Agenda Item 6.1(b)
For Decision

Council

CNL(10)12

Draft Report of the Aquaculture, Introductions and Transfers and Transgenics Focus Area Review Group

CNL(10)12

Draft Report of the Aquaculture, Introductions and Transfers and Transgenics Focus Area Review Grou

1. The third focus area is aquaculture, introductions and transfers and transgenics. Last year the Council established a Review Group to review and analyse the FARs; to identify common management and scientific approaches to challenges; to recommend best practice; and to provide feedback where additional actions may be helpful to ensure implementation of the commitments in the Williamsburg Resolution. The Group met in Washington DC in February 2010 and its Draft Report, IP(10)22, is attached. In section 5 of this Draft Report the Group has reviewed and analysed the FARs and provided feedback on where additional actions are needed. It has not developed recommendations on best practice because, last year, a Task Force established by the ISFA/NASCO Liaison Group developed 'Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks', SLG(09)5, and this Guidance was adopted by the Council. The Review Group has, however, provided some comments on this BMP Guidance in section 4 of the attached report.

2. The Review Group will present its findings to date at the ISFA/NASCO Liaison Group meeting in late April and at the Special Session open to all delegates during NASCO's Twenty-Seventh Annual Meeting in Quebec, when the Parties and jurisdictions will have an opportunity to respond to the assessments. The Council is asked to consider the Group's Draft Report and decide if any action is needed at this stage. The Group will present its final report in 2011 after completing its TORs by preparing an overview of approaches to addressing scientific and management challenges based on information provided in the FARs.

Secretary
Edinburgh
9 April 2010

IP(10)22

Draft Report of the Meeting of the *Ad Hoc* Review Group on Aquaculture, Introductions and Transfers and Transgenics

Palomar Hotel 2121 P Street, Washington DC

22 - 25 February 2010

1. **Opening of the Meeting by the Coordinator**

1.1 The Coordinator, Dr Malcolm Windsor, opened the meeting and welcomed the members of the Review Group to Washington DC. He indicated that the task before the Group is to review the measures taken by the jurisdictions to protect the wild salmon stocks from the impacts of aquaculture, introductions and transfers and transgenics in order to assess their consistency with NASCO's agreements. He stressed that this is the first time that NASCO had attempted such a review of aquaculture and related activities and the outcome will set the scene for the future. He noted that there are serious concerns about the impacts of salmon aquaculture, introductions and transfers and transgenics. NASCO has gone to great lengths to ensure that it has the best available scientific advice on the threats to the wild stocks from these activities. It is clear from the findings of the 2005 Bergen Symposium that while the salmon farming industry has made progress, real concerns remain about the impacts of escapees and sea lice on the wild stocks, in part linked to continuing growth of the industry. However, he stressed that poorly planned introductions and transfers, including stocking practices, can also have impacts on the wild stocks. He noted that in carrying out its reviews, the Group should have only one question in its mind - 'Do the steps in the FARs fully comply with NASCO's agreements to protect the wild stocks from genetic, disease, parasite and other impacts'. While neither he nor the Assistant Secretary would be reviewers the Secretariat would support the work of the Review Group. The members of the Review Group were specifically not representing their Party or Organization but the interests of the wild Atlantic salmon. While the Group did not need to produce unanimously agreed assessments he indicated that it may be more powerful if it could.

1.2 The members of the Review Group who participated in the meeting were: Torfinn Evensen, Heidi Hansen, Tim Sheehan, Bob Steinbock and Boyce Thorne Miller. Ms Marita Rasmussen contributed to the work of the Review Group by correspondence.

2. **Adoption of the Agenda**

2.1 The Group adopted its agenda, IP(10)20.

3. **Review of the Terms of Reference and consideration of working methods**

3.1 At its Twenty-Sixth Annual Meeting, the Council of NASCO had agreed on a format for the aquaculture and related activities Focus Area Reports (FARs), the composition of the Review Group, its Terms of Reference (ToRs) and a work schedule**,** CNL(09)15. The ToRs for the Review Group are as follows:

1. Review and analyze the FARs on Aquaculture, Introductions and Transfers, and Transgenics.

2. Prepare a report which includes the following:

   a. Identification of common challenges in the FARs;
   b. Identification of common management and scientific approaches to challenges, as reported in the FARs;
   c. Compilation of recommended best practice with the intention of increasing the collaborative learning aspect of the Next Steps Process; and
   d. Recommendations and/or feedback on each FAR where additional actions may be helpful to ensure implementation of the 12 commitments within the Williamsburg Resolution.

3.2 In 2009, the Council had considered an interim report from a Task Force established by the ISFA/NASCO Liaison Group to develop a series of best practice recommendations to address the continuing impacts of salmon farming on wild salmon stocks, CNL(09)17. The Task Force had developed 'Guidance on Best Management Practices to Address Impacts of Sea Lice and Escaped Farmed Salmon on Wild Salmon Stocks', SLG(09)5, hereinafter referred to as 'BMP Guidance' intended to assist NASCO's jurisdictions in framing the management of salmon aquaculture, in cooperation with their industries, in developing future NASCO Implementation Plans and in preparing their Focus Area Reports for the 2010 review and subsequently. The Council had agreed with the recommendation of the Task Force to incorporate this BMP Guidance in the format for the FARs. The recommended revised format for the FARs based on CNL(09)15 and including the elements from the BMP Guidance is contained in document CNL40.970 which had been circulated to the Parties to assist them in completing their FARs. The Group noted that the Council of NASCO had not amended the Group's Terms of Reference in the light of adoption of the BMP Guidance which had been adopted by both the International Salmon Farmers' Association (ISFA) and NASCO. These TORs still requested the Group to compile recommended best practice although this work had been undertaken by the Task Force and used as a basis for the information to be provided in the FARs. The Group decided, therefore, that it would review the BMP Guidance and provide feedback to the Council.

3.3 The procedure the *Ad Hoc* Review Group was asked to use to accomplish its work is as follows:

1. Meet in February 2010 to review the FARs submitted, collaborate to highlight questions and/or issues to be sent back to the Parties/jurisdictions by March 1, 2010. These answers should assist the *Ad Hoc* Review Group in preparing their report as outlined in item 2 above. Responses would be due from the Parties/jurisdictions by April 1, 2010.

2. Provide a draft report, as described in item 2, by May 15, 2010 for circulation to contracting Parties prior to the annual meeting.

3. Present an overview of the draft report at the Special Session at the 2010 Annual Meeting, and facilitate a discussion on the four areas identified above in item 2. Parties and jurisdictions will not be expected to present their FAR during the Special Session, but may be asked to present information at the request of the *Ad Hoc* Review Group.

4. Following the Special Session, prepare a final report for submission to the President by August 31, 2010.

3.4 The Review Group discussed its working methods. Prior to the meeting a format for assessing the FARs had been developed based closely on the elements contained in document CNL40.970 (see paragraph 5.8 below). An initial reviewer was assigned to each FAR from among the NASCO representatives and the NGOs also undertook initial reviews of all the FARs. These initial reviews from the NASCO representatives and the NGOs formed the basis for deliberations by the whole Group.

3.5 The Review Group noted that in addition to the presentation at the Special Session, the Council had agreed that the draft report of the Review Group should be made available for consideration at the Liaison Group meeting in late April, before the report is considered by NASCO. The Review Group agreed that it should, therefore, aim to complete its draft report for circulation to the Parties and the Liaison Group by the end of March at the latest.

3.6 The Review Group noted that the terms 'salmon farming' and 'salmon aquaculture' are sometimes used synonymously. Throughout this report and in its assessments the Review Group has used the terms as defined in the Williamsburg Resolution as follows:

Salmon aquaculture: The culture or husbandry of Atlantic salmon, including salmon farming, salmon ranching and salmon enhancement activities.
Salmon enhancement: The augmentation of wild stocks in individual river systems by the release of Atlantic salmon at different stages in their life-cycles.
Salmon farming: Production system which involves the rearing of Atlantic salmon in captivity for the duration of their life-cycle until harvested.
Salmon ranching: The release of reared Atlantic salmon smolts with the intention of harvesting all that return.

4. **Consideration of the Guidance on Best Practice**

The international goal for sea lice is '100% of farms to have effective sea lice management such that there is no increase in sea lice loads or lice-induced mortality of wild salmonids attributable to the farms'. The international goal for containment is '100% farmed fish to be retained in all production facilities'.

4.1 The Assistant Secretary presented an overview of NASCO's agreements on aquaculture and related activities and the background to the development of the BMP Guidance, SLG(09)5, that had been adopted by both ISFA and NASCO in 2009. The basic principle of this guidance is that salmon stocks in areas with salmon farming should be in as healthy a state as those in areas without salmon farming. The international goal for sea lice is '100% of farms to have effective sea lice management such that there is no increase in sea lice loads or lice-induced mortality of wild salmonids attributable to the farms'. The international goal for containment is '100% farmed fish to be retained in all production facilities'. The Task Force had subsequently developed an explanation of the terms used in the BMP Guidance and considered the possible development of a Decision Tree to assist jurisdictions in understanding the application of the BMP Guidance. The Task Force had also considered other issues such as the use of sterile salmon in farming and the consequences of hybridization between farmed and wild salmon. The Task Force had noted that while the Williamsburg Resolution remains valid it needed to be strengthened in its interpretation and application, particularly in terms of defined goals and assessment of outcomes. The BMP Guidance was intended to assist the NASCO Parties and jurisdictions in framing the management of salmon aquaculture, in cooperation with their industries, in developing future NASCO Implementation Plans and in preparing their Focus Area Reports for the 2010 review and subsequently. To this end, the BMP Guidance had, at the request of the Council, been incorporated into the guidance on preparing the aquaculture focus area reports (see document CNL40.970).

