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Status of the Exploits River stock of Atlantic salmon (Salmo salar L.) in 1996

by

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Abstract

The Exploits River was the site of an Atlantic salmon colonization program from 1957-1993. Counts at fishways and angling data provided the basis for assessing the status of the salmon population and determining percent of conservation egg deposition achieved. The 1996 freshwater escapement to the Exploits, of 32,369 (30,316 small and 2,053 large) the highest recorded to date, was 179% of the average 1992-95 escapement and 405% of the 1987-1991 mean and 259% of the 1984-1989 mean. In 1996 the lower, middle and upper Exploits received 221%, 43% and 25% of the required egg deposition respectively. Escapement to the Grand Falls fishway (middle Exploits) more than doubled any previous count. Anticipated returns for 1997 are presented based on a fry to adult recruit relationship using mean data for the 1992-1996 period and on a relationships between 2⁺ and 3⁺ as well as 3⁺ and 4⁺ recruits.

Résumé

La rivière Exploits a fait l'objet d'un programme de colonisation pour le saumon de l'Atlantique de 1957 à 1993. Les dénombrements réalisés aux passes à poisson et les données de la pêche à la ligne servent de fondement à l'évaluation de l'état de la population de saumon et à la détermination de l'atteinte de la ponte nécessaire à la conservation. L'échappée de 1996, de 32 369 saumons (30 316 petits et 2 053 gros), la plus élevée jamais enregistrée, correspond à 179 % de l'échappée moyenne de la période 1992-1995, à 405 % de celle de la période 1987-1991 et à 259 % de celle de la période 1984-1989. En 1996, la ponte dans les cours inférieur, médian et supérieur de l'Exploits a correspondu à, respectivement, 221 %, 43 % et 25 % de la ponte nécessaire. L'échappée à la passe à poisson de Grand Falls (cours médian) a été plus que deux fois supérieure à celle de toute année antérieure. On présente les remontées prévues pour 1997 qui sont fondées sur un rapport entre le nombre d'alevins et le recrutement adulte déterminé à partir des données moyennes pour la période 1992-1996 et le rapport entre les 2⁺ et les 3⁺ de même que celui entre les recrues 3⁺ et 4⁺.

Introduction

The Exploits River is the largest watershed in insular Newfoundland, encompassing a drainage area of 11,272 km² (Porter et al. 1974). The river flows in a northeasterly direction, entering the sea in SFA 4 (Fig. 1). Prior to the inception of enhancement activity (O'Connell and Bourgeois, 1987) less than 10% of watershed area was available to anadromous Atlantic salmon due to the presence of natural and man-made obstructions (Taylor and Bauld, 1973). The Exploits River requires 95.9 million eggs to meet it's conservation egg deposition requirement (Table 1). However, to date, only 53% of the colonizable habitat within the watershed has been stocked.

The intent of this document is to review the status of the stock in 1996.

Background

Stocking Activities

For details of the fry stockings conducted in the various sections of the Exploits River (Fig. 2), refer to Tables 2-4. With respect to the middle Exploits, 187,668 m² (egg requirement 45,040,320) of river habitat (Table 1) did not receive the required five years of stocking to establish a self-sustaining run.

Management measures implemented in 1992, which remained in place for 1996

1. Moratorium on commercial salmon fishing in insular Newfoundland.
2. Moratorium on the northern cod fishery affecting Salmon Fishing Areas (SFA's) 1-9 implemented on July 15, 1992. This measure eliminated by-catch of salmon in cod fishing gear.
3. In 1994, due to the low egg deposition in the upper Exploits (Table 4) and that the expected low returns in 1995 would represent returns from the last year of fry stocking, concern was expressed with respect to future returns to Red Indian Lake fishway. The increase in angling effort and catch (Table 5) realized on the Exploits in 1994 further reduced the rate of increase of spawners in the upper Exploits. In an effort to increase escapement at Red Indian Lake in 1995 to about 1,000 fish, special management measures were put in place for the

recreational fishery. In addition to the above management measures DFO, with funding from University of Waterloo, transferred approximately 300 adults from Grand Falls to a location within Red Indian Lake.

4. 1996 Management Plan

The following Management Plan was announced for the 1996 angling fishery:

Exploits River below Grand Falls

- Catch-and-release angling only June 22-July 9 and August 16-Sept. 2
- Catch-and-retain angling July 10- Aug.15. No quota. An in season review in late July would determine if a spawning escapement of 13,000 would be achieved and if not angling would revert to catch-and-release only.

Exploits River above Grand Falls

- The main stem of the river from Grand Falls to Red Indian Lake, and all tributaries above Red Indian Lake dam , will be open only for catch-and-release angling for the entire season.
- Tributaries between Grand Falls and Red Indian Lake will be open for catch-and-retain angling July 10- Aug. 15 inclusive. Catch-and-release angling will apply before and after these dates.
- 1,000 fish will be trucked from Grand Falls to Red Indian Lake.

The only change to the proposed plan was the extension of the hook and retain fishery from August 16 - September 2 in sections of the watershed where a retention fishery had occurred in 1996.

Industrial Activity

In September of 1995 Abitibi-Price, the operators of Grand Falls pulp and paper located in Grand Falls immediately downstream of the Grand Falls fishway, began operation of an Aeration Settlement Basin as a secondary waste water treatment process. This process reduced the Total Suspended Solids(TSS) and Biological Oxygen Demand(BOD) as follows;

Year	TSS (metric tonnes/day)	BOD (metric tonnes/day)
1995	*13.1	*12.1
1996	*4.2	*2.22

*Data for the time period Jan.1 - Sept. 30 for 1995 and 1996 supplied by Environment Canada.

With respect to BOD this translates to an 81.8% reduction in biochemical oxygen demand.

Methods

Adult Counts

Fish are enumerated at four fishway locations on the Exploits; i) Bishop Falls fishway which enumerates all fish entering the river at the community of Bishop Falls on the main stem of the river in the lower Exploits ii) Camp 1 fishway on Great Rattling Brook in the lower Exploits iii) Grand Falls fishway on the main stem of the Exploits at the community of Grand Falls-Winsor which enumerates all fish entering the middle and upper Exploits and iv) Red Indian Lake fishway at the outflow of Red Indian Lake which enumerates all fish entering the upper Exploits (see Fig. 2).

Fry Stocking

Fry stocking was conducted in riverine habitat utilizing mainly helicopters with some distribution via vehicle (in accessible locations). Stocking was conducted such that the habitat that was stocked received 75 fry per 100m² of habitat. Fry were stocked along the river banks in areas of low flow with depth less than 30 cm in areas where gravel/cobble substrate was present. If suitable habitat was available, fry were stocked at one quarter kilometre intervals on opposite sides of the river. The number of fry released in individual drops ranged from 5,000 - 50,000 depending on the available habitat to be stocked. Releases in excess of 25,000 fry/drop were only conducted on the main stem of the middle Exploits.

Angling Statistics

Angling catch and effort data prior to 1994 were supplied by DFO staff and from 1994 to present the data were collected by DFO

staff and River Monitors. Angling statistics presently (1994-1996) collected are reported for 7 various locations of which five are located in the lower Exploits; **Lower Exploits** I) downstream of the Bishops Falls fishway ii) Bishop Falls fishway to Grand Falls fishway (main stem of river only) iii) Great Rattling Brook downstream of Camp 1 fishway (includes angling at the mouth of Great Rattling Brook and therefore all fish angled at this location are not destined for Great Rattling Brook) iv) Great Rattling Brook upstream of Camp 1 fishway v) Stoney Brook (includes angling at the mouth of Stoney Brook and therefore all fish angled at this location are not destined for Stoney Brook) **middle** vi) Grand Falls fishway to Red Indian Lake fishway **upper** vii) upstream of Red Indian Lake. From 1985-1993 angling data was collected from four locations and prior to 1985 data was collected from three locations (Table 5).

Angling exploitation rates for above and below Bishop Falls are calculated as follows; Below Bishop Falls fishway = angling below Bishop Falls fishway / (count at Bishop Falls fishway + angling below Bishop Falls fishway + known removals); Above Bishop Falls fishway = angling above Bishop Falls fishway / count at Bishop Falls fishway

Biological Characteristics

Biological characteristic data presented in Tables 6 and 7 was collected from various locations within the Exploits watershed as detailed in the various tables.

Egg Depositions

Habitat determinations and conservation egg depositions are detailed in Table 1. Target egg requirement was calculated based on 240 egg/m² and 7 smolts/ha of standing water. Smolt production of 7 smolt/ha was divided by 1.9% to convert this to eggs (O'Connell et al., 1991).

Spawning escapement was calculated by subtracting angling catches and known removals from counts at fishways without inclusion of an estimate for poaching and disease or hook and release mortality. In 1992 and 1993 spawning surveys on various tributaries of the lower Exploits were utilized in calculating egg deposition.

Egg deposition is calculated based on a length fecundity relationship based on mean length of female fish. Data collected from broodstock from 1984-1991 were used to determine mean female length and percent female fish in the run. Calculations use a

mean female length of 52 cm (a mean no. of eggs per female of 2198) and that females compromise 77% of the run. **Caution:** Mean length of female fish may have changed since the 1992 management changes to commercial exploitation due to increased returns of large fish.

In order to calculate the egg deposition in areas where fry stocking occurred, an estimate of egg-to-fry survival of 20% (Sturge, 1968) was used to back calculate fry to eggs. Sturge (1968) gave a range of 10-30% for egg-to-fry survival and indicated that a figure of 20% appeared to be a reasonable value.

Spawners and recruits, 1975-1996, and predicted returns for 1997

As stated in O'Connell et. al. (1996) it is possible to estimate total population size of small salmon prior to any exploitation in rivers where escapement data is available and to estimate anticipated returns one year in advance. The methodology set out in O'Connell et. al. (1996) was utilized to determine total population size prior to 1992, the ratio of recruits to spawners and anticipated returns in 1997. A fry to recruit ratio was developed with respect to the Exploits watershed as fry stocking prevented comparing wild egg deposition to fry stocking; To account for this difference all eggs naturally deposited were converted to fry using 20% egg to fry survival. Freshwater ages of returning adults were available for all years with smolt ages ranging from 2⁺ - 6⁺ which were utilized.

