

**REPORT ON THE STATUS OF ATLANTIC SALMON STOCKS
IN EASTERN CANADA IN 1995**

**Atlantic Stock Assessment Secretariat
Fisheries Research Branch
Department of Fisheries and Oceans
200 Kent Street, Stn 1256
Ottawa, Ontario K1A 0E6
Canada**

June 1996

ORIGINAL COPY:

PLEASE LEAVE THIS COPY IN THE FILE
ROOM

TO OBTAIN A COPY OF THE ORIGINAL,
PLEASE CONTACT ISABELLE RONDEAU
AT 990-00293 (STN. 12S004)

THANKS,
CSAS

.....
COPIE ORIGINALE:

SVP LAISSER CETTE COPIE DANS LA SALLE
D'ARCHIVES.

POUR OBTENIR UNE COPIE CET
L'ORIGINALE,
SVP CONTACTER ISABELLE RONDEAU
AU 990-0293 (12S004)

MERCI,
CSAS

Original.

END

Table of Contents

Glossary.....	3
1.0 Introduction.....	5
2.0 Overview of Atlantic Salmon Stocks	7
2.1. Definitions	7
2.2. Description of Fisheries	7
2.3. Aquaculture Production in Eastern Canada	14
2.4. Definition of Conservation and Derivation of Targets	15
2.5. Status of the Stocks - Returns and Spawning Escapements.....	16
2.6. Production of Atlantic Salmon in Recent Years.....	20
2.7. Prospects.....	26
2.8. Environmental Conditions.....	28
2.9. Effects of Recent Changes in Management on Stock Status	29
3.0 Maritime Provinces Regional Summaries.....	30
3.1. Bay of Fundy Stocks (SFAs 22 & 23).....	31
3.2. Atlantic Coast of Mainland Nova Scotia (SFAs 20 & 21).....	40
3.3. Cape Breton Island Stocks (SFA 19 and part of SFA 18).....	47
3.4. Northumberland Strait Nova Scotia Stocks (SFA 18)	57
3.5. Prince Edward Island Stocks (SFA 17).....	63
3.6. Gulf New Brunswick Stocks (SFAs 15 & 16).....	67
4.0 Québec Regional Summaries	80
4.1. Gaspé (Fishing Areas Q1-Q3)	81
4.2. North Shore of the St. Lawrence (Fishing Areas Q5-Q9).....	90
4.3. Anticosti (Fishing Areas Q10).....	94
4.4. Ungava Bay (Fishing Area Q11)	97
5.0 Newfoundland Regional Summaries	98
5.1. Labrador (SFAs 1, 2, and 14B).....	99
5.2. Northern Peninsula East and Eastern Newfoundland (SFAs 3-8)	109
5.3. South Newfoundland (SFAs 9-11)	120
5.4. Southwest Newfoundland (SFAs 12-13)	131
5.5. Northern Peninsula West (SFA14A).....	141



Glossary

Terms and definitions related to salmon biology

Fry: see parr (below).

Large salmon: For recreational fisheries, large salmon refers to any salmon with a fork length greater than or equal to 63 cm. This size group contains mostly MSW maiden salmon as well as previous spawner 1SW and MSW salmon. These fish are frequently referred to as salmon by anglers. In the accounting of the commercial fisheries catches, large salmon are any fish weighing 2.7 kg whole weight and up.

Maiden spawner: can refer to 1SW and MSW salmon if they are returning to the rivers to spawn for the very first time in their life cycle. Other terms used to refer to these fish are virgin 1SW or virgin MSW salmon.

Multi-sea-winter (MSW) salmon: refers to salmon which have spent at least two full years at sea before returning to the river to spawn. In contrast to one-sea-winter salmon which mature after having spent one year in the ocean, MSW salmon take at least two years for maturing. MSW is reserved for describing the age of first maturation.

One-sea-winter (1SW) salmon: refers to salmon which have spent one full year at sea before returning to the river to spawn. Because they pass one winter in the ocean between the spring in which they migrate to sea as smolts and the following spring to fall when they return to the rivers to spawn, they are referred to as one-sea-winter fish. The term refers to the age of first maturation.

Parr: juvenile salmon found in the freshwater environment. Parr less than one year old, having hatched and emerged from the gravel bed in the spring are often referred to as fry.

Previous spawner: refers to 1SW and MSW salmon which have spawned previously, returned to sea after spawning, survived and are returning to the rivers for a second or more spawning. For example, previous 1SW salmon are salmon which originally spawned as 1SW maiden fish but are returning to spawn again. The proportion of previous spawners in the returns to a river varies immensely.

Small salmon: For recreational fisheries, small salmon refers to any salmon with a fork length (straight line from the tip of the snout to the edge of the fork in the tail) less than 63 cm. This size group contains mostly 1SW maiden salmon but in some areas of Canada (Bay of Fundy, Newfoundland) it is also comprised of 1SW previous spawners. There are generally very few MSW maiden salmon in this size group. These fish are frequently referred to as grilse by anglers. In the accounting of the commercial fisheries catches, small and large salmon are based on weight categories, small salmon weighing less than 2.7 kg whole weight.

Smolt: intermediate stage in the life cycle of the Atlantic salmon. Refers to juvenile salmon which undertake the migration and transition from freshwater to marine conditions.

Assessment methods and terminology

Counting fence: Barrier placed in the river which guides fish through narrow and easily monitored points during their migration upstream or downstream. Counting fences are usually portable, installed and removed every year and provide a total count of fish moving either upstream and downstream.

CPUE: Abbreviation for Catch-Per-Unit-Effort. This is the amount of fish caught divided by the amount of effort invested to catch it. CPUE data can be useful to indicate the changes occurring in fish population size. If you spend more time to catch fewer fish than in previous years, and other factors have not changed, then it probably indicates that your population is dropping. However, CPUE's are sensitive to changes in things like catch efficiency. If fishermen get better at fishing or come up with a gear which catches more fish for the same amount of time spent fishing, then CPUE values may not drop even when population size is falling.

Density : Number of something per unit area. For example, number of salmon parr per 100 square meters of stream area.

Escapees: fish stocked in sea-cages or shore-based facilities by the aquaculture industry which escape the facilities as a result of damage by storms, floods, predators, etc. These escapees usually show up in rivers and are frequently identified on the basis of fin erosion, body form or scale characteristics.

Escapement: the returns minus the fish removed by fisheries, by broodstock collections, etc. Escapement is the number of fish which are left to spawn in the river.

Exploitation rate : The fraction (percentage) of the fish in a population that are caught and killed by a fishery. The rates of exploitation that can be tolerated vary greatly among species.

Fishway: a structure constructed in a river which can be used by fish to ascend an otherwise impassable section of river. Fishways are located at major waterfalls, at hydro dams, and other such barriers to migration. Generally, a total count of fish using the fishway can be obtained by installing a holding trap at the top of the fishway and releasing fish after they have been counted.

Fluvial habitat: refers to habitat in a river as opposed to lakes or ponds or estuaries.

Lacustrine habitat: refers to habitat in lakes or ponds (generally standing water).

Mark and recapture: experimental technique used to estimate the total population size from a partial count. Fish are captured, marked with an easily identifiable tag and released back to the water. Fish are collected farther upriver or at a later date and the number of fish which have tags versus the number of fish which do not have tags is used to estimate the proportion of the population which has been marked. Because we know how many fish were marked originally, the total population size can be estimated.

pH: A measure of the acidity (hydrogen ion concentration) of the water. The scale runs from 0 - 14, with 0 being pure-acid, 7 being neutral, and 14 being extremely basic (lye). Salmonids are believed to be suffering the impacts of acid rain in some areas where pH is driven below 5 at certain times of year. These levels of acidity kill eggs and juveniles.

Returns: the number of salmon returning to the river from the sea. Generally, the returns are the fish remaining after high seas and coastal fisheries. For some rivers, the proportion of the population which was removed in coastal and high seas fisheries is estimated and the number of fish which would have returned to the river in the absence of these fisheries is reported.

Stock: The part of a fish population which is being considered for harvesting by fishermen. More formally refers to groupings of individuals within a species which do not normally mate with other groups. For Atlantic salmon, each river is assumed to contain at least one stock because of their high degree of homing ability to individual rivers and even tributaries of larger rivers.

Stock-recruit curves : These curves show the relationship between the number of adults spawning and the number of offspring they produce.

Year-class : The fish hatched in a given year.

1.0 Introduction

This report presents the results of the Atlantic salmon stock assessments for eastern Canada for 1995. There are approximately 550 Atlantic salmon rivers in eastern Canada, each of which could contain at least one stock. Assessments are prepared for a limited number of specific rivers, mostly on the basis of the size of the Atlantic salmon resource within the river, the demands by user groups, and as a result of requests for biological advice from fisheries management. The assessments provide the following information:

1. an accounting of the harvests,
2. an estimation of the total returns,
3. an estimation of the spawning escapement, which is the difference between the returns (2) and the harvests (1),
4. a comparison of the spawning escapement to the conservation target, and
5. an interpretation of the status of the resource in both the short and long terms with regards to the potential exploitation levels.

Preliminary analyses were presented at meetings during which input from industry, user groups, First Peoples and provincial governments was received and incorporated. The assessment documents were then written by the team leaders and peer reviewed regionally; the composition of the peer review teams varied by region but included representatives from universities, other DFO (Dept. of Fisheries and Oceans) scientists, representatives of First Nations and of angling associations. Regional summaries have been prepared and detailed research documents on individual stocks or geographical areas are publicly available from the Atlantic Stock Assessment Secretariat (Fisheries Research Branch, Dept. of Fisheries and Oceans, 200 Kent Street Stn 1256, Ottawa, Ontario K1A 0E6 Canada).

Section 2.0 provides an overview of the status of Atlantic salmon in 1995 for the Atlantic zone while section 3.0 to 5.0 provide regional overviews for each assessment region of Atlantic Canada: Maritimes, Québec, and Newfoundland. The Province of Québec information is included with concurrence of representatives of the Ministère de l'Environnement et de la Faune.

Many of the assessments were made possible through the collaboration between DFO, provincial government biologists, recreational fisheries associations, development associations, and First Peoples. Recreational fisheries associations were funded through cooperative recreational fisheries development agreements while many First Peoples initiatives were funded through the Aboriginal Fisheries Strategy.

Any comments on the present document should be addressed to the Regional Science Director in your Region:

for Maritimes Region:

J.S. Loch
Department of Fisheries and Oceans
Science Branch
P.O. Box 1006
Dartmouth, NS
B2Y 4A2

for Newfoundland and Labrador:

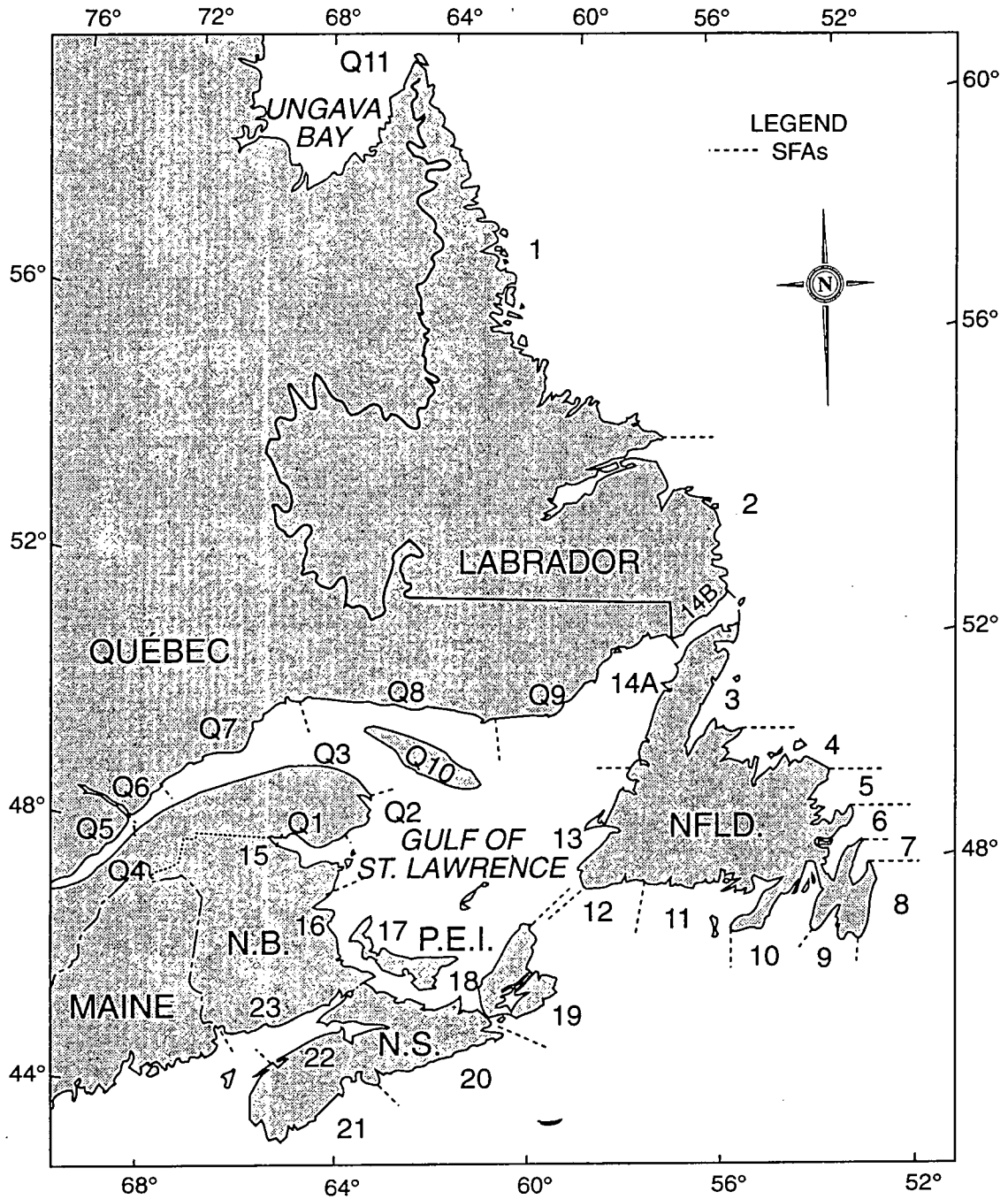
L. Coady
Department of Fisheries and Oceans
Science Branch
P.O. Box 5667
St. John's, Newfoundland
A1C 5X1

for Québec:

R. Chatelain
Ministère de l'Environnement et de la Faune
150 boulevard René-Lévesque Est, 5^e étage
Québec, Qc
G1R 4Y1

or to:

Department of Fisheries and Oceans
Fisheries Research Branch
200 Kent Street, Stn 1256
Ottawa, Ontario
K1A 0E6



2.0 OVERVIEW OF ATLANTIC SALMON STOCKS

Several sources of information are used to assess the status of Atlantic salmon of which the most important are derived from complete counts at fishways or counting fences, from mark and recapture experiments and finally from the fisheries themselves. Because of the high degree of homing ability, Atlantic salmon within a river are considered to comprise a stock (see Glossary). It is not possible to assess all stocks because sufficient information on the total returns, number of spawners, and the biological characteristics is available from only a small proportion of the rivers. Catch information is generally available from most individual rivers. Accordingly, both information on stock status offered in this document as well as fishery management practices are based primarily on geographic areas having within them several individual rivers. The 23 areas for which DFO manages the salmon fisheries directly are called Salmon Fishing Areas (SFA); for Québec, the management is delegated to the Ministère de l'Environnement et de la Faune and the fishing areas are designated by Q1 through Q11. These areas are shown in Figure 2.1.

2.1 Definitions

All the terms used to describe Atlantic salmon biology and management are defined in the glossary at the first part of this report. Two important terms used extensively throughout this document are:

Small salmon: refers to salmon less than 63 cm fork length (tip of the snout to the middle of the tail) or salmon less than approximately 2.7 kg whole weight, depending upon the fishery.

Large salmon: refers to salmon greater than or equal to 63 cm fork length or salmon greater than or equal to about 2.7 kg whole weight, depending upon the fishery.

2.2 Description of Fisheries

The five-year moratorium which was placed on the commercial fishery in insular Newfoundland in 1992 continued. In Labrador, commercial fishing quotas assigned by SFA were reduced from 1994 but the number of fishers remained unchanged. The opening of the Labrador commercial fishery was delayed in 1995 to July 3 from its regular opening of June 5. The delay was intended to reduce the exploitation rate on the large salmon and improve the escapement to the rivers. The season was to close on October 15 or when the quota was caught. Commercial fisheries in Québec in 1995 occurred in zone Q9 (June 24 to August 15) and in Ungava Bay (zone Q11 by First Peoples).

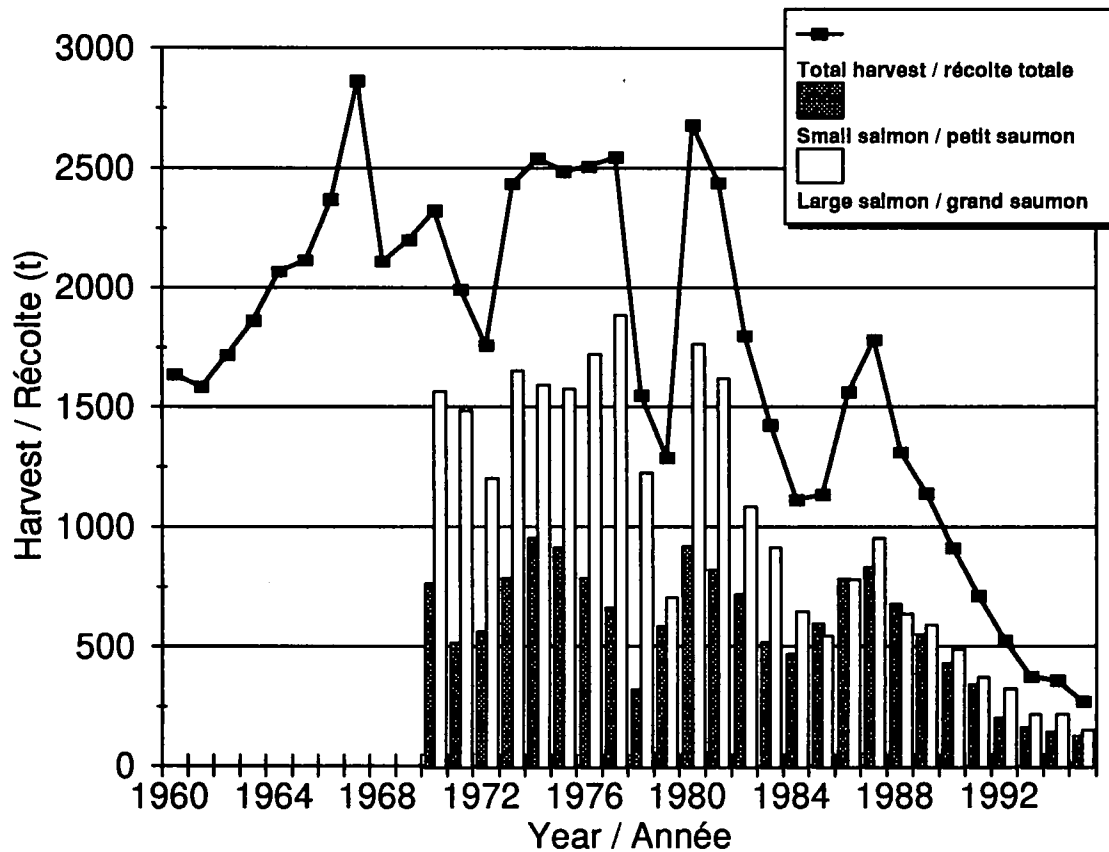
The Greenland commercial fishery occurred in 1995 after a hiatus in 1993 and 1994 resulting from a buyout of the quota by the Atlantic Salmon Fund. A quota of 77 t was set in 1995.

Only small salmon could be retained in the recreational fisheries except for Québec and Labrador. The seasonal bag limits in the recreational fishery remained at eight small salmon in New Brunswick and Nova Scotia with a daily limit of two retained. In PEI, the season and daily bag limits were 7 and 1 respectively. For insular Newfoundland, the seasonal bag limit was similar to 1994: six fish of which three small salmon could be retained prior to July 31 and three small salmon after that date. After the bag limit of three was reached in each time period, hook-and-release fishing only was permitted. In Labrador, there was no seasonal division of the bag limit but the season limit for large salmon was reduced from two in 1994 to one fish in 1995. In Québec, season and bag limits varied by zone: for Q1 to Q8 and Q10, the season limit was 7 fish of any size. For rivers in zone Q9 and Q11, the season limit was 10 fish. In most rivers of zones Q1 to Q7 and Q10, fishing for the day would end if the first fish kept was a large salmon. If the first fish kept was a small salmon, then fishing could continue until a second fish was caught, regardless of the size of the second fish. Daily limits in zone Q8 were two fish, Q9 it was three fish and in Q11 it was four fish.

Throughout this report, harvests in fisheries refers to fish which are caught and killed. In the recreational fisheries, reference is also made to catches which include both fish which are retained and fish which are released

back to the water alive. This distinction is important for all the years after 1983, when mandatory hook and release regulations for large salmon in the recreational fishery were introduced in many parts of eastern Canada.

The provisional harvest of salmon in 1995 by all users was 270 t, a reduction of 24% by weight from 1994. This harvest represented about 72,400 small salmon and 33,200 large salmon, reductions of 6% and 23% respectively from 1994 harvests.



The dramatic decline in harvested tonnage since 1988 is mostly the result of the large reductions in commercial fisheries effort and, since 1992, the closure of the insular Newfoundland commercial fishery.

Salmon were exploited by three user groups in eastern Canada in 1995: First Peoples, recreational fishers and commercial fishers. The 1995 harvest of small and large salmon, by number, was divided among the three user groups in different proportions depending on the province and the size group exploited. Newfoundland reported the largest proportion of the total harvest of small salmon and Québec reported the greatest share of the large salmon harvest. Recreational fisheries exploited the greatest number of small salmon in all the provinces and overall in Canada (79.5%). Commercial fishers took the largest share of large salmon (61.0%). First Peoples harvested 5.1% (by number) of the total small salmon and 14.1% of the total large salmon harvests in eastern Canada.

	% of provincial harvest			% of eastern Canada	Number of fish
	First Peoples	Recreational	Commercial		
Small salmon					
Newfoundland / Labrador	0.0 ¹	81.5	18.5	53.6	38,825
Québec	3.4	49.0	47.5	11.4	8,238
New Brunswick	14.6	85.4	0.0	30.9	22,338
P.E.I.	3.9	96.1	0.0	0.7	507
Nova Scotia	5.8	94.2	0.0	3.4	2,481
Large salmon					
Newfoundland / Labrador	0.0 ¹	5.1	94.9	32.4	10,759
Québec	18.1	35.6	46.2	65.4	21,712
New Brunswick	100.0	0.0	0.0	1.7	564
P.E.I.	0.0	0.0	0.0	0.0	0.0
Nova Scotia	100.0	0.0	0.0	0.6	189

¹ First Peoples in Conne River Newfoundland (SFA 11) did not fish in 1995 because of low returns.

First Peoples Fisheries

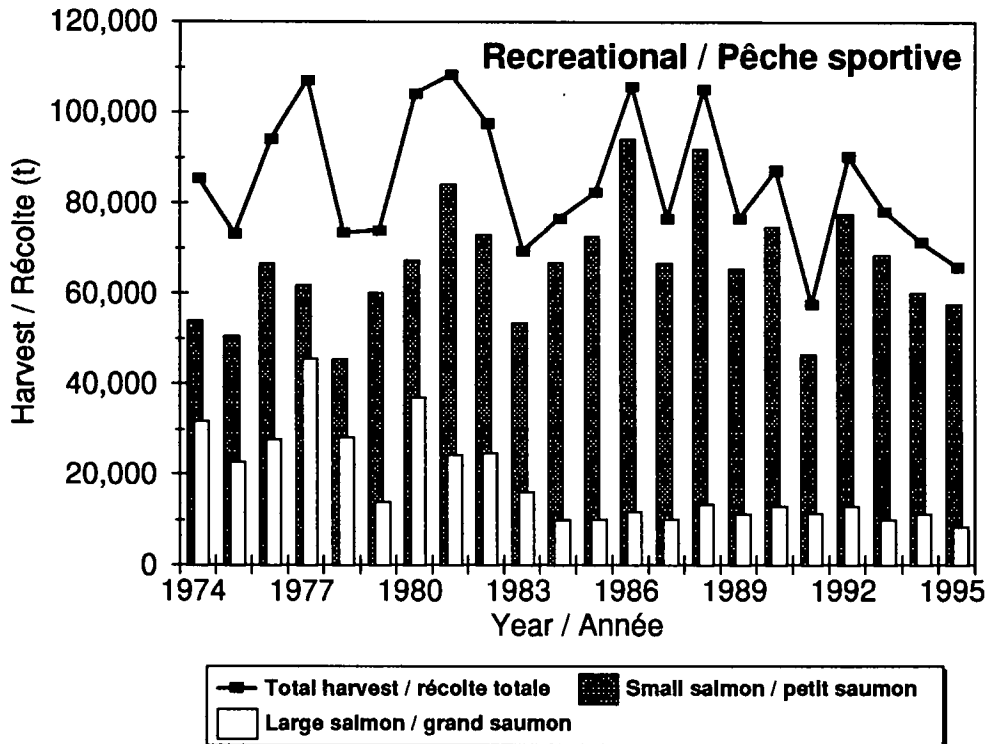
In Québec, First Peoples food fisheries took place subject to agreements or through permits issued to the bands. There are nine bands with food fisheries in addition to the fishing activities of the Inuit in Ungava. The permits generally describe gear and fishing effort. In the Maritimes and Newfoundland, food fishery harvest agreements were signed with several First Peoples in 1995. The signed agreements included allocations of small and large salmon. In many cases, harvests were less than the allocations. Harvests which occurred both within and outside agreements were obtained directly from the First Peoples. In SFA 23 (outer Bay of Fundy, NB), First Peoples declined a harvest of small salmon because of concerns to conservation. The Conne River (SFA 11) food fishery did not occur in 1994 and 1995 because the expected returns were below the conservation target for the river. Harvest by First Peoples with recreational or commercial licenses are reported under the recreational and commercial harvest categories.

First Peoples harvests in 1995 (by weight) were 78% of the previous year's harvest and 10% below the previous 5-year average harvest. The proportion of the harvest composed of large salmon remained unchanged relative to previous years.

Harvests	Year						
	1989	1990	1991	1992	1993	1994	1995
Weight (t)	30.4	31.9	29.1	34.2	42.6	41.7	32.3
% Large by weight	85%	78%	87%	83%	83%	83%	82%

Recreational Fisheries

Harvest in recreational fisheries in 1995 totalled 65,862 small and large salmon, the second lowest recorded since 1974. Small salmon harvests were 12% less than the previous five-year mean while large salmon harvests were the lowest ever at 8286 fish. Small salmon harvests have contributed more than 86% of the total harvests of both size groups since the imposition of hook and release large salmon recreational fisheries in the Maritimes Region and Insular Newfoundland in 1984.



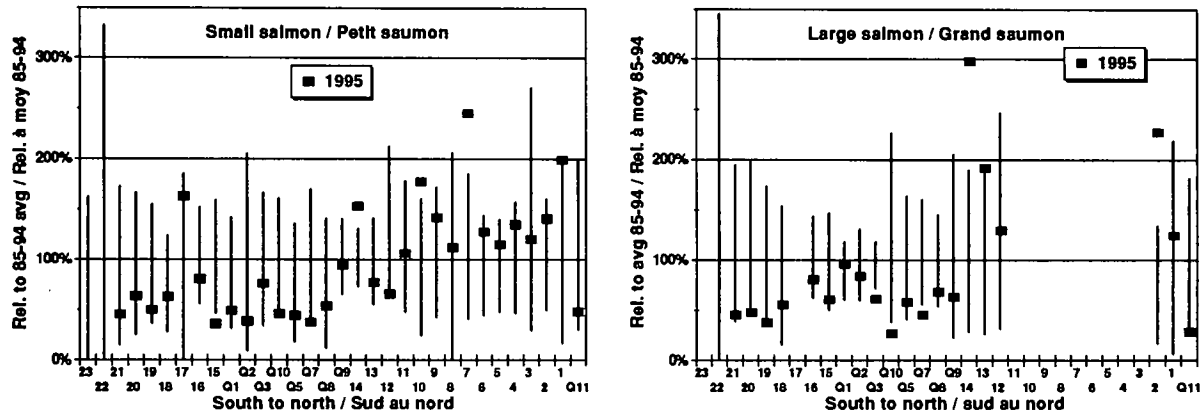
Reported harvests in all regions represent a small fraction of the potential harvests if all recreational license holders had caught the maximum allowed.

Province	Number of licenses ¹	# of tags ²	Size	Potential Harvests	Reported Harvests ¹	% of Potential
New Brunswick	30,500	8	Small	216,000	19,076	9%
Nova Scotia	4700	8	Small	38,000	2,337	6%
Prince Edward Island	633	7	Small	4431	487	11%
Newfoundland & Labrador	22,200	6	Small & Large	133,200	32,183	24%
Québec	<15,000	7	Small & Large	102,000	11,779	12%

¹ License sales and reported harvests for 1995 are preliminary

² # of tags issued with a full-season recreational license. Fewer tags are issued for different classes of non-resident licenses.

Recreational catches (including retained and released fish) by fishing area in 1995 were variable and generally less than the catches reported in most of the previous ten years.



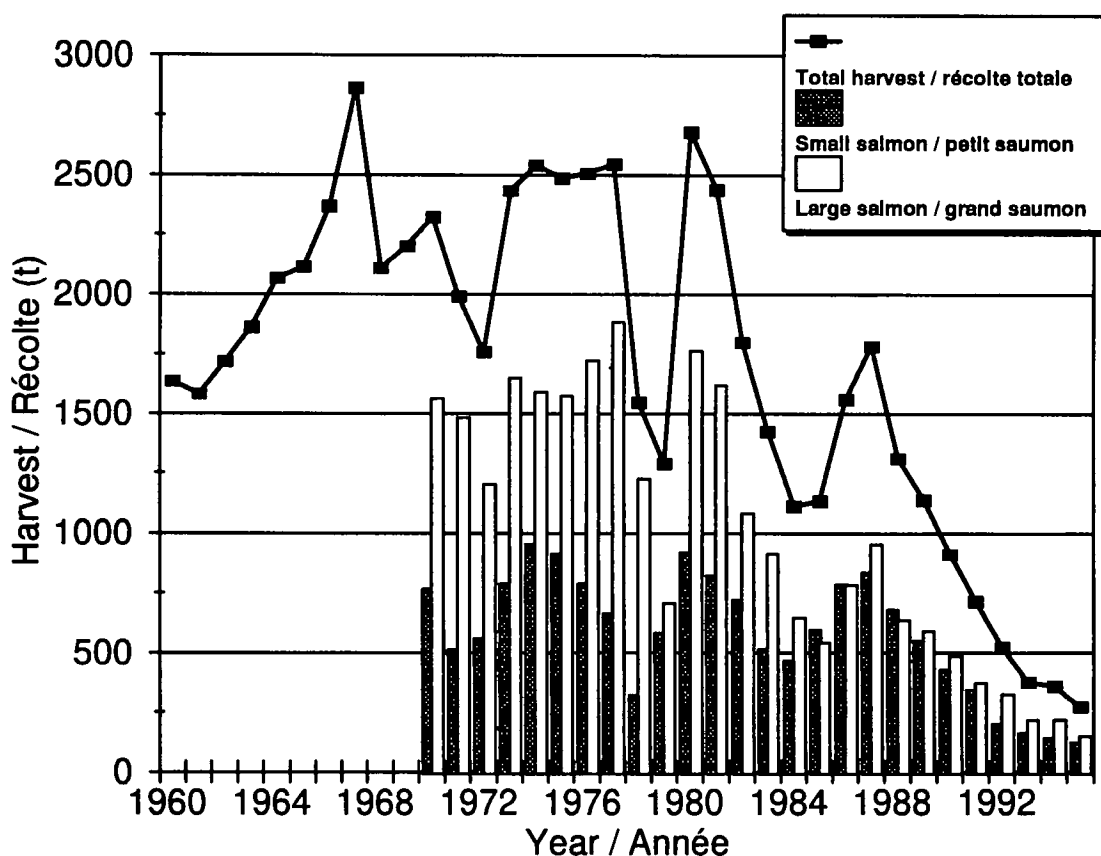
Angling catches by management area in 1995 relative to the previous ten-year average. Annual values are expressed as a percent of the average catch between 1985 and 1994. The vertical lines represent the minimum to maximum range. The black square is the 1995 catch expressed as a percent of the mean. A value of 100% for 1995 indicates that the 1995 catch was similar to the mean whereas a 1995 value of 300% indicates that the 1995 catch was three times as high as the previous ten-year average catch.

Small salmon catches were generally above the previous ten-year average in Labrador, the northeast coast of Newfoundland (SFA 1 to 11, 14) but down throughout Québec and the Maritime Region. Catches in Prince Edward Island (SFA 17) were above average but more than 90% of the returns originate from smolt stocking programs. Large salmon catches in the Maritime Region and Québec were down from the average but catches were among the highest in the last 10 years in western Newfoundland and Labrador (SFA 1, 2, 13, 14).

Because of the changes which have occurred in the management of the recreational fisheries since 1984, the use of angling catches as indices of abundance has been seriously compromised. Therefore, the interpretation of trends in abundance relies mostly on rivers where returns have been estimated or completely enumerated. As well, in 1995, rivers in several SFA were closed to angling for part or the entire season as a result of low stock abundance or low water and high temperatures (see regional summaries). Also hook and released fish are not equivalent to retained fish and their inclusion in catch statistics further compromises the reliability of interpretation of trends.

Commercial Fisheries

The commercial fisheries moratorium for insular Newfoundland established in 1992 remained in effect in 1995. Commercial fisheries occurred in Labrador (SFA 1, 2, 14B) and along the Québec north shore of the Gulf of St. Lawrence (Q9) at licensed effort levels and season (June 25 to August 15) similar to 1994. Inuit people in zone Q11 and SFA 1 also participate in commercial fisheries. The opening date of the Labrador commercial fishery was delayed to July 3 from June 5 in 1994 to increase the escapement to rivers of large salmon. The commercial harvest in 1995 declined to less than 100 t from a peak of more than 2,400 t in 1980.



Commercial harvest in Labrador was the lowest ever (55 t) but large salmon made up the second highest proportion of the harvests since the introduction of quotas in 1990. For Québec, the harvest and the proportion large salmon in the commercial fishery continued to decline in 1995.

	1989	1990	1991	1992	1993	1994	1995
Labrador							
Licensed effort	610	570	570	495	288	213	213
Quota (t)	N/A	340	295	273	178	92	73.5
Harvest (t)	330	202	120	204	112	93	55
% Large (by number)	46%	45%	33%	57%	50%	64%	59%
Québec (Q7 to Q9)							
Licensed effort	185	165	152	147	94	90	90
Quota (number)	33,125	29,605	28,359	23,400	15,325	15,175	15,175
Harvest (number)	20,790	19,517	19,653	19,700	14,869	14,240	13,653
% Large (by number)	87%	82%	83%	80%	75%	72%	71%

The Greenland fishery took an estimated 68 t of salmon (preliminary harvest values) and closed September 1. This fishery harvests salmon of North American and European origin of several different age classes exclusive of 1SW salmon. Salmon caught at Greenland in 1995 irrespective of the continent of origin would not have returned to homewaters until at least 1996, the year following the fishery.

Unreported removals

Unreported removals are defined as harvests which are caught and retained, but do not enter into the reported harvest statistics; such harvests could be both legal and illegal, but would not include catch and release mortalities whether they arise from nets or angling gear. Such estimates would not include fish retained by public or private agencies for broodstock purposes.

These removals are difficult to quantify. To develop such estimates, regional fisheries officials were asked to provide their best estimates, based on enforcement knowledge, of the magnitude of the unreported harvest in their areas. Because of the reduced commercial fishery landings, the unreported removals now make up a large proportion of the reported harvest although the magnitude of the unreported removals has decreased. These fish are the survivors of encounters with fishing gear and depending upon the retention rate and the short term mortality rate from such encounters, this could infer a substantial loss of fish if either or both of these rates are high. In spite of the salmon and cod commercial fishing moratoria, salmon are still encountering fishing gear throughout the Newfoundland coastal areas, based on the incidence of net-marked salmon observed at counting facilities. Salmon could be encountering fishing gear which has been legally set for other species, such as herring and capelin.

The estimates for Canada since 1986 are:

Year	Unreported removals (t)	Reported catch (t)	Unreported as % of reported catch
1986	315	1559	20%
1987	234	1784	13%
1988	161	1311	12%
1989	174	1139	15%
1990	111	911	12%
1991	127	711	18%
1992	136	522	26%
1993	161	373	43%
1994	105	355	30%
1995	98	270	36%

2.3 Aquaculture Production in Eastern Canada

Commercial aquaculture of Atlantic salmon first occurred in 1980 in the Bay of Fundy with the reported production of 11 t. Production increased exponentially during 1984 to 1992 when more than 10,000 t of annual production was reported. Commercial operations in the Bay of Fundy account for over 90% of the total Canadian production.

Atlantic salmon commercial aquaculture production (t) in eastern Canada					
Year	Atlantic Canada	Québec ¹ Q1	New Brunswick SFA 23	Nova Scotia SFA 19-21	Newfoundland SFA 11
1980	11		11		
1981	21		21		
1982	38		38		
1983	68		68		
1984	227		223	5	
1985	360		350	10	
1986	673		636	36	1
1987	1,357		1,318	37	2
1988	3,315	5	3,273	27	10
1989	4,760	10	4,500	250	0
1990	7,810	10	7,500	300	0
1991	9,395	50	9,000	320	31
1992	10,380	30	10,000	300	75
1993	11,115	20	10,145	850	100
1994	12,441	15	11,836	544	46
1995 ²	12,805	30	12,000	630	145

¹ All land-based facilities

² 1995 values are preliminary

Other species cultured commercially in eastern Canada include Arctic charr and rainbow (steelhead) trout. The Arctic charr production occurs in Newfoundland, all in shore-based facilities. Rainbow trout are cultured in the Bay of Fundy, Bras d'Or Lakes (SFA 19), and in Bay d'Espoir Newfoundland (SFA 11). In 1994, production of rainbow trout was 400 t from the Bay of Fundy, 300 t from the Bras d'Or Lakes and over 300 t from Bay d'Espoir. Escapees of both Arctic charr and steelhead trout have been recorded in many rivers in proximity to these production facilities. Production levels for 1995 were not available.

2.4 Definition of Conservation and Derivation of Targets

Conservation for salmon is defined as follows:

"That aspect of renewable resource management which ensures that utilization is sustainable and which safeguards ecological processes and genetic diversity for the maintenance of the resource concerned. Conservation ensures that the fullest sustainable advantage is derived from the resource base and that facilities are so located and conducted that the resource base is maintained." (CAFSAC Adv. Doc. 91/15).

The operational translation of conservation for eastern Canada is based on an egg deposition rate of 2.4 eggs/m² of fluvial rearing habitat (see glossary) and in addition for insular Newfoundland, 368 eggs/hectare of lacustrine habitat (ponds and lakes) (CAFSAC Adv. Doc. 91/15). For the northern peninsula of Newfoundland (SFA 3 and 14) and for Labrador, 105 eggs/hectare of lacustrine habitat is used (O'Connell et al. MS1991). The conservation target for a river is therefore the product of the fluvial habitat area and 2.4 eggs, plus for insular Newfoundland and Labrador, the surface area of lacustrine habitat times the appropriate egg per lacustrine area value. Targets for rivers are defined in terms of eggs and can be translated into the number of salmon required to meet the target using values of the average biological characteristics of the stock, including percent female and eggs per female.

References

- CAFSAC 1991. Definition of Conservation for Atlantic Salmon. CAFSAC Ad. Doc. 91/15 in Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC) Annual Report Vol. 14, 1991 pp. 147-150.
- O'Connell, M.F., J.B. Dempson, and R.J. Gibson, 1991. Atlantic salmon (*Salmo salar* L.) smolt production parameter values for fluvial and lacustrine habitat in Insular Newfoundland. CAFSAC Res. Doc. 91/19, 11p.
-

2.5 Status of Stocks - Returns and Spawning Escapements

A total of 73 rivers were assessed in 1995 (Fig. 2.5.2). Estimates of total returns of small and large salmon were obtained using various techniques; 46 were derived from counts at fishways and counting fences (FW, Fe), 7 were obtained using mark and recapture experiments (MR), 2 using fence counts and spawner redd counts (FR), 13 using visual counts by snorkeling or from shore (Vi), 1 from an acoustic system (AC), and 4 from angling catches (An).

Table 2.5.1. Index of rivers and methods used to assess the status of stocks of Atlantic salmon in eastern Canada in 1995. Method abbreviations are: FW = fishway, Fe = counting fence, FR = counting fence and redd counts, MR = mark and recapture experiments, Vi = visual counts mostly by divers or from shore, AC = acoustic monitoring, An = angling catches and estimated or assumed exploitation rates. Rivers are shown in Fig. 2.5.2. Superscript 1 indicates rivers for which returns have been enumerated since at least 1985, 2 indicates returns enumerated since at least 1990.

1	FW	Saint Croix	2	FW	Magaguadavic	3	FW	Saint John ¹	4	Fe	Nashwaak
5	Vi	Big Salmon	6	FW	Petitcodiac	7	Fe	Stewiacke	8	FW	Gaspereau
9	FW	LaHave ¹	10	Fe	Sackville	11	FW	Liscomb ¹	12	An	St. Marv's
13	FW	Grand ²	14	Vi	Middle ²	15	Vi	Baddeck	16	FW	Svdnev
17	Vi	North	18	MR	Margaree ¹	19	An	West (Ant.) ¹	20	Vi	Sutherlands
21	An	East (Pictou) ¹	22	An	Philio ¹	23	MR	Morell ¹	24	MR	Boucrouche
25	MR	SW Miramichi ¹	26	MR	NW Miramichi	27	FR	Nepisiguit ¹	28	Fe	Jacquet
29	MR	Restigouche ¹	30	Vi	Cascapedia	31	Vi	Bonaventure ¹	32	Fe	Port Daniel
33	Fe	Grand Pabos	34	Vi	Grande Rivière	35	Vi	Saint-Jean ¹	36	Vi	York ¹
37	Vi	Dartmouth ²	38	FW	Madeleine ¹	39	FW	Sainte-Anne	40	FW	Matane ¹
41	FW	Mitis	42	FW	Rimouski	43	FW	Ste-Marguerite ¹	44	FW	Des Escoumins
45	FW	de la Trinité ¹	46	FW	Aux Rochers	47	AC	Moisie	48	Fe	Mingan
49	Fe	Bec-Scie ¹	50	Vi	Jupiter ¹	51	Vi	de la Chaloupe ¹	52	FW	Lomond
53	MR	Humber	54	FR	Harrys	55	Fe	Flat Bay	56	Fe	Highlands
57	Fe	Conne ²	58	Fe	Little ²	59	FW	Northeast ¹	60	FW	Rocky ²
61	Fe	Biscay Bay ¹	62	Fe	Northwest	63	FW	Terra Nova ¹	64	FW	Middle Brook ¹
65	Fe	Gander ²	66	Fe	Cambellton	67	FW	Lower Exploits ¹	68	FW	Middle Exploits
69	FW	Upper Exploits	70	FW	Torrent ¹	71	Fe	Western Arm ¹	72	Fe	Forteau
73	Fe	Sand Hill									

The returns represent the size of the population before any in-river removals. Spawning escapement is determined by subtracting all the known removals, including food fisheries, recreational harvests, broodstock collections, and scientific samples from the total returns.

Total returns in 1995

Of the 73 stocks for which returns of salmon were determined in 1995, comparable data were collected in 1994 for 56 of these. Large salmon returns in 1995 were higher in Newfoundland and Labrador whereas returns were higher or unchanged relative to 1994 in the southern Gulf of St. Lawrence and Québec stocks. Large salmon returns were lower or unchanged in the Bay of Fundy and Atlantic coast of Nova Scotia. Small salmon returns were lower in 1995 in the Gulf of St. Lawrence and Québec but predominantly higher in the Newfoundland, Labrador and the Bay of Fundy/Atlantic coast of Nova Scotia areas.

Size group	Number of rivers in each category			
	Returns in 1995 relative to returns in 1994			
	Total	<90%	90% to 110%	> 110%
Bay of Fundy, Atlantic coast of NS (SFA 19 to 23)				
Small + Large	14	6	2	6
Small	9	3	1	5
Large	9	4	4	1
Southern Gulf of St. Lawrence and Québec (SFA 15 to 18, Q1 to Q10)				
Small + Large	23	11	3	9
Small	21	9	7	5
Large	21	7	5	9
Insular Newfoundland and Labrador (SFA 1 to 14)				
Small + Large	19	3	4	12
Small	19	3	4	12
Large	19	5	5	9

Fewer rivers, 28 in eastern Canada, have had returns enumerated going back to 1985. With the exception of the Newfoundland and Labrador rivers, the returns in 1995 in eastern Canada were generally among the lowest observed in the time series. For the rivers of Newfoundland and Labrador, large salmon and small salmon returns were among the highest in the last 11 years. Large salmon returns in the Gulf of St. Lawrence and Québec were at median levels whereas small salmon returns were among the lowest.

Size group	Number of rivers	Rank of 1995 within 1985 to 1995 period			Number of rivers	Rank of 1995 within 1990 to 1995 period		
		Highest	Lowest	Median		Highest	Lowest	Median
Bay of Fundy / Atlantic coast of Nova Scotia (SFA 19 to 23)								
Small + Large	3	9	10	10	5	3	6	4
Small	3	9	11	9	4	3	6	4
Large	3	10	11	11	4	2	6	5.5
Southern Gulf of St. Lawrence / Québec (SFA 15 to 18, Q1 to Q10)								
Small + Large	18	1	11	9	19	1	6	5
Small	15	1	11	10	17	1	6	6
Large	15	2	11	6	17	2	6	4
Newfoundland and Labrador (SFA 1 to 14)								
Small + Large	7	1	9	3	11	1	5	3
Small	7	1	8	4	11	1	4	3
Large	7	1	8	1	11	1	4	1

Rank of the 1995 returns of individual rivers within the last 11 years and within the last 6 years. A rank of 1 means the return in 1995 was the highest of the time series for that river. A rank of 11 in the eleven year time series means that the 1995 return was the lowest observed in 11 years for that river. The median rank represents the rank of the 1995 returns for which half the rivers were above and half were below.

Compared to more recent times, 1990 to 1994, the returns in 1995 were most frequently among the lowest in all the areas of eastern Canada, with the exception of Newfoundland / Labrador for which returns of large salmon were the highest observed in the last six years in more than half the rivers assessed.