4.2 The Review Group recognised that while its TORs included compiling best practice this work had been completed by the ISFA/NASCO Task Force. The Review Group welcomed this BMP Guidance and the development of more quantitative international goals and the recommendations for reporting and tracking which include monitoring of lice loads on wild salmonids in areas with and without farms; lice-induced mortality of wild salmonids and the efficacy of lice treatments. For containment, the reporting and tracking focuses not only on information on the level and causes of escapes from farms but the incidence of farmed salmon in the wild.

The Review Group welcomed this BMP Guidance and the development of more quantitative international goals and the recommendations for reporting and tracking.

4.3 The Review Group notes with concern information presented in the FARs that indicates increased lice abundance on farmed salmon in some jurisdictions in 2009 and the detection of resistance to both Emamectin benzoate (SLICE®) and pyrethroids. This development may jeopardise the ability to achieve the international goal for sea lice. The Review Group notes that there is no reference to the use of sterile salmon under the best management practices and suggests that this issue be

given further consideration by NASCO and the Liaison Group. The recognition of the value of marking to determine the origin of escaped farmed salmon is welcome (see paragraph 5.27 below). The Review Group also believes that development of Decision Trees relating to sea lice control and containment, as discussed by the Task Force, could be a useful tool in assisting jurisdictions in applying the BMP Guidance.

4.4 The Review Group recognised that while the BMP Guidance was only agreed in 2009, NASCO's agreements relating to aquaculture, introductions and transfers and transgenics date from the early 1990s and many elements were subsequently included in the Williamsburg Resolution together with the Liaison Group's 2001 Guidelines on Containment of Farm Salmon. The BMP Guidance was developed to assist in strengthening the application and interpretation of the Williamsburg Resolution. The Review Group, therefore, felt that all jurisdictions with salmon farming should be able to demonstrate clear progress towards achieving the international goals but in most cases data to demonstrate progress was not provided.

5. Review and analysis of FARs and identification of additional actions to ensure consistency with NASCO agreements relating to aquaculture, introductions and transfers and transgenics

Jurisdictions not submitting a FAR

5.1 Before presenting its recommendations arising from the reviews of the FARs, the Group wishes to note that four jurisdictions (Greenland, EU-Ireland, EU-Portugal, and EU-Spain) had not presented FARs by the end of its meeting. In the case of Greenland, the lack of an aquaculture and related activities FAR is to be expected as it does not have any of these activities. The Implementation Plan for Greenland states that there are 'no marine salmon aquaculture facilities in Greenland and, therefore, there are no environmentally threatening factors associated with this form of production originating from Greenland that could be detrimental to the stocks at West Greenland. The international sampling programme checks salmon for fish diseases, in particular the virus ISAv, of which all samples, as of now, have been negative'. There is only one small salmon river in Greenland and no stocking occurs. FARs were, however, expected for EU (Ireland, Portugal and Spain) and the Review Group reiterates the views of previous Review Groups that if there is to be a complete assessment of whether the management actions being taken around the North Atlantic are in accordance with NASCO's agreements the Council needs to have information from all jurisdictions.

5.2 The Group noted the following specific points in relation to minimising impacts of aquaculture and related activities in EU – Ireland, Portugal and Spain:

European Union – Ireland: The Review Group is aware that Ireland has a significant salmon farming industry with a production in 2008 of 11,000 tonnes. A Code of Containment has been developed and monitoring is undertaken for escapes and sea lice. Important research in relation to minimising impacts of aquaculture has been conducted in Ireland including 'common garden' experiments on the relative performance of farmed and wild salmon and their hybrids in the wild and studies into the performance of sterile salmon in aquaculture. Ireland has developed an Implementation Plan and provided comprehensive FARs relating to fisheries

management and habitat protection and restoration. It is disappointing, therefore, that an aquaculture and related activities FAR was not made available to the Group.

European Union – Portugal: The Group is aware of the very small wild salmon stocks and their tenuous state in Portugal which, however, being at the southern limit of the range, are very important for genetic diversity. While the Group is unaware of any salmon farming in Portugal it is aware that hatchery programmes have been conducted in support of stock rebuilding efforts.

European Union – Spain: The Group is aware that Spain has stocks which, being at the southern limit of the range, are important for genetic diversity but are vulnerable and that concerns have been expressed about the severe decline in returns experienced in 2009 to the main salmon rivers. There are stocking programmes in many rivers in Spain. While salmon farming had been carried out in Galicia it ceased about fifteen years ago. However, a Norwegian company has started farming in one Ria.

5.3 The Review Group recommends that the Council urge these jurisdictions to contribute to this important aspect of NASCO's work at the earliest opportunity.

Jurisdictions submitting a FAR

5.4 The Review Group welcomed the submission of the following thirteen FARs which it reviewed:

- Canada, IP(10)16;
- Denmark in respect of the Faroe Islands, IP(10)14;
- EU - Denmark, IP(10)11;
- EU - Finland, IP(10)5;
- EU -France, IP(10)9;
- EU - Germany, IP(10)6
- EU - Sweden, IP(10)8;
- EU - UK (England and Wales), IP(10)3;
- EU - UK (Northern Ireland), IP(10)10;
- EU - UK (Scotland), IP(10)15;
- Norway, IP(10)13;
- Russian Federation, IP(10)4;
- USA, IP(10)7.

5.5 While the Council had asked that the FARs be made available for review no later than 31 December 2009, only five jurisdictions were able to meet this deadline. Many of the FARs, including some of the longer documents, were not received until early or mid-February leaving limited time for the review. As noted by previous Review Groups the review process will only work effectively if the timetable set by the Council is adhered to.

Methodology

5.6 The Group agreed on a number of 'ground rules', based on those used by the previous three *Ad Hoc* Review Groups to guide its work in undertaking the reviews. These were as follows:

(a) An initial reviewer was appointed for each FAR who was asked to lead the discussion within the Group and to develop an assessment of consistency of the actions documented in the FAR with the Williamsburg Resolution and BMP Guidance;

(b) The initial reviewers would remain anonymous in the report and in the event that one or more members of the Review Group did not agree with a particular aspect or aspects of the review then the report would indicate that there were dissenting views but not disclose which members of the Review Group expressed the dissenting views unless they wished to be identified;

(c) The Review Group would base its reviews only on the information presented in the FARs and the final Implementation Plans;

(d) Because not all jurisdictions were represented on the Review Group, it was agreed that the NASCO representative on the Group from a jurisdiction whose FAR was being reviewed would not be present during the review of that report;

(e) Following the completion of the reviews all assessments were re-examined to ensure consistency.

5.7 The Review Group's TORs allowed for questions and issues to be raised with the jurisdictions before the Group completed its assessments. The Review Group decided that in view of the limited time available before its draft report was to be made available to the Liaison Group it would not seek further clarification from the jurisdictions but would base its assessments on the FARs as submitted. This would also be more transparent as any issues that either the Review Group or the jurisdictions wished to raise would be done so during the Special Session. While not required under its TORs, the Review Group decided to ask the Secretary to send the draft assessments to the jurisdictions indicating that it did not seek any feedback until the Special Session at the Twenty-Seventh Annual Meeting. Following that Special Session, the Group would carefully consider all feedback on its findings when finalising its assessments.

5.8 The Group developed a format to facilitate an assessment of the consistency of measures detailed in the FARs with the guidance from the Council. This 'check list', based closely on the elements in document CNL40.970, comprised the following:

- There is an overview of activities, policy and management structures;
- Initiatives for international cooperation to minimize adverse impacts on wild stocks are described;
- Progress towards achieving the international goals for sea lice and containment is described;
- There is a process to demonstrate prior to approval that proposed activities will not have a significant impact on wild salmon stocks;
- Appropriate risk assessment methodologies are being applied including in relation to site selection;

- An Action Plan has been developed and implemented to minimise escapes including: a Code of Containment and system for verifying compliance; technical standards for equipment; and procedures for reporting losses and their causes;
- Measures to minimise the impacts of ranched salmon have been implemented;
- Measures to minimise interactions from salmon enhancement activities, including introductions and transfers, have been implemented;
- Measures to minimise the risk of diseases and parasite transmission to wild stocks have been implemented e.g. area management, integrated pest management, single year class stocking and fallowing;
- Measures to control movements into a Commission area of reproductively viable Atlantic salmon or their gametes and introductions of reproductively viable non-indigenous anadromous salmonids or their gametes exist;
- Procedures exist to ensure no introductions of non-indigenous fish into a salmon river occur that would have unacceptable risks of adverse impacts;
- The NASCO Guidelines for Action on Transgenic salmon are being applied e.g. rearing of transgenic salmonids is confined to secure, self-contained land-based facilities;
- River classification and zoning systems have been developed where appropriate;
- Procedures are in place to initiate without delay corrective measures where adverse impacts are identified. There is a description of any factors impeding implementation of the BMP Guidance;
- Research and data collection are undertaken in support of the Williamsburg Resolution including monitoring programmes related to sea lice, containment and escapes;
- Educational materials have been developed to increase awareness of the risks of introductions and transfers;
- The effectiveness of measures taken is evaluated both in terms of the extent of and timescale of the effects;
- There is a clear explanation of how socio-economic factors are applied and how this affects attainment of NASCO's objectives.

5.9 For each of these elements the Review Group assessed if the approach was well developed and generally in accordance with NASCO's agreements. In presenting its assessments, the Group first described the elements that it felt required additional actions to ensure implementation of the NASCO agreements and then used standard text in a series of bullets to highlight these. However, as with previous Review Groups, it did not suggest the nature of the actions as this would be a matter for the jurisdiction concerned. The elements listed in paragraph 5.8 above are not all of equal importance in terms of minimising impacts of aquaculture and related activities on the wild stocks.

