1997

FOURTEENTH ANNUAL MEETING

ILULISSAT, GREENLAND

10-12 JUNE 1997

PRESIDENT:	MR EINAR LEMCHE (DENMARK (in respect of the Faroe Islands and Greenland))
VICE-PRESIDENT:	MR OLE TOUGAARD (EUROPEAN UNION)
SECRETARY:	DR MALCOLM WINDSOR

CNL(97)47

C O N T E N T S

CNL(97)47

REPORT OF THE FOURTEENTH ANNUAL MEETING OF THE COUNCIL 10-13 JUNE 1997, ILULISSAT, GREENLAND

1. Opening Session

1.1 The President, Mr Einar Lemche, opened the meeting, and introduced the Greenlandic Fisheries Minister, Mr Pâviarâq Heilmann, who made a Welcoming Address (Annex 1).

1.2 The President joined the Minister in welcoming the delegates to Ilulissat and made an opening statement on the work of the Organization (Annex 2).

1.3 The representatives of Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Union, Iceland, Norway, the Russian Federation and the United States of America made opening statements (Annex 3).

1.4 The representative of the International Baltic Sea Fishery Commission, attending the meeting as an observer, made an opening statement (Annex 4).

1.5 Two opening statements were made jointly on behalf of a number of NGOs. In addition, opening statements were made by the Atlantic Salmon Trust, The Federation of Irish Salmon and Sea-Trout Anglers, The National Anglers Representative Association, The Scottish Anglers National Association, and the Salmon Net Fishing Association of Scotland. These opening statements are contained in Annex 5.

1.6 The President expressed appreciation to the Parties, to the IGOs and to the NGOs for their statements and closed the Opening Session.

1.7 A list of participants is given in Annex 6.

2. Adoption Of Agenda

2.1 The Council adopted its agenda, CNL(97)40 (Annex 7).

3. Administrative Issues

3.1 Secretary's Report

The Secretary made a report to the Council, CNL(97)5, on the status of ratifications and accessions to the Convention, membership of the regional Commissions, applications for observer status at the 1997 meeting, possible topics for Special Sessions, the Organization's project work and the Headquarters Property. Reports were also made on the audited accounts for 1996, CNL(97)6, on the receipt of contributions for 1997, CNL(97)7, and on the draft budget, CNL(97)8.

In the light of the decision to set up a Working Group on the Precautionary Approach (see paragraph 5.2), the Council agreed that it would be appropriate to have a Special

Session at the 15th Annual Meeting on that same subject. The Working Group might advise on the structure of the Special Session.

Since the last annual meeting one new Non-Government Organization, The World Wide Fund for Nature (Norway), had been granted observer status, CNL(97)35, taking the total number of accredited NGOs to 24.

3.2 Report of the Finance and Administration Committee

The Chairman of the Finance and Administration Committee, Mr Eero Niemela, presented the report of the Committee, CNL(97)9. Upon the recommendation of the Committee the Council took the following decisions:

(a) to appoint Coopers and Lybrand of Edinburgh as auditors for the 1997 accounts;

(b) to accept the audited 1996 annual financial statement, CNL(97)6;

(c) to adopt a budget for 1998 and to note a forecast budget for 1999, CNL(97)52 (Annex 8).

(d) to adopt the report of the Finance and Administration Committee.

The President thanked Mr Niemela for his efficient work and that of the Committee.

3.3 Report on the Activities of the Organization

The Council adopted a report to the Parties, CNL(97)10, in accordance with Article 5, paragraph 6 of the Convention .

The Council reviewed a Report on the Activities of the Organization in 1995/96, CNL(97)11, for publication. It was agreed that the report should be updated to take account of the deliberations at the Fourteenth Annual Meeting and that the additional text would be agreed by correspondence with Heads of Delegations following the meeting. In this way a more timely publication would be produced within 3-4 months of the period covered by the report.

4. Scientific, Technical, Legal And Other Information

4.1 Scientific Advice from ICES

The representative of ICES presented the report of the Advisory Committee on Fishery Management (ACFM) to the Council, CNL(97)13 (Annex 9).

4.2 **Report of the Standing Scientific Committee**

The Chairman of the Committee presented a draft request to ICES for scientific advice. Upon the recommendation of the Committee, the Council adopted a request for scientific advice from ICES, CNL(97)50 (Annex 10).

4.3 **Catch Statistics and their Analysis**

The Secretary introduced a statistical paper presenting the official catch returns by the Parties for 1996, CNL(97)15 (Annex 11), and historical data for the period 1960-1996.

At its last meeting the Council had noted some discrepancies in the statistics provided by ICES and the official statistics provided by the Parties to NASCO and had asked the Secretary to seek clarification for the differences. The Secretary reported on the consultations with the Parties and indicated that measures had been taken by the Parties concerned to address the discrepancies noted in the 1995 statistics. However, there were again some differences between some of the figures presented by ICES and those provided to NASCO for the 1996 statistics although different Parties were concerned. The Secretary indicated that he would consult with these Parties to seek clarification for the differences.

In the ACFM Report ICES had sought clarification from NASCO on the way it wished statistics on salmon ranching to be presented. The Secretary indicated that the Minimum Standard for Catch Statistics adopted by the Council requires the inclusion of ranched salmon in the statistics provided to NASCO. The Council agreed that while it was helpful to separate the ranched component of the stocks it recognised the desirability of the statistics on ranched fish being consistent for all Parties. It was agreed that the Secretary should follow up this issue through consultations with the Parties and with ICES.

4.4 **Salmon Tagging and the Tag Return Incentive Scheme**

The Secretary presented a summary of tag release data, CNL(97)17 (Annex 12), which had been prepared from information submitted by ICES.

The Secretary reported on the operation of the Tag Return Incentive Scheme in 1996/97, CNL(97)18. The 1996 awards had received favourable publicity for the work of the Parties and of the Organization and the need to return scientific tags had again been publicised. In excess of 3,000 external tags had been entered into the 1997 draw.

The President announced that the draw for the Tag Return Incentive Scheme was made by the Auditor at NASCO Headquarters on 29 May and the winner of the $2500 Grand Prize was Mr Peter Langeng, Salsbruket, Norway. The Council offered its congratulations to the winner.

4.5 Review of International Salmon Related Literature Published in 1996

The Council took note of a review of the literature concerning Atlantic salmon published during 1996, CNL(97)19, which had been prepared in accordance with Article 13, paragraph 2 of the Convention. The Secretary indicated that efforts were being made to increase the scope of the literature included in the review and that in future the date of publication would be included with the press articles. The President suggested that this paper be made available to the members of the ICES Working Group on North Atlantic Salmon.

5. Conservation, Restoration, Enhancement And Rational Management Of Salmon Stocks

5.1 Measures Taken in Accordance with Articles 14 and 15 of the Convention

The Secretary presented a report on the returns made under Articles 14 and 15 of the Convention, CNL(97)20 (Annex 13). The representative of the USA indicated that the Salmon Conservation Plan for the State of Maine referred to in document CNL(97)20 has now been finalised and is undergoing public review. A copy of the Plan will be sent to the Secretariat.

5.2 The Use of the Precautionary Approach by NASCO

The Secretary introduced a paper on the use of the precautionary approach in the work of NASCO, CNL(97)21 (Annex 14).

The Council agreed to establish a Working Group to consider how the precautionary approach might be applied to NASCO's work. Representatives of ICES and FAO would be invited to contribute to the work of this group. Terms of Reference for this Working Group were agreed, CNL(97)49 (Annex 15).

5.3 Fishing for Salmon in International Waters by Non-Contracting Parties

Protocol for Non-Contracting Parties and Actions Taken in Accordance with the Resolution

The Secretary presented a report, CNL(97)22, which described developments in relation to the Protocol Open for Signature by States Not Parties to the Convention for the Conservation of Salmon in the North Atlantic Ocean and actions taken in relation to the Resolution on Fishing for Salmon on the High Seas, both of which were adopted by the Council at its Tenth Annual Meeting.

Information was presented to the Council on sightings of vessels fishing for salmon in international waters; scientific and technical data on the fishery; information on landings and transshipments and details of actions taken to establish contact with other international organizations. There have been no sightings since February 1994 but there have been few surveillance flights over the winter and spring period and these would not have covered the entire area of international waters.

International Cooperation on Surveillance

The Council received a report CNL(97)23 (Annex 16) of the second meeting of coastguard/fishery protection authorities on Surveillance of Fishing For Salmon in International Waters.

Since the first meeting of the group there has been a major change in the area because of the enormous growth in fishing for pelagic species. Concern had been expressed that even if a small percentage of the catch in these fisheries was post-smolts the losses of salmon could be significant. The Council was advised that the fishery for mackerel involves vessels from both Contracting and non-Contracting Parties to NASCO and it was agreed that the Secretary should contact the non-Contracting Parties concerned to advise them of NASCO's concerns. The Council was advised of research fishing programmes for pelagic fish conducted by Norway, Faroe Islands and Iceland from which information on by-catch of salmon might be obtained. The Council encouraged the Parties to explore options for obtaining information on the level of by-catches of salmon and to make this available to ICES.

The representative of ICES was asked to advise as to the information on incidental by-catches of salmon in large-scale pelagic fisheries for herring and mackerel. Document CNL(97)42 (Annex 17) was submitted by ICES. The Council agreed on the proposals and asked the Secretary to consult with the Parties and with ICES on this issue so that reports were sent to ICES. The Council agreed to take up this question of by-catch in a separate agenda item next year.

The meeting of coastguard/fishery protection agencies had recognised that there are long periods of the year when there is no surveillance corresponding to the periods when salmon fishing is known to have occurred in the past. The Council considered and did not pursue a proposal to conduct a pilot project to assess the utility of radar satellite data for the detection of salmon fishing by non-Contracting Parties in international waters. The Council was advised of a proposal to evaluate satellite surveillance systems in Norway over the next two years and agreed that the results of this study should be reviewed at a subsequent meeting of the coastguard/fishery protection authorities and NASCO with regard to its possible application in relation to surveillance of salmon fishing in international waters.

The representative of the European Union referred to the establishment of a joint control and enforcement scheme under the auspices of the North-East Atlantic Fisheries Commission (NEAFC). The Council asked that the Secretary consult with the Secretary of NEAFC with a view to exploring the possibility of obtaining surveillance information from the area of concern to NASCO.

The Council asked the Secretary to continue to take diplomatic action in relation to any future sightings.

5.4 Scientific Research Fishing in the Convention Area

The Council had previously considered the issue of whether there should be exemptions to Article 2 of the Convention so as to permit research fishing by the

Parties. There is, and has in the past been, interest by the Parties in research fishing for salmon but the Council had recognised that such research fishing would need to be under carefully controlled conditions. At its Thirteenth Annual Meeting the Council considered a draft Resolution on Scientific Research Fishing and had asked that the Secretary consult with the Parties with a view to adopting the Resolution by correspondence.

The Secretary reported, CNL(97)24, that following some amendments the Resolution on Scientific Research Fishing had been unanimously adopted by correspondence on 29 November 1996. The Resolution as adopted, CNL(96)60, is contained in Annex 18.

Prior to adoption of the Resolution the Council had unanimously approved scientific research fishing by Canada, EU (Scotland) and Norway. For operational reasons the Canadian research had to be aborted but reports on the research conducted by EU (Scotland) and Norway were made.

The Council unanimously approved a proposal by Norway, CNL(97)37, to conduct scientific research fishing for salmon commencing on 2 July 1997.

5.5 **Impacts of Aquaculture on Wild Salmon Stocks**

(a) Returns made in accordance with the Oslo Resolution

The Secretary presented a report, CNL(97)25 (Annex 19), on the returns made in accordance with Article 5 of the "Resolution by the Parties to the Convention for the Conservation of Salmon in the North Atlantic Ocean to Minimise Impacts from Salmon Aquaculture on the Wild Salmon Stocks" adopted in Oslo in 1994. It is the Council's intention that there would be full implementation of the Resolution by the Fifteenth Annual Meeting in 1998 and to achieve this aim, further measures would be needed.

In this regard the Council agreed to hold an inter-sessional meeting in Brussels on 26 and 27 January 1998 (immediately preceding the Working Group on the Precautionary Approach, referred to in paragraph 5.2) chaired by the Secretary to consider further the implementation of the Oslo Resolution in the light of the information arising from the ICES/NASCO Symposium.

The representative of the European Union advised the Council that, in addition to the measures referred to in document CNL(97)25, the European Commission had adopted a decision on 18 July 1996 on protective measures with regard to *Gyrodactylus salaris* in salmonids. Under this decision the introduction of live salmonids into Great Britain, Northern Ireland, the Isle of Man, Ireland and Guernsey is prohibited from outside these regions. Furthermore, introduction of salmonid eggs from outside these regions is subject to disinfection procedures to ensure the elimination of *Gyrodactylus salaris*.

The representative of Norway advised the Council that the new Fish Disease Act referred to in document CNL(97)25 has now completed its passage

through the Norwegian Parliament and will *inter alia* allow for the establishment of epidemiological zones and regions. He also indicated that the Norwegian authorities intend to conduct a sea fishery during the period 1 October - 1 March, when wild salmon are not present in coastal waters, in an attempt to capture escaped farmed salmon.

The representative of Canada indicated that the draft Code of Practice for containment of Atlantic salmon in sea cages referred to in document CNL(97)25 has now been prepared and will be part of detailed consultations with the aquaculture industry and other interested Parties over the coming year.

(b) Progress in establishing a liaison group with the salmon farming industry

The establishment of a wild/farmed salmon liaison group in order to provide an international forum for liaison between the salmon farming industry and managers of the wild stocks of Atlantic salmon on issues of mutual interest has been welcomed by the Council and by the International Salmon Farmers Association (ISFA). Terms of Reference had previously been agreed for the Group.

The Secretary reported, CNL(97)26, on progress in arranging the first meeting of the Group. A draft Agenda and Constitution previously agreed by the Council had been sent to the ISFA who had responded positively but had proposed that the meeting be delayed until after the ICES/NASCO Symposium so that the information presented at that meeting would be available to the Group. The ISFA had proposed that the first meeting of the Liaison Group be held in Boston in early 1998. The Council asked the Secretary to liaise with the ISFA on the arrangements for this meeting.

(c) Report on the ICES/NASCO Symposium

The Council considered a report, CNL(97)27 (Annex 20), of the ICES/NASCO Symposium on 'Interactions between Salmon Culture and Wild Stocks of Atlantic Salmon: the Scientific and Management Issues'. Approximately 170 delegates from 18 countries had attended the Symposium which had provided a useful forum for exchange of ideas and information.

The Secretary indicated that the latest scientific evidence presented at the symposium suggested that the abundance of cultured salmon in the wild is large and has resulted in a mixing of fish from different populations to an extent never seen before. Spawning between cultured fish will displace wild fish and inter-breeding between wild and farmed will certainly lead to genetic changes in wild populations. Some experts felt that loss of local adaptations and displacement of wild fish could lead to the collapse of wild populations. There are also serious adverse impacts from diseases and parasites. Additional measures are therefore needed to improve the containment of farmed salmon either through improvements to physical security or, more effectively, through the use of sterile salmon in farming. There were repeated references to the use of sterility as a way of protecting the wild stocks. A recurring theme at the

meeting was the need for enhanced cooperation between the salmon farming industry and those involved in the management of the wild stocks, so as to safeguard the wild stocks. This threat to wild stocks is perhaps a classic case where the precautionary approach is appropriate, since there are real grounds for concern about genetic damage, a scientific resolution of the question is not yet ready, and the damage, if it is occurring, is irreversible.

(d) Resolution on transgenic fish

At its Thirteenth Annual Meeting the Council had considered a draft Resolution on Transgenic Salmon (i.e. salmon that contains genes from another organism) and had asked that the Secretary consult with the Parties with a view to adopting the Resolution by correspondence. The Secretary reported, (CNL(97)28) (Annex 21), that it had not been possible to reach agreement on the draft Resolution but that the Council had previously agreed to consider a more detailed resolution taking into account the findings arising from the ICES/NASCO Symposium. At this Symposium all parties represented, including the industry representatives, had recognised that transgenic salmon pose severe risks to the wild stocks. The Council expressed its concerns about the risks posed by transgenic salmon and adopted NASCO Guidelines for Action on Transgenic Salmon, CNL(97)38 (Annex 22). The Council had previously agreed that the issue of transgenic salmon and the possible impacts on the wild stocks also be referred to the Liaison Group referred to in paragraph 5.5(b).

5.6 **The Atlantic Salmon as Predator and Prey - Management Implications**

The Council considered a review, CNL(97)44 (Annex 23), of the management implications arising from the Special Session entitled 'The Atlantic Salmon as Predator and Prey" held in 1996.

The representative of the European Union stated that his delegation considered this to be a factual summary of the Special Session but he could not consider any management measures in this regard. He wished to emphasise that research should be continued so as to obtain a clearer understanding of predator-prey relationships.

The representative of the USA indicated that although he accepted the document as a review of the Special Session, his delegation could not endorse the recommendations contained in the summary. He referred to relevant research being undertaken by ICES and by the Contracting Parties on ecological interactions. There was therefore no need for further action at this time.

The representative of Norway referred to research being undertaken including *inter alia* the Norwegian Marine Mammals Research programme.

The representative of Canada indicated that there is much ongoing research in Canada on predator-prey relationships, including studies on capelin.

5.7 **Guidelines on Catch and Release**

In recent years that there has been growing interest in catch and release in response to declining stock levels or components of the stocks in a number of North Atlantic countries. The Council had previously recognised that, to be effective as a management measure, it is important that stress and physical damage to fish intended for release is avoided, and that where catch and release is practiced, guidelines could be of benefit in avoiding damage.

At its Thirteenth Annual Meeting the Council had considered draft guidelines on catch and release and agreed that comments should be sent to the Secretary with a view to adopting the guidelines by correspondence. The Council adopted guidelines, CNL(97)43 (Annex 24), for use at the discretion of the Parties or of interested organizations.

5.8 **Guidelines on Stocking**

The Council had previously agreed to develop guidelines on stocking. However, because of other commitments and so as to allow information presented at the Bath Symposium to be considered, it had not been possible to prepare the guidelines for consideration at the Fourteenth Annual Meeting. The Council agreed to consider draft guidelines on stocking at its Fifteenth Annual Meeting.

5.9 **Reports on Conservation Measures Taken by the Three Regional Commissions**

The Chairman of each of the three regional Commissions reported to the Council on their activities.

6. Other Business

6.1 The Secretary referred to a communication, (CNL(97)34), which had been received from the United Nations concerning Resolutions on Straddling Fish Stocks and Highly Migratory Fish Stocks (Resolution 51/35) and on Large-Scale Pelagic Drift Net Fishing (Resolution 51/36). The Council asked the Secretary to respond, without reference to the Council, to the United Nations on this and any subsequent correspondence on these issues unless there was new information.

6.2 The Council considered a proposal, CNL(97)45 from the West Greenland Commission that NASCO undertake a review related to enhancing the level of reported catches and refining the estimates of unreported catches. The Council agreed to adopt this proposal, CNL(97)51 (Annex 25).

7. Date And Place Of Next Meeting

7.1 The Council agreed to hold its Fifteenth Annual Meeting in Edinburgh, Scotland from 8-12 June 1998.

7.2 The Council accepted an invitation from the European Union on behalf of Ireland to hold its Sixteenth Annual Meeting in Ireland from 8-11 June 1999.

8. Draft Report Of The Meeting

8.1 The Council agreed the draft report of the meeting, CNL(97)32.

9. Press Release

9.1 The Council adopted a press release, CNL(97)46 (Annex 26).

ANNEX 1

OPENING STATEMENT BY THE MINISTER OF FISHERIES
MR PÂVIARÂQ HEILMANN

Opening Statement by the Minister of Fisheries, Mr Pâviarâq Heilmann

Mr President, Distinguished Representatives, Delegates and Observers, Ladies and Gentlemen:

On behalf of the Greenland Home Rule Government I welcome you all to Ilulissat, to Greenland and to this 14th Annual Meeting of the North Atlantic Salmon Conservation Organization (NASCO).

It is an honour for Greenland to host this meeting. Furthermore it is inspiring to see such a large attendance. I think it is important that you get the feeling of these Arctic conditions which fishermen and the fishing industry in Greenland endure. In this town of Ilulissat fishing for Greenland Halibut and shrimps is of the utmost importance in daily life. As you may know, the salmon fishing takes place further south on the west coast of Greenland.

Ilulissat is, for Greenland, a big town with a highly developed fishing industry and with the capabilities to host a meeting of this magnitude and accommodate all of you. But that is it. As you have filled the town, we hope you will tolerate the inconvenience of not all of you being accommodated in one place.

Hunting and fishing is a natural part of the Greenlander's daily life. But if you ask a Greenlander living off the natural resources from sea and land - like seals, whales, birds, reindeer, halibut and salmon - first he will say he is a hunter - and then a fisherman. However, most commonly, fishing is what makes the money, while hunting and some of the fishing makes the daily bread for him and the family.

The situation of the small scale hunters and fishermen is getting more complex every year. The technological advances of the modern fishery, together with an increasing population, forces effective restrictions and quotas on most of the living resources, restrictions that threaten the old customs and the way of living in the Arctic.

Still, salmon is one of the species appreciated by the Greenlandic people. Not for catch and release, but as a natural part of a varied Greenlandic diet, a diet increasingly threatened by environmental pollutants, as recently published by the Arctic Monitoring and Assessment Programme (AMAP).

Extensive research in the field of the salmon's life cycle and ecology has been carried out through the years in NASCO history. Present and future surveys concern the impact of farmed salmon, where loss of control has led to the spread of diseases and irreversible mixing of genes. On the other hand, exaggerated control of the genes has made it possible to make highly questionable alterations to farmed salmon. For the wild salmon stocks, the risks at stake are just too high.

As a reaction to these problems, NASCO members have agreed to implement the Oslo Resolution by 1998. Greenland also welcomes future NASCO efforts to liaise with the International Salmon Farming Industry (ISFA) and would like to see this development lead into even more firm agreement with the farming industry in a cooperative spirit.

This issue represents just one of the threats to wild salmon stocks. A more holistic approach should be developed. NASCO members must actively practise the burden sharing principle and start to take into account all activities which affect salmon and their habitats.

I hope that the development of Greenland fishing tourism in future could be based on experiences in Arctic nature and possibilities to catch salmon and Arctic Char along with other interesting species. As you may know, we have only one single river in Greenland with the right physical and temperature conditions for salmon spawning. However, trolling and other fishing is just as interesting.

Once again, welcome to Ilulissat. I wish you success in completing the work ahead of you. Finally, I wish you all a very pleasant stay and hope it will be an eye-opener to the special Arctic conditions.

Thank you.

ANNEX 2

OPENING STATEMENT BY THE PRESIDENT

Opening Statement By The President

Minister, Distinguished Delegates, Ladies and Gentlemen:

I would like to add my welcome to that of Minister Pâviarâq Heilmann. It is a pleasure to see you all here in Ilulissat and I hope you have already learnt a little about Greenland, its way of life and will learn more during the next few days.

As you know, I was elected at the close of our last meeting in Gothenburg. In making my Opening Remarks, I must say that I am in the fortunate position of finding myself very much in agreement with the Closing Remarks made by our previous President, Mr Børre Pettersen of Norway.

He said, with regard to aquaculture, that "Adoption of the Oslo Resolution represented significant progress towards safeguarding the wild stocks. However, it is clear from the returns of the measures taken that much remains to be done before 1998 when the Parties should have fully implemented the recommendations. This is an issue that could cause us very severe difficulties in future". I agree with him.

He welcomed the situation that the NGOs now have the opportunity to speak directly to the Council during the Opening Session. He said that "They have a great deal of common sense and knowledge about salmon issues, and we all need their spirit to continue our work". I add my welcome to our NGOs and their contribution.

He said that "The trend of declining salmon abundance which we have witnessed since the mid- to late 70s has meant that major sacrifices have been needed. NASCO has been able to agree reductions in the quotas both at West Greenland and in the Faroe Islands and these measures are increasingly scientifically based. We will need to further refine the models for the West Greenland Commission and to continue the progress now being made in the North-East Atlantic Commission". We are doing that.

He went on to say that "I have recognised that the overall goal for the Parties is to establish the abundance of salmon on a much higher level than it is today, and that we all want to see more fish on the spawning grounds. But the situation is rather depressing. The stocks have declined in the twelve years of NASCO history. NASCO is not to blame. Most of the threats NASCO has identified need a strong political approach at national level, for example: acid rain, water pollution, hydro-power stations, dam building, climate change, and road construction. All these factors reduce the habitat and the spawning opportunities for the wild salmon, and the losses greatly exceed the losses for the high seas we devote so much time to controlling. And we all know that these damaging activities are still going on. To be frank, those damaging activities are more severe than the existence of the fisheries at Faroe and Greenland since NASCO provided the quotas. Most of the threats to the wild Atlantic salmon are in the hands of the nations who are Parties to the NASCO Convention".

Finally he said he was "convinced that the future direction of NASCO should be to combine the Precautionary Principle with the principle of burden-sharing. This means that if some Parties claim that there should be a lower quota at Faroe Islands and Greenland the consequence is that those who claim must also reduce their homewater catch. We must practise the burden-sharing principle and start to counter all the activities which destroy habitat. I am convinced that we all have a deep feeling for the salmon and its future, and that

we all want our great-grandchildren to see the wild salmon in its spawning grounds in the future. From the salmon's point of view, it doesn't matter who the killer is. It is not up to the salmon - it is up to us, to MAN". That is what he said and as your new President, I find myself very much in agreement with him.

Ladies and Gentlemen, it is now one year later than when he made those remarks. We have much to do in these next few days. In the Council we need to address the very complex questions of the impacts of aquaculture on the wild stocks. We need to consider the risk of genetic damage which could have far-reaching consequences, we need to begin the search for a form of salmon aquaculture which poses much less of a risk to the wild stocks. Technology moves fast and we need to consider how to cope with the development of transgenic salmon. What we do in these areas might well call for a Precautionary Approach and this is also on our agenda. However, we shall be considering the use of the Precautionary Approach in all aspects of conservation of salmon stocks and I believe that this will be a major challenge for us. It sounds a simple idea but it will be far from simple to put it into practice.

In the Commissions there is work to do on Regulatory Measures and on other aspects of conservation and I do hope that the three Commissions will work hard to reach a successful conclusion.

What is more, due to the frequency of flights, particularly to Europe, we have less time than normal to accomplish our work. I can only say to you that at least there is no night at this time of the year in Greenland.

With these few remarks, I would like to invite the Parties to make Opening Statements. Just so as to give a chance to be first to those with the misfortune to have a name in English that starts at the lower end of the alphabet, I will this year start with the United States of America.

ANNEX 3

OPENING STATEMENTS MADE BY THE PARTIES

Opening Statement By Canada

Mr. President, Minister, Distinguished Delegates, Observers, Ladies and Gentlemen:

May I begin with a special word of appreciation on behalf of the entire Canadian delegation for the warmth of our welcome in Ilulissat.

Canada and Greenland are neighbours. As northern people we share many challenges. These include the need to conserve Atlantic salmon and to reconcile this with the unique needs of northern communities which are vitally dependent on the harvest of marine resources.

Last year there was a particular focus on northern fisheries. We were challenged to integrate the demands of scientific advice calling for stringent conservation measures with an adjustment program that serves the fundamental needs of our northern communities.

That theme will again be an important focus for our work this week - and I believe we are well prepared to maintain progress.

The Parties in the West Greenland Commission have worked creatively and constructively during this past year to develop an arrangement which I am confident will be well received at this Meeting. This work reflects the integrated approach which NASCO Commissions are required to follow under Article 9 of the Convention.

For Canada, Article 9 is the integrating framework for development of our conservation strategies and management plans. A commitment to science-based conservation is a cornerstone of Canada's fisheries policy for all species. We integrate this with the requirements of Article 9 which include the interests of communities which are particularly dependent on salmon fisheries. These include the right of Aboriginal communities to fish for food, social and ceremonial purposes, the dependence of isolated communities on businesses related to recreational fishing and the remaining commercial fisheries, which take place only in remote coastal communities of Labrador and Quebec.

During the past year, Canada has put a major effort into developing a long term strategy for the Labrador fishery. However, before highlighting our work in that area, it would be useful to put our effort over the past decade into perspective - so that the challenges which remain are illuminated by the significant achievements - and the significant commitments - that have been made in recent years. As a result of this effort, there are now many rivers showing an improvement in spawning escapement.

Prior to 1987, annual catches of over 2,000 tonnes were not uncommon. Since then the total Canadian catch has decreased from 1,784 tonnes in 1987 to 287 tonnes in 1996. All sectors of our multi-faceted salmon fishery have shared in these reductions. For example, according to ICES, over 80% of our total harvest of large salmon used to be in the mixed stock commercial fisheries. It is now down to 25%.

The moratorium on commercial salmon fishing on the Island of Newfoundland, which started in 1992, continues. The only remaining commercial Atlantic salmon fisheries in Canada are in Labrador and in remote northern areas of Quebec.

Aboriginals, anglers, and outfitters have participated through a variety of measures including season limitations, bag limit reductions, catch and release requirements and, ultimately, several complete river and area closures.

We have made a large financial investment in conservation, enhancement and habitat restoration. The permanent retirement of commercial salmon fishing licences is one of the most important and expensive salmon conservation actions taken in Canada. Prior to 1987 there were 3,600 licences retired at a cost of over $28 million. Since then 87% of the remaining licenses have been retired at a further cost of over $43 million. There are now less than 300 licences which can be actively fished. In addition to the investment in licence retirements, the federal and provincial governments have invested many millions of dollars in stock and habitat improvement.

In the Labrador fishery the commercial quota was reduced from 73.5 tonnes in 1995 to 55 tonnes in 1996 with a series of further restraints placed on the length of the season and on the recreational fishery. We described 1996 as a transitional year.

We have followed up with an intense process of consultation and have developed an important long-term strategy which coordinates the complex interests of all the stakeholders. The participants included Aboriginal groups, commercial and recreational fishers, outfitters, the Atlantic Salmon Federation and the provincial government.

The strategy has six principal objectives:

- Rebuild stocks and enhance our understanding of them;
- Meet obligations to aboriginal people;
- Improve harvest management to ensure sustainability;
- Maximize socio-economic benefits;
- Increase dialogue through partnerships;
- Fulfil Canada's obligations with respect to non-Labrador origin salmon.

The Labrador Atlantic Salmon Management Plan for 1997 incorporates several more measures which progress toward fulfilling these objectives. They include closure of the Labrador Straits commercial fishery, a quota cut to 50 tonnes, measures to reduce salmon by-catches, effort reductions for anglers with more restrictions on retention of large salmon, as well as improved monitoring in several areas of the fishery.

The approach taken by Canada, working river by river, has brought people together in Labrador, as it has throughout Atlantic Canada and Quebec. There are many thousands of volunteers working on Canadian rivers for salmon conservation.

Canada believes that the commitment in our Labrador strategy and plans, and in the work of the West Greenland Commission, show that within NASCO the Parties are constructively addressing the issues of transition and conservation which are unique to the needs of the northern communities.

Our work this week will address several other important areas. The impact of aquaculture on the wild stocks is of paramount importance. It is another issue which requires a shared responsibility among all those who benefit from the resource and, like the needs of northern communities, requires the will to lay a foundation for transition. We shall look forward, as

the week progresses, to addressing particular areas such as effective cage security and containment measures where, hopefully, illustrations from our work in Canada can contribute to identifying measures for commitment and decision during the coming year.

Mr. President, may I close by conveying to you, from your many Canadian friends, our sincere respect for your leadership - not only in NASCO, but also in so many other international fisheries fora. You are one of the Atlantic wise men, and we know that under your direction this Fourteenth Meeting of NASCO will be truly productive.

Thank you.

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

Minister, Mr President, Distinguished Delegates, Observers, Ladies and Gentlemen:

It is a great pleasure to be here in the beautiful city of Ilulissat for the 14th Annual Meeting of NASCO. To some of us it is a very great pleasure to see this country again and the unforgettable Disko Bay where fisheries and hunting play a major role in the way of life of the people of Greenland.

For many years the fishing grounds in this country also played a major role in the way of life of the people in Faroe Islands.

The salmon fisheries in the Faroe Islands and Greenland is still a very important factor to the people in our countries.

However, we see this 14th meeting of NASCO as a further step forward in the fruitful discussions between our countries and an opportunity NASCO to strengthen regional cooperation in the North-East Atlantic and the West Greenland to the study and management of salmon.

In NASCO we also have the responsibility to raise our concerns and to do our best in the cooperation for rational management, conservation and optimum utilisation of the living resource of the sea and to develop such management procedures which take into account the relationship between our customary method of fisheries with respect to the stocks.

Many factors are affecting the salmon stocks, and great losses of salmon are caused by pollution and habitat damage. All these factors reduce the habitat and the spawning opportunities for wild salmon and these damaging activities are still going on and are more severe than the fisheries at Faroe Islands and Greenland.

The fishery for salmon in the Faroese waters does not threaten any stock. Since NASCO established a quota which has been reduced every year the fishery in the Faroese waters has been suspended. However, we would like to stress our right to fish, and sustainable utilisation of the stocks based upon the best scientific advice presented to NASCO.

With all the threats NASCO has to deal with, and which are in the hands of the Parties to the NASCO Convention, my delegation would prefer to see the burden sharing principle as a consideration in all decisions taken by NASCO. This means that the Faroese quota share cannot be lower than the existing level.

