Agenda item 6.8
For decision

Council

CNL(04)23

Report of the Technical Workshop on Development of a Decision Structure for Incorporating Social and Economic Factors into Management Decisions under a Precautionary Approach

CNL(04)23

Report of the Technical Workshop on Development of a Decision Structure for Incorporating Social and Economic Factors into Management Decisions under a Precautionary Approach

1. At its Twentieth Annual Meeting the Council considered the report of a Technical Workshop on the development of a framework for assessing social and economic values related to the wild Atlantic salmon. This Workshop had recognised that the wild Atlantic salmon has many aspects to its value. In addition to those associated with the fisheries, the salmon is a highly prized species and an indicator of environmental quality. The 'existence value' of the wild Atlantic salmon may greatly exceed the values associated with the commercial and recreational fisheries. A framework developed at the Workshop identifies all the elements of value and provides some guidance on assessment methodologies. The Workshop had recommended that administrators and decision-makers should ensure that the difficult-to-measure but long-lasting and widespread values associated with the Atlantic salmon are fully incorporated and given due weight in decisions in relation to management of wild Atlantic salmon and its habitats.

2. The Council welcomed the progress made at that meeting and asked that a second Technical Workshop be held to develop a decision structure for incorporating social and economic factors into management decisions under a Precautionary Approach. At the invitation of the US, that Workshop was held in New Orleans during 23 – 26 March 2004 and the report of the meeting is attached.

3. After reviewing a number of case studies provided by the Parties on how social and economic factors are currently incorporated into decisions concerning the conservation and management of Atlantic salmon, the Workshop discussed the implications of incorporating socio-economic factors in decision-making under the Precautionary Approach. It had been suggested that incorporating social and economic factors could undermine the effectiveness of the Precautionary Approach and that there was, therefore, a need to give due weight to biological factors. However, the Workshop concluded that if proper assessments are undertaken, cost benefit analysis should be supportive of salmon conservation because of the large existence value of the resource to society.

4. The Workshop developed Guidelines for Incorporating Social and Economic Factors in Decisions under the Precautionary Approach, which provide a framework to support and inform decision-making and which are intended to be used by those with responsibility for managing the wild Atlantic salmon and its environments and for communicating concerns to other sectors whose proposals could impact on the wild salmon and its environments. These Guidelines are contained in Annex 5 of the attached report. A number of hypothetical but realistic case studies were developed in order to test the guidelines and illustrate their use. The Workshop also recommended that the output from the two socio-economic workshops be developed into a handbook for use by NASCO and the Parties. The Workshop welcomed, as a valuable initiative for the future, a bio-economic modelling approach that would allow social and

economic factors to be integrated into a management model for Atlantic salmon. It recommends that the Council considers how such work might be encouraged.

5. The Council is asked to consider the recommendations from the Workshop and decide if it wishes to:

- adopt the Guidelines for Incorporating Social and Economic Factors in Decisions under the Precautionary Approach;

- ask the Parties to evaluate the Guidelines on a trial basis over a period of two years and report back on their experiences and on any suggestions for amendments to the Guidelines;

- ask the Secretariat to combine the output from the two Technical Workshops into one handbook so as to assist NASCO and its Parties in incorporating social and economic factors in applying the Precautionary Approach;

- encourage the development of a bio-economic model for integrating social and economic factors into management of Atlantic salmon under the Precautionary Approach.

Secretary
Edinburgh
8 April, 2004

WSEV(04)16

Report of the Technical Workshop to Develop a Decision Structure for Incorporating Social and Economic Factors into Management Decisions under a Precautionary Approach

Doubletree Hotel, New Orleans, USA
23-26 March, 2004

1. Opening of the Meeting

1.1 The Chairman, Dr Malcolm Windsor (Secretary of NASCO), opened the meeting and welcomed participants to New Orleans. He thanked the US delegation for hosting the meeting and for the arrangements made. He referred to the progress that had been made at the first Technical Workshop meeting, held in Edinburgh in January 2003, in reviewing the social and economic values of the Atlantic salmon and in developing an internationally agreed framework for assessing these values. This progress had been welcomed by the Council of NASCO which now sought guidance on incorporating social and economic values in decisions relating to the conservation and management of salmon under the Precautionary Approach.

1.2 A list of participants is contained in Annex 1.

2. Adoption of the Agenda

2.1 The Workshop adopted its agenda, WSEV(04)14 (Annex 2).

3. Overview of NASCO's work in applying the Precautionary Approach

3.1 The Assistant Secretary presented an overview of NASCO's actions in relation to application of the Precautionary Approach. Since adoption, in 1998, by NASCO and its Contracting Parties of the Precautionary Approach, considerable progress has been made in developing agreements in relation to: management of fisheries; habitat protection and restoration; aquaculture, introductions and transfers and transgenics; stock rebuilding programmes and by-catch. These agreements provide guidance to managers in ensuring that decisions relating to salmon conservation and management are consistent with the Precautionary Approach. Most of the agreements make reference to the need to take account of social and economic factors in such decisions although they provide no guidance as to how this is to be achieved.

3.2 The Secretary then presented a summary of the main conclusions from the first Technical Workshop meeting. The wild Atlantic salmon has many aspects to its value. In addition to those associated with the fisheries, the salmon is a highly prized species and an indicator of environmental quality. The 'existence value' of the wild Atlantic salmon may greatly exceed the values associated with the commercial and recreational fisheries. A framework developed at the Workshop identifies all the elements of value and provides some guidance on assessment methodologies. He

noted that the Workshop had recommended that administrators and decision-makers should ensure that the difficult-to-measure but long-lasting and widespread values associated with the Atlantic salmon are fully incorporated and given due weight in decisions in relation to management of wild Atlantic salmon and its habitats. He suggested that the challenge now before the Workshop was to develop a decision structure or guidelines which could assist managers in incorporating social and economic factors in decisions relating to conservation of wild Atlantic salmon stocks, in a way that is supportive of the Precautionary Approach. In this regard, the relevant Precautionary Approach agreements are those developed by the Council of NASCO on management of: salmon fisheries; habitat protection and restoration; aquaculture, introductions and transfers and transgenics; stock rebuilding programmes; and by-catch.

4. Consideration of the Terms of Reference

4.1 The Council of NASCO had asked that the Contracting Parties first update the table of information and bibliography of the social and economic values of wild Atlantic salmon contained in the report of the first Technical Workshop meeting. Then the Contracting Parties were asked to provide case studies on how social and economic factors have been incorporated into decisions relating to management of: fisheries; habitat; aquaculture, introductions and transfers and transgenics; and by-catch. The Council had asked that these case studies form the basis of a desk study to develop a standard methodology. The specific task assigned to the Workshop is to review the methodology and to develop a decision structure for incorporating social and economic factors into management decisions under a Precautionary Approach.

4.2 The Workshop discussed these Terms of Reference. A document was tabled by Norway, WSEV(04)7, with some suggestions on how the Workshop might address the tasks assigned to it. Norway proposed that existing approaches might be adapted for use by NASCO and its Contracting Parties and that Impact Assessment might be considered as a useful approach for incorporating social and economic factors in decisions under a Precautionary Approach. This approach is flexible and could be applied in the different legislative frameworks of NASCO's Contracting Parties and to the range of issues being addressed under the Precautionary Approach. The need for an integrated approach, applicable to all aspects of application of the Precautionary Approach, and for the output from the meeting to be clear, concise and comprehensible to administrators and stakeholders, was recognized.

4.3 The Workshop agreed that impact assessment provided a useful framework for incorporating social and economic factors in decisions concerning the conservation and management of Atlantic salmon and that other approaches, such as bio-economic modeling, might also be appropriate. However, the objective during the Workshop would be to develop guiding principles or guidelines to support and inform decision-making and which incorporated consideration of social and economic factors, rather than to provide a mechanism for making the decision.

5. Updating of table of existing data/studies on social and economic values of wild Atlantic salmon

5.1 A table providing an overview of existing information on the social and economic values of Atlantic salmon developed at the first Workshop was updated and a bibliography appended to it on the basis of information provided by the Parties. The Secretariat was asked to incorporate into the bibliography relevant references provided in the background papers for the first Workshop. The updated information and bibliography is contained in Annex 3.

6. Review of case studies on how social and economic factors have been incorporated into decisions concerning management of fisheries; habitat; aquaculture, introductions and transfers and transgenics; and by-catch

6.1 Case studies illustrating how social and economic factors have been incorporated into management decisions were provided by the European Union (UK - Scotland) Iceland, Norway, and the Russian Federation. These case studies are contained in Annex 4. In addition, a brief report was presented of a recent economic and socio-economic evaluation of the wild salmon in Ireland (the Indecon Report). This report presents an independent socio-economic evaluation of wild salmon in Ireland. The evaluation addresses the requirements for the long-term sustainable management of wild salmon stocks within an economic and socio-economic context, to ensure the viability of this important resource. The current status of the report is that following its presentation to the Minister, he requested the Central Fisheries Board to undertake a wide-ranging consultation process with interested stakeholders and the public. This process is now complete and the responses have been independently assessed. The outcome of this assessment will shortly be presented to the Minister for his consideration. A recently completed report, prepared for the Scottish Executive, entitled 'The economic impact of game and coarse angling in Scotland', was made available to the Workshop and introduced by one of its authors. The principal objective of the study was to analyse the impact of angler expenditure on output income and employment.

6.2 A representative of the EU (UK - England and Wales) presented a framework which had been developed, in conjunction with economists, for assessing the impacts of changes in policy on *inter alia* the environment, businesses, consumers, public health and safety, and crime. He noted that the scope of the assessment was necessarily broad since relatively minor changes in policy could have widespread impacts. He indicated that the framework might form a useful starting point for the Workshop in developing guiding principles for incorporating social and economic factors into decisions concerning the conservation and management of salmon. The work of the Environment Agency in England and Wales was also briefly described. The Agency's role is to contribute to sustainable development by improving and enhancing the environment. The guidance to the Agency from the Government is that, in exercising its functions, it should take into account the costs and benefits and the impacts of its decisions on rural communities. The Agency is developing some guidance to assist the decision-making process. In protecting the environment there will be different options, each with different costs and benefits. Reference was made to the EU Habitats Directive under which rivers may be designated as Special Areas of Conservation (SACs) for salmon. In designated rivers there is a requirement to

maintain good conservation status, and every proposal for a development that could affect that status is thoroughly reviewed. It is still possible for certain developments to be approved that could affect that status but only with Ministerial approval and where there is overwhelming public interest. There are, therefore, still situations where conservation does not have primacy. More detailed information is contained in document WSEV(04)15.