General comments on the FARs

Structure and content

5.10 The earliest NASCO agreements were developed almost twenty years ago. The Williamsburg Resolution, to minimise adverse impacts on the wild salmon stocks from aquaculture, introductions and transfers and transgenics, was adopted by NASCO in 2003 (and amended in 2004 and 2006). It consolidated NASCO's

previous agreements into one Resolution and incorporated elements intended to ensure consistency with the Precautionary Approach (e.g. burden of proof, corrective measures, risk assessments). The Williamsburg Resolution provides guidance to NASCO's jurisdictions on a diverse array of aquaculture activities including salmon farming, ranching and stocking that is conducted for a variety of purposes. There is variety in the type and magnitude of aquaculture related activities in which NASCO's jurisdictions are engaged. In some jurisdictions, the salmon populations are dependent on stocking programmes while in others there may be no stocking of salmon at all. Some jurisdictions have an enormous production of farmed Atlantic salmon whereas other jurisdictions have none. The size and status of the wild salmon populations across the jurisdictions also varies with some jurisdictions working to restore extinct populations or to prevent the extinctions of populations (including those designated to receive special government protection) whereas others have populations that still support significant, albeit reduced, recreational and commercial fisheries. In carrying out its work, the Review Group assessed each activity against the relevant guidance in the Williamsburg Resolution and, in the case of salmon farming, the BMP Guidance which was developed to strengthen the interpretation and application of the Williamsburg Resolution in relation to sea lice and containment.

5.11 The Group noted that some jurisdictions (Canada, EU - Finland, EU – France, EU - UK (England and Wales), EU - UK (Northern Ireland), EU - UK (Scotland), Norway, USA) had adhered to the guidance from the Council on the structure of their FARs. This had facilitated the Review Group's work and the Group urges all jurisdictions to adhere to the agreed format in future reporting. The Group also recommends that the Council considers providing further guidance to the jurisdictions concerning the amount of detail to be included in the FARs. It had previously been suggested that a limit of no more than 20 pages be applied with the option to provide more detailed information in annexes. While many FARs had kept to this guidance some FARs contained an enormous amount of detailed information in the annexes which was impossible for the Group to review. In future, where a jurisdiction wishes to provide supplementary information in annexes it would assist the reviewers if this could be summarised because there is very limited time to conduct the work. Some FARs presented a large amount of information describing the activities, policies and management structures in place rather than focusing on the outcomes of measures taken to implement the Williamsburg Resolution and to demonstrate progress towards achieving the international goals to safeguard the wild stocks. Conversely, several of the FARs comprised only the briefest of overviews that made it difficult to fully understand and, therefore, assess the measures in place.

It would be desirable that future FARs focus on outcomes and progress towards achieving the international goals so as to properly demonstrate whether or not salmon stocks in areas with salmon farming are in as healthy a state as those in areas without salmon farming.

5.12 Some of the FARs lacked transparency with regard to the nature of the challenges that exist in minimising impacts on the wild stocks from aquaculture and stated their own judgements about consistency of the measures in place with NASCO's agreements. It would be desirable that future FARs focus on outcomes and progress towards achieving the international goals so as to properly demonstrate whether or not salmon

stocks in areas with salmon farming are in as healthy a state as those in areas without salmon farming. Some FARs referred to duplication in the reporting format. This was, perhaps, inevitable given the inclusion of the BMP Guidance elements in an existing reporting format. However, it should be noted that there were some elements that few or none of the FARs provided any information on. The comments below apply to many of the FARs reviewed so, rather than repeat them in each assessment, the Review Group has summarised them in paragraphs 5.13 – 5.23 below.

Action Plans on Containment

5.13 Under the Guidelines on Containment of Farm Salmon (Annex 3 of the Williamsburg Resolution) each jurisdiction should draw up a national action plan, or regional plans. The action plan is described as the process through which internationally agreed guidelines on containment would be implemented at the national or regional level through existing or new voluntary codes of practice, regulations, or a combination of both. The Group discussed whether an action plan would be a single document detailing all the measures in place on containment in a particular jurisdiction or region but felt that, while such documentation was desirable, this would not be necessary to be consistent with the guidelines. Each jurisdiction is, however, required to have in place measures for minimising escapes; mechanisms for reporting information on the level and causes of escapes; and mechanisms for reporting and monitoring in order to assess compliance and to verify the efficacy of the measures taken. Taken together these elements would comprise an action plan.

International cooperation to minimize adverse impacts on wild stocks

5.14 The Williamsburg Resolution calls for cooperation to minimise impacts of aquaculture and related activities on the wild salmon stocks. For example, salmon farming in one jurisdiction clearly has the capacity to impact both farming activities and the wild stocks in another jurisdiction. It is essential that all marine and freshwater salmon farms meet the highest possible standards and that there is international cooperation to exchange information on best practice and agree on actions to eliminate impacts on wild salmon populations. The Review Group noted that few FARs presented information relating to international cooperation between the jurisdictions on matters relating to minimising impacts of aquaculture and related activities on the wild stocks and the outcomes of such cooperation. The Group is aware of international fora (e.g. the ISFA/NASCO Liaison Group and the WWF Salmon Aquaculture Dialogue) and bilateral initiatives (e.g. on border rivers) that were not referenced in the FARs. Participation in these fora might be more clearly reported in subsequent FARs. The ISFA/NASCO Liaison Group provides an international forum for developing recommendations for action on wild salmon conservation and sustainable salmon farming practices and the Group urges all jurisdictions with salmon farming to participate in the work of that Group.

Salmon ranching

5.15 The Williamsburg Resolution defines salmon ranching as ‘the release of reared Atlantic salmon smolts with the intention of harvesting all that return’. Article 5 of the Resolution states that measures should be taken to minimise impacts of ranched salmon by utilizing local stocks and developing and applying appropriate release and

harvest strategies. The FARs indicate that there is no ranching presently being undertaken in the North Atlantic other than on an experimental scale. There has, in the recent past, been large-scale ranching of salmon in Iceland and there is increasing 'ranching to the rod' in that country although how this activity would be categorised under the Williamsburg Resolution is unclear. The Review Group notes that this issue might need further consideration as it is possible that this activity could increase in future if marine survival rates improve.

Risk Assessments

5.16 Article 4 of the Williamsburg Resolution indicates that the Parties should develop and apply appropriate risk assessment methodologies in considering the measures to be taken to minimise the impacts on wild salmon of aquaculture and related activities. In Annex 7 of the Resolution it is indicated that there is a need to identify the appropriate factors to be included in a risk assessment in order to evaluate the potential impacts of aquaculture and related activities on wild salmon stocks. Such assessments should be an essential part of the approval process both for new farming sites or re-licensing or expansion of existing sites. The Review Group notes that while there is often a requirement to consider the impacts on the marine environment (particularly benthic impacts) or exposure of the site, little consideration appears to be given to the risks to the health, genetic diversity and status of wild salmonid stocks in the decision-making process. Thus, while the potential carrying capacity of the environment may be considered, the effects that the proposed increase in biomass would have on the wild salmon stocks in terms of the prevalence of sea lice, increased disease risk or increased threats from escapees may not be taken into account. The outcome of all risk assessments should be reviewed in the light of changes in the status of the wild stocks and any increase in production of farmed salmon. The Review Group highlights the frequent absence of wild salmon stock considerations in risk assessments and strongly encourages all jurisdictions to incorporate these considerations into decision-making processes in future.

5.17 A number of the FARs refer to risk-based approaches to monitoring and inspections in which farming sites that are considered to be at lower risk of non-compliance would receive less or no monitoring. The Review Group recognises that consistent with the Precautionary Approach where high risk sites are identified measures should be taken to eliminate the risks posed to the wild stocks and its environment. Where low risk sites are identified, appropriate monitoring would help to confirm, or reveal changes in, their low risk status.

Transgenic salmonids

5.18 The NASCO Guidelines for Action on Transgenic Salmonids (Annex 5 of the Williamsburg Resolution) state *inter alia* that Parties should: take all possible steps to ensure that the use of transgenic salmonids is confined to secure, self-contained, land-based facilities; inform salmon producers of the risks to wild stocks; and take steps to improve knowledge of the potential impacts of transgenic salmonids on wild stocks and their habitat. Most FARs indicate that there is no rearing of transgenic salmonids. However, the FAR for Canada indicates that while no transgenic salmonids have been approved for commercial aquaculture, release, or consumption, research has been approved to rear transgenic salmonids in contained facilities to assess the

environmental and human health risks, and the performance characteristics of the fish. The US FAR indicates that an application has been made to the Food and Drug Administration for approval to sell transgenic salmon in the US. While most jurisdictions with salmon farming have indicated that the industry is not in favour of rearing transgenics (and at the Liaison Group meeting ISFA has confirmed that it rejects the use of transgenic salmon) few FARs described clearly if the controls exist to ensure any use in the future is consistent with the NASCO Guidelines i.e. in secure, self-contained, land-based facilities. This element might be more clearly reported in subsequent FARs.

River Classification

5.19 Article 8 of the Williamsburg Resolution states that for the purpose of developing management measures concerning aquaculture and introductions and transfers, river classification and zoning systems should be developed, as appropriate. Both the Guidelines for Stocking Atlantic Salmon (Annex 4 of the Resolution) and the North American Commission Protocols for the Introduction and Transfer of Salmonids (Appendix 1 of the Resolution) refer to river classification or zoning. While it is clear that many jurisdictions are developing river classification, e.g. under the EU Water Framework and Habitats Directive, few FARs referred to how river classification was used for developing management measures in relation to aquaculture and related activities. This element might be more clearly reported in subsequent FARs. The Group notes that while wild salmon 'protection areas' and 'aquaculture exclusion zones' have been established in some jurisdictions there is a need to assess their effectiveness in protecting the wild stocks (see below).