Origin of returns in 1995

Fish designated as being of wild origin are defined as the progeny of fish where mate selection occurred naturally (eggs not stripped and fertilized artificially) and whose life cycle is completed in the natural environment. Hatchery origin fish, designated as fish introduced into the rivers regardless of life stage, were identified on the basis of the presence of an adipose-clip, from fin deformations, and/ or from scale characteristics. Not all hatchery fish could be identified as such in the returns because of stocking in the early life stages. Aquaculture escapees were identified from hatchery fish on the basis of fin erosion (especially of the tail) and from scale characteristics.

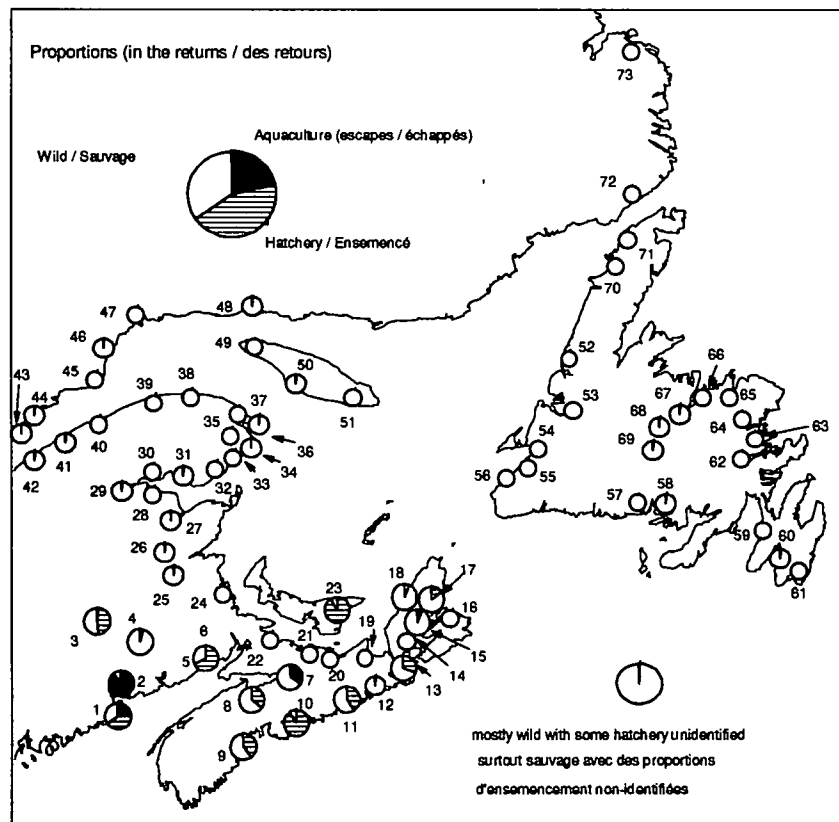


Fig. 2.5.1. Origin of salmon returning to rivers of eastern Canada in 1995.

The returns to the majority of the rivers in Newfoundland and to most rivers of the Gulf of St. Lawrence and Québec were comprised exclusively of wild salmon. Hatchery origin salmon made up varying proportions of the total returns and were most abundant in the rivers of the Bay of Fundy and the Atlantic coast of Nova Scotia. Aquaculture escapees were sampled from the returns to several rivers of the Bay of Fundy (St. Croix, Magaguadavic, Saint John, Stewiacke, Gaspereau) as well as in at least one river from the Bras d'Or Lakes of Cape Breton (Baddeck River). Other salmonid aquaculture escapees, rainbow trout from the Bay d'Espoir aquaculture industry, were observed at Conne River. Cage-reared Big Salmon River fish (SFA 23) were released into the Big Salmon River and in the Petitcodiac in the fall of 1995 to augment the natural spawning; as in 1994, these releases were greater than the estimated returns of wild salmon to the Big Salmon River.

Escapement and Egg Depositions in 1995

Egg depositions exceeded or equalled the specific river targets in 22 of the 73 rivers and were less than 50% of target in 22 other rivers. Large deficiencies in egg depositions were noted in the Bay of Fundy and Atlantic coast of Nova Scotia where 10 of the 12 rivers assessed had egg depositions which were less than 50% of target.

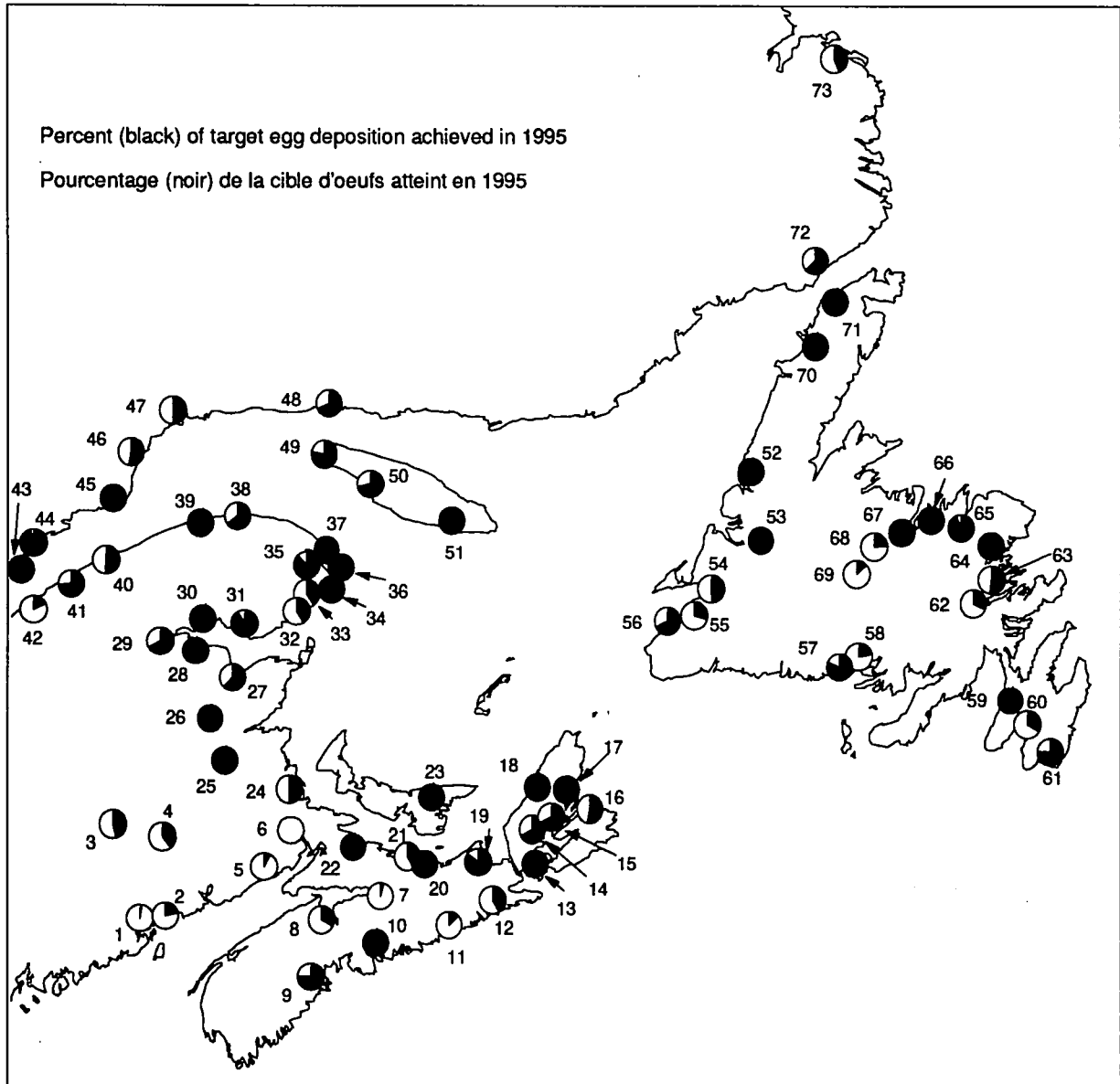


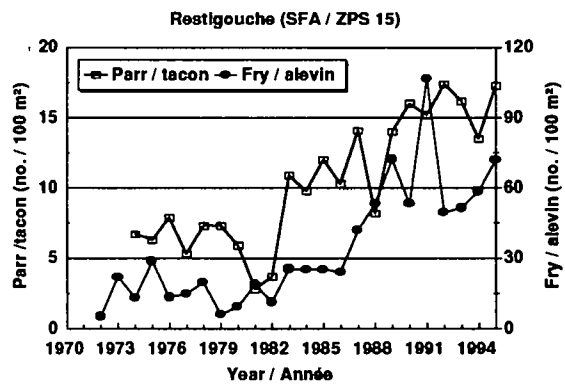
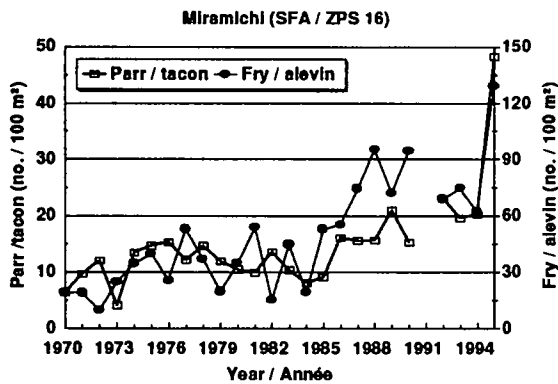
Fig. 2.5.2. Egg depositions relative to target for 73 rivers in eastern Canada in 1995. For key to river numbers, refer to Table 2.5.1.

2.6 Production of Atlantic Salmon in Recent Years

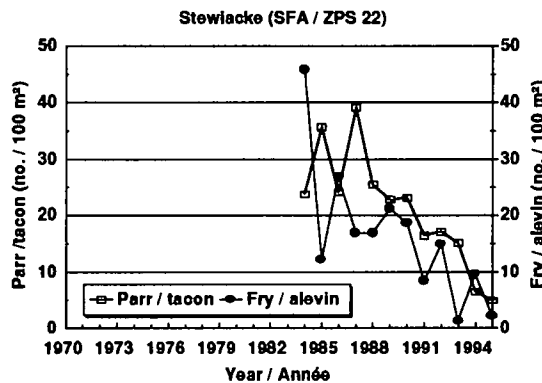
The production of Atlantic salmon is differentiated into two components: a freshwater phase and a marine phase. Freshwater production relates to the survival of juvenile salmon from the egg to the smolt stage. The marine production relates to the survival and growth from the smolt stage to the maturing adult fish. Both the freshwater and marine phases impact on the quantity of salmon returning to the rivers to spawn.

Freshwater production

Except for the rivers along the eastern and southern shores of Nova Scotia which have been impacted by acid precipitation and rivers of the inner Bay of Fundy, the freshwater production of the monitored rivers in Atlantic Canada has increased or remained constant at high levels since 1985. Densities of juveniles have been monitored annually since 1971 in the Miramichi and Restigouche rivers. In these rivers, juvenile densities of young-of-the-year (fry) and parr (juveniles of one or more years old) have increased since 1985 in response to increased spawning escapements.



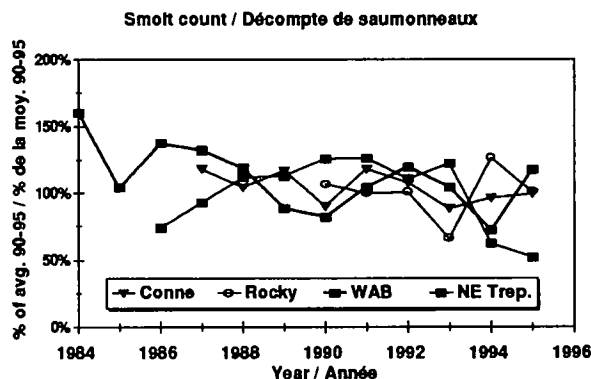
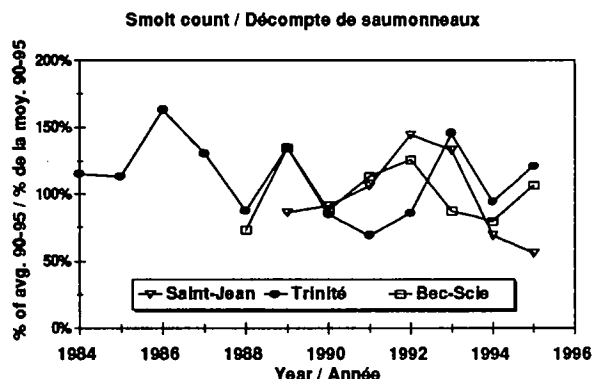
High densities of juveniles have also been reported from Nova Scotia rivers along the Gulf of St. Lawrence (SFA 18) and in several Cape Breton Island streams (SFA 19). This is in contrast to juvenile densities from an inner Bay of Fundy river (Stewiacke River) which have declined since 1984, as a result of reduced spawning escapement.



Counts of smolts are available from six rivers in Newfoundland, three rivers from Québec, and two tributaries of rivers in the Maritime Provinces. These provide direct measurements of the outputs from the freshwater habitat. Annual smolt output from a tributary can vary by five times but in the counts for entire rivers, smolt output has generally varied in magnitude by about a factor of two.

River	Years	Range in smolt counts		
		Minimum	Maximum	Magnitude
Little River (tributary of Stewiacke River SFA 22)	1990 - 1994	1500	4000	2.7 X
Lake O'Law Brook (tributary to Margaree River SFA 18)	1991 - 1994	631	2541	4.0 X
Catamaran Brook (tributary of the Northwest Miramichi SFA 16)	1990 - 1995	426	2135	5.0 X
Saint-Jean Q2	1989 - 1995	60227	154906	2.6 X
de la Trinité Q7	1984 - 1995	40695	96469	2.4 X
Bec-Scie Q10	1988 - 1995	4709	8687	1.8 X
Highlands SFA 13	1993 - 1995	9986	15839	1.6 X
Conne SFA 11	1987 - 1995	55765	74585	1.3 X
Rocky SFA 9	1990 - 1995	5115	9781	1.9 X
Northeast Trepassey SFA 9	1986 - 1995	792	1911	2.4 X
Campbellton SFA 4	1993 - 1995	31577	41633	1.3 X
Western Arm Brook (WAB) SFA 14A	1971 - 1995	5735	20653	3.6 X

Since the number of smolts leaving the rivers depends upon the number of eggs deposited and variable survival among years, smolt output is not constant from year to year. The production among river systems is also not necessarily synchronized and it is not possible to calculate how many smolts in total leave the rivers of Atlantic Canada for any given year. The seven rivers which have estimates of the total smolt output in the last five years indicate that in 1995, the number of smolts leaving the rivers was similar to the previous five-year average except for Saint-Jean River and Northeast Trepassey (NE Trep.) where smolt output was at 50% of the previous five-year average output.



Marine production

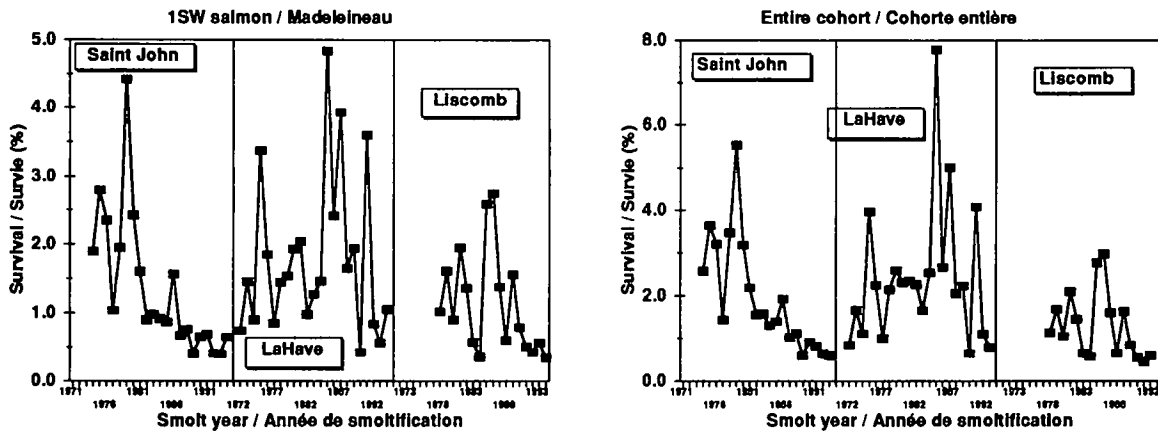
Marine production depends in large part on the number of smolts entering the sea, which varies annually, and the survival of these smolts to maturity. Sea survival back to the river also varies annually, as a result of variable natural and fisheries mortality. Reductions in marine fisheries exploitation would be expected to improve the survival rate back to the river but this can be offset by increases in natural mortality which can be brought about by variable causes, including environmental conditions, predation, and disease transmission.

Counts of smolts and adult salmon returns enable estimates of marine survival to be derived. Examination of trends over time provide insight into the impact of changes in management measures or other factors that can influence the production of salmon. Information from 11 rivers in Atlantic Canada with at least four years of smolt counts and corresponding adult counts are available; three are hatchery stocks and 8 are wild populations. Geographically, populations for which data were available ranged from the Saint John River (SFA 23- Bay of Fundy) in the south, LaHave River (SFA 21) and Liscomb River (SFA 20) along the Atlantic coast of Nova Scotia, Saint-Jean (Q2) in the Gaspé region, de la Trinité (Q7) in the Québec north shore, Bec-Scie (Q10) in Anticosti Island, and other populations from southern (SFAs 9 and 11), eastern and northern Newfoundland.

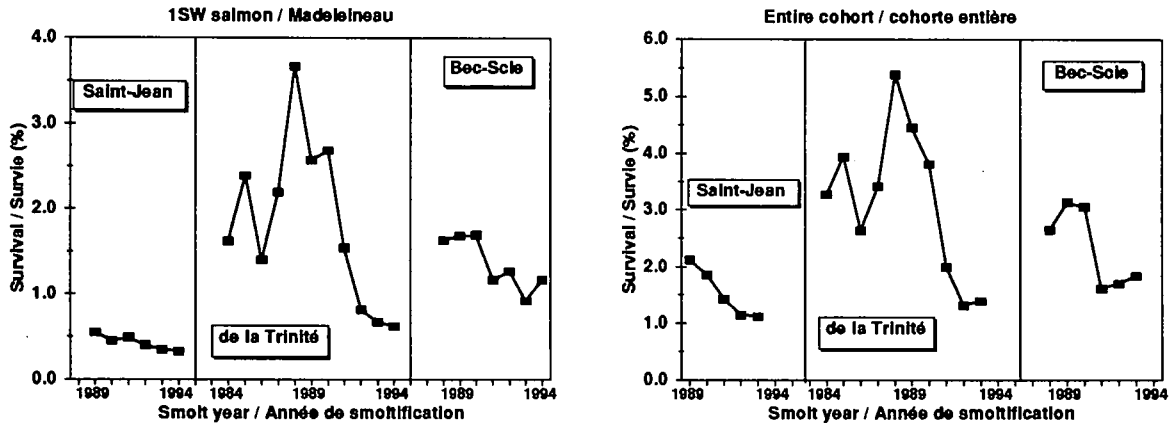
The following figures illustrate the return rate, or percent survival, from smolt to adults (as actual 1SW returns and for the entire cohort, all sea-ages for the three Québec rivers). Smolt year refers to the year of smolt migration and thus the survival corresponds to the return of adult salmon in the following year.

In general, survival of hatchery stocks is lower (avg. by river over all years from 1.13% to 1.38%) than that of wild stocks (avg. over all years of 1.53% to 5.44%). Similarly, survival of hatchery stocks is more variable (C.V. from 64.4% - 74.6%) than wild stocks (C.V. from 19.7% - 52.5%).

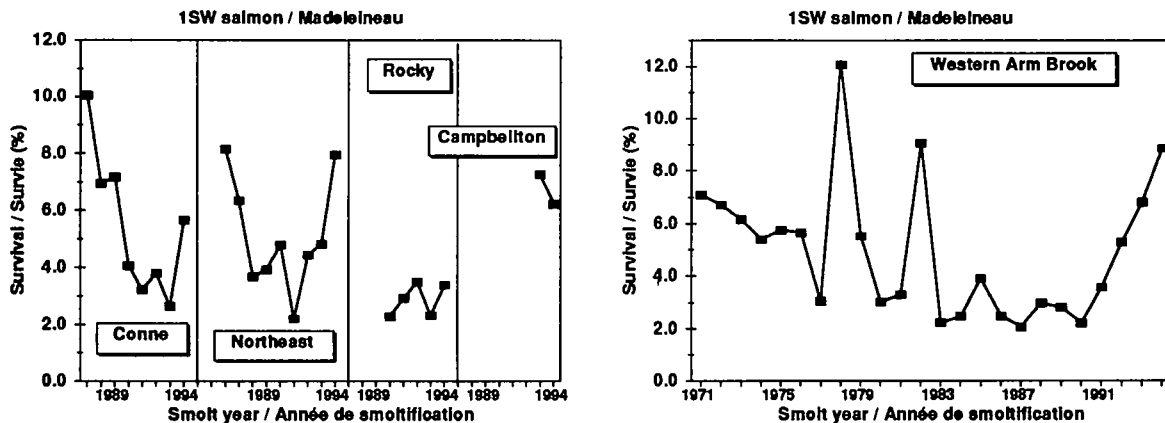
The three hatchery stocks from the Bay of Fundy / Atlantic coast of Nova Scotia show a declining trend over time which has become particularly acute in recent years.



Sea survivals in the Gulf of St. Lawrence stocks have also declined from the peak survivals of the 1989 smolt migration.



Survivals of the 1994 smolt migration improved for all the Newfoundland stocks with smolts from Western Arm Brook (SFA 14A) and Northeast Brook (Trepassey) (SFA 9) showing a consistent increase over the past three years.



On Newfoundland rivers, small salmon returns prior to 1992 would have been affected by the commercial fishery. Since then, survivals would have been expected to have increased as a result of the commercial salmon fishery moratorium.

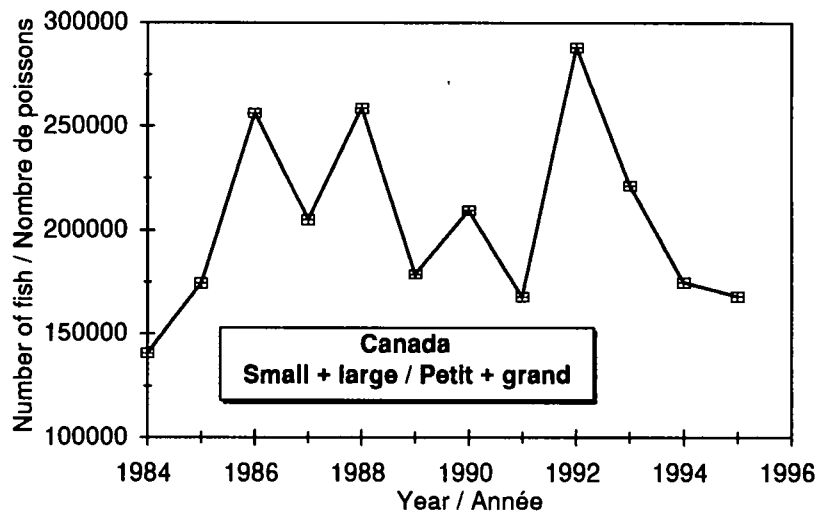
A rank ordering of survival values indicated that:

- 3 of the 10 rivers, had the lowest survival recorded in the 1994 smolt year-class (adult returns in 1995),
- 9 of the 10 rivers had either the lowest or second lowest sea survivals coinciding with the moratorium years (i.e. adult returns in 1992 to 1995).

Given the large scale reductions in marine exploitation that have occurred over the past several years, sea survival of the salmon populations from the Maritime and Québec stocks has not increased in the manner expected.

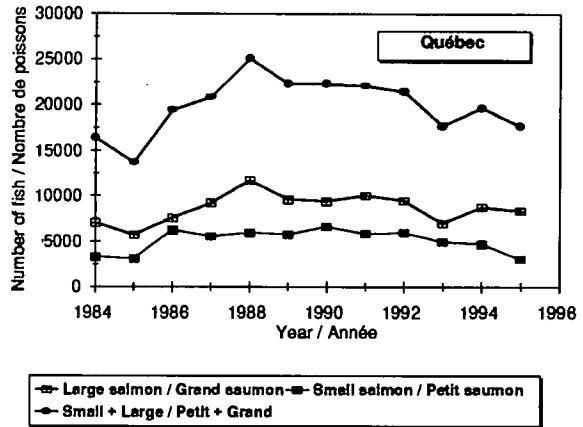
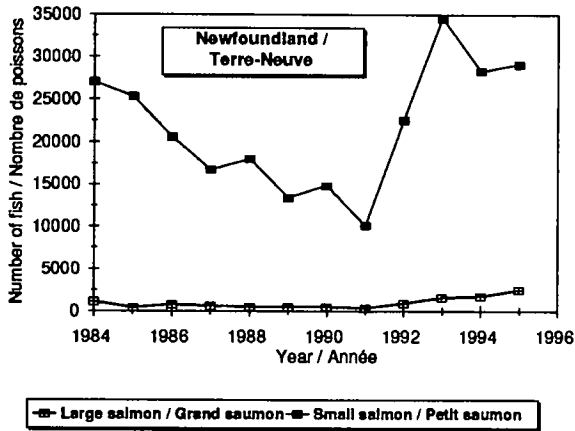
Environmental conditions in the ocean have been less favourable since 1989 than in the previous decade. More localized factors may add more variability to the annual variation in survival rate imposed by the high seas conditions. The interaction between aquaculture escapees and wild stocks is a concern being expressed on both sides of the Atlantic. There is speculation that survival of wild fish may be affected while they are in the area of aquaculture operations. While a significant correlation can be found between the survival of the Saint John smolts since 1980 and the growth in the aquaculture industry, decreased survivals have been observed in the hatchery stocking for the LaHave River and the Liscomb River, stocks in which the smolts do not migrate in the vicinity of the aquaculture production areas. As well, decreased survivals have occurred in several wild stocks from Québec and Newfoundland rivers in the absence of any potential aquaculture impacts.

Annual returns of salmon (sizes combined) are available for 28 rivers in Atlantic Canada since 1984. These returns do not account for commercial fisheries removals in Newfoundland, Labrador and Greenland and in some rivers include returns from hatchery stocking. Returns after commercial fisheries have varied between 141,000 and 288,000 fish with a peak return year in 1992.

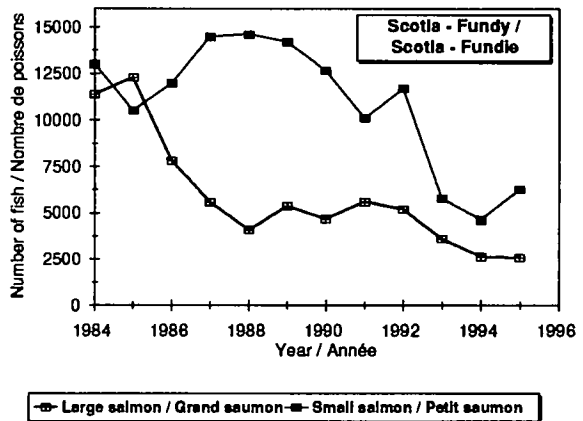
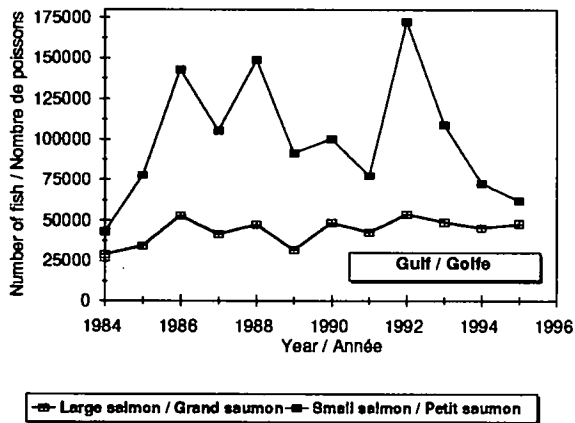


Peak return years differed for regions within eastern Canada: 1993 for Newfoundland rivers, 1988 for Québec rivers, 1992 for southern Gulf of St. Lawrence rivers and 1984 for the Bay of Fundy / Atlantic coast region. In-river returns in these monitored rivers in 1995 were the second highest for Newfoundland but returns to all other regions were dismal compared to returns since 1984. Gulf and Scotia Fundy returns were the second lowest and Québec returns were the third lowest (out of 12 years). The returns during the moratorium years 1993 to 1995 are lower than the returns of 1986 to 1988 when there were commercial fisheries in Newfoundland, Labrador and Greenland.

The returns of salmon differentiated into small and large size categories have been estimated for 22 rivers. The substantial reductions in the commercial exploitation since 1992 has produced a noticeable improvement in the returns of small and large salmon to many Newfoundland rivers.



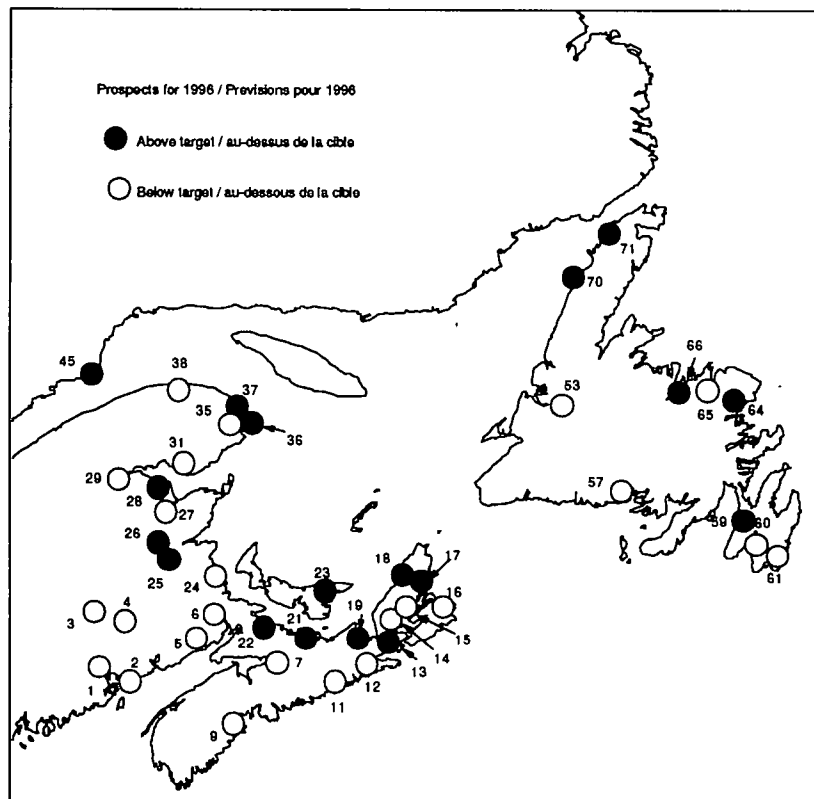
Returns of small salmon remained unchanged since 1984 but declined in the last two years in the Québec and southern Gulf of St. Lawrence stocks (Gulf). Returns of small and large salmon to the Bay of Fundy / Atlantic coast rivers have declined persistently since 1984.



2.7 Prospects

Short term - 1996

Stock to recruitment relationships, trends in sea survivals of hatchery and wild smolts, relationships between small salmon in one year to large salmon returns the following year, and correlations with marine conditions in the Labrador Sea are used to describe the prospects for 1996. These are summarized in the following figure in terms of whether or not the returns of fish would be expected to equal or exceed the target.



None of the rivers in the Bay of the Fundy / Atlantic coast of Nova Scotia, with exception to two Cape Breton Island rivers in SFA 19 are expected to meet conservation requirements in 1996. Most of the rivers (8 of 11) in the southern Gulf of St. Lawrence should receive returns which exceed conservation requirements. Several rivers in Québec had low returns of small salmon in 1995 and the returns of large salmon for these rivers are projected to be below requirements. Recruit per spawner ratios of the last three years, used to forecast returns to several Newfoundland rivers, indicate that returns in 1996 will not exceed conservation however the same method used in 1994 tended to underestimate the returns which resulted during 1995.

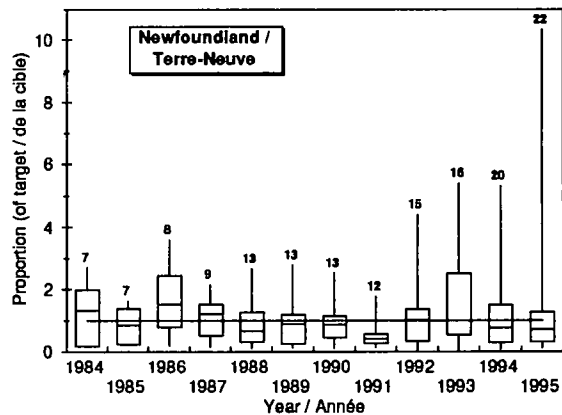
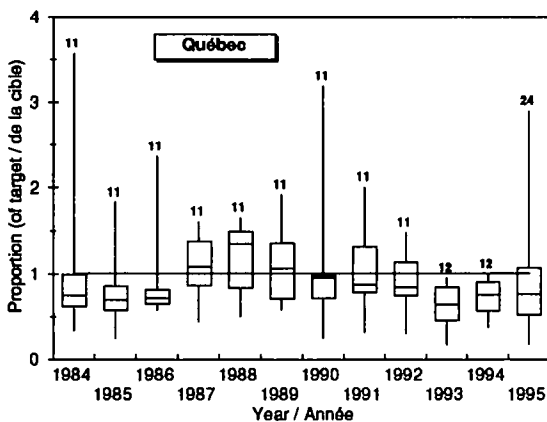
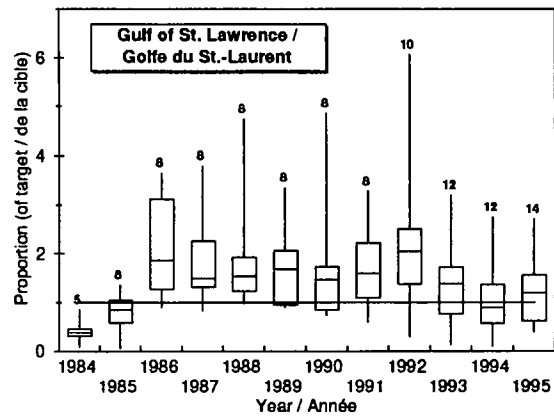
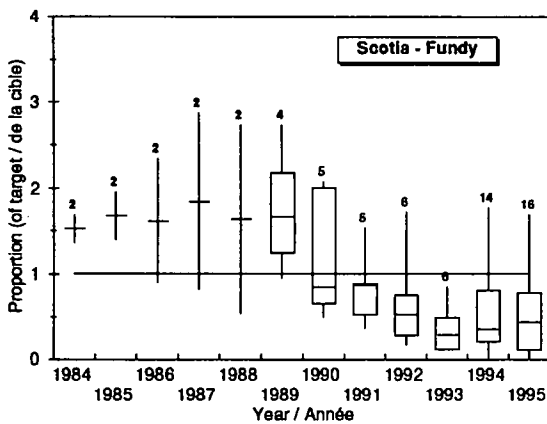
Long term - beyond 1996

A long term view of the prospects of the Atlantic salmon stocks of eastern Canada can be obtained from changes in abundance of juveniles in freshwater and spawning escapement levels achieved in recent years.

Escapements over time relative to targets have improved in some areas of Atlantic Canada but have declined in others. The Bay of Fundy/Atlantic coast of Nova Scotia rivers status has declined. Most of the rivers

received egg depositions in 1994 which were less than half of the target whereas in previous years, some of these rivers met or exceeded target, the most important example being the Saint John River (SFA 23). In spite of having received egg depositions which were greater than 50% of target, returns to the Bay of Fundy rivers continue to decline or stay low. For these rivers, the spawning stock is not replacing itself, the causes of which remain uncertain. In the Gulf of St. Lawrence, the number of rivers which received egg depositions less than 50% of target has increased since 1992. In the major river, the Miramichi (SFA 16), target egg deposition has been exceeded in 8 of the last 10 years.

Summary of egg depositions relative to target in the assessed rivers from four regions of eastern Canada. The vertical bar represents the range for the rivers assessed, the rectangle is the interquartile range (25th to 75th percentiles) and the horizontal line within the rectangle is the median. The horizontal line across the figure is the reference line indicating 100% of target egg deposition. The number above each vertical line is the number of rivers assessed in the given year.



An improvement in egg depositions in Newfoundland was noted in recent years; during 1989 to 1991, more than 50% of the rivers assessed received less than 50% of the target egg requirements. The increased egg depositions in recent years should result in improved recruitment back to the rivers before the end of the decade if marine

survival stabilizes or increases. The returns observed to the rivers of Newfoundland in the last three years are some of the progeny from the lower spawning escapements of 1988 to 1991.

Juvenile abundance in several monitored rivers of the Gulf of St. Lawrence has increased since 1985 and has remained at these higher levels. A similar response to increased egg depositions has been noted in Gander River (Section 5.2). In a monitored river of the inner Bay of Fundy, juvenile densities have continued to decline since 1984.

2.8 Environmental Conditions

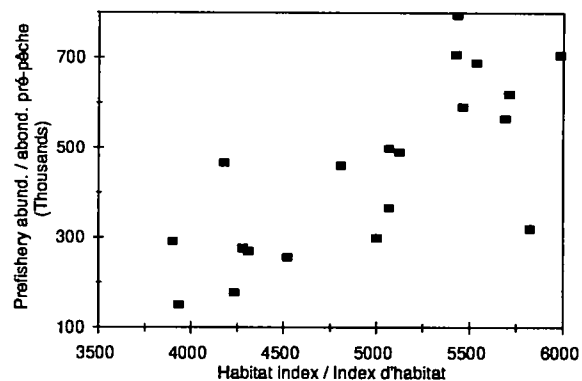
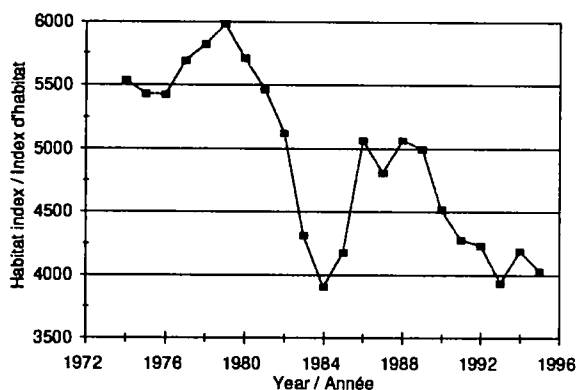
Environmental conditions in freshwater potentially affect the production of the rivers as well as the migration of adult salmon into the rivers. Marine conditions have an important role in the survival and growth of smolts to adults.

Low water levels were observed through the summer and fall of 1995 in many rivers of Atlantic Canada and Québec including Labrador in August. Record low flow discharges were recorded in the Restigouche and Miramichi Rivers. These conditions affected the angling activity and the upstream migration of salmon. Rivers in SFA 4 to 11 were closed to angling in part of July or August because of low water and high temperature conditions. Noticeable delays in the movement of salmon upriver were observed in several rivers throughout the Maritime region (Nashwaak - SFA 23, Miramichi River headwater barriers - SFA 16, Morell River - SFA 17, Margaree River - SFA 18).

Rivers along the south and northeastern shore of Nova Scotia (SFA 20 and 21) remain vulnerable to acid precipitation. Populations of Atlantic salmon are considered extinct in 14 rivers and remnant populations survive in 19 other rivers as a result of water quality impaired by acidification.

Marine conditions in 1994/95 would have affected the small salmon returning to the rivers in 1995 while conditions in 1993/94 and 1994/95 would have affected the large salmon stocks. Limited surface layer temperature data suggest that the waters in the Labrador Sea, including the Labrador and northern Newfoundland shelves, were generally cold in 1995 but warmer than 1994. Similar cold conditions persisted on the northeastern Scotian Shelf and along the Atlantic coast of Nova Scotia. In contrast, the Gulf of Maine region (believed to be utilized by 1SW salmon stocks from the inner Bay of Fundy) appeared to have been warmer than normal in 1995. The cold conditions in the Labrador Sea in 1995 and the warm temperatures in the Gulf of Maine reflect no change in the marine conditions from recent years and have paralleled the low marine survival experienced by "North Atlantic" and "inner Bay of Fundy" stocks in recent years.

Recent analyses have described a significant correlation between the estimated production of North American 2SW salmon and an index of marine habitat in the northwest Atlantic. It has been used to predict the prefishery abundance at Greenland of non-maturing 1SW salmon destined to return to North America as 2SW spawners in the subsequent year.



Significant correlations between this habitat index and return rates of hatchery smolts to the Saint John River and smolt survival rates to Conne River suggest that colder marine conditions may be having a detrimental effect on the natural survival at sea. The habitat index does not correlate with all the Atlantic salmon stocks (for example Miramichi River, Torrent River, Western Arm Brook) but appears to be a useful predictor of the potential returns of hatchery smolts to the Saint John River and to rivers of the Atlantic coast of Nova Scotia.

2.9 Effects of Recent Changes in Salmon Management on Stock Status

The closure of the commercial fisheries in the Maritime Provinces in 1984 resulted in a noticeable increase in returns of small and large salmon to the rivers. The effect of this reduced marine exploitation and the reduced in-river mortality, as a result of the mandatory hook and release in the recreational fishery of large salmon in many areas of eastern Canada, has been increased egg depositions in many rivers and increased juvenile abundance. In some areas, such as the Bay of Fundy, the increased escapement has not been sustained; returns to these rivers are now lower than they were prior to 1984. Entry of mature aquaculture-origin salmon to all rivers of the Bay of Fundy could be significant in 1996. A more thorough assessment of the impact of aquaculture escapees on wild salmon stocks is urgently required in the context of the growing abundance of escapees within rivers and the depressed state of some of the wild stocks.

The commercial fishery moratorium in Newfoundland introduced in 1992 and maintained through 1995 has had the most noticeable impact on the escapement to rivers of Newfoundland and Labrador. Some areas in Newfoundland (SFAs 11 to 13) which showed little or no improvement in escapement to the rivers during the moratorium years have either early run stocks and/or the exploitation on these stocks had already been reduced by the closure of the Port-aux-Basques drift-net fishery in 1971 and the delayed opening of the commercial seasons in 1978 and 1984. Generally, the proportion of large salmon in the returns to the rivers during the moratorium years were higher than in the period 1986 to 1991. While returns to the rivers of small and large salmon showed an overall improvement in the last four years, higher returns had been observed at several monitoring facilities in years prior to the moratorium. It was generally felt that, had the moratorium not been in effect, severe over-exploitation of many Atlantic salmon stocks would have occurred in 1995.

The marked decline in recreational catches and the failure of the Labrador commercial fishery to achieve its reduced quota in 1995 indicate that large salmon abundance in Labrador remains low. Consequently, exploitation on Labrador stocks and in particular the large salmon component, which contributes substantially to egg deposition, should be as low as possible.

3.0 Maritime Provinces Regional Summaries

Atlantic salmon rivers within the provinces of New Brunswick, Nova Scotia and Prince Edward Island are grouped within a region organizationally designated the Maritimes Region of the Department of Fisheries and Oceans (DFO). As part of the conservation mandate, Science Branch staff of DFO annually assess the status of numerous fish stocks and provide advice for their management. Between 1977 and 1992 eastern Canadian stock assessments were peer reviewed under the auspices of the Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC). Since 1993, each region of DFO has conducted its own review process - similar in intent but on a regional basis. The review of the anadromous Atlantic salmon stock status has been carried out on a Maritimes Region basis in 1994 and 1995.

The review of the 1995 stock status was conducted under the Regional Assessment Process (RAP) for the Maritimes Region, formed July 1995. The purpose of the RAP is to ensure thorough review of the individual stock assessments and the resulting biological advice provided for management of the stocks. RAP involves several steps. The first is the determination of the advice requirements. This is followed by assembling the available information and preparing a preliminary status report of the stock(s). Clients and other interests are then consulted to inform them of the stock status, to gather additional information and insights as well as to seek suggestions on how to improve the assessment in the future. After these consultations, the formal written assessment is prepared and reviewed by a committee of peers. The final steps include presentation of the results and conclusions to DFO fisheries managers and clients.

Documentation of RAP for 1995 is contained within a proceeding reports of the peer review (DFO Atlantic Fisheries Proceedings 96/1). There is a body of research documents which formed the basis of the peer review; these are published in the DFO Atlantic Fisheries Research Document series. The proceedings report and the research documents are available from the Maritimes Regional Advisory Process Office (DFO, P.O. Box 1006, Stn. 215, Dartmouth, Nova Scotia, Canada, B2Y 4A2).

For more information on the assessments of Atlantic salmon stocks in the Maritimes Region, you may contact the following individual:

Dr. John Ritter, Manager
Diadromous Fish Division
Science Branch
Dept. of Fisheries and Oceans
P.O. Box 550
Halifax, NS
B3J 2S7
CANADA

3.1 Bay of Fundy Stocks (SFAs 22 & 23)

General description

Atlantic salmon of the Bay of Fundy are comprised of two discrete complexes: i) those of the **inner** Bay, which most always mature after just one winter at sea (1SW), can have a high incidence of repeat spawning (returning for up to six consecutive spawnings) and are not known to migrate to the Labrador Sea, and ii) those of the **outer** Bay which have both one sea-winter (1SW) and two sea-winter (2SW) components, a relatively low incidence of repeat spawning and, migrate like Atlantic coast stocks to the Labrador Sea.

About 25 relatively small **inner Fundy** rivers in New Brunswick and Nova Scotia have had historical angling for Atlantic salmon. The status of these stocks was assessed using data from the Stewiacke and Big Salmon rivers - the largest in Nova Scotia and New Brunswick, respectively. Sea-age composition of Stewiacke River salmon was historically 70% recruit 1SW salmon and 30% repeat spawning 1SW salmon; that of the Big Salmon River has been 50% 1SW and 50% repeat spawning 1SW. Eggs from the stocks of the Big Salmon and Petitcodiac rivers in New Brunswick have been hatched and reared to fall fingerlings or smolts at the Saint John Fish Culture Station for research in their rivers of origin; eggs of Stewiacke River salmon in Nova Scotia have been hatched and raised at the Coldbrook Fish Culture Station, Nova Scotia, for research purposes in their river of origin.

Outer Fundy rivers number six in New Brunswick (excl. of tributaries) and two in Nova Scotia (Annapolis and Gaspereau rivers with very small salmon resources). The assessed stocks include those of the Saint John River *above* Mactaquac, the Nashwaak River (tributary to the Saint John below Mactaquac), the Magaguadavic and the St. Croix rivers - all in New Brunswick. Small:large salmon at Mactaquac in 1995 were about 60:40 for wild fish and 80:20 for hatchery-origin fish. In 1995, small salmon of hatchery-origin comprised 57% of the returns, up from 36% in 1994; large salmon increased to 26% from 22% in 1994. Previous spawners comprised only about 4% of large salmon; escaped sea-cage fish at Mactaquac comprised about 1% of the run. Small:large wild salmon on the Magaguadavic River at tide-head are about 60:40; hatchery fish are not stocked but sea-cage escapees (many non-mature 1SW fish) in 1995 comprised 89% of the entire return and about 70% of the escapement.

