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Newfoundland and Labrador Region
Canadian Science Advisory Secretariat
Science Advisory Report 2011/077

# STOCK ASSESSMENT OF NEWFOUNDLAND AND LABRADOR ATLANTIC SALMON - 2011

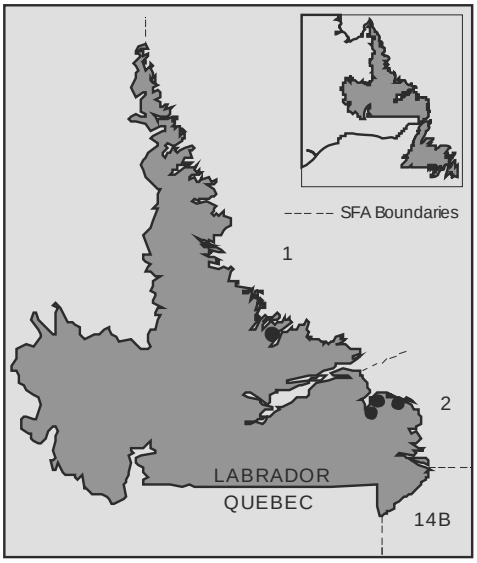


*Figure 1: Labrador portion of NL Region displaying assessment locations.*

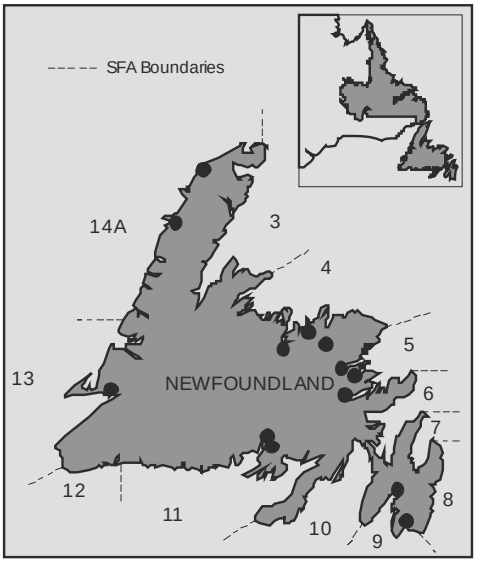


*Figure 2: Newfoundland portion of NL Region displaying assessment locations.*

## Context :

*There are 15 Atlantic salmon (Salmo salar) management areas, known as Salmon Fishing Areas (SFAs) 1-14B, in Newfoundland and Labrador (Fig. 1 and Fig. 2). Within these areas there are more than 470 rivers with reported Atlantic salmon populations characterized by differences in life history traits including freshwater residence time, age at first spawning, and the extent of ocean migrations. Spawning populations consist of varying proportions of small (fork length < 63 cm) and large (fork length ≥ 63 cm) salmon. The majority of rivers in Newfoundland contain populations of small salmon or grilse which are predominantly maiden fish (never spawned before) that have spent one year at sea before returning to spawn (one-sea-winter salmon, 1SW). In Labrador (SFAs 1, 2 and 14B), and western Newfoundland (SFAs 13 and 14A), there are important large salmon components that contain a mixture of maiden fish that have spent two (2SW) or more years (MSW) at sea before spawning and repeat spawners which are returning for a second or subsequent spawning. In other Newfoundland rivers, the large salmon component consists mainly of repeat spawners. Conservation requirements for Atlantic salmon rivers are considered to be threshold reference points. Conservation requirements have been established for individual rivers in Labrador (SFAs 1-2) based on 1.9 eggs per $m^2$ of river rearing habitat, Straits Area of Labrador (SFAs 14A-14B) based on 2.4 eggs per $m^2$ of river rearing habitat and 105 eggs per hectare of lake habitat and insular Newfoundland (SFAs 3-13) based on 2.4 eggs per $m^2$ of river rearing habitat and 368 eggs per hectare of lake. . Stock status is assessed based on the proportion of the conservation egg requirement achieved in a given year and the trends in abundance of various life stages.*

***The consequences of egg depositions below conservation to the long-term sustainability of the stock are unknown but the likelihood of deleterious effects are greater when egg depositions are below conservation. There should be no human induced mortality on stocks that are below 100% of conservation.***

*A Regional Advisory Process (RAP) meeting was held on the 8-9th of November 2011 in St. John's, NL to update the status of those stocks/rivers considered during the last assessment meeting. 2011 marks the fifth and final year of a five-year Atlantic salmon management program. This resource is assessed on an annual basis.*

# SUMMARY

## Newfoundland and Labrador Region (SFAs 1-14B)

- Marine survival appears to be the major factor limiting the abundance of Atlantic salmon within the region. Inter-annual variation in marine survival continues to fluctuate widely.

- The index of abundance of small and large salmon in insular Newfoundland for 2011 was above the previous five year mean (2006-10). However, the previous five year mean remains below the pre-moratorium index (prior to 1992) of abundance for both small and large salmon.

- In Labrador, returns of small and large salmon increased over the previous six year mean. The 2011 returns are in contrast to a five year declining trend. Abundance of large salmon has remained particularly low since the late 1980s.

- Eleven (65%) of the 17 Atlantic salmon stocks assessed in Newfoundland and Labrador achieved their conservation egg requirement. Of the six stocks that did not achieve conservation, four have historically undergone enhancement activities including fish passage and stocking. The remaining two stocks that failed to achieve conservation are in SFA 11.

- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated the South Newfoundland (SFA's 9-12) Atlantic salmon population as threatened in November 2010.
  http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_atlantic_salmon_2011_eng.pdf

## Labrador (SFA 1-2 and 14B)

- Abundance levels of large and small salmon in Labrador, in the previous six years, are below levels achieved prior to the moratorium.

- Returns of small and large salmon in 2011 were some of the highest in the series of record. The conservation egg requirement was achieved on all 4 assessed rivers.

- In 2011, numbers of small and large salmon were above the previous six year mean. There remains concern regarding the low level of large salmon spawners in Labrador.

## Newfoundland (SFAs 3-14A)

- Returns of small and large salmon in 2011 varied greatly among the various geographical areas. Compared to the previous five year mean (2006-10), small salmon returns increased on seven rivers and decreased on six, whereas, large salmon returns increased on nine and decreased on four. The index of abundance of small and large salmon was above the previous five year mean in insular Newfoundland.

- Conservation egg requirement was achieved on seven of 13 assessed rivers. Four of the six rivers that did not achieve conservation have had additional habitat made available through anthropogenic actions. (i.e. Exploits, Terra Nova, Northwest and Rocky). The remaining two rivers that did not achieve conservation were Conne River and Little River in SFA 11.

- In 2011 Parks Canada operated a counting fence on Western Brook in Gros Morne National Park. The Conservation egg requirement was not achieved.

- Compared to the previous five year mean (2006-10), marine survival increased on three of the five monitored rivers. The overall index of marine survival for 2011 was above the previous five year mean. The direction of change for smolt production was variable among the assessed rivers.

# BACKGROUND

## Recreational Fisheries

The recreational salmon fishery is managed according to the River Classification System. A five-year (2007-11) integrated Atlantic salmon fisheries Management Plan was introduced for Newfoundland and Labrador in 2007 (DFO 2007).