The Faroese research fishery has been recognised as being of major importance to the scientific programme and a continuation of this research is recommended by ICES. In respect of this, the Home Government of the Faroe Islands, in an agreement with the Faroese Salmon Fishermen's Association, will provide for such a research programme by one vessel later this year.

With the ongoing growth of the Atlanto-Scandian herring stock and its movements in the North Atlantic, the feeding area for a large proportion of the wild salmon in the North-East Atlantic, it is now more than ever important to strengthen the research on salmon at the sea.

We are looking forward to hearing and to discussing views which may give inspiration to solutions for rational utilisation of the fisheries resources in the North Atlantic and solutions for sustainable fisheries.

Opening Statement by the European Union

Mr. President, Minister, Distinguished Delegates and Observers:

We have now reached the 14th Annual Meeting of NASCO. Not only have we moved far away from NASCO's origins in the early 1980s, but today, we are also far away from our Organisation's headquarters in Edinburgh in Scotland. Our common interest in NASCO continues to increase through the years as the issues dealt with in NASCO also increase in their complexity.

As the European Union, we represent fifteen countries with very diverse points of view. Those European Union countries with a direct interest in North Atlantic salmon go from Finland in the north to Spain and Portugal in the south. Though not all the European Union Member States have a direct interest in salmon, all contain populations with a keen interest in salmon consumption - I can number myself among those people. At this week's meeting, as on previous occasions, the European Union will express one single voice on behalf of all our Member States.

We are here today in Ilulissat, one of the largest towns in Greenland (a population of 4,000 people and 6,000 working dogs), but it is certainly the smallest ever venue of any NASCO annual meeting. I come here on this occasion with great pleasure at being in a part of the world previously unknown to me. For the first time, I have had the opportunity to have some small understanding of the issues which affect one of the other Contracting Parties of NASCO and in particular, of those issues affecting the West Greenland Commission. For this opportunity, I would especially like to thank the hosts of the meeting, the Home Government of Greenland and especially the authorities of the town of Ilulissat. I am personally very satisfied with all the arrangements that have been made for our comfort in this very wild and beautiful part of the world and along with all my colleagues present, I very much look forward to the remainder of my stay.

We have a number of important challenges ahead of us in the next few days. We, as representatives of the Contracting Parties to NASCO, must make decisions on the future of the wild salmon stocks in the North Atlantic including addressing the important issue of transgenic salmon and introductions and transfers. We welcome the future collaboration with the salmon farming industry as a vehicle for improved management and safeguarding to the wild salmon stocks. As the European Union, we remain fully committed to the sound management of fishery resources based on the best possible scientific information available. I feel that this commitment will direct our week's work and enable us to reach clear decisions on the management of North Atlantic salmon.

The European Union will, as always, contribute towards the successful outcome of this year's meeting.

Mr. President, I would finally like to thank you personally for all your hard work in bringing this meeting to Ilulissat. I welcome you as the new President of NASCO and know that you will easily meet the challenge ahead of you. I wish you the very best in your work over the next few days and I look forward to working with you, the NASCO Secretariat and all our partners from the other Contracting Parties in the most constructive way possible in order to reach all the objectives we have set ourselves. Thank you.

Opening Statement by Iceland

Mr President, Minister, Distinguished Delegates, Observers, Ladies and Gentlemen:

We are pleased to participate in the 14th Annual Meeting of NASCO in the unique setting of Ilulissat and we thank you, Mr President, and the Greenland Home Rule, for your invitation and hospitality.

I would like to bring you greetings from Helgi Agustsson, who was unfortunately unable to head our delegation at this meeting.

As in most other salmon producing countries, the Icelandic angling catch in 1996 was considerably lower than in 1995 and 20% below the 5 and 10 years catch averages. This fact demonstrates that the stocks are at a low level and a considerable reduction in fishing effort both in coastal and oceanic areas should be advocated.

It is likely that the reduction in salmon abundance is primarily related to changes in the salmon's freshwater as well as marine habitats. Other complicating factors, however, cannot be ruled out, such as by-catch of salmon in other type of gear and poaching. Recently there has been disturbing news regarding by-catch of salmon in pelagic trawls, both in mackerel and herring fisheries, and the overall use of such trawls is increasing. Norwegian scientists have furthermore successfully caught half-grown salmon at sea using such gear. It is a disturbing fact that such incidents can probably only be documented but not stopped.

These and other issues related to the patrolling and surveillance of the international salmon areas were discussed at a NASCO meeting in London last March and the results are presented as a Council paper.

The ICES/NASCO symposium on the interaction of wild, reared and ranched salmon, which was held in Bath, England last April, was a great success although we are far from any final conclusion regarding this important issue. Further research is needed but we clearly need to use the precautionary approach to safeguard the salmon stocks as far as practicable.

During the last 3 years a new diatom algal growth has been observed in Icelandic rivers and seems to be spreading to more rivers. It is suspected that this growth is related to changes in environmental conditions, possibly changes in the ozone layer. Similar observations have been reported in Canada and scientists are comparing notes and documenting distribution of the algae.

As we have stated in the past, Iceland is greatly concerned that its share in the contribution to NASCO has risen beyond what is reasonable through the inclusion of the ranched salmon catch in the calculations. We have pointed out that ranching falls outside the scope of the NASCO Convention. In 1986 the Icelandic contribution was 5% of the total budget but has risen to more than 13% in recent years. Iceland urges other Parties to cooperate in finding a fair solution to this problem without having to make changes to the NASCO Convention.

We have a lot of important issues to discuss at this meeting and the Icelandic delegation looks forward to a fruitful meeting conducted in the spirit of cooperation and fairness. Thank you, Mr President.

Opening Statement by Norway

Mr President, Minister, Delegates, Observers, Ladies and Gentlemen:

It gives me great pleasure, and - I must admit - a certain excitement, to address the annual meeting of NASCO here in the very beautiful surroundings of Ilulissat. On behalf of my delegation, I want to thank the Home Rule Government for their kind invitation to this meeting.

To me, this country and these surroundings illustrate the direct relationship between nature and our societies. In this part of the world, utilization of the resources in the sea plays an essential role, and sustainable managment has been essential even long before this phrase was coined. Most of us, coming from highly industrialized parts of the world where nature in some respects has been tamed, could and should keep this dependence in mind throughout all our planning and management. When discussing conservation and management of Atlantic salmon, of course, these relationships become very obvious.

At the last annual meeting, I commented on the gloomy background for the meeting with a marked decrease in catch statistics. And I must say, Mr. President, that the situation this year seems to be even worse. This is the reason why the Norwegian Government has initiated work on a report on all significant factors affecting the wild stocks of Atlantic salmon in Norway, with a special focus on aquaculture, habitat management in rivers and regulatory measures in fisheries.

On this last issue, I briefly want to mention that Norway this year has introduced substantial restrictions in salmon fisheries, both in the rivers and in coastal waters. We have introduced a ban on one of the two gears used in sea fishing for salmon, namely the bend nets, and the other gear - the bag net - has been severely restricted. These regulations are, beyond doubt, the most severe since we introduced the drift net ban in 1989.

We all know that decisions taken on the international level have a bearing on national politics. Measures taken on the international level should therefore constantly be revised and improved to secure that observed changes and new challenges are met with appropriate management measures. To this end, I look forward to a constructive discussion, in particular on the politics on transgenic salmon and the application of the precautionary approach to salmon management.

Let me finally, Mr. President, thank you, our Greenlandic hosts and the Secretariat for your excellent work organizing and preparing for this meeting.

Thank you.

Opening Statement by the Russian Federation

Mr President, Mr Minister, Distinguished Delegates, Observers, Ladies and Gentlemen:

I am grateful for this opportunity to address the 14th Annual Meeting of NASCO and to express my warmest greetings. I would also like to send greetings on behalf of the leaders of the State Committee for Fisheries of the Russian Federation, who have expressed their profound satisfaction at the actions taken by the Organization and the Contracting Parties to promote conservation of Atlantic salmon stocks. In particular they support the development of international guidelines to conserve wild salmon stocks with undisturbed genetics which is of special importance.

In recent years notable changes in priorities of utilizing the Atlantic salmon stocks have taken place in Russia. As a result of management measures the commercial catches from rivers have been reduced. A catch limit for the coastal fishery in the White Sea is established annually, a proportion of which also reduces. Catch and release is being practised in our country as a conservation measure in recreational fisheries, and has considerably improved the situation in most salmon rivers. Our experience of fishing is limited, therefore we welcome and support NASCO's efforts in developing guidelines on catch and release and I hope that we can formally adopt these for use by the Parties.

Considerable work has been conducted by NASCO since the last meeting. The ICES/NASCO Symposium on Interactions between Salmon Culture and Wild Stocks of Atlantic Salmon is worthy of the highest evaluation, as well as the second meeting of the representatives of coastguard/fishery protection authorities, at which results from surveillance of salmon fishing in international waters during 1995-1996 were considered. International cooperation on these issues is considerable in international waters and the Russian delegation believes that it should be continued in future.

The forthcoming meeting of NASCO will consider many important issues. The most important of these is, in our opinion, the problem of transgenic salmon. We believe that discussion on this issue will be beneficial. NASCO has much experience in arranging special sessions on the most important issues. In particular, the session on "The Atlantic Salmon as Predator and Prey" which took place last year is of high practical importance. In this connection we support the proposal for arranging a special session on transgenic salmon during the15th Annual Meeting of NASCO, and the meeting of the Liaison Group between NASCO and the International salmon farming industry, which will be held in Boston in early 1998. In our opinion, this will allow the risks from transgenic salmon to be kept under control.

We believe that the issue of the salmon fishery in the sea is also important. Supporting NASCO's efforts towards surveillance of fishing for salmon in international waters, recognizing the importance of research fishing for salmon in international waters to study the marine phase of the life cycle and distribution during the post-smolt phase, and taking into account the significance of the Precautionary Approach to fisheries management, we should like the NASCO Contracting Parties to recognise a concern of Russia about allocating quotas for fishing in the Faroese economic zone. Strict conservation measures to reduce the commercial catch of salmon have been implemented by all the North-East Atlantic countries, and the issue of the Faroese quota should, in our opinion, be resolved in a way which takes account of these changes.

We should also like the situation of the Pechora Rivers to be considered at the Council meeting. The situation in this, the largest salmon river in Europe, is catastrophic and we are not able to resolve this problem on our own. Any assistance from international organizations would therefore be accepted with sincere gratitude.

Finally, on behalf of the members of the Russian delegation I would like to thank the Greenland Home Rule and the Secretariat for their work in organizing and preparing this meeting and for the hospitality on the "greenest" island in the World. I wish you all a successful meeting. Mr President, we believe our joint work will be fruitful and that we will find mutual understanding on all the issues.

Thank you, Mr President.

Opening Statement by the Unites States of America

Mr President, Minister Heilmann, Secretary Windsor, Representatives, Delegates, Ladies and Gentlemen:

I am pleased to take this opportunity to express the appreciation and gratitude of the United States to the people of Greenland and their Home Rule Government for hosting this 14th Annual Meeting of NASCO.

For us this is an opportunity to view the scenic splendour of your country and observe a way of life very different from our own. In this brief visit we can only begin to improve our understanding of this country and its people. However, I sincerely hope that the opportunity to spend this week in Greenland will raise our awareness of Greenland's perspective on the work of NASCO in developing workable and fair international conservation plans for Atlantic salmon.

As the name of the Organization attests, all NASCO Parties share the responsibility for conservation and we have made substantive, though slow, progress. We cannot claim success because many stocks are at dangerously low levels. But I hope we will soon see improvements if we hold to our task.

Here in Greenland your salmon fishery has been the focus of international concern and contention for some time. The fishermen of Greenland have seen large reductions in the size of their fishery as the stocks have declined and conservation efforts have increased to save the salmon and salmon fisheries. It must often seem, here, that the brunt of the conservation effort has been focused on Greenland. But other countries, including the United States, have also made major changes in fisheries and policies in order to protect the remaining stock and rebuild the salmon resources for all of our futures.

The United States is continuing to develop and implement conservation measures for the salmon in our rivers and we have seen some recent improvements in those stocks due to our stock enhancement efforts. But the stocks in our rivers are still at critically low levels, while interceptory fisheries still occur in Canada and Greenland. In Canada, we are encouraged by the recently published policy to reduce and eventually eliminate interceptory fisheries. We hope that the discussions in the North American Commission can further this effort through catch quota negotiations and other agreed measures.

For West Greenland, great credit in the name of conservation is due for the important precedent established under the 1993 agreement, of setting scientifically-based quotas with the simple principles of protecting spawning stocks of salmon and only harvesting the surplus. This is a precedent that the United States feels should be followed for all the fisheries under NASCO management in each of the Commissions. Unfortunately, last year, the agreement hit a snag and no NASCO quota for the West Greenland Commission area was established, which greatly concerns my government. However, two substantive intersessional meetings of the West Greenland Commission have occurred since last year. Accordingly, I am confident that we will be able to get back on the constructive course set in 1993. I believe we can refine our agreement to better account for the natural variation of the resource, the inherent uncertainties of the science, and the need for balance in the harvest of the salmon by all Parties and that similar progress towards scientific quota management can soon be made in the other Commissions of NASCO. I am confident that our enhanced

appreciation of Greenland, its people and their culture gained this week in Ilulissat will foster that progress.

In conclusion, Mr President and Minister Heilmann, let me assure you and the people of Greenland as well as the other Parties, that the United States is committed to the protection, restoration, and conservation of all populations of Atlantic salmon, and we will not ask more of others than of ourselves in this endeavour.

Thank you.

ANNEX 4

OPENING STATEMENT MADE BY INTER-GOVERNMENT ORGANIZATION

Opening Statement by the IBSFC

Mr President: The IBSFC welcomes the close cooperation that has been developed with NASCO in recent years.

Both organizations are faced with similar problems in protecting the wild salmon stocks.

In spite of a lot of effort made, IBSFC is not in a position to restore the wild Baltic salmon stocks using the traditional management tools (TACs, reduction of TACs, closed seasons and periods).

Among other measures, IBSFC has reduced the TAC for the main basin of the Baltic Sea from 630,000 fish (1993) to 410,000 fish (1997). Being aware that the problem can only be solved over a longer period of time and by complex measures, the Commission adopted at its first Extraordinary Session the "IBSFC Salmon Action Plan 1997-2010". The long-term objective is among others defined as follows:

"The production of wild salmon should gradually increase to attain by 2010 for each salmon river a natural production of wild Baltic salmon of at least 50% of the best estimate potential and within safe genetic limits, in order to achieve a better balance between wild and reared salmon".

A Salmon Action Plan Surveillance Group has been established for constant monitoring of the impact of the Action Plan and to propose amendments to it.

The first actions agreed upon in this group were:

- Establishment of a sub-group on Genetic and Ecological Aspects on Stocking of Baltic Salmon

- Elaboration of a salmon river inventory (salmon rivers and potential wild salmon rivers)

Thank you.

ANNEX 5

OPENING STATEMENTS MADE BY NON-GOVERNMENT ORGANIZATIONS

Joint NGO Statement on Homewater Fisheries

Retiring NASCO President Børre Pettersen in his final remarks at Gothenburg said "It seems to me that there are few links between how the Parties behave in NASCO, and how they behave in some important areas at a national level. I would like to quote an old Chinese saying - I hear what you are saying but your actions drown out your words. Therefore it surprises me that Parties don't seem to use the same principle within their own jurisdiction as they have agreed in the NASCO Convention. Interceptory Net Fisheries for mixed stocks of salmon still operate in coastal waters of the United Kingdom and the Republic of Ireland. Such fisheries also intercept salmon stocks from other countries".

Although we recognise that the UK has undertaken to phase out the North East coast drift net fishery, albeit over an extended timescale, and some measures are under consideration in Ireland, it is easy to understand why States such as Greenland have been reluctant to accept a quota when they see other Parties failing to control the interception of hundreds of tonnes of mixed stocks of salmon in their home waters.

While we understand the problems that the Governments of the United Kingdom and Republic of Ireland have in apportioning the exploitation of such mixed stocks between competing sections of the population, we believe that failure to control such exploitation has contributed to the rapid decline of salmon stocks in the North Atlantic.

We condemn the continued fishing of mixed stocks of Atlantic salmon outside their rivers of origin, and call for an immediate cessation of the practice, with the exception of Greenland and the Faroes when quotas have been set by NASCO.

NASCO has achieved considerable success in controlling exploitation of salmon in international waters, and on the high seas fisheries of the North East and North West Atlantic, by application of independent scientific advice from ICES. The NGOs respectfully suggest that the acceptance of independent scientific advice by the Parties in respect of their home waters would contribute significantly to the improvement of salmon management in the North Atlantic, help conserve this threatened species, and arrest the alarming decline of stocks apparent over the past 30 years.

<u>This statement is supported by:</u>

Association Internationale de Défense du Saumon Atlantique
Atlantic Salmon Federation (USA and Canada)
Atlantic Salmon Trust
European Anglers Alliance
Federation of Irish Salmon and Sea-trout Anglers
National Anglers Representative Association
Norges Bondelag
Norske Lakseelver
Salmon & Trout Association
Scottish Anglers National Association
Ulster Anglers Federation

Joint NGO Statement on Predation

The 1996 Special Session on "The Atlantic Salmon as Predator and Prey" produced a wide range of evidence on the damage done by both fish-eating birds and seals to salmon stocks. Much of this information was already familiar to many of the participants. Although no conclusions were drawn from the discussion which followed the presentation of the papers, and none appeared in the published report, the Special Session was useful in highlighting the threat to salmon stocks from predator species.

Around the United Kingdom alone, it is estimated that the grey seal population is growing at a rate of 6% annually, and that the amount of salmon eaten by seals in a year is more than double the catch of wild salmon and grilse by all methods. Recognition of the bird predation problem is even more widespread. The European Parliament, and now the Committee of the Regions (the advisory group representing European Union local authorities), have both called on the European Commission to take urgent action to counter the explosion in the cormorant population which has been accompanied by movement of the birds to inland waters to roost and feed.

The NGOs note with pleasure that the management implications of salmon predation are to be discussed under Item 5.6 of the Agenda. At the time of drafting this submission, the relevant Council paper has yet to be issued, but the NGOs appeal to the Council to come to a decision at this meeting to advise timely action to reduce the effect of both seal and bird predation on salmon stocks. Calls for further consideration or research will be pointless, well-directed research is already in progress, but the scale of the problem is such that interim measures need to be developed and undertaken without further delay.

This statement is supported by:

Association Internationale de Défense du Saumon Atlantique
Association of Scottish District Salmon Fishery Boards
Atlantic Salmon Federation (USA and Canada)
Atlantic Salmon Trust
European Anglers Alliance
Federation of Irish Salmon and Sea-trout Anglers
National Anglers Representative Association
Norges Bondelag
Norske Lakseelver
Salmon Net Fishing Association of Scotland
Salmon & Trout Association
Scottish Anglers National Association
Ulster Anglers Federation

Opening Statement by the Atlantic Salmon Trust

At the 1992 NASCO Council meeting we learnt with concern of the incidental catch of salmon in a pelagic trawl fishery for mackerel and horse mackerel in international waters close to the Norwegian EEZ (CNL(92)19, CNL(92)55). This fishery, which involves vessels from Lithuania, Estonia and Latvia, and possibly also the former German Democratic Republic and Bulgaria, takes place during the summer. An example was given where the by-catch of salmon in one haul amounted to 0.3t (equivalent to about 70 salmon). With an estimated involvement of between 25 and 100 vessels the potential catch of salmon could be large. In addition there is a similar larger fishery for mackerel inside the Norwegian EEZ in the same general area.

We are also very disturbed to read recently of the potential by-catch of post smolts in the mackerel and spring spawning herring fisheries and also of the capture of post smolts in the trawl fishery for redfish on the Reykjanes Ridge (CNL(97)12, pp. 29-30).

The control of such fisheries inside and outwith an EEZ, which are not specifically aiming to catch salmon, is very difficult. However, a protocol, drafted to cover salmon fishing by non-Contracting and Contracting Parties, could include a clause to cover by-catches. This is the sort of arrangement where by-catches occur in other fisheries, for example a limit is put on the amount of haddock and whiting that can be taken as a by-catch in the Danish North Sea pout fishery. However, before such arrangements were enforced we would suggest that biologists should accompany these vessels to observe and record any by-catch of salmon, and take various samples from these fish. They could also determine those areas providing the largest by-catches of salmon. If such an undertaking was impractical we would suggest a research fishery was undertaken in these areas using the same gear as the commercial fishers.

Opening Statement by the Federation of Irish Salmon and Sea Trout Anglers

Mr President, may I thank you most sincerely for your kind words of condolence on the death of the Honorary President of FISSTA, Mr Jim Maxwell. I do so on behalf of his wife and family, for FISSTA, his fellow NGOs and on my own behalf.

FISSTA congratulates you and the Home Rule Government of Greenland for your imaginative and courageous initiative in holding the NASCO conference here in Ilulissat. It is fitting that we from the salmon producing countries should visit one of the countries where our salmon travel to feed.

Jim Maxwell was an evangelist encapsulating what NGOs are or should be, and what they represent: the invaluable experience and voice of the ordinary angler on the river bank.

FISSTA and NASCO came into existence about the same time and Jim realised the importance of NGOs and he helped to create, in no small way, the development of their role and appreciation within NASCO. This healthy interaction between an inter-governmental organization and NGOs has had a beneficial "knock-on" effect in that a hopeful new era of better relationships between official bodies and anglers' representatives has arrived. This applies, apart from NASCO, to governmental bodies, fishery and marine departments, biologists and scientists, both national and international.

Consultations and cooperation rather than confrontation is far more preferable and progressive, where it is possible without NGOs compromising their independence of action and critical analysis and voicing of their concerns and views at home and abroad.

FISSTA showed what an NGO can achieve when we held a prestigious international conference entitled "Wild Salmon Management - The Angler's Options". This took place in Skibbereen (home town of Jim Maxwell) in September last. We were honoured to have Dr Peter Hutchinson, Assistant Secretary of NASCO, attend as well as other eminent international speakers. Instead of official governmental fishery organizations getting anglers to attend conferences, anglers were bringing the officials instead. It is intended to get the full papers and contributions of this conference published. It will stand as a fitting tribute to the vision and dedicated work of Jim Maxwell for wild salmon and sea trout.

Wreath Laying Ceremony in Ilulissat

During the NASCO delegates' tour among the icebergs on the evening of 11th June, a simple memorial service was held. A wreath of palm leaves brought from Mr Maxwell's garden in Ireland was laid upon the sea by the FISSTA delegate in the presence of other Irish and international delegates, governmental and non-governmental.

Attached to the wreath was a card from his family and another card decorated with a salmon fly with a simple message which read:- "Thank you Jim from all of your friends." That included people everywhere!

Opening Statement by the National Anglers Representative Association

Mr President, Minister, Delegates and fellow NGOs:

Thank you, Mr President, for the opportunity to address this 14th Annual Meeting of NASCO in Ilulissat. I am an NGO from Ireland representing the governing body called NARA - National Anglers Representative Association. We represent the interests of over 100 game angling clubs in Ireland - Salmon, Trout and Sea Trout. I am privileged to come from the Emerald Isle of Ireland to the Green Isle of Greenland to express my opinions.

At the NASCO conference I will confine my remarks to salmon.

I was privileged to represent my organization and all salmon anglers in Ireland on the Salmon Management Task Force set up by the Minister of State for the Marine, Eamon Gilmore, in October 1995.

The Report of the Task Force was accepted by the Minister in June 1996. I'm sure NASCO appreciates the task achieved by the Task Force in concluding their brief in a mere eight months.

I am invited to speak to you as an NGO from Ireland and so in doing that I am not in any way speaking for the Government or as an agent of Government, but I am pleased to report on progress by the Task Force and the Irish Government towards the better conservation of the wild Atlantic salmon resource in Ireland, including Spring salmon (2SW fish) using the precautionary approach.

Some measures have already been put in place to lessen the impact on mixed stocks and on spring salmon including the introduction of a four day fishing week, the delaying of the opening date for net fishing, 17 hours fishing time in every 24 hours, capping the number of commercial licences isued to the 1995 level and confining fishing to within a 6 mile limit of baselines. A quota and carcass tagging regime is being actively pursued with the intention of introducing it in 1998. Management plans for each of the major catchments are being drawn up. These are clear indications of burden-sharing by the net fishers and the anglers of Ireland.

As I say I am pleased to report this progress by Ireland and to be associated with it through my Governing Body, NARA, and our involvement in the Task Force. It is only the first step. Much much more needs to be done. We will be pushing the Irish Government and we will encourage all salmon interests to push for the implementation of further measures so that optimum spawning targets are achieved and that other interests including commercial fishermen are catered for in the best interests of the wild North Atlantic salmon.

Go raibh mile maith agaibh (thank you).

Opening Statement by the Scottish Anglers National Association

Mr President, Minister, Distinguished Delegates, Ladies and Gentlemen:

The Scottish Anglers National Association supports the joint NGO statement but wishes to comment briefly on the matter of transgenic salmon, a topic already mentioned by several speakers this morning.

It is evident from the Bath Symposium that there are very real concerns about the possible adverse impacts of transgenic salmon on the wild stocks via genetic, ecological, disease and parasitic factors.

We believe that the use of transgenic salmon in aquaculture could pose a major threat to wild stocks because of the irreversible transmission of transplanted genes through inter-breeding and because of ecological effects.

There is a need for positive action here and we trust some progress is made with the draft resolution on transgenics which is before you this week.

It is important for Council to consider the measures needed to safeguard currently dwindling wild stocks before transgenics technology is available on a commercial scale - perhaps as soon as the Millennium.

With this in mind, we and other NGOs support plans to make transgenic salmon the subject of a Special Session at the 15th Annual Meeting next year.

Thank you, Mr President.

Opening Statement by the Salmon Net Fishing Association of Scotland

The Salmon Net Fishing Association of Scotland welcomes this opportunity to make a brief opening statement.

In our opening statements at the Twelfth and Thirteenth Annual Meetings, we highlighted the rapid increase (from an estimated 65,000 animals in the mid 1970s to in excess of 100,000 animals in the mid 1990s) in the all-age grey seal population in British Waters with at least 90% associated with colonies breeding around the Scottish cost and adjacent islands. We reported that if salmon composed only 1-2% of the grey seal's diet it might be undetected, yet 2-4 times the 1994 British all-methods salmon catch would have been consumed. These quantities are equivalent to 515,000 - 1,030,000 adult salmon and not an insignificant number of fish.

The Report of the Scottish Salmon Strategy Task Force published in early 1997 confirmed our calculations and estimated that if salmon was only 1% of the minimum daily food requirement of Scotland's 96,800 grey seals in 1995, they would have eaten 1,413 tonnes of salmon (about 400,000 fish) or about 2.5 times the total catch of wild salmon and grilse (586 tonnes) taken that year. In addition, 240 tonnes of salmon (about 70,000 fish) may have been consumed that year by Scotland's 26,400 common seals.

Based on the same assumptions as those used by the Scottish Salmon Strategy Task Force that the minimum daily food requirement of each grey seal is 4kg and that only 1% is salmon, Scotland's estimated 60,000 grey seals in 1975 would have consumed 876 tonnes of salmon (about 250,000 fish). This tonnage is about half the total catch of wild salmon and grilse (1,621 tonnes) taken that year.

In 1975-95, the assumed loss to predation by grey seals has not only increased in total (from 876 to 1,413 tonnes) but also as a percentage of the total Scottish catch (from 50-250%) and now exceeds it by a factor of 2.5 (1,413 tonnes compared with 586 tonnes).

The most frequently used method for assessing seal diet in recent years has been to examine fish otoliths and cephalopod beaks found in stomachs and faecal samples. However, recent data suggest that this method is not appropriate for assessing physical interactions of seals on fisheries because the otolith reconstruction method does not reflect either the fishery prey species or prey size classes.

We urge NASCO to request ICES to re-examine the effect of seal predation on salmon stocks in the respective Commission areas.

ANNEX 6

LIST OF PARTICIPANTS - 1997

* Denotes Head of Delegation

CANADA

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MR GEORGES ARSENAULT	Department of Environment and Wildlife, Province of Quebec, Quebec
MR KEN CURNEW	Department of Forest Resources and Agrifoods, Province of Newfoundland and Labrador, St John's, Newfoundland
MR RICHARD HEGAN	Department of Fisheries and Oceans, Ottawa, Ontario
MR MURRAY HILL	Department of Fisheries, Province of Nova Scotia, Pictou, Nova Scotia
MR KEN JONES	Department of Fisheries and Oceans, Ottawa, Ontario
MR DAVID MEERBURG	Department of Fisheries and Oceans, Ottawa, Ontario
MR REX PORTER	Department of Fisheries and Oceans, St John's, Newfoundland

DENMARK (IN RESPECT OF THE FAROE ISLANDS AND GREENLAND)

MR EINAR LEMCHE	President of NASCO Greenland Home Rule, Copenhagen
*MR KAJ MORTENSEN	Representative Faroese Home Government, Torshavn

MR PÂVIARÂQ HEILMANN	Greenland Home Rule, Nuuk
MR JESPER KOLDBORG JENSEN	Representative Greenland Home Rule, Nuuk
MR PER KANNEWORFF	Institute of Natural Resources, Copenhagen
MR JASPUR KRUSE	Felagid Laksaskip, Klaksvik
MR SIVERTH D LARSEN	Greenland Home Rule, Nuuk
MR OLE PETERSEN	Ministry of Foreign Affairs, Copenhagen
MR SOFUS POULSEN	Faroese Commercial Attaché, Aberdeen
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EUROPEAN UNION

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MS ASTRID JAKOBS DE PADUA	Ministry of Agriculture, Forests and Fisheries, Bonn
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MR PEKKA NISKANEN	Ministry of Agriculture and Forestry, Helsinki
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MR HENRIK SVENBERG	Ministry of Agriculture, Stockholm
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ICELAND	
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NORWAY	
*MR STEINAR HERMANSEN	Representative Ministry of the Environment, Oslo
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DR KEVIN FRIEDLAND	National Marine Fisheries Service, Woods Hole, Massachusetts
MR ALLEN PETERSON	National Marine Fisheries Service, Woods Hole, Massachusetts
DR JEAN-PIERRE PLÉ	Department of State, Office of Marine Conservation, Washington DC

INTER-GOVERNMENT ORGANIZATIONS

DR ROGER BAILEY	International Council for the Exploration of the Sea, Copenhagen
MR JEAN-JACQUES MAGUIRE	International Council for the Exploration of the Sea, Sillery, Quebec
DR WALTER RANKE	International Baltic Sea Fishery Commission, Warsaw

NON-GOVERNMENT ORGANIZATIONS

MR RICHARD BEHAL	Federation of Irish Salmon and Sea-Trout Anglers, Ireland
MR PATRICK BYRNE	NARA, Ireland
MR IAN CALCOTT	Scottish Anglers National Association, Scotland
MR BJORNULF KRISTIANSEN	Norges Bondelag (Norwegian Farmers Union), Norway
DR FREDERIC MAZEAUD	AIDSA, France
DR DEREK MILLS	Atlantic Salmon Trust, UK
MR BJORN MOE	Norske Lakseelver (Norwegian Salmon Rivers), Norway
MR CHRIS POUPARD	Salmon and Trout Association, UK and European Anglers Alliance
MR HENNING RØED	World Wide Fund for Nature (Norway)
MR WILLIAM SHEARER	Salmon Net Fishing Association of Scotland and Association of Scottish District Salmon Fishery Boards

SECRETARIAT

DR MALCOLM WINDSOR	Secretary
DR PETER HUTCHINSON	Assistant Secretary
MISS MARGARET NICOLSON	PA to Secretary
MRS THERESA GAWTHORNE	PA

Assisting Secretariat

MRS AUGUSTA JEREMIASSEN	Greenland Home Rule
MRS KIRSTEN KOFOED	Greenland Home Rule

ANNEX 7

CNL(97)40

Fourteenth Annual Meeting of the Council
10-12 June 1997
Hotel Arctic, Ilulissat, Greenland

Agenda

1. Opening Session

2. Adoption of Agenda

3. Administrative Issues

3.1 Secretary's Report

3.2 Report of the Finance and Administration Committee

3.3 Reports on the Activities of the Organization

4. Scientific, Technical, Legal and Other Information

4.1 Scientific Advice from ICES

4.2 Report of the Standing Scientific Committee

4.3 Catch Statistics and their Analysis

4.4 Salmon Tagging and the Tag Return Incentive Scheme

4.5 Review of International Salmon Related Literature Published in 1996

5. Conservation, Restoration, Enhancement and Rational Management of Salmon Stocks

5.1 Measures Taken in Accordance with Articles 14 and 15 of the Convention

5.2 The Use of the Precautionary Approach by NASCO

5.3 Fishing for Salmon in International Waters by Non-Contracting Parties

(a) Protocol for Non-Contracting Parties and Actions Taken in Accordance with the Resolution
(b) International Cooperation on Surveillance

5.4 Scientific Research Fishing in the Convention Area

5.5 Impacts of Aquaculture on Wild Salmon Stocks

(a) Returns made in accordance with the Oslo Resolution
(b) Progress in establishing a Liaison Group with the salmon farming industry
(c) Report of the ICES/NASCO Symposium
(d) Resolution on Transgenic Salmon

5.6 The Atlantic Salmon as Predator and Prey - Management Implications

5.7 Guidelines on Catch and Release

5.8 Guidelines on Stocking

5.9 Reports on Conservation Measures Taken by the Three Regional Commissions

6. Other Business

7. Date and Place of Next Meeting

8. Draft Report of the Meeting

9. Press Release

ANNEX 8

COUNCIL

CNL(97)52

OUTLINE OF 1998 BUDGET, 1999 FORECAST BUDGET AND SCHEDULE OF CONTRIBUTIONS

North Atlantic Salmon Conservation Organization
1998 Budget And 1999 Forecast Budget (Pounds Sterling)

Section	Description	Expenditure	
		Budget 1998	Forecast 1999
1	Staff Related Costs	207,820	214,040
2	Travel and Subsistence	28,250	36,590
3	Contribution to ICES	26,970	27,770
4	Contribution to Working Capital Fund	0	0
5	Meetings	18,750	19,310
6	Office Supplies, Printing and Translations	27,390	28,200
7	Communications	10,870	11,180
8	Headquarters Property	-21,650	-20,980
9	Office Furniture and Equipment	7,250	7,460
10	Audit and Other Expenses	8,350	8,590
11	Tag Return Incentive Scheme	4,550	4,550
	Total	318,550	336,710

		Revenue	
		Budget 1998	Forecast 1999
12	Contributions - Contracting Parties	324,800	341,710
13	Miscellaneous Income - Interest	11,000	10,000
14	Stabilisation	-17,250	-15,000
15	Surplus or Deficit (-) From 1996	0	0
	Total	318,550	336,710

NASCO Budget Contributions For 1998 And Forecast Budget Contributions For 1999 (Pounds Sterling)

Catch (tonnes)	Party	Budget 1998	Forecast 1999
287	Canada	35,189	37,021
92	Denmark (Faroe Islands and Greenland)	20,738	21,818
1414	European Union	118,707	124,887
357	Iceland	40,376	42,478
787	Norway	72,242	76,003
131	Russian Federation	23,628	24,858
0	USA	13,920	14,645
3068	TOTAL	324,800	341,710

Contributions are based on the Official Catch Statistics as provided to NASCO. Column totals can be in error by a few pounds due to rounding.