Eggs of Saint John River adults, taken mostly at Mactaquac Dam, were reared at the Mactaquac and Saint John fish culture stations. Releases in 1995, for mitigation of hydro development and colonization, numbered in excess of 300,000 smolts, 600,000 6-week fry and 400,000 20-week parr. Eggs were provided to three stream-side incubators operated by stakeholders. Eggs of a few salmon returning to the St. Croix River in New Brunswick are reared at the Saint John Fish Culture Station, those of the Annapolis and Gaspereau rivers in Nova Scotia are reared at Cobequid Fish Culture Station for enhancement, native fisheries development, mitigation for hydroelectric projects or colonization.

The New Brunswick Atlantic salmonid aquaculture industry is located in or near Pass-amoquoddy Bay. Growers produced an estimated 14,500t of Atlantic salmon in 1995. Escapees in 1995 were not believed to have exceeded the 20,000-40,000 salmon reported for 1994. Aquaculture in **outer Fundy**, Nova Scotia, has been restricted to an experimental site near Digby.

Description of fisheries

Inner Fundy rivers have had no legal harvest since 1990; the Indian Brook and Millbrook First Nations had imposed and agreed to harvests of 295 small and 100 large salmon from non-inner Fundy stocks of Nova Scotia. Forecasts of low returns and spawning escapements in 1995 closed all **outer Fundy** rivers to any fishing for salmon. An allocation of 1,295 small salmon to First Peoples in 1994 was reduced to 150 small salmon from the Saint John River, only after that target was met. The effort was mostly by hook and line and few fish were harvested. Annapolis and Acadia First Nations were allocated 300 small salmon from Atlantic coast stocks, Nova Scotia.

Public consultations

Consultations with First Peoples, angling groups, the provinces and DFO area staff and fisheries officers concerned with **inner Fundy** rivers were facilitated at two meetings of a Steering Committee over-seeing the communal installation of the Stewiacke River Counting Fence and one meeting of the SFA 22 Zone Management Advisory Committee. For **outer Fundy** rivers, meetings of the SFA 23 Zone Management Advisory Committee were held in April, August and January to assess in-season and post-season returns and devise appropriate management strategies. These meetings were chaired by the DFO Area Manager and attended by First Peoples, angler associations, outfitters, DFO area staff and provincial and National Parks biologists. Deliberations were evaluated for inclusion in the draft assessments that were peer reviewed in February 1996. As well, a Science review on salmon initiatives above Mactaquac was held in June with Canadian and American stakeholders.

Environmental considerations

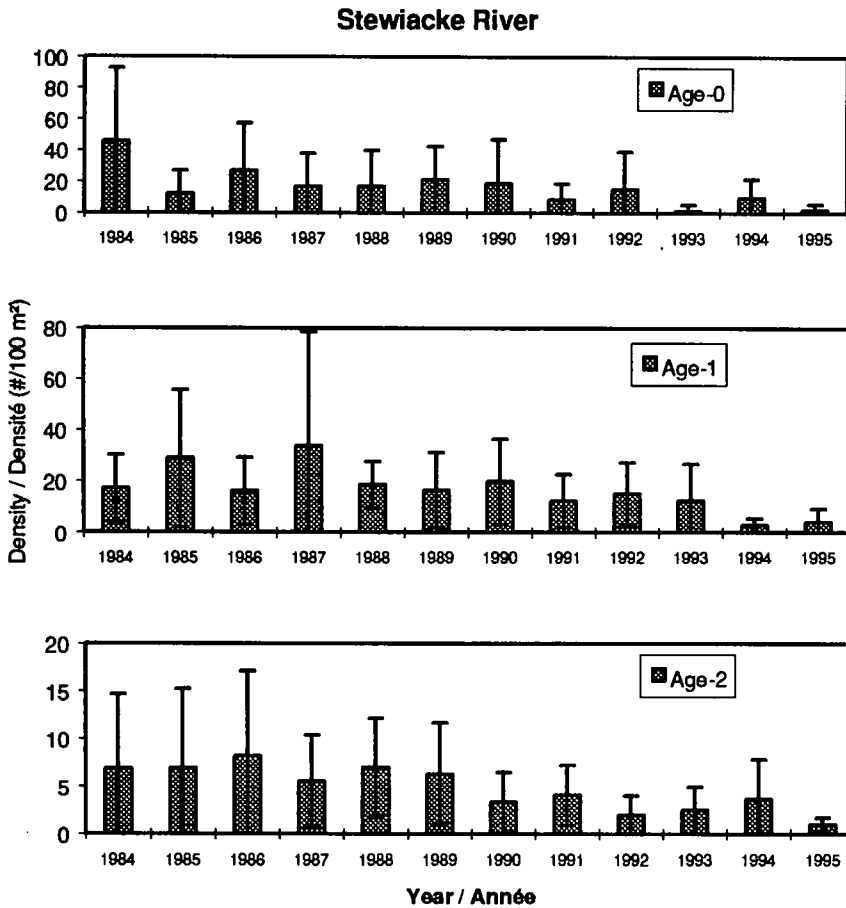
Analyses and the search for significant interaction between survival of **inner Fundy** smolts and environmental conditions, fisheries and/or status of prey and predator populations of the Bay of Fundy are ongoing but are hampered by direct evidence of the location of over-wintering areas and of a reliable index of survival. Fluctuations in abundance of commercially caught, and later recreationally caught salmon have been noted since 1900.

For **outer Fundy** stocks, indices of winter habitat in the North Atlantic (used to estimate pre-fishery abundance and allocations for the Greenland fishery) have yet to be fully implicated in recruitment processes of wild Saint John River salmon. However, relationships between the March index of habitat and i) return rates for hatchery-origin 1SW salmon, ii) return rates of 2SW hatchery salmon (affected by each winter), and iii) the length of wild 1SW returns (hatchery not tested) destined for Mactaquac are significant. Length and proportion of 1SW salmon from a smolt class are also related to winter habitat and have been previously interpreted as an expression of environmentally induced "cross-over" of potential non-maturing 1SW fish to maturing 1SW fish. The 1995 March index of habitat did not increase from the low values of the three previous years.

Status of stocks

Assessments of **inner Fundy** stocks are based on partial counts made during swim-throughs and from shore on the Big Salmon River (New Brunswick Department of Natural Resources and Energy), and a partial count at a fence on the Stewiacke River (Indian Brook First Nation, Cobequid Salmon Association, Nova Scotia Salmon Association, and Atlantic Salmon Federation). Juvenile salmon populations are monitored using electrofishing of parr in the Stewiacke and Big Salmon rivers and count of smolts out of the Little River, tributary to the Stewiacke.

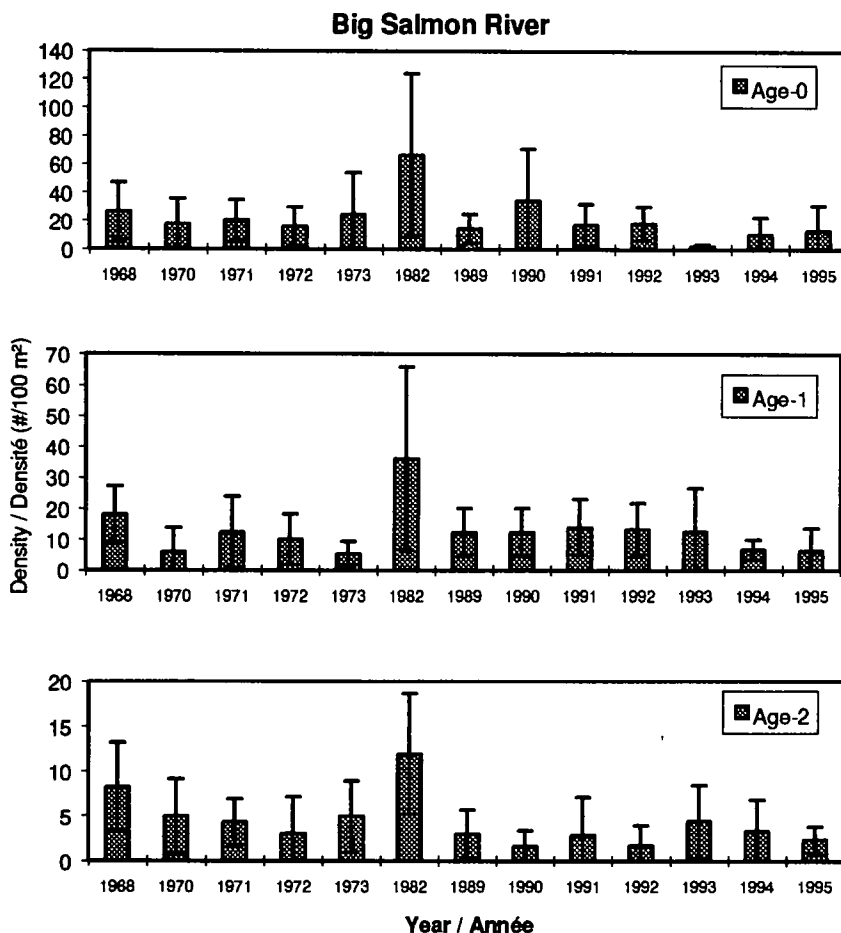
Mean age-1+ parr density in the Stewiacke River and tributaries increased to 4.02 per 100 m² but is significantly ($p=0.06$) lower than all mean densities prior to 1991.



The smolt count at Little River was incomplete due to high water conditions in 1995. Counts made during prime temperature, flow and seasonal periods were low.

The fence in the Stewiacke River operated from September 1 to November 14, 1995. A total of 37 large and 9 small salmon were recorded, presumably marked, and released above the fence. However, these records may be incomplete. Three unmarked salmon were captured above the fence site with the electrofishing boat in late November and December; no mark-and-recapture estimate was possible but the catch rate was the lowest of the 1988-1993 series and suggests that escapement of salmon in 1995 was extremely low. Seven of 21 salmon from which scales were provided were of aquaculture origins. The 21 fish had a potential for depositing 150,000 eggs; 49% of that potential was by salmon of aquaculture origin.

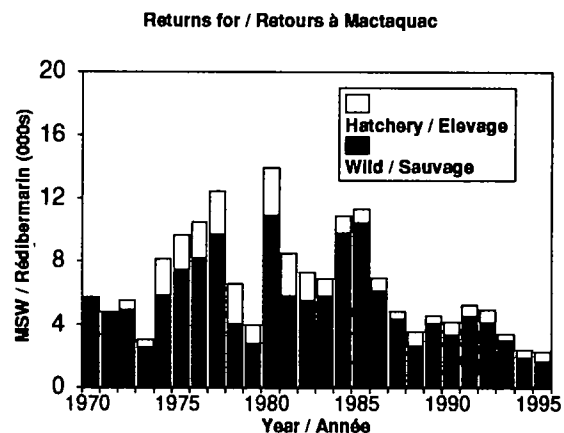
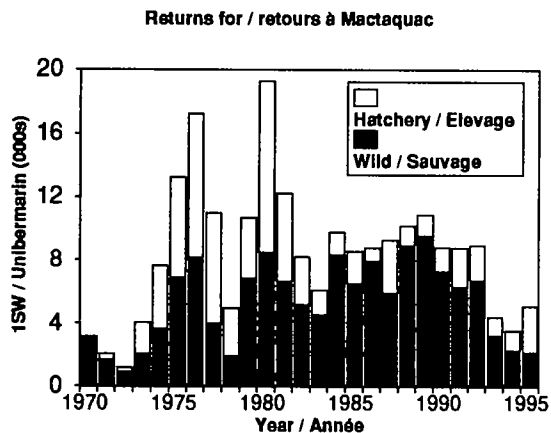
On the Big Salmon River, average densities of age-0+ parr increased to 21.3 from 10.4 per 100 m² in 1994; age-1+ parr densities of 6.4 per 100 m² were similar to those determined in 1968, 1970-1973, 1989-1994 and lower than those of 1982.



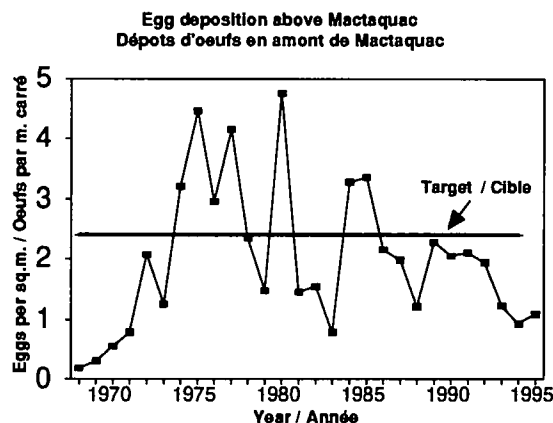
Counts of salmon from the shore on September 26, 1995, indicated approximately 110 salmon in the river (about 14% of requirements); 30% were classified as small salmon. No additional entrants were believed to have ascended in October when the spawning escapement was supplemented with 152 female and 75 male mature 2SW Big Salmon River fish reared in sea-cages. Observations in other inner Bay of Fundy rivers, especially Fundy National Park, indicate that returns in 1995 were once again very low.

Assessment of **outer Fundy** stocks is based on counts in the Saint John River at Mactaquac Dam (DFO), counts on the Nashwaak River at a fence (principally operated by St. Mary's and Kingsclear First Nations with assistance from DFO) and counts on the Magaguadavic and St. Croix rivers in fishways (Magaguadavic River at St. George - operated by the Magaguadavic Watershed Management Association and St. Croix River at Milltown - operated by the St. Croix River Recreational Fisheries Development Committee). The fence count on the Nashwaak River was incomplete; returns to the fence were estimated as the product of the 1995 count and reciprocal of the proportion that 1994 counts for the same period of operation were of the mark-and-recapture estimate of total returns in 1994. Fish of sea-cage origin were identified on the basis of erosion on the upper and lower lobes of the caudal fin. Sea survival was assessed on the basis of 1SW and MSW returns to Mactaquac from hatchery-reared and -released smolts.

Total small (5,079) returns destined for above Mactaquac exceeded those of 1994 but were less than in any other year since 1978. Large returns (2,355) destined for above Mactaquac were the fewest in the last 25 years and included 102 fish of aquaculture origin.



Identifiable hatchery fish increased to 57% of small and 27% of large returns; return rates for hatchery smolts were among the lowest of record for MSW (0.2%), whereas small salmon return rates increased over those of the two previous years, i.e., from 0.4% to 0.64%. Spawners numbered 1,887 large salmon and 4,839 small fish, 43% and 151% of the respective conservation requirements. Egg deposition (88% from large salmon) was 46% of requirement; conservation has not been met since 1985.



Counts at the Nashwaak fence of 569 small and 308 large salmon yielded an estimated return and escapement of 940 small and 436 large salmon. Spawners represented 61% and 28% of respective small and large requirements; egg depositions were estimated at about 39% of conservation requirements - 8% more than in 1994.

External and scale characteristics of 745 salmon captured in the Magaguadavic trap indicated that only 49 small and 30 large salmon were of wild origins - the lowest of several years of counts. The effective female escapement was estimated at 15 small wild, 16 small aquaculture, 15 wild large and 13 large aquaculture because many aquaculture fish were removed and the remainder were determined to be immature. Potential egg deposition was 22% of target; 52% of the total was of aquaculture origin. Evidence of genetic compromise is suggested by DNA tissue sampled from 75 large salmon collected in the mid-1970s, prior to the establishment of aquaculture initiatives in Passamaquoddy Bay, and 150 small and large salmon sampled between 1992-1994.

Returns to the St. Croix River, a system that has largely been undergoing redevelopment with Penobscot-origin stock (U.S.), numbered 60 fish, of which 13 were of aquaculture origin. Total counts were the lowest of the 13-year record. Egg deposition was about 2% of requirement; an additional 1% of requirement from wild-appearing returns was for the second consecutive year, laid down at Saint John Fish Culture Station.

Prospects

Age-1+ parr populations in **inner Fundy** rivers were again low in 1995. The age-1+ parr resultant of low escapements in 1993 will be the principal component of the 1996 smolt run. The age-0+ densities in 1995 were among the lowest on record and much lower than those associated with average smolt production. These data and apparent low marine survival indicate little potential for recovery within the next three years.

Small salmon returns destined for Mactaquac in 1996 should at least equal the 5,000 returns in 1995 and exceed the 3,200 small salmon spawning requirement. Wild small salmon returns to the Nashwaak, Magaguadavic and St. Croix rivers are not expected to exceed those of 1995 and would not approach conservation requirements. Numbers of escaped aquaculture fish cannot be projected, but are dependent on weather events and could continue to ascend the Magaguadavic fishway in significant numbers. If released upriver, aquaculture escapees could further dilute the gene pool of the "wild" stock.

Estimates of wild large salmon returns destined for Mactaquac have been based on regressions of large salmon returns (yr i+1) on small salmon returns (yr i) and their fork length with and without the effects of the recent moratoria in distant fisheries. The most realistic forecasts of large salmon returns may be 2,800 to 3,200 fish. It is highly unlikely that wild returns will meet conservation requirements of 4,400 fish. Hatchery returns destined for Mactaquac could number another 1,000 large fish and total wild and hatchery returns of large salmon could approach 85-98% of target requirements. Low numbers of wild small salmon returning to the Nashwaak, Magaguadavic and St. Croix rivers in 1995 and, a general expectation of associated low numbers of large salmon returning from the same smolt class, suggest that egg depositions by wild stocks are unlikely to meet conservation requirements in 1996. Large salmon of aquaculture origin salmon stock could continue the swamping of the "wild" gene pool of the Magaguadavic.

Management considerations

Conservation egg requirements were not met in any inner Fundy stocks assessed in 1995; there is every indication that closures are again warranted in 1996 and each year thereafter until conservation requirements have been consistently met for a period of several years. For the Gaspereau River, no surplus above spawning requirements is foreseen for 1996. The major problem on the Gaspereau River stems from water control practices at a hydroelectric dam. Water management options more favorable to salmon should be explored, in view of the termination of the current water agreement in 1997.

Target conservation requirements were unlikely to have been met in outer Fundy rivers in 1995 and except for above Mactaquac, there is no indication that returns in 1996 will be any different than those of 1995. Returns of small salmon to Mactaquac in 1996 should be surplus to conservation requirements but only because of the expected contribution from hatchery-origin fish. Allocations of small salmon from among fish destined to return to Mactaquac should await mid- and end-of-July forecasts of end-of-season returns to the Dam. Any allocations of small salmon from within the "above" Mactaquac stock component should consider harvest strategies that focus on fish of hatchery-origin and minimize the opportunity for catch-and-release of large salmon. Entry of mature aquaculture-origin salmon to all rivers of **Outer Fundy** could again be significant in 1996 and their removal at all fishway traps should be prosecuted without exception.

Summary sheets

More detailed information on individual assessments for the Stewiacke, the Saint John River above Mactaquac and the Nashwaak River are presented in the summary sheets.

STOCK: Stewiacke River (SFA 22)

TARGET: 3.1 million eggs (1061 salmon of all ages)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
First People's harvest									
Small	0	0	0	0	0	0	--	--	--
Large	0	0	0	0	0	0	--	--	--
Angling catch									
Small	0	0	0	0	0	0	--	--	--
Large	0	0	0	0	0	0	--	--	--
Broodstock (small + large)									
	18	13	12	30	14	0	0	30	15
Counts at fence									
Small			37	178	211	uk	37	211	107
Large			119	47	10	uk	10	119	44
Efficiency of the fence (%)									
			65%	55%	100%	uk	55%	100%	73%
Population estimate (small + large)									
			240	409	221	uk	221	409	218
% Hatchery origin in the returns									
			1%	4%	14%	uk	1%	14%	5%
% of egg target met									
			23%	39%	21%	uk	21%	39%	27%
Average juvenile densities (# per 100m²)									
# of sites	31	34	37	35	34	31	31	37	34
Age 0+	18.7	8.4	14.9	1.3	9.7	2.1	1.3	18.7	9.2
Age 1+	19.8	12.3	15.0	12.7	2.9	4.0	2.9	19.8	11.1
Age 2+	3.3	4.1	2.0	2.5	3.7	1.0	1.0	4.1	2.8
¹ 1990-1995 data.									

Harvests: The angling fishery has been closed since 1990.

Research data and assessment: Juvenile salmon are sampled by electrofishing and adult returns are enumerated at a counting fence located at the head of tidal influence. Fence data from 1995 are incomplete. Seven of twenty-one fish sampled were of aquaculture origin.

State of the stock: Stewiacke River data are used as indices for inner Bay of Fundy rivers which are presently severely under escaped. Total parr densities in 1995 are the lowest of record.

Forecast for 1996: No forecast is available for 1996, but combined low juvenile levels and marine survival make recovery unlikely within the next three years.

Management considerations: Considering the low state of the stock, no fisheries should occur in 1996.

STOCK: Saint John River, N.B. (*above Mactaquac*) (SFA 23)
TARGET: 29.4 million eggs (4,400 MSW and 3,200 1SW salmon)

Year	1990	1991	1992	1993	1994	1995	MIN	MAX	MEAN
First Peoples' Harvest:									
Small	273	657	560	241	250	50	241 ²	657 ²	396 ²
Large	247	957	748	462	90	25	90 ²	957 ²	501 ²
Angling harvest (retained catch)									
Small	2110	1690	2104	852	0	-	0 ¹	3580 ¹	2065 ¹
Counts									
1SW	7907	7575	7664	3907	3313	4970	3313 ¹	17314 ¹	8290 ¹
MSW	3919	4226	4203	2980	2206	2279	2010 ¹	10451 ¹	4907 ¹
Returns									
1SW	8804	8751	8940	4369	3534	5079	3534 ¹	19275 ¹	9731 ¹
MSW	4125	5215	4898	3389	2375	2355	2375 ¹	13916 ¹	7085 ¹
Spawning escapement									
1SW	6057	5721	5128	2819	2901	4839	2819 ²	6057 ²	4525 ²
MSW	3202	3481	3269	2149	1647	1887	1647 ²	3481 ²	2750 ²
% of target met									
1SW	189%	179%	160%	88%	91%	151%	88% ²	189% ²	141% ²
MSW	73%	79%	74%	49%	37%	43%	37% ²	79% ²	62% ²
Eggs	85%	87%	81%	51%	39%	46%	39% ²	87% ²	69% ²
¹ For the period 1975-1994									
² For the period 1990-1994									

Harvests: Salmon Fishing Area 23 was closed to recreational and commercial salmon fisheries in 1995. Fishing Agreements with requesting First Nations were begun on September 7 after the declaration of 1SW surpluses; only a few individuals exercised their right to fish.

Data and methodology: Counts of fish are obtained from the collection facility at Mactaquac Dam; returns destined for the Dam are the counts plus estimates of down river removals. Spawners equal the releases above Mactaquac minus estimates of upriver removals, not including poaching and disease. 1SW returns are forecast from a relationship between adjusted egg depositions recruiting to 1SW fish; forecasts of MSW returns are based on a relationship between MSW returns and their 1SW cohorts and their fork length, in the previous year.

State of the stock: Wild 1SW and MSW returns were the fewest in 17 and 25 years, respectively. Hatchery origin 1SW returns (57% of the total) were the highest since 1987; hatchery MSW returns (27% of the total) were the fourth highest since 1987. Egg deposition (30% from hatchery-origin fish) was 46% of requirement; the target has not been met since 1985. 1SW return rates for hatchery smolts increased to 0.6% from 0.4% in 1993 and 1994.

Forecast for 1996: 1SW returns destined for Mactaquac in 1996 should at least equal the 5,000 returns in 1995 and exceed the 3,200 1SW spawning requirements. MSW returns destined for Mactaquac in 1996 could number 2,800 to 3,300 fish (64-75% the 4,400 target spawning requirements); hatchery returns could number another 1,000 fish. Total MSW returns could approach 85-98% of target.

Management Considerations: Early client consultations and mid- and end-of-July forecasts should be requisite to any fishing plan in 1996.

STOCK: Nashwaak River, N.B. (*above counting fence*) (SFA 23)
TARGET: 10.7 million eggs (1,620 MSW and 1,530 1SW salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
First Peoples' harvest									
Small	-	-	-	2	40	-	2	40	21
Large	-	-	-	5	30	-	5	30	18
Angling harvest (retained)²									
Small	196	186	426	137	30 ³	-	137 ⁴	426 ⁴	236 ⁴
Partial counts									
1SW	-	-	-	83	403	569	83	403	243
MSW	-	-	-	155	274	308	155	274	215
Returns									
1SW	-	-	-	954	661	940	661	954	808
MSW	-	-	-	555	388	436	388	555	472
Spawning escapement									
1SW	-	-	-	866	610	940	610	866	738
MSW	-	-	-	555	349	436	349	555	452
% of target met									
1SW	-	-	-	57%	40%	61%	40%	57%	49%
MSW	-	-	-	36%	23%	28%	23%	36%	30%
Eggs	-	-	-	37%	31%	39%	31%	37%	34%
¹ For the period 1993-1994.									
² Catch above and below fence.									
³ Hook and release catch.									
⁴ For the period 1990-1993.									

Harvests: With the exception of a 150-fish allocation to Kingsclear and St. Mary's First Nations, September 7 - October 16, there were no legal fisheries for salmon on the Saint John River and tributaries in 1995. No salmon were known or reported to have been removed above the Nashwaak River fence.

Data and methodology: Partial counts are obtained from a counting fence located 23 km from the confluence with the Saint John River. Since 1993, total returns have been estimated by a mark-and-recapture technique (1994) and a proportional method (1993 and 1995) which uses the run timing of previous years when entire runs were estimated (1994) or monitored (1972, 1973 and 1975).

State of the stock: Counts at the fence indicate an estimated return and escapement of 940 1SW and 436 MSW representing 61 and 28% of the target. Egg deposition was 4.22 million eggs or 39% of the target of which 28% came from 1SW fish. The river has not attained more than 40% of target in the three years. Target numbers of MSW salmon were attained above the fence in 1973.

Forecast for 1996: There is little expectation for change in the numbers of wild 1SW fish in 1996 from those of the last three years (mean of 808 1SW fish). The 940 1SW fish in 1995 are suggestive of an increase of MSW salmon in 1996. However there is no evidence to suggest that the number of returns will be outside the range of the last three years (388-555 fish). The contribution of hatchery-origin fish to returns in 1996 has been, and will continue to be, minimal. In total, it is unlikely that the conservation target will be met in 1996.

3.2 Atlantic Coast of Mainland Nova Scotia (SFAs 20 & 21)

General description

SFAs 21 and 20 extend from Digby Gut on the outer Bay of Fundy to the Canso Causeway joining the mainland to Cape Breton Island. The area minimally contains 45 salmon rivers (16 in SFA 21, 29 in SFA 20). The rivers are medium-sized or smaller; only five (St. Mary's, LaHave, Medway, Mersey and Tusket) exceed drainage areas of 1400 km². Many of the rivers are in the 200 to 700 km² size range. Stock composition varies. Most stocks are composed of 70 to 80% small salmon and 20 to 30% large salmon. Historically the St. Mary's River had about 9% of its run as 3-sea-winter salmon.

Stocking from the Cobequid, Mersey and Coldbrook hatcheries in 1995 included 380,055 smolts to eleven rivers in southwestern Nova Scotia (SFA 21) and four rivers along the Eastern Shore (SFA 20). A total of 381,986 underyearling fish surplus to the smolt programs was also stocked in many of the same rivers. Fish are stocked primarily to mitigate for losses to acid rain, hydroelectric development, enhancement, colonization and development of First Peoples' fisheries. Salmon returning to rivers affected by acidification or obstructions, such as the Clyde and Mersey rivers, are comprised of largely hatchery-released fish.

Sea-cage production of Atlantic salmon and rainbow trout is practiced in Lobster Bay (Pubnico), Shelburne Harbour, St. Margaret's Bay, and Chedabucto Bay. The industry is under development and production has not yet reached capacities of the sites.

Description of fisheries

Allocations totalling 550 small salmon from rivers of SFAs 20 and 21 were made to First Nations. As well, tags were issued under the current Aboriginal Fisheries Arrangement with the Native Council of Nova Scotia's Netukulimkewé'l Commission for a potential harvest of 2760 small salmon by its members. Reported removals by First Peoples totalled 122 fish.

As in previous years, commercial fisheries were closed, by-catch in non-salmon commercial gears was prohibited, and recreational fishery catches were restricted to fish less than 63cm. In SFA 21, the opening of the angling seasons was delayed from May 10 to June 1 in most of the area and closed as usual on August 15. Exceptions were the Clyde, Jordan, Mersey, Meteghan and Mushamush rivers where there is limited possibility of natural reproduction (most or all returns were of hatchery origin) and conservation of wild stocks is not a concern.

In SFA 20, the angling seasons varied, depending on the river, within the dates June 1 to September 22. The West River Sheet Harbour was closed for the second year in a row because of a serious conservation concern.

In SFA 21, a total of 13,253 rod-days of effort was expended on 15 rivers in 1995. Effort was up 17% over 1994 when angling was closed on July 5, due to low water conditions. A total of 1,001 small salmon was reported retained and 147 released which was a 207% increase over 1994. The 368 large salmon reported released was a 40% increase over 1994. Catch-per-rod-day increased to 0.114 in 1995 from 0.052 in 1994. On the broader time scale, effort, number of small salmon retained and numbers of small and large salmon released in 1995 were less than the previous five-year means.

In SFA20, the collective retained small salmon catch of 892 fish was 65% of the previous five-year mean of 1,381 fish. The large salmon catch (412 fish) was well below the five-year mean of 498 fish. Three rivers, the Musquodoboit, St. Mary's and Salmon Guysborough, are not impacted by acidification like the other rivers in the area. These three rivers accounted for 96% of the large salmon catch in SFA 20.

Public Consultations

Consultations with First Peoples, anglers, commercial fishermen, and provincial biologists took place at meetings of the Zone Management Advisory Committee for SFAs 20 and 21 and with various local groups (e.g., St. Mary's River Association, LaHave Salmon Association, Eastern Shore Wildlife Assoc., Sackville Rivers

Assoc., Liscomb River Association, Musquodoboit River Association and several Aboriginal groups). Material discussed and presented at these meetings were included in the draft assessments which were peer reviewed February 5-8, 1996.

Environmental conditions

River discharges were highly variable in 1995. On the LaHave River (SFA 21), flows were highest in January, low in February, March and April, but high again in June. Good flows in June were resultant of two high flow peaks and flows moderated to normal conditions in July and remained low from late-July through to mid-October. These conditions favoured early entry of salmon into the river and proportional cumulative counts at Morgan Falls by July 15 were ahead of all previous years. These conditions also favoured angling and resulted in over-estimates of the end-of-season count by in-season forecasts. Flow conditions were similar for the St. Mary's River (SFA 20).

Many of the rivers are at the southerly edge of the range of the Atlantic salmon in Canada. More than half the area is degraded by the North American industrial and civilization fallout of acid precipitation. The area known as the Southern Uplands of Nova Scotia, lies south of a line drawn from Digby to Guysborough where salmon production is most negatively affected by acid precipitation. Annual average pH levels increased over those seen in 1994 and 1995, but many waters remain pH toxic, a prospect that is not likely to change in the near future.

The low sea survival of salmon smolts, as evidenced by the return rates on hatchery-reared fish indicate a problem in the sea. Water temperatures in the early spring of 1995 in the south Labrador Sea, potentially affecting survival of 2SW salmon returns in 1996, have not changed markedly from the low values observed since 1992 (see Figure in Section 2.). These data suggest that improved marine survival is unlikely for hatchery and wild large salmon returns in 1996.

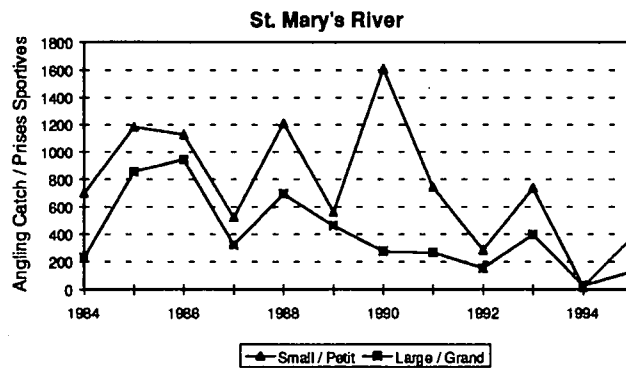
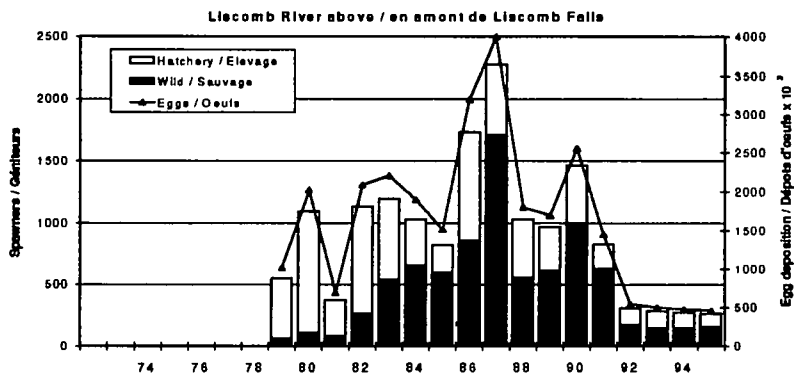
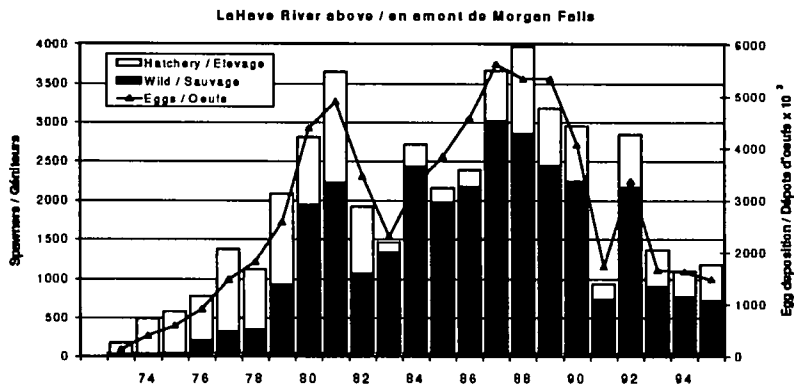
Status of the stocks

Stock status relative to conservation targets for acid impacted rivers is difficult to assess because conservation targets are influenced by the degree of acidification and management strategies may differ from those applied in non-impacted rivers. The degree of acidification is not known for all rivers in SFAs 20 and 21. Stock status is inferred from the time series of relative stock strengths at fixed monitoring sites and more generally by annual harvest levels in the recreational fisheries. This monitoring information is gathered at Morgan Falls on the LaHave River (1970-1995), Liscomb Falls on the Liscomb River (1979-1995), and from the Nova Scotia license stub return system. On both the LaHave and Liscomb rivers egg depositions were the lowest since 1979, reflecting low returns of wild and hatchery fish. Similarly, this pattern of low return is reflected in the recreational catches of small and large salmon from the St. Mary's River.

Total salmon returns to SFA 21 rivers were estimated by applying a 1995 catch rate developed for the LaHave River (28.9%, 90% C.L. 20.7-37.4) to the estimated catches of small and large salmon reported through the Nova Scotia salmon angler license-stubs. This method yielded an SFA21 population estimate of 5,240 (4,560-6,440, 5th and 95th percentiles) small and large salmon. No similar estimate is available for SFA 20.

Reduced marine survival continues to adversely affect returns to Atlantic coast of Nova Scotia rivers. Return rates to the 1SW salmon stage for hatchery-reared smolts released in the LaHave and Liscomb rivers continue to be low although the rate for LaHave smolts was up from 1994 (i.e., 1.05% from 0.56%).

Rivers in SFA 20 with headwaters draining rocks of sedimentary origin, as opposed to those draining non-acid-neutralizing metamorphic rocks, are producing salmon at better rates. These rivers include the East Branch of the St. Mary's, Musquodoboit and Salmon (Guys. Co.). Both the Musquodoboit and Salmon rivers have not experienced decreased angling catches like many of the acid impacted rivers.



Prospects

Salmon returns to Morgan Falls on the LaHave River in 1996 are expected to equal or exceed 1995 returns. The projected returns in 1996 are similar to those observed at Morgan Falls in four of the past five years.

Salmon returns to West River, Sheet Harbour have not met conservation requirements since at least 1989. The river was closed to all salmon fishing in 1994 following low returns from 1990 to 1993. Continuing high acidity in most rearing waters, along with low juvenile salmon population levels and recent low returns to other rivers in the area, indicate returns to West River will continue to be low in 1996.

Although a precise forecast is not available for returns to the Liscomb River, all indicators (low hatchery return rates, no significant increase in smolt stocking in 1995, low pH conditions throughout the river, and low returns of wild grilse in each of the past four years) indicate a fifth year of low return.

On the St. Mary's River, a forecast based on an exploitation rate of 0.30 and an assumed return equal to the previous five-year mean indicates that only 75% of the small salmon target will be met. Based on the recent history of low returns, it is unlikely that the conservation target for the St. Mary's will be met in 1996.

Management Considerations

Returns to rivers in SFA 21 are not expected to improve in 1996 over the 1995 levels unless there is a marked improvement in the marine survival of all sea age-classes. The exception is the LaHave River, where returns to Morgan Falls are forecast to be above conservation requirements assuming average exploitation below the Falls. Some surplus male hatchery fish are expected above the Falls in 1996. Native salmon stocks are lost to the Mersey, Jordan, Clyde and Meteghan rivers as a result of acidification and/or obstructed passage. No stock specific conservation requirement exists for these and the Mushamush River, all of which are stocked with hatchery fish. Accordingly, exploitation of returns to these rivers should be encouraged. Returns of hatchery smolts stocked in the Sackville River may be better than in many other rivers in SFA 20 and 21 because of the higher pH. Stocking in 1995 will provide good support to the run in 1996 if return rates remain unchanged. Returns may be greater than the interim target of 295 fish.

In SFA 20, the native salmon stock is lost to the East River, Sheet Harbour, because of acidification and habitat loss and fish passage obstruction due to hydro-electric development. Returns in 1996 will be primarily of hatchery-origin and, since there is no conservation concern, exploitation of hatchery returns should be encouraged.

Evidence of a decreasing salmon stock level in West River, Sheet Harbour, along with continuing low-pH conditions, clearly indicate that this stock is under great stress and should be protected against any exploitation. In other acid-stressed rivers of SFA 20 there is no prospect that 1996 salmon returns will exceed conservation requirements. Returns of small and large fish to the St Mary's River are expected to fall short of conservation requirements in 1996. No information is available to advise on the salmon stocks of the Musquodoboit and Salmon (Guys. Co.) rivers.

Conservation requirements in many rivers are not being achieved in spite of current reduced exploitation. A shift to greater use of in-season management adjustments would provide opportunity to reduce the risk of over-exploitation while allowing for a harvest when stock levels permit.

Summary sheets

More detailed information on individual assessments for the LaHave River, Liscomb River, and St. Mary's River are provided in the individual river summary sheets.

STOCK: LaHave River above Morgan Falls Fishway (SFA 21)
TARGET: Acid-stressed, target under development

Year	1990	1991	1992	1993	1994	1995	MIN ²	MAX ²	MEAN ²
Recreational catch									
Small ³	2008	233	1058	1655	136	553 ¹	136	2008	429
Counts									
Wild 1SW	1880	495	1915	777	641	577	495	1915	881
Wild MSW	396	236	215	121	128	143	121	395	168
Hatchery 1SW	596	109	558	381	207	372	109	596	325
Hatchery MSW ⁴	112	90	59	84	119	85	59	119	87
Total	2984	930	2747	1363	1095	1177	930	2984	1462
Return rates of hatchery smolts⁵									
1SW (%)	1.95%	0.42%	3.60%	0.84%	0.56%	1.05%	0.42%	3.60%	1.29%
MSW (%)	0.32%	0.29%	0.23%	0.48%	0.26%	0.23%	0.23%	0.48%	0.30%
¹ Preliminary data ² For the period 1989-1994 ³ Retained catch taken mostly below the enumeration site ⁴ Mostly as a result of smolt releases ⁵ Includes some parr; rates adjusted from prior publications									

Recreational catches: Catches are for the entire river rather than only those from the stock above Morgan Falls. Retention of large salmon has been prohibited since 1983.

Data and assessment: Counts are made at a fishway at a natural falls (Morgan Falls), 25.3 km above tidehead. An experiment in 1983 indicated that counts at the Falls are 42% of the total return.

State of the stock: Target conservation requirements at 2.4 eggs m⁻² and existing estimates of utilizable area are 2,800 small and 500 large salmon for the entire River; 56% of the drainage is below Morgan Falls. The egg deposition target established in 1984 for above Morgan Falls is 1.65x10⁶ eggs. Adequacy of that rate under conditions of some acid stress is uncertain. Estimated egg deposition above Morgan Falls in 1995 was 1.48X10⁶ eggs.

Conditions in 1995: River discharge during the angling season declined rapidly in July and low flows persisted until mid-October.

Forecast In 1996: Large salmon counts at Morgan Falls are estimated by regression on small salmon counts at Morgan Falls in the previous year. The 1996 forecast count is for 156 wild large salmon and 1010 hatchery large salmon. A return of 406 hatchery 1SW fish are projected for 1996 based on the numbers stocked and assuming average survival. A return of wild small salmon of 891 is predicted for 1996 based on the past five-year mean return. These forecasts assume an average harvest below Morgan Falls and indicate a modest surplus of mostly hatchery male small salmon above Morgan Falls.

STOCK: Liscomb River above Liscomb Falls Fishway (SFA 20)

TARGET: Acid stressed, currently under development; nominal target is 3.69 million eggs (1,929 small and 177 large salmon).

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
Recreational catch									
Small ²	176	64	19	14	24	24	14	289	110
Counts									
Wild small	955	586	145	134	134	150	134	1614	582
Wild large	44	38	27	11	10	6	6	117	57
Hatchery small	438	178	125	128	119	98	119	766	305
Hatchery large	22	22	12	12	8	7	8	175	53
Total	1459	824	309	283	271	261	271	2279	996
Egg depositions / m² (above fishway)									
	1.6	0.9	0.4	0.34	0.32	0.30	0.32	2.5	1.13
Return rate of hatchery smolts									
Small (%)	1.56%	0.79%	0.50%	0.42%	0.56%	0.34%	0.35%	2.75%	1.20%
Large (%)	0.05%	0.08%	0.05%	0.05%	0.03%	0.03%	0.03%	0.23%	0.12%
¹ For the period 1985-1994									
² Below fishway 1985-92; for the entire river 1993-95; numbers include harvest and releases.									

Description of fishery and fishery data: The fishery on Liscomb River was limited to a recreational harvest and hook and release. All large salmon caught in the recreational fishery have had to be released since 1984. Angling data are obtained from license stubs. Small salmon catches (1985-1995) have ranged from 14 in 1993 to 289 in 1987. Prior to 1993 the recreational fishery was limited to the 5 km of river below the fishway. The largest tributary to the main river, the Little Liscomb, has low pH levels and is assumed to be incapable of supporting salmon life.

Estimation of stock parameters: Counts of adult fish are obtained at Liscomb Falls fishway. Return rates are based on adults returning from 1- and 2-year old smolts released from the Cobequid or Mersey Fish Culture Stations (28,800 released in 1994).

Assessment results: The nominal target egg requirement of 2.4 eggs/m² has been met only once since 1979 (1987); a significant contribution to egg deposition comes from hatchery-origin fish of Liscomb River stock. The 1995 escapement resulted in egg deposition of approximately one-eighth (12%) of nominal target.

Forecast in 1996: Although forecasts of small salmon returns are unavailable, all indicators (low hatchery returns rates, no significant increase in smolt stocking in 1995, low pH values of ~4.8-5.0 throughout the river, and low returns of wild small salmon since 1991 suggest returns of small salmon in 1996 will be well below target. A relationship between small salmon returns in year i and large salmon returns in year i + 1 for the period 1989-94 predicts a return of 12 large salmon in 1996.

Management considerations: The consistently low return rate for hatchery fish to the Liscomb Falls trap and the current acidity problem on the river strongly suggests that returns in 1996 will not meet the conservation target. Progressively declining angler effort reflects the decline in returns over the past several years. Angler concern has prompted initiation of a liming project for winter 1996. The future potential of the Liscomb River requires reevaluation considering the severity of acid impact throughout the system.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

46

STOCK: St. Mary's River (SFA 20)

TARGET: 7.4 million eggs (2,436 1SW fish; 437 2SW salmon and 281 3SW plus repeat spawning salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
Recreational catch									
Small ²	2063	975	319	909	42	560	42	2063	986
Large	274	264	152	396	30	131	30	944	434
Effort (rod days)	6536	5486	4288	6199	1423	3543	1423	8183	5734
Escapement (estimated using 30% exploitation rate)									
Small	3761	1736	663	1722	124	1461	124	3761	1867
Large	886	854	491	1019	97	424	97	3052	1394
Egg deposition/m²	3.4	2.2	1.1	2.5	0.1	1.0	0.1	6.1	3.1
Stocking									
<i>Main River</i>									
0+ parr				5008					
<i>West Branch</i>									
2+ smolt	5538								
<i>East Branch</i>									
0+ parr	25060		43315	63471					
1+ parr	2565	7820	15293	10815	9561				
2+ smolt	18201	20683		19638	19755	25900			

¹ For the period 1985-1994

² Numbers include harvests and releases

Description of fishery and fishery data: Harvest and hook and release fisheries occurred in the recreational fishery only. Angling data were obtained by license stubs. No retention of large salmon since 1984. The 1994 recreational fishing season was closed July 21-August 11 and subsequently limited to a hook-and-release fishery. The local river association conducted a partial creel survey to forecast small salmon catch within season; the association estimated a catch of 620 small salmon.

Research data: Juvenile densities on the system have not varied widely since 1985 and remain low at about 6 parr per 100 m².

Estimation of stock parameters: The St. Mary's River sport catch was used as an indicator of returns to the St. Mary's River. The large salmon sport catch is related to the LaHave River wild small salmon returns the previous year. Biological characteristics are based on sample data collected from the recreational fishery between 1972 and 1984. Recent adult data from the West Branch suggest that a repeat-spawning 1SW stock inhabits that branch. Total returns to the St. Mary's River are estimated using an exploitation rate on the sport catch.

Assessment results: At an exploitation rate of 30%, the St. Mary's River returns, when converted to total eggs, would not have met target in either 1994 or 1995 but would have approximately met requirements in 1993. The 1995 estimated escapement would have achieved 42% of target.

Future prospects: Expected 1996 returns of small salmon using the previous five-year mean return derived using an average exploitation rate of 30% are about 75% of the small salmon conservation target. The relationship between St. Mary's River large salmon sport catch and LaHave River wild small salmon returns the previous year forecasts a large salmon sport catch in 1995 of 93 fish, which when expanded to returns using a 30% exploitation rate, is 43% of the target.

