DFO Atlantic Fisheries
Research Document 95/12

MPO Pêches de l'Atlantique
Document de recherche 95/12

STATUS OF ATLANTIC SALMON IN THE TABUSINTAC RIVER IN 1994

by

G. Atkinson and W. Hooper[1]
Department of Fisheries & Oceans
Science Branch, Gulf Region
P.O. Box 5030
Moncton, New Brunswick, E1C 9B6

[1] New Brunswick Department of Natural Resources and Energy
Fish and Wildlife Branch
P.O. Box 6000, Fredericton, N.B. E3B 5H1

TABLE OF CONTENTS

ABSTRACT

Angling statistics provided by the New Brunswick Department of Natural Resources and Energy were only preliminary at the time of publication, but indicate that catches were about 50% of the previous five year mean. A telephone creel survey on public water also indicated that the catch was down in 1994, and reported catch on leased water was down by 92% for large and 75% for small salmon. Poor catches were attributed to low water conditions. First Nation catches were 62% less than 1993 for small salmon and 56% less for large salmon. A mark-recapture experiment was the basis for estimating returns: tags were applied at estuary trapnets and recovered from small salmon in the angling fishery upriver. Small salmon total returns in 1994 were 1067 with a spawning escapement of 844, which was 258% above spawning target escapement. Large salmon total returns were 1414 with a spawning escapement of 1214, which was 234% above the spawning target. Spawning indices based on the kelt and bright angling fisheries indicate that spawning requirements were met in most years on the Tabusintac River. Further, a current juvenile survey shows near optimum densities at most sites. These data indicate that the Atlantic salmon stock in the Tabusintac River is stable at a level which meets or exceeds the established spawning target. At present, sufficient information on stock status has not been accumulated to forecast returns or harvestable surplus.

RÉSUMÉ

Quoique les statistiques de pêche à la ligne fournies par le ministère des Ressources naturelles et de l'Énergie du Nouveau-Brunswick n'étaient que préliminaires au moment de la publication du présent rapport, elles révèlent que les prises s'établissaient à environ 50 % de la moyenne des cinq années antérieures. Il ressort d'une enquête téléphonique sur les prises dans les eaux publiques réalisée auprès des pêcheurs que ces prises étaient également en baisse en 1994 et que les prises déclarées provenant de pêcheries à bail étaient en recul de 92 % en ce qui concerne le grand saumon et de 75 % pour ce qui est du petit saumon. Ces faibles prises ont été attribuées au bas niveau de l'eau. Les prises de grand et de petit saumon par les premières nations étaient inférieures de 56 % et 62 % respectivement à celles de 1993. 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 par les pêcheurs à la ligne en amont. Pour ce qui est des petits saumons, 1 067 d'entre eux ont remonté la rivière en 1994; l'échappée de reproducteurs était de 844 petits saumons, soit 258 % de la cible. En ce qui concerne les grands saumons, ils ont été 1 414 à remonter la rivière et ont produit une échappée de 1 214 reproducteurs, soit 234 % de la cible. D'après les indices de frai fondés sur la pêche à la ligne des saumons de montée et des saumons vides, les besoins de reproducteurs ont été comblés la plupart des années dans la rivière Tabusintac. De plus, une étude récente des juvéniles dénote des densités optimales dans la plupart des endroits. Ces données révèlent que le stock de saumon de l'Atlantique dans la Tabusintac reste à un niveau égal ou supérieur à la cible de reproducteurs. À l'heure actuelle, on n'a pas accumulé suffisamment de renseignements sur l'état du stock pour prévoir les montaisons, ou le surplus exploitable.

SUMMARY SHEET
Salmon in the Tabusintac River

	1989	1990	1991	1992	1993	1994	MIN	MAX	MEAN
Angling									
Large (Released)	165	80	84	488	191	102	25	488	202
Small (Rel + Kept)	184	95	154	330	258	110	15	330	204
First Nation Harvest									
Large				270	101	44			
Small				126	79	30			
Spawning escapement									
Large					667	1214			
Small					348	844			
Total returns									
Large					799	1414			
Small					599	1067			
Percent target met									
Large					179	334			
Small					174	358			
% egg target met									
					184	345			

Angling catch min and max are for years 1969 to 1993; mean is for 1989 to 1993.

Description of Fishery: Salmon are angled in leased and public water. Catch data for 1994 are preliminary. Burnt Church First Nation harvests salmon by gillnet and trapnet.

Target: 1.978 million eggs; 363 large salmon, 236 small salmon.

Fishery Data: None.

Research Data: Tags applied at trapnets and recaptured in the angling fishery were the basis for the assessment. Biological data was collected on the stock and juvenile densities were determined at 18 sites.

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

Assessment Results: Spawning escapement was met for large and small salmon in 1994. Total egg deposition was 345% of target.

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

Future Prospects: No forecast is available.

Management Considerations: There is a harvestable surplus of salmon from the Tabusintac River. The amount of this surplus is not predictable.

Introduction

The Tabusintac River is situated in Northumberland County, New Brunswick and flows east into the Gulf of St. Lawrence in Statistical District 70, Salmon Fishing Area (SFA) 16 (Figs.1, 2). A spawning run of Atlantic salmon enters the river during September and October, and is exploited for food by Burnt Church First Nation, and for recreational angling on both public and leased water. Information on stock status is required to manage salmon harvest on the Tabusintac River, ensuring that adequate spawning escapement occurs on a sustainable basis. Under the Aboriginal Fisheries Strategy (AFS) 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 Burnt Church First Nation, under the AFS. Tags were applied at First Nation trapnets, and recovered in the recreational fishery. This document provides an assessment of the stock for 1994 using the same methodology.

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 Tabusintac, were used to update spawning requirements. Results of an electroseining survey during the summer of 1994 were provided by DNRE.

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

Burnt Church First Nation harvests salmon from the Tabusintac River during September and October, by gillnets and trapnets. Prior to 1992 numbers taken were not recorded. Since then First Nation fishery guardians have provided harvest statistics from gillnets, and food fish removed from trapnets have been recorded in logbooks (Table 1). In 1994, a total of 44 large (63 cm or more) and 30 small (less than 63 cm) salmon were harvested for food.

Recreational

Recreational angling is carried out on a short stretch of public water at the head of tide, and above this the Tabusintac Club has leased rights to angling (Crown Angling Lease 13). Kelts are angled only on the public section of the river, from April 15 to May 15. The bright salmon season extends from July 1 to October 31, but almost all angling for bright salmon occurs from late September to the end of the season. Prior to 1984 , 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 fish, and this regulation remains in effect to date.

Recreational catch estimates are available from two sources. Department of Fisheries and Oceans (DFO) fishery officers estimate harvest from observations of average number of rods/day and average catch during routine patrols on public water, combined with kept fish reported in leased water. The New Brunswick Department of Natural Resources and Energy (DNRE) estimates catch (harvested and released) based on a random survey of approximately 15 percent of license purchasers. Since the proportion of anglers observed by DFO is not known, released fish are not estimated, and catch and effort are inconsistent compared with DNRE estimates (Atkinson and Claytor 1994), only the latter are reported (Table 2). Final estimates for 1994 have not yet been compiled, but preliminary figures indicate that catches in both the kelt and bright fisheries were only about half the previous five year mean, despite increased effort in both fisheries. A component of the DNRE estimates, the catch statistics provided by the Tabusintac Club as a condition of their lease on the river, are shown in Table 3. Club catch in 1994 was 5 large and 16 small salmon, all of which were released.The catch of large salmon was down 92%, and of small salmon 75%. Although most of the river is under lease, the catch on leased water usually represents about 30% of total for the river because the effort here is regulated, and on public water it is not. Low water in 1994 resulted in abnormally low catches on the lease.

A telephone survey was conducted of 24 anglers who frequently fish the public water on the Tabusintac. This list was accumulated by initially calling anglers who had returned tags in previous years and asking them for the names of others who fished on the river. These additional individuals were contacted and the process was repeated until no new names were obtained. Results indicated that 75 large salmon and 27 small salmon were caught and released, and 70 small salmon were harvested. Participants in the Tabusintac Salmon Science Workshop felt these figures represented a high proportion of the angling on the public section of the river (Appendix 1). These catches are about half of the DNRE previous five year mean, suggesting that for 1994, angling catch in public

water was down. For the purpose of this assessment, angling removals were calculated from the above figures by applying a hook and release mortality of 3% (Currie 1985) to all releases. The result was added to the total reported killed for the public and leased water combined, to give angling harvest estimates of 2 large and 71 small salmon.

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. It is estimated that 154 large and 122 small salmon were taken in the estuary. Poaching in the freshwater portion of the river was considered negligible, as fish remained in the tideway until late October due to low water. No apprehensions or seizures of gear were made by fishery officers.

