Fisheries and Oceans Pêches et Océans

Canadian Stock Assessment Proceedings Series 98/16

Évaluation des stocks canadien Séries des comptes rendus 98/16

Proceedings of the 1998 Newfoundland Regional Salmonid Stock Assessment Meeting

Edited by

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October 1998

Fisheries and Oceans Pêches et Océans

Canada

Canadian Manuscript Report of Fisheries and Aquatic Sciences

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Cat. No. Fs 98-4/98/16 ISSN 0706-6473

Correct citation for this publication:

Reddin, D. G. [ed.] 1998. Proceedings of the 1998 Newfoundland Region salmonid stock assessment meeting. Can. MS Rep. Fish. Aquat. Sci. 98/16 iv + 67 p.

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Abstract

Reddin, D. G. [ed.] Proceedings of the 1998 Newfoundland Region salmonid stock assessment meeting. Can. MS Rep. Fish. Aquat. Sci. 98/16 iv + 67 p.

The fifth annual Salmonid Stock Assessment Meeting for the Newfoundland Region was held in St. John's, March 9-13, 1998. The general status of Atlantic salmon stocks in Newfoundland and Labrador and assessments for 28 individual rivers in 1997 were examined. An overview of landings in the Arctic charr commercial fishery in Labrador in 1997 was also reviewed. Data and analyses involved in determining status of stocks were contained in 23 working papers. For Atlantic salmon, information obtained from a series of public meetings held in Newfoundland and Labrador in the fall of 1997 were incorporated into the assessment process. This report summarizes each of the working papers, stock status summary sheets for individual stocks, comments from the public meetings, and a discussion of issues related to the data used in stock assessments.

INTRODUCTION

The fifth annual Newfoundland Region Salmonid Stock Assessment Meeting was held in St. John's, March 9-13, 1998 at the Northwest Atlantic Fisheries Centre in St. John's. In addition to Department of Fisheries and Oceans (DFO) scientific and resource management staff, the meeting was attended by representatives of the Government of Newfoundland and Labrador, Parks Canada, Conne River First Nations Band, and students and staff of Memorial University of Newfoundland. Working papers containing information and analyses related to status of stocks, estimates of population size, and future abundance were presented and discussed. The assessment process incorporated information obtained from a series of public meetings that were held on science issues in the fall of 1997.

This report contains a summary of each of the working papers presented and associated discussions. Complete details of the data and methodologies used in the assessments will be published in the DFO Atlantic Fisheries Research Document series. Additional summaries, environmental considerations, future prospects, and management issues are presented in Anon. (1998)[1]. A copy of the agenda is shown in Appendix 1, the list of participants in Appendix 2, the list of working papers in Appendix 3, report of the public consultations in Appendix 4, and individual stock summary sheets in Appendix 5.

SUMMARIES OF PRESENTATIONS

A total of 23 working papers was presented, 22 on Atlantic salmon and one on Arctic charr. Two papers provided a general overview of the status of Atlantic salmon at the Salmon Fishing Area (SFA), sub-regional, and regional levels separately for insular Newfoundland and Labrador. Trends in recreational fishery catch and effort data, commercial fishery data (Labrador only), and counts at various facilities were examined in relation to the 1997 Management Plan and the moratorium on the Atlantic salmon commercial fishery, which was implemented in 1992 and entered its sixth year in 1997. Papers were presented that examined the status of Atlantic salmon in relation to conservation requirements for 28 rivers and also compared total river escapements, spawning escapements, and estimates of total population size (certain rivers) prior to and during the commercial fishery moratorium in insular Newfoundland. Elements of the results of these analyses for individual rivers are shown in the attached Summary Sheets (Appendix 5). A map showing the SFAs of the Newfoundland Region, the individual rivers assessed, and percent of egg conservation requirements achieved for each river in 1997 is provided in Fig. 1. A paper was presented that provided a analysis of information obtained from four years of the Atlantic salmon angler License Stub Return System in the Newfoundland Region. The paper on Arctic charr presented information on commercial fishery landings for 1997 as well as historical landings, quotas and results of the terminal in-river fishery at Southwest Arm Brook, Saglek Fiord.

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[1] DFO Science Stock Status Report Series D2-01 to D2-06.

GENERAL DISCUSSION

For the past several years, there have been concerns that continued management changes to the recreational fishery as well as reduced staff due to budget restraints have seriously eroded the usefulness of angling data for historical comparisons, especially in terms of relative abundance indices and long-term trends. This is especially true for 1997, wherein angling catch data is now derived solely through the License Stub Return System with the exception of SFAs 1 and 2 in Labrador. The lack of comparability of present data to historical data which is also severely hampered by the myriad of management changes that have been made over the years has severely restricted our abilities to assess status of stocks in these areas. Until a new time series of angling data is developed from the License Stub Return System, we now must rely exclusively on the information from rivers with monitoring facilities for stock assessments and information on trends in population sizes.

Unrecorded mortalities in freshwater in relation to estimates of spawning escapement and egg deposition continues to be an issue. Potential sources of unrecorded mortalities include poaching activity, hook-and-release fishing, and natural causes. Mortalities from some if not all of these sources are applicable to most river systems, although the rate probably varies annually and among rivers. The conservation requirement for fluvial habitat currently used throughout Atlantic Canada for Atlantic salmon is 240 eggs per 100 m^2. Removals due to poaching and disease have been incorporated into this value. In insular Newfoundland and Labrador, a substantial portion of total production is derived from pond habitat. Pond habitat is evaluated using a conservation requirement of 368 eggs per hectare (105 eggs per hectare is used in northern areas), but there is no allowance for poaching or disease in this value. In addition, at the time that the conservation requirements of 240 for fluvial and 368 for pond habitat was derived, hook-and-release fishing was not as popular as it is today and no mortalities for this factor were included. A factor of 10% mortality was applied to records hooked-and-released salmon and subtracted from spawning escapement.

Most information on the amount and type of fluvial Atlantic salmon habitat in insular Newfoundland and Labrador comes from river surveys conducted from helicopter, with minimal groundtruthing. Over the last few years efforts have been made to include parr produced in lake habitat as part of the conservation requirements. This remains to be completed for several SFAs in Newfoundland. In insular Newfoundland, habitat surveys utilized 1:50,000 topographical maps. To date estimates of egg deposition requirements for conservation have not been developed for Labrador due to incomplete surveys of rivers and our lack of knowledge of the productivity of rivers and ponds. However, in Labrador surveys conducted in the early 1970s were based on 1:250,000 topographical maps, which were the only maps available at that time. These smaller scale maps would eliminate the inclusion of substantial amounts of habitat contained in smaller tributaries that are not visible on the maps. Efforts are continuing to produce new habitat estimates for Labrador rivers based on 1:50,000 scale maps that are now becoming available.

RECOMMENDATIONS

1. Currently, the impacts of the commercial fishing moratorium on salmon stocks in insular Newfoundland are included in several working papers. It is recommended that the available information be drawn together and published in a Research Document.

2. There is a need to estimate the amount and productivity of parr-rearing habitat in Labrador in order to determine conservation requirements for individual rivers. The estimates of the number of small and large salmon required for conservation in Labrador were derived from estimates of production during a time when it was high. These estimates should be replaced by habitat-based conservation requirements similar to other rivers in Eastern Canada. Applicability of the conservation requirements of 240 eggs per m^2 for Labrador should be reviewed and amended if necessary.

3. Participants at the assessment meeting reiterated the recommendation previously stated that no fishing mortality should occur on stocks that are below conservation requirements.

4. a) The License Stub Return System reports should include variance and standard error for license stub catch and effort data for use in calculating confidence limits.
   b) A separate angling license for Labrador should be established to ensure the accuracy and precision of Labrador catch statistics derived from License Stub Return System.

5. At the assessment meetings to be held in 1999, methodologies used during in-season reviews should be examined in detail for accuracy and improved where possible. Techniques used on the West Coast might be useful and should be included.

6. The inclusion of repeat spawners and large salmon as part of the egg deposition and conservation requirements should be examined.

7. It is recommended that datasets be examined to refine conservation requirements. This should include reference to techniques described in Workshops held in France in 1997 and Dublin, Ireland in 1998.

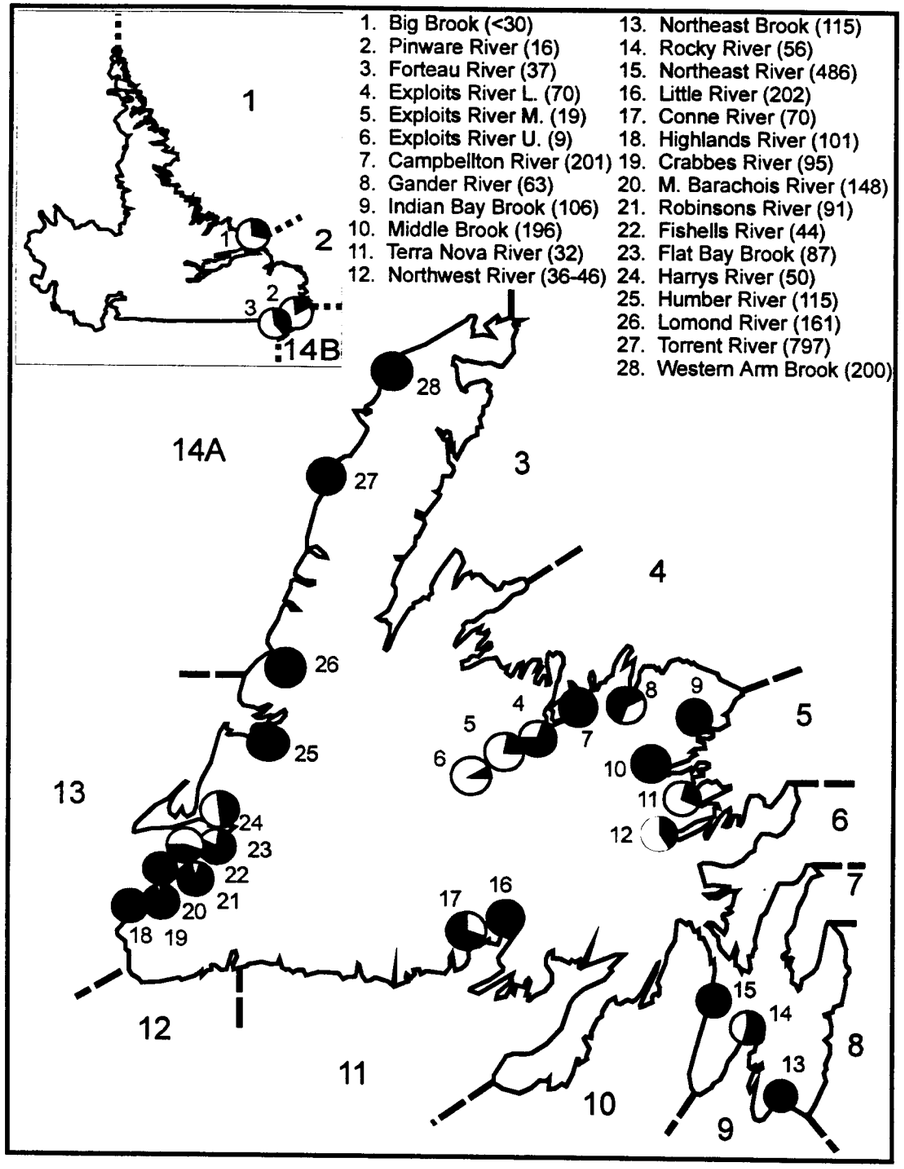

Figure 1. Map showing the Salmon Fishing Areas of Newfoundland and Labrador and the location of rivers, or river sections, for which Atlantic salmon egg deposition in relation to conservation requirement was determined. The black portion of the circle indicates the percentage of egg conservation requirement achieved in 1997. Values in parentheses represent the percentage of conservation requirement achieved. For Conne River the value is in relation to the Management Target, which is higher than the corresponding conservation requirement.

An Analysis of the Results of the License Stub Return System in the Newfoundland Region, 1994-97

Authors: M. F. O'Connell, N. M. Cochrane, E.G.M. Ash, and C. C. Mullins

Summary: The License Stub Return System was implemented in the Newfoundland Region in 1994 as an alternate method of collecting recreational fishery catch and effort data. Information obtained from the stub system was compared to that provided by DFO River Guardians during 1994-97 (for Labrador only in 1997). Comparisons were also made with results obtained from creel surveys conducted in Middle Brook, Bonavista Bay (SFA 5) and Pinware River, Labrador (SFA 14B) in 1997. Reported catch and effort data were extrapolated to the entire angling population using a modification of the bias correction technique developed for rivers in Nova Scotia. Effort expenditure (rod days) derived from the stub was consistently lower than that obtained from the creel surveys (complete coverage) and from DFO River Guardians. A cursory examination of angler return cards revealed that many anglers only reported effort associated with catch. Telephone calls to a sample of 31 of these anglers revealed that 58% had fished for varying periods throughout the season with no catch, caught, but did not report this as expended effort. Stub estimates of numbers of small and large salmon released were substantially higher than creel and guardian estimates. Stub estimates of numbers of small salmon retained were also higher than derived from both creel surveys, but the differences between the two methods were less than observed for released fish. There was no consistent pattern in numbers of retained fish when stub and Guardian estimates were compared; some rivers and SFAs were higher relative to the stub and some were lower.

Comments:

1. The overall response rate from a voluntary group and three post prompt groups for Newfoundland and Labrador for the four years was around 50-55%. This compares to in excess of 90% reported for Nova Scotia. Extrapolation to the entire angling population is obviously much less risky for Nova Scotia than it is for the Newfoundland Region. Thus the bias correction procedure employed may not adequately depict levels of catch and effort of non-respondents in the present exercise. There is some question as to whether or not complete coverage was indeed achieved in the creel surveys and hence data obtained could be minimal values.

Recommendations

1. If precision of estimates is to improve, it is imperative that the overall response rate be increased, especially when it comes to smaller rivers frequented by less than approximately 200 anglers. The mandatory return of license stubs should be strongly considered. Although not enforceable, it is still anticipated that this measure would result in a certain increased level of compliance. Efforts to increase public awareness through various forms of advertising should be

expanded. Every effort should be made to implement statistically designed telephone surveys as a means of correcting for under-reporting of effort and accounting for non-response and recall biases. Published literature reports show that failure to account for such biases can lead to substantial error in estimating catch and effort in angler log systems.

2. A separate angling license for Labrador should be established to ensure accuracy and provision of Labrador catch statistics developed from License Stub Return System.

Oceanographic conditions in the Newfoundland Region in 1977

Author: E. Colbourne

Summary: Sea temperatures at Station 27 during 1997 ranged from 0.0 to 0.5 °C above normal for the winter months over most of the water column. By mid-April a strong negative surface temperature anomaly developed with anomalies reaching near 1.0 °C below normal by mid-May and continued throughout the summer, while bottom temperatures remained near normal throughout the year. The summer upper layer salinities were normal, the first time since 1990, as well the annual depth average temperature at Station 27 was about normal. Time series from the inshore regions show below normal temperatures during mid-1997 but recovered to near normal values late in the year. During the summer of 1997, the CIL area off Bonavista and Hamilton Bank was well below normal continuing a trend established in 1994. Across the Grand Bank the CIL was above normal compared to near normal conditions in 1996. The total volume of sub-zero °C water on the Newfoundland Shelf during both summer and fall is continuing a below normal trend established in 1995. Bottom temperatures on Hamilton Bank and the Grand Bank during the fall of 1996 increased significantly over previous years and were up to 0.5°C above normal over many areas. During the fall of 1997, bottom temperatures were still above normal over many areas, particularly on the offshore portion of the Northeast Newfoundland Shelf. In general, during 1997 oceanographic conditions were still above normal over many areas, particularly over the deeper portions of the Northeast Newfoundland Shelf. The exception being the near shore in the upper water column and over the shallow portions of the Grand Bank where temperatures were colder than normal during late spring and early summer.

