2017

REPORT OF THE THIRTY-FOURTH ANNUAL MEETING OF THE COUNCIL

VARBERG, SWEDEN

6 - 9 JUNE 2017

President:	Mr Steinar Hermansen (Norway)
Vice-President:	Mr Jóannes Hansen (Denmark (in respect of the Faroe Islands and Greenland))
Secretary:	Dr Peter Hutchinson

CNL(17)59

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Report of the Thirty-Fourth Annual Meeting of the Council of the North Atlantic Salmon Conservation Organization

Varbergs Kusthotell, Varberg, Sweden

6 - 9 June 2017

1. Opening of the Meeting

1.1 The President of NASCO, Mr Steinar Hermansen (Norway), opened the meeting and introduced Dr Ingemar Berglund, Director at the Department for Fisheries Management at the Swedish Agency for Marine and Water Management, who welcomed delegates to Varberg (Annex 1). Mr Berglund gave a presentation on salmon in Sweden. The President then made an Opening Statement (Annex 2).

1.2 Written Opening Statements were tabled by Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Union, Norway, the Russian Federation and the United States of America (Annex 3).

1.3 A written Opening Statement was tabled by the European Inland Fisheries and Aquaculture Advisory Committee (EIFAAC) (Annex 4).

1.4 A written Opening Statement was tabled by the North Pacific Anadromous Fish Commission (NPAFC) (Annex 5).

1.5 A written Opening Statement was tabled on behalf of all the Non-Government Organisations (NGOs) attending the Annual Meeting (Annex 6).

1.6 The President expressed appreciation for these statements and the presentation.

1.7 A list of participants at the Thirty-Fourth Annual Meeting of the Council of NASCO is given in Annex 7.

2. Adoption of the Agenda

2.1 The Council adopted its Agenda, CNL(17)49 (Annex 8).

3. Election of Officers

3.1 Pursuant to Rule 14 of the Council's Rules of Procedure, the Council elected Mr Jóannes Hansen (Denmark (in respect of the Faroe Islands and Greenland)) as its President and Ms Sylvie Lapointe (Canada) as its Vice-President to serve for the remainder of their predecessors' terms of office which end at the close of the 2018 Annual Meeting.

4. Financial and Administrative Issues

4.1 Report of the Finance and Administration Committee

The Chair of the Finance and Administration Committee, Ms Kimberly Blankenbeker (USA), presented the report of the Committee, FAC(17)7. On the recommendation of the Committee, the Council took the following decisions:

(i) to accept the 2016 Audited Accounts, FAC(17)2;

(ii) to adopt a Budget for 2018 and to note a Forecast Budget for 2019, CNL(17)51 (Annex 9);

(iii) to confirm the appointment of Saffery Champness as auditors for the 2017 accounts;

(iv) to appoint Saffery Champness as auditors for the 2018, 2019 and 2020 accounts; and

(v) to adopt the report of the Finance and Administration Committee, CNL(17)5.

5. Scientific, Technical, Legal and Other Information

5.1 Secretary's Report

The Secretary made a report to the Council, CNL(17)6, on: the status of ratifications of, and accessions to, the Convention and membership of the regional Commissions; the receipt of contributions for 2017; applications for observer status to NASCO; applications to conduct scientific research fishing; fishing for salmon in international waters by non-NASCO Parties; NASCO's public relations work; and new studies relating to the socio-economic values of the wild Atlantic salmon.

The Secretary reported that there had been no changes to the status of ratifications of, and accessions to, the Convention or in the membership of the regional Commissions. All contributions for 2017 had been received, and there were no arrears. He reported that no applications had been made to conduct scientific research fishing under the NASCO Resolution during 2016.

Since the last Annual Meeting, the Atlantic Salmon Conservation Schools Network (ASCSN), based in the UK, had applied for, and been granted, observer status to NASCO. The objectives of the ASCSN are to foster links between education and organisations involved with the conservation of Atlantic salmon and gain greater recognition and public engagement in salmon conservation. NASCO now has 38 organisations with accredited observer status. One existing NGO, the Association of Salmon Fishery Boards, has changed its name to Fisheries Management Scotland.

The Secretary reported that the Norwegian and Icelandic coastguards had again been contacted to obtain details of airborne surveillance flights over the area of international waters north of the Faroe Islands. During this period the Icelandic coastguard had conducted two surveillance flights and the Norwegian coastguard had conducted seven surveillance flights. No vessels were observed fishing for salmon but the surveillance flights were all conducted in the period June - October so there are long periods of the year with no surveillance. No new information has been obtained from ports or about

landings and transhipments over the last year to suggest that there has been any fishing for salmon by vessels from non-NASCO Parties. The Secretary has continued to liaise with the Secretariats of NAFO and NEAFC.

The Secretary reported that five studies relating to the socio-economic values of wild Atlantic salmon had been brought to the attention of the Secretariat, along with a publication entitled 'Comparative economic performance and carbon footprint of two farming models for producing Atlantic salmon (*Salmo salar*): Land-based closed containment system in freshwater and open net pen in seawater', which may be of interest to the Parties/jurisdictions following the 2016 Theme-based Special Session.

5.2 **Report on the Activities of the Organisation in 2016**

In accordance with Article 5, paragraph 6 of the Convention, the Council adopted a Report on the Activities of the Organisation in 2016, CNL(17)7.

5.3 **Announcement of the Tag Return Incentive Scheme Grand Prize**

The President announced that the winner of the 2017 Grand Prize in the Tag Return Incentive Scheme was Mr Juan Cruz Medina of Bariloche, Argentina. The winning tag was of Russian origin and had been applied to an over-wintered autumn run grilse on the Gold Beach beat of the Ponoi River on 5 June 2016. It was recaptured on 10 June 2016, about 3km further upstream on the Purnach beat. The Council offered its congratulations to the winner.

5.4 **Scientific Advice from ICES**

The representative of ICES presented the report of the Advisory Committee (ACOM), CNL(17)8 (Annex 10). The ICES presentation is available as document CNL(17)55.

5.5 **Report of the International Atlantic Salmon Research Board**

The Report of the Meeting of the International Atlantic Salmon Research Board, CNL(17)9 (Annex 11), was presented by its Chairman, Mr Rory Saunders (USA).

A presentation was made on a new approach to tracking based on a technique for sub-surface oceanographic monitoring ('ROAM'). While this technique may not be suitable for nearshore waters, it offers potential for tracking salmon throughout the North Atlantic area at reasonable cost. The Council noted that a workshop is planned for late 2017 or early 2018 to further develop the technique. The Council recognised that it would be important for the International Atlantic Salmon Research Board to be kept informed of developments.

The Council had been asked by the Board if funds (£5,000) could be made available to support a 'likely suspects' model being developed by the Atlantic Salmon Trust. The Council also considered proposals from the Chair of the IASRB for additional funding to support its work. It was noted that after providing initial seed corn funding when the IASRB was established, the intent was that the Board would seek its own financial resources rather than these being provided through the NASCO budget. The Council also felt that additional information would be needed in relation to the proposal to seek advice on fundraising. The Council decided not to make the funds requested available

to the Board and that the Board should work within its existing funding.

The Secretary was asked to prepare a review of the procedures relating to the work of the International Atlantic Salmon Research Board and its Scientific Advisory Group.

5.6 Report of the Standing Scientific Committee

The Chairman of the Standing Scientific Committee (SSC), Dr Paddy Gargan (European Union), presented a draft request to ICES for scientific advice. The Council adopted a Request for Scientific Advice from ICES, CNL(17)10 (Annex 12).

6. Conservation, Restoration, Enhancement and Rational Management of Atlantic Salmon under the Precautionary Approach

6.1 Theme-based Special Session: Understanding the Risks and Benefits of Hatchery and Stocking Activities to Wild Atlantic Salmon Populations

At its Thirty-Third Annual Meeting, the Council had agreed to hold a half-day Theme-based Special Session during its 2017 Annual Meeting on the theme of risks and benefits to Atlantic salmon populations from hatchery and stocking activities. A Steering Committee, comprising Gérald Chaput (Canada), Paul Knight (NGOs) Ian Russell (European Union) and Arne Sivertsen (Norway) was appointed to work with the Secretary in developing a Programme and Objectives for the session, CNL(17)11.

The over-arching objective for the session was to facilitate an exchange of information relating to understanding the risks and benefits of hatchery and stocking activities to wild Atlantic salmon populations by:

- reviewing the latest scientific information on the risks (genetic and ecological) and benefits (demographic, reduced extinction risk) to wild Atlantic salmon fitness of hatchery and stocking activities;
- reviewing the approaches used to prevent the loss of Atlantic salmon populations at high risk of extinction (e.g. by live gene banking, smolt-to-adult supplementation);
- reviewing the approaches used to minimise unintended negative consequences to wild Atlantic salmon populations from hatchery and stocking activities;
- sharing information on policy frameworks for assessing the risks and benefits and the decision-making process for stocking proposals; and
- reviewing NASCO's Guidelines for Stocking Atlantic Salmon and considering the need for any revisions to them in the light of new information.

A report of the Theme-based Special Session will be prepared by the Steering Committee. The Council decided not to hold a Theme-based Special Session during the Thirty-Fifth Annual Meeting in 2018 given that there will be negotiations for new regulatory measures at that meeting.

6.2 **Special Session: Salmon and People in a Changing World - Planning for the International Year of the Salmon**

At its Thirty-Third (2016) Annual Meeting, the Council had recognised that an International Year of the Salmon (IYS) could provide a very good opportunity to raise awareness of the factors driving salmon abundance, the environmental and anthropogenic challenges they face and the measures being taken to address these. An Outline Proposal for an IYS, entitled 'Salmon and People in a Changing World', which included a proposed rationale, vision, themes and timings for the IYS, together with details of its scope, a governance model and initial budgetary considerations, was broadly accepted by the Council subject to some provisional points of clarification.

The Council held a half-day Special Session on the IYS. An Update on the Work of the International Year of the Salmon Committees and IYS planning (CNL(17)12rev) was presented. The IYS North Atlantic Steering Committee (NASC) had developed a programme for this session (CNL(17)13) and will prepare a report of the session.

The Council welcomed the representatives from NPAFC and expressed its appreciation for their contribution to the Meeting.

The Council noted that the NASC had identified the following tasks to be undertaken by the Coordinating Committee:

- development of an IYS logo;
- development of an IYS website (after considering the pros and cons of having a single shared website or separate websites);
- development of key messages at a salmosphere level;
- development of criteria for IYS endorsement/use of the IYS logo;
- organising an international symposium (through the Symposium Steering Committee).

The NASC considered that the primary task relating to research is to identify priorities and support implementation of research at a basin scale and it did not see the role of the Coordinating Committee as being to identify research priorities at a salmosphere scale. It was recognised that there could be benefits from improved exchanges among scientists working in the North Pacific, North Atlantic and Baltic. The benefits and opportunities for research programmes at a larger geographical scale should first be considered by the IASRB's Scientific Advisory Group or at the international symposium.

The Council asked that the President of NASCO contact the President of NPAFC to discuss the focus of joint activities under the IYS.

At the RFMO level, the NASC had recognised that SALSEA - Track was the Board's research priority. It had developed a number of key messages and examples of activities that might be conducted in the North Atlantic as a contribution to the IYS including production of a 'State of the Salmon' report. It was also recognised that there might be opportunities to raise awareness of the challenges facing salmon at Ministerial and high-level conferences. A one-page briefing note might be prepared. The NASC also recognised that a portal similar to that used for promoting awareness of activities under the World Fish Migration Day might be helpful.

The Council recognised the considerable potential of the IYS and noted that much of the activity in implementing the IYS will be a matter for the Parties and NGOs. There will be a need for enhanced co-ordination, particularly within the North Atlantic area, and the Council agreed on the need to provide for additional resources within the Secretariat to implement the IYS activities identified. In this regard the Council noted that funds were available in the 2018 budget to employ a full-time Assistant Secretary and considered that the duties of this position could include supporting the Secretary on IYS activities.

The Council accepted a proposal from Norway, CNL(17)19 to hold an IYS symposium in conjunction with the 2019 Annual Meeting. The symposium would be entitled 'Managing the Atlantic salmon in a rapidly changing environment - management challenges and possible responses'. The Council agreed that each Party and the NGOs should be asked to nominate one person to serve on the Symposium Steering Committee by the end of August 2017. The Committee should report back prior to the 2018 Annual Meeting. The Committee should develop the programme and make the arrangements for the symposium. This symposium, at a North Atlantic level, is in addition to the major event to launch the IYS.

6.3 **Special Session: Evaluation of Annual Progress Reports under the 2013 - 2018 Implementation Plans**

The primary purpose of the Annual Progress Reports (APRs) under the 2013 - 2018 Implementation Plans is to provide details of: any changes to the management regime for salmon and consequent changes to the Implementation Plans; actions that have been taken under the Implementation Plans in the previous year; significant changes to the status of stocks, and a report on catches; and actions taken in accordance with the provisions of the Convention. The 2017 APRs are contained in documents CNL(17)21 to CNL(17)39. A summary of the 2017 APRs (CNL(17)15) was presented.

The 2017 APRs had been subject to a critical evaluation by the Implementation Plan/Annual Progress Report Review Group to ensure that jurisdictions had provided a clear account of progress in implementing and evaluating the actions detailed in their Implementation Plans, along with the information required under the Convention. The Chairman of the Group, Mr Rory Saunders (USA), presented its report, CNL(17)14 (Annex 13), during a Special Session of the Council. Where shortcomings had been identified in the APRs, the Review Group had developed questions which were sent to the jurisdictions with a request that they provide written responses prior to the Annual Meeting. These responses are contained in CNL(17)20 (Annex 14). There were wide-ranging discussions during the Special Session and these are contained in CNL(17)53 (Annex 15).

The Council accepted the recommendation of the Review Group for changes to the reporting template. The Council agreed that, rather than developing questions for response by the Parties/jurisdictions, in future it should provide details of its evaluation of progress on each action in a table at the end of its review, highlighting shortcomings. The Parties/jurisdictions would be asked to address these shortcomings in their APRs for the following year.

The Council decided to establish a Working Group on Future Reporting under Implementation Plans and Evaluation of these Reports to be Chaired by Mr Rory

Saunders (USA). The Working Group should comprise one, but no more than two, representative(s) from each Party and from NASCO's accredited NGOs and ideally include members of the IP/APR Review Group. The names of those participating in the Working Group should be provided to the Secretariat by 30 August 2017. The Working Group should meet before 31 December 2017. The Terms of Reference for the Working Group are as follows:

(a) review the Guidelines for the Preparation and Evaluation of NASCO Implementation Plans and for Reporting on Progress, CNL(12)44, and advise on any changes required to streamline and further improve reporting in the next Implementation Plan cycle in order to ensure that reports are meaningful and that unnecessary burden is avoided;
(b) review the templates for preparation of Implementation Plans and Annual Progress Reports, CNL(12)42 and CNL(12)43, and advise on any changes to streamline and further improve reporting in the next Implementation Plan cycle, including options for including reporting under the Six Tenets for Effective Management of an Atlantic Salmon Fishery;
(c) propose a schedule for the development and review of Implementation Plans and submission and review of Annual Progress Reports.

The Council agreed that the Review Group should meet for two days to undertake the review of the 2018 APRs.

6.4 **Progress in Implementing the 'Action Plan for Taking Forward the Recommendations of the External Performance Review and the Review of the 'Next Steps' for NASCO', CNL(13)38**

In 2013, the Council had adopted an 'Action Plan for taking forward the recommendations of the External Performance Review and the review of the 'Next Steps' for NASCO' (CNL(13)38). The Secretary reported on progress in implementing the recommendations in the Action Plan, CNL(17)16. The recommendations in the Plan relate to:

- actions which had been implemented or planned at the time the 'Action Plan' was developed and for which there was a need to monitor progress and evaluate outcomes (section 1);
- new actions developed in response to the recommendations contained within the External Performance Review Report and the review of the 'Next Steps' for NASCO (section 2); and
- actions to strengthen NASCO's work on the management of salmon fisheries (section 3).

The Council welcomed the progress that had been made to implement the recommendations.

6.5 **Liaison with the Salmon Farming Industry**

In 2013, the Council agreed that an item should be retained on its Agenda entitled 'Liaison with the Salmon Farming Industry', during which a representative of the International Salmon Farmers' Association (ISFA) would be invited to participate in an exchange of information on issues concerning impacts of aquaculture on wild Atlantic salmon. The regular meetings of the Liaison Group would not be continued, but, if a specific need arose, consideration could be given to convening a joint *Ad hoc* group. ISFA was represented at the Thirty-Fourth Annual Meeting by Dr Jon Arne Grøttum.

The representative of ISFA presented information on Aquaculture Technological Developments Related to Sea Lice Management, CNL(17)50 (Annex 16). The representative of the NGOs indicated that there was a need to quash the argument about the level of mortality of wild stocks related to sea lice. He indicated that if 100 smolts went to sea and 3 returned normally but only 2 came back due to the additional mortality related to sea lice that would equate to a 30% loss of returning fish. He indicated that there was a need to accept that sea lice have impacts on the wild stocks and introduce systems that create a barrier between farmed and wild fish. This would eliminate the costs associated with the treatment.

The representative of ISFA responded that mortality at sea had increased markedly but there was still an impression that sea lice mortality explained the variation in wild salmon survival when the main factor is at sea mortality. He recognised that there was a need to control sea lice and that the authorities should set the regulations but not define the approaches to comply.

The representative of the NGOs responded that the establishment of a barrier to protect wild fish using approaches other than closed containment systems would be welcome.

The representative of ISFA indicated that while there are several projects involving closed containment systems, there are challenges and noted that all farmed production systems have some impacts.

The representative of the European Union noted that the presentation by ISFA had referred to several techniques for sea lice control. He asked how widely these are used and what work is on-going with wrasse for biological control. He referred to a large (€8 million) project on fish parasites, including sea lice, that had been funded under the EU Horizon 2020 Framework Programme for research and innovation.

The representative of ISFA indicated that he did not know how many sites or companies are using new approaches to sea lice control, but chemical treatments are not effective so new techniques are being used, including wrasse which are deployed at most sites.

6.6 **New or Emerging Opportunities for, or Threats to, Salmon Conservation and Management**

In accordance with the 'Strategic Approach for NASCO's Next Steps', this item had been included on the Council's Agenda annually and ICES had been requested to provide relevant information, which is contained in document CNL(17)8. The following information had been provided by ICES:

- a review of major threats to Atlantic salmon in Norway;
- gene flow from farmed escapees altering the life history of wild Atlantic salmon;
- update on Red Vent Syndrome;
- disease reports from Sweden;
- disease reports from the Russian Federation;
- update on sea lice investigations in Norway;
- progress with implementing the Quality Norm for Norwegian salmon populations;
- poor juvenile recruitment in UK (England and Wales) in 2016;
- progress in stock assessment models - Embedding Atlantic salmon stock assessment within an integrated Bayesian life cycle modelling framework;
- new opportunities for sampling salmon at sea including the International Ecosystem Summer Survey of the Nordic Seas;
- by-catch of salmon in the Icelandic mackerel fishery; and
- tracking and acoustic tagging studies.

Relevant information is also presented in the summary of Annual Progress Reports, CNL(17)15.

6.7 **Incorporating Social and Economic Factors in Salmon Management**

The Secretary reported that details of five studies related to the values of wild Atlantic salmon had been provided. Details of these studies are available in document CNL(17)6. The Council agreed to retain this item on future agendas.

6.8 **Management and Sampling of the St Pierre and Miquelon Salmon Fishery**

A report on the Management and Sampling of the St Pierre and Miquelon Salmon Fishery, CNL(17)17 (Annex 17), was presented by the representative of France (in respect of St Pierre and Miquelon). This report had also been considered in the North American Commission. The North American Commission had requested that the President write to France (in respect of St Pierre and Miquelon) noting NASCO's concerns and encouraging France (in respect of St Pierre and Miquelon) to become a member of NASCO. The Council agreed to this request.

6.9 **Reports on the Conservation Work of the Three Regional Commissions**

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

The representative of Canada provided additional information regarding a significant new activity notice relating to transgenic salmon, CNL(17)56 (Annex 18).

7. Appointment of a New Secretary

7.1 The President advised the Council that Dr Emma Hatfield had been appointed as the new Secretary of NASCO with effect from 1 October 2017. A statement from Dr Hatfield was made available to the Council, CNL(17)60.

8. Other Business

8.1 There was no other business.

9. Date and Place of Next Meeting

9.1 The Council accepted an invitation to hold its Thirty-Fifth Annual Meeting in the United States during 12 - 15 June 2018.

9.2 The Council accepted an invitation to hold its Thirty-Sixth Annual Meeting in Norway during 4 - 7 June 2019.

10. Report of the Meeting

10.1 The Council agreed the report of its Meeting.

11. Press Release

11.1 The Council agreed a Press Release, CNL(17)58 (Annex 19).

12. Close of the Meeting

12.1 A closing statement was made by the representative of NPAFC, (Annex 20)

12.2 The Secretary made a closing statement (Annex 21). The President closed the Thirty-Fourth Annual Meeting of NASCO.

Note: The annexes mentioned above begin on page 23, following the French translation of the report of the meeting. A list of Council papers is included in Annex 22.

CNL(17)59

Compte-rendu de la trente-quatrième session annuelle du Conseil de l'Organisation pour la conservation du saumon de l'Atlantique Nord

Varbergs Kusthotell, Varberg, Suède

6 - 9 juin 2017

1. Ouverture de la session

1.1 Le Président de l'OCSAN, M. Steinar Hermansen (Norvège), a ouvert la session et présenté le Dr Ingemar Berglund, Directeur du Département pour la Gestion des Pêcheries de l'Agence suédoise pour la gestion maritime et de l'eau, qui a accueilli les délégués à Varberg (Annexe 1). Mr Berglund a effectué une présentation sur le saumon en Suède. Le Président a ensuite fait une déclaration d'ouverture (Annexe 2).

1.2 Des déclarations d'ouverture écrites ont été présentées par le Canada, le Danemark (pour les Iles Féroé et le Groenland), l'Union européenne, la Norvège, la Fédération de Russie et les Etats-Unis (Annexe 3).

1.3 Une déclaration d'ouverture écrite a été présentée par la Commission européenne consultative pour les pêches et l'aquaculture dans les eaux intérieures (CECPAI) (Annexe 4).

1.4 Une déclaration d'ouverture écrite a été présentée par la Commission du poisson anadrome du Pacific Nord (CPAPN) (Annexe 5).

1.5 Une déclaration d'ouverture écrite a été présentée au nom de toutes les Organisations non gouvernementales (ONGs) qui ont participé à la session annuelle (Annexe 6).

1.6 Le Président a exprimé son appréciation pour ces déclarations et la présentation.

1.7 Une liste des participants à la trente-quatrième session annuelle du Conseil de l'Organisation pour la conservation du saumon de l'Atlantique Nord est donnée en Annexe 7.

2. Adoption de l'ordre du jour

2.1 Le Conseil a adopté son ordre du jour, CNL(17)49 (Annexe 8).

3. Election des Membres du Bureau

3.1 En vertu de l'Article 14 du Règlement Intérieur du Conseil, le Conseil a élu M. Jóannes Hansen (Danemark (pour les Iles Féroé et le Groenland)) en tant que Président et Mme Sylvie Lapointe (Canada) en tant que Vice-présidente pour servir pendant le reste du mandat de leurs prédécesseurs jusqu'à la clôture de la session annuelle de 2018.

4. Questions financières et administratives

4.1 Rapport du Comité financier et administratif

La Présidente du comité financier et administratif, Mme Kimberly Blankenbeker (Etats-Unis), a présenté le rapport du Comité, FAC(17)7. Sur les conseils du Comité, le Conseil a pris les décisions suivantes :

(i) accepter les comptes vérifiés de 2016, FAC(17)2 ;

(ii) adopter un budget pour 2018 et noter un budget prévisionnel pour 2019, CNL(17)51 (Annexe 9) ;

(iii) confirmer la nomination de Saffery Champness en tant que commissaires aux comptes de 2017;

(iv) nommer Saffery Champness en tant que commissaires aux comptes pour les comptes de 2018, 2019 et 2020 ; et

(v) adopter le rapport du Comité financier et administratif, CNL(17)5.

5. Informations scientifiques, techniques, juridiques et autres

5.1 Rapport du Secrétaire

Le Secrétaire a fait un rapport au Conseil, CNL(17)6, sur: les statuts de ratification de la Convention et d'accession à celle-ci et le statut de membre des Commissions régionales ; la réception des contributions pour 2017 ; les demandes effectuées pour le statut d'observateur de l'OCSAN ; les demandes effectuées pour mener une pêche à des fins de recherches scientifiques ; pêche au saumon en eaux internationales par des parties extérieures à l'OCSAN ; travail de relations publiques de l'OCSAN; et des nouvelles études relatives aux valeurs socio-économiques du Saumon atlantique sauvage.

Le Secrétaire a rapporté qu'il n'y avait eu aucun changement aux statuts de ratification de la Convention ou d'accession à celle-ci, ni au statut de membre des Commissions régionales. Toutes les contributions pour 2017 ont été reçues, et il n'y avait pas d'arriérés. Il a rapporté qu'il n'y avait eu aucune candidature pour exercer une pêche à des fins de recherches scientifiques conformément à la Résolution de l'OCSAN courant 2016.

Depuis la dernière session annuelle, le Réseau des écoles pour la conservation du saumon atlantique (ASCSN), basé au Royaume Uni, a postulé pour le statut d'observateur de l'OCSAN, ce qui lui a été accordé. Les objectifs de l'ASCSN sont de nourrir des liens entre l'éducation et des organisations impliquées dans la conservation du saumon atlantique et de sensibiliser le public pour qu'il s'implique davantage dans la conservation du saumon. 38 organisations sont actuellement accréditées en tant qu'observatrices de l'OCSAN. Une ONG actuelle, l'Association of Salmon Fishery Boards, a changé de nom pour devenir Fisheries Management Scotland.

Le Secrétaire a rapporté que les garde-côtes norvégiens et islandais avaient encore été contactés pour obtenir des informations relatives aux vols de surveillance aérienne au-dessus de la zone des eaux internationales au Nord des Iles Féroé. Au cours de cette

période les garde-côtes islandais avaient mené deux vols de surveillance aérienne et les garde-côtes norvégiens avaient mené sept vols de surveillance. Aucuns bateaux n'ont été observés pêchant le saumon mais les vols de surveillance ont tous été menés sur la période de juin – octobre, il y a donc de longues périodes de l'année pendant lesquelles aucune surveillance n'est effectuée. Aucunes nouvelles informations n'ont été obtenues de la part des ports ni sur des débordements et transbordements au cours de l'année dernière suggérant qu'une quelconque pêche au saumon aurait été effectuée par des navires de parties extérieures à l'OCSAN. Le Secrétaire a maintenu un lien avec les Secrétariats de la CPANE et l'OPANO.

Le Secrétaire a rapporté que cinq études relatives aux valeurs socio-économiques du saumon atlantique sauvage avait été portées à la connaissance du Secrétariat, ainsi qu'une publication intitulée 'Performance économique comparative et empreinte carbone de deux modèles d'exploitation de production de saumon atlantique (*Salmo salar*) : Système de confinement fermé terrestre en eau douce et cages en filet en mer', qui peuvent présenter un intérêt pour les Parties/juridictions suite à la séance spéciale thématique de 2016.

5.2 **Rapport sur les activités de l'Organisation en 2016**

Conformément à l'Article 5, paragraphe 6 de la Convention, le Conseil a adopté un Rapport sur les activités de l'Organisation en 2016, CNL(17)7.

5.3 **Annonce du gagnant du Grand Prix du Programme incitatif au renvoi des étiquettes**

Le Président a annoncé que le gagnant du Grand Prix de 2017 du Programme incitatif de l'OCSAN au renvoi des étiquettes était M. Juan Cruz Medina de Bariloche, en Argentine. L'étiquette gagnante d'origine russe avait été appliquée à un madeleineau retourné à la rivière en automne sur la section 'Gold Beach' de la rivière Ponoi le 5 juin 2016. Il a été repris le 10 juin 2016, environ 3km en amont, sur la section Purnach. Le Conseil a adressé ses félicitations au gagnant.

5.4 **Conseils scientifiques du CIEM**

Le représentant du CIEM a présenté le rapport du Comité consultatif (ACOM), CNL(17)8 (Annexe 10). La présentation du CIEM est disponible dans le document CNL(17)55.

5.5 **Rapport de la Commission internationale de recherche sur le saumon atlantique**

Le rapport de la session de la Commission internationale de recherche sur le saumon atlantique, CNL(17)9 (Annexe 11), a été présenté par son Président, M. Rory Saunders (Etats-Unis).

Une présentation a été effectuée sur une nouvelle approche de suivi fondée sur une technique pour la surveillance océanographique sous-marine ('ROAM'). Si cette technique peut ne pas être appropriée dans les eaux à proximité des côtes, elle présente un potentiel pour suivre le saumon dans l'ensemble de la Atlantique Nord à un prix raisonnable. Le Conseil a noté qu'un atelier est prévu pour la fin 2017 ou le début 2018 pour développer la technique encore davantage. Le Conseil a reconnu qu'il serait

important pour la Commission internationale de recherche sur le Saumon atlantique qu'il soit tenu informé des développements.

La Commission a demandé au Conseil si un financement (£5 000) pourrait être accordé pour soutenir le développement d'un modèle de causes potentielles de mortalité par l'Atlantic Salmon Trust. Le Conseil a aussi étudié des propositions du Président de la CIRSA concernant des financements supplémentaires pour soutenir son travail. Il a été noté qu'après l'attribution de financement initial à l'époque de la création de la CIRSA, l'intention était que la Commission pourvoit à ses propres ressources financières pour éviter qu'elles ne soient tirées du budget de l'OCSAN. Le Conseil a aussi considéré que des informations supplémentaires seraient nécessaires concernant la proposition de demande de conseil sur le financement. Le Conseil a décidé de ne pas rendre les fonds demandés disponibles à la Commission et que la Commission devrait travailler dans le cadre de son financement actuel.

Le Conseil a demandé au Secrétaire de préparer une révision des procédures pour le travail de la Commission internationale de recherche sur le saumon atlantique et de son Groupe consultatif scientifique.

5.6 Compte rendu du Comité scientifique permanent

Le Président du Comité scientifique permanent (SSC), le Dr Paddy Gargan (Union européenne), a présenté une demande provisoire de conseil scientifique au CIEM. Le Conseil a adopté une Demande de conseil scientifique auprès du CIEM, CNL(17)10 (Annexe 12).

6. Conservation, restauration, accroissement et gestion rationnelle du saumon atlantique dans le cadre de l'approche préventive

6.1 Séance spéciale thématique : Comprendre les risques et les avantages des activités d'élevage en écloserie et d'empoissonnement pour les populations de Saumon atlantique sauvage

Lors de sa Trente-troisième session annuelle, le Conseil a convenu de tenir une séance spéciale thématique d'une demi-journée au cours de sa session annuelle de 2017 sur le thème des risques et des avantages des activités d'élevage en écloserie et d'empoissonnement pour les populations de Saumon atlantique sauvage. Un Comité de direction, comprenant Gérald Chaput (Canada), Paul Knight (ONGs) Ian Russell (Union européenne) et Arne Sivertsen (Norvège) a été nommé pour travailler avec le Secrétaire au développement d'un Programme et d'objectifs pour la séance, CNL(17)11.

L'objectif principal de la séance était de faciliter l'échange d'informations sur ce que l'on comprend des risques et avantages des activités d'élevage en écloserie et d'empoissonnement pour les populations de Saumon atlantique sauvage en :

- passer en revue les informations scientifiques les plus récentes sur les risques (génétiques et écologiques) et avantages (démographiques, réduction des risques d'extinction) du caractère approprié des activités d'élevage en écloserie et d'empoissonnement pour la valeur sélective des populations de Saumon atlantique sauvage;

- passer en revue les approches employées pour prévenir la perte des populations de Saumon atlantique présentant des risques élevés d'extinction (e.g. banques de gènes vivants, l'ensemencement des saumoneaux élevés en captivité jusqu'à l'âge adulte (ESA)) ;
- passer en revue les approches employées pour minimiser les conséquences négatives involontaires sur les populations de Saumon atlantique sauvage des activités d'élevage en écloserie et d'empoissonnement;
- partage d'informations sur les cadres de politique pour évaluer les risques et avantages et le processus de prise de décision pour les propositions d'empoissonnement ; et
- passer en revue les Directives de l'OCSAN pour l'empoissonnement de Saumon atlantique et étudier les besoins éventuels de les réviser à la lumière de nouvelles informations.

Un rapport de la Séance spéciale thématique sera préparé par le Comité de direction. Le Conseil a décidé de ne pas tenir de Séance spéciale thématique pendant la Trente cinquième session annuelle en 2018 étant donné que des négociations pour de nouvelles mesures de règlementation auront lieu lors de la session.

6.2 **Séance spéciale : Du saumon et des hommes dans un monde changeant – Planification pour l'Année internationale du saumon**

Lors de sa Trente-troisième session annuelle (2016), le Conseil avait reconnu qu'une Année internationale du saumon (IYS) pourrait présenter une excellente opportunité pour sensibiliser le public aux facteurs déterminant l'abondance du saumon et les défis environnementaux et anthropogéniques auxquels ils font face et les mesures entreprises pour les traiter. Une proposition succincte pour une Année internationale du saumon (intitulée 'Du saumon et des hommes dans un monde changeant'), qui comprenait une proposition de justification, une vision, des thèmes et des délais pour l'IYS, ainsi que des informations concernant sa portée, un modèle de gouvernance et des considérations budgétaires initiales, a été largement acceptée par le Conseil sous réserve de quelques points de clarification provisoires.

Le Conseil a tenu une séance spéciale d'une demi-journée sur l'IYS. Une Mise à jour sur le travail des Comités de l'Année internationale du saumon et planification pour l'IYS (CNL(17)12rev) a été présentée. Le Comité de direction de l'Atlantique Nord de l'IYS (North Atlantic Steering Committee - NASC) avait développé un programme pour cette session (CNL(17)13) et va préparer un rapport de la séance.

Le Conseil a accueilli les représentants de la CPAPN et exprimé son appréciation de leur contribution à la Session.

Le Conseil a noté que le NASC avait identifié les tâches suivantes devant être prise en charge par le Comité de coordination :

- développement d'un logo IYS ;
- développement d'un site IYS (après avoir étudié les pour et les contre d'un seul site web partagé ou de sites web séparés) ;
- développement de messages clé au niveau salmosphère ;

- développement de critères pour l'approbation par l'IYS/ l'utilisation du logo IYS ;
- organisation d'un symposium international (à travers le Comité de direction du Symposium international).

Le NASC a considéré que la tâche principale en ce qui concerne la recherche est d'identifier les priorités et soutenir la mise en œuvre de la recherche à l'échelle du bassin et il n'a pas vu le rôle du Comité de coordination comme devant consister à identifier les priorités de recherche à l'échelle de la salmosphère. On a reconnu que l'amélioration des échanges entre les scientifiques travaillant dans le Pacifique Nord, l'Atlantique Nord et la Baltique pourrait présenter des avantages. Les avantages et les opportunités pour les programmes de recherche à une plus grande échelle géographique devraient tout d'abord être étudiés par le Groupe consultatif scientifique de la CIRSA ou au Symposium international.

Le Conseil a demandé au Président de l'OCSAN de contacter le Président de la CPAPN pour discuter des questions prioritaires d'activités conjointes dans le cadre de l'IYS.

Au niveau de l'ORGP, le NASC avait reconnu que SALSEA - Track était la priorité de recherche de la CIRSA. Il avait développé un certain nombre de messages clés et d'exemples d'activités qui pourraient être menés dans l'Atlantique Nord comme contribution à l'IYS y compris la production d'un rapport sur 'L'état du saumon'. On reconnait aussi qu'il existerait des opportunités pour sensibiliser sur les défis auxquels le saumon est confronté lors de conférences de haut responsables ou ministérielles. Une note de briefing d'une page pourrait être préparée. Le NASC a aussi reconnu qu'un portail similaire à celui qui était utilisé pour promouvoir la sensibilisation sur les activités menées dans le cadre de la Journée Mondiale de la Migration des Poissons (WFMD) pourrait être utile.

Le Conseil a reconnu le potentiel considérable de l'IYS et a noté qu'une grande partie des activités pour mettre en œuvre l'IYS serait une question à poser aux Parties et aux ONGs. Il sera nécessaire de valoriser la coordination, en particulier au sein de la zone Nord Atlantique, et le Conseil a convenu qu'il serait nécessaire de fournir davantage de ressources au sein du Secrétariat pour mettre en œuvre les activités identifiées pour l'IYS. A cet égard le Conseil a noté que des fonds étaient disponibles dans le budget 2018 pour recruter un Secrétaire adjoint à temps plein et a envisagé que les fonctions de ce poste incluent de soutenir le Secrétaire dans le cadre des activités de l'IYS.

Le Conseil a accepté une offre de la Norvège, CNL(17)19, de tenir un symposium d'IYS en lien avec la session annuelle de 2019. Le symposium serait intitulé 'Gérer le Saumon atlantique dans un environnement qui change rapidement - défis de gestion et mesures possibles'. Le Conseil a convenu qu'il faudrait demander pour chaque Partie et pour les ONGs qu'ils nomment une personne qui servirait au sein du Comité de direction du symposium d'ici à la fin août 2017. Le Comité devrait faire un rapport avant la session annuelle de 2018. Le Comité devrait développer le programme et organiser le symposium. Le symposium au niveau de l'Atlantique Nord, s'ajoute à l'évènement principal pour lancer l'IYS.

6.3 **Séance spéciale : évaluation des Rapports de progrès annuels réalisés dans le cadre des programmes d'application de 2013 - 2018**

L'objectif principal des Rapports de progrès annuels (APRs) conformément aux Programmes d'application de 2013 - 2018 est de fournir des informations sur toutes modifications du régime de gestion du saumon et sur les changements des Programmes d'application qui en découlent; les mesures qui ont été prises conformément aux Programmes d'application au cours de l'année précédente ; les changements significatifs au statuts des stocks, et un rapport sur les prises ; et les mesures prises conformément aux dispositions de la Convention. Les APRs de 2017 sont contenus dans les documents CNL(17)21 à CNL(17)39. Un résumé des rapports de 2017 (CNL(17)15) a été présenté.

Les APRs de 2017 avaient fait l'objet d'une évaluation critique par le Comité de révision des Programmes d'application/des APRs pour s'assurer que les juridictions avaient fourni un compte rendu clair du progrès de l'application et l'évaluation des mesures détaillées dans leurs Programmes d'application, de même que les informations requises en vertu de la Convention. Le Président du Groupe, M. Rory Saunders (Etats-Unis), a présenté son rapport, CNL(17)14 (Annexe 13), au cours de la séance spéciale du Conseil. En cas de manques dans les APRs, le Comité de révision avait développé des questions auxquelles les juridictions destinataires avaient reçu la demande de répondre par écrit avant la session annuelle. Ces réponses sont contenues dans le CNL(17)20 (Annexe 14). Il y a eu des discussions assez larges au cours de la séance spéciale et celles-ci sont incluses en CNL(17)53 (Annexe 15).

Le Conseil a accepté la recommandation du Groupe de révision relative à des changements au modèle de reporting. Le Conseil a convenu que, plutôt que de développer des questions à poser aux Parties/juridictions, à l'avenir il devrait fournir des détails de ses évaluations du progrès de chaque mesure dans un tableau à la fin de chaque évaluation pour souligner les lacunes. Il serait demandé aux Parties/juridictions de régler ces lacunes dans leurs APRs pour l'année suivante.

Le Conseil a décidé d'établir un Groupe de travail sur le Reporting futur en vertu des Programmes d'application et de l'Evaluation de ces rapports et devant être présidé par M. Rory Saunders (Etats-Unis). Le Groupe de travail devrait comprendre un, mais pas plus de deux, représentant(s) de chacune des Parties et des ONGs accréditées par l'OCSAN et idéalement inclure des membres du Groupe de révision des Programmes d'application/des APRs. Les noms des personnes participant au Groupe de travail devraient être communiqués au Secrétariat d'ici au 30 août 2017. Le Groupe de travail devrait se réunir avant le 31 décembre 2017. Les Termes de référence pour le Groupe de travail sont les suivants :

(a) passage en revue des Directives pour la préparation et l'évaluation des Programmes d'application de l'OCSAN et pour les rapports sur les progrès, CNL(12)44, et conseiller sur tous changements requis pour rationaliser et améliorer le reporting dans le prochain cycle des Programmes d'application afin de s'assurer que les rapports ont du sens et qu'un fardeau inutile est évité;

(b) passage en revue des modèles pour la préparation des Programmes d'application et des Rapports de progrès annuel, CNL(12)42 et CNL(12)43, et conseiller sur tout changements requis pour rationaliser et améliorer le reporting dans le prochain cycle du Programme d'application, y compris les options pour inclure le reporting

sous les Six principes pour une gestion efficace d'une pêcherie du saumon Atlantique;

(c) proposer un agenda pour le développement et le passage en revue des Programmes d'application et la soumission et le passage en revue des Rapports de progrès annuel.

Le Conseil a convenu que le Groupe de révision se réunisse pendant deux jours pour engager la révision des APRs de 2018.

6.4 **Progrès effectué dans l'application du 'Plan d'action pour mettre en œuvre les conseils de l'étude externe des performances et la révision des 'Prochaines Etapes' pour l'OCSAN', CNL(13)38**

En 2013, le Conseil a adopté un 'Plan d'action pour mettre en œuvre les conseils de l'étude externe des performances et la révision des 'Prochaines étapes' pour l'OCSAN' (CNL(13)38). Le Secrétaire a rendu compte des progrès de la mise en œuvre des conseils dans le Plan d'action, CNL(17)16. Les conseils figurant dans le Plan sont liés à :

- des actions planifiées ou mises en œuvre à l'époque du développement du 'Plan d'action' et pour lesquelles un suivi du progrès et une évaluation des résultats était nécessaire (section 1) ;
- nouvelles actions développées en réponse aux recommandations contenues dans le rapport de l'étude externe des performances et la révision des 'Prochaines étapes' de l'OCSAN (section 2) ; et
- actions pour renforcer le travail de gestion des pêcheries au saumon de l'OCSAN (section 3).

Le Conseil a accueilli le progrès effectués pour mettre en œuvre les recommandations.

6.5 **Liaison avec l'industrie salmonicole**

En 2013, le Conseil a convenu qu'un point devrait être maintenu dans son ordre du jour intitulé 'Liaison avec l'industrie salmonicole', au cours duquel un représentant de l'Association des producteurs de saumons internationaux (ISFA) serait invité à participer à un échange d'informations sur des questions relatives à l'impact de l'aquaculture sur le Saumon atlantique sauvage. Les réunions régulières du Groupe de liaison ne se poursuivraient pas, mais, si un besoin particulier se présentait, on pourrait envisager de convoquer un groupe mixte *Ad hoc*. L'ISFA était représenté à la Trente-quatrième session annuelle par le Dr Jon Arne Grøttum.

Le représentant de l'ISFA a présenté des informations sur la Gestion des développements technologiques aquacole relatifs à la gestion des poux du poisson, CNL(17)50 (Annexe 16). Le représentant des ONGs a indiqué qu'il était nécessaire de mettre fin au litige relatif au niveau de mortalité des stocks sauvages relatifs aux poux du poisson. Il a indiqué que si 100 saumoneaux allaient en mer et que 3 rentraient normalement mais que seuls 2 rentraient du fait d'une plus grande mortalité due aux poux du poisson ceci équivaudrait à une perte de 30% des retours de poissons. Il a indiqué qu'il était nécessaire d'accepter que les poux du saumon avaient des impacts sur les stocks sauvages et d'introduire des systèmes créant une barrière entre les

poissons d'élevage et les poissons sauvages. Ceci éliminerait les coûts associés au traitement.

Le représentant de l'ISFA a répondu que la mortalité en mer avait considérablement augmenté mais que l'on gardait l'impression que la mortalité due aux poux du poisson expliquait la variation en matière de survie du saumon sauvage lorsque le facteur principal est la mortalité en mer. Il a reconnu qu'il était nécessaire de contrôler les poux de poisson et que les autorités devraient fixer les règlements mais ne pas définir les approches à respecter.

Le représentant des ONGs a répondu que l'établissement d'une barrière pour protéger le poisson sauvage en utilisant des approches différentes des systèmes de confinement fermés serait la bienvenue.

Le représentant de l'ISFA a indiqué que bien qu'il existe plusieurs projets impliquant des systèmes de confinement fermés, il existe des défis et a souligné que tous les systèmes de production d'élevage avaient des impacts.

Le représentant de l'Union européenne a souligné que la présentation par l'ISFA avait fait référence à différentes techniques pour contrôler les poux du poisson. Il a demandé dans quelle mesure celles-ci étaient utilisées et quel travail était poursuivi avec les labres pour un contrôle biologique. Il a fait référence à un vaste projet (€8 million) sur les parasites des poissons, y compris les poux du poisson, qui avait été financé dans le cadre du Programme-cadre de l'UE Horizon 2020 pour la recherche et l'innovation.

Le représentant de l'ISFA a indiqué qu'il ne connaissait pas le nombre de sites ou d'entreprises utilisant de nouvelles approches pour contrôler les poux du poisson, mais que les traitements chimiques ne sont pas efficaces, et que des nouvelles techniques sont donc utilisées, y compris celle qui consiste à déployer des labres sur la plupart des sites.

6.6 Nouvelles opportunités ou opportunités naissantes pour, ou menaces contre, la conservation et la gestion du saumon

Conformément à 'l'Approche stratégique des Prochaines étapes de l'OCSAN' ; ce point a été inclus dans l'ordre du jour du Conseil et il a été demandé au CIEM de fournir des informations adéquates, contenues dans le document CNL(17)8. Les informations suivantes ont été fournies par le CIEM :

- un passage en revue des menaces principales sur le Saumon atlantique en Norvège;
- flux de gènes issus de poissons qui se sont échappé d'élevages altérant l'histoire de vie du Saumon atlantique sauvage ;
- mise à jour sur le Syndrome inflammatoire périannal ;
- rapports sur les maladies de la Suède;
- rapports sur les maladies de la Fédération de Russie ;
- mise à jour sur les études effectuées sur les poux du poisson par la Norvège ;
- progrès de la mise en œuvre de la Norme qualitative pour les populations de saumon norvégiens ;

- mauvais recrutement des jeunes saumons au Royaume Uni (Angleterre et Pays-Bas) en 2016;
- progrès des modèles d'évaluation de stock – Ancrer l'évaluation du stock de Saumon atlantique dans un cadre de modèle Bayésien de cycle de vie intégré; et
- Nouvelles opportunités pour échantillonner le saumon en mer y compris l'Etude internationale d'été de l'écosystème des mers nordiques (IESSNS);
- Prises accessoires de saumon dans la pêcherie de maquereau islandais; et
- Etudes de suivi et de marquage acoustique.

Des informations pertinentes sont aussi présentées dans le résumé des Rapports de progrès annuel, CNL(17)15.

6.7 **Incorporation des facteurs sociaux et économiques dans la gestion du saumon**

Le Secrétaire a rapporté que les éléments de cinq études relatives aux valeurs du Saumon atlantique sauvage avaient été fournis. Les éléments de ces études sont disponibles dans le document CNL(17)6. Le Conseil a convenu de retenir ce point sur les ordres du jour futurs.

6.8 **Pêcherie de saumons à St Pierre et Miquelon - Gestion et Échantillonnage**

Un rapport sur la gestion et l'échantillonnage de la pêcherie au saumon à St Pierre et Miquelon, CNL(17)17 (Annexe 17), a été présenté par la représentante de la France (pour St Pierre et Miquelon). Ce rapport a aussi été étudié par la Commission Nord-américaine. La Commission Nord-américaine avait demandé que le Président écrive à la France (pour St Pierre et Miquelon) pour soulever les préoccupations de l'OCSAN et encourager la France (pour St Pierre et Miquelon) à devenir membre de l'OCSAN. Le Conseil a convenu de cette demande.

6.9 **Rapports des trois Commissions régionales concernant leurs activités de conservation**

Le Président de chacune des trois Commissions régionales a présenté un rapport au Conseil sur les activités de leur Commission respective.

Le représentant du Canada a fourni des informations supplémentaires concernant une notification de nouvelle activité significative relative au saumon transgénique, CNL(17)56 (Annexe 18).

7. Nomination d'un nouveau Secrétaire

7.1 Le Président a informé le Conseil que le Dr Emma Hatfield avait été nommée en tant que nouvelle secrétaire de l'OCSAN avec effet à compter du 1er octobre 2017. Une déclaration de Dr Hatfield a été mise à la disposition du Conseil, CNL(17)60.

8. Divers

8.1 Aucune autre question n'a été soulevée.

9. Date et lieu de la prochaine session

9.1 Le Conseil a accepté une invitation de tenir sa trente-cinquième session annuelle aux Etats-Unis les 12 - 15 juin 2018.

9.2 Le Conseil a accepté une invitation de tenir sa trente-sixième session annuelle en Norvège les 4 - 7 juin 2019.

10. Compte rendu de la session

10.1 Le Conseil a accepté le compte-rendu de la session.

11. Communiqué de presse

11.1 Le Conseil a convenu d'un communiqué de presse, CNL(17)58 (Annexe 19).

12. Clôture de la session

12.1 Une déclaration de clôture a été effectuée par le représentant de la CPAPN, (Annexe 20).

12.2 Le Secrétaire a effectué une déclaration de clôture (Annexe 21). Le Président a clos la Trente-quatrième session annuelle de l'OCSAN.

Note: Une liste d'articles du Conseil est incluse en Annexe 22.

Annex 1

Welcoming Address by Dr Ingemar Berglund, Swedish Agency for Marine and Water Management at the Thirty-Fourth Annual Meeting of NASCO

Mr President, Distinguished Delegates, Observers, Members of the NASCO Secretariat, Ladies and Gentlemen,

My name is Ingemar Berglund and I am the Head of Department for Fisheries Management at The Swedish Agency for Marine and Water Management in Göteborg.

Sweden is proud and pleased to host this important meeting. On behalf of the European Union, the Swedish Minister for Rural Affairs and our agency I warmly welcome you to Varberg and the beautiful west coast of Sweden. I am especially pleased to welcome you to Sweden today because this is Sweden's National day.

This evening you are invited to a reception and after that I hope you all will have opportunity to join us in celebrating the Swedish National day at the events along the coastal walk and in the beautiful city of Varberg.

This is the second time that NASCO has held its Annual Meeting in Sweden. This time we are closer to the coast and in the County of Halland. At this evening's reception Ms. Lena Sommestad, County Governor of The County Administrative Board of Halland, will tell us more about the special value that the salmon has for the County of Halland.

Every county in Sweden has an animal that is a representative of the nature. For the County of Halland that animal is the Atlantic salmon. It is often said that what is good for the salmon is also good for Halland.

It seems like something of a coincidence, that Fiji and Sweden have initiated The Ocean Conference in New York during this week when we are together in Varberg. The Ocean Conference will focus on Sustainable Development Goal 14, one of 17 goals in the Agenda 2030. And at the NASCO meeting this goal will also be an important part of the meeting. The salmon is an indicator of the effectiveness of management fresh and coastal waters and the open sea. Both source to sea and sea to source.

Therefore, we in Sweden as with all other countries around the North Atlantic can only manage salmon stocks through international cooperation. NASCO is an inter-governmental forum for discussion and agreement on the conservation, enhancement and sustainable management of salmon stocks throughout the North Atlantic area, and it bears a weighty responsibility.

NASCO's work initially focused on management of the salmon stocks during their marine migrations and, in particular, the management of distant-water fisheries. More recently NASCO's focus has broadened to include the entire lifecycle of the salmon and the effects of different human activities on salmon stocks. These activities include fisheries, in the open sea, along the coast and in rivers, hydropower, discharges and abstraction that adversely affect water quality and habitat and salmon farming.

NASCOs guidelines and agreement address all these activities and contain recommendations designed to protect and restore salmon stocks and their habitats.

For Sweden, the implementation cycle for NASCO's guidelines and agreements into the management of our salmon stocks has been a driver and a source of inspiration. We are so

very impressed and greatly inspired by all that is going on in countries all around the North Atlantic to preserve and restore this special fish.

I can see from all the documents and the agendas for this meeting that you have a very full workload, including: consideration of many important issues such the risks and benefits of hatchery and stocking practices; evaluations of the Annual Progress Reports under the five-year Implementation Plan; preventing the spread of the parasite *Gyrodactylus salaris* and planning for the coming International Year of the Salmon.

But I sincerely hope you will find time during your stay here to enjoy the coast and the beautiful city of Varberg.

Before telling you a little more about the salmon and the salmon rivers in Sweden, I would once again welcome you to Sweden and wish you all a productive and enjoyable Thirty-Fourth Annual Meeting of NASCO.

Thanks

Annex 2

Opening Statement made by the President of NASCO

Distinguished Delegates, Observers, Ladies and Gentlemen

I would like to thank Mr. Berglund for his warm welcome and interesting presentation on salmon in Sweden. It is a great pleasure to add my welcome to you all. I would also thank our Swedish hosts for the excellent arrangements made for this the Thirty-Fourth Annual Meeting of NASCO.

It is very appropriate that we are meeting here in Varberg, in the County of Halland. The county symbol is the Atlantic salmon and some of the most important west coast salmon rivers are located in this County. It is encouraging to hear that despite the challenges posed by acidification, the parasite *Gyrodactylus salaris* and other factors, salmon stocks appear to have improved over the last ten years. Major efforts have been made to improve river connectivity and, in 2014, the coastal mixed-stock fishery was closed. We will no doubt hear more about the important work that is on-going to conserve and restore salmon on the west coast of Sweden, particularly for those taking the post-NASCO tours on Friday and Saturday.

We have much to occupy us over the next four days. Our programme includes a Theme-based Special Session on the risks and benefits of hatchery and stocking practices and Special Sessions on the International Year of the Salmon and on the evaluation of progress on the important actions contained in the Implementation Plans. We are now almost fully through the second reporting cycle and our Review Group has taken a close look at progress to date and suggested some changes to the reporting process. We will need to consider planning for the next cycle of Implementation Plans. We also need to appoint a new President, as this will be my last NASCO meeting, and a new Secretary as Peter will be retiring at the end of September after 32 years with the Organization.

The Commissions also have important issues to consider including in relation to introductions and transfers. For example, the North-East Atlantic Commission has a comprehensive report from its *Gyrodactylus salaris* Working Group to consider. This includes a new 'Road Map' with recommendations to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of the parasite and eradicate it where introduced. The International Atlantic Salmon Research Board will be reviewing progress with the SALSEA - Track initiative with some significant developments to report since last year.

We will need to work efficiently in the time available to us, but we have wonderful facilities, an excellent spirit of cooperation and a wide-range of experience and expertise on which to draw. We must also recognise that our work is set against a background of low, in some areas critically low, salmon abundance and our actions this week need to reflect this worrying situation. I know that our highly effective Secretariat will, as always, support us well. With that, I would like to move to our Agenda noting that, although there will be no verbal statements by Parties and observers, written statements provided to the Secretariat will be distributed and annexed to our report. Thank you for your attention, that concludes my opening remarks.

Annex 3

Opening Statements submitted by the Parties

Opening Statement submitted by Canada

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

It is a pleasure for the Canadian delegation to participate at this Annual Meeting in the beautiful city of Varberg, Sweden. I want to commend our hosts, Sweden and the EU, for selecting this wonderful venue and the excellent arrangements that have been made by the Secretariat as always.

Atlantic salmon have been, and continue to be, a very significant cultural, economic and environmental symbol for eastern Canada and a vital species for Aboriginal food, social and ceremonial fisheries.

The importance of this meeting and NASCO in general continues to be reinforced by the situation facing many of our salmon stocks. Despite the implementation of several important management measures to support conservation and stock rebuilding, annual counts of Atlantic salmon in southern Canadian rivers reached some of the lowest returns in recent years.

Domestically, Canada has demonstrated a strong commitment to Atlantic salmon conservation both from a policy and an investments perspective, which I will discuss throughout the week. Canada prepared a Forward Plan for Atlantic salmon to advance the 61 recommendations contained within the Special Report on Wild Atlantic Salmon in Eastern Canada by the Minister's Advisory Committee on Atlantic Salmon. As part of this Forward Plan, Canada initiated the review of its Wild Atlantic Policy in 2016, through a Working Group representing 17 indigenous, watershed, and conservation groups.

With significant new science funding announced last year, Canada is supporting some exciting new science initiatives, including the Joint Atlantic Salmon Research Venture and the International Year of the Salmon. Through these initiatives and others, we will seek to engage with partners to better understand Atlantic salmon survival at sea as well as increase in-river monitoring of salmon returns in selected rivers.

The conservation and rebuilding of wild Atlantic salmon stocks is a shared responsibility. It is also a continuous and long-term process that requires the concerted efforts of all those involved. While we continue to be concerned with the level of Greenland's unilateral quota, we greatly appreciate the extensive work they have done in 2016; including eliminating factory landings and ensuring its reported catches respect the limit in place. This was a challenging process for Greenland, but one that must continue. Canada again offers its support to Greenland to ensure the continued implementation of the regulatory measure throughout 2017 and beyond.

Canada is quite concerned with Saint Pierre and Miquelon's increased catches in 2016, recognizing that their wild Atlantic salmon harvests are from mixed-stocks produced exclusively outside its territory, a high percentage of which are from Canadian river-systems with depleted returns. We continue to encourage France (in respect of St Pierre and Miquelon) to join NASCO as a formal member, and to implement a comprehensive approach to the management of Atlantic salmon, in accordance with the objectives of NASCO, and in particular the six tenets for effective management.

It is clear that, to tackle the challenges facing salmon including climate change, we need ambitious plans, coupled with a fierce commitment to implementation. We will need to

augment our efforts as independent Parties of NASCO, as a collective of Parties in the Organization and we will need to strengthen partnerships with other organizations.

The International Year of the Salmon is one of our biggest and boldest program plans to date. Through NASCO and the North Pacific Anadromous Fish Commission, IYS has now advanced to the point where it sets out a unified and comprehensive framework to address the challenges facing salmon globally, so that salmon stocks and the peoples that depend upon them will be resilient. Over the course of our meeting this week, you will hear a lot more about IYS and plans for it will be further advanced. I hope you will consider how you as an individual or the organizations that you represent can contribute and deliver the rapid results that are needed to secure the future health and productivity of these iconic species and the communities that depend upon them.

In conclusion, I look forward to working closely with all of you and to a productive meeting this week.

Thank you.

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

Mr President, distinguished Delegates, Observers, Ladies and Gentlemen,

The DFG delegation would like to begin by thanking our Swedish hosts and the EU for arranging the Annual Meeting in this beautiful location of Varberg on the west coast of Sweden. Also, we like to thank the Secretary and his staff for once again having prepared this annual meeting so well.

Commercial salmon fisheries at sea were once of high importance both to the Faroe Islands and to Greenland. It was therefore at great expense to our fishing industries that the Faroese and Greenlandic governments decided to take responsibility and refrain from all commercial fishing of wild salmon in our waters with a view to re-building the stocks. Still, even though we have stopped our commercial salmon fisheries, we retain our rights to conduct fishing in accordance with NASCO's guidelines. Therefore, Greenland has continued to set a small quota in order to sustain the limited fishery that has been going on for generations in Greenland and is of high importance namely for the smaller and remote communities. It is not our belief that it is this limited fishery in Greenland that has prevented the recovery of the salmon.

Despite the strict regulation enforced at the expense of our commercial salmon fishing industries, we have not seen any significant recovery of the stocks and it must thus be concluded that we need to consider other factors and measures in order to improve the stocks. The river nations must step-up and keep their side of the bargain too and create the best possible conditions for re-building the salmon stocks. Greenland and the Faroe Islands are of the opinion that it was a step in the right direction to establish a procedure where the Parties now submit a written Annual Progress Report. The reports show that there is progress in the management of wild salmon, even though we also see examples of different challenges in some jurisdictions. Although there is still room for improvement in the reporting, we want to emphasise the importance of ensuring full transparency on how the Parties manage wild salmon in their rivers and waters. We would like to take this opportunity to reiterate what we have stated at a number of previous meetings, namely that the best and fairest solution would be if NASCO could regulate fisheries for wild salmon in the home waters of all Parties and jurisdictions of NASCO.

We would also like to highlight the important role NASCO has played in developing guidelines and best practices on how to manage the interplay between wild and farmed salmon.

Mr President, the Faroe Islands and Greenland are looking forward to a productive week in this lovely Varbergs Kusthotell and we assure you that we are prepared to work in a constructive way so that we collectively can contribute to a successful outcome of this 34th Annual NASCO meeting.

Thank you.

Opening Statement submitted by the European Union

Mr President, Mr Secretary, distinguished Delegates, Observers, Ladies and Gentlemen,

The European Union has the pleasure and honour to host the 34th Annual Meeting of NASCO and is delighted to welcome you all to the beautiful town of Varberg, which is close not only to scenic coastal landscapes but also to some important salmon rivers. We would like to praise the Swedish authorities for their warm hospitality and generosity and to sincerely thank our Swedish colleagues and the NASCO Secretariat for the outstanding organisation of this meeting and also for the post NASCO salmon study tours that should allow you to appreciate the efforts and measures put in place by the local authorities in collaboration with local stakeholders to restore habitats and contribute to rebuilding salmon stocks in this charming Swedish region.

Varberg is bathed by Kattegatt waters that connect the Baltic Sea to the North Sea and the Atlantic Ocean. For the European Union and many nations around the world, the oceans hold a key to the future. However, our oceans are under threat from over-exploitation, climate change, acidification, pollution and declining biodiversity. The UN 2030 Agenda for Sustainable Development identified conservation and sustainable use of oceans as one of the 17 Sustainable Development Goals (SDG 14). The European Union has recently set out its response to this Agenda in a new policy initiative calling for a cross-sectoral, rules-based international approach for improving the international ocean governance framework, reducing pressure on oceans and seas, creating the conditions for a sustainable blue economy and strengthening international ocean research and data. To complement this initiative, the European Union will host the fourth high-level "Our Ocean" conference in Malta on 5 and 6 October 2017. The conference is expected to trigger significant commitments that will reduce marine pollution, help managing aquatic resources sustainably, mitigate climate change and set up marine sanctuaries.

This large international mobilisation in favour of our oceans should ultimately benefit all the components of the marine ecosystem, including the marine component of the salmosphere. In this context, the work of NASCO is more than ever essential because the conservation and management of Atlantic salmon require cooperation across nations and jurisdictions, across the seas and the rivers, connecting the ocean and the land, calling upon ancestral and intangible links between man, the fish and nature. Despite our long-lasting efforts and the, at times painful, measures put in place in the European Union and other NASCO Parties, the expected results are still far from satisfactory. Given the many challenges that faces Atlantic salmon and the ongoing decrease in stock status and return rates in many rivers, we need to intensify our efforts and strategically use all available resources.

We have gathered in Varberg this week, to demonstrate once again our determination to work collectively, fulfil our commitments, exchange information, benchmark and share best practices in various aspects of salmon conservation and management, with emphasis this year on the risks and benefits to wild salmon from hatchery and stocking activities. We expect also to hear about recent developments and potential new avenues in science that might provide improvements in our understanding about Atlantic salmon and its specific challenges, while opening new perspectives for reduction and mitigation of environmental and anthropogenic impacts on the conservation of this emblematic species. This year again, the European Union will provide a voluntary contribution of 300.000 euro to NASCO to fund scientific work underpinning key priorities of the organisation.

We are also about to gear up with preparations for the International Year of the Salmon (IYS), which is expected to provide a tremendous opportunity for raising awareness about Atlantic salmon and helping NASCO to preserve and sustainably manage this species, which in addition to being a precious biological resource is also deeply rooted in the culture of many communities. We would like to work with other Parties in shaping the IYS at a scale compatible with the resources of NASCO, while ensuring a strong focus and visibility for the Atlantic salmon and for the key priorities of the organisation responsible for its conservation and management.

We would like to conclude by highlighting that this is a particularly significant moment for NASCO, since one of the pillars of the organisation is about to retire. It will be one of the great challenges of this meeting to select a new secretary that will be as knowledgeable, dedicated, committed and passionate about Atlantic salmon and NASCO as Peter is. On behalf of the EU delegation, thank you Peter and also Mairi for your invaluable work for NASCO and for your tremendous contribution in extending the Ariadne's thread that hopefully one day will lead Atlantic salmon out of its poor conservation status labyrinth, to return in large numbers from its Odyssey at sea.

Opening Statement submitted by Norway

Mr President, distinguished Delegates, Observers, Ladies and Gentlemen,

On behalf of Norway, I would like to thank the EU and Sweden for hosting the Thirty-Fourth Annual Meeting of NASCO.

In Norway, the pre-fishery abundance of wild Atlantic salmon runs stays reduced by more than half compared to historic levels. One of the main reasons still seems to be reduced survival at sea. However, local and regional differences indicate that adverse human impacts strongly influence the development and status of stocks.

The fishery regulations adopted over the last decade or so have - to a large extent - compensated for reduced salmon runs. Overexploitation is therefore no longer considered a major threat to larger populations. With the adoption of a new agreement for river Tana, there is also reason to believe that we will see the end of a long period with overexploitation of several Tana stocks.

The efforts to eradicate the salmon parasite *Gyrodactylus salaris* has given good results in recent years. After eradicating the parasite, the local salmon stocks are quickly re-built from the gene bank. We have reason to believe that yet two new regions will be declared free of the parasite later this year. That leaves us with two regions still infected. In the Driva region, a large dam is now operative and prevents salmon from migrating upstream, thereby reducing the infected area as a preparation for chemical treatment.

As in previous years, we are looking forward to this year`s special sessions. The pros and cons of stocking remain to be a widely - and often passionately discussed – issue. We are confident that the results of the special session will prove valuable for our work, as have the results of previous special sessions. We also look forward to get an update on the progress made on the IYS by other parties and the "lessons learned" by similar initiatives.

The classification of wild salmon stocks following the Norwegian Quality Norm has continued, and now comprises 148 rivers representing 83 % of the total spawning target in Norway. The results indicate that the status is not as good as desired and a plan for improvement will be prepared.

In closing we cannot avoid noting that this year's meeting will mark the end of an era. Our highly treasured Secretary, Dr Peter Hutchinson, has announced his retirement. He has, maybe more than anyone, made major contributions to the present status of NASCO as *the* leading organization for conservation of Atlantic salmon. Furthermore, Mairi Ferguson, a long time staff member, tireless working in support of Peter and all NASCO delegates, will retire later this year, as will our President Steinar Hermansen, who has served NASCO in many capacities for almost 3 decades.

This delegation wants to extend our gratitude and our very best wishes for their respective futures.

At last, the Norwegian delegation would like to thank Sweden and the whole Secretariat for the excellent preparations, and look forward to a productive and successful meeting.

Opening Statement submitted by the Russian Federation

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

On behalf of the delegation of the Russian Federation I am pleased to greet all participants of the Annual Meeting here in Varberg, Sweden.

Atlantic salmon is a national treasure in any country. And we realize that without international cooperation in conserving this resource, without combined efforts in developing a strategy for future actions one could hardly expect to be successful. Therefore, we do not have doubts that the work that will be accomplished in the course of this Annual Meeting will contribute to the preservation of this valuable species for the future generations.

Concluding this statement, I would like traditionally to thank our Swedish hosts and commend the splendid arrangements for this meeting. On behalf of the Russian delegation I wish all of us success in working together during this week.

Thank you for attention.

Opening Statement submitted by the United States

Mr President, Secretary Hutchinson, Distinguished Delegates, Observers, Ladies and Gentlemen:

The United States is delighted to join our NASCO friends and colleagues here in Varberg, Sweden, a very quaint and beautiful setting, for the 34th annual meeting of NASCO. We would like to offer our sincere thanks to our Swedish and EU hosts for their hospitality and for the excellent accommodations. We are excited to be here on the West Coast of Sweden, particularly given the promising work that has been undertaken in this area to restore Atlantic salmon habitats as well as connectivity to those habitats. We also wish to express our sincere appreciation to our Secretary and his staff, whose hard work each year sets the stage for the important deliberations of our organization.

NASCO annual meetings provide a tremendous opportunity to discuss the issues and challenges facing Atlantic salmon and to collaborate across the North Atlantic to achieve NASCO's goals of conserving, restoring, enhancing and rationally managing the species. In this regard, gathering and using the best available scientific information is critical.

In the United States, Atlantic salmon remain critically endangered. The risk of extinction is real and our responsibility, individually and collectively, to avoid such an outcome cannot be overstated. In the United States we have made significant progress through our Species in the Spotlight initiative, which aims to turn the tide for this species from a declining trend toward recovery. We have also begun extensive efforts to launch the International Year of the Salmon (IYS) effort. We are thoroughly committed to ensuring that IYS reaches the widest possible audience in the United States and believe that, through these efforts, we can raise awareness of and interest in the plight of salmon in our waters. Our domestic programs as well as IYS have brought and will continue to bring much needed visibility and support to Atlantic salmon recovery in the United States.

We are also very excited to be involved in Canada's Atlantic Salmon Research Joint Venture. The joint venture is designed to improve the coordination of science and research related to wild Atlantic salmon by bringing together experts from across Canada -- from government to academia to indigenous groups -- to focus on scientific research and the sharing of data and other information. We look forward to participating in the joint research venture, including in efforts to address the gap that exists between the science going on at the watershed level and other efforts taking place through international forums like NASCO.