In 2010, the recreational salmon fishery for all Labrador rivers opened 15 June and closed 15 September. Retention of large salmon was not permitted in SFA 14B of Labrador but was permitted on some rivers in SFA 2 and all rivers in SFA 1. In SFA 1 and some SFA 2 rivers, anglers could retain four salmon for the season, one of which could be large; other scheduled salmon rivers in SFA 2 were given a Class III designation, with a seasonal retention limit of two small salmon and no large salmon. The lower retention limit for some rivers in SFA 2 was implemented as a precautionary measure to prevent increased fishing mortality expected as a result of increased angling on rivers made easily accessible via the Trans-Labrador Highway. Rivers without direct access from the highway remained at a seasonal retention limit of four salmon. Angling catch data were derived from outfitting camp logbooks for SFA 1, a combination of logbook and License Stub Return data for SFA 2, and Licence Stub Return data for SFA 14B.

The 2010 recreational salmon fishery for all insular Newfoundland rivers opened 1 June and closed 7 September. A fall angling fishery occurs on the Class1 rivers from 8 September to 7 October (DFO 2007). Retention of large salmon was not permitted.

Recreational catch for the Newfoundland and Labrador Region are presented in Figure 3. Angling catch statistics from License Stub Returns in 2010 are preliminary and 2011 data are not yet available.

The retained recreational fishery catch has been relatively stable since 1999 and averages 23,712 retained salmon.

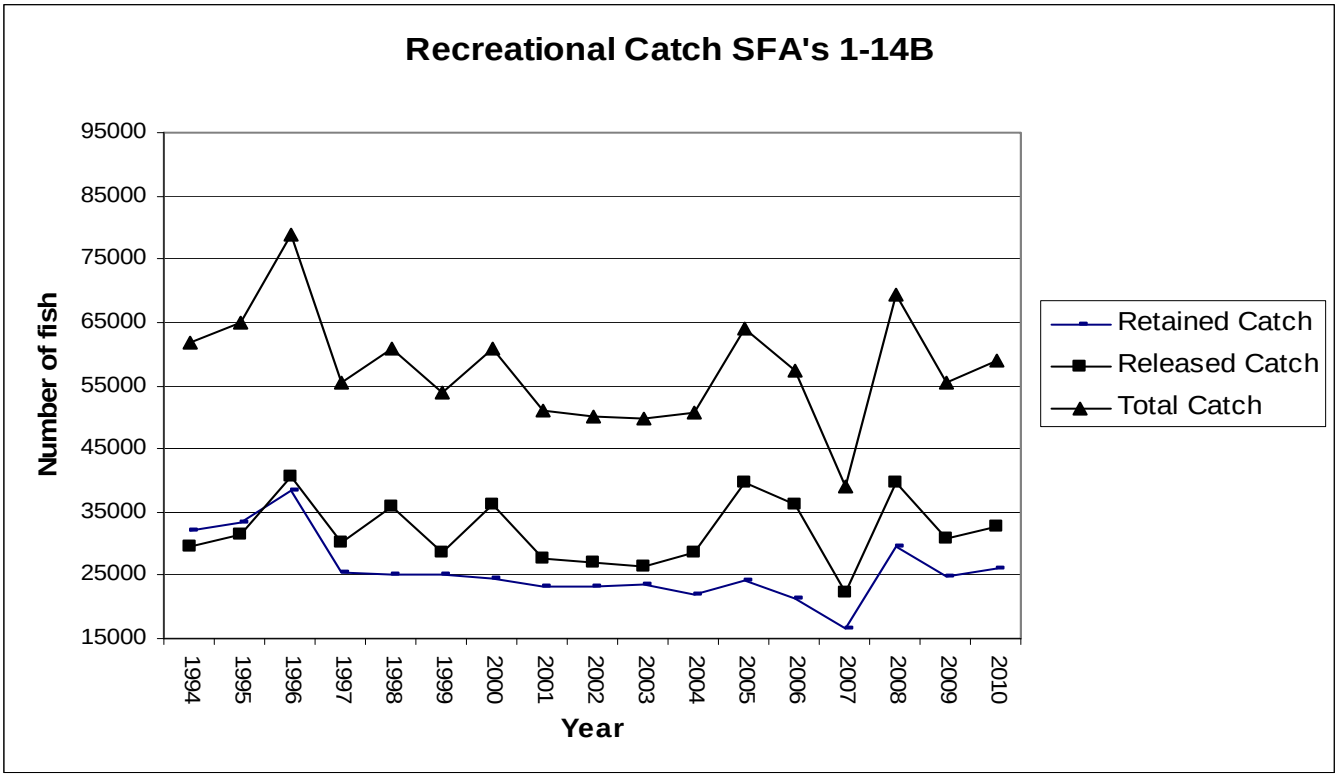


*Figure 3: Angled catch of Atlantic salmon for Newfoundland and Labrador Region.*

## Aboriginal/Subsistence Fisheries

Aboriginal subsistence fisheries for salmon, Arctic charr and brook trout occurred in Labrador under communal licence. An All Resident Subsistence Fishery for trout and charr permitted retention of up to four salmon as a by-catch in 2010. In insular Newfoundland Miawpukek First Nations hold a communal salmon fishing license but have not exercised their rights under this license since 1997 due to conservation concerns.

There has been no commercial salmon fishing in insular Newfoundland since 1992, the Straits area of Labrador (SFA 14B) since 1997, and the rest of Labrador (SFAs 1-2) since 1998.

Commercial salmon fishing in Greenland territorial waters was suspended in 2002. Greenlanders continued a subsistence harvest in 2002-10. In 2010, there was a small commercial and recreational net fishery in St. Pierre et Miquelon territorial waters. Harvests have been less than 5 t annually.

Information available on Labrador subsistence fishery catches indicates that around 36 t (13,998 salmon) were harvested in 2010 of which large salmon represented 43% of the catch by weight and 27% by number. Subsistence food fishery landings in 2010 are the highest in the time series (Fig. 4, Table 1). Landings for 2011 are currently unavailable.