Comments

1. As of early March, there is no oceanographic information available, however it was predicted that ocean surface temperatures should be warmer than normal for the winter months of 1998.

2. In early 1998, air temperatures were above normal by about 1.5°C at St. John's and total precipitation was only about one-half of normal values, which will effect spring and summer water levels in rivers.

Recommendations: None.

Marine Environmental Conditions in the Northwest Atlantic During 1997 Potentially Impacting Atlantic Salmon (*Salmo Salar*)

Authors: K.F. Drinkwater, J. Helbig, R. Petipas, and L. Petrie

Summary: During 1997, the wintertime large-scale atmospheric circulation (Icelandic Low and Bermuda-Azores High) remained weaker-than-normal for the second consecutive year. This resulted in a lower-than-average NAO index, well below the high values of the which was earlier 1990s. Associated with the weakening of the Icelandic Low, the northwest winds would have been weaker than normal over the Labrador Sea and wintertime air temperatures were, on average, warmer-than-normal. Relative to 1996, the NAO index strengthened and air temperatures cooled. Notable was a significant change in winter air temperatures from very early warm temperature anomalies to very cold in the latter half. Ice formed late, but as cold conditions and strong winds developed during the latter half of the winter the ice spread quickly. Ice lasted longer than normal in much of the Gulf and on the Scotian Shelf but not on the Newfoundland and Labrador shelves. In spite of the long lasting ice the areal extent of ice on the Scotian Shelf was below normal. During spring, air temperature anomalies were generally below normal during 1997, consistent with the air pressure pattern and weaker northwest winds over the Labrador Sea. During the summer, air temperature anomalies tended to be relatively small, fluctuate about their long-term means, and vary spatially. Seasonal sea surface temperature patterns were extracted from the MCSST data set. Anomalies in various regions varied in sign throughout the year, but much of the offshore North Atlantic and Labrador Sea was warmer than normal for most of the year. Over the continental shelves, the Grand Banks was relatively warm while the Scotian Shelf/Gulf of Maine region was characterized by both positive and negative anomalies as was the Gulf of St. Lawrence.

Comments: None.

Recommendations: None.

Status of Atlantic Salmon (*Salmo salar* L.) Stocks of Insular Newfoundland (SFAs 3-14A), 1997

Authors: M. F. O'Connell, J. B. Dempson, C. C. Mullins, D. G. Reddin, N. M. Cochrane, and D. Caines

Summary: The commercial Atlantic salmon fishery moratorium implemented in 1992 entered its sixth year in 1997. The moratorium placed on the Northern Cod Fishery in 1992, which should have eliminated by-catch of Atlantic salmon in cod fishing gear in

SFAs 1-9, continued in 1997. A moratorium was placed on cod fishing in SFAs 10-14A in August 1993, which remained in effect in 1997 with the exception of a limited fishery in SFA 11. Several indicators pointed to increased returns of small salmon in 1997 for many rivers, particularly those on the western side of the Northern Peninsula and on the northeast and east coasts: substantially increased spawning escapements in 1992 which were anticipated to result in increased returns of adults with a modal smolt age of 3+ years in 1997; record high (or nearly so) smolt production in 1996; increasing trends in smolt survival and good condition of smolts and record early smolt run timing, associated with good adult returns in the past; marine thermal habitat conditions in early 1997 that were among the best up to that point. With the exception of Bay St. George (SFA 13), overall returns of small salmon in 1997 decreased from 1996. Total population sizes of small salmon in 1997 were as low or lower than estimated for several years immediately preceding the moratorium. Sea survival decreased at all smolt-counting facilities except Highlands River (Bay St. George). Most evidence points to increased mortality at sea as being responsible for the lower than expected returns of small salmon. Returns of large salmon (mainly repeat spawning grilse) in 1997 increased at most counting facilities and in some cases were the highest on record. Smolt production in 1997 was the highest on record for four out of six rivers and among the highest in one. However, smolt run timing was late and this has been associated with decreased returns in the past. Given there was record or near record smolt production in 1997, even a modest improvement in sea survival could result in increased returns in 1998.

Comments:

1. Angling data were derived mainly from the License Stub Return System in 1997, as opposed to using information provided by River Guardians as in previous years. Effort data provided by the stub system were not representative. Many anglers only reported effort associated with catch and did not record effort expended when there was no catch. Also, when the two methods were compared for the period 1994-96, estimates of numbers of fish released according to the stub were substantially higher than reported by River Guardians. Therefore, direct comparisons of 1997 results for effort expenditure and catch per unit of effort (based on total catch, i.e., retained and released small and large salmon combined) with previous years is of little value.

Recommendations: None.

Status of Atlantic salmon (*Salmo salar* L.) stocks in Labrador, 1997

Authors: D. G. Reddin, C. C. Mullins, M. F. O'Connell and N. Cochrane

Summary: There are 3 management areas for Labrador salmon rivers and coastal fisheries: Salmon Fishing Area (SFA) 1 in northern Labrador, SFA 2 in southern Labrador, and SFA 14B in the straits shore area adjacent to the island of Newfoundland. The commercial fishery in SFA 14B was completely closed in 1997. In SFAs 1 and 2, the commercial fishing season opened on June 20 similar to 1996 with quotas basically unchanged since 1996. In 1997, the quota of 35.5 t was caught in SFA 2 in about 3 weeks while in SFA 1 only 8.6 t of the 14.5 t quota was caught. Estimates of the total number of salmon produced in Labrador, particularly the large salmon component, continues to be low compared to the 1970s while small salmon increased slightly from 1996. Management measures in recent years however, appear to have dramatically improved spawning escapements, with the potential for increased returns beginning in the year 1999. An analysis of salmon abundance based on sales slips (landing per sales slip per active fishermen) indicated that salmon abundance did not decline substantially in Labrador in 1997 compared to 1996 as it did in other areas of Atlantic Canada. However, in SFA 1, declines continued in 1997 as they have every year since 1994. Returns to Big Brook counting fence in SFA 1 were very low compared to conservation requirements. There were no counting facilities operated in SFA 2 in 1997. In spite of the commercial fishery closure in SFA 14B in 1997 and the restrictions on retention of large salmon in the angling fishery, the estimated returns to the river and spawning escapements of small and large salmon were probably at or near the lowest level on record. It is recommended that fishing mortality not increase at this time in SFAs 2 and 14B and further reductions in fishing mortality (commercial and angling) are recommended for SFA 1.

Comments:

1. Note that 1991 was a heavy ice year and may result in an understimate of numbers of salmon and spawners in that year.

2. Interpretation of angling catches must consider the high water levels in 1997 which may have resulted in a lower catches than would have occurred under normal conditions.

3. There should be a lag of one year between declines or increases in numbers of small and large salmon which does not appear in the last 7 years of the time series.

4. There is a great deal of uncertainty around the estimated numbers of small and large salmon. This is mainly due to the inferred exploitation rate. A small change in the exploitation rate will have a big impact on the estimated numbers of salmon.

Recommendations:

1. Additional counting facilities are urgently required in Labrador. Preferably, there should be two in each of SFAs 1 and 2. The counting projects at Forteau Brook and Pinware River should continue.

2. It is recommended that exploitation not be increased on Labrador salmon stocks.

Status of the Atlantic salmon (*Salmo salar* L.) stock of Pinware River and Forteau Brook, Labrador, 1997

Authors: C. C. Mullins and D. Caines

Summary: This is the second assessment of the status of the Atlantic salmon stock on Pinware River. A minimum of 6,110 ha of lacustrine habitat and 46,691 fluvial rearing units are available to salmon on this river. The conservation egg deposition requirement based on this habitat is 11,847,390 eggs. A mark and recapture technique was used to estimate the run size. On the basis of this technique, returns to the river in 1997 resulted in 16% (95% CI 5-24%) of the conservation egg deposition requirement being achieved. The proportion of large salmon observed at the tagging and recapture traps in 1997 was 40% greater than observed in 1996. This may have been due to the closure of the SFA 14B commercial salmon fishery in 1997. Except for the increase in the proportion of large salmon, the lower commercial effort and lower recreational bag limits since 1992 do not appear to have resulted in an increase in the total number of spawners on this river.

Comments:

1. The low numbers of salmon tagged and recaptured on the Pinware River in 1997 resulted in increased uncertainty around the estimate of the population size. However, this uncertainty has been incorporated into the assessment by calculating the probability of a lower population size given the mark-recapture results observed. The probability that the potential egg deposition was lower than estimated in 1997 is very low.

2. The Forteau River is the second largest of the three rivers in southern Labrador, SFA 14B. On the basis of angling catches and exploitation rates derived for 1994-95 when complete counts were obtained from the counting fence, this river also experienced low returns in 1997 compared to previous years. All recommendations were incorporated into the current assessment.

Recommendations: None.

The stock status of Atlantic salmon (*Salmo salar* L.) in Big Brook (Michaels River), Labrador, 1997

Authors: D. G. Reddin and P. B. Short

Summary: The status of the Atlantic salmon stock in Big Brook (Michaels River), Labrador in 1997 was determined using a counting fence, samples collected in the angling fishery, and records of angling mortalities. Big Brook is in northern Labrador

and located in Salmon Fishing Area (SFA) 1. The stock assessment was conducted in relation to reduced Atlantic salmon commercial fisheries in Labrador due to quota restrictions and the five-year moratorium on the commercial Atlantic salmon fishery in insular Newfoundland, which entered the sixth year in 1997. In 1997, total returns to Big Brook adjusted for the early removal of counting fence were 530 small and 104 large salmon. The number of spawners adjusted for angling mortalities is 454 small and 102 large salmon. The egg deposition required for conservation for Big Brook is 5,294,160 eggs using information from a river survey conducted by Murphy (1973). In 1997, the proportion achieved of the conservation egg requirements was very low probably much less than 30%.

Comments:

1. The angling catch was distributed above and below the counting fence but in the assessment angled salmon were assumed to all have been caught below the counting fence in the absence of detailed records giving the location of catch. If repeated in 1998, records should be kept of the location of angling catches in the river.

2. The results of the Big Brook stock assessment seem to be consistent with information on Hunt River also in northern Labrador. The catch statistics including catch rates indicate an overall declining trend in the number of salmon returning to Hunt River which was confirmed by the guides employed at the Abitibi-Consolidated fishing camp.

Recommendations:

1. This is the first year that an assessment has been conducted on Big Brook and the first salmon assessment on a northern Labrador river. If possible, it should be repeated to confirm the very low returns to the river and the low egg deposition relative to the conservation requirements for the river.

2. More biological information on fecundity, proportion female, and number of salmon in the spawning escapement is required.

3. Other rivers in northern Labrador require stock assessments to determine how widespread the low stock abundance is.

Status of Atlantic salmon (*Salmo salar* L.) in Campbellton River, Notre Dame Bay (SFA 4), Newfoundland in 1997

Authors: D. G. Reddin and P. R. Downton

Summary: The status of Atlantic salmon in Campbellton River in 1997 was determined from the number of salmon counted through a portable fish counting weir (fence)

located on the main stem just above head of tide as well as recreational fishery and biological characteristics data. The assessment was conducted in response to major management changes that were introduced in insular Newfoundland in 1992 and continued in 1993-97. Specifically, there was a moratorium on the commercial Atlantic salmon fishery in insular Newfoundland and restrictions were placed on recreational fishing in each Salmon Fishing Area. The number of salmon returning to the river in 1997 was 1,975 small and 321 large salmon. The spawning escapement measured as returns to the river minus angling mortalities was 1,731 small and 320 large salmon. The proportion of the conservation requirement achieved for Campbellton River in 1997 was 201%. This is the lowest in the 5-year time series; although well above the conservation requirements for the river. On average for the period of 1993-97, Campbellton River achieved 269% of its conservation requirements. Adult returns averaged 3,275 small and 279 large salmon, 1993-97. The 1997 smolt count of 62,050 is the highest on record, 1993-97. Historical records indicate that circa. 1800, adult returns to a harvesting weir were about 12,000 salmon.

Comments:

1. The decline in survival rates of virgin 1SW salmon returning in 1997 versus those for the repeat spawners that did not decline compared to previous estimates suggests that the higher than normal mortality occurred prior to adult return to the coast.

Recommendations:

1. The habitat survey should be completed and a new conservation requirement calculated.

2. Detailed biological sampling should be done on the downstream migrating kelts to determine if any abnormal circuli patterns are detectable on the scales. This may provide further information on the cause of the decline in returns to Newfoundland rivers in 1997.

Status of the Exploits River stock of Atlantic salmon (*Salmo salar* L.) in 1997

Authors: C. E. Bourgeois, J. Murray, and V. Mercer

Summary: The Exploits River in 1998 will receive the last returns from fry stocking programs which will be the 4^+ river age recruits from the 1993 fry stocking. The status of Atlantic salmon in the Exploits River in 1997 was derived from three fishway counts, recreational fishery data, fecundity data and biological characteristic data. River escapement (total production) was 16,144 salmon, composed of 15,263 small and 881 large salmon and is the lowest in the 1993 - 1997 time series. The watershed received 26% of the required conservation egg requirement with the lower, middle and

upper sections receiving 70%, 19% and 9% respectively. The 1997 egg deposition from natural spawning is the lowest for the lower and middle Exploits since 1993. The recreational fishery had a reduced season for retention of small salmon, with 2,996 retained small salmon and a total hook and release catch of 2,169 small salmon. The total recreational catch of 5,165 small salmon is the highest recorded to date on the Exploits River and is 32% of total production. There is concern that this high angling catch will impede the middle and upper sections of the watershed from achieving conservation requirements. Presently, the Exploits River angling fishery is managed based on achieving a spawning escapement of 13,000 small salmon. It is recommended that this management target be increased to 18,000 small salmon to accommodate growth of the Exploits River stock of salmon and that the area just downstream of Red Indian Lake fishway be closed for angling until the stock upstream of this area builds to a sustainable level.

Comments:

1. Concern was expressed over the low level of returns to the upper section (area upstream of Red Indian Lake) of the watershed. Consequently, there should be no exploitation on this stock component.

2. Hook-and-release mortality should be quantified for the Exploits River salmon stock.

Recommendations:

1. Egg conservation requirements for the Exploits River are fulfilled with 56,000 spawners. Because the salmon population was in a building stage through enhancement the conservation requirements could not be met for a number of years. Consequently, a Management Target of 13,000 spawners was set while the population builds. The egg depositions during the last five years have been high and the Management Target should be increased to 18,000 for the next five years to allow for further stock building.

2. Length measurements of both large and small salmon are required in 1998 to better calculate egg depositions.

Status of Atlantic Salmon (*Salmo salar* L.) in Gander River, Notre Dame Bay (SFA 4), Newfoundland, 1997

Authors: M. F. O'Connell, E.G.M. Ash, and A. Walsh

Summary: The status of Atlantic salmon in Gander River in 1997 was determined using counts of small and large salmon from a counting fence located on the main stem just above head of tide, recreational fishery data, and biological characteristics information. Total returns of small salmon in 1997 decreased by 56% from 1996 and

were the lowest since the implementation of the commercial salmon fishery moratorium in 1992. Returns of large salmon in 1997 however increased by 7% over 1996 and were the second highest of the moratorium years. Conservation egg requirement achieved in 1997 (63%) was the lowest of the moratorium years.

Comments: None.

Recommendations: It was recommended that in future estimates of recreational fishery catch and effort for Gander River be based on the Gander River license and not the general Provincial license.

