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STATUS OF ATLANTIC SALMON IN THE NEPISIGUIT AND JACQUET RIVERS, NEW BRUNSWICK, IN 1997

by

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Abstract

Egg deposition of Atlantic salmon in the Nepisiguit River in 1997 is believed to have been in the order of 50-60% of the requirement for conservation, similar to the situation of the past four years. The egg deposition requirement has not been met since 1988.

The estimated egg deposition of Atlantic salmon in the Jacquet River was 52% of the conservation requirement. Conservation requirements for the Jacquet River were recalculated as 571 large and 347 small salmon. Spawning escapement of both large and small salmon was less than the conservation requirement, as was returns of large salmon.

Résumé

On croit que la ponte du saumon atlantique dans la rivière Nepisiguit en 1997 correspondait à entre 50 et 60% de l'objectif de conservation, ce qui était le cas les quatre dernières années. L'objectif de ponte n'a pas été atteint depuis 1988.

La ponte estimative dans la rivière Jacquet correspondait à 52% de l'objectif de conservation. Un nouveau calcul des besoins de conservation les situe à 571 gros saumons et à 347 petits saumons. L'échappée de petits et de gros saumons était inférieure à l'objectif de conservation, tout comme les remontées de gros saumons.

1 - Introduction

Atlantic salmon occur naturally in the Nepisiguit (Fig. 1) and Jacquet (Fig. 2) rivers of northern New Brunswick. An active salmon stocking program has been carried out in the Nepisiguit River for the past two decades, initially to restore the population following a spill of mining waste and overfishing, and subsequently for enhancement purposes. In order to minimize losses of the existing wild population of the Jacquet River to poaching, the New Brunswick Department of Natural Resources and Energy has operated a salmon barrier fence since 1994.

This report documents the status of Atlantic salmon in the Nepisiguit and Jacquet rivers in 1997. For the Nepisiguit River, barrier fence counts, redd counts, estimates of angling catch, electrofishing surveys of juvenile abundance, and stocking data are summarized. For the Jacquet River, barrier fence counts and stocking data are presented. Electrofishing surveys of juvenile abundance in the Jacquet River in 1994-1996 are summarized. Conservation requirements for the Jacquet River are recalculated based on updated habitat measurements. In both rivers, egg depositions are estimated from salmon returns to the counting fences, removals and spawner abundances.

In the terminology utilised herein, salmon are subdivided into two size classes. Small salmon are adults less than 63 cm in fork length (1SW, one sea-winter salmon or grilse). Large salmon are adults greater than or equal to 63 cm in fork length (MSW or multi-sea-winter salmon).

2 - Nepisiguit River

2.1 - Conservation requirement

The conservation egg deposition for Atlantic salmon in the Nepisiguit River is **9.535 x 10^6 eggs (1626 large, 823 small salmon)**. This estimate was based on the following:

- accessible rearing habitat = 3.973 x 10^6 m^2 (Anon. 1978)
- optimal egg deposition = 2.4 eggs/m^2 (Elson 1975)
- average fecundity of females = 1,475 eggs/kg (Randall 1984)
- proportion of females in the large salmon population = 0.71, and in the small salmon population = 0.17 (Locke et al. 1994)
- mean weight of large salmon = 5.6 kg, of small salmon = 1.4 kg (weights estimated at counting fence, R. Baker, pers. comm.).

The re-evaluation of rearing habitat recommended by Locke et al. (1997) could not be carried out in 1997, but should be attempted in 1998.

2.2 - Fisheries

2.2.1 - Description of fisheries

Salmon fisheries in the Nepisiguit River include recreational angling and angling by members of Pabineau First Nation.

The recreational angling season was June 1 to October 15. Only hook-and-release fishing was permitted for large salmon, with a daily hook-and-release limit of four fish. Seasonal and daily bag limits for small salmon were eight and two fish, respectively. Anglers were required to stop fishing once the daily small salmon limit was reached.

The angling season for Pabineau First Nation, under an agreement with DFO, was June 1 to December 31. A quota of 400 small salmon was to be captured by angling only.

2.2.2 - First Nation fishery

The catch of First Nation anglers was estimated as 85 small salmon caught by 11 individuals (B. Paul Jr., Pabineau First Nation, personal communication). Approximately 75% of this catch occurred after September 1.

2.2.3 - Nepisiguit Salmon Association angling catch estimate

Angling catches estimated by the Nepisiguit Salmon Association (NSA) were 200 retained and 50 released small salmon, and 300 released large salmon (Table 1). Compared to the five-year mean of 633 small salmon and 300 large salmon, the 1997 angling catch of small salmon was down by 61% and large salmon catch was unchanged (Table 2, Fig. 3).

Fishing effort in 1997 (2200 rod-days) was the lowest estimated by NSA since 1984, and was 40% lower than the five-year mean of 3680 rod-days (Table 2). As in the previous three years (Locke et al. 1995; Locke and Mowbray 1996, 1997), most of the angling effort occurred in September (800 rod-days) and October (600 rod-days before the season closure on October 15) (Table 1).

Monthly catch per unit effort (CPUE) was highest in October at 0.34 fish/rod-day followed by September at 0.29 fish/rod-day (Table 1). CPUE for the full season was 0.25 fish/rod-day, the same as the five-year mean (Table 2).

2.2.4 - FISHSYS angling estimate

Angling catches estimated by the N.B. Dept. of Natural Resources and Energy FISHSYS angler survey (W. Hooper, pers. comm.) were 334 retained and 137 released small salmon, and 326 released large salmon (Table 2). This was the lowest small salmon catch estimated by FISHSYS since 1980. Fishing effort was estimated as 5121 rod-days, more than double the estimate obtained by the NSA. Small salmon catch was also estimated considerably higher than the NSA value, but large salmon catch was similar by both methods. Catch per unit effort for the full season was 0.16 fish/rod-day, considerably lower than the NSA estimate but similar to FISHSYS estimates for 1994 and 1995 (no data were available in 1996).

2.2.5 - Angler logbooks

Angling logbooks completed by twelve members of the Nepisiguit Salmon Association indicated angling in 1997 (CPUE of 0.33 fish/rod-day) was poorer than in 1996 (0.43 fish/rod-day) or 1995 (0.35 fish/rod-day) but better than in 1994 (0.27 fish/rod-day) (Table 3).

As in the previous three years, most angling (89% of the total rod-days) by logbook anglers took place in the waters below the fence. In all three years, CPUE has been consistently higher below than above the fence. In 1997, CPUE below the fence was lower than any of the previous three years, but CPUE above the fence was average.

2.3 - Research data

2.3.1 - Juvenile stocking and broodstock collection

In 1996, the Charlo Salmonid Enhancement Centre (S.E.C.) stocked 150,000 fall fingerlings and 12,000 age 1 smolts (Table 4) into the Nepisiguit River and its tributaries below Grand Falls (Fig. 1). Fry were unmarked, but all smolts were adipose-clipped. This was the second year that age 1 smolts were stocked from Charlo S.E.C.

The Nepisiguit Salmon Association obtained 350,000 eyed eggs from Charlo S.E.C., for streamside incubation at Grand Falls. Survival rate in the incubation boxes was 92.4%, producing 323,523 swim-up fry, of which 273,523 were stocked to the Nepisiguit River (Table 4). An additional 50,000 swim-up fry were stocked to the Tetagouche River above the falls. All fish were unmarked.

All broodstock used to produce eggs for this stocking were collected from the Nepisiguit River in 1996. In 1997, 103 large salmon (78% of the large salmon returns at the counting fence) were collected as broodstock. Two of these died after arrival at the hatchery.

2.3.2 - Counting fence

A salmon counting fence was operated by Pabineau First Nation in collaboration with Nepisiguit Salmon Association and DFO from June 14 to October 15 (Table 5). The fence was located in the Nepisiguit River, just above Gray's Ledge Pool.

Salmon captured at the fence during their upstream migration were counted, and all large and approximately 30% of small salmon were also measured, a scale sample was collected and fish were externally sexed if possible. Adipose fin clips (indicating hatchery origin) or numbered Carlin tags were noted. Salmon were released above the fence or retained as broodstock to be sent to Charlo Salmonid Enhancement Centre.

Very few salmon were recorded at the fence, compared to previous years (Table 6; Fig. 4). In total, 27 small salmon were counted at the fence. No small salmon were adipose fin-clipped (Table 6). In total, 132 large salmon were counted (including 1 fin-clipped).