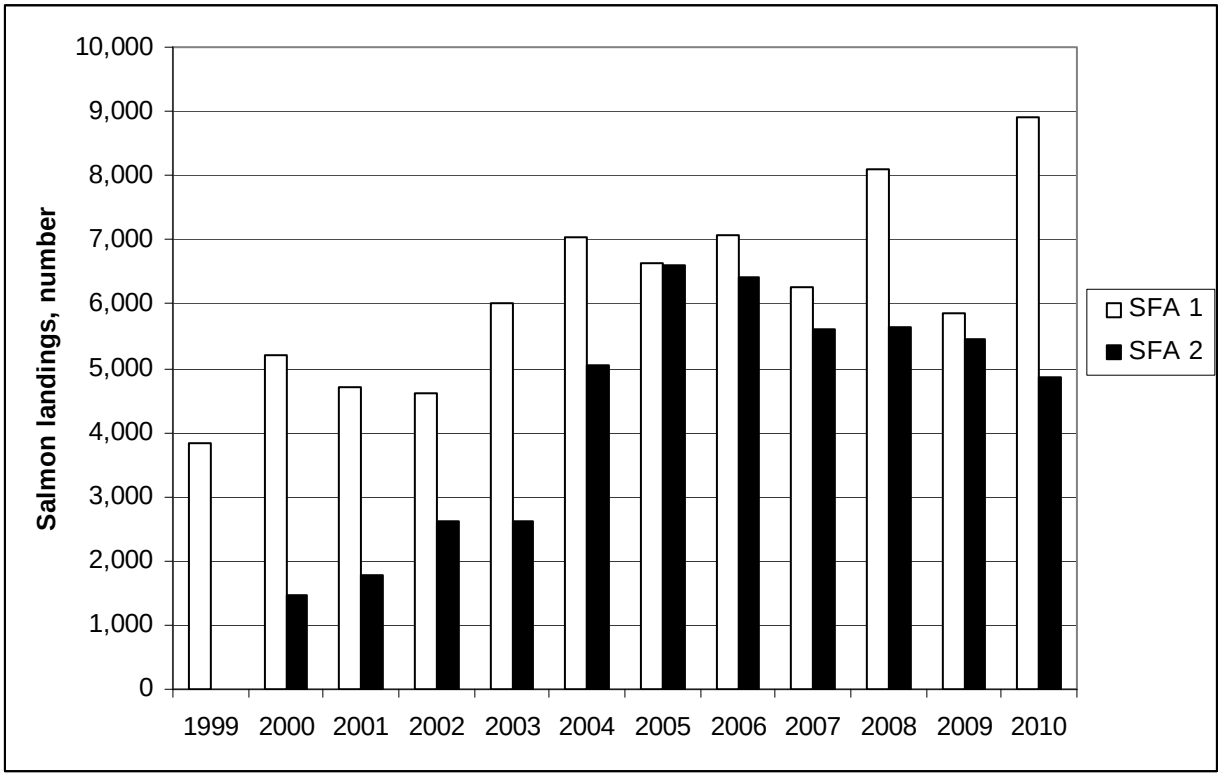


*Figure 4. Landings (number of fish)) reported in the Atlantic salmon food fisheries in Labrador for SFAs 1 and 2 (1999-2010).*

Prior to the closure of the Labrador commercial salmon fishery in 1998, landings (small and large salmon combined) averaged 369 t annually during the period from 1984-89, and 111 t per year from 1990-97, the period in which quotas and allowances were in effect. By comparison, approximately 36 t of salmon were self reported as harvested in subsistence fisheries in 2010.

A comparison of the index of abundance for Labrador salmon and the harvest of salmon in the food fisheries reveals different trends. It is accepted that harvest levels in the food fisheries are not indicators of abundance due to the management restrictions placed on the fishery (i.e. quota and season limits).

# ASSESSMENT

## Conservation Requirements for Labrador Rivers

Conservation requirements for Atlantic salmon in Labrador were discussed in detail by Reddin et al. (2006). Since 2007, an interim conservation limit of 190 eggs per 100 $m^2$ of fluvial habitat has been used in Labrador (SFAs 1 and 2).

# Resource Status–Adult salmon

## Labrador (SFAs 1, 2, & 14B)

Stock abundance trends can be tracked by examining trends of individual stocks, or in a collective manner where information from fisheries and from assessed rivers is combined to derive indices of abundance. The pre fishery abundance (recruits) and spawners are presented for small (Fig. 5) and large (Fig. 6) salmon in Labrador. The pre fishery abundance that is estimated herein is the abundance of Labrador salmon on the high seas prior to their homeward migration. This figure is not comparable to the total returns to rivers.

Despite improvements in runs to some rivers in recent years, overall abundance of recruits remains relatively low compared with pre-moratorium levels, where adjustments to correct for marine exploitation have been made. The abundance of small salmon while relatively high in recent years declined in 2009 and 2010 to amongst the lowest in the time series. There was an increase in the abundance of small salmon and large salmon in 2011. The large salmon index, while increasing in recent years, remains relatively low. This is a very important consideration for Labrador as the large salmon component has a higher portion of multi-sea-winter salmon. These multi-sea-winter salmon have a high percentage of female salmon, and thus can account for a high proportion of the overall egg requirement.

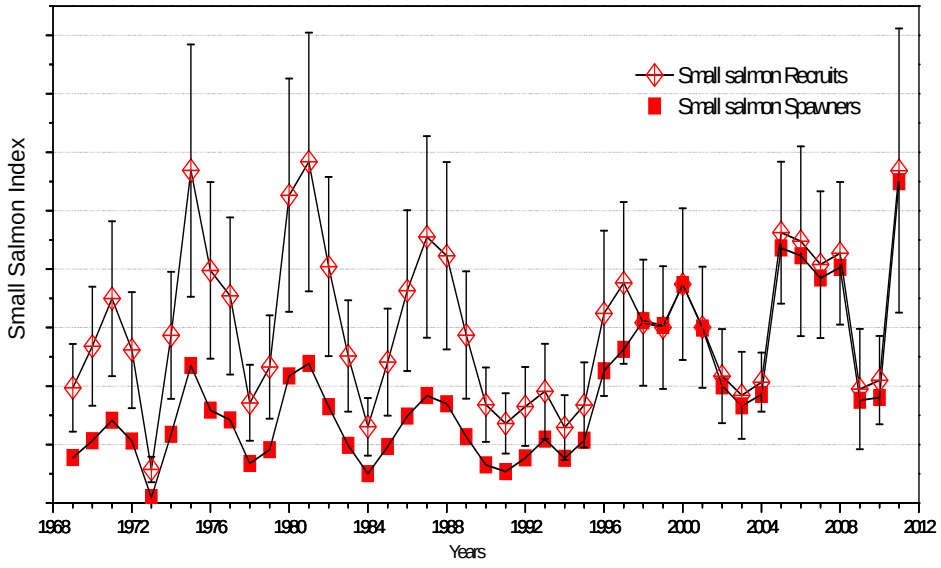


*Figure 5: Trends in abundance of small Atlantic salmon in Labrador, 1969 to 2011. Returns have been corrected to account for marine exploitation. Vertical lines represent the 95$^{th}$ confidence intervals...*

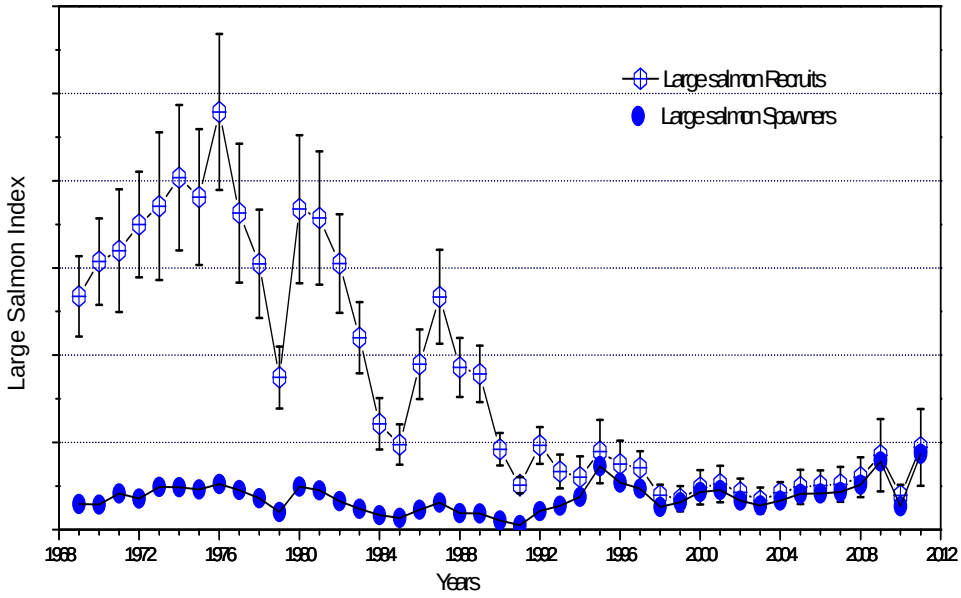


*Figure 6: Trends in abundance of large Atlantic salmon in Labrador, 1969 to 2011. Returns have been corrected to account for marine exploitation. Vertical lines represent the 95$^{th}$ confidence intervals. Solid line represents the mean for the previous six years.*

## Northern Labrador & Lake Melville (SFA 1)

One river was assessed in SFA 1. Salmon and charr stocks were enumerated at the fish counting facility at English River near Postville.