6.3 A representative of the US referred to the requirement under the National Environmental Policy Act to evaluate alternative options and their impacts for all Federal actions. In the case of the Atlantic salmon, which has been listed under the Endangered Species Act, preventing extinction of the species is given priority in all decisions concerning proposals that could impact the species or its habitats and he noted that a challenge for the workshop would be to develop a framework for incorporating social and economic factors in decision-making that would be applicable in situations both where salmon stock status is relatively good and in the US where the stocks are threatened with extinction.

6.4 A representative of the US reported on the outcome of a group discussion conducted during the Workshop. Economic and socio-cultural factors can be incorporated into the Precautionary Approach if the maximization of net benefits is used as a criterion to determine if a regulatory change will improve stock conservation. Firstly, socio-cultural factors can be incorporated into the management process through public hearings and meetings with stakeholders identified using sociological and anthropological scientific techniques. Legislatures can also establish social criteria by passing laws that create standards or criteria with which managers must comply. Secondly, the Precautionary Approach uses maximum sustainable yield as a limit instead of a target for fishery managers to ensure that over-fishing does not occur at any point in the future. This implies a precautionary stock size greater than the stock size that exists at maximum sustainable yield. This larger stock size at a lower fishing effort level means that catch rates per unit of effort will be greater and that the costs of harvesting fish per unit of fishing effort is lower, whether the harvest is by commercial or recreational fishermen. Thirdly, the higher catch rates also imply that the values of recreational fishing and the revenue from commercial fishing have increased as well as the values associated with non-consumptive uses of the salmon resource. The reductions in cost of harvesting and increases in values due to the larger stock size cause net benefits to increase as the precautionary target stock size is achieved. That is, maximum economic yield from the fishery can comply with the Precautionary Approach to management but may be constrained by the limits placed on it by legislative mandates or socio-cultural issues important to communities or regions.

6.5 The representative of Canada indicated that there are approximately 500 rivers in eastern Canada with populations of Atlantic salmon, 40% of which are in remote areas. Under the Canadian Constitution, the primary obligation is to conservation but after these requirements have been met, the aboriginal rights have priority followed by the recreational fishery. There is no commercial salmon fishery in Canada. The Federal Government is responsible for management of the fisheries except in the province of Quebec. He indicated that socio-economic factors influence all decisions concerning management and conservation of the resource but that under a Precautionary Approach the priority should be to protect and enhance the wild salmon

and that if there is uncertainty about the impact of a proposed development on the resource it should not be permitted.

7. Development of a decision structure for incorporating social and economic factors into decisions under a Precautionary Approach

7.1 The Workshop discussed the implications of incorporating socio-economic factors in decision-making under the Precautionary Approach. It had been suggested that incorporating social and economic factors could undermine the effectiveness of the Precautionary Approach and that there was, therefore, a need to give due weight to biological factors. However, it was noted that if proper assessments are undertaken (see paragraph 6.4) cost benefit analysis should be supportive of salmon conservation because of the large existence value of the resource to society. For example, a study indicated that Londoners have a willingness-to-pay to restore salmon to the River Thames, England of £12 million annually. Decisions had been taken in the past in which all the elements of value of the salmon had probably not been understood and incorporated. Consequently, developments had been approved which had had adverse consequences for the salmon. There are many examples of hydro-electric developments impacting adversely on the wild salmon stocks. Cost benefit analysis would, however, have taken into account in the decision-making process all the values of the salmon. In the US the full environmental cost of dams on salmon rivers is now being recognized and some dams have been removed. Consideration of socio-economic issues should assist resource managers in developing advice to politicians concerning salmon conservation and management. It was, however, recognized that there may be a need for expert economic advice to assist resource managers in this task.

7.2 The Workshop developed Guidelines for Incorporating Social and Economic Factors in Decisions under the Precautionary Approach, WSEV(04)12, Annex 5. These guidelines provide a framework to support and inform decision-making rather than a mechanism for making decisions. They are intended to be used by those with responsibility for managing the wild Atlantic salmon and its environments and for communicating concerns to other sectors whose proposals could impact on the wild salmon and its environments. In order to test the application of the guidelines, a number of case studies were developed in relation to management of salmon fisheries, habitat, aquaculture and by-catch. These are contained in Annex 6. Although all of the scenarios are realistic they were developed in order to test the guidelines and illustrate their use. In the light of this exercise the Workshop believed that the guidelines provide a clear and rational process for the task they were designed for. The Workshop felt that combining the output from the first and second Technical Workshop meetings into a handbook covering all NASCO's work on social and economic aspects of the Precautionary Approach would be most valuable.

7.3 A bio-economic modeling approach that would allow socio-economic factors to be integrated into a management model for Atlantic salmon was outlined by the US, WSEV(04)13, Annex 7. The Workshop welcomed this approach as a valuable initiative for the future and recommends that the Council considers how such work might be encouraged, possibly through a further Technical Workshop to develop a framework for the model.

8. Any other business

8.1 There was no other business.

9. Consideration of the report of the meeting

9.1 The Workshop agreed a report of its meeting.

10. Close of the meeting

10.1 The Chairman thanked the participants for their contribution to the Workshop and closed the meeting.

Annex 1

List of Participants

Canada

Mr Pierre Tremblay	NASCO Commissioner, Saint-foy, Quebec

European Union

Ms Carmen Beraldi	Secretaria General de Pesca, Madrid, Spain
Ms Paloma Carballo	Ministerio de Agricultura y Pesca, Madrid, Spain
Mr Richard Cowan	Department for Agriculture, Food and Rural Affairs, London, UK
Mr David Dunkley	Scottish Executive Environment and Rural Affairs Department, Edinburgh, UK
Dr Guy Mawle	Environment Agency, Bristol, UK
Dr John O'Connor	Central Fisheries Board, Dublin, Ireland
Dr Alan Radford	Glasgow Caledonian University, Glasgow, UK
Mr Andrew Thomson	European Commission, Brussels, Belgium

Iceland

Mr Arni Isaksson	Directorate of Freshwater Fisheries, Reykjavik

Norway

Dr Øystein Aas	Norwegian Institute for Nature Research, Lillehammer
Mr Raoul Bierach	Directorate for Nature Management, Trondheim

Russia

Dr Boris Prischepa	Murmanrybvod, Murmansk
Dr Svetlana Krylova	Murmanrybvod, Murmansk
Ms Elena Samoylova	PINRO, Murmansk
Dr Alexander Zubchenko	PINRO, Murmansk

USA

Dr Walter Keithly	Louisiana State University, Baton Rouge, Louisiana
Mr Pasquale Scida	National Marine Fisheries Service, Gloucester, Massachusetts
Mr John Ward	National Marine Fisheries Service, Silver Spring, Maryland

Secretariat

Dr Malcolm Windsor (Chairman)	Secretary
Dr Peter Hutchinson	Assistant Secretary

Annex 2

WSEV(04)14

Agenda

1. Opening of the Meeting

2. Adoption of the Agenda

3. Overview of NASCO's work in applying the Precautionary Approach

4. Consideration of the Terms of Reference

5. Updating of table of existing data/studies on social and economic values of wild Atlantic salmon

6. Review of case studies on how social and economic factors have been incorporated into decisions concerning management of fisheries; habitat; aquaculture, introductions and transfers and transgenics; and by-catch

7. Development of a decision structure for incorporating social and economic factors into decisions under a Precautionary Approach

8. Any other business

9. Consideration of the report of the meeting

10. Close of the meeting

Annex 3

Technical Workshop to Develop a Decision Structure for Incorporating Social and Economic Factors into Management Decisions under a Precautionary Approach

WSEV(04)19

Overview of Existing Information on the Social and Economic Values of Wild Atlantic Salmon – updating by the Parties

Overview of existing knowledge/data/studies of the social and economic values of wild Atlantic Salmon*

Values / Country	USA	Canada	Greenland	Iceland	Faroe Isl.	Norway	Russia	UK (Scot)	UK (E & W)
Economic value									
Use	r	r		R		Cr		RC	RC
Non-use	x	x		X		X			X
Economic impacts									
Direct		RC	C	R	c	rc	r	R	rc
Indirect		r		r		r		R	r
Cost/benefit		rc		r		r			
Social and cultural benefits									
Psychological	r					r			
Social	r			r		rc			
Cultural/indigenous peoples		s?				s			C?

Values / Country	UK (NI)	Ireland	Finland	Sweden	Denmark	Germany	France	Spain
Economic value								
Use		RC	R	r	r			r
Non-use								
Economic impacts								
Direct		RC						
Indirect		RC						r
Cost/benefit		RC						
Social and cultural benefits								
Psychological		RC						
Social		RC						r
Cultural/indigenous peoples		RC						r

* This table focuses on studies of Atlantic salmon, but it is recognised that studies of other fish resources or other environmental issues provide useful information for enhancing knowledge of the social and economic values of Atlantic salmon. The table is incomplete and may be added to by each of the countries listed.

Legend: Relevance of study Significant Minor
R/C/S r/c/s
R C S indicate recreational, commercial or subsistence
X indicates non-use value ? indicates uncertainty

Bibliography

Note: *This is not a comprehensive bibliography of studies concerning the social and economic value of Atlantic salmon. It is a selection of studies provided by the Parties as background information for the two Technical Workshop meetings.*

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The following background papers, available from the Secretariat, were submitted to the first Technical Workshop meeting held in Edinburgh, and contain information on the social and economic value of Atlantic salmon:

WSEV(03)3	Social and Economic Values of Atlantic Salmon – Information provided by the Parties (Canada, Denmark (in respect of the Faroe Islands and Greenland), European Union, Norway, Russia, USA)
WSEV(03)5	Economic Value of Icelandic Salmon (*Salmo salar* L.) in Angling and Net Fisheries
WSEV(03)6	Freshwater Fisheries in Iceland
WSEV(03)7	The Value of the Atlantic Salmon and its Fisheries in England and Wales
WSEV(03)9	Social and Economic Values of Atlantic Salmon - Information provided by the Parties - European Union – Finland
WSEV(03)10	Social and Economic Values of Atlantic Salmon – Canada

Annex 4

WSEV(04)18

Case Studies of how social and economic factors have been incorporated into decisions in relation to management of fisheries; habitat; aquaculture; introductions, transfers and transgenics; and by-catch

EU (UK – SCOTLAND)

Introduction

As a general rule, social and economic factors are taken into account throughout the management of wild salmon fisheries and aquaculture. Where new legislation is proposed, wide, public consultation is a necessary prerequisite. When subordinate legislation is being prepared, Regulatory Impact Assessments are required to determine the impacts the measures will have on stakeholders.

