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STATUS OF ATLANTIC SALMON IN THE BOUCTOUCHE RIVER IN 1994

by

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ABSTRACT

Angling effort on the Bouctouche River is low and in most years insufficient to estimate catches: estimates by the New Brunswick Department of Natural Resources for 1994 were not available at the time of publication. First Nation catches were 12 large and 11 small salmon. A mark-recapture experiment was the basis for estimating returns: tags were applied in estuary trapnets and recovered at a counting fence upriver. Large salmon total returns in 1994 were 255 with a spawning escapement of 198 which was 59% of target. Small salmon total returns were 126 with a spawning escapement of 96 which was 65% of the spawning target. Total egg deposition represented 61% of the egg target, if all fish spawned in the main river. Approximately half of the estimated spawning escapement passed upstream of the fence, but it is uncertain what proportion of the presumed spawners below the fence utilized the main river, or other nearby streams. Relative to the proportion of the target above the fence (88%), only 32% of target egg deposition was met. Spawning escapement was also not met in 1993 and juvenile densities at the sites surveyed in 1994 were well below optimum, confirming that spawning in recent years has been inadequate. These results indicate that there is no harvestable surplus of Atlantic salmon from the Bouctouche River. At present, sufficient information on stock status has not been accumulated to forecast returns.

RÉSUMÉ

L'effort de pêche à la ligne dans la rivière Bouctouche est faible et la plupart des années insuffisant pour permettre une estimation des prises; les estimations du ministère des Ressources naturelles et de l'Énergie du Nouveau-Brunswick pour 1994 n'étaient pas disponibles lors de la publication du présent rapport. Les prises des premières nations s'établissaient à 12 grands saumons et à 11 petits saumons. On s'est fondé sur une expérience de marquage-recapture pour estimer les montaisons; les saumons étaient marqués dans des filets-trappe placés dans l'estuaire et recapturés à une barrière de dénombrement située en amont. Pour ce qui est des grands saumons, 255 d'entre eux ont remonté la rivière en 1994; l'échappée de reproducteurs était de 198 saumons, soit 59 % de la cible. En ce qui concerne les petits saumons, ils ont été 126 à remonter la rivière et ont produit une échappée de 96 reproducteurs, soit 65 % de la cible. Si tous les saumons ont frayé dans le cours principal de la rivière, la ponte totale s'établissait à 61 % de la cible. Environ la moitié de l'échappée de reproducteurs estimée a franchi la barrière de dénombrement pour se retrouver en amont de celle-ci, mais on ne sait pas quelle proportion des frayeurs présumés restés en aval de la barrière a utilisé le cours principal de la rivière, ou d'autres cours d'eau voisins. En amont de la barrière, la ponte était à 32 % du niveau réquis. En 1993, également l'échappée-cible de reproducteurs n'avait pas été atteinte et les densités de juvéniles sur les lieux étudiés en 1994 étaient bien inférieures aux niveaux optimaux, ce qui confirme que le frai a été insuffisant ces dernières années. Ces résultats révèlent qu'il n'y a pas de surplus de saumon de l'Atlantique à récolter dans la rivière Bouctouche. À l'heure actuelle, on n'a pas accumulé suffisamment de renseignements sur l'état du stock pour prévoir les montaisons.

SUMMARY SHEET
Salmon in the Bouctouche River

	1989	1990	1991	1992	1993	1994	MIN	MAX	MEAN
Angling									
Large (Released)	52	47			22	na	34	52	
Small (Rel + Kept)		16			55	na	13	55	
First Nation Harvest									
Large				12	0	12			
Small				0	0	11			
Spawning escapement									
Large					28	198			
Small					18	96			
Total returns									
Large					79	255			
Small					62	126			
Percent target met									
Large					13	59			
Small					14	65			
% egg target met									
					13	61			

Angling catch min, max are for years 1984 to 1993; the mean was not calculated because angling catches are not estimated on a consistent basis.

Description of Fishery: Salmon are angled in public water; catch and effort data for 1994 are not available. Bouctouche First Nation harvests salmon by trapnet.

Target: 1.586 million eggs; 337 large salmon, 147 small salmon.

Fishery Data: None.

Research Data: Tags applied at trapnets and recaptured at a counting fence were the basis for the assessment. Biological data was collected on the stock and juvenile densities were determined at several sites.

Estimation of Stock Parameters: A Bayesian estimator was used to calculate large salmon returns from counting fence recaptures; small salmon returns were calculated from the small:large ratio.

Assessment Results: Spawning escapement was not met for large or small salmon in 1994. Total egg deposition was only 61% of target, if all fish spawned in the main Bouctouche River. Half the estimated spawning escapement passed above the counting fence, representing only 32% of target for this area: of the presumrd spawners below the fence, it is uncertain what proportion utilized the main river, or other nearby streams.

Ecological Considerations: Low water conditions delayed the upstream movement of salmon and reduced the angling catch.

Future Prospects: No forecast is available.

Management Considerations: There is no harvestable surplus of salmon from the Bouctouche River.

Introduction

The Bouctouche River is situated in Kent County, New Brunswick and flows in an easterly direction to Northumberland Strait in Statistical District 77, Salmon Fishing Area 16 (Figs.1,2). A spawning run of Atlantic salmon enters the river during September and October, and is exploited for food by Bouctouche First Nation and for public recreational angling. Information on stock status is required to manage salmon harvest on the Bouctouche, ensuring that adequate spawning escapement occurs on a sustainable basis. Under the Aboriginal Fisheries Strategy agreements signed with First Nations, the Department of Fisheries and Oceans provides funding and training to develop a co-management approach to the resource.

The stock on this river has been assessed once previously, in 1993 (Atkinson and Claytor 1994). This was accomplished through a mark-recapture experiment in cooperation with Bouctouche First Nation, under the federal government's Aboriginal Fisheries Strategy (AFS). Tags were applied at First Nation trapnets, and recovered in the recreational fishery. The present document provides an assessment of the stock for 1994. As in 1993 tags were applied at First Nation trapnets, but due to late installation the recapture trap did not recover sufficient tags to estimate returns. A counting fence operated by the Southeast Anglers Association served as the principal recapture site in 1994.

Habitat survey data provided by the New Brunswick Department of Natural Resources and Energy (DNRE), combined with accumulating information on the biological characteristics of the stock in the Bouctouche River, were used to update spawning requirements. Results of electroseining at several sites during the summer of 1994 were provided by the Southeast Anglers Association.

Description of Fisheries

Commercial

Commercial harvesting of Atlantic salmon ceased in 1984. The harvest from 1967 to 1983 in SFA 16 was presented in Atkinson and Claytor (1994).

First Nation

Bouctouche First Nation currently harvests salmon from research trapnets in the Bouctouche River during September and October. Prior to 1992, this was a sporadic gillnet fishery and numbers taken were not recorded. In 1992, 12 large (63 cm or more) salmon were taken; no fish were harvested in 1993 as a conservation measure due to low returns; and in 1994 a total of 12 large and 11 small (less than 63 cm) salmon were harvested for food.

Recreational

Recreational angling occurs from the head of tide upstream: there is no leased water on the system. Kelts are angled from April 15 to May 15, bright salmon from June 8 to October 31. The bright season was extended in 1993 from October 15 to the end of the month. Almost all angling for bright salmon occurs from late September to the end of the season. Prior to 1984 all kelts and bright fish could be retained; in 1984 large salmon kelts could be kept but all large bright salmon had to be released. Beginning in 1985, regulations have required all large salmon (brights and kelts) to be released, and only small salmon could be retained. In 1992, the season limit for small salmon was reduced from ten to eight, and this regulation remains in effect.

Recreational catch estimates were obtained from the New Brunswick Department of Natural Resources and Energy (DNRE). Estimates of catch are based on a random survey of approximately 15 percent of license purchasers: in the case of the Bouctouche River, the rate of survey return is often not high enough to estimate catch accurately (Table 1). DNRE 1994 estimates were not available at the time of publication.

Other

Estimates of unrecorded catch are obtained from fishery officers (DFO, DNRE, First Nation) and represent known or suspected removals in the estuary or freshwater due to by-catch in other gear or poaching. A survey of by-catch in the Bouctouche estuary in gaspareau traps (June), smelt traps (November), and eel traps (September, October) conducted by the Southeast Anglers Association found no incidence of salmon (Append.1). It is estimated by DFO fishery officers that 34 large and 16 small salmon were taken late in the season as by-catch in the estuary. Poaching in the freshwater portion of the river is considered to be a problem. Low water conditions kept fish in the tideway until a rise in level at the end of October allowed them to ascend further, following which a return to low levels left them vulnerable in small confined pools. An estimated 11 large and 3 small salmon were taken; no apprehensions or seizures of gear were made by fishery officers.

