in which the stock lives.

In terms of the other main area—the advisory process—Mr Farnell highlighted two points which are critical for the credibility of scientific advice: 1) transparency and "confidence building"; and 2) timeliness of advice. With respect to transparency and confidence building, this includes a) providing access to all relevant data used in the preparation of advice; b) allowing input from all interested parties (e.g., the "sandwich" approach); and c) clearly explaining to stakeholders what type of analysis has been done and how it was done. With regard to timeliness of advice, he proposed that managers and scientists coordinate closely to determine a realistic timetable and ensure that it is met.

The full text of this presentation is contained in Annex 6.

8 Summary of afternoon discussion

The main issues of discussion were centered on the advisory process and the topics that were covered included transparency, participation, inclusiveness, and responsibilities involved in the process.

It was agreed that we should work towards an ecosystem approach on a regional or local basis so that scientists from the relevant disciplines, managers, and stakeholders can work together to develop a common approach to ocean management. Also, we need a definition of the ecosystem approach to be able to limit the complexity of the approach; we need to limit it to crucial factors or influences. Unless we can achieve this, the approach will become unmanageable. Compared to land-use planning, we are at a primitive level in relation to the oceans; we have no planning on ocean resources or management.

There are a range of levels of transparency possible. ICES has said that it wants to increase transparency "as appropriate", but there are very different views of what "appropriate" means among the various affected communities; these are very strongly held, although different, views. However, it is a widely held view that much can be gained by opening assessment working groups to representatives from the fishing industry. This is supported by the experience from North America where there is much more participation in the advisory system. In North America, there has been

no choice but to open up the advisory process to the public. In Canada, this has been implemented for quite a while. In the USA, the legislation requires an open process, so fishermen can come to stock assessment meetings. Scientists can obtain a better idea of the data from this two-way dialogue and can better understand the circumstances under which the data were obtained. Representatives of the industry with appropriate knowledge can be very insightful in evaluating the consequences of the various policy options. It is inescapable that the scientists evaluating the stocks will be influenced by their own background and by the national issues regarding fish stocks. There is no problem with keeping a high degree of scientific credibility and still have stakeholders present. A general comment was that scientists, managers, and fishermen are co-dependent. Fishermen are an integral part of the process, not just “stakeholders”. Fishermen should recognize that if they want to be full participants in the process, the first requirements will be to act responsibly. They must provide full data, and admit that they need to do much better in this regard.

The starting point is that science should evaluate the options; managers should make the decisions. The two processes should be kept clearly separate.

Another central point is the integrity of the process. This is linked with transparency and perhaps could affect the credibility. Decision-makers have the greatest need for credibility. A key question is, therefore, how can we best obtain integrity in transparency? The credibility of scientists will not increase if the advisory process is completely opened up to observers, because the objectivity of the science process will be questioned.

In terms of the transparency debate, the ecosystem approach will open a multitude of objectives and science cannot take care of all of these objectives, as they require management decisions. We will need to find a way to consider the options and tradeoffs between the various objectives; this will require more interaction between the science process and management.

ICES has made progress in the past three years; ICES has held meetings between the North Sea Commission and the fishermen which have been very useful. ICES is taking an incremental approach to providing ecosystem advice and will not stop the short-term fisheries advice, but will include ecosystem information where available. ICES has focused on how to develop a suite of ecosystem indicators that will be tractable based on pressure and impact indicators rather than on state indicators. There has been a lot of development in the incorporation of ecosystem thinking over the years, and it would be good to push the ecosystem thinking along by developing more cross-linkages between the various disciplines.

Transparency of the advisory process is affected by the political climate; if transparency causes political impact on the advice, this will devalue the process. The important point is that everyone should be speaking the same language and working together. No one wants to create pressure on the scientists in making assessments (either from the fishing industry or environmental lobbies). The process should be made thoroughly transparent so that both stakeholders and managers are aware of the scientific process and how it is conducted.

The need for reliable and comprehensive data was stressed in several contributions. Science needs both reliability and credibility. Fisheries assessments have demonstrably improved when the fisheries data that go into the models are correct. Good models can only be differentiated from bad models when they are tested with good data.

Part of making the ecosystem approach operational relates to resources; we see that the demands on ICES are increasing. However, we must build systems that are balanced to the science capacity and the inclusiveness capacity. We need to consider the research needed to implement an ecosystem approach to management. The scientists need more interactions on the research issues, especially on cross-disciplinary questions.

9 Working groups

Three Working Groups met in parallel sessions on the morning of 27 April:

Working Group 1	Making it coherent across management of human activities that impact on marine ecosystems
Chair:	Georges Pichot, FANC, Prime Minister's Services, MUMM, Belgium
Rapporteur:	Olle Hagström, EC DG-Environment

Working Group 2	Making it operational
Chair:	Robert Canning, Department for Environment, Food and Rural Affairs, United Kingdom
Rapporteur:	Poul Degnbol, Chair of ACFM, ICES
Working Group 3	Making it more credible (involves research resources, transparency clear and effective communication, quality assurance, and inclusiveness of decision-making process)
Chair:	Tony Hawkins, North Sea Commission Fisheries Partnership
Rapporteur:	Kjartan Hoydal, NEAFC Executive Secretary

A summary of the outcome of the discussions in these working groups is provided below.

9.1 Working Group 1: Making it coherent across management of human activities that impact on marine ecosystems

This Working Group was chaired by Georges Pichot (FANC, Prime Minister's Services, MUMM, Belgium) and Olle Hagström (EC DG-Environment) acted as Rapporteur.

The Working Group noted that the Ecosystem Approach is a tool for delivering on sustainable development with its three pillars. In terms of ICES advice, ICES is perceived to be slow to react. It was proposed that ICES should move towards transparency, constrained by its need to maintain its scientific integrity. ICES should also be proactive, trying to foresee the likely future demands for advice and information.

However, implementation of the Ecosystem Approach requires an ICES reorientation from fisheries towards more environment input. Given that ICES is a network, this reorientation will only be possible if the institutes in the network adjust their strategies to this goal.

The ICES profile is driven by Clients who willing to pay for advice and information. Currently, this is dominated by Clients from the fisheries sector; more input from the environmental side would be desirable. The Ecosystem Approach will drive development in this direction.

It was pointed out that the following sectors require coherence:

- Spatial scales;
- Temporal scales;
- Social structures;
- Economic systems;
- Environmental;
- Scientific.

Issues relevant to spatial and temporal scales include: 1) management objectives; 2) ecological systems; and 3) monitoring programmes.

In terms of spatial scales, the relevant scale varies with the issue, and integration requires that these scales be nested upwards and downwards. Key issues at different scales include:

- Global scale: climate, persistent pollutants;
- Regional scale: assessing ecological effects at population levels;
- Local scale: coastal zone effects.

The work needs to start from the large scale and work downwards. Management at different scales needs a definition of the starting point at different scales for each human activity.

In terms of temporal, widely different scales are involved. Indicators should not necessarily be dismissed because they have long response time. Management, monitoring, and scientific systems all need a thorough understanding of

response time both in terms of system reaction and for monitoring. Shifting baselines should be avoided by a clear understanding and definition of the goals that we are trying to achieve.

With regard to social and economic issues, it was pointed out that ICES networks do not include the required expertise. Consideration need to be given to how advice can be provided in the absence of such expertise. Furthermore, social coherence in management is well developed at the local scale, but there is a gap at regional and larger scales.

With regard to environmental issues, many principles and objectives have been advocated, e.g., polluter pays, precautionary principle, prevention at source, etc. These principles still maintain their role. It was felt that environmental strategies have been largely opportunistic and that there is a need for more direct interactions among sectors (environment, fisheries, etc.). A broader approach is also required.

A useful tool would be to provide explicit theoretical scenarios developed not only for fisheries but for a wide range of environmental issues such as ecosystem structures and functions. These scenarios should be geared to Clients' needs, their objective, and policies.

In terms of scientific issues, the Working Group confined its comments to the natural sciences, but recognized the need for coherence for all disciplines involved. The focus is on the ecology of the system; we need to define the system and the structural and functional properties in the past, at present, and under different scenarios in the future. There is a need for the identification of human activities affecting the marine environment as well as key components and mapping of existing data and models.

9.2 Working Group 2: Making it more operational

This Working Group was chaired by Robert Canning (Department for Environment, Food and Rural Affairs, United Kingdom) and Poul Degnbol (Chair of ACFM, ICES) acted as Rapporteur.

The Working Group agreed that a main problem in making the ecosystem approach to marine management operational is improving governance. There is a need to develop governance institutions which can include multiple interests and objectives. Science has a role to produce the information base for policy decisions. This includes the development of indicators, or "measuring sticks", and connections between indicators.

Building on current initiatives, the progress in the development of an ecosystem approach will be incremental, but the impact may be seen as revolutionary. An example of this could be the protection of endangered species, which may affect interests such as fisheries.

It was noted that the identification of operational objectives is not a science issue but a policy issue. However, on the question of whether we need to identify objectives, there were two opinions:

- Yes – otherwise we cannot make specific decisions and there is no guidance for scientists;
- No – we will develop our targets as we go along; we can only identify targets on the basis of experience, in the negotiation process.

Nonetheless, objectives must be specific to guide scientific advice. The Baltic salmon action plan was cited as an example of specific objectives.

In conclusion, it was agreed that we need operational and specific targets or ecological quality objectives, but they will need to be developed over time in an interactive process between scientific advice and policy.

The Working Group noted that we need to have mechanisms to identify operational objectives. In Europe, objectives are negotiated between nations; therefore, objectives develop over time and may not always be apparent. But the OSPAR Commission has developed EcoQOs and has demonstrated a mechanism for this.

The Working Group noted that there are two types of objectives:

- 1) To avoid harm (the present main mode);
- 2) To achieve something good.

In terms of the knowledge requirements, the Working Group considered whether we have the data required to develop and implement an ecosystem approach. There were two answers to this question:

- Yes – we know a lot which can be converted into action;
- No – we do not have data on all impacts including, e.g., pollution and catches.

It was agreed that data should be spatially explicit to be able to support spatially based management as well as to be able to conduct a more informed dialogue with stakeholders. Gaps in the data should not be used as an excuse for not acting—we must decide what we can do today on the basis of current information.

With regard to the integration of social and economic issues, it is important that information on economic and social implications is a part of the decision-making process. It was noted that the political interest is mainly on social impacts as these have an economic basis. In Europe, advice on economic and social issues may not be delivered on an international level but rather nationally. However, it is not the role of ICES to deliver advice on socio-economic impacts, but ICES should cooperate with organizations with proper expertise if such advice is requested. ICES also works with performance evaluation of management including the advisory process.

The Working Group agreed that more stakeholder involvement is needed, both in high-level bodies for policy decisions, e.g., OSPAR, HELCOM, conferences of ministers, etc., as well as in regional groups such as RACs or working groups addressing specific issues. In this context, there is a need to distinguish between policy-making and the preparatory/working level. There should also be a distinction between stakeholder groups and public participation. Questions were raised, including: Are stakeholder groups just advisory or do they have management or decision-making responsibility? Who should be represented? Are there representative organizations at relevant levels? What are the criteria for representation: interest, professional background, opportunity/capacity to participate?

It was agreed that a toolkit is needed, e.g., spatial planning, marine protected areas, assessment techniques. Spatial management should be dynamic, reflecting the specific problems addressed and on a relevant scale. The level of decision reflects the scale and the authority regarding different uses. Nevertheless, spatial planning is necessary but not sufficient; habitat protection, etc., can be managed spatially but fisheries catches cannot. The role of ICES role is to make critical evaluation of the effectiveness of management tools including spatial tools.

9.3 Working Group 3: Making it more credible

This Working Group was chaired by Tony Hawkins (North Sea Commission Fisheries Partnership, UK) and Kjartan Hoydal (NEAFC Executive Secretary, UK) acted as Rapporteur.

The Working Group agreed that the ecosystem approach can include several concepts: To some people, it is a particular mindset or principle; to others, it is a process or a way of doing things; and to yet others, it is a particular goal. In spite of this, the point was made that we already have started to implement elements of the ecosystem approach. This process should be continued in incremental steps and we should not wait for the “grand master plan”, but instead get on with the job.

It was agreed that the impact of both fisheries and pollution needs to be considered in the ecosystem approach to marine management, and credible science in both elements is also needed. The ecosystem approach needs core principles to build the mindset, like the FAO Guidelines.

ICES environmental advice was seen as credible, but different opinions prevail among some fishermen about the credibility of the fisheries advice.

The Working Group stressed that we have to change attitudes not structures.

The ecosystem approach must be area-based, possibly with smaller systems nested within it. It will involve stakeholders in deciding goals and making choices. Fishermen need to be involved in the early (scientific) stage of the development of an ecosystem approach, to improve the basis for subsequent management decisions, as well as at the later stage, where they would have an opportunity to influence the decisions.

The ecosystem approach will be based on the best possible advice, bringing in a wider range of expertise. It will be cross-sectoral with respect governments, institutes, and stakeholders. It will need new platforms, such as the RACs, but this concept needs to be further developed and working procedures finalized as soon as possible.

Science should produce options; it must be kept distinct from policy. Management must identify goals and reach decisions.

Fishermen must decide how they would control their participation in the scientific part of the process. The benefits of the ecosystem approach must be made clear and understandable to fishermen.

The quality and extent of present and future knowledge will drive the decision-making process. However, scientific resources are overstretched and, if more tasks are added, the scientific process will suffer.

10 Panel 3: Follow-up actions

Panel 3 on Follow-up Actions was chaired by Mike Sissenwine. He invited the members of the panel to present their impressions of the findings and their personal conclusions from the meeting. The presentations are summarized below.

10.1 Kjartan Hoydal, NEAFC Executive Secretary

The Ecosystem Approach (EAP) has been a mandatory item on the agenda of the NEAFC Commission since 2001. The NEAFC Secretariat has reported to the Annual Meetings on regional and global discussions and summarized scientific literature on the subject. NEAFC has so far not recommended management measures, which include elements of Ecosystem Approach. This probably stems from the fact that the main fisheries for which NEAFC has recommended management measures are clean, pelagic, single-species fisheries. The EAP approach will probably play a much larger role in the process NEAFC has entered into, agreeing on management measures for deep-sea demersal fisheries.

The report to the next annual meeting of NEAFC in November 2004 will draw from this Dialogue Meeting. The variety of the contributions, which have dealt with regulations of different aspects of the management of human activities based on the best available scientific knowledge, will make it clearer where there is common ground and where things are so different between sectors that it will take considerable effort to bridge gaps. Integration of environmental and fisheries policies is a necessary, but difficult, process and the more we understand the details in other sectors the better.

Basically, the managers of different activities (fisheries, shipping, land-based discharges, mineral extraction, offshore industries, recreation and tourism) allocate competitive user rights to different users of the oceans. We are very far away from a situation where these competitive uses can be related to economic and social factors and weighted with respect to their importance and impact on the ecosystems.

The EAP will probably mean involvement of more stakeholders and ICES will be relied on to play an extended role in giving more detailed advice on the impact of other human activities than fisheries. I think it was a pity that we did not use this opportunity to draw on the important experience ICES has in giving detailed advice on fisheries for the last 25–30 years. The trend at the moment seems to be to give the advice provided by ICES a normative role. This creates problems for the scientists and creates friction—often unnecessary friction—with the industry.

NEAFC has had problems with the plans to open up Fisheries Assessment Working Groups to observers. Transparency serves an end, for example creating legitimacy for enforceable regulations based on scientific advice. Transparency in the provision of scientific advice is probably best served by making basic data and models available for scrutiny.

I will report back to the NEAFC Commission that there seems to be consensus that elements of EAP are already used in fisheries management and management in other sectors and the expected progress will be in incremental steps, using the management structures we have today and in the process establishing links between the various sectors using and having an impact on the marine ecosystems.

10.2 Patrick Murphy, EC DG Environment

Two years ago we embarked on an ecosystem approach; however, I feel that this is still not an overall approach. Should we take the same type of approach to shipping, offshore oil and gas industry, etc., as for fisheries? This will be a large task as there are many different industries that impact on the marine ecosystem. However, if we determine a specific status that we desire for the marine ecosystem, then this will cover all human influences that impact on the marine environment. We should approach the collection of information, assessment of information, and reporting of

information in the same way; however, the transport industry, chemicals industry, and energy industry do not use ICES to handle its information.

In response to comments that ICES is too fishy, the answer is that there should be more client demand for advice from ICES on non-fisheries issues and DG Environment will look into asking more environmental advice from ICES.