Juvenile Atlantic salmon (Salmo salar L.) abundance in the Experimental Ponds Area relative to adult returns to the Gander River as an index of marine survival: evidence for increased marine mortality in 1997

Authors: R. Knoechel, P.M. Ryan and M.F. O'Connell

Summary: A marine survival ratio index was calculated as the number of adult salmon returning to the Gander River divided by the total juvenile salmon populations in the Experimental Ponds Area at the headwaters of the river in the previous spring. This survival index increased more than four-fold in the first four years (1992-95) following closure of the commercial fishery in 1992. The index dropped moderately in 1996 and then precipitously to pre-closure levels in 1997, suggesting that there has been a sudden decrease in marine survival despite the continued closure of the commercial fishery in insular Newfoundland. The observed 1997 Experimental Ponds Area juvenile abundance of 3112 would yield a predicted return of 25,643 small adults if the high survival observed during the early post-moratorium years (1992-95) was achieved but only 4,979 if the poor survival of 1997 was repeated. It is thus unlikely that the Gander River conservation requirement of 21,828 adult spawners will be met in 1998.

Status of Atlantic Salmon (*Salmo salar* L.) in Indian Bay Brook, Middle Brook, and Terra Nova River (SFA 5), Northeast Brook, Trepassey (SFA 9), and Northeast River, Placentia (SFA 10), Newfoundland, 1997

Authors: M. F. O'Connell, E.G.M. Ash, and A. Walsh

Summary: The status of Atlantic salmon stocks was determined for Indian Bay Brook, Middle Brook, and Terra Nova River in Salmon Fishing Area (SFA 5), Northeast Brook, Trepassey in SFA 9, and Northeast River, Placentia in SFA 10. Total returns of small salmon to Indian Bay Brook and Middle Brook in 1997 decreased by 54% and 39% from 1996 and were the lowest since the commercial salmon fishery moratorium

was implemented in 1992. Total returns of small salmon to Terra Nova River decreased by 44% and were the second lowest of the moratorium years. Declines in small salmon returns were also recorded for Northeast Brook, Trepassey (32%) and Northeast River, Placentia (49%); returns for the former river were the lowest of the moratorium years and second lowest for the latter. Record high returns of large salmon occurred in Middle Brook and Northeast River, Placentia in 1997 while for Terra Nova River returns were the second highest recorded. Returns of large salmon to Northeast Brook, Trepassey were among the lowest of the moratorium years. Conservation egg requirements were achieved in all rivers except Terra Nova River. However, it should be noted that accessible rearing habitat above the lower Terra Nova River fishway more than doubled with the opening of the area above Mollyguajeck Falls in the early 1990s. Smolt-to-adult survival for Northeast Brook, Trepassey in 1997 (adult year) was 2.9%, compared with the record high of 9.2% in 1996. The survival value for 1997 was the lowest of the moratorium years and the second lowest of the entire time series.

Comments: It was noted that the percentage of repeat spawners among brood stock collected from the upper Terra Nova River fishway was higher than for fish sampled in the recreational fishery.

Recommendations: It was recommended that the impact of the moratorium on levels of returns of repeat spawning grilse be examined by smolt class.

Observations of temporal and spatial variability in density and relative condition factor of juvenile Atlantic salmon (*Salmo salar* L.) in the Harrys River drainage system, insular Newfoundland, from 1987-97

Authors: J. L. Fitzgerald, R. Knoechel and C. C. Mullins

Summary: Spatial and temporal variability of juvenile population densities and juvenile relative condition in Harry's River, Newfoundland were examined from 1987-1997. Apparent differences in growth allometry (slopes from log weight: log fork length regressions) among sites and years were attributable to variability in stomach contents of the smaller fish and to sex and maturity status of the largest fish. Pooling of all weight-length data permitted comparison among relative condition factors (regression intercepts for specific sites/years) for all years and locations. The most extreme (low) relative condition factors observed were confined to headwater streams in 1987, which was an unusually dry year. The data indicated that fish of all sizes and ages were under stress at those sites. Environmental conditions such as water discharge and monthly temperature ranges will be further explored in relation to spatial and temporal variability in relative juvenile condition. There was no significant correlation between density and juvenile condition overall, however one site (site 12) with consistently high total densities displayed average to above average relative condition in all years. No significant correlations were found between relative juvenile condition and habitat factors in 1996; however, potential relationships with benthic invertebrate abundance

remain to be explored. A declining proportion of females with increasing age class indicated that females made greater use of pond habitats than males. Observation of a high proportion (73%) of precociously mature males in the streams was consistent with the observed low proportion of males (29% in 1995) in adults returning from the sea. Circuli spacing within scale growth annuli will be used to determine growth rates of known precocious males during the year of sexual maturity to see if they differ significantly from non - maturing fish. Such information may provide a means of determining the proportion of precocious males from archived scales for all sites and years. Pre- and post-moratorium population densities provide valuable information regarding the future adult stocks on Harry's River. Changes in relative condition with increasing density will highlight those locations on Harrys River which are optimal for future spawners. Habitat conservation efforts should be concentrated in these areas.

Comments:

1. The subjective methods used to record habitat data may be better quantified if each site were sectioned into smaller areas. Although standard criteria were used to measure each variable, habitat data may be more representative of each site if smaller sections were measured.

2. The potential relationship between juvenile population densities and spawning redds should be investigated.

3. A smolt fence on Harrys River would provide valuable biological information regarding the transitional life stage from juvenile to adult salmon. This would enable determination of age - specific sexual maturity for both males and females and would provide insight into the percent precocity of juvenile males in the system.

4. Circuli spacings on scales should be examined to detect precocity.

5. Climate data collected at the Harrys River gauging station should be examined in relation to juvenile production.

Recommendations:

1. A smolt fence should be installed on Harrys River to provide biological information on age - specific sexual maturity of smolts in the system. This would also provide data on the proportion of males and females which are smoltifying and migrating to sea.

Status of Atlantic salmon in Conne River, SFA 11, Newfoundland, 1997

Authors: J. B. Dempson and G. Furey

Summary: Conne River flows into Bay d'Espoir on the south coast of Newfoundland. Adult salmon escapements have been monitored with a fish counting fence since 1986 while smolt populations have been surveyed by mark-recapture since 1987. In 1997, returns to home waters (river and estuary) were 3200 salmon < 63 cm in length (small) and 185 salmon ≥ 63 cm (large) in size. This represented a decrease of 28% for small salmon in comparison with the previous year. Large salmon returns were similar to those of 1996. Sea survival to 1SW salmon fell to 2.64%, the lowest value recorded and coincided with the earliest median smolt run timing recorded to date. Estimated egg deposition from small and large salmon represented 70% of the current Management Target of 7.8 million eggs, but met 125% of the conservation egg requirement. Analysis of Conne River salmon biological characteristic data indicated that the proportion of previous spawners in the small salmon category remained high in recent years. During the past two years, smolt runs at Conne River have been the largest recorded.

The commercial salmon fishery moratorium has had a negligible impact on the Conne River salmon stock. Salmon returns and sea survival rates continue to remain below levels experienced during the premoratorium period (1986-1991).

Comments

1. Conne River is distinguished from other Newfoundland salmon rivers in having a defined Management Target for the required number of eggs or fish. This is different, and higher, than a conservation requirement based on the habitat approach in place elsewhere in the Province. The management target was derived from fluvial habitat x 2.4 eggs/m^2 and egg/recruit applied to the 1987 total population size as determined from an assumed commercial exploitation rate.

2. It was noted that estimates of egg-to-smolt survival have increased coincident with declining egg depositions per unit area of fluvial habitat. The increased freshwater survival and highest smolt production on record is consistent with a number of other salmon stocks that have experienced increased freshwater survival in recent years.

The status of the Atlantic salmon stock of the Northwest River, Bonavista Bay (SFA 5), Newfoundland, 1997

Author: M. Simpson

Summary: The status of the Atlantic salmon on the Northwest River in 1997 was determined through the use of two salmon counting facilities. A salmon fence located at Stick Pool approximately 0.5 km. from the river mouth yielded counts of 408 small and 115 large salmon, while a trap located in Northwest Falls fishway approximately 2.5 km. upstream of Stick Pool counted 466 small and 182 large salmon. The higher upper trap values are thought to be due in part to a late start date at the lower trap, and in part to individual salmon passing through the Northwest falls fishway on more than one occasion. The river therefore achieved between 36% and 46% of it's conservation egg requirement compared to 55% in 1996 and 40% in 1995. The river was closed to recreational fishing in 1996 and 1997.

Comments:

1. The discrepancy between the upper and lower trap counts was noted and discussed. The consensus was that lower trap because it was not operational as early as the upper trap probably missed a few early fish that were counted by the upper trap. However, the upper trap count was thought to be artificially high as 8 out of approximately 235 tagged salmon are known to have passed through the trap at least twice. Consequently, it was decided to use the data from both traps to present a range rather than a specific number of returning salmon.

Recommendations:

1. Biological characteristics data from the SIAC system should be incorporated into future assessments.

Counts of Atlantic Salmon in Grand Bank Brook, Fortune Bay (SFA 11), Newfoundland

Authors: M. F. O'Connell

Summary: Counts of Atlantic salmon have been obtained from a fishway located in Grand Bank Brook since 1986. Grand Bank Brook serves as a water supply for the town of Grand Bank. A survey to determine the amount of fluvial rearing habitat available has to be performed before the conservation spawning requirement can be determined for this brook, and hence status of stock. Counts of small salmon have ranged from 46 in 1991 to 221 in 1996 and large salmon from 2 in 1988 to 35 in 1992.

Comments: None.

Recommendations: A habitat survey should be conducted and the conservation spawning requirement determined. The amount of angling above and below the fishway has to be determined in order to calculate total returns and spawning escapement. A minimum flow requirement below the fishway should be established.

Status of two enhanced Atlantic salmon (*Salmo salar* L.) stocks of the Newfoundland Region in 1997

Authors: C. E. Bourgeois, J. Murray, and V. Mercer

Summary: Stock assessments were conducted for two enhanced rivers namely Rocky (SFA 9) and Little River (SFA 11) with updates of fry stocking activities provided on three other rivers namely Romaines River and Flat Bay Brook (SFA 13) and Piper's Hole River (SFA 10). Stock status was determined for Rocky River and Little Rivers through complete counts of large and small salmon at a fishway and counting fence respectively. Fry stocking was conducted on all rivers except Rocky River in the spring of 1997. Rocky and Little rivers received 56% and 202% of their respective conservation egg depositions. Rocky and Little rivers are closed to recreational fishing. The 1997 escapement to Rocky and Little rivers were the highest and second highest in the two time series respectively. A total of 50,138, 149,555 and 86,903 fry were distributed to Romaines, Flat Bay and Piper's Hole rivers respectively in 1997. Smolt-to-1SW survival for Rocky River decreased to 2.8% for the 1996 smolt class. Rocky River recorded the highest smolt run to date in 1997 of 16,900. A forecast of returns is only available for Rocky River which suggests between 410 and 740 1SW salmon.

Comments: None.

Recommendations: None.

Status of Atlantic salmon (Salmo salar L.) in Highlands River, Bay St. George (SFA 13), Newfoundland in 1997

Authors: D. G. Reddin and R. R. Whalen

Summary: The status of Atlantic salmon in Highlands River in 1997 was determined from the number of salmon counted through separate portable fish counting weirs (fence) for smolt and adult salmon located on the main stem just above head of tide and biological characteristics data from kelt. The assessment was conducted in response to major management changes that were first introduced in Bay St. George in 1978, further restrictions were made in 1992 which continued in 1993-97 with the moratorium on commercial salmon fishing in Newfoundland. Adult returns in 1997 were 398 small salmon and 157 large salmon, respectively. The 1997 smolt count of 6,776 is the lowest on record for 1980-82 and 1993-97. The smolt and adult counts are complete. Sea survival for the 1995 smolt class was 2.9% including the small salmon returning in

1996 and large salmon in 1997. Sea survival for the 1996 smolt class was 3.2% for the small salmon returning in 1997; the highest on record. The proportion of the conservation requirement achieved for Highlands River in 1997 was 101%. This is the highest in the time series. On average for the period of 1980-82 and 1993-97, Highlands River achieved 58% of its conservation requirement.

Population estimates of juvenile salmon were made at 5 sites. At all stations, underyearlings were fewer than in 1995 and biomass was lower. An exceptionally high flood in February of 1996, prior to emergence of fry, moved massive amounts of substrate and was likely to have had a negative effect on the 1996 year class. Densities of the older parr were somewhat lower but not affected to the same degree.

Comments:

1. Juvenile surveys should continue to track the population recovery from the flood that occurred in February of 1996.

Recommendations:

1. Because of the low smolt output in 1997 and even if the high sea survival experienced in 1997 on the 1SW salmon returns continues may result in less than 100% of conservation requirements being achieved in 1998.

Status of Atlantic salmon (*Salmon salar* L.) populations in Crabbes and Robinsons Rivers, and Middle Barachois, Fischells and Flat Bay Brooks, Bay St. George's, Newfoundland, 1997

Author: T. Rex Porter and C. E. Bourgeois

Summary: Adult Atlantic salmon were visually counted in Crabbes River, Middle Barachois Brook, Robinsons River, Fischells River, and Flat Bay Brook in the last week of August by swimmers snorkeling down each river. Each river was divided into four or five sections, and each section was surveyed by a crew of two to six people. The larger tributaries were also surveyed. Salmon were usually found in pools with water depths greater than 1 m. An adjustment factor was applied to the counts in each section surveyed to account for fish not observed in larger pools. Retention was permitted in the angling fishery on Fischells Brook from June 19 to July 27; hook-and-release angling was permitted on all rivers from June 1 to September 1. The numbers of salmon retained and 10% of the hooked-and-released in the angling fisheries were added to the adjusted survey counts to give the total returns to each river. The estimated numbers of salmon counted in each river are: Crabbes River, 346 large and 1121 small salmon; Middle Barachois Brook, 182 large and 1044 small salmon; Robinsons River, 172 large and 1017 small salmon; Fischells Brook 73 small and 599

large salmon; Flat Bay Brook, 167 large and 1282 small salmon. Middle Barachois Brook was the only river that attained (148%) its conservation egg requirements. Crabbes River achieved 95% of its conservation requirements; and, Robinsons River achieved 91%, Fischells achieved 44%, and Flat Bay Brook achieved 89% of their conservation requirements. The estimated percentage of conservation levels attained for Crabbes River, Middle Barachois Brook, Robinsons River, and Flat Bay Brook in 1997 were higher than the levels estimated for 1996; and they are the highest estimated for the past 15 years. The spawning stock on Fischells Brook was at very low levels in 1997 and fishing mortality should be reduced. The information available did not lend itself to forecasting the abundance of salmon expected to return in 1998; however, the increased abundance of small salmon in rivers other than Fischells Brook, in 1997 compared to 1996, would suggest that there may be a slight increase in large salmon in 1998. The abundance of small salmon in 1998 may be lower due to the severe flooding in February 1996, which may have caused an increase in mortality of juvenile salmon.

Comments:

1. The visual survey appears to be a reasonable and inexpensive technique for assessing the spawning populations in Bay St. George's Bay. There may be some observer differences in sizing salmon as well as completeness of counts. Further insight is needed to determine observer effect. The biological characteristics used in the assessment were derived from other stocks and may not be correct for the present populations. Survey crews noted differences, among rivers, in size of small and large salmon. There is a discrepancy in the estimates of the number of salmon angled in some rivers and the estimated number of fish in the rivers. This could be caused by anglers catching kelt, and multiple catches of same fish or bias in the estimate of angled fish from the License Stub Return System.

Recommendations:

1. The counts and the sizing of fish by each team should be calibrated and considered in the adjustment factor.

2. Biological characteristics information should be collected for salmon in each river. One method to collect this information would be by seining the fish in September.

3. Continue to investigate techniques to improve estimates of numbers of salmon in the large pools where visual counting is ineffectual.