ANNEX 9

COUNCIL

CNL(97)13

REPORT OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT

REPORT TO THE NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

Source of information: Report of the Working Group on North Atlantic Salmon, April 1997 (ICES Doc. CM 1997/Assess:10).

Sections 1–4 of this report are set out in the order of the questions from NASCO to ICES (Appendix 1).

1 ATLANTIC SALMON IN THE NORTH ATLANTIC AREA

1.1 Overview of Catches

1.1.1 Nominal catches

Nominal catches of salmon by country in the North Atlantic (including ranched salmon in Iceland) for 1960-1996 are given in Table 1.1.1.1. Reported catches by NASCO Commission Areas are illustrated in Figure 1.1.1.1, and those for 1991–1996 are shown below (in tonnes (t)):

Area	1991	1992	1993	1994	1995	1996
NEAC	2947	3366	3340	3578	3283	2711
NAC	713	524	375	358	260	293
WGC	476	242	0	0	85	92
Total	4136	4132	3715	3936	3628	3096

The catch data for 1996 (Table 1.1.1.1) are provisional and incomplete, but the final figures are unlikely to exceed the low value of 1995. Catches in most countries remain below the averages of the previous 5 and 10 years. Some of the decline in catches in recent years can be accounted for by management plans which have reduced fishing effort in several countries.

1.1.2 Unreported catches of salmon

The total guess-estimate of unreported catch by fishery managers/protection officers or bailiffs within the NASCO Commission areas in 1996 was 1,123 t (Table 1.1.1.1), an increase of 6% compared with 1995 but 26% below the 1991–1995 mean of 1,525 t. There are no data available on salmon catches in international waters in 1996. Guess-estimates for the Commission Areas are given below (in tonnes):

Area	1991	1992	1993	1994	1995	1996
NEAC	1555	1825	1471	1157	942	947
NAC	127	137	161	107	98	156
WGC	n/a	n/a	12	12	<20	<20
International waters	25-100	25-100	25-100	25-100	n/a	n/a

1.1.3 Production of farmed and ranched salmon

The production of farmed salmon in the North Atlantic area in 1996 was 450,394 t. This is the largest production in the history of the farming industry (Figure 1.1.1.3) and represented a further 9% increase compared to 1995 (411,580 t) and a 54% increase on the 1991–1995 average (292,632 t).

The total production of ranched salmon in countries bordering the North Atlantic in 1996 was 266 t which is the lowest value since 1989. The majority (89%) of the ranching is conducted in Iceland, where ranched production is almost double the nominal catch of wild fish.

1.2 Recent Research Developments

Stock discrimination at West Greenland: Since 1969, discriminant analysis of scale characteristics of salmon at West Greenland has been conducted to determine the proportions of the two continental stock groups in this fishery. Scale characteristics are annually variable and discriminant functions have been parameterized using scale characters of known-origin fish.

Protein polymorphisms in tissue (starch gel electrophoresis of liver and muscle tissue) would not be expected to vary annually. Beginning in 1986 and continuing through 1991, a genotypic approach using protein polymorphisms was used to expand the database of known-origin scales for the discrimination between fish of different continents of origin.

In 1995, samples of muscle tissue (and scales) were taken from salmon landed in Nuuk, Greenland and assayed for microsatellite and mitochondrial DNA markers. Of 120 fish, 107 (89%) were of North American and 13 (11%) were of European origin.

To provide information on the reliability of scale classifications, the samples of 110 assayed fish with readable scales were classified using the same discriminant functions as were used to determine the continent of origin of scales sampled in 1995. Ninety percent were classified as North American and 10% as European salmon. A mis-classification rate of 14.5% and an error rate of ± 9.1% was deemed to be acceptable given the low number of European salmon in the test sample.

In-season identification to continent of origin using genetic techniques to calibrate scale-based identification of the catch at Greenland remains important (despite difficulties of cost and implementation). Investigation of environmental predictors of the scale-based features used in the classification is encouraged.

Neural networks to predict pre-fishery abundance: ICES examined the efficacy of predicting Atlantic salmon abundance in West Greenland with neural network models as well as the currently used linear regression models. The neural network was developed using four independent variables. The four variables were thermal habitat index values for March of the current year and May, June, and July values for the previous year when the pre-recruits were smolts.

The model was evaluated and out-performed a linear model fit with respect to two criteria: it provided the best reconstruction of observed patterns using unbiased fits and showed no bias associated with the magnitude of residuals. These characteristics are potentially critical at low population levels when estimation error puts the population at greater risk. However,

the precision of these models cannot be estimated at this time and thus they cannot yet provide a basis for advice.

1.3 Causes of Long-Term Changes in Sea-Age Composition

Possible explanations for changes in sea-age at maturity, including the likely roles of genetic and environmental (including fishery) effects, were tabled in Section 2.1 of the 1996 Report. No new information is available.

The 1996 Report stressed differences between the sexes and the multiplicity of possible interactive effects acting at every level and throughout life which determine age at maturity. In particular, data sets that have measures of absolute abundance and measures of maturity rate are not generally available. It was not possible therefore to assess these effects because there were not sufficient data to do so.

1.4 Causes of Changes in Abundance

Temporal changes in marine abundance at sea-age may relate to variation in smolt production, marine survival and maturation. Causes of marine mortality were discussed in Section 1.2.4 of the 1996 Report to NASCO. No new information on the effects on abundance of diseases, pathogens or predators has been made available to ICES.

1.4.1 Mortality and ocean climate

Attention has been directed at modelling the responses of North-east Atlantic salmon populations to marine environmental change. Trophic studies off the Faroes indicate that feeding cycles and potential prey abundance are changing and that this will affect salmon growth and survival.

Sea surface temperatures and post-smolt survival in the North-east Atlantic: Marine natural mortality in salmonid populations is believed to be highest during the first weeks to months at sea. It is also believed that mortality effects are growth mediated during this period due to variation in ocean productivity, interspecific competition, size-dependent predation or intraspecific interactions. Broad scale processes like ocean climate that may affect salmon growth, mortality and maturation mechanisms are of particular interest.

Return rates of tagged wild salmon smolts from the rivers Figgjo (southern Norway) and North Esk (eastern Scotland) since 1965 were used to evaluate survival conditions for this region. Survival rates were correlated between rivers and among sea ages (Figure 1.4.1.1) and were compared to the extent of thermal habitat in the North-east Atlantic Ocean. The strongest positive correlations between survival rate and extent of thermal habitat occurred during the month of May (8–10ºC water). A reciprocal negative correlation was also found between survival and 5–7ºC water in the same month.

Sea surface temperature distributions along a segment of the Norwegian coast from which post-smolts have been reported were contrasted between periods of good and poor salmon survival. The analyses showed that salmon survival has been poor when cool surface waters dominate the Norwegian coast and North Sea during May (Figure 1.4.1.2). Conversely, survival was good when the 8ºC isotherm extended northward along the Norwegian coast

during May. Thus, the variation in temperature conditions for this segment of the Norwegian coast during spring appears to be critical to the survival of post-smolts.

Sea temperatures and adult survival in the Barents Sea: Mean annual water temperatures in the 0–200 m depth interval along the Kola Meridian transect in the Barents Sea were shown to be linearly correlated with the abundance of spawning stock in the Tuloma River.

A comparison of recruits from all year classes and water temperatures at sea and in the river showed weak cyclical variations. Abundant year classes appeared in the years when mean yearly water temperature at sea was about 4° C or higher.

1.4.2 Smolt production

The number of salmon at sea depends on several variables, including the number of smolts which leave the river systems. Smolt production is dependent on adult numbers through levels of egg deposition. Declines in spawner numbers caused by declining trends in marine survival have the potential to feed-back negatively on marine abundance.

On the Girnock Burn, a tributary of the River Dee (UK, Scotland), smolt numbers are declining in response to a sequence of years in which egg deposition has been marginal or inadequate in relation to a threshold value (ca. 40 females). Reductions in spawners are attributed to increased natural mortality at earlier life stages.

The Girnock Burn produces mainly 2 or 3-year-old smolts and interactions among juvenile cohorts and changes in age composition at smolting buffer the effect of episodes of inadequate spawning. However, smolt production is not expected to be robust to a series of marginal or inadequate spawning years and reduced egg depositions are likely to reduce future recruitment.

1.5 Precautionary Approach and the Development of Assessments and Management Advice

Management of Atlantic salmon requires that the spawning populations of each river (and possibly subcatchments within the river) be conserved. This necessitates setting a **conservation limit** or minimum threshold (reference point) below which populations should not fall, and a higher **target reference** point for managing fisheries. Both reference points are consistent with the "precautionary approach"; limit reference points are intended to constrain harvesting within **safe biological limits** (above minimum biologically acceptable level [MBAL]). However, the life cycle of the salmon and the nature of the fisheries limit the possible management approaches and tools.

Anadromous Atlantic salmon leave their rivers to undertake feeding migrations in the ocean. Most are at sea for 1 (1SW fish) or 2 (2SW fish) years before returning to spawn for the first time. Fish returning after 2 or more years (MSW) generally undertake more distant migrations than those that return after 1 year. In the ocean, fish from many different populations mix together and catches are probably not proportionately distributed among individuals from all the contributing populations. There is therefore the potential to overexploit less productive stocks in mixed stock fisheries.

One-sea-winter and MSW cohorts are for the most part exploited by sea and home water fisheries in a single year. This means that independent verifications of projections of pre-fishery abundances are not available until after the fisheries. In addition, the salmon will not react like many other species in that, if disproportionate catches on one river's population are taken, there will not be compensatory shifts in growth and recruitment among the juveniles in other rivers. Thus, management of salmon has focused on a **fixed escapement strategy** designed to prevent salmon populations from falling below MBAL. In accordance with these considerations the following biological reference points have been established.

1.5.1 Conservation limit

MBAL for salmon has been suggested as a threshold below which spawning biomasses should not fall and has been defined from a fitted stock-recruitment relationship as the stock level that produces maximum gain (MSY). MSY can be defined and methodologically consistent MBAL values can therefore be derived wherever appropriate data are available. This choice is also consistent with ICES advice where "MBAL can be defined by the level of spawning stock below which the data indicated that the probability of poor recruitment increases as the spawning stock size decreases." MBAL is considered to be the conservation limit.

In Canada stock-recruitment relationships are available for a number of rivers. These supported a target egg deposition rate of 2.4 eggs/m^2 of fluvial habitat and, for two geographic areas of Newfoundland where many juveniles rear in lakes, either an additional 368 (south) or 105 (north) eggs/ha of lacustrine habitat. Egg needs are determined as the product of habitat area and the appropriate deposition value and are converted to female requirements (usually MSW fish) on the basis of fecundity. Where possible, one male is provided for each female. These spawner requirements serve as conservation limits and can be summed by region or country. A similar approach is used in the USA.

Countries in the North-east Atlantic are in various stages of developing conservation limits (Table 1.5.1.1) and are focusing on ensuring appropriate egg deposition rates. Long-term databases for calculating stock-recruitment relationships are rare and from geographically limited areas, and it is difficult to extrapolate from them to the very different river structures and climates found throughout the North-east region. In the UK (England and Wales), detailed methodologies have been developed to use data from rivers with established stock-recruitment relationships and reference points to establish reference points for other systems. Runs with unique characteristics (e.g. "springers" and "normal salmon") may be present within one system, and genetics studies are revealing substructures within catchment populations which may require approaches at the sub-catchment level. This complicates the task of setting reference points.

1.5.2 Target reference point

ICES has used a fixed escapement policy to provide advice on Atlantic salmon. Where conservation limits are valid and met, then in theory all fish exceeding this number are available for harvest. However, this may not always be appropriate. In practice, natural perturbations and imperfect management and enforcement tools do not permit such precise management. To manage using the precautionary approach it will be necessary to set higher targets to reduce the probability of falling below the conservation limit. The targets will be river specific depending on the quality of data available and the extent of exploitation in

mixed stock fisheries and in the river. The target is best set locally by scientists and managers who are most familiar with the biological characteristics of the population, the stock-recruitment relationship, and the realities of implementing and enforcing the management plan. Managers of in-river fisheries have the final responsibility for ensuring compliance with the targets and allocating surpluses among the needs of competing user groups. In addition, they may need to curtail in-river fisheries to compensate for management failures in sea fisheries and/or environmental conditions which have reduced anticipated fish returns.

1.5.3 Problems and constraints

To cope with unexpected events, the number of fish required to ensure that spawning escapement exceeds a set conservation limit may have to be considerably higher than the theoretical minimum.

Genetics considerations may also require higher conservation limits for some rivers. Where distinct populations exist within a catchment, more spawning fish may be required to maintain genetic diversity than would be called for by a simple reference point based on whole catchment egg depositions. Further, fisheries for Atlantic salmon that operate on a mixture of populations are by definition higher risk than those on single stocks (i.e., non-precautionary), particularly when reference points for individual stocks are combined. Accepting the individual river as a management unit requires that managers ensure sufficient escapement for all rivers to meet their conservation limits. Thus, as reference points are defined on increasingly fine scales (e.g., smaller and smaller tributaries), the number of fish required to escape all fisheries so as to meet the requirements of the weakest stock rapidly increases.

Finally, there is concern that management practice pays too little heed to the risk associated with management options, e.g., selection of mid point pre-fishery abundance value to set quotas (50% probability of failing to reach the conservation requirement) and fixed point spawner requirements (absence of advice on variability in the proportion of females, fecundity, origin of fish in the fishery etc.). For these reasons new methodologies are being developed to provide catch advice based on the probability of not meeting spawner requirements.

1.6 Compilation of Tag Release and Finclip Data for 1996

Data on releases of tagged and finclipped salmon in 1996 were compiled by ICES and provided under separate cover. In 1996, a total of nearly 3.4 million salmon were marked, nearly equal to the number marked in 1995. Finclips (1.63 million) and microtags (0.82 million) were the most frequently used marks. Most marks were applied to reared parr and smolts (3.33 million); only small numbers of wild parr and smolts (49 thousand) and adult fish (20 thousand) were marked.

2 ATLANTIC SALMON IN THE NORTH-EAST ATLANTIC COMMISSION AREA

2.1 Events in Fisheries and Status of Stocks

2.1.1 Fishing in the Faroese area 1995/1996

In accordance with the agreement between the Faroese Salmon Fishermen's Association and the North Atlantic Salmon Fund, commercial fishing for salmon in Faroese territorial waters was suspended for the years 1991 to 1996. A research fishery for salmon last operated in the Faroes area in December 1995. One research vessel fished a total of 8 long-line sets (8 days).

The total catch in the research fishery in December 1995 was 282 salmon (1 t). That value is too small to be considered representative of the size and age distribution of fish in the area or of catch rates (CPUE) that might have been expected in all or part of the 1995/1996 season. No fishing has taken place in the 1996/1997 season.

Origin of the catch: In the 1992/1993 to 1994/1995 fishing seasons, a total of about 5,500 salmon caught on long-line were tagged and released in the open sea north of the Faroes. After four fishing seasons (i.e. 1993–1996) 85 wild tagged fish (2.2%) have been reported recaptured in 10 countries. The estimated proportions of wild salmon from different countries, based on recoveries adjusted for homewater exploitation and tag reporting rates were as follows:

	Recaptures	
Country	**Total to date**	**%**
Norway	46	41.7
Scotland	12	20.7
Russia	5	16.5
Ireland	9	6.2
Denmark	2	5.1
Canada	4	3.5
Sweden	4	2.5
England	1	2.4
Spain	1	0.7
Iceland	1	0.7
Total	**85**	**100**

Of 19 tagged farmed/reared fish recovered (1.9% of those tagged), 18 were reported from Norway whereas one was recovered from the west coast of Sweden.

2.1.2 Homewater fisheries in the NEAC area

Gear and effort: Minor changes in commercial and recreational salmon fishing effort were reported in 1996, continuing the reduction in commercial fishing effort in the North-East Atlantic area in recent years. These reductions mainly arise from conservation measures in the respective countries and the reduced value of commercially caught salmon. Rod and line fishing has been increasing in some areas.

Catch: Provisional figures suggest that nominal catches of salmon in North-East Atlantic countries in 1996 were generally below the 1995 values and for most countries still below the previous 5 and 10 year averages. In general, fishing effort in terms of licences issued has been declining substantially over the years for commercial fisheries and increasing for recreational fisheries. The final value (including ranched fish) of 2,711 t for 1996 was below the 1995 value of 3,283 t.

CPUE: CPUE from recreational fisheries can be difficult to interpret. Catch-per-unit effort in rod fisheries in Finland, France and UK (Northern Ireland) show no trend for rod catch/**angler day** over the last 10 years. However, analysis of rod catch/**angler season** data which are available for rod fisheries in Finland and France indicate a significant upward trend in CPUE for the same period. CPUE for fixed engine fisheries in England and Wales shows no trend. For Scotland, there is a significant downward trend in CPUE in the net fishery.

Composition of catch: The proportion of 1SW fish in catches has increased for Russia and Finland, and decreased for Norway, Sweden and France. The proportion of 1SW fish in national catches varied among countries from 58% to over 90%. The lowest proportions of 1SW fish in catches were reported in Norway, Finland and France (rod fishery) and the highest in Ireland, France (net fishery), Iceland and Russia.

Origin of catch: Although it is known that there are wild fish from neighbouring countries in homewater catches, no new analyses on the distribution or number of these fish have been carried out since 1994. Farmed salmon continue to represent a large percentage of the national reported catch in both Norway (28%) and Faroes (20%) and ranched salmon now account for 65% of the national catch in Sweden. Although Iceland produces a large tonnage of ranched salmon, practically all this is harvested at the production sites. Farmed fish formed less than 3% of the national catches in Ireland, UK (Northern Ireland and Scotland).

Exploitation rates: Exploitation rates in homewater fisheries vary considerably among different river stocks. Mean rates (1991–1995) for a small number of monitored stocks range from less than 20% to over 80%. Increases in exploitation rates on stocks from Irish and UK (N Ireland) rivers have been shown in recent years, whereas a decrease is noted for one river in UK (Scotland) and one river in Russia. Although reported exploitation in some fisheries has changed, analyses indicate that there has been no overall trend in exploitation in fisheries over the last 10-year or 5-year periods for either 1SW or 2SW stocks in rivers for which data are available.

2.1.3 Status of stocks in the NEAC area

There are well over 1,000 rivers supporting salmon in the NEAC area, but for most of these there is no information on the status of the stocks. Estimates of pre-fishery abundance in the NEAC area have been updated and are now bounded by empirically derived precision estimates from a Monte Carlo analysis. Survival indices for combined river data for the NEAC area indicate a downward trend in survival to homewaters for the last 10 years for 2SW stocks. No trend was noted in the most recent 5 year period.

Figures 2.1.3.1 and 2.1.3.2 show the range of estimates of the pre-fishery abundance of maturing (1971–1996) and non-maturing (1970–1995) 1SW salmon in the NEAC area for northern and southern European stocks as defined below:

Southern European countries:	**Northern European countries:**
Ireland	Iceland
France	Finland
UK(England & Wales)	Norway
UK(Northern Ireland)	Russia
UK(Scotland)	Sweden
(Greenland catches)	(Faroes catches)

Trendlines (based on mean values) are shown in Figure 2.1.3.1 where the relationship for southern stocks over the 25 years is significant. The maturing component of the southern European stocks declined by more than 50% from the early 1970s to the early 1990s, although stocks appear to have stabilised at a low level in recent years. The non-maturing 1SW component of the southern European stocks, which is expected to contribute to West Greenland, has also declined and over the past 25 years now appears to be near the lowest level in the time series (Figure 2.1.3.1).

Estimates of both maturing and non-maturing pre-fishery abundance for the northern European stocks show less clear trends (Figure 2.1.3.2). Nevertheless, there appears to have been a steady decline in the maturing component of the stocks over the last nine years and in a similar period the abundance of non-maturing recruits has dropped to the lowest level in the series.

In 1996, estimates of spawner requirements were presented for seven rivers. Spawning thresholds were only exceeded in the Scorff and Nivelle (France) and the N. Esk (Scotland). A significant downward trend in egg deposition was noted for the previous 5-year period for all rivers combined.

Examination of the general trends suggests that there has been no significant change in smolt production in the north-east Atlantic as a whole. Adult runs in western European rivers showed no significant trend in run size over the last 10 years. For Russian rivers, an increasing trend in spawning escapement was noted over the previous 20- and 30-year periods. Over the most recent 10-year period, a decreasing trend has been noted. No trend is apparent for the previous 5-year period.

2.2 Effects of the Suspension of Commercial Fishing Activity at Faroes

Since 1991, the Faroese fishermen have agreed to suspend commercial fishing for the salmon quota set by NASCO in exchange for compensation payments. The number of fish saved from the fishery is estimated by subtracting the numbers of fish taken in the research fishery from the number that would have been expected to be caught if the commercial fishery had operated. The increase in returns to all homewaters is then estimated by subtracting the fish that would have died on their homeward migration. The great majority of these fish would be expected to return to European rivers although a small number of salmon tagged in the fishery have returned to North America.

The expected catch in the Faroese fishery was estimated to be equal to the mean catch in the 1988/1989 to 1990/1991 seasons (87,484 fish). Use of this average assumes that the total number of salmon available to the Faroese fishery has not changed since 1988. This assumption will be examined in future analyses. The estimated increased returns of wild 1SW and MSW salmon to homewaters in Europe and their contribution to the total estimated returns to the NEAC area for the years 1992–1996 follow:

	Estimated increased returns to home waters in Europe			
	1SW	**%**	**MSW**	**%**
1992	1,618	<1	40,327	3
1993	5,852	<1	55,466	5
1994	9,967	<1	64,207	5
1995	6,412	<1	67,936	6
1996	6,504	<1	71,389	7

In 1996, an additional 18,000 farm fish (nearly 107,000 over the 5 seasons of the suspension) will have escaped capture because the fishery did not take place.

Suspension of the fishery increased MSW returns to all European rivers by 3-7% and 1SW returns by less than 1%. However, analyses of smolt tagging data and results from the adult tagging studies (Section 2.1) indicate that 65-75% of the MSW salmon caught in the Faroes fishery would return to Scandinavian countries, Finland and Russia (northern Europe). If this were the case, increased returns might have represented 4% to 9% of the MSW returns to northern Europe between 1992 and 1996. If stocks and fisheries had remained stable, total catches would have been expected to increase by approximately the same proportions in the respective areas. However, any increase in catches either has been too small to be detected as a statistically significant change above the normal annual variation or has been masked by other factors such as reduced marine survival or reduced exploitation rates in homewaters.

2.3 Development of Age Specific Spawning Targets

A number of countries in the NEAC area have made considerable progress toward the development of biological reference points (MBALs and target fishing levels as opposed to *spawning targets;* see Section 1.5) for salmon (Table 1.5.1.1). In its 1995 report to NASCO, ICES recommended that "all countries should establish preliminary spawning targets for all their rivers as soon as possible". Subsequently NASCO requested ICES to "provide estimates of age specific spawning targets". In order to be consistent with present ICES terminology, we have used the term "conservation limits" instead of "spawning targets".

ICES advises against defining conservation limits on an age specific basis at present. In some catchments genetically distinct populations inhabiting subcatchments within a river system have been identified. Age specific reference points are not sufficient to provide adequate protection for those populations and other approaches need to be developed.

Certain countries, however, are faced with complicating factors and do not foresee having significant numbers of reference points in place within the next 5 years. Complicating factors include:

i) Paucity of databases for calculating stock-recruitment relationships or long-term trends;

ii) Uncertainty in extrapolating information from the limited number of rivers where relatively complete information is available to other rivers of different physical characteristics or in different geographic areas;

iii) The possibility of a single conservation limit compromising discrete populations which occupy spatially distinct areas within a river system, or which differ in their biological characteristics and do not interbreed (e.g. spring salmon versus autumn salmon). Hence, conservation limits may have to be set for each discrete population.

2.4 Provision of Catch Options with Assessment of Risk

2.4.1 Levels of exploitation by Faroes fishery

The levels of exploitation in the Faroes fishery on salmon from six monitored rivers in the NEAC area have been estimated from microtag and external tag recoveries for a number of years. Catch data from the Faroes fishery, including recent years with only small research catches, were positively correlated with exploitation rates for wild and hatchery 2SW from the R. Imsa (a small stock in Norway) and for wild 2SW salmon from the N. Esk, UK (Scotland). The correlation was not significant with the River Imsa hatchery data when years with small research-only catches were removed. Faroes catches were not correlated with 2SW exploitation rates of either the R. Drammen (Norway) or the R. Lagan (Sweden); few tags were returned from 2SW stocks of the Burrishole (Ireland) and R. Bush, UK (N. Ireland). At a catch of 500 t in the Faroes, the R. Imsa data are suggestive of 20-40% exploitation levels on hatchery and wild fish of that river; in the case of the N. Esk the data are suggestive of 4–8% exploitation on 2SW fish of that river.

2.4.2 Catch advice

Estimates of pre-fishery abundance suggest that numbers of maturing and non-maturing recruits in the NEAC area are around their lowest in the past 25 years (Figures 2.1.3.1 and 2.1.3.2). The maturing component of the northern European stock complex appears to show an alarming downward trend in recent years. The southern European stock complex (maturing and non-maturing) and the non-maturing component of the northern stock complex may have stabilised at their current depressed levels.

Although data are inadequate to relate pre-fishery abundance to actual spawning escapements, pre-fishery abundance data for northern and southern stocks suggest that a

precautionary approach is called for in the management of fisheries - particularly where they exploit mixed river stocks.

2.5 Potential By-Catch of Post-Smolts in Pelagic Fisheries

Since 1991, experimental trawls have located post-smolts in the area from the south-west of Ireland at 50° N up to 75° N. Over 404 post-smolts have been caught along with small numbers of 1SW salmon.

Both the fishery for mackerel and herring in the Norwegian Sea overlap spatially and temporally with the suggested routes of European post-smolts on their northward feeding migration. To date, however, there is only one record of a Carlin-tagged smolt taken in the mackerel fishery in International Waters in the Norwegian Sea.

The evidence that the season and location of significant pelagic fisheries overlap the documented and presumed occurrence of post-smolts suggest the potential for as yet undescribed by-catch mortality on post-smolts.

2.6 Data Deficiencies and Research Needs in the NEAC Area

ICES recognises the importance of the results generated from the research fishery programme in the Faroes area and recommends a continuation of the research fishery at a scale that will provide sufficient data for analyses.

Further information is required on the by-catch of post-smolts in marine fisheries. ICES endorses post-smolt surveys and the search for by-catch of salmon post-smolts in pelagic fisheries. Comparison of commercial fishing practices (depth, tow speeds etc.) and catch with research survey catches may provide a means of developing estimates of post-smolt mortality and further describing thermal preferences in marine thermal habitat.

In consultation with the Coordinating Working Party on Fishery Statistics (CWP), efforts should be made to standardise the way that catch-and-release data are handled in the catch statistics. The objective will be to provide an unbiased estimate of mortality due to fishing.

ICES requires guidance on the way NASCO would like the production of ranched fish to be reported in the catch tables.

Further work is required on the development of biological reference points for stocks in the NEAC area.

Efforts should be made to provide more accurate estimates of the level of catch by each country of stocks originating from other countries.

Relationships between environmental parameters and marine survival of salmon stocks in the NEAC area need to be further developed.

Efforts should be made to improve estimates of unreported catches in the Commission Area.

3 ATLANTIC SALMON IN THE NORTH AMERICAN COMMISSION AREA

3.1 Events in Fisheries and Status of Stocks

3.1.1 Fisheries in the NAC area

Gear and effort: Restrictions on commercial and recreational fisheries introduced in Canada in 1992 remained in force. In addition, further regulations were introduced in Labrador: in the commercial fishery the quota was reduced from 73.5 t to 55 t (the opening date was advanced by 2 weeks). In Québec the commercial fishery continued in zones Q9 and Q11, but in zone Q9 it was reduced from 15,175 fish to 12,068 fish. In the recreational fishery, hook-and-release regulations for small salmon were extended to more rivers of the Maritimes Region; the retention of large salmon continued only in Québec and Labrador.

In the USA there is no commercial fishery for salmon and angling (catch-and-release only) for sea-run salmon in 1996 was permitted only in the State of Maine. In Saint-Pierre and Miquelon (France) 10 professional fishermen used an estimated 10,400 m of surface gillnet and 42 licensed recreational gillnet fishermen used an estimated 7,560 m of surface gillnet.

Catch: The provisional landings for Canada in 1996 were 291 t, an increase of 12% from 1995 (Table 1.1.1.1). The landings of small salmon (87,141) and large salmon (30,066) represented an increase of 41% and a reduction of 12%, respectively, from those of 1995. Native Peoples' landings were almost 40 t, 84% of which was large salmon. The recreational landings totalled 80,438 small and large salmon, 14% above the previous 5-year mean. Commercial landings in Labrador and Québec declined to 81 t in 1996 from a peak of more than 2,400 t in 1980. Licence retirements and reduced quotas were partly responsible for the reduction in commercial catches. Unreported catch for the NAC area was guess-estimated at 156 t.

In the USA the estimated number of salmon caught and released in 1996 was 542 fish - 46% higher than in 1995 and 154% higher than in 1994. In the islands of Saint-Pierre and Miquelon (France) the harvest of salmon by commercial nets in 1996 is estimated to have been 950 kg - about double that of 1995. Recreational fishermen using gillnets harvested an estimated 560 kg of salmon.

Composition and origin of catch: No tagged fish of USA origin were reported from Canadian fisheries in 1996. This is consistent with the suspension, in 1995, of smolt tagging in USA rivers.

In Canada, returns to the majority of rivers in Newfoundland and Labrador are comprised exclusively of wild salmon. Hatchery-origin fish were most abundant in returns to rivers in the Bay of Fundy and along the Atlantic coast of Nova Scotia. Aquaculture escapees were sampled from the St. Croix, Magaguadavic and Saint John rivers in the Bay of Fundy as well as in the Baddeck River, Cape Breton and Conne River, Newfoundland.

In the USA, some salmon that were caught in the sport fishery in 1996 were escapees from aquaculture operations in Maine and New Brunswick (Canada).

3.1.2 Status of stocks in the NAC area

In most regions the returns of 2SW fish are near the lower end of the range of the twenty-five year time series. However, returns of 2SW salmon to Labrador in 1995 and 1996 were the

highest in the time series. Returns of 1SW salmon improved in all areas in 1996 relative to 1995 and in some regions (Labrador, Newfoundland and Québec) were near the highest in the time series and may indicate improved marine survival of this cohort. If this is the case, 2SW salmon returns and spawners may be expected to increase in 1997.

The North American Run-Reconstruction Model was used to estimate 1SW and 2SW returns and 1SW and 2SW "recruits" (fish prior to the Newfoundland and Labrador commercial fisheries) from 1971–1996. The rank of the estimated *returns* in 1996 in the 1971–1996 time series (Figures 3.1.2.1 and 3.1.2.2; inc. spawning targets) for 6 regions in North American is shown below. In the table the closer the rank is to 1 the better the relative performance of the stock:

	Rank of 1996 returns in 1971–1996 time series (1=highest)		**Mid-point estimate of 2SW spawners as proportion of escapement requirement**
Region	**1SW**	**2SW**	**(%)**
Labrador	3	3	60
Newfoundland	3	6	137
Québec	7	24	20
Gulf (Mainland)	16	22	95
Scotia-Fundy	17	23	44
USA	8	15	8

The above text table also shows the estimated total spawning escapement of 2SW salmon in each region expressed as a percentage of the spawning escapement requirement. Requirements in 1996 were only exceeded in Newfoundland and approached in the Gulf of St. Lawrence. Mid-point estimates of 2SW spawners for Canada could have been met or exceeded in only 3 of the past 26 years (1974, 1977 and 1980) by reduction of in-river fisheries. In the remaining years, spawning requirements could not have been met even with the elimination of in-river harvests (Figure 3.1.2.2).