As long as we can make progress, it is natural and fair that all stakeholders are involved in the process. The Sixth Framework should provide more resources for ecosystem studies. The issue of climate change overwhelms all other issues and should be an important component of the assessment and advice prepared by ICES. Eutrophication is also a major issue, and is growing in the Baltic Sea. ICES should pay more attention to eutrophication issues.

He noted that the Ecosystem Approach (EA) is analysed sector by sector, i.e., that the analysis is focusing on the human impact. He also noted that the key analysis is to focus on the externalities in the human impact. He found that this is a useful approach and noted that the incremental implementation strategy is shared by DG Environment. He found that key additional effects that should be included in the analysis of the ecosystem behaviour including climate change, land-based sources of pollutants, and eutrophication.

10.3 Alan Simcock, OSPAR Executive Secretary

In his presentation, Alan Simcock focused on coherence problems on several levels. At the international level, there is a split between the environmental and fisheries management. He noted that the OSPAR Convention explicitly excludes fisheries management, but it is difficult to discuss ecosystem issues without including all crucial processes in the system. There is, therefore, an obvious need for the various organizations to communicate and cooperate under an Ecosystem Approach to ocean management. There is also a split between the international and the national approaches, such that for many issues there is a need to demonstrate that international action should be taken for some issue rather than national action. This same split occurs between the EU and national levels. Thus, there are a number of fundamental splits in governance. Similarly, the ongoing discussion of shipping issues needs to be reconciled with the principle of freedom of navigation. Also, there needs to be coherence on the definition of the ecosystems themselves when analysing human impact from different sectors.

Alan Simcock stated that he, similar to Kjartan Hoydal, saw a need for making the ecosystem approach more explicit and proposed to present scenarios including costs estimates. This would involve the definition of possible and relevant scenarios, a specification of what is required to realize these scenarios and, finally, but not least, estimation of the costs (economic and social) involved to realize these scenarios. Alan Simcock noted the Working Group on European Marine Monitoring and Assessment (EMMA) under the European Marine Strategy process and found this important to determine which organizations are doing what and when. He considered that the Thirteenth Dialogue Meeting had contributed to the discussion under four headings: a) it consolidated a new ICES advisory approach; b) it focused on the species and human competition for the use of the ocean; c) it noted that coherence is partly lacking in the spatial control of the ocean; and d) it introduced an Ecosystem Approach with a focus on the identification of the human impacts and their sources. He concurred with many interventions at the meeting that the credibility of the approach and the associated advice needs to be maintained. This requires clear protocols. He found that ICES independence is important and he saw a need to bring the present discussion “in line” with the European Marine Strategy that is currently being developed within the EU.

10.4 Anne Christine Brusendorff, HELCOM Executive Secretary

I would like to outline how the ecosystem approach to management is being embedded within the HELCOM work as well as within a World Bank/GEF-funded Baltic Sea Regional Project, for which HELCOM acts as the implementing agency.

The overall goal/vision of HELCOM is to achieve a healthy Baltic Sea—meaning a sea with diverse biological components functioning in balance.

On the more operational level the focus of HELCOM has very much been on pollution reduction programmes:

- the 50% reduction target for nutrients;
- the cessation target for hazardous substances; and
- the elimination target for deliberate illegal oil discharges.

Trials for a more integrated management approach have been made with the setting up of a system of marine and coastal protected areas—protecting representative, endangered, and threatened coastal and marine fauna and flora. The implementation of management measures to protect these areas has been a first step towards the implementation of the principles of integrated coastal zone management, also in offshore areas.

Ecosystem-based management and the development of Ecological Quality Objectives will require a change in HELCOM's management towards deciding which state/health of the marine environment that we want to achieve—either in a so-called positive way: this is what we want to achieve—or vice-versa: this is what we would not like to end up with.

To do this, we need to know which activities have an impact on the marine environment and thus which activities we have to manage. While we cannot look at all activities, we will need to prioritize and start looking at the activities with the most detrimental effects. For this purpose, we can make use of the existing HELCOM assessments of both state and inputs to the Baltic marine environment.

A practical example of the implementation of the Large Marine Ecosystem (LME) management in the Baltic, and thereby the implementation of the ecosystem approach, is the World Bank/GEF-funded Baltic Sea Regional Project. The project is carried out in cooperation between HELCOM, ICES, and IBSFC. To kick off the project, four working groups have been established under the ICES Baltic Committee, with the Baltic Committee acting as the mother committee steering the overall scientific advice related to the Baltic Sea Regional Project. Regional capacity building is carried out in Russia, Estonia, Latvia, Lithuania, and Poland to ensure networking and cooperation between various institutions around the Baltic involved in the implementation of the ecosystem approach to management.

The project is built up of five modules:

- 1) productivity;
- 2) fish and fisheries;
- 3) ecosystem health;
- 4) socio-economics; and
- 5) governance.

A steering group, chaired jointly by the HELCOM and ICES Executive Secretaries, is overseeing the implementation of the project and advising on further developments.

While HELCOM's requests for scientific advice by ICES have been rather on a case-by-case basis, there could be a need for a more long-term, comprehensive planning of the requests needed to advise the decision-making process.

In the first instance, the need for scientific advice seems to fall within Level ONE, as overall conceptual questions to be answered to provide the basis for the policy objectives. Later on in the process, the need for both Level TWO and THREE advice will occur—to help make decisions to obtain the objectives and to help check the robustness and soundness of HELCOM's choices, in following the set policy objectives.

10.5 Olle Hagström, EC DG Environment

The Ecosystem Approach is only a tool for a more integrated approach to the management of human activities and advisory processes. It should not be seen as new religion that can solve all issues. We need, therefore, to use other tools as well.

The EA could be implemented based on current knowledge, but it should be seen as a gradual process. We could draw from the experience we had with the introduction of the Precautionary Approach in ICES as well as in fisheries management.

The EA has highlighted the need for other useful tools such as:

- spatial planning;
- spatial mapping;
- strategic impact assessment.

The EA focuses on long-term aspects and it is needed to look both forward with risk assessments as well as backwards to learn from the past.

This meeting has been useful for the development of the European Marine Strategy and has started a process of different thinking for the future. The meeting has also highlighted structural problems that would hamper an improved integration, which is a key word in this context.

10.6 Discussion

From the floor, Bob Dekker (Chairman, OSPAR Commission) commented that the Ecosystem Approach is designed to prevent damage or excessive impact on the ecosystems. He found it equally interesting as to whether an EA could be used to restore ecosystem health where ecosystems have suffered from excessive human use. He was not convinced that the answer would be a simple “yes”.

11 Final remarks and close of the Dialogue Meeting

In closing the meeting, Mike Sissenwine (ICES President) summarized the meeting as follows:

- While there is no formal definition of the Ecosystem Approach that is being implemented, there appears to be a clear and shared common understanding of the meaning and scope of an ecosystem approach. Key points are that it includes an adaptive approach to management and a social balance in the measures being implemented.
- The EA focuses on the process rather than on the actual management measures. Many different types of management tools can be used to achieve an ecosystem approach. The implementation is collaborative and incremental.
- The EA is already victorious and has been partly implemented in some cases.
- He mentioned that key factors to include in the analysis include;
 - Eutrophication;
 - Effects of climate change;
 - Cross-sectoral issues.

Mike Sissenwine found that science has a significant contribution to make, not least in finding a common currency in which we can express the gains that can be expected from ocean usage by humans against the possible negative impacts that there may be on the ecosystems themselves from such usage. We need to make comparisons across sectors so that we can prioritize among sectors.

To operationalize the EA, he found that the meeting has pointed to the requirements for new tools, the need for worked examples of how to implement an EA, and last but not least the quality of the data must be rigorously established. Good data are critical to reliable advice. This has been clearly established by examples from fisheries advice. He pointed to the stakeholder participation, but made a distinction between an active role in, .e.g., data collection and a more passive role in conclusions to be drawn from these data.

He noted that some interventions from participants have pointed to ICES being too fisheries and fish-stock oriented. He agreed that the profile must be broader, but also noted that ICES cannot do this alone; this process is a two-way exchange. ICES needs partners who can help it go forward on ecosystem issues on the environmental side.

In closing the meeting, Mike Sissenwine thanked the Minister Dermot Ahern, the host the Irish Marine Institute, and Peter Heffernan, for the excellent facilities and the reception. He thanked Paul Connolly and Helen Boles, for their assistance. He also thanked the ICES Secretariat for all the work behind the scenes.

Annex 1 Participation

BELGIUM

Mr Georges Pichot
(Chair of Working Group 1)
MUMM
Gulledelle 100
1200 Brussels
E-mail: g.pichot@mumm.ac.be

CANADA

Mr Dan McDougall
DFO
200 Kent Street
Ottawa, ONT K1A 0E6
E-mail: McDougallD@DFO-MPO.gc.ca

Ms Camille Mageau
DFO
200 Kent Street
Ottawa, ONT K1A 0E6
E-mail: MageauC@DFO-MPO.gc.ca

ESTONIA

Prof. Toomas Saat
Estonian Marine Institute, University of Tartu
10a Maealuse Str.
12618 Tallinn
E-mail: saat@sea.ee

Dr Robert Aps
Estonian Marine Institute, University of Tartu
10a Maealuse Str.
12618 Tallinn
E-mail: robert.aps@ness.sea.ee

Ms Leelo Kukk
Ministry of the Environment
Raevala 8
10143 Tallinn
E-mail: leelo.kukk@ekm.envir.ee

Mr Andres Varik
Estonian Fishermen's Association
Raevala 8
10143 Tallinn
E-mail: andres.varik@hotmail.ee

FINLAND

Ms Eeva-Liisa Poutanen
Ministry of the Environment
Environmental Protection
Department
Kasarmikatu 25
PB 35, 00023 Valtioneuvosto
E-mail: eeva-liisa.poutanen@ymparisto.fi

Mr Markku Aro
Ministry of Agriculture and Forestry
Department of Fisheries and Game
P.O.Box 30, Helsinki
FIN-00023 Government
E-mail: markku.aro@mmm.fi

Dr Petri Suuronen
Finnish Game and Fisheries
Research Institute
P.O. Box 6
FIN-00721 Helsinki
E-mail: petri.suuronen@rktl.fi

FRANCE

Dr Maurice Héral
IFREMER
155, Rue Jean-Jacques Rousseau
92138 Issy-les-Moulineaux
E-mail: mheral@ifremer.fr

Dr Marcel Chaussepied
IFREMER Centre de Brest
BP 70 - 29270 Plouzané
E-mail: Marcel.Chaussepied@ifremer.fr

Mr Nicolas Jeanjean
Ministry of the Environment
20 Avenue de Ségur
75302 Paris 07 SP
E-mail: nicolas.jeanjean@environnement.gouv.fr

Ms Odile Ganne
Ministry of the Environment
20 Avenue de Ségur
75302 Paris 07 SP
E-mail: odile.ganne@environnement.gouv.fr

GERMANY

Dr Fritz Holzwarth
(Speaker to Panel 1)
Ministry for the Environment,
Nature Conservation and Nuclear
Safety
Ref. WA 16 (M)
Heinrich-von-Stephan Strasse 1
53175 Bonn
E-mail: holzwarth.fritz@bmu.de

Mr Stephan Lutter
(Speaker to Panel 1)
WWF North-East Atlantic
Programme
Am Güthpol 11
D-28757 Bremen
E-mail: lutter@wwfneap.org

Dr Gerd Hubold
Bundesforschungsanstalt für
Fischerei
Institut für Seefischerei
Palmaille 9, D 22767 Hamburg
E-mail: gerd.hubold@ish.bfa-fisch.de

Mrs Marlies Reimann
Bundesministerium für
Verbraucherschutz,
Ernährung und Landwirtschaft Referat
622 Postfach 140270, D 53107 Bonn
E-mail: marlies.reimann@bmvel.bund.de

Mr Thomas Borchers
Bundesministerium für Umwelt,
Naturschutz und Reaktorsicherheit,
N II 2 - Ökologische
Grundsatzfragen Robert-Schumann-
Platz 3, D 53175 Bonn
E-mail: thomas.borchers@bmu.bund.de

Dr Anita Künitzer
Umweltbundesamt
Bismarckplatz 1, D-14193 Berlin
E-mail: anita.kuenitzer@uba.de

GERMANY (continued)

Dr Hartmut Heinrich
Bundesamt für Seeschifffahrt und
Hydrographie (BSH)
Sachgebiet Planung und
Koordination der
Meeresüberwachung Bernhard-
Nocht-Straße 78, D 20359 Hamburg
E-mail: hartmut.heinrich@bsh.de

Dr Hans-Georg Neuhoﬀ
Bundesministerium für Umwelt,
Naturschutz und Reaktorsicherheit
Referat WA I 6 (M) -
Meeresumweltschutz -
Robert-Schuman-Platz 3 , D 53175
Bonn
E-mail: Hans-
Georg.Neuhoﬀ@bmu.bund.de

Ms Heike Imhoff
Bundesministerium für Umwelt,
Naturschutz und Reaktorsicherheit
Referat WA I 6 (M) -
Meeresumweltschutz -
Robert-Schuman-Platz 3 , D 53175
Bonn
E-mail: Heike.Imhoff@bmu.bund.de

ICELAND

Pétur Bjarnason
Icelandic Fisheries Associaton
Skipholti 17
105 Reykjavík
E-mail: petur@fiskifelag.is

Halldór Thorgeirsson
Ministry for the Environment
Vonarstræti 4
101 Reykjavík
E-mail:
halldor.thorgeirsson@umhverfisradu
neyti.is

Jóhann Sigurjónsson
Marine Research Institute
Skúlagata 4
101 Reykjavík
E-mail: johann@hafro.is

Kolbeinn Árnason
Ministry of Fisheries
Skúlagata 4
150 Reykjavík
E-mail: kolbeinn.arnason@sjr.stjr.is

IRELAND

Mr Fergus Cahill
(Speaker to Panel 1)
Irish Representative for Philips
Petroleum &
Chairman of the Irish Offshore
Operators' Association, of the Irish
Branch of the Institute of Petroleum
& Marine Technical & Development
Services Ltd.
E-mail: fergusbcahill@eircom.net

Dr Peter Heffernan
Chief Executive Officer
Marine Institute
Galway Technology Park
Parkmore
Galway
E-mail: peter.heffernan@marine.ie

Mr Michael O Cinneide
Director
Marine Environment & Food Safety
Marine Institute
E-mail:
micheal.ocinneide@marine.ie

Ms Jacqueline Doyle
Marine Institute
E-mail: jacqueline.doyle@marine.ie

Dr Terry McMahon
The Marine Institute
E-mail: terry.mcmahon@marine.ie

Mr Sean O'Donoghue
Killybegs Fishermen's Organisation
Bruach na Mara
St. Catherine's Road
Killybegs
Co. Donegal
E-mail: kfo@eircom.net

Dr Emer Rogan
Director
Dept. of Zoology
University College Cork
Lee Maltings, Prospect Row
Cork
E-mail: e.rogan@ucc.ie

Ms Josephine Kelly
Department of Communications
Marine and Natural Resources
E-mail:
josephine.kelly@dcmnr.gov.ie

Mr James Lavelle
Department of Communications
Marine and Natural Resources
E-mail: james.lavelle@dcmnr.gov.ie

Mr Michael Keatinge
Fisheries Development Manager
Bord Iascaigh Mhara (BIM)
E-mail: keatinge@bim.ie

Mr Philip McGinnity
Marine Institute
E-mail: philip.mcgininity@marine.ie

Dr Cecil Beamish
Department of Communications
Marine and Natural Resources
E-mail: cecil.beamish@dcmnr.gov.ie

Dr Ciara McMahon
Radiological Protection Institute of
Ireland
E-mail: cmcmahon@rprii.ie

Ms Agnes McLaverty
Shell Exploration & Production Ltd.
(Ireland)
Corrib Hse., 52, Leeson St. Lower
Dublin 2
E-mail: agnes.mclaverty@shell.com

Mr Lorcaín O'Cinneide
Irish Fish Producers Organisation
(IFPO)
11 Elgin Rd.
Dublin 2
E-mail: ifpo@eircom.net

Dr Alan Craig
National Parks & Wildlife Section
Department of the Environment &
Local Government
7 Ely Place
Dublin 2
E-mail: ACraig@duchas.ie

Dr John Sadlier
Water Quality Section
Department of the Environment &
Local Government
Custom House
Dublin 1
E-mail: john_sadlier@environ.ie

LATVIA

Ms Baiba Zasa
 Latvian Environment Agency
 Ministry of the Environment of
 Latvia
 Rupniecibas iela 23, LV-1045
 Riga
 E-mail: Baiba.Zasa@lva.gov.lv

