

**North American Commission**

**NAC(01)6**

*Application of the Precautionary Approach to the Management of  
Atlantic Salmon Fisheries*

*(Tabled by Canada)*

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### *Application of the Precautionary Approach to the Management of Atlantic Salmon Fisheries*

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The Council report for 2000 indicated that each Contracting Party should apply the decision structure on a selection of rivers with different stock strategy and management policies. Contracting Parties would report back to the SCPA in the spring of 2002 so that there could be a thorough evaluation of the decision structure.

Following the Seventeenth Annual Meeting in Miramichi, regional jurisdictions in Canada were advised of this requirement and asked to choose at least one river in each DFO Region and the Province of Quebec on which to apply the structure.

Attached are completed decision structures for each of the following rivers;

- 1- Margaree River, Cape Breton, Nova Scotia ( original case study)
- 2- Matane River, Quebec
- 3- LaHave River, Lunenburg County, Nova Scotia
- 4- Conne River, Newfoundland
- 5- Flat Bay Brook River, Bay St. George, Newfoundland

The status of fisheries on these rivers ranges from a closure on the LaHave River to permitting retention of MSW and 1SW salmon in the case of the Matane River.

DFO has plans to review the usefulness of the decision structure in post-season consultations involving departmental managers, scientists and stakeholders. This review will include consideration of the ICES comments and comments arising from the Eighteenth Annual Meeting of NASCO and will form the basis for Canada's recommendations to the SCPA in the spring of 2002.

***Decision Structure to Aid the Council and Commissions of NASCO and  
NASCO's Contracting Parties in Implementing the Precautionary  
Approach to Management of North Atlantic Salmon Fisheries***

*Margaree River, Nova Scotia, for 2001*

***Background***

2001 forecast of return estimated to be 2780 MSW salmon (90% confidence limit 890 - 4740) and 880 1SW salmon (90% confidence limit 215 - 1645)

Conservation limit = 1036 MSW salmon and 582 1SW salmon

Management target = conservation limit plus 20% = 1243 MSW salmon and 699 1SW salmon

*\* Note that this management target used is hypothetical and would have to be set by managers but would likely be less risk averse than that for Greenland mixed stock fishery*

In recent years there has been a native food fishery (both MSW and 1SW harvests) and angling (1SW harvest and hook-and-release for MSW salmon) only.

***Does the fishery exploit salmon from more than one river?***

If no, see A.

If yes, see B.

**No, single stock fishery (at least just one river); returns have both early run (summer) and late run (fall) components. Therefore the decision structure for a single stock fishery is appropriate.**

## A. Single Stock

1. *Is the stock threatened by external factors (e.g. acidification, disease)?*

If yes, take special management action (e.g. establish gene bank).  
If no, go to A2.

**No.**

2. *Assess status of the stock (abundance and diversity)*

(a) *Have age-specific conservation limits been set?*

**Yes.**

- (i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

**Yes, returns above conservation limit and management target (returns were 1440 MSW and 460 1SW salmon).**

**Egg deposition primarily from MSW salmon and spawning levels have exceeded conservation limits for large salmon in 15 of the past 15 years.**

**Juvenile abundance is high and stable.**

**5-10% of returns originate in hatchery on river.**

**Wild adult abundance has been high and stable while hatchery origin adult abundance has been low and stable.**

- (ii) If no, assess other measures of abundance.

**Not applicable.**

(b) *Is the stock meeting other diversity criteria?*

**Yes.**

**3. *If either abundance or diversity are unsatisfactory, then seek to identify the reasons***

- (a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

**Not applicable.**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Not applicable.**

**4. *If both abundance and diversity are satisfactory:***

- (a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus).

**Harvest available is 2780-1243 = 1537 MSW salmon and 880-699 = 181 1SW salmon.**

**Harvests in 2000 were 81 MSW salmon and 133 1SW salmon.**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Some by-catch exists but a more important concern is unreported catch, mainly poaching in coastal waters and in the river.**

***Decision Structure to Aid the Council and Commissions of NASCO and  
NASCO's Contracting Parties in Implementing the Precautionary Approach  
to Management of North Atlantic Salmon Fisheries***

*Matane River, Quebec, for 2001*

***Background***

**Conservation limit: 623 large salmon (3.18 million eggs)**

**Management target: 725 large salmon (3.70 million eggs)**

The limit and target are expressed in numbers of large salmon so that delegates can clearly understand our objectives. Egg deposition is calculated at the end of the season, based on the theoretical deposition, both for large salmon and for one-sea-winter salmon. This approach is conservative, given that in theory, 5% of one-sea-winter salmon are females.