Management of fisheries

Salmon fishing is of significant social and economic importance to Scotland, especially in the more remote and rural areas. Many hotels and guest-houses rely upon angling to extend their season of operation, with salmon angling being available in Scotland between mid-January and the end of November. Employment of service industry staff, as well as the more direct employment of ghillies, fishing crews and bailiffs, is therefore often highly dependent upon salmon and salmon fishing. However, the objective is to ensure sustainable fisheries, and so management, while conscious of the social and economic demands, must often place the emphasis on limiting exploitation. In Scotland, salmon fisheries management is undertaken at the local level. Scotland is divided into 66 salmon fishery districts, for which 48 district salmon fishery boards have been established. The district salmon fishery boards have powers to do such acts, execute such works and incur such expenses as may appear to them expedient for the protection or improvement of the fisheries within their district; the increase of salmon; or the stocking of the waters of the district with salmon. To this end, a number of boards have undertaken significant work in developing local fishery management plans, such as encouraging the practice of catch and release; buying out and closing fisheries; operation of hatcheries; employment of bailiff staff to enforce the salmon and freshwater fisheries legislation. Fisheries are also managed to a very large extent by the proprietors and tenants, who may impose more stringent rules than the legislation does – for example the voluntary deferment of netting for six weeks at the start of the fishing season by members of the Salmon Net Fishing Association of Scotland; use of fly only on some angling beats either throughout the season or under certain river conditions.

Habitat

Habitat modification may be undertaken to provide improved facilities for fishing, to improve spawning and nursery areas, or to create new areas where salmon may be produced. However, habitat modifications may also be undertaken for reasons quite unrelated to fisheries, and the effects may be detrimental to salmon. For example, activities such as

forestry, agriculture, electricity generation, and road and rail works have all had impacts, often adverse, in the past. Social and economic factors are usually of great significance when assessing the effects of these activities. We all need electricity, industry may need forestry products, society needs agricultural produce, and the road and rail networks are essential to the running of the country. It is inconceivable that such activities could be stopped for the sole reason that they might impact on salmon. However, it is possible, and indeed necessary nowadays, to ensure that proper assessments are undertaken to estimate the likely impact on rivers and the salmon they support. For example, all those who propose a hydro-electricity scheme with an installed capacity of greater than 1MW must consult the Fisheries Committee, established under the Electricity Acts to advise developers and Ministers on the implications of such developments for migratory fish. Where installations have a capacity of 1MW or less, they are subject to the provisions of the Salmon (Fish Passes and Screens) (Scotland) Regulations 1994. In practice, many of these proposals are also sent to the Fisheries Committee for advice. Reference to such publications as "Forests and Water Guidelines" produced by the Forestry Commission[1] have been invaluable to woodland developers, while the series of publications on pollution control urban waste water and river engineering produced by the Scottish Environment Protection Agency[2] have provided developers with expert guidance on habitat modification and its effects. "River Crossings and Migratory Fish: Design Guidance[3]", published by the Scottish Executive, provides engineers designing bridges and culverts with detailed advice on the requirements of migratory fish, and is now accepted as a standard reference work.

Aquaculture

The Scottish fish farming industry is of great importance to the economy of Scotland, especially in remote and rural areas. The document, "A Strategic Framework for Scottish Aquaculture[4]", published by the Scottish Executive in March 2003, addresses the issue of developing a sustainable, diverse, competitive and economically viable aquaculture industry which balances economic progress with social justice and environmental responsibility. The document sets out four guiding principles:

The Economic Principle: Aquaculture should be enabled to make a positive contribution to the Scottish economy through being internationally competitive in the marketplace and economically viable at a national level.

The Environmental Principle: The industry should work in harmony with nature, managing and minimising transient environmental impacts, and avoiding significant, cumulative, long-term or irreversible changes to ecological systems, to cultural remains or to valued landscape and scenery.

The Social Principle: Aquaculture should foster strong community links, recognising and supporting the needs of local communities and working with community initiatives to manage local environments for mutual benefit. It must be integrated within its community, liaising locally and nationally on all appropriate matters.

[1] http://www.forestry.gov.uk/website/publications.nsf/$$search
[2] http://www.sepa.org.uk
[3] http://www.scotland.gov.uk/consultations/transport/rcmf-00.asp
[4] http://www.scotland.gov.uk/library5/environment/sfsa-00.asp

The Principle of Stewardship: While the first three principles relate to outcomes, the principle of stewardship relates to the ways in which these principles will be observed. It is about delivering outcomes sustainably. It embraces the precepts of transparency, integration, co-ordinated government and fit-for-purpose regulation, partnership and stakeholder participation, accountability, ethics and regard for animal welfare, and a culture of best practice and continuous improvement. This both reflects and develops the concept of stewardship set out in the Government's first Marine Stewardship Report[5].

Social and economic factors feature importantly in the work of the Tripartite Working Group, which comprises representatives of wild salmon fishery interests, the salmon farming industry and officials from the Scottish Executive. The development of Area Management Agreements is inevitably conditioned by social and economic factors as well as operational and biological considerations.

Introductions, transfers and transgenics

Introductions and transfers – salmon ova are imported into Scotland for the purposes of maintaining genetic diversity and continuity of production in the aquaculture industry. Such movements are subject to stringent fish health regulations, but socio-economic factors dictate that, subject to necessary regulation, these activities must be allowed to continue. Currently, the application of transgenic technology plays no part in Scottish commercial aquaculture production, nor are there plans for it to be introduced. Any proposals to use transgenic fish would require the consent of the Scottish Ministers.

By-catch

Salmon fishing rights in Scotland are private, heritable titles, and only those with the right to fish for salmon, or with written permission from a person having such right, may legally fish for salmon. There are few records of salmon being taken as a by-catch in other Scottish fisheries. Since the 1960s, regulations have been introduced to prohibit activities such as drift-netting, gill-netting, trolling for salmon. Thus, many of the gears that may have taken salmon as a by-catch may not be used. Regulations have also been introduced to prohibit the landing of salmon by unauthorised fishermen. Of course, salmon may be taken on occasion as a by-catch, but where this occurs, they must be released or an offence is committed.

ICELAND

Introduction

This report will describe how socio-economic factors have affected Icelandic decisions on management of salmon fisheries, riverine habitat, aquaculture, introductions of salmon stocks and control of by-catch.

It is very clear that the Icelandic Salmonid Fisheries Act and related regulatory measures are much affected by social and economic factors. This is most obvious in the structure of the law, where river owners are awarded the stewardship of the salmon populations in the rivers and must form an association to carry out local management and share costs as well as benefits. This is also quite pronounced in many other aspects of salmon management.

[5] http://www.defra.gov.uk/environment/marine/stewardship/default.htm

It is well known that socio-economic factors have considerable bearing on political decisions in the conduct of government. Fisheries management agencies, on the other hand, are mostly basing their decisions on scientific and biological factors. Closer scrutiny, however, reveals that there are complex relationships between these realms of science and politics.

In the first part of this paper I will discuss these aspects in relation to the management of salmon fisheries followed by an overview of these issues in relation to the management of river habitat, aquaculture, introductions, transfers and by-catch.

Management of salmon fisheries

Salmon fisheries play an integral part in Icelandic culture and the economy. It has been estimated that each angled salmon is directly worth at least US$ 600 to the Icelandic river owners. This generates significant income to these landowners, most of whom are farmers.

Net fisheries have been conducted in Icelandic glacial rivers for decades. These are now mostly in the Ölfusá-Hvítá system and the number of nets has been declining due to a reduction in the price of net-caught salmon as a result of the increased supply from aquaculture.

The fact that private individuals are entrusted with the stewardship of salmon rivers and reap the benefits of salmon angling brings in entirely different sets of socio-economic factors than those occurring in an economy where the resource is in public custody. The former system, e.g., requires comprehensive legislation, which ensures that there is fair sharing of the resource among its owners.

According to the Icelandic Salmonid Fisheries Act fishing rights can not be separated from the ownership of the land adjacent to the river or lake. The landowners are thus obliged to form a river association composed of all registered farms surrounding the river. Owners of small lots on rivers can have fishing rights but do not have a vote at an association meeting. The river association is obliged to make a register of dividends showing the shares of all landowners on the river. This is most often done by external commissioners appointed by a district judge.

Despite the private ownership, the Directorate of Freshwater Fisheries sets the total number of permissible rods for angling on each river. A permitted rod should on the average catch one salmon per day during a 100 day fishing season. This limited entry system ensures some stability in the exploitation from year to year but does not, for socio-economic reasons, allow any in-season measures or limitations, as the rods are sold up to a year in advance of the salmon season.

Catch and release is growing in Icelandic angling and has in recent years been about 18 percent of the nominal catch. This practice may not be needed for stock conservation in many rivers and can easily confuse the angling statistics both with respect to numbers and size of the fish. This practice originally started in Iceland through the influence on, and pressure from, foreign anglers, who had been required through regulations to release a large proportion of angled salmon in their home country. Since only fly-caught salmon can be released successfully this has led to fishing exclusively by fly in many rivers and many anglers now frown on other types of bait.

Since these changes are primarily angler-initiated and depend to a large extent on angling fashion they must be considered socio-economic in nature. Many anglers will now pay more for a fly-only "catch and release" fishery despite the fact that total and recorded catches will probably go down.