NETHERLANDS

Mr Bob Dekker
(Keynote Address Speaker)
 Ministry of Transport, Public Works
 and Water Management
 Directorate General for Water
 Management
 PO Box 20906
 NL-2500 EX The Hague
 E-mail: r.h.dekker@dgw.minvenw.nl

Mrs Hermien Busschbach
(Speaker to Panel 2)
 Ministry of Transport, Public Works
 and Water Management
 Directorate General for Water
 Management
 PO Box 20906
 NL-2500 EX The Hague
 E-mail: h.c.busschbach@
 dgw.minvenw.nl

Mr Eric Jagtman
 RIVO
 Postbus 68
 1970 AB IJmuiden
 E-mail: eric.jagtman@wur.nl

Mr Jaap de Vlas
 RIKZ
 Kerklaan 30
 9751NN Haren
 E-mail:
 j.dvlas@rikz.rws.minvenw.nl

Mr Christien Absil
 North Sea Foundation
 Drieharingstraat 25
 3511 BH Utrecht
 E-mail: c.absil@noordzee.nl

Ms Nathalie Steins
 The Dutch Fish Product Board
 Postbus 72
 2280 AB Rijswijk
 E-mail: nsteins@pvis.nl

Mr Garry Post
 Ministry of LNV, Directorate
 Natural resources
 Postbus 20401
 2500 EK Den Haag
 E-mail: g.j.post@minlnv.nl

Ms Barbara Schoute
 Ministry of LNV, Directorate
 Fisheries
 Postbus 20401
 2500 EK Den Haag
 E-mail: b.m.schoute@minlnv.nl

NORWAY

Mr Jørn Krog *(Speaker to Panel 1)*
 Royal Ministry of Fisheries
 P.O. Box 8118 Dep
 0032 Oslo
 E-mail: jorn.krog@fid.dep.no

Prof. Hein Rune Skjoldal
(Speaker at Panel 2)
 Institute of Marine Research
 P.O. Box 1870
 5817 Bergen
 E-mail: hein.rune.skjoldal@imr.no

Mr Johán H. Williams
 Director General
 Resources Department
 Ministry of Fisheries
 P.O. Box 8118 Dep
 0032 Oslo
 E-mail: johan.Williams@fid.dep.no

Peter Gullestad
 Norwegian Directorate of Fisheries
 P.O. Box 185, Sentrum
 5804 Bergen
 E-mail:
 Peter.Gullestad@fiskeridir.no

Tore Nepstad
 Institute of Marine Research
 P.O. Box 1870 Nordnes
 N-5817 Bergen
 E-mail: tore.nepstad@imr.no

Åsmund Bjørdal
 Institute of Marine Research
 P.O. Box 1870 Nordnes
 N-5817 Bergen
 E-mail: aasmund.bjoridal@imr.no

Ms Inger Winsnes
 Ministry for the Environment
 Ministry of the Environment,
 P.O. Box 8013 Dep, 0030 Oslo
 E-mail: Inger.Winsnes@md.dep.no

Mr Jan Ivar Maråk
 The Norwegian Fishing Vessel
 Owners Association
 Postboks 67 Sentrum
 6001 Ålesund
 E-mail: jan-ivar@fiskebat.no

Dr Grete Hovelsrud-Broda
 North Atlantic Marine Mammal
 Commission - NAMMCO
 Polar Environmental Centre
 9296 Tromsø, Norway
 E-mail: gretehb@nammco.no

POLAND

Sea Fisheries Institute
 ul. Kollataja 1
 81-332 GDYNIA
 E-mail: karnicki@mir.gdynia.pl

Russia
 VNIRO
 V.Krasnoselskaya 17
 107140 Moscow
 E-mail: dvasilyev@vniro.ru

SPAIN

Int Español de Oceanografía
 Centro Oceanográfica de Vigo
 Apdo 1552
 ES-36280 Vigo
 E-mail: javier.pereiro@vi.ieo.es

Ms María Cancelo
 Consellería de Pesca y Asuntos
 Marítimos Xunta de Galicia
 Santiago de Compostela
 (La Coruña)
 E-mail: maria.jose.cancelo.
 baquero@xunta.es

Mr Santiago Lens
 Int Español de Oceanografía
 Centro Oceanográfica de Vigo
 Apdo 1552
 ES-36200 Vigo
 E-mail: santiago.lens@vi.ieo.es

Mr Iñaki Quincoces Abad
 AZTI Foundation, AZTIMAR Unit.
 Txatxarramendi Ugarte, z/g. E-
 48395 Sukarrieta, Bizkaia
 E-mail: iquincoces@suk.azti.es

SPAIN (continued)

Dr Antonio Perez Criebeiro
FNCP
Direccion: c/ barquillo, 7-1º derecha
28004 Madrid
E-mail: fncp@arrakis.es

Javier Garat Pérez
Federación Española de
Organizaciones Pesqueras (FEOPE)
C/ Comandante Zorita nº 12, Esc. 4ª,
1º D
28020 Madrid
E-mail: javiergarat@feope.com

Ms Carmen Asencio
General Secretary of Marine
Fisheries
28006 MADRID
E-mail: casencio@mapya.es

SWEDEN

Fredrik Arrhenius
Institute of Marine Research
National Board of Fisheries
SE-453 21 Lysekil
E-mail:
fredrik.arrhenius@fiskeriverket.se

Dr Rolf Åkesson
Ministry of Agriculture, Food and
Fisheries
SE-103 33 Stockholm
E-mail: rolf.akesson@
agriculture.ministry.se

Stellan Hamrin
Ministry for the Environment
SE-103 33 Stockholm
E-mail: stellan.hamrin@
environment.ministry.se

Reine Johansson
Swedish Fishermens Association
Amerikaskjulet
SE-414 63 Göteborg
E-mail: marika.nilsson@
fiskaresservice.se

Katarina Veem
WWF
Ulriksdals Slott
SE-17081 Solna
E-mail: katarina.veem@wwf.se

Kjell Grip
Swedish Environmental Protection
Agency
Blekhölmsterrassen 36
SE-106 48 Stockholm
E-mail:
kjell.grip@naturvardsverket.se

UNITED KINGDOM

Dr Sharon Thompson
The RSPB, UK Headquarters
The Lodge
Sandy
Bedfordshire SG19 2DL
E-mail:
sharon.thompson@rspb.org.uk

Mr Robert Canning
(Chair of Working Group 2)
Department for Environment, Food
and Rural Affairs
Ashdown House, Room 3/C8
123 Victoria Street
London, SW1E 6DE
E-mail: robert.canning@defra.gsi.gov.uk

Dr Joe Horwood
CEFAS
Lowestoft Laboratory
Lowestoft
Suffolk NR33 0HT
E-mail: j.w.horwood@cefass.co.uk

Hamish Morrison
Scottish Fishermens Federation
14 Regent Quay
Aberdeen
AB11 5AE
E-mail: hamish@sff.co.uk

Lachlan Stuart
Scottish Executive Environment &
Rural Affairs
Pentland House
47 Robb's Loan
Edinburgh
EH14 1TY
E-mail: Lachlan.Stuart@
scotland.gsi.gov.uk

Doug Beveridge
National Federation of Fishermen's
Organisations
Marsden Road
Fish Docks
Grimsby
DN31 3SG
E-mail: dbeveridge@nffo.org.uk

Alan McCulla
ANIFPO (Northern Ireland
Fishermen's Organisation)
Fish Market
The Harbour
Kilkeel
BT34 4AX
E-mail: alan@anifpo.com

Dan Laffoley
English Nature
Northminster House
Peterborough
PE1 1UA
E-mail: dan.laffoley@english-
nature.org.uk

Mr Colin Penny
Department for Environment, Food
& Rural Affairs
120, East Block
10 Whitehall Place
London SW1A 2HH
E-mail: colin.e.penny@defra.gsi.gov.uk

Mr Anthony Hynes
Department for Environment, Food
& Rural Affairs
10 Whitehall Place East
London SW1A 2HH
E-mail: anthony.hynes@defra.gsi.gov.uk

Ann Bell
North Sea Commission Fisheries
Partnership
Aberdeenshire Council
Woodhill House
Westburn Road
Aberdeen AB16 5GB
E-mail: ann.bell@aberdeenshire.gov.uk

USA

Dr David Fluharty
University of Washington
School of Marine Affairs
3707 Brooklyn Ave. NE
Seattle, WA 98105-6715 USA
E-mail: fluharty@u.washington.edu

Mr Alan Risenhoover
NOAA/NMFS
SSMC3 RM: 14450
1315 East West Hwy
Silver Spring, MD 20910-3282 USA
E-mail: Alan.Risenhoover@noaa.gov

Dr Steven Murawski
NOAA/NMFS
166 water Street
Woods Hole, Massachusetts 02543
USA
E-mail: Steve.Murawski@noaa.gov

Dr Rita Curtis
NOAA/NMFS
SSMC3 RM: 12752
1315 East West Hwy
Silver Spring MD 20910-3282, USA
E-mail: Rita.Curtis@noaa.gov

REPRESENTATIVES OF INTERGOVERNMENTAL ORGANISATIONS

European Commission,
DG-Environment
Mr Patrick Murphy (*Panelist*)
European Commission
Rue de la Loi 200
B-1049 Brussels
Belgium
E-mail: Patrick.Murphy@cec.eu.int

Mr Olle Hagström
(*Rapporteur to Working Group 1*)
European Commission
Rue de la Loi 200
B-1049 Brussels
Belgium
E-mail: Ulle.hagstroem@cec.eu.int

European Commission,
DG-Fisheries
Mr John Farnell
(*Speaker at Panel 2*)
European Commission
Rue de la Loi 200
B-1049 Brussels
Belgium
E-mail: John.Farnell@cec.eu.int

FAO
Dr Serge Garcia (*Speaker at Panel 2*)
Département des Pêches de la FAO
Viale delle Terme di Caracalla
00100, Rome
Italy
E-mail: Serge.Garcia@fao.org

HELCOM
Dr Heike Herata
Federal Environmental Agency
Fachgebiet II 2.2: Stoffhaushalt
Gewässer
Postfach 33 00 22
D-14191 Berlin
Germany
E-mail: heike.herata@uba.de

Mr Jan Ekebom
Metsähallitus,
Natural Heritage Services, Central
Unit
P.O.Box 94, FIN-01301 Vantaa
Finland
E-mail: jan.ekebom@metso.fi

Anne Christine Brusendorff
(*Panelist*)
HELCOM
Katajanokanlaituri 6 B
FIN-00160 Helsinki
Finland
E-mail:
anne.christine.brusendorff@helcom.fi

IBSFC
Dr Walther Ranke
International Baltic Sea Fishery
Commission
ul. Hoza 20
00-528 Warsaw
Poland
E-mail: ibsfc@polbox.pl

OSPAR
Mr Alan Simcock
(*Moderator to Panel 1 and Panelist*)
OSPAR
New Court
48 Carey Street
London WC2A 2JQ /
UK
E-mail: alan@ospar.org

NEAFC
Dr Kjartan Hoydal (*Panelist and
Rapporteur to Working Group 3*)
NEAFC Secretariat
22 Berners Street
London W1T 3DY
United Kingdom
E-mail: kjartan@neafc.org

**OFFICERS AND SECRETARIAT OF THE
INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA**

Dr Mike Sissenwine (President of
ICES)
Chair of Dialogue Meeting
U.S. Department of Commerce,
NOAA
National Marine Fisheries Service
1315 East West Highway
Silver Spring, MD 20910
USA
E-mail:
michael.sissenwine@noaa.gov

Dr Paul Connolly
(Chair of ICES Management
Committee for the Advisory Process)
Moderator to Panel 2
Marine Institute
Fisheries Science Services
Galway Technology Park
Galway
Ireland
E-mail: paul.connolly@marine.ie

Dr Jake Rice (Chair of ICES
Consultative Committee)
Keynote Address Speaker
Canadian Science Advisory
Secretariat
DFO
200 Kent Street
Ottawa, ONT K1A 0E6
Canada
E-mail: ricej@dfo-mpo.gc.ca

Dr Poul Degnbol
(Chair of ICES Advisory Committee
on Fisheries Management)
Rapporteur to Working group 2
Institute for Fisheries
Management and Coastal
Community Development
North Sea Center
P.O. Box 104
9850 Hirtshals
Denmark
E-mail: pd@ifm.dk

Mr Simon Jennings
(Chair of ICES Advisory Committee
on Ecosystems)
CEFAS
Lowestoft Laboratory
Lowestoft
Suffolk NR33 0HT
UK
E-mail: s.jennings@cefass.co.uk

Mr Stig Carlberg
(Chair of ICES Advisory Committee
on the Marine Environment)
SMHI
International Relations Department
Byggnad 31, Nya Varvet
426 71 Västra Frölunda
Sweden
E-mail: stig.carlberg@smhi.se

Mr Jan Thulin
(Director GEF/Baltic Sea Regional
Project)
International Council for the
Exploration
of the Sea
Palægade 2-4
1261 Copenhagen K
Denmark
E-mail: jan@ices.dk

Mr David de G. Griffith
(General Secretary of ICES)
International Council for the
Exploration
of the Sea
Palægade 2-4
1261 Copenhagen K
Denmark
E-mail: david@ices.dk

Mr Hans Lassen
(Head of ICES Advisory
Programme)
International Council for the
Exploration
of the Sea
Palægade 2-4
1261 Copenhagen K
Denmark
E-mail: hans@ices.dk

Ms Janet Pawlak
(Special Adviser on Environmental
Issues)
International Council for the
Exploration
of the Sea
Palægade 2-4
1261 Copenhagen K
Denmark
E-mail: janet@ices.dk

Ms Louise Scharff
(ICES Secretariat)
International Council for the
Exploration
of the Sea
Palægade 2-4
1261 Copenhagen K
Denmark
E-mail: louise@ices.dk

Annex 2 Programme

ADVANCING SCIENTIFIC ADVICE FOR AN ECOSYSTEM APPROACH TO MANAGEMENT: COLLABORATION AMONGST MANAGERS, SCIENTISTS, AND OTHER STAKEHOLDERS

DUBLIN CASTLE, DUBLIN, IRELAND

26–27 APRIL 2004

DAY 1 SETTING THE SCENE

- 8:30–9:30 Registration (Secretariat assistance)
- 9:30–9:45 Welcome (Chair and Irish hosts) (Chair: **Mike Sissenwine**, ICES President)
- 9:45–10:15 Keynote address: Embedding the ecosystem approach into marine strategies - issues to be addressed:
Bob Dekker, Chairman of OSPAR
- 10:15–10:45 Coffee
- 10:45–11:35 Panel 1: Perspectives of managers and other stakeholders
(Moderator: **Alan Simcock**, OSPAR Executive Secretary)
1. Fishery Commission perspective: **Jørn Krog**, Fisheries Ministry Permanent Secretary, Norway;
 2. Environmental management perspective: **Fritz Holtzwarth**, Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany;
 3. Fishing industry perspective: **Niels Wichmann**, Danish Fishermen's Association;
 4. Environmental NGO: **Stephan Lutter**, WWF;
 5. Other industry stakeholder: Representative of the Offshore Oil and Gas Industry:
Fergus Cahill, Chairman, Irish Offshore Operators' Association
- 11:35–12:30 Panel Discussion
- 12:30–13:45 Lunch
- 13:45–14:15 The role of ICES in providing advice (examples of recent activities in the provision of advice)
(**Jake Rice**, Chair of ICES Consultative Committee)
- 14:15–15:15 Panel 2: Scientific advice for an ecosystem approach to management. Presentations by Panelists, drawn from science and management (Moderator: **Paul Connolly**, Chair of ICES Management Committee for the Advisory Process)
1. Making it coherent across management of human activities that impact on marine ecosystems:
Hein Rune Skjoldal, Institute of Marine Research, Norway (EcoQOs);
Hermien Busschbach, Ministry of Transport, Public Works and Water Management, Directorate General for Water Management, The Netherlands (policy side of coherence);
 2. Making it operational:
Serge Garcia, FAO (fisheries);
 3. Making it more credible:
John Farnell, EC DG-Fisheries.
- 15:15–15:45 Coffee
- 15:45–17:45 Panel discussion (continued)

DAY 2 WORKING GROUPS

Morning: 09:00–13:00; Coffee 11:00–11:30

Working Group 1 **Making it coherent across management of human activities that impact on marine ecosystems**

Chair: **Georges Pichot**, FANC, Prime Minister's Services, MUMM, Belgium

Rapporteur: **Olle Hagström**, EC DG-Environment

Working Group 2 **Making it operational**

Chair: **Robert Canning**, Department for Environment, Food and Rural Affairs, United Kingdom

Rapporteur: **Poul Degnbol**, Chair of ACFM, ICES

Working Group 3 **Making it more credible (involves research resources, transparency clear and effective communication, quality assurance, and inclusiveness of decision-making process)**

Chair: **Tony Hawkins**, North Sea Commission Fisheries Partnership

Rapporteur: **Kjartan Hoydal**, NEAFC Executive Secretary

13:00–14:15 Lunch (Rapporteurs prepare summary reports)

Afternoon **The Outcome** (Chair: **Mike Sissenwine**)

14:30–15:15 Presentation of Working Group summary reports

15:15–15:30 Coffee

15:30–16:45 Panel 3: Follow-up actions (Moderator: **Mike Sissenwine**). The panelists will identify the elements of the two days' discussions which they consider to be particularly relevant and valuable for their Commissions, and will indicate what recommendations they might make to their respective organizations regarding possible future actions.