Status of the Atlantic salmon (*Salmo salar* L.) stock of Harrys River/Pinchgut Brook, Newfoundland, 1997

Authors: C. C. Mullins, D. Caines and D. S. Drodge

Summary: Spawning escapements and potential egg depositions have increased on Harrys River in the last six years. However, spawning has been at most 52% of the conservation requirement. The recreational fishery was closed to retention angling in 1997 and no angling was permitted in the headwaters upstream from Home Pool. Anglers reported high water levels early in the 1997 season on Bay St. George rivers which may have affected angling effort and catches. Counts of small and large salmon at the counting fence on Pinchgut Brook were above those in 1996 and the 1992-96 mean. The count of large salmon and the proportion of large were the highest recorded in six years of assessment. A spawning survey was again conducted on the entire Harrys River system in mid-November. The results of the survey indicated that the Pinchgut Brook system accounted for 37% of the spawning on Harrys River in 1997 compared to 33% in 1996 and 41% in 1995. Based on the results of the survey, it was estimated that the total spawning escapement on Harrys River in 1997 was 1,841 salmon, 5% less than in 1996 but 62% greater than the 1992-96 mean. Spawning escapements have increased since 1992 but the conservation egg deposition requirement has not been achieved in six years of assessment. Potential egg depositions in 1997 were 50% of the conservation requirement of 7.8 million eggs. If retention angling had been permitted on the river in 1997, potential egg depositions would have been even lower.

Comments:

1. There is a great deal of concern about the status of the salmon stock on Harrys River. The river once produced the highest catches of all rivers in the Bay St. George area of SFA 13. The technique of using the percentage of spawning on Pinchgut Brook to estimate the total spawning escapement on Harrys River is a reasonable and inexpensive method of assessing the status of this stock. Previous attempts at using a counting fence to assess the entire run were unsuccessful due to extreme fluctuations in water levels. There has been little variation in the distribution of spawning on Harrys River in the three years of the survey. At this point in time, the spawning survey needs to be completed every year until all spawning areas are identified.

Recommendations:

1. Biological characteristics information for small and large salmon needs to be updated for Harrys River based on internal sex determination.

2. Conduct visual surveys of spawners on portions of the river as a verification of estimates based on the percentage of spawning on Pinchgut Brook.

3. Check redds at the test site for the presence of eggs to determine if false redds are being counted.

4. Spawning survey crews should recount the redds at the test after the survey is completed in order to evaluate the overall accuracy of redd counts.

Status of the Atlantic salmon (*Salmo salar* L.) stock of Humber River, Newfoundland, 1997

Authors: C. C. Mullins and D. Caines

Summary: This is the eighth assessment of that portion of the Humber River salmon stock that enters the river in June to August. A mark and recapture technique is used to estimate the run size. Returns of small salmon in 1997 were 51% less than in 1996 and returns of large salmon were 3% less. The returns of small salmon were the second lowest since 1992, whereas, the returns of large salmon were the third highest since 1992 and the proportion of large salmon was the highest recorded. The conservation egg deposition requirement was achieved in 1997. However, the potential egg deposition would have been much lower if the proportion of large salmon in the population had not increased from 1992-96 levels. Returns of small salmon are expected to increase in 1998. However, given the unexpected decline in returns in 1997 compared to 1996, the expectations for 1998 should be viewed with caution. Recreational harvests in 1998 should be closely monitored to avoid over exploitation of the resource if returns are lower than expected.

The view of anglers at public consultations meetings in 1997 was that there were more fish on the Humber River than indicated by the in-season review. This view is supported by the assessment.

Comments:

1. The fall run of salmon to the Lower Humber River appears to contain all age groups including previous spawners. Thus, the actual population of three-sea-winter salmon may be very low. The mark-recapture project is essential for assessing the Humber River salmon population.

Recommendations:

1. In order to assess the status of the Humber River stock in 1998 using the mark-recapture technique, greater effort will need to be put into either increasing the number of salmon tagged in the estuary or in developing a method of tag recapture that is not dependent on the recreational fishery. This is due to the additional restrictions that are proposed for the recreational fishery in 1998 which will limit the number of tags recaptured by anglers.

Status of Atlantic salmon (*Salmo salar* L.) stocks in Lomond River, Torrent River and Western Arm Brook, Newfoundland, 1997.

Author: C. C. Mullins and D. Caines

Summary: Atlantic salmon stocks are assessed based on counts of adult salmon at fish passage facilities on Lomond River and Torrent River and at a counting fence on Western Arm Brook. These facilities have been monitored since 1961 in the case of Lomond River, 1966 for Torrent River and 1971 for Western Arm Brook. The count of small salmon at the Lomond River fishway in 1997 was 30% greater than in 1996 but the counts of small salmon at Torrent River and Western Arm Brook were 50% less. The count of large salmon at Lomond River in 1997 was 22% less than in 1996 but the counts of large salmon at Torrent River and Western Arm Brook were 30% and 10% greater than in 1996. The proportion of large salmon has increased at all three facilities since 1992 and the proportion of large salmon was the highest on record at Torrent River and Western Arm Brook in 1997. The low returns of small salmon, at Western Arm Brook, in particular, in 1997 was unexpected because the marine survival of smolts had increased in the last five years following the commercial salmon fishery moratorium. The returns of small salmon represented only 3.0% of the smolts produced in 1996, 50% less than the 1992-96 mean survival. The smolt production on Western Arm Brook in 1997 was the highest recorded. Counts of small and large salmon on all three rivers in 1997 were greater than the 1984-91 mean prior to the moratorium. Conservation egg deposition requirements were exceeded on all three rivers in 1997 and in all years since 1992. On the basis of the ratio of recruits to spawners observed in recent years, returns of small salmon on Lomond River, Torrent River and Western Arm Brook are expected to increase in 1998. However, if marine survival of smolts continues to decline, returns to these rivers in 1998 will again be lower than expected. The total population size of small salmon in some pre-moratorium years was greater than in moratorium years for all rivers and this trend is not expected to change in 1998.

Comments:

1. There has been a significant increase in the total population size of small salmon on Torrent River. This is attributed to the enhancement program carried out in the early 1970s which involved transfers of adult salmon from Western Arm Brook.

Recommendations:

1. Habitat estimates for Torrent River should be verified from digitized 1:50,000 scale topographic maps and from in-stream measurements. In comparison to habitat available on Lomond River which has a smaller drainage basin area, the available habitat on Torrent River seems quite small.

2. Because a large portion of the total salmon habitat on the Lomond River is downstream of the fishway it is recommended that a mark-recapture experiment be conducted to determine salmon distribution within the entire system.

Northern Labrador Arctic charr: catch and effort update for 1997

Authors: M. Shears and J. B. Dempson

Summary: Northern Labrador Arctic charr landings in 1997 totaled 34 t, more than double that of the 1996 fishery but still only 58% of the previous ten-year (1987-96) mean of 65.4 t. Charr landings from the Nain Fishing Region were 38 t or 89% of the northern Labrador total. Nearly two-thirds of the Nain catch originated from subareas north of Black Island. For the first time since 1993 effort in the northern Labrador charr fishery increased. The increase was largely related to the issuance of new 'charr-only' fishing licenses. Areas where effort increased included the Voisey and Okak stock units. The experimental in-river terminal harvest of charr at Southwest Arm Brook, Saglek Fiord continued in 1997 with 2615 (4.1 t) fish delivered to the fish plant in Nain. Information on catch- and weight-at-age for each of the Voisey, Nain, and Okak stock units were updated along with data on numbers of charr tagged and released. It was again noted that there are no independent estimates of Arctic charr abundance for any of the stock unit areas. In the absence of river-specific information on charr abundance and monitoring of stock characteristics, only general statements can be made regarding the status of north Labrador charr populations.

Comments:

1. Aerial surveys of rivers can provide qualitative information on Arctic charr abundance. Fish counting fence projects, however, are required to determine actual abundances and variation among years.

Appendix 1
Newfoundland Region Salmonid Stock Assessment Meeting
March 9-13, 1998
Northwest Atlantic Fisheries Centre, St. John's
Chair: Dave Reddin

AGENDA

The meeting is scheduled to start on Monday, March 9 at 0900 hrs and to end on Friday, March 13 at 1600 hrs. There will not be a meeting on Thursday which is set aside for any re-analysis if required. The following is an outline of the topics for discussion and an order of presentation of working papers.

Monday, 9 March (Belle Bay Boardroom)

(0900-1215) Morning session

1. Call to order (0900 hrs)

2. Finalization of agenda

3. The Newfoundland Region stock assessment and documentation process - format and contributors to the Zonal Report, Stock Status Reports and individual stock summary sheets (5 areas), and proceedings documentation.

4. Atlantic salmon licence stub returns for 1994-97

5. Marine & freshwater environments in 1997

6. Stock status report on low returns in 1997

(1300-1700) Afternoon session

7. 1997 General stock status report Newfoundland & Labrador salmon

    7.1 Insular Newfoundland
    7.2 Labrador

8. Atlantic salmon river-specific stock assessments

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

        8.11 Pinware River
        8.12 Forteau Brook
        8.13 Big Brook (Michaels River)

    8.2 Northeast and east coasts Newfoundland (SFAs 3-8)

        8.21 Exploits River
        8.22 Campbellton River

Tuesday, 10 March (E B Dunne)

(0900-1215) Morning session

    8.2 Northeast and east coasts Newfoundland (SFAs 3-8)

        8.23 Gander River
        8.24 Gander River - juvenile production and predicted adult returns
        8.25 Middle Brook
        8.26 Terra Nova River
        8.27 Northwest River, Terra Nova National Park

    8.3 South Newfoundland (SFAs 9-11)

        8.31 Northeast Trepassey
        8.32 Rocky River

(1300-1700) Afternoon session

    8.3 South Newfoundland (SFAs 9-11)

        8.33 Northeast River, Placentia
        8.34 Grand Bank Brook
        8.35 Little River
        8.36 Conne River

Wednesday, 11 March (E B Dunne)

(0900-1215) Morning session

8.4 Southwest Newfoundland (SFAs 12-13)

- 8.41 Highlands River
- 8.42 Robinsons, Middle Barachois, Flat Bay & Crabbes
- 8.43 Harry's/Pinchgut
- 8.44 Harry=s River juvenile production data
- 8.45 Humber River

8.5 Northern Peninsula West (SFA 14A)

- 8.51 Lomond River
- 8.52 Torrent River
- 8.53 Western Arm Brook

(1300-1700) Afternoon session

9. Arctic Charr

10. Any other business

Friday, 28 February & Wednesday, March 5 (E B Dunne)

(0900-1215 & 1300-1600) Morning & afternoon sessions

12. Re-analysis & 2nd thoughts

February 17, 1998

To: Distribution

Subject: **1998 Regional Salmonid Assessments**

Science Branch will be conducting its annual assessments of salmonid stocks in Newfoundland and Labrador from March 9-13 (if required) at the Northwest Atlantic Fisheries Centre, St. John's. The assessment meeting provides an opportunity for peer review of assessment methodology and interpretation of results; accordingly, we are inviting you as an expert to participate in the review process.

Attached you will find the agenda for the meeting. I intend to run the meeting in the standard assessment format of presentation of the working paper by the author with a rapporteur for each paper to keep track of comments. There are three sets of documentation emanating from the regional salmonid assessments - Research Documents which are up to individual authors, a proceedings report providing summaries of the meeting, and Stock Status Reports with the Stock Summary Sheets. I anticipate having completed the review of working papers by Wednesday 11 March. I request that all authors come to the meeting with a summary of their working papers for the Proceeding Report already prepared in electronic form to which the author will add the comments and recommendations after he (she) has presented their paper. I have a template for the Stock Status Reports in Microsoft Word and a copies of last years report if anyone wants it. It would simplify matters if Stock Status Reports could be prepared in Word.

Dave Reddin

Appendix 2
List of Participants

Bourgeois, Chuck	DFO, Science, St. John's NF
Dempson, Brian	DFO, Science, St. John's NF
Fitzgerald, Jennifer	MSC student (MUN/DFO)
Gibson, R. John	DFO, Science, St. John's NF
Hinks, Ross	Conne River Indian Band Conne River NF
Knoechel, Roy	Dept. of Biology, Memorial University of Newfoundland and Labrador, St. John's NF
Meerburg, Dave	DFO, Science, Ottawa ON
Montevecchi, Bill	Dept. of Psychology, Memorial University of Newfoundland and Labrador, St. John's NF
Mullins, Conrad	DFO, Science, Corner Brook NF
O'Connell, Mike	DFO, Science, St. John's NF
Porter, T. Rex	DFO, Science, St. John's NF
Reddin. Dave	DFO, Science, St. John's NF
Ryan, Pat	DFO, Science, St. John's NF
Simpson, Mark	Parks Canada, Terra Nova National Park, Gloverton NF
Sqiures, Nicole	Memorial University of Newfoundland and Labrador O'Donnell High School – Mount Pearl NF
van Zyll de Jong, Mike	Department of Natural Resources Gov't. of Nfld.and Labrador, St. John's NF

Appendix 3
List of Working Papers

1) O'Connell, M.F., N.M. Cochrane, E.G.M. Ash and C.C. Mullins. An analysis of the results of the license stub return system in the Newfoundland region, 1994-97.

2) Colbourne, E. Oceanographic conditions in the Newfoundland region in 1997.

3) Drinkwater, K.F., J. Helbig, R. Pettipas, and L. Petrie. Marine environmental conditions in the Northwest Atlantic during 1997 potentially impacting Atlantic salmon (*Salmo salar*).

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Appendix 4
Results of DFO Public Meetings on Atlantic salmon Stock Assessments in Newfoundland and Labrador, 1997

Purpose: To seek input form anglers and the general public on possible causes of the low salmon returns to Newfoundland rivers in 1997.

Background: Science Branch staff presented the results of adult salmon counts at monitoring facilities in 1997 and reviewed the reasons why numbers were expected to be higher. Counts on most monitored rivers were lower in 1997 than in 1996 even though the smolt production in 1996 had been the highest recorded. The lower survival of smolts to adults indicated that the cause of the low returns was in the marine environment as opposed to freshwater and could not have been predicted based on historical stock assessment information.

The meeting was then turned to an open discussion of possible sources of marine mortality. Participants were asked to draw on their own experience and knowledge to either confirm or refute some of the possible causes that had already been identified and to suggest new ones.

ST. JOHN'S, DECEMBER 4, 1997

The meeting was called to order at 1930 hours by B. Dempson.

Approximately 30 people were in attendance. Representatives of the Salmonid Council, SAEN, FFAW, Evening Telegram, CBC Radio, VOCM Radio and the general public were in attendance

Presentations were made by B. Dempson and D. Reddin with C. Bourgeois recording the minutes. Presentations included reviews of the counts of adult salmon and smolts at fish counting facilities in insular Newfoundland; a review of evidence which shows a change in sea survival, a review of why expectations were for high salmon returns in 1997, and a discussion of probable causes for the low returns as well as discussion on various aspects of marine life history salmon. It was pointed out that the declines in returns of small salmon were most dramatic along the Northwest and Northeast coasts (a 38% to 59% decline from 1996). Returns of small salmon to rivers in Bonavista Bay and along the south coast appeared to be down by about 30%. The only exception to the wide spread decline which occurred in insular Newfoundland, appears to be in Bay St. George's where returns were equal to or better than in 1996. The returns of large salmon, generally, did not show the same magnitude of decline in numbers. The low returns were a direct result of a significant decline in sea survival. DFO has not determined the cause of the sharp decline; but it does not appear to be related to any marine fisheries. Although the cause is unclear, a change in natural mortality seems, at this time, to be the most probable cause.