Management considerations: Forecasts for 1996 indicate spawning escapements will not be met on the St. Mary's River for the third year in a row. Juvenile densities are low relative to other rivers which have met targets. However, parr densities on the St. Mary's River have been consistently low since 1985 despite the target having been achieved in some years according to the angler exploitation rate method.

3.3 Cape Breton Stocks (SFA 19 & part of 18)

General description

Cape Breton Island has at least 33 rivers which support Atlantic salmon. Rivers of Inverness and Victoria counties with headwaters in the Cape Breton Highlands have the steepest gradient and flow either into the Gulf of St. Lawrence (Margaree River), Bras d'Or Lakes (Middle and Baddeck rivers) or into waters of the Cabot Strait (North River). Rivers of Cape Breton and Richmond counties are of lower gradient and flow either into the Bras d'Or Lakes or the Atlantic Ocean (Sydney and Grand rivers).

The Margaree has the largest of the Island's salmon resources and has an estimated 2.8 million m² of juvenile production habitat. The next larger are the Middle and Baddeck with each of 0.8 million m² of habitat; the remainder of the rivers are smaller. Stock composition varies from that of the Margaree with summer- (20-40%) and fall- (60-80%) running components each comprised of 70-80% large salmon, to that of the Grand River which has predominantly (90-95%) a summer run of small salmon. The North River stock is primarily comprised of summer-run large fish; most stocks of other rivers tend to be large fish but of fall run-timing (Baddeck and Sydney rivers) or occasionally, with a small summer-run component (Middle River).

Stocking from the Cobequid, Mersey and Margaree fish culture stations in 1995 consisted of about 26,000, 38,000 and 23,000 smolts to the Grand, Margaree and North rivers, respectively. Indian (Qamsipuk) Brook also received 15,000 smolts as part of a sea-ranching development project for Eskasoni First Nation. Age-0⁺ and age-1⁺ parr were released to the Grand, Indian, Margaree and Salmon/Gaspereaux rivers. Few fish remain in fish culture stations for stocking of Cape Breton rivers in 1996 and, with the exception of Grand River and Qamsipuk Brook, no other stocks are on hand for distribution in 1997. Hatchery-origin fish comprised about 10% of small and 5% of large salmon returns in the Margaree. In excess of 15% of small salmon in the North and 30% of small salmon in the Grand rivers originated from hatchery releases.

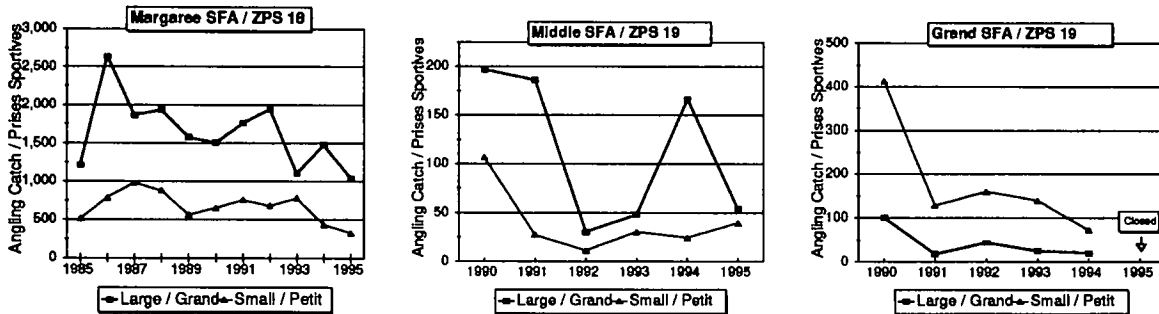
Salmonid aquaculture ventures exist at St. Peters and the Bras d'Or Lakes. Production is expected to be up over that of 1994 and similar to that of 1993, i.e., about a thousand tons of salmon and less than 300 tons of rainbow trout. Atlantic salmon are of Saint John River, River Philip and LaHave River origins. Vandalism in Whycomomagh Bay, Bras d'Or Lakes, allowed the escape of upwards of 20,000 salmon and possibly an equal number of rainbow trout in June, 1995. Salmon and rainbow trout escapees have been observed in the Middle and Baddeck rivers, in particular; a few rainbow trout are also being observed in the Margaree River.

Description of fisheries

Allocations totalling 2,920 small and 680 large salmon were made to First Peoples of Cape Breton Island. Of the total, 130 small and 650 large fish were targeted from the Margaree River; 20 small and 30 large were targeted from the North River. The remainder of the small fish was to come from either targeted locations in the Bras d'Or Lakes or, in the case of the 1,820 tags assigned by the Native Council of Nova Scotia for potential harvest by its members, from untargeted rivers. Reported harvests numbered about 200 fish of which 75% were aquaculture escapees taken in Whycomomagh Bay.

Commercial fisheries have been closed since 1985 (only two fishers remain eligible for re-entry) and by-catch in non-salmon commercial gears was prohibited. Rivers flowing into the Gulf of St. Lawrence, except those of Cape Breton Highlands National Park, were open to the retention of salmon less than 63cm, but only two, the Margaree and Mabou, are actively fished. The recreational fishery for salmon on other Cape Breton rivers in 1995 was largely restricted to hook-and-release. The Grand River, on the Atlantic coast, was closed to all fishing. Most seasons opened on June 1 and closed on either October 25 or 31. Estimated angling catches from NS Salmon Licence stub-returns were 661 small and 1,496 large; only 202 small fish were estimated to have been retained. Catches of small salmon were about the same as the low values of 1994; catches of large salmon were down 24% from the low values of 1994. The Margaree River attracted 88% of the Island's recreational effort for salmon; the Middle, Baddeck and North drew an additional 9% of

effort. Total effort was down 14% from 1994 and 34% from the mean effort, 1990-1994. The continuing decline in effort reflects the institution, Margaree and Mabou excepted, of hook-and-release regulations for all salmon in 1995 and, perhaps, the lateness in 1995 of significant numbers of fish to some rivers.



Public consultations

Consultations with First Peoples, anglers, Nova Scotia and Parks Canada biologists and fishery managers took place at several of the monthly meetings of the Cape Breton Sports Fishing Advisory Committee. One meeting, Dec 12, 1995, exclusively discussed assessment methodologies and preliminary interpretation of salmon stock status in 1995. Separate meetings were held with First Peoples (discussion of allocations for 1995) and with the Margaree Salmon Association (discussion of Science-planned activities in 1995). Representatives of the recreational fishers, academic communities, First Peoples and provincial natural resource agencies participated in peer review of materials background to this summary in February 1996.

Environmental considerations

Rivers of Cape Breton are resistant to the effects of acid precipitation; river discharges measured at Margaree were low but not as low as those of 1994. However, warm water at or above 10°C and low river discharges through September and much of October are believed to have contributed to unusually late upstream movement of salmon at all monitored sites, i.e., Margaree, Sydney and Grand rivers. Estimation of returns to Middle, Baddeck and North rivers may have preceded the last of returning adults.

Environmental conditions in the North Atlantic did not improve for salmon in 1995 and pre-fishery abundance of non-maturing salmon to the Greenland fishery, 1995, was forecast to be low. Large salmon of Cape Breton stocks have, in the past, contributed to distant fisheries and are assumed to be impacted by conditions contributing to low marine survival. Recent diminishing returns of small and large salmon to the Margaree and uncertain status of marine survival contribute to cautious interpretation of quantitative forecasts of returns based on 35+ years of spawner and return data.

Status of stocks

Returns to the Margaree, Middle, Baddeck and North rivers were based on mark-and-recapture techniques. On the Margaree, fish were marked at an estuarial trapnet and were recovered by seining/netting, monitoring of a counting fence on the Lake O'Law tributary and by sampling within the recreational fishery. On the Middle, Baddeck and North rivers, marks were applied the day previous to October swim-thrus and counts of salmon. Returns to the Sydney and Grand rivers were based on counts of salmon in traps in fishways. There are no measures of survival between smolt and 1SW or 2SW returns.

Returns to the Margaree were 2,365 large (90% CI: 1700 to 4500) and 737 small salmon. Large salmon escapement exceeded the target conservation requirements by 123%; the target has been exceeded each year since 1985, but in the last three years, by successively diminishing amounts. Wild large salmon accounted for 97% of the eggs deposited in 1995. For the fourth time in the last 10 years, small salmon escapement was below target.

Estimated returns to and escapements in the Middle and Baddeck rivers were about 70% (Middle 90% CI: 40% to 260%; Baddeck 90% CI: 50% to 130%) of conservation requirements but there is some uncertainty as to the completeness of those estimates. Escapements to the Middle River have not knowingly been met for the last six years. Juvenile densities, however, suggest that escapement, at least in 1993, may have been better than estimated.

The Baddeck River has only been assessed in 1994 and 1995; conservation requirements were not met in either year. Returns and escapement to the North River, only the second successful assessment in five years, were about 170% (90% CI: 70% to 180%) of requirements, down from the level of 1994.

The late-October and November count of salmon in the Sydney River is known to be incomplete but as such, represented about 60% of conservation requirements. Unrecorded removals may represent another 10% to 20% of requirements. Counts of salmon (one-third of hatchery origin) in the fishway at Grand River Falls, raised by an average by-pass rate, suggested an escapement of 120% of conservation requirements above the Falls.

Prospects

Quantitative forecasts of returns to the Margaree in 1996, range from 3,200-4,400 large fish. i.e., three to four times the conservation requirements. A 3-year decline in returns and uncertainty about marine survival trends suggest a more cautious prognosis of 2,400 to 2,900 large fish (returns in 1994 and 1995), 230% to 280% of target. Small salmon returns should number about 700 fish, i.e., 120% of target.

Marine conditions and respective apparent, and assumed, failures of the Middle and Baddeck rivers to meet conservation requirements in recent years suggest that returns in 1996 will be less than targets. Similar logic would suggest that the North River, which has exceeded conservation requirements in 1994 and 1995, should yield returns that exceed conservation in 1996. The same rationale suggests that the Sydney River should not be expected to attain target in 1996 whereas the returns to Grand River (above the Falls) are expected to exceed requirement. In the case of the Grand River, however, wild returns may just be adequate for attainment of the target; hatchery origin returns alone, by virtue of a tripling of smolt stocking in 1995, should approach the conservation requirements above Grand Falls.

Management considerations

Conservation egg depositions are being attained with apparent ease on the Margaree and, possibly, North rivers. Small salmon returns to the Margaree should exceed target but the surplus will likely be less than the harvests in 1994 and 1995. The target was met on the Grand River above Grand Falls in 1995 but only as a result of the intervention of hatchery stocking above the Falls and the complete closure of river fisheries. Juvenile densities on the Grand River above and below the Falls are very low. The relatively barren habitat should support juveniles resultant of egg depositions that exceed target in either 1995 or 1996.

The Middle and Baddeck rivers are, by current estimation procedures, not meeting conservation requirements. Returns to the Middle and Baddeck rivers may be underestimated in some years either because of the lateness of the run or because of incomplete reporting of harvests in Nyanza Bay and lower reaches of the rivers. The Sydney River did not meet conservation requirements but not all arrivals at the fishway were documented. Escapements, as judged by juvenile densities in the Middle River, may have exceeded those estimated for 1993. Vestiges of summer-run components to the Middle and Baddeck rivers deserve protection.

In-season estimates of the summer-run components on the Margaree and North rivers offer opportunities to adjust fishing plans in accordance with user-guided targets for escapement of run components or, in the case of the Margaree, attainment of conservation requirements for small salmon.

Allocations of surplus small or large salmon from any river should be in proportion to the abundance of the summer and fall run-timing components.

Summary sheets

More detailed information on individual assessments for the Margaree, Middle and Grand rivers are provided in the individual river summary sheets.

STOCK: Margaree River, Inverness Co. (SFA 18)
TARGET: 6.7 million eggs (1,036 large, 582 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
Angling catch²									
Large	1507	1757	1938	1102	1479	1040	1102	2636	1557
Small	649	752	678	777	429	323	429	977	657
First Peoples' harvest									
Large	-	1	-	58	50	4	-	-	-
Small	-	2	-	8	14	2	-	-	-
Total returns									
Large	5156	3484	6375	3358	2900	2365	1462	6375	4255
small	1977	1909	1645	2087	708	737	708	2209	1665
Spawning escapement									
Large	5022	3323	6222	3224	2759	2308	1378	6222	4110
Small	1471	1340	1088	1504	390	529	328	1504	1159
% of egg target met by large salmon									
	485%	321%	601%	311%	266%	223%	133%	601%	397%
Juveniles per 100m²									
# of sites		3	3	3	3	3	3	3	3
Fry		133	154	122	117	166	117	166	132
Parr		58	50	79	69	72	50	79	64

¹ Min and Max are for 1985-1994; juveniles, 1991-1994. Mean corresponds to 1990-1994; juveniles 1991-1994.
² All angling catches are NS license stub estimates. Angling catches for large salmon are hook-and-release estimates; small salmon include retained and released fish.

Harvests: Harvests were restricted to a reported 6 salmon taken by First Peoples, and an estimated 199 small salmon taken in the recreational fishery.

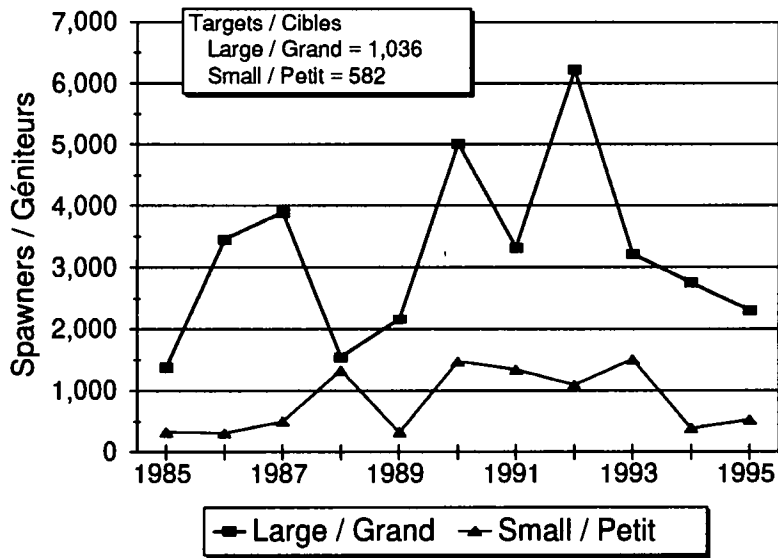
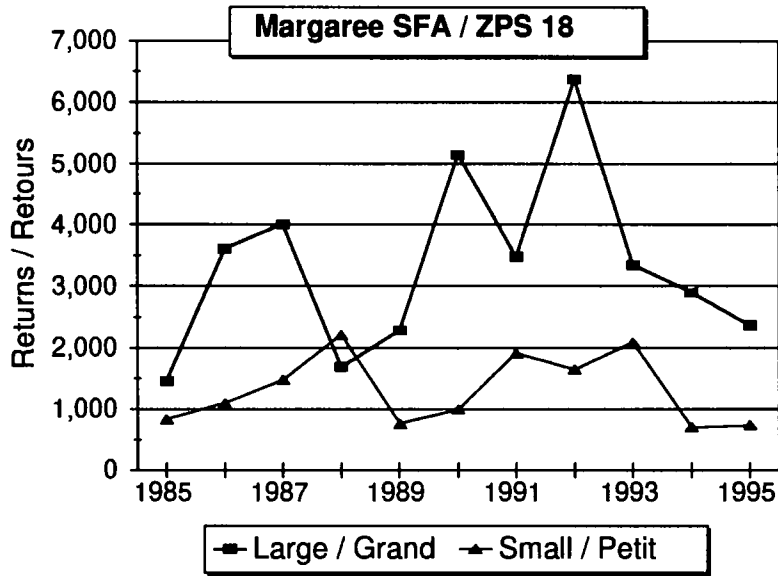
Data and Methodology: Counts of tagged and untagged adult salmon were obtained from a swim-thru count on Aug 2, seining on Oct 25, logbooks maintained by selected anglers (thru Oct 31) and a trap in the Lake O'Law counting fence (thru Nov 26). Most fish were tagged at the Levi's estuarial trap; additional tags were applied to fish seined in the Hatchery and Forks pools. Petersen mark-and-recapture principles and a Bayesian estimation procedure were used to describe the most probable (mode) number of large and small salmon returns. Densities of juvenile salmon were estimated at four tributary and one mainstem sites.

State of the Stock: Estimated large salmon returns of 2,365 fish were the lowest since 1989; small salmon (737) numbered about the same as those of 1994 and were among the fewest of the last 11 years. Egg depositions were 223% of the conservation requirement. Escapement of small salmon was 91% of target. Hatchery-origin small salmon were 17% and 5% of the respective summer and fall fish. As much as 45% of the salmon population ascended the river after October 25. Average juvenile densities of 166 fry and 72 parr per 100m² (3 ongoing sites) are consistent with recent high levels of egg deposition.

Forecast for 1996: Forecasts of returns for 1996 range from 3,200 to 4,400 large salmon. However declining estimates of large salmon returns since 1992, and low returns of small salmon support the contention for many stocks, that sea survival is now lower than previously experienced. Current sea survivals and low recruits per spawner are not accounted for in most forecast models and therefore can contribute to optimistic forecasts e.g., forecasts of large salmon returns for 1995 ranged from 2,700 to 4,700 salmon; 2,400 may have returned.

Therefore, large salmon returns in 1996 will exceed target but may be no greater than those of 1994-95 (2,400-2,900 fish); small salmon should also exceed the target but may also be similar to those of 1994-95 (700 fish).

Management considerations: Returns of small and large salmon should exceed conservation requirements; small salmon escapement may not meet conservation requirements. Summer-run large fish may comprise as few as 15% of the total run. Allocations of surplus fish should be in proportion to the relative abundances of summer-and fall-run fish. Mid-summer assessments offer the potential to adjust fishing plans.



STOCK: Middle River, Victoria Co. (SFA 19)
TARGET: 2.07 million eggs (470 large, 80 small)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
First Peoples' harvest (small + large)									
In-river	0	0	38	0	15	0	-	-	-
Estuarial ²	65	127	75	40	0	8	0	127	61
Angling catch									
Small	107	27	11	30	24	39	11	107	40
Large	197	186	30	48	166	54	30	197	125
Swim-through counts									
Small	69	18	56	2	35	23	2	69	36
Large	234	254	212	32	324	160	32	324	211
Total returns³									
Small + Large	510	417	362	127	470	379	127	470	377
Proportion of holding area covered in swim-through counts									
	0.83	1.00	0.96	0.55	0.83	0.83	0.55	1.00	0.83
Estimated escapement of small and large salmon									
	365	272	241	62	460	371	62	460	280
% of adults required									
	66%	49%	44%	11%	84%	67%	11%	84%	51%

¹ Min, Max, and Mean are for 1990-1994.
² 50% of the Wagmatcook First Nation harvest assumed to be of Middle River origin.
³ Swim-through counts/divided by proportion area covered, 1990-1993; mark-and-recapture model values (0% tag loss) 1994-1995, taken as 100% of area.

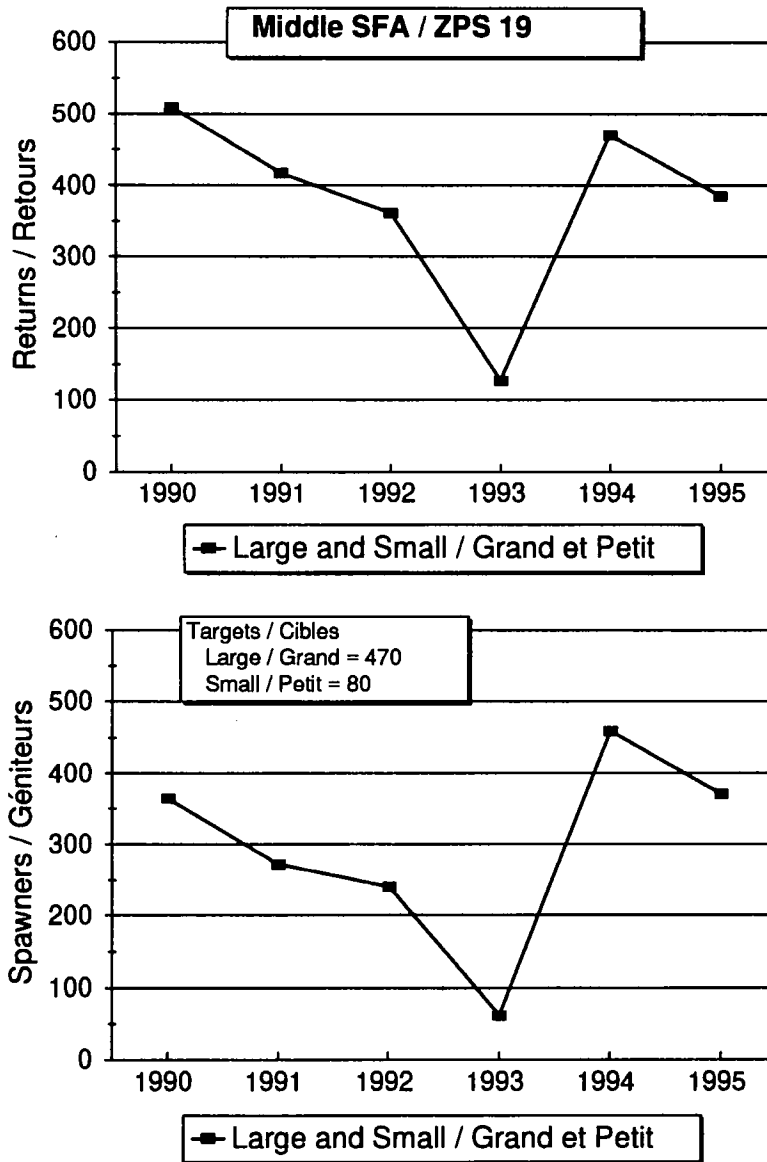
Harvests: Harvests of Middle River salmon were restricted to a reported 8 salmon taken by Wagmatcook First Nation. The recreational fishery was confined to hook-and-release.

Data and Methodology: Counts of tagged and untagged adult salmon were conducted on Oct 18, 1995, by teams of divers floating 83% of the river's salmon holding areas. (Tags had been applied to 12 fish on Oct 17.) Petersen mark-and-recapture principles and a Bayesian estimation procedure were used to describe the most probable number of fish in the river. Juvenile salmon densities were estimated at only 3 sites; two on the mainstem and one on MacKenzie Brook.

State of the Stock: Conservation requirements were estimated not to have been met on Oct 18, 1995. Target spawners as described by mid-, late-October counts and/or estimates have not been met since 1989. There has been no hatchery stocking since 1989. Fry densities resultant of 1994 spawning were as high as those of the Margaree where conservation requirements have been exceeded for the last 11 years. Parr densities of 18, 34 and 76 per 100m² were not as high as those of all Margaree sites but, respectable given that escapements in 1992-1993 were estimated, on average, to have been only 27% of requirements.

Forecast for 1996: Returns in 1996 are not expected to exceed those of 1995. The prognosis would be more optimistic if, in fact, returns in 1995 were estimated prior to completion of the run. Evidence from the Margaree, Sydney and Grand rivers suggests that salmon runs may have been unusually late in 1995.

Management considerations: Vestiges of the summer-run component deserve full protection; total returns may be somewhat underestimated because of late-run timing and unreported removals.



**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: Grand River, Richmond Co. (SFA 19)
TARGET: 1.1 million eggs, (545 salmon for entire river; 234 salmon for above Grand River Falls)

Year	1990	1991 ¹	1992	1993	1994	1995	MIN ²	MAX ²	MEAN ²
First Peoples' harvest									
In-river	24	39	0	0	0	-	-	-	-
Estuarial	0	0	0	0	0	-	-	-	-
Angling catch (total river)									
Small	416	115	139	113	81	-	81	416	173
Large	98	15	46	22	10	-	10	98	38
% Caught and retained above the fishway									
	31	31	31	31	0	-	0	31	25
Broodstock³									
	18	19	10	0	7	0	0	19	11
Count at fishway									
Small	527	234	114	91	64	157	64	527	206
Large	27	18	18	5	5	8	5	27	15
% Hatchery	43%	45%	38%	45%	14%	32%	14%	45%	37%
Fish which by-pass the fishway									
Small	52	176	40	32	130	105	32	176	86
Large	20	14	14	4	9	11	4	20	61
Population estimate above the fishway									
Small + Large	626	442	186	132	208 ⁴	281	132	626	319
Estimated escapement above the fishway									
Small + Large	455	348	133	97	201 ⁴	281	97	455	247
% of fish required above fishway									
	194%	149%	57%	41%	86% ⁴	120%	41%	194%	105%

¹ Inseason variation closures.
² Min, Max and Mean are for 1990-1994.
³ Broodstock collected at or above fishway.
⁴ Revised.

Harvests: River closed to all fishing in 1995.

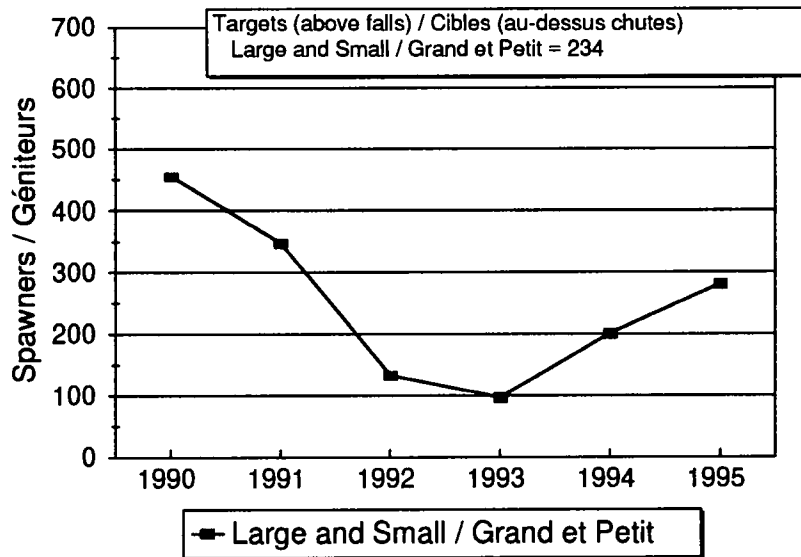
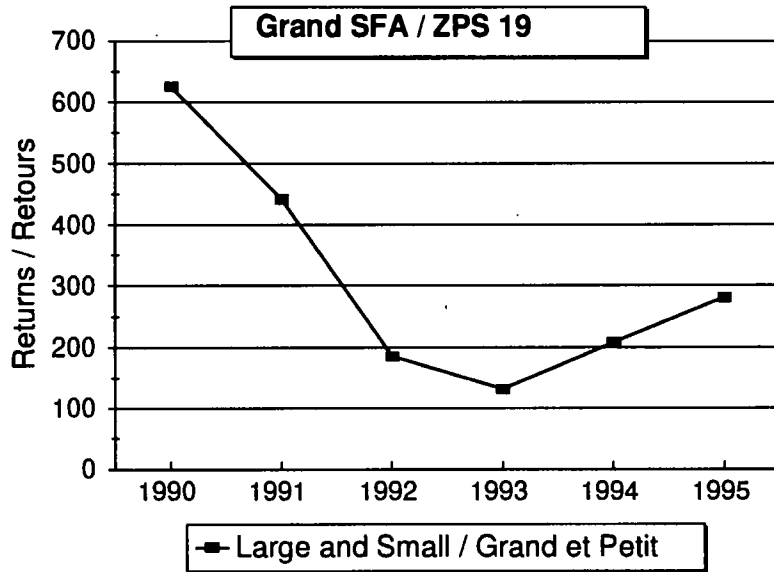
Data and methodology: Partial counts are obtained from a trap in a fishway at Grand Falls - 10.2 km from the head-of-tide. Total returns are estimated as Count/[1 - by-pass rate] where by-pass rates (0.4 for small and 0.57 for large) were estimated from the proportions of marked and unmarked fish found in broodstock collections above the Falls. Juvenile salmon densities were estimated at two sites each above and below the Falls and in Black River.

State of the stock: Conservation requirements were estimated to have been met in 1995 - the first time since 1991. Counts (70% of conservation requirements) were the highest since 1991; 20% of the run was tallied in late-October, early-November when normally the trap would have been removed. Hatchery fish comprised 32% of returns; double their contribution in 1994. Juvenile densities were low (4-13 and 2-14 fry and parr/100m², respectively) relative to rivers of Cape Breton Highlands. Densities at the two sites in 1995, that were also fished in 1988, were \geq densities of 1988.

Forecast for 1996: Returns to Grand Falls in 1996 should at least equal, if not exceed, returns in 1995. This prognosis is based on estimated returns to Grand River Falls increasing since 1993 when retention of small salmon

was last allowed in the recreational fishery; and the number of hatchery smolts stocked in 1995 and which will be contributing to returns in 1996 being 3.5 times that of 1994.

Management considerations: By-pass rates at Grand Falls are based on few data; estimates of returns above Grand Falls are not made without error. Returns to Grand Falls in 1996 from 1995 hatchery stocking should equal conservation requirements; there is no certainty that conservation requirements will be met below Grand Falls or in other coastal rivers with stocks similar to those of Grand River and which have received no hatchery stocking.



3.4 Northumberland Strait Nova Scotia Stocks (part of SFA 18)

General description

Fifteen separate rivers on the Northumberland Strait shore of Nova Scotia support Atlantic salmon stocks. Stock status information is available for eight of those stocks based on estimated targets and escapements calculated from exploitation rates. Additional information is available for the three principal rivers in the area, East River (Pictou), River Philip, and West River (Antigonish), which contributes to understanding of the status of the stocks in this area. The Atlantic salmon stocks of the Northumberland Strait area typically enter rivers in late autumn, usually after September 15. Historically, a small summer run of salmon was known to occur in River Philip. The spawning requirement in eggs for Northumberland Strait rivers is expected to come from large salmon with grilse spawners making up the 1:1 sex ratio.

Description of fisheries

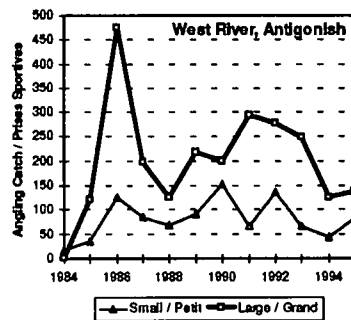
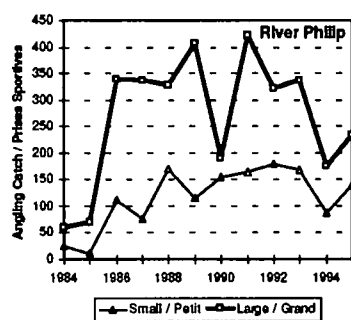
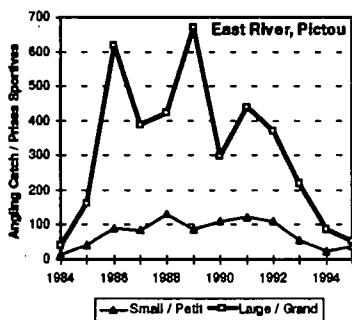
The angling seasons on the Northumberland Strait rivers have not changed for several years and were open from September 1 to October 31.

The Atlantic salmon sport catch on these rivers, as reported on license stubs, was 234 small salmon retained, 115 small salmon released and 530 large salmon released. The collective (retained and released) catch of 349 small salmon was 158% of the 1994 figure of 221 fish and 78% of the previous (1990-94) five-year mean of 450 small salmon. The number of large salmon reported released in 1995 was 530 fish. This figure is similar to the 553 large salmon angled in 1994 but well below the mean number angled over the previous five years (1990-94) of 1,100 fish.

The sport catch of large salmon in East River, Pictou in 1995 (51 fish) was lower than in 1994 and well below the five-year (1990-94) mean of 284 fish. Small salmon catch by anglers improved in 1995 (39 fish) relative to 1994 when only 23 small salmon were caught, but well below the five-year average catch of 90 fish.

In River Philip, anglers caught 140 small salmon, 107 of which were harvested. This catch level is comparable to the 1994 level but below the five-year mean catch of 159 small salmon. A total of 234 large salmon were released in River Philip in 1995 as compared with 176 in 1994 and 290 on average over the period 1990-94.

The catch of small salmon in West River, Antigonish was up somewhat from the 1994 level and similar to the five-year mean catch. The 1990-94 average large salmon catch of 229 fish was well above the 138 fish released in 1995.



Four First Nations (Indian Brook, Millbrook, Pictou Landing and Afton) harvested salmon from Northumberland Strait rivers. Pictou Landing reported harvesting 28 male large salmon and 2 small salmon on East River, Pictou, at their estuarial trap. Millbrook First Nation harvested 82 fish (52 large and 30 small salmon) in an estuarial trap in River Phillip.

Public consultations

Client service meetings were held with local river associations and First Nation groups. The meetings were attended by representatives from the province and a wide range of user groups. The methodology employed to complete the assessments was described and the information and data available from Fisheries and Oceans and various groups were tabled and explained or discussed as warranted. The material covered at the meetings was included in the working document tabled for peer review in February 1996.

Environmental considerations

The mean daily discharge on Middle River, Pictou, which is at the midpoint of the Northumberland Strait area, indicated that water levels in 1994 and 1995 were abnormally low until well into October. These extreme conditions delayed river entry and probably reduced opportunities and angling catches.

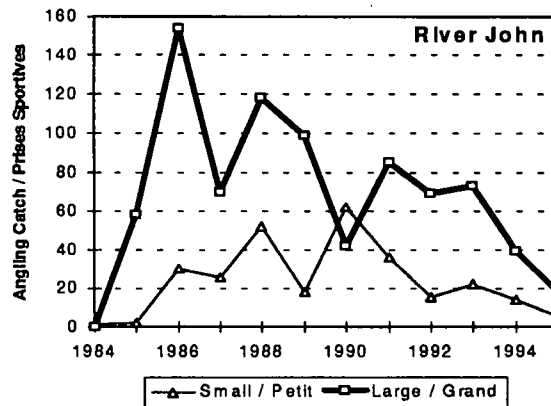
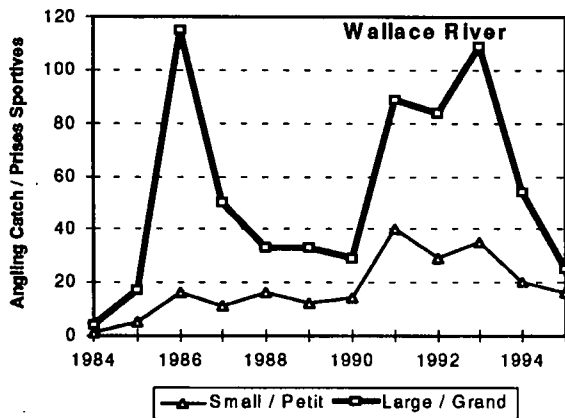
Status of the stocks

Stock status was based on an angler-based catch rate of 0.26 for small salmon and 0.45 for large salmon. The rate for small salmon was derived from fall-run tag returns on the Margaree River in 1995. Similarly, the 0.45 catch rate was determined for Margaree large salmon from license stub reported catches and the population estimate derived by mark-and-recapture for the entire large salmon run to the Margaree. Considering the low flow conditions through most of the fall and the resulting brevity of suitable angling conditions (as short as 9 days on some rivers), the 0.45 catch rate applied to the large salmon catch probably underestimated returns and spawning escapements in 1995.

Application of these rates indicated a surplus of spawners in River Philip (142% of target) but not in either East River (41%) or West River (85%). Snorkel-diver surveys support the surplus condition depicted for River Philip and suggest that the conservation target for East River may not have been achieved.

Although diver collaboration was not available for West River (Antigonish), angler diary CPUEs were very high (averaging 0.462), potentially indicating an abundance of adult fish. Juvenile densities in West River exceeded 200 fry and 70 parr per 100m² in both 1994 and 1995. This suggests that the target requirement was met or exceeded in West River in recent years, and in particular in 1994, for which achievement of only 51% of the target was estimated based on angling catch alone. Low flow and poor angling conditions through most of the fall in both 1994 and 1995 would have contributed to under-estimation of returns and spawning escapements. Accordingly, it is most likely that the conservation target for West River (Antigonish), was achieved in 1995.

Spawning escapements were known to meet target requirements in Sutherlands River because divers counted spawners equal to the target. In contrast, estimated escapements of large salmon to some small rivers in the area, derived using the 0.45 catch rate for large salmon, probably fell short of the target requirements. Such shortages are suspected to have occurred in the Wallace River and River John.



Prospects

Assuming returns in 1996 to East River (Pictou), River Philip and West River (Antigonish) are similar to the 1991 to 1995 average, then the large salmon target could be exceeded by perhaps as much as 25% in all three rivers. Targets for small salmon should again be exceeded in these and most other rivers in the area.

Management considerations

The returns of fish to the Northumberland Strait rivers are late in the autumn and anglers often have only two weeks to fish for them. Consequently, recreational fishing practices do not appear to be having a detrimental effect on these stocks.

Client groups expressed concern regarding the illegal harvest of salmon from some of the Northumberland Strait rivers. Illegal removals have not been taken into account in escapement estimates or forecasts. Accordingly, caution should be exercised in allocating projected surpluses considering the possible extent of illegal harvests.

Summary sheets

More detailed information on individual assessments for East River (Pictou), River Philip, and West River (Antigonish) are provided in the summary sheets.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

60

STOCK: East River (Pictou Co.) (SFA 18)
TARGET: 1.8 million eggs (271 large, 54 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ²	MAX ²	MEAN ²
Angling catch¹									
Large	299	440	371	221	87	51	87	670	284
Small	109	121	111	56	22	39	22	129	84
First Peoples' harvest									
Large	-	-	-	139	141	28	-	-	-
Small	-	-	-	-	5	2	-	-	-
Total returns									
Large	407	619	523	456	265	141	111	942	454
small	247	270	251	127	60	152	60	303	191
Spawning escapement									
Large	403	614	519	313	123	111	111	933	370
Small	182	200	184	92	41	127	41	223	140
% of Egg target met (large)									
	143%	219%	185%	111%	44% ³	41% ³	44%	332%	140%

¹ All angling catches are NS license stub estimates. Large salmon angling catch for 1986 to represent hook-and-release estimates.
² Min, Max are for 1986-1994. Mean is for 1990-1994.
³ Estimates concluded to be low but probably less than 100%.

Description of fisheries and fishery data: Harvests occurred in recreational and First Peoples' fisheries. A food fishery agreement was signed with Pictou Landing First Nation. Harvests under this agreement occurred on East River (Pictou), in an estuary trapnet. Reported harvest was 2 small and 28 large salmon. An additional 60 fish were released. Sportcatch data is obtained from license stubs and angler diaries. Recreational catches on East River, Pictou were about 18% and 46% of the recent-five-year means for large and small salmon, respectively.

Research data: Juvenile surveys by electrofishing indicated parr levels above 28 parr/100 m². A diver survey of spawners on November 6 and 7 on 14% of the river main stem counted 7% of the large salmon spawner requirement.

Estimation of stock parameters: Small salmon returns in 1995 were calculated using the 0.26 fall fishery exploitation rate determined for the Margaree River from actual tag returns. Large salmon returns were estimated using the 1995 catch rate of 0.45 derived for Margaree River large salmon from license stub reported catches and the population estimate determined by mark-and-recapture.

Assessment results: Spawning escapement estimates were 41% of target for large salmon and over 200% of target for small salmon.

Ecological considerations: Discharge was low in 1994 and 1995, relative to the 1989-93 mean discharge, through September and most of October (until October 23). Low water conditions probably influenced the angling catch because fish were not available for angling until late in the season.

Forecast for 1996: Average returns indicate that the large salmon conservation target is likely to be met and possibly exceeded by as much as 25% in 1996. Similarly, small salmon spawners are expected to exceed the target by a margin of 50 fish or more.

Management considerations: Angler access to East River (Pictou) fish is restricted to late autumn. This provides the fish a margin of safety from harvest. Local client groups have expressed concern regarding poaching of salmon on all rivers in the Northumberland Strait Nova Scotia area. Estimation of illegal removals is notoriously difficult and these have not been taken into account in escapement estimates or forecasts. Caution should be exercised when allocating projected surpluses to account for the losses due to illegal harvest.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: River Philip (SFA 18)
TARGET: 2.3 million eggs (358 large, 72 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ²	MAX ²	MEAN ²
Angling catch¹									
Large ¹	191	421	322	338	184	234	184	421	291
Small	155	164	179	167	87	140	76	179	151
First Peoples' harvest									
Large	-	-	-	50	15	52	-	-	-
Small	-	-	-	0	9	30	-	-	-
Total returns									
Large	279	578	461	524	281	572	279	578	415
small	362	360	398	373	198	568	169	538	338
Spawning escapement									
Large	276	573	457	469	264	508	264	573	408
Small	268	262	292	276	137	429	124	429	247
% of egg target met									
	77%	160%	128%	131%	74%	142%	44%	160%	114%

¹ All angling catches are NS license stub estimates. Large salmon angling catch for 1986 to present is hook-and-release estimates. Small salmon catch includes retained and released fish.

² Min, Max are for 1986 to 1994. Mean for 1990 to 1994.

Description of fisheries and fishery data: Harvests occurred in recreational and First Peoples' fisheries. A food fishery agreement was signed with Millbrook First Nation. Harvest under this agreement was 30 small salmon and 52 large salmon. The recreational catch of large salmon on River Philip was slightly below the 1990-94 mean but considerably above the 1994 value. A food fishery trapnet on River Philip operated from October 1 to October 28 and yielded the greatest catches around October 16. The majority of the angling catch also occurred after a storm event on October 13.

Research data: Several sites were electrofished in 1995 using a five-minute spotcheck technique and a complete density derived for one site using mark-and-recapture. The density data indicates parr in excess of 50 per 100 m², and at spotcheck sites, catches were similar to those noted in other years.

Estimation of stock parameters: Small salmon returns in 1995 were calculated using the 0.26 fall fishery exploitation rate determined for the Margaree River from actual tag returns. Large salmon returns were estimated using the 1995 catch rate of 0.45 derived for Margaree River large salmon from the license stub reported catches and the population estimate determined by mark-and-recapture.

Assessment results: Spawning escapement estimates were 142% of target for large salmon and 280% of target for small salmon.

Ecological considerations: Discharge was low in 1994 and 1995, relative to the 1989-93 mean discharge, through September and most of October (until October 23). Low water in 1995 probably influenced angling catch because fish were not available for angling until late in the season.

Forecast for 1996: Average returns indicate that the large salmon target is likely to be exceeded by about 25% in 1996. Similarly, small salmon returns are expected to exceed target by a considerable margin (possibly by more than 300 fish).

Management considerations: The late autumn access that anglers have to River Philip fish provide the fish a margin of safety. Local client groups have expressed concern regarding poaching of salmon on all rivers in the Northumberland Strait area. Estimates of those removals are difficult to estimate and have not been taken into account in escapement estimates or forecasts. Some caution should be exercised when allocating projected surpluses to account for the losses due to illegal harvest.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

62

STOCK: West River (Antigonish Co.) (SFA 18)
TARGET: 1.15 million eggs (353 large, 1 small salmon)¹

Year	1990	1991	1992	1993	1994	1995	MIN ³	MAX ³	MEAN ³
Angling catch²									
Large	200	294	277	248	126	138	126	476	229
Small	152	65	136	66	43	82	43	152	92
First Peoples' harvest									
Large	-	-	-	-	-	-	-	-	-
Small	-	-	-	-	-	-	-	-	-
Total returns									
Large	284	414	398	339	181	307	175	649	323
small	342	146	312	148	105	315	105	342	211
Spawning escapement									
Large	281	410	395	335	180	300	173	645	320
Small	253	108	233	108	77	265	77	253	156
% of Egg target met (large)									
	80%	116%	112%	95%	51%	85%	51%	116%	91%

1. Habitat area has been revised upward by about 3x.
2. All angling catches are NS license stub estimates. Large salmon angling catch for 1986 to represent hook-and-release estimates. Small salmon catches include retained and released fish.
3. Min, Max are for 1986-1994. Mean for 1990-1994.

Description of fisheries and fishery data: Harvests occurred in recreational fisheries. Angling catch and effort data are obtained from license stubs and angler diaries. The recreational catch of large salmon on West River, Antigonish was 60% of the 1990-94 mean and similar to the 1994 value. The majority of the angling catch occurred after October 20.

Research data: Two sites were electrofished in 1995. Fry and total parr densities exceeded 100 and 78 fish per 100 m², respectively. These data are similar to densities found at the same sites in 1994.

Estimation of stock parameters: Small salmon returns were calculated using the 0.26 fall fishery exploitation rate determined for the Margaree River from actual tag returns. Large salmon returns were estimated using the 1995 catch rate of 0.45 derived for Margaree River large salmon from license stub reported catches and the population estimate determined by mark-and-recapture.

Assessment results: Spawning escapement estimates were 85% of target for large salmon and more than 200 fish surplus to target for small salmon.

Ecological considerations: Discharge was low in 1994 and 1995, relative to the 1989-93 mean discharge, through September and most of October (until October 23). The low water probably influenced the angling catch because fish were not available for angling until late in the season.

Forecast in 1996: Average returns indicate that the large salmon return will meet and possibly exceed the conservation target by about 25% in 1996. Similarly, small salmon spawners are expected to exceed the target by a considerable margin (possibly by more than 200 fish).

Management considerations: Angler access to West River fish has been restricted to late autumn. This has provided the fish a margin of safety from harvest. Local client groups have expressed concern regarding poaching of salmon on all rivers in the Northumberland Strait area. Estimates of those removals are difficult and these have not been taken into account when estimating escapements or forecasts. Caution should be exercised when allocating projected surpluses to account for the losses due to illegal harvest.

3.5 Prince Edward Island Stocks (SFA 17)

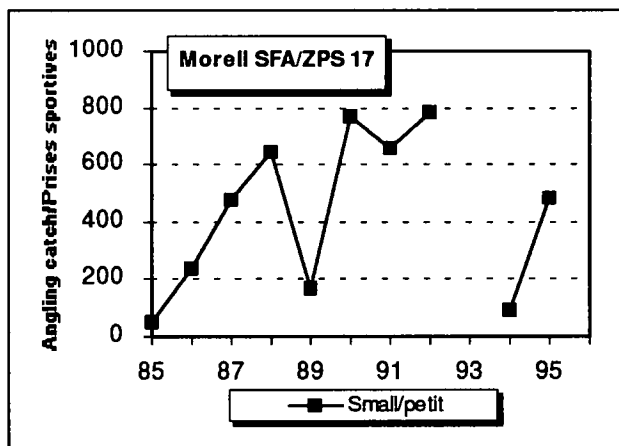
General description

The Morell River accounts for the majority of Prince Edward Island's (PEI) returning salmon, harvested salmon, and salmon rod-days. Although other salmon rivers collectively contain 70% of the total salmon rearing habitat, their runs are very small in most years. Most salmon returning to the Morell are small (93%), early-run (72%), and hatchery-reared (91%). Most salmon stocked on PEI are raised through a process known as semi-natural rearing. Fish hatched at the Cardigan Salmonid Enhancement Centre are released at age 1+ into open ponds where they receive food but are also subject to predation and natural environmental variation. They are stocked into the wild as 2+ smolts. In addition to the Morell, salmon are stocked in the Mill, Trout, Dunk, West, Valleyfield, and Midgell Rivers.

