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ATLANTIC SALMON AND TROUT INVESTIGATIONS, 1944

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ATLANTIC SALMON AND TROUT INVESTIGATIONS

VOLUME XXXI

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ATLANTIC SALMON AND TROUT INVESTIGATIONS

1944

Report No. V. Montée du saumon et de quelques autres poissons dans la rivière Petitcodiac, à Salisbury, 1944.

Par Robert Raymond

La trappe a été placée deux cents verges plus haut que le point d'atteinte des plus grandes marées. Construite de matériel neuf, elle a été terminée le 8 juillet et en opération à partir de cette date jusqu'au 14 octobre.

510 saumons y ont été capturés dont la très grande majorité était composée de "grilse". Le plus petit spécimen trouvé mesurait 16" et le plus grand 32", la longueur moyenne étant 23.1" et le poids moyen, 6 lbs. Un seul saumon marqué, (nageoire adipeuse coupée), a été pris dans la trappe et étiqueté.

Une corrélation très étroite semble exister, indépendamment des autres facteurs, entre la venue du saumon et la hauteur d'eau dans la rivière. Si l'on ajoute l'influence des grandes marées dont l'eau de recul atteignait la trappe, la relation est encore plus marquée.

La courbe de la température apparait tout aussi significative. A la fin de juillet, la température journalière moyenne étant entre 65° et 75°F., les premiers saumons font leur apparition. En août, on constate en même temps qu'une température soutenue de 78°F. et plus une absence de saumon pour plus d'une semaine. La montée reprend ensuite avec un abaissement de la température. En septembre, il y a plus grande activité dans le mouvement ascendant du saumon pour les températures de 68° à 70° qui marquent les sommets de la courbe. En octobre, alors que le thermographe enrégistre des oscillations entre 47° et 57°, les captures se sont faites

plus nombreuses pour les températures supérieures à 52° et plus rares pour les températures inférieures.

Les captures des poissons des autres espèces se répartissent comme suit: 165 suckers, 39 bass, 9 shad, 9 eels, 1 perch. 123 suckers ont été pris au cours du dernier mois. 40 sont capturés le 17 septembre et 21 le jour suivant. Roccus lineatus apparait en deux périodes: du 9 juillet au 7 août. 30 spécimens, et du 22 août au 16 septembre, 9.

Le nettoyage de la trappe et les algues

Dès la fin de la construction de la trappe, des algues se sont mises à s'accumuler sur les lattes au point de former un barrage. Il était absolument nécessaire de nettoyer la trappe au moins tous les jours et quelquefois deux fois par jour. Certains matins, l'eau était trois ou quatre pouces plus élevée en amont de la trappe completement bloquée. Ces algues à texture très fine s'étendent sur les lattes et forment des bandes très résistantes. Bien qu'elles adhèrent aux roches du fond de la rivière elles se détachent et descendent avec le courant dès qu'il survient une crue. Lors de la crue artificielle causée par l'ouverture du barrage au Sanatorium de The Glades le 19 juillet, le niveau de l'eau s'étant élevé subitement de plus de 16 pouces, toutes les algues ont été entrainées par le courant. Le lit de la rivière s'est maintenu propre durant plus d'une semaine.

Les algues qui ont nui aux opérations à partir de la construction de la trappe jusqu'aux environs du 15 août sont ensuite

à peu près disparues. Leur période de croissance semble coincider avec un niveau de l'eau très bas et des températures assez élévees. A cette période de croissance durant laquelle elles sont vertes, à texture très solide et aux fibres longues, succède la période de dépérissement alors qu'elles brunissent, perdent leur consistance et deviennent gélatineuses. Elles sont à ce moment entrainees par l'eau. En septembre et en octobre, elles sont disparues completement.

Une bonne manière de remédier en partie à cet inconvénient serait l'emploi de lattes plus etroites (1" au lieu de 1½") avec espacement plus grand (2" au lieu de 1½"). Il y aurait ainsi mois de surface d'adhérence et entraînement plus fort par l'eau dû a l'augmentation du débit direct.

Manipulation du saumon et ses réactions à sa mise en liberté

Etant donné que toutes les opérations de prélevement d'écailles et de mesure de longueur se font alors que le poisson est dans l'eau, et que la duree de manipulation est très courte, le saumon ne semble à peu près pas affecte.

Si le saumon est remis en liberté durant le jour, ce-lui-ci semble complètement désortienté. On peut pour un temps le voir tourner en cercles le long de la trappe et aller ensuite en réfugier près de la rive sous le couvert des arbustes. Quelques-uns iront se placer en plein soleil dans les angles formés par les ailes de la trappe et la rive. Ils y demeureront jusq'a l'obscurité s'ils ne sont pas dérangés. Certains demeurent à l'endroit

même ou ils ont été relâchés, à la tête de la trappe. D'autres enfin, mais très rares, se mettent à remonter la riviere pour s'arrêter à deux cents verges plus haut, endroit ou l'eau est plus profonde d'un pied et où des buissons donnent un excellent couvert. Ils y séjournenent deux ou trois jours et quelquefois une semaine.

Lorsque le saumon est gardé dans la trappe toute la journée et mis en liberté à la tombée de la nuit, il se met à remonter la rivière des qu'il est relâche. Sa direction est nettement indiquée par les rides formés sur l'eau par son déplacement. Tous les saumons mis en liberté à cette heure sont toujours partis vers le haut de la rivière. Il n'y a que des avantages à ne relâcher le saumon que le soir parcequ'ainsi aucun ne demeure près de la trappe. L'occasion prochaine de délit est alors enlevée au braconnier qui espérerait un coup heureux durant le jour. Si l'on dispose sur l'eau dans la trappe un cadre portant une piece de "burlap", on fournit au saumon un couvert qu'il utilisera aussitôt et sous lequel il restera immobile durant sa captivité. Il est en même temps invisible à l'oeil quelquefois indiscret du visiteur.

La premiere étape de la remontée du saumon apres sa mise en liberté se trouve a deux cents verges en amont de la trappe, endroit qui a été décrit plus haut. Quand par exemple, une douzaine de saumons étaient relâchés le même soir, on les y retrouvaient le lendemain. Ordinairement les individus de la journée suivante s'ajoutaient aux premiers, et, tout le groupe ne partait de cet endroit qu'après deux ou trois jours ou parfois y séjournait plus longtemps. C'était le point de rassemblement. On y a compté des lots allant jusqu'a cinquante. Le même saumon est demeuré a cet

endroit durant trois semaines. Tout son corps était devenu complètement noir et les peaux blanches qu'il portait sur les yeux semblaient l'avoir rendu aveugle. L'eau y est plus profonde qu'au site de la trappe d'environ un pied et demi. Le courant n'est pas plus rapide. Des buissons donnent un bon couvert naturel. La rive étant surélevée, on peut facilement apercevoir et compter les saumons au soleil de midi.

