Status of Atlantic salmon in the
Restigouche River, 1987

by

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ABSTRACT

During 1987, about 10,500 1SW and 11,300 MSW salmon were estimated to have returned to the Restigouche River. Despite a larger proportion of 3SW salmon in the spawning run than in 1986, total returns of MSW salmon in 1987 were only about 50% of the returns forecasted in the 1986 assessment (21,883 MSW salmon were forecasted). This discrepancy resulted from either a poor forecast methodology (the 1987 forecast was based on an extrapolation), or from significantly higher mortalities of MSW salmon at sea than usual (natural or fishing mortality). Egg deposition in 1987, based on angling data and field spawner counts, was estimated to be about 42.3 million eggs which was about 60% of spawning requirements for the Restigouche. Assuming average (1983 to 1987) returns to the Restigouche River in 1988, total returns could be about 12,900 MSW salmon and 8,500 1SW salmon. To improve the Restigouche assessment, research is critically needed to: 1. develop an alternate method of forecasting MSW salmon returns, and 2. estimate the angling exploitation rate for both 1SW and MSW salmon in recent years.

RESUME

En 1987, on a estimé à, respectivement, 10 500 et 11 300 le nombre de saumons unibermarins (UBM) et pluribermarins (PBM) qui sont revenus dans la rivière Restigouche. En dépit d'une grande proportion de saumons tribermarin (TBM) dans la remontée, par rapport à 1986, la remontée totale de saumons PBM de 1987 ne correspondait qu'à environ 50 % de la valeur prévue au cours de l'évaluation de 1986 (21 883 saumons PBM). Cet écart peut s'expliquer par une mauvaise méthode de prévision, la prévision pour 1987 reposant sur une extrapolation, ou par une mortalité en mer des saumons PBM, par pêche ou de causes naturelles, plus élevée que normale. La ponte de 1987 a été estimée, à partir des données de la pêche sportive et du dénombrement sur place des géniteurs, à 42,3 millions d'oeufs environ, ce qui correspond à environ 60 % de l'objectif établi pour la Restigouche. Si l'on se base sur des remontées moyennes (1983 à 1987), la remontée totale dans la Restigouche devrait être de 12 900 saumons PBM et de 8 500 saumons UBM environ en 1988. L'amélioration de l'évaluation des remontées dans la Restigouche exige que des recherches soient réalisées afin: 1) d'élaborer une autre méthode de prévision des remontées de saumons PBM et 2) d'estimer le taux d'exploitation de la pêche sportive des saumons UBM et PBM au cours des dernières années.

INTRODUCTION

The objective of this report is to provide a biological assessment of Atlantic salmon (Salmo salar) in Restigouche River for 1987. Landings of salmon from the Native and angling fisheries are summarized, escapement in 1987 is estimated from angling data, juvenile densities and spawner counts, and a forecast for salmon returns in 1988 is provided.

The management plan in the Restigouche River in 1987 was a continuation of a five-year conservation program initiated in 1984. Commercial fisheries in Baie des Chaleurs remained closed in both Québec and New Brunswick. Anglers in New Brunswick were required to release all multi-sea-winter (MSW) salmon ($\geq$ 63 cm) and catches of 1SW salmon were restricted by season, possession, and daily bag limits of ten, six and two fish, respectively. Québec anglers were allowed to land both 1SW and MSW salmon, with a daily and seasonal limit of one and seven fish, respectively. Québec anglers fishing in Québec/New Brunswick boundary waters, however were required to release all MSW salmon. For both provinces, it was illegal to retain salmon caught by non-salmon commercial gear (by-catch).

Native fishermen at Restigouche, Québec were allocated a salmon quota of 6,995 kg. Native fishermen at Eel River Bar, New Brunswick did not have a quota.

METHODS

1.   Angling and Native catch-and-effort data

Salmon catch-and-effort statistics for 1987 were available from essentially the same sources as in previous years. Angling data from Québec portions of the Restigouche River were provided by the Ministère du Loisir, de la Chasse et de la Pêche (MLCP). New Brunswick data were provided monthly by DFO fishery officers (mainly from camp logbooks), and Crown Reserve angling data were from the Department of Natural Resources and Energy (DNRE). Catches were identified as being 1SW or MSW salmon ($\geq$ 63 cm). Effort was given in rod-days where one rod-day was one fisherman fishing a river for any portion of one day.

Numbers of MSW salmon caught and released by anglers in New Brunswick from 1984 to 1987 were estimated using three methods: (i) correlation between catch and release of salmon at four angling camps and total Restigouche catch, 1970 to 1983 (Table 1); (ii) correlation between Québec angling and New Brunswick angling catches, 1970 to 1983 (Table 2); and (iii) reported catch-and-release data from DFO fishery officers.

Native fishery landings from Restigouche, Québec, were provided by MLCP, and data for Eel River Bar, New Brunswick, were reported from the Band Council office to DFO on a weekly basis. Counts of salmon at the

Upsalquitch fish barrier, monitored since 1980, were provided by DNRE. Counts of salmon at two estuarial monitoring traps (1985 to 1987) were provided by MLCP.

Biological characteristics of Atlantic salmon entering Restigouche River in 1987 were obtained from samples collected at the Native fishery and/or the estuarial traps (Fig. 1). Salmon were measured (FL to nearest cm) and aged.

2. Recruitment

Densities of juvenile salmon (ages 0+ and 1+) were estimated by electrofishing at 15 sites in the Restigouche River in 1987. Densities (number per 100m^2) were calculated using the removal method (Zippin 1956) and 95% confidence intervals were calculated after individual site counts were transformed (ln X+1). To identify long-term trends, mean densities at the same 15 sites were compared from 1972 to 1987. Densities of age 1+ parr (year i) were used to estimate numbers of spawners (year i-2) from 1970 to 1985 (see Section 3, Method 2).

3. Spawning escapement in 1987

As in previous assessments, two methods were used to estimate spawning escapement in 1987:

Method 1: Spawning escapement was calculated as angling catch/angling exploitation, minus angling and broodstock removals. An angling exploitation rate of 0.2 was used (Chadwick and Randall 1983). Total returns were calculated as the sum of escapement, harvest and poaching and disease removals. Because spawner count data suggest angling exploitation may be substantially higher than 0.2 (Table 3) escapement was also estimated using exploitation rates of 0.3 and 0.4 for comparison.

Method 2: A ratio of spawner to angled fish of 0.70 was used (Table 4). This ratio differed from the 1986 value (0.87; Randall et al. 1987) because (1) 1987 parr densities were included (2) the standard 15 sites were used in all years rather than all sites and (3) the overall average ratio was calculated as the sum of spawners divided by sum of angled fish rather than the mean of individual year ratios. Annual egg depositions were back-calculated from small parr densities assuming 10% survival (Elson 1957, 1974; Chadwick 1982), and a rearing area of 29,768,000 m2. Spawners were calculated by dividing egg deposition by the average number of eggs per MSW spawner (Randall 1984). Escapement in 1987 was estimated as the product of the spawner to angled fish ratio and angling catch (minus broodstock removals) in 1987.

Spawning surveys have been conducted on all major tributaries of the Restigouche River each autumn by DNRE and MLCP staff since 1982. Fishery staff canoe sections of the river and make visual counts of all salmon observed. Results of these surveys (including a preliminary 1987 count) are compared with spawner estimates from Methods 1 and 2 above.

In past assessments, mortalities due to poaching and disease were assumed to be 2 000 MSW and 1 000 1SW salmon each year, regardless of run strength. For this assessment, an estimate of poaching and disease mortality rate was estimated from data collected at the NW Upsalquitch River barrier (Table 5). Mortalities of salmon within the enclosure were recorded and divided into furunculosis (determined by internal and external examinations for lesions) and other (fence related etc.) deaths. After the fish were released from the enclosure in late September and before spawning, spawner and/or redd counts were made to provide an estimate of survival to spawning. These results indicated a total poaching and disease mortality rate of 0.14 and 0.16 for 1SW and MSW salmon, respectively (Table 5). Potential biases in this mortality estimate are: 1. furunculosis mortality may be higher at the enclosure than elsewhere because the fish are held at a high density; 2. poaching mortalities may be higher elsewhere in the Restigouche because fish are exposed to poachers throughout the season, not just from time of release (late September) to spawning. Despite these biases, this estimate of mortality is probably more realistic than assuming the constant numbers of fish as in previous assessments.

Mortalities from stress of catch-and-release of MSW salmon were estimated from observations at five angling camps. Camp managers provided data on the number of MSW salmon caught and released in their stretch of water, and an estimate of the total mortalities they observed that may have resulted from catch-and-release stress (i.e., no physical indication of furunculosis lesions on the fish). These estimates were made in 1985 and 1986 as well.

Egg deposition requirements for the total Restigouche River are 71,443,200 eggs (Randall 1984). About 12,200 MSW salmon are required to produce these eggs, and an additional 2,600 1SW salmon are required to ensure a 1:1 sex ratio at spawning.

4. Forecast

Returns of MSW salmon to the Restigouche River in 1988 were predicted using two methods: 1. from a significant correlation between 1SW salmon at Kedgwick Lodge (year i) and total MSW returns (year i+1). This method has been used in previous assessments (Chadwick et al. 1984; 1985; Randall et al. 1985; 1986; 1987). 2. from historic (1983-1987) averages. Returns of 1SW salmon were also predicted from previous five-year averages.

RESULTS

1. Landings

Landings of MSW salmon in Québec portions of the Restigouche watershed decreased to 873 fish in 1987 from 1,418 fish in 1986, a decrease of 38% (Table 6). Effort (rod-days) was the same in both years. Québec catches in 1987 were 16% below the long-term average (Table 2).