Management of river habitat

The riverine habitat is managed according to Chapter VII of the Salmonid Fisheries Act. Most of the activity centres around the following issues: construction of fishways, gravel mining, creation of fishing holes and prevention of bank erosion. All these projects are subject to the approval and supervision of the Directorate of Freshwater Fisheries.

Fishways

Numerous fishways have been constructed in Iceland, mostly past waterfalls blocking salmon migration. These have been constructed and financed by river associations with a 30 % grant from the Fisheries Enhancement Fund. The Directorate of Freshwater Fisheries must approve the construction of the fishway as well as its design and such a decision is at least partially socio-economic in nature as the project frequently increases the income of the river association in question in the long run. For that to happen it must, of course, also be biologically sound.

Gravel mining

Icelandic rivers carry great quantities of gravel into the lowland areas annually. Most of the bedrock is basaltic and very fragile. The freeze and thaw conditions as well as intense rain in the winter favour a great deal of weathering and fragmentation of the bedrock.

Icelandic houses are traditionally made out of concrete, which requires a great deal of gravel. Gravel is also extensively used for road building. There is thus a great deal of demand for this resource. Gravel has traditionally been taken from dry river beds or gravel pits on land. With increased environmental awareness as well as an increase in demand for gravel there has been an increasing trend to refrain from gravel mining in hills and mountains and rather go to the flat river beds in the lowland areas, which are a more renewable resource.

Since 1994 the Directorate of Freshwater Fisheries must grant a permit for any gravel mining which might affect biological conditions and/or fishing conditions in rivers. The permit is always based on a biological survey or a statement from freshwater fisheries experts as well as a positive statement from the landowners and the river association in question. The permit is also subject to various conditions regarding quantity, mining time and methods as well as execution and finish.

Management decisions on gravel mining must be considered socio-economic as well as biological.

Creation of fishing holes

One part of river improvement is the creation of new fishing holes on a stretch of river, where there are few suitable fishing places. This can clearly affect the biological conditions in the

river as well as the register of dividends, which is partly based on the salmon catch in the respective areas. Approval of the river association in question is thus a prerequisite for such a project, making it a highly socio-economic decision.

Prevention of bank erosion

Rivers are frequently eroding their banks and sometimes degrading fields as well as cultured land. If left undisturbed this could, in the long run, lead to financial losses for the farmer in question. This erosion can in many cases be stopped by stacking large rocks and boulders in the eroded area. As this project can also be beneficial for the fish populations by creating shelter in the rocks the biological and socio-economic factors are in harmony here.

Management of aquaculture

Aquaculture of salmon in sea-cages has recently started up again in Iceland. Such a culture was previously attempted in the late 1980s on an experimental scale and was not successful. The main reasons for these failures were the following:

- The areas selected were shallow and poorly sheltered.
- The Icelandic salmon stocks in use were slow-growing, with early maturation.
- Companies were small and frequently had cash flow problems.
- Farming equipment could not tolerate adverse climatic and oceanographic conditions and escapes were frequent.

After 1990 only one salmon cage-farm was in operation in a lagoon in northern Iceland, which had been permitted to import and use a selectively bred Norwegian aquaculture stock. This stock, which was imported to Iceland three times between 1985 and 1987, was also used in a number of land-based salmon farms in Iceland.

In 1991 the selective breeding company "Stofnfiskur" was established with government support and soon started to breed the imported Norwegian salmon stock for the purpose of using it for aquaculture. Since that time it has been the only salmon stock used for aquaculture in Iceland. Since it is one of a few virus-free aquaculture salmon stocks in Europe it has also been in demand for export.

In the year 2000 three companies applied for permits to start rearing Atlantic salmon in sea-cages in eastern Iceland using the selectively bred stock. Since the eastern fjords are relatively cold they intended to use land-based operations to produce 500 gram post-smolt, which then would be reared for only a year in sea-cages prior to slaughtering.

Although managers were concerned about the fact that these companies would be using the selectively bred stock of Norwegian origin, there were certain aspects which were considered to work in favour of the project:

- The cages should be limited to eastern and north-western Iceland, where there were few salmon rivers.
- There was considerable lack of employment in certain communities in the area, which would benefit from such a project.
- The salmon would only be 12-15 months in the cages, which should reduce the probability of escapes.

- The selectively bred salmon stock had a history of late maturation (2+ sea years), which was much later than any Icelandic stock, which should reduce returns from escapes.
- The selective breeding of this stock had been prioritized by the Icelandic parliament through public support of the "Stofnfiskur" breeding programme.
- No selectively bred Icelandic aquaculture stocks were thus available.

In 2001 the Minister of Agriculture established aquaculture zones, prohibiting aquaculture of salmon in bays and inlets close to the major salmon-producing areas in Iceland (Reg. no. 226/2001). The aquaculture chapter in the Salmonid Fisheries Act was furthermore strengthened in 2001 to cope with this new scenario.

From the foregoing it can be concluded that socio-economic factors have played a large part in the decision process regarding Icelandic aquaculture for decades. For example, the decision to allow importation of Norwegian salmon eggs in 1984 set the stage for the commercial development that followed in the land-based operations and subsequently the establishment of a commercial selective breeding company in 1991, which started to breed the imported stock. In fact, the same or similar stocks of Norwegian origin are now being used for aquaculture in all countries bordering the north-east Atlantic.

Introductions and transfers

Introductions of live salmonids into Iceland have been forbidden by law for decades but import of fertilized salmonid eggs has been open to an exemption after careful scrutiny of the donor stock. After the creation of the European Economic Area, Iceland was temporarily exempted from the provisions of Council Directive 91/67 EEC, but in November 2003 the Icelandic parliament passed some amendments to the Icelandic "Salmonid Fisheries Act", the "Laws on Importation of Animals" and the "Laws on Fish Diseases" to adapt Icelandic legislation to this directive.

In the execution of these laws the Icelandic authorities will be emphasizing the need to protect the unique health status of Icelandic farmed and wild salmonids, thereby safeguarding the interest of the owners and users of the valuable salmonid angling resources.

Transgenic salmonids have not been promoted or used in Icelandic aquaculture and their use is prohibited in line with EU regulations.

By-catch

Salmon fishing in the sea has been forbidden in Iceland since the 1930s. A handful of farms with heritable coastal netting rights were exempted. These fisheries have now been eliminated so the only salmon fisheries in the sea would be by-catches in sea-trout nets, which are still legal in some areas; also, incidental by-catches in the fisheries for marine species.

It is known that some salmon are caught in char-nets, especially on Iceland's north coast, and regulatory measures have been set in some areas, which prohibit net fishing for char during the peak of the salmon migration between June 10th and August 10th. Any compensation to owners of the netting rights must be paid by the stakeholders asking for such limitations, but seem unlikely as most of the char-netting parties do not provide catch statistics although they

are required to do so by law. The setting of these regulatory measures serves the double purpose of preventing illegal by-catch and providing greater numbers of salmon in the rivers.

In recent years there has been a great increase in the use of large pelagic trawls in the fisheries for various pelagic species such as blue whiting, herring, capelin and mackerel. There have been confirmed catches of salmon in pelagic trawls by Icelandic multi-gear vessels fishing for herring. The extent of the problem is, however, not documented.

Assuming that pelagic trawling could be a considerable source of marine mortality of salmon, the solution would be a high level socio-economic decision, which would probably be a difficult one to resolve in favour of the wild salmon, considering the importance and high value of commercial marine fisheries.

NORWAY

A number of studies have been undertaken to estimate social, cultural and economic values of the wild Atlantic salmon, its use, or related resources/uses, see document WSEV(03)3. These studies include studies of the economic value, economic impacts, and social and cultural benefits. While some of these studies have been important in decision-making in Norway, they all, for the most part, follow the "estimation" tradition, and just recently there have been some efforts on applying bioeconomic models on the issue of salmon fishing and the allocation of catches between the sea and river (see Skonhoft & Logstein 2003 in Norwegian).

In most of the studies there are limitations that reduce their direct application in this context:

- a study might focus the benefits of all angling in Norway, not only salmon angling;
- a study might have methodological weaknesses.

A majority of the studies are published as reports, and not too many in international refereed journals. Consequently, few studies are easy accessible for readers not familiar with Nordic languages.

However, one study should be carefully considered as a relevant case study for estimating important aspects of the value of Atlantic salmon, and that is the Study of the Economic Value of Recreational Fisheries in the Nordic Countries (Toivonen 2000).

The study has a relevant method (CVM) for our task; covers a very relevant/related topic; and covers several countries (Iceland, Sweden, Finland, Norway, Denmark). This report was specifically mentioned and discussed during the meeting in Edinburgh; however, it is worth having a closer look at the methods section of the report, as the team had some of the same challenges as the NASCO group have now in developing a study applicable in several countries.

RUSSIAN FEDERATION

Introduction

Salmon fisheries in northern Russia undoubtedly have a long history, as indicated by rock carvings of salmon and salmon fishing gear found near the Lake of Onega and dating back to

the III-II millennium BC. The Atlantic salmon has always been one of the most important species exploited by the fisheries in terms of value of the catch, the extent of the fisheries and the employment generated and the income created for a large number of people. Nowadays the commercial and recreational fisheries for Atlantic salmon continue to be an important source of income for whole regions and are often the sole source of income for the majority of families in the Pomor communities. Therefore, incorporation of social and economic considerations into management of Atlantic salmon stocks in northern Russia is vitally important. Of no lesser importance are social and economic aspects in relation to the development of aquaculture. On the one hand, this development can be very important for the economy of remote coastal areas, providing new possibilities for employment of people there and generating additional income for local communities. On the other hand, farmed salmon represent a potential threat to wild salmon stocks (disease, modification of genetic make-up) and may be one of the reasons behind the current decline in abundance of wild Atlantic salmon. This industry can, therefore, reduce the possibilities offered to the same local communities by commercial and recreational fisheries. It is also important to incorporate social and economic considerations into decisions relating, for instance, to the rights of First Nations in northern Russia.

Management of salmon fisheries

Before the 20th century all salmon fishing grounds in rivers and at sea were allocated for use by local individuals. Monasteries exploited the particularly lucrative fishing grounds (at river mouths). As early as the 15th century a part of the total harvest was traded to merchants from England and Norway. Indigenous people on the Kola Peninsula, Saamy, applied a principle of equal sharing of the catch, and there was a rotation of fishing grounds among them every third year, in accordance with a formal written agreement.