Counts of salmon returning to the fence are believed to have been inaccurate, for two reasons. First, the fence was removed earlier than anticipated (due to budgetary constraints) and much of the late run entered the river following removal of the fence and during a 24-hour period in mid-October when the fence was compromised due to leaf build-up and lifting of the fence. Second, gaps in the fence could have allowed salmon to pass through the fence without being counted. This observation is supported by angling catches and observations of small salmon upriver of the fence, early in the season before any small salmon had been counted at the fence (R. Baker, pers. comm.). Length frequencies of salmon recorded at the fence are also skewed toward larger sized individuals (Fig. 5).

In several previous stock assessments, returns to the fence were "adjusted" using angling catches and a regression equation (Locke et al. 1997). This was not done for the 1997 data because a large proportion of returns to the river are believed to have taken place after October 15, the end of the angling season on which the adjustments were based.

2.3.3 - Redd counts

Redd counts were conducted by the Nepisiguit Salmon Association both above and below the fence (Table 7). The total count was 2298 redds, very similar to the total of 2267 redds counted in 1996. The distribution of redds above and below the fence was also similar to that observed in 1996.

2.3.4 - Juvenile densities

Estimates of juvenile densities were obtained at 12 sites in the Nepisiguit River, 3 sites in Gordon Meadow Brook, and 6 sites in the Pabineau River electrofished by the Nepisiguit Salmon Association. Densities were estimated by the DeLury (1958) method, using removal from sites enclosed by barrier nets. Juvenile salmon were separated into age classes using fixed length categories (fry, ≤5.5 cm; parr, >5.5 cm).

Mean density of fry in 1997 (30.1 fry/100 m^2) was the third highest recorded since 1982, and was exceeded only by values in 1991 and 1994 (Fig. 6). Mean density of parr (6.3 parr/100 m^2) was the second lowest since 1990.

2.4 - Stock status

Based on the redd count data, spawning escapement of Atlantic salmon in the Nepisiguit River in 1997 was probably similar to levels calculated for recent years, approximately 50-60% of conservation requirement calculated for the entire accessible habitat. Spawning requirements have been exceeded in only two years (1987 and 1988) since 1982 (Table 8). Neither the conservation egg deposition or large salmon escapement have been met since 1988. Small salmon spawning escapement was exceeded in nine years, although not since 1993. Egg deposition has declined since 1989, but has remained at approximately 50-60% of the conservation level over the past four years.

2.5 - Ecological considerations

2.5.1 - Species interactions

Predation by piscivorous birds, primarily mergansers, on juvenile salmon is a major concern of some anglers on the Nepisiguit River. Merganser surveys carried out by the NSA and/or DNRE in July-September in 1994 through 1997 have counted similar numbers of mergansers in each year - a maximum of about 1.7 mergansers/river km, with up to 48 birds on the Nepisiguit River below Grand Falls in 1997.

2.5.2 - Environmental conditions

Morning water temperature at the counting fence (sampled daily at approximately 0800 h) rarely exceeded 20 C and never exceeded 25 C (Fig. 4).

Spot-checks of river pH by the NSA on September 2 and October 20 showed circumneutral readings: Nepisiguit River (7.04 -7.81), and Pabineau River (7.00-7.51).

2.6 - Management considerations

The recommended conservation level of spawning escapement was not achieved in 1997. Egg deposition is believed to have been approximately 50-60% of the conservation level.

3 - Jacquet River

3.1 - Conservation requirements

The conservation egg deposition that has been used for the Jacquet River is **2.724 million eggs,** based on an estimated habitat area of 1.135 million m^2. Based on this habitat area and updated biological data, Locke et al. (1997) recalculated the fish required to produce these eggs as 412 large and 250 small salmon.

Habitat surveys conducted by the N.B. D.N.R.E. in 1968-69 (Appendix 1) determined a habitat area of 1.574 million m^2. Based on this revised habitat area, conservation requirements are increased by 39% to **3.778 million eggs** to be obtained from **571 large and 347 small salmon**.

3.2 - Fisheries

Unlike the Nepisiguit River, angling for kelts was permitted in the Jacquet River from April 15 to May 15. Angling regulations for bright fish in the Jacquet River were similar to those in the Nepisiguit River with the exception of a later season closure, October 30.

The New Brunswick Aboriginal Peoples Council received a communal license for salmon fishing in a number of rivers, including the Jacquet River, with a total 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 in 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 in August 1 through September 15.

Pabineau First Nation also received a communal license for 10 small salmon to be taken by angling in the Jacquet River between June 3 and December 31.

As in 1996, no catch or harvest data for either the regular angling or the Native fisheries were available for 1997. Mean 1990-1995 angling catches were 19 small and 24 large kelts, and 67 small and 55 large bright salmon (Table 9). Fishing effort on bright salmon increased and CPUE decreased over this six-year period.

3.3 - Research data

3.3.1 - Juvenile stocking and broodstock collection

In 1997, 17,200 swim-up fry were stocked to the Jacquet River on June 17 and 18. Charlo Salmonid Enhancement Centre staff collected five large salmon (two males, three females) and one male grilse for broodstock.

3.3.2 - Counting fence

In 1997, a barrier fence was operated by the municipality of Belledune in collaboration with DNRE. The fence was installed for the fourth year at Big Rock Pool just upriver of the Highway 11 bridge. The fence operated from June 27 to November 3. In total, 282 large and 371 small salmon returned to the fence (Fig. 7); this includes 104 large and 143 small salmon seined just below the fence by project personnel on October 17 and 23, and placed in the holding pool. This has been a standard procedure in all years of fence operation. There were no mortalities recorded at the fence. Small salmon were released throughout the season to afford angling opportunities upriver.

As in previous years, the majority of fish (96% of large and 91% of small salmon) reached the fence after October 1 (Fig. 8).

3.3.3 - Juvenile abundance

Juvenile abundance in the Jacquet River was measured in 1994-1996 during electrofishing surveys of three to six sites by the DNRE. There were no electrofishing surveys in 1997.

Fry abundance in 1995 and parr abundance in 1996 were the highest of the three-year series (Fig. 9). Small salmon (grilse) from this cohort may be expected to return in 1998.

3.4 - Estimation of returns, removals and spawning escapement

Returns to the barrier fence were assumed to represent in-river returns. Mortalities at the fence were subtracted to obtain the number of salmon released above the fence. Removals of salmon upstream of the barrier fence were estimated as the mean angling mortality on bright fish in 1990-1995. Virtually all angling takes place above the fence (A. Madden, personal observation). Angling mortality of released large salmon was estimated as 3% of the total catch.

3.5 - Stock status

Conservation spawning escapement was not achieved in 1997 (Table 19). Only 52% of the conservation egg deposition was met. Spawning escapement was estimated as 280 large (49% of requirement) and 304 small (88% of requirement) salmon.

Returns of large salmon (282 fish) did not exceed the conservation requirement (571 fish).

3.6 - Management considerations

Atlantic salmon in the Jacquet River did not meet conservation requirements for the second year in a row. Large salmon spawning escapement was less than 50% of the requirement, and large salmon returns were less than the conservation requirement for spawning escapement.

4 - Research recommendations (Nepisiguit and Jacquet rivers)

1. Continue operation of the Nepisiguit River counting fence for assessment and broodstock collection. Early installation of the fence has been favoured in order to collect early-run broodstock. For the assessment program, it would be better to put the fence in later rather than earlier in order that the late October run of fish not be missed in the case of budget shortfalls.

2. Update the salmon habitat estimates in the Nepisiguit River, then reevaluate conservation requirements for total egg deposition.

5 - Acknowledgements

Much of the data on Atlantic salmon in the Nepisiguit River was collected by employees and volunteers of the Nepisiguit Salmon Association and Pabineau First Nation. We especially thank R. Baker, president of the NSA, and J. Grant and the staff of the counting fence. P. Cameron supplied DFO hatchery stocking data for both rivers. W. Hooper supplied DNRE electrofishing data for the Jacquet River. We thank the staff of the Jacquet River counting fence for their contributions to this report. R. Bernier assisted with data entry and analysis.

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Table 1. Monthly angling catches, effort, and catch per unit effort (CPUE) of Atlantic salmon on the Nepisiguit River in 1996. Information provided by the Nepisiguit Salmon Association.

Month	Small salmon		Large salmon	Effort (Rod-days)	CPUE (catch/rod-day)
	Retained	Released	Released		
June	0	0	30	200	0.15
July	25	0	30	400	0.14
August	10	0	15	200	0.12
Sept.	100	30	105	800	0.29
Oct.	65	20	120	600	0.34
TOTAL	200	50	300	2200	0.25

Table 2. Estimates of angling catch of Atlantic salmon in the Nepisiguit River, 1951-1997.