Estimates of numbers of MSW salmon caught and released in New Brunswick in 1987 are given below:

Method	R2	NB catch	Total catch minus camps	Total catch (NB and PQ)
1. Camps versus total angling	0.87	3,980	4,157	4,853
2. PQ vs NB angling	0.52	2,530	---	3,403
3. Reported by DFO officers	---	3,228	---	4,101

Method 1, which uses data from four angling camps to predict total numbers of MSW salmon caught and released in New Brunswick, was judged to be the best estimate, as in previous assessments (Randall et al. 1985; 1986; 1987). New Brunswick catch-and-release data from Method 1 indicated catches in 1987 decreased by 46% from 1986 (3,980 from 7,418; Table 2). Angling effort was similar in both years (Table 6). MSW salmon catches in New Brunswick in 1987 were above average (20%); however, recent catch-and-release data (1984 to 1987) are probably not comparable to historic landing data because of the possibility of recaptures and the inclusion of releases that may not have been landed (i.e., catch and release data may give higher estimates of angling catch than actual landing data).

Landings of 1SW salmon in Québec increased in 1987 (591 fish) from 1986 (498 fish) by 19% (Table 2). Landings in New Brunswick, however, decreased from 1986 (4,915 fish) to 1987 (4,477 fish), by 9%. Landings of 1SW salmon in both provinces were above long-term averages (Table 2). Returns of both 1SW and MSW salmon in 1987, judging from angling data, were above average (particularly 1SW salmon).

Reported landings from Native fisheries at Eel River Bar indicated increased catches of both MSW salmon and in particular 1SW salmon from 1986

to 1987 (Table 6). However, effort increased between years, from 12 gill nets and one trap in 1986 to 12 gill nets and two traps in 1987. Native fishermen at Restigouche, Québec reported catching only 661 MSW and 3 1SW salmon in 1987 (3,959 kg, or 57% of the quota). However, two facts suggested that the quota was attained: 1. catches of MSW salmon at the lower estuarial trap were significantly higher during June in 1987 (Table 8 and Fig 3.)than 1986 when the quota was achieved and 2. the Band Council agreed to stop fishing on 30 June. Therefore, we assumed that 986 MSW and 5 1SW salmon were landed (Table 6); these estimates were calculated by dividing the quota (6,995 kg) by the average weight of landed salmon (7.06 kg; n=408), and using the 1SW:MSW ratio in the reported landings. The duration of the fishery in 1987 was similar to 1986 but much shorter than in previous years (Fig. 2).

Total salmon landings in the Restigouche River from 1951 to 1987 are provided in Table 7.

Returns of 1SW and MSW salmon to the Upsalquitch barrier were down in 1987 from 1986 by 11 and 15%, respectively, but were substantially above the long term averages (Table 8). In contrast, catches of both 1SW and MSW salmon were greater at the lower estuary trap in 1987 compared to 1986 (1SW salmon increased by 77%; MSW salmon increased by 72%). Salmon catches at the upper trap were not comparable between years because the trap location was changed.

Judging from catches at the lower estuarial trap, salmon returned slightly later in June in 1987 than in 1986 (see cummulative % by 15 June, Fig. 3), but run-timing was generally similar in both years. Samples from the lower estuarial trap indicated 3SW salmon were larger than in 1986 (Table 9). Of the MSW salmon component of the run, age 3SW salmon were relatively more abundant in 1987 than in 1986 (Table 9). Most (74%) 1SW salmon were from the 1983 year-class (1982 spawners), 2SW salmon were mainly from the 1982 year-class (70%) and 3SW salmon were mainly from the 1981 year-class (78%). In each case, these represent fish that smoltified at age 3.

2.   Recruitment

Mean densities of juvenile salmon from 15 standard sites are compared to mean densities at all sites surveyed annually since 1972 in Table 10. Both age 0+ and age 1+ densities were significantly correlated between the two data sets (Table 10, lower). Mean densities of both 0+ and 1+ salmon were above average in 1987 (Table 10; Fig. 4).

3. Spawning escapement

3.1 1987

For estimating spawning escapement in 1987, angling catches of 4,853 MSW salmon and 5,068 1SW salmon were used in Methods 1 and 2 (Table 2). The MSW salmon catch included fish landed in Québec and fish caught and released in New Brunswick. Mortality rate attributed to catch-and-release stress was estimated to be 5% (as in 1986):

	Catch and release	Mortalities	Proportion
Camp 1	149	4	0.03
Camp 2	65	10	0.15
Camp 3	83	12	0.14
Camp 4	339	10	0.03
Camp 5	255	6	0.02
Total	891	42	0.05

Spawning escapements as estimated using Method 1 (angling exploition rate of 0.2) and Method 2 (spawner/angled fish ratio of 0.70) are given below:

	Method 1		Method 2	
	MSW	1SW	MSW	1SW
1. Total returns	30,374	29,921	11,309	10,475
2. Harvest in estuary	1,487	456	1,487	456
3. Harvest in river	873	5,068	873	5,068
4. Poaching and disease[1]	4,622	4,125	1,572	1,403
5. Broodstock	40	0	40	0
6. Catch-and-release mortality[2]	199	---	199	---
7. Spawners	23,153	20,272	7,138	3,548
8. Target spawners	12,200	2,600	12,200	2,600
% target achieved	190%	780%	59%	136%

[1] 0.16 and 0.14 of river returns for MSW and 1SW salmon, respectively
[2] 0.05

Methods 1 and 2 indicated potential egg depositions of 137.4 X 10^6 eggs (193% of requirements) and 42.3 X 10^6 eggs (about 60% of requirements), respectively. Field surveys by DNRE wardens in 1987 resulted in spawner counts of 3,578 1SW salmon and 7,124 MSW salmon which were remarkably close to the estimates from Method 2. (Note that DNRE estimates of spawners are preliminary; A. Madden, pers. comm.).[1]

Numbers of MSW salmon forecasted to return in 1987 were 21,883 fish (14,145 - 29,622) (Randall et al. 1987). Total returns from Method 2 in this assessment were therefore only 52% of the forecast, and were outside of the confidence interval. Total returns of 1SW salmon were 16% greater than forecasted (10,475 versus 9,060).

3.2 Spawners and total returns, 1970 to 1987

All indices of spawning escapement in Restigouche River from 1970 to 1987, including MSW salmon angling catches, parr densities and field spawner counts are summarized in Table 11. Regression analyses indicated that all indices were correlated except field spawner counts and resulting parr densities; however sample sizes in the latter comparisons were too small to be meaningful.

Spawning escapement and total returns of MSW salmon for the period 1970 to 1987 were calculated using Methods 1 and 2. For comparative purposes, three angling exploitations were used in Method 1 (0.2, 0.3 and 0.4)[2], and three different sets of spawner/angled fish ratios were used in Method 2 (annual ratios for all sites, for 15 standard sites (Table 4), and an average ratio of 0.70). Estimated spawners and total returns from the three sets of ratios in Method 2 were similar (Table 12); an average ratio of 0.70 was judged to be the most suitable because it was not influenced by year to year variability in angling catches and parr densities, both of which may be affected by environmental conditions such as water levels. Spawning escapements estimated using the 0.70 spawner/angled fish ratio were remarkably close to field survey estimates for the period 1982 to 1987 (Table 12). Spawning escapement and total returns as estimated from the lower angling exploitation rates exceeded the ratio estimates considerably (Table 12). However, a higher exploitation rate (0.4) indicated spawning levels and returns that were more comparable to both the ratio estimates and the field surveys.

Estimated spawners and total returns of 1SW salmon to Restigouche River, 1970 to 1987, are calculated in Table 13 (using a spawner/angled fish ratio of 0.70). Numbers of spawners observed during field surveys from 1982 to 1987 were similar to these estimates in all years.

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[1] Updated information indicated total spawner counts of 3930 1SW salmon and 8535 MSW salmon.

[2] These exploitation rates are for river returns after mortalities for poaching and disease (PAD) are subtracted. For MSW salmon, with a PAD rate of 0.16, corresponding exploitation rates on total returns would be less, i.e., 0.17, 0.25 and 0.34.

4. Forecast for 1988

MSW salmon returns in 1988 were predicted using the correlation between 1SW salmon catch at Kedgwick Lodge (year i) and total MSW salmon returns (year i+1). The regression equation was:

$$y = 9,214.48 + 41.3 \ x \qquad R^2 = 0.29; \ df = 16; \ P = 0.022$$

where y = MSW salmon returns (year i+1)
x = 1SW salmon catch, Kedgwick Lodge (year i)

$$y \ (1988) = 19,046 \ (9,474 - 28,619)$$

Data for this regression are given in Table 14. Note that this forecast for 1988 should be used with caution for the following reasons: 1. the correlation is highly dependant on the 1969-70 data point (Table 14), and 2. the 1987 1SW salmon catch at Kedgwick Lodge was the highest of all preceding years. The forecast for 1988 is therefore based on an extrapolation.

Assuming average (1983-1987) returns to the Restigouche River in 1988, total returns could be about 12,900 MSW salmon and 8,500 1SW salmon. After losses to poaching and disease, 1988 MSW returns would potentially be 1,400 fish short of the target spawning requirement; 1988 1SW returns could be 4,700 fish in excess of spawning requirements.

DISCUSSION

Returns of 1SW salmon were apparently similar in 1987 to 1986 in the Restigouche River. Returns of MSW salmon, however, were less than in 1986 and significantly less than forecasted in the 1986 assessement. Judging from angling catches and a calculated spawner/angled fish ratio of 0.7, total returns were estimated to be about 11,300 salmon, compared to a forecast of 21,900 (14,100-29,600). These results indicate the method of forecasting MSW salmon in the Restigouche is unreliable, at least in some years. Catches of 1SW salmon at Kedgwick Lodge in 1986 (on which the 1987 forecast of MSW salmon returns was based) were greater than in previous years (Table 14) and thus the 1987 prediction was an extrapolation. Kedgwick Lodge catches in 1987 were high, and the forecast of MSW salmon returns in 1988 is also an extrapolation and therefore should be used with caution. The methodology for forecasting salmon returns to Restigouche River is presently being reviewed in detail. It should also be noted however that returns of MSW salmon were significantly less than forecasted in the Miramichi and Saint John rivers in 1987 (ACFF Subcommittee Report 87/14), suggesting marine mortality outside of home waters (natural or fishing mortality) may have been higher than usual for several New Brunswick stocks.

