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Status of Atlantic Salmon (*Salmo salar* L.) in Eleven Rivers of Bay St. George (SFA 13), Newfoundland, 1994

by

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ABSTRACT

This paper provides details on the status of salmon stocks in eleven rivers of Bay St. George, Newfoundland. Bay St. George rivers have in the past been high producers of multi-year salmon or salmon that spend multiple years at sea. Estimates of available parr-rearing habitat in each river including stream and some pond habitat are used to provide target egg deposition rates consistent with biological conservation. Angling catches and exploitation rates developed from rivers in Bay St. George with counting facilities and adjusted for run timing are used to estimate total river returns for rivers without counting facilities. Stock status is provided in terms of achievement of target egg deposition rates. The results indicate that with the exception of Little and Grand Codroy rivers, no rivers in Bay St. George have achieved target egg deposition in recent years. Total recruits for Bay St. George salmon stocks have declined in recent years from higher numbers of recruits in the early 60s and 70s. Consistent with anglers observations the numbers of salmon in freshwater have increased in 1992-94 compared to previous years.

Résumé

Sont présentés des détails sur la situation des stocks de saumon dans 11 rivières tributaires de la baie St-Georges, à Terre-Neuve. Par le passé, ces rivières débitaient une abondance de saumons pluribermarins, ces saumons qui passent plusieurs hivers en mer. Des estimations des habitats disponibles pour les tacons dans chaque rivière, y compris des ruisseaux et certains étangs, sont utilisées pour établir des taux de ponte cibles répondant aux besoins de la conservation de la ressource. Les taux de capture à la ligne et d'exploitation établis dans les rivières tributaires de la baie munies d'une barrière de dénombrement et ajustés en fonction du moment de la remonte ont servi à estimer le nombre total de saumons amontants dans les rivières sans une telle barrière. La situation des stocks est établie en termes de l'atteinte des taux de ponte cibles. Les résultats révèlent que, sauf dans le cas des rivières Little Codroy et Grand Codroy, le taux de ponte cible n'a pas été atteint dans aucune des rivières tributaires de cette baie dans les dernières années. Le nombre total de recrues aux stocks de saumon de la baie a diminué dans les dernières années par rapport aux effectifs plus élevés observés au début des années 60 et dans les années 70. Conforme aux observations des pêcheurs à la ligne, le nombre de saumons présents en eau douce a augmenté au cours de la période 1992-1994 par rapport aux années précédentes.

INTRODUCTION

Bay St. George is located on the southwest corner of the island of Newfoundland in Salmon Fishing Area (SFA) 13 (Fig. 1). In total, there are twelve major salmon rivers in Bay St. George that constitute the most significant producing rivers on the island of Newfoundland of large (especially virgin 2SW and 3SW) Atlantic salmon (*Salmo salar* L.) (Porter & Chadwick 1983). In the mid-70s, serious declines in salmon catches especially of the large component in both commercial and angling fisheries led fisheries managers to reduce fishing effort which was achieved through season changes to both commercial and angling fisheries beginning in 1978. Also, the reductions in fishing effort included a complete closure of Highlands River to angling (Chadwick et al. 1978). In 1985, longer seasons were allowed for the angling fishery but the retention of large salmon was eliminated. In 1992, due to low abundance of salmon over a wide area of Atlantic Canada, a complete moratorium was imposed on commercial fishing in Newfoundland, commercial fishing quotas were reduced in Labrador, and the angling fishery was further restricted by reduced bag limits.

During public consultation meetings held by Science Branch of DFO in 1995 (O'Connell et al. 1995), the angling public expressed some concern about the status of Bay St. George salmon stocks. In their view, the abundance of salmon stocks in Bay St. George has continued to decline in spite of reductions in overall fishing effort. Also, these stocks have not responded to the commercial fishing moratorium in a similar way to stocks along the northeast and northwest coasts of Newfoundland (O'Connell et al. 1995). Due to the uncertainty in stock status of Bay St. George salmon and a lack of data upon which to base an assessment, it was decided to hold a Workshop in the spring of 1995 to review all of the available data, both public and private, resolve as best as possible the stock status, and make management recommendations for the 1996 fishing season. This paper is a summary of stock status of Bay St. George salmon based on information presented at the 1995 Workshop.

In this paper, we examine the status of Atlantic salmon in eleven rivers of Bay St. George. The rivers included in this assessment are Little Codroy River, Grand Codroy River, Crabbes River, Barachois Brook, Robinsons River, Fischells Brook, Flat Bay Brook, Little Barachois Brook, Southwest & Bottom brooks, and Harry's River (Fig. 1). Total returns and spawning escapements for the period of 1953-94 in each river are estimated based on exploitation rates and angling catches adjusted to reflect the entire salmon run. Exploitation rates were estimated from counts of small and large salmon at enumeration facilities in several Bay St. George rivers. The status of the individual salmon stocks is assessed based on the percentage of target egg depositions achieved, 1953-94.

METHODS

Recreational fishery data

Catch and effort data from the angling fishery in Bay St. George were collected by Department of Fisheries and Oceans (DFO) enforcement staff in conjunction with angling reports submitted by commercial fish camp operators and processed by DFO Science Branch personnel. Commercial catch data were collected by DFO enforcement staff from fish plant landing slips and processed by DFO Statistics and Informatics Branch personnel. Procedures for the collection and compilation of commercial and angling fishery data are described by Ash and O'Connell (1987). Angling seasons and quotas are presented in Tables 1 & 2 and are essential in order to understand trends in the catch statistics of Bay St. George rivers and their relation to salmon abundance. Spearman correlations were used to determine the coherence of catches and catch rates between the salmon stocks in various rivers, 1973-94. The catch statistics for 1973-94 used in the correlation analysis were adjusted to reflect the shorter seasons that came into effect in 1978 and slightly longer season in 1985 (Porter & Chadwick 1983). The sum of retained and released catches of small and large salmon are used.

Unrecorded mortalities

Complete understanding of all life history factors including mortalities is an important part of any stock assessment (Ricker 1975). Mortalities due to fishing that are not recorded as part of the catch statistics have been defined as non-catch fishing mortalities (Anon. 1980; Ricker 1976). Non-catch fishing mortalities should include those fish killed by both illegal and legal fishing activities. Legal fishing mortalities of salmon in Newfoundland and Labrador include catches in food (First Peoples), recreational, and commercial fisheries. Illegal mortalities include poaching in the sea and freshwater but by their very nature are extremely difficult to quantify. One aspect of non-catch fishing mortality that can be examined is the potential inaccuracies in recreational catch statistics. In 1995, a creel survey was conducted by Mr. Leo Foley for Southwest Brook during the week of June 12-18. This survey was carried out by observing anglers at the various fishing sites on Southwest Brook and then contacting them by telephone at the end of the week to obtain a record of effort and catch. The results of the creel were then compared to DFO statistics for the same week.

Biological characteristics

The biological characteristics of Atlantic salmon that are most important to the assessment of the status of a managed salmon stock are the body size and the number of spawning females in the population. The values of these two parameters determine the reproductive potential of the stock. The larger and more numerous the females then the more eggs that can be deposited in a given year. The greater the egg production then the greater the potential for survival to the next generation.

Knowledge of the age at which salmon migrate to sea for the first time as smolt is also important to fisheries managers in order to estimate when a particular year class will return to spawn. However, estimates of these types are complicated by the fact that one year class will produce smolt over several years, and that the proportion smoltifying in a given year may not be the same for each year class. In addition, salmon from different stocks (rivers) do not all spend the same length of time at sea, adding a further complication to the estimation of future spawner abundance.

The biological characteristics of Atlantic salmon in Bay St. George were determined from a total of 2,924 fish sampled at counting facilities and in recreational fisheries on 12 rivers in 1953-1994. Biological information collected from these fish included whole weight (kg), fork length (cm), sex, smolt age, sea age, and spawning history. Rivers were grouped according to their proximity to each other and guided by the results of the correlation analysis described above. The four river groups were: 1 - Little & Grand Codroy; 2 - Robinsons, Crabbes, & Barachois; 3 - Fischells, Flat Bay, & Little Barachois; and 4 - Southwest-Bottom & Harrys. Mean weights and percentage female were calculated for the following collapsed groups in descending order until sample sizes of greater than or equal to 30 were achieved. Year groupings were made on the basis of coherence in management plans and were: 1953-65 characterized by low effort and very few restrictions; 1966-77 characterized by increasing effort; 1978-84 characterized by the management changes brought into place in 1978; 1985-91 characterized by hook and release for large salmon, and individual river quotas; and 1992-94 by the moratorium on commercial salmon fishing and strict effort controls on angling through reduced seasons and a six fish season limit (Table 2). Mean weights and percentage female in 1953-91 were calculated for the following groups assessed in descending order until a sample size of greater than or equal to 30 was achieved:

1. River group / Year group / Females
2. River group / Year group / Males & females
3. River group mean / Females
4. River group mean / Males & females
5. Bay St. George mean / Females
6. Bay St. George mean / Males & females

For the years 1992-94, because of the potential for increased mean weight as a result of the commercial salmon fishing moratorium, the following groupings were used:

1. Year group (1992-94) / Females
2. Year group (1992-94) / Males & females
3. Bay St. George mean (1992-94) / Females
4. Bay St. George mean (1992-94) / Males & females
5. Bay St. George mean (1953-94) / Females
6. Bay St. George mean (1953-94) / Males & females

Target spawning requirements

Target spawning requirements for Atlantic salmon represent an estimate of the number of eggs (or spawners) required for conservation of the stock (O'Connell & Dempson 1995). The target egg deposition requirements for individual rivers was derived on the basis of the amount of habitat available for rearing and estimates of stock density required for conservation. In the case of Newfoundland salmon stocks, juvenile salmon rear in both stream and lake habitat and thus spawning requirements should be based on both types (O'Connell & Dempson 1995). Bay St. George rivers are atypical for Newfoundland since the available habitat is mostly fluvial with little pond habitat. Those lakes that are present are often found in the upper part of the watershed and are frequently obstructed to migrating salmon. Therefore, in relation to the river habitat, the contribution of parr produced in lakes to the total produced in Bay St. George rivers would be small but still important. In order to calculate target spawning escapement, the average biological characteristics of the stock must also be known or estimated.

Target spawning requirements for Bay St. George rivers were estimated from the amount of accessible fluvial habitat determined from stream surveys in the early 1970's (Porter et al., 1974). Lake habitat was measured from the 1:50,000 scale topographic maps. Both fluvial and lake habitat were used for the estimation of target spawners. Optimum egg deposition rates of 240 eggs per fluvial unit (100 sq. m) (Elson 1975) and 368 eggs per ha of lacustrine area were used to estimate the target egg deposition requirements (O'Connell & Dempson 1995).

The targets in terms of fish were estimated based on biological characteristics of Bay St. George salmon determined from fish sampled at counting facilities and in the recreational fishery in 1953-1994 (see BIOLOGICAL CHARACTERISTICS) and an estimated mean fecundity of 1540 eggs/kg of body weight (Porter & Chadwick 1983). Target spawners (TS) were calculated as follows:

$$(1) \qquad TS = \frac{\text{Target Egg Deposition (TED)}}{\text{Average Number of Eggs per Fish}}$$

$$= \frac{(\text{fluvial habitat} * 240 \text{ eggs per } m^2) + (\text{lacustrine habitat} * 368 \text{ eggs per ha})}{(\%\ \text{small} * \%\text{female} * \text{mean wt.} * 1540) + (\%\text{large} * \%\text{female} * \text{mean wt.} * 1540)}$$

where,

TED = target egg deposition

Total river returns, spawning escapement, and egg deposition

Total returns of small and large salmon to freshwater were estimated based on angling catches and assumed exploitation rates guided by the extant exploitation rates that are available for Bay St. George stocks. No adjustments were made for the effect of quotas on angling catches because in most years quotas were not reached, and if reached, it was not until very late in the season when most fish would already have entered and thus and had little effect on final catches (Table 1). Adjustments to angling catches for the variable opening and closing dates were made. Calculations were performed for small and large salmon separately and totals were obtained by summation.

Total river returns

In order to estimate total river returns, several factors had to be considered. One of these factors is run timing. The importance of understanding run timing and including it in calculations of total river returns is that with shortened angling seasons in recent years many salmon have already entered freshwater before the angling season opened or entered after it closed. Since run timing varied among rivers in Bay St. George and we are using exploitation rates on only a few rivers to tell us about all rivers, adjustment had to be made to angling catches to ensure that all fish are included in the estimated populations. The adjustment factors should account for salmon entering both before and after fishing seasons opened and closed. Angling catches were adjusted for changes to open/close times in angling seasons beginning in 1978 by examining weekly catches in 1975-77 and determining the proportion of catches (PC) that occurred in the portion of the angling season that is currently closed. The PCs were applied to catches in years with shorter seasons to provide a catch adjusted to the entire season. The final step was to estimate total numbers of fish entering freshwater based on exploitation rates.

Another factor to be considered is the effect of hook and release on catch statistics. Hook and release of large salmon was made mandatory beginning with the 1985 angling season. Therefore, catch statistics of hook and released large salmon are not equivalent to the former retained catch of large salmon. Consequently, catches of large salmon for 1985-91 were determined by the ratio of large:small salmon in 1978-84 angling catches which were applied to small salmon (retained & released) in 1985-91. After 1991, the number of hook and released large salmon was used. When there was a choice between several options for calculation of total returns, the option chosen was the one with the higher returns.

Total river returns (TRR) were calculated separately for small and large salmon where subscript $_S$ refers to small and $_L$ to large. TRR was calculated as follows:

(2) $$AAC_S = AC_S / (1 - PC_S)$$

where,

AAC_S = angling catch of small salmon adjusted to reflect entire season,
AC_S = unadjusted angling catch of small salmon,
PC_S =correction factor determined as the ratio of catches in the shortened season compared to catches in the full season using weekly catch data for 1975-77.

Equation (2) was also used to estimate the number of large salmon for 1953-84 and 1992-94. For the period of 1985-91, equation (2) was modified to account for the effect of hook and released large salmon as follows:

(3) $$AAC_L = (AC_S * LSR) / (1 - PC_L)$$

where,

LSR = ratio of large:small salmon for the seasonally adjusted fishing season, 1978-84.

(4) $$TRR_{S \text{ or } L} = AAC_{S \text{ or } L} / ER_{S \text{ or } L}$$

where,

$ER_{S \text{ or } L}$ = exploitation rates from rivers with enumeration facilities.

(5) $$ER_{S \text{ or } L} = AAC_{S \text{ or } L} / TRR_{S \text{ or } L}$$

where TRR to estimate exploitation rates for small and large salmon are from rivers with counting facilities.

Exploitation rates were derived from total river returns based on counts of small and large salmon at counting facilities in Bay St. George rivers and angling catches. Exploitation rates were assumed to apply across rivers and years.

Spawning escapement

Spawning escapement (SE) for small and large salmon was calculated according to the formula:

(6) $$SE_{S \text{ or } L} = TRR_{S \text{ or } L} - AC_{S \text{ or } L}$$

Egg deposition

Egg deposition (ED) was calculated for small and large salmon separately and then summed as follows:

(7) $$ED = (SE_S * PF_S * RF_S * MW_S) + (SE_L * PF_L * RF_L * MW_L)$$

where,

$PF_{S \text{ or } L}$ = proportion females
$RF_{S \text{ or } L}$ = relative fecundity (no. of eggs/kg)
$MW_{S \text{ or } L}$ = mean weight of females

Target egg deposition achieved

The percent of target egg deposition achieved in each year was calculated:

(8) $$\text{Percent of target achieved} = (ED / TED) * 100$$

Number of total recruits

It is possible to retrospectively estimate total population size of small and large salmon (or total number of small and large recruits), prior to any exploitation, for several year classes in some rivers (O'Connell et al. 1995). Since the implementation of the commercial fishery moratorium in 1992, the total number of small and large recruits (TNR) were equivalent to TRR (equation 1). Prior to 1992, TNR was calculated using a commercial fishery exploitation rate (μ_C) for small salmon of 0.60 from a range of possible values of 0.5 to 0.7 and for large salmon 0.8 from a range of possible values of 0.7 to 0.9 according to the equation:

(9) $$TNR_{S \text{ or } L} = TRR_{S \text{ or } L} / (1 - \mu_C)$$

O'Connell et al. (1995) show how spawning history can be examined and anticipated returns for future returns calculated using the above approach.

RESULTS

Angling fishery

Angling catch statistics for eleven Bay St. George rivers used in this assessment are summarized in Appendices 1-11. The quotas used to control the angling fishery have had little impact on catches (or spawning escapements) as they have been only rarely attained and if attained at was at a time in the angling season when salmon catches were almost complete (Table 1, Figs. 2 & 3). Since 1978, the angling seasons have varied from river to river and must be considered when estimating salmon abundance for Bay St. George rivers (Table 2). Angling catches for small (retained+released) and large (retained+released) salmon used to determine total recruits,

numbers of salmon entering freshwater, and spawners are shown in Tables 3 and 4. Correlation analyses indicate a reasonably high degree of coherence between the catch statistics on most of the selected rivers in Bay St. George (Table 5). Catch statistics for Little and Grand Codroy rivers were correlated most frequently with each other and less frequently with the other rivers in Bay St. George. Catch statistics for Crabbes River were correlated with the statistics for all other rivers but especially well with Barachois, Robinsons, and Fischells. The other rivers, i.e. Flat Bay, Little Barachois, Southwest-Bottom, and Harry's seemed to form a more cohesive unit in terms of their correlation statistics.

Unrecorded mortalities

The results of the creel survey conducted in 1995 on Southwest Brook by Mr. Leo Foley and comparable statistics collected by DFO staff are shown in the following table:

Source	Rods per day	Small retained	Small released	Large released
Creel	312	44	84	12
DFO	241	17	6	2
Diff (%)	71 (29)	27 (159)	78 (1300)	10 (500)
Creel/DFO	1.29	2.59	14	6

The results indicate the DFO catch records are considerably lower than the creel catch statistics. Effort expressed in rods per day had the smallest difference between the creel and DFO statistics of 29% while the number of small salmon released had the greatest difference of 1300%.

Biological characteristics

The parameter values for mean weights and percent female used to calculate the annual egg depositions are shown in Tables 6a & 6b. Increases in mean whole weight for small salmon in 1992-94 over previous years are noted and are probably due to the commercial fishing moratorium. There were no differences for mean weight of small salmon among rivers although mean weight of large salmon in Robinsons, Crabbes, and Barachois rivers was less than in others.

Target egg deposition

Target egg deposition ranged from a low of 0.9 $*10^6$ for Little Codroy River to a high of 7.6 $*10^6$ for Harry's River (Table 7). The target egg deposition when converted to fish, ranged from a low of 464 small plus large salmon spawners for Little Codroy to a high of 4,628 for Grand Codroy. Small salmon spawners ranged from a low of 363 for Little Codroy River to a high of 3,977 for

Grand Codroy. Large salmon spawners ranged from a low of 58 for Little Barachois Brook to a high of 651 for Grand Codroy (Table 8). Grand Codroy and Harry's are the largest rivers in Bay St. George. They have similar amounts of fluvial habitat and the highest target egg deposition requirements of the eleven Bay St. George rivers (Table 7). However, Grand Codroy has the highest target spawning requirement in terms of fish because of the lower percentage female small salmon (Table 8). Little Codroy River is the smallest river in terms of both target egg deposition and numbers of small and large salmon.

Total river returns, spawning escapement, and egg deposition

Run timing for the salmon stocks in Bay St. George rivers examined through weekly catch statistics for 1975-77 seems to be characterized by two general types, viz. earlier and later runs. A river with an earlier run is defined as one with first catches of small or large salmon caught in week 1 of the fishing season (15-21 May). A river with a later run is defined as one with first catches of small or large salmon in week 3 (1-7 June) or later. Rivers with earlier runs include Grand Codroy, Crabbes, Barachois, Robinson's, Fischells, and Southwest & Bottom (Table 9). Rivers with later runs include Little Codroy, Flat Bay, Little Barachois, and Harry's (Table 9). Figs. 2 & 3 show catch distributions of earlier run rivers, e.g. Robinson's River and later run rivers, e.g. Harry's River. For example, for Harry's River, the angling seasons in 1978-84 when applied to weekly catch data from 1975-77 indicate that 22 and 56% of the small and large salmon, respectively would not have been caught whereas it was 0% for both small and large salmon catches for the seasons in 1985-94 (Table 9). For Robinson's River, the proportions caught prior to opening dates were 34 and 78% for 1978-84 seasons and 3 and 28% for 1985-94 seasons for small and large salmon, respectively (Table 9). Also note that Harry's River and some other rivers in Bay St. George have a proportion of their runs entering after the season closed. The understanding of run timing of Bay St. George salmon stocks and it's diversity is an important component of the assessment.

Total river returns

The angling catches upon which total river returns are based are converted to total river returns using exploitation rates from the various counting facilities in rivers in Bay St. George. Exploitation rates for small and large salmon are available for Little Codroy, 1954-63; Harry's River in 1967; Fischells in 1988, and Flat Bay Brook in 1994 (Table 10). The counting fence operations on Little Codroy in 1954-63 were from mid-May to late-September and were assumed to represent the entire run. Angling exploitation rates for Little Codroy in 1954-63 were the lowest of the four rivers on which information was available (Table 10). The mean exploitation rates for small and large salmon on Little Codroy were assumed to represent those for Little and Grand Codroy rivers in 1953-65 and were adjusted upwards in 1966-77 to reflect greater accessibility to these rivers and then downward in 1978-94 to reflect the shorter angling fishing seasons that were in place during these earlier years (Table 11). The exploitation rates for small and large salmon on Harrys in 1967 were assumed to represent the period 1966-77 on Robinsons, Fischells, Little Barachois, Southwest & Bottom and Harry's (Table 11). The values from

Fischells in 1988 were assumed to represent the period from 1978-91 on these same rivers and the rates from Flat Bay in 1994 were used for 1992-94 (Table 11).

