NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

ORGANISATION POUR LA CONSERVATION DU SAUMON DE L'ATLANTIQUE NORD

REPORT OF THE

SEVENTH ANNUAL MEETING

OF THE COUNCIL

12-15 JUNE 1990

HELSINKI, FINLAND

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CONTENTS

		PAGE
REPORT OF THE SEVENTH ANNUAL MEETING OF THE COUNCIL OF NASCO, 12-15 JUNE 1990, HELSINKI, FINLAND		4
ANNEX 1	WELCOMING ADDRESS MADE BY MINISTER OF DEFENCE, FISHERIES AND GAME, FINLAND	12
ANNEX 2	ADDRESS BY PRESIDENT TO THE COUNCIL	13
ANNEX 3	OPENING STATEMENTS MADE BY THE REPRESENTATIVES OF THE UNITED STATES OF AMERICA, THE UNION OF SOVIET SOCIALIST REPUBLICS, SWEDEN, NORWAY, ICELAND, FINLAND, THE EUROPEAN ECONOMIC COMMUNITY, DENMARK (IN RESPECT OF THE FAROE ISLANDS AND GREENLAND), AND CANADA	16
ANNEX 4	LIST OF PARTICIPANTS	30
ANNEX 5	AGENDA, CNL(90)42	36
ANNEX 6	DECISION OF THE COUNCIL ON WORKING CAPITAL, CNL(90)53	38
ANNEX 7	1991 BUDGET AND 1992 FORECAST BUDGET, CNL(90)43	40
ANNEX 8	REPORT OF THE ICES ADVISORY COMMITTEE ON FISHERIES MANAGEMENT, CNL(90)12	44
ANNEX 9	DECISION OF THE COUNCIL TO REQUEST SCIENTIFIC ADVICE FROM ICES, CNL(90)48	60
ANNEX 10	RETURNS UNDER ARTICLES 14 AND 15 OF THE CONVENTION, CNL(90)14	62
ANNEX 11	CATCH STATISTIC RETURNS BY THE PARTIES, CNL(90)16	68
ANNEX 12	REPORT ON MEANS TO ACHIEVE IMPROVED COMPARABILITY OF CATCH STATISTICS, CNL(90)18	72
ANNEX 13	UNREPORTED CATCHES, CNL(90)19	76
ANNEX 14	FISHING FOR SALMON IN INTERNATIONAL WATERS, CNL(90)20	84

ANNEX 15	RESOLUTION ON FISHING FOR SALMON IN INTERNATIONAL WATERS, CNL(90)49	92
ANNEX 16	PRINCIPLE OF THE PURCHASE OF NASCO QUOTAS, CNL(90)21	94
ANNEX 17	ROLE OF NON-GOVERNMENT OBSERVERS IN NASCO, CNL(90)22	100
ANNEX 18	SUMMARY OF MICROTAG, FINCLIP AND EXTERNAL TAG RELEASES IN 1989, CNL(90)23	106
ANNEX 19	NASCO TAG RETURN INCENTIVE SCHEME, CNL(90)24	110
ANNEX 20	DATABASE OF SALMON RIVERS FLOWING INTO THE NASCO CONVENTION AREA, CNL(90)25	112
ANNEX 21	REPORT ON THE DEVELOPMENT OF GENETIC MARKERS, CNL(90)26	116
ANNEX 22	IMPACTS OF SALMON AQUACULTURE ON SALMON HABITATS, CNL(90)27	132
ANNEX 23	REPORT OF THE NORWEGIAN MEETING ON IMPACTS OF AQUACULTURE ON WILD STOCKS, CNL(90)28	144
ANNEX 24	DRAFT GUIDELINES FOR THE ESTABLISHMENT AND OPERATION OF SALMON GENE BANKS, CNL(90)29	154
ANNEX 25	DRAFT GUIDELINES FOR DEVELOPING ADVISORY CODES OF PRACTICE TO MINIMISE THREATS TO WILD SALMON STOCKS, CNL(90)31	162
ANNEX 26	STATEMENT BY NORWAY ON SEA-RANCHING OF ATLANTIC SALMON, CNL(90)47	168
ANNEX 27	RESOLUTION BY THE COUNCIL IN SUPPORT OF THE UNITED NATIONS GENERAL ASSEMBLY RESOLUTION 44/225, CNL(90)50	170
ANNEX 28	PRESS RELEASE, CNL(90)52	172
ANNEX 29	LIST OF COUNCIL PAPERS	174

CNL(90)51

REPORT OF THE SEVENTH ANNUAL MEETING OF THE COUNCIL OF THE NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION 12-15 JUNE 1990, INTERCONTINENTAL HOTEL, HELSINKI, FINLAND

1. OPENING SESSION

1.1 In the absence of the President, Mr Allen E Peterson, due to illness, the Vice-President, Mr Svein Aage Mehli opened the meeting and introduced Mr Ole Norrback, Minister of Defence, Fisheries and Game, Finland, who made a welcoming address (Annex 1). The Vice-President joined the Minister in welcoming delegates to the Seventh Annual Meeting of the Council. The President had prepared an address which was presented to the Council (Annex 2).

1.2 The representatives of the United States of America, the Union of Soviet Socialist Republics, Sweden, Norway, Iceland, Finland, the European Economic Community, Denmark (in respect of the Faroe Islands and Greenland), and Canada made opening statements (Annex 3).

1.3 A list of participants is given in Annex 4.

1.4 The Vice-President expressed appreciation to the members for their statements and closed the Opening Session.

2. ADOPTION OF THE AGENDA

2.1 The Council adopted its agenda, CNL(90)42, (Annex 5).

3. ELECTION OF OFFICERS

3.1 The Council held elections and Mr Allen Peterson (USA) was re-elected to be President and Mr Svein Aage Mehli (Norway) was re-elected to be Vice-President. The Council asked the Secretary to convey to the President their very best wishes for his return to good health.

4. SECRETARY'S REPORT

4.1 The Secretary made a report, CNL(90)6, to the Council on the status of ratifications of and accessions to the Convention, membership of the regional Commissions, the audited accounts for 1989, receipt of contributions for 1990, the Headquarters property at 11 Rutland Square, the Headquarters Agreement and external relations, and areas of work where the Organization might play a fruitful role where resources permit.

4.2 The Secretary also reported to the Council on applications for non-government observer status to NASCO. Since the Sixth Annual Meeting, four new applications had been received from:

The Federation of Irish Salmon & Sea Trout Anglers, Ireland

The Norwegian Association of Hunters and Anglers, Norway
Sami Parlamenta, Finland
The Finnish Sport Fisherman's Association, Finland

4.3 These organizations had accepted the conditions laid down and had been granted observer status. The Secretary also referred to the review of the rules governing such participation which was to be considered elsewhere on the agenda.

5. REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE

5.1 The Chairman of the Finance and Administration Committee presented the report of the Committee, CNL(90)10.

5.2 In addition to decisions taken relating to other agenda items the Council, upon the recommendation of the Committee, took the following decisions:

a) to appoint Coopers and Lybrand Deloitte of Edinburgh as auditors;
b) to modify Financial Rule 6.3 by deleting reference to 20,000 pounds sterling and inserting 30,000 pounds sterling, (CNL(90)53), (Annex 6).

5.3 Upon the recommendation of the Finance and Administration Committee the Council:

(a) accepted the audited 1989 annual financial statement, CNL(90)7;

(b) adopted a budget for 1991 and a forecast budget for 1992, CNL(90)43, (Annex 7).

5.4 The Council thanked the Chairman of the Finance and Administration Committee, Mr Tormod Karlstroem, for his work and that of the Committee.

6. SCIENTIFIC RESEARCH

Report to NASCO from the ACFM of ICES

6.1 The representative of ICES presented the report of the ICES Advisory Committee on Fisheries Management (ACFM) to the Council, CNL(90)12, (Annex 8).

Request to ICES for Scientific Advice for 1991

6.2 The Council adopted a decision to request scientific advice from ICES, CNL(90)48, (Annex 9).

7. IMPLEMENTATION OF THE CONVENTION

Returns under Articles 14 and 15 of the Convention

7.1 The Secretary presented a report on the returns made under Articles 14 and 15 of

the Convention, CNL(90)14, (Annex 10). The representative of Denmark (in respect of the Faroe Islands and Greenland) requested clarification of the commitments made under Article 15 paragraph 5(b) and referred to the need to make such commitments. The representative of the EEC stated that the Community considered that the maintenance in force of existing measures is tantamount to a commitment.

Laws, Regulations and Programmes

7.2 The Secretary presented a progress report on the Laws, Regulations and Programmes database,CNL(90)15. This unique record of salmon related legislation over the whole of the North Atlantic would be updated annually by the Article 14 and 15 returns.

Return of Catch Statistics

7.3 The Secretary introduced a statistical paper presenting the official catch returns by the Parties for 1989 and historical data by Party, CNL(90)16, (Annex 11).

Analysis of Catch Statistics

7.4 The Secretary introduced a discussion paper, CNL(90)18, (Annex 12), reviewing the means to achieve improved comparability of catch statistics. This review identified a number of possible actions to assist in achieving this objective.

7.5 The Council agreed that the establishment of a minimum standard for catch statistics was desirable and to this end took the steps outlined in paragraph 7.6 and 7.7 below.

7.6 The Council agreed that at its next Annual Meeting the Parties should be requested to consider what actions might be taken concerning the problems of comparability in terms of:

a) the inclusion of all components of the salmon fisheries in the statistics.

b) the inclusion of statistics for salmon caught in non-salmon gear where such retention is legal.

c) collection of statistics for both number and weight of salmon caught according to sea-age (or allocated to grilse and multi-sea-winter salmon).

d) where ranching of salmon is practised, the inclusion of such catches in the statistics.

e) the use of different conversion factors to calculate whole round weight.

7.7 The Council considered a review, CNL(90)19, (Annex 13), of the range of problems which could lead to unreported or under-reported catches. It was agreed that the Secretary should, in consultation with ICES, review any problems in implementing the methods listed in 1989 by the North Atlantic Salmon Working Group. The Secretary was also asked to prepare, in consultation with the Parties, a review of possible methods to reduce the impact of the factors which lead to unreported

catches.

Fishing for salmon in International Waters

7.8 The Secretary presented a report, CNL(90)20, (Annex 14), containing information on salmon fishing in international waters which involved re-flagging of vessels so as to avoid the provisions of the NASCO Convention. This paper contained evidence submitted to the Organization by the Faroese and Norwegian authorities. The vessels involved had used the flags of Poland and Panama, which are not signatories to the Convention.

7.9 The representative of the EEC provided further information on the operation of a number of vessels in the northern Norwegian Sea distinguishing between two different periods. Firstly, in the period prior to 1988/89 these vessels were registered in Denmark and a series of Court actions had been taken by the Danish authorities for illegal salmon fishing which resulted in fines and confiscations amounting to about US$6 million. After this period the vessels were registered in Poland and Panama and were not therefore under the jurisdiction of the Community or its Member States. The representative of the EEC stated that action was needed, both multilaterally through NASCO and bilaterally through individual member Parties, to approach the authorities of the countries concerned in order to eliminate this fishery which the Community deplored.

7.10 Statements were also made by Norway, Iceland, Finland, the United States of America, the Union of Soviet Socialist Republics, Denmark (in respect of the Faroe Islands and Greenland) and Canada deploring the use of flags of convenience for salmon fishing in international waters.

7.11 The Council adopted a resolution, CNL(90)49, (Annex 15), calling upon the Parties and the Organization to take action to ensure that such fishing was ended.

8. CONSIDERATION OF THE PRINCIPLE OF THE PAYMENT OF COMPENSATION FEES FOR NASCO QUOTAS.

8.1 The Council considered the principles involved in the question of the purchase of NASCO quotas,CNL(90)21, (Annex 16). The three basic principles reviewed concerned compatibility with the NASCO Convention, the willingness of Parties offered compensation to accept it, and the willingness of other Parties to pay it or to facilitate payment by other bodies.

8.2 The Council agreed that the Secretary should be asked to chair a Working Group of the contracting Parties on the concept of purchase of NASCO quotas. At this Working Group the principles outlined in paper CNL(90)21 should be further explored. The Parties would be invited to send participants. The Secretary should then prepare a paper on the conclusions of the Working Group which would be transmitted to the Council.

9. ROLE OF NON GOVERNMENT OBSERVERS IN NASCO

9.1 The Council considered a discussion paper on the role of non-government observers to NASCO, CNL(90)22, (Annex 17). The Council welcomed the opportunity it had to make contact with its observer organizations and the wealth of experience that they represented.

9.2 It was agreed that the Council would amend the conditions for NGO's for a two year trial period under which statements by NGO's would be permitted in the Council, at the discretion of the President, but only at sessions that are defined "Special Sessions" by the Council. The Observers would be consulted on what subjects they would like to see covered in Special Sessions.

10. SALMON TAGGING

Repository of tag release data

10.1 In accordance with the 1988 decision of the Council the Secretary presented a summary of tag release data, CNL(90)23, (Annex 18), from the information submitted by ICES.

NASCO Tag Return Incentive Scheme

10.2 The Secretary reported on the NASCO Tag Return Incentive Scheme, CNL(90)24, (Annex 19), which had been successfully implemented during the year. Experience in the first year indicated some minor clarifying changes would be necessary and these would be made in the correspondence requesting lists of eligible tags for 1990.

10.3 Some Parties had not been able, in the limited time available, to fully implement the necessary administrative and publicity arrangements but it was anticipated that the scheme would become more comprehensive during 1990 and subsequent years. The President had requested that the Secretary make arrangements with the Parties to ensure maximum publicity for the Scheme when the prizes are presented.

10.4 The Vice-President advised the Council that the draw for the Tag Return Incentive Scheme was made by the Auditor at NASCO Headquarters on 1 June. He announced that the winner of the $2500 prize was Mr Math Falksen of Godthaab, Greenland. The Council offered its congratulations to the winner.

11. DATABASE ON RIVERS FLOWING INTO NASCO CONVENTION AREA

11.1 In accordance with the request of the Council at its Sixth Meeting, the Secretary presented a format, CNL(90)25, (Annex 20), for the preparation of a database on all salmon rivers flowing into the NASCO Convention Area.

11.2 The Council accepted the proposed format and asked the Secretary to proceed in consultation with the Parties.

SPECIAL SESSION: IMPACTS OF AQUACULTURE ON WILD STOCKS

12. INTRODUCTION

12.1 The Vice-President referred to the Special Session held at the 1989 meeting and to the need to follow up its conclusions in the light of the potentially serious impacts of the growing numbers of farmed fish which now exist in the wild. The Secretary referred to the likely existence of the salmon, in its present geographical range, for at least the last 10,000 years and posed the basic question as to whether the rapid development of aquaculture was placing these wild stocks at risk.

13. GENETIC IMPACTS AND RELATED RESEARCH

13.1 The Secretary introduced a report CNL(90)26, (Annex 21), which referred to the probable existence of at least 2,000 stocks of Atlantic salmon in North America and Europe. Genetic studies have identified distinct stocks and there is concern that the genetic characteristcs of these stocks may be placed at risk. In order to assess these risks the need for an impact study has been stressed at a number of recent scientific conferences.

13.2 Having regard to the central importance in enabling the question of genetic impacts to be addressed, the Council encouraged the Parties to support, where possible, research into the development of genetic markers for salmon.

14. ENVIRONMENTAL THREATS TO WILD STOCKS FROM AQUACULTURE

14.1 The Secretary introduced a report, CNL(90)27, (Annex 22), on the potential environmental threats to wild stocks posed by salmon aquaculture. The Vice-President urged the Parties to encourage further research on the environmental problems caused by intensive salmon farming and to approve and further develop in future years codes of practice to minimise any adverse impacts.

15. REPORT OF INTERNATIONAL MEETING IN NORWAY ON IMPACTS OF AQUACULTURE ON WILD STOCKS

15.1 A report was presented, CNL(90)28, (Annex 23), summarising the main conclusions and recommendations from the recent international meeting arranged by the Norwegian authorities on the interactions between farmed and wild salmon. This meeting concluded that there are a number of gaps in our knowledge concerning the interactions between wild and farmed salmon and it is therefore important that appropriate national research be undertaken. Until the results of this research are available, however, it was recommended that the approach to salmon management should be precautionary and it should be assumed that there is a real risk to the native salmon stocks until it is proven otherwise.

16. DRAFT GUIDELINES FOR ESTABLISHMENT AND OPERATION OF GENE BANKS FOR THREATENED STOCKS

16.1 The Secretary presented a series of draft guidelines for the establishment and operation of gene banks for threatened stocks, CNL(90)29, (Annex 24). The Council agreed that these guidelines be approved for use by the Parties, on a voluntary basis, and that the Council be advised of future technical developments in this field.

17. REVIEW OF LEGISLATION RELATING TO INTRODUCTIONS AND TRANSFERS

17.1 The Secretary produced a review of legislation relating to introductions and transfers, CNL(90)30, which had been produced from the Organizations database on Laws, Regulations and Programmes. The Council agreed that such legislation should be kept under review in the light of the new situation where there were large-scale unintentional introductions and transfers arising from the escape of farmed fish.

17.2 The Vice-President indicated that the initiatives regarding introductions and transfers taken by the North American Commission might also be followed up in the North-East Atlantic Commission, particularly with regard to the establishment of an inventory of introductions and transfers of salmon.

18. POSSIBLE CODES OF PRACTICE TO MINIMIZE THREATS TO WILD STOCKS

18.1 The Secretary introduced draft guidelines for developing advisory codes of practice designed to minimise the threats to wild stocks, CNL(90)31, (Annex 25). The Council discussed the document which was considered to be of value to the Parties. It was agreed that the Parties would send any comments on the draft to the Secretary and that a revised document would be tabled at the next annual meeting.

18.2 The representative of Norway tabled a statement on sea-ranching of Atlantic salmon, CNL(90)47, (Annex 26). The Council asked the Secretary to prepare a definition of sea-ranching as it related to other enhancement activities.

19. REPORTS FROM THE REGIONAL COMMISSIONS

19.1 The Chairmen of the three regional Commissions reported to the Council on their activities.

20. REPORT ON THE ACTIVITIES OF THE ORGANIZATION IN 1989

20.1 The Council adopted a report to the Parties, CNL(90)32, on the activities of the Organization in 1989, in accordance with the requirements of Article 5, paragraph 6 of the Convention.

21. OTHER BUSINESS

21.1 The Secretary referred to a communication, CNL(90)36, that he had received from the Under Secretary General of the United Nations on the resolution of the General Assembly concerning the use of large scale pelagic drift nets. The views of the NASCO Council were sought by the UN.

21.2 The Council agreed on a resolution proposed by the United States, CNL(90)50, (Annex 27), and asked the Secretary to transmit it to the United Nations.

21.3 The representative of Finland referred to the desirability of NASCO being fully aware of the problems and progress in international management by other fisheries Commissions dealing with salmon. It was agreed that the Secretary be asked to obtain such information for presentation to the Council.

22. DATE AND PLACE OF NEXT MEETING

22.1 The Council confirmed the arrangements to hold its Eighth Annual Meeting in Edinburgh from 10-14 June 1991. The United States indicated that it was exploring the possibility of inviting NASCO to hold the Ninth Annual Meeting in the US from 9-12 June 1992.

23. DRAFT REPORT OF THE MEETING

23.1 The Council agreed the draft report of the meeting, CNL(90)34.

24. PRESS RELEASE

24.1 The Council adopted a press release, CNL(90)52 (Annex 28).

JUNE 1990
HELSINKI

ANNEX 1

WELCOMING ADDRESS BY MR OLE NORRBACK, MINISTER OF DEFENCE, FISHERIES AND GAME

Mr Vice-President, Distinguished Representatives and Commissioners, Delegates, Observers, Ladies and Gentlemen.

On behalf of the Finnish Government I have the honour to welcome the 7th Annual Meeting of NASCO to Finland. I also warmly welcome all participants to this meeting to be held in Helsinki and I hope you will enjoy your stay here. I know this is the second time your Organization convenes outside your headquarters base, Edinburgh, and I hope you will have good memories from Finland.

I am well informed of your valuable work and I appreciate very much the results you have so far gained to the benefit of North Atlantic salmon. I am convinced that this kind of international work is necessary to protect such a highly migratory species as the salmon. Only by joining the knowledge and resources of all member countries together can one expect useful and practical results in management work.

I also know that you will have in this meeting many problems to consider, such as fishing which is not compatible with the Convention and conflicts between farmed fish and wild stocks. Both of these items call for special attention and I understand that the problem of farmed salmon will be treated separately.

Mr Vice-President, we must not forget the problem of pollution which in the first place threatens smolt producing areas of salmon. To those who are living in a close connection with nature it is vitally important to work against pollution, to reduce industrial emissions and to work for having an unpolluted nature in the future as well. We who are responsible for fishing should walk in the front of the struggle for clean waters and clean nature. It seems to me that NASCO is faced with many difficult problems, but I am convinced that your Organization is capable of overcoming difficulties, perhaps not immediately, but with time and hard work. I wish you all every success in your valuable work.

Mr Vice-President, once more I would like to welcome all of you to Finland and to Helsinki, and I hope you will have an opportunity to enjoy also the Finnish summer during your stay.

JUNE 1990
HELSINKI

ANNEX 2

PERSONAL MESSAGE TO ATTENDEES OF THE SEVENTH ANNUAL MEETING OF NASCO FROM ALLEN E. PETERSON, JR PRESIDENT, NASCO

Minister, distinguished Representatives and Commissioners, Delegates, Observers, ladies and gentlemen.

It is with deep regret that I find that I am unable to attend the Seventh Annual Meeting of NASCO in the beautiful city of Helsinki.

I believe Dr Windsor previously informed the Representatives that early this year I had a tumor removed from my right eye. It turned out that the tumor was malignant and necessitated the eventual removal of my eye. I am pleased to inform you that the surgery was most successful and I am quickly learning to adjust to life using one eye. Unfortunately, however, the tumor that was removed involves a cancer which necessitates prolonged treatment with radiation and chemotherapy. My doctors advised me that it would not be in my interest to interrupt the treatments to make the trip to Helsinki nor did they believe that I would be strong enough to make the trip and perform at full capacity. You know me well enough to know that I would not want to preside over the meeting if I could not devote 100 percent attentiveness, and all of my energies to its successful conclusion. Consequently as President I have officially notified the Secretary of my inability to preside at this meeting and asked that Rule 13 be invoked and that our very able Vice President, the distinguished delegate from Norway, Svein Mehli, preside in my stead for the duration of the Seventh Annual Meeting.

The Vice President, Secretary, and myself have had an opportunity to confer on the agenda and the issues that will come before you. Mr Mehli and Dr Windsor are well prepared to oversee this meeting in my absence. I also want you to know that during the periods of convalescence, I have continued to confer with Dr Windsor. I have given him guidance and direction, the benefit of my views, and have tried, to the fullest extent of my ability, to exercise all of the authorities vested in me as the President. I even expect to make a phone call or two during the course of the meeting to find out how things are going!

I was looking forward to this meeting because there are many issues that will come before the Council and the Commissions that may affect significantly the conservation and management of Atlantic salmon for years to come. I was hoping to be an active participant in some of those discussions, and not simply chair the meeting.

One of the more important issues you will consider is the presence of a directed fishery for salmon in international waters. Dr Windsor, other Parties, and myself have investigated this fishery and I trust that all of the facts pertaining to it will be brought before the Council. I trust you will authorise the President to act on behalf of the Organization to take all the necessary and appropriate steps to try and stop this fishery.

Another issue of great interest and potential significance for the management of salmon is the initiative developed in Iceland for a "buyout" of the Faroese and West Greenland salmon quotas. After careful consultation with several parties I instructed the Secretary to prepare a paper so the Council could consider the pros and cons related to such a management proposal. I hope the Council will examine thoroughly this issue without bias and prejudice so that when, and if, such a proposal is actually put before a Commission, the Commission will have the benefit of the thinking of all the parties.

Several papers on the relationship of wild stocks of salmon and aquaculture salmon will be presented for your consideration. I expect that the Council will want to take action and propose further recommendations on this most important subject as well.

There are several other topics that will require your close attention, including the review of the scientific advice requested from ICES; improving the comparability and accuracy of catch statistics; and further development of NASCO's data base on management systems used by member Parties. In addition, NASCO will be making the first rewards under the tag return incentive scheme. I hope these rewards will be well publicized in the home countries of the fishermen. This will encourage the return of tags in future years and thus improve our data bases. At the same time we may generate favourable publicity for NASCO.

There is one final issue that I must bring to your attention. At the end of the Sixth Annual Meeting, representatives of the non-government observers met with me to express their concerns over their inability to more actively participate in the deliberations of NASCO. They sincerely believe that they could make significant contributions to our deliberations. At the very least, if given an opportunity to observe all of the meetings, they would be in a better position to explain and represent the actions of NASCO to their organizations. As the President of the Organization, I informed them of the NASCO history regarding non-government observers. I assured them, however, that the Parties were not of closed minds and that NASCO was an evolving, dynamic organization and that I was sure the Council would be willing to consider further the role of non-government observers. To this extent, I directed the Secretary to prepare a paper and place an appropriate agenda item before you.

When we consider the emergence of "glasnost" and the recent events in Eastern Europe, it is inconceivable to me that NASCO cannot modify its rules of procedure to provide greater involvement of our non-government observers. Certainly the private initiative that was developed in Iceland for the buyout of quotas demonstrates the role that non-government parties can contribute to NASCO. Undoubtedly, our understanding of the relationship between wild salmon and cultured salmon would benefit from such input. For us to make decisions on this complex matter without consideration of the views and advice of the aquaculturists would be a mistake. At a minimum I recommend you consider allowing non-government observers to sit in on the deliberations of the Commissions. Further, I recommend you allow them, under controlled circumstances, to make statements and provide inputs on the major subjects that come before the Council and the Commissions. I do not propose that non-government observers be given the privilege to speak out at any and all times, on any and all issues, but I do believe that we can develop rules of procedure that would permit their participation at appropriate times under agreed upon conditions. I hope the Council will agree with me.

In conclusion, let me thank you for allowing me to address you in this most unusual manner. To all of you who have sent me your best wishes and notes of encouragement to get well, I thank you from the bottom of my heart. Until one is faced with such a personal problem it is difficult to appreciate how much a note from a friend can mean. To my friends in the delegations of all the Parties, I wish you the very best. I regret missing the opportunity to renew our friendships this year, but my doctors tell me that soon I will be well and I look forward to seeing you again next year at the Eighth Annual Meeting of NASCO. Until then, my heart and spirit are with you. Good luck in your deliberations!

JUNE 1990
HELSINKI

ANNEX 3

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF THE UNITED STATES

Mr Vice President, Dr Windsor, representatives, observers and guests.

The United States is once again pleased to participate in the deliberations of the NASCO Council and appreciates this opportunity to visit Finland. This Seventh Annual Meeting will be a particularly poignant time if, for no other reason, than because it is marked by the absence of Richard Buck, who has resigned and our President, Allen Peterson, who is seriously ill.

History will remember Richard Buck as one of the notable salmon conservationists of our time. No one will ever fault his dedication or his perseverance or question that his contributions made a difference. I personally regret Mr Buck's unexpected withdrawal and trust that NASCO will later this week consider an appropriate tribute to him.

It is particularly painful to note the absence of our President, Allen Peterson, but it is even more important for us to recognise that it is much more painful for Allen. He is now very ill, but has every likelihood of making a total recovery and being with us next year. He has done everything he can to prepare our Vice President and our Secretary for this meeting and I am sure it will go as smoothly as possible in his absence.

Replacing Richard Buck for this meeting is William Townsend who is the President of the Maine Council of the Atlantic Salmon Federation. I am also pleased to introduce Richard Roe, Director, the Northeast Region, National Marine Fisheries Service, who serves on the US delegation in lieu of Allen Peterson.

This Seventh Annual Meeting is also especially meaningful because our agenda must impress even the casual observer that we are witnessing an era of great and dramatic change in Atlantic salmon management. Let me list a few of the more important changes. We are seeing significant improvement in the scientific assessments upon which we base the management of mixed stock salmon fisheries. We are seeing the continued growth of an aquaculture industry and the impact of that industry upon the environment and wild stocks. We are seeing a continued trend of diminishing wild salmon production and must view with alarm the triad of decreasing average size, decreasing numbers of multi sea winter (MSW) fish and decreasing spring runs. And finally, in the agenda of this meeting, we see a vital demonstration that NASCO itself is changing and growing.

Recently the reports of the North Atlantic Salmon Working Group and the Advisory Committee on Fisheries Management have contained findings that represent a marked change in the assessment of salmon stocks in the North Atlantic. In earlier years the Commissions of NASCO were largely restricted to the use of descriptive information of fisheries upon which to base management recommendations. In 1987 NASCO asked ICES to discuss scientifically based approaches for managing salmon in the context of existing fisheries. Two aspects of this request were identified by ICES: (1) to establish a practical management strategy and (2) to describe a possible scientific approach to providing supporting advice. ICES indicated that three principle objectives of management were (1)

the conservation of stocks, (2) optimization of yields, and (3) minimization of the variability of the yield from each fishery. We were told by ICES that conservation can best be achieved by controlling fishing mortality to ensure an adequate number of spawners in each river system. We were told that this must be the first priority of salmon management and that the scientific results such as those described in the ICES report on tagging studies offered a scientific approach that could be very useful. Some of us were already aware of the importance of tagging studies but apparently some of us were not. Certain conservation measures were delayed therefore until we had more information on the declining status of the resource especially as reflected by levels of fishing mortality. This year we have greatly improved information on the levels of fishing mortality compared to the preliminary data we have seen in earlier reports. We can now base our management on solid scientific advice and attempt to optimize yields in various mixed stock fisheries. We can now return to the objectives of management as defined in 1987 and work toward the conservation of the stocks, to optimize yields and to minimize the variability in yields. While we appreciate and applaud the progress made by our scientific advisors we must also be aware that the form and structure of ACFM and Working Group reports might also benefit from open discussion of the impact of these changes and our future objectives.

Six years ago the USA proposed to Canada that they consider a catch-quota system to control their fishing mortality. The USA felt that quotas were fundamental to rational and efficient management. Canada rejected our proposal but did institute a five year management plan based upon spawning targets to be achieved through in-river restrictions. This five year plan increased the survival rate within the index rivers from 30% to 75% and has allowed Canada to almost reach its original spawning potential objective. This plan was truly commendable, but after five years the results show that while spawning targets have been generally reached they have been achieved by grilse and not MSW fish. This is not what was intended. The USA thinks that MSW fish did not return to the rivers in Canada principally because they were intercepted at sea.

Canada and the US therefore have a lot in common, an increasing proportion of grilse and too few MSW fish. This result is likewise not what our restoration program was designed to achieve and likewise the principal cause in the US appears to be interception at sea, interceptions being made totally by fishermen who are not citizens of the USA.

Canada has made progress in stopping its interception of our fish. Canada halted its fall fishery that was catching large numbers of US fish. Canada has stopped the commercial fisheries off Nova Scotia and New Brunswick and has begun a buyback program to reduce the number of gear units. These are significant accomplishments and Canada should be proud of its efforts.

Although the USA was pleased that some progress was being made in 1988 the USA again proposed that Canada adopt a quota system and again Canada declined. Although Canada did recommend an allowance system, the events during 1989 have made it clear that US stocks were still not rebuilding. Returns of two sea winter fish to US rivers continue at depressed levels both in respect to raw counts of fish and in respect to the simple computed statistic of return rate. This was and is of great concern to the restoration effort in New England, and I see the case for a parallel concern in respect to the rivers of Atlantic Canada. Many rivers in Atlantic Canada have provided a lot of fish for the creel in recent years, but there are signs that the MSW components of these stocks continue to be at depressed levels despite the five year plan.

Now we understand that Canada has at last instituted a catch quota system and they should indeed be congratulated. We can see that Canada seriously intends to rebuild its salmon runs and their efforts will certainly benefit the USA.

Canada's intentions and their results thus far demonstrate that Canada is responding to the challenge of conservation. But the intentions and results manifest at West Greenland are another matter. Our efforts to substantially reduce the catch of our fish at West Greenland through NASCO have achieved only moderate success at best. It is clear that too many US fish are still being intercepted. The best evidence is that at least 60% of our one sea winter fish and 80% of our two sea winter fish are being caught at West Greenland.

I must say to you that this is too much. It must stop.

The US notes with great concern the letter from Dr Emory Anderson, General Secretary of ICES, with regard to political and other influences which may detract from the scientific quality of ICES advice and subsequently any management decisions considered by NASCO. The US is fully supportive of Dr Anderson's position and will cooperate fully to keep the NASCO/ICES relationship as it should be.

There are several other issues on our agenda which give evidence to NASCO's maturation as a fisheries management organization.

I am particularly pleased to see secretarial reports this year on the subjects of unreported catches, the compatibility of catch statistics, the principle of purchasing quotas, continuing consideration of introductions and transfers, the impact of aquaculture on wild stocks and the role of non-government observers in NASCO.

These are precisely the kinds of considerations that NASCO must investigate fully in order to function at the cutting edge of salmon management.

It is my personal view, that if NASCO can deal responsibly with these subjects, dickering about precise quota numbers might not turn out to be so difficult after all.
The preparation of these papers and other accomplishments that have been achieved by the Secretary in preparing for this meeting should be recognized. Dr Windsor has truly accomplished great labors in developing this material for our consideration. Some of these issues do pose difficult questions, but the supporting material has been so well prepared and the questions so well stated that we may indeed accomplish new and meaningful commitments during the next few days.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF THE USSR

Mr President, Distinguished Representatives and delegates, ladies and gentlemen.

A year has passed since the last meeting. During this period, the member states of NASCO have done a great deal of work in elaborating regulatory measures for the Atlantic salmon fishery, in which I should like to mark the undoubted merits of the Organization and it's Secretariat.