Panelists:

Anne Christine Brusendorff, HELCOM Executive Secretary

John Farnell, EC DG-Fisheries

Kjartan Hoydal, NEAFC Executive Secretary

Patrick Murphy, EC DG-Environment

Alan Simcock, OSPAR Executive Secretary

Annex 3 Embedding the ecosystem approach into marine strategies—issues to be addressed (keynote address for management) (Bob Dekker, Chairman of the OSPAR Commission)

This morning I want to try to suggest the main lines on which we need to be thinking if we are going to achieve an ecosystem approach to the management of all the human activities that affect our seas. To do this, I want:

- first, to review briefly where we are and why we got here;
- secondly, to look at the main challenges that we face; and
- thirdly, to suggest some points which I think that we might profitably consider.

So, to start, why are we all talking about adopting “an ecosystem approach to the management of human activities”?

It is over a century since efforts started to get international cooperation in some aspects of managing human activities that affect the marine environment. In the North East Atlantic and the Baltic, there has been cooperation on some aspects of fisheries management since the early years of the 20th Century. Global cooperation on preventing shipping disasters started in 1914, as a result of the *Titanic* – though the effective start had to wait for the end of the First World War.

This cooperation took on a new dimension with the events of the late 1960s and early 1970s. The *Torrey Canyon* disaster sparked a new level of concern over threats from shipping to the marine and coastal environments and led to new global agreements and regional response arrangements. The acceptance of 200-mile fishing limits, coupled with the EC Common Fisheries Policy, changed the way we had to think about fisheries. The threat of dumping and land-based discharges, dramatically exemplified by the case of the *Stella Maris*, meant that we had to agree on common approaches to the main pollution threats. And the emergence in our region of the offshore oil and gas industry meant that we needed to have common standards in that field as well.

Although each of these innovations led to intensified international cooperation, it was **sectoral** cooperation. The different Ministries in each Government worked with their opposite numbers in other Governments, and in dialogue with the relevant industries, to improve matters in their sector. Often cooperation was better between the parallel Ministries in different countries than between the different Ministries in a single country.

By the Rio Summit in 1992, we had realized that this sectoral approach was not working. Agenda 21, and our regional agreements, began to stress the need to have a **holistic** approach to the marine environment, and therefore to managing the human activities that impact on it.

Since then, we have been struggling to find ways to implement this great idea. It needs a change in our thinking as significant as the new level of international cooperation that was begun in the 1970s. Just as then we had to find ways of working between the varying systems in different countries trying to do the same sort of things in the same field, now we have to find ways not only of doing that, but also of ensuring that there is a common framework for our approaches in the different fields.

ICES is to be congratulated on arranging this dialogue meeting as a contribution to this task. ICES has a unique status as the source of objective and politically independent scientific advice on the marine environment. They can therefore bring a special contribution by enabling us to consider the scientific foundations on which any successful ecosystem approach has to be built.

What, then, are the main challenges that this meeting needs to address?

To start with, I suggest that there is one issue that we should **NOT** spend time on – the definition of the ecosystem approach. Many international commitments have been made to apply such an approach. The general principle is clear and compelling. But working out the detail is very much still work in progress. It is here, rather than polishing further the statement of general principles, that meetings such as this can best focus.

There are many published descriptions of the “ecosystem approach”, most with the same general ideas. As an example, a long description has been adopted by the Parties to the Convention on Biological Diversity as the “primary

framework” for action taken under the Convention. A more manageable description can be found in the output of the Stakeholders’ Conference on the European Marine Strategy held at Køge in December 2002. Building on earlier work by the North Sea Conference this states that the ecosystem approach is

“the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.”

Although there may be scope for further polishing of this definition, I think that it gives a sufficient base on which to consider how to provide the scientific foundations of the ecosystem approach - a task for which this dialogue meeting is well suited.

The Ministerial Declaration from the First Joint Ministerial Meeting of OSPAR and HELCOM at Bremen in 2003 gives us some important pointers for this task. I would like to quote some of the text at length, because it gives a widely agreed steer on where we should be going and the problems to be addressed:

“Changes in Europe – the enlargement of the European Union; the increasing interdependence of the marine environments of different countries; the ever-growing public interest in, and concern for the seas; the European Union initiative to develop a strategy to conserve and protect the marine environment – make it essential for us to develop and improve the ways in which we work together.” In particular, we commit ourselves to work with the European Union initiative and, in collaboration with the other marine conventions, to extend and develop it, within our fields of competence, into a European Marine Strategy for the seas around Europe, which can receive the commitment of other Conventions and their Contracting Parties. Through such developments, we must exploit the possibilities for synergy between all the international bodies and national authorities involved. These developments will also enable us to deliver the commitments that were affirmed at the World Summit on Sustainable Development to strengthening regional cooperation and coordination between regional organizations and programmes dealing with the seas.

*To our long-standing tradition of international cooperation on individual issues, we must add a new and decisive impetus, based on an approach which matches the interlinkages within the marine ecosystems, on a determination to ensure that policies interface effectively with each other, and on clear-cut understandings of which organization will do what. We shall integrate within our countries, the European Union and the European Economic Area the policies affecting the oceans and seas. We shall ensure that the potential impact on the marine environment is taken into account in **all** policies and programmes and we recognize that marine environment policy cannot on its own redress the problems of the marine environment resulting from pressures created by other policies – these must be tackled at source.”*

Themes which the Ministerial Declaration identified as being particularly important included the application of the ecosystem approach and the environmental impact of fisheries and shipping. These are themes which the Fifth North Sea Conference had also identified as of particular importance for their area. We shall have a Ministerial Meeting devoted to them in March 2006 in Sweden.

Recognizing the central position of the ecosystem approach, Ministers agreed that better integration of environmental objectives with economic and social goals is a basic requirement for advancing and strengthening these three interdependent and mutually reinforcing pillars of sustainable development. Work on the conservation and protection of the marine environment must therefore form part of our management of the full range of human activities, demands and pressures placed on the North East Atlantic and the Baltic. Since it is the ecosystems as a whole that are affected by these impacts, we must use those ecosystems as the focus of our integration.

There are five main fields between which we need to develop this new form of inter-sectoral cooperation: pollution prevention, fisheries management, shipping management, nature protection, and the management of offshore industries. The last covers at least two well-established ones - oil and gas, and sand and aggregate extraction - and new and developing ones, such as offshore wind-energy.

The interactions between these fields raise many sensitive issues—above all the environmental impact of fisheries. But the integration that is needed must not be seen as subordinating the needs of one sector to those of others.

The first challenge is therefore to find the detailed ways to achieve this integration at the policy level. As our Ministers said at Bremen, “The policy objectives for fisheries, for nature conservation and for the protection of the marine

environment are complementary. Their integration is an on-going process, which should be intensified for each others' benefit. In this field, as in others, we stress the importance of cooperation among governments and relevant international bodies across all the issues related to the management of human activities affecting the maritime areas and to the conservation and protection of the marine environment, in order to ensure an integrated, holistic approach."

In the same way, the development of the European Marine Strategy will promote this integration. I am glad that the Netherlands will be able to host a second Stakeholder Conference in Rotterdam in November, to look at the detail of the objectives and approaches by which we can set out to make the ecosystem approach a reality. To ensure delivery at the practical level, we need to set consistent operational objectives for each of the policy fields at regional and more local scales. This means finding ways through which the many different authorities and international organizations involved can deliver consistent policy objectives in each of their jurisdictions. These policy objectives need to address economic, environmental and social objectives at the same time.

The second challenge is to develop means of measuring our progress. It is not enough to have a consistent set of objectives. We need to know whether or not we are moving towards them. This means that we need a framework of ecological quality objectives which will show how the ecosystem is developing. Just as operational objectives need to be compatible in the social and economic fields, as well as the ecological field, so there must be measurable indicators for policy in social and economic fields as well.

The third challenge is to develop our ecosystem approach through an inclusive consultative process. The different facets must also be scientifically sound, but to do this means working on at least two fronts.

One is simply understanding the complexities of ecosystem structure and function, and knowing the ways that human activities may affect them. The seas are a vast, and even now largely unknown, domain. Countries often do not have resources to carry out the necessary research in the areas under their jurisdictions. Cooperation is essential.

The second front is to enable the clear and legitimate role for special interest groups to participate in setting objectives, as part of the inclusive governance that characterizes an ecosystem approach.

Bringing these two fronts together requires both differentiating what people would like to be true from what really is true, and ensuring that the legitimate dialogue about the outcomes of applying social and cultural values to ecological issues is not confused with discussing the scientific aspects of how ecosystems are structured and how they function. Thus there must be a provision for impartial and rigorous science input, with the science contributions subjected to independent peer review.

As a personal comment, I would like to add that the fishing industry, as fundamental stakeholders, must be given every opportunity to contribute their knowledge and experience to the process of embedding the ecosystem approach into marine strategies. It is good to see such a full participation of fishing industry and other stakeholders in this Dialogue Meeting, and I look forward very much to hearing what they have to say

Finally, I want to suggest some points of attack that I think that we could usefully bear in mind in addressing these challenges.

The first point of attack that I want to suggest is that we need to identify where the interactions occur between the different policy fields.

I think that there are at least four main areas of interaction.

The first area of interaction is the spatial distribution of activities in the maritime area. All our States, including in some fields the European Community, have procedures and controls for allocating certain parts of the maritime area for certain activities. Elsewhere, there are spatial overlaps between certain activities. And new overlaps are developing, with the emergence of new activities such as offshore wind-energy.

We need to think about the implications of allocations of space to certain activities and the overlaps that will occur. OSPAR has started looking at these issues, and this meeting can usefully consider the ways in which we capture the information that we need for this sort of work.

The second area of interaction is that of breeding. Protection of breeding grounds—whether for fish or for other wild-life—is long established. But issues such as the possible impact of endocrine disruptors on the breeding success of various species comprise a field in which we are only just beginning to find our way.

We need to develop the conceptual framework for thinking about such issues. Much work is being done on endocrine disruptors but progress is slow - largely because of this lack of knowledge about how to separate out the possible different factors affecting breeding success. This meeting could think about the long-term scientific approaches in this field.

The third area of interaction is that of growing-up. Again, the importance of nursery areas for some fish species has long been recognized. But we need to think about the way in which various developments may affect the development of the species that constitute our ecosystems up to the stage where reproduction starts. This covers such issues as the emergence of new fisheries, such as that for orange roughy, which have a very different reproductive pattern from the long-established commercial fish species. But it also covers such issues as the impact of noise from shipping on marine mammals, siltation from rivers and the dumping of dredged material and impacts that wind-energy farms, whether onshore or offshore, may have on migratory patterns. Another form of interference that we need to think about is the way in which we change the composition of the benthos by actions such as minerals extraction or beam-trawling which promote the growth of opportunistic species at the expense of fragile ones.

The fourth area of interaction is the food-web. The significance of this area was highlighted by the 1997 North Sea Intermediate Ministerial Meeting on Fisheries and the Environment. The impacts to be considered are manifold. Over-enrichment with nutrients from land-based sources can fundamentally affect the food-web. Over-fishing or excessive catches that have to be discarded can equally affect the food-web. We only have to think about the growth of scavenging species of seabirds as a result of increased fisheries discards.

In these four areas, and in the other areas of interaction that people here are no doubt itching to tell me I have forgotten, we need to think about three sets of questions.

First, what do we know about these interactions? How robust is our understanding? How can we measure changes?

Secondly, how can we improve our knowledge? What are the issues that we should be bringing forward for research programmes? What are the techniques that we can use to measure the sensitivity of the ecosystems to these interactions?

Thirdly, how do we apply this knowledge? How do we get the knowledge from the experts who collect it to the decision-makers who need to apply it?

So, to sum up, this Dialogue Meeting comes at a very opportune moment to start thinking about the way in which science and policy-making on the marine environment can be brought together to create a new framework based on the ecosystem approach.

There are three challenges to which we need to respond: to agree a set of coherent, consistent operational objectives addressing economic, environmental and social issues; to develop means of measuring progress towards these objectives in all three fields; and to develop ways of working that are inclusive of all significant stakeholders while remaining firmly based on sound science.

My suggestion is that the clue to our way through this labyrinth is to look at the areas of interaction between the different human activities and the ecosystem, and think about what we know on such interactions, how we can improve those understandings and how we can better apply those understandings.

On that basis, I urge everyone to be prepared to approach all these issues with open minds, so that we can make a real contribution from this Dialogue Meeting to the evolution of a new, integrated approach to the marine environment, focused on ensuring that we have healthy, sustainable ecosystems.

Annex 4 Panel 1: Perspectives of managers and their stakeholders

1 Fishery commission perspective

Jørn Krog, Fisheries Ministry Permanent Secretary, Norway

We wish for a marine ecosystem whose living resources can provide us with food and serve as a basis for income generation now and in the future. We realize that a healthy, well functioning and productive ecosystem will provide optimal levels of production for harvesting.

Man is an integral part of the ecosystem. It follows from this that it must be accepted that man will affect the ecosystem through harvesting. But man also has the ability to seriously and negatively affect the ecosystem. By using our right to harvest, we also take on a responsibility. Our ambition must be that we get the maximum benefit from our harvesting without reducing the future value of the resources and the marine environment in general.

We need to have a common understanding of what an ecosystem-based approach to management actually means. The main goals for ecosystem-based fisheries management would be:

- healthy marine ecosystems;
- healthy productive fish stocks;
- balanced harvest at different trophic levels from plankton feeders to top predators;
- healthy fishing industry and coastal communities;
- healthy seafood.

In accordance with this, ecosystem-based advice for fisheries management should focus on:

1. advice for “healthy” oceans as a sound basis for marine life and seafood production;
2. improved scientific management advice by incorporating ecosystem information in fish stock assessments and forecasts;
3. advice on improved fish capture methods in order to reduce ecosystem effects of fishing.

The important issues relating to the first point above are

- monitoring the status of harmful substances; and
- to develop simple and useful indicators for the status of the marine ecosystem as such, in order to monitor the effects of fishing and other human activities on marine ecosystems’ biodiversity.

The second point contains what is generally regarded as ICES core activity, i.e., advice on TAC. Of particular focus here are:

- utilizing multi-species (who eats who) and ecosystem dynamics data and information;
- demand for huge increase in ecosystem data (space/time) and effective data handling systems and models.

It may also be this issue which is most demanding with respect to data input, knowledge, and understanding. We need more knowledge about how harvesting impacts, not only on the target species, but also on other species and the other elements of the ecosystem. To assess the impacts of human activities, we need knowledge about the balancing processes in the ecosystem and natural fluctuations.

Regarding my third point, this would be to

- clarify and quantify ecosystem effects of different fishing methods and seek improvements of species- and size selectivity (to avoid by-catch of unwanted fish, birds, mammals);
- reduce ghost-fishing and by-catch mortality;
- reduce negative effects on bottom habitats;

- improve catch/energy and emission ratio; and
- improve catch quality.

So what does this mean with respect to practical fisheries management? More knowledge, would be the immediate and obvious answer. More knowledge about species interactions, natural fluctuations, human impact of fishing, and so on. And we should continue to improve our knowledge base. But we know that economic and human resources are limited. So in which field is knowledge most needed for sustainable management of the living marine resources? This is an area where scientific advice would be welcome.

In the absence of ultimate knowledge about the ecosystem, monitoring will be important. It will be necessary to identify good indicators for a healthy ecosystem, and to make use of long time series to analyse the causes for the developments recorded.

Another way of attacking this challenge is to ask: what do we actually need in order to be operational? Up to now, advice has mainly been based on single-species modelling. This method could be regarded as “good enough” – it has not resulted in any proven negative consequences on the ecosystem. But still, we think we can improve on how we harvest and optimize the value from the marine resources in the long term.

