STOCK ASSESSMENT OF NEWFOUNDLAND AND LABRADOR ATLANTIC SALMON – 2012

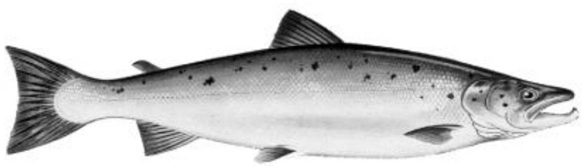

Image: Atlantic Salmon (Salmo salar)

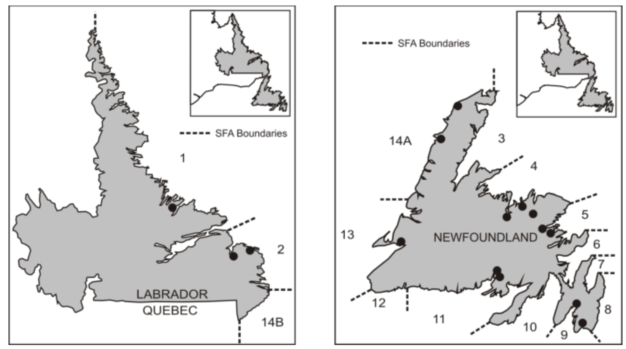

Figure 1. Assessment locations in Newfoundland and Labrador Region

Context:

There are 15 Atlantic Salmon (Salmo salar) management areas, known as Salmon Fishing Areas (SFAs) 1-14B, in Newfoundland and Labrador (NL) (Fig. 1). 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 migration. Spawning populations consist of varying proportions of small (fork length < 63 cm) and large (fork length $\geq$ 63 cm) salmon. The majority of rivers in Newfoundland (SFA 3-12) contain populations of small salmon which are predominantly maiden fish (never spawned before) that have spent one-year at sea before returning to spawn (grilse, one-sea-winter, 1SW). The large salmon component in this area consists mainly of repeat spawners (repeat-spawning grilse) which are returning for a second or subsequent spawning. In Labrador (SFAs 1, 2 and 14B) and western Newfoundland (SFAs 13 and 14A), there are important large salmon components that contain maiden fish that have spent two (two-sea-winter, 2SW) or more years (multi-sea-winter, MSW) at sea before spawning.

Conservation egg requirements for Atlantic Salmon have been established for individual rivers in Labrador (SFAs 1-2) based on 1.9 eggs per m^2 of river rearing habitat, the 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 habitat. Conservation egg requirements are considered to be threshold reference points. The level to which egg depositions can fall below conservation before threatening the long term sustainability of the population needs to be determined. According to the Wild Atlantic Salmon Conservation Policy (DFO 2009), at some level below conservation "the population is at a level of abundance at which further mortalities will lead to continued decline in the spawner abundance and an increasing risk of serious harm". Atlantic Salmon stock status is currently assessed based on the proportion of the conservation egg requirement achieved in a given year and trends in abundance of various life stages.

A Regional Advisory Process (RAP) meeting was held on the 19-21 of November 2012 in St. John's, NL to update the status of those stocks/rivers considered during the last assessment meeting.

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 the index of marine survival continues to fluctuate widely (Fig. 10).
- The index of abundance of small and large salmon in insular Newfoundland for 2012 was below (small) or similar to (large) the previous five-year mean (2007-11). However, the previous five-year mean remains below the pre-moratorium index (prior to 1992) of abundance for both small and large salmon when adjustments for marine exploitation are incorporated.
- In Labrador, returns of small salmon in 2012 remain unchanged from the previous six-year mean on English River but declined below the six-year mean for Sand Hill River and Southwest Brook. On Sand Hill River returns of large salmon in 2012 were above the previous six-year mean and remain unchanged at the other two rivers. Abundance of large salmon has remained particularly low since the 1980s (mean 1980-89 was 114,490 large salmon: mean 1990-2012 was 31,412).
- Six (40 %) of the 15 Atlantic Salmon rivers assessed in Newfoundland and Labrador in 2012 achieved their conservation egg requirement. Six of the nine rivers that did not achieve conservation are in SFA 2 (2 rivers), SFA 9 (1 river), SFA 11 (2 rivers) and SFA 13 (1 river). The remaining three rivers that did not achieve conservation have historically undergone enhancement activities, including the opening of new habitat and stocking, and are still being colonized.
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the South Newfoundland (SFAs 9-12) Atlantic Salmon populations as threatened in November 2010.
- In 2012, a Recovery Potential Assessment (RPA) was conducted for South Newfoundland Designatable Unit (DU) 4. Publications from this process will be posted as they become available on the Canadian Science Advisory Secretariat website.
- Estimates of retained and total catch (retained + released) in the recreational fishery for the Newfoundland and Labrador region have been trending upward in recent years (Fig. 2). The estimates of retained catch and total catch for 2011 are above their previous five-year mean by 17 % and 12 % respectively.
- Estimates of removals in the Labrador subsistence fisheries (net fisheries) in 2011 have increased 21 % by number and 27 % by weight over the previous six-year mean.

Labrador (SFAs 1-2 and 14B)

- Abundance levels of large and small salmon in Labrador, on average, are below levels achieved prior to the moratorium (Figs. 4 and 5).
- In 2012, numbers of small salmon were similar to (English River) or below (Sand Hill River and Southwest Brook) the six-year mean, whereas large salmon were above (Sand Hill River) or similar to the previous six-year mean (English River and Southwest Brook).
- Smolt production at Sand Hill River in 2012 was the highest recorded value (82,537).
- The low level of large salmon spawners in Labrador remains a concern.

Newfoundland (SFAs 3-14A)

- The 2012 salmon returns resulted, in part, from egg depositions in 2007 that were the lowest observed since the moratorium.
- Returns of small and large salmon in 2012 varied greatly among the various geographical areas. Compared to the previous five-year mean (2007-11), small salmon returns increased on six rivers and decreased on five whereas, large salmon returns increased on eight and decreased on three. One river was assessed using total returns (small and large combined) and returns in 2012 were less than the 2007-11 mean. The index of abundance of small salmon was below the previous five-year mean, whereas the large salmon index was similar to the previous five-year mean.
- Conservation egg requirements were achieved on five of 12 assessed rivers. Four of the seven rivers that did not achieve conservation are in SFAs 9, 11 and 13. The remaining three have historically undergone enhancement activities (i.e., Exploits, Terra Nova and Rocky).
- Compared to the previous five-year mean (2007-11), marine survival increased on one of the five monitored rivers. The overall index of marine survival for 2012 was below the previous five-year mean. The direction of change for smolt production was positive or unchanged for four of the five monitored rivers. Smolt production has declined on Rocky River for the past two years and 2012 was the lowest recorded value (previous record low was in 2003).

BACKGROUND

Recreational Fisheries

The recreational salmon fishery is managed according to a River Classification System which is used to develop retention levels based on the health of individual salmon stocks, without jeopardising conservation goals. A new Integrated Atlantic Salmon Fisheries Management Plan was introduced for Newfoundland and Labrador in 2012.

In 2012, the recreational salmon fishery for all Labrador rivers opened 15 June and closed 15 September. Retention of large salmon has not been permitted since 2011. In SFA 1 and some SFA 2 scheduled rivers, anglers could retain four small salmon for the season; other scheduled salmon rivers in SFA 2 and all SFA 14B had a two fish retention (Class III). The lower retention limit in these rivers was implemented as a precautionary measure to address increased fishing pressure expected due to the construction of the Trans-Labrador Highway (TLH). 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 License Stub Return data for SFA 14B.