A series of practical steps aimed at conservation and the increase of Atlantic salmon stocks in the North European region has been undertaken in the Soviet Union during the past year.

I should like to mention that due to the existance since 1960 of specific salmon fishery using fish counting fences, which permits not less than 50% of spawners to run upstream, the abundance of salmon in main salmon-bearing rivers of the Murmansk region has begun to increase.

But the Soviet Union is anxious, as previously, about ongoing, practically uncontrollable, scientifically unsubstantiated marine salmon fishery in the North-East Atlantic, the pressure of which, on separate populations, is far from being equivalent.

The Soviet Union appeals to limitation and consequent complete cessation of marine salmon fishery.

I consider it expedient to emphasise the importance of expanded activities in smolt tagging with the aim of estimating intensity of the stocks exploitation in various regions of the Atlantic basin and to work out an optimal strategy of Atlantic salmon stocks regulation.

In conclusion of my short speech, I would like to express my hope that our meeting will be constructive and wish all the participants successful and fruitful work.

Thank you.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF SWEDEN

Mr Acting President, Distinguished Representatives, Delegates and Observers.

The Swedish Delegation is looking forward with great interest to this Annual meeting of NASCO. Certain new elements call for the attention of the Council.

At our last meeting in Edinburgh, Sweden characterized the NASCO Convention as a long-term salmon management plan, calling for shared sacrifices among all its users. All parties have to give clear commitments to the maintenance and restoration of Atlantic salmon stocks. The Swedish Delegation was of the opinion that both acidification and genetic threats unfortunately seemed to be long-term elements working against the aims of our salmon management plan which is meant to be stable and integrated in a long-term perspective.

Many severe problems are common to several Parties. Undoubtedly, acidification is one of the major causes of losses of Atlantic salmon in Scandinavia. The estimated potential of the Swedish catch of wild Atlantic salmon has been shown to be highly dependent on liming. If liming had not been carried out, the potential loss of wild salmon would be about 40% of the annual total Swedish catch of wild salmon in the Convention area. So far a total sum of 195 million SEK (30 million US $) has been used for liming measures in river systems with outlets along the Swedish west coast. At our last meeting the Finnish Delegation drew the Council's attention to the fact that river systems in areas in the far north, until today considered to be in an undisturbed natural state, had been acidified. Norwegian investigations indicate that between 625,000 and 1,250,000 salmon smolts are lost annually due to acidification in Scandinavia.

In addition to the losses for Sweden from acidification, there are the considerable losses due to the regulated interceptional fishery in the North Atlantic. Furthermore, we have the unregulated fishery of salmon in international waters which of course is of great concern to us all. Several vessels have been reported in 1990 operating under convenience flags in international waters off the Norwegian coast. We are very worried about these practices which undermine the objectives of the Convention. In this connection we would like to draw attention to paragraph 3 of Article 2 in the Convention. In addition perhaps we have to try to find some more unconventional solutions to this problem.

Last summer a NASCO-delegation carried out a study trip to the Kola peninsula, USSR. A series of measures and practical steps were discussed and recommended aiming at a conservation and an increase of Atlantic salmon stocks, several of them aboriginal. The management of stocks in border rivers was of special concern, and for those stocks NASCO might have played an active role. The Swedish Delegation considers this role as an example of the accepted widened activities of NASCO.

Finally, I would like to mention one very important institutional feature within NASCO, that is the active role of the elected officers of this Organization. I am thinking especially of their dedicated work to find mutually acceptable solutions. Another also very important feature is the effective NASCO Secretariat, which deserves our unreserved praise.

Thank you Mr President.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF NORWAY

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

It is a great pleasure for me and my delegation to be present at this Seventh Annual Meeting of NASCO. We are confident that this meeting will be constructive. I would like to thank our host, the Government of Finland, for the kind invitation to Helsinki.

During the last year Atlantic Salmon have been given considerable attention in Norway. The strict regulations introduced in the 1989 season have improved the spawning escapement of Atlantic salmon to Norwegian rivers. Further, effort to combat salmon diseases and parasites has been escalated, mitigation of acid rivers has increased and the program of gene preservation of Atlantic salmon has been expanded and now includes a live gene bank.

Norway is the major producer of farmed salmon. The Government and the farming industry have established a constructive cooperation to meet the rising concern of the interaction between farmed and wild salmon. This is reflected by the fact that the Norwegian fish farming industry is now represented in the Norwegian delegation. The delegation is also expanded with representatives from the Norwegian Association of Hunters and Anglers.

It is vital that salmon management is based on scientific knowledge. A very important step was the Loen symposium on interaction between farmed and wild Atlantic salmon arranged by Norway in April this year and supported by NASCO. The meeting gave full support to the precautionary principle. This principle was fully stated at the Bergen Conference, "Action for a Common Future" in May.

Regarding the Atlantic salmon we expect NASCO to play a major role in following up this principle.

Thank you, Mr President.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF ICELAND

Mr Vice-President, Distinguished Representatives, Delegates and Observers.

Iceland thanks the Finnish government for the invitation of hosting the Seventh Annual Meeting in Helsinki. Unfortunately the meeting is overshadowed by the illness of our President, Mr Allen Peterson, to whom we extend our wishes of speedy recovery. In the light of the situation we welcome the Vice-President, Mr Svein Mehli of Norway, as our President for the rest of the meeting.

Since the last annual meeting in Edinburgh, there have been several developments of great significance for Icelandic salmon fisheries, as well as for the cooperation within NASCO. In Iceland the 1989 salmon season was much inferior to the 1988 season, primarily in the grilse component, which can probably mostly be attributed to natural fluctuations. The two-sea winter component, on the other hand, was also short of expectation and there were abnormally high incidences of net marks on these fish both in south-western and north-eastern Iceland. This arouses suspicion of illegal drift-net fisheries in international waters in the North Atlantic in addition to the illegal long-line fisheries already under investigation. We wish to thank the Faroese Home Government for its vigilance and frankness in exposing and dealing with the illegal long-line vessels fishing in the international area and hope that the ensuing proceedings by the Danish government will eliminate such fisheries. There is no way that NASCO can credibly regulate quotas in existing salmon fisheries in the North Atlantic, knowing the greater or equal volume illegal fisheries are on-going. Such loopholes in international cooperation must be plugged.

Since the last NASCO meeting an initiative was started by Icelandic salmon interests to buy up NASCO quotas from Faroese and Greenlandic fishermen. This effort has been led by Mr Orri Vigfusson, a well-known Icelandic angler. Due to the nature of the Icelandic salmon fisheries there was an initial understanding that this would be a private initiative and the Icelandic government would not be supplying the finances required for these transactions. It was also clear that Icelandic interests, having only a small fraction of the total catch of Atlantic salmon, would only be providing a small fraction of total payments required. The success of this venture is thus dependent on major funding from private or public parties in other salmon producing nations in proportion to their share in the respective sea catches. Although this has so far been a private initiative the principle has large support within the Icelandic government which has facilitated ongoing negotiations in various ways, this being one way to increase the returns of salmon to homewaters.

Ranching continues to expand in Iceland. In 1989 over 6 million smolts were released in private salmon ranching out of a total smolt production of 10 million. Over 50% of the total salmon catch in 1989 was from ranching operations. Two million smolts were reared onwards in sea cages and a similar number in pump-ashore farms. Escapees from sea cages are of special concern and in 1989 over 30% of the catch in Ellida-river in south-western Iceland was of reared origin. In Iceland these problems, fortunately, are limited to a fairly small geographical area and most salmon stocks are unaffected. With salmon culture growing world-wide these problems are getting to be of international concern. The conclusions of a recent meeting in Norway, presented in a Council paper at this meeting, demonstrate the complexity of these problems, which both have a bearing on genetic integrity of wild stocks, as well as the danger of spreading diseases and parasites.

We can see that our agenda is well filled for the next four days with matters of great importance to the Atlantic salmon resource. Although all are of great importance the Icelandic delegation puts primary emphasis on satisfactory solution to the illegal salmon fisheries in the international area in the North Atlantic, which otherwise might undermine the credibility of this forum. Finally we wish to thank Dr Windsor and his staff for preparing this meeting so effectively.

Thank you Mr President.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF FINLAND

Mr Vice-President, Ladies and Gentlemen.

The Finnish Delegation is very pleased that the 7th Annual Meeting of NASCO is convening in Helsinki. I hope you will all enjoy your stay in our capital.

In the area of the North-East Atlantic Commission there is still in force for the coming fishing season regulatory measures, which we consider necessary to protect the wild stocks. We hope that these measures, which are introduced in the form of total allowance catch, will continue also in the future. However, we have been informed that salmon fishing which is against the rules and objectives of the Convention have taken place under cover of flags of convenience. The catches of this fishing have been considerable. The Finnish delegation is very worried about this kind of development and considers that such illegal fishing endangers the objectives of the Convention and erodes our work.

Mr Vice-President, the large scale fish farming of salmon causes continuous threat in the form of fish diseases and genetic disorders to the wild stocks. Therefore those Member States concerned, as well as our Organization, should do their best to minimise such negative effects. We are also increasingly concerned about damages to the environment caused by atmospheric pollution and the resulting acidification of salmon rivers. Continuous pollution leads to decreased production of smolts and finally destroys living conditions of salmon.

To enhance further the protection of salmon stocks in the Teno River, Finland and Norway revised the Teno Fishing Agreement which entered into force at the beginning of January this year. The revised Agreement includes, for example, shortening of the fishing season, some technical regulations concerning fishing gear and total prohibition of stocking. In this context I would like to express our disappointment that fish farming in Teno fjord has increased contrary to what was agreed during the negotiations concerning revision of the Fishing Agreement.

Since management of salmon stocks in our northern rivers is based only on regulatory measures, we hope that further regulation of the salmon fishery will also take place in areas outside river basins. We recognise the management measures which were introduced last year in the Norwegian west coast as most important to salmon stocks in the North-East Atlantic. We would also welcome such measures further in the north. Mr Vice-President, the work of NASCO has proved to be important and successful and we hope that in the future also it will benefit wild salmon all over the Convention area. I hope that this meeting will be productive and will give some new and useful results. Once again I hope that all of you will find Helsinki a nice place to visit.

Thank you Mr Vice-President.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF THE EUROPEAN ECONOMIC COMMUNITY

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

The European Community looks forward to the Seventh Annual Meeting of NASCO in the expectation of a fruitful and constructive meeting which will enable NASCO to fulfil its mandate of promoting the conservation, restoration, enhancement and rational management of the salmon in the North Atlantic Ocean, through cooperation between the Contracting Parties.

To date we have witnessed considerable progress within NASCO. This progress has been made possible by the spirit of cooperation between Contracting Parties, which is illustrated by the adoption of meaningful regulatory measures and the coordinated approach of the Parties in increasing the scientific knowledge of the salmon stocks.

The Community is a major state of origin for the North Atlantic salmon stocks and the conservation measures in force in the Member States of the Community bear testimony to its commitment to the North Atlantic salmon resource. The human and financial resources devoted to the management of the salmon stocks within the Community reflect the considerable socio-economic importance which the salmon stocks represent for our coastal communities as well as the angling communities.

NASCO has a well-balanced agenda before it reflecting the various issues that confront it. The Community has noted with concern the reports of fishing for salmon in international waters by vessels that are registered in countries that are not Parties to the NASCO Convention. This fishery, which is in contradiction with the NASCO Convention, undermines the conservation of the stocks and therefore the Community would urge that NASCO urgently addresses this issue.

The Community welcomes the initiative of the special session on the important subject of the impact of aquaculture on wild salmon in particular due to the rapid increase in the aquaculture sector.

The Community delegation would like to express its appreciation to the Government of Finland for extending the invitation to NASCO. The beautiful location of Helsinki will be an inspiring factor in promoting fruitful discussions. Finally the Community delegation compliments the NASCO Secretary and his staff for their preparatory work.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF DENMARK (IN RESPECT OF THE FAROE ISLANDS AND GREENLAND)

Mr President,

As mentioned in our Opening Statement in 1989, the results achieved at our last meetings have set an example and established a framework of cooperation which hopefully will persist in the years to come.

There are, however, three areas where no progress has occurred.

Unreported catches

Biologists estimate for the fourth consecutive year that unreported catches exceed 2,000 tons.

For the Faroe Islands and Greenland - the only Parties on whom quotas are imposed by NASCO - this figure is totally unacceptable. Our quotas are approximately 1,400 tons put together. Other Parties' catches have annually totalled 6-9,000 tons in the past few years. These figures show that our quotas, which NASCO spends such a long time negotiating, amount to no more than one-fifth of other countries' catches. Unreported catches are almost double the size of our quotas.

The Faroe Islands and Greenland have repeatedly drawn NASCO's attention to this unreasonable fact. But to no avail. When the will and the ability to "put one's own house in order" is so limited as it has proved to be for unreported catches, it is difficult for the Faroe Islands and Greenland to conclude new agreements with respect to regulatory measures upon the expiration of the present agreements.

Unilateral commitments

Up to the present, NASCO has set regulatory measures for the Faroe Islands and Greenland only. According to the Convention, NASCO cannot adopt regulatory measures with respect to a Party's catches of salmon having left that Party's rivers as smolts.

This fundamental imbalance is partly counteracted by the fact that countries of origin can actually commit themselves to manage and enhance their stocks of salmon. Reference is made to Article 15(5)(b) of the Convention.

However, it is far from clear which unilateral commitments countries of origin have actually undertaken under Article 15(5)(b). This is unsatisfactory.

Upon the expiration of the present regulatory measures for the Faroe Islands and Greenland the interesting issue for us will be not only which new measures might be adopted, but also which commitments our partners will be willing to undertake as part of a reasonable package solution.

Determination of TACs

Article 66(2) of the Convention on the Law of the Sea empowers countries of origin to

establish TACs for the stocks of salmon which originate from their rivers. If such TACs are established, the next step will be to determine quotas not only for host countries, but also for countries of origin.

Biologists have been working on the TAC issue for years without being able to reach usable solutions.

We recognise the difficulties of progressing with this work, but are also of the opinion that more general points of view should be adopted in the ICES Working Group. It is essential to determine TACs - and along with them quotas also for the countries of origin.

We hope that, at this Annual Meeting, NASCO and the Contracting Parties to the Convention will adopt concrete measures to achieve progress in the areas mentioned.

OPENING STATEMENT MADE BY THE REPRESENTATIVE OF CANADA

Mr. Vice-President, Representatives, Delegates, Observers:

It is a pleasure for the Canadian delegation to participate in the Seventh Annual Meeting of the North Atlantic Salmon Conservation Organization in Helsinki.

I would like to express our appreciation for the warm words of welcome extended by our Finnish hosts and the Minister of Fisheries. Finland has paved the way over the years of an enhanced dialogue between east and west, and today must take credit and pride in seeing the unprecedented changes taking place in east-west relations.

I cannot but express the hope that our President and regular chairperson of these meetings, will soon be back with us and that his health will improve. Meanwhile, I am reassured to see that our meeting will be in such good hands as those of our Vice-President, Mr. Melhi.

The 1990 Canadian Salmon management plan was announced by the Canadian Minister of Fisheries and Oceans on June 4, only a week prior to this meeting. Our overriding priority in the development of the new plan has remained the same, the conservation and the rebuilding of Atlantic salmon stocks. However, decisions were not easy this year.

As many of you may be aware, the Canadian fishing industry is presently going through an extremely difficult period, probably the worse since Canada's extension of jurisdiction in 1977. Reduced TACs have led to less fishing opportunities for Atlantic Canadian fishermen and the closure of many processing plants in Atlantic Canada.

On the other hand, recent scientific advice on the state of our salmon stocks in Atlantic Canada, concluded that despite some positive results achieved with the previous five-year plan, the estimated number of returns of grilse in 1989 was generally lower than in previous years. More stringent conservation measures were therefore deemed necessary for 1990.

Canada's 1990 salmon management plan retains all the previously established conservation measures, namely, no commercial fishery in the Maritime provinces, release of large salmon in the recreational fishery, limited fishing seasons, prohibition of the by-catch of salmon in other fisheries.

In addition, Canada has for the first time this year, introduced quotas for the Newfoundland commercial fishery. This measure should address the problem of interception through controlled commercial catches. The commercial salmon fishery in Newfoundland and Labrador will be reviewed at mid-season and closures could be implemented if it is judged necessary to further protect salmon stocks.

I believe these new measure will address the U.S. requests for reduced salmon catches in certain areas in Newfoundland and Labrador. Canada will also continue its consultations with user groups to implement a zonal/river management system in certain rivers for 1990 and beyond. This approach of managing salmon on a zonal/river basis is one that Canada intends to develop further.

Canada has imposed very stringent measures in 1990 on its commercial fishery . These measures call for severe sacrifices from commercial fishermen at a time when the fishing industry is experiencing serious difficulties in other important commercial fisheries. Canada will therefore be looking for similar restrictions by other relevant parties during the upcoming discussions.

Mr. Vice-President, we have learned over the years how to work well together and I know that I can count on the cooperation of other parties in this regard.

Thank you Mr President

JUNE 1990
HELSINKI

ANNEX 4

SEVENTH ANNUAL MEETING OF THE COUNCIL
12-15 JUNE 1990, INTERCONTINENTAL HOTEL, HELSINKI, FINLAND

LIST OF PARTICIPANTS

* Denotes Head of Delegation

CANADA

*MR WAYNE SHINNERS	Representative Department of Fisheries and Oceans, Ottawa, Ontario
DR WILF CARTER	Representative Atlantic Salmon Federation, St Andrews, New Brunswick
DR GABY WARD	Representative Champlain College, Quebec
MR DAVID MEERBURG	Department of Fisheries and Oceans, Ottawa, Ontario
MS LOUISE COTE	Department of Fisheries and Oceans, Ottawa, Ontario
MR REX PORTER	Department of Fisheries and Oceans, St John's, Newfoundland
MS EDITH DUSSAULT	Department of Fisheries and Oceans, Ottawa, Ontario
MR DAVID VARDY	Department of Fisheries, Government of Newfoundland and Labrador, St John's, Newfoundland

DENMARK (IN RESPECT OF THE FAROE ISLANDS AND GREENLAND)

*MR EINAR LEMCHE	Representative Greenland Home Rule, Copenhagen Office
MR SOFUS POULSEN	Faroese Commercial Attache, Aberdeen
MR HJALTI I JAKUPSSTOVU	Fisheries Research Institute, Torshavn, Faroe Islands
MRS AMALIE JESSEN	Directorate of Fisheries, Greenland
MR JENS MOELLER JENSEN	Greenland Fisheries Research Institute, Copenhagen
MR HERGEIR NIELSEN	Member of Home Rule Parliament, Torshavn, Faroe Islands

MR MANNE NAES	Chairman of Faroese Salmon Fishermen's Association, Torshavn, Faroe Islands
MR PAVIA NIELSEN	Fishermen's and Hunters' Organization, Greenland
MR PAVIARAQ HEILMANN	Fishermen's and Hunters' Organization, Greenland

EEC

*MR JOHN SPENCER	Representative Directorate-General of Fisheries, EEC Commission, Brussels
MR PIETER BANGMA	Representative Directorate-General of Fisheries, EEC Commission, Brussels
MR EUGENE HUTCHINSON	Presidency, Irish Permanent Representation, Brussels
MR AUGUSTO BETTE	Secretariat of the Council of the European Communities, Brussels
MR JOHN CARBERY	Secretariat of the Council of the European Communities, Brussels
MR JOHN KEOHANE	Department of the Marine, Dublin
MR DOMINIQUE PINEY	Ministère de la Mer, Direction des Pêches Maritimes, Paris
MR CHARLES MCCALL	Ministry of Agriculture, Fisheries and Food, London
MR TED POTTER	Ministry of Agriculture, Fisheries and Food, Lowestoft
DR TONY BURNE	Ministry of Agriculture, Fisheries and Food, London
MR BOB WILLIAMSON	Department of Agriculture and Fisheries for Scotland, Edinburgh
MR DAVID DUNKLEY	Department of Agriculture and Fisheries for Scotland, Montrose
MRS HANNE LAUGER	Ministry of Fisheries, Copenhagen
DR KEVIN O'GRADY	National Rivers Authority, London

FINLAND

*MR PEKKA NISKANEN	Representative Ministry of Agriculture and Forestry, Helsinki

MR EERO NIEMELA	Representative Finnish Game and Fisheries Institute, Helsinki
MR KARI AIRAKSINEN	Representative Ministry of Agriculture & Forestry, Helsinki
MR MARKKU ARO	Ministry of Agriculture and Forestry, Helsinki
MR MARKKU MYLLYLA	Federation of Finnish Fisheries Association, Helsinki
MR ERKKI IKONEN	Finnish Game and Fisheries Research Institute, Helsinki
MR KAI WESTMAN	Finnish Game and Fisheries Research Institute, Helsinki
ICELAND	
*MR HELGI AGUSTSSON	Representative Ambassador, Icelandic Embassy, London
MR ARNI ISAKSSON	Representative Institute of Freshwater Fisheries, Reykjavik
NORWAY	
*MR SVEIN MEHLI	Representative Directorate for Nature Management, Trondheim
MR TORMOD KARLSTROEM	Representative Ministry of the Environment, Oslo
MR TROND HAUKEBOE	Representative Fylkesmannen i More og Romsdal, Molde
MR STEINAR HERMANSEN	Ministry of the Environment, Oslo
MR TROND WOLD	Norske fiskeoppdretteres forening, Trondheim
MR PER IVAR BERGAN	Directorate for Nature Management, Trondheim
DR LARS PETTER HANSEN	Norwegian Institute for Nature Research, Trondheim
MR GEORG RIEBER MOHN	Regional Board of Salmon Fishery, Oslo
MS ASTRID LANGVATN	Directorate for Nature Management, Trondheim
MR BORRE PETTERSEN	Norwegian Hunters and Anglers Organization
MS MAY BRITT BROFOSS	Royal Norwegian Embassy, Helsinki

SWEDEN

*MR GUNNAR HOERSTADIUS	Representative Ministry of Agriculture, Stockholm
DR INGEMAR OLSSON	Representative National Board of Fisheries, Gotborg

USA

*DR FRANK CARLTON	Representative National Coalition for Marine Conservation, Savannah, Georgia
MR RICHARD ROE	Representative National Marine Fisheries Service, Gloucester, MA
MR CLINTON TOWNSEND	Representative Canaan, Maine
MR STETSON TINKHAM	Dept of State, Office of Fisheries Affairs, Washington
MR DEAN SWANSON	National Marine Fisheries Service, Silver Spring, MD
MR JAMES MCCALLUM	US House of Representatives, Washington DC
MR ARTHUR NEILL	National Marine Fisheries Service, Woods Hole, Mass.
MR RICHARD SEAMANS	National Marine Fisheries Service, Gloucester, Mass.
DR VAUGHN ANTHONY	National Marine Fisheries Service, Woods Hole, Mass.
MR ROBERT JONES	Connecticut Bureau of Fisheries, Hartford, Connecticut
MR HENRY LYMAN	Atlantic Salmon Federation, Boston, MA
MR GILBERT RADONSKI	Sport Fishing Institute, Washington, DC
DR JAMES WEAVER	US Fish and Wildlife Service, Newton Corner, MA
MR DAVID EGAN	Connecticut River Atlantic Salmon Commission, Guilford
MR BILL VAIL	Maine Sea Run Salmon Council, Maine
MR HOWARD LARSEN	US Fish and Wildlife Service, Gainesville, Florida

USSR

*DR GEORGY LUKA	Representative PINRO, Murmansk

MR ALEXANDRE ZVIRIAKO	Ministry of Fisheries, Moscow
MR KONSTANTIN BUDANOV	Murmanrybvod, Murmansk

ICES

DR EMORY ANDERSON	International Council for the Exploration of the Sea, Copenhagen
DR RICHARD GRAINGER	International Council for the Exploration of the Sea, Copenhagen
MR BERNARD VASKE	Institut fur Hochseefisherei und Fischverarbeitung, German Democratic Republic
MR JOHN BROWNE	Dept of the Marine, Dublin

NON-GOVERNMENT OBSERVERS

AIDSA	AMBASSADOR CLAUDE BATAULT
Scottish Anglers National Association	MR WILLIAM BROWN
Atlantic Salmon Trust Institute of Fisheries Management	MR JEREMY READ
Salmon and Trout Association	MR JAMES FERGUSON
Sami Parlamenta	MR JOUNI KITTI
Finnish Sports Fishermens Association	MR MARTTI SAROMAA
Association of Icelandic Angling Clubs	MR ORRI VIGFUSSON

SECRETARIAT

Secretary	DR MALCOLM WINDSOR
Assistant Secretary	DR PETER HUTCHINSON
PA to Secretary	MS SANDRA LORIMER
PA	MRS THERESA GAWTHORNE

JUNE 1990
HELSINKI

ANNEX 5

CNL(90)42
SEVENTH ANNUAL MEETING OF COUNCIL
12-15 JUNE 1990
HELSINKI, FINLAND

AGENDA		PAPER NO:
1.	Opening session	
2.	Adoption of the agenda	CNL(90)1 CNL(90)2 CNL(90)3 CNL(90)4
3.	Election of Officers	CNL(90)5
4.	Secretary's Report	CNL(90)6 CNL(90)7 CNL(90)8
5.	Report of the Finance and Administration Committee	CNL(90)9 CNL(90)10
6.	Scientific Research	
	- Report to NASCO from the ACFM of ICES	CNL(90)11 CNL(90)12
	- Request to ICES for Scientific Advice for 1991	CNL(90)13
7.	Implementation of the Convention	
	- Returns under Articles 14 and 15 of the Convention	CNL(90)14
	- Laws, Regulations and Programmes	CNL(90)15
	- Return of Catch Statistics	CNL(90)16 CNL(90)17
	- Analysis of catch statistics	CNL(90)18 CNL(90)19
	- Fishing for salmon in international waters	CNL(90)20

8.	Consideration of the principle of the payment of compensation fees for NASCO quotas.	CNL(90)21
9.	Role of non-government observers in NASCO	CNL(90)22
10.	Salmon Tagging	
	- Repository of tag release data	CNL(90)23
	- NASCO Tag Return Incentive Scheme	CNL(90)24
11.	Database on rivers flowing into NASCO Convention Area	CNL(90)25

Impacts of aquaculture on wild stocks

12.	Introduction	
13.	Genetic impacts and related research	CNL(90)26
14.	Environmental threats to wild stocks from aquaculture	CNL(90)27
15.	Report of international meeting in Norway on impacts of aquaculture on wild stocks	CNL(90)28
16.	Draft guideline for establishment and operation of gene banks for threatened stocks	CNL(90)29
17.	Review of legislation relating to introductions and transfers	CNL(90)30
18.	Possible Codes of Practice to minimize threats to wild stocks	CNL(90)31

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19.	Reports from the regional Commissions	
20.	Report on the activities of the Organization in 1989	CNL(90)32
21.	Other business	
22.	Date and place of next meeting	CNL(90)33
23.	Draft Report of the Meeting	CNL(90)34
24.	Press Release	CNL(90)35

JUNE 1990
HELSINKI

ANNEX 6

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

CNL(90)53

DECISION OF THE COUNCIL ON WORKING CAPITAL

Having regard to the need to review the level of the Working Capital Fund in the light of the Organization's responsibilities for its Headquarters Property and other factors the Council decides:

- to change the level of the Working Capital Fund from 20,000 pounds sterling to 30,000 pounds sterling and therefore to amend Financial Rule 6.3 to read:

- "The Working Capital Fund will be established in the initial budget at 3,000 pounds sterling and may be increased by budgetary provision, miscellaneous income and any cash surplus in the General Fund at the close of a financial year that is not required to meet outstanding commitments in terms of Rule 4.3 until the fund reaches 30,000 pounds sterling. Any surplus above 30,000 pounds sterling shall be entered as income in the budget and used to offset members' contributions for the next financial year".

JUNE 1990
HELSINKI

ANNEX 7

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

COUNCIL

PAPER CNL(90)43

1991 BUDGET AND 1992 FORECAST BUDGET

CNL(90)43

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION
1991 BUDGET AND 1992 FORECAST BUDGET (Pounds Sterling)

SECTION	DESCRIPTION	EXPENDITURE	
		BUDGET 1991	FORECAST 1992
1	STAFF RELATED COSTS	128270	138520
2	TRAVEL AND SUBSISTENCE	19920	27510
3	CONTRIBUTION TO ICES	21800	23540
4	CONTRIBUTION TO WORKING CAPITAL FUND	0	0
5	MEETINGS	18190	6810
6	OFFICE SUPPLIES, PRINTING AND TRANSLATIONS	28260	30520
7	COMMUNICATIONS	8200	8840
8	HEADQUARTERS PROPERTY	48370	44700
9	OFFICE FURNITURE AND EQUIPMENT	8230	8880
10	AUDIT AND OTHER EXPENSES	7900	8520
	TOTAL	289140	297840
		REVENUE	
11	CONTRIBUTIONS - CONTRACTING PARTIES	285146	295340
12	MISCELLANEOUS INCOME - INTEREST	2500	2500
13	SURPLUS OR DEFICIT(-)FROM 1989	1494	0
	TOTAL	289140	297840

NASCO BUDGET CONTRIBUTIONS FOR 1991 AND FORECAST
BUDGET CONTRIBUTIONS FOR 1992 (Pounds sterling)

CATCH (tonnes)	PARTY		BUDGET 1991	FORECAST 1992
1166	CANADA		50610	52419
	DENMARK	(FAROE ISLANDS)		
		(GREENLAND)		
701		(TOTAL)	34217	35440
2183	EEC		86462	89553
52	FINLAND		11338	11743
270	ICELAND		19023	19703
900	NORWAY		41233	42707
29	SWEDEN		10527	10904
2	USA		9575	9918
359	USSR		22161	22953
5662	TOTAL		285146	295340

Contributions are based on 1989 catches as advised by the Parties. Column totals can be in error by a few pounds due to rounding.

JUNE 1990
HELSINKI

ANNEX 8

COUNCIL

PAPER CNL(90)12

REPORT OF THE ICES ADVISORY COMMITTEE ON FISHERIES MANAGEMENT

1. QUESTIONS OF INTEREST TO THE NORTH ATLANTIC COMMISSION

Source of Information: Report of the North Atlantic Salmon Working Group Report (ICES, C.M. 1990/Assess:11).

1.1 The Catch (Tables 1 and 2)

Nominal landings in tonnes for all countries

1984	1985	1986	1987	1988	Mean	1989[1]
6,890	8,092	9,246	8,141	7,714	8,017	5,777

[1] Preliminary

1.2 Models

ACFM recommends that the modelling currently being carried out on "index" rivers should be extended and that countries should develop run reconstruction models of their national stocks and bring appropriate data to the 1991 Working Group meeting.

1.3 Ratio of Micro-tagged to Fin-clipped Fish

With regard to the ratio of microtagged to adipose fin-clipped salmon, the conclusion was that there were no great differences in ratios at release and sampling sites that could not be accounted for.

1.4 Acoustic Surveys at Sea

It is recommended that a more detailed analysis of CPUE data should be carried out before further surveys are undertaken.

1.5 Movements of Salmon at Sea

This is identified as an area where data are required by the Working Group and is the basis of a recommendation by ACFM (see 1.9 below).

1.6 Tag and Fin-clip Compilation

The compilation of tag release and fin clip data was completed. The numbers in millions were:

Year	Microtags	External	Clips
1989	>1.6	0.26	2.07
1988	>1.4	0.40	1.46

1.7 Progress on Data Requirements and Recommendations

Progress on data requirements and recommendations specified in 1988 were reported by the Working Group.

1.8 Data Requirements

Data requirements for further meetings were listed by the Working Group.

1.9 Recommendations

Further progress in developing and applying models to answer questions on interactions between fisheries will depend on estimating exploitation rates and determining the origin of stocks.

ACFM, therefore, endorses the recommendation that countries should develop run reconstruction models of their national stocks for discussion at the 1991 Study Group meetings and for input to a North Atlantic model at the Working Group meeting in 1991.

Research effort on methods of stock discrimination such as body form and scale analysis, gene frequencies and other biochemical methods should be increased.

Research effort should be increased on methods to distinguish between maturing and non-maturing components of the fisheries.

ACFM endorsed the recommendations of the Study Groups (Appendix 2 of the Working Group report). The Study Groups should meet in 1991 to prepare data for the Working Group, an extra day should be allocated to the Study Group on the Norwegian Sea and Faroes Salmon Fishery, and both Study Groups should provide text suitable to answer the questions of interest to the North American and North-East Atlantic Commission areas.

It is recommended that the Workshop to Discuss Techniques to Distinguish Fish Farm Escapees from Wild Salmon should report to the Working Group on North Atlantic Salmon.

2. SALMON IN THE WEST GREENLAND COMMISSION AREA

Source of information: Report of the North Atlantic Salmon Working Group (ICES, C.M. 1990/Assess:11).

2.1 The Fishery

Nominal landings in tonnes

Year	1984	1985	1986	1987	1988	Mean	1989
Actual landings	297	864	960	966	893	796	337
Agreed TAC	870	852	909	935	900	-	900

The gear used is drift net (140 mm stretched mesh).

2.3 Effort

No information for 1989.

2.4 Composition of the Catch in Numbers

Numbers of salmon of North American and European origin in West Greenland catches were as follows:

	North American	European	Total
SW1	60,020	50,339	110,359
SW2	3,378	2,001	5,379
PS	1,559	316	1,875
Total	64,957	52,656	117,613
%	55	44	

There are four methods used to obtain harvest estimates of Maine salmon in the Greenland fishery. (1) The proportional harvest method is based on the number of 1SW North American salmon of river age 1 in the West Greenland fishery, as apportioned by the relative proportions of age 1 smolts produced by USA and Canadian hatcheries. (2) A stock identification extension of the previous method, referred to as the imaging method, is based on identifications of North American 1SW, river age 1 salmon by a discriminant function based on circuli spacing on the scales of age 1 smolts produced by the various North American hatcheries. It only estimates the harvest of 1-year-old hatchery salmon in the fishery. (3) The Carlin tag method relies on the proportion of tags in the homewater run in the year following the fishery and can only provide estimates a year after the fishery. (4) Similarly, the coded wire tag (CWT) method makes use of the proportion of fish with CWTs in the homewater run in the year after the fishery.