Average exploitation rates of 6% and 10% for small and large salmon were lowest for Little Codroy and 44% and 80% for small and large salmon were highest for Fischells. Lower exploitation rates were shown for Flat Bay in 1994 consistent with lowering of exploitation rates due to the instigation of split seasons and lower season limits for retention of six salmon. A matrix of exploitation rates for small and large salmon was developed from the calculated rates and applied to rivers in other years (Table 11). The lowest rates were for Little and Grand Codroy rivers while higher rates were thought to be applicable to other rivers and years.

Estimated totals of small and large salmon entering Bay St. George rivers declined for all rivers except Little and Grand Codroy over the period of 1953-91 (Tables 12 & 13). Except for small salmon returns for Little and Grand Codroys, Flat Bay and Harry's, most rivers had increased small and large salmon returns to freshwater in 1992-94 compared to 1985-91. In total, the salmon population in freshwater in Bay St. George improved in the period 1992-94 (Fig. 4). For large salmon, the number of fish entering freshwater in 1994 was the highest since 1983. For small salmon, the number of fish entering freshwater in 1994 was the highest since 1988.

Spawning escapement

Spawning escapements for small and large salmon are presented in Tables 14 and 15. Spawning escapements of small and large salmon into Bay St. George rivers generally increased in 1978-84 over previous years, decreased in 1985-91 and then increased in 1992-94 (Fig. 5).

Target egg deposition

Only two out of eleven rivers achieved 100% of their target egg deposition in 1994 (Table 16). These rivers were Little Codroy and Grand Codroy. Target egg deposition requirements on most rivers were achieved in the past but only during the mid-1960's and the early 1980's, e.g., on Grand Codroy, Robinsons and Harrys (Table 16, Fig. 6). Only Crabbes, Fischells, and Little Barachois rivers have never achieved target egg deposition. Even if there had been no recreational fishery in 1994, the percentage of the target achieved would have been only slightly higher on all rivers.

The mean percentage of the target egg deposition achieved on all Bay St. George rivers in 1992-1994 was higher than the mean percentage achieved in 1985-1991 and equivalent to the 1953-1965 period in some cases (Table 16).

Number of recruits

The declines in total number of small and large salmon recruits including salmon caught in the former commercial fishery continued into the 1992-94 period with some minor increases in both small and large salmon numbers (Fig. 7). However, relative to previous years when total recruits were much higher, the number of small and large salmon in the post-moratorium period (1992-94) were quite low.

DISCUSSION

In general, the assessment information for Bay St. George salmon stocks indicates salmon stocks that are in serious decline. While there is some evidence of increased small and large salmon escapement, the majority of Bay St. George rivers still suffer from a deficit of spawners. Levels vary between 30-70%. Exceptions are the two most southerly rivers -- Little Codroy and Grand Codroy, both of which have escapements at 300 or more percent of target spawning escapement. Highlands River, the next most adjacent river to the Codroys, has also increased to 86% of escapement due primarily to increases in large salmon (Anon. 1995). Both Little and Grand Codroy rivers have large portions of their watersheds closed to angling and all of Highlands River has been closed to angling since 1978. Other Bay St. George rivers appear to have stabilized in the period of 1992-94 from a downward trend of several years but at approximately 50% of target spawning escapement. This increase is due to the moratorium on commercial salmon fishing and other measures put into place to reduce exploitation.

The downward pattern in the number of salmon recruits appears to be similar to one found throughout most of Eastern Canada. Only rivers on the northeast and northwest coasts of Newfoundland appear to have substantially benefitted from the closure of the commercial fishery -- most likely a result of the small impact of earlier management changes to the commercial fishery in those areas (O'Connell et al. 1995).

The basis for these conclusions about the status of Bay St. George salmon appears to concur with angler perceptions, although the scientific evidence is not as conclusive as one would like it to be. This is because there is a lack of continuous data on river escapement for any river in the region. While Little Codroy had enumeration facilities in place in the 1950's and 1960's, they were discontinued in 1966; several other rivers have had adult counting facilities for periods of time but none were of sufficient duration to unequivocally document population trends. In recent years, Highlands River has had the longest running facility but there is some doubt about the representativeness of that river as an 'indicator' for other rivers in Bay St. George. While efforts have been made to utilize angling catch data to estimate adult returns to individual rivers, the process is not without problems. The principle assumptions are the appropriateness of the catch model and the accuracy of the catch data used in it. As the creel survey for Southwest Brook showed for one week of 1995, DFO catch statistics were substantially lower than the catches from the creel survey. Any problems with the catch statistics will be reflected in the model results to

some degree; although it is more important that the catch statistics be precise than accurate; although overall accuracy is also desirable. The high degree of correlation between the catch statistics for Bay St. George rivers is consistent with a high degree of precision, that is they are at least internally consistent although they may under- or over-estimate the true value. The comparison between statistics for the one week creel survey of Southwest Brook suggests that the catch statistics are not very accurate and the degree of inaccuracy increases for hook and release fisheries.

Several questions come immediately to mind. Is the above summary accurate? Are Little and Grand Codroy rivers really in as good condition as suggested? Conversely, are the other rivers in as really as bad condition as suggested? Are components of runs systematically being missed because they come in early or late in spite of attempts to adjust catches to include them? Does the use of angling catch statistics that seem to consistently under-report actual landings lead to smaller population estimates than the actual? All of these questions are possible and some under-estimation or over-estimation of the salmon populations in Bay St. George rivers has undoubtedly occurred; although the magnitude is unknown. However, the trends indicated are in concurrence with observations by the angling community (O'Connell et al. 1995) and by more detailed assessments conducted on Flat Bay Brook and Harry's River (O'Connell et al. 1995). Also, anglers report more salmon in freshwater in the 1992-94 period than in previous years. This is in agreement with the results of the assessment.

Stocks on most rivers appeared to be doing well in the 1950's and early 1960's, but declined in the late-1960's and 1970's when angling catches also declined substantially. Stocks appeared to improve in the early-1980's, probably in response to the shortened recreational and commercial fishing seasons of the 1978-83 period. However, this improvement did not continue into the mid-1980's when all large salmon were required to be released. Salmon stocks on all Bay St. George rivers showed some improvement in 1992-1994 compared to the previous five to ten years, but returns are still at extremely low levels relative to the target spawning requirements and the populations overall have declined substantially.

Annual variation in biological characteristics of Atlantic salmon can affect measures of potential spawning success, and therefore, our view of the status of the stock. Biological sampling of salmon landed in the Bay St. George recreational fishery should be conducted every year in order to build up the database of information on these stocks. The small sample sizes on some rivers make it difficult to detect changes over time and can affect the accuracy of estimates of spawning success. The minimum sample sizes used in this analysis were set to 30 male and female fish. At least 60 small salmon on each river should be sampled assuming a 50:50 sex ratio. Means of sampling large salmon should also be investigated.

The increase in the body weight, percentage female, and incidence of repeat spawners observed in salmon in Bay St. George rivers in recent years indicates a potential for increased egg deposition. This is consistent with the release of larger salmon from the commercial fishery with the beginning of the commercial fishing moratorium in 1992. However, if the conditions in

freshwater have deteriorated relative to previous years this potential improvement in year-class strength may be compromised.

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Table 1. Quotas in Bay St. George rivers and dates of closure, 1986-1994.

River Name	River Quotas								
	1994	1993	1992**	1991	1990	1989	1988	1987	1986
Barachois	175 Aug. 7	175* Aug. 21	175* Aug. 1	175	175	175 Jul. 23	175* Aug. 16	350 Jul. 15	350
Fischells	200* Aug. 6	200	200	200 Aug. 16	200	200 Jul. 23			
Flat Bay	250 Aug. 7	250	250	250* Aug. 8	250* Aug. 25	250 Aug. 3	300	300 Jul. 15	400
Harry's	350 Aug. 7	350* Aug. 21	350	350* July 24	350* Aug. 25	350	350* Aug. 21	350 Jul. 15	

'*' River quota reached.
'**' Zonal quota reached in 1992.
- In 1994 all rivers were closed after the in-season review.
- Closures in other years other than for quotas caught were due to low water.

Table 2. Angling seasons for selected Bay St. George rivers. For 1953-77 angling season was fixed to date and after 1978 it was fixed to open and close on Saturday.

Years	Little Codroy	Grand Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	Little Barachois	Southwest & Bottom	Harry's
1953-77	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept	24 May- 15 Sept
1978-84	1 Jul- 15 Aug	20 Jun- 31 Aug	20 Jun- 31 Aug	20 Jun- 31 Aug	20 Jun- 31 Aug	20 Jun- 31 Aug	20 Jun- 31 Aug	1 Jul- 15 Aug	20 Jun- 31 Aug	1 Jul- 15 Aug
1985	1 Jul- 2 Aug	8 Jun- 2 Sept	8 Jun- 2 Sept	8 Jun- 2 Sept	8 Jun- 2 Sept	8 Jun- 2 Sept	8 Jun- 2 Sept	1 Jul- 2 Sept	8 Jun- 2 Sept	1 Jul- 2 Sept
1986-92	20 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	20 Jun- 7 Sept	1 Jun- 7 Sept	20 Jun- 7 Sept
93-94	11 Jun- 5 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	1 Jun- 7 Sept	11 Jun- 7 Sept	1 Jun- 7 Sept	11 Jun- 7 Sept

Table 3. Angling catches of small Atlantic salmon in Bay St. George rivers, 1953-1994 (Unadjusted).

	Small Salmon (retained and released)								Southwest &	
Year	L Codroy	G Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	L Barachois	Bottom	Harry's
1953	17	556	71	23	489	97	666	68	117	935
1954	14	310	116	33	370	34	329	42	48	244
1955	6	442	76	27	363	32	431	57	114	499
1956	2	510	180	228	588	147	566	140	120	668
1957	4	545	331	167	796	182	718	131	223	1418
1958	3	414	134	109	360	156	620	101	265	984
1959	3	449	236	59	488	144	334	44	255	604
1960	1	432	147	86	760	95	1010	114	603	603
1961	1	512	324	215	732	193	764	136	307	734
1962	6	675	569	236	1005	282	1378	189	597	1488
1963	7	728	468	271	1206	425	1827	222	736	2467
1964	9	985	818	342	935	305	1853	302	694	2673
1965	20	862	430	542	1021	202	778	253	768	1175
1966	19	678	240	187	504	52	576	150	555	620
1967	30	688	485	546	847	355	898	125	876	706
1968	50	925	452	613	805	277	951	97	527	863
1969	10	965	833	766	567	416	857	59	866	1491
1970	42	627	303	372	519	302	1496	110	604	1662
1971	31	732	310	550	373	239	1019	172	419	1435
1972	38	468	398	348	287	133	879	295	554	782
1973	35	825	333	568	820	401	696	230	895	1583
1974	43	991	294	257	354	220	510	316	364	941
1975	46	1126	270	510	611	184	408	256	1606	704
1976	126	1205	191	526	556	185	609	205	581	902
1977	95	773	217	534	403	245	209	249	568	1008
1978	29	510	138	51	235	154	140	73	274	713
1979	83	1135	229	124	495	67	72	37	180	148
1980	35	1032	363	290	684	227	445	183	426	518
1981	87	1148	389	210	861	272	457	151	659	659
1982	43	1112	561	137	905	357	427	169	741	570
1983	46	795	105	84	235	128	308	84	614	533
1984	78	1686	394	158	502	214	325	101	633	720
1985	67	1241	95	98	373	145	303	71	280	173
1986	138	1651	347	200	341	184	174	73	309	382
1987	73	1261	84	51	230	59	219	43	386	378
1988	118	1399	284	202	290	374	249	104	330	434
1989	56	635	47	79	116	17	130	15	258	324
1990	102	1254	112	138	232	116	277	25	392	706
1991	118	1452	103	68	176	157	251	145	568	370
1992	67	990	289	222	410	141	223	92	353	346
1993	85	740	150	253	225	157	173	174	205	342
1994	95	632	211	179	248	274	136	111	120	237

Table 4. Angling catches of large Atlantic salmon in Bay St. George rivers, 1953-1994 (Unadjusted).

	Large Salmon (retained and released)									
Year	L Codroy	G Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	L Barachois	Southwest & Bottom	Harry's
1953	79	367	34	4	152	38	119	29	46	146
1954	25	154	51	14	203	43	46	6	76	18
1955	4	132	99	15	106	45	33	3	61	61
1956	6	299	219	70	199	69	29	8	37	206
1957	4	270	311	68	178	78	19	12	128	493
1958	9	349	274	87	298	99	39	10	78	218
1959	2	237	184	16	98	31	18	22	152	95
1960	0	135	50	15	117	38	65	17	11	91
1961	1	271	112	25	166	72	35	7	144	119
1962	1	236	196	47	117	57	74	14	65	226
1963	4	337	300	145	390	120	92	9	291	457
1964	12	332	291	99	282	136	97	42	155	373
1965	25	301	242	111	200	84	175	23	108	262
1966	10	301	155	90	142	55	33	8	324	316
1967	6	238	201	159	166	40	63	4	383	248
1968	0	222	227	124	147	44	40	0	87	85
1969	8	223	234	154	73	77	95	0	28	181
1970	11	137	150	69	80	135	115	0	125	207
1971	11	120	85	54	57	27	80	4	150	47
1972	28	120	152	184	41	63	71	18	152	32
1973	32	143	106	77	85	81	84	35	165	196
1974	13	149	98	70	17	27	59	47	214	34
1975	16	123	90	117	42	21	42	27	254	16
1976	50	132	58	46	56	16	48	29	71	40
1977	40	212	126	56	184	66	26	37	161	68
1978	10	148	127	102	68	31	12	7	27	65
1979	2	30	14	0	23	0	4	0	6	1
1980	8	250	91	24	113	40	26	10	46	65
1981	11	133	115	3	129	11	39	7	34	18
1982	40	200	75	2	41	7	33	8	32	31
1983	15	119	38	1	9	7	7	1	25	30
1984	4	179	14	.	23	8	7	2	14	11
1985	2	204	3	1	7	3	6	.	20	.
1986	5	321	0	23	37	4	2	0	30	8
1987	0	181	4	0	15	2	0	0	6	8
1988	4	129	17	11	9	7	5	2	31	11
1989	0	66	5	1	11	0	1	0	16	3
1990	18	123	25	7	22	12	6	0	13	22
1991	.	56	9	6	10	16	2	.	40	4
1992	14	344	88	22	75	11	20	8	57	28
1993	29	251	24	11	18	34	17	24	63	50
1994	52	320	45	14	38	47	32	10	33	50

Table 5. Correlation matrix (Spearman) for selected rivers in Bay St. George using adjusted catch data, 1973-94. Each element of the matrix indicates the correlation statistics for s=small salmon, l=large salmon, e=effort (rod days), p=percent large, c=catch rate for small and large salmon. The '-' indicates the correlation was not significant at greater than 5%, lower case significant at 10%, and upper case significant at 5% or less. All significant correlations are positive.

River	Little Codroy	Grand Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	Little Barachois	Southwest & Bottom	Harry's
L Codroy	====									
G Codroy	S l - P C	====								
Crabbes	- - - P -	- - - P -	== =							
Barachois	- - E - -	- - - p -	S LePC	====						
Robinsons	- - - - -	- l E P -	SLEPC	S - - P C	====					
Fischells	- l e P -	- L - P -	SLEPC	S L e PC	S L - P C	====				
Flat Bay	- L - P -	- - E P -	S L-PC	S - - - C	S l e P c	S l - P C	===			
L Barachois	- l - P -	- - - P -	S l E P-	S - E - C	S - - - -	S - E P -	S LE PC	====		
Southw-Bottom	- - - P -	- - - P -	S LEPC	S - - - C	S - - - C	- - - p -	S LE PC	S L E P c	===	
Harrys	- - e P -	- - - P -	S LEpC	S - e - C	S l - P C	S L e PC	S L - PC	S L E P -	S - - - C	===

Table 6a. Mean weights (kg) of female Atlantic salmon in Bay St. George rivers, 1953-1994 used to calculate egg depositions.

Year Group	Little & Grand Codroys		Robinsons, Crabbes & Barachois		Fischells, Flat Bay, & Little Barachois		Southwest-Bottom & Harry's	
	Small	Large	Small	Large	Small	Large	Small	Small
53-65	1.63	5.34	1.38	3.69	1.37	5.07	1.29	5.07
66-77	1.43	5.27	1.45	3.69	1.38	3.69	1.32	5.07
78-84	1.43	5.27	1.36	3.69	1.37	5.07	1.24	5.07
85-91	1.43	5.27	1.41	3.69	1.33	5.07	1.29	5.07
92-94	1.63	5.27	1.63	5.06	1.63	5.06	1.63	5.06

Table 6b. Percentage female of Atlantic salmon in Bay St. George rivers, 1953-1994.

Year Group	Little & Grand Codroys		Robinsons, Crabbes & Barachois		Fischells, Flat Bay, & Little Barachois		Southwest-Bottom & Harry's	
	Small	Large	Small	Large	Small	Large	Small	Large
53-65	33.3	92.0	53.3	85.9	56.1	85.9	48.2	85.9
66-77	33.7	91.7	35.8	85.9	57.8	85.9	46.4	85.9
78-84	33.3	92.0	61.1	85.9	56.1	85.9	51.5	85.9
85-91	33.3	92.0	53.3	85.9	51.8	85.9	48.2	85.9
92-94	71.9	86.8	71.9	86.8	71.9	86.8	71.9	86.8

Table 7. Drainage area, available fluvial habitat, and target egg deposition requirements for selected salmon rivers in Bay St. George. Targets are on the basis of an optimal egg deposition rate of 240 eggs per fluvial unit and 368 eggs per ha standing water.

RIVER NAME	DRAINAGE AREA (sq. km)	FLUVIAL REARING UNITS (100 sq. m)	STANDING WATER (ha)	TARGET EGGS (x 10**6)
Little Codroy	244	3,890		0.9
Grand Codroy	956	25,963		6.2
Crabbes	551	18,429	381	4.6
Barachois	241	8,395	362	2.1
Robinsons	439	13,491	124	3.3
Fischells	360	13,661	948	3.6
Flat Bay	635	16,012		3.8
Little Barachois	354	7,104		1.7
Southwest and Bottom	814	18,970		4.6
Harry's	816	26,394	3,546	7.6
Total	5,721	162,702	5,495	41.1

Table 8. Target spawners for selected Bay St. George rivers based on fecundity of 1540 eggs/kg (Anon., 1978).

	BIOLOGICAL CHARACTERISTICS								
	SMALL SALMON			LARGE SALMON					
RIVER NAME	% Overall	% Female	Mean Wt. (kg)	% Overall	% Female	Mean Wt. (kg)	TARGET SPAWNERS Small	Large	Total
Little Codroy	78.4	53.9	1.40	21.6	86.8	3.81	363	100	464
Grand Codroy	85.9	33.3	1.43	14.1	86.8	3.81	3,977	651	4,628
Crabbes	76.8	54.4	1.34	23.2	86.8	3.81	1,714	518	2,232
Barachois	84.2	41.9	1.32	15.8	86.8	3.81	1,189	223	1,412
Robinsons	86.8	54.4	1.35	13.2	86.8	3.81	1,726	261	1,987
Fischells	82.6	50.0	1.38	17.4	86.8	3.81	1,698	358	2,056
Flat Bay	94.8	57.4	1.38	5.2	86.8	3.81	2,560	141	2,701
Little Barachois	94.4	68.4	1.36	5.6	86.8	3.81	983	58	1,042
Southwest and Bottom	85.5	45.0	1.27	14.5	86.8	3.81	2,615	442	3,057
Harry's	91.9	67.3	1.54	8.1	86.8	3.81	3,739	328	4,068
Total	83.0	52.9	1.38	17.0	86.8	3.81	21,767	3,307	25,074

Note 1: % Overall is 1953-1994 mean based on estimated returns in Tables 12 & 13.
Note 2: % Female is the mean for the river (N>=30) or the mean for all Bay St. George rivers (N>=30), 1954-1994.
Note 3: Mean weight is the mean weight of females for the river (N>=30) or the mean weight of males and females for the river (N>=30) or the mean weight of males and females for the river (N>=30), 1954-1994.

Table 9. Summary of angling catches in Bay St. George rivers from 1975-77 that wer outwith the angling seasons in 1978-84 and 1985-94.

River	Percent before season				Percent before season			
	1978-84		1985-94		1978-84		1985-94	
	Small	Large	Small	Large	Small	Large	Small	Large
Gr Codroy	11	49	0	6	0	0	0	0
Crabbes	33	60	3	13	0	0	0	0
Barachois	59	89	13	62	0	0	0	0
Robinson's	34	78	3	28	1	0	0	0
Fischells	36	89	8	35	0	0	0	0
South&Bottom	15	46	5	33	3	1	0	0
L Codroy	7	11	0	0	21	16	0	0
Highlands	34	38	3	3	3	3	0	0
Flat Bay	8	5	0	0	0	0	0	0
L. Barachois	28	34	0	0	16	16	3	4
Harry's	22	56	0	0	17	9	2	1
Average	26	50	3	16	6	4	1	0

Table 10. Angling exploitation rates on small and large Atlantic salmon in Bay St. George, 1954-1994. Partial counts at counting facilities were adjusted to the complete run.

Year	Little Codroy		Fischells		Flat Bay		Harrys	
	Small	Large	Small	Large	Small	Large	Small	Large
1954	0.10	0.31						
1955	0.06	0.11						
1956	0.03	0.14						
1957	0.03	0.08						
1958	0.04	0.16						
1959	0.04	0.04						
1960	0.02	0.00						
1961	0.04	0.03						
1962	0.15	0.03						
1963	0.06	0.10						
1964								
1965								
1966								
1967							0.45	0.56
1968								
1969								
1970								
1971								
1972								
1973								
1974								
1975								
1976								
1977								
1978								
1979								
1980								
1981								
1982								
1983								
1984								
1985								
1986								
1987								
1988			0.44	0.80				
1989								
1990								
1991								
1992								
1993								
1994					0.26	0.46		
Mean	0.06	0.10	0.44	0.80	0.26	0.46	0.45	0.56

Note: Angling exploitation rates for 1988 and 1994 are based on retained small and retained and hooked and released large salmon.

Table 11. Angling exploitation rates (unadjusted) on Atlantic salmon in Bay St. George rivers, 1953-1994.