Despite poorer MSW salmon returns in 1987 than expected, the management plan in effect potentially allowed a high proportion of returns to

survive to spawn in 1987 (63%; Table 13). Both the spawner to angled fish ratio and preliminary data from field surveys indicated about 7,000 MSW salmon spawned, suggesting about 60% of egg deposition requirements were met.

Both Methods 1 and 2 in this assessment utilize angling catches to estimate total returns and spawning escapement of salmon. We accepted Method 2 as being the best method because numbers of estimated spawners from Method 2 were about equal to estimates of spawners (both 1SW and MSW salmon) from field surveys. Accepting a spawner/angled fish ratio of 0.70, and a poaching and disease mortality rate of 0.16 implies an angling exploitation rate of > 0.40 for MSW salmon. This relationship can be seen when comparing spawners and returns from Method 2 and Method 1 using different angling exploitation rates (Table 12). As exploitation increases, estimates of spawners from the two Methods converge. Whether or not an angling exploitation rate of > 0.40 is reasonable for Restigouche salmon, however, needs to be confirmed. Exploitation is potentially high because of the characteristics of the river: salmon return early in the season and thus are exposed to anglers during the entire angling season, and the water is clear and many anglers only fish where they can see fish. Nevertheless, an independent estimate of exploitation rate is required for Restigouche salmon.

Because Method 2 is dependent on angling catches, the estimates of spawners in 1987 may be an underestimate. Water levels were unusually low during the angling season (Fig. 5), and angling catches tend to be lower in low water years in the Restigouche River (Randall unpublished data). Indices of salmon returns that were independant of angling catches (e.g., trap and barrier counts) indicated salmon returns similar to or higher than in 1986. These discrepancies emphasize the need for a permanent counting facility on the Restigouche River that can be used to monitor salmon returns each year independently of the angling and Native fisheries.

Assuming average returns of salmon in 1988, 1SW returns could be about 8,500 fish and MSW salmon returns could be about 12,900 fish. After mortalities from poaching and disease (0.14 for 1SW and 0.16 for MSW salmon), these returns would result in a deficit of about 1400 MSW salmon and a surplus of 4700 1SW salmon to spawning requirements.

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Table 1.   Catch of MSW salmon at four index angling camps (Chadwick et al. 1984) and total catch in the Restigouche River.

Year	MSW salmon angling catch	
	Angling camps	Total catch minus camps
1970	277	1,765
1971	194	822
1972	601	4,440
1973	571	4,321
1974	959	4,989
1975	494	2,407
1976		
1977	909	5,798
1978	615	4,410
1979	353	1,470
1980	905	5,252
1981	602	3,638
1982	453	2,129
1983	409	1,659
1984	490	(2,836)[1]
1985	859	(5,203)[1]
1986	1,233	(7,603)[1]
1987	696	(4,157)[1]

[1] Total catches from 1984 to 1987 were estimated from the correlation between catch at the angling camps (x) and total catch (y) 1970 to 1983; $y = -308.7 + 6.4(x)$; $R^2 = 0.87$, $P < 0.01$.

Table 2. Estimated angling catches of salmon in the Restigouche River, 1970 to 1987.

Year	MSW			1SW			Proportion MSW
	PQ	NB	Total	PQ	NB	Total	
1970	326	1,716	2,042	166	1,340	1,506	0.58
1971	259	757	1,016	173	999	1,172	0.46
1972	1,171	3,870	5,041	111	978	1,089	0.82
1973	1,146	3,746	4,892	147	1,423	1,570	0.76
1974	1,163	4,785	5,948	129	1,038	1,167	0.84
1975	741	2,160	2,901	149	1,130	1,279	0.69
1976	1,029	4,481	5,510	377	2,345	2,722	0.67
1977	1,579	5,128	6,707	459	2,333	2,792	0.71
1978	1,652	3,373	5,025	282	1,322	1,604	0.76
1979	826	997	1,823	556	1,990	2,546	0.42
1980	2,059	4,098	6,157	409	2,833	3,242	0.66
1981	1,408	2,832	4,240	635	3,010	3,645	0.54
1982	962	1,620	2,582	402	2,449	2,851	0.48
1983	587	1,481	2,068	181	715	896	0.70
1984	570	[2,756][1]	[3,326]	348	1,474	1,822	0.65
1985	752	[5,310]	[6,062]	259	3,258	3,517	0.63
1986	1,418	[7,418]	[8,836]	498	4,915	5,413	0.62
Mean (70-86)	1,038	3,325	4,363	311	1,974	2,284	0.65[2]
1987	873	[3,980]	[4,853]	591	4,477	5,068	0.49

[1] Estimates in parenthesis [ ] include MSW salmon released in New Brunswick. New Brunswick catch-and-release data (1984 to 1987) were estimated from a correlation between four angling camps and total angling catch (Table 1).

[2] Mean proportion MSM calculated after arcsine transformation.

Table 3.   Estimated angling exploitation rates (U) in Restigouche River, 1982 to 1987.   Numbers of spawners were estimated from field surveys and returns were estimated assuming a poaching and disease rate of 0.16 for MSW and 0.14 for 1SW salmon.

Yr	1SW				MSW salmon				
	Angling	Spawners	Returns	u	Angling	Landings	Spawners	Returns	u
1982	2,851	1,577	5,149	0.55	2,582	2,582	3,563	7,315	0.35
1983	896	986	2,188	0.41	2,068	2,068	2,397	5,315	0.39
1984	1,822	1,374	3,716	0.49	3,326	708	5,233	7,073	(0.10)
1985	3,517	2,111	6,544	0.54	6,062	1,177	7,898	10,804	(0.11)
1986	5,413	5,190	12,329	0.44	8,836	1,789	9,542	13,489	(0.13)
1987	5,068	3,578	10,053	0.50	4,853	1,072	7,124	9,757	(0.11)

( ) catch-and-release of MSW salmon in New Brunswick.

Table 4. Ratios of spawners per angled fish in Restigouche River, 1970 to 1985. Spawners were calculated from parr densities from all sites (Columns 2. and 6.) and from 15 standard sites (Columns 3. and 7.).

1.	2.	3.	4.	5.	6.	7.	8.	9.
Year (i)	Parr.m^{-2} (i + 2)	Parr.m^{-2} (i + 2)	Eggs/MSW salmon	Angling catch	Spawners (2.)	Spawners (3.)	Spawner/Angled (2.)	(3.)
1970	0.021	0.025	5,933	2,042	1,054	1,254	0.52	0.61
1971	0.025	0.028	5,933	1,016	1,254	1,405	1.23	1.38
1972	0.068	0.061	5,661	5,041	3,576	3,208	0.71	0.64
1973	0.099	0.048	6,282	4,892	4,691	2,275	0.96	0.47
1974	0.085	0.069	6,056	5,948	4,178	3,392	0.70	0.57
1975	0.043	0.039	6,565	2,901	1,950	1,768	0.67	0.61
1976	0.081	0.063	6,441	5,510	3,744	2,912	0.68	0.53
1977	0.071	0.059	5,445	6,707	3,882	3,226	0.58	0.48
1978	0.039	0.038	6,094	5,025	1,905	1,856	0.38	0.37
1979	0.035	0.024	6,155	1,823	1,693	1,161	0.93	0.64
1980	0.041	0.033	4,700	6,157	2,597	2,090	0.42	0.34
1981	0.068	0.078	5,933	4,240	3,412	3,914	0.80	0.92
1982	0.050	0.073	5,933	2,582	2,509	3,663	0.97	1.42
1983	0.100	0.104	5,933	2,068	5,017	5,218	2.43	2.52
1984	0.066	0.075	5,933	3,326	3,311	3,763	1.00	1.13
1985	0.094	0.094	5,933	6,062	4,716	4,716	0.78	0.78
Sum				65,340	49,489	45,821		
Mean ratio							0.76	0.70

Table 5. Counts of salmon at Upsalquitch barrier, 1982 to 1986, and estimated survival at spawning.

| | Arrivals at barrier | | Mortalities at barrier | | | | Poaching mortalities above barrier | | Spawners | | Proportion lost | | | | | |
| | | | Furunculosis | | Other | | | | | | Furunculosis at barrier | | Poaching above the barrier | | Furunculosis & above barrier | |
Year	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW
1982	819	622	16	46	6	1	203	127	594	448	.02	.07	.25	.20	.27	.28
1983	430	301	18	18	2	1	0	0	410	282	.04	.06	.00	.00	.04	.06
1984	518	642	7	40	5	2	131	174	375	426	.01	.06	.25	.27	.27	.33
1985	748	517	5	2	4	1	105	83	634	431	.01	.00	.14	.16	.15	.16
1986	1,738	1,166	11	7	1	4	86	55	1,640	1,100	.01	.01	.05	.05	.06	.05
Mean (82-86)[1]	851	650	11	23	4	2	105	88	731	537	.02	.03	.11	.10	.14	.16
1987	1,544	988	18	48	2	0					.01	.05				

[1] Mean proportions calculated after arcsine transformation.

Table 6. Preliminary 1987 nominal landings and effort in Restigouche River from Native and angling fisheries. Landings for 1986 and 1985 (updated from Randall et al. 1987) given for comparison.

Fishery	1987			1986			1985		
	MSW	1SW	Effort	MSW	1SW	Effort	MSW	1SW	Effort
Native									
N.B.	501	451		431	26		241	0	
P.Q.	986	5		1,145	4		976	35	
Angling									
N.B.	----	4,477	10,217	----	4,915	10,098	----	3,258	10,499
P.Q.	873	591	7,805	1,418	498	7,811	752	259	5,759
Total	2,360	5,524		2,994	5,443		1,969	3,552	

Table 7. Commercial, angling and Native salmon landings from Baie des Chaleurs
and Restigouche River, 1951 to 1987. Data sources given in Appendices 1 to 4.

