



Agenda item 6.2(a)
For decision

Council

CNL(00)18

***Report of the Standing Committee on the Precautionary Approach -
Application of a Precautionary Approach to
Management of Salmon Fisheries***

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Management of Salmon Fisheries***

1. Last year the Council agreed an Action Plan for Application of the Precautionary Approach. The Action Plan covers application of a Precautionary Approach to: management of North Atlantic salmon fisheries; socio-economic issues; unreported catches; scientific advice and research requirements; stock rebuilding programmes; introductions and transfers, aquaculture and transgenics; habitat issues and by-catch. Under this Action Plan a Standing Committee on the Precautionary Approach (SCPA) was established comprising Heads of Delegations plus additional experts as appropriate. The SCPA meets as directed by the Council with the objectives of:
 - coordinating the implementation of the Action Plan;
 - ensuring coordination and consistency in implementing the Precautionary Approach in each regional Commission;
 - reporting to the Council on: progress in implementing the Action Plan, the need for additional actions and the activities of other organizations in relation to the Precautionary Approach.
2. The first meeting of the SCPA on management of North Atlantic salmon fisheries was held in Miami, Florida, during 21-23 March 2000 under the chairmanship of Dr Andy Rosenberg (USA). The report of the meeting is attached. As this was the first meeting of the SCPA, and given the Committee's objectives of ensuring coordination and consistency in implementing the Precautionary Approach, the Committee agreed that it would be appropriate to consider further the interpretation of the guiding principles which apply to all aspects of application of a Precautionary Approach before proceeding to the specific terms of reference which related only to the management of North Atlantic salmon fisheries. It is unlikely that these principles would be reviewed at subsequent meetings of the SCPA as it goes on to consider each element of the Action Plan. The Committee therefore developed some general comments on interpretation of these guiding principles which are contained in Section 5 of the attached report. The Committee also developed a decision structure for use by the Council and Commissions of NASCO and by the relevant authorities in the management of single and mixed stock salmon fisheries. This decision structure is contained in Annex 4 of the attached report.
3. The Council is asked to consider the recommendations of the SCPA and decide on future action in the light of this report.

Secretary
Edinburgh
17 April 2000

SCPA(00)15

Report of the First Meeting of the Standing Committee on the Precautionary Approach

Application of a Precautionary Approach to Salmon Fisheries Management

***Doubletree Hotel, Coconut Grove, Miami
21 - 23 March 2000***

1. Opening of the Meeting

- 1.1 The Chairman, Dr Andy Rosenberg (USA), opened the meeting and welcomed participants to Miami for the first meeting of NASCO's Standing Committee on the Precautionary Approach (SCPA). He referred to the importance of the meeting not only to NASCO and its Contracting Parties but potentially also for fisheries management internationally. He noted that while many international organizations are working on implementation of the Precautionary Approach, NASCO has made real progress in developing a comprehensive Action Plan. While there has been extensive discussion and scientific consideration of the Precautionary Approach in a number of regional and international fisheries fora, there has been less progress in incorporating the Precautionary Approach into management decisions. He indicated that there was a need to develop a clear but flexible management decision structure for use by NASCO and its Contracting Parties and that this would be the focus of the meeting and the challenge for the SCPA.

- 1.2 A list of participants is contained in Annex 1.

2. Nomination of a Rapporteur

- 2.1 The Committee appointed Dr Peter Hutchinson as rapporteur for the meeting.

3. Adoption of the Agenda

- 3.1 The Committee adopted its agenda, SCPA(00)8 (Annex 2) after agreeing that item 6(c) should read "Development of guidelines for pre-agreed management actions for homewater fisheries". The Committee also agreed that there was a need to clarify the meaning of the term "conservation" during the progress of the meeting.

4. Consideration of the Terms of Reference in the context of the overall Action Plan

- 4.1 The Committee considered the Terms of Reference for the meeting, SCPA(00)2. The Chairman indicated that clarification of the meaning of the term "conservation" would be appropriate under the first of these terms of reference.

5. Consideration of the Guiding Principles of the Precautionary Approach

5.1 The SCPA's objectives include co-ordinating the implementation of the Action Plan and ensuring consistency in implementing the Precautionary Approach. As this was the first meeting of the SCPA since the Council had adopted the guiding principles of the Precautionary Approach, the Committee agreed that it was important that there was consistency in their interpretation. It is unlikely that the Committee will review these principles at each subsequent meeting as it goes on to address each element of the Action Plan. The Committee therefore reviewed the guiding principles of the Precautionary Approach with a view to offering general comments on their interpretation.