Maybe we need more advanced advice which takes biodiversity and ecosystem productivity into account and at the same time provides for the largest possible value from harvesting. However, what is most valuable may not be straightforward and will have to be agreed by the respective fisheries commissions. For instance, a maximum yield of cod may require a “no-take” of capelin or shrimp. This may not be regarded as favourable to other parts of the fishing industry and fleet groups, or because of income opportunities from capelin or shrimp. Likewise, it might be possible to get a higher stock of cod if the populations of marine mammals were reduced. This may again be a problem for tourism, for example. (I am only talking about harvesting which will not put any stock in danger.)

I would like to touch upon the term “maximum sustainable yield” (MSY), which has been promoted as a desired level of outtake from a stock. This term, in its literal meaning, would present us with some problems, as I have mentioned above. A maximum outtake from one stock would normally mean less from something else. The question would then be what is the more desired, which again is not unambiguous.

There are three basic objectives to be considered in fisheries management:

- optimal outtake—ecologically based models would be useful tools in finding the limits and range of optimal harvest levels set by nature;
- economic parameters are central to ensure a sustainable development of the fishing industry—these would also be possible to quantify;
- but we also have a third goal: to attain sustainable social development.

The economic and social implications of fisheries also have to be considered by States when harvesting strategies are developed. It is important to maintain that the advice from ICES is made strictly on a scientific basis regarding the ecosystem. But it will be of great importance that ICES in its advice gives options for TACs or for harvesting strategies and the estimated consequences of such options, to allow management some leeway for taking other considerations into account.

Advice on harvesting strategies for single stocks would be one issue of direct interest to management at this stage. What quantified ambition for catch composition is possible?

For instance what would be realistic catch options for cod in the long term, under the present exploitation levels for shrimp and sea mammals? The underlying goals for this approach would be optimal harvesting and more predictability on quotas.

A challenging question, which inevitably arises, is what changes in the ecosystem caused by harvesting are we willing to accept? What is a desired stock level of the various species? What kind of problems does this pose? Are there absolute limits to our harvesting? With reference to what I mentioned above regarding what kind of harvesting would give most value, it is of interest to note the experience from the West Atlantic. After the collapse of the cod stocks, the shellfish production has increased many-fold, and provides higher earnings than the cod fisheries ever did. But would it be acceptable to aim for a situation like that?

It is the health and production of the ecosystem in the long term which is of main importance in the end. Many resources are now channelled into annual estimates and fine tuning of forecasts—in an ever-changing and unpredictable reality. Long-term assessments might change this focus and result in a win-win situation, both for the ecosystem and man.

2 Environmental management perspective

Fritz Holzwarth, Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany

1 From the early treaties to the present

Realizing that our seas are large, but nevertheless vulnerable, resulted in a series of treaties most of which were negotiated in the early 1970s. These treaties were dealing with the prevention of pollution, where pollution was defined as harmful effects, and used a substance by substance approach. In the following decade these were complemented by the principles of reducing pollution at source, of precautionary action, the polluter pays principle and the waste stream approach (with BAT and BEP).

The International Conferences on the Protection of the North Sea started the systematic international assessments of problems, broadened the scope by addressing matters such as impacts of fisheries and nature protection and added political impetus as the driving force.

The subsequent update of treaties in 1992 consequentially moved on to the proactive protection of the marine environment. The UN Conference on Environment and Development in the same year introduced (in Chapter 17 of Agenda 21) the concept of the integrated management and sustainable development of coastal areas, including exclusive economic zones. This was then further developed into the ecosystem approach to the management of human activities that impact on the marine environment.

2 FAQs on the “ecosystem approach”

2.1 What is the “ecosystem approach”?

Irrespective of the definitions of an ecosystem approach that have been developed in various fora, I suggest to use the more comprehensive approach of the HELCOM and OSPAR Commissions that define the ecosystem approach as "the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity". (This definition corresponds to what has been proposed by ICES.)

2.2 What is the ecosystem to be considered?

“Ecosystem” means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (CBD: Article 2). But what are the boundaries of the "complex" that we need to consider?

2.3 What are the impacts to be considered?

The impacts to be considered are those that could result in pollution, i.e. in hazards to human health, harm to living resources and marine ecosystems, damage to amenities or interference with other legitimate uses of the sea.

2.4 What human activities result in such impacts?

Activities to be considered, for example, are:

- the introduction by man, directly or indirectly, of substances or energy that results in harmful effects
- activities that significantly imbalance ecosystems due to:
- excessive exploitation of one or several of its components,
- introduction of alien or genetically modified organisms,
- physical impact.

2.5 Which management tools are available?

Management tools to be considered, for example, are:

- prevention of emissions, discharges, losses;
- end of pipe technology (if preventive action is not yet at hand);
- restrictions on the exploitation of non-renewable and renewable ecosystem components;
- prevention of the introduction of non-indigenous species;
- assessments and limitation of physical impacts.

3 Hurdles on the way

3.1 The difficulty of thinking in networks

For an “ecosystem approach to management”, it is indispensable to consider all components of the ecosystem in question and human impacts on these components in conjunction. Usually we are not in the position to anticipate the short-term consequences of more than, let’s say two changes at a time without aids. For anything more, and in particular with respect to longer-term developments, we need carefully designed and evaluated models.

3.2 Limitations in scientific knowledge

Models can only be as good as the quality and quantity of information fed into them. There is ample room and need for improvement for both quality and quantity.

3.3 Imbalanced development

There is common agreement that sustainable development rests on the pillars of:

- social progress (which is particularly significant for developing countries),
- economic growth,
- environmental protection

provided that these pillars are developed in a balanced way. However, politicians have a tendency of overemphasizing the pillars of social progress and economic growth at the expense of environmental protection.

3.4 Lack of, or inappropriate, action

In particular where we have, in principle, sufficient knowledge to achieve sustainable development, this often enough fails to materialize due to, for example:

- Lack of action due to communication problems (between authorities, scientists, stakeholders and population);
- Maladjusted management structures;
- Lack in political will to do what is right.

Some of the results of the “December fever” in the Fisheries Council provide examples of such failure.

4 Challenges on the way forward

4.1 The ecosystem approach: an iterative process

Since the oceans cover 71% of our planet, they are the largest interdependent ecosystem on earth. How can we approach this under operational considerations? For the time being we are doing a lot, but our main focus is on certain aspects and sectoral strategies (e.g., hazardous substances, eutrophication, biodiversity) rather than on an ecosystem approach. We are certainly making progress but it is still difficult to make people interested or feel responsible for something that is not in their immediate field of action.

The first starting point is: What are our responsibilities?

- The local responsibility for our national territory, territorial and EEZ waters. This is relatively easy to define since we are talking about “tending our own garden”;
- The regional responsibility for Convention and European Community waters.

This is a different dimension and requires taking also some long-distance responsibilities that may not be so obvious.

- The global responsibility for the world oceans.

This is perhaps the most difficult to communicate. My using product XYZ allegedly affects the Arctic and the reproduction of polar bears? And it remains up to us to accept and fulfil these responsibilities.

The next step is to define the level of comprehensiveness—or networking—to start with. In terms of fisheries management, for example, we started with a single-species approach, are currently trying to get to grips with a multi-species approach, and wish to get as soon as possible to a moderate but true ecosystem approach that considers food-web interdependencies as well as material or non-material impacts on the environment.

For each of these responsibilities, we need to clarify as a third step the resources at our disposal in terms of man-power, existing measures, information and research capacities etc. and how we distribute tasks without duplicating efforts.

The example from the fisheries sector gives some indication that we are dealing with an iterative process that needs to be run again and again, each time increasing our basis of knowledge and slowly shifting our approach level from simplicity to more and more sophistication.

4.2 The ecosystem approach: a societal challenge

Finally, protecting the marine environment, in particular on the basis of an ecosystem approach, has a number of societal challenges: First and foremost policies for the protection of the marine environment can only be effective if other policy sectors recognize the importance of their contribution. That is the only way of getting the level of integration necessary for implementing an eco-system approach to the management of human activities that impact on the marine environment as defined by HELCOM and OSPAR. Therefore it is indispensable to address this level of integration in the forthcoming European Marine Strategy.

Besides that we need to educate ourselves to think in terms of networks. And with regard to the general public we need to broaden their horizon again and again beyond their immediate small-scale family and community experience to enable them to find the answers to: “Why should I—in economically difficult times—(and in this particular context they will always be difficult) care about the sea since I am living 500 km away from it? And why, in particular, should I also care about the sea areas of our neighbouring states?”

In addition, there is also the important question of reconciling the various interests of the stakeholders. As it sometimes seems, there is the group of those who wish to use the sea without any impediment and there is the group of those who wish to protect the marine environment at any rate.

On the way to achieving these aims we need to get the protection of our seas into the focus of the general public. We need to make it transparent and understandable where we want to go, what we wish to achieve and how we wish to achieve it. We need to recall for ourselves and make the general public understand that approaching the sea from just one perspective, the users' perspective, would in the shorter but certainly in the longer run mean that we destroy our very basis for getting our customary benefits from the sea such as food and amenities to name only the most obvious ones.

Thank you for your attention.

3 Fishing industry perspective

Niels Wichmann, Danish Fishermen's Association

I have been asked to give a fishing industry perspective. It is not the industry perspective, but one industry perspective. There may be many—and many different—perspectives. My basis is Denmark, so naturally I look at the Dialogue Meeting topic through Danish glasses. Our activities are influenced both by national and EU rules, so the EU system is also part of my presentation. I know, of course, that a number of ICES countries are not members of the EU, but I think that most issues are of common interest irrespective of national or international legal basis.

“A dead fish is a good fish.” This may seem a provocation, but it is not intended that way. I have put this slide up to try to force you to focus on how the fishermen think. They have always killed fish for a living, and frankly they intend to continue doing so, if they are allowed.

They are aware that they disturb the ecosystem every time they take a fish out of the sea. Until recent years, they have not given the ecosystem as such much consideration because there always has been plenty of fish and there always will be plenty of fish to catch. It is our waters and our fish.

“More science equals less fish.” This is another provocation perhaps. But you know as well as I that that is the general perception among fishermen. “Every time we have these (stupid) scientists along they collect data just to use data against us by reducing our fishing opportunities.” So we have a situation, where we have a confrontation between the fishing industry and “The System”.

Let us look at “The System”, as we try to present it to our fishermen in our newspaper in my association. It is in Danish; that doesn't matter; you all know the flow of the advice and the decision-making process.

What is the basis—sustainability—it has been written into all our texts for many years, and is generally accepted. Further to sustainability, we have witnessed the introduction of the Precautionary Approach (or Principle) with its reference points, etc.

Whereas sustainability is easily explainable and understood and supported, because naturally there should also be fish to catch for the next generations, the Precautionary Approach is more difficult to explain and understand. It is also made more difficult when we do not know whether the reference points are the right ones. We are now faced with a demand to introduce Ecosystem-Based Management. That requires Ecosystem-Based advice, from ICES and from others.

Is that possible? My answer is: “Yes”, provided that we organize ourselves properly and communicate properly—the communication bit has not been one of the strengths of the scientific community in the past.

What to do? – I would like to share with you some of the things that we are trying to do in Denmark.

First, the fishery: How do we close the gap between the scientific community and the fishermen, which indeed may not be as wide in our country as in other countries, since for more than twenty years we have had scientists employed in our association, so we have the interpreters in-house!

We have chosen to say: We need to get closer to the scientists and vice versa, and in a recently published action plan have suggested the following three lines of action:

- a) More fishermen onboard research vessels;
- b) More scientists onboard fishing vessels—systematic programme, with a minimum of 100 trips per year. No payment.
- c) Information from fishermen must systematically be fed into the scientific system to improve data—at national level.

Fishermen in other nations have taken other approaches to this (the Dutch scenario).

The fishery is only one side of Ecosystem-Based Advice and Management, perhaps the easiest. How do we deal with all the other things in the marine ecosystem? In Denmark, our association asked for a commission to be set up to examine influences on the marine ecosystem other than the fishery. It happened. The committee, headed by an ex-politician, Mr Hjortnæs, and the secretariat (Mogens Schou and Niels Axel Nielsen, who are also our ICES representatives), came up

with a very interesting report and a lot of recommendations. They recommended that a number of important issues be looked at by different scientific bodies:

- interaction between marine species (not just the ones we fish);
- predators' and top predators' (not just fishing) influence;
- climatic changes;
- eutrophication;
- pesticides and other harmful substances;
- habitat effects—industry, oil- and gas activities, etc.;
- aquaculture.

How do we go about this at the international level? We work through our established fora, plus we put emphasis on the RACs—this is an obvious area for the RACs (Regional Advisory Councils).

We do not aim at replacing ICES. We do not aim at influencing the ICES process apart from contributing better data, if possible, and opening the advisory process up. But we do aim at influencing STECF!

We hope, of course, that the recommendations will be followed and can form an integral part of the future ecosystem-based advice along with the advice on fishery activity.

Fishermen are part of “The System”. We aim at becoming true stakeholders in the process and implementation of Ecosystem-Based Management and thus create the situation, where “Ecosystem-based management = more science = more fish” happens!

4 Environmental NGO

Stephan Lutter, WWF

Position statement: WWF considers the application of the ecosystem approach, incorporating the precautionary principle, as fundamental to achieve the sustainable use of the seas, and in seeking truly comprehensive and integrated governance. We welcome the adoption of this concept by Environment Ministers at the 5th North Sea Conference and the Joint OSPAR-HELCOM Ministerial Meeting (Bremen, June 2003) and acknowledge the ecosystem approach to management (EAM) being at the centre of the consultations to develop a European Marine Strategy.

Own involvement: WWF's advocacy efforts to improve marine environmental policy, our initiatives to foster ecosystem approaches and eco-region conservation as well as our field work in marine conservation projects are based on scientific advice, covering ecological, socio-economic, and political aspects. In various ways, they are also interrelated to the scientific advice provided to governmental and intergovernmental institutions, including the advice provided by ICES to the EC and regional seas commissions such as OSPAR and HELCOM. We further closely follow and evaluate scientific advice mechanisms beyond ICES—to refer to the meeting of the Advisory Committee to ASCOBANS coming up in Poland later this week as an actual example.

The challenge: central to the ecosystem approach is the holistic assessment of the impacts of human activities on the marine ecosystem and the development of the respective integrated management measures. Hence, the introduction of an ecosystem approach to management of all human activities affecting our seas is a double challenge: on the one hand, established sectoral advice mechanisms will be required to expand their scope to become more holistic and/or integrate better with each other. On the other hand, the governance of new institutions such as the Regional Advisory Councils (RACs) for fisheries could become a test case for stakeholder endorsement and straightforward implementation of scientific advice in decision making and management of human activities at ecosystem, eco-regional or zonal level.

Key elements: WWF identifies six points as critical for the development and implementation of a holistic ecosystem approach, with scientific advice playing its role in each of these areas:

- The setting of a vision and environmental goals with stakeholder engagement;
- Developing an integrated marine policy;
- Assessing the resource and status of the resource (including the use of biodiversity, socio-economic and risk assessments, and threats analysis);

- Establishing a spatial planning system, incorporating mapping activities and a decision making process to identify what activities can take place where;
- Identification of delivery tools, such as consents, permits and economic tools; and
- Developing a strategy for delivery incorporating a legislative framework to delivering an ecosystem approach.

The tool-box: recognizing that it is human activities that we aim to manage not ecosystems, there are only a limited amount of tools available for marine management. These can be broadly divided into two groups: assessment tools and delivery tools. Strategic environmental assessment (SEA), taking account of cumulative impacts by all sectors and incorporating both socio-economic and ecological assessment and risk assessment, alongside environmental impact assessment (EIA) can be used to facilitate decision-making processes. While the delivery tools can be largely grouped under three headings:

- (i) spatial controls;
- (ii) controls on levels; and
- (iii) best practice including appropriate technological advances etc.

Ecological Quality Objectives (EcoQOs), preferably to be established for process variables and functional aspects of the marine ecosystem, are just considered one out of a whole range of delivery tools for an ecosystem approach. A system of spatial planning for the marine environment is an equally necessary tool for the delivery of an ecosystem-based approach to management of human activities in the marine environment. It will also provide an essential framework in which conservation of marine biodiversity, through initiatives such as Marine Protected Areas, can counterbalance the growing demand for space at sea for human use. The precautionary principle and/or zero option must have a bearing on each type of the delivery tools referred to above: in the absence of conclusive scientific evidence, a potentially harmful human activity needs to be reduced in scale or avoided entirely.

The combination of tools used will depend on the biology of discrete ecological regions and social and economic factors. Putting these measures in place also requires a decision-making process and ways and means of monitoring and evaluating the success of the measures, the latter being an important arena for scientific advice, too.

