

# “TOWARDS AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT”

REPORT OF THE FRCC ENVIRONMENT & ECOLOGY  
WORKSHOP

HELD AT THE UNIVERSITÉ DE MONCTON, DEC 15-16 1997

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## REPORT OF THE ENVIRONMENT AND ECOLOGY WORKSHOP

### “TOWARDS AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT” HELD AT THE UNIVERSITÉ DE MONCTON, DEC 15-16 1997.

#### 1. OVERVIEW

As part of its mandate, the FRCC is to foster the development of an ecosystem approach to the management of Canadian Atlantic groundfish resources. Responsibility for initiating discussion on this theme falls upon the Council's Environment & Ecology (E&E) Committee.

Considering the variety of definitions of just what is meant by “ecosystem approach”, and the range of reactions to the expression, the E&E committee recommended that to clarify how the FRCC could be most effective in fostering this approach, a consultative workshop should be held to debate the question.

The workshop was held on Dec 15-16,1997, and was hosted by the Université de Moncton, at the invitation of Dean of Science (and FRCC member) Dr. Victorin Mallet. Participation was by invitation, from a list compiled by members of the E&E committee, after consultation with the full Council, to include wide representation in area and interests while keeping numbers small enough to involve all participants in the discussion.

Invitees having responded positively to the initial invitation were faxed briefing notes on Dec. 1, 1997. These notes were also made available upon registration at the workshop.

The report introduces the reader to the workshop with the material sent to participants: the letter of invitation and the briefing notes. The conduct of the meeting is reviewed and the final agenda included. Summaries of the invited talks are then presented, followed by a synopsis of points raised in discussion. The report ends with recommendations and action items for the FRCC. A list of participants and a short bibliography of useful references are attached in appendix; so are written briefs received from participants.

## 2. LETTER OF INVITATION

November 4, 1997

Dear Workshop Participant:

The conservation objectives which define the mandate of the Fisheries Resource Conservation Council (the FRCC) include the development of “a more profound understanding of fish-producing ecosystems” and an “ecosystem approach to fisheries management.”

There has been much discussion about what is meant by ecosystem approach to fisheries management. It is generally agreed that it does not mean management of the ecosystem, but rather an integrated management of human interventions which takes into account the response and variability of the natural ecosystem.

The Environment and Ecology Committee of the FRCC has been tasked with exploring these issues and bringing forth practical suggestions to strengthen the conservation objectives for the groundfish fishery in Atlantic Canada.

To gather opinions on what measures might be considered for detailed consideration and further debate, the Committee will hold a short workshop, by invitation only, on *December 15-16 at the Université de Moncton*. Participants will be provided with briefing material on the ecosystem approach and examples of initiatives in other areas which follow this approach. The workshop’s report is expected to include a list of policy, scientific, administrative, management and educational activities towards an ecosystem approach to the management of Atlantic groundfish fisheries.

It is my pleasure to invite you to this workshop. As you will see from the preliminary agenda, the exercise will be quite focused and, to gather a wide range of opinions, the FRCC has invited people representing a broad variety of backgrounds. A block of rooms has been set aside for the FRCC at the Hotel Beauséjour, 750 Main Street in Moncton at \$68/night. Participants are to make their own reservations with the hotel at (506) 854-4344.

Although the workshop’s duration has been reduced to minimize costs, we regret that funds will not be available to cover participants’ expenses. Participants are requested to confirm before November 14 by contacting the FRCC at (613) 998-0433 phone, (613) 998-1146 fax or e-mail at [catrina.tapley@frcc.x400.gc.ca](mailto:catrina.tapley@frcc.x400.gc.ca) whether you will be able to come. Further details will be forwarded to participants.

Your participation at this workshop will assist the FRCC’s Environment and Ecology Committee in defining what an ecosystem approach means, in practice. I hope we can count on your presence and look forward to meeting with you in Moncton.

With best wishes,



Paul H. LeBlond  
Chair, Environment and Ecology Committee

### 3. BRIEFING NOTES

#### “TOWARDS AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT”

An “ecosystem approach” is currently advocated (for example in DFO’s Sustainable Development Strategy Discussion paper) as a framework for conservation-based management of natural resources. There is a variety of views as to what this expression actually means and considerable uncertainty on how to implement such an approach.

The Fisheries Resource Conservation Council (FRCC) wishes to consider practical measures towards an ecosystem approach which will strengthen its conservation objectives for Canada’s Atlantic groundfish resources. Participants of this workshop will help identify and prioritize such measures.

These briefing notes are circulated to all participants to provide adequate background for the workshop. Please read them carefully.

#### A. WHAT IS AN “ECOSYSTEM APPROACH”?

A variety of definitions have been proposed. In its Dec 1995 Strategic Planning Workshop, the FRCC viewed it as “an approach which seeks to understand the impact of human intervention on target species as well as on their food and on their preys.”

A panel of the American Fisheries Society refers to “a management philosophy that focuses on local and large geographic scales, considers long-term temporal scales, and preserves biotic and abiotic components of ecosystems when making natural resource management decisions.”

Canadian biologist J.R. Vallentyne sees the ecosystem approach as “explicitly recognizing that human populations, together with their various inputs, and by-products, formed an important part of the ecosystem.”

The Ecological Society of America offers the following definition: “...management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure and function.”

These various definitions attempt to condense in a short paragraph the idea that an “ecosystem approach” to renewable natural resource management must consider the complexity and variability of natural ecosystems and try to understand the integrated impact of all human activities affecting it. In the phrase coined by U.S. pioneer conservationist Aldo Leopold, one should “Think like a Mountain.” In our case, “Think like an Ocean”.

It is important to note that all the definitions:

- i include the idea of sustainability: measures taken today must not ruin tomorrow’s prospects;
- ii- recognize that in order to achieve this goal, sufficient knowledge of the system is necessary;
- iii- recognize the complexity and variability of the natural environment; iv - and thus advocate a precautionary approach;
- v- include humans and their activities as part of the system;
- vi- insist on the need to integrate knowledge and management perspectives: for example, fisheries cannot be managed independently from water quality, social assistance programs and parallel ocean development initiatives;
- vi- require collaboration among all human participants - different gear sectors, social groups, government departments and agencies, etc...to the international level.

An ecosystem approach to the management of fisheries resources would then require an intimate knowledge of the ocean ecosystem and of its variability, agreement among fishers and managers on goals and methods of fishing which do not endanger ecosystem integrity, and a social situation where there was no pressure to go beyond such goals. Some would describe this as an unreachable utopia; others will argue that it is the only path to sustainability. Most, however, will agree that some of this makes sense and that fisheries management and conservation would be well served by taking steps towards an approach which fosters ecosystem health.

What practical steps can be taken now or in the near future? Are there any initiatives elsewhere to inspire us? In this workshop, we will draw from these initiatives and from the general principles behind the ecosystem approach to arrive at practical suggestions.

## **B. PRACTICAL STEPS TOWARDS AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT.**

When thinking of implementing an ecosystem approach, things become vague. Examples provide the best inspiration. Our invited speakers will describe practices and initiatives introduced elsewhere as well as in Atlantic Canada, in the marine domain as well as on land.

Two perspectives may guide our steps. First, the “ecosystem” part of “ecosystem approach” suggests that the more we know about the natural ecosystem and its workings, the closer we can get to the right approach. A deeper knowledge of the interactions between fish, their predators, their food and their environment is required. Scientists need to develop that knowledge and make it accessible to others through a variety of efforts: multi-species studies, ecosystem models, holistic indicators, key species... Most biologists are well aware of this; they need encouragement and support. Participation of fishers and of the general public in information gathering and analysis is desirable within an ecosystem approach. How is this to be achieved? More funding? Wider scientific efforts? Public education? Since entire communities are concerned, perhaps entire communities, not just specialists need to address these issues.

The second part is of course the “approach”: the human behaviour which creates management - and recognizes that man is indeed also part of the ecosystem. Promoters of the ecosystem approach insist that it should take into account all human interventions: transportation, recreation, sport and commercial fishing, waste disposal, resource extraction, etc... must all be considered as affecting the marine ecosystem. Science, management and policy-making must be coordinated. Human motives - socio-economic factors affecting the drives of the higher predator - must be reckoned as part of the ecosystem.

Basin-wide integration, as in the Great Lakes, or over a watershed, as is now becoming the practice in fresh-water management, are examples to guide us. Habitat protection for enhancing availability of the resource - as practiced, for example, by Ducks Unlimited - and as suggested in Marine Protected Area discussion papers, offers another avenue. Sustainability is not to be measured in terms of output (so many tons of fish, so many board-feet of lumber), but in terms of ecosystem integrity. For example, a selectively logged forest continues to be a forest as logs are removed from it (the Merv Wilkinson example) - is this example a lesson for fisheries?

The ecosystem approach emphasizes long-term, large-scale benefits over short term, local advantages. Will likely approaches be disruptive of current practices? How can this be avoided? How can an ecosystem approach be introduced without causing economic havoc? If there is a price to pay, how can it be demonstrated to be worth it?