For the above referenced estimates of anticipated returns the 1980 and 1983 counts at Bishop Falls fishway were estimated as follows. The percentage of the Bishop Falls fishway escapement that was enumerated at Camp 1 and Grand Falls fishways was calculated and this percentage was used to calculate the number of fish that would have been enumerated at the Bishop Falls fishway. For the 1980 count the mean of the previous five years (1975-1979) was used and for the 1983 count the mean of the previous eight years (1975-1982) was used. The 1974 count at Grand Falls fishway was not used in any calculation as the fishway operated for only part of the season.

Anticipated returns for 1997 3⁺ and 4⁺ freshwater age recruits were also estimated using the following approach.

Regression relationships (significant at the 5% level) of 2⁺ recruits in year x versus 3⁺ recruits in year x +1 and 3⁺ recruits in year x versus 4⁺ recruits in year x +1. This derivation is possible as the number of 2⁺ (freshwater age)

recruits from the 1992 egg deposition is known as well as the 3⁺ recruits from the 1991 egg deposition.

Results and Discussion

Table 1 details the accessible rearing area and target egg deposition for the Exploits River. The use of fixed parameters, such as 240 eggs/m² of fluvial habitat and 7 smolts/ha of standing water habitat, has certain limitations (see O'Connell & Dempson, 1991 for discussion on this topic).

Table 8 details the 1975 -1996 counts from the various fishways on the Exploits whilst Tables 6 - 7 detail smolt and adult biological characteristics.

The 1996 total count at the Bishop's Falls fishway of 31,814 (29,761 small and 2,053 large) was 243%, 421% and 186% of the 1982 - 1986 mean, 1987 -1991 mean and of 1992 - 1995 (post moratorium) mean respectively (Table 8).

The 1996 freshwater escapement of 32,369 (count at Bishops Falls fishway + removals below the fishway) to the Exploits was 179% of the 1992-95 escapement and 405% of the 1987-1991 mean and 226% of the 1982-1986 mean. The 1992-1996 freshwater escapement plus bycatch (unknown) is equal to watershed adult production. The 1996 adult returns to the Exploits River watershed approaches the 1982-86 adult production of the watershed if the assumption that the commercial fishery harvested 60% of adult returns is correct. The 1984 returns were the watershed's highest adult production with 1996 having the highest freshwater escapement.

A negative linear relationship was found to exist between fry in year x and subsequent adult recruits in year $x + 2-6$ for the recruit years 1980 - 1996 (Figure 3 and Appendix 1). With the removal of the 1984 and 1985 recruits this relation whilst still negative became significant at the 5% level. The 1984 and 1985 recruits were removed as the commercial fisheries in these years had low catches due to ice conditions and river escapement was likely higher than would be expected in these years when compared to other years when there was a commercial fishery. Total recruits was calculated as previously mentioned by dividing river escapement by $(1-.6)$ to account for a commercial fishery that on average caught 60% of production. Figure 3 shows that for the recruit years 1989 - 1995 that lower numbers of recruits per fry were realized than for the 1980 -1988 time frame. A major shift occurred in the number of recruits realized from the fry

contributing to the 1996 recruits (Figure 3) which accounts for the high river escapement on the Exploits in 1996. The most plausible explanations for this is high survival of fry to 2+ smolts compared to previous years. No strong evidence exists to support higher than average smolt to adult survival as seen from smolt to adult survival on the Campbelton River in SFA 4. Figure 3 indicates higher numbers of recruits from lower fry numbers.

Table 5 details the angling statistics for the Exploits watershed. In 1995 the recreational fishery was managed by a retention season and a retention quota whilst in 1996 the fishery was managed by a retention season making comparisons with previous years difficult. The 1995 retained catch of 1,336 was below the 1990-1994 mean of 1,619 fish and 43.5% of the 1994 catch. The 1996 catch (retained) of 1,915 was 103% of the 1992-1995 catch and 140% of the 1995 catch. Angling exploitation (retention only) downstream of Bishop Falls fishway has generally declined since the early 1980's with the 1980-1995 mean being 51.4% of the total 1996 catch and the 1985-1995 and 1990-1995 means being 41.6% and 46.0% respectively of total retained fish in 1996. It is very likely that the late opening for the retention fishery on the Exploits in 1995 and 1996 had an impact on the retention fishery downstream of Bishop Falls which accounted for 29% of the 1996 retention catch.

In 1996 3,313 total (3,202 small and 111 large) fish were hooked and released in the recreational fishery on the Exploits River with 1,089 small and 44 large being released below Bishop Falls.

Run timing (cumulative percent of run to date) for Bishops, Camp 1 and Grand Falls fishways are presented in Tables 9-11 respectively. The average dates for the 1986-1995 period for 50 percent of the escapement for Bishops, Camp 1 and Grand Falls fishways are the week of July 19, July 28 and August 6 respectively. Mid season reviews of escapement for various watershed sections could be conducted on these dates respectively as the count would represent 50% of the run.

In 1996 fish at the Bishop Falls fishway were examined for netmarks as they were enumerated with 16.15% of the fish posing marks (Table 12). All marks were classed as netmarks and estimates of netmarks are likely high. In addition due to the large numbers of fish enumerated the accuracy of these figures are questionable. The accuracy was likely higher on days when fewer fish were enumerated however the percent of fish marked was high throughout the entire season. Without knowing the efficiency of this fishing gear total production cannot be estimated. While the assumption that river escapement equals total production is

assumed it is obvious that this is not the case. While there are legal pelagic and groundfish fisheries in operation throughout the entire migrational period the authors would have expected the numbers of fish that possessed netmarks to decrease throughout the season which did not appear to happen.

Egg Deposition and Percent of Target Egg Achieved

Lower Exploits

Table 2 details the number of spawners and subsequent egg deposition and % conservation egg deposition achieved for Great Rattling Brook and for other tributaries (combined) of the lower Exploits for the period 1957-1995. The egg deposition for Great Rattling Brook in 1996 was 103% of conservation which compares to the 1992-96 mean of 71% the 1984-89 mean of 65% and 1992-95 mean of 63%. Since the moratorium Great Rattling Brook has received between 43 and 103% of conservation egg deposition while the various other tributaries of the Lower Exploits have received between 115 and 449% of conservation egg deposition.

The 1996 egg deposition within the lower Exploits was 221% of conservation with a post moratorium (1992-1996) mean of 120% which compares to the 1987-1991 mean of 51% and the 1985-1989 mean of 69%.

Middle Exploits

The middle Exploits requires a deposition of 64.2 million eggs to meet its total conservation requirement (Table 1); however the 187,668 100m² of habitat in the main stem of the river (egg requirement 45x10⁸) have not received adequate stocking to be producing a self-sustaining run of adults. Furthermore it is questioned if smolt production in the order of 3 smolts per unit should be expected from this habitat (the main stem of the middle Exploits River is fast flowing and 1 - 2 metres deep in many areas).

The middle Exploits received an egg deposition of 27.3 million eggs from natural spawning which is 42.6% of conservation and 142% of the 19.2 million conservation requirement if one excludes the main stem of the river (Table 3).

Figure 4 details the count at Grand Falls and the percent of the fish released at Bishop Falls that were enumerated at Grand Falls. The 1996 count at Grand Falls of 14,343 adults was more

than double any previous count at this facility and was resultant from the low egg depositions in 1990 and 1991 based on 3⁺ and 4⁺ smolt ages.

The returns to Grand Falls in 1996 were the offspring of the natural spawners from 1989-1992 (1710 in total) and fry stocking in 1991 -1993. The escapement to Grand Falls in 1996 is the highest recorded to date (see Figure 4).

A possible explanation for the high escapement to Grand Falls fishway is the improvement in the water quality of the Grand Falls mill effluent. At this point in time the authors recommend caution in attributing the high returns to Grand Falls to any particular event or occurrence.

Upper Exploits

The upper Exploits requires an egg deposition of 15.4 million eggs but only received 25.1% of this conservation requirement in 1996 (Table 4). This was in part accomplished by the transfer of 1,114 adults from Grand Falls fishway. With the cessation of stocking in 1991 and low natural egg depositions in 1990-1995 returns during the next three years are expected to be very low. The 1996 returns of 733 which was below the 1995 count of 818 are mainly the offspring fry stocked in 1991. The authors strongly recommend that measures be undertaken to increase the egg deposition in the upper Exploits.

Anticipated returns for 1997

1. Fry to recruit ratio method

River ages of recruits were used to back-calculate numbers of fry contributing to annual returns and these may vary from actual smolt ages(%) due to differential survival of smolts thus not properly reflecting freshwater smolt production.

The estimated returns of small salmon for 1997 based on the average recruit to fry ratio for smolts aged 2⁺-6⁺ for the 1992-1996 adult return years is 29,103 with a predicted high and low of 68,706 and 13,377 respectively (see Table 13 and Appendix 1). This would translate into a reduction from the 1996 escapement and is lower than the mean of 20,905 for the 1992-96 period. An estimate of the precision of this estimator is given in Table 14 which suggests that recruits are on average overestimated by 30 %.

In an effort to determine the effect of the high returns in 1996 on this estimator the 1992-1995 returns were estimated without inclusion of the 1996 data. This data is presented in Table 13 and reveals a tendency to overestimate returns using the 1996 data whilst using only the 1992-95 data a tendency to underestimate returns occurs. Using this approach the prediction for 1997 would be 19,507 small recruits or a 33% reduction over the above estimate. An estimate of the precision of this estimator is given in Table 14 which suggests that recruits are on average underestimated by 10 %.

This estimator predicts small salmon recruits only and does not predict total returns as the repeat spawners have to be added to the estimator to predict total returns. A good estimator of repeat spawners is unavailable since the moratorium as the recreational fishery does not provide an estimate of the repeat spawners above 63 cm.

2. Relationship of recruits in year x to year $x+1$ for recruits river age 3^+ and 4^+ .

Significant relationships (at the 5 % level) were found between recruits with river ages 2 and 3 as well as 3 and 4 in years x and $x+1$ (Figures 5 and 6). Data used to calculate these relationships are in Appendix 1. This methodology allows for the estimation of the river age 3 and 4 recruits for the 1997 recruits which comprise the majority of the annual recruits. Solving the equation in Figures 5 and 6 the prediction for 1997 recruits would be 31,408 and 9775 recruits with river ages 3^+ and 4^+ respectively. This estimate of 41,183 recruits does not include recruits with river ages 2, 5 and 6 or any repeat spawners.

Management Considerations

One of DFO'S objectives on the Exploits River is to increase spawning escapement above Red Indian Lake. This was attempted in 1995-96 through quotas and catch-and-release angling. It is suggested that in 1997 that the recreational fishery be controlled to allow for increased spawners to escape above Red Indian Lake. Even with the increased escapement to the Exploits in 1996 escapement to Red Indian Lake decreased over 1995. The spawning escapement on the Exploits River should not be allowed to decrease to below 13,000 adults. To further address the escapement above Red Indian Lake it is recommended that at least

1,000 adults be trucked from Grand Falls fishway to Red Indian Lake.

