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STATUS OF ATLANTIC SALMON IN THE RESTIGOUCHE RIVER IN 1996

by

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Abstract

Salmon egg deposition and large salmon spawning escapement in the Restigouche system were believed to be approximately 10-20% below the levels required for conservation, based on an angling-based population estimate and extrapolations from visual counts. Angling-based population estimates were calculated using a range of angling exploitations from 0.3 to 0.5. The exploitation rate was believed to be relatively low in 1996, probably approximating 0.3-0.35 as was the case in nearby Gaspé rivers. At an exploitation rate of 0.3, spawning escapement was approximately 11,000 large and 8,000 small salmon, which represents 93% and 304%, respectively, of the conservation requirement. Small salmon spawning escapement exceeded target according to all assessment methods. Returns (exploitation rate = 0.3) were approximately 16,000 large and 13,000 small salmon. Angling catches (retained+released) were 3,823 large and 3,414 small salmon. Large salmon catch increased by 17% relative to the five-year mean and small salmon catch was similar to the five-year mean (more than double the catch in 1995). Retained large salmon angling catch (Québec) was 1,001 fish. New Brunswick First Nations harvest was at least 213 large and 77 small salmon. Québec First Nations harvest was unknown. Densities of all juvenile age classes, determined by electrofishing, were 32-52% below the five-year means. This was unexpected since high densities of age 0 and 1 parr were sampled in 1995. Assuming average (1992-1996) returns in 1997, total returns (angling-based estimate, exploitation rate of 0.3 to 0.5) will be 9,000-15,000 large and 8,000-14,000 small salmon.

Résumé

On estime que le taux de ponte des saumons et l'échappée des grands saumons aux frayères, dans le réseau de la rivière Ristigouche, étaient à peu près de 10 à 20% inférieurs aux impératifs de conservation. Ces chiffres sont basés sur une estimation de la population effectuée à partir des résultats de la pêche à la ligne et d'extrapolations faites à partir de dénombrements visuels. Les estimations de la population selon la pêche à la ligne ont été calculées au moyen d'une fourchette de taux d'exploitation de 0,3 à 0,5. Il semble que le taux d'exploitation ait été relativement faible en 1996, s'établissant probablement aux environs de 0,3 à 0,35, comme ce fut le cas pour les rivières avoisinantes en Gaspésie. À un taux d'exploitation de 0,3, l'échappée des géniteurs a été d'environ 11 000 grands saumons et 8 000 petits saumons, ce qui représente 93% et 304% respectivement des impératifs de conservation. L'échapée aux frayères des petits saumons a dépassé les objectifs selon toutes les méthodes d'évaluation. Les remontes (selon un taux d'exploitation de 0,3) étaient d'environ 16 000 grands saumons et 13 000 petits saumons. Les taux de capture à la ligne (saumons retenus + saumons remis à l'eau) étaient de 3 823 grands saumons et 3 414 petits. Les prises de grands saumons ont augmenté de 17% par rapport à la moyenne de cinq ans et les prises de petits saumons étaient semblables à la moyenne de cinq ans (plus du double des prises de 1995). Les pêcheurs à la ligne (au Québec) ont retenu 1 001 grands saumons. Les prises des Premières Nations du Nouveau-Brunswick étaient d'au moins 213 grands saumons et 77 petits. On ne connaît pas les prises des Premières Nations du Québec. Les densités de toutes les classes d'âge de juvéniles, déterminées par la pêche à l'électricité, étaient de 32 à 52% inférieures à la moyenne des cinq ans. Voilà un résultat inattendu puisque l'on avait observé de fortes densités de tacons d'âge 0 et 1 dans les échantillons prélevés en 1995. En présumant des remontes de saumons moyennes (de 1992 à 1996) pour 1997, le total des remontes (estimation fondée sur la pêche à la ligne, taux d'exploitation de 0,3 à 0,5) se situera entre 9 000 et 15 000 grands saumons et entre 8 000 et 14 000 petits saumons.

1 - Introduction

The objective of this report is to evaluate the status of Atlantic salmon in the Restigouche River in 1996. Numbers of spawners are estimated from (1) a mark-recapture experiment, (2) angling data and exploitation rates believed to represent lower and upper limits, and (3) visual surveys of spawners. This report summarizes angling and First Nations harvest statistics, juvenile salmon densities at 15 standard electrofishing sites, hatchery stocking and broodstock collection, and forecasts of adult salmon returns in 1997. Evaluation of visual counting methodology was continued in 1996 with a tagging experiment in the Kedgwick and Little Main Restigouche rivers.

In the terminology of this report, small salmon (grilse) are adults less than 63 cm in fork length, which are comprised mainly of 1SW (one-sea-winter) maiden salmon. Large salmon (also known as salmon, MSW or multi-sea-winter salmon) are adults greater than or equal to 63 cm in fork length. This category contains mainly maiden 2SW and 3SW fish and previous spawners.

2 - Conservation requirements

The egg deposition necessary for conservation of Atlantic salmon in the Restigouche River, based on a requirement for 2.4 eggs/m^2 of habitat (Elson 1975), is 71,443,200 eggs (Randall 1984). About 12,200 large salmon are required to produce these eggs. An additional 2,600 small salmon are required to ensure a 1:1 sex ratio at spawning, based on past sex ratios of large and small salmon (Randall 1984).

The above estimate of spawning habitat is based on DFO's estimate of rearing area, 29.8 x 10^6 m^2. DNRE considers the rearing area in the system to be 32.3 x 10^6 m^2 (A. Madden unpubl. data). At the time when the current conservation requirement was determined, the DNRE estimate of rearing area was only 24 x 10^6 m^2 and consequently the larger estimate, 29.8 x 10^6 m^2, was used (Randall 1984).

Recommendation: Re-evaluation of the conservation egg deposition of the Restigouche system, as recommended in last year's stock assessment document (Locke et al. 1996) was not carried out in 1996. Adequate numbers of salmon killed in harvest fisheries were not available to determine whether sex ratios and eggs/fish have changed in response to management and regulatory changes since 1984. Collection of these data should be attempted again in 1997; in addition, rearing area and age structure of the population may have to be updated.

3 - Fisheries

3.1 - Description of fisheries

Restigouche salmon were fished by recreational anglers and First Nation communities.

Recreational angling was permitted in all tributaries and the main stem from June 1 to August 31. In Québec portions of the Kedgwick River, the season was extended to September 30. An extension of the regular season in New Brunswick waters permitted hook-and-release angling only to September 15. Anglers in New Brunswick tributaries and provincial boundary waters were required to release all large salmon. Catches of small salmon by New Brunswick license holders were restricted by seasonal and daily bag limits to eight and two fish, respectively. New Brunswick license holders angling in provincial boundary waters were regulated by Québec seasonal and daily bag limits of seven and one fish, respectively. However, for practical purposes the daily bag limit for New Brunswick anglers in provincial boundary waters was two small salmon, since Québec regulations permitted retention of a second salmon when the first fish caught in a day was a small salmon. Anglers licensed in Québec and fishing in Québec tributaries were allowed to retain both small and large salmon up to the daily and seasonal bag limits; if the first fish caught in a day was a small salmon, a second salmon could be caught and retained irrespective of size.

Most salmon captured by First Nations fisheries were gillnetted in the estuary, although some angling also took place in freshwater portions of the river, primarily the Upsalquitch system and to some extent the Kedgwick and Little Main Restigouche rivers. Gillnet fisheries were centred at Listuguj First Nation at Ristigouche, Québec, and at Eel River Bar First Nation near Dalhousie, N.B. (Fig. 1). No food-fishery trapnets were operated.

Eel River Bar First Nation's target harvest was set at 500 large and 50 small salmon to be harvested from Chaleur Bay, Crown Open waters of the Restigouche system, Benjamin River, Charlo River, Jacquet River and/or Eel River. The estuarine (Chaleur Bay) component of this harvest could be taken using up to 30 gillnets, each up to 400' in length, and up to three trapnets, during the season May 25-December 31. Salmon were to be removed from other areas by angling only during the season June 1-December 31. Jigging was specifically excluded from this agreement. The gillnet fishery was carried out from early June to mid-July (Table 1), and the freshwater angling fishery occurred through the summer and autumn.

There was no quota or harvest target for Listuguj First Nation. The fishing season agreed upon with the Québec government was June 5-July 21. In the interests of conservation, gillnet fishing was limited to five nights/week (allowing unobstructed passage of fish from 8 A.M. on Monday to 4 P.M. on Wednesday) and an area of the upper estuary immediately below the mouth of the river was designated as a conservation zone where gillnetting was not permitted.

Madawaska Maliseet First Nation fished upriver with a target harvest of 60 large and 190 small salmon to be taken from specified portions of the St. John and Restigouche (Crown Open waters of the Main Restigouche, Kedgwick and Gounamitz rivers) watersheds. Angling was the only authorized means of harvest. This license covered April 1, 1996 to March 31, 1997.

The New Brunswick Aboriginal Peoples Council received a communal license with an allocation of 45 small salmon. These salmon were to be taken by angling only, from the waters of

the Upsalquitch, Charlo, Benjamin and Jacquet rivers during August 1 through October 31; and from the waters of the Restigouche River (from the confluence of the Restigouche and Matapedia rivers for a distance of approximately 10 km upstream) during August 1 through September 15.

Commercial salmon fisheries in Chaleur Bay have been closed in Québec since 1984, and in New Brunswick since 1985. Commercial fisheries in both provinces were prohibited from landing salmon caught in non-salmon fishing gear (by-catch).

3.2 - Fishery data

Fishery data were obtained from the sources listed in Appendix 6 of Claytor et al. (1994). No data were obtained from Listuguj First Nation in 1996, so the mean estuarine catch in 1989-1993 (the five most recent years for which data were available) was used, as was also necessary in 1994 and 1995. It was assumed that there was no river component to the Listuguj salmon harvest. The salmon harvest of Eel River Bar First Nation was subdivided into estuarine and freshwater components (R. Simonson, ERBFN band council, pers. comm.). The salmon harvest of Madawaska First Nation was entirely from freshwater portions of the river.

Angling harvests (retained fish) were 1,001 large (Québec only) and 3,384 small salmon (Québec and New Brunswick combined) (Table 2).

Angling catches were much higher in 1996 than in 1995 (Table 3, Fig. 2). Angling catch of small salmon was more than double the 1995 catch. Small salmon angling catch was similar to the five-year (1991-1995) mean, and large salmon catch was 17% higher than the mean. Catches of both small and large salmon were higher than the 1995 catches in every tributary (Table 4). As usual, the majority of the catch (74% of large salmon, 78% of small salmon) was taken in New Brunswick or provincial boundary waters (Table 3). In 1996, 53% of the angled salmon were large (Table 3).

Small salmon catch per unit effort (CPUE) in 1996 was more than double the 1995 CPUE, but was 5% lower than the five-year mean (Table 5). Large salmon CPUE was 11% higher than the mean.

Landings by New Brunswick Aboriginal communities were at least 77 small salmon and 213 large salmon, which were reported by Eel River Bar First Nation, Madawaska Maliseet First Nation and the New Brunswick Aboriginal Peoples Council. New Brunswick landings decreased by 15% overall (a decrease of 34% in large salmon and an increase of 328% in small salmon) in 1996 relative to the five-year means (Table 6). Trends in Listuguj First Nation landings could not be determined; the estimated catch was 18 small and 985 large salmon (means of the 1989-1993 harvests). **Recommendation:** Harvest data is required from all fisheries; the salmon harvest of Listuguj First Nation evidently represents a large component of removals from this river, but these data have not been available since 1993. The New Brunswick Aboriginal Peoples Council, with a

communal license including the Restigouche for the first time, also did not provide data on river-specific removals but did report total catch.

Concerns expressed in the media regarding gillnetting of salmon by natives in the Upsalquitch system were not substantiated by DFO or DNRE fisheries conservation officers patrolling in this area. Native fishing in the Upsalquitch system was by angling, and no gillnetting by natives was observed or reported to officers. There is, however, believed to be a problem with non-native individuals who use gillnets for poaching in this system, and unauthorized removals are known to have taken place at the DNRE barrier pool on the Northwest Upsalquitch River. These removals compromised the quality of data collected at Ten Mile Fence in 1996, and possibly in previous years also. In addition, observations by DFO and DNRE conservation officers of salmon removed by natives accounted for at least the total reported by Eel River Bar and Madawaska Maliseet First Nations. It is likely that either these bands have underestimated their catch, or that harvest by members of other bands has not been accounted for. Jigging practices may result in high mortality of injured salmon, especially in warm-water years. **Recommendation:** There must be better monitoring of removals (all sources) of salmon from the Upsalquitch River, in order to determine whether current levels of salmon harvest in this tributary are sustainable and consistent with conservation requirements.

Total reported and estimated landings of salmon in the Restigouche system in 1996 (5,678 fish) were intermediate between landings in 1995 (3,681 fish) and in 1994 (7,244 fish) (Table 7).

4 - Research data

4.1 - Morrissey Rock trapnet

For the fifth year, a tagging trapnet was operated jointly at Morrissey Rock Pool (Fig. 1) by Eel River Bar First Nation and DFO. Design and dimensions of the trapnet were similar to those described by Locke et al. (1995). The trapnet was operated from June 11 to September 16.

In response to concerns raised by Pinkham's angling camp (located approx 1 km upriver) that interception of fish at Morrissey Rock Pool was adversely affecting their fishing success, the trapnet was lifted from Friday evening to Sunday evening each week.

During the season 73 large and 280 small salmon were counted (Table 8, Figs. 3,4). The small salmon count increased by 139% over the count in 1995 despite the reduction in fishing effort in 1996. The large salmon count decreased by 51% relative to captures in 1995, probably due to the combined effect of reduced fishing effort throughout the season and the later starting date (Fig. 4). Timing of the large salmon run was consistent with previous years (Fig. 4).

In total, 254 small salmon were tagged with blue Carlin tags and released. Fish which were visibly diseased or injured were released but not tagged. No large salmon were tagged in 1996.

The occurrence of presumed furunculosis (based on external signs such as reddish fins or other areas of the body), parasites (sea lice) and net-marked fish was lower (most instances) compared to previous years (1993-1995) in which this was recorded (Table 9). The proportion of salmon recorded with these conditions should probably be interpreted as minimum estimates of their occurrence.

"Catches" of dead salmon on the upstream side of the trapnet and leaders, recorded as an index of in-river mortality, were similar to the values recorded in 1995 and lower than reported in the previous two years (Table 10).

The proportion of tags, placed on small salmon in 1996 and recovered the same year, was 11% (28 of 254 tags) (Table 11). No tags were recovered from fish found dead in the river, unlike the high proportion (28% of recoveries, 5% of tags applied) observed in 1995. The absence of tag recoveries from dead fish is a more typical situation, as these recoveries were rare in 1992-1994. The majority of tag recoveries (82%) in 1996 were from angled fish.

Length-frequencies showed that small salmon sampled at Morrissey Rock trapnet were slightly larger than had been observed in the previous three years (Fig. 5). Length-frequencies in the large salmon categories seemed to be more evenly represented among age classes than in previous years sampled (Fig. 6). There was a smaller proportion of fish <80-85 cm, probably representing fish aged 2SW, than had occurred in 1993-1995.