Already this week, the West Greenland Commission (WGC) held an important intersessional meeting to discuss the results of Greenland's 2016 mixed stock fishery, including progress in improving the monitoring, control, and catch accountability of that fishery. We appreciate Greenland's continuing efforts to enhance monitoring and control and are very encouraged that the fishery remained within its quota last year. We look forward to working with our colleagues in the West Greenland Commission here this week and through the intersessional process to begin consideration of the future conservation and management measures.

We are also looking forward to an informative and successful special sessions this week. The themed-based special session entitled: *Understanding the Risks and Benefits of Hatchery and Stocking Activities to Wild Atlantic Salmon Populations*, presents an important opportunity to share information about how these activities affect wild Atlantic salmon recovery and restoration.

Further, during the special session on IYS this week, we hope to learn lessons from others that have engaged in International Years and extensive international awareness campaigns -- lessons that can be applied to ensure the success of IYS. We also hope to hear about the values people place on this species to help ensure that the messages we develop and strategies and approaches used to broadcast them are successful.

Finally, as always, we are looking forward to the special session on the annual progress reports. Providing a transparent description of the steps being taken by all parties to conserve and rationally manage Atlantic salmon in our homewaters keeps us accountable and is essential to the success of NASCO agreements. This is the primary component of the implementation plan process. As such, we must redouble our efforts to make the development and review of annual progress reports as robust as possible. We urge everyone to take full advantage of this crucial special session. In addition, we look forward to considering the process to be used to develop the next round of implementation plans, which start in 2018. The current round of reporting has taught us so much about what is effective and what needs improvement. We hope we can build on those lessons to improve the accountability and transparency of NASCO and its members further.

I would be remiss if I did not take a moment to reflect on the especially poignant nature of this 34th annual meeting of NASCO. Our organization is at a point of significant change. To begin, this NASCO meeting will be the last that Peter Hutchinson will serve as our Secretary. Peter has dedicated over 30 years, his entire professional career, to the organization. His outstanding work, leadership, and commitment to this organization are without equal. Peter, we thank you for your tireless efforts in support of this body and wish you the very best in your well-earned retirement. In addition to Peter, we are also losing Mairi Ferguson, Personal Assistant to the Secretary. Mairi's contributions to NASCO over the last 10 years have been exceptional. If anyone works more tirelessly than Peter, it is Mairi. Her shoes will be very difficult to fill. Finally, I must recognize our President Steinar Hermansen, who will also be retiring after this annual meeting. Steinar's leadership as the longtime head of Norway's delegation and more recently as President, has been instrumental in moving NASCO forward during challenging times. The United States would like to express our sincerest gratitude for everything he has done for the organization. Needless to say, all of these outstanding individuals will be sorely missed, and NASCO will hardly be the same without them.

In closing, thanks once again to our kind hosts and the Secretariat staff for the excellent meeting preparations. We look forward to working with you all this week to achieve a successful meeting.

Thank you.

Annex 4

Opening Statement submitted by the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC)

Mr President, Mr Secretary, delegates, observers, ladies and gentlemen. I am grateful for the opportunity to provide an opening statement on behalf of the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) at this the 34th Annual meeting of NASCO.

By way of background EIFAAC is a statutory, advisory fishery body under the Constitution of the Food and Agriculture Organization (FAO) of the United Nations. Established in 1957, it is an inter-governmental forum for collaboration and information exchange on inland fisheries and aquaculture across European countries. EIFAAC has currently 34 members including the European Union.

Governments, institutions and agencies, including NASCO, can benefit from international advice derived from the EIFAAC's network linking policy-makers, managers, scientists and others working on inland fisheries and aquaculture issues.

EIFAAC's mission is to promote the long-term sustainable development, utilization, conservation, restoration and responsible management of European inland fisheries and aquaculture and to support sustainable economic, social, and recreational activities through:

- providing advice and information;
- encouraging enhanced stakeholder participation and communication; and
- the delivery of effective research.

EIFAAC has currently active project groups looking at a number of prioritised research areas that may be of interest to NASCO parties, these include:

- fish passage best practice;
- the management/threat of aquatic invasive species in Europe; and
- the downstream passage of fish at hydropower dams.

The EIFAAC project aimed at delivering a symposium on Adapting Inland Fisheries to Climate Change may be of particular interest to NASCO delegates, as it is supporting a discussion between stakeholders, including anglers, managers, scientists, and legislators on the future of recreational fisheries in an era of climate change. This project will culminate in an EIFAAC Symposium which will be hosted by the Polish Government from the 4th to 6th of September 2017 in Stare Jabłonki. The symposium will be followed directly by EIFAAC's 29th Session.

EIFAAC and NASCO share the common goal of wild Atlantic salmon conservation while respecting the social, economic and cultural value of this unique species. EIFAAC is well positioned to offer expert advice and support to NASCO on issues affecting the Atlantic salmon in the freshwater element of its lifecycle.

I would like to take this opportunity to thank our hosts and facilitators for their wonderful welcome to Varberg, Sweden and for the facilities and hospitality provided. Finally, may I wish all of you a productive and enjoyable NASCO session.

Annex 5

Opening Statement submitted by the North Pacific Anadromous Fish Commission (NPAFC)

Mr. President, delegates, ladies and gentlemen,

I am very pleased to attend the 34th Annual meeting of NASCO here in Varberg, Sweden representing the North Pacific Anadromous Fish Commission (NPAFC). My name is Mark Saunders and I am with the NPAFC Secretariat as Director for the International Year of the Salmon (IYS) for the North Pacific region. The NPAFC President, Dr Carmel Lowe and Executive Director, Dr Vladimir Radchenko would like to pass on their best wishes for a successful meeting.

The NPAFC just completed their annual meeting in Victoria, B.C. Canada that included a 25th anniversary celebration. It was very inspiring to reflect on the significant enforcement and scientific accomplishments made over that time frame. It was inspiration that was appreciated as NPAFC positions itself to address the increasing challenges that salmon face. In 2015-17, the North Pacific was impacted by extreme El Nino conditions referred to as "the blob" that were unmatched in magnitude and duration. Declining productivity in salmon populations observed in many stocks in the northeast Pacific Ocean since the late 1990's is now being seen with Chum salmon in the northwest Pacific Ocean.

The International Year of the Salmon is the bold and timely response that NASCO and NPAFC have jointly forged to facilitate a hemispheric partnership that can establish the conditions required to create a well-informed community of decision makers who can establish the conditions necessary for the resilience of salmon and people in an uncertain future. We have established governance mechanisms and through actual and virtual meetings of Atlantic and Pacific Steering, Symposium Steering and Coordinating Committees we are moving forward with implementation.

The NPAFC at their recent meeting has committed Commission funds as well as additional investments from Canada, the United States and the University of British Columbia to support additional staff to manage the IYS in the North Pacific. The investment by Canada in the IYS activities for both NASCO and NPAFC is appreciated. Partners in the North Pacific have agreed to support a results-based planning process to convene small workshops of experts to identify high-impact projects for outreach and each of the IYS themes. NPAFC hopes to engage managers and scientists from NASCO parties in this planning endeavour. Workshops and symposia will be important tool in IYS implementation and NPAFC has agreed to hold workshops in association with each annual meeting over the next five years to track progress and raise awareness of the IYS within each host country. Additionally, in 2018 Japan will be hosting a workshop on the "Sustainable Management of Chum Salmon in Changing Environments". We will work with the Symposium Steering Committee to develop a joint schedule of workshops and Symposia.

Most importantly we await NASCO's decision regarding the opening symposium and NPAFC's request to increase the scope of the event. This opening event presents an opportunity to catch the world's attention and we have strong indications that sponsorship from the NGO community will be available.

I would like to thank those participating in Committees and in particular acknowledge the strong contributions and leadership of Mr Daniel Morris and Dr Peter Hutchinson. During this meeting you will hear about the progress made to date and consider ideas for implementation relating to our opening symposium and outreach through the mini-symposium. The NPAFC and the North Pacific Steering Committee regard hemispheric engagement in IYS activities as essential to success of the IYS. We recognize the logistical and fiscal challenges of operating across the vast distances but see a larger benefit in combining and leveraging our capacities.

I am pleased to be able to introduce Dr. George Iwama who has joined our IYS team in the NPAFC Secretariat as the Chief Scientist for the North Pacific Region and to note that Dr Jim Irvine, the Canadian representative on the NPAFC IYS Working Group has been able to join us from Canada's west coast.

I look forward to the IYS mini-symposium and a week of engagement with all of you and I wish you every success with this meeting.

Annex 6

Opening Statement submitted by the NASCO's Accredited Non-Government Organisations

NGOs welcome the opportunity to participate in the Thirty-Fourth Annual Meeting of NASCO in Varberg, Sweden and thank our hosts for the arrangements made. We greatly appreciate NASCO's inclusive approach to our involvement in these proceedings.

Once again, the NGOs call on the Parties to NASCO to remember the fundamental objective of this forum – the protection of wild Atlantic salmon, a species which shows no signs of significant recovery throughout its North Atlantic range and in some areas is critically endangered

The NGOs have had another active year, taking part in the majority of NASCO initiatives and bringing our knowledge and experience of fisheries management and conservation to the table. We have helped organise the Special Sessions on hatcheries and stocking practices and the International Year of the Salmon. We very much welcome the focus on topics through these Theme-based Special Sessions and we welcome the IYS as an opportunity to raise awareness of the challenges facing salmon in the Atlantic. We have once again served on the Review Group to assess the Annual Progress Reports by Parties in reaching the goals set out in their Implementation Plans and we contributed to the North-East Atlantic Commission's Gyrodactylus Working Group. NGO organisations are leaders in scientific research into all aspects of the Atlantic salmon life cycle, from the quality of freshwater ecosystems to sophisticated research tracking salmon during their marine migration on both sides of the Atlantic. We participate in ICES and NASCO's ISARB to share our scientific research and suggest other areas where we require further work. We have also enthusiastically supported the Six Tenets initiative in the West Greenland Commission although we recognise that self-assessments are far less rigorous an approach to the open review of the Greenland fishery by the other Parties and NGOs that has resulted in new measures to improve monitoring and control. We hope shortcomings identified for States of Origin will be addressed.

The Implementation Plan and Annual Review process was adopted by NASCO to provide more insight, transparency and accountability by Parties to NASCO. It was agreed as an alternative to Convention change. Alas, we believe that not all Parties have fully embraced this initiative, and the NGOs are continually frustrated at the lack of data provided in some APRs, and the obvious reluctance of some jurisdictions to follow NASCO's guidelines relating to the sustainable management and conservation of wild Atlantic salmon.

This became apparent not only in the review of APRs, but also in the Special Session at last year's Annual Meeting addressing the impacts of salmon farming on wild Atlantic salmon. The NGOs believe that it is totally unacceptable, for instance, that Parties are so complacent as to allow 30% of migrating wild smolts to be killed by sea lice emanating from salmon farms, or that a build-up of 8 adult female parasites can be allowed on farmed fish before regulatory action is taken. NASCO's Special Sessions are about sharing best practice, and the latter example is all the more unbelievable in the light of another Party, which does not have a population of wild salmon, reporting its regulation that orders the compulsory slaughter of any farm which fails on three inspections to control lice levels down to just 1.5 parasites per fish. The NGOs are also extremely concerned by the evidence presented last year of widescale genetic introgression of farmed genes into wild salmon populations in Norway (and elsewhere).

It is worth repeating here the final paragraph of the Steering Group's Concluding Remarks in their report on the Aquaculture Special Session last year:

"…there is now an urgent need for all Parties/jurisdictions to adopt stronger measures if their international responsibilities are to be met which it (the Steering Committee) believes is not currently the case. The Steering Committee reiterates that the agreed international goals are that there is no increase in sea lice loads or lice-induced mortality of wild salmonids attributable to the farms, and 100% of farmed fish are retained in all production facilities."

The impacts of salmon farming are wreaking havoc on wild salmon and sea trout stocks, and the government control in Canada, Ireland, Norway and Scotland is failing to address the issue. The NGOs believe that the only long-term answer is for the industry to invest in closed containment units, providing a biological barrier between farmed and wild fish. We note the commitment made by ISFA last year to report on technological developments that can protect wild salmon from impacts from salmon farming and we hope these will be presented on the Council agenda item specifically for this purpose.

The NGOs also welcome the Hardangerfjord Conference (May 2017) developments as announced by Norske Industri and we look forward to their implementation by Marine Harvest and hope the rest of the industry will follow in due course.

We continue to stress that Atlantic salmon should only be retained in fisheries where the populations of specific natal rivers are known to be surpassing conservation limits. It has been agreed at NASCO that mixed-stock fisheries pose particular risks and that management actions should aim to protect the weakest of the contributing stocks, yet they continue in Greenland, Norway, England and Canada. The NGOs acknowledge and appreciate that Scotland continues its moratorium on coastal netting, that the Faroe Islands keep their marine salmon fishery closed, and that Greenland has tougher regulation to control the exploitation of its fisheries.

If Atlantic salmon are to thrive again across their range, all Parties have to take management and conservation seriously. Just filling in the APR forms and hoping to get away with scant information is no longer acceptable. The APRs must now focus on measurable outcomes that are supported by sound science and accurate statistics. Future reporting must be more transparent and inclusive.

The NGOs hope that, at this meeting in Sweden, Parties show their genuine commitment to protecting wild Atlantic salmon as their absolute priority. Yes/but politics – YES salmon need protecting, BUT other priorities mean we can't do that as effectively as NASCO dictates – must end now. If it does not, and the Parties continue to make excuses for failing in their international responsibilities towards the protection of wild Atlantic salmon, then this amazing anadromous fish can only continue to decline – and it will be on your watch.

Annex 7

List of Participants

* Denotes Head of Delegation

CANADA

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Annex 8

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Agenda

1. Opening of the Meeting

2. Adoption of the Agenda

3. Election of Officers

4. Financial and Administrative Issues

4.1 Report of the Finance and Administration Committee

5. Scientific, Technical, Legal and Other Information

5.1 Secretary's Report

5.2 Report on the Activities of the Organisation in 2016

5.3 Announcement of the Tag Return Incentive Scheme Grand Prize

5.4 Scientific Advice from ICES

5.5 Report of the International Atlantic Salmon Research Board

5.6 Report of the Standing Scientific Committee

6. Conservation, Restoration, Enhancement and Rational Management of Atlantic Salmon under the Precautionary Approach

6.1 Theme-based Special Session: Understanding the Risks and Benefits of Hatchery and Stocking Activities to Wild Atlantic Salmon Populations

6.2 Special Session: Salmon and People in a Changing World - Planning for the International Year of the Salmon

6.3 Special Session: Evaluation of Annual Progress Reports under the 2013 - 2018 Implementation Plans

6.4 Progress in Implementing the 'Action Plan for Taking Forward the Recommendations of the External Performance Review and the Review of the 'Next Steps' for NASCO', CNL(13)38

6.5 Liaison with the Salmon Farming Industry

6.6 New or Emerging Opportunities for, or Threats to, Salmon Conservation and Management

6.7 Incorporating Social and Economic Factors in Salmon Management

6.8 Management and Sampling of the St Pierre and Miquelon Salmon Fishery

6.9 Reports on the Conservation Work of the Three Regional Commissions

7. Appointment of a New Secretary

8. Other Business

9. Date and Place of Next Meeting

10. Report of the Meeting

11. Press Release

12. Close of the Meeting

Annex 9

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North Atlantic Salmon Conservation Organization
2018 Budget and 2019 Forecast Budget (Pounds Sterling)

		Budget 2018	Forecast 2019
	Expenditure		
1.	Staff-related costs	341,300	349,800
2.	Travel and subsistence	30,000	30,000
3.	Research and advice	64,600	66,000
4.	Contribution to Working Capital Fund	0	0
5.	Meetings	11,000	11,000
6.	Office supplies, printing and translation	26,500	27,500
7.	Communications	16,000	17,000
8.	Headquarters Property	40,000	42,000
9.	Office furniture and equipment	6,500	6,500
10.	Audit and other expenses	11,000	11,500
11.	Tag Return Incentive Scheme	4,500	4,500
12.	International Atlantic Salmon Research Fund	0	0
13.	Contribution to Contractual Obligation Fund	35,000	35,000
14.	Contribution to Recruitment Fund	15,000	15,000
15.	Contribution to IYS Fund	40,000	20,000
	Total Expenditure	**641,400**	**635,800**
	Income		
16.	Contributions - Contracting Parties	592,400	586,800
17.	General Fund – Interest	1,000	1,000
18.	Income from Headquarters Property	48,000	48,000
19.	Surplus or Deficit (-) from 2016	0	0
	Total Income	**641,400**	**635,800**

2018 Budget & 2019 Forecast Budget (Pounds Sterling) - Expenditure by Sub-section

		Budget 2018	Forecast 2019
1.	**Staff-related costs**		
1.1	Secretariat members	217,400	222,800
1.2	Temporary, part-time and contract staff	32,400	33,200
1.3	Staff Fund contributions, allowances, other staff costs	91,500	93,800
	Total	**341,300**	**349,800**
2.	**Travel and subsistence**		
2.1	Travel to Annual Meeting	10,000	8,000
2.2	Official travel and subsistence	20,000	22,000
	Total	**30,000**	**30,000**
3.	**Research and advice**		
3.1	Annual contribution to ICES	64,600	66,000
3.2	Other research and advice	0	0
	Total	**64,600**	**66,000**
4.	**Contribution to Working Capital Fund**	**0**	**0**
5.	**Meetings**		
5.1	Costs of Annual Meeting	4,000	4,000
5.2	Costs of other meetings	7,000	7,000
	Total	**11,000**	**11,000**
6.	**Office supplies, printing and translation**		
6.1	Office supplies	16,000	17,000
6.2	Printing	8,000	8,000
6.3	Translations	2,500	2,500
	Total	**26,500**	**27,500**
7.	**Communications**		
7.1	Telecommunications	4,000	4,500
7.2	Postage and courier services	3,000	3,000
7.3	IT support & website	9,000	9,500
7.4	Communications, professional support and design	0	0
	Total	**16,000**	**17,000**
8.	**Headquarters Property**		
8.1	Capital and interest payments	0	0
8.2	Maintenance, services and other building-related costs	40,000	42,000
	Total	**40,000**	**42,000**
9.	**Office furniture and equipment**		
9.1	Furniture	0	1,500
9.2	Equipment	6,500	5,000
	Total	**6,500**	**6,500**
10.	**Audit and other expenses**		
10.1	Audit and accountancy fees	6,000	6,500
10.2	Bank charges and insurances	1,000	1,000
10.3	Miscellaneous	4,000	4,000
	Total	**11,000**	**11,500**
11.	**Tag Return Incentive Scheme**	**4,500**	**4,500**
12.	**Contribution to IASRF**	**0**	**0**
13.	**Contribution to Contractual Obligation Fund**	**35,000**	**35,000**
14.	**Contribution to Recruitment Fund**	**15,000**	**15,000**
15.	**Contribution to IYS Fund**	**40,000**	**20,000**
	Total Expenditure	**641,400**	**635,800**

2017 Budget Contributions (Pounds Sterling) Adjusted for Confirmed rather than Provisional 2015 Catches (tonnes)

Party	2015 catch (provisional)	2015 catch (confirmed)	2017 contribution (provisional)	2017 contribution (confirmed)	Adjustment
Canada	134	140	78,953	81,231	2,277
Denmark (Faroe Islands and Greenland)	58	58	51,228	51,265	37
European Union	299	289	139,145	135,680	-3,465
Norway	583	585	242,749	243,849	1,100
Russian Federation	80	80	59,254	59,305	51
USA	0	0	30,070	30,070	0
Total	**1,154**	**1,152**	**601,400**	**601,400**	**0**

Note: A positive adjustment represents an underpayment in 2017.

NASCO Budget Contributions for 2018 and Forecast Budget Contributions for 2019 (Pounds Sterling)

Party	2016 catch (provisional)	2018 contribution	Adjustment from 2017	2018 adjusted contribution	2019 forecast contribution
Canada	135	81,169	2,277	83,446	80,401
Denmark (Faroe Islands and Greenland)	27	39,930	37	39,966	39,552
European Union	256	127,371	-3,465	123,906	126,167
Norway	612	263,307	1,100	264,407	260,818
Russian Federation	56	51,003	51	51,054	50,521
USA	0	29,620	0	29,620	29,340
Total	**1,086**	**592,400**	**0**	**592,400**	**586,800**

Contributions are based on the official returns.

Column totals in both tables can be in error by a few pounds due to rounding.

Five-year NASCO Budgeted Expenditure and Income Projections 2018 - 2022

		2018	Forecast 2019	Forecast 2020	Forecast 2021	Forecast 2022
	Expenditure					
1.	Staff related costs	341,300	349,800	358,500	370,000	381,000
2.	Travel & Subsistence	30,000	30,000	25,000	35,000	37,000
3.	Research & advice	64,600	66,000	68,000	70,000	70,000
4.	Contribution to Working Capital	0	0	0	0	0
5.	Meetings	11,000	11,000	37,000	9,000	10,000
6.	Office supplies, printing and translations	26,500	27,500	29,000	29,000	30,000
7.	Communications	16,000	17,000	19,000	19,000	20,000
8.	Headquarters Property	40,000	42,000	43,000	42,000	43,000
9.	Office furniture & equipment	6,500	6,500	6,500	6,500	6,500
10.	Audit & other expenses	11,000	11,500	12,000	12,000	13,000
11.	Tag return incentive scheme	4,500	4,500	4,500	4,500	4,500
12.	International Cooperative Research	0	0	0	0	0
13.	Contribution to Contractual Obligation Fund	35,000	35,000	35,000	35,000	40,000
14.	Contribution to Recruitment Fund	15,000	15,000	15,000	15,000	15,000
15.	Contribution to IYS Fund	40,000	20,000	0	0	0
	Total	**641,400**	**635,800**	**652,500**	**647,000**	**665,000**
	Income					
16.	Contributions of Contracting Parties	592,400	586,800	601,500	596,000	614,000
17.	Interest Received on General Fund	1,000	1,000	1,000	1,000	1,000
18.	Income from HQ property	48,000	48,000	50,000	50,000	50,000
	Total	**641,400**	**635,800**	**652,500**	**647,000**	**665,000**

Annex 10

Council

CNL(17)8

Report of the ICES Advisory Committee

Only the advice concerning general issues of relevance to the North Atlantic is given in this report. The detailed advice on a Commission area basis is annexed to the report of the Commissions.

NORTH ATLANTIC SALMON STOCKS

Introduction

Main tasks

In 2016 the ICES Advisory Committee (ACOM) resolved (C. Res. 2016/2/ACOM21) that the Working Group on North Atlantic Salmon [WGNAS] (chaired by Gerald Chaput, Canada) would meet at ICES HQ, 29 March–7 April 2017 to consider questions posed to ICES by the North Atlantic Salmon Conservation Organization (NASCO). In early February 2017, NASCO informed ICES of the results of the application of the Framework of Indicators for West Greenland and Faroes which concluded that there was no need for revised catch advice for 2017. Consequently, the questions previously submitted by NASCO were revised.

The sections of the report which provide the responses to the terms of reference are identified below.

Question		Section
1	With respect to Atlantic salmon in the North Atlantic area:	sal.oth.nasco
1.1	provide an overview of salmon catches and landings by country, including unreported catches and catch and release, and production of farmed and ranched Atlantic salmon in 2016[1];	
1.2	report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];	
1.3	provide a review of examples of successes and failures in wild salmon restoration and rehabilitation and develop a classification of activities which could be recommended under various conditions or threats to the persistence of populations[3];	
1.4	provide a summary of the available diet data for marine life stages of Atlantic salmon and identify key prey species at different life stages (e.g. herring at post-smolt stages, capelin in West Greenland waters and the Barents Sea)[4];	
1.5	provide a description of the potential future impacts of climate change on salmon stock dynamics;	
1.6	provide a compilation of tag releases by country in 2016; and	
1.7	identify relevant data deficiencies, monitoring needs and research requirements.	
2	With respect to Atlantic salmon in the North-East Atlantic Commission area:	sal.27.neac
2.1	describe the key events of the 2016 fisheries[5];	
2.2	review and report on the development of age-specific stock conservation limits including updating the time-series of the number of river stocks with established CL's by jurisdiction;	
2.3	describe the status of the stocks including updating the time-series of trends in the number of river stocks meeting CL's by jurisdiction;	
2.4	provide information on the size, distribution and timing of the blue whiting fishery in the North East Atlantic area and any	

	official observer information relating to bycatch which may indicate possible impact of this fishery on wild salmon; and	
2.5	identify relevant data deficiencies, monitoring needs and research requirements.	
3	With respect to Atlantic salmon in the North American Commission area:	sal.21.nac
3.1	describe the key events of the 2016 fisheries (including the fishery at St Pierre and Miquelon)[5];	
3.2	update age-specific stock conservation limits based on new information as available including updating the time-series of the number of river stocks with established CL's by jurisdiction;	
3.3	describe the status of the stocks including updating the time-series of trends in the number of river stocks meeting CL's by jurisdiction; and	
3.4	identify relevant data deficiencies, monitoring needs and research requirements.	
4	With respect to Atlantic salmon in the West Greenland Commission area:	sal.2127.wgc
4.1	describe the key events of the 2016 fisheries[5];	
4.2	describe the status of the stocks[6]; and	
4.3	identify relevant data deficiencies, monitoring needs and research requirements.	

[1] With regard to question 1.1, for the estimates of unreported catch the information provided should, where possible, indicate the location of the unreported catch in the following categories: in-river; estuarine; and coastal. Numbers of salmon caught and released in recreational fisheries should be provided.

[2.] With regard to question 1.2, ICES is requested to include reports on any significant advances in understanding of the biology of Atlantic salmon that is pertinent to NASCO, including information on any new research into the migration and distribution of salmon at sea and the potential implications of climate change for salmon management.

[3.] With regards to question 1.3, NASCO is particularly interested in case studies highlighting successes and failures of various restoration efforts employed across the North Atlantic by all Parties/jurisdictions and the metrics used for evaluating success or failure.

[4.] In response to question 1.4, ICES is requested to comment on any significant changes in population dynamics (i.e. abundance, distribution, size structure, and energy density) of key prey species which may be associated with changes in salmon abundance, distribution, and marine ecology (e.g. the recently identified decreases in capelin energy density and the consequences on marine productivity of Atlantic salmon while also providing information related to fisheries which catch significant numbers of the identified key prey species (i.e. direct harvest or bycatch).

[5.] In the responses to questions 2.1, 3.1 and 4. 1, ICES is asked to provide details of catch, gear, effort, composition and origin of the catch and rates of exploitation. For homewater fisheries, the information provided should indicate the location of the catch in the following categories: in-river; estuarine; and coastal. Information on any other sources of fishing mortality for salmon is also requested. For 4.1 ICES should review the results of the recent phone surveys and advise on the appropriateness for incorporating resulting estimates of unreported catch into the assessment process.

[6.] In response to question 4.2, ICES is requested to provide a brief summary of the status of North American and North-East Atlantic salmon stocks. The detailed information on the

status of these stocks should be provided in response to questions 2.3 and 3.3. The status of these stocks should be provided in response to questions 2.3 and 3.3.

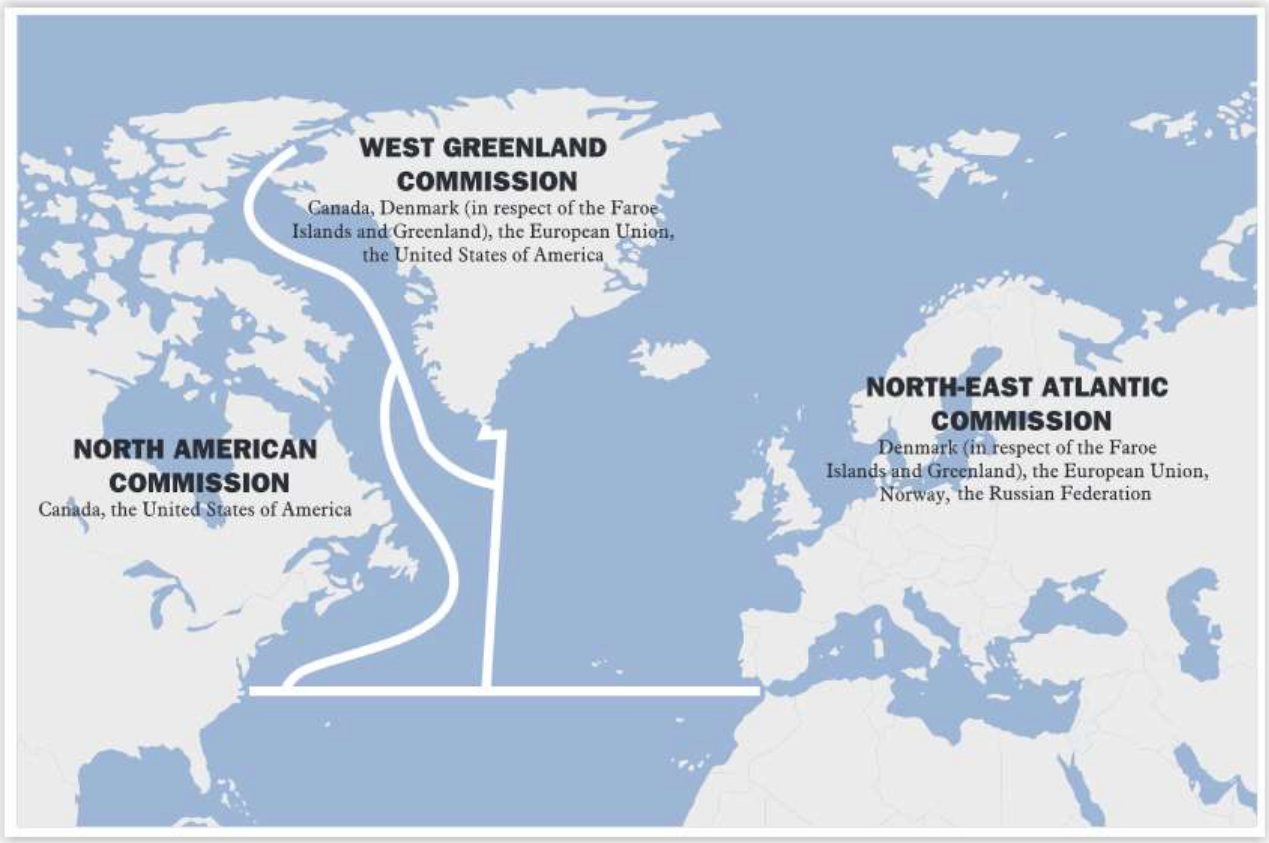
In response to the terms of reference, the working group considered 41 working documents. A complete list of acronyms and abbreviations used in this report is provided in Annex 1. References cited are given in Annex 2.

Please note that for practical reasons the tables are found at the end, immediately before the annexes.

Management framework for salmon in the North Atlantic

The advice generated by ICES is in response to terms of reference posed by the North Atlantic Salmon Conservation Organization (NASCO), pursuant to its role in international management of salmon. NASCO was set up in 1984 by international convention (the Convention for the Conservation of Salmon in the North Atlantic Ocean), with a responsibility for the conservation, restoration, enhancement, and rational management of wild salmon in the North Atlantic. Although sovereign states retain their role in the regulation of salmon fisheries for salmon originating in their own rivers, distant-water salmon fisheries, such as those at Greenland and Faroes, which take salmon originating in rivers of another Party, are regulated by NASCO under the terms of the Convention. NASCO now has six Parties that are signatories to the Convention, including the EU which represents its Member States.

NASCO's three commission areas, the North American Commission (NAC), the West Greenland Commission (WGC), and the North-East Atlantic Commission (NEAC) are shown below. The mid-Atlantic area is not covered by any of the three NASCO commissions but, under Article 4 of the NASCO Convention, NASCO provides a forum for consultation and cooperation on matters concerning the salmon stocks in this area.



Management objectives

NASCO has identified the primary management objective of that organization as:

"To contribute through consultation and co-operation to the conservation, restoration, enhancement and rational management of salmon stocks taking into account the best scientific advice available".

NASCO further stated that "the Agreement on the Adoption of a Precautionary Approach states that an objective for the management of salmon fisheries is to provide the diversity and abundance of salmon stocks", and NASCO's Standing Committee on the Precautionary Approach interpreted this as being "to maintain both the productive capacity and diversity of salmon stocks" (NASCO, 1998).

NASCO's Action Plan for Application of the Precautionary Approach (NASCO, 1998) provides an interpretation of how this is to be achieved:

- "Management measures should be aimed at maintaining all stocks above their conservation limits by the use of management targets".
- "Socio-economic factors could be taken into account in applying the precautionary approach to fisheries management issues".
- "The precautionary approach is an integrated approach that requires, *inter alia*, that stock rebuilding programmes (including as appropriate, habitat improvements, stock enhancement, and fishery management actions) be developed for stocks that are below conservation limits".

Reference points and application of precaution

Atlantic salmon has characteristics of short-lived fish stocks; mature abundance is sensitive to annual recruitment because there are only a few age groups in the adult spawning stock. Incoming recruitment is often the main component of the fishable stock. For such fish stocks, the ICES maximum sustainable yield (MSY) approach is aimed at achieving a target escapement (MSY $B_{escapement}$, the amount of biomass left to spawn). No catch should be allowed unless this escapement can be achieved. The escapement level should be set so there is a low risk of future recruitment being impaired. In addition, due to differences in status of individual stocks within stock complexes, mixed-stock fisheries present particular threats that need to be considered.

ICES considers that, to be consistent with the MSY and the precautionary approach, fisheries should only take place on salmon from rivers where stocks have been shown to be at full reproductive capacity. Conservation limits (CLs) for North Atlantic salmon stock complexes have been defined by ICES as the level of stock (number of spawners) that will achieve long-term average maximum sustainable yield. Generally, ICES considers that full reproductive capacity is met when conservation limits are attained with a 95% probability. It should be noted that ICES is requested by NASCO to provide advice on the status of the stocks as to whether they meet these CLs. Conservation limits (CLs) for North Atlantic salmon stock complexes have been defined by ICES as the level of stock (number of spawners) that will achieve long-term average maximum sustainable yield.

In many regions of North America, the CLs are calculated as the number of spawners required to fully seed the wetted area of the rivers. The definition of conservation limit in Canada varies by region and in some areas, historically, the values used were equivalent to maximizing / optimizing freshwater production. These are used in Canada as limit reference points and they do not correspond to MSY values. Reference points for Atlantic salmon are currently being reviewed for conformity with the precautionary approach policy in Canada, and revised reference points are expected to be developed. In some regions of Europe,

pseudo-stock–recruitment observations are used to calculate a hockey-stick relationship, with the inflection point defining the national CLs. In the remaining regions, the CLs are calculated as the number of spawners that will achieve long-term average MSY, as derived from the adult-to-adult stock and recruitment relationship (Ricker, 1975; ICES, 1993).

NASCO has adopted the region-specific CLs (NASCO, 1998). These CLs are limit reference points (S_{lim}); having populations fall below these limits should be avoided with high probability.

Management targets have not yet been defined for all North Atlantic salmon stocks. When these have been defined, they will play an important role in ICES advice.

Where there are no specific management objectives for the assessment of the status of stocks and advice on management of national components and geographical groupings of the stock complexes in the NEAC area, the following default approach shall apply:

ICES considers that if the lower bound of the 90% confidence interval of the current estimate of spawners is above the CL, then the stock is at full reproductive capacity (equivalent to a probability of at least 95% of meeting the CL).
When the lower bound of the confidence interval is below the CL, but the midpoint is above, then ICES considers the stock to be at risk of suffering reduced reproductive capacity.
Finally, when the midpoint is below the CL, ICES considers the stock to suffer reduced reproductive capacity.

For catch advice on the mixed-stock fishery at West Greenland (catching non-maturing one-sea-winter (1SW) fish from North America and non-maturing 1SW fish from Southern NEAC), NASCO has adopted a risk level (probability) of 75% of simultaneous attainment of management objectives in seven geographic regions (ICES, 2003) as part of an agreed management plan. NASCO uses the same approach for catch advice for the mixed-stock fishery, affecting six geographic regions for the North American stock complex. ICES notes that the choice of a 75% risk (probability) for simultaneous attainment of six or seven stock units is approximately equivalent to a 95% probability of attainment for each individual unit (ICES, 2013).

There is no formally agreed management plan for the fishery at Faroes. However, ICES has developed a risk-based framework for providing catch advice for fish exploited in this fishery (mainly multi-sea-winter (MSW) fish from NEAC countries). Catch advice is provided at both the stock complex and the country level. Tables of catch options provide the probability of meeting CLs in the individual stock complexes or countries, as well as in all the stock complexes or countries simultaneously. ICES has previously recommended (ICES, 2013) that management decisions should be based principally on a 95% probability of attainment of CLs in each stock complex / country individually. The simultaneous attainment probability may also be used as a guide, but managers should be aware that this will generally be quite low when large numbers of management units are used.

NASCO 1.1 Provide an overview of salmon catches and landings by country, including unreported catches and catch and release, and production of farmed and ranched Atlantic salmon in 2016

Nominal catches of salmon

The nominal catch of a fishery is defined as the round, fresh weight of fish that are caught and retained. Figure 1 displays reported total nominal catch of salmon in four North Atlantic regions from 1960 to 2016. Nominal catches reported by country are given in Table 4. Catch statistics in the North Atlantic include fish farm escapees, and in some Northeast Atlantic countries also ranched fish.

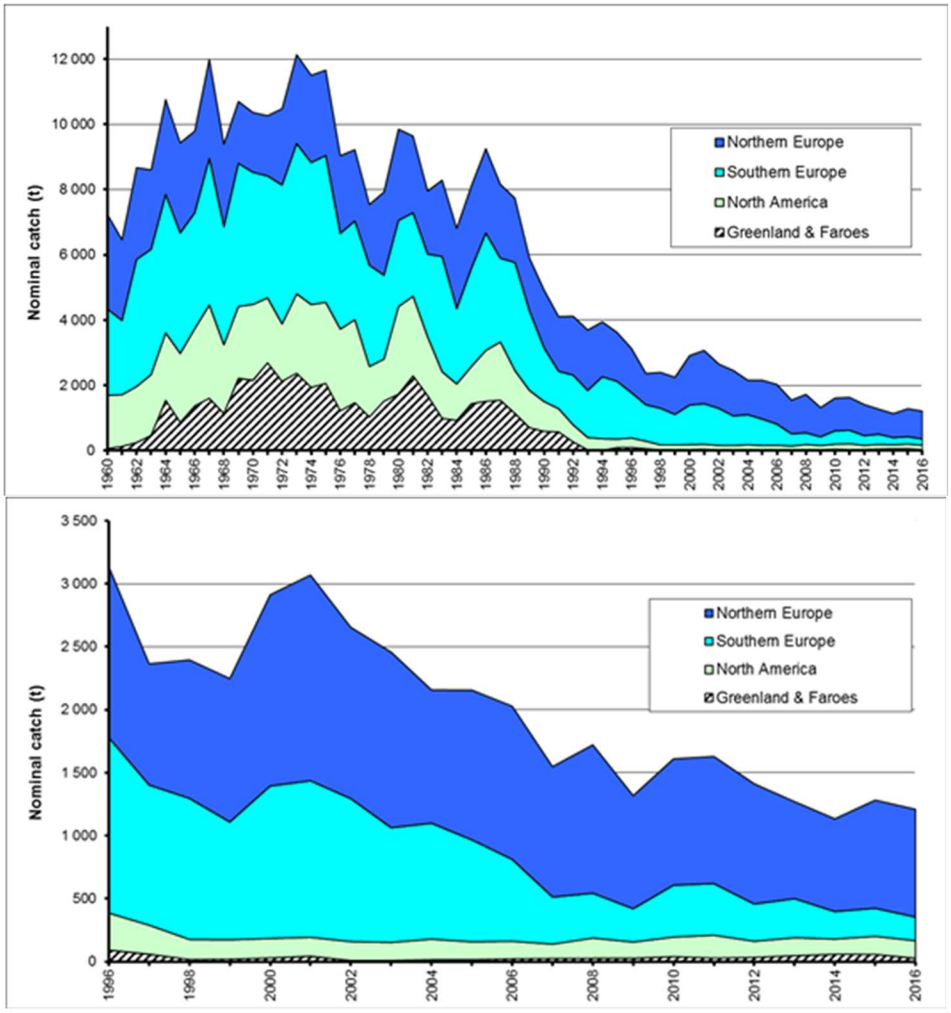


Figure 1 Total reported nominal catch of salmon (tonnes round fresh weight) in four North Atlantic regions, 1960–2016 (top) and 1996–2016 (bottom).

Icelandic catches have traditionally been split into two separate categories, wild and ranched, reflecting the fact that Iceland has been the main North Atlantic country where large-scale ranching has been undertaken, with the specific intention of harvesting all returns at the release site and with no prospect of wild spawning success. The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching for rod fisheries in two Icelandic rivers continued into 2016 (Table 4). Catches in Sweden are also split between wild and ranched categories over the entire time-series. The latter fish represent adult salmon which have originated from hatchery-reared smolts and which have been released under programmes to mitigate for hydropower development schemes. These fish are also exploited

very heavily in home waters and have no possibility of spawning naturally in the wild. While ranching does occur in some other countries, this is on a much smaller scale. Some of these operations are experimental and at others harvesting does not occur solely at the release site. The ranched component in these countries has therefore been included in the nominal catch.

Table 1 Reported catches (tonnes) for the three NASCO commission areas for 2007–2016.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NEAC	1409	1533	1162	1414	1419	1250	1080	954	1081	1043
NAC	114	162	129	156	182	129	143	122	144	140
WGC	25	26	26	40	28	33	47	58	57	27
Total	1548	1721	1318	1610	1629	1412	1270	1134	1282	1209

The provisional total nominal catch for 2016 was 1209 t, 70 t below the updated catch for 2015 (1282 t). The 2016 catch was the second lowest in the time-series, after 2014. Catches were below the previous five- and ten-year averages in the majority of countries (Figure 2).

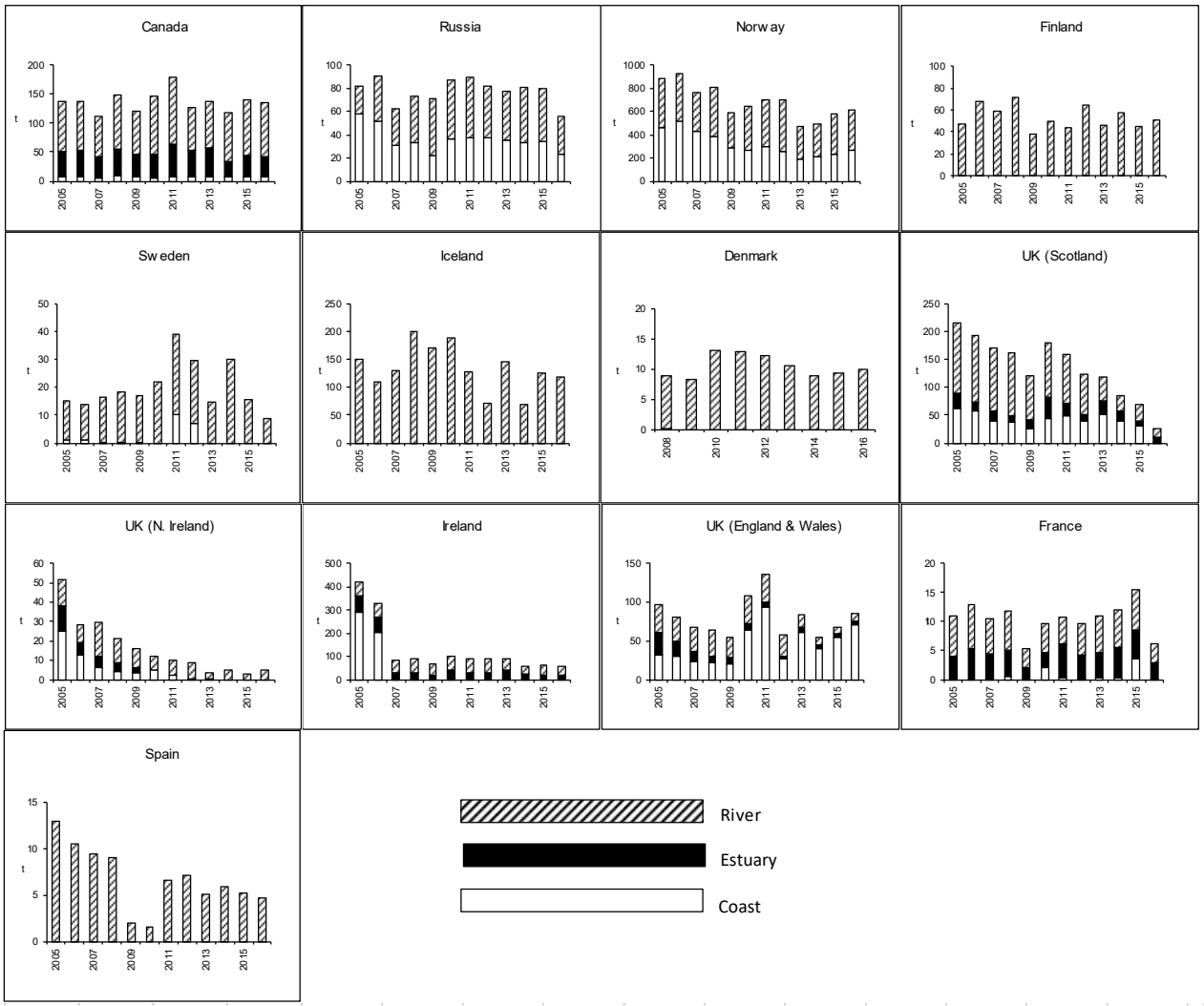


Figure 2 Nominal catch (t) by country taken in coastal, estuarine, and riverine fisheries, 2005–2016 (except Denmark: 2008–2016). Note that the scales on the *y*-axes vary.

ICES considers that mixed-stock fisheries present particular threats to stock status. Presently these mixed-stock fisheries predominantly operate in coastal areas and NASCO specifically requests that the nominal catches in home-water fisheries be partitioned according to whether the catch is taken in coastal, estuarine, or riverine areas. The 2016 nominal catch (in tonnes) was partitioned accordingly and is shown below for the NEAC and NAC commission areas. Figure 2 and Table 5 present these data on a country-by-country basis. There is considerable

variability in the distribution of the catch among individual countries. In most countries, the majority of the catch is now taken in freshwater, and across the time-series the coastal catch has declined markedly. However, nominal catches in freshwater have also declined in many countries, either partly or entirely as a result of management measures and increasing use of catch-and-release in rod fisheries.

Table 2 2016 nominal catch (in tonnes) for the NEAC and NAC commission areas.

AREA	COAST		ESTUARY		RIVER		TOTAL
	Weight	%	Weight	%	Weight	%	Weight
NEAC 2016	364	35	37	4	643	62	1043
NAC 2016	11	8	43	31	86	61	140

Coastal, estuarine, and riverine catch data aggregated by region are presented in Figure 3. In Northern NEAC, a decreasing proportion and weight of the nominal catch has been taken in coastal regions (from 46% to 34% and 565 t to 293 t, in 2006 and 2016 respectively), noting that there are no coastal fisheries in Iceland and Finland, that in-river catch has stayed fairly consistent over this time period, and that estuarine catches represent a negligible component of the catch in this area. In Southern NEAC, catches in all fishery areas have declined dramatically since 2006. While coastal fisheries historically made up the largest component of the catch, these fisheries have declined the most, reflecting widespread measures to reduce exploitation in a number of countries. Since 2007, the majority of the catch in this area has been taken in freshwater. In NAC, the total catch over the period 2006–2016 has been fluctuating around 140 t. The majority of the catch in this area has been taken in riverine fisheries; the catch in coastal fisheries has been relatively small in any year (13 t or less).

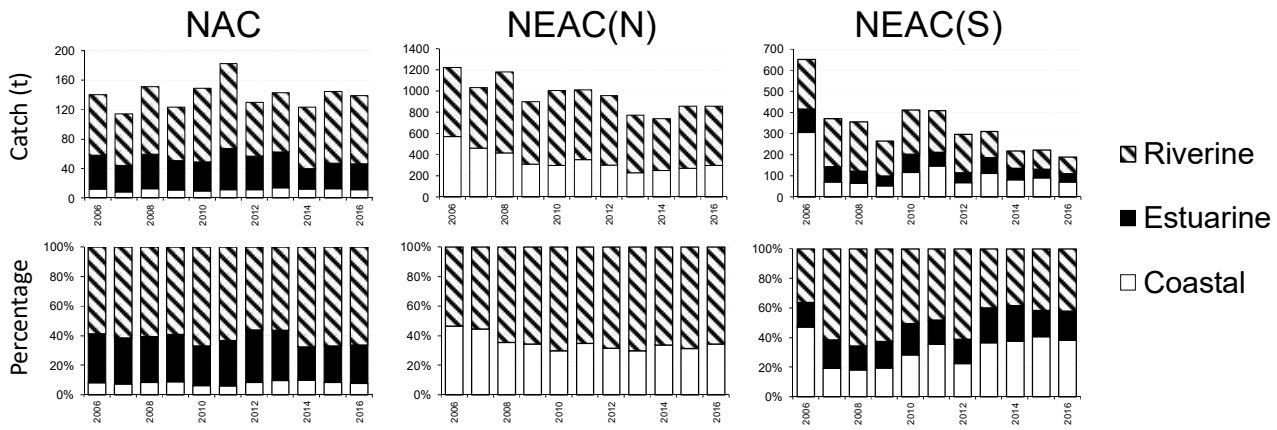


Figure 3 Nominal catches (t; top panel) and percentages of nominal catch (bottom panel) taken in coastal, estuarine, and riverine fisheries for the NAC area, and for the Northern (NEAC(N)) and Southern (NEAC(S)) NEAC areas, 2006–2016. Note that scales of vertical axes in the top panel vary.

Unreported catches

The total unreported catch in NASCO areas in 2016 was estimated at 335 t. There was no estimate for Russia, France, Spain, and St. Pierre and Miquelon in 2016, although reported catches in the latter two areas are small. The unreported catch in the NEAC area in 2016 was estimated at 298 t, and those for the West Greenland and North American commission areas at 10 t and 27 t, respectively.

Table 3 Unreported catch (in tonnes) by NASCO commission areas in the last ten years.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NEAC	465	433	317	357	382	363	272	256	298	298
NAC	-[1]	-[1]	16	26	29	31	24	21	17	27
WGC	10	10	10	10	10	10	10	10	10	10
Total	475	443	343	393	421	403	306	287	325	335
Total as % of reported catch	23.5	20.5	20.1	19.4	21.2	22.2	19.1	20.6	20.2	21.7

[1] Data not available for Canada in 2007 and 2008.

The 2016 unreported catch by country is provided in Table 6. It has not been possible to separate the unreported catch into that taken in coastal, estuarine, and riverine areas. Over recent years, efforts have been made to reduce the level of unreported catch in a number of countries (e.g. through improved reporting procedures and the introduction of carcass tagging and logbook schemes).

Catch-and-release

The practice of catch-and-release (C&R) in rod fisheries has become increasingly common as a salmon management/conservation measure in light of the widespread decline in salmon abundance in the North Atlantic. In some areas of Canada and USA, C&R has been practised since 1984, and in more recent years it has also been widely used in many European countries, both as a result of statutory regulation and through voluntary practice. Catch-and-release mortality is considered in some national assessments of spawner escapement, with estimates ranging from 3% to 20% among jurisdictions (ICES, 2010).

The nominal catches do not include salmon that have been caught and released. Table 7 presents C&R information from 1991 to 2016 for countries that have records; C&R may also be practised in other countries while not being formally recorded. There are large differences in the percentage of the total rod catch that is released; in 2016, this ranged from 18% in Sweden to 90% in UK (Scotland), reflecting varying management practices and angler attitudes among countries. Within countries, the percentage of fish released has tended to increase over time. There is also evidence from some countries that larger MSW fish are released in higher proportions than smaller fish. Overall, more than 195 000 salmon were reported to have been caught-and-released around the North Atlantic in 2016.

Farming and sea ranching of Atlantic salmon

The provisional estimate of farmed Atlantic salmon production in the North Atlantic area for 2016 was more than 1512 kt. The production of farmed salmon in this area has been over one million tonnes since 2009. Norway and UK (Scotland) continue to produce the majority of the farmed salmon in the North Atlantic (78% and 12%, respectively). The total farmed salmon production appears to have stabilized in the last few years in the North Atlantic area.

Worldwide production of farmed Atlantic salmon has been in excess of one million tonnes since 2001, and over two million tonnes since 2012. The total worldwide production in 2016 is provisionally estimated at around 2262 kt (Figure 4), a similar level to 2015. Production outside the North Atlantic is estimated to have accounted for one third of the total in 2016, with production outside the North Atlantic dominated by Chile (81%).

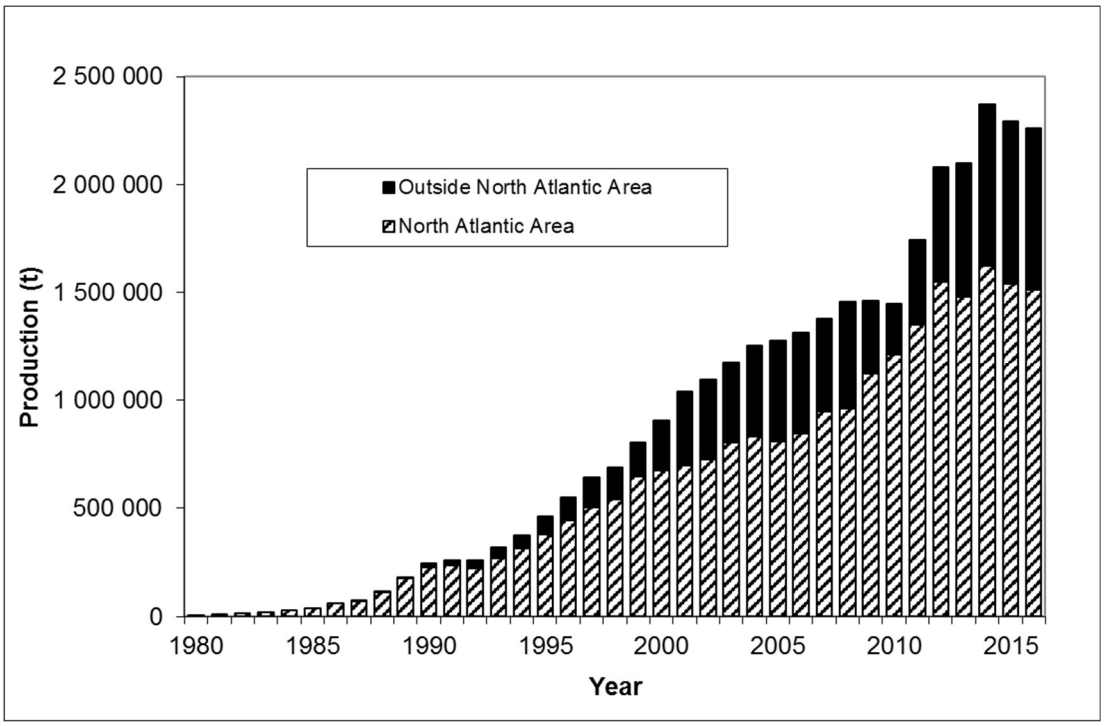


Figure 4 Worldwide production of farmed Atlantic salmon, 1980 to 2016.

The reported nominal catch of Atlantic salmon in the North Atlantic was in the order of 0.05% of the worldwide production of farmed Atlantic salmon in 2016.

The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic in 2016 was 37 t, all taken in Iceland, Sweden, and Ireland (Figure 5) with the majority of the catch taken in Iceland (31 t). No estimate of ranched salmon production was made in Norway in 2016, where such catches have been very low in recent years (< 1 t), or in UK (N. Ireland), where the proportion of ranched fish has not been assessed between 2008 and 2016 owing to a lack of microtag returns.

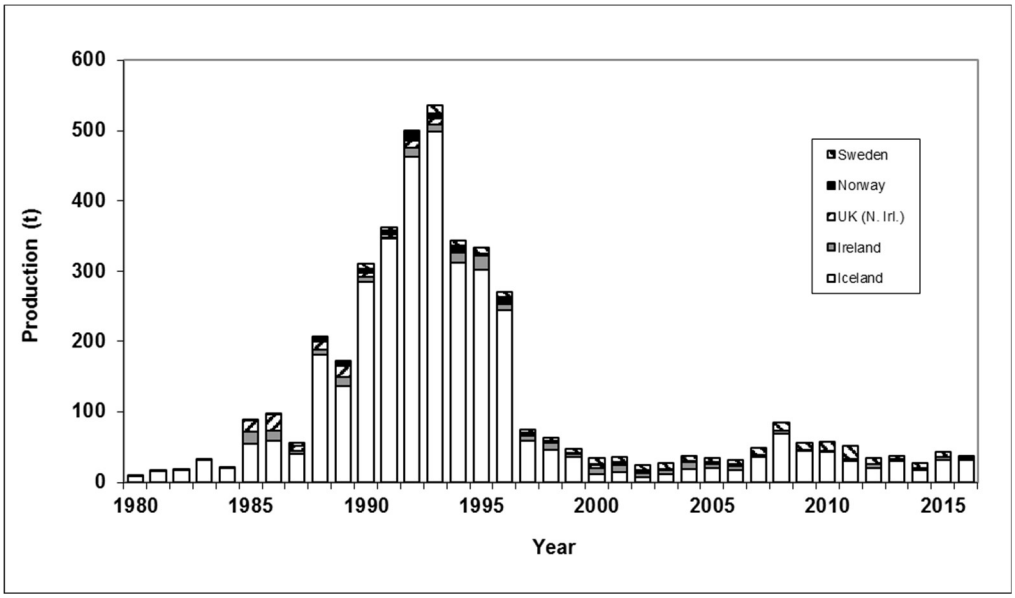


Figure 5 Production of ranched Atlantic salmon (tonnes round fresh weight) in the North Atlantic, 1980 to 2016.

NASCO 1.2 Report on significant, new, or emerging threats to, or opportunities for, salmon conservation and management

Review of major threats to Atlantic salmon in Norway

A recent paper has evaluated the major anthropogenic threats to Atlantic salmon in Norway using two-dimensional analyses (Forseth *et al.,* 2017). One dimension considered the effect of the threat and the other dimension considered the most likely development of the threat in the future (Figure 6). Escaped farmed salmon and salmon lice from fish farms were identified as expanding population threats since they scored high on both axes, with escaped farmed salmon being the largest current threat. The parasite *Gyrodactylus salaris*, acidification, and hydropower development also scored high along the effect axis, but lower on the development axis and were thus categorized as stabilized.

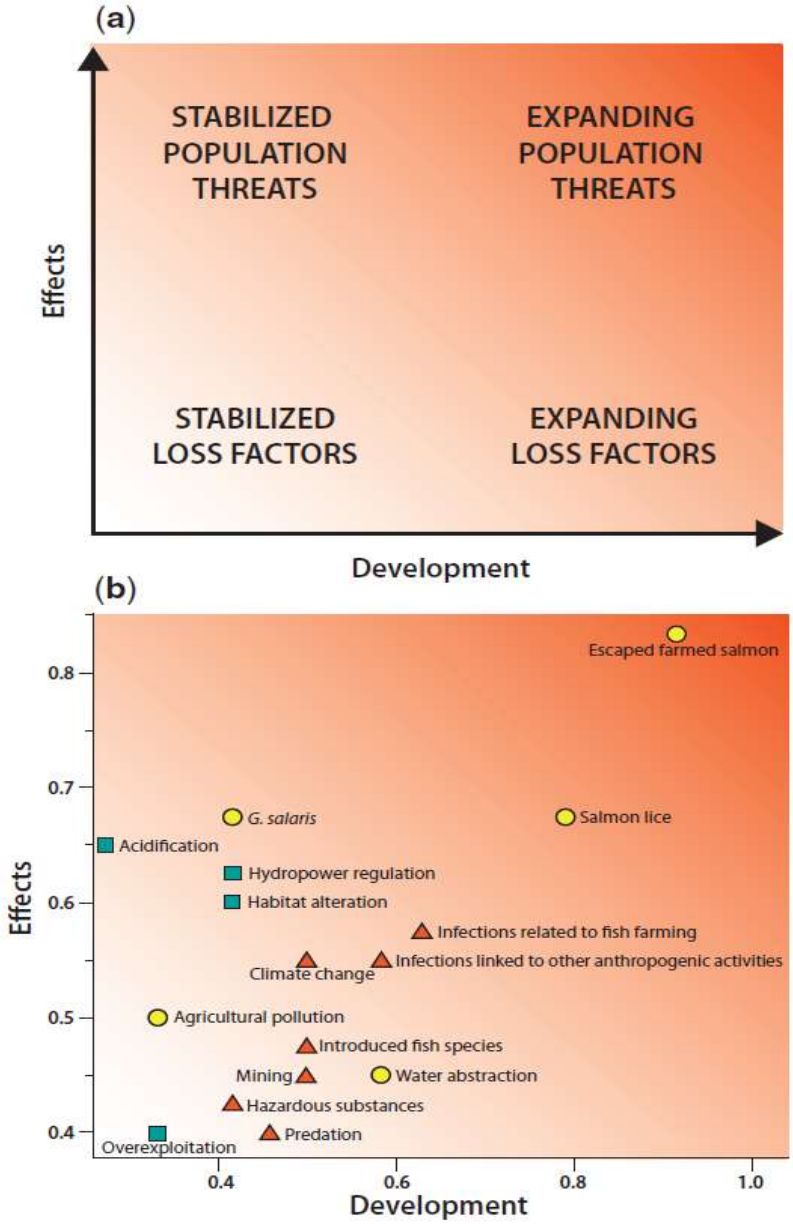


Figure 6 Panel (a) The classification system developed to rank different anthropogenic impacts on Norwegian Atlantic salmon populations along the Effects and Development axes. The four major impact categories are indicated, but the system is continuous. Background coloring indicates severity of impacts, with dark as the most severe. Panel (b) Location within the classification system of the 16 impact factors considered in 2015. For illustration, the information on each impact factor and the uncertainty of future development is indicated by the color of the markers. Green squares = Extensive knowledge and small uncertainty, yellow circles = moderate knowledge and moderate uncertainty, and red triangles = poor knowledge and high uncertainty. Figure extracted from Forseth *et al.* (2017).

Gene flow from farmed escapes alters the life history of wild Atlantic salmon

Many experimental studies have shown that farmed salmon and hybrids have altered phenotypes compared to wild salmon (reviewed in Glover *et al.,* 2017, and ICES, 2016a). In Atlantic salmon, gene flow from domesticated stocks into wild conspecific populations is well documented with introgression levels up to a maximum average of 40% (domesticated ancestry) among the spawners in some populations (Karlsson *et al.,* 2016). However, the experimental conditions and the limited number of whole-river experiments do not necessarily represent the extent or scale of the impact of domesticated introgression on

natural populations. A recent study by Bolstad *et al.* (2017) together with the extensive experimental literature on the subject provides solid evidence that gene flow from escaped farmed salmon has a strong effect on important biological characteristics of wild Atlantic salmon.

Based on data from 62 salmon populations along the entire Norwegian coastline, Bolstad *et al.* (2017) showed that groups of individuals with a high level of introgression had altered size- and age-at-maturation. The effect of introgression on size- and age-at-maturation differed between sexes and among different types of populations.

In the Eastern Atlantic populations with high mean sea age, females with high levels of introgression had a higher probability of maturing after two winters at sea compared to individuals with a low level of introgression. In contrast, males with a higher level of introgression had a higher probability of maturing after one winter at sea (Figure 7). Thus, there are fewer old and large salmon with increasing levels of introgression in these populations. These effects of introgression were not observed in populations with a lower mean sea age. There was also an effect on size independent of age, which increased with increasing introgression. This effect was largest in the populations with low mean sea age.

In the Barents/White Sea populations, which are of different phylogeny from the source of domesticated salmon, the estimated effects of introgression were in several cases stronger in this phylogenetic group than in the Eastern Atlantic phylogenetic group. In particular, there was a dramatic increase in age-independent weight in the populations with low mean sea age, and the males in these populations with high levels of introgression matured after two sea winters instead of one.

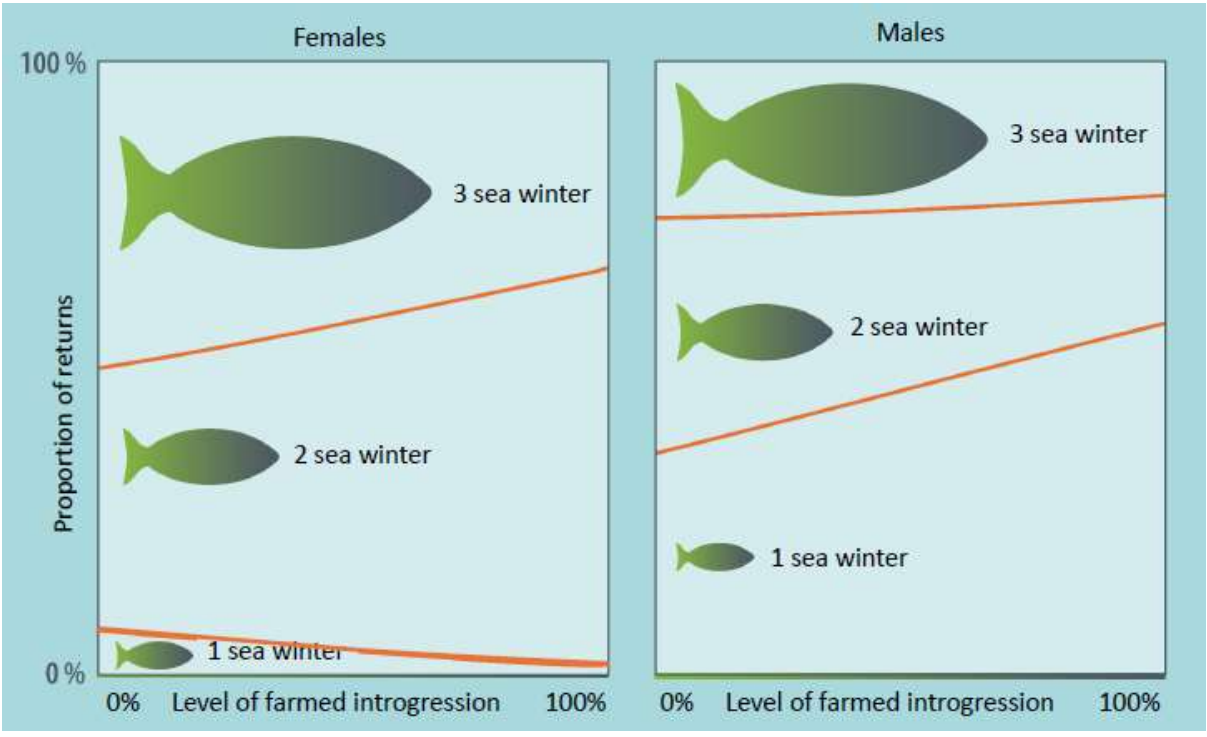


Figure 7 Changes in sea age distribution of returns with the level of farmed introgression (farmed ancestry) in 22 rivers of the Eastern Atlantic phylogenetic group, characterized by a high proportion of late maturing fish and distributed along the Norwegian coast (Bolstad *et al.,* 2017).

Diseases and parasites

Update on red vent syndrome (*Anisakiasis*)

In recent years, a number of countries in the NEAC and NAC areas have reported on salmon returning to rivers with swollen and/or bleeding vents (ICES, 2016b). The condition, known as red vent syndrome (RVS or *Anisakiasis*), has been observed since 2004 and has been linked to the presence of a nematode worm, *Anisakis simplex* (Beck *et al.,* 2008), which occurs commonly in other marine fish and marine mammals. A number of regions within the NEAC area observed a notable increase in the incidence of salmon with RVS in 2007 (ICES, 2008). Levels in the NEAC area were typically lower from 2008 (ICES, 2009, 2010, 2011), but trapping records for rivers in the UK (England and Wales) and France suggested that levels of RVS increased again in 2013, with the observed levels being the highest in the time-series for some of the monitored stocks (ICES, 2014). Monitoring for the presence of RVS has continued on three rivers in UK (England and Wales; rivers Tyne, Dee, and Lune). In 2016, RVS levels on the Tyne and Dee, 4% and 22% respectively, were below or at the long-term average of the time-series. Similarly, the RVS level on the Lune (19%) was at the average of the observed values, although the sample size was small. In Ireland in 2016, a lower level of incidence of RVS was reported in fish taken in the Galway weir salmon fishery compared to 2015.

There is no clear indication that RVS affects either the survival of the fish in freshwater or their spawning success. Recent results have also demonstrated that affected vents show signs of progressive healing in freshwater (ICES, 2014).

Disease reports from Sweden

Disease and mortality issues in returning salmon and sea trout have been prevalent in a number of rivers in Sweden that drain to the Baltic Sea (ICES, 2017a). After high levels of mortality in two consecutive years (2014 and 2015), the Swedish National Veterinary Institute (SVA) conducted a sampling programme in 2016 to investigate the rivers affected: the Torneälven (northern Baltic), Umeälven (mid-Baltic), and the Mörrumsån (southern Baltic), all at a distance of approximately 200 km from North Atlantic salmon rivers. In total, 112 diseased or wounded fish were sampled in 2016. Of the 112 fish sampled, 42 (38%) had wounds typical of ulcerative dermal necrosis (UDN), but analyses showed that only 15 met criteria indicative of UDN. However, it has still not been concluded that UDN was the underlying cause of the symptoms observed, as other infections can result in similar wounds and damaged tissue. Routine analyses for viruses and bacteria gave no conclusive results, although bacteria associated with skin lesions were identified in a few individuals. Next generation sequencing indicated the presence of herpes- and irido-viruses in the population, viruses that are harder to cultivate. These viruses can cause skin lesions, but the findings need to be investigated further to ascertain the presence of virus and clarify virulence and prevalence. In summary, no outbreak of UDN was confirmed and numbers of dead salmon seem to have decreased since 2015.