- (a) *"The need to be more cautious when information is uncertain, unreliable or inadequate."*

Given the complex biology of the Atlantic salmon and its wide-ranging environmental needs, work on all aspects of salmon management, conservation and exploitation will always involve uncertain, unreliable or inadequate information. There will therefore always be a need for caution. The greater the uncertainty the greater will be the need for caution. The Committee agreed that in all circumstances a Precautionary Approach is appropriate. Adoption of a Precautionary Approach does not mean that there is a decreased need for scientific information but rather that it should be a priority, recognising potential financial constraints, to obtain more information on which to base management decisions. Where uncertainty is identified steps should be taken to reduce it.

- (b) *"The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures."*

Managers should not wait for full certainty before taking action. There would have to be reasonable grounds for taking cautious conservation and management measures, which should be proportionate to the perceived risks. The question of risk is difficult as it can be perceived differently from different viewpoints. Nevertheless it has to be taken into account in a transparent manner. There is a need to take into account the complexity of salmon stocks but it can never be argued that there is not enough information to apply a Precautionary Approach. For many, if not all, salmon rivers there is some information on the salmon stocks and their habitat. Under a Precautionary Approach, however, there is a requirement to gather additional information so as to reduce uncertainty.

- (c) *"Consideration of the needs of future generations and avoidance of changes that are not potentially reversible."*

There could be no doubt that future generations have a right to the resource, and that it is the present generation that has to safeguard that right. The loss of salmon stocks, and the subsequent negative impacts on communities dependent on salmon, will compromise the needs of future generations. There is a need to avoid irreversible changes, i.e. changes that are not reversible within a reasonable time period; in

practice the timescale would be related to generation times of salmon populations. There is a need to clearly state the likely impact of measures in the short, medium and long term.

- (d) *"Prior identification of undesirable outcomes and of measures that will avoid them or correct them."*

The Committee agreed that undesirable outcomes should be identified whenever possible. They may be related to ecological and biological factors as well as socio-economic factors. They are mostly self-evident such as irreversible change, collapse of wild stocks and loss of communities dependent on salmon fisheries. In relation to management of salmon fisheries, failure to achieve conservation limits is a clear undesirable outcome. In dealing with other issues relating to salmon conservation and management, such as by-catch or habitat issues, different undesirable outcomes will exist. The interplay between all these undesirable outcomes will be complex and may involve conflicts with management regimes for other species and other activities.

- (e) *"Initiation of corrective measures without delay and that these should achieve their purpose promptly."*

Pre-agreed procedures for implementing appropriate measures are essential. Under the Precautionary Approach the measures should be commensurate with the risk to the resource and designed to have a demonstrable effect within an agreed timescale. It was recognised that there could be no guarantee that the measures would achieve their purpose promptly because of factors beyond the control of managers. Nevertheless, the higher the risk to the stock the greater is the need for measures which are designed to achieve their purpose promptly. There is a need to monitor these corrective measures so as to evaluate their effectiveness and take appropriate action.

- (f) *"Priority to be given to conserving the productive capacity of the resource where the likely impact of resource use is uncertain."*

The productive capacity of the resource is governed by two components: 1) the productive capacity of the accessible habitat, and 2) the ability of the stock to fully utilise that capacity. Measures to protect the productive capacity of the resource should be required even in the absence of full scientific proof of their need. The standard of proof of the need to take such measures should be commensurate with the potential risks to the resource. The higher the risks to the resource the lower the standard of proof required to take measures. The timeliness of the measures is a very important consideration.

- (g) *"Appropriate placement of the burden of proof by adhering to the above requirements."*

It is often not possible to assess in advance what the impact of resource or habitat use will be. Where there are reasonable grounds for believing that such use may adversely affect salmon stocks, those proposing the use should, in principle, carry the burden of providing proof that their actions do not affect the productive capacity of

the resource or lead to irreversible changes. All resource use should be subject to a management regime.

- 5.2 The Committee also discussed the following three general issues (the roles of scientific advisers and managers, socio-economic factors and diversity and abundance) related to application of the Precautionary Approach.

The roles of scientific advisers and managers

- 5.3 The Committee affirmed that it is not for the scientific advisers to take on the burden of being precautionary but to provide the advice needed for the managers to implement a Precautionary Approach. The Committee recognised the desirability of a continuous process of dialogue between scientists and managers.

- 5.4 The Committee agreed that the role of scientific advisers includes to:

- advise on the status of the stocks;
- advise on the appropriate biological reference points needed to meet the management objectives;
- monitor the various management regimes and advise on their effectiveness;
- advise on areas of uncertainty and how they might be reduced;
- advise on the research required in support of the Precautionary Approach;
- advise on potential impacts and effectiveness of proposed management measures.

