Juvenile Atlantic Salmon Densities Restigouche River System, New Brunswick, 1979-81

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Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

The correct citation appears above the abstract of each report.

Rapport statistique canadien des sciences halieutiques et aquatiques

Ces rapports servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des Rapports statistiques reflètent la vaste gamme des intérêts et politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Le titre exact paraît au haut du résumé de chaque rapport.

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CONTENTS

LIST OF TABLES

ABSTRACT

Pickard, P.R. and J.L. Peppar. 1984. Juvenile Atlantic salmon densities, Restigouche River system, New Brunswick, 1979-81. Can. Data Rep. Fish. Aquat. Sci. No. 433. v + 15 p.

Over the period 1979-81, electroseining operations were conducted throughout the freshwater reaches of the Restigouche River system, New Brunswick, to determine population densities of juvenile Atlantic salmon. These operations were established, primarily, to determine relative spawning success each year, in relation to increased or decreased escapements of adult salmon to the river system. This report summarizes the calculated juvenile densities for all sites sampled.

Key words: Atlantic salmon, juvenile salmon densities, electrofishing, Restigouche River system, sampling sites.

RÉSUMÉ

Pickard, P.R. and J.L. Peppar. 1984. Juvenile Atlantic salmon densities, Restigouche River system, New Brunswick, 1979-81. Can. Data Rep. Fish. Aquat. Sci. No. 433. v + 15 p.

De 1979 à 1981, on a procédé à des opérations de sennage électrique dans toutes les zones d'eau douce du réseau de la rivière Restigouche (Nouveau-Brunswick) afin de déterminer les densités de population des jeunes saumons de l'Atlantique. Ces opérations visaient avant tout à déterminer quel était, chaque année, la part de succès de la fraie par rapport à l'accroissement ou à la diminution du nombre de saumons adultes ayant réussi à s'échapper et à atteindre les frayères dans le réseau de la rivière. Le présent rapport résume les densités calculées de jeunes saumons pour tous les lieux d'échantillonnage.

INTRODUCTION

The Fisheries Research Branch's biological investigations in the Restigouche River system of northern New Brunswick were initiated in 1972 to assess the effects of the total, commercial salmon-fishing closure imposed that year, to estimate the magnitude of future runs and to provide advice on lifting of the commercial ban.

Electroseining operations were conducted throughout the freshwater reaches of the system each year, to determine population densities of juvenile Atlantic salmon. These operations were established, primarily, to determine relative spawning success, in relation to increased or decreased escapements of adult salmon to the river system. With this objective in mind, operations each year concentrated on the repetition of sites sampled in previous years, so that consecutive-year comparisons could be drawn.

This report summarizes data obtained from juvenile-salmon population assessments conducted over the period 1979-81. Data obtained for the period 1972-78 have been previously presented (Peppar and Pickard 1979). Calculated juvenile densities (numbers/100 m^2) are presented for all sites sampled by the electroseinig operations.

SCOPE OF OPERATIONS

Electroseining operations were conducted on a number of selected streams throughout the Restigouche River system (Fig.) Most of the streams studied were inaccessible for much of their length; thus, sampling sites had to be selected in areas of reasonable access by standard and/or four-wheel-drive vehicles. Locations of sites not described in the previous report are described (Appendix A). Descriptions of a few old sites have been revised and updated.

METHODS AND PRESENTATION OF DATA

On each stream, sampling sites with similar physical characteristics were selected. Every attempt was made to select sites possessing all three basic kinds of habitat - pool, run and riffle. Barrier nets were employed to fence off areas in the order of 280-360 m^2. Each sampling site was fenced off with barriers at its upper and lower boundaries, and on one side as well, if the full width of stream could not be covered.

All sites were diagrammed on data sheets (Appendix B) at the time of sampling, indicating their location, habitat and substrate characteristics. For year-to-year recognition, a permanent object at each site was blazed or marked with red paint to mark the position of the upper or lower barrier.

All seining was performed with variable-pulse shockers. Two units were employed - a portable Dirigo 500 and/or a Dirigo 600 Electrofisher. These units produced 0-600 volts, giving 0-10 amperes (usually held close to 1.0 ampere), stunning the fish but minimizing actual mortality or injury. In addition to the shocker, an apron seine and dip net were employed.