Le "Mitton's Pool" ne peut être considéré comme une étape dans la montée du saumon. Quelques individus seulement s'y arrêtent. Jamais durant l'été on y a observé de rassemblement.

Par contre, Jones Pool ou "Salmon Pool" semble être l'endroit idéal. L'eau y est relativement profonde: 12 a 17 pieds dans le creux du centre. Le saumon se tient près du fond. Le 13 septembre, Mr. Bruce Barnes y note la présence de 65 saumons. A cette date, 106 saumons étaient passés par la trappe.

Moment de l'entree du saumon dans la trappe

Les observations faites quant au moment exact de l'entree du saumon dans la trappe permettent de dire que la moitié du saumon arrive dans la trappe avant minuit, c'est-à-dire durant les trois ou qyatre premières heures de la nuit. Certains jours, on a compté le tiers du nombre de captures de toute la nuit durant la première heure d'obscurité complète. Voici d'ailleurs quelques chiffres précis:

2 septembre	5 saumons		2 avant 10 p.m. 1 entre 10 et 11 p.m.
4	"	19	"	6 avant 10 p.m. 8 entre 10 p.m. et 5 a.m. 5 dans l'ouverture de la trappe le matin.
5	"	3	"	aucun avant 11 p.m.
6	"	18	"	8 avant 10.15 p.m.
7	"	3	"	1 avant 11 p.m.
8	"	4	"	2 avant 11 p.m.
11	"	4	"	3 avant 10 p.m.
14	"	4	"	2 avant 11 p.m.
16	"	36	"	12 avant 11 p.m. 7 entre 11 et 12 p.m.
20	"	14	"	6 avant 10 p.m. 3 entre 10 et 11 p.m.

Etant donné la position de la trappe, le saumon venu avec la marée de jour demeurerait au point où aurait atteint la marée et se mettrait à remonter la rivière dès le commencement de l'obscurité. Des cas se sont présentés où le saumon est venu avec les grandes marées de jour.

Le braconnage

Le système de protection actuellement mis en force par Mr. Bruce Barnes semble donner d'excellents résultats. L'emploi de filets dans les "pools" et les lieux de rassemblement du saumon a été pratiquement impossible, étant donné la surveillance continuelle des gardiens. Dans le Jones' Pool, ou l'usage d'un filet serait le plus effectif, des achigans de grande taille qui y ont été vus à la fin d'août sont demeurés à cet endroit jusqu'au

début d'octobre alors qu'ils ont été capturés par des pêcheurs sportifs. Près de la trappe, aucun filet n'a pu être employé, un gardien spécial exerçant sa surveillance durant la nuit et l'opérateur de la trappe y demeurant tout le jour. Les quelques tentatives isolées qui ont pu être faites le long de la rivière l'ont été au moyen de dards (spears).

Le système de protection très rigoureux actuellement employé semble toutefois indisposer la population riveraine. On en veut semblant de main-mise du département des Pêcheries sur une rivière qui quelques années auparavant fournissait le saumon à quiconque allait le chercher. On trouve anormal qu'on ne puisse cueillir le saumon qui passe à sa porte alors que le pêcheur de l'estuaire en capture à pleins filets. Voici les principales objections émises contre le système actuel:

-Il y a quinze ans, on prenait tout le saumon que l'on pouvait, et il en restait assez pour la reproduction et la survivance de l'espèce. La preuve, c'est qu'il y en a encore.

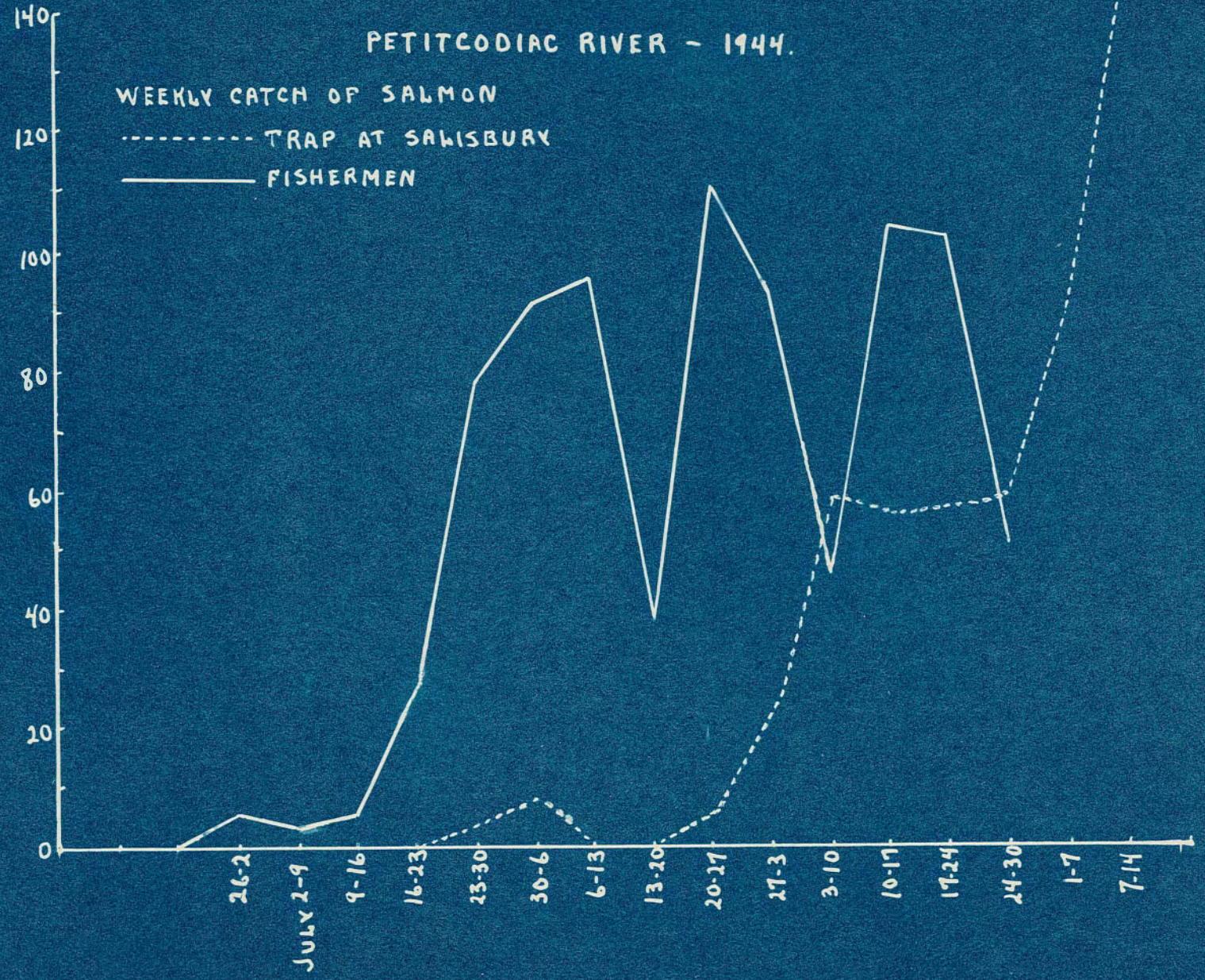
-On applique la force pour protéger le $\frac{1}{4}$ du saumon de la région et on laisse les $\frac{3}{4}$ au libre usage des pêcheurs de l'estuaire. Une protection si rigoureuse est-elle logique?