Disease reports from Russia

ICES (2016b) noted that in summer 2015 a mass mortality of adult salmon was observed in Russia in the Kola River, Murmansk region, owing to disease diagnosed as UDN. In 2016, mortality of spawning fish caused by the same disease was observed in the Kola River again and in the Tuloma River, the outlet of which is located 10 km from the Kola River mouth. Both

rivers drain into the inner part of the Kola Bay. The source of the pathogen was unknown, but the timing of the disease incidence in 2015 coincided with mass mortalities of farmed salmon observed in late autumn 2014 and spring/summer 2015 and with the disposal in summer 2015 of dead farmed fish on the bank of the Kola River, near the urban settlement of Molochny near the Kola River outlet. The total mortalities in these rivers from disease are unknown.

In late July 2016 a few salmon with red bellies (disease symptoms similar to those found in fish from Kola and Tuloma) were caught in the Motovsky Gulf with gillnets during surveys in the coastal areas of the Barents Sea. The Motovsky Gulf is a body of water between the northwestern coast of the Kola Peninsula and the southern coast of the Rybachy Peninsula, Murmansk region. The Bolshaya Zapadnaya Litsa, Titovka, and Ura rivers drain into the Motovsky Gulf. It was noted that salmon farms in the Titovka Bay and in the Ura Bay also suffered from mass mortality of farmed salmon in sea cages in 2015. Some further, more sporadic reports were received on individual diseased salmon caught or found in other Barents Sea rivers of the Kola Peninsula in 2015–2016.

Update on sea lice investigations in Norway

The surveillance programme for salmon lice infections on wild salmon post-smolts and sea trout at specific localities along the Norwegian coast continued in 2016 (Nilsen *et al.,* 2017). In 2016, the field activities in the surveillance programme were based on predictions from the hydrodynamic model in relation to the spreading and distribution of salmon louse larvae. In this model, data from weekly counts of sea lice at fish farms are coupled with detailed hydrodynamic modelling to predict the distribution of sea lice larvae, and the infection pressure on wild salmonids (Sandvik *et al.,* 2016). Field sampling was directed to areas where the model predicted high densities of infective salmon louse copepodites in the post-smolt migration period. The field examinations were conducted in two periods: an early period covering the migration period of salmon post-smolts, and a late period 2–3 weeks later focused on sea trout infection. In general, the surveillance programme demonstrated varying infection pressure along the coast during the post-smolt migration period in 2016. The number of sea lice observed on salmon in fish farms was generally at the same level as in 2015, but with increased levels in some regions and lower in others (Hjeltnes *et al.,* 2017). There was a significant reduction in the use of chemicals to treat salmon louse infections on farmed salmon in 2016 compared to 2015 (41% reduction). This decrease resulted from fish farmers switching to alternative methods for removal of sea lice, such as various mechanical methods, as resistance to the commonly used chemicals continues to be a serious problem (Hjeltnes *et al.,* 2017).

In 2017, a new management regime for salmonid aquaculture will be implemented in Norway (Anon., 2017a). Under this management regime, the level of aquaculture production in 13 defined production areas along the coast will be regulated and adjusted according to the estimated added mortality resulting from salmon louse infections inferred on wild salmon populations in each production area. In production areas where estimates indicate that mortality from salmon lice is >30%, salmonid aquaculture production may be reduced. Where estimates indicate that added mortality from salmon lice infections is between 10% and 30%, aquaculture production may remain at the same level. If added mortality is estimated to be below 10%, production may be allowed to increase in that area (Anon., 2015a, 2015b).

Poor juvenile recruitment in UK (England and Wales) in 2016

Densities of juvenile salmon, particularly 0+ fry, were very low in many rivers in UK (England and Wales) in 2016 and well below long-term averages. While there has been a modest decline in juvenile salmon densities since 2009, the scale of the downturn in 2016 was particularly notable and affected rivers throughout the country (Figure 8). The widespread nature of these observations suggested that factors operating at a broad scale were responsible for the declines in juvenile densities, albeit with some regional variation.

The UK Met Office described the winter of 2015/2016 as "remarkable", with severe flooding in December from record rainfall totals, accompanied by exceptional warmth from a persistent flow of tropical maritime air. The winter was the second wettest in the UK (in a time-series dating back to 1910) and Storm Desmond on 5 December set a new 24-hour rainfall record for the UK, with 341.4 mm of rain falling in a 24-hour period. This resulted in severe and extensive flooding across many northern and western parts of the country and affected many rivers, with rivers like the River Tyne registering the highest winter flows on record. These extreme high flow events coincided with the salmon spawning period and may have caused mortality because of the wash-out of eggs and alevins from redds and/or sediment deposition in the redds.

The winter of 2015/2016 was also the warmest on record in UK (England and Wales) and temperatures in December were reported to be the warmest for both the UK and the Central England Temperature (CET) series, which dates back to 1659. The unusually warm conditions in the winter of 2015/2016 combined with the flood events may thus also have been an important factor in the observed declines in juvenile salmon recruitment.

In summary, low densities of juvenile salmon in 2016 (Figure 8) probably resulted from a combination of factors, including unusually high winter flows and unusually high winter temperatures, with relatively low numbers of spawners in some catchments. It is probable that the relative importance of different factors affected different catchments and sub-catchments to varying degrees. The impact of this event will be monitored to assess the effects on subsequent smolt (two-year-olds in 2018) and adult recruitment (1SW in 2019 and 2SW in 2020).

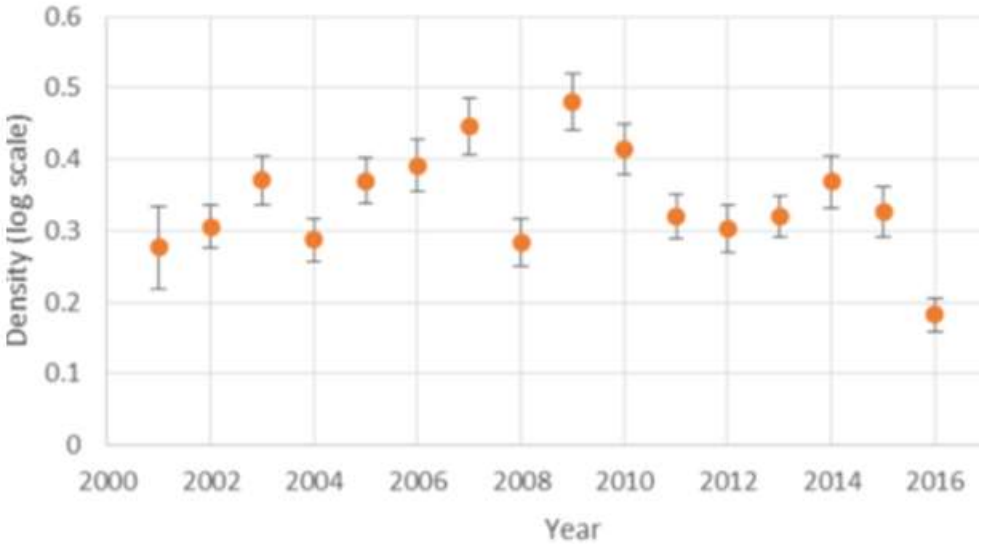


Figure 8 The density (on the log scale) of 0+ salmon fry averaged for all catchments in England where juvenile screening data were consistently available, 2001 to 2016.

Progress with implementing the Quality Norm for Norwegian salmon populations

In August 2013, a management system – The Quality Norm for Wild Populations of Atlantic Salmon ("Kvalitetsnorm for ville bestander av Atlantisk laks") – was adopted by the Norwegian government (Anon., 2013). A more detailed description of the Quality Norm is given in ICES (2014). In 2016, the first classification of populations based on both dimensions (conservation limit and harvest potential, and genetic integrity) was conducted for 104 populations (ICES, 2016b). Up to now, 148 salmon populations have been classified. These include the 104 populations classified in 2016. Updated estimates of the degree of introgression from farmed Atlantic salmon in a large number of salmon populations were available, and a combined classification in both dimensions of the quality norm was made (Anon., 2017b). Of the 148 populations considered, 29 (20%) were classified as being in good or very good condition, 42 (28%) populations were classified as being in moderate condition, while 77 (52%) were in poor or very poor condition (Figure 9).

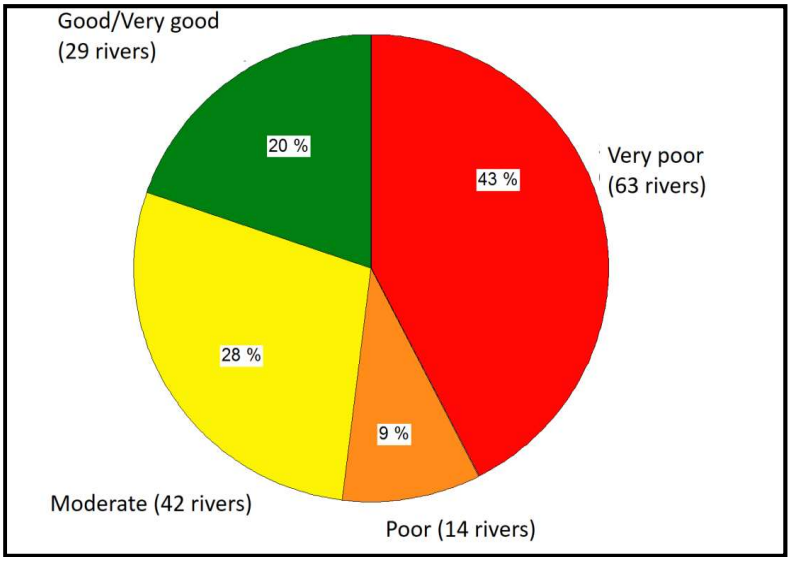


Figure 9 Final classification in the Quality Norm system for 148 Norwegian rivers. Figure translated from Anon. (2017b).

Update on opportunities for investigating salmon at sea

The International Ecosystem Summer Survey of the Nordic Seas (IESSNS)

This is a collaborative programme involving research vessels from Iceland, the Faroes, and Norway; surveys are carried out annually in July–August and present an opportunity to improve knowledge on many marine fish species, including salmon at sea. The area surveyed (3.0 million km^2 in 2016) overlaps in time and space with the known distribution of post-smolts in the North Atlantic, and as these cruises target pelagic species such as herring and mackerel with surface trawling at predetermined locations, bycatch of salmon post-smolts and adult salmon is not uncommon. In 2016 a total of 103 post-smolt and adult salmon were caught by the participating vessels in different regions of the North Atlantic (Figure 10). The breakdown by average length (Figure 10) differentiates between locations of post-smolts and adults. This post-smolt distribution is similar to previous marine surveys for salmon at sea (Anon., 2012) and simulated distributions based on larger sample sizes from directed surveys (Mork *et al.,* 2012). The Working Group has been liaising with the coordinator of the IESSNS surveys to clarify sampling protocols and a number of samples have been collected and frozen for subsequent analysis. The Institute of Marine Research (Bergen, Norway) is

developing a plan to collate all the information from the analysis of the samples of individual salmon caught in earlier years, as well as those from last year's cruises.

The samples are expected to provide valuable information on the distribution of salmon at sea, the size, sex, and diet of individual fish, and they will also enable stock origin to be investigated using genetic techniques. The IESSNS survey data will also provide information on salmon distribution in relation to other pelagic species, hydrography, and plankton abundance.

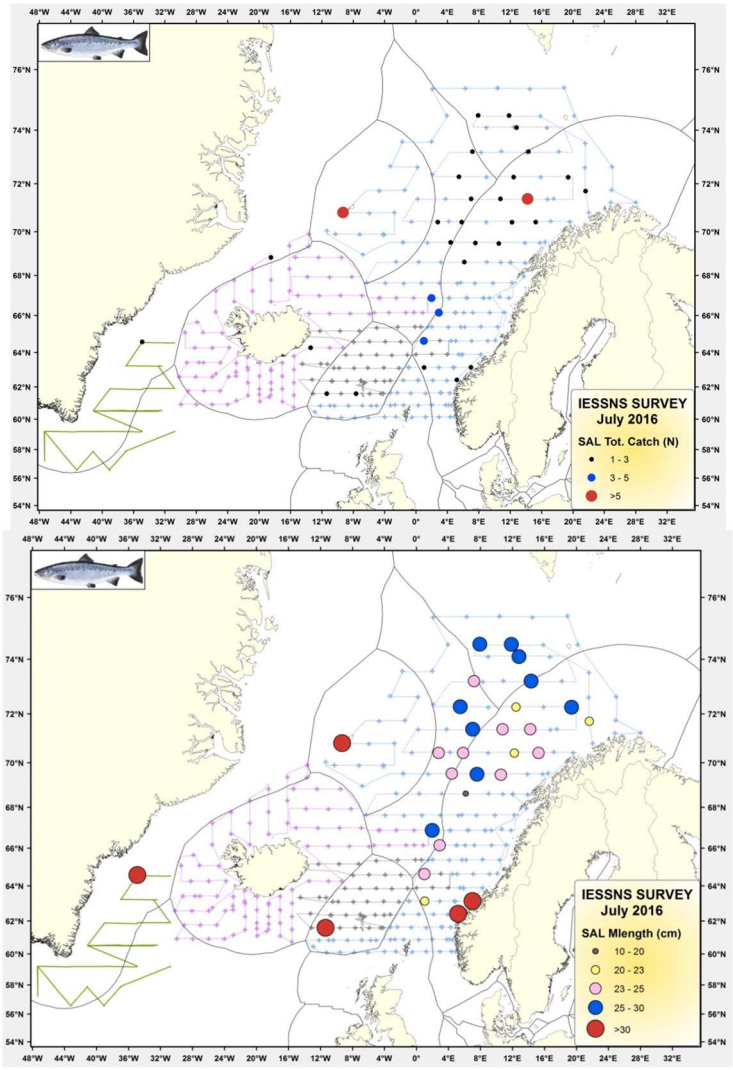


Figure 10 Locations and number of Atlantic salmon taken during IESSNS surveys in the Northeast Atlantic in July 2016 (upper panel) and the mean length of Atlantic salmon taken by location (bottom panel) during IESSNS surveys in the Northeast Atlantic in July 2016 (lower panel).

Bycatch of salmon in the Icelandic mackerel fishery

Since 2007, mackerel have been at high abundance within the Icelandic EEZ. A fishery opened in that year and the average catch of mackerel has been 163 thousand tonnes over the past five years. Mackerel are predominantly caught using midwater trawls during the summer months. Partial screening of the catch has been undertaken by the Icelandic Directorate of Fisheries to check for possible bycatch of salmon; this screening has involved both on-board inspections and screening at landing sites. In addition, salmon taken as bycatch have been voluntarily reported by the Icelandic mackerel fleet and have been

recovered during surveys carried out by Marine and Freshwater Research Institute research vessels.

Between 2010 and 2014, 703 salmon have been recovered from the screening programmes and subject to investigation, including: tag recovery, collection of scales, otoliths and DNA samples, and stomach contents analysis. DNA analysis to date has enabled 186 salmon to be assigned to their area of origin (Olafsson *et al*., 2015). Eight fish, from post-smolts caught close to land, were determined to be of Icelandic origin. Of the remaining 178 samples caught further offshore, 121 individuals (68%) were from mainland Europe, the UK, and Ireland, 53 individuals (30%) were from Scandinavia and Northern Russia, and 4 individuals were from Iceland (2%) (ICES, 2016b).

Between 2010 and 2013, 107 894 tonnes of mackerel catches have been screened for salmon, resulting in a total bycatch recovery of 170 salmon. On average, the bycatch of salmon has been estimated at 5.4 fish per 1000 tonnes of mackerel caught. Over the period, this has ranged from 4.7 fish per 1000 tonnes in 2013 to 6.2 fish per 1000 tonnes in 2011. In 2016, the Icelandic Directorate of Fisheries detected 53 salmon. Of these, 50 were recovered from a mackerel catch of 9186 tonnes, again representing an average of 5.4 salmon per 1000 tonnes of mackerel. The remaining three salmon were caught in other fisheries. The data collected to date thus suggest that the proportion of salmon in the mackerel catches has been relatively stable over the time, and similar to those reported by ICES (2014). The Icelandic Directorate of Fisheries plan to continue screening for salmon bycatch in the mackerel fishery. This ongoing analysis will provide further information on the distribution and origin of salmon off the east and west coasts of Iceland.

Tracking and acoustic tagging studies

There is continued interest in the development of techniques to help investigate salmon mortality at sea and to better partition mortality between different periods of the marine phase of the life cycle. To this end, NASCO's International Atlantic Salmon Research Board (IASRB) adopted a resolution in 2014 to further support the development of telemetry programmes in the ocean.

The Atlantic Salmon Federation in Canada, in partnership with the Oceans Tracking Network and a number of collaborators have captured, sampled, and tagged with acoustic transmitters more than 3000 smolts from four rivers of the Gulf of St. Lawrence in eastern Canada over a period of fourteen years, from 2003 to 2016. Salmon smolts from additional research projects were also released with acoustic tags in 2016. Acoustic arrays to detect tagged fish were positioned at the head of tide of each river, at the exit from the bays to the Gulf of St. Lawrence (GoSL), and at the Strait of Belle Isle (SoBI) leading to the Labrador Sea, more than 800 km from the point of release.

Results to date indicate that the probability of smolt survival through freshwater was high for two rivers, while it was lower and highly variable in two others with the survival rate through freshwater negatively associated with migration duration. The survival rates from release to the outer bays leading to the GoSL varied annually, with noticeably lower survivals during the last four years for smolts from the Miramichi River release areas. The survival rates through the GoSL to the Labrador Sea were also highly variable, although some years showed very low mortality in this area.

The SoBI (between Labrador and Newfoundland) appears to be the primary route for smolts and kelts exiting the GoSL. The only other possible exit is through the Cabot Strait, and this array has been in place since 2012. Only two smolt tags were detected on the Cabot array (originating in Miramichi in 2012 and Cascapedia in 2013) although adult salmon, tagged as kelt in the preceding year, have been detected at this array. In 2016, kelts from Miramichi and Restigouche rivers crossed the SoBI array during a three-week period at end of June and early July, whereas smolts from many different stocks crossed this line together between 10 and 20 July (Figure 11).

Salmon kelts (400 in total) have been acoustically tagged in the Miramichi (since 2008) and Restigouche (since 2013) rivers. Some of these acoustically tagged kelts (53) have also been fitted with satellite tags (PSATs), since 2012 in Miramichi River and starting in 2016 in Restigouche River. There has been a high mortality of kelts in the GoSL and pop-up tags have provided data on where and how some of the kelts are dying (Strøm *et al.,* 2017). Seven of the PSAT-tagged kelts migrated beyond the Gulf of St Lawrence and into the Labrador Sea via SoBI. Of these seven, four followed the Labrador coast north towards Baffin Island, whereas three moved off the continental shelf over deep-water zones and deep dives down to 600–800 m were detected.

Additional research questions being addressed with acoustic telemetry are related to predation. Over the past four years, predator–prey interactions have been studied among diadromous species in the Miramichi River, with a focus on the spatial and temporal overlap of Atlantic salmon smolts and striped bass. Losses of acoustically tagged Miramichi smolts have been noted in areas where striped bass were known to be spawning. Preliminary modelling of acoustic tag tracks from smolts suggest that 10–19% of the smolt tracks from northwestern Miramichi and 2–20% of the smolt tracks from the southwestern Miramichi are consistent with tag tracks of striped bass, leading to the conclusion that these tagged smolts had been predated by striped bass. However, the results are highly variable over the past four years (2013–2016).

These tracking programmes provide useful information in the assessment of marine mortality on North Atlantic salmon stocks. These techniques have been proposed, and are being implemented in other areas, both in the Northwest and the Northeast Atlantic (e.g. SALSEA Track), in line with the NASCO IASRB resolution.

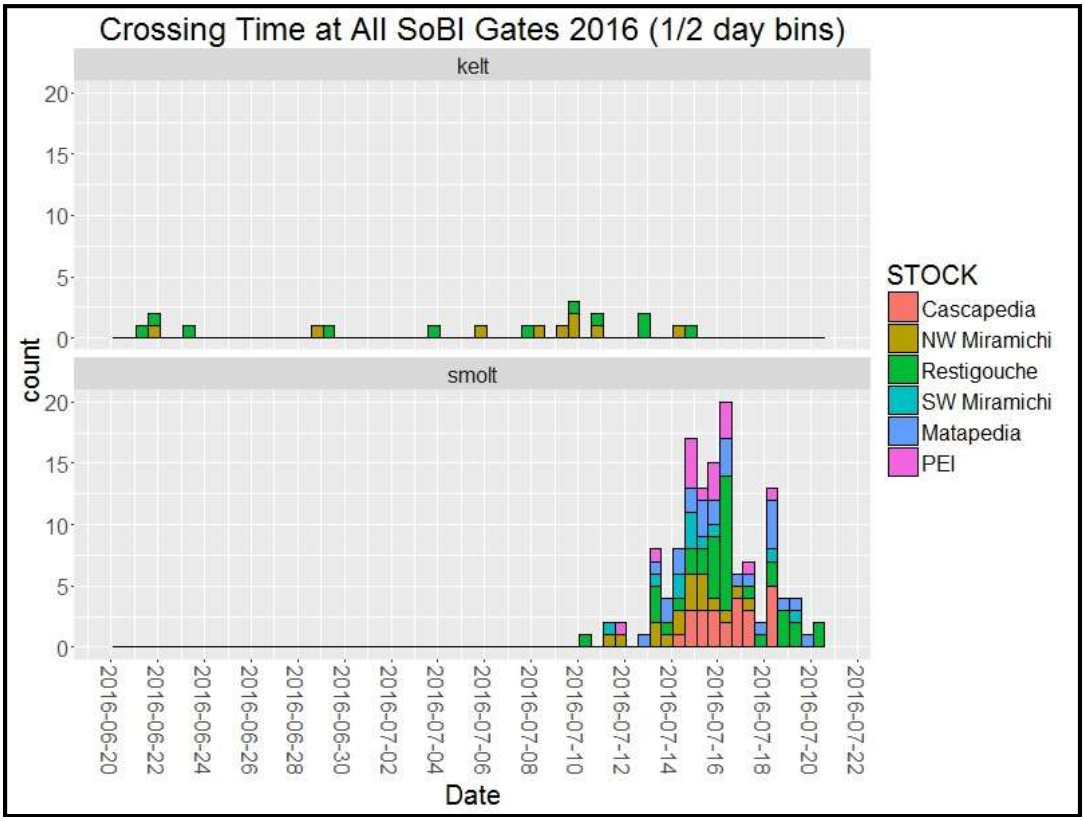


Figure 11 Counts and dates of acoustically tagged Atlantic salmon smolts and kelt from various Gulf of St. Lawrence rivers (PEI = Prince Edward Island) crossing the Strait of Belle Isle (SoBI) receiver array in 2016.

Progress in stock assessment models – Embedding Atlantic salmon stock assessment within an integrated Bayesian life cycle modelling framework

Developments in modelling and forecasting abundance of Atlantic salmon using life cycle models have been reported previously (ICES, 2015, 2016b). The life cycle model provides a framework to improve the understanding of the drivers and mechanisms of changes in Atlantic salmon population dynamics and productivity in the North Atlantic. An important limitation in the models currently used by ICES is that three different models are run for the three stock complexes (Northern NEAC, Southern NEAC, and NAC) and some core demographic processes, including survival in the first year at sea and proportion of the stock that matures as 1SW salmon are not harmonized among the three stock complexes. The most recent version of the life cycle model forms the basis of a graduate thesis research and considers the dynamics of the stock units in Southern NEAC and NAC complexes in a single hierarchical model where all populations follow the same life history processes, but with stock-specific parameters and data inputs (Figure 12). One of the most important changes is the simultaneous treatment of the dynamics of both 1SW and 2SW fish with estimation of the temporal variation of the proportion of fish maturing as 1SW for all stock units. Setting the dynamics of all stock units in a single hierarchical model provides the rationale for implicitly modelling covariation in the dynamics of the different populations that share migration routes and feeding areas at sea and are harvested in mixed-stock fisheries, particularly at West Greenland for NAC and Southern NEAC salmon. The approach also allows for disentangling the effects of fisheries from those of environmental and ecosystem factors in a hierarchy of spatial scales from a global effect scale shared by all populations to local effect scales for each stock unit independently.

The latest version of the life cycle model reviewed was applied to thirteen stock units (seven in the Southern NEAC stock complex and six stock units in NAC) for a time-series from

1971 to 2014. Stock units of the Northern NEAC complex were not included yet because of differences in the available time-series which only covers the 1983 to 2014 period. The life cycle model is implemented in JAGS (http://mcmc-jags.sourceforge.net/) and was run under the R platform (rjags library). The model provides estimates of trends in marine productivity (expressed as post-smolt survival rate to January 1 of the first winter at sea) and the proportion maturing as one-sea-winter for all stock units of Southern NEAC and NAC.

The initial results provide a broad picture of Atlantic salmon population dynamics in the North Atlantic, providing evidence of a decline in the marine survival and an increase in the proportions of fish that mature after one year at sea, common to all stock units in NAC and Southern NEAC (Figure 13). Post-smolt survivals decreased over the time-series with a marked decline in the early 1990s, while the proportion of early maturing fish increased for almost all stocks from the 1970s to the 1990s and then decreased again for some stock units (Figure 13). For both the post-smolt survivals and the proportions of fish maturing as 1SW, common trends extracted from a Principal Component Analysis, account for more than 50% of the variance of the time-series, with only slight differences between the trends extracted from the NAC and Southern NEAC stock units separately (Figure 13).

The collective patterns observed across the thirteen stock units largely support the hypothesis of a synchronous response of populations to large-scale ecosystem changes in the North Atlantic in the last three decades that simultaneously impact distant populations during their marine migrations to and/or at common marine feeding grounds (West Greenland, Labrador, Faroes). Results also suggest some yet unknown relationships between marine survival and age-at-maturation. Although the causes and mechanisms for those changes remain unknown, results support previous studies that suggest a mechanism involving a decline in salmon prey abundance and/or quality as a response to bottom-up environmentally driven changes (Beaugrand and Reid, 2012; Mills *et al.,* 2013; Friedland *et al.,* 2014; Renkawitz *et al.,* 2015).

The life cycle model provides estimates and forecasts of variables of interest that can be compared to the ICES PFA model outputs. Estimates of stock-unit-specific PFA are similar for the Southern NEAC stock units (Figure 14). For the NAC complex, the current results indicate that there can be important differences in the posterior distribution estimates from the life cycle model compared to the previous model used by ICES. This is the result of differences in the inclusion of factors in the life cycle model, including the egg contributions of 1SW maturing salmon and the covariance structure in both the post-smolt survivals and the proportions maturing. The differences are more important for the Newfoundland stock unit, for example, in which there is an important contribution to total eggs by 1SW maturing fish, but estimates from the two modelling approaches are very close for stock units in NAC that have lower contributions to eggs by 1SW maturing salmon (Figure 14).

Anticipated improvements to model development and application

The integrated life cycle modelling framework facilitates incorporation of improvements in data inputs. Given the reported changes in smolt characteristics including proportions at age over time (Russell *et al.,* 2012), and the variations in the biological characteristics of returns of salmon to rivers (ICES, 2013), there would be benefit in improving a number of input data streams. Additionally, new stock origin data on catches in mixed-stock fisheries, based on genetic analyses, are becoming available (Bradbury *et al.,* 2016) and these inputs should be examined and compared to the current assumptions of stock composition of the mixed-stock fishery catches currently used by ICES.

The life cycle model currently models the dynamics between eggs and smolts as a density-independent function, with an average survival rate of 0.7% from egg to smolt. This value was selected based on average egg-to-smolt survival rates over a range of populations of varying status in UK (England and Wales) and UK (Scotland), as summarized in Hutchings and Jones (1998). There are consequences to the inferences on post-smolt survival rates if alternate freshwater dynamics are assumed, including compensatory density-dependent functions (Massiot-Granier *et al.,* 2014). Including more data and information on the freshwater phase of the life cycle constitutes one of the most important improvements in the modelling and for advancing the understanding of ecological inferences. Available data on monitored rivers could be used to provide better information on the egg-to-smolt survival rate dynamics, including parameterization of density-dependent survival rates as well as the variability among stock units.

The life cycle model built in a Bayesian framework provides a fully integrated method for assessing the consequences of mixed-stock fisheries (West Greenland, Faroes, Labrador, Newfoundland, and Saint Pierre and Miquelon) options on returns to rivers and to attainment of conservation limits by stock units, within a risk analysis framework. This differs from the current models used by ICES in which three independent models for Southern NEAC, Northern NEAC, and NAC are used.

The Northern NEAC stock units are not included in the current version of the model because of differences in the available time-series; the Northern NEAC complex input data begin in 1983 whereas the Southern NEAC and NAC time-series begin in 1971. Technical options could be explored to assess the feasibility of using time-series of data of different lengths between stock units as a means of integrating the Northern NEAC complex in the life cycle model without compromising the information from the longer time-series. For the objective of developing catch options, it may be sufficient to align the time-series in all the stock complexes to those of the Northern NEAC complex. This compromise would likely have minimal impact on forecasting results for the provision of advice, but it would result in an important loss of information for ecological inferences.

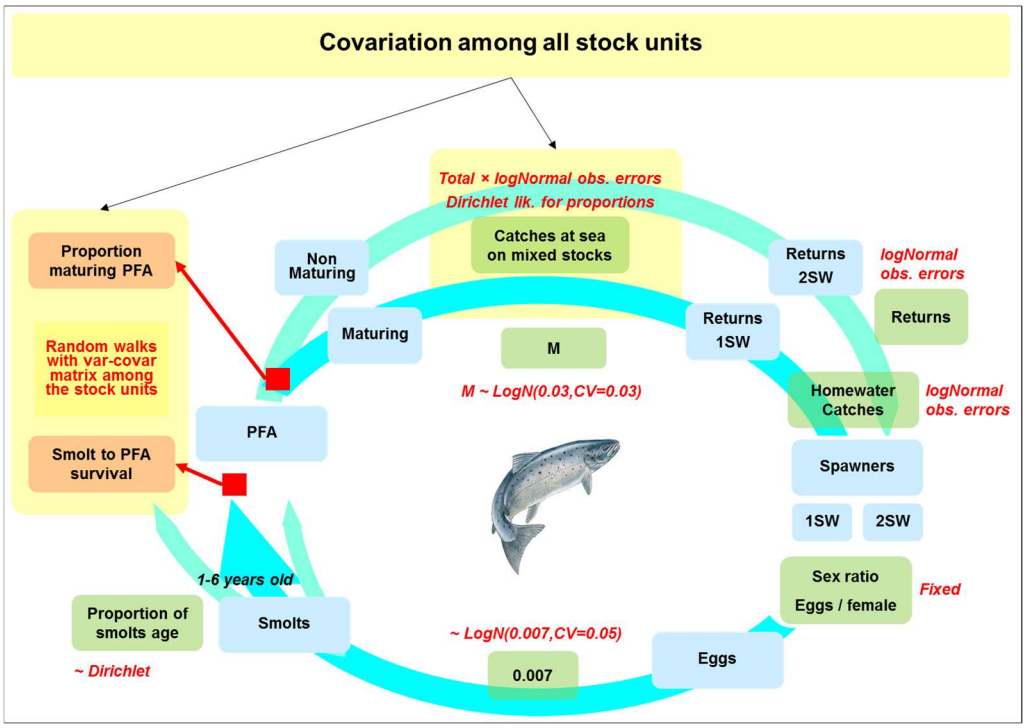


Figure 12 Schematic of the full life cycle model applied to the thirteen stock units of North America and Southern NEAC. Variables in light grey are the main stages considered in the stage-structured model. Light green boxes are the main sources of data assimilated in the model. Observation errors are introduced in returns and catches at sea. The smolt-to-PFA survival and the proportion of maturing PFA are estimated for the time-series (1971 to 2014). Yellow boxes indicate the location of the covariation among stock units.

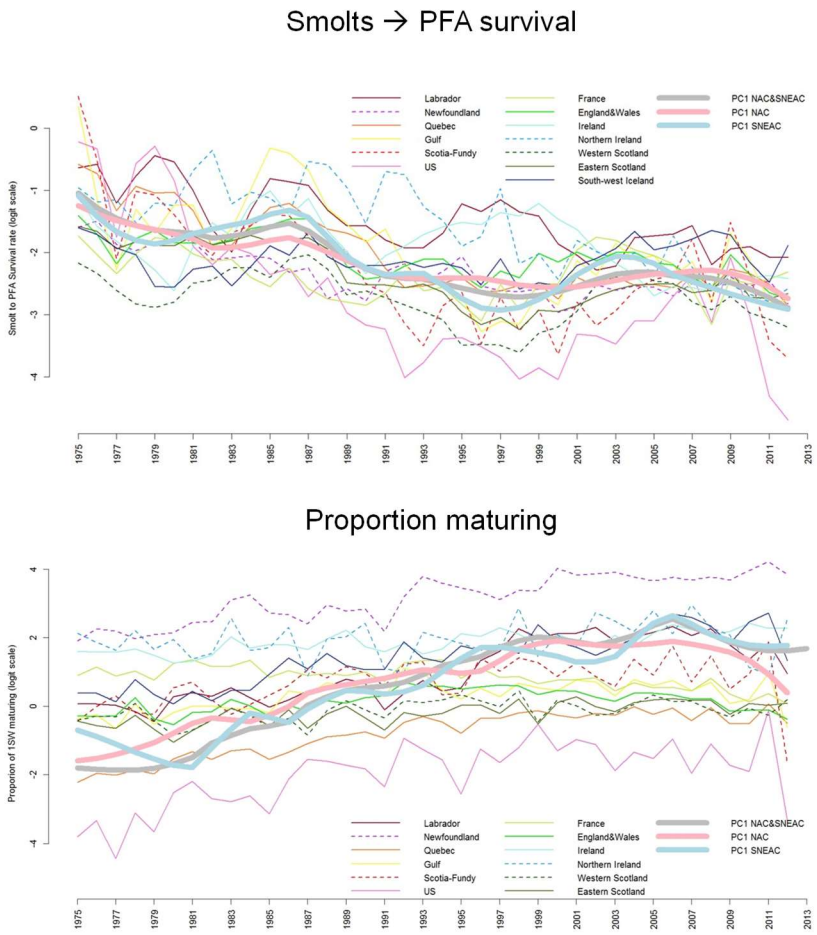


Figure 13 Time-series of estimates of smolt-to-PFA survival (top) and proportion of maturing PFA (bottom), on the logit scale, for 13 stock units in North America and Southern NEAC. Thin lines are the medians of marginal posterior distributions for the 13 stock units. Thick lines are the first principal components that indicate global trends among the 13 stock units and, separately for stock units in NAC and Southern NEAC, on the range corresponding to the logit range.

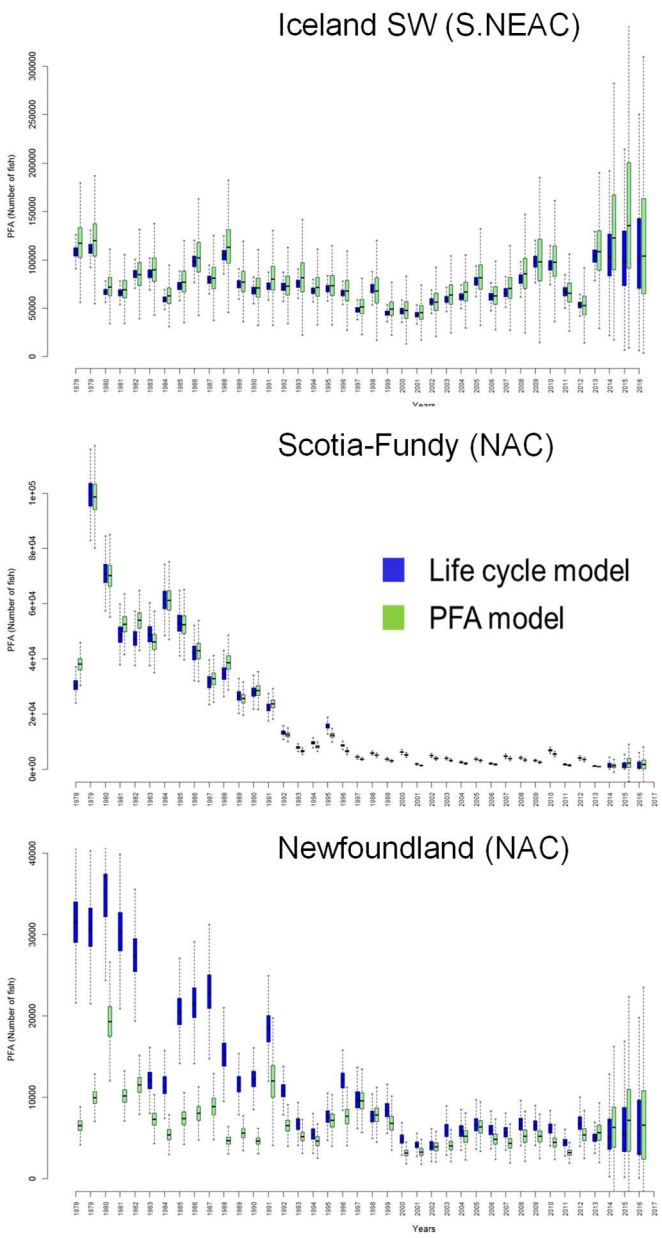


Figure 14 Comparison between the PFA estimates (non-maturing component of the PFA only) from the PFA and from the Bayesian life cycle model. Box plots are summaries of marginal posterior distributions. Forecasting is presented for the last three years. Both methods provide very similar estimates of PFA for stock units in Southern NEAC (here exemplified by Iceland), and for stock units in NAC with a low proportion of 1SW fish in returns (here exemplified by Scotia-Fundy). Differences are higher for stock units with a high proportion of 1SW in returns (here Newfoundland), with an average 90% of 1SW in returns.

NASCO 1.3 Provide a review of examples of successes and failures in wild salmon restoration and rehabilitation, and to develop a classification of activities which could be recommended under various conditions or threats to the persistence of populations

The Working Group on the Effectiveness of Recovery Actions for Atlantic Salmon (WGERAAS) met for a third and final time on 10–12 November 2015 at ICES HQ in Copenhagen to complete their analysis of both the case studies and the Database on Effectiveness of Recovery Actions for Atlantic Salmon (DBERAAS). A total of 15 case studies were received, together with a total of 568 individual river stocks entered in DBERAAS (Table 8). Analyses of the case studies and DBERAAS have both been completed, and the ICES report is currently being finalized.

Successful restoration and rehabilitation was characterized by:

- A limited number of stressors acting on the population;
- Successfully addressing all stressors acting on the population;
- A river stock with moderate to high marine survival estimates.

Based on the analysis of DBERAAS 'Stressor' entries the following stressors were most often reported as having a high or very high impact:

1. Climate change;
2. Barriers;
3. Freshwater habitat degradation.

Similarly, based on the analysis of the DBERAAS 'Action' entries, the following recovery and restoration were most often reported as having a high or very high benefit:

1. Improvements in connectivity;
2. Improvements in freshwater quality;
3. Freshwater habitat restoration.

The compilation of the DBERAAS database, including the identification of the stressors that were constraining salmon population rehabilitation and recovery was completed by regional experts and based on available evidence, which is much more complete for freshwater systems. Indeed, habitat fragmentation and water quality degradation are two important stressors that have been demonstrated as having contributed to the reductions, and in some cases the loss of salmon populations in rivers. As Atlantic salmon is an obligate freshwater spawner, conditions in freshwater, particularly those associated with connectivity and barriers, are important stressors for which clear remedial actions can be undertaken to improve the probabilities of population.

Reintroduction of Atlantic salmon in the Rhine

Following the extirpation of Atlantic salmon in Germany in the 1950s, reintroducing the species was not considered for many years, mainly because of heavy water pollution and lack of river continuity in many places. In the late 1970s the first salmon reintroduction initiatives started in tributaries of Ems and Elbe, followed later by initiatives in all German river areas that flow into the North and Baltic seas (e.g. Weser, Rhine, and Oder). Some of these activities were discontinued, because prospects of success remained uncertain and/or because

of insurmountable obstacles. Others resulted in more comprehensive and long-term programmes (i.e. “Salmon 2000”).

Despite the numerous impediments of the international Rhine, salmon now return regularly and migrate upstream to spawn. From 1990 to 2016, around ten million young salmon were stocked in the Rhine system. Since then, 8816 adult returns were officially enumerated through various methods (control stations, fish counters, and random electrofishing campaigns or random observations and reports (Figure 10). It is possible, based on anecdotal evidence, that the actual number might be considerably higher. Fisheries on salmon are still prohibited in the entire Rhine catchment. While stocks of mixed origin were used in the early years restock the Rhine, this is now carried out with mainly local stocks from regional hatcheries, mainly produced from Rhine returns, and partially supplemented by imported ova of internationally agreed origin (Upper Rhine: Allier/France; Middle/Lower Rhine: Ätran/Sweden). Details of a coordinated genetic monitoring programme, which will monitor all stocked fish, is being prepared in 2017, with the programme running for the next two years. Because of high natural reproduction, stocking measures have been stopped in some tributaries, to investigate the development of self-sustaining salmon populations (e.g. River Agger). Ecological continuity in the main channel and tributaries of the Rhine has been further improved over the last years and the partial opening in 2018 of the Haringvliet sluices, an important access from the North Sea to the river system in the Netherlands, is on schedule.

In Germany, a complementary study on downstream migration of Atlantic salmon smolt at three hydropower stations, using different technologies to reduce negative impact on migrating fish, showed mortalities up to 25% for the whole study area. The mortality was assessed against losses in a free-flowing reference river stretch. The reservoir upstream of the power station was identified as an area of high mortality, especially in the River Sieg, with the main reason suggested as potential presence of fish predators in a slow-flowing reservoir compared to a free-flowing river stretch (Økland *et al.,* 2016).

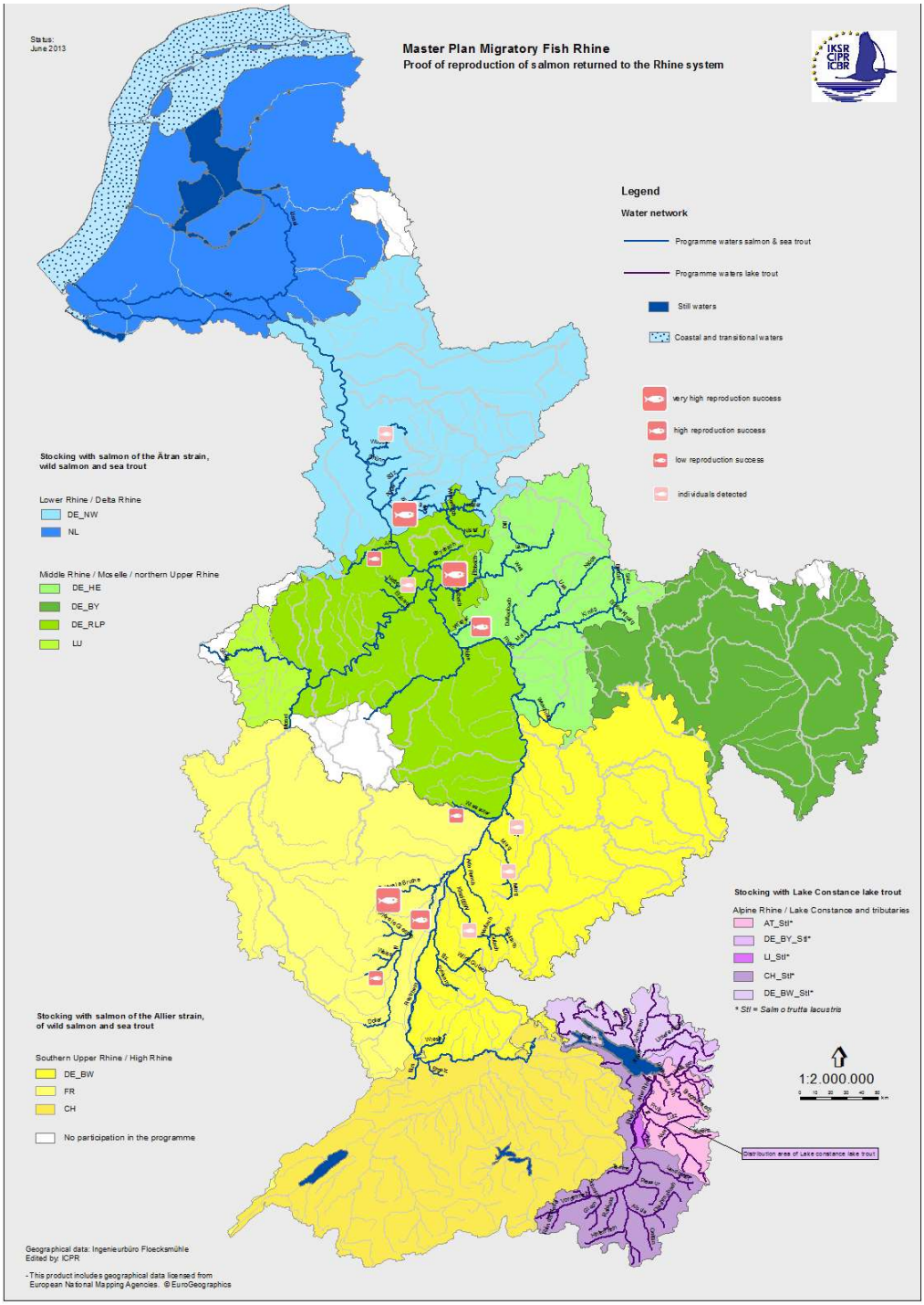


Figure 15 Summary of reintroduction of salmon in the Rhine system: stocking origins and evidence for reproductive success of returning salmon (figure from ICPR, 2013).

NASCO 1.4 Provide a summary of the available diet data for marine life stages of Atlantic salmon and identify key prey species at different life stages

Identifying key prey items of salmon at different marine life stages furthers the understanding of feeding and ecology of salmon and the identification of potential bottom–up effects on salmon abundance and population dynamics.

NASCO asked ICES to provide a summary of the available diet data for the marine life stages of Atlantic salmon and to identify key prey species at different life stages. In addition, ICES was requested to comment on any significant changes in population dynamics (i.e. abundance, distribution, size structure, and energy density) of key prey species which may be associated with changes in salmon abundance, distribution, and marine ecology (e.g. the recently identified decreases in capelin energy density and the consequences on marine productivity of Atlantic salmon), while also providing information related to fisheries which catch significant numbers of the identified key prey species (i.e. direct harvest or bycatch).

Life stage, geographic location, and water depth are useful indicators of Atlantic salmon diet at different stages during the marine phase. The marine phase of North American Atlantic salmon was partitioned into three discrete stages based on age, location, and maturity:

- post-smolt, representing the first six months at sea, either nearshore (coastal embayments, fjords, nearshore continental shelf) or offshore (shelf and oceanic waters);
- the 1SW maturing/non-maturing phases, offshore and at Greenland, Faroes, Norwegian Sea;
- the 1SW/2SW mature/maturing/kelts – nearshore phase in coastal waters.

This provided a geographic and ecological framework for grouping information (from sources covering over 85 years of intermittent data collection; 1935–2017) from which key prey items were identified. The primary prey items were determined based on historical and contemporary abundance in Atlantic salmon diets. Generally, the item was classified as a key prey species if it comprised over 20% (by weight or number) of the stomach contents, or if significant regional variation in dominant or emerging prey (i.e. increasing over time) was evident. The resulting areas, stages, and sources of information for the Northwest Atlantic are shown in Figure 16.

For the identified key prey species, summary information is provided:

- distribution and abundance (trends and current abundance when available);
- size structure and energy density/proximate composition, when available;
- fisheries interests, if any, and description of fisheries exploitation and management when available.

Diet of salmon during the marine phase

There are differences in the extent of the literature available on the diet of Atlantic salmon from the Northwest and the Northeast Atlantic, as well as some differences in diet associated with geographic differences in species composition. No information on temporal variation in diet has been collected in a consistent manner.

Northwest Atlantic

Feeding intensity and diet composition varies with life stage, gape size (Scharf *et al.*, 2000), season, and location, and there are obvious differences in diet associated with water depth. Capelin (*Mallotus villosus*), Atlantic herring (*Clupea harengus*), and sandlance (*Ammodytes* spp., referred to as sandeel in Europe) are frequently consumed at shallow depths, while deep-water fish (barracudina), amphipods (*Themisto* sp.), euphausiids (i.e. *Meganyctiphanes norvegica* and *Thysanoessa intermis*), and cephalopods (i.e. boreoatlantic armhook squid) are consumed at deeper depths (Table 9).

Some of the key prey species identified are important during multiple life stages and in multiple locations:

- Post-smolts in nearshore shallow waters: Atlantic herring (fall spawned 1+, 30% by weight, in US waters) and sandlance (94% occurrence; in Canadian waters) over shallow nearshore waters. Renkawitz and Sheehan (2011) showed differences between hatchery and wild diets, with hatchery post-smolts consuming less food and lower quality food than naturally reared smolts.

- Post-smolts in offshore waters: Switch from fish prey in nearshore waters to pelagic amphipods (39% by number) and euphausiids (49% by number). In deep waters of the Labrador Sea, post-smolts consume amphipods (59% by weight) and cephalopods (24% by weight), but capelin (78% by weight) were found in samples of post-smolts collected over shallow offshore banks.

- 1SW maturing/non-maturing offshore phase: On offshore banks in the Labrador Sea, sandlance (67% by weight) was abundant, whereas in deeper water, deeper water fish (i.e. barracudina; 58% by weight) were dominant.

- 1SW non-maturing at West Greenland: Forage primarily on capelin (53% by weight) with important contributions of deep-water pelagic invertebrate species such as amphipods (*Themisto* sp.; 20% by weight) and squid (*Gonatus* sp.; armhook squid, 15% by weight, but increasing over time).

- 1SW/2SW mature/maturing in the nearshore phase: As maturing adults move into shallower coastal waters during the spring of the spawning migration, a wide variety of prey are consumed with intensive feeding on capelin (76% by weight) and Atlantic herring (15% by weight but important regionally in the Gulf of Maine and Bay of Fundy) and sometimes on sandlance in smaller amounts. Returning adults, thought to cease foraging before freshwater entry (Cairns, 2002), have also been shown to forage in coastal waters on diadromous species (i.e., rainbow smelt and alewife).

- Kelt phase: Kelts are known to feed actively in rivers and estuaries in spring while migrating back to the ocean. Previous spawners at other life stages have been sampled in other studies, but details of diet have not been reported separately. They probably feed on the same spatiotemporally abundant foods that other salmon consume; at West Greenland there was no difference in the diets of 1SW non-maturing fish and previous spawners.

Northeast Atlantic

There are large temporal and spatial differences in the diet of salmon in the Northeast Atlantic (Rikardsen and Dempson, 2011). There are also differences in the diet with increasing size of the salmon (Rikardsen and Dempson, 2011; Table 10).

Post-smolts in coastal regions: Feed primarily on fish larvae. Based on studies in the early 2000s, post-smolts in the northern region mainly feed on herring larvae, sandeel larvae, and amphipods, whereas further south they feed on blue whiting larvae, sandeel larvae, and other fish larvae (Haugland *et al.,* 2006). There was, however, large interannual variability. Other fish larvae and euphausiids can also be important for post-smolts (Hansen and Pethon, 1985).

Post-smolts in fjords: Salmon are opportunistic feeders when they migrate through the fjords. The composition of the post-smolt diet varies among Norwegian fjords and among years (Rikardsen *et al.,* 2004). Feeding in the fjords was more extensive with more food and fewer empty stomachs in the north than in the south, suggesting that food availability might be higher in northern fjords. The diet in the fjords consists of a variety of organism groups (Table 10), but on a weight basis it was dominated by pelagic fish larvae (Rikardsen *et al.,* 2004; Hvidsten *et al.,* 2009), particularly sandeel, herring, and gadoids (Rikardsen *et al.,* 2004). The proportion of fish in the stomachs was higher in the outer reaches of the fjords than in the inner parts of the fjords (Rikardsen *et al.,* 2004).

Post-smolts in offshore areas: In general, post-smolts feed on large zooplankton in oceanic regions (Rikardsen and Dempson, 2011). From the SALSEA data (Anon., 2012), the main food items of post-smolts were juvenile fish and amphipods (*Themisto* sp.). Salmon also showed clear differences in diet among years; when *Themisto* sp. and fish were less dominant in their diet, salmon post-smolts seemed to have a broader diet and fed more on small prey.

As with post-smolts, there are temporal and spatial differences in the diet of larger salmon. Small pelagic fish, large zooplankton, and mesopelagic fish are important prey items. Herring and capelin have previously been reported to be the main components of the diet along the middle and central Norwegian coast (Hansen and Pethon, 1985). Of the macrozooplankton, the euphausiids and amphipods are considered to be important. Mesopelagic fish (such as *Maurolicus muelleri* and *Benthosema glaciale*) and squid (*Gonatus fabricii*) are also preyed upon by larger salmon in the Northeast Atlantic, especially during the winter (Jacobsen and Hansen, 2000). Further south, sandeel and herring were the dominant prey items in the diet of returning salmon in Scottish waters (Fraser, 1987), and blue whiting and mackerel have been important for salmon in Faroese waters in the autumn (Jacobsen and Hansen, 2000). Spatial differences in diet are apparent, considering that sprat dominated the diets in coastal Irish waters (Twomey and Molly, 1974) and herring the diets in the northern Baltic Sea (Salminen *et al.,* 1994). The general picture is that larger salmon feed on larger prey and are opportunistic predators capable of switching diet according to availability (Rikardsen and Dempson, 2011).

Key prey species characteristics and fisheries

The key prey species of Atlantic salmon fall into two general categories: harvested fish (capelin, Atlantic herring, sandeel, and other pelagic species) and unharvested prey, including fish (barracudina and sandlance), crustaceans (amphipods and euphausiids), and cephalopods (armhook squid). More information was available for commercially important fish species,

but for all the other unharvested species, fish and invertebrates, very little is known besides basic life history and distribution.

Commercially important species

More information was available for commercially important fish species, but very little information was available for capelin in Greenlandic waters. The commercially important species in the Northwest Atlantic (Atlantic herring in US waters and capelin in Canadian waters) appear to be responding positively to the fishery management actions taken over the past 25 years. Spawning-stock biomass (SSB) of Atlantic herring in US waters is estimated to be well above the SSB target (Deroba, 2015) although the mean weight of Atlantic herring in the Gulf of Maine has declined drastically over the past 30 years (Golet *et al.,* 2015). The abundance indices for the Newfoundland/Labrador stock of capelin suggest that the stock is approximately 25% of the peak estimates from the 1980s, but increasing over the past few years (DFO, 2015). In contrast to the Northeast Atlantic, sandlance (*Ammodytes* sp.) are not commercially exploited in the Northwest Atlantic.

The Northeast Atlantic is generally well monitored due to the intensity of fishing for commercially important small pelagic fish species. Norwegian spring-spawning herring, blue whiting, and mackerel can each have annual landings that exceed 1 to 1.5 million tonnes. Monitoring in summertime is concentrated in the Norwegian Sea and the surrounding area (Icelandic Sea, Greenland Sea, northern North Sea), as these are the main feeding grounds for the large pelagic stocks.

- There are numerous stocks of herring in the Northeast Atlantic. The largest stocks are the Norwegian spring-spawning (NSS) herring (SSB in 2016 approximately 5 million tonnes; ICES, 2016c) and North Sea herring (SSB in 2016 approximately 2 million tonnes). In addition there are some smaller Icelandic, Norwegian, Scottish, and Irish stocks. Although all stocks can be locally important prey for salmon, NSS herring are probably the most important prey owing to the large stock size and spatial overlap with both post-smolt and larger salmon. However, NSS herring have very variable recruitment success, with roughly 10 years between each large year class (Toresen and Østvedt, 2000). There were several strong year classes in the late 1990s and early 2000s. The last strong year was in 2004. Even though the following year classes have been weak, there would have been abundant herring larvae available for post-smolts, given that recruitment failure of herring is caused by high mortality after the larval phase.

- Mackerel can be important for salmon both as prey and as a potential competitor. The mackerel stock is presently around 4.5 million tonnes and has had very good recruitment in the last 10–15 years (ICES, 2016d). The stock is expanding further north and west and is now distributed over the entire Norwegian Sea, around Iceland, and to the southeastern part of Greenland during the summer (Nøttestad *et al.,* 2016), and also into the Barents Sea. In recent years a large biomass of mackerel has migrated into the Norwegian Sea along the Norwegian coast in May. These mackerel feed to some extent on herring larvae (Skaret *et al.,* 2015) and can be an important competitor for salmon. Although several strong year classes have been produced lately, the spatiotemporal overlap with post-smolts and larger salmon is probably limited. With the expansion of feeding, mackerel, including the smaller mackerel (1- and 2-year-olds), have migrated further north and are now found over large parts of the Norwegian Sea.

- There are two stocks of capelin in the Northeast Atlantic, the Icelandic capelin and the Barents Sea capelin. The majority of capelin spawn at three to four years of age and are short-lived. The Icelandic stock utilizes feeding grounds north and west of Iceland. After low stock levels around 1980 and 1990, the stock size has been fairly stable, and well above the ICES B_{lim} (biomass limit) reference point since the early 1990s (ICES, 2016e). The Barents Sea stock has had large fluctuations since the 1970s (ICES, 2016f). The stock collapsed around 1985, 1993, and 2003, but recovered quickly again each time. The stock is presently collapsed again, but is assumed it will recover again as a high abundance of juvenile capelin has been recorded.

- Sandeel (*Ammodytes* sp.) larvae can be an important part of the diet for post-smolts (Haugland *et al.,* 2006) because of their large spatiotemporal overlap. In the northern North Sea, sandeel populations are considered to have collapsed and there are currently no fisheries in the area around Shetland. The sandeel stock in the southern and central North Sea is in good condition, although much smaller than during the 1980s and 1990s (ICES, 2016g).

- The biomass of blue whiting has increased in recent years owing to good recruitment and is presently around 6.7 million tonnes (ICES, 2016c). Blue whiting larvae can be an important part of the diet for post-smolts in the southern region (Haugland *et al.,* 2006), as the larvae are distributed north and west of the UK and Ireland in April and May. Juvenile blue whiting can also be an important part of the diet for larger salmon in the winter, as the juveniles do not migrate to the spawning areas but remain widely distributed from Portugal to the Norwegian Sea during the winter.

Non-commercially important species

Very little is known about the unharvested species although they are considered to be fairly abundant, given their prevalence in the diets of many other marine species. Small zooplankton (< 2 mm) are generally sampled with WP-2 nets hauled vertically from 200 m to the surface. Macrozooplankton, including amphipods and euphausiids, are sampled with MOCNESS (Multiple Opening/Closing Net and Environmental Sensing System) multi-nets or with macrozooplankton trawls. MOCNESS nets are not fully efficient for capturing large zooplankton as it is possible for individuals to avoid the gear. The time-series of abundance for macrozooplankton are very short and limited in geographic and seasonal distributions.

In general, there are more zooplankton in the northwestern region than in the southeastern region of the Norwegian Sea. The water masses in the western region are cold arctic waters which flow southward. As this water is too cold for most pelagic fish (< 2°C), larger zooplankton that would otherwise be vulnerable to fish predation are more prevalent in this region. The biomass of small zooplankton (< 2 mm) in the Norwegian Sea in May consists mainly of smaller copepods, with *Calanus finmarchicus* as a dominating species. The time-series (1996–2016) indicates a generally decreasing trend, but with some variation between years (ICES, 2016h). The lowest biomass was recorded in 2009, but since then the biomass has increased slightly. Although the biomass is lower than in the 1990s, the levels are still high compared to other regions such as in the Barents Sea.

As for the smaller zooplankton, abundance of large zooplankton has been decreasing over the last 5–10 years compared to the period 1991–2010 (ICES, 2016c). However, these data are uncertain and need to be quality controlled before any final conclusions are made. The spatial variation and exact decrease in abundance of large zooplankton has not been quantified to date.

Mesopelagic fish are present worldwide. They inhabit depths of 200–1000 m with diurnal migrations. The most common species in the Northwest Atlantic are myctophids (lanternfish) and barracudinas, and in the Northeast Atlantic *Maurolicus muelleri*, *Benthosema glaciale*, and *Arctozenus risso*. It is assumed that abundance decreases with latitude. The present and historical biomasses of mesopelagic fish in the North Atlantic are unknown.

Ecosystem considerations

There have been large changes in the preferred feeding areas for NSS herring, mackerel, and capelin since the mid-1990s and up to the present time. NSS herring now feed east of Iceland and further northwest towards Greenland, instead of in the central Norwegian Sea. Mackerel are found throughout the Norwegian Sea, south of Iceland, and into Greenlandic waters. Icelandic capelin are migrating further northwest than they used to during the feeding periods. These changes may be partly related to climate change and warmer waters, but may also be caused by changes in prey availability. Mackerel have shown reduced growth-at-age in the last decade, and this change is correlated with the abundance of herring and mackerel feeding in the Northeast Atlantic (Olafsdottir *et al.,* 2016).

Although much of the available information for salmon prey abundance in the North Atlantic is uncertain, the results indicate highly variable and generally less available prey for post-smolts in the last 10 to 15 years. Important fish larvae of herring and sandeel are less abundant in the Northeast Atlantic than they used to be, and there is a low spatiotemporal overlap between post-smolt and mackerel and blue whiting larvae. Furthermore, there are indications of a reduction in abundance of zooplankton in the Norwegian Sea.

There is, however, good availability of prey for larger salmon. All of the pelagic stocks feeding in the Norwegian Sea are abundant (NSS herring, blue whiting, and mackerel). In addition, the Icelandic capelin stock feeds in western Northeast Atlantic and the Greenland Sea areas. Large zooplankton are also more abundant in the western Northeast Atlantic and Greenland Sea than further to the east. Abundant juvenile blue whiting and an unknown biomass of mesopelagic fish are potential prey during the winter. Although the larval abundance of post-smolt prey species in the Northeast Atlantic has declined it is uncertain whether this reduction has resulted in reduced growth and survival. Furthermore, it is not known whether the changes in zooplankton abundance are driven by bottom–up or top–down processes.

Altered forage conditions have been shown to have effects for some species in terms of size and body condition (Golet *et al.,* 2007*,* 2015; Sherwood *et al.,* 2007) and by inference have affected survival and population abundance via direct and indirect mechanisms (Walsh and Morgan, 1999; Dutil and Brander, 2003; Mills *et al.,* 2013; Renkawitz *et al.,* 2015) (Figure 17). Because of insufficient baselines of key metrics or time-series of monitoring information/data, it is not known if similar changes in distribution, abundance, size structure, proximate composition, or energy density of unharvested species have also occurred.

The general picture is that Atlantic salmon are opportunistic predators capable of switching diet according to availability (Rikardsen and Dempson, 2011). However, not all prey have a similar energetic content nor is the energy value of prey constant over time (Renkawitz *et al.,* 2015). Many prey items of Altantic salmon are poorly studied and monitored because they are not of commerical importance in the North Atlantic. Consequently the impact of variations in distribution, abundance, and forage quality of these prey on Altantic salmon growth, maturation, and survival is largely unknown, and though the trophic link through

bottom–up effects is hypothesized, it is difficult to demonstrate. For example, reductions in abundance of small copepods such as *C. finmarchicus*, which themselves are not an important prey for salmon but are important prey for organisms that salmon prey upon, may be expected to lead to reduced prey for salmon, given that the ecosystem processes are largely driven by bottom–up energy flow.

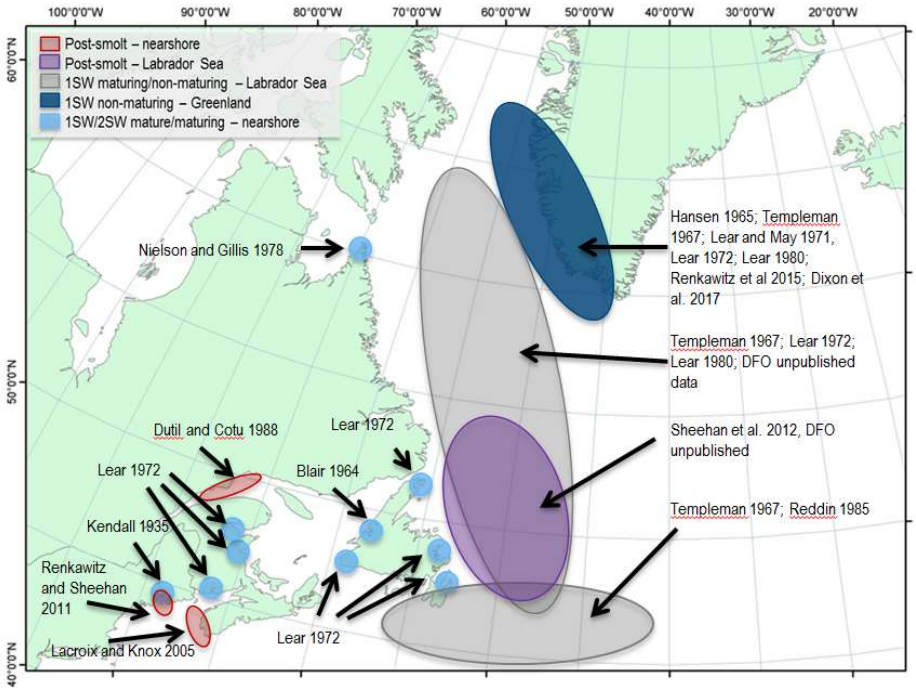


Figure 16 Approximate geographic areas, associated distinct marine phases, and literature sources of Atlantic salmon dietary information for the Northwest Atlantic.

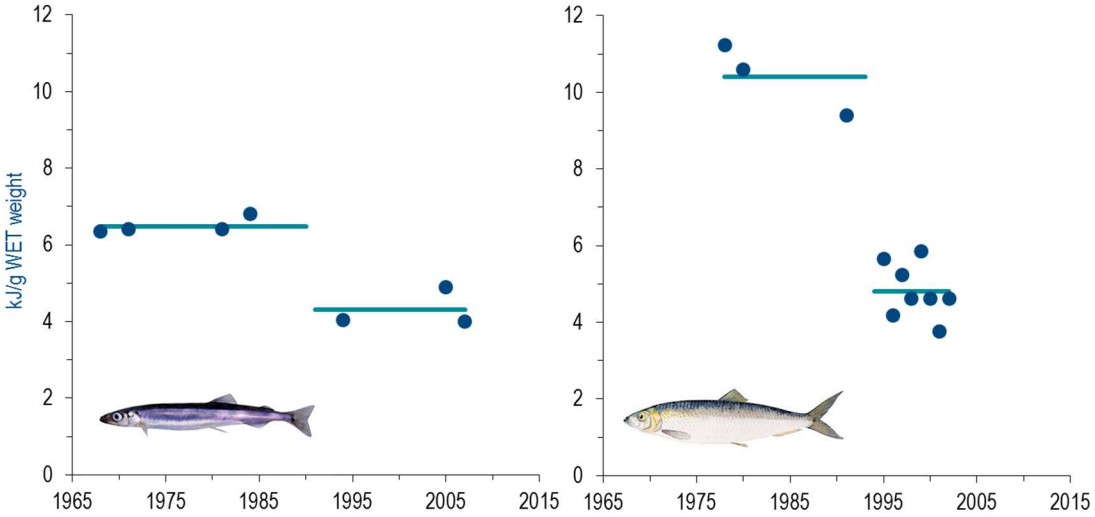


Figure 17 Energy density estimates (kJ g^{-1}) of capelin in the Labrador Sea (left) and Atlantic herring in the Gulf of Maine (right) with mean energy densities (bars) before and after the year 1990. Energy density estimates were selected that incorporated potentially large seasonal and ontogenic energy density variations. Data are reproduced from Renkawitz *et al.* (2015) for capelin and McGurk *et al.* (1980), Steimel and Terranove (1985), Lawson *et al.* (1998), and Diamond and Devlin (2003) for Atlantic herring.

NASCO 1.5 Provide a description of the potential future impacts of climate change on salmon stock dynamics

Advice summary

Climate change (CC) can be expected to impact Atlantic salmon at both the regional and Atlantic Ocean scale. Numerous biotic and abiotic factors that affect salmon survival are likely to be modified by CC, but the relative impact and interactions among these factors are poorly understood. While there will be some negative impacts, some positive impacts can also be expected for some Atlantic salmon populations. CC has the potential to affect the distribution, productivity, migration patterns, genetic variation, and other biological characteristics of the species within the range of the populations.

Invariably, projections from CC modelling suggest conditions of the atmosphere and the aquatic environment that have not previously been manifest in recorded history, and the response of Atlantic salmon populations to these novel conditions are highly uncertain.

The potential impacts of CC are discussed in the context of the fish species, Atlantic salmon (*Salmo salar*), and its populations rather than specifically on Atlantic salmon fisheries. It is evident, however, that consequences of CC on salmon stocks will likely have subsequent effects for human uses (i.e. fisheries).

