UPDATE OF STOCK STATUS OF ATLANTIC SALMON (*SALMO SALAR*) IN DFO GULF REGION (NEW BRUNSWICK SALMON FISHING AREAS 15 AND 16) FOR 2014

Context

The last assessment of stock status of Atlantic salmon for Fisheries and Oceans Canada (DFO) Gulf Region was completed after the 2013 return year (DFO 2014). DFO Fisheries and Aquaculture Management (FAM) requested an update of the status of the Atlantic Salmon stocks in DFO Gulf Region for 2014. Indicators for adult and juvenile Atlantic Salmon stocks of the Restigouche River (Salmon Fishing Area 15) and the Miramichi River (SFA 16) are provided in this report. Juvenile indices for the Buctouche River (SFA 16) are also provided.

This Science Response Report results from the Science Response Process of December 11, 2014 on Indicators for Atlantic Salmon for Gulf New Brunswick rivers (SFA 15, 16). No additional publications from this process are anticipated.

Background

All rivers flowing into the southern Gulf of St. Lawrence are included in DFO Gulf Region. Atlantic Salmon (*Salmo salar*) management areas in DFO Gulf Region are defined by four salmon fishing areas (SFA 15 to 18) encompassing portions of the three Maritime provinces (New Brunswick, Nova Scotia, and Prince Edward Island).

For management purposes, Atlantic Salmon are categorized as small salmon (grilse; fish with a fork length less than 63 cm) and large salmon (fish with a fork length equal to or greater than 63 cm).

Analysis and Response

Abundance indices of adult salmon

Information on adult salmon abundance is provided for the Restigouche River of SFA 15 and the Miramichi River of SFA 16.

Restigouche River (SFA 15)

Information on adult salmon abundance from the Restigouche River comes primarily from angling catches and effort as well as end of season spawner counts. The province of New Brunswick Northwest Upsalquitch protection barrier was not operated in 2014. As of the date of this review, the recreational fishery data for 2014 are incomplete; only lodge data compiled by DFO Science are available (Fig. 1). Preliminary values of catch of small salmon in 2014 are the lowest of the time series beginning in 2001 although a similarly low value as 2014 was reported in 2003. Large salmon catches in 2014 were the third lowest, and close to the low values reported in 2002 and 2006 (Fig. 1). The catches from the Crown Reserve waters of the Restigouche have historically been equivalent to 33% of lodge and lease data for large salmon and 53% of lodge and lease data for small salmon. Adjusted for the average ratio

of Crown Reserve to lodge catches, the provisional recreational fishery catches for 2014 are 1,799 large salmon and 1,614 small salmon from the Restigouche (NB) waters (excluding Matapedia River).

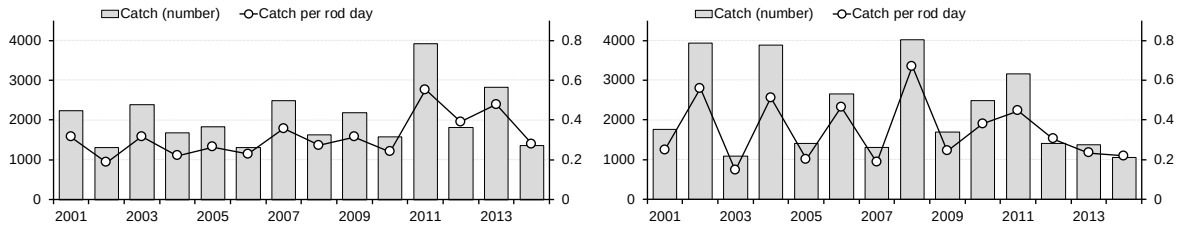

Figure 1. Reported catches and catch per rod day of large salmon (left panel) and small salmon (right panel) from lodges and leases in the Restigouche (NB) waters, 2001 to 2014. The data for 2014 are preliminary.

Based on an assumed angling exploitation rate of 40% and adding estimates of aboriginal harvests in the estuary, an approach similar to previous assessments (DFO 2014), returns to the Restigouche River (NB) in 2014 were estimated at 4,750 large salmon and 4,077 small salmon (Fig. 2), representing 83% of the conservation requirement for large salmon. Based on an angling exploitation rate of 40%, the Restigouche River (NB portion) has met or exceeded the conservation egg requirement in 6 of the last 10 years (Fig. 3).

