Council

CNL(06)48

Resolution by the Parties to the Convention for the Conservation of Salmon in the North Atlantic Ocean to Minimise Impacts from Aquaculture, Introductions and Transfers, and Transgenics on the Wild Salmon Stocks

The Williamsburg Resolution

(Adopted at the Twentieth Annual Meeting of NASCO in June 2003 and amended at the Twenty-First Annual Meeting of NASCO in June 2004 and at the Twenty-Third Annual Meeting of NASCO in June 2006)

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The Parties,

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

WELCOMING the achievements in salmon conservation by the Parties to the Convention, within the framework of the Convention, and the role of the North Atlantic Salmon Conservation Organization (the "Organization") therein;

NOTING that NASCO and its Contracting Parties have agreed to apply the Precautionary Approach to the conservation of salmon and acknowledging the need for measures taken in accordance with this Resolution to be consistent with the Precautionary Approach;

AWARE of the need for cooperation between the Parties in order to maintain and to restore the wild salmon stocks, and promote sustainable conservation and management of such stocks;

RECOGNISING the benefits, including the socio-economic benefits, which have resulted from the development of salmon aquaculture;

CONSCIOUS of the threats to the wild stocks of salmon from different human activities, including possible adverse effects from aquaculture, introductions and transfers and transgenics;

RECOGNISING that in order to protect wild salmon stocks from adverse impacts that can or might be caused by aquaculture, introductions and transfers, and transgenics, there is a need to take into account local conditions in determining appropriate management measures;

DESIRING to minimise the possible adverse impacts of aquaculture, introductions and transfers and transgenics on the wild stocks and noting the earlier initiatives taken by the Organization in this respect;

RESOLVE as follows:

ARTICLE 1

Cooperation between the Parties

The Parties shall cooperate in order to minimise adverse effects to the wild salmon stocks from aquaculture, introductions and transfers and transgenics.

ARTICLE 2

Definitions

For the purposes of this Resolution definitions are as given in Annex 1.

ARTICLE 3

Burden of Proof

Each Party, in accordance with the Precautionary Approach, should require the proponent of an activity covered by this Resolution to provide all information necessary to demonstrate that the proposed activity will not have a significant adverse impact on wild salmon stocks or lead to irreversible change.

ARTICLE 4

Risk Assessment

Risk assessment is integral to the implementation of the Precautionary Approach and serves to promote transparency in the decision-making process. Risk assessment should include identification of options and consideration of mitigation measures. The Parties should develop and apply appropriate risk assessment methodologies in considering the measures to be taken in accordance with this Resolution.

ARTICLE 5

Measures to Minimise Impacts of Aquaculture and Introductions and Transfers

Each Party shall take measures, in accordance with Annexes 2, 3 and 4 to this Resolution, to:

- minimise escapes of farmed salmon to a level that is as close as practicable to zero through the development and implementation of action plans as envisaged under the Guidelines on Containment of Farm Salmon (CNL(01)53);
- minimise impacts of ranched salmon by utilizing local stocks and developing and applying appropriate release and harvest strategies;
- minimise the adverse genetic and other biological interactions from salmon enhancement activities, including introductions and transfers;
- minimise the risk of disease and parasite transmission between all aquaculture activities, introductions and transfers, and wild salmon stocks.

Movements into a Commission area of reproductively viable Atlantic salmon or their gametes that have originated from outside that Commission area should not be permitted.

ARTICLE 6

Non-Indigenous Fish

No non-indigenous fish should be introduced into a river containing Atlantic salmon without a thorough evaluation of the potential adverse impacts on the Atlantic salmon population(s) which indicates that there is no unacceptable risk of adverse ecological interactions.

Introductions into any Commission area of reproductively viable non-indigenous anadromous salmonids or their gametes should not be permitted.

ARTICLE 7

Transgenic Salmonids

The Parties should apply the Guidelines for Action on Transgenic Salmon, CNL(97)48 (Annex 5), to protect against potential impacts from transgenic salmonids on wild salmon stocks. In view of the current lack of scientific knowledge on the impact of transgenic salmonids on wild salmon stocks, the use of transgenic salmonids should be considered a high-risk activity. There should be a strong presumption against any such use.

ARTICLE 8

River Classification and Zoning

For the purposes of developing management measures concerning aquaculture and introductions and transfers, Parties should, as appropriate, develop and apply river classification and zoning systems. Details of such systems should be established in accordance with the guidance in Annex 6.

ARTICLE 9

Mitigation and Corrective Measures

Where significant adverse impacts on wild salmon stocks are identified, the Parties should initiate corrective measures without delay and these should be designed to achieve their purpose promptly.

Mitigation measures can include activities to safeguard against potential future impacts (e.g. contingency planning, gene banks).

ARTICLE 10

Implementation

In order to have confidence that the wild stocks are protected from irreversible genetic change, from significant ecological impacts and from significant impacts of diseases and parasites, full implementation of the measures in this Resolution and its Annexes is essential. Local conditions may warrant consideration of stronger measures. All measures should be regarded as adaptable to improved salmon aquaculture technologies and methodologies (e.g. use of sterile fish, lice vaccines, etc.)

Where detailed agreements are developed by a regional Commission of NASCO in support of this Resolution, they will be appended. Appendix 1 indicates the current situation within the North American Commission. Appendix 2 contains a Memorandum of Understanding between Canada and the USA intended to reconcile the differences between the methods used to authorise introductions and transfers in the two countries. Any further guidelines to assist in implementing this Resolution will be annexed.

Each Party shall report annually to the Organization on the measures adopted and actions taken under Articles 5, 6, 7 and 9.

ARTICLE 11

Research and Development

Each Party should encourage research and data collection in support of this Resolution (as detailed in Annex 7) and should take steps to improve the effectiveness of the measures contained in this Resolution.

Each Party shall report annually to the Organization on the research and development carried out.

ARTICLE 12

Dissemination of Information

Educational materials should be developed and distributed to increase awareness of the risks that introductions and transfers of aquatic species may pose to wild salmon stocks and the need for the measures that control these activities.

Annex 1

Definitions relating to Salmon Aquaculture, Introductions and Transfers and Transgenics

Term	Definition
Containment	Physical containment: Prevention of escapes of farmed salmon into the freshwater and marine environments. Containment of diseases and parasites: Implementation of measures to prevent the transfer (spread) of diseases and parasites between aquaculture facilities and wild fish.
Epidemiological zones	Zones defined by lack or presence of specific pathogens.
Introduction	The intentional or accidental release of a species into an environment outside its native or natural range.
Mitigation stocking	Stocking conducted as a voluntary action or statutory requirement to mitigate lost production due to an activity that cannot be removed.
Non-indigenous	Not originating or occurring naturally in a particular environment; introduced outside its native or natural range.
Population	A group of organisms of a species occupying a specific geographical area.
Rehabilitation	The rebuilding of a diminished population of a finfish species, using a remnant-reproducing nucleus, toward the level that its environment is now capable of supporting.
Restoration	The re-establishment of a finfish species in waters occupied in historical times.
Risk assessment	The process of identifying and describing the risks of activities having an impact on fisheries resources, habitat or aquaculture before such activities take place; the process of identifying a hazard and estimating the risk presented by the hazard, in either qualitative or quantitative terms.
River classification	Designation of a river or watershed according to the degree of human impact.
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.
Salmonid*	All species and hybrids of the family Salmonidae.

Stock* (Management unit)	A management unit comprising one or more salmon populations.
Stock (local)	A stock from a river or tributary in close proximity to the river to be stocked. This may refer to rivers with a common bay of entry or closely related catchment areas.
Stocking	The deliberate release of Atlantic salmon into the wild at any stage of their life-cycle for enhancement, mitigation, restoration, rehabilitation or ranching purposes.
Transfer*	The deliberate or accidental transport of Atlantic salmon within their native or natural range.
Transgenic	An organism that has been modified by genetic engineering to contain DNA from an external source.
Wild salmon	Fish that have spent their entire life-cycle in the wild and originate from parents which were also spawned and continuously lived in the wild.
Zone	Geographic area reflective of the degree of degradation or manipulation of wild Atlantic salmon populations.