- 5.5 The Committee agreed that the role of managers includes to:

- set clear objectives for what they want to achieve in salmon management;
- indicate what level of risks they are prepared to accept of not achieving their objectives;
- decide on management targets;
- specify the appropriate timescales for their objectives;
- develop and implement pre-agreed management actions and stock rebuilding programmes;
- develop and implement other appropriate management strategies;
- implement monitoring and evaluation programmes for management measures.

- 5.6 It was recognised that under a Precautionary Approach there will be a need for managers to state clearly, when they propose and agree on measures, how the measures satisfy the principles of the Precautionary Approach as laid down by the Council.

Socio-economic factors

- 5.7 The Committee discussed the interplay between biological factors and socio-economic factors in relation to the Precautionary Approach. Allowing socio-economic factors to dominate could undermine the effectiveness of the Precautionary Approach and it is, therefore, necessary to give proper emphasis to biological factors. However, the Committee recognised that in particular circumstances it may be

necessary to address biological concerns over a sufficient timescale so as to allow socio-economic aspects to be taken into account in order to balance the risks to the salmon stocks with the risks to the fishing communities. Application of a Precautionary Approach involves assessment of these risks. The issue of how the relevant short-term and long-term socio-economic factors are included in the Precautionary Approach will be the subject of a subsequent meeting of the SCPA.

Diversity and abundance

- 5.8 The Agreement on the Adoption of a Precautionary Approach states that an objective for the management of salmon fisheries is to promote the diversity and abundance of salmon stocks. The Committee interpreted this as being to maintain both the productive capacity and diversity of salmon stocks.

6. Application of the Precautionary Approach to management of salmon fisheries - Structures for Decision-making

- 6.1 A communication from the European Commission on the Precautionary Principle was tabled, SCPA(00)9. A document containing the salmon resolutions of the IBSC was made available to the Committee for information, SCPA(00)10.

Definitions

- 6.2 The Committee agreed a number of definitions in relation to application of the Precautionary Approach, SCPA(00)11 (Annex 3).

Risk levels for establishing management targets

- 6.3 The NASCO Agreement on Adoption of a Precautionary Approach states that stocks should be “maintained above the conservation limits by the use of management targets.” The view was expressed that there might be the possibility of having two conservation limits so as to take into account both abundance and diversity. Alternatively, one limit but a different level of risk might be used. The Committee recognised that it is necessary to consider both abundance and diversity. The Committee agreed that the conservation limit currently used by NASCO, i.e. the spawning stock level that produces maximum sustainable yield, was precautionary in nature. However, the desirability of ensuring that the spawning stock does not fall below this level, through the establishment of a management target at a higher level so as to take into account uncertainty in the status of the stocks, in the biological reference points and in fishery management capabilities, was recognised. The Committee, therefore, recommended that managers set management objectives and appropriate risk levels so that ICES can advise on management targets for all rivers for which conservation limits have been established.
- 6.4 The NASCO Agreement states that conservation limits and management targets should be set for each river and combined as appropriate for the management of different stock groupings defined by managers. The Committee recognised the desirability of having as small groupings as possible and that these groupings should

be based on geographical proximity, biological information and, in some situations, socio-economic information. The need for scientific advice in establishing appropriate groupings by managers was recognised.

- 6.5 The Council has stressed the importance of progress in establishing conservation limits on rivers in the North-East Atlantic area. In this regard the Committee welcomed the European Commission funded programme of concerted action on the development of a scientific basis for the management of wild Atlantic salmon in the North-East Atlantic, a summary of which was presented, SCPA(00)12. The objectives of this programme include *inter alia* evaluating progress towards setting river-specific or regional conservation limits and evaluating alternative management approaches.

Pre-agreed management actions

- 6.6 The NASCO Agreement on Adoption of a Precautionary Approach states that the management procedure for all salmon fisheries could include the following elements:
- (a) definition of target spawning stock levels in the relevant rivers;
 - (b) definition of pre-fishery abundance of individual salmon stocks or groups of stocks occurring in the relevant fishery;
 - (c) utilisation only of the surplus according to (a) and (b) above;
 - (d) socio-economic factors.
- 6.7 The Agreement further states that the Precautionary Approach requires “the formulation of pre-agreed management actions in the form of procedures to be applied over a range of stock conditions”. If an individual stock or group of stocks fail pre-agreed compliance criteria, the pre-agreed measures should be implemented so as to maintain stocks above conservation limits as required by the Agreement.
- 6.8 The Committee agreed that procedures for developing pre-agreed management actions for distant water fisheries and guidelines for the development of pre-agreed management actions for homewater fisheries should follow the same decision structure (see paragraph 6.13 and Annex 4) and tests for compatibility with the Precautionary Approach.

Stock rebuilding programmes (SRPs)

- 6.9 The NASCO Agreement on Adoption of a Precautionary Approach requires that “stock rebuilding programmes (including, as appropriate, habitat improvement, stock enhancement and fishery management actions), be developed for stocks that are below their conservation limits.”