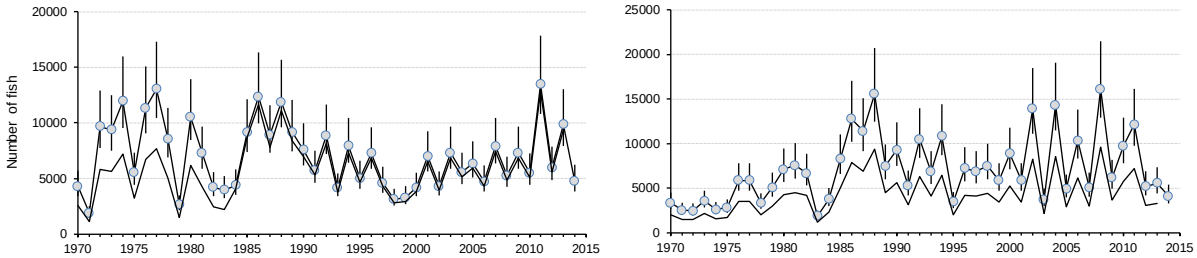

Figure 2. Returns (grey circle are for 40% catch rate and vertical error bars show range based on catch rates of 30% to 50%) and spawners (solid line for 40% catch rate assumption) based on angling catches of large salmon (left) and small salmon (right) to Restigouche River (NB portion), 1970 to 2014. The data for 2014 are preliminary.

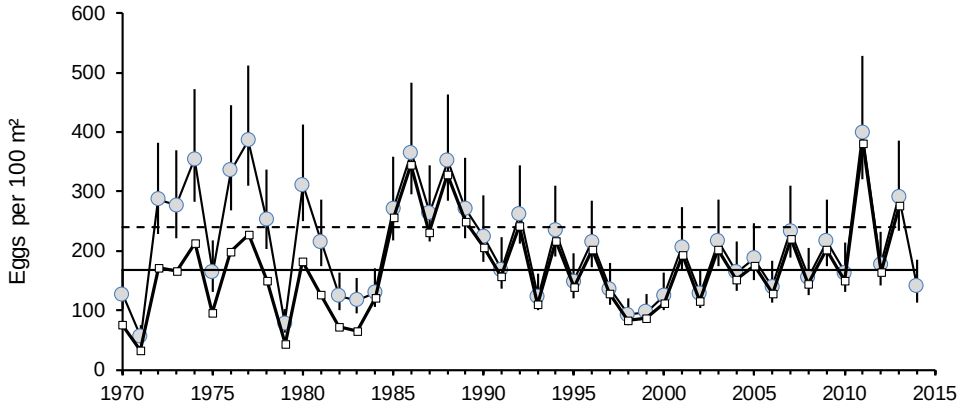

Figure 3. The potential eggs (expressed as eggs per 100 m² of wetted habitat area; total area of 21.6 million m²) by large salmon for the returns (grey circles are assumed catch rate of 40%, error bars show range for catch rates of 30% to 50%) and the spawners (white square symbols for an assumed catch rate of 40%) in the New Brunswick portion of the Restigouche River, 1970 to 2014. The solid horizontal line is the egg deposition rate of

168 eggs per 100 m² presently used to assess attainment of conservation for the Restigouche River. The dashed horizontal line is the egg deposition rate corresponding to 240 eggs per 100 m² used in other rivers of Gulf Region. The estimates for 2014 are based on preliminary data.

Assessments on the Restigouche River are also informed by spawner counts at the end of the season, after all fisheries and inriver losses. In late September 2014, end of season spawner counts were conducted in all four Restigouche (NB) tributaries (Kedgwick, Little Main Restigouche, Upsalquitch, and Patapedia) and the main stem Restigouche (Fig. 4). Counts derived from snorkelling should be considered a minimum estimate of spawners. Visibility was generally fair during 2014 surveys. Large salmon counts in 2014 were below all previous years in most areas. The large salmon spawner counts in 2014 were all below the area specific conservation requirements; 61% for the Kedgwick, 29% for the Little Main Restigouche, 63% for the Upsalquitch, 39% for the Patapedia, and 67% for the main stem Restigouche River. Small salmon counts in 2014 in all tributaries were among the lowest of the time series of observations beginning in 1999. Spawner counts from the Matapedia River are not available at this time.