The North American Run-Reconstruction Model was also used to update the estimate of pre-fishery abundance of non-maturing (prior to Greenland and North American fisheries) and maturing 1SW salmon from 1971-1996 (Figure 3.1.2.3). The 1996 estimate of pre-fishery abundance of **non-maturing** 1SW salmon was 8% above the record low estimate in 1994. Similarly, the 1996 estimate of abundance of **maturing** 1SW salmon increased by 46% over the record low 1994 estimate. Estimates for 1995 and 1996 suggest an end to the historically low values of non-maturing 1SW salmon and, in the case of 1SW maturing salmon, a clear increase. The decline in total recruits over the last 10 years has been accompanied by an increase in the proportion of the North American stock maturing as 1SW fish. This proportion has risen from about 45% at the beginning of the 1970s to around 70% in the last 4 years.

The estimate of the total number of 1SW salmon returning to Labrador and Newfoundland rivers and coastal waters of other areas of North America in 1996 (Figure 3.1.2.4) is 44% higher than the estimate for 1995 and 20% higher than the average of the previous years (1971–1995). The estimate is the fourth highest observed in the past 10 years and seventh

highest in the 26-year time series, 1971–1996. The estimated 2SW returns (Figure 3.1.2.4) are 10% lower than the total returns for 1995 but similar to those of 1994 and the average of the past 10 years.

The majority of the USA returns were recorded in the rivers of Maine, with the Penobscot River accounting for about 74% of the total USA catch. Salmon returns to the Penobscot River were 52% higher than in 1995, 23% higher than the 1991–95 average and 17% lower than the 1986-95 average. Returns to most USA rivers are hatchery-dependent and remain at low levels compared to spawning requirements.

Egg depositions exceeded or equalled the specific river requirements in 32 of the 85 rivers which were assessed in Canada and were less than 50% of requirements in 22 other rivers. Large deficiencies in egg depositions were noted in the Bay of Fundy and Atlantic coast of Nova Scotia where 10 of the 20 rivers assessed had egg depositions which were less than 50% of requirements (Figure 3.1.2.5).

3.2 Effects of Quota Management and Closure after 1991 in Canadian Commercial Salmon Fisheries

In 1992, a 5-year moratorium was placed on the commercial Atlantic salmon fishery in insular Newfoundland while in Labrador and Québec North-Shore and Ungava, fishing continued under quota or allowance catch. In conjunction with the commercial salmon fishing moratorium, a commercial licence retirement programme went into effect in insular Newfoundland, in SFAs 1, 2 and 14B of Labrador, and in Q7, Q8 and a part of Q9 in Québec; there were no changes in the management measures in Q11.

Newfoundland: The effect of the 5-year moratorium on the commercial salmon fishery in insular Newfoundland in 1992 was evaluated by comparing index ratio values developed from counts of small and large salmon at facilities on different rivers for pre-moratorium (1984-1991) and moratorium (1992-1996) periods. The year 1992 was treated as the base year and the index value was contrasted between the periods before and after the moratorium. Index ratios increased between pre-moratorium (pre) and moratorium (mor) years (see text table below); most moratorium values exceeded "1", i.e. returns exceeded the 1992 base year.

	Small salmon		Large salmon	
River/(coast)	**Pre**	**Mor**	**Pre**	**Mor**
Exploits (NE)	0.80	1.52	0.73	3.09
Gander/Salm NE)	0.76	1.07	0.18	1.01
Gander (NE)	0.40	1.18	0.13	0.47
Middle (NE)	0.72	1.28	0.52	2.55
Terra Nova (NE)	0.84	1.38	0.47	1.54
NE Placentia (S)	0.54	0.94	0.43	1.64
Humber (W)	0.51	1.17	0.22	0.64
Lomond(W)	0.82	1.50	0.31	0.88
Torent (W)	0.84	1.93	0.54	2.18
Western Arm (W)	0.70	1.85	0.08	3.25

Many stocks reached their lowest or second lowest level of abundance in 1991. Three south coast rivers, not tabled above, had average index values during the moratorium that were lower than the pre-moratorium period. Estimates of commercial exploitation rates for pre-moratorium years on the above rivers averaged 49% (range 29-66%) for small salmon and 76% (range 64-98%) for large salmon.

Labrador: There were reductions in the commercial exploitation rates (1992–1995) and reductions of up to 31 t in commercial landings in 1995; no new information was tabled for the 1996 season.

Québec: In zones Q7 and Q8, the mean annual commercial catches before closure from 1984–1991 were 389 small and 8,893 large salmon. During the same years, the annual mean recreational catch was 1,596 small salmon and 3,167 large salmon. Full commercial closure was in effect in 1993-96 when mean recreational fisheries landings were down by 20% from pre-moratorium years. Assuming that exploitation rates in commercial fisheries declined in the same proportion as the recreational fisheries, the 1993 closure may have resulted in an annual savings of 311 small and 7,195 large salmon.

In zone Q9, the commercial quota was reduced by 20%, from 15,175 fish in 1995 to 12,068 fish in 1996. The opening date was also delayed by 7 days. The quota reduction is assumed to have reduced the catch by 20% because more than 90% of the quota was reached in the four previous years and 95% of the quota was reached in 1996. Delays in the opening date could have contributed to a reduction in the proportion of large salmon in the catch. From 1984-1995, large salmon averaged 73% of the landings. In 1996, the proportion of large salmon in the commercial fisheries dropped to 61% even though the proportion of large salmon in the recreational catch remained unchanged from that of the 5 previous years.

Other Areas: ICES previously indicated that there was an increase in size-at-age and in the proportion of previously spawned 1SW and 2SW salmon returning to the Miramichi River. These observations are consistent with reduced commercial exploitation, which was thought to be size selective. Similar trends to those reported for the Miramichi River have been reported for the Restigouche River. However, other factors such as natural mortality may have contributed to the decline in returns.

Although the Newfoundland and Labrador commercial salmon fisheries used to harvest small and large salmon with origins in Nova Scotia, New Brunswick, Québec, and USA, the

benefits in returns to these provinces cannot be quantified. The estimates of returns of 2SW salmon to SFAs 19-23, Q1-Q11, and USA from 1992–1996 are lower than the returns from 1987–1991 which is not consistent with a reduction in marine fishing mortality.

3.3 Spawning Requirements

As discussed in Section 2.3, the spawning requirement is now considered as a conservation limit. In Canada, the threshold reference point has been synonymously defined as the **conservation requirement** or **conservation limit**. The conservation requirements for North America have been previously expressed in terms of the number of 2SW fish (180,495) required for all production areas in North America. No new requirements for North American rivers have been proposed.

3.4 Development of Catch Options

Catch options for 2SW salmon in North America in 1998 have been developed from 1997 estimates of pre-fishery abundance for 1SW non-maturing salmon. Only a small proportion of the cohort would be expected to be harvested (in Labrador in 1997) as 1SW non-maturing salmon if exploitation and stock composition patterns were similar to recent years.

Mortalities in mixed stock and terminal fisheries in Canada were summed with those of USA to estimate total 2SW equivalent mortalities for the 6 regions of North America for the period 1972–1996. The mid-point estimates of i) harvests of 1SW non-maturing salmon in Newfoundland-Labrador commercial fisheries (adjusted by natural mortalities of 1% per month for 11 months), ii) 2SW harvests in these same fisheries (adjusted by 1 month) and iii) 2SW fish in terminal fisheries (2SW returns - 2SW spawners) were summed. Mortalities within North America peaked at almost 375,000 fish in 1976 and are now around 30,000 2SW salmon equivalents. In the most recent two years estimated, those taken as non-maturing fish in Labrador constituted only 5 % of the total catch of 2SW fish.

In-river fisheries accounted for from as little as 18% of the cohort destined to be 2SW salmon (in 1973, 1975 and 1987) to the highest value yet of 75% in the 1996 fisheries. The percentage taken in in-river fisheries increased significantly with the reduction and closures of the Newfoundland and Labrador commercial fisheries, particularly since 1992.

North American 2SW salmon equivalent mortalities in Canadian and USA fisheries (based on the 2SW return year) from 1972–1996, indicate that harvests within the USA approached 0.05 % of the total on just a few occasions (and some of this would also have been harvested in Canada). The percentage of the total (Canada, USA and Greenland) 2SW equivalents that has been taken in North American waters was 60% in 1996 and has ranged from 41–100%. Values of 100% coincided with the closure of the Greenland commercial fishery in 1994 and 1995.

The pre-fishery abundance forecast for 1SW non-maturing salmon in 1997 is 196,858 fish (50% probability level; see Section 4.2). Assuming a 40% Greenland/ 60% North America division of the surplus for harvest (after reserving the spawner requirement of 201,483) catch options as 2SW salmon equivalents were developed for North America in 1998 (surplus reduced by 11 months of mortality at 1% per month). As there is a wide variability in the forecast of pre-fishery abundance, a precautionary approach would utilize probabilities much lower than 50%, at least for composite (mixed stock) fisheries.

Catch Options for 1998 North American Fisheries (Probability levels refer to probability density function estimates of pre-fishery abundance)	
Probability Level %	Catch Options in 2SW Salmon Equivalents (no.)
25	0
30	0
35	0
40	0
45	0
50	0
55	6,396
60	15,535
65	24,857
70	34,666
75	45,427

An update of projections, with associated probabilities of achieving spawner requirements, can be provided at the conclusion of the Greenland and North American fisheries on non-maturing 1SW fish in 1997.

3.5 Multi-Year Projections of Salmon Abundance

Quantitative forecasts of abundance are restricted to previously described pre-fishery abundances for 1SW non-maturing salmon in 1997. These projections are dependent on the winter marine habitat in the same year. As it is not possible to determine sea surface temperature in advance, the predictive power of this model is restricted to the current year.

Various indicators of stock strength in future years, including juvenile densities and 2SW lagged spawners, were considered as possible long-term predictors. However, none were found to be particularly useful. Increased juvenile densities in many monitored rivers, an increase in 2SW spawning escapement in some rivers, increased fry stocking in USA rivers and recent signs that marine survival of smolts has increased all support the view that abundance may increase. Notable exceptions are the stocks of the Atlantic coast of Nova Scotia and the Bay of Fundy where juvenile densities and marine survival rates are low, the hatcheries cannot sustain themselves because there is insufficient money for production, and the populations are impacted by industrial activities.

3.6 Data deficiencies and research needs

It would be instructive to compare current estimates of returns and escapements in Labrador with those values estimated by summing the individual estimates for SFAs 1, 2 and 14B calculated from SFA-specific exploitation rates for fishing effort within each of the respective areas.

There is a need for improved habitat surveys for rivers in Labrador and Ungava so that spawner requirements can be based on habitat characteristics.

Possible changes in the biological characteristics (mean weight, sex ratio, sea-age composition) of returns to rivers, spawning stocks, and total recruits prior to fisheries should be investigated. As new information becomes available, refined estimates of spawning requirements in USA and Canada will be obtained by incorporating new information such as biological characteristics for individual stocks, habitat measurements and stock and recruitment analysis.

Annual estimates of wild smolt-to-adult salmon survival rates need to be obtained for rivers in Labrador, New Brunswick and Nova Scotia. In addition, sea survival rates of hatchery and wild salmon should be examined to determine if changes in survival of hatchery releases can be used as an index of sea survival of wild salmon. Efforts should be made to improve estimates of unreported catches.

4 ATLANTIC SALMON IN THE WEST GREENLAND COMMISSION AREA

4.1 Events in Fisheries and Status of Stocks

4.1.1 Fishery in WGC area

Catch: In 1996, no agreement was obtained on a quota for salmon in the West Greenland Commission. Greenland authorities permitted a fishery of up to 174 t. The fishery began on 12 August and ended on 11 November after a long period with low catches. Nominal catches were 92 t (Table 1.1.1.1), the majority being landed in August and September. As in recent years, most of the catch (79%) was landed in NAFO Divisions 1C and 1E. The unreported catch was guess-estimated at less than 20 t.

Gear and effort: Only vessels less than 42 ft (<12.8 m) were allowed to participate in the commercial salmon fishery in Greenland coastal waters in 1996. The fishery was conducted under quotas distributed at the community level and assessed through daily licensee reports to the Licence Control Office. Entry into the fishery was limited to professional fishers or hunters fishing their own gear (single hook and line; 2,000 knot 140 mm stretched mesh fixed or drifting gill net of any length) within 40 nautical miles of the west coast or 12 nautical miles of the east coast. Licences for salmon fishing were not issued to vessels with licences for the shrimp fishery.

Fishing for private consumption was restricted to residents of Greenland. Permitted gear is hook and line, one fixed gillnet (2,000 knot 140 mm stretched mesh), or a similar 30 fathom drift net, tended daily. Private harvests are not permitted to be sold and are not counted against the quota.

Permits may be issued for tourists to fish with hook and line only. There is no daily catch limit, but the catch may not be sold. Very few tourist licences were issued in 1996.

Origin of catches: Based on a discriminant analysis of characteristics from scales sampled in the fishery in 1996, 42% of the catch was of North American origin - down from the 65% value in 1995 and the lowest since 1983. (Low values were a more frequent occurrence during the mid 1970s.) The catch at West Greenland in 1996 was estimated to consist of 37.5 t (12,900 salmon) of North American and 54.7 t (19,150 salmon) of European origin.

Seven Canadian-origin salmon (external tags) were captured at West Greenland in 1996. Six of the fish had been among 7,500 adults tagged in 1995 for mark-and-recapture estimates of returns to the Miramichi and Margaree rivers.

Biological characteristics of the catch: Mean lengths of 1SW North American (63.4 cm) and European (63.0 cm) fish in 1996 exceeded all previous values for the 1990s and may signal an end to the downward trend in mean length from 1969–1995. Mean weights of 1SW salmon at West Greenland also increased in 1996. Mean lengths and weights of 2SW salmon were similar to values observed in recent years.

The proportion of river age 3 fish among European origin salmon was 31.5% - well above the mean value from 1968–1995 of 17.3%, but within the range exhibited since 1991. River age 4 fish (10.2%) were the most abundant on record; river age 1 fish (7.6%) comprised the smallest proportion in 25 years. Among North American fish, river age 2 fish (23.8%) were the lowest in 20 years. Proportions of other river ages were not appreciably different from the 1968–1995 means.

The sea-age composition of European samples in 1996 (97.1% 1SW, 1.7% 2SW and 1.2% previous spawners) was similar to values observed since 1985. North American samples (92.1% 1SW, 5.4% 2SW and 2.5% PS) consisted of about 3% more 2SW and older fish than the average from 1985–1995.

4.1.2 Status of stocks in the WGC area

Salmon caught in the West Greenland area are non-maturing 1SW salmon or older destined to return to homewaters in Europe or North America as MSW fish if they survived. A small population exists in a river in NAFO Division 1D, Greenland. Despite some improvements in the annual returns to a number of rivers, both in European and North American areas, the overall status of the stocks contributing to the West Greenland fishery remains poor. As a result, the status of stocks within the West Greenland area is thought to be low compared to historical levels.

Stocks originating in the North-east Atlantic: The most abundant European stocks in West Greenland are thought to originate from the UK and Ireland. Survival indices for combined river data for the NEAC area indicate a downward trend in survival to homewaters for the last ten years for 2SW wild stocks. No trend was noted in the most recent 5-year period. This is consistent with the estimates that have been made of the pre-fishery abundance of non-maturing 1SW salmon from southern Europe; these have declined over the past 25 years and now appear to be near the lowest level in the time series (see Section 2.4.1 and Figure 2.1.3.1).

Conservation reference points have been presented for only 7 European stocks and these do not generally provide separate reference levels for 1SW and 2SW salmon. As a result, they cannot be used to assess the status of the stock components contributing to the West Greenland fishery.

In general, there has been no significant change in smolt production in the North-east Atlantic, and adult runs in western European rivers showed no significant trend in run sizes over the last 10 years.

Stocks originating in North America: The North American Run-Reconstruction Model was used to update the estimates of pre-fishery abundance of non-maturing and maturing 1SW salmon from 1971–1996 (Section 3.1.2 and Figure 3.1.2.3a). The 1996 estimate of pre-fishery abundance of non-maturing 1SW salmon was 8% above the record low value for 1994. The results suggest a levelling off of a decline to historically low levels for 1SW non-maturing salmon. In addition to the steady decline in total recruits (both maturing and non-maturing 1SW salmon) over the last 10 years, there has been a steady increase in the proportion of the North American stock maturing as 1SW fish. This proportion has risen from about 45% at the beginning of the 1970s to around 70% in the last four years (Figure 3.1.2.3b).

The estimate of the total number of maturing 1SW salmon returning to Labrador and Newfoundland rivers and coastal waters of other areas of North America in 1996 (Figure 3.1.2.4) is 44% higher than the estimate for 1995 and 20% higher than the average of the years 1971–1995. The estimate is the fourth highest observed in the past 10 years and seventh highest in the 26-year time series, 1971–1996. The estimated 2SW returns (Figure 3.1.2.4) are 10% lower than the total returns for 1995 but similar to both the 1994 returns and the average for the past 10 years.

In most regions the returns of 2SW fish are near the lower end of the twenty-five year time series. However, returns of 2SW salmon to Labrador in 1995 and 1996 were the highest in the time series. Returns of 1SW salmon improved in all areas in 1996 relative to 1995 and in some regions (Labrador, Newfoundland, and Québec) were close to the highest levels in the time series (see text table Section 3.1.2).

The majority of the USA returns were recorded in the rivers of Maine, with the Penobscot River accounting for about 74% of the total. Salmon returns to the Penobscot River were 52% higher than in 1995, 23% higher than the average, 1991–1995, and 17% lower than the average, 1986–1995. Returns to most rivers are hatchery-dependent and remain at low levels compared to spawning requirements.

Egg depositions exceeded or equalled the specific river requirements in 32 of the 85 rivers which were assessed in Canada and were less than 50% of requirements in 22 other rivers. Large deficiencies in egg depositions were noted in the Bay of Fundy and Atlantic coast of Nova Scotia where 10 of the 20 rivers assessed had egg depositions which were less than 50% of requirements (Figure 3.1.2.5).

North American salmon stocks remain at low levels relative to production in the 1970s. The 1SW non-maturing component continues to be depressed with river returns and total production amongst the lowest recorded. Returns of maturing 1SW salmon to North American rivers in 1996, however, are quite high in many areas, notably Labrador, Newfoundland, Québec and USA which may indicate improved marine survival rates of this cohort. If this is the case, improvement in 2SW salmon returns and spawners may be expected in 1997. Only two areas achieved or came close to achieving their spawning requirements for 2SW salmon in 1996. They were Newfoundland, where 2SW salmon make up only a small proportion of salmon production, and the Gulf of St. Lawrence, where 2SW salmon are a high proportion of production and very important in terms of their contribution to both North American and Greenland fisheries.

4.2 Catch Options with an Assessment of Risks

4.2.1 Introduction

ICES has used models based on thermal habitat in the north-west Atlantic to forecast pre-fishery abundance, in order to provide catch advice for the West Greenland fishery. While the approach has been consistent since 1993, the models themselves have varied slightly over the years. Changes have been made to the model formulation in an attempt to improve its predictive capability and to include biological mechanisms. In each of the years the models used the following predictor variables: 1993 and 1994 - thermal habitat in March; 1995 - thermal habitat in January, February, and March, and 1996 - thermal habitat in February and lagged spawners from the Labrador, Newfoundland, Québec, and Scotia-Fundy regions of Canada.

Update of thermal habitat: Marine habitat is measured as a relative index of the area suitable for salmon overwintering, termed "thermal habitat", and is derived from sea surface temperature data and previously published catch rates for salmon from research vessels fishing in the north-west Atlantic. Thermal habitat for February was updated to include data for 1997. Two periods of decline (1980 to 1984 and 1988 to 1995) are apparent (Table 4.2.1.1). The value for 1997 increased from that of 1996 and is the highest value in the previous 7 years.

4.2.2 Pre-fishery abundance forecast

ICES reviewed the procedures used to forecast pre-fishery abundance in 1996 and considered alternative model formulations that may be useful in future assessments. A review of potential thermal habitat and lagged spawner variables did not reveal any data relationships not previously detected, or result in a new linear model significantly more robust than that used in 1996. Thus the model (thermal habitat for February and lagged spawners [sum of lagged spawners from Labrador, Newfoundland, Scotia-Fundy and Québec]) was updated to reflect the addition of the new data (Figure 4.2.2.1).

The linear fit to the model of pre-fishery abundance versus February thermal habitat and lagged spawners produced a significant relationship between observed and predicted values at less than the 5% level ($F_{(2,15)}$=18.7). With the addition of the data for 1995, there is an improvement in fit over that of last year (r^2=0.71 in 1997 versus 0.68 in 1996). The forecast estimate of pre-fishery abundance for 1997 is about 197,000 fish at the 50% probability level (Table 4.2.2.1 and Figure 4.2.2.2). Despite the considerable increase in thermal habitat, the low values of lagged spawners and the decrease in the proportion of North American stock at West Greenland have resulted in a modest 11% gain in estimated pre-fishery abundance over that of 1996.

4.2.3 Development of catch options for 1997

The spawning requirement for all North American rivers is currently set at 180,495 2SW fish which is the equivalent of 201,483 pre-fishery recruits prior to natural mortality between Greenland and home waters. To achieve the management goal, these fish must be reserved to meet spawning requirements.

The procedure for estimating the quota for West Greenland is summarised in Appendix 2. Forecast parameter values for the proportion of the stock at West Greenland which is of

North American origin [PropNA], mean weights of North American and European 1SW salmon [WT1SWNA and WT1SWE, respectively], and a correction factor for the expected sea age composition of the total landings [ACF] used in the procedure are given in Table 4.2.3.1.

Greenland quota levels for the forecast of pre-fishery abundance were computed with the revised model and are shown in Table 4.2.3.1. Values are given for different probabilities of failing to achieve the summed North American spawning requirements. Nevertheless, even with a zero TAC on non-maturing 1SW salmon, the overall spawning target for North American 2SW salmon is not expected to be met.

4.2.4 Risk assessment of catch options

The provision of catch advice in a risk framework involves the incorporation of the uncertainty in all the factors used to develop the catch options. An analysis of the probability of not meeting the conservation requirements in the six stock areas of North America was conducted by incorporating the uncertainty in all the parameters used to evaluate the spawning escapement to North America. They included i) uncertainty of the pre-fishery abundance forecast, ii) variability in the biological characteristics (proportion North American origin, weight of 1SW North American origin, weight of 1SW European origin, age correction factor), iii) variability in the exploitation rates in North America and iv) the spawner requirement probability plot.

Under the assumption of recruitment in direct proportion to the spawner requirement, just over 200,000 fish are required to escape to North America to produce a 50% probability of achieving the spawner requirement concurrently in six stock areas. This value is higher than the 180,495 fish point estimate of total requirements to North America because it incorporates the annual variation in the proportion of females in each of the stock areas.

The risk analysis assumed that the management of West Greenland and North American fisheries in 1998 would be similar to that of 1996 and that exploitation in North America would be between 0.15 and 0.28. The impact of these fisheries on the salmon returning to homewaters in 1998 in the absence of any fishery at Greenland in 1997 results in a 65% probability of not meeting the conservation requirements in at least one of the six stock areas (Figure 4.2.4.1). This analysis assumes that salmon will return to each geographic area in proportion to the relative spawning requirements in each area and that the exploitation rates in each of the six stock areas are similar.

The cumulative consequences of fisheries at Greenland in 1997 and in North America in 1998 on the potential spawning escapements to North American stock areas increase the probability of escapement falling below 50% of requirements in North America. There is a 22% probability of escapement below 50% of requirements with no fisheries and the probability rises to greater than 50% at a Greenland catch option of 400 t and exploitation rates between 0.15 and 0.28 in North America (Figure 4.2.4.1).

Even if fisheries are restricted to levels which provide a 50% probability that the overall escapement requirements are achieved, it is likely that some stocks will fail to meet their individual spawner requirements while others will exceed requirement levels. This unequal achievement of escapement goals may result from random variation between years or from systematic differences in the patterns of exploitation on fish from different rivers or regions.

In the latter case, adoption of a 50% probability level may result in some stocks failing to meet requirement levels over several consecutive years if the full TAC is harvested. This would be likely to result in a long-term decline in those stocks.

4.2.5 Catch advice

It is evident from indicators of stock status, including the current and predicted estimates of pre-fishery abundance, that the North American stock complex is in a tenuous condition. The resource is close to record low abundance, despite almost complete closures of mixed and single stock fisheries, because of the continuing trend of below-requirement spawning escapements for 2SW salmon, and the low marine survival rates for some monitored stocks. The increasing advantage associated with each additional spawner in under-seeded river systems makes a strong case for a conservative management strategy. **ICES recommends that there should be no exploitation of the 1996 smolt cohort as non-maturing 1SW fish in North America or at Greenland in 1997, and also recommends that the cohort should not be exploited as mature 2SW fish in North America in 1998. Exceptions are in-river harvests from stocks which are above biologically-based escapement requirements. Further, fishing mortality on this cohort should be minimised in the North American Commission and in the West Greenland Commission Areas by controlling by-catch in other fisheries.**

4.3 Data deficiencies and research needs in the WGC area

The mean weights, sea ages and proportion of fish originating from North America and Europe are essential parameters to provide catch advice for the West Greenland fishery. As these parameters are known to vary over time, ICES recommends that the sampling programme which was carried out in 1995 and 1996 be continued and improved to cover as much of the landings as possible.

Effort should be made to improve the estimates of unreported catches.

The catch options for the West Greenland fishery are based almost entirely upon data derived from North American stocks. In view of the evidence of a long-term decline in the European stock components contributing to this fishery (southern European non-maturing 1SW recruits) ICES emphasises the need for information from these stocks to be incorporated into the assessments as soon as possible.

5 OTHER ISSUES

5.1 Joint meeting

The North Atlantic Salmon Working Group and the Baltic Salmon and Trout Assessment Working Group had a joint session at ICES Headquarters during their 1997 meetings to discuss problems common to both Working Groups. Two issues were considered which may be of interest to NASCO.

5.2 Spawning Targets

Progress on the Implementation of Spawning Targets: Summary conclusions and recommendations from the Spawning Target Workshop held in Pont-Scorff (France) in June

1996 were presented. The Group reviewed progress in the development and application of spawning requirement reference points. There has been substantial progress in the establishment of reference points in the NEAC area. There were no changes in the spawning requirements for rivers in North America.

One of the conclusions of the Spawning Target Workshop was that further progress in the development and transportation of reference points would occur with collection and analysis of additional data sets rather than refinements in analytical methods. There are few relevant data sets (long-term with large contrast in spawning escapement levels) in either the NAC or the NEAC areas. A number of recommendations were made by the participants of the joint session. They were:

1. Data series which were being used to provide reference points should be continued.

2. Probability analyses and similar approaches to quantify uncertainty should be used on existing stock-recruitment relationships.

3. The development of new data series and stock-recruitment relationships should be encouraged.

4. A list of rivers where sufficient information is available to establish reference points should be compiled. Contact individuals who are involved in the collection of data or involved in the development of methods/models should be identified and progress in transporting reference points for Atlantic salmon stocks should also be recorded to encourage the dissemination of data, information and methodologies. A preliminary list was developed at the meeting.

5.3 Definition of terms

It was agreed that the goal of current wild salmon management practices is to maintain self sustaining populations, and to try to ensure that populations retain characteristics as close to those of "native" salmon as possible. To respond to management needs, biologists must define a variety of salmon types as "wild". Both Working Groups agreed that the term is best used to describe populations which are (or are making progress towards becoming) self-sustaining. In a management context, all categories of "wild salmon" require a precautionary approach with appropriate measures taken to protect them.

The Group defined Atlantic salmon "types", based upon parental origin and the amount of their life cycle spent in the wild:

> ***Native salmon*** are wild salmon which are members of a population with no known effects from intentional or accidental releases.
>
> ***Wild salmon*** are fish that have spent their entire life cycle in the wild and originate from parents which were also spawned and continuously lived in the wild.
>
> ***Naturalized salmon*** are fish that have spent their entire life cycle in the wild and originate from parents, one or both of which were not wild or native salmon.

Stocked salmon are fish that have had artificial spawning and/or rearing techniques applied at some point in their life cycle and/or originate from intentional releases to the wild.

Escaped salmon are fish that have spent part or all of their life cycle undergoing artificial propagation and originate from accidental or unplanned releases into the wild.

APPENDIX 1
CNL(96)58
REQUEST FOR SCIENTIFIC ADVICE FROM ICES

1. With respect to Atlantic salmon in the North Atlantic area:

    1.1 provide an overview of salmon catches, including unreported catches, and production of farmed and ranched salmon in 1996;
    1.2 report on significant developments which might assist NASCO with the management of salmon stocks;
    1.3 describe the causes of long-term changes in sea-age composition of salmon stocks;
    1.4 describe the causes of changes in abundance of salmon with special reference to changes in natural mortality and ocean climate;
    1.5 review the development of assessments and management advice from the perspective of the precautionary approach;
    1.6 provide a compilation of microtag, finclip and external tag releases by ICES member countries in 1996.

2. With respect to Atlantic salmon in the North-East Atlantic Commission area:

    2.1 describe the events of the 1996 fisheries and the status of the stocks;
    2.2 update the evaluation of the effects on stocks and homewater fisheries of the suspension of commercial fishing activity at Faroes since 1991;
    2.3 develop age specific spawning targets;
    2.4 provide catch options with an assessment of risks relative to the objective of achieving spawning targets;
    2.5 evaluate the potential by-catch of post-smolts in pelagic fisheries;
    2.6 identify relevant data deficiencies and research requirements.

3. With respect to Atlantic salmon in the North American Commission area:

    3.1 describe the events of the 1996 fisheries and the status of the stocks;
    3.2 update the evaluation of the effects on US and Canadian stocks and fisheries of quota management and closures implemented after 1991 in the Canadian commercial salmon fisheries;
    3.3 update age specific spawning targets based on new information as available;
    3.4 provide catch options with an assessment of risks relative to the objective of achieving spawning targets;
    3.5 provide multi-year projections of salmon abundance;
    3.6 identify relevant data deficiencies and research requirements.

4. With respect to Atlantic salmon in the West Greenland Commission area:

    4.1 describe the events of the 1996 fisheries and the status of the stocks;
    4.2 provide catch options with an assessment of risks relative to the objective of achieving spawning targets;
    4.3 identify relevant data deficiencies and research requirements.

APPENDIX 2

COMPUTATION OF CATCH ADVICE FOR WEST GREENLAND

The North American Spawning Target (SpT) for 2SW salmon stands at 180,495 fish.

This number must be divided by the survival rate for the fish from the time of the West Greenland fishery to their return of the fish to home waters (11 months) to give the Spawning Requirement Reserve (SpR). Thus:

Eq. 1. SpR = SpT * (exp(11*M) (where M = 0.01)

The Maximum Allowable Harvest (MAH) may be defined as the number of non-maturing 1SW fish that are available for harvest. This number is calculated by subtracting the Spawning Target Reserve from the pre-fishery abundance (PFA).

Eq. 2. MAH = PFA - SpR

To provide catch advice for West Greenland it is then necessary to decide on the proportion of the MAH to be allocated to Greenland (f_{NA}). The allowable harvest of North American non-maturing 1SW salmon at West Greenland NA1SW) may then be defined as

Eq. 3. $NA1SW = f_{NA} * MAH$

The estimated number of European salmon that will be caught at West Greenland (E1SW) will depend upon the harvest of North American fish and the proportion of the fish in the West Greenland fishery that originate from North America [PropNA][1]. Thus:

Eq. 4. E1SW = (NA1SW / PropNA) - NA1SW

To convert the numbers of North American and European 1SW salmon into total catch at West Greenland in tonnes, it is necessary to incorporate the mean weights (kg) of salmon for North America [WT1SWNA][1] and Europe [WT1SWE][1] and an age correction factor for multi-sea winter salmon at Greenland based on the total weight of salmon caught divided by the weight of 1SW salmon [ACF][1] .

The quota (in tonnes) at Greenland is then estimated as

Eq. 5. Quota = (NA1SW * WT1SWNA + E1SW * WT1SWE) * ACF/1000

[1] New sampling data from the 1996 fishery at West Greenland were used to update the forecast values of the proportion of North American salmon in the catch (PropNA), the mean weights by continent [WT1SWNA, WT1SWE] and the age correction factor [ACF] in 1997.

PropNA = 0.557
WT1SWNA = 2.647
WT1SWE = 2.750
ACF = 1.133

ANNEX 10

COUNCIL

CNL(97)50

REQUEST FOR SCIENTIFIC ADVICE FROM ICES

1. With respect to Atlantic salmon in the North Atlantic area:

   1.1 provide an overview of salmon catches, including unreported catches and catch and release, and worldwide production of farmed and ranched salmon in 1997;
   1.2 report on significant developments which might assist NASCO with the management of salmon stocks;
   1.3 provide any new information on the causes of changes in abundance of salmon;
   1.4 comment and advise on the Report of the NASCO Working Group on the Precautionary Approach, as it relates to the work of ICES;
   1.5 provide a compilation of microtag, finclip and external tag releases by ICES member countries in 1997.

2. With respect to Atlantic salmon in the North-East Atlantic Commission area:

   2.1 describe the events of the 1997 fisheries and the status of the stocks;
   2.2 update the evaluation of the effects on stocks and homewater fisheries of the suspension of commercial fishing activity at Faroes since 1991;
   2.3 provide age specific stock conservation limits for all stocks occurring in the Commission area based on best available information;
   2.4 estimate the expected abundance of salmon in the North-East Atlantic for 1998/1999;
   2.5 provide catch options with an assessment of risks relative to the objective of exceeding stock conservation limits;
   2.6 evaluate any new information on the potential by-catch of post-smolts in pelagic fisheries;
   2.7 identify relevant data deficiencies and research requirements.