<u>Climate and drivers</u>

- Before 2050, atmospheric concentrations of carbon-based emissions are neither expected to flatten out nor to be reduced. Even if emissions were to be reduced, the overturning of the ocean is at the scale of 1000 years, so the changed conditions in the ocean will persist.

- Climate variation has been large and seemingly cyclical over the past 800 thousand years of record, with annual temperature variations greater than 10°C from peak to trough. Atlantic salmon has persisted through all the climate variations of the past 500 thousand years.

- The climate projections indicate increased intra-annual variations in a number of parameters at global and regional scales; these variations are equally, if not more consequential than the changes in average values to salmon persistence. The changes that are observed and projected are very rapid and the rate of variation may well exceed the rate at which Atlantic salmon may adaptively respond.

- Changes in chemical and biological characteristics of oceans and freshwaters associated with increased atmospheric carbon include, but are not limited to, increased air and water temperatures (freshwater and marine), freshening of surface ocean layers, reduced pH (increasing acidification) of oceanic waters, and reductions in oxygen concentrations. Global warming also affects terrestrial systems, the freshwater environment of lakes and rivers, and the transitional waters between the marine and freshwater.

- Temperature and precipitation are primary drivers affecting aquatic ecosystems in general, and are major drivers for salmon in freshwater. Variations in these components influence many other environmental factors including: river discharge and level, pH, dissolved oxygen levels, water colour, and light penetration.

- Variations in biotic factors due to CC, including food availability and inter-specific competitions, are likely to occur.

- For Atlantic salmon, much of the CC research in freshwater has focused on specific drivers, while in marine waters, research has tended to examine linkages with climate forcing indices. There is much less information available for transitional waters (i.e. estuaries) as these have been much less studied.

Potential impacts

- Marine and freshwater habitat for Atlantic salmon is likely to extend further north in the future under continuing trends in global warming.

- Some loss of suitable freshwater habitat could occur, particularly in the southern part of the range, but this is unlikely to result in the loss of entire regional stock components.

- Increased stream temperatures are likely to result in increased freshwater growth in juveniles and productivity in many areas throughout the range, but this could change smolt age and run timing which might not be beneficial to survival. In the absence of thermal refugia, freshwater habitats could become limiting for some populations in areas where stream temperatures exceed lethal limits.

- Competition with, and predation by, other fish species, native and introduced, could increase in future as some of these species are currently expanding their ranges because of environmental change.

- Reduced survival may result from increased prevalence and virulence of parasites and pathogens.

- CC may alter migration routes and distribution of salmon at sea, with unknown consequences for survival.

- Environmental and genetic adaptation can facilitate adjustment to changing environmental conditions, if the rate of change in the environmental conditions does not exceed the capacity of the organism for genetic adaptation.

Request

In its request for advice, NASCO requested ICES:

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

....
1.5 quantify possible future impacts of climate change on salmon stock dynamics;
....

The ICES Secretariat indicated to NASCO on 10 November 2016 that it would not be possible to quantify possible future impacts of climate change on salmon stock dynamics. However, ICES indicated that it would be in a position to provide information on the issue and that the request could be modified as follows:

1.5 provide a description of the potential future impacts of climate change on salmon stock dynamics;

To address the request, a Workshop on Potential Impacts of Climate Change on Atlantic Salmon Stock Dynamics (WKCCISAL, ICES 2017c) was organized.

Basis of the advice

Methods

The WKCCISAL terms of reference (ICES, 2017c) were addressed though a comprehensive review of recent peer-reviewed literature, presentations from participants, reviews of working documents prepared ahead of the meeting, as well as the development of documents and text for the report during the meeting.

Background

Anthropogenic CC refers to the consequence of anthropogenic inputs of carbon dioxide (CO_2) and other related compounds to the atmosphere. The most frequently expressed CC response is changes in temperatures. Higher concentrations of greenhouse gases lead to increasing temperatures (global warming), because longwave radiation is reflected back to earth. This phenomenon has been observed since the mid-20th century (IPCC, 2014). Climate variation has been large and seemingly cyclical over the past 800 thousand years of record, and particularly so over the past 500 thousand years, corresponding roughly to the evolutionary divergence of *Salmo salar* and *Salmo trutta* from a common ancestor (Figure 18). Over that time period, annual temperature variations have been estimated at greater than 10°C from peak to trough, while estimates of atmospheric carbon dioxide concentration varied from approximately 150 ppm to just over 300 ppm.

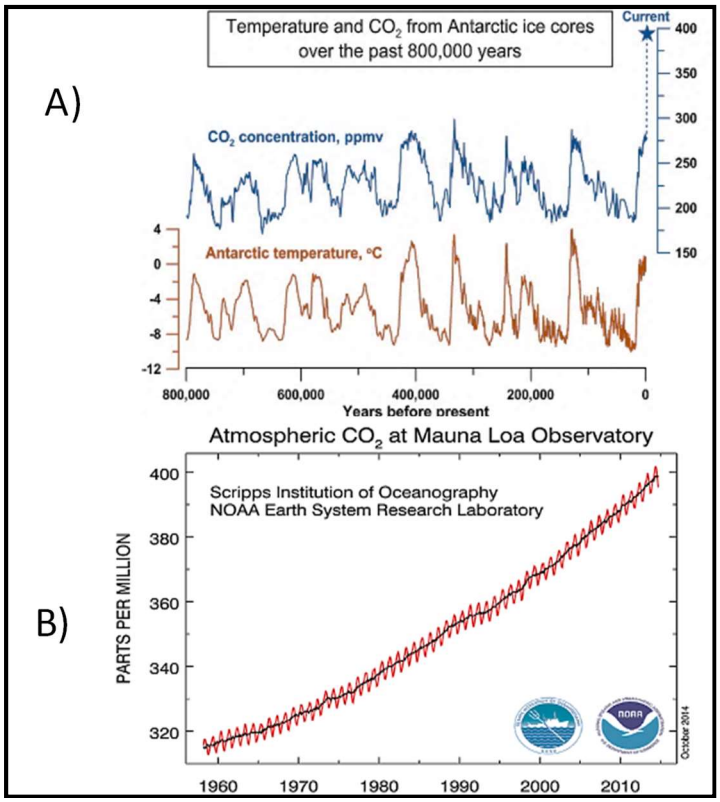


Figure 18 Upper panel A: estimated CO_2 concentrations and average temperatures inferred from ice core samples from Antarctica from 800 thousand years ago to the present. Temperature is inferred from oxygen isotope signatures which are directly related to temperature. Panel B: measured CO_2 concentrations in the atmosphere for the period 1958 to 2014.

Human-made greenhouse gas emissions "have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever", at levels that exceed 400 ppm (parts per million; IPCC, 2014) (Figure 18). The rate of increase since industrialization has also exceeded the rates of increase of any previous cycle. At present, over 60% of the anthropogenic greenhouse gas emissions are CO_2 emissions (IPCC, 2014). CO_2 emissions are partly taken up by the ocean (about 30%) and the land (about 30% via plants and soils), while about 40% remain in the atmosphere, leading to increasing CO_2 concentrations in the atmosphere (Figure 19). Air temperature changes recorded over the previous 150 years (1860+) show temperatures increasing continually on average, and in the recent period, exceeding projections of temperatures for most CC models.

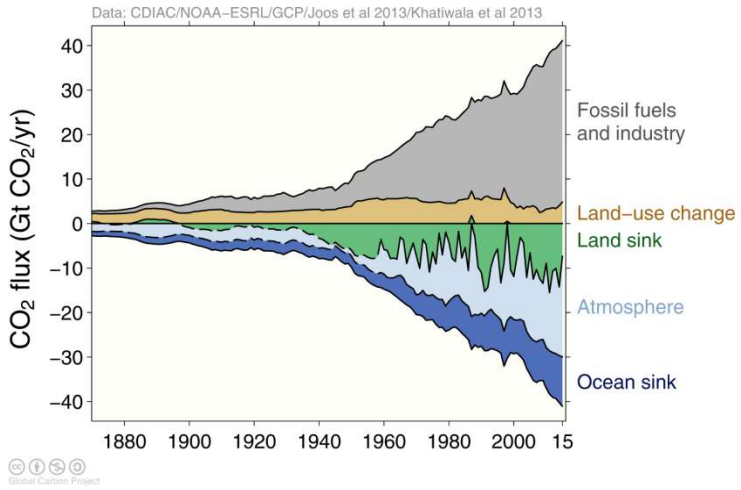


Figure 19 The fate of anthropogenic greenhouse gas emissions for the period 1870 to 2015. Illustration from the Global Carbon Project (Le Quéré *et al.,* 2016).

CC and weather are interconnected. Whereas weather refers to conditions over short time frames (days), climate is defined as average weather over longer periods (years). Observations show that there have been changes in weather (e.g. Kendon *et al.*, 2014; van Haren *et al.*, 2013), and changes in weather over time identify CC. Extremes in weather have been observed more frequently during the last few decades and when averaged out over the number of years will indicate changes in the average weather over time, thus climate. The chaotic nature of weather makes it unpredictable beyond a few days, whereas projecting changes in climate caused by changes in atmospheric composition or other factors is much more manageable, especially on large scales. These extremes in weather have been predicted by the Intergovernmental Panel on Climate Change (IPCC) in various reports (e.g. IPCC, 2014). The climate projections also indicate increased intra-annual variation at global and regional scales.

Teleconnections in the North Atlantic

One of the ways climate and weather connect to the environment of Atlantic salmon is through teleconnection patterns. Teleconnections are recurring and persistent atmospheric conditions that result from large-scale pressure and circulation variations spanning vast geographical areas. Such patterns can last from several weeks to several consecutive years, reflecting an important part of both the interannual and interdecadal variability of the atmospheric circulation. Many of the teleconnection patterns are planetary-scale in nature, spanning entire ocean basins and continents.

An important teleconnection in the Northern Hemisphere is the North Atlantic Oscillation (NAO; Barnston and Livezey, 1987). It is essentially a north–south differential in sea level pressure over the Atlantic (IPCC, 2007; Figure 20). The differential of the NAO is strongest in the winter months (December to March; Hurrell *et al.*, 2003). A high winter NAO corresponds with mild winter climate and strong storms in Western Europe (Jonsson and Jonsson, 2004).

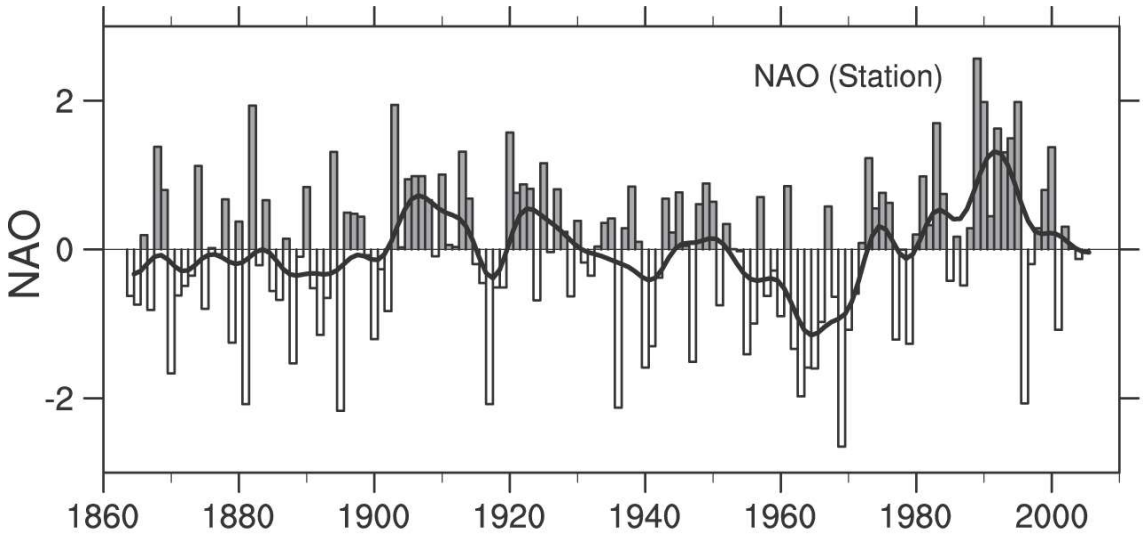


Figure 20 Normalized indices (units of standard deviation) of the mean winter (December–March) NAO developed from sea level pressure data. The index is based on the difference of normalized sea level pressure between Lisbon, Portugal and Stykkisholmur/Reykjavik, Iceland from 1864 to 2005. The average winter sea level pressure data at each station were normalized by dividing each seasonal pressure anomaly by the long-term (1864 to 1983) standard deviation. The smooth black curves show decadal variations (see Appendix 3.A of IPCC, 2007). The individual bar corresponds to the January of the winter season (e.g., 1990 is the winter of 1989/1990). Updated from Hurrell *et al.* (2003); see http://www.cgd.ucar.edu/cas/jhurrell/indices.html for updated time-series. (Source: Top panel Figure 3.31 from IPCC, 2007).

An example of a longer cycle Atlantic teleconnection pattern is the Atlantic Multidecadal Oscillation (AMO). The AMO has a periodicity of approximately 20–40 years, with major oscillations between warm and cool conditions (Figure 21). Since 2000, the North Atlantic has been in a strong warm period, whereas the period between 1960 and 1990 was characteristically colder.

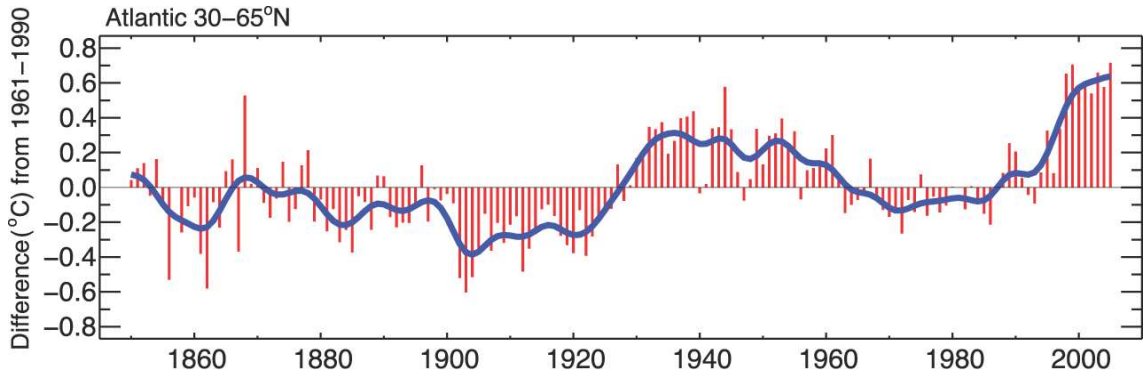


Figure 21 Atlantic Multidecadal Oscillation index from 1850 to 2005 represented by annual anomalies of SST in the extratropical North Atlantic (30–65°N). The series comes from HadSST2 (Rayner *et al.*, 2006) and are relative to the 1961 to 1990 mean (°C). The smooth blue curves show decadal variations (see Appendix 3.A of IPCC, 2007). (Source: Top panel Figure 3.33 from IPCC, 2007).

Elaboration on the advice

a) Changes in climate that may potentially impact wild Atlantic salmon in its distributional range based on the predictions of climate change, including those from the most recent International Panel on Climate Change

In order to estimate possible consequences of CC, the IPCC utilizes different future emission scenarios that range between being very optimistic (i.e. humankind is able to reduce emissions drastically in the future) and very pessimistic (i.e. humankind will not reduce emissions in the future). These scenarios are referred to as Representative Concentration Pathways (RCPs) and are available in the latest IPCC report (IPCC, 2014). The emission estimate for 2016 is in line with the RCP8.5 model projection (Figure 22).

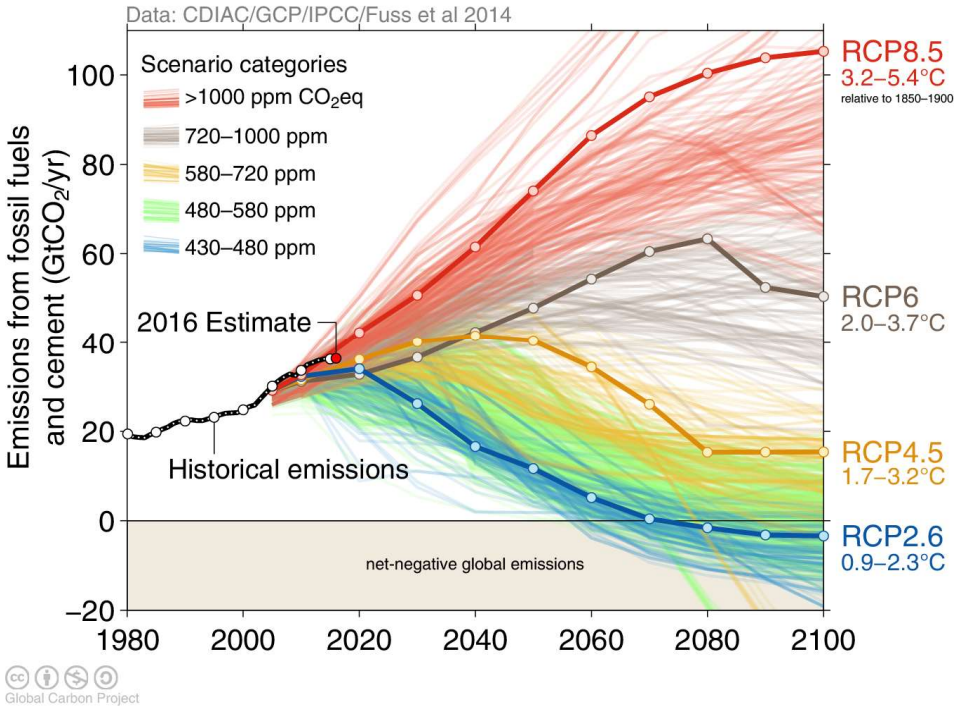


Figure 22 Representative Concentration Pathways (RCP) and their associated emissions from fossil fuels. Illustration from the Global Carbon Project (2016; www.globalcarbonproject.org/carbonbudget, published on 14 November 2016).

Before 2050, atmospheric concentrations of carbon-based emissions are not expected to reduce or flatten out. Even if emissions were to be reduced, the overturning of the ocean is at the scale of 1000 years, so the conditions in the ocean will persist. Although the global effect is for an increase in temperatures, there can be periodic declines in temperature and the occurrence of extreme weather events. The variations in certain physical and chemical responses (temperature, salinity, pH) are consistent across model scenario projections, whereas others are more uncertain (primary productivity in the ocean). The climate projections also indicate increased intra-annual variations. These variations are equally, if not more consequential to salmon persistence.

b) Review the conclusions of published literature and research on the biological and environmental drivers that impact on stock dynamics of Atlantic salmon

A review of the scientific literature was initiated for the workshop and the papers were categorized by topic and issue addressed.

Of 49 papers reviewed (ICES, 2017c), 61% addressed CC considerations in the North Atlantic and 59% addressed issues specific to Atlantic salmon. In general the publications conclude that CC will impact profoundly on the general oceanic and freshwater conditions through changing weather and teleconnection patterns. This in turn will influence growth

and predation pressure, resulting in reduced marine survival for most stocks. Increased stream temperatures may result in increased growth and production in northern areas, but could reduce recruitment in southern stocks. All these interactions in marine, freshwater, and estuarine waters are very complex, not always well understood, and likely to have different outcomes for stocks on a regional scale. Some of the papers discussed mitigation options, ranging from cutting carbon emissions to reducing stream temperature and mitigating for other stressors and their synergistic effects.

c) Biological and environmental drivers that can influence Atlantic salmon abundance and distribution

Drivers are the physical, biological, and chemical controls that shape the characteristics of ecosystems across broad spatial scales (Alexander *et al.,* 2016). Since Atlantic salmon can be found in a wide range of ecosystems extending from the headwaters of river systems in eastern North America and western Europe to the northern Atlantic Ocean and Baltic Sea and habitats in between, the discussion on drivers is presented in terms of three specific aquatic environments: freshwater, transitional waters (i.e. estuaries), and marine waters. Water flows physically connect these ecosystems and since large-scale pressure and circulation patterns extend across multiple ecosystems (see teleconnection patterns in previous section), effects in one ecosystem may become apparent later in the life of salmon when they have moved and occupy the next ecosystem.

For Atlantic salmon, much of the climate-change research in freshwater has focused on specific drivers, while in marine waters, research has tended to examine linkages with climate forcing indices even though these are not causal (Link *et al.,* 2010). There is much less information available for transitional areas (i.e. estuaries) as these have been much less studied.

Freshwater

Temperature and precipitation are primary drivers affecting aquatic ecosystems in general, and major drivers for salmon in freshwater. Changes in these parameters influence many other environmental factors, including: river discharge and level, pH, dissolved oxygen levels, water colour, and light penetration. Resulting changes in biotic factors, including food availability and interspecific competitions, will also impact salmon productivity in the freshwater phase.

Temperature influences rates of organic matter decomposition by bacteria as well as rates of in-stream primary productivity. Dissolved organic carbon concentrations impact pH levels as many dissolved organic carbon compounds are organic acids (Clark *et al.,* 2005; Evans *et al.*, 2005).

Temperature has a direct effect on the survival of eggs and can also influence the size of alevins at hatching through regulating the relative proportions of the yolk sac used for metabolism and tissue growth. Oxygen requirements vary at different stages of development and are further influenced by factors such as egg size, temperature, the spatial arrangement of eggs within the redd, and the velocity of intragravel water flow (Crisp, 1996; Youngson *et al.*, 2004). Other factors affecting hatching time and egg and alevin survival include the gravel composition, light, stream bed conformation and hydraulics, patterns of discharge and mechanical shock (Crisp, 1996). Many of these factors may be modified by climatic change.

The timing of fry emergence in salmon is influenced by environmental conditions during egg development, most notably by water temperature (Elliott and Hurley, 1998; Garcia de Leaniz *et al*., 2000). It is generally accepted that spawning dates are adapted to current thermal and flow conditions such that juvenile emergence timing is optimized as a result of selection pressures (e.g. Heggberget, 1988; Jensen *et al*., 1991). Marked changes in temperature or flow during early development may create a mismatch between emergence and environmental conditions, resulting in increased levels of early juvenile mortality (Jensen *et al*., 1991).

Temperature affects physiological processes of fish at all life stages (Graham and Harrod, 2009). Juvenile salmon grow fast over a wide temperature range (10–18°C; Handeland *et al.,* 2008). Growth declines as temperature increases above the optimum, and the optimum is also affected by interaction with prey availability. Several studies have highlighted that the relative influence of temperature, water discharge and density, is highly dependent on the spatial scale and site-specific conditions.

Over the geographic range of Atlantic salmon, there is a significant negative correlation between the age of smoltification and an index of growth potential (Metcalfe and Thorpe, 1990). While temperature may be the primary determinant of systematic shifts in smolt age, other factors can influence parr growth and age at smoltification, including the hydrological and thermal regime of the nursery river, latitude, elevation, prey availability, and density of competing salmonids.

The timing of smolt and seawater entry is believed to have evolved such that smolts enter the sea in synchrony with optimal biotic and abiotic conditions (Hvidsten *et al.,* 1998). The timing of smolt migration varies with latitude, with southern populations moving out to sea earlier than northerly ones (Otero *et al.,* 2014). Migration is also correlated to body size, with larger smolts typically migrating earlier, and furthermore appears to have a genetic component (Stewart *et al*., 2006).

Estuaries

Estuaries are ecosystems that are influenced by both changing conditions upstream in freshwater and the open ocean. Although estuaries are vital for the survival of Atlantic salmon, an understanding of their ecological function is limited. Because of their location at the junction of rivers and the ocean, estuaries also tend to be sites of major human settlements, and are therefore especially vulnerable to anthropogenic stressors. Estuaries are much more than a migration corridor for salmon – they are where salmon must make the osmoregulatory adjustments necessary for survival, both when migrating to sea as smolts or kelts, and when returning to freshwater as adults. Stress during these periods can be heightened for example by large temperature differentials or by the presence of parasites and diseases.

Marine ecosystem

Numerous factors, both biotic and abiotic, affect the survival of salmon in the sea, but their relative impact and the interactions among them are poorly understood. The lack of detailed knowledge of post-smolt movements, distribution, and habitats is a key constraint in this regard (Friedland, 1998; Dadswell *et al*., 2010). The generally accepted view is that the main marine mortality events take place during the first year of sea life when survival, maturation, and migration trajectories are being defined (Hansen and Quinn, 1998; Potter and Crozier, 2000; Friedland *et al*., 2005, 2009) and when the fish are smaller (Friedland *et al*., 1996).

Marine environmental drivers include temperature (typically mean sea surface temperature is used), and various teleconnection patterns (climate forcing indices) such as the North Atlantic Oscillation (NAO) and Atlantic Multidecadal Oscillation (AMO); these indices are not causal but represent ecosystem processes that drive ecosystem dynamics (Link *et al.,* 2010). Additional environmental drivers include salinity, oxygen, and changing large-scale oceanographic patterns related to wind and turbulence (Trenkel *et al.,* 2014). Biological drivers may include density dependence and competition, prey condition and availability, top–down effects of species on their prey, bottom–up effects of species on their predators, and predator impacts on species population dynamics (Trenkel *et al.,* 2014).

Sea surface temperatures and the extent of ice cover seem to constrain Atlantic salmon distribution at sea. Surface currents are strongly dependent on surface winds (Mork *et al*., 2012), which are strongly influenced by teleconnection patterns like the NAO.

e) Predicted changes in drivers associated with climate change projections

Changes in physical, chemical, and biological characteristics of oceans and freshwaters associated with increased atmospheric carbon include, but are not limited to, increased air and water temperatures (freshwater and marine), freshening of surface ocean layers, reduced pH (increasing acidification) of oceanic waters, and reductions in oxygen concentrations. CC also affects terrestrial systems, the freshwater environment of lakes and rivers, and the transitional waters between the marine and freshwater.

Earth system models are used to study possible developments and consequences of anthropogenic CC (IPCC, 2014). Determining impacts of CC on important drivers and ultimately on Atlantic salmon requires downscaling (a procedure that takes information from a large scale to make predictions at local scales) CC scenarios from Global Circulation Models using Regional Climate Models (Figure 23). The uncertainty in model projections increases with every additional stage.

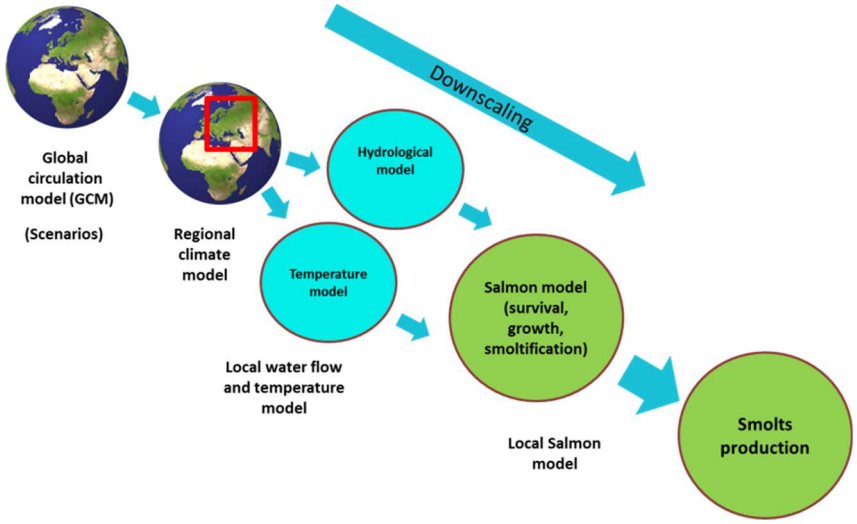


Figure 23 Schematic of downscaling climate change scenarios from Global Circulation Models to local effects (adapted from Sundt-Hansen *et al.*; in review).

Freshwater

By altering the precipitation (and therefore discharge) and temperature drivers, CC is expected to alter the freshwater habitat of Atlantic salmon.

In northern Europe and North America, CC is projected to result in warmer, drier summers and milder, wetter winters with more precipitation falling as rain and less as snow, a decrease in ice-covered periods, and more frequent extreme weather events and the severity of floods and droughts are expected to increase (IPCC, 2014; Figure 24). As a result, river systems are likely to be affected by increased runoff and earlier spring peak discharge in many glacier and snow-fed rivers (Jonsson and Jonsson, 2009). Since consequences of changing precipitation patterns vary among climate zones, projected effects on river discharge also vary among climate zones (Schneider *et al.*, 2013).

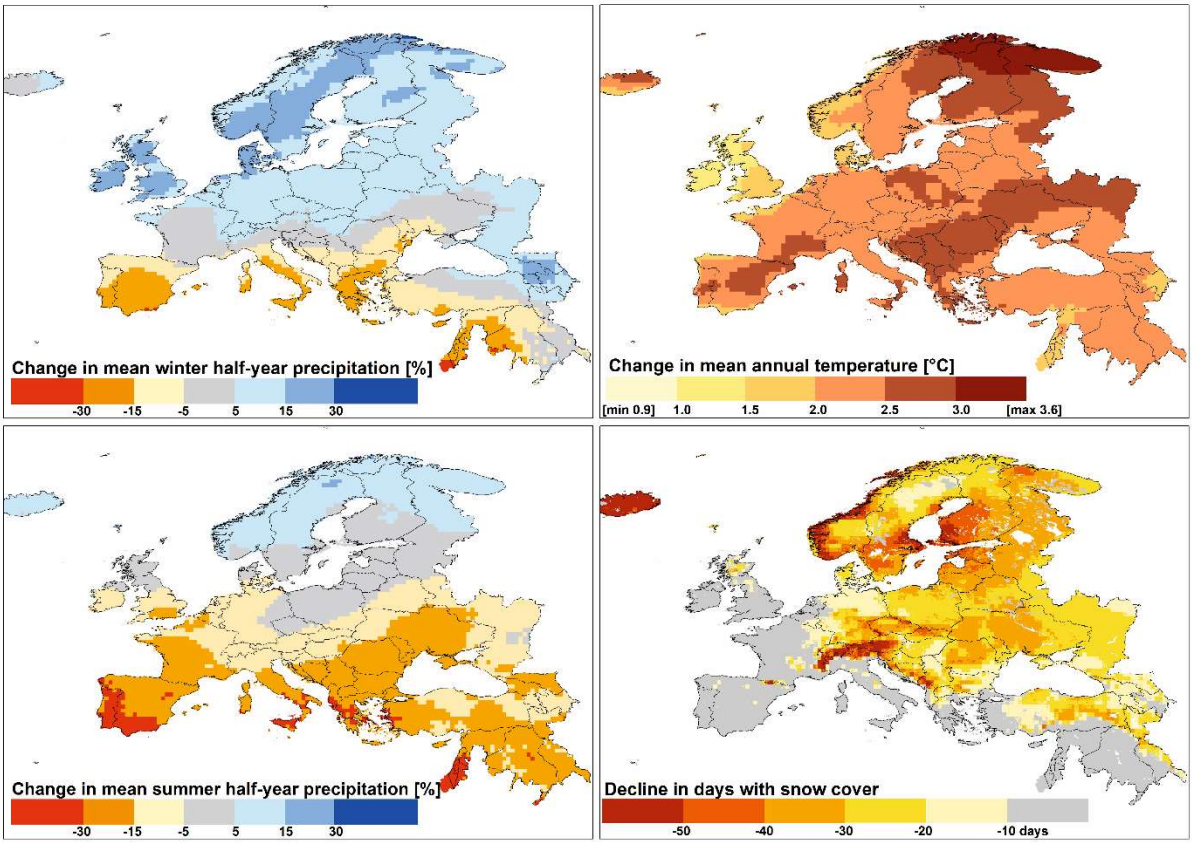


Figure 24 Changes in climate in 2050 relative to present-day climate: mean precipitation during winter (upper left) and summer (lower left), mean annual temperature (upper right), and decline in snow duration (lower right). The map represents the mean of three climate projections (Illustration from Schneider *et al.* 2013, with approval from author).

Increased air temperature may not always lead to increased water temperature. For instance, increased water temperatures over the next century in rivers in Canada are projected to be lower than the projected increases in air temperature (approximately 60–75% of the increase in air temperature; Caissie *et al.*, 2014). In other cases, for instance in Iceland, owing to complex interactions in oceanic circulation, the increase in air temperature due to CC today is associated with a decrease in water temperature in salmon-producing rivers (ICES, 2017c).

Marine

The CC projections of the marine environment indicate increases in sea surface temperature as well as increases in the amplitude of the annual cycles of sea surface temperature (Figure. 10.1.9.8), with higher temperatures in both the summer and winter. Warming is projected to result in progressive reductions in the spatial extent of sea ice in the North Atlantic, with September sea ice being essentially absent by 2080 (Figure 26). The changes in sea surface temperature are not expected to be uniform across the North Atlantic with greater warming in sea surface temperatures in the Northwest Atlantic and the Norwegian Sea than in the Northeast Atlantic, as well as south of Iceland and west of Greenland (Figure 27). Associated with loss of Arctic sea ice and glaciers, the surface waters are projected to become fresher (less saline) with the largest reductions in salinity in the northern portions of the North Atlantic (Figure 27).

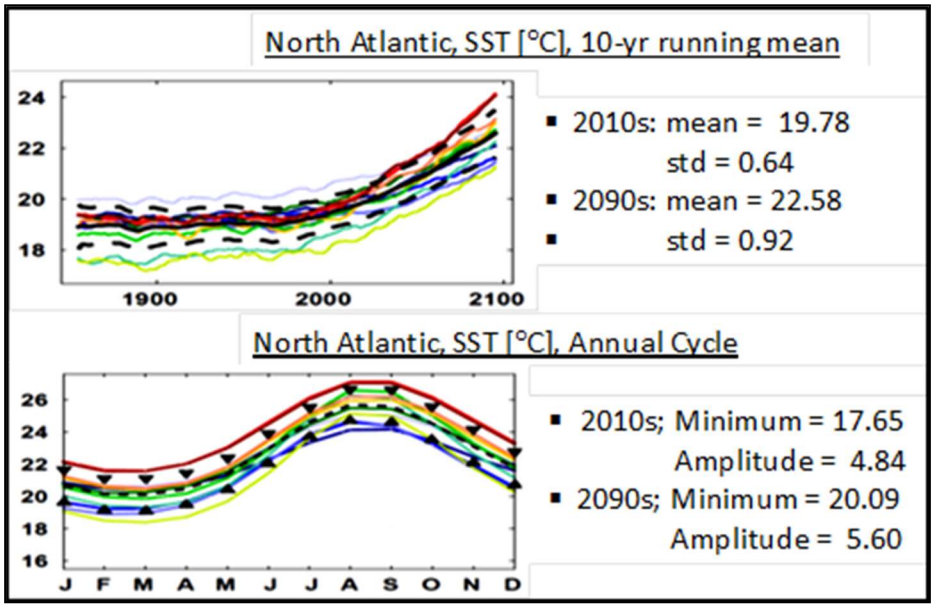


Figure 25 Projected annual mean sea surface temperature (°C) (upper panel) and annual cycle of temperatures in the 2090s for the North Atlantic, based on the RCP8.5 scenario, averaged over 12 models. Unpublished analyses from N. Goris, Uni Research Climate, Bjerknes Centre for Climate Research, Norway.

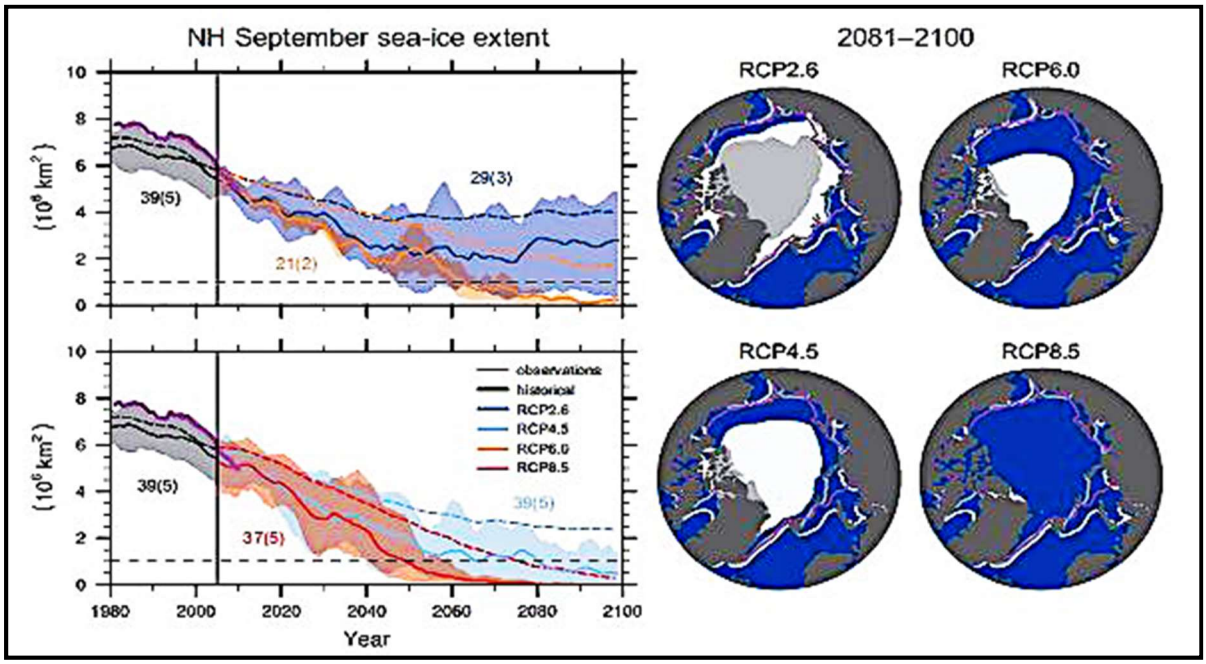


Figure 26 Current (to 2004) and projected to 2100 areal extent (km²) of sea ice in September in the North Atlantic for four climate scenarios. RCP8.5 is the scenario that more closely aligns with current emission values in 2016 (Figure 22). (Source: http://www.barentsportal.com/barentsportal/index.php/en/more/future-prospects/594-.)

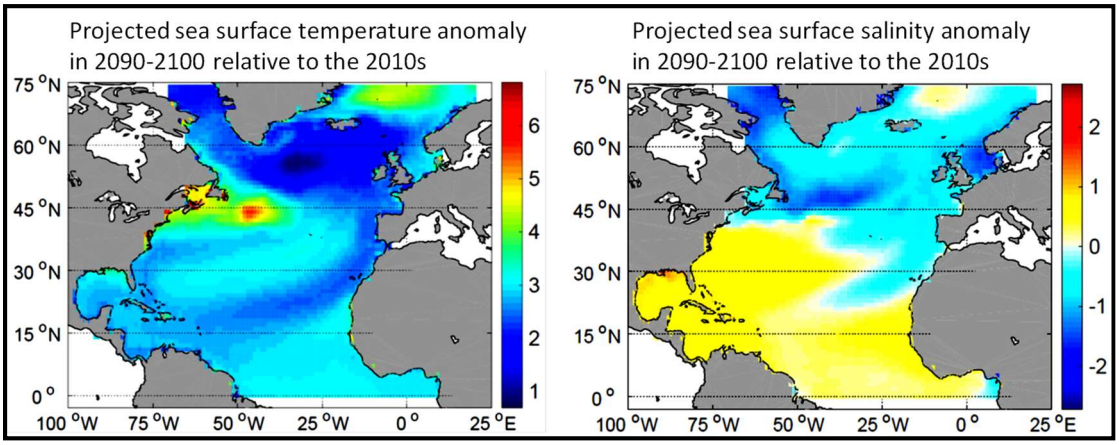


Figure 27 Projected differences (anomalies) in mean sea surface temperature (°C) (left panel) and sea surface salinity (right panel) in the 2090s relative to the 2010s, based on the RCP8.5 scenario, averaged over 12 models. Unpublished analyses from N. Goris, Uni Research Climate, Bjerknes Centre for Climate Research, Norway.

f) Potential effects of climate change on Atlantic salmon stock dynamics

Habitats – Freshwater

Climate-induced changes in precipitation patterns will result in changes in river discharge that can directly influence the amount of habitat for salmon. Increases in discharge, particularly from low levels, will increase the wetted area. The amount of shelter (interstitial spaces) in a river may limit the carrying capacity of the river, and an increase in the wetted area may result in additional habitat becoming available. Because of the relationship between discharge, wetted area, and shelter, in general the productive capacity of rivers will be reduced in areas where discharge is reduced. An increase in discharge in winter may increase habitat availability in winter, and therefore available shelter for juveniles.

Despite a general trend of lower discharges in rivers in the southern distribution range of Atlantic salmon and higher discharges in the northern distribution range, large regional differences will exist depending on factors such as altitude, gradient, groundwater influence, and topography.

With CC, new freshwater habitats may become available for Atlantic salmon in the northern areas where Atlantic salmon are presently not found.

Habitats – Estuaries

CC-related impacts in freshwater (e.g. increased temperatures, altered discharge) affecting estuarine salinity and turbidity may change the ability of salmon to successfully osmoregulate and survive. These changes may be positive or negative for Atlantic salmon. Climate-altered freshwater discharge patterns may directly affect the amount and quality of estuarine habitat used by salmon. Climate-related changes in marine teleconnection patterns may reduce upwelling, which may reduce nutrient supplies to estuaries, affecting foodwebs and young salmon (Levings, 2016).

Habitats – Marine

CC projections indicate a warming at higher latitudes, as well as an increase in amplitude of the annual temperature cycle. The primary feeding grounds of adult Atlantic salmon are at these higher latitudes (e.g. ICES, 2017b). It is not likely that sea surface temperature (SST) in the current feeding areas will be outside the thermal optimum for the species (e.g. Jonsson and Jonsson, 2009). However, together with the projected changes in other factors such as PP (primary production), SSS (sea surface salinity), pH, and dissolved oxygen, these changes are likely to impact on other components of the ecosystem that affect salmon.

With the likely event of the Arctic Ocean becoming free of ice in the summer in the next 10–20 years (Wang and Overland, 2009), currently inaccessible physical marine habitat will probably become available to Atlantic salmon. A recent peer-reviewed publication by Jensen *et al.* (2014) suggests the marine range of Atlantic salmon might already be moving northward in the east Atlantic area.

Biological characteristics – Freshwater/estuaries

Changing temperature and flow regimes resulting from CC have the potential to influence spawning success in salmon in a variety of ways, including the ability of adult fish to access suitable spawning areas, timing of spawning, and in the size and quality of eggs. Marked changes in temperature or flow during early development may create a mismatch between emergence and environmental conditions, resulting in increased levels of early juvenile mortality (Jensen *et al.*, 1991) as a result of CC.

Juvenile growth declines as temperature increases above the optimum range. The effect that predicted temperature increases might have on growth of juveniles and age at smoltification is complex and variable (Swansburg *et al.*, 2002). As mortality at sea is generally thought to be growth-mediated, particularly by factors acting during the first summer (Friedland *et al.*, 2009), this will have consequences on sea survival. The timing of smolt migration is thought to be crucial to the survival of Atlantic salmon at sea (Hansen, 1987) and is believed to have evolved such that smolts enter the sea in synchrony with optimal biotic and abiotic conditions (Hvidsten *et al.*, 1998). Changes in the run-timing of smolts due to variations in climate are, therefore, a concern due to a possible temporal mismatch with optimal conditions for early post-smolt growth and survival (Russell *et al.*, 2012).

Biological characteristics – Marine

Age-at-maturation is a key life-history trait, as the fitness of an individual is reported to be more sensitive to changes in this trait than to changes in many other life-history traits (Stearns, 1992). It has been suggested that both good and poor growth conditions can lead to delayed maturation (Jonsson *et al.*, 2016), with no mechanistic framework available to explain how seasonal growth and ocean environment combine to produce annual variability in maturation. As a result it is currently impossible to predict how CC may affect age-at-maturation.

The mean sizes of returning salmon in a number of areas are continuing to show declining trends (ICES, 2016b). However, these changes are not manifested in all populations (ICES, 2008). The decrease in growth in recent years has been linked to indirect effects of warming in areas where salmon are located at sea (Todd *et al.*, 2008) and thus could be driven by CC.

Interactions with other species – Freshwater

As a result a CC range expansion of non-native species could be expected. Two examples follow.

Pink salmon (*Oncorhynchus gorbuscha*) was introduced in northwestern Russia in the 1930s, and from around 1960 regular runs of pink salmon appeared in Norwegian rivers (Berg, 1977). It is suggested that odd-year populations appear to be benefiting from CC more than even-year populations in the Pacific (Irvine *et al.*, 2014), something that might also apply to the populations now established in northwestern Russian and northern Norway. However, as pointed out by ICES (2013), since pink salmon typically spawn in the lower reaches of rivers downstream of where Atlantic salmon spawn, and pink salmon fry have a very short freshwater residence, pink salmon may never be significant competitors with Atlantic salmon.

Smallmouth bass (*Micropterus dolomieu*) was introduced into eastern North America in the late 1800s and has subsequently been expanding northward. The presence of non-native smallmouth bass has the potential to impact Atlantic salmon through predation and competition. Given smallmouth bass prefer warmer water, incremental warming associated with CC could lead to an increase in available habitat for smallmouth bass and enhanced recruitment, survival, and dispersal northwards.

Interactions with other species – Marine

Increased freshwater growth as a result of increased stream temperatures has been reported to produce younger and smaller smolts and thus could result in higher smolt and post-smolt predation in the ocean.

Increases in inter-specific competition might occur as a result of changing distribution patterns for several marine pelagic species. For example, negative relationships have been observed between herring abundance in the Norwegian Sea and salmon catches and between herring abundance and marine survival of smolts from the River Figgjo (Crozier *et al.*, 2003). Similar correlations between survival indices and herring recruitment have been observed in the Baltic Sea (ICES, 2008).

It has been shown that higher sea water temperatures decrease generation time, and increase the rate of development and maturation in the salmon louse (*Lepeophtheirus salmonis*), resulting in higher production of salmon lice (Tully *et al.*, 1993). Mortality in Atlantic salmon as a result of salmon lice infestation may rise, especially in areas of intensive open-cage aquaculture for salmon. Other marine parasites are likely to exhibit similar increases in production with rising SST, as will virulence, transmission rates, and synergistic effects with other stressors (Marcogliese, 2008).

Migration routes

Changes in migratory pathways have been suggested as a factor affecting the survival of salmon post-smolts. Further changes in conditions that affect migratory pathways are expected under CC. It is unclear how this will affect marine survival of different Atlantic salmon stocks.

Distribution patterns

In evolutionary history, large distributional changes of Atlantic salmon have been associated with glacial (ice ages) and interglacial periods.

The effects of CC could potentially influence the distribution range of Atlantic salmon. Modelling studies (e.g. Lassalle and Rochard, 2009) have suggested the European range of Atlantic salmon could be altered markedly as a result of CC by 2100, with a disappearance of the species in river basins from Portugal, Spain, and southern France. For North America, Chu *et al.* (2005) and Minns *et al.* (1995) predict that populations of salmonids might be lost in the southern part of their ranges. However, these modelling studies do not take into account the ability of the species to genetically adapt to the changing environmental conditions. Taking such responses into consideration, Piou and Prévost (2013) conclude that in the next 30 years it is unlikely that French populations will be extirpated as a result of CC.

In contrast to possible range contraction in the southern part of the range, CC might result in a range expansion in the northern, western, and eastern parts of the range of salmon. There is much more landmass available for potential colonization in North America relative to Europe. However, it remains unclear if habitat losses in the southern part of the range would be compensated by colonization of habitats at higher latitudes for the species as a whole.

Genetic diversity and evolutionary/phenotypic responses

It is likely that there will be a net reduction in genetic diversity and genetic structure under CC. Under CC the abundance of salmon in the southern populations is expected to decline, which will result in reductions in effective population size. The southern genetic stock complexes (phylogenetic groups) have the greatest genetic diversity for Atlantic salmon and are at the greatest threat of loss caused by CC. The expected simultaneous range expansion of northern stocks with associated founder effects, will not compensate for this loss of genetic diversity.

Atlantic salmon can respond quickly to environmental fluctuations by phenotypic plasticity (variations in life history traits that are directly driven by the environment rather than genetics). But if the effects of CC are too rapid or too severe, phenotypic plasticity may be inadequate to allow populations to persist and genetic adaption to occur.

Knowledge gaps

This advice provides a review of the current evidence based on the latest available information in the peer-reviewed literature. While these recent findings have advanced our understanding of the potential consequences of CC on Atlantic salmon, substantial uncertainties remain:

- CC is expected to increase variability of weather events, but many CC projections are at seasonal or even annual scales (e.g. river discharge, temperature). However, it is at the daily or even finer scales that the most significant deleterious consequences for survival can occur for salmon (e.g. extreme low flows combined with high temperatures).

- One of the challenges concerning earth system models is that they are computationally expensive and can therefore only be run with relatively coarse grid resolution and a limited number of variables and processes. Despite progress in refining the resolution of earth

system models, the current resolution does not suffice to reproduce realistic small-scale features, which are important for coastal regions and rivers. While it is reasonable to generalize about CC effects globally, local impacts will depend on local variations in weather patterns and the frequency of episodic events.

- Projections can be made within various climate zones and hydrological models can be used to predict changes in river flow regimes at the scale of individual watersheds through downscaling. However, uncertainty is introduced at every stage of the downscaling process.

- The greatest uncertainty is the inability to predict sudden large phase-shifts in either climate, marine, or terrestrial systems. Current concentrations of CO_2 in the atmosphere exceed any levels previously estimated for the last 800 000 years. Consequences for Atlantic salmon, which have persisted for more than 500 000 years, are unknown.

Reports from ICES expert groups relevant to North Atlantic salmon

WGRECORDS

The Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS) provides a topical forum for the coordination of ICES activities relating to species which use both freshwater and marine environments to complete their life cycles, like eel, Atlantic salmon, sea trout, lampreys, shads, smelts, etc. The Group considers progress and future requirements in the field of diadromous science and management and organizes expert groups, theme sessions, and symposia. There is also a significant role in co-ordinating with other science and advice working groups in ICES.

A diadromous fish theme session will convene at the 2017 ICES Annual Science Conference in Fort Lauderdale, Florida, USA. This session will consider presentations on:

- Status, distribution, ecology, or biology of poorly understood diadromous fish species;
- Approaches for systematic monitoring of poorly understood diadromous species;
- Using some species as index species for environmental change;
- Lessons learned that might help management and conservation of functionally similar species.;
- Impending threats, particularly invasive species or interactions with other species undergoing range expansion;
- Physiological drivers controlling the movements of diadromous fish and addressing gaps in knowledge.

Other issues reported on included:

- Information from Portugal and the UK on fish passage and mitigation actions relevant to diadromous fish.
- The need for a host to support the DBERAAS database, a product of the ICES Working Group on Effective Recovery Actions for Atlantic Salmon (WGERAAS).
- ICES Cooperative Research Report on "Fifty Years of Marine Tag Recoveries from Atlantic Salmon" was in final editorial stages and would be published shortly (CRR 282).

ICES and the International Year of the Salmon

Further progress on developing an International Year of the Salmon event was made during 2016. Primary partners have been identified as the North Pacific Anadromous Fish Commission (NPAFC) and the North Atlantic Salmon Conservation Organization (NASCO), international intergovernmental organizations established to conserve anadromous salmon in the North Pacific and Atlantic oceans, respectively (http://www.npafc.org/new/science_IYS.html and //www.nasco.int/iys.html). ICES recognises this opportunity to raise awareness of the salmon globally, the issues facing these species, and the considerable efforts being made to conserve and restore stocks. At the SCICOM meeting in September 2016, ICES formally accepted the invitation from the IYS Steering Committee to become a partner. ICES appointed the Head of Science Support and the SCICOM Representative for Ireland to engage with the process and be part of the North Atlantic Steering Committee and the Symposium Steering Committee.

In November 2016, NASCO held a meeting of the North Atlantic Steering Committee which ICES attended. In March 2017 SCICOM approved a resolution to support the IYS symposium in the third quarter of 2018, with an issue of the *ICES Journal* to be allocated pending discussions with the Editor-in-Chief. ICES recognised this as a high priority, given that ICES is the primary advice provider for Atlantic salmon in the North Atlantic and has been advising the North Atlantic Salmon Conservation Organization since 1983. Given the current persistent decline in salmon stocks in the North Atlantic, and a similar decline for some important Pacific salmon stocks, there is a need to share information to inform a wider research initiative to explain this decline and rational management.

It is anticipated that a wide range of participants will attend this symposium given the existing links between the Pacific, Atlantic (East and West), and Baltic and the degree of international interest in wild salmon biology and science between freshwater and marine environments. Specifically, it is anticipated that there will be involvement of scientists from ICES, NASCO, NPAFC, PICES, universities, government, state organizations, and NGOs (e.g. Atlantic Salmon Trust, Atlantic Salmon Federation). The outputs of the symposium and the research activities associated with the IYS are expected to feed into the advice process of the ICES ACOM and enhance ICES advice to NASCO. There will also be links with the ICES Science Plan through SCICOM, the Science Steering Group on Environmental Processes and Dynamics (SGEPD), and associated EGs.

NASCO 1.6 Provide a compilation of tag releases by country in 2016

Data on releases of tagged, fin-clipped, and otherwise marked salmon in 2016 are compiled as a separate report (ICES, 2017d). A summary of tag releases is provided in Table 11. About 3.2 million salmon were marked in 2016, a decrease from the 3.8 million fish marked in 2015. The adipose clip was the most commonly used primary mark (2.55 million), with coded wire microtags (0.379 million) the most common tag applied and 254 880 fish were marked with external tags. Most marks were applied to hatchery-origin juveniles (3.1 million), while 81 188 wild juveniles and 8136 adults were also marked. In 2016, 64 669 PIT tagged, Data Storage Tags (DSTs), and radio and/or sonic transmitting tags (pingers) were also reported by some countries (Table 11).

A tagging and wide-scale tag screening programme in the Northeast Atlantic was initiated in 2015, directed at pelagic species (herring and mackerel) using glass-encapsulated passive integrated transponder (PIT) tags / RFID tags (Radio Frequency Identity tags) (ICES, 2015). RFID detector systems have been installed at a number of fish processing plants in different countries, and catches landed at these plants are automatically screened for tagged fish. In 2016 more than 32 000 salmon were released with such tags. Therefore there is a potential for RFID tagged salmon as bycatch in pelagic fisheries to be detected at fish plants with the appropriate detecting equipment. A list of unknown tags detected by these detectors was received from Institute Marine Research (Bergen Norway) in 2015 and updated in 2016. The list was distributed to agencies using RFID tags for salmon. One agency confirmed that one of the detected tags had been applied to a smolt in Norway.

NASCO 1.7 Identify relevant data deficiencies, monitoring needs, and research requirements

ICES recommends that the WGNAS should meet in 2018 (Chair: Martha Robertson, Canada) to address questions posed by ICES, including those posed by NASCO. Unless otherwise

notified, the working group intends to convene at the headquarters of ICES in Copenhagen, Denmark. The meeting will be held from 4 to 13 April 2018.

The following relevant data deficiencies, monitoring needs, and research requirements were identified:

North Atlantic Salmon Stocks

The continuation and expansion of tracking programmes provides information that is useful in the assessment of marine mortality on North Atlantic salmon stocks. These techniques have been proposed, and are being implemented in other areas, both in the Northwest and the Northeast Atlantic (e.g. SALSEA Track), in line with the NASCO IASRB resolution.

In order to fully consider a life cycle model as an improvement and alternative to the current assessment and forecast model used for providing catch advice, improvements to data inputs, and the incorporation of a number of alternative life history dynamics need to occur well ahead of the 2018 ICES WGNAS meeting. As such, a workshop of jurisdictional experts is proposed before the end of the 2017 calendar year. The purpose of the meeting would be to review current national input data given reductions in fisheries particularly in the NEAC area, to incorporate improved data inputs and alternate population dynamic functions, to enable the running of the inference and forecast components, and to develop documentation related to the model. The changes to the model inputs and the model would then be reviewed at the 2018 ICES WGNAS meeting for consideration as an alternate approach for the provision of the next cycle of multi-year catch advice.

In 2015 ICES received information from the Institute of Marine Research (IMR), Bergen, Norway, related to a new tagging initiative and wide-scale tag screening programme in the Northeast Atlantic. The tagging programme is directed at pelagic species (herring and mackerel) using glass-encapsulated passive integrated transponder (PIT) tags / RFID tags (Radio Frequency Identity tags) (ICES, 2015). RFID detector systems have been installed at a number of fish processing plants in different countries, and catches landed at these plants are automatically screened for tagged fish. It is recommended that the list of tag detections be sent to the National Tagging coordinators (ICES, 2017d) and to the members of the WGNAS to determine if any salmon tags have been detected.

Atlantic salmon from North America

1) Sampling and supporting descriptions of the Labrador and Saint Pierre and Miquelon mixed-stock fisheries should be continued and expanded (i.e. sample size, geographic coverage, tissue samples, seasonal distribution of the samples) in future years to improve the information on biological characteristics and stock origin of salmon harvested in these mixed-stock fisheries.

Additional monitoring should be considered in Labrador to estimate stock status for that region, including evaluation of the utility of other available data sources (e.g. Aboriginal and recreational catches and effort) to describe stock status in Labrador.

Atlantic salmon at West Greenland

1) Continued efforts to improve the reporting system of catch in the Greenland fishery and to ensure that detailed statistics related to spatially and temporally explicit catch and effort data be provided for analyses.

The continuation of the phone survey programme in Greenland according to a standardized and consistent annual approach, with consideration given to surveying a higher proportion of licensed fishers and the inclusion of the non-licensed fishers. Information gained on the level of total catches for this fishery will provide for a more accurate assessment of the status of stocks and assessment of risk with varying levels of harvest.

The continuation and potential expansion of the broad geographic sampling programme including in Nuuk (multiple NAFO divisions, including factory landings when permitted) to more accurately estimate continent and region of origin and biological characteristics of Atlantic salmon in the mixed-stock fishery.

Progress be made in assigning the European origin salmon from the West Greenland fishery to a sub-complex region of origin.

Table 4 Reported total nominal catches of salmon by country (in tonnes round fresh weight), 1960 to 2016 (2016 figures include provisional data).

	NAC Area			NEAC (N. Area)								NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
Year	Canada (1)	USA	St. P&M	Norway (2)	Russia (3)	Iceland Wild	Iceland Ranch (4)	Sweden Wild	Sweden Ranch (15)	Denmark	Finland	Ireland (5,6)	UK (E & W)	UK (N.Irl.) (6,7)	UK (Scotl.)	France (8)	Spain (9)	Faroes (10)	East Grld.	West Grld. (11)	Other (12)	Reported Nominal Catch	NASCO Areas (13)	International waters (14)
1960	1 636	1	-	1 659	1 100	100	-	40	0	-	-	743	283	139	1 443	-	33	-	-	60	-	7 237	-	-
1961	1 583	1	-	1 533	790	127	-	27	0	-	-	707	232	132	1 185	-	20	-	-	127	-	6 464	-	-
1962	1 719	1	-	1 935	710	125	-	45	0	-	-	1 459	318	356	1 738	-	23	-	-	244	-	8 673	-	-
1963	1 861	1	-	1 786	480	145	-	23	0	-	-	1 458	325	306	1 725	-	28	-	-	466	-	8 604	-	-
1964	2 069	1	-	2 147	590	135	-	36	0	-	-	1 617	307	377	1 907	-	34	-	-	1 539	-	10 759	-	-
1965	2 116	1	-	2 000	590	133	-	40	0	-	-	1 457	320	281	1 593	-	42	-	-	861	-	9 434	-	-
1966	2 369	1	-	1 791	570	104	2	36	0	-	-	1 238	387	287	1 595	-	42	-	-	1 370	-	9 792	-	-
1967	2 863	1	-	1 980	883	144	2	25	0	-	-	1 463	420	449	2 117	-	43	-	-	1 601	-	11 991	-	-
1968	2 111	1	-	1 514	827	161	1	20	0	-	-	1 413	282	312	1 578	-	38	5	-	1 127	403	9 793	-	-
1969	2 202	1	-	1 383	360	131	2	22	0	-	-	1 730	377	267	1 955	-	54	7	-	2 210	893	11 594	-	-
1970	2 323	1	-	1 171	448	182	13	20	0	-	-	1 787	527	297	1 392	-	45	12	-	2 146	922	11 286	-	-
1971	1 992	1	-	1 207	417	196	8	17	1	-	-	1 639	426	234	1 421	-	16	-	-	2 689	471	10 735	-	-
1972	1 759	1	-	1 578	462	245	5	17	1	-	32	1 804	442	210	1 727	34	40	9	-	2 113	486	10 965	-	-
1973	2 434	3	-	1 726	772	148	8	22	1	-	50	1 930	450	182	2 006	12	24	28	-	2 341	533	12 670	-	-
1974	2 539	1	-	1 633	709	215	10	31	1	-	76	2 128	383	184	1 628	13	16	20	-	1 917	373	11 877	-	-
1975	2 485	2	-	1 537	811	145	21	26	0	-	76	2 216	447	164	1 621	25	27	28	-	2 030	475	12 136	-	-
1976	2 506	1	3	1 530	542	216	9	20	0	-	66	1 561	208	113	1 019	9	21	40	<1	1 175	289	9 327	-	-
1977	2 545	2	-	1 488	497	123	7	9	1	-	59	1 372	345	110	1 160	19	19	40	6	1 420	192	9 414	-	-
1978	1 545	4	-	1 050	476	285	6	10	0	-	37	1 230	349	148	1 323	20	32	37	8	984	138	7 682	-	-
1979	1 287	3	-	1 831	455	219	6	11	1	-	26	1 097	261	99	1 076	10	29	119	<0,5	1 395	193	8 118	-	-
1980	2 680	6	-	1 830	664	241	8	16	1	-	34	947	360	122	1 134	30	47	536	<0,5	1 194	277	10 127	-	-
1981	2 437	6	-	1 656	463	147	16	25	1	-	44	685	493	101	1 233	20	25	1 025	<0,5	1 264	313	9 954	-	-
1982	1 798	6	-	1 348	364	130	17	24	1	-	54	993	286	132	1 092	20	10	606	<0,5	1 077	437	8 395	-	-
1983	1 424	1	3	1 550	507	166	32	27	1	-	58	1 656	429	187	1 221	16	23	678	<0,5	310	466	8 755	-	-
1984	1 112	2	3	1 623	593	139	20	39	1	-	46	829	345	78	1 013	25	18	628	<0,5	297	101	6 912	-	-
1985	1 133	2	3	1 561	659	162	55	44	1	-	49	1 595	361	98	913	22	13	566	7	864	-	8 108	-	-
1986	1 559	2	3	1 598	608	232	59	52	2	-	37	1 730	430	109	1 271	28	27	530	19	960	-	9 255	315	-
1987	1 784	1	2	1 385	564	181	40	43	4	-	49	1 239	302	56	922	27	18	576	<0,5	966	-	8 159	2 788	-
1988	1 310	1	2	1 076	420	217	180	36	4	-	36	1 874	395	114	882	32	18	243	4	893	-	7 737	3 248	-
1989	1 139	2	2	905	364	141	136	25	4	-	52	1 079	296	142	895	14	7	364	-	337	-	5 904	2 277	-
1990	911	2	2	930	313	141	285	27	6	13	60	567	338	94	624	15	7	315	-	274	-	4 925	1 890	180-350

Table 4 (continued).

Year	NAC Area			NEAC (N. Area)								NEAC (S. Area)						Faroes & Greenland				Total Reported Nominal Catch	Unreported catches	
	Canada (1)	USA	St. P&M	Norway (2)	Russia (3)	Iceland Wild	Iceland Ranch (4)	Sweden Wild	Sweden Ranch (15)	Denmark	Finland	Ireland (5,6)	UK (E & W)	UK (N.Irl.) (6,7)	UK (Scotl.)	France (8)	Spain (9)	Faroes (10)	East Grld.	West Grld. (11)	Other (12)		NASCO Areas (13)	International waters (14)
1991	711	1	1	876	215	129	346	34	4	3	70	404	200	55	462	13	11	95	4	472	-	4 106	1 682	25-100
1992	522	1	2	867	167	174	462	46	3	10	77	630	171	91	600	20	11	23	5	237	-	4 119	1 962	25-100
1993	373	1	3	923	139	157	499	44	12	9	70	541	248	83	547	16	8	23	-	-	-	3 696	1 644	25-100
1994	355	0	3	996	141	136	313	37	7	6	49	804	324	91	649	18	10	6	-	-	-	3 945	1 276	25-100
1995	260	0	1	839	128	146	303	28	9	3	48	790	295	83	588	10	9	5	2	83	-	3 629	1 060	-
1996	292	0	2	787	131	118	243	26	7	2	44	685	183	77	427	13	7	-	0	92	-	3 136	1 123	-
1997	229	0	2	630	111	97	59	15	4	1	45	570	142	93	296	8	4	-	1	58	-	2 364	827	-
1998	157	0	2	740	131	119	46	10	5	1	48	624	123	78	283	8	4	6	0	11	-	2 395	1 210	-
1999	152	0	2	811	103	111	35	11	5	1	62	515	150	53	199	11	6	0	0	19	-	2 247	1 032	-
2000	153	0	2	1 176	124	73	11	24	9	5	95	621	219	78	274	11	7	8	0	21	-	2 912	1 269	-
2001	148	0	2	1 267	114	74	14	25	7	6	126	730	184	53	251	11	13	0	0	43	-	3 069	1 180	-
2002	148	0	2	1 019	118	90	7	20	8	5	93	682	161	81	191	11	9	0	0	9	-	2 654	1 039	-
2003	141	0	3	1 071	107	99	11	15	10	4	78	551	89	56	192	13	9	0	0	9	-	2 457	847	-
2004	161	0	3	784	82	111	18	13	7	4	39	489	111	48	245	19	7	0	0	15	-	2 157	686	-
2005	139	0	3	888	82	129	21	9	6	8	47	422	97	52	215	11	13	0	0	15	-	2 155	700	-
2006	137	0	3	932	91	93	17	8	6	2	67	326	80	29	192	13	11	0	0	22	-	2 028	670	-
2007	112	0	2	767	63	93	36	6	10	3	58	85	67	30	171	11	9	0	0	25	-	1 548	475	-
2008	158	0	4	807	73	132	69	8	10	9	71	89	64	21	161	12	9	0	0	26	-	1 721	443	-
2009	126	0	3	595	71	126	44	7	10	8	36	68	54	16	121	4	2	0	0,8	26	-	1 318	343	-
2010	153	0	3	642	88	147	42	9	13	13	49	99	109	12	180	10	2	0	1,7	38	-	1 610	393	-
2011	179	0	4	696	89	98	30	20	19	13	44	87	136	10	159	11	7	0	0,1	27	-	1 629	421	-
2012	126	0	3	696	82	50	20	21	9	12	64	88	58	9	124	10	7	0	0,5	33	-	1 412	403	-
2013	137	0	5	475	78	116	31	10	4	11	46	87	84	4	119	11	5	0	0,0	47	-	1 270	306	-
2014	118	0	4	490	81	51	18	24	6	9	58	57	54	5	84	12	6	0	0,1	58	-	1 134	287	-
2015	140	0	4	583	80	94	31	9	7	9	45	63	68	3	68	16	5	0	1,0	56	-	1 282	325	-
2016	135	0	5	612	56	87	31	6	3	9	51	58	86	5	27	6	5	0	1,5	26	-	1 209	335	-
Average 2011-2015	140	0	4	588	82	82	26	17	9	11	51	76	80	6	111	12	6	0	0,3	44	-	1 345	348	-
2006-2015	139	0	3	668	80	100	34	12	9	9	54	105	77	14	138	11	6	0	0,4	36	-	1 495	407	-

KEY:

1. Includes estimates of some local sales, and, prior to 1984, by-catch
2. Before 1966, sea trout and sea charr included (5% of total).
3. Figures from 1991 to 2000 do not include catches taken in the recreational (rod) fishery.
4 From 1990, catch includes fish ranched for both commercial and angling purposes.
5. Improved reporting of rod catches in 1994 and data derived from carcase tagging and log books from 2002.
6. Catch on River Foyle allocated 50% Ireland and 50% N. Ireland.
7. Angling catch (derived from carcase tagging and log books) first included in 2002.
8. Data for France include some unreported catches.
9. Weights estimated from mean weight of fish caught in Asturias (80-90% of Spanish catch).
10. Between 1991 & 1999, there was only a research fishery at Faroes. In 1997 & 1999 no fishery took place; the commercial fishery resumed in 2000, but has not operated since 2001.
11. Includes catches made in the West Greenland area by Norway, Faroes, Sweden and Denmark in 1965-1975.
12. Includes catches in Norwegian Sea by vessels from Denmark, Sweden, Germany, Norway and Finland.
13. No unreported catch estimate available for Canada in 2007 and 2008. Data for Canada in 2009 and 2010 are incomplete. No unreported catch estimate available for Russia since 2008.
14. Estimates refer to season ending in given year.
15. Catches from hatchery-reared smolts released under programmes to mitigate for hydropower development

Table 5 The catch (tonnes round fresh weight) and % of the nominal catch by country taken in coastal, estuarine, and riverine fisheries, 2000 to 2016. Data for 2016 include provisional data.