Summary of Removals

Location	Large	Small
First Nation Food	12	11
Angling	na	na
Unrecorded: estuary	34	16
: freshwater	11	3
Total	57	30

Target

The required number of spawners for the Bouctouche River was calculated using Method 2 recommended by Randall (1985) for the Miramichi River. The number of spawners needed to meet egg deposition requirements was calculated assuming all egg deposition came from large salmon. The numbers of small salmon required were calculated assuming that at least one male spawner was needed for each female large salmon. Average fecundity values were assumed to be equivalent to Miramichi stock, based on river proximity: also, the Bouctouche was stocked in 1978-79 with 37,000 juvenile salmon from the Miramichi River (Newbould 1983). Sex determination was done on external characters, with sex ratios derived accordingly: those used in the calculation below are averages of values observed from 1993-94.

Egg deposition rate = 2.4 eggs/square meter (Elson 1975)

Rearing area = 661,000 square meters (DNRE, Table 2.)

Fecundity : Large salmon, 6816 eggs; Small salmon, 2908 eggs
(Randall 1985)

Sex ratio : Large salmon; 69% female, 31% male
: Small salmon; 12% female, 88% male

Eggs/large salmon : 6816 x 0.69 = 4703

Eggs/small salmon : 2908 x 0.12 = 349

Eggs required : 2.4 eggs/sq m x 661,000 sq m
= 1.586 million eggs

Large salmon required : 1,586,000 / 4703 = 337

Large salmon females : 337 x 0.69 = 233

Large salmon males : 337 - 233 = 104

Small salmon males required to balance sex ratio : 233 - 104 = 129

Small salmon required (total) : 129 / 0.88 = 147

Research Data

Mark/Recapture

In cooperation with Bouctouche First Nation, two trapnets were operated in the tidal portion of the river to mark and recapture salmon. The lower (mark trap) was situated 3 km upriver (west) of the Route 11 bridge in Bouctouche, the upper (recapture trap) was located approximately two km upstream from this point (Fig.3). The box portion of the traps measured 3.7 m (12') wide by 18.3 m (60') long and was constructed with 5.7 cm (2.25") mesh knotless nylon. A single leader of approximately 60 m (200'), extending from shore into a door in the middle of the long side of the box, was made from 11.4 cm (5.5') mesh polypropylene. Salmon caught in both traps were marked with small blue Carlin tags attached with a single wire through the back behind the first ray of the dorsal fin, measured, sexed on external characters, scale sampled for ageing, and released.

The lower trap was operated from September 28 to November 4, and the upper from October 31 to November 4; the first salmon was caught on September 29, the last on November 2. Small salmon numbers peaked between October 8 and 14 (Week 41); this timing was the same as in 1992 and about one week later than 1993. Large salmon peaked between October 22 and 28 (Week 43), which was two weeks later than both 1992 and 1993. Total catch for both traps was 43 large and 15 small salmon (Tables 3,4, Fig.4). Of these, 31 large and 4 small salmon were tagged and released. Relative to total trap catch in 1993, large salmon were higher by 26% and small salmon lower by 44%. In 1992 only the mark trap was operated: relative to that year the 1994 mark trap catch was lower by 42% for large and 35% for small salmon.

The principal source of tag recaptures was a counting fence installed on the main stem of the river 2.75 km upstream from the head of tide at the junction of its two main tributaries, the North and South Branches (Fig.3). The fence consisted of two small trapnets each about 6m (20') long by 3m (9') wide held in place with steel rods driven into the stream bed, and connected to each other and the shore by leaders such that all fish moving upstream

were directed into one trap, and those going downstream into the other. The fence was operated from October 8 to November 23 by members of the Southeast Anglers Association, funded through the Recreational Fisheries Cooperative Agreements with DFO. Each fish was measured, sexed and a scale sample was taken from 20% of the sample for ageing. To assure an accurate count, all fish released upstream were marked by punching a 5mm (1/4') hole in the caudal fin. Any marked fish released downstream from the fence was not recounted if subsequently caught returning upstream. Due to very low water conditions salmon remained in the estuary until well after the fence was installed. The first fish reached the fence on October 22 (Week 43) following a small rise in water level, but few passed upstream until November 1 (Week 44) when a substantial rainfall brought the majority of fish through the fence in the subsequent two days. A total of 92 large and 48 small salmon were counted through the fence (Table 5, Fig.5). One small salmon which was unmarked was taken in the downstream trap, making the known upstream count of small salmon 49. At the fence, thirteen large salmon were tagged; no tags were observed on small salmon. Two tags were recovered in the recapture trap, but due to the short term of operation these were not considered in estimating returns: only those applied at the marking trap were used. No tags were returned by anglers. The efficiency of the marking trap for large salmon was calculated in two ways. Of 92 large salmon caught at the counting fence 13, or 14%, carried tags applied or seen (previously tagged) at the marking trap: of eight tags applied in previous years that were recaptured at the fence two, or 25%, were seen at the marking trap. Due to the larger sample size the former is probably closer to the real efficiency than the latter. Tagging effort and recaptures may be summarized as follows:

Tags Applied

Location	Large	Small
Marking trap	30	3
Recapture trap	1	1

Tags Recaptured

	Large		Small	
Location	Recap	Catch	Recap	Catch
Recapture trap	3	8	0	2
Counting fence	13	92	0	49

Biological Characteristics

Modal length of small salmon caught in 1994 was 60 cm and of

large salmon 80 cm (Fig.6). Mean length of small salmon was 56cm; 8% were females and 92% males. The mean length of large salmon was 80cm; 63% were females and 37% males. The large salmon proportion of the catch in 1994 was 63%, small salmon making up 37%. The 1994 sample has not yet been aged: of known-age fish in 1993, 2+, 3+, and 4+ smolts respectively comprised 39%, 54% and 7% of the sample. Of the multi-sea-winter (MSW) component, 7% were repeat spawners and 68% of these were females. None of the repeat spawners had previously spawned as a one-sea-winter (1SW) fish, or grilse (Table 6). Of the tagged large salmon caught at the counting fence in 1994, 37% were apparently repeat spawners as determined from the date of tag application: 16% were tagged in 1992 and 21% in 1993.

Electroseining

In September of 1994 members of the Southeast Anglers Association electroseined at three locations on the Bouctouche to determine densities and percent habitat saturation (PHS) of juvenile salmonids. One of these locations was on the main stem of the river below the junction of the North and South Branches, the other two on the South Branch (Fig.3). Due to the small areas available of separate habitat type (riffle, run, pool), several sections of each were fished and the results pooled to represent a larger area. This resulted in one "site" each on the main stem and South Branch, representing each of the three habitat types. Sites were open, and methods used were as described in Zippin (1958), and Grant and Kramer (1990). A PHS value around 27 is considered optimum; above this a greater than 50% chance exists that a density dependent response will occur. No juvenile salmon were found in any of the three habitats in the composite site on the South Branch. On the main stem site only the riffle and run areas were found to contain juveniles, but at PHS values well below optimum (Table 7.). Brook trout were also found at low densities in these sites except from the riffle habitat on the South Branch, where a fingerling density of 14.68 per 100 square meters was found. Although not an extensive survey of the Bouctouche system, these results suggest that spawning escapement in recent years has not been adequate.

Estimation of Stock Parameters

Returns of large salmon past the marking trap were calculated from tag recaptures at the counting fence, using a Bayesian estimator as described by Gazey and Staley (1986). The most probable population size given R recaptures out of M marks placed in a sampled catch of C was calculated over a range of possible population sizes. Only tags applied in the current year, or those from previous years or other rivers which were seen at the marking trap, were used: this is the number indicated in the tagging summary above. A tag loss rate was not factored into the calculations because it is negligible over the short period (one month) during which all tags were recaptured. Total large salmon

returns to the system were obtained by adding known or estimated removals to this point, then the corresponding small salmon total returns were computed using the average (1992-94) observed small:large ratio. The small salmon proportion of counting facility catches was as follows: 1992-23%, 1993-39%, 1994-37%, average-33%. Spawning escapement was then calculated as follows:

Spawners = Total Returns - Total Removals

Assessment Results

Total returns and Spawning Escapement

The distribution for estimates of total returns to the river indicates that the most probable is 126 for small salmon and 255 for large salmon (Figs.7,8). This represents a 2 and 3.2 fold increase in small and large salmon respectively, over 1993 returns. Subtracting removals, spawning escapement for small salmon was 96 and for large salmon 198 (Figs.7,8). The probability of achieving target escapements was only 8% for large and 15% for small salmon (Fig.9). These estimates are 65% of target for small and 59% for large salmon. Total egg deposition (large + small salmon) was 61% of target for the system. The proportion of the spawning target above the counting fence is 88% of the total: the fish released above the fence (92 large, 49 small salmon) represent only 31% of this target for large and 38% for small salmon, with total egg deposition being 32% of target. Thus, the spawning target for 1994 was not met on the Bouctouche River. Since escapement has been well below target for two years, the stock appears to be at a level inconsistent with achieving adequate spawning.

Sources of uncertainty

Approximately half of the estimated total spawning escapement passed above the counting fence, but it is uncertain what proportion of the balance may have spawned in the main river between the head of tide and the fence, or in other nearby streams not tributary to the main river. The proportion of the spawning target in the main river below the fence is 12% of the total: egg deposition would have been 271% of this target if all presumed spawners below the fence used only this area. If practicable, relocation of the counting fence near the head of tide would provide a more accurate estimate of returns to the main Bouctouche River, and more extensive electrofishing in the entire system would determine the extent of habitat use and help to refine the spawning target. A redd count survey, conditions permitting, could assist in interpreting spawning success.