Issues and concerns raised at the meeting

- It was stated that 1997 was not as disastrous as most people have been led to believe. It was also noted that several rivers (i.e. Garia Bay and Long Harbour in particular) appeared to have very good runs of salmon in 1997.
- The issue of unknown bycatch was raised. Capelin fishermen noted that there was less salmon bycatch this year and last year as compared to previous years.
- Some people commented that the sentinel fishery was catching "lots" of salmon. This statement was contradicted by L. Sullivan, a commercial fisherman, who is involved with the sentinel fishery and had a cod trap in the water for 28 days and caught no salmon. He suggested that a commercial test fishery for salmon be conducted to assist scientists with data collection. It was pointed out to Mr. Sullivan that there was presently a commercial salmon fishery in Labrador. It was also pointed out that the number of sentinel fishermen is very low compared to effort prior to the moratorium on the salmon fishery.
- The issue of having to throw back meshed salmon was raised. Some individuals present felt fishermen should be allowed to retain these fish.
- The St. Pierre commercial and recreational salmon fishery was raised. Attendees were informed that DFO receives statistics through ICES from St. Pierre regarding catch and the numbers of salmon caught in this fishery are low.
- R. Maddigan asked if it was generally felt that the total population size of salmon was down?
- A question was asked regarding the size of repeat spawning salmon and the attendees were informed that consecutive repeat spawners usually are less than 63 cm.
- It was asked where the salmon were being hit the hardest in the bays/estuaries or on the high seas.
- It was questioned if it was felt that the runs of salmon were later this year and if warm temperatures and low water kept the fish from entering freshwater until later in the year. It was pointed out that the DFO extended operating dates on several of its counting facilities to answer this question. Some fish but not significant portions of the run were encountered during these later dates.
- The point of counting fence/facility washouts could lead one to believe that runs were down when they may not have been. It was pointed out that the information available from counting facilities did not suggest this but again we were only certain of rivers where counts are available.
- R. Maddigan asked why DFO makes forecasts when they are invariably wrong.
- An individual noted that possibly heavy metal pollution in the ocean may be the cause of low salmon abundance. He suggested that most heavy metal toxins are getting deposited in the Arctic and may be coming down the Labrador Current. He noted that this may also be the cause of the cod stocks moving inshore.
- A comment was made that the mesh size of capelin leaders should be more regulated in terms of minimum mesh size.
- It was noted that the condition (size and weight) of returning salmon in 1997 appeared to be good suggesting that whatever caused the low abundance did not affect the growth of the surviving fish.

- R. Maddigan noted that in his opinion poaching was up in 1997 with the protection effort being half of previous years. It was his opinion that 20-25% of the fish on the Southwest coast were net marked. He felt that the stock should be protected as a first priority and then worry about what caused the low abundance.
- The issue of trout nets in Labrador was raised with respect to a high salmon by-catch in the vicinity of Michael's River.
- It was felt by a few individuals that the salmon resource was being transferred to the recreational fishermen and as such the commercial fishermen wanted half of the 1998 allocation for a commercial fishery.
- R. Maddigan questioned if a retention recreational fishery would be allowed on healthy rivers in 1998, and if not why not.

The meeting adjourned at 2205 hours.

GANDER, DECEMBER 4, 1997

The meeting was called to order by M. O'Connell

The presentation focused mainly on the status of the Gander River stock in 1997, an overview of stocks in general in insular Newfoundland, information used to forecast returns for 1997, and possible reasons for the poor returns in 1997.

Main points arising out of the meeting concerning both the Science presentation and the proposed GRMA Management Plan were as follows:

- The severity of the declines in general and the decline in the total population size for Gander River in particular in 1997, was acknowledged, and there appeared to be a general acceptance of the proposed measures put forward by GRMA.

- One person in the audience blamed the low returns on the harvesting of capelin in recent years, from the perspective that the fishery is depleting one of the main food resources of salmon. This perception was dominant amongst most of the gathering, even when presented with all the other possible causes for the low returns in 1997.

- There was criticisms of the low level of resources devoted towards understanding causes of mortality of salmon in the sea and of cut backs in funding for in-rivers projects since the demise of CASEC.

- There appeared to be a consensus among those present that outfitters should be given camp quotas, this was from the perspective of keeping 119 guides employed. This representative of the outfitters (Calvin Saunders) stated that camp quotas would provide stability in the market place as opposed to the uncertainty exhibited in 1997, which resulted in a higher manner of cancellations and a faltering image.

- The rumored marine exploitation by Portuguese ships was debunked.

- It appears that GRMA will not be seeking funding for continuing the counting fence beyond next year; they will be pursuing an alternate means of assessment such as mark-recapture and the Guigné counter.

Public Meeting – December 4, 1997, St. John's, Newfoundland

A Public Meeting was held in St. John's on the evening of December 4, 1997, to discuss issues related to the apparent low return of Atlantic salmon to Newfoundland rivers during 1997. Information was provided on the general status of the stock (based on preliminary information), the various sources of information used in the assessment process, as well as on various reasons why the low returns were unexpected. A comprehensive list of factors that could have potentially impacted salmon return was presented, followed by an open discussion with the audience.

Note: Both CBC radio and VOCM radio personnel were present and taped the entire proceedings of the Public Meeting.

It was noted that a workshop to address the issue of 1997 returns is planned for February, 1998, that will encompass Quebec and maritime salmon stocks as well.

Issues raised during the meeting:

- Need more rivers surveyed for salmon abundance.
- Need additional work done in the marine environment
- Need additional work on predation by cod and seals
- Research on impacts related to toxic substances is required
- Some rivers on the south coast are too small to be considered representative of other south coast salmon rivers.
- Records of salmon by-catch in the sentinel cod fishery should be obtained
- Substantive numbers of salmon are caught in capelin gear. Fishers should be allowed to keep any salmon caught. At least the Department could then obtain useful by-catch information on the amount of salmon caught
- Eel traps do not catch salmon parr. Don't bring in any more regulations that would curtail eel fishers activities
- The amount of poaching has increased by 3-4 times this past year
- The first priority for the Department should be to protect the salmon we have and worry about finding reasons for what happened next
- Raw sewage deposited directly into Conception Bay is largely responsible for the why there are no salmon in the local rivers anymore
- On rivers that are "healthly" salmon should be allowed to be caught and thus angling should be either maintained or increased on these rivers

STEPHENVILLE, DECEMBER 4, 1997

Meeting attendance: Stephenville Dec. 4, 1997 (7:30 p.m. - 11:00 p.m.)

AFFILIATION	NUMBER OF PARTICIPANTS
1. Unaffiliated sport fishers and others	17
2. Bay St. George Hunting and Fishing Association	11
3. SPAWN	7
4. ASF	1
5. DFO	1
6. Bay St. George Salmon Advisory Committee	1
7. Indian Head Rod and Gun Association	1
8. Codroy Valley Development Association	2
9. Media	3
TOTAL	44

Points and Questions Raised:

- There was general agreement that the floods experienced in Bay St. George rivers in the winter of 1995 would have had an impact on smolt production in these rivers and this was most likely the reason for the low smolt count on Highlands River in 1997.

- The high water levels early in the 1997 recreational salmon fishery resulted in lower numbers of anglers on the rivers and may have resulted in the higher spawning escapements indicated by the preliminary assessment results for Bay St. George rivers.

- What is the effect of disease and pollution from aquaculture industry on wild stocks?

- Arctic char escapees may have affected juvenile salmon survival on the Humber River. If seals don't eat salmon then why is ASF against seals? **A**: Predation by seals and cod need to be substantiated.

- How accurate were predictions of adult returns in previous years? A: We have typically underestimated the anticipated returns because our predictions are based on an average smolt-to-adult survival rate.

- Is it possible that salmon are now feeding somewhere else in the north Atlantic given that they did not always occur off west Greenland - at least the Greenlanders did not know about them?

- There is a high level of agrilcultural pesticide use in the Bay St. George area that could end up in the estuaries and affect food availability of where smolts.

- What is the population of large salmon in our rivers?

- Mr. Ivan Young presented information from the logbooks of a former commercial salmon fisherman in Bay St. George: In the 1990-91 this fisherman caught 2500 lb. of salmon with one half the gear he used to catch 5000 lb. in the 1950s. Therefore, is the population really down?

- Whatever happened in 1997 to cause the low returns in other parts of the island did not happen in Bay St. George because returns were good in 1997. However, the problem of low returns is widespread. It also occurred in Europe. Therefore, whatever the cause it is having a wide effect. It is probably marine poaching.

- If you superimposed the graphs of seal and salmon population size over time there would probably be a correlation.

- Maybe something caused the smolts/adults to group together more at sea and made them more vulnerable.

- Do kelts eat smolts, given that they both migrate to sea at about the same time?

- Seals in estuaries and in rivers can have an effect on adult returns. There are now more seals in the sea than salmon. Seals have been sighted in rivers.

- Lampreys are known to occur in this area and could be killing salmon.

- There are more seagulls at the mouths of rivers now than in the past. Several hundred were seen staging at the mouth of Fox Island River during the smolt run.

- Oily bilge water discharge from tankers at sea could be having an effect on sea-survival.

- There were more salmon on the Humber River in 1997 than indicated by the in-season review. **A:** In-season review based on creel survey results at Big Falls. Tag return information to-date already suggests a higher return than in the in-season review but only about half of 1996.

Other Concerns:

- There was general concern for the high angling pressure on Little Barachois River and S.W. and Bottom Brooks in 1997. People felt that this should be addressed.

- There is a great deal of clearcutting around Bay St. George rivers and others. There should be more enforcement of cutting regulations. Clearcutting causes loss of fish habitat in rivers and could result in lower survival of salmon.

- The meeting ended with unanimous support for more funding to be directed towards marine research and testing of hypotheses on the causes of marine mortality. We need to determine the cause of the high mortality at sea so that better predictions can be made of adult returns in the future given the high value of the salmon resource in Newfoundland.

GRAND FALLS, DECEMBER 17, 1997

The meeting was called at the request of Mr. David Barker, a concerned citizen and sports fisherman. Mr. Barker felt that there were sufficient numbers of anglers interested in having an input into the review and evaluation of the level of abundance of Atlantic salmon in 1997 to warrant a public meeting in Grand Falls - Windsor. The meeting was attended by 35-40 people, several of which came from as far away as Springdale, Brighton, Lewisporte, and Botwood. There were representatives from the Indian River Watershed Management Committee, Exploits Watershed Management Association, Environment Resource Management Association, commercial fishermen, sport fishermen, and DFO.

The meeting was opened by Mr. David Barker followed by a presentation by Rex Porter, Science Branch DFO. The presentation included a review of the counts of adult salmon and smolts at fish counting facilities in insular Newfoundland; a review of evidence which shows a change in sea survival, a review of why we thought there would be high salmon returns in 1997, and a discussion of probable causes for the low returns. It was pointed out that the declines in returns of small salmon were most dramatic along the Northwest and Northeast coasts (a 38% to 59% decline from 1996). Returns of small salmon to rivers in Bonavista Bay and along the south coast appeared to be down by about 30%. The only exception to the wide spread decline which occurred in insular Newfoundland, appears to be in Bay St. Georges where returns were equal to or better than in 1996. The returns of large salmon, generally, did not show a decline in numbers. The low returns were a direct result of a significant decline in sea survival. DFO has not determined the cause of the sharp decline; but it does not appear to be related to any marine fisheries. A change in natural mortality seems, at this time, to be the most probable cause.

At the end of the meeting there was some discussion on the numbers of salmon returning to the Exploits River and management issues related to community watershed management.

Issues and concerns raised at the meeting:

- There were questions raised as to how the estimates of spawners and smolts were derived; and as to whether or not the methods used in the projections were sufficiently reliable to have warranted our expectation of high returns in 1997.

- For some rivers like the Exploits River, it would appear that 1996 was the anomaly, not 1997.

- The question was raised as to whether or not there are sufficient smolt counting facilities to provide a good indication of changes in sea survival for all salmon populations in insular Newfoundland.

- One angler felt strongly that DFO was dishonest and not presenting all of the information or the correct information to the public. He felt that DFO was being devious and was protecting the salmon for outfitters and the rich anglers.

- There was concern that the counting fences may have an adverse effect on salmon populations and may have been partly responsible for the low returns.

- There was a concern that the low returns in Conne River may be related to the development of the aquaculture industry. The disease problems may be affecting wild salmon in the area and the high numbers of steelhead trout that escape may be eating a large number of smolts.

- The point was raised that salmon have a 5 to 6 year cycle and that we have seen low returns before and stocks have rebounded. Maybe 1997 is just a one year low survival and that it will rebound next year.

- It was pointed out by one fisherman that there is still a major problem of by-catch of salmon in commercial gear, particularly in leaders to capelin traps, and bait nets for lobster fishing. Herring nets are used to catch bait for lobster in July, at a time when herring is not used for bait because it is too soft. The fisherman felt that in his area (Brighton) the by-catch of salmon in recent years may be as high as in years when there was a commercial salmon fishery. These high by-catches may be inhibiting the recovery of salmon populations. It was pointed out though, that there was not a dramatic increase in by-catch in 1997 to account for the decline in sea survival observed in 1997.

- Many people felt that predation by cod fish and seals was probably a significant factor in the low survival. However, it was recognized that in order for predation to cause a change in survival rate in 1997, there would have had to be a shift in the migration pattern of salmon; such as smolts staying close to the coast for longer period of time in 1996.

- The reduction in plankton abundance in the mid-Atlantic could have implications on the food available to salmon.

- There was a general belief that capelin should not be fished commercially because abundance appears low and that it is the food base for most predator fish and birds in the ocean. If we over fish capelin then there will be serious consequences. We may be already seeing this effect.

- The issue was raised that DFO may not have sufficient resources to properly conduct stock assessments or to properly investigate the cause of the low marine survival. Research should be directed at studying the predation by cod and seals on salmon.

- If causes of the low returns in Europe and Canada are related than changes in the environment may be a contributing factor.

Several Management Issues were raised:

- By-catch of salmon in capelin leaders and bait nets is a serious problem.

- There was a general concern that DFO would over react to the low returns in 1997 and close the recreational fishery.

- There was concern that community watershed management was leading to management of the salmon for outfitters, rich anglers, and unfairly limit access to the average angler.

- After the meeting several anglers mentioned the serious problem of hook and release mortality on the Exploits River. One angler saw 5 dead salmon in one back eddy which were obviously killed from hook and release. Causes of the mortality was related to poor.

Appendix 5
Summary Sheets

STOCK: Big Brook (Michaels River) (SFA 1) **Drainage area:** 793 km² (accessible)

CONSERVATION REQUIREMENT: 5.294 million eggs calculated as fluvial area x 2.4 eggs/m²

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	-	-	-	-	-	530	-	-
Large	-	-	-	-	-	104	-	-
Recreational harvest (small salmon)								
Retained	79	-	62	92	36	73	0	412
Released	-	-	22	21	12	32	0	32
Recreational harvest (large salmon)								
Retained	172	-	10	5	5	2	0	172
Released	-	-	1	0	0	1	0	1
Spawners								
Small	-	-	-	-	-	454	-	-
Large	-	-	-	-	-	102	-	-
Egg Conservation Requirement								
% met	-	-	-	-	-	-	-	-

[1] Min and max are for the entire period of record since 1974.

Data and Methodology: A complete count of the adult salmon migration was obtained from a portable fish counting fence for the first time in 1997. A hook-and-release mortality rate of 10% was used in the calculation of spawning escapement for 1997. Recreational data for 1997 came from DFO angling statistics collected from the outfitting camp on the river and are preliminary. Egg requirements for fluvial habitat were calculated similar to other rivers in North America, however, due to a lack of information on lacustrine rearing in Labrador, lacustrine habitat was not included in the calculation.

State of stock: Conservation requirements were not met in 1997. No number is available for percent of conservation requirement met due to the low number of adult salmon sampled from Big Brook. However, the percent of conservation requirement achieved was probably very low (less than 30%).

Forecast: No forecast available.