Description of fisheries

The basic salmon angling season on Prince Edward Island is 15 June - 15 September, but other seasons apply in some rivers. In the Morell, salmon angling is permitted from 1 June to 14 October at most sites, 15 June - 31 October in part of the main branch, and 15 June - 30 November in Leard's Pond. A new rule requiring use of barbless hooks for salmon angling after 15 September was imposed in 1995. The daily bag limit was one small salmon and the seasonal limit was seven. Salmon licence sales totalled 633 in 1995. Sport harvest on the Morell was estimated as 464 small salmon, of which an estimated 94% were of hatchery origin. This is an increase over the estimated 89 salmon taken in 1994, but is lower than harvest estimates for the early 1990s. Total harvest of small salmon on PEI was 487.

An agreement between the Department of Fisheries and Oceans and the PEI Native Council allowed for a harvest of 400 small salmon on the Morell River in 1995. Nineteen small and one large salmon were taken.



Public consultations

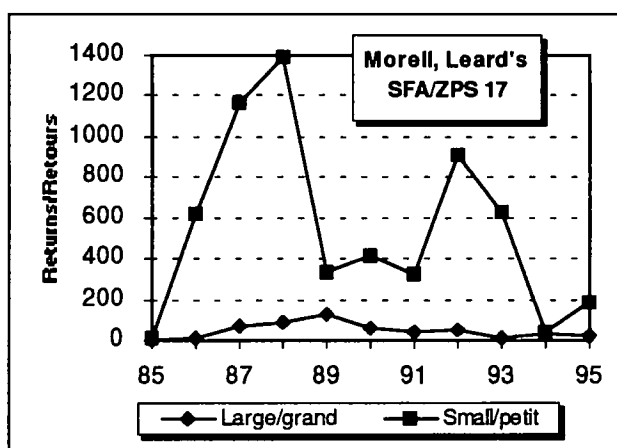
A public consultation meeting, held in Charlottetown on 11 January 1996, was attended by angling group representatives, DFO Area staff, DFO Science staff, and Provincial representatives. The assessment methodology was described and preliminary stock status was presented. Preliminary plans for stocking in 1996 were outlined. Public representatives voiced concern about high water temperatures caused by solar heating in shallow impoundments, and asked if the Department could use its regulations to require that impoundments be managed in a way that avoids excessive heating. A meeting to further investigate this is planned.

Environmental considerations

The summer of 1995 was moderately warm, but temperatures did not reach the extremes of the previous year. Because Prince Edward Island rivers are largely groundwater-fed, warm summers have less effect on discharge than is the case on many mainland rivers.

Status of the stocks

A mark-and-recapture analysis of results from two counting traps yielded an estimated run of 1550 salmon on the Morell in 1995. Comparisons with previous years are not possible because this is the first estimate of the Morell salmon run. Two hundred and one salmon were captured at the Leard's Fishway in 1995. This is the lowest return in 10 years (except for 1994), but counts may be downwardly biased because some fish entered the pond by an unknown route which circumvents the trap. For the river as a whole, estimated spawning potential from returning fish which escaped the fishery was 158% of target, of which 125% came from hatchery fish. Of the 158%, small salmon were responsible for 93% of target and large salmon were responsible for 65%. Calculated spawning potential above Leard's was above target from 1986 to 1993, but fell to 10% in 1994 and 43% in 1995. However, estimates of spawning potential above Leard's are downwardly biased because some fish entered the pond without being counted.



Prospects

Previous returns are the only method of forecasting the Morell River salmon run. If wild salmon return at the same rate as in 1995, and if hatchery fish return at the rate calculated for 1995, 1030 salmon will return to the Morell in 1996. This is a decrease of 34% from 1995 estimates. Prospective returns are lower because fewer 2+ smolts were stocked in 1995. Using numbers of wild returns in 1995, the numbers of hatchery smolts stocked, and the hatchery smolt survival rates determined for the 1995 returns, prospective returns in 1996 are 95 wild small fish, 810 hatchery small fish, 43 wild large fish, and 82 hatchery fish. Spawn deposition by the Morell's prospective 1996 salmon run would be 166% of target if no fish were harvested. With harvests at the 1995 level, spawn deposition would be 119% of target.

Management considerations

Stocking of Atlantic salmon in the Morell River has provided put-and-take angling opportunities in most years. Fishway counts in 1995 recovered from the very low returns of 1994, which followed a year in which 2+ smolts were not released. This underlines the essential role of semi-natural rearing in maintaining the Morell salmon run. In the absence of stocking, the run would be well below target.

Prince Edward Island rivers face chronic siltation problems which are exacerbated by the current expansion of the potato industry. Continuing silt pollution and the occasional pesticide kill work at cross-purposes to stocking and stream enhancement efforts.

Summary sheets

More detailed information on the assessment for the Morell River is provided in the summary sheet.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

66

STOCK: Morell River (SFA 17)
TARGET: Total system: 569,222 eggs (159 large salmon, 85 small salmon)
 Above Leard's Pond Fishway: 179,345 eggs (50 large salmon, 27 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN	MAX	MEAN
Angling catch (total system)									
Large (released)	N/A	164	N/A	N/A	99	98	98	164	120
Small (released)	N/A	1033	N/A	N/A	111	139	111	1033	428
Small (kept)	768	657	781	N/A	89	464	89	781	552
First Peoples' harvest (total system)									
Large						1			
Small						19			
Spawning escapement (total system)									
Large						103			
Small						963			
Total returns¹									
Large (total system)						104			
Small (total system)						1446			
Large (above Leard's)	63	39	46	11	29	15	11	63	34
Small (above Leard's)	409	327	907	628	36	186	36	907	416
% egg target met¹									
Total system						158%			
Above Leard's	201%	114%	281%	141%	10%	43%	10%	281%	132%
¹ Total returns and % egg target above Leard's are minimum values, as some fish enter Leard's Pond without being counted.									

Description of Fisheries: Estimated landings by sport and Native harvesters were 483 small salmon and one large salmon in 1995. This is a sharp increase from the previous year, but is nevertheless lower than the catches of the early 1990s.

Data and assessment: Run size, estimated by Bayesian mark-and-recapture analysis, was 1550 fish in 1995. Fish captured at Leard's Fishway have declined since the early 1990s, but this does not confirm a decrease in run size because some fish are circumventing the fishway. The harvest of 484 salmon represents an exploitation rate of 36%.

State of the stock: For the river as a whole, potential egg deposition exceeded target by 58%. Above Leard's Pond, egg deposition was calculated as 43% of target, but this figure underestimates true potential deposition because some fish entered the pond without being counted.

Ecological considerations: The summer of 1995 was moderately warm, but water temperatures did not attain the extremes of the previous year.

Management considerations: The Morell salmon run is maintained primarily by the stocking of 2+ smolts reared semi-naturally in ponds. 91% of salmon returning in 1995 were of hatchery origin. Return rate for small salmon in 1995 was 5.2% of the fish stocked. Salmonids on PEI face chronic stream siltation and sporadic pesticide kills.

Forecast for 1996: Fewer 2+ smolts were stocked in the Morell in 1995 than in most previous years. If wild salmon return at the same rate as 1995, and if hatchery salmon return at the rate calculated for the 1995, 1030 salmon will return to the Morell in 1996. This would yield an egg deposition of 166% of the conservation target if no fish were harvested. With harvests at the 1995 levels, egg deposition would be 119% of target.

3.6 Gulf New Brunswick Stocks (SFAs 15 & 16)

General description

Rivers in Salmon Fishing Areas 15 and 16 are included in Gulf New Brunswick. River assessments in this area are provided for Restigouche, Jacquet, Nepisiguit, Northwest Miramichi, Southwest Miramichi and Bouctouche rivers. The Northwest and Southwest Miramichi rivers together comprise about 60% of the rearing area in Gulf New Brunswick and the Restigouche about 30% of the area. The Tabusintac and Richibucto rivers were not assessed in 1995 because no new data were available.

The Restigouche is an early-run river with most salmon returning before the end of August. Salmon returns to the Restigouche are composed of approximately equal numbers of large and small salmon. The Nepisiguit, Northwest and Southwest Miramichi rivers have both early- and late-run components. These rivers are dominated by small salmon returns, which account for approximately 75% of the salmon entering the Miramichi system, and about 60% of the Nepisiguit run. The Jacquet and Bouctouche rivers are primarily late-run rivers with most of the returns entering the river after September 1. In the two and three years for which data have been collected on salmon in these rivers, the large salmon component has accounted for 50 to 67% of the returns annually.

Hatchery stocking has occurred in the past five years in the Restigouche River, Tetagouche River, Nepisiguit River, Big Tracadie River, Northwest Miramichi and Southwest Miramichi rivers. A large portion of the hatchery stocking is of unmarked stages especially unfed and feeding young-of-the-year. Smolt stocking has occurred in the Miramichi River. There is no salmonid aquaculture activity in Gulf New Brunswick.

Hatchery-reared fish account for 0-1% of returns to the Miramichi, Restigouche, Jacquet and Bouctouche rivers. Marked hatchery returns to the Nepisiguit River were 3% of large salmon and 5% of small salmon returns in 1995.

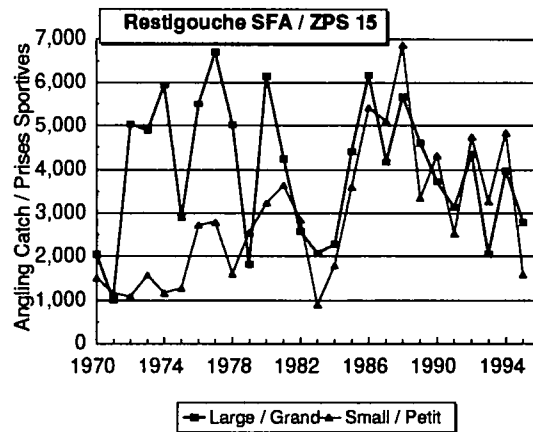
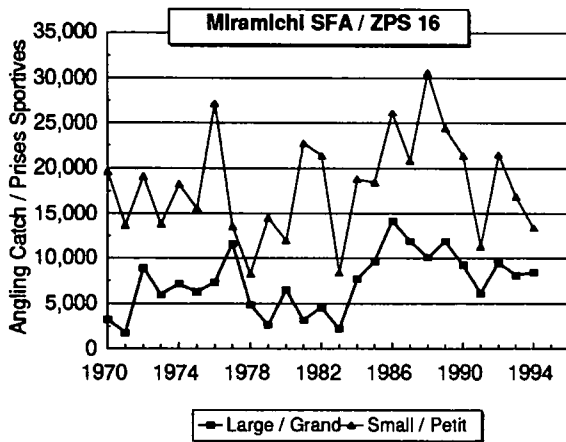
Description of fisheries

First Peoples' food fisheries harvests took place in the Northwest and Southwest Miramichi, Restigouche, Nepisiguit and Bouctouche rivers in 1995. Harvest allocations (by salmon size group) and gear limits were included within the terms of food fishery agreements. Total harvests from Gulf New Brunswick water by First Peoples in 1995 were about 3100 small and 700 large salmon. Additional harvests from the Restigouche system by First Peoples resident in Québec were estimated at approximately 18 small and 1003 large salmon based on mean values for 1989-93.

There has not been any commercial fishery or legal retention of bycatch of Atlantic salmon in Gulf New Brunswick since 1984.

The major recreational fisheries occur on the Restigouche River and the Northwest and Southwest Miramichi rivers. Angling seasons were river-specific; angling terminated on August 31 in the Restigouche system but most other rivers had angling seasons extending into October. Variation orders closed angling fisheries in portions of the Miramichi watershed during much of the summer due to high-temperature, low-water conditions.

Angling catch data for 1995 are not yet available for the Miramichi watershed. Estimates of salmon escapements to this river were derived assuming the mean angling catches in 1990 through 1994 approximated the 1995 catches of small and large salmon. Angling effort on the Restigouche River was essentially unchanged from the previous five years. The catches of small salmon from the Restigouche River in 1995 were the lowest since 1983, and 60% below the previous five-year average. Large salmon catches in 1995 were 19% below the previous five-year average in the Restigouche.



Public consultations

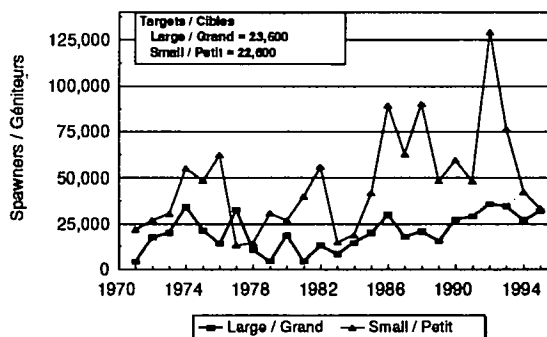
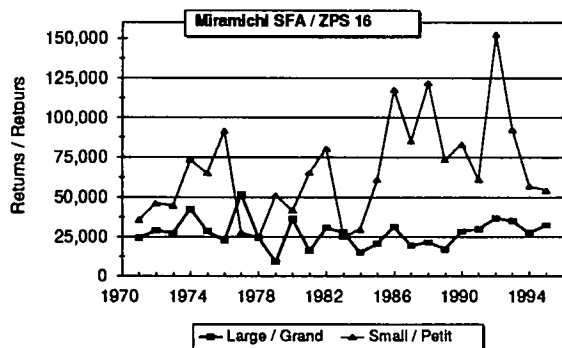
A series of Science workshops was conducted during December 1995 and January 1996 for each of the rivers assessed. These meetings were attended by angling groups, First Peoples, DFO Area staff, DFO Fisheries Officers, and Québec (Ministère de l'Environnement et de la Faune) and New Brunswick (Department of Natural Resources and Energy) biologists. Data collected by these groups were tabled at the meetings, assessment methodologies were described and preliminary stock status was presented and discussed. The data tabled at the meetings and discussions related to the analysis and interpretation were included in the draft assessments prepared by the team leaders which were subsequently peer reviewed in February 1996.

Environmental considerations

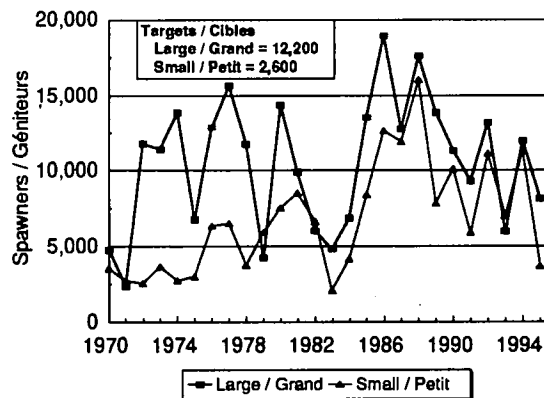
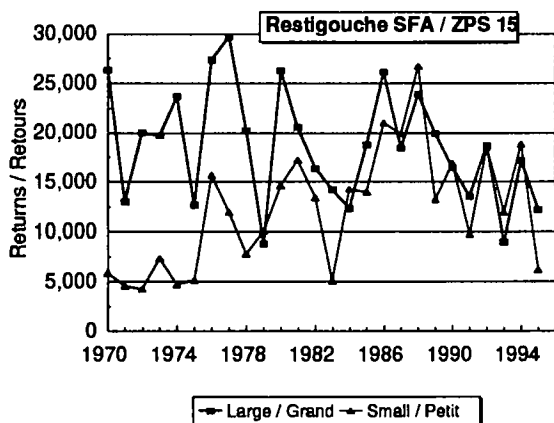
Spring runoff was low to average in 1995 and little or no ice scour occurred on the major rivers. The trend of low river discharge continued through the summer; June to September river flows were exceptionally low in most of Gulf New Brunswick. Discharge in the Upsalquitch River was the lowest recorded in 80 years, and 15-year lows were recorded in parts of the Miramichi system. Water temperatures throughout Gulf New Brunswick were exceptionally high through most of this period. Low discharge and high temperature conditions delayed the migration of salmon in the Miramichi, Restigouche and Nepisiguit. Major salmon runs did not begin until October in most rivers, even those which are normally considered to contain early-run stocks.

Status of the stocks

Salmon stocks of the Miramichi River were assessed using mark-and-recapture techniques. Trapnets were used to mark fish entering the river and recaptures of tags at upriver trapnets were used to estimate the population size. The return and spawning escapement of large salmon for the entire Miramichi River increased relative to 1994, but small salmon were unchanged from 1994. In 1995, 178% of the egg target for the entire Miramichi River was achieved, consistent with the five-year mean for the whole system. The probability that the egg target was met or exceeded was >99%. Estimates of the percent of egg target met varied for each branch; 265% of the egg target for the Northwest Miramichi River (99% probability that target was met or exceeded) and 139% of the egg target for the Southwest Miramichi (81% probability that target was met or exceeded). In both tributaries, the egg deposition in 1995 exceeded the 1994 levels.



Spawning escapement of large salmon to the Restigouche River in 1995 did not exceed target according to a mark-and-recapture experiment, an angling catch-based estimate and visual spawner counts by divers. Small salmon spawning escapement exceeded target by all methods. Egg deposition was conservatively estimated at 67% of target (angling catch method with exploitation of 30%). Small salmon returns were particularly poor in 1995; they were estimated to be only 60% of the five-year mean (estimated by the corresponding method). The angling catch-based method was favoured over the mark-and-recapture estimate in 1995 because of the small sample size of the latter (103 small salmon marked, 9 recaptured). In previous years, the angling catch-based estimate was presented for a range of exploitation rates (0.3 to 0.5), however in 1995 the number of salmon counted by divers in the Restigouche system in autumn (8304 large salmon, 2637 small salmon) exceeded the estimate based on an exploitation rate of 0.5 (4425 large salmon, 1558 small salmon). Thus the estimate based on an exploitation rate of 0.3 (8148 large salmon, 3677 small salmon) was considered to be a more reasonable approximation of the number of spawners in the system. Compared to 1994 values which indicated that 56-101% of the target egg deposition was achieved, egg deposition in 1995 (67% of target) was probably lower. (Note: the numbers of spawners and returns in the following figure are based on the angling catch method with exploitation rate of 0.3.)



Escapement to the Nepisiguit River was conservatively estimated as 62% of target, based on returns to a counting fence, and angling catch. Escapement was similar to that estimated in 1994 (59% of the egg deposition target). As in the Restigouche River, small salmon returns were poor, less than half of the five-year mean.

In the Jacquet River, large salmon spawning escapement exceeded the target (137% of target). However, small salmon returns followed the same trend observed in the other two Chaleur Bay rivers (Restigouche and Nepisiguit); the 1995 returns to a counting fence were about half of the numbers recorded in 1994.

In the Bouctouche River, egg depositions at most equalled 58% of the egg target. Returns of both large and small salmon, estimated by a mark-and-recapture experiment, were fewer than those estimated in 1994.

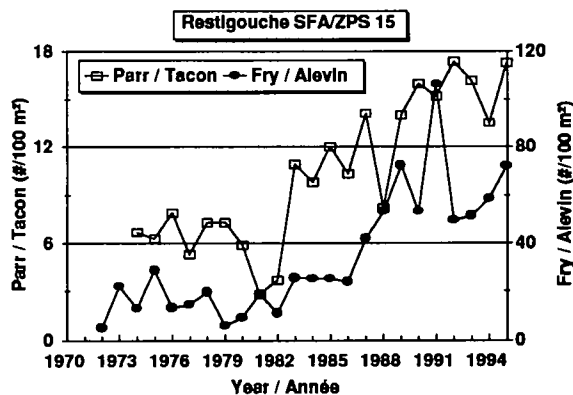
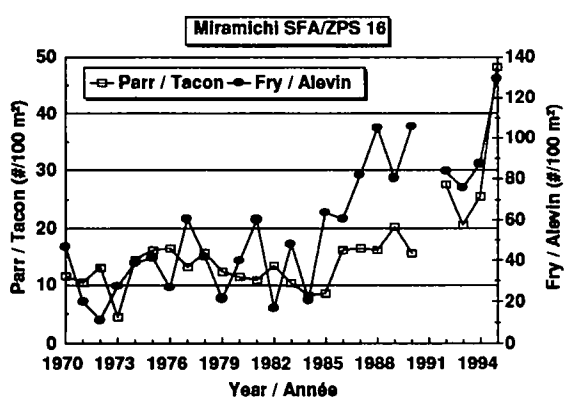
Prospects

Short term prospects (forecasts for 1996) are available for the Miramichi River using small salmon returns to predict large salmon returns the following year and smolt enumerations. The small salmon to large salmon relationship indicates an 81% probability that large salmon returns should meet or exceed the target. Large salmon returns in 1996 are expected to exceed the target spawning requirements by about 30%, or 7,000 large salmon. Trends in smolt migrations and subsequent returns of small salmon the following year at Catamaran Brook, a tributary stream of the Northwest Miramichi, suggest that small salmon returns in 1996 should be on the order of those observed in 1995 and therefore about two times the 22,600 required to meet the conservation target.

The prediction for the Restigouche, based on five-year trends of conservative return estimates is that returns will not exceed spawning requirements. Prospects for the Jacquet River, based on returns to the counting fence in excess of spawning requirements during two years of operation, are also good.

The five-year trend in the Nepisiguit River also indicates that returns will probably not achieve spawning target. The three-year trend for the Bouctouche River has been that returns are less than spawning requirements and this will probably continue in 1996.

A long term view beyond 1996 is obtained by looking at time series of juvenile densities. Juvenile densities measured at index sites in the Miramichi, Restigouche and Nepisiguit rivers have increased consistently since the mid-1980's. Juvenile densities in the Restigouche and Miramichi rivers since 1986 have been more than twice the levels observed in the 1970 to 1985 time period. Whether the increased freshwater production in recent years results in increased returns of salmon to the rivers will depend upon the marine conditions and survival. The Catamaran Brook smolt to small salmon survivals are high but variable; other indices of marine survival are nonexistent for these stocks.



Management considerations

Effects of current fishing practices

Current fishing practices do not seem to be having an adverse effect on the Miramichi River as spawning requirements have been exceeded in most years. Jacquet River salmon returns, since the installation of the barrier fence, have also exceeded spawning requirements.

Indications for the Bouctouche, Restigouche and Nepisiguit rivers are that there will be no surplus to spawning requirements of large salmon. In the Restigouche River, large salmon harvests occur in both the First Peoples' food fisheries and in the recreational fisheries in Québec; this is the only river of SFA 15 or 16 in which a substantial number of large salmon continues to be removed each year. Surpluses of small salmon have occurred annually in the Restigouche and escapements have exceeded the target. Small salmon escapements in the Nepisiguit and Bouctouche have not exceeded target in recent years.

Ecological considerations

Abnormally low and warm water conditions throughout Gulf New Brunswick in the summer and early fall of 1995 delayed the entry of salmon into rivers, including the Miramichi and Restigouche watersheds, and consequently reduced angling catch. There are no concerns in Gulf New Brunswick rivers regarding aquaculture escapees or foreign species intrusions. Negative interactions between brook trout and salmon are of concern to numerous angling associations who are equally interested in trout stocks. Negative effects of mergansers and cormorants on juvenile salmon are also of concern to angling associations.

Summary sheets

More detailed information on individual assessments for the Restigouche, Jacquet, Nepisiguit, Miramichi, Northwest Miramichi, Southwest Miramichi and Bouctouche rivers are provided in the summary sheets.

Report on the status of Atlantic salmon stocks in eastern Canada in 1995

STOCK: Restigouche River, (SFA 15)

TARGET: 71.4 million eggs (12,200 large salmon, 2600 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ²
Angling catch (retained + released)									
Large	3735	3137	4355	2055	3979	2792	1016	6707	3452
Small	4324	2522	4751	3268	4840	1589	896	6873	3941
Angling catch (retained)									
Large	893	956	1004	514	963	866	514	6707	866
Small	4324	2522	4751	3268	4840	1589	896	6873	3941
First Peoples' harvest³									
Large	1606	1111	1412	1194	1333 ³	1187 ³	129	2950	1331
Small	136	19	55	0	47 ³	39 ³	0	178	53
Spawning escapement (mark-and-recapture method)⁴									
Large (x 1000)				6 (4-9)	16 (12-26)	12 (7-33)	6	34	11
Small (x 1000)				7 (5-12)	17 (12-29)	6 (3-18)	7	17	12
Total returns (mark-and-recapture method)⁴									
Large (x 1000)				9 (7-13)	22 (18-34)	17 (11-42)	9	43	15
Small (x 1000)				12 (10-18)	26 (20-40)	9 (5-23)	12	26	19
% egg deposition met (mark-and-recapture method)⁴									
				48% (37-76)	137% (105-218)	98% (57-270)	48%	277%	185%
Spawning escapement (angling exploitation method)⁵									
Large (x 1000)	6-11	5-9	7-13	3-6	6-12	4-8	1-2	11-19	6-10
Small (x 1000)	4-10	3-6	5-11	3-8	5-11	2-4	1-2	10-16	4-9
Total returns (angling exploitation method)⁵									
Large (x 1000)	10-16	9-14	12-19	6-9	11-17	8-12	6-9	23-26	10-15
Small (x 1000)	10-17	6-10	11-18	8-13	11-19	4-6	3-4	16-26	9-15
% egg deposition met (angling exploitation method)⁵									
	53% to 95%	43% to 78%	62% to 111%	28% to 52%	56% to 101%	36% to 67%	9% to 20%	89% to 159%	48% to 87%
Average juvenile densities (# per 100 m²)									
# OF SITES	15	8	10	15	11	13			
AGE 0+	53	107	50	51	59	72	5	107	64
AGE 1+	13	12	15	12	11	15	2	15	12
AGE 2+	3	3	3	5	3	3	0.4	5	3

¹ Min, Max for years 1970 to present.

² Mean for years 1990-94.

³ First People's harvests in Québec in 1994 and 1995 are estimated as the mean of 1989-93 values.

⁴ Most probable value with 95% confidence limits.

⁵ Range given reflects uncertainty of angling exploitation rate (assumed to be between 0.3 and 0.5), from which spawning escapement, eggs, and total returns are derived.

Recreational catch: Angling catches of large (including catch and release in N.B.) and small salmon in 1995 were 19% and 60% below the five-year means, respectively. Note that retention of angled large salmon is permitted in Québec waters.

Data and assessment: In 1989-92 the assessment was based only on angling catch with an assumed exploitation rate of 0.3-0.5. A mark-and-recapture experiment was used to estimate river population and spawning escapement in 1993-95 and this estimate is presented along with that of the earlier method. In 1995, mark-population estimates are about 30% higher than the least conservative angling-based estimate with an exploitation rate of 0.3. For management purposes the angling based estimate at exploitation rate = 0.3 is recommended; according to this estimate, 67% of the target egg deposition was met.

State of the stock: Egg deposition based on large salmon spawning escapement was 67% of target. Small salmon escapement exceeded target levels, but was low compared to recent years.

Forecast for 1996: Based on mean returns from 1991-1995 (angling-based method), between 9,000-14,000 large salmon and 8,000 - 13,000 small salmon are expected to return in 1996.

Management Considerations: No estimates for 1995 indicate that the conservation targets for large salmon and eggs were exceeded; and conservative estimates indicate that they were not met. Annual estimates of juvenile densities continue to be high. Annually, there continues to be a surplus of small salmon to the conservation requirements and there is no reason to expect this to change in 1996.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: Jacquet River, (SFA 15)
TARGET: 2.72 million eggs (320 large salmon, 180 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ²
Angling catch (bright salmon)									
Large (Released)	58	23	95		100	0	0	105	69
Small (Retained)	82	56	105		33	61	33	110	69
Spawning escapement									
Large					493	437			
Small					486	288			
Total returns									
Large					595	584			
Small					613	359			
% Egg target met (large salmon only)									
					154%	137%			
¹ Min and Max of years 1984-95. ² Mean of years 1990-94.									

Recreational catch: Angling catches of small and large salmon were lower than average.

Data and assessment: Salmon spawning escapement has been estimated from returns to a counting fence in conjunction with harvest statistics. Poaching mortalities are conservatively estimated at 16% for large and 14% for small salmon (based on the Restigouche assessment).

State of the stock: The estimated spawning escapement of large salmon was 437 in 1995, well above requirements for the system. Small salmon spawning escapement of 288 was also above requirements. The estimated egg deposition was 37% above target.

Forecast for 1996: None available.

Management considerations: Considering that the conservation targets were exceeded in each of the past two years, according to barrier fence counts, no problem in meeting the targets for both small and large salmon is expected in 1996.

Report on the status of Atlantic salmon stocks in eastern Canada in 1995

75

STOCK: Nepisiguit River, (SFA 15)
TARGET: 9.6 million eggs (1363 large salmon, 690 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ²
Angling catch									
Large (Released)	300	300	270	258	250	300	60	600	276
Small (Retained)	500	700	800	470	380	350	229	1000	570
First Peoples' harvest									
Large	n/a	n/a	n/a	50	0	44			
Small	n/a	n/a	n/a	200	120	131			
Spawning escapement									
Large	1117	1026	336	925	773	819	109	2381	835
Small	1593	2164	1092	836	501	425	309	2900	1237
Total returns									
Large	1390	1290	642	1084	892	1037	545	2700	1267
Small	2152	2930	1974	1511	1018	918	562	2930	1917
% Egg target met (large salmon only)									
	89%	85%	29%	72%	59%	62%	9%	187%	67%
Average juvenile densities (Number per 100 m²)									
NO. OF SITES	13	17	18	24	20	19			
AGE 0+	16	29	33	19	38	16	2	38	27
AGE 1+	3	4	10	8	6	7	1	10	6
AGE 2+	0.1	1	1	2	1	1	0	2	1

¹ Min, Max for years 1970 to present.
² Mean for years 1990-94.

Recreational catch: Small salmon angling harvest was the lowest since 1985. Large salmon catch was average. First Peoples' harvest in 1995 was 131 small and 44 large salmon.

Data and assessment: Salmon spawning escapement was estimated from returns to a counting fence in conjunction with harvest statistics. For years 1990, 1991, 1993-95, counting fence returns were estimated using the historic relationship between fence counts and angling catch above the fence. This estimate may be conservative in 1995 because of low water conditions; a higher proportion of fish than usual remained in the estuary or lower river until after the end of the angling season. Spawning escapement below the fence was estimated using the distribution of spawning redds above and below the fence. Total returns below the fence were then calculated as the sum of spawning escapement plus removals.

State of the stock: The estimated spawning escapement of large salmon was 819, well below requirements for the system. Small salmon spawning escapement of 425 was also below requirements. Returns of large salmon were 18% below average, and returns of small salmon were 52% below average.

Forecast for 1996: None available.

Management considerations: The Nepisiguit River has not met target spawning requirements in the past four years. It is unlikely there will be a harvestable surplus of large salmon in 1996, or in the immediate future.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

76

STOCK: Miramichi River, (SFA 16)
TARGET: 132 million eggs (23,600 large salmon, 22,600 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ²
Angling catch³									
Large	9258	6147	9476	8131	8451	8293 ⁴	1792	14215	8293
Small	21372	11300	21482	16898	13415	16893 ⁴	8310	30586	16893
First Peoples' harvest⁵									
Large	609	544	608	208	124	185	124 ⁵	898 ⁵	419
Small	2110	1111	1652	601	2977	3004	100 ⁵	3004 ⁵	1690
Other harvest⁶									
Large	99	131	142	166	119	125	99	166	131
Small	142	189	198	236	270	164	142	270	207
Spawning escapement									
Large (x 1000)	28	29	36	35	27	32	4	36	31
Small (x 1000)	60	48	135	76	40	34	13	135	72
Total returns									
Large (x 1000)	29	30	37	35	27	33	9	52	32
Small (x 1000)	83	61	153	92	57	54	24	153	89
% egg target met	152%	159%	242%	170%	130%	178%	23%	242%	171%
Average juvenile densities (Number per 100 m²)									
NO. OF SITES	15	3	14	15	14	12			
AGE 0+	95	34	74	69	82	130	10	130	73
PARR	15	25	25	20	23	48	4	48	22

¹ Min, Max over the period 1971-95 unless stated otherwise.

² Mean for years 1990-94.

³ All angling catch are NB DNRE Fishsys values and include released fish. Angling catch for large salmon is hook and release estimate of catch.

⁴ Estimated as mean of 1990-94 angling catch.

⁵ Native harvest includes harvest reported by Burnt Church, Red Bank and Eel Ground First Nations.

⁶ Other harvest includes broodstock removals, mortalities at all index traps and all samples.

Recreational catch: Has ranged from 7686 to 14,215 large and 11,300 to 30,586 small salmon during the past 10 years. Effort in rod-days has increased in recent years. Angling catches for 1994 are revised final values. The 1995 catches are preliminary values based on the 1990-94 average because 1995 estimates are not yet available.

Data and assessment: For 1989-91, returns were estimated from trap efficiency at a DFO trap operated in the estuary of the Miramichi River at Millbank. The efficiency of this trap was calibrated from tag recapture experiments in 1985 through 1992. Index traps were operated in the estuaries of the Northwest and Southwest Miramichi rivers in 1992 to 1995. Returns of small and large salmon were estimated separately from marks applied at these traps and recaptures upstream. Escapements were estimated as returns minus known removals.

State of the stock: Target egg deposition rates have been almost met or exceeded in each of the last ten years.

Forecast for 1996: The probability distribution model prediction for large salmon returns in 1996 is 30,507 with a probability of meeting the spawning target (23,600) of 81% (i.e., a 19% chance of returns being less than 23,600) Grilse returns are expected to be similar to 1995, i.e., about two times the target.

Report on the status of Atlantic salmon stocks in eastern Canada in 1995

STOCK: Northwest Miramichi River, (SFA 16)
TARGET: 41 million eggs (7316 large salmon, 7006 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ²
Angling catch³									
Large	2229	1533	1794	2186	2249	1998 ⁴	419	3836	1998
Small	6825	3056	6960	6171	5166	5636 ⁴	2232	9825	5636
First Peoples' harvest									
Large	502	462	580	54	81	172	54	898	336
Small	2095	1109	1616	477	2921	1795	100	2921	1644
Other harvest⁵									
Large	39	44	56	100	51	31			58
Small	0	29	61	106	68	115			53
Spawning escapement									
Large (x 1000)	n.a.	n.a.	9	10	13	15			
Small (x 1000)	n.a.	n.a.	22	40	13	15			
Total returns									
Large (x 1000)	n.a.	n.a.	10	11	13	15			
Small (x 1000)	n.a.	n.a.	31	46	21	22			
% egg target met	n.a.	n.a.	198%	175%	197%	265%			
Average juvenile densities (Number per 100 m²)									
NO. OF SITES	4	2	4	4	4	4			
AGE 0+	24	35	55	46	31	48	3	59	38
PARR	13	23	18	22	20	34	3	34	19

¹ Min, Max over the period 1972 to present unless stated otherwise.

² Mean for years 1990-94.

³ All angling catches are NB DNRE Fishsys values and include released fish. Angling catch for large salmon is hook and release estimate of catch.

⁴ Angling catch is estimated as the 1990-94 mean.

⁵ Other harvest includes broodstock removals, mortalities at all index traps and all samples.

Recreational catch: New Brunswick Department of Natural Resources and Energy Fishsys estimates indicate that in the years 1987-91, 27-34% (mean: 31%) of total angling in the Miramichi River has occurred in the Northwest Miramichi. Values for 1992-94 are final revised estimates of catch. The 1995 values are not yet available and the mean values for the years 1990-94 have been used as preliminary figures.

Data and assessment: Returns of small salmon and large salmon to the Northwest Miramichi River were estimated in 1992-95 from a mark-and-recapture program, applying tags at Eel Ground Enclosure trap and recovering tags from traps at Red Bank, and from fences in the headwaters of the Northwest Miramichi and in Catamaran Brook. Spawners were estimated as returns minus known and estimated removals.

State of the stock: The spawning target for large salmon was exceeded in 1992-95.

Forecast for 1996: Based on the forecast for the Miramichi River and the proportion of total salmon returning to the Northwest Miramichi (38%), returns in 1996 should exceed the spawning requirements.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: Southwest Miramichi River, (SFA 16)
TARGET: 88 million eggs (15,730 large salmon, 15,063 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ²
Angling catch³									
Large	7029	4614	7682	5945	6202	6294 ⁴	1373	10387	6294
Small	14547	8244	14522	10727	8249	11258 ⁴	4570	22137	11258
First Peoples' harvest⁵									
Large	0	0	0	0	0	0			
Small	0	0	0	0	0	1170			
Other harvest⁶									
Large	49	39	75	66	68	94			59
Small	0	39	26	130	202	49			79
Spawning escapement									
Large (x 1000)	n.a.	n.a.	27	22	14	17			
Small (x 1000)	n.a.	n.a.	106	33	26	19			
Total returns									
Large (x 1000)	n.a.	n.a.	27	22	14	17			
Small (x 1000)	n.a.	n.a.	121	43	34	32			
% Egg target met	n.a.	n.a.	259%	150%	108%	139%			
Average juvenile densities (Number per 100 m²)									
NO. OF SITES	9	1	8	9	8	8			
AGE 0+	142	63	98	89	115	170	15	170	101
PARR	17	28	33	20	28	59	5	55	25

¹ Min, Max over the period 1972 to present unless stated otherwise.

² Mean for years 1990-94.

³ All angling catches are NB DNRE Fishsys values and include released fish. Angling harvest for large salmon is hook and release estimate of catch.

⁴ Angling catch is estimated as the 1990-94 mean.

⁵ Eel Ground First Nations fishery occurred in the Southwest branch using a trapnet.

⁶ Other harvest includes broodstock removals, mortalities at all index traps and all samples.

Recreational catch: New Brunswick Department of Natural Resources and Energy Fishsys estimates indicate that over the period 1987-91, 66-73% (mean: 69%) of total angling in the Miramichi River has occurred in the Southwest Miramichi. The 1995 values are preliminary and represent the average catches for the period 1990-94 because the 1995 estimates are not yet available. Values for 1994 have been finalized.

Data and assessment: Returns of small salmon and large salmon to the Southwest Miramichi River were estimated in 1992-95 from a mark-and-recapture program, applying tags at Enclosure trap and recovering tags from a recapture trapnet upstream, from creel surveys, and from fences and barriers in the Southwest Miramichi. Spawners were estimated as returns minus known and estimated removals.

State of the stock: The egg deposition target was exceeded in 1992-95.

Forecast for 1996: Based on the forecast for the Miramichi River and the proportion of total salmon returning to the Southwest Miramichi (62%), returns in 1996 should exceed the spawning requirements.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: Bouctouche River (SFA 16)
TARGET: 1.586 million eggs (268 large salmon, 189 small salmon)¹

Year	1990	1991	1992	1993	1994	1995	MIN ²	MAX ²	MEAN
Angling catch									
Large (Released)	47			22	7	na	7	52	
Small (Rel + Kept) 16				55	20	na	13	55	
First Peoples' harvest									
Large			12	0	12	0			
Small			0	0	11	15			
Other Removals³									
Large				50	45	33			
Small				0	19	32			
Spawning Escapement									
Large				28	198	127			
Small				18	96	67			
Total Returns									
Large				79	255	160			
Small				62	126	122			
Percent target met									
Large				13%	59%	47%			
Small				14%	65%	35%			
% Egg target met									
(All salmon)				13%	61%	50%			

¹ The egg target remains unchanged; target spawners have been adjusted to reflect stock characteristics observed in the current year.
² Angling catch min, max are for years to 1984-94; the mean was not calculated because angling catches are not estimated on a consistent basis.
³ Other removals include poaching estimates and broodstock removals.

Recreational catches: Catch statistics from the New Brunswick Department of Natural Resources and Energy were not available at the time of publication. A telephone survey indicated a minimum of 8 small salmon were retained.

Data and assessment: Returns of large and small salmon to the Bouctouche River were estimated from tags applied at two estuary trapnets and recaptured at the upper trapnet and a counting fence. Spawners were estimated as returns minus known and estimated removals.

State of the stock: Spawning escapement was not met for large or small salmon in 1995. Total egg deposition was maximally 50% of target.

Forecast for 1996: Because 1995 is only the third year of data on returns, no quantitative forecast of returns can be made for 1996.

Management considerations: There is not likely to be a harvestable surplus of salmon in the Bouctouche River in 1996.

4.0 Québec Regional Summaries

There are 117 rivers in the province of Québec which harbour Atlantic salmon populations. First Nations' food fisheries occur on nine rivers and in Ungava Bay, recreational fishing is permitted on 101 rivers and commercial exploitation is now restricted to the lower North Shore of the Gulf of St. Lawrence (Q9) and in Ungava Bay. The principal information related to harvests, exploitation, returns, spawning escapements and status have been summarized annually since 1991. Two documents are of relevance to the interpretation of the status of Atlantic salmon stocks in Québec:

- Caron, F., H. Gouin, D. Deschamps, et M. Shields. 1996. Bilan de l'exploitation du saumon au Québec en 1995. Ministère de l'Environnement et de la Faune, Direction de la faune et des habitats, Service de la faune aquatique. 55 p.
- Caron F., D. Deschamps, C. Raymond, et M. Shields. 1996. Registre des données de l'exploitation du saumon au Québec, 1985-1995. Ministère de l'Environnement et de la Faune, Direction de la faune et des habitats, Service de la faune aquatique. 147 p.

These documents are available at the following address:

François Caron
Ministère de l'Environnement et de la Faune
150 boul. René-Lévesque Est, 5e étage
Québec, Qc
G1R 4Y1

4.1 Gaspé (Fishing Areas Q1-Q3)

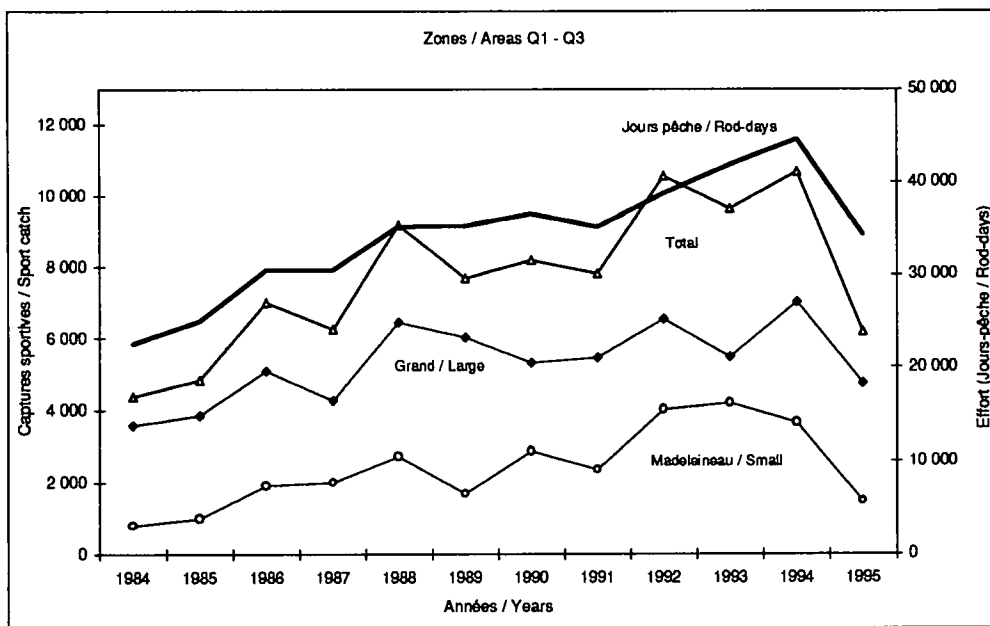
There are 28 salmon rivers within areas Q1 to Q3. Returns and spawners are obtained from diver counts in September, after the fisheries. These visual methods are feasible because of extremely clear water conditions. On ten rivers, counts are obtained at fishways or counting fences. Public consultations with user groups took place in November and December 1995 in each of the fishing areas.

Enhancement activities in 1995 took place on 4 rivers within area Q1 (Bonaventure, Petite rivière Cascapédia, Cascapédia, and Nouvelle), 6 rivers within area Q2 (York, Saint-Jean, Malabaie, Petit Pabos, Grand Pabos, and Anse à la Barbe) and 6 rivers within area Q3 (Rimouski, Mitis, Matane, Cap-Chat, Sainte-Anne, and Jacques-Cartier). Different life stages were stocked into these rivers: 970000 eggs, 95000 fry, 27000 1-year old parr, and 261000 smolts of which 77% were one-year olds.

Description of fisheries

First Peoples' food fisheries occur in two locations in area Q1: near the mouths of the Restigouche and Cascapédia rivers. There is no commercial fishery in these areas.

Recreational catches decreased by 42 % relative to 1994, and were 34 % below the mean (Table 4.1.1). Small salmon catches were particularly lower, 60% below the 1994 catches and 57% below the previous five-year mean. Effort was also reduced in 1995 by 28% and 13% relative to the previous year and previous five-year mean, respectively. Total effort in 1995 was 34284 rod days. Overall, fishing conditions were very poor and the fishing success (catch per unit effort) declined to 0.18 fish per rod day. The exploitation rate, which was the highest ever recorded in 1994 at 41%, was 27% in 1995, the lowest of the last seven years.



Status of the stocks

Essentially all the riverine habitat in the rivers of areas Q1 to Q3 is accessible to salmon. Consequently all the riverine habitat is considered to be usable by salmon. For management purposes, target egg depositions are calculated using all the accessible area and an egg deposition rate of 1.68 per m² which is equivalent to 2.4 eggs per m² of spawning and rearing habitat area (comprises 70% of the total area).

The total returns of salmon in 1995 were estimated at 23260 fish, 10% less than 1994 and 14% less than the previous five-year mean (Table 4.1.1). Because of the lower exploitation rate in 1995, spawning escapement increased by 11% relative to 1994 but was 2% below the previous five-year mean. Egg depositions for areas Q1 to Q3 were estimated to have been 88 % of target, an improvement of 21% relative to the 1994 deposition (72% of target) and 13% above the previous five-year mean egg deposition (78% of target). Lower overall returns in 1995 were mainly the result of the lower abundance of small salmon relative to previous years.

Prospects

The populations of salmon within areas Q1 to Q3 are comprised of about 30% 1SW salmon (grilse), 60% 2SW salmon and about 10% 3SW salmon and previous spawners. The relationship between small salmon returns in a given year and large salmon returns in the subsequent year was examined for the rivers with a long time series of observations and which are not receiving significant hatchery stocking. Based on the significant relationship for 5 of 7 rivers examined, large salmon returns in 1996 are expected to be low as a result of the low returns of small salmon observed in 1995.

Smolt production from Saint-Jean River has been low in recent years. Combined with low sea survivals of 1SW salmon observed in 1995, this suggests that large salmon returns in 1996 will be low.

Summary sheets

More detailed information on individual river assessments for Bonaventure (Q1), Dartmouth(Q2), York (Q2), Saint-Jean (Q2), Matane(Q3) and Madeleine(Q3) are presented in the summary sheets.