The spawning target as established for the main Bouctouche River may be unrealistically high in terms of actual habitat

accessible to spawning salmon, as suggested by low juvenile densities in the upper part of the system; also, several smaller unsurveyed streams flow into the estuary which may have spawning potential for salmon.

Delayed installation of both traps, and in particular the recapture trap, made estimation of returns by this method impossible and reduced the number of tags available for potential recapture by other methods. The negotiation of a five year agreement between DFO and Bouctouche First Nation has been concluded and should permit timely and concurrent installation of both traps in the future.

The validity of applying 2.4 eggs/sq. m as an optimum deposition to all rivers is constantly challenged. Ways to refine this for individual rivers need to be sought.

Fecundity values used to derive target spawners from target egg deposition have been assumed from similar stock (Miramichi), rather than determined by direct measurement. This information could be obtained directly from food fish removed from assessment trapnets by the First Nation crews operating them, if harvesting continues.

Angling statistics are currently inadequate to determine catch and effort, principally due to small sample size, and collation of data is not done in time to incorporate them into the assessments. A cooperative logbook and/or creel census program with DNRE and the Southeast Anglers Association could greatly improve this situation.

Ecological Considerations

Water flows in the Bouctouche River were abnormally low until the beginning of November. Fish concentrated at the head of tide but few ascended further until after this time. Consequently, angling conditions were worse than average, possibly accounting for the lack of tags returned from this fishery. Rain at the end of October raised water levels enough to permit salmon to move upstream past the counting fence, but the height was still below normal and may have prevented some of the run from reaching upstream spawning areas. The water quickly fell to a low level again, leaving fish confined and exposed in small pools. Only five small and four large salmon had descended past the counting fence by the time it was removed on November 23.

Forecast/Prospects

At present there is no reliable method of forecasting returns of Atlantic salmon to the Bouctouche River. It may be possible to develop in-season forecasting using run-timing to the trapnets when a sufficient number of years of trapnet operation have accumulated.

Given a longer term data set, it may be possible to develop a stock/recruit relationship. Increased returns in 1994 over the previous year indicate a potential for recovery.

Management Considerations

The spawning target for the Bouctouche has not been met in either 1993 or 1994, the two years for which the stock has been assessed. Only 61% of the egg target was potentially met in 1994, indicating that there is no harvestable surplus.

Research Recommendations

1. Install mark and recapture traps in the estuary by the end of August, to sample the entire run and estimate returns to the system.

2. Relocate the counting fence near head of tide, to more accurately monitor returns to the main river.

3. Extend the electroseining survey, to determine the extent of habitat use in the main river and other small streams emptying into the estuary, and obtain juvenile densities to help validate spawning success.

4. Conduct a redd count survey, to help validate spawning success and extent of habitat use.

5. Examine ways to refine the optimum egg deposition rate, to establish more accurate spawning targets.

6. Obtain direct measurements of fecundity from First Nation food fishery, to establish more accurate stock-specific spawning targets.

7. Establish a logbook and/or creel census program with DNRE and the Southeast Anglers Association, to obtain better and more timely data on angling catch and effort.

Acknowledgements

We thank Bouctouche First Nation for operating the trapnets on the Bouctouche River (1994) and the collection of relevant data; members of the Southeast Anglers Association for operating the counting fence and collecting electroseining and by-catch data; the New Brunswick Department of Natural Resources and Energy (DNRE) for providing habitat survey data; and attendees at the Salmon Science Workshop for their input and suggestions (Append.2).

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Table 1. Atlantic salmon angling catch on the Bouctouche River,1984-1994. Estimates provided by New Brunswick Department of Natural Resources and Energy. Large salmon kelts could be retained in 1984, after which all large salmon angling was catch-and-release. Small salmon numbers include released fish. Dashes (-) indicate insufficient data to calculate; 1994 values not available (na).

	Kelts				Bright Salmon				All Salmon		
Year	Small	Large	Total	% Large	Small	Large	Total	% Large	Total	Rods	CPUE
1984	-	-	-	-	13	-	13	-	13	13	1.000
1985	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	60	34	94	36.2	94	94	1.000
1987	-	-	-	-	-	-	-	-	-	53	-
1988	-	-	-	-	-	-	-	-	-	31	-
1989	-	-	-	-	-	52	52	-	52	192	0.271
1990	-	-	-	-	16	47	63	74.6	63	213	0.296
1991	-	-	-	-	-	-	-	-	-	308	-
1992	-	-	-	-	-	-	-	-	-	314	-
1993	-	-	-	-	55	22	77	28.6	77	717	0.107
1994	na	na	na	na	na	na	na	na	na	na	na
Mean(89-93)	-	-	-	-	-	-	-	-	-	349	-
+/- Mean	-	-	-	-	-	-	-	-	-	-	-

Table 2. Rearing area of the Bouctouche River and tributaries, 1989. Data provided by DNRE.

	Area in sq. m			
Stream	Riffle	Non-Riffle	Non-Productive	Total
Bouctouche (Main)	118906	258837	103	377846
North Branch	5473	16904	0	22377
Tributary (to N. Branch)	1149	3751	0	4900
Richard's Brook	4119	2587	0	6706
Johnson Brook	8036	12418	190	20644
Mc Lean Brook	5094	4726	0	9820
Yankee Brook	4690	3731	0	8421
South Branch	72617	133517	0	206134
Bailey Brook	743	3626	0	4369
Total	220827	440097	293	661217

Table 3 . Catches of large and small salmon at Bouctouche R. traps, 1994, by day and standard week.

Date MoDa	Mark Large	Mark Small	Recap Large	Recap Small	Both Large	Both Small
928	0	0	-	-	0	0
929	3	1	-	-	3	1
930	1	0	-	-	1	0
1001	0	0	-	-	0	0
1002	0	0	-	-	0	0
1003	0	0	-	-	0	0
1004	0	1	-	-	0	1
1005	3	1	-	-	3	1
1006	2	1	-	-	2	1
1007	0	0	-	-	0	0
1008	0	0	-	-	0	0
1009	0	0	-	-	0	0
1010	0	0	-	-	0	0
1011	5	4	-	-	5	4
1012	0	1	-	-	0	1
1013	2	0	-	-	2	0
1014	0	0	-	-	0	0
1015	0	0	-	-	0	0
1016	0	0	-	-	0	0
1017	2	1	-	-	2	1
1018	1	0	-	-	1	0
1019	0	0	-	-	0	0
1020	3	0	-	-	3	0
1021	2	0	-	-	2	0
1022	1	0	-	-	1	0
1023	0	0	-	-	0	0
1024	4	2	-	-	4	2
1025	2	0	-	-	2	0
1026	2	1	-	-	2	1
1027	1	0	-	-	1	0
1028	1	0	-	-	1	0
1029	0	0	-	-	0	0
1030	0	0	-	-	0	0
1031	2	0	3	0	5	0
1101	1	0	0	0	1	0
1102	0	0	2	2	2	2
1103	0	0	0	0	0	0
1104	0	0	0	0	0	0

Std. Week	Mark Large	Mark Small	Recap Large	Recap Small	Both Large	Both Small
39	4	1	0	0	4	1
40	5	3	0	0	5	3
41	7	5	0	0	7	5
42	8	1	0	0	8	1
43	11	3	0	0	11	3
44	3	0	5	2	8	2

Cumulative Total

Std. Week	Mark Large	Mark Small	Recap Large	Recap Small	Both Large	Both Small
39	4	1	0	0	4	1
40	9	4	0	0	9	4
41	16	9	0	0	16	9
42	24	10	0	0	24	10
43	35	13	0	0	35	13
44	38	13	5	2	43	15

Table 4. Standardized weeks used to describe run timing.

Week	Month	Days
33	August	13-19
34	August	20-26
35	August	27-02
36	September	03-09
37	September	10-16
38	September	17-23
39	September	24-30
40	October	01-07
41	October	08-14
42	October	15-21
43	October	22-28
44	October	29-04
45	November	05-11
46	November	12-18
47	November	19-25

Table 5. Catches of large and small salmon at Bouctouche R. counting fence, 1994.