Harvest estimates of Maine (USA) salmon at West Greenland by various methods

	Carlin tag	CWT	Proportional harvest	Image[1]
1988	2,261	4,466	4,812	5,087
1989	-	-	4,547	2,985

[1] Estimate of 1-year-old hatchery-origin fish.

2.5 Exploitation Rates

It was not possible to precisely determine exploitation rates at West Greenland, but the USA (Maine) stocks were modelled to provide the boundaries of these rates.

Total exploitation rates in all fisheries on extant 1SW Maine stocks were estimated. These estimates depend on the tag reporting rate used in the harvest calculations. Assuming the rate normally used in the harvest model of 80%, the exploitation rates in the period 1967-1988 on 1SW salmon averaged 0.43, and ranged between 0.4 and 0.5 during 1986-1988. Assuming the reporting rate had been overestimated by a factor of 2, the average exploitation rate was 0.60 and it ranged between 0.60 and 0.68 during 1986-1988.

Estimates of exploitation rates at West Greenland depend on the fraction of the stock migrating to this fishery. The Maine stock was modelled using different values for this fraction. In 1988, the ranges varied between 0.43-0.87 and 0.6-0.93 depending on the tag reporting rate used.

Exploitation rates on Maine and St John River salmon in both the West Greenland and in the Newfoundland/Labrador fisheries were obtained using a calibration method which additionally provides estimates of the fraction of both stocks in each of the fisheries. In 1988, exploitation in West Greenland ranged between 0.44-0.63 for the St John stock and 0.43-0.62 for the Maine stocks. In 1987 in the Newfoundland/Labrador fishery, exploitation rates ranged between 0.76-0.79 for the St John stock and 0.49-0.53 for Maine-origin salmon. The different values depend on the tag reporting rate used.

The consequences of these calculations are that substantial numbers of salmon (58 to 99%) would have to return to homewaters from feeding grounds other than those at West Greenland.

ACFM encourages the use of these models, but cautions that results from them are very preliminary and suggest that the assumptions used in the models should be clearly specified and evaluated.

2.6 Effectiveness of Management Measures

After one year with individual boat quotas, the TAC was again divided into a "free quota" and a "small boat quota". Because of the low landings in 1989, it was not possible to measure the effect of that change.

3. SALMON IN THE NORTH-EAST ATLANTIC COMMISSION AREA

Source of information: Report of the North Atlantic Salmon Working Group 1990 (ICES C.M. 1990/Assess:11).

3.1 Faroese Fishery in the Norwegian Sea

3.1.1 The fishery at the Faroes in the 1988/1989 season and in 1989

The fishery in the 1988/1989 season was poor due mainly to severe storms.

Nominal catches in tonnes

Season	Catch Wt (t)	Nos	Year	Catch Wt(t)
1983/1984	651	124,508	1984	628
1984/1985	598	135,776	1985	566
1985/1986	545	154,554	1986	530
1986/1987	539	140,304	1987	576
1987/1988	208	65,011	1988	243
Mean	508	124,031	Mean	509
1988/1989	309	93,496	1989	364

3.1.2 Catch per unit effort

The gear used in the fishery is long line. The CPUE is presented as catch per 1,000 hooks.

Catch per 1,000 hooks

Year	1983/1984	1984/1985	1985/1986	1986/1987	1987/1988	Mean	88/89
CPUE (Fishery)	51	36	58	64	48	51	72
CPUE (Faroes EEZ)	-	-	-	62	43	-	72

The CPUE was variable throughout the season starting at a high level, decreasing in January and February and increasing for the remainder of the season. Despite the low catch, the overall CPUE was the highest recorded. There was no fishing by Faroese boats outside the Faroese EEZ in the 1988-1989 season.

3.1.3 Composition of the catch

Age composition was determined from length frequency distributions and scale samples.

Numbers by sea age in the catch

Season	Sea Age 1	%	2	%	3	%	4	%	Total No.	Catch (t)	Mean weight
1983/84	4,052	3	107,487	86	12,923	10	46	0	124,508	651	5.23
1984/85	345	0	125,158	92	10,273	8	0	0	135,776	598	4.40
1985/86	1,762	1	147,770	96	4,945	3	76	0	154,554	545	3.53
1986/87	76	0	133,078	95	7,070	5	80	0	140,304	539	3.84
1987/88	5,833	9	55,728	86	3,450	5	0	0	65,011	208	3.20
1988/89	1,351	1	86,417	92	5,728	6	0	0	93,496	309	3.30

3.1.4 Origin of the catch

Recapture rates at the Faroes per 1,000 fish released suggest that the contribution to the fishery by Norwegian stocks has remained relatively stable and considerably higher than UK and Irish stocks. Sweden contributes at a high rate but overall smolt production is relatively low. In the 1988/1989 season, tags from the USA, Canada, UK (Northern Ireland), and the USSR were recovered in the fishery.

3.1.5 Exploitation rates at the Faroes

Exploitation rates on two Norwegian stocks were estimated during the seasons 1981/1982 to 1988/1989. Exploitation on 1SW salmon has ranged from 0.5 to 5% and on 2SW salmon from 3 to 56%. In recent seasons, exploitation rates on River Imsa (Norway) and North Esk (Scotland) salmon have decreased and those on Irish and Northern Irish stocks have remained low.

3.1.6 Effectiveness of management measures

During the effort limitation programme over the period 1987-1989, the following catches (tonnes) were taken:

Season	Catch	No.	Year	Catch	Catch allowed
1986/1987	539	140,304	1987	576	626.5 + 5%
1987/1988	208	65,011	1988	243	626.5 + 5%
1988/1989	309	93,496	1989	364	625.5 + 5%
Total	1,056	298,811		1,183	1,790

The Faroese catch is controlled by an effort limitation programme such that the total nominal catch should not exceed 1,790 t in any given year. In 1989, the catch of 364t was well below the permitted maximum. The overall catch for the whole trial period was 1,183t, or 66% of the TAC.

A total of 26 licenses was permitted for the 1988/1989 season, 19 of which were issued and only

12 of which were used. The total effort for the season was 1,042,040 hooks. These were fished during 525 sets, which is a third of the permitted maximum of 1,600 annually. Since effort was voluntarily restricted, it was not possible to assess the effectiveness of mandatory effort restrictions as a management measure.

3.2 Homewater Fisheries

3.2.1 Catches

The total nominal catch in homewater fisheries in 1989 was 3,907t.

Nominal catches in tonnes

	1984	1985	1986	1987	1988	Mean	1989[1]
France	25	22	28	27	32	27	14
Eng/Wales	345	361	430	302	395	367	296
Scotland	1,013	913	1,271	922	882	1,000	780
Ireland	829	1,595	1,730	1,239	1,874	1,453	1,079
N. Ireland	78	98	109	56	114	91	142
Norway	1,623	1,561	1,598	1,385	1,076	1,449	881
Sweden	40	45	54	47	40	45	29
Finland	44	49	38	49	34	43	52
USSR	593	659	608	564	419	569	359
Iceland	159	217	310	222	396	261	275
Total	4,749	5,520	6,176	4,313	5,262	5,305	3,907

[1] Preliminary

In general, catches were lower in most countries and very low river flows were identified as a contributing factor. Iceland and the USSR reported increases in the proportion of 1SW salmon in their runs.

3.2.2 Exploitation rates

In several countries, exploitation rates were lower in 1989 although this was not uniform across all sea ages.

Exploitation rates in Homewaters

Country	Stock/Rivers	1SW	2SW	All ages
France	Elorn (W)	0.06	0.62	
Scotland	N. Esk (W)	0.35	0.36	
Ireland	Burrishoole (H)	0.72 - 0.82		
N. Ireland	R. Bush (H)	0.89	0.60	
Norway	R. Imsa (W)	0.59 - 0.67	0.67 - 0.74	
	R. Imsa 1+(H)	0.48 - 0.56	0.81 - 0.86	
	R. Imsa 2+(H)	0.27 - 0.34	0.38 - 0.44	
	R. Drammen 1+(H)	0.32 - 0.40	0.50 - 0.57	
	R. Drammen 2+(H)		0.53 - 0.60	
Iceland	R. Ellidaar			0.41
USSR	Barents Sea Rivers			0.68
	White Sea Rivers			0.52

H = Hatchery-reared stock. W = Wild stock. In some countries, 2 estimates are given depending on the tag reporting rate used or the estimate of unreported catch. These are shown as a range in the table.

3.2.3 Status of stocks

Overall stock levels in freshwater are lower relative to recent years but in some countries stock levels were reported as high.

3.2.4 Effectiveness of management measures

Iceland: Regulations introduced in 1988 have reduced the transfer of stocks between river systems.

Norway: The drift net fishery was banned, restrictions were introduced in inshore fisheries and fishing by all methods was banned in 74 of approximately 500 rivers.

Nominal catches (tonnes) by various methods in Norway

	1982	1983	1984	1985	1986	1987	1988	1989[1]
Drift nets	590	826	866	667	795	552	527	0
Other nets	469	418	458	572	497	461	314	484
Freshwater	289	306	299	322	306	372	235	397
% Freshwater	0.21	0.20	0.18	0.21	0.19	0.27	0.22	0.45
Total	1,348	1,550	1,623	1,561	1,598	1,385	1,076	881

[1] Preliminary

The ban on drift netting has resulted in a larger number of salmon being available to the other salmon fisheries, and the regulation of those fisheries has probably resulted in a substantial increase in freshwater escapement.

3.2.5 Impact of aquaculture

There were only point samples available, and it was not possible to estimate the number present in the sea. There is also a conflict in that fish that escape as smolts from cages cannot be separated from reared fish released for enhancement or sea-ranching.

Reared fish in Samples

Country	Location	Percentage Recorded
Iceland	River Ellidaar	30
Ireland	Drift Net Fishery	0.5 - 6.0
	River Burrishoole	7.0
Norway	Coastal/Fjords	7.0 - 66.0
Rivers		0 - 78.0
Scotland	Coastal	0.7 - 6.6

4. SALMON IN THE NORTH AMERICAN COMMISSION AREA

Source of Information: Report of the North Atlantic Salmon Working Group 1990 (ICES, C.M. 1990/Assess:11).

4.1 Canada

4.1.1 The fisheries in 1989

Total landings (tonnes)

Landings	1984	1985	1986	1987	1988	Mean 1984-1988	Mean 1979-1983	1989[1]
1SW	467	593	780	833	677	670	709	550
MSW	645	540	779	951	633	710	1,216	616
Total	1,112	1,133	1,559	1,784	1,311	1,380	1,925	1,166

[1] Preliminary

The total landings in 1989 were harvested by the following fisheries: commercial (84%), recreational (14%), and native (2%).

The landings of 1SW and MSW salmon in 1989 were 18% and 13%, respectively, below the mean landings for the period 1984-1988. The mean landings for 1979-83 are shown in the table for comparison because management measures were introduced in 1984, which significantly restricted the fisheries.

Landings in the Newfoundland-Labrador commercial fisheries (tonnes)

Landings	1984	1985	1986	1987	1988	Mean 1984-1988	Mean 1979-1983	1989
1SW	332	470	608	705	511	525	595	417
MSW	465	411	622	780	461	548	875	416
Total	797	881	1,230	1,485	972	1,073	1,470	823

The landings of 1SW and MSW salmon in 1989 were 21% and 24% below the mean landings for the period 1984-88.

4.1.2 Composition of the catch

The Canadian commercial fisheries harvest salmon of Canadian and USA origin. The estimate of 1SW Maine-origin fish in the Newfoundland/Labrador fishery in 1988 was 393 fish. Estimates of harvest of USA-origin salmon in 1989 cannot be made until adult salmon returns to homewaters in 1990 have been enumerated.

4.1.3 Status of stock

In 1989, the target spawning biomass was achieved or exceeded in 6 of 11 river stocks assessed. The target spawning biomass was achieved on the Miramichi river, but on the Saint John and Restigouche rivers only 70% and 55%, respectively, of the target was achieved. On these rivers, 1SW target spawning numbers were achieved or exceeded but MSW numbers were not.

River	Target values			1989 spawning escapement		
	Eggs(10^6)	Fish		Eggs (10^6)	Fish	
		MSW	1SW		MSW	1SW
Restigouche	71.4	12,200	2,600	39.2	6,569	2,559
Miramichi	132.0	23,600	22,600	124.1	14,636	50,641
St John[1]	29.5	4,400	3,200	21.1	3,130	7,356
Margaree	6.7	1,036	579	7.8	1,219	606
LaHave[2]	1.7	94	575	4.3	450	2,466
Conne	7.8	-	4,000	7.6	303	3,386

[1] Above Mactaquac; wild and hatchery fish
[2] Above Morgan Falls; wild fish only

In many rivers in New Brunswick and Nova Scotia the percentage of MSW salmon has been lower during 1987-1989 than in previous years. No immediate explanation is available. The returns of grilse to rivers in Newfoundland, Nova Scotia and New Brunswick were generally below previous years. The 1SW returns to many Newfoundland rivers were 50% below the previous 5-year mean. The MSW salmon returns were below the previous 5-year mean at 6 out of 10 monitoring sites in Nova Scotia and New Brunswick and at 2 out of 4 sites in Quebec.

4.1.4 Exploitation rates

Exploitation rates on the 1SW component of 9 stocks in the recreational fishery in Newfoundland ranged from 0.08 to 0.53 during 1983-1989. The overall mean exploitation rate across rivers and years was 0.23. Mean rates were significantly different among river systems and years. Modelling of the exploitation patterns in the recreation fisheries in Newfoundland rivers may require annual estimates of exploitation rates.

The estimates of commercial exploitation on two 1SW stocks in Newfoundland are:

	1988	1989
Conne River		0.03
Exploits River	0.61	0.57

The low commercial exploitation rate on the Conne river stock is related to the early run timing of this stock. The mean exploitation rates during 1974-1988 for the Saint John river stock under the assumptions that 0.3, 0.5, and 0.7 of the total population is available to the fisheries are as follows:

	Nfld Lab (yr i)			Greenland (yr i)			Homewaters (yr i+1)
	0.3	0.5	0.7	0.7	0.5	0.3	
Mean 1974-1988	0.44	0.33	0.27	0.34	0.41	0.52	0.41

4.1.5 Harvest of USA (Maine origin) salmon in Canada

Harvest estimates in numbers

	1SW Mean		2SW Mean	
	1988	1983-1987	1989	1984-1988
Newfoundland/ Labrador	393	1,280	61	42
Other	0	27	0	0

The estimate of harvest of USA-origin 1SW salmon in the Newfoundland-Labrador commercial fishery in 1988 was 69% less than the mean harvest estimates for 1984-88. The above estimates are based on 85% efficiency of fish passages in Maine and are 5% lower than estimates based on 100% efficiency.

4.1.6 Effectiveness of management measures

No new management measures were introduced in 1989. The combined effects of all measures taken by Canada to reduce the harvest of USA-origin salmon was assessed by comparing the harvest of 1SW salmon of Maine origin in the Newfoundland and Labrador fishery with the run size of 2SW fish the following year in Maine. The harvest to run ratio of 0.13 for the year 1988 was the second lowest of the period 1967-1988.

4.2 USA

4.2.1 The fisheries in 1989

The recreational fishery in Maine is the only fishery on Atlantic salmon.

Nominal landings in numbers

Landings	1984	1985	1986	1987	1988	Mean 1984-1988	1989
1SW	50	23	76	33	49	46	157
MSW	559	534	465	249	210	403	330
Total	609	557	541	282	259	450	487

The recreational catch in Maine was 89% higher than in 1988, and 8% higher than the mean catch during 1984-1988. The catch of 1SW salmon is 331% higher than the 1984-1988 mean catch.

4.2.2 Composition of the catch

The catches in the USA rivers are believed to be only of USA-origin salmon.

4.2.3 Status of stocks

The estimated total run of 2SW salmon to Maine rivers in 1989 was 2,941 salmon. It is similar to the run size in 1988 (2,870 2SW salmon) and 25% below the mean run size (3,917) for the period 1979-1988. The spawning escapement to the Penobscot river in 1989 was 31% of its target spawning requirement. There has been a decline in the numbers of 3SW and PS salmon in the recreational fisheries since 1962.

The 1SW:MSW ratios of salmon of the 1985-1987 smolt classes for the Penobscot river were about 0.36 and are the highest recorded.

4.2.4 Exploitation rates

The exploitation rate in the Penobscot river in 1989 was 12.6%.

4.2.5 Effectiveness of management measures

No new management measures were introduced in 1989.

Table 1 Nominal catch of SALMON by country (in tonnes round fresh weight), 1960-1989.

Year	France	Engl.+ Wales	Scotland	Ireland[2]	Northern Ireland[2,3]	Norway[4]	Sweden (west coast)	Finland	USSR	Iceland	Canada[5]	USA	Faroes	West Green-land	East Green-land	Others[6]	Total[1]
1960	75	283	1,436	743	139	1,659	40	-	1,100	100	1,636	1	-	60	-	-	7,272
1961	75	232	1,196	707	132	1,533	27	-	790	127	1,583	1	-	127	-	-	6,530
1962	75	318	1,740	1,459	356	1,935	45	-	710	125	1,719	1	-	244	-	-	8,727
1963	75	325	1,698	1,458	306	1,786	23	-	480	145	1,861	1	-	466	-	-	8,624
1964	75	307	1,914	1,617	377	2,147	36	-	590	135	2,069	1	-	1,539	-	-	10,807
1965	75	320	1,563	1,457	281	2,000	40	-	590	133	2,116	1	-	861	-	-	9,437
1966	75	387	1,624	1,238	287	1,791	36	-	570	106	2,369	1	-	1,370	-	-	9,854
1967	75	420	2,133	1,463	449	1,980	25	-	883	146	2,863	1	-	1,601	-	-	12,039
1968	75	282	1,563	1,413	312	1,514	20	-	827	162	2,111	1	5	1,127	-	403	9,815
1969	75	377	1,947	1,730	267	1,383	22	-	360	133	2,202	1	7	2,210	-	893	11,607
1970	75	527	1,329	1,787	297	1,171	20	-	448	195	2,323	1	12	2,146	-	922	11,253
1971	75	426	1,419	1,639	234	1,207	18	-	417	204	1,992	1	-	2,689	-	471	10,792
1972	34	442	1,693	1,804	210	1,568	18	32	462	250	1,759	1	9	2,113	-	486	10,891
1973	12	450	1,964	1,930	182	1,726	23	50	772	256	2,434	2.7	28	2,341	-	533	12,704
1974	13	383	1,641	2,128	184	1,633	32	76	709	225	2,539	0.9	20	1,917	-	373	11,874
1975	25	447	1,561	2,216	164	1,537	26	76	811	266	2,485	1.7	28	2,030	-	475	12,149
1976	9	208	1,010	1,561	113	1,530	20	66	772	225	2,506	0.8	40	1,175	<1	289	9,526
1977	19	345	1,131	1,372	110	1,488	10	59	497	230	2,545	2.4	40	1,420	6	192	9,466
1978	20	349	1,323	1,230	148	1,050	10	37	476	291	1,545	4.1	37	984	8	138	7,650
1979	10	261	1,075	1,097	99	1,831	12	26	455	225	1,287	2.5	119	1,395	<1	193	8,089
1980	30	360	1,134	947	122	1,830	17	34	664	249	2,680	5.5	536	1,194	<1	277	10,081
1981	20	493	1,233	685	101	1,656	26	44	463	163	2,437	6.0	1,025	1,264	<1	313	9,930
1982	20	286	1,092	993	132	1,348	25	54	364	147	1,798	6.4	865	1,077	<1	437	8,645
1983	16	429	1,221	1,656	187	1,550	28	57	507	198	1,424	1.3	678	310	<1	466	8,729
1984	25	345	1,013	829	78	1,623	40	44	593	159	1,112	2.2	628	297	<1	101	6,890
1985	22	361	913	1,595	98	1,561	45	49	659	217	1,133	2.1	566	864	7	-	8,092
1986	28	430	1,271	1,730	109	1,598	54	38	608	310	1,559	1.9	530	960	19	-	9,246
1987	27	302	922	1,239	56	1,385	47	49	564	222	1,784	1.2	576	966	<1	-	8,141
1988	32	395	882	1,874	114	1,076	40	34	419	396	1,311	0.9	243	893	4	-	7,714
1989[1]	14	296	780	1,079	142	881	29	52	359	275	1,166	1.7	364	337	<1	-	5,777

[1] Provisional figures.
[2] Catch on River Foyle allocated 50% Ireland and 50% Northern Ireland.
[3] Not including angling catch (mainly grilse).
[4] Before 1966, sea trout and sea char included (5% total).
[5] Includes estimates of some local sales and by-catch.
[6] Includes catches on Norwegian Sea by vessels from Denmark, Sweden, Federal Republic of Germany, Norway, and Finland.

Table 2 Nominal catch of SALMON in homewaters by country (in tonnes round fresh weight), 1960-1989.

Year	France	Engl.+ Wales	Scotland[2]			Ireland[3]			N.Ire-land[3,4]	Norway[5]			Sweden (west coast)	Finland			USSR	Ice-land	Canada[6]			USA	Total all countr.
	T	T	S	G	T	S	G	T	T	S	G	T	T	S	G	T	T	T	S	G	T	T	T
1960	75	283	927	509	1,436	-	-	743	139	-	-	1,659	40	-	-	-	1,100	100	-	-	1,636	1	7,212
1961	75	232	772	424	1,196	-	-	707	132	-	-	1,533	27	-	-	-	790	127	-	-	1,583	1	6,403
1962	75	318	808	932	1,740	-	-	1,459	356	-	-	1,935	45	-	-	-	710	125	-	-	1,719	1	8,483
1963	75	325	1,168	530	1,698	-	-	1,458	306	-	-	1,786	23	-	-	-	480	145	-	-	1,861	1	8,158
1964	75	307	913	1,001	1,914	-	-	1,617	377	-	-	2,147	36	-	-	-	590	135	-	-	2,069	1	9,268
1965	75	320	835	728	1,563	-	-	1,457	281	-	-	2,000	40	-	-	-	590	133	-	-	2,116	1	8,576
1966	75	387	788	836	1,624	-	-	1,238	287	-	-	1,791	36	-	-	-	570	106	-	-	2,369	1	8,484
1967	75	420	857	1,276	2,133	-	-	1,463	449	-	-	1,980	25	-	-	-	883	146	-	-	2,863	1	10,438
1968	75	282	783	780	1,563	-	-	1,413	312	-	-	1,514	20	-	-	-	827	162	-	-	2,111	1	8,280
1969	75	377	539	1,408	1,947	-	-	1,730	267	801	582	1,383	22	-	-	-	360	133	-	-	2,202	1	8,497
1970	75	527	503	826	1,329	-	-	1,787	297	815	356	1,171	20	-	-	-	448	195	1,562	761	2,323	1	8,173
1971	75	426	496	923	1,419	-	-	1,639	234	771	436	1,207	18	-	-	-	417	204	1,482	510	1,992	1	7,632
1972	34	442	588	1,105	1,693	200	1,604	1,804	210	1,064	514	1,578	18	-	-	32	462	250	1,201	558	1,759	1	8,283
1973	12	450	661	1,303	1,964	244	1,686	1,930	182	1,220	506	1,726	23	-	-	50	772	256	1,651	783	2,434	2.7	9,802
1974	13	383	578	1,063	1,641	170	1,958	2,128	184	1,149	484	1,633	32	-	-	76	709	225	1,589	950	2,539	0.9	9,564
1975	25	447	669	892	1,561	274	1,942	2,216	164	1,038	499	1,537	26	-	-	76	811	266	1,573	912	2,485	1.7	9,616
1976	9	208	328	682	1,010	109	1,452	1,561	113	1,063	467	1,530	20	-	-	66	772	225	1,721	785	2,506	0.8	8,021
1977	19	345	369	762	1,131	145	1,227	1,372	110	1,018	470	1,488	10	-	-	59	497	230	1,883	662	2,545	2.4	7,808
1978	20	349	781	542	1,323	147	1,082	1,230	148	668	382	1,050	10	-	-	37	476	291	1,225	320	1,545	4.1	6,483
1979	10	261	598	478	1,075	105	922	1,097	99	1,150	681	1,831	12	-	-	26	455	225	705	582	1,287	2.5	6,383
1980	30	360	851	283	1,134	202	745	947	122	1,352	478	1,830	17	-	-	34	664	249	1,763	917	2,680	5.5	8,073
1981	20	493	843	389	1,233	164	521	685	101	1,189	467	1,656	26	-	-	44	463	163	1,619	818	2,437	6.0	7,327
1982	20	286	596	496	1,092	63	930	993	132	985	363	1,348	25	-	-	54	364	147	1,082	716	1,798	6.4	6,265
1983	16	429	672	549	1,221	150	1,506	1,656	187	957	593	1,550	28	-	-	57	507	198	911	513	1,424	1.3	7,274
1984	25	345	504	509	1,013	101	728	829	78	995	628	1,623	40	-	-	44	593	159	645	467	1,112	2.2	5,863
1985	22	361	514	399	913	100	1,495	1,595	98	923	638	1,561	45	-	-	49	659	217	540	593	1,133	2.1	6,655
1986	28	430	745	526	1,271	136	1,594	1,730	109	1,042	556	1,598	54	28	10	38	608	310	779	780	1,559	1.9	7,737
1987	27	302	503	419	922	127	1,112	1,239	56	894	491	1,385	47	35	14	49	564	222	951	833	1,784	1.2	6,598[7]
1988[1]	32	395	501	381	882	141	1,733	1,874	114	656	420	1,076	40	26	8	34	419	396	633	677	1,311	0.9	6,574
1989[1]	14	296	412	368	780	132	947	1,079	142	479	402	881	29	17	35	52	359	275	616	550	1,166	1.7	5,075

S = Salmon (2SW or MSW fish). G = Grilse (1SW fish). T = S + G.

[1] Provisional figures.
[2] Salmon and grilse figures for 1962-1977 corrected for grilse error.
[3] Catch on River Foyle allocated 50% Ireland and 50% N. Ireland.
[4] Not including angling catch (mainly grilse).
[5] Before 1966, sea trout and sea char included (5% total).
[6] Includes estimates of some local sales and by-catch, some fish in "G" column are non-maturing.
[7] 0.08 t reported by Portugal not included.

JUNE 1990
HELSINKI

ANNEX 9

COUNCIL

PAPER CNL(90)48

DECISION OF THE COUNCIL TO REQUEST SCIENTIFIC ADVICE FROM ICES

The Council decides to request the following scientific advice from ICES:

(1) With respect to Atlantic salmon in each Commission area, where relevant:

(a) describe events of the 1990 fisheries with respect to gear, effort, composition and origin of the catch;

(b) continue the development of run-reconstruction models of national stocks for input to a North Atlantic salmon model to describe fisheries interactions and stock dynamics;

(c) estimate exploitation rates and status of stocks in home water and interception fisheries on stocks occurring in the Commission area;

(d) evaluate the effects of the management measures in the salmon fisheries at Faroes and West Greenland on stocks occurring in the Commission area;

(e) evaluate the effects of the newly introduced quotas in the commercial salmon fishery of Newfoundland and Labrador and the regulations introduced into Norwegian salmon fisheries in 1989 on stocks occurring in the Commission area;

(f) specify data deficiencies and research needs;

(g) provide quantitative estimates of the effect of fish farm escapees on salmon stocks and catches.

(2) With respect to Atlantic salmon in the North-East Atlantic Commission and West Greenland Commission areas:

(a) describe the distribution of parasites and diseases that are harmful to Atlantic salmon and assess their effects on wild salmon stocks.

JUNE 1990
HELSINKI

ANNEX 10

COUNCIL

PAPER CNL(90)14

RETURNS UNDER ARTICLES 14 AND 15 OF THE CONVENTION

CNL(90)14

RETURNS UNDER ARTICLES 14 AND 15 OF THE CONVENTION

The form for the 1989 return was circulated on 9 January 1990 for completion by the Parties. All Parties were requested to complete and return the form 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.

Secretary
Edinburgh
18 May 1990

ARTICLE 14

1. ACTIONS TAKEN TO MAKE EFFECTIVE THE PROVISIONS OF THE CONVENTION

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.

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

Denmark (in respect of the Faroe Islands and Greenland)

In the Faroe Islands, one vessel was fined Dkr 50,000 and had its gear and illegal catch confiscated on 24 April 1989.

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.

Norway

The Norwegian authorities have contacted the Polish authorities about the salmon fishing in international waters in the Norwegian Sea by Polish vessels. The following response was received from the Ministry of Foreign Affairs of the Republic of Poland:

"The Republic of Poland is not a party to the North Atlantic Salmon Convention. It is nevertheless interested in the strict observance of its provisions by all Polish fishing vessels. Therefore the competent Polish authorities will undertake all measures aiming at refraining from activities which are incompatible with the Convention by the Polish fishing vessels. The Ministry of Foreign Affairs avails itself of this opportunity to renew to the Royal Norwegian Embassy its highest consideration."

1.3 Measures to minimise the by-catches of salmon originating in the rivers of the other member. [North American Commission members only]

NO NEW ACTIONS

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. [North American Commission members only]

NO NEW ACTIONS

2. ACTIONS TAKEN TO IMPLEMENT REGULATORY MEASURES UNDER ARTICLE 13

Denmark (in respect of Faroe Islands and Greenland)

Under Executive Order No.25 of 23 June 1989 the following provisions applied to the Greenland salmon fishery in 1989:

1) Salmon fishery to be performed only with fish hooks or nets with a mesh size of 140mm.
2) In division 1F the fishery (on municipality quota) starts on 1 August and ends on 16 August. In divisions 1C-1E the fishery starts on 18 August (and is resumed in 1F).
3) Fishing is permitted in West Greenland waters up to 40 nautical miles from baselines.
4) Licences are only issued to Greenlandic persons or companies.
5) Vessels of 50BRT/BT or above are not permitted for salmon fishery.
6) The total quota is divided into a free quota of 447t to start 18 August for all divisions, and allocated municipality quotas of 453t. Fishing for the municipality quotas starts when the free quota is fished, for division if eventually resumed.

Under Executive Order No.26 of 14 July 1989 the Municipality quotas must only be taken by boats of less than 30 feet in length.

ARTICLE 15

3. LAWS, REGULATIONS AND PROGRAMMES ADOPTED OR REPEALED SINCE THE LAST NOTIFICATION

Denmark (in respect of Faroe Islands and Greenland)

Under Executive Order No.25 of 23 June 1989 the following provisions applied to the Greenland salmon fishery in 1989:

1) Salmon fishery to be performed only with fish hooks or nets with a mesh size of 140mm.
2) In division 1F the fishery (on municipality quota) starts on 1 August and ends on 16 August. In divisions 1C-1E the fishery starts on 18 August (and is resumed in 1F).
3) Fishing is permitted in West Greenland waters up to 40 nautical miles from baselines.
4) Licences are only issued to Greenlandic persons or companies.
5) Vessels of 50BRT/BT or above are not permitted for salmon fishery.
6) The total quota is divided into a free quota of 447t to start 18 August for all divisions, and allocated municipality quotas of 453t. Fishing for the municipality quotas starts when the free quota is fished, for division if eventually resumed.

Under Executive Order No.26 of 14 July 1989 the Municipality quotas must only be taken by boats of less than 30 feet in length.

EEC

The wealth of salmon legislation of a Community, national, regional or local nature within the European Community is subject to a process of continuous review and assessment to ensure its effectiveness for the conservation and rational management of the salmon stocks concerned. Therefore, whilst major framework legislation are not by their nature in the short-term subject to modification, laws are enacted, adopted or repealed relating to the day-to-day management of the stocks at the level of river's or river systems in conformity with the objectives of Community Management. The Community has submitted:

(a) New salmon conservation measures introduced in England and Wales, Scotland and Northern Ireland in 1989.
(b) A list of byelaws made during 1989 in relation to extensions to fishing seasons in Ireland.
(c) Decrees introduced in France.

Iceland

A regulatory measure was set limiting the size and position of trout nets in Icelandic coastal waters.

Norway

A law on the use of monofilament net in salmon gear from 1 January 1991.

Sweden

1. Two new closed areas for fishing for salmon and sea-trout with nets.
2. One considerably enlarged closed area for fishing for salmon and sea-trout with nets.
3. Fishing for salmon with hand tackle no longer prohibited in one river (from 1 March 1990).

4. OTHER NEW COMMITMENTS RELATING TO THE CONSERVATION, RESTORATION, ENHANCEMENT AND RATIONAL MANAGEMENT OF SALMON STOCKS SUBJECT TO THE CONVENTION

EEC

These new commitments are incorporated in the above mentioned section.

Norway

The Ministry of the Environment and the Ministry of Fisheries have decided to establish 52 protection zones for salmon. These zones cover the fjord areas outside 121 rivers. The zones are established for a 5 year period and within the zones aquaculture activities are strongly regulated. The largest zone in 120km long but the majority of zones are much smaller.

USSR

Adoption of document No 02-52/7354 of 22 December 1988 by the USSR Ministry of Fisheries on the cessation of the fishery for Atlantic salmon in the Pechora river due to the poor state of the stock.

5. OTHER FACTORS WHICH MAY SIGNIFICANTLY AFFECT THE ABUNDANCE OF SALMON STOCKS SUBJECT TO THE CONVENTION

EEC

Awaiting the ACFM Report to analyse this factor.

Iceland

Continued increase in sea-ranching activity. Increased Icelandic contribution.

