	Council *Guidelines on the Use of Stock Rebuilding Programmes in the Context of the Precautionary Management of Salmon Stocks*	CNL(25)50

Guidelines on the Use of Stock Rebuilding Programmes in the Context of the Precautionary Management of Salmon Stocks

1. Introduction

This document provides guidance on the process of establishing Stock Rebuilding Programmes (SRP) for wild Atlantic salmon stocks, in relation to the Precautionary Approach as adopted by NASCO in 1998[1]. It also references several other guidance documents developed by NASCO and should be read in conjunction with those documents. These Guidelines replace a previous set of NASCO Guidelines adopted in 2004 and incorporate current concerns in the context of the overarching threat of climate change.

An SRP is likely to be a suite of management measures designed to restore a wild Atlantic salmon stock to a sustainable level as measured using a defined river-specific target. The nature and extent of the programme will depend upon the status of the stock and the pressures that it is facing.

While the short-term response to a stock failing to achieve its river-specific target may be to reduce or eliminate exploitation, there will generally be a need to identify and address the causes of the stock decline along with other actions.

2. Determination of the Need for a Stock Rebuilding Programme

I. Consult Stakeholders[2]

Stakeholder groups and Indigenous Peoples need to be consulted when SRPs are being considered and kept informed when action is planned. Wherever possible, they should be involved from the earliest stages in the development of an SRP. Benefit may be gained from their general experience of wild Atlantic salmon management and their specific knowledge of the stock(s) in question.

Consideration also needs to be given to the potential incidental effects of an SRP on other users or those with interests in other parts of the ecosystem that may be affected. Early involvement may also help to secure the buy-in of groups that may be affected by proposed measures.

The responsibilities of different groups and organizations in the SRP must be clearly defined.

Consideration should be given to the development of education material for dissemination to interested groups and the wider public.

II. Evaluate Status of Stock

A. When to Develop Stock Rebuilding Programmes

It is recommended that SRPs be developed for all stocks that are failing to exceed their Conservation Limits (CLs) or other relevant reference points (RP). Parties / jurisdictions may also consider SRPs where the long-term viability of the stock is at risk of failing to exceed its CL. Most NASCO Parties / jurisdictions have established CLs for many of their salmon stocks, based at a national, regional, river or population level according to their management objectives. There may be some Parties / jurisdictions that use alternative means for determining if a stock is healthy and these Guidelines are also applicable in those cases.

[1] Agreement on Adoption of a Precautionary Approach, CNL(98)46

[2] Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach, CNL(04)57

However, assessing the status of the stock requires more than simply determining whether the escapement has fallen below the CL, and a range of other factors will influence management decisions on the nature and extent of the SRP. As Parties / jurisdictions identify a stock that is in need of rebuilding by an SRP, baseline data need to be documented to assist determining the impact made by an implemented SRP.

B. Uncertainty in Assessments of Stock Status

Information on the stock may be limited, so there may be uncertainties about both the CL / RP and the current stock status. In addition, the numbers of salmon returning to spawn can be highly variable, and so the stock will sometimes fluctuate around the CL / RP simply as a result of natural variation. These uncertainties must be taken into account in the decision-making process.

C. Nature of Stock Decline

Both the duration and degree of the stock decline are relevant to the determination of the need for an SRP. The further a stock falls below its CL / RP and the more years for which it does this, the greater the need for management action. The nature of the stock decline (e.g. timing and severity of decline) may also be informative in identifying the main causes. However, if the stock has been well above the CL / RP in recent years, this may suggest that the current management practices are appropriate under most normal circumstances. Interim measures may be required when stocks are severely depleted, that is when they are so far below the CL / RP that urgent action is required to prevent their extirpation.

D. Stock Diversity

Consideration must also be given to other stock criteria, such as age structure, run timing, fecundity and genetic diversity. A minor overall shortfall in egg deposition, for example, may mask an underlying problem with one or more stock components.

III. Evaluate Causes of Stock Decline and Threats to Stock

Proposals for remedial measures should be developed on the basis of a full assessment of the pressures faced by the stock. Stocks may fall below their CL / RP as a result of reduced production and / or increased mortality, and these can result from either natural or anthropogenic factors (including fishing). The exact reasons for the stock decline may be unknown and multifaceted, but possible causes and potential threats should be described and evaluated. The following categories of factors may be considered:

A. Climate Change

(*including more intense and more frequent short-term weather events such as storms, flood and drought conditions and heat waves, as well as long-term changes in sea level, warming rivers and oceans and associated changes in predator and prey distributions*)

Climate change is an overarching, anthropogenic-induced change that will directly affect wild Atlantic salmon and exacerbate the many existing threats that create additional challenges for the survival of wild Atlantic salmon at all life history stages. Remedial measures will be needed to address the rapid changes in conditions that are likely to be brought about due to climate change.