The 1996 recreational fishery on the Exploits angled 5,228 fish of which 1,915 were retained. Concern is expressed over earlier openings of the retention recreational fishery as this fishery has the potential to seriously erode egg deposition within the various sections of the Exploits watershed.

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Table 1: Rearing area and target egg deposition for sections of the Exploits River.

Exploits River	Riverine Habitat (m ²)	Lacustrine Habitat (ha)	Target Egg Deposition
Lower	57,552	6,915	16,360,112
Middle	234,873	21,178	64,171,941
main stem	187,668	0	45,040,320
tributaries	47,205	21,178	19,131,621
Upper	55,437	5,665	15,384,617
Total	347,862	33,758	95,916,670

Table 2. Details of egg deposition Lower Exploits (G.R.B.=Great Rattling Brook; Other=Other Tributaries)

Year	No. fry released G.R.B.	No. spawners G.R.B.	No. spawners other	Total eggs G.R.B.	Total eggs other	% Target G.R.B.	% Target other	% Target total
1957		610	*	1,032,401	*	10	*	*
1958		786	*	1,330,274	*	13	*	*
1959		329	1,005	556,819	*	5	*	*
1960		785	892	1,328,581	1,509,674	13	28	18
1961		626	577	1,059,480	976,549	10	18	13
1962		1,212	*	2,051,262	*	20	*	*
1963		578	691	978,242	1,169,490	9	22	14
1964		1,886	*	3,191,980	*	31	*	*
1965		777	594	1,315,041	1,005,321	13	19	1
1966		1,412		2,389,754	0	23	0	15
1967		1,204	829	2,037,722	1,403,049	20	26	22
1968		2,021	*	3,420,462	*	33	*	*
1969		1,182	272	2,000,488	460,349	19	9	16
1970		1,222	*	2,068,186	*	20	*	*
1971		1,163	66	1,968,331	111,702	19	2	13
1972		729	114	1,233,803	192,940	12	4	9
1973		*	*	0	*	*	*	*
1974		*	2,647	0	4,479,942	*	83	*
1975		4,601	4,225	7,787,008	7,150,644	75	133	94
1976		2,004	983	3,391,690	1,663,688	32	31	32
1977		3,632	1,395	6,147,015	2,360,982	59	44	54
1978		2,139	671	3,620,172	1,135,641	35	21	30
1979		3,048	2,434	5,158,618	4,119,448	49	77	59
1980		4,611	*	7,803,933	*	75	*	*
1981		4,741	660	8,023,953	1,117,024	77	21	58
1982		2,877	2,258	4,869,207	3,821,575	47	71	55
1983		3,252	*	5,503,880	*	53	*	*
1984		6,178	5,679	10,456,018	9,611,480	100	179	127
1985		5,952	3,712	10,073,522	6,282,412	96	117	103
1986		2,742	3,035	5,616,360	5,136,616	54	95	68
1987	195,127	230	3,236	4,744,161	5,476,801	45	102	65
1988	870,979	896	1,900	6,469,514	3,215,674	62	60	61
1989	990,614	46	2,574	3,215,478	4,356,392	31	81	48
1990	627,525	11	2,313	3,483,172	3,914,660	33	73	47
1991	692,911	1,086	1,993	1,838,012	3,755,473	18	70	35
1992	76,480	3,762	3666+	6,367,035	6,204,558	61	115	79
1993	0	5,927	4273+	10,031,210	7,231,882	96	134	109
1994	0	2637	6023	4,463,017	10,193,687	43	189	93
1995	0	3113	6104	5,268,628	10,330,776	50	192	99
1996	0	4952	11150	10,732,997	24,166,583	103	449	221

* indicates no data

+ results of spawning survey

Table 3. Details of egg deposition Middle Exploits.

Year	No. Fry Released	Spawners Released	Natural Egg Deposition	Fry to Egg Equiv.	Total Eggs	%Target Egg Achieved
1967	0	0	0	768600	768600	1.2
1968	153720	0	0	841700	841700	1.3
1969	168340	0	0	1644600	1644600	2.6
1970	328920	0	0	1479730	1479730	2.3
1971	295946	0	0	1612530	1612530	2.5
1972	322506	0	0	2053445	2053445	3.2
1973	410689	0	0	1779000	1779000	2.8
1974	355800	31	88491	1063050	1151541	1.8
1975	212610	650	1855455	6463125	8318580	13.0
1976	1292625	79	225509	6733930	6959439	10.8
1977	1346786	27	77073	6832050	6909123	10.8
1978	1366410	0	0	3628785	3629785	5.7
1979	725757	47	134164	9352470	9486634	14.8
1980	1870494	2246	6411309	4513470	10924779	17.0
1981	902694	2586	7381855	3941270	11323125	17.6
1982	788254	1229	3508236	1926610	5434846	8.5
1983	385322	810	2312182	3960965	6273147	9.8
1984	792193	3750	10704545	2539510	13244055	20.6
1985	507902	2981	8509400	2558670	11068070	17.2
1986	511734	0	0	5333120	5333120	8.3
1987	1066624	80	228364	5243995	5472359	8.5
1988	1048799	5	14273	7854460	7868733	12.3
1989	1570892	0	0	8758425	8758425	13.6
1990	1751685	2	5709	7436240	7441949	11.6
1991	1487248	267	762164	9304990	10067154	15.7
1992	1605761	1441	4113400	8464850	12578250	19.6
1993	1692970	5174	14769418	0	14769418	23.0
1994	0	5857	16719073	0	16719073	26.1
1995	0	5416	15460218	0	15460218	24.1
1996	0	12,615	27341834	0	27341834	42.6

Note: Egg target is 64 million (45 for main stem and 19 for tributaries)

Table 4. Details of egg deposition Upper Exploits.

Year	No. Fry Released	Fry to egg	Adults Spawning	Total Eggs	% Target egg Deposition
1975	0	952665	0	952665	6.19
1976	190533	892390	0	892390	5.80
1977	178478	155580	0	155580	1.01
1978	31116	0	0	0	0.00
1979	0	0	0	0	0.00
1980	0	3326500	0	3326500	21.62
1981	665300	4460735	0	4460735	28.99
1982	892147	2041055	0	2041055	13.27
1983	408211	1992570	0	1992570	12.95
1984	398514	4403050	0	4403050	28.62
1985	880610	8189350	0	8189350	53.23
1986	1637870	11078265	0	11078265	72.01
1987	2215653	14895245	0	14895245	96.82
1988	2979049	19275305	0	19275305	125.29
1989	3855061	18345255	0	18345255	119.24
1990	3669051	13471645	0	13471645	87.57
1991	2694329	0	28	47389	0.31
1992	0	0	141	238637	1.6
1993	0	0	585	990089	6.4
1994	0	0	633	1071327	7.0
1995	0	0	1102	1865091	12.1
1996	0	0	1784	3866653	25.1

Table 5. Angling statistics for Exploits River

Year	Lower Exploits			Bishop Falls to Grand Falls	Middle	Upper	Total Retained Catch	Total Released Catch	Total Effort
	Below Bishop Falls	Great Rattling Brook	Stoney Brook		Exploits	Exploits			
1975	1563	47	9				1,619		5,702
1976	1651	222	61				1,934		5,775
1977	1342	417	93				1,852		6,944
1978	990	241	249				1,480		5,031
1979	1431						1,431		8,363
1980	1417	164	209				1,790		7,427
1981	1558	303					1,861		7,515
1982	1519	132	82				1,733		9,630
1983	527	332	494				1,353		5,079
1984	1809	398	217				2,424		9,459
1985	903	560	1004	531			2,998		8,600
1986	646	478	631	302			2057		8,123
1987	467	94	995	379			1935		5,891
1988	522	50	608	551			1731		6,181
1989	385	16	152	24			577		3,813
1990	366	59	454	38			917		5,869
1991	414	71	279	281			1045		5,931
1992	966	163	227	52			1408	199	4,347
1993	831	258	393	173			1655	3,039	7,896
1994	1388	492	144	938	110	0	3072	1,175	16,330
1995	435	246	419	234	2	0	1,336	1,603	10,089
1996	555	378	547	307	128	0	1,915	3,313	11,987

Table 6. Biological characteristics of Exploits River smolt 1984-1995.

YEAR	Life Stage	FORK LENGTH			WEIGHT			RIVER AGE		
		MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE
1984	smolt	16.4(954)	2.3	12.0-26.8	57.6(39)	9.4	38.2-76.8	3.5(938)	0.6	2.0-6.0
1985	smolt	16.6(280)	1.9	10.6-26.7	42.7(252)	15.8	12.4-169.0	3.2(276)	0.5	2.0-5.0
1986	smolt	15.4(1378)	2.3	6.70-26.7	34.1(1212)	14.8	7.8-207.0	3.6(1299)	0.7	2.0-7.0
1987	smolt	17.3(779)	2.3	10.8-28.4	51.3(776)	22.4	15.6-228.1	3.4(780)	0.7	2.0-6.0
1988	smolt	16.3(823)	3.1	10.3-26.7	46.4(823)	29.7	12.8-333.8	3.7(805)	0.8	2.0-7.0
1989	smolt	15.7(600)	2.8	10.1-26.3	43.6(593)	23.2	13.7-176.8	3.4(613)	0.7	2.0-5.0
1990	smolt	16.2(557)	3.0	8.8-33.9	46.7(555)	27.8	8.1-246.0	3.4(552)	0.7	2.0-5.0
1991	smolt	17.5(100)	2.8	12.3-28.4	52.2(100)	27.3	21.6-190.7	3.3(98)	0.7	2.0-5.0
1992	smolt	16.5(173)	1.5	12.9-21.6	42.3(170)	11.7	18.2-104.6	3.4(173)	0.6	2.0-5.0
1993	smolt	16.6(201)	1.9	12.8-23.0	46.4(201)	16.0	20.6-119.0	3.3(197)	0.6	2.0-5.0
1994	smolt	15.9(215)	1.8	9.2-21.0	38.3(215)	12.4	10.7-79.0	3.5(214)	0.6	1.0-5.0
1995	smolt	15.7(189)	1.9	11.2-23.7	34.6(199)	14.5	13.2-124.4	3.2(199)	0.7	1.0-5.0

Sample Locations

1984 - Bishops Falls forebay, Lake Ambrose, Lloyd's River

1985 - Bishops Falls forebay

1986 - Bishops Falls forebay, Badger Brook, Great Rattling Brook, Stoney Brook, Little Red Indian Brook, Red Indian Lake, Noel Paul's Brook

1987 - 1990 Bishops Falls forebay, Badger Brook, Great Rattling Brook, Stoney Brook, Little Red Indian Brook, Red Indian Lake, Noel Paul's Brook, Three Brooks, Little Rattling Brook, Greenwoods Brook

1991 - 1993 & 1995 Bishops Falls forebay

1994 - Bishops Falls forebay, Stoney Brookg

Table 7. Biological Characteristics Exploits River Adults 1984 - 1996.