4.2 - Upsalquitch fish barrier

Returns to the barrier fence operated by DNRE at 10 Mile Pool on the Northwest Upsalquitch River (Fig. 1) were 959 small and 587 large salmon (Table 12). These returns represent a decrease of 16% relative to the 5-year mean for small salmon, and a decrease of 25% for large salmon. Large salmon comprised 38% of the total run to the fence, compared to 40% on average in the past five years. Run timing was later than usual for large salmon and earlier than usual for small salmon (Fig. 7). The quality of data obtained from this barrier fence in 1996 may have been compromised by the poaching known to have taken place here. There is no estimate of the number of fish poached.

4.3 - Causapscal fish barrier

Returns to Ministère de l'Environnement et de la Faune (MEF)'s barrier fence on the Causapscal River (a tributary of the Matapedia River; Fig. 1) were 4 small salmon and 441 large salmon (Table 12). Large salmon numbers increased relative to the five-year mean by 18%, similar to the proportional change in large salmon angling catch and CPUE summed over the Restigouche system (Table 5). Since small salmon are not retained well by the conduit fence, their proportional change is not a valid indicator of abundance of small fish at the Causapscal fence.

4.4 - Pre-spawner surveys (snorkel)

4.4.1 - Abundance estimates

Snorkelling counts were carried out by MEF/LFN in the Matapedia and Patapedia rivers, and by DFO/DNRE in the Kedgwick and Little Main Restigouche rivers. The Upsalquitch and Main Restigouche rivers were not surveyed. The method used varied with river size and water clarity. For the most part, observations were made by divers, but when conditions allowed (clear water, weak current), some counts were conducted from canoes. Counts were made just before the spawning season when salmon were still concentrated in pools.

The MEF/LFN divers provided a single count for each tributary. In small tributaries such as the upper Patapedia and Causapscal rivers, one diver drifted downriver counting all salmon. In intermediate-size tributaries (e.g. the lower reaches of the Patapedia River), the team included a diver and a canoeist. The canoe preceded the diver downriver, so as to form a 45° angle with the bank, and funnel salmon towards the diver, who was responsible for counting. In large and deep rivers, such as the Matapedia River, two divers and a canoe formed a 45° angle with the bank. As they drifted downriver, the first diver was responsible for counting fish passing between himself and the canoe. The second diver counted all other fish.

The DFO/DNRE divers in the Little Main Restigouche River provided counts for salmon in pools over approximately 8 km of the river. Salmon counted from canoes by W. Hooper and associates (DNRE, Fredericton), while conducting other work in adjacent areas of the Little Main Restigouche River on the same day that the diver counts were being done, were added to the total.

Each of the DFO/DNRE divers in the Kedgwick River provided a separate count of salmon by pool so that observer variability could be examined. A team of two divers accompanied by a canoeist surveyed each section. Each diver drifted through each of the pools one or more times in order to obtain the best possible count of salmon in the time available. The total number of fish in the area counted was determined based on individual counts (where there was substantial difference in experience levels of the divers, the count of the more experienced diver was usually selected unless some other factor affected the relative quality of the two counts) or counts averaged over the two observers (where experience was reasonably similar). The methods by which the total count was obtained were determined after consultation with each team of divers and are documented on a case-by-case basis in Appendix 1.

Abundance of spawners observed by these methods in 1996, excluding the Upsalquitch and Main Restigouche rivers, was 5,064 large and 2,178 small salmon (Table 13a). The mean counts in 1994-1995, for approximately the same areas, were 3,925 large and 1,959 small salmon. Thus, the numbers of salmon counted in 1996 were 29% (large salmon) and 11% (small salmon) higher than the mean numbers counted in 1994-1995. Including all tributaries and the main stem, the mean counts in 1994-1995 were 6,627 large and 3,940 small salmon. If the same proportions of

1996:1994-95 observations hold for the whole system as for the areas sampled in 1996, the whole-system abundances for 1996 would have been 8,550 large and 4,380 small salmon. If the diver counts underestimate the number of salmon by 20%, as suggested by MEF (G. Landry, unpub. data), then the adjusted estimate for 1996 would be 10,260 large and 5,256 small salmon. Section 4.4.2 provides preliminary data which suggest that the diver counts may underestimate abundance by as much as 30% (see below); if so, the adjusted estimate for 1996 would be 11,115 large and 5,694 small salmon.

4.4.2 - Accuracy of abundance estimates

The accuracy of abundance estimates obtained from DFO/DNRE divers in the Little Main Restigouche and Kedgwick rivers was examined using a tag observation experiment. Streamer tags, visible to divers on both sides and above the salmon, were attached near the posterior edge of the dorsal fin of salmon seined during broodstock collections. Streamer-tagged salmon were released following measurement of fork length and collection of a scale sample. Yellow tags were applied to 63 large and 34 small salmon at Kedgwick Forks Pool on September 10 and orange tags were applied to 9 large and 10 small salmon at Junction Pool on September 17. Because the sample size of orange tags was small, the following discussion refers only to the yellow-tagged sample.

During the diver surveys on September 23-25, no tags were observed in the Little Main Restigouche River (Appendix 1). However, 67% of the tags applied to large salmon at Kedgwick Forks Pool, and 76% of the small salmon tags, were observed in the Kedgwick River (Table 14). Overall, about 70% of the tagged fish from Kedgwick Forks were observed during snorkelling. The similarity of the proportions of small and large salmon tags observed suggests that accuracy of counting was about the same for each size class.

The approximately 30% of streamer-tagged salmon which were not seen presumably moved up the North Kedgwick River above Gin Creek (the uppermost limit of snorkelling) or the South Kedgwick River (which was not snorkelled, although some pools were spot-checked from the bank and no salmon were seen), moved downstream into the Main Restigouche River below Junction Pool (unlikely because no yellow tags were seen between Connors Pool and Junction Pool), were present in the stretch counted but were not observed by the snorkellers, had lost their tags, or were removed by natural mortality, native anglers, or poachers. **Recommendation:** Continue to evaluate the performance of visual counts by divers. Repeat and expand the streamer-tagging experiment to determine whether similar proportions of tagged fish are observed annually and in different river stretches. Expand coverage of diver counts to the whole system.

4.5 - Spawner surveys (canoe)

Spawner surveys were carried out by DNRE, MEF, and DFO (Conservation & Protection) personnel in autumn, as close as possible to the time of spawning when fish were observed on gravel bars. Fish were counted in New Brunswick and provincial boundary waters by observers

standing in canoes while poling downstream. Areas inaccessible to canoes were walked. Counts provided for Québec waters have been collected as described in section 4.4 since 1992, but were carried out from canoes in previous years. DNRE collates the data from various sources and provides abundance estimates for each tributary. Redd counts or historical abundance relationships between parts of the system were used to estimate spawner abundance in areas not sampled. Barrier fence counts were added to the totals for the Northwest Upsalquitch and Causapscal rivers.

The estimated abundance of spawners in the entire system in 1996 was 8,193 large and 3,559 small salmon (Table 13b). In 1996, 35% of spawners were reported from the Matapedia, 19% from the Upsalquitch, 16% from the Kedgwick, 14% from the Little Main Restigouche, 10% from the Patapedia and 7% from the Main Restigouche River (Table 15). The proportion of spawners found in the Upsalquitch and Main Restigouche rivers decreased relative to the five-year mean proportions, while that of the other tributaries increased.

4.6 - Hatchery stocking and broodstock collection

In total, 320,000 eyed eggs, 97,070 feeding fry and 134,988 age 0 parr were distributed by the Charlo Salmonid Enhancement Centre (Table 16).

Adults to be used as broodstock were collected from Forks Pool in the Kedgwick River (52 female large salmon, 43 male large salmon), Junction Pool at the confluence of the Kedgwick and Little Main Restigouche rivers (40 female large salmon, 14 male large salmon, 3 male small salmon) and Ten Mile barrier fence on the Northwest Upsalquitch River (3 female large salmon, 2 male large salmon). A total of 1,046,796 eggs (503,818 Kedgwick, 519,384 presumed Little Main Restigouche, and 23,594 Upsalquitch River stock) was collected (1.5% of the egg requirement for the Restigouche system).

4.7 - Electrofishing

Juvenile salmon were electrofished by DFO at 15 standard sites during July and August (Fig. 1). Abundances were calculated by the removal method (Zippin 1956). Densities of juveniles per unit area were determined using site areas measured at the time of sampling. Ninety-five percent confidence intervals of the mean densities were calculated after individual site counts were transformed to natural logarithms. Densities of salmon fry and parr have been estimated at these sites each year since 1972.

Densities of all juvenile age classes were low in 1996. Mean densities of 44.1 age 0, 8.7 age 1 and 1.5 age 2 parr$\times 100$ m^{-2} had decreased by 35%, 32% and 52%, respectively, relative to their five-year means (Table 17, Fig. 8). This decrease in density was not surprising in the case of age 0 parr, given the low spawning escapement estimated in 1995 (Locke et al. 1996). However, the low age 1 and 2 parr densities were unexpected given the large densities of these cohorts observed in

1995 (Table 17). The low abundance of all juvenile age classes suggests that poor overwintering survival may have been responsible.

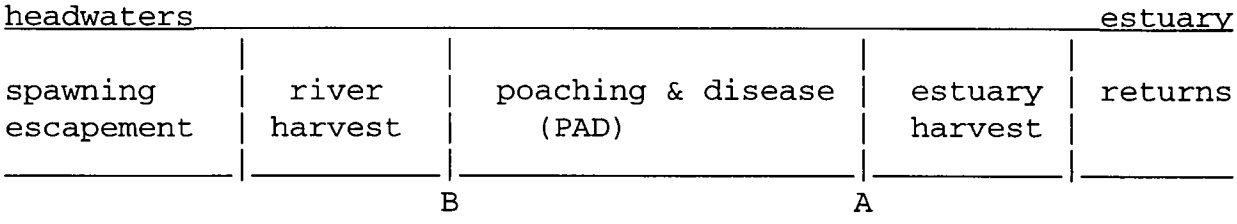
Densities of juveniles were generally higher at electrofishing sites on the Kedgwick River than at the sites on the Main and Little Main Restigouche rivers (Fig. 9).

5 - Estimation of stock parameters

5.1 - Angling-based estimate

Total returns were considered to be the sum of estuary harvest, river harvest, poaching and disease (PAD) removals, and spawning escapement.

Returns = Estuary harvest + PAD + River harvest + Escapement



Estuary harvest is First Nations harvest.

An adjustment for mortality resulting from poaching and disease is normally excluded from calculations of spawning escapement in other rivers since the conservation requirement of 2.4 eggs/m^2 takes this source of mortality into account. It has been retained in the assessment for the Restigouche River since in this system poaching and disease occurs prior to or at the same time as in-river removals and thus must be added to these to estimate returns.

The poaching and disease (PAD) mortality rate was assumed to be 0.14 of the population entering the river (i.e. after estuary harvest, but before angling) for small salmon and 0.16 for large salmon, as in previous assessments (Randall et al. 1988). The calculation was made as follows:

For large salmon, **PAD = 0.16[B/0.84]** because,

PAD = 16% of the population at point A and,

The population at point A = B + 0.16 A
= B/0.84

B, the population available to anglers = angling catch/exploitation rate

B = Catch/Exp

Therefore, **PAD = 0.16[(Catch/Exp)/0.84]**

By similar logic, PAD for small salmon was calculated as:

PAD = 0.14[(Catch/Exp)/0.86]

River harvest for small fish is the sum of fish lost to angling (including mortality associated with catch-and-release during the September 1996 extension to the angling fishery in N.B.), broodstock collection (Charlo hatchery, N.B.) and First Nations river removals. The mortality associated with catch-and-release of small salmon was assumed to be 6%, the same as large salmon (Courtenay et al. 1991).

River harvest for large fish is the sum of fish lost to angling (Québec), mortality associated with catch and release (N.B.), broodstock collection and First Nations river removals.

Spawning escapement was calculated as angling catch divided by angling exploitation rate minus river harvest. Angling exploitation rate is unknown for the Restigouche River, but Randall et al. (1990) argued that it is probably somewhere between 0.3 and 0.5. Therefore, spawning escapements were calculated for these limits.

Returns were estimated as 10,264-16,332 large (Tables 18, 19) and 7,958-13,251 small (Tables 20, 21) salmon. The ranges reflect the difference in the estimates when exploitation rate is set to 0.3 or 0.5. Spawning escapement was calculated as 6,285-11,382 large and 3,362-7,914 small salmon (Fig. 10).

5.2 - Mark-recapture experiment

An estimate of river population (point A in PAD description) in 1996 was made using small salmon marked with blue carlin tags at the Morrissey Rock trapnet. The estimate was obtained using a Bayesian estimator as described by Gazey and Staley (1986). The most probable population size given R recaptures out of M marks in a sampled catch of C was calculated over a range of possible population sizes. Total small salmon returns to point "A" (the trapnet) by August 13 (the last date a small salmon was tagged) was calculated using all angling returns (to September 15). Tagged fish therefore had up to four weeks in which to disperse throughout the system.

The values of R, M and C required for the Bayesian estimate were obtained as:

M ('Tags applied'): 254 small salmon were tagged and released by August 13. 10% tagging mortality was assumed as in the Miramichi River. Tag loss was assumed to occur after tagging

mortality at a rate of 0.009/day as in the Margaree River (Chaput et al. 1993). Median days to recapture was 16.5 days.

R ('Tags recaptured'): All recaptures at angling camps contacted for tag returns were utilized. This accounted for 21 of the 23 angled small salmon tags returned in 1996. Tag reporting rate was believed to be 100% at these camps.

C ('Total recaptures'): The total small salmon catch at these angling camps was 2079.

Spawning escapement was obtained by subtracting angling catch (including First Nations in-river catch), other freshwater removals (broodstock, hook-and-release mortality of small (in 1996) and large salmon) and a poaching-and-disease correction (see section 5.1). Total returns were obtained by adding First Nations estuary harvest.

The above procedure was used to obtain small salmon estimates. The large salmon population estimate was made using the ratio of large:small salmon in the combined New Brunswick and Québec angling catch (53% large salmon in 1996, Table 3).

The spawning escapement estimates from the 1996 mark-recapture study were 16,873 (95% C.L. of 11,426-29,661) large (Table 22) and 13,089 (8,144-24,699) small (Table 23) salmon. Returns of large salmon were estimated as 22,868 (16,384-38,092) fish and of small salmon were 19,268 (13,518-32,768) fish.

6 - Assessment results

	Large spawners	**Small spawners**
Requirement	**12,200**	**2,600**
Angling exploitation estimate, ER=0.5	6,285	3,362
Angling exploitation estimate, ER=0.3	11,382	7,914
Mark-recapture estimate (95% confidence limits)	16,873 (11,426-29,661)	13,089 (8,144-24,699)
Diver spawner counts (partial count)	5,064	2,178
Canoe-based spawner counts	8,193	3,559

As in previous years (Figs. 10, 11), the mark-recapture estimate was much higher than any other estimate of spawner abundance. This is not a conservative method of estimating spawning escapement and should not be used for management of the population. Methods utilizing angling exploitation rate concluded that large salmon spawning escapement was, at best, about 93% of the conservation requirement (ER=0.3) and, at worst, about 52% (ER=0.5). Taking into account the partial coverage of the diver-based counts, both methods of visual assessment estimated abundance within the range bounded by the angling exploitation rate methods. Under the high water conditions of 1996, it is likely that ER was closer to 0.3 than to 0.5, and this is consistent with MEF's observations of ER on Gaspé rivers (G. Landry, unpub. data). Most likely, spawning escapement of large salmon was within 80-90% of the conservation requirement. Spawning escapement of small salmon was found to exceed the requirement by all methods of stock assessment.