Year Group	Little & Grand Codroy		Robinsons, Crabbes & Barachois		Fischells, Flat Bay & Little Barachois		Southwest-Bottom, & Harry's	
	Small	Large	Small	Large	Small	Large	Small	Large
53-65	0.06	0.10	0.30	0.40	0.30	0.40	0.30	0.40
66-77	0.15	0.30	0.45	0.55	0.45	0.55	0.45	0.55
78-84	0.10	0.20	0.44	0.80	0.44	0.80	0.44	0.80
85-91	0.10	0.20	0.44	0.80	0.44	0.80	0.44	0.80
92-94	0.10	0.20	0.26	0.46	0.26	0.46	0.26	0.46

Table 12. Estimated total returns to Bay St. George rivers, 1953-1994.

	Small Salmon								Southwest	
Year	L Codroy	G Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	L Barachois	& Bottom	Harry's
1953	283	9267	237	77	1630	323	2220	227	390	3117
1954	233	5167	387	110	1233	113	1097	140	160	813
1955	100	7367	253	90	1210	107	1437	190	380	1663
1956	33	8500	600	760	1960	490	1887	467	400	2227
1957	67	9083	1103	557	2653	607	2393	437	743	4727
1958	50	6900	447	363	1200	520	2067	337	883	3280
1959	50	7483	787	197	1627	480	1113	147	850	2013
1960	17	7200	490	287	2533	317	3367	380	2010	2010
1961	17	8533	1080	717	2440	643	2547	453	1023	2447
1962	100	11250	1897	787	3350	940	4593	630	1990	4960
1963	117	12133	1560	903	4020	1417	6090	740	2453	8223
1964	150	16417	2727	1140	3117	1017	6177	1007	2313	8910
1965	333	14367	1433	1807	3403	673	2593	843	2560	3917
1966	127	4520	533	416	1120	116	1280	333	1233	1378
1967	200	4587	1078	1213	1882	789	1996	278	1947	1569
1968	333	6167	1004	1362	1789	616	2113	216	1171	1918
1969	67	6433	1851	1702	1260	924	1904	131	1924	3313
1970	280	4180	673	827	1153	671	3324	244	1342	3693
1971	207	4880	689	1222	829	531	2264	382	931	3189
1972	253	3120	884	773	638	296	1953	656	1231	1738
1973	233	5500	740	1262	1822	891	1547	511	1989	3518
1974	287	6607	653	571	787	489	1133	702	809	2091
1975	307	7507	600	1133	1358	409	907	569	3569	1564
1976	840	8033	424	1169	1236	411	1353	456	1291	2004
1977	633	5153	482	1187	896	544	464	553	1262	2240
1978	403	5730	471	285	827	551	348	298	765	2675
1979	1153	12753	782	692	1743	240	179	151	502	555
1980	486	11596	1240	1619	2408	812	1107	748	1189	1943
1981	1208	12899	1329	1172	3031	973	1137	617	1839	2472
1982	597	12494	1916	765	3186	1276	1062	691	2068	2138
1983	639	8933	359	469	827	458	766	343	1713	1999
1984	1083	18944	1346	882	1767	765	808	413	1766	2701
1985	670	12410	224	258	880	361	693	167	674	404
1986	1380	16510	819	526	804	458	398	172	744	892
1987	730	12610	198	134	543	147	501	101	930	883
1988	1180	13990	670	531	684	930	570	245	795	1013
1989	560	6350	111	208	274	42	297	35	621	757
1990	1020	12540	264	363	547	289	634	59	944	1649
1991	1180	14520	243	179	415	391	574	342	1368	864
1992	670	9900	682	584	967	351	510	217	850	808
1993	850	7400	354	665	531	391	396	410	494	799
1994	950	6320	774	732	910	1060	484	407	450	861
Mean 53-65	119	9513	1000	599	2337	588	2891	461	1243	3716
Mean 66-77	314	5557	801	1070	1231	557	1687	419	1558	2351
Mean 78-84	796	11907	1063	840	1970	725	772	466	1406	2069
Mean 85-91	960	12704	361	314	592	374	524	160	868	923
Mean 92-94	823	7873	603	661	803	600	463	345	598	822

Table 13. Estimated total returns to Bay St. George rivers, 1953-1994.

	Large Salmon								Southwest	
Year	L Codroy	G Codroy	Crabbes	Barachois	Robinson	Fischells	Flat Bay	L Barachois	& Bottom	Harry's
1953	790	3670	85	10	380	95	298	73	115	365
1954	250	1540	128	35	508	108	115	15	190	45
1955	40	1320	248	38	265	113	83	8	153	153
1956	60	2990	548	175	498	173	73	20	93	515
1957	40	2700	778	170	445	195	48	30	320	1233
1958	90	3490	685	218	745	248	98	25	195	545
1959	20	2370	460	40	245	78	45	55	380	238
1960	0	1350	125	38	293	95	163	43	28	228
1961	10	2710	280	63	415	180	88	18	360	298
1962	10	2360	490	118	293	143	185	35	163	565
1963	40	3370	750	363	975	300	230	23	728	1143
1964	120	3320	728	248	705	340	243	105	388	933
1965	250	3010	605	278	500	210	438	58	270	655
1966	33	1003	282	164	258	100	60	15	589	575
1967	20	793	365	289	302	73	115	7	696	451
1968	0	740	413	225	267	80	73	0	158	155
1969	27	743	425	280	133	140	173	0	51	329
1970	37	457	273	125	145	245	209	0	227	376
1971	37	400	155	98	104	49	145	7	273	85
1972	93	400	276	335	75	115	129	33	276	58
1973	107	477	193	140	155	147	153	64	300	356
1974	43	497	178	127	31	49	107	85	389	62
1975	53	410	164	213	76	38	76	49	462	29
1976	167	440	105	84	102	29	87	53	129	73
1977	133	707	229	102	335	120	47	67	293	124
1978	68	1451	397	1159	386	352	16	18	64	232
1979	14	294	44	0	131	0	5	0	14	4
1980	55	2451	284	273	642	455	34	25	108	232
1981	75	1304	359	34	733	125	51	18	80	64
1982	274	1961	234	23	233	80	43	20	75	111
1983	103	1167	119	11	51	80	9	3	59	107
1984	27	1755	44	0	131	91	9	5	33	39
1985	75	942	30	40	67	20	22	4	27	13
1986	155	1254	108	82	61	26	13	4	30	28
1987	82	958	26	21	41	8	16	2	38	27
1988	132	1062	89	83	52	53	18	6	32	31
1989	63	482	15	33	21	2	10	1	25	23
1990	114	952	35	57	42	16	20	1	38	51
1991	132	1103	32	28	32	22	18	8	55	27
1992	70	1830	126	72	130	21	25	10	106	35
1993	145	1335	34	36	31	65	21	31	118	63
1994	260	1702	113	81	115	158	70	23	108	110
Mean 53-65	132	2631	454	138	482	175	162	39	260	532
Mean 66-77	63	589	255	182	165	99	115	32	320	223
Mean 78-84	88	1483	212	214	330	169	24	13	62	113
Mean 85-91	108	965	48	49	45	21	17	4	35	29
Mean 92-94	158	1622	91	63	92	82	39	21	111	70

Table 14. Spawning escapement of small Atlantic salmon in Bay St. George rivers, 1953-94.

	Small Salmon							Southwest		
Year	L Codroy	G Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	L Barachois	& Bottom	Harry's
1953	266	8711	166	54	1141	226	1554	159	273	2182
1954	219	4857	271	77	863	79	768	98	112	569
1955	94	6925	177	63	847	75	1006	133	266	1164
1956	31	7990	420	532	1372	343	1321	327	280	1559
1957	63	8538	772	390	1857	425	1675	306	520	3309
1958	47	6486	313	254	840	364	1447	236	618	2296
1959	47	7034	551	138	1139	336	779	103	595	1409
1960	16	6768	343	201	1773	222	2357	266	1407	1407
1961	16	8021	756	502	1708	450	1783	317	716	1713
1962	94	10575	1328	551	2345	658	3215	441	1393	3472
1963	110	11405	1092	632	2814	992	4263	518	1717	5756
1964	141	15432	1909	798	2182	712	4324	705	1619	6237
1965	313	13505	1003	1265	2382	471	1815	590	1792	2742
1966	108	3842	293	229	616	64	704	183	678	758
1967	170	3899	593	667	1035	434	1098	153	1071	863
1968	283	5242	552	749	984	339	1162	119	644	1055
1969	57	5468	1018	936	693	508	1047	72	1058	1822
1970	238	3553	370	455	634	369	1828	134	738	2031
1971	176	4148	379	672	456	292	1245	210	512	1754
1972	215	2652	486	425	351	163	1074	361	677	956
1973	198	4675	407	694	1002	490	851	281	1094	1935
1974	244	5616	359	314	433	269	623	386	445	1150
1975	261	6381	330	623	747	225	499	313	1963	860
1976	714	6828	233	643	680	226	744	251	710	1102
1977	538	4380	265	653	493	299	255	304	694	1232
1978	374	5220	333	234	592	397	208	225	491	1962
1979	1070	11618	553	568	1248	173	107	114	322	407
1980	451	10564	877	1329	1724	585	662	565	763	1425
1981	1121	11751	940	962	2170	701	680	466	1180	1813
1982	554	11382	1355	628	2281	919	635	522	1327	1568
1983	593	8138	254	385	592	330	458	259	1099	1466
1984	1005	17258	952	724	1265	551	483	312	1133	1981
1985	603	11169	129	160	507	216	390	96	394	231
1986	1242	14859	472	326	463	274	224	99	435	510
1987	657	11349	114	83	313	88	282	58	544	505
1988	1062	12591	386	329	394	556	321	141	465	579
1989	504	5715	64	129	158	25	167	20	363	433
1990	918	11286	152	225	315	173	357	34	552	943
1991	1062	13068	140	111	239	234	323	197	800	494
1992	603	8910	393	362	557	210	287	125	497	462
1993	765	6680	204	435	306	234	223	237	320	480
1994	865	5806	600	578	750	844	356	297	337	708
Mean 53-65	112	8942	700	420	1636	412	2024	323	870	2601
Mean 66-77	267	4724	441	588	677	306	928	231	857	1293
Mean 78-84	738	10847	752	690	1410	522	462	352	902	1518
Mean 85-91	864	11434	208	195	341	224	295	92	508	528
Mean 92-94	744	7132	399	459	538	429	289	220	385	550

Table 15. Spawning escapement of large Atlantic salmon in Bay St. George rivers, 1953-94.

	Large Salmon								Southwest	
Year	L Codroy	G Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	L Barachois	& Bottom	Harry's
1953	711	3303	51	6	228	57	179	44	69	219
1954	225	1386	77	21	305	65	69	9	114	27
1955	36	1188	149	23	159	68	50	5	92	92
1956	54	2691	329	105	299	104	44	12	56	309
1957	36	2430	467	102	267	117	29	18	192	740
1958	81	3141	411	131	447	149	59	15	117	327
1959	18	2133	276	24	147	47	27	33	228	143
1960	0	1215	75	23	176	57	98	26	17	137
1961	9	2439	168	38	249	108	53	11	216	179
1962	9	2124	294	71	176	86	111	21	98	339
1963	36	3033	450	218	585	180	138	14	437	686
1964	108	2988	437	149	423	204	146	63	233	560
1965	225	2709	363	167	300	126	263	35	162	393
1966	23	702	127	74	116	45	27	7	265	259
1967	14	555	164	130	136	33	52	3	313	203
1968	0	518	186	101	120	36	33	0	71	70
1969	19	520	191	126	60	63	78	0	23	148
1970	26	320	123	56	65	110	94	0	102	169
1971	26	280	70	44	47	22	65	3	123	38
1972	65	280	124	151	34	52	58	15	124	26
1973	75	334	87	63	70	66	69	29	135	160
1974	30	348	80	57	14	22	48	38	175	28
1975	37	287	74	96	34	17	34	22	208	13
1976	117	308	47	38	46	13	39	24	58	33
1977	93	495	103	46	151	54	21	30	132	56
1978	58	1303	270	1057	318	321	4	11	37	167
1979	12	264	30	0	108	0	1	0	8	3
1980	47	2201	193	249	529	415	8	15	62	167
1981	64	1171	244	31	604	114	12	11	46	46
1982	234	1761	159	21	192	73	10	12	43	80
1983	88	1048	97	10	42	79	2	2	34	77
1984	23	1576	30	0	108	83	2	3	19	28
1985	75	942	30	40	67	20	22	4	27	13
1986	155	1254	108	82	61	26	13	4	30	28
1987	82	958	26	21	41	8	16	2	38	27
1988	132	1062	89	83	52	53	18	6	32	31
1989	63	482	15	33	21	2	10	1	25	23
1990	114	952	35	57	42	16	20	1	38	51
1991	132	1103	32	28	32	22	18	8	55	27
1992	70	1830	126	72	130	21	25	10	106	35
1993	145	1335	34	36	31	65	21	31	118	63
1994	260	1702	113	81	115	158	70	23	108	110
1995	145	1237	77	74	71	198	39	11	104	85
1996	246	1699	75	64	74	282	57	49	153	116
Mean 53-65	119	2368	273	83	289	105	97	23	156	319
Mean 66-77	44	412	115	82	74	44	52	14	144	100
Mean 78-84	75	1332	146	195	272	155	6	8	36	81
Mean 85-91	108	965	48	49	45	21	17	4	35	29
Mean 92-94	158	1622	91	63	92	82	39	21	111	70

Table 16. Percentage of target egg deposition achieved in selected Bay St. George rivers, 1953-94.
'*' some values are from assessments based on counting facilities in these years.

Year	L Codroy	G Codroy	Crabbes	Barachois	Robinsons	Fischells	Flat Bay	L Barachois	Southwest &Bottom	Harry's
1953	600	518	10	4	73	18	79	28	16	47
1954	202	233	15	9	75	15	36	10	19	10
1955	38	237	20	8	53	15	40	11	19	23
1956	47	434	46	52	92	30	48	27	14	47
1957	35	410	69	44	104	35	57	28	39	106
1958	70	468	52	43	95	39	55	22	30	57
1959	19	353	43	13	61	20	29	20	46	30
1960	1	238	17	16	87	18	90	28	32	30
1961	9	404	37	35	96	35	64	26	47	37
1962	16	400	64	45	107	37	118	39	44	73
1963	39	521	75	83	184	66	155	41	100	132
1964	100	570	94	76	138	61	159	74	68	127
1965	210	510	64	105	127	39	102	55	62	69
1966	27	130	19	25	32	10	27	16	53	32
1967	25	113	28	54	45	21	44	12	68	28
1968	23	124	30	51	42	18	43	9	24	19
1969	19	127	38	63	26	29	47	5	25	36
1970	39	80	20	30	25	33	75	10	30	40
1971	34	83	14	35	18	14	51	16	29	25
1972	69	65	22	50	14	15	44	32	32	14
1973	75	96	16	40	35	29	39	32	43	38
1974	44	108	15	25	13	13	28	43	35	17
1975	50	110	14	45	23	11	22	31	71	12
1976	150	118	9	32	23	10	31	27	23	16
1977	117	111	16	35	34	20	12	34	34	20
1978	76	218	38	254	70	72	7	20	16	40
1979	93	168	19	34	65	6	4	8	8	5
1980	73	388	45	136	146	96	22	45	26	33
1981	140	279	52	64	174	44	23	36	32	27
1982	231	345	55	42	117	43	21	41	35	27
1983	117	221	17	25	29	25	14	19	29	26
1984	98	392	30	43	65	33	15	23	27	28
1985	107	244	6	18	28	10	15	8	12	4
1986	221	325	24	36	25	13	8	8	14	9
1987	117	248	6	9	17	4	11	5	17	9
1988	189	275	19	37	22	26	12	11	15	10
1989	90	125	3	14	9	1	6	2	11	7
1990	164	247	8	25	17	8	13	3	17	16
1991	189	286	7	12	13	11	12	16	25	9
*1992	169	465	34	53	57	14	18	17	36	12
*1993	257	344	13	48	23	24	14	38	30	38
*1994	363	361	41	74	65	71	27	41	29	48
Mean 53-65	107	407	47	41	99	33	79	32	41	61
Mean 66-77	56	105	20	40	28	19	39	22	39	25
Mean 78-84	118	287	37	86	95	46	15	27	25	27
Mean 85-91	154	250	10	22	19	10	11	7	16	9
Mean 92-94	263	390	29	58	49	37	20	32	32	33

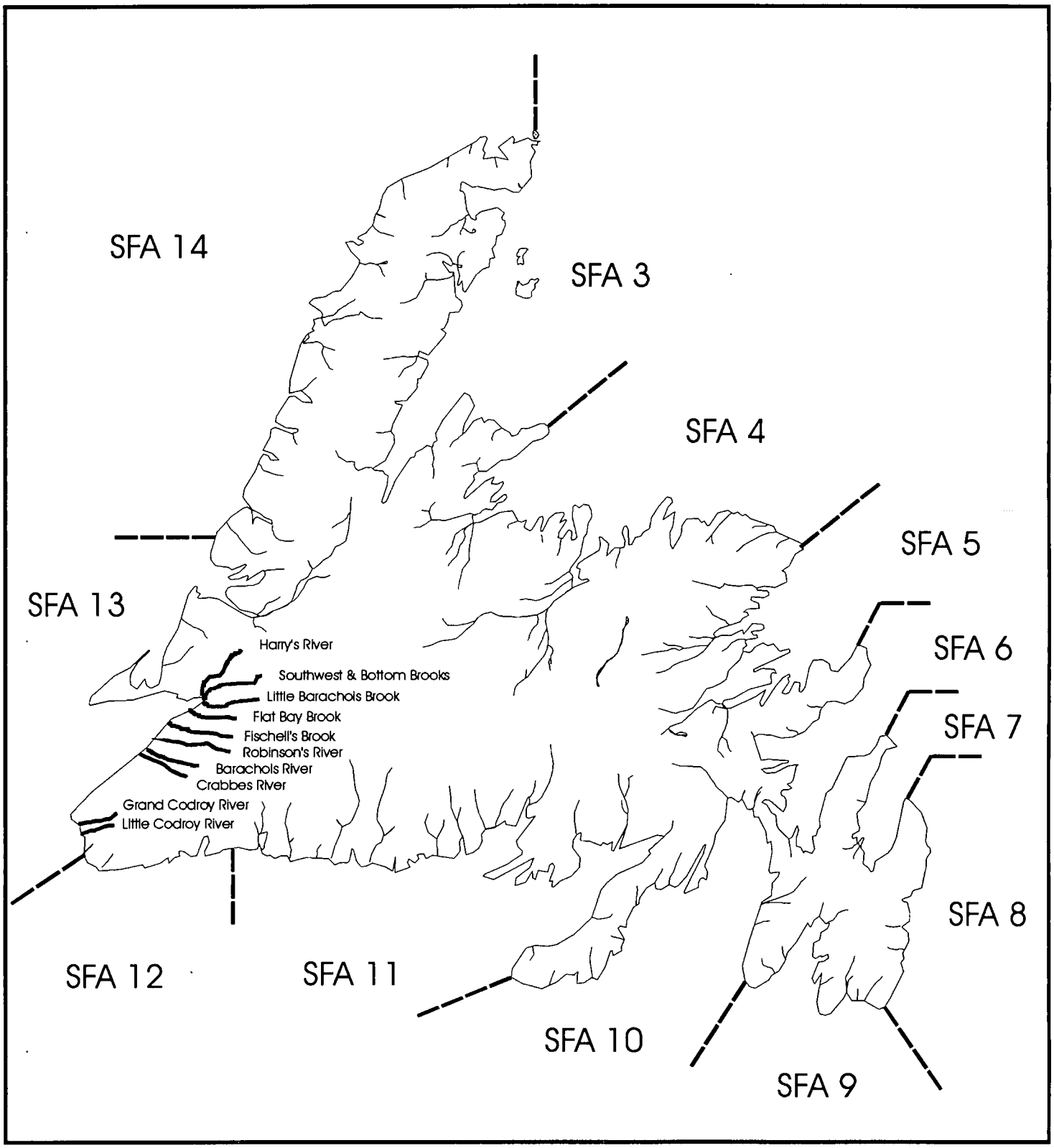
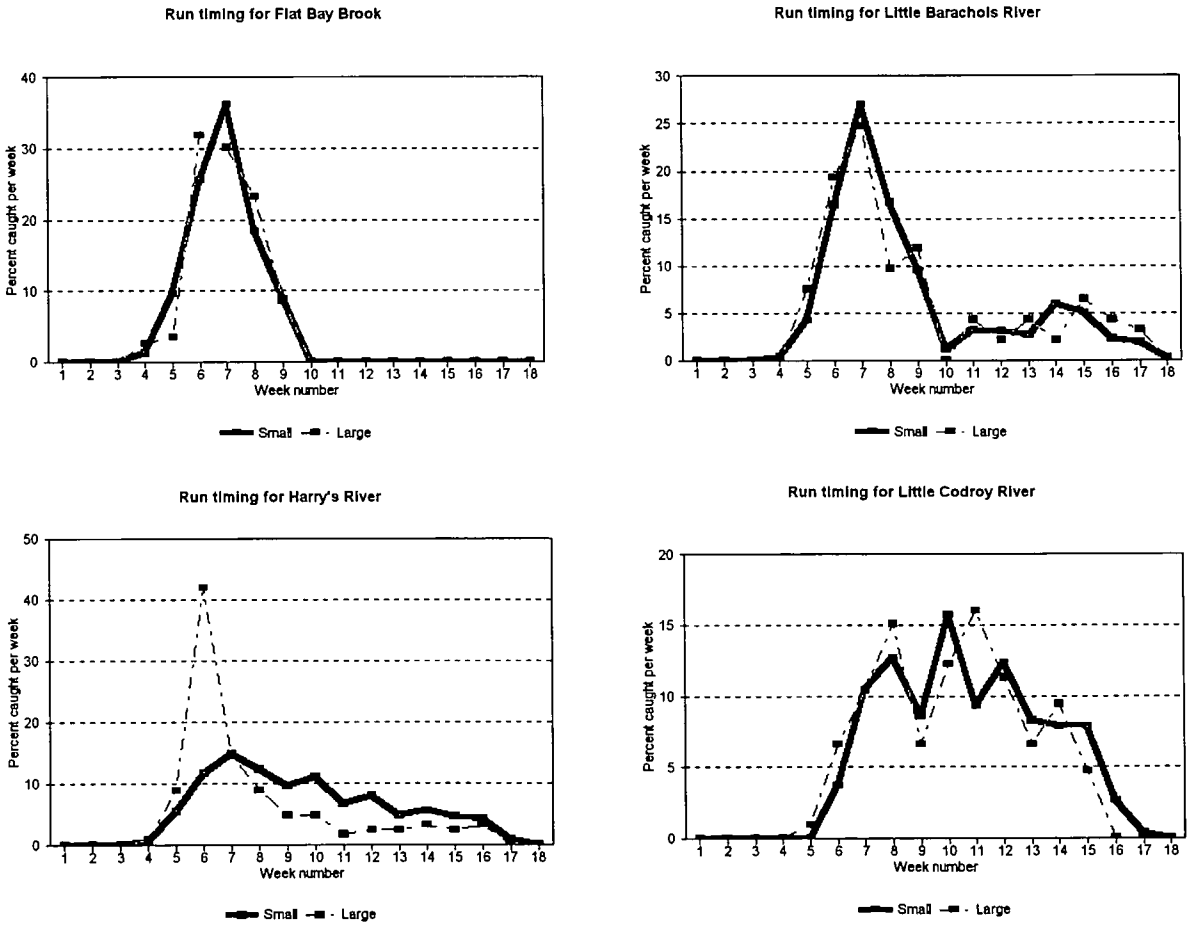


Figure 1. Map showing the Salmon Fishing Areas for Newfoundland and selected rivers in Bay St. George.

