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**STATUS OF ATLANTIC SALMON IN THE RICHIBUCTO RIVER, NEW BRUNSWICK  
IN 1992, 1993**

by

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<sup>1</sup>La présente série documente les bases scientifiques des évaluations des ressources halieutiques sur la côte atlantique du Canada. Elle traite des problèmes courants selon les échéanciers dictés. Les documents qu'elle contient ne doivent pas être considérés comme des énoncés définitifs sur les sujets traités, mais plutôt comme des rapports d'étape sur les études en cours.

Les Documents de recherche sont publiés dans la langue officielle utilisée dans le manuscrit envoyé au secrétariat.

**ABSTRACT**

Angling effort is small on the Richibucto River and catch estimates are not made. First Nation harvest was about 50% of 1992 values in 1993 for large salmon and about 80% of 1992 values in 1993 for small salmon. A population estimate using mark-recapture techniques indicated that spawning requirements were met for large salmon but not small salmon in 1992. In 1993, insufficient tags were placed to provide a population estimate. A qualitative assessment assuming similar efficiency in the marking trapnet in 1992 and 1993 and similar exploitation rates in the First Nation fishery indicates that spawning requirements for large and small salmon were not met in 1993. A forecast is not yet possible for the Richibucto River.

**Résumé**

Comme l'effort de pêche à la ligne dans la rivière Richibouctou est faible, il n'y a pas d'estimation des prises. En 1993, la récolte par les premières nations correspondait à environ 50 % et 80 % de celle de 1992 en ce qui concernait respectivement le grand et le petit saumon. Une estimation de la population réalisée au moyen de marquages-recaptures a révélé que les besoins de géniteurs avaient été comblés parmi les grand saumons, mais non parmi les petits en 1992. En 1993, le nombre de saumons marqués était insuffisant pour fournir une estimation de la population. Une évaluation qualitative fondée sur l'hypothèse d'une même efficacité du parc de marquage en 1992 et en 1993 ainsi que sur les mêmes taux d'exploitation par les premières nations révèle que les besoins de géniteurs n'ont été atteints ni chez les grands, ni chez les petits saumons en 1993. Il n'est pas encore possible d'établir de prévision en ce qui concerne la rivière Richibouctou.

## SUMMARY SHEET

**STOCK:** Richibucto River, SFA 16  
**TARGET:** 2.9 million eggs (575 large salmon, 309 small salmon)  
**REARING AREA:** 1,226,000 m<sup>2</sup>, 2% of SFA 16, 1% of Gulf New Brunswick

	1988	1989	1990	1991	1992	1993	MIN	MAX	MEAN
<b>First Nation Harvest</b>									
Large					452	253			
Small					61	50			
<b>Spawning escapement</b>									
Large					467				
Small					80				
<b>Total returns</b>									
Large					1119				
Small					142				
<b>% egg target met</b>					83	Below			

**Landings:** Angling effort is very low on this river and catch is not estimated. First Nation harvest was about 1/2 of 1992 values for large salmon in 1993 and about 20% lower than 1992 in 1993 for small salmon.

**Data and assessment:** A mark-recapture experiment formed the basis for population and spawning escapement estimates on the Richibucto River. The First Nation food fishery was used as the recapture site in 1992. In 1993, insufficient tags were placed to permit a population estimate. Returns and escapement in 1993 were qualitatively assessed assuming the same efficiencies of trapnets in 1993 as 1992 and similar exploitation rates in the First Nation fishery in 1992 and 1993.

**State of the stock:** Spawning escapement was met for large salmon in 1992 but not for small salmon. Large and small salmon were below requirements in 1993. This conclusion was based on the decline in trapnet catches, only about 25% as many large salmon were caught in the trapnet in 1993 compared to 1992, and declines in First Nation harvests of large salmon. Not enough fish were captured to make a mark-recapture population estimate in 1993 so a qualitative assessment was made based on changes in trapnet and First Nation harvests.

**Forecast for 1994:** A forecast is not available for 1994.

## INTRODUCTION

The purpose of this document is to provide an assessment of the Atlantic salmon stock in the Richibucto River in 1993.

The Richibucto River is situated in Kent County, New Brunswick and flows east into Northumberland strait (Statistical District 76, Salmon Fishing Area 16, Figs.1, 2). Although some salmon may enter the river in June and July, the main run is believed to occur during September and October.

Reliable estimates of angling effort and catch on this system are not available for any year. Kelts can be angled from April 15 to May 15, and bright fish from June 8 to October 31. Since 1984, all fish 63 cm and over (large salmon) have been released and the season limit for fish less than 63 cm (small salmon) was reduced from ten to eight in 1992. This regulation remained in effect in 1993. Big Cove First Nation harvests salmon by gillnet in the fall. There has been no commercial harvest in Salmon Fishing Area 16 from 1984 to 1993.

## MATERIALS AND METHODS

### Landings

Recreational catch estimates were not available for the Richibucto River.

First Nation harvest has been reported by Department of Fisheries and Oceans (DFO) fishery officers for most years since 1982. From 1992 on, Big Cove First Nation has agreed to provide harvest statistics to DFO Resource Allocation Section, in accordance with Aboriginal Fisheries Strategy agreements.

Commercial landings for Salmon Fishing Area 16 (1967-1983) are reported; the fishery was closed in 1984.

### Spawning Requirements

The required number of spawners for the Richibucto was calculated using the method (Method 2) recommended by Randall (1985) for the Miramichi River. The number of spawners required to meet egg deposition requirements was calculated presuming that 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.