Estimates of the number of fish within a sample area were obtained by making several uniform coverages. Electroseining was done back and forth across the area while proceeding from the upper to the lower barrier. The elapsed time for the initial "sweep" (complete coverage of an area) was adhered to closely for succeeding sweeps, so that each would approximate a similar unit of effort. Generally, five sweeps were made at each sampling site.

All salmon taken in a sweep were measured (fork length) and sizes were recorded in a length-frequency table. Sizes recorded in this manner allowed the determination of the numbers of fry (under-yearlings), small and large parr (post-yearlings), on the basis of the mode distributions obtained. Numbers obtained were then applied to density/unit area calculations (Appendix C). The tables to follow summarize the caluclated juvenile densitiies obtained for all the individual sites and the mean densities for all streams over the three years of sampling.

RESULTS

The streams and corresponding numbers of sites where electroseining operations were conducted are summarized (Table 1). The table also indicates total areas sampled each year, average area per site and total numbers of juvenile salmon obtained.

Calculated densities of Atlantic salmon juveniles (fry, small parr and large parr) - as determined by the electroseining operations in the Restigouche River system, 1979-81 - are summarized on an individual site basis (Tables 2-4) and as mean densities for each of the streams sampled (Tables 5-7).

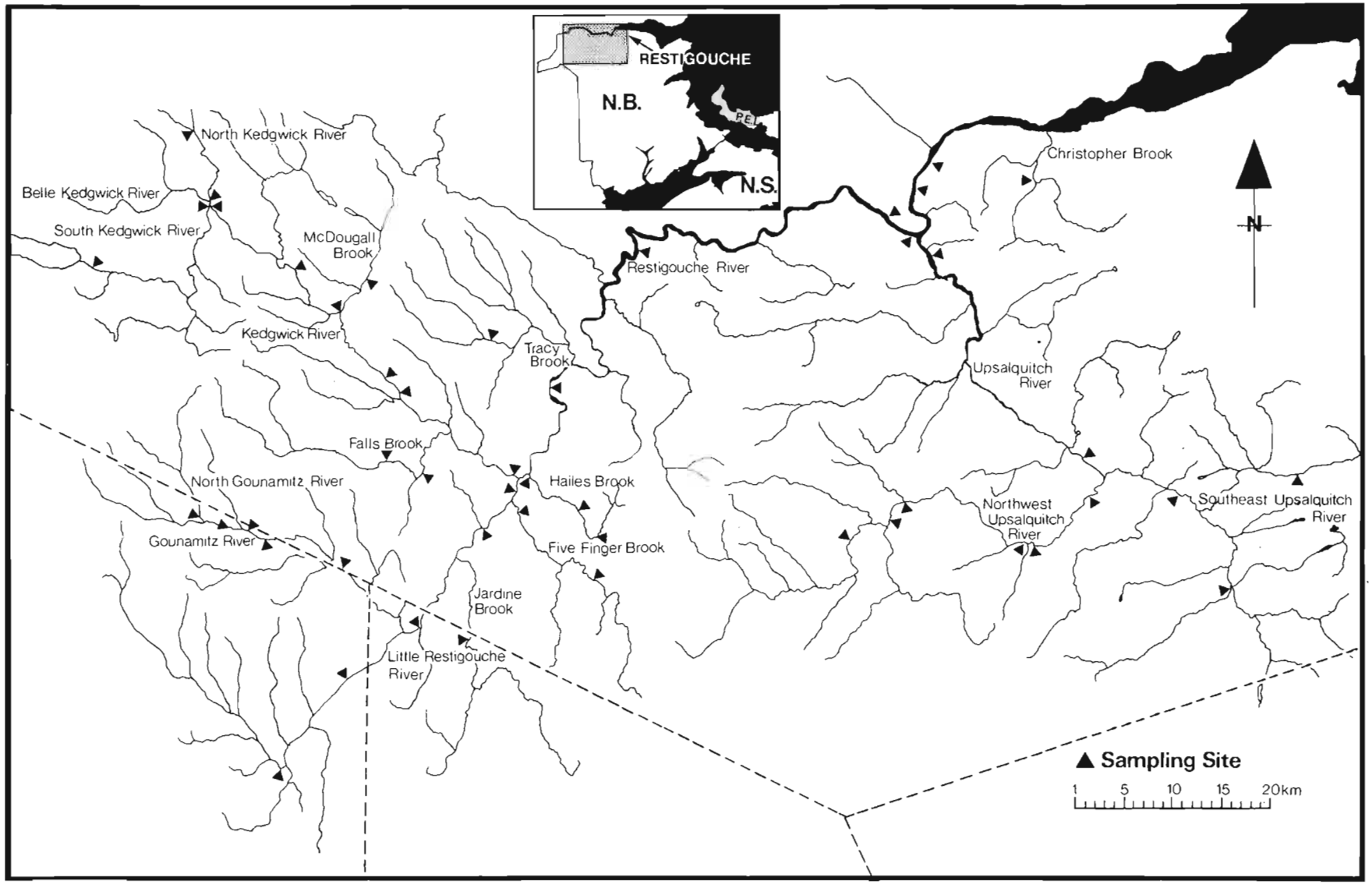

FIG. Restigouche River system, showing location of electroseining sampling sites, 1979-81.

TABLE 1. Streams and numbers of sites on the Restigouche River system where electroseining operations were conducted, 1979-81.

River or stream	Numbers of sites sampled 1979	1980	1981