Fig. 2. Run timing for later run rivers in Bay St. George, Nfld, 1975-77.

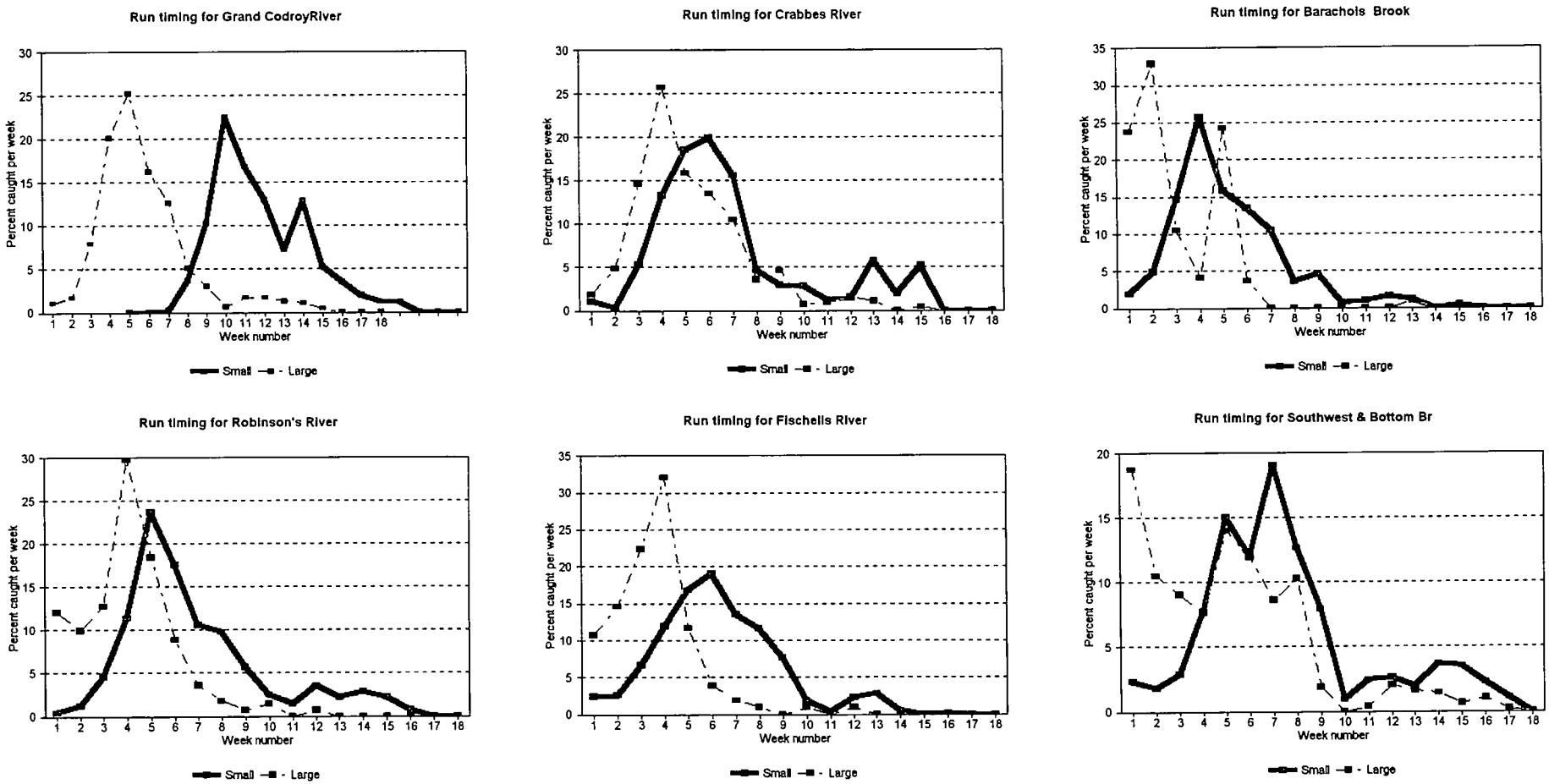


Week1: 18 - 24 May
Week3: 1 - 7 June
Week5: 15 - 21 June

Week7: 29 June - 5 July
Week9: 13 - 19 July
Week11: 27 July -2 Aug

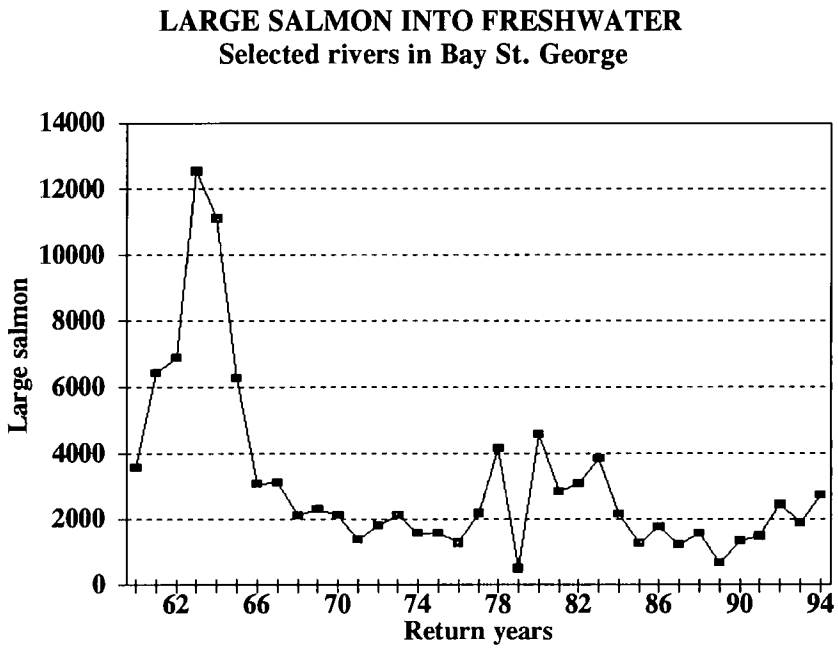
Week13: 10 - 16 Aug
Week15: 24 - 30 Aug
Week17: 7 - 13 Sept

Fig. 3. Run timing for earlier run rivers in Bay St. George, Nfld, 1975-77.



Week1: 18 - 24 May
Week3: 1 - 7 June
Week5: 15 - 21 June
Week7: 29 June - 5 July
Week9: 13 - 19 July
Week11: 27 July -2 Aug
Week13: 10 - 16 Aug
Week15: 24 - 30 Aug
Week17: 7 - 13 Sept

Fig. 4. Total small and large salmon entering selected rivers in Bay St. George, Nfld.



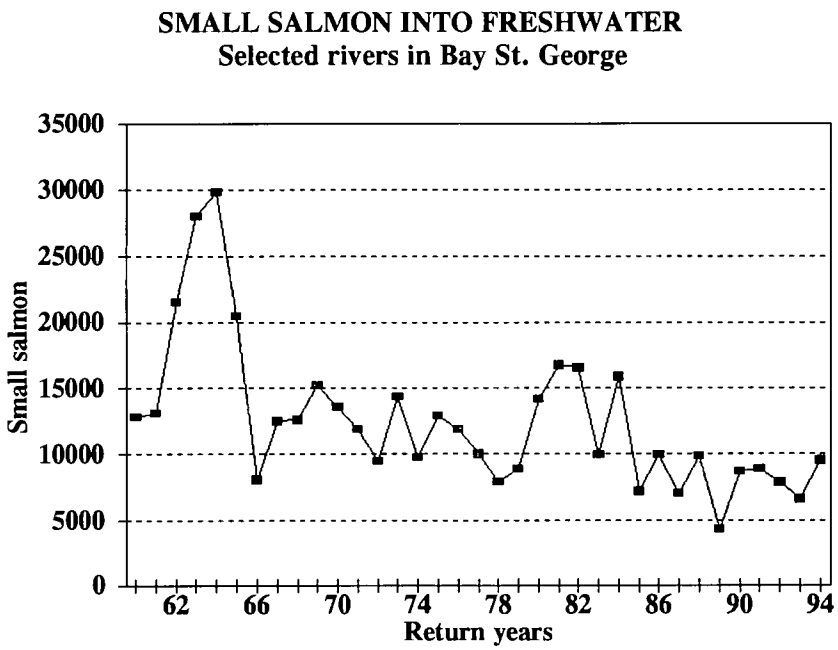


Fig. 5. Total spawners for small and large salmon for selected rivers in Bay St. George, Nfld.

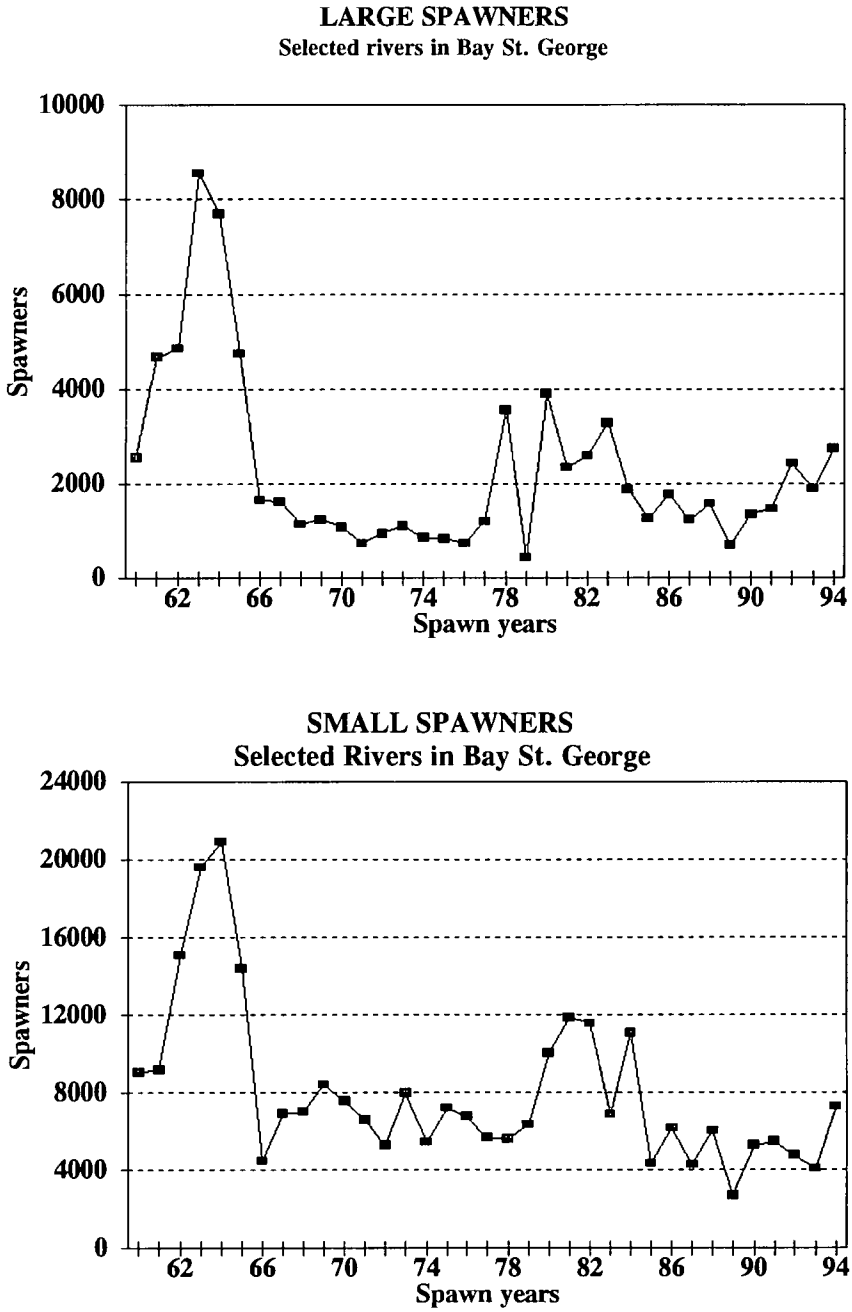


Fig. 6. Percentage of target egg deposition achieved in Bay St. George rivers, 1953-94.

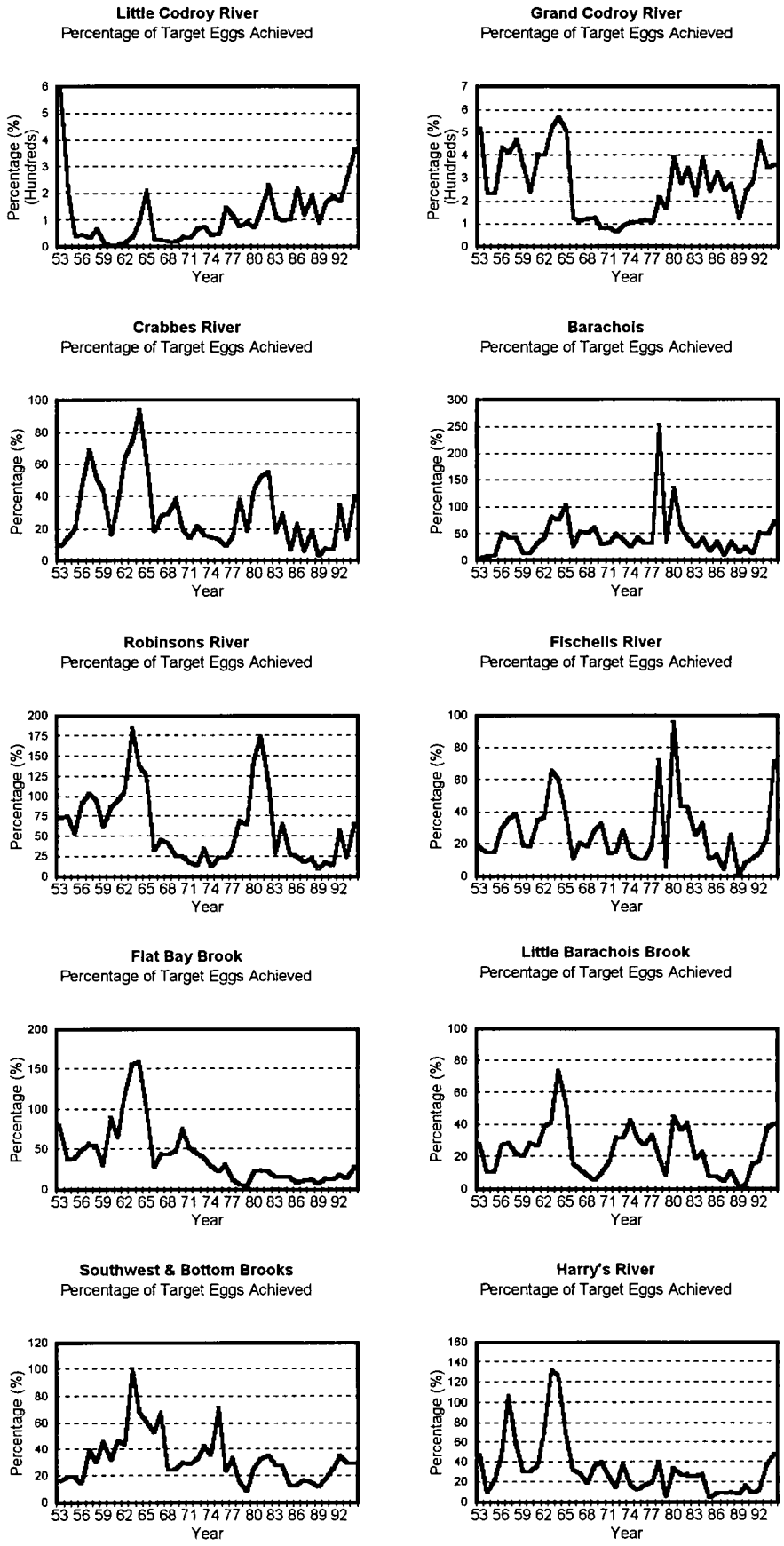
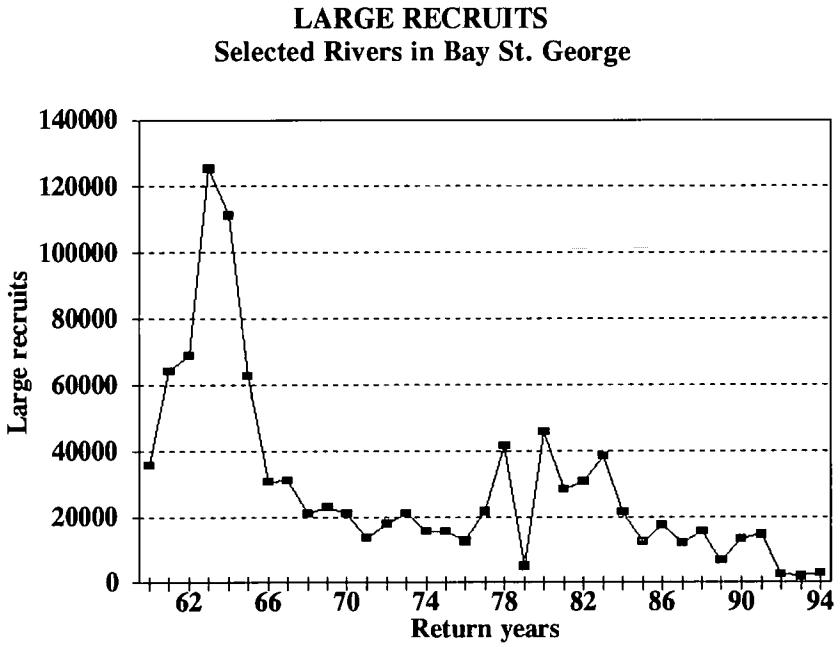
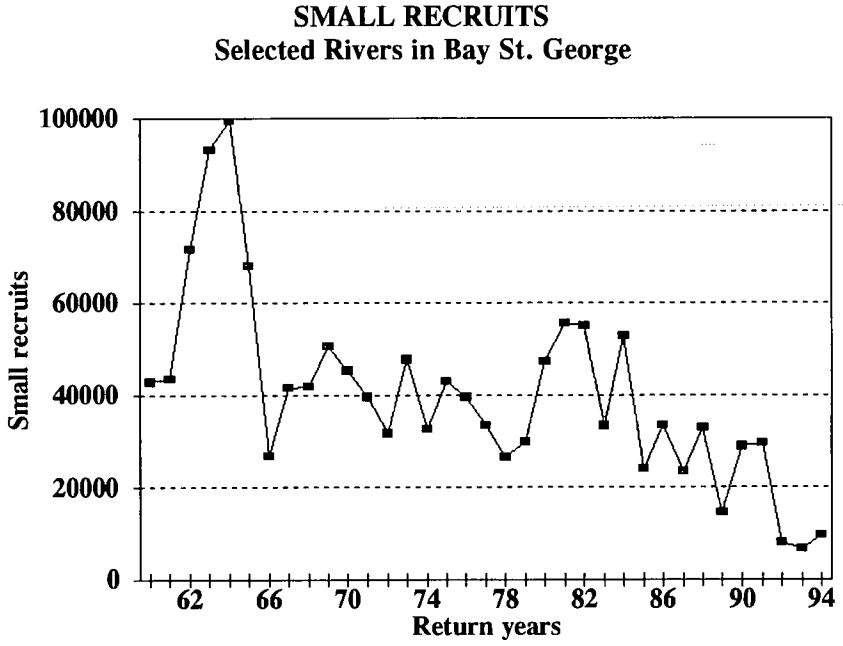


Fig. 7. Total recruits estimated prior to commercial fis for small and large salmon for selected rivers in Bay St. George, Nfld, 1953-94.





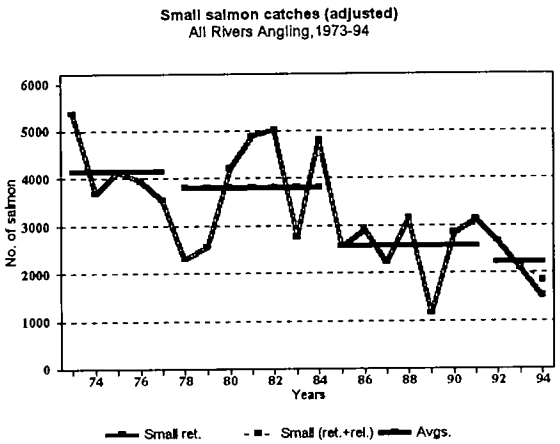
Appendix 1a. Angling catch statistics in selected Bay St. George rivers, 1953-94.