The 2012 recreational salmon fishery for all insular Newfoundland rivers opened on 1 June and closed on 7 September. A fall catch-and-release angling fishery occurred on Class1 rivers from 8 September to 7 October. Retention of large salmon has not been permitted since the early 1980s.

The 2011 angling catch statistics from License Stub Returns are preliminary and 2012 data are not yet available. Recreational catch for the Newfoundland and Labrador Region from 1994 to 2011 is presented in Fig. 2. Retained and released catches have been trending upwards since 2007. Estimates of retained and total catch (retained + released) for 2011 are above their previous five-year mean by 17 % and 12 % respectively. It should be noted that in 2012, 14% of the potential number of recreational fishing days available in insular Newfoundland were closed for environmental reasons (i.e., low water levels and/or high water temperatures).

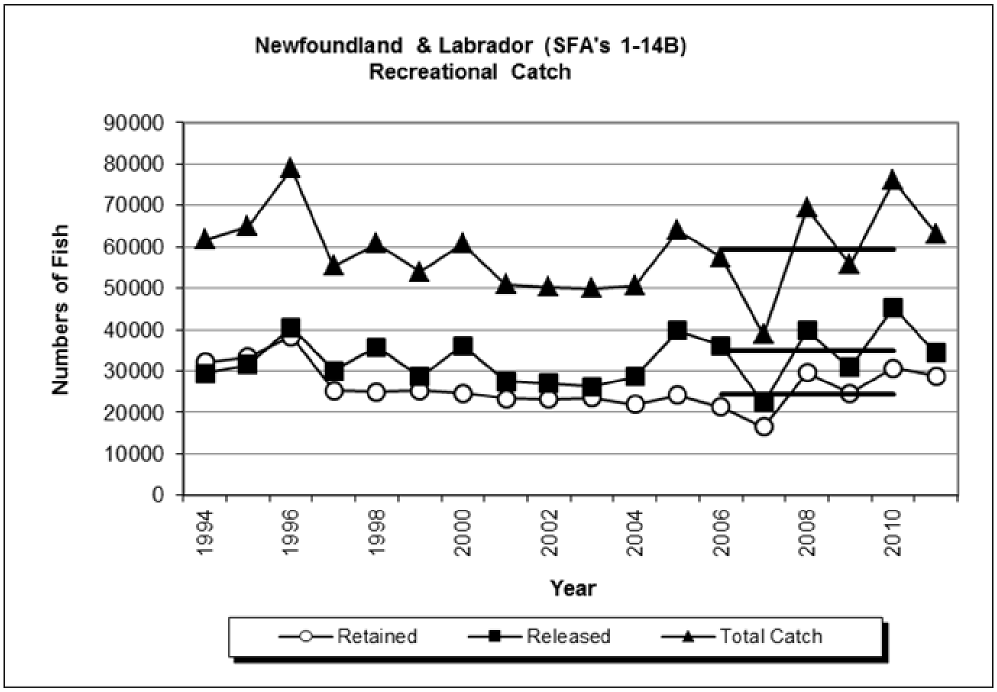

Figure 2. Angled catch of Atlantic Salmon for the Newfoundland and Labrador Region (1994-2011). Horizontal solid line represents the mean for the previous five years (2006-10).

Aboriginal/Subsistence Fisheries

There has been no commercial salmon fishing in insular Newfoundland (SFA 3-14A) since 1992, the Straits area of Labrador (SFA 14B) since 1997, and the rest of Labrador (SFAs 1-2) since 1998.

Aboriginal food, social and ceremonial (FSC) fisheries for Atlantic Salmon, Arctic Charr and Brook Trout occur in Labrador under communal licenses. Labrador also has a Resident Subsistence Fishery for trout and charr with a permitted retention of salmon by-catch (three salmon since 2011). In insular Newfoundland, Miawpukek First Nations hold a FSC communal salmon fishing license but have chosen not to harvest salmon under this license since 1997 due to conservation concerns.

Labrador FSC/subsistence fisheries harvested approximately 41 t (15,585 salmon) in 2011, the highest in the time series (Fig. 3, Appendix 1). Large salmon represented 44 % (18 t) of the catch by weight and 29 % (4,448) by number. Landings for 2012 are currently unavailable.

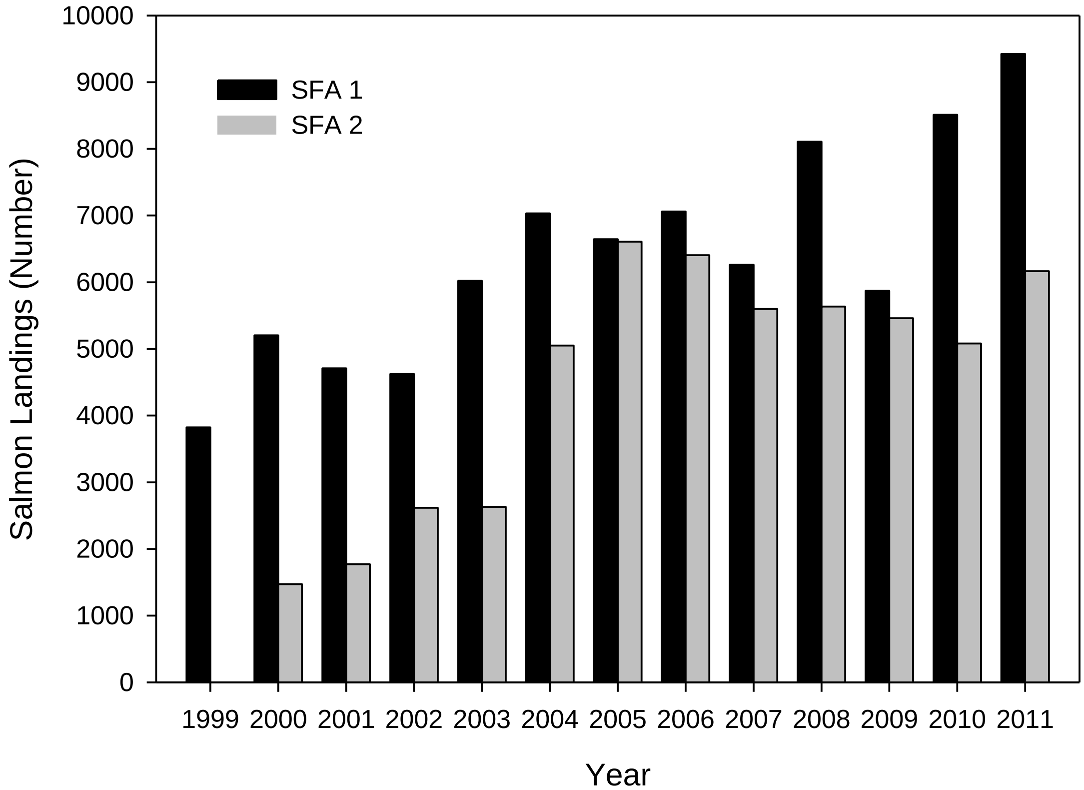

Figure 3. Landings (number of fish) reported in the Atlantic Salmon food fisheries in Labrador for SFAs 1 and 2 (1999-2011).

ASSESSMENT

Resource Status–Adult Salmon

Labrador (SFAs 1, 2, and 14B)

Stock abundance trends can be tracked by examining trends of individual stocks, or in a collective manner where information from fisheries and assessed rivers is combined to derive indices of abundance. The pre-fishery abundance (recruits - abundance of salmon on the high seas prior to their homeward migration) as determined by the International Council for the Exploration of the Sea (ICES) are presented for small (Fig. 4) and large (Fig. 5) salmon in Labrador.