Main Restigouche River	6	6	6
Upsalquitch River	9	9	10
Kedgwick River	5	5	5
Belle Kedgwick River	1	1	1
North Kedgwick River	2	2	2
South Kedgwick River	2	2	2
Gounamitz River	4	4	4
North Gounamitz River	1	1	1
Five Fingers Brook	2	2	2
Jardine Brook	1	1	1
Little Main Restigouche River	5	5	5
Christopher Brook	1	1	1
Falls Brook	-	-	1
Tracy Brook	1	-	1
Hailes Brook	-	3	3
Totals	40	42	45
Total area sampled (m^2)	14,298	14,625	16,515
Average area per site (m^2)	357	348	367
Total numbers of salmon captured	2,624	2,271	3,198

TABLE 2. Calculated densities of Atlantic salmon fry, as determined by electroseining in the Restigouche River system, 1979-81.

River or stream	Site number	Fry density per 100 m^2 1979	1980	1981
Main Restigouche River	26	9.6	23.5	23.9
	27	2.0	2.8	11.6
	28	18.4	5.1	14.3
	29	13.0	5.4	23.8
	34	8.3	10.0	14.1
	37	8.2	15.9	31.1
Upsalquitch River	A	12.4	23.2	20.2
	B	10.7	14.0	16.8
	1B	17.7	8.2	16.0
	D	21.0	13.4	20.0
	E	18.0	13.4	19.7
	G	15.4	7.0	10.1
	H	18.2	13.2	16.7
	K	39.9	12.6	34.6
	L	34.5	17.6	46.5
	P	-	-	7.8
Kedgwick River	1	11.7	8.8	29.3
	2	10.4	2.8	19.1
	3	24.4	42.3	83.6
	15	3.9	<1	8.1
	31	5.8	39.3	24.7
Belle Kedgwick River	6	1.7	<1	18.1
North Kedgwick River	5	10.6	1.4	12.0
	8	2.4	3.0	10.5
South Kedgwick River	7	6.1	<1	8.4
	14	1.9	7.3	6.5
Gounamitz River	9	<1	5.2	17.1
	11	<1	12.3	4.9
	12	<1	18.2	11.2
	13	<1	16.2	28.2
North Gounamitz River	23	1.9	2.7	7.1
Five Fingers Brook	19	5.7	8.5	13.8
	32	1.9	9.8	6.8
Jardine Brook	20	3.2	8.8	8.2
Little Main Restigouche River	21	4.6	11.3	22.6
	22	7.4	14.6	14.2
	30	14.7	6.1	10.0
	35	52.9	17.1	23.3
	36	3.0	6.6	26.8
Christopher Brook	33	3.7	<1	6.9
Falls Brook	17	-	-	4.1
Tracy Brook	25	2.5	-	<1
Hailes Brook	38	-	16.0	6.5
	39	-	<1	<1
	40[1]	-	<1	<1
Overall mean		10.7	10.9	17.3
Total number of estimates		40	41	44

[1] Site 40 not considered in overall mean.