Year	Commercial 1SW	Commercial MSW	Angling 1SW	Angling MSW	Native 1SW	Native MSW	Total
1951		42,453					(46,149)[1]
1952		39,619					(45,758)
1953		31,893					(35,042)
1954		31,327					(34,683)
1955		18,356					(20,705)
1956		15,167					(17,829)
1957		19,916					(23,686)
1958		26,791					(36,496)
1959		32,035					(35,513)
1960		30,618	627	2,427			33,672
1961		21,970	125	3,135			25,230
1962		27,428	203	3,236			30,867
1963		24,097	1,621	5,793			31,511
1964		28,775	136	6,788			35,699
1965		39,547	4,071	3,526			47,144
1966		33,310	1,909	2,138			37,357
1967		34,728	1,341	3,020			39,089
1968		26,719	465	745			27,929
1969		18,356	1,489	1,512			21,357
1970		18,180	1,506	2,042			21,728
1971		8,967	1,172	1,016			11,155
1972	36	23	1,089	5,041			6,189
1973	1,272	295	1,570	4,892			8,029
1974	132	68	1,167	5,948			7,315
1975	163	1,026	1,279	2,901	3	132	5,504
1976	5,107	225	2,722	5,510	13	1,641	15,218
1977	1,134	168	2,792	6,707	19	2,950	13,770
1978	1,522	156	1,604	5,025	23	129	8,459
1979	83	671	2,546	1,823	169	896	6,188
1980	1,986	9	3,242	6,157	58	1,827	13,279
1981	3,045	3,534	3,645	4,240			14,464
1982	2,202	4,437	2,851	2,582	148	1,521	13,741
1983	1,552	4,569	896	2,068	32	1,476	10,593
1984	7,161	2,026	1,822	570	178	1,283	13,040
1985	0	0	3,517	752	35	1,217	5,521
1986	0	0	5,413	1,418	30	1,576	8,437
1987	0	0	5,068	873	456	1,487	7,884

1Totals from 1951 to 1959 include angling landings for which the 1SW to MSW
ratio was unknown.

Table 8.   Counts of salmon at a fish barrier on NW Upsalquitch River, 1980
to 1987, and in two estuarial traps, 1985 to 1987.

Year	1SW	MSW	Total
Upsalquitch barrier			
1980	843	887	1,730
1981	789	481	1,270
1982	819	622	1,441
1983	430	301	731
1984	518	642	1,160
1985	748	517	1,265
1986	1,738	1,166	2,904
Mean (80-86)	841	659	1,500
1987	1,544	988	2,532
Estuarial traps			
Lower			
1985	16	52	68
1986	64	109	173
1987	113	188	301
Upper			
1985	34	34	68
1986	109	59	168
1987	468	254	722

Table 9. Biological characteristics of salmon in Restigouche River. Data for 1985 to 1987 from salmon sampled at the Native fishery and/or estuarial traps (Fig. 1). For comparison, data for 1972 to 1980 (Dalhousie trap; Peppar 1983) are also given. Fork length and sea age data includes previous spawners; smolt age composition is for virgin salmon. (PS = previous spawners; y-c = year class).

1. Fork length

	1SW			2SW			3SW			PS		
	n	X	SD	n	X	SD	n	X	SD	n	X	SD
1972-1980	1,488	53.2	2.7	699	76.5	4.8	291	92.0	4.2	46	95.0	11.1
1985	48	53.2	3.7	45	75.7	4.7	29	92.0	4.3	9	91.9	14.7
1986	170	56.3	3.1	136	77.2	4.2	14	91.4	4.2	13	98.5	10.5
1987	552	55.1	3.1	273	78.6	4.4	97	93.4	3.3	57	96.6	8.7

2. Smolt age, 1987

	1SW			2SW			3SW		
	n	%	y-c	n	%	y-c	n	%	y-c
2	114	22	1984	112	22	1983	26	17	1982
3	382	74	1983	354	70	1982	116	78	1981
4	22	4	1982	43	8	1981	7	5	1980

3. Sea age, %

	1SW	2SW	3SW	PS
1972-1980	39	43 (70)[1]	15	3
1985	24	38 (50)[1]	30	8
1986	38	50 (81)[1]	7	5
1987	38	39 (63)[1]	16	7

[1] % of MSW salmon which were 2SW.

Table 10. Juvenile salmon densities (number per 100 m^2) in the Restigouche
River, 1972 to 1987. (n = number of sites).

1	2	3	4	5	6	7
		All Sites			Standard Sites	
Year	n	Age 0+	Age 1+	n	Age 0+	Age 1+
1972	21	4.8	2.1	15	5.2	2.5
1973	25	18.0	2.5	15	22.0	2.8
1974	26	12.9	6.8	15	13.1	6.1
1975	31	32.6	9.9	15	28.6	4.8
1976	29	14.7	8.5	15	13.3	6.9
1977	34	17.2	4.3	15	14.7	3.9
1978	38	23.8	8.1	15	19.5	6.3
1979	40	10.4	7.1	15	6.1	5.9
1980	42	10.5	3.9	15	9.3	3.8
1981	45	16.3	3.5	15	18.9	2.4
1982	47	8.4	4.1	15	11.2	3.3
1983	51	23.9	6.8	15	25.4	7.8
1984	51	25.1	5.0	15	25.1	7.3
1985	45	23.0	10.0	15	25.2	10.4
1986	30	24.2	6.6	15	23.9	7.5
1972-86 mean		17.7	5.9		17.4	5.5
1987	--	----	----	15	42.0	9.4

Correlations:

	r	P	n
3 with 6	0.94	0.001	15
4 with 7	0.77	0.001	15
3 with 4 (lagged 1 yr)	0.55	0.043	14
6 with 7 (lagged 1 yr)	0.71	0.003	15

Table 11. Summary of indices of spawning escapement in the Restigouche River, 1970 to 1987. Indices include angling catches in New Brunswick as estimated by DNRE and DFO, catches from Québec (PQ), parr densities in New Brunswick (15 sites), and spawner counts from field surveys.

1	2	3	4	5	6	7	8
		MSW angling catch			Parr densities		Spawners
Year	DNRE	DFO	PQ	Total	0+	1+	
1970	746	1,716	326	2,042	----	2.5	-----
1971	560	757	259	1,016	5.2	2.8	-----
1972	2,291	3,870	1,171	5,041	22.0	6.1	-----
1973	2,528	3,746	1,146	4,892	13.1	4.8	-----
1974	3,600	4,785	1,163	5,948	28.6	6.9	-----
1975	1,671	2,160	741	2,901	13.3	3.9	-----
1976	1,874	4,481	1,029	5,510	14.7	6.3	-----
1977	2,599	5,128	1,579	6,707	19.5	5.9	-----
1978	2,167	3,373	1,652	5,025	6.1	3.8	-----
1979	661	997	826	1,823	9.3	2.4	-----
1980	3,419	4,098	2,059	6,157	18.9	3.3	-----
1981	2,780	2,832	1,408	4,240	11.2	7.8	-----
1982	1,269	1,620	962	2,582	25.4	7.3	3,563
1983	710	1,481	587	2,068	25.1	10.4	2,397
1984	1,401	2,756	570	3,326	25.2	7.5	5,233
1985	3,214	5,310	752	6,062	23.9	9.4	7,898
1986	4,372	7,418	1,418	8,836	42.0	----	9,542
1987	-----	3,980	873	4,853	----	----	7,124

[1]DNRE angling catch for 1984 as adjusted by S. O'Neil (pers. comm.)

Correlations:

	r	P	n	
2 with 3	0.90	0.001	17	
2 with 4	0.71	0.001	17	
3 with 4	0.57	0.014	18	
3 with 6	0.60	0.014	16	
3 with 7	0.31	NS	16	
3 with 6	0.69	0.004	15	(1983 excluded)
3 with 7	0.55	0.035	15	(1983 excluded)
5 with 8	0.96	0.003	6	
8 with 6	0.67	NS	5	
8 with 7	-0.07	NS	4	

Table 12. Estimated spawners (S, upper) and returns (R, lower) of MSW salmon to Restigouche River, 1970 - 1987. Spawners and returns were estimated using three angling exploitation rates (Method 1) and three sets of spawner/angled fish ratios (see text). Spawners as estimated from field surveys also given (1982-1987).