* for the purposes of the NAC Protocols, a different definition is used, see NAC(94)14

Annex 2

General Measures to Minimise Impacts

This Annex is designed to provide guidance to NASCO's Parties on minimising impacts of salmon aquaculture and introductions and transfers on wild salmon stocks. The guidelines will be regularly reviewed and updated as appropriate in the light of new scientific information and changing technologies and methodologies.

1. Siting and Operation of Aquaculture Activities

1.1 Salmon aquaculture facilities should only be located where hydrographical, epidemiological, biological and ecological standards can be met. Factors which may be taken into consideration include: availability of water supply and receiving waters for discharge; water quality and exchange; water depth; site protection; separation distances between aquaculture facilities; and distance from salmon rivers. Further guidance on containment is provided in Annex 3.

1.2 Consideration should be given to the establishment of "wild salmon protection areas" where salmon aquaculture is restricted or prohibited. Such protection areas may minimise genetic, disease, parasite and environmental impacts.

1.3 The designation of "aquaculture regions", where all the steps in the production process are carried out and which are separated from similar regions by areas without aquaculture, could also be considered. Such regions could provide a framework for management of the aquaculture industry and could assist in controlling the spread of fish diseases and parasites.

1.4 The separation distance between aquaculture facilities at marine sites should be based on a general assessment of local conditions. Wherever possible, different generations of salmon should be reared in separate locations. As local conditions permit, a fallowing regime should be practised as a means of minimising outbreaks of disease and parasites. Aquaculture production should be adapted to the holding capacity of an individual site and should not exceed density levels based on science and good husbandry practices.

1.5 Dead and dying fish should be removed immediately from aquaculture production facilities, taking into account worker safety, and weather and sea state conditions. Mortalities should be disposed of, along with waste materials, in an approved manner. Procedures should be established to address the effective removal and disposal of infectious material. Contingency plans should be established for the disposal of mortalities from emergency situations.

1.6 Depending on local regulations and protocols, tagging or marking or inventory tracking systems will be used in order to facilitate the identification of farmed salmon in the wild and their separation from wild fish, to determine the source of escapes and to assess the interactions of escaped farmed salmon with the wild stocks. These systems could be coupled with river monitoring and recapture systems that allow holding and close examination of returning fish in the rivers.

2. Diseases and Parasites

2.1 All steps in the aquaculture production process from hatchery to processing plant, including transportation of live fish materials, should be conducted in accordance with appropriate fish health protection practices. This includes attention to the application of appropriate husbandry techniques to minimise the risk of disease in the reared stock. These might include vaccination, use of optimal stocking densities, careful handling, frequent inspection of fish, proper diet and feeding regimes, avoidance of unnecessary disturbance of the fish, detailed health inspections, disinfection of transportation equipment and the use of foot baths at production facilities.

Specified diseases and parasites

2.2 Mapping of the presence of serious diseases and parasites should be used to establish epidemiological zones (either with or without specific pathogens). Management measures within these zones should include monitoring to confirm the disease status of a zone and eradication. These zones should be established for at least the following diseases: Viral Haemorrhagic Septicaemia (VHS), Infectious Haematopoietic Necrosis (IHN), Infectious Salmon Anaemia (ISA) and the parasite *Gyrodactylus salaris*.

2.3 Movements of live salmonids and their eggs from a zone where any of the specified diseases is present to a zone free of these diseases should not be permitted. However, movements of salmonid eggs may be permitted where there is minimal risk of transmission of the specified diseases or parasite.

2.4 A list of the prevailing infectious diseases and parasites, and the methods in practice for their control, should be maintained by the appropriate authorities.

Unknown diseases and parasites

2.5 Procedures should be established for the early identification and detection of, and rapid response to, an outbreak of any new disease or parasitic infection likely to affect Atlantic salmon. These procedures should include the establishment of official surveillance services responsible for the monitoring of the health of both wild and farmed fish. The procedures should also demand the rapid introduction of restrictions on the movement of salmonids in the case of an outbreak of a disease or parasitic infection until the status of the disease or parasitic infection is known.

2.6 Even with such procedures, it may not be possible to respond in time to prevent the spread of such a disease or parasitic infection. It is recommended that the Contracting Parties, when establishing or reviewing rules on transfers of fish, consider additional protective measures such as:

- **the establishment of zones:** the intention of such zones, between which the movement of live salmonid fish and their gametes should be restricted and which might be defined using geographical, climatic or biological criteria, is to limit the spread of parasites and diseases to wild stocks;

- **the movement of salmonids:** for disease prevention purposes, the trade in eggs is safer than the trade in live fish. It must, however, be recognised that

some serious diseases, such as IPN, BKD and IHN, may be transferred with eggs and ovarian fluid;

- **diseases of wild fish:** there is a need to strengthen and amend disease controls to minimise disease transfer between aquaculture activities and wild fish.

Health inspections of donor facilities

2.7 Movements of live salmonids and their eggs from hatcheries to areas containing Atlantic salmon stocks, or to facilities where there is a risk of transmission of infection to such areas, should only take place from facilities where regular inspections have not detected significant diseases and parasites.

Use of medicines and disinfectants

2.8 Medicines and disinfectants to control diseases and parasites must be used with care and in accordance with the manufacturer's instructions and any Codes of Practice, and in compliance with regulatory authorities.

3. Gene Banks

3.1 Various activities may result in serious adverse impacts on salmon stocks and strains such that the potential exists that a portion of the salmon genome is lost. In order to protect against this possibility, Parties should consider the establishment of gene banks for stocks that are in danger of extirpation. This could provide a source of genetic material for future restoration programmes.

Annex 3

Guidelines on Containment of Farm Salmon, CNL(01)53

Section 1: Introduction

1.1 The North Atlantic salmon farming industry and the North Atlantic Salmon Conservation Organization (NASCO) have established a Liaison Group. This Liaison Group recognised the importance of conserving and enhancing wild salmon stocks and of supporting a sustainable salmon farming industry and is seeking to establish mutually beneficial working arrangements in order to make recommendations on wild salmon conservation and sustainable farming practices. To this end the Liaison Group has developed guidelines on containment to apply throughout the NASCO Convention area.

1.2 Both Parties recognise that a number of guidelines and measures, outlined below, should apply to all salmon aquaculture activities. The Liaison Group should be updated annually on progress on the development of parallel measures in relation to these activities.

Section 2: Objectives

2.1 These guidelines are intended to result in the prevention of escapes of farmed salmon in the freshwater and marine environments.

Section 3: Site Selection

3.1 Sites shall be selected having regard to the capability of the equipment to withstand the weather and other environmental conditions likely to be experienced at that site;

3.2 In the interest of avoiding collision damage, equipment shall comply with the relevant national and international regulations regarding navigation and marking;

3.3 Careful consideration shall be given to the siting of land-based facilities, so as to minimise the risk of escapes from these facilities.

Section 4: Equipment and Structures

4.1 Nets, cages and mooring systems shall be designed, constructed and deployed to prevent escapes, having proper regard to the prevailing conditions at the site. Mooring systems should have a significant in-built safety margin;

4.2 Nets and cages should be marked with an identification number; adequate records of each net and cage in use should be maintained in order to assess its fitness for purpose;

4.3 Nets shall be: compatible with the cages with which they will be used; secured to the cage collar so that the collar alone bears the strain; and adequately UV-protected. Net weights shall be installed in such a way as to prevent damage to the nets;

4.4 Tank systems shall be designed to contain fish effectively and to minimise the chances of fish escaping. Where the outflow from tanks passes into a settling pond, the outflow from the settling pond should incorporate a screen of suitable size and construction to minimise the chances of fish escaping;

4.5 Effective predator deterrence methods shall be implemented as appropriate; these should be up-graded as improved, site-appropriate and cost-effective systems of proven efficacy become available; records of predator attacks that may have caused escapes should be maintained for audit;

4.6 Salmon farming systems should be upgraded as improved, site-appropriate and cost-effective systems of proven efficacy become available.