Despite improvements in small and large salmon returns to some rivers in recent years, overall abundances in 2012 were below the previous six-year means (Fig. 4 and 5). The abundance of large salmon recruits remain relatively low compared with pre-moratorium levels, where adjustments to correct for marine exploitation have been made (Fig. 5). The number of large salmon spawners has remained relatively constant throughout the time series (1960-2012) (Fig. 5).

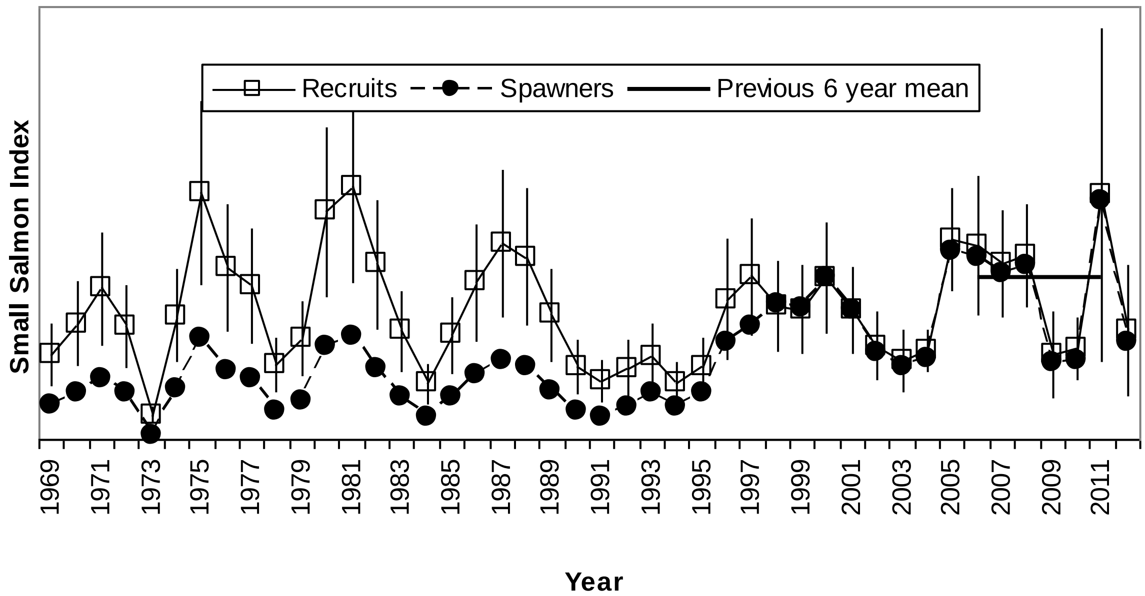

Figure 4. Trends in abundance of small Atlantic Salmon in Labrador, 1969 to 2012. Recruits are river returns that have been corrected to account for marine exploitation. Vertical lines represent the 95th confidence intervals. Horizontal solid line represents the mean for the previous six years (2006-11).

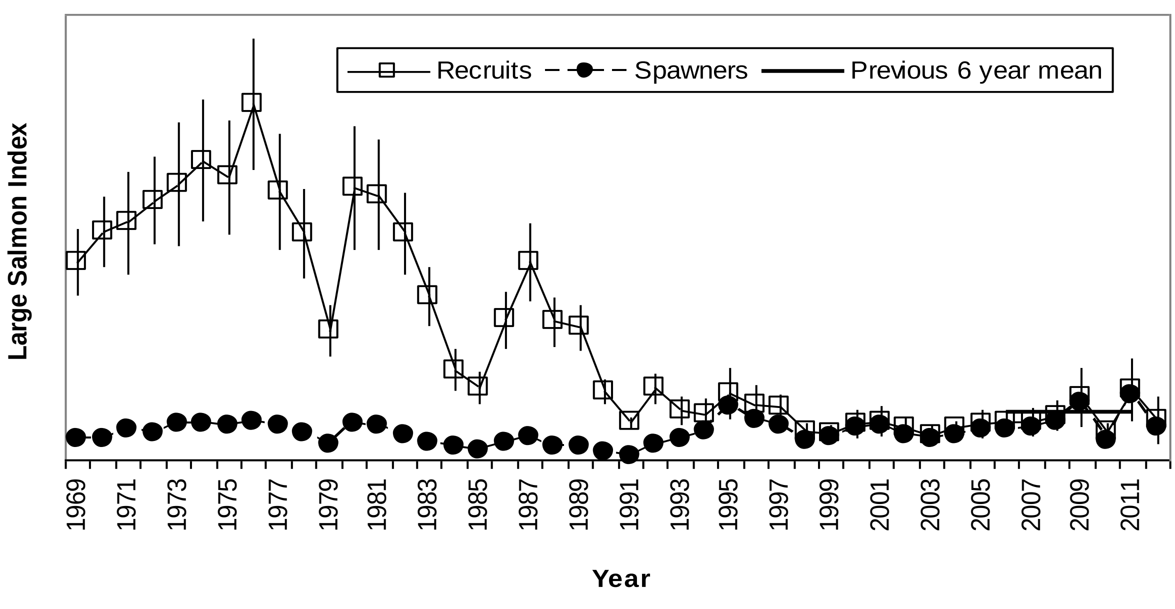

Figure 5. Trends in abundance of large Atlantic Salmon in Labrador, 1969 to 2012. Recruits are river returns that have been corrected to account for marine exploitation. Vertical lines represent the 95th confidence intervals. Horizontal solid line represents the mean for the previous six years (2006-11).

Northern Labrador and Lake Melville (SFA 1)

There are nine scheduled salmon rivers in SFA 1. One river was assessed in 2012: English River near Postville.

Total returns were very similar to the previous six-year mean (Appendix 2).

English River achieved 129 % of its conservation egg requirement which is similar to the previous six-year mean. English River has achieved conservation in six out of the last seven years (Appendix 2).

Southern Labrador (SFA 2)

There are 16 scheduled salmon rivers in SFA 2. Two rivers were assessed in 2012: Sand Hill River and Southwest Brook (tributary of Paradise River).

There was a decrease in returns of small salmon on Sand Hill River and Southwest Brook compared to the previous six-year mean (Appendix 2). However, no change was observed for large salmon on Southwest Brook. Large salmon returns increased compared to the previous six-year mean at Sand Hill River.

The percent conservation egg requirement achieved at Sand Hill River (96 %) and Southwest Brook (75 %) declined compared to the previous six-year mean. Sand Hill River and Southwest River have achieved conservation in three and four years, respectively, of the previous seven years (Appendix 2).

Labrador Straits (SFA 14B)

There are three scheduled salmon rivers in SFA 14B. No rivers were assessed in 2012.

Newfoundland (SFAs 3-14A)

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 (Dempson et al. 2004). In the latter case, the variability inherent in each individual river is accounted for in the modelling process.

Overall abundance of small salmon returns to Newfoundland continues to fluctuate and has generally remained lower than pre-moratorium levels (1984-91), where adjustments to correct for marine exploitation have been made (Fig. 6). 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. Since the peak in 2010, abundance of small salmon has declined and 2012 was below the previous five-year mean (2007-11) (Fig. 6). The 2012 return year of small salmon was in part derived from the egg deposition of 2007, which was the lowest of the moratorium time series, and lower marine survival of 2011 smolts.