Corrective measures

5.20 The Williamsburg Resolution states that where significant adverse impacts on wild stocks are identified, the Parties should initiate corrective measures without delay and these should be designed and implemented to achieve their purpose promptly. This is an important aspect of the Precautionary Approach. The Guidelines on Containment of Farm Salmon refer to the need for escape contingency plans, Annex 2 of the Williamsburg Resolution refers to the establishment of gene banks to protect against loss of genetic diversity and the 'Road Map' for *G. salaris* developed by the North-East Atlantic Commission refers to the need for contingency plans to be developed. Many FARs did not report clearly on this aspect and in others little information was presented on the nature of the measures to be taken to protect the wild stocks when unforeseen impacts are detected. For future reporting, this important aspect of the Precautionary Approach should be addressed.

Socio-economic information

5.21 NASCO's Guidelines for Incorporating Social and Economic Factors in Decisions under the Precautionary Approach, CNL(04)57, provide a framework for incorporating social and economic factors into decisions which may affect the wild Atlantic salmon and the environments in which it lives. Previous Review Groups have noted that most FARs did not provide a clear indication of how socio-economic factors are incorporated into management decisions. This was also the case for the aquaculture and related activities reports. While some FARs did refer to the social

and economic values associated with the salmon farming industry they did not refer to the economic values associated with the wild stocks which also need to be taken into account in management decisions. There are also instances where the value of the wild stocks has been adversely affected by impacts from aquaculture and related activities. For future reporting, it would be essential that this aspect is addressed. In the interim, the Review Group notes the Council's intention to hold a Special Session on how socio-economic factors are incorporated into management decisions and believes that it would be valuable to have examples relating to aquaculture, introductions and transfers and transgenics.

Evaluation of the effectiveness of measures taken

5.22 A central theme of the Precautionary Approach is the assessment of the effectiveness of management measures taken and, where necessary, adaptation of these measures so as to safeguard the wild stocks. Adaptive management is also highlighted in the BMP Guidance. Many of the FARs did not describe programmes to assess the effectiveness of their management measures. In this regard, the Review Group wishes to stress that while it may have indicated in the assessments that the measures taken are consistent with NASCO's agreements, it cannot assess if the measures are effective in safeguarding the wild stocks and achieving the international goals contained in the BMP Guidance. This BMP Guidance contains clear recommendations for reporting and tracking to support assessment of the progress made towards achievement of the international goals. For future reporting, it will be essential that there is clear presentation of the outcomes of the monitoring in support of the BMP Guidance in order to assess progress towards the international goals.

Research, Development and Data Collection

5.23 Consistent with the Precautionary Approach a lack of scientific information should not be used as a reason for failing to take conservation measures. The Review Group notes that the jurisdictions have, to varying degrees, developed programmes of research in support of the Williamsburg Resolution. The Group notes that the Liaison Group intends to review this information with a view to identifying research gaps and data deficiencies and wishes to highlight that the BMP Guidance makes specific recommendations on reporting and tracking. In particular, the Review Group notes that while a very low percentage of farm fish escapes, 100% containment may never be achievable and the number of escaped farmed salmon remains large relative to wild fish abundance. Further research and development on improved containment technologies, alternative approaches to the production of sterile salmon and commercial-scale trials with sterile salmon are urgently required. Similarly, in relation to sea lice there is a need for further research and development of vaccines and effective therapeutants, particularly given the evidence of resistance to existing treatments.

General Comments Relating to the Assessments

Introduction

> ***The Review Group recognises that progress has been made by the salmon farming industry in addressing impacts on wild salmon stocks. It concluded, however, that in spite of the wealth of regulations and measures demonstrated in the FARs relating to salmon farming no jurisdiction was able to show that it had reached a situation where it had achieved the international goals.***

5.24 The Review Group's assessments are contained in Annex 1. The Review Group recognises that progress has been made by the salmon farming industry in addressing impacts on wild salmon stocks. It concluded, however, that in spite of the wealth of regulations and measures demonstrated in the FARs relating to salmon farming, no jurisdiction was able to show that it had reached a situation where it had achieved the international goals so that impacts on the wild stocks had been avoided. The salmon farming industry is very successful but it is its scale and continuing growth that poses real challenges to addressing impacts on the wild stocks. The level of escapes may now be an extremely small percentage of the farmed salmon production but remains high relative to the numbers of wild salmon. Similarly, the number of sea lice may be less than one per farmed fish but that may still translate to large numbers of lice in the environment because of the scale of production. Often the monitoring described is related to the situation at the farms rather than focusing on the wild fish. However, the Review Group welcomes the establishment of more quantitative international goals and the reporting and tracking that includes monitoring of wild fish as recommended in the BMP Guidance.

> ***The level of escapes may now be an extremely small percentage of the farmed salmon production but remains high relative to the numbers of wild salmon. Similarly, the number of sea lice may be less than one per farmed fish but that may still translate to large numbers of lice in the environment because of the scale of production.***

Scale of Activities

> **Jurisdictions with a large production of farmed salmon bear a particular responsibility to minimize the threats that their activities pose to the wild stocks domestically and internationally.**

5.25 Over the last twenty years or so, there has been a dramatic growth of salmon farming in the North Atlantic (see Figure 1 below). There can be little doubt that the scale of the salmon farming industry (production is now around 600 times the harvest of the wild fish) means that it has the potential to do more damage than other aquaculture practices and, therefore, has a responsibility to eliminate impacts. The findings of the 2005 ICES/NASCO Bergen Symposium highlight that the major challenges in managing impacts of aquaculture on the wild stocks relate to containment and sea lice in salmon farming. It was in recognition of these threats that the Liaison Group recently agreed on the BMP Guidance to strengthen the interpretation and application

of the Williamsburg Resolution. Jurisdictions with a large production of farmed salmon bear a particular responsibility to minimize the threats that their activities pose to the wild stocks domestically and internationally. These jurisdictions may wish to consider whether national and regional limits on total salmon farming production as well as on densities of facilities would be appropriate. That said, however, it should also be noted that even low levels of salmon farming and poorly planned introductions and transfers still have the potential to adversely affect wild salmon populations on a local scale. The guidance in the Williamsburg Resolution and the BMP Guidance needs to be fully implemented by all jurisdictions with stronger measures where local conditions dictate.

Even low levels of salmon farming and poorly planned introductions and transfers still have the potential to adversely affect wild salmon populations on a local scale.

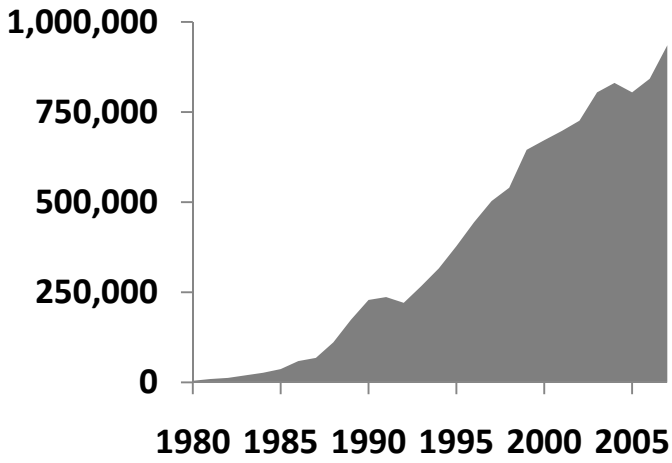

Figure 1: Production of farmed Atlantic salmon in the North Atlantic (Source: ICES)

Responsibility for setting standards

5.26 The Review Group considers that there is a need for caution in assigning responsibility for setting standards for containment, disease prevention and control and for compliance monitoring. In some jurisdictions, both are the responsibility of the salmon farming industry and, in the some cases, compliance is voluntary. The Review Group notes that there is an evolution from voluntary measures to legislation in a number of jurisdictions and believes that better protection of the wild stocks from adverse impacts may be achieved when government authorities set technical and environmental standards, oversee monitoring and impose strict monitoring requirements and schedules. There should also be monitoring programmes of wild salmon populations to determine impacts from aquaculture as recommended in the BMP Guidance. The Review Group believes that it is essential that measures designed to safeguard the wild salmon stocks are enforced and that any non-compliance is addressed.

Containment

5.27 The Review Group notes the recommendations in the BMP Guidance concerning reporting and tracking in support of the international goal on containment and wishes

to stress that escaped farmed salmon should always be reported as numbers of escaped fish from farms (both marine and freshwater facilities) with the total number of farms together with monitoring for escapees in wild salmon populations (e.g. numbers and percentages in fisheries and spawning stocks). This information will enable a clearer assessment of the impacts on the wild stocks and the effects of salmon farming development. Often, contingency plans for escapes include only efforts to recapture escaped farmed salmon in the vicinity of the cages, but consideration could also be given to the opportunities to recapture escaped farmed salmon migrating into rivers where this can be achieved without damaging the wild stocks. Evidence suggests that escaped farmed salmon disperse rapidly from the site so recapture efforts immediately following an escape event may not be successful. These recapture efforts should not be seen as an alternative to stringent measures to improve containment. The Review Group notes that the BMP Guidance identifies methods to track the origin of escaped farmed salmon as a factor that would facilitate implementation of the guidance. This is an international issue because escaped farmed salmon can, and do, migrate between jurisdictions. The Review Group considers that there should be an effective tagging or marking system that enables escaped farmed salmon from both freshwater and marine farms to be identified in the wild (e.g. a visual mark or tag) and that would allow identification of the facility from which the fish originated (e.g. genetic marking).

The Review Group considers that there should be an effective tagging or marking system that enables escaped farmed salmon from both freshwater and marine farms to be identified in the wild and that would allow identification of the facility from which the fish originated.

Sea lice

Resistance to sea lice treatments is a worrying development.