In the 20th century the system of management of salmon fisheries changed. Priority was given to the commercial fishery prosecuted by state-run companies. All fishermen engaged in this fishery had social and economic guarantees given by the government, which included high wages and certain benefits.

In the 1990s, with the development of the recreational fishery, priorities changed and the commercial fishery lost its importance. Now it is maintained in the coastal areas of the White Sea only as a traditional fishery conducted by local people. This fishery is clearly of a social nature, intended to resolve economic difficulties in local communities. However, it does so only to a limited extent, as it is strictly restricted by quotas. As this fishery exploits mixed stocks, the commercial quotas are established on the basis of risk analysis. Quotas are allocated by Fisheries Councils of the Regional Administrations in accordance with TACs allocated by the Government of the Russian Federation through issuance of a relevant Executive Order. This fishery provides employment to about 500-600 fishermen, indigenous people in these regions. Until recently there was no legislative basis to justify allocation of quotas for this fishery as a social measure. This was provided as a result of adoption of the Federal Law of 7 May 2001 “On territories of traditional use of natural resources by small indigenous nations of the North, Siberia and Far East of the Russian Federation”.

The recreational fishery has a more prominent social and economic importance and is expanding continuously. The recreational fishery allows a much larger number of people to use the resource. For instance, in 2003 more than 11,000 anglers took part in this fishery. This type of fishery also contributes to the development of infrastructure for fishing tourism,

provides additional possibilities for employment, and is economically more profitable. For instance, on the Kola Peninsula the recreational fishery generates about US$ 6,000,000 to 7,000,000 to the region's budget annually and creates more than 450 jobs.

Management of river habitat

Incorporation of social and economic considerations into the Precautionary Approach when it is applied to management of habitat in salmon rivers in Russia is important in taking decisions on river development, road and rail works, construction of industrial installations, extraction of minerals, agricultural development and other human activities, which can lead to modification of salmon habitat. Development of the economy is undoubtedly a priority; however, today there is a system developed at a federal level for control of activities impacting on aquatic biological resources and habitat, which is based on federal laws such as the Laws "On Animal World","Protection of Environment", and "Aquatic Code of the Russian Federation". The Government of the Russian Federation approved "Regulations on water protection zones". These laws enable the authorities to stop projects which may cause considerable damage to salmon habitat, or ensure compensation for the damage caused. In accordance with the "Regulations on water protection zones", protection zones in which any economic activity is forbidden, unless there is a special permit for it, may be established on all salmon rivers.

Management of aquaculture

Farming of aquatic animals is a potential area of economic development and this development is of great social and economic importance: employment for local people, development of the processing industry, etc. Currently there is only one farm for salmon, which is located in the coastal zone in the Barents Sea, and there are a few rainbow trout farms in the coastal zone of the White Sea. There is potential for the culture of aquatic animals such as red king crab, sea urchin and mussels. These developments are important for resolving social and economic issues and regulations have already been adopted at the regional level, which stipulate the principal conditions for operation of aquaculture units, compliance with which should help minimize potential adverse impacts.

Introductions and transfers

To minimize the risk to wild salmon stocks from introductions and transfers, import of live fish from other countries to the Russian Federation is prohibited. Movements of eggs to aquaculture facilities are conducted in accordance with established veterinary regulations. Stocking of hatchery-reared salmon juveniles is allowed only after they have been inspected and an appropriate permit issued.

Introductions of pink salmon to the White and Barents Sea basins, undertaken with the aim of resolving social and economic problems in the coastal regions, have been suspended to allow the risks to the stocks of wild Atlantic salmon to be assessed. Currently under consideration is the need for additional studies on pink salmon biology and its interactions with indigenous species.

By-catch

In order to conserve Atlantic salmon stocks in the White Sea rivers, the drift-net fishery for White Sea herring was closed as this fishery harvested large numbers of salmon post-smolts as by-catch. However, the problem of by-catch of adult salmon in the fishery for White Sea herring and pink salmon by set nets remains unresolved. More than 50 fishermen are engaged in this fishery and any decision to limit or close this fishery will definitely have social and economic implications.

Annex 5

WSEV(04)12

Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach

The principal objective of NASCO and its Contracting Parties in applying the Precautionary Approach to the conservation and management of Atlantic salmon is to protect the resource and preserve the environments in which it lives. Under the Precautionary Approach priority should be given to conserving the productive capacity of the resource.

These Guidelines form a framework for incorporating social and economic factors into decisions which may affect the wild Atlantic salmon and the environments in which it lives. The guidelines have been developed on the basis that all decisions in relation to:

- management of salmon fisheries;
- habitat protection and restoration;
- aquaculture, introductions and transfers and transgenics;
- stock rebuilding programmes;
- by-catch

will be taken in the context of the Precautionary Approach as adopted by NASCO and its Contracting Parties. In applying these Guidelines there may be a need for expert social and economic advice.

These Guidelines are intended for use by those who have responsibility for managing the wild Atlantic salmon and its environments. However, they are also intended to be used for communicating concerns to other sectors whose proposals could impact on the wild salmon and its environments.

The means by which social and economic factors may be incorporated in decisions under the Precautionary Approach is through socio-economic impact assessments. In these guidelines, the purpose of socio-economic impact assessments is to support and inform decision-making, rather than to provide a mechanism for making the decision.

The impacts from a particular proposal may affect not only the salmon. For example, schemes to improve salmon habitat are likely to benefit wildlife in general. On the other hand, actions designed to benefit the Atlantic salmon (e.g. predator control) may have other environmental costs.

The following steps should be followed in carrying out a socio-economic impact assessment of a proposal that could affect the wild Atlantic salmon and its environment:

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The proposal should first be considered in the light of the appropriate NASCO agreement on application of the Precautionary Approach. The objective of the proposal should be identified together with an appropriate range of options, within the relevant legislative framework, for achieving that objective. It should be borne in mind that rejecting the proposal is always an option. The options should then be subject to the socio-economic evaluation that follows.

(a) What is the proposal, its objective and how would it affect the wild Atlantic salmon and the environment in which it lives?
(b) How does the proposal conform with the appropriate NASCO agreement on application of the Precautionary Approach?
(c) What is the range of options available, within the relevant legislative framework, that would achieve the objectives of the proposal?

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

Under the Precautionary Approach, it is the responsibility of the proponent of a proposal to provide all necessary information to allow a thorough assessment of the risks associated with that proposal. There is a need to avoid deleterious impacts that are serious or irreversible. Deleterious impacts that are neither serious nor irreversible should not, however, be ignored and should be subject to evaluation albeit that this may be less rigorous. The impacts of these options on the salmon and its environments should be clearly stated.

(a) What information has been provided by the proponent of the proposal which will allow for a thorough assessment of the risks to the salmon and its environments?
(b) What is the impact of each option on the salmon and its environments?
(c) Do any of the options involve the risk of serious or irreversible damage to the salmon and its environment and what are these risks?

3. Identify the stakeholders and how their behaviour might be affected by each option.

In principle the potential stakeholder constituency should be as wide as possible but subsequent analysis should focus on those stakeholders who will be directly or indirectly affected.

(a) Who are the stakeholders who will be directly or indirectly affected by each option?
(b) What is the likely impact of each option on the behaviour of those stakeholders?

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

The economic and social values associated with salmon and the different groups of stakeholders associated with these are listed in NASCO Council document CNL(03)18. It is appropriate to consider whether and to what extent these values and each stakeholder group will be affected. It may also be appropriate to consider the economic impacts for local, regional or national economies.

While it may be theoretically possible, though difficult, to put an economic value on all costs and benefits, in practice this may not be feasible. The assessment may therefore include a number of different units of value, monetary and non-monetary. The non-monetary elements of value may be difficult to assess but may be highly significant.

The level of assessment should be proportionate to the scale of change proposed and its likely impact. For major changes, detailed quantitative analysis would be appropriate whereas for smaller changes the analysis would be semi-quantitative or even qualitative.

The time period over which the benefits and costs are being considered should be explicit. The assessment should also indicate how costs and benefits will change over that period. For example, stricter fishing regulations may impose short- term costs but generate economic benefits in the long term.

(a) What are the key elements of value, monetary and non-monetary, which should be incorporated into the assessments?
(b) To what extent is the scale of the assessment being conducted proportionate to the scale of the change proposed and the potential impact of the proposal?
(c) What are the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option for each group of stakeholders?
(d) What are the impacts of those changes for each option and for each group of stakeholders?

5. Rank options and consult with stakeholders as appropriate.

The options should be ranked on the basis of costs and benefits and presented to the stakeholders who would be affected by each of the options.

(a) What is the ranking of all the options on the basis of costs and benefits?
(b) What was the outcome of the consultations with stakeholders who will be affected by these ranked options?

6. Review the options, including mitigation measures or compensation where appropriate.

Where these options may have social, economic or environmental costs the possibilities for mitigation or compensation should be explored.

(a) Where there are social, economic or environmental costs what are the possibilities for mitigation or compensation?

7. Choose option and implement.

On the basis of steps 1-6 above, the option with the highest social, economic and environmental benefits would normally be chosen and implemented, but the decision maker will have the responsibility for assigning weightings to the various costs and benefits.

(a) Which option has been chosen and was it selected on the basis of it having the highest social, economic and environmental benefits or on some other basis? If the selection was not on the basis of the highest social, economic and environmental benefits, on what basis was it made?
(b) What is the timescale for implementation?

8. Monitor impacts and consider need for further mitigation.

After implementation of the chosen option its social, economic and environmental impacts should be monitored, proportionate to the scale of the change and its potential impact, to ensure conformity with the Precautionary Approach and the need for mitigation measures considered. Under the Precautionary Approach, where there is a risk of a serious or irreversible deleterious impact, corrective measures should be implemented without delay and should be designed to achieve their purpose promptly.

(a) What steps have been taken to monitor the social, economic and environmental impacts of the chosen option following its implementation to ensure consistency with the Precautionary Approach?
(b) What procedures have been developed for introducing corrective measures, in the event that monitoring reveals unanticipated, undesirable impacts?