B. Environmental Change

(including rainfall and river flow patterns, river temperatures, changes in water pH)

Short-term environmental change often occurs as a result of distinct natural events such as fires, storms or landslides. Long-term environmental change often occurs as a result of ongoing anthropogenic activities not associated with climate change, such as pollution, hydropower operations, clear-cutting forests, etc. Appropriate management actions will need to take account of best predictions of the likely duration and extent of the environmental change.

C. Habitat Degradation

(including water quality, water chemistry, water quantity caused by man-made structures or extractions, sedimentation, factors affecting food production, obstructions and impediments to juvenile or adult migration)

Habitat degradation often results in harmful reduction of population productivity levels and carrying capacity. It is important to identify areas of degraded habitat and determine whether the causes are natural or man-made and whether or not the impact is reversible.

D. Impacts of Salmonid Farming

(including escaped fish, genetic introgression in wild salmon stocks, transfer of sea lice and other pathogens from farmed salmon to wild salmon)

The open pen rearing of Atlantic salmon and other salmonids has been shown to have deleterious impacts on wild Atlantic salmon stocks. It is important to assess the extent of the impact of such fish farms on wild stocks.

E. Species Interactions

(including predator and prey interactions, diseases and parasites, competition with native species, interactions with non-native species including intentional introductions and dispersal of previously introduced species into new regions, such as pink salmon)

Issues discussed in this section are considered separate to interactions related to impacts of salmon farming as discussed in 2.III.D above. The potential impact of all trophic level interactions should be assessed taking into account known characteristics such as salmon and predator / prey ecology and any changes in stocks of other species. Other species may carry pathogens that could affect wild Atlantic salmon. The stocking of other fish species could introduce a source for competition and alter predator / prey interactions.

F. Fisheries

(including catches of wild Atlantic salmon in all directed fisheries in marine, estuarine and freshwater habitats, bycatch of all life stages of wild Atlantic salmon, non-catch fishing mortality, harvesting of prey species)

There are directed fisheries that harvest adult wild Atlantic salmon; studies have shown that even catch and release recreational fishing is a source of mortality. There is evidence of bycatch of wild Atlantic salmon in some marine fisheries, e.g. in mackerel fisheries, but the full scale is unknown. Bycatch is likely in fisheries that overlap with wild Atlantic salmon migrations. Fisheries that harvest forage species may reduce the amount of available food for wild Atlantic salmon.

G. Stock Component Effects

(including sea-age groups, size classes, tributary populations, etc.)

The threats listed above may affect stock components differently. It is important to identify those components in greatest need of protection or restoration in each instance. For example, age groups may be differentially affected by fisheries that are size-selective, and tributary populations may be differentially affected by water quality problems.

H. Loss of Genetic Diversity and Integrity

(inbreeding, loss of rare alleles, reduced effective population size)

When salmon stocks decline there is often a loss of genetic diversity that leads to inbreeding, loss of rare alleles and a reduced effective population size. This in turn leads to reduced fitness and performance and thus survival. Stock rebuilding programmes often include the stocking of hatchery-reared fish, which can cause or accelerate negative genetic impacts (see 'Guidelines for Stocking Atlantic Salmon', CNL(24)61).

I. Research Needs

The lack of sufficient data can be an obstacle to an appropriate evidence base to inform stock rebuilding programmes.

3. Initiation of Stock Rebuilding Programmes

I. Plan and Prioritise Management Actions

The SRP should be developed to address the causes of stock decline and threats that have been identified in section 2.III. Efforts should be made to ensure all activities are consistent with the Precautionary Approach. The SRP should include an agreed series of aims and objectives, within a defined timeline, against which stock recovery should be monitored and assessed, as well as both interim and final targets. Where several causes of stock decline have been identified, prioritisation of actions may assist in planning the SRP.

A. Climate Change Mitigation

When a specific impact can be attributed to climate change, special actions may be possible. For example, if river water temperature is exceeding the species' tolerance, the identification and protection of cold-water refuges could be considered. Cold water refuges can also be achieved by creating shade through the planting of trees in the riparian zone. At locations and times when fish are likely to be stressed by high water temperatures, fisheries, including catch and release, should be suspended to minimise the risk of increased mortality.

B. Environmental Change Mitigation

If a distinct natural event is the cause of stock decline, remedial action should be considered to reduce the impact and build resilience. For example, in the case of a landslide, any blockages resulting in migratory barriers should be removed and damaged habitat restored. Environmental change caused by anthropogenic activities can often be mitigated through the termination of the harmful activity (such as pollution), the reversal of the impacts (such as liming acidified rivers) or compensation of the impact (such as fish passage at migration barriers). All new proposals need to be appropriately assessed and regulated to minimise the risk of harmful environmental change.