Section 5: Management System Operations

5.1 Farm management procedures shall ensure supervision by appropriately trained, qualified or experienced personnel. There is a need for constant vigilance during operations that could result in escapes;

5.2 Procedures shall be adopted to ensure that escapes are prevented during movement and handling of stocks (e.g. during stocking, counting, grading, transport, transfers, treatment and harvesting of fish), and during net changes and cleaning;

5.3 Regular preventative maintenance, inspection and repair procedures shall be adopted in order to prevent escapes;

5.4 Stress testing of all nets in use shall be conducted on a regular basis and testing protocols, minimum breaking strengths and thresholds for net replacement should be specified in action plans. Records of the results of the tests shall be retained throughout the period the net is in use;

5.5 When it is necessary to tow cages, great care shall be taken to avoid damage to the nets;

5.6 Storm preparation procedures shall be developed to minimise the risk of damage from storms detailing the actions to be taken to ensure that the site is made ready; after each storm all nets, cages and mooring systems shall be inspected for damage;

5.7 Vessels shall be operated so as to minimise the risk of accidental damage to the equipment;

5.8 Where practicable, security systems should be installed so as to deter acts of vandalism and malicious damage.

Section 6: Verification

6.1 Management systems should include as a minimum all details of introductions, grading, transfers, treatments, handling or any other incident or occurrence that may have led to an escape. These details shall be recorded and retained for audit. Detailed records should allow estimates of escapes to be made. It is recognised that not all discrepancies will be the result of escapes;

6.2 When an event occurs which leads to an escape defined as significant under the action plan, the operator shall advise the appropriate authorities immediately;

6.3 A site-specific contingency plan shall be developed for use when an event occurs which may have led to an escape defined as significant under the action plan. The contingency plan shall include details of the method of recapture to be used and the area and timeframe over which a recapture programme would apply. Efforts shall be made to recapture farmed salmon immediately provided that this is practicable and does not adversely affect wild Atlantic salmon populations;

6.4 Action plans should require appropriate authorities to take all reasonable efforts to issue permits for facilitating the contingency plans developed for each farm.

Section 7: Development of Action Plans

7.1 Each jurisdiction should draw up a national action plan, or regional plans, at the earliest opportunity, based on these guidelines. The action plan is the process through which internationally agreed guidelines on containment would be implemented at national or regional level through existing or new voluntary codes of practice, regulations, or a combination of both;

7.2 Each action plan should:

7.2.1 create a systematic basis for minimising escapes so as to achieve a level of escapes that is as close to zero as is practicable;

7.2.2 include a mechanism for reporting information on the level and causes of escapes;

7.2.3 include a mechanism for reporting and monitoring in order to assess compliance and to verify the plan's efficacy;

7.2.4 identify areas for research and development.

7.3 The action plan should be based on co-operation between industry and the relevant authorities and should include the allocation of responsibilities under the plan(s) and a timetable for implementation.

Section 8: Reporting to the Liaison Group

8.1 Each jurisdiction should advise the Liaison Group annually on progress in implementing its action plan(s).

Section 9: Revision

9.1 These guidelines shall be subject to revision, with the agreement of the Liaison Group, to take account of new scientific, technical and other relevant information.

Annex 4

Guidelines for Stocking Atlantic Salmon

I. Introduction

The term "stocking" is defined as "the deliberate release of Atlantic salmon into the wild at any stage of their life-cycle for enhancement, mitigation, restoration, rehabilitation or ranching purposes," as defined in Annex 1 of this Resolution.

Stocking is widely carried out by many government and private entities for the reasons listed above. While these programmes are sometimes successful, it is now known that stocking can also have negative impacts on wild salmon populations and other species and that poor hatchery practices may negatively impact the characteristics of the wild salmon population that we wish to conserve. Potential consequences include: depression of the survival and abundance of indigenous populations and straying of stocked fish into nearby rivers. There is thus a need to consider fully the risks as well as the benefits arising from stocking.

Codes of Practice for stocking are widely available as are very detailed stocking manuals. These codes and manuals are designed to address issues of local or national relevance.

The present document is designed to provide guidance to NASCO's Parties on applying the Precautionary Approach to the authorisation and conduct of any stocking of Atlantic salmon into the wild. The guidelines will be regularly reviewed and updated as appropriate in the light of new scientific information.

II. Rationale for Stocking

There are many possible causes for decline of Atlantic salmon populations and stocking may not be an appropriate solution. Where a river is at or close to carrying capacity there may be little or no benefit from stocking. In addition, stocking is carried out for ranching purposes.

NASCO's Guidelines on the Use of Stock Rebuilding Programmes, CNL(04)55, provide guidance on compliance assessment, evaluation of the problem, development of a management plan and monitoring and evaluation of progress. In addition, to assist its Parties in applying the Precautionary Approach, NASCO has developed a Decision Structure for Management of North Atlantic Salmon Fisheries, CNL31.332, and a Plan of Action for the Protection and Restoration of Atlantic Salmon Habitat, CNL(01)51. It is recommended that these documents be consulted in determining if stocking is an appropriate management response to a perceived problem.

In accordance with the Precautionary Approach appropriate risk assessment methodology should be developed and applied by the Parties to proposals for stocking. Proponents must provide all information necessary to demonstrate that a proposed stocking activity will not have a significant adverse impact on wild salmon populations or have an unacceptable impact on the ecosystem.

III. Guidelines for Conducting Stocking

A. Definition of river classes

For the purposes of these guidelines, three types of river are defined on the basis of the extent to which salmon and their habitats have been affected by human activities: Class I, Class II and Class III.

Rivers are classified as Class I when they are pristine. Class I rivers have no significant human-induced habitat alterations, and neither any history of introductions or transfers of fish into the watersheds nor any fish-rearing operations in the watersheds, and no aquaculture has been conducted in marine cage culture within a specified distance of the river.

Rivers are classified as Class II if one or more of the following conditions occur: the habitat has been altered; non-indigenous wild or hatchery-reared Atlantic salmon populations have been released; or aquaculture has been conducted in marine cage culture within a specified distance of the river. Non-indigenous species may be present in land-based facilities. Introduced species such as rainbow trout would be treated as indigenous if a population has been established for 10 or more years. Many rivers around the North Atlantic will belong to this class.

Rivers are classified as Class III if habitats have been altered or if fish communities are destabilised, such as the loss of component populations, or non-indigenous species are present.

B. Guidelines applicable to all rivers

1. Atlantic salmon of European origin, including Icelandic origin, should not be released in the North American Commission area and Atlantic salmon of North American origin should not be released in the North-East Atlantic Commission area.

2. Prior to any transfer of eggs, juveniles or broodstock, health inspections of the donor facility will be undertaken. No fish will be transferred from the facility to other facilities or released into waters within the NASCO Convention area if emergency diseases, as defined by national, state, or provincial authorities, are detected at the donor facility.

3. Fish with restricted diseases, as defined by national, state, or provincial authorities, may be transferred between facilities or released into waters within the NASCO Convention area, provided that this does not result in changing the disease status of the receiving facility or waters. These transfers must also comply with national, state or provincial regulations.