3. With respect to Atlantic salmon in the North American Commission area:

   3.1 describe the events of the 1997 fisheries and the status of the stocks;
   3.2 update the evaluation of the effects on US and Canadian stocks and fisheries of management measures implemented after 1991 in the Canadian commercial salmon fisheries;
   3.3 update age-specific stock conservation limits based on new information as available;
   3.4 provide catch options with an assessment of risks relative to the objective of exceeding stock conservation limits;
   3.5 identify relevant data deficiencies and research requirements.

4. With respect to Atlantic salmon in the West Greenland Commission area;

4.1 describe the events of the 1997 fisheries and the status of the stocks;
4.2 evaluate the impact of the Reserve Quota at West Greenland on salmon stocks in relation to the goal of exceeding stock conservation limits {spawning targets};
4.3 provide a detailed explanation of any changes to the model used to provide catch advice and of the impacts of any changes to the model on the calculated quota;
4.4 provide age specific stock conservation limits {spawning targets} for all stocks occurring in the Commission area based on best available information;
4.5 examine critically the model used to provide catch advice, looking at all the assumptions, and comment on the confidence limits on the output from the model;
4.6 provide catch options with an assessment of risks relative to the objective of exceeding stock conservation limits {spawning targets};
4.7 identify relevant data deficiencies and research requirements.

ANNEX 11

COUNCIL

CNL(97)15

CATCH STATISTICS - RETURNS BY THE PARTIES

CNL(97)15

CATCH STATISTICS - RETURNS BY THE PARTIES

1. The Official Catch Statistics, as submitted by the Parties, are tabulated overleaf (Table 1). The figures for 1996 are provisional. These catch statistics, which have been rounded to the nearest tonne, will be used to calculate the contributions to NASCO for 1998 unless the Secretary is advised otherwise.

2. Under Article 12 of the Convention, the Secretary shall compile and disseminate statistics and reports concerning the salmon stocks subject to the Convention. Table 2 presents catch statistics for the period 1960-1996 by Party to the NASCO Convention.

3. Tables 1 and 2 are set out in the format for the presentation of catch statistics which was agreed by the Council at its Fifth Annual Meeting. A further, more detailed, record of catch statistics during the period 1960-1996 is provided, for information only, in paper CNL(97)16.

4. Last year the Council noted some discrepancies between the figures contained in the ICES report and the Official Statistics as notified to NASCO. It was agreed that the Secretary should consult the Parties to seek clarification of the reasons for the differences. In accordance with this request I contacted the Parties concerned. In the case of the European Union, a number of discrepancies were identified. For Northern Ireland, the statistics provided to NASCO were provisional statistics while the confirmed catch was sent to ICES. For Scotland, the figure provided to NASCO comprised salmon (including fish farm escapes) caught and released as well as those retained while the ICES figure only contained salmon (excluding fish farm escapes) which had been retained. This year the statistics sent to both organizations are comparable. For England and Wales, the figure provided to NASCO was in error. In the case of Denmark (in respect of the Faroe Islands and Greenland) the difference was due to an error in the figure provided to the ICES Working Group. This year there are again discrepancies in the statistics provided by some Parties and I will seek clarification as to the reasons for these differences with the Parties concerned.

Secretary
Edinburgh
7 May 1997

Table 1: Official Catch Statistics

	Provisional 1996 Catch (Tonnes)	Provisional 1996 Catch According To Sea Age						Confirmed 1995 Catch (Tonnes)
		1SW		MSW		Total		
		No	Wt	No	Wt	No	Wt	
Canada	287	-	141.7	-	145.1	-	286.8	259
Denmark (In Respect Of Faroe Islands And Greenland)	92	-	-					86
Faroe Islands *	0	0	0	-	-	-	-	3
Greenland	92	-	-	-	-	-	-	83
European Union	1,414	-	-	-	-	-	-	1,852
Iceland	357	-	-	-	-	-	-	439
Norway	787	110,085	215	97,016	572	207,101	787	839
Russian Federation	131	33,986	79	9,158	52	43,144	131	130
United States Of America	0	-	-	-	-	-	-	0

* Compensation agreements were in place for the Faroese fishery in 1995 and 1996.

Table 2: Catches Of Atlantic Salmon By The Parties To The NASCO Convention

	Canada	Denmark *	European Union	Finland	Iceland	Norway	Russian Federation	Sweden	USA
1960	1636	60	2641		100	1576	1100	40	1
1961	1583	127	2276		127	1456	790	27	1
1962	1719	244	3894		125	1838	710	45	1
1963	1861	466	3842		145	1697	480	23	1
1964	2069	1539	4242		135	2040	590	36	1
1965	2116	861	3693		133	1900	590	40	1
1966	2369	1338	3549		106	1823	570	36	1
1967	2863	1600	4492		146	2058	883	25	1
1968	2111	1167	3623		162	1752	827	150	1
1969	2202	2350	4407		133	2083	360	76	1
1970	2323	2354	4069		195	1861	448	52	1
1971	1992	2511	3745		204	1847	417	35	1
1972	1759	2146	4261	32	250	1976	462	38	1
1973	2434	2402	4604	50	256	2126	772	73	3
1974	2539	1945	4432	76	225	1973	709	57	1
1975	2485	2086	4500	76	266	1754	811	56	2
1976	2506	1479	2931	66	225	1530	772	45	1
1977	2545	1652	3025	59	230	1488	497	10	2
1978	1545	1159	3102	37	291	1050	476	10	4
1979	1287	1694	2572	26	225	1831	455	12	3
1980	2680	2052	2640	34	249	1830	664	17	6
1981	2437	2602	2557	44	163	1656	463	26	6
1982	1798	2350	2533	83	147	1348	354	25	6
1983	1424	1433	3532	79	198	1550	507	28	1
1984	1112	997	2308	75	159	1623	593	40	2
1985	1133	1430	3002	49	217	1561	659	45	2
1986	1559	1490	3524	38	330	1597	608	53	2
1987	1784	1539	2593	49	250	1385	559	47	1
1988	1311	1136	2833	34	412	1076	419	40	1
1989	1139	701	2450	52	277	905	359	29	2
1990	912	542	1645	59	426	930	316	33	2
1991	711	533	1139	69	505	877	215	38	1
1992	520	260	1506	77	636	867	166	49	1
1993	373	35	1483	70	656	923	140	56	1
1994	355	18	1919	48	448	996	141	44	0
1995	259	86	1852	-	439	839	130	-	0
1996	287	92	1414	-	357	787	131	-	0

NOTES: *In respect of the Faroe Islands and Greenland

1. The European Union catch from 1995 includes the catches by Finland and Sweden.
2. The catch for Denmark in respect of the Faroe Islands and Greenland includes the catch for Greenland when it was a member of the European Union and the catches up to 1983 by Denmark.
3. Figures from 1986 on are the official catch returns to NASCO. Figures to 1986 are based on data contained in the ICES Working Group Reports.
4. The Faroese fishery was subject to compensation agreements in 1991-1996. The West Greenland fishery was subject to compensation agreements in 1993 and 1994.

ANNEX 12

COUNCIL

CNL(97)17

SUMMARY OF MICROTAG, FINCLIP AND EXTERNAL TAG RELEASES IN 1996

CNL(97)17

SUMMARY OF MICROTAG, FINCLIP AND EXTERNAL TAG RELEASES IN 1996

1. The annual summary of the information on tagging programmes conducted by the Parties in 1996 is attached as Table 1. Approximately 3.4 million fish were either tagged or marked prior to release during 1996 of which 25% were microtagged, 48% were finclipped (principally adipose clips), 6% were tagged with external tags (principally Carlin tags) and 20% were branded or dyemarked. More than 1 million fish bore auxiliary marks, principally adipose clips, used in conjunction with microtagging. More than 98% of the fish marked were of hatchery origin.

2. Table 2 presents a comparison of the tagging programmes in 1995 and 1996. The 1996 figure of 3.4 million released marked fish is approximately 4% higher than the number released the previous year due to increases in the number of microtagged, externally tagged and particularly branded/dye marked fish which more than compensated for the large reduction in the number of fish which had been finclipped. There was an increase in the number of hatchery reared fish but a reduction in the number of wild fish marked in 1996 compared to 1995.

Secretary
Edinburgh
7 May 1997

Table 1

Summary Of 1996 Tag Releases By Party

Party	Origin	Marking Method				
		Microtags	External Tags	Brands, Dyemarks etc.	Finclips	Auxilliary tags Finclips, Marks etc.
Canada	Hatchery	-	16,885	-	1,082,462	5,885
	Wild	-	12,129	-	-	-
	Mixed*	-	1,254	-	-	-
	TOTAL		30,268	-	1,082,462	5,885
European Union	Hatchery	617,695	10,115	47,180	282,532	767,709
	Wild	28,278	4,790	767	-	32,813
	TOTAL	645,973	14,905	47,947	282,532	800,522
Iceland	Hatchery	205,037	151	-	-	205,037
	Wild	7,407	-	-	-	7,407
	TOTAL	212,444	151	-	-	212,444
Norway	Hatchery	-	103,582	-	-	-
	Wild	-	2,375	-	-	-
	TOTAL	-	105,957	-	-	-
Russian Federation	Hatchery	-	8,078	-	236,900	-
	Wild	-	3,359	-	-	-
	TOTAL	-	11,437	-	236,900	-
USA**	Hatchery	-	53,200	646,140	24,900	-
	Wild	-	876	220	3,052	408
	Mixed*	-	73	-	-	-
	TOTAL	-	54,149	646,360	27,952	408
Total	**Hatchery**	**822,732**	**192,011**	**693,320**	**1,626,794**	**978,631**
	Wild	**35,685**	**23,529**	**987**	**3,052**	**40,628**
	Mixed*	**-**	**1,327**	**-**	**-**	**-**
	TOTAL	**858,417**	**216,867**	**694,307**	**1,629,846**	**1,019,259**

* Either not differentiated into hatchery or wild fish or origin unknown.

Table 2

Comparison Of 1995 And 1996 Tagging Programmes

	1995	1996	% Change
Microtags			
Hatchery	774,827	822,732	+6.2
Wild	51,405	35,685	-30.6
TOTAL	826,232	858,417	+3.9
External Tags			
Hatchery	118,718	192,011	+61.7
Wild	27,617	23,529	-14.8
Mixed	1,998	1,327	-33.6
TOTAL	148,333	216,867	+46.2
Brands, Dyemarks			
Hatchery	1,619	693,320	+427.2
Wild	1,577	987	-37.4
Mixed	327	-	-
TOTAL	3,523	694,307	+196.1
Finclips			
Hatchery	2,286,296	1,626,794	-28.8
Wild	2,133	3,052	+43.1
TOTAL	2,288,429	1,629,846	-28.8
Total			
Hatchery	**3,181,460**	**3,334,857**	**+4.8**
Wild	**82,732**	**63,253**	**-23.5**
Mixed	**2,325**	**1,327**	**-42.9**
Total	**3,266,517**	**3,399,437**	**+4.1**

ANNEX 13

COUNCIL

CNL(97)20

RETURNS UNDER ARTICLES 14 AND 15 OF THE CONVENTION

CNL(97)20

RETURNS UNDER ARTICLES 14 AND 15 OF THE CONVENTION

The request for the return of information required under the NASCO Convention and relevant to the period 1 January - 31 December 1996 was circulated on 15 January 1997. All Parties were requested to make a return even if there had been no changes since the last notification. Where changes have been notified under Article 15, the Laws, Regulations and Programmes concerned have been lodged with the Secretariat and this information will be incorporated into the Laws, Regulations and Programmes database. Copies of the detailed submissions are available from the Secretariat. A summary of the new actions taken under Articles 14 and 15 of the Convention is attached. At the time of preparation of this paper, information has not been received from all EU member states which have salmon interests.

Secretary
Edinburgh
6 May 1997

Article 14

1. Actions Taken To Make Effective The Provisions Of The Convention *(Article 14, Paragraph 1)*

1.1 The prohibition of fishing for salmon beyond 12* nautical miles from the baselines from which the breadth of the territorial sea is measured. *(Article 2, paragraph 2)*

* 40 nautical miles at West Greenland
* Area of fisheries jurisdiction of the Faroe Islands

Norway

The coastguard in Norway reports no illegal fishing after inspection of the high sea area.

1.2 Inviting the attention of States not party to the Convention to any matter relating to the activities of the vessels of that State which appears to affect adversely the salmon stocks subject to the Convention. *(Article 2, paragraph 3)*

No New Actions

1.3 Measures to minimise the by-catches of salmon originating in the rivers of the other member. *(Article 7, paragraph 2)* [North American Commission members only]

Canada

The quota for the commercial salmon fishery in Labrador was reduced from 73.5t to 55t in 1996. As in 1995, the traditional early June opening of the fishery was delayed. In 1996, the season opened on June 20.

1.4 Alteration in fishing patterns in a manner which results in the initiation of fishing or increase in catches of salmon originating in the rivers of another Party, except with the consent of the latter. *(Article 7, paragraph 3)* [North American Commission members only]

No New Actions

2. Actions Taken To Implement Regulatory Measures Under Article 13 *(Article 14, Paragraph 1)*

Denmark (in respect of the Faroe Islands and Greenland)

Alterations in the Fishery Law no. 18 (1996):

- Limitations in access to professional fishery licenses
- Catch or value hereof could be Confiscated, and now equipment or vessel as well - in accordance to regulations in criminal law.

3. Laws, Regulations And Programmes Adopted Or Repealed Since The Last Notification *(Article 15, Paragraph 5(A))*

European Union

Ireland

The number of commercial fishing licences has been limited resulting in an overall decrease in the total number of licences available.

United Kingdom

In the United Kingdom a number of new regulations were introduced in 1996. These include Limitation of Salmon and Trout Netting Orders and a byelaw on harmonising migratory salmonid catch returns in England and Wales; Regulations prohibiting the use of natural prawns and shrimps as baits and lures while fishing with rod and line in certain rivers in Scotland; an Order prohibiting fishing for sea fish with monofilament gill nets in the specified area or the carriage of monofilament gill net having a mesh size less than 250mm for any purpose in any British fishing boat in the specified area; and a byelaw specifying the fishing licence duties in Northern Ireland.

Norway

Management changes

The process of changing the organization of river and salmon stock management has proceeded in 1996 and is now part of a statewide project (1996 - 1999). One of the major goals of this project is to provide a basis for sustainable local management models for wildlife and fisheries management in a broad sense. A further NOK 1.9 million were invested in these efforts in cooperation with the authorities for agriculture, and by the end of 1996 local planning had commenced in about 70 rivers. River councils were established in 28 rivers and regional salmon management councils in about 10 areas, eg for the Oslofjord and Skagerrak coastline and the Trondheimsfjord.

Also in 1996 new local and regional fishing regulations for rivers and sea areas were introduced with the intention of protecting weak and vulnerable salmon stocks. On the initiative of the Directorate for Nature Management the county governors started a thorough analysis of the development of salmon stocks. The coast was divided into more or less naturally defined areas, and analyses were made for every area. This was initiated to prepare a basis for decision-making on the need for even more strict and geographically precise regulations in 1997.

The delegation of authority to the municipalities, regarding organization of both fishing and holders of fishing rights, local management planning and so on, was implemented in 1996.

Supervision in territorial sea areas and watercourses

The total cost of supervision in territorial sea areas and watercourses was NOK 7.8 million.

In 1996 a new act on organization of nature supervision-activities was adopted by the parliament. It is expected that this act will influence both the organization and funding of the supervision in years to come.

USA

In 1995, the federal government proposed to list seven river populations of Atlantic salmon in Maine as threatened under the Federal Endangered Species Act. Following that announcement, the Governor of the State of Maine formed an Atlantic Salmon Task Force to draft a Conservation Plan for the recovery of those populations. In March of 1997, the State submitted the Conservation Plan to the Federal Government for consideration as it determines whether or not to list Atlantic salmon under the Endangered Species Act. The Conservation Plan examines forestry, agriculture, aquaculture and recreational fishing for their potential impact to wild Atlantic salmon populations. The Plan includes suggestions for improved compliance with existing regulatory mechanisms designed to protect salmon (eg best management practices, catch and release only, etc) and recommends further actions to improve freshwater habitat. Portions of that Plan are currently being implemented, although it will not be finalized until after the federal agencies have accepted the Plan. That Plan is currently being implemented. In July of this year the new salmon agency in the state, the Maine Atlantic Salmon Authority, will gain Atlantic salmon management authority in all Maine rivers. (Because the Plan is in draft form it is not being provided to NASCO at this time).

4. Other New Commitments Relating To The Conservation, Restoration, Enhancement And Rational Management Of Salmon Stocks Subject To The Convention *(Article 15, paragraph 5(b))*

Canada

A commitment has been made to develop both a shorter term plan and a long-term strategy for the future of the Labrador salmon fisheries in light of the relatively poor stock status for Atlantic salmon in Labrador rivers.

European Union

Ireland

Publication of and Government approval of the Salmon Task Force Report.
Commitment to implementing the recommendations of the Salmon Management Task Force

Norway

Norwegian Salmonid Register

The status of salmon stocks as of 31 December 1996 according to the Norwegian categorization is as follows:

No of rivers containing a stock of salmon	669
Rivers whose natural salmon stock has become extinct	41
Rivers containing salmon stock threatened by extinction	54
Rivers containing vulnerable salmon stocks	147
Rivers containing small, natural salmon stocks	242
Rivers containing large, long-established salmon stocks	98
Rivers whose natural salmon stock is extinct and a new one has been established	9
Rivers where there is uncertainty as to whether salmon form a stock	10
Rivers where a salmon stock is present, but its status is unknown	68

The following threats are recorded:

Regulation of the river
Other forms of physical disturbance
Acidification
Agricultural pollution
Other forms of pollution
Escape of farmed salmon
Gyrodactylus salaris
Other fish diseases
Overfishing
Unknown threats
Liming

In 1996, 16 Atlantic salmon rivers were limed in Norway at a cost of NOK 40 million. Among these were two large watercourses in southernmost Norway, Tovdalselva and Mandalselva. In both rivers the natural Atlantic salmon stocks are extinct due to acidification. Before acidification catches of salmon were as high as 30 tons per year at the end of the last century. In both rivers a restocking program will be carried out in connection with the liming program.

Rotenone treatment

In 1996 one watercourse was treated with rotenone against *Gyrodactylus salaris*, bringing the total number of watercourses treated in Norway to 24. The experience with rotenone treatment is good. So far 11 rivers have been taken off the sick list. In the other 11 rivers it is too early to conclude whether or not the treatments have been successful. Fortunately, no *G salaris* have been observed so far in these rivers. In just two rivers the extermination of the parasite has failed. The Norwegian authorities spent NOK 3.2 million in 1996 on these activities. The prospects of exterminating the parasite from Norwegian rivers are good. A committee has proposed a strategy which proposed rotenone treatment of 14 rivers.

Gene-bank and sperm-bank

By the end of 1996 sperm from a total of 5832 salmon from 158 stocks has been frozen in the Norwegian gene bank to provide a possibility of rescuing stocks from extinction. 33 characteristic and valuable stocks have been taken into the "living gene banks" in Haukvik (Mid Norway), in Eidfjord (Southwest Norway) and in Bjerka (North Norway).

In 1996 sperm from 170 salmon from 24 stocks was frozen. Male and female salmon from 10 stocks were taken into the living gene banks. Norway is spending about NOK 8 million every year to operate the gene bank. In addition approximately NOK 4 million was invested in new facilities and equipment during 1996.

International research programmes

In connection with research and monitoring of *Gyrodactylus salaris* cooperation between Norway, Finland and Karelia in Russia has commenced. The cooperation between Norway and Russia on environmental issues on research and management of Atlantic salmon continues.

USA

In addition to the protective programs referred to in section 3, the federal government is undertaking river-specific stocking program to aid recovery of the wild populations in the seven rivers identified as eligible for protection under the Federal Endangered Species Act. These programs are in addition to restoration programs on other rivers in the United States.

The increased attention brought to Atlantic salmon as a result of its consideration for protection under the US Endangered Species Act has resulted in more action on the part of private industry, conservation groups and fishing clubs. Of particular interest

is Project SHARE (Salmon Habitat and River Enhancement), a voluntary association of landowners, businesses, government officials, researchers, educators, and conservation organizations committed to conserve and enhance Atlantic salmon habitat and populations in the Downeast region of Maine.

5. Other Factors Which May Significantly Affect The Abundance Of Salmon Stocks Subject To The Convention *(Article 15, Paragraph 5(C))*

European Union

Sweden

A Working Group has been established to elaborate a research programme on the salmon parasite *Gyrodactylus salaris*, which seems to indicate an increased abundance in some west-coast rivers.

Norway

Acidification

Acidification is still one of the main threats to the salmon stocks in Norway. In the Agder counties in southern parts of Norway almost all natural stocks are extinct as a result of heavy acidification. Acidification is now also a serious problem in salmon rivers in the western parts of Norway. In 1996 research projects are carried out in order to determine critical chemical values for salmon in rivers affected by acidification. This is essential knowledge for the authorities when planning the future liming activity in salmon rivers.

The acid rain monitoring program has indicated improved conditions in surface water in Norway during the last few years. It is not yet known whether this is an effect of favourable weather conditions during winter and spring time or of reduced deposition of acid rain. So far there is no indication of improved conditions for the salmon stocks in rivers affected by acidification.

Gyrodactylus salaris

The monogenean parasite *Gyrodactylus salaris* is one of the most serious threats to the Atlantic salmon in Norway today.

The total number of Norwegian rivers which are infected or have been infected with *G. salaris* is 40. The parasite has also been reported in 37 hatcheries. Rotenone treatment of the infected watercourses and clearing of infected hatcheries are being carried out to eliminate the parasite. This method has been used in 24 *Gyrodactylus* - infected rivers, and there is now only one hatchery infected with the parasite.

Sea lice

Sea lice (*Lepeophtheirus salmonis* and *Caligus elongatus*) in fish farms and on wild fish populations are still a problem in Norway. In 1996 the situation was similar to the situation in previous years.

Escaped farmed salmon

The actual number of salmon which escaped during the normal production cycles is not known.

In Norwegian coastal salmon fisheries the proportion of farmed salmon has varied between 34 and 54% (unweighted means) in the period 1989 to 1996, the highest proportion being recorded during the last year. In freshwater the proportion of farmed salmon in anglers catches is relatively low, and has varied between 4 and 7% during the same period (7% in 1996). In catches of brood stocks, the proportion is much higher and varied between 21 and 38% (31% in 1996).

ANNEX 14

COUNCIL

CNL(97)21

THE USE OF THE PRECAUTIONARY APPROACH BY NASCO

CNL(97)21

THE USE OF THE PRECAUTIONARY APPROACH BY NASCO

Introduction

At its Thirteenth Annual Meeting the Council considered a brief report on the Precautionary Approach to fisheries management. The President commented that although the Precautionary Approach is easy to understand it is more difficult to implement as a management tool. The Secretary was requested to prepare a paper bringing forward specific ideas as to how to adopt the Precautionary Approach to all of the work of NASCO.

The Precautionary Principle

It has been reported that the Precautionary Principle originated in Germany as "das Vorsorgeprinzip" designed to control pollution (Nollkaemper, 1991). While it is often assumed to be a new concept, the Precautionary Principle has been the basis of much US environmental legislation since the early 1970s but in recent years it has been formally enshrined in many international agreements to such an extent that it is said to be becoming the "norm" in international law (Bodansky, 1991). The Precautionary Principle "institutionalises" caution although caution is not defined and the extent to which caution should be exercised is not specified (Dovers and Handmyer, 1995). The Precautionary Principle is sometimes confused with the saying 'prevention is better than cure'. However, most environmental protection regulations are intended to prevent damage where the outcome of an action can be predicted, whereas the Precautionary Principle advocates restraint on development if there is reasonable suspicion of possible damage without waiting for scientific proof, i.e. any decision should err on the safe side (Hay, 1991). The application of the Precautionary Principle therefore involves a shift in the onus of proof from those advocating the protection of the environment to those proposing actions which might damage it (Dovers and Handmyer, 1995).

The Precautionary Principle was defined in the 1992 Australian Inter-Governmental Agreement on the Environment as follows: "where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation" (in Dovers and Handmyer, 1995). This definition introduces the concept that the potential damage should be serious or irreversible and that there is some ignorance of how the systems might be affected. An early example of the application of the Precautionary Principle in an international agreement was the measures taken to protect the ozone layer by reducing emissions of chlorofluorocarbons (CFCs) and other substances. The basis for action was existing empirical evidence of an anthropogenic change in the ozone layer and a theoretical knowledge of the basic mechanisms involved. There was, however, and still is, an incomplete understanding of the large, dynamic system involved (Kelton, 1995). While the Precautionary Principle has been applied to protection of the ozone layer and the reduction of greenhouse gases, global issues clearly of concern to the wellbeing of humanity, it has perhaps been most widely advocated in relation to marine pollution (Nollkaemper, 1991). The concept of the precautionary principle has been broadened from toxic substances, to natural substances (eg nutrients) and more recently to the management of renewable resources including fisheries (Anon, 1997).

The Precautionary Approach

The terms "Precautionary Principle" and "Precautionary Approach" are often used synonymously but the term "approach" implies more flexibility allowing for socio-economic factors to be taken into consideration in its application (Anon, 1997). The Precautionary Approach is perhaps more appropriate for use in fisheries since management errors are unlikely to threaten humanity and in most cases, though not all, the impacts are likely to be reversible (Garcia, 1996). Neverthless, errors in fisheries management may have serious impacts on the resources and serious social and economic implications.

Application by other fisheries bodies

Principles, by their nature, do not set out the means by which they are to be realised (Nollkaemper, 1991). At a practical level it will therefore be necessary to develop guidelines and such guidelines have been developed on fishery management, fishery research, fishery technology and species introductions in relation to the FAO Code of Conduct for Responsible Fisheries (Anon, 1995).

In these guidelines it is noted that application of the Precautionary Approach to fisheries involves the application of prudent foresight and that it requires *inter alia*:

- avoidance of changes that are potentially irreversible

- prior identification of undesirable outcomes and measures to avoid or correct them

- that corrective measures are initiated without delay and that they should achieve their purpose promptly

- that where the impact of resource use is uncertain priority should be given to conserving the productive capacity of the resource

- that harvesting should be commensurate with estimated sustainable levels

- appropriate placement of the burden of proof by adhering to the requirements above.

A key question in considering the application of a precautionary approach is "how much evidence of environmental harm is necessary to warrant precautionary action?" (Bodansky, 1991). This raises the concepts of the burden of proof and the standard of proof.

In relation to these concepts it has been recognised (Anon, 1995) that:

- all activities have some environmental impact and it is not appropriate to assume that these are negligible until proved otherwise;

- the Precautionary Approach does not imply that no activity can take place until all potential impacts have been assessed and found to be negligible;

- all fishing activity should be subject to prior review and authorization and that management plans should be in place which specify the management objectives and how the impacts are to be assessed, prioritised and addressed;

- the standard of proof to be used in making decisions about authorizing an activity should be commensurate with the potential risks to the resource, while also taking into account the expected benefits.

Some formulations of the precautionary approach have gone further however and reverse the burden of proof by not allowing an activity to proceed unless it can be proved to be safe (Bodansky, 1991).

In the case of the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, implementation of the precautionary approach involves the establishment of stock-specific precautionary "reference points" which correspond to the state of the resource and of the fishery and which can be used as a guide to fisheries management. Two types of reference point are proposed:

- "conservation" or "limit" reference points which set boundaries intended to constrain harvesting within safe biological limits within which the stocks can produce maximum sustainable yield.

- "management" or "target" reference points intended to meet management objectives

As the reference points are approached the UN Agreement requires that conservation and management action be taken.

Rationale for application of a Precautionary Approach to salmon management

Although the Atlantic salmon is a small resource compared to many marine species it is highly prized and generates considerable economic benefits throughout its North Atlantic range. It is of social, economic, cultural and ceremonial significance. It is probably unique in being highly valued by those who have no interest in harvesting it. The Atlantic salmon is also an important indicator species in terms of environmental quality and in many river systems where diversity is low it is a key species in terms of fish production. The anadromous life-cycle of the species means that it is exposed to a wide range of pressures in both the freshwater and marine environments and the genetic structure and the small size of many salmon populations means that the resource is particularly vulnerable. Despite the best efforts of management agencies some stocks of salmon have been lost, and others are threatened with loss, throughout its range. In recent years there has been growing concern about the abundance of North Atlantic salmon stocks which appear to have declined as a result of factors which are poorly understood but which have resulted in reduced survival in the marine environment. Many of the pressures on the resource are poorly understood but their effects may be effectively irreversible, for example through the loss of local adaptations, or only slowly reversible. In these circumstances adherence to the Precautionary Principle and adoption of a Precautionary Approach to the conservation and management of Atlantic salmon would certainly seem to be appropriate.

Definition

If NASCO wished to adopt the Precautionary Approach and decided to use the same definition as used in the UN Agreement, managers would exercise more caution when information is uncertain, unreliable or inadequate and the absence of adequate scientific

information would not be used as a reason for postponing or failing to take conservation and management measures.

Application by NASCO

The NASCO Convention requires the Organization to contribute "through consultation and cooperation to the conservation, restoration, enhancement and rational management of salmon stocks taking into account the best scientific evidence available to it". If there were a perfect understanding by the scientists advising NASCO of all the factors influencing the resource it might be argued that there would be no need for a Precautionary Approach.

In most, if not all, fishery science this is not the case and the best scientific advice may involve considerable uncertainty in some areas, or absence of a consensus among scientists or absence of any scientific information. In view of this situation, application of a Precautionary Approach to NASCO's work would seem to be justified. To take a specific example, the possible genetic damage to discrete wild salmon stocks through interbreeding with escaped farm fish might be a classic example of a situation where damage is feared and would probably be irreversible but where the evidence is not yet clear. There are other areas such as habitat management, introductions and transfers and pollution, etc. where the Precautionary Approach would also have application.

It will be necessary to look at each area of management in turn and decide what the Precautionary Approach means in each case. For salmon it is a particularly complex subject and it has not been possible, or desirable, in this paper to develop a specific set of proposals. That process would need a great deal of consultation and the Council may, therefore, wish to consider establishing a Working Group to consider in greater detail how the Precautionary Approach might be applied to NASCO's work. The terms of reference for such a Working Group might be "To consider how the Precautionary Approach might apply to all aspects of salmon management and to advise the Council of its recommendations before the 15th Annual Meeting".

Secretary
Edinburgh
14 May 1997

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USE OF THE PRECAUTIONARY APPROACH IN INTERNATIONAL AGREEMENTS

Rio Declaration on Environment and Development

Principle 15 of the Rio Declaration on Environment and Development states that "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

Convention on Biological Diversity

Although the Precautionary Principle is not specifically referred to in the Convention, the Preamble includes the following elements:

"The Contracting Parties:

Aware of the general lack of information and knowledge regarding biological diversity and of the urgent need to develop scientific, technical and institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures;

Noting it is vital to anticipate, prevent and attack the causes of significant reduction or loss of biological diversity at source;

Noting also that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat".

North Sea Conference

The adoption of the Precautionary Principle was accepted by all the North Sea States at the Second International Conference on the Protection of the North Sea held in London in 1987. This principle allowed for reductions in emissions of pollutants at source even where there is no scientific evidence to prove a causal link between emissions and environmental effects.

At the Fourth International Conference on the Protection of the North Sea, held in Esbjerg, Denmark during 8-9 June 1995 it was agreed that an Intermediate Ministerial Meeting (IMM) on the Integration of Fisheries and Environmental Issues would be held in March 1997 and to establish a Committee of North Sea Senior Officials (CONSSO) to prepare for this meeting. The Ministers also recommended that the Precautionary Principle should be applied in North Sea fisheries management. In preparation for the IMM in 1997 the CONSSO arranged a seminar which was held in Oslo during 9-10 September 1996. This seminar, which placed special emphasis on the North Sea fisheries, had as its aims to:

i) clarify the different views on the application of the Precautionary Principle to practical fisheries management, and to identify areas of consensus.

ii) discuss the Precautionary Approach in case studies for three different North Sea Fisheries.

In the report from the meeting it is concluded that the Precautionary Approach is considered more flexible than the Precautionary Principle and includes consideration of the socio-economic implications of its application. The Precautionary Principle is regarded as very restrictive and prescriptive and fishing cannot be undertaken in accordance with the Precautionary Principle. The Precautionary Approach may be regarded as a set of practical guidelines on how to deal with uncertainties in fishery management in a responsible way.

In the Statement of Conclusions arising from the Intermediate Ministerial Meeting on the Integration of Fisheries and Environmental Issues, held in March 1997, it is stated that "the Ministers, in the exercise of their political responsibilities, agree that the future fisheries and environmental protection, conservation and management measures, including the management of North Sea fisheries, should be guided by …….. application of a Precautionary Approach to management of living marine resources, set out in the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks and the FAO International Code of Conduct.

Food and Agriculture Organization of the United Nations - Code of Conduct for Responsible Fisheries

At its Nineteenth Session in March 1991 the FAO's Committee on Fisheries (COFI) called for the development of new concepts which would lead to responsible, sustained fisheries. Following the International Conference on Responsible Fishing held in Cancun, Mexico in 1992 which requested FAO to prepare an international Code of Conduct, the FAO Governing Bodies recommended the formulation of a global code which would establish, in a non-mandatory manner, principles and standards applicable to the conservation, management and development of all fisheries. The Code was unanimously adopted on 31 October 1995.