In 2011, small and large salmon returns were above the previous six year mean.

English River achieved 176% of its conservation egg requirement which exceeded the previous six year mean. English River has achieved conservation in 5 out of the last 6 years.

## Southern Labrador (SFA 2)

In 2011, three rivers were assessed in SFA 2: Sand Hill River, Muddy Bay Brook and Southwest Brook (tributary of Paradise River). All three rivers achieved conservation (204%, 130% and 120% respectively).

There was an increase in returns of small salmon on Sand Hill River compared to the previous six year mean. However, no change was observed for small salmon on Muddy Bay and Southwest Brook. Large salmon returns decreased compared to the previous six year mean at Sand Hill River but remained unchanged at the other two rivers.

In 2011, the percent conservation requirement achieved at Sandhill River (204%) increased compared to the previous six year mean and remained unchanged at Southwest Brook (120%) and Muddy Bay Brook (130%). Sand Hill River, Muddy Bay Brook and Southwest River have achieved conservation in 3, 4, and 5 out of the previous 6 years respectively (Note: Muddy Bay Brook not assessed in 2010).

Sand Hill River experienced the highest returns of both small and large salmon in the time series on record.

## Labrador Straits (SFA 14B)

No rivers were assessed in SFA 14b in 2011.

## Newfoundland (SFAs 3-14A)

*Small salmon*

Salmon abundance and hence stock status can be tracked by examining trends of individual stocks, or in a collective manner where information on salmon returns to all monitored rivers is combined to derive composite indices of abundance. In the latter case, the variability inherent in each individual river is accounted for in the modelling process. As illustrated below for Newfoundland small salmon, overall abundance continues to fluctuate and has generally remained low by comparison with pre-moratorium levels (1984-1991) where adjustments to correct for marine exploitation have been made (Fig. 7). Abundance fell dramatically from 2004 to 2007, with the latter being a record low year. Since then abundance increased such that 2010 was the highest recorded since 1988. Overall abundance declined in 2011 but remained higher than the previous five year mean. Ten rivers had returns of small salmon that were lower than the previous year while record high returns occurred on Terra Nova and Campbellton rivers.

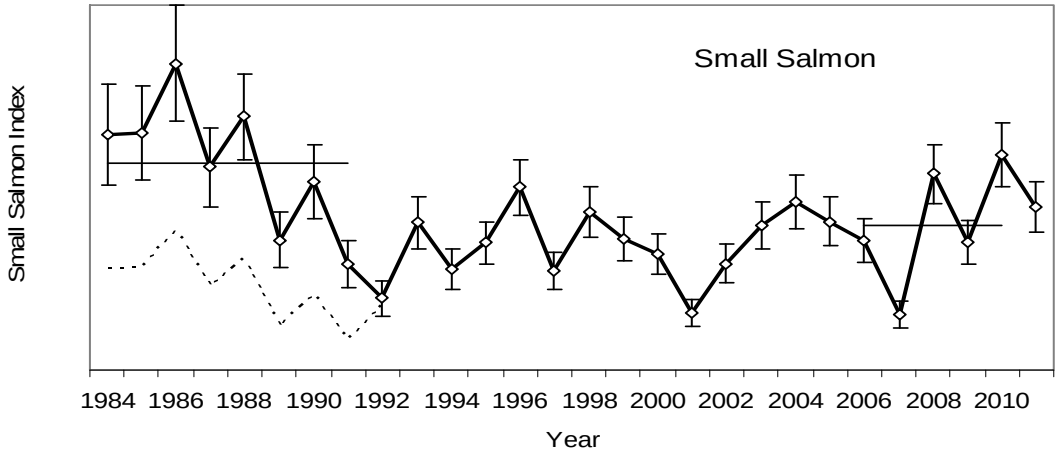


*Figure 7. Trends in abundance of small Atlantic salmon in Newfoundland 1984 to 2011. Returns from 1984 to 1991 have been corrected to account for marine exploitation. Horizontal lines illustrate the mean abundance index for the periods 1984-1991 and 2006-2010. Vertical lines represent ± 1 standard error. The fine dashed line represents returns unadjusted for exploitation for the period 1984 – 1991*.

*Large salmon*

The overall trend of large salmon returns to Newfoundland is similar to that of small salmon (Fig. 8). There was a precipitous decline in abundance from the mid-1980s until the early 1990s. Following the closure of the Newfoundland commercial salmon fishery in 1992, abundance of large salmon increased consistently until 1998. Since then there was a general declining trend through to 2009 followed by increased returns in 2010 and again in 2011. Ten rivers

experienced increased returns of large salmon in 2011 compared to the previous year and all monitored rivers, excluding the four on the south coast, had returns higher than the previous five year mean (2006-2010). Record high returns of large salmon occurred at Exploits, Campbellton and Torrent rivers, with anomalously high returns observed at the latter river compared to historical data.

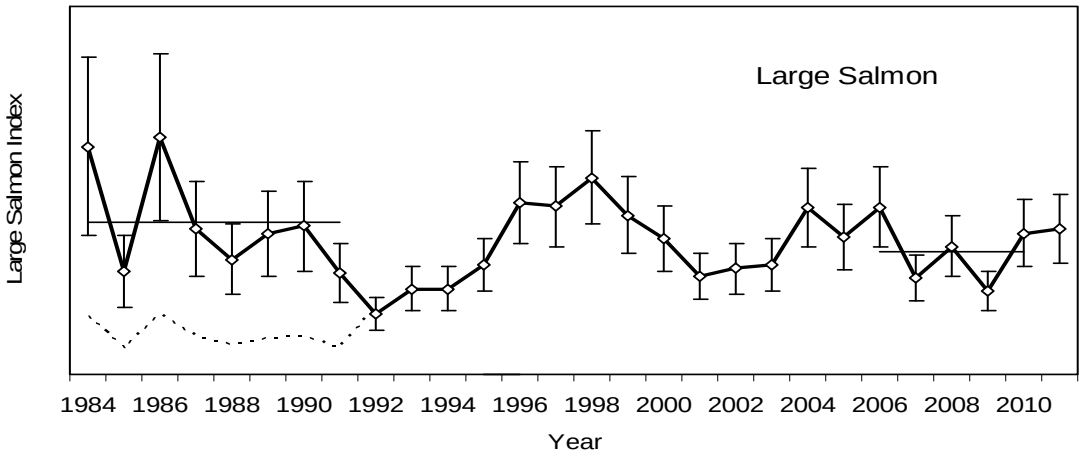


*Figure 8. Trends in abundance of large Atlantic salmon in Newfoundland, 1984 to 2011. Returns from 1984 to 1991 have been corrected to account for marine exploitation. Horizontal lines illustrate the mean abundance index for the periods 1984-1991 and 2006-2010. Vertical lines represent ± 1 standard error. The fine dashed line represents returns unadjusted for exploitation for the period 1984 – 1991.*

*Summary*

In recent years, more extreme variability has been observed in the returns of small salmon where values have fluctuated from almost record lows to record highs. While the overall returns and spawning escapements have increased relative to the pre-moratorium period, total stock size is often still lower than levels obtained prior to the closure of the Newfoundland commercial salmon fishery when adjusted for marine exploitation.