Recommendation: In three of the four years of mark-recapture estimation of spawner abundance, this figure has exceeded all other estimates by a factor of ~1.5 or more (Fig. 10). The mark-recapture estimate is not believed to accurately represent spawner abundance. Alternative means of population assessment, for example an expansion of the diver-based spawner counts, are recommended. The main value of the Morrissey Rock trapnet has been in providing data on run timing and biology (size and condition of returning salmon, for example). It is probably not necessary to operate this trapnet in every year.

7 - Outlook

Compared to pre-1984 levels, densities of all age classes of juvenile salmon have increased in the Restigouche River in the past decade (Fig. 8). However, over the past five years, densities of parr have been relatively stable, suggesting that there will be no significant change in returns in the coming year unless marine survival improves. Therefore, returns of large and small salmon in 1997 are expected to be similar to mean returns for the period 1992 to 1996 (based on the angling catch-exploitation rate method with ER of 0.3 to 0.5). The expected returns are 9,350-14,748 large and 8,336-13,874 small salmon. The expected range of returns of large salmon varies from 23% below to 21% above the conservation requirement for spawning escapement. Expected small salmon returns are well above the conservation requirement for spawning escapement.

8 - Management Considerations

The level of precision in estimates does not allow us to conclude that conservation requirements were exceeded in 1996. Conservative estimates indicate that they were approached. All estimates indicate that small salmon escapement exceeded conservation requirements.

There is no indication that salmon returns in 1997 will be any better than the previous five years. Large salmon spawning escapement has not exceeded requirements in any of these years. In some of these years, returns are believed to have exceeded conservation requirements, but in all

years exploitation of large salmon reduced spawning escapement to a point below or just meeting requirements.

Current fishing mortality of large salmon should not be increased in 1997. Current harvesting strategies for small salmon appear to be feasible.

9 - Research Recommendations

1. The performance of the current mark-recapture estimate as an assessment technique for this river has been poor. Alternative means of population assessment, for example an expansion of the diver-based spawner counts, are recommended. The main value of the Morrissey Rock trapnet has been in providing data on run timing and biology (size and condition of returning salmon, for example). It is probably not necessary to operate this trapnet in every year.

2. Experiments to evaluate the performance of visual counts by divers should be continued. The streamer-tagging experiment should be repeated and expanded to determine whether similar proportions of tagged fish are observed annually and in different river stretches.

3. Reliable harvest data from Listuguj First Nation netting is required for this assessment, regardless of the assessment method selected. However, a shift in assessment method to diver-based spawner counts would reduce the reliance of the assessment on accurate harvest data, at least to the extent of independently determining spawning escapement. Harvest data would still be required to calculate returns.

4. Removals of salmon from the Upsalquitch River (all sources) should be more closely monitored. The sustainability of harvest from this river should be investigated.

5. The conservation requirement for egg deposition in the Restigouche should be re-examined. Two different estimates of habitat area are presently in use by DFO and DNRE. DFO, DNRE and MEF each use different egg deposition (eggs/m^2) requirements for conservation. Biological characteristics of the stock have not been sampled since the commercial fishery closure and adoption of a catch-and-release fishery for large salmon in New Brunswick. Collection of data on sex ratios, length-weight relationships, and egg production could be carried out at existing harvest fisheries. The appropriateness of the 2.4 eggs/m^2 requirement, currently used by DFO as a default in the absence of river-specific data, should be evaluated, perhaps using electrofishing above barrier fences to determine juvenile survival rates at egg depositions higher than the average for the system.

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Table 1. Operating dates of First Nations fisheries in Chaleur Bay and Restigouche River, 1979 to 1996.

Year	New Brunswick		Québec
	Gillnet	Trapnet[a]	Gillnet
1979	May 14 - Oct 24		Jun 6 - Aug 1
1980	May 19 - Jul 13		Jun 2 - Jul 28
1981	May 15 - Aug 30		
1982	May 17 - Aug 1		Jun 9 - Aug 2
1983	May 16 - Aug 28		Jun 3 - Aug 7
1984	May 14 - Aug 27		Jun 5 - Aug 10
1985	May 20 - Aug 25		Jun 3 - Jul 31
1986	May 19 - Aug 10	May 26 - Jul 20	Jun 2 - Jun 26
1987	May 24 - Jul 27	May 24 - Jul 15	Jun 1 - Jun 30
1988	May 16 - Aug 26	May 16 - Aug 14	Jun 6 - Jul 6
1989	May 15 - Aug 20	May 29 - Aug 20	Jun 5 - Jun 30
1990	May 14 - Jul 22	May 22 - Jul 25	Jun 11 - Jul 6
1991	May 12 - Jul 27	May 26 - Jul 27	Jun 3 - Jun 28
1992	May 25 - Aug 23	May 26 - Aug 2	Jun 10, 11, 12, 16, 17, 25 & 30 Jul 1, 6, 9, 10, 14, 15 & 19
1993	May 17 - Aug 8		May 17 - Aug 8
1994	May 16 - Jul 16		N/A
1995	May 29 - Oct 1		? - Jul 26
1996	Jun 3 - Jul 15		Jun 5 - Jul 21

[a] One trap net in 1986. Two trap nets in 1987 to 1992.

Table 2. Preliminary estimates of harvests (numbers) of small and large salmon in Restigouche River, 1996. Harvests of salmon in 1995 are given for comparison.

Fishery		1996		1995		Mean (91-95)		1996 c.f. Mean	
		Small	Large	Small	Large	Small	Large	Small	Large
First Nations									
	N.B.	77	213	21	202	18	322	+328%	-34%
	P.Q.[a]	18	985	18	985	-	-	-	-
Angling									
	N.B.	2629		1235		2727		-4%	
	P.Q.	755	1001	354	866	667	861	+13%	+16%
Total		3479	2199	1628	2053	-	-	-	-

[a] Québec First Nation harvests (1994 to 1996) are 1989-93 means. Thus, previous five-year means were not calculated in this and subsequent tables that involve First Nations harvests.

Table 3. Estimated angling catches of salmon in the Restigouche River, 1970 to 1996. Estimates of large salmon (1984 to 1996) and small salmon (1996) include released fish in New Brunswick. New Brunswick catch-and-release data were estimates from angling lodge logbooks, crown reserve angler questionnaires and DFO fishery officers.

	Large			Small			Proportion Large		
Year	PQ	NB	Total	PQ	NB	Total	PQ	NB	Total
1970	326	1716	2042	166	1340	1506	0.66	0.56	0.58
1971	259	757	1016	173	999	1172	0.60	0.43	0.46
1972	1171	3870	5041	111	978	1089	0.91	0.80	0.82
1973	1146	3746	4892	147	1423	1570	0.89	0.72	0.76
1974	1163	4785	5948	129	1038	1167	0.90	0.82	0.84
1975	741	2160	2901	149	1130	1279	0.83	0.66	0.69
1976	1029	4481	5510	377	2345	2722	0.73	0.66	0.67
1977	1579	5128	6707	459	2333	2792	0.77	0.69	0.71
1978	1652	3373	5025	282	1322	1604	0.85	0.72	0.76
1979	826	997	1823	556	1990	2546	0.60	0.33	0.42
1980	2059	4098	6157	409	2833	3242	0.83	0.59	0.66
1981	1408	2832	4240	635	3010	3645	0.69	0.48	0.54
1982	962	1620	2582	402	2449	2851	0.71	0.40	0.48
1983	587	1481	2068	181	715	896	0.76	0.67	0.70
1984	604	1672	2276	314	1474	1788	0.66	0.53	0.56
1985	851	3563	4414	344	3258	3602	0.71	0.52	0.55
1986	1420	4763	6183	502	4915	5417	0.74	0.49	0.53
1987	970	3203	4173	696	4414	5110	0.58	0.42	0.45
1988	1129	4546	5675	789	6084	6873	0.59	0.43	0.45
1989	1162	3441	4603	509	2851	3360	0.70	0.55	0.58
1990	893	2842	3735	765	3559	4324	0.54	0.44	0.46
1991	956	2181	3137	535	1987	2522	0.64	0.52	0.55
1992	1004	3351	4355	752	3999	4751	0.57	0.46	0.48
1993	514	1541	2055	796	2472	3268	0.39	0.38	0.39
1994	963	3016	3979	898	3942	4840	0.52	0.43	0.45
1995	866	1926	2792	354	1235	1589	0.71	0.61	0.64
1996	1001	2822	3823	755	2659	3414	0.57	0.51	0.53
Mean (91-95)	861	2403	3264	667	2727	3394	0.57	0.48	0.50
1996 c.f. Mean	+16%	+17%	+17%	+13%	-2%	+1%	0%	+6%	+6%

Table 4. Estimated angling salmon catches from Restigouche River, by tributary, 1970 to 1996. Prior to 1982 Little Main catches included in Main Restigouche. Catches of large salmon (1984 to 1996) and small salmon (1996) include released fish in New Brunswick.

	Matapedia		Upsalquitch		Patapedia		Kedgwick		Little Main		Main Restigouche	
Year	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
1970	162	290	270	122	4	24	323	205			747	1401
1971	153	217	344	90	20	40	128	67			527	602
1972	102	1010	362	984	7	144	165	425			453	2478
1973	147	1098	498	512	0	43	128	548			797	2691
1974	124	1083	433	579	5	63	80	289			525	3934
1975	131	692	462	262	18	31	136	316			532	1600
1976	296	922	767	753	80	88	209	348			1370	3399
1977	278	1312	554	901	181	227	368	684			1411	3583
1978	251	1457	449	507	31	158	143	423			730	2480
1979	466	754	507	135	90	60	316	123			1167	751
1980	311	1784	1178	592	95	229	284	468			1374	3084
1981	485	1176	1234	221	148	175	356	473			1422	2195
1982	259	841	818	214	143	112	322	190	59	50	1250	1175
1983	154	456	203	218	27	103	68	224	14	0	430	1067
1984	285	560	483	346	44	59	149	164	102	27	725	1120
1985	291	807	1175	507	104	84	330	185	163	50	1539	2781
1986	389	1289	1397	630	163	187	566	519	481	155	2421	3403
1987	602	915	819	410	193	77	583	409	407	142	2506	2220
1988	680	1068	1296	659	185	107	807	707	524	74	3381	3060
1989	466	1119	836	515	73	62	208	544	43	31	1734	2332
1990	718	856	905	375	81	45	304	258	152	108	2164	2093
1991	521	940	403	195	30	29	277	403	121	75	1170	1495
1992	693	966	1180	561	122	57	420	320	238	141	2098	2310
1993	735	505	644	221	80	16	231	104	85	42	1493	1167
1994	822	917	1212	508	147	51	455	231	269	106	1935	2166
1995	337	829	307	304	32	71	119	202	32	32	762	1354
1996	721	922	793	311	49	84	268	311	49	42	1534	2153
Mean (91-95)	622	831	749	358	82	45	300	252	149	79	1492	1698
1996 c.f. Mean	+16%	+11%	+6%	-13%	-40%	+87%	-11%	+23%	-67%	-47%	+3%	+27%

Table 5. Preliminary estimates of angling catch, effort and CPUE in New Brunswick and Québec portions of the Restigouche River, 1996. Catch, effort and CPUE in 1995 are given for comparison.

		1996			1995			Mean (91-95)			1996 c.f. Mean		
		Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
N.B.	Small[a]	2659	10612	0.25	1235	9948	0.12	2727	9920	0.27	-2%	+7%	-7%
	Large[b]	2822	10612	0.27	1926	9948	0.19	2403	9920	0.24	+17%	+7%	+13%
P.Q.	Small	755	7686	0.10	354	6980	0.05	667	7276	0.09	+13%	+6%	+11%
	Large	1001	7686	0.13	866	6980	0.12	861	7276	0.12	+16%	+6%	+8%
N.B.+	Small	3414	18298	0.19	1589	16928	0.09	3394	17196	0.20	+1%	+6%	-5%
P.Q.	Large	3823	18298	0.21	2792	16928	0.16	3264	17196	0.19	+17%	+6%	+11%

[a] Estimates of N.B. small salmon (1996) include released fish.
[b] Estimates of N.B. large salmon are released fish.

Table 6. First Nations salmon landings for Chaleur Bay and Restigouche River, 1975 to 1996.

	New Brunswick									Québec[a,b]			
	Estuary			River			Total			Estuary			
Year	Small	Large	Total	Small	Large	Total	Small	Large	Total	Small	Large	Total	Total
1975	3	132	135				3	132	135				135
1976	13	124	137				13	124	137	0	1517	1517	1654
1977	19	212	231				19	212	231	0	2738	2738	2969
1978	23	129	152				23	129	152				152
1979	84	148	232				84	148	232	85	748	833	1065
1980	34	264	298				34	264	298	24	1563	1587	1885
1981	20	211	231				20	211	231				231
1982	12	155	167				12	155	167	148	1521	1669	1836
1983	0	260	260				0	260	260	32	1216	1248	1508
1984	1	213	214				1	213	214	177	1070	1247	1461
1985	0	241	241				0	241	241	35	976	1011	1252
1986	26	431	457				26	431	457	4	1145	1149	1606
1987	95	916	1011				95	916	1011	5	986	991	2002
1988	70	509	579				70	509	579	3	921	924	1503
1989	151	568	719				151	568	719	12	1081	1093	1812
1990	120	471	591				120	471	591	16	1135	1151	1742
1991	10	252	262				10	252	262	9	859	868	1130
1992	2	464	466	0	10	10	2	474	476	53	948	1001	1477
1993	0	293	293	0	8	8	0	301	301	0	901	901	1202
1994	29	348	377	29	32	61	58	380	438	18	985	1003	1441
1995	0	178	178	21	24	45	21	202	223	18	985	1003	1226
1996	0	176	176	77	37	114	77	213	290	18	985	1003	1293
Mean (91-95)	8	307	315	13	19	31	18	322	340	-	-	-	-
1996 c.f. Mean	-100%	-43%	-44%	+492%	+95%	+268%	+328%	-34%	-15%	-	-	-	-

[a] Québec First Nation landings (1987) from (Randall et al. 1988).
[b] Québec First Nation landings (1994 to 1996) are 1989-93 means.

Table 7. Commercial, angling and First Nations salmon landings from Chaleur Bay and Restigouche River, 1970 to 1996.

	Commercial		Angling		First Nations		
Year	Small	Large	Small	Large	Small	Large	Total
1970		18180	1506	2042			21728
1971		8967	1172	1016			11155
1972	36	23	1089	5041			6189
1973	1272	295	1570	4892			8029
1974	132	68	1167	5948			7315
1975	163	1026	1279	2901	3	132	5504
1976	5107	225	2722	5510	13	1641	15218
1977	1134	168	2792	6707	19	2950	13770
1978	1522	156	1604	5025	23	129	8459
1979	83	671	2546	1823	169	896	6188
1980	1986	9	3242	6157	58	1827	13279
1981	3045	3534	3645	4240	20	211	14695
1982	2202	4437	2851	2582	160	1676	13908
1983	1552	4569	896	2068	32	1476	10593
1984	7161	2026	1788	604	178	1283	13040
1985	0	0	3602	851	35	1217	5705
1986	0	0	5417	1420	30	1576	8443
1987	0	0	5110	970	100	1902	8082
1988	0	0	6873	1129	73	1430	9505
1989	0	0	3360	1162	163	1649	6334
1990	0	0	4324	893	136	1606	6959
1991	0	0	2522	956	19	1111	4608
1992	0	0	4751	1004	55	1422	7232
1993	0	0	3268	514	0	1202	4984
1994	0	0	4840	963	76	1365	7244
1995	0	0	1589	866	39	1187	3681
1996	0	0	3384	1001	95	1198	5678
Mean (91-95)	0	0	3394	861	-	-	-
1996 c.f. Mean	0%	0%	-0%	+16%	-	-	-

Table 8. Salmon catches and dates of operation at Morrissey Rock, Adams' Shore and Smith Island trapnets.