STOCK: Pinware River (SFA 14B) **Drainage area:** 2,486 km²
CONSERVATION REQUIREMENT: 11.8 million eggs (~ 4,654 small and 817 large salmon) is based on 2.4 eggs /m² and 105 eggs per ha of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river[2]								
Small	1880	1958	1117	1665	3084	874	874	5030
Large	647	445	271	590	426	179	135	1680
Recreational harvest (small salmon)[3]								
Retained	628	654	373	556	330	292	292	1680
Released	38	336	68	195	327	124	38	336
Recreational harvest (large salmon)[3]								
Retained	229	199	97	190	82		45	561
Released	0	26	10	76	14	127	0	127
Spawners								
Small	1248	1270	737	1089	2721	570	570	3350
Large	418	243	173	392	343	167	90	1119
Egg conservation requirement								
% met	37	28	18	33	52	16	16	83

[1] Min and max are for the period of record since 1974.

[2] Total returns for 1974-97 were estimated based on an angling exploitation rate of 0.3340 derived for 1997. Retuns in 1996 based on exploitation rate of 0.1070.

[3] Recreational catches for 1996 and 1997 are based on angler surveys.

Recreational catches: Catches of small salmon in recent years were low compared to the 1980s but catches of large salmon have increased slightly. Rod days of effort have generally increased in recent years and catch-per-unit-effort has continued to decline in comparison to the 1970s and 1980s.

Data and methodology: Recreational fishery data for 1997 are from an angler survey and data for 1996 was provided by fishing lodges and river monitors. Total returns to the river were based on angling exploitation rates derived from mark-recapture experiments in 1996 and 1997. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1985-97.

State of the stock: With the commercial salmon fishery closed in SFA 14B, the stock achieved 5-24% of the conservation requirement in 1997. The stock is currently at an extremely low level. It is estimated that the stock has not achieved the conservation requirement in recent years and that 1997 was the lowest recorded.

STOCK: Forteau River (SFA 14B) **Drainage area**: 389 km^2

CONSERVATION REQUIREMENT: 1.4 million eggs (~647 small and 49 large salmon) is based on 2.4 eggs/m^2 and 105 eggs per hectare of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river[2]								
Small	397	760	458	461	-	223	223	1342
Large	55	288	77	147	-	56	18	288
Recreational harvest (small salmon)[3]								
Retained	219	385	309	249	-	97	97	818
Released	23	78	18	32	-	39	18	78
Recreational harvest (large salmon)[3]								
Retained	9	43	4	19	-	-	3	43
Released	0	4	0	5	-	12	0	12
Spawners								
Small	178	375	149	212	-	122	105	524
Large	46	245	73	127	-	55	15	245
Egg conservation requirement								
% met	40	143	46	74	-	37	20	143

[1] Min and max are for the period of record since 1974.
[2]Total returns to river for 1974-93 and 1997 based on exploitation rates in the recreational fishery derived for 1994 and 1995.
[3]Recreational catches for 1996 and 1997 are based on creel census or the license stub return system.

Recreational catches: Catches of small salmon in recent years were low compared to the 1980s. Catches of large salmon increased slightly in recent years but remain extremely low compared to the 1960s. Rod days of effort have generally increased in recent years and catch-per-unit-effort has continued to decline in compared to the 1970s and 1980s.

Data and methodology: Counts are available from a counting fence operated in 1994-97. Counts in 1996-97 were partial. Recreational fishery data for 1997 are from the license stub return system and are preliminary. Estimates of angling exploitation are available for 1994-95. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1985-97.

State of the stock: With the SFA 14B commercial salmon fishery closed in 1997, the stock achieved 37% of the conservation requirement. The stock is currently at an extremely low level. It is estimated that there were years in the 1960 when the conservation requirement was achieved but it was achieved in only one of the last ten years.

STOCK: Exploits River (SFA 4) **Drainage area**: 11,272 km^2

MANAGEMENT TARGET: 95.9 million eggs (equivalent to 56,670 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to rivers								
Small	13504	22150	17556	16149	30316	15263	4740	19205
Large	314	627	916	941	2053	881	343	352
Recreational harvest (small salmon)								
Retained	1408	1655	3072	1302	1915	2996	577	3072
Released	-	2980	1145	1531	3202	2169	1145	3202
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	83
Released	2	59	30	72	111	0	0	111
Other removals[2]								
Small salmon	0	0	0	0	41	144	41	144
Large salmon	0	0	0	0	0	0	0	0
Broodstock removal	1078	0	62	76	0	0	31	5111
Spawners	11319	20818	15282	15628	30082	13007	2326	30082
Fry stocked	168224 1	1692970	0	0	0	0	212610	6416567
Egg conservation requirement								
% met:	31	44	34	34	61	26	6	61
Lower Exploits	101	159	90	95	166	70	26	166
Middle Exploits	20	23	26	24	42	19	2	42
Upper Exploits	2	6	7	12	26	9	0	125

[1] Min and max are for the period of record since 1974.
[2] Mortalities include removals for research.

Data and methodology: There are 35 million m^2 units of fluvial habitat and 34,000 ha of lacustrine habitat. Conservation egg requirements are to come from small salmon. Previous fry releases are backcalculated to eggs for derivation of % of conservation egg deposition achieved in areas stocked. Total returns to the river are based on the count at Bishop Falls fishway plus angling below the fishway. A hook and release mortality rate of 10% was used in the calculation of spawning escapements for the years 1993-97. Recreational data for 1997 are from River Guardians.

Broodstock requirements: None at present.

Recreational catches: The 1997 recreational fishery on the main stem of the Exploits River, upstream of Grand Falls was open only to hook and release for the entire season.

State of the stock: Overall returns to the Exploits River, have improved during the moratorium years; however returns to the upper section of the watershed are extremely low and all efforts should be made to increase escapement to this section of the watershed.

Forecast: No quantitative forecast available.

STOCK: Campbellton River (SFA 4) **Drainage area**: 296 km^2 (accessible)

CONSERVATION REQUIREMENT: 2.916 million eggs (~1480 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs per hectare.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	-	4001	2857	3035	3208	1975	1975	4001
Large	-	145	191	218	560	321	145	560
Recreational harvest (small salmon)								
Retained	311	316	340	393	463	238	23	1547
Released	-	103	4	47	93	62	4	103
Recreational harvest (large salmon)								
Retained	-	-	-	-	-	-	0	63
Released	-	0	1	1	31	7	0	31
Spawners								
Small	-	3675	2517	2637	2736	1731	2517	3675
Large	-	145	191	218	557	320	145	557
Egg conservation requirement								
% met		311	239	279	304	201	201	311
Smolt count		31577	41633	39715	58369	62050	31577	62050
% Sea survival								
(adult return year)			7.2	6.1	7.2	2.3	2.3	7.2

[1] Min and max are for the period of record since 1974.

Data and methodology: Smolts were enumerated at a counting fence. Returning adult salmon are enumerated at a fishing counting fence with a video camera system. A hook-and-release mortality rate of 10% was used in the calculation of spawning escapements for the years 1993-97. Recreational data for 1997 were from the license stub return system and are preliminary.

State of the stock: Conservation requirements were met from 1993 to 1997.

Forecast: No forecast available.

STOCK: Gander River (SFA 4) **Drainage area:** 6,398 km^2

CONSERVATION REQUIREMENT: 46.211 million eggs (21,828 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river								
Small	18179	26205	18273	22266	23946	10591	6745	26205
Large	4180	1734	1072	1121	1753	1883	473	4180
Recreational harvest (small salmon)								
Retained	1268	1271	2122	2598	2974	990	990	4578
Released	-	1950	448	612	1153	821	448	1950
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	-	92	39	74	73	152	39	152
Spawners								
Small	17143	24739	16106	19606	20822	9519	5565	24739
Large	4180	1725	1068	1114	1746	1868	473	4180
Egg conservation requirement								
% met	118	128	91	95	124	63	36	128

[1]Min and max are for the period of record since 1974.

Note: Any changes from previous years are due to the updating of preliminary data and biological characteristics information.

Recreational catches: Catches declined during 1981-91, before the salmon moratorium. Effort has increased substantially since 1994. The number of small salmon retained in 1997 was 990 (a decrease of 67% from 1996) and the number released were 821 compared to 1153 in 1996.

Data and methodology: Complete counts of salmon were obtained at a fish counting fence during 1989-97, and have historically been counted at a fishway located on a tributary, Salmon Brook. Recreational fishery data for 1997 are from the license stub return system and are preliminary. Data for large salmon for 1997 are incomplete. A hook-and -release mortality of 10% was used in the calculation of spawning escapements for the years 1993-97.

State of the stock: The percentage of conservation requirement achieved in 1997 was the lowest since the start of the commercial salmon fishery moratorium in 1992. Conservation egg requirement was achieved in three of the six moratorium years. Conservation requirement in terms of small salmon was met only in 1993. Using Salmon Brook as an indicator of returns to the entire river, it is likely that returns of small salmon of a magnitude similar to or greater than those in 1992-97 occurred in pre-moratorium years. The total population size in 1997 was lower than estimated for the three years immediately preceding the moratorium.

STOCK: Indian Bay Brook (SFA 5) **Drainage area:** 703 km^2

CONSERVATION REQUIREMENT: 4.6 million eggs (~2,055 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river								
Small	2500	7286	2445	4553	3241	1439	1411	7286
Large	N/A	N/A	N/A	N/A	N/A	352	-	-
Recreational harvest (small salmon)								
Retained	350	510	589	683	551	206	263	893
Released	-	225	171	288	36	58	36	288
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	-	0	1	0	0	14	0	14
Spawners								
Small	2150	6753	1839	3842	2687	1227	1143	6753
Large	N/A	N/A	N/A	N/A	N/A	351	-	-
Egg conservation requirement								
% met	-	-	-	-	-	106	-	-

[1]Min and max are for the period of record since 1974.

Recreational catches: In 1997, a total of 206 small salmon was retained and 58 were released.

Data and methodology: A complete count is available from a fish counting fence, which operated in 1997. Total returns of small salmon and number of small salmon spawners prior to 1997 were derived from angling data and exploitation rates. Recreational fishery data for 1997 are from the license stub return system and are preliminary. A hook-and-release mortality of 10% was used in the calculation of spawning escapement for 1997.

State of the stock: Conservation requirement in terms of eggs was achieved in 1997. In terms of small salmon only 60% of conservation requirement was met, which underscores the important contribution of large salmon to total egg deposition. The conservation requirement for small salmon was estimated to have been achieved in four of the six moratorium years.

STOCK: Middle Brook (SFA 5) **Drainage area:** 276 km^2

CONSERVATION REQUIREMENT: 2.3 millions eggs (1,012 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river								
Small	1563	2247	1844	1448	2112	1287	626	2247
Large	43	88	90	168	161	262	13	262
Recreational harvest (small salmon)								
Retained	423	299	409	402	476	77	28	789
Released	-	387	122	82	153	10	37	387
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	-	37	0	0	0	1	1	37
Other mortalities								
Small	-	-	-	3	16	-	-	-
Large	-	-	-	-	-	-	-	-
Spawners								
Small	1140	1909	1423	1037	1605	1209	461	1909
Large	43	84	90	168	161	262	13	262
Egg conservation requirement								
% met	148	238	174	114	250	196	49	250

[1]Min and max are for the period of record since 1974.

Note: Any changes from previous years are due to the updating of preliminary data and biological characteristics information.

Recreational catches: Rod-days of effort peaked during the mid-1980s but declined substantially in recent years. A total of 77 small salmon was retained in 1997 and 10 were released.

Data and methodology: Complete counts are available from a fishway located on the lower river. Recreational fishery data for 1997 are from a creel survey. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1993-97.

State of the stock: Conservation requirement was exceeded in 1992-97. Egg deposition was below conservation requirement for pre-salmon moratorium years 1985-91. Counts of small salmon similar to or higher than those observed during the moratorium years 1992-97 occurred in pre-salmon moratorium years. Counts of large salmon in 1995 and 1996 were the highest recorded. Total population size of small salmon in 1997 was lower than estimated for several years immediately preceding the moratorium.

STOCK: Terra Nova River (SFA 5) **Drainage area:** 1,883 km^2

CONSERVATION REQUIREMENT: 14.30 million eggs (7,094 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river								
Small	1780	3050	2035	2638	2575	1786	1127	3050
Large	270	472	246	638	472	527	56	638
Recreational harvest (small salmon)								
Retained	409	484	822	696	896	279	243	896
Released	-	569	178	132	260	127	127	569
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	-	62	44	72	113	5	5	113
Broodstock removals[2]								
Small	-	-	64	222	225	352	-	-
Large	-	-	9	44	32	29	-	-
Spawners								
Small	1371	2620	1305	1835	1577	1142	815	2620
Large	270	467	232	587	429	498	56	587
Egg conservation requirement								
% met	28	53	26	45	36	32	14	53

[1]Min and max are for the period of record since 1974.

[2]In 1994-97, a number of adults were removed as broodstock for an incubation facility for subsequent fry stocking back to Terra Nova River above Mollyguajeck Falls; these adults were deducted from spawning escapements in the calculation of percent of conservation requirement met presented above.

Note: any changes from previous years are due to the updating of preliminary data and biological characteristics information.

Recreational catches: Harvests in pre-salmon moratorium years 1989-91 were low relative to those of the late 1970s and early 1980s. Rod days of effort have generally increased over time, especially in recent years. A total of 279 small salmon was retained in 1997 and 127 were released.

Data and methodology: Counts are available from a fishway located on the lower river. Recreational fishery data for 1997 are from the license stub return system and are preliminary. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1993-97.

State of the stock: The proportion of conservation requirement achieved in 1997 was 32%. Although this river has never achieved conservation requirement, egg depositions during the moratorium years 1992-97 were generally higher than in pre-moratorium years. Total population size in 1997 was lower than estimated for several years immediately preceding the moratorium.

STOCK: Northwest River (SFA 5) **Drainage area:** 689 km^2

CONSERVATION REQUIREMENT:4.1 millions eggs (1,726 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	-	-	-	498	593	408-466	408	593
Large	-	-	-	135	203	115-182	115	203
Recreational harvest (small salmon)								
Retained	148	164	167	97	-	-	30	336
Released	-	73	1	0	7	-	0	73
Recreational harvest (large salmon)								
Retained	0	0	0	0	-	-	0	0
Released	-	0	3	0	0	-	0	3
Egg conservation requirement								
% met	-	-	-	40	55	36-46	40	55

[1] Min and max are for the entire period of record since 1974.

Recreational catches: For the period 1974-91, harvests ranged from 30 to 336 small salmon. Effort in rod-days of effort peaked during the late 1970s and reached lowest levels in the early 1990s; effort in 1994 however was among the highest recorded. In 1988, the portion of the lower river within the boundaries of Terra Nova National Park came under park management, using the National Park license and tagging system. Outside the park boundaries, the river was managed according to regulations in place for other rivers in insular Newfoundland. In 1996, the river was closed to all angling following a pre-season analysis which projected that less than 50% of conservation requirement would be achieved. The river was opened to hook-and-release fishing on August 10; however, the portion of the river inside Park boundaries was not opened due to low water levels and high water temperatures. In 1997, the pre-season analysis once again forecasted less than 50% of the conservation requirement could be achieved, so the river remained closed.

Data and assessment: A count was obtained at a counting fence installed in the lower river in 1995-97. The fence was operated by Terra Nova National Park personnel. In 1997, a count was again taken at the counting fence (lower trap) and also at a trap (upper trap) stationed at the Northwest Falls fishway (funded by Genergy Inc.). Counts from both traps are presented above, as a higher count was obtained at the upper trap. This is thought to be due in part to a late start date for the lower trap and in part to individual salmon being recounted at the upper trap after dropping back over Northwest Falls and than being counted at least twice. The actual number of returning salmon is thought to lie between the upper and lower trap values.

State of the stock: The river received 40% of the conservation requirement in 1995, 55% in 1996 and between 36% (based on lower trap count) and 46% (based on upper trap count) in 1997.

Forecast: No quantitative forecast was available, however, it is unlikely that conservation requirements will be met in 1998.