## Northeast and Eastern Newfoundland (SFAs 3-8)

Six rivers were assessed in 2011: Exploits River, Campbellton River, and Gander River in SFA 4, and Middle Brook, Terra Nova River and Northwest River (Port Blandford) in SFA 5. With the exception of Gander River, all stocks were assessed directly from salmon returning to fish counting facilities. The status of Gander River has been inferred from salmon returning to a fishway on Salmon Brook tributary since 2000.

Compared to the previous five year mean (2006-10), total returns increased on all monitored rivers for small salmon except Northwest River and all rivers for large salmon.

Egg deposition was above the previous five year mean (2006-10) for all monitored rivers. In 2011, conservation requirements were met on Gander River (148%), Campbellton River (495%) and Middle Brook (283%) (Table2). Campbellton River and Middle Brook have exceeded conservation requirements in each year of the moratorium period (Table 2). Gander River met or exceeded conservation requirements in only 4 of the past 6 years. Terra Nova River, Exploits River and Northwest River (Port Blandford) have undergone enhancement activities and have

yet to achieve conservation. Total returns of small and large salmon to Campbellton River and small salmon to Terra Nova River in 2011 were the highest on record.

In spite of great increases in spawning escapements for most assessed rivers in SFA 4 and 5 during the initial five year moratorium period (1992-96), longer term increases in adult recruitment (i.e. small salmon) have not been realised.

Concern has been expressed for the lack of growth in salmon returns to the Upper Exploits watershed which was made accessible to adult spawners in 1989.

### South Newfoundland (SFAs 9-11)

Four rivers were assessed in 2011: Northeast Brook (Trepassey) and Rocky River in SFA 9, Conne River and Little River in SFA 11 (Fig. 2). Spawning escapements are evaluated using fish counting facilities while mark-recapture methods are used to survey smolt production at Conne River.

Total returns of small salmon in 2011 decreased on three of the four monitored rivers compared to the previous five year mean (2006-10). Returns of small salmon to Rocky River have increased since 2007 and are currently above the previous five year mean. Enhancement activities occurred on Rocky River during the period 1984-96 after a fishway was constructed to allow access beyond the impassable waterfall at the river mouth.

Less than 10 large fish were counted at either Northeast Brook (Trepassey) or Little River. At all four rivers returns of large salmon were lower than the previous five year mean. As noted in past years, large salmon at rivers such as Conne River are predominately alternate spawning grilse.

Conservation egg requirements in 2011 were only achieved at Northeast Brook(137%) which achieved conservation in 6 out the last 6 years. Conne River (61%) and Little River (37%) have met conservation in only 2 of the past 6 years. Rocky River (81%) is still considered to be in a development phase.

### Southwest Newfoundland (SFAs 12-13)

No rivers were assessed in SFA 12 in 2011.

In SFA 13, Atlantic salmon were monitored on Harry's River at approximately river km 3 near the mouth of the river using a DIDSON sonar. Harry's River achieved its conservation egg requirement in 2011.

Estimates of the total number of spawners on Harry's River increased in 2011 compared to the previous five year mean (2006-10).

Additional rivers (Middle Barachois, Robinsons, Fischells, Flat Bay, and Crabbes) previously assessed using snorkel surveys were not completed in 2011.

### Northwest Newfoundland (SFA 14A)

Two rivers, Torrent River and Western Arm Brook, were assessed in 2011 using fish counting facilities. On both rivers total returns of small salmon decreased compared to the previous five

year mean (2006-10). Total returns of large salmon increased at Torrent River and Western Arm Brook compared to the previous five year mean. The Torrent River had a record high proportion of large fish and since 2009 had a much greater proportion of large fish by comparison with most other years. It should be noted that for Western Arm Brook and Torrent River, large fish are mostly repeat spawners.

Torrent River and Western Arm Brook have consistently exceeded their egg conservation requirement. In 2011 Torrent River and Western Arm Brook achieved 867% and 458% of their egg conservation.

Since 2000 Parks Canada has run salmon counting fences on four rivers falling entirely or partially within Gros Morne National Park. These include Western Brook, Deer Arm Brook, Trout River, and Baker's Brook. While returns on Western Brook were consistently <100 salmon from 1984-1990, since 2007 a fence has been operated annually and counts have fluctuated above and below the conservation target of 500 small salmon. Counts of small (<63 cm) and large salmon (>63 cm), respectively, were 344 and 167 in 2007; 881 and 143 in 2008; 433 and 127 in 2009; 779 and 151 in 2010; and 331 and 168 in 2011.

## Smolt Production and Marine Survival

Information on both smolt and adult salmon counts are currently available from six rivers: Sand Hill River (SFA 2) Campbellton River (SFA 4); Northeast Brook (Trepassey) (SFA 9); Rocky River (SFA 9); Conne River (SFA 11); and Western Arm Brook (SFA 14A). Thus, estimates of marine survival from smolts to adult small salmon can be derived and examined in relation to trends over time or in view of changes in management plans. The data series ranges from 41 years at Western Arm Brook to 4 years at Sand Hill River. Smolt monitoring at Highlands River (SFA 13) ended in 2000.

### Smolt production

Smolt production in 2011 decreased in three of five monitored stocks by comparison with the previous five-year mean (2006-2010) (Fig. 9). Decreases ranged from 11% fewer smolts at Conne River to 48% less at Northeast Brook, Trepassey, the fewest recorded since 1995. Conne River numbers may be biased low owing to the late start of smolt survey as a result of high water conditions at the beginning of the run. Smolt production at Rocky River was 36% less than the mean, and was the lowest value observed since 2003. Western Arm Brook had 11% more smolts, relative to the mean, while numbers of smolts at Campbellton River were similar to the 2006-2010 average. There was no smolt count on Sandhill River in 2011.