	Morrissey Rock			Adams' Shore			Smith Island		
Year	Small	Large	Operating dates	Small	Large	Operating dates	Small	Large	Operating dates
1992	63	38	Jul. 15-Aug. 5 Aug. 11-Oct. 22						
1993	342	51	Jun. 1-Jun. 2 Jun. 16-Aug. 16						
1994	455	136	Jun. 16-Sep. 20	141	23	Jun. 20-Sep. 11			
1995	117	149	Jun. 4-Jul. 4 Jul. 6-Jul. 11 Jul. 13-Jul. 18 Jul. 20-Jul. 25 Jul. 27-Aug. 1 Aug. 3-Aug. 8 Aug. 10-Aug. 15 Aug. 17-Aug. 22 Aug. 24-Aug. 29 Aug. 31-Sep. 4	289	173	Jun. 6-Aug. 11	106	36	Jun. 15-Aug. 11
1996	280	73	Jun. 11-Jun. 14 Jun. 17-Jun. 21 Jun. 24-Jun. 28 Jul. 1-Jul. 5 Jul. 8-Jul. 12 Jul. 15-Jul. 19 Jul. 24-Jul. 26 Jul. 29-Aug. 2 Aug. 5-Aug. 9 Aug. 12-Aug. 16 Aug. 19-Aug. 23 Aug. 26-Aug. 30 Sep. 2-Sep. 6 Sep. 9-Sep. 13 Sep. 16						

Table 9. Percentage of salmon trapped at Morrissey Rock with presumed furunculosis (i.e. with red fins or body), ectoparasites (sea lice) or net marks.

Large salmon

Percent of salmon with furunculosis

	1993		1994		1995		1996	
Period[a]	%	Trap catch	%	Trap catch	%	Trap catch	%	Trap catch
Jun. 1-15	0	1	-	-	3	32	7	15
Jun. 16-30	0	14	0	43	0	61	0	17
Jul. 1-15	0	22	6	55	0	34	0	8
Jul. 16-31	11	9	0	28	19	21	0	29
Aug. 1-15	25	4	0	7	0	1	0	2
Aug. 16-31	0	1	0	1	0	0	0	2
Sep. 1-15	-	-	0	1	0	0	0	0
Sep. 16-30	-	-	0	1	-	-	0	0
Total number with condition	2	51	3	136	5	149	1	73

Small Salmon

Percent of salmon with furunculosis

	1993		1994		1995		1996	
Period[a]	%	Trap catch	%	Trap catch	%	Trap catch	%	Trap catch
Jun. 1-15	0	0	-	-	0	0	0	1
Jun. 16-30	0	14	0	26	0	18	5	22
Jul. 1-15	0	117	2	199	0	47	0	104
Jul. 16-31	2	115	2	168	2	43	1	131
Aug. 1-15	5	91	0	54	0	8	0	20
Aug. 16-31	0	5	0	5	0	1	0	2
Sep. 1-15	-	-	0	1	0	0	0	0
Sep. 16-30	-	-	0	2	-	-	0	0
Total number with condition	7	342	7	455	1	117	2	280

Large salmon

Percent of salmon with sea lice

	1993		1994		1995		1996	
Period[a]	%	Trap catch	%	Trap catch	%	Trap catch	%	Trap catch
Jun. 1-15	0	1	-	-	50	32	20	15
Jun. 16-30	7	14	46	43	16	61	24	17
Jul. 1-15	5	22	49	55	23	34	13	8
Jul. 16-31	0	9	14	28	24	21	21	29
Aug. 1-15	0	4	43	7	0	1	100	2
Aug. 16-31	0	1	100	1	0	0	0	2
Sep. 1-15	-	-	0	1	0	0	0	0
Sep. 16-30	-	-	0	1	-	-	0	0
Total number with condition	2	51	55	136	39	149	16	73

Small Salmon

Percent of salmon with sea lice

	1993		1994		1995		1996	
Period[a]	%	Trap catch	%	Trap catch	%	Trap catch	%	Trap catch
Jun. 1-15	0	0	-	-	0	0	0	1
Jun. 16-30	57	14	31	26	39	18	73	22
Jul. 1-15	10	117	27	199	23	47	55	104
Jul. 16-31	12	115	45	168	21	43	48	131
Aug. 1-15	40	91	55	54	13	8	55	20
Aug. 16-31	0	5	60	5	0	1	0	2
Sep. 1-15	-	-	100	1	0	0	0	0
Sep. 16-30	-	-	100	2	-	-	0	0
Total number with condition	69	342	173	455	28	117	147	280

Large salmon

Percent of salmon with net marks

	1993		1994		1995		1996	
Period[a]	%	Trap catch	%	Trap catch	%	Trap catch	%	Trap catch
Jun. 1-15	0	1	-	-	13	32	27	15
Jun. 16-30	14	14	42	43	8	61	12	17
Jul. 1-15	18	22	18	55	9	34	0	8
Jul. 16-31	0	9	0	28	14	21	0	29
Aug. 1-15	0	4	29	7	0	1	0	2
Aug. 16-31	0	1	0	1	0	0	0	2
Sep. 1-15	-	-	0	1	0	0	0	0
Sep. 16-30	-	-	0	1	-	-	0	0
Total number with condition	6	51	30	136	15	149	6	73

Small Salmon

Percent of salmon with net marks

	1993		1994		1995		1996	
Period[a]	%	Trap catch	%	Trap catch	%	Trap catch	%	Trap catch
Jun. 1-15	0	0	-	-	0	0	0	1
Jun. 16-30	14	14	23	26	6	18	5	22
Jul. 1-15	10	117	13	199	11	47	10	104
Jul. 16-31	8	115	22	168	12	43	2	131
Aug. 1-15	14	91	15	54	12	8	0	20
Aug. 16-31	0	5	20	5	0	1	0	2
Sep. 1-15	-	-	0	1	0	0	0	0
Sep. 16-30	-	-	0	2	-	-	0	0
Total number with condition	36	342	77	455	12	117	14	280

[a] Operating dates are shown in Table 8.

Table 10. Dead salmon (large and small combined) found against the upstream side of the Morrissey Rock trapnet and leaders.

Period[a]	1993	1994	1995	1996
Jun. 1-15	0	-	0	0
Jun. 16-30	3	0	0	2
Jul. 1-15	13	3	3	2
Jul. 16-31	0	5	0	0
Aug. 1-15	0	6	0	1
Aug. 16-31	0	0	0	0
Sep. 1-15	-	1	0	0
Sep. 16-30	-	0	-	0
Total	16	15	3	5

[a] Operating dates are shown in Table 8.

Table 11. Means by which tags applied to small salmon at Morrissey Rock and Listuguj traps were recovered, 1993 to 1996.

	Percent of recoveries (no.)				
	Morrissey Rock trap				Listuguj traps
Method of recovery	1993	1994	1995	1996	1995
Angling	63 (36)	58 (38)	56 (10)	82 (23)	33 (7)
Upsalquitch barrier fence	32 (18)	24 (16)	6 (1)	14 (4)	5 (1)
Morrissey Rock recaptures	3 (2)	11 (7)	5 (1)	4 (1)	5 (1)
Listuguj traps recaptures	- (-)	- (-)	- (-)	- (-)	38 (8)
Broodstock	0 (0)	4 (3)	5 (1)	0 (0)	5 (1)
Found dead by anglers	2 (1)	3 (2)	28 (5)	0 (0)	14 (3)
Total number recovered	(57)	(66)	(18)	(28)	(21)
Total number applied	329	430	103	254	279

Table 12. Counts of salmon at two fish barriers in the Restigouche River system.

Year	Small	Large	Total	Proportion Large	Operating Dates
NW Upsalquitch barrier					
1980	843	887	1730	0.51	Jun. 17 - Oct. 19
1981	789	481	1270	0.38	Jun. 5 - Oct. 29
1982	819	622	1441	0.43	Jun. 4 - Oct. 17
1983	430	301	731	0.41	Jun. 20 - Oct. 30
1984	518	642	1160	0.55	Jun. 8 - Oct. 28
1985	748	517	1265	0.41	Jun. 5 - Oct. 27
1986	1738	1166	2904	0.40	Jun. 6 - Oct. 23
1987	1557	1000	2557	0.39	Jun. 10 - Oct. 29
1988	1121	993	2114	0.47	Jun. 6 - Oct. 25
1989	1051	894	1945	0.46	Jun. 4 - Oct. 22
1990	1324	946	2270	0.42	Jun. 22 - Oct. 14
1991	1267	930	2197	0.42	Jun. 1 - Oct. 16
1992	1351	963	2314	0.42	Jun. 22 - Oct. 22
1993	957	353	1310	0.27	Jun. 27 - Oct. 13
1994	1329	740	2069	0.36	Jun. 26 - Oct. 18
1995	817	946	1763	0.54	Jun. 19 - Oct. 23
1996	959	587	1546	0.38	Jun. 17 - Oct. 23
Mean (91-95)	1144	786	1931	0.40	
1996 c.f. Mean	-16%	-25%	-20%	-5%	
Causapscal barrier					
1988	49	505	554	0.91	Jun. 12 - Sep. 6
1989	7	605	612	0.99	Jun. 18 - Sep. 14
1990	37	456	493	0.92	Jun. 12 - Aug. 14
1991	9	451	460	0.98	Jun. 17 - Aug. 26
1992	8	350	358	0.98	Jun. 12 - Aug. 5
1993	12	256	268	0.96	Jun. 18 - Aug. 17
1994	3	349	352	0.99	Jun. 21 - Sep. 21
1995	1	462	463	1.00	Jun. 12 - Sep. 14
1996	4	441	445	0.99	Jun. 22 - Sep. 20
Mean (91-95)	7	374	380	0.98	
1996 c.f. Mean	-43%	+18%	+17%	+1%	

Table 13. (a) Pre-spawning salmon counts, primarily by divers, of the Restigouche River system, 1994 to 1996.

	Matapedia		Upsalquitch		Patapedia		Kedgwick		Little Main		Main Restigouche		Restigouche System		Restigouche System
Year	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small + Large
1994	383	1389	1795	1282	282	670	960	772	572	414	458	1157	4450	5684	10134
1995	669	2461	1497	2002	232	825	717	1276	102	43	213	963	3430	7570	11000
1996[a]	1291	2807	-	-	338	777	436	992	113	488	-	-	2178	5064	-
Mean (94-95)	526	1925	1646	1642	257	748	839	1024	337	229	336	1060	3940	6627	10567
1996 c.f. Mean	+145%	+46%	-	-	+32%	+4%	-48%	-3%	-66%	+113%	-	-	-	-	-

[a] Count incomplete. Upsalquitch and Main Restigouche rivers were not surveyed.

(b) Salmon spawner counts, primarily by canoeists, of the Restigouche River system, 1985 to 1996.

	Matapedia		Upsalquitch		Patapedia		Kedgwick		Little Main		Main Restigouche		Restigouche System		Restigouche System
Year	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small + Large
1985	321	892	925	1174	61	548	108	968	525	1859	343	2342	2283	7783	10066
1986	336	1114	2632	2451	311	728	281	976	1241	2541	413	1708	5214	9518	14732
1987	622	946	1948	2179	80	953	582	1729	610	1418	357	949	4199	8174	12373
1988	791	1243	1761	2140	317	1117	602	1546	536	2128	238	962	4245	9136	13381
1989	764	1834	1387	2223	178	1012	289	1640	923	2442	803	2837	4344	11988	16332
1990[a]	1080	1289			214	783									
1991	640	1152	2247	1575	162	586	423	1204	332	862	453	1713	4257	7092	11349
1992	711	1023	1986	1434	141	502	161	515	200	665	73	565	3272	4704	7976
1993	628	1010	1183	570	98	442	127	370	175	500	141	620	2352	3512	5864
1994	384	1376	1909	1534	282	670	518	1111	611	1192	686	988	4390	6871	11261
1995	669	2461	1263	1578	232	825	83	1244	96	1319	294	877	2637	8304	10941
1996	1291	2807	724	1469	338	777	546	1313	398	1265	262	562	3559	8193	11752
Mean (91-95)	606	1404	1718	1338	183	605	262	889	283	908	329	953	3382	6097	9478
1996 c.f. Mean	+113%	+100%	-58%	+10%	+85%	+28%	+108%	+48%	+41%	+39%	-20%	-41%	+5%	+34%	+24%

[a] Count incomplete. High water prevented field spawner count in New Brunswick.

Table 14. Summary of snorkeller counts of streamer-tagged and untagged salmon in the Kedgwick River, September 23-25, 1996.

Stretch	Large salmon			Small salmon		
	Untagged	Tagged	% Tagged	Untagged	Tagged	% Tagged
North Branch (Gin Creek to driving dam)	53	8	13	14	3	18
Forks Pool to Fraser Lodge	247	32	11	93	20	18
Fraser Lodge to Connors Pool	169	2	1	121	3	2
Total	469	42	8	228	26	10

Table 15. Distribution of spawning salmon (primarily canoe-based counts) and spawning habitat among tributaries of the Restigouche River system.

Year	Percentage of total spawner numbers by tributary:					
	Matapedia	Upsalquitch	Patapedia	Kedgwick	Little Main	Main Restigouche
1985	12.0	20.9	6.0	10.7	23.7	26.7
1986	9.8	34.5	7.1	8.5	25.7	14.4
1987	12.7	33.3	8.3	18.7	16.4	10.6
1988	15.2	29.2	10.7	16.0	19.9	9.0
1989	15.9	22.1	7.3	11.8	20.6	22.3
1991	15.8	33.7	6.6	14.3	10.5	19.1
1992	21.7	42.9	8.1	8.5	10.8	8.0
1993	27.9	29.9	9.2	8.5	11.5	13.0
1994	15.6	30.6	8.4	14.5	16.0	14.9
1995	28.6	26.0	9.7	12.1	12.9	10.7
1996	34.9	18.7	9.5	15.8	14.1	7.0
Mean (91-95)	21.9	32.6	8.4	11.6	12.3	13.1
1996 c.f. Mean	+59%	-43%	+13%	+36%	+15%	-47%
Habitat	21.4	13.1	5.8	8.1	5.9	45.8

Table 16. Distributions of Atlantic salmon to the Restigouche River system (by system of broodstock origin) by the Charlo Salmonid Enhancement Centre in 1996. Fish were not adipose-clipped or otherwise marked unless noted under Destination.