The overall trend of large salmon returns to Newfoundland is similar to that of small salmon (Fig. 7). 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 until 1998 and declined again until 2003. Since then, returns of large salmon have fluctuated more widely. Large salmon abundance in 2012 was similar to the previous five-year mean (Fig. 7).

While the overall spawning escapements have increased relative to the pre-moratorium period, total stock size is often still lower than levels recorded prior to the closure of the Newfoundland commercial salmon fishery when adjusted for marine exploitation.

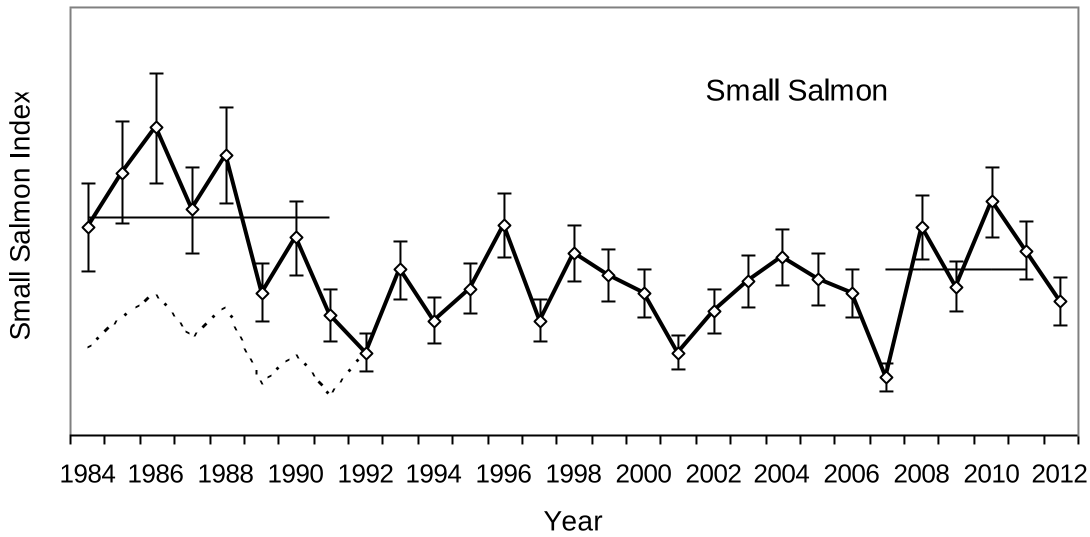

Figure 6. Trends in abundance of small Atlantic Salmon in Newfoundland, 1984-2012. Returns from 1984 to 1991 have been corrected to account for marine exploitation. Horizontal lines illustrate the mean abundance index for the periods 1984-91 and 2007-11. Vertical lines represent ± 1 standard error. The fine dashed line represents returns unadjusted for exploitation for the period 1984-91.

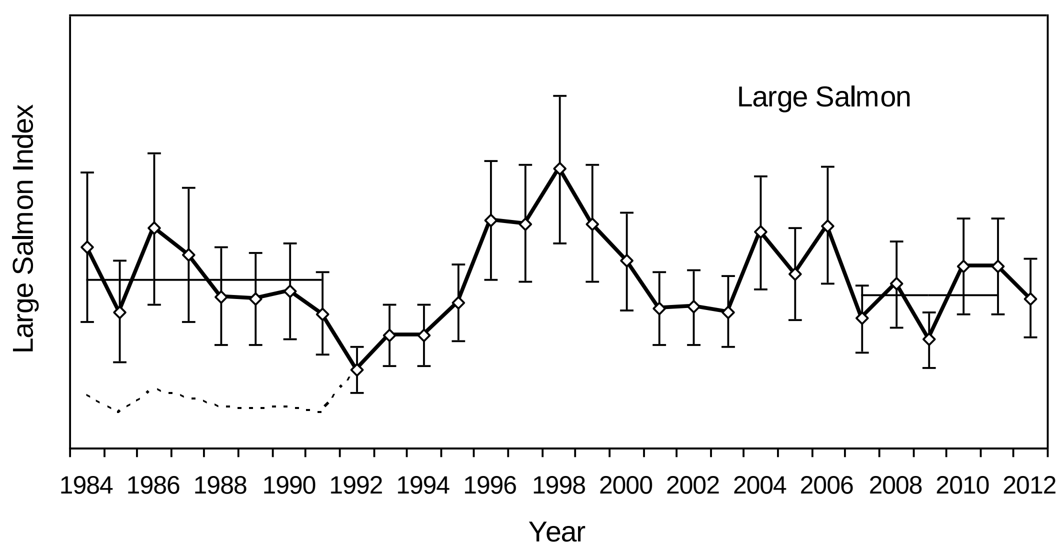

Figure 7. Trends in abundance of large Atlantic Salmon in Newfoundland, 1984-2012. Returns from 1984 to 1991 have been corrected to account for marine exploitation. Horizontal lines illustrate the mean abundance index for the periods 1984-91 and 2007-11. Vertical lines represent ± 1 standard error. The fine dashed line represents returns unadjusted for exploitation for the period 1984–91.

Northeast and Eastern Newfoundland (SFAs 3-8)

There are 60 scheduled salmon rivers in SFAs 3-8. Five rivers were assessed in 2012: Exploits River, Campbellton River, and Gander River in SFA 4, and Middle Brook and Terra Nova River 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. The seventeen-year time series of data (1995-2011) at Northwest Brook, Port Blandford was terminated.

Total returns of both small and large salmon in 2012 were greater than the previous five-year mean (2007-11) on all monitored rivers except the Exploits River (Appendix 2).

In 2012, conservation egg requirements were achieved at Gander River (128 %), Campbellton River (394 %) and Middle Brook (299 %) (Appendix 2). Total returns of small salmon to Middle Brook were the highest recorded. Gander River has achieved conservation in five of the previous six years. Campbellton River and Middle Brook have exceeded conservation in each year of the moratorium period. In 2012, conservation was not achieved on Exploits River (49 %) and Terra Nova River (56 %). It should be noted that large areas of rearing habitat were made accessible in the upper areas of Exploits River (above Red Indian, 1989) and Terra Nova River (above Mollyguajeck Falls, 1985) and these rivers have yet to achieve conservation. Compared to the previous five-year mean (2007-11), Gander River, Middle Brook and Terra Nova River had higher conservation egg requirements in 2012, Campbellton River remained the same, and Exploits River was lower (Appendix 2).

South Newfoundland (SFAs 9-11)

There are 48 scheduled salmon rivers in SFAs 9-11. Four rivers were assessed in 2012: Northeast Brook (Trepassey) and Rocky River in SFA 9, Conne River and Little River in SFA 11. Spawning escapements are evaluated using fish counting facilities while mark-recapture methods are used to estimate smolt production at Conne River.

Total returns of small salmon in 2012 were 30 to 62 % below the previous five-year mean (2007-11) on three of the four assessed rivers (Appendix 2). In contrast, total returns of small salmon at Conne River were 8 % greater than the 2007-11 mean. However, the Conne River salmon population still remains well below returns observed in the 1980s and 1990s and has experienced a 74 % decline rate from 1986 to 2012. Returns of small salmon to Northeast Brook (Trepassey) in 2012 were the lowest recorded (1984-2012). Over all years (1984-2012) small salmon returns to this river have declined by 50 %. At Little River, returns were the second lowest since 1992.

Returns of large salmon declined at Rocky River and Conne River relative to the previous five-year means, while returns to Little River and Northeast Brook (Trepassey) were similar (Appendix 2). Returns of large salmon to Conne River and Northeast Brook (Trepassey) have declined by 78 % and over 90 %, respectively throughout their time series.