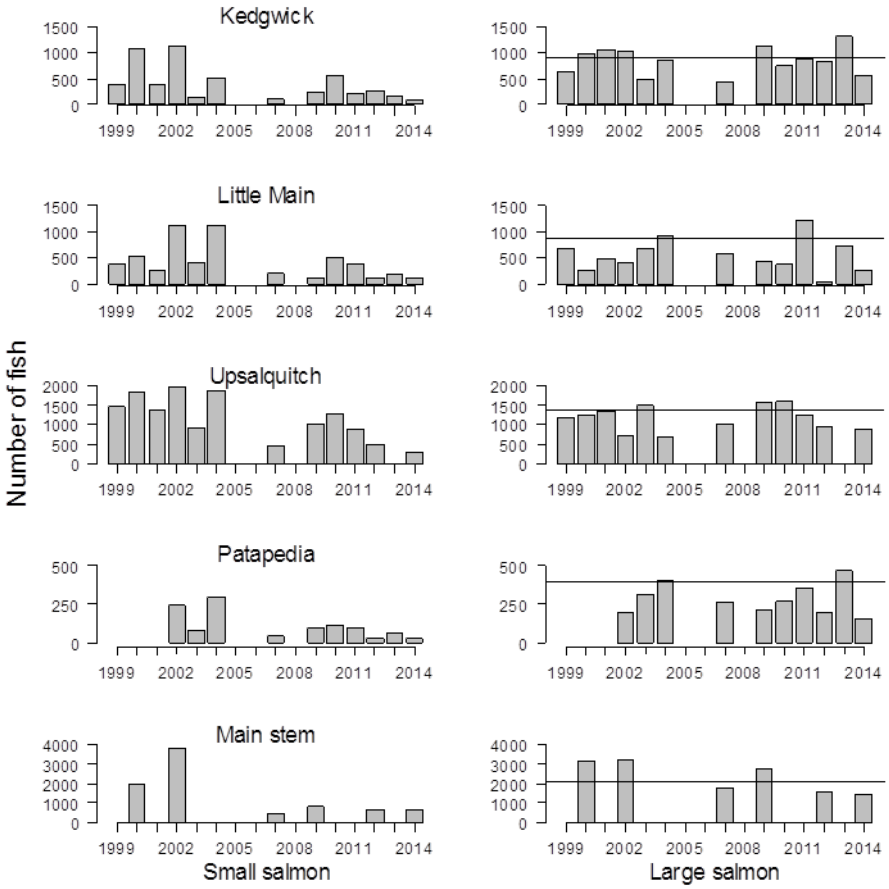

Figure 4. Summary of end of season salmon counts by size group (small salmon left column, large salmon right column) from four tributaries and the main stem of the Restigouche River for 1999 to 2014. The solid horizontal lines in the large salmon panels are the area specific conservation requirements expressed as large salmon. Spawner counts could not be completed in all years depending on water conditions.

Miramichi River (SFA 16)

The Miramichi River is the largest river in SFA 16 and Gulf Region. Returns are estimated using catches and mark and recapture experiments at monitoring trapnets in tidal waters (DFO 2014). The

estimates in the time series are not adjusted for periods when the counting facilities were not operating. In 2014, the Southwest Miramichi trapnet was not operating from July 4 to 16 and the Northwest Miramichi trapnet was not operating from July 4 to 10 due to high water.

Estimated returns of large salmon to the Miramichi River in 2014 were 10,270 fish (median; 95% confidence interval of 6,850 to 16,000) (Fig. 5). The returns of large salmon in 2014 are the lowest of the time series since 1979. The estimated returns of small salmon in 2014 were 7,475 fish (95% C.I. 5,380 to 10,400), the lowest value of the time series beginning in 1971 and following on equally low values of 8,200 and 11,900 fish in 2012 and 2013, respectively (Fig. 5).

Estimates for the two main branches of the Miramichi are available since 1992 (Fig. 5). The returns of large salmon to the Southwest Miramichi River in 2014 were estimated at 8,940 fish (95% C.I. 5,600 – 14,700), the lowest value since 1992. The estimated returns of small salmon in 2014 of 6,180 fish (median; 95% C.I. 4,135 to 9,100) were the second lowest, after 2011, of the time series (Fig. 5).

The returns of large salmon to the Northwest Miramichi River were estimated at 1,235 fish (median, 95% C.I. 730 to 2,470), the lowest of the time series (Fig. 5). The estimated returns of small salmon to the Northwest Miramichi River in 2014 were 1,240 fish (median, 95% C.I. 875 to 2,005) the lowest of the time series (Fig. 5).