Retention of large salmon and one-sea-winter salmon is authorized on this river because the conservation limit is exceeded each year. Because there is a fishway at the mouth of the river, salmon counts can be conducted (distinguishing between large salmon and one-sea-winter salmon). Recreational catches must be reported so that the chronology of migration and the percentage of annual spawning by date can be determined. An action plan is therefore developed for attaining the conservation limit at the end of the season. The management target, set in co-operation with the river management organization, is higher than the conservation limit. Using the spawning chronology as a historical basis, estimates during the season are set to aid decision-making on reaching the conservation limit. If the spawning level shows that the management target will not be reached at the end of the season, a mandatory large-salmon release is ordered.

For the 2000 season, the release order was implemented on September 5. The management decision was based on the fact that the management target did not seem possible, even though the conservation limit had already been exceeded. The number of days left in the fishing season and the expected spawning levels were taken into account.

***Does the fishery exploit salmon from more than one river?***

If no, see A.

If yes, see B.

**No, this recreational fishery exploits only salmon stock that migrate in the river.**

## A. Single Stock

1. *Is the stock threatened by external factors (e.g. acidification, disease)?*

If yes, take special management action as appropriate (e.g. establish gene bank).  
If no, go to A2

**No.**

2. *Assess status of the stock (abundance and diversity)*

(a) *Have age-specific conservation limits been set?*

**Yes**

- (i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

**Yes, the estimated egg deposition for 1996-99 exceeded the conservation limit and the management target. In 2000, the conservation limit was exceeded, but the management target was not reached for large salmon ( 676 / 725 ), although it was reached for egg deposition (3.83 million / 3.70 million). In 2000, reproducers were at 1966 levels (676 large salmon and 1,290 one-sea-winter salmon) for a total spawn of 2,623 (915 large and 1,708 first-winter-sea salmon).**

- (ii) If no, assess other measures of abundance.

**Not applicable**

(b) *Is the stock meeting other diversity criteria?*

**Yes**

3. ***If either abundance or diversity are unsatisfactory, then seek to identify the reasons.***

- (a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

**If the stock in the Matane River no longer met conservation requirements, a mandatory large salmon release would be implemented until the situation was corrected. If the cause was intense harvesting or an acute environmental problem (toxic spill), measures to severely limit harvesting would be imposed.**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Because stock status is monitored annually via counts at the fishway, the effectiveness of the restoration measures could be monitored.**

4. ***If both abundance and diversity are satisfactory:***

- (a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus).

**Between 2,000 and 3,000 salmon spawn in the Matane River. From 1996 to 1999, the salmon harvest varied from 1,036 to 608. In 1999, 337 large salmon and 271 one-sea-winter salmon were caught. In 2000, 239 large and 418 one-sea-winter salmon were caught. The conservation limit is still being exceeded. A mid-season action plan that takes into account the spawning chronology specific to this river has been in effect for some years. August 15 was chosen as the date to check management objectives. Thus, on August 15, based on a 28% harvest rate of large salmon counted at the fishway, and an average large salmon migration of 85%, 630 large salmon must be counted at the fishway if the recreational fisheries are to be allowed to retain large salmon catches after August 15.**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Because stock status is monitored annually via counts at the fishway, the effectiveness of the restoration measures could be monitored.**



***Decision Structure to Aid the Council and Commissions of NASCO and  
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to Management of North Atlantic Salmon Fisheries***

*LaHave River, Nova Scotia for 2001*

***Background***

The LaHave River is the index management river for Salmon Fishing Area 21 and 20. The river is partially impacted by low pH water (about 3% of the production). Productivity is generally low, 15-25 smolts per spawning fish. The river has received hatchery support stocking since 1972 and annual assessments are by origin of stock and age-at-maturity. The run is composed salmon that mature after one- and two-sea-winters. Egg deposition is contributed equally by the two age-at-maturity groups. About 50% of the production in the river assessed by counts of smolts and adults migrating past Morgans Falls on the Main LaHave River. Both pre-season and in-season assessments are made and advice concerning the probability of counting the spawning requirement at Morgans Falls is given. Management and clients have expressed interest in using a 75% chance of achieving the requirement before allowing direct harvest.

***Does the fishery exploit salmon from more than one river?***

If no, see A.

If yes, see B

**No**

## A. Single Stock

1. *Is the stock threatened by external factors (e.g. acidification, disease)?*

If yes, take special management action as appropriate (e.g. establish gene bank).  
If no, go to A2.

**No single local external factor threatens the stock, however the stock is not sustainable at marine survival less than about 5%. The four year average wild smolt return is 3.17% and peaked at 4.8% in 2000.**

2. *Assess status of the stock (abundance and diversity)*

(a) *Have age-specific conservation limits been set?*

**Yes**

- (i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

**Yes, an age specific conservation requirement is in place at  $1.96 \times 10^6$  eggs, or 1,320 fish of average age structure. The requirement has not been met in 10 of the past 17 years and is trending down.**

- (ii) If no, assess other measures of abundance.