TABLE 3. Calculated densities of Atlantic salmon small parr, as determined by electroseining in the Restigouche River system, 1979-81.

River or stream	Site number	Small-parr density per 100 m^2 1979	1980	1981
Main Restigouche River	26	8.0	15.7	3.2
	27	5.3	7.9	9.4
	28	14.9	1.9	9.6
	29	3.9	<1	<1
	34	4.7	6.9	10.4
	37	<1	3.9	1.5
Upsalquitch River	A	4.5	2.2	4.9
	B	7.3	2.3	2.0
	1B	10.7	1.1	2.8
	D	12.2	5.1	2.0
	E	5.5	2.5	1.7
	G	13.4	5.2	5.2
	H	7.8	2.8	2.3
	K	30.4	14.2	7.0
	L	16.0	11.4	13.1
	P	-	-	4.0
Kedgwick River	1	3.4	4.7	4.8
	2	5.2	2.3	2.0
	3	5.1	<1	<1
	15	9.0	13.9	6.3
	31	2.7	9.3	3.5
Belle Kedgwick River	6	4.9	<1	2.6
North Kedgwick River	5	7.5	7.8	4.7
	8	13.2	7.4	2.0
South Kedgwick River	7	7.7	5.1	2.7
	14	6.2	3.0	<1
Gounamitz River	9	2.3	1.9	5.1
	11	4.5	<1	<1
	12	<1	<1	3.9
	13	<1	<1	1.1
North Gounamitz River	23	6.5	1.4	<1
Five Fingers Brook	19	10.5	2.2	<1
	32	9.2	4.9	7.1
Jardine Brook	20	5.5	2.2	1.5
Little Main Restigouche River	21	<1	<1	<1
	22	12.9	<1	1.9
	30	3.1	<1	2.3
	35	10.4	2.5	4.4
	36	5.4	<1	1.4
Christopher Brook	33	3.1	<1	3.1
Falls Brook	17	-	-	<1
Tracy Brook	25	<1	-	<1
Hailes Brook	38	-	3.8	7.4
	39	-	9.0	5.8
	40 [1]	-	0	0
Overall mean		7.1	4.1	3.6
Total number of estimates		40	41	44

[1]Site 40 not considered in overall mean.

TABLE 4. Calculated densities of Atlantic salmon large parr, as determined by electroseining in the Restigouche River system, 1979-81.

River or stream	Site number	Large-parr density per 100 m^2 1979	1980	1981
Main Restigouche River	26	3.9	15.6	< 1
	27	< 1	< 1	< 1
	28	1.2	< 1	< 1
	29	< 1	< 1	< 1
	34	1.0	2.3	1.2
	37	< 1	< 1	< 1
Upsalquitch River	A	2.8	< 1	< 1
	B	3.9	2.4	< 1
	1B	6.7	5.0	< 1
	D	2.3	1.9	1.3
	E	1.5	< 1	< 1
	G	1.4	2.3	< 1
	H	5.8	< 1	< 1
	K	2.6	2.7	2.1
	L	11.2	3.2	4.4
	P	-	-	3.3
Kedgwick River	1	< 1	< 1	< 1
	2	< 1	< 1	< 1
	3	< 1	< 1	< 1
	15	4.5	< 1	1.1
	31	< 1	< 1	< 1
Belle Kedgwick River	6	1.5	1.6	< 1
North Kedgwick River	5	1.2	< 1	< 1
	8	1.7	2.6	< 1
South Kedgwick River	7	< 1	3.4	< 1
	14	2.2	1.4	< 1
Gounamitz River	9	< 1	< 1	< 1
	11	< 1	< 1	< 1
	12	< 1	< 1	< 1
	13	1.2	< 1	< 1
North Gounamitz River	23	< 1	1.1	< 1
Five Fingers Brook	19	7.7	4.9	2.8
	32	< 1	< 1	< 1
Jardine Brook	20	2.7	2.0	< 1
Little Main Restigouche River	21	< 1	< 1	< 1
	22	3.4	< 1	< 1
	30	< 1	< 1	< 1
	35	< 1	< 1	< 1
	36	2.5	< 1	< 1
Christopher Brook	33	1.3	< 1	< 1
Falls Brook	17	-	-	< 1
Tracy Brook	25	< 1	-	< 1
Hailes Brook	38	-	1.2	< 1
	39	-	3.0	2.9
	40 [1]	-	< 1	< 1
Overall mean		2.1	1.7	< 1
Total number of estimates		40	41	44

[1]Site 40 not considered in overall mean.