These are not easy questions. We ask you to use your imagination, to think up ideas. This workshop is basically a brain-storming session and you should not to limit yourself to what has already been done or be deterred by apparent obstacles.

While everyone will have a chance to speak their piece briefly, only a few formal presentations will be made. If you are concerned that your ideas may not receive the time which you think they need for full exposure, please write them down and bring a written brief with you (or send it after the meeting). Briefs will be included in the workshop report and will receive the direct attention of the full Council when it considers the recommendations of its Environment & Ecology Committee.

Please direct any questions regarding the workshop topic and/or its organisation to the FRCC Secretariat.

Paul H. LeBlond  
Chair, Environment & Ecology Committee of the FRCC

## 4. CONDUCT OF THE MEETING

The meeting followed the preliminary agenda circulated with the briefing notes, except for the replacement of the presentation by B.Kovic (who could not attend because of weather) by a talk on a similar topic, but from a different perspective, by R. Haedrich, of Memorial University. The organisers wish to express their thanks to Prof. Haedrich for his willingness to step into the breach on very short notice.

All confirmed invitees, except for Mr. Kovic, were present at the workshop.

Just before lunch, break-out groups were formed to focus discussion on various aspects of fisheries management and how they could be adapted to an ecological approach. Group leaders were asked to present a one-page report of their lunch-time discussions. Each presentation generated a lively exchange of views.

The organisers wish to express their gratitude to Dr. Victorin Mallet, who hosted the meeting and to his secretary, Ms. Monette Saulnier, who assisted with registration and meeting logistics.

### AGENDA

#### FRCC WORKSHOP DECEMBER -15-16, 1997

#### “TOWARDS AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT”

#### MONDAY 15 DECEMBER: TAILLON BUILDING

16:30 Registration

17:00 Reception

Welcome to Université de Moncton: Victorin Mallet, Dean of Science

The FRCC's mandate: Fred Woodman, Chairman

Goals of the Workshop: Paul LeBlond, Chairman of the Workshop

18:00 Dinner

“Ecosystem Approach in Resource Management: Model Forests.”

Speaker: Louis Lapierre, Univ. de Moncton

#### *TUESDAY 16 DECEMBER TAILLON BUILDING*

08:45 Steps towards Ecosystem Approach: Three 20 min talks + 10 min. questions/discussion

\* Tracy Mehan, Office of the Great Lakes, Lansing MI: “The Great Lakes System”.

\* François Poulin / Marc-André Bédard: “Gaspé-Sud / Hortus Projects”

10:00 Break

10:30 \* Richard Haedrich, Memorial University: “Scientific and Traditional Knowledge”

11:00 General Discussion

12:15 Lunch - breakout groups

13:15 Breakout group reports/discussion

16:30 End of meeting.

#### *BREAKOUT GROUPS*

Topics, discussion leaders.

1. Community Participation: Brian Giroux, Roy Drake

2. Agency Coordination: John Kearney, Mike O'Connor

3. Conservation initiatives: David Coon, Ted Potter

4. Science and Traditional Knowledge: John Anderson, Omer Chouinard

5. Education: Martin Willison, Ilke Milewski

6. Economics: Patrick McGuinness, Arthur Bull

7. Management: Jim Baird, Dan Lane

## 5. SUMMARY OF PRESENTATIONS

Speakers were invited to present examples of application of the ecosystem approach, as they understood it, or of initiatives leading towards such an approach. The first two presentations, by Louis Lapierre and Tracy Mehan, on The Fundy Model Forest, in New Brunswick, and on The Great Lakes Ecosystem respectively, introduced workshop participants to the practice of an ecosystem approach in fields or geographical areas remote from their daily concerns. In this way, ideas and practices could be considered without the immediate surge of objections which usually accompanies a new proposal in familiar terrain. The other two presentations addressed issues central to the ecosystem approach: local community initiatives linked to integrated regional management (in the Gaspé-Sud/Hortus project) and the harmonisation of systematic scientific knowledge with traditional knowledge.

### 5.1 LOUIS LAPIERRE: SUSTAINABLE RESOURCE MANAGEMENT INTO THE 21<sup>ST</sup> CENTURY

Dr. Louis Lapierre is Professor of Ecology and holder of the K.C. Irving Chair on Sustainable Development at the Université de Moncton.

In his talk, Prof. Lapierre described the New Brunswick Fundy Model Forest project, one of ten model forests in Canada. Model forests have social, economic and environmental goals. One of the big steps is to bring people to the table to manage sustainably. Public participation is seen as an essential component of sustainable forest management, helping to set goals on how much is to be taken from the forest. Implementation of these goals, rather than some harvest objective, determine exploitation rates and methods.

The first element of the Model Forest project consists of organisation and development: bringing stakeholders to the table and designing a process which allows understanding of issues, expression of preferences, resolution of concerns and reaching of satisfactory compromises. Model Forest projects also include elements of education and cultural participation; economic diversification and consideration of biodiversity.

A management plan for a Model Forest would include efforts to optimize forest exploitation, biodiversity, economic and social conditions in a mutually re-inforcing way.

Dr. Lapierre reflected on his earlier attempt to extend the Model Forest concept to a Model Ocean area in the Gulf of St. Lawrence. In his view, the multiplicity of fishing groups and interests would make it much more difficult (but not necessarily impossible) to reach the consensus required to set up an equivalent system in the ocean.

Extension of the Model Forest concept and experience to the ocean domain would require starting small, in coastal communities where inhabitants identify with the oceanic area (e.g. an estuarine area, such as the Richibucto (N.B.) Environment and Resource Enhancement Project), and proceeding gradually to wider spatial scales. As on land, where forests are recognized to consist of more than just trees, the ocean must be recognized to be more than just a source of fish. Sustainable management of fisheries must include considerations of biodiversity, habitat, social and economic conditions.

### 5.2 TRACY MEHAN: THE GREAT LAKES ECOSYSTEM

G. Tracy Mehan, III, is director of the Michigan Office of the Great Lakes and a member of Governor John Engler's Cabinet.

Human impact on the Great Lakes Basin, where 35 million people live, has been very heavy. As Mr. Mehan pointed out, "the environmental history of this region is a story of extreme degradation and remarkable restoration, still underway." Much of the impact has been associated with chemical pollution; restoration has required extensive international, inter-state and regional coordination. The Great Lakes Water Quality Agreement between Canada and the United States undertook "to restore and maintain the chemical, physical and biological integrity of the waters of the Great Lake Basin ecosystem", defined as "...the interacting components of air, land, water and living organisms, including humans, within the drainage basin..." Coordinated control of chemical impacts had notable success, as evidenced by recovery of bald eagle populations nesting around the lakes.

Another significant anthropogenic impact in the Great Lakes is the introduction of more than 140 exotic species, which were not present in the 1800's. Some of these, such as lampreys and zebra mussels, have had a devastating impact on native fish stocks. Dr Cooper, of Michigan State University, was quoted as stating that introduced exotic species had an even worse impact than chemical pollution on the integrity of the ecosystem. "Environmental and resource managers throughout the region are now taking a broader ecosystem approach," said Mr. Mehan, going beyond (without abandoning them) traditional chemical controls to include concerns for habitat, overfishing and the role of exotic species.

For example, the Great Lakes Fisheries Commission, a bi-national body which includes the three Great Lake states, the province of Ontario, and various tribal authorities, has introduced a program which, by combining water quality standards, lamprey controls, sport and commercial fishing, and stock enhancement, has allowed lake-trout to become self-sustaining again in some areas of Lake Superior.

Application of the ecosystem approach to fisheries management in the Great Lakes has thus consisted of integrated interventions of all agencies and groups concerned to maintain or restore the environmental conditions (chemical, physical and biological) favourable to fish stock sustainability. In concluding, Mr Mehan noted that: "The Great Lakes ecosystem is a dynamic one which, over time, responds to its own internal processes and external influences. Human beings, as active agents, need to adopt thought and actions consistent with the actual state of the resources." He also noted that an "ecosystem approach" was neither purely scientific nor purely political, and there was a need to define its practice through case studies well anchored in place and time.

Mr. Mehan mentioned that, in his opinion, it would not be possible to revert to original environmental conditions in the Great Lakes. Perhaps this is an omen for what might happen to the Atlantic marine environment if steps are not taken soon to counter the effects of pollution, overfishing and habitat degradation.

### **5.3 FRANÇOIS POULIN: THE GASPÉ SUD PROJECT MARC-ANDRÉ BERNARD: LE PROJET HORTUS**

François Poulin is the Director General of the Alliance des Pêcheurs Professionnels du Québec. Marc-André Bernard is the biologist in charge of Project Hortus.

The Projet Gaspé Sud is a pilot project to create a new fisheries management regime within an integrated inshore fishing zone in the Bay des Chaleurs and the South Shore of the Gaspé coast. Mr. Poulin reviewed the project, submitted in March 1997 to the Minister of Fisheries and Oceans by the "Regroupement des pêcheurs professionnels du Sud de la Gaspésie. An overview of the project, distributed to participants, is attached to this report.