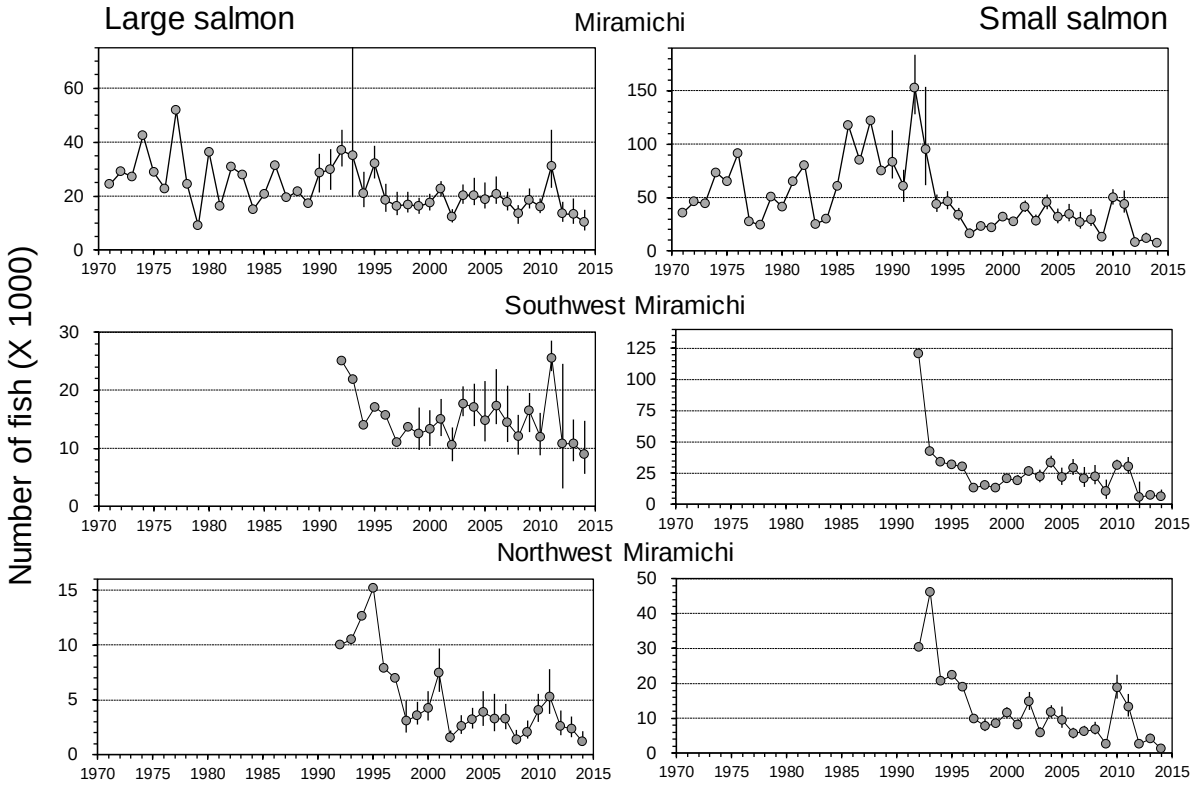

Figure 5. Estimates (median and 5th to 95th percentile range) of large salmon (left column) and small salmon (right column) returns for the Miramichi River for 1970-2014 (upper row), the Southwest Miramichi River 1992-2014 (middle row), and the Northwest Miramichi River 1992-2014 (bottom row).

The Dungarvon Barrier of the Southwest Miramichi was out of operation from July 6 to 23 due to damage associated with high water conditions. The Northwest Miramichi Barrier was minimally affected during the same period and was out of operation during July 7 and 8. Counts at the Northwest Miramichi Barrier in 2014 were 185 small salmon and 65 large salmon, the lowest values of the time

series beginning in 1988. Counts at the Dungarvon Barrier in 2014, unadjusted for the washout period, were 106 small salmon and 78 large salmon, also the lowest of the time series beginning in 1981.