Norway

During 1988 and 1989 a great number of salmon escaped from fish farms. No exact figures are given but it has been estimated that about 1 million fish escaped in each year. Escaped fish may have negative effects on wild stocks.

Sweden

Effects of the intensive algal bloom in 1988 cannot be excluded.

JUNE 1990
HELSINKI

ANNEX 11

COUNCIL

PAPER CNL(90)16

CATCH STATISTIC RETURNS BY THE PARTIES

CNL(90)16

CATCH STATISTIC RETURNS BY THE PARTIES

1. At its Fourth Annual Meeting the Council decided that, in accordance with Article 15, paragraph 1, of the Convention, the Parties should be asked to provide available catch statistics for salmon stocks subject to the Convention, directly to the Council. A format for the return of the Official Catch Statistics was agreed by the Council at its Fifth Annual Meeting and this year this format was incorporated into the format for returns under Articles 14 and 15 of the Convention.

2. The Official Catch Statistics for 1989, as submitted by the Parties, are tabulated overleaf (Table 1). These catch statistics, rounded to the nearest tonne, will be used to calculate the contributions to NASCO for 1991 unless the Secretary is advised otherwise.

3. Under Article 12 of the Convention, the Secretary is to compile and disseminate statistics and reports concerning salmon stocks subject to the Convention. Table 2 presents catch statistics for the period 1960-89 by Party to the NASCO Convention.

4. 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 1960-1989 is provided for information only in paper CNL(90)17.

Secretary
Edinburgh
1 May 1990

TABLE 1: OFFICIAL CATCH STATISTICS

	PROVISIONAL 1989 CATCH (TONNES)	PROVISIONAL 1989 CATCH ACCORDING TO SEA AGE						CONFIRMED 1988 CATCH (TONNES)
		1SW		MSW		TOTAL		
		NO.	WT	NO.	WT	NO.	WT	
CANADA	**1166**	304654	550	141183	616	445837	1166	1311
DENMARK (In respect of Faroe Islands and Greenland)	**701**							1136
FAROE ISLANDS *(1)	**364**	1351	--	92145	--	93496	--	243
GREENLAND	**337**	--	--	--	--	--	--	893
EUROPEAN ECONOMIC COMMUNITY	**2183.2**	--	--	--	--	--	--	2832.7
FINLAND	**52**	--	35	--	17	--	52	34
ICELAND	**270**	--	--	--	--	--	--	412
NORWAY *(2)	**899.5**	95250	--	42620	--	137870	487.5	1076.3
SWEDEN	**29.3**	--	--	--	--	--	--	40
UNION OF SOVIET SOCIALIST REPUBLICS	**359**	78023	164	24789	195	102812	359	419
UNITED STATES OF AMERICA	**1.7**	157	0.3	330	1.4	487	1.7	0.9

*(1) Breakdown of the Faroese catch according to sea-age is for the 1988/89 season catch of 309 tonnes.

*(2) Breakdown of the Norwegian catch according to sea-age is on the basis of fish <3kg being allocated to 1SW and fish >3kg being allocated to MSW and is for the catch taken in the sea of 487.5 tonnes.

TABLE 2: CATCHES OF ATLANTIC SALMON BY THE PARTIES TO THE NASCO CONVENTION

	CANADA	DENMARK*	EEC	FINLAND	ICELAND	NORWAY	SWEDEN	USA	USSR
1960	1636	60	2676		100	1576	40	2	1100
1961	1583	127	2342		127	1456	27	2	790
1962	1719	244	3948		125	1838	45	2	710
1963	1861	466	3862		145	1697	23	2	480
1964	2069	1539	4290		135	2040	36	2	590
1965	2116	861	3696		133	1900	40	2	590
1966	2369	1338	3611		106	1823	36	2	570
1967	2863	1600	4540		146	2058	25	2	883
1968	2111	1167	3645		162	1752	150	2	827
1969	2202	2350	4420		133	2083	76	2	360
1970	2323	2361	4036		195	1861	52	2	448
1971	1992	2511	3802		204	1847	35	2	417
1972	1759	2146	4187	32	250	1976	38	2	462
1973	2434	2402	4538	50	256	2126	73	3	772
1974	2539	1945	4339	76	225	1973	57	1	709
1975	2485	2086	4413	76	266	1754	56	2	811
1976	2506	1480	2901	66	225	1530	45	1	
1977	2545	1658	2977	59	230	1488	10	2	
1978	1545	1167	3070	37	291	1050	10	4	
1979	1287	1695	2542	26	225	1831	12	3	430
1980	2680	2053	2593	34	249	1830	17	6	631
1981	2437	2603	2532	44	163	1656	26	6	450
1982	1798	2610	2523	83	147	1348	25	6	311
1983	1424	1434	3509	78	198	1550	28	1	436
1984	1112	998	2290	73	159	1623	40	2	593
1985	1133	1437	2989	49	217	1561	45	2	652
1986	1559	1490	3524	38	330	1597	53	2	608
1987	1784	1539	2593	49	250	1385	47	1	559
1988	1311	1136	2833	34	412	1076	40	1	419
1989	1166	701	2183	52	270	900	29	2	359

NOTES: * In respect of Faroe Islands & Greenland

1. The EEC catch consists of the sum of the catches of the present members of the Community for which data are available.

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 Community 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.

JUNE 1990
HELSINKI

ANNEX 12

COUNCIL

PAPER CNL(90)18

REPORT ON MEANS TO ACHIEVE IMPROVED COMPARABILITY OF CATCH STATISTICS

CNL(90)18

REPORT ON MEANS TO ACHIEVE IMPROVED COMPARABILITY OF CATCH STATISTICS

1. INTRODUCTION:

1.1 At its First Annual Meeting the Council, taking into account Article 15, paragraph 1 of the Convention, asked the Secretary to undertake an analysis of catch statistics for salmon stocks subject to the Convention.

1.2 In order to undertake this analysis a questionnaire (CNL(87)11) was prepared, in consultation with the Parties, and the responses to this questionnaire formed the basis of an analysis of catch statistics, CNL(89)14, presented to the Council at its Sixth Annual Meeting. This analysis dealt with the methods of collection of catch statistics and the forms of publication of those data. The report concluded that both the method of collection and the processing and publication of catch statistics are complex matters. It was shown that clear differences exist between Parties which may affect the comparability of the catch data. The Council, therefore, requested the Secretary to prepare a discussion paper reviewing the means to achieve improved comparability of the statistics. This review considers the differences, which were identified in last years analysis.

2. DIFFERENCES IN THE METHODS OF COLLECTING CATCH STATISTICS

2.1 The most commonly adopted method of collecting catch statistics in the North Atlantic is to license all fishermen and to require licensed fishermen to make catch returns. However, various other methods of collecting catch statistics are also used. An assessment of the relative merits of these systems is not possible. In most cases, salmon catch statistics are collected from all components (ie recreational, commercial and other) of the fisheries although in the case of the EEC (France, Northern Ireland (excluding the River Foyle)) and the Faroe Islands statistics are not collected from the recreational fisheries. In the case of the EEC (Portugal) no catch statistics are collected from either the recreational or commercial fisheries. The magnitude of these omissions is, however, unknown.

2.2 There are also differences in the way in which salmon caught in non-salmon gear are treated by the Parties. In Norway and Sweden, fishermen are required to make catch returns for salmon caught in non-salmon gear, although in Norway catches from non-salmon gear are not usually reported. In Canada, Iceland and the EEC (Scotland) it is normally illegal to retain salmon caught in non-salmon gear. In the EEC (England and Wales, France and Ireland), Faroe Islands, Finland and USSR catch returns are not required for salmon taken in non-salmon gear.

3. DIFFERENCES IN THE DATA CONTAINED IN THE PUBLISHED STATISTICS

3.1 In most cases the published statistics include catches from all components of the

fishery although in the case of the EEC (France, Northern Ireland (excluding the river Foyle)) and the Faroe Islands the statistics do not include catches from the recreational fisheries. No statistics are published for the EEC (Portugal).

3.2 The published statistics for some Parties include information on both numbers and weight of salmon caught. However, those for the EEC (France, Northern Ireland), Greenland, Faroe Islands, Finland (commercial catches) and the USSR include only weight data.

3.3 In the main the published weight data are derived from actual weighings of whole round fish. In Canada, however, site specific average weights for multi-sea-winter salmon and grilse are sometimes used. In the case of catches in the Faroe Islands and Greenland, and a small proportion of the catch in Sweden, fish are landed either glazed and gutted (Faroe Islands) or gutted (Greenland and Sweden). However, these landed weights are converted to round fresh weight equivalent. Different raising factors are used (1.11 for Greenland and Faroe Islands; 1.1 for Sweden).

3.4 Although a number of Parties allocate the catches to weight classes in their published statistics, only Canada, Finland and the EEC (Scotland) differentiate into multi-sea-winter salmon and grilse. Different criteria are used for this differentiation. In Canada this differentiation is on the basis of length (grilse less than 63cm and salmon 63cm and over) and some error is known to occur. In the EEC (Scotland) the differentiation is on the basis of weight. In Iceland although the statistics do not differentiate between multi-sea-winter salmon and grilse an estimate could be made by assuming that grilse weigh less than 7 pounds.

3.5 In the commercial statistics for the EEC (Northern Ireland) allowance is made for the inclusion of sea-trout in the catch returns. No such allowance is made in the statistics of other Parties. Returns to ranching stations are included in the Icelandic salmon statistics but returns to such stations are not included in the published statistics of other Parties.

4. MEANS OF ACHIEVING IMPROVED COMPARABILITY OF CATCH STATISTICS

4.1 Although an assessment of the relative merits of the different systems of collecting salmon catch statistics is beyond the scope of this review, it is clear that differences exist in the completeness of the information collected and published by the Parties. Improved comparability could be achieved by the collection and inclusion in the published statistics of catch data from all components (ie recreational, commercial and other) of the fisheries by all Parties. There may also be scope for improved comparability in the way that catches of salmon in non-salmon gear are treated.

4.2 At its Fifth Annual Meeting the Council adopted a format for the return of official catch statistics to NASCO. This format requests, where available, details of the provisional catch of Atlantic salmon in numbers and weight according to sea-age. The published statistics for a number of Parties include only weight data. Although a number of Parties allocate catches to weight classes very few publish statistics according to sea-age or which differentiate between multi-sea-winter salmon and grilse. More comparable statistics and more complete returns to NASCO would result from all Parties obtaining details of catch in number as well as by weight,

according to sea-age or differentiated into multi-sea-winter salmon and grilse. Where published statistics do differentiate between multi-sea-winter salmon and grilse different criteria are used which presumably reflect differences in the salmon stocks concerned.

4.3 In most cases the weight data included in the published statistics are derived from actual weighings of whole round fish. The only exceptions to this are where site specific average weights are sometimes used (Canada) or where the fish are landed gutted or gutted and glazed and converted to round fresh weight equivalent. Where gutted weights are converted different raising factors are used. The use of different raising factors may reflect differences in the stocks concerned. It is not known what effect the use of different raising factors has on the comparability of the statistics.

4.4 There might also be scope for improved comparability in the way ranched salmon are treated. At present the only Party which includes returns of salmon to ranching units in its statistics is Iceland. (Ranching is defined as an aquaculture system in which juvenile fish are released to grow on natural foods, unprotected, in marine waters from which they are harvested at marketable size.)

5. CONCLUSIONS

5.1 As this review shows there are a number of differences in methods of collecting salmon catch data and in the scope of the published statistics. Under Article 15 paragraph 1 of the Convention there is a requirement to provide catch statistics to the Council and it would seem desirable that the data submitted by each Party are broadly comparable and as complete as possible. The Council is asked to consider the following possibilities:

(a) the inclusion of catch statistics from all components of the salmon fisheries.

(b) the inclusion of statistics for salmon caught in non-salmon gear, where such retention is legal.

(c) collection of statistics for both number and weight of salmon caught according to sea-age (or allocated to grilse and multi-sea-winter salmon)

(d) a review of the basis for different raising factors.

(e) the inclusion of ranched salmon in the statistics.

Secretary
Edinburgh
18 April 1990

JUNE 1990
HELSINKI

ANNEX 13

COUNCIL

CNL(90)19

UNREPORTED CATCHES

CNL(90)19

UNREPORTED CATCHES

SUMMARY

1. At its Sixth Annual Meeting the Council directed the Secretary to review the range of problems which could lead to unreported or under-reported catches. The attached paper (Appendix 1) attempts such a review and assesses the use of unreported catch data. The paper does not attempt to quantify such unreported catches.

2. There are two main sources of mortality generated directly or indirectly by fishing but which are not included in the recorded catch (non-catch fishing mortality):

   (a) mortalities associated with the fishing process but where the fish are not retained and therefore not recorded eg discard mortality.

   (b) fish that are caught and retained but which do not enter into reported catch statistics ie unreported catches.

3. A number of problems have been identified in the attached paper that might lead to unreported catches. These can be grouped under five headings as follows:

   i) Absence of requirement for catch statistics to be collected
   ii) Suppression of information thought to be unfavourable
   iii) Local sale or consumption
   iv) Innocent inaccuracy in making returns
   v) Fishing in international waters
   vi) Illegal fishing

4. The Working Group on North Atlantic salmon has stated that unreported catches are an important component of stock assessments, but that the accuracy of unreported catch estimates continues to be a problem because of the lack of studies to assess them. The Working Group have outlined a number of possible approaches to assessing unreported catches (paragraph 3.2, in Appendix 1).

5. At its Seventh Annual Meeting the Council will be addressing two areas of relevance to the question of unreported catches. These are:

   (1) Comparability of Catch Statistics - not all Parties collect statistics from all components of the salmon fisheries. A paper reviewing the means to achieve improved comparability of the catch statistics is presented separately (CNL(90)18).

   (2) Fishing for Salmon in international waters - the Parties may decide to take action, in accordance with Article 2, paragraph 3 of the Convention, to eliminate this problem which is reviewed separately in paper CNL(90)20.

6. The Council is asked to consider the list of factors which lead to unreported catches as summarised in paragraph 3 above and to decide what further action might be taken.

(a) If the Council so decides the Secretary might, in consultation with ICES, briefly review any problems associated with implementing the proposals outlined by the Working Group (as outlined in paragraph 3.2 in the attached document).

(b) If the Council so decides, the Secretary might, in consultation with the Parties, produce a review of possible methods to reduce the impact of the factors which lead to unreported catches (as outlined in paragraph 3 above).

Secretary
Edinburgh
18 April 1990

Appendix 1

CNL(90)19

UNREPORTED CATCHES

1. INTRODUCTION

1.1 At its Fifth Annual Meeting the Council discussed the question of unreported catches and agreed that this subject could be reviewed in the light of the analysis of catch statistics being prepared by the Secretary. This analysis, CNL(89)14, was submitted to the Council at its Sixth Annual Meeting but no assessment of unreported catches was possible on the basis of the information contained in the questionnaire. The Council therefore directed the Secretary to review the range of problems which could lead to unreported or under-reported catches.

1.2 Unreported catches form a component of non-catch fishing mortality which has been defined as "mortality generated directly or indirectly by fishing but which is not included in the recorded catch" (Anon, 1987). Six types of non-catch fishing mortality have been identified (Anon, 1981):

(a) Predation mortality - fish caught in gear but subsequently removed by predators.
(b) Drop-out mortality - fish killed by the gear but lost prior to hauling.
(c) Haul-back mortality - fish killed by gear but lost during haul back.
(d) Escapement mortality - fish caught temporarily by the gear which escape but die later as an indirect result of the encounter.
(e) Discard mortality - fish discarded that are dead or die as a result of handling.
(f) Other mortality not appearing as recorded catch, including fish used directly by fishermen, illegal catch or unreported local sales.

1.3 The Working Group on North Atlantic Salmon has defined unreported catches as:

"Harvests which are caught and retained, but do not enter into reported catch statistics; such harvests could be either legal or illegal, but would not include catch and release mortalities whether they arise from nets or angling gear. Such estimates would not include fish retained by public or private agencies for broodstock purposes destined for enhancement" (Anon, 1989).

Unreported catches differ from the other forms of non-catch fishing mortality in that they are retained but do not enter into the statistics. They may arise from both legal (lawful) and illegal (unlawful) fisheries.

2. FACTORS WHICH MAY LEAD TO UNREPORTED CATCHES:

2.1 A number of factors have been identified which might give rise to unreported catches:

(i) Lack of requirement for statistics to be collected from particular parts (beats) of

rivers (Veitch, 1989), from certain river systems (Harris, 1988) or from certain components of the fisheries eg. not all Parties collect catch statistics from the recreational fisheries. A paper reviewing the means to achieve improved comparability of catch statistics is presented separately as CNL(90)18.

(ii) Catches of salmon in non-salmon gear from which returns are not required or are not made. In Norway and Sweden catch returns are required for salmon caught in non-salmon gear, although in Norway these catches are not usually reported. In Canada, Iceland and in almost all cases in the EEC (Scotland) it is illegal to retain salmon caught in non-salmon gear. In the EEC (England and Wales, France, Ireland), Faroe Islands, Finland and the USSR catch returns are not required for salmon taken in non-salmon gear (see paper CNL(89)14).

(iii) The link between declared catch and management measures which the fishermen perceive as adverse. Competition between fishermen eg. in some countries the commercial fishery is under pressure from the recreational fishery for its reduction and ultimately abolition (Harris, 1988).

(iv) The use of declared catches in assessing taxes, rates or other financial liabilities assessed on catch (Harris, 1988; Gudjonsson, 1988; Veitch, 1989).

(v) Local consumption or sale of fish by fishermen which does not appear in the statistics (Anon, 1989; Veitch, 1989).

(vi) Innocent inaccuracy in making returns (Harris, 1988).

(vii) There is recent evidence of fishing in international waters by vessels which are registered in a country which is not a Party to the NASCO Convention. A paper detailing the information available concerning this activity has been prepared for consideration by the Council, CNL(90)20.

(viii) Illegal fishing for salmon ie fishing in contravention of statutory controls. A number of different types of illegal salmon fishing have been identified although these will depend on the statutory controls present in each country. They include fishing without authority, fishing during prohibited periods, fishing using illegal gear or illegal methods, fishing in prohibited locations and retention of salmon caught in non-salmon gear.

2.2 The extent of unreported catches and the relative importance of the factors contributing to unreported catches is likely to vary from year to year, between area/regions and between countries. Although no assessment of the relative importance of the factors is possible a number of authors have drawn attention to the problem of illegal fishing (Anon, 1983; Crawford, 1988; Harris, 1988; Hazell, 1988; Mehli, 1988; Whittaker, 1988; Williamson; 1988, Champion, 1989; Veitch, 1989). For example, Williamson (1988) considered that the reported catch probably understated the actual catch of lawful fishermen but that the amount of bias in this does not vary much from year to year, while the unlawful catch has sometimes been substantial and has varied markedly from year to year. Champion (1989) believed that the control of illegal fishing was by far the biggest problem of salmon fisheries management (other than allocation of the resource). Illegally caught salmon is not necessarily unreported, however, since fish caught by illegal methods or at illegal

times may appear in the returns of authorised fishermen (Crawford, 1988). Furthermore, in some of the cases described in paragraph 2.1 it may be that the catches are reported if statistics are also provided by dealers etc.

3. USE OF UNREPORTED CATCHES IN STOCK ASSESSMENTS

3.1 Very few of the 90-100 fish stock assessments that are carried out annually by the ICES Working Groups are based solely on the officially reported statistics, since the participating scientists generally provide "unofficial" estimates of their country's catches which include estimates of additional catches (non-reported, misreported etc) (Anon, 1987) and discards. The discrepancies between official and scientific estimates do not exist for all countries and are more prevalent for some species than others (Anon, 1987). The ICES Working Group on North Atlantic Salmon has stated that unreported catches are an important component in Atlantic salmon stock assessments (Anon, 1989). Since its 1986 meeting the Working Group has provided "rough estimates", or "guess-estimates" of unreported catches for those countries that provided information on unreported catch.

3.2 A number of local studies of limited scope have been carried out in attempts to quantify unreported catches from lawful salmon fisheries (Harris, 1988; Champion, 1989) and from illegal fishing (Whitaker, 1988). However, the Working Group on North Atlantic Salmon has concluded that the accuracy of unreported catch estimates will continue to be a problem in the future as there are few definitive studies ongoing to estimate unreported catches which are "guess-estimates" for most countries (Anon, 1989). The Working Group considered a number of methods which could be used to estimate unreported catches, although not all methods may be appropriate for all countries and fisheries. These are:

(i) Estimates of illegal catch by local inspectors or fisheries officers
(ii) Issue of logbooks
(iii) Creel or commercial catch surveys
(iv) Mark - recapture techniques
(v) Comparison of landings in market categories to expected values
(vi) Surveys of coastal areas for illegal nets and records of catch per net to estimate total illegal catch
(vii) Surveys of households to estimate local sales
(viii) Tagging scheme for landed salmon

3.3 In the recommendations contained in last years Report of the Working Group on North Atlantic Salmon, (Anon, 1989) it is stated that the salmon run reconstruction models are essential to providing management advice and to the development of sound assessments of salmon stocks. A number of recommendations were made for research on index rivers to provide data for input to the run reconstruction models. These included the need to obtain reliable estimates of non-reported catch. At their Sixth Annual Meetings both the North-East Atlantic Commission and the West Greenland Commission supported these recommendations, with the West Greenland Commission emphasising the need "to produce the information needed to refine the salmon run reconstruction models".

4. CONCLUSIONS

4.1 At its Seventh Annual Meeting the Council will be addressing two areas of relevance to the question of unreported catches. These are:

(1) Comparability of Catch Statistics - not all Parties collect statistics from all components of the salmon fisheries. A paper reviewing the means to achieve improved comparability of the catch statistics is presented separately (CNL(90)18).

(2) Fishing for Salmon in International Waters - the Parties may decide to take action, in accordance with Article 2, paragraph 3 of the Convention, to eliminate this problem which is reviewed separately in paper CNL(90)20.

4.2 The Council is asked to consider the list of factors which lead to unreported catches as summarised in paragraph 2.1 above and to decide what further action might be taken.

(1) If the Council so decides the Secretary might, in consultation with ICES, briefly review any problems associated with implementing the proposals outlined by the Working Group (as listed in paragraph 3.2 above).

(2) If the Council so decides, the Secretary might, in consultation with the Parties, produce a review of possible methods to reduce the impact of the factors which lead to unreported catches (as outlined in paragraph 2.1 above).

References:

Anon (1981): Report of meeting of North Atlantic Salmon Working Group ICES CM 1981/M:10

Anon (1983): Salmon Conservation: a new approach
Report by the Salmon Sales Group of the National Water Council

Anon (1987): The Statistical Programme of ICES
ICES Statistics Committee Liaison Working Group 1987

Anon (1989): Report of the Working Group on North Atlantic Salmon
ICES CM 1989/Assess:12

Champion, A S (1989): The English North East Drift Net Fishery
In: Tweed Towards 2000 (Editor: Mills, D H)
Tweed Foundation, Berwick Upon Tweed

Crawford, W G (1988): The Impact of Illegal Fishing on Salmon Stocks in the Foyle Area
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

Gudjonsson, T (1988): Exploitation of Atlantic Salmon in Iceland
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

Harris, G S (1988): The Status and Exploitation of Salmon in England and Wales
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

Hazell, S D (1988): The Indian Atlantic Salmon Fishery on the Restigouche River: Illegal Fishing or Aboriginal Right?
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

Mehli, S A (1988): Illegal Net Fishing for Salmon in Norway
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

Veitch, A (1989): Illegal Fishing
In: Tweed Towards 2000 (Editor: Mills, D H)
Tweed Foundation, Berwick upon Tweed

Whitaker, T K (1988): Exploitation of Salmon in Ireland
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

Williamson, R B (1988): Status of Exploitation of Atlantic Salmon in Scotland
In: Atlantic Salmon: Planning for the Future
(Editors: Mills, D H and Piggins, D) Croom Helm

JUNE 1990
HELSINKI

ANNEX 14

COUNCIL

PAPER CNL(90)20

FISHING FOR SALMON IN INTERNATIONAL WATERS

CNL(90)20
FISHING FOR SALMON IN INTERNATIONAL WATERS

1. Over the last 9 months there have been a number of reports of fishing for salmon in international waters by vessels that were registered in countries that are not Parties to the NASCO Convention. The reports indicated that some of the vessels were skippered, however, by Danish Nationals and it appears that the re-flagging is a mechanism to avoid the provisions of the NASCO Convention. The re-flagging so far has been to Poland and Panama. The indications are that at least seven vessels are operating and their catch this season could be up to 630 tonnes all taken in the North-East Atlantic Commission area.

2. This is a matter of serious concern and the practice could increase if the vessels concerned are not penalised. Some bilateral action has already been taken. Iceland has made approaches through diplomatic channels to the Polish authorities who have indicated a willingness to stop the practice by adopting legislation based on the NASCO Convention. The United States has made approaches through diplomatic channels to the Panamanian authorities who have also expressed willingness to assist. The US State Department believes, however, that NASCO should take the lead in formulating long-term strategies to prevent this type of fishery.

3. The evidence provided to NASCO is attached (Appendix 1). It consists of statements from the Faroe Islands and from Norway.

4. The Danish authorities are carrying out a police investigation into the involvement of Danish nationals and it is anticipated that a report on progress with this investigation will be made to the Council.

5. The Parties are asked to consider this matter, to provide further evidence if it is available and to decide what action should be taken. It should be borne in mind that if the Danish investigation does not result in prosecution, many other flags could be used so as to enable the fishing to continue. Under Article 2, paragraph 3 of the Convention "The Parties shall invite the attention of any State not a Party to this Convention to any matter relating to the activities of the vessels of that State which appears to affect adversely the conservation, restoration, enhancement or rational management of salmon stocks subject to this Convention or the implementation of the Convention".

Secretary
Edinburgh
10 May 1990

Appendix 1

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F. L. j. nr.
(at tilskilla í svari)

13. 2 1990

F.L. j. nr. 1509-3-11

NASCO
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Scotland UK
fax no. 009-44-31 228 4384

Some Additional Details on the Polish Salmon Vessel "Minna".

The Faroese Home Government wants to inform the Contracting Parties of NASCO the following details further to letters dated 29. 1. 1990 and 9. 2. 1990.

The following details of interest are taken from the report from the Police in Tórshavn.

1. The adress of the shipping company, to which the bill of the repairs undertaken in Tórshavn has been sent, is:
Boltic Sea Food Trading,
Smedegårds Parken 16,
DK 3700 Rønne,
Bornholm, Denmark.

2. From a copy of a "Bill of Trade" concerning the vessel **Minna** it appears that the vessel was sold by one Vagn Pedersen, Poppelvej 2A, DK 6705 Esbjerg, Denmark, to **Polfish Co. ldt. Ul. Sterowa 18, P-84120 Wladyslawowo, Poland.** The bill of trade is dated 13. nov. 1989

Kjartan Hoydal
Faroe Home Government
Director of Fisheries

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29. 1 1990

F.L. j. nr. 1509-3-11

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Salmon fishery by Polish vessel in the North East Atlantic.

The Faroese Home Government wants to inform the Contracting Parties of NASCO that the Faroese Fisheries Inspection Services had the opportunity to continue the monitoring of the activities of the Polish vessel "Minna", which returned to the harbour of Tórshavn 2 February 1990.

The following details of interest are taken from the report of the inspection:

1. The reason for coming to Tórshavn was need for some repairs. A leak was repaired at the local shipyard.

2. The vessel had fished 5 tonnes of salmon since its last visit to Tórshavn. The catches were made in seven long line sets at approx. 65 Degr. N and 4 Degr. E north of the Faroes. The number of salmon in each set ranged from 181 to 720. The size range was 50 - 90 cm and the average weight was estimated at 4.0 - 4.5 kilo.

3. The skipper intended to go back to the same area and fish up to 25 tonnes of salmon and then return to Poland.

According to information from the harbourmasters office in Tórshavn the vessel left 5 February at 19.00 hrs.

Some further information may indicate the lower limit of the problem of salmon fishing in the North East Atlantic by countries not members to the NASCO. A Faroese fish exporter has been approached by a foreign company about buying 360 tonnes of salmon from 4 foreign vessels, operating in North East Atlantic waters. The Faroese fish exporter informed the Home Government and was told that no import licence would be granted and nothing has been heard from the foreign company since.

Kjartan Hoydal
Faroe Home Government
Director of Fisheries

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29. 1 1990

F.L. j. nr. 1509-3-11

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fax no. 009-44-31 228 4384

Possible illegal salmon fishery by Polish vessel.

The Faroese Home Government wants to inform the Contracting Parties of NASCO that the Fisheries Inspection Services in the Faroes has asked the police to undertake an investigation of a Polish salmon vessel, which entered the harbour of Tórshavn 18. January 1990.

The police has returned an extensive report in Danish, but has not seen any possibility of initiating legal procedures. This is based on the fact that although the vessel was fully geared for salmon long line fishing, it did not have any salmon aboard. Also Poland is not a Contracting Party to NASCO.

The information on the vessel is as follows:

Name:	MINNA
GRT	84.48 GRT
Radio signal	OZTH
Registration	WLA 69
Horsepower	400 HP

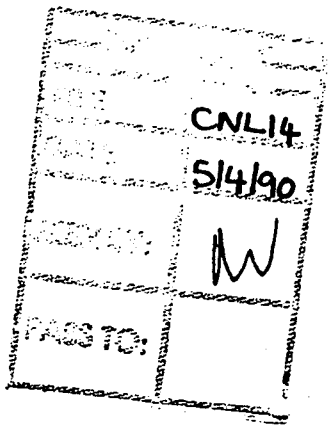
The vessel i owned by Pol-Fish, ldt. (75 %) and by Danish interests (25 %). The crew consisted of 2 Danish citizens and 3 Polish. The police was informed that the vessel intended to undertake salmon fishery in international waters and the catch would be landed in a Polish harbour.

The vessel har earlier held a Danish registration. The police has sent its report to the Danish Ministry of Fishery.

Kjartan Hoydal
Faroe Home Government
Director of Fisheries

DIREKTORATET FOR NATURFORVALTNING

SAKSBEHANDLER	Deres ref.	Vår ref.	Dato,
Svein Aage Mehli/ass		3768/90-068	3.4.1990



NASCO
11 Rutland Square
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SALMON FISHERIES IN INTERNATIONAL WATERS

Your letter of 15 March 1990 with ref. CNL 14.181.

The Norwegian coast guard has made the following registrations of long line fishing boats, fishing for salmon in the Norwegian sea. The observation periode started in January 1990 and it still continues.

Date	Name of fishing Vessel	Position	
26/1-90	Uncle Sam	6627 N 0048 W	
22/2-90*	1 Vessel	6651 N 0109 W	
	1 Vessel	6655 N 0024 W	
	1 Vessel	6705 N 0020 W	WLA 12
	1 Vessel	6656 N 0302 W	
22/2-90	1 Vessel	6743 N 0034 W	
	1 Vessel	6741 N 0030 W	
	1 Vessel	6750 N 0040 W	

* Photos taken of 4 boats:
"Anette Bri", "Seagull", "Minna", "Brodal".

10/3-90	Brodal	6645 N 0317 W	

Best regards

Svein Aage Mehli

Svein Aage Mehli

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JUNE 1990
HELSINKI

ANNEX 15

COUNCIL

PAPER CNL(90)49

RESOLUTION OF THE COUNCIL OF NASCO AT ITS SEVENTH ANNUAL MEETING HELSINKI, 12-15 JUNE 1990 FISHING FOR SALMON IN INTERNATIONAL WATERS

PAPER CNL(90)49

RESOLUTION OF THE COUNCIL OF NASCO AT ITS SEVENTH ANNUAL MEETING HELSINKI, 12-15 JUNE 1990 FISHING FOR SALMON IN INTERNATIONAL WATERS

The Council

HAVING regard to the relevant provisions of international law and, in particular, the provisions on anadromous fish stocks in the United Nations Convention on the Law of the Sea;

RECALLING the objective of NASCO to contribute through consultation and cooperation to the conservation, restoration, enhancement and rational management of salmon stocks subject to the Convention for the Conservation of Salmon in the North Atlantic Ocean,

RECALLING the prohibition on salmon fishing in international waters contained in the NASCO Convention;

RECALLING the Regulatory Measure adopted by NASCO for the North-East Atlantic waters;

NOTING that over the last twelve months there have been a number of reports of fishing for salmon in international waters by vessels that are registered in countries that are not Parties to the NASCO Convention;

EXPRESSING concern that this fishery is seriously undermining the conservation measures in force and is contrary to the objectives of the provisions of the NASCO Convention;

HAVING regard to Article 2 paragraph 3 of the NASCO Convention which states that the Contracting Parties shall invite the attention of any State not a Party to the Convention to any matter relating to the activities of the vessels of that State which appears to affect adversely the conservation, restoration, enhancement or rational management of salmon stocks subject to this Convention or the implementation of the Convention,

1. Calls upon all Contracting Parties to the NASCO Convention to intervene through diplomatic channels with the countries which permit the registration of those vessels which are involved in the salmon fishery in the international waters of the North-East Atlantic Ocean, to request these countries to take all necessary measures in order to prevent fishing for salmon in international waters.

2. Requests the President, on behalf of the Council of NASCO, to draw the attention of the countries concerned to the activities of these vessels and their adverse impact on conservation of salmon.

3. Requests the Secretary of NASCO to bring the present resolution to the attention of international organizations.

JUNE 1990
HELSINKI

ANNEX 16

COUNCIL

CNL(90)21

PRINCIPLE OF THE PURCHASE OF NASCO QUOTAS

CNL(90)21

PRINCIPLE OF THE PURCHASE OF NASCO QUOTAS

INTRODUCTION

1. During the past months there has been a private initiative (by an Icelandic river owner, Mr Orri Vigfusson) to enter into negotiations to "buy-out" salmon quotas from the Faroe Islands and Greenland. In his campaign he has contacted private and public organizations in Europe and North America with a view to raising money. I have previously notified members of the Council of these proposals in memos dated 13 November and 8 December.