(a) Data for bright and kelt fisheries, collected by DFO C&P, 1951-1983. All fish caught are assumed to have been retained.

Year	Bright Fish Small	Bright Fish Large	Bright Fish Total	Kelts Small	Kelts Large	Kelts Total	Effort (rod-days)
1951	.	.	286	.	.	40	1776
1952	.	.	415	.	.	30	1765
1953	.	.	595	.	.	42	2035
1954	.	.	1255	.	.	42	1640
1955	.	.	783	.	.	148	2275
1956	.	.	389	.	.	117	1686
1957	.	.	590	.	.	135	3130
1958	.	.	963	.	.	85	3540
1959	.	.	376	.	.	85	2150
1960	.	.	193	.	.	50	905
1961	.	.	313	.	.	25	1360
1962	.	.	446	.	.	70	1570
1963	.	.	334	.	.	10	878
1964	.	.	232	.	.	213	557
1965	473	20	493	120	6	126	371
1966	407	38	445	.	.	354	818
1967	410	46	456	.	.	42	604
1968	189	5	194	.	.	55	551
1969	38	5	43	.	.	32	480
1970	2	0	2	.	.	0	97
1971	16	1	17	.	.	0	192
1972	16	10	26	.	.	0	165
1973	0	95	95	.	.	0	1000
1974	28	140	168	.	.	7	1227
1975	77	95	172	8	14	22	1457
1976	335	100	435	3	0	3	576
1977	28	38	66	0	0	0	678
1978	40	69	109	0	0	0	1215
1979	44	6	50	0	15	15	614
1980	135	103	238	.	.	.	1515
1981	130	179	309	46	62	108	1730
1982	130	187	317	25	30	55	1780
1983	117	176	293	.	.	.	1343

Table 2. Continued.

(b) Angling data collected by Nepisiguit Salmon Association, showing removals and releases for the bright fishery.

Year	Small salmon		Large salmon	Effort (rod-days)	CPUE (catch/rod-day)
	Removed	Released	Released		
1984	600	150	150	3015	0.30
1985	no data				
1986	800	400	500	3600	0.47
1987	800	550	500	4250	0.44
1988	1000	400	600	5000	0.40
1989	600	100	490	4000	0.30
1990	500	100	300	3400	0.26
1991	700	150	300	3700	0.31
1992	800	330	270	4700	0.30
1993	470	85	258	3300	0.25
1994	380	70	250	3700	0.19
1995	350	100	300	2900	0.26
1996	450	130	420	3800	0.26
1997	200	50	300	2200	0.25
Mean (92-96)	490	143	300	3680	0.25
% change (97 cf. mean)	-59%	-65%	0%	-40%	0%

Table 2. Continued.

(c) Angling data from DNRE FISHSYS angler surveys, 1969-1997, showing estimates of retained small salmon and released large salmon for the bright fishery.

Year	Small salmon		Large salmon	Effort (rod-days)	CPUE (catch/rod-day)
	Removed	Released	Released		
1969	46		9	150	0.37
1970	41		0	196	0.21
1971	0		0	38	0
1972	23		20	352	0.12
1973	0		14	294	0.05
1974	39		12	633	0.08
1975	8		8	57	0.28
1976	207		79	633	0.45
1977	52		0	221	0.24
1978	18		30	473	0.10
1979	14		0	1052	0.01
1980	752		145	2952	0.30
1981	1033		170	3599	0.33
1982	522		81	3429	0.18
1983	430		50	4140	0.12
1984	814		289	2444	0.45
1985	1135		653	7084	0.25
1986	2018		939	7365	0.40
1987	1903		1072	7498	0.40
1988	1429		703	6578	0.32
1989	778		795	5433	0.29
1990	1035		528	9781	0.16
1991	1628		792	10869	0.22
1992	1153		705	11861	0.16
1993	1546		1013	12393	0.21
1994	484		147	5044	0.13
1995	490		20	3070	0.17
1996	no data				
1997	334	137	326	5121	0.16

Table 3. Angling records from logbooks distributed to Nepisiguit Salmon Association members, 1997. Numbers of landed fish only.

Angler	Rod-days		Small salmon				Large salmon		Total catch		Catch/rod-day		
	Above fence	Below fence	Retained		Released		Released		Above fence	Below fence	Above fence	Below fence	Total
			Above fence	Below fence	Above fence	Below fence	Above fence	Below fence					
1	2.8	7.2	0	0	0	0	0	2	0	2	0	0.28	0.20
2	2.0	1.0	1	0	0	0	1	1	2	1	1.00	1.00	1.00
3	3.2	14.8	0	3	0	0	0	1	0	4	0	0.27	0.22
4	4.2	34.8	0	0	0	11	0	14	0	25	0	0.72	0.64
5	2.0	19.0	0	4	0	0	0	1	0	5	0	0.26	0.24
6	0.5	7.5	0	0	0	0	0	7	0	7	0	0.93	0.88
7	0.8	10.2	0	0	0	0	0	2	0	2	0	0.20	0.18
8	0	18.0	0	4	0	0	0	2	0	6	-	0.33	0.33
9	0	14.0	0	0	0	0	0	0	0	0	-	0	0
10	0	1.0	0	0	0	0	0	0	0	0	-	0	0
11	1.0	3.0	0	0	0	0	0	1	0	1	0	0.33	0.25
12	0	5.0	0	1	0	0	0	1	0	2	-	0.40	0.40
totals													
1997	16.5	135.5	1	12	0	11	1	32	2	55	0.13	0.39	0.33
1996	48.3	132.7	4	22	6	22	5	20	15	60	0.31	0.48	0.43
1995	58.5	114.5	5	21	3	10	3	24	11	55	0.19	0.39	0.35
1994	50.0	96.0	10	8	2	11	0	9	12	28	0.24	0.29	0.27

Table 4. Number of juvenile salmon stocked to the Nepisiguit system. Value in parentheses is percentage of salmon marked (AC=adipose fin clip, NT = magnetic wire nose tag, CT = Carlin tag). Source: 1976-1981, Newbould 1983; 1982-1992, Nepisiguit Salmon Association; 1993-1997, Charlo Salmonid Enhancement Centre). Swim-up fry from streamside incubation boxes, all other life stages from hatcheries.

Year	Swim-up fry	Feeding fry (3 cm)	Fingerling fry (7 cm)	Age 1 parr	Age 2 smolt	YEARLY TOTAL
1976	0	0	78,196 (unmarked)	0	33,101 (100% AC)	111,297
1977	0	0	0	0	0	0
1978	0	0	166,283 (100% AC)	5,320 (100% AC)	0	171,603
1979	0	138,600 (unmarked)	86,947 (100% AC)	4,229 (100% AC)	2,002 (100% AC&CT)	231,778
1980	0	0	178,047 (100% AC)	6,978 (100% AC)	23,588 (100% AC&NT)	208,613
1981	0	176,440 (unmarked)	498,301 (100% AC)	3,819 (100% AC)	7,635 (100% AC&NT)	686,195
1982	0	0	293,140 (100% AC)	2,980 (100% AC)	0	296,120
1983	0	216,172 (unmarked)	298,453 (100% AC)	10,645 (100% AC)	10,454 (100% AC)	535,724
1984	0	65,576 (unmarked)	261,141 (100% AC)	18,667 (100% AC)	10,752 (100% AC&NT)	356,136
1985	25,669 (unmarked)	30,000 (unmarked)	316,618 (100% AC)	11,152 (100% AC)	10,650 (100% AC)	394,089
1986	48,312 (unmarked)	98,734 (unmarked)	268,277 (unmarked)	2,540 (100% AC)	10,706 (100% AC&NT)	428,569

Table 4. Continued.