C. Habitat Restoration

Degraded habitat can often be improved by using commonly accepted restoration practices such as removal of barriers, reconstruction of original river channel and the addition of habitat complexity such as creating river meanders, in-river wood structures and boulder clusters. Further guidance is provided in document CNL(10)51[3], which provides a framework for use by jurisdictions that have responsibility for activities involving wild Atlantic salmon habitat.

[3] NASCO Guidelines for the Protection, Restoration and Enhancement of Atlantic salmon Habitat, CNL(10)51

D. Reducing the Impacts of Salmonid Farming

NASCO provides guidance on best management practices (BMPs) in salmonid farming in document SLG(09)5[4], which are intended to reduce the impacts of salmonid farming. If such BMPs are not implemented or are followed but are ineffective, eliminating specific open pen farms and transitioning to closed containment facilities may be advisable.

E. Mitigating Species Interactions

These actions will depend on the involved species and the nature of the interaction with wild Atlantic salmon (e.g. competition or predator / prey interactions). If the interacting species is non-native, its elimination, reduction or containment should be considered, if feasible. The effects of programmes introducing and / or stocking other species should be evaluated for negative interactions with wild Atlantic salmon and curtailed if necessary. Non-lethal deterrence of native wild Atlantic salmon predators could also be considered, where feasible. In limited cases, where deterrence methods are not appropriate or have failed, lethal methods of control of native wild Atlantic salmon predators might be considered when carried out under appropriate legal constraints. Issues created as a result of negative species interactions could be mitigated through the restoration of native habitat suitable to improve conditions favourable for wild Atlantic salmon. Possible sources of pathogens affecting wild Atlantic salmon should be investigated and appropriate management measures implemented.

F. Fishery Management

Assessments at the relevant scale of how aspects of fisheries activity are contributing to stock decline and long-term sustainability should be conducted based on the best available data. Reducing the mortality in directed wild Atlantic salmon fisheries is often the first response to a decline in stocks since it is likely to have the most immediate effect on the spawning escapement. However, reducing mortality alone is unlikely to have long-term benefits for recovery if other issues are the root cause of the decline. Therefore, reducing harvest and unwanted mortality, such as in catch and release fisheries, should be seen in the context of other measures that may be taken, such as reductions in unreported catch and bycatch, improving and restoring habitat and reducing the impacts of salmonid farming. Reductions in fisheries mortality may only be required while other problems / threats are remedied. However, if long-term changes in production are expected, there may be a need for a modified harvest strategy. Ideally, such responses should be based upon approved plans. If bycatch of wild Atlantic salmon or the harvest of wild Atlantic salmon forage species are shown to be having a detrimental impact to any stock rebuilding programme, efforts should be made to eliminate these threats. The NASCO Decision Structure[5] provides further guidance on the decision-making process for determining appropriate management measures in targeted fisheries.

G. Conserving Diversity of Stock Components

Management decisions must take all components of the stock into consideration. For example, if a fishery is killing only early-run fish, that harvest must either be eliminated or the mortality should be distributed throughout the entire time frame of the run. Furthermore, if there is a size-selective fishery, size-at-harvest and / or gear regulations can be adjusted to reduce such selectivity. Additionally, if broodstock collection for any SRP does not sample all stock components adequately, such practices need to be modified.

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[4] Guidance on Best Management Practices to address impacts of sea lice and escaped farmed salmon on wild salmon stocks, SLG(09)5

[5] Decision Structure For Management of North Atlantic Salmon Fisheries. 2002. CNL31.332

H. Conserving and Restoring Genetic Diversity and Integrity

Conserving genetic variation and integrity will improve the chances that a stock can be rebuilt. Gene banking can be an important tool in conserving and restoring genetic diversity such as through the conservation of important and rare alleles and traits. Further guidance on gene banking can be found in document CNL(25)51 (also see section 3.II.C. below). Further guidance on stocking can be found in NASCO's 'Guidelines for Stocking Atlantic Salmon', CNL(24)61.

I. Research Needs

Where there is insufficient information of the nature and / or extent of the threats facing the stock, the management plan needs to include a provision for further research.

II. Interim Measures

Where stocks are severely depleted, full recovery is likely to take several generations; therefore, there may be a need to develop a staged approach to any SRP and to adopt certain interim measures, such as, and in no particular order:

A. Interim Reference Points

Where stock rebuilding is likely to take several generations it may be appropriate to define intermediate 'recovery' reference points. This may assist in tracking stock recovery over a longer period.