Date MoDa	Upstream Large	Upstream Small	Downstream Large	Downstream Small
1008	0	0	0	0
1009	0	0	0	0
1010	0	0	0	0
1011	0	0	0	0
1012	0	0	0	0
1013	0	0	0	0
1014	0	0	0	0
1015	0	0	0	0
1016	0	0	0	0
1017	0	0	0	0
1018	0	0	0	0
1019	0	0	0	0
1020	0	0	0	0
1021	0	0	0	0
1022	1	2	0	0
1023	2	6	0	0
1024	2	8	0	0
1025	0	1	0	0
1026	0	1	0	0
1027	1	1	0	0
1028	3	0	0	0
1029	0	1	0	0
1030	1	2	0	0
1031	0	1	0	0
1101	11	7	0	0
1102	45	13	0	0
1103	16	4	2	1
1104	2	1	0	1
1105	2	0	0	0
1106	2	0	1	0
1107	2	0	0	2
1108	0	0	1	0
1109	0	0	0	0
1110	0	0	0	0
1111	0	0	0	0
1112	0	0	0	0
1113	0	0	0	0
1114	0	0	0	0
1115	0	0	0	0
1116	0	0	0	0
1117	0	0	0	0
1118	0	0	0	0
1119	0	0	0	0
1120	0	0	0	0
1121	0	0	0	0
1122	2	0	0	1
1123	0	0	0	0

Std. Week	Upstream Large	Upstream Small	Downstream Large	Downstream Small
41	0	0	0	0
42	0	0	0	0
43	9	19	0	0
44	75	29	2	2
45	6	0	2	2
46	0	0	0	0
47	2	0	0	1

Cumulative Total

Std. Week	Upstream Large	Upstream Small	Downstream Large	Downstream Small
41	0	0	0	0
42	0	0	0	0
43	9	19	0	0
44	84	48	2	2
45	90	48	4	4
46	90	48	4	4
47	92	48	4	5

Table 6. Age distribution of Bouctouche R. salmon, 1993.
SW = sea winter. Repeat spawner categories indicate total sea age, followed by sea ages at which the fish spawned.

			Repeat Spawners			
Smolt Age	1SW	2SW	3.1	3.2	5.2.4	Total
2	11	14	1	1	0	27
3	10	27	0	0	1	38
4	5	0	0	0	0	5
Total	26	41	1	1	1	70

Table 7. Densities and Percent Habitat Saturation (PHS) of juvenile Atlantic salmon at two locations on the Bouctouche R., 1994. Data provided by the Southeast Anglers Association.

		Area	No. per 100 sq.m			
Location	Habitat	sq.m	0+	1+	2+	PHS
Bouctouche (main)	Riffle	1280	0	1.95	0.7	3
	Run	1440	0	0.68	0	1
	Pool	600	0	0	0	0
Bouctouche (South Branch)	Riffle	1020	0	0	0	0
	Run	1020	0	0	0	0
	Pool	180	0	0	0	0

0+ = Fry: < and = 7.0 cm
1+ = Small Parr: 7.1 - 11.0 cm
2+ = Large Parr: > or = 11.1 cm

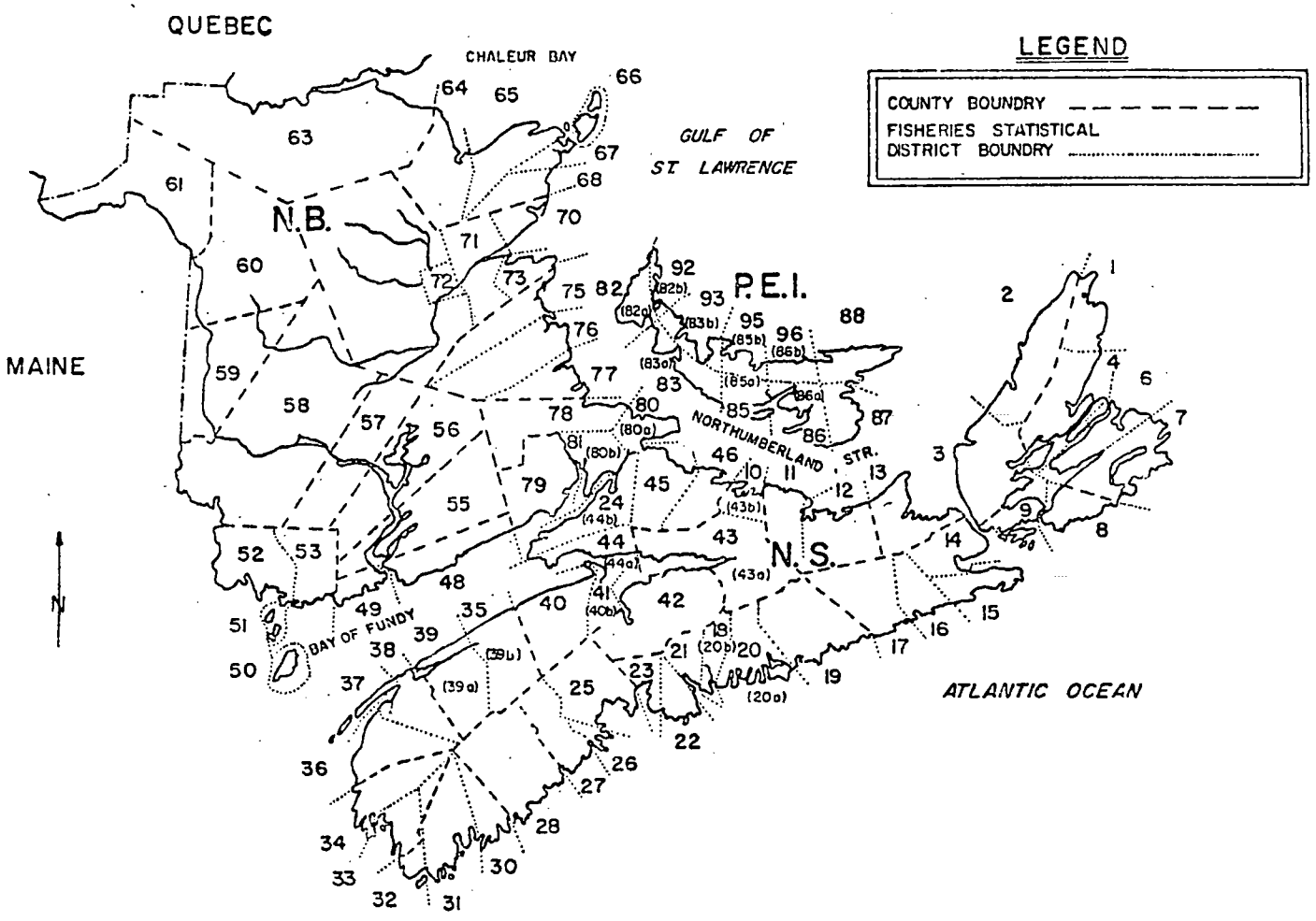


Figure 1. Fisheries Statistical Districts in Atlantic Canada.

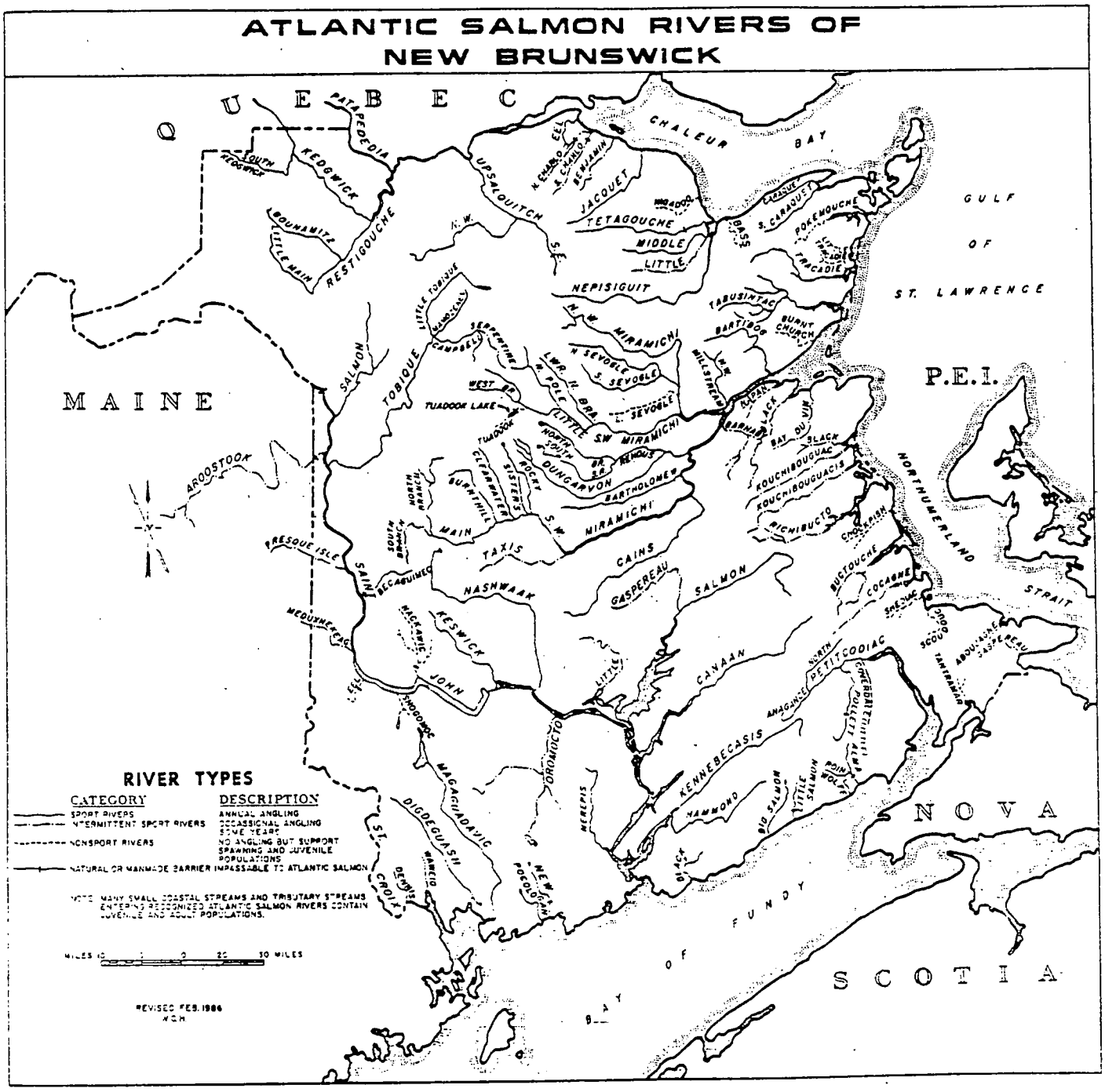


Figure 2. Atlantic salmon angling rivers of New Brunswick. (Map prepared by DNRE)