YEAR	LIFE STAGE	FORK LENGTH (cm)			WEIGHT (kg)			RIVER AGE		
		MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE
1984	1SW	49.63 (1735)	2.77	39.00-60.00	1.18 (1735)	0.21	0.51-2.40	3.22 (1501)	0.46	2-5
	Repeat	56.17 (65)	4.99	46.50-76.00	1.83 (65)	0.60	0.80-4.80	3.32 (53)	0.55	2-5
	2SW	65.00 (1)			2.20 (1)					
	small	49.91 (1960)	3.00	38.50-62.00	1.21 (1958)	0.24	0.55-2.80	3.22 (1550)	0.46	2-5
	large	67.56 (8)	4.95	63.00-76.00	2.97 (8)	0.90	2.20-4.80	3.00 (3)	0.00	3.00
1985	1SW	50.96 (3604)	2.75	37.00-67.00	1.35 (3604)	0.21	0.55-2.96	3.46 (3111)	0.56	2-7
	Repeat	54.11 (102)	3.38	48.00-63.00	1.56 (101)	0.30	0.98-2.64	3.25 (80)	0.52	2-4
	2SW	53.50 (1)			1.40 (1)					
	small	51.10 (3851)	2.80	37.00-62.50	1.36 (3850)	0.22	0.55-2.96	3.45 (3188)	0.57	2-7
	large	64.40 (7)	1.73	63.00-67.00	2.22 (7)	0.41	1.60-2.84	3.50 (4)	0.58	3-4
1986	1SW	52.23 (243)	5.17	41.10-66.50	1.42 (238)	0.44	0.65-2.90	3.56 (242)	0.60	2-5
	Repeat	66.74 (69)	6.43	44.30-81.00	3.00 (68)	0.74	1.00-4.30	3.19 (67)	0.47	2-4
	2SW	68.10 (21)	2.48	64.50-73.80	3.13 (21)	0.42	2.60-3.99	3.14 (21)	0.57	2-5
	small	52.25 (2505)	3.13	29.90-62.90	1.45 (285)	0.44	0.45-3.20	3.54 (259)	0.60	2-5
	large	69.22 (80)	3.30	63.00-81.00	3.24 (79)	0.47	2.35-4.30	3.17 (72)	0.50	2-5
1987	1SW	50.13 (456)	6.42	27.70-74.00	1.22 (413)	0.54	0.40-3.85	3.47 (394)	0.61	2-6
	Repeat	63.40 (124)	6.81	38.30-77.00	2.50 (96)	0.84	0.50-4.60	3.31 (97)	0.57	2-5
	2SW	68.90 (3)	4.55	64.00-73.00	2.80 (1)			2.50 (2)	0.71	2-3
	small	51.29 (4225)	3.88	23.00-62.90	1.27 (507)	0.49	0.10-2.60	3.48 (443)	0.64	2-6
	large	69.61 (110)	3.59	63.00-78.00	3.30 (72)	0.61	2.00-4.60	3.25 (56)	0.58	2-4
1988	1SW	48.58 (475)	5.66	34.60-67.10	1.12 (426)	0.38	0.45-2.60	3.50 (448)	0.65	2-6
	Repeat	58.09 (35)	7.24	39.00-74.00	2.03 (31)	0.86	0.65-4.50	3.61 (28)	0.79	2-6
	2SW	66.20 (4)	6.13	60.50-72.80	2.87 (4)	0.90	2.10-3.99	3.25 (4)	0.50	3-4
	small	50.59 (5104)	3.74	25.40-62.50	1.12 (566)	0.45	0.30-2.40	3.65 (531)	0.83	2-8
	large	69.22 (16)	4.78	63.10-81.00	3.17 (16)	0.71	2.20-4.50	3.50 (6)	0.55	3-4
1989	1SW	51.97 (387)	5.68	37.60-68.80	1.38 (376)	0.42	0.55-3.00	3.53 (323)	0.63	2-7
	Repeat	56.73 (37)	8.08	41.00-75.00	1.87 (36)	0.75	0.70-4.20	3.33 (30)	0.55	3-5
	2SW	67.17 (3)	3.41	65.00-71.10	2.73 (3)	0.53	2.25-3.30	3.00 (3)	0.00	3-3
	small	52.45 (4332)	3.68	25.00-62.50	1.29 (479)	0.46	0.30-2.30	3.75 (398)	0.93	2-9
	large	67.01 (21)	3.10	63.00-75.00	2.78 (21)	0.55	2.00-4.20	3.42 (12)	0.51	3-4

1990	1SW	53.00 (340)	5.58	40.50-67.00	1.38 (338)	0.41	0.58-2.66	3.49 (320)	0.62	2-6
	Repeat	61.95 (52)	6.75	44.10-80.20	2.30 (52)	0.87	0.62-5.20	3.36 (44)	0.49	3=4
	2SW	66.50 (3)	2.60	63.50-68.00	2.85 (3)	0.45	2.34-3.12	3.67 (3)	0.58	3-4
	small	52.92 (3801)	3.63	29.20-62.90	1.41 (739)	0.37	0.20-2.66	3.56 (364)	0.75	2-9
	large	66.81 (36)	3.92	63.00-80.20	2.79 (34)	0.75	1.90-5.20	3.42 (24)	0.50	3-4
1991	1SW	52.51 (227)	5.47	35.00-64.10	1.43 (227)	0.40	0.50-2.40	3.60 (212)	0.65	2-6
	Repeat	56.57 (20)	3.20	47.40-61.50	1.82 (20)	0.27	1.10-2.30	3.72 (18)	0.75	3-5
	2SW	66.70 (1)			2.65 (1)					
	small	51.10 (1377)	4.42	26.60-61.80	1.36 (1372)	0.29	0.20-2.40	3.84 (273)	0.97	2-8
	large	64.60 (3)	1.90	63.00-66.70	2.47 (3)	0.16	2.35-2.65	4.00 (1)		
1992	1SW	54.08 (243)	4.86	38.70-65.70	1.59 (243)	0.38	0.65-2.90	3.50 (423)	0.70	2-6
	Repeat	59.59 (40)	4.63	54.00-74.80	2.11 (40)	0.59	0.15-4.35	3.54 (52)	0.61	2-5
	2SW	68.57 (3)	3.86	64.20-71.50	3.27 (3)	0.64	0.25-3.80	3.17 (6)	0.41	3-4
	small	52.51 (1078)	3.68	29.00-62.80	1.48 (1077)	0.28	0.40-2.60	3.62 (271)	0.81	2-8
	large	68.20 (10)	4.29	63.00-74.80	3.04 (10)	0.90	1.35-4.35	3.63 (8)	0.74	3-5
1993	1SW							3.40 (94)	0.54	3-5
	Repeat							3.40 (10)	0.70	2-4
	small									
	large									
1994	1SW	54.43 (387)	2.99	46.00-63.00	1.69 (207)	0.35	0.91-2.90	3.38 (393)	0.62	2-5
	Repeat	58.75 (20)	3.27	51.00-63.00	2.19 (12)	0.62	1.36-2.99	3.20 (20)	0.62	2-5
	small	54.54 (407)	3.06	46.00-62.50	1.69 (216)	0.35	0.91-2.90	3.39 (403)	0.71	2-9
	large	63.00 (4)	0.00	63.00-63.00	2.87 (4)	0.25	2.49-2.99	3.25 (4)	1.26	2-5
1995	1SW	53.63 (56)	3.06	49.00-61.00	1.76 (32)	0.38	1.27-2.63	3.21 (56)	0.62	2-5
	Repeat	-	-	-	-	-	-	-	-	-
	small	53.63 (56)	3.06	49.00-61.00	1.76 (32)	0.38	1.27-2.63	3.21 (56)	0.62	2-5
	large									
1996	1SW	54.26 (56)	3.73	43.00-63.00	-	-	-	3.22 (59)	0.62	2-5
	Repeat	60.00 (5)	2.24	57.00-63.00	-	-	-	3.40 (5)	0.55	3-4
	small	54.45 (59)	3.70	43.00-61.00	-	-	-	3.25 (59)	0.60	2-5
	large	63.00 (2)	0.00	63.00-63.00	-	-	-	3.00 (2)	0.00	3-3

-samples from 1984-1992 were Noel Paul's broodstock

-samples were collected from Grand Falls each year and from Great Rattling Brook from 1986-1990

-1993 samples from Camp 1, Grand Falls & Red Indian Lake fishways

-1994 - 1996 angling samples from Lower Exploits

Table 8 . Counts at various counting facilities on the Exploits River.

Year	Count at Bishops			Count at Camp 1			Count at Grand Falls			Count at Red Indian Lake		
	small	large	total	small	large	total	small	large	total	small	large	total
1959	886	119	*1005									
1960	1013	157	1170	94	9	103						
1961	839	118	957	319	53	372						
1962				1037	31	1068						
1963	1202	65	1267	491	37	528						
1964				1752	116	1868						
1965	1228	203	1431	587	190	777						
1966	829	506	*1335	942	470	1412						
1967	1372	710	2082	822	382	1204						
1968				1334	687	2021						
1969	979	498	1477	892	290	1182						
1970				1023	199	1222						
1971	961	300	1261	902	261	1163						
1972	794	113	907	495	234	*729						
1973	205	89	294									
1974	2538	411	2949				64	0	*64			
1975	9218	1439	10657	5531	505	6036	319	21	340			
1976	3991	460	4451	2935	117	3052	128	5	133			
1977	6148	581	6729	4300	271	4571	244	9	253			
1978	3790	303	4093	2704	81	2785	132	6	138			
1979	6715	277	6992	3925	124	4049	501	8	509			
1980				4597	426	5023	3062	23	3085			
1981	8114	1695	*9809	4264	514	4778	3809	227	4036			
1982	7605	181	7786	2796	122	2918	2321	67	2388			
1983				2952	302	*3254	2182	37	2219			

1984	17219	529	17748	6300	111	*6411	4993	50	5043				
1985	16652	183	16835	5985	38	6023	4992	11	5003				
1986	9697	355	10052	3072	174	3246	2243	67	2310				
1987	9014	310	9324	2327	41	2368	2211	41	2252				
1988	8974	147	9121	3433	10	3443	2535	34	2569				
1989	7192	89	7281	1694	14	1708	2737	70	2807				
1990	6629	122	6751	1057	15	1072	2697	118	2815				
1991	5245	99	5344	1060	40	1100			1614	29	0	29	
1992	12538	314	12852	3520	242	3762	2609	64	2673	138	3	141	
1993	21319	627	21946	5615	312	*5927	5658	101	5759	571	14	585	
1994	16168	916	17084	2488	333	*2821	6430	196	6626	611	25	636	
1995	15714	941	16655	2719	394	*3113	N/A	N/A	6523	774	44	818	
1996	29761	2053	31814	4502	578	*5080	13489	906	14395	776	20	796	

Table 9 . Cumulative percent of run to date for Bishops Falls fishway 1986-1996.