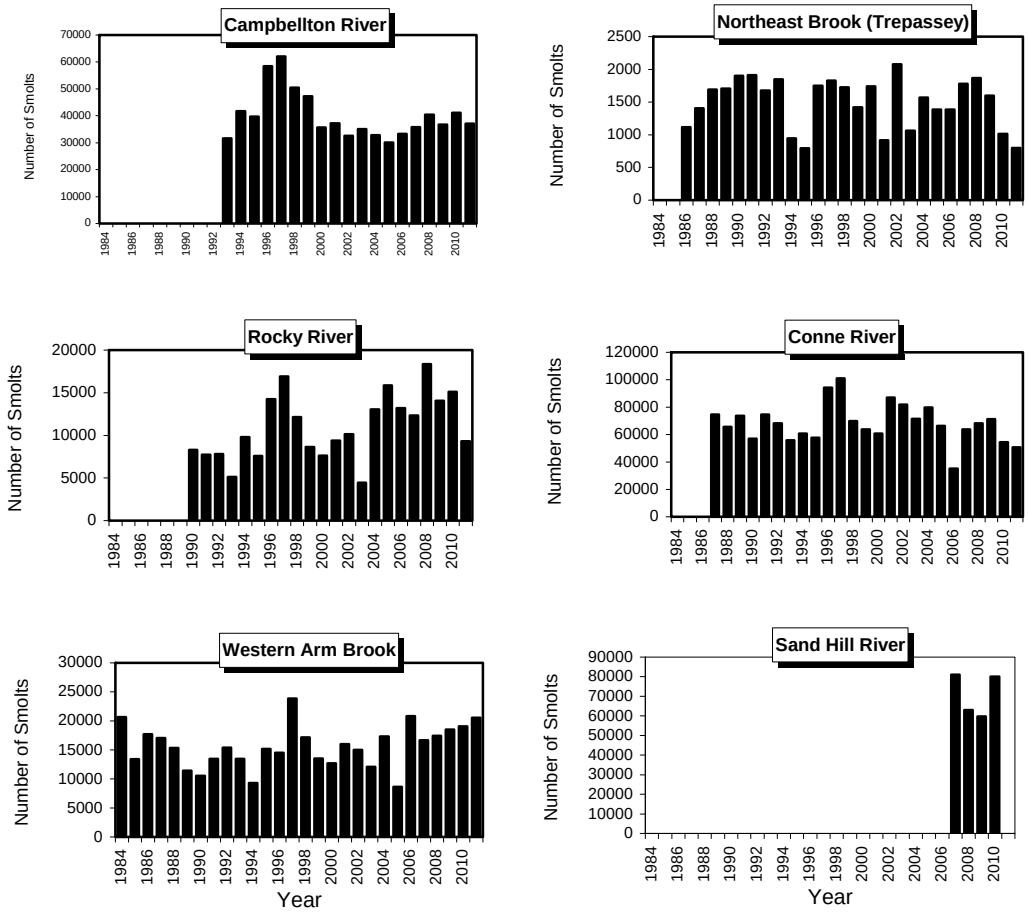


*Figure 9. Trends in smolt production from various Newfoundland and Labrador Atlantic salmon rivers.*

## Marine survival

Marine survival, corresponding to adult small salmon returns in 2011, averaged 6.5% across all five insular Newfoundland rivers. In Labrador, marine survival for Sand Hill River was 10.7%. Survival increased compared to 2010 at Sand Hill River, Conne River, Northeast Brook, and Campbellton River with the later achieving a record high return rate (11.8%) (Fig. 10). Survival declined at Western Arm Brook and Rocky River by comparison with 2010. Only at Conne River was the survival rate of adults returning in 2011 lower than the previous five year mean (2006-2010). Consistent with previous years, higher rates of survival were observed at northern insular Newfoundland locations (Western Arm Brook and Campbellton River) compared to southern populations.

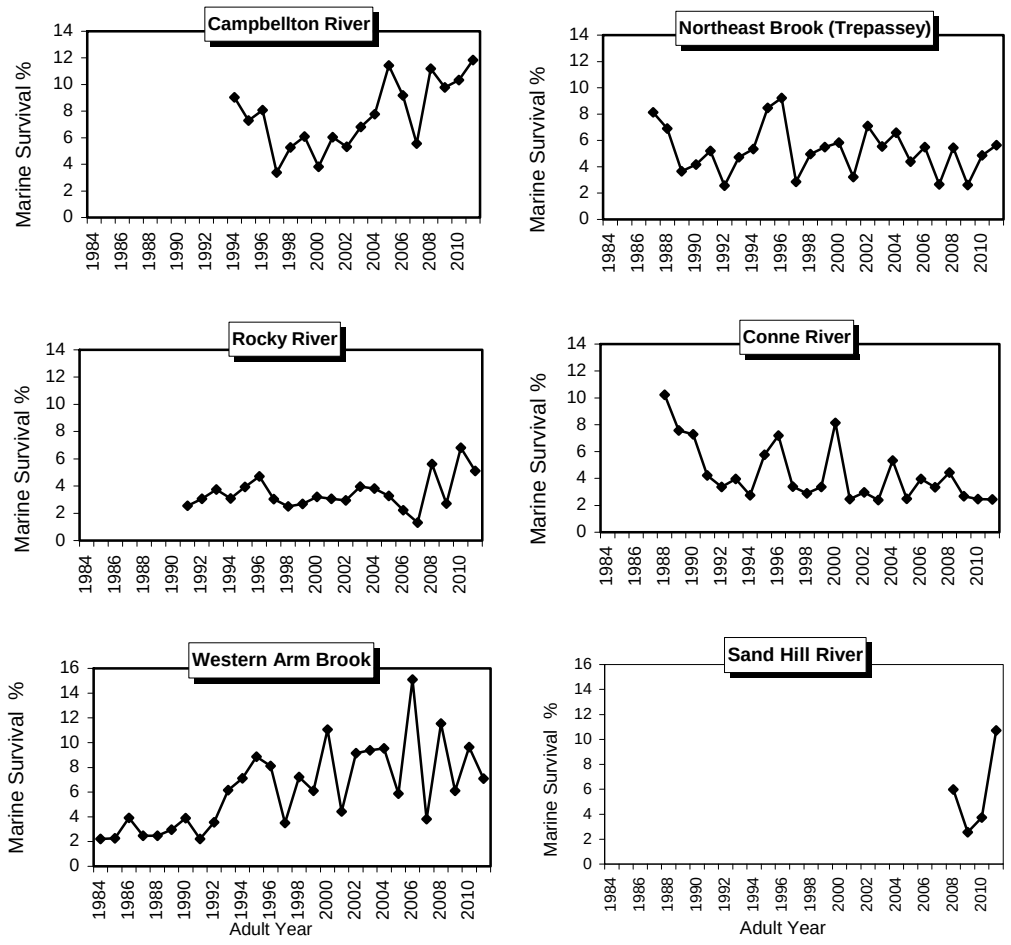


*Figure 10. Marine survival rates for adult small salmon at various Newfoundland and Labrador rivers. Survival rates have not been adjusted for marine exploitation in years prior to 1992 when commercial fisheries for salmon occurred. Thus, values represent survival of salmon back to the river.*

A composite index of marine survival derived from all five insular Newfoundland rivers is shown below (Fig. 11). Here, survival of smolts to adult small salmon is illustrated for the period 1986 to 2011, where year represents the year of adult small salmon returns. As observed, the index of smolt survival fell dramatically for smolts that went to sea in 2006 and returned as adults in 2007, as it did for smolts migrating in 2008 and returning as adults in 2009. This was followed by an increase in survival in 2010 with a slight decrease for 2011. The overall trend through out the entire data series reveals only a marginal increase in survival over time.

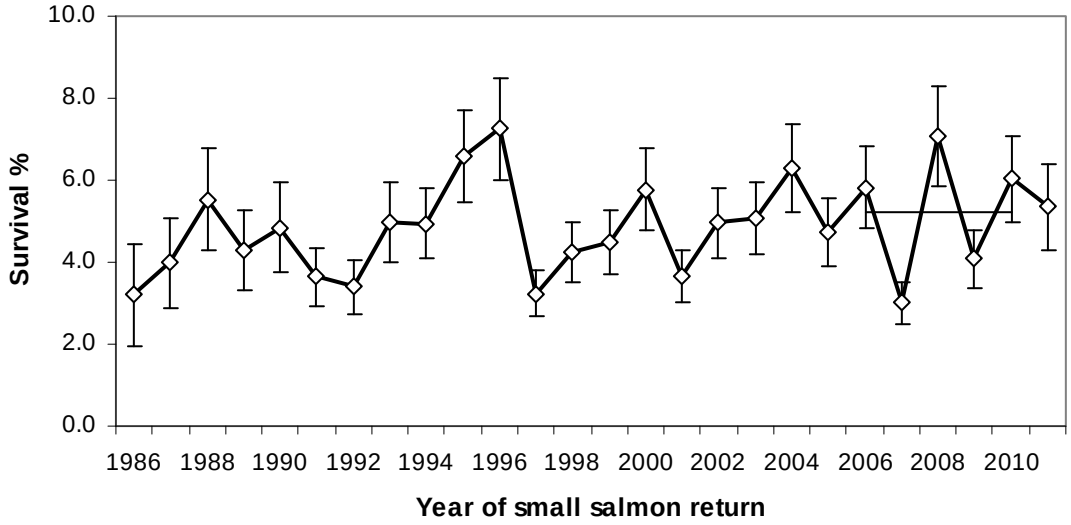


*Figure 11. Standardized mean survival of smolts to adult small salmon derived from a general linear model analysis of monitored Newfoundland rivers. Year represents the year of smolt migration. Vertical lines represent one standard error about the mean*.