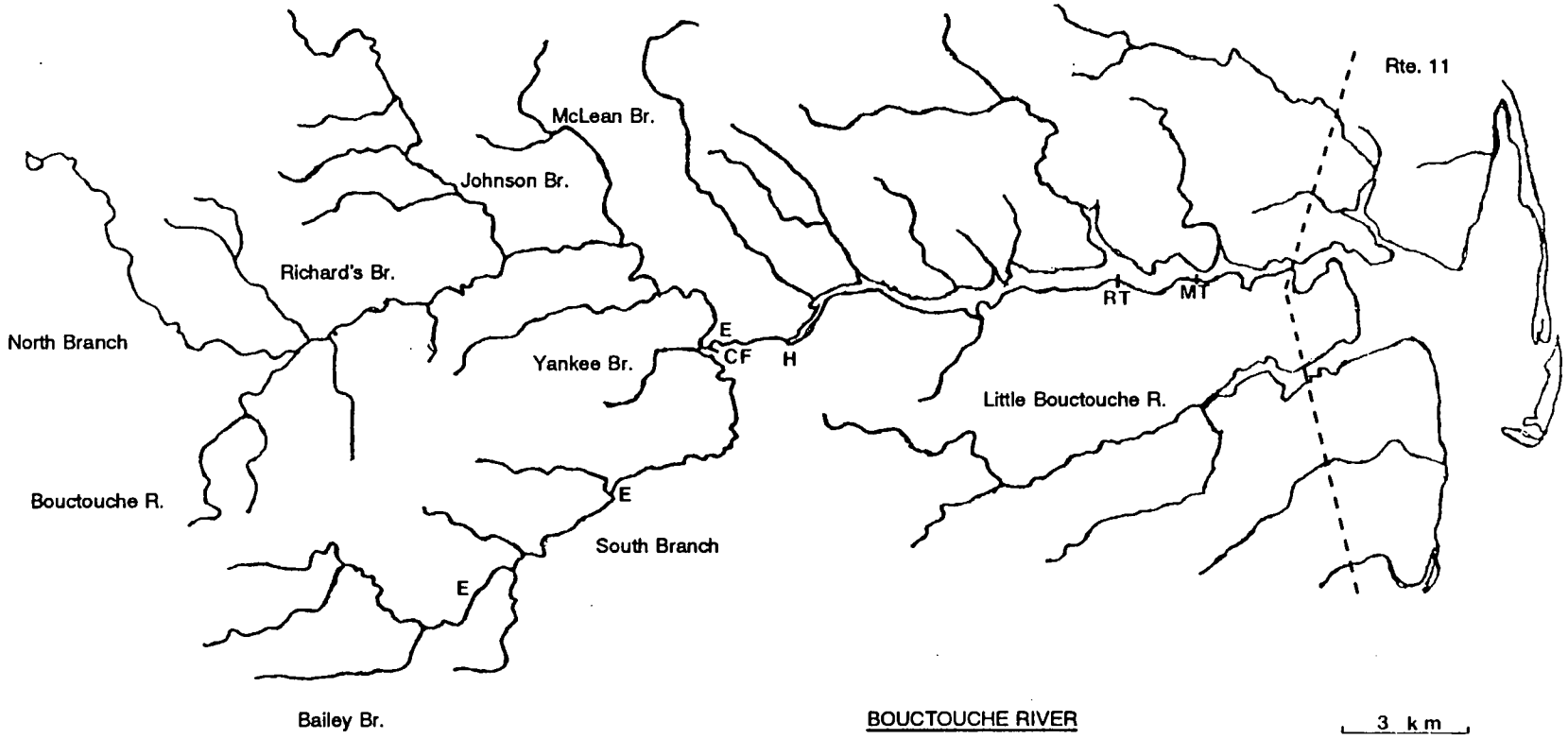


Figure 3. Location of traps, counting fence and electroseining sites on the Bouctouche River, 1994. **MT** - Mark Trap; **RT** - Recapture Trap; **H** - Head of tide; **CF** - Counting Fence; **E** - Electroseining sites.

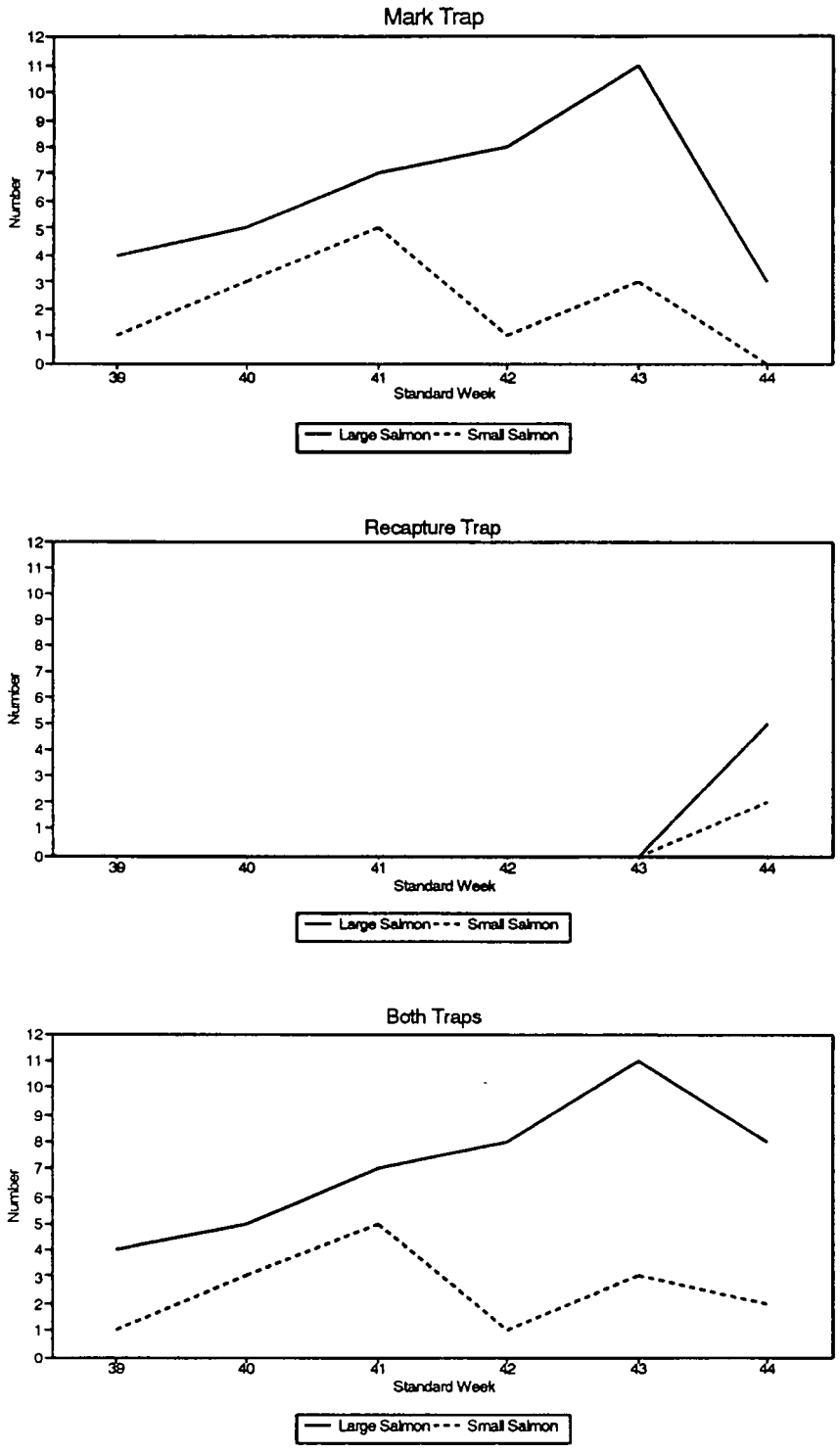


Figure 4. Catch by standard week at Bouctouche R. traps, 1994. Recapture trap operated only during week 44.