Country	Year	Coast		Estuary		River		Total
		Weight	%	Weight	%	Weight	%	weight
Spain	2000	0	0	0	0	7	100	7
	2001	0	0	0	0	13	100	13
	2002	0	0	0	0	9	100	9
	2003	0	0	0	0	7	100	7
	2004	0	0	0	0	7	100	7
	2005	0	0	0	0	13	100	13
	2006	0	0	0	0	11	100	11
	2007	0	0	0	0	10	100	10
	2008	0	0	0	0	10	100	10
	2009	0	0	0	0	2	100	2
	2010	0	0	0	0	2	100	2
	2011	0	0	0	0	7	100	7
	2012	0	0	0	0	8	100	8
	2013	0	0	0	0	5	100	5
	2014	0	0	0	0	7	100	7
	2015	0	0	0	0	5	100	5
	2016	0	0	0	0	5	100	5
France	2000	0	4	4	35	7	61	11
	2001	0	4	5	44	6	53	11
	2002	2	14	4	30	6	56	12
	2003	0	0	6	44	7	56	13
	2004	0	0	10	51	9	49	19
	2005	0	0	4	38	7	62	11
	2006	0	0	5	41	8	59	13
	2007	0	0	4	42	6	58	11
	2008	1	5	5	39	7	57	12
	2009	0	4	2	34	3	62	5
	2010	2	22	3	26	5	52	10
	2011	0	3	6	54	5	43	11
	2012	0	1	4	44	5	55	10
	2013	0	3	4	40	6	57	11
	2014	0	2	5	43	7	55	12
	2015	4	23	5	32	7	45	16
	2016	0	2	3	45	3	52	6
Ireland	2000	440	71	79	13	102	16	621
	2001	551	75	109	15	70	10	730
	2002	514	75	89	13	79	12	682
	2003	403	73	92	17	56	10	551
	2004	342	70	76	16	71	15	489
	2005	291	69	70	17	60	14	421
	2006	206	63	60	18	61	19	327
	2007	0	0	31	37	52	63	83
	2008	0	0	29	33	60	67	89
	2009	0	0	20	30	47	70	67
	2010	0	0	38	39	60	61	99
	2011	0	0	32	37	55	63	87
	2012	0	0	28	32	60	68	88
	2013	0	0	38	44	49	56	87
	2014	0	0	26	46	31	54	57
	2015	0	0	21	33	42	67	63
	2016	0	0	19	33	39	67	58
UK (England & Wales)	2000	157	72	25	12	37	17	219
	2001	129	70	24	13	31	17	184
	2002	108	67	24	15	29	18	161
	2003	42	47	27	30	20	23	89
	2004	39	35	19	17	53	47	111
	2005	32	33	28	29	36	37	97
	2006	30	37	21	26	30	37	80
	2007	24	36	13	20	30	44	67
	2008	22	34	8	13	34	53	64
	2009	20	37	9	16	25	47	54
	2010	64	59	9	8	36	33	109
	2011	93	69	6	5	36	27	136

Country	Year	Coast		Estuary		River		Total
		Weight	%	Weight	%	Weight	%	weight
	2012	26	45	5	8	27	47	58
	2013	61	73	6	7	17	20	84
	2014	41	76	4	8	9	16	54
	2015	55	82	4	6	8	12	68
	2016	71	82	6	6	10	11	86
UK (Scotland)	2000	76	28	41	15	157	57	274
	2001	77	30	22	9	153	61	251
	2002	55	29	20	10	116	61	191
	2003	87	45	23	12	83	43	193
	2004	67	27	20	8	160	65	247
	2005	62	29	27	12	128	59	217
	2006	57	30	17	9	119	62	193
	2007	40	24	17	10	113	66	171
	2008	38	24	11	7	112	70	161
	2009	27	22	14	12	79	66	121
	2010	44	25	38	21	98	54	180
	2011	48	30	23	15	87	55	159
	2012	40	32	11	9	73	59	124
	2013	50	42	26	22	43	36	119
	2014	41	49	17	20	26	31	84
	2015	31	45	9	14	28	41	68
	2016	0	1	10	37	17	63	27
UK (N. Ireland)	2000	63	82	14	18	-	-	77
	2001	41	77	12	23	-	-	53
	2002	40	49	24	29	18	22	81
	2003	25	45	20	35	11	20	56
	2004	23	48	11	22	14	29	48
	2005	25	49	13	25	14	26	52
	2006	13	45	6	22	9	32	29
	2007	6	21	6	20	17	59	30
	2008	4	19	5	22	12	59	21
	2009	4	24	2	15	10	62	16
	2010	5	39	0	0	7	61	12
	2011	3	24	0	0	8	76	10
	2012	0	0	0	0	9	100	9
	2013	0	1	0	0	4	99	4
	2014	0	0	0	0	2	100	2
	2015	0	0	0	0	3	100	3
	2016	0	0	0	0	5	100	5
Iceland	2000	0	0	0	0	85	100	85
	2001	0	0	0	0	88	100	88
	2002	0	0	0	0	97	100	97
	2003	0	0	0	0	110	100	110
	2004	0	0	0	0	130	100	130
	2005	0	0	0	0	149	100	149
	2006	0	0	0	0	111	100	111
	2007	0	0	0	0	129	100	129
	2008	0	0	0	0	200	100	200
	2009	0	0	0	0	171	100	171
	2010	0	0	0	0	190	100	190
	2011	0	0	0	0	128	100	128
	2012	0	0	0	0	70	100	70
	2013	0	0	0	0	147	100	147
	2014	0	0	0	0	68	100	68
	2015	0	0	0	0	125	100	125
	2016	0	0	0	0	119	100	119
Denmark	2000							
	2001							
	2002							
	2003							
	2004							
	2005							
	2006							
	2007							
	2008	0	1	0	0	9	99	9
	2009	0	0	0	0	8	100	8
	2010	0	1	0	0	13	99	13

Country	Year	Coast		Estuary		River		Total
		Weight	%	Weight	%	Weight	%	weight
	2011	0	0	0	0	13	100	13
	2012	0	0	0	0	12	100	12
	2013	0	0	0	0	11	100	11
	2014	0	0	0	0	9	100	9
	2015	0	0	0	0	9	100	9
	2016	0	0	0	0	10	100	10
Sweden	2000	10	30	0	0	23	70	33
	2001	9	27	0	0	24	73	33
	2002	7	25	0	0	21	75	28
	2003	7	28	0	0	18	72	25
	2004	3	16	0	0	16	84	19
	2005	1	7	0	0	14	93	15
	2006	1	7	0	0	13	93	14
	2007	0	1	0	0	16	99	16
	2008	0	1	0	0	18	99	18
	2009	0	3	0	0	17	97	17
	2010	0	0	0	0	22	100	22
	2011	10	26	0	0	29	74	39
	2012	7	24	0	0	23	76	30
	2013	0	0	0	0	15	100	15
	2014	0	0	0	0	30	100	30
	2015	0	0	0	0	16	100	16
	2016	0	0	0	0	9	100	9
Norway	2000	619	53	0	0	557	47	1176
	2001	696	55	0	0	570	45	1266
	2002	596	58	0	0	423	42	1019
	2003	597	56	0	0	474	44	1071
	2004	469	60	0	0	316	40	785
	2005	463	52	0	0	424	48	888
	2006	512	55	0	0	420	45	932
	2007	427	56	0	0	340	44	767
	2008	382	47	0	0	425	53	807
	2009	284	48	0	0	312	52	595
	2010	260	41	0	0	382	59	642
	2011	302	43	0	0	394	57	696
	2012	255	37	0	0	440	63	696
	2013	192	40	0	0	283	60	475
	2014	213	43	0	0	277	57	490
	2015	233	40	0	0	350	60	583
	2016	269	44	0	0	343	56	612
Finland	2000	0	0	0	0	96	100	96
	2001	0	0	0	0	126	100	126
	2002	0	0	0	0	94	100	94
	2003	0	0	0	0	75	100	75
	2004	0	0	0	0	39	100	39
	2005	0	0	0	0	47	100	47
	2006	0	0	0	0	67	100	67
	2007	0	0	0	0	59	100	59
	2008	0	0	0	0	71	100	71
	2009	0	0	0	0	38	100	38
	2010	0	0	0	0	49	100	49
	2011	0	0	0	0	44	100	44
	2012	0	0	0	0	64	100	64
	2013	0	0	0	0	46	100	46
	2014	0	0	0	0	58	100	58
	2015	0	0	0	0	45	100	45
	2016	0	0	0	0	51	100	51
Russia	2000	64	52	15	12	45	36	124
	2001	70	61	0	0	44	39	114
	2002	60	51	0	0	58	49	118
	2003	57	53	0	0	50	47	107
	2004	46	56	0	0	36	44	82
	2005	58	70	0	0	25	30	82
	2006	52	57	0	0	39	43	91
	2007	31	50	0	0	31	50	63
	2008	33	45	0	0	40	55	73
	2009	22	31	0	0	49	69	71

Country	Year	Coast		Estuary		River		Total
		Weight	%	Weight	%	Weight	%	weight
	2010	36	41	0	0	52	59	88
	2011	37	42	0	0	52	58	89
	2012	38	46	0	0	45	54	82
	2013	36	46	0	0	42	54	78
	2014	33	41	0	0	48	59	81
	2015	34	42	0	0	46	58	80
	2016	24	42	0	0	32	58	56
Canada	2000	2	2	29	19	117	79	148
	2001	3	2	28	20	112	78	143
	2002	4	2	30	20	114	77	148
	2003	5	3	36	27	96	70	137
	2004	7	4	46	29	109	67	161
	2005	7	5	44	32	88	63	139
	2006	8	6	46	34	83	60	137
	2007	6	5	36	32	70	63	112
	2008	9	6	47	32	92	62	147
	2009	7	6	40	33	73	61	119
	2010	6	4	40	27	100	69	146
	2011	7	4	56	31	115	65	178
	2012	8	6	46	36	73	57	127
	2013	8	6	49	36	80	58	137
	2014	7	6	28	24	83	71	118
	2015	8	6	35	25	97	69	140
	2016	7	5	36	26	92	68	135
France (Islands of St. Pierre and Miquelon	2000	2	100	0	0	0	0	2
	2001	2	100	0	0	0	0	2
	2002	2	100	0	0	0	0	2
	2003	3	100	0	0	0	0	3
	2004	3	100	0	0	0	0	3
	2005	3	100	0	0	0	0	3
	2006	4	100	0	0	0	0	4
	2007	2	100	0	0	0	0	2
	2008	3	100	0	0	0	0	3
	2009	3	100	0	0	0	0	3
	2010	3	100	0	0	0	0	3
	2011	4	100	0	0	0	0	4
	2012	1	100	0	0	0	0	1
	2013	5	100	0	0	0	0	5
	2014	4	100	0	0	0	0	4
	2015	4	100	0	0	0	0	4
	2016	5	100	0	0	0	0	5
Total NEAC	2016	364	35	37	4	643	62	1043
Total NAC	2016	11	8	36	26	92	67	140

Table 6 Estimates of unreported catches by various methods, in tonnes by country within national EEZs in the North East Atlantic, North American, and West Greenland commissions of NASCO, 2016.

Commission Area	Country	Unreported Catch t	Unreported as % of Total North Atlantic Catch (Unreported + Reported)	Unreported as % of Total National Catch (Unreported + Reported)
NEAC	Denmark	6	0.4	40
NEAC	Finland	6	0.4	10
NEAC	Iceland	3	0.2	2
NEAC	Ireland	6	0.4	9
NEAC	Norway	263	18.8	30
NEAC	Sweden	1	0.1	10
NEAC	UK (E & W)	10	0.7	11
NEAC	UK (N.Ireland)	0	0.0	6
NEAC	UK (Scotland)	3	0.2	10
NAC	USA	0	0.0	0
NAC	Canada	27	2.0	17
WGC	Greenland	10	0.7	27
	Total Unreported Catch *	335	21.7	
	Total Reported Catch of North Atlantic salmon	1209		

* No unreported catch estimate available for France and Russia in 2016.
Unreported catch estimates not provided for Spain & St. Pierre et Miquelon

Table 7 Numbers of fish caught and released in rod fisheries along with the % of the total rod catch (released + retained) for countries in the North Atlantic where records are available, 1991–2016. Figures for 2016 are provisional.

Year	Canada [4]		USA		Iceland		Russia [1]		UK (E&W)		UK (Scotland)		Ireland		UK (N Ireland) [2]		Denmark		Sweden		Norway [3]	
	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch
1991	22 167	28	239	50			3 211	51														
1992	37 803	29	407	67			10 120	73														
1993	44 803	36	507	77			11 246	82	1 448	10												
1994	52 887	43	249	95			12 056	83	3 227	13	6 595	8										
1995	46 029	46	370	100			11 904	84	3 189	20	12 151	14										
1996	52 166	41	542	100	669	2	10 745	73	3 428	20	10 413	15										
1997	50 009	50	333	100	1 558	5	14 823	87	3 132	24	10 965	18										
1998	56 289	53	273	100	2 826	7	12 776	81	4 378	30	13 464	18										
1999	48 720	50	211	100	3 055	10	11 450	77	4 382	42	14 846	28										
2000	64 482	56	0	-	2 918	11	12 914	74	7 470	42	21 072	32										
2001	59 387	55	0	-	3 611	12	16 945	76	6 143	43	27 724	38										
2002	50 924	52	0	-	5 985	18	25 248	80	7 658	50	24 058	42										
2003	53 645	55	0	-	5 361	16	33 862	81	6 425	56	29 170	55										
2004	62 316	57	0	-	7 362	16	24 679	76	13 211	48	46 279	50					255	19				
2005	63 005	62	0	-	9 224	17	23 592	87	11 983	56	46 165	55	2 553	12			606	27				
2006	60 486	62	1	100	8 735	19	33 380	82	10 959	56	47 669	55	5 409	22	302	18	794	65				
2007	41 192	58	3	100	9 691	18	44 341	90	10 917	55	55 660	61	15 113	44	470	16	959	57				
2008	54 887	53	61	100	17 178	20	41 881	86	13 035	55	53 347	62	13 563	38	648	20	2 033	71			5 512	5
2009	52 151	59	0	-	17 514	24			9 096	58	48 418	67	11 422	39	847	21	1 709	53			6 696	6
2010	55 895	53	0	-	21 476	29	14 585	56	15 012	60	78 357	70	15 142	40	823	25	2 512	60			15 041	12
2011	71 358	57	0	-	18 593	32			14 406	62	64 813	73	12 688	38	1 197	36	2 153	55			14 303	12
2012	43 287	57	0	-	9 752	28	4 743	43	11 952	65	63 370	74	11 891	35	5 014	59	2 153	55			18 611	14
2013	50 630	59	0	-	23 133	34	3 732	39	10 458	70	54 003	80	10 682	37	1 507	64	1 932	57			15 953	15
2014	41 613	54	0	-	13 616	41	8 479	52	7 992	78	37 270	82	6 537	37	1 065	50	1 918	61	445	15	20 281	19
2015	65 440	64	0	-	21 914	31	7 028	50	8 113	79	46 827	84	9 383	37	61	100	2 989	70	725	19	25 433	19
2016	69 590	65	0	-	16 643	29	10 793	76	9 192	80	49 469	90	10 280	41	230	100	3 801	72	345	18	25 198	21
5-yr mean																						
2011-2015	54 466	58			17 402	33	5 996	46	10 584	71	53 257	78	10 236	37	1 769	62	2 229	60			18 916	16
% change on 5-year mean	28	12			-4	-11	80	65	-13	13	-7	15	0	11			71	21			33	32

Key:

[1] Since 2009 data are either unavailable or incomplete, however catch-and-release is understood to have remained at similar high levels as before.

[2] Data for 2006-2009, 2014 is for the DCAL area only; the figures from 2010 are a total for UK (N.Ireland). Data for 2015 and 2016 is for R. Bush only.

[3] The statistics were collected on a voluntary basis, the numbers reported must be viewed as a minimum.

[4] Released fish in the kelt fishery of New Brunswick are not included in the totals for Canada.

Table 8 Overview of number of case studies and Data Base on Effectiveness of Recovery Actions for Atlantic Salmon (DBERAAS) river stock entries per country.

Country	Region	Number of rivers in DBERAAS	Number of case studies
Iceland	N/S NEAC	84	0
Faroe Islands	N NEAC	0	0
Norway	N NEAC	0	1
Sweden	N NEAC/HELCOM	77	1
Russian Federation	N NEAC/HELCOM	0	1
Finland	N NEAC/HELCOM	69	1
Poland	HELCOM	0	0
Lithuania	HELCOM	0	0
Estonia	HELCOM	12	0
Denmark	N NEAC/HELCOM	9	0
Germany	S NEAC/HELCOM	4	1
France	S NEAC	0	2
Spain	S NEAC	10	0
Ireland	S NEAC	148	4
UK (England and Wales)	S NEAC	93	2
UK (Scotland)	S NEAC	0	0
UK (Northern Ireland)	S NEAC	19	0
Canada	NAC	0	1
USA	NAC	43	1
Greenland	WGC	0	0
Total	All	568	15

Table 9 Summary of key prey items in diets of salmon in the Northwest Atlantic.

LIFE STAGE	SHALLOW WATERS	DEEP WATERS
Post-smolt nearshore	Atlantic herring Capelin	Amphipods Euphausiids
Post-smolt offshore (Labrador Sea)	Capelin	Amphipods Armhook squid
1SW maturing / non-maturing (Offshore, Labrador Sea)	Sandlance	Barracudina
1SW maturing / non-maturing (West Greenland)	Capelin	Amphipods Armhook squid
1SW/2SW mature / maturing (nearshore)	Atlantic herring Capelin	

Table 10 Atlantic salmon prey item list compiled from Rikardsen *et al.* (2004). **** = very important prey (> 50% by weight if taken); *** = prey often found in stomachs and important if less energy rich prey is assumed not available; ** = occasionally found, but in low abundance; * = rare (< 1% by weight); and – = not reported.

Prey organism	Post-smolts – estuaries	Post-smolts – fjord and coast	Post-smolts – oceanic	Pre-adults / adults oceanic
Pisces				
Ammodytidae (Sandeel)	***	****	****	****
Herring *(Clupea harengus)*	***	****	****	****
Other Clupeoids	-	-	-	**
Capelin *(Malotus villosus)*	-	***	***	****
Gadidae (Cod fishes)	***	***	***	***
Atlantic cod *(Gadus morhua)*	**	***	**	**
Saithe *(Pollachius virens)*	**	***	**	*
Blue whiting *(Micromesistius poutassou)*	-	-	***	**
Other Gadidae	-	-	**	**
Myctophidae (Lantern fishes)	-	-	**	****
Paralepididae/Barracudinas (2)	-	-	-	***
Perlside	-	-	*	***
Scorpaenidae (Redfish)	-	-	*	*
Gasterosteidae (Stickleback)	*	-	-	*
Scombridae (Mackerel, *Scomber scomber)*	-	-	-	*
Anarhichadidae (Wolffish fry)	-	-	-	*
Belonidae (Garpike)	-	-	-	*
Pleuronedidae (Flatfish)	-	-	-	*
Osmeridae	-	-	-	*
Cyclopteridae (Lumpfish)	-	-	-	*
Stichaeidae	-	-	-	*
Cottidae (Sculpins fry)	-	-	-	*
Cottunculidae	-	-	-	*
Agonidae	-	-	-	*
Crustacea				
Copepoda	**	**	**	*
Amphipoda – planktonic (Hyperiidae)	**	***	***	****
Amphipoda – Bentic (Gammaridae)	***	**	-	-
Isopoda	*	*	*	*
Mysidacea (Mysids)	-	*		
Euphausiacea (Euphausids)	*	**	**	***
Decapoda – Plantonic larvae	*	*	*	*
Decapoda – Shrimps	-	-	*	***
Other crustacean	-	*	*	*
Mollusca – Cephalopoda (Squids)	-	-	*	**
Mollusca – Gastropods (sea slugs)	-	*	*	*
Mollusca – Bivalvia (pelagic)	-	-	-	*
Insecta	****	****	*	*
Polychaetea	*	*	*	*
Chaetognatha (Arrow worm)	-	*	-	*

Table 11 Summary of Atlantic salmon tagged and marked in 2016 – 'Hatchery' and 'Wild' juvenile refers to smolts and parr.

		Primary Tag or Mark				
Country	Origin	Microtag	External mark[2]	Adipose clip	Other Internal[1]	Total
Canada	Hatchery Adult	0	2,557	0	1,521	**4,078**
	Hatchery Juvenile	0	305	202,027	45	**202,377**
	Wild Adult	0	3,197	35	79	**3,311**
	Wild Juvenile	0	20,093	20,737	590	**41,420**
	Total	**0**	**26,152**	**222,799**	**2,235**	**251,186**
Denmark	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	92,450	20,000	305,100	1,903	419,453
	Wild Adult	0	0	0	788	788
	Wild Juvenile	0	0	0	0	0
	Total	**92,450**	**20,000**	**305,100**	**2,691**	**420,241**
France[4]	Hatchery Adult					
	Hatchery Juvenile[3]					
	Wild Adult[3]					
	Wild Juvenile					
	Total					
Iceland	Hatchery Adult	0		0	0	0
	Hatchery Juvenile	47,345	0	0	0	47,345
	Wild Adult	0	79	0	0	79
	Wild Juvenile	6,052	9	0	0	6,061
	Total	**53,397**	**88**	**0**	**0**	**53,485**
Ireland	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	185,891	0	0	0	185,891
	Wild Adult	0	0	0	0	0
	Wild Juvenile	6,639	0	0	0	6,639
	Total	**192,530**	**0**	**0**	**0**	**192,530**
Norway	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	22,445	6,958	0	40,797	70,200
	Wild Adult	0	1,003	0	0	1,003
	Wild Juvenile	0		0	2,638	2,638
	Total	**22,445**	**7,961**	**0**	**43,435**	**73,841**
Russia	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	1,461,482	0	1,461,482
	Wild Adult	0	1,524	0	0	1,524
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**1,524**	**1,461,482**	**0**	**1,463,006**
Spain	Hatchery Adult	0	0	0	0	**0**
	Hatchery Juvenile	0	92,393	0	0	**92,393**
	Wild Adult	0	0	0	0	**0**
	Wild Juvenile	0	0	0	0	**0**
	Total	**0**	**92,393**	**0**	**0**	**92,393**
Sweden	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	3100	164,931	0	168,031
	Wild Adult	0	381	0	0	381
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**3,481**	**164,931**	**0**	**168,412**
UK (England &	Hatchery Adult	0	0	0	0	0
Wales)	Hatchery Juvenile	0	0	11,647	0	11,647
	Wild Adult	0	514	0	2	516
	Wild Juvenile	5,722	0	6,121		11,843
	Total	**5,722**	**514**	**17,768**	**2**	**24,006**
UK (N. Ireland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	10,230	0	57,645	0	67,875
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**10,230**	**0**	**57,645**	**0**	**67,875**
UK (Scotland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	103,141	0	103,141
	Wild Adult	0	520	14	0	534
	Wild Juvenile	2,300	0	30	10,257	12,587
	Total	**2,300**	**520**	**103,185**	**10,257**	**116,262**
USA	Hatchery Adult	0	7	22	3,293	3,322
	Hatchery Juvenile	0	102,240	215,074	2,756	320,070
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**102,247**	**215,096**	**6,049**	**323,392**
All Countries	Hatchery Adult	0	2,564	22	4,814	7,400
	Hatchery Juvenile	358,361	224,996	2,521,047	45,501	3,149,905
	Wild Adult	0	7,218	49	869	8,136
	Wild Juvenile	20,713	20,102	26,888	13,485	81,188
	Total	**379,074**	**254,880**	**2,548,006**	**64,669**	**3,246,629**

[1] Includes other internal tags (PIT, ultrasonic, radio, DST, etc.); [2]Includes Carlin, spaghetti, streamers, VIE etc; [3] includes external dye mark. [4] Tag information for France not available for 2016.

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Annex 2 of CNL(17)8
Glossary of acronyms and abbreviations

1SW (*One-Sea-Winter*). Maiden adult salmon that has spent one winter at sea.

2SW (*Two-Sea-Winter*). Maiden adult salmon that has spent two winters at sea.

ACOM (*Advisory Committee*) of ICES. The Committee works on the basis of scientific assessment prepared in the ICES expert groups. The advisory process includes peer review of the assessment before it can be used as the basis for advice. The Advisory Committee has one member from each member country under the direction of an independent chair appointed by the Council.

ASF (*Atlantic Salmon Federation*). A non-governmental organisation dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well-being and survival depend.

BHSRA (*Bayesian Hierarchical Stock and Recruitment Approach*). Models for the analysis of a group of related stock–recruit datasets. Hierarchical modelling is a statistical technique that allows the modelling of the dependence among parameters that are related or connected through the use of a hierarchical model structure. Hierarchical models can be used to combine data from several independent sources.

Blim (*Biomass limit reference point*). The minimum spawning stock biomass.

BRP (*Biological Reference Point*). The spawning stock level that produces maximum sustainable yield (Conservation Limit).

CET (Central England Temperature). Daily and monthly temperatures time-series representative of a roughly triangular area of the United Kingdom enclosed by Lancashire, London and Bristol.

CL, i.e. Slim (*Conservation Limit*). Demarcation of undesirable stock levels or levels of fishing activity; the ultimate objective when managing stocks and regulating fisheries will be to ensure that there is a high probability that undesirable levels are avoided.

CPUE (*Catch per Unit of Effort*). A derived quantity obtained from the independent values of catch and effort.

C&R (*Catch and Release*). Catch and release is a practice within recreational fishing intended as a technique of conservation. After capture, the fish are unhooked and returned to the water before experiencing serious exhaustion or injury. Using barbless hooks, it is often possible to release the fish without removing it from the water (a slack line is frequently sufficient).

CWT (*Coded Wire Tag*). The CWT is a length of magnetized stainless steel wire 0.25 mm in diameter. The tag is marked with rows of numbers denoting specific batch or individual codes. Tags are cut from rolls of wire by an injector that hypodermically implants them into suitable tissue. The standard length of a tag is 1.1 mm.

DBERAAS (*Database on Effectiveness of Recovery Actions for Atlantic Salmon*). Database output from WGERAAS.

DFO *(Department of Fisheries and Oceans*). DFO and its Special Operating Agency, the Canadian Coast Guard, deliver programmes and services that support sustainable use and development of Canada's waterways and aquatic resources.

DNA (*Deoxyribonucleic Acid*). DNA is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms (with the exception of RNA- Ribonucleic Acid viruses). The main role of DNA molecules is the long-term storage of information. DNA is often compared to a set of blueprints, like a recipe or a code, since it contains the instructions needed to construct other components of cells, such as proteins and RNA molecules.

DST *(Data Storage Tag*). A miniature data logger with sensors including salinity, temperature, and depth that is attached to fish and other marine animals.

EEZ *(Exclusive Economic Zone*). EEZ is a concept adopted at the Third United Nations Conference on the Law of the Sea, whereby a coastal State assumes jurisdiction over the exploration and exploitation of marine resources in its adjacent section of the continental shelf, taken to be a band extending 200 miles from the shore.

ENPI CBC *(European Neighbourhood and Partnership Instrument Cross-Border Cooperation*). ENPI CBC is one of the financing instruments of the European Union. The ENPI programmes are being implemented on the external borders of the EU. It is designed to target sustainable development and approximation to EU policies and standards; supporting the agreed priorities in the European Neighbourhood Policy Action Plans, as well as the Strategic Partnership with Russia.

FSC (*Food, Social and Ceremonial fishery*). Aboriginal fishery in Canada for food, social or ceremonial purposes.

FWI (*Framework of Indicators*). The FWI is a tool used to indicate if any significant change in the status of stocks used to inform the previously provided multiannual management advice has occurred.

GFLK (*Greenland Fisheries Licence Control Authority*).

GLM (*Generalised Linear Model*). A conventional linear regression model for a continuous response variable given continuous and/or categorical predictors.

GoSL (*Gulf of St Lawrence*).

GUL (*Gulf of St. Lawrence*).

HoT (Head of Tide). Limit of tidal influence in a river.

IASRB (*International Atlantic Salmon Research Board*). Platform established by NASCO in 2001 to encourage and facilitate cooperation and collaboration on research related to marine mortality in Atlantic salmon.

ICES (*International Council for the Exploration of the Sea*). A global organisation that develops science and advice to support the sustainable use of the oceans through the coordination of oceanic and coastal monitoring and research, and advising international commissions and governments on marine policy and management issues.

ICPR (*International Commission for the Protection of the Rhine*).

IESSNS (*International Ecosystem Summer Survey of the Nordic Seas*). A collaborative programme involving research vessels from Iceland, the Faroe Islands and Norway.

IMR (*Institute of Marine Research*). Norwegian institute who provide advice to Norwegian authorities on aquaculture and the ecosystems of the Barents Sea, the Norwegian Sea, the North Sea and the Norwegian coastal zone.

IPCC (*Intergovernmental Panel on Climate Change*). The international body for assessing the science related to climate change.

IYS (*International Year of the Salmon*). An international framework for collaborative outreach and research launched by NPAFC, NASCO and other partners. The IYS focal year will be 2019, with projects and activities starting in 2018 and continuing into 2020.

JAGS (*Just Another Gibbs Sampler*). Aprogram for analysis of Bayesian hierarchical models using Markov Chain Monte Carlo (MCMC) simulation.

LAB (*Labrador Central*).

LE (*Lagged Eggs*). The summation of lagged eggs from 1 and 2 sea-winter fish is used for the first calculation of PFA.

MCMC (*Markov Chain Monte Carlo*). Re-sampling algorithm used in (Bayesian) statistics.

MOCNESS (*Multiple Opening/Closing Net and Environmental Sensing System*).

MSA (*Mixed-stock Analysis*). Genetic analytical technique to estimate the proportions origin of fish in a mixed-stock fishery.
or

MSA (*Miramichi Salmon Association*).

MSY (*Maximum Sustainable Yield*). The largest average annual catch that may be taken from a stock continuously without affecting the catch of future years; a constant long-term MSY is not a reality in most fisheries, where stock sizes vary with the strength of year classes moving through the fishery.

MSW (*Multi-Sea-Winter*). A MSW salmon is an adult salmon which has spent two or more winters at sea and may be a repeat spawner.

NAC (*North American Commission*). The North American Atlantic Commission of NASCO or the North American Commission area of NASCO.

NAFO (*Northwest Atlantic Fisheries Organisation*). NAFO is an intergovernmental fisheries science and management organization that ensures the long-term conservation and sustainable use of the fishery resources in the Northwest Atlantic.

NASCO (*North Atlantic Salmon Conservation Organisation*). An international organisation, established by an inter-governmental convention in 1984. The objective of NASCO is to conserve, restore, enhance and rationally manage Atlantic salmon through international cooperation taking account of the best available scientific information.

NCC (*NunatuKavut Community Council*). NCC is one of four subsistence fisheries harvesting salmonids in Labrador.

NEAC (*North Eastern Atlantic Commission*). North-East Atlantic Commission of NASCO or the North-East Atlantic Commission area of NASCO.

NEAC – N (*North Eastern Atlantic Commission- northern area*). The northern portion of the North-East Atlantic Commission area of NASCO.

NEAC – S (*North Eastern Atlantic Commission – southern area*). The southern portion of the North-East Atlantic Commission area of NASCO.

NFL (*Newfoundland*).

NG (*Nunatsiavut Government*). NG is one of four subsistence fisheries harvesting salmonids in Labrador. NG members are fishing in the northern Labrador communities.

NOAA (*National Oceanic and Atmospheric Administration*). A scientific agency within the United States Department of Commerce.

NPAFC (*North Pacific Anadromous Fish Commission*). An international inter-governmental organization established by the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean. The Convention was signed on February 11, 1992, and took effect on February 16, 1993. The member countries are Canada, Japan, Republic of Korea, Russian Federation, and United States of America. As defined in the Convention, the primary objective of the NPAFC is to promote the conservation of anadromous stocks in the Convention Area. The Convention Area is the international waters of the North Pacific Ocean and its adjacent seas north of 33°North beyond the 200-mile zones (exclusive economic zones) of the coastal States.

NSS (*Norwegian-spring-spawning*).

OSPAR (*Convention for the Protection of the Marine Environment of the North-East Atlantic*). OSPAR is the mechanism by which fifteen Governments of the west coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the Northeast Atlantic. It started in 1972 with the Oslo Convention against dumping. It was broadened to cover land-based sources and the offshore industry by the Paris Convention of 1974. These two conventions were unified, updated and extended by the 1992 OSPAR Convention. The new annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities that can adversely affect the sea.

PFA (*Pre-Fishery Abundance*). The numbers of salmon estimated to be alive in the ocean from a particular stock at a specified time.

PICES (*North Pacific Marine Science Organization*). PICES, the North Pacific Marine Science Organization, is an intergovernmental scientific organization that was established and held its first meetings in 1992. Its present members are Canada, People's Republic of China, Japan, Republic of Korea, Russian Federation, and the United States of America. The purposes of the Organization are as follows: (1) Promote and coordinate marine research in the northern North Pacific and adjacent seas especially northward of 30 degrees North, (2) advance scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities, and (3) promote the collection and rapid exchange of scientific information on these issues.

PIT (*Passive Integrated Transponder*). PIT tags use radio frequency identification technology. PIT tags lack an internal power source. They are energized on encountering an electromagnetic field emitted from a transceiver. The tag's unique identity code is programmed into the microchip's nonvolatile memory.

PSAT (*ParkinsonSat satellite tags*)

Q Areas. (*Québec Areas*). Areas for which the Ministère des Ressources naturelles et de la Faune manages the salmon fisheries.

RFID (*Radio Frequency Identity tag*).

RR model (*Run-Reconstruction model*). RR model is used to estimate PFA and national CLs.

RVS (*Red Vent Syndrome*). This condition has been noted since 2005, and has been linked to the presence of a nematode worm, *Anisakis simplex*. This is a common parasite of marine fish and is also found in migratory species. The larval nematode stages in fish are usually found spirally coiled on the mesenteries, internal organs and less frequently in the somatic muscle of host fish.

SAC (*Special Area of Conservation*). Strictly protected site designated under the European Committee Habitats Directive.

SALSEA (*Salmon at Sea*). An international programme of co-operative research, adopted in 2005, designed to improve understanding of the migration and distribution of salmon at sea in relation to feeding opportunities and predation.

SALSEA-Merge (*Salmon at Sea Merge*). SALSEA-Merge is an international programme of cooperative research designed to improve understanding of the migration and distribution of salmon at sea in relation to feeding opportunities and predation. It differentiates between tasks which can be achieved through enhanced coordination of existing ongoing research, and those involving new research for which funding is required.

SALSEA-Track (*Salmon at Sea Track*). SALSEA-Track is the second phase of the SALSEA Programme. It employs advances in telemetry technology to precisely track Atlantic salmon along their migration routes through cooperative international research initiatives.

SE (*standard error*).

SER (*Spawning Escapement Reserve*). The CL increased to take account of natural mortality between the recruitment date (assumed to be 1st January) and the date of return to homewaters.

SFA *(Salmon Fishing Areas).* Areas for which the Department of Fisheries and Oceans (DFO) Canada manages the salmon fisheries.

Slim, i.e. CL (*Conservation Limit*). Demarcation of undesirable stock levels or levels of fishing activity; the ultimate objective when managing stocks and regulating fisheries will be to ensure that there is a high probability that the undesirable levels are avoided.

S_{MSY} (*Spawners for maximum sustainable yield*). The spawner abundance that generates recruitment at a level that provides a maximum exploitable yield (recruitment minus spawners).

SNP (*Single Nucleotide Polymorphism*). Type of genetic marker used in stock identification and population genetic studies.

S–R (*Stock recruitment*).

SoBI (*Strait of Belle Isle*).

SSB (Spawning stock biomass).

SVA (*Swedish National Veterinary Institute*)

TAC (*Total Allowable Catch*). TAC is the quantity of fish that can be taken from each stock each year.

ToR (*Terms of reference*).

UDN (*Ulcerative Dermal Necrosis*). Disease mainly affecting wild Atlantic salmon, sea trout and sometimes other salmonids. It usually occurs in adult fish returning from the sea in the colder months of the year and starts as small lesions on the scale-less regions of the fish, mainly the snout, above the eye and near the gill cover. On entry to freshwater lesions ulcerate and may become infected with secondary pathogens like the fungus *Saprolegnia* spp. Major outbreaks of UDN occurred in the 1880s (UK) and 1960s–1970s (UK and Ireland), but the disease has also been reported from France, and in 2015 from the Baltic and Russia.

UK (*United Kingdom and Northern Ireland*). Country in Europe.

VIE (*Visual implant elastomer tag*).

WGC (*West Greenland Commission*). The West Greenland Commission of NASCO or the West Greenland Commission area of NASCO.

WGERAAS (*Working Group on Effectiveness of Recovery Actions for Atlantic Salmon*). The task of the working group is to provide a review of examples of successes and failures in wild salmon restoration and rehabilitation and develop a classification of activities which could

be recommended under various conditions or threats to the persistence of populations. The Working Group held its final meeting in Copenhagen in November 2015.

WGF (*West Greenland Fishery*). Regulatory measures for the WGF have been agreed by the West Greenland Commission of NASCO for most years since NASCO's establishment. These have resulted in greatly reduced allowable catches in the WGF, reflecting declining abundance of the salmon stocks in the area.

WGNAS (*Working Group on North Atlantic Salmon*). ICES working group responsible for the annual assessment of the status of salmon stocks across the North Atlantic and formulating catch advice for NASCO.

WGRECORDS (*Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species)*. WGRECORDS was reconstituted as a Working Group from the Transition Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (TGRECORDS).

WGWIDE (*ICES Working Group on Widely Distributed Stocks*).

WKCCISAL (*The Workshop on Potential Impacts of Climate Change on Atlantic Salmon Stock Dynamics*).

WKTRUTTA2 (*Workshop on sea trout*). A workshop was held in February 2016 to focus on the development of models to help address key management questions and to develop Biological Reference Points for use in the management of sea trout stocks and fisheries.

Annex 11

CNL(17)9

Report of the Sixteenth Meeting of the International Atlantic Salmon Research Board

Varbergs Kusthotell, Varberg, Sweden

5 June 2017

1. Opening of the Meeting

1.1 The Chairman, Mr Rory Saunders (USA), opened the meeting and welcomed members of the Board, their scientific advisers and observers to Varberg.

1.2 A list of participants is contained in Annex 1.

2. Adoption of the Agenda

2.1 The Board adopted its Agenda, ICR(17)5 (Annex 2).

3. Election of Officers

3.1 The Board unanimously re-elected Mr Rory Saunders as its Chairman for a further period of two years to commence from the close of the Thirty-Fourth Annual Meeting of NASCO.

4. Report of the Scientific Advisory Group

4.1 The Chairman of the Board's Scientific Advisory Group (SAG), Dr Niall Ó Maoiléidigh, presented a report on the Group's meeting, SAG(17)7 (Annex 3). During its meeting the SAG had:

- discussed the Updated Inventory of Marine Research. Twelve new projects have been included since last year, some of which have been ongoing for some time and one of which is completed. Seven of these new projects involve telemetry. The value of the inventory was recognised;
- considered the timing of the next review of the inventory and, given that the Board has identified its research priority as SALSEA – Track, and that the focal year of IYS is 2019, recommended that the next review should be deferred to 2019 or 2020;
- reviewed the metadatabase of salmon survey data and sample collections. In 2016, the Board agreed that information on scale collections should be included in the metadatabase and information has been received from the Russian Federation and the United States. Information has also been included in the metadatabase on the West Greenland Sampling Programme Biological Characteristics database. The Chairman encouraged Parties/jurisdictions to contribute further information on scale collections for inclusion in the metadatabase;

- received updates on the International Year of the Salmon from Mr Mark Saunders (on activities in the North Pacific) and Mr Dan Morris (on activities in the North Atlantic. Mr Morris urged the SAG to dream big to make the IYS a success.

- discussed developments in relation to SALSEA - Track (see item 5 below);

- received progress reports on two projects for which funding had been provided to the Board through EU 'grants for actions'. These projects are 'Understanding and comparing early migration of European salmon populations at sea' and 'Sea lice model for the sustainable development of Atlantic salmon and fisheries'.

- received a report on the SAMARCH project, a collaborative project with partners in England and France to track salmon and sea trout in support of stock assessments and measures to protect them.

- received a report on a new approach to tracking 'ROAM' based on a technique for sub-surface oceanographic monitoring. A study plan to track sub-adult salmon at Greenland using this technique was described. While this technique is not suitable for nearshore waters it offers potential in tracking salmon through the North Atlantic area at reasonable cost;

- received an update on the telemetry programme being conducted by the Atlantic Salmon Federation;

- received an update on the project entitled 'Enhancement of a North American Atlantic salmon genetic baseline for individual and stock identification and application of the baseline to historical scales collected at West Greenland' which is being funded through the Board. Sample collection and processing has been completed and final results are expected by October 2017;
- considered an application to the Board for endorsement and funding by the Atlantic Salmon Trust (UK). A sum of £5,000 is being sought (see SAG(17)4 and ICR(17)4) which would, if approved, be used to help organise and run a scientific workshop related to the development of a 'suspects model';

4.2 In the light of the recommendations from the SAG, the Board decided:

- to ask the Parties to provide to the Secretariat, by 1 July, any changes or updates for the inventory, prior to it being uploaded to the IASRB website;

- to postpone the next review of the Updated Inventory of Marine Research until 2019 or 2020;

- to endorse the AST project to develop a 'suspects model' and to explore options to provide financial support;

- to encourage Parties/jurisdictions to provide details of archive scale collections for inclusion in the metadatabase and ask the Secretary to contact Parties/jurisdictions in order to seek relevant additional information.

5. Developments in relation to SALSEA - Track

5.1 In 2014, the Board had endorsed the need for an international acoustic tracking programme and adopted a Resolution (ICR(14)10) encouraging Parties to continue the development of local collaborative telemetry projects, encouraging the development of large international collaborative projects building on local efforts and encouraging Parties to make efforts to identify funding sources. The Board had noted that the telemetry programme should build on the success and identity of the SALSEA Programme.

5.2 In 2015, the Board received a report from its Telemetry Workshop that had, *inter alia*, developed 12 outline project proposals. The Board had recognised that it would be important to liaise with the outline project leaders with a view to following progress and, where appropriate, to provide support to assist with their implementation. The Board also recognised the high value of the SALSEA brand and the strong impact of NASCO as the international forum for consultation and cooperation on wild Atlantic salmon. The Board reaffirmed its commitment to an international telemetry project under the SALSEA brand, named 'SALSEA - Track'. Specifically, the Board will support SALSEA - Track as a continuing commitment to understanding the factors affecting mortality of salmon at sea, to make funds available to prepare a vision statement for SALSEA - Track and to advance existing initiatives towards an integrated collaborative telemetry programme.

5.3 The Chairman introduced document ICR(17)3 (Annex 4) providing an update on developments in relation to SALSEA - Track. Following the Board's 2016 Annual Meeting, applications for funding from the European Union were successfully completed and funding has been granted for two following projects and the progress on each is shown in italics:

- Understanding and comparing early mortality of European salmon populations at sea

  The SMOLTRACK project has just started, but already good progress has been made. Central purchase of telemetry equipment has enabled partners to get a large discount to the benefit of the whole project. As a consequence, several partners have now committed to do a two season study instead of the originally planned 1 season study. The first workshop with partners was held in Galway from 28 February - 1 March 2017. The general criteria for the study were discussed and co-ordinated, an overview of the study sites was presented and a Standard Operating Procedure (SOP) was developed. The workshop also included a practical hands-on tagging course for all partners. These steps will ensure a good possibility for comparison between the sites. The acoustic systems are in place at all partners and tagging began in the last week of March, with the majority of smolts expected to be tagged in April and early May.
- Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture

  The EU funded NASCO project Licetrack, Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture, began in early March 2017 when a workshop of all project partners took place at IFI headquarters in Dublin. The workshop covered items such as fieldwork planning for the sentinel cage experiment in Killary harbour, development of hydrodynamic modelling in

Norway, Scotland and Ireland, development of a standard model and project budget. Sentinel cages were manufactured and delivered during the first week in May and the first batch of salmon smolts was put to sea in six cages in Killary Harbour on 8 May. These salmon smolts were removed on 16 May and lice counts undertaken. A second batch of salmon smolts was put into the sentinel cages on 16 May and sampled on 23 May. Three cages are fitted with salinity and temperature probes and velocity meters. Some mortality of salmon smolts was encountered due to high water temperatures. A bag net has also been operating in Killary since early May. Farmed salmon in the vicinity of Killary Harbour are due to be harvested in late May and the site left fallow for a period. Salmon smolts will continue to be monitored in sentinel cages during this fallow period to provide baseline data. It is expected that larger salmon will be moved to sites in Killary harbour in autumn and salmon smolts will be placed in sentinel cages to monitor lice levels during this period. The field work element of the project has progressed as set out in the project plan and work is ongoing in developing a hydrodynamic model for Killary harbour. The development of a standard model using hydrodynamic models of local currents to generate sea lice dispersal patterns in any site specific location is also being progressed.

5.4 Progress reports were received for 6 of the 12 outline projects developed at the Telemetry Workshop. Lack of funding or resources was identified as a factor hindering implementation of some of these projects. Identifying potential funders and attracting their interest in SALSEA - Track is a considerable undertaking that requires specialist skills. In the first phase of the SALSEA Programme, the Board had sought support from professional fund-raisers, Brakeley Consultants. The Secretary has contacted one of those involved in the earlier work and they have advised that their minimum contract would be for around £12,000. This would enable advice to be provided on an approach to fundraising but a fundraising programme would involve considerable cost. The IASRB agreed that the first step would be to develop Terms of Reference for the work to be undertaken in developing the fundraising approach including such considerations as questions to addressing ethical issues in the choice of potential funders and whether or not to seek funding for one or two well developed projects or the entire 12 project programme.

5.5 The Chair referred to the hemispheric collaboration envisaged under the IYS and asked Mr Mark Saunders (NPAFC) to provide an update. Mr Saunders referred to areas of overlap in interests in the North Atlantic and North Pacific identifying tracking studies and wild/farmed fish interactions. NPAFC sees collaboration as an essential component of the IYS and there have been similar long-term declines in abundance in the Pacific in more than 100 populations in the North Pacific and salmon face similar uncertainties in future. He indicated that those in the North Pacific want synergies in bringing resources to the IYS. Over the last year the governance model has been defined, a logo developed and work has commenced on the IYS website. NPAFC would like to work together inter-sessionally over the next months to manage joint interests.

6. Finance and Administrative Issues

6.1 The Secretary introduced document ICR(17)2 presenting the Board's accounts for 2016. The decision had been taken not to have the 2016 accounts audited, but rather income and expenditure statements has been prepared. At the end of 2016, the balance of the International Atlantic Salmon Research Fund was £354,491.17. On 22 December

2016, the Board had received payment from the European Union of 70% (totaling €377,838.88) of the approved grants for two projects 'Understanding and comparing early migration of European salmon populations at sea' and 'Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture'. At current exchange rates this is equivalent to approximately £321,300 and is ring-fenced for these EU supported projects. The funding has levered substantial funding by the partners in the projects. For the Board's general account, the year-end balance was £32,791 but a sum of £16,900 has subsequently been paid to the to support the project entitled 'Enhancement of a North American Atlantic salmon genetic baseline for individual and stock identification and application of the baseline to historical scales collected at West Greenland'. The Board had received a donation amounting to £215 from a research project seeking to estimate willingness to pay. The current funds available amount to approximately £15,000. The Board had previously agreed that it was desirable to retain a reserve of £4,000 - £5,000.

6.2 The Chairman thanked the representative of the European Union for this generous contribution.

6.3 The Board agreed that given the increases in its resources it should have its 2017 accounts audited and the Secretary indicated that he thought this would involve costs of around £1,500 - £2,000. The Board decided that it would have its 2017 accounts audited by NASCO's auditors, Saffery Champness (Edinburgh).

6.4 The Chair noted that this would mean that if the cost of the audit and the agreed reserve were taken into account, the Board had a total of £13,000 in its general fund and the cost of the pilot fundraising exercise and the support for the AST proposal amounted to £17,000. Given the relatively small amount of funding needed to support the request from AST, it was suggested that the Chair might seek approval from the Council to use a sum of £5,000 from the IYS Fund to support the AST proposal, ICR(17)4 (Annex 5). The Chair also asked if there was agreement on the fund-raising payment to Brakeley Consultants if financial support from the Council (from the IYS Fund) were received. Consensus on this point was not reached given the agreement to develop terms of reference in section 5.4 of this report.

7. Other Business

7.1 There was no other business.

8. Report of the Meeting

8.1 The Board agreed a report of its meeting.

9. Date and Place of the Next Meeting

9.1 The Board agreed to hold its next meeting in conjunction with the Thirty-Fifth Annual Meeting of NASCO during 12 - 18 June 2018.

10. Close of the Meeting

10.1 The Chairman thanked participants for their contributions and closed the meeting.

List of Participants

Canada

Mr Bud Bird
Mr Doug Bliss
Mr Gérald Chaput
Ms Shelley Denny
Ms Patricia Edwards
Dr James Irvine
Dr Martha Robertson

European Union

Dr Dennis Ensing
Dr Jaakko Erkinaro
Dr Cathal Gallagher
Mr John McCartney
Dr Michael Millane
Dr Niall Ó Maoiléidigh
Mr Ian Russell
Mr Lawrence Talks

Norway

Mr Raoul Bierach
Mr Arne Eggereide
Dr Peder Fiske

Russian Federation

Dr Konstantin Drevetnyak
Ms Alina Nikolaeva
Dr Sergey Prusov

USA

Mr Rory Saunders
Mr Tim Sheehan

NGOs

Mr David Meerburg
Dr Walter Crozier
Professor Ken Whelan
Dr Nigel Milner

Secretariat

Dr Peter Hutchinson

ICR(17)5

Agenda

1. Opening of the Meeting
2. Adoption of the Agenda
3. Election of Officers
4. Report of the Scientific Advisory Group
5. Developments in relation to SALSEA - Track
6. Finance and Administrative Issues
7. Other Business
8. Report of the Meeting
9. Date and Place of the Next Meeting
10. Close of the Meeting

SAG(17)7

Report of the Meeting of the Scientific Advisory Group of the International Atlantic Salmon Research Board

Varbergs Kusthotell, Varberg, Sweden

5 June 2017

1. Opening of the Meeting

1.1 The Chairman of the Scientific Advisory Group (SAG), Dr Niall Ó Maoiléidigh (European Union), opened the meeting and welcomed participants to Varberg.

1.2 A list of participants is contained in Annex 1.

2. Adoption of the Agenda

2.1 The SAG adopted its Agenda, SAG(17)5 (Annex 2).

3. Review of the Updated Inventory of Research and the Metadatabase of Salmon Survey Data and Sample Collections

Research Inventory

3.1 The Chairman presented an overview of the Inventory of Research Relating to Salmon Mortality in the Sea, SAG(17)2. For 2017, the total annual expenditure on the 53 ongoing projects (3 of which are uncosted) is approximately £6.9 million. Approximately 40% of the expenditure is associated with long-term monitoring programmes. He indicated that there are twelve new projects, some of which have been ongoing for some time and one of which is completed. Seven of these new projects involve acoustic telemetry. The new projects are as follows:

Canada

- Tracking the migration behavior of Atlantic salmon kelts (Middle and Baddeck rivers), through a unique inland brackish sea of Cape Breton, Canada;
- Evaluating the role of bottom-up effects of prey availability on the survival or local abundance of repeat spawning Atlantic salmon between two ecosystems;
- Movements and survival rates of acoustic tagged smolts from Campbellton River, Newfoundland;
- Research into factors of early marine phase postsmolt mortality using acoustic predator-detection tags *(Northwest Miramichi River, New Brunswick, Canada);*
- Research into factors of early marine phase postsmolt mortality using acoustic predator-detection tags *(Stewiacke River, Inner Bay of Fundy, Nova Scotia, Canada);*

- Migration, distribution, survival of smolts from Nashwaak River;
- Early marine phase migration, and survival of Atlantic post-smolts from multi-sea-winter salmon populations of Quebec;
- West River Acid Rain Mitigation Project.

European Union - Ireland

- Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture;
- Unlocking the archive: using scale and otolith chronologies to resolve climate impacts.

European Union - UK (Northern Ireland)

- COMPASS (Collaborative Oceanography & Monitoring for Protected Areas and Species).

United States

- Effects of climate-driven ecosystem change on Atlantic salmon growth and survival at sea; analyses of West Greenland salmon.

3.2 The SAG has previously recognised that as there is insufficient time available to thoroughly review the inventory at its meetings or at the meetings of the ICES Working Group on North Atlantic Salmon and the Board had, therefore, agreed that review of the inventory should be conducted by a SAG Sub-Group every 3 or 4 years. The inventory was last reviewed in 2012 by the Sub-Group on the Future Direction of Research on Marine Survival of Salmon and, if the agreed schedule is followed, the next review of the inventory would be due in 2017. However, the SAG noted that one of the purposes of the review is to identify research needs and it recognised that the Board has agreed that its current priority is to partition mortality of salmon along their migration routes through telemetry studies (SALSEA - Track). The SAG also considered that it might be appropriate to wait until after the IYS to conduct the next review of the inventory. The SAG, therefore, recommends to the Board that the need for a further review of the inventory should be reconsidered in 2019 or 2020.

3.3 The SAG noted that Table 3 in the inventory allocates projects to their relevant SALSEA work package and that this presentation continued to be informative and should be retained.

3.4 The SAG recommended to the Board that the Parties be asked to provide any comments on the inventory to the Secretariat by 1 July and, thereafter, that the revised inventory should be uploaded to the IASRB website.

3.5 Professor Ken Whelan of the Atlantic Salmon Trust (AST) informed the SAG that the AST had recently appointed Matt Newton as a coordinator for telemetry projects in the UK and that some new projects would be commencing soon and would then be available for inclusion in the inventory.

3.6 Mr Mark Saunders (North Pacific Anadromous Fish Commission) indicated that the inventory was a valuable source of information and that there was interest in developing an inventory for research on salmon for the hemisphere.

Metadatabase

3.7 The Secretary reported that the Board had previously decided that it could play an important role with regard to marine salmon survey data and sample co-ordination by establishing a metadatabase of existing datasets and sample collections of relevance to mortality of salmon at sea. This metadatabase was established in 2014 and is made available on the IASRB's website. Prior to the 2016 Annual Meeting, the metadatabase contained the following eleven entries:

- Greenland tag recaptures (data);
- SALSEA-Merge biological samples (biological samples);
- External tag recoveries from tagging programmes in Canada, USA, EU, Norway and Russia and international adult salmon tagging at Faroes and Greenland (data);
- Faroes CWT recoveries (data);
- Greenland catch data (data);
- North-East Atlantic run reconstruction data (data);
- SALSEA Greenland (biological samples);
- SALSEA North America biological samples (biological samples);
- North American Run Reconstruction Data (data);
- SALSEA-Merge marine feeding (data);
- SALSEA-Merge Genetics Database: Genetically-based Regional Assignment of Atlantic Salmon Protocol (GRAASP) (data).

3.8 In 2015, the SAG had discussed the high value of archival scale collections that, as a result of advances in analytical methods, can now be used for genetic, stable isotope and growth studies. Additional information may be obtained in the future in response to further advances in analytical methods. The SAG had noted that these collections may be lost when individual scientists retire unless appropriate arrangements are in place to archive them and ensure their safe storage so that they may be available for analysis. The SAG recognised that, even if the scales themselves are not lost, the information accompanying them could be or they could be damaged while in storage. In 2016, it was recognised that the Board could play a role in identifying such scale collections, raising their profile with a view to safeguarding them for future use. The IASRB agreed that information on these scale collections should, as a first step, be included in the IASRB metadatabase. Accordingly, Parties/jurisdictions were requested to provide details to the Secretariat of any archival scale collections and information has been received from the Russian Federation and the United States. The Board had also agreed that information on the West Greenland Sampling Programme Biological Characteristics database should be included in the metadatabase. The following new datasets have been included in the metadatabase since 2016:

- Kolarctic Coastal samples;
- PINRO Atlantic salmon scales collection;

- USA origin juvenile and adult scale samples; and
- West Greenland Sampling Database.

3.9 The Chair encouraged other Parties/jurisdictions to contribute details of scale collections for inclusion in the metadatabase. He referred to the existence of scale collections in Ireland dating back to the 1920s which are stored in a secure facility and a metadatabase entry will be developed during the course of a new project and the information provided to NASCO.

4. Update on the International Year of the Salmon

4.1 At its 2016 Annual Meeting, the Council had recognised that an International Year of the Salmon (IYS) could provide a very good opportunity to raise awareness of the factors driving salmon abundance, the environmental and anthropogenic challenges they face and the measures being taken to address these. An Outline Proposal for an IYS, entitled '*Salmon and People in a Changing World*', which included a proposed rationale, vision, themes and timings for the IYS, together with details of its scope, a governance model and initial budgetary considerations, was broadly accepted by the Council in 2016 subject to some provisional points of clarification. The focal year of the IYS is 2019. There are five research themes for the IYS and the Board has previously recognised that there might be some synergies between the IYS and SALSEA - Track. The IYS research themes are as follows:

- Status of Salmon: to understand the present status of salmon and their environment;
- Salmon in a changing salmosphere: to understand and quantify the effects of natural environmental variability and anthropogenic factors affecting salmon distribution and abundance and to make projections of their future changes;
- New Frontiers: to develop new technologies and analytical methods to advance salmon science and to explore the uncharted regions of the salmosphere;
- Human Dimension: to investigate the cultural, social and economic elements that depend upon sustainable salmon populations;
- Information Systems: to develop an integrated archive of accessible electronic data collected during the IYS and tools to support future research.

4.2 In 2016, the SAG noted that the SALSEA - Track programme fitted well into the first three of these themes. There was support for the proposed international symposium as a means to improve exchanges between scientists working in the Pacific and Atlantic.

4.3 The Chairman referred to Council document CNL(17)12 which provides an update on IYS activities since last year. He referred to ICES being a core partner of NASCO in the IYS and its interest in facilitating improved dialogue between scientists working in the Pacific and Atlantic. He referred to consideration of climate change issues at the last meeting of the Working Group on the North Atlantic Salmon at which there had been valuable input from scientists in the North Pacific.

4.4 The Chair welcomed Mr Mark Saunders, Dr George Iwama and Dr Jim Irvine from the North Pacific Anadromous Fish Commission (NPAFC). Mr Saunders provided an update on IYS activities in the North Pacific. He indicated that NPAFC had conducted its Annual Meeting about two weeks ago and that there is considerable interest in this

hemispheric approach to salmon research and outreach. He indicated that 2015 witnessed the largest EL Ninô event in the Pacific, both in magnitude and duration, and impacts on salmon stocks are evident. He indicated that the Committees envisaged under the IYS Outline Proposal had been established in a flat rather than hierarchical structure. An IYS Secretariat had been established for the North Pacific to support planning and fund raising. The North Pacific Steering Committee had considered the timing and scope of the IYS symposium proposed for autumn 2018. The NPAFC IYS Working Group had considered potential research activities aligned with NPAFC's Science Plan and a large winter survey involving five vessels is proposed. A primer for planning IYS activities has been developed which identifies impact measures for each IYS outcome and the intention would be to discuss this within the Coordinating Committee. He indicated a number of overlapping priorities in the North Pacific and North Atlantic including understanding survival across life history stages, aquaculture/wild salmon interactions, expansion of the research inventory to cover the hemisphere, and the use of telemetry as some examples. He looks forward to planning joint activities with NASCO that will be transformational.

4.5 Mr Dan Morris indicated that he was looking forward to the IYS Special Session to be held during the Annual Meeting and he hoped that the SAG would find the programe that had been developed to be relevant and of interest. He noted that NPAFC has a large emphasis on research and impressive levels of investment. NPAFC and NASCO are approaching the IYS differently and the situation in the two oceans is very different with greater abundance and utilisation in the Pacific but scarcity in the North Atlantic. He noted that the NPAFC Steering Committee has an expansive view of the IYS over a five year period. There is a need to develop an approach for collaboration since in NASCO the IYS is having to fit in with other activities. There is a need to identify what we have in common, including interest in a better understanding of how habitats are changing, sharing data, a joint symposium and possibly research at the salmosphere level. He advocated dreaming big to make the IYS a success.

5. Developments in relation to SALSEA - Track

5.1 In 2014, the IASRB had endorsed the need for an international telemetery programme and adopted a Resolution (ICR(14)10) encouraging Parties to continue the development of local collaborative telemetry projects, encouraging the development of large international collaborative projects building on local efforts and encouraging Parties to make efforts to identify funding sources. The Board had noted that the telemetry programme should build on the success and identity of the SALSEA Programme and had recognised that there may be a role for the Board in co-ordinating efforts and supporting fund raising initiatives. In 2014, a Telemetry Workshop organised by the Board had developed 12 outline project proposals utilising telemetry. The Board had recognised that if the international telemetry programme is to proceed, it would be important to liaise with the project leaders with a view to following progress and, where appropriate, to provide support to assist with their implementation.

5.2 In 2015, the Board had recognised the high value of the SALSEA brand and the strong impact of NASCO as the international forum for consultation and co-operation on wild Atlantic salmon. The Board reaffirmed its commitment to an international telemetry project under the SALSEA brand, namely SALSEA - Track. Specifically, the Board agreed to support SALSEA - Track as a continuing commitment to understanding the factors affecting the mortality of salmon at sea, to make funds available to prepare a

vision statement for SALSEA - Track and to advance existing initiatives towards an integrated collaborative telemetry programme.

5.3 In 2016, the Board had confirmed that it endorsed the twelve projects but noted that, if they changed substantially, they should be referred to the SAG. It was recognised that there might be scope to combine some of these projects into larger projects within the North American and North-East Atlantic Commission areas.

5.4 The Chairman of the Board, Mr Rory Saunders (USA) introduced paper ICR(17)3. He provided an update on progress with the twelve projects, noted additional new projects relating to telemetry that had been included in the inventory and referred to funding provided to the IASRB to support two projects (see 5.5).

5.5 Dr Cathal Gallagher presented updates on two projects for which funding had been provided to the IASRB through an EU 'grant for action' award. The Lice Track project aims to develop a sea lice integrative model, and involves parties in Norway, Scotland and Ireland. A planning workshop had been held in early 2017. The main test site is in an Irish National Salmonid Index Catchment where there is some salmon farming located in close proximity but with high densities in some years and low densities in others. The field work is underway and sentinel cages have been deployed. A second project, Smolt Track, has also commenced with an expert workshop at which there was a review of tagging techniques and sharing best practice and development of SOPs. The project involves partners in Denmark, England, Northern Ireland, Spain and Ireland where there are different mortality factors operating e.g. sea lice in Ireland and cormorants in Denmark. New partners are seeking to join the project.

5.6 Mr Lawrence Talks made a presentation on the SAMARCH project which involves ten partners in England and France. Funding has just been approved for the project to establish a genetic dataset. The project will be conducted from 2017 - 2022 with funding of €7.8million. It will aim to track salmon and sea trout smolts and sea trout kelts in estuary and inshore waters. It should provide information to establish a genetic dataset, improve stock assessment for salmon and sea trout and support the protection of salmon and sea trout stocks.

5.7 Mr Tim Sheehan provided an overview of a new approach for tracking marine species in the open ocean, through a collaborative effort between NOAA Fisheries, Woods Hole Oceanographic Institute, (WHOI), and the Atlantic Salmon Federation. The approach is designed to overcome many of the significant challenges associated with tracking Atlantic salmon throughout their marine migration.

5.8 The new approach, ROAM (RAFOS Ocean Acoustic Monitoring), is a modification of RAFOS, a commonly used technique for sub-surface oceanographic monitoring. Hydrophones are used to detect and record 'pong' detections while also collecting a suite of environmental data. Once the sound source detections are downloaded from the hydrophone, the estimated distance of the hydrophone from the sound source can be calculated for each 'pong' recorded. Daily position estimates can then be calculated to approximately one square kilometre based on triangulation from the daily distance estimates.

5.9 He described a study plan to track sub-adult Atlantic salmon captured at Greenland throughout the Labrador Sea during their return migration using the ROAM approach.

A total of 8 sound sources would adequately cover the study area which ranges from Nova Scotia (Canada) north to Disko Bay (Greenland). The sound source would need to be custom built and would cost approximately US$50K each, US$400K in total. The sound source would remain active for a period up to 10 years and efforts are being pursued to have them deployed in-kind by a potential collaborator. The ROAM archive and PSAT tag costs have yet to be determined but are expected to be approximately equal to current acoustic and PSAT costs if not cheaper. The tentative plan is for sound source deployment to occur in 2018/19 with tagging to occur in 2018/19-2020/21. NOAA Fisheries, WHOI, and ASF are currently working to organize this project.

5.10 Mr Sheehan noted that as with any new effort, there would be initial start-up costs, although these costs may be considered reasonable given the scope of the project. This is a new approach for old technology and although expectations are high for success, field and laboratory testing is needed and ongoing. Many challenges remain to be identified and further planning and coordination are needed to move this technology and effort forward. It was also noted that the technique is not appropriate for nearshore positioning given issues with sound propagation in shallow environments nearshore. It was also noted that any large scale tagging is inevitably difficult to coordinate. However, the ROAM approach may provide an ability to accurately track Atlantic salmon further out to sea than previously possible. The miniaturization of the RAFOS approach will overcome many of the cons from contemporary tracking technologies and the archive and PSAT version will provide different approaches for tracking different life stages. In addition to precise location estimates, concurrent environmental data will also be collected. Sound source coverage from Nova Scotia (Canada) north to Disko Bay (Greenland and eastward from France north to the Kola Peninsula (Russia) may be theoretically achievable with 20 sound sources at an approximate cost of US$1 million. This could provide a monitoring network covering the range of Atlantic salmon across the North Atlantic.

5.11 In response to a question from the Chair, Mr Sheehan indicated that while the ROAM project was not a specific project within the 12 endorsed by the Board, it was technically part of the satellite tagging project at West Greenland, which has been endorsed, and could be extended to other endorsed projects. He indicated that the technology exists but it needs to be included in existing pop-off satellite tag housing and it may reduce the size of these tags up to 50%. The technology is already being used by oceanographers and should not have impacts on marine mammals. For the smolt tags there would be a need for tag recovery programs but at the moment the focus was on satellite tags. It was noted that interference from other sound sources was not a problem in the open ocean but it could be in coastal areas. The Ocean Tracking Network (OTN) was aware of this development and had expressed interest. Further communication has not occurred yet.

5.12 The SAG noted the enormous potential of this development in terms of being able to monitor tagged fish across the entire North Atlantic at a relatively modest cost. The SAG recommended that this research should continue to be reported at the SAG and brought to the attention of the IASRB.

5.13 Mr Dave Meerburg (ASF Canada) updated the SAG on its smolt and kelt tracking studies in the Gulf of St Lawrence. A more detailed report is available in the report of the 2017 meeting of the ICES Working Group on North Atlantic Salmon.

6. Progress Reports on Projects Funded by the IASRB

6.1 Mr Tim Sheehan indicated that the United States had previously made a contribution of £16,900 (US$26,000) to the IASRB to support an extension of a study undertaken in 2014/15 (SAG(15)4). The extension study is being led by Dr Ian Bradbury, Fisheries and Oceans Canada, and is entitled 'Enhancement of a North American Atlantic Salmon genetic baseline for individual and stock identification'. The details of the project were to be finalised following last year's Annual Meeting and the research was to be initiated thereafter. He provided an update on the project to the SAG on behalf of Dr Bradbury. The funds are to support the genetic processing and analysis of approximately 670 individual scale samples collected from the West Greenland fishery to obtain region of origin assignments for North American origin fish. The target years are 1970, 1971, 1972, 1976, 1980, 1981 and 1982. These years were selected to increase the sample size of North American region of origin assignments prior to 1990. Previous work supported by the Board (SAG(15)4) presented a time-series of North American region of origin contributions to the West Greenland fishery (1968-2014); however, sample size prior to 1990 was low. Mr Sheehan confirmed that the funds had been transferred to DFO and that sample collection had been completed. The initial processing has been completed and the laboratory is currently re-running samples whose preliminary genetic results were found to be deficient. Final results are expected by October 2017 and a final report will be provided to the SAG at their 2018 Meeting.

7. Review of Project Applications for Potential Funding by the IASRB

7.1 Under the Board's Guidelines for Submitting Proposals for Research, Workshops, Symposia and Other Activities for Support by the IASRB, ICR(09)10, applications seeking either only endorsement by the Board or funding support from the Board may be considered. Applications are reviewed by the SAG which makes its recommendations to the Board.

7.2 The Chairman referred to an application by the Atlantic Salmon Trust for endorsement by the Board of a 'suspects model' and a request for £5,000 funding to help organise and run a scientific workshop of 6 to 8 specialists in Autumn 2017. Professor Walter Crozier (Atlantic Salmon Trust) presented documents SAG(17)4 and ICR(17)4 and referred to a request for endorsement for the project and support for the workshop which would examine in detail the feasibility of the framework proposed in SAG(17)4 and support the development of a consortium bid for funding in the form of a Concerted Action or other appropriate science support mechanism. The Atlantic Salmon Trust has funded the work to date and will continue to support its further development on a partnership basis into the future.

7.4 The SAG considered that the development of the 'suspects model' was a valuable initiative that could support new modelling approaches being developed by the ICES Working Group on North Atlantic Salmon. It recommended that the Board endorse the development of the model and approve the request for funding. Mr Mark Saunders indicated that there is considerable interest in a similar approach in the Pacific and that IYS funds may be available to allow participation of scientists from the Pacific in the AST Workshop.