## Sources of Uncertainty

No information is available on the salmon stocks in SFAs 3, 6, 7, 10, 12 and 14B and the Lake Melville area of SFA 1.

Salmon populations in assessed rivers may be unique and not representative of other rivers in the SFA.

Returns of small salmon for all rivers include repeat spawners. Therefore, sea survival of smolts to small salmon is an overestimate of marine survival of maiden 1SW and 2SW fish.

Returns to Gander River have been estimated using counts from an upstream tributary, Salmon Brook, since 2000. A retrospective comparison between the actual and estimated total returns on the Gander River revealed deviations of 50-60%. Uncertainties around Gander River estimates are included in the insular Newfoundland stock status report.

Returns to Harry's River in 2011 were derived from data using a DIDSON sonar. Uncertainties with respect to the final numbers of large and small fish enumerated still remain an issue at present.

Uncertainty exists with respect to the estimates of adult salmon at Conne River although correction factors were applied for times when the fence was inoperable for 2011.

There is uncertainty with respect to the applicability of some biological characteristics i.e sex ratios, fecundity, sea age and sizing of large and small salmon.

# CONCLUSIONS AND ADVICE

In general, low marine survival continues to be the limiting factor affecting abundance of Newfoundland and Labrador salmon.

There are four areas of concern for salmon populations in the region: Labrador populations in the long term, South coast SFA's 9-12 especially Conne River, Bay St. George (with the exception of Harry's River) and the upper Exploits River watershed. Committee on Status of Endangered Wildlife in Canada (COSEWIC) has designated the South Newfoundland (SFA' 9-12) as threatened in November 2010.

There is concern that returns at Conne River in 2011 declined (~15%) from the previous five year mean while the overall cumulative decline since the mid-1980s has been over 70%. Conne River continues to remain at or below pre-moratorium levels compared to other rivers in the region which have improved in recent years. Marine survival at Conne River is particularly concerning.

In Bay St. George there is particular concern for the large salmon components, many of which are 2-sea-winter salmon. Concern for these stocks has been noted for more than two decades. Some, but not all of these fluctuations, may be attributed to the frequent extremes in river discharge. Poaching in some Bay St. George rivers is also believed to be a long-standing problem hampering stock recovery. The increased management efforts with respect to conservation/stock recovery strategies (Stewardship Programs) and associated monitoring plans, as well as enforcement have been successful on Bay St. George Rivers. DFO should continue to support the stewardship initiatives and implement management options that will maximize the spawning population.

Concern was expressed in 2008 for Middle Barachois Brook (Bay St. George), which only achieved 28% of its conservation egg limit. The Middle Barachois Brook salmon population had shown declines and was believed to be at seriously low levels.

Concern had been expressed in previous assessments that no new information has been tabled with respect to the status of Atlantic salmon in Middle Barachois Brook. If there is additional information data/evidence with respect to the status of this stock it should be brought forward. Further assessment of the status of Atlantic salmon in Middle Barachois Brook is required.

Concern has been expressed for the lack of growth in the egg deposition level achieved in the Upper Exploits watershed, that was made accessible in 1989.

River classification study:

- During the period of River Classification, there was a reduction in the retained salmon catch by on average 6000 fish per year.
- Greatest effect was on reduction of retained fish on Class II and III rivers where catch and effort declined.
- Conversely retained catch and effort increased on Class I rivers. For the Class I rivers assessed there is no indication that this increase in retained catch was detrimental to the stock
- River Classification altered angling effort and catch to rivers with higher allowable retention limits.
- Increasing retention limits during the angling season may result in increases in effort and catch as was observed on Flat Bay and Harry's River in 2008 and 2010. However, the

effect of increased returns on catch and effort, during those years, has not been fully tested.
- Overall there was a reduction in harvested fish and therefore an increase in spawning escapement as a result of River Classification

Two Brook trout papers were peer reviewed and accepted:

1).Attitudes and Management Preferences of Anglers Fishing for Brook Trout, *Salvelinus fontinalis*, on the Avalon Peninsula, Newfoundland and Labrador, Canada

- Anglers on the Avalon Peninsula are in agreement with current trout management regulations for the area surveyed.

2).Comparing Age, Growth, and Mortality of Brook Trout (*Salvelinus fontinalis*) sampled from Seven Lakes on the Northern Peninsula, Newfoundland to assess the efficacy of established regulations for Ten Mile Lake**.**

- Ten Mile Lake does not stand out as being unique in terms of fishing quality.
- Three of the six lakes sampled other than Ten Mile Lake displayed mean fish lengths larger than Ten Mile Lake.
- Catch rates for Ten Mile Lake did not significantly differ from any other sampled lakes.
- In light of the information presented herein, a review of angler preferences with respect to the current management plan for Ten Mile Lake could be considered.

## Management Advice

There should be a reduction in exploitation of large salmon in Labrador in 2012.

There should be no increase in fishing mortality/allocations on Newfoundland and Labrador salmon stocks in 2012 except for areas which have in-season special management plans and where conservation requirement limits are being exceeded.

Science recommends that options be assessed and action be taken to increase egg deposition in the upper section of the Exploits watershed (e.g. reduce exploitation, transfer adults).

Continued and enhanced efforts should be made to improve the number of spawners in all Bay St. George rivers.

## Research Recommendations

In general, monitored south coast rivers did not respond to the commercial salmon fishery moratorium in any consistent, positive way by comparison with other regions in Newfoundland and Labrador. Accordingly, it is recommended that salmon abundance monitoring be expanded to determine if other south coast stocks are under producing with respect to adult salmon abundance.

Additional research projects, stakeholder engagement and additional efforts to better understand interactions impacting marine survival on the Conne River (SFA 11) salmon population should also be conducted.

Research is required on the Labrador large salmon populations to determine if the assessed rivers are representative of other populations, in particular, rivers in the harvested areas of Lake Melville and the Straits. These stocks are known to have different biological characteristics.

Research is needed to measure the accuracy and utility of the Licence Stub (Angler Log) Survey.

## OTHER CONSIDERATIONS

### Freshwater Environment

No scheduled salmon rivers were closed for environmental reasons in 2011.