Year	Method 1 0.2 S1	Method 1 0.3 S2	Method 1 0.4 S3	Method 2 All Sites S4	Method 2 15 Sites S5	Method 2 0.70 S6	Field Surveys
Spawners							
1970	8,168	4,765	3,063	1,062	1,246	1,429	-----
1971	4,064	2,371	1,524	1,250	1,402	711	-----
1972	20,164	11,762	7,561	3,579	3,226	3,529	-----
1973	19,568	11,415	7,338	4,696	2,299	3,424	-----
1974	23,792	13,879	8,922	4,164	3,390	4,164	-----
1975	11,604	6,769	4,351	1,944	1,770	2,031	-----
1976	22,040	12,857	8,265	3,747	2,920	3,857	-----
1977	26,828	15,650	10,060	3,890	3,219	4,695	-----
1978	20,100	11,725	7,537	1,909	1,859	3,517	-----
1979	7,292	4,254	2,734	1,695	1,167	1,276	-----
1980	24,628	14,366	9,235	2,586	2,093	4,310	-----
1981	16,960	9,893	6,360	3,392	3,901	2,968	-----
1982	10,328	6,025	3,873	2,505	3,666	1,807	3,563
1983	8,272	4,825	3,102	5,025	5,211	1,448	2,397
1984	15,888	10,345	7,573	5,910	6,342	4,912	5,233
1985	29,096	18,993	13,941	9,576	9,576	9,091	7,898
1986	42,354	27,627	20,264	13,725	13,195	13,195	9,542
1987	23,153	15,065	11,020	7,429	7,138	7,138	7,124

Returns Year	R1	R2	R3	R4	R5	R6	
1970	30,335	26,283	24,258	21,875	22,094	22,313	
1971	15,015	12,999	11,991	11,664	11,846	11,023	
1972	30,030	20,027	15,026	10,285	9,865	10,225	
1973	29,415	19,708	14,855	11,710	8,856	10,196	
1974	35,473	23,672	17,771	12,106	11,185	12,106	
1975	18,426	12,670	9,792	6,926	6,718	7,029	
1976	34,664	23,732	18,265	12,886	11,902	13,017	
1977	43,041	29,734	23,080	15,734	14,935	16,692	
1978	30,196	20,226	15,241	8,541	8,481	10,455	
1979	12,418	8,801	6,993	5,756	5,126	5,256	
1980	38,486	26,269	20,161	12,244	11,658	14,297	
1981	28,773	20,360	16,153	12,620	13,226	12,115	
1982	21,327	16,204	13,643	12,014	13,397	11,184	
1983	18,355	14,252	12,200	14,490	14,711	10,230	
1984	23,107	16,508	13,208	11,228	11,743	10,040	
1985	37,301	25,273	19,259	14,063	14,063	13,486	
1986	54,172	36,640	27,874	20,090	19,459	19,459	
1987	30,374	20,745	15,931	11,655	11,309	11,309	

Table 13. Estimated spawners and total returns of MSW salmon (upper) and 1SW salmon (lower) in Restigouche River, 1970 - 1987. Spawners were estimated using a spawner/angled fish ratio of 0.7.

Year	Harvest Estuary	Harvest River	MSW Released	PAD	Spawners (S)		Returns (R)	S/R
MSW Salmon								
1970	18,180	2,042	-----	661	1,429		22,313	0.06
1971	8,967	1,016	-----	329	711		11,023	0.06
1972	23	5,041	-----	1,633	3,529		10,225	0.35
1973	295	4,892	-----	1,584	3,424		10,196	0.34
1974	68	5,948	-----	1,926	4,164		12,106	0.34
1975	1,158	2,901	-----	939	2,031		7,029	0.29
1976	1,866	5,510	-----	1,784	3,857		13,017	0.30
1977	3,118	6,707	-----	2,172	4,695		16,692	0.28
1978	285	5,025	-----	1,627	3,517		10,455	0.34
1979	1,567	1,823	-----	590	1,276		5,256	0.24
1980	1,836	6,157	-----	1,994	4,310		14,297	0.30
1981	3,534	4,240	-----	1,373	2,968		12,115	0.24
1982	5,958	2,582	-----	836	1,807	(3,563)[1]	11,184	0.16
1983	6,045	2,068	-----	670	1,448	(2,397)	10,230	0.14
1984	3,309	742[2]	3,326	1,077	4,912	(5,233)	10,040	0.49
1985	1,217	1,214[2]	6,062	1,963	9,091	(7,898)	13,486	0.67
1986	1,576	1,826[2]	8,836	2,862	13,195	(9,542)	19,459	0.68
1987	1,487	1,112[2]	4,853	1,572	7,138	(7,124)	11,309	0.63
1SW Salmon								
1970	0	1,506		417	1,054		2,977	
1971	0	1,172		324	820		2,317	
1972	36	1,089		301	762		2,189	
1973	1,272	1,570		435	1,099		4,376	
1974	132	1,167		323	817		2,439	
1975	166	1,279		354	895		2,694	
1976	5,120	2,722		753	1,905		10,501	
1977	1,153	2,792		773	1,954		6,672	
1978	1,545	1,604		444	1,123		4,716	
1979	252	2,546		705	1,782		5,285	
1980	2,044	3,242		897	2,269		8,453	
1981	3,045	3,645		1,009	2,551		10,250	
1982	2,350	2,851		789	1,996	(1,577)	7,986	
1983	1,584	896		248	627	(986)	3,355	
1984	7,339	1,822		504	1,275	(1,374)	10,941	
1985	35	3,517		973	2,462	(2,111)	6,987	
1986	30	5,413		1,498	3,789	(5,190)	10,730	
1987	456	5,068		1,403	3,548	(3,578)	10,474	

[1](Spawner counts from field surveys.)

[2]River harvests from 1984 to 1987 include catch and release mortalities of 138, 425, 371 and 199 MSW salmon, respectively, and broodstock removals of 34,37,37 and 40 MSW salmon, respectively.

Table 14. Total returns of MSW salmon to Restigouche River and catch of 1SW salmon at Kedgwick Lodge in the previous year (1969-87). Total returns are calculated in Table 13. Returns of MSW salmon predicted for 1988 are given in parenthesis.

Year (i)	Kedgwick Lodge 1SW salmon catch (year i)	Total returns of MSW salmon to Restigouche (year i+1)
1969	174	22,313
1970	124	11,023
1971	72	10,225
1972	36	10,196
1973	30	12,106
1974	27	7,029
1975	33	13,017
1976	71	16,692
1977	37	10,455
1978	25	5,256
1979	128	14,297
1980	26	12,115
1981	45	11,184
1982	69	10,230
1983	44	10,040
1984	83	13,486
1985	98	19,459
1986	199	11,309
1987	238	(19,046)
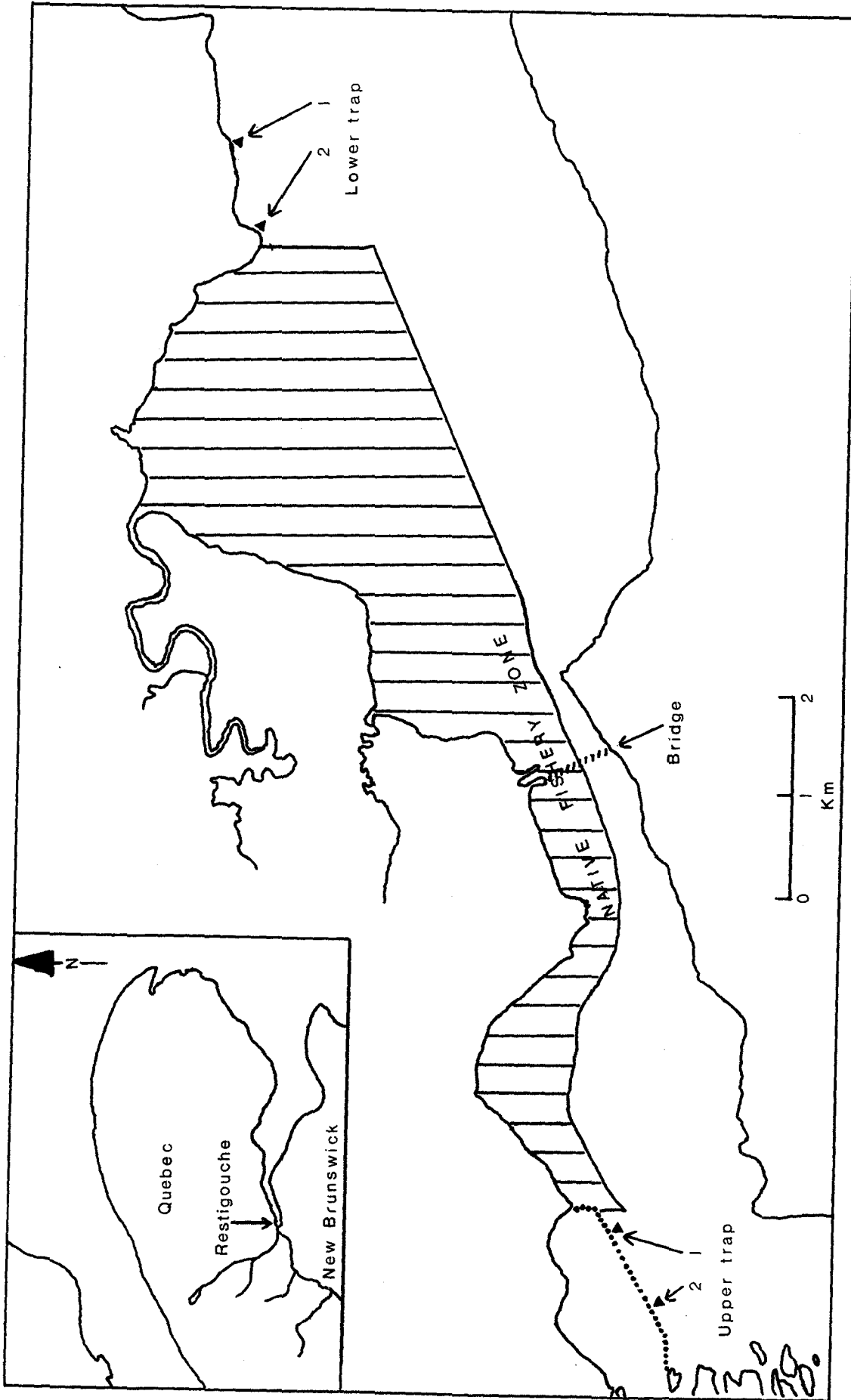
Figure 1. General location of two trap nets in the estuary of the Restigouche River, operated by the Ministere du Loisir, de la Chasse et de la Peche from 1985 to 1987. (1 is 1985 locations; 2 is 1986 and 1987 locations)
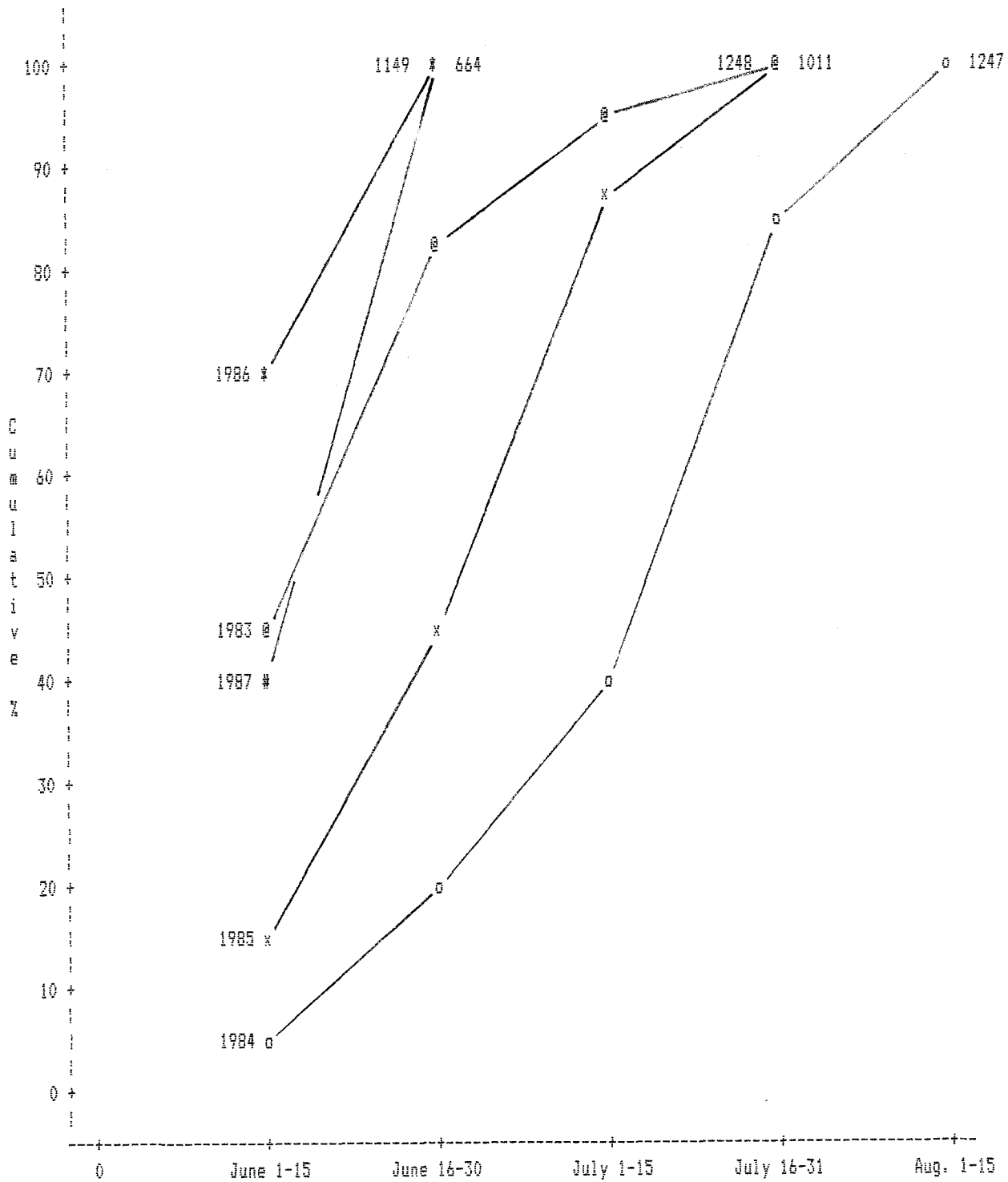
Fig. 2. Semi-monthly cumulative catch (%) of 1SW
and MSW salmon in the Native fishery at
Restigouche, Quebec, 1983 to 1987.
Total catch each year is indicated.