TABLE 5. Mean densities of Atlantic salmon fry, as determined by electroseining in the Restigouche River system, 1979-81.

River or stream	Fry density per 100 m^2		
	1979	1980	1981
Main Restigouche River	9.9	10.5	19.8
Upsalquitch River	20.9	13.6	20.8
Kedgwick River	11.3	18.8	33.0
Belle Kedgwick River	1.7	<1	18.1
North Kedgwick River	6.5	2.2	11.3
South Kedgwick River	4.0	3.9	7.4
Gounamitz River	<1	13.0	15.4
North Gounamitz River	1.9	2.7	7.1
Five Fingers Brook	3.8	9.1	10.3
Jardine Brook	3.2	8.8	8.2
Little Main Restigouche River	16.5	11.1	19.4
Christopher Brook	3.7	<1	6.9
Falls Brook	-	-	4.1
Tracy Brook	2.5	-	<1
Hailes Brook	-	8.3	3.5
Overall	10.7	10.9	17.3

TABLE 6. Mean densities of Atlantic salmon small parr, as determined by electroseining in the Restigouche River system, 1979-81.

River or stream	Small-parr density per 100 m^2		
	1979	1980	1981
Main Restigouche River	6.2	6.1	5.8
Upsalquitch River	12.0	5.2	4.5
Kedgwick River	5.1	6.2	3.4
Belle Kedgwick River	4.9	<1	2.6
North Kedgwick River	10.3	7.6	3.4
South Kedgwick River	7.0	4.0	1.6
Gounamitz River	1.9	<1	2.7
North Gounamitz River	6.5	1.4	<1
Five Fingers Brook	9.8	3.6	3.8
Jardine Brook	5.5	2.2	1.5
Little Main Restigouche River	6.5	<1	2.1
Christopher Brook	3.1	<1	3.1
Falls Brook	-	-	<1
Tracy Brook	<1	-	<1
Hailes Brook	-	6.4	6.6
Overall	7.1	4.1	3.6

TABLE 7. Mean densities of Atlantic salmon large parr, as determined by electroseining in the Restigouche River system, 1979-81.

River or stream	Large-parr density per 100 m^2		
	1979	1980	1981
Main Restigouche River	1.3	3.3	<1
Upsalquitch River	4.3	2.1	1.4
Kedgwick River	1.3	<1	<1
Belle Kedgwick River	1.5	1.6	<1
North Kedgwick River	1.4	1.6	<1
South Kedgwick River	1.4	2.4	<1
Gounamitz River	<1	<1	<1
North Gounamitz River	<1	1.1	<1
Five Fingers Brook	4.1	2.7	1.7
Jardine Brook	2.7	2.0	<1
Little Main Restigouche River	1.5	<1	<1
Christopher Brook	1.3	<1	<1
Falls Brook	-	-	<1
Tracy Brook	<1	-	<1
Hailes Brook	-	2.1	1.7
Overall	2.1	1.7	<1

APPENDIX A

LOCATIONS OF RESTIGOUCHE RIVER ELECTROSEINING SITES

For simplification, the following seven key points will be used to describe distances to sites:

(K) Kedgwick, New Brunswick: center of the village, main intersection, near church.

(Q) Saint-Quentin, New Brunswick: center of village, intersection of Canada and Martin streets ("flashing lights").

(A) Montgomery Bridge: crosses Little Main Restigouche River about 8.7 mi (14.0 km) west of Kedgwick (K) and is above the mouth of the Kedgwick River.

(B) Beginning of Gounamitz Road (Miller Road), about 4.9 mi (7.9 km) in Fraser's Road from point (A).

(C) Beginning of road to right, just before Whites Brook church and about 6.2 mi (10.0 km) northeast of Kedgwick (K).

(D) Southeast bridge: crosses Southeast Upsalquitch River about 32.0 mi (51.5 km) southwest of Selwood, New Brunswick, about Mile 32 of new International Paper Co. (I.P.) road.