B. Stocking

NASCO considers that where integrity (i.e. evolutionary and ecological naturalness) of the wild stock is a management priority, stocking should not be considered as a remediation measure. Despite the risks associated with stocking, there are some limited situations where stocking may be beneficial for wild Atlantic salmon to circumvent bottlenecks in production where the stock is at immediate risk of extirpation. Such interim stocking should be undertaken in conjunction with other actions aimed at addressing the cause of the stock decline. Further guidance is provided in NASCO's 'Guidelines for Stocking Atlantic Salmon', CNL(24)61.

C. Gene Banking

This can be considered another means of protecting valuable stock traits when the total loss of a stock is possible. However, it should be noted that gene banking should be implemented at an early stage of the SRP. Further guidance is provided in NASCO's 'Guidelines for Gene Banking for Wild Atlantic Salmon', CNL(25)51.

III. Assess Social and Economic Factors

Consider the social and economic consequences of different management options including the possible impacts on other users and other activities that may affect success[6]. NASCO developed its 'Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach', CNL(04)57, to provide a framework for incorporating social and economic factors into decisions that may affect wild Atlantic salmon and the environments in which it lives.

[6] It is worth noting that NASCO has agreed, as part of its Ten-Year Strategy, CNL(24)71rev, that any of its Resolutions, Agreements and Guidelines to be updated from 2025 onwards will include socio-economic considerations

These factors include, for example:

- Indigenous Peoples' knowledge / rights / customs;
- whether there is a need to permit a residual fishery to continue (e.g. subsistence fishing);
- whether the fishery itself has an intrinsic value (e.g. cultural and / or heritage values of specific methods); or
- whether certain lower impact fishing activities (e.g. catch and release angling) may be allowed with the aim of retaining public interest in wild Atlantic salmon conservation.

IV. Monitor and Evaluate Stock Recovery

Monitoring should be conducted until the aims and objectives of the SRP are reached, to permit appropriate evaluation of the stock recovery. Objectives, and the strategies to achieve them, should be reviewed, and revised if necessary, at regular intervals during the recovery process.

The stock recovery assessment must reference the appropriate baseline (see section 2.II.A), against which success should be measured. This should also help identify any failures in the SRP that would need to be addressed.

Consideration should be given to post-project evaluation (after the original aims and objectives have been met) to assess the long-term efficacy of the SRP.

Efforts should be made to disseminate the outcome of any SRP, including both successes and failures, to facilitate knowledge-sharing.

Glossary

Allele – a variant form of a gene. For example, humans have two copies of most genes (one from each parent): the copies are alleles of that gene.

Conservation Limits (CLs) – reference points or thresholds used to define the minimum number of spawning adults required for a healthy, sustainable salmon population in a specific river or population.

Broodstock – an individual or a group of mature individuals used in aquaculture / hatcheries for breeding purposes. Broodstock can be a population of salmon maintained in captivity as a source of progeny used in stocking.

Escapement – the number of adult salmon that return to their spawning grounds, typically used as an indicator of stock health.

Fecundity – the reproductive capacity of an organism, often measured as the number of eggs produced by a female fish, which influences stock sustainability.

Gene banking – the artificial maintenance and / or preservation of genetic variation over multiple generations of salmon populations that are currently, or anticipated to be, suffering from population decline. Typically, a gene bank is cryopreserved samples of milt from targeted salmon populations. The samples can be thawed and used in the future to culture individuals as part of a recovery or restoration programme.

Genetic diversity – the biological variation of genes that occurs within species or a local population of the species. High levels of genetic diversity (many different genes or alleles) are considered favourable to help the species to adapt to changing conditions such as climate change. Low levels of genetic diversity (fewer different genes or alleles) can lead to fish with reduced fertility and resilience in the wild.

Genetic introgression – the incorporation of novel genes or alleles from one group of fish (e.g. hatchery-origin salmon) into the gene pool of a second, distinct group of fish (e.g. wild-origin salmon) via mating.

Reference Points (RPs) – benchmarks used to guide management decisions regarding the status of a salmon stock, such as target population levels or biomass thresholds.

Sea-age groups – subdivisions of a salmon population based on the number of years spent at sea before returning to fresh water to spawn, influencing the timing and management of fisheries.

Stock – a management unit comprising one or more wild Atlantic salmon populations. This would be established by managers, in part, for the purpose of regulating fisheries.

Stock diversity – the variety within a stock of salmon, including factors like age structure, run timing, and genetic diversity, all of which contribute to the resilience and sustainability of the stock.

Trophic interactions – the relationships between organisms within an ecosystem, including predator-prey dynamics, competition for food, and other interspecies interactions that can affect salmon populations.