Under Article 6 (General Principles) of the Code it is stated that 'States and sub-regional and regional fisheries management organizations should apply a Precautionary Approach widely to conservation, management and exploitation'.

In 1995 a Technical Consultation on the Precautionary Approach to Capture Fisheries (Including Species Introductions) was held in Lysekil, Sweden. Guidelines were developed on Fishery Management, Fishery Research, Fishery Technology and Species Introductions to provide support for the FAO Code of Conduct for Responsible Fisheries.

The Technical Consultation concluded that the Precautionary Approach involves the application of prudent foresight and it requires inter alia:

- consideration of the needs of future generations and avoidance of changes that are not potentially reversible;

- prior identification of undesirable outcomes and of measures that will avoid them or correct them;

- that any necessary corrective measures are initiated without delay and that they should achieve their purpose promptly;

- that where the likely impact of resource use is uncertain, priority should be given to conserving the productive capacity of the resource;

- that harvesting and processing capacity should be commensurate with estimated sustainable levels;

- all fishing activities must have prior management authorisation and be subject to review;

- an established legal and institutional framework for fishery management, within which management plans implementing the above points are instituted for each fishery;

- appropriate placement of the burden of proof by adhering to the above requirements.

With regard to the burden and standard of proof it is recognised that:

- all fishing activities have environmental impacts and it is not appropriate to assume that these are negligible until proved otherwise;

- the precautionary approach does not imply that no fishing activity can take place until all potential impacts have been assessed and found to be negligible;

- the precautionary approach requires that all fishing activities be subject to prior review and authorisation; that management plans be in place and that interim management measures should apply until a plan is in place;

- the standard of proof used in decision-making should be commensurate with the potential risk to the resource while taking into account the expected benefits.

United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks

This Agreement was opened for signature on 4 December 1995 . While it was not possible to reach consensus on inclusion of the Precautionary Principle in the agreement because of fears that this could lead to a moratorium on fishing a requirement for States to apply a Precautionary Approach was included. Under Article 5 of the Agreement, which deals with general principles, it is stated that in order to conserve and manage Straddling Fish Stocks and Highly Migratory Fish Stocks coastal states and states fishing on the high seas shall apply the precautionary approach in accordance with Article 6. This Article includes the following elements:

1) States shall apply the precautionary approach widely to conservation, management and exploitation of straddling fish stocks and highly migratory fish stocks in order to protect the living marine resources and preserve the marine environment.

2) States shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.

3) In implementing the precautionary approach, States shall:

   a) improve decision making for fishery resource conservation and management by obtaining and sharing the best scientific information available and implementing improved techniques for dealing with risk and uncertainty.

   b) apply the guidelines set out in Annex II of the Agreement and determine, on the basis of the best scientific information available, stock-specific reference points and the action to be taken if they are exceeded.

A precautionary reference point is defined as "an estimated value derived through an agreed scientific procedure, which corresponds to the state of the resource and of the fishery, and which can be used as a guide for fisheries management". Two types of precautionary reference point are required - 'conservation or limit' reference points which set the boundaries which are intended to constrain harvesting within safe biological limits within which the stocks can produce maximum sustainable yield and 'target' reference points which are intended to meet management objectives. Under the Agreement, States shall take measures to ensure that, when reference points are approached, they are not exceeded and guidance is given on the measures to be taken by States in the event that they are exceeded. Where a natural phenomenon has a significant adverse impact on the status of straddling fish stocks or highly migratory fish stocks, conservation measures shall be adopted on an emergency basis to ensure that fishing activity does not exacerbate such adverse impacts.

Treaty of Maastricht

“Community policy on the environment shall occur at a high level of protection……It should be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay”.

Montreal Protocol on Substances that Deplete the Ozone Layer

In the Preample it is stated that “Determined to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it”.

Framework Convention on Climate Change

"The Parties should take precautionary measures to anticipate, prevent, or minimise the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reasons for postponing such measures …..".

Oslo-Paris Convention on Protection of the Environment of the North-East Atlantic

"The Contracting Parties shall apply ……. the Precautionary Principle, by virtue of which preventive measures are taken when there are reasonable grounds for concern that substances or energy introduced, directly or indirectly into the marine environment may bring about hazards to human health ….. even when there is no conclusive evidence of a causal relationship between the inputs and the effects."

ANNEX 15

COUNCIL

CNL(97)49

TERMS OF REFERENCE FOR A NASCO WORKING GROUP ON THE PRECAUTIONARY APPROACH

The Council agreed that a Working Group on the Precautionary Approach in North Atlantic Salmon Management shall meet 28, 29 and 30 January 1998 in Brussels, chaired by Mr E C E Potter (European Union), and that representatives of ICES and FAO would be invited to participate as observers as well as the members nominated by the Contracting Parties. The Report of the Working Group should be distributed by the Secretary to the Parties by 15 February 1998 and, given their approval, will be forwarded to ICES so that its advice on the implementation of the precautionary approach can be obtained at the 15th Annual Meeting.

The Terms of Reference for the Working Group are as follows:

1) Review the principles of the precautionary approach as described in FAO Technical Paper No. 350/1, in the UN Agreement on Straddling and Highly Migratory Fish Stocks and pursuant information developed by ICES.

2) Describe the range of activities engaged in by NASCO where the principles of the precautionary approach might be applied.

3) Recognising the size of the task of applying the precautionary approach to all of NASCO's work, specifically advise on application of the precautionary approach to:

   - the management of North Atlantic salmon fisheries.
   - the formulation of management advice and associated scientific research.
   - the area of introductions and transfers, including aquaculture impacts and possible use of transgenic fish.

4) Describe technical tasks, in the form of requests for scientific advice to ICES and further work to be carried out within NASCO to further clarify and support the application of the precautionary approach in NASCO's work.

ANNEX 16

COUNCIL

CNL(97)23

SURVEILLANCE OF FISHING FOR SALMON IN INTERNATIONAL WATERS

CNL(97)23

SURVEILLANCE OF FISHING FOR SALMON IN INTERNATIONAL WATERS

1. Following the Special Meeting of the Council on Fishing for Salmon in International Waters in 1992, the Secretary was asked to call a meeting of the Coastguard/Fishery Protection authorities in the North-East Atlantic to review the options for improvements in surveillance through improved international cooperation. This meeting was held in 1993 and a number of recommendations were formulated at the meeting, including a proposal for a specific salmon-related surveillance project, and these were subsequently endorsed by the Council. It was also agreed that a second meeting be held to review the results of this project and other relevant developments. The Council asked the Secretary to report back on this meeting. In accordance with this decision, a second meeting of Coastguards/Fishery Protection authorities was held on 20 March 1997 and the report of the meeting is attached (Attachment 1).

2. At this meeting reports were received on the results of the salmon fishery surveillance carried out in 1995/96. There has been a major change in the area, since the last meeting, because of the enormous growth in fishing for pelagic species such as herring and mackerel. The catches in this fishery are extremely large. If only a minute percentage of the catch was post-smolts, the salmon losses could be highly significant. The meeting also recognised that there are large periods of the year when there is no surveillance, corresponding with the period when salmon fishing is known to have occurred in the past, and the area covered by surveillance is not complete.

3. In view of the limitations in the surveillance, NASCO had approached the UK Defence Evaluation and Research Agency (DERA), who are now taking on commissioned work, to assess the usefulness of radar satellite imagery to the problem of surveillance of fishing for salmon in international waters. Since the directed salmon fishery takes place over very large geographical areas and at times of the year when there may be 24 hours of darkness and heavy cloud, radar may offer a practical approach to improving the surveillance cover. While satellite systems are now beginning to be used for detection of illegal dumping at sea and oil slick detection, and early results suggest a high level of vessel detection success (>90%), the vessels used for fishing for salmon in international waters are small and sea conditions may be extreme. DERA felt there was a need to conduct a pilot project to assess the utility of the technology to this particular situation. A brief summary of the DERA proposal is attached as Attachment 2.

4. If the experiment, which might cost about £10,000, were successful it would clarify whether this system could be used to alert us to the presence of vessels in international waters. The Council is asked to decide whether it wishes to commission the experiment, to await the result of Norwegian evaluations which may take place over the next two years, but which are unlikely to look specifically at the utility of satellites in relation to surveillance of fishing for salmon in international waters, or to take other action.

Secretary
Edinburgh
14 April 1997

Report of the Second International Meeting on Surveillance of Fishing for Salmon in International Waters Fishmongers Hall, London, 20 March 1997

1. Chairman's Introduction and Welcome

1.1 The Chairman, Dr Malcolm Windsor, opened the meeting and welcomed the delegates to London. He referred to the progress that had been made at the first meeting in 1993 in reviewing the sources of available information and in developing recommendations for strengthening the surveillance. NASCO welcomed the cooperation with the coastguard/fishery protection authorities since successful diplomatic actions depended on reliable surveillance information. While there was evidence that NASCO's actions have resulted in a reduction in the problem, to the extent that the last sighting was of a single vessel in February 1994, the Atlantic salmon resource is small and at present abundance is low. Even one vessel could undermine the strict conservation measures that have been introduced nationally and internationally.

1.2 A list of participants is given in Appendix 1. Apologies were received from the Icelandic Coastguard representative, Captain Helgi Hallvardsson, who was unable to attend the meeting because of unforeseen circumstances. The agenda for the meeting is contained in Appendix 2.

2. Overview of the Problem and NASCO's Actions

2.1 A background paper was presented which described the problem of fishing for salmon in international waters since it was first reported to NASCO in 1989/90, and which reviewed the existing sources of information and summarised the recommendations from the first meeting.

2.2 All of the reported sightings of fishing activity have been by airborne surveillance flights by the Norwegian and Icelandic coastguards. In addition, valuable information has been obtained from inspection of vessels at sea and during port calls when more detailed information including details of catches has been obtained. Salmon fishing activity has been observed between approximately 66°30'N - 72°20'N and 6°30'E - 5° 40'W. All of the sightings were in the months January - June although it is known that fishing has also occurred in the period October - December. No sightings have been obtained since February 1994 but the need for vigilance has been stressed since there appears to be a market for wild salmon on the continent with buyers prepared to pay a premium price. It was recognised that there are considerable periods of the year, coinciding with the period of the fishery, when there are no surveillance flights and that the fishery could be conducted over very large geographical areas making detection during surveillance flights difficult. It was also recognised that patrol ships do not usually operate in international waters but concentrate on the main fishing areas within EEZ's which may not coincide with the routes to and from international waters. There have been no changes to the sources of information available to assess the scale of the problem since the first meeting.

2.3 In the light of the limitations in the existing surveillance information, and as it had been agreed that many of the sightings had been obtained by chance, a number of measures were agreed at the first meeting to improve the surveillance operation.

3. Reports by the Parties on the Salmon Fishery Surveillance Project

3.1 At the 1993 meeting it had been agreed that a cooperative salmon fishery surveillance project should be undertaken in order to better assess the scale of the problem. It was anticipated that the primary source of information would be the Icelandic and Norwegian coastguards' airborne surveys. This project had originally been scheduled for 1994/1995 but because of other commitments, which were not anticipated, it was not possible for all coastguard authorities to contribute fully to this project. Following consultations it had been agreed that the project be re-scheduled for 1995/96 (week 45 in November 1995, week 6 in February 1996 and week 18 in April/May 1996). It was recognised that the exact timing of the surveys would be dependent on the weather. The surveys would attempt to cover the entire area of international waters.

3.2 In accordance with the project plan three flights over international waters had been undertaken by the Icelandic coastguard on the agreed dates and additional surveillance flights had been conducted on 7/5/96, 16/5/96 and 12/8/96. While there had been no evidence of directed salmon fishing in international waters, vessels fishing for capelin and herring had been located in the area. The Norwegian coastguard had made 21 flights over the area of international waters during 1996. The number of flights had been increased in response to the heavy fishing activity for pelagic species in the area. In addition to the airborne surveillance, a Norwegian coastguard ship had patrolled the international waters close to the Norwegian EEZ. No new information was available from the Faroe Islands or from Scotland.

3.3 Concern was expressed about the possible by-catch of salmon in fisheries for pelagic species such as mackerel, herring and capelin. Evidence presented to NASCO in 1992 indicated that by-catches of salmon in a pelagic trawl fishery for mackerel and horse mackerel in international waters close to the Norwegian EEZ were as high as 0.3 tonnes in a single haul. Furthermore, one of NASCO's Grand Prize winners in the Tag Return Incentive Scheme had been a tag return from a herring processing plant. The catches of Atlanto Scandian herring and of capelin (the latter being fished for mainly within the Icelandic EEZ and the Jan Mayen fishery zone) are now very large (thought to be in excess of 1 million tonnes for each species) while the catch of mackerel is thought to be of the order of 100,000-200,000 tonnes. It was thought that post-smolts could go undetected in large hauls particularly if the fish was ultimately destined for industrial purposes. While most of the herring landed is now used for human consumption, capelin is used for industrial purposes. Given the scale of the fishery and the recent evidence that post-smolts tend to form shoals from particular rivers, even a small number of salmon per haul could be damaging to the stocks. Experience from scientific research fishing for Atlantic salmon using surface trawls indicated that to be successful the gear must be fished right on the surface. This research also indicated that when fished at night the nets caught large quantities of mackerel but no salmon. It was thought that most of the catch of herring and mackerel in international waters was taken using purse-seine nets during the summer months (May - September) and that these might result in a by-catch of salmon. It was

recognised that more information was needed on this issue. While the pelagic fisheries are probably not the cause of the low abundance of salmon stocks their expansion at the present time could have implications for the recovery of salmon stocks if there is a significant by-catch problem.

3.4 It was recognised that the situation had changed since the last meeting of the Group in 1993. There is now a large-scale pelagic fishery in international waters involving many vessels. While this might result in improved surveillance of the area, there is concern about the by-catch of salmon in the fishery. It was agreed that more information was needed on this fishery and in this respect NASCO had requested ICES to evaluate the potential by-catch of post-smolts in pelagic fisheries. It was also recommended that the question of by-catch of salmon should be taken up with fishermen's organizations and processing plants in an attempt to obtain more detailed information on the scale of the problem. The need for continued vigilance in relation to directed fishing for salmon in international waters was recognised.

4. Use of Information from Military Sources

4.1 At the 1993 meeting the Norwegian coastguard, which is linked to the military, agreed to explore the possibilities of obtaining surveillance information from NATO AWACS aircraft which have extremely advanced radar systems capable of covering large areas.

4.2 AWACS would be capable of detecting the presence of vessels and could probably provide information on size and speed of vessels. The information could be made available in real time to the coastguard authority. While AWACS information would not be able to provide the detailed information required for diplomatic action it could serve as a warning of the presence of vessels in the area which the coastguards could then investigate using more traditional surveillance methods. It was agreed that AWACS planes might therefore provide useful information in support of the coastguards' airborne surveillance operations although this information would probably only be available on an occasional basis.

5. Use of Information from Ports

5.1 At the 1993 meeting the importance of good information from ports had been stressed and the Icelandic and Norwegian coastguards had agreed to see if their port records were held in such a way as to allow searching for certain vessel names and call signs. It had also been agreed that an effort should be made to inform port authorities, even in small ports, of the problem. Following the 1993 meeting a note concerning the problem of fishing for salmon in international waters had been agreed by correspondence and following translation this had been distributed to coastguard/fishery protection authorities for dissemination to the relevant port authorities in each country.

5.2 The Norwegian coastguard reported on the coastal surveillance system in operation in Norwegian inner coastal waters. Under this system all foreign vessels must report to the naval authorities 24 hours in advance of their arrival. This information is computerised and it is possible to search the stored information by vessel name. Vessels sailing through Norwegian inner territorial waters, other than during innocent

passage, are also required to register with the authorities. It was agreed that this system might provide valuable information on the activities of vessels known to have fished for salmon in international waters in the past. However, the salmon vessels travelling from or returning to the Baltic from international waters would not have needed to register unless they were within inner waters.

6. Use of Information from Satellites

6.1 At the 1993 meeting it had been agreed that advances in satellite technology might have a significant impact on the surveillance problem and that these should be kept under close review. Satellites using synthetic aperture radar are able to detect vessels during hours of darkness and through cloud cover although fine resolution would be needed to enable vessels of 30m in length to be detected. The salmon fishing takes place during winter months when there may be 24 hours darkness and in areas prone to heavy cloud cover so radar is the only available technology likely to work.

6.2 In 1995 a new Canadian commercial satellite, RADARSAT, was launched and this and the European Space Agency's ERS1 and ERS2 satellites have synthetic aperture radar on board. Both are beginning to be used for vessel detection in connection with illegal dumping at sea, oil slick detection and other applications. Preliminary verification or 'truthing' of satellite information with coastguard information from the English Channel suggests that 90% of the vessels identified by the coastal radar were detected by the satellite radar system.

6.3 In view of the advances in satellite based radar systems for vessel detection NASCO had approached the Defence Evaluation Research Agency (DERA) of the UK Ministry of Defence regarding the application of satellite surveillance in detecting vessels in international waters. Such a system, if capable of detecting small vessels at reasonable cost, could serve as a first warning of the presence of vessels in the area thereby reducing the need for frequent airborne surveys. In the event that a vessel was detected the coastguard authorities could be alerted so that the detailed information needed for diplomatic purposes could be obtained. DERA had responded with a proposal to undertake a short pilot investigation into the use of RADARSAT radar imagery for surveillance of the area concerned. This satellite has a number of advantages over the ERS systems which mean that it is likely to be more cost effective in large-scale surveillance. The proposal involved three phases as follows:

i) an archive search of RADARSAT data to see if coincident imagery exists for past airborne surveillance flights. On the basis of this information the decision would be taken as to whether or not real time data should be acquired.

ii) liaise through NASCO with coastguard authorities to plan a number of coincident RADARSAT scenes over the target areas.

iii) carry out ship detection techniques on the RADARSAT imagery obtained either from archive or from planned acquisitions.

6.4 The view was expressed by the Scottish delegates that satellite reconnaissance might be a rather expensive means of obtaining sighting information which would still need to be validated. They would favour efforts to obtain information from the home ports

of vessels known to have been involved in fishing for salmon in international waters. While satellite information is expensive it has the advantage of covering the whole area and could be used to reduce the number of airborne surveillance operations. The Norwegian coastguard indicated that they intended to proceed with an evaluation of satellite surveillance of ships. Radar satellite detection would be a method of focussing inspection flights into areas where there had been a sighting of a vessel or vessels by the satellite. The utility of such systems in detection of salmon fishing vessels in international waters should be re-examined at the next meeting of NASCO and the coastguard/fishery protection agencies.

6.5 The possible use of transponders in relation to fishing for salmon in international waters was discussed. Within EU waters fishing vessels greater than 24m in length fishing for certain species in certain areas will be required to have a transponder fitted from 1998. These transponders allow a vessel to be located accurately by satellite. It was recognised that vessels fishing for salmon in international waters are unlikely to have a transponder fitted but if it was a requirement of the flag state concerned the transponder could easily be deactivated so as to avoid detection. The attention of the group was also drawn to the Global Marine Distress Safety System under which vessels are required to notify their position. While the group recognised that not all countries may be party to this system, and there were doubts as to whether the information could be used in relation to the problem of fishing for salmon in international waters, it was agreed that more information should be obtained on the system from the International Maritime Organization.

7. General Publicity and Communication of Information

7.1 At the 1993 meeting it was agreed that efforts should be made to improve local awareness of the problem of fishing for salmon in international waters A press release had been agreed by correspondence following the meeting and after translation this had been sent to the coastguard/fishery protection authorities for distribution to the press and radio networks in each country. It had also been agreed that NASCO should serve as the centre for exchange of information and guidelines were agreed by correspondence which were circulated to all coastguard/fishery protection authorities.

7.2 It was agreed that no further measures were necessary to increase general publicity and communication of information at the present time. However, where a coastguard/fishery protection authority believes that there is a need to bring the issue to the attention of the general public in future the existing press release could, after any necessary amendment, be re-issued.

8. Options for Improvements in Longer-term Surveillance through Cooperation

8.1 No other recommendations for improved surveillance were developed.

9. Any Other Business

9.1 There was no other business but it was agreed that it was important to continue to exchange information and review surveillance options in the light of developments in

technology. It was agreed that there should be a further meeting of the group, when further developments justified it, probably in 2 to 3 years time.

Appendix 1

List of Participants

Commodore Klepsvik	Inspector, Norwegian Coastguard, HQ Defence Command, Oslo Mil/Husby, N-0016 Oslo 1, Norway
Mr Martin Kruse	Vaktar Og Bjargingartanastan, Faroese Inspection and Rescue Service, Torshavn FR 100, Faroe Islands
Mr Arni Isaksson	Directorate of Freshwater Fisheries, Vagnhofdi 7, 112 Reykjavik, Iceland
Mr David Dunkley	Inspector of Salmon Fisheries, SOAEFD, Pentland House, 47 Robb's Loan, Edinburgh, EH14 1TY
Mr Paul du Vivier	Scottish Fisheries Protection Agency, Pentland House, 47 Robb's Loan, Edinburgh, EH14 1TY
Dr Malcolm Windsor	NASCO, 11 Rutland Square, Edinburgh, EH1 2AS
Dr Peter Hutchinson	NASCO, 11 Rutland Square, Edinburgh, EH1 2AS

Appendix 2

International Meeting On Surveillance

Of Fishing For Salmon In International Waters

A G E N D A

1. Chairman's Introduction and Welcome
2. Overview of the Problem and NASCO's Actions
3. Reports by the Parties on the Salmon Fishery Surveillance Project
4. Use of Information from Military Sources
5. Use of Information from Ports
6. Use of Information from Satellites
7. General Publicity and Communication of Information
8. Options for Improvements in Longer-term Surveillance through Cooperation
9. Any Other Business

Attachment 2

ANNEX 17

COUNCIL

CNL(97)42

RECORDING INCIDENTAL BY-CATCHES OF SALMON IN LARGE-SCALE PELAGIC FISHERIES FOR HERRING AND MACKEREL

Currently, there are almost no reports of incidental catches of salmon post-smolts or non-maturing 1SW salmon in fisheries for other species. The fisheries of concern (those for herring and mackerel), however, are taking several hundreds of thousands of tonnes in areas where salmon are known to occur. Any incidental catches are therefore likely to be a minute proportion of the catch although in total they may not be insignificant. The incidence of such catches may also differ between areas, seasons, fishing methods and fishing depths.

In the absence of information on the salmon by-catch and its variability in the large-scale pelagic fisheries for herring and mackerel, it is not possible to lay down cost-effective guidelines for sampling or quantifying by-catch in these fisheries. There is, nevertheless, information from Norwegian surveys that post-smolts can be caught in trawls towed close to the sea surface. In the first instance, it would therefore be appropriate to describe the activities of the vessels participating in the fisheries for herring and mackerel, in particular with respect to the duration and depth of fishing during different phases of each fishing operation (e.g. shooting, towing, hauling). In addition, some focused sampling should be carried out on vessels participating in the fisheries concerned in those areas and at times when salmon have been recorded by research vessel. An appropriate number of trips might be around 10-20. In addition, all records of catches of salmon on research vessel surveys carried out using pelagic trawls or purse-seines should be collated as soon as possible, with details of the gear used and depth at which the catch was taken. On the basis of the information obtained, ICES might be in a position either to estimate by-catches or to advise on future research requirements.

ANNEX 18

COUNCIL

CNL(96)60

RESOLUTION BY THE PARTIES TO THE CONVENTION FOR THE CONSERVATION OF SALMON IN THE NORTH ATLANTIC OCEAN CONCERNING SCIENTIFIC RESEARCH FISHING

CNL(96)60

RESOLUTION BY THE PARTIES TO THE CONVENTION FOR THE CONSERVATION OF SALMON IN THE NORTH ATLANTIC OCEAN CONCERNING SCIENTIFIC RESEARCH FISHING

The PARTIES,

NOTING the provisions of the Convention for the Conservation of Salmon in the North Atlantic Ocean of 2 March 1982 (the "Convention") which seeks to promote the conservation, restoration, enhancement and rational management of salmon stocks;

NOTING that under Article 2 of the Convention fishing of salmon is prohibited beyond areas of fisheries jurisdiction and within areas of fisheries jurisdiction beyond 12 nautical miles except in the West Greenland Commission area (up to 40 nautical miles) and in the North-East Atlantic (within the area of fisheries jurisdiction of the Faroe Islands);

NOTING that under Article 4 of the Convention the Council shall make recommendations to the Parties, the International Council for the Exploration of the Sea and other appropriate fisheries and scientific organizations concerning the undertaking of scientific research;

DESIRING to promote the acquisition, analysis and dissemination of scientific information pertaining to salmon stocks in the North Atlantic Ocean;

DESIRING to cooperate on scientific research fishing for Atlantic salmon that is consistent with the objectives of the Convention;

RECOGNISING the possible benefits to rational management of salmon stocks from scientific research fishing in the sea;

RESOLVE as follows:

Scientific research fishing in areas where salmon fishing is prohibited by the Convention may be undertaken by the Parties subject to the conditions detailed in the Annex to this Resolution.

In areas of fisheries jurisdiction where salmon fishing is subject to an allowable catch as part of a regulatory measure adopted by NASCO and where the catch from scientific research fishing will not be allocated as part of the allowable catch under the regulatory measure the Annex shall also apply.

ANNEX

1. Any Party or Parties wishing to undertake scientific research fishing for Atlantic salmon in accordance with this Resolution shall deliver a proposal to the Secretary no less than 45 days before it wishes to commence fishing.

   The proposal should, whenever possible, include details of:

   a) the purpose of the research fishing
   b) the dates during which the research fishing will take place
   c) the area in which the research fishing will take place
   d) the name, registration, call sign and a description of any participating vessels.
   e) the type and amount of gear to be used
   f) the estimated total weight and numbers of salmon to be retained

   The Secretary shall immediately transmit copies of the proposal to all Parties.

2. The results of this scientific research fishing shall be made available to the Council of NASCO and to ICES as soon as practicable, including details of any catches.

3. Atlantic salmon caught during scientific research fishing in accordance with this Resolution shall only be retained for scientific research.

4. Where the planned research is outside areas of fisheries jurisdiction a Party may object to the proposal by informing the Secretary within 30 days of the date of the Secretary's notification giving reasons for the objection. In the event of an objection being received by the Secretary the research programme shall not be implemented pending a decision by the Council, based upon a review of the scientific merits of such research.

ANNEX 19

COUNCIL

CNL(97)25

RETURNS MADE IN ACCORDANCE WITH THE OSLO RESOLUTION

CNL(97)25

RETURNS MADE IN ACCORDANCE WITH THE OSLO RESOLUTION

At its Twelfth Annual Meeting the Council reviewed progress in relation to the 'Resolution by the Parties to the Convention for the Conservation of Salmon in the North Atlantic Ocean to Minimise Impacts from Salmon Aquaculture on the Wild Salmon Stocks', henceforth called the 'Oslo Resolution' for brevity, which was adopted in Oslo in 1994. The Parties agreed at this time that the subject of the impacts of aquaculture on the wild stocks would be reviewed annually and that the situation with regard to the implementation of the recommendations contained in the Oslo Resolution would be re-examined at the Fifteenth Annual Meeting in 1998 with a view to considering whether additional measures may be desirable. Under Article 5 of the Resolution each Party is required to provide to the Organization, on an annual basis, information of a scope to be determined by the Council, concerning measures adopted under Article 2 (measures to minimise genetic and other biological interactions), Article 3 (measures to minimise the risk of transmission of diseases and parasites to the wild stocks of salmon) and on research and development (Article 4). In 1995 a format was agreed for the provision of this information which was circulated to the Parties with the request for annual returns under Articles 14 and 15 of the Convention. Details of the actions taken by the Parties are given below.

Have any measures been taken to minimise genetic and other biological interactions?

The scope of measures referred to in Article 2 of the Resolution is listed in Parts 1 and 2 of the Annex to the Resolution.

Canada

The Department of Fisheries and Oceans (DFO) is working with industry and provincial governments to develop a Code of Practice for the containment of Atlantic salmon in sea-cage culture in the Atlantic Provinces.

DFO is nearing completion of a national policy to minimize potential impacts of research with, and culture of, transgenic fish.

Denmark (in respect of the Faroe Islands and Greenland)

No measures have been taken.

European Union

Finland

No measures have been taken.

Ireland

Aquaculture operators are obliged to ensure that escapees are not present in these operations.

Sweden

No measures have been taken.

United Kingdom

The problems associated with escapes of farmed fish have been the subject of much scientific interest and investigation in recent years and scientists from The Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD) are well to the forefront of such work. No final conclusions have been reached on the long-term impact of such escapes on wild salmon populations but it is clear that escapes of fish should be prevented wherever possible and monitored where accidents occur. Against that background SOAEFD have been looking at the possibility of developing a code of practice on fish farm escapes which would be agreed with the fish farming industry and representatives of wild salmon interests.

Iceland

No measures have been taken.

Norway

A new proposal has been put forward to the Ministry of Fisheries regarding certification of technical equipment used in fish farming.

Russia

No measures have been taken.

USA

An Aquaculture Work group was formed to address the potential impact of Atlantic salmon aquaculture to wild salmon populations in the State of Maine. As a result of those discussions, the Maine aquaculture industry is developing and has agreed to adopt a Fish Culture Code of Practice for the culture of salmon in freshwater and at sea cage sites. Experimentation with triploids is on-going. Also, there is a proposal to place weirs on four Atlantic salmon rivers to aid in research and management and to cull out aquaculture escapes.

Have any measures been taken to minimise the risk of transmission of diseases and parasites to the wild stocks of salmon?

The scope of the measures referred to in Article 3 of the Resolution is listed in Parts 1 and 3 of the Annex to the Resolution.

Canada

DFO is amending the Fish Health Protection Regulations (FHPR) to provide more flexibility to approve transfers of salmonid eggs and fish. These amendments do not increase the risk of introducing exotic diseases and spreading indigenous diseases to new areas.

DFO is developing a Quality Assurance/Quality Control program for Laboratories conducting disease diagnostic tests under the FHPR.

Denmark (in respect of the Faroe Islands and Greenland)

No measures have been taken.

European Union

Finland

Voluntary disinfection in organised disinfection stations for all fishermen.

Ireland

All stocks must be certified disease free before transfer to marine cages.
Use of vaccine and treatments greatly reduces the incidence of diseases.

Sweden

No measures have been taken.

United Kingdom

The Diseases of Fish Act 1937, amended by the Diseases of Fish Act 1983, requires the notification of any suspicion of the presence of a notifiable disease to the relevant Minister. The Act provides powers for those appointed as Inspectors under this Act to take samples of any fish, eggs of fish or foodstuffs of fish for testing purposes. Where the pressence of disease is suspected or confirmed, all movements of live fish and eggs of fish may be controlled.

The Registration of Fish Farming and Shellfish Farming Business Order 1985, made under the Disease of Fish Act 1983, requires anyone who carries on a business of fish farming to register the business with Fisheries Departments and to keep stocking and movement records.

The Fish Health Regulations 1992, as amended, implement Council Directive 91/67/EEC and

Decisions made under it and control the movement into Great Britain from elsewhere in the EU of all live fish, their eggs and gametes; and certain dead fish. Directive 91/67 also makes provision for Member States to forward programmes for approval to the Commission to prevent the introduction or spread of certain diseases including IPN, BKD, SPC, Gyrodactylosis and Furunculosis as set out at List III of Annex A of 91/67. Great Britain is seeking controls in respect of IPN, BKD, *Gyrodactylus salaris* and Furunculosis in salmon.

The Diseases of Fish (Control) Regulations 1994 implement the disease control measures which are required on a EU-wide basis where suspicion and/or confirmation of the List I disease ISA, and the List II diseases IHN and VHS occurs. Should a List I or a List II disease be confirmed in Great Britain, the measures in these Regulations would come into effect (as witnessed during the outbreak of VHS on Gigha in 1994).

Iceland

No measures have been taken.

Norway

A proposal for a new fish disease act is still under consideration. This proposal contains stricter regulations in general and allows for the regionalisation of the Norwegian fish farming industry.

Russia

No measures have been taken.

USA

An emergency disease eradication program is being developed to outline steps to be taken in the event of detection of exotic fish pathogens in public or private rearing facilities. There is a commitment to expand the ongoing epidemiological monitoring program in the State of Maine to determine the type, incidence and geographic distribution of salmonid pathogens in Maine. In addition, the industry's husbandry practices are being documented, evaluated, and compiled into a Fish Health Code of Practice by veterinarians at the University of Maine and the Maine Aquaculture Association.

Has any research, small-scale testing and full-scale implementation been carried out in support of the Resolution?

The scope of the research and development envisaged under the Resolution is listed in Part 4 of the Annex to the Resolution.

Canada

DFO has conducted collaborative research with the Atlantic Salmon Federation and other institutions on the impact of salmon cages on migration of salmon smolts in the Bay of Fundy, and the effect of sea lice treatments on non-target organisms.

Work continues in DFO, the private sector and universities, to develop and evaluate sea cage performance of triploid Atlantic salmon.

DFO is conducting research to develop an all-female line of Atlantic salmon which, when combined with techniques to render them non-reproductive, will minimize the chances of genetic interaction should escapes occur.

Denmark (in respect of the Faroe Islands and Greenland)

No measures have been taken.

European Union

Finland

No measures have been taken.

Ireland

The following research projects are being conducted:

An assessment of the genetic consequences of deliberate and inadvertent introduction of non-native Atlantic salmon into natural populations (EU Project No. AIR CT 92 0719).

