



Report of The Bergen Conference on

Implementing the Ecosystem Approach to Fisheries

26. – 28. September 2006
Raddisson SAS Hotel Royal
Bergen
Norway



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Background

In 2001 Iceland hosted a Conference on Responsible Fisheries in the Marine Ecosystem, organised jointly with the Food and Agriculture Organisation (FAO) of the United Nations and with the co-sponsorship of Norway. A new conference, organised by the Nordic Council of Ministers and the Governments of Iceland and Norway, with technical support of FAO, was held in Bergen, Norway from 26 to 28 September 2006 to address progress made towards implementing the ecosystem approach to fisheries.

An ecosystem approach for sustainable use is central to the implementation of international agreements such as the UN Convention on Biological Diversity. Its principles are also embodied in the FAO Code of Conduct for Responsible Fisheries and in binding law such as the UN Fish Stocks Agreement. A political commitment to implementing the ecosystem approach by incorporating ecosystem considerations into fisheries management resulted from the 2001 Reykjavik Conference. The need to incorporate the ecosystem approach in responsible fisheries was reaffirmed and consolidated at the World Summit on Sustainable Development in Johannesburg 2002, where a target year of 2010 was set for its achievement.

Consistent with the above commitments, many nations and regional and international governmental and non-governmental organizations have embraced the ecosystem approach and a number are progressing towards actual implementation. Experience has been gained at various scales, including the local, national and regional (e.g. the Large Marine Ecosystems) scales, in both developing and developed parts of the World. Despite some progress made, there is still widespread uncertainty as regards the scientific and governance requirements, and the possible social and economic consequences of implementing an ecosystem approach.

The aims of the Bergen Conference were to review concepts and address implementation issues related to applying the ecosystem approach to fisheries, to exchange experiences made and constraints encountered so far, and to identify strategies and best practices that will facilitate further implementation in practical fisheries management.

Participants

A total of about 170 participants from 38 countries and five continents attended the conference, including professionals with different backgrounds and experiences, such as scientists, fisheries management and conservation practitioners, fishery industry representatives, non-governmental organizations and other interested parties. The list of participants is available at the CIEAF webpage (<http://cieaf.imr.no>).

Format and programme of the conference

A Steering Group of four persons from FAO, Iceland and Norway prepared the conference programme which is included as Annex 2.

The conference was organised in 5 consecutive plenary sessions:

Session 1 – The ecosystem approach: concepts and strategies

Session 2 – The knowledge base for an ecosystem approach

Session 3 – Approaches and tools for managing fisheries as part of the ecosystem approach

Session 4 – Experiences from case studies

Session 5 – Implementing the ecosystem approach to fisheries: the way forward

Each of sessions 1-4 were chaired by appointed chairpersons who gave brief introductory statements at the beginning of their respective sessions that each consisted of 6 to 9 oral presentations (invited or contributed). Each session was followed by a general discussion lead by the chairperson.

A separate poster session, related to the topics of the four sessions and with a total of 10 contributions, was also included in the programme.

Session 5 had the format of a panel discussion. The panel included the chairs from the previous sessions as well as additional representatives from the fishing industry, management and research. A bullet point summary from the previous four sessions had been prepared by a group consisting of the session chairs and conference steering group and was presented at the start of the final session.

Outcome

A Conference summary, prepared by the members of the steering group, is attached as Annex 3. This includes brief summaries of all the oral presentations and the introductory statements by the chairs in sessions 1-4, the introductory statements by the panellists in session 5, as well as main points of conclusions from presentations and interventions at the conference.

The Nordic Council of Ministers has used the Conference and the Conference summary as a basis for a statement to be presented to the FAO Committee on Fisheries (COFI) that will consider the issue of Ecosystem Approach to Fisheries in connection with its 27th session in March 2007.

The Bergen Conference on Implementing the Ecosystem Approach to Fisheries

26 – 28 September 2006
Radisson SAS Hotel Royal, Bryggen
Bergen, Norway



Monday 25 September

1800-2000 – Registration at Radisson SAS Hotel Royal, Bryggen

2000-2200 – Informal get-together at Directorate of Fisheries

Tuesday 26 September

0800 – 0900 Registration

0900 Opening of Conference
Hans Edvard Seim, Commissioner, City of Bergen
Vidar Ulriksen, State Secretary, Ministry of Fisheries and Coastal Affairs,
Norway

0930 Coffee Break

1000 *Session 1: The Ecosystem Approach: Concepts and Strategies*
Chairperson: Mike Sinclair, Canada

1005 Gabriella Bianchi, FAO

The concept of Ecosystem Approach to Fisheries in FAO

1025 Marjo Vierros, Convention on Biological Diversity (CBD)

The concept of Ecosystem Approach in CBD

1045 Kristján Thórarinnsson, Iceland

The concept of Ecosystem Approach in a Nordic perspective

1105 Ken Sherman, USA

The Large Marine Ecosystem Approach

1130 Coffee Break

1200 Katherine Short, World Wildlife Fund (WWF)

Ecosystem-based Management, moving from theoretical concept to useful operational reality

1220 Cassandra de Young, FAO

Economic, social and institutional considerations of applying the ecosystem approach to fisheries management.

1240 General Discussion

- 1300 *Lunch*
- 1430** ***Session 2: The knowledge base for an ecosystem approach***
 Chairperson: Poul Degnbol, EC
- 1435 Robert O'Boyle *et al.*, Canada
The scientific research requirements of an ecosystem approach to fisheries
- 1455 Gunnar Stefansson, Iceland
Recent developments on methods for evaluating the effects of fishing and efficiency of control measures in an ecosystem context
- 1515 Helle Siegstad, Greenland
Greenland ecosystems: Major challenges – limited knowledge
- 1535 Kjellrun Hiis Hauge, Norway
Ecofish, a project to facilitate Ecosystem Advice to Fisheries
- 1600 *Coffee Break*
- 1630 Rick Fletcher, Australia
Implementing ecosystem approaches to fisheries management at fishery, country and regional levels: lessons learned from Australia and the Pacific
- 1650 Erik Olsen, Norway
Synoptic ecosystem surveys in the Barents Sea
- 1710 Svein Sundby, Norway
Climate change and the resilience of marine ecosystems to fishing
- 1730 General Discussion
- 1800** ***Poster Session***

Wednesday 27 September

- 0900** ***Session 3: Approaches and tools for managing fisheries as part of the ecosystem approach***
 Chairperson: Serge Garcia, FAO
- 0905 Grimur Valdimarsson, FAO
The Ecosystem Approach – The industry perspective
- 0925 Peter Gullestad, Norway
Marine Protected Areas - A useful tool in fisheries management?
- 0945 Sigurd Tjelmeland, Norway and Anatoly Filin, Russia
Evaluation of long term yields in the Barents Sea Ecosystem
- 1005 Henning Winker and Rainer Froese, Germany
A common sense approach to ecosystem-based fisheries management
- 1025 Anthony Charles, Canada
Benefits and costs of implementing the ecosystem approach to fisheries
- 1045 Wojciech Wawrzynski, Poland
Marine Science Communication: EurOceans Public Outreach Association (short movie presentation)