River	Number	Stage	Destination
Kedgwick	120,000	eyed eggs	MSRT[a] incubation boxes
	150,000	eyed eggs	NWSA[b] incubation boxes
	32,000	feeding fry	Runnymede Lodge satellite site (M. Restigouche R.)
	32,000	feeding fry	MSRT[a] satellite site
	5,000	feeding fry	Larrys Gulch Lodge satellite site (M. Restigouche R.)
	134,988	0 parr	Kedgwick River
Little Main	50,000	eyed eggs	NWSA[b] incubation boxes
	16,000	feeding fry	Boston Brook Lodge satellite site (L.M. Restigouche R.)
NW. Upsalquitch	4,500	feeding fry	Boland Brook Lodge satellite site (M. Upsalquitch R.)
	7,570	feeding fry	Upsalquitch River

[a] Management of Salmon in the Restigouche and tributaries.
[b] Northwest Salmon Association.

Table 17. Juvenile densities of Atlantic salmon in the Restigouche River, 1972 to 1996. Juvenile densities (number per 100m^2) are mean densities of 15 (1972-1990, 1993 and 1996), 8 (1991), 10 (1992), 11 (1994) and 13 (1995) standard sites, designated by year of spawning.

Spawning Year (i)	Juvenile salmon densities		
	Age 0 (year i+1)	Age 1 (year i+2)	Age 2 (year i+3)
1971	5.2	2.8	0.6
1972	22.0	6.1	1.5
1973	13.1	4.8	1.0
1974	28.6	6.9	1.4
1975	13.3	3.9	1.0
1976	14.7	6.3	1.4
1977	19.5	5.9	2.1
1978	6.1	3.8	0.4
1979	9.3	2.4	0.4
1980	18.9	3.3	3.1
1981	11.2	7.8	2.5
1982	25.4	7.3	1.6
1983	25.1	10.4	2.8
1984	25.2	7.5	4.7
1985	23.9	9.4	2.1
1986	42.0	6.1	1.9
1987	53.2	12.1	3.1
1988	72.1	12.9	2.9
1989	53.2	12.3	2.8
1990	106.5	14.6	4.7
1991	49.6	11.5	2.6
1992	51.4	10.9	2.6
1993	58.5	14.7	1.5
1994	71.9	8.7	-
1995	44.1	-	-
1996	-	-	-
Mean (91-95)	67.6	12.8	3.1
1996 c.f. Mean	-35%	-32%	-52%

Table 18. Estimated spawners (S) and total returns (R) of large salmon in Restigouche River, 1970 to 1996. Spawners were estimated using an angling exploitation rate (u) of 0.3.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River[a]				
1970	18180	2042		1297	4765	26284
1971	8967	1016		645	2371	12999
1972	23	5041		3201	11762	20027
1973	295	4892		3106	11415	19708
1974	68	5948		3777	13879	23672
1975	1158	2901		1842	6769	12670
1976	1866	5510		3499	12857	23732
1977	3118	6707		4259	15650	29734
1978	285	5025		3191	11725	20226
1979	1567	1823		1158	4254	8802
1980	1836	6157		3910	14366	26269
1981	3745	4240		2692	9893	20570
1982	6113	2582		1640	6025	16360
1983	6045	2068		1313	4825	14251
1984	3309	722	2276	1445	6865	12341
1985	1217	1173	4414	2803	13540	18733
1986	1576	1695	6183	3926	18915	26112
1987	1902	1170	4173	2650	12740	18462
1988	1430	1329	5675	3604	17588	23951
1989	1649	1492	4603	2923	13851	19915
1990	1606	1146	3735	2372	11304	16428
1991	1111	1181	3137	1992	9276	13560
1992	1412	1337	4355	2765	13180	18694
1993	1194	779	2055	1305	6071	9349
1994	1333	1308	3979	2527	11955	17123
1995	1163	1164	2792	1773	8143	12243
1996	1161	1361	3823	2428	11382	16332
Mean (91-95)	-	1154	3264	2072	9725	-
1996 c.f. Mean	-	+18%	+17%	+17%	+17%	-

[a] River harvests (1984 to 1996) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 19. Estimated spawners (S) and total returns (R) of large salmon in Restigouche River, 1970 to 1996. Spawners were estimated using an angling exploitation rate (u) of 0.5.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River[a]				
1970	18180	2042		778	2042	23042
1971	8967	1016		387	1016	11386
1972	23	5041		1921	5041	12026
1973	295	4892		1864	4892	11943
1974	68	5948		2266	5948	14230
1975	1158	2901		1105	2901	8065
1976	1866	5510		2099	5510	14985
1977	3118	6707		2555	6707	19087
1978	285	5025		1915	5025	12250
1979	1567	1823		695	1823	5908
1980	1836	6157		2346	6157	16496
1981	3745	4240		1615	4240	13840
1982	6113	2582		984	2582	12261
1983	6045	2068		788	2068	10969
1984	3309	722	2276	867	3830	8728
1985	1217	1173	4414	1682	7655	11727
1986	1576	1695	6183	2356	10671	16298
1987	1902	1170	4173	1590	7176	11838
1988	1430	1329	5675	2162	10021	14942
1989	1649	1492	4603	1754	7714	12609
1990	1606	1146	3735	1423	6324	10499
1991	1111	1181	3137	1195	5093	8580
1992	1412	1337	4355	1659	7373	11781
1993	1194	779	2055	783	3331	6087
1994	1333	1308	3979	1516	6650	10807
1995	1163	1164	2792	1064	4420	7811
1996	1161	1361	3823	1457	6285	10264
Mean (91-95)	-	1154	3264	1243	5373	-
1996 c.f. Mean	-	+18%	+17%	+17%	+17%	-

[a] River harvests (1984 to 1996) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 20. Estimated spawners (S) and total returns (R) of small salmon in Restigouche River, 1970 to 1996. Spawners were estimated using an angling exploitation rate (u) of 0.3.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River[a]				
1970	0	1506		817	3514	5837
1971	0	1172		636	2735	4543
1972	36	1089		591	2541	4257
1973	1272	1570		852	3663	7357
1974	132	1167		633	2723	4655
1975	166	1279		694	2984	5123
1976	5120	2722		1477	6351	15670
1977	1153	2792		1515	6515	11975
1978	1545	1604		870	3743	7762
1979	252	2546		1382	5941	10121
1980	2044	3242		1759	7565	14610
1981	3065	3645		1978	8505	17193
1982	2362	2851		1547	6652	13412
1983	1584	896		486	2091	5057
1984	7339	1788		970	4172	14269
1985	35	3602		1955	8405	13997
1986	30	5417		2940	12640	21027
1987	100	5110		2773	11923	19906
1988	73	6873		3730	16037	26713
1989	163	3360		1823	7840	13186
1990	136	4324		2346	10089	16895
1991	19	2522		1369	5885	9795
1992	55	4755	4751	2578	11082	18470
1993	0	3288	3268	1773	7605	12666
1994	47	4869	4840	2627	11264	18807
1995	18	1620	1589	862	3677	6177
1996	18	3466	3414	1853	7914	13251
Mean (91-95)	-	3411	3612	1842	7903	-
1996 c.f. Mean	-	+2%	-5%	+1%	+0%	-

[a] River harvests (1992 to 1996) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 21. Estimated spawners (S) and total returns (R) of small salmon in Restigouche River, 1970 to 1996. Spawners were estimated using an angling exploitation rate (u) of 0.5.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River[a]				
1970	0	1506		490	1506	3502
1971	0	1172		382	1172	2726
1972	36	1089		355	1089	2569
1973	1272	1570		511	1570	4923
1974	132	1167		380	1167	2846
1975	166	1279		416	1279	3140
1976	5120	2722		886	2722	11450
1977	1153	2792		909	2792	7646
1978	1545	1604		522	1604	5275
1979	252	2546		829	2546	6173
1980	2044	3242		1056	3242	9584
1981	3065	3645		1187	3645	11542
1982	2362	2851		928	2851	8992
1983	1584	896		292	896	3668
1984	7339	1788		582	1788	11497
1985	35	3602		1173	3602	8412
1986	30	5417		1764	5417	12628
1987	100	5110		1664	5110	11984
1988	73	6873		2238	6873	16057
1989	163	3360		1094	3360	7977
1990	136	4324		1408	4324	10192
1991	19	2522		821	2522	5884
1992	55	4755	4751	1547	4747	11104
1993	0	3288	3268	1064	3248	7600
1994	47	4869	4840	1576	4811	11303
1995	18	1620	1589	517	1558	3713
1996	18	3466	3414	1112	3362	7958
Mean (91-95)	-	3411	3612	1105	3377	-
1996 c.f. Mean	-	+2%	-5%	+1%	-0%	-

[a] River harvests (1992 to 1996) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 22. Estimated spawners and total returns of large salmon in Restigouche River, 1993 to 1996, with 95% confidence limits. Spawners were estimated using mark-recapture techniques.

Year	Harvest		River population at point A	Poaching and Disease (PAD)	Spawners		Returns	
	Estuary	River[a]						
1993	1194	779	7672	1228	5665	(4323- 9022)	8866	(7268-12862)
1994	1333	1308	20864	3338	16218	(12438-25839)	22197	(17697-33651)
1995	1163	1164	15689	2510	12015	(6975-32922)	16852	(10852-41741)
1996	1161	1361	21707	3473	16873	(11426-29661)	22868	(16384-38092)
Mean (93-95)	-	1084	14742	2359	11299		-	
1996 c.f. Mean	-	+26%	+47%	+47%	+49%		-	

[a] River harvests (1993 to 1996) include catch-and-release mortalities and broodstock and First Nations removals.

Table 23. Estimated spawners and total returns of small salmon in Restigouche River, 1993 to 1996, with 95% confidence limits. Spawners were estimated using mark-recapture techniques.

Year	Harvest		River population at point A	Poaching and Disease (PAD)	Spawners		Returns	
	Estuary	River[a]						
1993	0	3288	12000	1680	7032	(4882-12407)	12000	(9500-18250)
1994	47	4869	25500	3570	17061	(12331-29101)	25547	(20047-39547)
1995	18	1620	8825	1236	5969	(3067-18009)	8843	(5468-22843)
1996	18	3466	19250	2695	13089	(8144-24699)	19268	(13518-32768)
Mean (93-95)	-	3259	15442	2162	10021		-	
1996 c.f. Mean	-	+6%	+25%	+25%	+31%		-	

[a] River harvests (1993 to 1996) may include catch-and-release mortalities and broodstock and First Nations removals.

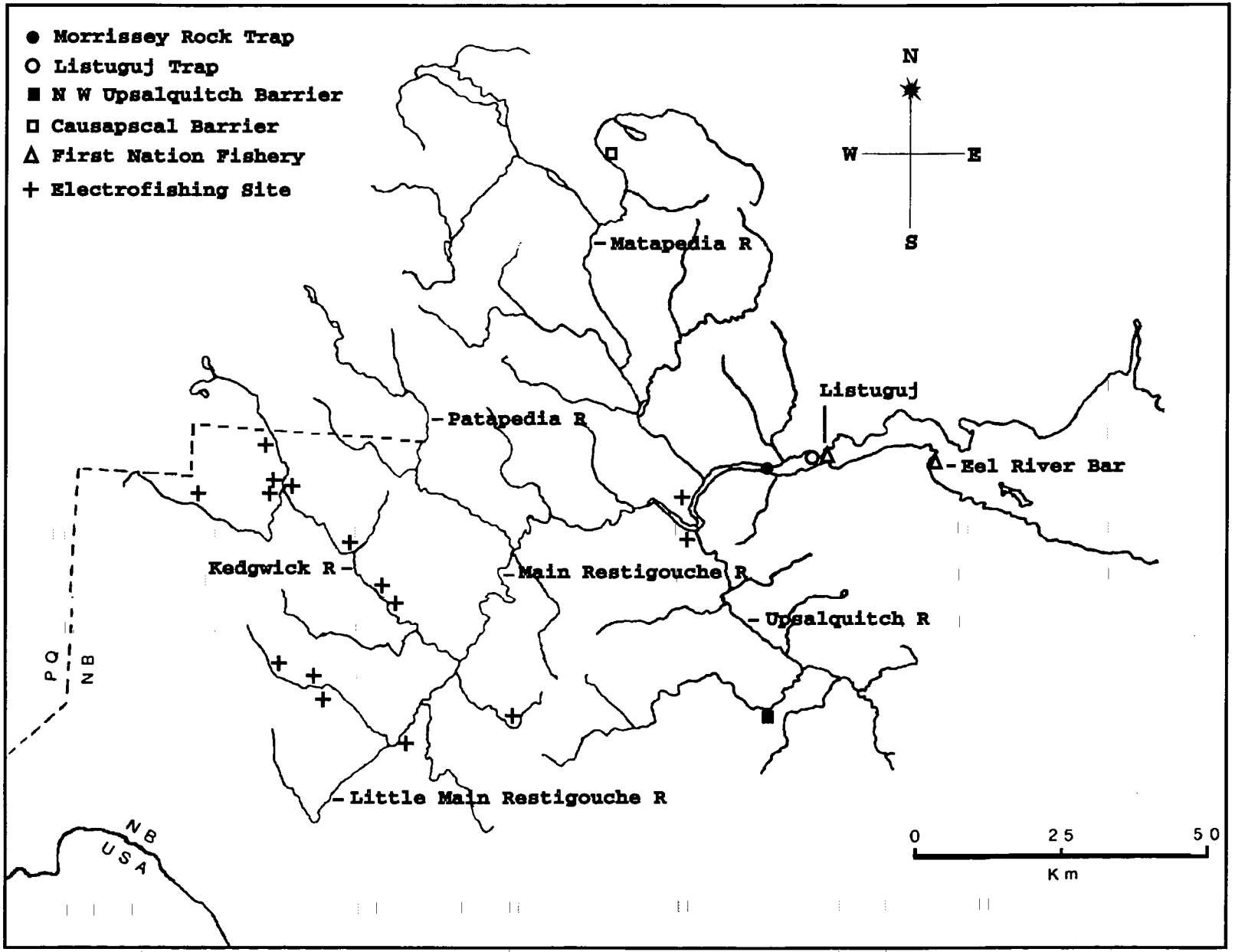

Figure 1. Map of the Restigouche River showing the location of salmon counting facilities, First Nations fisheries and electrofishing sites in 1996.