Summary of Removals

Location	Large	Small
First Nation Food	44	30
Angling	2	71
Unrecorded (estuary)	154	122
Total	200	223

Target

The required number of spawners for the Tabusintac was calculated using Method 2 as 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 Tabusintac was stocked with salmon of Miramichi origin each year from 1961 to 1971, and 1973 (Mark Hambrook, DFO, pers. comm.). 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 = 824,000 square meters (DNRE, Table 4.)

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

Sex ratio : Large salmon; 80% female, 20% male

: Small salmon; 8% female, 92% male

Eggs/large salmon : 6816 x 0.80 = 5453

Eggs/small salmon : 2908 x 0.08 = 233

Eggs required : 2.4 eggs/sq m x 824,000 sq m

= 1.978 million eggs

Large salmon required : 1,978,000 / 5453 = 363

Large salmon females : 363 x 0.80 = 290

Large salmon males : 363 - 290 = 73

Small salmon males required to balance sex ratio : 290 - 73 = 217

Small salmon required (total) : 217 / 0.92 = 236

Research Data

Mark/Recapture

In 1994, in cooperation with Burnt Church First Nation, two trapnets were operated in the tidal portion of the river to mark and recapture salmon. The lower (mark trap) was situated one half km upstream (west) of the Route 460 bridge at Cains Point, the upper (recapture trap) approximately two km upstream from the mark trap (Fig.3). Both traps were adjacent to Reserve land. 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. Downstream-angled leaders of approximately 30 m (100') and 60 m (200'), one extending to shore, were 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 4 to November 9, and the upper from August 22 to November 9. The first salmon was

caught on September 8, the last on October 29. Small salmon numbers peaked on October 5 (Week 40) and large salmon on October 18 (Week 42). This was one week later for small salmon and three for large, compared to 1993. Combined catch for both traps was 196 large and 127 small salmon; of these, 179 large and 119 small salmon were tagged and released (Table 5,6, Fig.4).

The principal source of tag recaptures was from salmon angled on public water upstream of both trapnets: sampled catch size was determined from a telephone survey of 24 anglers as described above. Four participants in the survey caught no fish; eight of the twenty who were successful caught tagged fish. A small number of tags were recaptured at the upper trap and by anglers on the Crown Lease, but these were not used to estimate returns. Sampled catch size was obtained from trap logbooks, and catch records provided by the Tabusintac Club. Tagging effort and recaptures may be summarized as follows:

Tags Applied

Location	Large	Small
Marking trap	87	59
Recapture trap	92	60
Total	179	119

Tags Recaptured

	Large		Small	
Location	Recap	Catch	Recap	Catch
Recapture trap	0	101	2	70
Public angling	6	73	12	94
Club (lease) angling	2	5	1	16

Biological Characteristics

Modal length of small salmon caught in 1994 was 56 cm and of large salmon 78 cm (Fig. 5). The mean length of small salmon was 56cm; 10% were females and 90% males. The mean length of large salmon was 79cm; 84% were females and 16% males. Large salmon comprised 60% of the catch in 1994, small salmon making up 40%. The 1994 sample has not yet been aged. Of known-age fish in 1993, 2+, 3+, and 4+ smolts respectively comprised 27%, 71% and 2% of the sample. Of the multi-sea-winter (MSW) component, 20% were repeat spawners and 78% of these were females. None of the repeat spawners

had previously spawned as a one-sea-winter (1SW) fish, or grilse (Table 7).

Electroseining

In the summer of 1994 an electroseining survey by DNRE determined densities and percent habitat saturation (PHS) of juvenile salmonids at 18 sites on the Tabusintac and its major tributaries (Table 8, Fig.3). 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. Sites in the upper reaches of the system (10,11,12,16,17,19) have few or no salmon and are dominated by brook trout, probably because the streams are small and shallow and most salmon cannot access them in normal years. Most of the other sites in the lower sections of the river have near or above optimum PHS values, suggesting that spawning escapement in recent years has been adequate.

Estimation of Stock Parameters

The recapture sample that was considered the most reliable to use in calculating returns was the catch of small salmon on the public section of the river, as determined from the telephone survey and summarized in the tagging effort above. None of the tags obtained in the survey had been previously reported. Angling returns from the lease and recaptures from the upper trap were too few, and reported catch of large salmon is unreliable because many are released at a distance by breaking the line, and the presence of tags cannot be determined. Therefore the tags applied at the traps were pooled and returns of small salmon past the marking sites was calculated from angled tags on public water 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 traps, were used. A tag loss rate was not factored into the calculations because it was negligible over the short period (one month) during which all tags were recaptured. Since not all untagged angled small salmon were harvested, the total sample size was adjusted by applying the angling exploitation rate in this fishery (0.10) to the released component to calculate probable number of recaptures. This adjusted catch is the one reported above. Total small salmon returns to the system were obtained by adding known or estimated removals to this point, then the corresponding large salmon returns were computed using the average (1993-94) observed large:small ratio at the traps. The large salmon proportion of trapnet captures was 53% for 1993 and 60% for 1994. The mean value was 57%. 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 numbers are 1067 for small salmon and 1414 for large salmon (Figs.6,7). This represents nearly a twofold increase over 1993 returns. Subtracting removals, the spawning escapement for small salmon was 844 and for large salmon 1214 (Figs.6,7). These estimates are 358% of target for small and 334% for large salmon. The probability of exceeding target spawning escapement for both small and large salmon was greater than 99% in 1994 (Fig.8). Total egg deposition (large + small salmon) was 345% of target.

Examination of kelt catches as well as angling exploitation rate and catch in the bright fishery, relative to target spawning requirements, has indicated that these have been met in most years since 1984 (Atkinson and Claytor 1994). This is supported by the electroseining results discussed above. The salmon stock on the Tabusintac appears to be stable at a level in excess of that required to meet spawning targets.

Sources of uncertainty

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.

The habitat area used to calculate target egg deposition in 1994 has been revised based on data from the most recent DNRE survey and has resulted in a higher target than formerly employed. Results from a recent electroseining survey (DNRE) indicate that not all of this area may be used by or accessible to salmon. That is, the egg target may be unrealistically high. More electroseining over a number of years would indicate the extent to which salmon use the system.

Fecundity values used to derive target spawners from target egg deposition have been assumed from similar stocks (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, and possibly by guardians from the First Nation gillnet fishery.

Although DNRE angling statistics are currently the most accurate for the system, they are not available in time to incorporate them into the assessments. A larger sample size and

earlier collation of data would provide more reliable and timely information to determine current season catch and effort trends, and to compare kelt returns with the previous year's spawning escapement. DNRE biologists say that changes are being implemented to address this need in the future.

Kelt catch as an indication of spawning the previous year could be misleading since most are released. The proportion of recaptures in the total catch would be unknown. Perhaps the catch could be adjusted using angling exploitation rate to calculate the probable number of recaptures.

Ecological Considerations

Discharge in the Tabusintac system was abnormally low until the beginning of November. Fish concentrated at the head of tide but did not ascend further until after this time. Consequently, angling was reported to be much worse than average in the leased water until the close of the season. Rain at the end of October raised water levels to near normal and salmon were able to reach the spawning areas.

Forecast/Prospects

The relationship between small salmon angling catch in one year and large salmon angling catch the following year was examined to determine if it could be used to provide a pre-season forecast for the Tabusintac River (Atkinson and Claytor 1994). There was no relationship. As a result, forecasting by this means is not possible. 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. Available data suggest that the stock of Atlantic salmon in the Tabusintac is increasing.

Management Considerations

The 1994 spawning target for the Tabusintac was met and exceeded by 245%. Since the target in 1993 was also exceeded (by 84%), the status of the stock indicates that there is a harvestable surplus. However, given the current inability to forecast returns on either a long or short term basis, the extent of the surplus is not predictable in future years.

Research Recommendations

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

2. Continue and extend electroseining surveys, to determine the extent of salmon spawning and juvenile densities.

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

4. Examine ways to adjust kelt catch for recaptures, to provide a more accurate index of spawning escapement the previous year.

5. Continue the telephone creel survey, to obtain tag returns and evaluate DNRE catch estimates.

Acknowledgements

We thank Burnt Church First Nation for operating the trapnets on the Tabusintac River (1994) and the collection of relevant data; the New Brunswick Department of Natural Resources and Energy for providing habitat survey and electroseining data; and attendees of the Salmon Science Workshop for their input and suggestions (Append.1).

Literature Cited

Atkinson, G. and R.R. Claytor. 1994. Status of Atlantic salmon in the Tabusintac River in 1993. DFO Atlantic Fisheries Research Document 94/5.

Currie, B. 1985. North Pole Stream hook and release program. Proceedings of the 1985 Northeast Salmon Workshop, Moncton, NB.

Elson, P.F. 1975. Atlantic salmon rivers. Smolt production and optimal spawning - an overview of natural production. Int. Atlantic Sal. Found. Spec. Public. Ser. 6:96-119.

Gazey, W.J., and M.J. Staley. 1986. Population estimation from mark-recapture experiments using a sequential Bayes algorithm. Ecology 67: 941-951.