- 1105 *Coffee Break*
- 1130 Dorothy Dankel, Norway
Fisheries management in practise: World wide perspective on past success and failures
- 1150 Hein Rune Skjoldal and Ole Arve Misund, Norway
Ecosystem approach to management: definitions, principles and experiences from implementation
- 1210 Serge Garcia, FAO
Ecosystem approach and integrated assessment of fisheries: between an urgent necessity and an ideological trap
- 1230 General Discussion
- 1300 *Lunch*
- 1430 ***Session 4: Experiences from case studies***
Chairperson: Lori Ridgeway, Canada
- 1435 Inger Winsnes, Norway
Integrated management plan for the Barents Sea and the seas off Lofoten
- 1455 Jóhann Sígurjónsson, Iceland
The Ecosystem Approach to Fisheries: Status of implementation in Iceland
- 1515 Mick O'Toole, Namibia
The implementation of the Ecosystem Approach to fisheries management in the Benguela region – experiences, advances and problems
- 1540 *Coffee Break*
- 1610 Richard McLoughlin *et al.*, Australia
Implementing the ecosystem approach in Commonwealth (federally) managed fisheries
- 1630 Galen Tromble, USA
Ecosystem Approach to Fisheries in USA
- 1650 Qisheng Tang, China
Implementing the Ecosystem Approach to Fisheries - the basic information from China
- 1710 Jorge Lopez, El Salvador
Fisheries and Aquaculture integration policy for the Central American Isthmus
- 1930 *Conference Dinner at Fløien folkrestaurant***
Funicular leaves frequently

Thursday 28 September

0900 *Session 5: Implementing the ecosystem approach to fisheries: the way forward*

Moderator: Mike Sinclair

Introductions by members of a panel of invited experts will set the stage for a final plenary discussion as regards the way forward, taking into consideration lessons learned, challenges and obstacles to implementation.

Poul Degnbol, EC
Serge Garcia, FAO
Lori Ridgeway, Canada
Peter Gullestad, Norway
Johann Sigurjonsson, Iceland
Qisheng Tang, China
Inge Halstensen, Norway

1200 *Closing the conference*

Hein Rune Skjoldal, Institute of Marine Research

Halvard P. Johansen, Norwegian Ministry of Fisheries and Coastal affairs

1300 *Lunch*

POSTERS

- Soichuro Kuruso, Japan Mechanism of the formation of shared common fishery rights and fisheries resource management: the case of shellfisheries in Kashimanada, Japan
- Paul Siri *et al.*, USA Ecosystem based management in California: Implementing policy reform while improving science for management
- Michael Hirshfield, USA Implementing the ecosystem approach: An NGO perspective
- Virginia Gonzalez, USA Ecosystem management in the Southern Ocean: The Antarctic krill fishery
- Daud Hassan, Australia UNEP regional seas program on land-based sources of marine pollution control: a legal analysis
- Hugo Arancibia, Chile Recent advances towards the implementation of the ecosystem approach to fisheries management in central Chile
- Lucy Burn, UK The UK market for Sustainable Seafood. New England Seafood Intl. Ltd. England
- Mitsutaku Makina, Japan Ecosystem approach to fisheries in Japan: Case of Shiretoko world natural heritage
- Nadir A. Salman, Yemen Environmental impacts of land-based activities on fisheries in the Red Sea coasts of Yemen
- Jeppe Kolding, Norway Lake Victoria Nile perch fisheries - threatened by exploitation or eutrophication?
- Sebastián Villasante, Spain: Redirecting the Common Fisheries Policy: the ecosystem based management advances in Europe
- Tania Zaharia, Romania: Issues of the Romanian fishery as reflection of ecological conditions from the Black Sea
- Gloria L. Gallardo F., Sweden: Landscapes of extinction towards landscapes of confidence? Beyond private and public ownership: common fishing as a sustainable sea resource management in artisan fishing communities. Cases from Chile

Conference summary

Implementing the Ecosystem Approach to Fisheries Bergen, Norway 26-28 September 2006

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^c Institute of Marine Research, PO Box 1870 Nordnes, NO-5817 Bergen, Norway

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Abstract

The Bergen Conference was a follow-up from the Reykjavik Conference in 2001 and was organised by the Nordic Council of Ministers and the Governments of Iceland and Norway, with technical support of FAO. The aims of the conference were to review concepts and share experiences from implementation, and to identify strategies and best practices that will facilitate further implementation of the ecosystem approach to fisheries (EAF). The conference was organised with four sessions on concepts and strategies, knowledge base, approaches and tools, and experiences from case studies, followed by a fifth session on the way forward.

Many terms have been used related to the ecosystem approach (EA) but we are converging towards a common understanding of the concept. With respect to fisheries, the EA has two dimensions: a vertical dimension of application of the EA to fisheries (EAF) and a horizontal dimension of integration of fisheries with other sectors into a holistic management framework. The EA is a strategy and not a “blue-print” action plan, and its application needs to be tailored to the specific ecological, social and cultural conditions in each geographical area. Application of the EA may start with present knowledge, but more focused ecosystem research is needed to make it more effective, and limited knowledge requires added precaution. Ecological risk assessment may be an important tool to apply in an EAF, as may the use of MPAs in combination with other management measures. An EAF can be kept simple and implemented incrementally from existing measures in fisheries management.

1. Introduction

Ecosystem approach to management is a principle ascribed to and adopted by many governments and international organisations and agreements. The World's leaders in Johannesburg in 2002, at the World Summit on Sustainable Development, called for the application of an ecosystem approach by 2010. The UN Convention on Biological Diversity

(CBD) has the Ecosystem Approach (EA) as a core element of its work programme¹, and the UN Food and Agriculture Organization (FAO) has developed guidelines for application of the Ecosystem Approach to Fisheries (EAF) (FAO 2003, 2006).

The Nordic Council of Ministers and the Governments of Iceland and Norway organised, with the technical support of FAO, a conference on the implementation of the EAF in Bergen, 26-28 September 2006. This conference was a follow-up from the Conference on Responsible Fisheries in the Marine Ecosystem, held in Reykjavik in October 2001 (FAO 2002, Sinclair and Valdimarsson 2003). The aims of the Bergen Conference were to review concepts and share experiences from implementation of the EAF, and to identify strategies and best practices that will facilitate further implementation in practical fisheries management. The conference was attended by about 170 participants from 38 countries, including scientists, representatives of fisheries administrations, fishermen organizations and environmental NGOs.

The conference was organised with 4 consecutive sessions addressing: i) concepts and strategies, ii) knowledge base, iii) approaches and tools, and iv) experiences from case studies. In each session there were 6-9 invited or submitted oral presentations, followed by a general discussion led by a chairperson. All oral presentations are available at: www.cieaf.imr.no. There was also a separate poster session with additional presentations related to the topics of the 4 sessions. Following peer review, the presented papers will be published as a conference proceedings.