-Il y a autant de garde-pêche le long de la rivière que de saumons dans la rivière. Combien chaque saumon rendu sur les lieux du frai coûte-t-il au Gouvernement?

-Si les pêcheurs profitent du moment du frai pour prendre le saumon, pourquoi ne pourrait-on pas faire la même chose en rivière?

Au dire des vieux habitants de l'endroit, la rivière était

beaucoup plus populeuse en saumon il y a une vingtaine d'années. Un bon coup de filet durant la nuit rapportait rarement moins de trente à quarante saumons. Un citoyen accompagné de deux assistants aurait pris au moyen de dards 113 saumons durant une seule journée. Un autre se spécialisait dans la salage du saumon avant l'hiver. On rapporte même un cas ou l'on aurait donné le surplus d'une pêche en nourriture aux renards. Pendant la montée du saumon, chacun se prêtait au sport favori de la pêche au dard. On venait de quinze milles à la ronde. Certains commerçants de Moncton embauchaient des "pêcheurs" qui se chargeaient de fournir le marché. Le niveau moyen de l'eau était plus élevé qu'aujourd'hui.


PETITCODIAC RIVER - 1944.
WEEKLY CATCH OF SALMON
TRAP AT SALISBURY
FISHERMEN
140
120
100
80
60
40
20
0
26-2
JULY 2-9
9-16
16-23
23-30
30-6
6-13
13-20
20-27
27-3
3-10
10-17
17-24
24-30
1-7
7-14

Relevé hebdomadaire des captures de saumon par les pêcheurs et dans la trappe

	Pêcheurs	Trappe
Juin 26-Juillet 2	6	0
Juillet 2 - Juillet 9	4	0
Juillet 9 - Juillet 16	6	0
Juillet 16 - Juillet 23	27	0
Juillet 23 - Juillet 30	78	4
Juillet 30 - Août 6	91	8
Août 6 - Août 13	96	0
Août 13 - Août 20	38	0
Août 20 - Août 27	111	6
Août 27 - Septembre 3	92	24
Septembre 3 - Septembre 10	46	58
Septembre 10 - Septembre 17	104	56
Septembre 17 - Septembre 24	102	57
Septembre 24 - Septembre 30	50	60
Octobre 1 - Octobre 7		90
Octobre 7 - Octobre 14		147
	851*	510

* 6 envelopes ne portent pas de date. (Total 857)

Durant la semaine du 13 au 20 août, la température moyenne est environ 5 degrés plus élevée que la semaine qui précède et la semaine qui suit.

Durant la semaine du 3 au 10 septembre, pluie, brume et vent.

Le relevé précedent est établi d'apres les pêcheurs qui prélevaient les ecailles (857)

Appendix 1. Data on daily water temperatures, water heights and catch of salmon.

Date	Max.temp.	Min.temp.	Mean temp.	Water height	Daily catch
June 22	80.1	55.4	57.7	14	-
23	74.1	57.2	65.6	14½	-
24	73.2	64.1	68.6	14	-
25	71.4	64.9	68.1	13	-
26	70.4	64.4	67.4	27½	-
27	76.5	64.4	70.5	23	-
28	81.4	69.0	75.2	20	-
29	85.4	72.7	79.0	18½	-
30	81.4	74.0	77.7	15½	-
July 1	78.4	70.9	74.6	14½	-
2	78.4	66.4	72.4	14	-
3	77.9	66.2	72.0	14	-
4	76.2	66.1	71.1	13	-
5	80.1	66.1	73.1	12	-
6	75.9	68.6	72.2	12	-
7	80.8	65.6	73.2	12	-
8	82.4	69.9	76.1	11½	-
9	86.4	72.2	79.3	11½	/
10	81.1	72.4	71.7	11½	-
11	77.2	69.4	73.3	11½	-
12	77.8	69.4	73.6	12	-
13	78.2	69.7	73.9	12	-
14	81.4	67.0	74.2	11½	-
15	81.8	68.4	75.1	11	-

Date	Max.temp.	Min.temp.	Mean tem.	Water height	Daily catch
July 16	81.4	69.9	75.7	11	0
17	81.4	70.9	76.1	10½	0
18	79.4	67.4	73.4	10½	0
19	80.2	61.9	71.0	10½	0
20	77.5	64.7	71.1	10	0
21	77.2	63.7	70.4	9	0
22	81.6	65.6	73.6	9½	0
23	81.8	67.2	74.5	9½	0
24	80.4	65.9	73.1	10	0
25	80.0	69.6	74.8	10	0
26	80.8	69.6	75.2	10	0
27	73.2	68.9	71.0	9½	1
28	65.4	64.2	64.8	9½	3
29	72.7	64.4	68.5	10	0
30	69.8	66.9	68.3	11	1
31	76.7	67.4	72.0	11	3
Aug. 1	76.4	67.4	71.9	11½	0
2	82.6	68.4	75.5	11½	3
3	85.4	72.4	78.9	10½	0
4	85.1	72.1	78.6	10	1
5	85.4	72.4	78.9	9½	0
6	81.4	73.4	77.4	9	0
7	-	-	-	10	0
8	81.1	66.9	74.0	10	0
9	83.4	60.4	71.9	10	0
10	77.9	65.7	72.8	9½	0