Fecundity was assumed to be equivalent to Miramichi stock based on similar mean length; other biological characteristics were assumed similar to Tabusintac stock, since both are similar size rivers with probably greater stock homogeneity than large systems

such as the Miramichi. The spawning requirements were then calculated as follows:

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

Rearing area = 1,226,000 square meters (Anon 1978)

Mean length = large salmon- 79cm; small salmon- 56cm

Fecundity = large salmon- 6816 eggs; small salmon- 2908 eggs  
(Randall 1985)

Sex ratio = large salmon- 75% female; 25% male  
= small salmon- 7% female; 93% male

Eggs/large salmon = 6816 \* 0.75 = 5112

Eggs/small salmon = 2908 \* 0.07 = 204

Eggs required = 2.4 eggs/sq m \* 1,226,000 sq m  
= 2.94 million eggs

Large salmon required = 2,940,000 / 5112 = 575

Large salmon females = 575 \* 0.75 = 431

Large salmon males = 575 - 431 = 144

Small salmon males required to balance sex ratio = 431 - 144  
= 287

Small salmon required (total) = 287 / 0.93 = 309

#### **Total Returns, Spawning Escapement and Egg Deposition**

In 1993, in cooperation with Big Cove First Nation, two trapnets were operated in the tidal portion of the river to mark and recapture salmon. The lower trap was situated 11 km upstream (west) of the Route 134 bridge in Rexton, the upper trap approximately one half km beyond this, both adjacent to Reserve land. The box portion of the traps measured 12 feet wide by 60 feet long and was constructed with 2.25 inch mesh knotless nylon. A single leader of approximately 200 feet, extending from shore to a door in the middle of the long side of the box, was made from 5.5

inch mesh polypropylene. All salmon caught in the traps were marked with small blue Carlin tags attached with a single wire through the back immediately in front of the dorsal fin. In 1992, only the lower trapnet was operated. In 1993 the second trap was constructed with the intention of operating it as a recapture site, but due to installation difficulties was located too close to the first trap to make this practicable. Both traps were therefore considered as marking sites, with recaptures expected from the First Nation fishery.

Tags were readily reported in 1992 and reporting rate was assumed to be 100% from the First Nation gillnet fishery. In 1993, few tags were returned from the First Nation gillnet fishery and a population estimate based on tag returns was not possible. Catch in both years was obtained from First Nation catch reports.

An estimate of the total returns to the river in 1992 was obtained 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.

Spawning escapement was then calculated as follows:

Spawners = Total returns - Removals (First Nation, angling,  
poaching)

Egg deposition was calculated as the number of small or large salmon spawners times the eggs per small or large salmon, as calculated above.

In 1993, population size and spawning escapement was qualitatively compared to 1992 assuming that the lower trapnet efficiency was the same in both years. A second index of relative abundance to 1992 was the catch in the First Nation fishery.

### **Biological Characteristics**

Fork length of all fish trapped was measured, and scale samples were taken for ageing. Sex was determined on external features. Because of small sample size, mean length and sex ratio have been assumed similar to Tabusintac stock: fecundity has been assumed similar to Miramichi stock (Randall 1985). In future, sampling of First Nation catch is expected to provide verification of sex ratio, fecundity and length/weight relationship.

## Forecast

At present there is no reliable method of forecasting returns of Atlantic salmon to the Richibucto River.

## Other species

Brook trout, gaspereau, striped bass, flounder, eels, tomcod mackerel, smelt, suckers, skate, and white perch were caught and enumerated at the trapnets.

## RESULTS AND DISCUSSION

### Landings

Commercial landings for Salmon Fishing Area 16 (1967-1983) are presented in Table 1; since this fishery was closed in 1984 it no longer affects returns of spawning fish. Since this is the first assessment of the Richibucto River, the table is included as an historical document. First Nation harvest (1982-1993) is shown in Table 2. As of 1992, Big Cove First Nation agreed to report harvest statistics directly to DFO Resource Allocation Section in accordance with Aboriginal Fisheries Strategy agreements; previously estimates were provided by DFO fishery officers. The 1993 harvest of 50 small salmon and 253 large salmon represents an overall increase of 66% over the previous five year mean. Small salmon harvest was up 22% and large salmon harvest increased 89%. In 1993 Big Cove First Nation agreed to a maximum harvest from the Richibucto River of 125 large salmon and 425 small salmon: the large salmon harvest exceeded the allotment by 102%.

### Total Returns and Spawning Escapement

In 1992, the lower trap was operated from September 3 to November 8. Daily catches of small and large salmon are presented in Fig. 3, and indicate a peak for small salmon on October 6 and for large salmon between October 10 and 23.

In 1993, the lower trap was operated from August 11 to November 2 and the upper from September 29 to November 2. Daily catches of large and small salmon at both traps are presented in Figure 4, and a summary by standard week in Tables 3 and 4. A peak in run timing for small salmon occurred on October 1: no peak was evident for large salmon.

Tagging effort and recaptures were:

**Tags applied**

	Large Salmon	Small Salmon
1992		
Mark Trap	41	12
1993		
Mark Trap	8	10
Recapture Trap	2	3
Total	10	13

Few tags were applied in 1993 presumably because of lower returns to the river, and operational difficulties with the upper trap.

**Tags recaptured**

	Large Salmon		Small Salmon	
	Recap	Catch	Recap	Catch
1992				
First Nation	14	452	4	61
1993				
Recapture Trap	0	2	0	3
First Nation	3	253	0	50



### Estimated removals

	Large Salmon	Small Salmon
1992		
First Nation Food Fishery	452	61
Poaching	200	0
1993		
First Nation Food Fishery	253	50
Poaching	200	0

The First Nation food fish are totals of reported catch from gillnets. Poaching removals have been estimated by DNRE game wardens based on seizures and have been assumed to be the same in both years.