5.28 Sea lice larvae can survive independently in coastal waters for 20-50 days during which time they may be dispersed along the coast (as far as 180km during a 15 day period). Consequently any treatment zone for this parasite must be large in order to be effective. Other salmonids, such as sea trout, may suffer infection rates higher than those on wild Atlantic salmon. The Review Group notes the recommendation in the BMP Guidance on reporting and tracking and wishes to stress that, from the perspective of minimizing impacts on the wild stocks, lice monitoring programmes are required not just on the farmed fish in the cages but also on wild salmonids if there is to be an assessment of progress towards the international goal. Monitoring, at appropriate times of year, of lice loads on wild salmonids in areas with and without farms as well as of lice-induced mortality of wild salmonids, that have been treated or that are held as sentinel fish in cages, are needed to better assess sea lice impacts on the wild stocks. At present this monitoring is not commonly conducted. Monitoring for the efficacy of sea lice treatments is also essential and is commonly done. Ideally monitoring would be undertaken by governments with industry support. Resistance to sea lice treatments is a worrying development. One important control mechanism is coordinated fallowing over large geographical areas along with single year class stocking. In a defined region all farmed fish should be the same age and the focus should be on the numbers of fish (hosts) rather than biomass, which changes over

time. Where possible, several treatment methods should be used to prevent resistance developing. Vaccination, if developed, against sea lice is unlikely to be 100% effective. There should be contingency plans that would apply in the event of a serious outbreak so that there is a rapid and effective response to prevent the transmission to the wild stocks and spread of the disease and parasite (including treatment methods, restrictions on movements, mass harvesting, disposal arrangements etc.).

NGO Statements

5.29 The following statements were made by the NGO Group but did not find unanimous support from the rest of the Review Group.

Application of NASCO's principles

5.30 The NASCO Convention applies to the North Atlantic but not to other areas where Atlantic salmon are farmed in marine and freshwater habitats where they are non-native. However, when a country has agreed to the principles of NASCO, including the principles of the Williamsburg Resolution, it would be consistent and strongly advisable that they apply these principles to other areas of their respective countries that are not in the NASCO Convention Area and are not native habitat for Atlantic salmon. In particular, they should adhere to the principle discouraging the introduction of non-native salmon or salmonid species that might interfere with native salmon or salmonid species. For example, escapes from Atlantic salmon aquaculture along the Pacific coast of North America have led to such introductions.

5.31 Companies from one NASCO country operating in another country should meet the national standards for salmon aquaculture operations in their home country as well as the country in which they are operating.

5.32 The NGOs note that in some jurisdictions management and regulation of both salmon farming and the wild stocks are the responsibility of different government departments while in others they are the responsibility of the same department. The NGOs consider that separating the management and regulation of salmon farming from that for wild salmon could help avoid any conflicts of interest that may occur when the two sectors are managed within the same department. While this is a matter for individual jurisdictions, the NGOs observed that at NASCO the primary responsibility of the jurisdictions is the conservation of wild salmon through adherence to the Williamsburg Resolution and implementation of the BMP Guidance, rather than placing wild stocks at risk by accommodating the commercial demands of the salmon farming industry.

Need for enforcement

5.33 The NGOs recognise the need for rigorous enforcement linked to failures highlighted by monitoring and the need for legislation to enable closure or relocation of farms failing to achieve satisfactory sea lice levels or experiencing escape events or other significant losses. Strong and enforceable standards for lice levels and escapes/losses are essential and should be established on the basis of effects on wild salmon and

should be consistent with best available independent scientific advice and rapidly adaptive to changes in that advice.

Presumption against farming

5.34 NASCO's agreements aim to minimize the possible threats from adverse impacts of salmon aquaculture, introductions and transfers and transgenics on the wild stocks. As noted by the Task Force, the general principle should be that wild salmon stocks in areas with fish farming should be as healthy as those in areas without fish farms. Salmon farming is certainly not the only threat to wild salmon stocks, but the NGOs believe the impact is threatening enough that salmon farming and wild stocks are best kept well separated if the wild stocks are to flourish. In addition, there should not be a presumption that aquaculture is compatible with healthy wild salmon populations, as there seems to be in most jurisdictions. It is, instead, recommended that there be a presumption against salmon farming in all coastal waters in the vicinity of salmon rivers, particularly where a jurisdiction has populations of salmon and specific rivers designated under conservation legislation. Exclusion zones should be established based on best available independent scientific advice (i.e. not in-house studies by paid consultants). Furthermore, the NGOs consider that there should be a presumption against any freshwater salmonid aquaculture in river catchments (including lakes) containing a wild population of migratory salmonids.

Issues not addressed in the Williamsburg Resolution

5.35 The NGOs consider that there are issues, particularly concerning salmon farming activities that are not adequately addressed in the Williamsburg Resolution or the BMP Guidance. For example, there should be a clear recognition that assessment of the impacts of salmon farms on the wild stocks should be an essential component of the pre-approval process and for determining the continuing existence or expansion of sites. In this process, risk assessment has been identified as a key tool, but it should be clear that it is no more than that. Risk assessment, in itself, is not precautionary but it can organize information in a way that assists in making precautionary decisions. Other information is often appropriate as well. A better definition of risk assessment would provide guidance on how to apply it (e.g. using it to decide which farms don't have to be monitored is far from precautionary and far from useful in protecting wild salmon). The option of down-sizing, relocating or eliminating salmon farms should also be considered as a possible corrective measure where problems are identified or in response to changes in wild stock abundance. In general, it is important to identify in advance possible threats that may occur to the wild stocks from salmon farming and how best to avoid them or respond to them when they arise. Moving salmon farms offshore should not be viewed as a means of avoiding the need for limiting development. The need for assessment of impacts on wild stocks is just as important for offshore farms as it is for coastal farms. The increasing ratio of farmed salmon to wild salmon populations is a growing concern and must be considered in the pre-approval assessment.

5.36 The scale and rate of growth of salmon farming development are not, but should be, addressed in the Williamsburg Resolution, with guidelines for setting limits to growth ahead of time. More emphasis is needed on the importance of monitoring that can accurately assess the impact on populations of wild salmon in both the marine and

freshwater environments. Apparently guidance is needed as most jurisdictions have not succeeded in establishing reliable and thorough monitoring programmes. International guidance is also needed on what conditions should trigger decisions to relocate, limit growth or reduce density and capacity of salmon farms in a region. This is not just an issue within national boundaries. Salmon in distant ocean waters can and may already be severely impacted by salmon farming in coastal waters. It is also essential that the potential impact of large-scale offshore farming, which looms in the future and could impact wild salmon stocks, be assessed before it is permitted to proceed. Marine spatial planning is being explored or undertaken by many jurisdictions. Mariculture, including salmon farming, should figure prominently in these deliberations, including if and where it is an appropriate activity and its compatibility or incompatibility with other maritime activities. Overall, it is essential that in applying the Precautionary Approach to aquaculture and introductions and transfers, the population status, genetic diversity, and health of the wild salmon are taken into full account. This applies whenever jurisdictions are making decisions about permitting and location of facilities.

5.37 The NGOs, therefore, recommend that NASCO considers developing a more detailed protocol for Atlantic salmon farming to augment (not replace) the Williamsburg Resolution and provide standards for achieving the goal of negligible harm to wild salmon populations.

Issues not addressed in the FARs

5.38 The NGOs note that several of the FARs from jurisdictions with salmon farming omitted some information or procedural knowledge that is publicly available and is known to the NGOs in those jurisdictions. With those omissions the FARs appeared to present a more favourable picture than the actual situation with regard to the impacts of salmon farming on the wild salmon stocks or on efforts to avoid such impacts.

6. Identification of common challenges and common management and scientific approaches to address them

6.1 The Council asked that the Review Group identify common management and scientific approaches to challenges as reported in the FARs. This overview will be prepared later, taking into account the discussions during the Special Session at NASCO's 2010 Annual Meeting.

7. Arrangements for the 2010 Special Session

7.1 The Group discussed arrangements for presentation of its draft report both to the Liaison Group meeting in April in London and to the Council at the Special Session in June. For the Liaison Group meeting, the report would ideally be presented by members of the Review Group but if none are able to participate in that meeting the Coordinator agreed to present the report.

7.2 For the Special Session in June, it was agreed that following a general introduction from the Coordinator describing the way the Group had approached its work, there would be a presentation of the assessments by at least one Group member from the

Parties and one from the NGOs. The Special Session will allow for feedback from the Liaison Group, the NASCO Parties and the NGOs.

8. **Report of the meeting**

8.1 The Group agreed a draft report to the Council and will either meet again or work by correspondence to carry out the tasks not yet completed before issuing a final report. The Group may not be able to complete its work by 31 August as requested and as for the previous Review Groups assumes that this will not cause problems as its final report cannot be presented until June 2011.

9. **Any other business**

9.1 There was no other business.

10. **Close of the meeting**

10.1 In closing the meeting, the Coordinator thanked participants for their valuable contributions, very hard work on the review and their effort to ensure fairness, balance and consistency.

Annex 1

IP(10)21

Assessments of the FARs

The Review Group's assessments of the thirteen FARs follow. They should be read in conjunction with the general comments that apply to all of the FARs in paragraphs 5.10 to 5.23 of the Group's draft report.

Canada

The Review Group is aware that the salmon farming industry in Atlantic Canada is concentrated in the province of New Brunswick, with significant activities also in Nova Scotia and Newfoundland and Labrador. Production in 2008 was 35,000 tonnes, the fourth highest production in the North Atlantic. There is also significant production of farmed Atlantic salmon on the West Coast of Canada. The FAR indicates that in order to achieve single-year class farming, six major aquaculture Bay Management Areas were established in the Bay of Fundy in 2006. Each year, one-third of all sites is left fallow while another third is receiving smolts and the remaining third is harvesting product. The fallowing practice is designed to break the cycle of sea lice before an outbreak can occur. SLICE has recently been approved for use in Canada, and is the only treatment used. Introductions and transfers are governed by the 2002 National Code on Introductions and Transfers of Aquatic Organisms and related regulatory procedures. The majority of introductions and transfers is for salmon farming but there are also significant movements for wild stock enhancement purposes. Under the Code, a licence will only be issued for the release or transfer of fish if it will not adversely affect the stock size or genetic characteristics of fish stocks. Since the introduction of the Code, Canada has not approved any new introductions or transfers of non-indigenous fish into rivers containing Atlantic salmon. Initiatives are underway to address unlawful introductions. A new National Aquatic Animal Health Program has been developed and the Health of Animal Act is being amended to provide protection for farmed and wild aquatic animals against infectious diseases. Canada is the only jurisdiction to report rearing of transgenic salmon. This is for research purposes in land-based closed containment systems.