Table 4.1.1. Sport catch, removals, returns, spawning escapement and percent of target met in the rivers of Gaspé, Areas Q1 to Q3, 1984 to 1995. Target eggs was 77.71 million prior to 1993 and is 78.14 million since 1993. Eggs deposited are expressed in millions. ER = Exploitation rate.

Year	Sport Catch			Effort	CPUE	ER	Removals		Total Returns	Spawning		% of target
	Small	Large	Total				Other	Total		Fish	Eggs (millions)	
1984	779	3582	4361	22464	0.19	30%	280	4641	14662	10021	41.89	54%
1985	976	3847	4823	24919	0.19	34%	130	4953	14070	9117	35.49	46%
1986	1919	5087	7006	30450	0.23	32%	420	7426	22082	14656	49.37	64%
1987	1994	4266	6260	30435	0.21	26%	566	6826	23857	17031	61.26	79%
1988	2734	6451	9185	35204	0.26	32%	309	9494	28784	19290	73.89	95%
1989	1669	6022	7691	35208	0.22	28%	728	8419	27246	18827	72.52	93%
1990	2898	5300	8198	36562	0.22	30%	546	8744	26925	18181	63.04	81%
1991	2358	5458	7816	35154	0.22	30%	369	8185	25646	17461	63.30	81%
1992	4028	6533	10561	38762	0.27	36%	319	10880	29636	18756	63.92	82%
1993	4192	5458	9650	41807	0.23	39%	245	9895	25040	15145	55.85	71%
1994	3661	7022	10683	44616	0.24	41%	441	11124	25966	14842	56.51	72%
1995	1461	4739	6200	34284	0.18	27%	516	6716	23260	16544	68.49	88%
1990-1994	3427	5954	9382	39380	0.24	35%	384	9766	26898	16877	60.52	78%
1995 compared to												
1994	-60%	-33%	-42%	-23%	-24%	-35%	17%	-40%	-10%	11%	21%	21%
1990-1994	-57%	-20%	-34%	-13%	-24%	-24%	34%	-31%	-14%	-2%	13%	13%

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: Bonaventure (Q1)
TARGET: 8.42 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	52	163	313	391	476	343	480	399	477	536	584	164	52	584	383
Large	485	381	721	502	1058	1033	980	899	927	767	1134	870	381	1134	780
Total	537	544	1034	893	1534	1376	1460	1098	1404	1303	1718	1034	537	1718	1173
Smolt counts															
Returns															
Small	163	368	821	1237	1173	878	1291	1329	1160	829	916	329	163	1329	924
Large	1517	858	1901	1588	2610	2647	2633	2368	2284	1767	2802	2618	858	2802	2089
Total	1680	1226	2722	2825	3783	3525	3924	3897	3444	2596	3718	2945	1226	3924	3013
Spawners															
Total	1143	682	1688	1932	2249	2149	2464	2562	2008	1261	1974	1871	682	2562	1828
% of egg target met ²	59%	25%	60%	60%	79%	85%	95%	85%	73%	51%	91%	91%	25%	95%	69%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodology: Target egg deposition is for accessible habitat.

Data and assessment: Returns and spawners are estimated from diver counts of spawners and mandatory declaration of recreational harvest.

Prospects: Based on the low return of small salmon in 1995, large salmon returns in 1996 are expected to be low.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: Dartmouth (Q2)
TARGET: 2.99 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	8	34	43	35	57	36	150	130	141	267	202	35	8	267	100
Large	166	210	140	136	304	323	195	287	390	473	588	319	138	588	292
Total	174	244	183	173	361	359	345	417	531	740	790	354	173	790	392
Smolt counts															
Returns															
Small	39	59	121	518	-	190	485	369	411	372	331	185	39	518	290
Large	660	498	602	961	-	1214	788	1169	1282	1069	1077	1001	498	1282	933
Total	708	557	723	1479	1541	1404	1273	1538	1693	1441	1408	1186	557	1693	1251
Spawners															
Total	500	313	540	1306	1180	1045	927	1121	1162	700	609	832	313	1306	865
% of egg target met ²	79%	46%	74%	133%	151%	142%	96%	141%	143%	95%	77%	100%	46%	151%	107%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodology: Target egg deposition is for accessible habitat.

Data and assessment: Returns and spawners are estimated from diver counts of spawners and mandatory declaration of recreational harvest.

Prospects: Based on the low return of small salmon in 1995, large salmon returns in 1996 are expected to be low.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK: York (Q2)
TARGET: 4.39 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	8	57	91	63	128	89	161	118	329	329	261	68	8	329	149
Large	444	366	488	420	894	806	399	566	730	620	750	484	366	894	587
Total	452	423	579	483	1022	895	530	684	1059	949	1011	552	423	1059	736
Smolt counts															
Returns															
Small	104	132	196	467	436	248	388	292	566	433	451	221	104	566	338
Large	1290	903	1066	1551	2150	1845	1230	1453	1655	1320	1592	1517	903	2150	1460
Total	1394	1035	1262	2018	2586	2093	1618	1745	2221	1753	2043	1738	1035	2586	1797
Spawners															
Total	923	597	670	1535	1584	1198	1088	1061	1141	803	984	1180	597	1584	1051
% of egg target met ²	104%	66%	71%	143%	158%	131%	100%	112%	114%	88%	100%	129%	66%	158%	100%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodology: Target egg deposition is for accessible habitat.

Data and assessment: Returns and spawners are estimated from diver counts of spawners and mandatory declaration of recreational harvest.

Prospects: Based on the low return of small salmon in 1995, large salmon returns in 1996 are expected to be low.

STOCK: Saint-Jean (Q2)
TARGET: 3.77 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	25	19	70	114	150	107	220	143	303	320	256	80	19	320	157
Large	346	322	240	267	587	504	254	507	623	508	578	420	240	623	430
Total	370	341	310	381	737	611	474	650	926	828	834	500	310	926	587
Smolt counts	-	-	-	-	-	92666	97992	113927	154980	142972	74285	60227	74285	154980	112804
Returns															
Small	113	81	155	563	426	282	512	437	559	819	494	245	61	819	382
Large	1118	795	819	1069	1816	1375	772	1487	1478	1102	1258	1138	772	1916	1199
Total	1229	856	974	1632	2342	1637	1284	1924	2037	1721	1752	1383	856	2342	1581
Spawners															
Total	807	515	644	1240	1578	1002	801	1274	1108	887	908	856	515	1578	979
% of egg target met ²	91%	60%	71%	100%	165%	100%	65%	124%	108%	75%	86%	88%	60%	165%	96%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodology: Target egg deposition is for accessible habitat.

Data and assessment: Returns and spawners are estimated from diver counts of spawners and mandatory declaration of recreational harvest. Smolt counts are based on mark and recapture experiments. Smolt counts from previous years have been finalized.

Prospects: Low smolt production in 1994, low sea survival of the returning 1SW salmon and the low return of small salmon in 1995 suggest that large salmon returns in 1996 will be low.

STOCK: Matane (Q3)
TARGET: 5.64 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	215	180	344	254	480	46	321	372	645	712	479	302	46	712	366
Large	455	455	520	489	498	127	516	482	680	620	602	277	127	680	495
Total	670	616	864	743	978	173	837	854	1325	1332	1081	579	173	1332	861
Smolt counts															
Returns															
Small	898	794	2236	1081	1081	1171	1227	1508	2014	1830	1186	1239	794	2236	1368
Large	1201	1297	1631	2330	2318	976	1580	1450	1579	1338	1480	938	976	2330	1583
Total	2099	2091	3867	3411	3399	2147	2807	2958	3593	3168	2676	2177	2091	3867	2929
Spawners															
Total	1393	1475	3003	2668	2402	1074	1070	2104	2258	1834	1540	1528	1393	3003	2057
% of egg target met²	60%	70%	97%	152%	148%	73%	89%	82%	78%	62%	71%	51%	60%	152%	89%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodology: Target egg deposition is for accessible habitat. Egg depositions are for small and large salmon combined. Spawners are estimated from counts at a fishway minus removals in the recreational fishery.

Recreational fishery: In 1989, the recreational fishery was cloed in August as a result of the low returns of large salmon enumerated at the the fishway.

Data and assessment: Counts of small and large salmon are obtained at a fishway; a small number of salmon captured upstream of the fishway is included in the fishway counts. In addition to the counts at the fishway, it was estimated that about 1500 salmon were captured at the mouth of the river in 1988 and 1989.

Prospects: This river was one of the few rivers where returns of small salmon in 1995 were close to the average returns which suggests that returns of large salmon in 1996 should be about average.

STOCK: Madeleine (Q3)
TARGET: 4.72 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	15	29	122	105	148	133	133	132	223	267	204	109	15	267	137
Large	89	95	89	117	226	186	251	190	182	249	316	170	89	316	182
Total	104	124	211	222	374	318	384	322	415	516	520	279	104	520	319
Smolt counts															
Returns															
Small	128	286	734	606	731	686	651	659	737	694	824	442	128	737	594
Large	711	614	836	1286	1137	1127	1134	957	890	979	1111	740	614	1286	980
Total	839	900	1570	1892	1868	1813	1785	1616	1627	1673	1735	1182	839	1892	1574
Spawners															
Total	700	757	1359	1670	1494	1495	1401	1294	1212	1157	1215	903	709	1670	1251
% of egg target met ²	66%	56%	85%	131%	103%	106%	100%	87%	79%	82%	89%	64%	59%	131%	89%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodology: Target egg deposition is for accessible habitat. Egg depositions are for small and large salmon combined. Spawners are estimated from counts at a fishway minus removals in the recreational fishery.

Data and assessment: Counts of small and large salmon are obtained at a fishway; a small number of salmon captured upstream of the fishway is included in the fishway counts.

Prospects: Based on the low return of small salmon in 1995, large salmon returns in 1996 are expected to be low.

4.2 North Shore of the St. Lawrence (Fishing Areas Q5-Q9)

Description of fisheries

There are 60 salmon rivers in areas Q5 to Q9. Recreational fishing is prohibited on 6 of these rivers. Small salmon only can be retained on two rivers and river specific quotas were set on two other rivers. For the Moisie River (Q8), the daily limit which was 3 salmon in previous years was reduced to one salmon per day in 1995.

First Peoples' food fisheries occur at sites near the **Escoumins, Betsiamites, Moisie, Mingan, Natashquan** and **Saint-Augustin** rivers. No food fishery took place in **Olomane** River. Total food fisheries harvests in 1995 were 1511 fish.

The commercial fishery was closed in Area Q7 in 1993 and in Area Q8 in 1994. In Area Q9, 90 commercial fishers shared a quota of 15175 salmon. The commercial catch of large salmon in 1995 was 9738 fish, a 2% reduction from 1994 and 29% less than the average (Table 4.2.1). The small salmon harvest was 3915 fish, 1% more than 1994 and 8% more than the previous five-year average.

In spite of the reduction in the commercial fishery in recent years, recreational catches continue to decline significantly. Large salmon harvest in 1995 (2684 fish) was 17% below 1994 harvest and 39% below the previous five-year average. Small salmon harvests in 1995 of 2036 fish were 33% less than in 1994 and 39% below the previous five-year average.

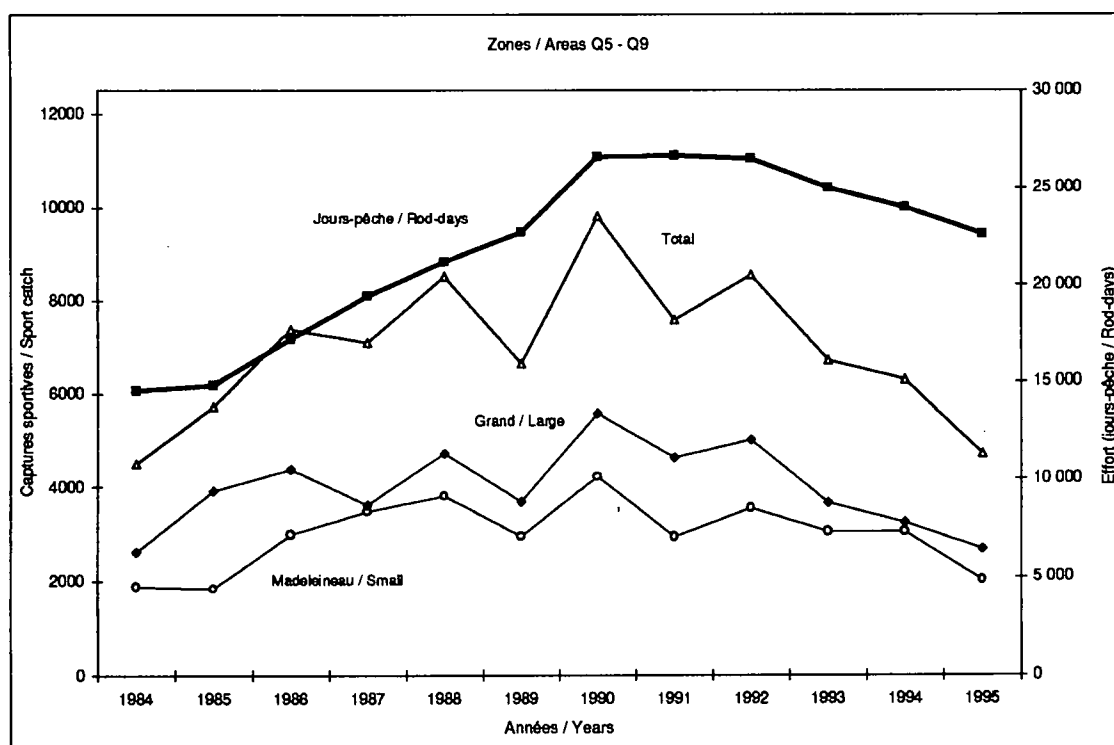


Table 4.2.1. Sport catch, commercial catch and First Peoples' food fisheries catches in Areas Q5 to Q9, 1984 to 1995. Effort in the sport fishery is in units of rod days. Catches are expressed as numbers of fish. Target egg deposition for rivers in these zones was 221.06 million eggs up to 1991 and is 223.93 million eggs since 1992.

Year	Sport catch			Effort	CPUE	Commercial catch			Sport + Commercial	First Peoples' fisheries
	Small	Large	Total			Small	Large	Total		
1984	1876	2628	4504	14572	0.31	794	11220	12014	16518	827
1985	1825	3906	5731	14830	0.39	2093	14834	16927	22658	1281
1986	2994	4376	7370	17213	0.43	3707	18095	21802	29172	487
1987	3473	3612	7085	19401	0.37	2992	20533	23525	30610	1399
1988	3795	4716	8511	21206	0.40	4760	18103	22863	31374	1805
1989	2955	3673	6628	22693	0.29	2615	17910	20525	27153	1336
1990	4219	5579	9798	26592	0.37	3425	15867	19292	29090	1430
1991	2946	4625	7571	26674	0.28	3282	15983	19263	26836	1316
1992	3537	5006	8543	26519	0.32	3849	15514	19363	27906	1642
1993	3043	3648	6691	24993	0.27	3627	11030	14657	21348	1728
1994	3043	3241	6284	23980	0.26	3861	9939	13800	20084	1444
1995	2036	2684	4720	22485	0.21	3915	9738	13653	18373	1511
1990-1994	3358	4420	7777	25752	0.30	3609	13667	17275	25053	1512
1995 compared to										
1994	-33%	-17%	-25%	-6%	-20%	1%	-2%	-1%	-9%	5%
1990-1994	-39%	-39%	-39%	-13%	-30%	8%	-29%	-21%	-27%	0%

Status of stocks

Egg deposition assessments are conducted on 12 rivers in the western portion of this area (Q5 to Q8) which include four rivers under restoration efforts. In these 12 rivers, the egg depositions in 1995 varied between 33% and 208% relative to the egg deposition targets. These egg depositions represent an improvement relative to 1994 and the previous five-year average. Wild smolt sea survival from de la Trinité River and hatchery smolt survivals from River aux Rochers in 1994/95 were the lowest observed in the time series.

Prospects

As a result of the significant changes in the commercial fisheries management in these areas, it is not possible to define the small salmon to large salmon relationship described in Section 4.1. This relationship was examined for de la Trinité River for which returns to the river include the commercial harvest of the nine fishers who actively fished stations at the mouth of the river. The relationship is significant which suggests that based on the low returns of small salmon to de la Trinité River in 1995, returns of large salmon in 1996 are anticipated to be low.

Summary sheets

More detailed information on individual river assessments for Sainte-Marguerite (north-east) and de la Trinité rivers are presented in the summary sheets.

STOCK: Sainte-Marguerite (north-east) (Q6)

TARGET: 1.74 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	24	7	41	64	64	111	102	90	129	70	162	29	7	162	79
Large	25	48	41	34	54	76	232	111	191	48	78	77	25	232	85
Total	49	55	82	98	118	187	334	201	320	118	240	106	49	334	164
Smolt counts															
Returns															
Small	122	370	311	286	258	641	530	286	358	148	471	254	122	641	345
Large	177	26	126	265	262	550	997	612	355	209	229	545	26	997	348
Total	299	405	437	551	520	1191	1536	898	713	357	700	799	299	1536	692
Spawners															
Total	250	350	355	453	402	980	1176	579	390	239	460	693	239	1176	512
% of egg target met ²	17%	45%	29%	47%	43%	89%	159%	100%	74%	47%	49%	145%	17%	159%	64%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodologies: Target egg deposition if for accessible habitat.

Data and assessment: Adult counts are available from a fishway located on the lower river.

STOCK: de la Trinité (Q7)
TARGET: 3.03 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	417	164	514	523	583	493	674	345	217	171	183	100	164	674	399
Large	137	257	226	131	105	133	168	128	156	57	35	108	35	257	138
Total	554	421	740	654	688	626	832	473	373	228	218	208	218	832	528
Smolt counts	68218	67134	96469	77552	51827	80056	50328	40862	50835	86226	55913	71882	40862	96469	65947
Returns															
Small	1805	1107	1603	1352	1995	1892	2047	1349	827	409	579	348	348	2047	1315
Large	1018	1236	1227	1144	1336	1079	1055	1707	1255	272	309	671	272	1707	1058
Total	2823	2343	2830	2496	3031	2971	3102	3056	1882	681	888	1019	681	3102	2373
Spawners															
Total	1731	1274	1473	1202	1761	1662	1601	1375	811	451	670	807	451	1761	1274
% of egg target met ²	73%	69%	78%	81%	135%	71%	81%	75%	84%	41%	61%	106%	41%	135%	77%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodologies: Target egg deposition if for accessible habitat. Target eggs to come from small and large salmon.

Data and assessment: Adult counts are available from a fishway located on the lower river. Smolts are estimated by mark and recapture experiments.

Commercial fishery: The commercial fishery was closed in 1992.

Prospects: Low smolt output in 1994, low sea survival to small salmon in 1995 and low returns of small salmon in 1995 suggest that returns of large salmon in 1996 will be low.

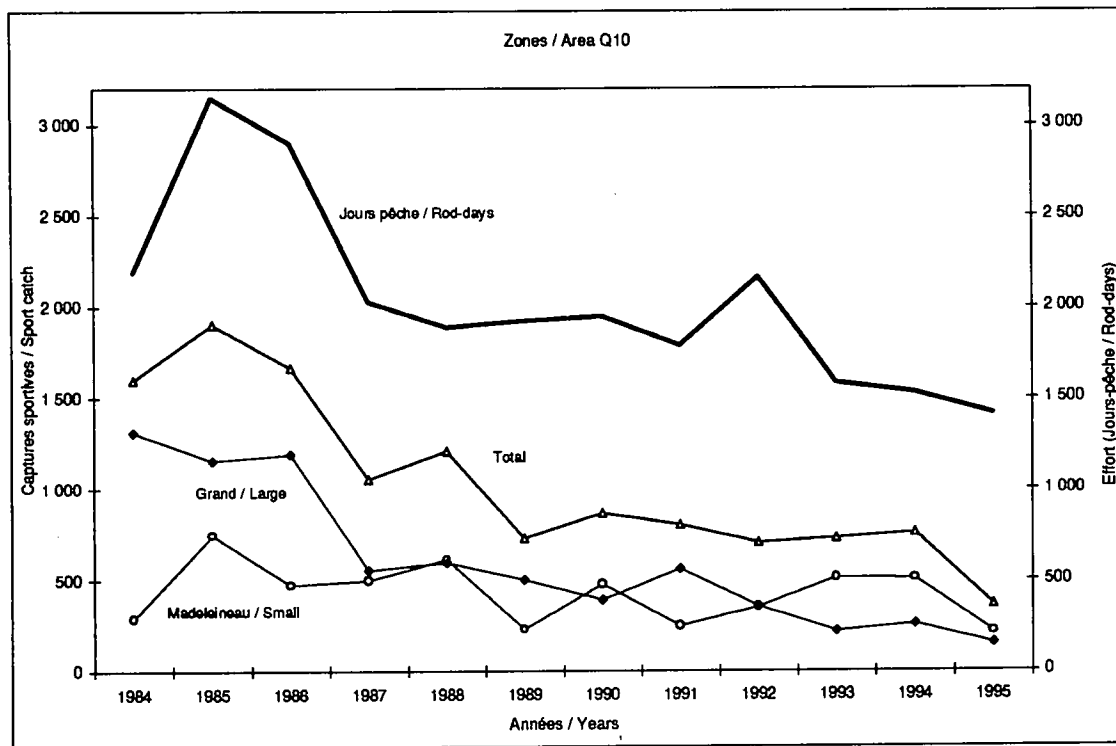
4.3 Anticosti (Fishing Area Q10)

There are 24 salmon rivers in Anticosti Island, most are small. Exploitation on all these rivers occurs through outfitters through leases from the government. During dry years such as in 1995, salmon do not enter the small rivers until September and are subsequently unavailable for angling.

Description of fisheries

There are no commercial fisheries nor First Nations food fisheries in this area.

The recreational harvest in 1995 decreased by 52% and 53% relative to the 1994 and previous five-year mean, respectively. Harvests in 1995 were the lowest since 1984 (Table 4.3.1) Effort decreased by 8% and 22% relative to 1994 and the previous five-year mean. Fishing success, as measured by the catch per unit of effort, fell to 0.26 salmon per rod day, the lowest level since 1984. Overall, angling conditions were very poor on all the small rivers because of extremely low water conditions.



Status of stocks

Returns to nine rivers on Anticosti Island have been estimated since 1990. In 1995, returns were 4% higher than in 1994 and 10% higher than the previous five-year mean return. Consequently, the egg depositions in 1995

in these nine rivers were 56% above the 1994 value and 54% above the previous five-year mean egg deposition (Table 4.3.1).

Prospects

As in the other fishing areas in Québec, returns of small salmon in 1995 were low compared to previous years. Although no quantitative relationship between small salmon returns and large salmon returns in the subsequent year has been established, the low returns of small salmon in 1995 in addition to the low sea survival of small salmon monitored on Bec-Scie River and a low smolt run from Bec-Scie River in the last two years suggest that returns of large salmon in 1996 will be low.

Table 4.3.1. Sport catch, removals, returns, spawning escapement and percent of target met in the rivers of Anticosti, Area Q10, 1984 to 1995.

Year	Sport Catch			Effort	CPUE	Removals		Total Returns ¹	Spawning ¹		% of target
	Small	Large	Total			Other	Total		Fish	Eggs (millions)	
1984	288	1308	1596	2191	0.73	0	1596	6004	4408		
1985	745	1156	1901	3147	0.60	0	1901	7101	5200		
1986	473	1191	1664	2898	0.57	0	1664	6763	5099		
1987	499	555	1054	2025	0.52	0	1054	3521	2467		
1988	612	594	1206	1887	0.64	0	1206	4090	2884		
1989	227	502	729	1921	0.38	0	729	3913	3184		
1990	474	389	863	1948	0.44	0	863	2798	2082	3.78	41%
1991	243	559	802	1783	0.45	23	825	2737	2032	4.98	54%
1992	351	353	704	2164	0.33	0	704	2345	1779	4.57	49%
1993	513	216	729	1583	0.46	17	746	2439	1853	3.13	34%
1994	507	254	761	1529	0.50	6	767	2756	2114	4.05	44%
1995	213	152	365	1414	0.26	10	375	2865	2516	6.30	68%
1990-1994	418	354	772	1801	0.43	9	781	2615	1972	4.10	44%
1995 compared to											
1994	-58%	-40%	-52%	-8%	-48%	67%	-51%	4%	19%	56%	56%
1990-1994	-49%	-57%	-53%	-22%	-40%	9%	-52%	10%	28%	54%	54%

¹ Variable number of rivers included in the total for Q10. For comparative purposes, 1989 to 1995 totals include the following rivers: à l'Huile, Macdonald, Patate, Box, Dauphiné, Chaloupe, Ferrée, Galiote, Jupiter, la Loutre and Bec-Scie. The spawning target for these rivers is 10.16 million eggs.

Summary sheets

More detailed information on the individual river assessment for Bec-Scie River is presented in the summary sheet.

**Report on the status of Atlantic salmon
stocks in eastern Canada in 1995**

STOCK : Bec-Scie (Q10)
TARGET : 0.23 million eggs

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	MIN. ¹	MAX. ¹	MEAN ¹
Recreational harvest															
Small	8	29	21	11	23	1	35	14	17	30	18	6	1	35	19
Large	60	34	50	8	23	3	9	22	15	5	6	4	3	60	21
Total	68	63	71	19	46	4	44	36	32	35	24	10	4	71	40
Smolt counts	-	-	-	-	4709	8687	5651	7298	8117	5628	5118	6860	4709	8687	6458
Returns															
Small	-	-	-	125	102	74	144	94	84	102	50	57	50	144	97
Large	-	-	-	80	70	122	54	130	83	38	34	50	34	130	76
Total	172	263	137	205	172	196	198	224	167	140	84	107	84	263	178
Spawners															
Total	104	200	66	158	121	196	154	185	134	105	60	96	60	200	135
% of egg target met ²	99%	178%	70%	105%	83%	187%	92%	165%	111%	65%	47%	78%	47%	187%	109%
¹ MIN, MAX, MEAN for 1984 to 1994															
² Represents egg depositions by small and large salmon combined															

Methodologies: Target egg deposition is for accessible habitat area. Eggs are deposited by small and large salmon. Smolt estimates are obtained from a counting fence; values prior to 1992 have been corrected. Adult returns are similarly estimated at the counting fence.

Recreational fishery: The recreational fishery is restricted to 4 anglers per day.

4.4 Ungava Bay (Fishing Area Q11)

There are four salmon rivers in Ungava Bay, Fishing Area Q11. Recreational fishing is permitted on three of these rivers. Most of the harvests occur in the commercial and food fisheries which are restricted to the local Inuit people.

The 1995 harvest numbers are preliminary. Harvests in 1995 were 2314 salmon, down 30% relative to 1994 and 13% relative to the previous five-year mean. In the recreational fishery, 494 salmon were harvested, an increase of 20% relative to 1994 but a reduction of 31% relative to the 1990 to 1994 average.

Status of stocks

Other than harvests, there are no other indicators of stock status. Changes in the food fishery practices and reductions in the landed value of salmon have impacted on the net fisheries for salmon in this area. A joint scientific committee consisting of representatives from the Inuit communities and MEF (province of Québec) has been formed to address issues related to status of Atlantic salmon stocks in this area.

5.0 Newfoundland Regional Summaries

More information on the assessment of Atlantic salmon stocks in the Newfoundland Region can be obtained from the following:

Mr. Rex Porter
Science Branch
Dept. of Fisheries and Oceans
P.O. Box 5667
St. John's, NF
A1C 5X1
CANADA

5.1 Labrador (SFAs 1, 2, and 14B)

General description

River assessments in this area are provided for Sandhill River and Forteau River. By Labrador standards, these rivers are relatively small. In general, rivers in Labrador possess a significant large salmon component (mainly maiden multi-sea-winter salmon). In 1995, 17% of the run to Sandhill River was comprised of large salmon compared to 24% for Forteau River (based on total returns to the river). In addition to further reductions in quotas in 1995, the start of the commercial fishery was delayed from June 5 to July 3. The objective of the delayed opening of the commercial fishery was to allow greater escapements of multi-sea-winter salmon into Labrador rivers.

Description of fisheries

The percentage of the commercial fishery quota caught and quotas (in parentheses) in each SFA and for SFAs combined in Labrador since 1990 were as follows:

YEAR	SFA 1	SFA 2	SFA 14B	SFAS 1, 2, & 14B
1990	65% (80)	64% (200)	38% (60)	59% (260)
1991	13% (80)	38% (200)	227% (15)	41% (295)
1992	83% (80)	67% (200)	131% (13)	75% (273)
1993	31% (80)	76% (90)	238% (8)	63% (178)
1994	96% (24)	107% (60)	75% (8)	101% (92)
1995	79% (19)	79% (48)	31% (6.5)	76% (73.5)

The overall commercial fishery quota for Labrador (73.5 t) was not caught in 1995 (Table 5.1.1). The 1995 quota was reduced considerably from 1992 and 1993 levels as was the 1994 quota. The catch for SFA 1 was 4 t below the quota of 19 t, SFA 2 was 10 t below the quota of 48 t, and SFA 14B fell short of its 6.5 t quota by 4.5 t. Commercial catches of small and large salmon in 1995 continued at the low levels characteristic of recent years (Figs 5.1.1 and 5.1.2). Recreational catches of small and large salmon (retained plus released fish) in 1995 were above the means and effort expenditure although declining slightly from 1994 was still one of the highest on record, as was CPUE (for small and large salmon combined) (Fig. 5.1.3). The number of small salmon retained in 1995 was well below the means and comparable to levels for the quota years 1992 and 1993; the number of large salmon retained was similar to the means and 1993 but below 1992 (Fig. 5.1.3). The recreational quota for retained fish was not caught in all SFAs of Labrador in 1993 although it was caught in 1992. In SFA 14B, the number of large salmon retained doubled in 1995 over 1994.

Public consultation

Advisory meetings were held with representatives of the Government of Newfoundland and Labrador and organized angler groups. A meeting with the general public was held in Forteau. The purpose of the meeting was to give the public at large the opportunity to input into the stock assessment process. Items discussed included evidence of unrecorded mortalities (due to poaching, hook-and-release fishing, etc.), effects of water levels and water temperatures on angling success, perceptions of abundance of salmon in 1995 and information on long term population size in the local area, and how the 1995 management plan affected angling success. Information

provided in the consultation meetings were incorporated into stock assessments and subjected to peer review in February, 1996.

Environmental considerations

Average conditions applied to the marine environment in 1995. Ice coverage during the winter was above normal but in early spring it returned to near normal, with average conditions achieved by mid-May. For freshwater, in southern Labrador, streamflow was slightly below normal for June. In July, stream flows were above normal. In August, streamflows were considerably below normal with a new August monthly minimum record flow set in the Eagle River.

Status of stocks

Indices of abundance were from complete counts of small and large salmon for Sandhill River and Forteau River, commercial and recreational fishery data (retained plus released fish). Since the overall commercial fishery quota was not caught in years prior to 1994, data for these years (1990-93) were used as indices of abundance, although the decreases in licensed effort, especially since 1992, should have resulted in somewhat lower catches. In 1995, the quotas were not attained in any of SFAs 1, 2 and 14B. Recreational catches in Labrador have historically constituted only a small proportion of total removals and therefore a cautious approach must be taken in interpretation of trends as representative of abundance.

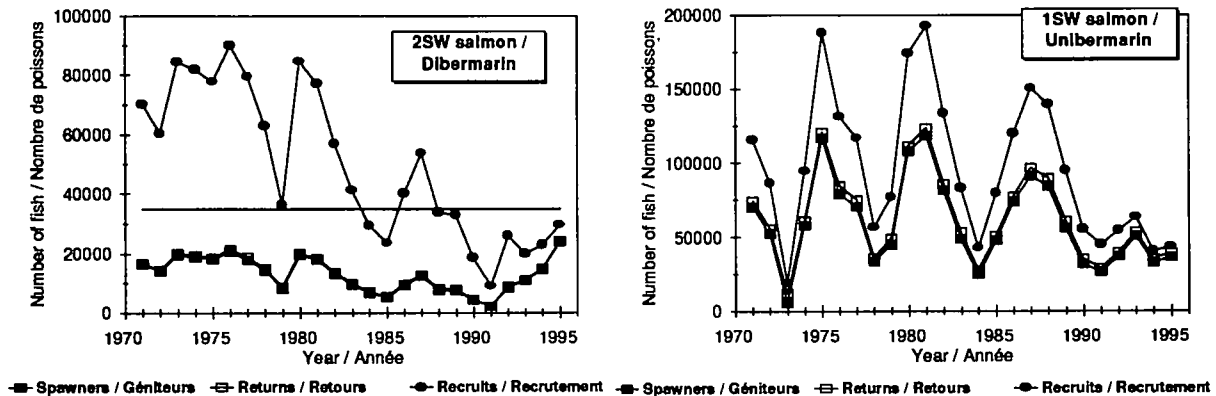
The total returns (count at the fence plus angling catch below the fence) of small salmon to Sandhill River in 1995 were slightly higher than for 1994 and somewhat higher than 1972, which was the lowest for the period 1970-73 (the only previous data available). The count of large salmon in 1995 was lower than in 1994; although higher than any recorded in 1970-73. Total returns of small salmon to Forteau River in 1995 were similar to those in 1994 while returns of large salmon doubled those of 1994 (counts were only available for 1994 and 1995). Egg depositions were below target in both Sandhill River (44%) and Forteau River (63%) in 1995.

The estimates of total production of small and large salmon returning to Sandhill River in 1995 were substantially less than in the early 1970s. The production estimates include the component which would have been caught in commercial fisheries in Newfoundland, Labrador, and Greenland. Also, it is clear that even with no commercial fishing in 1994 and 1995 Sandhill River would still not have achieved target spawning requirement. This indicates that the population of large salmon is continuing to decline, although the population of small salmon increased in 1995 over 1994.

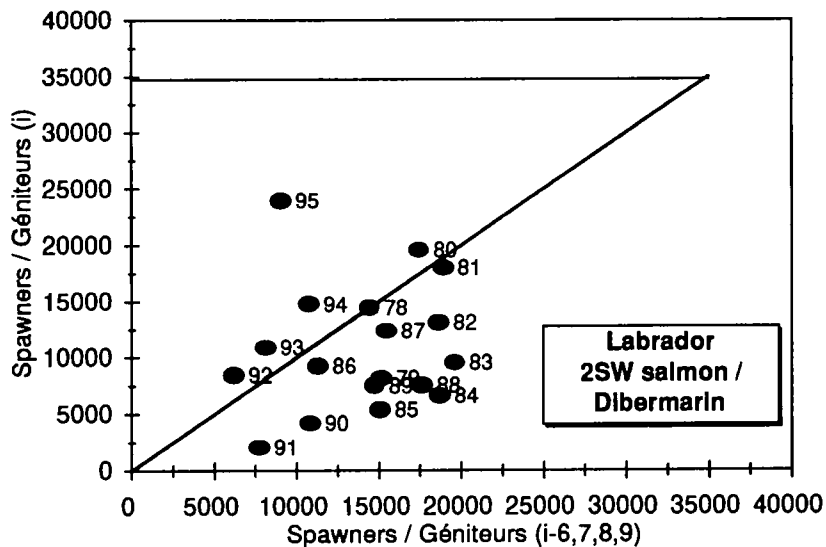
Year	Estimate of total production from Sandhill River		Production relative to target
	Small	Large	
1970	6173	3469	103%
1971	6167	6687	235%
1972	3495	4399	151%
1973	8164	12670	439%
1994	2482	1525	72%
1995	3159	924	64%
Mean 1970-73	6000	6806	232%

For 2SW salmon collectively, it would appear that estimated overall total stock size in 1995 increased over 1994 but remained substantially below the stock size in the 1970s. Increased large salmon returns to Forteau and Sandhill rivers most likely resulted from the change in the opening date for commercial fishing, from June 5 in previous years to July 3 in 1995. For 1SW salmon, estimated stock size in 1995 was slightly higher than in 1994

but remained the fourth lowest estimated since 1971. Trends for estimated total numbers of 1SW and 2SW salmon spawners for all of Labrador were similar to that of estimated total stock size. Total 2SW recruits (prior to the Labrador coastal commercial fishery) in 1995 were less than the target 2SW spawning requirements for Labrador. Estimated spawning escapement of 2SW salmon was the highest estimated since 1971. Recreational fisheries remove a very small number of salmon in-river (returns - spawners = recreational harvest).



Estimated numbers of 2SW salmon spawning in Labrador during 1992 to 1995 were above the replacement line, but remained below target spawning requirement. The closest year to target for Labrador was 1995 when about 70% of the target was achieved. Prior to 1992, spawners were consistently below the replacement line indicating that the spawning stock was being fished down.



Prospects

In 1992-95, it is possible that fish once taken in the commercial fishery in SFA 3 and to a lesser extent in SFAs 4-7, contributed to catches in Labrador. In the past, Labrador-origin Atlantic salmon have been intercepted in these areas. The exploitation of Labrador stocks in Newfoundland has been eliminated and there have been considerable reductions in the commercial fishery in Labrador. As a result of these measures, river escapements of 2SW salmon for Labrador as a whole improved in 1995, as indicated by commercial and recreational fishery data, but estimates of total spawning escapement have been higher in the past when intensive commercial fisheries were active. The increased escapement of 2SW salmon in 1995 is consistent with the intent of the delayed opening of the commercial fishing season. The analysis of estimated total population sizes of small and large salmon for Sandhill River and Labrador as a whole suggests there has been a decline in recent years, although an improvement was noted for large salmon in 1995. Low population sizes of small and large salmon in 1995 corresponded to years of above average commercial and recreational fishery catches in 1988 and 1989. Recreational catches and catch rates in 1990 and 1991 might be indicative of below average spawning escapements, which could contribute to lower future returns relative to 1995, should natural survival rates remain the same. It should be cautioned that runs were late in 1991 due to ice conditions.

Management considerations

Although there appears to have been some improvement in returns in the past few years, the present low population sizes of small and large salmon compared to the late 1970s and early 1980s, years when there was a substantial commercial fishery, is a matter of serious concern. The marked decline in recreational catches of small and large salmon in SFA 14B in 1995 and the fact that the commercial quota for this area was not caught, is of particular concern. **Consequently, exploitation on Labrador stocks and in particular the large salmon component, which contributes substantially to egg deposition, should be as low as possible until stocks improve.**

In 1995, the estuary of Forteau River was scheduled for fly fishing only. This change was implemented to reduce high mortality of kelts which occurred in the previous bait and spinner fishery. The majority of large salmon returns to Forteau River are consecutive spawning grilse, hence the mortality of kelts should be kept to a minimum in order to maximize the contribution of this component to egg deposition.

Summary sheets

More detailed information on individual river assessments for Sandhill River and Forteau River are provided in the summary sheets.

Table 5.1.1. Commercial catches of small and large salmon from Labrador, SFAs 1, 2 and 14B for 1974 to 1995.

Year	Small weight	Small number	Large weight	Large number	Total weight	Total number	Quota weight
1974	113	56321	602	122765	715	179086	
1975	213	111791	492	114521	705	226312	
1976	165	78209	591	131540	756	209749	
1977	140	69602	572	116980	712	186582	
1978	64	33656	430	91473	494	125129	
1979	96	45714	230	52238	326	97952	
1980	228	103479	625	124955	853	228434	
1981	238	114680	576	112334	814	227014	
1982	159	79449	389	83243	548	162692	
1983	98	49441	272	60212	370	109653	
1984	53	25590	200	43202	253	68792	
1985	86	47359	152	33995	238	81354	
1986	141	71396	297	58565	438	129961	
1987	178	89454	385	79170	563	168624	
1988	159	83109	235	49598	394	132707	
1989	114	56486	216	47743	330	104229	
1990	67	33027	136	27487	203	60514	340
1991	54	26768	66	13465	120	40233	295
1992	46	24249	157	32341	203	56590	273
1993	32	17074	80	17096	112	34170	178
1994	18	8640	75	15377	93	24017	92
1995	15	7188	40	10213	55	17401	73.5
Period 1984 to 1989							
Mean	121.8	62232	247.5	52046	369.3	114278	
Std. Dev.	46.9	23907	82.3	15536	122.8	36859	
95% LCL	72.6	37139	161.1	35739	240.4	75590	
95% UCL	171	87325	333.9	68352	498.3	152966	
Period 1986 to 1991							
Mean	118.8	60040	222.5	46005	341.3	106045	
Std. Dev.	50	25983	113.3	23132	161.2	48180	
95% LCL	66.3	32768	103.6	21726	172.2	55475	
95% UCL	171.4	87312	341.4	70284	510.5	156615	
% Change, 1995 versus							
1994	-17%	-17%	-47%	-34%	-40%	-28%	
1984-1989	-88%	-88%	-84%	-80%	-85%	-85%	
1986-1991	-87	-88	-82	-78	-84	-84	

Labrador Commercial Fishery Small Salmon (SFAs 1, 2, and 14B)

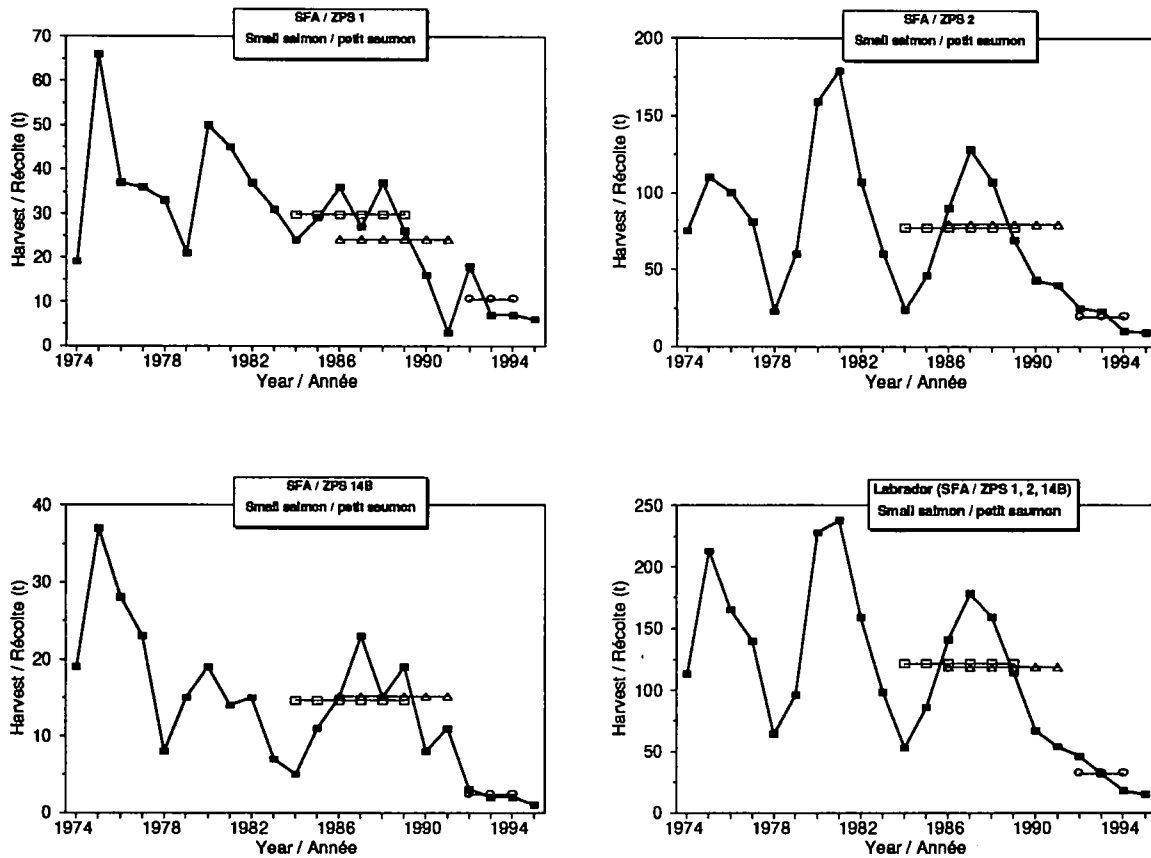


Figure 5.1.1. Labrador commercial harvest of small salmon (tonnes) for SFAs 1, 2, and 14B separately and combined. Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean.

Labrador Commercial Fishery Large Salmon (SFAs 1, 2, and 14B)

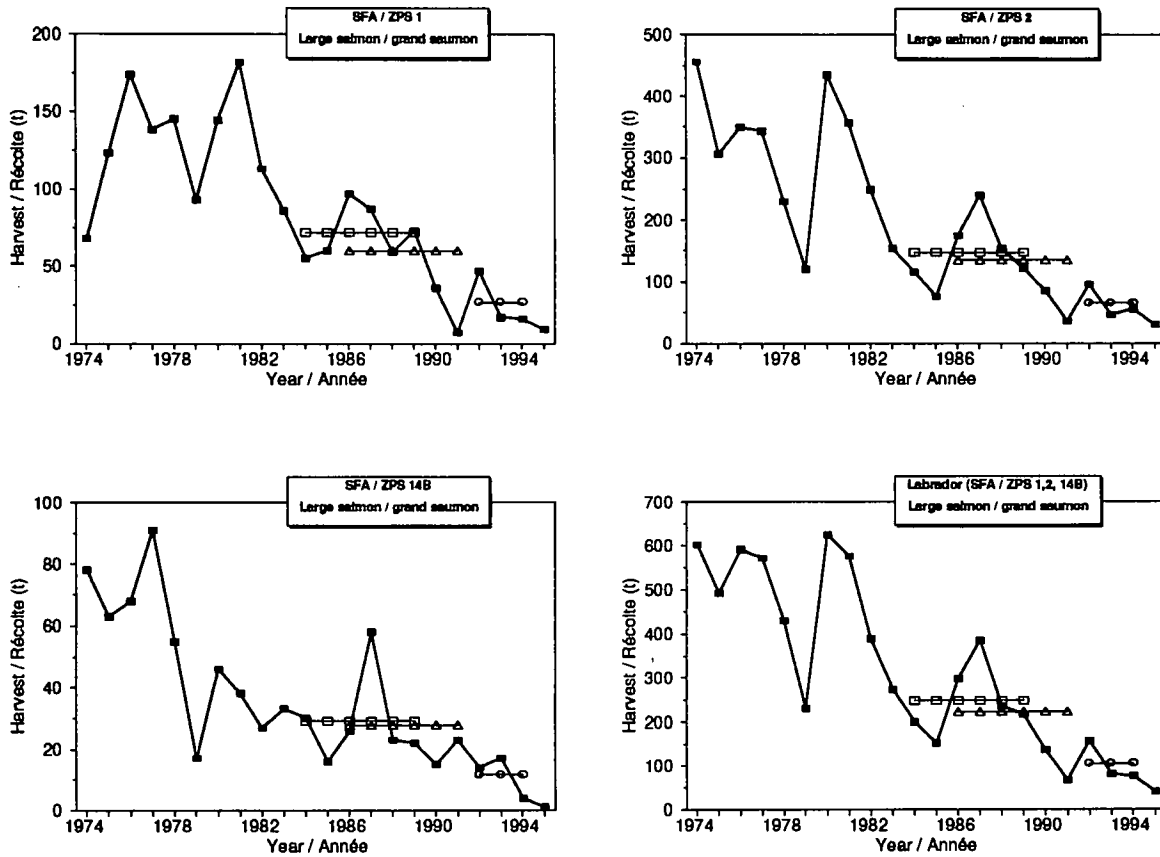


Figure 5.1.2. Labrador commercial harvest of large salmon (tonnes) for SFAs 1, 2, and 14B separately and combined. Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean.