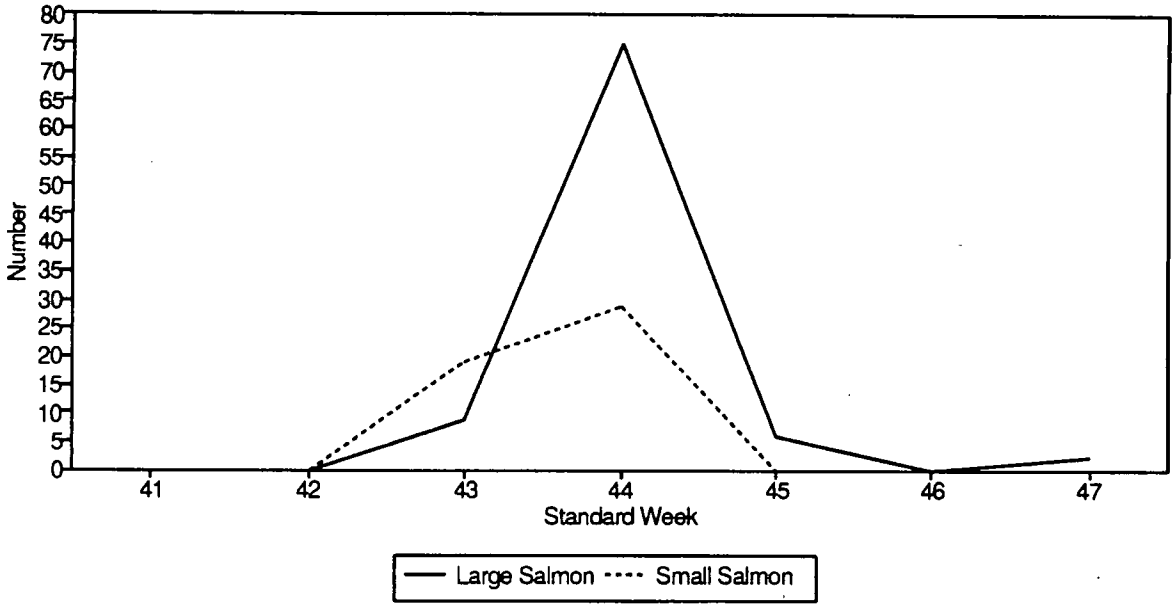


Figure 5. Upstream catch by standard week at Bouctouche R. counting fence, 1994.

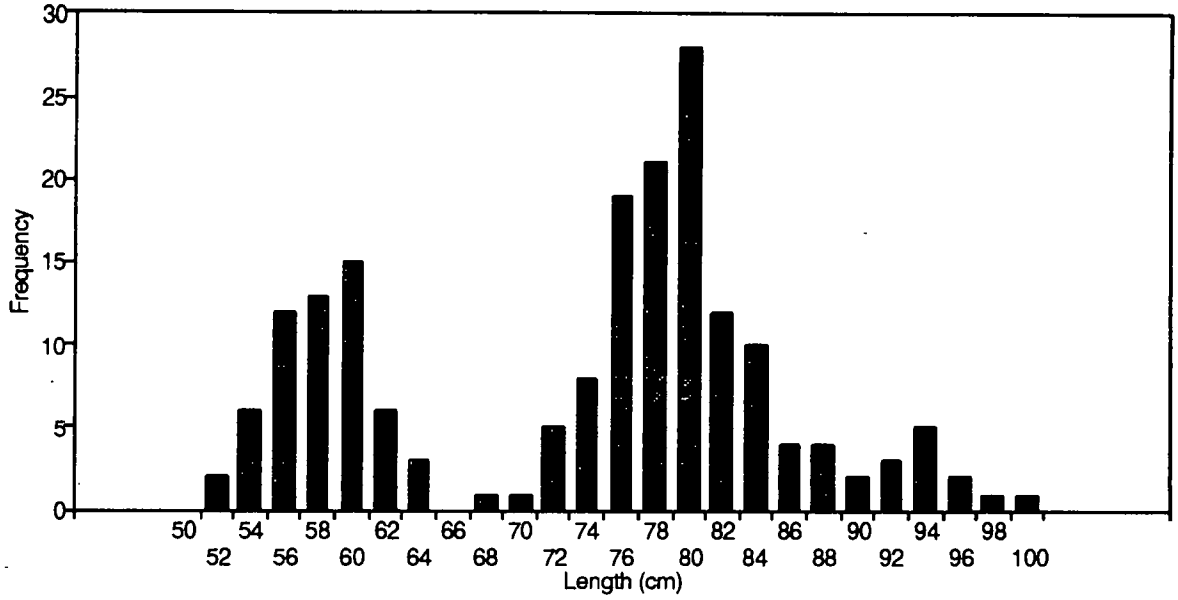


Figure 6. Length frequency of salmon caught in Bouctouche R. traps, 1994.

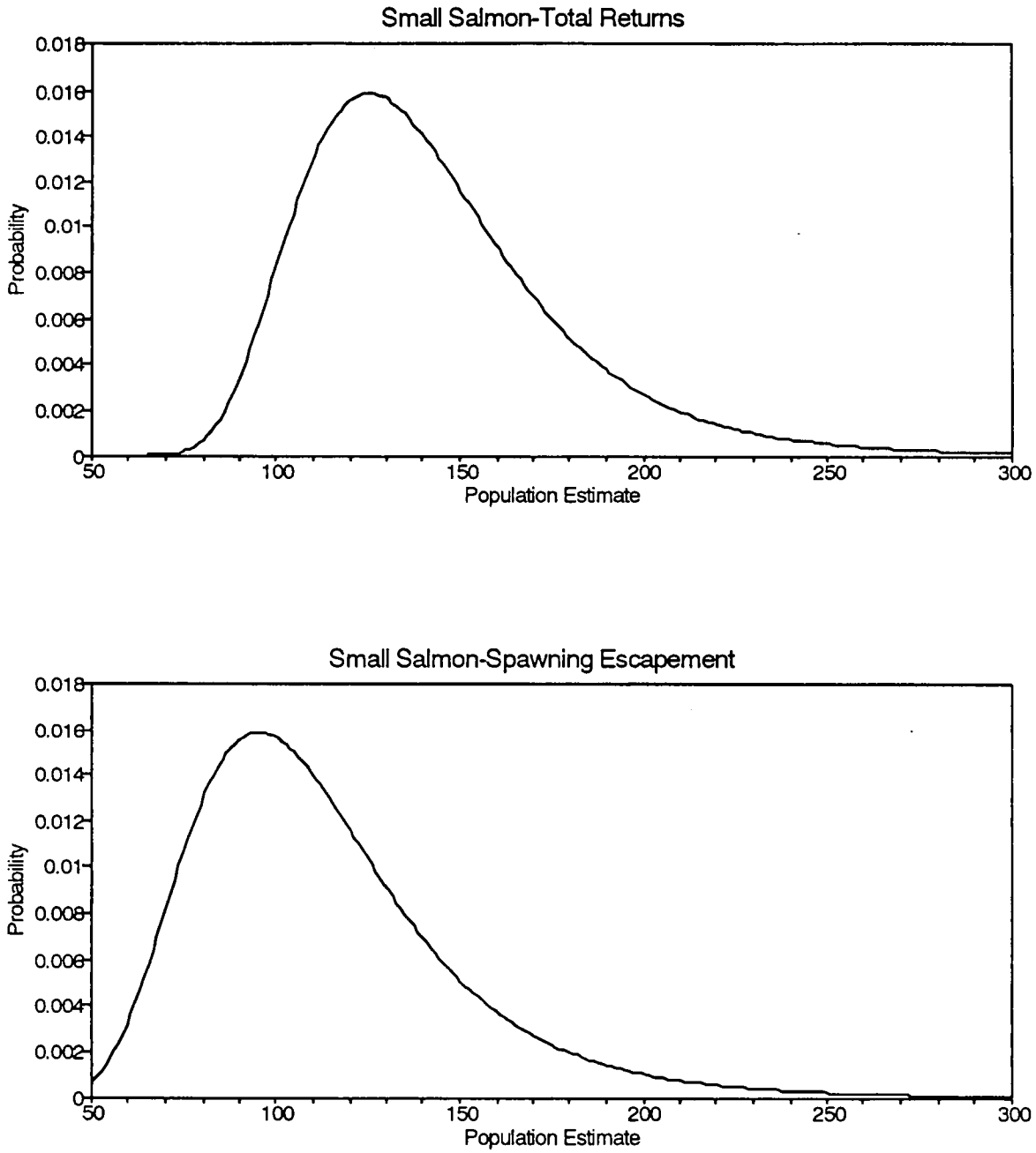
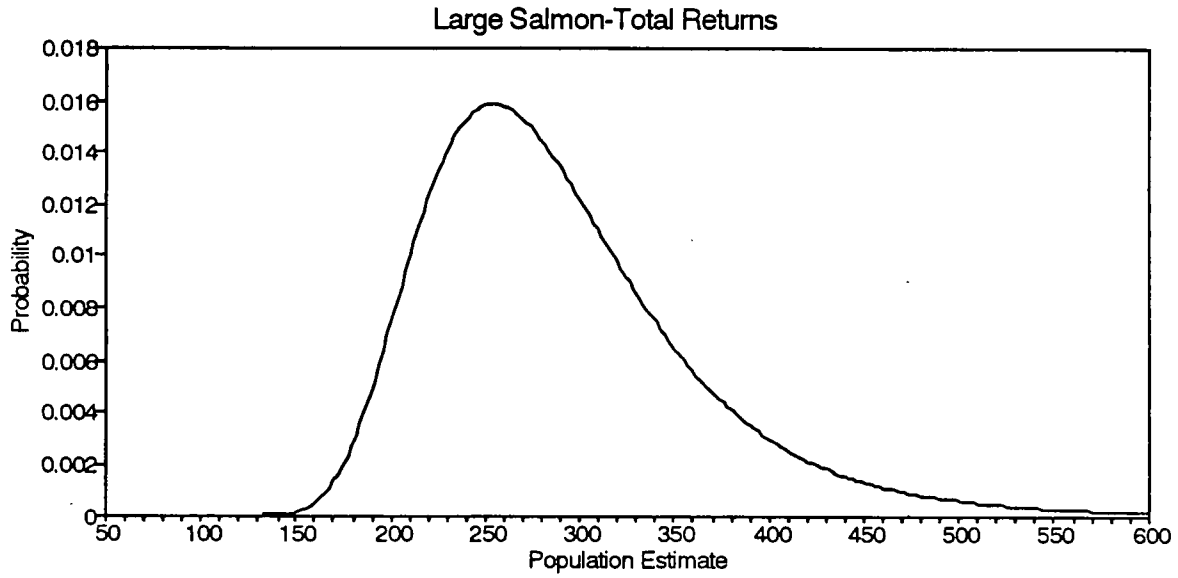