Date	Julian Day	Year										
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
June 9	160	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
	166	0.00	0.12	0.00	0.07	0.00	0.02	0.02	0.00	0.06	0.00	0.23
	173	0.41	0.97	0.24	0.76	0.15	0.07	0.10	0.59	0.28	0.38	3.36
	179	1.28	3.73	2.02	2.21	1.41	0.32	0.25	1.33	1.67	2.20	14.22
Jul. 5	186	4.67	13.89	5.11	14.68	13.23	1.03	1.50	12.67	13.35	11.59	44.08
	193	20.28	37.72	25.29	41.00	34.81	5.91	17.94	28.38	36.37	42.39	68.40
	200	37.07	69.66	51.15	61.20	57.80	25.77	43.79	45.55	60.78	63.10	82.50
	207	60.58	86.75	77.69	77.96	75.13	49.14	71.87	69.60	74.64	80.13	90.54
Aug. 4	214	75.06	93.84	89.90	87.50	85.47	69.07	87.75	83.25	87.44	88.61	95.39
	221	88.40	96.79	96.08	92.83	90.68	78.37	94.53	93.43	93.26	93.28	97.32
	228	92.89	98.22	98.20	96.64	94.67	88.17	97.64	96.93	96.21	96.56	98.38
	235	96.47	98.72	99.51	98.76	97.81	93.88	99.20	98.62	97.55	97.93	99.18
	242	98.25	99.09	100.00	99.93	99.60	96.99	99.77	99.49	98.54	99.04	99.80
Sept. 6	249	98.98	99.44		100.00	100.00	98.67	100.00	99.75	99.16	99.76	100.00
	256	99.57	99.62				99.83		99.97	99.72	100.00	
	263	99.73	99.96				100.00		100.00	100.00		
	270	99.81	100.00									
	277	99.90										
Oct. 11	284	100.00										

Date of 100% of count does not represent closure of fishway.

Table 10. Cumulative percent run to date Camp 1 Fishway 1986-1996.

Date	Julian Day	Year											
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
June 23	174	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	181	0.46%	0.30%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	188	1.60%	3.29%	0.55%	3.04%	0.00%	0.00%	0.00%	0.07%	0.50%	0.00%	18.76%	
	195	3.33%	10.47%	8.07%	22.31%	12.03%	1.27%	0.88%	3.63%	8.47%	9.22%	43.58%	
	202	12.05%	17.99%	29.71%	44.96%	34.33%	4.45%	8.03%	14.39%	30.70%	31.74%	43.82%	
July 28	209	43.75%	17.99%	56.61%	67.10%	79.20%	25.82%	37.13%	29.14%	44.31%	64.41%	64.69%	
	216	64.08%	17.99%	71.74%	76.23%	92.91%	50.1%	72.43%	47.63%	64.76%	80.95%	76.12%	
	223	82.13%	17.99%	84.05%	90.93%	97.11%	71.45%	81.77%	75.05%	77.03%	89.82%	86.83%	
	230	87.31%	17.99%	91.20%	94.50%	98.23%	84.73%	93.04%	91.99%	87.13%	94.76%	93.70%	
August 25	237	91.93%	42.27%	96.20%	98.54%	99.25%	91.18%	98.43%	97.64%	91.24%	97.88%	98.70%	
	244	95.07%	52.53%	98.61%	100.00%	100.00%	100.00%	99.65%	99.33%	96.49%	98.84%	100.00%	
	251	98.18%	57.52%	99.07%				100.00%	100.00%	98.05%	99.26%		
	258	99.20%	81.80%	99.91%						98.90%	100.00%		
	265	99.82%	95.52%	100.00%						99.57%			
	272	100.00%	96.03%							100.00%			
	279		99.54%										
October 9	282		100.00%										

Date of 100% of count does not represent closure of fishway.

Table 11. Cumulative percent of run to date for Grand Falls Fishway 1986-1996.

Date	Julian Day	Year									
		1986	1987	1988	1989	1990	1992	1993	1994	1995	1996
July 3	184		0.00%		0.93%			0.00%			0.00%
	190		1.15%		1.89%	0.00%		0.17%	0.00%	0.00%	7.39%
	197	0.00%	6.44%	0.00%	14.64%	3.56%	0.00%	0.85%	2.16%	5.35%	22.87%
	204	6.28%	20.47%	9.77%	33.99%	16.44%	2.92%	0.89%	14.69%	17.55%	32.84%
Aug. 6	211	20.09%	40.90%	26.59%	55.04%	32.85%	24.46%	15.18%	31.98%	53.07%	55.95%
	218	30.13%	61.86%	60.18%	66.62%	61.98%	41.74%	32.58%	60.94%	73.10%	78.54%
	225	49.05%	80.02%	76.02%	84.93%	78.58%	59.54%	66.16%	70.43%	82.94%	85.15%
	232	80.69%	83.93%	83.85%	91.52%	86.68%	79.88%	82.43%	82.13%	86.02%	89.87%
	239	85.45%	91.25%	90.23%	94.87%	97.51%	87.25%	90.42%	89.34%	90.10%	94.81%
Sept. 3	246	89.74%	95.83%	98.05%	96.54%	100.00%	91.06%	92.12%	92.74%	91.89%	96.08%
	253	92.86%	96.58%	98.05%	100.00%		91.06%	98.16%	93.34%	94.91%	97.85%
	260	93.55%	97.11%	99.88%			96.22%	98.84%	94.13%	97.32%	98.6%
	267	93.64%	99.64%	99.96%			98.28%	99.01%	94.94%	98.85%	100.00%
Oct. 1	274	94.03%	99.69%	100.00%			99.40%	99.57%	99.43%	100.00%	
	281	97.01%	100.00%				99.85%	100.00%	100.00%		
	288	98.36%					99.85%				
Oct.22	294	100.00%					100.00%				

Date of 100% of count does not represent closure of fishway.

Table 12.. Daily numbers of salmon through Bishop's Falls fishway with netmarks in 1996.

Date	Total Salmon	No. With Net Marks	% Net Marked
June 10	23	0	0.00
June 11	17	2	11.76
June 12	19	1	5.26
June 13	5	0	0.00
June 14	0	0	0.00
June 15	9	2	22.22
June 16	44	9	20.45
June 17	10	0	0.00
June 18	149	16	10.74
June 19	213	25	11.74
June 20	266	67	25.19
June 21	205	38	18.54
June 22	107	29	27.10
June 23	131	67	51.15
June 24	488	56	11.48
June 25	616	53	8.60
June 26	718	89	12.40
June 27	930	379	40.75
June 28	569	108	18.98
June 29	361	111	30.75
June 30	769	168	21.85
July 1	1678	325	19.37
July 2	1855	488	26.31
July 3	1865	373	20.00
July 4	1471	403	27.40
July 5	1489	386	25.92
July 6	1469	188	12.80
July 7	1515	148	9.77
July 8	667	69	10.34
July 9	485	79	16.29
July 10	1336	83	6.21
July 11	1149	61	5.31

July 12	1109	68	6.13
July 13	835	54	6.47
July 14	806	48	5.96
July 15	932	69	7.40
July 16	251	36	14.34
July 17	454	73	16.08
July 18	558	56	10.04
July 19	646	45	6.97
July 20	503	63	12.52
July 21	534	49	9.18
July 22	349	53	15.19
July 23	217	39	17.97
July 24	415	48	11.57
July 25	292	27	9.25
July 26	253	23	9.09
July 27	259	47	18.15
July 28	364	91	25.00
July 29	203	51	25.12
July 30	209	28	13.40
July 31	211	18	8.53
Aug. 1	116	27	23.28
Aug. 2	171	26	15.20
Aug. 3	159	22	13.84
Aug. 4	81	26	32.10
Aug. 5	104	12	11.54
Aug. 6	93	19	20.43
Aug. 7	75	11	14.67
Aug. 8	38	9	23.68
Aug. 9	61	12	19.67
Aug. 10	52	9	17.31
Aug. 11	58	14	24.14
Aug. 12	72	14	19.44
Aug. 13	51	11	21.57
Aug. 14	40	7	17.50
Aug. 15	36	11	30.56
Aug. 16	28	6	21.43

Aug. 17	41	8	19.51
Aug. 18	51	8	15.69
Aug. 19	35	6	17.14
Aug. 20	24	5	20.83
Aug. 21	19	5	26.32
Aug. 22	33	4	12.12
Aug. 23	51	8	15.69
Aug. 24	38	5	13.16
Aug. 25	38	7	18.42
Aug. 26	36	8	22.22
Aug. 27	35	11	31.43
Aug. 28	29	2	6.90
Aug. 29	11	0	0.00
Aug. 30	11	1	9.09
Aug. 31	8	2	25.00
Sept. 1	8	2	25.00
Sept. 2	6	0	0.00
Sept. 3	13	4	30.77
Sept. 4	9	0	0.00
Sept. 5	16	2	12.50
Sept. 6	4	0	0.00
TOTAL	31779	5133	16.15

Table 13. Predicted 1997 returns using 1992-1996 (post moratorium) return data.