Total returns were estimated using the data provided above and using the adjusted Petersen method (Ricker 1975) and the Bayesian method of Gazey and Staley (1986). A tag loss rate of 0.9% per day as determined for the Margaree River (Chaput 1993) was applied to the mean number of days a fish was at large (12) before recapture.

The small salmon population estimate for 1992 was 142 with a spawning escapement of 80 (Fig. 5). The large salmon population estimate was 1119 with a spawning escapement of 467 (Fig. 6). The large salmon spawning requirement was met but not the small salmon requirement.

The trapnet caught similar numbers of small salmon in 1993 but only 1/4 the number of large salmon. Similarly, the First Nation large salmon catches in 1993 were 1/2 those of 1992. It is concluded that large salmon spawning requirements were not met in 1993.

### Biological Characteristics

The length frequency distribution of salmon trapped in 1992 is presented in Figure 7. The modal length for large salmon in 1992 was 80cm; for small salmon there were modes at 54 and 60 cm. The age distribution of the sample from 1992 is shown in Table 5. Of known-age fish, 2+ smolts comprised 55% of the sample and 3+ smolts 45%. Repeat spawners accounted for 9% of large salmon. The mean length of large salmon from 1992 was 79cm, of small salmon 55cm. The above data for 1993 is not presented because sample size makes

interpretation unreliable; similarly, sex ratios and large salmon proportion of the catch have not been determined on a large enough sample to be considered reliable.

### Other species

Total counts of other species caught in the traps are as follows:

Species	1992 Count	1993 Count
Brook trout	0	2
Gaspereau	22	1480
Striped Bass	10,024	2294
Flounder	2090	144
Eels	96	175
Tomcod	2011	366
Mackerel	17	22
Smelt	1	0
Suckers	2	0
Skate	6	0
White Perch	33	6

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Table 1. Commercial salmon landings for Salmon Fishing Area 16 (1967-1983) in kg.  
The commercial fishery was closed in SFA 16 from 1984 on. The Richibucto R. is in District 76.

Fisheries Statistical District										
Year	70	71	72	73	75	76	77	78	80	Total
1967	37,621	21,913	10,314	324,802	31,670	23,805	56	8	0	450,188
1968	18,233	19,790	6,435	150,614	13,916	8,505	29	0	0	217,523
1969	12,388	20,674	12,195	116,097	14,464	7,051	5	61	0	182,935
1970	12,763	20,307	12,460	104,595	13,443	11,618	6	12	0	175,205
1971	5,741	12,628	7,928	51,343	1,635	1,899	4	2	0	81,180
1972	0	5	682	10,034	0	227	227	1,555	91	12,820
1973	114	136	45	2,732	545	364	150	0	114	4,200
1974	159	152	0	3,318	136	0	59	16	84	3,925
1975	108	117	0	2,503	556	1,775	69	325	227	5,680
1976	138	129	45	6,464	315	591	105	909	1,023	9,718
1977	0	153	0	27,645	1,927	685	227	1,364	136	32,137
1978	2,112	11	0	36,561	655	674	656	445	0	41,114
1979	2,486	9	0	16,053	886	342	84	230	0	20,090
1980	26,586	0	0	29,607	1,134	606	0	0	0	57,933
1981	3,534	10,463	2,029	20,179	1,502	483	0	0	0	38,190
1982	3,454	8,581	652	28,699	2,819	1,127	0	34	0	45,366
1983	4,498	5,735	763	33,069	1,540	847	0	0	0	46,452

Table 2. First Nation harvest of Atlantic salmon in the Richibucto River, 1982-1993.  
NA, not available.

Year	Small Salmon	Large Salmon	Total	% Large Salmon
1982	20	84	104	81
1983	25	64	89	72
1984	47	44	91	48
1985	23	99	122	81
1986	76	69	145	48
1987	NA	NA	NA	-
1988	19	32	51	63
1989	16	32	48	67
1990	93	73	166	44
1991	51	82	133	62
1992	61	452	513	88
1993	50	253	303	84
Mean(88-92)	48	134	182	65
+/- Mean	22%	89%	66%	29%

Table 3. Weekly catches of large and small salmon at Richibucto River traps, 1993.  
Recapture trap began fishing in week 39.

Week	Both traps		Mark trap		Recapture trap	
	Large Salmon	Small Salmon	Large Salmon	Small Salmon	Large Salmon	Small Salmon
34	1	0	1	0	0	0
35	1	0	1	0	0	0
36	1	0	1	0	0	0
37	1	1	0	1	1	0
38	0	0	0	0	0	0
39	2	3	2	2	0	1
40	2	9	2	7	0	2
41	2	0	2	0	0	0
42	1	0	0	0	1	0

Cumulative total						
Week	Both traps		Mark trap		Recapture trap	
	Large Salmon	Small Salmon	Large Salmon	Small Salmon	Large Salmon	Small Salmon
34	1	0	1	0	0	0
35	2	0	2	0	0	0
36	3	0	3	0	0	0
37	4	1	3	1	1	0
38	4	1	3	1	1	0
39	6	4	5	3	1	1
40	8	13	7	10	1	3
41	10	13	9	10	1	3
42	11	13	9	10	2	3

Table 4. Standardized weeks used to describe timing.

Week	Month	Days
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

Table 5. Age distribution of Richibucto R. salmon, 1992.

Repeat spawner categories indicate total sea age, followed by sea ages at which the fish spawned.