Hybridisation between escaped farmed Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*): frequency, distribution, behavioural mechanisms and effects on fitness (EU Project No. AIR3 CT94 2484).

Minimising the interaction of cultured and wild fish: comprehensive evaluation of the use of sterile triploid Atlantic salmon (EU Project No. AIR CT94 2216).

Sweden

No measures have been taken.

United Kingdom

No measures have been taken but see information for the United Kingdom in previous sections.

Iceland

No measures have been taken.

Norway

Research on the ecological effects of escaped triploid fish has commenced as part of an EU funded project. Research on methods of tagging and the cost of tagging is in progress.

Russia

No measures have been taken.

USA

Currently there is research on raising Penobscot strain triploids.

Conclusions

It is clear from the above returns that measures have been taken in accordance with the Oslo Resolution although, to date, not by all Parties. Some of the information presented above is not new information but indicates a continued commitment to existing measures referred to in last year's report. The Council's intention was that there would be full implementation of the Resolution by the Fifteenth Annual Meeting in 1998. That leaves only one year in which to complete the programme and last year the President indicated that to achieve this aim, further measures would be needed. There are a number of areas where no actions have yet been taken by many Parties, for example on use of sterile salmon, local broodstocks and wild salmon protection areas.

ANNEX 20

COUNCIL

CNL(97)27

REPORT OF THE ICES/NASCO SYMPOSIUM INTERACTIONS BETWEEN SALMON CULTURE AND WILD STOCKS OF ATLANTIC SALMON: THE SCIENTIFIC AND MANAGEMENT ISSUES

CNL(97)27

REPORT OF THE ICES/NASCO SYMPOSIUM INTERACTIONS BETWEEN SALMON CULTURE AND WILD STOCKS OF ATLANTIC SALMON: THE SCIENTIFIC AND MANAGEMENT ISSUES

Summary

1. The ICES/NASCO Symposium on "Interactions between salmon culture and wild stocks of Atlantic salmon: the scientific and management issues" was held in Bath, England from 18-22 April 1997. Approximately 170 delegates, from 18 countries, involved with salmon management, research and aquaculture in the North Atlantic, Baltic and Pacific areas attended the meeting. The symposium provided a useful forum for exchange of ideas and information but it did not provide an appropriate forum for decision-taking. A report of the main issues arising at the meeting as seen from the NASCO Secretariat viewpoint is attached.

2. From the information presented at the symposium, it is clear that the abundance of cultured salmon in the natural environment is large and has resulted in a mixing of fish from different populations to an extent never seen before. Recently conducted experiments into the impact of cultured salmon on wild stocks indicate that spawning between cultured fish will have negative consequences for the wild stocks, since the offspring of cultured fish will occupy juvenile habitat and displace wild fish. While the competitive ability and growth rate of the offspring of cultured salmon may be higher than for wild fish their survival is lower. Interbreeding between cultured and wild fish will probably also have negative consequences and will certainly lead to genetic changes in the wild population. The potential exists for serious genetic intrusion into local stocks with consequent genetic homogenisation. There were experts who felt that this hybridisation would not cause problems. There were also experts who felt that loss of local adaptations in wild stocks and displacement of wild fish through competition could lead to the collapse of wild populations. It is also clear that there have been serious adverse impacts on the wild stocks following introductions of diseases and parasites with movements of live fish and there is real concern about the effects of sea lice on the wild stocks.

3. Progress has been made by the salmon farming industry towards sustainable aquaculture particularly with regard to disease control. However, escape from cage systems is inevitable and interbreeding between farmed and wild salmon is occurring on a large scale. Since the salmon farming industry began managers of the wild stocks have faced a number of questions which needed to be addressed. Firstly, the question arose as to whether farmed salmon would survive in the wild. Research has shown that they do. This led to the question as to whether these farmed fish would spawn in the wild. Research shows that they do. The question then arose as to whether the offspring of escaped farmed fish would be viable and we now know that they are. It was also argued that farmed fish would be unable to compete with wild fish but this is not the case. The central question which remains to be answered is whether the spawning between cultured and wild salmon which is now known to be happening will result in damage to or the collapse of the wild stocks. If, as managers,

we wait for proof of this damage it could result in changes to the wild stocks that are irreversible. Further research is needed but in this situation, there is clearly no room for complacency.

4. The latest scientific evidence presented at the symposium would suggest that additional measures are needed to improve the containment of farmed salmon either through improvements to physical security or, more effectively, through the use of sterile salmon in farming. There were repeated references to the use of sterility as a way of protecting the wild stocks although the industry expressed concerns that its use might lead to ecological impacts on the wild stocks. Given the Parties' commitment to the Convention on Biological Diversity, the FAO Code of Conduct for Responsible Fisheries and the NASCO Convention, the Council may wish to consider what further action might be needed. A recurring theme at the meeting was the need for enhanced cooperation between the salmon farming industry and those involved in the management of the wild stocks so as to safeguard the wild stocks on which the industry is based. In this regard, the planned consultation with the International Salmon Farming Industry, now scheduled for March 1998, would be a good opportunity to review the issues listed in the Closing Session of the Symposium (see page 10). Following that consultation, the Oslo Resolution of NASCO might be critically reviewed at the June 1998 meeting as was the intention when it was adopted in 1994, so that firm decisions can be taken about further action. This threat to wild stocks is perhaps a classic case where the Precautionary Approach is appropriate, since there are real grounds for concern about genetic damage, a scientific resolution of the question is not yet ready, and the damage, if it is occurring, will be irreversible.

Secretary
Edinburgh
7 May 1997

CNL(97)27

Report of the ICES/NASCO Symposium Interactions between Salmon Culture and Wild Stocks of Atlantic Salmon: The Scientific and Management Issues

1. Introduction

The ICES/NASCO Symposium on "Interactions between salmon culture and wild stocks of Atlantic salmon: the scientific and Management Issues" was held in Bath, England from 18-22 April 1997. The objectives of the Symposium were:

- to review the results of research on the interactions between salmon culture (farming, ranching or enhancement) and wild Atlantic salmon

- to examine the practical implications of such interactions for salmon management

- to identify gaps in current knowledge and to establish future research priorities

The Symposium was sponsored by the European Union Fair Programme and the Norwegian Directorate for Nature Management and supported by the Atlantic Salmon Trust (UK), the Environment Agency (UK), the Biological Resources Division of the US Geological Survey and the Directorate of Freshwater Fisheries Salmonid Enhancement Fund and Institute of Freshwater Fisheries (Iceland). Approximately 170 delegates from 18 countries involved with salmon management, research and aquaculture in the North Atlantic, Baltic and Pacific areas attended.

The Symposium was opened on behalf of ICES by its President, M Alain Maucorps, and on behalf of NASCO by its past President, Mr Allen E Peterson Jnr. There were seven sessions: Keynote Speeches, Genetic Interactions, Ecological Interactions, Diseases and Parasite Interactions, the Genetic Problem and Practical Solutions, Management Implications and Synthesis and Management Considerations. The main points arising from these Sessions, including the discussions, are presented below:

2. Summary of Sessions

Session 1 Keynote Speeches

Continued development of salmon culture will require that managers of the wild stocks proceed on the basis of risk assessment and minimisation since escape of farmed salmon cannot be prevented.

The view was expressed that the genetic arguments for adverse impacts on the wild stocks are "more philosophical than real". The published literature indicates that adverse effects would be anticipated, particularly if the intrusions of farmed fish occurred year after year.

Concern was expressed about disease interactions and about the adverse effects of introductions and transfers.

Progress has been made towards sustainable salmon farming through more efficient use of feeds, reduction of pollution and prevention of disease and following the development of voluntary and mandatory codes.

The need for continued cooperation between those involved with the wild stocks and the salmon farming industry was recognised so as to allow the continued development of salmon farming while safeguarding the wild stocks on which the industry depends.

Concern was expressed about the development of transgenic salmon and their availability for use in aquaculture. Their use has not been endorsed by industry associations because of fears about their environmental impacts and possible adverse consumer reaction.

Salmon enhancement can be a useful management tool but there is a need to carefully evaluate the chances of success, the possible adverse effects and the costs prior to proceeding and to evaluate whether the objectives have been met following the programme.

Session 2 - Genetic Interactions

The presence of significant genetic variation within both wild and cultured salmon has been well documented. The within-population component is larger than the between-population component although conflicting estimates of the magnitude of these two components were given. Genetic differences exist between different stocks even in locations close to one another.

Genetic diversity is maintained by accurate homing and determines the viability, productivity and character of a stock. Genomes are, however, dynamic not static. In general, the more distant the locations of the stocks the greater the genetic difference between them. Three major regional groupings can be identified - the Baltic, the Western European and the Canadian groups.

Hatchery production, especially when accompanied by intense selection for commercially important traits such as growth rate, late sexual maturation and flesh colour, alters the salmon genome. In the Norwegian breeding programme the process of domestication, at the genetic level, is well advanced.

Conclusive genetic evidence was provided that farmed fish breed in the wild and interbreed with wild salmon. There are, therefore, genetic interactions between farmed and wild salmon.

Fitness experiments showed that farmed non-native stocks outgrew local stocks and ultimately displaced them. It remains unclear as to whether the difference was due to the fact that the fish were non-native or to the fact that they were of farmed origin. Transplanted wild stocks performed less well in host rivers than did the stocks native to these rivers. Such fitness experiments should be continued and expanded in future.

Concern was expressed that farmed salmon are homogenising the genetic distinctions between stocks eroding the between-stock variability even when the within-stock variation is kept high. Since selected Norwegian farmed stock is now the most commonly farmed salmon in Europe, the potential exists for serious genetic intrusion into local stocks with consequent homogenisation effects.

Session 3 - Ecological Interactions

Behavioural interactions between cultured and wild salmon are possible at any stage of freshwater life. Both competitive and reproductive interactions occur, including interspecific hybridisation with brown trout, and a very large number of composite scenarios for interaction can be envisaged.

Reproductive performance of farmed fish relative to wild fish is impaired, especially in the case of the males. For farmed female salmon the number of fry generated per unit of body weight may be only 30% relative to wild fish but escaped fish that have been at liberty for longer periods of time might have higher reproductive success.

The progeny of genetically-selected farmed fish or the progeny of farmed and wild fish out-perform wild juveniles. In space-limited stream habitat, competitive displacement and therefore mortality of wild fish is a probable result.

Relative fitness of the progeny of wild fish and escaped farmed fish is probably not constant throughout life, i.e. the progeny of genetically selected farmed fish may show superior performance in freshwater habitat coupled with low fitness as adults. This will lead to lowered recruitment in following generations.

Session 4 - Disease and Parasite Interactions

Serious consequences have resulted from the accidental introduction with live fish of exotic diseases to previously unaffected areas, e.g. furunculosis, *Gyrodactylus salaris*. For example, *Gyrodactylus salaris* transfer to the Keret River in Russia was linked to transfer of young salmon from a hatchery and resulted in serious consequences for the wild salmon populations of that river. Current national and international legislation and codes of practice are established to protect zones free from listed serious diseases. This is a continuing priority area of concern.

Most endemic diseases are now under control in fish farms with the exception of sea lice. There is currently concern and controversy regarding the possibility that this infection may be amplified within salmon farms with subsequent detrimental effects to local populations of wild salmon. The pattern of infection and pathogenicity of lice on sea trout and salmon are substantively different. Focuses of infection with lice occur in the immediate vicinity of infected farms, in river estuaries and at a lower level in the open sea (on both trout and salmon). Salmon farm monitoring for lice provides information useful for development of improved site management measures to control lice infestations. High levels of canthaxanthin-like pigment in fish farm lice show potential in differentiating these from lice from wild fish.

There is a need for the application of proper experimental design to assess cause/effect relationships of lice/host interactions. To maintain scientific objectivity (i.e. use of the null hypothesis) and to use this knowledge to develop procedures to contain and control adverse effects for both salmon farmers and recreational fisheries interests, is the requirement, and indeed the challenge for scientists, farm managers and governments.

Session 5 - The Genetic Problem and Practical Solutions

Introgression with and/or ecological displacement by cultured fish may cause damage to wild populations. It was agreed that the safest situation would be to have no releases, be cautious and avoid the consequences of change in gene frequency behaviour. Gene frequencies in populations of wild salmon can be changed by cultured fish but further research is needed to clarify if this will be harmful.

Introgression could be prevented by using sterile fish in aquaculture. Production of triploids using pressure treatment is 100% effective. These fish exhibit similar growth rates to non-maturing diploid fish but they can be more difficult to rear and there can be problems of deformities. However, triploids grow to a larger more profitable size, their appearance is closer to that of wild fish and they are potentially more heterozygous. The increased costs of production should be balanced against the threat posed to the wild stocks by the continued use of diploid fish in aquaculture. Triploid fish could cause ecological interactions with the wild stocks.

The production of transgenic salmon can be used to allow aquaculture to expand into areas where it is not presently possible, for example by incorporation of an anti-freeze gene. Transgenic salmon may also be produced with greatly enhanced growth rates. However, there is real concern about the potential adverse effects of transgenic salmon on the wild stocks and further research is needed.

Salmon intended for release for enhancement of wild stocks should be based on wild stocks and reared in the hatchery for as short a time as possible.

If nothing is done to protect the wild populations from introgression with cultured fish the impact may be irreversible or only slowly reversible.

Session 6 - Management Implications

This session reviewed the impacts of cultured fish on wild stocks from deliberate releases for enhancement, deliberate releases for ranching and unintentional escapes from farms. Each has potential for interactions with wild fish ecologically by competitive displacement; pathologically by diseases transmission and genetically by introgression.

While evidence for ecological interference is lacking and evidence for disease transmission is debated and disputed, interbreeding has occurred although its scale and ultimate success is not yet documented.

The presence of cultured fish in sea and coastal fisheries leads to increased exploitation on wild stocks.

Salmon culture will continue to develop and so the probability of continuing impacts of cultured fish on the wild stocks remains. What can managers do to minimise the potentially adverse effects of the interactions? As regards deliberate releases research is needed into oceanic control processes in the North Atlantic and Baltic to clarify if the assumption that these seas can support augmented populations is valid. In the case of salmon farming the overall priority is to prevent escapes and efforts should be made to improve security. The production of sterile salmon should be encouraged together with the following subsidiary measures: increased domestication of farmed stocks based on local material; improved

therapeutants; protected coastal zones; strengthened wild populations; gene banks; fishing for escapees.

Session 7 - Synthesis and Management Considerations

Panel Session

The Chairman noted that the International Salmon Farmers Association had been invited to co-chair this final session but had declined to do so. The Norwegian Salmon Farmers had been invited to have a representative on the Panel but they had not responded. Mr Bjarne Aalvik from Norway had stood in at short notice.

Dr Per Wramner (National Board of Fisheries, Sweden) referred to the relationship between enhancement activities in the Baltic and the declining wild stocks and to the need for cooperation between the parties involved to ensure that the wild stocks are protected. In the light of the information presented at the symposium he identified three areas which required urgent attention:

1) Increased efforts to protect wild salmon in the Baltic and the Swedish west coast rivers by developing measures to counteract the negative impacts of cultured fish which had been highlighted during the symposium.

2) Increased research efforts particularly into methods to minimise impacts of cultured fish.

3) Actions to reduce the impacts of salmon farming on wild stocks through a process of adaptive management.

He stressed that all Parties to the Convention on Biological Diversity have committed themselves to conserve biodiversity so the discussion should not have been focused on if we need to protect the wild stocks but how this should be achieved. He also referred to other international agreements including the Code of Conduct for Responsible Fisheries developed by the FAO and which includes provisions concerning aquaculture, and to the increasing use of the Precautionary Approach by inter-governmental organizations. He expressed the opinion that it is preferable to reduce the impacts of aquaculture now while development can be controlled rather than waiting until the industry is forced to take action by regulations or consumer pressure. In the long term it will be in the interests of the industry to reduce the impacts even if the costs are high but a "business as usual" attitude threatened the future of aquaculture and the conservation of the wild stocks. He would wish to see progress through a positive attitude of cooperation.

Mr William Thompson (New Brunswick Salmon Growers Association, Canada): stressed that there was a need to focus clearly on the central issue of keeping salmon in the rivers and how that could be achieved. He indicated that it would be up to society to decide how much it was willing to contribute to achieving this objective but he believed that, given the concerns about issues such as education, health, and unemployment, wild salmon conservation would not be a high priority. Preserving the strains of salmon in hundreds of rivers will take considerable resources. He expressed some reservations about the genetic concerns expressed during the symposium given that the human world is evolving into a melting pot and he questioned if the same could not happen for salmon without adverse

effects. Achievement of the objective of keeping salmon in rivers would also involve addressing habitat issues in freshwater which would compete for available resources. He believed that there is a need to consider how the public will view the various competing issues. It is clear that there is a high public demand for farmed salmon so the industry will not go away and will continue to create employment, generate economic benefits and provide a valuable and nutritious product. He stressed that salmon farmers do not intend to damage the wild stocks on which the industry is based but the industry will not accept controls unless they will be of benefit in maintaining salmon stocks in the rivers. We must, therefore, leave the meeting with a plan as to how this objective can be achieved. He noted that there are areas where salmon farming can improve and these improvements, for example in containment technology and disease prevention, will be achieved more quickly with support and cooperation from those involved with the wild stocks, not criticism.

Mr Rex Porter (Department of Fisheries and Oceans, Canada): indicated that, although drawing conclusions from the information presented was not easy, the findings of the symposium supported the conclusions arising from the Loen conference held in Norway in 1991 and the advice from the ICES Scientific Study Group on the Effects of Reared Atlantic Salmon on Wild Salmon, that cultured salmon pose a risk of adverse effects on the wild populations. These risks from intentionally or unintentionally released cultured salmon may be genetic, health or ecological. He stressed that while different views had been expressed on the effects of spawning between cultured and wild salmon all of the evidence presented was of negative impacts and the view had been expressed that this could lead to a collapse of wild populations particularly if the cultured fish spawned repeatedly over time. He concluded that the genetic diversity present in the wild stocks is important and should be protected and that this diversity can be compromised by the release of cultured fish. Both wild and cultured salmon generate economic and social benefits. There is a need for improved dialogue and cooperation at an international level so as to prevent interactions. While some geneticists had put forward the view that genetic interactions were unlikely to have negative effects on the wild stocks there was no research to support this position and the consequences of not taking action to minimise genetic interactions are too great. He indicated that emphasis should be given to developing triploid stocks for use in aquaculture but until such time as these stocks are available there is a need to improve containment, develop local stocks for use in aquaculture and establish procedures for the recapture of escapes. There should also be a ban of inter-continental transfers of stocks. He stressed that there is a need to recognise that there is a potential for adverse effects from cultured fish and that there will be benefits to the industry from safeguarding the wild stocks through a cooperative approach within NASCO.

***Mr William Crowe (Scottish Salmon Growers Association, Scotland)*:** referred to the importance of salmon farming to the economy of the Highlands and Islands of Scotland. This success story has been applauded by the UK government as an example of a successful private enterprise. Salmon farming is first and foremost a commercial business which creates 2000 jobs on the farms and a further 2500 jobs in processing. 16 million consumers in the UK appreciate the product but only 15% of these are concerned to some extent about environmental issues. He indicated that the industry had developed at a time when Government funding for research on food production was declining but was mindful of the need to safeguard the environment, the SSGA had developed a statement entitled “sharing the environment”. The salmon farming industry has been accused of causing pollution of the environment but over the last twenty years fish health has never been better indicating that environmental conditions have not deteriorated. The salmon farming industry aims to send healthy stocks to sea and to prevent ingress of diseases from the wild. Much progress has

been made through the development of vaccines and approximately £1.6 million has been spent by the industry on sea-lice research. He stated that he was not convinced by the genetic arguments he had heard during the symposium because stocking of smolts in Scottish rivers had occurred until as recently as 1995 under agreements between proprietors and salmon farmers. Straying of wild fish was also well documented. Smolts from salmon farming had been used to successfully restore salmon to the Thames but if these fish had inferior genes surely "Mother Nature" would have culled them out. With regard to transgenic salmon he indicated that the SSGA was opposed to their use in farming because of their possible environmental impacts not because of fears about consumer perception. Triploid salmon had in the past been used in Scotland but they were found to be prone to disease and gave poorer performance. He believed that the Precautionary Approach should be invoked in relation to triploids since they could be damaging to the wild stocks and there was a need for further research before their use in aquaculture was advocated. In conclusion, he indicated that the SSGA would continue to press for higher standards of containment of fish through greater security of moorings and nets and will continue to lobby the government to allow the industry access to a wider range of therapeutants so as to allow diseases and parasites to be effectively controlled.

Mr Bjarne Aalvik (Ministry of Fisheries, Norway): indicated that he sensed that the attitude was one of "where you stand depends on where you sit" or put another way "tell me where you work and I'll tell you what you mean". He referred to a Government white paper on aquaculture in Norway which had received broad political agreement and which stated that aquaculture should have a balanced and sustainable development. Salmon farming is an extremely important industry in Norway creating 14,000 man-years of employment and generating £0.6 billion annually to the economy. He noted that one problem specifically referred to during the symposium is that of escapes and while it is impossible to eliminate these, much progress could be made in reducing the scale of the problem. In Norway recommendations have been developed on minimising escapes and it is recognised that the wild salmon resource represents an important gene pool for the industry. The Norwegian Salmon Farmers Association has decided not to use transgenic salmon because of possible marketing problems but no decision has been taken with regard to the use of sterile salmon. He concluded that it is extremely important that there is an open dialogue between salmon farmers and those concerned with the wild stocks.

Mr John Browne (Marine Institute, Dublin): indicated that while the symposium had contributed to a clearer understanding of the interactions between wild and cultured salmon, little progress had been made towards finding practical solutions to the problems. He referred to the differences of opinion being expressed by scientists but stressed that there was a need to avoid emotional arguments and to deal with facts. He had been particularly concerned by statements such as "introduction of genes is unlikely to affect performance in the wild" since we are only just beginning to understand the genome of the wild salmon and it is clear that if we lose salmon stocks it will be very difficult indeed to restore the lost populations. Given the evidence presented at the symposium, particularly concerning the lower rate of return of farmed/wild progeny, he indicated that he will be advising his administration that cultured stocks pose a risk to the wild stocks and the ability to maximise their productivity. One area where he felt that progress should be made was in the use of sterile fish. While there have been some problems with their use he expressed amazement at the attitude of the farming industry since if sterile salmon were marketed as a contribution to protecting the wild stocks he believed that the consumers would accept them, as they have, for example accepted and been prepared to pay extra for dolphin-friendly tuna. He raised two

questions. Firstly, are sterile transgenic salmon more of a risk than reproductively viable fish which could replace the wild stocks and, secondly, should Ireland develop local stocks for farming or is it preferable to continue to use a stock which might not be able to compete as effectively as a native stock?

Closing Session

Dr Malcolm Windsor (Secretary of NASCO): stated that the symposium had facilitated a valuable exchange of ideas and information and had raised many important questions, some of which remain unanswered. While it was not an appropriate forum for making resolutions or taking decisions, he hoped each participant would take back some issues which he or she would then have to resolve.

He expressed the hope that the scientists would carry out the research necessary to fill the remaining gaps in our knowledge and that ICES would serve as the forum for this research advice when it came to fruition. He also encouraged those involved in salmon farming to consider further how they can contribute through changes in management and rearing techniques to protecting the wild stocks on which ultimately the industry depends. Managers of the wild salmon stocks will need to find better ways of addressing the issues raised during the symposium. A number of these will be put before NASCO at its next annual meeting with a view to seeking agreement on the next steps needed to protect the wild stocks. This should be done in cooperation with the salmon farming industry at an international level so as to avoid the industry in any particular country being placed at a competitive disadvantage by any new measures. Further measures for enhancement and ranching will also be considered. The following issues will be placed before NASCO.

- Cage security/management - how can we significantly improve cage security so as to prevent escapes and improve cage management so as to reduce disease problems?

- Sterilization - can triploids have advantages, not disadvantages? Surely marketing aspects can be overcome.

- Domestication - is it a way forward to reduce interactions? How long would it take before an animal became so domesticated that it will not interbreed?

- Use of local stocks or exotic stocks - which route is best?

- Better therapeutants - is there room for further progress? Much has been achieved. Can the industry be helped by government action?

- Zones for the protection of the wild stocks - are they working and are they rightly conceived and operated?

- Clearing up escapees - can we agree on procedures and methods?

- Marking farmed fish - can tagging of farmed fish help us to identify problems?

- Education of fish farmers - can the national associations of salmon farmers help?

- Gene banks - is there room for a joint approach here between industry and government. Can they offer much in the long term?

- Transgenics - Do these represent a terrible danger or a clever way forward? NASCO is already committed to an international resolution on transgenics in June.

- Stocking - internationally-agreed guidelines are being considered by NASCO so that it does not do more harm than good

- Salmon ranching - perhaps also international guidelines need to be developed by NASCO

- Further conservation measures to make wild stocks stronger so that they can withstand impacts of aquaculture

He referred to the terrible publicity that would result if the salmon farming industry was seen to have contributed to the collapse of the wild stocks. This would clearly not be in their interests and, apart from consumer reaction, this gene bank on which the industry depends would have been lost. Much progress has been made in disease treatment through improved cage management, fallowing, lower stocking densities and use of vaccines but there is real concern about the impacts of sea lice on the wild stocks.

He referred to the progress made since the Loen meeting in that some of the experiments called for at that meeting have been conducted. These experiments showed that the interactions between wild and cultured fish will result in changes to the characteristics of the wild stocks which in the worst-case scenario might lead to the collapse of these stocks. The wild stocks may be replaced by a new hybrid stock with unknown staying power and this would be contrary to the Convention on Biological Diversity and the NASCO Convention. The homing precision of the salmon is presumably for a purpose; it may be a kind of genetic tuning of benefit to their survival. We are interfering with this process. If we get this wrong the changes are probably irreversible and in these circumstances adherence to the Precautionary Approach, which is being increasingly used in international fisheries management, would seem to be appropriate. He hoped that by working together with the industry it would be possible to safeguard the wild stocks. It would be a tragedy if wild salmon no longer went about their migration and entered our rivers.

Dr Ingemar Olsson (Vice-President of ICES) referred to the excellent spirit of cooperation between NASCO and ICES and to the success of previous joint meetings. He indicated that NASCO might be seen as a pioneer of co-management and he referred to previous meetings in which managers, scientists and industry representatives had participated. This symposium had again brought together participants with a wide range of interests and much new information had been presented which could form the basis for management considerations by NASCO. It is clear, however, that there are still considerable gaps in our knowledge of interactions so further research will be needed and ICES will provide a forum for this new information. It is important, given international obligations under the Convention on Biodiversity, that this research takes place. He drew attention to two relevant Theme Sessions at the next ICES meeting in Baltimore, USA which will deal with Diadromous Fish Extinctions and the Precautionary Approach - scientific advice on management of marine resources and the marine environment. On behalf of ICES he thanked the Co-Conveners, the

sponsors and all participants for their contribution to a most successful and significant symposium.

Mr Allen Peterson (former President of NASCO) referred to the success of the salmon farming industry in meeting the growing demand for aquatic resources and to the fact that aquaculture is likely to expand further in the future. The wild salmon were in trouble prior to the dramatic expansion of salmon farming but there are real concerns about the threats to the wild stocks from cultured fish. He referred to the diminishing number of species with extinctions occurring every year. The latest threatened species are the Great Apes which are being slaughtered in Zaire for food. He posed the question "How can we be concerned about the killing of apes by people who are just trying to live?" The cod fishery in the western Atlantic collapsed because jobs were involved and people said that nothing could be done. In the case of salmon the issue is not remote - all participants at the symposium are part of it. In the case of aquaculture it is not a case that the industry cannot afford to take the measures needed to safeguard the wild stocks. Extinctions of species have happened time and time again and the fate of the Atlantic salmon is in our hands. He concluded that we must not allow irreversible changes to take place which will threaten this valuable resource.

ANNEX 21

COUNCIL

CNL(97)28

RESOLUTION ON TRANSGENIC SALMON

CNL(97)28

RESOLUTION ON TRANSGENIC SALMON

1. Transgenic salmon, i.e. salmon containing genes from another organism, are now available to fish farmers. They can grow considerably faster than "standard" fish. The extent to which transgenic salmon will be utilised by the farming industry will depend, among other factors, on the regulatory environment and on predicted consumer reaction to a genetically modified product. Salmon farmers are naturally very cautious about this development but one salmon farmer in Scotland is known to have experimented with the rearing of transgenic salmon. If such salmon are used in existing cage technologies, they will inevitably escape. The issue of the use of transgenic salmon in aquaculture had been considered at a meeting of the North-East Atlantic Commission's Ad Hoc Working Group on Introductions and Transfers in 1996 and all Parties agreed that such use could pose a major threat to the wild stocks because of the irreversible transmission of transplanted genes through inter-breeding and because of ecological effects both in the marine and freshwater environments. While the development of new biotechnologies such as transgenic organisms may offer benefits, their use also raises important questions related to ecological consequences.

2. Last year the Council considered the risks to the wild stocks from transgenic salmon. A draft Resolution designed to control the risks to the wild stocks and to develop more information was tabled and the Council asked the Secretary to consult with the Parties with a view to adopting the Resolution by correspondence. In accordance with this decision I circulated copies of the draft Resolution to the Parties on 15 October 1996. The US delegation felt that they could not agree to the Resolution unless the background paper on transgenic salmon (CNL(96)30) tabled for consideration by the Council last June was changed. The Norwegian delegation felt that, as a matter of principle, changes should not be made to the background paper although they could agree to the comments proposed by the US being annexed to the report of the Council meeting. In the light of these different views, the President and I felt it would be unwise to proceed with the Resolution and we advised the Parties accordingly. The Council had, however, already agreed to develop a further more detailed resolution on transgenic salmon at its 1997 Meeting.

3. The draft Resolution considered by the Council last year had proposed that subsequent resolutions on this topic should take into account any findings by the ICES/NASCO Symposium on this issue. That Symposium has now been held and industry representatives there recognised that transgenic salmon pose a severe risk to the wild stocks. It was stated that some industry associations did not endorse the use of transgenic salmon because of the environmental risks, rather than because of the anticipated consumer reaction to the product. While no specific recommendations were sought or developed at the meeting to address the concerns about transgenic fish, the need to contain all cultured fish either through physical or biological measures was recognised. This need for containment would be even more vital in the case of transgenic salmon if there is to be confidence that their use in aquaculture is not going to pose real risks to the wild stocks.

4. The Council will be asked to consider the attached Resolution on Transgenic salmon (Appendix 1) with a view to its adoption.

Secretary
Edinburgh
6 May 1997

Appendix 1

DRAFT RESOLUTION ON TRANSGENIC SALMON

THE PARTIES:

NOTING the provisions of the Convention for the Conservation of Salmon in the North Atlantic Ocean of 2 March 1982 which seeks to promote the conservation, restoration, enhancement and rational management of salmon stocks;

HAVING REGARD to the potentially serious threat posed to wild salmon stocks from transgenic salmon, which are salmon that contain genes from another organism;

RECOGNISING that there is an urgent need to take steps to ensure the protection of the wild stocks;

TAKING INTO ACCOUNT the FAO Code of Conduct for Responsible Fisheries, in particular Article 9.3, and the ICES Code of Practice on the Introductions and Transfers of Marine Organisms;

AGREE that they will cooperate to develop means by which transgenic salmon cannot impact wild salmon stocks;

RESOLVE as follows:

a) to advise the NASCO Council of any proposal to permit the rearing of transgenic salmonids and provide details of the proposed method of containment and other measures to safeguard the wild stocks;

b) to ensure that the use of transgenic salmon, in any part of the NASCO Convention Area, is confined to secure, self-contained facilities;

c) to take into account the ongoing work by the Parties to the Convention on Biological Diversity to develop a Protocol on Biosafety;

d) to ensure that any development, transportation and growth of transgenic salmon incorporate the Precautionary Approach and the FAO Code of Conduct for Responsible Fisheries to safeguard the environment and biological diversity;

e) to inform their salmon producers of the potentially serious risks to wild stocks of this development and consult with the salmon farming industry on this matter through the new Liaison Group established between NASCO and the international salmon farming industry;

f) to take steps, as appropriate, to improve knowledge on the potential impacts of transgenic fish on the wild stocks and their habitat;

g) to examine the trade implications associated with transgenic salmon in accordance with World Trade Organization Agreements and other instruments of international law.

ANNEX 22

COUNCIL

CNL(97)48

NASCO GUIDELINES FOR ACTION ON TRANSGENIC SALMON

THE PARTIES to NASCO are aware of the development of transgenic salmon (i.e. salmon that contain genes from another organism). While there may be benefits from the introduction of such salmon if, for example, they could not interbreed with wild stocks the Council recognises that there are also risks which may lead to irreversible genetic changes and ecological interactions.

The Council considers that there is an urgent need to take steps to ensure the protection of the wild stocks and has therefore agreed to cooperate to develop means such that transgenic salmon cannot impact upon wild salmon stocks. The following specific steps are agreed.

The Parties will:

a) advise the NASCO Council of any proposal to permit the rearing of transgenic salmonids and provide details of the proposed method of containment and other measures to safeguard the wild stocks;

b) take all possible actions to ensure that the use of transgenic salmon, in any part of the NASCO Convention Area, is confined to secure, self-contained, land-based facilities;

c) take into account the ongoing work by the Parties to the Convention on Biological Diversity to develop a Protocol on Biosafety;

d) inform their salmon producers of the potentially serious risks to wild stocks of this development and consult with the salmon farming industry on this matter through the new Liaison Group established between NASCO and the international salmon farming industry;

e) take steps, as appropriate, to improve knowledge on the potential impacts of transgenic fish on the wild stocks and their habitat;

f) examine the trade implications associated with transgenic salmon in accordance with World Trade Organization Agreements and other instruments of international law.