Annex 6

Case Studies to test the application of the Guidelines for incorporating social and economic factors into decisions under a Precautionary Approach

1. Scenarios concerning management of North Atlantic salmon fisheries

Scenario A: The advice from the international scientific community is that abundance of salmon in the North Atlantic has increased. A mixed stock fishery in the sea exploiting stocks from a wide range of rivers over a large geographical area and whose communities are highly dependent on fisheries for their existence wishes, therefore, to increase its catch.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The proposal is to increase the catch of the mixed stock fishery. Its objective is to take advantage of the improved abundance of salmon and thereby increase their profit from the fishery and improve the quality of life of the dependent communities.

It is assumed that the relevant legislative framework includes:

- the mixed stock fishery operating within one Party's waters.
- the salmon taken in the fishery are derived from other Parties' rivers; and that
- quotas for the fishery are set by agreement at NASCO between the relevant parties.

Options:

(i) do nothing and seek alternative sources of profit;
(ii) set the quota to reflect the increased abundance of salmon and take the quota;
(iii) set the quota but other Parties to compensate the fishing community for not taking either part or all of the quota.

A final list of options for detailed consideration would be decided following appropriate expert consultation and consultation between the NASCO Parties.

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

Although the overall abundance of salmon has increased there may still be some contributing stocks in a seriously depleted condition. Any increase in catch, such as under the second option, could, therefore, increase the risk of losing these stocks.

The risk of taking no action to increase the quota would be that the Party concerned might stop participating in the NASCO process, which would imply a loss of overall control of the fishery and potentially greater damage to the stocks.

3. Identify the stakeholders and how their behaviour might be affected by each option.

Country with sea fishery

Fishermen
Fishery-related businesses
Vessel owners
General public (especially in fishing communities)
Government
NGOs

Homewater countries

Fishermen (anglers and netsmen)
Fisheries-related businesses (including tourism)
Fishery owners
General public (especially in communities in salmon areas)
Government
NGOs

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

On the basis of the economic and social analysis identified in the SCPA Technical Workshop, CNL(03)18, the costs and benefits of the options would be evaluated. The key values relevant in this scenario are likely to be:

Country with sea fishery

- Fishermen: enhanced profits
- Fisheries-related businesses: changes in income and employment
- Fishing communities: economic impact; reduced social costs of full employment

Homewater countries

- Anglers: change in net willingness-to-pay
- Netsmen: enhanced profits
- Fisheries-related businesses: changes in income and employment
- Fishing communities: economic impact; reduced social costs of full employment
- General public (especially in communities in salmon areas): existence and cultural values

Under **Option 1** net benefits would increase for homewater countries, reflecting increased abundance of salmon returning to homewater rivers. Net benefits might also increase for distant water fisheries in the long term if spawning escapement increases, but also in the short term if catch per unit effort increases.

Under **Option 2** net benefits would increase more immediately, and probably more significantly, than under Option 1 for the country with the sea fishery. For homewater countries, increases in net benefits would be lower overall than under Option 1 and in some locations might actually decline.

Under **Option 3** everybody is a potential winner provided that the compensation accepted by the country with the sea fishery does not exceed the increase in net benefits in the homewater countries (their willingness to pay). Monetary compensation alone might not improve the quality of life due to social costs through reduced employment. Alternative employment opportunities would be needed.

5. Rank options and consult with stakeholders as appropriate.

In this case the ranking is inherent in the assessment process. In consultation with stakeholders we would explain the rationale behind each option and the associated uncertainties to explain the proposed ranking.

6. Review the options, including mitigation measures or compensation where appropriate.

Final ranking subsequent to feedback to consultation. Consultation may reduce uncertainty about the viability of particular options.

7. Choose option and implement.

Implement on the basis of steps 1-6, subject to agreement by relevant parties.

8. Monitor impacts and consider need for further mitigation.

Compliance with the agreed option will be monitored under agreed procedures. Quotas and/or compensation will be subject to annual review.

Scenario B: A new government regulation is proposed to delay the start of the salmon angling season by two months.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The proposal is to delay the start of the salmon angling season by two months. The objective is to increase spawning escapement of early-run salmon to conserve the genetic diversity of the salmon stock and enhance the future value of the fishery. A delay in the start of the angling season is one way of achieving this. A number of other potential options could be identified, including:

- Closure of the early season rod fishery;
- Imposition of voluntary catch and release for the entire season;
- Imposition of mandatory catch and release for two months, followed by voluntary catch and release;
- Imposition of close times;

- Restriction of fishing methods;
- Restriction of estuary netting;
- Do nothing and hope for improvement.

The final list of options for detailed consideration would be decided following appropriate expert consultation. For practical purposes the final list should not be too large.

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

Apart from "do nothing" all of the options seek to reduce risk to this genetic component of the stock.

3. Identify the stakeholders and how their behaviour might be affected by each option.

Netsmen
Anglers
Fishing-related business
Fishery Owners
General Public
Conservation Agencies
Government
NGO's

The impact of each of the final options on the behaviour of stakeholders would be assessed through surveys, consultation and analysis as appropriate. For example, discussion with anglers to determine the likely compliance with catch and release.

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

On the basis of the economic and social values identified in the SCPA Technical Workshop report, CNL(03)18, the costs and benefits of the option list would be evaluated. For example, closure of the early-season fishery will have greater economic costs than other options but a greater certainty of a reduction in angling mortality. On the other hand, in the absence of anglers on the bank, mortality through illegal fishing might increase. For the catch and release option, economic costs will be less but there is greater uncertainty about achieving the desired increase in spawning escapement. The analysis will highlight the trade-offs and ensure more informed decision-making. The benefits and costs need to be evaluated in the short and long term and in the case of spring salmon this would require at least two generations.

On the basis of preliminary discussion we would rank mandatory catch and release higher than the other options.

5. Rank options and consult with stakeholders as appropriate.

In consultation with stakeholders we would explain the rationale behind each option and the uncertainties associated with each to explain the proposed ranking.

6. Review the options, including mitigation measures or compensation where appropriate.

Final ranking subsequent to feedback to consultation. Consultation may reduce uncertainty about the viability of particular options.

7. Choose option and implement.

Implementation.

8. Monitor impacts and consider need for further mitigation.

There will be on-going monitoring of compliance and a regular performance review to see if objectives have been achieved or whether further initiatives are required.

2. A scenario concerning habitat protection and restoration

A small hydro-electric company wishes to dam a salmon river so as to provide cheaper electricity to local communities, but this will cause loss of salmon production upstream of the dam.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The proposal is to dam a salmon river so as to provide cheaper electricity to local communities. The policy objective is to seek to conserve salmon stocks by persuading the relevant authorities to ensure that the conditions attaching to the permission to develop the hydro plant address the concerns of fishery managers relating to the salmon stock and its habitat.

Biological, social and economic arguments will be developed to best present the case for the long-term sustainable rational management of the stock and its environment. The presumption is that the proposers have not fully evaluated the long-term biological, economic and social impacts resulting from the reduction of salmon stocks associated with their proposal.

The most relevant available options are:

- Do nothing.
- Oppose the project.
- Negotiate mitigating terms and conditions to minimise the risk to salmon migration and its habitat.

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

In assessing the risk of serious or irreversible environmental impacts, the importance of the stock in question should first be considered. If it is a large genetically distinct stock and if the proposed hydro installation is considered to greatly or totally impede migrating salmon or seriously damage their spawning habitat, then the risk could be serious or irreversible. The 'do nothing' option has the highest risk of irreversible consequences. The other two options carry less risk for salmon stocks.

3. Identify the stakeholders and how their behaviour might be affected by each option.

The principal stakeholders that may be impacted under the above options are:

Riparian owners: Lose their salmon angling income. The capital value of the fishery will fall. The heritable value will also be adversely affected.

Anglers: Lose the opportunity to fish. They may have to travel further to get fishing and it may not be as good.

Guest houses/ghillies/tackle shops/local shops and restaurants, etc.: They will lose the income from the anglers.

NGO's such as angler representative bodies: Particularly in recent years, NGO's have been recognised as legitimate stakeholders in salmon management and any intervention that results in a negative impact on their policies and remits needs to be addressed.

Project proposers: Lose the opportunity to make money (the conditions applied could impact on profit margins and even the viability of the project.)

State agencies: Planning, environmental management, flooding, power generation, etc. A poorly researched and managed project could have serious cost, nuisance and other implications for State agencies and even politicians/Government.

Local community: May lose opportunity to get cheaper power or alternatively may forego all the pleasures associated with having a healthy stock of wild fish in their local river.

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

To assess the social, economic and environmental costs and benefits it will be necessary to engage the services of appropriate specialists in these areas. The EIS-type model might be appropriate here. The availability of hard data and meaningful consultation with appropriate stakeholders is critical. Also critical is measurement of the non-monetary elements such as quality-of-life values.

With respect to the "Do Nothing" option, the relative biological, economic and social values of the two competing interests may leave few real and defendable choices. Indeed, the importance of that particular salmon stock *per se*, may not be great. Again if the project does not go ahead on this river, it may get approval to proceed on a neighbouring but more important salmon river.

It may be possible to persuade the appropriate authorities that, on balance, the benefits that might derive from the development of this project could not be justified when compared to the biological, economic and social consequences.

On the other hand, it may be possible to negotiate mitigating terms and conditions to minimise the risk to salmon migration and its habitat. This might be enhancement of feeder systems below the hydro site or enhancement of an entirely separate river system or salmon stock which is under threat. These enhancements would be funded by the project promoters.

5. Rank options and consult with stakeholders as appropriate.

The ranking of the available options is a central element of the assessment and decision-making process in a case of this nature. Due process and transparency are essential to retain the support and engagement of all stakeholders. Great care must be taken from the outset to ensure this is delivered effectively.

6. Review the options, including mitigation measures or compensation where appropriate.

As a result of consultation further mitigating measures or compensation funded by the proposer may be appropriate.

7. Choose option and implement.

In this scenario, where the decision is made by a third party, it is hoped that steps 1-6 result in an outcome that provides for the long-term sustainability of salmon stocks.