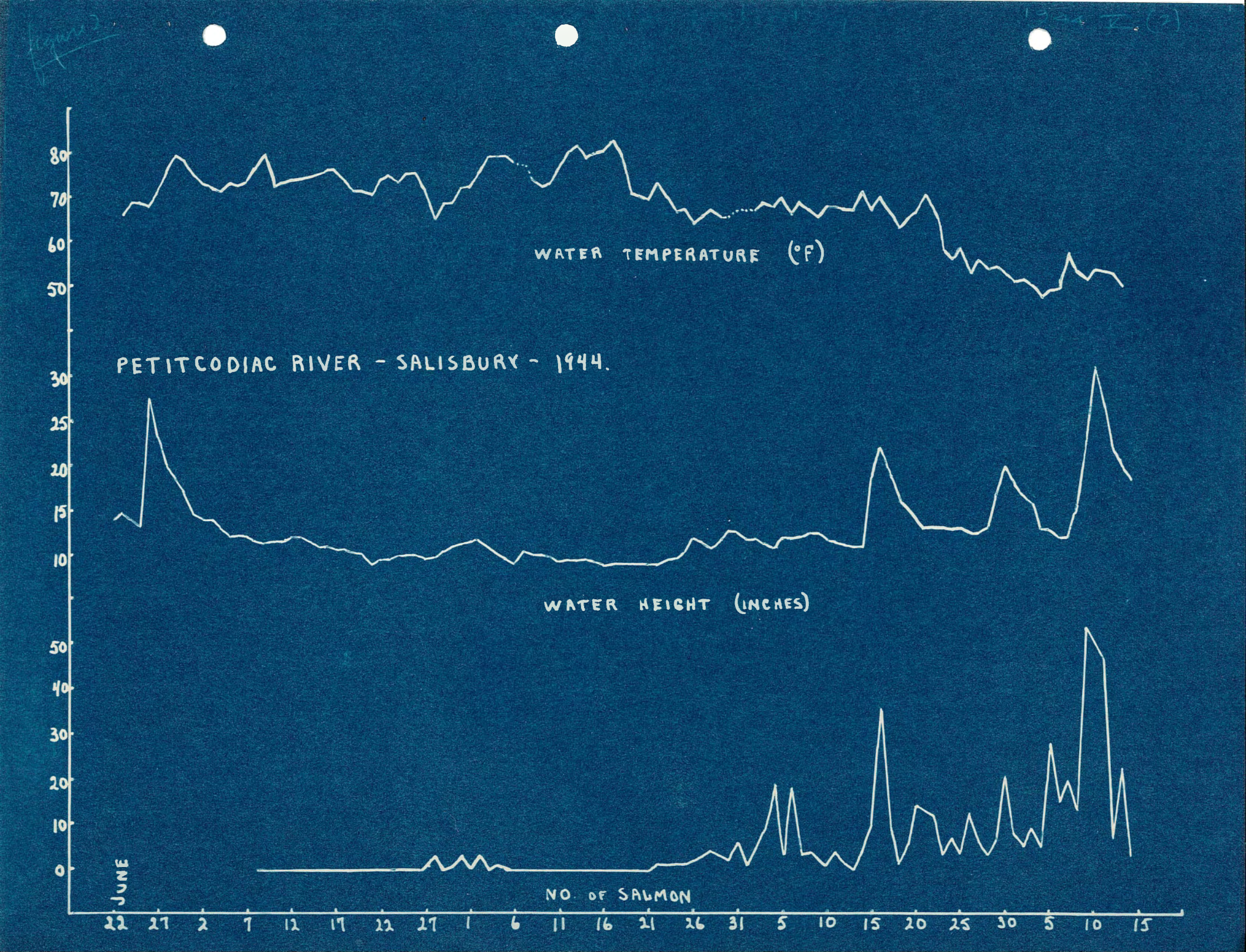
Date	Max.temp.	Min.temp.	Mean temp.	Water height	Daily cat
Aug.11	86.1	66.9	76.5	9½	0
12	87.4	72.4	79.9	9½	0
13	89.4	73.4	81.4	9½	0
14	86.4	69.4	77.9	9½	0
15	88.4	70.9	79.6	9	0
16	89.4	70.9	80.1	9	0
17	91.4	73.4	82.4	n9	0
18	81.4	75.4	78.4	9	0
19	76.9	64.4	70.6	9	0
20	80.4	59.0	69.7	9	0
21 21	73.4	64.4	68.9	9	0
22	78.9	67.4	73.1	9	1
23	73.9	65.4	69.6	9½	1 marked
24	70.4	62.0	66.2	9¾	1
25	72.4	61.4	66.9	10½	1
26	67.4	59.4	63.4	12	2
27	73.4	57.4	65.4	11¼	3
28	-	58.6	-	10¾	4
29	-	-	-	11¾	3
30	-	-	-	12¾	2
31	-	-	-	12¼	6
Sept.1	-	-	-	11¾	1
2	-	-	-	11¾	5
3	72.6	64.4	68.5	11½	9
4	72.1	62.7	67.4	11	19
5	76.4	63.4	69.9	12	3

Date	Max.temp.	Min. temp.	Mean temp.	Water height	Daily catch
Sept. 6	67.1	65.4	66.2	12	18
7	72.8	64.4	68.6	12	3
8	70.1	63.4	66.7	12¼	4
9	70.3	59.9	65.1	12⅛	2
10	75.1	60.4	67.7	11⅞	1
11	76.4	58.4	67.4	11⅝	4
12	73.4	60.4	66.9	11½	1
13	72.4	60.9	66.6	11	0
14	76.4	66.4	71.4	11	4
15	70.8	62.2	66.5	18⅛	10
16	73.4	66.4	69.9	22	36
17	70.4	61.4	65.9	19	9
18	68.4	56.9	62.6	16	1
19	70.8	59.4	65.1	15	5
20	73.2	60.1	66.6	14	14
21	74.9	66.4	70.6	13	13
22	72.1	61.4	66.7	13	12
23	61.8	53.9	57.8	13	3
24	63.0	48.4	55.7	13	7
25	64.4	53.4	58.9	13	3
26	56.5	49.4	52.9	12⅞	13
27	61.5	50.4	55.9	12⅞	6
28	55.4	51.9	53.6	13	3
29	56.9	51.9	54.4	17	7
30	57.4	48.4	52.9	20	21

Date	Max.temp.	Min. temp.	Mean temp.	Water height	Daily catch
Oct. 1	53.4	48.4	50.9	18	8
2	54.4	48.4	51.4	16½	5
3	53.4	46.4	49.9	15½	9
4	52.9	41.9	47.4	13	5
5	54.9	43.4	49.1	13	28
6	53.5	45.4	49.4	12	15
7	62.6	52.4	57.5	12	20
8	55.9	50.4	53.2	13	13
9	52.4	51.4	51.9	23	54
10	54.9	53.4	54.1	31	47
11	53.9	51.9	52.9	26½	
12	55.4	50.6	53.0	22	7
13	52.9	47.4	50.1	20	23
14	-	-	-	18½	3

Appendix 2. Daily catch of salmon in the tide head trap at Salisbury:

July	8	0	Aug.	21	0	Oct.	4	5
	9	0		22	1		5	28
	10	0		23	1		6	15
	11	0		24	1		7	20
	12	0		25	1		8	13
	13	0		26	2		9	54
	14	0		27	3		10)	
	15	0		28	4		11)	47
	16	0		29	3		12	7
	17	0		30	2		13	23
	18	0		31	6		14	3
	19	0						
	20	0	Sept.	1	1	Total		510
	21	0		2	5			
	22	0		3	9			
	23	0		4	19			
	24	0		5	3			
	25	0		6	18			
	26	0		7	3			
	27	1		8	4			
	28	3		9	2			
	29	0		10	1			
	30	1		11	4			
	31	3		12	1			
				13	0			
Aug.	1	0		14	4			
	2	3		15	10			
	3	0		16	36			
	4	1		17	9			
	5	0		18	1			
	6	0		19	3			
	7	0		20	14			
	8	0		21	13			
	9	0		22	12			
	10	0		23	3			
	11	0		24	7			
	12	0		25	3			
	13	0		26	13			
	14	0		27	6			
	15	0		28	3			
	16	0		29	7			
	17	0		30	21			
	18	0						
	19	0	Oct.	1	8			
	20	0		2	5			
				3	9			


PETITCODIAC RIVER - SALISBURY - 1944.
80
70
60
50
WATER TEMPERATURE (°F)
30
25
20
15
10
WATER HEIGHT (INCHES)
50
40
30
20
10
0
NO. OF SALMON
JUNE
22 27 2 7 12 17 22 27 1 6 11 16 21 26 31 5 10 15 20 25 30 5 10 15

Appendix 3. Daily report of the salmon caught by fishermen in the estuary: (Data obtained from the salmon envelopes).

None before June 26th.

June	26	2	Aug.	6	0	Sept.	17	0
	27	0		7	24		18	28
	28	4		8	12		19	30
	29	0		9	9		20	24
	30	0		10	28		21	14
				11	23		22	6
July	1	1		12	0		23	0
	2	0		13	0		24	0
	3	0		14	13		25	12
	4	0		15	14		26	8
	5	1		16	2		27	12
	6	1		17	6		28	10
	7	2		18	3		29	8
	8	0		19	0		30	0
	9	0		20	0			
	10	1		21	30	Total		853
	11	1		22	27			
	12	4		23	27			
	13	0		24	6			
	14	0		25	21			
	15	0		26	0			
	16	0		27	0			
	17	4		28	14			
	18	8		29	15			
	19	4		30	40			
	20	3		31	10			
	21	8						
	22	1	Sept.	1	13			
	23	0		2	0			
	24	16		3	0			
	25	15		4	8			
	26	12		5	9			
	27	19		6	5			
	28	16		7	9			
	29	0		8	15			
	30	0		9	0			
	31	15		10	0			
				11	25			
Aug.	1	17		12	17			
	2	20		13	39			
	3	24		14	15			
	4	15		15	8			
	5	0		16	0			

Appendix 4. Striped bass. (Roccus lineatus)

Number: 39

July 9 - August 7: 30

August 22 - September 16: 9

Length: 17-18-19-18-11½ 14-10-8-10-10-10-10-9-9-8-7-11-9-14-11
12-10-12-7-15-17-11-14-10-12".

9-10-9-16-10-10-11-20-19".

Mean length: 11.8

Appendix 5. Suckers. (Catostomus commersonnii)

Number: 165

July	9	5
	10	2
	11	4
	12	1
	13	4
	14	3
	15	3
	16	2
Aug.	5	6
	6	4
	7	8
	9	2
	31	2
Sept.	16	8
	17	40
	18	21
	19	7
	20	4
	21	2
	22	1
	26	2
	30	4
Oct.	1	2
	3	1
	5	6
	7	3
	9	3
	11	9
	12	5
	13	1

Length of 142 suckers:

10-4-4-4-12-9-7-9-6-4-4-4-6-4-4-4-6-6
4-4-5½-7-8-4½-4½-12-8-8-9½-15-15-15-
5-16-16-15-17-15-16-15-15-17-18-15-16-
17-16-12-12-14-14-13-12-13-14-14-12-14-
13-12-11-14-13-12-12-14-15-14-13-14-13-
18-17-14-16-15-13-12-11-12-18-17-12-17-14-
16-15-13-14-11-18-8-16-9-14-13-12-15-17-
14-17-13-18-15-16½-14-14-11-19-17-13-
15-13-17-17-14-17-16-11-9-16-14-17-17-
15-18-16-15-15-18-14-16-17-15-14-17-17-
15-10-11-18-15".

Mean length: 12¾

ATLANTIC SALMON AND TROUT INVESTIGATIONS

1944

Report No. VI. Experimental planting of Atlantic salmon underyearlings in the middle Pollett river.

By P. F. Elson

Planting of Atlantic salmon underyearlings in the middle part of the Pollett river, tributary of the Petitcodiac river, New Brunswick, was done for the third consecutive year in 1944. Both of the earlier plantings had been done according to the same general scheme, which involved 'spot-planting' of the young fish along that part of the river, including tributaries, between the Jordan Memorial Sanatorium and the dam at Elgin, in such a manner that fingerlings were scattered over several hundred yards of water and no stretch of suitable water longer than about 1 mile was left unseeded. (Atlantic Salmon and Trout Investigations, 1942 MS report No. VIII and 1943 MS report No. XIII).

Surveys made in 1943 and 1944 indicated an almost complete lack of survivors of these plantings in the main river, while parr in fair numbers (about 1 to 8 % of those planted in such places) were found in the tributary brooks. Also there appeared to be a slightly better survival for the 1942 planting than for the 1943. The 1942 planting was followed by a period of rather low water and high temperatures, while in 1943 there were lower temperatures but rather high water following the planting. Which of these two conditions would have the most adverse effect on the planted fish it is difficult to say, but by comparison with results from the lower part of the North river it would appear

that some of the loss could well be attributable to high water immediately following planting. In this latter stream there was a fairly good survival in the summer of 1942 following the 1941 planting, which was not subjected to very high water in the autumn following planting; and there was a relatively poor survival in the summer of 1944, from the 1943 fall planting which was subjected to considerable high water following planting. In any case the outstanding feature of both Pollett plantings has been the lack of survivors in the main river; whether this was due to adverse physical conditions such as low water levels and high temperatures, excessively high water levels and accompanying strong current, or to the action of predators (mergansers work the middle Pollett rather thoroughly) makes little difference in as far as the results are concerned. Because of this dearth of survivors in the main river it was decided to alter the plan for 1944 to take account of the facts already observed. Since survivors were almost nil in the main river but reasonably abundant in the tributaries an obvious scheme was to plant all, or most of, the fish in the tributary brooks. This was the plan selected for 1944.

Since it was decided to use the same number of fish for the '44 planting as had been used for the two previous plantings the relative density of planting was necessarily somewhat greater than in '42 and '43. However by utilizing longer stretches of the tributaries the planting density was kept well within limits which might be encountered under natural conditions. A few fish were placed in the main river, but only in rapids a short dis-

tense above large ponds. These latter places were selected for planting because some surviving parr had been found in association with such places. Whether the significance of the ponds is in the physical conditions supplied in the habitat or in the relative lack of bird predators resulting from proximity to human activity is not definite.