The Council will:

ask the newly established Working Group on the Precautionary Approach to consider specifically the risks and conservation benefits from transgenic salmon as part of its response on introductions and transfers.

ANNEX 23

COUNCIL

CNL(97)44

THE ATLANTIC SALMON AS PREDATOR AND PREY - MANAGEMENT IMPLICATIONS

CNL(97)44

THE ATLANTIC SALMON AS PREDATOR AND PREY - MANAGEMENT IMPLICATIONS

Summary

The attached paper reviews the presentations and discussion from the Special Session held at the last Annual Meeting.

Predators

We can identify many predators of the salmon but we have difficulties in quantifying their impacts. It is clear that at some stages of the life-cycle predation losses can be compensated for. However, salmon population abundance is presently low and while management measures designed to reduce exploitation in fisheries have been introduced to control the impact of Man some predator populations have increased dramatically in recent years. This had led to increasing calls from users of the resource to restore the balance to ecosystems through the development of management plans. There are real difficulties associated with the control of predators such as birds and seals, particularly those involving lethal methods, because of public reaction. This reaction is likely to be strongest to proposals to cull populations where the intention is to reduce the population size without necessarily utilising the carcasses.

Prey

With regard to the prey of the salmon there is also a lack of hard evidence as to the impact of the fisheries for species such as sandeels and capelin on wild salmon stocks. There are two elements to this, first that the tonnages taken are so large that even if a small percentage of the catch were salmon smolts or post-smolts there could be a significant impact. Secondly, there is the question of whether the removal of this high energy feed depresses the growth and survival of salmon. Here, again we face difficulties since there is a lack of scientific information although the issues are perhaps not so dominated by emotional reactions. The industrial fisheries in the North Sea are not controlled by any international body and harvests tend to be linked to abundance. Further research is needed into the impacts of the harvesting of sandeels and capelin on salmon, but application of the FAO Code of Conduct for Responsible Fisheries may have implications for these fisheries. This Code encourages States to ensure that the level of fishing is commensurate with the state of the fisheries resources and that management measures are developed which not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species.

Possible actions

In an ideal world for the salmon, there would be control of certain predators, such as some species of seal and some fish-eating birds, and controls on the harvest in the industrial fisheries. However, the question for NASCO is what steps can realistically be taken in this direction so as to assist in conservation of wild salmon stocks at a time of very low abundance. These issues might also be referred to the proposed Working Group on the Precautionary Approach if the Council agreed to proceed with the establishment of this

Group (see paper CNL(97)21). In this regard some participants suggested that education of the public is vital so that people living in cities might be convinced that the seal, for example, is damaging wild salmon stocks and the livelihoods of coastal and rural communities. They need to be convinced that it is reasonable to consider management of the populations. The methods used will have to be acceptable to the public and non-lethal methods, such as birth control for seals, have been advocated. The public will also need to be convinced that controlling birds is a sensible move to conserve the salmon. There is no quick solution but the Council may wish to decide whether it wishes to ask new scientific questions, sponsor more work in the areas described in the attached review and take some steps to influence public opinion by publication, interviews or to take other measures.

Secretary
Ilulissat
11 June 1997

The Atlantic Salmon as Predator and Prey - Management Implications

Introduction

Last year, at the request of the Non-Government Organizations, the Council held a Special Session entitled "The Atlantic Salmon as Predator and Prey". Concern has been expressed in recent years about the rapidly increasing populations of some of the predators of Atlantic salmon and at the same time about the harvest of the prey of Atlantic salmon in industrial fisheries. These are controversial and emotive issues on which strong, diametrically opposing views are often expressed but they are issues of relevance to the conservation, restoration, enhancement and rational management of salmon. Predator-prey relationships are complex and last year we took the first step by reviewing the available information on these issues. Presentations were made on "The predators of Atlantic salmon and their impact on salmon stocks"; "The public perception of predator control programmes"; "The prey of the Atlantic salmon" and "The impact of industrial fisheries in the North Sea on the prey of salmon". There was also a lively discussion period in which many different views were expressed. The Council agreed that the management implications arising from this Special Session would be considered at its Fourteenth Annual Meeting. This paper summarises the main points emerging from each of the presentations and from the discussions.

The Atlantic Salmon as Predator

Summary of points raised in presentations

The major prey of the Atlantic salmon in freshwater are different species of insects. In estuarine/coastal waters the diet gradually changes from insects to marine invertebrates (crustaceans) and to small fish (herring and sandeel). In oceanic waters salmon feed on fish (capelin, sandeel, herring, lantern fish) and on amphipods, euphausiids and squid. During the homing migration the feeding intensity decreases as the fish approach freshwater.

Mortality in freshwater is high (up to 99% to smolt stage) and density-dependent. Many factors determine the survival of salmon at sea and while these are poorly understood, density-dependent mortality does not appear to be significant.

The diet of the salmon at all stages of its life-cycle varies with age (size), location and time of year. It has been suggested that the Atlantic salmon is an opportunistic feeder, i.e. consumes whatever is most readily available. However, in the ocean phase there is no information available to compare the distribution of food organisms available to salmon with what they actually eat.

Some species which are targeted by industrial fisheries (e.g. sandeel) are consumed by salmon in estuarine/coastal waters as post-smolts, during the oceanic phase and again in coastal waters on their return migration.

The industrial fishery in the North Sea developed in the late 1940s. The fishery was originally based on exploitation of herring, but sandeels, Norway pout and sprat are now the main target species. Only Norway and Denmark have large-scale industrial fisheries in the North Sea, with Denmark taking more than 80% of the catch. The harvest peaked at about 2 million tonnes in the 1960s but over the last 15 years has been between 1-1.6 million tonnes annually. Industrial fisheries are defined as those utilising small mesh nets (<32mm) where

the harvested fish are intended for conversion into fish meal and oil. The fisheries are highly seasonal. The most important fishery is for sandeel which takes place principally in the second quarter of the year.

The industrial fishery in the North Sea is intensely controversial. Some hold the view that such fisheries represent a good way to harvest a resource which otherwise would not be utilised, while others believe that the fisheries are harmful to other species of fish, marine mammals and sea birds.

The by-catch of species which are harvested for consumption in the industrial fishery is small (principally herring, whiting and blue whiting) in terms of weight but as the by-catch is of juvenile fish it takes a higher share of the catch in terms of numbers. Industrial fishing may result in changes in abundance and the size composition of the target species. An indirect effect of the fishery may be to change predator-prey relationships.

Industrial fisheries take less than 25% of the total annual production of sandeel, Norway pout and sprat compared to the 80% of the annual production of cod taken in the consumption fishery. Assessments of the target species in industrial fisheries is complicated because they are short-lived species in which natural mortality due to predation plays a key role. The Norway pout and sandeel stocks are believed by ACFM to be within safe biological limits and while the state of the sprat stock is unknown, recruitment and biomass appear to be high at present.

It has been estimated that a 40% reduction in effort in the industrial fisheries would lead to a reduction in overall yield but landings in the consumption fishery would increase by between 2-20%. The biomass of all species, particularly the industrial species and herring, would be expected to increase if the industrial fishery is reduced.

Discussion

Two issues of concern that were not addressed during the presentations but which arose during the discussion period were the possible by-catch of salmon smolts in the industrial fishery and the effect of harvesting a known prey of salmon smolts and post-smolts in coastal waters.

With regard to the by-catch of salmon in the fishery, monitoring of the catches by Danish scientists over a period of 40 years has failed to reveal any salmon. The available evidence suggests that salmon feed near the surface (although they are also known to include some deep water species in their diet). The industrial fishery exploits sandeels on the sea bed. However, with such large catches, even one smolt in every million sandeels landed could represent a serious source of mortality for salmon (Hawkins, 1996).

With regard to the effects of harvesting the prey of the salmon, the view was expressed that if catch rates fell the fishery would not be profitable and that this would safeguard against over-fishing of the stock. The sandeel fishery is, however, essentially unregulated in terms of the allowable harvest and there have been calls to establish a Total Allowable Catch (Hawkins, 1996). The use of an east-west division of the North Sea along the 4°E longitude line has been proposed, westwards of which reductions in sandeel extractions should be allowed (Robertson et al, 1996). While there is evidence that salmon smolts move rapidly out of coastal waters and it has been stated that salmon numbers are unlikely to be sensitive to year

to year changes in availability of any particular prey (Hislop and Shelton, 1993), the availability of sandeels in coastal waters may be critical to the early growth of smolts (Morgan et al, 1986). It is therefore important to ensure that the food supply of salmon is not overexploited (Hawkins, 1996) particularly as smolts must learn to exploit new species and adjust to a major physiological change following entry to the marine environment and may therefore be more vulnerable to predation at this time (Hislop and Shelton, 1993). The situation is complex because there is also a large seal population feeding on sandeels at this time which might lead to predation of smolts. Careful research is needed and Danish and Scottish scientists are collaborating to assess the impact of this sandeel fishery.

Concern was also expressed about the harvest of capelin in the North Atlantic region and the impact on Atlantic salmon. The concern again relates to the possible by-catch of salmon post-smolts in capelin and other pelagic fisheries (Anon, 1997a) and to the effect of harvesting a known prey of the salmon. The harvests of capelin have been very high. For example, catches of capelin in the Barents Sea were as high as 3 million tonnes in the 1970s, although there was no harvest in this region in 1994 or 1995. In the Iceland-Greenland-Jan Mayen area the catch of capelin exceeded 1 million tonnes in 1993 but fell to 540,000 tonnes in 1995 (Anon, 1996a). Carscadden and Reddin (1982) stated that there is no doubt that a biological relationship exists between adult salmon and capelin and although they are not the exclusive component of the diet, and salmon, being opportunistic, could switch to whatever is most abundant in the area, they have a high energy content and may be very important to the survival of Atlantic salmon in cold winters when a high fat content is required.

The Council may therefore wish to encourage further research into these issues with a view to obtaining a clearer understanding of the by-catch of salmon in industrial and pelagic fisheries and into the importance of species such as capelin and sandeels in the diet of salmon. Such studies have been called for by ICES which endorses post-smolt surveys and the search for by-catch of salmon post-smolts in pelagic fisheries (see CNL(97)13).

The Atlantic Salmon as Prey

Summary of points raised in presentations

Predation of Atlantic salmon occurs at every stage of the life-cycle and over fifty predators have been identified from the North Atlantic region.

The most important predators on young Atlantic salmon are herons, belted kingfishers and mergansers which exhibit a marked preference for salmon over other available species. The impact of this predation on salmon populations is hard to assess because of compensation processes which operate until the large parr stage.

Smolts possess an array of strategies to avoid predation. Nevertheless, mortality during the smolt migration can be great in some systems in some years. The predation by European cormorants on wild salmon smolts in the river Bush was estimated to be 51-66% of the population. Cormorant populations have been increasing dramatically in many areas (nearly 7% per year in the US to the extent that present abundance may be at an all time high). As the carrying capacity of coastal areas has been reached the cormorants have moved inland. Red-breasted mergansers and goosanders can also cause very significant mortality of smolts. Saithe, cod and other species of fish can cause considerable mortality in the estuaries.

In the sea, salmon soon become too large to be suitable prey for birds. The greatest potential for heavy predation at sea is from seals, both in the feeding areas and as the adults return to the rivers to spawn. The control of seals has become a highly emotional issue. Bounties and culling have been common methods used to control seal populations in both the Pacific and Atlantic but these programmes have stopped or are decreasing due to changing public attitudes and most seal populations are increasing. Studies of the diet of seals have concluded that seals are opportunistic feeders.

The grey seal is of greatest concern and causes great financial losses to commercial fisheries, including salmon fisheries, and to salmon aquaculture. In the North Atlantic region the populations are increasing at between 7-13% per annum. There is some evidence that the damage to fisheries is caused by a small number of seals (rogue seals) which cause most of the problems. There is conflicting evidence about the occurrence of salmon in the diet of grey seals. Almost 20 years ago, ICES suggested that grey seals could kill as many salmon as the commercial fishery and abundance of grey seals has increased considerably since that time.

Salmon have been recorded very infrequently in the diet of harp seals. Harp seals may have a greater effect by consuming the prey of the salmon, e.g. capelin, than through direct predation. Predation on capelin by harp seals may have important consequences for salmon, particularly in cold winters, when a high fat content is required.

Common or harbour seals feed opportunistically. No studies have been conducted near salmon rivers when salmon were present so no salmon have been reported in their diet. Phocine distemper virus caused significant mortality in common seal populations in Europe, but some populations have been increasing dramatically (8-15%) in recent years.

Salmon have not been recorded in the diet of bearded seals or hooded seals. Salmon have been recorded in the diet of ringed seals in the Baltic and around the Kola peninsula but these species probably do not feed on salmon during the summer months.

Atlantic salmon stocks have declined dramatically in the North Atlantic region despite management actions designed to reduce exploitation. At the same time, increases in seals and fish-eating bird populations have been reported. In the Maritime Provinces preliminary estimates indicate that cormorants may consume up to 500,000 smolts annually, red-breasted mergansers may consume up to 400,000 smolts and juvenile salmon annually, and common mergansers may consume up to 6 million juvenile salmon annually.

Bird control programmes have been considered to be “one of the most promising tools available for increasing salmon stocks”. However, the results of bird control programmes have been scientifically ambiguous. Future studies would need to be designed very carefully and in a different fashion. For example, in an early study on the Margaree River in Canada, the salmon smolt count doubled following bird control. However, there was no knowledge of the spawning populations or hatchery success that contributed to each smolt class.

Animal rights organizations would not consider it acceptable to kill predators unless full utilisation was made of the carcasses. Trapping and removal of birds is considered a difficult option. Other predator control programmes in North America in recent years, such as control of the wolf to benefit large game animals, have been heavily protested by environmental groups.

The arguments against predator control tend to be based on emotional reactions to the predators concerned. These arguments should not influence the analysis of scientific data and the provision of scientific advice but have to be considered when all the social aspects of management are reviewed.

The closer the predation is to maturity of the salmon the more obvious the impact because predation during earlier life-stages (up to the large parr stage) may be compensated for by higher survival of the remaining individuals.

Discussion

A number of points emerged during the discussion. These included:

- salmon populations are at low abundance and while many of Man's impacts are being managed and controlled, many predator populations are expanding which could have adverse effects on salmon directly through predation and indirectly through competition for prey.

- while the abundance of the harp seal population in Canada may have been higher in the nineteenth century than it is today, there is no indication that other predators such as fish-eating birds were more abundant than today and in some cases they have been considerably less abundant.

- many factors influence the abundance of salmon, particularly the quality of the habitat, and those against control of fish-eating birds argue that these factors should be addressed before avian control programmes are considered.

- permission to control fish-eating birds may be granted if damage to a fishery could be demonstrated. However, demonstration of such damage is difficult because of the complexity of predator-prey relationships and it is therefore difficult to obtain support from concerned interest groups.

- any programmes to control fish-eating birds need to be carefully considered focusing on individual rivers at particular times with a view to demonstrating the benefits of the programme. Animal rights organizations would not consider it acceptable to kill predators unless full utilization was made of the carcasses.

- any seal harvest aimed at restoring the balance to marine ecosystems must be very carefully planned because export bans imposed in response to a seal harvest could adversely affect the fishing industry. The need for greater cooperation between coastal States with regard to the harvesting of seals in future was stressed. Any predator control programme will be very carefully monitored by animal rights groups.

- the absence of salmon from the diet of seals does not mean they are not consumed since the hard parts of the skeleton required for identification may not be consumed. Even if eaten infrequently by seals the losses could be large because of the increased abundance of seals.

- there are many misconceptions and much mis-information about the harvesting of seals. For example, the most effective method of killing seals (use of clubs) is unacceptable to the public as it is perceived as being barbaric. The public is receptive to the facts and it is important to counter the emotional approach with the best scientific information.

The Atlantic salmon has been recorded in the diets of more than fifty species ranging from trout to kingfishers to bottle-nose dolphins and it is neither feasible nor necessary to consider management action for all these predators. During the freshwater phase of the life-cycle (up to the parr stage) compensation mechanisms may mitigate for predation losses. However, where salmon abundance is low or where the predation occurs in the later stages of the life-cycle the mortality may, under certain circumstances, result in losses to fisheries and to spawning populations. This loss may be particularly serious where the predator populations are increasing significantly in abundance, where the salmon populations are depleted, where salmon are concentrated or vulnerable and where the predator is selective (Anon, 1996). Under these circumstances management action may be deemed necessary. From the information presented above there would appear to be good reasons for considering management action in relation to some species of fish-eating birds (cormorants and sawbill ducks) and in relation to seals.

In the Maritime Provinces of Canada preliminary estimates suggest that red-breasted mergansers and cormorants may consume 900,000 smolts and juvenile salmon annually, with common mergansers consuming up to 6 million juvenile salmon annually. The results of programmes to control these and other species of fish-eating birds have been ambiguous. Although there is little doubt that some species of seal eat salmon, it is also difficult to quantify the impact of this predation on salmon populations and fisheries (Anon, 1996b). There are two major problems - the extent to which provenance of the samples determines the findings and the failure to detect some species of fish, such as salmon, in the diet because their skeletal structures are soft and friable and do not endure in faecal samples. Even in experimental studies where salmon were fed to seals, it was very difficult to obtain evidence of salmon in the diet (Boyle et al, 1990).

Where management action is proposed non-lethal methods such as scaring devices, harassment tactics or removal of roosting sites (in the case of some species of birds) could be considered. Removal of fish-eating birds from the river at certain times of the year may be successful although trapping and removal of birds is seen as a difficult option. Where stocking of salmon occurs, careful attention should be paid to the release strategy (timing and location). If these measures fail, lethal methods may need to be considered. There is likely to be a strong public reaction to such proposals and demonstrating that there has been damage to the fishery may be a pre-requisite. The Canadian management programme for seals has evoked a strong public reaction in Canada and in other countries and given rise to actions which have affected trade and Canada's image internationally (Anon, 1984). It may not be necessary to permanently reduce or even significantly reduce temporarily the predator population during a control programme. In the case of seals there is evidence that a few "rogue" seals may be the source of many of the problems. However, there are also concerns about indirect effects of seals on salmon populations and addressing these concerns would clearly require more extensive management action. Seal management plans have been called for recently in a number of countries (Smart, 1995; Kristiansen, 1995).

A recent survey in Canada indicated that the vast majority of respondents disagreed with hunting of seal pups for their pelts but hunting seals for the meat was seen to be acceptable to most, provided the number hunted was effectively controlled (Anon, 1995). An argument in favour of increasing the total allowable catch (TAC) of seals in Canada was that the increasing seal population was inhibiting the recovery of fish stocks and prolonging unemployment. Arguments against increasing the TAC related to the small market for seal products so expansion of the harvest would effectively be a cull, i.e. seals would be killed but their carcasses would not be utilised. Culls were also opposed because it was felt that seals were only one part of the problem and that overfishing was a significant influence. Seal culls are therefore unlikely to be an acceptable way to manage the expanding seal population (Anon, 1997b). Harvesting of seals could result in boycotts of fishery products by other countries unless there was increased cooperation between member Parties on these issues. Non-lethal methods which aim to limit the growth of seal populations might include the use of contraceptives (hormone pellets) which have been developed in Canada and which are showing some promising results (Anon, 1997b). However, the Canadian public opinion survey indicated that birth control injections for seals were seen as "a waste of taxpayers' money", "ludicrous" "ridiculous" and "interfering with nature" (Anon, 1995).

Summary by the President

From the information presented at the Special Session it is clear that there is a need for further scientific information but there would appear to be grounds for considering management action in relation to both predators of salmon and in relation to industrial fishing. There would appear to be some benefits from considering these issues internationally and while there is unlikely to be a quick solution the Council may wish to consider whether it wishes to ask new scientific questions to ICES, support further research by the Parties and to take some steps to influence public opinion, since any management action will need to be widely acceptable to the public.

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ANNEX 24

COUNCIL

CNL(97)43

GUIDELINES ON CATCH AND RELEASE

GUIDELINES ON CATCH AND RELEASE

1. Introduction

In response to concern about stock levels, catch and release is being practised in a number of countries as a measure to reduce fishing mortality in recreational fisheries. To be of value, Atlantic salmon which have been caught by anglers, handled and then released must survive without a substantial reduction in fitness. While further studies are needed to assess the effects of catch and release (e.g. on salmon caught early in the season) the research to date indicates that the survival following catch and release can be high, although survival is influenced by water temperature (e.g. studies have shown that at water temperatures greater than 18°C mortality can exceed 30%). Fish which have been played quickly and handled gently will have the best chance of surviving. Where the intention is to return Atlantic salmon to the water after capture the following guidelines should assist in conservation efforts.

In many countries, kelts and species other than salmon caught while salmon angling are released. The application of these guidelines to the treatment of these fish should also improve their chances of survival following release.

The decision as to whether, and if so where and when, catch and release is appropriate should be made by those managing the specific fishery concerned in the light of all the known factors about that particular stock. The publication of these guidelines and their adoption by NASCO does not imply that NASCO endorses catch and release in any particular circumstances.

2. Type of Gear

Artificial flies should be used since fish caught by this means are less likely to suffer serious damage than fish caught using baited hooks or lures.

Small, barbless hooks should be used since they do less damage, are easier to remove and reduce handling time which can be an important factor influencing survival. Treble hooks should not be used.

Gaffs and tailers should not be used if the fish are intended for release. If necessary a large landing net made from non-abrasive netting and with small meshes should be used.

The fishing gear used should be strong enough to enable the fish to be brought in quickly, taking account of the prevailing conditions and the possible size of fish that might be caught.

3. Bringing the Fish In

If a fish is caught it should be brought in quickly by keeping pressure on it until it can be guided into quiet water for quick release.

4. Releasing the Fish

Fish intended for release should be kept in the water. Exposing a fish to the air for even a short period, for example to take a photograph, can significantly reduce its chance of survival.

The weight of the fish should be estimated from its length so as to avoid removing the fish from the water. The table below gives approximate conversion values. Where possible, conversion tables should be developed for appropriate river stocks.

Handling of the fish should be minimised but when necessary the fish should be gently supported from beneath but must not be squeezed or held by the gills.

If the hook cannot be removed, the leader should be cut close to the hook prior to release.

After removing the hook, or cutting the leader if the hook could not be removed, the fish should be supported in the water facing into the current and allowed to recover until it swims off.

Fish which have suffered serious damage (hooked in the gills or eyes or bleeding heavily) should be retained in preference to lightly hooked fish unless their retention contravenes local or national regulations.

5. The Benefits

The evidence we have suggests that if fish are handled according to these guidelines, most of them will survive. Carefully releasing fish rather than retaining them can therefore make a real contribution to conservation.

The North Atlantic Salmon Conservation Organization (NASCO) is an inter-governmental Commission established in 1984 to promote the conservation, restoration, enhancement and rational management of salmon stocks in the North Atlantic Ocean through international cooperation, taking into account the best available scientific advice. The member Parties are Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Union, Iceland, Norway, the Russian Federation and the United States of America. Further details about the Organization and additional copies of these guidelines can be obtained from:

NASCO
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Approximate conversion values:

Length cm	Length inches	Approx. weight kg	Approx. weight lbs/oz	Length cm	Length inches	Approx. weight kg	Approx. weigh lbs/oz	Length cm	Length inches	Approx. weight kg	Approx. weight lbs/oz
47	18.5	1.16	2 9								
48	18.9	1.23	2 11								
49	19.3	1.31	2 14								
50	19.7	1.39	3 1	70	27.6	3.77	8 5	90	35.4	7.95	17 8
51	20.0	1.48	3 4	71	28.0	3.94	8 11	91	35.8	8.21	18 1
52	20.5	1.56	3 7	72	28.3	4.10	9 0	92	36.2	8.48	18 11
53	20.9	1.65	3 10	73	28.7	4.27	9 7	93	36.6	8.76	19 5
54	21.3	1.75	3 14	74	29.1	4.45	9 13	94	37.0	9.04	19 15
55	21.7	1.85	4 1	75	29.5	4.63	10 3	95	37.4	9.33	20 9
56	22.0	1.95	4 5	76	29.9	4.82	10 10	96	37.8	9.62	21 3
57	22.4	2.05	4 8	77	30.3	5.01	11 0	97	38.2	9.92	21 14
58	22.8	2.16	4 12	78	30.7	5.20	11 7	98	38.6	10.23	22 9
59	23.2	2.27	5 1	79	31.1	5.40	11 14	99	39.0	10.54	23 4
60	23.6	2.39	5 4	80	31.5	5.61	12 6	100	39.4	10.86	23 15
61	24.0	2.51	5 8	81	31.9	5.82	12 13	101	39.8	11.19	24 10
62	24.4	2.63	5 13	82	32.3	6.03	13 5	102	40.2	11.52	25 6
63	24.8	2.76	6 1	83	32.7	6.25	13 12	103	40.6	11.86	26 2
64	25.2	2.89	6 6	84	33.1	6.48	14 5	104	40.9	12.20	26 14
65	25.6	3.03	6 11	85	33.5	6.71	14 13	105	41.3	12.55	27 11
66	26.0	3.17	7 0	86	33.9	6.95	15 5	106	41.7	12.91	28 7
67	26.4	3.31	7 5	87	34.3	7.19	15 14	107	42.1	13.27	29 4
68	26.8	3.46	7 10	88	34.6	7.44	16 6	108	42.5	13.64	30 1
69	27.2	3.62	8 0	89	35.0	7.69	16 15	109	42.9	14.02	30 14

Note: The weights given in this table in pounds (lbs) and ounces (oz) have been rounded to the nearest ounce.

ANNEX 25

COUNCIL

CNL(97)51

DECISION OF THE COUNCIL FOR REFINING THE ESTIMATES OF CATCH

Given the significantly high amount of salmon catch reported as "Guess-estimates" provided by ICES and the ICES recommendation that measures be taken to better account for this portion of the salmon catch, the Council requests the Secretary to undertake a review of previous NASCO actions to enhance the level of reported catch. The Secretary shall provide his report to the Parties by 31 December 1997 and the Parties will be asked to approve the report within one month. The Parties will report on measures they have taken to improve the level of the reported catch statistics, in light of the Secretary's Report, for the next annual meeting. Their reviews shall consider progress made to date, continuing problems and possible methods to better categorize the nature of these catches such as subsistence, local sales, by-catch, legal and illegal takes.

ANNEX 26

COUNCIL

CNL(97)46

PRESS RELEASE

The Fourteenth Annual Meeting of the North Atlantic Salmon Conservation Organization (NASCO) which is concerned with international cooperation on the conservation, restoration, enhancement and rational management of the North Atlantic Salmon was held in Ilulissat, Greenland, during 9-12 June under the Presidency of Mr Einar Lemche (Denmark (in respect of the Faroe Islands and Greenland)).

The Organization has as its member Parties Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Union, Iceland, Norway, the Russian Federation, and the United States of America. Observers from two Inter-Governmental and thirteen Non-Governmental organizations also participated. NASCO comprises a Council and three Commissions (North American Commission, North-East Atlantic Commission and West Greenland Commission).

NASCO's regional Commissions may establish regulatory measures for salmon fisheries. The scientific advice presented to the Commissions indicated that most salmon stocks remain in poor condition in spite of the management measures taken in recent years although some improvements were noted.

In the West Greenland Commission, agreement was reached on an overall catch quota of 57 tonnes for 1997 under an amendment to a five-year agreement made in 1993. The North-East Atlantic Commission established a quota of 380 tonnes for the Faroese fishery in 1998 and additional restrictive regulatory measures. This Commission also adopted a Resolution on Guidelines to Protect the Wild Salmon Stocks from Introductions and Transfers. Introductions and transfers may pose ecological and genetic threats and may lead to the spreading of diseases and parasites to the wild stocks.

The North American Commission reviewed the 1996 fisheries and the Canadian and US management measures. NASCO was informed of the details of a long-term strategy and management plan for re-building Labrador's salmon stocks. The Commission also endorsed a number of recommendations for revision to its Protocols on Introductions and Transfers, inclusion of protocols on transgenic salmon, freshwater and estuarine cage rearing of juvenile salmonids and establishment of a database on aquaculture escapees.

The Council reviewed a report on an international symposium it had organised in conjunction with the International Council for the Exploration of the Sea (ICES) on the "Interactions between Wild and Cultured Salmon: the Scientific and Management Issues". The latest scientific information suggests that spawning between cultured fish will displace the wild fish and inter-breeding between wild and farmed salmon will lead to genetic changes in the wild stocks which could have negative impacts. There is also concern about disease and parasite interactions. In 1994 the Council had adopted a Resolution to Minimise Impacts of Aquaculture and it was agreed that in the light of this information the implementation of this Resolution should be reviewed prior to the next annual meeting.

The Council adopted Guidelines for action on transgenic salmon designed to contain the risks. The Council also agreed to establish a Working Group to advise on how the Precautionary Approach might be applied in relation to NASCO's work on management measures and the associated scientific research and on introductions and transfers including aquaculture impacts and possible use of transgenic salmon.

Guidelines on catch and release fishing were adopted. Further steps were taken to eliminate the problem of fishing for salmon in international waters by non-Contracting Parties and to obtain information on by-catch of salmon in pelagic fisheries, and reduce the level of unreported catch.

The Fifteenth Annual Meeting of the Organization will be held in Edinburgh, UK during 8-12 June 1998.

ANNEX 27

LIST OF COUNCIL PAPERS

Paper No.	Title
CNL(97)0	List of Papers (updated version)
CNL(97)1	Provisional Agenda
CNL(97)2	Draft Agenda
CNL(97)3	Explanatory Memorandum on the Draft Agenda
CNL(97)4	Proposed Schedule of Meetings
CNL(97)5	Secretary's Report
CNL(97)6	Audited Accounts for 1996
CNL(97)7	Contributions by the Parties
CNL(97)8	Budget Commentary
CNL(97)9	Report of the Finance and Administration Committee
CNL(97)10	Report on the Activities of the Organization in 1996 (not for publication)
CNL(97)11	Report on the Activities of the Organization in 1995/96 (for publication)
CNL(97)12	Report of the ICES Working Group on North Atlantic Salmon
CNL(97)13	Report of the ICES Advisory Committee on Fishery Management
CNL(97)14	Request for Scientific Advice from ICES
CNL(97)15	Catch Statistics - Returns by the Parties
CNL(97)16	Historical Catch Record 1960-1996
CNL(97)17	Summary of Microtag, Finclip and External Tag Releases in 1996
CNL(97)18	NASCO Tag Return Incentive Scheme
CNL(97)19	Review of International Salmon Related Literature
CNL(97)20	Returns under Articles 14 and 15 of the Convention

CNL(97)21	The Use of the Precautionary Approach by NASCO
CNL(97)22	Fishing for Salmon in International Waters
CNL(97)23	Surveillance of Fishing for Salmon in International Waters
CNL(97)24	Resolution concerning Scientific Research Fishing
CNL(97)25	Returns made in accordance with the Oslo Resolution
CNL(97)26	Establishment of a Liaison Group between NASCO and the International Salmon Farming Industry
CNL(97)27	Report of the ICES/NASCO Symposium
CNL(97)28	Resolution on Transgenic Salmon
CNL(97)29	The Atlantic Salmon as Predator and Prey - Management Implications
CNL(97)30	Guidelines on Catch and Release
CNL(97)31	Dates and Places of 1998 and 1999 Meetings
CNL(97)32	Draft Report
CNL(97)33	Draft Press Release
CNL(97)34	United Nations Resolutions on Straddling Fish Stocks and Highly Migratory Fish Stocks and on Large-scale Drift-net Fishing
CNL(97)35	Application for Non-Goverment Observer Status to NASCO by WWF (Norway)
CNL(97)36	Proposal for a Special Session in 1998
CNL(97)37	Proposal from Norway to Conduct Scientific Research Fishing for Salmon in the North-East Atlantic
CNL(97)38	NASCO Guidelines for Action on Transgenic Salmon
CNL(97)39	The Adoption of the Precautionary Approach
CNL(97)40	Agenda
CNL(97)41	Proposed Terms of Reference for a NASCO Working Group on the Precautionary Approach
CNL(97)42	Recording Incidental By-Catches of Salmon in Large-Scale Pelagic

	Fisheries for Herring and Mackerel
CNL(97)43	Guidelines on Catch and Release
CNL(97)44	The Atlantic Salmon as Predator and Prey - Management Implications
CNL(97)45	Proposal by the West Greenland Commission for Refining the Estimates of Unreported Catch
CNL(97)46	Press Release
CNL(97)47	Report of Council
CNL(97)48	NASCO Guidelines for Action on Transgenic Salmon
CNL(97)49	Terms of Reference for a NASCO Working Group on the Precautionary Approach
CNL(97)50	Request for Scientific Advice from ICES
CNL(97)51	Decision of the Council for Refining the Estimates of Catch
CNL(97)52	Outline of 1998 Budget, 1999 Forecast Budget and Schedule of Contributions
CNL(97)70	NGO Statement - Atlantic Salmon Trust
CNL(97)71	NGO Statement - Scottish Anglers National Association
CNL(97)72	NGO Statement - Salmon Net Fishing Association of Scotland
CNL(97)73	NGO Statement - Atlantic Salmon Federation (Canada)
CNL(97)74	NGO Statement - World Wide Fund for Nature (Norway)
NOTE	This is a listing of all the Council papers. Some, but not all, of these papers are included in this report as annexes.