Geographic scale: WWF believes that regional or zonal management is required for

- (i) the development of practical marine management measures;
- (ii) biological monitoring and evaluation at an appropriate level;
- (iii) to address social and economic realities in different regions; and
- (iv) to facilitate decision-making frameworks that include representatives of all legitimate interests in a region, for example, to negotiate and form strategies for implementation of management solutions.

Again, scientific advice is key to identify the appropriate scale of management regimes, based on ecosystem features and properties. In the marine environment, the concept of Large Marine Ecosystems (LME) appears to be the most suitable one to define such delimitations and boundaries. It was used to identify WWF's marine eco-region approach at a global scale.

There are already two initiatives that can effectively be seen as the first stages of regional or zonal fisheries management, the Irish Sea Cod Recovery Programme and the North Sea Commission Fisheries Partnership. However, regional or zonal management of fisheries as a sector is not integrated ecosystem management of all activities.

Lessons from the past: while a holistic ecosystem approach that is both scientifically based and capable of implementation still remains in its infancy, there are certain lessons from established sectoral and geopolitical advisory and implementation processes that might provide food for thought and help advance such an approach. The following list is not exhaustive and only picks up on a few recent examples from the northern seas context, but might be useful to point to flaws and failures in the current system with a view to finding remedy:

- The specific management recommendations from the five regional Quality Status Reports (rQSRs) on the North-East Atlantic marine environment (OSPAR, 2000), incorporating a wealth of scientific expertise and highlighting requirements for measures at the spatial and resource level in addition to generic measures already addressed in the holistic main QSR, have never been followed up systematically because there is no decision-making and management structure corresponding to the assessment units.
- The pilot project on EAM for one of these regions, the Greater North Sea (II), almost exclusively concentrates on the development and implementation of EcoQOs whereas the aspect of consistent spatial management is omitted, in spite of various stakeholder views expressing the need to address this issue.

- In the development of an OSPAR list of species and habitats under threat or decline, and of measures to improve their status, a lack of the precautionary component in scientific advice and review was observed for certain elements such as seamount ecosystems although precaution would have been reasonable due to ecosystem-based experience gained in other parts of the world, e.g., Australian waters.
- Similar examples could be found in relation to certain chemical pollutants.
- Where urgent action is clearly recommended by ICES in order to prevent further habitat or community loss, e.g., cold-water corals and deep-sea fish stocks, the machinery to implement such advice (EC, NEAFC) runs at rather slow pace and needs to be fuelled by stakeholders and other institutions, including NGOs' campaigns, OSPAR Ministers' commitments and individual governments' proactive steps (Norwegian coral legislation) to keep the momentum and become effective. While lack of speed in implementation is an important concern in general, this comment is not to belittle the value of the particular achievement itself: the adoption of a regulation, by the Fisheries Council, to protect the first deep-water coral habitat in EU waters (Darwin Mounds) from bottom trawling is an important precedent for further integration of conservation and fisheries policies.
- Contrary to the guidance and obligation provided by the reformed CFP, decision-making at Council level in many cases continues to sadly ignore the scientific advice provided by ICES, ASCOBANS and others, which recently led to complete failure in attempts to save North Sea cod stocks and to effectively reduce small cetacean by-catch.

Main conclusions

Making scientific advice to EAM coherent: WWF believes that the mutual exchange of information between the scientific community and related advisory institutions and decision-making or management bodies must encompass the full range of human impacts affecting the marine environment.

Making scientific advice to EAM operational: WWF believes that decision-making or management bodies need to start requesting scientific advice at all levels of EAM development and consistently for all assessment and delivery tools. The geographic scale of assessment, advisory and management must be based on ecosystem features and brought in line with each other.

Making scientific advice to EAM more credible: WWF believes that credibility could be increased via inclusiveness of decision-making processes and stringent implementation at political level. Scientific advice should not shy away from recommending precautionary action.

5 Other Industry Stakeholder

Fergus Cahill, Chairman, Irish Offshore Operator's Association

This meeting is well provided with experts in the sciences, fisheries, ecology, and environmental management, and I must acknowledge that I am qualified in none of these areas. Rather, therefore, than trying to advance the discussion on a scientific or academic level, I would like to describe briefly to you, in the context of the oil industry, some examples of what might be described as embryonic ecosystem approaches to the integrated management of the marine environment in Ireland.

1. Reactivation of the Whiddy Island Oil Terminal in Bantry Bay

This Terminal was built by Gulf Oil in 1969 to transship crude oil to European refineries from VLCC's, which, because of their deep draft, could not access NWE ports. On its establishment, there was little economic activity in the area. Emigration and depopulation were the norm, and the investment and employment in the terminal was widely welcomed.

In 1979, operations at the terminal were brought to a halt by the explosion of the tanker Betelgeuse, and the terminal lay dormant for many years. However, through the enterprise of local people, a very substantial replacement business was developed in mussel farming. Inshore fishing also developed, and with increased prosperity, tourism became a major employer in the area.

In the early 1990's, the terminal passed into the ownership of the Irish National Petroleum Corporation (INPC) and in 1994 the decision was made to reactivate it, principally for strategic storage of crude oil. The damaged jetty was to be replaced by a Single Point Mooring (SPM). Given both the Betelgeuse tragedy and some relatively small, though in their context significant, oil spills from vessels using the terminal, and, on the other hand, the intervening development

of substantial economic activity depending on a high-quality environment, the reactivation of the terminal was not welcomed with open arms, to put it mildly.

Thus, it was necessary to put a great deal of work into convincing the established stakeholders that an active oil terminal could successfully co-exist with environmentally sensitive activities such as mussel farming, inshore fishing and tourism. This was not an easy task. The stakeholders included the local communities, the Bantry Harbour Commissioners, the mussel farmers, the Bantry Bay Inshore Fishermen's Association, local tourism interests, Cork County Council, the Environmental Protection Agency, the Department of the Marine, An Bórd Iascaigh Mhara (The Sea Fisheries Board), the Marine Institute, and of course the terminal itself. Reconciling the often-conflicting requirements of these agencies was not an easy task. Designing an environmental protection package, including baseline studies, monitoring programmes, and ballast water control, that satisfied all requirements while conflicting with none, needed considerable expertise, detailed knowledge of the various regulatory regimes and, above all, significant diplomatic skills. We were fortunate that our consultants, Byrne Ó Cléirigh, were adept in all these areas, and the proof of the pudding, as they say, is that the SPM is in place, and the terminal continues to work in close cooperation with the other stakeholders.

Looking back, we can perceive the development and application of an integrated management plan, covering diverse social and economic objectives, environmental protection, and ecological quality goals. More interestingly still, the process described above led to the establishment of the Bantry Bay Charter. This project aimed to develop a consensus-based integrated coastal management strategy for Bantry Bay, and was designed to look in an integrated way at issues traditionally handled by sectoral agencies. No less than sixty stakeholder organizations were directly involved in the development and agreement of the Charter, and while the project itself has lapsed due to funding difficulties, its legacy can be seen in the harmonious coexistence of numerous and diverse interests in Bantry Bay.

2. Petroleum Infrastructure Programme (PIP)

To move closer to the present day, the Petroleum Infrastructure Programme (PIP), established in 1997, is being funded and managed by the exploration and production sector of the industry – the offshore license holders – and the Petroleum Affairs Division (PAD) of the Department of Communications, Marine and Natural Resources. Its objectives are to strengthen local support structures, to fund data gathering and to provide a forum for cooperation. Common industry issues are being addressed in such areas as regional data gathering, applied research projects, research cruises, training and provision of equipment to local universities and institutions. Cooperation with other industry groupings and research teams is encouraged. Data and information are gathered under the headings of Subsurface and Seabed Geology and Geophysics, Metocean, Environmental and Engineering. Under the chairmanship of Mr Noel Murphy of the PAD, in excess of ninety joint industry projects have been completed or are in progress and more are planned for this year. The work of the PIP is providing a wide background for the informed development and management of offshore projects. Details of the PIP programme and the projects funded are available at www.pip.ie.

The National Seabed Survey, a complete survey of the Irish Continental Shelf, is now significantly complementing this programme. This project is managed jointly by the Geological Survey of Ireland and The Marine Institute, and is already greatly widening the spectrum of data available to assist and support the effective management of offshore activities.

3. Marine License Vetting Committee (MLVC)

The licensing of petroleum development projects offshore Ireland is governed by a complex body of legislation. I would like to focus on the work of the Marine License Vetting Committee (MLVC), chaired by Dr Terry McMahon of the Marine Institute, whose recommendations on the granting of Foreshore Leases, the approval of Plans of Development, and Pipeline Consents are central to the decision making of the Minister.

In summary, the Environmental Impact Statement (EIS), prepared and submitted by the developer, is reviewed and assessed by the MLVC, who also engage in a detailed consultative process involving both public meetings and a review of written submissions from individual stakeholders and interested parties. This process takes into account not alone "traditional" environmental issues, but also embraces cultural and heritage effects of the proposed development, as they may be impacted by the relevant environmental issues. Thus, weight is accorded to the views of a wide range of stakeholders.

The establishment of an Environmental Monitoring Group, comprising representatives of the main stakeholders, ensures local stakeholder involvement throughout the lifetime of the project.

In conclusion, I would observe that the above approaches have generally evolved in the context of specific projects, rather than being designed ab initio. This, in my view is a good thing. It is a mistake to try to legislate for every eventuality, or to be too prescriptive in regulation. The future will always surprise us, and if, as the aim of the meeting states, we are to make the process coherent, operational and credible, I believe that the correct approach is to have certain core principles, and to allow the system to adapt to meet specific circumstances. The industry is happy to work with all stakeholders to achieve such optimal results, and I hope, rather like Moliere's Monsieur Jourdain, that we will be pleasantly surprised to discover that we have been practicing an ecosystem approach all along, without knowing it.

Acknowledgements

My thanks to Byrne Ó Cléirigh, the Marine Institute, and The Petroleum Affairs Division of DCMNR for their assistance in preparing this contribution.

Annex 5 The role of ICES in providing advice (with examples) (keynote address for science) (Jake Rice, Chair of the ICES Consultative Committee)

There are two parts to this title: “What is advice?”, and “What is ICES role in providing it?” We cannot answer the second until we are all on same page with the first.

I may sound presumptuous to tell managers “what is advice”. However I have two credentials to do so:

1. I have attended ACFM and ACME and ACE for almost every meeting for the past seven years.
2. My job in Canada is to coordinate the provision of advice on fisheries, species-at-risk, reviews of environmental impact assessments, implementation of ecosystem approach, etc.

These have left me with the strong impression that both scientists and managers have a very myopic view of “what is advice”. This is not a big problem as long as we worked in disciplinary stovepipes. If we are looking for truly integrated advice for management in an ecosystem approach, this myopia is a big problem.

Management and Policy need advice on THREE levels:

- 1) Level One: The infrequent but truly “Big Conceptual Questions” – what should be the policy objectives. ICES role there is to provide advice on appropriate objectives from biological/ecological/health perspectives. There are, of course, social and economic objectives as well, but advice on those aspects of policy come from economic and social advisors and consultation. The advice on Level One aspects of biological objectives often has less immediacy than the social and economic advice, but it is more inexorable. Failure to respect the conservation and health boundaries at the high policy levels pretty much guarantees failure to sustain the social and economic objectives in the medium term as well. By avoiding a little short term social or economic pain, at the expense of sound biological objectives, you can ensure much more pain later.
- 2) If we do a good job advising on Level One, wise managers have to seek advice at Level Two, and ask the “Big Technical Question” – how can progress towards achieving the policy objective best be made, and measured. Managers need performance measures for their policies of known accuracy, precision, sensitivity, specificity, cost-effectiveness, etc. The recent interest in indicators and reference points for taking an ecosystem approach to management highlights how demanding these questions can be, and how ineffective management can be if sound advice has not been sought when it should have been.
- 3) Then, if we do a good job answering Level Two requests for advice, we are set up for providing lots of recurrent Level Three advice on “Operational Questions” – what do the measures say about the effectiveness of pursuing the objective, and what, if anything should be done to improve the situation. A large portion of ICES advice is just feedback on whether management policies and measures that have already been adopted are leading to the desired outcomes, as reflected in pre-selected performance measures. If so, the managers stay on course; if not, the managers adjust.

Whatever the “advice” may look like, it is always one of those three tasks. Any one of them skipped, or done poorly, and both credibility (science advisors) and effectiveness (policy and manager officers) suffer.

Conceptually, ICES has the same role in all three levels of advice. It is the source of impartial, objective and, increasingly, integrated advice on the natural and physical science aspects of whatever question is posed. Particularly for Levels One and Two, ICES also has an important role in engaging in dialogue with clients about what questions are posed to it. Both sides can become quite frustrated unless the questions are well posed. The scientists may receive intractable questions which they then convert into tractable – but possibly different – ones; the managers may receive answers that don’t help them make their policy choices.

Neither managers nor ICES usually think of the nature of advice in these levels from the conceptual to the operational. Instead, both tend to think thematically—fisheries advice, environmental advice, and ecosystem advice. This has led to a lot of misunderstandings and even some distrust among those working thematically.

Fisheries advice has two advantages. First, it operates within a very mature advisory framework, so most advice is at Level Three. We may even forget that some time in the past a lot of work was done to decide that SSB and Fishing Mortality are appropriate biological currencies for measuring progress towards the biological objectives of healthy stocks. However, when we do try to make adjustments to Level Two advice—for example, setting up Limit and Precautionary Reference Points—we find these more fundamental questions challenging for both science advisors and

their clients. Second, fish stocks give rapid feedback on whether management is achieving its objectives. Hence, because most fisheries advice is at level Three, it *looks* really a lot like “advice”. It advises exactly where current stock status lies relative to Level Two reference points, and exactly what managers should do to correct discrepancies.

It also has a disadvantage—the Level Three advisor tasks of estimating current status of SSB and F is analytically complex. The basic data series are straightforward; research surveys and commercial catches (although many national authorities seem hopelessly incapable of providing accurate catch data to ICES). Integrating them into biomass and fishing mortality requires complex analyses and models, and requires substantial expertise.

In many environmental areas, the technically sophisticated tasks are at Level Two: in selecting the measures and taking them. Moreover, the environmental challenges are continually changing so new Level One and Two questions keep emerging. Just as Science had to take on the challenge of developing fisheries reference points, before managers began to ask for them, Science advisors have had to be proactive in highlighting where new environmental challenges lie and what to do about them. Some of ICES most important advisory tasks have been in this domain—Level Two and sometimes even Level One advice on environmental issues; for example:

- the Codes of Practice on the Introductions and Transfers of Marine Organisms and the work of the WGBOSV on ship-borne transfer of organisms, and
- the ICES work on ecosystem effects of marine sand and gravel extraction, including the new Guidelines for the Management of Marine Sediment Extraction.

Neither of these advisory tasks was requested by management commissions; rather, management activities could be developed once ICES proactively provided a framework in which they could work. ICES also designed the main monitoring programmes for contaminants that were adopted by OSPAR and HELCOM 25 years ago, and these have been running, with updates recommended by ICES, ever since. It also developed the methodology for environmental assessment reports (quality status reports) and the data assessment methods for temporal trends of contaminants and nutrients in biota and in riverine and atmospheric inputs. There are all proactive Level Two advice, creating the tools which allow environmental health to be monitored and managed.

For at least three reasons, there is much less environmental advice at Level Three. First for many factors, as long as monitoring programs are based on sound science (Level Two), managers can interpret the trends pretty directly without scientists to undertake technically complex modelling efforts. Second, feedback to detect ineffective management measures and provide guidance on necessary adjustments accumulates much more incrementally, so advice on changes to management is reasonable only periodically rather than annual TAC adjustments. Finally, there is inadequate knowledge to set science-based limit levels for many contaminants and foreign subjects, so there is no starting point for advice relative to limit reference points.

For all three of these reasons a lot of environmental advice *looks* more like just providing “data and information”. The important thing, though, is that in both environmental and fisheries areas we are giving the managers exactly what they need—feedback on the effectiveness of their measures in meeting their objectives. It is only the time scales and the places where complexities arise that the advice *looks* a little different between fisheries and environmental issues. It *functions* in very similar manners, and that is what matters.

Even if I have made the case for the different roles of science advice in supporting different management needs, why go to ICES for the advice. Commission staffs can hire their own technical experts for the technical tasks. The role of ICES follows directly from the very special position of science advice in government decision-making. Science advisors are not just one more partisan advocacy group; they provide objective, impartial, policy-and-value neutral information which should form the common starting point for dialogue among all the value-laden social, economic, and cultural interest. ICES has the independence and culture to uniquely fill that role. In fisheries, choosing and interpreting the complex technical analyses provides ample room for bias and subjectivity, so it is essential that policy and management experts go to an independent source for advice on these analyses. With environmental issues, policy bias can be imposed by selecting poorly designed or insensitive monitoring protocols, or just through benign neglect. Hence, independent science advisors have a vital role in designing field protocols and in QA/QC and publication of the data sources.