## SOURCES OF INFORMATION

This Science Advisory Report is from the regional advisory meeting, November 8-9, 2011, on the Status of Atlantic Salmon in Newfoundland & Labrador. Additional publications from this process will be posted as they become available on the Fisheries and Oceans Canada Science Advisory Schedule at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

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*Table 1. Subsistence Atlantic salmon fisheries landings in Labrador as of October, 2011.*

| | Small salmon | | Large salmon | | Total | |
|---|---|---|---|---|---|---|
| | **Number** | **Weight (kg)** | **Number** | **Weight (kg)** | **Number** | **Weight (kg)** |
| **SFA 1** | | | | | | |
| 1999 | 2,739 | 5,580 | 1,084 | 4,220 | 3,824 | 9,800 |
| 2000 | 4,111 | 8,111 | 1,092 | 4,365 | 5,203 | 12,474 |
| 2001 | 3,394 | 6,995 | 1,299 | 5,121 | 4,708 | 12,117 |
| 2002 | 3,609 | 7,386 | 1,015 | 4,441 | 4,624 | 11,827 |
| 2003 | 4,382 | 9,094 | 1,639 | 7,026 | 6,021 | 16,120 |
| 2004 | 4,822 | 10,038 | 2,210 | 8,656 | 7,032 | 18,694 |
| 2005 | 4,958 | 10,116 | 1,687 | 6,930 | 6,644 | 17,046 |
| 2006 | 5,422 | 11,189 | 1,639 | 6,330 | 7,061 | 17,519 |
| 2007 | 4,700 | 8,306 | 1,560 | 5,314 | 6,261 | 13,619 |
| 2008 | 5,154 | 10,342 | 2,955 | 13,627 | 8,109 | 23,968 |
| 2009 | 3,964 | 8,173 | 1,907 | 8,232 | 5,871 | 16,405 |
| 2010 | 6,227 | 13,116 | 2,689 | 11,351 | 8,912 | 24,468 |
| **SFA 2** | | | | | | |
| 1999 | - | - | - | - | - | - |
| 2000 | 1,212 | 2,242 | 260 | 897 | 1,472 | 3,139 |
| 2001 | 1,396 | 2,793 | 374 | 1,378 | 1,770 | 4,172 |
| 2002 | 2,197 | 4,196 | 422 | 1,549 | 2,619 | 5,745 |
| 2003 | 2,095 | 4,102 | 536 | 1,885 | 2,632 | 5,987 |
| 2004 | 3,480 | 7,166 | 1,450 | 5,480 | 5,050 | 12,852 |
| 2005 | 5,479 | 10,922 | 1,130 | 3,946 | 6,609 | 14,868 |
| 2006 | 4,955 | 10,008 | 1,451 | 5,193 | 6,406 | 15,201 |
| 2007 | 4,507 | 8,764 | 1,092 | 4,073 | 5,599 | 12,837 |
| 2008 | 4,680 | 9,044 | 954 | 3,349 | 5,634 | 12,393 |
| 2009 | 4,024 | 7,956 | 1,437 | 5,449 | 5,461 | 13,405 |
| 2010 | 3,796 | 7,554 | 1,070 | 3,887 | 4,865 | 11,441 |

*Table 2. Summary of Atlantic salmon stock status in Newfoundland and Labrador, 2011. Conservation met refers to the actual percentage of the conservation spawning requirement achieved. Refer to footnotes for definition of characters and abbreviations.*

| Region | | | Total Returns 2011 | | Total Returns 2005-2010 mean | | Conservation met (%) | | | Status in 2011: Smolts Relative to: | Status in 2011: Marine Survival Relative to: | Status in 2011: Egg Deposition Relative to: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River | SFA | Method | Small | Large | Small | Large | 2011 | 2005-2010 mean | 2005-2011 | 2005-2010 mean | 2005-2010 mean | 2005-2010 mean |
| **LABRADOR** | | | | | | | | | | | | |
| English River | 1 | Fe | 419 | 156 | 389 | 53 | 176 | 104 | 5 of 7 yrs | | | ⇧ |
| Sand Hill River | 2 | Fe | 8565 | 970 | 3979 | 662 | 204 | 102 | 4 of 7 yrs | | ⇧ | ⇧ |
| Muddy Bay Brook | 2 | Fe | 348 | 19 | 359 | 19 | 130 | 134 | 4 of 6 yrs | | | ⇔ |
| Southwest Brook (Paradise River) | 2 | Fe | 380 | 33 | 370 | 31 | 124 | 120 | 5 of 7 yrs | | | ⇔ |

| Region | | | Total Returns 2011 | | Total Returns 2006-2010 mean | | Conservation met (%) | | | Status in 2011: Smolts Relative to: | Status in 2011: Marine Survival Relative to: | Status in 2011: Egg Deposition Relative to: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River | SFA | Method | Small | Large | Small | Large | 2011 | 2006-2010 mean | 2006-2011 | 2006-2010 mean | 2006-2010 mean | 2006-2010 mean |
| **INSULAR NEWFOUNDLAND** | | | | | | | | | | | | |
| Northeast Coast (SFA's 3-8) | | | | | | | | | | | | |
| Exploits River | 4 | Fw | 39221 | 7059 | 30082 | 4907 | 71 | 59 | 0 of 6 yrs | | | ⇧ |
| Campbellton River | 4 | Fe | 4860 | 583 | 3272 | 435 | 495 | 319 | 6 0f 6 yrs | ⇔ | ⇧ | ⇧ |
| Gander River [1] | 4 | EFw | 25965 | 1805 | 18008 | 1432 | 148 | 100 | 4 of 6 yrs | | | ⇧ |
| Middle Brook | 5 | Fw | 2564 | 192 | 1805 | 120 | 283 | 187 | 6 of 6 yrs | | | ⇧ |
| Terra Nova River | 5 | Fw | 4755 | 503 | 2898 | 360 | 80 | 50 | 0 of 6 yrs | | | ⇧ |
| Northwest River (Port Blandford) | 5 | Fe | 756 | 223 | 862 | 176 | 75 | 61 | 0 of 6 yrs | | | ⇧ |
| South Coast (SFA's 9-11) | | | | | | | | | | | | |
| Northeast Brook (Trepassey) | 9 | Fe | 57 | 3 | 67 | 3 | 137 | 160 | 6 of 6 yrs | ⇩ | ⇧ | ⇩ |
| Rocky River | 9 | Fe | 771 | 39 | 532 | 42 | 81 | 58 | 0 of 6 yrs | ⇩ | ⇧ | ⇧ |
| Little River | 11 | Fe | 85 | 1 | 149 | 9 | 37 | 67 | 1 of 6 yrs | | | ⇩ |
| Conne River | 11 | Fe | 1543 | 74 | 2046 | 104 | 61 | 85 | 2 of 6 yrs | ⇩ | ⇩ | ⇩ |
| Southwest Coast (SFA's 12-13) | | | | | | | | | | | | |
| Harry's River [2] | 13 | DIDSON | 4024 | | 3108 | | 109 [3] | 97 | 4 of 6 yrs | | | ⇧ |
| Northwest Coast (SFA 14A) | | | | | | | | | | | | |
| Torrent River | 14A | Fw | 2689 | 1740 | 4065 | 1190 | 867 | 863 | 6 of 6 yrs | | | ⇔ |
| Western Arm Bk | 14A | Fe | 1351 | 75 | 1372 | 29 | 458 | 482 | 6 of 6 yrs | ⇧ | ⇩ | ⇔ |

Assessment Methods:
Fe = counting fence
Fw = fishway count
EFw = estimated from tributary fishway count
DIDSON = Dual-Frequency IDentification SONar

Trend symbols:
⇩ > 10% decrease
⇧ > 10% increase
⇔ no change = ± 10%

Footnotes:
Marine survival is from smolts in year i to small salmon in year i + 1.
190 eggs/100 m2 was used to determine the conservation levels for Labrador rivers.
[1] Gander River was assessed using a fish counting fence from 1989 to 1999.
[2] Harry's River shows total returns of salmon (small + large)
[3] Based on proportion of large in previous 5yr mean (2006-2010).

## FOR MORE INFORMATION

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