Smolt Age	Small Salmon	Large Salmon	Repeat spawners			Total
			3.2	4.2	5.2.4	
2	0	21	1	0	1	23
3	12	7	0	0	0	19
?	1	3	0	1	0	5
Total	13	31	1	1	1	47

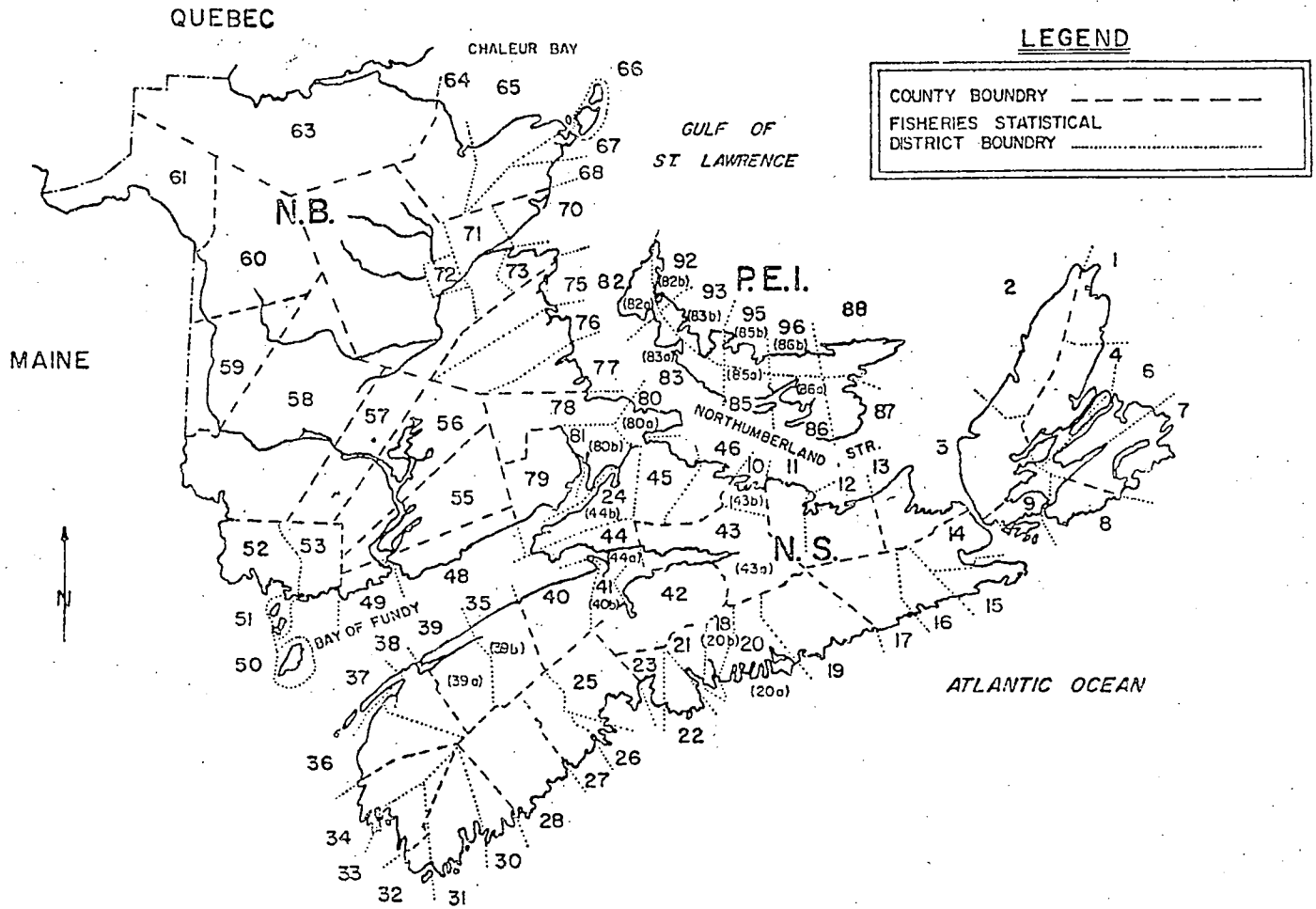


Figure 1. Fisheries Statistical Districts in Atlantic Canada.