The fundamental goal of this 5-year pilot project is "the search for a durable and viable equilibrium between the number of inshore fishermen harvesting the proposed integrated inshore fishing zone and the long term fishing potential of the same zone". The project is focused on the development of a multi-species inshore fishery, and the search for an equitable sharing of the resources.

The project is inspired by the FAO's position on coastal fisheries and advocates control of adjacent marine resources by coastal communities. It welcomes participation by First Nation fishers and combines social, economic and ecosystem considerations.

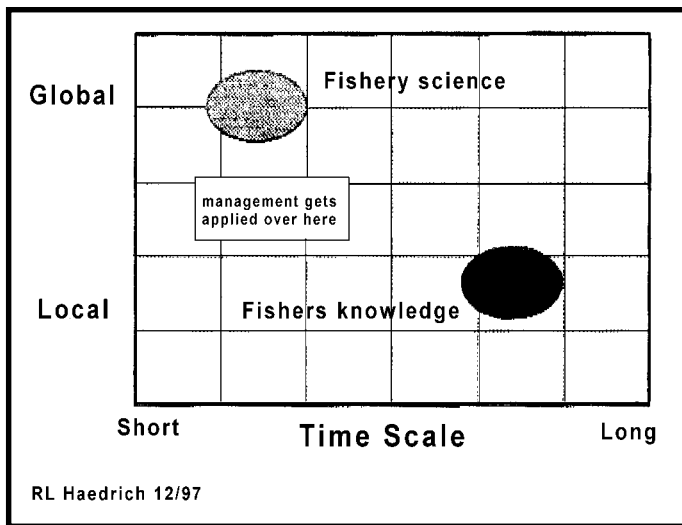
Projet Hortus is a local, focused initiative coordinated with and integrated within the broader-scale Gaspé-Sud project. Bringing together 18 community organisations over a dozen meetings to create a "garden" project in Cascapedia Bay, where diverse uses of the sea will co-exist.

### **5.4 RICHARD HAEDRICH: SCIENCE AND TRADITIONAL KNOWLEDGE**

Dr. Haedrich is a professor of Ocean Sciences at Memorial University of Newfoundland and an expert in deep-sea fishes.

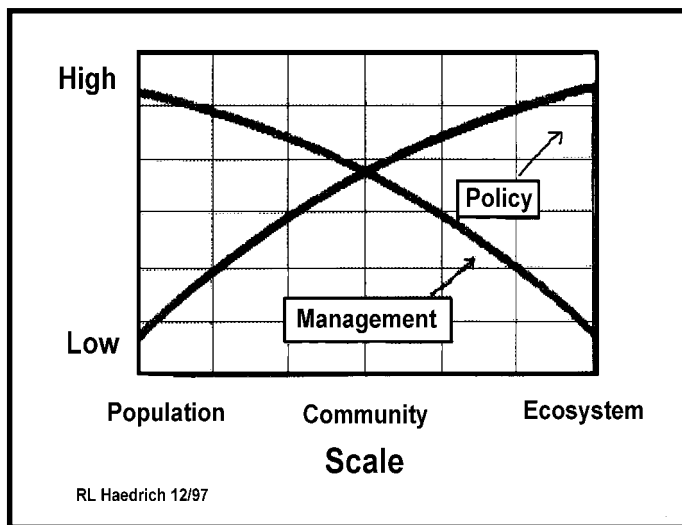
Dr Haedrich presented some thoughts on the relative use and meaning of traditional and scientific information, the former defined as gathered by fishermen at sea and passed on to their children and others by anecdotal means, the latter obtained systematically through scientific methodology. Traditional knowledge is relevant to local conditions and their variations over long-time scales, while scientific knowledge, as available today, applies to large spatial scales but only to short time scales (e.g. this year's survey). The two approaches represent isolated bubbles of information on a Stommel diagram of space and time scales.

Figure #1



Because of this disparity in scales, it appears that currently fishers' knowledge is more useful for long-term policy setting which applies to whole ecosystems, whereas scientific knowledge deals with fish populations is more useful for the actual management of fisheries. If management is to follow policy and be matched to ecological time and space scales both approaches must be drawn upon.

Figure #2



How to bring the two approaches closer together? Perhaps through the common language of charts, suggested Haedrich, who showed a 1900's chart of the Gulf of Maine which had spawning areas and other traditional fisheries information on it. Through letting fishermen indicate on charts "This is where I saw it" or "This is where we used to fish", the information could be put in a format useful for scientific analysis and scales of common interest can be identified.

## 6. SYNOPSIS OF DISCUSSIONS

Each formal presentation was followed by wide-ranging questioning and discussion. Comments have been grouped by topic, most of them coinciding with the themes considered by the break-out groups, other arising spontaneously from the floor. Only an edited synopsis is presented: there has been no attempt at verbatim reporting and specific comments have not been attributed to individual speakers.

### 6.1. COMMUNITY PARTICIPATION

Community participation is widely recognized as an essential element of any sustainable or ecological management scheme. People living with the environment and drawing directly from its resources must play an important role in decisions about its management. The first question is to define the relevant community: by geography? interests? How wide and all-encompassing is a community? Can, or should, the approx. 1,600 coastal communities in Atlantic Canada be brought together within a broader meta-community? If one is to speak of ecosystem management associated with community involvement, it is important to match the scale of one with that of the other. A small community alone cannot effectively manage an ecosystem which extends over a much larger spatial scale: decisions taken in other communities will impact the ecosystem. Creating a large-scale functional community by speaking with individuals in order to reach common objectives was seen as impractical: a more workable method is to proceed hierarchically, by encouraging local groups with specific interests to define their preferences and objectives; these groups in turn associating within a regional, broader-based organisation, and so on. An example of this process was presented from the Bay of Fundy, where Bay-wide groupings support and extend local initiatives. It was also suggested that one might learn from the biological definition: “a community is made of linked species sharing the resources of the ecosystem.” Also, from a different perspective, that management should be linked to habitat types rather to single species. A warning about community involvement and community control however: in our system where opportunities must be available to all (or at least to all within a licensed group) it is impossible to extend community-based privileges to one community without making them available to all communities. The importance of the process for arriving at consensus, or more appropriately compromise, positions was stressed, inspired in part by Dr. Lapierre’s Model Forest example. Techniques of “interest-based” negotiation were advocated, in which positions are attacked, not people.

### 6.2. AGENCY COORDINATION

The first reaction of participants to this topic was frustration at the lack of coordination. The Great Lakes history clearly shows the need for coordinated efforts in protecting and restoring the environment and its resources. Some concern was expressed however about potentially increasing bureaucratic complexity or weakening DFO’s focus on the fishing industry. Suggestions to move towards closer integration of various human rules and activities included an inventory of existing environmental and resource use legislation, the creation of a (DFO?) website for ecological fisheries management projects, discussion papers, etc... Finally, interagency coordination in an ecological approach can only take place if the various agencies, - international, federal, provincial, municipal, etc... - are aware of the need for such coordination and come to the table to plan for it: coordination itself occurs in a step-wise fashion. Transparency was claimed by all to be of crucial importance to all coordination and interagency communication processes. There was a call for a broadening of perspective in dealing with ocean issues - general ocean ecosystem policy should integrate downstream effects of land-based development as well as shore-based activities. It is not sufficient to coordinate agencies concerned with the ocean: actions taken on land have an impact at sea.

### 6.3. CONSERVATION INITIATIVES

What conservation initiatives, within and beyond the FRCC’s Groundfish Conservation Framework, might contribute to an ecological approach to fisheries management? It was first suggested that the FRCC should define a mechanism for supporting and encouraging current initiatives - by providing information about them and rallying DFO, industry and public support in their favour. To be deserving of support, existing as well as future initiatives should satisfy agreed-upon criteria, documenting, for example, their conservation effectiveness, and their economic and social impacts. Such criteria should be based on solid scientific, legal and economic bases. There is

also a need for a clear articulation of a vision to guide a transition towards an ecological approach, inspired in part by the FRCC's Groundfish Conservation Framework and by the work of Model Forests. Many of the topics discussed at the workshop provide the seeds of such a vision and suggest practical steps towards it: Marine Protected Areas, public education, community consultation, blending of scientific and traditional knowledge.

## 6.4. SCIENCE AND TRADITIONAL KNOWLEDGE

Science and traditional knowledge represent equivalent forms of excellence in the expression of knowledge; together they create a broader basis of knowledge to assist decision making. Science is quantitative and usually, broad in scale; traditional knowledge is qualitative and local in scale. Nevertheless, both contribute to information about the environment and should be brought together rather than considered as fundamentally different. Science, after all, evolved from less systematic, more traditional ways of observing nature.

There was not universal agreement with Dr. Haedrich's division or pertinence of traditional knowledge as local and long-time scale versus science as broadly based over short time scales: after all, there are scientific measurements of some fish stocks dating back to the turn of the century. Another argument for the complementarity of both approaches!