8. Monitor impacts and consider need for further mitigation.

On-going monitoring of impacts, particularly if option three is implemented, must be undertaken and should be included in the conditions attaching to the approval to construct and operate the hydro installation. Again, quantitative and qualitative baseline data are essential. In line with the Precautionary Approach, the cost of ongoing monitoring should be borne by the hydro owner and there must be a mechanism to ensure corrective action is taken in a timely manner when warranted. On-going monitoring would include, *inter alia*, fish migration, water flow/abstraction, efficacy of fish passes, impacts of screens in headraces and tailraces, water quality, water temperature, changes to spawning areas and food supply, etc.

3. Scenarios concerning aquaculture

Scenario A: The international company Fishygrowth Inc. has applied to establish a new fish farm near the treasured Goldmine salmon river, located in the remote fjord area of the northern country Midgaard. The farm would likely have the potential to affect this river as well as three neighbouring rivers. The situation is further confounded by the fact that the farm will be located not far from the international border of Highgaard, the neighbouring country which has very little aquaculture but many salmon rivers.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The issue of locating a new fish farm in a fjord is, in most cases, the responsibility of authorities which do not deal with salmon management. Most salmon management authorities, however, are consulted and thus have impacts on the assessment and licensing processes. They can thus have considerable influence on the acceptance or rejection of fish farms, which might pose threats to salmon and wild salmon interests. Both the Williamsburg Resolution and the Guidelines for Social and Economic Impact Assessment serve as important "templates" to applicants and other authorities as to what the wild salmon sector expect to be addressed in the Environmental Impact Assessment. Since the location of fish farms is a highly important issue in the management context it should be considered here.

The following should be considered:

- Have all relevant options for location and management of the business been considered?
- Is the application reasonable and have environmental, social and economic values been taken into account in a justifiable way?
- If so, should the proposal be accepted, rejected or accepted with certain conditions?

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

In this example/task, Environmental Impact Assessments are demanded in most countries, assessing many interests and conditions, regarding environmental effects, possible effects on wildlife and landscape, pollution, effects for transportation, economic and social effects in general. However, these overall assessments are controlled by other authorities, and the interests of wild salmon, and the benefits to society of the wild salmon are just two of many interests. Also, several countries are making changes in their legislation and decision-making regarding aquaculture. Different authorities and different levels handle such proposals, depending on the size of the business, the status of the wild salmon stock, etc. For instance, often local authorities decide on smaller farms. In situations where the wild salmon is threatened, national/federal authorities are usually involved, with the wild salmon authority more influential in the decision.

The input from fisheries managers would need to consider the relevance of the Precautionary Approach and the implementation of social and economic values into the Precautionary Approach and the following question might be asked:

Does the proposed farm comply with the general guidelines to minimise impacts from aquaculture on the wild salmon stocks?

The Williamsburg Resolution should be used as a checklist to assess to what extent the new farm is a "state-of the-art" business that has taken this Resolution into account. If the proposed farm does not comply with the Resolution, the proposal could be sent back with specific questions and suggestions in line with these guidelines.

3. Identify the stakeholders and how their behaviour might be affected by each option.

Have all stakeholders related to wild salmon interests been identified and their interests described in a justifiable way? All relevant stakeholders should be identified, including anglers, netsmen, fishing businesses, and NGOs from the local communities that are affected. Stakeholders will vary from country to country. Fisheries Associations and Fishery Boards need to be consulted where salmon fisheries are privately owned but in other cases the resource is public and relevant governments responsible. In this case, stakeholders in the neighbouring country should also be consulted, possibly through diplomatic channels.

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impact of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

It is likely that many socio-economic factors have already been considered in an Environmental Impact Assessment. This needs to be scrutinized by the Salmon Management Agency prior to final licensing of the fish farm. Two issues are paramount for them: Are the benefits and costs of the farm operation justifiable and correct? Are the benefits and costs to the wild salmon and related interests justifiable and correct? Have both short- and long-term benefits and costs been considered?

5. Rank options and consult with stakeholders as appropriate.

There could be number of options open for changing the impact of the fish farm. The quantity produced could be reduced, the location shifted away from the rivers or split into several units. This, of course, needs to be done through consultation with the proponent of the aquaculture activity.

6. Review the options, including mitigation measures or compensation where appropriate.

The operation of the fish farm could be approved with stringent conditions regarding gear, quantity produced, partial or total tagging of salmon as well as monitoring measures, c.f. the Williamsburg Resolution. Are the benefits of the mitigating actions greater than their cost?

7. Chose options and implement.

The fish farm would be approved or alternatively rejected due to excessive environmental effects especially in the long term.

8. Monitor impacts and consider need for further mitigation.

If licensed, the impacts of the farm would be monitored and mitigated if possible.

Scenario B: An angling association in Scotland concerned about declining catches of salmon wishes to augment the stock through a hatchery rearing programme using salmon from a river fifty miles away.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

An angling association concerned about declining catches of salmon wishes to augment the stock through a hatchery rearing programme using salmon from a river fifty miles away.

Background information on management regime: In Scotland, salmon fishing rights in fresh water and in the sea are private, heritable titles which may be held separately from any land. Scotland is divided into 66 salmon fishery districts. Salmon fishery management in Scotland has been devolved to District Salmon Fishery Boards (DSFBs). Membership of these DSFBs comprises elected representatives of salmon fishery proprietors and, where appropriate, co-opted representatives of tenant netsmen and anglers. Representatives of Local Authorities and Government Agencies such as Scottish Natural Heritage and the Scottish Environment Protection Agency are, in many cases, invited to participate. Currently, 48 DSFBs have been established. All of the major salmon rivers have DSFBs in place.

Relevant legislation currently in force: Section 24 of the Salmon Act 1986 makes it an offence for any person to introduce salmon or the eggs of salmon into waters in a salmon fishery district where a DSFB has been established without the prior approval of the Board.

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

The DSFB should take account of the recommendations in the Williamsburg Resolution, particularly the guidelines for stocking;

Has the proponent undertaken an appropriate environmental impact assessment (EIA) to determine that stocking is necessary? Is there some physical factor or factors that limit salmon production; has the proponent considered options other than stocking? The assessment need not always be a full-scale EIA, which may attract great cost, but the proponent must demonstrate that full consideration has been given to possible impacts;

If the result of the EIA submitted by the proponent is that stocking is deemed to be necessary, has it determined whether the source of the stock to be used is appropriate?

Does an appropriate hatchery exist? Has the hatchery been registered with Fisheries Research Services to include it in the monitoring undertaken by Fisheries Health Inspectorate?

If there is no hatchery, has planning permission from the relevant Local Authority been sought in order to build one?

Is there evidence that there will be adverse genetic interactions, given that these may be as bad or almost as bad if salmon from a neighbouring river are used?

The DSFB should establish whether there is a shortage of salmon. Do declining catches reflect decreased stock abundance, or is there some other cause, such as changes in run-timing, changes in flow regime, or some other non-stock-related factor?

The DSFB should examine whether other options are available and not merely rely on the assessment provided by the proponent. Expert advice should be sought from appropriate sources, such as Fishery Research Services, Fishery Trusts, and retained biologists. The options might include habitat restoration or improvement; re-negotiation of compensation flow agreements; stocking with local stocks; kelt reconditioning; apply to Scottish Ministers for appropriate Orders or Regulations to address management or conservation issues (e.g. alteration of close times, baits and lures, mandatory catch and release); education that decreased catch rates are likely to provide a better long-term solution; or do nothing;

Risk analyses should be performed on each option to assess whether any action taken would have a serious or irreversible impact on local stocks.

3. Identify the stakeholders and how their behaviour might be affected by each option.

The DSFB should identify the stakeholders likely to be affected. These would include other fishery owners and angling groups operating elsewhere in the river; the DSFBs, owners and operators in neighbouring rivers that might be affected by straying; owners and operators in the source river; downstream interests in the area such as service industries (hotels, tackle dealers, etc.).

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

The DSFB should estimate the potential environmental cost of each option. In the case of the proposed stocking programme, in addition to the environmental costs, the potential social and economic costs should be assessed. The assessment should address the long-term costs of affecting adversely the local stocks, and balance this against the potential short-term gains and long-term costs to local stocks of introducing non-native fish.

The assessment need not always be a full-scale EIA, which may attract great cost, but the DSFB should give full consideration to possible impacts.

5. Rank options and consult with stakeholders as appropriate.

The DSFB should rank the possible options on the basis of costs and benefits, taking into account the effect on local jobs (ghillies, water bailiffs, hotels, etc.) of the recorded decline in salmon catches, and the long-term implications for these sectors of each of the options.

The DSFB should present the list of options to appropriate stakeholders for their comment. The stakeholders might include other salmon fishery owners within the catchment; other local angling interests; Local Authorities; NGOs; appropriate Government Departments and Agencies.

6. Review the options, including mitigation measures or compensation where appropriate.

In the light of the comments received, the DSFB should decide on the appropriate course of action to follow.

7. Choose an option and implement.

The appropriate option, based on the analysis above, should be implemented for a fixed period.

8. Monitor impacts and consider need for further mitigation.

Stock status and catches should be monitored before and after implementation of the chosen option, and the programme kept under review. If necessary the measure may be allowed to fall when the prescribed time limit is reached, or it may be renewed as it is or modified in the light of experience gained during the appraisal period.

Scenario C: An angling society in the US wishes to augment the stock in a river through a hatchery rearing programme using salmon from a separate, nearby river. The association wants to stock fish from the Penobscot River (currently not listed as endangered under the U.S. Endangered Species Act) in a river adjacent to those with populations which are endangered, but which currently does not have an extant wild population[1]. Currently Atlantic salmon fishing is prohibited in Maine, thus this project would be attempting to restore a population to this river for a purpose other than angling – although part of the motive could be for angling at some point in the future.