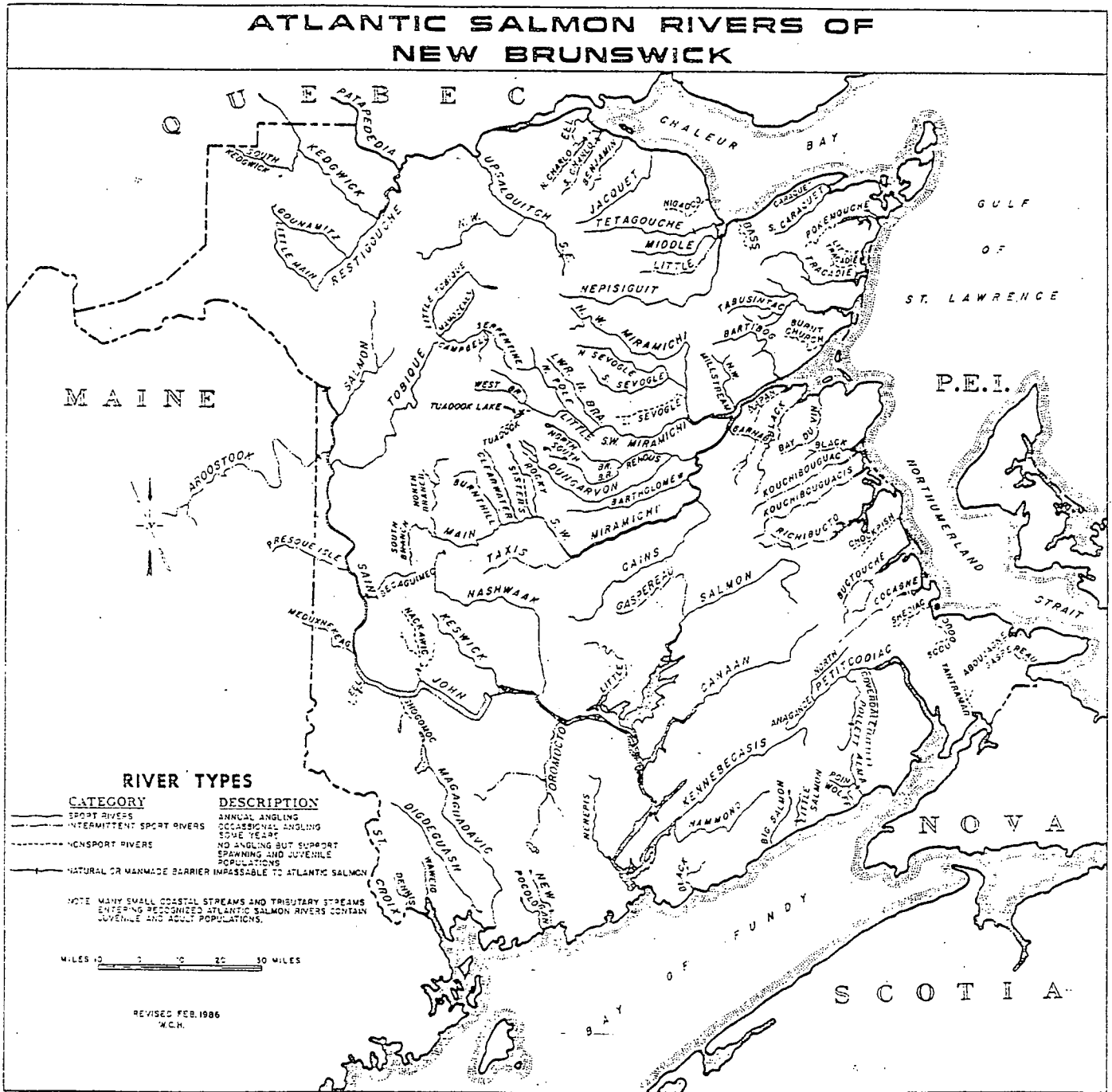


Figure 2. Atlantic salmon angling rivers of New Brunswick.  
(Map prepared by DNRE.)

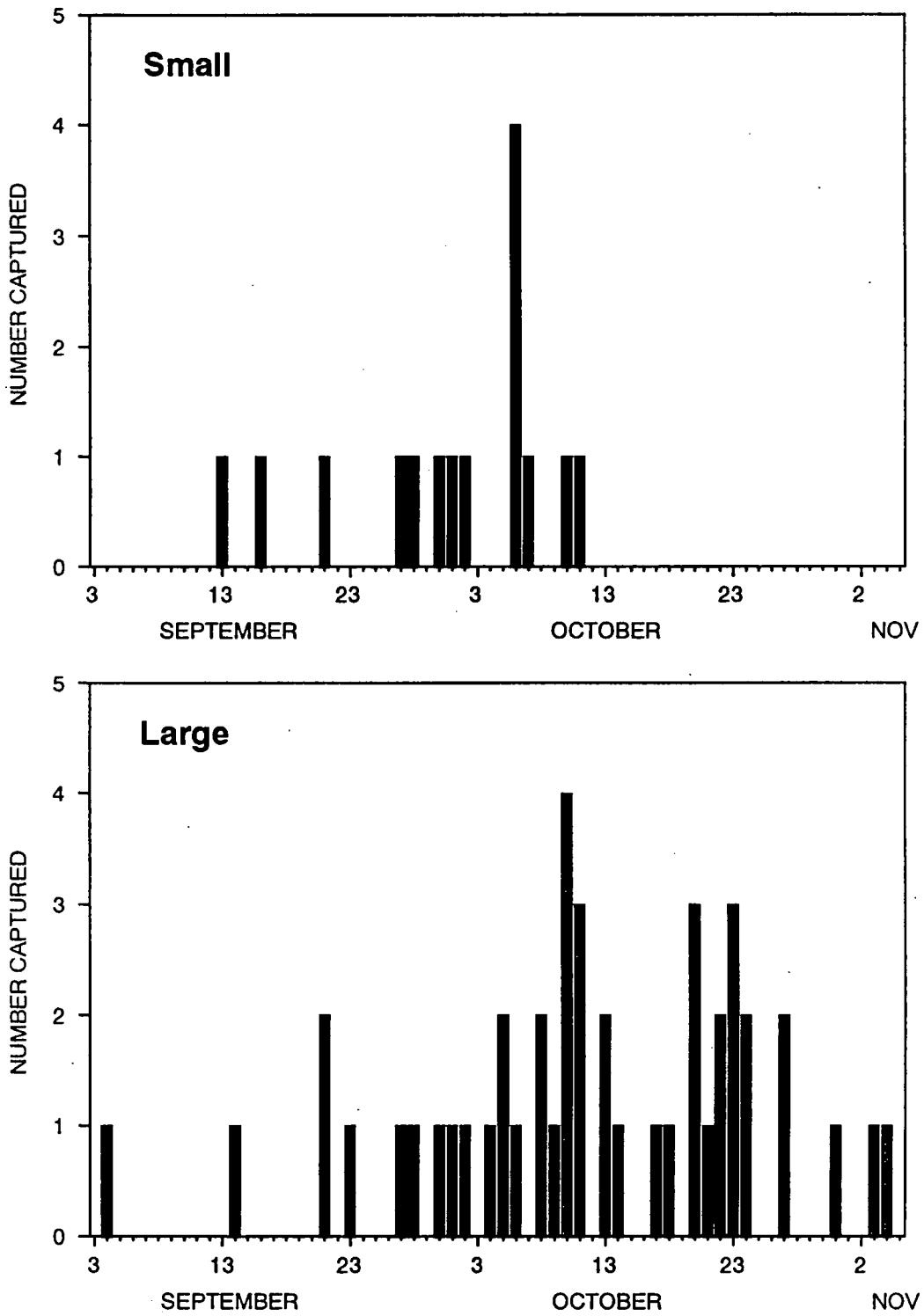


Figure 3. Daily small and large salmon captures in Richibucto River trap, 1992.