In 2012, conservation egg requirements were not achieved at any of the assessed rivers on the south coast: Northeast Brook 55 %, Rocky River 46 %; Conne River 79 % and Little River 30 % (Appendix 2). Little River and Conne River have only achieved conservation in one of the previous six years. 2012 was the first year in its time series that Northeast Brook did not achieve conservation. Rocky River was made accessible to anadromous salmon following the construction of a fishway at the river mouth. Extensive enhancement activities occurred from 1984-96. This river has yet to achieve conservation.

Environmental conditions in 2012, specifically low water levels, may have contributed to lower returns of salmon in some of these rivers by delaying or preventing salmon from entering.

However, anomalously low spawning escapements in 2007 coupled with below average smolt survival in 2011 may have also impacted returns of adult salmon in 2012.

Rivers along the south coast, including those in SFA 12, were recently designated as ‘threatened’ by COSEWIC (South Newfoundland DU4, COSEWIC 2010). A recovery potential analysis (DFO 2012) concluded that there is a 50 % chance that salmon populations on the south coast will continue to decline under current marine and angling mortality rates. A composite index of abundance based on returns at four fish counting facilities over the past fifteen-years (1998-2012) indicates that, of the rivers presently monitored, small and large salmon returns have declined by 41 % and 90 %, respectively. Clearly, south coast monitored rivers continue to do poorly.

Southwest Newfoundland (SFAs 12-13)

There are 10 scheduled salmon rivers in SFA 12. No rivers were assessed in 2012.

There are 18 scheduled salmon rivers in SFA 13. One river was assessed in 2012: Harry’s River. Atlantic Salmon were monitored on Harry’s River at a location approximately 3 km upstream from the river mouth using a DIDSON sonar system. Total returns of salmon in 2012 was 30 % less than the previous five-year mean (2007-11) and the lowest recorded since 2007. The conservation egg requirement for Harry’s River was calculated based on the proportion of large salmon from a five-year mean (2006-2010). Harry’s River achieved 64 % of its conservation egg requirement in 2012 and has achieved conservation in three of the previous six years.

Northwest Newfoundland (SFA 14A)

There are 22 scheduled salmon rivers in SFA 14A. Two rivers were assessed in 2012: Torrent River and Western Arm Brook. Returns of small salmon in 2012 were greater than the previous five-year mean (2007-11) at Torrent River and less than the 2007-11 mean at Western Arm Brook (Appendix 2). Whereas, large salmon returns in 2011 were greater than the previous five-year mean (2007-11) at Western Arm Brook and less than the 2007-11 mean at Torrent River.

Conservation egg requirements were achieved at Torrent River (670 %) and Western Arm Brook (405 %), however these values are less than the previous five-year mean (Appendix 2). Torrent River and Western Arm Brook have achieved conservation since 1984 and 1992, respectively.

Smolt Production and Marine Survival

Information on both smolt and adult salmon counts are routinely monitored at five rivers: Campbellton River (SFA 4); Northeast Brook (Trepassey) (SFA 9); Rocky River (SFA 9); Conne River (SFA 11); and Western Arm Brook (SFA 14A). When water levels allow, a smolt count is also conducted at a sixth site, Sand Hill River, Labrador (SFA 2). 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.

Smolt production

Smolt production in 2012 was less than the previous five-year mean (2007-11) at three of the five assessed rivers (Fig. 8). Decreases ranged from 15 % at Conne River to 59 % at Rocky River. The smolt count at Rocky River in 2012 was the lowest recorded since 2003. Number of smolts at Conne and Rocky rivers may be biased low owing to the late start of smolt monitoring. Smolts at Western Arm Brook in 2012 were 26 % less than the 2007-11 mean. Northeast Brook (Trepassey) and Campbellton River experienced a greater number of smolts in 2012 relative to the 2007-11 mean. The smolt count at Sand Hill River in 2012 was a complete count of more than 80,000 smolts at the fence (i.e. no estimation required) and the highest recorded.

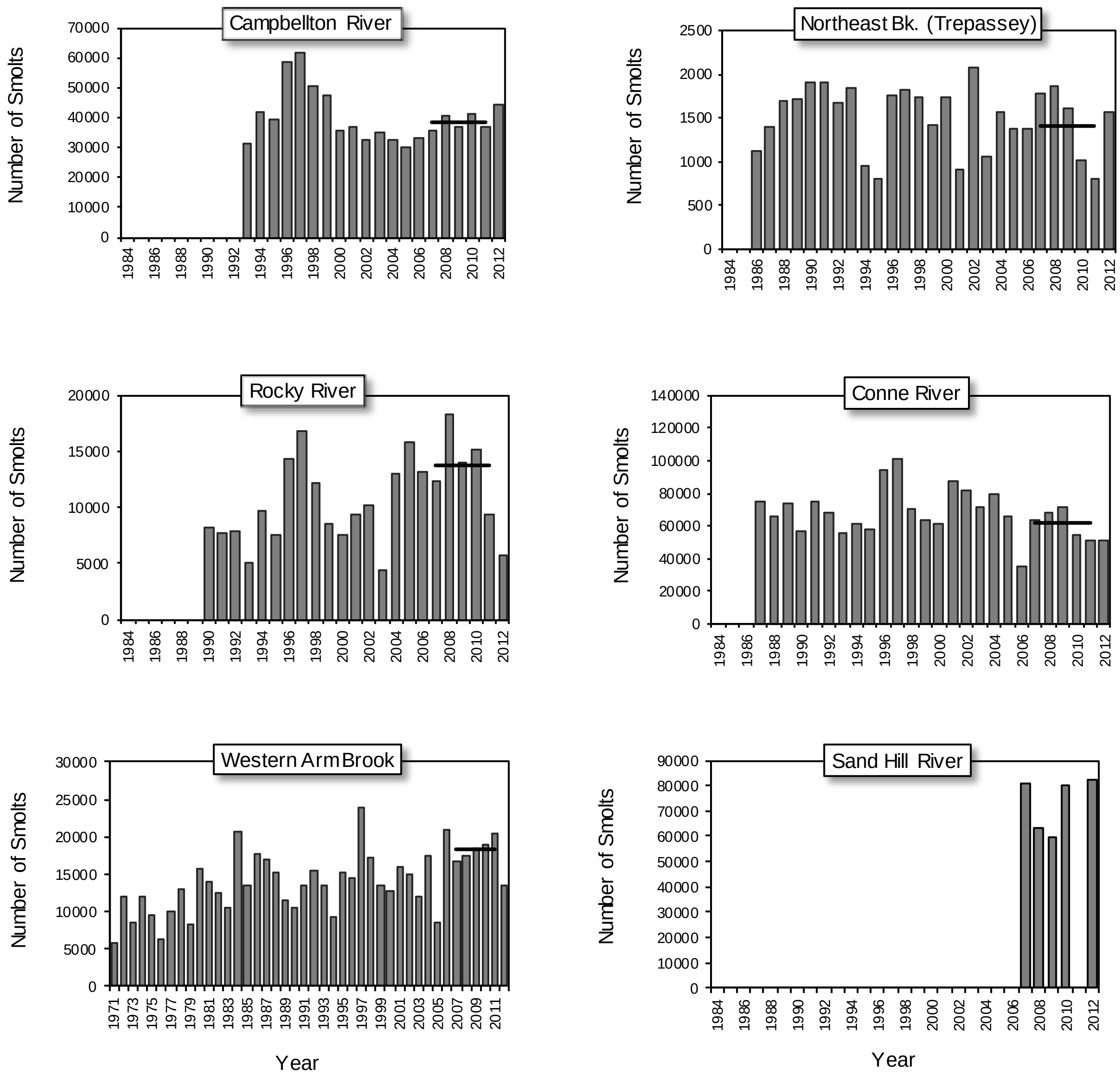

Figure 8. Trends in smolt production at various Newfoundland and Labrador Atlantic Salmon rivers. Horizontal solid line illustrates the mean for the previous five years (2007-11).