4. Where hatchery rearing programmes are used in support of stocking programmes specialist advice should be sought in order to minimise genetic impacts in resultant generations. Hatchery rearing programmes should comply with the following measures:

    (a) Wherever possible, use eggs or progeny of wild fish;

(b) Ensure that wild fish removal will not significantly adversely impact on donor population(s);

(c) Derive broodstock from all phenotype age groups and components of a donor population[1];

(d) Careful consideration must be given to the size of the effective breeding population and its management. Geneticists have generally recommended that a minimum of a random group of 50 pairs be used for each cohort. However, that advice may not always be appropriate. For rehabilitation projects, where wild populations may be severely limited (i.e. remnant populations and live gene bank situations), it is essential that specialist advice be sought in order to minimise genetic impacts in resultant generations;

(e) Ideally, for genetic reasons, each male should be mated separately with a female so that the contribution of all males is equal (i.e. do not mix milt of males prior to fertilization, which can promote sperm competition);

(f) Where a river, or tributary, has completely lost its salmon population(s), several populations might be used for stocking to provide wide genetic variability for natural selection. However, genetic advice should be sought;

(g) Where there are suitable areas of unoccupied habitat, stocking with eggs or fry is recommended as stocked populations will benefit from natural selection during the juvenile phase.

5. Stocking and management programmes should take account of the fact that most Atlantic salmon in rivers are structured into a number of populations.

C. Guidelines applicable to Class I rivers

1. *General*

(a) No Atlantic salmon reared in a fish culture facility are to be released into a Class I river, another river which has its estuary within an appropriate, specified distance of a Class I river, or a marine site that is within an appropriate, specified distance of a Class I river;

(b) In general, no non-indigenous[2] Atlantic salmon are to be released into a Class I river.

2. *Rehabilitation*

(a) Generally, rehabilitation is not necessary in Class I rivers. However, where human-induced or natural events impact on a Class I river the preferred methods are to improve degraded habitat and to ensure escapement of sufficient spawners through fisheries management.

[1] The term 'population' here is used to denote a genetic population, i.e. populations are groups of animals within which mating is more or less random and among which interbreeding is more or less constrained.
[2] Not belonging to the local genetic population.

3. ***Restoration (or establishment) of Atlantic salmon in a river or part of a watershed where there are no salmon***

(a) Expert advice should be sought to identify the best option, based on the genetic and ecological characteristics of the donor population or the habitat characteristics of the donor stream;

(b) Consideration should be given to the impacts on the existing fish community and fisheries.

4. ***Ranching***

(a) Atlantic salmon ranching should only take place at release sites located greater than an appropriate, specified distance from the estuary of a Class I river and if it is demonstrated that the activity will not significantly affect wild Atlantic salmon populations.

D. Guidelines applicable to Class II rivers

1. ***General***

(a) Atlantic salmon, with the exception noted in III-B-1 of these guidelines, may be considered for stocking, if fish health and genetic protocols are followed and risk assessments show, on the basis of careful ecological impact evaluation, that negative impacts on local populations of Atlantic salmon will be minimal. Use of non-indigenous fish should only be used as a last resort.

2. ***Rehabilitation***

(a) The preferred methods are to improve degraded habitat and to ensure escapement of sufficient spawners through fisheries management;

(b) If further measures are required, residual population(s) of wild fish should be used. If the residual populations are too small, thorough genetic and ecological assessments should be carried out to identify the best option for rehabilitation purposes.

3. ***Restoration (or establishment) of Atlantic salmon in a river or part of a watershed where there are no salmon***

(a) For restoration, use a population(s) from a tributary within the same watershed or from a nearby river(s) that has similar genetic and ecological characteristics to the original population(s);

(b) For establishment, use a population(s) from a tributary within the same watershed or from a nearby river(s) that has similar habitat characteristics;

(c) Consideration should be given to the impacts on the existing fish community and fisheries.

4. ***Ranching***

(a) Atlantic salmon ranching should only take place at release sites located greater than an appropriate, specified distance from the estuary of a Class II river and if it is demonstrated that the activity will not significantly affect wild Atlantic salmon populations.

E. Guidelines applicable to Class III rivers

1. ***General***

(a) Atlantic salmon, with the exception noted in item III-B-1 of these Guidelines, may be considered for stocking, if fish health and genetic protocols are followed and risk assessments show, on the basis of careful ecological impact evaluation, that negative impacts on local populations of Atlantic salmon will be minimal.

2. ***Rehabilitation***

(a) The preferred methods are to improve degraded habitat and to ensure escapement of sufficient spawners through fisheries management;

(b) Rehabilitation may be achieved by stocking cultured fish.

3. ***Establishment or restoration of Atlantic salmon in a river or part of a watershed where there are no salmon***

(a) For restoration, use a population(s) from a tributary within the same watershed or from a nearby river(s) that has similar genetic and ecological characteristics to the original population(s);

(b) For establishment, use a population(s) from a tributary within the same watershed or from a nearby river(s) that has similar habitat characteristics;

(c) Consideration should be given to the impacts on the existing fish community and fisheries.

4. ***Ranching***

(a) Ranching of Atlantic salmon should only be permitted if it is demonstrated that the activity will not significantly affect wild Atlantic salmon populations.

IV. Guidelines for Authorising Stocking

A. Introduction

Both proponents and agencies responsible for managing Atlantic salmon must ensure that the risk of adverse effects on wild Atlantic salmon populations from stocking is minimised.

B. Responsibility of proponent of stocking

1. Proponents must submit an application for stocking of Atlantic salmon to the permit-issuing agency (see Box 1).

2. The application should provide a full justification for stocking and sufficient documentary evidence to allow for an evaluation of the impacts of the proposed stocking activities on the wild Atlantic salmon and its habitats.

3. The lead-time required for notice and justification of stocking will be determined by the permit-issuing agency.

4. Proponents must report all stockings that are conducted.

C. Responsibility of those with the authority to issue permits

1. Enact laws to protect wild populations of Atlantic salmon and prevent the release of Atlantic salmon that will significantly affect the productivity of existing wild Atlantic salmon populations.

2. Draw the Guidelines to the attention of all proponents of stocking at the application stage.

3. Establish, maintain, and operate a permit system and inventory for all stockings of Atlantic salmon.

4. Enact regulations to control the stocking of Atlantic salmon.

5. Establish a formal scientific evaluation process to review all applications (private and government agencies) for the stocking of Atlantic salmon and recommend conditional acceptance or rejection of the proposed stocking(s) based on the potential impact on the ecosystem.

6. Establish an evaluation process to determine the effectiveness of stocking activities and their impacts on wild Atlantic salmon populations.

7. Within a class of rivers, each agency may be more restrictive in setting salmon stocking requirements.

8. Submit to NASCO, as requested, information of a scope to be determined by the Council in relation to the application of these Guidelines.

Box 1. Guidance for proponents in the preparation of stocking proposals

The following information should be provided to the permit-issuing agency with all applications to stock Atlantic salmon so as to enable the risk of adverse effects from the proposed activities on wild Atlantic salmon populations to be evaluated.

(1) Name the population and/or strain and, where available, its genetic characteristics, and include:

  (a) Time and quantity of stocking;

  (b) A list of anticipated future stockings;

  (c) A list of previous stockings.

(2) Area, place, river or hatchery from which the fish will be obtained.

(3) Proposed place of release and any interim rearing sites.

(4) Disease status of donor hatchery, river or other location from which fish are obtained.

(5) Disease status of recipient facility or stream (where available).

(6) Objectives of the stocking and the rationale for not using a local population (if such use is not proposed).

(7) Details of the available biological characteristics of the donor population. This would include such characteristics as run timing, time of spawning, age-at-maturity, size-at-age, etc. and potential for competition with local populations of Atlantic salmon in the recipient waters or nearby waters.

(8) Information on similar stockings.

(9) Proposed procedure for transportation from donor to recipient site.

(10) Measures to be taken to prevent transmission of disease agents and to reduce the risk of escape of fish.

(11) Species composition at proposed site of introduction and adjacent rivers.

(12) Climatic regime and water chemistry, including pH of waters at the site of proposed introduction and of adjacent rivers.

(13) Potential of stocked fish to disperse to nearby streams.

(14) A bibliography of pertinent literature.

(15) A plan for monitoring, in order to assess how successful stocking has been.