Considering the biological characteristics of salmon in 2014, the total eggs in the returns of large salmon and small salmon combined were sufficient to attain only 55% of the conservation requirement for the Miramichi River overall in 2014 (Fig. 6). The percentage of the conservation requirement attained in the Southwest Miramichi has been higher in all years since 1996 than either for the Miramichi overall or the Northwest Miramichi in particular (Fig. 6). The eggs from the returns of small and large salmon combined to the Southwest Miramichi River were sufficient to attain only 70% of the conservation requirements in 2014. The percentage of the conservation requirement in the returns attained for the Northwest Miramichi was 22% in 2014; attainment of conservation has been at or below 50% in most years since 2002 (Fig. 6). The percentages of conservation requirements attained after fisheries losses will be less than these values.

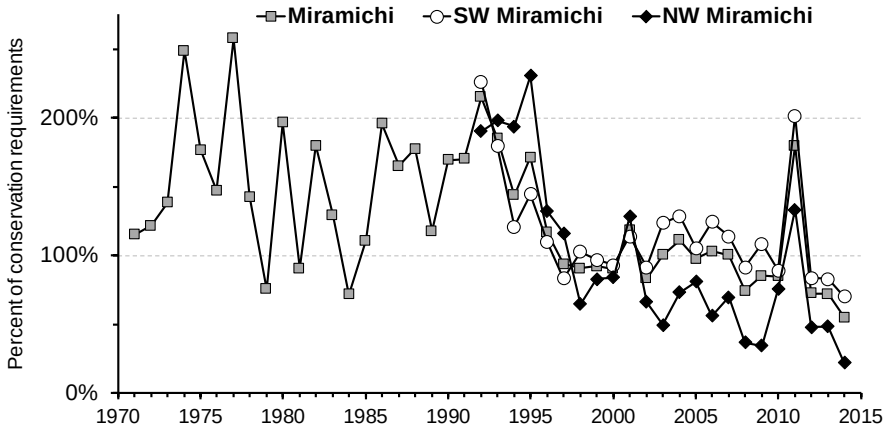

Figure 6. Percentages of the conservation requirements (eggs) attained in the returns of small salmon and large salmon combined from the Miramichi River overall (1971 to 2014), the Southwest Miramichi (1992 to 2014) and the Northwest Miramichi (1992 to 2014) rivers.

Juvenile indices

Indices of freshwater production are derived from electrofishing surveys of juvenile salmon. Fixed site sampling for juvenile salmon has been conducted most consistently since 1971 in the Miramichi and Restigouche rivers. Abundances at sites, in terms of number of fish per habitat area sampled by age or size group (densities), are obtained using successive removal sampling or by catch per unit effort sampling calibrated to densities. Sampling intensities vary among years and among rivers. Densities are referenced for two time periods, prior to 1984 and post-1984 (or later depending upon the age group) corresponding to the year (1984) when commercial fisheries were closed and the introduction of mandatory catch-and-release for large salmon in the recreational fishery.

Restigouche River

In 2014, two to three cohorts (fry, small parr, large parr) were captured at most sampling sites (n = 67) indicating that there had been multiple years of spawning success. Densities of Atlantic salmon fry, small parr (mostly one-year old), and large parr (mostly two-year and older) all increased post-1984 and remain at moderate levels (Fig. 7). Fry and small parr abundances since 1996 show a decrease whereas large parr show an increase in density (Fig. 7). Results from juvenile salmon surveys in 2008 and 2011, which showed decreased abundance of some age classes, could be biased due to difficult

sampling conditions (extremely high water) rather than an indicator of actual lower abundance. All sites sampled have become and remain occupied by juveniles with the exception of some small streams which are prone to periodic blockages to spawners by beaver dams.