The new territory used in 1944 consisted primarily of the upper parts of the larger tributaries. This involved taking fish into somewhat less accessible parts than in other years, but since more fish were put out at each place the sum total of labour was not greatly different from the other two plantings.

Babcock Brook. In this, the largest tributary, earlier plantings extended only about 1/2 mile above the highway bridge, i. e. about 7/8 mile above the mouth of the stream. In 1944 an old road striking the brook about 1 1/2 miles above the highway was cleared out so as to make this part of the brook accessible by team and wagon. By planting nearly 1/2 mile above this point the portion of the stream used for salmon planting was about doubled. In its lower part this stream is stony with much rapid and pool, though the gravel is flat and not very loose. The lower mile of the new portion is quite similar to the lower part of the stream, but with generally more rapid water and fewer and shallower pools. Farther up there is an increasing amount of sand in the stream bed, possibly associated with a beaver dam just above the upper limit of planting, but not enough to prevent utilization of the stretch by some salmon. Above, however, the stream is small and rather cold, with either sand or rocky

bottom and is to be regarded as trout rather than salmon water. The entire stream runs through forest. About 3 miles of stream was covered by the planting.

Salmon Hole Creek. This is the second largest tributary. The area planted was extended by using about 1/4 mile of stream extending from the uppermost farmhouse on the brook upstream. A 1/2 mile stretch between the former upper limit of planting (at Roland Kaye's) and the new stretch, being intermittent in flow in summertime, was left unplanted. This new part is small, shallow, bottom of rather small gravel with some stones and sand, but has alternate pools and rapids. It is overgrown by alders in the lower part and runs through forest above. A total of about 3 miles above the mouth of the brook was covered by the planting.

Gladstone Brook. This brook is considerably smaller than the two previous. Its upper portion, flowing mostly through fields and meadow, is very small, with stony or gravelly bottom. Below the point where road and brook diverge the bottom is of rather fine gravel over bed rock and large stones. About 1/4 mile below the lowest clearing along the road the brook enters forest and is either overgrown with alders or runs through forest for the rest of its course. A total of about 1 1/2 miles of the brook, from Mapleton down, seems to be capable of supporting some salmon. The lower 1 1/2 miles become intermittent in dry weather.

Lee Brook. On Lee brook the planting territory was extended by planting additional fish in that portion of the brook below the old Lee road (now a private lane). This new part is

thus between the upper and lower plantings of other years. This part is largely overgrown with alders, or through forest in its lower part; the bottomis gravelly to stoney with much rapids and small pools; it is slightly more declivitous then the uppermost part and generally intermediate in character between the part above the Lee road and the part in the vicinity of Elgin. While the new planting did not actually increase the 2 1/4 miles of the brook used for salmon it did give an improved distribution of more fish.

Berchard Brook. As in Lee brook no additional territory was used in 1944 but a considerably larger number of underyearlings was scattered over intermediate parts of the brook. In all about 1 1/2 miles of this brook, from the mouth up, were planted.

Mapleton Brook. This small brook, because of a lack of survivors from earlier plantings, was not called on to bear much of the increased number of fish allotted to the tributaries for this year.

It should be kept in mind that the primary object of these plantings in the middle Pollett has been to secure the 'best yield of smolts from the fish planted'. Thus in the first two plantings the fish were distributed roughly in accordance with the estimated capacity of the river to support yearling parr (1 underyearling planted for each 'expected' parr). In 1944 the experiment involved planting the same total number of underyearlings, but in order to get the 'best' yield, placing them in places where survival had already been demonstrated to be of the highest order.

Method of planting

The techniques used in planting were similar to those used before and involved spot-planting with due allowance for dispersal to populate intervening areas, the planted fish at each location being spread over approximately 1/4 mile of stream. The underyearlings received from the hatchery were held in screened boxes at 3 convenient points along the main river and then transferred to the planting sites in small numbers (dependent on the time required for distribution etc.) in wooden barrels supplied by the hatchery. Actual planting of the fish was then done from pails by picking out a few fish in a small screen dipper, counting individuals and liberating them in or very near suitable water for fish of their size.

While it had been hoped to use fish of River Philip stock as in other years this was not possible. Underyearling salmon were therefore obtained from the Miramichi hatchery (fish of Miramichi stock) at South Esk, N. B. These were brought down on August 20 and distributed in proper proportion among the 3 holding points on the main river. Because of an error at the hatchery it was necessary to bring down an additional lot on August 26, the Cobequid hatchery truck which was employed for planting distribution being also used to bring down this second shipment, which resulted in a small delay in the work of planting.

Actual distribution of the young salmon was assisted by Supt. P. B. Stretton of the Cobequid hatchery, who brought with him truck, barrels and some holding boxes.

Details of 1944 operations

Salmon underyearlings received from Miramichi hatchery at the Pollett river, August 22, 1944

Held at	No. to be planted — Water		total for section	R'e'd from hatchery — 1st trip#	2nd trip
Sta. 1 (for sect. 1 and Gladstone bk.) Mapleton road bridge	Lee brk.	3,000	7,000	8 bbls. est'd at 7,200 actually about 4,000	7,000 planted off truck 1,500
	Barehard	1,000			
	Mapleton	500			
	Gladstone	2,500			
Sta. 2 (for sect. 2 except Gladstone) Salmon Hole	Sal. Hole	3,000	4,500	5 bbls. est'd. at 4,500 about 2,500	
	Pollett below				
	Sal. Hole	1,500			
Sta. 3 (for sect. 3) Moore bridge	Babcock	4,000	5,000	7 bbls. est'd. at 6,300 actually about 3,500	
	Pollett above				
	Sen.	1,000			

#The error at Miramichi hatchery in counting the no. of fish per barrel (error was made in recording weight of a standard no. of fish) was not discovered until much of the planting had been done. Since the fish were counted as planted no error was carried into the planting. But since the figure given of 900 fish per barrel was considerably high some shifting of fish between stations had to be made as planting progressed. This was done with very little loss of time, the chief loss resulting from the mistake being in the time necessary for making a second trip to the hatchery where one should have sufficed. We accompanied the truck on this second trip and found that the method of counting fish by weighing a standard number, or by counting the no. of fish per unit of weight and then weighing out the required weight

of fish was actually quite accurate - at least sufficiently so for ordinary planting purposes - provided a consistant degree of care was taken in draining the fish before weighing. Actual figures have been misplaced but to the best of our memory the accuracy in weighing about 1,000 fish of a size running about 1,000 per 12 to 16 oz. was of the order of 2% or better. This was very much more satisfactory than methods of visual estimation used by some of the hatcheries in sending shipments during the first years of the Petitcodiac experiments.

Size of salmon underyearlings of Miramichi stock planted in the Pollett river, 1944.

Shipment	Number measured	Size range	Mean length $\leq \frac{Nx}{N}$	Standard deviation $\sqrt{\frac{\leq Nx^2 - (\leq Nx)^2/N}{N-1}}$
1	95	31 - 54 mm.	42.9 mm.	4.2 mm.
2	82	33 - 49 mm.	41.3 mm.	3.9 mm.