Circumstances under which SRPs required

- 6.10 The Committee discussed the circumstances under which stock rebuilding programmes might be required. There are no hard and fast rules because there should be a continuum between existing management programmes and stock rebuilding programmes.

Procedures for disseminating information on SRPs

- 6.11 The Committee recognised that where stock rebuilding programmes are initiated there could be benefits from an exchange of information and experiences between NASCO Parties. This information might include details of the nature of the problem(s) and of the measures being used to rebuild the stock, the anticipated duration of the programme and its costs, progress in rebuilding the stock and the criteria being used to assess the effectiveness of the programme. However, provision of this information on an annual basis to either ICES or NASCO could be a considerable administrative burden. It might be very useful to have a Special Session at NASCO's annual meetings dedicated to reviewing the Parties' stock rebuilding programmes, along the lines of those held to review measures taken in relation to minimising impacts of aquaculture. This could consider successes and failures in stock rebuilding programmes. With regard to the North-East Atlantic Commission, ICES has been requested to advise on the effectiveness of management measures in homewaters.

Procedures for assessing effectiveness of SRPs

- 6.12 An important element of the Precautionary Approach is that the effectiveness of management measures, including stock rebuilding programmes, should be evaluated. The Committee agreed that a stock rebuilding programme could be considered to have achieved its objective when the conservation limit had been exceeded and other diversity criteria had been met.

Structures for decision-making

- 6.13 The Committee developed a decision structure to aid the Council and Commissions of NASCO and the relevant authorities in implementing the Precautionary Approach to Atlantic salmon management, SCPA(00)13 (Annex 4). This decision structure has been drafted broadly to facilitate wide and flexible application. It is recommended by the Committee that the decision structure be used in developing pre-agreed and other management actions for distant water fisheries and as guidance for the preparation of such management actions for homewater fisheries. It is recommended that the Commissions and the relevant authorities, when making management decisions, would explicitly address each point in the decision structure. It is also recommended that the relevant authorities have in place effective mechanisms for fisheries monitoring, surveillance, control and enforcement to ensure compliance with the management measures. In applying this structure, it is understood that management decisions will be made in accordance with the assessment of risk such that, in the face of uncertainty, the risks to abundance and diversity of the stock(s) are low and the probability of achieving management goals is high. The decision structure is intended

to be used iteratively such that the effect of actions will be monitored and evaluated and decisions reconsidered to ensure that they are consistent with the Precautionary Approach.

- 6.14 The Committee noted that in particular circumstances society may impose limitations on the strict adherence to the Precautionary Approach.
- 6.15 A number of case studies using this decision structure were considered by the Committee, SCPA(00)14 (Annex 5).

7. Date and Place of Next Meeting

- 7.1 The Committee agreed that there would not be an opportunity for a further meeting before the Seventeenth Annual Meeting of NASCO, at which the Council will consider arrangements and terms of reference for the next meeting of the SCPA, in accordance with the Action Plan for Application of the Precautionary Approach.

8. Any Other Business

- 8.1 The Committee would like to stress that it sees the outcome of this first meeting as subject to review and modification in the light of experience in applying the recommendations proposed here. In this regard, the Committee would recommend to the Council that the Commissions of NASCO and the Contracting Parties report back on the practical aspects and on any difficulties encountered in applying the recommendations, including the decision structure, made by the Committee.
- 8.2 There was no other business.

9. Consideration of the Draft Report of the Meeting

- 9.1 The Committee agreed a report of the meeting.

10. Close of Meeting

- 10.1 The Chairman closed the meeting and thanked all participants for their contributions to a productive first meeting of the Committee.

Miami
23 March 2000

*List of Participants***Canada**

Mr Michael Calcutt	Department of Fisheries and Oceans, Ottawa
Ms Edith Dussault	Department of Fisheries and Oceans, Ottawa
Mr David Meerburg	Department of Fisheries and Oceans, Ottawa
Mr Jacque Robichaud	Department of Fisheries and Oceans, Ottawa

Denmark (Faroe Islands and Greenland)

Mr Jan Arge Jacobsen	Faroes Fishery Laboratory, Torshavn, Faroe Islands
Mr Mogens Holm Pedersen	Ministry of Foreign Affairs, Copenhagen, Denmark
Mr Hedin Weihe	Faroeese Home Government, Torshavn, Faroe Islands