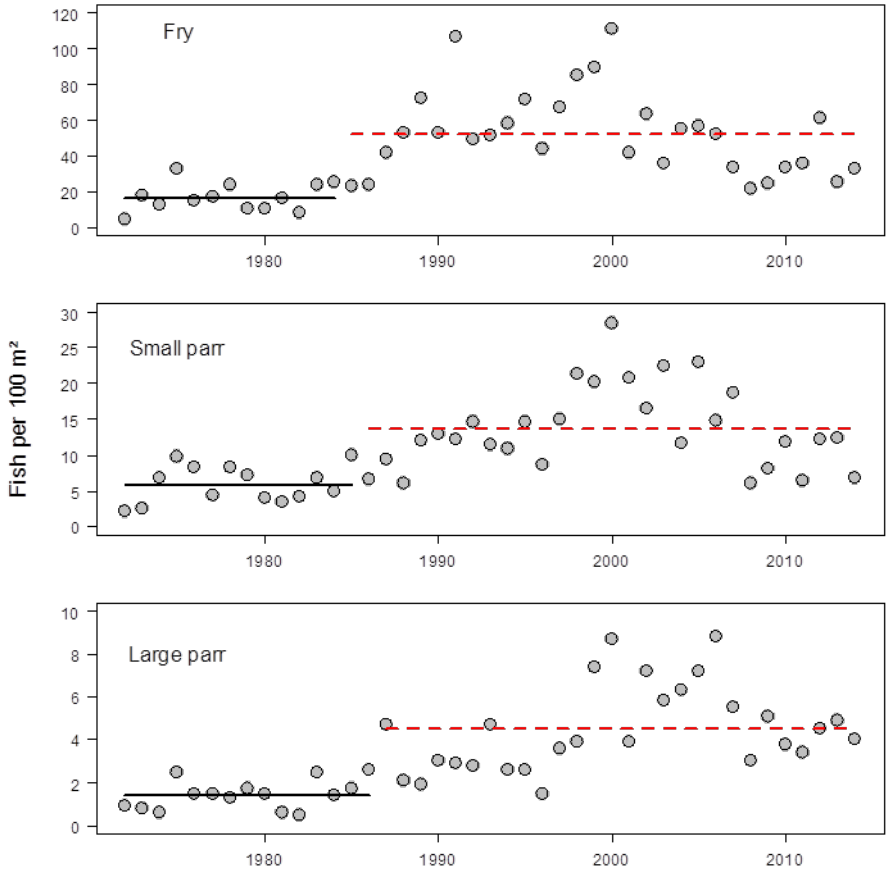

Figure 7. Mean juvenile densities (fish per 100 m²) for fry (upper panel), small parr (middle panel) and large parr (lower panel) for the sites sampled in the Restigouche River (NB waters only, excluding Matapedia and Patapedia rivers), 1972 to 2014. Horizontal solid line and the horizontal dashed line in each panel are the average densities corresponding to periods before and after, respectively, the significant management changes were implemented to the commercial and recreational salmon fisheries in 1984.

Miramichi River

Densities of Atlantic Salmon fry, small parr, and large parr in the Miramichi watershed were summarized according to the four major tributaries (Southwest Miramichi [SW], Renous, Northwest Miramichi [NW], and Little Southwest Miramichi [LSW] rivers). Average juvenile densities were calculated only when four or more sites per large river system were surveyed in a given year.

Salmon fry were captured at all 56 sites sampled in 2014 which indicates that adult salmon continue to spawn throughout the Miramichi watershed. Average fry densities in 2014 ranged between 37 (Little Southwest) and 90 (Southwest) per 100 m^2 and were average or below average for each river (Fig. 8). Above average levels of fry in 2012 correspond to the high spawning escapements, in excess of conservation requirements, in 2011. In 2013 and 2014, average fry densities were lower than in 2012 which are consistent with lower spawning escapements attained in 2012 and 2013 (Fig. 8).

Average small parr densities varied from 12 to 20 per 100 m² among the four main rivers in 2014. Average large parr densities in 2014 ranged from 4.5 (Renous) to 8 (Southwest) per 100 m^2. With the

exception of the Northwest Miramichi, the average large parr densities in 2014 were at or above the long term averages for the rivers since 1987 (Fig. 8).

Overall, juvenile salmon abundances have varied around higher average levels since the 1984 closure of the commercial fishery and the mandatory release of large salmon in the recreational fishery.