If traditional knowledge is to contribute to fisheries management and supplement scientific information, it must be treated using its own appropriate methodology. Beyond the use of maps as a common language, the cultural element of traditional knowledge must be taken into account. Whether science and traditional knowledge should treat their separate windows in space and time scales remains a matter of debate. There is a need for clarification, especially for the fishing industry, of the relative roles of these sources of information and how they are to be blended together. It was suggested that where science and traditional knowledge differ, a precautionary approach be adopted, erring on the side of caution in favour of conservation objectives.

What science wants from traditional knowledge is the development of methods to assure scientists of the generality and consistency of traditional observations and results in an open and transparent way. In turn, what traditional knowledge experts (fishers, sociologists...) want from scientists is means of incorporating traditional knowledge into surveys and ecological studies in an open and transparent way.

What we are left with is a call for a process which brings science and traditional knowledge into a common framework. This process should include the development of methods which ensure quality control of qualitative knowledge as well as of methods which incorporate traditional knowledge in the design of surveys and the interpretation of their results.

## 6.5. ECOLOGY

It is impossible to speak of an ecological approach to fisheries management without considering the biological basis of natural marine ecosystems. In the words of one participant: "The marine environment is too complex, fluid and dynamic to impose on it narrow, arbitrary boundaries". The non-linearity and variability of natural ecosystems makes them difficult (some would say impossible) to manage. An ecosystem approach must recognize and adapt itself to these features of natural ecosystems. Fisheries scientists have made serious efforts to consider multi-species fisheries management. As biologists, they are also generally keen to take a broader ecosystemic approach to fisheries science; however, some also feel trapped by the requirements of the current single-species management schemes and the demands made for accuracy of stock estimates. The necessity of federal involvement, with DFO as the lead federal agency, in large-scale ecological concerns was widely acknowledged, and it was agreed that it is important to continue to ensure that scientific discussions include all relevant perspectives, including fishers, academia and NGO's. The dissemination of ecological information through maps, atlases and other means was seen as an important step in educating stakeholders and the public, in harmonizing traditional and scientific knowledge, in establishing the basis for ecosystem thinking in ocean management, and in providing the information necessary to consider Marine Protected Areas under the Oceans Act. Examples of current efforts at developing an "Ecosystem Description" of Atlantic waters were mentioned (Geomatics International and Nova Scotia Museum). One should remember however that it is essential to have some clear goals (e.g. protecting spawning areas, characterization of habitat types, etc...) in mind when using geographical ecosystem information

for management purposes. Finally, a periodic ecosystem assessment of fisheries status and impact was suggested as a tool to assist in developing an ecological approach. It was suggested that the FRCC could play a role in stimulating interactions between DFO, academic and industry spokespersons in the development of such an assessment process.

## 6.6. EDUCATION

Within the perspective of an ecological approach, one should recall that education is: 1 - a continuous living process, evolving as knowledge evolves; and that 2- it has formal and informal aspects. Teachers and journalists are both involved in education, for example. The breakout group recommended that the FRCC should teach by example and show the way towards an ecological approach by recommending to the Minister that future appointments to the Council reflect the issues discussed at the workshop, as pertinent to an ecological approach.

## 6.7. ECONOMICS

Commentators offered a variety of relevant opinions, pointing out:

- \* the need for a buy-out program to address over-capacity issues in the fishery;
- \* that economic pressures (markets, employment, capital needs) should not be allowed to undermine ecological requirements (spawning areas, protection of juveniles...)
- \* economics is part of ecological planning;
- \* ecology must be part of economic planning - a significantly different emphasis;
- \* an ecosystem approach would best be tried on smaller “bubble” projects; smaller scale would allow local management control, more intimate appreciation of the ecosystem;
- \* having, in the same area, competitive fisheries together with rights-based fisheries causes problems in management and the application of conservation measures;
- \* there is a need for a transitional strategy to get to the ideal future from the present situation;
- \* many fishers are nearing retirement age - their replacement (or not) is part of the transition.

One should remember that economics and ecology are etymologically closely related. After a period of divergence, during which environmental costs were completely externalized, ecological considerations are beginning to be incorporated into economic thinking. Ecological economics, as this new approach is called, specifically includes environmental costs and benefits within the total balance sheet (Costanza, 1991). We recognize various elements of ecological economics in the comments offered at the workshop and particularly in the integrated management paradigm adopted by the Model Forest. A systematic application of ecological economic thinking to fisheries is clearly to be encouraged.

## 6.8. MANAGEMENT

In an ecological approach, management should mimic nature and be on the scale of an ecosystem. Agencies with broader scope (e.g. DFO) should be concerned with large scale management; local organisations with local issues. Given the current single-species focus of fisheries management, progress towards a more ecological approach may require a modified decision-making system, centred less on TAC's and more on the sustainability of the ecosystem as a whole, somewhat following the process outlined in the Model Forest presentation of Dr. Lapierre. In such a system, conflicts between community or user groups are resolved at the table rather than on the back of the resource, a clear advantage to conservation. Management by consensus was thought to be easy: what's difficult is arriving at a consensus. Matching fisheries management to ecological scales, the latter being defined in terms of harvested populations as well as of fishing communities, is seen as desirable. Bottom-up management is of course easier for smaller biological communities, where such efforts should begin. Difficulties were recognized regarding the definition of access to local resources by local communities, in keeping with the adjacency principle. Never-

theless, the principle of making decisions at the lowest level of management possible was strongly argued. Small scales are easier to understand; people also find them easier to relate to. For guidance in dealing with migratory species, one might be inspired by conservation measures applied to migratory birds - although it was pointed out that the comparison is not quite appropriate, since they do not sustain a commercial harvest.

## 6.9. ABORIGINAL FISHERIES

The workshop was forcefully reminded of the expanding role of First Nations in Atlantic fisheries. It is clear that the broader “community” will have to include native communities as full participants whose access is guaranteed under the Constitution. All conservation issues are likely to be impacted. First Nations councils will have to be consulted and will be an important source of experience and wisdom in moving towards an ecosystem approach. As their perspective on many issues is likely to be quite different from that of other stakeholders, it is important that a deep dialogue be initiated as soon as possible.

## 6.10. EXPECTATIONS

As a prominent official standard bearer for conservation, the FRCC has earned wide respect within the fishing industry and conservation-minded NGO's. Expectations of what the FRCC can actually do however greatly exceed its power as an advisory body. The FRCC only makes recommendations. Nevertheless, these recommendations can be very influential and can stimulate action by others, in government, industry and the public. Comments were made on the mandate of the FRCC: too specifically focused on groundfish. How can the FRCC foster an ecological approach while focusing on single species management of only some of the fisheries resources? Some participants wanted the FRCC's mandate to be expanded to an Ecosystem Approach to Fisheries Management.

## 7. CONCLUSIONS

The Moncton workshop led to focused and active discussion. Valuable contributions were made by all participants, resulting in suggestions for immediate action and longer-term partnerships. A general recognition of a need to go beyond current fisheries management practices pervaded the meeting, tempered by puzzlement at how to proceed and how to deal with a variety of practical issues. “I'm sure we are a long way from an ecosystem approach”, someone remarked, while adding that he was “more convinced than ever that we need to introduce” that approach. While some participants thought of an ecosystem approach as equivalent to a multi-species management scheme, another view - perhaps more realistic as an intermediate step - defines it as a “transparent definable process that assesses the status of one species, taking into account its interactions with other species.”

For most participants, an ecosystem approach to fisheries management was seen as bringing together two essential components: recognition and respect for the ocean ecosystem and community-based involvement in its management. It may be argued that the link between the two is not entirely necessary - one might exist without the other - but they are closely related in the mind of most intervenors. Perhaps the perceived need for both brings them together. In any case, human intervention is certainly a major element of the ecosystem approach. To quote Edward Maltby (1997): “The earlier separation of ecology and economics and of ‘nature’ and human society (at least in western cultures) favoured still by some conservationists is not helpful.” Further: “...ecosystem based management is only partly about science. It is much more about cultures and society.

It is very clear that there is a great conceptual distance between a functioning ecosystem approach, as sketched by the participants, and present-day fisheries management. In contrast to today's single species or single stock management regime, where the fishery is pursued by competing gear sectors and regional groups, restrained by a variety of regulations, an ideal ecosystem approach is characterized by a concern for the integrity of the natural ecosystem, and a bottom-based, community-oriented management regime.

The ideal of communities at peace with nature and each other, happy to draw from the environment only what it can provide without damaging its ecosystemic stability, will appear utopic to some, who may imagine is as an attempt to re-create an idyllic and imaginary past. There are however significant differences between yesterday's and today's conditions. Fishing capacities and catches are now at a level which threaten the very core of the marine ecosystem. Respect for nature is no longer a philosophical option; it is a necessity. Fisheries are operating

at the limits, and beyond, of what can be taken from the ocean. There remain a number of important questions regarding the definitions of ecosystems and of communities and how they are to be matched, in space and time, but the course towards sustainability seems to be set along the two guiding axes of the ecological approach and must be guided by sound scientific research.