European Union

Dr Walter Crozier	Dept. of Agriculture & Rural Development for Northern Ireland, Bushmills, Northern Ireland, UK
Mr David Dunkley	SERAD, Edinburgh, Scotland, UK
Mr Curt Insulander	Swedish Salmon Research Institute, Alvkarleby, Sweden
Mr Ivor Llewelyn	MAFF, London, England, UK
Mr Pentti Munne	Ministry of Agriculture and Forestry, Helsinki, Finland
Mr Ted Potter	CEFAS, Lowestoft, England, UK
Mr George Thomson	SERAD, Edinburgh, Scotland, UK
Mr Andrew Thomson	European Commission, Brussels, Belgium
Mr Ole Tougaard	European Commission, Brussels, Belgium
Dr Ken Whelan	Marine Institute, Newport, Ireland

Iceland

Mr Arni Isaksson	Directorate of Freshwater Fisheries, Reykjavik
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Norway

Mr Dagfinn Gausen	Directorate for Nature Management, Trondheim
Dr Lars Petter Hansen	Norwegian Institute for Nature Research, Oslo

Russian Federation

Ms Svetlana Krylova	Murmanrybvod, Murmansk
Mr Vladimir Moskalenko	PINRO, Murmansk
Mr Boris F Prischepa	Murmanrybvod, Murmansk
Ms Elena Samoylova	PINRO, Murmansk
Dr Alexander Zubchenko	PINRO, Murmansk

USA

Ms Kimberly Blankenkemper	National Marine Fisheries Service, Silver Spring
Ms Mary Colligan	National Marine Fisheries Service, Gloucester
Ms Boyce Thorne Miller	Seaweb, Washington DC
Dr Andrew Rosenberg (Chairman)	National Marine Fisheries Service, Silver Spring

Observers

Dr Walter Ranke	International Baltic Sea Fishery Commission, Warsaw, Poland
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Secretariat

Dr Peter Hutchinson
Dr Malcolm Windsor

A G E N D A

1. Opening of the Meeting
2. Nomination of a Rapporteur
3. Adoption of the Agenda
4. Consideration of the Terms of Reference in the context of the overall Action Plan
5. Consideration of the Guiding Principles of the Precautionary Approach
6. Application of the Precautionary Approach to Management of Salmon Fisheries - Structures for Decision-making
 - (a) Risk levels for establishing management targets
 - (b) Pre-agreed management actions for distant water fisheries
 - (c) Development of guidelines for pre-agreed management actions for homewater fisheries
 - (d) Stock rebuilding programmes
 - (i) Circumstances under which required
 - (ii) Procedures for disseminating information
 - (iii) Procedures for assessing effectiveness
7. Date and Place of Next Meeting (if agreed)
8. Any Other Business
9. Consideration of the Draft Report of the Meeting
10. Close of Meeting

Guiding Definitions of Terms Used in Salmon Fisheries Management

Distant water fisheries: Fisheries in areas outside the jurisdiction of the country of origin. With respect to the NASCO Convention this specifically refers to fisheries under the jurisdiction of the Faroe Islands and Greenland.

Homewater fisheries: Fisheries within the jurisdiction of the countries of origin (within 12 miles).

Population: A group of salmon, members of which breed freely with each other, but not with others outside the group. The smallest group that can be usefully managed.

Stock: A management unit comprising one or more salmon populations. This would be established by managers, in part, for the purpose of regulating fisheries. (The term may be used to describe those salmon either originating from or occurring in a particular area. Thus, for example, salmon from separate rivers are referred to as “river stocks” and salmon occurring at West Greenland may be referred to as the “West Greenland stock”).

Mixed stock fishery: A fishery exploiting a significant number of salmon from two or more river stocks.

Conservation: The process of ensuring that the abundance of salmon in a stock is maintained at or above a satisfactory level (i.e. above the conservation limit with an agreed probability) and that natural diversity is maintained.

Conservation Limits (CL): CLs demarcate the undesirable spawning stock level at which recruitment would begin to decline significantly. The level cannot be used in management without also defining the acceptable probability (e.g. proportion of years) when the stock may be permitted to fall below the CL.

Currently NASCO and ICES define the CL as the spawning stock level that produces maximum sustainable yield. Formerly referred to as Minimum Biologically Acceptable Level (MBAL) or a Spawning Target.

Management Target (MT): The MT is the stock level employed by managers/scientists to aim at in order to achieve the objective of exceeding the CL for the desired proportion of years and for achieving other management objectives. The MT will therefore be greater than the CL with the margin between them at least reflecting the risks, decided by managers, of stocks falling below the CL.

Stock Rebuilding Programme (SRP): An SRP is an array of management measures, including possibly habitat improvement, exploitation control and stocking, designed to restore a stock above its conservation limit. An SRP could be a part of setting routine management plans.

Decision Structure to Aid the Council and Commissions of NASCO and the Relevant Authorities in Implementing the Precautionary Approach to Management of North Atlantic Salmon Fisheries

Does the fishery exploit salmon from more than one river?