[1] A hypothetical example could also be explored in which fish from one of the endangered U.S. populations were to be stocked in a river with no population or no endangered population. This would complicate matters in that an endangered species carries its protection wherever it goes and this example would be expanding the endangered species beyond its current range. Such use would have to be of benefit to the endangered population, and would also introduce additional socio-economic impacts that are associated with the protection of endangered species. While this would complicate the analysis, and the legal framework under which this action would be taken is more complex, the steps involved in evaluating the socio-economic and environmental impacts, costs, and benefits would be similar.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The U.S. Federal government controls the hatchery brood stock, and would have to agree to provide the angling association with the eggs, fry, or smolt to be stocked or reared. This also has to be approved by a technical advisory committee in Maine, as well as a Maine State agency charged with Atlantic salmon management. The federal action (the federal government giving the eggs to the association) would trigger the National Environmental Policy Act (NEPA), which requires an environmental review (including a socio-economic review) of the action. The U.S. government would be responsible for this review, which would require a description of the action and its purpose and need. If the project were determined to be of more than "minor" significance, an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) would be conducted. Both an EA and an EIS require the identification and analysis of several alternatives, including the "no action" alternative. Consistency with the appropriate NASCO agreement on application of the Precautionary Approach, specifically the Williamsburg Resolution, would be noted here.

2. Assess for each option whether there is risk of serious or irreversible deleterious impact on the salmon and its environments.

The review under NEPA would require an assessment of the environmental impacts of the action, including a conclusion (if applicable) of no "significant" impact.

3. Identify the stakeholders and how their behaviour might be affected by each option.

Depending on the significance of the project, NEPA requires public review for anything which would be of more than "minor" impact. Stakeholders here would be the salmon association, landowners along the river, NGO's, anglers of other species, perhaps the aquaculture industry, and other state and federal agencies.

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of the impact of the change.

If the project were determined to be of more than "minor" significance, an EA or an EIS would be conducted. Both an EA and an EIS require socio-economic analysis of alternatives. In this case an EA may be written, and the Federal agency authorizing the action would be responsible for the analyses, although the agency may pass that responsibility on to the proponent (in this case the salmon association). Of particular importance will be the impacts on the endangered wild Atlantic salmon population, including the benefits and costs associated with those impacts.

5. Rank options and consult with stakeholders as appropriate.

A "preferred" alternative would be identified, and a draft EA would be made available for public review and comment.

6. Review the options, including mitigation measures or compensation where appropriate.

The EA process requires the identification of mitigation measures.

7. Choose option and implement.

After review of the public input, the Federal agency would decide if it will provide the eggs (as requested, or perhaps in a modified fashion (e.g., more, less, fry instead of eggs, etc.).

8. Monitor impacts and consider need for further mitigation.

The Maine State agency, in its permit to the association, would likely require monitoring of the results of the stocking. This would be of interest to the association as well since they are interested in seeing fish return. The United States, in general, is trying to implement salmon recovery and restoration projects using an experimental design, with monitoring required before, during, and after project implementation to better assess the impact of the project.

4. A scenario concerning by-catch

Nascovia , a country from outside the North Atlantic area, obtains a quota from another international fisheries organization to fish for pelagic species in international waters on the migration routes of wild salmon post-smolts. There is evidence that such fisheries can take significant amounts of salmon post-smolts.

1. Describe the proposal, its objective and the options within the relevant legislative framework for achieving the objective.

The change consists of a new fishery for pelagic species to provide economic benefits to country Nascovia. The change is lawful, within the rules of the other international fisheries organization. The quota has been fixed so the only options are to consider changes in fishing methods or timing. There is a risk of serious deleterious effects on abundance and diversity of wild Atlantic salmon so it is unacceptable to take no action. As a bare minimum, scientific studies or an observer programme should be initiated to better understand the scale of the problem.

2. Assess for each option whether there is a risk of serious or irreversible deleterious impact on the salmon and its environments.

Scientific evidence suggests that a very small proportion of the catch may consist of salmon post-smolts. Nevertheless, this level may constitute a large proportion of salmon post-smolts in the area at the time of the fishery. However, there is considerable uncertainty in the scientific estimates of the level of by-catch of salmon.

3. Identify the stakeholders and how their behaviour might be affected by each option.

Nascovian fishermen, vessel owners and fish processors;
Owners of salmon fisheries on rivers to which the stocks would have returned had they not been harvested as by-catch;
Salmon anglers on rivers to which the stocks would have returned had they not been harvested as by-catch;
Commercial and subsistence fishermen who would have exploited the salmon that would have returned had they not been harvested as by-catch (including distant water fisheries on the salmon's migration routes);
Those inhabitants in the states of origin of the fish harvested as by-catch and which will not, therefore, return to the rivers resulting in loss of existence value, etc.

4. Assess the changes in social, economic and environmental costs and benefits, both short- and long-term, associated with each option, and determine the economic impacts of those changes. This should be done for each group of stakeholders. The scale of the assessment should be proportionate to the scale of change.

Option 1 is to lower the height of the head rope of the pelagic trawl by 5m. This measure might eliminate the by-catch or more likely reduce it substantially but it will reduce the catch-per-unit-effort of the pelagic trawls by 15%.

Option 2 is to stop the pelagic fishery during daylight hours, in which case the by-catch might be eliminated or, more likely, substantially reduced but the catch-per-unit-effort of the target pelagic species would fall by 50%.

At this point there may be a need to obtain professional economic advice on the losses to Nascovian stakeholders versus the gains to state of origin stakeholders of each option. The existence values of the salmon must be fully incorporated and not just the value of a tonne of salmon. The long-term impacts on the salmon must be considered.

5. Rank options and consult with stakeholders as appropriate.

The option with maximum benefit to the salmon and the stakeholders who benefit from it is to stop the new fishery. The option with the least benefit to the salmon and the stakeholders who benefit from it is to allow the fishery to proceed in its present or an expanded form. The option of modifying the operation of the fishery would have an intermediate effect.

6. Review the options, including mitigation measures or compensation where appropriate.

Option 1: NASCO and its Contracting Parties attempt to persuade the international organisation concerned that they should issue new regulations concerning fishing methods and patterns because they are undermining NASCO's conservation efforts.

Option 2: NASCO and its Contracting Parties and/or the private sector could offer compensation to Nascovian fishermen to change fishing patterns

7. Choose option and implement.

Option 1 is chosen and representations are made to the international organization to change fishing methods.

8. Monitor impacts and consider need for further mitigation.

Research is undertaken to evaluate the impacts of the change in fishing methods on the level of by-catch, with a view to considering the need for further representations should the level of by-catch not fall as anticipated.

Annex 7

WSEV(04)13

A Modeling Approach for Integrating Socio-economic Factors into Atlantic Salmon Management

The North Atlantic salmon fishery is a complex organization of many different stakeholders representing direct users of the resource and those that benefit indirectly from its existence. Within the salmon fishery, commercial, recreational, and First Nations have a direct, consumptive demand for the resource. Non-consumptive demands for the resource also exist with tourists visiting spawning sites and observing wildlife that has congregated around spawning streams. Interactions also occur with other industries or activities that compete with salmon for the resources upon which they are dependent. Hydro-electric power and flood control, aquaculture, agriculture, forestry, industrial development and pollution, and the construction of roads and bridges, can temporarily or permanently change the environment and habitat of salmon. In addition, salmon is managed differently by different jurisdictions; some maintain an open access fishery while others employ property rights in the management of their stocks. Given these many different interactions, it is often difficult to determine how a particular management action will affect different components of the North Atlantic salmon fishery. More importantly, research into the biology, economics, and social components of the salmon fishery are not compatible and are not easily compared within an integrated, management framework. A conceptual or empirical North Atlantic salmon model could be developed that would allow information about the management of salmon to be developed that would account for these interactions.

Such a model would have four basic components for each stakeholder. The first is an assessment of the market for products or services that are produced or provided by, or based on, the resource. This assessment would include the demand for recreational fishing trips based on their travel costs, supply and demand for salmon products commercially produced, impacts from other substitute products on salmon prices and availability, and demand for services related to salmon viewing or existence value. This assessment allows the determination of the values of salmon and quantities needed by the different consumptive and non-consumptive users of the resource. It also allows the determination of how these values change over time and with changes in the management environment.

A second component is a measure of the values, profits, or costs associated with providing these products and services by individuals or firms. Leasing of salmon fishing sites to recreational fishermen is a source of income to landowners. Guide and charter services are businesses that generate value to the nation. Commercial sales of aquaculture-produced salmon reduce market prices for wild-caught salmon and could cause a reallocation to recreational users of wild salmon. Satisfaction from recreational fishing also generates a value for wild salmon. This assessment allows the impacts on individuals' or firms' provision of services or products to be analysed. That is, how much will be produced, what is the resulting demand for labor, how much income is produced, etc.

The third component is to determine the level of participation in the salmon-related industries. The numbers of recreational and commercial fishermen, environmental tourists, and other users need to be determined for each stakeholder group. The decision to enter or

exit an activity can change under different management institutions, levels of abundance, or costs of participating relative to other activities. Based on the individual levels of production, total production of a good or service by the entire group of stakeholders can be determined.

Once identified for each stakeholder group these three components can be combined with the final component, which is the biology of the stock or related stocks. Changes in fishing effort will impact the size of the stock. This includes an understanding of growth rates, recruitment, etc. of the fish species. This change in stock size over time will impact the values of salmon used by consumptive and non-consumptive stakeholders. Once developed for each stakeholder group, the discounted net benefits generated by each group can be summed to determine the change in total net benefits for each proposed change in the management environment.

This approach to understanding how net benefits change in a group of salmon dependent or related industries need not be time-consuming or expensive. Existing studies of salmon values can be incorporated into the management framework, expert opinion can be used to determine parameter values to explain behaviour, and case studies can be used. Simple analyses can be developed initially that can be replaced by more comprehensive analyses conducted in the future if needed. Statistical programmes to develop the necessary data for these model components could be simplified if combined with existing stock assessment data collection survey programmes. Alternatively, qualitative assessments can be used to rank the alternatives without explicit empirical values being generated for each alternative. In this approach, the framework can be assembled and agreed to by stakeholders and then alternatives evaluated and discussed to ensure agreement with the outcome.

The result of this modeling approach is a better understanding of the interactions between components of the salmon-related industries and stocks of fish. Research can be conducted that provides information to improve the model over time. Interactions between the stock dynamics and the economic and socio-cultural aspects of salmon can be better understood. Information that assists managers in making decisions can be provided and improved over time. Manager decisions about the use of the salmon resource can be improved and biological, economic, and social research can be made more responsive to the needs of the managers.