Moving towards a management regime inspired by the ecological ideal will be possible only through a series of small steps. First, enough people have to be convinced of the need to move in that new direction. Initiatives in the desired direction have to be encouraged and used as guideposts, defining the path and strengthening the resolve. Broad-based participation and support of the public and the fishing industry will be required.

Having started the workshop with a presentation on the Fundy Model Forest, it is appropriate to end on a similar note, drawing again from a forestry analogy. As Clarence Pautzke, Executive Director of the North Pacific Fishery Management Council put it at the Global Trends in Fisheries Management Conference: "If the practice of not seeing the forest for the trees has brought us to our present state of affairs in the Northwest logging industry, then our inability to see the ocean for the fish, because we see fish as a product, I would suggest has brought us to the present state of affairs in our global fisheries management." (Pikitch et al., 1997). The urgent need for a new approach was recognized by McGinn in her essay in the 1998 State of the World: "With timely action, fisheries can continue to provide food, jobs and enjoyment for millions of people worldwide. But ultimately this means changing our focus from what is done to a fish to what can be done for the fish. An the time for that change is now."

## 8. RECOMMENDATIONS

These recommendations are presented by the Environment and Ecology Committee to the FRCC for discussion. From this discussion will emerge a selection of priority lines of action to enhance the Council's continuing conservation work.

- R-1 Using the advice received at the Moncton workshop as well as information from current literature, the FRCC should determine, through the following action items, how it will move towards an ecosystem approach within its existing mandate.
  - A-1 The E&E Committee will prepare a position paper to be completed in the fall of 1998.
  - A-2 This same committee, with the help of the Secretariate, will collect information on the ecosystem approach in resource management in general and fisheries in particular.
- R-2 The FRCC should recognize initiatives by regional and industry groups towards community and industry-based ecosystem approaches in fisheries management as follows:
  - A-3 The E&E Committee will compile, for the FRCC's information, a list of on-going initiatives which it considers pertinent to an ecological approach to fisheries management in Atlantic Canadian waters.
- R-3 As part of its conservation strategy, the FRCC should develop closer links with all stakeholders, including First Nations, on the formulation and development of an ecosystem approach as follows:
  - A-4 The FRCC will seek information, within the framework of regular as well as special consultations, on initiatives leading towards an ecosystem approach.
- R-4 Information on ocean ecosystems must be made more broadly understandable and available as a tool for public education and fisheries management.
  - A-5 The FRCC will encourage DFO to develop partnerships towards the development of information material integrating traditional and scientific sources of ecosystem knowledge.
  - A-6 The FRCC will request that DFO develop partnerships towards the dissemination (publications, atlases, web site...) of ecosystem knowledge.

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## BRIEFS SUBMITTED AT THE WORKSHOP, DECEMBER 15-16, 1997

### 1. PILOT PROJECT TO CREATE AN INTEGRATED FISHERIES RESOURCES HARVESTING AREA (TRANSLATED)

*This document constitutes a pilot project designed to define, over the coming years, a new approach to the inshore fishery in Chaleur Bay and along the south coast of the Gaspé and the east coast of New Brunswick.*

*This new approach has become essential if we are to avoid repeating the mistakes of the past which led to the widely publicized tragedy of the closure of the cod fishery in 1993, a tragedy which in five years has cost Canadian taxpayers over \$2.0 billion and for which no real sustainable solution has as yet been proposed for the future.*

**Project submitted jointly by the Regroupement des pêcheurs professionnels du Sud de la Gaspésie  
(member of the Alliance) (Appendix VI)  
and the  
Maritime Fishermen's Union (Appendix VII)  
to  
Fisheries and Oceans Canada  
February 1998**

#### *PILOT PROJECT (summary sheet)*

**Project title:** Creation of an experimental integrated inshore fisheries resources harvesting area.

**Geographic borders:** Integrated area comprised of four subareas, i.e. one joint Quebec/New Brunswick area in Chaleur Bay, one Gaspé South area northeast of Chaleur Bay, and two areas in New Brunswick, namely the Northeast and Northumberland Strait (see map in Appendix I and justification of area boundaries in Appendix II).

**Nature of project:** Pilot experiment to develop a new sustainable model for the co-management (status/environment), harvesting, conservation and development of inshore fisheries resources by fishers adjacent to the integrated area (Appendix III).

**Objectives:** Seek a sustainable balance between the exploitable potential of fisheries resources in a maritime area and the maximum number of adjacent inshore fishers (traditional or Aboriginal) who can make a decent living from them.

This approach is based on the professionalization and accountability of inshore fishers for the marine environment on which they depend, and recognizes the need to make fishers more versatile in seeking greater security, professional stability and profitability.

(For secondary objectives, see Appendix IV.)

**Target clientele:** The target clientele includes fixed-gear fishers operating vessels under 50 feet who are adjacent to the integrated area, as well as a number of new entrants (still to be determined) to satisfy the unquestionable and entirely legitimate historic rights of the Aboriginal communities adjacent to this area. Agreements might be possible to permit and regulate the use of mobile gear by inshore vessels under 50 feet LOA for species which can only be harvested using such gear.

At the outset, the number of harvesters could be around 1500 inshore fishers, including Aboriginal people. The five-year term of the pilot project will serve to determine the appropriateness of creating an integrated area and the number of active fishers who could make a decent living from it on a sustainable basis; at the

same time, it could serve to define any necessary programs which might offer surplus fishers worthwhile alternatives that can realize the objective of a balance between harvesters and resources, which is the foundation of the pilot project - in particular, a rationalization program.

**Project schedule:** The pilot project would last five years, starting January 1, 1999 and ending December 31, 2003.

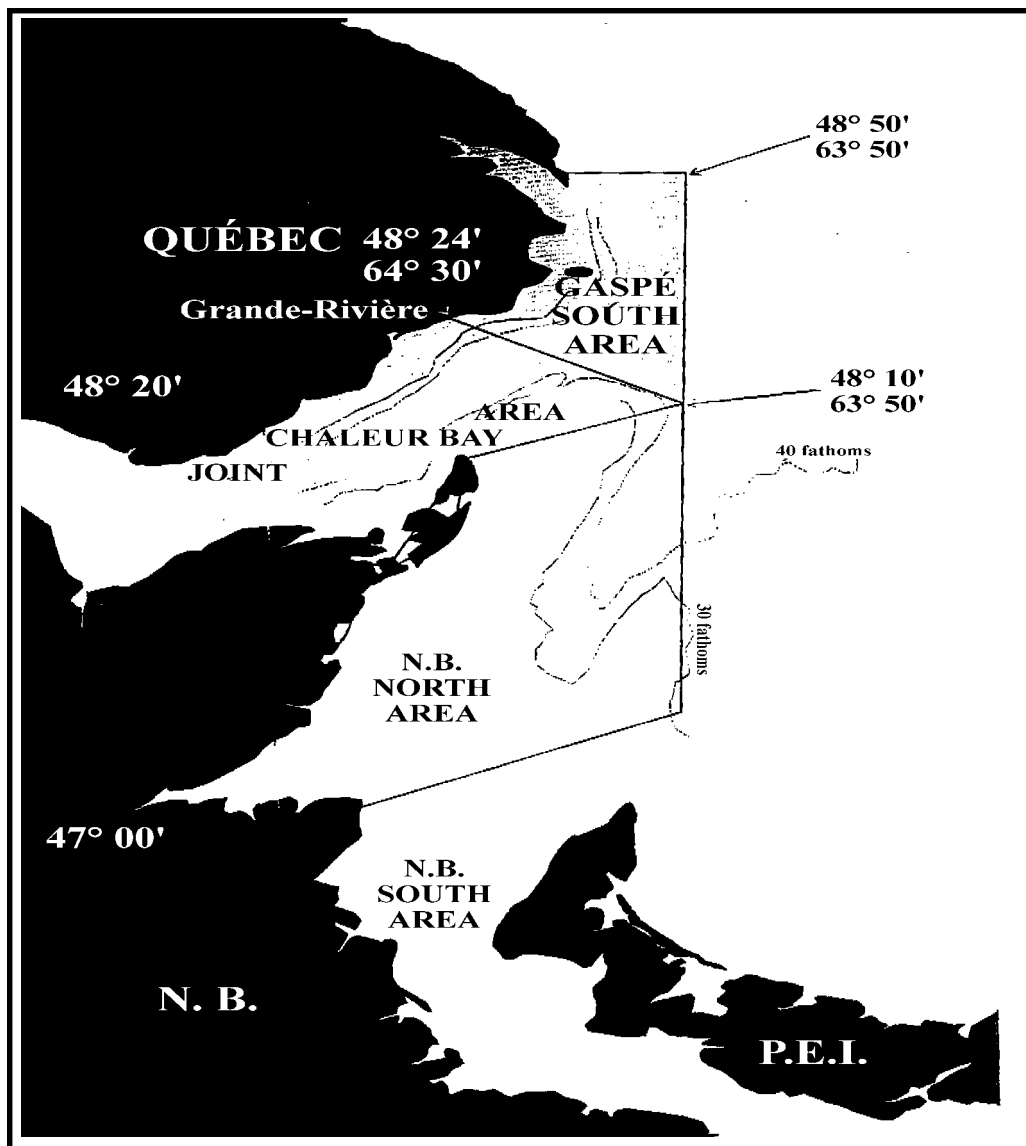
However, essential management of this pilot project requires a preparatory phase which must extend from April 1, 1998 to December 31, 1998, a phase which must conclude with the signing of a five-year pilot partnership agreement on status/environment co-management.