Labrador Recreational Fishery (SFAs 1,2, and 14B)

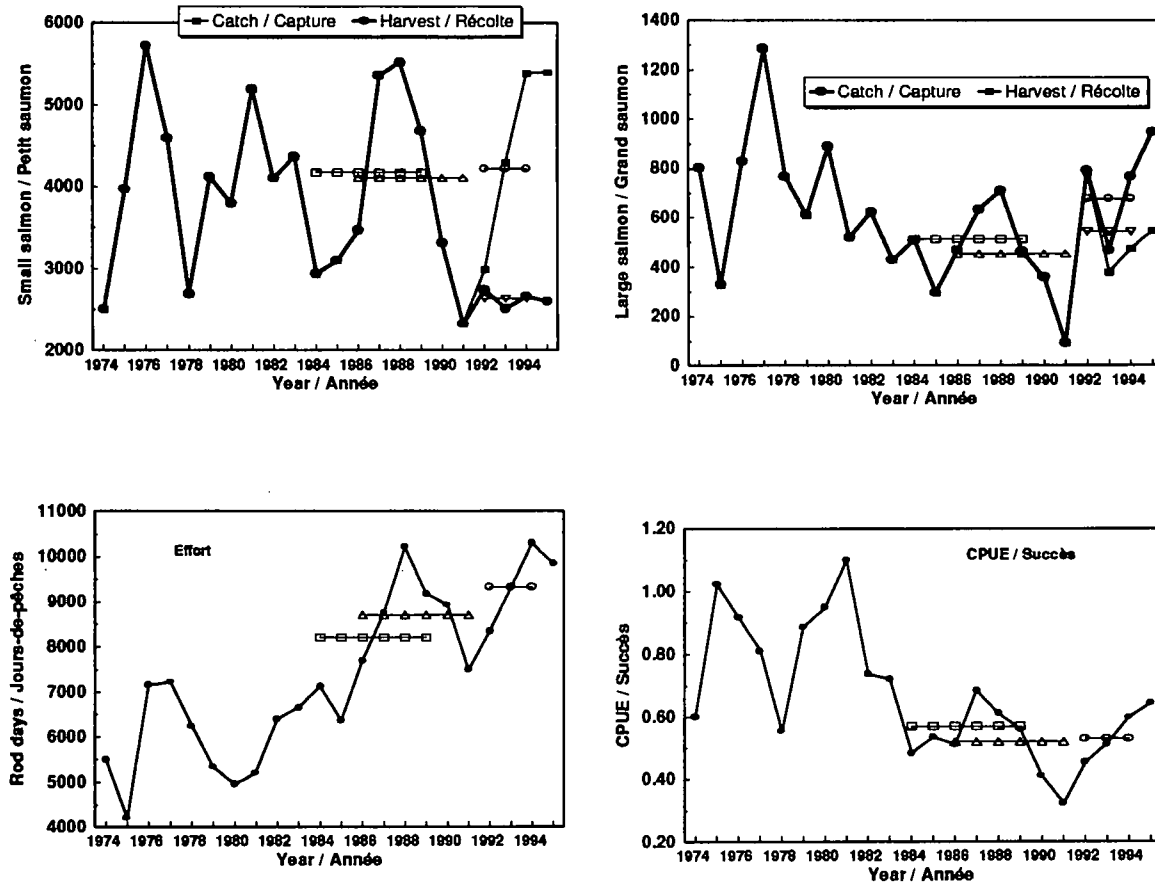


Figure 5.1.3. Recreational catch and harvest of small and large salmon (harvest, 1974-95; catch, 1992-95), effort (rod days), and catch per unit of effort (catch of small plus large divided by effort) during 1974 to 1995 in Labrador (SFAs 1, 2, and 14B). Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean for catch (retained + released) and inverted triangle is the 1992-94 mean for harvest.

STOCK: Sandhill River, SFA 2

TARGET: 23.544 million eggs.

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational catch									
Small	372	197	448	258	279	289	100	702	372
Large	38	18	25	12	29	28	2	94	25
Adult counts ²									
Small					2159	2781	2038	4761	
Large					730	559	138	730	
% Target eggs met (small +large)					39%	44%			
¹ Recreational catch is for the period 1974 to 1991. Catches for 1992-1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Catches prior to 1992 and for 1994 are for retained fish for the entire angling season. ² Counts are for the period 1970-1973 and 1994-1995. Values in this table have been updated from 1994									

Recreational catches: Catches have ranged from 122 to 785 during the period 1974-95. The number of small salmon retained in 1995 was 289 and 340 were released. The number of large salmon retained was 28 and 14 were released.

Data and assessment: Complete counts of smolt and adult salmon (1970 - 3600 small, 138 large; 1971 - 3484 small, 266 large; 1972 - 1901 small, 168 large; 1973 - 4584 small, 491 large) migrations were obtained from portable fish counting fences in 1970-73 and a complete count of adults was done in 1994-95.

State of the stock: Egg deposition in 1995 was 10.3 million eggs which was below target requirements.

Accessible habitat: A new calculation of available habitat was done to include data collected during an aerial survey of the system.

Target: Fluvial = 9.428 million m²; Lacustrine = 8730 ha

STOCK: Forteau River (SFA 14B)

TARGET : 1.4 million eggs (~ 361small and 140 large salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
Returns to counting fence									
Small	.	.	.	.	228	315	.	.	.
Large	.	.	.	.	74	136	.	.	.
Angling catch below fence									
Small	.	.	.	.	230	146	.	.	.
Large	.	.	.	.	3	11	.	.	.
Total returns to river²									
Small	532	336	397	760	458	461	269	1342	706
Large	43	18	55	288	77	147	18	196	107
Spawning escapement									
Small	208	131	178	375	149	212	131	524	275
Large	36	15	46	245	73	127	15	164	89
% of Target eggs met (small + large)³									
	34%	20%	40%	143%	46%	74%	20%	96%	59%

¹ MIN., MAX., MEAN are for 1974-1991
² Total returns to river for 1974-1993 estimated from 1995 ER of 0.6095 for small and 0.1633 for large retained and released salmon.
³ Values in this table are updated from previous reports based on revised habitat parameter values. Available rearing area was measured from a stream survey in 1995 and from a 1:50,000 scale topographical map on GIS.

Methodology: Fluvial habitat includes 515,500 m² and lacustrine habitat includes 896 ha of standing water. Target egg deposition is based on 2.4 eggs per m² fluvial area and 105 eggs per ha of lacustrine area. Target eggs are to come from large and small salmon.

Recreational fishery: The recreational effort and retained catch of small salmon in 1995 were below the recreational effort and retained catch of small salmon in 1994. The 1995 retained catch of large salmon was above 1994. In the recreational fishery only one large salmon per licence was allowed to be retained as opposed to two in 1994. The angling pool directly below the counting fence was closed to angling (retained and release) for the entire fishing season.

Commercial fishery: The opening date of the SFA 14(B) commercial fishery in 1995 was July 3 as opposed to the June 6 opening in 1994. Only 1.6t of the 6.5t quota was caught in 1995, but the commercial licenced effort remained the same as in 1994.

Data and assessment: An adult salmon counting fence was operated in 1994 and 1995. The total returns of small salmon to the Forteau River in 1995 were similar to the total returns of small salmon in 1994 but the returns of large salmon in 1995 were 91% above the total return in 1994.

State of the stock: The target egg deposition for the Forteau River is 1,417,680 eggs. Potential egg depositions were 46% of this target in 1994 and 74% in 1995. The percent of target achieved in 1994 was 22% below the 1974-1991 mean but the percent achieved 1995 was 20% above the 1974-1991.

Forecast: Based on similar spawning escapements in 1989 and 1990 and assuming that the smolt-age distribution and smolt-adult survival of small salmon remain similar to previous year, the returns of small salmon in 1996 are not expected to be higher than in 1995.

5.2 Northern Peninsula East and Eastern Newfoundland (SFAs 3-8)

General description

Rivers assessed in this area include Exploits River, Campbellton River, and Gander River in SFA 4 and Middle Brook, Terra Nova River, and Northwest River (Terra Nova National Park) in SFA 5. Exploits River is the largest river in insular Newfoundland and Gander River the third largest. Historically, rivers in this area have been characterized by runs comprised of in excess of 90% small salmon. There has been a general increase in the proportion of large salmon in rivers since the closure of the commercial fishery (1992). Most large salmon are repeat spawning one-sea-winter salmon (1SW). The Exploits River has undergone Atlantic salmon enhancement since the 1950s, with the last stocking with swim-up fry occurring in 1993. Enhancement involving adult transfers was carried out in Terra Nova River during 1985-89 and a fry stocking program was initiated in 1995.

Description of fisheries

Most scheduled rivers in SFA 4 were closed to angling for about one week in August and rivers in SFAs 6-8 were closed for one week in July, because of low water levels and high water temperatures. These closures particularly in SFA 4 are believed to have reduced the overall catch for the Area. There was a four week "hook-and-release" fishery in the lower Gander River from September 9 to October 8. The recreational catch (17,546) of small salmon (retained plus released fish) in 1995 for the entire area was 19% lower than the catch in 1994 but 27% and 56% above the 1984-89 and 1986-91 means respectively (Fig. 5.2.1). Angling effort in 1995 decreased by 13% from 1994 but was considerably higher than the means. The CPUE (0.28) decreased slightly from previous years. Catches and catch rates comparable to those observed since the closure of the commercial fishery occurred during some pre-moratorium years. The numbers of small salmon retained in 1994 and 1995 were higher than catches in 1992 and 1993, when quotas were in effect (Fig. 5.2.1). Shortened angling seasons and quotas for Main River (Sop's Arm) and Exploits River contributed to the decreases in total catch and effort for SFAs 3-8.

Net marks were found on 8.9% of the salmon sampled at the counting facility in Gander River during the period June 17- July 5, 1995 and on 5.0% of the salmon entering Campbellton River. The sample taken in Gander River may not be indicative of the entire run. At Campbellton River, net marks were observed on fish throughout the run using a video camera counter.

Public consultation

Advisory meetings were held with representatives of the Government of Newfoundland and Labrador and organized angler groups. A meeting with the general public was held in Grand Falls. The agenda was the same as described for Labrador (Section 3.1). Information provided in the consultation meetings were incorporated in the stock assessments which were subjected to peer review in February 1996.

Environmental considerations

Most rivers in SFAs 4, 6, 7, and 8 were closed to angling for about one week in either July or August because of low water levels and high water temperatures.

Status of stocks

Indices of abundance were from complete counts of small and large salmon for Exploits River, Campbellton River, Gander River, Middle Brook, Terra Nova River, and Northwest River, and recreational fishery data (retained plus released fish, Fig. 5.2.1). Collectively over all rivers, counts of small and large salmon, during the four years of closure of the commercial fisheries (1992-95), have increased significantly over counts

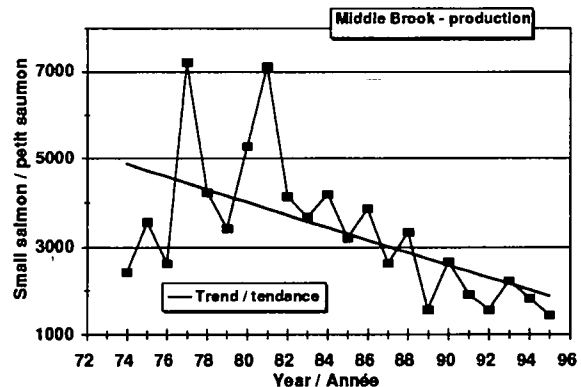
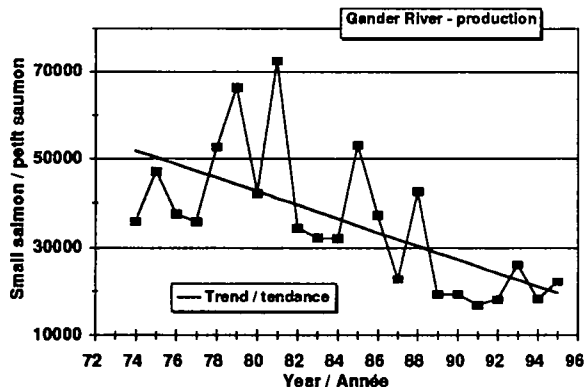
during pre-moratorium years 1986-91. However, at several counting facilities, counts of small and large salmon similar to or greater than those of 1992-95 occurred in certain pre-moratorium years.

Target egg deposition was achieved, in 1995, in Campbellton River and Middle Brook but not achieved in the Exploits, Gander, Terra Nova, and Northwest rivers.

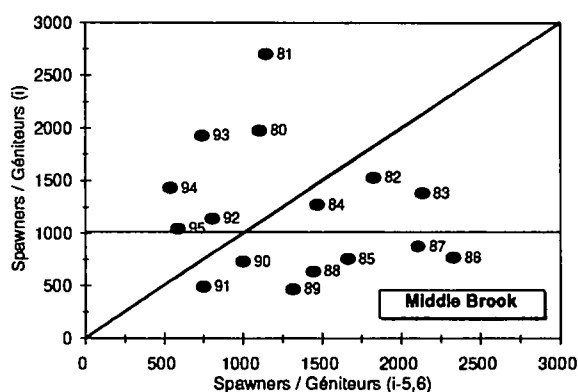
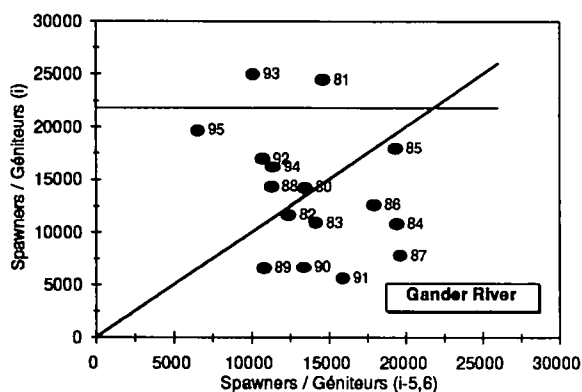
Percent target egg deposition achieved in rivers of SFAs 4 to 8 during the five-year period prior to the commercial salmon fishery moratorium (1987-1991) and the four years during the moratorium (1992-1994)

	1987	1988	1989	1990	1991	1992	1993	1994	1995
SFA 4 - Exploits River									
Lower		61%	48%	47%	35%	79%	109%	124%	99%
Middle		12%	14%	12%	16%	20%	23%	27%	24%
Upper		125%	119%	88%	0	2%	6%	7%	12%
SFA 4 - Gander River									
				36%	33%	112%	135%	89%	93%
SFA 4 - Campbellton River									
							320%	245%	295%
SFA 5 - Northwest River									
									40%
SFA 5 - Terra Nova River									
		30%	20%	20%	16%	31%	56%	29%	49%
SFA 5 - Middle Brook									
		66%	50%	75%	51%	145%	222%	175%	120%

The estimated total numbers of small salmon produced in Gander River and Middle Brook (before any exploitation) have declined since 1974 and levels during the moratorium years were among the lowest on record for both rivers.



The relationships between parents (small salmon) and future spawners for Gander River and Middle Brook are shown in the figures below. For both rivers, numbers of small salmon spawners were above the replacement line during the moratorium years; numbers of small salmon were below target requirement in 1992, 1994 and 1995 in Gander River but exceeded the target in all four moratorium years in Middle Brook.



Prospects

Angling catches and numbers of salmon counted at fish counting facilities indicate that the spawning escapements in 1991 were the lowest on record. These low spawning escapements suggest that the returns in 1996 could be lower than in 1992-95 especially if natural survival rates are similar to recent years. The first recruitment from the increased egg depositions in 1992 will not occur until 1997-98.

Based on a retrospective analysis of total population size and the number of small salmon produced per spawner, returns to the Gander River in 1996 are anticipated to be below target requirement, with no recreational fishery. However, an estimate of returns to the river based on juvenile population estimates as an indicator of abundance indicates that the returns will exceed target requirement. Returns of small salmon to Middle Brook in 1996 are anticipated to be above the target.

Management considerations

The management objective of splitting the seasonal bag limit (three retained fish prior to and after July 31) to constrain catches to the levels achieved by quotas in 1992 and 1993 did not appear to work to the extent expected. Effort and the number of small salmon retained increased markedly in 1994 and 1995 compared to 1992 and 1993, which was also reflected in increased exploitation rates (double in some rivers). The occurrence of net marks on salmon in the Gander and Campbellton rivers was likely the result of illegal fishing in coastal waters.

There were special management measures for Main River, Sopp's Arm (SFA3) and Exploits River (SFA 4) in 1995. Angling effort and catch had increased on both rivers after the closure of the commercial fishery in 1992. There was concern that the increased exploitation would negatively affect the spawning stock in Main River and jeopardize the enhancement program in the Upper Exploits River. The management strategy for Main River in 1995 was a shorter angling season for retention of salmon (July 8 - September 4) and quota of 500 salmon. This strategy was successful and should be continued in 1996.

The management objective in the Exploits River was to reduce the exploitation to allow a greater number of salmon to spawn above Red Indian Lake and to maintain angling catches at a level similar to pre-1992. The strategy was to delay the opening of the angling fishery for retention of salmon until July 8, at which time the fishery would be under a quota of 1000 salmon (700 prior to July 31 and 300 after July 31). This strategy was not successful. The quota of 700 salmon was caught in five days and under pressure from user groups an addition of 330 small salmon was made to the quota. It is recommended that for 1996 at least 1000 salmon be transferred above Red Indian Lake from Grand Falls and that the spawning escapement above Bishop's falls not be permitted to fall below 13,000 salmon.

The fall "hook-and-release" fishery in the Gander River was approved in 1995 when the in-season review forecast indicated that the egg deposition target would be exceeded. The in-season forecasts took into consideration egg deposition from small and large salmon based on biological characteristics of the 1994 run. The fall "hook-and-release" season was from September 9 to October 8. Using 1995 biological characteristics and total counts for the year, Gander River did not achieve its egg deposition requirement. It is recommended that in 1996 a fall "hook-and-release" fishery be approved only if an in-season forecast indicates spawning target in terms of small salmon (22,000) will be achieved and if a fall fishery is approved, it should be closed by September 30 to reduce stress on the spawners in the river.

Summary sheets

More detailed information on individual river assessments for Exploits River, Campbellton River, Gander River, Middle Brook, Terra Nova River, and Northwest River are provided in the summary sheets.

Northern Peninsula East and Eastern (SFAs 3-8)

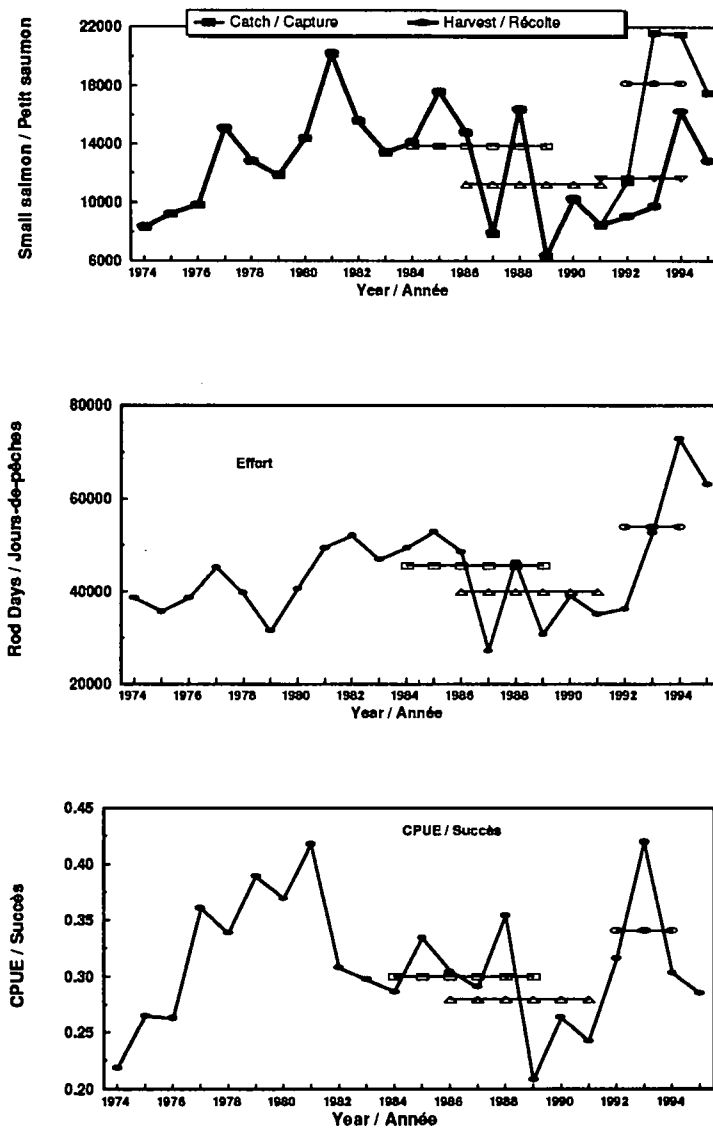


Figure 5.2.1. Small salmon recreational catch, harvest, effort and catch per unit of effort (CPUE) for Northern Peninsula East and Eastern Newfoundland (SFAs 3 to 8). Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean for catch (retained + released) and inverted triangle is the 1992-94 mean for harvest.

STOCK: Gander River (SFA 4)

TARGET: 46.211 million eggs (~21,828 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	MEAN ¹
Recreational harvest (small salmon)¹	1155	1180	1268	1271	2122	2598	1155	4575	2459
Counts²									
Small	7520	6445	18179 ³	25905	18080	22002	6445	7743	7236
Large	508	670	4162 ³	1734	1072	1121	473	670	550
% egg target met²	36%	33%	112%	135%	89%	93%	33%	36%	35%

¹ Recreational fishery data are for the period 1974 to 1991. Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and excludes hook-and-release fish. Data prior to 1992 and for 1994-1995 are retained fish for the entire angling season. Data for 1987 are omitted from the calculations of min., max., and mean due to closure of parts of the river resulting from drought conditions.

² Summaries for counts and target egg deposition are for 1989-1991. Target egg deposition represents the contribution of both small and large salmon.

³ Counts for 1992 were adjusted.

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

Recreational catches: Catches have ranged from 1,155 to 4,575 small salmon during the period 1974-91. Catches declined during 1981-91, before the salmon moratorium. Effort has remained relatively steady. The number of small salmon retained in 1995 was 2598 (an increase of 22% over 1994) and the number released was 612 compared to 448 in 1994.

Data and assessment: Complete counts of salmon were obtained at a fish counting fence during 1989-95, and have historically been counted at a fishway located on a tributary, Salmon Brook.

State of the stock: Target egg deposition was not achieved in 1995 (-7%). The relative contribution of large salmon to total egg deposition was 13%, which was the same as for 1994, but represented a substantial decline from 40% observed in 1992 and was also below the average for 1989-91 (17%). Except for 1993, target spawning requirement in terms of small salmon (after angling removals) was not met in 1992 (-21%), 1994 (-26%), and 1995 (-10%). 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 1992-95 occurred in pre-salmon moratorium years. Total population sizes of small salmon and spawning escapements for pre-salmon moratorium years 1989-91 were the lowest for the period 1974-91. Increased returns arising from the closure of the commercial fishery in 1992 are not expected until 1997 or 1998. Counts of large salmon at Salmon Brook in 1992-95 were the highest on record.

Forecast: Based on a retrospective analysis of total population size and ratio of small salmon produced per spawner, returns in 1995 were anticipated to be below target requirement, without a recreational fishery. Actual returns were 37% higher, possibly related to increased natural survival. If survival remains the same as for 1995 then anticipated returns in 1996 could be similar to actual returns in 1995. An alternate prediction based on juvenile population estimates as indices of abundance indicates target requirement will be exceeded in 1996.

STOCK: Middle Brook (SFA 5)
TARGET: 2.3 millions eggs (~1012 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational harvest (small salmon)²									
	349	278	423	299	409	402	165	708	461
Fishway counts³									
Small	745	562	1168	1959	1513	1139	496	2414	1118
Large	13	14	43	87	90	168	13	91	34
% of Target eggs met⁴									
	75%	51%	145%	222%	175%	120%	51%	134%	80%

¹Recreational harvest is for the period 1974 to 1991.

²Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Data prior to 1992 and for 1994-1995 are retained fish for the entire angling season. The years 1979 and 1987 are omitted from calculations of min, max, and mean due to river closures resulting from drought conditions.

³Means for fishway counts are from 1980 to 1991.

⁴Summary for target egg deposition applies from 1984 to 1991 and represents the contribution of both small and large salmon.

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

Recreational catches: For the period 1974-91, harvests ranged from 165 to 789 small salmon. Rod-days of effort peaked during the mid-1980s but declined substantially in recent years. A total of 402 small salmon was retained in 1995 and 82 were released.

Data and assessment: Complete counts are available from a fishway located on the lower river.

State of the stock: Target egg deposition requirement was exceeded in 1992-95. Egg deposition was below target requirement for pre-salmon moratorium years 1985-91. Higher counts of both small and large salmon occurred in pre-salmon moratorium years than were observed in 1992-94. Total population size of small salmon during the moratorium years was substantially lower than in the late 1970s and early 1980s.

Forecast: Based on a retrospective analysis of total population size and the number of small salmon produced per spawner, returns in 1996 are anticipated to be in excess of the target requirement.

STOCK: Terra Nova River (SFA 5)
TARGET: 14.30 million eggs (~7094 small fish)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational harvest (small salmon)²									
	624	448	409	484	822	696	243	850	559
Fishway counts									
Small	1149	873	1443	2713	1571	2258	569	1737	1087
Large	144	114	270	470	242	634	19	206	101
% of target eggs met (small + large)⁴									
	20%	16%	31%	56%	29%	49%	15%	30%	20%

¹Recreational harvests are for the period 1974 to 1991.

²Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Data prior to 1992 and for 1994-1995 are retained fish for the entire angling season.

³Means for fishway counts are from 1979 to 1991.

⁴Summary for targets applies from 1984 to 1991.

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

Recreational catches: For the period 1974-91, harvests ranged from 243 to 850 small salmon. 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. A total of 696 small salmon was retained in 1995 and 132 were released.

Data and assessment: Counts are available from a fishway located on the lower river. Counts of small and large salmon for 1993 are incomplete. In 1994 and 1995, a number of adults were removed as broodstock for an incubation facility for subsequent fry stocking back to Terra Nova River; these adults were deducted from spawning escapements in the calculation of percent of target met presented above.

State of the stock: The count of small salmon in 1995 was the second highest on record and that of large salmon the highest. The proportion of target egg deposition achieved in 1995 was 49%, the second highest on record.

STOCK: Campbellton River (SFA 4)
TARGET: 2.916 million eggs (1480 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational harvest (small salmon)²									
	106	126	311	316	340	393	23	1547	626
Smolt counts									
				31577	41633	39715	31577	41633	37642
Smolt to 1SW sea survival (%)									
				7.2%	6.2%				
Adult Counts									
Small				4001	2857	3035			
Large				145	191	218			
% of egg target met (small + large)									
				320%	245%	294%			

¹Recreational harvest is for the period 1974 to 1991.

² Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Harvests prior to 1992 are for retained fish for the entire angling season. Harvests for 1979 and 1987 were not included in the mean since in that year the river was closed for most of the angling season due to drought conditions. Harvests for 1994 are retained small salmon.

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

Recreational catches: Harvests have ranged from 23 to 1547 during the period 1974-95. Harvests declined during 1981-91 before the salmon moratorium. Effort has remained relatively steady until 1992. The number of small salmon retained in 1995 was 393 and 47 were released.

Data and assessment: Complete counts of smolt and adult salmon migrations were obtained from portable fish counting fences in 1993-95.

State of the stock: Egg deposition in 1995 was 8.57 million eggs which was in excess of target requirement.

Accessible habitat:

Fluvial = 596,000 m²; Lacustrine = 4037.3 ha.

STOCK: Exploits River (SFA 4)
TARGET: 95.9 million eggs (equivalent to 56,670 small salmon)
 Lower Exploits 16.4 million eggs
 Middle Exploits 64.2 million eggs
 Upper Exploits 15.4 million eggs

Year	1990	1991	1992	1993	1994	1995	MIN	MAX	Mean ⁴
Recreational harvest¹ (retained only)									
Small	917	1045	1408	1655	3072	1302	577	2998	1660
Broodstock removals²									
	3869	1408	1078	0	0	0	31	5111	3371
Returns¹									
Total	7117	5758	13818	22777	18472	17090	3845	19557	8966
Small	6995	5659	13504	22150	17556	16149	4740	19205	8785
Large	122	99	314	627	916	941	343	352	180
% Target eggs met³:									
Lower	47%	35%	79%	109%	124%	99%	35%	127%	51%
Middle	12%	14%	20%	23%	27%	24%	8%	21%	12%
Upper	88%	0%	2%	6%	7%	12%	0%	125%	66%
¹ MIN, MAX period from 1974-1991.									
² MIN, MAX period from 1974-1992.									
³ MIN, MAX period from 1987-1991.									
⁴ MEAN period from 1987-1991.									

Methodologies: Fluvial habitat includes 35 million m² and lacustrine habitat includes 34,000 ha. Target egg requirements are to come from small salmon. Previous fry releases are backcalculated to eggs for % of target 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. Spawning escapements for the tributaries of the Lower Exploits except for Great Rattling Brook are derived from spawning surveys in 1992 and 1993.

Broodstock requirements: None at present.

Recreational catches: The 1995 recreational fishery on the Exploits was restricted by quota of 1330 small salmon retained.

State of the stock: The egg requirement for the Middle Exploits includes the main stem of the river which at present is not producing adults. If this habitat is removed, then the Middle Exploits in 1995 achieved 81% of its target. The low returns to the Upper Exploits is cause for concern and every effort should be made to reduce mortality on these returning adults.

STOCK: Northwest River (SFA 5)
TARGET: 4.1 millions eggs (~1726 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational harvest (small salmon)²									
	64	30	148	164	167	97	30	336	174
Counts									
Small						498			
Large						135			
% of target eggs met						40%			
¹ Recreational catch is for the period 1974 to 1991. ² Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Data prior to 1992 and for 1994-1995 are retained fish for the entire angling season. The years 1979 and 1987 are omitted from calculations of min, max, and mean due to river closures resulting from drought conditions.									

Recreational catches: For the period 1974-91, harvests ranged from 30 to 336 small salmon. 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 of park boundaries, the river was managed according to regulations in place for the remaining rivers in insular Newfoundland.

Data and assessment: A count was obtained at a counting fence installed in the lower river in 1995. The fence was operated by Terra Nova National Park personnel.

State of the stock: The river received 40% of target egg deposition requirement in 1995.

5.3 South Newfoundland (SFAs 9-11)

General description

Rivers assessed in this area include Biscay Bay River and Rocky River (SFA 9), Northeast River (Placentia) (SFA 10), and Conne River and Little River (SFA 11). Historically, rivers in this area have been characterized by runs comprised of in excess of 90% small salmon. Since the moratorium, the proportion of large salmon has increased in Rocky River and Northeast River (Placentia). Most large salmon are repeat spawning one-sea-winter (1SW) salmon.

Bay D'Espoir is the site of an aquaculture industry utilizing rainbow (steelhead) trout and Atlantic salmon. Production (t) during 1991-95 was as follows:

Year	Rainbow trout	Atlantic salmon
1991	30	31
1992	87	75
1993	113	100
1994	328	46
1995	325	145

Numbers of both of these species have escaped sea cages and entered Conne River. Rainbow trout have also been documented to occur in three other inner Bay d'Espoir rivers. An estimated 20,000 rainbow trout escaped in 1995 while approximately 100,000 salmon parr (Saint John River, N.B. stock) escaped during a winter storm in February 1996. Test fisheries for rainbow trout were conducted in Bay d'Espoir during May and September 1995. Results, particularly from the fall survey, suggest a high abundance of escaped rainbow trout in the Bay d'Espoir area. No evidence of rainbow trout predation on salmon was noted from the 1995 surveys. A rainbow trout fish-out pond also operated at St. Veronica's, Bay D'Espoir.

Little River was stocked with Atlantic salmon swim-up fry for several years, ending in 1993. However, brood was again removed in 1995. Atlantic salmon broodstock were also removed from Rocky River in 1995 for incubation and swim-up fry stocking in 1996. Brood fish were taken from Conne River in 1994 with fry (N = 128 thousand) stocked in 1995. Brood was again taken from Conne River in 1995.

Description of fisheries

In 1995, Conne River was closed to recreational fishing and there was no First Peoples' food fishery. Both Little River and Rocky River were closed to recreational fishing in 1995. The recreational catch of small salmon (retained plus released fish) in 1995 increased 57% over 1994 and was greater than the 1986-91, and 1992-94 means (Fig. 5.3.1). It was lower, however, than the 1984-89 mean (-7%). Effort in 1995 was the highest recorded since 1983, and was the second highest value since 1974. CPUE increased over 1994 but decreased from the means. Compared to the recreational fishery quota years 1992 and 1993, the number of small salmon retained in 1995 was well above that of both years, and was the highest recorded since 1990.

In 1995, of the salmon sampled entering Conne River during June and July, 7% possessed net marks.

Public consultation

Advisory meetings were held with representatives of the Government of Newfoundland and Labrador and organized angler groups. Meetings with the general public were held in St. John's and Gander. The agenda was the same as described for Labrador (Section 3.1). Stock assessments were subjected to peer review in February, 1996.

Environmental considerations

Rivers in SFA 9 were closed to angling from July 10-19 due to low water levels and high water temperatures. Similarly, rivers in SFAs 10 and 11 were closed anywhere from 6 to 12 days in July, and from 4 to 14 days in August. Smolt-to-adult survival back to the river for Northeast Brook (Trepassey) (SFA 9) was the highest recorded in 1995. The same was true for Rocky River. Conne River (SFA 11) showed a marked increase in survival in 1995 (5.8%), the highest level achieved since 1990. These survivals, while now increasing, are still low given the closure of the commercial fisheries. Higher values have been recorded at Conne River and comparable values at Northeast Brook (Trepassey) in pre-moratorium years. This is suggestive of high or above average natural mortality at sea in 1992-95 for these rivers and probably for southern Newfoundland rivers in general. Conditions appear to have changed for the south coast rivers in 1995. Since 1987, smolt production for Conne River and Northeast Brook (except for 1994) has been relatively stable.

Spring environmental conditions at Conne River were again cold in 1995. An air temperature index for the period April 1-May 15 was the coldest recorded over a nine year period (1987-95). Previously, this index was directly associated with the timing of the smolt migration, with later runs occurring in colder years. In 1995, however, smolt run timing actually increased relative to 1993 and 1994. Run timing was also related to subsequent sea survival.

Status of stocks

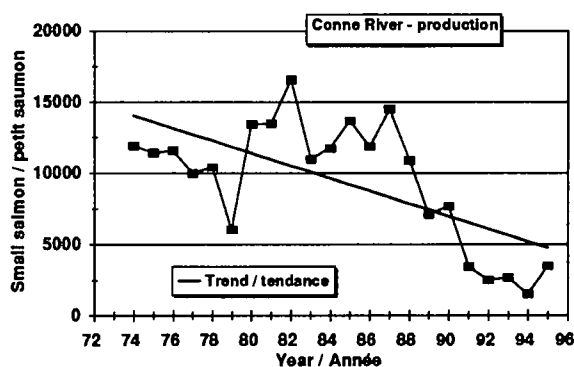
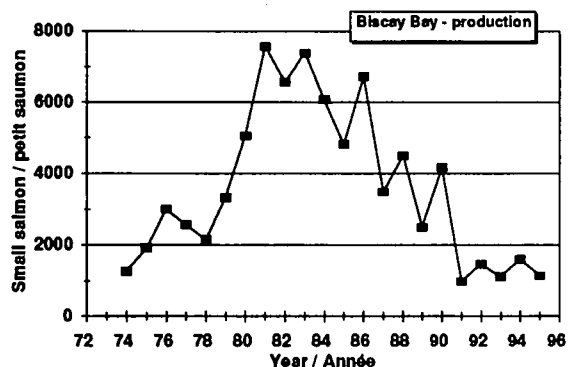
Indices of abundance were from counts of small and large salmon for Conne River, Little River, Northeast River (Placentia), Rocky River, Biscay Bay River, Piper's Hole River, and except for 1994 and 1995, recreational fishery data (retained plus released fish, Fig. 5.3.1). Recreational fishery data for 1994 and 1995 cannot be used as indices of abundance or as indicative of the effectiveness of the 1995 management plan because of the river closures in SFAs 9 and 10. With the exception of Rocky River and Northeast River (Placentia), counts of small and large salmon were significantly lower during the moratorium years than in the pre-moratorium period (1986-91). Of the rivers assessed, target egg deposition in 1995 was achieved only in Northeast River (Placentia). Biscay Bay and Conne rivers achieved 76% and 81% of their targets, respectively.

Percent target egg deposition achieved in rivers of SFAs 9, 10 and 11 during the five-year period prior to the commercial salmon fishery moratorium (1987-1991) and the four years during the moratorium (1992-1995).

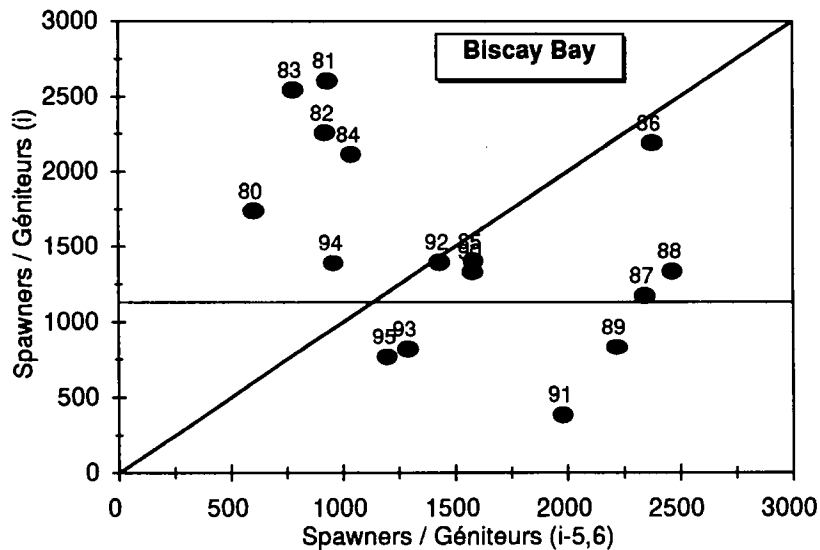
	1987	1988	1989	1990	1991	1992	1993	1994	1995
SFA 9 - Biscay Bay	119%	127%	89%	128%	39%	132%	91%	134%	77%
SFA 9 - Rocky River	23%	36%	20%	40%	22%	28%	34%	25%	33%
SFA 10 - Northeast Placentia	153%	209%	278%	253%	162%	497%	471%	387%	378%
SFA 11 - Conne River	214%	159%	103%	112%	51%	51%	61%	40%	81%
SFA 11 - Little River ¹	51%	30%	61%	105%	47%	45%	82%	38%	22%

¹ There is a colonization program at Little River. Eggs were removed from most adult returns, incubated, and fry subsequently stocked into the system. Target achieved includes natural egg deposition and fry stocking egg equivalents.

Estimates of the total numbers of small salmon produced in Biscay Bay River (before any exploitation) declined dramatically since 1981 and levels during the moratorium years were among the lowest on record. There was also a significant decline in small salmon production in Conne River since 1974 with lowest levels recorded during 1991-95.



An examination of the relationship between parents (small salmon) and future spawners of small salmon for Biscay Bay River indicates that the only moratorium year above the replacement line was 1994 although the target was also exceeded in 1992 and in several other years before the moratorium.



Prospects

Catches of small salmon were relatively low in pre-moratorium years 1989-91, and if indicative of spawning escapements, returns in 1996 could continue to be low if natural survival rates remain at the same low levels observed in recent years. There is an indication, however, that sea survival has improved but is still low considering the major changes in marine exploitation. Angling data and counts suggest that low returns could continue after 1997 if sea survival remains below levels expected given the commercial moratorium.

Based on a retrospective analysis of total population size and the number of small salmon produced per spawner, returns to Biscay Bay River in 1996 are anticipated to be less than 75% of target requirement. At Conne River, sea survival of 6.4% will be needed in order for total returns to meet or exceed the current target of 4,000 small salmon. While sea survival increased in 1995, there is nothing to suggest that survivals approximating 7% will occur.

Management considerations

Conne River, in contrast to the other rivers under consideration, is characterized by early runs of small salmon (since 1986, 70-80% of the run has been complete by early July). The implementation of the 1984 management plan, which delayed the opening of the commercial fishery from mid-May to June 5, should have had a more noticeable impact on Conne River returns than the moratorium.

The First Peoples' at Conne River have expressed concerns regarding possible high levels of illegal removals for the Conne River stock. Sustained salmon runs exceeding the current target should be obtained prior to any resumption of exploitation on the Conne River stock.

Summary sheets

More detailed information on individual river assessments for Conne River, Little River, Northeast River (Placentia), Rocky River, and Biscay Bay River are provided in the summary sheets.

South Newfoundland (SFAs 9 to 11)

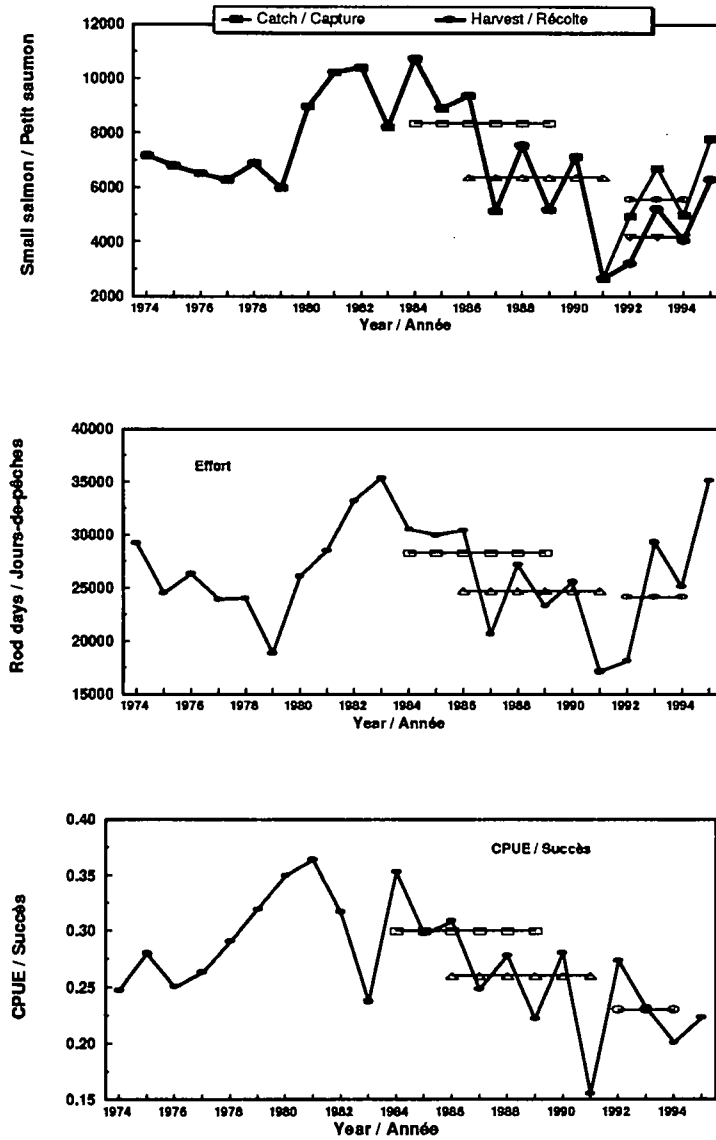


Figure 5.3.1. Small salmon recreational catch, harvest, effort and catch per unit of effort (CPUE) for South Newfoundland (SFAs 9 to 11). Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean for catch (retained + released) and inverted triangle is the 1992-94 mean for harvest.

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

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.

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
HARVEST:									
First Peoples' harvest									
Large	11	3	5	3	0	0	0	11	3
Small	948	281	483	417	0	0	18	948	459
Recreational harvest									
Small	767	108	329	0	0	0	0	3302	1824
Smolt count²	56943	74645	68208	55765	60762	62749	55765	74645	65927
Sea survival³	4.2%	3.4%	4.0%	2.7%	5.8%		2.7%	10.2%	
Returns:									
Large	372	89	159	100	100	110	89	516	355
Small	5368	2411	2523	2703	1533	3502	2411	10155	6472
Escapement:									
Large	361	87	153	97	99	108	87	488	345
Small	3765	2062	1783	2353	1435	3376	2062	7823	4709
% Target eggs met:									
	112%	51%	51%	61%	40%	81%	51%	214%	131%
¹ Minimum, maximum and mean recreational harvest for period 1974-91; other mean data for 1986-91 to coincide with the pre-moratorium period. Angling harvests are DFO statistics. 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 reduced to 500 fish for 1993. First Peoples fishery closed in 1994 and 1995. ² Min., max. and mean for the period 1987 to 1995. ³ Sea survival of smolt to small salmon returns. Min. and max. are for 1987 to 1994 smolt migrations.									

Data and methodology: Smolts used in adult forecasts are surveyed by mark-recapture. Returning adult salmon are enumerated at a fish counting fence. A video camera system was introduced in 1993.

State of the stock: Target requirements were met from 1986-90. Only 40-61% of the target was achieved from 1991-1994. This increased to 81% in 1995. Sea survival increased to the highest value in five years (5.8%), but is still low relative to the 1987-90 period. An enhancement project was initiated in 1994 with approximately 128 thousand fry released in 1995. Note that these fry have not been included in terms of the percentage target achieved in the above table.

Forecast: Estimated smolt output in 1995 was 62,749 (55,300-70,197); similar to 1994. At 4% survival, the average recorded during 1990-92, no more than 2,500 fish would be expected to return in 1996. A sea survival of 6.4% will be needed in order for total returns to meet or exceed the 4,000 salmon necessary to reach the target egg deposition. Sea survival of 7-10% has been recorded at Conne River in past years. Survival of salmon appears to be associated with timing of the smolt run and smolt condition. At present, there is nothing to suggest that survivals approximating 7% will occur. In-season monitoring could be used to update managers on changing conditions as the 1996 run progresses.