If no, see A.

If yes, see B.

A. Single Stock

1. Is the stock threatened by external factors (e.g. acidification, disease)?

If yes, take special management action as appropriate (e.g. establish gene bank).

If no, go to A2.

2. Assess status of the stock (abundance and diversity)

(a) Have age-specific conservation limits been set?

(i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

(ii) If no, assess other measures of abundance.

(b) Is the stock meeting other diversity criteria?

3. If either abundance or diversity are unsatisfactory, then seek to identify the reasons.

(a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

(b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

4. If both abundance and diversity are satisfactory:

(a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus).

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

B. Mixed Stock

1. *Identify river stocks that are available to the fishery*
2. *Identify stock components that are exploited by the fishery*
3. *Assess abundance and diversity of individual stocks contributing to the fishery (see A above)*
4. *Is abundance and diversity satisfactory (consider the % of stocks that are unsatisfactory and the extent of failure for each stock)?*
 - (a) If yes, go to 5.
 - (b) If no, consider closing the fishery (taking into account socio-economic factors). If the decision is made not to close the fishery, then continue to 5.
5. *Is the combined conservation limit(s) for all stocks subject to the fishery being exceeded?*
 - (a) If yes, implement pre-agreed procedures for the management of the fishery based on effort or quota control:
 - Quota control
 - define management target based on an assessment of risk of failing conservation limits
 - predict pre-fishery abundance
 - determine exploitable surplus
 - apply pre-agreed rules on setting quotas
 - Effort control (and quota control in the absence of management targets and/or prediction of pre-fishery abundance)
 - evaluate effectiveness of previous effort control measures and apply appropriate changes.
 - (b) If no, consider closing the fishery taking into account socio-economic factors. If the decision is made not to close the fishery, apply pre-agreed reserve measures to minimize exploitation.
6. *Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution*

***Case Studies Using the Decision Structure for Implementing the
Precautionary Approach to Management of Atlantic Salmon Fisheries***

Note: The following four case studies are for illustrative purposes only and should not be used for management.

Example 1: Margaree River, Cape Breton for 2000

2000 forecast of return estimated to be 3000 MSW salmon (90% confidence limit 1200 - 4860) and 950 1SW salmon (90% confidence limit 300 - 1630)

Conservation limit = 1250 MSW salmon and 660 1SW salmon

Management target = conservation limit plus 20% = 1500 MSW salmon and 792 1SW salmon

** Note that the management target used is hypothetical and would have to be set by managers but would likely be less risk averse than that for Greenland mixed stock fishery*

In recent years there has been a native food fishery (both MSW and 1SW harvests) and angling (1SW harvest and hook-and-release for MSW salmon) only.

Does the fishery exploit salmon from more than one river?

If no, see A.

No, single stock fishery (at least just one river); returns have both early run (summer) and late run (fall) components. Therefore the decision structure for a single stock fishery is appropriate.

If yes, see B.

Not applicable.

A. Single Stock

1. Is the stock threatened by external factors (e.g. acidification, disease)?

If yes, take special management action (e.g. establish gene bank).

Not applicable.

If no, go to A2.

No.

2. Assess status of the stock (abundance and diversity)

- (a) Have age-specific conservation limits been set?

Yes.

- (i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

Yes, returns above conservation limit and management target in 1999 (returns were 2060 MSW and 820 ISW salmon).

Egg deposition primarily from MSW salmon and spawning levels have exceeded conservation limits for large salmon in 15 of the past 15 years.

Juvenile abundance is high and stable.

5-10% of returns originate in hatchery on river.

Wild adult abundance has been high and stable while hatchery origin adult abundance has been low and stable.

- (ii) If no, assess other measures of abundance.

Not applicable.

- (b) Is the stock meeting other diversity criteria?

Yes.

3. If either abundance or diversity are unsatisfactory, then seek to identify the reasons

- (a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

Not applicable.

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

Not applicable.

4. If both abundance and diversity are satisfactory:

- (a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus).

Harvest available is $3000 - 1500 = 1500$ MSW salmon and $950 - 792 = 158$ ISW salmon.

Harvests in 1999 were 927 MSW salmon and 376 ISW salmon.

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

Some by-catch exists but a more important concern is unreported catch, mainly poaching in coastal waters and in the river.

Example 2: Greenland Low Abundance

Forecast 1999 pre-fishery abundance (PFA) at 50% level was 79,450 ISW North American origin salmon

Conservation limit = 183,852

Management target = conservation limit plus 30% = 239,008

* Note that the management target would have to be agreed by the West Greenland Commission

Does the fishery exploit salmon from more than one river?

If no, see A.

Not applicable.

If yes, see B.

Yes. Therefore the decision structure for a mixed stock fishery is appropriate.