Start-up of this pilot project therefore requires that it be immediately approved by the competent government authorities.

**Project funding:** Each of the participants involved in the preparatory phase will assume the inherent costs of its participation. During this phase, costs of a community nature could be defrayed by a budget shared by the participants.

Costs for the five years of pilot project delivery will be divided equitably among the stakeholders under a co-management partnership agreement to be signed by the parties at the conclusion of the preparatory phase; these costs together with the inherent costs of a rationalization program will be financed jointly by DFO and by a levy on landings.

**APPENDIX I**



## **APPENDIX II**

### **PILOT PROJECT TO CREATE AN INTEGRATED FISHERIES RESOURCES HARVESTING AREA**

#### **JUSTIFICATION OF THE BOUNDARIES OF THE INTEGRATED AREA**

The boundaries proposed are those of the traditional fishing territory of Gaspé and Acadian inshore fishers, a territory where they have fished in an environmentally friendly manner for more than 300 years, never endangering the various fisheries resources. For more than 3,000 years of history, it has also been the ancestral fishing territory of Aboriginal people, who also want to retain their access to it.

It is urgent that this territory be restored to the traditional inshore fishers, who have been literally expelled from it over the past 30 years by unbridled industrial fishing, conceived without judgment or qualification by technocrats eager for the big industrial push which over the years has translated into a series of stock collapses, the last one being that of cod, which has cost the Canadian population over \$2 billion.

Unfortunately, a good many senior technocrats are still involved in the fisheries, and they defend this industrial model despite the fact that it has been synonymous with ruin and desolation, not only in Eastern Canada but throughout the world.

Time is pressing: it is legitimate for the inshore fishers to hope to one day be able to make a decent living and to leave something to their descendants.

In this regard, the inshore fishers share the concerns of the FAO (UN) with respect to small-scale fishing (see Appendix V).

They also consider themselves the victims of an unspeakable injustice in being the only ones not to have obtained renewed access to the inshore resources along the Gaspé and Acadian coasts, access of which they have literally been stripped by industrial fishing and its supporters. For snow crab, for example, all the other regions of the Gulf have obtained this inshore access, the last two being Gaspé North (1994) and the west coast of Newfoundland (1994).

## **APPENDIX III**

### **PILOT PROJECT TO CREATE AN INTEGRATED FISHERIES RESOURCES HARVESTING AREA**

#### **NATURE OF THE PROJECT**

This pilot project involves the development, within the framework of a five-year partnership (co-management) agreement starting January 1, 1999, of a new sustainable model for the management, harvesting, conservation and development of all fisheries resources available and accessible to inshore fishers and Aboriginal people adjacent to the integrated management area proposed in Appendix I.

A multi-species approach to inshore fisheries is to be developed, based on the professionalization and accountability of inshore fishers and Natives for their ancestral fishing grounds.

In the proposed territory, this means a return to a versatile model of inshore fishing that is sustainable (ecological) and cost-effective (economical), a model which on the one hand offers several centuries of solid guarantees that the environment and resources will be respected, and which on the other has been sufficiently modernized over the last three decades to offer legitimate guarantees of supply for the processing sector.

The balance sheet on 30 years of industrialized and specialized fishing speaks volumes about the lamentable failure of this formula, which over the years has been characterized by the successive collapse of most of the Gulf of St. Lawrence stocks, closure of a series of processing plants, and the massive complementary mobilization of government social programs funded by Canadian taxpayers: one need only mention, for example, the collapse since 1970 of our stocks of herring, redfish, crab, turbot, cod, hake, etc.

In the present difficult socio-economic context in Canada, there is no longer any place for a fishing industry which, using resources that belong to all Canadians, creates rich industrial fishers (crabbers and shrimpers) on the one hand, and on the other poor fishers who are supported by social programs.

Neither is there any place for an excessively specialized fishing industry that creates short-term fishery activities such as crab (about 7 weeks), lobster (10 weeks), groundfish (10 weeks) and pelagics (5 weeks), specialty fisheries that are able to survive only because of massive backing from social programs, notably employment insurance.

It is becoming urgent to make the necessary change in direction and to allow access to versatility, in both harvesting and processing; this alone can stabilize the fishing industry and make it cost-effective by letting it operate throughout the annual period when the Gulf is ice-free.

## APPENDIX IV

### PILOT PROJECT TO CREATE AN INTEGRATED FISHERIES RESOURCES HARVESTING AREA

#### OBJECTIVES

The basic objective of the pilot project is to aim for a sustainable, viable and profitable balance between the number of inshore fishers working the proposed integrated area and the sustainable fisheries potential of that area.

The secondary objectives which seem to us essential in pursuing the primary objective are to strive for the following:

- **Versatility**, to allow inshore fishers access to a range of resources (shellfish, groundfish and pelagics) sufficiently diversified so that they can practice their profession for the longest possible yearly period in a context of security, stability and profitability much more effective than now possible under the industrial model based on specialization. Only the versatility proposed by the pilot project can offer inshore fishers legitimate alternatives in the event of a collapse in market prices or in a resource, for example. In the recent past, the current industrial model has had no options to offer apart from massive recourse to government protectionism financed by Canadian taxpayers.
- **Equitable sharing of available, accessible resources**, which will allow, always on the basis of long-term equilibrium, the greatest possible number of fishers, crewmen and plant workers to earn a decent living from the rational harvesting of fisheries resources belonging to the Canadian people, in coastal areas where there is often no other industry to offer a worthwhile alternative to workers and fishers who are deemed surplus. The resources presently available can be augmented by underutilized species and species with farming potential.

This objective of maintaining the highest possible number of viable jobs is precisely that of the pilot project, contrary to the present industrial model which is characterized by a concentration in the hands of a few big overspecialized industrial fishers of enormous capital and highly advanced technology which afford little room for harvesting labour and cause considerable damage to the marine environment and marine species.

For all practical purposes, if DFO wants to make the 500-odd industrial fishing vessels now cruising the Gulf cost-effective so as to maintain and stabilize the technocratic industrial model that has been imposed for 30 years, it will have to concentrate all resources in their hands and wipe out about 7,000 inshore fishing units and some 18,000 related jobs. Such an attitude on the part of DFO is no longer justifiable.

- **Social peace** between inshore fishers and industrial fishers, by assigning each fleet its own grounds, thereby avoiding the confrontations that have been ongoing for more than 30 years and are intensifying as resources become scarcer due to industrial overfishing.

The tension in the Gulf has reached fever pitch with the announcement of the signing of the snow crab co-management agreement in July 1997. The inshore fishers fear that the government is capitulating to the lobbying of the rich and powerful crabbers and shrimpers, the grave and immediate consequence of which will be the death-knell of the inshore fishery and a match to the powder keg.

Only the acceptance of this pilot project will maintain a light at the end of the tunnel, and avoid a veritable social explosion in the communities concerned.

## **APPENDIX V**

### **PILOT PROJECT TO CREATE AN INTEGRATED FISHERIES RESOURCES HARVESTING AREA**

#### **SMALL-SCALE FISHERIES**

Almost 50 percent of total world landings are estimated to come from small-scale capture fisheries, and most of this production is used for direct human consumption. The small-scale sector employs many more people than the other fisheries sectors (although the catch per person employed is much less than for those employed in other fisheries) and many communities rely solely on fisheries for their existence. Against this background is the fact that coastal fisheries, most commonly exploited by the small-scale sector, are generally overfished in most parts of the world. The reasons for this include the lack of assured access to stocks, the inability to fish further offshore, and the interaction with industrial fishing fleets operating illegally too close to the shore. Small-scale fisheries are also under threat from other users in the coastal zones and they are perhaps the first to be affected by land-based pollution and other changes in the coastal area.

More recently the small-scale sector has come under threat through legislation enacted in favour of recreational users of the aquatic environment and this has had an adverse effect on small-scale fisheries in some small island developing states (SIDS).

FAO has advocated an integrated approach to small-scale fisheries conservation and management, not only within the fisheries sector itself, but also within coastal area management schemes. Better and safer craft for more advanced artisanal fisheries have been developed, appropriate fishing gear has been introduced and, in order to acquire new tools as well as to assist in marketing, institutional credit programmes have been promoted (with promising results in some parts of Africa and Asia).