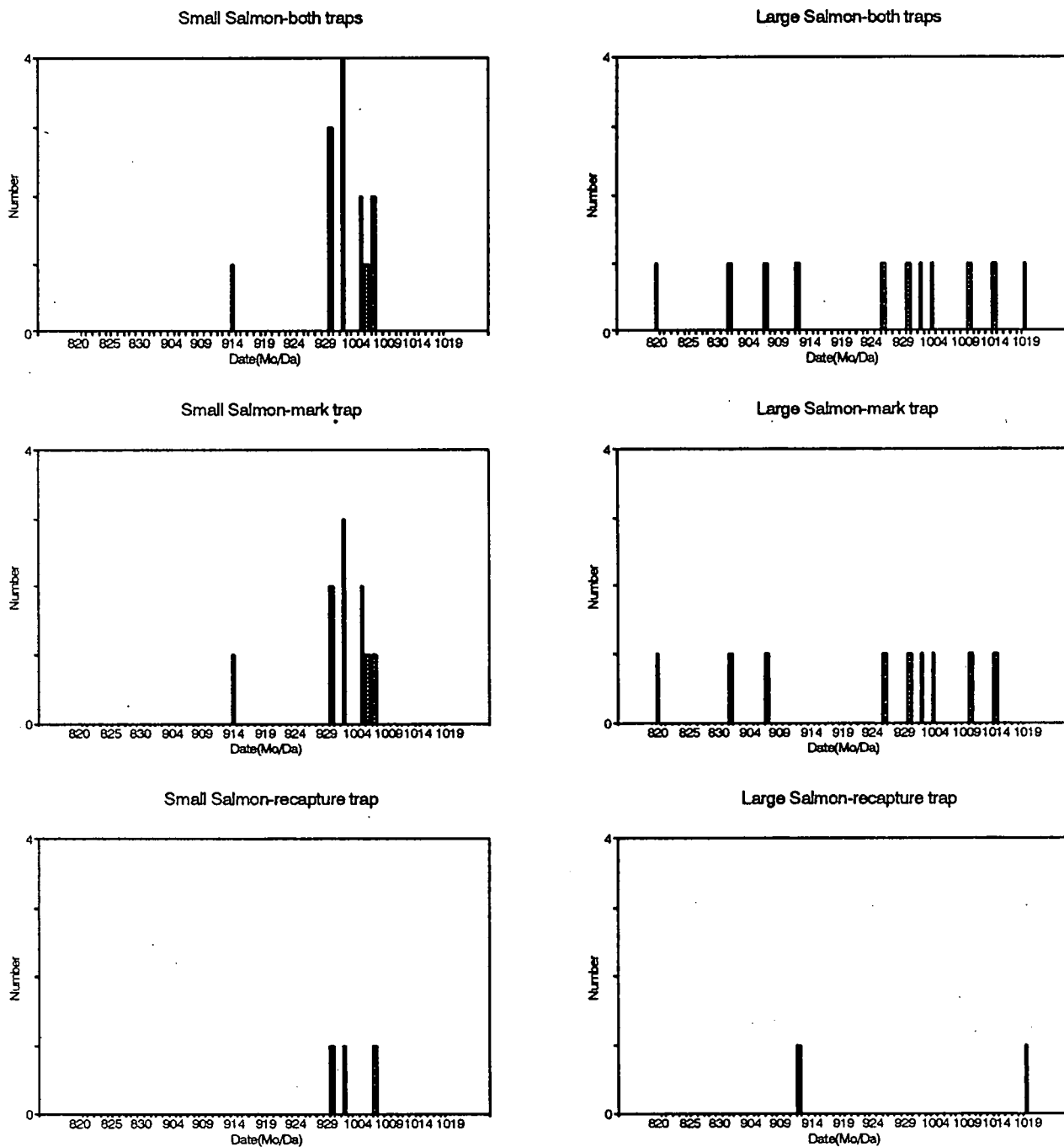


Figure 4. Daily catches of small and large salmon at Richibucto R. traps, 1993. Mark trap operated 811-1102; Recapture trap 929-1102.