Marine survival

Marine survival of smolts from 2011 to adult small salmon returns in 2012 was less than the previous five-year mean (2007-11) at Northeast Brook (Trepassey) and Western Arm Brook, similar to the 2007-11 mean at Campbellton River and Rocky River, and greater than the 2007-11 mean on Conne River (Fig. 9). Consistent with previous years, higher rates of marine survival were observed at northern insular Newfoundland locations (Western Arm Brook and Campbellton River) compared with southern populations (Fig. 9).

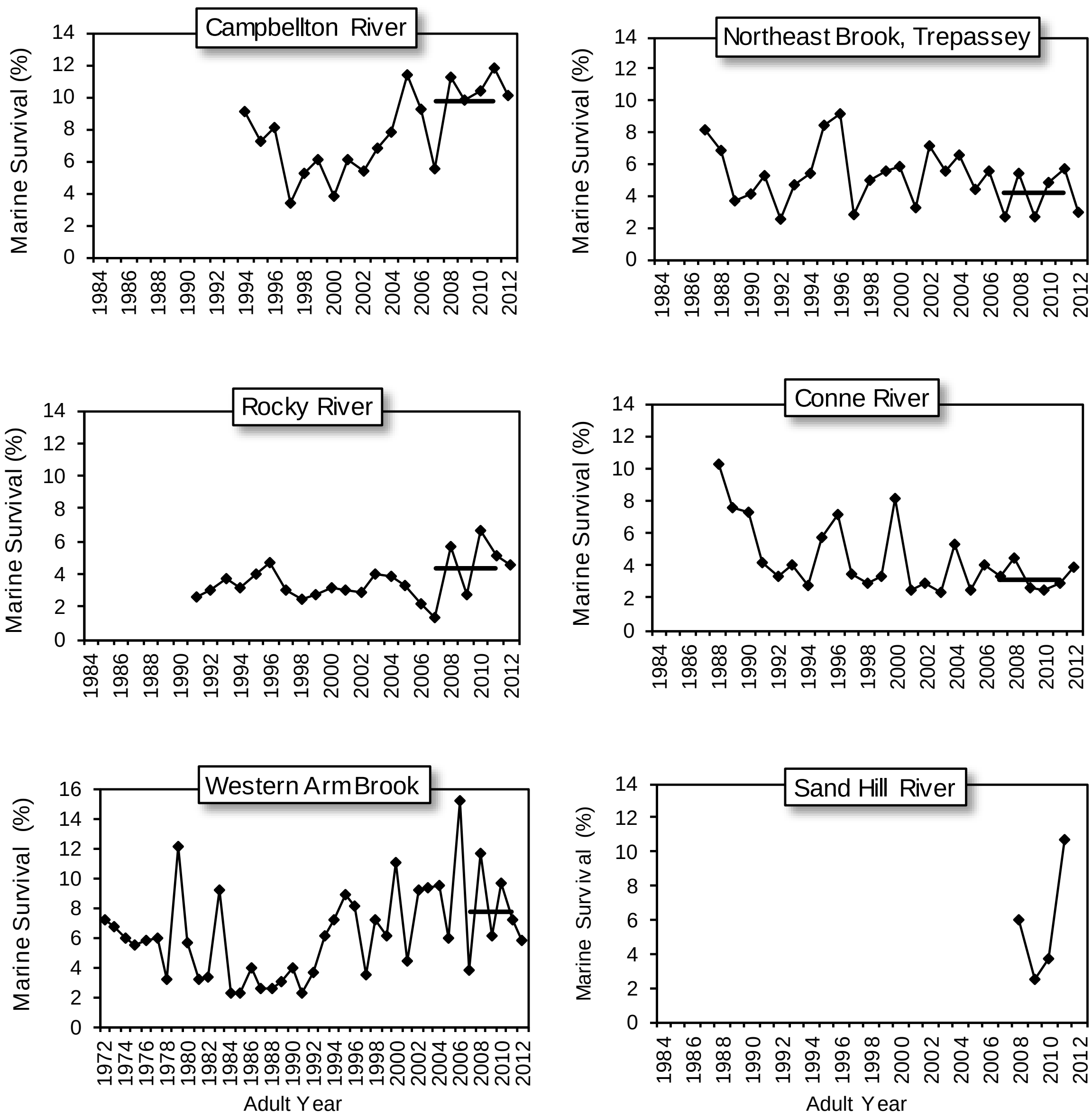

Figure 9. Marine survival rates of smolts to adult small salmon returns at various Newfoundland and Labrador rivers. Survival rates have not been adjusted for marine exploitation during the commercial salmon fishery (prior to 1992) or for Labrador Aboriginal fisheries. Thus, values represent survival of salmon back to the river. Horizontal solid line illustrates the mean for the previous five years (2007-11).

Marine survival of smolts to adult small salmon was also examined in a collective manner using data from the five assessed rivers in Newfoundland to derive a composite index. The standardized mean survival of smolts in 2011 to adult small salmon returns in 2012 was 5.0 % and slightly below the previous five-year mean (Fig. 10).

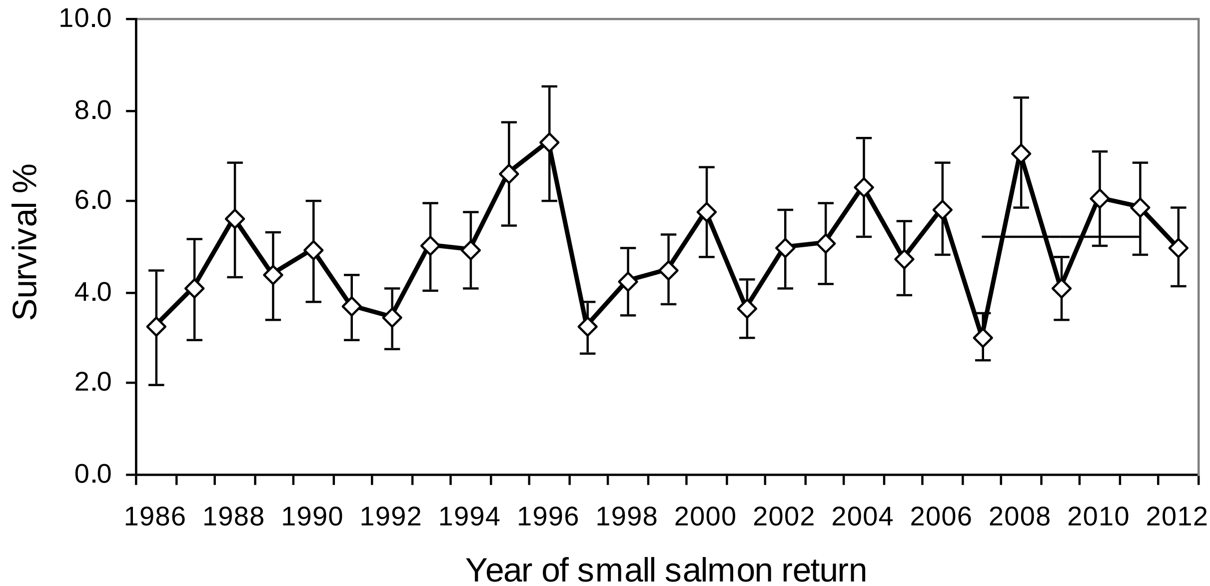

Figure 10. Standardized mean survival of smolts to adult small salmon derived from a general linear model analysis of monitored Newfoundland rivers. Year represents the year of adult small salmon return. Vertical lines represent one standard error about the mean. Horizontal solid line illustrates the mean for the previous five years (2007-11).