All these jobs can be done *technically* by experts in management agencies; they just can’t be done *credibly*. Despite its arm’s-length position, even ICES credibility is being challenged, because society is abandoning the historic culture of isolated experts working behind closed doors and releasing the white smoke when a wise decision is reached. ICES – and its clients – are both responding to this change in societal values, albeit with some difficulty. These two days are an important part of our common response to these changes, in fact. Personally, I think we are responding far too slowly, and in ways which make all of our processes for requesting, for providing, and for acting on advice more complex but not better. It is demonstrably true, and beyond challenge, that sound and impartial science advice can be provided in

settings inclusive of knowledgeable individuals from relevant industry sectors, environmental groups, and community organizations, and until those who fear change can get over their prejudices we will all be under an increasing sense of siege.

The change in the inclusiveness of our practices is not the only challenge we face together, however. The growing interest in an “ecosystem approach” presents another set of significant challenges. The ecosystem approach necessarily drives us all back up to Level One questions. Again, ICES has been very proactive through ACE, ACME, and WGECC both in laying out the higher level conceptual objectives (Level One), and trying to operationalize them (Level Two). ICES work on EcoQs and EcoQOs in the context of the Bergen Declaration are the beginnings of a whole new scale of doing business. However, it’s been so long since managers and policy makers took seriously the asking for and responding to advice on Policy-level questions that they are not posing requests for advice very well; and we science advisors are so out of practice in providing *useful* (rather than just pedantic) advice on policy questions that we aren’t doing brilliantly either.

Moreover, a huge part of the infrastructure in both the management and the science advisory sides is occupied with level three work for old fisheries objectives, and level two work for old environmental issues. The discrepancies that result should surprise none of us. Those getting the advice lose sleep over the discrepancies between the preliminary Level One advice they are getting on integrated ecosystem issues and the very mature Level Three advice they are getting on detailed fisheries problems. In fact there is no reason at all why the two types of advice should NOT have big discrepancies. Managing fisheries in an ecosystem context will not be business as usual, nor will actions on environmental quality. One occasionally encounters statements that current problems with uncertainty in Level Three advice (particularly in fisheries) will somehow be reduced when science and management take a more ecosystem approach to their work. Any such expectations are false. The uncertainties may be better explained and perhaps even better quantified; they will not be *reduced*. They will be larger. At least for many single-species fisheries assessments, we can write out functional forms for key population dynamics, and have time series of data with which to parameterize them. When we put more complex ecosystem processes into these models, both the equations we will use and the data for parameterize them will be much more uncertain, and the uncertainties will be carried forward in the results and advice. Note that the ecosystem approach did not *create* these new uncertainties; it only forced us all to address them directly for the first time. Therefore, it won’t help to try to turn back the clock.

Both the discrepancies and the increasing uncertainty we expect in the near future are unwelcome to both groups—those getting the advice and those producing it. There is even a risk that we go into denial and become overly obsessed with detail in current advice, even if for different reasons. Managers could become obsessed with detail because the older, non-integrative approaches to management (and assessment) has allowed so many stocks to reach such horrible states that there is no room for further manoeuvring, when an ecosystem approach will almost certainly require even greater management actions on more uncertain scientific advice. Scientists may become obsessed with detail in Levels Two and Three partly because they feel under siege, and partly because they are trying to provide the accuracy and precision of Level Three answers to Level One and Two questions which are much more complex and for which the information is far more incomplete.

Focusing on detail and magnifying inconsistencies is exactly the wrong thing to do in a time when change—big change—is looming. The detail won’t be perfect during a time of transition. So managers and the science advisors have some choices to make. If we want greater accuracy and precision; greater detail and consistency, we have no choice but to focus ever more exclusively on Level Three advisory tasks in the old stovepipe context. If we are really good we will be able to accurately and precisely track the history of failures of most fisheries and a fair number of environmental policies and management measures. If we do want new integrated, ecosystem-aware policy frameworks, though, the overall patterns are already obvious. We should put more effort on both sides into level one and level two advisory questions about the ecosystem approach, and get them right, and get a new approach off to a reasonable start.

Here again ICES has a more important role than ever. Not only does it maintain its value as a source of arm’s-length, impartial, and credible advice, it is the *one* place which consistently attracts the necessary breadth of expertise to provide advice in an integrated ecosystem context. It has made the proactive changes organizationally; it has created the necessary new expert groups to do the work; its basic advisory format is evolving. It is receiving and acting on more diverse and challenging requests for advice on components of an ecosystem approach. This is a foundation for a good future, and this Dialogue Meeting is a good setting to work at building the future on that foundation.

Annex 6 Panel 2: Scientific advice for an ecosystem approach to management

1 Making it coherent across management of human activities that impact on marine ecosystems

Making it coherent—Ecological Quality Objectives (EcoQOs)

Hein Rune Skjoldal, Institute of Marine Research, Norway

The Ecosystem Approach to management can be described with five main components:

- Objectives;
- Monitoring (and research);
- Assessment;
- Advice;
- Management.

In this presentation, the development of Ecological Quality Objectives (EcoQOs) as part of an ecosystem approach will be described.

The North Sea Ministers first requested the development of ecological objectives for marine management at the Third International Conference on the Protection of the North Sea in The Hague in March 1990. Based on this request, three workshops to begin the development of such an approach were held between 1992 and 1995 under the sponsorship of the OSPAR Commission, with the first also sponsored by the North Sea Task Force. Further support to the ecosystem approach was provided by the Fourth North Sea Conference, which took place in Esbjerg, Denmark in June 1995, and the Intermediate Ministerial Meeting on Fisheries and the Environment, in Bergen in March 1997. As a follow up, a Workshop on the Ecosystem Approach was held in 1998 in Oslo, Norway, which concluded, among others, that clear objectives are needed as part of the development of an ecosystem approach. The workshop further suggested that Ecological Quality Objectives, under development within OSPAR, could provide a solid basis for defining clear objectives. As a result, a workshop specifically on Ecological Quality Objectives was organized in 1999 in Scheveningen, the Netherlands.

ICES established the new Advisory Committee on Ecosystems from 2001 and has, through this committee, provided advice on the development of Ecological Quality Objectives (EcoQOs). Advice provided in the 2001 ACE report served as a basis for an OSPAR progress report to the Fifth North Sea Conference, which took place in Bergen, Norway in March 2002. The Bergen Declaration established a framework to implement a set of Ecological Quality Objectives for the North Sea. In this Declaration, North Sea Ministers requested OSPAR to implement a set of ten Ecological Quality Objectives in a pilot project and to develop a further set of eleven EcoQOs, in collaboration with ICES and other relevant organizations. A report on this development will be prepared by OSPAR by 2005. ICES has conducted a considerable amount of work on these EcoQOs and the EcoQO framework and provided extensive advice to OSPAR in the ACE reports from 2001 on.

A possible hierarchy of ecosystem objectives is as follows:

- Overall objective (goal);
- General objectives;
- Specific objectives;
- Variables;
- Indicators:
 - Targets,
 - Standards.

The Ecological Quality Objective framework is structured as follows:

- Issues;
- EcoQ elements;
- EcoQOs;
- Indicators:
 - Targets,
 - Standards.

Ecological Quality (EcoQ) is defined as “An **overall expression of the structure and function of the marine ecosystem** taking into account the biological community and natural physiographic, geographic, and climatic factors as well as physical and chemical conditions including those resulting from human activities”.

An Ecological Quality Objective (EcoQO) is “The **desired level of ecological quality** relative to a reference level”.

It should be noted that these definitions are at the ecosystem level. Evidently, the structure and function of an ecosystem can only be described by a number of different variables as a multivariate expression. An integrated set of EcoQOs will therefore need to be developed, covering, on the one hand, the influence of human activities on the marine ecosystem, while reflecting, on the other hand, key features of ecosystem properties.

In 2001, ICES developed criteria for the evaluation of EcoQ metrics and EcoQOs. These criteria state that good EcoQs should be:

- a) relatively easy to understand by non-scientists and those who will decide on their use;
- b) sensitive to a manageable human activity;
- c) relatively tightly linked in time to that activity;
- d) easily and accurately measured, with a low error rate;
- e) responsive primarily to a human activity, with low responsiveness to other causes of change;
- f) measurable over a large proportion of the area to which the EcoQ metric is to apply;
- g) based on an existing body or time series of data to allow a realistic setting of objectives.

The issues that were agreed by North Sea Ministers at the Fifth North Sea Conference, as listed in Annex 3 to the Bergen Declaration, are: 1) commercial fish species; 2) threatened and declining species; 3) sea mammals; 4) seabirds; 5) fish communities; 6) benthic communities; 7) plankton communities; 8) habitats; 9) nutrient budgets and production; and 10) oxygen consumption.

Twenty-one ecological quality elements were agreed in relation to these ten issues: (a) Spawning stock biomass of commercial fish species; (b) Presence and extent of threatened and declining species in the North Sea; (c) Seal population trends in the North Sea; (d) Utilization of seal breeding sites in the North Sea; (e) By-catch of harbour porpoises; (f) Proportion of oiled common guillemots among those found dead or dying on beaches; (g) Mercury concentrations in seabird eggs and feathers; (h) Organochlorine concentrations in seabird eggs; (i) Plastic particles in stomachs of seabirds; (j) Local sandeel availability to black-legged kittiwakes; (k) Seabird population trends as an index of seabird community health; (l) Changes in the proportion of large fish and hence the average weight and average maximum length of the fish community; (m) Changes/kills in zoobenthos in relation to eutrophication; (n) Imposex in dogwhelk *Nucella lapillus*; (o) Density of sensitive (e.g., fragile) species; (p) Density of opportunistic species; (q) Phytoplankton chlorophyll *a*; (r) Phytoplankton indicator species for eutrophication; (s) Restore and/or maintain habitat quality; (t) Winter nutrient (DIN and DIP) concentrations; and (u) Oxygen.

Ten Ecological Quality Objectives were agreed in the Bergen Declaration by North Sea Ministers to be included in a pilot project for implementation in the North Sea under the OSPAR Commission. Furthermore, the remaining eleven EcoQ elements should be further developed and implemented. OSPAR was requested to review the status of the use of EcoQOs by 2005.

The distribution of the 21 EcoQ elements (labelled with the letters from (a) to (u)) over the ten issues and six human impact categories (as used in the previous OSPAR Joint Assessment and Monitoring Programme) is shown in the table below. A fair number of EcoQ elements relate to fisheries and to eutrophication. Some elements relate to pollution, but they are limited to seabirds and benthic communities. One element relates to litter, and none to mariculture.

Issue	Pollution	Eutrophication	Litter	Fisheries	Mariculture	Ecosystem/ habitat
1. Reference points for commercial fish species				a		
2. Threatened or declining species				(b)		(b)
3. Sea mammals				e		c, d
4. Sea birds	f, g, h, (k)		i	j, (k)		k
5. Fish communities				l		l
6. Benthic communities	n, (o, p)	m, (o, p)		(o, p)		
7. Plankton communities		q, r				
8. Habitats						s
9. Nutrient budgets and production		t				
10. Oxygen consumption		u				

During Spring 2004, seven ICES working groups are reviewing and evaluating the 21 Ecological Quality elements including the ten EcoQOs in the North Sea pilot project. The results of these evaluations will be compiled by the Advisory Committee on Ecosystems at its June 2004 meeting and advice will be provided to OSPAR in response to its extensive request in relation to the review and further development of EcoQ elements and EcoQOs.

Marine ecosystems are in constant change due to natural variability. This poses a major challenge for the development and implementation of EcoQOs. In particular, climate variability and change is a major forcing factor on ecosystem dynamics, affecting for example fish stock dynamics and contaminant pathways. ICES will need to develop better means to understand these impacts and to take them into account in its advice on the further development of an ecosystem approach to marine management.

Coherence at different policy levels

Hermien Busschbach, Ministry of Transport, Public Works and Water Management, The Netherlands

In this presentation, I will look at the coherence of the ecosystem approach at different policy levels, covering the global level with the Convention on Biological Diversity (CBD), the regional level with organizations such as the OSPAR Commission, and the national level.

Starting at the global level, for the ecosystem approach, the CBD provides the global framework. Under the CBD, there are the twelve Malawi principles as overarching principles that form a primary framework for action on an ecosystem approach. At the Seventh Conference of Parties (COP 7) to the CBD, they have been made operational, for example, by the agreement on the establishment and maintenance of marine and coastal protected areas. The twelve Malawi (CBD) principles of an ecosystem approach are:

- 1) Management objectives are a matter of societal choice.
- 2) Management should be decentralized to the lowest appropriate level.
- 3) Managers should consider the effects of their activities on adjacent or other ecosystems.
- 4) There is a need to understand the ecosystem in an economic context, as one basis for management programmes.
- 5) The ecosystem approach includes conservation of ecosystem structure and functioning.*
- 6) Ecosystems must be managed within the limits to their functioning.
- 7) The ecosystem approach should be undertaken at the appropriate scale.*
- 8) Objectives for ecosystem management should be set for the long term.*
- 9) Management must recognize that change is inevitable.
- 10) The ecosystem approach should seek the appropriate balance between conservation and use of biological diversity.*
- 11) The ecosystem approach should consider all forms of relevant information.*
- 12) The ecosystem approach should involve all relevant sectors of society and scientific disciplines.*

The principles marked with an asterisk (*) have been applied by ICES in the development of advice for OSPAR on issues related to the ecosystem approach.

The global level provides a framework for regional implementation. For marine ecosystems, the regional level is the most appropriate level for implementation.

In the OSPAR framework, Annex V to the 1992 OSPAR Convention is related to the conservation of ecosystems and biological diversity, and thus to CBD principles. In this framework, there are several means to make the ecosystem approach operational. These include:

- The development of the Texel-Faial criteria for selection for species and habitats in need of protection;
- The adoption of an OSPAR Priority List of Threatened and Declining Species and Habitats;
- The development of principles for the designation of Marine Protected Areas;
- The development of a set of Ecological Quality Objectives.

In relation to the above OSPAR work, extensive use has been made of ICES for the development of scientific advice concerning Ecological Quality Objectives, while no requests concerning Marine Protected Areas have been directed to ICES from OSPAR.

In the EU framework, there are several policies that implement the ecosystem approach in different ways. For marine issues, the most important policies include the Birds and Habitats Directives, the Common Fisheries Policy (CFP), and the European Marine Strategy. In the revision of the CFP, the ecosystem approach has been included as a way to manage fisheries.

In developing the European Marine Strategy, there is a direct link to the Malawi principles. ICES has an important role in advising the EC in relation to the European Marine Strategy by coordinating the preparation of a draft Road Map that provides guidance on how to develop an ecosystem approach to managing human activities impacting the marine environment; this contains a direct reference to the Malawi principles.

Implementing a truly ecosystem approach as defined by the European Marine Strategy framework represents a significant challenge owing to the following factors, among many others:

- the protection of some ecosystem components may result in great harm to other components;
- there is a large variability in marine ecosystems in both time and space, which needs to be taken into account in management and in monitoring;
- human impacts on habitats can be additive or synergistic;
- there are many possibilities to work on ecosystem components but fewer possibilities in relation to processes and mechanism owing to incomplete knowledge of the latter.

Obviously, there is a considerable amount of work to be done to implement an overall ecosystem approach to marine management.

The European Marine Strategy is particularly intended to improve coherence in approaches to marine management. The European Marine Strategy will promote the development of a coherent policy to promote sustainable use and to protect the ecosystems of the European Seas; it is intended to improve coherence within the EU framework (among Directorates General) and also to improve the coherence of activities of European national authorities as well as in relation to other international organisations such as the International Maritime Organization. Such coherence is needed because there are already a number of relevant regulations and many competent authorities. Accordingly, the use of the ecosystem approach should promote internal coherence in the policy field.

Fisheries is a sector that is in the process of implementing an ecosystem approach to management. The challenge, however, is to integrate fisheries policy into an overall marine policy.

When management is conducted on a sector-by-sector basis or on the basis of single ecosystem properties (single contaminants, one type of species), managing is much easier than within an ecosystem approach. Diverse ecosystem properties affect, or are affected by, fishing, and an ecosystem approach requires that all ecosystem properties be considered within the (wider) management framework. As an example, effects on non-target species should be taken

into account in the management of fisheries under an ecosystem approach, as also should be species that have a function in the ecosystem (such as harvest stock for predators).