7.5 The Board had previously agreed that it would be important to have reserves available to it so that it could continue to support initiatives such as the Greenland and Faroes GSI

projects; the Board's support had assisted in securing additional funding from other sources. These projects had resulted in new information of value to management with limited financial support from the Board. The Sub-Group on the Future Direction of Research on Marine Survival of Salmon had noted in 2012 that the Board had very limited resources and recognized that if it is to continue to play a role in supporting research on salmon at sea it should consider how it can address this situation.

8. Other Business

8.1 There was no other business.

9. Report of the Meeting

9.1 The SAG agreed a report of its meeting.

10. Date and Place of the Next Meeting

10.1 The SAG agreed to hold its next meeting in conjunction with the Thirty-Fifth Annual Meeting of NASCO during 12 - 18 June 2018.

11. Close of the Meeting

11.1 The Chairman of the SAG thanked the participants for their contributions and closed the meeting.

Annex 1 of SAG(17)7

List of Participants

Canada

Mr Bud Bird
Mr Gérald Chaput
Ms Shelley Denny
Ms Patricia Edwards
Dr James Irvine
Dr Martha Robertson
Ms Annette Rumbolt

European Union

Dr Stamatis Varsamos
Dr Dennis Ensing
Dr Jaakko Erkinaro
Dr Cathal Gallagher
Mr John McCartney
Dr Michael Millane
Dr Niall Ó Maoiléidigh
Dr Arnaud Peyronnet
Mr Ian Russell
Mr Lawrence Talks

Norway

Dr Peder Fiske

Russian Federation

Ms Alina Nikolaeva
Dr Sergey Prusov

USA

Mr Daniel Morris
Mr Rory Saunders
Mr Tim Sheehan

IGOs

Dr George Iwama
Mr Mark Saunders

NGOs

Dr Walter Crozier
Professor Ken Whelan
Dr Nigel Milner

Secretariat

Dr Peter Hutchinson

SAG(17)5

Agenda

1. Opening of the Meeting
2. Adoption of the Agenda
3. Review of the Updated Inventory of Research and the Metadatabase of Salmon Survey Data and Sample Collections
4. Update on the International Year of the Salmon
5. Developments in relation to SALSEA - Track
6. Progress Reports on Projects Funded by the IASRB
7. Review of Project Applications for Potential Funding by the IASRB
8. Other Business
9. Report of the Meeting
10. Date and Place of the Next Meeting
11. Close of the Meeting

ICR(17)3

Progress Report on SALSEA - Track

1. At its 2013 meeting, the Board had agreed that a particular focus of its work should be studies to partition mortality of salmon among the phases of its marine migration. In 2014, the Board adopted a Resolution on Research on Salmon at Sea, ICR(14)6, which *inter alia*:

   - encourages NASCO Parties to continue the development of local collaborative telemetry projects;
   - encourages the development of large international collaborative telemetry projects that together build upon and expand local efforts; and
   - requests NASCO Parties to make efforts to identify funding sources to support telemetry projects.

2. To support an integrated collaborative telemetry programme, the Board organised a Telemetry Workshop in December 2014. At this Workshop, twelve outline project proposals for telemetry-based research were developed. In 2015, the Board recognised the high value of the SALSEA brand and the strong impact of NASCO as the international forum for consultation and co-operation on wild Atlantic salmon. The Board had re-affirmed its commitment to an international telemetry project under the SALSEA brand, named SALSEA - Track. Specifically, in 2015 the Board agreed that it would support SALSEA - Track as a continuing commitment to understanding the factors affecting mortality of salmon at sea, to make funds available to prepare a vision statement for SALSEA - Track and to advance existing initiatives towards an integrated collaborative telemetry programme.

3. The Board recognised that if the international telemetry programme is to proceed, it would be important to follow progress in taking forward the twelve outline projects and, where appropriate, provide support to assist with their implementation. Last year, the Board had confirmed that it endorsed these twelve projects but noted that, if they changed substantially, they should be referred to the Board's Scientific Advisory Group (SAG). It was recognised that there might be scope to combine some of these projects into larger projects within the NAC and NEAC areas. The SALSEA - Track brochure had been developed, in consultation with members of the Board/SAG and a professional fund-raiser, prior to the Board's 2016 meeting and has been widely distributed and well received. At the 2016 meeting, the representative of the European Union had indicated that the intention was to make a voluntary contribution to NASCO to support two projects relating to marine mortality with funding of €300,000 per project representing 80% of the costs with the balance of funding requiring to be found from third parties (Member States).

4. This paper provides an update on progress with the twelve outline projects and on the funding from the EU and details new telemetry projects reported through the inventory of research relating to salmon mortality at sea.

Progress on the twelve outline projects

5. In accordance with the Board's request that progress in taking forward the twelve outline projects be followed, the contact for each project was requested to provide an update on progress to date, identifying any challenges in progressing the projects and advising of any assistance the Board may be able to offer to support implementation of the projects and in disseminating information relating to them. The responses received are summarised below:

Drifters and BioProbes: Options for detecting acoustically tagged fish in large geographic areas (NAC and/or NEAC)	**Progress report (John Kocik and Fred Whoriskey):** Within the Canada Atlantic Salmon Research Joint Venture, preliminary conversations have occurred between DFO, NOAA, OTN and the Atlantic Salmon Federation (ASF) as to funding some preliminary research and development to evaluate a cost-effective real time recording drifter. This tool would be able to transmit acoustic tag detections on a satellite platform eliminating the need for drifter recovery. The Ocean Tracking Network (OTN) has submitted funding requests to do the required engineering and integration work to add acoustic receivers to the MetOcean drifter and to build and test a prototype with the intent of having an operational unit ready for 2018.
New Receiver Lines/Arrays/Grids (NAC)	**Progress report (Tim Sheehan, John Kocik, Jon Carr and Fred Whoriskey):** Some progress has been made on this project in 2016. With regards to adding acoustic receiver capacity of/to marine autonomous vehicles, OTN has requested funding to add two new Slocum Gliders and two SV3 Wave Gliders to its fleet to increase North Atlantic Ocean coverage and is working within the nascent Ocean Gliders Canada to arrange to place acoustic receivers on gliders operating within marine areas used by salmon during their marine migration, including the Labrador Sea. OTN has also been working through the Horizon 2020 AtlantOS program to partner with a variety of agencies and programs (DFO, OSNAP, OceanSITES, University of Washington and others) that have established fixed moorings in the North Atlantic Ocean and Labrador Sea to add acoustic receivers to the moorings. This is significantly expanding the acoustic receiver network that could be used to track the marine movements of salmon.  *Map of fixed deployments (red dots) of acoustic receivers operating or to be installed by 2018 in the Western Atlantic Ocean and linked to the OTN data system. Does not include receivers mounted on gliders and which are currently operating in the Labrador Sea.* Starting in 2015, ASF deployed a second line of receivers (N=28) in the Strait of Belle Isle to measure the efficiency of the existing line and calibrate stage-specific survival estimates for post-smolts travelling through the Gulf of St Lawrence. ASF has had discussions with DFO (St. Johns, Newfoundland) and plans to deploy a few receivers in the Labrador Sea in 2017 (up to 20 VR2AR units are planned for deployment off the coast of Spear Harbour).

	With this developing capacity, what is now needed is a solid plan/idea for the science that needs to be done, identification of critical new infrastructure that might need to be added, and identification of how the science and infrastructure will be sustained for the necessary time period.
Platforms of Opportunity in the NAC area: Stationary Platforms of Opportunity Receiver Exchange (SPORE)	**Progress report (John Kocik):** The NOAA team maintained extant opportunistic arrays in 2016 and continued working with the whale passive acoustic group. Due to expanded work in the Narraguagus Bay area and overall telemetry workload and funding issues, the telemetry monitoring on lobster traps (t-MOLT) and coastal rivers projects were suspended for 2017. These platforms were often deployed after post-smolts left US waters or in river systems without tagged smolts so impacts to salmon monitoring are minimal. Expansion of opportunities in the northwest GoM and associated waters of the Bay of Fundy remains a mutual NOAA and DFO goal.
NAC kelt satellite tagging	**Progress report (Tim Sheehan and Jon Carr):** No significant progress has been made to date due to resource needs, and current commitments. Tentative conversations within the US and with ASF as to possibly pursuing this type of effort have been conducted, but if this project were to be conducted it would not be until 2018/2019. However, the ASF has continued their kelt tagging efforts in the Gulf of St. Lawrence (Miramichi and Restigouche rivers, and Cascapedia planned for 2017), but no new efforts outside of the Gulf have been initiated. A peer reviewed manuscript on PSAT kelt tracking has recently been published (2017, doi:10.1093/icesjms/fsw220).
Generic Index River Sites in the NEAC area	No progress report received.
Malin Head to Islay Receiver Array (NEAC)	**Progress report (Paddy Boylan):** Following the Telemetry Workshop in London, the SeaMonitor project was developed and funding was sought under INTERREG V. A description of the project was provided to the IASRB/SAG last year (see SAG(16)4). Unfortunately, this application was unsuccessful. The project included the Loughs Agency as the lead with partners from: the Marine Institute; University of Glasgow; Queens University Belfast; Ocean Tracking Network; Marine Scotland Science; National University of Ireland, Cork; Mayo Institute of Technology, Galway; Agriculture, Food and Biosciences Institute for Northern Ireland; and the University of California, Davis, USA. The consortium is still keen to look for a mechanism to fund the project and as a result a ready-made project is available if another funding opportunity arises. The total project cost was €8.23 million but elements could be tailored into smaller projects depending on available funding.
North Sea Loose Array (NEAC)	No progress report received.
West-coast Scottish arrays (NEAC)	No progress report received.
Studies of migration along the European shelf edge and into the Norwegian Sea using drifters/AUVs etc (NEAC)	No progress report received.
NEAC kelt satellite tagging	No progress report received.
Sub-adult satellite tagging at Faroes	No progress report received.
Adult satellite/acoustic tagging at Greenland	**Progress report (Tim Sheehan and Jon Carr):** Planning (ASF, NOAA, Greenland Institute for Natural Resources) has been ongoing for

	a multi-year satellite/acoustic tagging effort at West Greenland starting in 2017. Preliminary plans are for 2017 activities to focus on developing and refining capture methods for supplying high quality fish for tagging. Tagging would be initiated in 2018 and continue through 2020.

6. The response to our request for progress reports and identification of factors hindering implementation for the twelve outline projects has not resulted in information for all projects. However, for those that have responded, some have indicated that lack of resources is an issue. In the first phase of the SALSEA Programme, the Board had sought support from professional fund-raisers, Brakeley Consultants and we have maintained contact with one of those involved in the earlier work (Anne Conner) who remains very keen on the work of the Board. She volunteered to review the SALSEA - Track brochure and believes that together with the companion 'Salmon at Sea' brochure, which was developed following the Salmon Summit in 2011, the information available is informative and should be attractive to potential funders including corporates, foundations and high-worth individuals.

7. Identifying potential funders and attracting their interest in SALSEA - Track is a considerable undertaking that requires specialist skills. It would also require a clear description of the planned research and the funding required before funders could be identified and approached. The process would require professional support and Anne Conner's minimum contract would be for around £12,000 (for around 20 days of her time). However, this would only be feasible if we had planned and costed projects that could be presented to potential funders. One approach might be for the IASRB to identify one or two of the twelve projects, perhaps one North American and one European, as model projects that could be promoted in the first instance and seek advice on a fund-raising strategy in support of those projects.

8. The Resolution on Research on Salmon at Sea, ICR(14)10, which encourages NASCO Parties to continue the development of local collaborative telemetry projects, should also be supportive of applications for funding and the Board can also support telemetry projects through endorsements as it has for the twelve outline projects.

EU funding to the IASRB

9. Following the Board's 2016 meeting, applications for funding through EU 'Grants for an action' were completed for two projects and these were approved for funding (up to 80% of eligible costs). A summary of the projects and a brief report on their progress is provided below.

Understanding and comparing early mortality of European salmon populations at sea

10. *Summary:* Over recent decades, the abundance of wild Atlantic salmon stocks has been in decline throughout their migratory range despite the significant management measures put in place both domestically and at an international level. There is evidence that the initial mortality, immediately after smolts enter salt water, is very high and that this 'point mortality' may explain most of the variation seen in return rates of salmon. Estuarine and near shore mortalities may also be occurring in the part of the marine life cycle where management intervention is feasible. This project will determine the mortality of salmon smolts and post-smolts during their migration through the lower parts of rivers, estuaries/fjords and near-shore areas through case studies using telemetry in rivers in five areas: Denmark, England, Ireland, Northern Ireland and Spain. Mortality of kelts migrating

on the same route will also be investigated in Denmark. In combination with other published results, the research will provide crucial input on marine mortality to existing models used for assessment purposes and test if the measured initial mortality can explain observed variation in return rates. If causality between post-smolt mortality and run size can be established, the findings may inform future management and conservation of (some) Atlantic salmon stocks.

Total project cost (including in-kind contributions): €918,300
EU contribution to the IASRB: €299,800
Partners: DTU Aqua (National Institute of Aquatic Resources), Denmark; Centre for Environment, Fisheries & Aquaculture Science (Cefas), UK; Xunta de Galicia, Spain; Agri-Food and Biosciences Institute (AFBI), UK. In-kind contribution from Inland Fisheries Ireland.

11. *Progress to date:* The SMOLTRACK project has just started, but already good progress has been made. Central purchase of telemetry equipment has enabled partners to get a large discount to the benefit of the whole project. As a consequence, several partners have now committed to do a two season study instead of the originally planned 1 season study. The first workshop with partners was held in Galway from 28 February - 1 March 2017. The general criteria for the study were discussed and co-ordinated, an overview of the study sites was presented and a Standard Operating Procedure (SOP) was developed. The workshop also included a practical hands-on tagging course for all partners. These steps will ensure a good possibility for comparison between the sites. The acoustic systems are in place at all partners and tagging began in the last week of March, with the majority of smolts expected to be tagged in April and early May.

Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture

12. *Summary:* This project proposes to develop a sea lice integrative model developing and refining hydrodynamic modelling, environmental variables, sea lice production on salmon farms and other data requirements to support sustainable development of aquaculture and wild salmon stocks. Existing modelling tools have been developed in Norway and Scotland. These models simulate dispersal of larval sea lice based on farm production, hydrodynamics, water temperature and salinity, and have been used to identify the role of specific salmon farming sites as recipients or sources of sea lice. In order to make directly comparable estimations of lice dispersal, and hence larval concentrations and infection pressure, the models need to be standardised. The work carried out in each country can also benefit from the exchange of ideas to ensure optimal solutions are arrived at. For this reason, we will seek to form a network that will meet with the objective of developing a standard model that can be plugged into any hydrodynamic model of local currents to generate sea lice dispersal patterns. This project will contribute to developing best management practice for sea lice control and define a range of production strategies aiming at reducing the presence of sea lice and their negative impacts, both on farmed and wild Atlantic salmon.

Total project cost (including in-kind contributions): €618,604
EU contribution to the IASRB: €239,994
Partners: Inland Fisheries Ireland. In-kind contributions from Norwegian Institute for Nature Research; Institute of Marine Research, Norway; Marine Science Scotland; National University of Ireland, Galway

13. *Progress to date:* The EU funded NASCO project Licetrack, Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture, began in early March 2017 when a workshop of all project partners took place at IFI headquarters in Dublin. The workshop covered items such as fieldwork planning for the sentinel cage experiment in Killary harbour, development of hydrodynamic modelling in Norway, Scotland and Ireland, development of a standard model and project budget. Sentinel cages were manufactured and delivered during the first week in May and the first batch of salmon smolts was put to sea in six cages in Killary Harbour on 8 May. These salmon smolts were removed on 16 May and lice counts undertaken. A second batch of salmon smolts was put into the sentinel cages on 16 May and sampled on 23 May. Three cages are fitted with salinity and temperature probes and velocity meters. Some mortality of salmon smolts was encountered due to high water temperatures. A bag net has also been operating in Killary since early May. Farmed salmon in the vicinity of Killary Harbour are due to be harvested in late May and the site left fallow for a period. Salmon smolts will continue to be monitored in sentinel cages during this fallow period to provide baseline data. It is expected that larger salmon will be moved to sites in Killary harbour in autumn and salmon smolts will be placed in sentinel cages to monitor lice levels during this period. The field work element of the project has progressed as set out in the project plan and work is ongoing in developing a hydrodynamic model for Killary harbour. The development of a standard model using hydrodynamic models of local currents to generate sea lice dispersal patterns in any site specific location is also being progressed.

Scottish type sentinel cage used in Killary harbor

Deploying sentinel cages in Killary harbour

14. The funding provided by the European Commission of approximately €600,000 is very much appreciated and has contributed to projects costing approximately €1.5million in total being implemented. We have been advised that additional funding is available through the EU 'Grants for an action' in 2017 with €300,000 available towards eligible costs for each approved project.

Inventory of research

15. The inventory of research relating to salmon mortality at sea, SAG(17)2, includes 21 ongoing projects related to the migratory behaviour of individual fish (C16, C18, C25, C27, C29, C30, C31, C32, C33, De4, De5, Ir12, Ir13, Ir14, Ni4, N18, U4, U5, U10, U13,

U16). Seven new projects involving tracking individual fish have been included since last year and these are as follows:

C27: Tracking the migration behaviour of Atlantic salmon kelts (Middle and Baddeck rivers), through a unique inland brackish sea of Cape Breton, Canada;

C29: Movements and survival rates of acoustic tagged smolts from Campbellton River, Newfoundland;

C30: Research into factors of early marine phase post-smolt mortality using acoustic predator-detection tags;

C31: Research into factors of early marine phase post-smolt mortality using acoustic predator-detection tags;

C32: Migration, distribution, survival of smolts from Nashwaak River;

C33: Early marine phase migration, and survival of Atlantic post-smolts from multi-sea-winter salmon populations of Quebec; and

Ni4: COMPASS (Collaborative Oceanography & Monitoring for Protected Areas and Species)

In summary

16. SALSEA - Track is a novel and exciting project proposal that has the potential to answer key questions relating to the conservation and management of Atlantic salmon. The success of the project is entirely dependent upon extensive international co-operation and partnerships between scientists, public sector funders, private sector foundations, NGO groups and industry. If the necessary co-ordination and funding come together, it will undoubtedly have a high profile. Given that the Board has committed to support SALSEA - Track as a continuing effort to understanding mortality of salmon at sea, there are a number of measures it may wish to consider in order to further its goal of advancing an integrated, collaborative telemetry programme. The Board has previously recognised that it could play an important role by: supporting fund-raising initiatives; providing funds as resources permit; endorsing projects; serving as a forum for information exchange and collaboration among research groups; and facilitating co-ordination of the research programme.

17. The Board has, of course, already played a significant role in support of this initiative by funding the Telemetry Workshop that brought together the key scientists who may collaborate in future telemetry studies on salmon and at which the outline project proposals, subsequently endorsed by the Board, were developed. It has adopted a Resolution and it has prepared a brochure which should be supportive of telemetry studies. The Board's inventory indicates that seven new telemetry studies have been initiated since last year. The NASCO/IASRB have successfully applied for EU funding to support two projects related to mortality of salmon at sea and additional funding could be made available in 2017 if acceptable projects are forthcoming. The International Year of the Salmon, although focused on outreach activities in the North Atlantic, may be supportive of research relevant to SALSEA - Track. If the Board is to engage in fund-raising to support the twelve outline projects, it will need professional advice and that will need clarification of the research to be conducted and its cost and this might best be achieved by focusing on one or two model projects. The Board will need to consider its further role in taking forward SALSEA - Track and we look forward to discussing this further at the Annual Meeting.

Chairman and Secretary of the IASRB
Edinburgh
23 May 2017

ICR(17)4

Application for funding to the International Atlantic Salmon Research Board Salmon at Sea: a 'likely suspects' approach to guiding research

The Proposal - summary

SALSEA identified potential sources of mortality during the initial smolt migration to feeding grounds but it did not aim to quantify or fully understand these. It is evident however, that since these factors can vary in time and space, such variation may be expected to account for some if not most of the variability in return rates observed among salmon stocks and between years. As plans for new research develop, it is necessary to consider how that research can be targeted and prioritised. The overview accompanying this application suggests that it is possible to identify an overall strategic framework that would provide coherent guidance in this regard.

A strategic approach is proposed that would place candidate mortality factors within an overall spatio/temporal framework of salmon throughout the marine phase, with a view to quantifying the potential of each factor to influence survival (the "likely suspects") and to link these dynamically in such a way that the cumulative effects of these factors is made to account for the observed survival variations in cohorts of salmon.

Given the number of, and variation in, likely factors influencing mortality at sea, the approach is not designed to be modelling in the meaning of inputting variables to test or predict outcomes, but is more akin to an "accounting exercise" and can be used to identify the likely impact both individually and cumulatively of the "suspects". A key objective is to prompt specific testable hypotheses about the operation of the factors involved and hence aid targeting of research to further refine the estimates of the potential scale of mortality at each part of the marine phase. A particular focus would be on identifying where and how mortality factors had changed between earlier periods of higher marine survival and the more recent/current low survival phase.

Funding Requested

At this early stage of development of the likely suspects concept, the AST is in discussion with a number of scientists in relevant fields in Europe and North America and also with our partner organisation the Atlantic Salmon Federation (ASF). As part of the concept development, the AST is seeking a contribution of £5,000 from NASCO IASRB to help organise and run a scientific workshop of 6 to 8 specialists in Autumn 2017. If this is not possible the endorsement of the Board for the project concept and approach would be very welcome. The planned workshop would examine in detail the feasibility of the proposed framework and support the development of a consortium bid for funding in the form of a Concerted Action of other appropriate science support mechanism. AST has funded the work to date and will continue to support its further development on a partnership basis into the future.

Workshop Budget

It is difficult at this time to give a precise budget for the organisation and running of the workshop but the following are the approximate costs – on the basis of a six person meeting, two from North America and 4 from Europe:

Further Development of Concept and preparation for workshop:

	£3,000 (consultant)
Travel and accommodation costs	£6,800
AST – staff time	£2,500
Total:	£12,300

Time Frame

It is envisaged that the workshop would be organised in Edinburgh in late September / October 2017 and that a report on the meeting and a detailed, costed research proposal would be completed by January 2018.

The Workshop Team

The workshop will be organised by the Atlantic Trust Executive Team in conjunction with Professor Walter Crozier, who is currently on contract to AST to develop the Suspects Framework.

Professor Ken Whelan,
Research Director,
Atlantic Salmon Trust,
11 Rutland Square,
Edinburgh, EH1 2AS
Scotland, UK

Annex 12

CNL(17)10

Request for Scientific Advice from ICES

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

1.1 provide an overview of salmon catches and landings by country, including unreported catches and catch and release, and production of farmed and ranched Atlantic salmon in 2017[1];

1.2 report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];

1.3 provide a review of examples of successes and failures in wild salmon restoration and rehabilitation and develop a classification of activities which could be recommended under various conditions or threats to the persistence of populations[3];

1.4 provide a compilation of tag releases by country in 2017; and

1.5 identify relevant data deficiencies, monitoring needs and research requirements.

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

2.1 describe the key events of the 2017 fisheries[4];

2.2 review and report on the development of age-specific stock conservation limits, including updating the time-series of the number of river stocks with established CLs by jurisdiction;

2.3 describe the status of the stocks, including updating the time-series of trends in the number of river stocks meeting CLs by jurisdiction;

2.4 provide catch options or alternative management advice for the 2018/19-2020/21 fishing seasons, with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding[5]; and

2.5 update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.

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

3.1 describe the key events of the 2017 fisheries (including the fishery at St Pierre and Miquelon)[4];

3.2 update age-specific stock conservation limits based on new information as available, including updating the time-series of the number of river stocks with established CLs by jurisdiction;

3.3 describe the status of the stocks, including updating the time-series of trends in the number of river stocks meeting CLs by jurisdiction;

3.4 provide catch options or alternative management advice for 2018-2021 with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding[5]; and

3.5 update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.

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

4.1 describe the key events of the 2017 fisheries[4];
4.2 describe the status of the stocks[6];
4.3 provide catch options or alternative management advice for 2018-2020 with an assessment of risk relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding[5];
4.4 update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.

Notes:

1. *With regard to question 1.1, for the estimates of unreported catch the information provided should, where possible, indicate the location of the unreported catch in the following categories: in-river; estuarine; and coastal. Numbers of salmon caught and released in recreational fisheries should be provided.*
2. *With regard to question 1.2, ICES is requested to include reports on any significant advances in understanding of the biology of Atlantic salmon that is pertinent to NASCO, including information on any new research into the migration and distribution of salmon at sea and the potential implications of climate change for salmon management.*
3. *with respect to question 1.3, NASCO is aware that the WGERAAS final report is being prepared and will be submitted to ICES in 2017*
4. *In the responses to questions 2.1, 3.1 and 4.1, ICES is asked to provide details of catch, gear, effort, composition and origin of the catch and rates of exploitation. For homewater fisheries, the information provided should indicate the location of the catch in the following categories: in-river; estuarine; and coastal. Information on any other sources of fishing mortality for salmon is also requested. For 4.1 ICES should review the results of the recent phone surveys and advise on the appropriateness for incorporating resulting estimates of unreported catch into the assessment process.*
5. *In response to questions 2.4, 3.4 and 4.3, provide a detailed explanation and critical examination of any changes to the models used to provide catch advice and report on any developments in relation to incorporating environmental variables in these models.*
6. *In response to question 4.2, ICES is requested to provide a brief summary of the status of North American and North-East Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to questions 2.3 and 3.3.*

Attendees:

Sergey Prusov (NEAC, manager representative)
Peder Fiske (NEAC, scientist representative)
Annette Rumbolt (NAC, manager representative)
Tim Sheehan (NAC, scientist representative)
Esben Ehlers (WGC, manager representative)
Niall Ó Maoiléidigh (WGC, scientist representative)
Gérald Chaput (ICES representative, Observer)
Patrick Gargan (Coordinator)

Annex 13

CNL(17)14

Report of the Meeting of the Implementation Plan/Annual Progress Report Review Group

Rydges Kensington Hotel, London, UK

6 and 7 April 2017

1. Opening of the Meeting

1.1 The Chairman, Mr Rory Saunders (USA), opened the meeting and welcomed members of the Review Group to London. He noted that the main task before the Review Group was to evaluate the 2017 Annual Progress Reports (APRs) under the 2013 - 2018 Implementation Plans (IPs) which detail the measures to be taken by Parties/jurisdictions to implement NASCO's agreements. The evaluation is intended to ensure that Parties/jurisdictions have provided a clear account of progress in implementing and evaluating the actions detailed in their IPs and the other information requested in the APRs. The 2017 APRs are the fourth under the current IPs and, as such, the second cycle of reporting is nearing completion and it would be expected that considerable progress should have been made on the actions identified in the IPs. He suggested that the Review Group might also wish to consider arrangements for the next cycle of IPs with a view to making recommendations to the Council.

1.2 Paddy Gargan, Hugo Hansen, Paul Knight, Rory Saunders (Chairman) and Lawrence Talks participated in the meeting. Steve Sutton was unable to participate in the meeting but provided input to the reviews. The NASCO Secretary co-ordinated the work of the Group.

2. Adoption of the Agenda

2.1 The Review Group adopted its Agenda, IP(17)3 (Annex 1).

3. Review of the Terms of Reference and Consideration of Working Methods

3.1 The primary purpose of APRs is to provide details of:

- any changes to the management regime for salmon and consequent changes to the IP;
- actions that have been taken under the IP in the previous year;
- significant changes to the status of stocks and a report on catches; and
- actions taken in accordance with the provisions of the Convention.

3.2 The Council had agreed (see CNL(12)44) that the purpose of the evaluation of the APRs is to ensure that Parties/jurisdictions have provided a clear account of progress in implementing and evaluating the actions detailed in their IPs and have provided the information required under the Convention. Where the Review Group identified

shortcomings in the APRs, it had been asked to develop a list of questions to be sent to the Party/jurisdiction concerned. The Council had previously agreed that Parties/jurisdictions should provide written responses to these questions in advance of the Annual Meeting so that the responses could be circulated prior to discussion during a Special Session of the Council at the Annual Meeting.

Working Methods

3.3 The Review Group adopted the same working methods as it had used at its previous meetings as described in document CNL(16)13. In summary, the Review Group continued to adopt the following 'ground rules' in undertaking its 2017 evaluations:

(a) initial reviewers were appointed for each APR (mainly the same reviewers as for the IPs and previous APR evaluations) and asked to lead the discussion within the Group and to produce an initial evaluation of each APR. This included an assessment of progress against each of the actions in the IP and the reporting on: new initiatives or achievements for salmon conservation and management; stock status and new factors affecting salmon abundance; catch statistics; and the additional information required under the Convention;

(b) in reporting the evaluations, the initial reviewers remained anonymous but in the event that one or more members of the Review Group did not agree with a particular aspect or aspects of the evaluation, the report would indicate that there were dissenting views without disclosing which members of the Group expressed the dissenting views unless they wished to be identified;

(c) while the Group drew on information in the IPs, it only commented on the information presented in the APRs;

(d) because not all Parties/jurisdictions were represented on the Group, it was agreed that a member of the Review Group from a Party/jurisdiction whose APR was being reviewed would not be present during the initial review of that report. The members of the Group were appointed by the Council to represent NASCO, not their Party/Organisation.

3.4 For each APR, the Review Group assessed whether satisfactory responses had been provided on:

- any changes to the IP, new initiatives and significant changes in stock status;
- the provision of complete catch data;
- progress made on each action; and
- other returns required under the Convention.

3.5 When all evaluations were complete, a consistency check was undertaken of all the assessments.

4. Update on Receipt of Implementation Plans and Evaluation of any new IPs

Overview of the IP evaluations

4.1 In its report to the Council's Thirty-Second (2015) Annual Meeting, the Review Group had noted that it had reviewed 18 IPs and, of these, 11 were considered to be

satisfactory. The Review Group had considered that the following IPs contained clear omissions or inadequacies: Canada; Denmark (in respect of the Faroe Islands and Greenland) - Faroe Islands; EU - Spain (Asturias); EU - Spain (Cantabria); EU - Spain (Galicia); EU - UK (Scotland); and the Russian Federation.

4.2 For those jurisdictions that have salmon farming, the Review Group had recognised that providing quantitative data to demonstrate progress towards the international goals for sea lice and containment (questions 4.2 and 4.3 in the IP template, respectively) was challenging. However, the Group had expressed the opinion that the IPs for all Parties/jurisdictions with salmon farming should present quantitative data in a transparent manner to demonstrate progress made over the period of the IP towards the international goals for sea lice and containment rather than describing only the management measures in place. The Review Group had recommended that where this information had not been provided in the IPs, it should be reported through the APRs or, if that was not feasible, prior to the start of the next IP cycle. The Review Group noted that some additional information had been provided at the Theme-based Special Session held during the Thirty-Third (2016) Annual Meeting.

4.3 The Review Group had emphasised that a score of '1' on an IP simply meant that a satisfactory answer/information had been provided and it did not mean that the Party/jurisdiction concerned was necessarily meeting NASCO guidelines or agreements. In some cases, responses were considered to be satisfactory even when the response was incomplete, provided that an action had been identified to begin to address any major shortcoming.

Changes to IPs since the 2016 Review Group meeting

4.4 It is the Council's intention that IPs apply for a period of five years (2013 - 2018), and generally require no annual modification unless circumstances change significantly. At its 2014 Annual Meeting, the Council had asked that where a Party/jurisdiction had changed its IP, it should send the revised IP to the Secretariat no later than 1 December each year. No revised IPs had been received since the Group's 2016 Annual Meeting.

4.5 Following the Review Group's 2015 meeting, and prior to NASCO's 2015 Annual Meeting, an Implementation Plan was received for EU - France, CNL(15)39rev. It had been submitted to the Secretariat as a partial plan to be further developed and it did not include identification of any threats/challenges in relation to aquaculture, introductions and transfers and transgenics and, consequently, no relevant actions. It was not, therefore, reviewed. However, the Review Group had welcomed this contribution, noted that the IP appeared to be generally satisfactory and encouraged EU - France to complete its plan without further delay so that it could be fully evaluated. The 2017 APR indicates that France is committed to submitting a complete IP by the second half of 2017. The Review Group is concerned that it has taken more than two years to complete the remaining section (aquaculture, introductions and transfers and transgenics) of the French IP and notes that the current reporting cycle will end in 2018.

4.6 At the time of the Review Group's meeting, an IP had still not been received for EU - Portugal which is a concern given the significant challenges facing salmon managers in the southern part of the species' range. The Review Group reiterated this concern and asked that EU - Portugal be encouraged to report on the measures being taken to safeguard the resource in accordance with NASCO agreements and guidelines.

4.7 The Review Group notes that a self-assessment using the Six Tenets for Effective Management of an Atlantic Salmon Fishery had been received from EU - Spain (Bizkaia) but an IP has not been submitted. The Review Group encourages EU - Spain (Bizkaia) to participate in the IP process.

5. Evaluation of the 2017 Annual Progress Reports and Development of Feedback to the Parties/jurisdictions

Overview of the 2016 Annual Progress Report Evaluations

5.1 In 2016, the Review Group noted that several of the 2016 APRs had provided similar information to that provided in 2014 and 2015, even when the Group had previously sought clarification or further detail in its questions. The Review Group had again noted that evaluating the progress reported on actions in the APRs was very difficult when the descriptions of the planned actions in the IP were vague or imprecise. The Group had further noted that the APRs for several Parties/jurisdictions continued to lack a clear account of progress in implementing and evaluating some, or all, of the actions detailed in their IPs, despite the further guidance provided on completing the template and the provision of examples of good practice. The Review Group also experienced considerable difficulties in interpreting the progress in some APRs because of the continuing use of links to websites and references to publications. Overall, the Review Group had again considered that the most common fault with the information provided continues to be a lack of quantitative evidence on the extent of the progress made and/or what the results have been. All Parties/jurisdictions were asked to address this in future APRs. The Review Group had noted that if the evaluation process is to work effectively, and be fair and equitable, clearer and more detailed reporting would be required in the 2017 APRs for several Parties and jurisdictions.

2017 Annual Progress Report Evaluations

5.2 The 2017 APR template was issued on 12 January 2017 and, although the deadline for submission agreed by the Council is 1 April, Parties/jurisdictions had been encouraged to complete and return their APRs to the Secretariat by 24 March 2017 given the earlier date of the Review Group meeting. European Union - Sweden and the United States submitted their APRs by this date but most other APRs were received on 3 or 4 April. As requested by the Council, the Secretariat had completed the 'Description of Actions' and 'Expected Outcomes' fields in the APR template for each Party/jurisdiction using the text from the most recent versions of the IPs and had amended the 'Current Status of Action' field, to make it a choice field with only four options ('Not started', 'Ongoing', 'Completed for Current Year' and 'Completed'). The 2017 reporting template had also been amended to highlight the fact that APRs should be stand-alone documents with a clear summary of progress that did not rely on links or references to additional information. In 2016, the Review Group had particularly commended EU - Sweden for the clarity of its APR and this APR was issued with the 2017 APR templates to assist all Parties/jurisdictions in reporting in 2017.

5.3 Seventeen APRs were submitted and reviewed by the Review Group at its 2017 meeting. Only EU - UK (Northern Ireland) indicated that it proposed to review its IP in 2017. This revision is being taken in response to the NASCO review process, and to better capture the main objectives for salmon management, the threats to wild salmon

and the challenges to their management and better clarify the actions to be taken. The Review Group wishes to highlight that some of the actions in the current IP for Northern Ireland are unclear and read like progress reports making it difficult to evaluate progress and encourages Northern Ireland to address this during revision of its IP. The Review Group evaluated the following APRs:

Party/jurisdiction	Document No.	Date APR received by Secretariat	Proposed amendments to IP in 2017
Canada	CNL(17)26	31 March 2017	No
Denmark (in respect of the Faroe Islands and Greenland) - Faroe Islands	CNL(17)24	28 March 2017	No
Denmark (in respect of the Faroe Islands and Greenland) - Greenland			
EU - Denmark	CNL(17)33	3 April 2017	No
EU - Finland			
EU - France	CNL(17)30rev	27 March 2017	No
EU - Germany	CNL(17)35	4 April 2017	No
EU - Ireland	CNL(17)37	4 April 2017	No
EU - Portugal			
EU - Spain (Asturias)	CNL(17)27	3 April 2017	No
EU - Spain (Cantabria)	CNL(17)36	3 April 2017	No
EU - Spain (Galicia)	CNL(17)28	3 April 2017	No
EU - Spain (Navarra)	CNL(17)29	3 April 2017	No
EU - Sweden	CNL(17)21	21 March 2017	No
EU - UK (England and Wales)	CNL(17)31	3 April 2017	No
EU - UK (Northern Ireland)	CNL(17)34	3 April 2017	Yes
EU - UK (Scotland)	CNL(17)32	3 April 2017	No
Norway	CNL(17)25	31 March 2017	No
Russian Federation	CNL(17)23	28 March 2017	No
United States	CNL(17)22	24 March 2017	No

5.4 Where the Review Group considered that there were shortcomings in an APR, the Council had requested that it develop a list of questions to be sent to the Party/jurisdiction concerned by 1 May. In some instances, the Review Group also asked questions where it felt that further information on the action would be helpful. The Review Group agreed that the questions should be sent to the Parties/jurisdictions by the Secretary as soon as possible after its meeting and that each Party/jurisdiction be asked to respond in writing no later than 12 May so that the responses can be circulated prior to, and discussed at, the Special Session to be held during the 2017 Annual Meeting.

5.5 The Review Group's evaluations of the 2017 APRs are contained in document IP(17)4 (Annex 2). All the evaluations were agreed unanimously by the Review Group. The Review Group used the following format in presenting its evaluations:

- a paragraph (shown in bold italics) summarising its overall assessment of the APR in terms of whether it provided a clear account of progress and noting any shortcomings;
- a paragraph highlighting interesting developments or challenges related to implementation of NASCO's agreements and guidelines;
- paragraphs summarising the actions taken in relation to management of fisheries, habitat protection and restoration and aquaculture and related activities; and
- a list of questions where clarification is being sought from the Party/jurisdiction about the information (or lack of information) provided in the APR.

5.6 For some APRs, and as previously indicated by the Review Group, evaluating the progress made on actions remained difficult because the descriptions of the planned actions in the IP were vague or imprecise. The Review Group had previously highlighted such shortcomings and has noted this difficulty in some of its evaluations. The Review Group noted that the APRs for several Parties/jurisdictions continued to lack a clear account of progress in implementing and evaluating some, or all, of the actions detailed in their IPs, despite the further guidance provided on completing the template and the provision of examples of good practice. These reports either included:

- one or more gaps in the 'Progress on Action to Date';
- very little information or quantitative data to demonstrate progress and continuing reliance on links to information; and/or
- comment(s) bearing no clear relationship to the proposed action(s).

5.7 The Review Group also noted that several of the 2017 APRs had provided similar information to that provided in 2014, 2015 and 2016 even when the Review Group had previously sought clarification or further detail in its questions.

5.8 These shortcomings are a continuing concern to the Review Group given that improving commitment to NASCO agreements was a key aspect of the 'Next Steps' and External Performance reviews and as the second reporting cycle is almost completed. When preparing future APRs, Parties/jurisdictions are again reminded to provide evidence of progress made to address the action in the current year or to indicate that no further progress was made, taking account of previous questions asked by the Review Group.

5.9 The Review Group prepared a summary table (Table 1 below) to provide an overview of the number of actions in each IP/APR, the progress with their implementation and the extent to which that progress was reported in 2017 for each Party/jurisdiction. This table should be interpreted with care taking account of the explanatory footnotes.

5.10 The Review Group is concerned that, for some Parties/jurisdictions, actions have not yet started or where actions are on-going there has either been no report of progress or the reporting is unclear. Overall, the Review Group again considered that the most common fault with the information provided continues to be a lack of quantitative evidence on the extent of the progress made and/or what the results have been. All Parties/jurisdictions are asked to address this in future APRs.

5.11 Last year, the Review Group had noted that if the evaluation process is to work effectively, and be fair and equitable, clearer and more detailed reporting will be required in the 2017 APRs for several EU Member States. The Review Group considers that more detailed, clearer reporting will be required in the 2018 APRs for:

- EU - Denmark;
- EU - France;
- EU - Spain (Asturias);
- EU - Spain (Cantabria);
- EU - Spain (Galicia);
- EU - UK (Scotland); and
- Russian Federation.

5.12 The Review Group wishes to particularly commend the Faroe Islands for the clarity of its 2017 APR.

5.13 The Review Group noted that several Parties/jurisdictions reported some interesting and useful developments and challenges in addressing NASCO's Resolutions, Agreements and Guidelines, including:

- **Canada:** release of the 'Forward Plan for Atlantic Salmon' designed to take forward the 61 recommendations of the Ministerial Advisory Committee on Atlantic Salmon. Key highlights include reviewing the Wild Atlantic Salmon Conservation Policy and improving the co-ordination of science and research related to wild salmon through an Atlantic Salmon Research Joint Venture;
- **Denmark (in respect of the Faroe Islands and Greenland) - Faroe Islands:** adoption of a new regulation for sea lice which includes a lower threshold for treatment of 1.5 sexually mature female lice per salmon. If the threshold is exceeded on three occasions in succession all fish at the farm must be slaughtered within 2 months;
- **EU - Denmark:** a new cormorant plan has been issued with additional measures to protect salmon. Monitoring in the River Skjern indicated that less than 50% of smolts survived passage through the estuary with cormorant predation, described in the APR as 'devastating', accounting for most of the loss. Stocking will cease in the River Storå from 2017 as the stock has been re-built;
- **EU - Germany:** lower returns in 2016 to the Rhine and Elbe rivers. Smolt predation by birds, particularly cormorants, is a significant problem in the Rhine and beavers are altering salmon habitats in the Elbe;
- **EU - Spain (Navarra):** demolition of two dams in the lower reaches of the Bidasoa river funded through the LIFE IREKIBAI project;
- **EU - Sweden:** development of a national plan for future conservation and management of Baltic and Atlantic salmon and sea-running brown trout;
- **EU - UK (England and Wales):** launch of the Environment Agency's 'Salmon Five Point Approach (5PA)'. Its mission is to restore abundance, diversity and resilience of salmon stocks throughout England, maximising the production of healthy wild salmon smolts and seeking to reduce salmon mortality at sea. The work is focused

in five areas: improving marine survival; further reducing exploitation; removing barriers to migration and enhancing habitat; safeguarding sufficient flows; and improving water quality. In Wales, fishermen and fisheries have been asked to introduce voluntary measures to ensure no salmon are killed in 2017;

- **EU - UK (Northern Ireland):** considerably improved returns, particularly of one-sea-winter salmon, in 2016. In the Lower Bann, returns were at a 20-year high;
- **EU - UK (Scotland):** introduction of a range of legislative measures to ensure harvesting is sustainable and that fishing does not damage vulnerable stocks or cause damage to the network of Special Areas of Conservation. The killing of salmon in inland waters is now managed on an annual basis and mandatory catch and release has been introduced for districts (or rivers) where stocks are below their conservation limits. The annual assessment model has been refined to allow the 2017 assessments to be made at the river level where data permit. For 2016, 28% of stocks were classed as grade 1 (> 80% chance of meeting CL), 29% as grade 2 (60 - 80% chance of meeting CL) and 43% as grade 3 (<60% chance of meeting CL);
- **Norway:** classification of 104 salmon stocks (representing 76% of the total Norwegian spawning target) using a National Quality Norm for Wild Salmon. While management targets were achieved for 82 of these stocks, only 23 of the stocks were classed as 'Good or very good' and 52 stocks were classed as 'Poor or very poor';
- **Russian Federation:** mortality of salmon in two rivers in the Murmansk region caused by Ulcerative Dermal Necrosis (UDN). Unlike 2015, no decision was taken to close the recreational fisheries in the affected rivers;
- **United States:** release of a draft recovery plan for endangered Atlantic salmon within the Gulf of Maine region outlining specific approaches to reduce threats to the species, identifying specific timetables for action and estimating costs to achieve recovery goals. Returns to the US remain 'dire' with a provisional return of 626 fish in 2016.

Parties/jurisdictions not submitting APRs

5.14 No APRs had been received from Denmark (in respect of the Faroe Islands and Greenland) - Greenland, EU - Finland and EU - Portugal by the time the Review Group met to undertake its evaluations and were consequently not reviewed. The lack of these APRs is a concern to the Review Group.

Improvements to the APR template

5.15 The Review Group noted that the category 'Completed for the Year' had been included as a choice field in the 2017 APR reporting template because some actions, such as monitoring programmes, are annual activities while others would not be expected to be completed until the end of the IP reporting cycle. The inclusion of this additional category appeared to have caused some confusion in completing the 2017 APRs and the Review Group considers that it would be clearer use only three choices: 'Not Started', 'Ongoing', 'Completed' for the 2018 APRs and recommends that the Council requests that the Secretary makes this change to the reporting template.

5.16 The Review Group discussed the approach to highlighting shortcomings in the APRs. The Council had requested that where such shortcomings were identified, questions should be provided to the Parties/jurisdictions concerned for response prior to the

Annual Meeting. The Review Group considers that this approach has a number of limitations. Some of the responses received to date have been unclear and the Party/jurisdiction may not include any clarification in subsequent reporting resulting in the same or a similar question being asked the following year. This process is also time consuming and is undertaken at a busy time of year for the Parties/jurisdictions and the Secretariat in the build-up to the Annual Meeting. In addition, this approach constrains the timing of the Review Group meeting and the time it has available to conduct its evaluations. The Review Group proposes that for the 2018 APRs, rather than developing questions for response by the Parties/jurisdictions concerned it details its evaluation of progress on each action in a table at the end of each review, highlighting shortcomings, and that Parties/jurisdictions are asked to address these in the APR for the following year. The Review Group recognises that the current APR cycle is close to completion but believes that this approach might be a valuable improvement that could be used in the next reporting cycle.

6. Arrangements for Presenting the Group's Report to the Council

6.1 The Review Group agreed that the Chairman would present its report to the Council during the Special Session at the Thirty-Fourth (2017) Annual Meeting. The Group agreed that this should briefly summarise the Group's working methods and provide an overview of the evaluations in terms of completeness and timeliness of reporting and progress to date. The circulation of the responses to the Group's questions ahead of the Annual Meeting should facilitate discussion at the meeting involving all Parties and NGOs.

7. Recommendations for the Third Round of Implementation Plans

7.1 At its 2015 meeting, the Review Group had discussed changes that might be made to the next (third) cycle of IPs and the subsequent APRs, which it anticipates will commence in 2019, so that these might be considered with a view to improving the effectiveness of future reporting. These were as follows:

- many of the actions that were planned by Parties/jurisdictions had been vague or unclear making it difficult to assess progress. In other cases, actions had little bearing on NASCO agreements or guidelines, even when the Party/jurisdiction was not abiding by the terms of the agreements and guidelines. In the next round of IPs, it may be necessary to include specific topic areas on which Parties/jurisdictions would be expected to provide an action if they do not demonstrate that they are fully compliant with NASCO agreements and guidelines;
- greater efforts should be made in the next round of IPs to ensure that all actions are clearly and concisely described. Any IPs that do not should not be accepted by the Review Group but returned to the Party/jurisdiction for revision; and
- there may be a need to include some standard questions in the template for the next round of IPs with a view to ensuring that such information is provided by all Parties/jurisdictions (e.g. relating to sea lice levels and containment within marine salmon farms).

7.2 The Review Group noted that all the Members of the West Greenland Commission had agreed to apply the Six Tenets for Effective Management of an Atlantic Salmon Fishery in order to evaluate the monitoring and control measures applying to their salmon

fisheries. These tenets have already been applied to the salmon fishery at West Greenland and led to the adoption of an Updated Plan for Implementation of Monitoring and Control Measures in the Salmon Fishery at West Greenland, progress on which had been reported in the 2016 APR for Greenland, CNL(16)21. There had been some discussions within the West Greenland Commission as to whether the six tenets might be applied more widely to include all NASCO Parties/jurisdictions. If that is done, consideration might be given to including a section in the new IPs dealing with the monitoring and control elements covered by the six tenets.

7.3 The Review Group noted that in 2011, prior to the development of the second cycle of Implementation Plans covering the five-year period 2013 - 2018, the Council established a Working Group on Future Reporting under Implementation Plans and Evaluation of these Reports comprising one, but no more than two representatives from each Party and from NASCO's accredited NGOs (representatives were to be notified to the Secretariat by 1 July 2011). That Working Group was asked to report its recommendations to the 2012 Annual Meeting and its report included 'Guidelines for the Preparation and Evaluation of NASCO Implementation Plans and for Reporting on Progress', CNL(12)44 and templates for both Implementation Plans, CNL(12)42 and Annual Progress Reports, CNL(12)43. The timetable used for the development of IPs covering the period 2013 - 2018 was as follows:

June 2011	Council decides to establish a Working Group on Future Reporting under Implementation Plans and Evaluation of these Reports
July 2011	Members of the Working Group notified to the Secretariat
November 2011	Meeting of the Working Group on Future Reporting under Implementation Plans and Evaluation of these Reports and Guidelines
June 2012	Council adopts 'Guidelines for the Preparation and Evaluation of NASCO Implementation Plans and for Reporting on Progress', CNL(12)44 and templates for both Implementation Plans, CNL(12)42 and Annual Progress Reports, CNL(12)43.
February 2013	2013 - 2018 Implementation Plans submitted to the Secretariat
March 2013	Review of Implementation Plans
June 2013	Review Group's findings presented to the Council
September 2013	Final 2013 - 2018 Implementation Plans submitted to the Secretariat

7.4 While it is not a matter for the Review Group to decide on the arrangements for future Implementation Plans/Annual Progress Reports, it wishes to highlight to the Council that if a new cycle of IPs (2019 – 2024) is to commence in 2019, there would be a need to decide on the arrangements for preparing for this cycle at the 2017 Annual Meeting.

8. Report of the Meeting

8.1 The Review Group agreed a report of its meeting.

9. Any Other Business

9.1 There was no other business.

10. Close of the Meeting

10.1 The Chairman thanked the members of the Review Group for their contribution to the meeting and wished them a safe journey home.

Table 1: Summary overview of progress on the actions reported in the 2017 APRs

		Denmark (in respect of the Faroe Islands and Greenland)		European Union															
	Canada	Faroe Islands	Greenland	Denmark	Finland	France	Germany	Ireland	Portugal	Spain - Asturias	Spain - Cantabria	Spain - Galicia	Spain - Navarra	Sweden	UK - England & Wales	UK - Northern Ireland	UK - Scotland	Norway	Russian Federation	USA
Actions Related to the Management of Salmon Fisheries																				
F1	CD	CD-FY		OG		OG-NP	OG	OG		OG-NP	NS	NS	NS	OG	OG	CD-FY	OG	OG	OG-NP	CD-FY
F2	OG			CD		OG-NP	OG	OG		OG-NP	NS	OG	OG	OG	OG	CD-FY	OG	OG	CD	CD-FY
F3	OG			OG-NP		OG-NP		OG			NS	OG	CD	OG	OG	OG	OG	OG	OG	CD-FY
F4	OG					NS					NS	OG-NP	CD	CD	OG	OG	OG	OG	CD	
F5	OG										OG			OG	OG		OG-NP			
F6														OG						
F7														OG						
F8														OG						
F9														OG						
F10														OG						
F11														OG						
Actions Related to Habitat Protection and Restoration																				
H1	OG			OG		NS	OG	OG		OG	OG-NP	NS	NS	OG	OG	OG	OG	OG	OG	CD-FY
H2	OG			OG-NP		OG-NP	OG	OG		OG-NP	OG-NP	OG-NP	OG	CD	OG	CD-FY	OG	OG	OG-NP	CD-FY
H3	OG			OG-NP		NS	OG	OG		CD-NP	NS	OG-NP		OG	OG	OG	OG-NP	OG		CD-FY
H4						OG-NP		OG-NP			NS	OG		CD	OG	CD-FY	OG	OG		CD-FY
H5														OG		OG				
H6																CD				
Actions Related to Aquaculture and Associated Activities																				
A1	OG-NP	OG					OG	OG-NP			NS			OG	OG	CD-FY	OG	OG	OG	CD-FY
A2	OG-NP						OG	OG						OG	OG		CD-NP	OG	OG	CD
A3	CD							OG							OG		CD-NP	OG	OG	CD-FY
A4	OG																	OG		CD-FY

Key: *NS = Not Started; OG = Ongoing - with clear progress report; OG-NP = Ongoing - without clear progress report; CD = Completed - with clear progress report; CD-NP = Completed - without clear progress report; CD-FY Completed for Year – with clear progress report; CD-FY-NP Completed for Year – without clear progress report.*

Note: *The table above is intended to show for each Party/jurisdiction which actions in the IP have been initiated and are ongoing, which have yet to commence, and which are completed. It should be noted that the Implementation Plans specify the planned timescales for implementing the actions and these will differ, with not all scheduled to commence in 2013 and some continuing beyond 2018. The scope of the work under each action will also differ. In some cases, an action to address a particular threat/challenge might comprise a number of different elements and although the action is shown as ongoing it does not mean that all elements have commenced or conversely that some are not completed. There is also a wide range in the number of actions in each Implementation Plan.*

IP(17)3

Meeting of the Implementation Plan/Annual Progress Report Review Group

Agenda

1. Opening of the Meeting
2. Adoption of the Agenda
3. Review of the Terms of Reference and Consideration of Working Methods
4. Update on Receipt of Implementation Plans and Evaluation of any new IPs
5. Evaluation of the 2017 Annual Progress Reports and Development of Feedback to the Parties/jurisdictions
6. Arrangements for Presenting the Group's Report to the Council
7. Recommendations for the Third Round of Implementation Plans
8. Report of the Meeting
9. Any Other Business
10. Close of the Meeting

IP(17)4

Evaluation of Annual Progress Reports and Questions from the Review Group to Parties/jurisdictions

Canada, CNL(17)26

The Annual Progress Report provides a generally clear and comprehensive report on the 12 actions identified in the Implementation Plan, particularly in relation to Action F4. Ten of these actions are on-going and two actions (Actions F1 and A3) have been completed. As previously reported by the Review Group, the precise activities that were planned are unclear, making it difficult to evaluate the progress made. Nonetheless, the APR provides generally clear and comprehensive reports to address the topic areas covered by each action. However, there is a lack of quantitative information, notably for actions A1 and A2, and a number of questions are raised for clarification.

Canada has published a *Forward Plan for Atlantic Salmon* in response to the Ministerial Advisory Committee on Atlantic Salmon's 61 recommendations to address conservation, enforcement, science and international issues. A priority is to review the Wild Atlantic Salmon Conservation Policy, which will be done collaboratively, with publication expected in 2017. Next steps include the formulation of regionally distinct implementation plans. Also of note is the formation of an Atlantic Salmon Research Joint Venture to prioritise scientific research and data and information-sharing. The intention is to fill the gap between watershed level science and that taking place through international fora like NASCO. Fisheries and Ocean Canada is to explore options for aquaculture legislative reform, including the development of an Aquaculture Act, to develop a clear and transparent legislative framework that enshrines the highest standards for environmental protection and mandates more transparent national public reporting for greater accountability. An outcomes-based standard for sea lice management could be considered for incorporation into new legislation.

Actions related to the management of salmon fisheries: Following new management measures to reduce exploitation and promote catch and release, release rates are estimated at 95% for large salmon and 51% for small salmon. In New Brunswick, Nova Scotia and Prince Edward Island restrictive measures, including total catch and release and gear restrictions, continued in 2016. In Newfoundland and Labrador, where declines in returns of >30% have been seen on more than half of monitored rivers in 2016, a decision on further management measures will be taken after stakeholder consultations. In Quebec, the new management measures have contributed to a 35% reduction in harvested salmon compared to the 5-year average while angler visits and fishing success with catch and release are among the highest in 20 years (Action F1). Fisheries and Ocean Canada is reviewing options to eradicate smallmouth bass from Miramichi Lake, which is connected to the Miramichi River in New Brunswick (Action F2). Linked to the Nova Scotia Salmon Association liming project, 2016 monitoring indicates a three to four fold increase in smolt output in the main branch of the West River. The scheme has been expanded with a second lime doser and a helicopter assisted catchment liming project (Action F3). Fisheries and Oceans Canada Gulf Region published an educational internet page on how to properly release Atlantic salmon in the recreational fishery. Enforcement continues to be actively pursued with 7,606 fishers and 23,349 fishing sites checked and 372 violations detected in 2016 (Action F4). Measures in place to restrict salmon by-catch include: restricted use of monofilament herring and mackerel gill nets when salmon

are present, closed areas for gill nets, delayed season openings and complete angling closures to all species in areas where salmon are vulnerable (Action F5).

Actions related to habitat protection and restoration: As part of the Recovery Strategy for Atlantic salmon in the Inner Bay of Fundy, work is underway to identify critical estuarine and marine habitat. An Action Plan for the iBOF Atlantic salmon has been prepared. Federal funding programmes provide on-going financial support for salmon conservation and recovery activities (>$4m) (Action H1). The Fisheries Protection Program is developing guidelines on: pipeline and transportation watercourse crossings, large and medium water intakes, and marine and coastal infrastructure (Action H2). Inter-jurisdictional discussions and collaborative activities are on-going but no new agreements have been struck (Action H3).

Actions related to aquaculture and associated activities: The Aquaculture Activities Regulations, which came into force in 2015, require increased reporting by licence holders. Specific data on drug and pesticide use for 2016 is not yet available. However, Fisheries and Oceans Canada has verified that there were no morbidity/mortality events caused by aquaculture activities during 2016. Further to the new regulations, Fisheries and Oceans Canada is to explore options for legislative reform, including the development of an Aquaculture Act. The goal is to develop a clear and transparent legislative framework that enshrines the highest standards for environmental protection and mandates more transparent national public reporting for greater accountability. An outcomes-based standard for sea lice management could be considered for incorporation into new legislation (Action A1). The use of triploid Icelandic salmon in Placentia Bay aquaculture operations was reviewed by the Introductions and Transfers Committee under the National Code of Introductions and Transfers. A formal risk assessment process was conducted and Fisheries and Oceans Canada approved the project pending verification of the triploid process and health status at the time of transfer. Should the project be approved, hatchery construction would begin immediately, with planned fish entry to sea cages in 2018 (Action A2). Canada's renewed National Code on Introductions and Transfers of Aquatic Organisms and the National Aquatic Animal Health Program were implemented in 2015 (Action A3). Canada has previously decided to permit the commercial production of transgenic Atlantic salmon in contained facilities. In 2016, the transgenic AquaAdvantage™ Atlantic Salmon were approved for human food and animal feed use. In 2016, there were no known regulatory violations in relation to these activities (Action A4).

Questions for written response prior to the 2017 Annual Meeting:

1. *Are the guidelines that are being developed in relation to pipeline and transportation watercourse crossings, large and medium water intakes, and marine and coastal infrastructure under the Fisheries Protection Program being developed with relevant government departments and planners and are they being supported by legislation? (Action H2).*

2. *Given the announcement that Fisheries and Oceans Canada will explore options for aquaculture legislative reform, including the development of an Aquaculture Act, will this be used as an opportunity to develop measures to support the achievement of the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action A1)?*

3. *The North American Commission Protocols for the Introduction and Transfer of Salmonids appended to the Williamsburg Resolution state that: 'Reproductively viable strains of Atlantic salmon of European origin, including Icelandic origin, are not to be released or used in aquaculture in the North American Commission Area'. With regard to the approval of the Placentia Bay aquaculture project, can triploid rates of 100% be assured and will the salmon reared be all-female strains (Action A2)?*

4. *The Review Group considers that all Parties and jurisdictions with salmon farming should have presented quantitative data in a transparent manner in their Implementation Plans as a baseline for demonstrating progress towards meeting the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. Summary data are requested to provide the baselines for Canadian salmon farming facilities (Actions A1 and A2).*

Denmark (in respect of the Faroe Islands and Greenland) - Faroe Islands, CNL(17)24

The Implementation Plan identifies only two proposed actions (there are no self-sustaining salmon populations in the Faroe Islands), and the APR provides a clear report on the progress made to address each action in 2016, one of which (Action F1) was completed for the year and the other (Action A1) is ongoing. The Review Group had proposed that all Parties and jurisdictions with salmon farming should have presented quantitative data in their Implementation Plans to demonstrate progress in implementing NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. Where this information had not been provided, the Review Group had requested that it be provided in the APR. The Review Group welcomes new information provided in the current APR.

There was no salmon fishery at Faroes in the 2016/17 season.

Actions related to management of salmon fisheries: In 2015, NASCO's North-East Atlantic Commission agreed a Decision regarding the salmon fishery in Faroese waters in 2015/16, 2016/17 and 2017/18, NEA(15)10. In accordance with this decision, and consistent with the advice from ICES, no salmon fishery took place in Faroese waters in the 2016/17 season (Action F1).

Actions related to habitat protection and restoration: Because of the small size of the Faroese rivers, there is no historic record of any natural wild salmon population in Faroese rivers or fjords. Since there are no self-supporting wild salmon stocks in Faroese rivers, there are no actions in the Implementation Plan relating to habitat protection and restoration.

Actions related to aquaculture and associated activities: A new regulation on sea lice control was adopted in 2016 which sets out strict regulatory control measures in relation to sea lice on salmon farms. Sea lice must be counted every two weeks throughout the year and lice counting must distinguish between different life stages and sizes of lice. The number of mature female lice per fish (threshold) must not exceed 1.5. If exceeded more than three times in a row, all the fish at the farm must be slaughtered within 2 months. Farms with few lice problems may increase the number of smolts put to sea. Farms with significant lice problems are obliged to decrease the number of smolts put to sea. In 2016, the number of smolts put to sea was reduced by 30% at one site and by 10% at another site and one site was denied permission to increase the number of smolts put to sea. Reporting of escapes is mandatory and farmers are obliged to have a contingency plan in case of escape incidents and to attempt to recapture escapees. The most recent information on escapes indicates that, in 2014, two incidents occurred with an estimated escape of 40,000 fish averaging 4.8kg. Since salmon mortalities are reported on a daily basis, escapes can be indirectly verified through calculation of loss of fish at slaughter. Relatively reliable estimates of escapees are, therefore, available (Action A1).

Questions for written response prior to the 2017 Annual Meeting:

The Review Group has no questions on this APR and comments the Faroe Islands on the clarity of its report.

European Union - Denmark, CNL(17)33

The Implementation Plan identifies six proposed actions, one of which (Action F2) was completed in 2016, and is considered to have partly achieved its objective. The remaining five actions were on-going in 2016. For some of the actions quantitative measures of progress are still lacking. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

The steady increase in salmon populations in all four rivers in Denmark has ceased with the trend stabilising or reversing in recent years. In the River Skjern, recruitment was low given the number of spawners so runs are expected to decline in the coming years. Monitoring in the River Skjern, has highlighted the 'devastating effect' of cormorant predation with less than 50% of smolts surviving passage through the estuary in 2016 and cormorant predation was responsible for most of the loss. A new cormorant plan has been developed with additional measures to protect salmon. However, for the River Storå, the population size is considered to be large enough to stop stocking from 2017. Catch quotas for each river are revised annually and seasons adjusted where necessary. The main barrier on the River Kongeå is being removed in 2017 providing access to more than 100km of free-flowing river with spawning and nursery areas.

No estimate has been provided of unreported catch and the confirmed catches for 2015 have not been provided but it is as stated that these were as previously reported.

Actions related to management of salmon fisheries: Denmark has continued to apply a national cormorant plan to regulate recruitment of cormorants where predation on salmonids is documented. The action is on-going with an increased number of measures being employed including shooting, removal of colonies and efforts to keep the birds away from the rivers. Despite these measures the APR indicates that the predation problem is 'worse than ever' and on the River Skjern the impact is 'devastating' (Action F1). The by-catch of salmon and sea trout in fisheries in the Ringkøbing Fjord is being assessed. The study has shown a very high by-catch of sea trout but a small by-catch of salmon. This action is completed and considered to have partially achieved its objective but a quantitative measure of progress is lacking (Action F2). Work is also underway to develop more reliable reference points for four wild salmon stocks in Denmark. Studies of potential run size have been initiated and potential runs are considerably higher than current returns. The APR indicates that the cormorant problem needs to be addressed before realistic reference points can be established (Action F3).

Actions related to habitat protection and restoration: Several hundred obstructions to fish migration have been removed as part of a programme to improve access for salmon and sea trout. The main barrier on the River Kongeå is being removed in 2017 providing access to more than 100km of free-flowing river including spawning and nursery areas. However, there is still no plan for removal of the two most important barriers on the River Storå (Action H1). Many habitat restoration projects are said to have been conducted in most watersheds, but no further details have been provided (Action H2). The APR states that 'present and potential salmon production has been estimated for Skjern, Ribe, Storå and Varde river will also be evaluated'. It is not clear which evaluations have been undertaken and which are planned (Action H3).

Actions related to aquaculture and associated activities: No actions were proposed in the Implementation Plan.

Questions for written response prior to the 2017 Annual Meeting:

1. *What further action is planned to reduce the mortality of salmonid smolts caused by cormorants given the 'devastating effect' identified in the APR (Action F1)?*

2. *What levels of by-catch of salmon were observed in the Ringkøbing Fjord and why is the project considered to have only partially achieved its objectives (Action F2)?*

3. *When is it anticipated that reliable reference points will be established for Danish salmon rivers (Action F3)?*

4. *Please provide quantitative data to demonstrate the great benefits to salmon of the restoration projects being undertaken in most watersheds (Action H1).*

5. *Please provide quantitative data to demonstrate restoration of habitat from earlier canalisation, pipe-laying and dredging (Action H2).*

6. *When is it anticipated that information on the present and potential salmon production will become available for all rivers (Action H3)?*

European Union - France, CNL(17)30rev

The partial Implementation Plan identifies eight proposed actions relating to management of salmon fisheries and habitat protection and restoration. The section of the Implementation Plan relating to aquaculture and associated activities has not been completed and consequently there are no actions on this topic in the APR. The APR reports on the progress made to address the eight actions in 2016; five actions were on-going and three have not yet started. For the on-going actions, The APR provides very little information on progress in delivering actions to protect and restore stocks. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

The APR indicates that regional management actions are referenced in the PLAGEPOMI with two new projects adopted in 2016. However, these new initiatives are provided in French (and via links to websites) and could not be reviewed.

No estimate of unreported catch in 2016 has been provided, although data on catch and release have been provided for professional and recreational fishermen.

Actions related to management of salmon fisheries: The APR indicates that discussions are on-going, in particular with the Ministry in charge of sea fishing, to obtain more information on by-catch in other fisheries in order to determine if new measures are needed to protect salmon (Action F1) and in order to develop and implement rules, criteria or management strategies to eliminate unreported catches (Action F2). Project 'renosaum', aims to redefine existing conservation limits and investigate the possibility of transporting them to all salmon rivers in France to provide a reliable management system for setting catch quotas (Action F3). Very little information is provided to allow progress on Actions F1, F2 and F3 to be assessed. Action F4 seeks to conduct annual assessments of the status of salmon stocks to determine the need for measures to control exploitation but has not yet commenced.

Actions related to habitat protection and restoration: Action H1, to update a classification table and monitor implementation of the Water Framework Directive, and Action H3, to update salmonid mesohabitat maps for use in reporting the location of spawning and nursery habitats, have not yet started. The objectives set out in PLAGEPOMI are to preserve and restore habitats and restore and guarantee free movement of migratory fish. Watercourse classification is the priority of SDAGEs 2016 - 2012 programme which seeks to reduce the impact of existing structures in a fixed five-year programme with a deadline of 2018 - 2020 (Action H2). The SALMOGLOB project, which is being conducted in close collaboration with the ICES Working Group on North Atlantic Salmon, seeks to improve understanding and awareness of the ecological and demographic mechanisms that are responsible for the decline of the marine productivity of Atlantic salmon populations and to improve stock assessment models by better accounting for biological and ecological knowledge. A PhD project related to this project is on-going(Action H4). Very little information is provided to allow progress on Actions H2 and H4 to be assessed.

Actions related to aquaculture and associated activities: There are no actions relating to aquaculture in the IP.

Questions for written response prior to the 2017 Annual Meeting:

1. *Please provide additional information to demonstrate progress on all on-going actions (Actions F1, F2, F3, H2 and H4).*

2. *All the actions in the IP are scheduled to be completed by 2018. Have steps been identified to commence progress on actions F4, H1 and H3?*

European Union - Germany, CNL(17)35

The Implementation Plan identifies seven proposed actions all of which were ongoing. The APR provides clear and comprehensive reports on the progress made to address them in 2016 with detailed supplementary information provided in annexes to the APR.

A genetic monitoring programme has been launched by the International Commission for the Protection of the Rhine (ICPR) and installation of innovative fish passes is planned in the River Murg in the upper Rhine. Cross-border co-operation has been strengthened in relation to salmon re-introduction in the upper Elbe and video monitoring has commenced in the River Nuthe (a tributary of the Elbe). Salmon stocking in the Schwarze/Pulsnitz river system in the Elbe catchment was doubled in 2016 and the fish passage will be restored at a major obstruction (Kroppen weir) in 2017.

No estimate of unreported catch has been provided but it is recognised that bycatch and illegal catches occur but are likely to be at a very low level. Catch and release is not practiced (salmon fisheries are prohibited in the Rhine).