Year of Returns		Recruit to fry ratio					No. of Recruits					Predicted Small Recruits
		2+	3+	4+	5+	6+	2+	3+	4+	5+	6+	
1997	Mean	.00022	.00274	.00103	.00011	.00001	1287	21741	5692	315	67	29103
	High	.00051	.00726	.00139	.00015	.00001	3001	57509	7657	459	80	68706
	Low	.00003	.00118	.00066	.00004	.00001	195	9366	3633	126	57	13377
1996	Mean	.00018	.00162	.00096	.00010	.00001	1426	8905	2877	546	82	13835
1995	Mean	.00015	.00296	.00113	.00012	.00001	802	8882	6449	840	86	17059
1994	Mean	.00024	.00304	.00108	.00010	.00001	717	17417	7486	764	72	26456
1993	Mean	.00026	.00313	.00094	.00011	.00001	1513	21770	6900	688	54	30925
1992	Mean	.00026	.00313	.00105	.00009	.00001	1810	22927	6488	515	83	31823

Table 14. Comparison of 1992 - 1996 predicted returns(with and without inclusion of the 1996 return data) with actual observed data.

YEAR	DATA USED	PREDICTED	OBSERVED	DIFFERENCE	%DIFFERENCE	MEAN DIFFERENCE
1992	93-96	31823	13818	-18005	-130	
1993	92+94-96	30925	22777	-8148	-35	
1994	92-93+95-96	26456	18472	-7984	-43	
1995	92-94+96	17059	17090	+31	.002	
1996	92-95	13835	32369	+18534	57	
1997	92-96	29103				-30
1992	93-95	20874	13818	-7056	-51	
1993	92+94-95	20184	22777	1903	8	
1994	92-93+95	17608	18472	864	5	
1995	92-94	11927	17090	5163	30	
1996	92-95	13835	32369	18534	57	
1997	92-95	19507				10

Appendix 1. Data used to estimate total recruits and anticipated returns for Exploits River 1997.

Year x	Spawning Escapement	Percentage at freshwater age					Number of females in year x	Total fry in year x + 1	Freshwater Escapement in year x	Total Recruits in year x	Fry contributing to year class x
		2	3	4	5	6					
1975	8843	0.8	61.6	36.9	0.8	0	6915	4471877	12220	30550	
1976	3013	1	53.3	43.5	2.2	0.1	2522	2711395	6102	15255	
1977	5054	0.2	52.9	43	3.8	0.2	4043	3299189	8071	20178	
1978	2810	1.7	65.9	30.4	1.7	0.2	2214	1741226	5083	12708	
1979	5529	8.1	62.8	27.5	1.6	0	4324	3815276	8423	21058	
1980	9891	2.1	93.2	4.6	0.1	0	7834	4976644	13334	33335	4234509
1981	7987	3.2	80	16.3	0.5	0	5783	4077804	11367	28418	3004669
1982	6364	0.8	45.4	48.7	4.9	0.1	5104	2939520	9305	23263	3051546
1983	5495	3	56	37.9	3	0.2	4286	3080860	8529	21323	2430223
1984	15382	0.6	77.9	20.3	1.3	0	11629	5902623	19557	48893	3398318
1985	12645	0.7	56.4	40.3	2.5	0.1	9307	6062689	17738	44345	4419758
1986	5777	1.8	53.9	40.6	3.6	0	4327	5525231	10698	26745	4408715
1987	3546	1.8	57	37.5	3.4	0.2	2794	6147476	9791	24478	3436995
1988	2801	1.9	53.1	38.5	6	0.4	2182	7314792	9643	24108	3144377
1989	2620	0.6	53.4	41.9	3.7	0.3	1957	6945805	7666	19165	4600253
1990	2326	1.1	54.8	40.1	3.8	0.3	1805	5728729	7117	17793	5875974
1991	3374	0.4	47.8	43.5	7.8	0.4	2537	2996840	5758	14395	5775648
1992	11319	2.5	52.6	37.6	6.7	0.6	8172	5512728	13818	13818	5935545
1993	21122	1	59.6	37.5	1.9	0	17278	7923597	22777	22777	6839357
1994	15150	4.1	58.6	33.7	3.6	0	10923	5906715	18472	18472	6991514
1995	15735	8.9	62.5	26.8	1.8	0	13721	6936529	17090	17090	5840316
1996	29226	6.3	67.2	23.4	3.1	0	23556	12668925	32369	32369	3917021

Appendix 1 continued

Spawning Year (Recruit Year)	River Escapement	Total Recruits	Spawning Escapement	Total Fry	Recruits					Total Recruits	No. of recruits per Fry					
					2+	3+	4+	5+	6+		2+	3+	4+	5+	6+	Total
x(x+4,x+5, x+6,x+7)	x	x	x	x+1	x+4	x+5	x+6	x+7	x+8		2+	3+	4+	5+	6+	Total
1975 (79,80,81,82)	12,220	30,550	8,843	4,471,877	1,706	31,068	4,632	1,140	21	38,567	0.0004	0.00695	0.001036	0.0003	0.000005	0.00862
1976	6,102	15,255	3,013	2,711,395	700	22,734	11,329	640	43	35,446	0.0003	0.00839	0.004178	0.0002	0.00002	0.013073
1977(81,82,83,84)	8,071	20,178	5,054	3,299,189	909	10,561	8,081	636	0	20,188	0.0003	0.0032	0.002449	0.0002	0	0.00612
1978	5,083	12,708	2,810	1,741,226	186	11,941	9,925	1,109	44	23,205	0.0001	0.00686	0.0057	0.0006	0.00003	0.013327
1979(83,84,85,86)	8,423	21,058	5,529	3,815,276	640	38,088	17,871	963	0	57,561	0.0002	0.00998	0.004684	0.0003	0	0.015087
1980	13,334	33,335	9,891	4,976,644	293	25,011	10,858	832	49	37,044	0.00006	0.00503	0.002182	0.0002	0.00001	0.00744
1981(85,86,87,88)	11,367	28,418	7,987	4,077,804	310	14,416	9,179	1,446	96	25,448	0.00008	0.00354	0.002251	0.0004	0.00002	0.00624
1982	9,305	23,263	6,364	2,939,520	481	13,952	9,282	709	57	24,482	0.0002	0.00475	0.003158	0.0002	0.00002	0.00833
1983(87,88,89,90)	8259	21,323	5,495	3,080,860	441	12,801	8,030	676	53	22,002	0.0001	0.00416	0.002606	0.0002	0.00002	0.00714
1984	19,557	48,893	15,382	5,902,623	458	10,234	7,135	1,123	58	19,008	0.00008	0.00173	0.001209	0.0002	0.00001	0.00322
1985(89,90,91,92)	17,738	44,345	12,645	6,062,689	115	9,751	6,262	926	83	17,136	0.00002	0.00161	0.001033	0.0002	0.00001	0.00283
1986	10,698	26,745	5,777	5,525,231	196	6,881	5,196	433	0	12,705	0.00004	0.00125	0.00094	0.0000	0	0.0023
1987(91,92,93,94)	9,791	24,478	3,546	6,147,476	58	7,268	8,541	665	0	16,532	0.000009	0.00118	0.001389	0.0001	0	0.00269
1988	9,643	24,108	2,801	7,314,792	345	13,575	6,225	308	0	20,453	0.00005	0.00186	0.00085	0.0000	0	0.0028
1989(93,94,95,96)	7,666	19,165	2,620	6,945,805	228	10,825	4,580	1,003	0	16,636	0.00003	0.00156	0.00066	0.0001		0.0024
1990	7,117	17,793	2,326	5,728,729	757	10,681	7,574				0.0001	0.00186	0.001322			
1991(95,96,97,98)	5,758	14,395	3,374	2,996,840	1,521	21,752					0.0005	0.00726				
1992	13,818	13,818	11,319	5,512,728	2,039						0.0004					
1993(97,98,99,00)	22,777	22,777	21,122	7,923,597												
1994	18,472	18,472	15,150	5,906,715												
1995(99,00,01,02)	17,090	17,090	15,735	6,936,529												
1996	32,369	32,369	29,226	12,668,925												

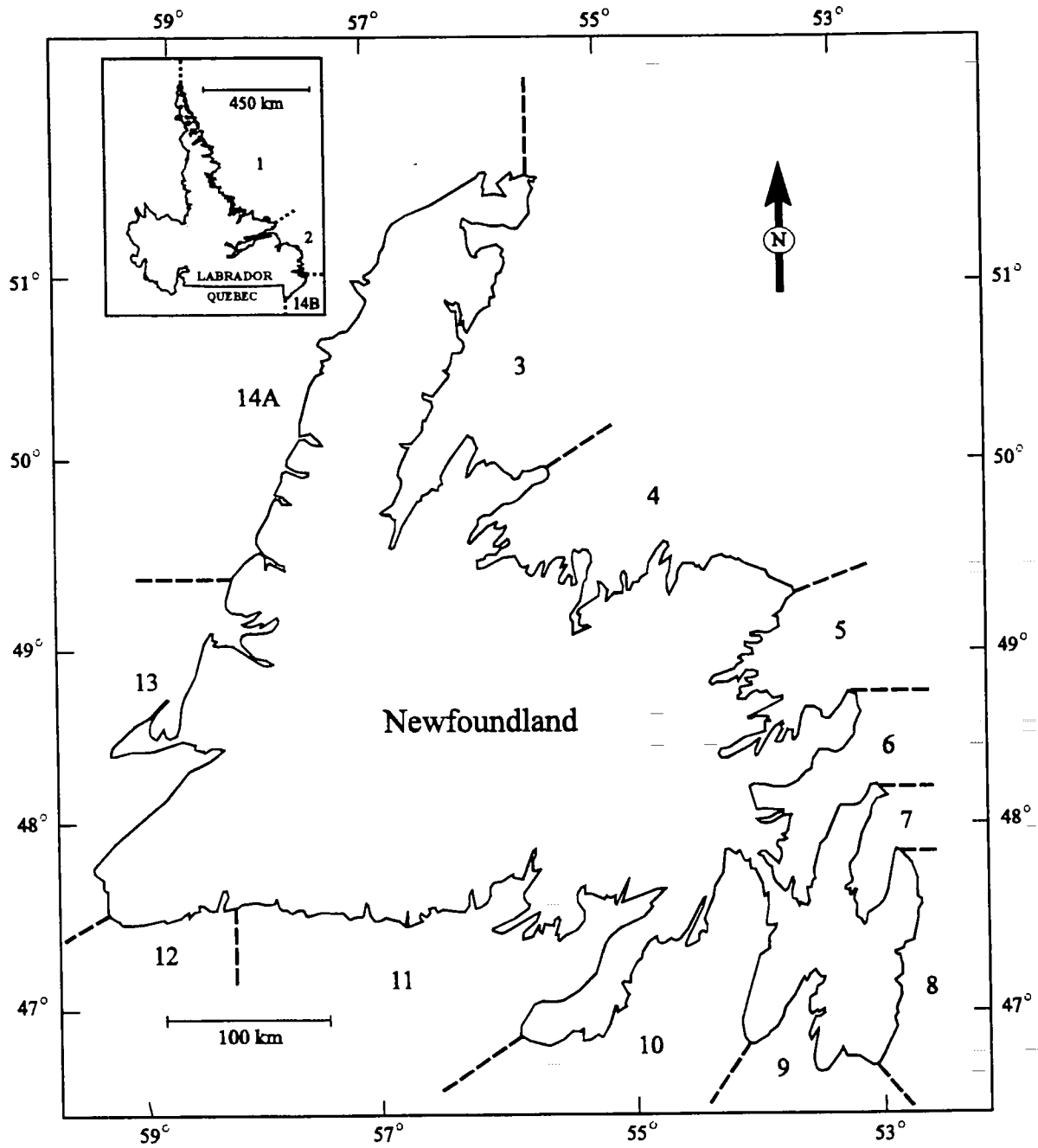


Fig. 1. Map showing the 14 Salmon Fishing Areas of the Newfoundland Region.