STOCK: Northeast Brook, Trepassey (SFA 9) **Drainage area:** 21 km^2

CONSERVATION REQUIREMENT: 0.14 million eggs (~51 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	49	79	99	80	73	50	49	158
Large	10	17	15	12	15	9	9	41
Recreational harvest (small salmon)								
Retained		----------Closed to angling----------						
Released								
Recreational harvest (large salmon)								
Retained		----------Closed to angling----------						
Released								
Spawners								
Egg conservation requirement								
% met	126	194	239	194	196	115	115	368
Smolt counts	1674	1849	944	792	1749	1832	792	1911
% sea survival								
(adult return year)	2.6	4.7	5.4	8.5	9.2	2.9	2.6	9.2

[1] Min and max are for the entire period of record since 1984.

Data and methodology: Counts of adults and smolts have been available from a counting fence since 1984 and 1986. Up until a few years ago, this small system formed one of a group of experimental rivers involved in research on stock-recruitment relationships and definition of smolt production in terms of various habitat types. The system has become an important indicator of smolt (year i) to (small salmon year i + 1) survival (repeat spawners included).

State of the stock: Conservation egg requirement has been met every year in the time series, but the lowest level achieved occurred in 1997. In terms of small salmon, the second lowest percentage of conservation requirement achieved occurred in 1997. The maximum number of smolts counted was 1911 in 1991 while the lowest was 792 in 1995. Highest sea survival prior to the commercial salmon-fishing moratorium (8.1%) was recorded in 1987. Lowest survival (2.6%) occurred in 1992. Since the start of the moratorium in 1992, sea survival rose to a peak of 9.2% in 1996 only to plummet to 2.9% in 1997.

STOCK: Rocky River (SFA 9) **Drainage area:** 296 km^2

MANAGEMENT TARGET: 3.4 million eggs (~881 small salmon) calculated as fluvial area x 2.4 eggs/m^2 and lacustrine area x 368 eggs/ha.

	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to rivers								
Small	237	292	158	385	356	435	80	435
Large	46	72	19	39	45	89	1	72
Recreational harvest (small salmon)								
Retained				CLOSED				
Released								
Recreational harvest (large salmon)								
Retained								
Released				CLOSED				
Other mortalities[2]								
Small salmon	0	0	0	0	1	0	0	1
Large salmon	0	0	2	0	0	0	0	2
Broodstock removal	0	0	62	76	0	0	0	76
Spawners								
Small	237	292	96	309	355	435	80	435
Large	46	72	17	39	45	89	1	89
Fry stocked	0	0	0	81983	162231	0	0	434500
Egg conservation requirement								
% met	28	34	25	56	34	56	17	64
Smolt count	7813	5115	9781	7577	14261	16900	5115	16900
% Sea Survival								
(adult return year)[2]	2.9	3.5	2.3	3.4	4.2	2.8	2.3	4.2

[1] Min and max are for the period of record since 1987.
[2] Known in river mortalities.

Background: Rocky River was stocked with salmon fry from 1983 to 1987 and in 1995 and 1997 with the first salmon returning to the reconstructed fishway realized in 1987. Also in 1987, 140 adult salmon were transferred into Rocky River from Little Salmonier River. Recreational fishery is closed on this river.

Data and methodology: Fluvial habitat consists of 1.08 million m^2 and lacustrine habitat includes 2200 ha. Biological characteristics used in calculations are those for Rocky River stock. Fry releases are back-calculated to eggs for derivation of % conservation requirements achieved. Complete adult counts are available from a trap installed in the fishway. Smolts have been enumerated annually since 1990. Sea survival is smolt to 1SW salmon returns to the fishway.

State of the stock: Stock is still expanding due to enhancement program. Sea survival declined in 1977 from values in 1995-96, but was higher than lowest value in 1994. Conservation requirements were not met in 1997.

Forecast: No forecast for 1997 is available.

STOCK: Northeast River (SFA 10) **Drainage area:** 94 km²

CONSERVATION REQUIREMENT: 0.72 million eggs (~224 small salmon) calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 eggs/ha.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river								
Small	956	980	710	774	1420	722	350	1420
Large	46	65	70	74	123	185	0	185
Recreational harvest (small salmon)								
Retained	37	132	39	127	268	94	19	349
Released	-	61	5	8	7	44	5	61
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	-	0	0	0	0	34	0	34
Other mortalities								
Small	-	-	-	25	49	-	-	-
Large	-	-	-	5	-	-	-	-
Broodstock[2]								
Small	-	-	-	-	31	-	-	-
Large	-	-	-	-	-	-	-	-
Spawners								
Small	919	842	670	646	1102	593	317	1102
Large	46	65	70	74	123	182	0	182
Egg conservation requirement								
% met	555	527	434	422	736	486	152	736

[1]Min and max are for the period of record since 1974.

[2]In 1997, a total of 31 small salmon was removed as broodstock for enhancement projects in Rennies River and Waterford River, St. John's.

Note: Any changes from previous years are due to the updating of preliminary data and biological characteristics information.

Recreational catches: Rod-days of effort in 1996 were the highest recorded. In 1997, a total of 94 small salmon was retained and 44 were released.

Data and methodology: Counts are available from a fishway on the lower river. Recreational fishery data for 1997 are from the license stub return system and are preliminary. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1993-97.

State of the stock: Conservation requirement has been exceeded every year since 1984. The count of large salmon in 1997 was the highest on record. Total population size of small salmon in 1997 was lower than estimated for several years immediately preceding the moratorium.

STOCK: Grand Bank Brook (SFA 11) **Drainage area:** 67 km²

CONSERVATION REQUIREMENT: Unknown due to lack of stream survey.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to river								
Small	101	182[2]	-	-	221	164	149	211
Large	35	6[2]	-	-	33	33	2	15
Recreational harvest (small salmon)								
Retained	6	109	25	62	105	4	4	109
Released	-	24	1	4	24	4	1	24
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	-	0	0	0	0	0	0	0

[1]Min and max are for the period of record since 1974.

[2]Partial count.

Recreational catches: Rod days of effort in 1995 and 1996 were the highest recorded since 1988. In 1997, a total of 4 small salmon was retained and 4 were released.

Data and methodology: Counts of salmon are available from a fishway, which operated 1986-93 and 1996-97. Counts for 1987, and 1991 are partial and are not included in the means. Recreational fishery data for 1997 are from the license stub return system and are preliminary.

State of the stock: A stream survey is required in order to define the conservation egg requirement for this brook. Until this is done, the status of the stock will be unknown.

STOCK: Little River (SFA 11) **Drainage area**: 183 km²

CONSERVATION REQUIREMENT: 0.306 million eggs (~230 small salmon) calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 eggs per hectare.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	104	169	73	118	674	399	55	674
Large	21	11	11	17	127	79	3	127
Recreational harvest (small salmon)								
Retained	0	0	0	0	0	0	N/A	N/A
Released	0	0	0	0	0	0	N/A	N/A
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	N/A	N/A
Released	0	0	0	0	0	0	N/A	N/A
Other mortalities[2]								
Small	2	5	0	5	18	13	0	18
Large	0	0	0	0	1	1	0	1
Brood stock removals:								
Small	89	96	0	80	118	0	0	79
Large	8	4	0	5	1	0	0	6
Spawners								
Small	13	68	73	33	538	386	13	538
Large	13	7	11	12	125	78	3	125
Fry stocked	20743	131243	118472	0	92528	145921	20070	145921
Egg conservation requirement % met:	44	80	37	56	288	202	29	288
Smolt Count	382	324	501	2712	4449	2521	324	4449

[1]Min and max are for the period of record since 1974.
[2]Known in-river mortalities.

Data and methodology: Conservation egg deposition is derived for accessible habitat (1,308 riverine units). Biological characteristics used in calculations are those for salmon from Little River and Conne River. Fry releases are back-calculated to eggs to derive % of conservation egg deposition requirements achieved. Total returns to the river are based on fence counts.

Recreational catches: The recreational fishery was closed in 1989 and the only angling statistics for the river predated 1975.

State of the stock: The stock size appears to be increasing.

Forecast: There is no forecast for 1998.

STOCK: Conne River (SFA 11) **Drainage area**: 602 km²

MANAGEMENT TARGET: 7.8 million eggs (~4000 small salmon) calculated as fluvial area x 2.4 eggs/m² and egg/recruit applied to total population as derived from assumed commercial exploitation rates.

	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total Returns to home waters								
Small	2523	2703	1533	3502	4440	3200	2411	10155
Large	159	100	100	110	179	185	89	516
First Peoples' harvest								
Small	483	417	0	0	0	514	0	948
Large	5	3	0	0	0	1	0	11
Recreational harvest (small salmon)								
Retained	329	0	0	0	0	197	0	3302
Released	-	0	0	0	0	80	0	80
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	27
Released	-	0	0	0	0	0	0	0
Other mortalities								
Small salmon	8	3	5	9	13	6	3	48
Large salmon	2	1	1	2	0	0	0	2
Broodstock removal								
Small salmon	0	0	93	117	25	0	25	245
Large salmon	0	0	1	0	0	0	0	1
Spawners								
Small	1783	2353	1435	3376	4402	2558	1435	7823
Large	153	97	99	108	179	182	87	488
Management target % eggs met	51	61	40	81	112	70	40	214
Smolt estimate	68208	55765	60762	62749	94088	100983	55765	100983
% Sea survival[2]	3.4	4.0	2.7	5.8	7.2	3.4	2.7	10.2

[1] Min and max are for the period of record since 1974. First Peoples harvest in salt water includes some salmon from other rivers. First Peoples fishery quota of 1200 fish has been in effect since 1986, but was reduced to 500 fish for 1993. First Peoples fishery was closed from 1994-96, while a preliminary allocation of 600 small salmon was provided in 1997 with a further allocation pending an inseason review of stock status.
[2] Sea survival is from smolt to small salmon returns in year of adult return.

Data and methodology: Smolts estimates are derived from mark-recapture surveys. Returning adult salmon are enumerated at a fish counting fence. Angling harvests for Conne River are from DFO statistics. A video camera system was introduced in 1993.

State of the stock: The Management Target, which is higher than the conservation egg requirement, was met from 1986 to 1990 and again in 1996. Only 40-61% of the target was achieved from 1991-1994, rose to 81% in 1995 and was 70% in 1997. Sea survival to small salmon fell to the lowest value (3.4%) since 1993-94. In contrast with the Management Target, the Conservation egg requirement was met or exceeded from 1986-1990, in 1993, and again from 1995-1997.

Forecast: Estimated smolt output in 1997 was the highest on record: 100,983 (C.L. 92,812-109,154). A sea survival of 4% would result in 4000 adult salmon returns in 1998. While survivals in the 7 - 10% range have occurred in the past, in recent years 1SW survival has remained low varying from 2.6 to 7.2%. Given the high variability in marine survival in recent years, and the late timing and lower condition of smolts in the 1997 run, a specific quantitative preseason forecast for 1998 is not provided.

STOCK: Highlands River (SFA 13) **Drainage area**: 183.1 km² (accessible)

CONSERVATION REQUIREMENT: 1.5 million eggs calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 egg per hectare.

Year	1980	1981	1982	1993	1994	1995	1996	1997	Min[1]	Max
Total returns to the river										
Small	82	127	100	137	145	172	199	398	82	39
Large	55	29	56	78	148	120	142	157	29	15
Recreational harvest (small salmon)						CLOSED SINCE 1978				
Retained	-	-	-	-	-	-	-	-	21	4
Released	-	-	-	-	-	-	-	-	-	
Recreational harvest (large salmon)						CLOSED SINCE 1978				
Retained	-	-	-	-	-	-	-	-	8	1
Released	-	-	-	-	-	-	-	-	-	
Spawners										
Small	82	127	100	137	145	172	199	398	82	39
Large	55	29	56	78	148	120	142	157	29	15
Egg conservation requirement										
% met	32	26	34	47	86	68	78	101	26	10
Smolt count	15130	15839	12373	9986	10503	12160	12383	6776	6776	158
% Sea survival (adult return year)										
Small	-	0.8	0.6	-	1.5	1.6	1.6	3.2	0.6	3
Large	-	-	0.4	-	-	1.2	1.4	1.3	0.4	1

[1] Min and Max are for the period of record since 1974.

Data and methodology: Counts of smolt and adult salmon were obtained with a fish counting fence in 1980-82 and in 1993-97. Juvenile densities were measured at 5 stations to determine changes in juvenile salmon production. Sea survival is calculated for small salmon returning in year x + 1 and large salmon returning in year x + 2 by dividing the number of adults by the number of smolt in year x.

State of the stock: The number of large salmon has increased since the closure of the commercial fishery. Conservation requirements were achieved in 1997. Large salmon component now consists of about 50% repeat spawners. Juvenile densities had declined substantially in the summers of 1996-97 in association with a flood in the winter of 1996.

Forecast : Because of the low smolt count in 1997, it is possible that the conservation requirements will not be met in 1998.

STOCK: Crabbes River (SFA 13) **Drainage area**: 551 km²

CONSERVATION REQUIREMENT: 4.6 million eggs (spawners not defined) calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 eggs per hectare.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	682	354	774	N/A	844	1154	111	1916
Large	126	34	113	N/A	239	358	15	359
Recreational harvest (small salmon)								
Retained	263	150	174	26	N/A	4	47	561
Released	26	0	37	5	N/A	286	0	286
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	14	127
Released	88	24	45	32	N/A	122	0	122
Spawners								
Small	419	204	600	N/A	844	1121	64	1355
Large	126	34	113	N/A	239	346	15	346
Egg conservation requirement								
% met:	34	13	41	N/A	68	95	3	95

[1] Min and max are for the period of record since 1974.

Data and methodology: Visual counts of salmon were made by swimmers in late August, 1996 and 1997. An adjustment factor was applied to the visual counts to give an estimate of the total number of salmon in the river. For years prior to 1995, the assessment was based on applying an angling exploitation rate to the recreational catches. Angling data prior to 1997 was collected by river guardians. In 1997, angling catches are from the License Stub Return System and are preliminary. A hook-and-release mortality of 10% of released salmon is used in 1997 calculations.

State of the stock: In 1997, Crabbes River achieved 95% of its egg deposition required for conservation. This estimate is the highest calculated for the 45 year time series. This stock has been at very low population size and has not achieved its conservation requirements in the past 45 years.

Forecast: There is no forecast of abundance for 1998.

STOCK: Middle Barachois Brook (SFA 13) **Drainage area**: 241 km²

CONSERVATION REQUIREMENT: 2.1 million eggs (spawners not defined) calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 eggs per hectare.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	584	665	732	N/A	805	1104	134	1619
Large	72	36	81	N/A	36	188	0	1159
Recreational harvest (small salmon)								
Retained	222	230	154	53	N/A	44	51	526
Released	0	23	25	2	N/A	155	0	155
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	117
Released	22	11	14	24	N/A	58	0	58
Spawners								
Small	362	435	578	N/A	805	1044	83	1329
Large	72	36	81	N/A	36	182	0	1057
Egg conservation requirement								
% met:	53	48	74	N/A	81	148	9	254

[1] Min and max are for the years in which data are available from 1974 to 1997.

Data and methodology: Visual counts of salmon were made by swimmers in late August, 1996 and 1997. An adjustment factor was applied to the visual counts to give an estimate of the total number of salmon in the river. For years prior to 1995, the assessment was based on applying an angling exploitation rate to the recreational catches. Angling data prior to 1997 was collected by river guardians. In 1997, angling catches are from the License Stub Return System and are preliminary. A hook-and-release mortality of 10% is used in 1997 calculations.

State of the stock: In 1997, Middle Barachois Brook achieved 148% of its egg deposition required for conservation. This estimate is the highest calculated since 1980. This stock has been at very low population size, and 1997 was the first time the river achieved its conservation requirements since 1980.

Forecast: There is no forecast of abundance for 1998.