Grant, J.W.A., and D.L. Kramer. 1990. Territory size as a predictor of the upper limit to population density of juvenile salmonids in streams. Can. J. Fish. Aquat. Sci. 47: 1724-1737.

Randall, R.G. 1985. Spawning potential and spawning requirements of Atlantic salmon in the Miramichi River, New Brunswick. CAFSAC Res. Doc. 85/68.

Zippin, C. 1958. The removal method of population estimation. J. Wildl. Man. 22(1): 82-90.

Table 1. Burnt Church First Nation harvest of Atlantic salmon in the Tabusintac River.

Year	Gillnets		Trapnets		Total	
	Large	Small	Large	Small	Large	Small
1992	270	126	0	0	270	126
1993	64	48	37	31	101	79
1994	28	22	16	8	44	30

Table 2. Atlantic salmon angling catch on the Tabusintac River, 1969-1993. Estimates provided by DNRE. Large salmon kelts could be retained in 1984, after which all large salmon angling was catch-and-release. Dashes (-) indicate insufficient data to calculate; 1994 data are preliminary.

	Kelts							
	Small							
Year	Kept	Rel.	Total	Large	TOTAL	% Large	Rods	CPUE
1969	150	-	150	49	199	24.6	-	-
1970	111	-	111	97	208	46.6	-	-
1971	114	-	114	57	171	33.3	-	-
1972	29	-	29	26	55	47.3	-	-
1973	20	-	20	154	174	88.5	-	-
1974	34	-	34	113	147	76.9	-	-
1975	49	-	49	90	139	64.7	-	-
1976	36	-	36	7	43	16.3	314	0.137
1977	-	-	-	52	52	100.0	-	-
1978	53	-	53	89	142	62.7	320	0.444
1979	7	-	7	-	7	-	190	0.037
1980	38	-	38	15	53	28.3	69	0.768
1981	74	-	74	89	163	54.6	133	1.226
1982	531	-	531	135	666	20.3	684	0.974
1983	160	-	160	60	220	27.3	640	0.344
1984	331	106	437	234	671	34.9	-	-
1985	-	-	-	38	38	100.0	77	0.494
1986	51	-	51	60	111	54.1	-	-
1987	62	196	258	545	803	67.9	304	2.641
1988	132	139	271	187	458	40.8	140	3.271
1989	96	17	113	140	253	55.3	116	2.181
1990	112	-	112	269	381	70.6	1059	0.360
1991	109	36	145	87	232	37.5	494	0.470
1992	125	98	223	467	690	67.7	686	1.006
1993	151	216	367	384	751	51.1	909	0.826
1994	18	115	133	141	274	31.5	1121	0.244
Mean(89-93)	119	-	192	269	461	58.4	653	0.969
94 +/- Mean	-85%	-	-31%	-48%	-41%	-46%	72%	-75%

	Total Bright Salmon							
	Small							
Year	Kept	Rel.	Total	Large	TOTAL	% Large	Rods	CPUE
1969	126	-	126	133	259	51.4	-	-
1970	46	-	46	25	71	35.2	-	-
1971	24	-	24	31	55	56.4	-	-
1972	67	-	67	244	311	78.5	-	-
1973	107	-	107	114	221	51.6	-	-
1974	28	-	28	68	96	70.8	-	-
1975	115	-	115	49	164	29.9	-	-
1976	228	-	228	43	271	15.9	773	0.351
1977	-	-	-	-	-	-	84	-
1978	101	-	101	66	167	39.5	1634	0.102
1979	15	-	15	-	15	-	366	0.041
1980	115	-	115	69	184	37.5	804	0.229
1981	166	-	166	14	180	7.8	627	0.287
1982	261	-	261	153	414	37.0	1359	0.305
1983	90	-	90	140	230	60.9	1540	0.149
1984	123	-	123	68	191	35.6	1118	0.171
1985	19	-	19	38	57	66.7	229	0.249
1986	129	-	129	301	430	70.0	1147	0.375
1987	116	-	116	258	374	69.0	598	0.625
1988	77	103	180	359	539	66.6	437	1.233
1989	122	62	184	165	349	47.3	531	0.657
1990	64	31	95	80	175	45.7	740	0.236
1991	70	84	154	84	238	35.3	847	0.281
1992	227	103	330	488	818	59.7	1663	0.492
1993	102	156	258	191	449	42.5	1087	0.413
1994	17	93	110	102	212	48.1	1183	0.179
Mean(89-93)	117	87	204	202	406	49.7	974	0.416
94 +/- Mean	-85%	7%	-46%	-49%	-48%	-3%	21%	-57%

Table 2. (Continued)

Early Bright Salmon

Year	Small Kept	Small Rel.	Small Total	Large	TOTAL	% Large	Rods	CPUE
1969	38	-	38	37	75	49.3	-	-
1970	7	-	7	-	7	-	-	-
1971	-	-	-	-	-	-	-	-
1972	18	-	18	12	30	40.0	-	-
1973	-	-	-	7	7	100.0	-	-
1974	-	-	-	23	23	100.0	-	-
1975	-	-	-	-	-	-	-	-
1976	150	-	150	14	164	8.5	-	-
1977	-	-	-	-	-	-	-	-
1978	-	-	-	24	24	100.0	-	-
1979	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-
1981	92	-	92	7	99	7.1	-	-
1982	144	-	144	90	234	38.5	-	-
1983	50	-	50	50	100	50.0	-	-
1984	13	-	-	13	-	-	-	-
1985	-	-	-	-	-	-	-	-
1986	60	-	-	241	-	-	-	-
1987	-	-	-	17	-	-	-	-
1988	7	-	-	78	-	-	-	-
1989	-	-	-	52	-	-	-	-
1990	24	-	-	24	-	-	-	-
1991	14	-	-	14	-	-	266	0.105
1992	36	36	-	63	135	46.7	724	0.186
1993	23	22	45	82	127	64.6	315	0.403
1994	0	0	0	45	45	100	317	0.142
Mean(89-93)	-	-	-	47	-	-	-	-
94 +/- Mean	-	-	-	-4%	-	-	-	-

Late Bright Salmon

Year	Small Kept	Small Rel.	Small Total	Large	TOTAL	% Large	Rods	CPUE
1969	88	-	88	96	184	52.2	-	-
1970	39	-	39	25	64	39.1	-	-
1971	24	-	24	31	55	56.4	-	-
1972	49	-	49	232	281	82.6	-	-
1973	107	-	107	107	214	50.0	-	-
1974	28	-	28	45	73	61.6	-	-
1975	115	-	115	49	164	29.9	-	-
1976	78	-	78	29	107	27.1	-	-
1977	-	-	-	-	-	-	-	-
1978	101	-	101	42	143	29.4	-	-
1979	15	-	15	-	15	-	-	-
1980	115	-	115	69	184	37.5	-	-
1981	74	-	74	7	81	8.6	-	-
1982	117	-	117	63	180	35.0	-	-
1983	40	-	40	90	130	69.2	-	-
1984	110	-	-	55	-	-	-	-
1985	19	-	-	38	-	-	-	-
1986	69	-	-	60	-	-	-	-
1987	116	-	-	241	-	-	-	-
1988	70	-	-	281	-	-	-	-
1989	122	-	-	113	-	-	-	-
1990	40	-	-	56	-	-	-	-
1991	56	-	-	70	-	-	581	-
1992	191	67	258	425	683	62.2	939	0.727
1993	79	134	213	109	322	33.9	772	0.417
1994	17	93	110	57	167	34.1	866	0.193
Mean(89-93)	98	-	-	155	-	-	-	-
94 +/- Mean	-	-	-	-63%	-	-	-	-

Table 3. Bright Atlantic salmon catch and effort for Tabusintac Club (Crown Angling Lease 13), 1981-1994.