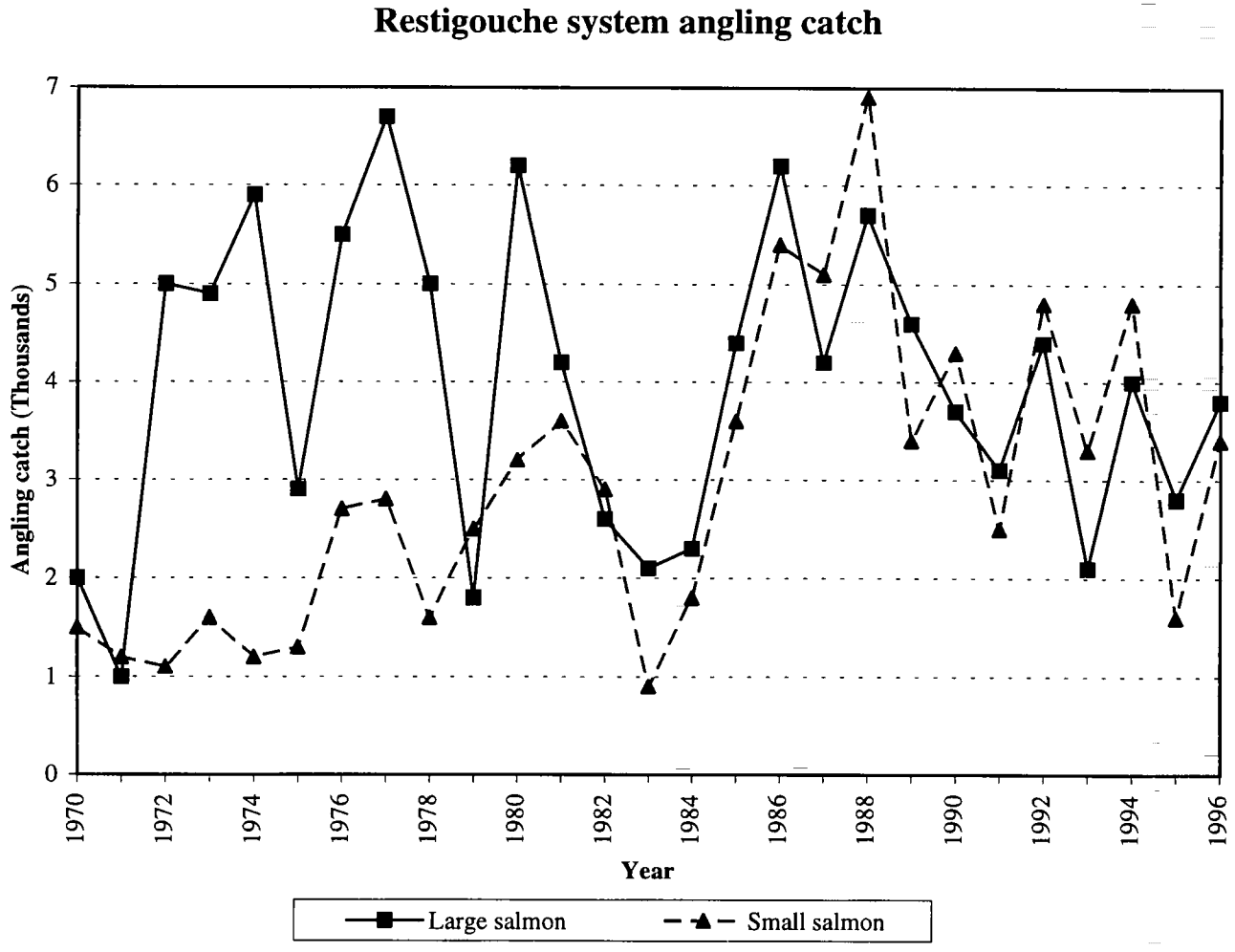

Figure 2. Angling catch of Atlantic salmon in the Restigouche River, 1970-1996.

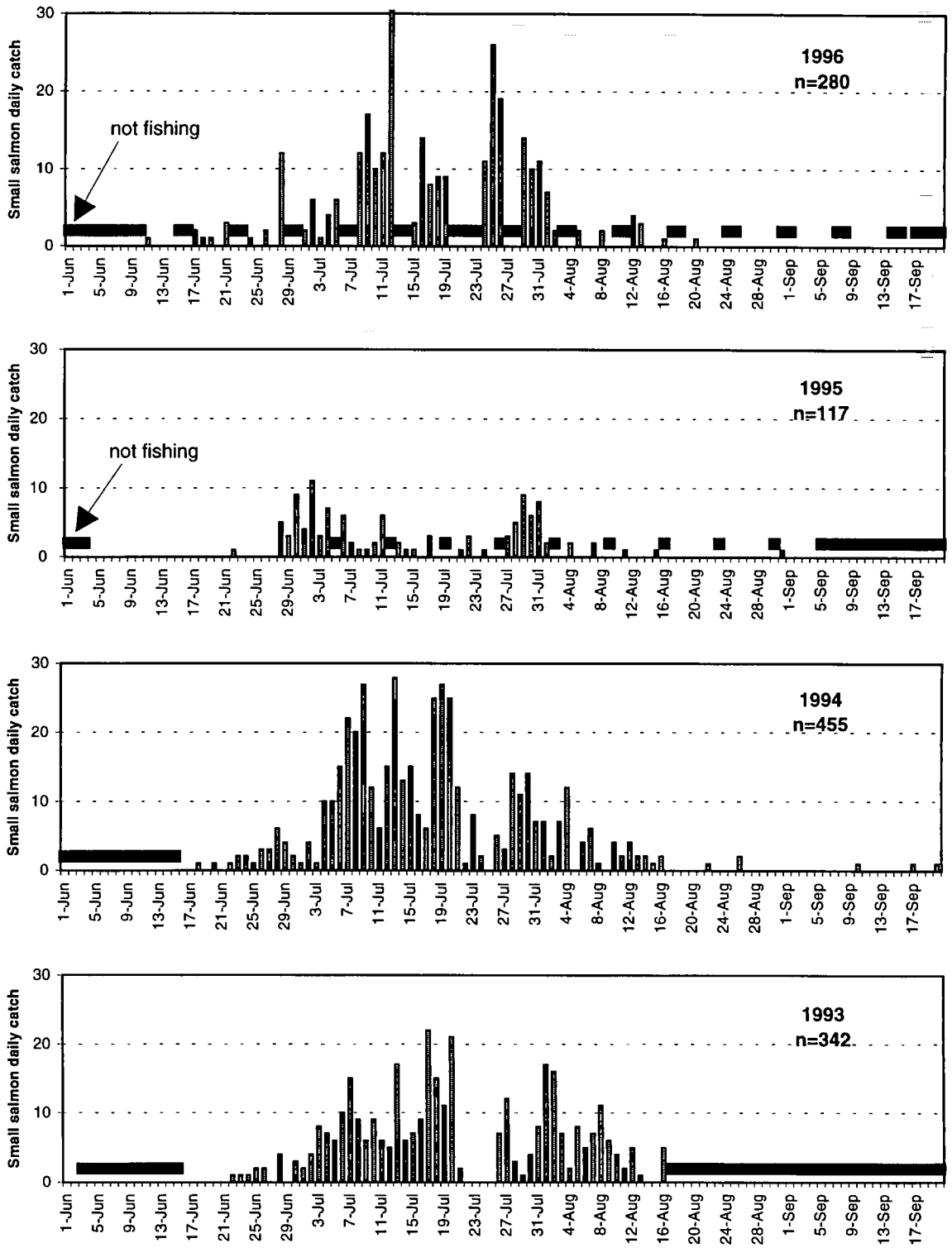

Figure 3. Daily catches of small salmon at the Morrissey Rock assessment trap in 1993-1996. Horizontal bars indicate periods when the trap was not operating.

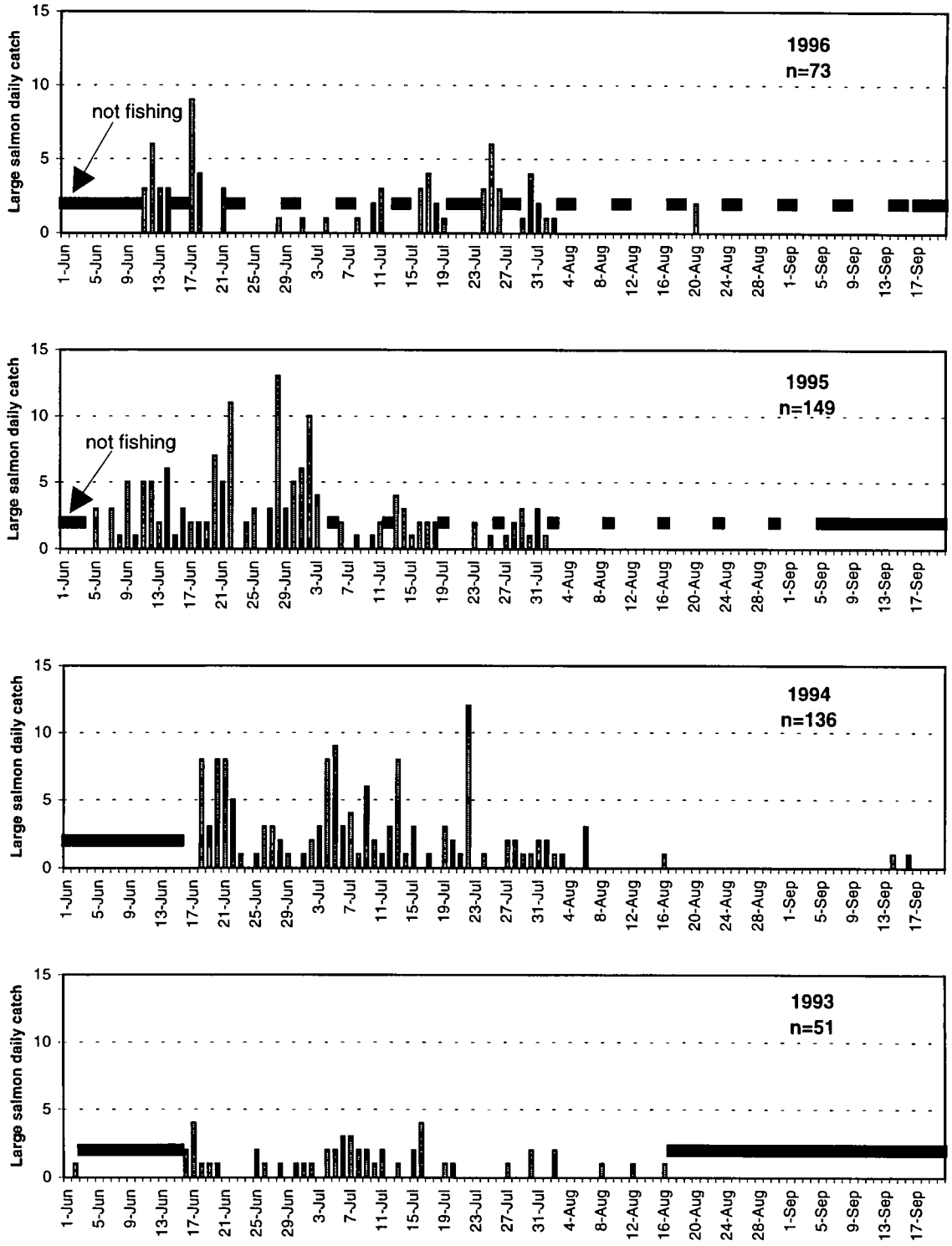

Figure 4. Daily catches of large salmon at the Morrissey Rock assessment trap in 1993-1996. Horizontal bars indicate periods when the trap was not operating.

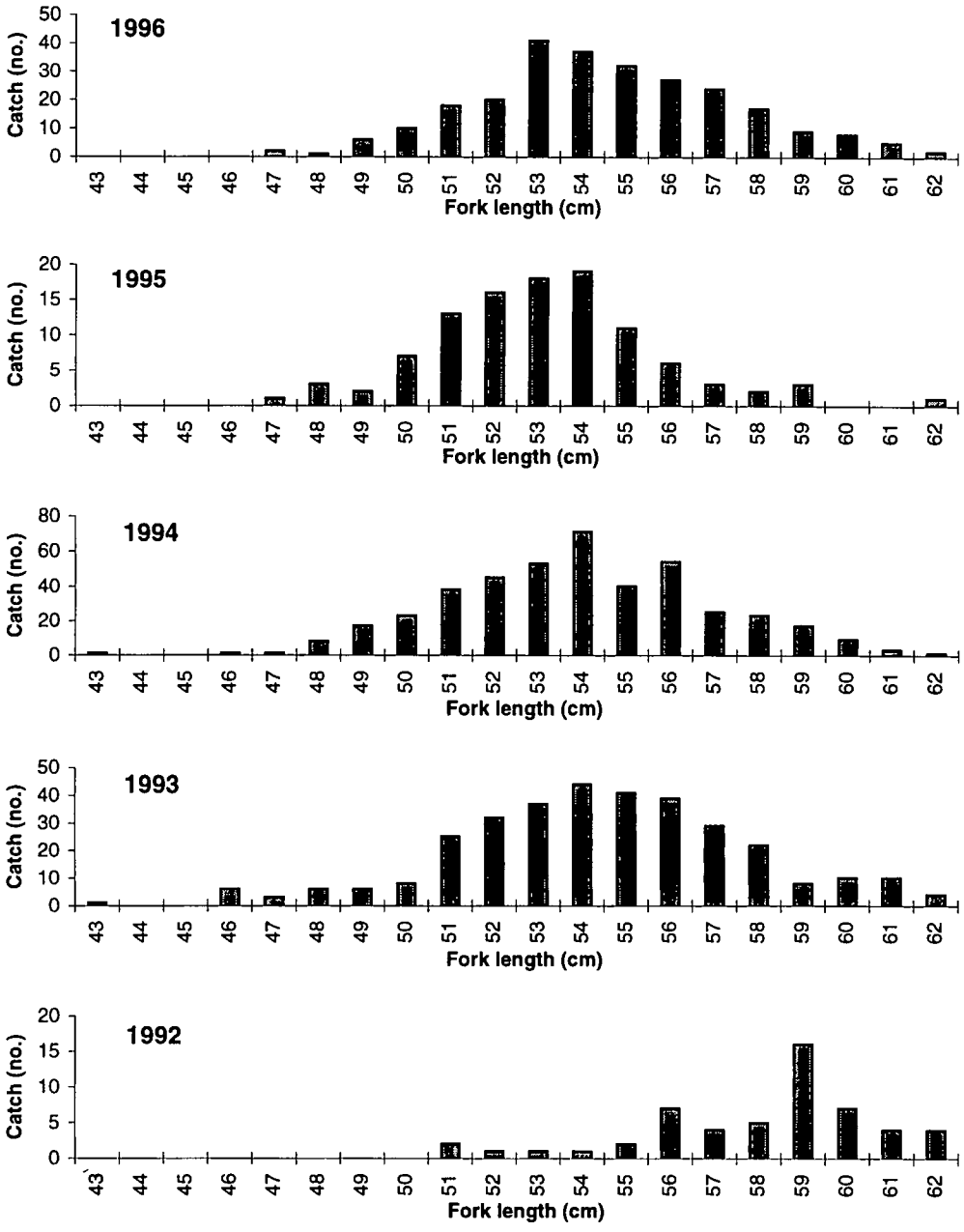

Figure 5. Length distribution (numbers) of small salmon caught in the Morrissey Rock trapnet on the Restigouche River, 1992-1996.