STOCK: Northeast River (SFA 10)

TARGET: 0.72 million eggs (~224 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational harvest (small salmon)									
	173	19	37	132	39	127	19	349	168
Counts²									
Small	551	353	921	847	677	663	223	725	415
Large	25	8	46	65	70	74	0	56	29
% of target eggs met³									
	253%	162%	497%	471%	387%	378%	152%	349%	219%
¹ Recreational harvest is for the period 1974 to 1991. Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Data prior to 1992 and for 1994-1995 are retained fish for the entire angling season. Data for 1987 are omitted from the calculation of the mean due to river closure resulting from drought conditions. ² Summaries for fishway counts are for the period 1976 to 1991 and for percent of target from 1984 to 1991. Percentage of target met reflects the contribution from both small and large salmon. ³ Adjusted. Note: any changes from previous years are due to updating count and catch data and biological characteristics information.									

Recreational catches: For the period 1974-91, harvests have ranged from 19 to 349 small salmon. Rod-days of effort peaked during the early 1980s but declined substantially in recent years. In 1995, a total of 127 small salmon was retained and 8 were released.

Data and assessment: Counts are available from a fishway.

State of the stock: Target egg deposition requirement has been exceeded in all years including salmon moratorium years 1992-95. The counts of small salmon in 1994 and 1995 decreased from the highs of 1992 and 1993; the count of large salmon in 1995 was the highest on record.

STOCK: Biscay Bay River (SFA 9)

TARGET: 2.9 million eggs (~1134 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational harvest (small salmon)									
	232	10	75	299	214	386	10	424	234
Counts²									
Small	1657	394	1442	1107	1592	1071	394	2516	1656
Large	73	35	51	120	68	56	35	101	75
% of target eggs met²									
	128%	39%	132%	91%	134%	77%	39%	208%	1305
¹ Recreational harvest is for the period 1974 to 1991. Harvests for 1992 and 1993 are retained catches to the time the SFA quota was caught and do not include hook-and-release fish. Data prior to 1992 and for 1994-1995 are retained fish for the entire angling season. Data for 1987 are omitted from the calculation of the mean due to river closure resulting from drought conditions. ² Summaries for fence counts are from 1983 to 1991 and for percent of target from 1984 to 1991. Percentage of target met since 1984 reflects the contribution of both small and large salmon. Counts for 1985, 1989, 1992, and 1993 were adjusted to total counts. Note: any changes from previous years are due to updating count and catch data and biological characteristics information.									

Recreational catches: For the period 1974-91, harvests have ranged from 10 to 424 small salmon. Rod-days of effort were relatively stable during the past decade. In 1995, a total of 386 small salmon was retained and 112 were released.

Data and assessment: Complete counts are available from a fish counting fence which has been in operation since 1983.

State of the stock: Since 1984, from 39 to 208% of target egg deposition was achieved. During commercial salmon fishery moratorium years, the target was exceeded in 1992 and 1994 but not in 1993. Generally, counts of small and large salmon were higher in pre-salmon moratorium years than in 1992-95; however the 1993 count of large salmon was the highest recorded. Total population size of small salmon during the moratorium years was substantially lower than in the early 1980s.

Forecast: Based on a retrospective analysis of total population size and the number of small salmon produced per spawner, returns in 1996 are anticipated to be below the target requirement without a recreational fishery.

STOCK: Little River (SFA 11)

TARGET: 0.314 million eggs (equivalent to 230 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Recreational catch²	*	*	*	*	*	*	NA	NA	NA
Smolt			382	324	495	2712	324	495	400
Total returns:	173	61	125	180	88	135	61	173	95
Small	158	55	104	169	75	118	55	158	89
Large	15	6	21	11	13	17	3	15	6
% Target eggs met³:	105%	47%	45%	82%	38%	22% ⁴	29%	105%	54%
¹ MIN, MAX, and Mean period 1987 -1991. ² Recreational fishery closed. ³ Represents contribution from both small and large salmon.. ⁴ 1995 egg deposition is preliminary									

Background: Little River is the site of an enhancement project where limited fry stocking commenced in 1990 and ended in the spring of 1994. Eggs were again planted in 1995.

Methodologies: Target egg deposition is for accessible habitat (130800 m² of fluvial habitat). Target eggs are to come from small salmon. Biological characteristics are those of Little River and the Conne River. Current fry releases are backcalculated to eggs for % of target egg achieved in areas stocked. Total returns to the river are based on fence counts.

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

Data and assessment: Complete adult counts are available from a counting fence. Smolt counts are available for the period 1992 to 1995.

State of the stock: For 1992-1994 the stock averaged 47% of target egg requirements based on natural spawning and fry releases.

STOCK: Rocky River (SFA 9)

TARGET: 3.4 million eggs (equivalent to 881 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Returns									
Total	418	227	283	354	177	424	81	418	245
Small salmon	401	211	237	282	159	385	80	401	235
Large salmon	17	16	46	72	18	39	1	17	10
Broodstock									
	0	0	0	0	62	72	62	72	67
Smolt									
	8287	7732	7813	5115	9781	7786	5115	9781	7752
% sea survival ²	2.5%	3.1%	4.1%	2.4%	3.3%				
% Target eggs met: ³	40%	22%	28%	34%	255	33% ⁴	17%	40%	26%
¹ Min, Max and Mean period from 1987-1991. ² % sea survival is from smolt to small salmon return. ³ Note: A new fecundity relationship was established in 1995 affecting previous % target achieved ⁴ 1995 egg deposition is preliminary due to artificial egg incubation.									

Background: Rocky River was stocked with salmon fry from 1983-1987 with the first returns to the reconstructed fishway realized in 1987.

Methodologies: Fluvial habitat consists of 1.08 million m² and lacustrine habitat includes 2200 ha. Target eggs are to come from small salmon. Biological characteristics used are those of the Rocky River stock. Previous fry releases are backcalculated to eggs for % of target egg achieved in areas stocked.

Recreational fisheries: The recreational fishery is closed on this river.

Data and assessment: Complete adult counts are available from a trap installed in the fishway.

State of the stock: On average, the watershed is achieving 30% of its required target egg deposition.

Forecast: Based on the 1990-1994 smolt-to-adult survival, between 189 and 323 maiden 1SW salmon are expected in 1996. As this forecast will not meet target egg deposition it is recommended that the recreational fishery remain closed.

5.4 Southwest Newfoundland (SFAs 12-13)

General description

Individual river assessments in this area are provided for Humber River (57% of the total drainage area of SFA 13 and the second largest river in insular Newfoundland), Harrys River, Flat Bay Brook, and Highlands River. A general overview is also provided of the status of salmon stocks on selected rivers in the Bay St. George area of SFA 13 for the years 1953 to 1994 (no summary sheets are provided). Several rivers in Bay St. George possess a significant large salmon component of which many are maiden multi-sea-winter fish. Five rivers in SFA 13 were managed by river-specific quotas in 1995 compared to six in 1994 - one of the six in 1994 (Flat Bay Brook) was closed completely in 1995. Hughes Brook (in Bay of Islands/Humber River estuary) was the site of an enhancement program in 1987-92 involving the stocking of Atlantic salmon swim-up fry. Fry were also stocked into North Brook (a tributary of Humber River) during the same period. Fry were stocked in Flat Bay Brook and Romaines River for the first time in 1995.

In the past few years, Arctic charr were reared in cages in Grand Lake (Humber River). There are no anadromous Atlantic salmon in Grand Lake. An estimated 20000-40000 charr escaped in 1994 and Arctic charr were reported caught by anglers in Deer Lake on the Humber River and were observed in tagging traps operated in the estuary. None were angled or observed in tagging traps in 1995. A rainbow trout fish-out pond operated at Mine Pond, near Stephenville.

Description of fisheries

In SFA 13, the quota on Fox Island River was reached on July 31 and the river was closed to retention of small salmon. Eight other rivers in SFA 13 were closed to retention in 1995 as a result of an in-season review of salmon abundance which indicated that less than 50% of the target spawning requirements would be achieved in 1995. Rivers involved in the in-season review, their closure dates, and the dates of the cumulative angling catches on which the reviews were based were as follows:

Crabbes	- July 10/95 (catch to June 25)
Barachois	- July 10/95 (catch to July 2)
Robinsons	- July 10/95 (catch up to July 2)
Fischells	- July 10/95 (catch up to July 2)
Little Barachois	- July 16/95 (catch up to July 9)
Southwest & Bottom	- July 16/95 (catch up to July 9)
Harrys	- July 16/95 (catch up to July 9)
Serpentine	- August 2/95

Comparisons of catch and effort data on these rivers in 1995 with previous years should be made with caution because of the early closure dates in 1995. Seven of these rivers were also closed to retention (August 8) after the in-season review in 1994. Historically, only 10% or less of the total season catch in these rivers was taken after August 8, which should not affect comparability of the 1994 recreational fishery data with previous years. Individual river quotas for retained fish had been reached on Fischells Brook and Fox Island River in 1994.

The effort and total (retained + released) catch of small salmon in 1995 decreased in comparison to the catch in 1994 and to the long-term means (Fig. 5.4.1). Retained catches of small salmon in 1995 were the lowest of the post-moratorium years (1992-95) and the second lowest on record. The number of large salmon released in 1995 was similar to 1994 but increased in comparison to the long-term means. The numbers of large salmon

released since the moratorium have been well above the 1984-89 and 1986-91 means; however, there were years prior to the moratorium, in the late 1970s and early 1980s, when catches were comparable to 1992-95. CPUE for small and large salmon in 1995 (influenced by increased catches of large salmon in 1995) increased slightly in comparison to 1994 but decreased in comparison to the long-term means (Fig. 5.4.1).

Public consultations

Advisory meetings were held with representatives of the Government of Newfoundland and Labrador and organized angler groups. Meetings with the general public were held in South Branch and Deer Lake. The agenda was the same as for Labrador (Section 5.1) with the exception that there was a question specifically for Bay St. George on the status of stocks on Little Codroy and Grand Codroy Rivers relative to other rivers in the area. In addition, a three day workshop was held in May 1995 by DFO, client groups and individual anglers to discuss shared concern over the apparent low response, compared to rivers in other SFAs, of salmon stocks in Bay St. George to the commercial salmon moratorium. Results of these deliberations are reflected below. Stock assessments were subjected to peer review in February 1996.

Environmental considerations

In SFA 12-13, no rivers were closed to angling in 1995 due to low water levels. Anglers attending public consultations in Deer Lake noted that angling conditions were good all summer.

Status of stocks

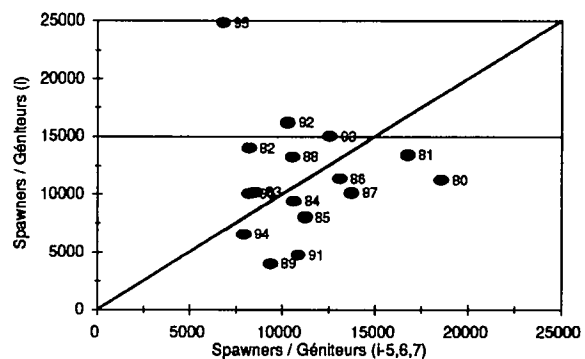
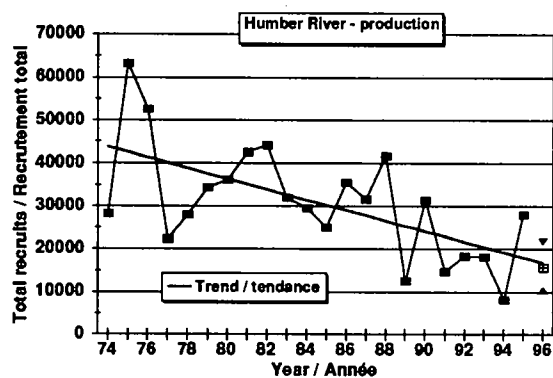
Indices of abundance were from complete counts (Highlands River and Pinchgut Brook) and mark and recapture estimates of run size (Humber River), and angling data (retained plus released fish, Fig. 5.4.1). Counts of small and large salmon for Highlands River in 1993-95 improved over the period 1980-82 (only previous data available). However, the count of large salmon in 1995 decreased from that in 1994. The average number of smolts counted at the Highlands River counting fence in 1993-95 (10,430) declined from that recorded during 1980-82 (14,447). With the exception of two-year-old smolts in 1995, smolts leaving Highlands River in 1992-95 were produced by pre-moratorium spawning escapements. For Pinchgut Brook, the returns and spawning escapements of small salmon in 1995 were the highest recorded while that of and large salmon decreased compared to 1994 and the 1992-94 mean. Estimated returns of small (highest on record) and large salmon to the Humber River in 1995 were above those in 1994 and the 1992-94 mean and the pre-moratorium years 1990 and 1991. Adult counts for Flat Bay Brook and Romaines River were incomplete in 1995.

Percent target egg depositions achieved in SFA 13 rivers in five years prior to the commercial salmon moratorium (1987-91) and four years during the moratorium (1992-95). * denotes a preliminary value. Values for Pinchgut are updated from the 1994 report based on revised rearing habitat and biological characteristics.

Year:	1987	1988	1989	1990	1991	1992	1993	1994	1995
Humber River	61%	80%	24%	60%	27%	117%	96%	40%	129%*
Harry's River	12%	38%	48%	49%
Pinchgut Brook	36%	117%	145%	150%
Flat Bay Brook	27%	29%*
Highlands River	47%	77%	68%

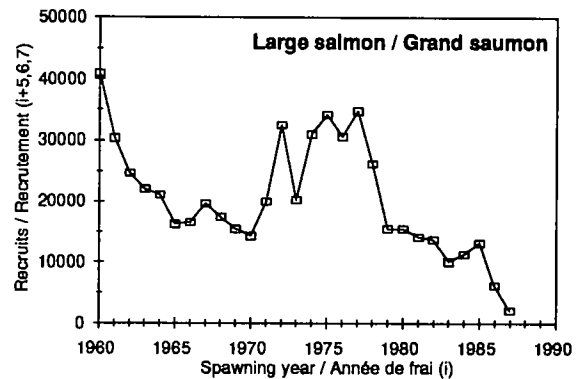
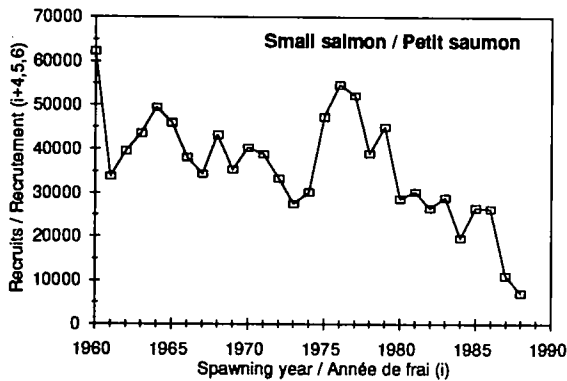
Of the rivers assessed, Humber River and Pinchgut Brook achieved target egg deposition in 1995. Pinchgut Brook is a tributary of Harrys River and contains a large proportion of the spawning habitat for the entire system. Therefore, the percentage of target achieved for Pinchgut Brook is expected to be considerably higher than for Harry's River as a whole. Based on a spawning survey conducted in the fall of 1995 on Harry's River is estimated to have achieved less than 50% of its spawning target in 1995. The percentage of target achieved by salmon in Humber River in 1995 was the highest recorded.

Estimates of the size of the total population of small and large salmon (before any exploitation) on the Humber River have declined significantly since 1974, with the exception of 1995, values for the moratorium years being among the lowest recorded (left panel, figure below). The recruitment back to the river in 1996, based on the mean recruit/spawner ratio in 1992-1995, is anticipated to be less than in 1995 (open square is mid-point estimate, triangles are the min. and max. estimates). The relationship between parents and future spawners (after exploitation including in-river) for Humber River (small and large salmon combined) is also shown (right panel, figure below). The diagonal line is the replacement line and the horizontal line is the target spawning requirement. In 13 of the 16 years, the spawning escapements have been below target but have replaced themselves in seven out of 16 years. Spawners were above the replacement line during three out of four post-moratorium years. The target egg deposition was achieved in 1992, 1993 and 1995 but not in 1994.



Estimates of the total population size in 10 selected rivers in the Bay St. George area of SFA 13 were derived based on angling data and constant exploitation rates adjusted for the length of the angling season. With the exception of Little Codroy and Grand Codroy rivers, which actually flow southwest and empty into the Cabot Strait just south of Bay St. George, none of these rivers had achieved their conservation target egg deposition levels in 1992-1994- in spite of slight improvements since 1992.

Total recruits for Bay St. George salmon stocks have declined in recent years from higher numbers of recruits in the early 1960s and 1970s. Small salmon recruits in 1994 produced from spawners in 1988 and large salmon recruits from spawners in 1987 were the lowest recorded.



Prospects

Catches of small and large salmon were relatively low in 1989-91, and if indicative of spawning escapements, returns could continue to be low in the next few years, if natural survival rates remain the same. Assuming that the dominant smolt-age of SFA 12-13 small salmon is three years, the first significant recruits produced by spawners since the commercial fishing moratorium will return to rivers 1997. There are indications that escapements of large salmon improved markedly during moratorium years; however, the first significant returns of adults from these spawners are not expected until 1998. Based on a retrospective analysis of total population size and the numbers of small and large salmon produced per spawner, returns of small salmon to the Humber River in 1996 are anticipated to be slightly below the target requirement while returns of large salmon are expected to exceed the target.

Management considerations

Reasons for the lack of improvement in returns of small salmon are unclear. Opinions expressed during public consultations were that clear-cutting of forest areas along several rivers in Bay St. George and poaching, particularly on Harry's River, may play a significant role. Stocks in SFAs 12 and 13 are not expected to benefit as much from the moratorium as other areas of insular Newfoundland because these stocks were subjected to a shorter commercial fishery season introduced in 1978, which should have resulted in lower exploitation. Typically, Atlantic salmon enter rivers in SFAs 12 and 13 in late May and early June. The change in the commercial fishing season opening date from May 24 to June 5 in 1984 in other areas of insular Newfoundland should have reduced interception of fish destined for SFAs 12 and 13. Also, the closure of the SFA 12 commercial fishery in 1984 should have further reduced exploitation on these stocks. Consequently, the number of fish available for release into freshwater during the moratorium would be lower than for some other areas and would reduce potential increases from the moratorium correspondingly. Also reductions in marine survival that have been observed in some other areas would further impact on expected returns as a result of the moratorium.

The number of small salmon retained in SFA 13 rivers in 1995 was less than for the recreational fishery quota years 1992 and 1993 because of early closure from the in season review which indicated low stock abundance.

In contrast to most other rivers in SFA 13, the status of the spawning stock on the Humber River improved in 1992 and in each year since the moratorium. However, it must be kept in mind that the smolt-age

distribution of Humber River small and large salmon in 1994 and 1995 was approximately 50% age-3 and 50% age-4 fish. Spawning escapement in 1992 was strong and recruitment of small salmon from this spawning year would be expected in 1997 and 1998, but large salmon would not recruit until 1998 and 1999. This is a particularly important consideration at this time given the interest expressed by anglers in 1995 in implementation a fall fishery for large salmon on the lower Humber River.

The Pinchgut Brook tributary system is the uppermost headwater of Harrys River and is the primary spawning area for the system based on the 1995 spawning survey. Angling catches on the Pinchgut Brook system and other tributaries flowing into headwaters of Harrys River represented only 7.2% of the Harrys River catch in 1984-89, therefore, it would not be a great loss to the fishery if these areas were closed completely to angling in order to create a sanctuary.

Spawning escapements and egg deposition appear to have increased slightly on both Harrys River and Pinchgut Brook in the last four years. However, spawning on Harrys River as a whole has been at most 49% of the target based on the 1995 assessment. This is consistent with estimates of the stock status derived during the in-season review in 1994 and 1995. It is also consistent with the view of anglers expressed during public consultations in 1995 that Bay St. George rivers, with the exception of Grand Codroy and Little Codroy, have generally experienced poor returns in recent years. Other than angling data, there is no database on which to assess these stocks and the latter two rivers may not be any better off than the rest. Severe poaching has been identified (by both anglers and DFO guardians) as a long standing problem on Harrys River and other rivers in Bay St. George. It was suggested by anglers that unrecorded mortalities within the river could be as high as 50% of the run. Current assessments do not include this as a factor, therefore, spawning escapements may be even lower than estimated. Also, if conditions in freshwater have deteriorated in recent years as was indicated by habitat information presented at the Bay St. George workshop in 1995 and by anglers at the public consultations, then the potential for future improvements in year-class strength will be compromised.

Summary sheets

More detailed information on individual river assessments for Humber River, Harry's River (and Pinchgut Brook), Highlands River, and Flat Bay Brook are provided in the summary sheets.

Southwest Newfoundland (SFAs 12 and 13)

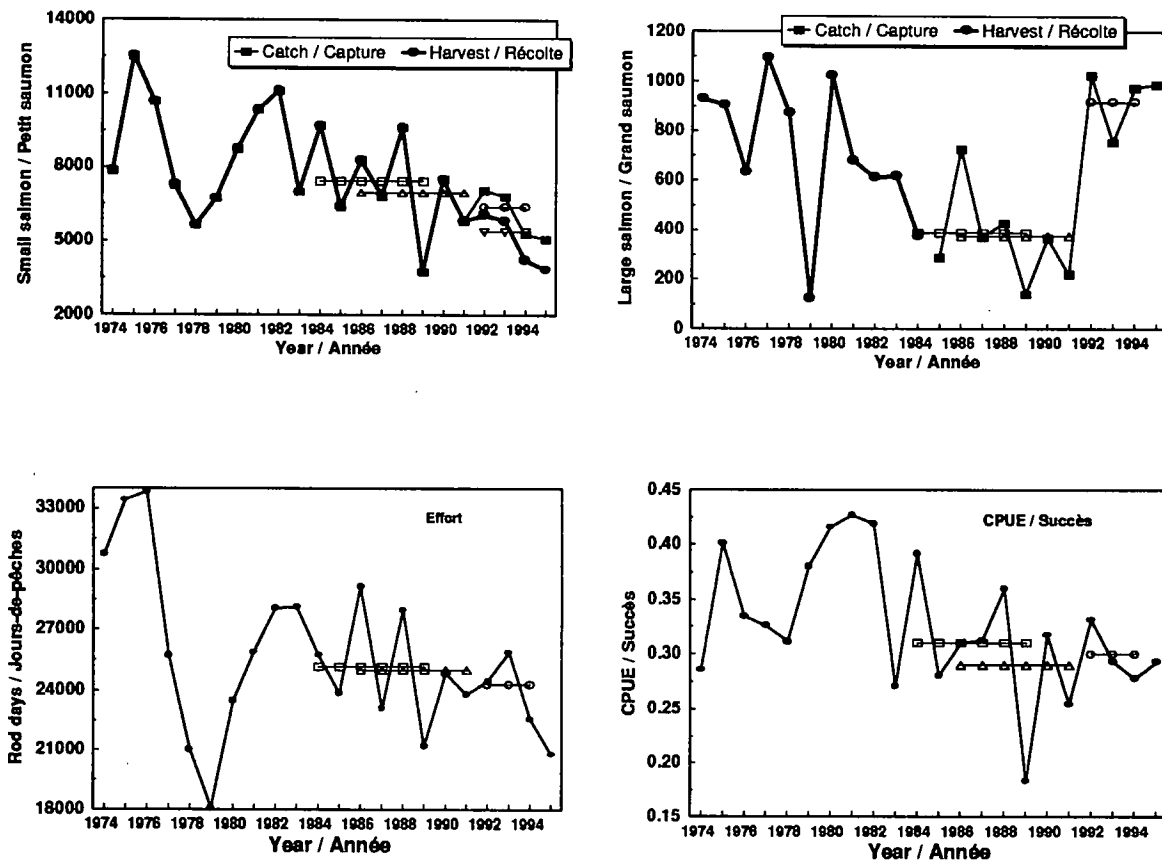


Fig. 5.4.1. Recreational catch and harvest of small and large salmon (retained, 1974-95; retained plus released, 1992-95), effort (rod days), and catch per unit of effort (catch of small plus large divided by effort) during 1974 to 1995 in Southwest Newfoundland (SFAs 12-13). The catch of large salmon prior to 1985 was all harvested and for 1985 to 1994 was all released. Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean for catch (retained + released) and inverted triangle is the 1992-94 mean for harvest.

STOCK: Humber River (SFA 13)

TARGET¹: 28.3 million eggs (~13,651 small and 1,326 large salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ²	MAX ²	Mean ²
Angling catch³:									
Small	3054	1431	4349	4161	2523	5150	1217	6147	3268
Large	75	11	177	112	166	233	10	303	100
Returns⁴:									
Small	12216	5724	17571	18477	7995	27898	4868	24588	13074
Large	855	401	2945	636	1030	2064	341	2945	915
Estimated spawning escapement:									
Small	9162	4293	13222	14316	5472	22748	3651	18441	9805
Large	855	401	2945	636	1030	2064	341	2945	850
% Target eggs met (small + large):									
	60%	27%	117%	96%	40%	129% ⁵	24%	119%	63%

¹ The target egg deposition requirement is based on fluvial and lacustrine habitat.

² MIN, MAX, MEAN are for 1974-1991.

³ Angling catch of small salmon in 1992-1995 is estimated based on a creel survey conducted at Big Falls. Catch of small is retained fish, catch of large is released fish.

⁴ Total returns for 1974-1991 were estimated based on an angling exploitation rate of 25% adjusted for tag loss and reporting rate.

⁵ Preliminary data based on tags returned up to January 31, 1996.

Methodology: Fluvial habitat includes 11.5 million m² and lacustrine habitat includes 1,751 ha (excluding Deer Lake - 5930 ha). Target egg deposition is based on 2.4 eggs /m² of fluvial area and 368 eggs per ha of lacustrine area. Biological characteristics are based on samples from the recreational fishery and from the tagging trap located in the estuary of the Humber River. Returns of small salmon are currently estimated by mark-recapture method. Returns of large salmon are assumed to equal returns of small salmon multiplied by the ratio of large to small salmon in the tagging traps. Returns of small salmon in 1992 were based on an angling exploitation rate derived from tags recovered at the Big Falls section of the river by DFO creel survey personnel. The estimate of exploitation rate reported in 1992 had not been adjusted for tag loss but the current value for 1992 includes this adjustment based on a tag loss rate of 23%.

Recreational fishery: The Humber River produces about 40% of the small salmon catch in SFA 13. Recreational catches estimated in 1992 and 1993 were among the highest on the river since the early 1980s. The recreational catch of small salmon (retained) in 1995 was 100% above the retained catch of small salmon in 1994.

Data and assessment: The 1995 assessment was the sixth assessment of Humber River salmon using the mark-recapture method.

State of the stock: The mean potential egg deposition in 1974-1991 represented about 63% of the target. The 1992-1994 mean was 84% of the target and 129% in 1995. The status of the stock in 1995 was the highest since the commercial salmon moratorium and since 1974.

Forecast: The only forecast that can be provided is based on the relationship between spawners and recruits back to the river. Based on the mean R/S ratio in 1993-1995, the anticipated total recruitment in 1996 is expected to be less than in 1995 but within the range of 1992-1995 recruits.

STOCK: Harry's River (SFA 13)

TARGET: 7.64 million eggs

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Pinchgut Brook									
Returns to the fence									
Small	.	.	222	576	563	752	222	576	454
Large	.	.	5	43	47	28	5	47	32
Spawning escapement above the fence									
Small	.	.	212	548	545	749	212	548	435
Large	.	.	5	43	47	28	5	47	32
% target eggs met above fence (small + large)									
	.	.	36%	117%	145%	150%	36%	145%	99%
Harrys River									
Estimated spawning escapement (small + large)									
	.	.	529	1441	1444	1895	529	1444	1138
% Target eggs met (small + large) ² :									
	.	.	12%	38%	48%	49%	12%	49%	32%

¹MIN, MAX, MEAN are for 1992-1994.
² Target egg and spawner requirements and % of target achieved are updated from the 1994 report based on revised habitat values and biological characteristics. Target egg requirement is preliminary because it includes only lake areas >5 ha.

Methodology: Fluvial habitat includes 2,639,400 m² and lacustrine habitat includes 3,546 ha (preliminary - includes all lakes >5ha). Target egg deposition is based on 2.4 eggs/m² of fluvial area and 368 eggs per ha of lacustrine area. Potential egg depositions were calculated from spawning escapements based on 1,540 eggs per kg of body weight of female salmon.

Recreational fishery: In the mid-1960s, Harrys River produced the largest recreational catches of any river in Bay St. George but catches began to decline in the 1970s and 1980s. The fishery has been controlled by a river quota of 350 small salmon since 1987 and in-season reviews in 1994-1995. The retention fishery was closed in 1994-1995 as a result of the in-season review and in 1992-1993 due to quotas being reached (1992-zonal; 1993-river). Harrys River recreational catch of small salmon was 13% of the Bay St. George recreational catch in 1995 compared to 43% in 1953.

Data and assessment: Assessment of the stocks in Harrys River in 1992-1995, included the operation of a counting fence on Pinchgut Brook in 1992-1995; a spawning survey in November 1995; and a mark-recapture experiment in July 1995. The redds counted on Pinchgut Brook in 1995 was 41% of Harrys River. The total spawning escapements on Harrys River in 1992-1995 were estimated based on the total spawning escapement on Pinchgut Brook adjusted by the proportion of redds counted on the Pinchgut system in 1995. The returns estimate in 1995 based on tagging was similar to the estimate based on the spawning survey results. Counts in 1992 may not represent the complete run into Pinchgut Brook.

State of the stock: Spawning escapements on Harrys River appear to have increased slightly since 1992 but have been less than 50% of the spawning requirement based on this assessment. The percentage of the target achieved on Pinchgut Brook has also increased since the commercial salmon moratorium in 1992.

STOCK: Flat Bay River (SFA 13)
TARGET: 3.843 million eggs

Year	1990	1991	1992	1993	1994	1995	MIN	MAX	Mean
Recreational catch (retained only)¹									
Small salmon	277	251	223	173	128	0	72	609	306
Large salmon ²	0	0	0	0	0	0	4	59	28
Broodstock removals:					43	83			
Total returns:					554	698			
Small Salmon					484	650			
Large Salmon					70	48			
% Target eggs met:					27% ³	29% ⁴			
¹ MIN, MAX mean period from 1974-1991.									
² MIN, MAX mean period from 1974-1983.									
³ This value has been updated from the 1994 report to account for eggs distributed from broodstock removals.									
⁴ Preliminary data									

Methodologies: Habitat area is 1.6 million m². Target egg requirements are to come from small and large salmon. Total returns are based on a fence count and angling below the fence. The 1994 and 1995 fence counts are partial counts.

Broodstock requirements: 150,000 eggs.

Recreational catches: The Flat Bay River stock has been under quota (small salmon) since 1986, as follows: 1986 = 400, 1987-1988 = 300, and 1989-1994 = 250. The quota has only been achieved in two years. In 1995 the river was closed to recreational fishing.

State of the stock: The stock is severely depressed and every effort should be made to increase spawning escapement.

STOCK: Highlands River (SFA 13)

TARGET: 1.55 million eggs

Year	1980	1981	1982..	1993	1994	1995	MIN	MAX	MEAN
Recreational catch ¹ (closed since 1978)							19	114	67
Fence counts									
Smolt	15130	15839	12373	9986	10503	10802 ²			
Small	82	127	100	137	145	172			
Large	55	29	56	78	148	120			
%Target eggs met:									
(small + large)	32%	26%	34%	47%	77%	68%			
¹ Recreational fishery data are available for 1953-1977 only since the river was closed to angling from 1978 to present. ² Adjusted from actual count of 9009 to account for smolt that migrated after June 8 when fence became inoperable. ³ Based on weighted average percent female of kelt sampled over all years 1980-82 and 1993-95 and mean length of kelt 1993-95 and bright salmon 1995.									

Data and assessment: Counts of smolt and adult salmon were obtained with a fish counting fence in 1980-82 and in 1993-95. Juvenile densities were measured at 19 stations to determine changes in juvenile salmon production. Juvenile studies at the higher egg deposition following the moratorium will give a better estimate of the potential production of different reaches and a more accurate estimation of the target egg deposition.

State of the stock: Egg deposition in 1995 is slightly lower than in 1994 but higher than that observed in 1993 and much higher than in 1980-82. The improved returns in 1993-95, compared to 1980-82, are attributed to the closure of the commercial fisheries. Sea survival of the 1993 smolt-class to adult salmon returns (small + large salmon) was 2.4%, which is higher than the 1.2% observed from the 1980 smolt-class. Despite closure to angling since 1978, egg deposition has remained below the reference 2.4eggs/m². A major tributary was blocked by a collapsed bridge until recently, but has not yet naturally re-colonized. Some small tributaries are obstructed by beaver dams.

5.5 Northern Peninsula West (SFA 14A)

General description

Rivers assessed in this area include Lomond River, Torrent River, and Western Arm Brook. The Torrent River is the site of a previous enhancement project utilizing an adult transfer. Historically, rivers in this area have been characterized by runs comprised in excess of 90% small salmon. There has been a general increase in the proportion of large salmon during the moratorium. Most large salmon are repeat spawning one-sea-winter salmon.

In recent years, Arctic charr have been reared in cages in Portland Creek and a number of these have escaped. A rainbow trout fish-out pond has operated in Spirity Pond, Bonne Bay, southern portion of SFA 14A.

Description of fisheries

Western Arm Brook is closed to recreational fishing. Recreational catches in Lomond River have been controlled by individual river quota since 1989. Watson's Brook and Pincent's Brook are under quota control. The 1995 retention quota of 375 small salmon was reached in the Lomond River with the total catch in 1995 being the highest on record. The CUPE was the highest in nine years. The recreational fishery (for retention) in Torrent River in 1995 was opened after an escapement of 750 fish had passed through the fishway. The area above the fishway in Torrent river is closed to recreational fishing. The total catch for Torrent River was the highest recorded to date with the CUPE being the fourth highest recorded.

Public consultation

Advisory meetings were held with representatives of the Government of Newfoundland and Labrador and organized angler groups. A meeting with the general public was held in Deer Lake. The agenda was the same as described for Labrador (Section 5.1). Stock assessments were subjected to peer review in February 1996.

Environmental considerations

There were no river closures due to low water levels or high water temperatures.

Status of stocks

Indices of abundance were from complete counts of small and large salmon for Lomond River, Torrent River, and Western Arm Brook, and recreational fishery data (retained plus released fish, Fig. 5.5.1). Recreational total catches of small salmon in 1995 increased over 1994 (48%) and the 1984-89 (78%), 1986-91 (77%), and 1992-94 (47%) means; the number of large salmon released also increased over 1994 and the means (54, 825, 618, and 80%, respectively). Collectively counts of large salmon in 1995 were the highest recorded to date at each facility. The counts of small salmon for Lomond and Torrent rivers were the highest on record while that of Western Arm Brook is the third highest recorded during the moratorium years. For Western Arm Brook, there were years prior to the moratorium when counts of small salmon were higher than during the moratorium; counts of large salmon during the moratorium were consistently higher than in pre-moratorium years. Overall, counts of small salmon for Lomond and Torrent rivers were higher during the moratorium than prior to the moratorium; large salmon counts improved over pre-moratorium years for Lomond River but not Torrent River.

Of the rivers assessed, target egg deposition was achieved in all rivers.

Percent target egg deposition achieved in rivers of SFA 14A during the five-year period prior to the commercial salmon fishery moratorium (1987-1991) and the four years during the moratorium (1992-1995)

	1987	1988	1989	1990	1991	1992	1993	1994	1995
Lomond River	56%	70%	N/A	N/A	N/A	121%	118%	143%	187%
Torrent River	201%	266%	225%	221%	176%	314%	538%	530%	1033%
Western Arm Brook	103%	72%	144%	114%	68%	151%	288%	292%	284%

The number of recruits per small salmon has shown a decline for Western Arm Brook since 1983 indicating pre-moratorium populations were larger.

Prospects

The smolt count of 15,144 for Western Arm Brook in 1995 was 63% above the 1994 count, and assuming that smolt-to-adult survival is equivalent to 1995, then 1996 returns are expected to be above 1995 returns, which exceeded target. Smolt-to-adult survival has been increasing since 1992.

Management considerations

Counts of small and large salmon at counting facilities and increased recreational catches of small and large salmon in this area since 1992 suggest an overall improvement in the status of stocks since the commercial salmon moratorium. The high egg deposition rates in Torrent River, above the fishway, and in Western Arm Brook offer a unique opportunity to study adult production at optimum spawning. For scientific purposes it is recommended to keep these areas closed to recreational fishing: above the Torrent River fishway and Western Arm Brook.

Summary sheets

More detailed information on individual river assessments for Lomond River, Torrent River and Western Arm Brook are provided in the summary sheets.

Northern Peninsula West (SFA 14A)

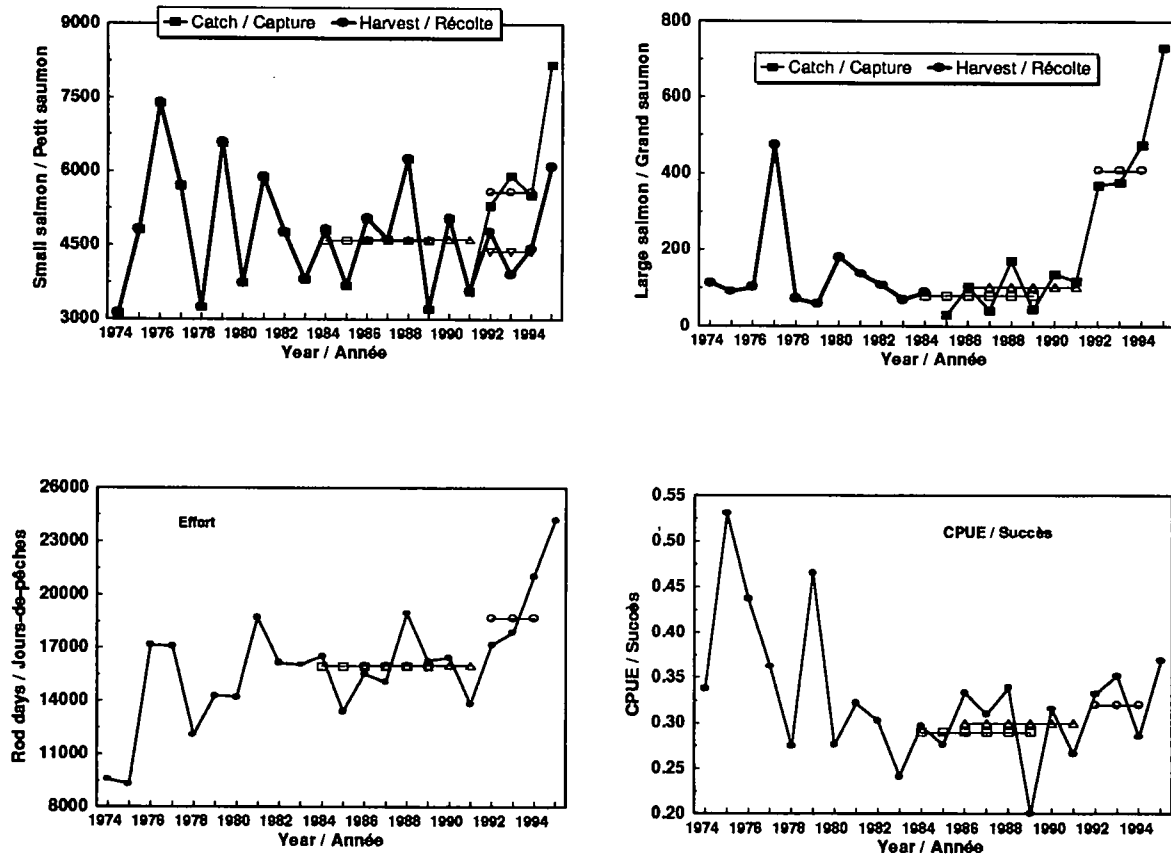


Figure 5.5.1. Recreational catch and harvest of small and large salmon (retained, 1974-95; retained plus released, 1992-95), effort (rod days), and catch per unit of effort (catch of small plus large divided by effort) during 1974 to 1995 in Northern Peninsula West (SFA 14A). The catch of large salmon prior to 1985 was all harvested and for 1985 to 1994 was all released. Open square is the 1984-89 mean, upright triangle is the 1986-91 mean, open circle is the 1992-94 mean for catch (retained + released) and inverted triangle is the 1992-94 mean for harvest.

STOCK: Lomond River (above the fishway) (SFA 14A)

TARGET: 1.1 million eggs (~ 653 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Returns to fishway									
Small	...No Counts		435	526	701	1002	1	440	224
Large	Available (90-91)		80	34	50	95	0	50	19
Angling catch below fishway									
Small	386	328	357	275	325	343	203	650	366
Large	17	10	56	36	58	62	2	46	18
Approximate total returns²									
Small	.	.	792	801	1026	1345	259	986	590
Large	.	.	80	34	50	95	3	75	31
Known removals above fishway									
Small	.	.	16	22	.	20	0	0	0
Large	.	.	0	1	.	0	0	0	0
Spawning escapement above fishway									
Small	.	.	419	504	701	982	1	440	224
Large	.	.	80	33	50	95	0	50	19
% of Target eggs met (small + large)³									
			121%	118%	143%	187%	0%	74%	37%
¹ MIN, MAX, MEAN are for 1974-1988.									
² Approximate because of the occurrence of spawning below the fishway. Large salmon were not retained after 1984.									
³ Egg depositions in 1992 and 1993 are based on biological characteristics for 1993.									

Methodology: Fluvial habitat includes 215,600 m² and lacustrine habitat includes 1,570 ha of standing water. Target egg deposition is based on 2.4 eggs/m² of fluvial area and 368 eggs per ha of lacustrine area. Target eggs are to come from small salmon. Potential egg deposition was determined from counts of small and large salmon at the fishway and biological characteristics obtained from samples at the fishway and in the recreational fishery.

Recreational fishery: The recreational fishery above the fishway has been closed since 1978. The recreational fishery on the Lomond River has been managed by a river quota of 350 small salmon from 1986-1994. The quota increased to 375 small salmon in 1995. The river was closed to retention angling when the quota was reached in 1995. Angling is currently not permitted above the fishway.

Data and assessment: Counts of salmon using the fishway on Lomond River are available from 1962-1995 with the exception of 1968-1970 and 1989-1991 when the fishway was not monitored.

State of the stock: The state of the stock should be assessed in terms of the whole river. The area above the fishway represents about 40% of the total river area. Potential egg depositions averaged 37% of the target above the fishway in 1974-1988 compared to 127% in 1992-1994 and 187% in 1995.

STOCK: Torrent River (above the fishway), (SFA 14A)

TARGET: 1.5 million eggs (~ 867 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Returns to fishway									
Small	2296	1415	2347	4009	3592	5799	38	2815	1509
Large	82	73	169	222	331	611	3	523	113
Angling catch below fishway									
Small	222	150	477	179	227	331	0	340	118
Large	4	1	6	15	9	36	0	18	3
Approximate total returns to river²									
Small	2518	1565	2824	4188	3819	6130	96	3155	1626
Large	82	73	169	222	331	611	7	525	115
Total spawners above fishway									
Small	2296	1415	2347	4009	3592	5799	138	2815	1533
Large	82	73	169	222	331	611	3	523	113
% of Target eggs met (small + large)³									
	221%	176%	314%	538%	530%	1033%	17%	360%	195%

¹MIN, MAX, MEAN are for 1974-1991.
²Approximate because of the occurrence of spawning below the fishway.
³Potential egg depositions in 1990-1993 were calculated based on the 1985-1989 female mean wt. of 1.6 kg for small and 4.13 kg for large salmon.

Methodology: Fluvial habitat includes 516,800 m² and lacustrine habitat includes 2,323 ha of standing water. Target egg deposition is based on 2.4 eggs/m² of fluvial area and 105 eggs per ha of lacustrine area. Target eggs are to come from small salmon. Potential egg depositions were determined from the spawning escapement of small and large salmon based on a fecundity of 1783 eggs per kg estimated for Western Arm Brook. Biological characteristics used to calculate the potential egg depositions in 1974-1984 and in 1990-93 were the mean weight and percent female of small and large salmon in 1985-1989. Potential egg depositions for all other years were based on biological characteristics of the current year. Biological characteristics were from samples collected at the fishway.

Recreational fishery: The river was not open to angling in 1995 until 750 salmon had passed through the fishway. The minimum in 1994 and previous years was 1000 salmon. Angling is currently not permitted above the fishway.

Data and assessment: The salmon stock above the fishway on Torrent River was enhanced in 1972-1976 with the transfer of over 700 adult salmon from Western Arm Brook. The numbers of small and large salmon returning to the fishway in 1995 were the highest on record and the count of large salmon in 1995 was almost twice the number in 1994.

State of the stock: It is estimated that the Torrent River stock has reached its target egg deposition since 1978. The percentage of the target achieved in 1995 was 90% above the 1993 and 1994 values.

STOCK: Western Arm Brook, (SFA 14A)

TARGET: 0.91 million eggs (~ 344 small salmon)

Year	1990	1991	1992	1993	1994	1995	MIN ¹	MAX ¹	Mean ¹
Returns to counting fence									
Small	322	233	480	947	954	823	120	1578	492
Large	0	1	8	8	31	33	0	4	1
Angling catch below fence:									
Small							0	171	41
Large							0	2	0
Total returns to river:									
Small	322	233	480	947	954	823	233	1578	533
Large	0	1	8	8	31	33	0	5	2
Smolt counts and sea survival²									
Counts	10563	13453	15405	13435	9284	15144	5735	20653	12424
%Survival	2.2%	3.6%	6.1%	7.1%	8.9%		2.2%	12.1%	4.9%
Spawning escapement above fence									
Small	322	233	480	947	954	789	120	1578	468
Large	0	1	8	8	31	30	0	4	1
% Target eggs met (small + large)									
	114%	68%	151%	288%	292%	284%	31%	287%	111%
¹ MIN, MAX, MEAN are for 1974-1991.									
² Sea survivals are based on smolt to small salmon returns the following year. Min. max., and mean are for the years 1971 to 1995.									

Methodology: Fluvial habitat includes 290,000 m² and lacustrine habitat includes 2,017 ha of standing water. Target egg deposition is based on 2.4 eggs/m² of fluvial area and 105 eggs per ha of lacustrine area. Target egg requirements are to come from small salmon. Total returns to the river are based on counts at the fence and angling catches below the fence. Potential egg depositions were calculated from the total spawning escapement of small and large salmon based on 1783 eggs per kg of females and biological characteristics observed at the fence in the current year.

Recreational fishery: The recreational fishery on this river has been closed since 1987 because of high angling exploitation below the counting fence.

Data and assessment: Complete adult and smolt counts at the counting fence are available since 1971. Adults from Western Arm Brook were transferred above the fishway in Torrent River in 1972-1976. Maximum transfers in a given year were 238 fish.

State of the stock: Potential egg depositions in 1974-1991 averaged 111% of the target. The percentages of the target achieved in 1993-1995 were among the five highest observed since 1974.

Forecast: The number of smolt counted on Western Arm Brook in 1995 was 63% above the count in 1994. Therefore, assuming that the smolt-to-adult survival rate in 1996 will be similar to that of 1995, returns of small salmon in 1996 are expected to exceed target requirement.