A fifth and final session was arranged as a panel discussion, including the session chairs from the previous sessions and supplemented with representatives from the fishing industry, management and research.

The United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS) at its 7th meeting held at the UN Headquarter from 12 to 16 June 2006, dealt with the issue 'Ecosystem approaches and oceans'. To provide continuity from this meeting, **Lori Ridgeway** (Canada), one of the two co-chairs, informed the conference about the outcome of the New York meeting (Document UN GA A761/156). The UNICPOLOS meeting was attended by 101 states, 24 IGOs and 16 NGOs with the aim to build a common understanding on EA and to close implementation gaps. While the approach has a broad international buy-in, many participants claimed that there is not enough knowledge to get started. The review on the implementation of the UN fish stock agreement showed that many countries would not take action because of lack of information. An important objective of the New York meeting was to demystify the concept of ecosystem approach and to share experiences from its implementation from both developed and developing countries.

Ridgeway stressed that the lack of a clear agreed definition of Ecosystem Approach should not be an issue delaying its implementation. Furthermore, EA is about managing human activities and should be implemented also where knowledge is incomplete. However, there is an inverse relationship between knowledge and precaution, and the more limited the knowledge the more conservative (precautionary) should the management measures be. It is important to get started and improve understanding over time. Integrated management of human activities should still be based on sound sectoral management. Major challenges will be faced at the regional level, as regards for instance fitting the work of RFMOs into the

¹ <http://www.biodiv.org/programmes/areas/marine/ecosystem.asp>

cross-sectoral approach to management. Basic issues such as overcapacity need to be resolved regardless of whether EA is implemented or not. Main steps that should be taken to implement EA should consist in including EA in national policy, increasing research funding, improving coordination among ministries and management bodies, and identifying stakeholders.

The authors of the present conference summary constituted the Steering Group for the Bergen conference. Here we provide a short summary of the presentations in the 4 sessions, and a summary of main items arising from the discussions. There was no conference declaration or statement prepared from the meeting. However, based on the conference outcome, the Nordic Council of Ministers will present a statement to the FAO Committee on Fisheries (COFI) that will consider the issue of Ecosystem Approach to Fisheries in connection with its 27th session in March 2007.

2. Concepts and strategies

The first session dealt with concepts and strategies for the ecosystem approach. The session was chaired by **Michael Sinclair** (DFO, Canada). He introduced the session by referring to other relevant meetings, such as the ICES/SCOR symposium on “Ecosystem Effects of Fishing” (Montpellier, 1999); the Iceland/FAO/Norway Conference on Responsible Fisheries in the Marine Ecosystem (Reykjavik, 2001) and the recent 7th meeting of the Open ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS; New York, June 2006).

Based on the documentation and the conclusions from these meetings, it was noted that the Ecosystem Approach to fisheries encompasses diverse concepts creating confusion among stakeholders (fishing industry, managers, policy makers and scientists). Three main conceptual pillars were therefore proposed as main components:

1. The effects of fisheries on ecosystems (e.g. trawling impacts, incidental mortality of vulnerable species, etc.)
2. The effect of ecosystems on fisheries (such as climate change impacts on abundance and distribution of commercially important stocks) and
3. Attempts to “manage ecosystems” through manipulation (as for example to generate enhanced cod and shrimp biomass levels by limiting fisheries of capelin, and fishing sea urchins to enhance kelp production).

Different stakeholders give different emphasis to each of the components, with the industry most interested in the second and the third pillars, while conservationists and some NGOs are most interested in the first.

Main results from the Reykjavik Conference included a set of necessary conditions and strategies for the implementation of EA to fisheries. Among the main necessary conditions, reduction of fishing capacity and rights-based fishing were mentioned. Relevant strategies included:

- Integrated management of multiple fisheries and other ocean uses within a geographic context;
- Definition of a broader set of conservation objectives to sustain target species and ecosystem structure and functioning;

- Definition of management areas based on ecological boundaries adjusted to areas of administrative convenience as appropriate, recognizing that a nested approach will be required;
- Initiate an evolutionary rather than a revolutionary process.

An important result of the Bergen Conference should be that of providing a balanced and converged perspective of the diverse concepts of EA to fisheries, including the three pillars above.

Six presentations were included in this session.

Gabriella Bianchi (FAO) noted that the principles that underlie the EA to fisheries (EAF), as presented in the FAO guidelines, are not new. They can all be found in the FAO Code of Conduct for Responsible Fisheries² (FAO 1995) that, in turn, was built consistently with policy developments at the international level within the United Nations Convention on Environment and Development (UNCED) and the United Nations Convention on the Law of the Sea (UNCLOS) contexts. The EAF concept has drawn attention to these principles and on the need to put them into practice. Reference was made to the many denominations related to holistic approaches to management (e.g EAF, SLA, ICZM, etc). It was noted that these are largely consistent with each other in terms of broad sustainability objectives but differ in the emphasis they give to the various dimensions of a management system, i.e. the human, ecological and institutional dimensions, and that their relevance depends on the context. A major distinction in approaches is perhaps between those that are cross-sectoral, integrating multiple ecosystem uses, and those dealing with a specific sector, like the EAF. Both cross-sectoral and sectoral approaches are relevant, they are complementary and could be implemented in parallel. Despite the progress made in embracing the EAF principles, it was concluded that reconciling short-term economic and social gains with long-term sustainability would still prove to be a major challenge.

The CBD adopted the Ecosystem Approach in 1995. This is described as a strategy for integrated management of land, water and living resources and is underpinned by twelve principles and five points of operational guidance (CBD COP Decision V/6³). **Marjo Vierros** (CBD) explained that these principles are interlinked and that their application should be balanced according to the local context. As a strategy, EA promotes conservation, sustainable use and equity. Although very similar in the basic principles, the CBD EA differs from the EAF in that it entails integrated (cross-sectoral) management. It was stressed that for ocean areas, the main challenge lies in integrating the various management approaches into a comprehensive and cohesive plan. She noted that there is no single way to implement the EA and that the scale has to fit the problem. COP7 (2004) has developed implementation guidelines to facilitate the further implementation of the EA⁴. Important challenges include integration between sectors and participation of stakeholders.

Kristján Thórarinsson (Iceland) noted that despite the overall agreement on its basic principles, perceptions seem still to be quite different as regards what EAF really entails. In Nordic countries such as Greenland, Iceland, Faroe Islands and coastal Norway, fisheries are extremely important, both for economic and social reasons. Fisheries management is therefore very important and advanced management procedures have been developed. The need for

² <http://www.fao.org/DOCREP/005/v9878e/v9878e00.htm>

³ <http://www.biodiv.org/decisions/default.aspx?m=COP-05&id=7148&lg=0>

⁴ <http://www.biodiv.org/decisions/default.aspx?m=COP-07&id=7748&lg=0>

decentralising decision-making was underscored, including the need to use existing institutions and mechanisms to incrementally add ecosystem considerations. The character of EAF concepts was further defined as *didactic* as opposed to *normative*, meaning that EAF should be a reference framework rather than a detailed plan of action advocating specific solutions. Furthermore, priorities for action should be set locally, to optimise the use of limited resources and capacity and reflect the needs at the local level. Possibly a reduction in fishing effort, advocated also under the conventional fisheries management framework, would result in achieving broader ecosystem objectives. Finally, EAF would require a learning process of the various stakeholders. Managers should understand the implications of the new concepts, government authorities should reflect on the commitments made, and the fishing industry needs to know what is expected.