Annex 5

NASCO Guidelines for Action on Transgenic Salmonids, CNL(04)41

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

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

The Parties will:

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

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

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

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

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

Furthermore, those Parties to NASCO that are also Parties to the Cartagena Protocol on Biosafety to the Convention on Biological Diversity should take into account the provisions of that Protocol.

*Note: At its Seventeenth General Meeting in Galway, Ireland, in September 1996, the International Salmon Farmers' Association (ISFA) adopted its Policy on Transgenic Salmon, which states that "In accordance with sound environmental practices, the ISFA firmly rejects transgenic salmon production".

Annex 6

River Classification and Zoning

For the purpose of developing management measures concerning aquaculture, introductions and transfers, Contracting Parties should classify their Atlantic salmon rivers. Where appropriate, consideration should be given to grouping neighbouring or biologically (or otherwise) similar river systems into complementary management zones. River classification and zonation systems are useful to identify specific rivers and/or areas that need special protection. For example, rivers and/or areas that have been subject to significant enhancement efforts may need to be differentiated from rivers and/or areas that have not. This could allow managers to easily identify the rivers and/or areas where future enhancement efforts may or may not be appropriate.

The NAC Protocols and the NASCO Salmon Rivers Database provide examples of river classification systems. Contracting Parties should consider these examples in developing classification systems that are appropriate to their needs. Parties are further encouraged to work co-operatively in developing such systems (e.g. NEAC Parties could develop a classification system that complements the Water Framework Directive).

In conducting a risk assessment for a proposed aquaculture, or introductions and transfers, activity, the classification of the river(s) and/or zone(s) should be taken into account and class/zone-specific factors should be considered. Furthermore, in developing measures appropriate to each class of river or management zone, it is recognised that local conditions are a very significant factor and should also be considered.

Annex 7

Research and Development and Data Collection

Research and data collection should be carried out, as appropriate, in support of this Resolution. Recognising that research requirements are continually developing, a list of current research areas is identified in this Annex. Where appropriate, successful research results should be taken forward to pilot testing

Areas for research and pilot testing include:

Sterile fish

Methodology and techniques for sterilization are now well developed; research should now focus on developing strains of sterile fish which could perform at a level similar to current strains of fish used in farm production. Trials should be encouraged to evaluate the performance of strains of sterile fish under production conditions.

Tagging and marking

Tagging and marking is being used on a small scale in order to facilitate the identification of farmed salmon in the wild and their separation from wild fish, to determine the source of escapes and to assess the interactions of escaped farmed salmon with the wild stocks. Full evaluation of those trials should be conducted in order to assess effectiveness, the feasibility of large-scale marking, and associated costs. Consideration should also be given to food safety, product quality and animal welfare.

Evaluation of production methods

There should be an ongoing evaluation of current and new production methods and technology (e.g. improved containment techniques, development of suitable strains of sterile fish, development of sea lice vaccines, etc.).

Aquaculture broodstock

Research is recommended on broodstock selection methodology to minimise impacts on wild salmon stocks.

Genetics

Great advances have been made in genetic research in the past decade. These methods should be applied in investigating, in greater detail, interactions between wild salmon and salmon of aquaculture origin, including the extent of hybridization, composition of stocks, and identification of disease strains and appropriate treatment.

Diseases and parasites

The transmission of diseases and parasites between salmon reared in aquaculture and the wild stocks is an area of considerable concern. Research on vectors for transmission, and methods

to prevent and control disease and parasite outbreaks in wild salmon and in aquaculture, should be encouraged.

Interactions

Information should be collected and analyzed on the extent of intermingling in rivers and at sea between wild salmon and salmon of aquaculture origin.

Risk assessment frameworks

There has been considerable activity in the development of risk assessment frameworks. There remains a need to identify the appropriate factors to be included in a risk assessment in order to evaluate the potential impacts of aquaculture, introductions and transfers, and transgenics on wild salmon stocks.

Biological impacts

Further work is recommended on biological interactions between wild salmon and salmon of aquaculture origin including competition and behavioural interactions that may affect the viability and success of the wild populations.

Escape prevention

Research into escape detection technologies and improved containment systems should be encouraged.

Appendix 1

North American Commission Protocols for the Introduction and Transfer of Salmonids Summary of Protocols by Zone, NAC(94)14

Note:

This document contains only summary Protocols and should be read in conjunction with document NAC(92)24.

1 ZONING OF RIVER SYSTEMS

The NAC has adopted the concept of Zoning for application of these protocols to the NAC Area. Three zones have been designated based on the degree of degradation or manipulation of the wild Atlantic salmon populations (Figure 1). The NAC recognizes that Atlantic salmon populations have been variously affected by human activities. These activities include over-harvesting, selective fishing, habitat degradation, mixing of stocks, introduction of non-indigenous fish species, and spreading fish diseases. Atlantic salmon stocks in northern areas (Zone I) have generally been least affected, and those stocks in the southern area (Zone III) have been most affected, by humans.

In order to allow operational flexibility within a Zone, river systems have been classified as Class I, II, or III rivers. Generally, rivers will have the same classification as the Zone in which they occur. For example, in Zone II, river systems will be mainly categorized as Class II. However, a river system may be assigned a higher classification than the Zone in which it is located (e.g. Class I river in Zone II) to allow additional protection for valuable Atlantic salmon stocks. In extenuating circumstances and if a river is sufficiently isolated from other rivers, it is acceptable to have a river with a lower classification than the Zone in which it is located (e.g. Class III rivers within Zone II or Class II rivers in Zone I).

All rivers are generally classified at the same level as the Zone designation. Member countries wishing to change the location of Zone boundaries or to have rivers of a lower classification within a Zone should submit their recommendations, with scientific justifications, to NAC.

2 DESCRIPTION OF ZONES

Zone I: Geographic Area: Northern Quebec, Labrador, Anticosti Island and the major salmon-producing rivers in Newfoundland north of Cape Ray and west of Cape Saint John; namely: all rivers from Cape Ray to Cape Anguille and in Bay of Islands, Lomond River, Portland Creek, River of Ponds, Torrent River, Castors River, St. Genevieve River, Western Arm Brook, Salmon River (Hare Bay), Northeast River (Canada Bay), and Main River (Sop's Arm).

Rivers are classified primarily as Class I. They are pristine rivers with no significant man-made habitat alterations, no history of transfers of fish into the watersheds, and no fish-rearing operations in the watersheds.

Zone II: Geographic Area: Quebec rivers flowing into Gulf of St. Lawrence south of Pte. des Monts, Gaspé region of Quebec, Magdalen Islands, Prince Edward Island, New Brunswick, Nova Scotia, Newfoundland (except rivers designated as Class I rivers, referenced above in description of Zone I) and State of Maine east of Rockland.

Rivers are classified primarily as Class II watersheds in which one or more of the following conditions occur: the habitat has been altered; non-indigenous wild or hatchery-reared Atlantic salmon stocks have been released; or aquaculture has been conducted in marine cage culture. Non-indigenous species may be present in land-based facilities. Introduced species such as rainbow trout would be treated as indigenous if a population has been established for ten or more years.

Zone III: Geographic Area: Lake Ontario, southern Quebec draining to St. Lawrence River, State of Maine west of Rockland, New Hampshire, New York, Connecticut, Massachusetts, New Jersey, Rhode Island, and Vermont.

Rivers are classified primarily as Class III watersheds in which habitats have been altered, or where fish communities are destabilized, or exotic species are present.

3 PROTOCOLS

3.1 Protocols applicable to all three Zones

(1) Reproductively viable strains of Atlantic salmon of European origin, including Icelandic origin, are not to be released or used in Aquaculture in the North American Commission Area. This ban on importation or use of European-origin Atlantic salmon will remain in place until scientific information confirms that the risk of adverse genetic effects on wild Atlantic salmon stocks is minimal.