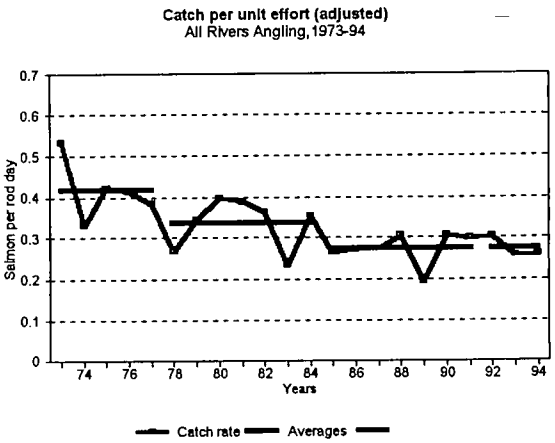
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	7832	3039		3039	1955		1955	4994		4994	0.64	39
1954	3861	1540		1540	1103		1103	2643		2643	0.68	42
1955	5453	2047		2047	1070		1070	3117		3117	0.57	34
1956	7809	3149		3149	2109		2109	5258		5258	0.67	40
1957	8485	4515		4515	3004		3004	7519		7519	0.89	40
1958	7171	3146		3146	2714		2714	5860		5860	0.82	46
1959	8349	2616		2616	1685		1685	4301		4301	0.52	39
1960	7372	3851		3851	1025		1025	4876		4876	0.66	21
1961	9948	3918		3918	1753		1753	5671		5671	0.57	31
1962	11952	6425		6425	2049		2049	8474		8474	0.71	24
1963	14967	8357		8357	3995		3995	12352		12352	0.83	32
1964	16211	8916		8916	3415		3415	12331		12331	0.76	28
1965	14232	6051		6051	1531		1531	7582		7582	0.53	20
1966	11388	3581		3581	1434		1434	5015		5015	0.44	29
1967	14658	5556		5556	1508		1508	7064		7064	0.48	21
1968	14633	5560		5560	976		976	6536		6536	0.45	15
1969	15468	6830		6830	1073		1073	7903		7903	0.51	14
1970	19106	6037		6037	1029		1029	7066		7066	0.37	15
1971	17613	5280		5280	635		635	5915		5915	0.34	11
1972	15391	4182		4182	861		861	5043		5043	0.33	17
1973	18710	6386		6386	1004		1004	7390		7390	0.39	14
1974	18577	4290		4290	728		728	5018		5018	0.27	15
1975	21092	5721		5721	748		748	6469		6469	0.31	12
1976	20567	5086		5086	546		546	5632		5632	0.27	10
1977	16575	4301		4301	976		976	5277		5277	0.32	18
1978	10912	2317		2317	597		597	2914		2914	0.27	20
1979	7661	2570		2570	80		80	2650		2650	0.35	3
1980	12261	4203		4203	673		673	4876		4876	0.40	14
1981	13941	4893		4893	500		500	5393		5393	0.39	9
1982	15066	5022		5022	469		469	5491		5491	0.36	9
1983	16116	3047		3047	553		553	3600		3600	0.22	15
1984	14311	4811		4811	262		262	5073		5073	0.35	5
1985	12360	2846		2846		246	246	2846	246	3092	0.25	8
1986	16211	3799		3799		430	430	3799	430	4229	0.26	10
1987	12159	2784		2784		216	216	2784	216	3000	0.25	7
1988	14122	3784		3784		226	226	3784	226	4010	0.28	6
1989	10073	1677		1677		103	103	1677	103	1780	0.18	6
1990	12765	3354		3354		248	248	3354	248	3602	0.28	7
1991	12672	3408		3408		143	143	3408	143	3551	0.28	4
1992	12857	3115		3115		667	667	3115	667	3782	0.29	18
1993	12927	2406	98	2504		521	521	2406	619	3025	0.23	17
1994	11404	1807	436	2243		641	641	1807	1077	2884	0.25	22

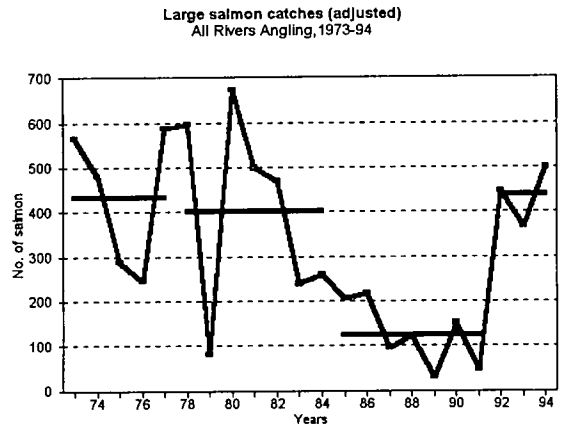
Appendix 1b. Angling catch statistics in selected Bay St. George rivers, 1973-94 adjusted to reduced angling seasons.

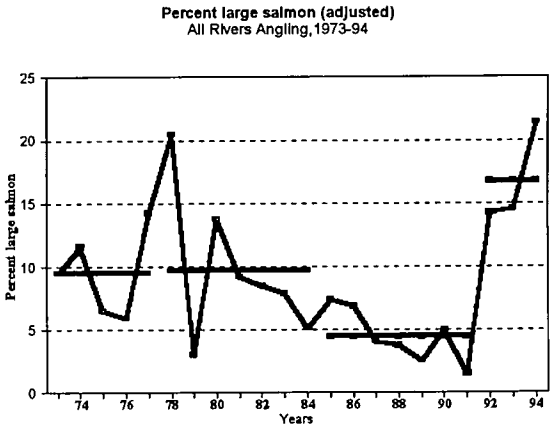
	Effort	Small			Large			Total			Catch rate	%
Year	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Total	Salmon/rod	large
1973	11108	5373		5373	566		566	5939		5939	0.53	10
1974	12562	3671		3671	481		481	4152		4152	0.33	12
1975	10410	4130		4130	287		287	4417		4417	0.42	6
1976	10133	3936		3936	246		246	4182		4182	0.41	6
1977	10756	3542		3542	588		588	4130		4130	0.38	14
1978	10912	2317		2317	597		597	2914		2914	0.27	20
1979	7661	2570		2570	80		80	2650		2650	0.35	3
1980	12261	4203		4203	673		673	4876		4876	0.40	14
1981	13901	4893		4893	499		499	5392		5392	0.39	9
1982	15066	5022		5022	469		469	5491		5491	0.36	9
1983	12872	2782		2782	238		238	3020		3020	0.23	8
1984	14311	4811		4811	259		259	5070		5070	0.35	5
1985	10493	2580		2580		205	205	2580	205	2785	0.27	7
1986	11563	2935		2935		217	217	2935	217	3152	0.27	7
1987	8446	2222		2222		95	95	2222	95	2317	0.27	4
1988	10737	3158		3158		123	123	3158	123	3281	0.31	4
1989	6107	1145		1145		30	30	1145	30	1175	0.19	3
1990	9801	2858		2858		150	150	2858	150	3008	0.31	5
1991	10616	3133		3133		48	48	3133	48	3181	0.30	2
1992	10292	2677		2677		446	446	2677	446	3123	0.30	14
1993	9767	2094	62	2156		368	368	2094	430	2524	0.26	15
1994	8923	1514	319	1833		499	499	1514	818	2332	0.26	21

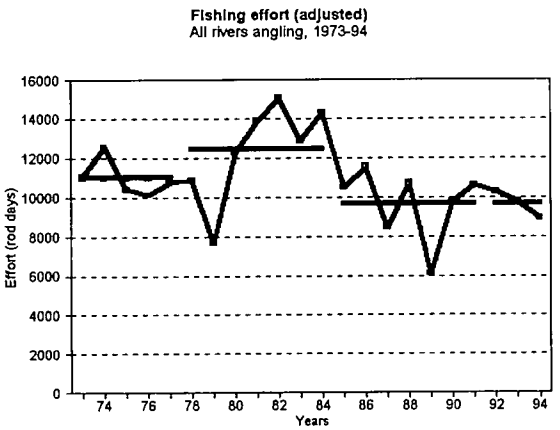
Appendix 1c. Summarized angling catch statistics for selected Bay St. George rivers, 1973-94. Bars represent averages for the time period spanned by the bar.











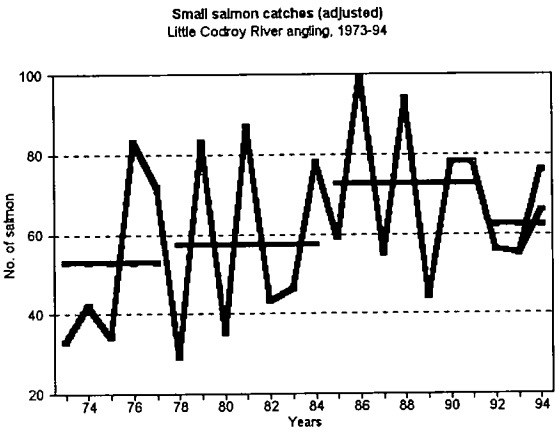
Appendix 2a. Angling catch statistics for Little Codroy River, Bay St. George, 1953-94.

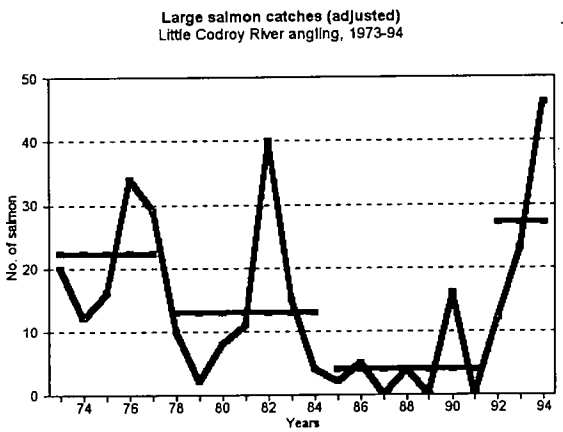
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	175	17		17	79		79	96		96	0.55	82
1954	93	14		14	25		25	39		39	0.42	64
1955	140	6		6	4		4	10		10	0.07	40
1956	101	2		2	6		6	8		8	0.08	75
1957	38	4		4	4		4	8		8	0.21	50
1958	57	3		3	9		9	12		12	0.21	75
1959	162	3		3	2		2	5		5	0.03	40
1960	111	1		1	0		0	1		1	0.01	0
1961	16	1		1	1		1	2		2	0.13	50
1962	76	6		6	1		1	7		7	0.09	14
1963	141	7		7	4		4	11		11	0.08	36
1964	323	9		9	12		12	21		21	0.07	57
1965	155	20		20	25		25	45		45	0.29	56
1966	197	19		19	10		10	29		29	0.15	34
1967	218	30		30	6		6	36		36	0.17	17
1968	150	50		50	0		0	50		50	0.33	0
1969	255	10		10	8		8	18		18	0.07	44
1970	381	42		42	11		11	53		53	0.14	21
1971	318	31		31	11		11	42		42	0.13	26
1972	451	38		38	28		28	66		66	0.15	42
1973	531	35		35	32		32	67		67	0.13	48
1974	316	43		43	13		13	56		56	0.18	23
1975	221	46		46	16		16	62		62	0.28	26
1976	522	126		126	50		50	176		176	0.34	28
1977	494	95		95	40		40	135		135	0.27	30
1978	273	29		29	10		10	39		39	0.14	26
1979	336	83		83	2		2	85		85	0.25	2
1980	227	35		35	8		8	43		43	0.19	19
1981	377	87		87	11		11	98		98	0.26	11
1982	294	43		43	40		40	83		83	0.28	48
1983	266	46		46	15		15	61		61	0.23	25
1984	318	78		78	4		4	82		82	0.26	5
1985	265	67		67		2	2	67	2	69	0.26	3
1986	385	138		138		5	5	138	5	143	0.37	3
1987	308	73		73		0	0	73	0	73	0.24	0
1988	378	118		118		4	4	118	4	122	0.32	3
1989	324	56		56		0	0	56	0	56	0.17	0
1990	390	102		102		18	18	102	18	120	0.31	15
1991	383	118		118		0	0	118	0	118	0.31	0
1992	416	67		67		14	14	67	14	81	0.19	17
1993	476	85	0	85		29	29	85	29	114	0.24	25
1994	464	85	10	95		52	52	85	62	147	0.32	35

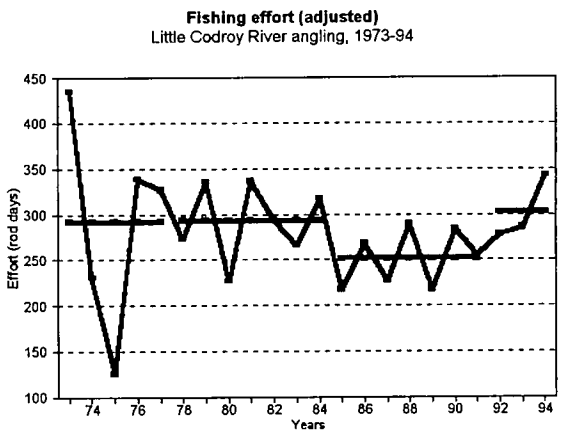
Appendix 2b. Angling catch statistics for Little Codroy River, Bay St. George, 1973-94 adjusted to reduced angling seasons.

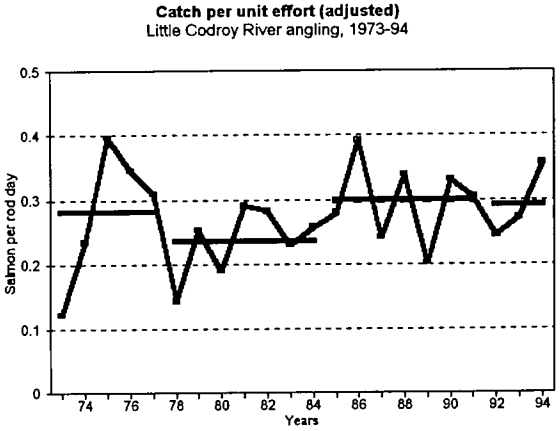
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1973	435	33		33	20		20	53		53	0.12	38
1974	231	42		42	12		12	54		54	0.23	22
1975	126	34		34	16		16	50		50	0.40	32
1976	339	83		83	34		34	117		117	0.35	29
1977	327	72		72	29		29	101		101	0.31	29
1978	273	29		29	10		10	39		39	0.14	26
1979	336	83		83	2		2	85		85	0.25	2
1980	227	35		35	8		8	43		43	0.19	19
1981	337	87		87	11		11	98		98	0.29	11
1982	294	43		43	40		40	83		83	0.28	48
1983	266	46		46	15		15	61		61	0.23	25
1984	318	78		78	4		4	82		82	0.26	5
1985	218	59		59		2	2	59	2	61	0.28	3
1986	268	100		100		5	5	100	5	105	0.39	5
1987	228	55		55		0	0	55	0	55	0.24	0
1988	289	94		94		4	4	94	4	98	0.34	4
1989	218	44		44		0	0	44	0	44	0.20	0
1990	284	78		78		16	16	78	16	94	0.33	17
1991	256	78		78		0	0	78	0	78	0.30	0
1992	278	56		56		12	12	56	12	68	0.24	18
1993	286	55	0	55		23	23	55	23	78	0.27	29
1994	343	66	10	76		46	46	66	56	122	0.36	38

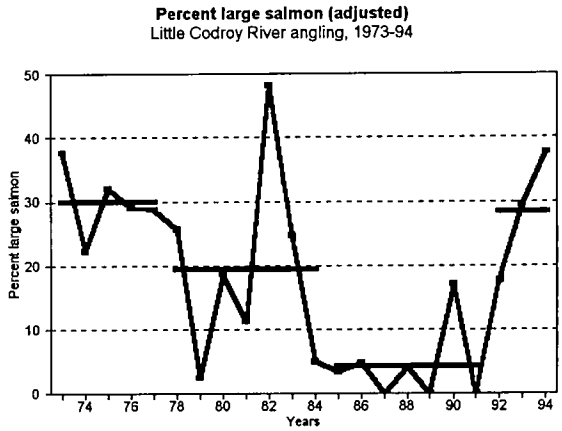
Appendix 2c. Summarized angling catch statistics for Little Codroy River, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.











Appendix 3a. Angling catch statistics in Grand Codroy River, Bay St. George, 1953-94.

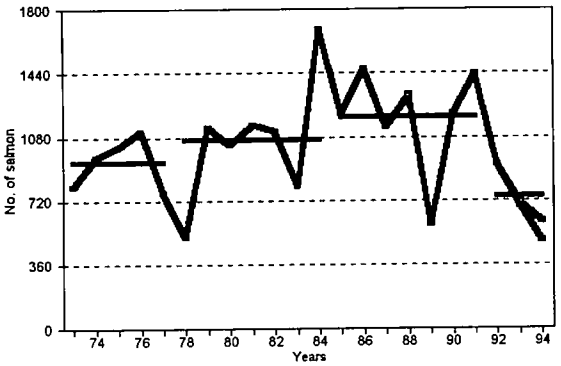
	Effort	Small			Large			Total		Total	Catch rate	%
Year	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	1424	556		556	367		367	923		923	0.65	40
1954	1060	310		310	154		154	464		464	0.44	33
1955	1152	442		442	132		132	574		574	0.50	23
1956	1411	510		510	299		299	809		809	0.57	37
1957	1195	545		545	270		270	815		815	0.68	33
1958	1737	414		414	349		349	763		763	0.44	46
1959	1665	449		449	237		237	686		686	0.41	35
1960	1679	432		432	135		135	567		567	0.34	24
1961	2011	512		512	271		271	783		783	0.39	35
1962	2205	675		675	236		236	911		911	0.41	26
1963	2328	728		728	337		337	1065		1065	0.46	32
1964	2465	985		985	332		332	1317		1317	0.53	25
1965	2458	862		862	301		301	1163		1163	0.47	26
1966	3051	678		678	301		301	979		979	0.32	31
1967	3260	688		688	238		238	926		926	0.28	26
1968	3988	925		925	222		222	1147		1147	0.29	19
1969	3390	965		965	223		223	1188		1188	0.35	19
1970	3447	627		627	137		137	764		764	0.22	18
1971	3243	732		732	120		120	852		852	0.26	14
1972	2637	468		468	120		120	588		588	0.22	20
1973	3468	825		825	143		143	968		968	0.28	15
1974	4144	991		991	149		149	1140		1140	0.28	13
1975	3757	1126		1126	123		123	1249		1249	0.33	10
1976	4174	1205		1205	132		132	1337		1337	0.32	10
1977	3069	773		773	212		212	985		985	0.32	22
1978	3125	510		510	148		148	658		658	0.21	22
1979	3298	1135		1135	30		30	1165		1165	0.35	3
1980	4645	1032		1032	250		250	1282		1282	0.28	20
1981	4407	1148		1148	133		133	1281		1281	0.29	10
1982	5300	1112		1112	200		200	1312		1312	0.25	15
1983	5959	867		867	219		219	1086		1086	0.18	20
1984	5391	1686		1686	179		179	1865		1865	0.35	10
1985	4676	1241		1241		204	204	1241	204	1445	0.31	14
1986	6337	1651		1651		321	321	1651	321	1972	0.31	16
1987	5546	1261		1261		181	181	1261	181	1442	0.26	13
1988	5158	1399		1399		129	129	1399	129	1528	0.30	8
1989	3902	635		635		66	66	635	66	701	0.18	9
1990	4885	1254		1254		123	123	1254	123	1377	0.28	9
1991	5758	1452		1452		56	56	1452	56	1508	0.26	4
1992	4635	990		990		344	344	990	344	1334	0.29	26
1993	4345	720	20	740		251	251	720	271	991	0.23	25
1994	3662	514	118	632		320	320	514	438	952	0.26	34

Appendix 3b. Angling catch statistics in Grand Codroy River, Bay St. George, 1973-94 adjusted to reduced angling seasons.

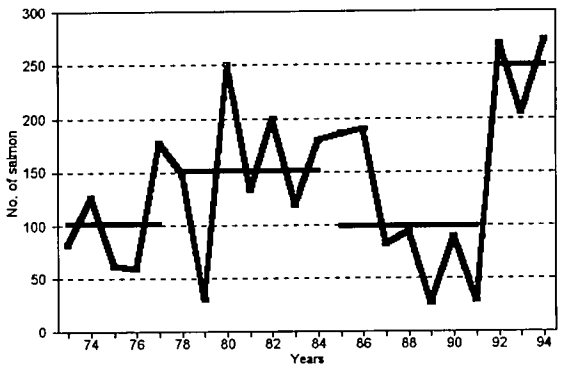
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1973	2836	797		797	82		82	879		879	0.31	9
1974	3796	962		962	127		127	1089		1089	0.29	12
1975	2945	1018		1018	62		62	1080		1080	0.37	6
1976	3177	1114		1114	59		59	1173		1173	0.37	5
1977	2825	760		760	177		177	937		937	0.33	19
1978	3125	510		510	148		148	658		658	0.21	22
1979	3298	1135		1135	30		30	1165		1165	0.35	3
1980	4645	1032		1032	250		250	1282		1282	0.28	20
1981	4407	1148		1148	133		133	1281		1281	0.29	10
1982	5300	1112		1112	200		200	1312		1312	0.25	15
1983	4389	795		795	119		119	914		914	0.21	13
1984	5391	1686		1686	179		179	1865		1865	0.35	10
1985	4350	1211		1211		186	186	1211	186	1397	0.32	13
1986	5258	1464		1464		190	190	1464	190	1654	0.31	11
1987	4347	1137		1137		82	82	1137	82	1219	0.28	7
1988	4364	1317		1317		95	95	1317	95	1412	0.32	7
1989	2785	583		583		26	26	583	26	609	0.22	4
1990	4396	1211		1211		90	90	1211	90	1301	0.30	7
1991	5177	1435		1435		29	29	1435	29	1464	0.28	2
1992	4079	916		916		269	269	916	269	1185	0.29	23
1993	3903	686	20	706		205	205	686	225	911	0.23	23
1994	3298	491	109	600		272	272	491	381	872	0.26	31

Appendix 3c. Summarized angling catch statistics for Grand Codroy River, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.