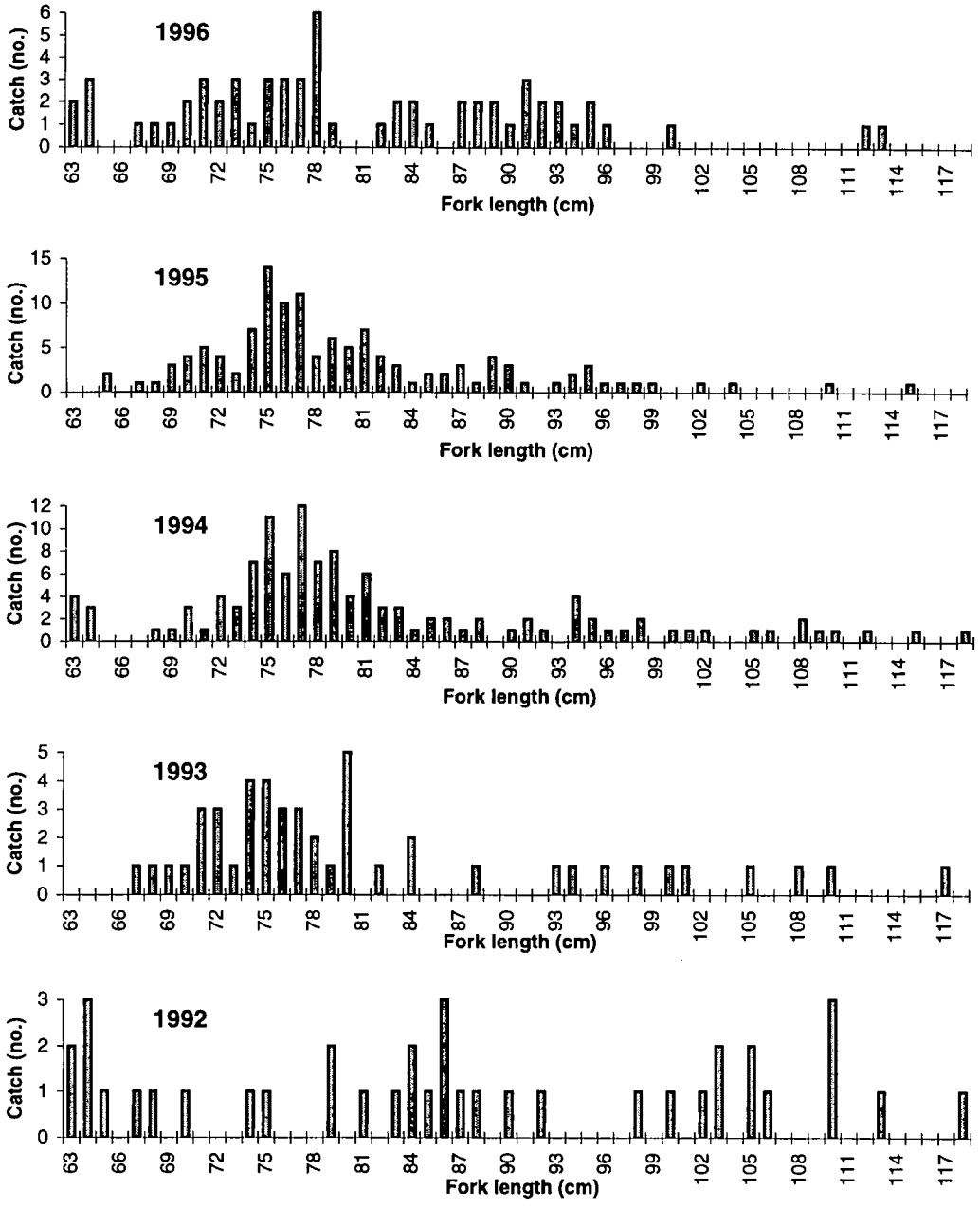

Figure 6. Length distribution (numbers) of large salmon caught in the Morrissey Rock trapnet on the Restigouche River, 1992-1996.

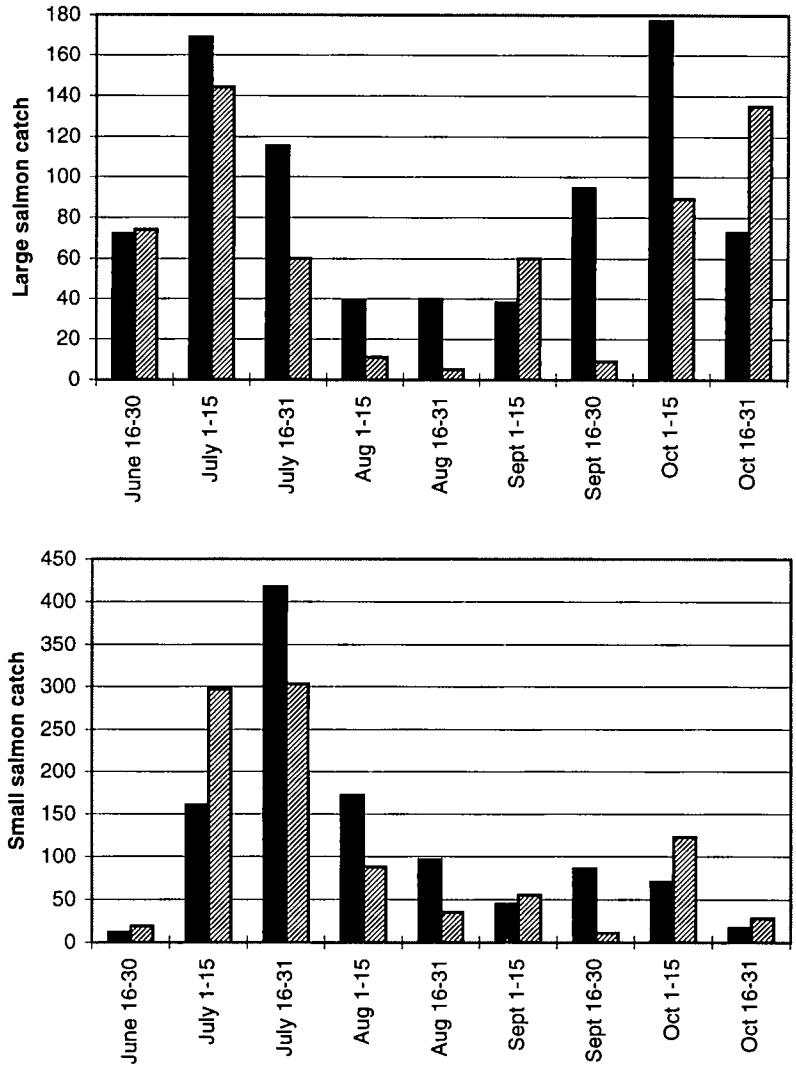

Figure 7. Semi-monthly catches of large and small salmon at the Northwest Upsalquitch River barrier fence in 1996 (hatched bars), compared to the five-year (1991-95) mean (solid bars).

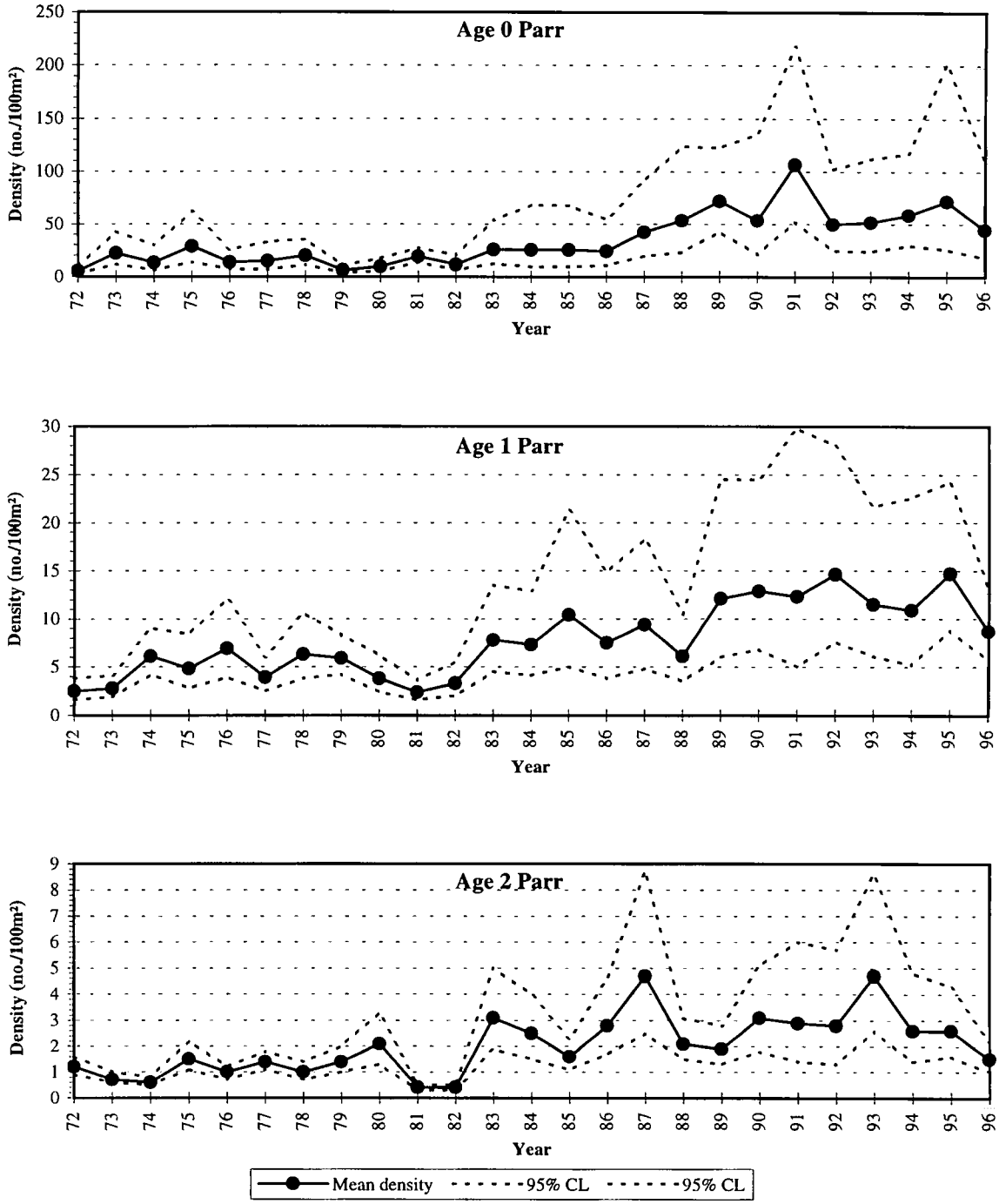

Figure 8. Mean densities of age 0, 1 and 2 parr in the Restigouche River, 1972-1996 (15 sites, 1972-1990, 1993 and 1996; 8 sites, 1991; 10 sites, 1992; 11 sites, 1994 and 13 sites, 1995). Dashed lines are 95% confidence limits.

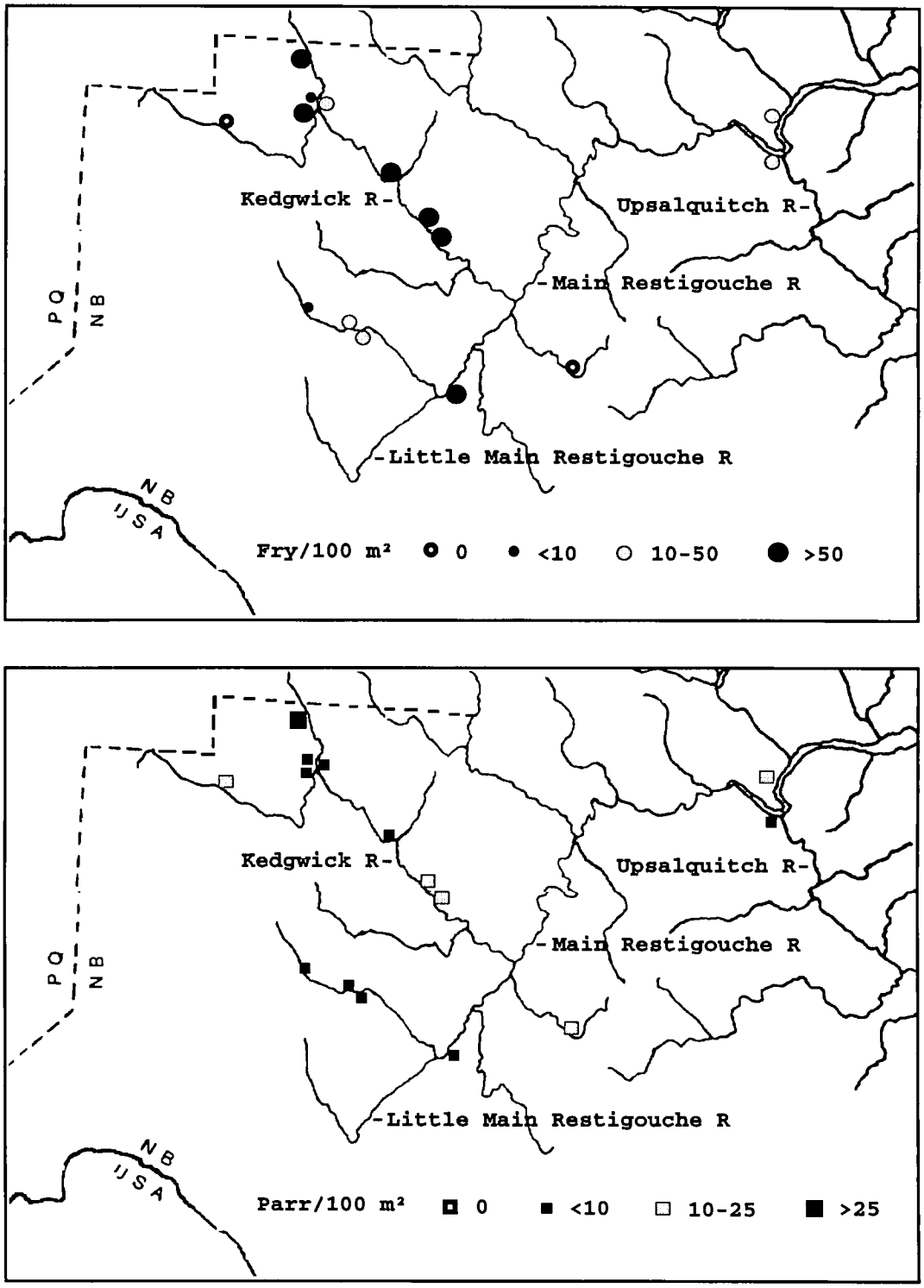

Figure 9. Density of fry (age 0) and parr (ages 1 and 2) at 15 standard electrofishing sites in the Restigouche River in 1996.