(2) No live salmonid fishes, fertilized eggs, gametes, or fish products are to be imported from IHN enzootic areas, unless sources have an acceptable history of disease testing demonstrating the absence of IHN (e.g. Great Lakes Fish Health Disease Committee protocol requirements). IHN infected areas currently include State of Washington, Oregon, Idaho, California, Alaska, British Columbia, Japan, and parts of Taiwan and France.

(3) Prior to any transfer of eggs, juveniles or brood stock a minimum of three health inspections of the donor facility will be undertaken during the two-year period immediately preceding the transfer; and

- No fish will be transferred from the facility to other facilities or released in waters within the NAC Area if emergency diseases are detected at a rearing facility (see Annex III, Part II of NAC(92)24);

- Fish with restricted diseases may be transferred or released in the NAC Area provided that this does not result in changing the disease status of the receiving facility or waters. These transfers must also comply with

national, state or provincial regulations (see Annex III, Part II of NAC(92)24).

(4) Prior to any movement of non-native fishes into a river system or rearing site inhabited by Atlantic salmon the agency with jurisdiction shall review and evaluate fully the potential for interspecific competition which would adversely impact on the productivity of wild Atlantic salmon populations. Such evaluations should be undertaken, to the extent possible, with information on the river in which the introduction is to occur and from similar situations.

(5) Hatchery rearing programmes to support the introduction, re-establishment, rehabilitation and enhancement of Atlantic salmon should try to comply with the following measures:

(a) Use only F1 progeny from wild stocks;

(b) Derive broodstock from all phenotype age-groups and the entire run of a donor population;

(c) Avoid selection of the "best" fish during the hatchery rearing period; and

(d) During spawning, make only single paired matings from a broodstock population of no less than 100 parents. Should the number of one sex be fewer than 50, the number of spawners of the other sex should be increased to achieve a minimum effective population size (N_e) of 100.

$$N_e = \frac{4N♂N♀}{N♂+N♀}$$

3.2 Protocols applicable to Zone I

Zone I consists of Class I watersheds where every effort must be made to maintain the existing genetic integrity of Atlantic salmon stocks. The following summary protocols apply.

3.2.1 General within Zone I

No Atlantic salmon reared in a fish culture facility are to be released into a Class I river, another river which has its estuary less than 30 km from a Class I river, or a marine site less than 30 km from a Class I river (distances would be measured in a straight line(s) headland to headland).

No non-indigenous fish species, other than Arctic charr and brook trout, or non-indigenous Atlantic salmon stock is to be introduced into a Class I watershed.

3.2.2 Rehabilitation

Fisheries management techniques will be used to ensure sufficient spawners such that spawning escapement exceeds a minimum target level to maintain an effective breeding population.

Habitat that becomes degraded will be restored to the greatest extent possible.

3.2.3 Establishment or re-establishment of Atlantic salmon in a river or part of a watershed where there are no salmon

Use transfers of adults or juvenile salmon from the residual population in other parts of the watershed.

A nearby salmon stock which has similar phenotypic characteristics to the lost stock could be transferred if there is no residual stock in the recipient watershed and provided an effective breeding population is maintained in the donor watershed (See Section 3.1 (5)).

If the biological characteristics of the original stock are not known or there was no previous stock in the recipient watershed, then transfer broodstock or early life stages from a nearby river having similar habitat characteristics.

3.2.4 Aquaculture

(i) Rearing in marine or freshwater cages, or land-based facilities:

- Reproductively viable Arctic charr and brook trout may be reared in marine and freshwater cages and in land-based facilities;

- Rearing of other salmonids or non-indigenous fishes is not permitted in the marine environment within 30 km of a Class I river, in a Class I river, or in a watershed with its estuary less than 30 km from the estuary of a Class I river. (30 km is measured in a straight line(s) headland to headland);

- Rearing of reproductively viable indigenous species and reproductively sterile non-indigenous species is permitted in land-based facilities;

- Reproductively sterile salmonids may be reared in the marine environment, and/or in a watershed with its estuary greater than 30 km from a Class I river, provided that the risk of adverse effects on wild salmon stocks is minimal;

- Natural or man-made ponds which have adequate screening of the outlet and inlet streams, such that the risk of fish escaping is low, can also be treated as land-based facilities.

(ii) Commercial ranching:

- No commercial ranching of salmonids is permitted within 30 km of the estuary of a Class I river (measured in a straight line(s) headland to headland);

- At locations greater than 30 km from the estuary of a Class I river, reproductively sterile Atlantic salmon, reproductively viable brook trout or Arctic charr, and reproductively sterile non-indigenous species may be ranched provided that the risk of adverse effects on wild Atlantic salmon stocks are minimal.

3.3 Protocols applicable to Zone II

3.3.1 General within Zone II

Reproductively viable non-indigenous species, other than Arctic charr and brook trout, and reproductively viable Atlantic salmon stocks, non-indigenous to the NAC area, are not to be introduced into watersheds or into the marine environment of Zone II.

Restoration, enhancement and aquaculture activities are permitted in the freshwater and marine environments.

3.3.2 Rehabilitation

The preferred methods are to improve degraded habitat and ensure escapement of sufficient spawners through fisheries management.

If further measures are required, use residual stocks for rehabilitation and enhancement. If the residual stock is too small, select a donor stock having similar life-history and biochemical characteristics from a tributary or nearby river.

Stocking of hatchery-reared smolts is preferred, to reduce competition with juveniles of the natural stocks.

3.3.3 Establishment or re-establishment of Atlantic salmon in a river or part of a watershed where there are no salmon

To establish an Atlantic salmon stock, use a stock from a nearby river having similar stream habitat characteristics.

If re-establishing a stock, use a stock from a nearby river which has similar biological characteristics to the original stock.

It is preferable to stock rivers with broodstock or early life-history stages (eggs and fry); this would allow selection and imprinting by juveniles to occur.

If eggs are spawned artificially, use single pair matings and optimize the effective number of parents (See Section 3.1(5)).

3.3.4 Aquaculture

(i) Rearing in marine or freshwater cages, and land-based facilities:

- It is important to apply methods which minimize escapes;

- Reproductively viable Arctic charr and brook trout may be reared in marine and freshwater cages and in land-based facilities;

- Develop domesticated salmon broodstock using local stocks; or, if local stocks are limited, use nearby stocks;

- Reproductively viable non-indigenous species may only be introduced into land-based facilities where risk of escapement is minimal;

- Non-indigenous salmonid stocks may be introduced into the wild or used in cage rearing operations if the fish are reproductively sterile and the risk of adverse ecological interactions is minimal.

(ii) Commercial ranching:

- Commercial Atlantic salmon ranching will only be permitted at release sites located greater than 20 km from the estuary of a Class II river (measured in a straight line(s) headland to headland) and it is demonstrated that the activity will not negatively affect wild Atlantic salmon stocks;

- Non-indigenous species or distant national Atlantic salmon stocks may be used if the fish are reproductively sterile and the risk of adverse ecological interactions is minimal.

3.4 Protocols applicable to Zone III

3.4.1 General within Zone III

Indigenous and non-indigenous salmonid and non-salmonid [except reproductively viable Atlantic salmon stocks non-indigenous to the NAC Area] fishes may be considered for introduction or transfer if fish health and genetic protocols are followed and negative impacts on Atlantic salmon can be shown to be minimal using careful ecological impact evaluation.

3.4.2 Rehabilitation

Habitat quality should be upgraded wherever possible.

Rebuilding stocks can be achieved by controlling exploitation and by stocking cultured fish.

3.4.3 Establishment or re-establishment of Atlantic salmon in a river or part of a watershed where there are no salmon

Transfer source stocks from nearest rivers having similar habitat characteristics.

Stock with juvenile stages (eggs, fry and/or parr). If eggs are spawned artificially, use single pair matings and optimize the effective number of parents (Section 3.1(5)).