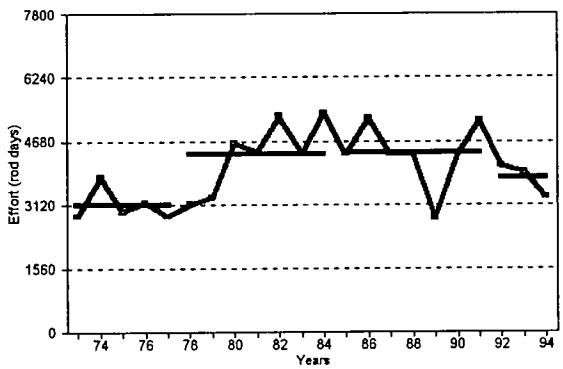
Small salmon catches (adjusted)
Grand Codroy River angling, 1973-94



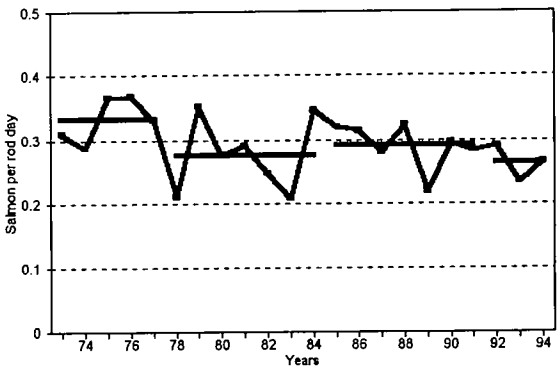
Large salmon catches (adjusted)
Grand Codroy River angling, 1973-94



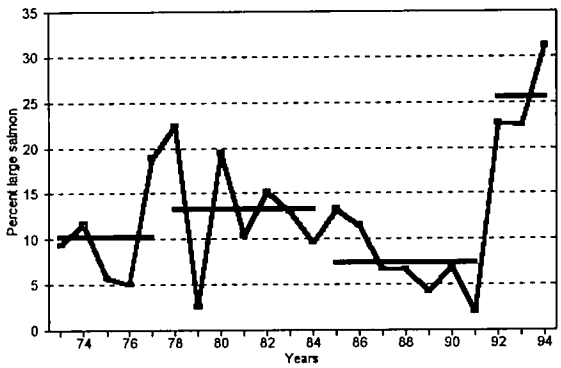
Fishing effort (adjusted)
Grand Codroy River angling, 1973-94



Catch per unit effort (adjusted)
Grand Codroy River angling, 1973-94



Percent large salmon (adjusted)
Grand Codroy River angling, 1973-94



Appendix 4a. Angling catch statistics for Robinson's River, Bay St. George, 1953-94.

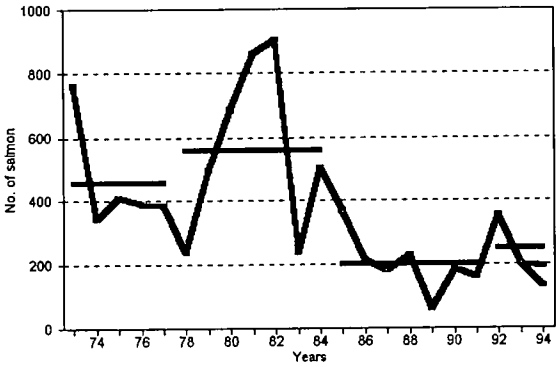
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	874	489		489	1066		1066	1555		1555	1.78	69
1954	725	370		370	670		670	1040		1040	1.43	64
1955	754	363		363	617		617	980		980	1.30	63
1956	1482	588		588	1166		1166	1754		1754	1.18	66
1957	1822	796		796	1621		1621	2417		2417	1.33	67
1958	1772	360		360	1551		1551	1911		1911	1.08	81
1959	1615	488		488	928		928	1416		1416	0.88	66
1960	1726	760		760	603		603	1363		1363	0.79	44
1961	1481	732		732	967		967	1699		1699	1.15	57
1962	1438	1005		1005	1133		1133	2138		2138	1.49	53
1963	1823	1206		1206	2240		2240	3446		3446	1.89	65
1964	1551	935		935	1878		1878	2813		2813	1.81	67
1965	1455	1021		1021	200		200	1221		1221	0.84	16
1966	1070	504		504	142		142	646		646	0.60	22
1967	1491	847		847	166		166	1013		1013	0.68	16
1968	1805	805		805	147		147	952		952	0.53	15
1969	1040	567		567	73		73	640		640	0.62	11
1970	1037	519		519	80		80	599		599	0.58	13
1971	1171	373		373	57		57	430		430	0.37	13
1972	640	287		287	41		41	328		328	0.51	13
1973	1437	820		820	85		85	905		905	0.63	9
1974	1134	354		354	17		17	371		371	0.33	5
1975	1556	611		611	42		42	653		653	0.42	6
1976	1842	556		556	56		56	612		612	0.33	9
1977	1184	403		403	184		184	587		587	0.50	31
1978	671	235		235	68		68	303		303	0.45	22
1979	989	495		495	23		23	518		518	0.52	4
1980	1352	684		684	113		113	797		797	0.59	14
1981	1527	861		861	129		129	990		990	0.65	13
1982	1648	905		905	41		41	946		946	0.57	4
1983	2580	278		278	210		210	488		488	0.19	43
1984	1884	502		502	23		23	525		525	0.28	4
1985	1905	373		373		7	7	373	7	380	0.20	2
1986	2344	341		341		37	37	341	37	378	0.16	10
1987	1276	230		230		15	15	230	15	245	0.19	6
1988	1528	290		290		9	9	290	9	299	0.20	3
1989	971	116		116		11	11	116	11	127	0.13	9
1990	1182	232		232		22	22	232	22	254	0.21	9
1991	818	176		176		10	10	176	10	186	0.23	5
1992	1552	410		410		75	75	410	75	485	0.31	15
1993	1284	225	0	225		18	18	225	18	243	0.19	7
1994	1051	160	88	248		38	38	160	126	286	0.27	13

Appendix 4b. Angling catch statistics for Robinson's River, Bay St. George, 1973-94 adjusted to reduced angling seasons.

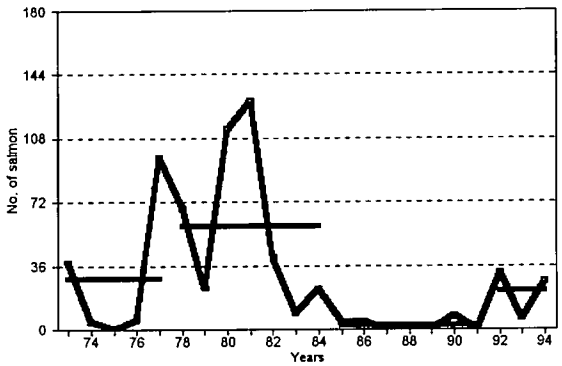
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1973	1091	759		759	38		38	797		797	0.73	5
1974	935	338		338	4		4	342		342	0.37	1
1975	912	407		407	0		0	407		407	0.45	0
1976	987	387		387	5		5	392		392	0.40	1
1977	873	381		381	97		97	478		478	0.55	20
1978	671	235		235	68		68	303		303	0.45	22
1979	989	495		495	23		23	518		518	0.52	4
1980	1352	684		684	113		113	797		797	0.59	14
1981	1527	861		861	129		129	990		990	0.65	13
1982	1648	905		905	41		41	946		946	0.57	4
1983	1581	235		235	9		9	244		244	0.15	4
1984	1884	502		502	23		23	525		525	0.28	4
1985	1623	365		365		4	4	365	4	369	0.23	1
1986	1277	211		211		4	4	211	4	215	0.17	2
1987	640	178		178		0	0	178	0	178	0.28	0
1988	963	225		225		0	0	225	0	225	0.23	0
1989	480	60		60		0	0	60	0	60	0.13	0
1990	784	185		185		8	8	185	8	193	0.25	4
1991	674	161		161		0	0	161	0	161	0.24	0
1992	1162	349		349		32	32	349	32	381	0.33	8
1993	920	199	0	199		6	6	199	6	205	0.22	3
1994	781	132	60	192		27	27	132	87	219	0.28	12

Appendix 4c. Summarized angling catch statistics for Robinsons River, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.

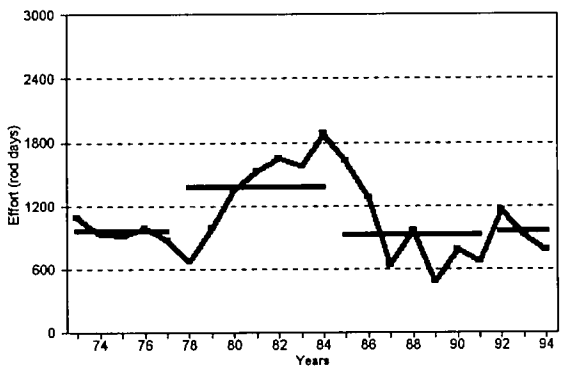
Small salmon catches (adjusted)
Robinson's River angling, 1973-94



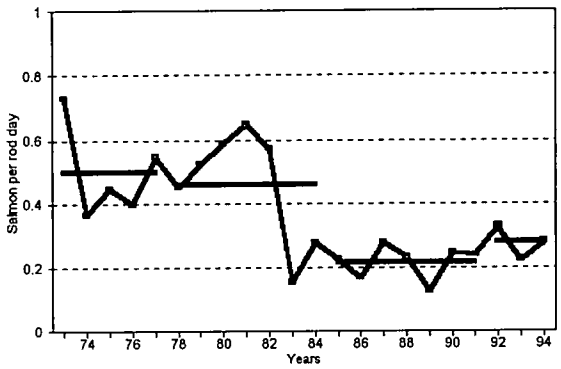
Large salmon catches (adjusted)
Robinson's River angling, 1973-94



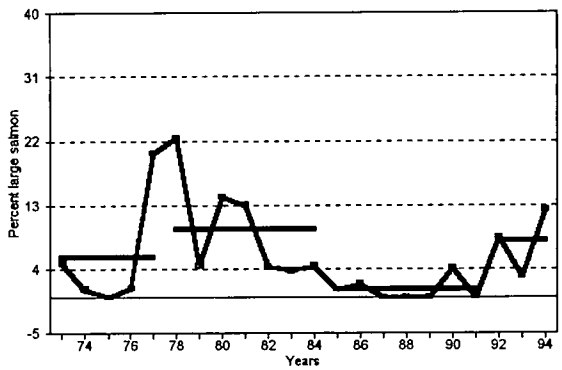
Fishing effort (adjusted)
Robinson's River angling, 1973-94



Catch per unit effort (adjusted)
Robinson's River angling, 1973-94



Percent large salmon (adjusted)
Robinson's River angling, 1973-94



Appendix 5a. Angling catch statistics for Crabbes River, Bay St. George, 1953-94.

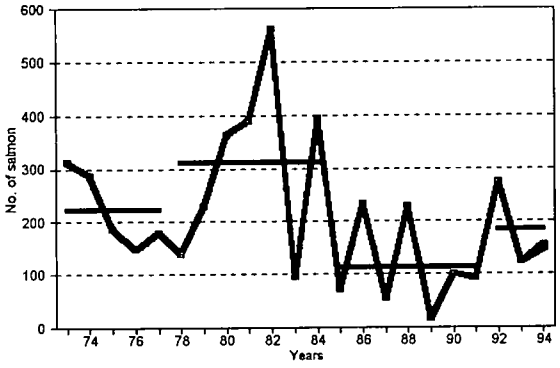
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	153	71		71	34		34	105		105	0.69	32
1954	157	116		116	51		51	167		167	1.06	31
1955	194	76		76	99		99	175		175	0.90	57
1956	747	180		180	219		219	399		399	0.53	55
1957	1278	331		331	311		311	642		642	0.50	48
1958	1088	134		134	274		274	408		408	0.38	67
1959	1142	236		236	184		184	420		420	0.37	44
1960	838	147		147	50		50	197		197	0.24	25
1961	1005	324		324	112		112	436		436	0.43	26
1962	1170	569		569	196		196	765		765	0.65	26
1963	1272	468		468	300		300	768		768	0.60	39
1964	1625	818		818	291		291	1109		1109	0.68	26
1965	1252	430		430	242		242	672		672	0.54	36
1966	954	240		240	155		155	395		395	0.41	39
1967	1054	485		485	201		201	686		686	0.65	29
1968	1063	452		452	227		227	679		679	0.64	33
1969	1397	833		833	234		234	1067		1067	0.76	22
1970	1324	303		303	150		150	453		453	0.34	33
1971	1026	310		310	85		85	395		395	0.38	22
1972	932	398		398	152		152	550		550	0.59	28
1973	830	333		333	106		106	439		439	0.53	24
1974	1010	294		294	98		98	392		392	0.39	25
1975	1641	270		270	90		90	360		360	0.22	25
1976	859	191		191	58		58	249		249	0.29	23
1977	859	217		217	126		126	343		343	0.40	37
1978	907	138		138	127		127	265		265	0.29	48
1979	501	229		229	14		14	243		243	0.49	6
1980	902	363		363	91		91	454		454	0.50	20
1981	905	389		389	115		115	504		504	0.56	23
1982	1135	561		561	75		75	636		636	0.56	12
1983	758	105		105	38		38	143		143	0.19	27
1984	848	394		394	14		14	408		408	0.48	3
1985	602	95		95		3	3	95	3	98	0.16	3
1986	997	347		347		0	0	347	0	347	0.35	0
1987	377	84		84		4	4	84	4	88	0.23	5
1988	773	284		284		17	17	284	17	301	0.39	6
1989	419	47		47		5	5	47	5	52	0.12	10
1990	457	112		112		25	25	112	25	137	0.30	18
1991	385	103		103		9	9	103	9	112	0.29	8
1992	822	289		289		88	88	289	88	377	0.46	23
1993	737	150	0	150		24	24	150	24	174	0.24	14
1994	906	174	37	211		45	45	174	82	256	0.28	18

Appendix 5b. Angling catch statistics for Crabbes River, Bay St. George, 1973-94 adjusted to reduced angling seasons.

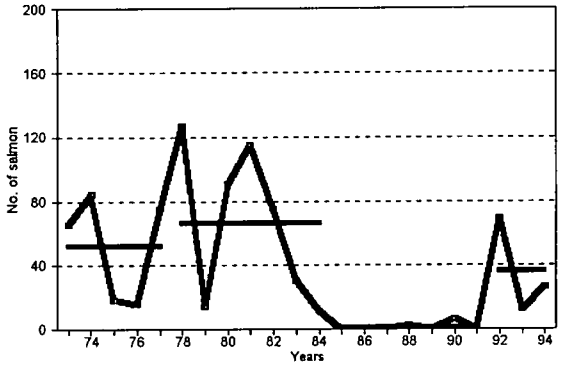
Year	Effort	Small			Large			Total		Total	Catch rate	% large
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	
1973	576	312		312	65		65	377		377	0.65	17
1974	840	287		287	84		84	371		371	0.44	23
1975	796	186		186	18		18	204		204	0.26	9
1976	498	146		146	15		15	161		161	0.32	9
1977	606	178		178	75		75	253		253	0.42	30
1978	907	138		138	127		127	265		265	0.29	48
1979	501	229		229	14		14	243		243	0.49	6
1980	902	363		363	91		91	454		454	0.50	20
1981	905	389		389	115		115	504		504	0.56	23
1982	1135	561		561	75		75	636		636	0.56	12
1983	658	94		94	30		30	124		124	0.19	24
1984	848	394		394	11		11	405		405	0.48	3
1985	426	71		71		0	0	71	0	71	0.17	0
1986	653	235		235		0	0	235	0	235	0.36	0
1987	183	53		53		0	0	53	0	53	0.29	0
1988	588	230		230		2	2	230	2	232	0.39	1
1989	121	16		16		0	0	16	0	16	0.13	0
1990	334	99		99		6	6	99	6	105	0.31	6
1991	301	91		91		0	0	91	0	91	0.30	0
1992	718	274		274		69	69	274	69	343	0.48	20
1993	534	122	0	122		12	12	122	12	134	0.25	9
1994	621	146	9	155		26	26	146	35	181	0.29	14

Appendix 5c. Summarized angling catch statistics for Crabbes River, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.

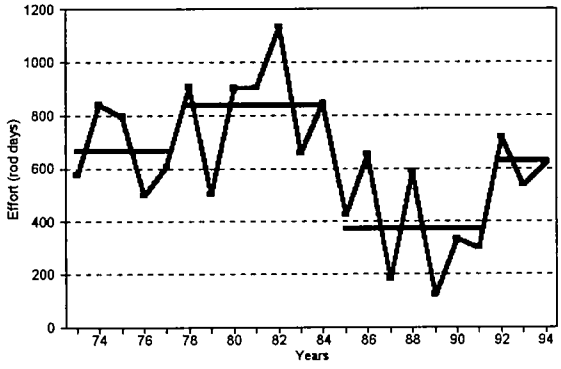
Small salmon catches (adjusted)
Crabbes River angling, 1973-94



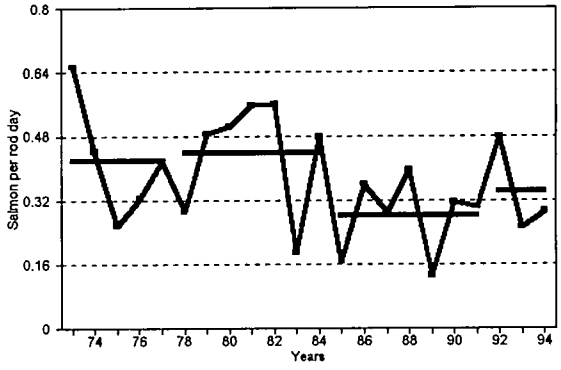
Large salmon catches (adjusted)
Crabbes River angling, 1973-94



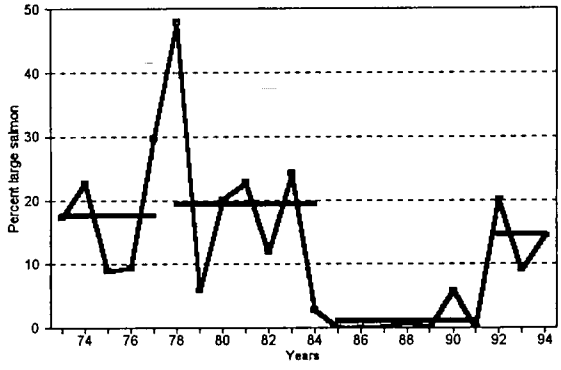
Fishing effort (adjusted)
Crabbes River angling, 1973-94



Catch per unit effort (adjusted)
Crabbes River angling, 1973-94



Percent large salmon (adjusted)
Crabbes River angling, 1973-94



Appendix 6a. Angling catch statistics for Barachois River, Bay St. George, 1953-94.

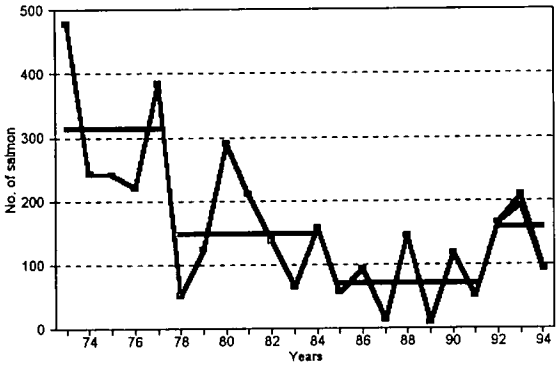
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	45	23		23	4		4	27		27	0.00	15
1954	66	33		33	14		14	47		47	0.71	30
1955	60	27		27	15		15	42		42	0.70	36
1956	183	228		228	70		70	298		298	1.63	23
1957	185	167		167	68		68	235		235	1.27	29
1958	237	109		109	87		87	196		196	0.83	44
1959	184	59		59	16		16	75		75	0.41	21
1960	179	86		86	15		15	101		101	0.56	15
1961	336	215		215	25		25	240		240	0.71	10
1962	404	236		236	47		47	283		283	0.70	17
1963	750	271		271	145		145	416		416	0.55	35
1964	839	342		342	99		99	441		441	0.53	22
1965	966	542		542	111		111	653		653	0.68	17
1966	507	187		187	90		90	277		277	0.55	32
1967	788	546		546	159		159	705		705	0.89	23
1968	878	613		613	124		124	737		737	0.84	17
1969	1343	766		766	154		154	920		920	0.69	17
1970	1300	372		372	69		69	441		441	0.34	16
1971	904	550		550	54		54	604		604	0.67	9
1972	1025	348		348	184		184	532		532	0.52	35
1973	1222	568		568	77		77	645		645	0.53	12
1974	894	257		257	70		70	327		327	0.37	21
1975	1129	510		510	117		117	627		627	0.56	19
1976	1572	526		526	46		46	572		572	0.36	8
1977	1218	534		534	56		56	590		590	0.48	9
1978	273	51		51	102		102	153		153	0.56	67
1979	342	124		124	0		0	124		124	0.36	0
1980	622	290		290	24		24	314		314	0.50	8
1981	487	210		210	3		3	213		213	0.44	1
1982	313	137		137	2		2	139		139	0.44	1
1983	292	84		84	1		1	85		85	0.29	1
1984	320	158		158	0		0	158		158	0.49	0
1985	422	98		98		1	1	98	1	99	0.23	1
1986	683	200		200		23	23	200	23	223	0.33	10
1987	208	51		51		0	0	51	0	51	0.25	0
1988	565	202		202		11	11	202	11	213	0.38	5
1989	395	79		79		1	1	79	1	80	0.20	1
1990	547	138		138		7	7	138	7	145	0.27	5
1991	293	68		68		6	6	68	6	74	0.25	8
1992	535	222		222		22	22	222	22	244	0.46	9
1993	916	230	23	253		11	11	230	34	264	0.29	4
1994	785	154	25	179		14	14	154	39	193	0.25	7

Appendix 6b. Angling catch statistics for Barachois River, Bay St. George, 1973-94 adjusted to reduced angling seasons.