Legend: @ 1983 o 1984 x 1985 # 1986 # 1987
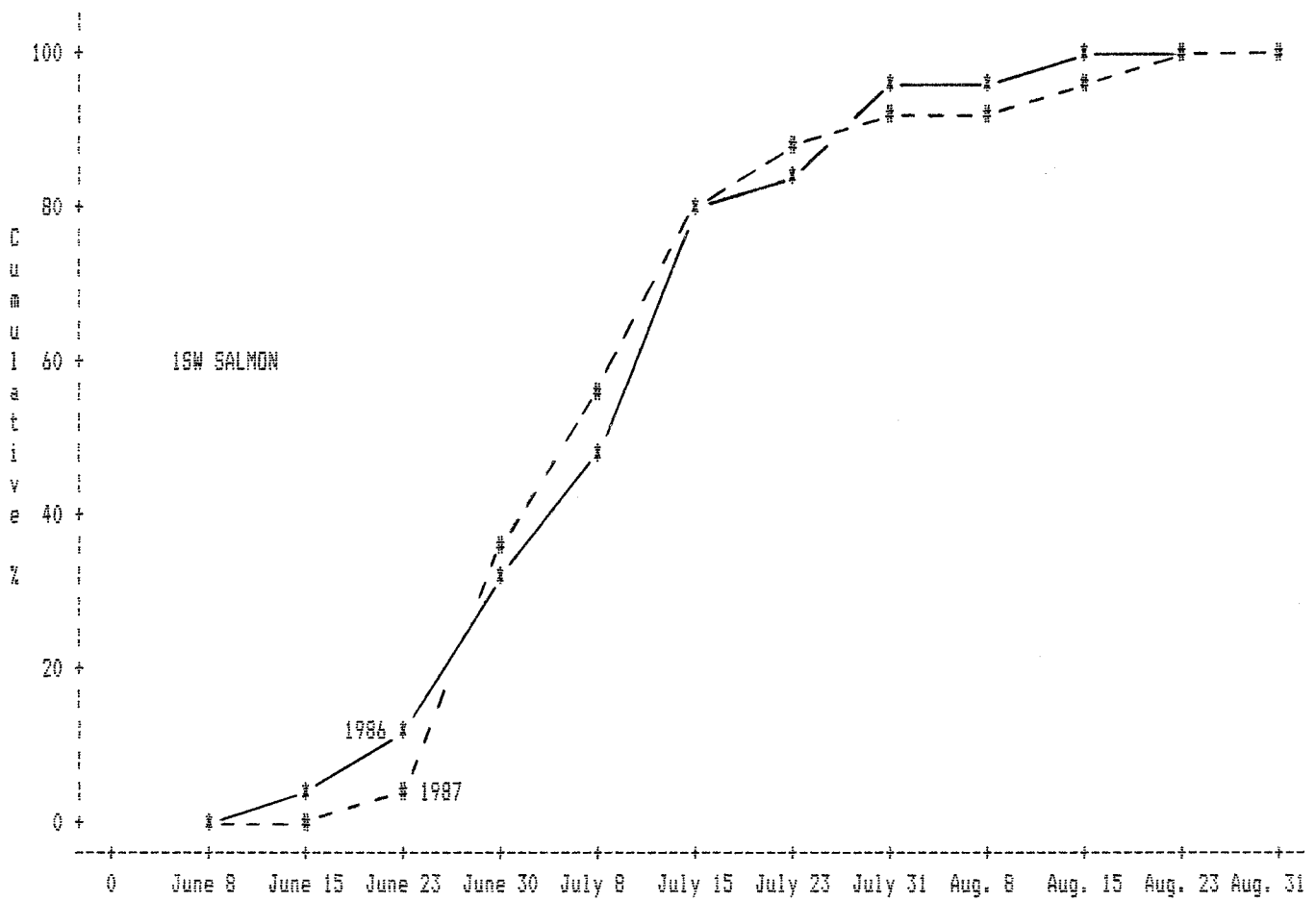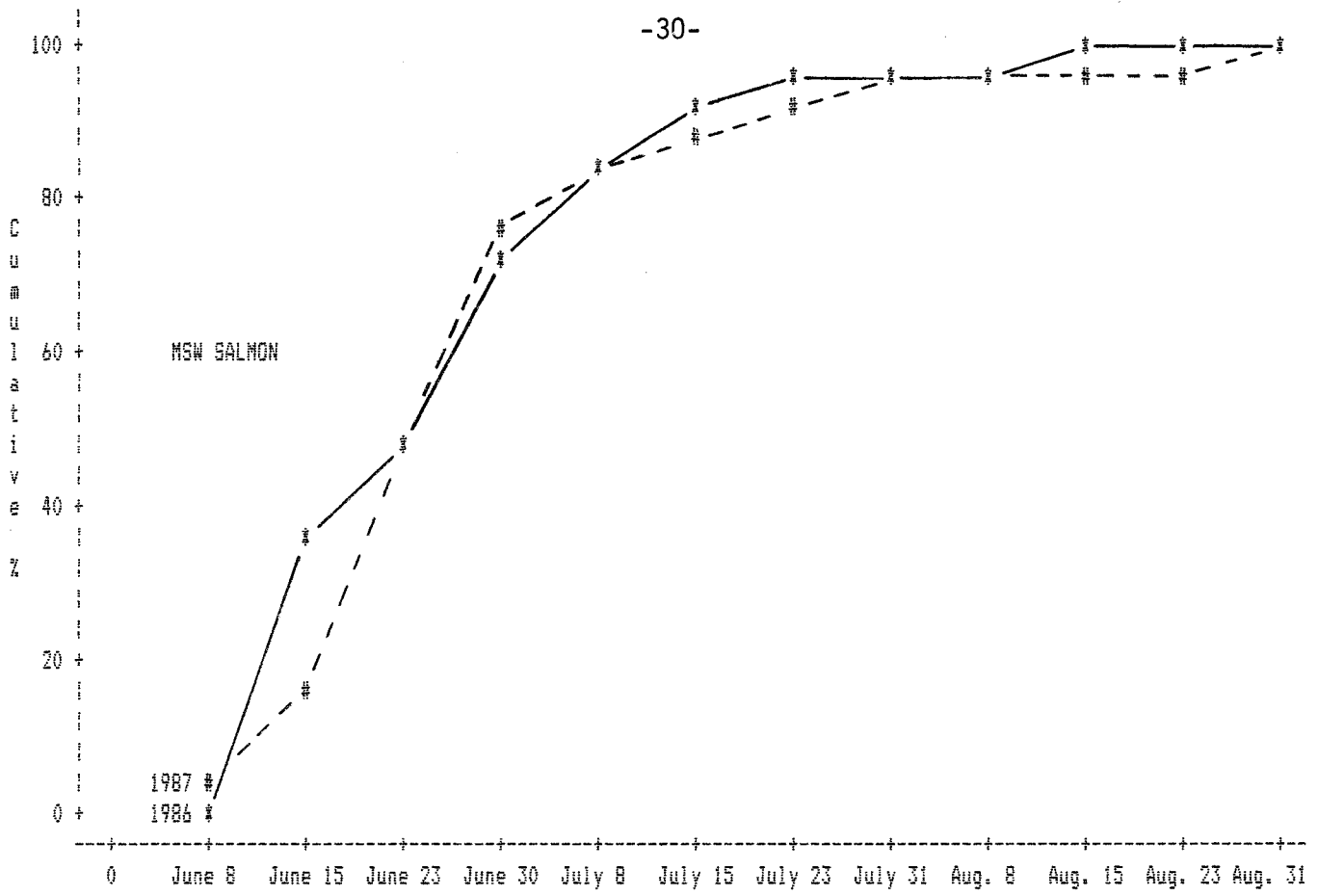
Fig. 3. Cumulative catch (%) of MSW and 1SW salmon
in the lower estuarial trap, Restigouche
River, 1986(*), 1987(#)
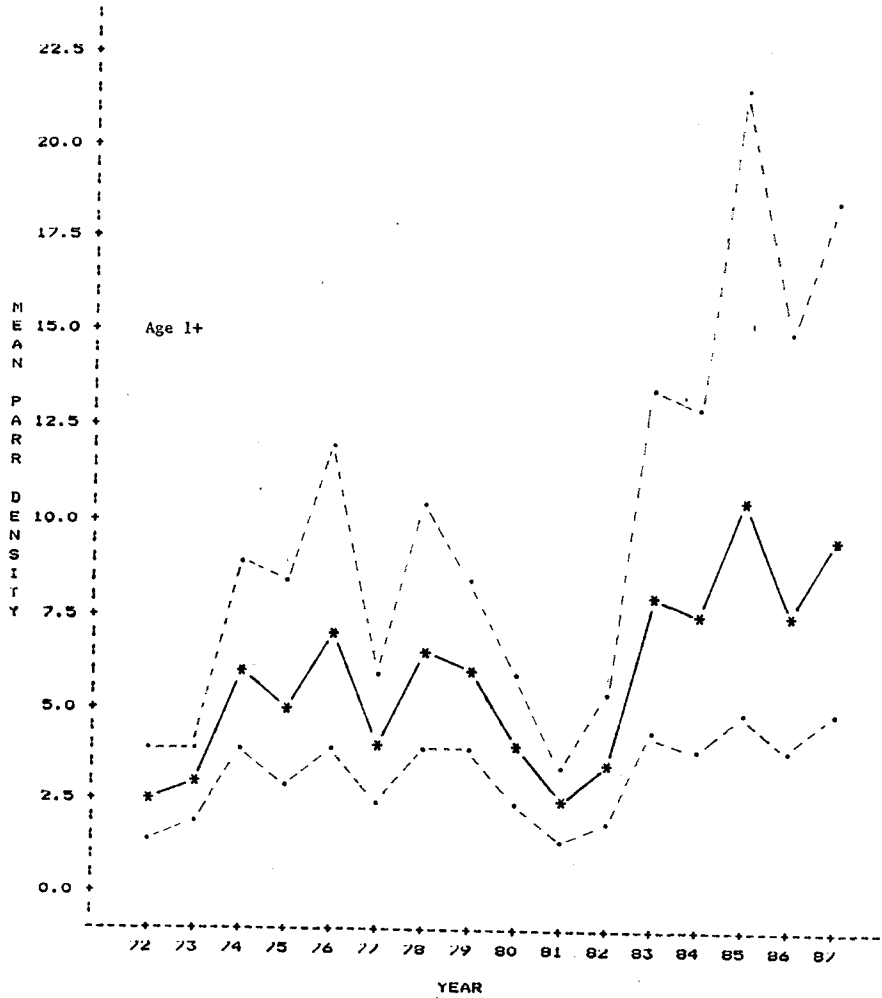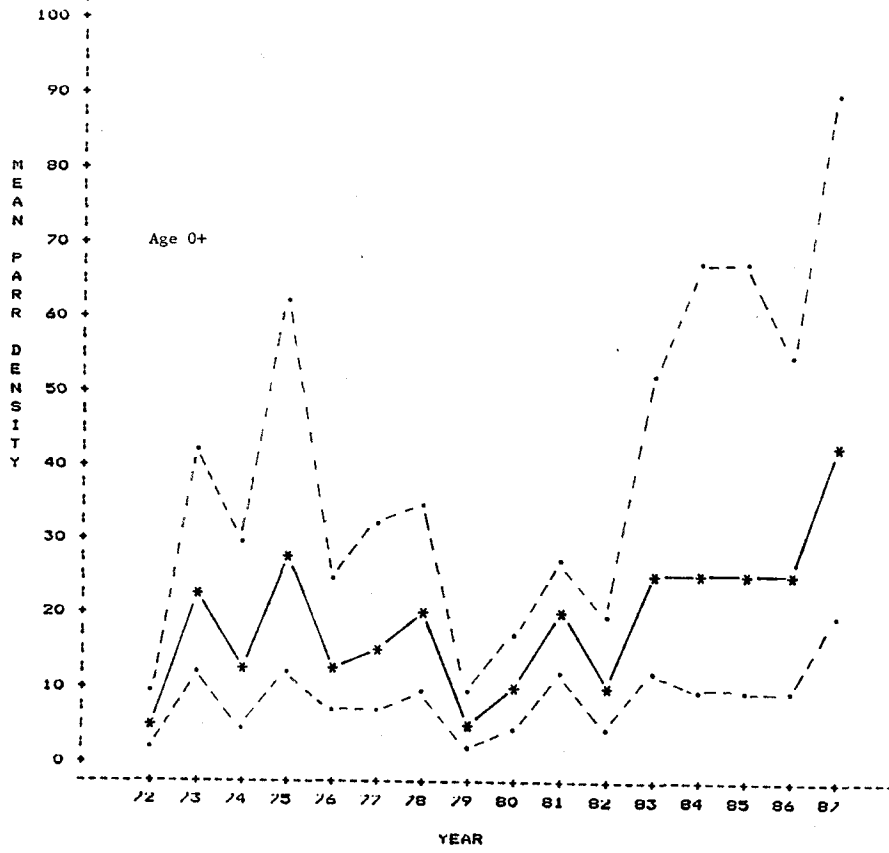
Fig. 4. Mean densities (per $100m^2$) of juvenile Atlantic salmon in the Restigouche River, 1972-87. (95% confidence intervals are indicated).

```
Percent of median

140 +      * * * * *
    !      * * * * *
    !      * * * * *
    !      * * * * *
120 +      * * * * *
    !      * * * * *
    !      * * * * *
    !      * * * * *
100 +------* * * * *------------------------------------------------
    !      * * * * *
    !      * * * * *
    !      * * * * *
 80 +      * * * * *
    !      * * * * *
    !      * * * * *
    !      * * * * *                            * * * * *
 60 +      * * * * *                            * * * * *
    !      * * * * *                            * * * * *
    !      * * * * *              * * * * *      * * * * *    * * * * *
    !      * * * * *              * * * * *      * * * * *    * * * * *
 40 +      * * * * *              * * * * *      * * * * *    * * * * *
    !      * * * * *              * * * * *      * * * * *    * * * * *
    !      * * * * *              * * * * *      * * * * *    * * * * *
    !      * * * * *    * * * * * * * * * *      * * * * *    * * * * *
 20 +      * * * * *  * * * * *   * * * * * * * * * *  * * * * *  * * * * *
    !      * * * * *  * * * * *   * * * * * * * * * *  * * * * *  * * * * *
    !      * * * * *  * * * * *   * * * * * * * * * *  * * * * *  * * * * *
    !      * * * * *  * * * * *   * * * * * * * * * *  * * * * *  * * * * *
    ------------------------------------------------------------------

         Apr.     May      June     July      Aug.      Sep.
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Fig. 5.   Mean monthly discharge, cubic meters per sec, of
          surface water in the Upsalquitch River, 1987,
          expressed as a percent of the long term median

APPENDIX 1

Commercial salmon landings from Baie des Chaleurs and Restigouche River, 1951 to 1987. Data sources given in Appendix 4.

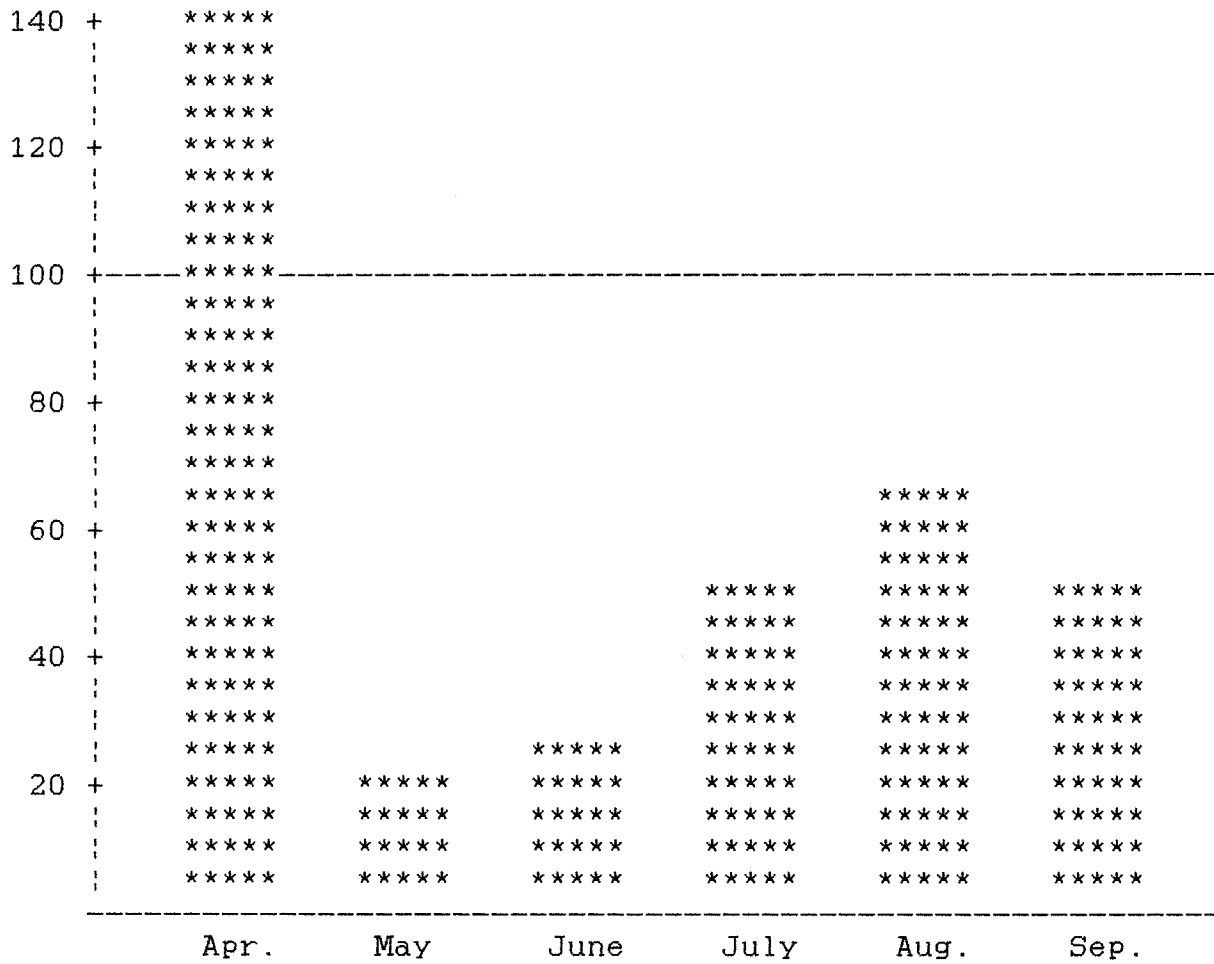| Year	New Brunswick			Québec			TOTAL
	1SW	MSW	TOTAL	1SW	MSW	TOTAL	
1951		17,718	17,718		24,735	24,735	42,453
1952		19,207	19,207		20,412	20,412	39,619
1953		16,868	16,868		15,025	15,025	31,893
1954		17,081	17,081		14,246	14,246	31,327
1955		8,221	8,221		10,135	10,135	18,356
1956		7,513	7,513		7,654	7,654	15,167