Notwithstanding the progress made in enhancing fisheries conservation and management in coastal areas, competition for fisheries resources with industrial fleets and the lack of effective MCS mean that inshore fisheries will remain under threat. The situation is a matter of primary concern because of the impact that this unsustainable use of coastal fisheries resources has had on food security among highly vulnerable and very often impoverished communities.

Small-scale fisheries require the support of fishery managers, and they need assured access to areas that should be out-of-bounds to all other users. This requires strengthened MCS systems. Furthermore, in cases of coastal navigation practices and, where they exist, vessel traffic separations, as well as the avoidance of sensitive areas, there is an urgent need for close cooperation with other international agencies to ensure that the priorities for small-scale fisheries are given proper consideration.

#### **Traditional approaches to fisheries conservation and management**

The difficulties associated with transplanting current fisheries conservation and management concepts and systems to developing states have encouraged renewed interest in some of these states to build on traditional (or community) fisheries conservation and management practices. Among many indigenous communities communal control over access to fisheries resources, as well as the use of a range of conservation-oriented measures in coastal fisheries, operate to ensure sustainability.

With the advent of rapid social change, population increases, urbanization, the rise of commercial opportunities for sales of fish and fisheries products, and the introduction of more effective mobile gears, these traditional management systems have come under extreme pressure and have, in some cases, started to disintegrate. However, the merits of fostering community control over vulnerable coastal fisheries are apparent and, given the mixed results that have been achieved with other conservation and management approaches, traditional management practices provide a viable alternative, in some cases, for regulating the use of coastal fisheries resources.

In some industrialized states community-based systems of fisheries conservation and management are institutionalized and effectively applied (e.g. Japan). Within these systems fishermen, often together with their cooperatives, play a central role in conservation and management decisions for fisheries resources. In general, fisheries managed in this manner tend to be both resource-sustainable and economically efficient.

Excerpt from an FAO document published by the UN in 1995, entitled *The State of World Fisheries and Aquaculture* (pages 22 and 23).

## 2. ECOSYSTEM MANAGEMENT OF FISHERIES BY MARK BUTLER AND MARTIN WILLISON

### *Ecosystem Management of Fisheries*

by Martin Willison and Mark Butler; Ecology Action Centre, Halifax, Nova Scotia

The term “ecosystem management” can be taken to mean that we manage our activities as if ecology is a meaningful science. Unfortunately, this is not the way modern enterprises are usually conducted. Instead, it is usually assumed that engineering, political and short-term economic factors must be considered first, and ecological considerations are then required to be compromised in order to obtain a desired managerial outcome. Ecologists know that this is impossible to achieve, and consequently tend to be sceptics who throw up their hands when asked to struggle with the complex problems of applied marine ecology, including fisheries ecology.

In using the concept “ecosystem”, the scientist takes a systems analytical approach to understanding the marine environment. In practical terms, the observer defines the system under consideration (whether it be a bucket of seawater in a laboratory or the entire global oceans system) and then tries to understand the relationships among the living and non-living components of the natural system.

Ecosystems, however, are immensely complex, and our knowledge is very limited. Indeed, as the ecologist Daniel Botkin has pointed out recently, it is hard to model reliably anything more complex than the interaction between one living species and its abiotic environment. More complex living systems behave roughly like their notional (computer-generated) models for a short period, but always end up behaving unpredictably after a few cycles.

Although the science of ecology is far from perfect, this does not mean that we should ignore it. (Political science and economics, after all, are even less perfect!). Rather, we should make the best use of the generalizations that ecology can provide, while at the same time drawing on the observations made by marine naturalists, whether they be professionals (marine scientists) or amateurs (commonly fishermen).

Since ecology deals with the relationships among all the components of a living system, and management requires that we examine a system which is defined in space and time, the ecosystem concept is very useful. If, for example, we wish to consider the management of a fishery for Atlantic cod in the management zone 4X (southwest Nova Scotia) over a period of one year, we need to consider all the factors that might affect that population: the cod’s prey, the cod’s predators, the primary production, the state of the physical environment, and so on. If we do this, we quickly come to realize that there are connections among all the components of the “system”, including the actions of the most aggressive predator of all - ourselves. Furthermore, some actions on land, apparently separate from the marine environment, can also influence the behaviour of the system.

We have seen only too well how fisheries management can go wrong when management is considered on a species-by-species basis. Look at the pattern in many of the recent fishery collapses. When stocks were high relative to the fishing effort, a single species approach to management was relatively successful. In essence, management focused on access to a boundless resource (falsely described as “resilient” by some scientists). But once that resource became limited, the approach failed because a host of complicating cross-acting factors were overlooked, a phenomenon well illustrated by the ongoing debate among scientists and others over the causes of the collapse of Atlantic groundfisheries.

The roles played in the collapse by water temperature, fishing effort, changes in fishing methods, changes in breeding and feeding habitat, fish population biology, seals, availability of prey and competing fisheries tend to have different champions. Yet the ecologist immediately recognizes that all of these factors (as well as many unmentioned) interact - that all are important and none is constant. It makes little sense to focus intensely on one factor when all vary. It makes lots of sense to consider the system as a whole.

When fishing patterns are changed, the change is almost never introduced in the context of considering the whole system. For example, the shark fishery in Atlantic Canada (both directed and as a bycatch) was initiated without considering the impact on other species. Sharks have been heavily fished in the North Atlantic without adequate consideration of their role as predators of seals and other fish-eating marine mammals. Now, as the seal population rises, we blame the seals for eating too many groundfish while ignoring our role as an exploiter of one of the major predators of one of our competitors. It can be argued that the reason for this lack of vision is that fisheries management is conducted stock-by-stock.

## Future Directions

Moving away from the present management structure will not be easy, even for those who clearly see its failings. At the present time, the system is structured to provide an estimate of total allowable catch (TAC) for any particular species in a defined area. The TAC is then divided among fishermen according to socio-economic and political considerations. If we try to insert an “ecosystem approach” into the present arrangement, the outcome is unlikely to be successful. Instead, we need to examine the failings of the management system itself, then make radical reforms to its structure. For example, James Wilson and a group of American resource economists have suggested that the quota system itself is fundamentally flawed and that there is need for a “parametric approach” to management that provides much greater local autonomy and control. This concept is compatible with the emerging discipline of ecological economics, which utilizes our growing understanding of the dynamism and local variation of natural systems.

Since it will take a long time to redevise the fisheries management system to a model geared to sustainability, it would be wise to introduce interim measures such as restrictions on damaging gears, marine protected areas, seasonal closures, and inclusion of fishermen and their knowledge in the management process. Such interim approaches must be seen as experimental; as part of an adaptive process. Most important is the need for recognition of the worldwide pattern of over-exploited fish stocks, and for a global limit on the capture fisheries. Only within the context of a new conservation paradigm can fisheries management be adapted to this new reality.

## Habitat

Among the most fundamental of ecological conceptions missing from Canadian ocean fisheries management has been adequate attention to habitat. Consideration of habitat within the context of an ecosystem approach to fisheries management can be used to illustrate the general changes that might occur.

Habitat can be defined simply as an animal’s home. In the ocean, we talk about the pelagic (upper layers) and benthic (ocean bottom) realms, though this division is partly a convenience and that tends to be over-used when considering real marine systems.

Fisheries science has tended to disregard the role of benthic habitat in the life histories of groundfish, yet the structure of the bottom of the ocean is important for the feeding and reproduction of cod, and the survival of juveniles. Despite this, we behave as if the structure of the benthic component of habitat is irrelevant to the health of cod and similar bottom-feeding fish.

Little is known about the structure of benthic habitat in Atlantic Canadian waters, the relationships among its living components, and the impacts on it of fishing activities. To the ecologist taking an ecosystem approach to fisheries management, it is just common sense that before introducing otter trawling (“dragging”), there would have been thorough research on what it does to local benthic habitat. It is over forty years since this benthic-plowing activity began, and yet the first research has been conducted only recently, after systemic changes have already occurred.

The issue of otter trawling is obviously a contentious one. There has been massive investment in the technology, and many people have invested their lives in its use and management. Yet the precautionary principle embedded in Canada’s new Oceans Act legally requires us not just to be cautious in taking new actions but also to review past assumptions about what does, and does not, cause irreparable damage to the health of the ocean systems within our jurisdiction. To quote an American scientist, Peter Auster, “I am not advocating that mobile fishing gear not be used anywhere, but suggesting that perhaps we should not use it everywhere.”

If the Oceans Act is to be interpreted broadly, we must begin an open, objective, fair, and effective process to evaluate fishing gear impacts on habitat. This examination should include all fishing technologies about which there is reason for concern, such as monofilament gill nets, bottom dragging and dredging, and many other fishing gears. In some respects we are lucky in that we need not do this in a political or historical vacuum - we can examine how other leading countries with longer histories of intense impacts on the ocean, such as Norway, have dealt with this issue. Learning from each other is, after all, a successful behavioural trait well known to ecologists!