Figure 7. Small salmon total returns and spawning escapement for the Bouctouche River in 1994.



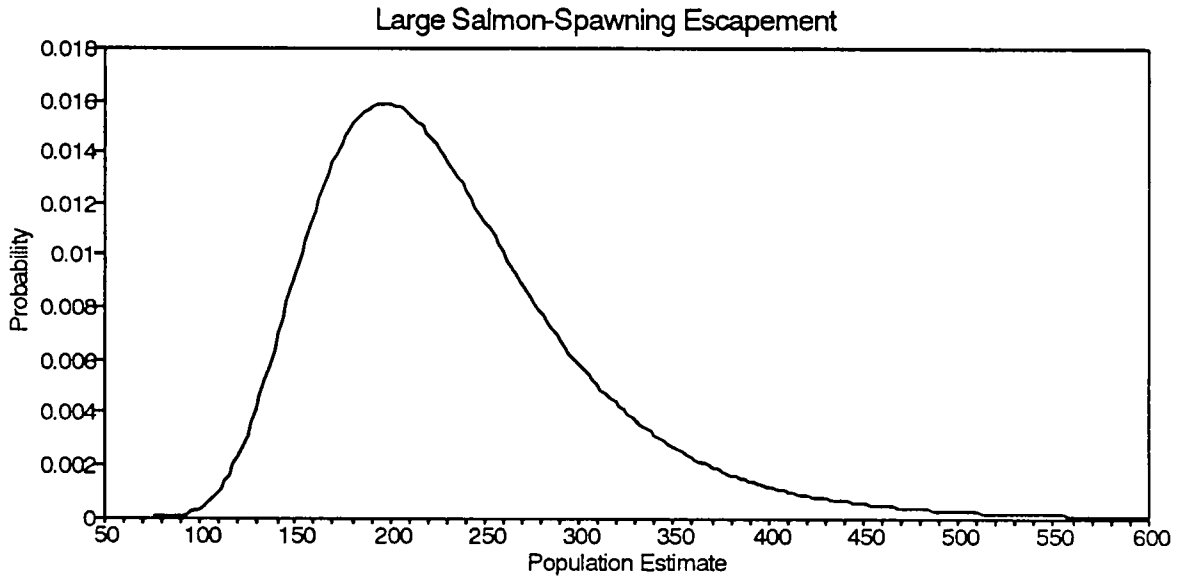


Figure 8. Large salmon total returns and spawning escapement for the Bouctouche River in 1994.

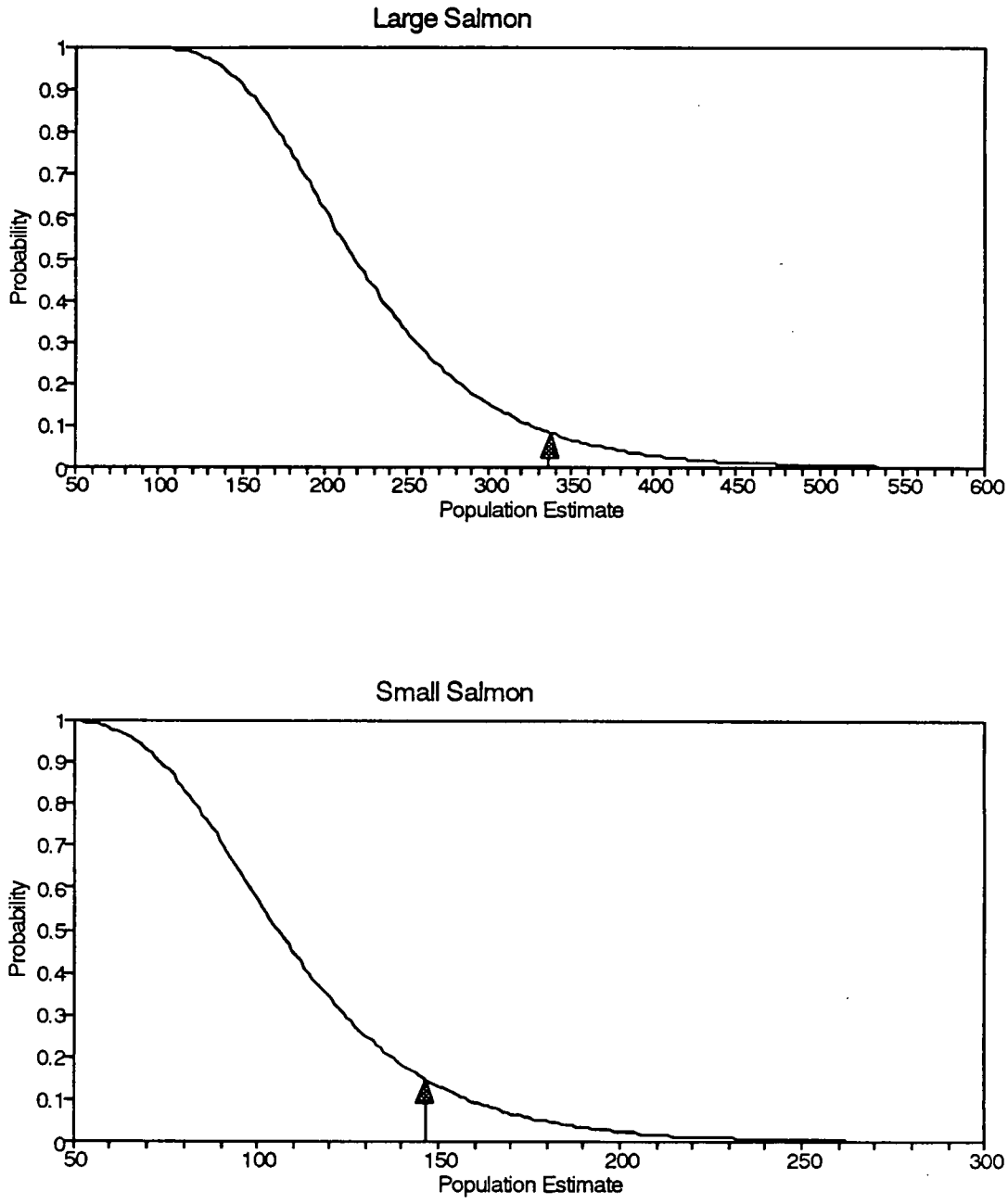


Figure 9. Probability of achieving target spawning escapements for large (337) and small (147) salmon for the Bouctouche River in 1994.

Appendix 1. By-catch data provided by Southeast Anglers Assoc.

Gaspareau Fishing By-Catch, 1994. - Bouctouche River

Date	# of traps fished	SPECIES		
		Gaspareau	Trout	Other
06/01	3	32	1	87 bass; 30 flounder; 12 tomcod; 2 smelt; 31 hareng
06/08	4	TNTC	2	22 bass; 20 flounder; 25 tomcod; 2 smelt; 2 hareng; 2 stingray
06/09	3	TNTC	1	21 bass; 1 eel; 8 flounder; 3 smelt; 5 hareng; 1 stingray
06/10	4	TNTC	2	12 bass; 1 eel; 3 lamprey; 9 flounder; 1 hareng; 1 chad
06/13	4	TNTC	1	10 bass; 1 lamprey; 10 flounder; 3 tomcod; 5 hareng; 4 stringray; 1 chad
06/14	7	TNTC	2	12 bass; 1 perch; 3 eel; 1 lamprey; 53 flounder; 1 tomcod; 4 stingray
06/23	3	TNTC	1	4 bass; 7 flounder; 3 tomcod; 2 hareng; 2 stingray; 1 chad

TNTC = Too numerous to count.
Water Temperature - 14°C - 18°C
Trout Size - 24 cm (9 1/2 inches) - 35 cm (13 3/4 inches)
A total of 7 sites were monitored (See attached for site location).