2. Whether or not this initiative can find support, it raises issues of principle which a number of Parties believe should be discussed openly in the forum of NASCO Council, since NASCO quotas belong to governments and not to fishermen. PART ONE of this paper deals with the principles involved. PART TWO is only relevant if the Parties decide that they can resolve these principles, otherwise it can be ignored.

PART ONE

BASIC PRINCIPLES

3. There are a number of basic principles that need to be considered with regard to the payment of compensation for quotas:

   (A) Is the establishment of a NASCO fund or funds to compensate for relinquishing all or part of NASCO quotas consistent with the Convention?

   (B) Are the Parties to which compensation is offered willing to accept the principle of such compensation?

   (C) Are the other Parties willing to accept the principle of the payment of compensation, whether the funding be from private or public sources, or a mixture of both?

PRINCIPLE A - CONSISTENCY WITH NASCO CONVENTION

4. It is for all the Parties to decide in Council whether principle A is acceptable to them. The only guidance that can be offered by the Secretary is that there is no article in the NASCO Convention which would rule out the establishment of a Compensation Fund. Indeed the Financial Rules appear to have been framed so as to permit voluntary contributions to the organization for a purpose consistent with its policies, aims and activities. The acceptance of voluntary contributions from the Parties, and from non-members (public bodies, private organizations or private persons) is therefore specifically permitted.

5. It could be argued that it is the role of NASCO, through the appropriate Commission, only to negotiate the quota. If, after a quota is negotiated, private bilateral or multi-lateral deals are made to buy all or part of that quota then that is a separate matter in which NASCO need not be concerned. Those opposed to the concept could argue that the establishment of a compensation fund could alter the management of the resource from a biological basis to a financial basis.

6. On the other hand, it could be argued that, if there is a willingness for such a major change in managing fisheries to happen, NASCO should not avoid the issue and should be the forum in which it is operated, whatever the source of the funds. Otherwise management could be under the effective control of one or more private bodies whose intentions and actions might change without notice.

7. It will be valuable for the Council to debate the issue and consider the arguments of principle.

PRINCIPLE B - ACCEPTANCE OF COMPENSATION

8. This principle is a matter for consideration by the Parties to whom compensation is likely to be offered. So far as can be ascertained initiatives are being considered only for the Faroe Islands and Greenland. Clearly, however, the quota belongs not to any private individual or fisherman but to the state. Only the government concerned can consider the complex of economic, financial, employment, investment and social issues involved. It will be of particular value to have the views of Denmark (in respect of the Faroe Islands and Greenland) on this principle.

9. If a Party accepts compensation it will need to be assured that the funds are available, that they are properly held and that they can be transferred on the required date so that the Party can take the necessary measures of enforcement.

PRINCIPLE C - PAYMENT OF COMPENSATION

10. This principle is a matter for consideration by those Parties who might contribute to the Compensation Fund or permit it to be funded by other bodies. Unless a formula were to be agreed, these Parties will need to decide, probably individually, whether the use of public funds is appropriate in their case, whether only private funding can be accepted or whether a mixture of both is acceptable.

11. If a Party contributes to a Compensation Fund, or agrees that private bodies might do so, it will need assurances that the governments accepting compensation have taken the necessary steps to enforce the relinquishment of the quota. This is best achieved by the statutory declarations made to NASCO annually under Articles 14 and 15 of the Convention.

PART TWO

12. If the Council decides that Compensation Funds are incompatible with the work of the Organization there is no need for further consideration. The next part of this paper is relevant only if there is a willingness to examine the issue in more detail. If the Council accepts the principle in general it will be for the Commissions to decide whether to negotiate such measures. Prior to the operation of a Compensation Fund there are a number of other principles to be resolved. Are the Parties concerned:

(a) prepared to accept a long term or a short term Compensation Programme?

(b) prepared to accept all or part of the quota for compensation?

However, these would be matters for detailed negotiation within a Commission.

MECHANISMS

13. As already indicated, the NASCO Financial Rules already provide for the Organization to hold different, separate funds and to accept voluntary contributions. There is no reason why NASCO should not operate the Compensation Fund if the Parties so wished, its rules offer some protection to all the Parties concerned.

14. A possible mechanism would be as follows:

(a) The Parties concerned might negotiate a quota in the appropriate NASCO Commission as usual but the regulation might contain, by unanimous agreement, a clause permitting the payment of compensation for relinquishing all or part of the quota. There might then be a secondary negotiation, within the Commission or outside it, to agree on the amount of that compensation.

(b) As soon as the NASCO negotiation is completed (normally in mid-June) the Compensation Fund for that particular fishery could be declared open for contributions. The Fund could remain open until 31 December in the same year (or 30 June in the following year in the case of the Greenland fishery although this would need to be adjusted in the event of an emergency regulation) at which point the corresponding tonnage, or the maximum agreed in the regulation, could be compensated by a single payment. The Parties could decide individually whether or not they would add public funds to those provided by the private sector.

(c) The country accepting compensation would declare in its annual return to NASCO Council under Articles 14 and 15 how it had enforced the regulatory measure including the relinquishment of all or part of its quota.

(d) The same basic Financial Rules and auditing process would apply to the Compensation Fund as apply to other NASCO funds. No additional costs to NASCO in operating such a fund are foreseen. Any interest generated would accrue to the fund concerned.

CONCLUSIONS

15. The establishment of a NASCO Compensation Fund does not appear to be incompatible with the NASCO Convention. Such separate voluntary funds from the members or from non government sources are specifically permitted under the Financial Rules if the objectives of the funds are consistent with the policies, aims and activities of the Organization.

16. The relinquishment, in whole or in part, of NASCO quotas in return for a compensation payment does, however, represent a major change in fisheries management. Present regulatory measures involve biological, political and economic considerations but the compensation principle introduces new financial aspects. For those receiving the funds there would also be complex social, employment, investment and wider policy issues to consider. For those paying the funds there is a basic question as to whether public funds could be used for such a purpose, whether private funds may be accepted, or whether a mixture of both is appropriate.

17. Whatever the mechanisms used and the sources of funding, the interests of the Parties concerned could be protected by the provisions of the NASCO Convention under Articles 14 and 15 and the Financial Rules of the Organization.

Secretary
Edinburgh
23 March 1990

JUNE 1990
HELSINKI

ANNEX 17

COUNCIL

PAPER CNL(90)22

ROLE OF NON-GOVERNMENT OBSERVERS IN NASCO

CNL(90)22

ROLE OF NON-GOVERNMENT OBSERVERS IN NASCO

1. At its Sixth Annual Meeting the Council asked the Secretary to produce a discussion paper on the role of Observer Status to NASCO whilst stressing the importance of NASCO maintaining close contact with a range of other bodies with salmon interests.

2. The present rules apply only to attendance at Council meetings. NGOs are not permitted to attend Commission meetings. The rules, which have been in force for a trial period which started in 1985 and is of unspecified length, are as follows:

   (i) that the Secretary, in consultation with the President, shall decide whether the objectives of the organisation applying are compatible with those of NASCO,

   (ii) that the non-government organisation shall apply not less than 15 days before the meeting of the Council,

   (iii) that no more than two representatives of the non-government organisation shall be allowed to attend the meeting,

   (iv) that the representatives of the non-government organisation shall not be permitted to make any statements of any kind at the meetings,

   (v) that the non-government organisation shall demonstrate to the satisfaction of the Secretary that it has, as an organisation, a legitimate interest in the proceedings,

   (vi) that the non-government organisation shall comply with any other conditions imposed by the Council or by the Secretary.

3. NASCO now has thirteen non-government observer organisations listed in Appendix 1. It would seem reasonable that, after 5 years, the trial period might end. From the information and views presented to the Secretary so far it could be concluded that the arrangement to have observers has worked well. The observer organisations have been able to mix with NASCO delegates thus bringing their considerable experience to meetings. Equally the observers have been able to appreciate the complexities of international negotiations and have been able to communicate to their members the main issues considered in NASCO. It would be fair to conclude (a) that there have been benefits to both sides and (b) that no problem whatsoever has occurred due to the participation of non-government observers. There could eventually be a problem of space if the number of NGOs were to be greatly increased but numbers could be restricted to one representative for each NGO if that was thought to be necessary.

4. The President met with observers at the conclusion of the Sixth Annual Meeting and following that meeting a communication (Appendix 2) has been received on behalf of eight of the NGOs. In summary this requests:

(a) NGOs to be able to attend Commission meetings as well as Council;

(b) NGOs to be able to contribute to Special Sessions of Council by speaking or submitting written contributions on the topic concerned;

(c) that these new arrangements operate for a two-year trial period.

5. The Council are invited to review this question of the role of NGOs and to decide what action should be taken. It seems that there are four main options possible:

Option 1

The present arrangements could be accepted as a permanent arrangement until the Council decides on a further review.

Option 2

The Council could amend the conditions for NGO's for a new two year trial period. The amendments would not extend observer rights to the Commissions but would permit statements by the NGO's in the Council but only at the discretion of the President and only at sessions that are defined "Special Session" by the Council.

Option 3

The Council could amend the conditions for NGOs for a new two year trial period. The amendment would extend observer rights to the Commissions but would still not permit statements of any kind in Council or Commissions.

Option 4

The Council could amend the conditions for NGOs for a new two year trial period. The amendments would extend observer rights to the Commissions and would also permit statements by NGOs in the Council but only at the discretion of the President and only at sessions that are defined "Special Sessions" by the Council.

6. In addition to these changes, and so as to restrict NGO status to bodies which are directly interested in wild salmon rather than farmed salmon, the Council might wish to give some guidance to the President and Secretary in administering Rule (i) in paragraph 2 above. It is suggested that the policy might be that "In principle only those organisations with a direct interest in the conservation and management of wild salmon stocks should be admitted as NGOs. However, NGOs representing other salmon interests could be invited to attend and contribute to "Special Sessions" as defined by the Council".

7. The Council is asked to consider these options and to decide which rules should in future govern the attendance of NGO's.

Secretary
Edinburgh
15 March 1990

Appendix 1

NON-GOVERNMENT OBSERVER ORGANISATIONS TO NASCO

The Atlantic Salmon Trust	(based in the UK)
The Salmon and Trout Association	(based in the UK)
Association Internationale de Defense du Saumon Atlantique	(based in France)
The Scottish Anglers National Association	(based in the UK)
The Water Authorities Association	(based in the UK)
Association of Scottish District Salmon Fishery Boards	(based in the UK)
The Atlantic Salmon Federation	(based in Canada)
Association of Icelandic Angling Clubs	(based in Iceland)
Icelandic Federation of River Owners	(based in Iceland)
The Atlantic Salmon Federation	(based in the USA)
The Institute of Fisheries Management	(based in the UK)
Federation of Irish Salmon & Sea Trout Anglers	(based in Ireland)
The Norwegian Association of Hunters and Anglers	(based in Norway)

The declared aims and objectives of these organisations have previously been reported to the Council.

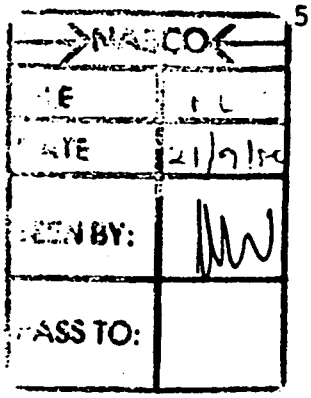
Appendix 2

THE ATLANTIC SALMON TRUST LTD.

Company Registered in England Reg No 984293 Registered Charity No 292742

Moulin, Pitlochry, Perthshire PH16 5JQ Telephone: (0796) 3439

Mr. Alan Petersen
President
c/o Dr. Malcolm Windsor
NASCO
11 Rutland Square
Edinburgh EH1 2AS



5th September, 1989

Dear Mr. Petersen,

THE ROLE OF NON GOVERNMENT OBSERVERS

At a meeting on Friday 16th June you intimated to several of the NASCO observers that you were sympathetic to our frustration at not being able to participate in the meetings. Paragraph 3.4 of the Council's Report confirms the wish of Council to be in close touch with other bodies with salmon interests.

I write on behalf of those organisations listed below to explain our concerns. All observers appreciate the reluctance of the NASCO members to allow n.g.o.'s to participate fully in all the deliberations of the Council and the Commission. The attendance of observers has been on a trial basis and it is suggested that, as we have all remained observers and proved to be responsible, the time has come to review the rules of our attendance. We feel that the observers often have expert and special knowledge to contribute and that we could be helpful to NASCO.
As we are not allowed even to attend Commission meetings, we have little idea how business is conducted in those commissions and how decisions are reached.

Up to the Sixth Annual Meeting, Council business has mostly been formal, and little spontaneous discussion has taken place. At the Sixth Meeting the session on aquaculture was, in our view, a welcome step forward. It is submitted that this session could have been even more valuable if observers had been allowed to participate.

We would like to suggest to you that you should consider having further special sessions on topics of general interest to NASCO and that at these sessions the observers be allowed to speak. We are sure that a procedure could be devised to keep such sessions to a reasonable length.

Contd/...

We would also ask you to consider allowing observers to attend Commission meetings in order that we can give the benefit of our knowledge to the delegations in order to help them in their deliberations. We would, of course, not seek any voting rights.

We would ask you to consider allowing us this suggested increased role for a trial period of two years, after which the position should be reviewed.

Yours sincerely,

D. J. Mackenzie
On behalf ofthe following organisations:

Atlantic Salmon Trust

Association Internationale de Defense du Saumon Atlantique
(Ambassador Claude Batault)

Association of Scottish District Salmon Fishery Boards
(Group Captain J. R. C. Proudlock)

Scottish Anglers National Association
(Dr. Donald Muir)

Salmon and Trout Association
(Lord Hunter)

Water Authorities Association
(Mr. Tony Champion)

Association of Icelandic Angling Clubs
(Dr. D. H. Mills)

Institute of Fisheries Management
(Mr. Alan Holden)

JUNE 1990
HELSINKI

ANNEX 18

COUNCIL

PAPER CNL(90)23

SUMMARY OF MICROTAG, FINCLIP AND EXTERNAL TAG RELEASES IN 1989

CNL(90)23

SUMMARY OF MICROTAG, FINCLIP AND EXTERNAL TAG RELEASES IN 1989

1. At its Fifth Annual Meeting the Council asked that the new compilation of tag release information requested by NASCO and provided by ICES should continue on an annual basis so that the information be deposited with NASCO. The General Secretary of ICES and the Secretary of NASCO have arranged that this procedure continue.

2. A summary of the information on tagging programmes conducted by the Parties in 1988 is attached as Table 1. About 3.9 million fish were either tagged or marked during 1989, prior to release of which 41% were microtagged, 52% were finclipped, 6% were tagged with external tags and less than 1% were branded or dyemarked. In addition approximately 1.7 million auxiliary marks were used, principally adipose clips used in conjunction with microtagging. Out of the total of 3.9 million marked fish released, approximately 94% were of hatchery origin.

3. Table 2 presents a comparison of the tagging programmes in 1988 and 1989. The 1989 figure of 3.9 million released marked fish is 19.8% higher than the number released the previous year. There was a 13% increase in the release of microtagged fish but the principal reason for the increase was due to a 42% increase in the number of finclipped fish. There was a 38% reduction in the number of external tags applied in 1989. The number of wild fish tagged increased by almost 40% in 1989.

Secretary
Edinburgh
10 May 1990

TABLE 1

SUMMARY OF 1989 TAG RELEASES BY PARTY

PARTY	ORIGIN	MARKING METHOD				
		MICROTAGS	EXTERNAL TAGS	BRANDS, DYEMARKS ETC.	FINCLIPS	AUXILIARY TAGS FINCLIPS, MARKS ETC.
Canada	Hatchery	59148	53490	-----	1030265	103323
	Wild	----	8222	-----	173932	-----
	Mixed*	-----	1408	-----	------	-----
	TOTAL	59148	63120	-----	1204197	103323
Denmark (Faroe Islands)	Hatchery	26943	----	-----	11714	26943
	Wild	-----	13	-----	------	-----
	TOTAL	26943	13	-----	11714	26943
EEC	Hatchery	426831	585	19019	59501	456305
	Wild	21522	6957	-----	193	26456
	Mixed*	-----	-----	-----	48	-----
	TOTAL	448353	7542	19019	59742	482761
Iceland	Hatchery	417427	-----	-----	------	417427
	Wild	2341	-----	-----	------	2341
	Mixed*	-----	1081	-----	------	-----
	TOTAL	419768	1081	-----	------	419768
Norway	Hatchery	-----	98347	-----	------	-----
	Wild	-----	2194	-----	------	-----
	TOTAL	-----	100541	-----	------	-----
Sweden	Hatchery	-----	9749	-----	------	1871
	Wild	-----	-----	-----		-----
	TOTAL	-----	9749	-----	------	1871
USA	Hatchery	660932	52527	-----	151523	660932
	Wild	-----	-----	-----	------	-----
	TOTAL	660932	52527	-----	151523	660932
USSR	Hatchery	2397	6230	-----	646866	6127
	Wild	-----	-----	-----	------	-----
	TOTAL	2397	6230	-----	646866	6127
TOTAL	Hatchery	1593678	220928	19019	1899869	1672928
	Wild	23863	17386	-----	174125	28797
	Mixed	-----	2489	-----	48	-----
	TOTAL	1617541	240803	19019	2074042	1701725

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

TABLE 2

COMPARISON OF 1988 AND 1989 TAGGING PROGRAMMES

	1988	1989	% CHANGE
MICROTAGS			
Hatchery	1384320	1593678	+15.1
Wild	45255	23863	-47.3
TOTAL	1429575	1617541	+13.1
EXTERNAL TAGS			
Hatchery	349416	220928	-36.8
Wild	41228	17386	-57.8
Mixed	1130	2489	+120.2
TOTAL	391774	240803	-38.5
BRANDS, DYEMARKS			
Hatchery	18730	19019	+1.5
Wild	1105	-----	-------
TOTAL	19835	19019	-4.1
FINCLIPS			
Hatchery	1389055	1899869	+36.8
Wild	66533	174125	+161.7
Mixed	300	48	-84.0
TOTAL	1455888	2074042	+42.4
TOTAL			
HATCHERY	**3141521**	**3733494**	**+18.8**
WILD	**154121**	**215374**	**+39.7**
MIXED	**1430**	**2537**	**+77.4**
TOTAL	**3297072**	**3951405**	**+19.8**

JUNE 1990
HELSINKI

ANNEX 19

COUNCIL

PAPER CNL(90)24

NASCO TAG RETURN INCENTIVE SCHEME

CNL(90)24

NASCO TAG RETURN INCENTIVE SCHEME

1. The NASCO Tag Return Incentive Scheme was established on a trial basis for four years: 1989, 1990, 1991 and 1992 to encourage and improve tag returns. The United States agreed to fund the scheme for the trial period and participation by the Parties is on a voluntary basis. At its Sixth Annual Meeting the Council agreed the Rules of the Scheme (CNL(89)17) and the wording for the initial publicity (CNL(89)41). Most Parties have indicated that they intend to participate in the Scheme although some concern was expressed about implementing the Scheme fully during 1989. However, it is anticipated that the Scheme will have been well publicised prior to and during the 1990 fishing season. A number of points requiring clarification have also arisen and these will be addressed in the letter requesting tag return information for 1990.

2. In accordance with the Rules of the Scheme the participating Parties were requested to provide, by 1 May, a list of names and addresses of persons returning eligible external tags during the year 1 January to 31 December 1989. Alternatively a list of serial numbers only was considered acceptable provided that the identity of the person returning the tag was known by the Party concerned. The country of recapture of the tag was also requested in order that the tag could be allocated to its appropriate NASCO Commission area.

3. The information submitted was entered into a database from which details were printed on cards for inclusion in the draw. A total of 1233 eligible tags were returned and entered into the draw for the grand prize. 346, 182, 705, eligible tags were entered into the draws in the North American Commission, the West Greenland Commission and the North-East Atlantic Commission, respectively. The draw was made on 1 June in the presence of a representative of Coopers and Lybrand Deloitte the auditors to NASCO, and in accordance with the Rules of the Scheme. The winner of the $2500 will be announced by the President at the Seventh Annual Meeting. The winners of the prizes in each Commission area will be announced by the Chairmen of the respective Commissions at the Seventh Annual Meeting. A list of prize winners will be circulated to all delegates after the announcement of the awards.

4. Although the announcement of the prizes will be mentioned in the Press Release issued at the close of the Seventh Annual Meeting, the President believes that, since the whole aim of the scheme is to improve awareness of the need to return scientific tags, it will be vital to follow up the announcement in Helsinki by some publicity and public relations effort in the country of the recipients of the prizes. In the light of this he has asked that the Secretary make arrangements with the Parties to ensure maximum publicity when the prizes are presented. This might take the form of a brief ceremony in the country concerned with adequate press coverage of the background to the awards. The Secretary would then be asked to report annually to the Council on the operation of the scheme.

Secretary
30 May 1990
Edinburgh

JUNE 1990
HELSINKI

ANNEX 20

COUNCIL

CNL(90)25

DATABASE OF SALMON RIVERS FLOWING INTO THE NASCO CONVENTION AREA

CNL(90)25

DATABASE OF SALMON RIVERS FLOWING INTO THE NASCO CONVENTION AREA

1. At its Sixth Annual Meeting the Council asked the Secretary to prepare, in consultation with the Parties, a list of all salmon rivers flowing into the NASCO Convention area where stocks have been lost or are threatened with loss.

2. In order that this information can be collected from the Parties and the database established, a system of categorising rivers together with definitions for each category, a method of identifying those rivers and a return form for submission of the information have been prepared. In initiating this project it became clear that the Council does not have a list of all salmon rivers flowing into the Convention area and that this information might be useful in considering the losses in perspective. A five point system, which we hope is unambiguous, is therefore proposed as follows:

CATEGORY 1: LOST
Rivers in which there is no natural or maintained stock of salmon but which are known to have contained salmon in the past.

CATEGORY 2: MAINTAINED
Rivers in which there is no natural stock of salmon, which are known to have contained salmon in the past, but in which a salmon stock is now only maintained through human intervention.

CATEGORY 3: RESTORED
Rivers in which the natural stock of salmon is known to have been lost in the past but in which there is now a self-sustaining stock of salmon as a result of restoration efforts or natural recolonization.

CATEGORY 4: THREATENED WITH LOSS
Rivers in which there is a threat to the natural stock of salmon which would lead to loss of the stock unless the factor(s) causing the threat is(are) removed.

CATEGORY 5: NOT THREATENED WITH LOSS
Rivers in which the natural salmon stocks are not considered to be threatened with loss (as defined in Category 4).

3. For the purposes of this project the following definition of a river is proposed:

A river is named as the main stem of the system of rivers and tributaries at the point, within the NASCO Convention area, where it reaches the sea. A tributary is defined as any river or stream which does not flow directly into the sea but flows into a river as defined above.

4. A draft form for return of the information is contained in Appendix 1. For each river details of the river name, its category and locational information (latitude and longitude bearings) for the point at which it enters the sea are requested. In addition a section for other information has been included. It would be useful if

the following information, in particular, could be provided if available:

Category 1: Information on the cause and approximate date of the loss.
Category 2: Information on the cause and approximate date of the loss prior to the stock being maintained.
Category 3: Information on the cause and approximate date of the loss prior to restoration.
Category 4: Information on the nature of the threat(s) to the salmon stock.
Category 5: Details of any major losses known to have occurred within these rivers eg. major tributaries lost to salmon production.

In the case of Categories 4 and 5 it would be useful if those stocks which are considered to be of particular conservation value could be identified.

In the case of border and cross-border rivers each Party should provide information.

5. A period of at least twelve months is suggested for the Parties to return the information. Completion of the project could take several years. But when completed the database will provide a unique record of all North Atlantic salmon rivers with an indication of their status at the end of the 20th century. The assessment might then be updated every 5 or 10 years.

6. The Council is asked to consider the proposed arrangements for categorising rivers and collection of the information for this project which is being undertaken in accordance with Article 15 paragraph 2 of the Convention. Any necessary amendments could then be made and the information requested from the Parties after the Seventh Annual Meeting. A progress report would be made to the Council at its Eighth Annual Meeting and annually thereafter.

Secretary
Edinburgh
5 April 1990

SALMON RIVERS DATABASE - RETURN FORM

PARTY: **COUNTRY/REGION/STATE:**

Category (See paragraph 2)	River Name (See paragraph 3)	Location		Other Information
		Latitude	Longitude	

JUNE 1990
HELSINKI

ANNEX 21

COUNCIL

PAPER CNL(90)26

REPORT ON THE DEVELOPMENT OF GENETIC MARKERS

CNL(90)26

REPORT ON THE DEVELOPMENT OF GENETIC MARKERS

1. The marked homing instinct of the salmon favours the development of distinct stocks (ie a population which differs genetically from other populations of the same species). On the basis of circumstantial evidence the species has been sub-divided into genetically distinct sub-units and it has been estimated that about 2000 stocks of Atlantic salmon exist in Europe and North America. Genetic studies have confirmed the existence of distinct stocks and there is some evidence that these differences may be adaptations to conditions in individual rivers.

2. The rapid development of the salmon farming industry has led to concern about the possible impact of genetically different salmon which escape or are released from rearing units. Escapes are now occurring on a very large scale and we now have evidence that these fish enter rivers and spawn with the wild fish. There is some evidence in the literature on other species of adverse impacts of reared fish on wild populations.

3. Perhaps the central question in assessing the potential damage done to wild stocks by the release of millions of cultured fish is whether inter-breeding will result in hybrids which are less fit to survive in the wild. Some theoretical studies suggest that extinction of the characteristics of the native stocks is possible. Both the recent NASCO/ICES Meeting on "Genetic Threats to Wild Salmon Posed by Salmon Aquaculture" and the Norwegian Meeting on "Interactions between Cultured and Wild Atlantic Salmon" have recommended that controlled experimental releases of genetically distinguishable cultured fish into a river with a native salmon stock may provide the most effective means of defining the genetic threat. In order to carry out such an impact study there is a need to develop methods of distinguishing genetically between wild and reared fish. The attached paper summarises the present state of the science and the techniques presently used. The meetings concluded that a modification of the technique known as DNA fingerprinting (which is now increasingly used in forensic work) would help resolve the question of the genetic threat by enabling such an impact study to be undertaken.

4. It is anticipated that, depending on funding, such techniques could be developed within 2 years. Having regard to the central importance of this work in enabling this question of genetic impacts to proceed, Council may wish to consider what steps might be taken to assist or support this development. Council may also wish to be kept advised of developments in this field.

Secretary
11 May 1990
Edinburgh

CNL(90)26

REPORT ON THE DEVELOPMENT OF GENETIC MARKERS

1. INTRODUCTION

1.1 At its Sixth Annual Meeting the Council considered a report from the joint NASCO/ICES meeting in Dublin on the genetic threats to wild salmon from salmon aquaculture, CNL(89)19. In addition to identifying a number of research areas which could be addressed at present such as the behaviour of farmed fish, the extent to which farmed fish are represented among spawners and whether farmed and wild fish interbreed or interact ecologically, there was general agreement on the need for experimentation to assess the genetic impact of reared fish on wild stocks. It was agreed that such experimentation would be facilitated by the development of techniques to identify individual fish through genetic markers and the urgent need to support such research was recognised.

1.2 In the light of the recommendations from this meeting the Council endorsed the need to identify genetic markers so that individual races of salmon could be distinguished and research on genetic impacts and other impacts could proceed. The Secretary was asked to prepare a report on this subject including a listing of the major research centres where the work is being carried out. This paper reviews the techniques used and the results of studies that have been carried out to investigate the genetic structure of salmon populations and assesses the ability of these techniques to identify individual fish to identify individual fish to a given population. A listing of centres where research on this subject is being carried out is contained in Annex 2.

2. SALMON GENETICS

2.1 Salmonid fish exhibit striking ecological and morphological intraspecific differences between and even within various waters. The widespread distribution and well marked homing instinct of the Atlantic salmon are attributes favouring the development of distinct stocks i.e a population which differs genetically from other populations of the same species (Wilkins, 1985). On the basis of circumstantial evidence the species has often been subdivided into genetically distinct sub-units (Ryman, 1983). For example, Saunders and Bailey (1980) estimated that 2000 stocks of Atlantic salmon exist in Europe and North America.

2.2 A number of biochemical techniques have been employed to investigate the genetic structure of Atlantic salmon stocks and these are described below together with the results of these studies to date. The genetic information in individual salmon is contained in deoxyribonucleic acid (DNA), a complex giant molecule arranged in a double helix structure and which occurs principally within the cell nucleus. DNA consists of a series of subunits called nucleotides of which there are four types depending on the base they contain (Kapuscinski and Jacobson, 1987). These bases are adenine (A), guanine (G), thymine (T) and cytosine (C) and they always

combine A-T (T-A) or C-G (G-C) (Cross, 1989a). The genetic code is contained in different base sequences (Utter et al, 1987) and this code is a triplet code with three bases coding for an individual amino acid (Kapuscinski and Jacobson, 1987). An analogy has been made between the structure of DNA and a ladder, with the sides of the ladder consisting of alternating sugar (deoxyribose) and phosphate groups and the rungs of the ladder being pairs of bases (Utter et al, 1987). A gene is a sequence of nucleotides occupying a specific position on a DNA molecule. There are structural genes that code for proteins, genes that code for molecules that are involved in protein synthesis and regulatory genes that regulate the functioning of other genes (Kapusinski and Jacobson, 1987). Genes are arranged in specific linear array in chromosomes (Cross, 1989a).

2.3 Atlantic salmon possess between 54-58 chromosomes (Hartley, 1988) with 54-56 chromosomes having been reported in Canadian salmon and 58 chromosomes in Scottish salmon (Phillips and Hartley, 1988). Half of these chromosomes, all carrying a different set of genes is inherited from the mother and the other half from the father. In most cells the chromosomes occur in homologous pairs ie maternal and paternal chromosomes carrying the same genes occur in pairs (Cross, 1989a). The location of a gene on a chromosome is called a locus and the paired nature of chromosomes permits two different forms of a gene for a particular locus to exist in a single fish. Different forms of a gene are called alleles and many alleles may exist for a particular locus (Utter et al, 1987). In such a case the allele is known as polymorphic, as opposed to a monomorphic locus where only one allele is known. Each individual can only possess two alleles although many alleles may occur (Cross, 1989a). An animal is known as a homozygote if the two genes at a given locus are the same and a heterozygote if the genes are different.

3. PROTEIN ELECTROPHORESIS

3.1 As was stated above a triplet of bases (known as a codon) in the DNA codes for a particular amino acid (the building blocks of proteins). Variation in proteins therefore is indicative of the genetic code. Five of the twenty common amino acids which make up proteins are charged - lysine, arginine and histidine are positively charged and aspartic acid and glutamic acid are negatively charged. If allelic differences occur at a protein locus the net charge of the protein may change and protein electrophoresis makes it possible to identify these differences (Utter et al, 1987). However, since only five of the twenty amino acids are charged, it is possible for amino acid substitutions to occur without a change in the charge of the protein. Furthermore, since there are considerably more combinations of bases in a triplet of bases then there are amino acids it is possible for changes in the genetic code to occur without changing the amino acid composition of the protein.

3.2 Detailed descriptions of the technique of protein electrophoresis are presented in Utter et al (1987) and Cross (1989). Basically, protein solutions from a variety of tissues are applied to a gel through which is passed an electric current. Different proteins migrate at different speeds through the gel and these differences are visualised by staining. The resultant banding pattern can be used to identify polymorphic loci and the frequency of alleles and heterozygosity of populations can be calculated (Cross, 1989a).

3.3 Protein electrophoresis has been the standard technique for studying population genetics of salmonid fish and has provided much useful information (Cross, 1989a). However, proteins evolve very slowly and the technique is limited by the number of polymorphic loci and by limitations in staining techniques (Ferguson, personal communication). Amino acid sequencing, in which the structure of the proteins is examined is an extremely slow process and is very expensive and unlikely therefore to be used in order to detect genetic markers.

Use of protein electrophoresis to determine stock structure in Atlantic salmon

3.4 The earliest use of protein electrophoresis in stock identification work with Atlantic salmon was that of Nyman (1970) who used sera typing to distinguish between European and North American origin salmon caught off the west coast of Greenland. By rearing juvenile salmon from Canada and Sweden under identical conditions a number of protein differences were identified which could distinguish these populations. Controls were later added from Ireland, Scotland, Norway and Finland and the results used in the analysis of adult salmon caught at West Greenland. Although some of the differences useful in separating juveniles reared under identical conditions could not be used with adult fish from the fishery, slight but significant differences in blood serum transferrin and alpha$_2$-globulin proved "quite adequate" for distinguishing continent of origin. Verspoor (1986) studied allele frequencies at four loci in Atlantic salmon from North America and Europe and showed that salmon from the two continents are genetically very different. He found that there was a very low probability that a fish from Europe and a fish from North America would have the same combination of genes at these loci whereas the opposite was true within continents. The technique could therefore be used to determine the proportional contribution by continent of origin with a very high assignment accuracy (>99%). However, the problem with the genetic approach to assessing content of origin in a mixed stock fishery is that it is impossible to obtain the necessary tissue samples from fish caught in the commercial fishery (Nyman, 1970; Verspoor, 1986). The analysis of scale characters which was found to be the most reliable method of discriminating continent of origin has been used at West Greenland since 1964 although Reddin et al (1987) have proposed that scale analysis should be linked with protein electrophoresis to enable a database to be developed annually from salmon known to have been at Greenland.