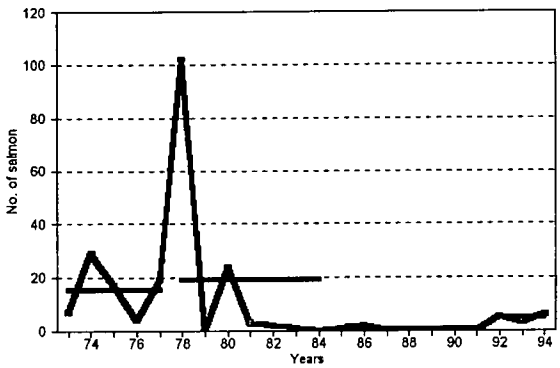
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1973	627	478		478	7		7	485		485	0.77	1
1974	519	242		242	29		29	271		271	0.52	11
1975	395	241		241	17		17	258		258	0.65	7
1976	560	221		221	4		4	225		225	0.40	2
1977	758	384		384	19		19	403		403	0.53	5
1978	273	51		51	102		102	153		153	0.56	67
1979	342	124		124	0		0	124		124	0.36	0
1980	622	290		290	24		24	314		314	0.50	8
1981	487	210		210	3		3	213		213	0.44	1
1982	313	137		137	2		2	139		139	0.44	1
1983	240	65		65	1		1	66		66	0.28	2
1984	320	158		158	0		0	158		158	0.49	0
1985	212	56		56		1	1	56	1	57	0.27	2
1986	314	94		94		2	2	94	2	96	0.31	2
1987	65	13		13		0	0	13	0	13	0.20	0
1988	315	145		145		0	0	145	0	145	0.46	0
1989	97	9		9		0	0	9	0	9	0.09	0
1990	361	118		118		0	0	118	0	118	0.33	0
1991	131	50		50		0	0	50	0	50	0.38	0
1992	335	166		166		5	5	166	5	171	0.51	3
1993	561	194	15	209		3	3	194	18	212	0.38	1
1994	430	93	3	96		6	6	93	9	102	0.24	6

Appendix 6c. Summarized angling catch statistics for Barachois River, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.

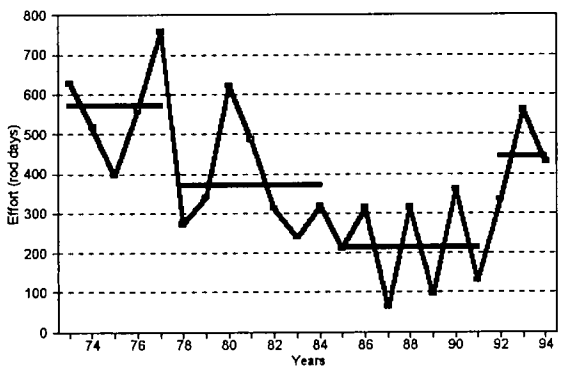
Small salmon catches (adjusted)
Barachois River angling, 1973-94



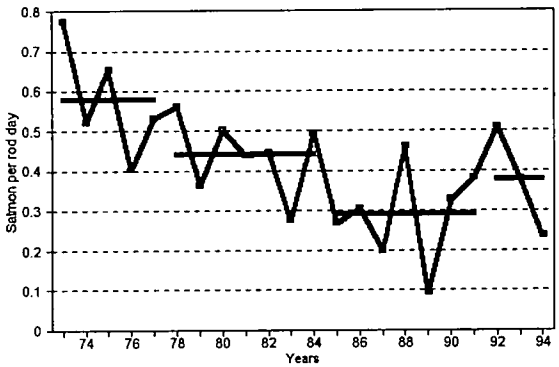
Large salmon catches (adjusted)
Barachois River angling, 1973-94



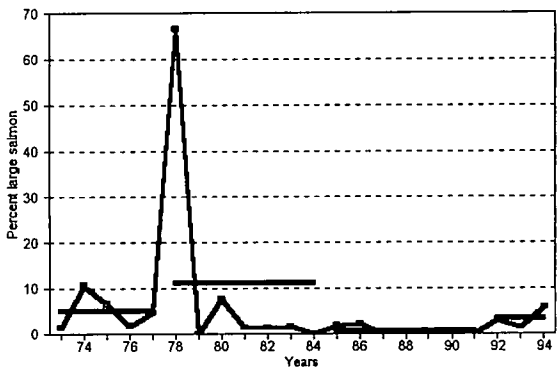
Fishing effort (adjusted)
Barachois River angling, 1973-94



Catch per unit effort (adjusted)
Barachois River angling, 1973-94



Percent large salmon (adjusted)
Barachois River angling, 1973-94



Appendix 7a. Angling catch statistics for Fischell's Brook, Bay St. George, 1953-94.

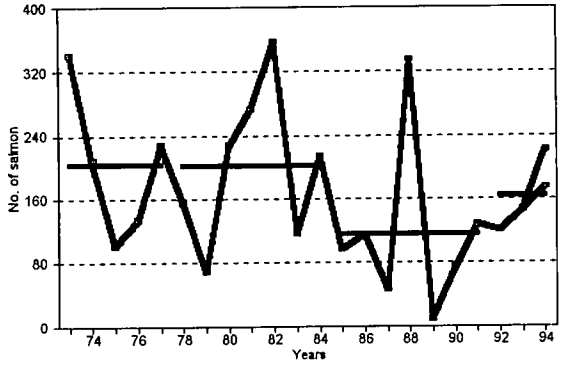
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	211	97		97	38		38	135		135	0.64	28
1954	172	34		34	43		43	77		77	0.45	56
1955	215	32		32	45		45	77		77	0.36	58
1956	259	147		147	69		69	216		216	0.83	32
1957	441	182		182	78		78	260		260	0.59	30
1958	459	156		156	99		99	255		255	0.56	39
1959	407	144		144	31		31	175		175	0.43	18
1960	366	95		95	38		38	133		133	0.36	29
1961	582	193		193	72		72	265		265	0.46	27
1962	674	282		282	57		57	339		339	0.50	17
1963	943	425		425	120		120	545		545	0.58	22
1964	874	305		305	136		136	441		441	0.50	31
1965	624	202		202	84		84	286		286	0.46	29
1966	442	52		52	55		55	107		107	0.24	51
1967	612	355		355	40		40	395		395	0.65	10
1968	642	277		277	44		44	321		321	0.50	14
1969	718	416		416	77		77	493		493	0.69	16
1970	766	302		302	135		135	437		437	0.57	31
1971	582	239		239	27		27	266		266	0.46	10
1972	417	133		133	63		63	196		196	0.47	32
1973	952	401		401	81		81	482		482	0.51	17
1974	753	220		220	27		27	247		247	0.33	11
1975	522	184		184	21		21	205		205	0.39	10
1976	418	185		185	16		16	201		201	0.48	8
1977	468	245		245	66		66	311		311	0.66	21
1978	292	154		154	31		31	185		185	0.63	17
1979	168	67		67	0		0	67		67	0.40	0
1980	386	227		227	40		40	267		267	0.69	15
1981	463	272		272	11		11	283		283	0.61	4
1982	651	357		357	7		7	364		364	0.56	2
1983	377	128		128	7		7	135		135	0.36	5
1984	411	214		214	8		8	222		222	0.54	4
1985	373	145		145		3	3	145	3	148	0.40	2
1986	427	184		184		4	4	184	4	188	0.44	2
1987	266	59		59		2	2	59	2	61	0.23	3
1988	840	374		374		7	7	374	7	381	0.45	2
1989	110	17		17		0	0	17	0	17	0.15	0
1990	256	116		116		12	12	116	12	128	0.50	9
1991	414	157		157		16	16	157	16	173	0.42	9
1992	384	141		141		11	11	141	11	152	0.40	7
1993	819	157	0	157		34	34	157	34	191	0.23	18
1994	702	216	58	274		47	47	216	105	321	0.46	15

Appendix 7b. Angling catch statistics for Fischell's Brook, Bay St. George, 1973-94 adjusted to reduced angling seasons.

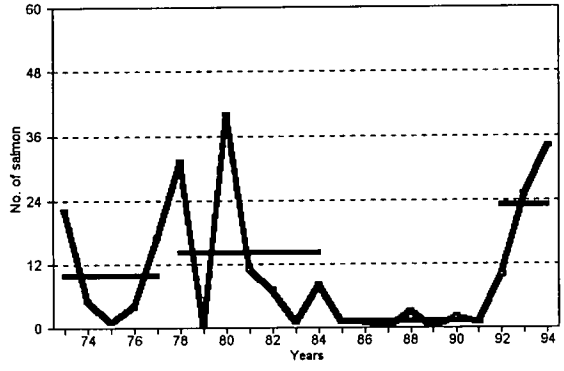
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released		Retained	Released		Retained	Released	Catch	Salmon/rod	large
1973	595	341		341	22		22	363		363	0.61	6
1974	541	208		208	5		5	213		213	0.39	2
1975	227	100		100	1		1	101		101	0.44	1
1976	219	133		133	4		4	137		137	0.63	3
1977	316	227		227	17		17	244		244	0.77	7
1978	292	154		154	31		31	185		185	0.63	17
1979	168	67		67	0		0	67		67	0.40	0
1980	386	227		227	40		40	267		267	0.69	15
1981	463	272		272	11		11	283		283	0.61	4
1982	651	357		357	7		7	364		364	0.56	2
1983	322	115		115	1		1	116		116	0.36	1
1984	411	214		214	8		8	222		222	0.54	4
1985	248	96		96		1	1	96	1	97	0.39	1
1986	254	115		115		1	1	115	1	116	0.46	1
1987	161	45		45		0	0	45	0	45	0.28	0
1988	712	335		335		3	3	335	3	338	0.47	1
1989	44	9		9		0	0	9	0	9	0.20	0
1990	163	74		74		2	2	74	2	76	0.47	3
1991	312	127		127		1	1	127	1	128	0.41	1
1992	340	120		120		10	10	120	10	130	0.38	8
1993	576	146	0	146		25	25	146	25	171	0.30	15
1994	513	174	47	221		34	34	174	81	255	0.50	13

Appendix 7c. Summarized angling catch statistics for Fischell's Brook, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.

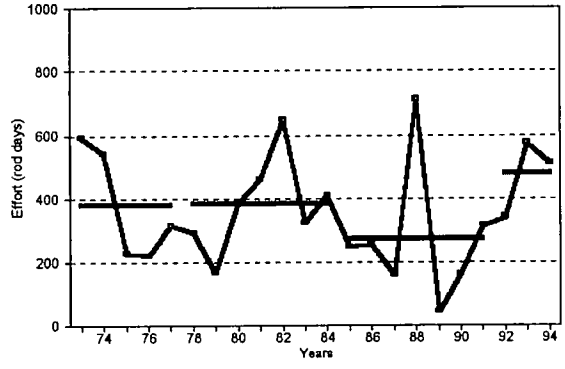
Small salmon catches (adjusted)
Fischell's Brook angling, 1973-94



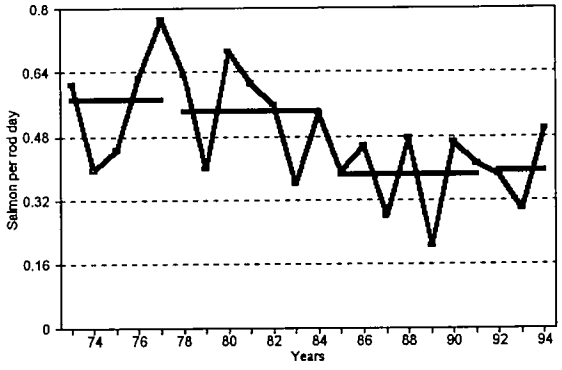
Large salmon catches (adjusted)
Fischell's Brook angling, 1973-94



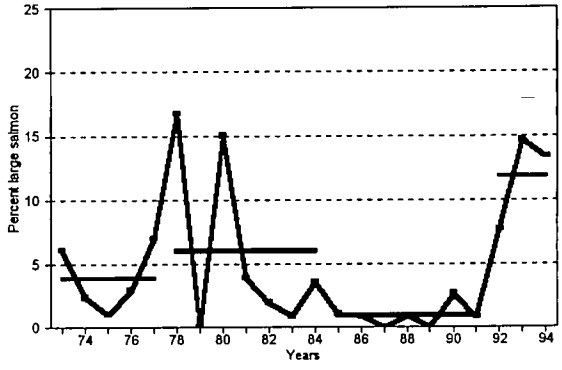
Fishing effort (adjusted)
Fischell's Brook angling, 1973-94



Catch per unit effort (adjusted)
Fischell's Brook angling, 1973-94



Percent large salmon (adjusted)
Fischell's Brook angling, 1973-94



Appendix 8a. Angling catch statistics in Flat Bay Brook, Bay St. George, 1953-94.

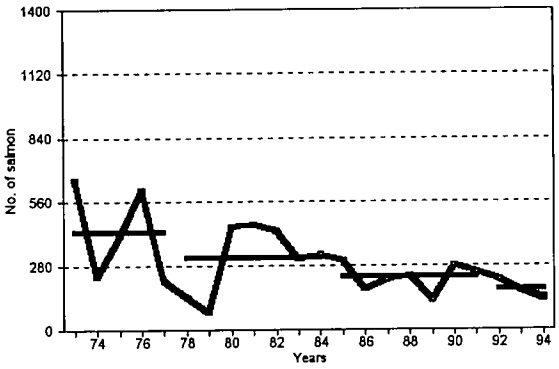
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Release	Total	Retained	Released	Catch	Salmon/rod	large
1953	900	666		666	146		146	812		812	0.90	18
1954	499	329		329	46		46	375		375	0.75	12
1955	864	431		431	33		33	464		464	0.54	7
1956	773	566		566	29		29	595		595	0.77	5
1957	884	718		718	19		19	737		737	0.83	3
1958	902	620		620	39		39	659		659	0.73	6
1959	613	334		334	18		18	352		352	0.57	5
1960	1559	1010		1010	65		65	1075		1075	0.69	6
1961	1176	764		764	35		35	799		799	0.68	4
1962	1200	1378		1378	74		74	1452		1452	1.21	5
1963	1515	1827		1827	92		92	1919		1919	1.27	5
1964	1657	1853		1853	97		97	1950		1950	1.18	5
1965	1658	778		778	175		175	953		953	0.57	18
1966	861	576		576	33		33	609		609	0.71	5
1967	1485	898		898	63		63	961		961	0.65	7
1968	1505	951		951	40		40	991		991	0.66	4
1969	1635	857		857	95		95	952		952	0.58	10
1970	3206	1496		1496	115		115	1611		1611	0.50	7
1971	2741	1019		1019	80		80	1099		1099	0.40	7
1972	2559	879		879	71		71	950		950	0.37	7
1973	2064	696		696	84		84	780		780	0.38	11
1974	2156	510		510	59		59	569		569	0.26	10
1975	2625	408		408	42		42	450		450	0.17	9
1976	1705	609		609	48		48	657		657	0.39	7
1977	1045	209		209	26		26	235		235	0.22	11
1978	537	140		140	12		12	152		152	0.28	8
1979	263	72		72	4		4	76		76	0.29	5
1980	932	445		445	26		26	471		471	0.51	6
1981	1299	457		457	39		39	496		496	0.38	8
1982	1357	427		427	33		33	460		460	0.34	7
1983	1123	308		308	7		7	315		315	0.28	2
1984	602	325		325	7		7	332		332	0.55	2
1985	1060	303		303		6	6	303	6	309	0.29	2
1986	684	174		174		2	2	174	2	176	0.26	1
1987	816	219		219		0	0	219	0	219	0.27	0
1988	871	249		249		5	5	249	5	254	0.29	2
1989	612	130		130		1	1	130	1	131	0.21	1
1990	939	277		277		6	6	277	6	283	0.30	2
1991	977	251		251		2	2	251	2	253	0.26	1
1992	666	223		223		20	20	223	20	243	0.36	8
1993	678	173	0	173		17	17	173	17	190	0.28	9
1994	615	128	8	136		32	32	128	40	168	0.27	19

Appendix 8b. Angling catches in Flat Bay Brook, Bay St. George, 1973-94 adjusted to reduced angling sea

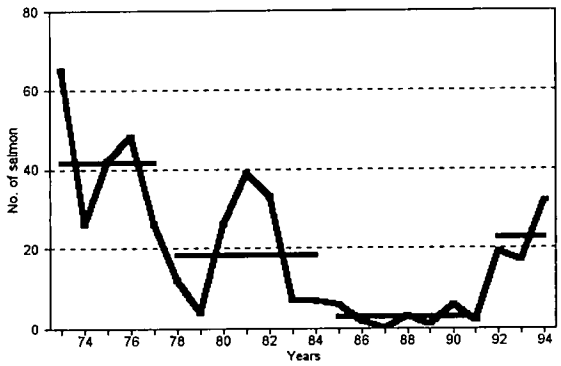
Year	Effort	Small			Large			Total		Total
	Rod days	Retained	Released	Total	Retained	Release	Total	Retained	Released	Catch
1973		654		654	65		65	719		719
1974		229		229	26		26	255		255
1975		408		408	42		42	450		450
1976		609		609	48		48	657		657
1977		209		209	26		26	235		235
1978	537	140		140	12		12	152		152
1979	263	72		72	4		4	76		76
1980	932	445		445	26		26	471		471
1981	1299	457		457	39		39	496		496
1982	1357	427		427	33		33	460		460
1983	1063	307		307	7		7	314		314
1984	602	325		325	7		7	332		332
1985	1008	302		302		6	6	302	6	308
1986	640	173		173		2	2	173	2	175
1987	757	216		216		0	0	216	0	216
1988	832	234		234		3	3	234	3	237
1989	555	126		126		1	1	126	1	127
1990	935	277		277		6	6	277	6	283
1991	977	251		251		2	2	251	2	253
1992	647	217		217		19	19	217	19	236
1993	649	169	0	169		17	17	169	17	186
1994	565	128	8	136		32	32	128	40	168

Appendix 8c. Summarized angling catch statistics for Flat Bay Brook, Bay St. George, 1973-94. Bars represent averages for the time period spanned by the bar.

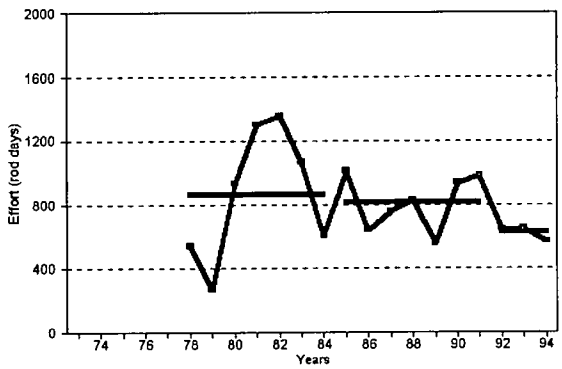
Small salmon catches (adjusted)
Flat Bay Brook angling, 1973-94



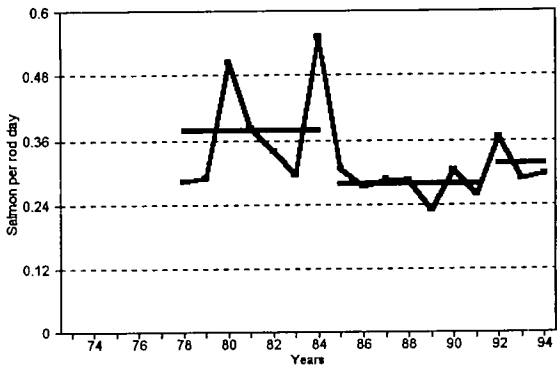
Large salmon catches (adjusted)
Flat Bay Brook angling, 1973-94



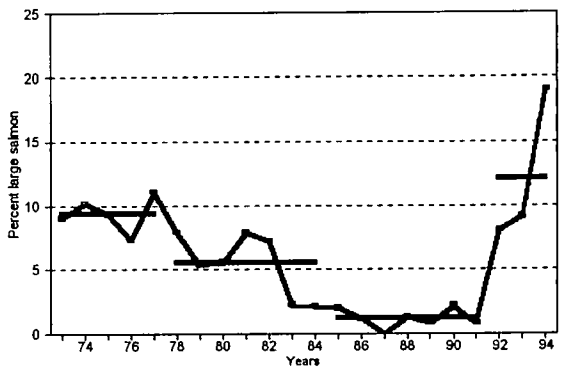
Fishing effort (adjusted)
Flat Bay Brook angling, 1973-94



Catch per unit effort (adjusted)
Flat Bay Brook angling, 1973-94



Percent large salmon (adjusted)
Flat Bay Brook angling, 1973-94



Appendix 9a. Angling catch statistics for Little Barachois, Bay St. George, 1953-94.

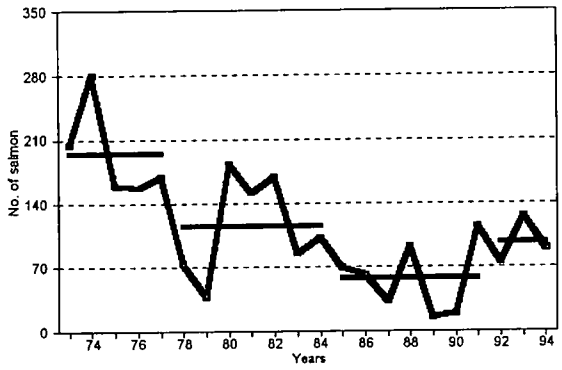
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	115	68		68	29		29	97		97	0.84	30
1954	96	42		42	6		6	48		48	0.50	13
1955	204	57		57	3		3	60		60	0.29	5
1956	307	140		140	8		8	148		148	0.48	5
1957	226	131		131	12		12	143		143	0.63	8
1958	209	101		101	10		10	111		111	0.53	9
1959	247	44		44	22		22	66		66	0.27	33
1960	346	114		114	17		17	131		131	0.38	13
1961	361	136		136	7		7	143		143	0.40	5
1962	381	189		189	14		14	203		203	0.53	7
1963	357	222		222	9		9	231		231	0.65	4
1964	569	302		302	42		42	344		344	0.60	12
1965	690	253		253	23		23	276		276	0.40	8
1966	223	150		150	8		8	158		158	0.71	5
1967	253	125		125	4		4	129		129	0.51	3
1968	266	97		97	0		0	97		97	0.36	0
1969	142	59		59	0		0	59		59	0.42	0
1970	301	110		110	0		0	110		110	0.37	0
1971	337	172		172	4		4	176		176	0.52	2
1972	485	295		295	18		18	313		313	0.65	6
1973	621	230		230	35		35	265		265	0.43	13
1974	999	316		316	47		47	363		363	0.36	13
1975	756	256		256	27		27	283		283	0.37	10
1976	717	205		205	29		29	234		234	0.33	12
1977	932	249		249	37		37	286		286	0.31	13
1978	339	73		73	7		7	80		80	0.24	9
1979	165	37		37	0		0	37		37	0.22	0
1980	436	183		183	10		10	193		193	0.44	5
1981	602	151		151	7		7	158		158	0.26	4
1982	489	169		169	8		8	177		177	0.36	5
1983	270	84		84	1		1	85		85	0.31	1
1984	246	101		101	2		2	103		103	0.42	2
1985	209	71		71		0	0	71	0	71	0.34	0
1986	221	73		73		0	0	73	0	73	0.33	0
1987	148	43		43		0	0	43	0	43	0.29	0
1988	325	104		104		2	2	104	2	106	0.33	2
1989	89	15		15		0	0	15	0	15	0.17	0
1990	206	25		25		0	0	25	0	25	0.12	0
1991	419	145		145		0	0	145	0	145	0.35	0
1992	329	92		92		8	8	92	8	100	0.30	8
1993	601	173	1	174		24	24	173	25	198	0.33	12
1994	484	110	1	111		10	10	110	11	121	0.25	8

Appendix 9b. Angling catch statistics for Little Barachois Brook, Bay St. George, 1973-94 adjusted to reduced angling seasons.