Year	Swim-up fry	Feeding fry (3 cm)	Fingerling fry (7 cm)	Age 1 parr	Age 2 smolt	YEARLY TOTAL
1987	144,450 (unmarked)	82,306 (unmarked)	206,814 (unmarked)	1,872 (100% AC)	10,706 (100% AC&NT)	446,148
1988	293,465 (unmarked)	141,000 (unmarked)	208,046 (unmarked)	0	8,792 (100%AC&NT)	651,303
1989	335,533 (unmarked)	0	284,004 (28% AC)	0	10,000 (100%AC&NT)	629,577
1990	342,981 (unmarked)	0	400,000 (35% AC)	6,500 (100%AC)	11,700 (100% AC&NT)	761,181
1991	243,016 (unmarked)	0	176,702 (100% AC)	0	9,663 (100% AC&NT)	429,381
1992	335,801 (unmarked)	118,542 (unmarked)	146,950 (10% AC)	12,441	11,641 (100% AC)	625,375
1993	336,277 (unmarked)	0	149,522 (65% AC)	30,944 (100% AC)	0	516,743
1994	255,000 (unmarked)	168,000 (unmarked)	0	0	0	423,000
1995	105,000 (unmarked)	0	90,906 (13% AC)	0	0	195,906
1996	240,000 (unmarked)	118,000 (unmarked)	154,129 (unmarked)	11,107 (100% AC)	12,921 (age 1 smolt) (100% AC)	536,157
1997	273,500 (unmarked)	0	150,000 (unmarked)	0	12,000 (age 1 smolt) (100% AC)	435,500

TOTAL STOCKED, 1976 - 1997: 9,070,395

Table 5. Dates of operation of the Nepisiguit counting fence, 1982-1997.

Year	Dates of operation
1982	May 28-Nov. 1
1983	May 26-Nov. 4
1984	May 27-30, June 4-Nov. 7
1985	May 30-Nov. 8
1986	June 2-Nov. 5
1987	June 4-July 12, July 17-Nov. 5
1988	June 3-Oct. 23
1989	June 5-Aug. 14, Aug. 17-Nov. 6
1990	June 15-July 25, Aug. 4-11, Aug. 26-Sept. 4
1991	June 22-July 5, July 9-12, July 16-19, July 23-26, July 30-31, Aug. 1-2, Aug. 6-9, Aug. 13-15, Aug. 19-22, Aug. 26-30, Sept. 3-13
1992	June 25-Oct. 23
1993	July 2-Oct. 25
1994	June 29-Oct. 26
1995	July 6-Oct. 20
1996	June 18-Oct. 9
1997	June 14-Oct.15

Table 6. Salmon counts at the Nepisiguit River counting fence, subdivided into adipose fin-clipped (AC) and unclipped salmon.

	Small salmon			Large salmon		
Year	AC	not AC	Total	AC	not AC	Total
1982	211	784	995	138	234	372
1983	70	236	306	29	262	291
1984	125	831	956	102	310	412
1985	160	349	509	194	627	821
1986	496	913	1409	363	581	944
1987	734	1000	1734	477	905	1382
1988	552	1865	2417	460	1392	1852
1989	90	386	476	323	757	1080
1990*	65 (564)	87 (755)	152 (1319)	59 (303)	125 (641)	184 (944)
1991*	15 (226)	104 (1570)	119 (1796)	22 (175)	88 (698)	110 (873)
1992	182	930	1112	13	428	441
1993*	14 (100)	104 (742)	118 (842)	20 (80)	177 (709)	197 (789)
1994*	24 (52)	242 (525)	266 (577)	6 (17)	227 (635)	233 (652)
1995*	8 (26)	173 (551)	181 (577)	12 (25)	359 (757)	371 (782)
1996*	6 (19)	191 (596)	197 (615)	5 (13)	330 (884)	335 (897)
1997	0	27	27	1	131	132

* numbers in parentheses are estimated counts at fence, obtained by regression analysis as explained in the text.

Table 7. Redd counts in the Nepisiguit River and tributaries. Above and below fence refer to the current fence location. Both tributaries are located below the fence. (--) indicates that no observations were made.

Year	Nepisiguit River Above fence	Below fence	Total	Pabineau River	Gordon Meadow Brook	% of redds above fence
1981	--	--	--	17	8	--
1982	149	87	236	52	66	63.1
1983	1164	414	1578	--	--	73.8
1984	1014	564	1578	--	--	64.3
1985	1341	513	1854	--	--	72.3
1986	2250	692	2942	337	91	76.5
1987	2447	1383	3830	158	64	63.9
1988	3017	1468	4485	177	39	67.3
1989	732[a]	43[a]	775[a]	--	--	--
1990	--	--	--	--	--	--
1991	--	--	--	--	--	--
1992	--	--	--	--	--	--
1993	1647	--	1647[a]	--	--	--
1994	2198	754	2952	--	--	74.5
1995	2763[a]	163	2926[a]	--	--	--
1996	2030	237	2267	--	--	89.5
1997	2087	211	2298	--	--	90.8

Mean = 73.6%

[a] Incomplete counts

Table 8. Annual estimates of total returns and total spawners for large and small salmon in the Nepisiguit River. Spawner numbers in bold type exceeded the conservation spawning escapement of 1626 large salmon and 823 small salmon. Egg deposition is calculated from spawner estimates, assuming 5864.6 eggs/large spawner (8260 eggs/large female) and 351.05 eggs/small spawner (2065 eggs/small female).

Year	Large salmon			Small salmon				
	Returns	Spawners	Egg deposition (x 10^6)	Returns	Spawners	Egg deposition (x 10^6)	Total egg deposition (x 10^6)	% of egg requirement
1982	668	249	1.46	1537	**1223**	0.43	1.89	7
1983	545	109	0.54	562	325	0.11	0.75	8
1984	692	376	2.21	2139	**999**	0.35	2.56	27
1985	1218	948	5.56	858	575	0.20	5.76	60
1986	1397	1128	6.62	2414	**1546**	0.54	7.16	75
1987	2014	**1699**	9.96	2890	**2017**	0.71	10.67	112
1988	2700	**2381**	13.96	4057	**2900**	1.02	14.98	157
1989	1568	1239	7.27	968	309	0.11	7.38	77
1990	1390	1117	6.55	2152	**1593**	0.56	7.11	75
1991	1290	1026	6.02	2930	**2164**	0.76	6.78	71
1992	642	336	1.97	1974	**1092**	0.38	2.35	25
1993	1084	925	5.42	1511	**836**	0.29	5.71	60
1994	892	773	4.53	1018	501	0.18	4.71	49
1995	1037	819	4.80	918	425	0.15	4.95	52
1996	1178	976	5.72	1036	499	0.18	5.90	62
1997	---	---	---	---	---	---	---	50-60

Table 9. Annual angling catch (including retained and hooked-and-released salmon) and effort (rod-days) in the Jacquet River.

Year	Kelts Small	Large	Total	Effort	CPUE	Bright salmon Small	Large	Total	Effort	CPUE
1984	0	3	3	50	0.06	39	-	39	275	0.14
1985	6	-	6	25	0.24	34	52	86	270	0.32
1986	10	6	16	50	0.32	76	105	181	355	0.51
1987	15	50	65	120	0.54	45	27	72	165	0.44
1988	16	42	58	180	0.32	110	70	180	320	0.56
1989	13	25	38	165	0.23	70	42	112	330	0.34
1990	20	32	52	75	0.69	82	58	140	330	0.42
1991	15	35	50	150	0.33	56	23	79	295	0.27
1992	20	15	35	90	0.39	105	95	200	455	0.44
1993	no data									
1994	20	10	30	90	0.33	33	100	133	720	0.18
1995	18	30	48	130	0.37	61	0	61	740	0.08
1996	no data									
1997	no data									
Mean (90-95)	19	24	43	107	0.42	67	55	123	508	0.28

Table 10. Summary of Atlantic salmon stock assessment in the Jacquet River, 1994-1996. Egg deposition is calculated based on biological data collected at the counting fence in 1994-1996 (large salmon: 8229.8 eggs/female, 80.3% females in population; small salmon: 3735.3 eggs/female, 9.3% females in population).