3.5 Protein electrophoresis has demonstrated clear genetic differences between European, North American and Baltic salmon. On a finer scale, Moller (1970) demonstrated regional differences in North American salmon populations and Payne (1974) argued that there was a latitudinal cline in North America, (although a more detailed analysis by Verspoor (1986) did not support this argument). Payne et al (1971) also demonstrated regional differences in British and Irish salmon populations. These early studies were based on allelic distribution at a single locus and they could not quantify either the level of genetic variation within or the amount of differentiation among populations (Stahl, 1981). Analysis of more extensive data by Cross and Healy (1983) provided unequivocal evidence of stock discreteness (Thorpe and Mitchell, 1981). Similar evidence was presented by Stahl (1983) for Baltic salmon where discreteness within and between river systems was demonstrated. These electrophoretic studies are supported by strong circumstantial evidence in the form of different physiological capacities which have been shown to be heritable and morphological differences between river populations (Thorpe and Mitchell, 1981).

Cross and Healy (1983) concluded that the rivers in their study and possibly all Atlantic salmon rivers should be regarded as genetically separate populations.

3.6 In an Irish salmon population, Cross and Ward (1980) detected variation in one of the three loci for isocitrate dehydrogenase in the river Blackwater which was not present in populations in Scandinavian or Canadian populations. However, Davidson et al (1989) considered that while this locus could provide a means for identifying salmon from the river Blackwater it is not very useful as the rare allele occurs at a very low frequency and approximately 70% of the salmon in the population could not be distinguished from Canadian or Swedish salmon. If the allele present in the Blackwater population could be established in a hatchery stock in the homozygous condition it could provide a marker for use in an impact study in a river where the allele is not present. However, this would be a costly and time consuming process. Thomson et al (1990) described an enhancement programme on the river Test, England in which local and non-local stocks are being introduced into the river. Significant differences in allele frequencies exist between parr from different origins and a monitoring programme, involving microtagging and protein electrophoresis, has been set up to examine the immediate effect of the introduction and the genetical interaction between introduced fish and the native population. However, frequency data such as this would not enable the performance of progeny of native and introduced stocks to be monitored (Thompson, personal communication). Davidson et al (1989) concluded that protein electrophoresis is not sufficient to yield clear cut differences between Atlantic salmon stocks and there is a requirement for a set of unique alleles that have been fixed in a stock-specific manner. This has prompted the search for other types of genetic markers. Research is also being conducted to identify other protein loci that may also be useful in assessing stock structure in Atlantic salmon.

Use of protein electrophoresis to determine the genetic structure of reared salmon

3.7 Protein electrophoresis has also been used to compare the genetic composition of reared strains and wild populations of Atlantic salmon in a number of North Atlantic countries. Verspoor (1986) compared the first generation progeny of wild adults reared in a hatchery with the wild stocks from which they were derived in Eastern Canada. He demonstrated that the wild stocks showed a significantly higher mean heterozygosity than the comparable hatchery stocks and a higher mean number of alleles per locus indicating that significant reductions in genetic variability as a result of founder effects had occurred after only one generation in the hatchery. In Scotland, Youngson et al (1989) assessed the level of genetic variation in 12 Scottish strains of farmed Atlantic salmon and showed that the strains differed genetically from each other, and overall they differed from a representative group of wild Scottish populations. They also demonstrated that farmed strains differed genetically from the specific source population from which they had originally been derived, and these differences at one locus could only be explained if selective pressure had been acting consistently on the strains or on the source populations over the period since the strains were established.

3.8 McElligott et al (1987) examined five samples of different year classes and/or parentage from the same hatchery in western Ireland, all of which originated from the local wild population which was also sampled in two separate years. Gene frequencies of all reared samples of the same origin differed significantly from each

other and from the wild sample, while in contrast wild samples did not differ over time. Some reared samples also exhibited slightly lower levels of genetic variability compared with the wild population. Similarly, Cross and King (1983) compared the progeny of five generations of artificially reared sea ranched salmon with the wild Burrishoole river stock from which they had been derived. Gene frequencies differed significantly at a number of loci between the wild and artificially reared fish. Erosion of genetic variability was also evident in the hatchery reared samples and it was argued that these differences were the result of founder effects and genetic drift rather than selection by some aspect of the rearing regime. In Sweden Stahl (1983) demonstrated that hatchery stocks of Atlantic salmon exhibited a significantly lower amount of genetic variability than natural populations.

3.9 Cross (1989b) concluded that significant differences in gene frequencies usually occur between reared strains and their progenitors and that some reared strains have lower genetic variability than wild populations which may result in loss of rare alleles in the reared strains. Johansson (1981) and Cross and King (1983) believed that hatchery procedures select for salmon well adapted to rearing conditions but less well adapted to survival in the wild.

4. DNA ANALYSIS

4.1 Since the 1970's methods of DNA structural analysis have been developed and some are now being used in investigations of salmonid fish (Cross, 1989). Gyllensten and Wilson (1987) considered that the increase in hatchery propagation of salmonids gives rise to the need for:

i) Detailed descriptions of the genetic structure of natural and hatchery propagated populations.
ii) Genetic markers with which single fish can be assigned unambiguously to a specific hatchery strain or natural population.
iii) Systems for monitoring quantitative and qualitative changes in the genetic resources resulting from various management activities.

More genetic differences may be found by working at the DNA level and studies of both mitochondrial and nuclear DNA are being undertaken, although the methods are still experimental (Cross, 1989).

Mitochondrial DNA (mtDNA):

4.2 Mitochondrial DNA (mtDNA) is contained in a single circular chromosome between approximately 16700-16800 (Birt et al, 1986; Gyllensten and Wilson, 1987; Hovey et al, 1989) and 18000 (Cross, 1989a), base pairs along. Although in some vertebrates including humans the entire base sequence of mtDNA has been determined, the mtDNA of fish is much less well known (Gyllensten and Wilson, 1987). The mitochondrial genome has become very popular for genetic studies and in most vertebrate populations there is substantial mtDNA variation. In salmonids most of the studies that have been carried out to date have used restriction enzymes (endonucleases) rather than studying the variation directly by base sequencing (Gyllensten and Wilson, 1987). Restriction endonucleases cleave DNA at specific locations called recognition sites, and the number and length (number of base pairs)

of each of the resulting fragments are then determined (Kapuscinski and Jacobsen, 1987). Restriction endonucleases that recognise 4, 5 or 6 base pairs can be used, with the 4 base restriction enzymes giving the highest resolving power. There are a number of advantages of mtDNA analysis:

(1) deals directly with DNA so that investigators can be sure of the genetic basis for the variation (Kapuscinski and Jacobsen, 1987).

(2) easily isolated from the nuclear genome and is small in size and therefore manageable (Davidson et al, 1989; Cross, 1989a; Kapuscinski and Jacobsen, 1987).

(3) accumulates substitutions very rapidly thereby giving a magnified view of genetic distances between closely related taxa (Gyllensten and Wilson, 1987; Kapuscinski and Jacobsen, 1987).

(4) provides additional genetic markers for stock identification (Kapuscinski and Jacobsen, 1987) by allowing for studies of genes that do no produce proteins (Kapuscinski and Jacobsen, 1987), and nucleotide variation that does not affect the gene product (Gyllensten and Wilson, 1987).

(5) the transfer of mtDNA along maternal lines may be an advantage (Kapuscinski and Jacobsen, 1987) particularly in the study of brown trout/Atlantic salmon hybrids (Davidson et al, 1989).

(6) particularly sensitive for detecting inbreeding in hatchery populations (Cross, 1989a) because individuals are haploid and the effective population size for mtDNA is smaller than for nuclear DNA. mtDNA variations will therefore be lost more easily when a population goes through a bottleneck in population size (Gyllensten and Wilson, 1987).

(7) there is evidence that it may be possible to identify individual fish to their specific populations, which is not possible at present with enzyme electrophoresis (Cross, 1989a).

4.3 However, there are a number of difficulties in using mtDNA. The equipment is more expensive than that required for protein electrophoresis, the cost of each assay is more expensive and personnel using the technique require to be highly trained (Kapuscinski and Jacobsen, 1987; Cross, 1989a). Furthermore, the error in measuring fragment size is approximately 5% and in some cases comparable fragments may not vary by this amount (Davidson et al, 1989).

Use of mtDNA to determine stock structure in Atlantic salmon

4.4 To date relatively few studies have been carried out of Atlantic salmon using mtDNA analysis. Gyllensten and Wilson (1987) studied inter- and intra-specific variability in the mtDNA of salmonids using restriction enzyme analysis. They studied nine hatchery populations and one natural population representing five salmonid species (Atlantic salmon, brown trout, rainbow trout, brook trout and cutthroat trout). A phytogenetic tree was produced which indicated similar relationships to those derived from protein electrophoresis with a fairly close mtDNA relationship between European brown trout and the Atlantic salmon. No

variation was found in any of the hatchery populations (including Atlantic salmon) which is in contrast to the survey of wild populations and indicating that each hatchery propagated population may have originated from a small number of females. On average the Swedish hatchery stocks retained only 25% of the mtDNA variability of the natural populations.

4.5 Birt et al (1986) compared the mitochondrial genomes of anadromous and non-anadromous salmon from two separate river systems in Newfoundland in an attempt to identify a marker that could be used to identify the two forms. By analysing the fragment pattern produced by using six base pair recognition sequence restriction endonucleases they found a single restriction enzyme produced a variant fragment pattern. However, the variant pattern only occurred in a single non-anadromous fish, all other salmon sampled exhibited identical fragment patterns. They concluded that the genetic similarity between the two populations was extremely high. However, restriction endonucleases which recognise four bases enabled identification of landlocked or anadromous Finnish salmon (Palva, 1986 in Davidson, 1989) and Davidson (1989) concluded that this more sensitive procedure "offers great promise and should be the method of choice in screening programmes of Atlantic salmon populations over the entire range of the species". Studies utilising 20 restriction enzymes in order to identify continent of origin of fish at West Greenland indicated that there were seven distinct mutation sites between the continental groups. Two distinct genotypes were observed amongst European salmon suggesting that the methodology may have greater resolution than to continent of origin. Comparisons of continent of origin identifications made by mtDNA and protein electrophoresis were in agreement (Anon, 1988). The European genotype has however, subsequently been found in Newfoundland and Nova Scotia (Davidson, personal communication). A recent study of Hovey et al (1989) examined mitochondrial DNA variation in salmon from five spawning sites in the river Itchen, England. Six matriarchal lineages were discovered and two of the six were site specific. The authors concluded that their results suggest a reasonable expectation of discriminating spawning aggregations of Atlantic salmon. Verspoor and Knox (1990) reported that fragment length polymorphisms in mitochondrial DNA offers possibilities of identifying markers to distinguish between Norwegian and Scottish salmon.

4.6 A new method of mtDNA analysis known as the polymerase chain reaction (PCR) has recently been developed in which a section of DNA, identified by endmarkers, is amplified many thousands of times and the base sequence determined (Cross, 1989a). One advantage of this technique is that it eliminates the need for a costly ultra-centrifuge. Davidson et al (1990) used this technique to compare Atlantic salmon from both sides of the Atlantic, but no differences were detected that could be used to differentiate between salmon from North America and Scotland. The number of base substitutions observed among the salmon examined represented the lowest level of genetic variability of all the species examined by these authors. They therefore concluded that if genetic markers are to be found it will be necessary to examine a more rapidly evolving region of the mitochondrial genome.

Nuclear DNA

4.7 Recently attention has focused on the larger and more complex nuclear genome in order to try to identify markers that would allow individual fish to be assigned

unambiguously to a given population. Within the nuclear genome there are certain regions which do not appear to have any function but which evolve very rapidly (Hypervariable regions). Since they have no known function there is no restraint on mutations being introduced. Variation in these regions is not due to base changes within the DNA but to repetition of a given base sequence ie there is variation in the number of tandem repeats. These hypervariable regions may yield a large number of alleles.

4.8 The basic repeated sequence of bases is highly conserved and is similar in plants, humans and fish etc. Probes have been developed for use in other animal species that enable these highly variable repeat sequences to be identified in the technique known as DNA fingerprinting. This technique using Jeffrey's probes is being developed for Atlantic salmon by research workers at Queen's University, Belfast, Northern Ireland and should enable individual fish to be identified. Work is now being undertaken on single locus probes which would simplify interpretation of the results and should lead to individual family and population markers. Although development of these probes is expensive and requires a very high level of expertise it is anticipated that screening will be quicker and therefore costs lower than for mitochondrial DNA analysis. It is anticipated that such probes could be developed within two years depending on funding (approximately £30,000 per annum).

4.9 Work on nuclear DNA is also being carried out by Dr Davidsons laboratory in Newfoundland. A restriction fragment length poloymorphism has been identified in the ribosomal RNA gene complex which can unambiguously tell the continent of origin of an individual salmon. Other repetitive elements are being examined for their value as genetic markers. Davidson et al (1990) concluded that repetitive regions of the nuclear genome may prove useful and provide population specific markers.

4.10 DNA samples are stable over time and can be obtained from alcohol preserved or frozen specimens. Very small tissue samples are required and could be obtained for example from the adipose fin without the need to sacrifice the fish (Ferguson, personal communication).

5. ASSESSMENT OF THE GENETIC IMPACT OF SALMON FARMING ON WILD STOCKS

5.1 The rapid development of the salmon farming industry in the North Atlantic has led to concern about the possible genetic impact of salmon which escape or are released from rearing units. Such escapes are occurring on a very large scale (eg in Norway it has been estimated that approximately 1 million salmon escaped from farms in both 1988 and 1989) and there is now evidence that these fish enter rivers at spawning time and spawn with wild fish. There is therefore an urgent need for knowledge of the genetic structure of natural hatchery populations and of the genetic interactions between hatchery and wild stocks (Gyllensten and Wilson, 1987; Hovey et al, 1989).

5.2 Studies of the genetic structure of Atlantic salmon populations have demonstrated discreteness both between and within river systems. Studies of farmed stocks have demonstrated lower genetic variability than in the wild populations. Such studies

discreteness both between and within river systems. Studies of farmed stocks have demonstrated lower genetic variability than in the wild populations. Such studies have been undertaken principally by protein electrophoresis. However, it is not clear whether frequency differences in proteins between populations arise through selection (local adaptation) or chance (Wilkins, 1989). Several studies have demonstrated the adaptive significance of genetic differences in salmonid populations (Riddell et al, 1981; Kanis et al, 1976; Bams, 1976) and some variants show distribution patterns which suggest that they do have selective value (Wilkins, 1989). At the NASCO/ICES meeting on the "Genetic threats to Wild Salmon Posed By Salmon Aquaculture" a range of views was expressed although the only evidence presented suggested that some adverse effects were possible. There was general agreement on the need for, and difficulty associated with, the necessary experimentation required to assess the genetic impact. Similarly, at the recent international meeting in Loen, Norway, one of the conclusions of the meeting was that deliberate experimental releases of genetically distinguishable cultured fish into a river with a native salmon stock may provide the most effective means of defining the extent of genetical and ecological interactions between these fish of genetically different background. It was recommended that such experimentation be undertaken although the need to find appropriate markers and the difficulty associated with such experiments were stressed.

5.3 At its Sixth Annual Meeting the Council of NASCO endorsed the need to identify genetic markers. Presently, research is being carried out with all three of the techniques previously described in order to identify genetic markers which could be used to identify individual fish and would enable the impact of fish farm escapes to be assessed. A listing of centres where such work is being undertaken is contained in Appendix 2. The NASCO/ICES meeting concluded that the development of techniques for the analysis of variation in nuclear DNA would help to solve many of these and other open questions and the meeting therefore recommended that development work in this field should be supported. Research workers at Queen's University in Belfast, Northern Ireland, are optimistic that with appropriate funding useful genetic markers, based on variation in nuclear DNA, can be developed within two years. Since DNA samples are stable they are confident that an appropriate impact study could be undertaken with tissue samples being preserved for analysis once the development work on suitable probes is complete.

LISTING OF MAJOR CENTRES WHERE RESEARCH ON DEVELOPMENT OF GENETIC MARKERS IS BEING UNDERTAKEN

PROTEIN ELECTROPHORESIS

4Department of Zoology
University of Cork
Cork
Ireland
(Dr T Cross)

Ministry of Agriculture, Fisheries & Food
Fisheries Laboratory
Lowestoft
England
(Dr D Thompson in collaboration with University of Buckingham)

Department of Agriculture and Fisheries for Scotland
Marine Laboratory
Aberdeen
Scotland
(Dr A Youngson)

Department of Biology and Biochemistry
Queens University
Belfast
Northern Ireland
(Dr A Ferguson)

MITOCHONDRIAL DNA

Department of Biochemistry
Memorial University of Newfoundland
St John's
Newfoundland
Canada
(Dr W Davidson)

Ministry of Agriculture, Fisheries & Food
Fisheries Laboratory
Lowestoft
England
(Dr D Thompson in collaboration with University of Buckingham)

Department of Agriculture and Fisheries for Scotland
Marine Laboratory
Aberdeen
Scotland
(Dr E Verspoor)

Department of Biology and Biochemistry
Queens University
Belfast
Northern Ireland
(Dr A Ferguson)

NUCLEAR DNA

Department of Biochemistry
Memorial University of Newfoundland
St John's
Newfoundland
Canada
(Dr W Davidson)

Department of Biology and Biochemistry
Queens University
Belfast
Northern Ireland
(Dr A Ferguson)

Marine Gene Probe Programme
Dalhousie University
Halifax
Nova Scotia
Canada
(Research into DNA fingerprinting but not known if working on Atlantic salmon)
(Mr R Doyle)

REFERENCES:

Anon (1988): Report of the Working Group on North Atlantic salmon. ICES CM1988/Assess:16

Bams, R A (1976): Survival and propensity for homing as affected by presence or absence of locally adapted parental genes in to transplanted populations of pink salmon (*Oncorhynchus gorbuscha*). Journal of the Fisheries Research Board of Canada 33: 2716-2725.

Birt, T P; Green, J M and Davidson, W S (1986): Analysis of mitochondrial DNA in allopatric anadromous and non-anadromous Atlantic salmon, *Salmo salar*. Canadian Journal of Zoology 64: 118-120.

Cross, T F (1989a): Genetics and the management of the Atlantic salmon. Atlantic Salmon Trust/Atlantic Salmon Fellowship 1987/88 Atlantic Salmon Trust, Pitlochry 74pp.

Cross, T F (1989b): To what extent are farmed and wild salmon genetically distinct? In Report of the NASCO/ICES meeting on Genetic Threats to wild stocks from Salmon Aquaculture CNL(89)19.

Cross, T F and Healy, J A (1983): The use of biochemical genetics to distinguish populations of Atlantic salmon, *Salmo salar*. *Irish Fisheries Investigation Series A 23: 61-66.*

Cross, T F and King J (1983): Genetic effects of hatchery rearing in Atlantic salmon. Aquaculture 33: 33-40.

Cross, T F and Ward, R D (1980): Protein variation and duplicate loci in the Atlantic salmon, *Salmo salar* L. Genetical Research 36: 147-165.

Davidson, W S, Birt, T P and Green, J M (1989): A review of genetic variation in Atlantic salmon *Salmo salar* L, and its importance for stock identification, enhancement programmes and aquaculture. Journal of Fish Biology 34:

Davidson, W S; Bartlett, S E; Birt T P; Cutler, M G; Green, J P and McVeigh, H P (1990): How genetically different are Atlantic salmon from Europe and North America? Paper presented to the Symposium on "Interactions between cultured and wild Atlantic salmon". Loen, Norway 23-26 April 1990.

Ferguson, A (1986): Genetics and the management of natural salmonid stocks. Proceedings of Institute of Fisheries Management 17th Annual Study Course. University of Ulster, Coleraine. 9-11 September 1986.

Gyllensten, U and Wilson, A C (1987): Mitochondrial DNA of salmonids. Inter-and intraspecific variability detected with restriction enzymes. In: Population Genetics and Fishery Management (Ed: Ryman, N and Utter, F) Washington Sea Grant Programme, University of Washington Press, Seattle.

Hartley, S E (1988): Cytogenetic studies of Atlantic salmon, *Salmo salar* L in Scotland. Journal of Fish Biology 33: 735-740.

Hovey, S J; King, D P F; Thompson, D and Scott, A (1989): Mitochondrial DNA and allozyme analysis of Atlantic salmon *Salmo salar* L, in England and Wales. Journal of Fish Biology 35 (Supplement A): 253-260.

Johansson, N (1981): General problems in Atlantic salmon rearing in Sweden. In: Fish Gene Pools: preservation of genetic resources in relation to the wild stocks (N Ryman Ed) Ecological Bulletin 34 Stockholm.

Kanis, E; Refstie, T and Gjedrum, T (1976): A genetic analysis of egg, alevin and fry mortality in salmon (*Salmo salar*), sea trout (*Salmo trutta*) and rainbow trout (*Salmo gairdneri*) Aquaculture 8: 259-268.

Kapuscinski, A R and Jacobson, L D (1987): Genetic guidelines for fisheries management. Minnesota Sea Grant, University of Minnesota. 66pp.

McElligott, E A; Maguire, T M F and Cross, T F (1987): The amount and nature of electrophorectically detectable genetic polymorphism in hatchery reared Atlantic salmon (*Salmo salar* L) in Ireland ICES CM 1987/M:13.

Moller, D (1970): Genetic diversity in Atlantic salmon and salmon management in relation to genetic factors. International Atlantic Salmon Foundation Special Publication. Series 1.

Nyman, L (1970): Origin of salmon at West Greenland. ICES/ICNAF Joint Working Party on North Atlantic Salmon. ICES/ICNAF Salmon Document 70/4.

Payne, R H (1974): Transferrin variation in North American populations of the Atlantic salmon, *Salmo salar*. Journal of the Fisheries Research Board of Canada 31: 1037-1041.

Payne, R H; Child, A R and Forrest, A (1971): Geographical variation in the Atlantic salmon. Nature 231 May 28: 250-252.

Phillips, R B and Hartley, S E (1988): Fluorescent bonding patterns in the chromosomes of the genus *Salmo*. Genome 30: 193-197.

Reddin, D G; Verspoor, E and Downton, P R (1987): An integrated phenotypic and genotypic approach to discriminating Atlantic salmon. ICES CM1987/M:16.

Riddell, B E; Leggett, W C and Saunders, R L (1981): Evidence of adaptive polygenic variation between two populations of Atlantic salmon (*Salmo salar*) native to tributaries of the S W Miramichi River, N.B. Canadian Journal of Fisheries and Aquatic Sciences 38: 321-333.

Ryman, N (1983): Patterns of distribution of biochemical genetic variation in salmonids: differences between species. Aquaculture 33: 1-21.

Saunders, R L and Bailey, J K (1980): The role of genetics in Atlantic salmon management. Proceeding International Atlantic Salmon Symposium (Ed: Wert, A J) Edinburgh.

Stahl, G (1983): Differences in the amount and distribution of genetic variation between natural populations and hatchery stocks of Atlantic salmon. Aquaculture 33: 23-32.

Thompson, D (1990): An application of isozyme typing to a hatchery based enhancement programme on the River Test, England. Symposium on the Interactions between cultured and wild Atlantic salmon. Loen, Norway 23-26 April 1990.

Thorpe, J E and Mitchell, K A (1981): Stocks of Atlantic salmon (*Salmo salar*) in Britain and Ireland: discreteness and current management. Canadian Journal of Fisheries and Aquatic Sciences 38: 1576-1590.

Utter, F: Aebersold, P and Winans, G (1987): Interpreting genetic variation detected by electrophoresis. In: Population genetics and Fishery Management (Ed: Ryman, N and Utter F) Washington Sea Grant Programme. University of Washington Press, Seattle.

Verspoor, E (1986): Spatial correlations of transferrin allele frequencies in Atlantic salmon, *Salmo salar*, populations from North America. Canadian Journal of Fisheries and Aquatic Sciences 43: 1074-1078.

Verspoor, E and Knox, D (1990): Detection of a potential mtDNA restriction fragment length polymorphism for identification of salmon of farmed and Norwegian origin in wild Symposium on "Interactions between cultured and wild salmon" Loen, Norway 23-26 April 1990.

Wilkins, N P (1985): Salmon stocks: A genetic perspective. Atlantic Salmon Trust, Moulin, Pitlochry.

Wilkins, N P (1990): Report on Workshop on Genetic Protein Variation in Atlantic Salmon. Marine Laboratory, Aberdeen 14-16 December 1988.

Youngson, A F; Martin, S A M; Jordon, W C and Verspoor E (1989): Genetic protein variation in Farmed Atlantic salmon in Scotland: Comparison of Farmed strains with their wild source populations. Scottish Fisheries Research Report 42: 12pp.

JUNE 1990
HELSINKI

ANNEX 22

COUNCIL

PAPER CNL(90)27

IMPACTS OF SALMON AQUACULTURE ON SALMON HABITATS

CNL(90)27

IMPACTS OF SALMON AQUACULTURE ON SALMON HABITATS

1. At its Sixth Annual Meeting, the Council asked the Secretary to prepare a review of the available information on the impact of salmon aquaculture on salmon habitats, and this review is attached as Appendix 1.

2. Salmon aquaculture is an intensive industry consisting of production of smolts in freshwater followed by ongrowing to harvestable size in sea-water. Most of the available literature on the impacts of salmon farming on the environment relates to cage mariculture operations. Since the majority of the salmons weight is put on in sea-water the largest inputs to the environment occur during this phase. Concern has, however, also been expressed about the impacts in freshwater. These concerns include the potential impacts of wastes (waste food, faecal material, scales, mucus and other detritus), excreted material and chemicals and the possible effects on the behaviour of wild salmon.

3. A number of effects of waste and excreted material on sediment and water quality have been observed although these are often localised and of principal concern to the farmer since deterioration of the environment could affect the viability of the farm. There are reports of adverse effects of aquaculture on fisheries. Nutrient enrichment could lead to problems of phytoplankton blooms and these could have serious consequences for the wild fish. There is no evidence of aquaculture activities stimulating toxic blooms although some of the constituents of salmon feeds are known to be growth requirements for some toxic algal species. Concern has been expressed about the environmental fate of some of the chemicals used in aquaculture but there is a paucity of information on the fate and effect of many of the compounds used. There are gaps in our knowledge in a number of other areas that could potentially affect the wild stocks.

4. The recent international meeting in Norway on "Interactions between cultured and wild salmon" recognised the need for a precautionary approach in order to safeguard the wild stocks until assessment of the impacts was possible. The meeting also supported the need for Codes of Practice to minimise potentially adverse impacts on wild stocks. Elements designed to safeguard the habitat of wild stocks from the potential impact of salmon aquaculture have been incorporated into the draft guidelines to minimise impacts of salmon aquaculture on wild stocks.

5. In order to assess and minimise the environmental impacts the Council could:

   (a) encourage further research on the environmental problems caused by intensive salmon farming.

   (b) approve and further develop in future years a series of recommendations put before the Council in paper CNL(90)31.

Secretary
Edinburgh
14 May 1990

CNL(90)27
IMPACTS OF SALMON AQUACULTURE ON SALMON HABITATS

1. INTRODUCTION:

1.1 At its Sixth Annual Meeting the Council considered a paper from the ICES Working Group on Mariculture on the environmental threats to wild stocks posed by salmon aquaculture, CNL(89)20. This paper concluded that the main concerns relate to the genetic threat and to disease transmission from cultured to wild stocks. In accordance with the decision of the Council the following review deals with the threat to salmon habitats from salmon aquaculture. It does not deal with genetic or ecological interactions, interactions resulting from introductions and transfers, or disease and parasite interactions which are covered elsewhere (CNL(89)19; CNL(89)22; CNL(89)23; CNL(90)26; CNL(90)28).

1.2 Salmon aquaculture consists of a two phase operation - production of smolts in freshwater followed by ongrowing to harvestable size in sea-water. It is an intensive industry which involves the addition of waste products, principally nutrients and suspended solids, and the addition of chemicals, including chemicals used in disease treatment and treatments applied to equipment (Anon, 1989a). These additions result in a number of changes to the sediments and water column. Since the majority of the salmons weight is put on in the marine environment the greatest inputs to the environment occur during this phase. The majority of studies of the environmental impacts of salmon farming have concentrated on the effects of cage mariculture. No data is available on the water quality around land-based salmon mariculture installations (Anon, 1989a). In freshwater, there is very limited information on the environmental effects associated with salmon smolt production although the effects of rainbow trout culture have been documented (Mills, 1987). In interpreting this information it should be borne in mind that a substantial smolt rearing unit producing 300,000 S1 smolts annually will only have a production of approximately 15 tonnes per annum.

1.3 Concern about the rapid expansion of the industry and its effects on the aquatic environment has recently been expressed by a number of conservation organisations and this concern is shared by the industry who fear that the harmful feedback could affect the economic viability of the farm (Gowen and Bradbury, 1987).

2. ADDITION OF WASTE PRODUCTS TO THE ENVIRONMENT

2.1 Gowen and McCluskey (1988) calculated the average flux of carbon and nitrogen through a salmon cage farm based on data from a number of studies. They showed that of the original input (44% carbon and 7.7% nitrogen), 20% would be wasted and 80% consumed, although some of the waste food may be consumed by other fish species. Of this, 30% of consumed carbon and 10% of consumed nitrogen would enter the environment through faeces and 65% of the consumed nitrogen would be excreted. Therefore, for an input of 1 tonne of feed, 88kg of carbon and

15.4kg of nitrogen will enter the environment as waste feed, together with 105.6kg of carbon in the faeces and 6.2kg and 40kg of nitrogen in the faeces and excreta respectively. Feed losses may be greater from cage units than from land-based systems (in Anon, 1989a). In Finland, the nutrient load from fish farms is under 4% for phosphorous and under 2% for nitrogen of the total nutrient load derived from human activities (Makinen, 1989). Waste products in solid form (faeces and waste food together with scales, mucus and other detritus) will tend to settle while excreted material will be in the soluble form (Anon, 1989a).

Freshwater rearing

2.2 Mills (1987) considered the problems of production of solid waste and nutrient enrichment resulting from cage-rearing of salmon smolts in freshwater. He considered that the degree of phosphorus loading and its effects on water quality were of particular concern. Phosphorous is generally the limiting nutrient in inland waters (Anon, 1989a). In a review of the impacts of salmonid cage culture on inland fisheries Phillips et al (1985) reported increased concentrations of suspended solids and nutrients and reduced concentrations of oxygen in and around the cages, together with increased oxygen consumption and nutrient and organic content of the sediments. These changes are accompanied by changes in the microbial, planktonic and benthic communities of inland waters although no adverse impacts of eutrophication on the fish communities have been reported.

2.3 Alabaster (1982) undertook a survey by questionnaire of freshwater fish farm effluents in fifteen European countries which highlighted a number of environmental problems. He found that at an average flow of water there was a reduction in dissolved oxygen of 1.6mg/litre between the influent and effluent to freshwater farms, and that there was also a tendency for the pH of the effluent to be lower as a result of increased levels of carbon dioxide. However, downstream fisheries were not generally adversely affected unless the total flow of recipient waters was less than 5 litre/second for each tonne of annual production of fish. At discharges below 8 litre/second/tonne, settlement of solids, low dissolved oxygen and "sewage fungus" occurred in the recipient rivers and at high dilutions increased eutrophication attributable to increased concentrations of organic phosphorous occurred. A similar survey was conducted by Solbe (1972) of 148 freshwater fish farms, principally small rainbow trout units discharging into rivers in the UK. The incidence of pollution downstream of the discharge was noted in most cases, principally as a result of the discharge of high concentrations of suspended solids, and in a few cases mortalities had occurred among the native fish populations. However, in general there was little deterioration to either fisheries or aquatic invertebrates and where effects on fisheries did occur they could be related to particular aspects of the effluent concerned. A study of the effect of a 90 tonne rainbow trout unit by Mantle (1982) demonstrated local changes in dissolved oxygen, pH, nutrients and suspended solids together with an increase in invertebrates tolerant of organic enrichment and loss of intolerant species of invertebrates. Warrer-Hansen (1982) concluded that feeding of the fish is a major factor causing pollution, with trash fish diets producing up to twice the pollution loading of dry pellets.

Mariculture

2.4 A number of studies have investigated the impact of salmon cage units on the

sediments and benthic invertebrates (Braaten et al (1983); Rosenthal and Rangeley (1989); Gowen and McCluskey (1988); Brown et al (1987)). Most Norwegian farms have been located in shallow and well protected sites where the rate of exchange near the bottom has been insufficient. Under such conditions organic material may build up beneath the cages resulting in increased oxygen consumption in near-bottom waters and the release of methane and hydrogen sulphide gases which could have repercussions for the health of the fish (Gowen and McCluskey, 1988). Loss of appetite, gill damage and increased mortality of farm stock have been reported under such conditions (Braaten et al, 1983; Rosenthal and Rangeley, 1989). Ammonium released from anoxic sediments could contribute to the total soluble nitrogenous waste produced (Gowen and Bradbury, 1987) although this is probably less significant than direct fish excretion (Anon, 1989a). Braaten et al (1983) concluded that careful attention should be given to site selection and to all routine feeding and cleaning operations at salmon farms in order to minimise such pollution. Gowen and McCluskey (1988) surveyed a number of fish farm sites in Scotland and showed that there was organic enrichment beneath and in the vicinity of each of the farms. However, at all sites the effects of the organic waste appeared to be confined to within 60m of the farm, with severe effects confined to approximately 15m. These authors concluded that where there is sufficient depth and movement of water the site is unlikely to become "soured". Similarly, Brown et al (1987) demonstrated that changes in the benthic fauna below salmon cages were restricted to within 120m with the most marked changes (an azoic zone) observed within 15m of the cages. A recent report by the Nature Conservancy Council in the UK has concluded that the impacts of marine fish farming on the sediments are likely to be highly localised and a problem for the fish farmer rather than the wider native indigenous flora and fauna (Anon, 1989a). However, the formation of anoxic sediments could provide suitable conditions for the accumulation of dinoflagellate cysts and their subsequent release into the water column may result in the development of blooms (Rosenthal et al, 1987).