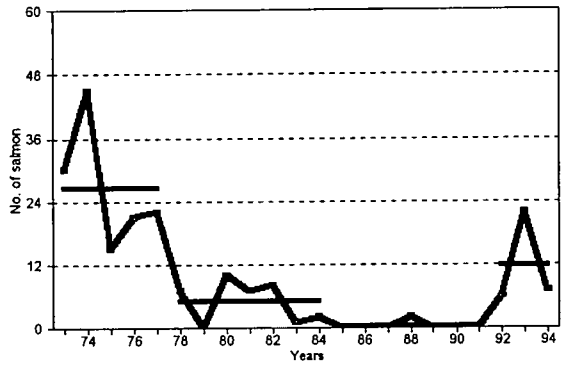
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1973	487	203		203	30		30	233		233	0.48	13
1974	746	280		280	45		45	325		325	0.44	14
1975	454	159		159	15		15	174		174	0.38	9
1976	482	156		156	21		21	177		177	0.37	12
1977	629	169		169	22		22	191		191	0.30	12
1978	339	73		73	7		7	80		80	0.24	9
1979	165	37		37	0		0	37		37	0.22	0
1980	436	183		183	10		10	193		193	0.44	5
1981	602	151		151	7		7	158		158	0.26	4
1982	489	169		169	8		8	177		177	0.36	5
1983	270	84		84	1		1	85		85	0.31	1
1984	246	101		101	2		2	103		103	0.42	2
1985	198	69		69		0	0	69	0	69	0.35	0
1986	174	61		61		0	0	61	0	61	0.35	0
1987	109	32		32		0	0	32	0	32	0.29	0
1988	275	92		92		2	2	92	2	94	0.34	2
1989	70	15		15		0	0	15	0	15	0.21	0
1990	161	19		19		0	0	19	0	19	0.12	0
1991	311	114		114		0	0	114	0	114	0.37	0
1992	268	74		74		6	6	74	6	80	0.30	8
1993	379	126	0	126		22	22	126	22	148	0.39	15
1994	332	89	1	90		7	7	89	8	97	0.29	7

Appendix 9c. Summarized angling catch statistics for Little Barachois Brook, Bay St. George, 1973-94. Bars represents the averages for the time period spanned by the bar.

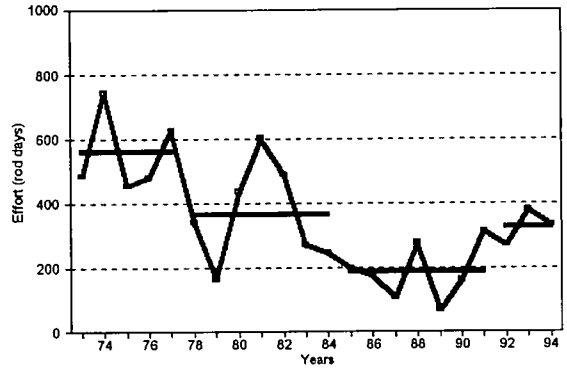
Small salmon catches (adjusted)
Little Barachois Br. angling, 1973-94



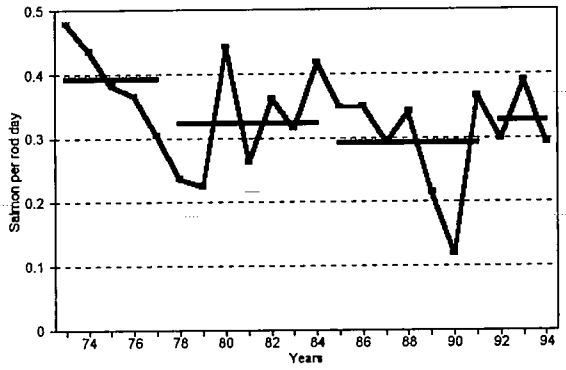
Large salmon catches (adjusted)
Little Barachois Br. angling, 1973-94



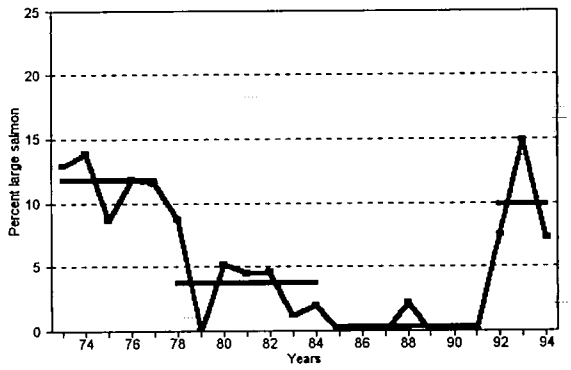
Fishing effort (adjusted)
Little Barachois Br. angling, 1973-94



Catch per unit effort (adjusted)
Little Barachois Br. angling, 1973-94



Percent large salmon (adjusted)
Little Barachois Br. angling, 1973-94



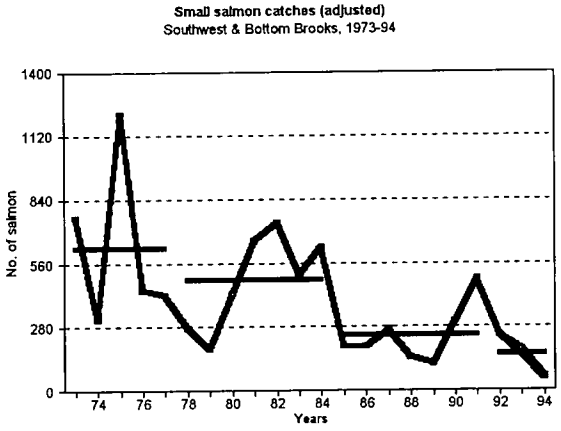
Appendix 10a. Angling catch statistics for Southwest & Bottom Brooks, Bay St. George, 1953-94.

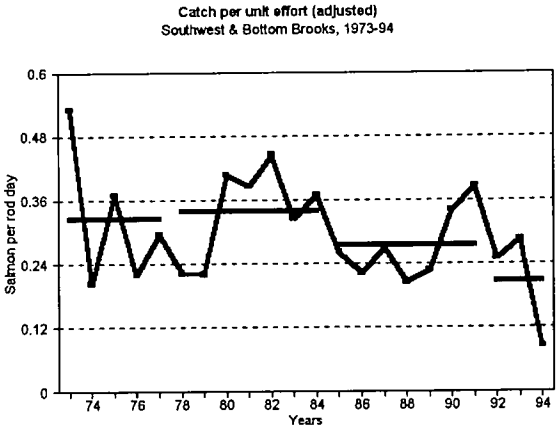
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	477	117		117	46		46	163		163	0.34	28
1954	193	48		48	76		76	124		124	0.64	61
1955	406	114		114	61		61	175		175	0.43	35
1956	335	120		120	37		37	157		157	0.47	24
1957	727	223		223	128		128	351		351	0.48	36
1958	173	265		265	78		78	343		343	1.98	23
1959	848	255		255	152		152	407		407	0.48	37
1960	266	603		603	11		11	614		614	2.31	2
1961	1304	307		307	144		144	451		451	0.35	32
1962	1088	597		597	65		65	662		662	0.61	10
1963	1484	736		736	291		291	1027		1027	0.69	28
1964	2375	694		694	155		155	849		849	0.36	18
1965	1636	768		768	108		108	876		876	0.54	12
1966	1970	555		555	324		324	879		879	0.45	37
1967	2867	876		876	383		383	1259		1259	0.44	30
1968	1696	527		527	87		87	614		614	0.36	14
1969	2188	866		866	28		28	894		894	0.41	3
1970	2056	604		604	125		125	729		729	0.35	17
1971	2145	419		419	150		150	569		569	0.27	26
1972	2613	554		554	152		152	706		706	0.27	22
1973	2837	895		895	165		165	1060		1060	0.37	16
1974	2953	364		364	214		214	578		578	0.20	37
1975	6705	1606		1606	254		254	1860		1860	0.28	14
1976	5865	581		581	71		71	652		652	0.11	11
1977	3453	568		568	161		161	729		729	0.21	22
1978	1353	274		274	27		27	301		301	0.22	9
1979	844	180		180	6		6	186		186	0.22	3
1980	1157	426		426	46		46	472		472	0.41	10
1981	1792	659		659	34		34	693		693	0.39	5
1982	1738	741		741	32		32	773		773	0.44	4
1983	2052	614		614	25		25	639		639	0.31	4
1984	1748	633		633	14		14	647		647	0.37	2
1985	1162	280		280		20	20	280	20	300	0.26	7
1986	1505	309		309		30	30	309	30	339	0.23	9
1987	1571	386		386		6	6	386	6	392	0.25	2
1988	1607	330		330		31	31	330	31	361	0.22	9
1989	1290	258		258		16	16	258	16	274	0.21	6
1990	1721	392		392		13	13	392	13	405	0.24	3
1991	1769	568		568		40	40	568	40	608	0.34	7
1992	1424	335		335		57	57	335	57	392	0.28	15
1993	1201	174	31	205		63	63	174	94	268	0.22	24
1994	1217	113	7	120		33	33	113	40	153	0.13	22

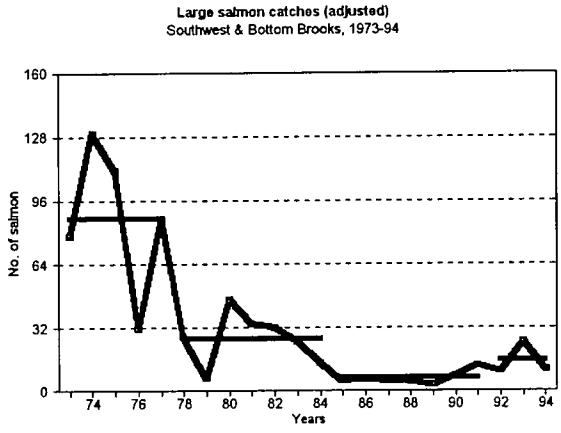
Appendix 10b. Angling catch statistics for Southwest & Bottom Brooks, Bay St. George, 1973-94 adjusted to reduced angling seasons.

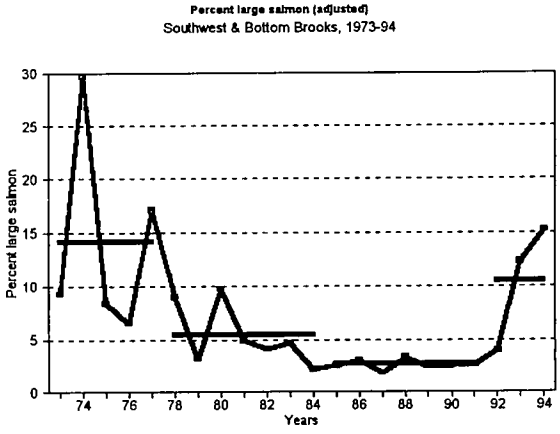
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1973	1584	761		761	78		78	839		839	0.53	9
1974	2159	308		308	130		130	438		438	0.20	30
1975	3596	1216		1216	111		111	1327		1327	0.37	8
1976	2164	441		441	31		31	472		472	0.22	7
1977	1718	421		421	87		87	508		508	0.30	17
1978	1353	274		274	27		27	301		301	0.22	9
1979	844	180		180	6		6	186		186	0.22	3
1980	1157	426		426	46		46	472		472	0.41	10
1981	1792	659		659	34		34	693		693	0.39	5
1982	1738	741		741	32		32	773		773	0.44	4
1983	1644	508		508	25		25	533		533	0.32	5
1984	1748	633		633	14		14	647		647	0.37	2
1985	748	191		191		5	5	191	5	196	0.26	3
1986	895	193		193		6	6	193	6	199	0.22	3
1987	1015	267		267		5	5	267	5	272	0.27	2
1988	729	145		145		5	5	145	5	150	0.21	3
1989	529	118		118		3	3	118	3	121	0.23	2
1990	915	304		304		8	8	304	8	312	0.34	3
1991	1307	491		491		13	13	491	13	504	0.39	3
1992	1005	242		242		10	10	242	10	252	0.25	4
1993	713	158	20	178		25	25	158	45	203	0.28	12
1994	846	54	7	61		11	11	54	18	72	0.09	15

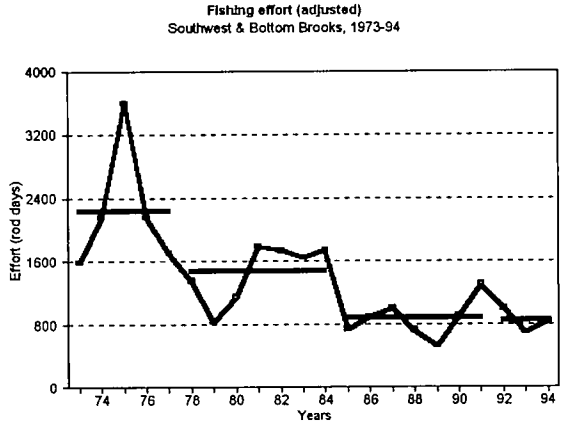
Appendix 10c. Summarized angling catch statistics for Southwest & bottom brooks, Bay St. George, 1973-
Bars represents the averages for the time period spanned by the bar.











Appendix 11a. Angling catches in Harry's River, Bay St. George, 1953-94.

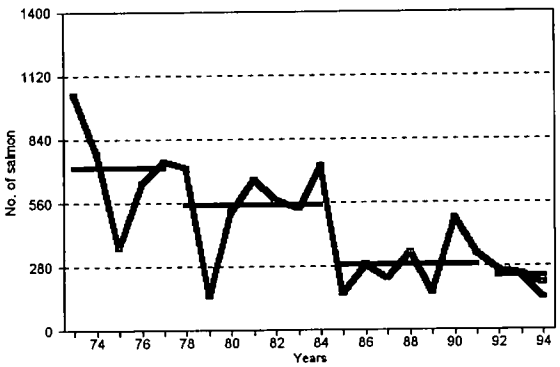
Year	Effort	Small			Large			Total		Total	Catch rate	%
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	large
1953	3458	935		935	146		146	1081		1081	0.31	14
1954	800	244		244	18		18	262		262	0.33	7
1955	1464	499		499	61		61	560		560	0.38	11
1956	2211	668		668	206		206	874		874	0.40	24
1957	1689	1418		1418	493		493	1911		1911	1.13	26
1958	537	984		984	218		218	1202		1202	2.24	18
1959	1466	604		604	95		95	699		699	0.48	14
1960	302	603		603	91		91	694		694	2.30	13
1961	1676	734		734	119		119	853		853	0.51	14
1962	3316	1488		1488	226		226	1714		1714	0.52	13
1963	4354	2467		2467	457		457	2924		2924	0.67	16
1964	3933	2673		2673	373		373	3046		3046	0.77	12
1965	3338	1175		1175	262		262	1437		1437	0.43	18
1966	2113	620		620	316		316	936		936	0.44	34
1967	2630	706		706	248		248	954		954	0.36	26
1968	2640	863		863	85		85	948		948	0.36	9
1969	3360	1491		1491	181		181	1672		1672	0.50	11
1970	5288	1662		1662	207		207	1869		1869	0.35	11
1971	5146	1435		1435	47		47	1482		1482	0.29	3
1972	3632	782		782	32		32	814		814	0.22	4
1973	4748	1583		1583	196		196	1779		1779	0.37	11
1974	4218	941		941	34		34	975		975	0.23	3
1975	2180	704		704	16		16	720		720	0.33	2
1976	2893	902		902	40		40	942		942	0.33	4
1977	3853	1008		1008	68		68	1076		1076	0.28	6
1978	3142	713		713	65		65	778		778	0.25	8
1979	755	148		148	1		1	149		149	0.20	1
1980	1602	518		518	65		65	583		583	0.36	11
1981	2082	659		659	18		18	677		677	0.33	3
1982	2141	570		570	31		31	601		601	0.28	5
1983	2439	533		533	30		30	563		563	0.23	5
1984	2543	720		720	11		11	731		731	0.29	2
1985	1686	173		173		0	0	173	0	173	0.10	0
1986	2628	382		382		8	8	382	8	390	0.15	2
1987	1643	378		378		8	8	378	8	386	0.23	2
1988	2077	434		434		11	11	434	11	445	0.21	2
1989	1961	324		324		3	3	324	3	327	0.17	1
1990	2182	706		706		22	22	706	22	728	0.33	3
1991	1456	370		370		4	4	370	4	374	0.26	1
1992	2094	346		346		28	28	346	28	374	0.18	7
1993	1870	319	23	342		50	50	319	73	392	0.21	13
1994	1518	153	84	237		50	50	153	134	287	0.19	17

Appendix 11b. Angling in Harry's River, Bay St. George, 1973-94 adjusted to reduced angling seasons.

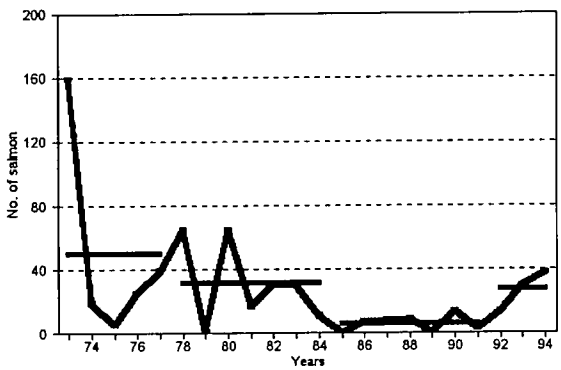
Year	Effort	Small			Large			Total		Total	Catch rate	% large
	Rod days	Retained	Released	Total	Retained	Released	Total	Retained	Released	Catch	Salmon/rod	
1973	2877	1035		1035	159		159	1194		1194	0.42	13
1974	2795	775		775	19		19	794		794	0.28	2
1975	959	361		361	5		5	366		366	0.38	1
1976	1707	646		646	25		25	671		671	0.39	4
1977	2704	741		741	39		39	780		780	0.29	5
1978	3142	713		713	65		65	778		778	0.25	8
1979	755	148		148	1		1	149		149	0.20	1
1980	1602	518		518	65		65	583		583	0.36	11
1981	2082	659		659	17		17	676		676	0.32	3
1982	2141	570		570	31		31	601		601	0.28	5
1983	2439	533		533	30		30	563		563	0.23	5
1984	2543	720		720	11		11	731		731	0.29	2
1985	1462	160		160		0	0	160	0	160	0.11	0
1986	1830	289		289		7	7	289	7	296	0.16	2
1987	941	226		226		8	8	226	8	234	0.25	3
1988	1670	341		341		9	9	341	9	350	0.21	3
1989	1208	165		165		0	0	165	0	165	0.14	0
1990	1468	493		493		14	14	493	14	507	0.35	3
1991	1170	335		335		3	3	335	3	338	0.29	1
1992	1460	263		263		14	14	263	14	277	0.19	5
1993	1246	239	7	246		30	30	239	37	276	0.22	11
1994	1194	141	65	206		38	38	141	103	244	0.20	16

Appendix 11c. Summarized angling catch statistics for Harry's River, Bay St. George, 1973-94. Bars represents the averages for the time period spanned by the bar.

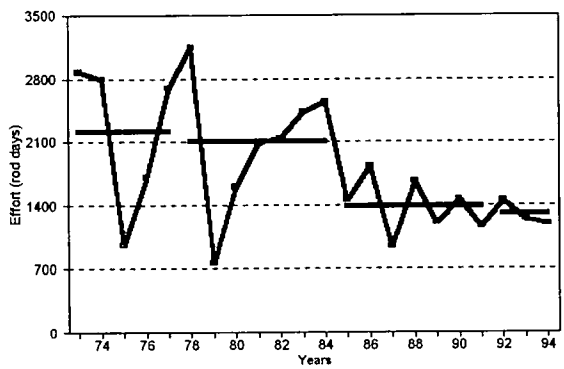
Small salmon catches (adjusted)
Harry's River angling, 1973-94



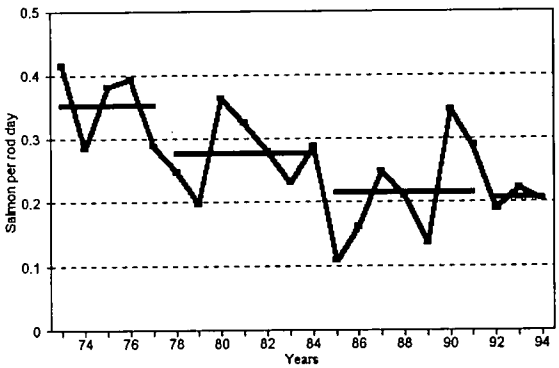
Large salmon catches (adjusted)
Harry's River angling, 1973-94



Fishing effort (adjusted)
Harry's River angling, 1973-94



Catch per unit effort (adjusted)
Harry's River angling, 1973-94



Percent large salmon (adjusted)
Harry's River angling, 1973-94