In relation to the implementation of an integrated approach at the national level, the example of the Oosterschelde makes clear the type of difficulties faced in the Netherlands by implementing the ecosystem approach.

The Oosterschelde is situated in the southwest of the Netherlands, in the centre of the Delta area. An event that triggered action was the flood of 1953. This flood was a result of neglected dikes and a complex of unfavourable coincidental hydro-meteorological circumstances that caused extremely high water levels. An integrated water system approach gradually evolved during the decision-making process following the 1953 floods. In 1986, 33 years later, the top priority of safety was successfully implemented with the completion of the Delta works.

But even though the choice of a storm-surge barrier was made in order to ensure both safety and protection of the environment, we are beginning to realise that such large-scale construction works are nevertheless accompanied by unpredictable developments. Re-adjustments will be needed to ensure future functioning to the best extent possible.

In order to secure safety against the sea, the Delta Plan was developed. This plan consisted of the shortening of the coastline from 700 km to 100 km and was based on the construction of engineering structures such as dams and sluices. At that time, the plan focused only on sea defenses and there was no real concern about coastal waters that would be transformed into freshwater lakes. As immediate action was required, completion of the project was originally scheduled for 1978.

Some effects of management action are predictable, but others are not. Although the choice of a storm-surge barrier was the ultimate compromise between safety and environment, only time would tell which effects this decision would have on the Oosterschelde ecosystem. Predictions that were made before the construction of the Delta works have now been evaluated, seventeen years later. A decreasing exposure time of mudflats in the Oosterschelde had been predicted; however, its ecological consequences had not been mentioned.

A *water-system approach* means that the starting point is the water system, not the wishes of the society. The wishes have to be attuned to the possibilities provided by the water systems that can be developed. An *integrated approach* means that all relevant factors and stakeholders are involved in the decision-making process. These kinds of large-scale projects need political and public engagement. The *integrated water-system approach* became the basis for the revolutionary developments in water management during the past decade in The Netherlands, and far abroad.

Let me give an example of a direct consequence of decreasing exposure time of mudflats for birds, using the oystercatcher as an example. Especially in winter, birds need more food in order to maintain their body temperature. At a certain point, the decreasing exposure time will prevent the bird from further foraging as the mudflats are flooded again. This process affects not one single bird, but all waders that depend on the Oosterschelde mudflats for their food.

What is needed is adaptive management: learning by doing and utilizing feedback in decision-making (via a dialogue between scientists and policy-makers). This should include:

- Collection of data (ecological, socio-economic);
- Defining objectives;
- Formulation of assumptions;
- Testing of assumptions via monitoring;
- Re-assessment of assumptions and adopting and integrating this re-assessment in decision making.

2. Making it operational

Serge Garcia, FAO

While there is consensus on the fact that fisheries have no alternative but to be both socially and ecologically viable, there is much **less consensus yet as to what EAF really entails** and how it is to be implemented in practice.

The scientific component of the process is important but is not the only one constraining progress towards meeting the WSSD target.

The EAF is defined as an extension of conventional fisheries management. In red, in the slide I have noted the elements that need to be better understood and monitored. The implication is that existing institutional infrastructures, staff, laws, regulations, research programmes, etc., will need to adapt at a rate deemed **acceptable by society**.

There is **very little practical experience on how to do so** even if there are already a number of guidance documents, including from FAO. Managers, scientists, and stakeholders have to figure out, together, how to turn a set of ethically and politically correct but fuzzy principles into operational plans dealing with more **ecosystem components** than fishers and stocks and with a **broader range of ecosystem services** than just seafood and fisheries livelihoods.

One of the first fundamental steps in the implementation of the ecosystem approach is to turn the fuzzy **axioms, general principles, and overarching goals** of the international instruments into concrete **operational objectives and constraints**.

The process **needs to be participative** to ensure its “appropriation” by the stakeholders, increasing the chances of effective implementation even if this will significantly increase interaction costs. **Participative research** is one of the ingredients foreseen in that process.

The scientific, administrative, and institutional **capacity to implement conventional management is already insufficient** in many places. This capacity is a fortiori very insufficient to implement the more complex ecosystem approach. This is particularly true in most of the developing world and when the approach is implemented in a decentralized process where local capacity is both crucial and extremely deficient.

Selected areas for which efforts are needed to increase capacity include: the modernization and creation of new institutions (e.g., property rights and participatory mechanisms) including processes of interaction between Ministries and between regional organizations dealing respectively with the environment, fisheries, and other competing uses; the further development of human resources such as scientists, observers, information specialists, managers and advisers, fishers’ representatives, etc.; the development of targeted research and integrated information management systems to support interdisciplinary research, community understanding, and public scrutiny.

The implementation planning process is not really different from the process of elaboration of a standard fisheries management plan and I will only stress two issues I have just mentioned: The strong need for a **participative approach** involving the main stakeholders and the need for the development of a comprehensive **information management system**.

There is a **large overlap between the EAF and other frameworks** already adopted. The sustainable development framework, the precautionary and ecosystem approaches, the livelihood approach, the integrated management of coastal areas, etc., have a lot in common. This should lead to strong interactions between actors involved in their implementation, joining resources, sharing implementation costs, and reducing contradictions in policy and legislation.

This calls also for a better coordination of the various national and regional governance systems.

The science in support of EAF must be an extension of the science in support of conventional management. It will need to focus on better understanding of ecosystem functioning, variability and change; on uncertainty and risk assessment and management; on improvement of forecasting capacity; on identification and elaboration of key indicators; on provision of ex-ante and ex-post assessments of policy and management options.

While contributing actively to the necessarily adaptive process, it needs to integrate social sciences much more effectively and develop broader and more effective communication with society.

Many of the elements needed are already available. The use of **indicators** and of the **precautionary approach, including their combination in decision rules**, is already current in a few places even if still at an **embryonic level** and with significant improvements needed. **Predator-prey relationships, natural climatic variations, and habitat degradation studies**, for example, are already part of the current fishery research agenda. **Interaction of fisheries with other sectors and pollution impacts** on fisheries, however, are still poorly addressed.

A **large number of indicators are identified already** but most of them are not systematically collected, their behaviour is still often misunderstood, and few of them can really be integrated in decision systems.

It seems that, while **only a few indicators can be afforded** and used directly for fisheries operational monitoring and decision-making, many more are needed, in the background, for the scientists to keep monitoring ecosystem changes, better understand ecosystem functions, and eventually forecast problems in case of anomalous conditions.

Ecosystem-based decision rules are another aspect of the integration of indicators and reference points on which a lot more research is needed. In that respect, it may be becoming clearer that the stocks- or populations-based indicators presently used for conventional management will still be needed for short-term, year-to-year, EAF management. However, these short-term decisions will need to be nested in more ecosystem-based sets of indicators and decision rules at medium-term scale (e.g., for medium-term planning, multi-year plans of operation) as well as at longer-term level (e.g., for strategic and investment planning, capacity control, habitat rehabilitation, etc.).

We do not have the time to discuss here the question of the **systems of representation** needed to organize the management objectives and the related indicators, priorities, etc. I wish only to stress that these systems have been elaborated in the context of **sustainable development frameworks** and are most appropriate for EAF.

It would be a **major error, however, to reduce EAF implementation to the use of some additional environmental or biodiversity indicators**. The EAF is an integrated approach and the availability of a set of ecological indicators and reference values is absolutely necessary but will not be sufficient.

Better science is clearly needed, for better understanding of ecosystems, development of indicators, for monitoring and decision-making, option analysis, performance assessment, etc.

A large integration of social sciences is urgently and absolutely needed to better integrate people in the ecosystem, as constitutive and active components and not simply as extraneous, disturbing elements or systems variables.

All of this, however, will fail if the conventional fisheries plagues of overcapacity, lack of integrated development planning, and, above all, the century-old issue of resources allocation is not confronted, at ecosystem level.

3. Making it more credible

John Farnell, EC DG Fisheries

Introduction

Commentators on the EU fisheries policy always used to blame the politicians. "They never listen to the scientists." The decline in EU fish stocks was largely the Ministers' fault.

Recently, however, the emphasis has changed. Since the decisions taken in December 2002 to reform the Common Fisheries Policy, EU Ministers have signed up to long-term management of fisheries resources, taking into account environmental policy requirements, and based on the precautionary approach. Sustainability, based on scientific advice about what that means, has been placed firmly at the centre of European fisheries management.

And now the cry is no longer, "The managers are ignoring scientific advice" but rather, "The scientific advice is unsound and managers would be mad to follow it".

The more that scientific advice is accepted as the basis for management decisions, the more important it is for scientific advice to be credible, or convincing, to all of the parties concerned. That is not just a task for the scientific community alone. It requires cooperation and participation by the other parties in the process, managers, the fisheries sector, and other stakeholders.

I would like this afternoon to look at two main areas which we need to address in order to enhance the credibility of scientific advice for fisheries management:

First, the **form** in which advice is delivered (or the **type of advice** that is offered);

And second, the **processes and procedures** to be followed.

All of us, scientists, managers and fishermen alike, will have to change our current thinking if we are to make scientific advice on fisheries management more credible than it is today.

First then,

I. The type of advice we need

Current fisheries management advice from ICES is based on a number of assumptions, such as:

- 1) We know how much fish is being caught;
- 2) Stock size, fishing mortality, and future catches can all be forecast accurately;
- 3) We can best assess the state of fish stocks individually rather than as part of a larger system.

Consequently, advice is usually presented in a form that appears to forecast the response of the stock to short-term changes in catches, and implicitly in TACs.

But these assumptions are open to question:

- ✓ catch data are generally believed to be false because of misreporting;
- ✓ there are real uncertainties about estimated stock size (and, consequently the fishing mortality rate); and
- ✓ many fish stocks are exploited in mixed fisheries by different fleets with different behaviours, and are subject to other non-fishery related influences.

So, the standard form in which ICES delivers its advice today challenges credibility: Scientists need to recognize the precariousness of their assumptions and change the form of advice in order to take account of that. And fisheries managers, the fishing industry, and other stakeholders need to change their behaviour and expectations to make the task of fisheries scientists easier.

Three issues would seem to be a necessary part of this process:

- Improving data
- Dealing with uncertainty, and
- Enlarging the context of stock assessments.

Issue number 1. Improving catch and effort data

Good data are the essential pre-condition for credible advice.

Fishing is a “data-rich” activity. In theory, we should know where and when every fishing vessel has taken its catch, and how much effort is exerted in each of the sea areas. But obtaining those data can be a major problem. There are problems about the accuracy of recorded catch data from fishing vessels. Then there is the issue of access to data by scientists.

The first problem, the accuracy of data about catch and effort, is in the hands of the fishing industry. Until fishermen understand the need for accurate data, and the fact that withholding data is not an advantage but a fundamental handicap to an assessment of what is going on in the sea, then this problem will remain with us. Managers can, of course, help to make fishermen realize this, by demonstrating that the absence of data will, under the precautionary principle, lead to more restriction of fishing, not less.

Data on non-fishing effects on the ecosystem are much more difficult to come by. There is going to be a long time-lag before we get equivalent data in respect of these effects to the other data available on fishing activity.

The second problem, access by scientists to available data, can and must be addressed under the rules of the CFP. Member States have a legal obligation to make data available to scientists. The Commission will pursue them if they do not—and publicize any lack of cooperation. This is a high priority for the Commission. We are also coming forward with proposals for inclusion of environmental impact data in our data collection Regulation for fisheries management.

Issue number 2. Dealing with uncertainty

Today fisheries scientific advice looks as if it has everything it needs. Catch-forecast tables are interpreted as indicating that a particular TAC will produce a particular fishing mortality and a particular stock size, when experience shows that the outcomes over time do not correspond to the forecasts.

At present, the advice is determined by two-year-ahead forecasts, based on an uncertain starting point and assumptions (such as catch constraints) that are unlikely to hold true. If ICES uses assumptions, then the users of advice will assume, rightly or wrongly, that the ICES assumption is justified. In cases where it is not, the credibility of ICES and its advice withers.

Would it not be more reasonable, more credible for scientists to identify those parameters that can be estimated most reliably and to use those in formulating advice? For example, estimating relative values (such as the size of the stock compared to its size ten years ago), estimating trends (a decline or an increase in a population parameter) or estimating parameters derived from a number of years of data (e.g., $F_{0.1}$ or an average F) is much less demanding than estimating absolute values (such as the current size of the stock in tonnes, compared to an absolute reference point for biomass in tonnes).

ICES should, in the Commission's view, move away from advice based on short-term forecasts to advice that is less sensitive to error. "Harvest-rule based advice" is what the European Union is looking for, not numbers for next year with spurious accuracy.

The third issue relating to the "form of advice" is:

Issue number 3. Widening the context of assessments

This is partly a question of moving away from the standard "stock-by-stock" assessment model, in which the situation of each stock is treated in isolation from the other stocks with which it is fished. It is also a question of taking account explicitly of the wider ecosystem in which the stock lives.

No one is pretending that this is easy, that we will develop multi-species models or, even more difficult, ecosystem models in the immediate future. But the important thing is to try and to be seen to be trying to reach that goal.

For the reality of fishing is that many fishing fleets fish for a variety of stocks rather than a single one, and that even when fishing mainly for one, they have an impact on others to a greater or lesser degree.

ICES has recognized that reality, and has begun to present its advice in a way that takes some account of "fisheries-based" models for assessments. I would like to underline that even approximate linkages between fisheries, or between fishing and other environmental influences, are more useful to managers than the most precise estimates of what will happen to a single stock in the imaginary world of its being fished in glorious isolation. As data availability increases, especially regarding ecosystem influences and effects, this linkage can be made more precise.

II. The advisory process

Turning to "process and procedure" in the advisory process, there are two points under this heading which are critical for the credibility of scientific advice.

The first is transparency and "confidence building".

Much is at stake in advice for fisheries management: the protection of biodiversity and habitats, the survival of certain fish species, the economic future of the fishing industry. It is reasonable, therefore, to require that scientists can give a clear account of how they go about their business. This means moving away from the "black box" mentality ("You don't need to know how we do things") to one where each step of the advisory procedure is known and understood. In more concrete terms, it means:

- a) Providing access to all relevant data. Catch and survey information should be made available in detailed form and on request to all interested parties, together with the results of intermediate analyses.
- b) Allowing input from all interested parties. The Commission supports the contribution of stakeholders' information to the ICES processes, while also supporting the independence of ICES analysts in performing their roles (the "sandwich" approach).
- c) Having completed an analysis, being able to explain clearly to stakeholders what has been done and how it has been done. Although this is demanding of time and difficult when technically complicated issues must be explained, it is indispensable for the credibility of the advice. (The Commission has made it a requirement under the Memorandum of Understanding that ICES should, on request, provide scientists to Regional Advisory Council meetings to explain advisory procedures and methods in detail.)

Again, this is not an easy task. But it is essential if scientists and their customers are to understand each other.

The second point is: Timeliness of advice.

The worst advice is advice that arrives too late.

One of the main challenges we are all facing is improving the responsiveness of the advisory system to management priorities, when the demand for advice is potentially infinite.

Managers and scientists need to coordinate closely to make sure that

- ✓ the timetable within which advice is required made clear;
- ✓ that this timetable is compatible with availability of both data and expertise, and if not, that priorities are changed to make it so compatible; and
- ✓ that the timetable, once agreed, is met.

This will require a change in working habits by both customer organizations and scientific ones. Customers must recognize that deadlines for advice have to take account of other priorities and availability of expertise; scientists must be ready to change their work programmes in a more "customer-led" approach.

Conclusion

To sum up, Chairman, Ladies and Gentlemen, we are in a period of major change in the management of scientific advice for fisheries management.

The scarcity of scientific expertise, the political sensitivity of scientific advice, the need to focus on essentials, and the need for efficiency are all forcing this change: A change to a more comprehensive advisory system, and a more open one.

Scientists, managers, and the fishing industry alike have something to contribute. To put it bluntly, we all have to do a better job. Scientists must be big enough to admit that their traditional approach to providing advice has to be abandoned in favour of a more comprehensive and robust approach that takes account of the concerns of the fishing sector and of the information provided by that sector.

Managers must be big enough to accept that not everything can be done at once, that proper management of scarce scientific resources requires clear choices about priorities, and that asking for advice without ensuring that the data are available is an empty gesture.

And, finally, the fishing industry must be ready to accept that better scientific advice is ultimately dependent upon fishermen telling the truth. As long as they think that there is more to be gained by concealing the truth, then they have only themselves to blame when advice is based on assumptions on prejudice, not fact.

I am confident that all three parties are ready to "turn a corner" and get onto the right path.

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