1957		9,639	9,639		10,277	10,277	19,916
1958		15,380	15,380		11,411	11,211	26,791
1959		16,159	16,159		15,876	15,876	32,035
1960		13,537	13,537		17,081	17,081	30,618
1961		12,119	12,119		9,851	9,851	21,970
1962		16,443	16,443		10,985	10,985	27,428
1963		13,820	13,820		10,277	10,277	24,097
1964		15,876	15,876		12,899	12,899	28,775
1965		22,750	22,750		16,797	16,797	39,547
1966		17,789	17,789		15,521	15,521	33,310
1967		21,404	21,404		13,324	13,324	34,728
1968		15,734	15,734		10,985	10,985	26,719
1969		10,206	10,206		8,150	8,150	18,356
1970		9,100	9,100		9,080	9,080	18,180
1971		3,949	3,949		5,018	5,018	8,967
1972	36	23	59	0	0	0	59
1973	723	168	891	549	127	676	1,567
1974	31	16	47	101	52	153	200
1975	144	906	1,050	19	120	139	1,189
1976	3,674	162	3,836	1,433	63	1,496	5,332
1977	1,134	168	1,302	0	0	0	1,302
1978	1,522	156	1,678	0	0	0	1,678
1979	83	671	754	0	0	0	754
1980	1,986	9	1,995	0	0	0	1,995
1981	3,045	3,534	6,579	0	0	0	6,579
1982	2,118	2,545	4,663	84	1,892	1,976	6,639
1983	1,467	2,227	3,694	85	2,342	2,427	6,121
1984	7,161	2,026	9,187	0	0	0	9,187
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0

APPENDIX 2

Angling salmon landings from Restigouche River, 1951 to 1987. Data sources given in Appendix 4.

Year	New Brunswick			Québec			TOTAL
	1SW	MSW	TOTAL	1SW	MSW	TOTAL	
1951			3,511	25	160	185	3,696
1952			5,662	104	373	477	6,139
1953			2,963	75	111	186	3,149
1954			2,855	127	374	501	3,356
1955			2,018	99	232	331	2,349
1956			2,328	107	227	334	2,662
1957			3,387	124	259	383	3,770
1958			9,135	220	350	570	9,705
1959			3,161	108	209	317	3,478
1960	621	2,406	3,027	6	21	27	3,054
1961	117	3,103	3,220	8	32	40	3,260
1962	202	3,236	3,438	1	0	1	3,439
1963	1,617	5,788	7,405	4	5	9	7,414
1964	0	6,480	6,480	136	308	444	6,924
1965	3,860	3,050	6,910	211	476	687	7,597
1966	1,710	1,687	3,397	199	451	650	4,047
1967	1,084	2,440	3,524	257	580	837	4,361
1968	408	617	1,025	57	128	185	1,210
1969	1,352	1,200	2,552	137	312	449	3,001
1970	1,340	1,716	3,056	166	326	492	3,548
1971	999	757	1,756	173	259	432	2,188
1972	978	3,870	4,848	111	1,171	1,282	6,130
1973	1,423	3,746	5,169	147	1,146	1,293	6,462
1974	1,038	4,785	5,823	129	1,163	1,292	7,115
1975	1,130	2,160	3,290	149	741	890	4,180
1976	2,345	4,481	6,826	377	1,029	1,406	8,232
1977	2,333	5,128	7,461	459	1,579	2,038	9,499
1978	1,322	3,373	4,695	282	1,652	1,934	6,629
1979	1,990	997	2,987	556	826	1,382	4,369
1980	2,833	4,098	6,931	409	2,059	2,468	9,399
1981	3,010	2,832	5,842	635	1,408	2,043	7,885
1982	2,449	1,620	4,069	402	962	1,364	5,433
1983	715	1,481	2,196	181	587	768	2,964
1984	1,474	0	1,474	348	570	918	2,392
1985	3,258	0	3,258	259	752	1,011	4,269