Mark Butler, Chair, Marine Issues Committee, Ecology Action Centre, Halifax

Martin Willison, Professor, Dalhousie University, Halifax

### 3. LETTER FROM DAVID COON, POLICY DIRECTOR, CONSERVATION COUNCIL OF NEW BRUNSWICK

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CONSERVATION COUNCIL  
OF NEW BRUNSWICK

CONSEIL DE LA CONSERVATION  
DU NOUVEAU-BRUNSWICK

December 17, 1997

Paul LeBlond  
Fisheries Research Conservation Council  
P.O. Box 2001, Station D  
Ottawa, Ontario  
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Dear Paul:

Thank you for inviting us to your workshop "Towards and Ecosystem Approach to Fisheries Management." The decision by the FRCC and your committee to examine this issue certainly was timely. I would like to pass on a couple of comments for your consideration.

Taking an ecosystem approach to management must mean that fishing and other human activities do not change or degrade the structure, function or composition of the ecosystem. This means writing fishing rules that place the emphasis on controlling effort in terms of how, when and where to fish according to ecological principles, rather than on how much to fish. This necessarily means restricting technology, both in terms of when and where different kinds of gear can be used, and with respect to the design of the gear itself.

Will an ecological approach be disruptive to current practices? Of course, some current practices have decimated fishery after fishery. How can a new approach be introduced without causing economic havoc? The old approach caused economic havoc for 40,000 people.

How do we begin? How do we phase in a new approach? Clearly, the priority should be placed on helping, and certainly not hindering, those initiatives that have arisen from fishermen's organizations and coastal communities to pursue an ecosystem approach. The Bay of Fundy Fisheries Council is one example.

DFO must be willing to relinquish some control, to take some risks, to have some trust if the new approaches being developed by fishermen's organizations are going to have a chance of working. We hope the FRCC will impress this imperative on the Minister.

The other matter I would raise with you is the necessity for your report to clearly and explicitly articulate the purpose and goals of an ecosystem approach to management. It cannot be all things to all participants in the fishery.

I trust these comments will be helpful to you in preparation of your report.

Yours truly

David Coon  
Policy Director



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International Year of the Ocean 1998 Année internationale de l'océan

4. BRIEF PRESENTED TO THE PARLIAMENTARY STANDING COMMITTEE ON FISHERIES,  
BY INKA MILEWSKI, PRESIDENT, CONSERATION COUNCIL OF NEW BRUNSWICK



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Council**  
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*People for Environmental Responsibility*



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*L'environnement, ça nous regarde!*

**Brief Presented to  
The Parliamentary Standing Committee on Fisheries**  
November 28, 1997  
by Inka Milewski, President, Conservation Council of New Brunswick

The Conservation Council of New Brunswick has spent the last three years examining the history of the current fisheries crisis in Atlantic Canada and working towards defining an alternative approach to fisheries management: one that respects fish and the communities that have been built upon these resources.

We are participating in these hearings because we believe the current analysis of what went wrong in fisheries management and what to do about it is deeply flawed. As your Committee has no doubt heard from various sectors, there are too many fishermen chasing too few fish and the solution is to impose individual transferable quotas (ITQs) on fisheries management and TAGs. One rationale for advancing this system of management is that it will help reduce the number of fishermen. ITQs are supposed to provide fishermen the means to retire from the fishery because it gives them a tradeable commodity. Under a privatized fishery, fishermen will be able to sell their right or license to fish to the highest bidder. The assumed outcome is there will be fewer people catching fish and those left in the fishery will be better guardians of the resource because they own the fish. This simplistic solution demonstrates a fundamental lack of understanding of fish and fishing.

Privatization does not and will not require quota owners to care for spawning fish, protect spawning habitat or juvenile nursery areas - the cornerstones of any fishery. Nor will it require them to change their fishing practices to avoid by-catch, high grading, or habitat destruction.

We believe there are two key reasons why just about every commercial fish stocks has been brought to its knees: 1) the current quota-based system of management, where it is assumed that fish can be counted and then managed, has failed to protect fish stock from collapse coupled with; 2) unregulated technology.

In the first instance, if fisheries management is just a matter of counting fish and adjusting fishing effort from year to year, why then have the various groundfish stocks under moratorium failed to recovery despite a cessation of fishing effort? There is a need to shift science and management effort from single-species, quota-based management to multi-species, ecosystem-based management. The inadequacy of science is directly related to the questions it is trying to answer. Management must ask new and different questions and science needs to respond. We need to see a shift from calculating how many fish can be caught to determining where, when and how fish are caught. This form of management is called parametric or ecological management. It has been argued the amount and type of information required to manage fish under a parametric system is too great and not dependable. I might just say at this point that while numerous fisheries are under moratoria, legions of scientists and technicians continue to collect large amounts of information which are feed into computer models that still cannot explain why stocks are not recovering.



We believe the type of information collected should be on the scale at which populations function (eg spawning activity, the structure of local populations, habitat). This means breaking down fish stocks from one management unit, like 4T cod or 4X haddock, to smaller units. We now know that a fish stock can be made up of many discrete populations, each with a definable set of characteristics. By identifying and monitoring these sub- or meta-populations over the long-term, we are more likely to see important trends and patterns that tell us more about the state of the ecosystem and fishery than knowing how many fish are out there. This also means that data gathering, analysis, enforcement, and management will need to be decentralized to correspond to the scale of ecological information gathered.

Second, the federal government has failed to address the role of technology in the fisheries crisis. We reject the notion of "too many fishermen". We believe there is too much technology and until technology and gear are reined in fisheries management of any sort will likely fail. Currently, the industry has the capacity to find, access, and catch every fish in the sea. A little more than a year ago the Fisheries Resource Conservation Council (FRCC) released a discussion paper and held consultations on gear technology. Instead of identifying the ecological or conservation needs of fish and developing a set of criteria for the usage, design, and relative desirability of groundfish gear that respects these need, the FRCC placed the interests of the technology ahead of the conservation needs of the resource.

For example, the Consultation Paper on Gear Technology did not address how gear is used (i.e., the impact of groundfish gear on habitat requirements of other species), when it is used (i.e., fishing during spawning or roe fishing), and the scale of the technology. Gear should be evaluated against the ecological and biological requirements of fish. Ecological criteria means protecting energy flows in the food web which can be altered when fishing causes a species shift or shift in fish size. In this case, gear must be designed to minimize the catch of unwanted species and sizes and to limit the overall catch per trip. Biological criteria means protecting habitat for various life stages and avoiding the harvest of eggs and spawners and it requires both specialization in gear and its manner of usage. This means gear must be designed to minimize disruption of spawning areas and juvenile habitat for all commercial species not just groundfish.

As for the scale of technology, the FRCC has completely ducked the issue demonstrating the continuing policy dissonance between conservation (FRCC) and development (DFO). While the Gear Technology Subcommittee indicated it is not the FRCC's intention to recommend the banning of any particular gear type, DFO's fisheries policy has contemplated banning the least damaging most conservation-friendly groundfish gear - the hook and line used by handliners - through their current efforts to restructure the Atlantic fishery. DFO has determined that groundfish handlining is not a key licence and therefore suggested its elimination. Two other conservation-oriented fisheries, herring weirs and shut-offs, have also been considered for elimination under this new restructuring.

As a result of our analysis, the Conservation Council is advocating a complete re-orientation and re-structuring of fishing management. In developing this new management structure for fisheries we have been guided by two principles: 1) Proprietary rights to the common fishery resource should be allocated to those geographic communities most dependent on it for their economic, social and cultural well-being; and 2) management of fisheries should be placed in public hands at the community level, and not privatized to individual and corporate interests. The re-structuring process begins by placing trusteeship of and responsibility for fish resources at the community level. We believe this level of management mimics or parallels the level at which ecological events/changes are more readily observed. It also allows the community to carry out

integrated management of both the resource and its environment, a necessary element which has eluded fisheries management to date. This will require the formation of new community and regional institutions.

We propose three levels of institutions to oversee fishing, conservation and habitat protection. At the community level (defined by geography and ecology) there would be an elected Community Fisheries Board with a fisheries management council comprised of fishing industry representatives as a subset; at the larger ecosystem level there would be a Bioregional Fisheries Board comprised of representatives from Community Fisheries Boards. Offshore Fisheries Boards would govern the offshore, with representation from Bioregional Boards. With a shift to community-based management, much of DFO's budget allocation for management and administration would be transferred to the new community and regional institutions.

It is difficult to fully elaborate our approach in the time allocated. We urge you to read our publication, *Beyond Crisis in the Fisheries: A Proposal for Community-based Ecological Fisheries Management* which outlines in more detail the role and function of each of these Boards, as well as the analysis which brought us to these conclusions.

You are no doubt thinking that re-structuring the current traditional management approach will be a lot of work and difficult. It will be. However, we believe there is no choice but to deal with these issues. Yet without this kind and scale of restructuring, we will lose more fish stocks and the communities that depend on them.