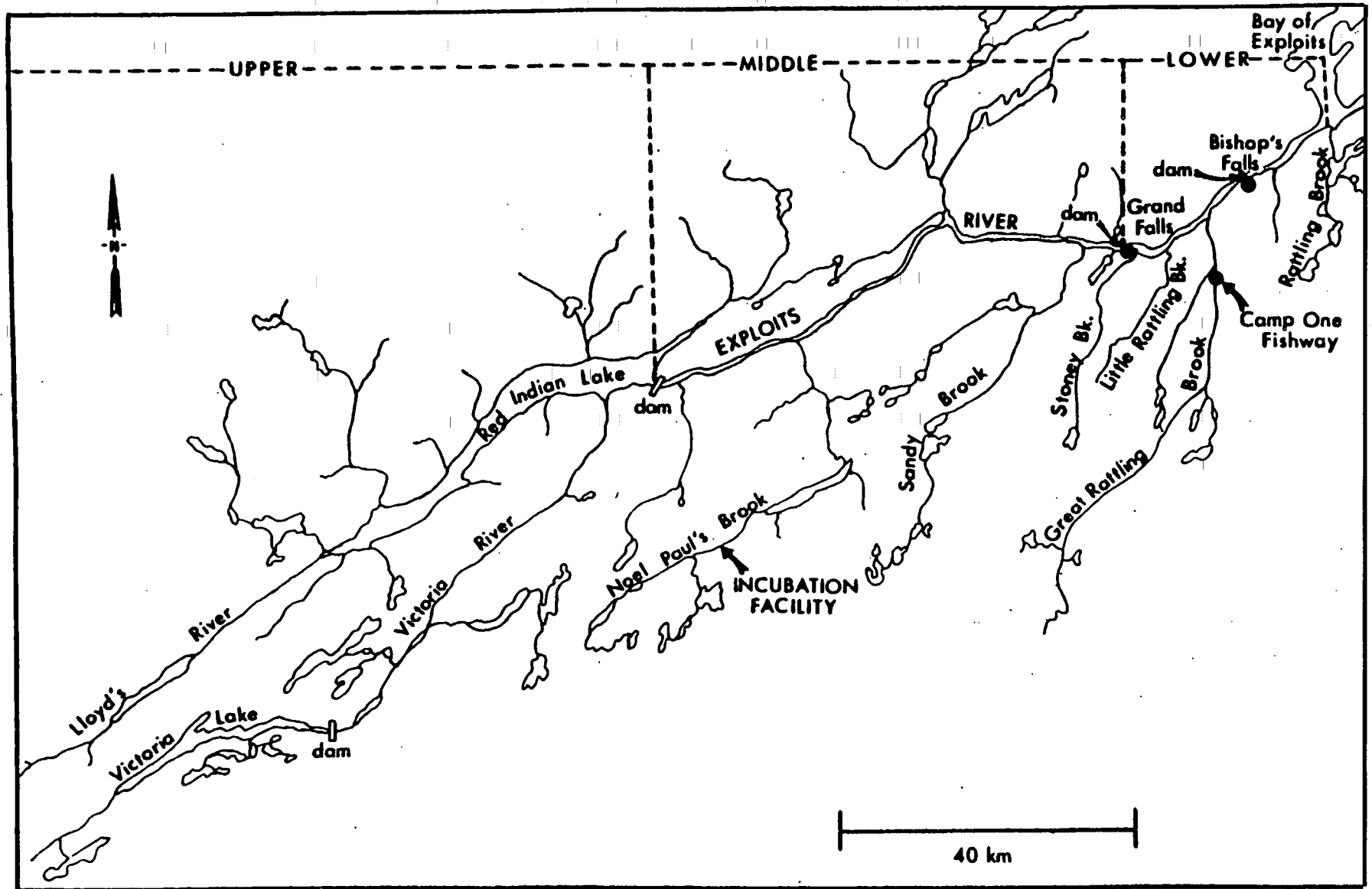


Fig. 2. Detailed map of the Exploits River system.

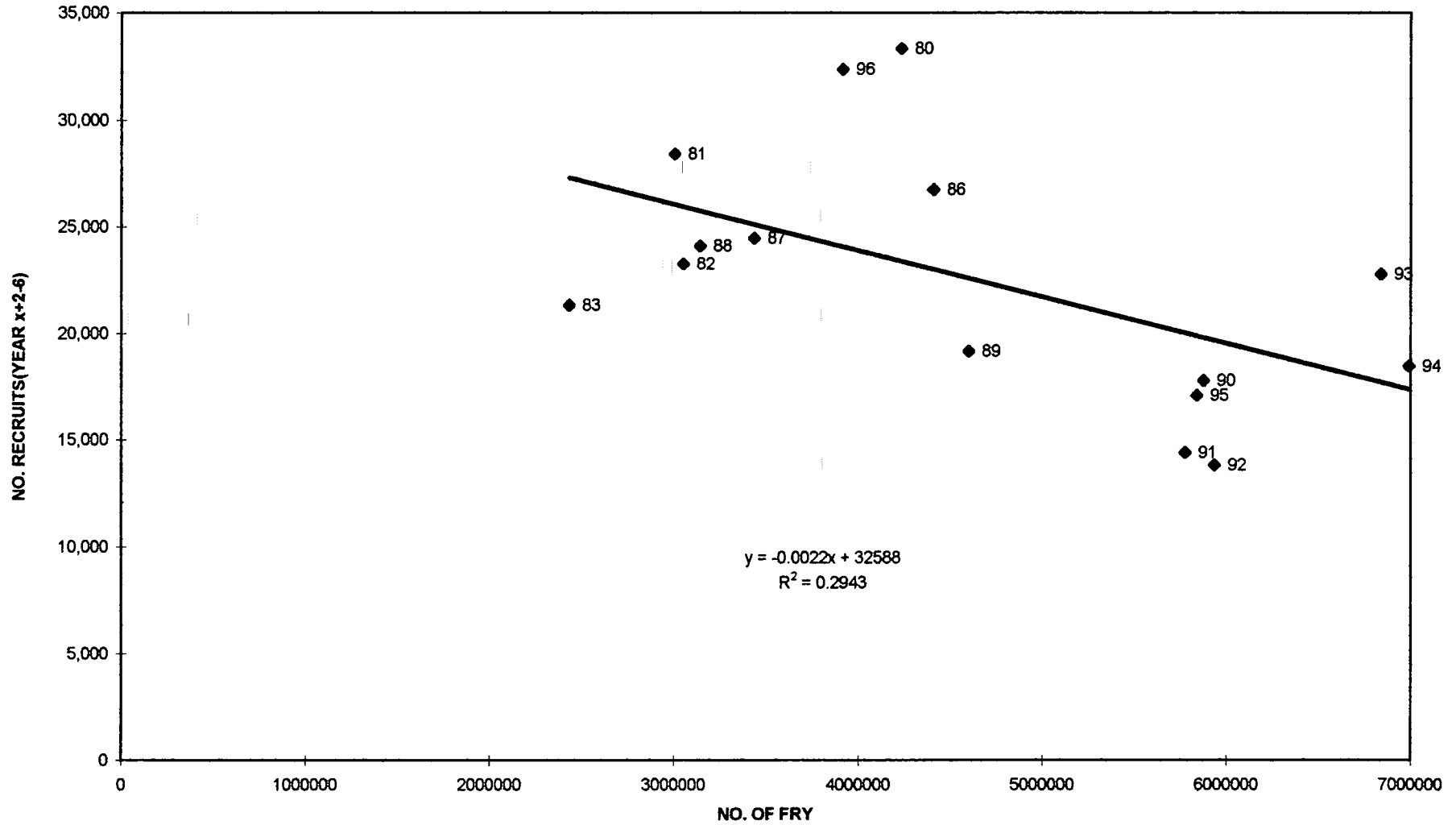


Figure 3. Regression relationship for fry to recruit (by year-class) for Exploits River.