**Not applicable**

(b) *Is the stock meeting other diversity criteria?*

**Yes, the adult age structure is diversified, as well as the juvenile and smolt age structure.**

3. *If either abundance or diversity are unsatisfactory, then seek to identify the reasons.*

- (a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

**Not applicable**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Monitoring is continuous, refinement of models to predict counts is ongoing, marine survival is limiting, while stocking is numerically positive, economic returns from enhancement are marginal because of reduced relative performance of stocked smolts compared to wild smolts.**

4. *If both abundance and diversity are satisfactory:*

- (a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus).

**A management plan is in effect. The result was closure of all directed fisheries in 2000.**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Monitoring is ongoing and management options are being reviewed.**

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*Conne River, Newfoundland, for 2001*

***Background***

DFO re-opened the recreational fishery in 2000 based on projections of achieving the conservation target of 2400 small salmon as opposed to a management target of 4000 fish, which was in effect since the late 1980's. Based on a ten-year time series, it appears that the management target was set too high. DFO will be consulting with the angling and aboriginal communities to establish an appropriate new management target which will be more in line with the lower risk of not achieving the conservation target .

Based upon the point estimate of the number of smolts that migrated in 2000, a marine survival rate of 4.1% would be required in order to achieve conservation spawning requirements (2400 small salmon) in 2001, while a survival of 6.6% would be needed to meet a previous management target (4000 small salmon). Based upon sea survival rates observed over the past 13 years, and without any consideration of the trend for lower survival rates during the 1990's, the probability of achieving the above returns are 57% and 38%, for the conservation limit and management target, respectively. (Dempson 2001)

Conservation limit; 2474 small salmon, equivalent to about 4.3 million eggs.

Management target; App 4000 small salmon, or 7.8 million eggs. (Management target is under review, and will require consultations with stakeholders. This process is expected to take place in fall 2001.)

In 2000, adult returns (5,393) were the highest since 1990, but still below the 1986-1989 years.

***Does the fishery exploit salmon from more than one river?***

If no, see A

If yes, see B

**No, single stock fishery.**

## A. Single Stock

1. *Is the stock threatened by external factors (e.g. acidification, disease)?*

If yes, take special management action (e.g. establish gene bank.)  
If no, go to A2

**Yes, The Conne River salmon stock has the potential for interaction with salmonids (salmon and steelhead trout) which escape from the aquaculture industry in Bay d'Espoir.**

2. *Assess status of the stock (abundance and diversity)*

(a) *Have age-specific conservation limits been set?*

**No**

- (i) If yes, is the conservation limit being exceeded according to agreed compliance criteria (e.g. 3 out of 4 years)?

**No. The level of conservation attained is based on eggs from all sea ages. Conservation limits have been exceeded in the past two years and exceeded in the past two out of the last five years. For management purposes the conservation level has been set in terms of small salmon only since the numbers of large salmon are quite variable and comprise mainly of repeat spawning grilse. There has been no evidence of a significant multi-sea winter component to the Conne River stock.**

- (ii) If no, assess other measures of abundance

**Not applicable.**

(b) *Is the stock meeting other diversity criteria?*

**Not applicable**

3. ***If either abundance or diversity are unsatisfactory, then seek to identify the reasons.***

- (a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

**DFO has a stock conservation program in place for the Conne River salmon stock, which includes the following management measures: (a) delayed opening of the angling season by one week to June 14; (b) river classification set at a Class III, with a maximum retention of two grilse; and (c) a one week mid-season closure of the recreational fishery to provide for an in-season review and evaluation.**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Not applicable**

4. ***If both abundance and diversity are satisfactory:***

- (a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus).

**Question (a) has been addressed in section 3**

- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Questions (b) has been addressed in section 3.**

***Decision Structure to Aid the Council and Commissions of NASCO and  
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to Management of North Atlantic Salmon Fisheries***

*Flat Bay Brook River, Newfoundland, for 2001*

***Background***

There is insufficient information available to forecast the abundance of Atlantic salmon in 2001. However, based on estimates of the spawning escapements in previous years there is no reason to believe that returns in 2001 will be lower than in 2000.

Conservation limit: Conservation level is 3.8 million eggs. No fish equivalence has been calculated due to the uncertainty as to the proportion of the eggs that should come from large salmon.