Integrated assessment and management of marine resources and ecosystems in the respective regions are the main objective of the comprehensive Large Marine Ecosystem (LME) programme network consisting of 121 countries involved in 17 LMEs, supported by funding from the Global Environmental Facility (GEF). **Ken Sherman** explained how the LME programmes are implemented following a five-module methodology (productivity, fish and fisheries, pollution, socio-economics, and governance) that helps countries towards adopting practical joint governance. Indicators have been identified for each of the five modules. The LME programmes are based on an extensive collaboration with many international governmental and non- governmental organizations including UNEP and FAO. It was noted that application of an ecosystem approach will entail a need for more funding. As an example, the US was expected to have to double their marine research budget to meet the knowledge requirements for EA.

Kathrine Short (WWF) presented WWF's (World Wide Fund for Nature) work related to Ecosystem-Based Management (EBM). Drawing from the FAO Code of Conduct for Responsible Fisheries and other relevant international processes, WWF's strategy includes integrated management of high seas areas, and aims at sectoral engagement, mitigating fishing impacts, protecting areas and species, and providing alternative livelihoods. According to WWF's view, EBM principles relate to maintenance of ecosystem structure and functioning, consider human needs and values, are based on a shared vision of all stakeholders and on scientific knowledge. Maintaining the structure and function of ecosystems should be the main purpose of management. Ecosystem manipulation in the sense of altering ecosystem structure by, for example, removing predators, should be avoided. WWF has developed guidelines for the practical implementation of EBM that lead through twelve operational steps. The desirability of developing an international toolkit to facilitate the application of ecosystem-based approaches was highlighted. The toolkit could include, for example, case studies, be related to policy and legislation (including incentives and enforcement), a minimum suite of indicators, social, ecological and economic aspects and examples of industry voluntary codes of conduct. A proposal in this direction will be raised in connection with the forthcoming session of the FAO Committee on Fisheries in early 2007.

An expert consultation on the Social, Economic and Institutional implications of implementing an EA to fisheries was convened by FAO in June 2006 and included fifteen experts with natural and social scientific background and representing a wide range of interests. **Cassandra de Young** (FAO) explained how the meeting had been run and the main themes that were dealt with, such as human values, ecosystem services, benefits and costs of applying EAF, creating incentives, financing its application and the necessary policy and institutional frameworks. One of the main recommendations stemming from the June meeting

was the development of supplemental FAO Technical Guidelines for Responsible Fisheries on the economic, social and institutional considerations of applying the EAF; providing a concise document highlighting how economic, social and institutional considerations can be integrated into the application of EAF.

3. The knowledge base

This session was chaired by **Poul Degnbol** (Denmark, EC/DG Fisheries). He opened the session with the key message that knowledge, in order to be useful for fisheries management, must first of all relate to objectives. Secondly, management decisions need to be simple and the knowledge supporting them must be communicated clearly so that it is understood, despite describing the complexities of ecosystems. Therefore, knowledge for EA to fisheries should help understanding the complexities of marine ecosystems and human interactions with them, while delivering information that can be easily understood and fed into the decision-making process. Progress made so far is mainly related to the acceptance of the need to move from a predictive to a more adaptive approach to the knowledge-policy interaction. The knowledge scope for EA was presented based on CBD Decision V/6. Knowledge should be related to the objectives of conservation, sustainable use, and fair and equitable sharing of benefits, and to how to address these three objectives simultaneously. Another important research area, related to implementation, is the development of adaptive management.

Six presentations were included in this session, but it was noted that research needs for EA to fisheries were also dealt with under other sessions.

Robert O'Boyle (Canada) noticed how much attention so far had been devoted to the overall EA to fisheries framework, including overall and operational objectives and stakeholder participation, and how there was an urgent need to evaluate the scientific research requirements for effective implementation of the EA. These should include specific fishing impacts but also cumulative impacts across fleets and sectors. Based on experiences made from the Scotian Shelf, he illustrated the approach used to identify research priorities in Canada. Starting from each management objective or question posed, associated research is identified and its 'tractability' (probability the issue is resolved within 3 to 5 years) evaluated. The best venue for carrying out the research is also identified. The type of issues considered included the impacts of fisheries on marine ecosystems and the impact of the ecosystem on fisheries. In this context he underscored the challenge of interpreting causality and cumulative effects. Some examples were given of research questions and how these had been dealt with, including biodiversity, productivity and habitat issues.

Gunnar Stefansson (Iceland) presented the results of a study that compared the efficiency of control measures in relation to management objectives in an ecosystem context. The comparison included quota systems, effort controls and Marine Protected Areas (MPAs). Some key results seem to depart from general perceptions. For example, the results showed that, contrary to what is usually thought, MPAs may have the same effect upon a fish stock and its productivity as do conventional output regulations. On the other hand, MPAs do not guarantee enhanced fishing outside the protected area and they help only if they are large enough to cover most of the resource. MPAs can provide significant benefits if they are combined with other management measures. They can also represent a buffer against uncertainty under catch and effort control systems. Stefansson drew the attention to the need for carefully designing MPAs in order to maximise their efficiency.

Greenland is a large country characterised by complex and dynamic marine coastal systems. **Helle Siegstad** (Greenland) described how in her country these complexities were dealt with in terms of establishing the scientific basis for ecosystem-based management. She presented the ECOGREEN Programme, intended to improve the understanding of the physical and biogeochemical interactions of the marine ecosystems around Greenland, the ecosystem structure and functioning, human behaviour (drivers), and human activities. Two main research lines are related to natural sciences and social sciences, respectively, feeding into a third area, i.e. the interactions between social and natural systems. These, in turn, feed into management recommendations. ECOGREEN includes a monitoring programme and provides a framework for prioritizing research.

A programme that has come about in response to EA to fisheries is ECOFISH, presented by **Kjellrun Hiis Hauge** (Norway). The approach is multidisciplinary, within the natural science domain, and aims at developing an integrated system of models describing ecosystem functioning and focussing on processes of importance to harvestable stocks. The programme will revise the ecosystem observation system and develop a set of indicators covering a wide range of ecosystem properties. A feed-back loop from models will be used to improve sampling schemes.

Another presentation within the natural science domain, by **Erik Olsen** (Norway), described an ecosystem monitoring programme for the Barents Sea based on extensive ecosystem surveys. These surveys include many components such as oceanography, pollution, pelagic, demersal and 0-group fish, invertebrates, benthos, plankton, marine mammals, and seabirds. Main advantages of this programme are related to being able to obtain a synoptic view of the ecosystem while an obvious challenge was reconciling different survey objectives and strategies.