	1994		1995		1996		1997	
	Large salmon	Small salmon	Large salmon	Small salmon	Large salmon	Small salmon	Large salmon	Small salmon
Returns (to fence)	595	613	584	359	337	600	282	371
Releases from fence (returns - mortalities)	594	603	582	354	335	595	282	371
Angling mortalities	3	33	0	61	2	67	2	67
Spawning escapement	591	570	582	293	333	528	280	304
Egg deposition (x 10^6)	3.9	0.2	3.8	0.1	2.2	0.2	1.9	0.1
Total egg deposition (large+small salmon) (x 10^6)	4.1		3.9		2.4		2.0	
% of conservation requirement met	109%		103%		63%		52%	

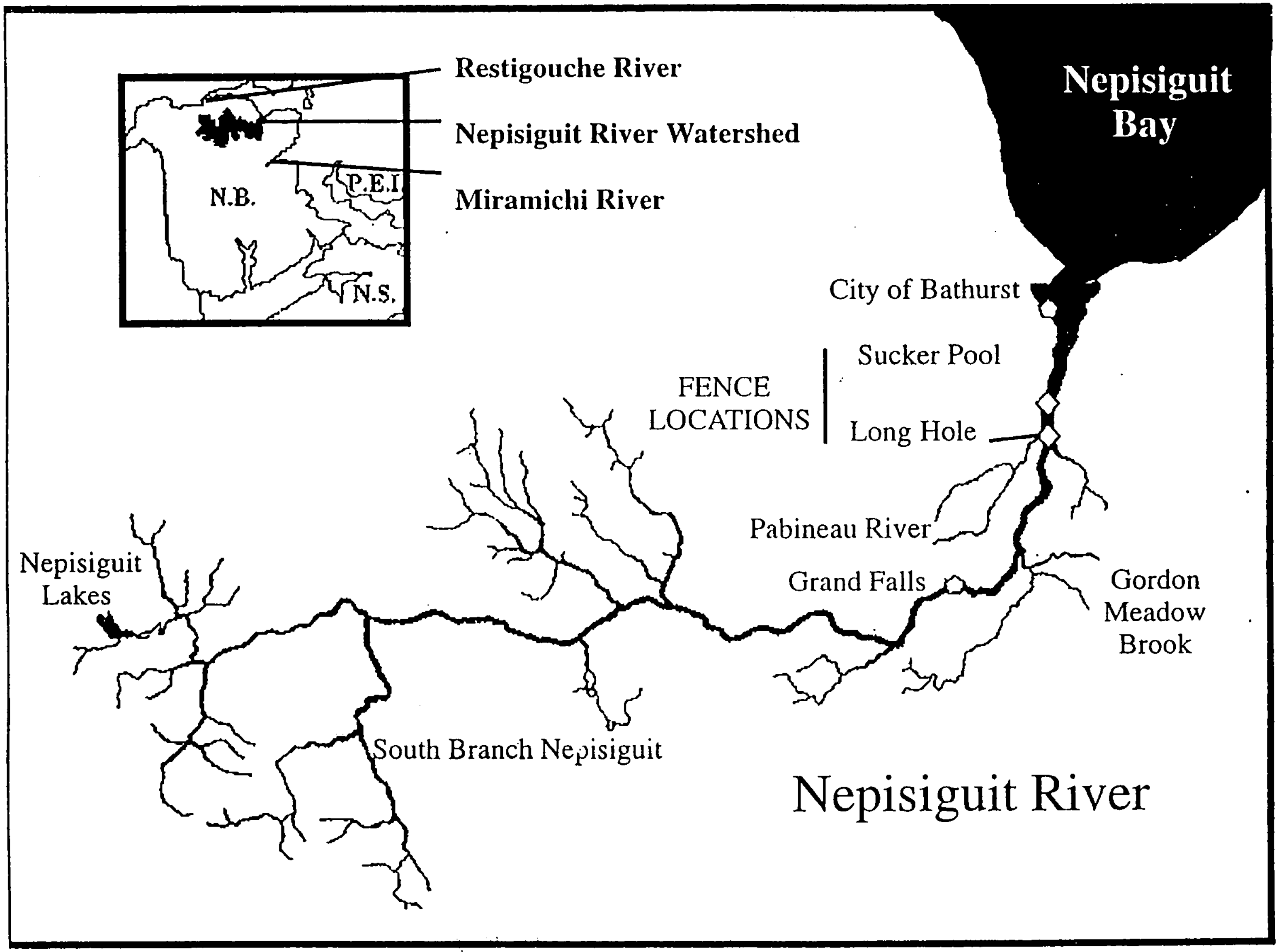


Figure 1. Map of the Nepisiguit River system, showing locations of the salmon counting fence at Sucker Pool in 1981-1991 and 1995-1997 and at Long Hole in 1992-1994.

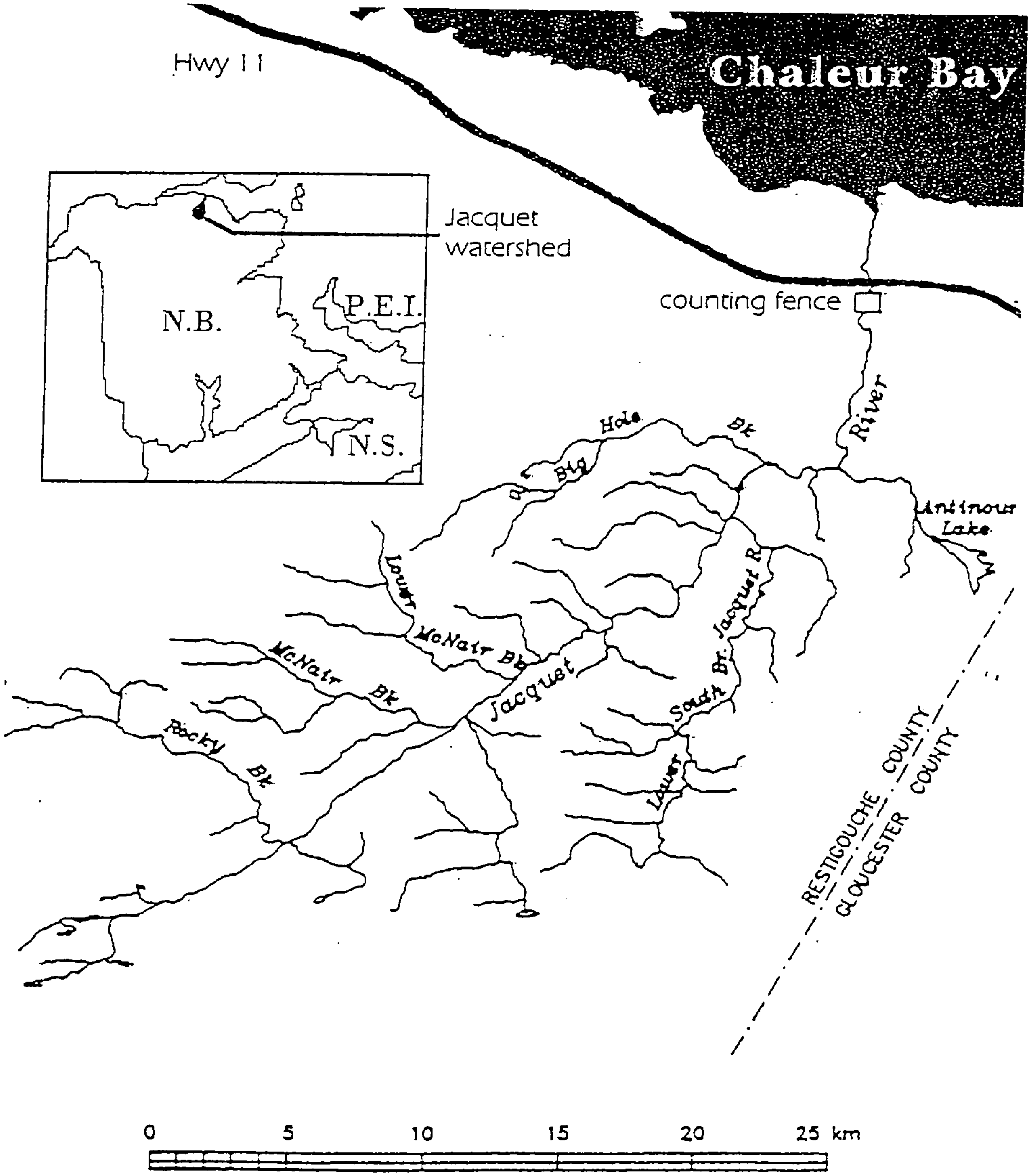


Figure 2. Map of the Jacquet River, showing location of the barrier fence.