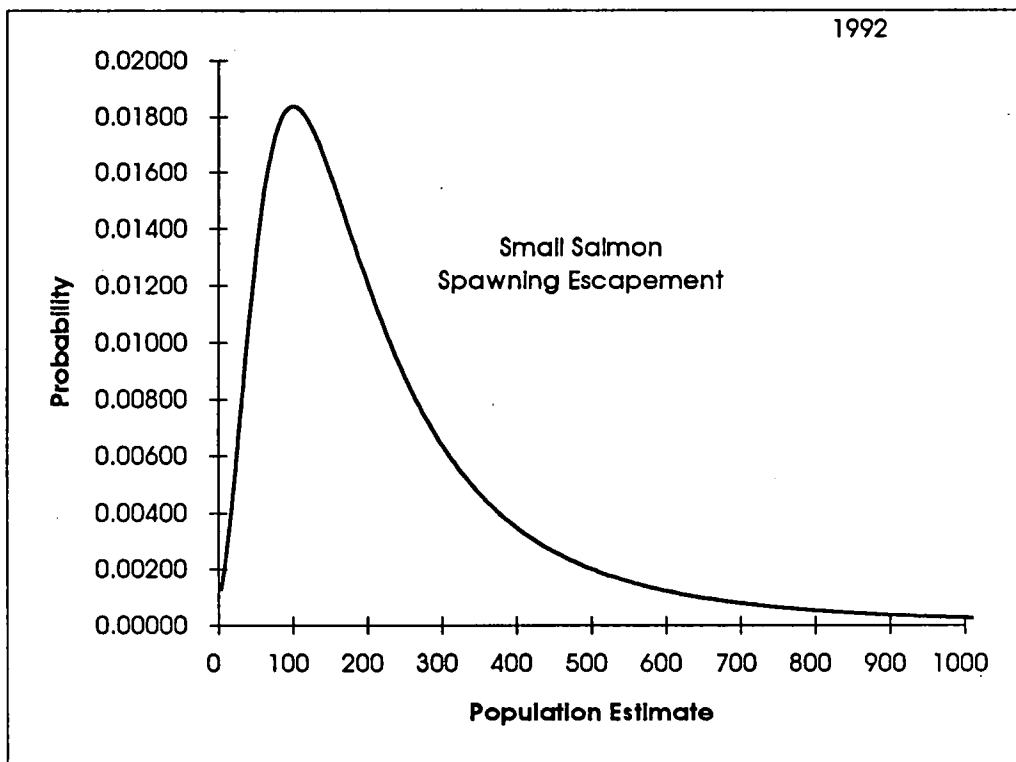
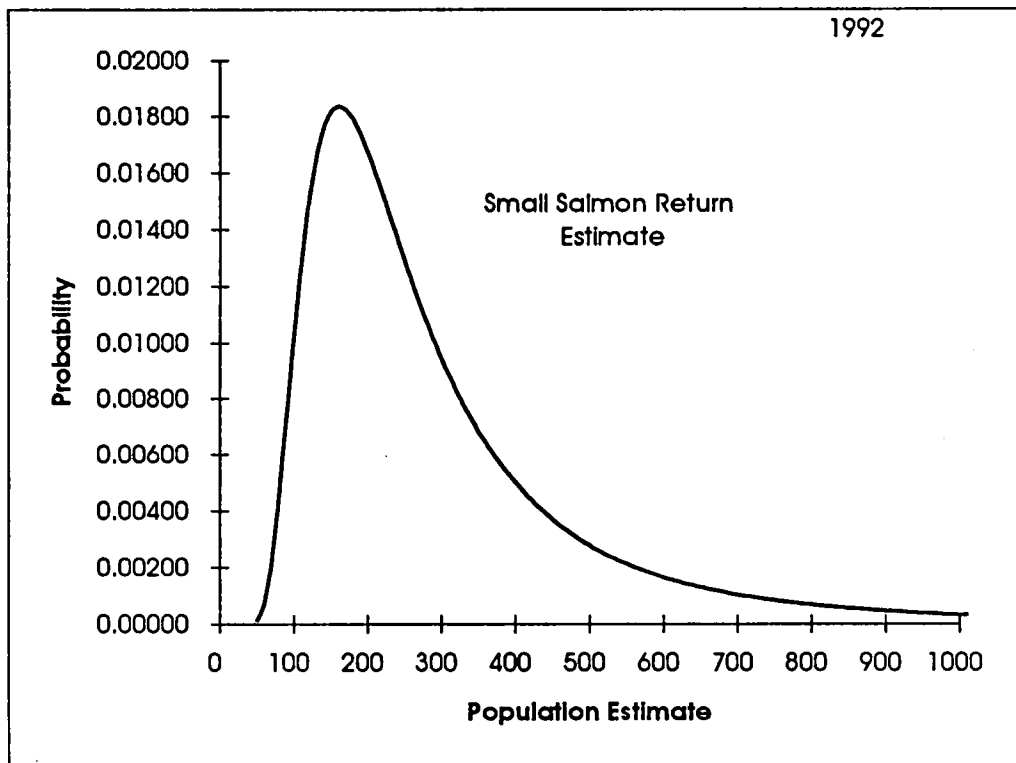


Fig. 5. Small salmon population and spawning escapement estimates for the Richibucto River, NB, 1992.