While a slight difference in the sizes of the two lots of fish is indicated by the measurements this is probably not sufficient to cause a differential in their rates of survival or growth

after being planted, but is rather a result of their having been reared under slightly different conditions at the hatchery (information from the hatchery superintendent). The fish planted this year did, however, average nearly a centimeter longer than those planted in 1943.

Plantings of Atlantic salmon underyearlings in the Pollett river, 1944

Operations are recorded below in chronological order as best giving the method of procedure. The general plan of distribution can be seen by reference to the accompanying map. Base of operations was Petitcodiac village.

Aug. 23 — **For Salmon Hole Creek - 3,000 fish.**

10.15 a. m. — arrive at Sta. 2 (Salmon Hole)

10.40 a. m. — Trip 1. Leave sta. 2 with 1,933 fish (approx.)

11.00 a. m. — arrive at Dobson's Mill (old ford about 3/4 mile above mouth of creek)
starting at head of meadow 175 paces above ford
1. in 265 paces on up . . . . . .400 fish

leave at 11.30 a. m. — 2. in 220 paces below ford 400

11.40 a. m. — arrive at Len Bennister's bridge (previously but erroneously called Len Master's)
1. in 220 paces down 400

leave at 12.40 p. m. — 2. in 275 paces on down 400

12.45 p. m. — arrive at Roland Kaye's old place
starting at old dam behind house

leave at 1.00 p. m. — 1. in 220 paces up 333

dinner at Petitcodiac

2.30 p. m. — leave Petitcodiac for Sta. 3 (Moore bridge) and pick up about 2,500 fish

3.30 p. m. — Trip 2. leave sta. 3

3.40 p. m. arrive at Roland Kaye's
starting at old dam
1. in first 220 paces up . . . . . 67 fish

leave at 4.10 p. m. 2. in next 220 paces on up 400

4.20 p. m. arrive at upper farm (Douthright's) where road diverges from brook, and drive back lane about 1/4 mile to field from lane crossing brook

leave at 4.45 p. m. 1. in 440 paces on up 500

5.00 p. m. Trip 3. arrive at sta. 2
In Salmon Hole creek
1. in 220 paces up from mouth 100

For Pollett river above Forest Glen pond - 1,500 fish

in main river., starting at 1st rapids below Salmon Hole

finish at 6.00 p. m. 1. in 440 paces on down 1,500

load 2 bbls. with water and go to Sta. 1 (Mapleton bridge) for about 3,000 fish which were taken down to sta. 3 for morning

leave sta. 3 at 7.30 p. m.

Aug. 24

For Babcock Brook - 4,000 fish

8.30 a. m. arrive at sta. 3

9.00 a. m. Trip 4. leave sta. 3, with about 2,000 fish in 4 bbls., in Charles Wood's wagon, for old camp on brook about 1 1/2 miles above road bridge.
starting at bridge below camp
1. in 600 paces up stream 1,000
(including in East branch, lower 100 paces . . . 78 fish; mouth of this branch to camp bridge . . . 200).

2. in 440 paces below camp bridge 1,000

12.00 p. m. arrive back at Wood's

dinner at Wood's

1.45 p. m. Trip 5. leave sta. 3 with about 2,000 fish (truck).

2.00 p. m. arrive at highway bridge on Babcock brook, walk up wood road on east side of brook 440 paces and up brook 50 paces more to lower

limit '42 and '43 plantings (blaze on tree) (estimated at 440 paces above bridge via brook); from this point
1. in 600 paces up . . . . . 750 fish

2. down to bridge 750

3. starting 110 paces below bridge
leave at 3.25 p. m. in 220 paces on down 500

For Pollett river above Sanatorium pond - 1,000 fish

return to sta. 3 for fish

3.50 p. m. Trip 6. arrive at Horseman's pasture fence on river bank, opposite lane

leave at 4.30 p. m. 1. in 220 paces down stream 1,000

(First shipment of fish used up).

Aug. 25 and 26 To South Esk for more fish (about 8,000 brought).

Aug. 26

1.30 p. m. leave Petitcodiac for sta. 1 where about 4,000 fish were left in pontoon, rest carried on in truck.

For Mapleton Brook - 500 fish

2.30 p. m. Trip 7. arrive at Mapleton brook, where brook approaches road about 3/4 mile above its mouth, from fence at lower bend in brook (S to W)

1. in 220 paces down 250

2. from 50 paces above 2nd house up
leave at 3.10 p. m. in 220 paces on up (to cat-tail swamp) 250

For Gladstone Brook - 2,500 fish

3.20 p. m. arrive at west fork of brook on Mapleton road

1. in 220 paces down (to confluence) . . . 300

2. in 1/4 mile on down to where brook
leave at 4.10 p. m. and road diverge 300

at clearing about 5/8 mile below Mapleton starting at edge of woods above big elm tree

1. in 220 paces on up . . . . . 300 fish

2. in 150 paces down from old elm 200

(raining heavily) deposit about 2,000 fish in small pontoon in creek and

leave at 4.35 p. m. for Petitcodiac

Aug. 27 Sunday - did not work

Aug. 28

8.45 a. m. leave Petitcodiac

9.20 a. m. Trip 8. arrive at Gladstone brook at big elm

1. starting 150 paces below big elm in 730 paces on down 800

back at pontoon at 10.00 a. m.

2. starting at old saw mill about 3/4 mile below big elm in 440 paces on down 600

back at truck at 11.00 a. m. with about 600 fish remaining

For Barehard Brook - 1,000 fish

For Lee Brook - 3,000 fish

11.15 a. m. arrive at Elgin in Barehard brook

1. from a point opposite road fork in south end of Elgin town in 220 paces up 250

2. from confluence of Lee and Barehard brooks in 300 paces up (to falls over rock outcrop) 250

finish at 12.00 p. m.

dinner at Elgin

12.45 p. m. Trip 9. leave Elgin for sta. 1 to pick up fish

1.10 p. m. arrive at bridge crossing Lee-Barehard brook

in Lee brook

1. starting 440 paces above confluence with Bershard, in 440 paces on up . . . . . 1,000 fish

leave at 2.00 p. m.

2. at old Lee road (now a lane on Goggin's farm) in 440 paces up (to fence) 1,000

starting 880 paces below old road in 440 paces on down 1,000

leave at 4.00 p. m.

in Bershard brook

3. at Chesley Steeves' bridge in 220 paces up 250

in 220 paces down 250

leave at 5.00 p. m.

return to sta. 1, pick up remaining pontoons at stas. 1 and 3 and all fish (about 2,000 left over) and arrive at Petitcodiac at

6.45 p. m.