1 - 34 cm (13.3 inches)
2 - 23 cm (9.1 inches)
3 - 27 cm (10.6 inches)

Appendix 1. (cont'd)

Smelt Fishing By-Catch, 1994 - Bouctouche River

Date	# of Traps Fished	# of Days Fished	Smelt	Other
11/04	5	2	TNTC	TNTC tomcod; 120 flounder; 1 crab

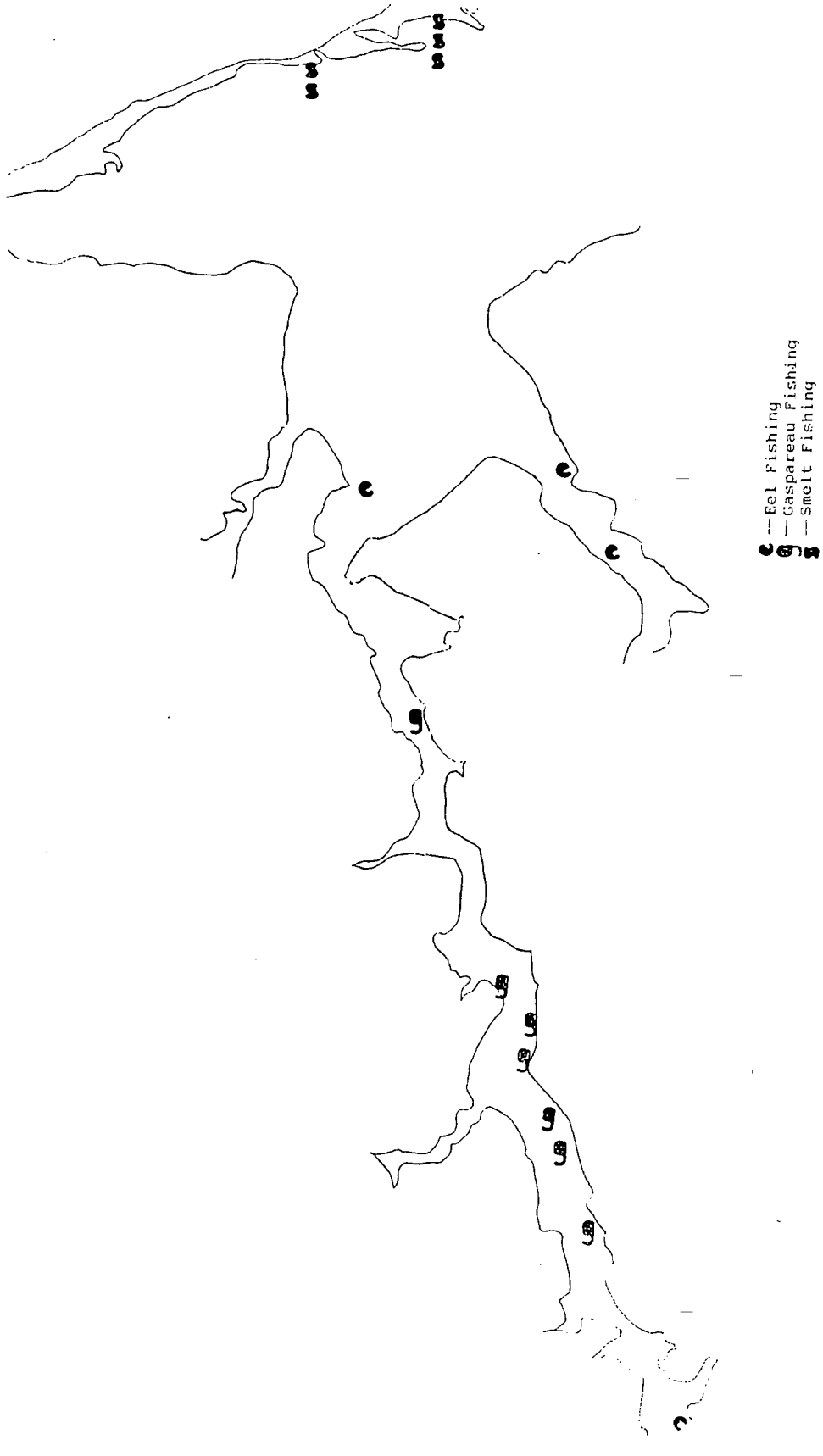
Eel Fishing By-Catch, 1994 - Little Bouctouche River

Date	# of Traps Fished	# of Days Fished	Eel	Other
09/28	2	1	11	None
10/06	3	1	9	None
10/15	2	2	7	None
10/25	1	2	3	1 trout (4 inches); 2 smelt; 12 tomcod; 1 flounder; 12 barbel

All by-catch was recorded.

Appendix 1. (cont'd)

Location of gear sampled for by-catch in the Bouctouche estuary, 1994.



Appendix 2.

NOTES FROM THE BOUCTOUCHE SALMON SCIENCE WORKSHOP

Band Office, Bouctouche First Nation
0930-1230 Hours, Thursday, 8 December 1994

Chairperson:	
Ross Claytor	DFO, Science, Moncton
Notes:	
John Peppar	DFO, Science, Moncton
Attendees:	
Gary Sanipass	Bouctouche First Nation
Sheldon Simon	c/o Bouctouche First Nation
Joanne LeBlanc	Southeastern Anglers Association
Gilles Cormier	Southeastern Anglers Association
Bernard Albert	Kent County Anglers Association
Tom Pettigrew	NB DNRE, Hampton
Tim Lutzac	DFO, Science, Moncton
Gary Atkinson	DFO, Science, Moncton

1. Introduction.

Ross Claytor provided overviews of the stock assessment procedure, objectives of the meeting, and an outline of the proposed agenda.

In outlining the stock assessment procedure, he noted that the ultimate objective of the science workshop in this process was to produce an assessment document for the Bouctouche River salmon stock.

2. Bouctouche Salmon Stock Status.

Ross noted that presentations and points of discussion at this workshop would follow a format similar to last year, and be arranged under the following basic components:

1. **Fisheries** -- landings and description.
2. **Target** -- spawning escapement.
3. **Data** -- mark-recapture, logbook summaries, age determinations, juvenile surveys, spawner surveys and hatchery stockings.
4. **Status** -- methods, comparison of results, target met, trends and ecology.
5. **Prospects** -- short-term, long-term and in-season.
6. **Summary** -- improvements.

Appendix 2. (cont'd)

Gary Atkinson presented information on the status of the Bouctouche River salmon stock in 1994 (including: trap net catches, tags applied, recapture information from the counting fence, First Nation harvests, estimates of poaching).

Points of Discussion

Landings

- Estimates of the unrecorded harvests in the estuary were outlined (First Nation food fishery removals from the trap catches, bycatches from other gear, estimate of poaching). The SE Anglers Association noted that no salmon bycatch was recorded or observed in their survey of the gaspereau fisheries.
- Some members noted that poaching may have been higher this year, due to the low water conditions, which provided easier access to salmon for illegal angling and other activities (jigging, use of pitch forks, etc.). Some personal experiences were related. However, no charges were laid or apprehensions made in 1994.
- DNRE angling data to be provided when analyses completed (logbook and FISHSYS data).

Target

- Procedure to calculate the spawning requirement was outlined.
- The spawning requirement calculations now incorporate the value for the rearing area of the system as provided by DNRE. This value is based on a survey of system conducted in 1989; Tom Pettigrew provided an overview of how the survey was conducted, and the coverage obtained, etc. A description and map are to be included in the assessment document.
- The target for the Bouctouche River is higher than previously calculated, with the use of this rearing area value.

Data

- Results from the mark-recapture experiment were used to estimate total returns, and subsequent escapement to the system. Based on these estimates, 63% and 84% of large and small salmon targets, respectively, were met for the Bouctouche River in 1994.

Appendix 2. (cont'd)

- Some concerns were raised re: the estimates made from the mark-recapture experiment. These included: the traps were located far away from the Bouctouche River itself; all the tagging was done in the estuary, and therefore, tags were available to other streams entering the estuary, and not just the Bouctouche River. The traps are likely estimating returns to the whole estuarial system, not just the Bouctouche River system.
- Electrofishing and reconnaisance survey data were provided by the SE Anglers Association; a description of methods and coverage, and results obtained, will be included in the assessment document.

Status

- Both tidal traps should be installed at the same time, if they are still to be used in assessing the Bouctouche salmon stock.
- A permanent counting fence should be employed, and be placed somewhere between the forks and tidehead, from early-August onwards.
- Electrofishing should be done to help validate spawning success from the previous year.
- A redd count survey could be added to the program, to assist in interpreting spawning success.
- The monitoring of kelts should be considered. Are the fall vs spring movements relatively constant from year to year? Or do they vary with environmental conditions?

Projects For Next Year:

- Install and operate both traps in the estuary.
- Install and operate a counting fence in an upriver location.
- Conduct electrofishing; expand program.