Ecosystem-based approaches may be different in various ways but they all share the fact of dealing with risk management. Thus, the approach taken by Australia, as presented by **Rick Fletcher** (Australia), provides a framework for implementing an ecosystem approach, including a risk assessment process to systematically identify issues of priority, develop management objectives, and identify indicators and management measures needed. The outcomes may be very different in different situations/fisheries. Based on experiences gained in Australia and Pacific Island States, it has become clear that the less industrial the fishery is, the more community focus will be necessary. Furthermore, it seems that main issues are related to Governance, while “ecosystem issues” have not been considered as a main problem. Final recommendations were related to not letting scientists running the process while encouraging a strong participation by those involved in the management of the fishery.

Svein Sundby (Norway) provided an overview of the main climatic processes that affect marine ecosystems. Climate affects various ecosystem components in various ways, both at the individual and population levels, and at different time and space scales. Examples of good correlations between annual temperature fluctuations and abundance of 0-group or juvenile fish are many. These can be related to interannual, decadal and multidecadal processes. The effects of large scale, decadal climatic variability such as the North Atlantic Oscillation index (NAO) have been documented for many living organisms, ranging from trees to birds and marine mammals. Examples of multidecadal fluctuations (e.g Atlantic Multidecadal Oscillation - AMO) can also be found, and the Norwegian spring spawning herring is one of the fish stocks showing a response to such fluctuations. It was noted that, because of the

strong relationship between zooplankton biomass and pelagic fish biomass, measuring zooplankton biomass should be a priority.

4. Approaches and tools for managing fisheries as part of the ecosystem approach

This session was chaired by **Serge Garcia** (FAO). He introduced the session by illustrating the conditions needed or desirable for a successful application of an ecosystem approach. An enabling environment, with political commitment, appropriate legal framework and rules, ministerial coordination etc. is one of the prerequisites. Effective implementation depends on additional factors such as adequate administrations, common understanding of the framework, participation, availability of relevant information, and successful integration among various interrelated programmes. Implementation can be facilitated through programmes of awareness raising and by various incentives/disincentives and capacity building and could periodically be assessed. Conservation measures (such as establishment of MPAs) can also be implemented as part of the EA.

Grimur Valdimarsson (FAO) presented the industry perspective on EA to fisheries. There seem to be some scepticism on new demands and worries about extremisms. The industry perceives management objectives as being often complicated and sometimes contradictory. Overall, they look for clearer rights, shared responsibilities and simplicity in the new framework. Successful EA to fisheries would require a shift in approach, with the industry playing a significant role in its implementation. The importance of fishing rights for achieving sustainability objectives was underscored.

One of the tools often proposed for an effective implementation of EA to fisheries is the use of Marine Protected Areas (MPAs). **Peter Gullestad** (Norway) illustrated the Norwegian experience on the use of MPAs or area closures and regulations used in fisheries management and examples were provided of their use in the management of redfish, lobster and seaweeds. He concluded that MPAs have been a management tool for many decades already, but that their use will become more extensive under an EA framework.

Modelling and simulations have been important tools to identify and assess/compare management options. Under an EAF, the work needs to be expanded to include multispecies interactions and environmental impacts on these. A joint project between Norway and Russia, aiming at developing such a modelling tool for the Barents Sea, was presented by **Sigurd Tjelmeland** (Norway). Preliminary results have shown the great importance of recruitment variability. The choice of model for the recruitment function is of critical importance for the simulation results, and the mechanisms behind the recruitment variability and function need to be more closely investigated.

Henning Winker (Germany) presented a single species approach based on the concept of L_{opt} , suggested as an alternative to the approach adopted by the European Union that uses MSY as a target reference. L_{opt} is the length of fish corresponding to the maximum cohort (year-class) biomass. This approach is more conservative than the MSY target in that it implies to let more fish grow to large size. Thus it favours the reduction of catches and discards of juvenile fish and pre-spawners.

The implementation of the EA to fisheries entails costs and benefits. **Anthony Charles** (Canada) emphasised that these should always be taken into account when considering

alternative management strategies. Costs and benefits can be grouped according to categories such as ecological, economic, social, and management. Costs and benefits should be assessed at different time scales. He underscored the importance of assessing the issue of distribution of costs and benefits among fishers and between them and society, which are central issues behind perceptions and social responses.

Communication was the main focus of the two following presentations. **Wojciech Wawrzynski** (Poland) highlighted the importance of marine science communication to the public, using media such as video programmes (an example was given at the conference). Scientific results are translated into a more comprehensible language and, in this way, become more easily available to the public. The importance of another aspect of communication, the one between scientists, policy-makers and stakeholders, emerged in the results of a study by **Dorothy Jane Dankel** (Norway) who had analysed the reasons for success and failures in a number of fisheries. The importance of communication would become even greater under an ecosystem approach, mainly because this is characterised by a stronger emphasis on bottom-up approaches.

Hein Rune Skjoldal (Norway) reported on the important developments in the North Sea towards an ecosystem approach to management. At an intermediate ministerial meeting in 1997, ministers and EU commissioners responsible for North Sea fisheries and environment agreed to develop and apply an ecosystem approach in order to integrate fisheries and environmental protection, conservation and management measures. This culminated in the Bergen Declaration from the 5th North Sea Conference in 2002, where a political commitment was made to implement an ecosystem approach. The ministers agreed to a conceptual framework for the EA including an integrated set of Ecological Quality Objectives. The European Union has developed a proposed European Marine Strategy Directive that focuses on the implementation of the EA at the scale of geographically defined marine ecosystems (e.g. the Baltic Sea, the North Sea, etc.). In Norway, because of these developments, the Institute of Marine Research, which provides most of the scientific advice for fisheries management, has recently changed its structure to strengthen an ecosystem focus in its research and advisory work.

Serge Garcia (FAO) focused on the interface between fisheries assessments and decision-making and the challenges under an ecosystem approach. Decision-making will have to balance tensions and reconcile different interests and management objectives, and the interface between science and policy has a key role to play in this respect. A key issue, however, is related to the complexity of the systems to be assessed and the validity of different approaches to address this complexity. The conventional scientific approach is related to positivism (aiming at unravelling the true laws of nature). Its adequacy to provide, in the short-term, knowledge that can be usefully applied to policy-making and management is questioned. An alternative approach, related to constructivism, questions the existence of such laws and aims at social construction of knowledge. Garcia concluded that the change towards a more constructivist (post-normal) approach was already taking place, and this was seen as being justified and necessary. An integrated advisory process (IAP) that combines the analytical process with a participatory process could provide a platform for this change to take place towards a system that utilises both approaches.

5. Experiences from case studies

The chair, **Lori Ridgeway** (Canada), introduced the session by referring to the UNICPOLOS meeting in New York a few months previously that she had co-chaired (see Introduction). At that meeting emphasis was given to demystifying the concept of ecosystem approach, and progress of implementing an ecosystem approach was presented for selected countries and regions. The examples included both developed and developing countries. At the present conference some of the same examples were presented as case studies. Some of the examples dealt with management at the cross-sectoral level, while others were related to the application of an ecosystem approach within the fisheries sector.