	Early Bright Salmon							
	Small							
Year	Kept	Rel.	Total	Large	TOTAL	% Large	Rods	CPUE
1981	15	55	70	1	71	1.4	210	0.338
1982	2	16	18	15	33	45.5	300	0.110
1983	0	1	1	0	1	0.0	327	0.003
1984	0	0	0	2	2	100.0	200	0.010
1985	0	4	4	0	4	0.0	-	-
1986	1	6	7	7	14	50.0	240	0.058
1987	0	8	8	0	8	0.0	264	0.030
1988	1	17	18	0	18	0.0	256	0.070
1989	0	0	0	0	0	-	235	0.000
1990	0	3	3	0	3	0.0	275	0.011
1991	0	0	0	0	0	-	285	0.000
1992	0	10	10	0	10	0.0	270	0.037
1993	0	2	2	0	2	0.0	280	0.007
1994	na	na	na	na	na	na	na	na
Mean(89-93)	0	3	3	0	3	-	269	0.011
94 +/- Mean	-	-	-	-	-	-	-	-

	Late Bright Salmon							
	Small							
Year	Kept	Rel.	Total	Large	TOTAL	% Large	Rods	CPUE
1981	9	45	54	29	83	34.9	235	0.353
1982	15	45	60	63	123	51.2	242	0.508
1983	0	5	5	7	12	58.3	275	0.044
1984	2	4	6	5	11	45.5	85	0.129
1985	3	3	6	3	9	33.3	-	-
1986	23	34	57	84	141	59.6	233	0.605
1987	36	44	80	103	183	56.3	256	0.715
1988	20	50	70	92	162	56.8	198	0.818
1989	13	31	44	35	79	44.3	170	0.465
1990	17	69	86	48	134	35.8	245	0.547
1991	14	52	66	92	158	58.2	270	0.585
1992	8	45	53	46	99	46.5	260	0.381
1993	8	67	75	76	151	50.3	240	0.629
1994	0	16	16	5	21	23.8	na	na
Mean(89-93)	12	53	65	59	124	47	237	0.521
94 +/- Mean	-100%	-70%	-75%	-92%	-83%	-49%	-	-

	Total Bright Salmon								
	Small								% DNRE
Year	Kept	Rel.	Total	Large	TOTAL	% Large	Rods	CPUE	Catch
1981	24	100	124	30	154	19.5	445	0.346	86
1982	17	61	78	78	156	50.0	542	0.288	38
1983	0	6	6	7	13	53.8	602	0.022	6
1984	2	4	6	7	13	53.8	285	0.046	7
1985	3	7	10	3	13	23.1	0	-	23
1986	24	40	64	91	155	58.7	473	0.328	29
1987	36	52	88	103	191	53.9	520	0.367	51
1988	21	67	88	92	180	51.1	454	0.396	33
1989	13	31	44	35	79	44.3	405	0.195	23
1990	17	72	89	48	137	35.0	520	0.263	78
1991	14	52	66	92	158	58.2	555	0.285	66
1992	8	55	63	46	109	42.2	530	0.206	13
1993	8	69	77	76	153	49.7	520	0.294	38
1994	0	16	16	5	21	23.8	na	na	na
Mean(89-93)	15	55	70	63	133	47.2	493	0.269	31
94 +/- Mean	-100%	-71%	-77%	-92%	-84%	-50%	-	-	-

Table 4. Rearing area of the Tabusintac River and tributaries. Unsurveyed estimate represents half the distance from the nearest surveyed section upstream to the headwaters. Data provided by DNRE.

	Area in sq. m		
Stream	Surveyed	Estimated Unsurveyed	Total
Tabusintac (Main)	605933	4400	610333
Big Eskedelloc R.	61350	14400	75750
North Brook	10909	10200	21109
Middle Brook	990	5200	6190
Pisiguit Brook	8908	9300	18208
Big Hole Brook	92704	-	92704
Total	780794	43500	824294

Table 5. Catches of large and small salmon at Tabusintac R. traps, 1994, by day and standard week.

Date MoDa	Mark Large	Mark Small	Recap Large	Recap Small	Both Large	Both Small
822	-	-	0	0	0	0
823	-	-	0	0	0	0
824	-	-	0	0	0	0
825	-	-	0	0	0	0
826	-	-	0	0	0	0
827	-	-	0	0	0	0
828	-	-	0	0	0	0
829	-	-	0	0	0	0
830	-	-	0	0	0	0
831	-	-	0	0	0	0
901	-	-	0	0	0	0
902	-	-	0	0	0	0
903	-	-	0	0	0	0
904	0	0	0	0	0	0
905	0	0	0	0	0	0
906	0	0	0	0	0	0
907	0	0	0	0	0	0
908	3	4	5	5	8	9
909	3	1	0	0	3	1
910	1	0	0	0	1	0
911	0	0	0	0	0	0
912	0	0	1	0	1	0
913	2	5	2	2	4	7
914	1	1	4	3	5	4
915	0	0	3	2	3	2
916	1	4	0	0	1	4
917	0	0	0	0	0	0
918	0	0	0	0	0	0
919	0	0	0	0	0	0
920	0	0	1	1	1	1
921	0	0	0	0	0	0
922	0	0	0	0	0	0
923	1	1	0	0	1	1
924	0	0	0	0	0	0
925	0	0	0	0	0	0
926	0	0	0	0	0	0
927	0	0	0	0	0	0
928	0	0	0	0	0	0
929	0	0	0	0	0	0
930	0	0	0	0	0	0
1001	8	9	3	1	11	10
1002	0	0	5	8	5	8
1003	0	0	5	2	5	2
1004	0	0	2	4	2	4
1005	5	2	7	10	12	12
1006	8	4	5	6	13	10
1007	2	4	5	4	7	8
1008	4	1	2	2	6	3
1009	0	0	0	0	0	0
1010	0	0	0	0	0	0
1011	0	0	0	0	0	0
1012	2	5	4	2	6	7
1013	1	3	1	0	2	3
1014	0	0	3	3	3	3
1015	4	0	6	0	10	0
1016	0	5	10	3	10	8
1017	4	3	8	2	12	5
1018	9	1	7	1	16	2
1019	7	2	2	2	9	4
1020	6	1	0	0	6	1
1021	10	1	0	2	10	3
1022	0	0	0	0	0	0
1023	0	0	0	0	0	0
1024	8	1	2	1	10	2
1025	1	0	4	1	5	1
1026	4	1	2	1	6	2
1027	0	0	0	0	0	0
1028	0	0	0	0	0	0
1029	0	0	2	0	2	0
1030	0	0	0	0	0	0
1031	0	0	0	0	0	0
1101	0	0	0	0	0	0
1102	0	0	0	0	0	0
1103	0	0	0	0	0	0
1104	0	0	0	0	0	0
1105	0	0	0	0	0	0
1106	0	0	0	0	0	0
1107	0	0	0	0	0	0
1108	0	0	0	0	0	0
1109	0	0	0	0	0	0

Std. Week	Mark Large	Mark Small	Recap Large	Recap Small	Both Large	Both Small
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	6	5	5	5	11	10
37	5	10	10	7	15	17
38	1	1	1	1	2	2
39	0	0	0	0	0	0
40	23	19	32	35	55	54
41	7	9	10	7	17	16
42	40	13	33	10	73	23
43	13	2	8	3	21	5
44	0	0	2	0	2	0
45	0	0	0	0	0	0

Cumulative Total

Std. Week	Mark Large	Mark Small	Recap Large	Recap Small	Both Large	Both Small
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	6	5	5	5	11	10
37	11	15	15	12	26	27
38	12	16	16	13	28	29
39	12	16	16	13	28	29
40	35	35	48	48	83	83
41	42	44	58	55	100	99
42	82	57	91	65	173	122
43	95	59	99	68	194	127
44	95	59	101	68	196	127
45	95	59	101	68	196	127

Table 6. 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 7 . Age distribution of Tabusintac 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	3.2	4.2	4.2.3	5.2.4	Total
2	23	37	0	6	1	4	71
3	101	74	2	8	1	5	191
4	5	0	0	0	0	0	5
?	5	5	0	0	0	0	10
Total	134	116	2	14	2	9	277

Table 8. Densities and Percent Habitat Saturation (PHS) of juvenile salmonids in the Tabusintac River, 1994.

LOCATION		HABITAT TYPE (m^2)			SALMON DENSITY (per 100m^2)				BROOK TROUT (per 100m^2)		
RIVER	SITE NO.	RIFFLE	RUN	POOL	0+	1+	2+	PHS	0+	1+	PHS
Tabusintac (High Landing)	1	522	---	---	41.84	3.88	0.58	7.7	---	---	---
Tabusintac (High Landing)	2	---	---	632.1	31.19	9.04	3.56	17.6	---	---	---
Tabusintac (Big Hole)	3	760	---	---	111.78	78.71	8.41	59.3	---	---	---
Tabusintac (Big Hole)	4	450	75	---	91.93	14.43	4.15	24.1	---	---	---
Tabusintac (Above Crossing)	5	230	229	---	238.48	53.45	6.11	63.2	---	---	---
Tabusintac (Below Crossing)	6	---	506	---	11.32	5.50	1.72	5.9	---	---	---
Tabusintac (Home Camp)	7	---	253	---	64.08	15.07	28.83	49.2	---	---	---
Tabusintac (Kenny Camp)	8	---	290	---	3.50	20.73	3.76	17.0	---	---	---
Tabusintac (Above Curve Pool)	9	---	233.7	---	57.35	45.92	18.27	54.8	---	---	---
Tabusintac (Above Bridge-Bathurst Highway)	10	---	387	---	1.56	1.04	0.56	1.30	18.04	7.92	9.0
Tabusintac (Below Forks- N. Branch and Tabusintac R.)	11				---	---	---	---	8.30	5.95	6.9
Tabusintac (Above Forks)	12	---	100	---	---	---	---	---	59.23	14.50	36.7
Tabusintac (Below Bathurst Hwy)	13	---	341	---	16.30	---	1.77	3.9	---	---	---
Tabusintac (Above Curve Pool)	14	---	148.2	---	66.97	48.78	12.94	52.4	---	---	---
Tabusintac (Kenny Camp)	15	---	434	---	.69	5.58	2.77	7.7	1.45	---	---
Big Eskedelloc (Below Bathurst Highway)	16	196	---	---	---	---	---	---	32.61	21.75	33.1
Big Eskedelloc (Above Bathurst Highway)	17	183.6			---	---	---	---	9.70	22.06	24.3
Pisiguit Brk (Dunbar Gulch)	19	252	---	---	---	---	---	---	3.01	5.31	5.4