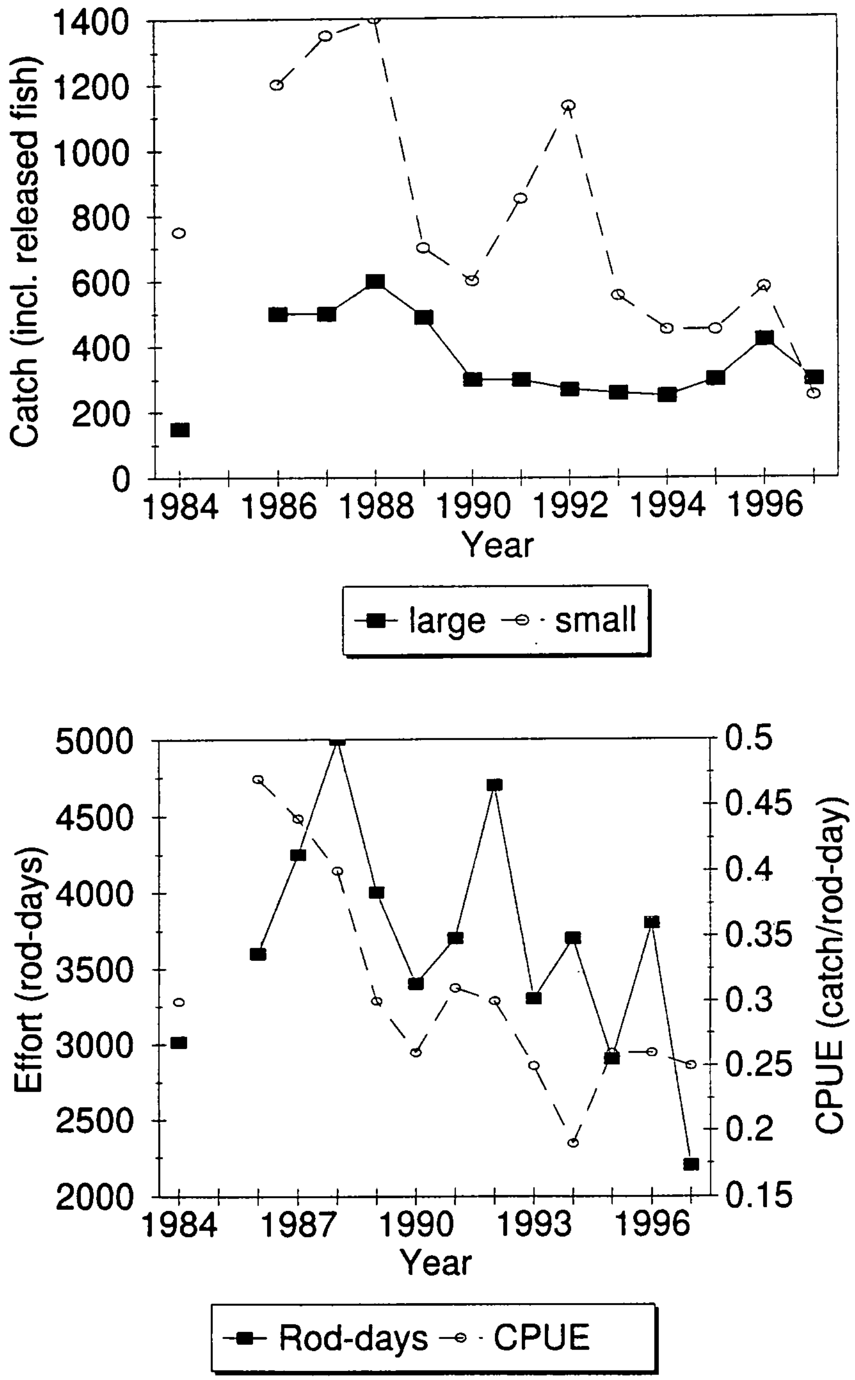


Figure 3. Angling catches, rod-days and catch per unit effort (CPUE) of bright Atlantic salmon on the Nepisiguit River, 1984-1997, according to estimates by the Nepisiguit Salmon Association.

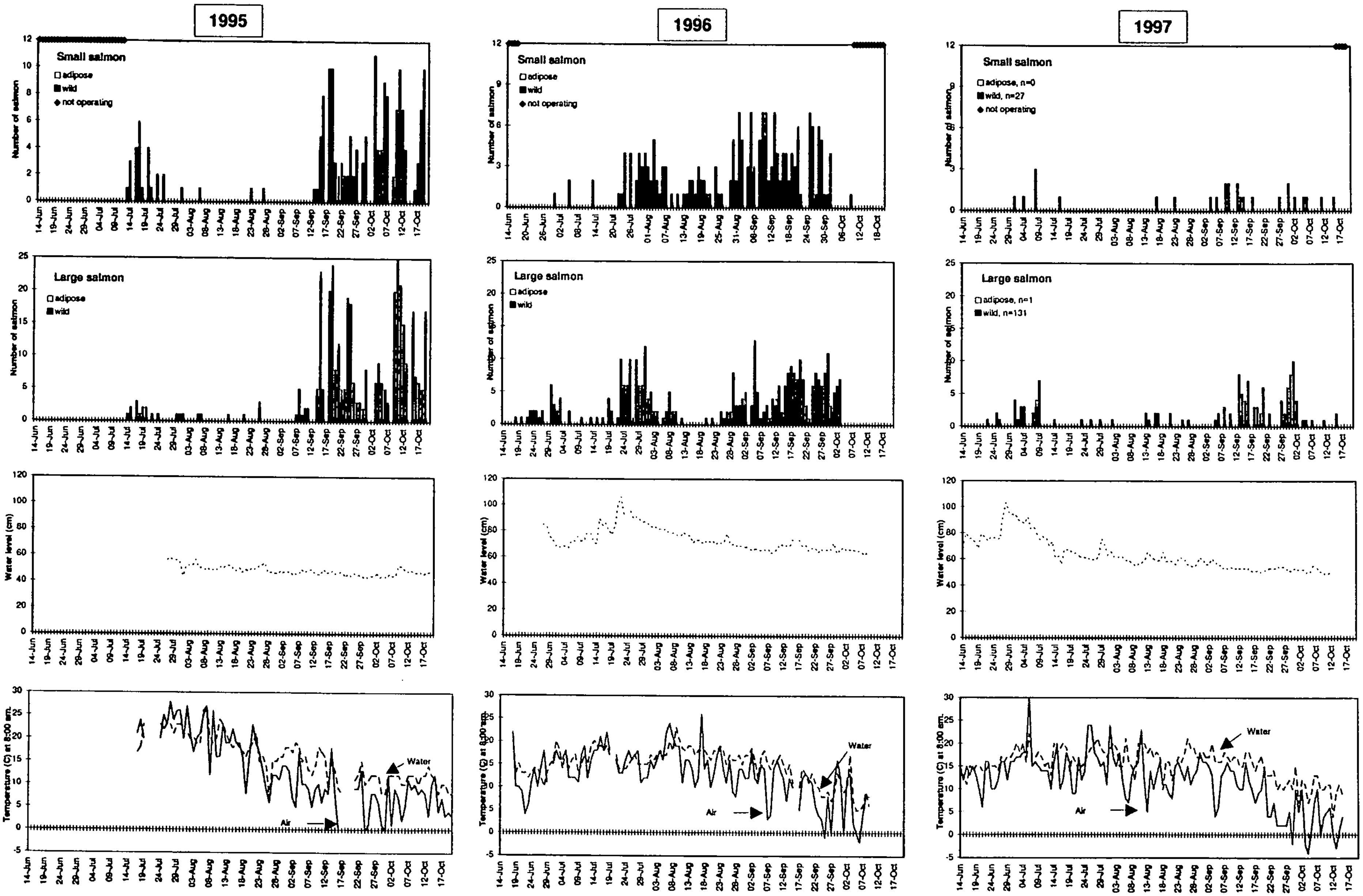


Figure 4. Daily returns of small and large salmon, water levels, and temperatures at the Nepisiguit River counting fence, 1995-1997.