The Barents Sea is rich in natural resources, both living (e.g. fish) and non-living (oil), and is the basis for considerable economic activity. As an example of an integrated, cross-sectoral approach, **Inger Winsnes** (Norway) presented a management plan for this region. The Government of Norway has adopted the ecosystem approach to ocean management and the management plan for the Barents Sea is a step in its practical implementation. The plan is developed to reconcile different uses by providing a framework that allows the exploitation of the various resources while maintaining the ecosystem structure and function. Goals and targets were set and agreed for this region. Governance is based on the establishment of a steering committee under the Ministry of Environment that includes representatives of relevant government agencies. The committee agrees on management measures. Advice is provided by a 'Management Forum', that receives input from research, monitoring and from the users. The management plan is a dynamic document and will be updated regularly, the first update foreseen for 2010. It is recognised that cooperation with Russia is important in order to include the whole Barents Sea as an ecosystem.

Jóhann Sigurjónsson (Iceland) recalled that the Reykjavik conference had concluded that many of the measures implemented under single-species management schemes were also useful under an EA to fisheries scheme. What was needed was their successful implementation. The adoption of an incremental and pragmatic approach to EA to fisheries was therefore seen as the way to go. Examples of how Iceland was incorporating ecosystem considerations in this pragmatic way were presented. It was concluded that this approach would eventually also contribute to a more holistic management approach.

Three countries from Southern Africa (Angola, Namibia and South Africa), making up the coastal states of the Benguela Current Large Marine Ecosystem (BCLME), are committed to the implementation of the EA. **Michael O'Toole** explained how these countries use the opportunity provided by the GEF BCLME programme to strengthen progress towards this end through a project that consist of a cooperative effort by the management agencies of the three countries, the BCLME programme, and FAO. Focusing on several of the main fisheries in the respective countries, the project has pursued a structured and participatory approach to identify gaps in existing management approaches and to prioritise measures to address these gaps. Costs and benefits are being measured in terms of the broad objectives applicable in each fishery. The results of this project provide a valuable framework for future refinement and implementation of the EA to fisheries as part of a wider cross-sectoral framework. The three countries have recently signed an agreement to establish a management commission for the Benguela Current LME.

Since the Reykjavik Conference in 2001, Australia has made good progress on implementing many of the elements of an ecosystem approach to fisheries management. **Richard**

McLoughlin (Australia) explained that by 2007 all the elements relevant to the ecosystem approach are to be fully integrated and implemented. The decision to move in this direction was taken by the Australian Government, with inputs from science, management and the industry. Main elements of the approach include: implementing formal harvest strategies for target and by-product stocks in every fishery; undertaking ecological risk assessment and developing a risk management response; implementing large scale spatial management; enhancement of fishery data collection; and enhancing liaison and communication capacity.

Protecting, restoring and managing the use of coastal and ocean resources is one of the strategic goals of NOAA (National Oceanographic and Atmospheric Administration), and NOAA Fisheries works to achieve this goal. **Galen Tromble** (USA) presented experience from the USA where, despite the perceived challenges in implementing the EA, progress had been made in several regions where Fisheries Ecosystem Plans (FEPs) had been developed. A FEP describes the known components of ecosystems and main interactions for a given region. They increase the managers' awareness of how their decisions affect the ecosystem. Progress is also being made in the science needed in support of the implementation of EA to fisheries. However, important challenges still remain and are related to providing management with decision support tools to help deal with increasing complexity of objectives and information, to the need for better communication and outreach to the public and to policy makers, and to the need to strengthen the statutory basis for the EA. Finally, governance issues are seen as being very challenging.

Qisheng Tang (China) considered the Yellow Sea and illustrated some of the main management issues that need to be dealt with in this ecosystem. Major changes in species composition have been witnessed since the 1950s with an increase in small pelagics as compared to bottom dwelling and long-lived species. This is also reflected in a drop in trophic level during that period. The Yellow Sea LME is characterised by multiple uses and a major challenge is to look at the combined effects of these on the ecosystem. Another major challenge is how to deal with increasing demand for seafood while the ecosystem has a limited carrying capacity. Tang described how the science to support ecosystem approach was developed in several GLOBEC research programmes in China.

Jorge López (Nicaragua) informed on the political commitment expressed by the central American countries belonging to the organization OSPESCA (Organization del Sector Pesquero y Acuicola del Istmo Centroamericano) to the principles of sustainability and precaution that are consistent with an ecosystem approach.

6. Implementing the ecosystem approach to fisheries - the way forward

6.1 Panel discussion

The final session of the Conference was a plenary discussion assisted by a panel and moderated by **Mike Sinclair** (Canada). A bullet point summary of the preceding four sessions were prepared by a group consisting of the session chairs and the conference steering group assisted by **Robert O'Boyle** (Canada). This summary was distributed to the meeting and presented to the plenary by O'Boyle.

The panel consisted of the session chairs (Poul Degnbol, Serge Garcia, Lori Ridgeway) supplemented with representatives from the fishing industry (Inge Halstensen), management

(Peter Gullestad), and research (Jóhann Sigurjónsson). As back-drop to the discussion, each panelist briefly commented on what she/he perceived to be main issues.

Inge Halstensen (Norway) gave a brief sketch of the history of the relationship between the fishing industry and fisheries science in Norway during the last 50 years. This history had gone through a time of confrontation and distrust, to the present situation with much improved communication and a feeling by the fishing industry that they are included in the process. Halstensen emphasised that modern fishing vessels are well equipped and can provide valuable information on the fish stocks to the fisheries scientists.

Peter Gullestad (Norway) is the Director of fisheries in Norway. He emphasised that the ecosystem approach is incremental as a process but represents a revolutionary change in the way we need to think about fish and fisheries in the marine ecosystem. Multispecies interactions, climate forcing, recruitment variability, bottom habitats, and genetic effects are key words for a broadened ecological context for fisheries. He challenged the scientists to coordinate their work better to meet the need for a broader cross-disciplinary approach, and pointed to the need for more integration in the scientific advisory process supporting management.

Jóhann Sigurjónsson (Iceland) is Director of the Marine Research Institute at Iceland. He said that the ecosystem approach should not be seen as a threat but as an opportunity to do better and to avoid mistakes of the past. Management actions still need to be taken within the fisheries sector, and effort reduction is one measure that will lead to less environmental impact by fisheries. The increased information need on different aspects of the marine ecosystems may mean that we have to be satisfied with qualitative assessments where quantitative assessments are difficult to perform. The cost of science will inevitably increase, and one issue is to secure the motivation of the fisheries scientists who may see the EA as just another burden put on their shoulders.

Qisheng Tang (China) is Director of the Yellow Sea Fisheries Institute. During the last 20 years there has been a move to ecosystem focus in the management of this sea. At the same time, major changes in the ecosystem have been taking place that are not well understood. There is a need for better ecosystem knowledge to advice the government about management of the Yellow Sea to secure long-term food production from capture-fisheries and aquaculture. Elements in the implementation of the EA for the Yellow Sea include basic research in China-GLOBEC, monitoring in the GOOS (Global Ocean Observing System) framework, and management as an LME.