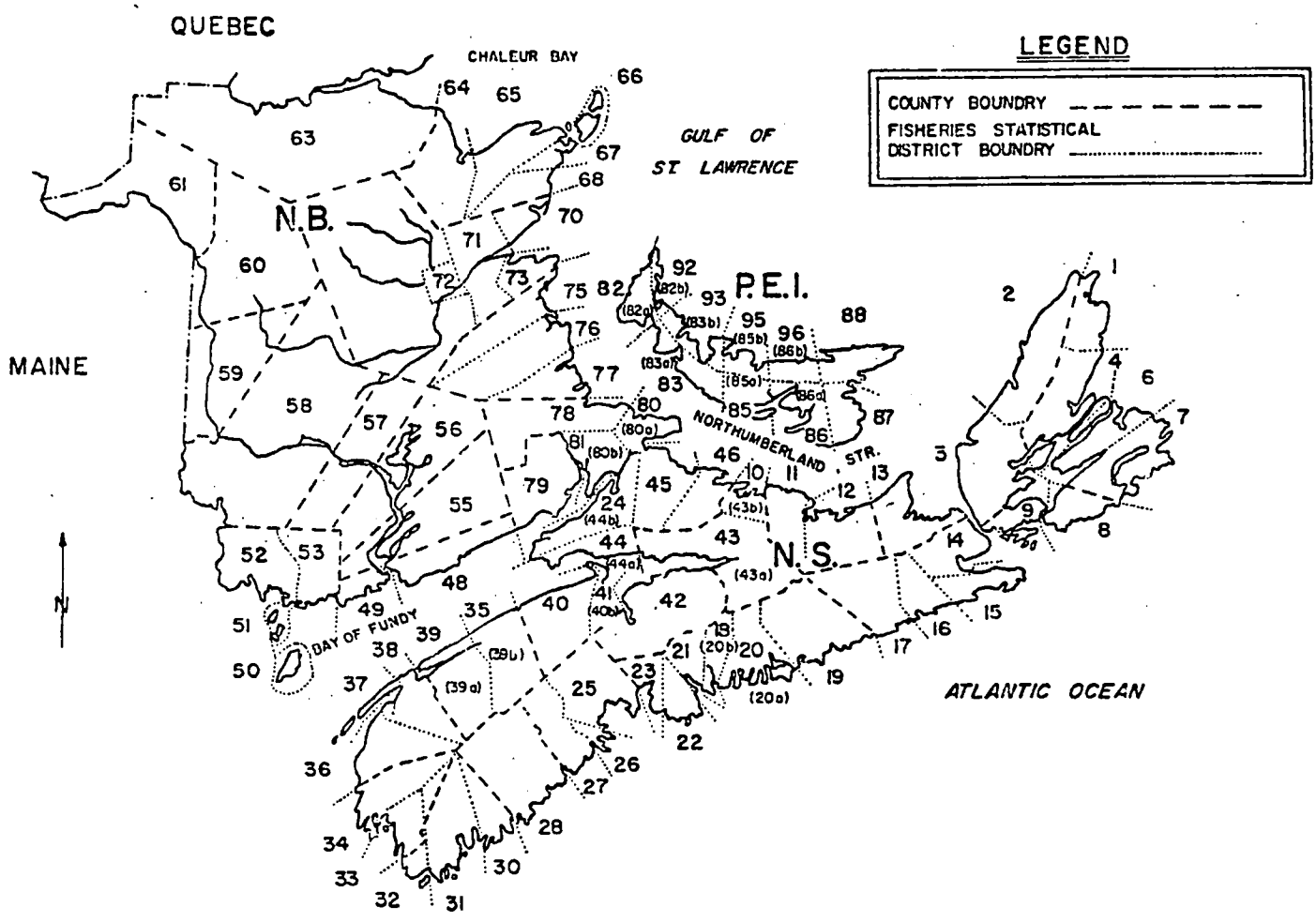


Figure 1. Fisheries Statistical Districts in Atlantic Canada.

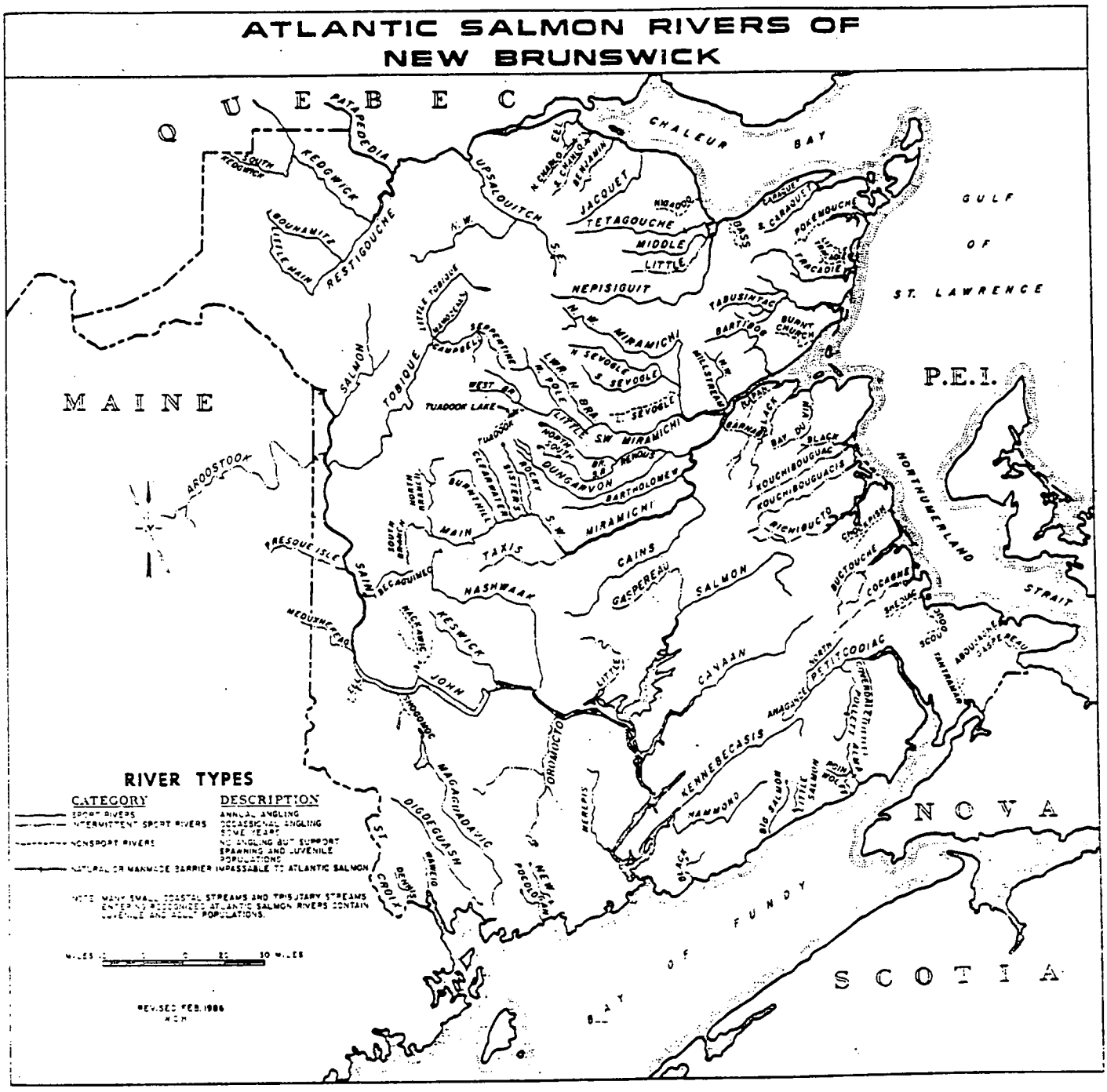


Figure 2. Atlantic salmon angling rivers of New Brunswick. (Map prepared by DNRE)