2.5 The most significant characteristics of the soluble fraction of wastes from fish farms as they affect water quality are suspended solids, various nitrogen and phosphorous compounds, vitamins and trace elements. Nitrogen is generally the limiting nutrient in marine waters (Anon, 1989a). Gowen and McCluskey (1988) could find no evidence of a fish farm increasing the nutrient status of the sea-loch studied with regard to nitrate and phosphate. There was a localised increase in ammonium around the farm site, but no increase in phytoplankton biomass, although any such increase could have been dispersed or consumed by zooplankton. Direct ammonium toxicity to either farmed or wild fish populations is, however, considered unlikely (Anon, 1989a) Similarly, Muller-Haeckel (1986) found that there was no increase of nutrients and no denser growth of algae around a well flushed cage site in the Bothnian Sea. In general, widespread hypernutrification and eutrophication is unlikely to result from mariculture although localised eutrophication could occur in poorly flushed sites (Gowen and Bradbury, 1987). There is however a need for caution since in one study of an enclosed Irish sea lough a salmon farm was implicated in the formation of a localised phytoplankton bloom and such phenomena could have serious consequences for the wild fish (Anon, 1989a). The ICES Study Group on "Environmental Impacts of Mariculture" has recognised that mariculture activity could bring about changes in the natural populations of marine algae and that such changes could have implications for public health, natural populations of marine organisms and the viability of the industry (Rosenthal et al, 1987).

Similarly, the Nature Conservancy Council believes that the effect of marine fish farming on phytoplankton is critical for both farmed and wild communities, particularly if enhancement of phytoplankton productivity results in the formation of toxic blooms (Anon, 1989a). Biotin has been implicated in the effects of *Gyrodinium aureolum* and vitamin B12 is a growth requirement for the toxic microflagellate *Prymnesium parvum.* Both chemicals are constituents of fish feed (Rosenthal et al, 1987; Gowen and Bradbury, 1987). However, Gowen and Bradbury (1987) concluded that there was no evidence that the occurrence of toxic phytoplankton blooms in Scotland and Norway are related to fish farming activity.

2.6 Muller-Haekel (1986) found that the oxygen concentration within the farm cages was high throughout the year, although reductions within cages of up to 2mg/l, depending on stocking rate, tidal flow and degree of fouling, have been reported (Anon, 1989a). Significant oxygen depletion should be localised and a problem principally for the reared fish. The bottom water beneath fish farms can become depleted in oxygen for long periods of time (Brown et al, 1987) particularly where stratification of the water column occurs (Anon, 1989a). Upwelling of this water could be harmful to the reared fish (Gowen and Bradbury, 1987). Increased production of phytoplankton as a result of eutrophication could result in depletion of dissolved oxygen levels through algal respiration at night and microbial degradation of algal cells (Rosenthal et al, 1987).

2.7 The effects of wastes from salmon aquaculture on microbial communities are also important. Several studies have shown that Vibrio spp are frequently found in higher numbers in areas of increase organic input (Anon, 1989a). Munro (1990) described modelling studies on the release of *Aeromonas salmonicida* from sea cages in a hypothetical sea-loch which indicated that fish entering the loch would probably encounter viable bacteria released from the farm and would therefore be at risk of infection. This risk would be higher for fish spending a long period of time in the loch.

2.8 In addition to the wastes produced during on-growing, recent concern has been expressed about the bleeding of salmon during harvesting which generates a significant volume of sea water/blood mixture (Anon, 1989c). Such a mixture represents a rich source of nutrients, has a high oxygen demand, may contain pathogens and may cause visual pollution. Recently, a procedure for sterilizing such blood and water mixtures has been accepted by the Department of the Marine in Ireland.

3. ADDITION OF CHEMICALS

3.1 A wide variety of chemicals including vaccines, therapeutants, disinfectants and anaesthetics, are used in aquaculture which if unrecognised or misused represent a potential threat to the health of the cultured organism, the indigenous biota or the human consumer (Rosenthal et al, 1987). Lists of the chemicals used in aquaculture have been given by Solbe (1982); Schnick et al, (1986) and Anon (1989b). There is a paucity of information on the environmental fate and effects of many of the compounds in common use (Anon, 1989b) and there is an urgent need for more information on the effect after discharge of therapeutic and prophylactic chemicals (Maitland, 1985).

3.2 Rosenthal et al (1987) have also drawn attention to the use of plastics in fish farming which contain a variety of compounds many of which are toxic to aquatic life, although some protection is provided by their low solubility, slow rate of leaching and dilution. They concluded that the environmental effects of these toxicants beyond the confines of the culture facilities remains largely unresolved.

Freshwater rearing

3.3 Solbe (1982) found that in a survey of 148 freshwater farms in the UK, malachite green and formalin were the most commonly used chemicals although data on the concentrations discharged was limited. He stressed the need for guidelines on the use of these chemicals in order to protect the environment.

3.4 In Finland, the use of oxytetracycline in freshwater increased in years when furunculosis was diagnosed, reaching a peak of 600kg (Makinen, 1989). Austin (1985) has shown that during treatment with oxytetracycline 90% of bacterial strains examined from the effluent of a trout farm showed antibiotic resistance although resistance was lost nine days after treatment.

Mariculture

3.5 One of the most common chemical treatments in salmon mariculture is an immersion treatment with the pesticides trichlorvon or dichlorvos. These chemicals are used to treat the copepod ectoparasites *Lepeophtherius salmonis* and *Caligus elongatus*, (salmon lice). Because the treatment is only effective against the adult stages and because several stages of the parasite may be present on the fish at any one time, it may be necessary to treat farmed salmon 2-5 times a year (Anon, 1989a). Concern has recently been expressed about this treatment (Ross and Horsman, 1988). In a recent letter to the Journal of Experimental Eye Research, Fraser et al (1989) suggest that dichlorvos may be a possible cause of cataracts in wild salmon. The letter describes a survey of netted salmon from the West Coast of Scotland during which the incidence of cataracts, had increased from near negligible levels to around 55% during the period 1984-1988. Since juvenile salmon in freshwater were not affected the authors concluded that the problem was of marine origin. Fully or partially opaque eyes have previously been reported from salmon caught in the Faroese fishery where neither hooking injury nor parasites or abrasions were responsible (Anon, 1986). Fraser et al (1989) reported that dichlorvos is known to cause cataracts if ingested at relatively high concentrations in food and they therefore examined the membrane potential and electrical resistance of rainbow trout lenses in an artificial aqueous humour with and without the presence of dichlorvos. Their results indicated that overnight incubation in the solution containing dichlorvos produced a marked loss of lens transparency. They speculated that since Nuvan 500EC (Ciba-Geigy Limited, Basel) forms small droplets in dilute saltwater solutions, which are stable for days, a single droplet impacting on the eye could raise the dichlorvos level in the anterior chamber to a concentration greater than that needed to cause loss of lens transparency. They also speculated that concentrations high enough to cause lens opacity might also be accumulated through the food chain. They believed that their observations explain the increased incidence of cataract in wild salmon. Dichlorvos is presently used to control sea-lice in all the major Atlantic salmon farming countries (Anon, 1989b). In a recent response to Fraser et al's (1989) published letter Dobson and Schuurman

(1990) concluded that "there appears to be no logic behind Fraser et al's hypothesis and there exist many other less far fetched explanations to account for cataract formation in the Atlantic salmon". In summary, they considered that the suggestion that a product with a short half-life in sea water could somehow affect wild salmon some miles away from its point of release but not affect the salmon being treated was not credible, particularly since the substance is non-bioaccumulative and undergoes no biomagnification in soil, water, plants, vertebrates or invertebrates. They also questioned the criteria for assessing whether or not the fish had cataracts since corneal opacity can occur and transient opacity may occur post-mortem; the completeness of the review of the literature concerning possible causes of cataracts other than dichlorvos such as abrasion in salmon caught in nets and stress; and the experimental treatment. Dichlorvos on farms is used at concentrations of 1ppm for up to 1 hour, while the concentration of dichlorvos used by Fraser et al (1989) to induce cataracts was 60ppm overnight. Such a concentration in seawater would kill Atlantic salmon in less than 15 minutes. Farmed fish regularly treated with dichlorvos are not affected by cataracts (Dobson and Schuurman, 1990).

3.6 Concern has also been expressed concerning Nuvan's toxicity to marine organisms, particularly to sensitive species such as lobsters. Recent experiments have shown that concentrations of the chemical fall rapidly to below the level of detection (one tenth of a ppb) in the vicinity of farms being treated. Lobster larvae held at 0.5ppb were shown to moult successfully and effects to even the most sensitive species would be restricted to a radius of a few meters of the treated site (Anon, 1990). Recently, the cleaning symbiosis between wrasses (Labridae) and lice infested salmon has been investigated (Bjordal, 1988). Three different wrasse species were identified as functional cleaners of lice infested salmon (the goldsinny, *Ctenolabrus rupestris*; the rock cook, *Centrolabrus exoletus*; and the female cuckoo wrasse, *Labrus ossifagus*) with the goldsinny and the rock cook being the most potent cleaners. Sea trials with wrasse are being undertaken in Scotland. Research is also being conducted into the possibility of developing a vaccine to trigger a defence reaction to sea-lice infestations (Anon, 1990).

3.7 Considerable quantities of antibiotics are used by the salmon mariculture industry. For example, in 1984 the antibiotic consumption by the Norwegian industry included over 6 tonnes of oxytetracycline, almost 8 tonnes of Tribrissen R and 5 1/2 tonnes of Nitrofurazolidone (in Rosenthal et al, 1987) Such usage may have serious effects on the environment such as the development of resistant bacteria and the transfer of such resistance genetically to other bacteria, including fish pathogens. (Torsvik et al, 1988). Studies of bacteria in the bottom sediments of a fish farm receiving treatment with oxytetracycline in Norway demonstrated that high proportions of the bacterial flora were resistant to the drug compared to a control site, and that the level of resistant bacteria did not change significantly for 13 months after the treatment. In the fish farm sediment there was also slightly higher resistance to trimethoprim and sulfadiazine.

3.8 A number of antifoulants have been used to treat netting used in salmon cages. Traditional anti-foulants used copper but during the 1970's paints containing organotin species, particularly tributyltin (TBT) were developed and concern has recently been expressed over the effects of this chemical on non-target organisms (Balls, 1987). Balls (1987) studied the leaching of TBT from a moored array of cages with netting freshly treated with TBT based antifoulants. The concentrations

detected in and around the raft were higher than those reported to produce effects on biota in laboratory studies, and the occurrence of imposex in dogwhelks was found to be widespread in the sea loch studied. The use of TBT has subsequently been banned by a number of North Atlantic salmon producing countries (Anon, 1989b).

4. OTHER IMPACTS OF SALMON AQUACULTURE ON SALMON HABITATS

4.1 A number of authors have drawn attention to the utilisation of waste food by other species of fish (eg Phillips et al, 1985; Anon, 1989a). There is a need for further research into the effects of stimulation of wild fish on predator-prey relationships. For example, juvenile saithe, *Pollachius virens*, are known to be scavengers around sea-cages and the relationship between these stocks and prey species for salmon smolts requires further study. It is also important to ascertain whether or not wild smolts are attracted to and enter cages since they may be preyed upon by farmed stocks (Anon, 1989b).

4.2 There is also a need to ascertain whether the migratory behaviour of salmon is adversely affected by farming (Phillips et al, 1985). No information is available on the effects of pheromones released by cultured fish on wild salmon (Anon, 1989b).

5. CONCLUSION:

5.1 This review has shown that there are considerable gaps in our knowledge concerning the impacts of salmon aquaculture on salmon habitats. Where studies have been conducted, the results have indicated that many of the impacts tend to be of a localised nature and are likely to result in problems to the reared fish. However, there are incidences of adverse effects on fisheries and there are a number of areas of concern for which data is lacking. As with the other interactions between aquaculture and the wild stocks eg genetic interactions a precautionary approach would safeguard the wild stocks until more detailed assessments are possible (see for example CNL(90)28).

5.2 Measures to address the possible areas of impacts on salmon habitats have been incorporated into the draft guidelines to minimise impacts of salmon aquaculture on wild stocks (CNL(90)31) which the Council will consider at its Seventh Annual Meeting. The recent Norwegian meeting on "Interactions between cultured and wild salmon" supported the need for Codes of Practice to minimise the potentially adverse impacts of aquaculture on wild stocks.

REFERENCES:

Alabaster, J S (1982): Survey of Fish-Farm effluents in some EIFAC countries. Report of the EIFAC Workshop on fish-farm effluents. EIFAC Technical Paper 41: 5-20

Anon (1986): Report of the Meeting of the Special Study Group on the Norwegian Sea and Faroes Salmon Fishery. ICES CM1986/M:8

Anon (1989a): Fish farming and the safeguard of the Natural Marine Environment of Scotland. Nature Conservancy Council January 1989 136pp

Anon (1989b): Report of the Working Group on Environmental Impacts of Mariculture. ICES CM1989/F:11

Anon (1989c): A solution to the bleeding problem: Aquaculture Ireland

Anon (1990): Industry defends necessary use of lice chemical. Fish Farming International 17(1)

Austin, B (1985): Anti-biotic pollution from fish farms: effects on aquatic microflora. Microbiological Science 2: 113-117.

Balls, P W (1987): Tributyltin (TBT) in the waters of a Scottish sea loch arising from the use of antifoulant treated netting by salmon farms. Aquaculture 65: 2227-2237.

Bjordal, A (1988): Cleaning symbiosis between wrasses (Labridea) and lice infested salmon (*Salmo salar*) in mariculture.

Braaten, B; Aure, J; Ervik, A and Boge, E (1983): Pollution problems in Norwegian Fish Farming. ICES, CM 1983/F:26.

Brown, J R; Gowen, R J and McCluskey, D S (1987): The effect of salmon farming on the benthos of a Scottish sea loch. Journal of Experimental Marine Biology and Ecology 109: 39-51.

Dobson, D P and Schuurman, H J (1990): Possible causes of cataract in Atlantic salmon (*Salmo salar*). Experimental Eye Research 50: 439-442.

Fraser, P; Duncan, G and Tomlinson, J (1989): Effects of a cholinesterase inhibitor on Salmonid Lens: A possible cause for the increase incidence of cataract in salmon, *Salmo salar* L. Experimental Eye Research 49: 293-298.

Gowen, R J and Bradbury, N B (1987): The ecological impact of salmon farming in coastal waters: a review. Oceanography and Marine Biology Annual Review 25: 563-575.

Gowen, R J and McCluskey, D S (1988): Investigations into benthic enrichment, hypernutrification and eutrophication associated with mariculture in Scottish coastal waters. Report to Highlands and Islands Development Board, Crown Estate Commissioners, Countryside Commission for Scotland, Nature Conservancy Council and Scottish Salmon Growers Association.

Mantle, G J (1982): Biological and Chemical Changes associated with the discharge of fish-farm effluent. Report of the EIFAC Workshop on fish-farm effluents. EIFAC Technical Paper 41:

Maitland, P S (1985): The potential impact of fish culture on wild stocks of Atlantic salmon in Scotland. In: The States of the Atlantic Salmon in Scotland (Ed Jenkins, D and Shearer, W M) ITE Symposium No. 15 Banchory 13-14 February 1985.

Makinen, T (1989): Fish culture and environmental impacts in Finland. ICES CM 1989/F:10.

Mills, D H (1987): Consideration of scientific problems associated with possible cage-rearing of salmon smolts in Scottish lochs and hydro-electric reservoirs. ICES CM 1987/M:5.

Muller-Haeckel, A (1986): Control of water quality around a cage fish farm in the Norrby Archipelago (North Bothnian Sea). Vatten 42: 205-209.

Munro, A L S (1990): Release of *Aeromonas salmonicida* from sea cages and possible risks to wild Atlantic Salmon. Paper presented to symposium "Interactions between cultured and wild salmon", Norway 22-26 April 1990.

Phillips, M J; Beveridge, M C M and Ross, L G (1985): The environmental impact of salmonid cage culture on inland fisheries: present status and future trends. Journal of Fish Biology 27 (Supplement A): 123-137.

Rosenthal, H; Weston D; Gowen R and Black, E (1988): Report of the ad hoc Study Group on "Environmental Impact of Mariculture". ICES CM 1987/F:2.

Rosenthal, H and Rangeley, R W (1989): The effect of a salmon cage culture on the benthic community in a largely enclosed bay (Dark harbour, Grand Manon Island, New Brunswick, Canada). ICES CM1989/F:23.

Ross, A and Horsmann, P V (1988): The use of Nuvan 500EC in the salmon farming industry. Marine Conservation Society, Ross-on-Wye

Schnick, I R A; Meyer, F P and Walsh, D F (1986): Status of fishery chemicals in 1985. Progressive Fish Culturist 48(1): 1-17

Solbe, J F de L G (1982): Fish-farm effluents; A United Kingdom survey. Report of the EIFAC Workshop on fish-farm effluents. EIFAC Technical Paper 4: 29-55

Torsvik, V L; Sorheim, R and Goksoyr, J (1988): Anti-biotic resistance of bacteria from fish farm sediments. ICES CM 1988/F:10.

Warrer-Hansen, I (1982): Evaluation of matter discharged from trout farming in Denmark. Report of the EIFAC Workshop on fish-farm effluents. EIFAC Technical Paper 41: 57-63

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HELSINKI

ANNEX 23

COUNCIL

PAPER CNL(90)28

REPORT ON THE NORWEGIAN MEETING ON IMPACTS OF AQUACULTURE ON WILD STOCKS

PAPER CNL(90)28

REPORT ON THE NORWEGIAN MEETING ON IMPACTS OF AQUACULTURE ON WILD STOCKS

1. INTRODUCTION

1.1 There has been growing concern in recent years in many North Atlantic countries about the possibilities of adverse impacts on wild salmon stocks from the rapidly expanding salmon farming industry. The Council of NASCO has previously noted the potentially serious nature of a number of these impacts and has agreed on a number of courses of action.

1.2 At the Fifth Annual Meeting of NASCO it was announced that the Norwegian Government intended to hold an international meeting to assess the interactions between cultured and wild Atlantic salmon. This meeting was held in Loen, Norway, during 23-26 April 1990 and was attended by scientists and managers from most North Atlantic countries with salmon interests.

1.3 The meeting was opened by Mr Peter Johan Schei of the Directorate for Nature Management, Norway. In his address he expressed concern about escapes of farmed salmon and stressed the need for immediate action to safeguard the wild stocks. He noted the great interest in and high priority afforded to the subject by a number of research organizations throughout the North Atlantic and called for international cooperation to address the problem since maintenance of genetic diversity in the wild stocks may be crucial to the survival of both the wild salmon and the fish farming industry.

2. SUMMARY OF THE MEETING

2.1 The meeting consisted of nine sessions. Concern has been expressed about possible genetic, ecological and disease and parasite interactions and sessions were devoted to each of these subject areas. In addition, there was an introductory session and sessions on migration and development of cultured and wild salmon, salmon spawning behaviour and containment. The papers from each of these sessions will eventually be published but a brief summary of each session is given in Appendix 1.

2.2 The final session was a synthesis session devoted to the discussion and formulation of conclusions and recommendations concerning research and management. These conclusions and recommendations are presented below.

CONCLUSIONS AND RECOMMENDATIONS

3. GENERAL CONCLUSIONS

3.1 For about 10,000 years the salmon has been largely undisturbed except by fishing and other environmental changes, mainly in the last 200 years. There is now a new threat. Native Atlantic salmon are now outnumbered by salmon of cultured origin. Large numbers of farmed fish have escaped and are entering salmon rivers. It has

been documented that in some Norwegian rivers over half of the adult salmon are of farmed origin in the spawning season.

3.2 There is firm evidence that escaped cultured fish do migrate, do enter freshwater, and we have some evidence that they do spawn with wild fish. Thus unintended and accidental interactions between wild and farmed fish are already occurring.

3.3 There are still gaps in our knowledge of the impacts of the genetic, disease and environmental interactions between wild and farmed salmon and these are outlined in the following sections. It is very important that these gaps in our knowledge be filled by undertaking appropriate national research, communicated through international cooperation. However, such research will take many years to complete and if the international community awaits the firm conclusion of this work the changes, which are potentially irreversible, will have already taken place. Therefore the approach to this problem should be precautionary. On the evidence available to date it should be assumed that there is a real risk to the native salmon until it is proven that there is no such risk.

4. OCCURRENCE AND BEHAVIOUR OF CULTURED SALMON

4.1 Experiments in North Atlantic waters suggest that:

(a) immature farmed fish released into a river as smolts will return there but when transferred to another river before release will return to that river and not to their river of origin;

(b) farmed smolts which escape from a sea site tend to return to the general area of the sea site but are essentially "homeless" due to lack of experience. At maturity they will enter adjacent rivers on an uncertain basis, but few return to their hatchery of origin. However, straying rates and distances increase the later they escape from the sea site;

(c) fish released at later stages from sea sites in winter show considerably increased straying rates and there are seasonal variations in the survival of such fish;

(d) farmed fish may enter rivers later than the wild fish and their behaviour differs. They spend less time in the rivers. Due to later spawning by farmed fish they can overcut redds made by wild fish.

(e) escaped farmed fish are now occurring in increasing numbers on the spawning grounds of salmon in a number of North Atlantic countries. Observations suggest that they reproduce both with each other and with wild fish although reproductive success has yet to be shown. Biochemical studies are required to establish that hybridisation occurs;

(f) reared salmon may have less reproductive success than the wild fish.

4.2 Deliberate experimental releases of genetically distinguishable cultured fish into a river with a native salmon stock may provide the most effective means of defining the extent of genetical and ecological interactions between these fish of genetically

different background. It is recommended that such experimentation be undertaken, although the need to find appropriate markers and the difficulty associated with such experimentation were stressed.

5. GENETIC IMPACTS

5.1 Variations in life history parameters exist between and within different river populations. Some of these variations are interpreted as adaptations. These traits include morphology, migration patterns and developmental timing. The details of these adaptations need to be clarified by appropriate genetic studies, and by empirical studies of controlled introductions.

5.2 There is evidence that fish produced in hatcheries may show marked changes in fitness. Interactions can therefore be damaging to the wild stocks and one solution might be to make the cultured salmon unfit for survival to breed in the wild. To prevent potential negative genetic effects of farming on wild stocks, more information is needed on the genetic and biological structure of farming broodstocks. There is also a need to recognise the direction of selection in smolt production units, to ensure that change is minimised. Long-term biological and genetic (population and quantitative) monitoring is needed for cultivated stocks.

5.3 There is empirical evidence that releases of hatchery fish have resulted in genetic changes in wild populations. This evidence has stimulated the production of theoretical models which suggest that, where intrusions of farmed fish are as massive as already observed in some instances, the characteristics of native stocks could become extinct after only a few generations. There is a need to further develop the scope and complexity of such models, and to test them experimentally.

5.4 In the light of the concerns expressed at the meeting all steps should be taken to conserve the genetic diversity of natural stocks. The best solution is conservation of the wild stocks through rational management and conservation of their natural environments. The establishment of gene banks is also supported. Improved techniques (for example the cryopreservation of embryonic tissue) for the establishment and operation of gene banks is strongly recommended.

6. DISEASES AND PARASITES

6.1 The conditions of farming can favour the outbreak of disease and the transmission of pathogens increasing the risk of infections being passed between wild and cultured fish. Good husbandry and health management of farmed fish are therefore of great importance, and appropriate controls are desirable.

6.2 The movement of fish from one locality to another except under carefully controlled conditions poses the risk of introducing parasites and new diseases or strains of diseases to which local fish are not adapted, as probably was the case with the introduction of *Gyrodactylus salaris* in Norway. In this case the parasite causes a great problem and has almost completely wiped out some salmon stocks. In the light of the evidence produced at this meeting it seems clear that moving salmon, except under carefully controlled conditions, is a highly undesirable practice and should be minimised.

6.3 There is full support for investigations on the transmission of diseases and parasites between wild and cultured stocks. A major goal should be control of disease in salmon farms.

7. IDENTIFICATION OF CULTURED FISH

7.1 Although methods of identifying fish which have escaped as adults are adequate it is recommended that research be intensified into improved methods for identifying all life stages of cultured fish and their progeny.

7.2 To gauge the scale of the problem it would be valuable for all countries catching salmon to monitor the incidence of fish of farmed origin in their catches and runs. Where large scale escapes of farmed salmon are know to have occurred experiments should be encouraged on the occurrence, behaviour and reproductive success of such fish.

8. CONTAINMENT

8.1 In general, steps should be taken to reduce escapement and reduce the number of farmed fish in spawning populations. Aquaculture operations should be located on the basis of minimising impacts on the wild stocks, and careful attention should be paid to the design and operation of culture units. The maintenance of healthy natural populations will help in resisting the impact of escapes. The deliberate release of surplus or diseased stock should be prevented.

8.2 In view of the impossibility of eliminating the escape of farmed fish, ways must be found to reduce their impact on wild populations. There is a need for the development of cheap, effective and safe methods of sterilisation that do not compromise the economics of farming so that escaped farmed fish do not enter rivers to breed.

8.3 The development of codes of practice used by the farming industry, which would include measures to minimise escapes and their potential impact on wild stocks, is to be encouraged. For examples, zones free of aquaculture could be established near stocks which are designated for conservation reasons, or are threatened. Measures such as emergency netting or trapping of escaped fish could be included. Guidelines on methods of preventing the development of inbred strains could also be prepared.

9. ACKNOWLEDGEMENTS

We would like to express our gratitude to the Norwegian Directorate for Nature Management for organising this meeting which was of considerable importance to the work of NASCO. In this regard the work of Lars Hansen and Svein Mehli was very much appreciated.

Secretary
9 May 1990
Edinburgh

Appendix 1

SUMMARIES OF PRESENTED PAPERS

1. Summary of the introductory session

1.1 Two papers in this session described salmon farming in Norway. The importance of fish farming to Norway was stressed and it was stated that the number of employees in the industry will probably eventually exceed the number employed in the Norwegian oil industry. However, a number of concerns were expressed particularly concerning the use of antibiotics and the escape of farmed fish. A multi-disciplinary committee has been established to propose measures to reduce escapes. The environmental fears are shared by the farmers who wish to see the industry develop in harmony with the environment.

1.2 The genetic origin of Norwegian farmed salmon was described. Although initially derived from at least 40 different rivers and localities, studies at the Institute of Aquaculture Research have shown that after four generations only one or two strains are dominating in each of four populations (year classes).

1.3 A paper describing stock structure in salmon was presented. Data presented illustrated the negative genetic effects of existing practices of exploitation and management of salmonid populations. Artificial reproduction, commercial exploitation and transplantations result in reductions in genetic diversity in salmon populations and therefore cause their biological degradation.

1.4 The theme for the conference was set by a review of the potential interactions between wild and cultured salmon including genetic and disease and parasite interactions.

2. Summary of the session on migration and development of cultured and wild salmon

2.1 Three papers on migration of cultured and wild salmon were presented from Norway. Research carried out on the river Imsa showed that when salmon escape at the smolt stage from freshwater they will return with relatively high precision to that river. When smolts and post-smolts escape from fjord areas in most months they will tend to return to the general area and stray to nearby rivers. However, when post-smolts escape in winter they will stray further away. When fish escape at an adult stage they will enter rivers in the vicinity they are in when for physiological reasons they have to move into freshwater. Small fish escaping in the winter may have poor survival. Comparison of the migratory behaviour of wild and hatchery reared salmon showed that about 6% of wild fish were caught in the sea while only 3% of hatchery fish were caught. Straying into rivers other than the Imsa was greater in hatchery fish and although both wild and hatchery adults returned to coastal waters at the same time, wild fish entered freshwater earlier than hatchery fish and stayed for a longer period of time. While most wild males appeared to spawn up to one third of hatchery reared males did not. Hatchery fish also exhibited marked movements up and down stream and had a higher incidence of injury. Studies in the river Surma showed that both recapture rates and straying of sea ranched salmon increased with increasing release distance from freshwater

and future sea ranching projects should therefore reduce straying by releasing smolts in rivers.

2.2 The results of delayed release experiments in the Baltic were presented. The technique has been proposed for use as part of the management of Baltic salmon since very high recapture rates can be achieved. However, concern has been expressed about the effect of the use of the technique on wild populations. Of 33,000 experimentally released fish about 30% were recaptured, but only 0.3% were recaptured in rivers. Coastal released fish did not seem to show any significant difference in straying frequency compared with river released fish.

2.3 The results of a study from Scotland in which the migration and spawning behaviour of farmed salmon which had escaped from a neighbouring marine farm unit into the river Polla were described. Wild fish tended to be distributed further upstream than the farmed fish but not significantly so. Most farmed female fish spawned in the lower section of the river and commenced spawning significantly later than the wild fish. Farmed males were more widely distributed than the farmed female fish. Excavation of redds showed that the proportion containing farmed eggs ranged from 13% in the upper section to 90% in the lower section. However the effects of this spawning cannot yet be assessed. In some cases farmed fish had removed wild spawn by overcutting existing redds.

3. Summary of the session on salmon spawning behaviour

3.1 A model developed in Canada was used to assess the threat of extinction to native populations experiencing spawning intrusions by cultured Atlantic salmon. On the basis of empirical data it was assumed that interbreeding would occur, that there are large fitness differences between wild and cultured fish and that there would be no hybrid dysgenesis (loss of viability in the eggs of hybrids). Under these conditions the model predicts that if cultured salmon constituted more than 30% of the spawning population and if they enter a river system to spawn at frequent intervals then the native genomes would become extinct within four generations.

3.2 A number of papers dealing with reproductive behaviour and spawning success in brown trout, coho salmon and Atlantic salmon were presented. For coho salmon the relative breeding success of hatchery males compared to wild males was 0.4 while relative breeding success of hatchery females compared to wild females was 0.7. Studies with Atlantic salmon have shown that hatchery males are less successful in breeding than wild males.

3.3 One paper reported that hatchery populations evolve through direct selection, indirect selection and drift at a rapid rate such that hatchery fish are maladapted to conditions in the wild. If these fish reproduce with wild fish many of the progeny will result from crossing of wild males and wild females because these fish have high breeding success. There will be moderate numbers of progeny resulting from wild and hatchery fish crossing and few progeny from hatchery males crossing with hatchery females. It was stated that enhancement should not be undertaken through hatchery stocks but other methods should be considered such as the use of spawning channels.

4. Summary of the session on ecological interference

4.1 A report on the methods developed to enable wild and reared salmon to be distinguished was presented. A number of scale characters in combination have been successfully used to distinguish wild fish from fish farm escapes. However, scale characters could not be used to distinguish ranched or stocked fish from the wild stocks. In addition to scale characters optical isomers of astaxanthin have been used in Norway to separate wild and farmed fish and during discussion attention was drawn to the value of fatty acids (Omega 3 and Omega 6) in separating farmed and wild fish.

4.2 Details of the occurrence of farmed fish in Icelandic rivers were presented which showed that increasing proportions of farmed fish are occurring in the rivers of south-west Iceland. Netting in the Ellidaar river showed that one third of the fish were of farmed origin. These fish were found to be sexually mature and kelts were found in the system. In other rivers in this area the proportion of reared fish was estimated to vary between 29-46% in 1989. Occurrence of farmed fish in the northern rivers is rare but has also increased recently. There is a great deal of concern about the potential interactions and the use of sterile fish in order to reduce the threat is being seriously considered.

4.3 In Norway systematic attempts have been made to assess the numbers of reared fish in the fisheries and on the spawning grounds. A number of problems in the techniques for estimating the number of reared fish were noted. However, the results indicate that a very high proportion of reared fish now occur in homewater fisheries and in the spawning populations. In some cases the number of reared fish exceeded the number of wild fish on the spawning grounds. Concern was expressed about the potential problems these reared fish may pose to wild populations. In a separate study results from three rivers in the Bergen area have shown that escaped female fish will spawn successfully in suitable spawning sites and that these fish may overcut the redds produced by wild fish.

4.4 Experiments that have been carried out to assess competition of wild and cultured salmon were described. The need to improve our understanding of salmon genetics and behavioural ecology was stressed. It was stated that if hatchery fish were unfit in the wild then there would be a cost to the wild stocks if interbreeding occurred but that this would be unlikely to be a long term effect.

5. Summary of the sessions of genetics

5.1 A review of local adaptation in salmonids was presented. Local adaptation is defined as a process whereby natural selection increases the frequency of traits within a population that enhance the survival or reproductive success of individuals expressing them. A review of the literature was presented which favoured the idea that local adaptation is responsible for much of the genetic variation observed among populations in morphological and meristic, behavioural, developmental, physiological and biochemical and life history traits. Local adaptation is evident both on a broad geographical scale and microgeographically and even between "seasonal races" inhabiting the same habitats. Manipulative experiments could provide valuable information on the consequences of changes to adaptive character complexes of wild fish from introgression with cultured salmon.

5.2 Two papers were presented which used protein electrophoresis to examine genetic variation in farmed Atlantic salmon. In Ireland most of the 1990 smolt production was based on five strains, four of Norwegian origin and one of predominantly Scottish origin. It seems likely that the genetic variability in these strains has been decreased by management practices. The five reared strains analysed differed significantly from each other in genetic composition, despite the fact that four strains originated from the same Norwegian source. The need to assay additional enzyme loci was stressed together with the need for better records of the founding and further propagation of strains. Studies in Scotland have shown that the genetic constitution of farmed lines has changed since they were established, with the possibility of directional change at one locus. Most of the changes in culture can be attributed to genetic drift. In Scotland a large proportion of farmed salmon are of Norwegian origin but protein polymorphisms have not proven to be of value in distinguishing Norwegian and Scottish salmon. Mitochondrial DNA offers more possibility of identifying markers, and a potential variant to identify the proportion of Norwegian salmon in a monitoring context has been identified. There is a need to survey more populations however.