3.4.4 Aquaculture

(i) Rearing in marine or freshwater cages, or land-based facilities:

- Use of local stocks is preferred but non-indigenous stocks may be cultured;

- Marine cage culture can be widely practised; but preferred locations are at least 20 km from watersheds managed for salmon production (measurements are by straight lines from headland to headland);

- Culture of non-indigenous species in land-based facilities on Class III watersheds is permitted in adequately controlled facilities where risk of escapement is minimal.

(ii) Commercial ranching:

- Commercial ranching of salmonids is permitted if it is demonstrated that the activity will not negatively affect Atlantic salmon rehabilitation or enhancement programmes or the development of wild Atlantic salmon stocks.

4 GUIDELINES FOR APPROVAL OF INTRODUCTIONS AND TRANSFERS

Both proponents and agencies responsible for managing salmonids have a responsibility for ensuring that risk of adverse effects on Atlantic salmon stocks from introductions and transfers of salmonids and other fishes is low. Reasonable laws to protect wild stocks should be enacted by each agency, as necessary. Resource management agencies will determine protection for habitats with Atlantic salmon potential.

4.1 Responsibility of proponent

The proponent must submit an application for introduction or transfer of fishes to the permit-issuing agency. This request must provide a full justification for the introduction or transfer such that a complete evaluation will be possible prior to issuance of a permit. The list of information to be included in the justification for introductions and transfers is in Section 4.4 below. The lead time required for notice and justification of introductions and transfers will be determined by the permit-issuing agency. Proponents should be aware of the protocols established for introductions and transfers.

4.2 Responsibility of government agencies having the authority to issue permits

These agencies shall be those entities having the responsibility for fishery management within the receiving area. The responsibilities of the agencies shall include:

(1) Establish, maintain, and operate a permit system and inventory for all introductions and transfers of fishes;

(2) Enact regulations required to control the introductions and transfers of fishes as per established protocols;

(3) Establish a formal scientific evaluation process to review all applications (private and government agencies) for the introduction and transfer of all species and recommend conditional acceptance or rejection of the proposed

introductions and transfers based on the potential impact on the productivity of Atlantic salmon;

(4) Within the Zones each agency may be more restrictive in classifying individual watersheds. Rarely, a less restrictive classification may be applied to an individual watershed if its estuary is at least 30 km in Zone I, or 20 km in Zone II (measured in straight lines headland to headland) from a watershed with a higher classification;

(5) Annually, submit to the NAC Scientific Working Group the results of the permit submission/review process, and a list of introductions and/or international transfers proposed for their jurisdiction;

(6) Prevent the release of fishes which will adversely affect the productivity of wild Atlantic salmon stocks.

4.3 Responsibilities of the NAC Scientific Working Group on Salmonid Introductions and Transfers

(1) Maintain an inventory of all introductions of salmonids, transfers of salmonids from IHN-infected areas, and importation of salmonids across national boundaries into the Commission Area.

(2) Review and evaluate all introductions and transfers referenced in Section 4.3(1) above in relation to the NAC protocols and report the results to the North American Commission.

4.4 Preparation of proposals

The following information is required, by the permit-issuing agency, with applications involving introductions and transfers of salmonids, except for restocking into source river. This information will be used to evaluate the risk of adverse effects on Atlantic salmon stocks.

(1) Name the species, strain and quantity to be introduced or transferred, and include:

(a) Time of introduction or transfer;

(b) List anticipated future introductions or transfers;

(c) List previous introductions and/or transfers.

(2) Area, place, river or hatchery from which the fish will be obtained.

(3) Proposed place of release and any interim rearing sites.

(4) Disease status of donor hatchery, river or other location from which fish are obtained.

(5) Disease status of recipient facility or stream (where available).

(6) Objectives of the introduction or transfer and the rationale for not using local stock or species.

(7) For non-indigenous species, provide the available information on the proposed species' life-history, preferred habitat, potential parasites and disease agents, and potential for competition with Atlantic salmon in the recipient waters or nearby waters.

(8) Information on similar transfers or introductions.

(9) Proposed procedure for transportation from donor to recipient site.

(10) List measures to be taken to prevent transmission of disease agents and to reduce the risk of escape of fish.

(11) Species composition at proposed site of introduction and adjacent rivers.

(12) Climatic regime and water chemistry, including pH of waters at the site of proposed introduction and of adjacent rivers.

(13) For indigenous species determine the life-history and biological characteristics of donor stock. This would include such characteristics as run timing, time of spawning, age-at-maturity, size-at-age etc.

(14) Potential of introduced or transferred fish to disperse to nearby streams.

(15) A bibliography of pertinent literature should be appended to the proposal.

4.5 Evaluation of proposals

The evaluation of proposals will be the responsibility of the permitting agency and will focus on the risk to Atlantic salmon production and potential production associated with the proposed introductions and/or transfers. The evaluation will be based on the classification of the recipient watershed. All requests for introductions or transfers must provide sufficient detail (Section 4.4 above) such that the potential risk of adverse effects to Atlantic salmon stocks can be evaluated.

The evaluation of potential adverse effects on fish health will consider the disease history of the donor and recipient facility and/or watershed with specific reference to the potential for transferring emergency diseases. The risk of detrimental genetic effects of introducing a non-indigenous stock into a river will be evaluated taking into consideration the phenotypic and life-history characteristics of the donor stock, the biochemical information (mitochondrial/nuclear DNA and enzyme frequencies, if available), and geographic distance between donor and recipient locations. The evaluation of the risk of ecological effects on Atlantic salmon populations is more involved. Introduction of non-indigenous Atlantic salmon stocks and/or non-indigenous species will be evaluated by considering the life-history and habitat requirements of the transferred fish.

The introduction of non-indigenous species poses a significant risk to the productivity of the Atlantic salmon stocks. Evaluation will be by comparison of the habitat requirement and behaviour of both the proposed introduced species and the indigenous Atlantic salmon stock at all life stages. The habitat requirements and areas of possible interactions with Atlantic salmon have been described for 13 fish species (see Part IV, Ecological Subgroup report). These can be used to provide a cursory evaluation of the life-history stage at which interactions would occur. However, more detailed information on stocks and habitats in both donor and recipient locations would be required in the form of an envirogram (example is provided in Part IV). Where insufficient data are available, research will be required prior to permitting the introduction or transfer.

An outline example of the type of information which is available in the species summaries (Part IV) is presented below for rainbow trout:

(1) Conditions under which interactions may occur:

- spawning rainbow trout may overcut Atlantic salmon redds and displace developing eggs;
- competitive interaction of juveniles: (i) exploitative competition for food; and (ii) interference competition;
- rainbow trout juveniles are more aggressive than juvenile Atlantic salmon, and may displace salmon from pools; and
- large rainbow trout are piscivorous and could prey on all stages of young salmon including emigrating smolts.

(2) Low interaction:

- in streams which Atlantic salmon do not utilize;
- in streams in which salmon are well established; and
- aquaculture using sterile fish or land-based facility.

(3) Conditions under which no interaction would occur. It would be permissible to use reproductively viable rainbow trout:

- in habitats with pH less than 5.5;
- if rainbow trout are already present in recipient stream; and
- in disturbed ecosystems where Atlantic salmon are absent and sport fishing would be improved.

5 GLOSSARY

Applicant: See proponent.

Aquaculture: The culture or husbandry of aquatic fauna other than in research, in hobby aquaria, or in governmental enhancement activities.

Commercial ranching: The release of a fish species from a culture facility to range freely in the ocean for harvest and for profit.

Competition: Demand by two or more organisms or kinds of organism at the same time for some environmental resource in excess of the available supply.

Containment: Characteristic of a facility which has an approved design which minimizes operator error to cause escape of fish, or unauthorized persons to release contained fish.

Diversity: All of the variations in an individual population or species.

Enhancement: The enlargement or increase in number of individuals in a population by providing access to more or improved habitats or by using fish culture facility production capability.

Exotic: See introduced species.

Fish: A live finfish.