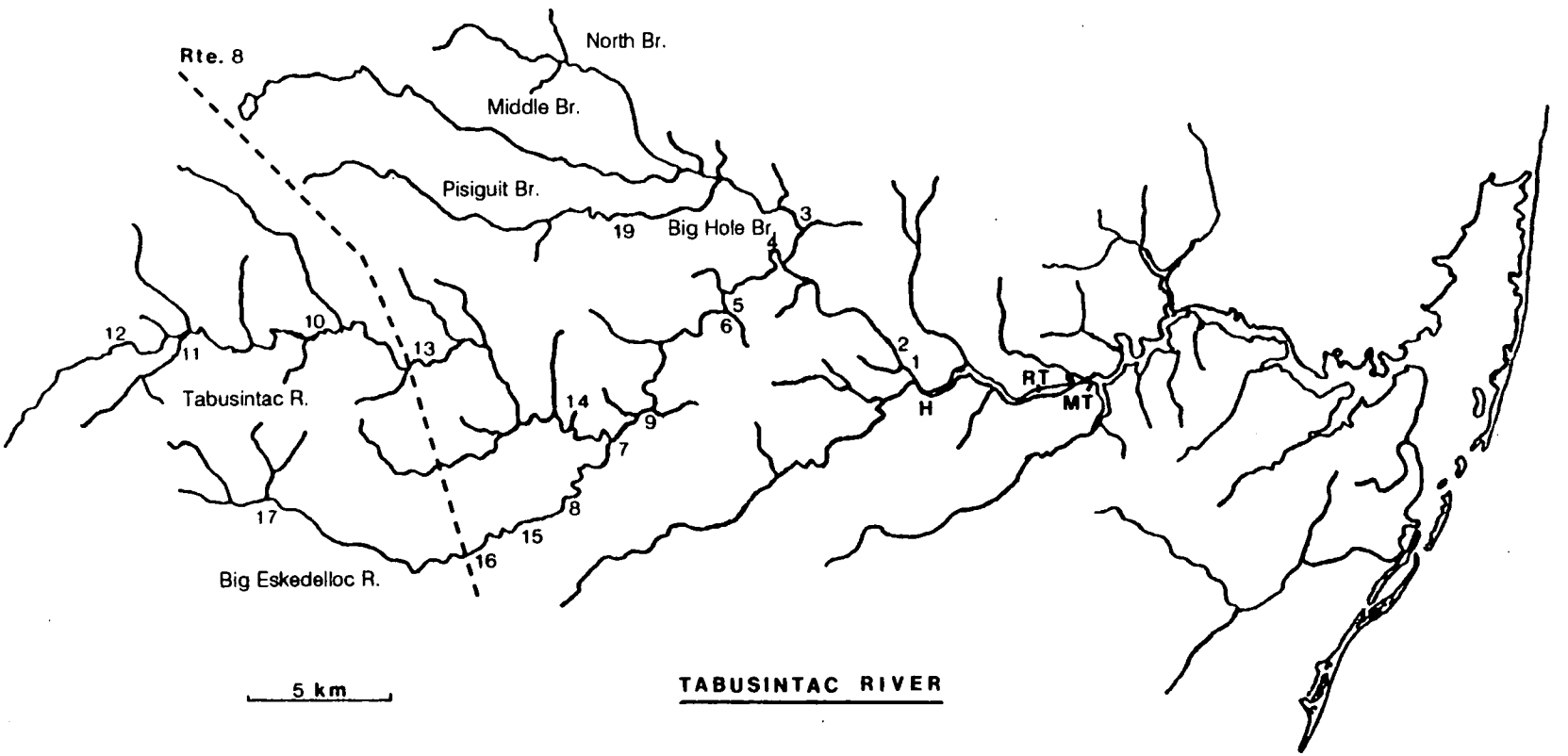


Figure 3. Location of traps and electroseining sites on the Tabusintac River, 1994. **MT** - Mark Trap; **RT** - Recapture Trap; **H** - Head of tide. Numbers indicate electroseining sites.

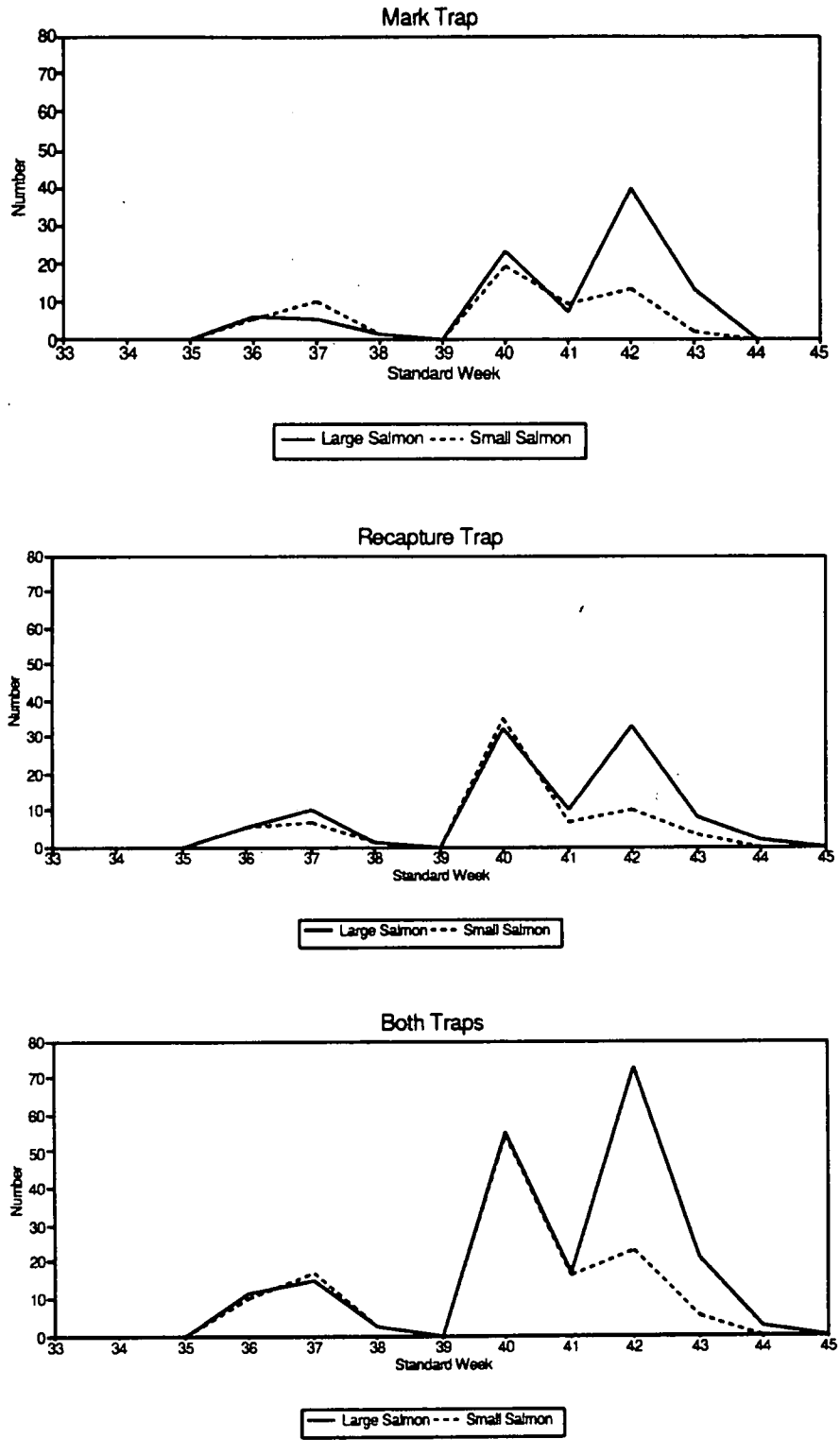


Figure 4 . Catches by standard week at Tabusintac R. traps, 1994.
Mark trap operated from week 36 - 45; Recapture trap from 33 - 45.

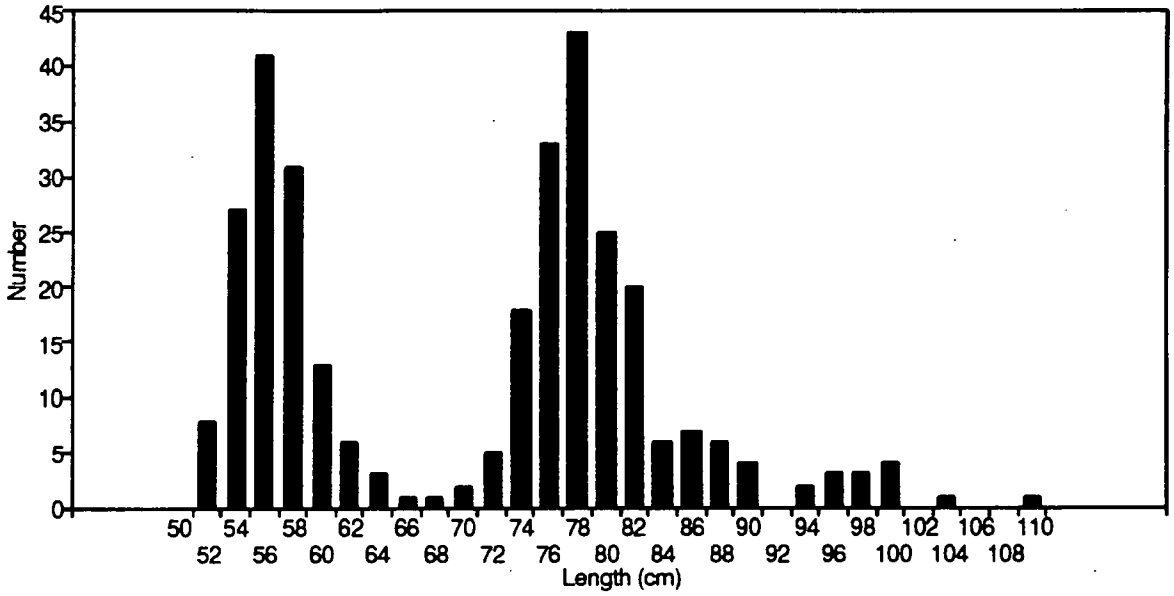


Figure 5. Length frequency of salmon caught in Tabusintac R. traps, 1994.