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Mileage for work

Aug. 22.	hatchery to Petitcodiac, including for placing fish in pontoons at stations 1, 2 and 3	30	miles
Aug. 23	planting	5	"
Aug. 24	planting	18	"
Aug. 25	to South Esk	145	"
Aug. 26	return to Petitcodiac	125	"
	planting	42	"
Aug. 28	planting	48	"
	Actual mileage for planting	177	"

Total time for planting operations, exclusive of bringing fish . . . . . 3 1/2 days

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Summary

1. For the third consecutive year Atlantic salmon underyearlings were planted in the middle part of the Pollett river, tributary of the Petitcodiac river, N. B.

2. Planting was done at the same time of year as before and approximately the same number of fingerlings was used.

3. Fingerlings this year were from the hatchery at South Esk, N. B., and were of Miramichi stock rather than River Philip stock as in previous years. They averaged about 4.2 cm. in length.

4. Techniques of handling and planting were the same as in 1942 and 1943.

5. Because of low survival rates found in the main river from the first 2 plantings, the 1944 planting was varied by putting most of the fish in the tributary brooks, where survival had been better. This was in line with the primary purpose of the Pollett plantings, which was to get the best production of smolts from the fish planted.

6. Details of distribution of the underyearling salmon are given below, with the figures for the 1943 plantings being given for comparison. ('Section' numbers are as for the 1942 and 1943 reports).

		1944	1943
Section I	main river	0	2,718
	Barchard bk.	1,000	290
	Lee bk.	3,000	536
	Barchard-Lee	0	218
	Cowland Mtn. bk.	0	70
	Mapleton bk.	500	380

		1944	1943
Section II	main river	1,500	5,542
	Gladstone bk.	2,500	655
	Salmon Hole ork.	3,000	1,053
Section III	main river	1,000	4,308
	Babcock bk.	4,000	665
Total for main river		2,500	12,568
Total for tributaries		14,000	3,914
Grand total		16,500	16,482

7. Time required for actual planting was 3 1/2 days (Aug. 23, 24, 26 (1/2 day) and 28). Fish of the first shipment were held in pontoons a day before planting was started; about 1/3 of the second shipment were planted as soon as received and the remainder on the second day after. Total mileage for planting was 177 miles. As in previous years the work was done by 2 men.

Appendix 1. Lengths of Atlantic salmon underyearlings planted in the Pollett river, 1944. Salmon of Miramichi stock, received in 2 shipments; 1st shipment reared under slightly better conditions (outdoor tanks).

Length mm.	$(x - \bar{x}_0)$	N_1 ship.1	N_1x_1	$N_1x_1^2$	N_2 ship. 2	N_2x_2	$N_2x_2^2$	
30	-12	0	0	0	0	0	0	
31	-11	1	-11	121	0	0	0	
32	-10	0	0	0	0	0	0	
33	-9	1	-9	81	2	-18	162	
34	-8	1	-8	64	3	-24	192	
35	-7	3	-21	147	1	-7	49	
36	-6	3	-18	108	2	-12	72	
37	-5	3	-15	75	7	-35	175	
38	-4	2	-8	32	5	-20	80	
39	-3	3	-9	27	9	-27	81	
40	-2	5	-10	20	5	-10	20	
41	-1	8	-8	8	7	-7	7	
42	0	8	0	0	10	0	0	(assumed mean)
43	1	8	8	8	8	8	8	
44	2	17	34	68	4	8	16	
45	3	10	30	90	7	21	63	
46	4	5	20	80	1	4	16	
47	5	7	35	175	6	30	150	
48	6	6	36	216	4	24	144	
49	7	0	0	0	1	7	49	
50	8	0	0	0	0	0	0	
51	9	2	18	162	0	0	0	
52	10	1	10	100	0	0	0	
53	11	0	0	0	0	0	0	
54	12	1	12	144	0	0	0	
Totals		95	86	1,726	82	-58	1,284	
Mean lengths $(\bar{x} = \frac{\Sigma N_1x_1}{N_1})$		$42 + \frac{86}{95}$			$42 + \frac{-58}{82}$			

for shipment 1 . . . 42.9 mm.
for shipment 2 . . . 41.3 mm.

Standard deviation of means

$$\left(\sqrt{\frac{\Sigma Nx^2 - (\Sigma Nx)^2/N}{N-1}}\right)$$ for 1st shipment $= \sqrt{\frac{1726 - (86)^2/95}{94}} = \sqrt{17.6}$

$= \pm 4.2$

for 2nd shipment $= \sqrt{\frac{1284 - (58)^2/82}{81}} = \sqrt{15.3}$

$= \pm 3.9$

To test difference of the two means

Within sample variations

formula

1st shipment		2nd shipment
$1726 - \frac{(86)^2}{95}$	$(x-\bar{x}_2)^2 = \Sigma x_p^2 - \frac{(T_p)^2}{N_p}$	$1284 - \frac{(58)^2}{82}$
$= 1648$		$= 1243$

total within samples variation $= 1648 + 1243 = 2891$

variance of total sample. formula $= \Sigma x_t^2 - \frac{T_t^2}{N_t}$

$$= 1726 + 1284 - \frac{(86 + (-58))}{95 + 82} = 3006$$

Source of variation	degrees of freedom	sum of squares	Mean square (col. 2 / col. 3)
between samples	1	115	115
within samples	175	2891	16.5
total	176	3006	

$F = \frac{115}{16.5} \doteq 7$ i. e. about 1% probability that means are from same population

Also $t = \sqrt{F} = \sqrt{7} = 2.646$ i. e. about 1% probability

To test whether differences in variances of means could account for differences in means

Source of variation	degrees of freedom	sum of squares	mean square
1st sample	94	1648	17.5
2nd sample	81	1243	15.4

$F = \frac{17.5}{15.4} = 1.136$ i. e. a little less than 20% probability that variances could account for differences observed in means.

While there is some chance that the variances of the two observed means could account for their differences, the likelihood seems to be that the two lots of fish should be described as coming from different 'populations'. This would actually be in accord with known facts for the group of larger fish had been kept under slightly more favourable conditions for a time at the hatchery. However for the purposes of the planting experiments these differences can well be regarded as being more than covered

by the vafiation amongst individuals of each group, and once the fish were planted other factors than initial size differences of such small amount would probably be much more important to the survival and growth of each fish. The matter, while interesting, seems to be in this case of academic interest only.

FIGURE 1. Showing locations of plantings and the planting density for the 1944 distribution of Atlantic salmon underyearlings in the Pollett river, Aug. 22 - 28. From Map 402A, Petitcodiac Sheet (East Half); Bureau of Geology and Topography, Dept. of Mines and Resources, Ottawa.

Figure 1.

The POLLETT RIVER
between Elgin and
the Sanatorium

salmon under yearlings planted
(one dot = 50 fish)

main roads. ---- trails.
---- little used roads.