Poul Degnbol stressed that the bottom line is to regulate fishing activities. The EU has just issued a Green paper on its maritime policy⁵, including the proposed Marine Strategy⁶ as the environmental sustainability pillar. In 2003 the status of European fisheries was described as being generally poor and there has been little improvement in this bleak situation. The Precautionary Approach was seen as part of the problem since this builds upon limits to be avoided. Lacking clear targets, staying out of real trouble has come to be seen as OK and a *de facto* target. There is the need for political will and arena to move from bad to good. This should include a move to an adaptive approach where the fishing industry is brought into the management process. The establishment of RACs (Regional Advisory Councils) was seen as one step in moving away from a top-down to a more inclusive approach.

⁵ http://ec.europa.eu/maritimeaffairs/pdf/com_2006_0275_en_part2.pdf

⁶ <http://ec.europa.eu/environment/water/marine.htm>

Serge Garcia considered the reliance on limit-based precautionary reference points and the lack of targets as a serious drawback for fisheries management. It was like driving at high speed along roads without knowing where one was going. He pointed to the tensions between holism and reductionism in science and management, and to the need to bring socio-economic aspects more strongly into play in the management process.

Lori Ridgeway spoke as a policy maker or “integrator”, with a focus on the EA as a framework for planning and decision-making. She pointed to specific challenges that had to be addressed for successful implementation and application of the EA. These included identification of core fisheries management issues that will have to be tackled irrespective of an EA or not. Another issue was the question of how to build the appropriate buy-in from industry, government and other stakeholders for the difficult decisions that an EA can entail. The multiplicity of risks and benefits that must be taken into account, as well as the need for increased precaution, may mean lower activities in all sectors including in fisheries. How then to devise win-win outcomes that may secure buy-in and provide incentives for cooperation and compliance by industry and other stakeholders? The EA is an inclusive approach to planning and decision-making, and governance therefore matters. Ridgeway raised the question of how to create inclusive stakeholder processes without bogging down the whole decision-making process itself. Which institutional arrangements or “tables” do we need, which decisions are to be made at these “tables”, and by whom? She finally raised the question of whether there is need for changes to policy and legal frameworks. Are there policy gaps that hinder the implementation of the EA?

The moderator invited brief interventions by representatives from the fishing industry and environmental NGOs. Other conference participants also gave brief interventions during the panel discussion.

6.2 Main items from conference discussions and presentations

A summary of the discussions during each of the first four sessions and the final panel discussion are provided here. We have edited together what we consider main points made during discussions or presentations under four subheadings corresponding to the four themes addressed by the conference. This is followed by some concluding remarks.

Concepts and Strategies

Many terms but conceptual convergence – A wide range of terms are being used related to ecosystem approach, such as *ecosystem management*, *ecosystem-based management*, *ecosystem-based fisheries management* (EBFM), *ecosystem approach to fisheries* (EAF), etc. While some of these terms may lack clear definitions and be used in different ways, there are core elements in common across the different terminology. We are therefore converging towards a common understanding of the concept of ecosystem approach and can move forward despite the differences in terminology. However, the different terms and their different use in different contexts still contribute to lack of clarity and confusion.

Application within and across sectors – Perhaps the most important distinction in concepts is between application of the ecosystem approach within the fisheries sector (as well as in other sectors) and across multiple sectors including fisheries. The latter is the truly holistic approach as used for instance in CBD, while the Ecosystem Approach to Fisheries (EAF) of

FAO is an example of the former. These two dimensions (vertically within a sector and horizontally across sectors) should not be seen as opposing but rather as complementary to each other. Sound sectoral management is likely to be a prerequisite to achieve successful integrated management of human activities across sectors. The need for cross-sectoral integration will vary dependent on the specific circumstances and is likely to be largest in the coastal zone where pressures from different human activities are most expressed.

Strategy, not “blue-print” action plan – The Ecosystem Approach is a strategy for integrated management that builds on a number of general principles. The application of the EA needs to be tailored to the specific ecological, social and cultural conditions in each specific geographical area. There are therefore many different ways to implement the EA that are consistent with the strategy and its general principles. The EA is not a detailed and prescriptive action plan to be applied everywhere without adaptation to local conditions.

Multiple objectives – many stakeholders – The broadening to more ecosystem considerations in fisheries management, as well as the need to coordinate with other sectors, mean that multiple objectives are a key feature of the ecosystem approach. This implies extensive communications between different stakeholder interests, researchers and managers. New mechanisms of interaction need to be developed, which are interactive and exploratory of options and not based on a one-way process from predictions through management proposals to consultations. The objectives are policy objectives and their translation into operational management objectives. An important part of the consultations is to reach a common understanding and agreement on the objectives.

Ecosystem manipulations – There is a two-way interaction between fisheries (and any other relevant human activities in other sectors) and marine ecosystems in that fisheries impact the ecosystem and the ecosystem conditions affect fisheries. Fisheries reflect *de facto* a human modification of the ecosystem. Methods for stock rebuilding or habitat rehabilitation are, indeed, manipulations, aiming to reverse excessive stress. However, the complexity of the two-way interaction between fisheries and ecosystems limits our ability to assess impacts and predict consequences of remedial measures. The principle of sustainability is to use nature within its own limits so that its productive and regenerative capacity and biodiversity are not reduced or threatened in the long term.

Knowledge base

Start with present knowledge – Lack of knowledge should not be used as an excuse to delay implementation of the ecosystem approach. There is always some knowledge for any area and we can start from that basis. While good knowledge about the ecosystem is an advantage for effective application of the EA, ecosystem considerations in fisheries and integration across sectors can start with present knowledge and be improved as we go along. There is however an urgent need to improve knowledge and understanding of social aspects and institutional frameworks required for adaptive change.

Limited knowledge means more precaution - There is an inverse relationship between the degree of scientific certainty and the degree of caution we need to exert in order not to adversely affect nature. The better our knowledge, the more precisely we can predict impacts and advise on management measures. In contrast, poor knowledge entails limited ability to predict and consequently the need to exercise considerable precaution in our measures. This is

one of the main challenges of the EA: How to balance knowledge and precaution and how to communicate this balance to achieve broad consensus among stakeholders?

More focused ecosystem research is needed – “More research is needed” is a common statement from scientists, who have limited credibility in this context since they are stakeholders in the activity of science. However, there is general acceptance that the broader ecosystem considerations that are needed in fisheries, and cross-sectoral in other sectors as well, will require more knowledge and information which must be supplied through increased research and monitoring. Understanding the biodiversity-productivity linkage, trophic processes, habitat resilience to human disturbance, and impacts of climate variation and change are key natural science themes that need to be further addressed and explored. A part of the increase can no doubt be achieved through better coordination and use of current knowledge and resources spent in different sectors as well as by stricter prioritisation of research which is relevant and provides us better insight into the workings of the marine ecosystems.