In 2000, Flat Bay Brook achieved 167% of its egg deposition required for conservation. The estimates are the highest for the time series (1962-2000). There appears to have been an increasing trend in abundance since 1984. The total river escapement of small salmon (2308) in 2000 is similar to the estimated escapement in 1999. The river escapement of large salmon (477) is twice as high as the estimate in 1999. (Porter, 2001)

Visual counts of salmon were made by snorkellers in August each year 1996-2000. Adjustment factors were applied to visual counts to give estimates of the total number of salmon in the river. In 1995, the assessment was based on the counting fence and angling data. 1996-2000 angling data was obtained from the Licence Stub Return System. A 10% hook and release mortality was assumed. (Porter, 2001)

Management target: to-date no management target has been set for Flat Bay Brook. This process will require consultations with the local stakeholders, which is expected to occur this fall.

***Does the fishery exploit salmon from more than one river?***

If no, see A

If yes, see B

**No**

## A. Single Stock

1. *Is the stock threatened by external factors (e.g. acidification, disease)?*

If yes, take special management action as appropriate (e.g. establish gene bank).  
If no, go to A2

**No. However, rainbow trout, escapees from aquaculture operations, have been observed in the river in 1995 and 2000.**

2. *Assess status of the stock (abundance and diversity)*

(a) *Have age-specific conservation limits been set?*

**No. Conservation limit is based on eggs from all sea ages. Conservation Limits were exceeded in 1999-2000**

(ii) If no, assess other measures of abundance.

**None**

(b) *Is the stock meeting other diversity criteria?*

**Not-applicable**

3. *If either abundance or diversity are unsatisfactory, then seek to identify the reasons*

(a) Immediately implement pre-agreed procedures to introduce appropriate measures to address reasons for failure (including stock rebuilding programmes).

**Salmon fry stocking occurred from 1995 to 1997. The program was discontinued in 1998 due to the observed improvements in spawning stock and a lack of funding**

**Following the commercial moratorium in 1992, angling on Flat Bay Brook was limited to a catch and release fishery. This management strategy continued until 2000 when DFO introduced a limited two week retention fishery (June 24-July 9). As a precautionary approach, Flat Bay Brook was assigned a Class 3 designation whereby anglers are limited to a seasonal maximum two grilse retention. This management strategy will continue for the 2001-angling season.**



- (b) Monitor the effect of the measures and take the results into account in future management and assessment; include identification of information gaps, process and timeframe for resolution.

**Monitoring will occur through a visual count of adult spawners in August after the retention-angling season. Results of the count will determine management strategy for 2002.**

**4. *If both abundance and diversity are satisfactory:***

- (a) Implement pre-agreed management actions to permit harvest of the surplus taking into account uncertainty (where appropriate use management targets to establish the exploitable surplus.)

**No management target has been established. The 2001 recreational fishery will be open for hook and release from June 1 to September 7. However, a retention fishery will occur from June 24 to July 9.**

- (b) Monitor the effect of the measures and take the results into account in future Management and assessment; include identification of information gaps, process and timeframe for resolution.

**Visual counts will be made of spawners in late summer. Information gaps are primarily biological characteristics of the spawners, namely; sex ratio, weight, length and sea-age distribution. These data will be collected from the angling fishery over a two-year period.**

## EXPLANATORY NOTES FOR NEWFOUNDLAND DECISION STRUCTURE EXAMPLES

### Precautionary Approach to Management.

- ***The decision structure examples of Conne River and Flat Bay Brook, require further elaboration.***
- There are added costs to conducting more extensive consultations with the angling community. Additional resources are required by Science in order to conduct the necessary stock assessments.
- In 1999, DFO developed and adopted a new management strategy for the recreational salmon fishery for insular Nfld. One of the key objectives was to provide stability and predictability in the management of the recreational fishery. This objective was accomplished with the introduction of a River Classification System.

### ***River Classification System;***

- This new system provides for different retention levels based on the health of individual stocks,
- The river classification system represents a major shift from the global management approach of previous years.
- Each class of rivers has different retention levels that are considered reasonable without jeopardizing conservation.
- In deriving river classifications, both quantitative and qualitative criteria were used.

### ***Quantitative Criteria;***

- Rivers were classified according to the degree to which conservation-spawning requirements were met on average during the moratorium years (1992-96)
- Total river returns and percent of conservation spawning requirements met were derived from two types of rivers, namely rivers with and without counting facilities. For rivers without counting facilities, exploitation rates were used to calculate total river returns.
- The only other quantitative information available was trends in historical angling data, which applied to the great majority of scheduled rivers.

### ***Qualitative Criteria;***

Rivers were classified in relation to;

- The degree of remoteness.
- Level of angling effort.
- Proximity too highly populated areas.
- Small rivers with relatively small salmon populations.
- The perception of stock size based on observations from local anglers and field staff.

The qualitative criteria used to classify rivers is, in effect, adopting a precautionary approach to fisheries management. In the absence of quantitative information on local salmon populations, DFO has applied the lowest class designation of either a Class 3 or 4 which provides for a total catch and release fishery (only) or a maximum retention limit of two grilse.