Both Federal and Provincial governments are involved in the management of aquaculture and related activities in Canada. Different regulatory approaches are being used in different provinces and in some cases only examples from specific provinces were provided. This made it difficult to assess the FAR as a whole.

No reference was made in the FAR to the NAC Protocols on Introductions and Transfers or to cooperation with the US including the escape notification arrangement. Furthermore, no data were presented to describe progress towards achievement of the international goals for sea lice and containment. The FAR states that the incidence and number of escapes are declining in all provinces as a result of the measures introduced even though farmed production is increasing. However, it is also stated that the records are not yet maintained by the Provinces in a format that allows easy analysis. The Review Group notes that while Codes of Containment have been developed and implemented consistent approaches are not used across the Provinces. For example, immediate reporting of escapes is not required in Nova Scotia (where it is, however, common practice). In New Brunswick, where the industry

is located close to endangered wild salmon populations listed under the Species at Risk Act, the code is voluntary but in Newfoundland it is mandatory. There is not yet an integrated pest management system although this is being explored and the issue of inconsistent approaches across Provinces referred to above applies to measures to minimise disease and parasite transmission. Contrary to the NAC Protocols there is no general prohibition on importation of reproductively viable Atlantic salmon from outside the Commission area. River classification schemes were not reported for all Provinces. There was a lack of a clear description of the procedures involved in corrective measures where adverse impacts are identified.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- progress towards achieving the international goals for sea lice and containment was not demonstrated;
- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to minimise the risk of disease and parasite transmission have not been implemented;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- classification and zoning systems have not been developed;
- procedures in place to initiate corrective measures are not adequately described.

Denmark - (Faroe Islands)

Atlantic salmon are not native to the Faroe Islands. However, stocking of salmon of Icelandic and Norwegian origin has resulted in the establishment of salmon runs maintained by stocking in four small rivers and an annual catch of 400 – 600 fish. Stocking of sea trout is also undertaken. It is not clear whether there is natural production of salmon in the rivers that are enhanced by stocking or if the salmon runs are entirely hatchery maintained. The Faroe Islands is the third largest producer of farmed salmon in the North Atlantic. Production has increased to approximately 50,000 tonnes in 2009 following reduction in the incidence of diseases (mainly ISA) which had resulted in a sharp fall from the peak production of 60,000 tonnes in 2003. The FAR states that NASCO's agreements are largely not relevant in the context of the Faroe Islands because there are no self-sustaining wild salmon stocks. While the Review Group recognises that the salmon populations in Faroes were introduced, it remains unclear if these should be considered wild given the length of time they have been established. Furthermore, escaped farmed salmon are an international issue so the measures taken to minimise escapes and prevent disease outbreaks are important in that context, particularly given the close proximity to marine feeding grounds for wild salmon.

Containment measures include technical standards for equipment, monthly inspections of nets by certified divers and mandatory reporting of escapes. The FAR indicates that there have been few reported significant escape incidents in recent years. Fish health is monitored monthly through all stages of production, imports to the Faroe Islands are regulated in accordance with EU fish health regulations, and fallowing and single-year class stocking are used. Regulations intended to reduce the occurrence of sea lice in farmed fish and to impair

the development of resistance to preventative treatment have been developed that require regular sampling for, and reporting of sea lice on farmed fish and sets out the required procedures for treatment, which can also require coordinated efforts between fish farming facilities. Medical treatment of sea lice is registered by date of treatment, medicine and dosages.

While there is international cooperation with other research institutes, no cooperation is described in relation to minimising impacts on the wild salmon stocks. The FAR indicates that sea lice caused serious problems for the industry in 2009 resulting in new measures to improve treatment methods and their coordination and lice monitoring. However, no data is provided to allow assessment of progress towards achieving the international goals for either sea lice or containment. While there is a requirement to report losses and there are inspections of the nets, there is no overall Code of Containment, no technical standards for equipment and no system for verifying compliance with standards. The procedures to control movements into the Commission area are based solely on health status of the exporting country. There is a procedure in place for implementing corrective measures in the event of heavy metal or organic matter build-up in the sediments around farms but there are no contingency plans in place in the event of a large scale escape or disease outbreak.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- progress towards achieving the international goals for sea lice and containment was not demonstrated;
- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- procedures in place to initiate corrective measures are not adequately described.

EU – Denmark

There is no salmon farming in Denmark. There are five salmon rivers, four of which have wild stocks and valuable efforts are being made to rebuild these stocks through stocking and habitat restoration work. Broodstocks for stocking are obtained from each river and the resulting progeny are only released back into that river (except in the case of rivers that have lost their salmon population). Crossing between the wild strains is not permitted and they are held separately in the hatcheries. Genetic guidance has been developed and applied regarding optimal numbers of spawners and breeding protocols. A proportion of the released hatchery fish are marked to allow evaluation of the stocking programme. The FAR indicates that the two hatcheries both use re-circulated water and high health status is maintained. Stocking is mainly of fed fry but smolts are also released particularly in the river with no wild stocks.
The FAR indicates that containment in the hatcheries is 100% but no information is presented on the containment measures in support of this statement. No information was presented concerning controls on movements of non-indigenous anadromous salmonids originating outside the Commission area. While the FAR indicates that the introduction of foreign strains of Atlantic salmon is not allowed, no information was presented in relation to

introductions of non-indigenous species or on the procedures for implementing corrective measures where adverse impacts are identified.

The following issues are not consistent with NASCO's agreements and need additional actions:

- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- the procedures to ensure that no non-indigenous fish species are introduced into a salmon river that would have unacceptable risks of adverse impacts to the wild stocks are not adequately described;
- procedures in place to initiate corrective measures are not adequately described.

EU – Finland

There are only two Atlantic salmon rivers in Finland, the rivers Teno and Naatamo, both border rivers with Norway. There is no coastline and, therefore, no marine salmon farming in Finland although there is on the Norwegian coastline. In the River Teno, fish farming is not allowed, no releases of fish of any kind are permitted within the salmon migration area and transfers from other watersheds into the Teno of live fish or eggs that have not been disinfected are prohibited. In practice, the only aquaculture activity permitted is small-scale transfers of indigenous fish between lakes or tributaries within the Teno catchment outside the salmon migration area and only under licence. In the Naatamo, transfers from other watersheds into the catchment of live fish or eggs that have not been disinfected are prohibited but there is no general prohibition on fish farming and stocking. However, in practice there is only one small hatchery that releases newly hatched fry of char, whitefish and grayling derived from eggs collected from wild broodfish in lakes outside the salmon migration area. This hatchery is subject to annual health inspections.

A monitoring programme is in place for the parasite *G. salaris*, a contingency plan is being developed, new legislation intended to prevent the possible spread of the parasite has been introduced and educational materials (roadside signs, leaflets, video tapes) to increase public awareness of the parasite, its effects on wild salmon and the measures required to prevent its spread have been developed in cooperation with Norway. The Review Group believes that such cooperation between Sweden, Norway, Finland and Russia on *G. salaris* is very important. There is monitoring to identify the origin of salmon (wild or escaped farmed) covering all fishing methods and seasons in both rivers.

These procedures are consistent with the NASCO agreements and guidelines.

EU – France

The Review Group is aware that France has some major salmon rivers but that the presence of numerous dams has resulted in the loss of habitat resulting in the loss of some stocks and severe declines in others. Restoration and rebuilding efforts are being undertaken and ten rivers have stocking programmes to restore lost wild stocks, sustain remaining stocks and maintain fisheries. The hatcheries mainly produce eggs, unfed and fed fry but smolts are also stocked. Rearing at freshwater hatcheries is in tanks and the outlets are fitted with screens to

prevent escapes. The stocking policy has evolved from being based on imported eggs to the use of native strains. Fish are now stocked at earlier life-history stages and progress is being made in developing genetic guidance for hatchery programmes. However, the limited numbers of available wild spawners and their sex ratios is a concern since the need to protect the wild stocks from which the hatchery material is sourced is recognised. There are two marine sites for commercial salmon farming located in sheltered locations with a production of 1,500 tonnes; one of these farms utilises local French stocks while the other uses Scottish strains. There are inspections of nets and all escapes must be reported and there are risk-based site inspections.

The FAR indicates that while there is some international cooperation through the Federation of European Aquaculture Producers, collaboration on the restocking programme is rare within France and internationally. No information was presented to allow assessment of progress towards the international goals for sea lice and containment and reference is made to a number of 'black spots' relating to aquaculture that need to be addressed. Although the FAR indicates that a comprehensive dossier of information must be provided before a licence for salmon farming is issued, it is not clear if this is the responsibility of the proponent of the activity or the authority. Freshwater hatcheries are required to screen outflows and marine sites must report escapes, but there are no technical standards for marine farms. The FAR recognises that further progress in implementing genetic protocols and in assessing the health status of spawners is required in the stocking programme. There is no reference to measures for the control of sea lice such as single year-class stocking or fallowing. While no non-native salmon stocks have been used for many years in France, there is no law prohibiting movements that originate from outside the Commission area. No procedures for initiating corrective measures have been described in relation to salmon farming although areas for improvements to hatchery practices for the stocking programmes have been identified.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- no information is presented to allow assessment of progress towards the international goals for sea lice and containment;
- the process to demonstrate prior to approval that proposed activities will not have a significant impact on wild salmon stocks is not adequately described;
- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to minimise interactions from salmon enhancement activities are not adequately described;
- adequate measures to minimise the risk of disease and parasite transmission have not been implemented;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- procedures in place to initiate corrective measures are not adequately described.