Approaches and tools

Ecological risk assessment can be an important tool – Risk assessment is a common tool in business and industry at large. A similar approach can usefully be applied within an ecosystem approach, where ecological risk assessment related to human well-being, ecosystem conservation and sustainable use can be a core tool. Ecological Risk Assessments (ERA) need to be carried out for all fisheries where relevant, and can be applied both in data-rich and data-poor situations. Risk assessments should be linked with other broader assessments of environmental or ecosystem status and of impacts from other human activities on the marine ecosystem. ERA is a tool that can help to identify critical issues for implementing EA to fisheries, as well as to sort out which issues can and cannot be influenced by management actions.

MPAs and area closures in fisheries – Area closures and fishing restrictions in Marine Protected Areas (MPAs) have been widely used as measures in fisheries management for many decades. They have been used to protect juvenile or spawning fish and important fish habitats or to regulate among different fisheries. Area restrictions established for fisheries management purposes can also serve broader conservation objectives. MPAs can be an important tool but they are not a panacea and are most useful if used in combination with other management tools. In this respect, fleet behaviour needs to be carefully considered when using this management tool.

More emphasis on the human dimension – The Ecosystem Approach is primarily about managing human beings. It is therefore important to include socio-economic and institutional considerations in EA planning needed for adaptive change to achieve the dual objectives of socio-economic benefits and environmental sustainability. Fair and equitable sharing of benefits is also an element that needs attention. Knowledge and tools are needed to facilitate inclusion of equity and social aspects and to strengthen the human dimension of the EA. People tend to respond more to incentives than to commands. Therefore, objectives and incentives need to be aligned in order to facilitate successful implementation of EA to fisheries. Cost-benefits analysis should always be undertaken when considering alternative management strategies. The issue of distribution of costs and benefits among fishers and between them and society and between generations is a central issue behind perceptions and social responses.

Incremental implementation – revolution in thinking – Many of the elements of today’s fisheries management, like effort or fleet control, harvest control rules, modelling and simulations, will continue to play important roles also under an EA to fisheries. If successfully implemented, they can contribute substantially to sustainable use and ecosystem conservation. Thus the EA can build on existing elements and be further implemented and improved in an incremental or step-wise manner. However, what may be required is a radical change or revolution in our thinking and attitudes towards ecosystems, ecological relationships, stakeholder involvement, and collaborative frameworks.

We need targets so that we know where to go – Staying out of real trouble, or avoid falling off the cliff, are not really good targets. Sadly, this is the current situation where avoiding limits, often with limited success, is the common practice in fisheries management in many places. We need to develop and apply ecologically based targets that help us know where to go so that we can achieve the dual objectives of sustainable use and ecosystem conservation. This will help us towards achieving the commitment from Johannesburg (2002) to rebuild fish stocks to MSY-levels by 2015.

Experiences from case studies

Implementation is underway – The EA to management in general, and to fisheries in particular, is underway in many nations and in international contexts. Many governments have adopted the principle and EA is being implemented nationally. There is a wide range of cases where two or more countries collaborate across EEZ borders to implement EA to the management of Large Marine Ecosystems (LMEs). Learning by doing is important, and the range of national and international projects is providing important lessons that should be broadly shared as a basis for improvements as we go along.

Keep it simple – EA is not mystical – While ecosystems may seem complex in all their details with the diversity of species, populations and habitats, the ecosystem approach is fairly straightforward. There is nothing mystical about either ecosystems or EA. Experiences that are emerging from case studies, suggest that the EA can be kept simple, starting with existing institutional structures, and modified and improved as we go along. The most important thing is perhaps a change in mind-set to be more open for collaboration and to stakeholder involvement.

Get involved, please – Stakeholder involvement is important, as is the need for improved communication between science, policy-making and society. Stakeholder involvement and the need for broader considerations both within the fisheries sector as well as across the different sectors, require new approaches such as an integrated advisory process (IAP). Such processes already operate in a few countries and should be strengthened and generalized, although their application may require additional costs as compared to conventional management.

6.3 Concluding remarks

Implementing the Ecosystem Approach to fisheries is often perceived as a very challenging goal and the concept has intimidated government institutions worldwide for its perceived ambitious goals. The Bergen Conference clearly resulted in the recognition that EA core issues are not new. While a number of holistic approaches are being proposed that may differ in emphasis, it was recognized that they largely converge conceptually in aiming at

implementing principles of sustainable development by harmonizing ecosystem sustainability with human well-being. EA to fisheries is only the consolidation and actual implementation of principles and policies that are already agreed to, such as the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on Biological Diversity (CBD) and the Code of Conduct for Responsible Fisheries (CCRF). EA is a strategy that should promote conservation, sustainable use and equitable sharing of ecosystem services. There are many ways in which it could be implemented, depending on context, means, culture, etc.

The Reykjavik Conference in 2001 can be considered as a milestone in terms of putting into focus the issue of ecosystem considerations in fisheries management. The WSSD (Johannesburg, 2002) specifically refers to Reykjavik and sets 2010 as the time frame for the application of the EA. Although ambitious, this target date has urged countries to take initiatives towards the realization of an ecosystem approach; the implementation phase towards this end, as shown by this conference, seems to be well on its way.

The UNICPOLOS meeting in June 2006 focused on demystifying the concept of EA by sharing experiences from its implementation around the world. The Bergen Conference has followed on this path and contributed to the convergence of various perceptions towards a common understanding of the EA concept. We are not quite there yet as some differences in perception still persist. Provision of clear definitions and explanations of terminology is one way to improve clarity and avoid misunderstandings on semantic grounds. Through learning by doing and sharing experiences as we go along in the further implementation of the EA to fisheries, we will no doubt contribute to a common understanding.

Concluding remarks at the conference were provided by **Hein Rune Skjoldal** (Norway). He underlined three points in his summary:

1. The EA is an approach to management and not to science. It has implications and requirements to science as one of the supporting elements of an EA framework.
2. The EA requires ecosystems. These should be defined geographical entities as increasingly recognised, for instance by UNICPOLOS 2006. The LMEs identified world-wide are good examples. Once ecosystem boundaries are defined, it becomes obvious who are the competent authorities and relevant stakeholders for its management.
3. The EA has two main dimensions – vertically within a sector (e.g. fisheries) and horizontally across sectors. Both dimensions should be seen as relevant and complementary. This distinction may help clarify the EA concept.

References

FAO, 2002. Report of the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem. Reykjavik, Iceland, 1-4 October 2001. FAO Fisheries Report No. 658. Rome, FAO. 128 p.

FAO, 2003. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries. NO. 4, Suppl. 2. Rome, FAO. 112 p.

FAO, 2005. Putting into practice the ecosystem approach to fisheries. Rome, FAO. 76 p.

Secretariat of the Convention on Biological Diversity. Ecosystem Approach, 2004.
<http://www.biodiv.org/programmes/areas/marine/ecosystem.asp>

Sinclair, M. and Valdimarsson, G. (Eds.) 2003. Responsible Fisheries in the Marine Ecosystem. CABI Publishing, UK and FAO. 426 p.