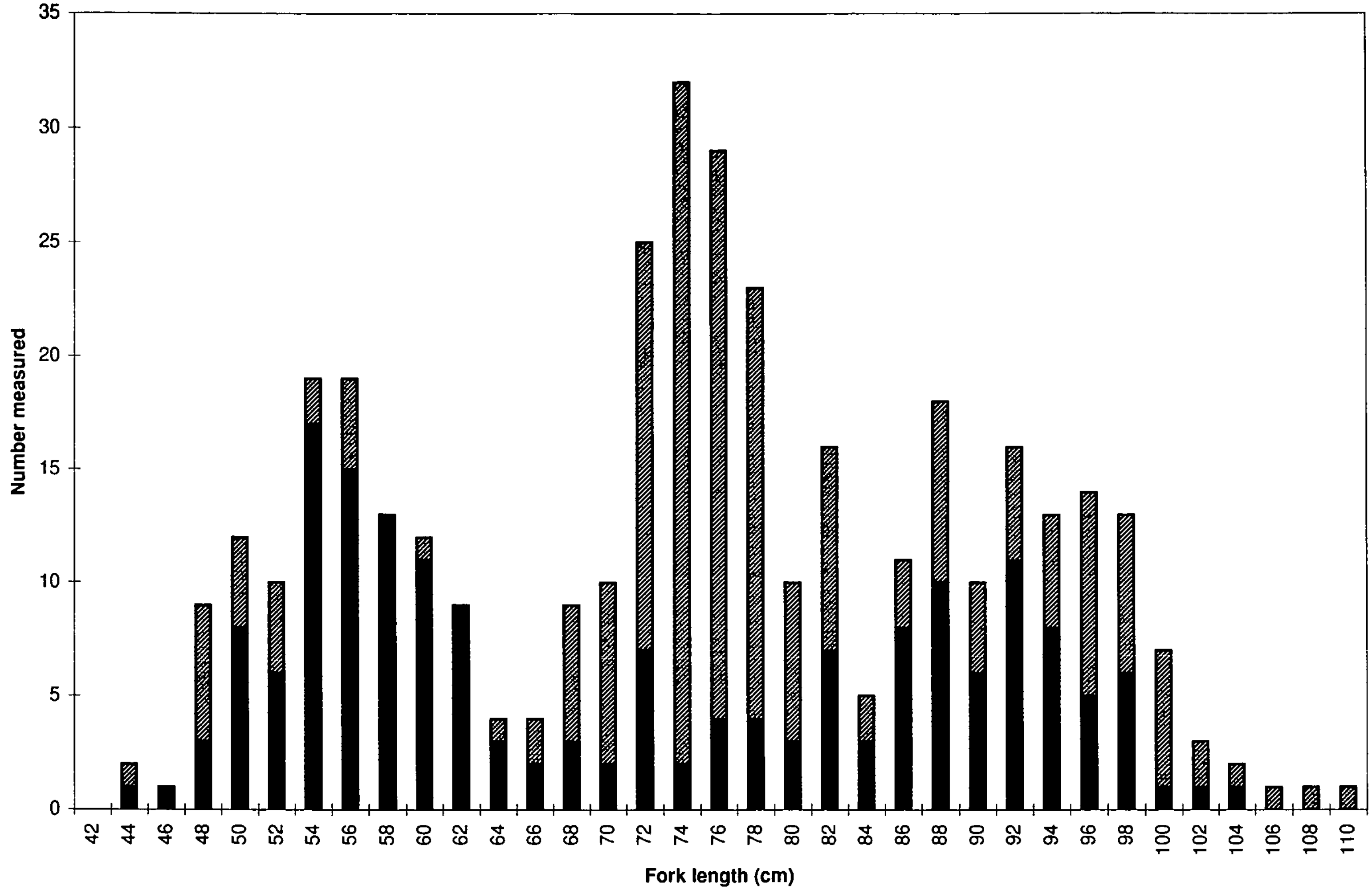


Fig. 5. Length frequency of Atlantic salmon returning to the Nepisiguit River counting fence in 1996 and 1997. Solid bars show number of males and hatched bars show number of females in each length category.

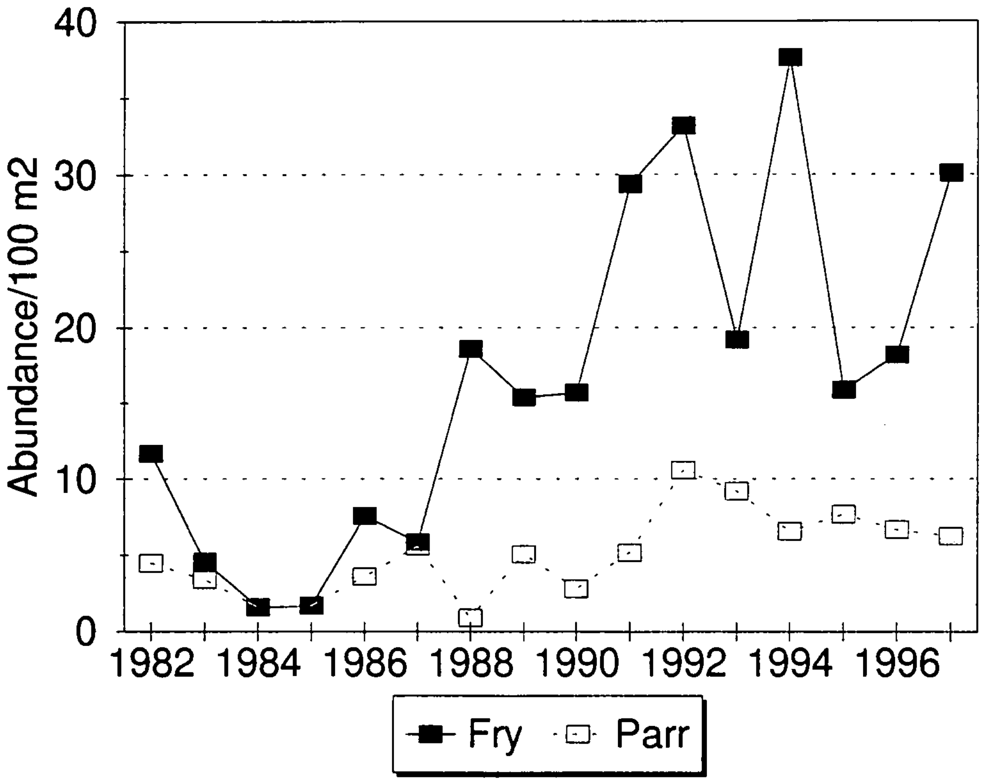
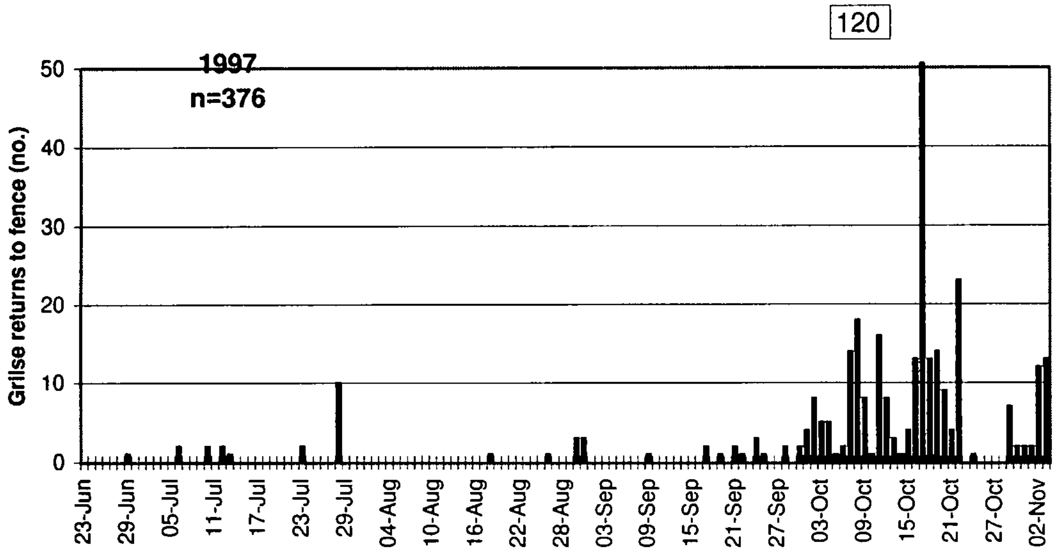


Figure 6. Mean juvenile salmon abundance at electrofishing sites on the Nepisiguit River (below Grand Falls), Pabineau River and Gordon Meadow Brook.