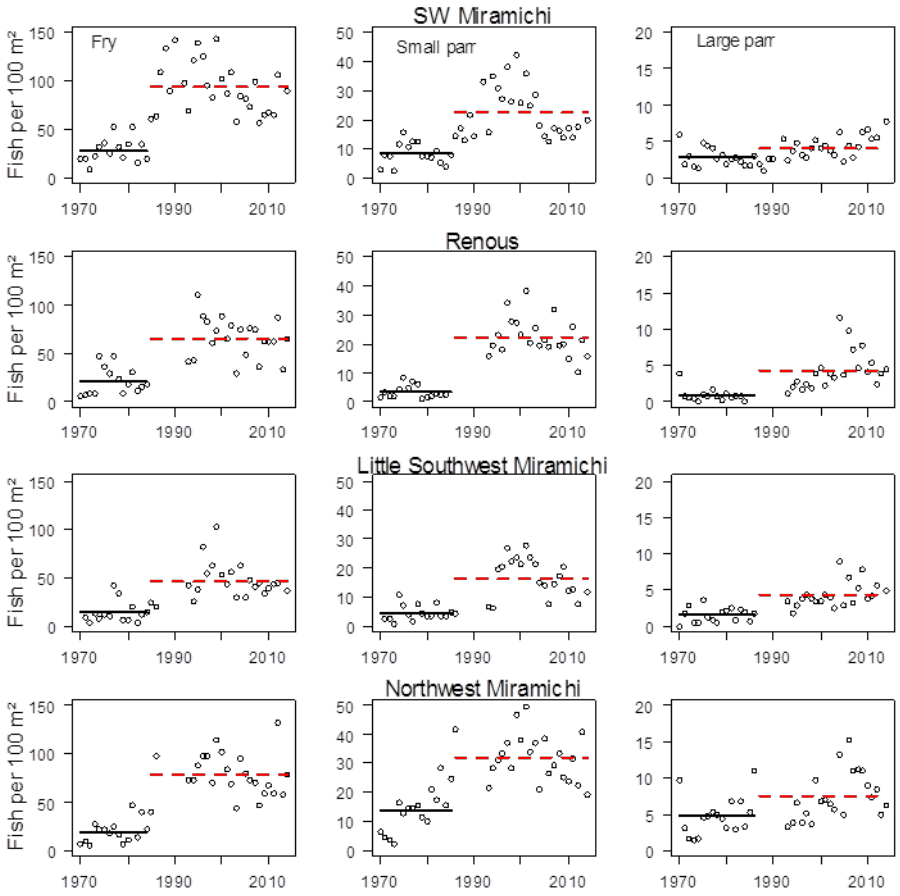

Figure 8. Annual average densities, expressed as fish per 100 m² of sampled area, for fry (left column), small parr (middle column), and large parr (right column) at sampled sites in the four major rivers of the Miramichi watershed: Southwest Miramichi (upper row), Renous River (second row), Little Southwest Miramichi (third row), and Northwest Miramichi (bottom row) for 1970 to 2014. Horizontal solid line and the horizontal dashed line in each panel are the average densities corresponding to periods before and after, respectively, significant management changes were implemented to the commercial and recreational salmon fisheries in 1984.

SFA 16B

In 2014, five sites were surveyed on the Buctouche River. The average densities of salmon fry and parr in 2014 were below the average values since the management changes in 1998 (Fig. 9). Salmon fry densities of over 40 per 100 m^2 were observed in the Buctouche River in 2000 following an adult salmon assessment the previous year that determined that conservation requirements had been met. Similar levels of fry were observed in 2005, suggesting that spawning requirements may have been achieved in 2004

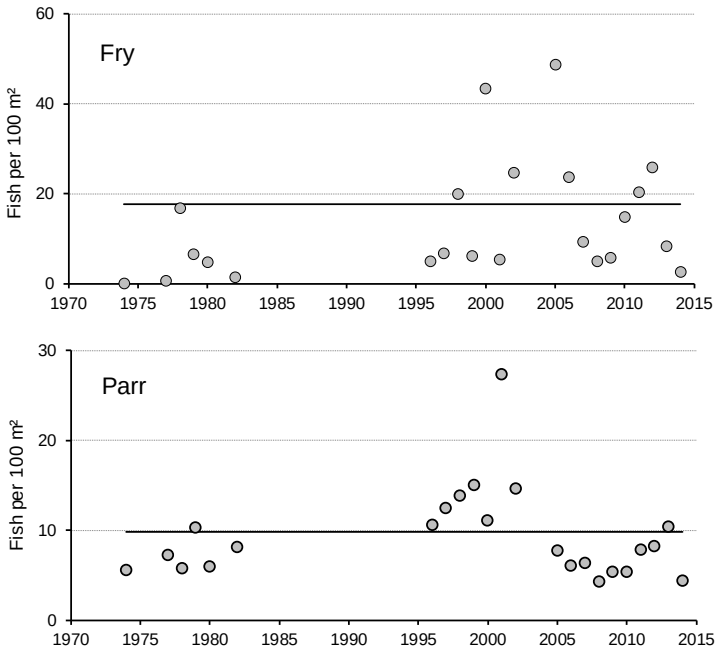

Figure 9. Average densities, expressed as fish per 100 m² of sampled area, for fry (upper panel) and parr (size groups combined, lower panel) from sampled sites in the Buctouche River 1974 to 2014 sampling years. The horizontal lines represent averages for fry and parr for the years after closure of the aboriginal and recreational fisheries in 1998.