5.3 Two experiments were described where the impact of reared fish on wild stocks is being monitored. In Norway a genetic marker (fine spotting) has been identified in brown trout and an experiment has been established to estimate the spawning success of farmed trout and hybridization with wild trout, to examine the growth and survival of different offspring groups and to monitor the wild populations after the gene pulse experiment. In the river Test, England, fin-clipped and microtagged hatchery reared fish are being used to enhance the wild stocks. Significant differences in allele frequencies have been identified between batches of parr from different origins. It is hoped that monitoring and sampling of returning adult salmon could give some insight into the immediate effect of this introduction of non-native fish and the genetical interaction between these fish and the native population.

5.4 A review of the literature on genetic effects of aquaculture on natural fish populations was presented. Empirical observations confirm the often negative and always unpredictable genetic effects on native fish following large scale introductions of exogenous populations. A reduced natural productivity appears to accompany introgression or displacement of natural stocks. A theoretical model of the genetic impacts of introgression between farmed and wild fish indicated that there would be loss of gene variants, reduced fitness and the loss of adaptive stock differences.

5.5 Studies in Canada which have attempted to identify markers to assign a given salmon to a particular population unambiguously were described. These studies have shown that Atlantic salmon have a very low level of variability. One view expressed was that the entire concept of genetic preservation of populations should probably be reconsidered. Continuous changes of allele frequencies is a major component of short term genetic dynamics of populations. It was argued that the allele frequencies of today are probably not unique products of long-term evolution within each strain, but rather the results of recent events including manipulation such as selective harvesting.

6. Summary of session on diseases and parasites

6.1 Modelling studies on the release of *Aeromonas salmonicida* from sea cages in a hypothetical sea loch have indicated that any fish entering the loch would probably encounter viable bacteria and would therefore be at risk of infection. This risk would be higher for fish spending a long period of time in the loch. When furunculosis first occurred in Scotland in the 1920s and 1930s it caused severe losses and since the disease has recently been introduced to Norway and is now being transmitted along the coast, Norwegian salmon populations are potentially at risk. The possibility of an epidemic of the disease as occurred in Scotland cannot therefore be ruled out.

6.2 The results of a survey on the status of infectious disease in wild salmonids from a number of Norwegian rivers were presented. UDN was diagnosed in rivers in south-east Norway and furunculosis in mid-Norway. IPN and the new EIBS virus like particles were detected in rivers from the whole country. BKD was found in only one river. While a number of diseases cause problems in the farm environment, there does not appear to be an infectious disease problem in Norwegian rivers at the moment. However, concern was expressed about the number of escaped fish which might be infected with disease and which could cause a severe problem in future years.

6.3 The results of research on the ectoparasite *Gyrodactylus salaris* in Norway were presented. *G. salaris* is probably a recent introduction to Norway which has been recorded from 34 rivers and about 35 hatcheries. The distribution is associated with stocking of fish from infected salmon hatcheries. Populations of salmon parr have been greatly reduced in infected rivers and catches of adult salmon in these rivers have declined. The goal of the Norwegian authorities is to prevent the further spread of *G. salaris* and to exterminate the parasite in as many infected rivers and hatcheries as possible. Rotenone treatment of the river Vikja in 1981-82 has successfully eradicated the parasite from the wild populations of salmon.

7. Summary of the session on containment

7.1 A number of methods of sterilising fish were described including the production of all female triploid salmon. Such fish have good flesh quality and can be marketed at any time. From the point of view of the interactions between farmed and wild salmon sterile fish do not enter rivers but remain in coastal waters.

7.2 The Norwegian gene banks of wild salmon stocks were described. Gene banks based on cryopreserved sperm and hatchery maintained populations have been established in an attempt to protect the genetic diversity of the wild stocks from escapes from the salmon farming industry. Samples of sperm from 97 river systems have been cryopreserved in addition to hatchery maintained populations on 22 rivers in mid-Norway.

7.3 The measures which are being used in Norway to reduce the impact of reared salmon on wild populations were described. These include measures to reduce the occurrence of farmed fish in nature such as catching escaped fish in the sea and in streams and rivers, and measures to safeguard the wild stocks such as fishing regulations, enhancement of stocks and the establishment of gene banks. In addition, careful attention is being paid to the location of fish farms and to technical improvements in farm design.

JUNE 1990
HELSINKI

ANNEX 24

COUNCIL

PAPER CNL(90)29

DRAFT GUIDELINES FOR THE ESTABLISHMENT AND OPERATION OF SALMON GENE BANKS

CNL(90)29

DRAFT GUIDELINES FOR THE ESTABLISHMENT AND OPERATION OF SALMON GENE BANKS

SUMMARY AND CONCLUSIONS

1. Loss of Atlantic salmon production has occurred in a number of North Atlantic countries and in some cases river systems have been totally lost to salmon production. These losses have occurred for a number of reasons including physical alteration of the habitat, acidification and introductions of parasites etc. The rapid increase in salmon farming poses a number of new threats to the wild stocks. In particular, there is now considerable concern about the genetic threat posed by escapees. A number of recent conferences, including the recent NASCO/ICES meeting, have called for the development of gene banks to protect the genetic resources of the wild stocks. Such action is in line with advice given to international organizations by the Food and Agriculture Organization of the United Nations.

2. Protection of stocks considered to be threatened can be achieved either by the maintenance of hatchery populations or by the establishment of wildlife reserves. Such living gene banks are, however, costly and do not guarantee protection. A relatively inexpensive and secure alternative method of conserving the genetic variation present in the wild stocks is the establishment of gene banks based on cryopreservation.

3. During the Special Session on the Impacts of Aquaculture at its Sixth Annual Meeting, the Council considered a review of the mechanisms, costs and benefits of gene banks for threatened stocks and agreed to consider the adoption of draft guidelines for the establishment and operation of such gene banks. The advantage of this subject receiving international review is that, should the Parties decide to establish gene banks, the agreed techniques used would be precise enough to prevent the introduction of unacceptable levels of genetic selection into the recovered population, and would be compatible internationally.

4. The Council may wish to consider whether it should adopt the draft guidelines in the attached paper so that the basic techniques are agreed. The cost of running a gene bank is not high and, if more stocks are threatened, it may be worth considering the establishment of a central gene bank as a conservation measure. The salmon farming industry might well be interested in supporting such a venture because the industry may need to go back to wild stocks from time to time to regain genetic diversity. Consideration could also be given to the establishment of a central databank of salmon populations in the North Atlantic from which samples have been cryopreserved. For the time being, however, the Organization need only advise the Council at intervals of any technical developments which affect Gene Banks (eg the development of the ability to freeze eggs) so that the guidelines can be adapted in the light of new technologies.

Secretary
Edinburgh
18 April 1990

CNL(90)29

DRAFT GUIDELINES FOR THE ESTABLISHMENT AND OPERATION OF SALMON GENE BANKS

INTRODUCTION:

1.1 Loss of Atlantic salmon production has occurred in a number of North Atlantic countries, and in some cases river systems have been totally lost to salmon production. A new threat, the genetic threat to wild stocks posed by increasing numbers of escapees from salmon aquaculture is potentially serious and the joint NASCO/ICES meeting on "Genetic Threats to Wild Salmon posed by Salmon Aquaculture" endorsed a number of practical measures including the development of gene banks to conserve the genetic resources present in the wild stocks. Similarly, the ICES Study Group on Acid Rain recommended that consideration should be given to the development of programmes to protect the genomes of Atlantic salmon including the creation of refuges and/or preservation of gonadal products. By adopting such a conservative approach towards conservation of genetic resources the probability of inflicting irreparable harm upon systems which are not fully understood would be minimised and such action is in line with advice given to international organizations from the Food and Agriculture Organization of the United Nations.

1.2 During the Special Session on the Impacts of Aquaculture on Wild Stocks, at the Sixth Annual Meeting of the Council, the Secretary presented a paper, CNL(89)21, on the mechanisms, costs and benefits of gene banks for threatened stocks. This review concentrated on cryopreservation of male salmon gametes since this form of gene bank is relatively cheap to establish and offers absolute protection. Gene banks based on hatchery maintained populations or wildlife reserves may also be established but do not offer absolute protection. In the light of this review, the Council asked the Secretary to consider possible draft guidelines for the establishment and operation of gene banks where Parties decide to establish them.

CRYOPRESERVATION:

2.1 Although the short-term storage of fish sperm has been possible for over a hundred years, cryopreservation techniques for long-term storage of fish sperm have been developed relatively recently. During the late 1970s dramatic progress was made with many authors reporting up to 90% fertilization success with cryopreserved spermatozoa. Consequently, gene banks based on cryopreservation of salmon sperm have been developed in a number of countries. As in agriculture, cryopreservation offers considerable advantages to the aquaculture industry and gene banks for use in aquaculture have been established at the Institute of Aquaculture, Stirling, UK and Cell Systems Ltd, Cambridge, UK. A gene bank for the preservation of the genetic diversity of threatened wild stocks of salmon has been established by the Directorate for Nature Management, Trondheim, Norway. These agencies and other researchers working in the field of cryopreservation of salmon sperm would be able

to offer practical advice to any Party contemplating the establishment of a salmon gene bank and addresses and contacts are given in Annex 1.

2.2 In contrast to the successful long-term storage of the embryos of mammalian species, the ova and embryos of fish have not so far been successfully cryopreserved although there are recent reports of some success with grass carp from China and research on cryopreservation of salmon ova is presently being undertaken. Cryopreservation of semen cannot of course preserve any genetic variation inherited along maternal lines. Sex reversal to produce functional males from genetic females could be undertaken. However, in Atlantic salmon the males are the heterogametic sex and there would therefore be little advantage in using this technique. Furthermore, the mitochondrial genome, a small genome inherited along maternal lines, would not be represented in sex reversed sperm. The following guidelines are based on cryopreservation of salmon sperm. In the event that cryopreservation of salmonid ova or embryos becomes possible the guidelines might need to be adapted to take account of the new technologies, although the most cost efficient method of preserving the genetic resources of a population in a gene bank might still be by cryopreservation of sperm.

2.3 In establishing any gene bank system it is essential that the sampling, cryopreservation and thawing procedures are precise to prevent the introduction of unacceptable levels of genetic selection into the recovered population. A reliable system of storage and documentation of samples is also vital. The guidelines below set out a number of procedures concerning sampling strategy, sampling techniques, cryopreservation, documentation and security and use of gene banks which it is hoped will be of benefit to the Parties should they decide to establish gene banks to protect threatened salmon stocks.

DRAFT GUIDELINES FOR THE ESTABLISHMENT AND OPERATION OF SALMON GENE BANKS

1. SAMPLING STRATEGY

1.1 In establishing a gene bank priority should be given to those stocks which are considered to be particularly valuable or vulnerable to loss in order to preserve those genotypes.

1.2 Representative sampling of population gene pools is a major undertaking, requiring the maintenance of very large collections with consequent cost implications. Excessive sampling of any one population reduces the total number of populations that may be sampled with given resources. The objective of the sampling programme should therefore be to obtain as representative a sample of the genetic diversity in the population as possible with samples being collected from all components of the spawning stock. The level of sampling will be determined by the losses in genetic variation that can be tolerated.

1.3 In the absence of genetic mapping, samples from 50-100 individuals from each river system should be collected. In rivers where the populations are threatened with loss repeat sampling over a number of years may be necessary in order to

obtain an adequate number of samples. In addition to the genetic aspects of the sampling strategy, the number of individuals sampled will influence the number of first generation progeny than can be produced for a given river system from the gene bank.

1.4 In the event that the results of genetic mapping are available the optimal sampling strategy should be determined on the basis of this information. In particular the occurrence of sympatric genetically isolated populations may require additional sampling.

2. SAMPLING TECHNIQUES

2.1 Donor males should be collected and anaesthetised and excess water should be removed before stripping begins. Care should be taken in handling the fish since in rivers threatened with loss these fish may be able to participate in natural spawning after release.

2.2 Precautions should be taken to ensure that reared fish are not included with males selected for stripping. Guidance on methods of identifying reared fish was contained in paper CNL(89)21.

2.3 All equipment coming into contact with the semen should be sterilized and dry.

2.4 Donor males yielding watery or bloody semen should be discarded. Care should be taken to avoid contamination of the semen by excess water, urine and excretions from the gut. A number of techniques such as catheterisation and removal of semen by syringe can be used to avoid contamination. Only semen that is creamy white in colour should be collected.

2.5 The same volume of semen should be collected from each individual.

2.6 Precautions should be taken to prevent the spread of diseases and parasites between sampling locations.

2.7 Samples may either be cryopreserved in the field, or stored chilled for up to 1 month and transported back to the laboratory for cryopreservation in conditions permitting precise control of freezing rate.

3. CRYOPRESERVATION TECHNIQUES

3.1 The easiest and most practical cryogen for long-term storage of salmon semen is liquid nitrogen (-196 degrees C). During storage the samples should be maintained under liquid nitrogen since storage in the vapour phase can give rise to variations in temperature.

3.2 Prior to cryopreservation it is necessary to add a cryoprotectant and an extender solution to the semen. A number of cryoprotectants and extender solutions have been successfully used with Atlantic salmon semen. Dimethyl sulphoxide (DMSO) glycerol and methanol have all proved to be successful cryoprotectants for freezing Atlantic salmon milt. The most successful extender solutions have generally been the simpler solutions that most closely resemble the major constituents of seminal plasma. High fertilization rates have been achieved with a freezing medium consisting of 0.3% glucose and 10% DMSO. The use of this medium at a dilution

rate of 1:3 has resulted in high fertilization rates, although higher dilution rates, (up to 1:8) have also been used. The most suitable technique for gene banking will be that which minimises the sperm to egg ratio.

3.3 A number of techniques for storing the extended semen are available including "French" straws or pellets stored in vials. There is little to chose between the techniques since both have been successfully used. The choice of technique will determine the equipment needed.

3.4 Freezing rates should be in the range 30-160 degrees C per minute. Slower freezing rates have generally been unsuccessful. Fine control of freezing rate is most easily achieved using the straw technique.

3.5 The viability of a sub-sample from each fish should be tested following cryopreservation. In addition, genetic screening may also be undertaken in order to try to eliminate any fish farm escapees which may have been inadvertently sampled.

4. DOCUMENTATION AND SECURITY

4.1 Careful attention should be paid to a system of documentation which will guarantee identification of samples such as a computer database providing identifying information. In addition to a unique reference number this database should include information on date and place of capture, results of any viability testing, genetic screening or disease certification. Consideration could be given to the establishment of a central data bank of salmon populations in the North Atlantic from which samples have been cryopreserved.

4.2 Ease and speed of access to samples can be facilitated by colour coding storage containers and straws or vials. Care should be taken when accessing material since samples warm rapidly (400 degrees C per minute) when removed from the liquid nitrogen.

4.3 In addition to identifying information, biological data on the donor male could be included such as length, weight and age data.

4.4 Storage units for cryopreserved samples should be fitted with alarms to warn when low levels of liquid nitrogen occur. Consideration could also be given to a duplicate gene bank to guard against catastrophic loss.

5. USING THE GENE BANK

5.1 Although a great deal of research has been carried out into the methods of freezing, more research is needed into thawing rates and subsequent fertilization procedures in order to formulate protocols for the optimum use of gene banks. A number of techniques for thawing cryopreserved semen have been used including thawing at ambient temperatures, addition of water and use of heated water baths (40-50 degrees C).

5.2 In general, thawing rates should be rapid enough to prevent recrystallisation. Since cryopreserved sperm remain active for less time than fresh sperm partly thawed sperm should be added to the eggs.

5.3 In the event of loss of a natural population, the gene bank samples from that

population could be used for re-establishment of the population. In the case of total loss female gametes could be obtained from the nearest neighbouring river with similar ecological conditions. Alternatively, the recently developed techniques of androgenesis in which the nuclear DNA in the egg is inactivated by irradiation could provide a method of producing progeny with paternal genes only. Either tetraploid males could be used or the diploid condition could be re-established by hydrostatic pressure shock. Since male Atlantic salmon are heterogametic both male and female progeny would result. These techniques are still experimental, however, and will not be applicable to gene banks established to protect the wild stocks until high survival rates are possible.

JUNE 1990
HELSINKI

ANNEX 25

COUNCIL

CNL(90)31

DRAFT GUIDELINES FOR DEVELOPING ADVISORY CODES OF PRACTICE TO MINIMISE THREATS TO WILD SALMON STOCKS

Note: These draft guidelines have previously been circulated to the Parties for comments. Where comments were received these have been included.

CNL(90)31
DRAFT GUIDELINES FOR DEVELOPING ADVISORY CODES OF PRACTICE TO MINIMISE THREATS TO WILD SALMON STOCKS

1. INTRODUCTION

1.1 At its Fifth Annual Meeting the Council considered the possibility of developing a series of recommendations or an advisory code of practice with the aim of reducing genetic, disease, and other potentially damaging interactions between farmed and wild stocks. A review paper, CNL(89)23, was presented which examined the potential impacts and outlined possible measures for minimising these threats.

1.2 The Council agreed that the Secretary should prepare draft guidelines, in consultation with the Parties, and taking account of the Codes of Practice developed by ICES and EIFAC, for consideration by the Council at its Seventh Annual Meeting. It was further agreed that current Codes of Practice, either voluntary or statutory, in salmon farming countries should be obtained and made available to the contracting Parties.

2. THE POTENTIAL THREATS TO WILD STOCKS FROM SALMON AQUACULTURE

2.1 A number of papers have previously been presented to the Council (CNL(88)21; CNL(89)19; CNL(89)20; CNL(89)23) which reviewed the potential threats to the wild stocks from the rapidly expanding salmon farming industry. At its Seventh Annual Meeting a number of new papers reviewing these threats will be presented to the Council (CNL(90)26; CNL(90)27; CNL(90)28 and CNL(90)30).

2.2 The main potential threats posed to the wild salmon stocks by salmonid aquaculture may be summarised as follows:

i) genetic interactions between reared Atlantic salmon (which escape or are released into the wild) and the wild stocks.
ii) ecological interactions between reared Atlantic salmon (which escape or are released into the wild) and the wild stocks.
iii) ecological interactions (including the introduction of non-indigenous disease organisms) between non-indigenous salmonids introduced for use in aquaculture (which escape or are released into the wild) and the wild stocks
iv) disease and parasite interactions
v) impacts of aquaculture on the aquatic environment

2.3 The salmon farming industry has expanded very rapidly to a production in excess of 150,000 tonnes in 1989. Although the extent of many of the interactions is still largely unknown a number of recent conferences and publications have called for the establishment of Codes of Practice to minimise the potential threats. For example, although a range of views concerning the genetic impacts of reared salmon on wild stocks was expressed at the joint NASCO/ICES meeting held in 1989, the meeting endorsed the need to develop Codes of Practice to minimise the threats. More recently the Norwegian meeting on "Interactions between cultured and wild salmon" recommended the adoption of a precautionary approach and supported the development of Codes of Practice (see Paper CNL(90)28).

3. EXISTING CODES OF PRACTICE OR SERIES OF RECOMMENDATIONS

3.1 The continued growth of the salmon farming industry will depend to a large extent on further successful marketing. Cornerstones of the industry's marketing strategy have been the health benefits of salmon in the diet and the image of the wild fish occurring in unpolluted waters. The industry has therefore responded rapidly to environmental issues which are perceived as threatening to the marketability of their product. The industry's organizations in a number of countries have already prepared voluntary Codes of Practice providing guidance on issues, including environmental issues, to their members. It is likely that the industry would be responsive to an internationally agreed Code or series of recommendations designed to minimise the potential threats to wild salmon stocks.

3.2 The Industry Codes and Statutory Codes, as submitted by the Parties, together with the ICES and EIFAC Codes concerning introductions and transfers have been presented separately to the Council. Copies of these Codes have been lodged with the NASCO Secretariat and are available to the Parties on request. Many of these Codes are concerned with specific interactions such as Codes designed to limit the spread of infectious disease, or governing introductions and transfers. The possible measures which might be included in a voluntary Code of Practice or series of recommendations should the Council decide to approve one are detailed below. The elements are intended to protect the wild stocks from the range of potential threats posed by salmon aquaculture.

4. A DRAFT CODE OF PRACTICE OR SERIES OF RECOMMENDATIONS

4.1 Measures to reduce the possible genetic and ecological impacts of reared fish

4.1.1 Establishing and maintaining broodstocks

- local stocks ie stocks from the same river, or a neighbouring river with similar ecological conditions, should be used wherever possible.
- broodstocks should be representative of the entire spawning run of the donor stock eg fish should not be selected on the basis of size etc.
- broodstocks should comprise at least 25-30 pairs of parental fish for each stock component.
- broodstocks should not be held in captivity for more than one generation so as to avoid genetic changes induced by hatchery rearing.
- selection of fish considered to have favourable attributes should be avoided.
- care should be taken to avoid the use of escaped farmed fish as broodstock.

Note:

The guidelines above concerning establishing and maintaining broodstocks should apply to hatcheries providing stocks for release to the wild (ie for enhancement and ranching). The salmon farming industry, however, has developed its own strains with attributes favourable to the farmer. Furthermore, use of wild stocks is likely to be undesirable to the industry because of the risk of introducing disease and parasites to the hatchery. The measures below (paragraphs 4.1.2-4.1.4) might therefore be more acceptable to the salmon farming industry.

4.1.2 Minimising escapes

- efficient security systems should be installed and used at all sea-based and landbased units.

- efficient anti-predator nets should be used on all systems.
- efficient inlet and outlet screens should be installed at all land based units.
- the risk of escape of fish from rearing units as a result of storm or ice damage should be minimised by using appropriate technology for the prevailing conditions.
- sea units should be sited to avoid the risk of damage by collision with vessels and should be adequately marked.
- immediate notification of escapes should be provided to the authorities concerned so that any appropriate action can be taken eg emergency netting.
- farmed stocks could be tagged to enable ease of identification in the event of escape.

4.1.3 River and Coastal Management

- management measures should be maintained in order to protect the abundance of wild stocks.
- particularly valuable stocks of salmon should be protected by the establishment of aquaculture-free zones.

4.1.4 Other Measures

- all female, triploid stock which are sterile could be used.
- gene banks for wild stocks considered to be threatened could be established.
- surplus farm stock should not be released into rivers containing salmon.

4.2 Measures to minimise the possible adverse effects from introductions and transfers

- the appropriate authorities should be consulted at the earliest possible stage prior to the intended introduction.
- the potential for ecological impact between the introduced species and native salmon stocks should be carefully reviewed and evaluated prior to any introduction
- precautions to prevent introduction of disease and parasites should be taken such as quarantine and health inspection reports prior to the introduction. (Some authorities recommend introduction to a quarantine facility from which all effluents are sterilised and use of only first generation progeny if no diseases or parasites become evident).
- intercontinental movements of Atlantic salmon should be avoided and movements across national boundaries discouraged or carefully monitored.
- measures should be taken to prevent the escape of introduced and transferred stocks.

4.3 Measures to minimise disease and parasite interactions

- careful attention should be paid to husbandry techniques to minimise the risk of disease in the reared stock eg use of appropriate stocking densities, careful handling, frequent inspection of fish, avoidance of unnecessary disturbance to fish and provision of a nutritionally balanced diet.
- careful attention should be paid to stock movements to prevent the spread

of diseases between farms eg detailed health inspections, disinfection of transportation equipment, provision of disinfectant wheel and foot baths.
- careful attention should be paid to the separation distance between fish farms.
- diseased stock must not be released to the wild.
- dead or dying fish should be removed from cages and disposed of in an approved manner eg buried in quick or slaked lime or burned.
- particularly valuable stocks of salmon should be protected by the establishment of aquaculture free zones.
- careful attention should be paid to site selection and measures should be taken to minimise deterioration of the environment around the cages so as to minimise stress to the reared fish.

4.4 Measures to minimise the impacts of aquaculture on the environment

- a detailed site survey should be carried out before approval to develop a site for aquaculture is granted eg chemical, biological and hydrographical.
- poorly flushed, shallow sites should be avoided.
- management practices to minimise the impact of waste feed on the environment should be adopted eg careful attention to the amount and timing of feeding, rotation of cages, use of low pollution feeds.
- chemicals must be used with care and in accordance with any manufacturers instructions and Codes of Practice. Chemicals should not be released into the aquatic environment in concentrations likely to damage the natural flora or fauna. Alternatives to chemical treatment might be considered eg the use of wrasse to control sea-lice.
- waste materials such as viscera, dead fish and blood must be disposed of in an approved manner.
- careful attention should be paid to the separation distance between fish farms.
- valuable stocks of salmon should be protected by the establishment of aquaculture free zones.

5. CONCLUSIONS

5.1 The approval of an internationally agreed series of recommendations as a framework for national use at the discretion of the Parties offers some advantages both to governments and to the aquaculture industry.

5.2 If this series of recommendations is approved by the Council the intention would be that the guidelines may be used entirely at the discretion of the Parties concerned. Clearly not all measures would be necessary in all situations but the guidelines might serve as a basis for the production of any mandatory or voluntary Codes should a Party decide to establish them.

Secretary
Edinburgh
9 May 1990

JUNE 1990
HELSINKI

ANNEX 26

COUNCIL

PAPER CNL(90)47

STATEMENT BY NORWAY ON SEA-RANCHING OF ATLANTIC SALMON

The Norwegian delegation wishes to draw attention to the main purposes of the NASCO cooperation, as outlined in the preamble of the Convention. First: The Parties desire "to promote the acquisition, analysis and dissemination of scientific information pertaining to salmon stocks in the North Atlantic Ocean". Secondly: The Parties desire "to promote the conservation, restoration, enhancement and rational management of salmon stocks in the North Atlantic Ocean through international cooperation".

In accordance with these substantial aims of the Convention, we express our concern as to certain aspects of the fast growing sea-ranching of Atlantic salmon, or at least the fast growing tribute to the idea of sea ranching. A major investment in sea-ranching projects ought not to be realized until possible ecological consequences are analysed. Possible effects on the stocks of wild Atlantic salmon are of special interest. A substantial increase of ranched salmon in the sea may also lead to demands of harvesting which might consequently threaten the wild stocks. It is our aim that this concern is brought to the attention of the Council of NASCO, as a significant expression of the "precautionary principle" in this field.

JUNE 1990
HELSINKI

ANNEX 27

COUNCIL

PAPER CNL(90)50

RESOLUTION BY THE COUNCIL IN SUPPORT OF THE UNITED NATIONS GENERAL ASSEMBLY RESOLUTION 44/225, ADOPTED 22 DECEMBER 1989, REGARDING LARGE-SCALE PELAGIC DRIFT NET FISHING

WHEREAS the objective of the North Atlantic Salmon Conservation Organization is to contribute through consultation and cooperation to the conservation, restoration, enhancement and rational management of salmon stocks in the Convention area, taking into account the best scientific evidence available to it and applicable international law; and

WHEREAS Resolution 44/225 adopted by the United Nations General Assembly on 22 December 1989 on large-scale pelagic driftnet fishing and its impacts on the living marine resources of the world's oceans and seas requests entities, such as the Organization, to study urgently large-scale pelagic driftnet fishing and its impacts on the living marine resources and to report their views to the Secretary-General; and

WHEREAS Resolution 44/225 also calls on all members of the international community to cooperate so as to carry out its various provisions.

NOW THEREFORE THE ORGANIZATION

Endorses the substance of Resolution 44/225.

Reiterates that the fishing of salmon, whether by use of large-scale pelagic driftnets or by any other means, beyond areas of fisheries jurisdiction of the coastal states within the Convention area is contrary to the objectives and spirit of the Convention.

Helsinki
15 June 1990

JUNE 1990
HELSINKI

ANNEX 28

COUNCIL

PAPER CNL(90)52

PRESS RELEASE

Delegates from throughout the North Atlantic recently attended the Seventh Annual Meeting of the North Atlantic Salmon Conservation Organization (NASCO) which was held this week at the Intercontinental Hotel, Helsinki.

NASCO is an inter-governmental organization based in Edinburgh, Scotland, which was established in 1984 by an international treaty, with the objective of contributing to the conservation, restoration, enhancement and rational management of salmon stocks. Representatives of Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Economic Community, Finland, Iceland, Norway, Sweden, the Union of Soviet Socialist Republics and the United States of America attended the meeting.

Of particular concern to the Council of NASCO were the recent reports of fishing for salmon in international waters in the North-East Atlantic by vessels re-registered in other countries not party to the Convention. The Council adopted a resolution deploring such activity. In response to a communication from the United Nations, the Council also adopted a resolution reiterating that the fishing of salmon by large scale drift nets or by any other means beyond areas of fisheries jurisdiction of Coastal States within the Convention area is contrary to the objectives and spirit of the Convention.

There have recently been private proposals to purchase NASCO quotas and the Council took note of the basic principles involved. It was agreed that a Working Group would be set up to further explore the matter. The Council took a number of steps to improve the comparability of catch statistics and to look at the range of problems which lead to unreported catches. In addition a Special Session was held on the Impacts of Aquaculture on the wild stocks. Concern was expressed about possible genetic, disease and other potentially damaging effects. The Council encouraged the Parties to undertake the necessary research to improve the understanding of these impacts. Guidelines on the establishment and operation of gene banks to protect threatened stocks were approved and the Council considered draft guidelines for developing advisory Codes of Practices to minimise impacts of aquaculture. Concern was expressed about the impacts of acid rain on salmon stocks.

The winners of the prizes in the NASCO Tag Return Incentive Scheme were also announced. The intention of the scheme is to stimulate and encourage the return of external tags applied for scientific purposes. The grand award of $2500 was won by a Greenlandic fisherman, Mr Math Falksen of Nuuk. Thirty one other prizes - ranging from $100 - $1500 - were awarded with ten prizes in each of NASCO's three Commissions - the North-East Atlantic Commission, the North American Commission and the West

Greenland Commission.

No new regulatory measures were adopted as all three regional Commissions have regulatory measures in force. Scientific reports on the stocks were received. Further research needs were identified.

The Eighth Annual Meeting of NASCO will be held in Edinburgh from 10-14 June 1991.

JUNE 1990
HELSINKI

ANNEX 29

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

LIST OF COUNCIL PAPERS

Paper No	Title
CNL(90)1	Provisional Agenda
CNL(90)2	Draft Agenda
CNL(90)3	Explanatory Memorandum on Draft Agenda CNL(90)2
CNL(90)4	Proposed schedule of meetings
CNL(90)5	Election of Officers
CNL(90)6	Secretary's Report
CNL(90)7	Audited Accounts for 1989
CNL(90)8	Contributions by the Parties
CNL(90)9	Outline of 1991 Draft Budget and 1992 Forecast Budget
CNL(90)10	Report of the Finance and Administration Committee
CNL(90)11	Report of the ICES North Atlantic Salmon Working Group
CNL(90)12	Report of the ICES Advisory Committee on Fisheries Management
CNL(90)13	Objectivity of the Scientific Advice from ICES
CNL(90)14	Returns under Articles 14 and 15 of the Convention
CNL(90)15	Report on Laws, Regulations and Programmes
CNL(90)16	Catch Statistic Returns by the Parties
CNL(90)17	Historical Catch Record 1960-1989
CNL(90)18	Report on means to achieve improved comparability of Catch Statistics
CNL(90)19	Unreported catches

CNL(90)20	Fishing for Salmon in International Waters
CNL(90)21	Principle of the purchase of NASCO Quotas
CNL(90)22	Role of Non-Government Observers in NASCO
CNL(90)23	Summary of microtag, finclip and external tag releases in 1989
CNL(90)24	NASCO Tag Return Incentive Scheme
CNL(90)25	Database of salmon rivers flowing into the NASCO Convention area
CNL(90)26	Report on the development of genetic markers
CNL(90)27	Impact of salmon aquaculture on salmon habitats
CNL(90)28	Report on the Norwegian meeting on impacts of aquaculture on wild stocks
CNL(90)29	Draft guidelines for the establishment and operation of salmon gene banks
CNL(90)30	Review of legislation relating to introductions and transfers
CNL(90)31	Draft guidelines for developing advisory codes of practice to minimise threats to wild salmon stocks
CNL(90)32	Report on the Activities of the Organization in 1989 (not for publication)
CNL(90)33	Dates and places of 1991 and 1992 meetings
CNL(90)34	Draft Report of the Seventh Annual Meeting
CNL(90)35	Draft Press release
CNL(90)36	Pelagic Drift Net Fishing
CNL(90)37	Retirement of Mr Richard A Buck
CNL(90)38	NASCO Tag Reward Scheme Grand Prize
CNL(90)39	Further applications for Non-Government Observer Status to NASCO
CNL(90)40	Working Group on Compensation (1st Draft for Discussion)
CNL(90)41	Draft Decision of the Council on Working Capital

CNL(90)42	Agenda
CNL(90)43	1991 Budget and 1992 Forecast Budget
CNL(90)44	Proposal by the United States for a Resolution by the Council in support of the United Nations General Assembly Resolution 44/225, adopted 22 December 1989, regarding large-scale pelagic drift net fishing
CNL(90)45	Draft request for Scientific Advice from ICES
CNL(90)46	Draft Resolution of the Council of NASCO at its Seventh Annual meeting - Fishing for Salmon in International Waters
CNL(90)47	Statement by Norway on Sea-Ranching of Atlantic Salmon
CNL(90)48	Decision of the Council to request Scientific advice from ICES
CNL(90)49	Resolution of the Council of NASCO at its Seventh Annual meeting - Fishing for Salmon in International Waters
CNL(90)50	Resolution by the Council in support of the United Nations General Assembly Resolution 44/225, adopted 22 December 1989, regarding large-scale Pelagic Drift Net Fishing
CNL(90)51	Report of the Seventh Annual Meeting of the Council
CNL(90)52	Press Release
CNL(90)53	Decision of the Council on Working Capital

NOTE: This list contains all papers submitted to the Council prior to and at the meeting. Some but not all of these papers are included in this report as annexes.