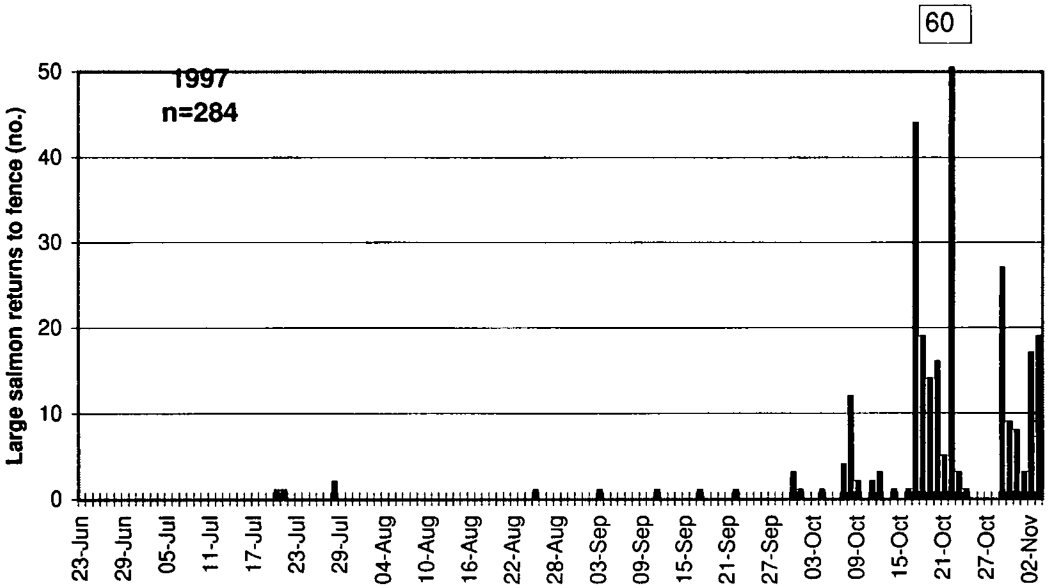
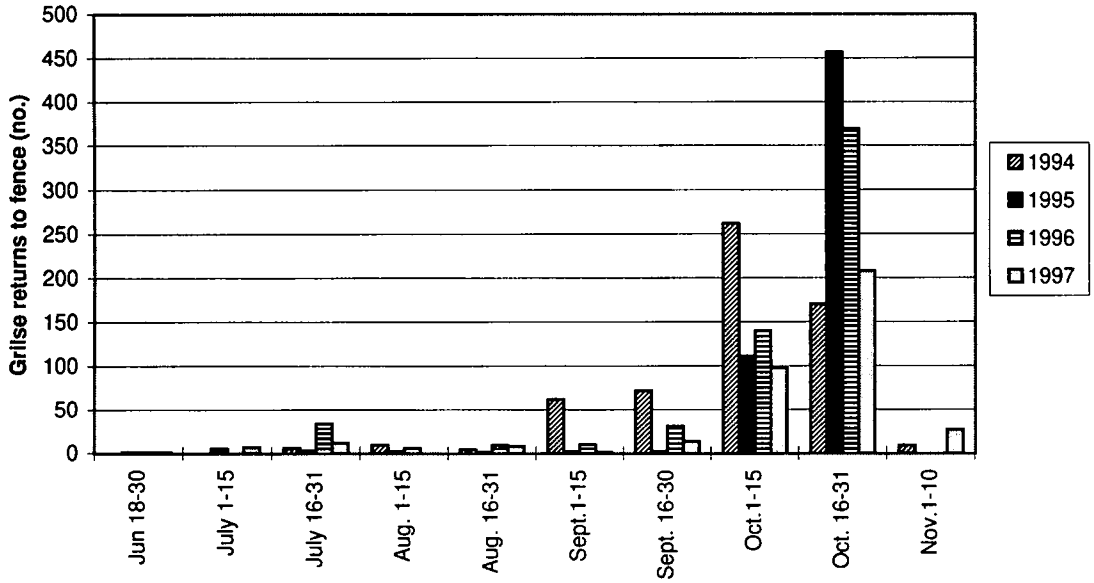


Fig. 7. Daily returns of small and large Atlantic salmon to the Jacquet River counting fence.



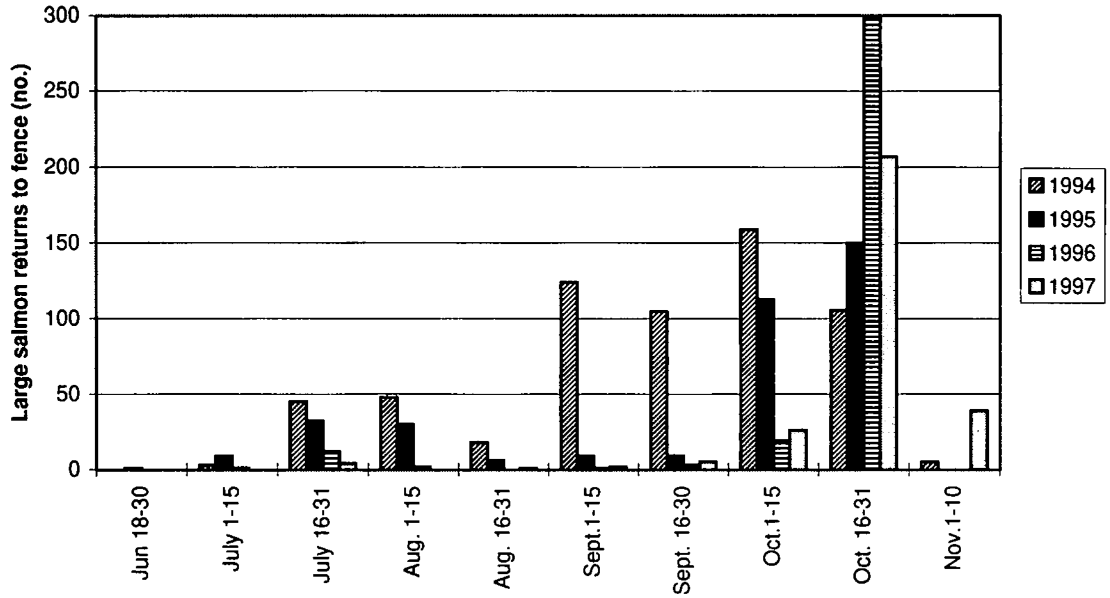


Fig. 8. Semi monthly returns of Atlantic salmon to the Jacquet River counting fence (1994-1997).

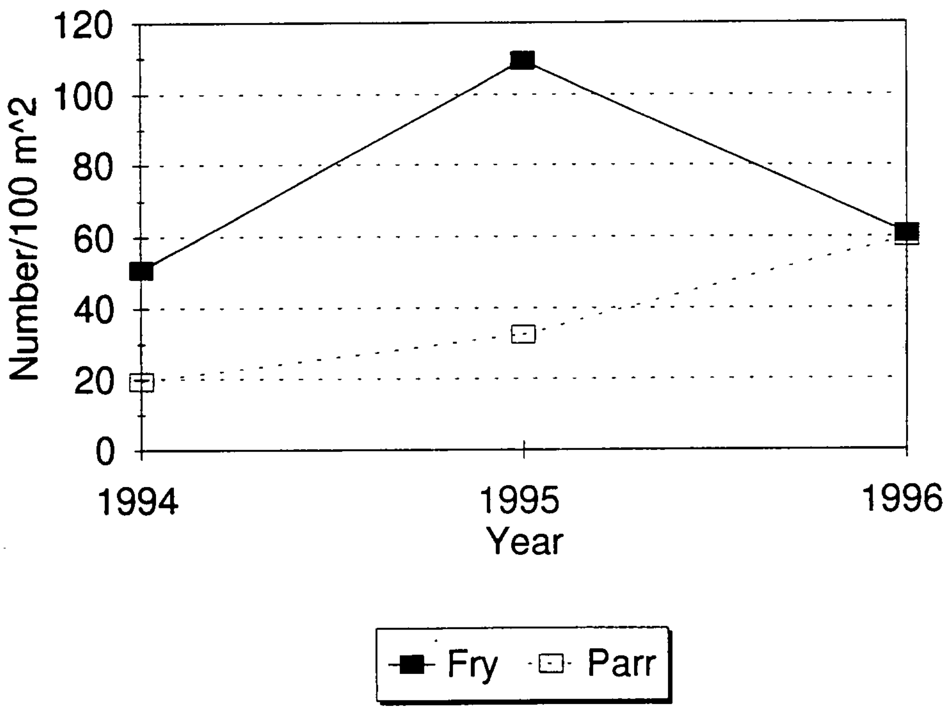


Figure 9. Mean juvenile salmon abundance at electrofishing sites on the Jacquet River.

Appendix 1. Estimate of salmon rearing habitat in the Jacquet River, obtained by stream surveys in 1968-1969 by New Brunswick Dept. of Natural Resources and Energy (W. Hooper, N.B.D.N.R.E., pers. comm.).

Section description	Habitat (m^2)
Jacquet R. Falls to Rocky Brook confluence	19,796
Rocky Brook	0
Rocky Brook confluence to 3.2 km mark	33,846
3.2 km mark to Sheds	49,560
Sheds to Lower McNair	55,394
Lower McNair to Upper Crossing (4.8 km)	23,463
Upper Crossing to Halfway	273,588
Halfway to Estuary	728,611
Lower South Jacquet tributaries (lower 8.5 miles)	146,772
Lower McNair Brook (lower 3.7 miles)	172,821
Big Hole Brook (lower 3.0 miles)	23,463
South Branch Jacquet (lower 5.0 miles)	46,671
TOTAL	1,573,985