B. Mixed Stock

1. Identify river stocks that are available to the fishery

The fishery exploits salmon destined to be MSW returns of both European and North American origin; most of the contribution from North America comes from southern North America and from southern Europe for European stocks.

2. Identify stock components that are exploited by the fishery

Approximately 75% of harvest in recent years has been from North American stocks.

3. Assess abundance and diversity of individual stocks contributing to the fishery (see A above)

Conservation limits have been set for all rivers in North America and some, but not all, in Europe; fishery has been managed in recent years based on North American stocks only.

4. Is abundance and diversity satisfactory (consider the % of stocks that are unsatisfactory and the extent of failure for each stock)?

- (a) If yes, go to 5.

Not applicable.

- (b) If no, consider closing the fishery (taking into account socio-economic factors). If the decision is made to not close the fishery, then continue to 5.

No. Egg depositions in 1998 exceeded or equalled river-specific conservation limits in 21 of 71 assessed rivers in Canada and in none of 18 assessed rivers in USA. Egg depositions were less than 50% of conservation limits in 24 rivers in Canada (34% of those assessed).

5. Is the combined conservation limit(s) for all stocks subject to the fishery being exceeded?

- (a) If yes, implement pre-agreed procedures for the management of the fishery based on effort or quota control:

- Quota control
 - define management target based on an assessment of risk of failing conservation limits
 - predict pre-fishery abundance
 - determine exploitable surplus
 - apply pre-agreed rules on setting quotas

- Effort control (and quota control in the absence of management targets and/or prediction of pre-fishery abundance)
 - evaluate effectiveness of previous effort control measures and apply appropriate changes.

Not applicable.

- (b) If no, consider closing the fishery taking into account socio-economic factors. If the decision is made not to close the fishery, apply pre-agreed reserve measures to minimize exploitation.

No. Far below conservation limit for North American stocks; close mixed stock fisheries in Greenland and North America and harvest only in-river where individual river stocks are above conservation limit. A reserve measure minimizing exploitation was implemented at West Greenland accounting for socio-economic concerns.

6. Monitor the effect of the measures and feedback to management/assessment; include identification of information gaps, process and timeframe for resolution

Almost all mixed stock fisheries in West Greenland and North America have been closed and commercial licences have been permanently retired in Canada; many rivers have been closed to all exploitation, others remain open to hook-and-release only for angling and on some rivers where stocks are healthy, normal harvests continue.

Stocks in USA and parts of Bay of Fundy (Outer Bay) are extremely low and being considered for listing under USA and Canadian processes.

Some by-catch exists but a more important concern is unreported catch, mainly poaching in coastal waters and in rivers of North America. In Europe there are concerns about the level of unreported catch and possible by-catch in fisheries for pelagic species.

Example 3: Greenland Higher Abundance as in 1986

Forecast of 1986 pre-fishery abundance (PFA) at 50% level to be 505,066 1SW North American origin salmon

Conservation limit = 183,852

Management target = conservation limit plus 30% = 239,008

* Note: The management target would have to be agreed by the West Greenland Commission

In this example, recent biological characteristics have been used rather than going back to 1986 data.

Does the fishery exploit salmon from more than one river?

If no, see A.

Not applicable.

If yes, see B.

Yes. Therefore the decision structure for a mixed stock fishery is appropriate.

B. Mixed Stock

1. *Identify river stocks that are available to the fishery*

The fishery exploits salmon destined to be MSW returns of both European and North American origin; most of the contribution from North America comes from southern North America and from southern Europe for European stocks.

2. *Identify stock components that are exploited by the fishery*

Approximately 60% of the harvest in recent years has been for North American stocks.

3. *Assess abundance and diversity of individual stocks contributing to the fishery (see A above)*

Conservation limits have been set for all rivers in North America and some, but not all, in Europe; fishery has been managed in recent years based on North American stocks only.

4. *Is abundance and diversity satisfactory (consider the % of stocks that are unsatisfactory and the extent of failure for each stock)?*

(a) If yes, go to 5.

Yes. Commentary would be added here to describe stock status in home rivers in previous year.

(b) If no, consider closing the fishery (taking into account socio-economic factors). If the decision is made to not close the fishery, then continue to 5.

Not applicable.

5. ***Is the combined conservation limit(s) for all stocks subject to the fishery being exceeded?***

(a) If yes, implement pre-agreed procedures for the management of the fishery based on effort or quota control:

- Quota control
 - define management target based on an assessment of risk of failing conservation limits
 - predict pre-fishery abundance
 - determine exploitable surplus
 - apply pre-agreed rules on setting quotas
- Effort control (and quota control in the absence of management targets and/or prediction of pre-fishery abundance)
 - evaluate effectiveness of previous effort control measures and apply appropriate changes.