EU – Germany

The Review Group notes that there is no salmon farming in Germany. All wild salmon stocks were extinct in Germany by the middle of the nineteenth century and valuable efforts are now being made to restore them. Restoration stocking uses eggs imported from other European countries (i.e. from within the North-East Atlantic Commission area) or increasingly derived from adults returning to the rivers or their progeny. The aim is to become independent of foreign origin ova and some material is already obtained from returning spawners, some kelts are reconditioned and there is some captive breeding. The habitats chosen for stocking are those known to have been occupied by salmon historically or that have suitable habitat today. All salmon hatcheries require authorisation and are subject to health inspections. All ova imported from abroad require a health certificate and all material is subject to a health check before stocking.

No information has been provided in the FAR in relation to initiatives for international cooperation, burden of proof, classification and zoning, policies concerning the introduction of non-indigenous fish into salmon rivers, and procedures to initiate corrective measures. While the FAR indicates that only stocks originating from countries within the North-East Atlantic Commission area have been used in the stocking programmes no information is presented on the existence of controls on movements from outside the Commission area. No information is presented relating to introductions of non-indigenous fish and there is no information on ongoing research and data collection in support of the restoration programme.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- the process to demonstrate prior to approval that proposed activities will not have a significant impact on wild salmon stocks is not adequately described;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- the procedures to ensure that no non-indigenous fish species are introduced into a salmon river that would have unacceptable risks of adverse impacts to the wild stocks are not adequately described;
- classification and zoning systems have not been developed;
- procedures in place to initiate corrective measures are not adequately described;
- research and development and data collection are not adequately described.

EU – Sweden

There are major habitat issues in Swedish West Coast rivers associated with acidification and hydro-electric power (HEP) schemes but significant stock rebuilding efforts are underway including liming programmes and large-scale stocking of smolts in three rivers affected by HEP. There is no marine salmon farming although escapees originating in other countries have been detected in rivers and caused problems for the compensatory stocking programme. The parasite *G. salaris* was first detected in 1989 and now occurs in most rivers. The parasite has significant effects on the growth and condition of parr in infected rivers. There are

cooperative programmes with Norway and Finland relating to this parasite and with Norway on stocking border rivers. This cooperation includes scientific cooperation related to identification of the parasite. There is only one salmon hatchery on a salmon river and ten rainbow trout farms. Stocking with salmon is restricted to local stocks from the river concerned and before any release of hatchery-reared fish a risk-benefit analysis is required. Permission for stocking with salmon is normally restricted to the ongoing national re-stocking programme, designed to compensate for lost production due to HEP generation. Any new aquaculture facilities on salmon rivers are prohibited and under a new strategy on introductions and transfers, it is recommended that h**a**bitat improvement to enhance natural regeneration of stocks should be prioritised over re-stocking.

It is not clear what protective measures relating to introductions and transfers of non-indigenous species apply in these rivers. There is no marine salmon farming in Sweden but there is no description of the containment measures employed at freshwater facilities for rearing salmon and rainbow trout. While the FAR indicates that stocking can only use material obtained from the river being stocked, no information has been provided to show that controls exist concerning the movement of salmon and non-indigenous salmonids that have originated outside the Commission area. While it is indicated that stocking with any species of salmonid is normally prohibited if the parasite *G.salaris* does not already exist in the river system, the FAR indicates that most rivers now have the parasite present. There is no description of procedures relating to the introduction of non-indigenous fish into a salmon river. The FAR indicates that the strategy to prevent the further spread of *G. salaris* is to prevent stocking of uninfected rivers and to disseminate information about the risks from the parasite but no initiatives for eradicating the parasite in infected rivers are described. Such initiatives are recommended in Annex 2 of the Williamsburg Resolution.

The following issues are not consistent with NASCO's agreements and need additional actions:

- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- the procedures to ensure that no non-indigenous fish species are introduced into a salmon river that would have unacceptable risks of adverse impacts to the wild stocks are not adequately described;
- procedures in place to initiate corrective measures are not adequately described.

EU – UK (England & Wales)

The FAR indicates that there is no saltwater farming of salmon but approximately 1.9 million salmon parr/smolts are reared annually in fresh water for on-growing in marine cages in Scotland. Rearing of juvenile salmon (~1.3 million) and small numbers of sea trout is undertaken to supply a range of mitigation, restoration and enhancement stocking programmes**.** There is also rearing of brown and rainbow trout, small numbers of non-indigenous species and coarse fish.

Consent is required to release fish and as part of the consenting procedure, the effects on the fisheries and the general ecology of the receiving and connected waters are considered including, fish health, fish ecology and the ecology of plants and other wildlife. Separate

regulations apply if the fish are not native to the British Isles. There is a risk-based approach to authorising fish farms. All fish farm operators are required to ensure that screens are in place to prevent the entrainment of salmon or migratory trout into the farm and to prevent the egress of farmed fish from the fish farm. Compliance is assessed by regular inspections. There is a clear policy for stocking that incorporates the elements in NASCO's guidelines. Stocking of non-native species or 'kinds' of fish would very rarely be permitted in waters containing salmon and then only subject to a risk assessment demonstrating that the expected effects on the salmon stocks would be minimal. A policy of only stocking triploid (sterile) brown trout is being introduced. There are no imports of live salmon or salmon ova from other NASCO Commission areas, there is a presumption against issuing any licences to keep or release non-indigenous anadromous salmonids or to release any non-native fish in a salmon river. Research is being conducted into the impacts of intensive in-river aquaculture on wild salmonids and in developing risk assessment frameworks for non-native species. Educational materials have been developed including material related to *G. salaris* for which a contingency plan has been developed.

These procedures are consistent with the NASCO agreements and guidelines.

EU – UK (Northern Ireland)

The FAR indicates that there is only one marine salmon farm in Northern Ireland which has two sites that are ten miles apart and are stocked and harvested alternately. Production is low (138t in 2008) and because of the lack of suitable sites, it is considered unlikely that additional licences will be issued for marine salmon farms. Any new applications would be subject to an Environmental Impact Assessment and consultations. Because of the hydrodynamics of the two sites currently operated, there has been no need to carry out any treatment for sea lice. Each site is stocked with a single year-class alternately allowing a 6-week fallowing of each site. Procedures and measures have been adopted in relation to both marine sites and freshwater facilities with regard to site selection, equipment and structures, management systems and operations, and verification. With regard to introductions and transfers, movements of Atlantic salmon and non-indigenous anadromous salmonids from outside the North-East Atlantic Commission area are not permitted and stocking of salmon rivers with non-indigenous fish are prohibited. Stocking to the wild requires the use of salmon sourced from the river to be stocked except where the salmon population has been extirpated. Contingency plans have been developed for *G. salaries,* escapes and jelly fish swarms around the farms.

No initiatives for international cooperation were reported although the Review Group is aware that such initiatives exist with the Republic of Ireland and the UK. A genetic study showed that interbreeding between escaped farmed salmon and wild fish had occurred in the Glenarm River following an escape event. Changes in gene frequencies in the wild population were documented and have persisted. Data were provided on the number and percentage of farmed origin salmon in coastal fisheries (11 - 18% or 500 – 900 salmon in recent years) and in the River Bush (zero or close to zero in recent years) and lice loads on commercially caught adult salmon. However, these data are not adequate to fully evaluate progress towards the international goals. The Review Group notes the absence of information on the licensing process and that the burden of proof appears to be on the regulatory authority, not the proponent of the activity.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- progress towards achieving the international goals for sea lice and containment was not demonstrated;
- the process to demonstrate prior to approval that proposed activities will not have a significant impact on wild salmon stocks is not adequately described.

EU – UK (Scotland)

Scotland is the second largest producer of farmed salmon in the North Atlantic with a production of approximately 130,000 tonnes in 2008 from 257 active marine sites. There is also farming of rainbow trout and small scale farming of other species (char, brown/sea trout, halibut and cod). There is a presumption against any further finfish aquaculture development covering the north and east coasts of Scotland. The FAR indicates that the salmon producers' organization has developed a Code of Good Practice which is currently being reviewed and updated. All salmon farmers are required to comply with this Code. Third party non-statutory audits of compliance with the Code are undertaken. Reporting of escapes is mandatory and sharing the information with wild fish interests is advised. New legislation will establish a risk-based approach to aquatic animal health surveillance. The FAR indicates that a number of controls is in place and these controls are being updated to ensure effective sea lice management, there is a process for sharing information on sea lice prevalence between fish farming companies and wild fish interests and monitoring of wild smolts is carried out by sweep netting to assess lice burdens. The Review Group welcomed the summary table indicating how each measure in the BMP Guidance is being addressed. It is an offence to introduce salmon or sea trout into waters without consent. Policy guidance has been developed to promote best practice for stocking that advocates a risk-based approach. It is an offence to introduce non-native species into the wild without a licence and there is a strong presumption against releasing non-indigenous fish into rivers containing salmon. Scotland has Additional Guarantees in relation to *G. salaris* (and BKD) and a contingency plan has been developed. Considerable efforts are being made to highlight the risks posed to the wild stocks by this parasite.