(H) Hailes Brook camp: about 7.7 mi (12.4 km) west of Kedgwick (K), en route to Montgomery Bridge.

SITE LOCATIONS - listed in order presented in the preceding tables.

Main Restigouche River

#37 About 2.8 mi (4.5 km) from Kedgwick, en route to Montgomery Bridge, take road leading to Downs Gulch at Castonguay's Welding Shop. Continue along main woods road about 7.5 mi (12.1 km), then turn left (just before parking area for Downs Gulch Lodge) and proceed about 0.3 mi (0.5 km) to river landing. Site is above approach to river.

Upsalquitch River

E. Proceed about 30.5 mi (49.1 km) in from Point C, then turn right in road indicated by sign "9 Mi N.W. Upsalquitch." About 3.7 mi (6.0 km) in this road, continue past turnoff to Site C about 0.7 mi (1.1 km) to river. Site is below lower 9-mi pool.

G. Proceed about 33.3 mi (53.6 km) in from Point C to forks indicated by sign "Crooked Rapids." Take right fork for about 0.5 mi (0.8 km), then turn right at sign "Craven Gulch." About 1.0 mi (1.6 km) in this road, turn left in road which goes to 3-mi pool and continue about 0.8 mi (1.3 km) to river. Site is off landing.

K. Proceed about 33.3 mi (53.6 km) in from Point C to forks indicated by sign "Crooked Rapids." Take right fork for about 0.5 mi (0.8 km), then turn right at sign "Craven Gulch." About 1.0 mi (1.6 km) in this road, continue past turnoff to Site G about 0.7 mi (1.1 km) to 3-mi bridge. Cross Northwest Upsalquitch River and follow main woods road about 3.0 mi (4.8 km) to intersection with Caribou Road. Continue left on Caribou Road about 3.4 mi (5.5 km) to intersection with I.P.'s new road at about Mile 32 (Point D about 0.1 mi) [0.2 km] to left). Turn right and proceed about 1.3 mi (2.1 km) to Flying Eddy Pool warden's camp lane. Immediately after turning left into camp lane, swing left and proceed on old road 0.1 mi (0.2 km) to landing. Site is off landing, about 550 ft (165 m) below Flying Eddy Pool.

L. About 13.1 mi (21.1 km) in I.P.'s road from Point D at about Mile 45, turn left off I.P.'s new road and proceed about 4.7 mi (7.6 km) to old gate area (Ramsay Lodge); then left for about 1.1 mi (1.8 km) to the mouth of Ramsay Brook. Site is about midway between the mouths of Ramsay and Murray brooks.

P. At Point D, take road going to Red and Middle brooks for about 0.5 mi (0.8 km) to clearing and forks. Take left fork for about 8.7 mi (14.0 km) (passing turnoff to Site O and crossing Red and Middle brooks) to intersection with I.P.'s old road. Turn right and proceed about 1.9 mi (3.1 km) to Little Southeast Upsalquitch River. Site is above bridge.

Falls Brook

#17 Cross bridge over Falls Brook about 6.5 mi (10.5 km) in Fraser's Road from Point A. Site originally (1972) where new bridge now crosses the brook. Site presently (since 1981) about 200 ft (60 m) below new bridge.

Hailes Brook

#38 Hailes Brook camp area. Upper end of site is about 10-15 ft (3-5 m) above outlet from salmon holding pond.

#39 About 1.4 mi (2.3 km) from Kedgwick, en route to Montgomery Bridge, cross Highway 265 (instead of turning right) and continue about 0.7 mi (1.1 km); then left about 1.1 mi (1.8 km) to Hailes Brook. Lower end of site is about 50-75 ft (15-23 m) above bridge.

#40 About 3.6 mi (5.8 km) from Kedgwick, en route to Saint-Quentin, turn right into field and proceed about 0.2 mi (0.3 km) across field to brook. Site is off approach to brook.

RESOURCE DEVELOPMENT BRANCH

A-

ELECTROSEINING DATA

SYSTEM	STATION	RECORDER	DATE

SWEEP # & TIME	1 MIN.	2 MIN.	3 MIN.	4 MIN.	5 MIN.	6 MIN.
SPECIES						
TOTAL						
SPECIES						
TOTAL						
SPECIES						
TOTAL						
SPECIES						
TOTAL						
SPECIES						
TOTAL						
SPECIES						
TOTAL						
SPECIES						
TOTAL						
SPECIES						
TOTAL						

THIS SHEET TO BE USED ONLY WHEN CATCH/EFFORT CALCULATIONS WISH TO BE MADE — NOT SUITABLE FOR SCHNABEL METHOD.