1986	4,915	0	4,915	498	1,418	1,916	6,831
1987	4,477	0	4,477	591	873	1,464	5,941

APPENDIX 3

Native salmon landings from Baie des Chaleurs and Restigouche River, 1975 to 1987. Data sources given in Appendix 4.

Year	New Brunswick			Québec			TOTAL
	1SW	MSW	TOTAL	1SW	MSW	TOTAL	
1975	3	132	135				135
1976	13	124	137	0	1,517	1,517	1,654
1977	19	212	231	0	2,738	2,738	2,969
1978	23	129	152				152
1979	84	148	232	85	748	833	1,065
1980	34	264	298	24	1,563	1,587	1,885
1981							
1982				148	1,521	1,669	1,669
1983	0	260	260	32	1,216	1,248	1,508
1984	1	213	214	177	1,070	1,247	1,461
1985	0	241	241	35	976	1,011	1,252
1986	26	431	457	4	1,145	1,149	1,606
1987	451	501	952	5	986	991	1,943

APPENDIX 4

Salmon landings for Baie des Chaleurs and Restigouche River given in Appendices 1 to 3 are from the following sources:

1. Commercial data

   New Brunswick: Districts 63, 64 and 65
   Québec: Districts 12, 13, 14 and 15

   New Brunswick and Québec commercial data for 1951 to 1969 from May and Lear (1971) and assume salmon average 6.4 kg.

   New Brunswick commercial for 1970 to 1984 from Redbooks (compiled by Department of Fisheries and Oceans, Science Branch, Halifax).

   Québec commercial for 1970 to 1981 from Bureau de la Statistique du Québec (G. Ouellet and J.P. Lebel, pers. comm.), and assume average weight and MSW/1SW ratio same as calculated from Redbooks.

   Québec commercial for 1982 to 1983 from Ministère du Loisir, de la Chasse et de la Pêche, Québec (G. Ouellet and G. Landry, pers. comm.).

2. Angling data

   New Brunswick angling data for 1951 to 1959 from Smith (1981); 1960 to 1969 from Swetnam and O'Neil (1985); 1970 to 1979 from O'Neil and Swetnam (1984); 1980 to 1983 from Swetnam and O'Neil (1984); 1984 from O'Neil et al. (1985); 1985 from O'Neil et al. (1986); and 1986 from O'Neil et al. (1987).

   Québec angling from 1951 to 1969 from New Brunswick Department of Natural Resources and Energy files (A. Madden, pers. comm.). Angling data for 1970 to 1986 from Ministère du Loisir, de la Chasse et de la Pêche, Québec (G. Ouellet, J.P. Lebel and G. Landry, pers. comm.).

3. Native data

   New Brunswick Native data for 1975 to 1982 from Department of Fisheries and Oceans, Protection and Regulations Branch files (R. Roy and M. Sullivan, pers. comm.); 1983 to 1986 from Department of Fisheries and Oceans, Resource Allocation and Development Branch, (K. Atwin, pers. comm.).

Québec Native data for 1976 to 1984 from Gaudreault (1984); 1985 and
1986 from Ministère du Loisir, de la Chasse et de la Pêche,
Québec (G. Landry, pers. comm.).

4. All 1987 data are preliminary as described in text.