'A fresh start: the renewed Strategic Framework for Scottish Aquaculture' includes six themes including healthier farmed fish and improved containment. A Containment Working Group is working to strengthen the approach to escape avoidance and it intends *inter alia* to develop a technical standard covering production in both freshwater and marine environments. Similarly, a Healthier Fish and Shellfish Working Group will update the current sea lice control regime by introducing a national system for publishing sea lice data, introducing threshold levels, ensuring single year-class stocking, fallowing and synchronous lice treatments and introducing statutory reporting on suspicion of sea lice resistance to therapeutants. The Review Group notes the evolution in the approach to address the impacts of salmon farming from voluntary approaches, through accredited schemes such as the Code of Good Practice to legislation and enforceable regulation.

However, the FAR does not present any data to assess if progress has been made towards achieving the international goals; this is especially true for sea lice. The Review Group notes

that a low percentage of escapees from a large biomass of farmed salmon can pose an elevated risk to the wild stocks. The current Code of Good Practice is described in the FAR as being outdated with regard to containment and it is currently being reviewed. Similarly, the Group notes that new initiatives for improved disease and parasite control are being developed but are not yet in place. The Review Group notes that imports of salmon ova from outside the Commission area occurred as recently as 2006.

The following issues are not consistent with NASCO's agreements and need additional actions:

- progress towards achieving the international goals for sea lice and containment was not demonstrated;
- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to minimise the risk of disease and parasite transmission have not been implemented;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented.

Norway

Norway is the largest producer of farmed Atlantic salmon in the world with production in 2009 of approximately 846,000 tonnes and between 600-700 sites holding fish at any one time (~1,038 licensed sites in total in 2009). Production has quadrupled over a fifteen year period. The FAR indicates that the major concerns relate to escapees and sea lice. The Group notes some major initiatives concerning measures to minimise impacts of aquaculture, introductions and transfers. For example, 52 national salmon rivers and 29 national salmon fjords have been designated in which the establishment of new salmon farms is prohibited and existing farms have been subject to stricter regulations since 2009. In 14 fjords the existing salmon farms will be prohibited from 2011. An Action Plan on Containment, 'Vision zero escapes' was developed in 2006 with the aim of achieving its goals in two years and an extension of this plan is now being considered. The plan includes technical standards, a permanent Commission of enquiry into escape events, and education and motivation efforts. Efforts are made to recapture escapees, a method of tracing escapes to the farm of origin has been developed for use in the case of non-reporting of losses and monitoring for escapees occurs in 39 rivers. Since 2007, there has been a coast wide (except Troms and Finnmark counties) synchronised delousing programme which becomes mandatory in 2010 and which is intended to protect out-migrating smolts.

Norwegian wild salmon populations in 46 rivers have been severely damaged by the introduction of the parasite *G. salaris*. Treatment of *G. salaris* has been successful in 21 rivers and in 2009 an updated Action Plan was developed dealing with surveillance, prevention of spread into uninfected rivers and measures to eradicate the parasite.. Gene banks (both living and cryopreserved) have been established. Stocking to the wild is restricted to the local stock and is kept to a minimum with greater emphasis on habitat protection and restoration. Salmon originating from outside the Commission area have not been introduced and it is prohibited to import and release anadromous freshwater fish.
No initiatives for international cooperation are described although the Review Group is aware from information presented in other FARs that such cooperation occurs with Finland, Scotland, and Sweden. Data were presented on the reported escapes of farmed salmon as

both numbers and as a proportion of the farmed stock. Information presented in the FAR indicates that the reported number of escapees has declined, but the number remains high (175,000 in 2009). Monitoring in rivers indicates that the proportion of escaped farmed salmon in spawning populations has also declined but since 2000 it has been between 11 – 18% and shows a slightly increasing trend since 2003. Appropriate thresholds have not been determined. A modelling study presented in the FAR predicts major changes in the composition (percentage wild origin) of the spawning run in all but two regions of Norway by 2100. Among the salmon that hatched in 1995 an estimated 75% or more came from wild parents in all regions while a century later it is predicted that < 75% will come from wild parents in all but two regions. Sea lice levels per fish were found to be three times higher in Autumn 2009 than in 2008. The data on sea lice are not adequate to assess progress towards the international goals. However, it is noted in the FAR that lice levels monitored annually on wild fish indicate that levels are significantly higher in areas with fish farms than in areas without. In response to the increased lice levels in 2009, compulsory synchronised delousing treatments are now required at new lower thresholds but a major challenge in achieving these targets to protect wild fish is the evidence of resistance to both emamectin benzoate and pyrethroid treatments, which was perhaps inevitable given the frequency of treatments.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- progress towards achieving the international goals for sea lice and containment was not demonstrated;
- adequate measures to minimise the risk of disease and parasite transmission have not been implemented.

Russian Federation

The FAR indicates that there are two salmon farms in the Murmansk region close to the border with Norway that use Norwegian or Scottish origin fish which are quarantined until health testing has confirmed that the material is disease-free. While production is presently a few hundred tonnes, projected production is around 23,000 tonnes. Stocking occurs in the Murmansk, Karelia and Archangelsk regions using indigenous salmon and fin clipping is used to allow evaluation of the effectiveness of the hatchery releases. There are plans to review the hatchery protocols since the effectiveness of stocking appears to be low. It is stated that there are presently no activities related to introductions and transfers and that no non-indigenous fish are released into salmon rivers and none are planned. The hatchery releases of pink salmon, a species native to the Pacific Ocean, that started in the 1930s ceased in 2000. The parasite *G. salaris* occurs in one river in Karelia.

The FAR did not follow the format provided by the Council and the information provided was unclear in a number of places. This made it difficult for the Group to assess the FAR. No information was presented on initiatives for international cooperation, to allow progress towards achieving the international goals to be assessed, on the burden of proof or on river classification and zoning. There are no technical standards for equipment and no requirement to report escapes although farms must have a contingency plan in the event of an escape event. While interim veterinary and sanitary rules for marine farms have been developed, they have not been approved. There do not appear to be requirements for single year-class

stocking or fallowing and there is no IPM. The FAR indicates that although the introductions of pink salmon have now ceased, it is not clear if controls exist to prevent future introductions. Pink salmon spawn in all rivers in the Murmansk region (supporting a fishery twice the harvest of Atlantic salmon) and the Review Group is aware the species also spawns in some Norwegian salmon rivers. The FAR does not describe any corrective measures intended to address this situation or to eradicate the parasite *G. salaris* in the infected river in Karelia.

The following issues are not consistent with NASCO's agreements and need additional actions:

- initiatives for international cooperation to minimise adverse impacts on wild stocks were not adequately described;
- no information is presented to allow assessment of progress towards the international goals for sea lice and containment;
- inadequate development and implementation of an Action Plan to minimise escapes;
- adequate measures to minimise the risk of disease and parasite transmission have not been implemented.
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- procedures in place to initiate corrective measures are not adequately described;
- classification and zoning systems have not been developed.

USA

The remaining wild populations of Atlantic salmon in Maine have been listed under the Endangered Species Act (ESA), while rivers in which the salmon populations have been extirpated are under restoration. The salmon farming industry is located in Maine and production has increased in recent years reaching 9,500 tonnes in 2008 following a major outbreak of ISA. Management actions have been implemented through Federal, State and local measures with the most significant federal measures implemented through the ESA consultation process which does not have regulatory enforcement power. The FAR describes a federal agency determination that salmon farming poses the risk of adverse effects on endangered salmon populations although it is not considered likely that these will drive the species to extinction. The FAR indicates that the option to relocate the farms away from the wild salmon rivers was considered but alternative suitable sites could not be identified. Rather the measures implemented include the use of only local North American stocks, containment measures to reduce escapes, audits and reporting requirements, prohibitions on stocking transgenic salmon and marking all salmon in marine pens. The salmon farming industry has employed a Containment Management System (CMS) at all production facilities including those in fresh water (e.g. three barrier screening at outflows). Site specific plans were developed following hazard analysis and include standard operating procedures covering, stocking and harvesting, net changes, predator control, managing unique events, record keeping, reporting of escapes and training. Monitoring of rivers for escapees is undertaken. An industry initiative, the Finfish Bay Management Agreement applies to all US companies in Cobscook Bay and certain Canadian companies and has led to better coordination of site fallowing, fewer overlapping year classes in production and reduced disease transmission between year classes. In addition an Integrated Pest Management

Programme is a requirement of the ISA programme and includes monitoring of sea lice levels and evaluating treatment efficiency. Thresholds for lice treatment have been established.
With regard to stocking, in Maine only local river specific stocks are used and standard mating protocols including screening for farmed salmon are applied. A gene bank has been established but is not described.

Data is presented on the occurrence of escaped farmed salmon in five rivers which shows that few escapees have been detected in recent years. However, the data presented is not adequate to allow an assessment of progress towards achieving the international goal for containment and no information is presented in relation to assessing progress in relation to the goal for sea lice. The FAR indicates that deliberate, authorized introductions of non-indigenous anadromous salmonids into the US North American Commission area do not occur but introductions of non-indigenous salmonids with the potential to become anadromous do occur. While imports of all salmonids into the US are controlled by federal salmonid importation regulations, these seek to minimize the spread of diseases and do not address ecological interactions. The FAR indicates that prohibitions on stocking non-indigenous fish into rivers containing Atlantic salmon are not in place and procedures for evaluating the impacts on wild salmon only exist in the case of federally supported programmes. The Group recognises that a requirement to mark all farmed salmon was introduced in 2009 which will allow identification of the source of escapes so corrective measures can be taken. A permanent weir is in place on one river but it is not clear how the temporary weirs would be used to initiate corrective measures on the other rivers.

The following issues are not consistent with NASCO's agreements and need additional actions:

- no information is presented to allow assessment of progress towards the international goals for sea lice and containment;
- adequate measures to control movements into a Commission area of reproductively viable Atlantic salmon and non-indigenous anadromous salmonids or their gametes have not been implemented;
- the procedures to ensure that no non-indigenous fish species are introduced into a salmon river that would have unacceptable risks of adverse impacts to the wild stocks are not adequately described;
- procedures in place to initiate corrective measures are not adequately described.