Sources of Uncertainty

No information is available on 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.

As the 2012 data are derived from the previous five-year mean of recreational data and preliminary Aboriginal/subsistence harvest data, there is uncertainty with respect to the estimates of these fisheries for the current year.

Returns of small salmon include a portion of repeat spawners. Therefore, marine survival of smolts to adult small salmon returns may overestimate marine survival of maiden one-sea-winter salmon.

Returns to Gander River have been estimated using counts from an upstream tributary, Salmon Brook, since 2000. There is a high amount of uncertainty around these estimates.

Returns to Harry’s River in 2012 were derived from data using a DIDSON sonar. The conservation egg requirement for Harry’s River was calculated based on the proportion of large salmon from a five-year mean (2006-10).

There are inherent uncertainties in the methods used to derive estimates of Labrador salmon abundance over the time series presented.

Historical or estimated biological characteristic data (e.g. fecundity, sex ratio, female size) are generally used in the assessment process. Given that these values will vary annually, there is uncertainty in the conservation egg requirement values reported where data are limited or not up to date.

CONCLUSIONS AND ADVICE

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

There are three areas of concern for salmon populations in the NL region: a) Labrador populations in the long term; b) South coast SFAs 9-12, especially Conne River. COSEWIC designated South Newfoundland (SFAs 9-12) salmon populations as threatened in November 2010; and c) Bay St. George (with the exception of Harry's River) based on historical data.

There is particular concern with respect to the declining trend in salmon returns at Conne River with the overall cumulative decline since the mid-1980s of over 70 %. Conne River continues to remain at or below pre-moratorium levels compared to other rivers in the region, many of which have improved in recent years with some setting record high levels of returns. Accordingly, the continued low marine survival at Conne River is particularly concerning.

Concern was expressed in 2008 for Middle Barachois Brook (Bay St. George), which only achieved 28 % of its conservation egg requirement. Further assessment of the status of Atlantic Salmon in Middle Barachois Brook is required.

In Bay St. George there has been noted concern for more than two decades regarding the large salmon components, some of which are two-sea-winter salmon. Poaching in some Bay St. George rivers is also believed to be a long-standing problem hampering salmon recovery. The increased management efforts with respect to conservation/stock recovery strategies (Stewardship Programs), associated monitoring plans, and enforcement have had some success on Bay St. George Rivers. DFO should continue to support the stewardship initiatives and implement management options that will maximize spawning populations.

Management Advice

There should be no increase in harvest/allocations on Newfoundland and Labrador salmon stocks in 2013, except for areas which have in-season special management plans and where conservation requirement limits are being exceeded.

There should be no human induced mortality on stocks that are below 100 % of conservation.

Enhanced efforts should be made to improve the number of spawners in South Newfoundland (DU 4) populations and to understand the reasons for the decline observed in abundance over the last three generations.

Continued and enhanced efforts should be made for improving 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 areas in Newfoundland and Labrador. Accordingly, it is recommended that salmon abundance monitoring be expanded to determine if other south coast rivers are under producing with respect to adult salmon abundance.

Additional research projects and stakeholder engagement are required to better understand interactions impacting marine survival of salmon populations in DU 4 (south coast), especially Conne River (SFA 11). Monitoring salmon populations in Fortune Bay is also recommended as this is an area of increased aquaculture production.

Research is required on the Labrador large salmon populations (SFAs 1, 2 and 14B) to determine if the assessed rivers are representative of other populations, in particular, rivers in the harvested areas of Lake Melville and the Straits Area. These populations are known to have different biological characteristics.

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

A research program should be developed to document the level of aquaculture escapees on south coast Newfoundland rivers with particular reference to interactions with wild salmon populations in SFA 11.

OTHER CONSIDERATIONS

Environmental Conditions

Freshwater Environment

In past years, freshwater environmental conditions were inferred by examining the frequency and extent that scheduled salmon rivers were closed for environmental reasons, specifically, low water levels and warm water temperatures (Dempson et al. 2001). During the 2012 angling season 110 out of 158 (70 %) scheduled rivers in insular Newfoundland were closed, the highest number since 2004 when 112 rivers were closed. Closures affected the entire island except SFA 12 on the south coast. The duration of river closures, however, was higher for SFAs 4 to 7 where 20 to 31 % of potential angling days were impacted. Overall, 14 % of all potential fishing days for all scheduled rivers in insular Newfoundland were affected by environmental closures (Fig. 11). Closures impact the angling catch and effort for a given year thus making year to year comparison of estimates of abundance based on angling catch challenging to interpret. This was the 9th highest closure rate over the 38 years for which information has been compiled but is considerably lower than in 1975, 1979, 1987 and 2004 when 20-37 % of angling days were closed (Fig. 11).

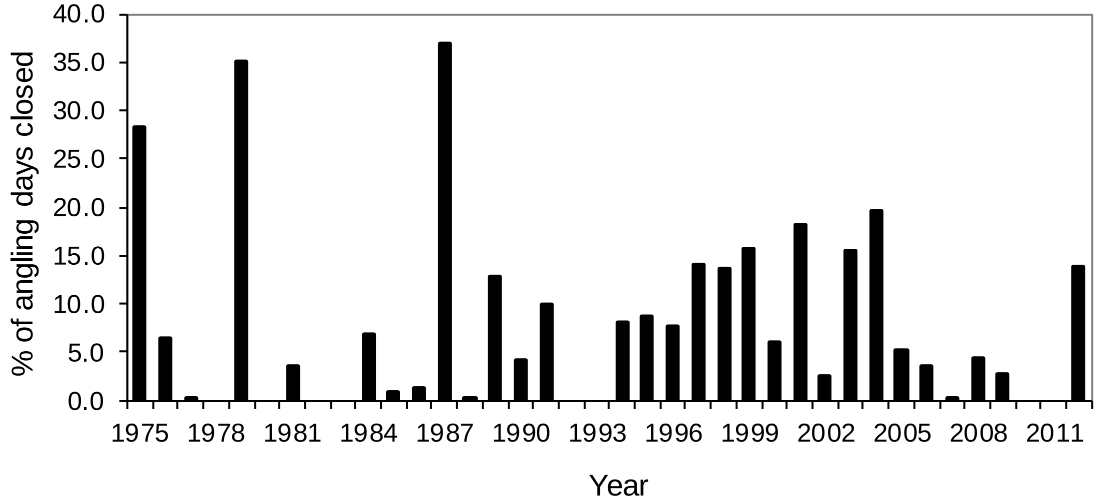

Figure 11. Percentage of potential angling days in insular Newfoundland that were closed for environmental reasons, 1975–2012.

SOURCES OF INFORMATION

This Science Advisory Report is from the November 19-21, 2012 Update on the Status of Atlantic Salmon in Newfoundland & Labrador. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

Bourgeois, C.E., Dempson, J.B., Reddin, D.G., Veinott, G.I., Robertson, M.J., Poole, R. and Cochrane, N.M. 2011. Status of Atlantic Salmon (*Salmo salar*) stocks of the Newfoundland and Labrador Region (SFAs 1-14A), 2010. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/117. 58 p.