Actions related to management of salmon fisheries: An annual exchange of information among relevant experts on the implementation of ICPR recommendations aimed at improving legal compliance and thus reducing by-catches and illegal catches of salmon by professional and recreational fishing has continued. The Dutch delegation to the ICPR has been asked to provide information on the legal implementation of the ban against fishing on salmonids in relation to illegal sale of salmonids at a Dutch market (Action F1). Stocking of the River Agger ceased in 2015 with a view to developing a self-sustaining salmon population (Action F2).

Actions related to habitat protection and restoration: In 2016, the focus in relation to increasing accessibility of spawning and juvenile habitats in the Rhine, Ems, Weser and Elbe has been on progressing the planning of 47 measures which were prioritised at the end of the second implementation phase at the end of 2015. Three measures have been constructed, 3 measures will start in 2017 and 21 measures are in the planning process. A further 9 measures are in the preliminary planning phase (Action H1). The fish passage at the barrage weir in Strasbourg was officially launched in spring 2016 and implementation planning has commenced for three efficient fish passages at three barrages in the upper Rhine. Partial opening of the Haringvliet sluices in the Netherlands is scheduled for 2018. A workshop on downstream migration was held in Maastricht in 2016 (Action H2). Action is on-going to re-establish longitudinal connectivity in the river Elbe and its primary tributaries. The previous International Management Plan (2013-2015) has been updated for the period 2016 - 2021 in accordance with the European Water Framework Directive. The selection of supra-regional priority watercourses has been modified in the updated plan (Action H3).

Actions related to aquaculture and associated activities: Action is on-going with the intention of establishing a separate, locally-adapted indigenous salmon population in North Rhine Westphalia tributaries of the Rhine so as to eliminate the need for foreign ova. Measures to allow an increase in captive breeding at the gene bank facility LANUV NRW are being taken. The Wild Salmon Centre Rhine-Seig operated very successfully but still required some imported material. It is anticipated that all programme waters could be sufficiently supplied with young salmon which has priority over imported material (Action A1). A genetic monitoring programme has been launched by the ICPR to assign returning adult salmon to their 'home' hatchery and thereby identify the most promising stocking strategies. Almost all hatcheries in the Rhine basin

participated in a pilot sampling campaign that was conducted in the winter of 2016/2017 and the programme will be further developed in 2017. (Action A2).

Questions for written response prior to the 2017 Annual Meeting:

1. *What is the estimated harvest of salmon in the Dutch fisheries and are there any proposals for measures to eliminate these harvests in the gill net fisheries close to the shore near the Haringvliet sluices (Action F1)?*

European Union - Ireland, CNL(17)37

The Implementation Plan identifies ten proposed actions all of which are on-going. As previously reported by the Review Group, the precise activities that are planned for some actions are unclear making it difficult to evaluate the progress made. Nevertheless, the APR provides clear and comprehensive reports on progress to address actions in 2016 with useful quantitative data to demonstrate progress on a number of actions.

The APR indicates that Ireland faces major challenges to achieve water quality targets set for 2021 and 2027 as required under the Water Framework Directive. A new Protocol for Standard Design of Marine Fin Fish Farms was introduced to standardise an improved design process for marine fin fish installations and will apply to all new and renewal licence applications.

Actions related to management of salmon fisheries: Enforcement activities related to illegal fishing are well described for 2016 including man hours spent (188,404), protection patrols undertaken (31,180), number of nets seized (301), number of Fixed Charge Notices issued (160) and number of prosecutions (66). In 2017, it became apparent that the powers to prosecute offences under the Fisheries Acts had not been transferred from the former Central and Regional Fisheries Boards to Inland Fisheries Ireland in 2010. Amending legislation is being prepared. Those found in contravention of the acts in the interim period can, however, be prosecuted once the amending legislation is in place (Action F1). Efforts are being made to improve catch reporting through the use of national carcass tagging and logbooks. In recent years, all commercial salmon fishermen have made a catch return. The percentage of recreational fishermen that reported in 2016 was 68.6% compared to 70.5% in 2015 and 2014. All anglers who do not return logbooks are written to and a proportion taken to court; an electronic licence application system is in place (Action F2). A national reporting mechanism for fish counter data and validation has been in place since 2014. Information from 31 counters (an increase of 10 since 2011 but one less than in 2015) was used to inform the 2017 assessment (Action F3).

Actions related to habitat protection and restoration: The APR indicates that Ireland faces major challenges to achieve water quality targets set for 2021 and 2027 as required under the Water Framework Directive. The target for 2015 has not been met. A State of the Environment report indicates that there has been no overall improvement in water quality over the first river basin cycle and improvements are required at 50% of rivers, lakes and estuaries that are impacted by pollution with agricultural sources accounting for 50% of pollution cases. The main success has been the virtual elimination of seriously polluted river sites but only 21 river sites were classified as having the highest quality compared to 575 between 1987 and 1990. The second round of River Basin Management Plans (RBMPs) were published in 2016 and the Irish Government has established a new structure with responsibility for various tasks in developing and implementing the next cycle of RBMPs (Action H1). The Forestry Act passed into law in October 2014 and a GIS-based management system is being used to ensure that forestry activities are approved only following detailed environmental consultation. In 2016, the HYDROFOR project report was published. This project investigated the relationship between forestry operations and water quality and ecology and the findings will inform the development of programmes of measures under the Water Framework Directive. Environmental requirements for afforestation were published in 2016 which updated the mandatory requirements for new afforestation and consolidated existing environmental guidelines (Action H2). Efforts to improve waste water treatment are ongoing and in recent years 81 waste water projects have been completed with 25 projects currently in progress. Further sustained investment is required. A 2016 report from the Environment Protection

Agency sets out compliance status and identifies the key national priorities that require solution, including 45 urban waste water schemes linked with river pollution, untreated waste water discharge from 43 areas in rivers, estuaries and coastal waters and reduction in the number of sites where bad ecological status was attributable to waste water from 9 in 2009 to 1 in 2015. Published information shows that the initial failure rate of domestic treatment systems was 48% but 79% of these systems are now compliant and 1,000 inspections are planned annually in 2015 - 2017 (Action H3). The APR indicates that stringent action is being taken by the Irish authorities to enforce Treatment Trigger Levels (TTLs) for sea lice, including accelerated harvests and early fallowing of sites, but no quantitative information has been provided (Action H4).

Actions related to aquaculture and associated activities: The APR indicates that in 2016 only two fish were identified as escapees during screening for coded wire tags and no escapees were reported from broodstock recovery programmes in seven rivers. In 2016, a new Protocol for Standard Design of Marine Fin Fish Farms was introduced to standardise an improved design process for marine fin fish installations and will apply to all new and licence renewal applications (Action A1). On-farm sea lice monitoring together with alternative approaches to complement husbandry and medicine treatments and rigorous regulatory oversight are reported to have led to improved sea lice levels throughout the Irish salmon farming industry and the APR indicates that sea lice levels have been well managed in 2016 with all of the inspections on smolts and 84% of inspections on one-sea-winter salmon below the TTLs (Action A2). There were no outbreaks of listed diseases in 2016. Phytoplankton and zooplankton blooms and jelly fish swarms were problematic at certain sites during the year (Action A3).

Questions for written response prior to the 2017 Annual Meeting

1. *How representative is the scanning programme for escapees and can information be provided on the number of escape events and the number of escapees from fish farms to support the statement that the level of escapes in Ireland is low (Action A1)?*

European Union - Spain (Asturias), CNL(17)27

The Implementation Plan identifies five proposed actions, and the APR indicates that all of these are on-going. The APR provides very little information on progress in delivering actions to protect and restore stocks. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

Fishing has been prohibited in estuaries and the sea since 2002. The average level of exploitation by anglers on salmon rivers is estimated at 27.1% and ranges from 7.3% to 46.8%. No catch and release data is provided though salmon over 75cm have to be released at certain periods of the year. Unreported catch is reported as being negligible in rivers and is reported not to occur in estuarine and coastal waters.

Actions related to the management of salmon fisheries: Annual monitoring programmes continue to be conducted in fishing reserves to reduce poaching (Action F1). 'Broodstock' counts have been undertaken to estimate the exploitation rates in fisheries. A fish counter has been installed at Caño on the Sella River and in 2016 operated from 21 March to 1 August. Salmon over 75cm have to be released during certain periods of the year (Action F2).

Actions related to habitat protection and restoration: An annual programme of cleaning and maintenance of fish ladders in mini hydroelectric plants and removing obstacles impeding the upstream movement of salmon has been completed for 2016. Observations of 'broodstock' indicate which obstacles are passable (Action H1). In 2016, further lectures were given to heighten awareness of the fragility of salmon in the region (Action H2). An up-to-date inventory of river obstacles that impede passage in the river network has been completed (as reported in 2015) (Action H3). Very little information is provided to allow progress on Actions H1, H2 and H3 to be assessed.

Actions related to aquaculture and associated activities: There are no actions relating to aquaculture in the IP.

Questions for written response prior to the 2017 Annual Meeting:

1. *Given the fragility of salmon stocks at the southern edge of their range and the level of angler exploitation, what measures are being taken to promote catch and release fishing and what is the current estimated level of catch and release (Action F1)?*

2. *Given the fragility of salmon stocks at the southern edge of their range, what actions are being taken to mitigate the impact of climate change (Action H2)?*

3. *Have any measures been put in place to optimise the downstream migration of smolts notably past hydropower stations (Action H3)?*

4. *Has an assessment been made of the effectiveness of the on-going stocking programme?*

European Union - Spain (Cantabria), CNL(17)36

The Implementation Plan identifies 10 proposed actions and the APR indicates that three of these are on-going and seven have not yet started. The APR provides very little information on the progress to address the on-going actions in 2016 and the Review Group is concerned to know when work will begin on the seven actions that have not yet started. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

There are no salmon fisheries in the sea. Two fish are reported to have been caught and released by anglers in 2016 (approximately 1.82% of the catch). Unreported catch is estimated to be zero.

Actions related to the management of salmon fisheries: The APR states that no work has started on actions to reduce exploitation of MSW salmon (Action F1), to promote catch and release (Action F2), to develop conservation limits and management targets (Action A3) and to estimate exploitation levels (Action F4). However, the opening of the fishing season was again delayed in 2016 (Action F1). From the 2016 season, both salmon retained and released are counted in terms of the quota for each fisherman and TAC for each salmon river in order to avoid fishermen continuing to release fish until they catch a larger specimen. Only two fish were released in 2016, representing 1.82% of the catch (Action F2). Sampling of smolts and juveniles is continuing in an index river but no estimates of marine survival have yet been obtained (Action F5).

Actions related to habitat protection and restoration: Maintenance work on existing fish passes continues to be carried out (Action H1). Four projects are underway to install gratings at the entrance and exits of hydropower facilities but progress has been limited (Action H2). Work has not started to provide appropriate river flows by implementing sustainable abstraction programmes (Action H3) and to develop integrated catchment management plans to reduce land-use impacts (Action H4).

Actions related to aquaculture and associated activities: Work has not started on the planned action to regulate salmonid stocking by implementing and enforcing existing and proposed new stocking programmes (Action A1).

Questions for written response prior to the 2017 Annual Meeting:

1. *All the actions in the IP are scheduled to be completed by 2018. What steps are being taken to commence progress on actions F1, F2, F3, F4, H3, H4 and A1?*

European Union - Spain (Galicia), CNL(17)28

The Implementation Plan identifies eight proposed actions, and the APR indicates that work is on-going on six of these and has not started on the remaining two. The APR provides very little information on progress on delivering other actions. The Review Group is concerned to know when work will begin on the remaining actions to protect and restore stocks. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

Reporting of the salmon that are caught and released is not mandatory in Galicia. About 7.5% of the licenses issued for salmon fishing in 2016 were for catch and release fishing but some fishermen practice catch and release with other kinds of license. It is estimated that in 2016 a minimum of 30 salmon out of a total of 204 salmon caught were released (14.7%).

Actions related to the management of salmon fisheries: Action F1 to establish Conservation Limits for the Eo, Ulla, Masma, Mandeo and Lérez rivers has not started (Action F1). Representatives of the Galician government participated in the annual meeting for the development of fishing rules for the fishery in the River Miño. As part of the NASCO Smoltrack project the survival of smolts was studied on the River Tea, the main tributary of the River Miño. (Action F2). A ban on natural baits for trout or sea trout was again rejected by fishermen in waters other than 'salmon waters' and there is an objection to increasing the extent of these waters in order to protect salmon. The APR recognises that more work is needed to increase awareness of the benefits of this type of regulation in protecting salmon (Action F3). No parr were available for stocking the River Sor in 2016. An evaluation of fish passage on the River Anllóns suggested that it was not worth continuing with the stocking programme (Action F4).

Actions related to habitat protection and restoration: The implementation of guidelines for the management of riparian vegetation in order to control river temperatures has not yet started (Action H1). Implementation of the WFD requires that all rivers achieve 'good ecological status'. The APR indicates that the Rivers Anllóns, Xubia and Miño just achieved 'moderate status' with some tributaries being in the 'bad status' category. No details are provided of actions to improve the status of these rivers (Action H2). No information is provided on the implementation of compensation flows and the APR indicates that there has been no reporting as required in River Basin Plans (Action H3). The construction of a fish pass on the River Sor and the removal of a barrier on the River Mandeo are under investigation. The presence of fish being held up at the Corcoesto Dam on the River Anllóns indicates that a fishway is urgently required (Action H4).

Actions related to aquaculture and associated activities: There are no actions relating to aquaculture in the IP.

Questions for written response prior to the 2017 Annual Meeting:

1. *Given the fragility of salmon stocks at the edge of their range, what measures are being taken to establish conservation limits (Action F1) and implement guidelines for the management of riparian vegetation in order to control river temperatures (Action H1)?*

2. *What alternatives to stocking are being implemented to enhance salmon stocks on the in the Rivers Mandeo, Xubia and Mera and to re-introduce salmon to the Rivers Sor, Anllóns and Eume and are stakeholders involved (Action F4)?*

3. *Has a programme of work been established to enable the Rivers Anllóns, Xubia and Miño to achieve good ecological status (Action H2)?*

European Union - Spain (Navarra), CNL(17)29

The Implementation Plan identifies six proposed actions, and the APR indicates that two are completed, two are on-going and two are yet to start. Where actions are on-going, the APR provides quantitative information on the progress made. The Review Group is concerned to know when work will begin on the remaining two actions.

In 2016 the annual catches were below the TAC and the MSW protection measures were applied with the angling season closed in the second week of July. There are no fisheries in estuaries or the sea, there is said to be no unreported catch and catch and release is considered to be uncommon. Through the LIFE IREKIBAI project (LIFE14 NAT/ES/000186) three fishways have been evaluated and two dams have been removed.

Actions related to the management of salmon fisheries: Work has not yet started on the development of conservation limits due to lack of funding (Action F1). Data for stock assessment was collected in 2016 with including biometric data collected from both rod caught salmon and salmon caught in a trap, monitoring of juveniles and redd counting. Smolt trapping was not possible due to previous flood damage to the rotary screw trap. In 2016, according to the tentative limits, the conservation status of the Bidasoa salmon stock remains unfavourable (Action F2). A TAC of 81 salmon was set for the rod fishery in 2016 with a TAC for MSW salmon alone of 28 fish. When 80% (22 fish) of the MSW TAC had been caught, the fishery was closed for one week (Action F3). Broodstock collection and fry and autumn parr stocking have been undertaken on the Bidasoa river and its tributaries in 2016. All stocked fish are marked (adipose clip) with parr also tagged with coded wire tags that allow the differentiation between the progeny of 1SW and MSW parents (Action F4).

Actions related to habitat protection and restoration: Work to update salmonid mesohabitat maps has not started (Action H1). Through the the LIFE IREKIBAI project (LIFE14 NAT/ES/000186) the first three fishways were evaluated during the 2016/2017 migrtions with the analysis of the data ongoing. Two dams (Endarlatsa and Bera) were removed during the summer of 2016 (Action H2).

Actions related to aquaculture and associated activities: There are no actions relating to aquaculture in the Implementation Plan.

Questions for written response prior to the 2017 Annual Meeting:

1. *Given the fragility of salmon stocks at the southern edge of their range, are steps what measures are being taken to to establish reference limits (Action F1) and salmonid mesohabitat maps (Action H1)?*

2. *Has the success of the stocking programme on the Bidasoa River been evaluated (Action F4)?*

European Union - Sweden, CNL(17)21

The Implementation Plan identifies eighteen proposed actions and the APR provides clear information on the progress made to address the majority of the actions in 2016, three of which are complete and fifteen are on-going. However, there appears to have been no progress on Actions H3 and H5 in 2016.

In 2015, the Swedish Government requested the preparation of a national plan for the future conservation and management of salmon and sea-running brown trout in both the Baltic Sea and the Atlantic Ocean. The plan was delivered in late 2015 but has not yet resulted in any changes in the Implementation Plan. In 2014, a ban was imposed on gill-net fishing for salmon along the coast at water depths >3m. Implementing actions and control has been undertaken in 2015 and 2016 resulting in no mixed-stock fishing on the coast. In 2013 and 2016, despite weak spawning runs due to impaired sea survival, the electrofishing monitoring has shown an increase of fry (0+) and parr (>0+) over the period 2012 - 2016.

Actions related to management of salmon fisheries: Legal commercial fishing for salmon on the coast has been prohibited since 2014 and catches were insignificant in 2016, with only occasional catch of salmon in gillnets by non-commercial fishermen. Catch and release in rivers increased to 18% and in individual rivers a maximum legal size was imposed. There is a bag limit of two salmonid fish in sport fishing on the coast. It is estimated that the bag limit will result in practically no fishing mortality for salmon in sport fishing in the sea (Action F1). The APR indicates that mixed-stock fisheries on the coast are 'trifling'. However, there is still a mixed-stock (reared and wild fish) fishery in the two major rivers; the proportion of wild fish caught as 'by-catch' is estimated to be 2% in the River Lagan and 25% in the Göta älv (Action F2). Fin clipping of reared salmon and trout has continued in 2016 and allows wild and reared salmon to be distinguished. During the period 2000 - 2016 the average number of marked reared salmon smolts released annually has been approximately 170,000. (Action F3). A genetic baseline has been completed for 18 of 23 salmon stocks and a report will be published in late 2017 (Action F4). The efficiency of the traps in the index River Ätran have been evaluated and the results have been used to establish Biological reference points (Action F5). Conservation limits and Management Targets have been set for the index river and a process for transporting these to other rivers has been developed (Actions F6). Data on in-river exploitation has been gathered for the index river over the period 1985 - 2016 but reporting of fishing effort data for other rivers is not required under Swedish legislation (Action F7). In 2017, a new project will be launched in an effort at increasing reporting of non-commercial catch data. Reporting of catch statistics is compulsory for commercial fishermen (Action F8). While there has been no national action on reducing over-exploitation of MSW fish in rivers through restrictions on landing large fish, voluntary restrictions have been implemented in some rivers (Action F9). The number of sites being monitored for salmon parr recruitment had decreased in recent years but it is planned to increase monitoring to 20 sites in 2017 to reverse this trend. (Action F10). Fish management units have already been formed in many rivers but a need for management units in smaller rivers and in some parts of the larger rivers has been identified. Information exchange and discussions with river managers and land owners are on-going. The catch of salmon in rivers without management units is generally low (Action F11).

Actions related to habitat protection and restoration: All salmon rivers and their tributaries with salmon that require liming are presently included in a liming program. Generally, the goal of keeping pH above 6 and labile aluminium at non toxic levels has been achieved (Action H1). A report on compiling the findings of habitat surveys indicates that available habitat has increased by 16% since 1991 mainly due to new fishways, liming operations and habitat

improvement (Action H2). A plan for continued habitat restoration in salmon rivers started in 2015 but no report on progress was provided for 2016 (Action H3). Criteria for best available technology (BAT) for hydropower generation were established in 2015 (Action H4). Work in establishing criteria and a work plan for surveillance of hydropower plants requires action (Action H5).

Actions related to aquaculture and associated activities: Annual monitoring of rivers for the presence of *G. salaris* was undertaken as planned. During 2015, the River Rolfsån in Halland County became infected and is being monitored. Measures have been undertaken to avoid spreading the parasite, e.g. a ban on stocking salmonid fish in the catchments of uninfected rivers. A report on the presence of *G.salaris* in Swedish rivers was compiled in February 2017 (Action A1). Alien (escaped) salmon have been collected and will be evaluated when the development of the baseline (Action F4) is published in 2017 (Action A2).

Questions for written response at the 2017 Annual Meeting:

1. *Are there plans to revise the legislation to require reporting to allow in river exploitation levels to be established for rivers other than the index river (Action F7)?*

2. *The APR indicates that the Swedish authorities consider G.salaris to be a great threat to salmon stocks. In the light of the spread of G.salaris to a new river in 2015, are there plans to increase monitoring and take additional measures to prevent the further spread of the parasite (Action A1) ?*

European Union - UK (England and Wales), CNL(17)31

The Implementation Plan identifies 12 proposed actions, a number of which are divided into sub-headings. The APR provides clear and comprehensive reports to address the topic areas covered by each action, all of which are on-going with three actions completed for the year.

A five-point approach (5PA) has been jointly developed which sets out high level commitments to restore England's salmon populations. The work is focused in five areas: improving marine survival; further reducing exploitation by nets and rods; removing barriers to migration and enhancing habitat; safeguarding sufficient flows; and improving water quality. Natural Resources Wales is examining options to reduce exploitation and is considering mandatory catch and release in rivers in the worst risk categories. In the interim, fishermen have been asked to introduce their own voluntary measures to ensure no salmon are killed in 2017. Natural Resources Wales is seeking to develop a new research initiative to investigate the effects of extreme winter climate on salmonid spawning and examine options for mitigation.

Actions related to management of salmon fisheries: An annual assessment of the status of salmon stocks was completed for 2016 and will be reported to ICES and published (Action F1). No Net Limitation Orders (NLOs) were renewed in 2016, but 12 are due for renewal in Wales in 2017. A catch condition limiting each licensee to a maximum catch of 10 salmon was introduced for the Solway haaf net fishery to protect salmon stocks. Catchment-wide mandatory catch limits were introduced on the Rivers Leven and Crake to restrict the number of fish taken. Discussion are underway under the 5PA initiative to review the need for further controls on exploitation. A stock assessment workshop was held and a number of improvements to existing measures were identified (Action F2). Actions F3a (implement new regulatory measures for the Severn Estuary MSF) and F3b (review and amendment of the 10-year NLO for the Anglian MSF) were completed in 2014 and 2015, respectively. The review of the NE coast beach net fishery is due to be completed in 2017 (Action F3c). Recent genetic studies confirm that the beach and drift net fisheries in Northeast England exploit salmon from rivers in Scotland (47%) as well as England (53%). Efforts to promote catch and release fishing include production of a video on how to play, handle and release salmon and a introduction of a voluntary carcass tagging scheme in the Rivers Ribble and Eden. In Wales, catch and release has been promoted through press releases and in discussions with local fishery groups. Catch and release has increased from 10% in 1993 to a provisional estimate of 80% in 2016 with further increases in rates anticipated under the 5PA initiative (Action F4). Efforts aimed at disrupting illegal fishing continued in 2016 with information provided on prosecutions in 2016 (Action F5).

Actions related to habitat protection and restoration: A climate change adaptation plan continues with over 15,000 trees planted in 2016. Measures included in the second cycle River Basin Management Plans (2015 - 2021) are designed to increase resilience to climate change. Natural Resources Wales has developed Prioritised Improvement Plans for all Natura 2000 sites in Wales and Thematic Plans produced identifying strategic actions to address issues including climate change. Thermal standards have been produced for transitional and coastal waters (Action H1). Progress in re-connecting salmon habitat continued in 2016 with improved access for salmon to 555km of river in England and improved access to about 700km of river in Wales. Natural Resources Wales has begun a 5-year programme to improve access and habitat for salmon as an alternative to mitigation stocking. New regulations to enhance powers to require fish passage and screening improvements are under development in England. Three reports related to hydropower impacts were published (Action H2). Under the Restoring Sustainable Abstraction Programme, 271 unsustainable abstraction licenses have been changed

in England and a further 158 will be modified by 2020, 16 of which relate to salmon rivers. In Wales, around 35 abstraction licenses have been modified or revoked and a further 10 will be modified by 2020. Implementation of Abstraction Reforms under the Water Bill is expected by 2020 (Action H3). A number of actions have been taken concerning integrated catchment management including investigating the sources of sediment, stakeholder engagement, priding advice to land managers, encouraging uptake of incentive schemes, pollution prevention campaigns and improving soil protection, making use of local partnerships and reviewing Good Agricultural and Environmental Condition. Progress includes: investigations and wet-weather walk-overs continue to target measures to tackle diffuse water pollution; more than 1,500 organisations are engaged with the catchment based approach nationwide; Natural Resources Wales provides a publicly available on-line mapping facility ('Water Watch Wales') for users to identify the WFD status of Water Bodies; a trial to better manage conflicts between fisheries and fish-eating birds was successful and funding secured to support two Fishery Management Advisers; Catchment Sensitive Farming advice has now been given to 19,995 farm holdings; by December 2016, the Countryside Stewardship scheme in England had 2,987 live agreements; the Angling Trust Save Our Salmon campaign highlighted agricultural pollution as a key concern, along with predation by fish-eating birds; the five-year £20million 'Unlocking the Severn' project aims to re-open the UK's longest river to all fish species; announcement of a £15m Natural Flood Management Programme; and Salmon and Trout Conservation UK is continuing its investigation into the state of fly life (Action H4).

Actions related to aquaculture and associated activities: As previously reported, the Environment Agency in England no longer permits stocking of salmon into rivers that are Special Areas of Conservation (SACs) where salmon is a qualifying feature. Natural Resources Wales ended the stocking of salmon and sea trout (as reported in 2015); alternatives being used include work to resolve barriers to migration and sub-optimum habitats (Action A1). A suite of activities designed to stop the introduction and spread of non-native species is described in including monitoring for *Saprolegnia* fungal infections which were less prevalent in 2016. Monitoring is also ongoing for Red Vent Syndrome. A Precautionary Approach is taken with regard to proposals to farm non-native species where these might pose a risk to native salmonids. Monitoring for *Gyrodactylus salaris* occurs on wild fish because of the low number of farms in England and Wales. In 2016, a novel non-destructive method for sampling wild salmonids was introduced. Biological control is being used including in relation to water fern. To increase awareness, an Invasive Species Week was organized in 2016 and involved 160 organisations. A European Piscicide Working Group has been formed (Action A2). Application of discharge controls for prohibited substances and associated research on the effects of contaminants from fish farms on wild salmon populations are ongoing. In 2016, preliminary figures indicate that 330km of river have been improved including through 15 schemes to reduce sediment, 8 to reduce phosphate, 29 to manage diffuse pollution and 10 to manage point source pollution. The equivalent statistics are available for Wales. There have been no new investigations into contaminants from fish farms but previous studies did not identify a component of the effluent responsible for specific impacts so the implications for wild salmonids remain unclear (Action A3).

Questions for written response prior to the 2017 Annual Meeting:

1. *What is the timeline for the delivery of new fish passage regulations (Action H2)?*

European Union - UK (Northern Ireland), CNL(17)34

The Implementation Plan identifies eleven proposed actions ten of which are on-going (with five completed for the current year) and one of which has been completed and is reported to have achieved its objective. As previously reported by the Review Group, the precise activities that were planned are unclear (with some descriptions of actions reading like progress reports) making it difficult to evaluate the progress made. Nonetheless, the APR provides generally clear and comprehensive reports to address the topic areas covered by each action. The Review Group welcomes new information provided on sea lice levels at the one salmon farm in Northern Ireland. The Review Group welcomes the commitment to update the Implementation Plan, by 1 December 2017, in response to its comments.

All primary rivers have now been surveyed for salmon habitat and CLs established on them. Commercial salmon fisheries no longer operate in Northern Ireland. Legislation is now in place across Northern Ireland which restrict recreational harvest to only rivers meeting their management targets. Returns of salmon, particularly one-sea-winer salmon, showed considerable improvement in the DAERA area in 2016 e.g. on the largest river (the Lower Bann) returns represented a 20-year high.

Information on catch and release is only provided for the DAERA area and only as a percentage rather than number and percentage.

Actions related to management of salmon fisheries: Commercial fisheries in both the DAERA area and Loughs Agency area are currently closed and river stocks contributing to the fisheries would need to meet their MTs consistently before consideration would be given to allowing fishing activity. Similarly, recreational harvests are only permitted on rivers meeting their MTs with catch and release in rivers in which MTs are not achieved. In 2016 only 3 rivers in the DAERA area were open for harvesting while in the Loughs Agency area all rivers except the Finn were open (Actions F1 and F2). No exploitation of MSW stocks is permitted in the DAERA area irrespective of whether rivers are meeting their MTs with compulsory catch and release prior to 1 June. In the cross-border River Melvin exploitation of MSW fish is controlled by an annual allocation of tags based on the harvestable surplus. In the Loughs Agency area, MSW harvest is limited to catch and release in the River Finn, the main fishery for MSW salmon and is limited by a maximum allocation of 5 tags per angler elsewhere (Action F3). Fishery enforcement activities are carried out in both the DAERA area and the Loughs Agency area (Action F4), with quantitative information provided (e.g. no detections of illegal catches in the DAERA area and 33 successful prosecutions in the Loughs Agency area in 2016).

Actions related to habitat protection and restoration: Assessment of the impacts on fisheries of hydropower applications continued in 2016 with 12 applications reviewed and fisheries advice provided. A higher Q value is required in salmonid rivers during abstraction. An assessment of the impacts of water abstraction on fish densities has commenced (Action H1). Fisheries advice was provided on several proposed drainage projects to ensure protection of fish stocks in 2016. In addition, habitat enhancement projects were carried out on 4 rivers in 2016 (Action H2). Monitoring in relation to pollution or waste disposal continued with inspections conducted at 278 farms in 2016. In addition, more than 1,800 investigations were conducted in relation to incidents of water pollution. A 'Fish Kill' Protocol was developed and introduced in 2016 to allow a co-ordinated response to reported fish mortalities (Action H3). Work to identify barriers to migration has continued and a study of cumulative effects is being written up. A range of habitat improvement and barrier removal/passage works were conducted in 2016 although it remains unclear if an inventory of connectivity issues throughout

Northern Ireland has been completed (Action H4). To reduce illegal alterations to salmon habitat, organised patrols were carried out in both the DAERA area and the Loughs Agency area. Information is presented on the number of applications received and assessed to remove material from the river bed and permission is not granted if there will be a negative impact on fish stocks. However, it is unclear if progress was made in 2016 to improve public awareness of the impacts of the removal of material from the river bed on salmon stocks (Action H5). All primary rivers have now been surveyed for salmon habitat and CLs have been established for them (Action H6).

Actions related to aquaculture and associated activities: An assessment of sea lice levels on wild salmon returning to the River Bush takes place annually and in 2016 91% of the fish had no sea lice, 6% low levels of lice and 3% moderate lice levels. An assessment of the level of genetic introgression in wild salmon from escaped farmed salmon has been completed but a rolling programme is conducted every 3 years with the next report due in 2018. Details of sea lice numbers monitored on farmed stocks are provided (Action A1).

Questions for written response prior to the 2017 Annual Meeting:

1. *What level of resources is available to detect illegal fishing activities in both the DAERA area and the Loughs Area (Action F4)?*

2. *Has an inventory of connectivity issues throughout Northern Ireland been developed and if not when is this expected (Action H6)?*

European Union - UK (Scotland), CNL(17)32

The Implementation Plan identifies 11 proposed actions, a number of which are divided into sub-headings. In 2016, the Review Group requested more detailed reporting on progress against each action in the 2017 APR. While this request was partially met, much of the 2017 APR remains unclear and relies on web links and publications. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

The Scottish Government introduced a series of legislative measures to manage exploitation in 2016 to ensure harvesting is sustainable and does not damage vulnerable stocks or the network of Special Areas of Conservation. The killing of salmon in inland waters is managed on an annual basis with mandatory catch and release introduced for those districts (or rivers) where stocks are below their conservation limits. During 2016, refinements were made to the annual assessment model to allow the 2017 assessments to be made at the river level where data are available.

The APR does not provide the catch data requested; the reasoning for this has previously been explained.

Actions related to management of salmon fisheries: A public consultation on the draft legislation to take forward Wild Fisheries reform, took place in 2016 (Action F1a) and an analysis of the value of wild fisheries in Scotland was published (Action F1b), but no details are provided, other than through weblinks. Fisheries management plans have been developed through the Wild Fisheries Reform process and a conservation plan template has been developed and distributed to local fisheries managers in order to identify pressures and proposed responses (Action F2a). A review of the salmon counter network and prioritisation of actions is underway with the priority being the potential for counters on SAC rivers. A PIT detector system is being installed in the River Awe to enhance interpretation of data from the existing counter (Action F2b). Action F3a appears to duplicate Action F2b. Historic data relevant to the nature of MSFs is being prepared for analysis and tracking of smolts from several rivers and development of a smolt dispersal model are underway to better understand marine migration routes (Action F3c). Action F4 seeks to improve salmon fisheries and enforcement and reduce illegal fishing. A new Working Group has agreed revisions to enforcement provisions and is considering the introduction of a national intelligence database (Action F4a). Carcass tagging for net caught fish in category 1 and 2 areas was introduced in 2016 (Action F4b). Implementation of a monitoring strategy for marine renewable energy projects is on-going together with projects to support the aims of the overall strategy e.g. trialing a trawl incorporating video recording and PIT tag detection (Action F5a). The Independent Consenting Review of Scottish Aquaculture was published in July 2016 and an Aquaculture Industry Leadership Group was established. A new sea lice management policy is being implemented (Action F5b). The SARF project remains ongoing (Action F5c). Voluntary industry-led publication of quarterly lice data continues (Action F5d). Sensitivity maps for aquaculture sites are being developed based on conservation status of wild salmon and the potential distance of influence of sea lice (Action F5e). An improved modeling tool for discharge consents has been launched (Action F5f). A report has been published on the Scottish Shelf Model that should inform sea lice dispersal projections (Action F5g). Links to websites are provided for Actions F5h and F5i but no summary information has been provided.

Actions related to habitat protection and restoration: Action H1 describes a broad suite of activities under Scotland's Climate Change Adaptation Plans. In 2016, a temperature

monitoring network was implemented including spatial modeling components to highlight sensitive areas. National temperature predictions and planting opportunity maps are being produced. Riparian tree planting has been carried out but no quantitative information provided A barrier assessment programme is underway with five barrier removal projects completed in 2016. Options development and design has commenced for 8 barriers, design has been completed for two barriers and 29 scoping studies undertaken (Action H2). Action H3 seeks to ensure provision of appropriate flows. The transferability of hydraulic habitat models has been assessed and models produced that can be applied to salmon fry. Research and reviews are ongoing in relation to implementing the RBMP process and issue of CAR licences for abstraction but no details are provided. An integrated catchment management approach is being conducted to reduce the impact of land use with farm visits in priority catchments and ~100% compliance with guidance in a number of these catchments but quantitative information is lacking (Action H4).

Actions related to aquaculture and associated activities: Scotland continues to regulate stocking of fish in its waters with 391 licenses issued in 2016 (Action A1). Progress on action A2 (implementation of EC Council Regulation 708/2007 concerning Use of Alien and Locally Absent Species in Aquaculture and encouraging water users to remain vigilant to the risks of non-native species and pathogens and report sightings) remains unclear although the *G. salaris* contingency plan is being updated. Action A3 is intended as a wide-ranging action concerning the implementation of the Aquaculture and Fisheries Act of 2013. The APR indicates that the Ministerial Group for Sustainable Aquaculture seeks to ensure that any growth of aquaculture in Scotland is sustainable but no further details are provided other than a reference to Action F5b.

Questions for written response prior to the 2017 Annual Meeting:

1. *Can additional information be provided in relation to the carcass tagging programme for rivers in category 1 and 2 areas (Action F4b)?*

2. *In seeking to ensure that growth of the aquaculture industry is sustainable, what measures are being taken to protect wild salmon and achievement of the international goals for sea lice and escapees set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action F5b and Action A3)?*

3. *What mechanism exists for engagement with wild salmon interests regarding the establishment of the Aquaculture Industry Leadership Group (Action F5b and Action A3)?*

4. *How will the redefining of satisfactory measures under the new sea lice management policy and the accompanying enforcement regime ensure the protection of wild salmon and achievement of the international goals for sea lice set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action F5b)?*

5. *Action A3 is reported to have been completed. Have the expected outcomes been achieved and, if so, please provide details (Action A3)?*

6. *The Review Group considers that all Parties and jurisdictions with salmon farming should have presented quantitative data in a transparent manner in their Implementation*

Plans as a baseline for demonstrating progress towards meeting the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. Summary data are requested to provide the baselines for Scottish salmon farming facilities.

Norway, CNL(17)25

The Implementation Plan identifies 12 planned actions and all are on-going. The APR provides a clear report on measures to address them in 2016, although the Review Group has identified some questions for clarification.

In 2016, 104 salmon populations were classified according to the National Quality Norm for Wild Salmon. Management targets, based on spawning target attainment alone, were achieved for 82 of the 104 classified stocks in the period 2010 - 2014. However, only 23 of the 104 stocks were classed as good or very good quality, 29 stocks were of moderate quality and 52 stocks were classified as poor or very poor. Forty-five stocks did not reach the goal for Conservation limit attainment and 68 stocks did not reach the goal according to the Genetic Integrity Dimension. Overall, quality status for 36 stocks was determined by influences from farmed salmon. For 32 stocks, the status was worse than good for both dimensions. An action plan is being developed with the goal of improving the status of the stocks.

National fishing regulations were revised in 2016. A new agreement for a revised management regime for the River Tana has been approved by the parliaments of both Norway and Finland.

Actions related to management of salmon fisheries: In 2016, out of 186 salmon stocks with sufficient information, management targets were achieved in 87% of stocks. In response to the scientific advice, new regulatory measures were introduced for sea and river fisheries in 2016 (Action F1). An increasing number of rivers were subject to mandatory mid-season fishery assessments in 2016. An evaluation revealed that very few managers initiate pre-agreed measures when the assessments indicate immediate angling restrictions are required and adjustments are needed (Action F2). In 2016, a workshop was held reviewing all the spawning targets in Nordland County. A report describing progress on a new method to calculate spawning targets is in process (Action F3). A new agreement on a revised management regime for the River Tana has been approved in 2017 by the parliaments of Norway and Finland (Action F4).

Actions related to habitat protection and restoration: Twenty-two rivers are now included in the national liming programme which cost NOK45 million (approximately £4 million) in 2016. Salmon stocks have been re-established in limed rivers and account for 10 - 14% of total salmon catch in Norwegian rivers (Action H1). Revisions of licence conditions and rules of operations for hydropower plants were addressed in 5 river systems in 2016 (Actions H2). The road authorities have removed 22 migration obstacles for salmon and sea trout in 2016 and future measures to mitigate obstacles have been prioritised (Action H3). In two rivers in Central Norway, migration barriers caused by erosion protection were replaced by small weirs and ponds in four tributaries (Action H4).

Actions related to aquaculture and associated activities: Growth or reduction in salmon aquaculture production is now regulated within each of the designated production areas with reference to the effects of sea lice on wild salmon stocks. Research on, and modelling of, how sea lice from salmon farms affect wild salmonids was refined in 2016 (Action A1). In 2016, the aquaculture industry removed 521 farmed fish from 37 salmon rivers to reduce the risk of genetic interaction with wild stocks. Research on sterile farmed salmon is on-going to reduce genetic and ecological threats to wild salmon populations and several commercial salmon farmers have started using triploid fish in 'green' salmon farm licenses. The national programme for monitoring escaped salmon is on-going and a field handbook, standardising the various methods used in the programme, was developed in 2016 (Action A2). Efforts to

combat the parasite *G. salaris* in five infected rivers in the Rauma region started in 2014 and these rivers will be monitored for a 5-year period. The two infected rivers in the Skibotn region were treated in 2015 and 2016. The building of a long-term fish barrier in the River Driva began in 2016 (Action A3). A surveillance programme has been established to identify self-sustaining pink salmon populations in rivers in Finnmark County and removal efforts to reduce the extent of spawning were carried out in 2016 (Action A4).

Questions for written response prior to the 2017 Annual Meeting:

1. *What steps have been taken to ensure pre-agreed measures are implemented when mid-season assessments indicate that these are required (Action F2)?*

2. *What level of mortality of wild salmonids is allowed before salmon farm production is decreased and how is this approach consistent with the international goals for sea lice in NASCO's Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action A1)?*

3. *Have the intended public consultation on amendments of the Norwegian Aquaculture Act been undertaken and if so has it resulted in a strengthened legal base for protection of wild salmon and achievement of the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action A2)?*

Russian Federation, CNL(17)23

The Implementation Plan identifies nine proposed actions, seven of which are on-going and two (Actions F2 and F4) are completed. The APR provides a clear report on the progress made to address five actions in 2016. Little information is provided to demonstrate progress on Actions F1, H2, A1 and A2. For the evaluation process to work effectively and be fair and equitable, the Review Group will require more detailed reporting on progress against each action in the 2018 APR.

During the salmon spawning run in 2015, a mass mortality of salmon was observed in the Kola River, Murmansk region, caused by Ulcerative Dermal Necrosis (UDN). In 2016, mortality attributed to UDN was again observed in the Kola River and also in the Tuloma River. However, no closure or restriction of recreational fisheries for salmon occurred in the Kola river and in the tributaries of the Tuloma river system during the 2016 season.

No estimate of unreported catch has been provided for 2016 (as was the case for 2015).

Actions related to management of salmon fisheries: In the Republic of Karelia the best guess-estimate of illegal catches in 2016 was 3 tonnes. No other estimates of unreported catches were available for 2016. In an effort to reduce the level of unreported catch, recreational fisheries for salmon were closed in some remote fishing sites in the Varzuga River for 2016 and catch-and-take fisheries were prohibited in some areas. Protection patrols in rivers, lakes and coastal areas were undertaken to prevent illegal fishing and some recreational and commercial fishing sites hired protection staff (Action F1). A comprehensive genetic baseline has been established through the Kolarctic Atlantic Salmon project (2011 - 2013) and has been used in establishing fishing regulations for anadromous fish (Action F2). Quota allocations for coastal salmon fisheries in the White Sea were made using data on salmon stock contributions to the fisheries. In 2016, 'free migration' periods were established for coastal fisheries in the White Sea. Salmon fisheries have been banned in areas of the Barents Sea and the White Sea to protect migrating salmon. Any fisheries have been banned in estuaries for 0.5km on both sides of outlets of rivers. Other seasonal restrictions have been set for coastal fisheries (Action F2). Conservation limits have been set for salmon stocks in the Murmansk region and were revised in 2016. In the Arkhangelsk region and the Nenets Autonomous Region, conservation limits have been set for exploited salmon stocks. No conservation limits have been established in the Republic of Karelia (Action F3). Clearer legislation was completed in 2015 to manage the fisheries conducted by indigenous small nations of the North. In 2016, salmon quotas were set for Sami communities of the Murmansk region (Action F4).

Actions related to habitat protection and restoration: The carrying capacity of some Barents Sea rivers of the Murmansk region was revised in 2016 on the basis of new data from spawning and nursery grounds mapping. The re-assessment of the carrying capacity of the White Sea rivers of the Murmansk and Archanglesk regions is underway. A study to estimate salmon habitat and productive capacity in the Republic of Karelia is planned (Action H1). General recommendations on habitat restoration were prepared for a number of salmon rivers in the Murmansk region in 2015 and then updated in 2016 but no detailed plans have been developed for specific rivers (Action H2).

Actions related to aquaculture and associated activities: The Federal Law on aquaculture came into force in 2014 and a new amendment was introduced in 2016. No by-law regarding management of sea lice in aquaculture has been developed. However, in accordance with the current rules on veterinary control, the regional veterinary authority inspect salmon farms

quarterly to check for diseases and parasites (Action A1). Veterinary controls for *G.salaris* are applied in aquaculture and new measures are under development. Some recreational fisheries companies in the Murmansk region have started voluntary programmes for anglers to disinfect their tackle, clothes etc. While basic recommendations to prevent the spread of *G.salaris* have been developed, no obligatory measures to prevent the introduction or further spread of the parasite through recreational fisheries have been developed (Action A2). A comprehensive scientific evaluation is required prior to any introduction of aquatic species and no movements originating from outside the North-East Atlantic Commission area of reproductively viable non-indigenous anadromous salmonids or their gametes has occurred in 2016 (Action A3).

Questions for written response prior to the 2017 Annual Meeting:

1. *The Review Group considers that all Parties and jurisdictions with salmon farming should have presented quantitative data in a transparent manner in their Implementation Plans to provide a baseline for demonstrating progress towards the international goals for sea lice and containment in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. The Russian Federation has not provided these data. Can the results of monitoring and enforcement for sea lice and escaped farmed salmon be provided?*

2. *The APR states the in cases of high sea lice infestation, approved methods are recommended. What are the Treatment Trigger Levels and what remedial actions are taken (Action A1)?*

3. *As the parasite G. salaris has been identified as a threat, what specific veterinary measures have been undertaken to prevent the spread of the parasite (Action A2)?*

United States of America, CNL(17)22

The Implementation Plan identifies twelve proposed actions, all of which are considered to be completed for the year. The APR provides a clear and comprehensive report on the progress made to address all the planned actions in 2016. However, the Review Group has a number of questions for clarification.

In 2016, the US Fish and Wildlife Service and NOAA Fisheries released a draft recovery plan for endangered Atlantic salmon within the Gulf of Maine region. The plan outlines specific approaches to reduce threats to salmon and provides a vision for Atlantic salmon recovery that includes long-term objectives and criteria, research and management actions, as well as time and cost estimates to recover and conserve the species in its native habitats. The status of Atlantic salmon in the United States remains 'dire' with provisional returns of 626 salmon in 2016.

Actions related to management of salmon fisheries: In 2016, the United States continued to play an active role in the work of NASCO including facilitating the sampling of the West Greenland fishery (Action F1). The APR indicates that there are stringent and extensive regulations governing recreational fishing for other species in salmon habitats. Fishing regulations explain that sea-run salmon are federally endangered and cannot be removed from the water. Anglers are also prohibited from retaining landlocked salmon and brown trout above 25 inches in about 40 specific waters to ensure that adult sea-run salmon are not incidentally captured and retained. A comprehensive conservation plan applicable to the entire freshwater range of endangered Atlantic salmon has not yet been developed (Action F2). For 2016, the vessel landing and dealer sales databases were queried and no record was found of Atlantic salmon having been caught. For the observer database, a recent summary report reveals the instance of salmon by-catch to be very limited over the time series (Action F3).

Actions related to habitat protection and restoration: In 2016, 30 additional aquatic connectivity projects were completed in Maine. Over 57km of stream were made accessible as a result of these projects. In Connecticut, one dam was removed in the area that is still actively managed for sea-run salmon. Removal of the Norton Mill Dam opened 17 miles of high quality habitat including areas stocked with salmon fry (Action H1). A summary of the last five years of enforcement actions in Maine pursuant to the Clean Water Act reveals fines totalling approximately US$400,000. There were no new enforcement actions made public in 2016 (Action H2). Consultations continued in 2016 among federal agencies where their activities occur in or near areas where Atlantic salmon Essential Fish Habitat (EFH) is designated. Sixteen conservation recommendations were issued which may include measures to avoid, minimise or mitigate or otherwise offset adverse effects on salmon habitat. In many instances, EFH conservation recommendations are not necessary because project proponents are already proposing best management practices to reduce impacts to the maximum extent practicable (Action H3). Under the Endangered Species Act, the United States has designated critical habitat for Atlantic salmon. NOAA and the US Fish and Wildlife Service conduct consultations with other federal agencies that require all federal agencies to ensure that any action they undertake or fund does not prevent the survival and recovery of endangered Atlantic salmon. In 2016, 55 consultations for projects within designated Critical Habitat were completed and resulted in changes to actions to reduce incidental mortality of endangered salmon (Action H4).

Actions related to aquaculture and associated activities: Monitoring continued regarding compliance with protective measures in place within the US salmon farming industry. The

current status of active farm sites in Maine shows all sites are in full compliance with the required permit conditions. However, in 2016, there were two escape events leading to recapture of two aquaculture escapees in the Dennys River and one in the Penobscot River. Since all of the farmed fish in the United States are genetically marked, authorities were able to determine that the fish were of farmed origin and from which site they escaped. Containment Management System plans are being reviewed with a view to determining if additional measures are required (Action A1). In 2016, Atlantic salmon returning to the Penobscot River were examined for the presence of sea lice and were free of any pathogens of concern (Action A1). In 2015, revisions to the existing fish health guidelines were completed and have been unanimously accepted (Action A2). Broodstock management protocols have been implemented at conservation hatcheries to maintain genetic diversity of the hatchery stock rebuilding program. Estimates of genetic diversity are used to monitor if genetic diversity within seven broodstock populations is being maintained over time. The results of monitoring are presented (Action A3). Many salmon rivers are no longer stocked with exotic species such as brown trout and rainbow trout. There is not yet a comprehensive conservation plan for Atlantic salmon regarding the stocking of salmonids to support recreational fisheries. There is, however, progress in curtailing stocking of non-native salmonids in salmon rivers. For example, in Maine, stocking locations of non-native salmonids will be spatially segregated from areas that are actively managed for Atlantic salmon (Action A4).

Questions for written response at the 2017 Annual Meeting:

1. *How effective is the 25 inch length limit on brown trout and landlocked salmon in protecting sea run salmon (Action F2)?*
2. *Can information on the scale of the by-catch reported to be very limited over the time series be provided (Action F3)?*
3. *Are there any penalties in place when authorities track escaped farmed salmon back to the farm of origin (Action A1)?*
4. *What was the scale of the escape event in 2016 and are the authorities confident that all escaped fish were recaptured (Action A1)?*

Annex 14

CNL(17)20

Written responses from the Parties/jurisdictions to the questions raised by the Implementation Plan/Annual Progress Report Review Group

Canada

1. *Are the guidelines that are being developed in relation to pipeline and transportation watercourse crossings, large and medium water intakes, and marine and coastal infrastructure under the Fisheries Protection Program being developed with relevant government departments and planners and are they being supported by legislation? (Action H2).*

The guidelines projects described are being developed through collaborations between Fisheries and Oceans Canada's (DFO's) Fisheries Protection Program and proponent groups that work with the Department on a regular basis to complete reviews of routine types of development projects. The focus of the guidelines is to ensure that the projects meet the requirements of the fisheries protection provisions of the Fisheries Act, and therefore other government agencies are not directly involved in their development. That being said, where there is potential interest from other government departments, DFO shares information and explores opportunities to cooperate on the implementation of the guidelines.

The guidelines are intended to provide advice on how to remain in compliance with the fisheries protection provisions, and therefore are policy-based. As guidelines are used and their effectiveness is assessed, the Department anticipates that it may consider enshrining these guidelines in regulation to give them force of law. At this point however, the guidelines are used to allow proponents to avoid impacts to fish and fish habitat, and thus avoid the need for regulatory reviews under the Act. Where these impacts cannot be avoided, and the guidelines cannot be followed fully, the proponents are recommended to request authorization from DFO under the Act.

2. *Given the announcement that Fisheries and Oceans Canada will explore options for aquaculture legislative reform, including the development of an Aquaculture Act, will this be used as an opportunity to develop measures to support the achievement of the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action A1)?*

It is too early in the exploratory process to be able to say definitively which legislative options Canada may wish to consider; however, international best practices will certainly be incorporated into discussions, where appropriate.

3. *The North American Commission Protocols for the Introduction and Transfer of Salmonids appended to the Williamsburg Resolution state that: 'Reproductively viable strains of Atlantic salmon of European origin, including Icelandic origin, are not to be released or used in aquaculture in the North American Commission Area'. With regard to the approval of the Placentia Bay aquaculture project, can triploid rates of 100% be assured and will the salmon reared be all-female strains (Action A2)?*

Triploid eggs are produced by application of hydrostatic pressure to fertilized eggs produced on a family-basis (i.e. eggs from one female) using a standardized protocol of application of 65,500 kPa for five minutes, at approximately 300 degree-minutes post-fertilization. At 360 degree-days post-fertilization, triploidisation is confirmed by measuring extracted DNA content using flow cytometry in which DNA from a pooled sample of pressure-treated larvae from each family is compared to average DNA content values from a diploid control sample. Triploidisation rates of 99% and above are expected from this protocol. Confidence in reported triploidy success rates is determined through selection of samples sizes from individual families using normal statistically appropriate methodologies.

Demonstration of 100% efficacy in all families is not possible unless every animal was tested, is logistically and cost prohibitive, and is not required by the Williamsburg Resolution. Failure of the triploid production process may be a consequence of egg fertilization failure where there is no incorporation of the paternal chromosomes or failure of pressure treatments to retain the second set of maternal chromosomes post-fertilization. "Failed" triploids will be composed of a mosaic of ambiguous results when measured DNA content falls out of range of both diploid and triploid groups due to poor sample preparation and aneuploid, gynogenetic, or normal diploid organisms. Families producing test results demonstrating presence of normal diploids are not authorized for transfer. Additional sampling to confirm triploidisation will occur during regular animal health surveillance in the hatchery by the provincial veterinary authorities.

All-female triploid production is planned subject to completion of hatchery and nursery construction and completion of the normal federal and provincial legislative and regulatory review and approval processes in Canada. If all approvals are secured, hatchery construction is planned to begin in 2017, first egg imports would occur in late fall 2017, first fish would be transferred to sea cages in fall 2018 or spring 2019, and first harvests realized in 2020. If all goes according to plans, peak stocking would occur in 2022.

4. *The Review Group considers that all Parties and jurisdictions with salmon farming should have presented quantitative data in a transparent manner in their Implementation Plans as a baseline for demonstrating progress towards meeting the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. Summary data are requested to provide the baselines for Canadian salmon farming facilities (Actions A1 and A2).*

Canada's Implementation Plan, developed in 2012 for the period 2013-2018, contains a commitment to implementing and improving sea lice and containment management tools which could include such elements as legislation, regulation, policy, standards, monitoring and reporting.

While Canada remains committed to the objectives of SLG(09)5 (*Guidelines on Best Management Practices to address impacts of sea lice and escaped farmed salmon on wild salmon stocks)*, the commitment in the current Implementation Plan is to ensuring that participants, including industry and governments, act in a coordinated manner that, using a risk and evidence-based approach, addresses impacts to wild fish populations.

As is indicated in the 2015 Progress Report, a number of federal and provincial initiatives are underway that will result in further information being reported on both sea lice and containment management in the 2016 Progress Report.

On behalf of Canada, DFO surveys provinces for the Progress Report and shares findings with the international community through regular NASCO reporting cycles. A comprehensive picture of Canada's management regime for sea lice and escapes has been developed and was presented at the NASCO Special Session on Aquaculture in June 2016.

European Union

EU Denmark

1. *What further action is planned to reduce the mortality of salmonid smolts caused by cormorants given the 'devastating effect' identified in the APR (Action F1)?*

The revised cormorant management plan gives wider options for management measures and the efficiency of these is now being tested in Skjern/Ringkøbing. So far, the results indicate that it is very difficult and resource demanding to substantially reduce the predation on smolts from cormorants as long as the number of birds is high. Cormorants are shot. Both in the river and in the estuary, at night roosts and newly established colonies are being removed. A major problem is winter predation on pre-smolts in the rivers. This predation is partly from wintering birds from Sweden and Finland, so it seems that the problems cannot be addressed without (Nordic) cooperation in attempt to reduce the number of cormorants overall. We seem to be running out of options for management on a national scale.

2. *What levels of by-catch of salmon were observed in the Ringkøbing Fjord and why is the project considered to have only partially achieved its objectives (Action F2)?*

The project in Ringkøbing Fjord aimed at estimating by-catch of sea trout, not salmon. Very few (if any) salmon are caught in the whitefish fishery (small mesh sizes), but the nets are rather problematic for the sea trout of 30-50 cm. The estimated bycatch of these were substantial and higher than the entire spawning run of sea-trout in Skjern River. The objectives were to suggest ways to regulate the whitefish gill-net fisheries to minimize the by-catch of salmonids, but both spatial and temporal management measures did not achieve this, so if the gill-netting is to continue a substantial bycatch must be expected.

3. *When is it anticipated that reliable reference points will be established for Danish salmon rivers (Action F3)?*

The data for establishing reference points in the 4 main rivers has been collected. The challenge is to agree on such points, because the systems are rather dynamic, still barrier removals and habitat restoration are ongoing and continue to increase the potential for smolt production, so the reference points should be adjusted accordingly. We are determined to find ambitious, but realistic reference points. If agreement can be reached the points can be established soon.

4. *Please provide quantitative data to demonstrate the great benefits to salmon of the restoration projects being undertaken in most watersheds (Action H1).*

We do have a number of quantitative data on this, but these are being (some have been) published internationally as well as being included in the output from the H2020 AMBER project, so to list them here in a NASCO report would not be feasible. However, the increase of the annual salmon runs in the 4 rivers of West-Jutland from app. 100 individuals in 1985 to

well over 15,000 now can almost exclusively be attributed to the habitat restorations (including barrier removal), because nothing else has changed.

5. *Please provide quantitative data to demonstrate restoration of habitat from earlier canalisation, pipe-laying and dredging (Action H2)?*

The number of restoration projects in the Danish rivers span from the large EU-Life NSH-project of 14 million EURO to small projects carried out by volunteers, so to gather even loose figures of the total area restored or influenced by restoration, is not possible. It is, however estimated that more than 2/3rd of the now available salmon habitat has been restored. However, most of this area was before in reasonably good condition, but upstream barriers and was only accessible after dam removal. When it comes to the proportion of river length re-meandered, opened from pipes and where gravel has been added for spawning substrate the area is smaller, but still substantial. On a national level, there are hundreds of restoration projects ongoing and even just in the 4 salmon rivers covered by the MP, nobody has an overview of all the projects being planned and carried out on a local level.

6. *When is it anticipated that information on the present and potential salmon production will become available for all rivers (Action H3)?*

The data has been collected, so they are available for all 4 rivers now, but the analyses and reports are still to be finalized.

EU France

1. *Please provide additional information to demonstrate progress on all ongoing actions (Actions F1, F2, F3, H2 and H4).*

Action F1: For the maritime (ie mostly downstream part of the estuary of river Adour) part of the French salmon fishery official data from the Direction in charge of the maritime fisheries give the amount of catches per year as it follows: for the year 2015 about 3.9 tons were declared. Among them 3.3 tons are coming from the EMU (Eel management unit) Adour and coastal streams and rivers which corresponds with ICEAS division VIII b. Almost all of that 3.3 tons were fished by professional boats from the department Pyrénées Atlantiques which correspond with the professional estuarine fishery of Adour river).

For the year 2016 data give 3.4 tons fished by maritime part of salmon fishery. Among them 2.5 tons were fished in the EMU of Adour and 2.4 tons of that 2.5 tons were precisely fished in Adour.

To assess by-catch a study has been made on the composition of declared catches. Indeed, professional downstream estuarine and coastal (within the 3 miles from the shore) fish of salmon is possible only for boats whose companies owners have a special license which is delivered at the national level in each region (regulation being the "*arrêté du 15 septembre 1993 instituant un régime commun de licences pour la pêche dans les estuaires et la pêche des poissons migrateurs le long des côtes du littoral de la mer du Nord, de la Manche et de l'océan Atlantique*"). We have then to see on the amount of catches how much were caught by authorized boats. It is indeed clear that those boats are boats which target salmon as a main fish among some other estuarine species as eel.

For 2016 that study has been made and it shows quite a high level of catches by those authorized boats: ie 2.2 t among 2.5 tons fished in Adour region. Precisely for Adour downstream estuary and transitional waters 257 kg on 2366 fished there were fished by some non-authorized boats. Only 7 referred boats fished bycatch salmon in 2016 for individual amounts close to 100 kg, which remain for those boats little amounts when compared to their global fishery.

We can then say that bycatch fishery is clearly assessed, and that on the other hand it concerns little quantities.

Action F2: For the maritime and estuarine fishery the Direction of maritime fisheries recalled to the control units of the department of Pyrénées Atlantiques the importance to target controls at sea and in downstream part of the estuary on the fishery of salmon to make sure boats targeting salmon have the specific salmon license.

The juridical framework about declaration of catches by that boats has been updated, within the framework of European regulations 1224/2009 and 404/2011, through the national regulation of 18 mars 2015 as follows: "*arrêté du 18 mars 2015 relatif aux obligations déclaratives en matière de pêche maritime*".

The local administrative services in charge of police of the sea targeted in 2016 five actions to control specifically that salmon is fished legally. No one of them lead to stress any infraction to the regulations."

Action F3: the Renosaum project has been delayed due to lack of qualified people. The project is now reoriented toward a PhD thesis. A master student is working (until September 2017) on stock-recruitment relationship and a new definition of CL. The PhD should start by the end of the year and will both develop and apply the new concept of CL on Brittany region and develop new management system of salmon angling in Brittany with the administration and stakeholder (though COGEPOMI).

Action H2: A collection of data on the various improvements carried out is under way and will be transmitted during the next report.
Action H4: Salmoglob is still an ongoing PhD. This has been presented in the last WGNAS meeting. Scientific articles are in preparation.

2. *All the actions in the IP are scheduled to be completed by 2018. Have steps been identified to commence progress on actions F4, H1 and H3?*

We will not be able to start these actions within the timeframe. We commit ourselves to take these topics more into consideration in the next plan by requesting more human resources.

EU Germany

1. *What is the estimated harvest of salmon in the Dutch fisheries and are there any proposals for measures to eliminate these harvests in the gill net fisheries close to the shore near the Haringvliet sluices (Action F1)?*

This question refers to fishing activities beyond the fisheries jurisdiction of Germany. Germany is not authorised to answer on behalf of the Netherlands.

You will find figures about the estimated harvest of migratory salmonids in the Dutch fisheries in the updated next version of the ICPR "Masterplan Migratory Fish Rhine". This will be publicly available not before the end of 2017.

EU Spain *(Asturias)*

1. *Given the fragility of salmon stocks at the southern edge of their range and the level of angler exploitation, what measures are being taken to promote catch and release fishing and what is the current estimated level of catch and release (Action F1)?*

Catch and release areas have increased significantly in recent years. In 2017 10% of the preserves are catch and release.

2. *Given the fragility of salmon stocks at the southern edge of their range, what actions are being taken to mitigate the impact of climate change (Action H2)?*

Climate change translates into decreases in river flow. In this sense, fishing for salmon (except catch & release) has been banned since 15 July since few years.

3. *Have any measures been put in place to optimize the downstream migration of smoltsnotably past hydropower stations (Action H3)?*

Work in progress on this topic for years and, by legislation, it is obliged to place grids to prevent fish entering channels.

4. *Has an assessment been made of the effectiveness of the ongoing stocking programme?*

Estimates of marked and survived fish returns are made. It will take more time (several years) to evaluate this issue.

EU Spain *(Galicia)*

1. *Given the fragility of salmon stocks at the edge of their range, what measures are being taken to establish Conservation Limits (Action F1) and implement guidelines for the management of riparian vegetation in order to control river temperatures (Action H1)?*

We have not adopted yet any special measure to stablish Conservation Limits (Action F1) for any river, other than maintaining the compilation of information on juveniles (all of the rivers) and adults where available. Guidelines for the management of riparian vegetation in RN 2000 rivers are included in the "Management Plan for Natura 2000 Network Areas in Galicia", which is currently pending.

2. *What alternatives to stocking are being implemented to enhance salmon stocks on the in the Rivers Mandeo, Xubia and Mera and to reintroduce salmon to the Rivers Sor, Anllóns and Eume and are stakeholders involved (Action F4)?*

No other measure was considered for the reinforcement of natural populations in rivers Mera or Xubia other than general measures already described (F3 or H3), whilst action H4 should be of major importance in river Mandeo and should be completed before any other action related with reinforcement. No other measures were considered for the reintroduction of salmon in

rivers Sor, Anllóns or Eume, though some other actions are related with these rivers (F3, H3, H4). No, stakeholders (local fishermen) are not involved in anything related with action F3.

3. *Has a programme of work been established to enable the Rivers Anllóns, Xubia and Miño to achieve good ecological status (Action H2)?*

There is not a specific plan for the achievement of "good quality" status in rivers Anllóns, Xubia or Miño and just the general plan for the whole basin of Galicia-Costa and for the Miño-Sil system.

EU Spain *(Navarra)*

1. *Given the fragility of salmon stocks at the southern edge of their range, are steps what measures are being taken to establish reference limits (Action F1) and salmonid mesohabitat maps (Action H1)?*

Since the lack of funding is impeding the realization of the establishment of the reference limits (Action F1) and salmonid mesohabitat maps (Action H1), the Government of Navarra is searching for different options to fund these two actions (e.g.: using own resources, etc.). Meanwhile, the provisional reference limits stablished in the IP are being taken into account and the mesohabitat map elaborated in 2007 is being used for management proposes.

2. *Has the success of the stocking programme on the Bidasoa River been evaluated (Action F4)?*

The stocking programme on the Bidasoa River is evaluated every year and results are included in the Annual Salmon Report, published in the webpage of the Government of Navarra (http://www.navarra.es/home_es/Temas/Medio+Ambiente/Pesca/Especies+pescables.htm).

EU Sweden

1. *Are there plans to revise the legislation to require reporting to allow in river exploitation levels to be established for rivers other than the index river (Action F7)?*

In the above mentioned national plan for the future conservation and management of salmon it was proposed that reporting from fishing in salmon rivers should be compulsory. A national review of this legislation has not begun. However, actions have been taken, such as information and financial contribution for example reporting systems, to raise the interest especially in the rivers for voluntary reporting of catches. The interest for this is much higher today than for some years ago.

2. *The APR indicates that the Swedish authorities consider G.salaris to be a great threat to salmon stocks. In the light of the spread of G.salaris to a new river in 2015, are there plans to increase monitoring and take additional measures to prevent the further spread of the parasite (Action A1)?*

The Gyro-monitoring programme was adjusted in 2016 because of the new infection. River Rolfsån where the new infection of *Gyrodactylus salaris* was found in 2015 is a river in the County of Halland. This is in the southern part of the Swedish west coast where the salinity is quite low (10-20 psu). Therefore, spread of the parasite is possible from one river to another through migration of salmon. In the northern part of the Swedish west coast were the salinity

is much higher (influenced by the North Sea) there has not been any spread of the parasite and the rivers are free from the parasite. Rivers in this area are also more spatially separated and stocking of salmonid fishes are not permitted in the watersheds, not even upstream of migration obstacles. Possible measures to prevent further spread of Gyrodactylus salaris especially through legislation and information will be evaluated. But it is stressed that the spread of Gyrodactylus observed during the latest years is considered to be of natural causes, fish migrating in brackish water in nearby rivers, and not due to stocking of fish or other human activities.

EU UK (England and Wales)

1. *What is the timeline for the delivery of new fish passage regulations?*

England's Department for Environment and Rural Affairs is reviewing the evidence needed to support delivery of new fish passage regulations. As such we cannot provide a timeline for the introduction of the legislation at this stage. Any proposal would be subject to formal consultation and the standard UK Parliamentary process before it could come into force.

EU UK (Northern Ireland)

1. *What level of resources is available to detect illegal fishing activities in both the DAERA area and the Loughs Area (Action F4)?*

There are currently 11 Fishery Protection Officers in the DAERA area of NI. These staff are dedicated enforcement officers tasked with protection and conservation of freshwater fish and salmon and the detection of illegal fishing activities. There are also another 13 DAERA Fishery officers who can provide some support and assistance with enforcement work. In the Loughs Agency area, there are 20 staff involved in protection work to detect illegal activities.

2. *Has an inventory of connectivity issues throughout Northern Ireland been developed and if not when is this expected (Action H6)?*

Some work on the identification of possible fish barriers has already been undertaken on a pilot basis using both anecdotal and physical evidence. To date information has data been assembled for the following rivers:

Ballinderry River
River Lagan
Sixmile Water
River Main
River Moyola

It is hoped to carry out a desk top survey that may assist with the identification of any fish barriers associated with road bridges over the next 12 – 18 months. This information could be used to help compile an inventory of fish barriers for NI and, subject resources being available, it could be considered as an objective for the next NI Implementation plan which has yet to be drafted.

EU UK (Scotland)

1. *Can additional information be provided in relation to the carcass tagging programme for rivers in category 1 and 2 areas (Action F4b)?*

Carcass tagging regulations came into force on 31st March 2016. The regulations apply to anyone taking a salmon above estuary limits in areas which were designated grade 1 or 2 in the Conservation of Salmon (Scotland) Regulations 2016 and The Tweed Regulation (Salmon Conservation) Order 2016.

Marine Scotland carried out and published, on 13 March 2017, an assessment of the first year of the tagging scheme. This was based on the findings of questionnaires issued to 9 fisheries and two boards in areas where tags were issued, and to the River Tweed Commission. Forms were returned by six fisheries and by one Board plus the River Tweed Commission. The report, which includes actions to strengthen compliance and enforcement, can be found at http://www.gov.scot/Resource/0051/00515194.pdf .

There was broad agreement that the guidance notes issued were fit for purpose, though comments were received on their distribution. Guidance has been reviewed and reissued for 2017. The revised guidance was published on 3 April 2017 and can be found at http://www.gov.scot/Resource/0051/00516332.docx .