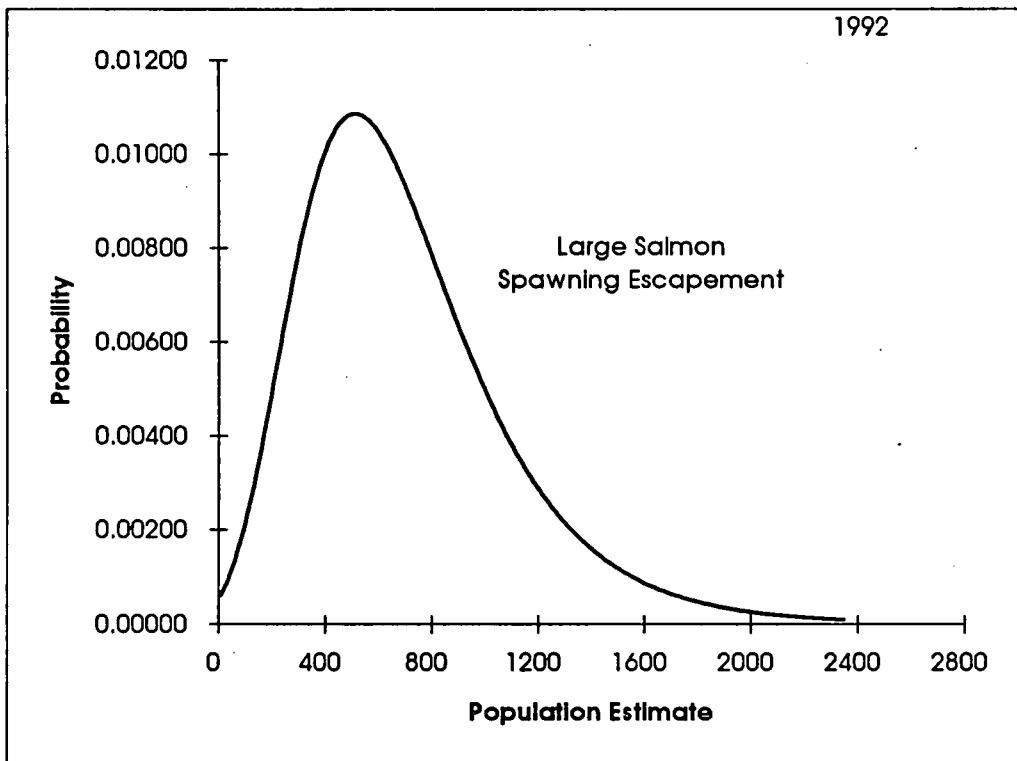
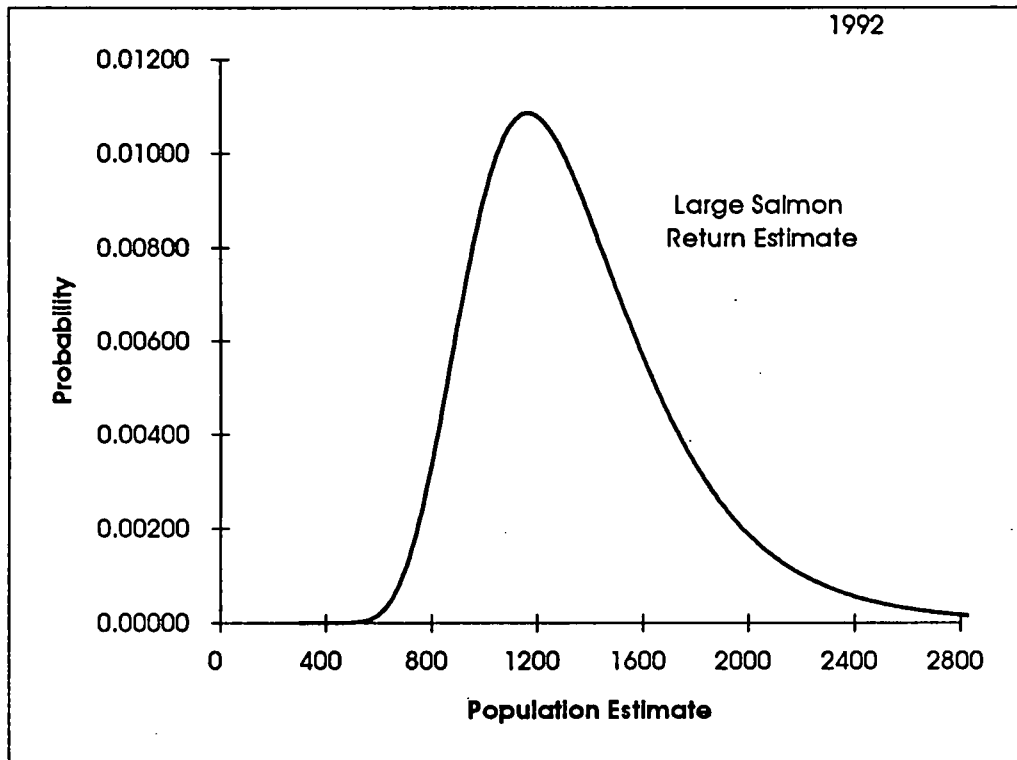


Fig. 6. Large population and spawning escapement estimates for the Richibucto River, NB, 1992.

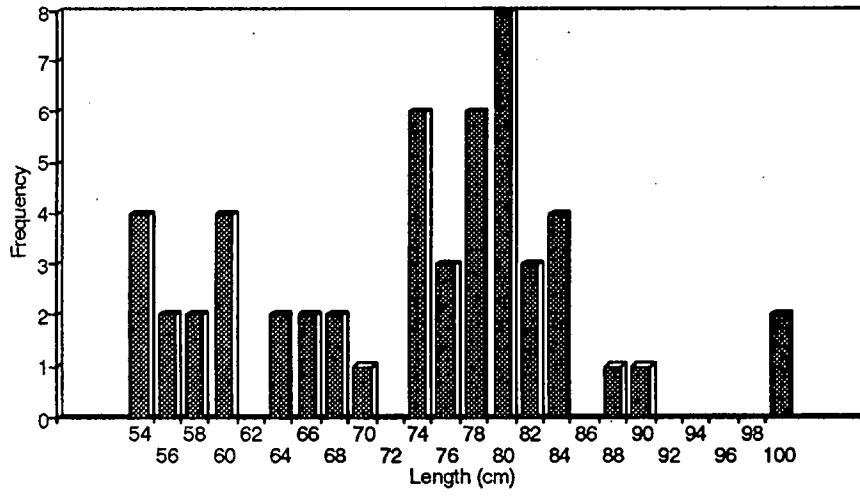


Figure 7. Length frequency of salmon caught in Richibucto R. trap, 1992.