STOCK: Robinsons River (SFA 13) **Drainage area**: 439 km²

CONSERVATION REQUIREMENT: 3.3 million eggs (spawners not defined) calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 eggs per hectare.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	967	531	910	N/A	768	1075	274	3186
Large	130	31	115	N/A	120	190	21	733
Recreational harvest (small salmon)								
Retained	386	225	160	73	N/A	4	73	905
Released	24	0	88	38	N/A	542	0	542
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	210
Released	75	18	38	23	N/A	180	7	180
Spawners								
Small	581	306	750	N/A	768	1017	158	2281
Large	130	31	115	N/A	120	172	21	604
Egg conservation requirement								
% met:	57	23	65	N/A	67	91	9	174

[1] Min and max are for the years in which data are available from 1974 to 1997.

Data and methodology: Visual counts of salmon were made by swimmers in late August, 1996 and 1997. An adjustment factor was applied to the visual counts to give an estimate of the total number of salmon in the river. For years prior to 1995, the assessment was based on applying an angling exploitation rate to the recreational catches. Angling data prior to 1997 was collected by river guardians. In 1997, angling catches are from the License Stub Return System and are preliminary. A hook-and-release mortality of 10% is used in 1997 calculations.

State of the stock: In 1997, Robinsons River achieved 91% of its egg deposition required for conservation. This estimate is the highest since 1982. This stock has been at very low population size and has not achieved its conservation requirements in the past 15 years.

Forecast: There is no forecast of abundance for 1998.

STOCK: Fischells Brook (SFA 13) **Drainage area**: 350 km²

CONSERVATION REQUIREMENT: 3.6 million eggs (spawners not defined) calculated as fluvial area x 2.4 eggs/m² and lacustrine area x 368 eggs per hectare.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	351	391	1060	N/A	N/A	800	42	1276
Large	21	65	158	N/A	N/A	85	0	455
Recreational harvest (small salmon)								
Retained	133	157	216	80	N/A	185	17	374
Released	8	0	58	112	N/A	162	0	162
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	210
Released	11	34	47	43	N/A	115	0	115
Spawners								
Small	218	234	844	N/A	N/A	599	25	919
Large	21	65	158	N/A	N/A	73	0	415
Egg conservation requirement								
% met:	14	24	71	N/A	N/A	44	1	96

[1] Min and max are for the years in which data are available from 1974 to 1997.

Data and methodology: Visual counts of salmon were made by swimmers in late August, 1996 and 1997. An adjustment factor was applied to the visual counts to give an estimate of the total number of salmon in the river. For years prior to 1995, the assessment was based on applying an angling exploitation rate to the recreational catches. Angling data prior to 1997 was collected by river guardians. In 1997, angling catches are from the License Stub Return System and are preliminary. A hook-and-release mortality of 10% is used in 1997 calculations.

State of the stock: In 1997, Fischells Brook achieved 44% of its egg deposition required for conservation. This estimate is the second highest achieved since 1981. This stock has been at very low population size and does not appear to have achieved its conservation requirements in the past 40 years. The numbers of large salmon returning to the river is very low.

Forecast: There is no forecast of abundance for 1998.

STOCK: Flat Bay Brook (SFA 13) **Drainage area**: 635 km²

CONSERVATION REQUIREMENT: 3.8 million eggs calculated as fluvial area x 2.4 eggs/m² .

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	510	396	420	650	1233	1308	179	1353
Large	25	21	70	48	132	173	5	173
Recreational harvest (small salmon)								
Retained	211	173	128	0	0	0	0	609
Released	12	0	8	0	0	258	0	258
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	4	59
Released	20	17	32	0	0	58	0	58
Other mortalities[2]								
Small	1	0	6	4	101	26	0	101
Large	2	2	3	0	14	6	0	14
Brood stock removals								
Small	0	0	43	79	81	0	0	79
Large	0	0	0	4	6	0	0	6
Spawners								
Small	287	223	243	567	1051	1282	107	1282
Large	23	19	67	44	112	167	1	167
Fry stocked	0	0	0	56059	127200	149555	56059	149555
Egg conservation requirement								
% met	18	14	19	45	85	89	4	85

[1] Min and max are for the period of record since 1974.
[2] Mortalities include known in-river mortalities and poaching.

Data and methodology: Prior to 1994, estimates of total returns and numbers of spawners were calculated using an assumed angling exploitation rate and angling data. Total returns and spawners (1994-95) are based on fence counts and angling data. The 1996 and 1997 returns were based on visual surveys conducted in late August of each year. An adjustment factor was applied to the visual counts to give an estimate of the total returns to the river. Stocked fry have been included as egg equivalents in year x-1 to calculate egg deposition. A hook-and-release mortality rate of 10% was used in the 1992-97 calculations. Angling data prior to 1997 were collected by river guardians. In 1997 angling catches are from the License Stub Return System and are preliminary

Recreational catches: The Flat Bay Brook stock was under quota control from 1986 to 1994 as follows: 1986=400 small; 1987-88=300 small; and 1989-94=250 small. The quota was only achieved in two years. The recreational fishery was closed in 1995 and 1996, but open to hook-and-release angling in 1997.

State of the stock: The egg deposition has increased in recent years to over 80%.

Forecast: No forecast available for 1998.

STOCK: Harrys River (SFA 13) **Drainage area:** 816 km²
CONSERVATION REQUIREMENT: 7.8 million eggs based on 2.4 eggs/m² of fluvial area and 368 eggs per ha of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	863	1663	1494	1982	1974	1717	864	1982
Large	15	104	116	72	137	198	15	198
Recreational harvest (small salmon)								
Retained	346	319	153	149	34	2	148	1008
Released	0	23	84	60	1196	584	0	60
Recreational harvest (Large salmon)								
Retained	.	.	.	.	.	.	1	68
Released	28	50	50	44	206	139	0	50
Spawners								
Small	517	1342	1333	1827	1820	1657	518	1827
Large	125	99	111	68	116	184	12	184
Egg conservation requirement								
% met	12	37	46	48	52	50	12	52
Spawners on Pinchgut Brook tributary								
Small	212	548	544	749	601	613	212	749
Large	5	43	47	28	38	68	5	68

[1]Min and max are for the period of record since 1974.

Recreational catches: Harrys River produced the largest recreational catches in Bay St. George in the 1960s but catches declined in the 1970s and 1980s. The fishery was managed under a quota of 350 small salmon in 1987-93 and in-season reviews were conducted in 1994-1995. The fishery was limited to catch and release angling in 1996 and 1997 and angling was not permitted in the headwaters upstream from Home Pool.

Data and methodology: Counts of small and large salmon are available from a counting fence on Pinchgut Brook tributary for 1992-97 and spawning redd surveys of the entire river were completed in 1995-97. Historical counting fence and spawning redd survey data are available for 1966-67. Recreational fishery data for 1996 and 1997 are from the licence stub return and are preliminary. A hook-and-release mortality of 10% was used in the calculation of spawning escapements. The total spawning escapement on Harrys River is estimated based on the proportion of the spawning escapment on Pinchgut Brook tributary derived from the fish counting fence and salmon redd counts.

State of the stock: The stock achieved 50% of the conservation requirement in 1997. The stock has improved in the last six years of assessment but has averaged less than 50% of the conservation requirement.

STOCK: Humber River (SFA 13) **Drainage area:** 7,679 km²
CONSERVATION REQUIREMENT: 28.3 million eggs (~15,749 small and 934 large salmon) is based on 2.4 eggs/m² and 368 eggs per ha of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	17571	18477	7995	27898	30445	14866	5724	30445
Large	2945	636	1030	2064	2679	2595	401	2945
Recreational harvest (small salmon)								
Retained	4349	4161	2523	5150	4740	2447	804	5150
Released	317	303	1438	1881	3016	1433	53	3016
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	27	303
Released	177	125	166	233	237	133	10	261
Spawners								
Small	13191	14286	5328	22560	25404	12276	4293	25404
Large	2927	624	1013	2041	2655	2582	400	2927
Egg conservation requirement								
% met	117	96	40	128	186	115	27	186

[1] Min and max are for the period of record since 1974.

Recreational catches: Total catches have improved in recent years. The catch of small salmon (retained) in 1997 was the lowest since 1992 but would have been affected by the early closure of the retention fishery on 27 July. A fall hook-and-release fishery was permitted below Deer Lake, 2 September to 30 September 1997. The catch was 1 small and 27 large salmon and the effort was 172 rod days.

Data and methodology: Recreational catches of small salmon in 1990-97 are derived from angler surveys at Big Falls. Catches of large salmon are from DFO catch statistics except for 1997 which was based on the angler survey. Total returns to the river in 1990-97 were based on angling exploitation rates derived from mark-recapture experiments in 1990-97.

State of the stock: The stock achieved 115% of the conservation requirement in 1997, 38% less than in 1996 which was the highest percentage achieved in the eight years of assessement. The increases in the percentage of conservation requirements achieved since the commercial salmon moratorium has given a false impression that the status of stocks has improved relative to long-term abundance. Assessments of this river has shown that this is not the case.

Management Considerations: Based on the 1996 assessment, the fall run of large salmon to the Lower Humber River consists of 2SW and 3SW salmon and previous spawners. The assessment suggests that the population size has increased in recent years. However, the population size appears to be low, probably less than 600 salmon. The 3SW component is unique to Newfoundland rivers and should be given special protection to minimize and to prevent any increase in fishing mortality.

STOCK: Lomond River (above the fishway) (SFA 14A) **Drainage area:** 470 km^2
CONSERVATION REQUIREMENT: 1.1 million eggs (~ 658 small salmon) based on 2.4 eggs/m^2 of fluvial area and 368 eggs per ha of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river[2]								
Small	794	816	1038	1365	982	1307	259	1365
Large	86	38	56	101	98	77	3	101
Recreational harvest (small salmon)								
Retained	357	281	325	343	371	496	203	650
Released	24	85	116	190	99	279	24	279
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	2	34
Released	56	40	58	62	49	49	2	62
Known removals above fishway								
Small	16	22	0	20	0	0	0	22
Large	0	1	0	0	0	0	0	1
Spawners								
Small	419	504	695	983	601	783	1	983
Large	80	33	49	95	93	72	0	95
Egg conservation requirement								
% met	121	118	142	187	143	161	31	187

[1] Min and max are for the period of record since 1974.
[2] Total returns are approximate because of spawning below the fishway.
Note: Any changes from previous years are due to the updating of preliminary data and biological characteristics information.

Recreational catches: Angling is currently not permitted above the fishway. Angling below the fishway was managed by a river quota of 375 small salmon in 1997 the same as in 1995-96. A quota of 350 small salmon was in place for 1986-94. The river was closed to retention angling on 15 August 1997.

Data and methodology: Counts are available from a fishway located 5.0 km upstream from the mouth of the river for 1961-97. The fishway was not monitored in 1968-70 and 1989-91. Recreational fishery data for 1997 are from the license stub return system and are preliminary. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1985-97.

State of the stock: The percentage of the conservation requirement above the fishway achieved in 1997 was 161%, 13% greater than in 1996. The return of small salmon in 1997 was 33% greater than in 1996 but 4% less than in 1995 when the highest returns were recorded. The return of large salmon in 1997 was 21% less than in 1996 and 24% less than in 1995, the highest return year. The area above the fishway represents about 40% of the total river area. This river has achieved conservation requirement every year since the commercial salmon fishery moratorium. This has given a false impression that the status of the stock has improved relative to long-term abundance. Assessments of this river have shown that this is not the case.

STOCK: Torrent River (above the fishway), (SFA 14A) **Drainage area:** 619 km^2
CONSERVATION REQUIREMENT: 1.5 million eggs (~ 656 small salmon) based on 2.4 eggs/m^2 of fluvial area and 105 eggs per ha of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river [2]								
Small	2832	4215	3827	6168	7371	4034	96	7371
Large	170	224	332	615	509	674	7	674
Recreational harvest (small salmon)								
Retained	477	179	227	331	421	328	31	477
Released	75	266	82	369	270	471	75	471
Recreational harvest (large salmon)								
Retained	0	0	0	0	0	0	0	0
Released	6	15	9	36	20	76	0	76
Spawners								
Small	2344	4009	3592	5800	6923	3659	121	6923
Large	169	222	331	611	507	666	3	666
Egg conservation requirement								
% met	313	538	530	1033	1279	797	161	1279

[1]Min and max are for the period of record since 1974.
[2] Total returns are approximate because of spawning below the fishway.

Note: Any changes from previous years are due to the updating of preliminary data and biological characteristics information.

Recreational catches: Angling is currently not permitted above the fishway. Angling below the fishway was permitted when a minmum spawning escapement of 750 salmon had pssed through the fishway in 1997. The river was open to hook-and-release angling until the minimum spawning escapement was reached then it opened to retention angling. The river was closed to retention angling after 14 August 1997. Catches and catch-per-unit-effort have increased over time, especially in recent years. A total of 328 small salmon were retained in 1997 and 471 were released.

Data and methodology: Counts are available from a fishway located 2.0 km upstream from the mouth of the river for 1966-97. Recreational fishery data for 1997 are from the licence stub return and are preliminary. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1985-97.

State of the stock: The percentage of the conservation requirement achieved above the fishway in 1997 was 797%, 38% less than in 1996. The return of small salmon in 1997 was 45% less than in 1996 when returns were the highest on record. The return of large salmon in 1997 was the highest recorded, 32% greater than in 1996. It is estimated that the Torrent River stock has achieved conservation requirement every year since 1978. This is due to the successful enhancement program carried out in 1972-76 when adult salmon were used to colonize above the fishway.

STOCK: Western Arm Brook, (SFA 14A) **Drainage area:** 149 km^2

CONSERVATION REQUIREMENT: 0.91 million eggs (~ 292 small salmon) based on 2.4 eggs/m^2 of fluvial area and 105 eggs per ha of lacustrine area.

Year	1992	1993	1994	1995	1996	1997	MIN[1]	MAX[1]
Total returns to the river								
Small	480	947	954	823	1230	509	233	1578
Large	8	8	31	33	50	55	0	55
Recreational harvest (small salmon)								
Retained	-	-	-	-	-	-	0	432
Released	-	-	-	-	-	-	-	-
Recreational harvest (large salmon)								
Retained	-	-	-	-	-	-	0	2
Released	-	-	-	-	-	-	-	-
Spawners								
Small	480	947	954	796	1189	508	117	1578
Large	8	8	31	30	48	55	0	55
Egg conservation requirement								
% met	151	288	292	286	415	200	30	415
Smolt count	15405	13435	9283	15144	14502	23845	5735	23845
% Sea survival[2]								
(adult return year)	3.6	5.3	6.8	8.9	8.1	3.0	2.1	12.0

[1] Min and max are for the period of record since 1974.
[2] Sea survival is from smolt to 1SW salmon returns in years of adult return.

Recreational catches: The river has been closed to angling since 1989.

Data and methodology: Counts of smolts and adult salmon are available from a counting fence located at the mouth of the river for 1971-97. A hook-and-release mortality of 10% was used in the calculation of spawning escapements for the years 1985-97.

State of the stock: The percentage of the conservation requirement achieved in 1997 was 200%, 52% less than in 1996. The return of small salmon in 1997 was 59% less than in 1996 when returns were the highest on record. This decrease in returns of small salmon was unexpected because higher marine survival of smolts had been experienced in recent years. A total of 3.0% of the smolts produced in 1996 returned to the river as adults in 1997. The return of large salmon in 1997 was the highest recorded, 10% greater than in 1996. The increases in the percentage of the conservation requirement achieved since the commercial salmon fishery moratorium has given a false impression that the status of the stock has improved relative to the long-term abundance. Assessments of this river have shown that this is not the case.

Forecast: The smolt count in 1997 was the highest recorded, 64% higher than in 1996. Assuming that the smolt survival rate remains the same as for smolts in 1996, returns of 1SW salmon would be expected to increase in 1998. However, given the wide range in smolt survival, especially in recent years, there is considerable uncertainty in this expectation.