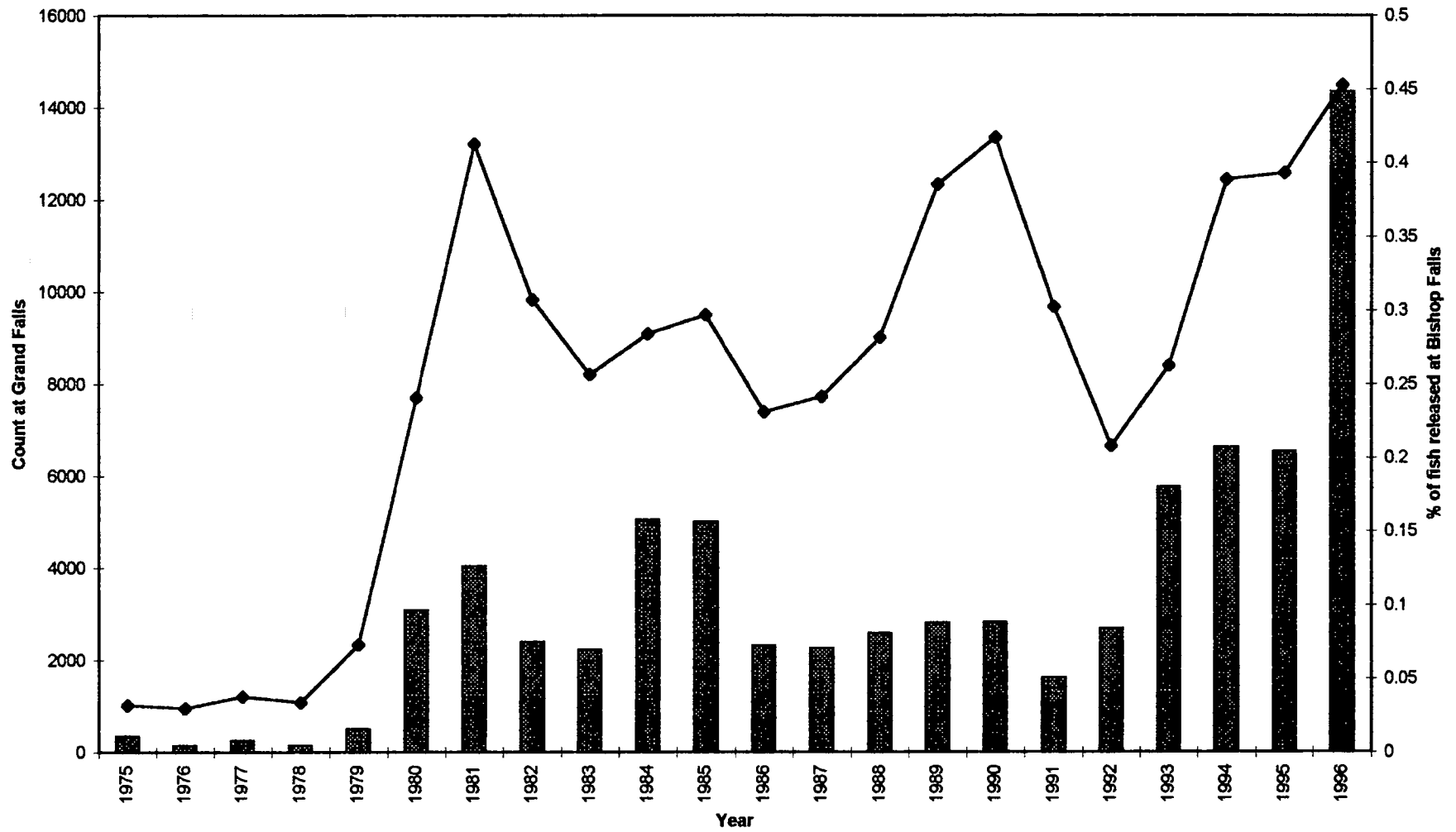


Figure 4. Count at Grand Falls and % of fish enumerated at Bishop Falls that escaped Grand Falls.

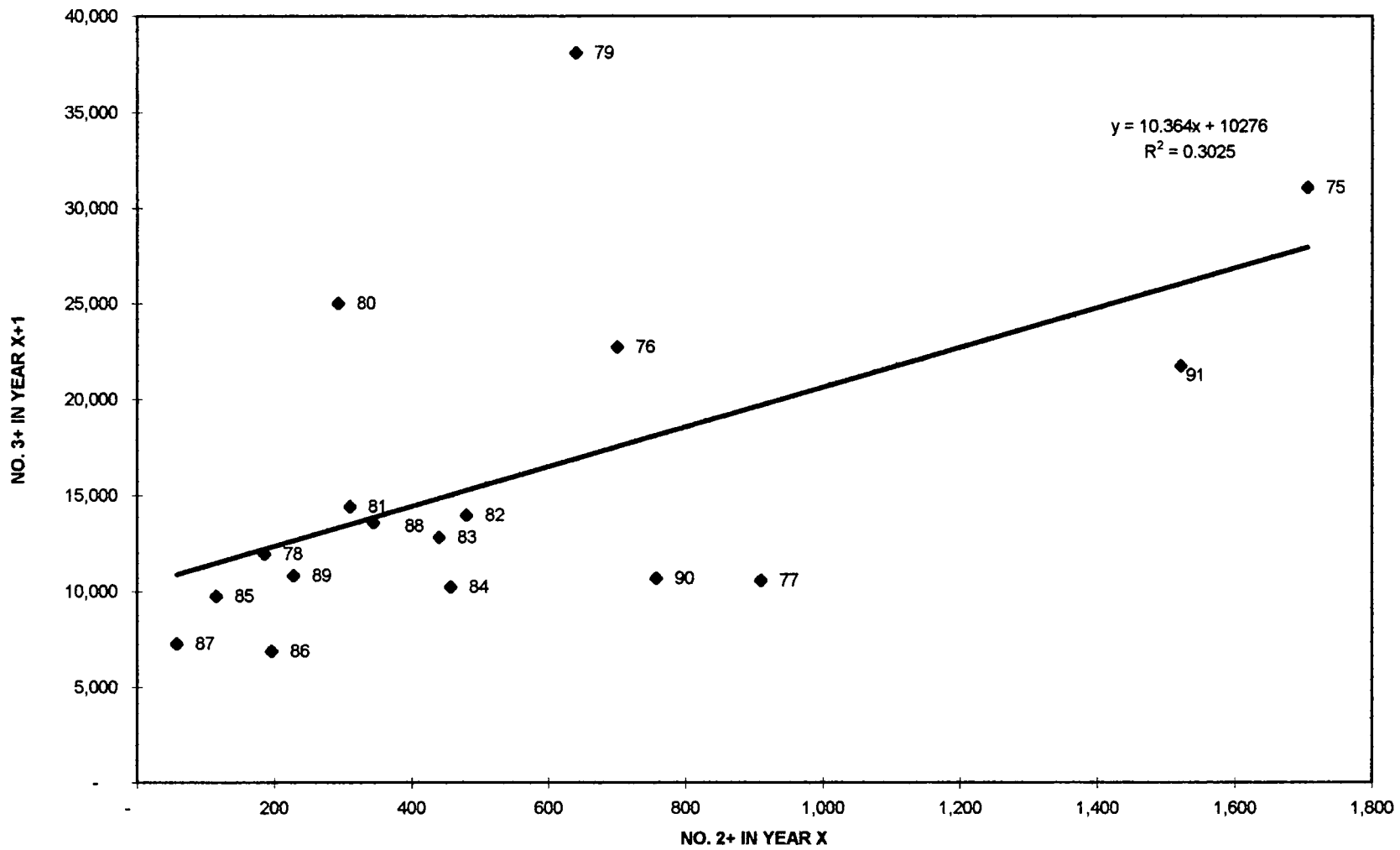


Figure 5. Regression relationship of 2⁺ river age recruits in year x on 3⁺ river age recruits in year x + 1.

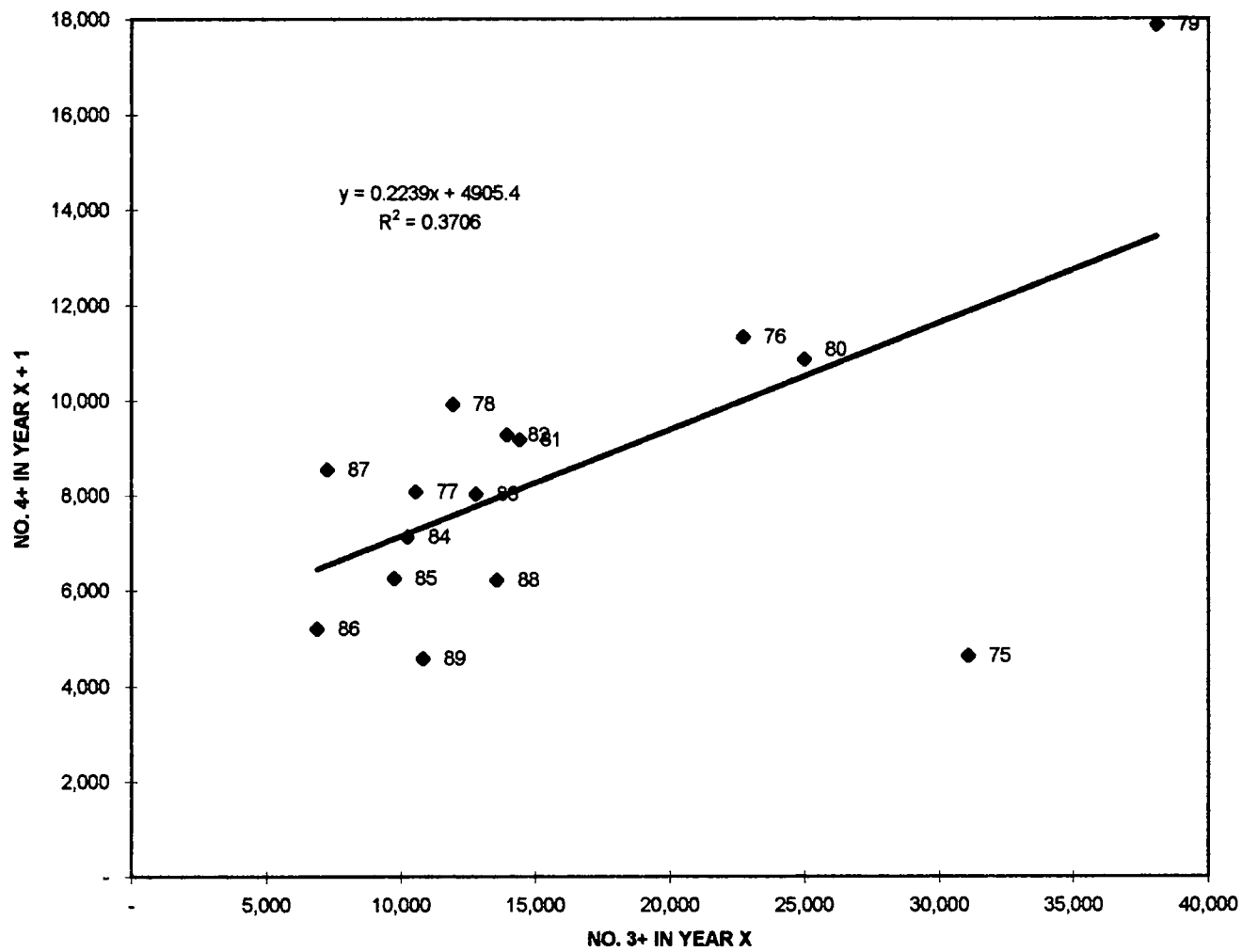


Figure 6. Regression relationship for 3⁺ river age recruits in year x on 4⁺ river age recruits in year x + 1.