2. *In seeking to ensure that growth of the aquaculture industry is sustainable, what measures are being taken to protect wild salmon and achievement of the international goals for sea lice and escapees set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action F5b and Action A3)?*

Information provided in the Annual Progress Report already includes a number of examples of past and recent developments aimed at improving sea lice management and strengthening the reporting, inspection and enforcement regime. A new Marine Scotland Topic Sheet setting out revised arrangements has been published and can be found at: http://www.gov.scot/Resource/0051/00516518.pdf. In addition, as noted in the report, Marine Scotland is seeking to improve Permitted Development Rights for fish farms and launched a public consultation on this issue on 5 May 2017. The consultation paper is at: https://consult.scotland.gov.uk/marine-scotland/rights-for-finfish-and-shellfish-developments.

On 30 March 2017 Scottish Government published a joint statement - endorsed by The Cabinet Secretary for the Environment, Climate Change and Land Reform and The Cabinet Secretary for The Rural Economy and Connectivity - to articulate the Scottish Government's vision for a sustainable and competitive aquaculture sector available at: http://www.gov.scot/Topics/marine/Fish-Shellfish/MinStatement

3. *What mechanism exists for engagement with wild salmon interests the establishment of the Aquaculture Industry Leadership Group (Action F5b and Action A3)?*

The Aquaculture Industry Leadership Group (AILG) is an industry led group with a focus on sustainable growth across the entire aquaculture value chain. Part of that group's considerations will be the interactions with the wild fish sector, building on the regular engagement already taking place at a local and representative levels across Scotland. The group has met twice and will next meet in August 2017.

4. *How will the redefining of satisfactory measures under the new sea lice management policy and the accompanying enforcement regime ensure the protection of wild salmon and achievement of the international goals for sea lice set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action F5b)?*

See response to question 2 above.

As our original response made clear, the Aquaculture and Fisheries (Scotland) Act 2007, as amended in 2013, gives Scottish Ministers legal powers to carry out inspections, to look at sea lice records and assess the measures in place to prevent, control and reduce parasites on farms.

5. *Action A3 is reported to have been completed. Have the expected outcomes been achieved and if so please provide details (Action A3)?*

The reference to this work being completed is specifically in relation to the conclusion of the Ministerial Group on Sustainable Aquaculture (MGSA) machinery, rather than the aspirations of sustainable economic growth which remain an ongoing activity, and in part will be championed through the AILG.

6. *The Review Group considers that all Parties and jurisdictions with salmon farming should have presented quantitative data in a transparent manner in their Implementation Plans as a baseline for demonstrating progress towards meeting the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. Summary data are requested to provide the baselines for Scottish salmon farming facilities.*

Data in relation to sea lice are already published by the industry representative body and are available on-line at http://scottishsalmon.co.uk/category/farming/fish-health/.

Norway

1. *What steps have been taken to ensure pre-agreed measures are implemented when mid-season assessments indicate that these are required (Action F2)?*

The Mid-season assessment and pre-agreed measures are based on a formal agreement between local management and the county governor. The spawning target attainments are assessed annually. If the spawning targets are not met and pre-agreed measures have not been introduced as agreed, the power of more local fisheries regulation might be revoked by central authorities and more rigid regulatory measures introduced; e.g a reduction of fishing season.

2. *What level of mortality of wild salmonids is allowed before salmon farm production is decreased and how is this approach consistent with the international goals for sea lice in NASCO's Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action A1)?*

The Norwegian Parliament has adopted a policy of acceptable level of impact that was presented in detail to the NASCO Council at the special session in Germany in 2016. The levels of sea lice induced mortality comprising high, moderate and low impact, has been decided on a scientific basis, and will be adjusted if new knowledge is put forward. It should be noted that this is an instrument to determine growth in the production capacity of the salmon farming industry in a geographical area, and not an instrument to handle sea lice in fish farms, nor to determine the Maximum Allowed Biomass (MAB) at each site.

Both the Norwegian Food Safety Authority (NFSA) and the salmon farming industry have over the past years intensified their work on sea lice control. One of the most efficient tools used by the NFSA is to reduce the MAB at individual sites by 50% in the next production cycle if the operator over a period is unable to meet the regulatory requirements for sea lice control. The assessments of the level of impact of sea lice-induced mortality is done by a panel of independent experts, who take into account all available data in their assessments. The assessments are not mathematical assessment of the acceptable/unacceptable levels of impacts presented to the NASCO Council last year, but rather an overall assessment, taking into account the uncertainties due to knowledge-gaps and the precautionary principle. The expert group report to a steering group comprising the Institute of Marine Research, the National Veterinary Institute and the Norwegian Institute of Nature Research who give their overall assessment and advice to the government. This advice will be used as a decision-making tool by the government when they decide upon amendments in the production capacity of the salmon farming industry in each of the 13 production areas established along the coast.

3. *Have the intended public consultation on amendments of the Norwegian Aquaculture Act been undertaken and if so has it resulted in a strengthened legal base for protection of wild salmon and achievement of the international goals for sea lice and containment set out in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks (Action A2)?*

The Norwegian Aquaculture Act was amended in 2013 and strengthened the environmental parts of the Act. In short, the following amendments were made:

- A legal basis to introduce mandatory tagging of aquaculture animals and use of sterile fish was introduced. The use of both sterile fish and mandatory tagging raise questions concerning animal welfare, and an actual introduction of these requirements is not likely for a couple of years. However, a number of licences has been granted for triploid fish, in order to gain experience on farming of triploid salmon in commercial size farms.
- In order to finance the removal of escaped aquaculture animals (salmon), there has (pursuant to the Aquaculture Act) been established a pool, financed by the entire salmon aquaculture industry, which will cover the cost to remove escaped farmed fish from a representative numbers of rivers, where the prevalence of farmed salmon is unacceptable.
- Some other minor adjustments were made to strengthen the environmental chapter of the Act, e.g. the obligation for farmers to work preventively to avoid adverse effects on the environment was made clearer.
- Several adjustments were made to the penal provisions of the Act, among them a revised system for administrative sanctioning. The new system i.e. provides that only companies can be given administrative fines and introduces a regime of control liability. Private individuals can still be prosecuted, but this requires gross negligence from the individual.

Russian Federation

1. *The Review Group considers that all Parties and jurisdictions with salmon farming should have presented quantitative data in a transparent manner in their Implementation Plans to provide a baseline for demonstrating progress towards the international goals for sea lice and containment in the NASCO Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks. The Russian Federation has not provided these data. Can the results of monitoring and enforcement for sea lice and escaped farmed salmon be provided?*

No specific monitoring programs for sea lice have been developed for salmon farms. However, the Veterinary Committee of Murmansk region inspects salmon farms in the Barents Sea quarterly to check salmon for diseases and parasites. No information on the level and dynamics of farmed salmon infestation with sea lice is available.

Monitoring of escaped farmed salmon in wild salmon populations is carried out annually as a part of the state monitoring of the status of salmon stocks. No farmed Atlantic salmon escapees have been found in the Barents Sea index rivers: Tuloma, Kola and Kharlovka.

2. *The APR states the in cases of high sea lice infestation, approved methods are recommended. What are the Treatment Trigger Levels and what remedial actions are taken (Action A1)?*

No specific legislation regarding veterinary control and management of sea lice in aquaculture has been adopted. No information on the Treatment Trigger Levels and the remedial actions is available.

3. *As the parasite G. salaris has been identified as a threat, what specific veterinary measures have been undertaken to prevent the spread of the parasite (Action A2)?*

Measures to prevent the spread of the parasite *G. salaris* are undertaken under the veterinary regulations for live fish, eggs and crayfish transfers which came in force by the order of the Ministry of Agriculture of USSR, 31.05.1971. The measures include an obligation to have permission from the Chief State Veterinary Inspector for any live fish, eggs and crayfish transfers. Recently the Anti-Epizootic Commission of the Murmansk region restricted live fish transfers from the region of Leningrad and from Republic of Karelia into Murmansk region.

United States

1. *How effective is the 25 inch length limit on brown trout and landlocked salmon in protecting sea run salmon (Action F2)?*

The 25 inch length limit is in place to ensure that sea-run salmon are not harvested by anglers inadvertently. For those anglers who may seek to purposefully take sea-run salmon, the 25 inch length is an "enforceable" restriction. Anglers found to be in violation of this length limit are subject to prosecution by the Maine Warden Service or Marine Patrol. An example of a very public enforcement action conducted by the Maine Warden Service can be found here: https://bangordailynews.com/2011/05/11/news/bangor/dover-foxcroft-man-sentenced-to-six-months-for-taking-selling-salmon/?ref=storyPrevNextLinks.

Quantifying progress on Action F2 remains a challenge. This activity involves both enforcement and deterrent activities of law enforcement. Given the sensitive nature of investigations and activities, it is difficult to publically describe activities under this action. We can, however, say that the use of the 25 inch length limit has risen steadily in more waters throughout the state of Maine in recent years thanks to collaboration among local fisheries managers and enforcement personnel. We are quite sure that the 25 inch length limit serves as a deterrent to potential poachers, but it is very difficult to quantify this certainty at this time.

2. *Can information the scale of the bycatch reported to be very limited over the time series be provided (Action F3)?*

Yes. We typically query the fisheries observer database for bycatch of salmon on an annual basis and report that information to NASCO. Typically, there are no reports of salmon bycatch in commercial fisheries catch in the United States. These reports are of course limited to what fisheries observers actually verify. To more fully estimate potential bycatch, Wigley et al. (2014) used recent estimates of discards from NOAA databases to estimate total discards of 14 federally managed species groups (including Atlantic salmon) across 56 commercial fleets. They estimated that approximately 49 pounds of Atlantic salmon would be discarded on an annual basis (using data from July 2012 through June 2013).

Wigley SE, Blaylock J, Rago PJ, Shield G. 2014. 2014 Discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 14-05; 157 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026. http://www.nefsc.noaa.gov/publications/crd/crd1405/crd1405.pdf

3. *Are there any penalties in place when authorities track escaped farmed salmon back to the farm of origin (Action A1)?*

In the case of egregious violations, penalties may be levied or permits to conduct aquaculture may be revoked. However, state and federal authorities are working with Cooke USA, Inc. to review their Containment Management System plans and corrective action reports to better understand the likely cause of these escapes and determine what additional measures will be implemented to increase containment effectiveness and reduce the number of escapes overall. At this time, we do not anticipate penalties in these instances given the willingness to improve containment at the sites from which the farm-origin salmon escaped.

4. What was the scale of the escape event in 2016 and are the authorities confident that all escaped fish were recaptured (Action A1)?

The scale of the escape events remains unknown. The Maine Department of Marine Resources (MDMR) led several field investigations to capture putative aquaculture origin fish after receiving reports of many large fish observed in the Dennys River, Maine. On Wednesday, August 31, 2016, regional DMR staff checked six locations between river kilometer (rkm) 1.33 and 5.81. About 36 fish were observed in an area known as Charlies Rips (rkm 2.24) and a second school of 12 fish was observed above Route 86 (rkm 5.12). After several attempts, the MDMR biologists were able to capture two fish from the river on September 2, 2016. The fish were initially determined to be farm-origin by overall appearance and scale analyses. Another farm-origin salmon was captured in the Penobscot River, Maine on September 29, 2016.

With respect to recapture of escapees, we cannot estimate the proportion of all escaped fish that were captured. We can say with certainty that no farm-origin fish spawned in the Penobscot River given the rigorous genetic screening program described in action A3.

Annex 15

CNL(17)53

Summary of discussions during the Special Session on the evaluation of Annual Progress Reports (APRs) under the 2013 - 2018 Implementation Plans

Stamatis Varsamos (European Union): thanked the Review Group for its work and provided an update on the missing APR for the European Union. He indicated that he had consulted colleagues in Portugal in order to ensure their involvement in the process. With regard to compliance with EU legislation there was progress being made both in relation to the Water Framework Directive and the Habitats Directive and he anticipated that Portugal would participate in the next Implementation Plan cycle scheduled to commence in 2019. He also referred to the lack of information on aquaculture in the Implementation Plan for France.

Bénédicte Valadou (European Union - France): indicated that France had advised that it would not be able to include information and actions related to aquaculture in its current Implementation Plan but would intend to do so in the next Implementation Plan cycle.

Steve Sutton (Atlantic Salmon Federation): thanked Canada for its APR and noted that it contained reports on a number of significant initiatives directed at the conservation of wild salmon. He noted that it is pleasing to see progress being made on these initiatives but one area where the NGOs remain frustrated is with the lack of clarity, accuracy, and completeness of information provided by the Aquaculture Management Branch of Fisheries and Oceans Canada (DFO). This was also noted by the Review Group in its assessment of Canada's APR and the Review Group had asked a number of questions to try to illicit additional information. He noted, however, that once again the same problems are evident with lack of accuracy and completeness in the responses to those questions. In particular, he referred to the question regarding the proposed aquaculture project in Placentia Bay, Newfoundland, where Grieg Seafarms plan to import and grow triploid Icelandic strain salmon. He indicated that the question posed by the Review Group was 'can Canada guarantee that the fish used will be all-female'. Canada had responded that 'All-female triploid production is planned subject to completion of hatchery and nursery construction and completion of the normal federal and provincial legislative and regulatory review and approval processes in Canada. If all approvals are secured, hatchery construction is planned to begin in 2017, first egg imports would occur in late fall 2017'. He indicated that information obtained by ASF, as part of the environmental assessment for this project, provides different information. Indeed, the environmental assessment report states that 'Since only mixed-sex triploids are currently available, DFO has received a commitment from Grieg officials to develop a schedule to transition to production to all-female lines… this is anticipated to take 3-5 years to complete. In the interim, DFO will authorize mixed-sex triploids'. He asked why there is a discrepancy between the environmental assessment report and the information provided by Canada in response to the Review Group's question and if something has changed, which means the plan is to now use all females immediately, could Canada provide details?

Sylvie Lapointe (Canada): replied that based on discussions with Grieg Seafarms officials in Newfoundland, use of all-female triploids is planned by the time of full commercial

development. The project has a phased development schedule that differs from that submitted in the provincial EA registration process based on technical assessment by provincial officials.

She indicated that it is reasonably possible that initial stockings (e.g. in year one and two) may include a mixture of all-female and mixed-sex triploids dependent upon the availability of sufficient quantities of family-selected all-female milt from the supplier's facility. As the project establishes marine farm sites, mixed-sex triploid production will decline to zero. Both the egg supplier (Stofnfiskur) and Grieg Seafarms, Newfoundland do not see value in mixed-sex triploid production. This is consistent with other salmon farming companies considering the use of triploids.

Jóannes Hansen (Denmark (in respect of the Faroe Islands and Greenland): highlighted the importance of Implementation Plans and Annual Progress Reports and welcomed the progress made in terms of the clarity and utility of the information provided. He referred to the development of a risk framework for the Faroese salmon fishery and the requirement that stocks should be at a sustainable level so the reporting under APRs is important in monitoring developments. He expressed concern that not all jurisdictions were reporting or providing detailed reports and noted that stocks in southern Europe are at risk.

Rory Saunders (United States of America, Chair of the Review Group): referred to the statement from France about the timescale for completion of its Implementation Plan through inclusion of information on aquaculture, introductions and transfers. He referred to the 2017 APR submitted by France, CNL(17)30rev, and noted that this states that France is 'committed to preparing and working on a plan as early as the second half of 2017'.

Dan Morris (United States of America): thanked the Review Group for its work and noted the very favourable review of the APR for the Faroe Islands which set a gold standard. He highlighted the progress with regard to mixed-stock fisheries in Scotland, but noted that the Review Group still felt the report lacked clarity, and the intention of Northern Ireland to amend its Implementation Plan to take account of the Review Group's comments.

Andrew Graham-Stewart (Salmon and Trout Conservation Scotland): stated that, as the Review Group's questions make clear, Scotland's APR is lacking in relevant detail. He expressed concern about what is being concealed and suggested that underlying the APR is a hidden agenda acting against the interests of wild fish. Almost everything that the Scottish Government Department (Marine Scotland) responsible for wild salmon does is aimed at promoting and protecting the salmon farming industry. He indicated that those present at last year's Special Session on impacts of salmon farming will recall that the Scottish Government representative announced that salmon farms would be permitted to have an average of eight adult female lice per fish before they might be forced to cull or harvest. The Scottish Government representative even had the gall to suggest that this amounted to progress! He stated that in fact it was another ten months before this woefully lax policy was implemented. Marine Scotland recently published a topic sheet on the policy and it does not even mention wild fish. He indicated that the truth is that Marine Scotland's absolute priority is the salmon farming industry and it seems that it will do virtually anything to shield the industry from proper scrutiny or indeed any meaningful regulation that might ensure that the industry is managed in a way that is consistent with NASCO's goals. He stated that Marine Scotland has long been dominated by a determination to foster the growth of salmon farming and he asked if the new Scottish Government representative would agree that it is now time for Scottish Government to honour its obligations to wild salmon under NASCO and that means urgently redressing the balance between the growth of salmon farming and the protection of wild fish.

Niall Greene (Salmon Watch Ireland): noted that the Irish APR is the result of inputs from two different government departments: the Department of Communications, Climate Action and Environment has statutory responsibility for the protection and conservation of wild salmonids and the Department of Agriculture, Food and the Marine has responsibility for the development and regulation of aquaculture, including salmon farming. He indicated that the part of the APR prepared by the Department of Communications, Climate Action and Environment, and concerned with the current state of wild salmon stocks, the challenges they face and the actions being taken by the authorities is, on the whole, an honest assessment of the situation. That part dealing with the impact of salmon farming on wild salmonids, prepared by the Department of Agriculture, Food and the Marine is, on the other hand, a litany of alternative facts underpinned by the opinion of its own scientific advice that the impact of sea lice on salmon survival is 1% - an outlier from almost the entire universe of published research on the subject. He asked if the Irish competent authority for the protection and conservation of wild salmon shares the views of the Irish department responsible for aquaculture reflected in the APR? He also asked for clarification of the official view of the competent authority on the impact of sea lice on wild salmon survival at sea.

Denis Maher (European Union - Ireland): responded that it was important to set some context since he represents the Irish ministry with responsibility for natural resources, including the conservation and protection of wild fish, particularly salmon, and hence participates in NASCO on behalf of the Irish Government. He indicated that Inland Fisheries Ireland (IFI) is the statutory scientific advisory body to the Department of Communications, Climate Action and Environment. The relevant competent and statutory authority for aquaculture licencing and development is the Department of Agriculture, Food and the Marine. That Department had been consulted in relation to the three questions submitted in advance of this meeting and provided the responses which have already been delivered. He indicated that from a wild fish perspective, the Department of Communications, Climate Action and Environment and IFI have consistently set out their position as regards the development of aquaculture. This position is to support the development of aquaculture which is environmentally sustainable and which is consistent with EU and international environmental obligations and requirements in particular the EU Habitats Directive under which salmon is included at Annex II. When consulted on aquaculture proposals it is this policy that guides inputs to the Department of Agriculture, Food and the Marine. He noted that the question posed is essentially what is the view of Ireland's wild fisheries authorities regarding the impact of sea lice on wild Atlantic salmon. He set out that position by referring to the published and peer reviewed work of IFI scientists. He indicated that IFI collaborated in an international study published in 2012 to examine the impact of sea lice on the marine survival of Atlantic salmon. The results reveal that that on average 39% of salmon mortalities were attributable to sea lice which impacts wild salmon numbers. The study involved experts from the Scottish Oceans Institute at the University of St Andrews, the Department of Zoology at the University of Otago in New Zealand, the Atlantic Veterinary College at the University of Prince Edward Island in Canada, the Institute of Marine Research in Norway, the Norwegian Institute for Nature Research and IFI. The study concludes that sea lice, which were likely acquired during early marine migration in areas with salmon farming, elevate local abundance of sea lice. The research was published in Proceedings of the Royal Society. The concern also raised is not only for a 39% loss in salmon abundance, but also the loss of genetic variability. Because natural mortality rates are high, even a proportionally small additive mortality from parasites can amount to a large loss in adult salmon recruitment. He stated that the finding that sea lice are responsible for 39% of the mortalities of salmon in the North-East Atlantic Ocean was considered significant in the context of declining salmon stocks across Europe. He indicated that the IFI

findings were supported by those of Krkošek *et al*. (2013) published in the Journal of Fish Diseases which demonstrate that sea lice cause losses of 34% of wild salmon returning to rivers in the West of Ireland. In 2014, IFI were part of a team of top international scientists from Norway, Scotland and Ireland that undertook a definitive review of over 300 scientific publications on the effects that sea lice can have on sea trout stocks. The team reviewed all available published studies and concluded that sea lice have negatively impacted wild sea trout stocks. He noted that the study was funded by the Norwegian Seafood Research Fund which provides investment in Norwegian seafood industry-based R&D. The study also examined the potential effect of sea lice on salmon and concluded that sea lice have a potentially significant and detrimental effect on marine survival of Atlantic salmon with potentially 12 to 44% fewer salmon spawning in salmon farming areas. These conclusions concur with previously published IFI research on the potential impact of sea lice from marine salmon farms on salmon survival. The most recent study by IFI, entitled 'Quantifying the contribution of sea lice from aquaculture to declining annual returns in a wild Atlantic salmon population' was published only last month in the international journal 'Aquaculture Environment Interactions'. The study used 30 years of data from the Erriff river (National Salmonid Index Catchment) in the West of Ireland to evaluate the effect of sea lice from salmon aquaculture on wild Atlantic salmon and showed that smolts migrating to sea can become infected with sea lice from salmon farms and suffer increased mortality soon after leaving the coast. The results from this long-term study indicate that returns of wild adult salmon can be reduced by more than 50% in years following high lice levels on nearby salmon farms during the smolt out-migration. To quote from the authors 'We find that the predicted 50% reduction in 1SW salmon returns following a high lice year is greater than the average year-to-year variation attributable to environmental effects'. Modelled lice impact levels and a fitted stock-recruitment relationship were used to estimate how annual returns of Erriff salmon might have looked over the last 30 years in the absence of a serious impact of sea lice from aquaculture. He noted that the results suggest that Erriff salmon returns could now be twice as large without the observed anthropogenic lice impacts, but would probably show a similar long-term decline.

Bill Hicks (Salmon and Trout Conservation UK): Indicated that his concern is that the Scottish Government has not put in place the legislative framework necessary to protect wild fish from sea lice emanating from salmon farms. He wished to ask two questions about two obvious deficiencies. He noted that in answer to the Review Group's questions (CNL(17)20 page 10) relating to the protection of wild fish from sea lice, Scotland relies on the 2007 Act as amended by the 2013 Act and the April 2017 policy on the regulation of sea lice pursuant to those Acts. That policy states that persistent levels of eight sea lice per fish may lead to enforcement action. However, the Scottish Government's position is that those Acts cannot be used for the purpose of protecting wild fish. That has been made clear on a number of occasions. Their view is that those Acts and, therefore the new policy, can only be used for the protection of the health of the farmed fish. It has nothing to do with the protection of wild fish. He indicated that there is, therefore, no clear legislative framework which would enable the Scottish Government to take enforcement action against fish farms for the purpose of protecting wild salmon. His first question was, therefore, in two parts as follows:

- Will the Scottish Government representatives please confirm that, in their view, the 2007 and 2013 Acts and their new Policy cannot be used for the purpose of protecting wild fish?

- Will they as a matter of urgency start taking steps to put in place a clear statutory framework to enable them to take action, if necessary, to protect wild fish from fish farms?

He indicated that his second question related to a different point. At the moment, unlike in most NASCO countries, sea lice figures for individual farms are not made public in Scotland. Records for individual farms have to be kept, but in the published data they are hidden in area averages. He suggested that there is no justification for not making the individual figures public and it could easily be done without delay as no new primary legislation would be needed. The only purpose of keeping individual figures secret can be to protect farmers with a poor lice record from public scrutiny and embarrassment. He asked the following question:

- Will the Scottish Government representatives take steps to require individual farm lice figures be made public? And if not why not?

Mike Palmer (European Union - UK (Scotland): indicated that firstly, Marine Scotland disagreed with the charge that the Scottish policy position unduly favoured the aquaculture sector. He pointed to the joint ministerial statement on aquaculture published by Scottish ministers in March 2017 and the Scottish Government position, expressed therein, of maintaining a rounded and balanced view which recognised both the economic importance of aquaculture and the need to protect wild salmon within a context of environmental sustainability. The Scottish Government was pursuing both these goals and did not see them as mutually exclusive. On the eight lice per fish question, he said that this was the wrong number to focus on. The Scottish Government's sea lice enforcement policy starts at 0.5 lice per fish as the trigger for starting treatment and then at three lice per fish for agreeing actions required to bring numbers back down again. The number of eight lice per fish is an upper limit which the Scottish Government and the aquaculture sector would hope to avoid given the actions taken at lower levels. It acts as an extreme reference point for the requirement to take welfare action on the fish. With regard to legislation, he noted that Marine Scotland had a commitment to introduce wild fisheries legislation for the current Parliamentary session. If any stakeholder wished to make a proposal for what it should contain they were at liberty to do so. Finally, on farm level lice reporting, he explained that Marine Scotland took a partnership collaborative approach with the sector, which had seen improvements in levels of reporting. Marine Scotland wanted to continue to work with industry to see how much further reporting arrangements could be developed, rather than imposing measures on the sector. Public reporting was now disaggregated across 30 areas and Marine Scotland had made it clear that if current levels of reporting were not deemed to be sufficient it reserved the right to take stock of the arrangements and move to more fine-grained reporting requirements. He indicated that this would be part of the review of the reporting policy to which Marine Scotland is committed.

Nigel Milner (Institute of Fisheries Management): referred to the River Tyne which has the largest rod fishery for salmon in England and Wales following natural recovery of the stock as a result of improvements in water quality in the river. He noted that there is also a hatchery programme with stocking at two to three times the mitigation level. He asked, given the risks associated with stocking identified during the Theme-based Special Session, if the Environment Agency would comment on this programme and the risks to wild stocks and consider following the excellent policy regarding stocking in Wales.

Lawrence Talks (European Union - UK (England and Wales): replied that the Environment Agency stock salmon into the River Tyne to mitigate for the loss of spawning habitat in the River Tyne catchment due to Kielder reservoir, which is one of the largest manmade lakes in Europe. This is an obligation set out under Schedule 1 of the Northumbrian Water Transfer Scheme and is paid for by Northumbria Water. The number of juvenile salmon stocked into the River Tyne has been reduced over recent years and is now 390,000 juvenile salmon (2016). He noted that the stocking programme follows guidelines including factorial mating, with

offspring being returned close to the same locations as the adult fish were captured; stocking is focussed on areas with lower than optimum salmon densities; and more recently precocious parr have formed a component of the broodstock as would be the case in a fully natural environment. He indicated that in terms of risks, there have been no measured or observed detrimental impacts of the hatchery stocking, which has taken place since 1978. Further, over this period, salmon stocks on the River Tyne have improved dramatically and the river is now the most productive salmon fishery in England. Although this improvement is in a large part due to water quality improvements and better regulation since the 1960s, the Environment Agency supports the work of the Kielder Salmon Centre, which is seen as an asset to rural Northumberland, providing a focus for salmon and wider environmental education. The Kielder Salmon Centre also provides fish for research. He indicated that in the light of Natural Resources Wales' revised stocking policy, the Environment Agency reviewed its stocking Operational Instruction in 2015 in consultation with the England Fisheries Group. This resulted in a decision to no longer permit salmon stocking into SSSI and SAC rivers where salmon are a feature of interest. Further, salmon from the Kielder Salmon Centre are now only stocked into the Tyne catchment and are no longer stocked to other rivers. He noted that to conserve and enhance River Tyne salmon stocks, in addition to stocking, the Environment Agency works with a wide range of partners to improve catchment conditions for salmon, which has included, for example, the construction of a fish pass on Hexham Weir.

Siegfried Darschnik (Der Atlantische Lachs): asked three questions in relation to the report for Germany. First, does prioritising supplying all programme waters sufficiently with young-of-the-year salmon, using foreign imported genetic material over import independence, represent the renunciation of the prime goal of establishing a particular, locally adapted strain of wild and breeding salmon from returning adult fish and finally the renunciation to establish an indigenous, self sustaining salmon population in North Rhine Westphalia Rhine tributaries? Also how is the term 'sufficiently' to be seen in this context i.e. sufficient for what purpose? Second, does the use of the domesticated ranching Gudena strain, well adapted to handling, artificial propagation and rearing represent the implementation of the new strategy and is there the expectation to get a sufficient number of returning adults to establish a ranching scheme comparable to the Gudena? Third, why is it that only Baden Wuerttemberg recognizes smolt predation by cormorants as a serious threat to the establishment of a salmon population. If this conviction is not shared by the other federal states, namely North-Rhine-Westphalia and the ICPR, why have our questions on last year's EU-Germany report, concerning this crucial issue, not been answered in any factual way? What other reasons do you recognise and what is their proportionate contribution to the near 100% loss of downstream migrating smolts leading to the absolute discrepancy between the number of smolt equivalents produced by stocking and natural reproduction given in your table in Annex 3 and the catastrophically low number of returning adults?

Stamatis Varsamos (European Union): thanked Mr Darschnik for his intervention but noted that a similar intervention had been made at the 2016 Annual Meeting and he had nothing further to add to the response given at that time.

Steve Sutton (Atlantic Salmon Federation): indicated that he wished to address a question to the United States about the Canadian APR and Canada's response to the question about the Grieg aquaculture proposal in Placentia Bay, Newfoundland. He noted that the Review Group had asked the following question to Canada: 'The North American Commission Protocols for the Introduction and Transfer of Salmonids appended to the Williamsburg Resolution state that: 'Reproductively viable strains of Atlantic salmon of European origin, including Icelandic origin, are not to be released or used in aquaculture in the North American Commission Area'.

With regard to the approval of the Placentia Bay aquaculture project, can triploid rates of 100% be assured?' He noted that the answer provided by DFO indicates that triploidy success rate may be as low as 99%, and that demonstrating 100% efficacy is not possible. Likewise, the environmental assessment for the project recognises that despite the use of triploidy, some risk of genetic introgression remains because some of the fish grown in the sea cages will be reproductively viable. Given this, he asked if the United States considers that the project is consistent with the Williamsburg Resolution and, if so, what is the rational for that conclusion?

Dan Morris (United States of America): responded that Canada has reached out to the United States to discuss the proposed Placentia Bay aquaculture project and the United States appreciates Canada's efforts to date to provide information about it. He indicated that the United States is following this project closely to understand the risks involved and because the triploid technology may hold promise, and the techniques may find their way into proposals from industry in the United States at some point in the future. The United States views NASCO as an important venue for information exchange particularly in relation to novel approaches and technologies that may be applied to common challenges faced by the international community. He indicated that he would not provide a legal opinion on the Williamsburg Resolution and suggested that questions about the Placentia Bay proposal be directed to Canada.

Annex 16

CNL(17)50

INTERNATIONAL SALMON FARMERS ASSOCIATION (ISFA)
Report to NASCO 2017
Aquaculture Technological Developments Related to Sea Lice Management

Mr President, distinguished Delegates, Observes, Ladies and Gentlemen, on behalf of ISFA, I would like to thank the EU and Sweden for hosting the Thirty-Fourth Annual Meeting of NASCO and the Council for this opportunity to present this report.

The International Salmon Farmers Association(ISFA) shares the concerns of NASCO regarding the control of sea lice in salmon aquaculture. This concern is related to animal welfare and their potential negative effects on wild fish. Viewed against marine mortality rates at or above 95%, the additional mortality attributable to sea lice from both wild and cultured salmon has been estimated at around 1% (Jackson et al., 2013, ICES 2016).

In a number of jurisdictions, sea lice has become an important factor for the authorities in regulating the growth in the aquaculture industry. As such, the investment in controlling and reducing lice levels in marine net pens has become significant. For example, the Norwegian Aquaculture industry last year invested about 5 billion NOK (about 600 million US dollars) to combat sea lice and in the development and testing of alternative treatment methods.

The aquaculture industry's main objectives to combat sea lice are to:

1. Keep the amount of salmon lice in aquaculture operations as low as possible to minimise negative effects on cultures and wild fish;
2. Ensure access to viable treatment methods; and
3. Ensure that sea lice management methods are effective.

To achieve these objectives, the following main points constitute the overall strategy:

1. Identifying most suitable geographical sea location;.
2. Establishing suitable management zones and fallowing;
3. Controlling the amount of salmon lice on aquaculture sites by means of biological and/or mechanical measures only; and
4. Coordinating the combat of increasing levels of salmon lice through intensified biological and mechanical de-lousing measures and, if necessary, using medicines in accordance with agreed criteria.

The main objectives and overall strategy points are still valid and have over the last couple of years materialised through the "blue triangle".

The blue triangle is divided into four levels:

1. **Biological protection**
   This is the basic level consisting of **breeding** for increased resistance against salmon lice and development of different **infeed products** stimulating the mucus layer of the fish skin and the immune system.

2. **Mechanical protection**
   This second level consists of different methods protecting the salmon from the infestation stage of the salmon lice. Methods relevant at this level are for example different types of skirts around the upper 5-10 meters of the cages, artificial lights to keep the fish deeper in the cages, electric fences, and snorkels to keep the fish deeper in the sea but still allowing the fish to fill the swim bladder by reaching the sea surface through the snorkel.

3. **Biological removal**
   The most relevant methods here are cleaner fish. The industry is today establishing production units, and the aim is that industry became self-sufficient with cleaner fish.

4. **Mechanical removal**
   At this level are different methods using for example fresh water or sea water with higher temperature (around 30-32 °C) than the sea temperature, and hosing the fish with low pressure water (<1 Bar). These methods are evolving to require minimal handling of the fish. Several farms also use laser to kill the sea lice.

5. **Medicated reduction of salmon lice**
   Anthelmintic treatments and Hydrogen Peroxide are the tools in this fourth and last level. Except for available infeed treatments, which varies regionally, these methods involve handling of the fish.

The main ideas behind this pyramid approach is to establish procedures on the farms where the preferred measures for controlling the levels of salmon lice are those that minimize handling of the fish and the use of medications. Although effective methods are available at the first

four levels, the use of the methods on the first three levels are not optimized. When new treatments are made available it is important to apply the principles of the pyramid to minimize their use while continuing to treat effectively. In doing so we maintain the salmon lice's sensitivity to the treatments and minimize any possible negative effects on the environment.

Several farms now prolong the "smolt period" be keeping the fish in closed containment in the beginning of the production cycle. This is done to increase the size of the fish put into the sea cages. With increased size, the production period is reduced and by that also the time the fish is exposed for sea lices. The industry except that this also will be an significant contribution to get better control of the parasite.

All farmers monitor and report on sea lice at all farms. They work with top scientists around the world to collaborate on research and monitoring projects leading to the development of new technologies. Information is shared with fisheries groups and the community through various reporting systems, depending on the operational jurisdiction. All sea lice treatment products undergo extensive risk assessments by federal agencies to ensure they are safe for salmon, other species, the environment and human health. Treatments must be prescribed and their use managed by a veterinarian. All products used to date have been approved for use, and all treatments are reported to government regulators and stakeholders. All salmon farms, for example in Canada and the United States are certified to BAP / GAA or ASC certification – which among many other factors addresses sea lice. So not only are farmers in compliance with legislation and regulations, but they are compliant with global standards that go above and beyond those regulations.

Salmon farmers around the world are making significant investments and progress in the development and testing of nonchemical sea lice control methods. Over the last 5 years in excess of 20 million euros have been spent on a number of biological and physical control methods that show great promise. Pressure showers, hot water and fresh water systems, cages skirts and floating containment barriers are all being tried to physically remove or exclude sea lice. Biological control measures such as cleaner fish, so called biological fences, vaccines and a selection of sea lice resistant salmon strains are all being researched and trialled.

Farm management methods such as area or zone management, site rotation and fallowing have been employed in Canada for some time along with site to site coordinated sea lice management activities within these management areas. The efficacy and stage of development of any of these management tools varies between the specific sites in which they are being used, but significant progress has been made.

Of course, many of the techniques and tools being developed are proprietary, making communication of specifics difficult but ISFA members remain committed to sharing test results amongst themselves in order to increase the pace of innovation and success.

The International Salmon Farmers Association (ISFA) is an umbrella organization comprised of national and regional associations from around the world. ISFA members share a common vision and dedication to helping our farmers and industry professionals produce healthy food, revitalize coastal communities and build vibrant businesses.

Annex 17

Council

CNL(17)17

Management and Sampling of the St Pierre and Miquelon Salmon Fishery

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MINISTÈRE DES OUTRE-MER

DIRECTION GÉNÉRALE DES OUTRE-MER

SOUS-DIRECTION DES POLITIQUES PUBLIQUES

BUREAU DES POLITIQUES AGRICOLES,
RURALES ET MARITIMES

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RÉF : 17-014755-D

Paris, le 15 MAI 2017

La Ministre des outre-mer

à

M. Steinar Hermansen,
Président de l'Organisation de conservation du saumon de l'Atlantique nord (OCSAN)

Objet : Rapport annuel sur la pêcherie du saumon à Saint-Pierre-et-Miquelon

En prévision de la trente-quatrième réunion annuelle de l'OCSAN à Varberg, Suède, du 6 au 9 juin 2017, les autorités françaises ont l'honneur de vous faire parvenir le rapport de la France au titre de Saint-Pierre-et-Miquelon préparé par la Direction des Territoires, de l'Agriculture et de la Mer à Saint-Pierre.

En 2016 la coopération entre l'Ifremer et Pêches et Océans Canada s'est poursuivie, permettant de disposer aussi d'informations scientifiques.

Le sous-directeur
des politiques publiques

Pierre-Jean CAZELLES

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RÉPUBLIQUE FRANÇAISE

PRÉFET DE SAINT-PIERRE-ET-MIQUELON

Direction des Territoires,
de l'Alimentation et de la Mer

Service des Affaires Maritimes et Portuaires

Saint-Pierre, 22 March 2017

L'adjointe au directeur, chef du service des affaires maritimes et portuaires

to

Monsieur le directeur des pêches maritimes et de l'aquaculture

Tour Sequoia
92055 LA DEFENSE CEDEX

Reference:

Contact: Julie Matanowski
julie.matanowski@equipement-agriculture.gouv.fr
Tel: 05 08 41 15.30- **Fax:** 05 08 41 48 34

RE: Report on the 2016 salmon fishery

Annual Report on the Atlantic Salmon Fishery at St Pierre and Miquelon 2016 Season

CC: MOM/Délégué IFREMER SPM / Archives

Tel: 05 08 41 15 30-Fax: 05 08 41 48 34
BP 4206 1, rue Gloanec
97500 Saint-Pierre

1. Legislation

Salmon fishing at Saint Pierre and Miquelon is regulated by the Rural and Maritime Fishery Law, in particular Book IX, the Order of 20 March 1987 and the Order of 24 March 2015 revising the Annexes of Decree No 87-182, which were repealed and integrated into the Rural and Maritime Fishery Law by Decree No 1608/2014 of December 2014.

This legislation establishes the following:

- the fishery is subject to authorisation and an Annual Fishery Plan
- the minimum capture size is 48cm
- nets must be declared and marked
- the minimum mesh size is 125mm
- the fishery season is restricted to 1 May - 31 July
- fishing gear must not be placed within 300m of a river mouth
- restricted fishing effort:
  - 3 x 360m nets for professional fishermen
  - 1 x 180m net for recreational fishermen
- all catch must be declared (through annual declarations and a fishing log)
- all catch in the recreational fishery must be tagged

436 boat inspections were carried out by the Maritime and Port Affairs Service between 9 May and 7 July. These were carried out at random on 48 occasions, in the morning and/or the evening, on both recreational and professional vessels.

2. Authorisation

Authority to fish is granted to professional fishermen (who may sell their catch) and recreational fishermen (who are not permitted to sell their catch).

The allocation procedure is based on fishery precedence and on the applicant's compliance with catch declaration obligations throughout the previous year.

The Maritime and Port Affairs Service deals with requests for permission to fish and allocates each authorised fisher with a specific site to fish for the entire season. The overall fishery site plan is mapped and published by Order of the Prefect.

In 2016, 8 professional and 70 recreational permits were issued. The total number of permits issued has remained stable over the last 4 years, while the number of actual fishers has remained constant since 2005 (an average of 50 fishers per year over the last 11 years).

3. Salmon catch

The total 2016 catch stands at:

Professional catch: 978.58kg (1,213kg in 2015). 436 salmon caught
Recreational catch: 3,749kg (2,300kg in 2015). 1,246 salmon caught

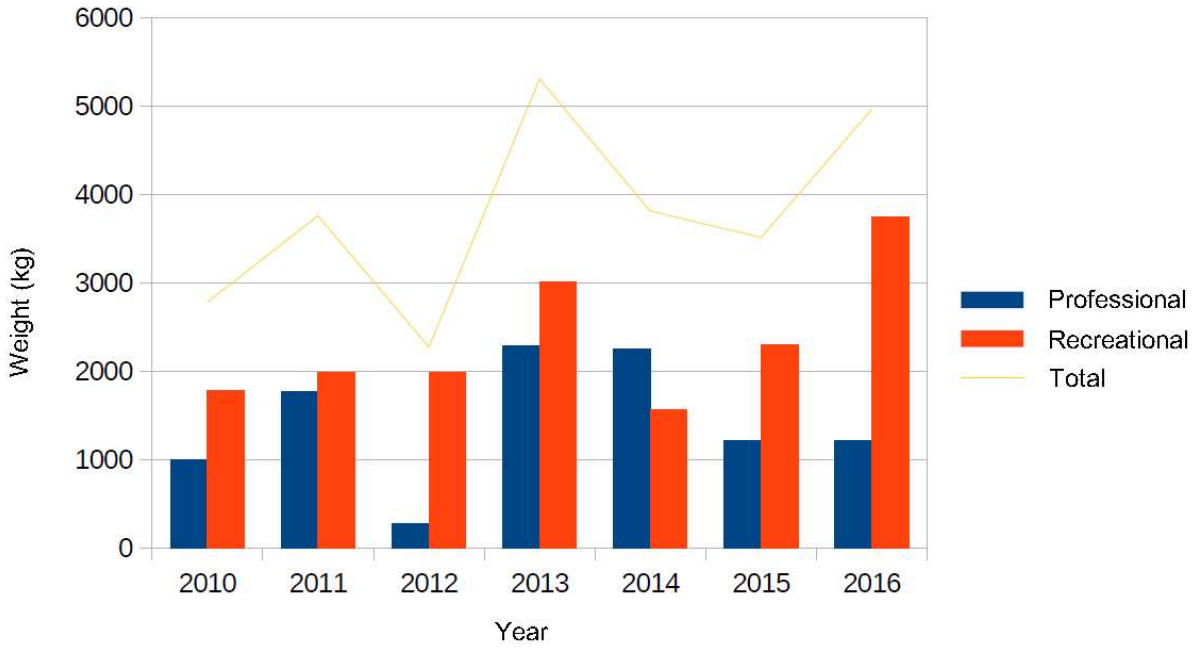
The total weight of the 2016 catch was therefore 4,727kg, compared to 3,513kg in 2015.

The 1,246 salmon caught by 65 recreational boats averages around 19 salmon per recreational fisher. However, the highest catch by a single recreational vessel was 49 salmon. It should also be noted that many people only fish for a very short period and bring their nets in well before the end of the permitted time-frame, when they consider that their catch is sufficient for their personal use and that of their immediate circle.

The 436 salmon caught by 8 professional vessels averages around 54 salmon per professional fisher. The highest catch by a single professional vessel was 247 salmon. One professional license holder reported that he did not fish this season.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Professional Fishery															
No. of licenses	12	12	13	14	13	13	9	8	9	9	9	9	12	8	8
Catch volume	**1223**	**1620**	**1499**	**2243**	**1730**	**970**	**1604**	**1864**	**1002**	**1764**	**278**	**2291**	**2250**	**1213**	**978**
Recreational Fishery															
No. of licenses	42	42	42	52	52	53	55	50	57	58	60	64	70	70	70
Catch Volume	**729**	**1272**	**1285**	**1044**	**1825**	**1062**	**1846**	**1600**	**1780**	**1992**	**1168**	**3011**	**1561**	**2300**	**3749**
Total catch	1952	2892	2784	3287	3855	2032	3450	3464	2782	3756	1446	5302	3811	3513	4727

Salmon catch at St Pierre and Miquelon 2010 - 2016



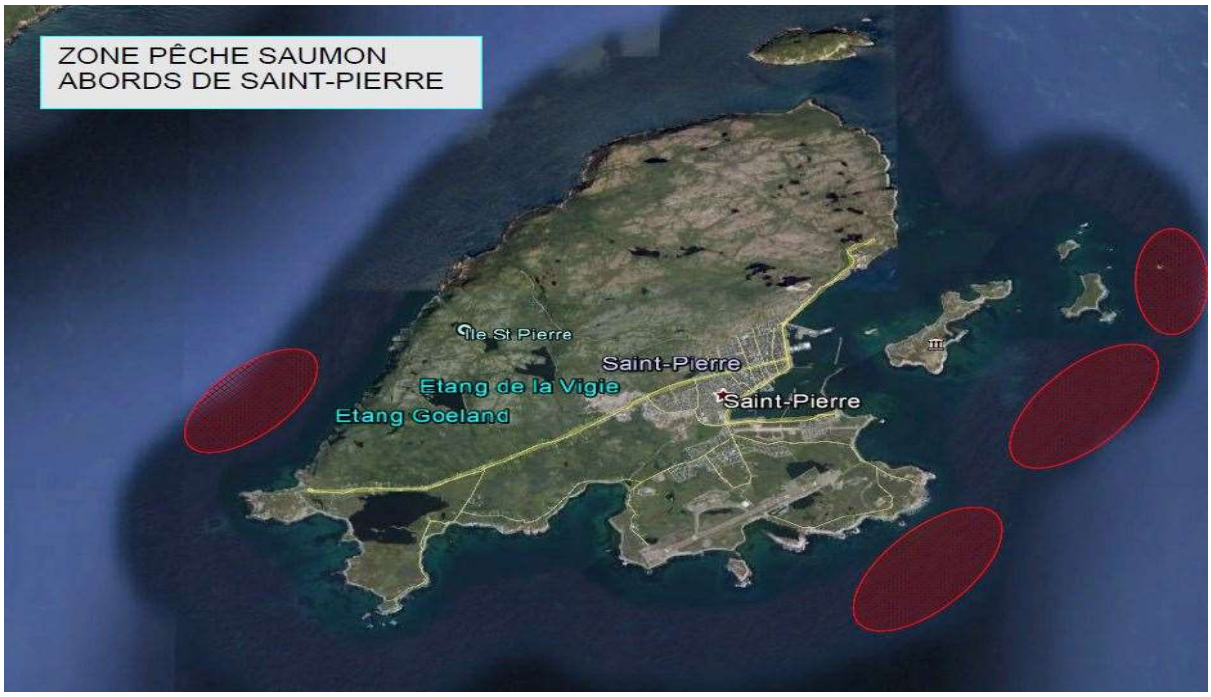
There is no export of salmon and all salmon caught are consumed by the local market. Most are retained for personal consumption, with only a few sold to restaurants or individuals through a local fishmonger, or directly by the fisher to individuals at market.

It should be noted that there is no salmon fishing in the archipelago's rivers and that the territory imports around 16 tonnes of farmed salmon from Canada. The annual consumption of salmon is approximately 3kg per inhabitant.

4. Profile of fishers/location of fishing sites

The average salmon fisher on the archipelago is male (no females fish), aged approximately 55 years old (the youngest being 38 and the oldest 77).

The Atlantic salmon fishing sites are located around the archipelago as follows:



5. 2016 Project Reports

5.1 *Parr Study in the Belle river*

The situation in 2015: Many in-river fishers reported the presence of parr in the Belle river (Langlade) in 2014. A study will be carried out to determine whether the river, whose mouth is frequently obstructed, could sustain more salmon if their return to the

river was facilitated by dredging the river mouth. An awareness campaign will be launched in April to ensure that in-river anglers can distinguish between parr and trout. Depending on the results, it is planned to dredge the river mouth and establish a fisheries exclusion zone to facilitate the return of salmon to the river.

2016 Update: The Belle river was not obstructed in 2016 and there was therefore no need to dredge the river. Electro-fishing was carried out to determine whether there were parr present in the river. The results are not yet known, but initial indications seem to show that some were found. These efforts will therefore continue in 2017.

5.2 *Seal counts*

The situation in 2015: The November 2015 report on the current status of, and recommendations for monitoring, the seal population at St Pierre and Miquelon does not indicate an overpopulation of these marine mammals in the archipelago. However, the report establishes a procedure for monitoring seal populations, recognising the different species. The report also recommends studying the seals' diet and interactions between seals and fishing activity.

2016 Update: It has not been established that the seal population is increasing. However, the impact of these mammals on fishery resources, particularly salmon, is under serious consideration. Two studies, one involving telemetric tracking of seals (the BEST project) and another involving an analysis of their diet, are currently seeking funding. Two seal counts were carried out in July and November 2016 and four more are planned for April, July, September and November 2017.

Annex 18

CNL(17)56

Statement from Canada relating to transgenic salmon

Canada would like to provide additional information to that presented in document NAC(17)9 (which is contained in Annex 6 of the Report of the North American Commission meeting) regarding the proposal to produce genetically engineered salmon in a closed containment land-based facility in Prince Edward Island. Specifically, in 2013, the Minister of the Environment published a Significant New Activity Notice (No. 16528) under Section 110 of the Canadian Environmental Protection Act (1999) that details the conditions under which activities specific to the described genetically engineered salmon would not constitute a significant new activity. The Significant New Activity Notice is published and available on the website in 'Canada Gazette Vol. 147, No. 47 — November 23, 2013'. A Significant New Activity Notice is a legal instrument issued by the Minister of the Environment pursuant to section 110 of the Canadian Environmental Protection Act, 1999. The Significant New Activity Notice sets out the appropriate information that must be provided to the Minister for assessment prior to the commencement of a new activity as described in the Notice. A Significant New Activity Notice does not constitute an endorsement from Environment Canada or the Government of Canada of the living organism to which it relates, or an exemption from any other laws or regulations that are in force in Canada and that may apply to this living organism or activities involving the living organism.

Annex 19

CNL(17)58

Press Release

North Atlantic Salmon Conservation Organization (NASCO)
Thirty-Fourth Annual Meeting, Varberg, Sweden
6 - 9 June 2017

Many North Atlantic Salmon Stocks at Critically Low Levels - Multinational cooperation essential to study causes, find and implement solutions

Delegates from countries across the North Atlantic and beyond met in Varberg, Sweden, this week with one goal: to ensure the future of North Atlantic salmon. Despite strict conservation and management over the years, many stocks of this iconic species are in real danger, with threats often difficult to identify and address. This week, NASCO and its members considered actions taken on numerous fronts aimed at enhancing the conservation and rational management of Atlantic salmon. New initiatives were also advanced. Key actions and initiatives included:

- As highlighted in a special session, NASCO, in cooperation with the North Pacific Anadromous Fish Commission (NPAFC), and its members are taking steps to implement the International Year of the Salmon (IYS), including planning a high profile kick-off event in 2018, to officially launch this major initiative. IYS is a bold multi-year effort intended to create a hemispheric partnership to facilitate an intense burst of outreach and research that will fill knowledge gaps and catalyse new ways to generate and share knowledge necessary for the resilience of salmon and people in a changing world.

- Also in support of its SALSEA - Track and the IYS, NASCO's International Atlantic Salmon Research Board highlighted a potentially ground breaking, hemispheric level research activity aimed at improving understanding of salmon migrations and shed light on the key question of why salmon are dying at sea.

- Through an important Theme-based Special Session, NASCO explored the effectiveness of using stocking programs as a tool to support wild Atlantic salmon stocks. The session brought together experts on various aspects of and approaches to stocking and was highly informative, thought provoking, and generated discussion among the Parties about the risks of stocking.

- Norway reported on its success in preventing the spread of the parasite *Gyrodactylus salaris* and eradicating it from many infected rivers. Work by Norway to fully eradicate this deadly salmon parasite is ongoing. The information shared on these actions is important to the broader effort within NASCO to stop this killer.

- Denmark (in respect of the Faroe Islands and Greenland) reported on actions taken by Greenland in 2016 to monitor and control its mixed stock, interceptory salmon fishery in line with a three-year regulatory measure adopted in 2015. NASCO's Parties acknowledged the important improvements made by Greenland in managing its fishery but also noted the need for additional steps to enhance monitoring and control further.

As the current regulatory measure will end in 2017, an intersessional process is being established to consider the outcomes from the 2017 fishery and begin discussions of a possible future regulatory measure.

- Other NASCO Parties reported on their efforts to monitor and control their commercial, recreational, and/or subsistence fisheries in line with six identified tenets of effective fisheries management. Significant actions have been taken by a number of jurisdictions, including the closure of many fisheries.

- Non-member France (in respect of St. Pierre and Miquelon) reported on its 2016 mixed stock, interceptory salmon fishery, which has seen increases over time. Threatened and endangered populations of salmon from Canada and the United States are vulnerable to this fishery. NASCO will write to France (in respect of St. Pierre and Miquelon) to express its concerns, request effective management action be taken, and ask France to join NASCO in respect of St Pierre and Miquelon.

- In a successful special session, NASCO critically and publicly reviewed how well parties are meeting their NASCO commitments. This review is intended, among other things, to help hold members accountable to those responsibilities. The success of this review and evaluation process is essential to the effectiveness and credibility of the organization. A new review cycle will begin in 2019 and possible improvements to the review and evaluation process will be considered over the course of the coming year.

Of these significant actions, retiring NASCO President Steinar Hermansen (Norway) said:

'When you look at the important work being done by NASCO and its members in support of salmon conservation, you have to remain optimistic about the future of this spectacular species. There is no doubt that threats and challenges continue but the commitment of NASCO and its Parties to Atlantic salmon is both undeniable and unshakable. I am proud to have served this organization for over 25 years - first as head delegate from Norway and, for the last three years, as NASCO President.'

NASCO elected with acclamation Jóannes V. Hansen, Denmark (in respect of the Faroe Islands and Greenland), as its next President. 'This is a time of great challenges for Atlantic salmon and significant changes for NASCO, but I am confident that I am leaving the organization in excellent hands,' said Hermansen.

NASCO also appointed a new Secretary to replace Dr Peter Hutchinson, who will be retiring at the end of September 2017. Said Hermansen, 'I have never known a more dedicated, professional, and competent public servant in my life. Dr Hutchinson's retirement is a great loss to NASCO, but after all he has given to NASCO over 32 years of service, we can only wish him all the very best in his well-deserved retirement'. Dr Hutchinson's successor, Dr Emma Hatfield, was selected this week in Varberg. She comes to NASCO from the European Commission. 'Dr Hatfield brings an excellent background and strong skills to the post of NASCO Secretary. There is no doubt that she will be a great asset to this organisation,' observed Hermansen.

The Thirty-Fourth Annual Meeting of NASCO was held during 6 - 9 June in Varberg, Sweden.

Notes for Editors:

NASCO is an intergovernmental organisation formed by a treaty in 1984 and is based in Edinburgh, Scotland. Its objectives are the conservation, restoration and rational management of wild Atlantic salmon stocks, which do not recognise national boundaries. It is the only intergovernmental organisation with this mandate which it implements through international consultation, negotiation and co-operation.

The Parties to the Convention are: Canada, Denmark (in respect of the Faroe Islands and Greenland), the European Union, Norway, the Russian Federation and the USA. There are 38 non-government observers accredited to the Organization.

The 2017 Annual Meeting included 102 participants, including scientists, policy makers and representatives of inter-governmental organisations and non-governmental organisations who met to discuss the status of wild Atlantic salmon and to consider management issues. The Thirty-Fifth Annual Meeting of NASCO will be held in the United States during 12-15 June 2018, and the Thirty-Sixth Annual Meeting will be hosted by Norway.

For further information contact:
Dr Peter Hutchinson, Secretary
NASCO
Tel: +44 (0)131 228 2551
Email: hq@nasco.int
Website: www.nasco.int

Annex 20

Closing Remarks by North Pacific Anadromous Fish Commission (NPAFC)

Mr. President, delegates, ladies and gentlemen,

On behalf of NPAFC, George Iwama and I would like to congratulate NASCO on what has been a very successful meeting.

Thank you to our Swedish hosts who have made my first trip to Sweden a memorable one, complete with an ABBA sing-along.

Congratulations to your new President Mr. Jóannes Hansen and Vice-President Ms. Sylvie Lapointe and thank you to your outgoing President Mr. Steinar Hermansen.

Congratulations and best wishes to Mairi Ferguson on her retirement. Mairi has always made me feel welcome and has been so helpful.

Congratulations Peter on your retirement. Many have remarked on your talents and they were not lost on me. You and Dan Morris were able to generate the first draft of our joint proposal overnight in Vancouver, a remarkable feat that gave form to the International Year of the Salmon partnership between NPAFC and NASCO. I have appreciated your leadership and organizational skills implementing the IYS and wish you all of the best.

I commend NASCO on your two special sessions. The IYS session was inspirational and much will be directly incorporated into the IYS moving forward. The stocking session or enhancement as we call it in the Pacific, was extremely timely and several papers will reverberate across both the Atlantic and the Pacific.

Our delegation from the Pacific has learned a lot this week and have formed and fostered relationships as partners in the International Year of the Salmon at Commission level and perhaps even more importantly on a personal level. Like any successful relationship, the partnership is built on shared vision, trust and clear communication. If any of you have been involved in a long-distance relationship in your personal lives you know the effort that such a relationship requires.

In terms of shared vision, I continue to be inspired by the passion for salmon that drives us as organizations and individuals and is the basis of our relationship. We have striking overlap in our management issues and research priorities. There is no question that we can achieve more by working together to address the state of salmon than the collective sum of our activities if we work in isolation.

In delivering the IYS we need to continue working to build trust between our organizations through increased communication, planning and exchange of ideas. Our Coordinating and Steering Committees have much work to do in the near future to ensure hemispheric coordination and communication of the overall vision, the opening event and the research activities including symposia, workshops and projects such as ROAM and the Atlantic Salmon Trust's "Usual Suspects". We need to reflect on our governance to ensure we are nimble and collaborative in our decision-making. Face to face meetings and participation in each other meetings is key. We need to work to attend Steering Committee meetings and annual meetings in each other's basin. Our symposia need to reflect topics of hemispheric importance and we

need to find resources and to have scientists and managers participate in symposia wherever they are held.

It will be our pleasure to work with Peter and the new Secretary and Deputy Secretary in transition. I know our NPAFC President Carmel Lowe will be reaching out to incoming President Jóannes Hansen to explore opportunities for collaboration between our two Commissions.

At Wednesday's IYS special session Dan Morris asked us to jump into the deep end of the IYS pool. I believe we are walking in somewhat cautiously from the shallow end but I look forward to a year of ramping up and jointly defining the IYS. At the meetings of our two Commissions next year I envision a buzz of excitement as we finalize our plans for an exciting launch in late 2018 and implementation in 2019.

I wish all of you safe travels and I know our paths will be crossing very soon.

Annex 21

Speech by the Secretary of NASCO at closing session of the Thirty-Fourth (2017) Annual Meeting of the Council of NASCO, Varberg, Sweden

Ladies and Gentlemen

About fifty years ago during a holiday in Scotland, my family joined a crowd of people gathered on a bridge overlooking the mouth of a river. They were there to witness one of nature's spectacles, salmon and sea trout migrating upstream. People were talking about an epic journey and the mystery of how the salmon found its way back from distant waters. I was enthralled and captivated. However, not for one moment could I have imagined that I would have the great privilege to spend virtually all my career working on this wonderful fish. I would like to thank you sincerely for that opportunity, for your support and encouragement and for your friendship.

I have had the very great privilege to witness the work being undertaken all around the North Atlantic by the many individuals devoted and committed to conserving and restoring salmon and the 2,500 rivers they frequent. Each one of those rivers, although very different in nature and scale, would be immeasurably poorer without the wild Atlantic salmon. It is an indicator of the well-being of the aquatic environments it frequents; an iconic symbol that delivers benefits wherever it occurs.

These are challenging times both for the salmon and those charged with conserving them. Despite all the sacrifices, abundance is low, in some areas critically low, diversity is threatened and we face further uncertainty associated with a changing climate.

When Neil Armstrong, the American astronaut, was asked why mankind was interested in going to the moon he replied '*I think we're going to the moon because it's in the nature of the human being to face challenges. It's by the nature of his deep inner soul... we're required to do these things just as salmon swim upstream'*.

Of all the animals on earth, it is interesting that the first human being to walk on the moon would choose the salmon. But this is a special fish, one that has to face many natural challenges to complete its remarkable life cycle and which, perhaps more than ever, needs our support if it is to meet the challenges facing it and the environments it frequents.

The former British Poet Laureate, Ted Hughes, wrote '*When the stateless salmon planned his global enterprise, to feed mankind and lead all rivers back to paradise, he needed a human voice to press mankind to pay the price*'. That in a nutshell is NASCO's role. Only a small number of species have their own international treaty devoted to their conservation and restoration. The Atlantic salmon does and that is a tremendous asset. We heard this from Dr Berglund in his opening remarks and I have heard it many times over the last 32 years. Indeed, the need for international cooperation on this species has probably never been greater.

As our 2011 Salmon Summit concluded, faced with low survival at sea the goal must be to ensure that the 2,500 salmon rivers that flow into the North Atlantic produce the maximum number of healthy wild salmon smolts. That must be the objective to counter the many obstacles facing smolts as they head out into the ocean and ensure that as many adults return. We will need to take a broad approach; focusing only on fisheries will not be enough, important though that is. In that regard, the information presented last year concerning introgression from escaped farmed salmon is extremely worrying.

But our actions can make a difference. Look at the evidence. Rivers in Norway have been rebuilt following the devastation caused by the parasite *Gyrodactylus salaris*; rivers in Norway, Sweden and Canada have recovered after liming programmes; and salmon are returning to urban rivers for the first time since the Industrial Revolution. Last year we witnessed first-hand the massive improvements in river connectivity on the Rhine, and in the US dams have been removed to benefit not just of salmon but other anadromous fish. These examples should inspire further action.

People care about salmon for many and varied reasons. That should be a terrific support to our work and we need to harness that in addressing the challenges that lay ahead. But I'm not sure that the public differentiates between the abundant farmed salmon in the supermarkets and the wild fish which is critically endangered in some areas. We need to do more to raise awareness of the challenges facing the wild salmon and the International Year of the Salmon in 2019 is a wonderful opportunity to do so. The next cycle of Implementation Plans is a great opportunity to take further, decisive action on the broad focus areas of NASCO and that would also be a great contribution to the International Year of the Salmon in 2019. This should not be seen as a reporting obligation but a real opportunity to take major steps to protect the wild Atlantic salmon.

In NASCO we work in a very transparent and inclusive manner, with a very good spirit of trust that allows us to tackle difficult issues as they emerge. Some refer to the NASCO family. We have learned to understand each other's positions and the challenges we face in achieving our shared objective. That spirit of trust and cooperation takes years to build and it is one of NASCO's great strengths. Guard it carefully because it is vital to our work. I will miss that spirit and I will miss these gatherings.

I have had the privilege to work with wonderful colleagues. I worked closely for 28 years with my predecessor as Secretary, Malcolm Windsor, and I learned enormously from him. Zila, Margaret, Theresa and Sophie all provided first-class support to me. But a very special thanks to my current colleagues in the Secretariat, Mairi, who is also retiring this year, Louise and Vicky, for all their effort and support. They have been a wonderful team, very committed and dedicated to NASCO and the wild Atlantic salmon. If I have been able to support and assist you during my time in NASCO, it is only because of the support and assistance I have received from my colleagues to whom my sincere thanks. I know Louise and Vicky will be a great asset to Emma Hatfield when she becomes Secretary of NASCO in October.

Few people get the opportunity to lead an international organisation let alone one devoted to this very special fish; it has been a privilege to do so for the last five years and to have been involved with NASCO for almost 32 years. Thank you again for that opportunity; it has been a great pleasure and a very rewarding experience for me.

In closing, I would like to quote Roderick Haig-Brown, the Canadian angler, conservationist and author who stated that '*.. any given generation of men can have only a lease, not ownership, of the earth; and one essential term of the lease is that the earth be handed down on to the next generation with unimpaired potentialities. This is the conservationists concern*'.

That is the challenge, that is what our Convention requires and that is what the wild Atlantic salmon deserves. I wish you well in your endeavours and I very much hope that your continuing efforts will be rewarded with improved abundance of this most iconic of fish.

Annex 22

CNL(17)00

CNL(17)1	Provisional Agenda (English and French)
CNL(17)2	Draft Agenda (English and French)
CNL(17)3	Explanatory Memorandum on the Agenda
CNL(17)4	Draft Schedule of Meetings
CNL(17)5	Report of the Finance and Administration Committee
CNL(17)6	Secretary's Report
CNL(17)7	Report on the Activities of the North Atlantic Salmon Conservation Organization in 2016
CNL(17)8	Report of the ICES Advisory Committee (ACOM)
CNL(17)9	Report of the Sixteenth Meeting of the International Atlantic Salmon Research Board
CNL(17)10	Request for Scientific Advice from ICES
CNL(17)11	Programme for the Theme-Based Special Session: Understanding the Risks and Benefits of Hatchery and Stocking Activities to Wild Atlantic Salmon Populations
CNL(17)12	Update on the work of the International Year of the Salmon Committees and IYS planning
CNL(17)13	Programme for the Special Session: Salmon and People in a Changing World – Planning for the International Year of the Salmon
CNL(17)14	Report of the Meeting of the Implementation Plan/Annual Progress Report Review Group
CNL(17)15	Summary of Annual Progress Reports under the 2013 – 2018 Implementation Plans
CNL(17)16	Report on Progress in Implementing the 'Action Plan for taking forward the recommendations of the External Performance Review and the review of the 'Next Steps' for NASCO', CNL(13)38
CNL(17)17	Management and Sampling of the St Pierre and Miquelon Salmon Fishery
CNL(17)18	Summary of Council Decisions
CNL(17)19	Proposal for a symposium on Atlantic salmon in conjunction with the 2019 (Thirty-Sixth) Annual Meeting of NASCO: Managing the Atlantic salmon in a rapidly changing environment – management challenges and possible responses (Tabled by Norway)
CNL(17)20	Written responses from the Parties/jurisdictions to the questions raised by the Implementation Plan/Annual Progress Report Review Group
CNL(17)21	Annual Progress Report: European Union – Sweden
CNL(17)22	Annual Progress Report: United States
CNL(17)23	Annual Progress Report: Russian Federation
CNL(17)24	Annual Progress Report: Faroe Islands
CNL(17)25	Annual Progress Report: Norway
CNL(17)26	Annual Progress Report: Canada
CNL(17)27	Annual Progress Report: European Union – Spain (Asturias)
CNL(17)28	Annual Progress Report: European Union – Spain (Galacia)
CNL(17)29	Annual Progress Report: European Union – Spain (Navarra)
CNL(17)30rev	Annual Progress Report: European Union –France
CNL(17)31rev	Annual Progress Report: European Union – UK (England and Wales)
CNL(17)32rev	Annual Progress Report: European Union – UK (Scotland)
CNL(17)33	Annual Progress Report: European Union – Denmark
CNL(17)34	Annual Progress Report: European Union – UK (Northern Ireland)

CNL(17)35	Annual Progress Report: European Union – Germany
CNL(17)36	Annual Progress Report: European Union – Spain (Cantabria)
CNL(17)37	Annual Progress Report: European Union – Ireland
CNL(17)38	Annual Progress Report: European Union – Finland
CNL(17)39	Annual Progress Report: Greenland
CNL(17)40	Approaches to minimising unintended negative consequences to wild Atlantic salmon populations from hatchery and stocking activities (Kyle A Young, University of Zurich)
CNL(17)41	Risks and benefits to wild Atlantic salmon populations from hatchery and stocking activities with particular emphasis on smolt to adult captive-reared supplementation (Dylan J Fraser, Concordia University, Montreal, Canada)
CNL(17)42	Lessons from the International Year of the Reef (Emily Corcoran)
CNL(17)43	Approaches used to prevent the loss of Atlantic salmon populations at high risk of extinction including gene banks, adult captive rearing, smolt-to adult supplementation – Gene banking of wild Atlantic salmonids in Norway (Arne Sivertsen, Norwegian Environment Agency, Trondheim, Norway)
CNL(17)44	The policy relating to hatchery and stocking activities in Norway - managing risks and benefits (Anne Kristin Jøranlid, Norwegian Environment Agency)
CNL(17)45	World Fish Migration Day - strategic partnerships and the role of governments (Kerry Brink)
CNL(17)46	The policy relating to hatchery and stocking activities in Wales – managing risks and benefits (Peter Gough, Principal Fisheries Advisor, Natural Resources Wales)
CNL(17)47	The policy relating to hatchery and stocking activities in France – managing risks and benefits (Bénédicte Valadou, French Biodiversity Agency)
CNL(17)48	Policies and Regulatory Framework for Stocking Activities of Atlantic Salmon in Canada (Doug Bliss)
CNL(17)49	Agenda
CNL(17)50	International Salmon Farmers Association (ISFA) Report to NASCO 2017
CNL(17)51	2018 Draft Budget, 2019 Forecast Budget and Five-year (2018-2022) Budgeting Plan
CNL(17)52	Draft Report
CNL(17)53	Questions at Special Session 2017
CNL(17)54	Draft Press Release
CNL(17)55	ICES Presentations
CNL(17)56	Statement from Canada
CNL(17)57	Press Release
CNL(17)58	Final Press Release
CNL(17)59	Report of the Meeting
CNL(17)60	Statement from Dr Emma Hatfield