COSEWIC. 2010. COSEWIC assessment and status report on the Atlantic Salmon *Salmo salar* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 136 p.

Dempson, J.B., O'Connell, M.F., and Cochrane, N. 2001. Potential impact of climate warming on recreational fishing opportunities for Atlantic Salmon, *Salmo salar* L., in Newfoundland, Canada. Fish. Manage. Ecol. 8: 69-82.

Dempson, J.B., O'Connell, M.F., and Schwarz, C.J. 2004. Spatial and temporal trends in abundance of Atlantic Salmon, *Salmo salar*, in Newfoundland with emphasis on impacts of the 1992 closure of the commercial fishery. Fish. Manage. Ecol. 11: 387-402.

DFO. 2012. Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (*Salmo salar*) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/007. 43 p.

DFO. 2009. The Wild Atlantic Salmon Conservation Policy, Fisheries and Oceans Canada, Fisheries Management Policies.

DFO. 2007. 2007-2011 Atlantic Salmon integrated management plan Newfoundland and Labrador. Fisheries Management Branch, Newfoundland Region. St. John's, NL.

NASCO. 2009 NASCO Guidelines for the Management of Salmon Fisheries. NASCO. Edinburgh, Scotland, UK, NASCO Council Document CNL (09) 43. 12 p.

O'Connell, M.F., and J Dempson, B. 1995. Target spawning requirements for Atlantic Salmon, *Salmo salar* L., in Newfoundland rivers. Fish. Manage. Ecol. 2: 161-170.

Reddin, D.G., Dempson, J.B., and Amiro, P.G. 2006. Conservation requirements for Atlantic Salmon (*Salmo salar* L.) in Labrador rivers. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/071. 29 pp.

Reddin, D.G. 2010. Atlantic Salmon return and spawner estimates for Labrador. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/045. iv + 19 p.

APPENDIX 1: SUBSISTENCE ATLANTIC SALMON FISHERIES LANDINGS IN LABRADOR AS OF NOVEMBER 2012

SFA 1

	Small salmon		Large salmon		Total	
Year	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)
1999	2739	5580	1084	4220	3824	9800
2000	4111	8111	1092	4365	5203	12474
2001	3394	6995	1299	5121	4708	12117
2002	3609	7386	1015	4441	4624	11827
2003	4382	9094	1639	7026	6021	16120
2004	4822	10038	2210	8656	7032	18694
2005	4958	10116	1687	6930	6644	17046
2006	5422	11189	1639	6330	7061	17519
2007	4700	8306	1560	5314	6261	13619
2008	5154	10342	2955	13627	8109	23968
2009	3964	8173	1907	8232	5871	16405
2010	5904	12630	2606	11004	8510	23634
2011	6477	13844	2947	12816	9420	26660

SFA 2

	Small salmon		Large salmon		Total	
Year	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)
1999	-	-	-	-	-	-
2000	1212	2242	260	897	1472	3139
2001	1396	2793	374	1378	1770	4172
2002	2197	4196	422	1549	2619	5745
2003	2095	4102	536	1885	2632	5987
2004	3480	7166	1450	5480	5050	12852
2005	5479	10922	1130	3946	6609	14868
2006	4955	10008	1451	5193	6406	15201
2007	4507	8764	1092	4073	5599	12837
2008	4680	9044	954	3349	5634	12393
2009	4024	7956	1437	5449	5461	13405
2010	3963	7893	1119	4066	5081	11959
2011	4665	9285	1501	5409	6165	14694

APPENDIX 2: SUMMARY OF ATLANTIC SALMON STOCK STATUS IN NEWFOUNDLAND AND LABRADOR, 2012.

Region			Total Returns				Conservation Egg Requirement Achieved (%)			Status in 2012		
			2012		2006-2011 mean					Smolts Relative to:	Marine Survival Relative to:	Conservation Achieved Relative to:
River	SFA	Method	Small	Large	Small	Large	2012	2006-2011 mean	2006-2012	2006-2011 mean	2006-2011 mean	2006-2011 mean
LABRADOR												
English River	1	Fe	**423**	**82**	403	75	**129**	120	6 of 7 yrs			⇔
Sand Hill River	2	Fe	**3527**	**734**	4238	678	**96**	108	3 of 7 yrs	⇧		↓
Southwest Bk. (Paradise River)	2	Fe	**211**	**29**	291	28	**75**	96	4 of 7 yrs			↓

Region			Total Returns				Conservation Egg Requirement Achieved (%)			Status in 2012		
			2012		2007-2011 mean					Smolts Relative to:	Marine Survival Relative to:	Conservation Achieved Relative to:
River	SFA	Method	Small	Large	Small	Large	2012	2007-2011 mean	2007-2012	2007-2011 mean	2007-2011 mean	2007-2011 mean
INSULAR NEWFOUNDLAND												
Northeast Coast (SFA's 3-8)												
Exploits River	4	Fw	**25349**	**5578**	31953	5778	**49**	63	0 of 6 yrs			↓
Campbellton River	4	Fe	**3755**	**548**	3691	486	**394**	364	6 of 6 yrs	⇧	⇔	⇔
Gander River [1]	4	EFw	**22652**	**1698**	20409	1407	**128**	111	5 of 6 yrs			⇧
Middle Brook	5	Fw	**2828**	**173**	2137	135	**299**	215	6 of 6 yrs			⇧
Terra Nova River	5	Fw	**3746**	**452**	3346	373	**64**	56	0 of 6 yrs			⇧
South Coast (SFA's 9-11)												
Northeast Brook (Trepassey)	9	Fe	**24**	**0**	64	3	**55**	148	5 of 6 yrs	⇔	↓	↓
Rocky River	9	Fe	**430**	**30**	616	39	**46**	66	0 of 6 yrs	↓	⇔	↓
Little River	11	Fe	**65**	**4**	139	4	**30**	61	1 of 6 yrs			↓
Conne River	11	Fe	**1965**	**71**	1826	85	**79**	75	1 of 6 yrs	↓	⇧	⇔
Southwest Coast (SFA's 12-13)												
Harry's River [2]	13	D	**2248**		3188		**64** [3]	96	3 of 6 yrs			↓
Northwest Coast (SFA 14A)												
Torrent River	14A	Fw	**3950**	**474**	3772	1250	**670**	865	6 of 6 yrs			↓
Western Arm Bk	14A	Fe	**1173**	**93**	1382	35	**405**	484	6 of 6 yrs	↓	↓	↓

Assessment Methods:
Fe = counting fence
Fw = fishway count
EFw = estimated from tributary fishway count
D = 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 counting fence 1989-1999, and was estimated from a tributary count after
[2] Harry's River shows total returns of salmon (small + large).
[3] Based on proportion of large from 5 year average (2006-2010).

THIS REPORT IS AVAILABLE FROM THE:

Centre for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5667
St. John's NL A1C 5X1

Telephone: 709-772-8892
E-Mail: DFONLCentreforScienceAdvice@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087

Correct Citation for this Publication:

DFO. 2014. Stock assessment of Newfoundland and Labrador Atlantic Salmon – 2012. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/080.

Aussi disponible en français :

MPO. 2014. Évaluation du stock de saumon de l'Atlantique de Terre-Neuve et du Labrador – 2012. Secr. can. de consult. sci. du MPO. Avis. sci. 2012/080