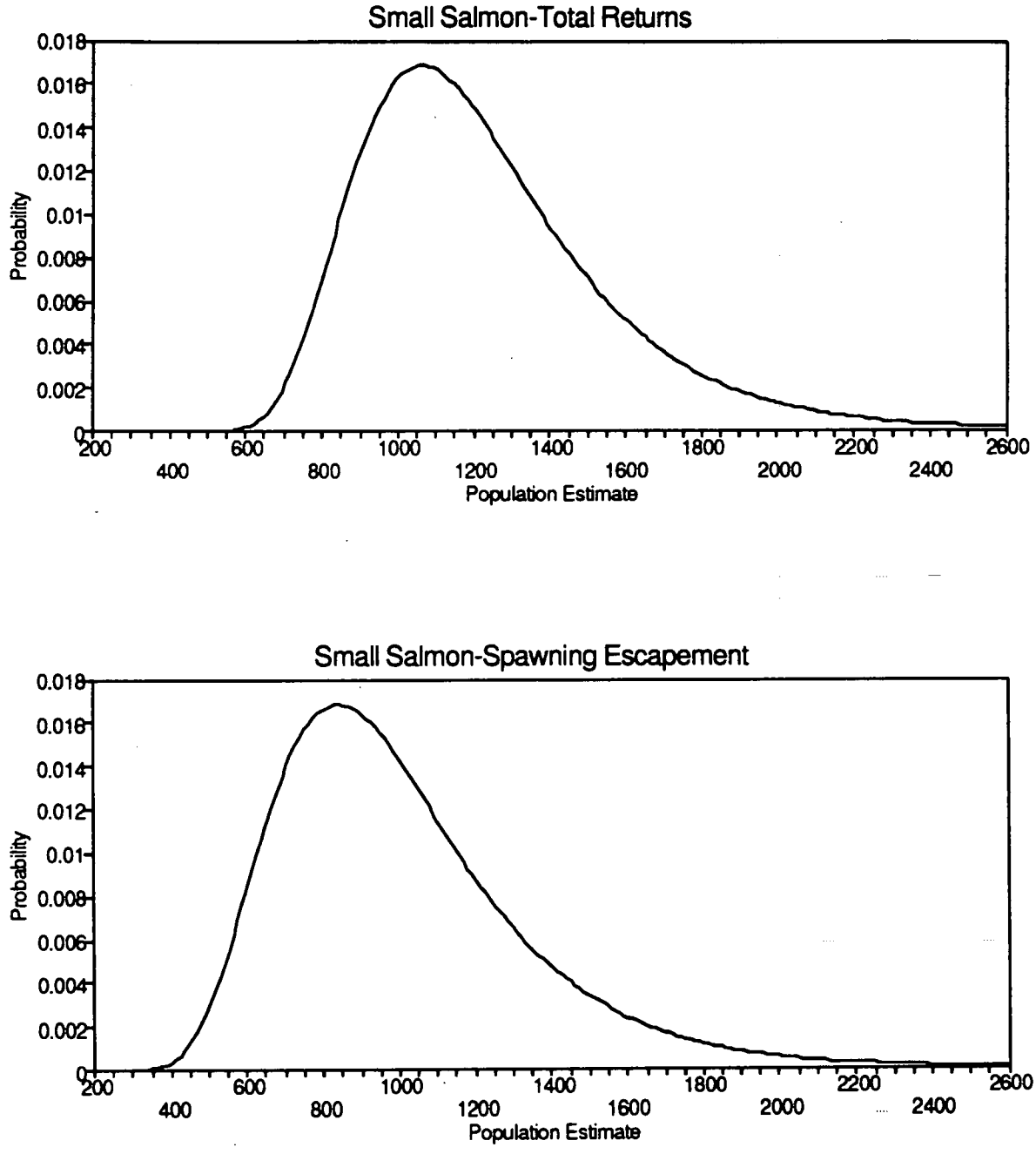
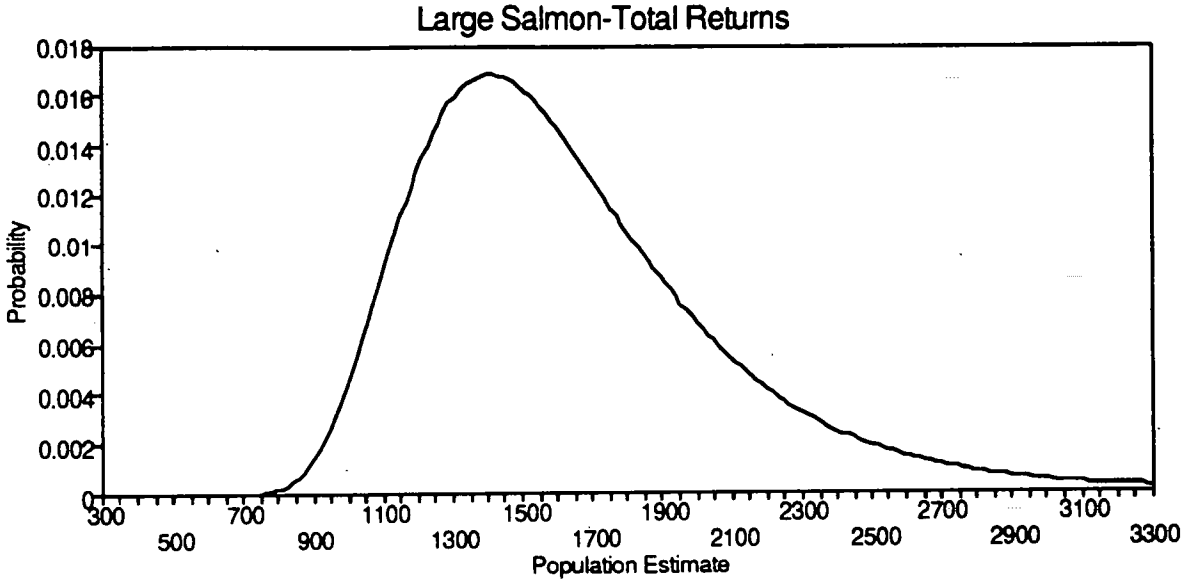


Figure 6. Small salmon total returns and spawning escapement for the Tabusintac River in 1994.



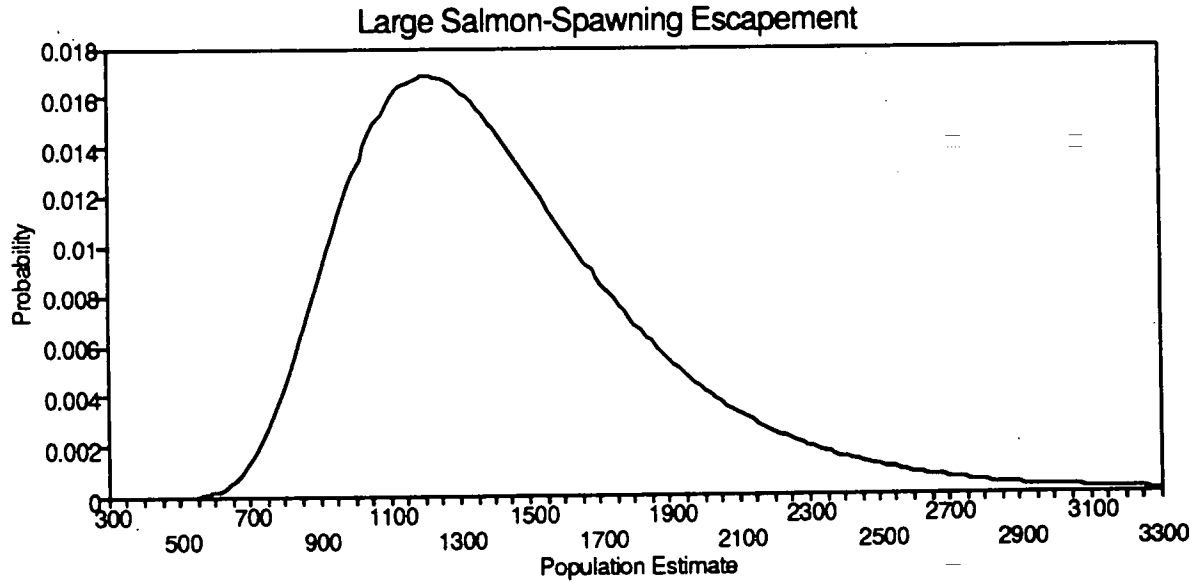


Figure 7. Large salmon total returns and spawning escapement for the Tabusintac River in 1994.