Yes, abundance above conservation limit and management target. After retaining spawning reserve (266,800: reserve is management target accounting for natural mortality), surplus available for harvest is 505,066 - 266,800 = 238,266 North American origin salmon.

*Quota at Greenland = $[(0.40 * 238,266 * 2.62) + (0.40 * 238,266 / 584 - 0.4 * 238,266 * 2.74)] / 1.14 = 496$ tonnes.*

(b) If no, consider closing the fishery taking into account socio-economic factors. If the decision is made not to close the fishery, apply pre-agreed reserve measures to minimize exploitation.

Not applicable.

6. ***Monitor the effect of the measures and feedback to management/assessment; include identification of information gaps, process and timeframe for resolution***

Commentary would be added here on monitoring effect of the measure.

Example 4: River Bush (UK, N. Ireland), for 1998

Does the fishery exploit salmon from more than one river?

If no, see A.

No. Therefore the decision structure for a single stock fishery is appropriate.

If yes, see B.

Not applicable.

A. Single Stock

1. Is the stock threatened by external factors (e.g. acidification, disease)?

If yes, take special management action (e.g. establish gene bank).

Not applicable.

If no, go to A2.

No (but see section 4, below).

2. Assess status of stock (abundance and diversity)

(a) Have age-specific conservation limits been set?

Yes. A conservation limit of 2.3 million eggs (the Minimum Biologically Acceptable Level) has been set for the river, based on a river-specific stock-recruitment study. As the population comprises mainly 1SW fish (average 88%), the conservation limit has been set with respect to this age component only.

(i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

The egg deposition in year 1998 was 3.07 million eggs, and the conservation limit has been exceeded in this river in 6 out of the last 10 years (compliance criterion requires deposition to be above conservation limit in >50% of years).

(ii) If no, assess other measures of abundance.

Not applicable.

(b) Is the stock meeting other diversity criteria?

Yes. Periodic genetic monitoring of the river stock has indicated the presence of a single population, which is maintaining acceptable levels of intra-population genetic diversity (heterozygosity). Phenotypic diversity is also being maintained, as the proportion of MSW fish has not altered significantly over a 25 year period. A hatchery strain maintained for ranching experiments

on this river is separate from the wild population, as hatchery-origin fish are all removed at a trap in the lower river.

3. *If either abundance or diversity are unsatisfactory, then seek to identify the reasons*

While abundance and diversity are judged satisfactory, there are concerns about the long-term effects of a trend for reduction in survival during the freshwater phase of the life cycle. Contributory reasons have been identified as habitat degradation, in particular siltation of spawning gravels, as well as significant avian predation (cormorants).

- (a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

Studies are in progress to identify the extent of the habitat degradation and remedial measures are being tried out on a pilot scale at present.

A programme of controlled culling of cormorants under licence is ongoing.

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

The habitat remedial measures are being monitored for effectiveness, by means of habitat and fishery surveys. However, the effectiveness of the predator control programme is not being assessed due to resource limitations. Further information is required on other sources of predation, such as otters, which are believed to be taking wild fish in considerable numbers.

4. *If both abundance and diversity are satisfactory:*

- (a) Implement pre-agreed management actions to permit harvest of the surplus, taking into account uncertainty (where appropriate, use management targets to establish exploitable surplus).

Pre-agreed management actions comprise effort limitation, via restrictions on numbers of nets licensed together with seasonal and weekly close periods. Rod fisheries on the river are also regulated via effort control. A management target is not yet available for this stock.

Monitoring of marine survival (via microtagging of wild migrating smolts) carried out for the last 12 years has indicated a reduction in natural marine survival of fish returning in 1998. Survival to homewaters of the 1997 wild smolt cohort fell to 19%, which is well below the previous 10 year range of 25%-35%. Discussions have been held with managers in order to decide pre-agreed measures to reduce fishing effort, in the event that the reduction in marine survival persists.

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

The effect of existing management measures is being continuously monitored via the scientific project on this stock, which yields information on adult and juvenile abundance, return rates and marine and freshwater exploitation. Any future management measures will be similarly evaluated.

Statement by Norway

Norway expresses concern about the use of the procedures detailed in paragraph 6.6 in relation to high seas fisheries as Norway has serious problems seeing how high seas fisheries can be operated in compliance with the Precautionary Approach. Norway suggests that NASCO should explore new possibilities of reaching a solution to this problem that can be accepted by all Parties.

Statement by Denmark (in respect of the Faroe Islands and Greenland)

In accordance with the NASCO Convention, the Faroe Islands and Greenland are entitled to fish for salmon under regulatory measures agreed within NASCO. Such fisheries are in compliance with the Precautionary Approach.