Conclusions

Preliminary indices of returns of large salmon to the Restigouche River in 2014 were down from 2013 and among the lowest values since 2002. The lower large salmon returns in 2014 follow on low returns of small salmon in 2012 and 2013. This contrasts with the situation in 2011 when high abundance of large salmon had been preceded by greatly improved returns and abundance of small salmon in 2010 relative to the previous fifteen years. Small salmon returns to the Restigouche River overall and in individual tributaries in 2014 were among the lowest values of the past decade. In 2014, the large salmon returns were below the conservation requirements in the Restigouche River (NB) overall (83%) and in all of the surveyed tributaries (29% to 67%) based on end of season spawner counts.

Returns of large salmon in 2014 for the Miramichi River were at the lowest value since the late 1970s. Returns of small salmon in 2014 were the lowest of the time series beginning in 1971 and represent the third consecutive year of low small salmon returns. Eggs in the combined returns of small salmon and large salmon were 55% of conservation requirements for the Miramichi River, 70% for the Southwest Miramichi and 22% for the Northwest Miramichi.

The striking feature in the stock status of salmon in Gulf Region New Brunswick is the region wide low abundance of small salmon observed in 2012 to 2014 and the low abundance of large salmon in 2014. High water conditions in July that resulted in the counting facilities (barrier fence, estuary trapnet) being out of operation for one week (Northwest Miramichi) and about two weeks (Southwest Miramichi) may have resulted in an underestimate of returns but anecdotal information from recreational fisheries reports suggest the returns in the summer of 2014 in the Miramichi River were low even compared to the low returns of recent years.

Juvenile abundance indices remain at moderate to high levels. Abundance of adult salmon is constrained by low marine survival, which begins from the point of assessment in freshwater near the head of tide and ends with adult returns back to the river one and two or more years later. The phenomenon of reduced marine survival is widespread for Atlantic Salmon stocks from eastern North America.

Contributors

Name	Affiliation
Bélanger, Pierre	DFO Ecosystems and Fisheries Management Gulf Region
Breau, Cindy	DFO Science Gulf Region
Biron, Michel	DFO Science Gulf Region
Cameron, Paul	DFO Science Gulf Region
Carr, Jon	Atlantic Salmon Federation
Chaput, Gérald	DFO Science Gulf Region
Collet, Kathryn	New Brunswick Department of Natural Resources
Connell, Chris	New Brunswick Department of Natural Resources
Douglas, Scott	DFO Science Gulf Region
Fairchild, Wayne	DFO Science Gulf Region
Gillis, Carole-Anne	Restigouche River Watershed Management Committee
Hambrook, Mark	Miramichi Salmon Association
Hayward, John	DFO Science Gulf Region
Isaac, Denny	Gespe'gewaq Micmaq Resource Council
Lanteigne, Marc	DFO Science Gulf Region
LeBlanc, David	Restigouche River Watershed Management Committee
Labadie, Holly	Miramichi Salmon Association
Sheasgreen, Joe	DFO Science Gulf Region

Approved by

Marc Lanteigne
A/Science Director
Gulf Region
February 13, 2015

Sources of information

DFO. 2014. Stock status of Atlantic salmon (*Salmo salar*) in DFO Gulf Region (Salmon Fishing Areas 15 to 18) to 2013. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/057.

This Report is Available from the

Centre for Science Advice (CSA)
Gulf Region
Fisheries and Oceans Canada
P.O. Box 5030, Moncton, NB E1C 9B6

Telephone: 506-851-6253
E-Mail: csas-sccs@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-3769

Correct Citation for this Publication:

DFO. 2015. Update of stock status of Atlantic Salmon (*Salmo salar*) in DFO Gulf Region (New Brunswick Salmon Fishing Areas 15 and 16) for 2014. DFO Can. Sci. Advis. Sec. Sci. Resp. 2015/008.

Aussi disponible en français :

MPO. 2015. Mise à jour de l'état des stocks de saumon de l'Atlantique (Salmo salar) dans la région du Golfe du MPO (zones de pêche du saumon 15 et 16 du Nouveau-Brunswick) pour 2014. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2015/008.