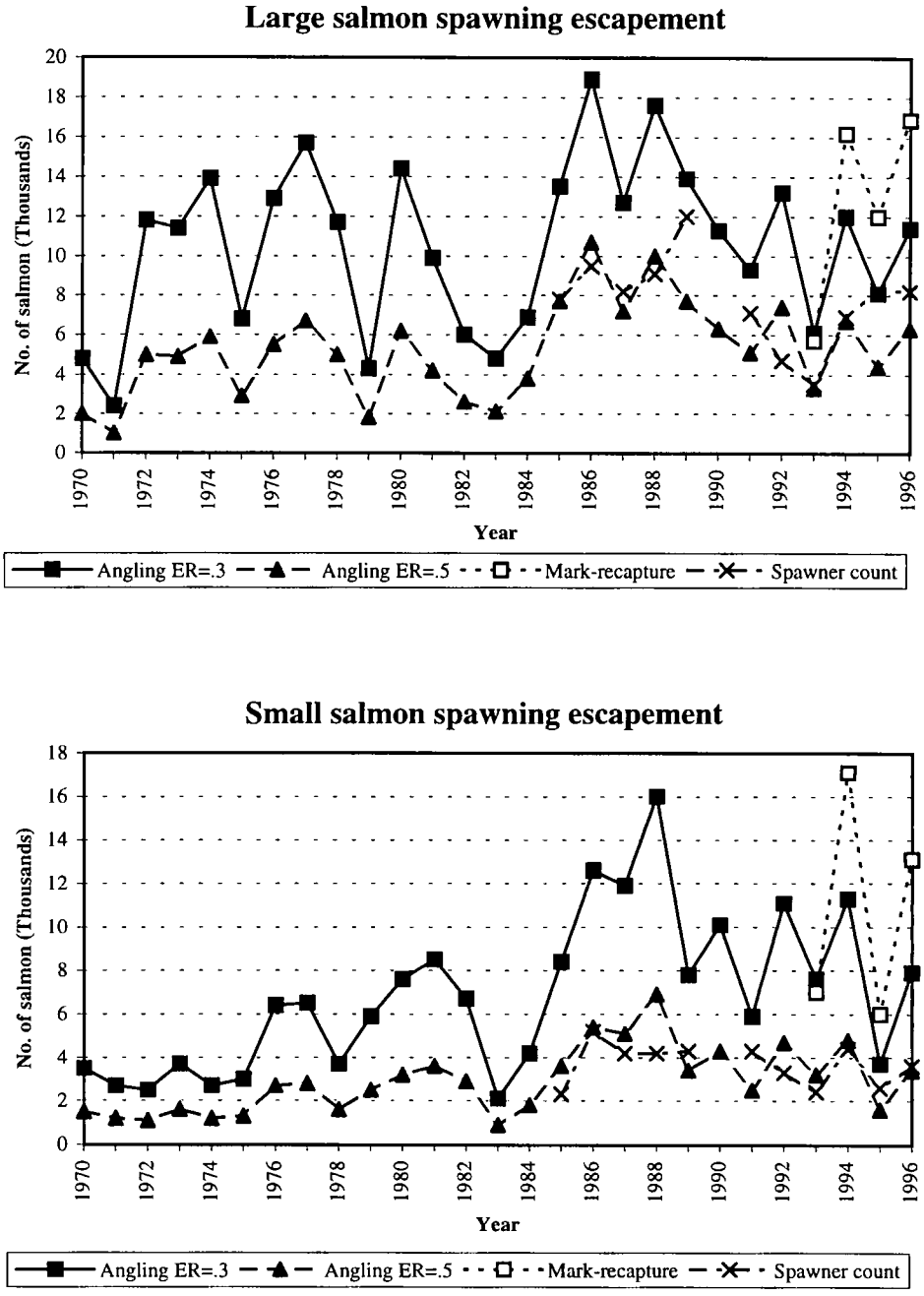

Figure 10. Comparison of large and small salmon spawning escapement estimates by different methods, 1970-1996.

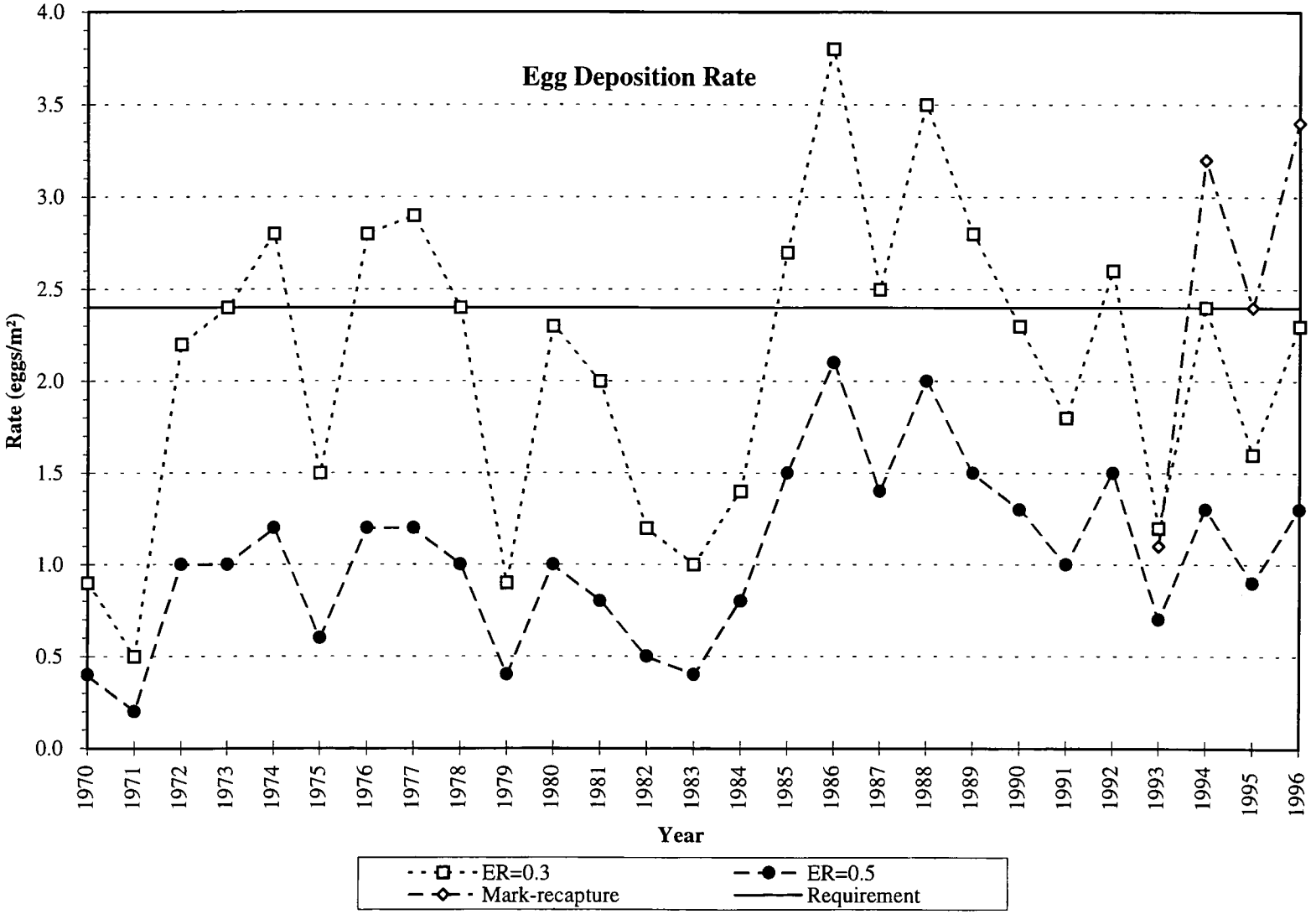

Figure 11. Egg deposition rates of Restigouche River salmon, 1970-1996, estimated from angling exploitation rate method (two levels of exploitation rate, ER) and mark-recapture method. Horizontal line indicates conservation requirement deposition rate.

APPENDIX 1

Summary of snorkeller counts of Atlantic salmon, Kedgwick and Little Main Restigouche rivers
Counted Sept. 23-25/96
Lower part of Little Main was counted from canoe.

	Salmon			Grilse			TOTAL		
River	**1996**	**1995**	**1994**	**1996**	**1995**	**1994**	**1996**	**1995**	**1994**
Kedgwick	992	1276	772	436	717	960	1428	1993	1732
Little Main	488	43	414	113	102	572	601	145	986
TOTAL	**1480**	**1319**	**1186**	**549**	**819**	**1532**	**2029**	**2138**	**2718**

Kedgwick R. totals - Sept. 23-25, 1996

Stretch	Salmon			Grilse		
	Untagged	Tagged	Total	Untagged	Tagged	Total
N. Branch	53	8	61	14	3	17
Forks to Frasers	247	32	279	93	20	113
Frasers to Conners	169	2	171	121	4	125
Conners to Clearwater	26	0	26	62	0	62
Clearwater to Junction	452	3	455	118	1	119
TOTAL	**947**	**45**	**992**	**408**	**28**	**436**

Little Main Restigouche R. totals - Jardine to Junction were counted from canoe

Stretch	Salmon			Grilse		
	Untagged	Tagged	Total	Untagged	Tagged	Total
Boston Bk. to Jardine	270	0	270	43	0	43
Jardine to Junction	218	0	218	70	0	70
TOTAL	**488**	**0**	**488**	**113**	**0**	**113**

Snorkeller counts of Atlantic salmon, Kedgwick and Little Main Restigouche rivers

Stretch: North Branch Kedgwick (Gin Creek to Driving Dam)
Snorkellers: A. Locke, E. LeBlanc Poler: A. Lavoie
Sept. 23 1996
Weather: Overcast.

Pool	Ed's counts Salmon Untagged	Tagged	Grilse Untagged	Tagged	Andrea's counts Salmon Untagged	Tagged	Grilse Untagged	Tagged	Comments
2nd Island (campsite	25	2	7	1	23	2	3	0	YELLOW tags
Long, narrow	0	0	0	0	0	0	0	0	
Below Devil's Elbow	1	0	1	0	2	0	1	0	
2nd below D. Elbow	0	0	0	0	0	0	0	0	
3rd below D. Elbow	0	0	0	0	0	0	0	0	
Above Falls	3	0	2	0	3	0	2	0	
Falls (above+below)	0	0	0	0	0	0	0	0	
1st below falls	0	0	0	0	0	0	0	0	
2nd below falls	0	0	0	0	0	0	0	0	
3rd below falls	0	0	0	0	0	0	0	0	
4th below falls	0	0	0	0	0	0	0	0	
Bridge Pool	0	0	0	0	0	0	0	0	
Driving Dam	23	6	4	2	25	6	4	2	
TOTAL	52	8	14	3	53	8	10	2	
CONSENSUS	53	8	14	3	used Ed's counts for grilse, Andrea's for salmon				

Stretch: upper Kedgwick (Kedgwick Forks to Fraser Camp)
Snorkellers: E. LeBlanc, A. Verschoor Poler: A. Lavoie
Sept. 24 1996
Weather: Overcast/ Sunny breaks.

Pool	Ed's counts Salmon Untagged	Tagged	Grilse Untagged	Tagged	Anthony's counts Salmon Untagged	Tagged	Grilse Untagged	Tagged	
Forks	108	24	38	14	98	17	15	3	YELLOW tags
1st below Forks	0	0	0	0	0	0	0	0	
2nd below Forks	0	0	0	0	0	0	0	0	
29 Mile	0	0	0	0	0	0	0	0	
Below 29 Mile	0	0	0	0	0	0	0	0	
Upper Campbell	0	0	0	0	0	0	0	0	
Lower Campbell	0	0	0	0	0	0	0	0	
Above Crabtree	0	0	0	0	0	0	0	0	
Crabtree	109	8	26	5	95	5	13	1	
Below Crabtree	0	0	2	0	0	0	1	0	
Buckhorn	0	0	0	0	0	0	0	0	
Red Rock	1	0	1	1	0	0	0	0	
Lower Red Rock	0	0	0	0	0	0	0	0	
Clinch	0	0	0	0	0	0	0	0	
Below Clinch	0	0	0	0	0	0	0	0	
Upper Trout	0	0	0	0	0	0	0	0	
Lower Trout	19	0	14	0	9	0	3	0	
Slough Gundy	0	0	0	0	0	0	0	0	
Camp Pool	10	0	12	0	11	0	5	0	
TOTAL	247	32	93	20	213	22	37	4	
CONSENSUS	247	32	93	20	used Ed's counts				

Stretch: Middle Kedgwick (Fraser's Camp to Connors Pool)
Snorkellers: F. Mowbray, A. Steeves Poler: R. Firth
Sept. 24 1996
Weather: Overcast/ Sunny breaks.

Pool	Fran's counts				Andy's counts				
	Salmon		Grilse		Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	
Barr	5	0	2	0	5	0	2	0	
Flying Eddy	0	0	0	0	0	0	0	0	
False Alarm	31	0	8	1	11	0	8	1	CARLIN
Davis	36	0	31	2	40	0	31	2	YELLOW
McDougall	13	0	12	0	18	0	12	0	
Wyers	28	1	17	0	34	1	17	0	YELLOW
Dead Man	44	1	40	1	45	1	41	1	YELLOW
Connors	0	0	0	0	16	0	10	0	
TOTAL	157	2	110	4	169	2	121	4	
CONSENSUS	169	2	121	4	used Andy's counts				

Stretch: Middle Kedgwick #2 (Connors to Clearwater)
Snorkellers: A. Steeves, A. Lavoie Poler: R. Firth
Sept. 25 1996
Weather: Overcast/Sunny breaks.

Pool	Andy's counts				Ann's counts			
	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged
15 mile	15	0	36	0	0		0	
Whalens	11	0	26	0	0	8	22	0
12 mile	0	0	0	0	0	0	0	0
11 mile	0	0	0	0	0	0	0	0
TOTAL	26	0	62	0	0		22	
CONSENSUS	26	0	62	0	used Andy's counts			

Stretch: Lower Kedgwick (Clearwater to Junction Pool)
Snorkellers: A. Locke, P. Cameron Poler: A. Belliveau
Sept. 24 1996
Weather: Overcast/ Sunny breaks.

Pool	Andrea's counts				Paul's counts				
	Salmon		Grilse		Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	
Clearwater	0	0	0	0	0	0	0	0	
Ten Mile	0	0	0	0	0	0	0	0	
Bogan	13	0	11	0	10	0	4	0	
Upper Nine Mile	0	0	0	0	0	0	0	0	
Nine Mile	15	0	3	0	15	0	3	0	
Lower Nine Mile	0	0	0	0	0	0	0	0	
Peters	0	0	0	0	0	0	0	0	
8 Mile	0	0	0	0	0	0	1	0	
7 Mile	63	0	19	0	63	0	19	0	
Darlet	0	0	0	0	0	0	0	0	
Falls Brook	0	0	0	0	0	0	0	0	
Mistake	0	0	0	0	0	0	0	0	
Deer Lick	0	0	0	0	0	0	0	0	
5 Mile	0	0	0	0	0	0	0	0	
Upper 4 Mile	62	1	19	1	85	1	13	0	ORANGE on salmon, CARLIN on grilse
4 Mile	0	0	0	0	0	0	0	0	
Picard	0	0	0	0	0	0	0	0	

3 Mile	42	0	15	0	60	0	8	0	
Home	0	0	0	0	0	0	0	0	
Lower Pot Hole	0	0	0	0	0	0	0	0	
Sundown	0	0	0	0	0	0	0	0	
2 Mile	0	0	0	0	0	0	0	0	
1 Mile	0	0	0	0	0	0	0	0	
Half Mile	0	0	0	0	0	0	0	0	
Jam/Junction	238	2	60	0	167	0	20	0	300 total, 80% salmon;ORANGE tags
TOTAL	433	3	127	1	400	1	68	0	
CONSENSUS	452	3	117.5	1	used mean counts excluding Junction; added on Andrea's Junction count				

Stretch: Little Main Restigouche (Boston Brook to Jardine)
Snorkellers: A. Madden, M. Robinson/L. Anderson Polers: L. Anderson/M.Robinson
Sept. 24 1996
Weather: Overcast/ Sunny breaks

Pool	Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged
Boston Brook	164	0	12	0
2nd pool	0	0	0	0
3rd pool	0	0	0	0
4th pool	0	0	0	0
5th pool	16	0	7	0
Between 5th and 6th	6	0	7	0
6th	11	0	2	0
7th	73	0	14	0
8th	0	0	0	0
8 Mile	0	0	1	0
Jardine	0	0	0	0
TOTAL	270	0	43	0

Stretch: Lower Little Main (Jardine to Junction)
Canoe counts by Bill Hooper and crew
Sept. 24 1996

Pool names	Salmon	Grilse	
not obtained	4	13	
	67	9	
	11	5	
	60	15	75 total, 80% salmon
	0	2	
	16	11	27 total, 60% salmon
	60	15	75 total, 80% salmon
TOTAL	218	70	