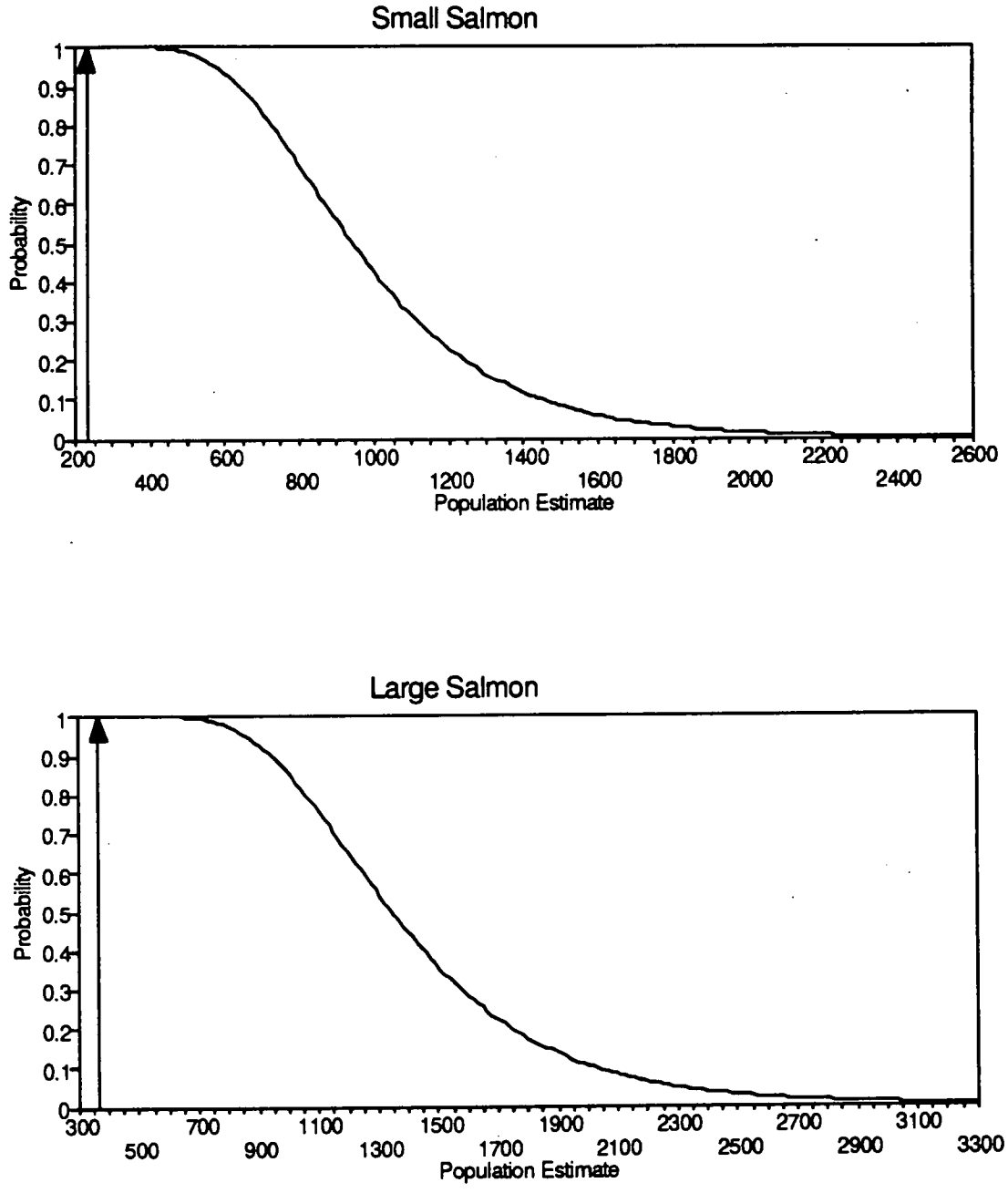


Figure 8. Probability of exceeding target spawning escapements for small (236) and large (363) salmon for the Tabusintac River in 1994.

Appendix 1.

NOTES FROM THE TABUSINTAC SALMON SCIENCE WORKSHOP

Training Centre, Burnt Church First Nation
0930-1200 Hours, Tuesday, 6 December 1994

Chairperson:

Ross Claytor	DFO, Science, Moncton

Notes:

John Peppar	DFO, Science, Moncton

Attendees:

Alex Dedam	Burnt Church First Nation
Weldon Ward	Burnt Church First Nation
Marcel Joe	Burnt Church First Nation
Ronald MacKnight	Tabusintac Fish and Game Association
Bill Hooper	NB DNRE, Fredericton
Bernie Dubee	NB DNRE, Newcastle
Tim Lutzac	DFO, Science, Moncton
Gary Atkinson	DFO, Science, Moncton

1. Introduction.

The meeting was opened with remarks and a prayer offering by Alex Dedam. Alex noted that although the Burnt Church First Nation had yet to sign a fisheries agreement with DFO, it was important that dialogue not stop. We must all continue, as interested parties, to work towards good functional partnerships and linkages in our interests and efforts.

Ross Claytor provided an overview of the objectives of the meeting, and an outline of the proposed agenda (attached). He noted some of the comments made in the summary sheet in last year's Tabusintac River salmon assessment document, particularly:

- a mark-recapture experiment was the basis for estimating population size and spawning escapement;
- tag recoveries from angling fisheries were used as the recapture sites;
- angling catches in the kelt fishery as reported, and the bright fishery after adjusting for exploitation rate, were used as indices of spawning escapement in past years;
- spawning targets for small and large salmon were met in 1993, and in most years since 1984.

Appendix 1. (cont'd)

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 Tabusintac River salmon stock.

2. Tabusintac 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.

Gary Atkinson presented information on the status of the Tabusintac River salmon stock in 1994 (including: DFO-provided catches on the River, Tabusintac Club data, gillnet landings, biological characteristics re: target, aging data, etc.).

Points of Discussion

Landings

- The angling catch statistics (kelts and brights) provided by DFO (C&P) are all **harvests** of small salmon; no estimates were made of large salmon hooked and released.
- Members agreed, that low water conditions were experienced during the angling season this year.
- Angling catches were down against the previous 5-year mean catch for the River; considerably (62%) on bright fish, and only slightly (1%) on kelts.
- Angling effort was down (20%) against the mean for brights, and up slightly (4%) for kelts.
- The Tabusintac Club catch was down considerably from the previous 5-year mean catches for small salmon (76%) and large salmon (94%).
- DNRE angling catch data may be available by mid-February/95.
- Numbers of salmon taken by the gillnet fishery operated by the Burnt Church First Nation were provided by Weldon Ward.

Appendix 1. (cont'd)

Target

- DFO's target for the Tabusintac River was estimated utilizing the value of 2.4 eggs per square metre and an estimate of rearing area for the system; actual data used and methodology employed to make the calculations, were shown and explained.
- DNRE questionned the value for the estimate of rearing area used by DFO in their calculations; they felt the value was too low. DNRE is to provide DFO with the field data for verification of the 'right value'.
- The verified rearing area value is to be used in the stock assessment; the spawning requirements will be updated.

Data

- Traps in the mark-recapture experiment fished throughout the entire late-run migration period (traps had been fishing for about two weeks before the first fish was caught).
- Details of the timings of catches at the traps were provided. Catches of small and large salmon peaked at the same time in both traps (week of 1-7 October for small salmon, and week of 15-21 October for large salmon).
- Escapements this year were estimated to be 2 to 2+ times (large vs small salmon) what they were last year; well over the required target (by some 400%).
- DNRE provided results from electrofishing surveys conducted throughout the river system. Their results show salmon production to be more concentrated in the lower stretches of the system; levels of fry encountered in the surveys indicate good spawning last year.
- The Burnt Church First Nation provided catch data for the gillnet fishery operated in 1994.
- Members agreed that poaching on the River this year may have been less than some other years due to the low water conditions and lack of access to some areas of the system.

Status

Status of action Items From Last Year's Meeting:

- Catch of kelts - data re: multiple recaptures: these data are still needed, and are considered important, as kelts are a good indicator of grilse spawning the previous year.
- Sport catch by week or month - to look at summer run: data are available (Club and DNRE data) for analyses.
- Quantitative criteria to substantiate poaching estimates: still to be examined; there must be some way to track if poaching activity is increasing or decreasing (utilize numbers of charges, violations, etc.).

Appendix 1. (cont'd)

- Rearing area estimates: value to be verified for this year's assessment document.
- Biological sampling of First Nation catches: still to do, and should be done.
- Historical records re: electrofishing surveys: still to do, and should be done.
- Size distributions of salmon caught - is size changing?: still to be done; Club historical catch records to be used.
- Stocking records: data available from DFO.