Fish culture facility: Any fish culture station, hatchery, rearing pond, net pen, or container holding, rearing, or releasing salmonids.

Gamete: Mature germ cell (sperm or egg) possessing a haploid chromosome set and capable of formation of a new individual by fusion with another gamete.

Genetics: A branch of biology that deals with the heredity and variation of organisms and with the mechanisms by which these are effected.

Indigenous: Existing and having originated naturally in a particular region or environment.

Introduced species: Any finfish species intentionally or accidentally transported or released by Man into an environment outside its native or natural range.

Introduction: The intentional or accidental release of a species into an environment outside its native or natural range.

Isolation: Means restricted movement of fish and fish pathogens within a facility by means of physical barriers, on-site sanitary procedures and separate water supply and drain systems and cultural equipment.

Mariculture: Aquaculture in sea water.

Native: See indigenous.

N_e: Effective population size $= \frac{4N♂N♀}{N♂+N♀}$

Niche: A site or habitat supplying the sum of the physical and biotic life-controlling factors necessary for the successful existence of a finfish in a given habitat.

Non-indigenous: Not originating or occurring naturally in a particular environment; introduced outside its native or natural range.

Population: A group of organisms of a species occupying a specific geographic area.

Predator: An individual that preys upon and eats live fish, usually of another species.

Proponent: A private or public group which requests permission to introduce or transfer any finfish within or between countries and lobbies for the proposal.

Quarantine: The holding or rearing of fish under conditions which prevent the escape or movement of fish and fish disease agents. (For a detailed description of a quarantine facility see Annex IX of Part II).

Rehabilitation: The rebuilding of a diminished population of a finfish species, using a remnant reproducing nucleus, toward the level that its environment is now capable of supporting.

Restoration: The re-establishment of a finfish species in waters occupied in historical times.

Salmonid: All species and hybrids of the Family Salmonidae covered by the AFS checklist special publication No. 12, "A list of Common and Scientific Names of Fishes from the United States and Canada (1980)".

Species: A group of interbreeding natural populations that are reproductively isolated from other groups.

Stock: Population of organisms sharing a common gene pool which is sufficiently discrete to warrant consideration as a self-perpetuating system which can be managed.

Strain: A group of individuals with a common ancestry that exhibits genetic, physiological, or morphological differences from other groups as a result of husbandry practices.

Transfer: The deliberate or accidental movement of a species between waters within its native or natural geographic range, usually with the result that a viable population results in the new locations.

Transferred species: Any finfish intentionally or accidentally transported and released within its native or natural geographic range.

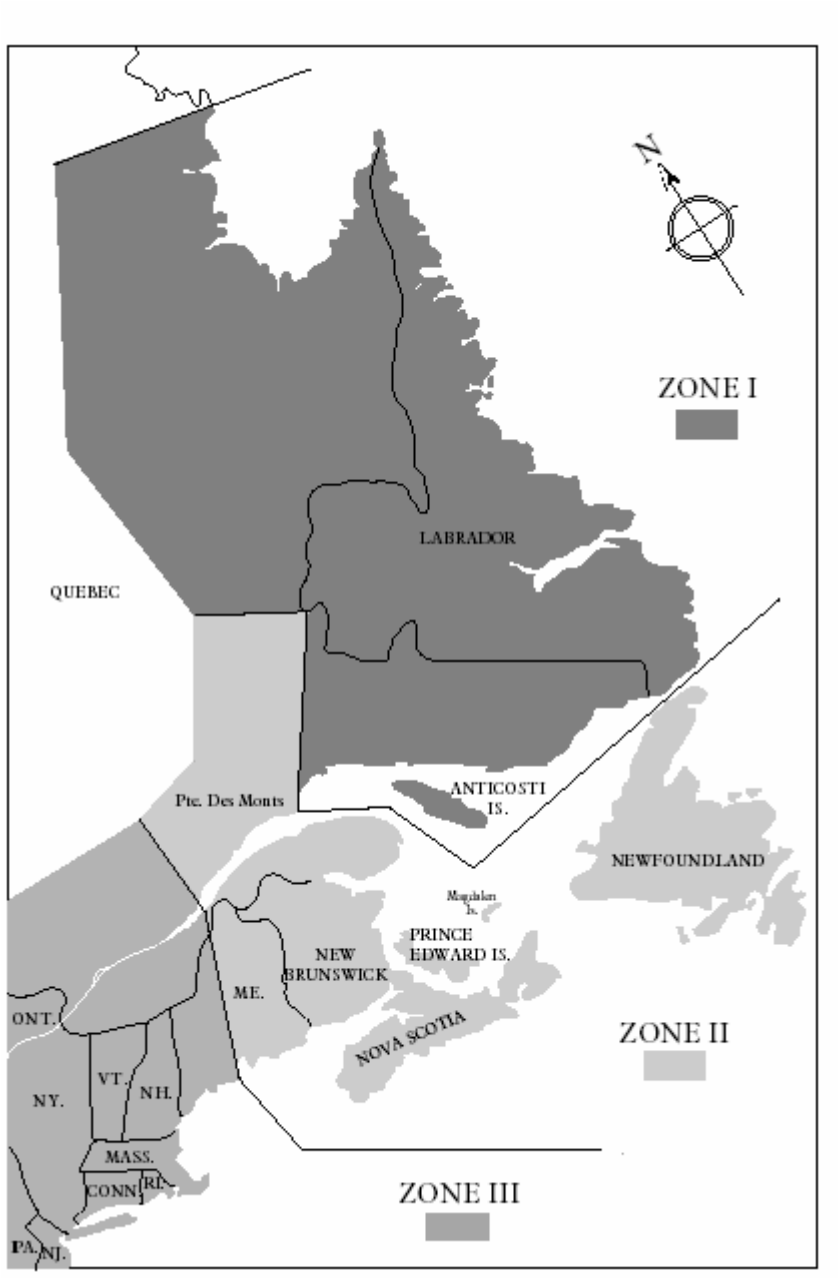

Figure 1.

Map of eastern Canada and northeastern USA showing the three zones designated for implementation of the Protocols. Certain rivers on the west coast of Newfoundland are designated as Zone I, even though Newfoundland is shown as being in Zone II.

Appendix 2

NAC(05)7

Memorandum of Understanding between Canada and USA

Preamble

The North American Commission (NAC) of NASCO recognizes the potential effects that introductions and transfers of aquatic species can have on fish health, genetics, and their ecology. In 2003, NASCO adopted the Williamsburg Resolution which referenced the NAC Protocols as contained in NAC(92)24 and ancillary document NAC(94)14. In Canada, the National Code on Introductions and Transfers of Aquatic Organisms was adopted in 2001. It is acknowledged that Canada and the United States utilize different methods within their countries for authorization of introductions and transfers. This Memorandum of Understanding is meant to reconcile the differences between the methods used but recognizes the common goal is the conservation and protection of wild Atlantic salmon.

Memorandum of Understanding

Canada and the United States have agreed to record the following in connection with the introductions and transfers of salmonids in the North American (NAC) area:

A. Authorizations of Introductions and Transfers

In Canada, the National Code on Introductions and Transfers of Aquatic Organisms is the mechanism for approval of introductions and transfers which is authorized by permits. In the United States, state and federal permits are the mechanisms for authorizing introductions and transfers.

B. Requirement to Report

The Parties agree to report to the NAC annually on any decision made under their respective jurisdiction that has an impact on the other jurisdiction. In particular, any decisions made that are not consistent with the NAC Protocols will be identified.

C. Requirement to Consult

The Parties agree to consult with each other if either jurisdiction receives a proposal for an introduction or transfer that may have an impact on the other, including any proposal that would be inconsistent with the NAC Protocols.

D. Need for Review

The Parties agree to convene the NAC Scientific Working Group, from time to time, to review the provisions of the Williamsburg Resolution with respect to developments that may have an application on introductions and transfers in the NAC area and provide recommendations to the Parties for their consideration and action, if required.