CALCULATIONS FOUND ON BIO-16-

RESOURCE DEVELOPMENT BRANCH

B–

LENGTHS	WIDTHS	RATE of FLOW
LEFT BANK	LR. BARRIER	1
		2
		3
		4
RIGHT BANK	UP. BARRIER	AVERAGE
AVERAGE x		= SQ. YARDS

DEPTHS (IN INCHES)

UPPER BARRIER	+	+	+	+	0	=
	+	+	+	+	0	=
	+	+	+	+	0	=
	+	+	+	+	0	=
LOWER BARRIER	+	+	+	+	0	=

MAXIMUM DEPTH ____ IN. ÷ n = ____ IN. TOTAL

SKETCH and/or NOTES – pools, % riffle, bottom type, cover, banks.

CREW
PROBE
DIP

AIR TEMPERATURE	
H_2O TEMPERATURE	
pH	
SPECIFIC COND.	
WEATHER	
BARRIERS USED	

MACHINE #

	LOAD VOLTS	LOAD AMPS
1		
2		
3		
4		
5		
6		

REMARKS

Environment Canada Environnement Canada
Fisheries Pêches

B10 – 16	A–

ELECTROSEINING CALCULATIONS

STREAM	STATION	DATE

SPECIES	SPECIES

n	UNMARKED CAUGHT U	MARKED IN AREA OR REMOVED ΣU= X	U^2	X^2	UX	n	UNMARKED CAUGHT U	MARKED IN AREA OR REMOVED ΣU= X	U^2	X^2	UX
1						1					
2						2					
3						3					
4						4					
5						5					
6						6					
(n)	ΣU	ΣX	ΣU^2	ΣX^2	ΣUX	(n)	ΣU	ΣX	ΣU^2	ΣX^2	ΣUX
$(\Sigma U)^2$		$(\Sigma X)^2$		ΣUΣX		$(\Sigma U)^2$		$(\Sigma X)^2$		ΣUΣX	

	$A = n\Sigma UX - \Sigma U\Sigma X$		
	$B = n\Sigma X^2 - (\Sigma X)^2$		
	$\hat{k} = -A/B$		
	$\widehat{kN} = (\Sigma U + \hat{k}\Sigma X)/n$		
	$\hat{N} = \widehat{kN}/\hat{k}$ POPULATION ESTIMATE		
	ACTUAL CATCH = ΣU		
	ESTIMATE DENSITY / SQ. YD.		

B10 – 16	B–

SPECIES						SPECIES					
n	UNMARKED CAUGHT U	MARKED IN AREA OR REMOVED $\sum U = X$	U^2	X^2	UX	n	UNMARKED CAUGHT U	MARKED IN AREA OR REMOVED $\sum U = X$	U^2	X^2	UX
1						1					
2						2					
3						3					
4						4					
5						5					
6						6					
(n)	$\sum U$	$\sum X$	$\sum U^2$	$\sum X^2$	$\sum UX$	(n)	$\sum U$	$\sum X$	$\sum U^2$	$\sum X^2$	$\sum UX$
$(\sum U)^2$		$(\sum X)^2$		$\sum U \sum X$		$(\sum U)^2$		$(\sum X)^2$		$\sum U \sum X$	

	$A = n\sum UX - \sum U \sum X$		
	$B = n\sum X^2 - (\sum X)^2$		
	$\hat{k} = A/B$		
	$\hat{kN} = (\sum U + \hat{k}\sum X)/n$		
	$N = \hat{kN}/\hat{k}$ POPULATION ESTIMATE		
	ACTUAL CATCH $= \sum U$		
	ESTIMATE DENSITY / SQ. YD.		

THIS SHEET CAN BE USED ONLY WHEN CATCH-EFFORT CALCULATIONS WISH TO BE MADE — NOT SUITABLE FOR SCHNABEL METHOD. BASIC DATA IS FROM B10-15.	CALCULATOR

NOTES

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REFERENCE

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