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RESOURCE DEVELOPMENT BRANCH

MANUSCRIPT REPORT

No. 72-9

Fisheries Inventory of the Northwest Miramichi River Basin, New Brunswick, with particular reference to Atlantic Salmon

by

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FISHERIES INVENTORY OF THE NORTHWEST MIRAMICHI RIVER BASIN, NEW BRUNSWICK, WITH PARTICULAR REFERENCE TO ATLANTIC SALMON

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July, 1972.

page no.

Table of Contents

List of Figures

1.0 Introduction

In an effort to improve and extend the knowledge of Atlantic Salmon in the Miramichi River Basin in New Brunswick, the Northwest Miramichi and its tributaries were inventorized in 1966. The Miramichi River is by far the most productive river for Atlantic salmon in Canada, and the Northwest branch, forming 18 per cent (819 square miles) of the total drainage basin area of 4510 square miles, is a significant contributor to the total production. Unfortunately, this contribution has been reduced in recent years because of severe changes in water quality of the main river and one of its tributaries caused by escaping toxic effluent from a base-metal mining operation (Dominy MS 1967).

The Fisheries Research Board in 1950 chose the 70-mile long main stem of the Northwest Miramichi as a site for long term investigations of Atlantic salmon. As a result, data have accumulated on upstream and downstream migrations, survival rates, juvenile salmon densities, time of return and distribution patterns, contribution to fisheries and effects of pollutants (Henderson *et al* MS 1965, Sprague *et al* 1965 and Saunders 1967). However, there has been no significant study of fish or fish habitat in any tributaries to the main Northwest Miramichi

including the Sevogle River which forms approximately 37 per cent of the total drainage basin and it is the purpose of the present study to fill this gap in the knowledge.

2.0 Historical information on the basin.

Ganong (1904 a,b) has provided physiographic descriptions of the main Northwest Miramichi and Sevogle Rivers and his notes are still applicable in most respects today. For ease of treatment, he divided the main Northwest into five distinct sections, viz: (a) source to Little Bald Mountain, (b) Little Bald Mountain to near Glory Hole Brook (mile 46), (c) near Glory Hole Brook to below Stoney Brook, (d) below Stoney Brook to Portage River and (e) Portage River to Red Bank. At that time, there were five to six fishing and hunting camps and a few lumber camps above Portage River. Some grilse were observed in the pools near Little Bald Mountain and Ganong ascribed to the Northwest Miramichi the accolade of being "one of the finest of salmon streams". His treatment of the Sevogle was less detailed but nonetheless worthwhile as a historical and descriptive document.

Less than 700 people (about 1.6 per cent of the total Miramichi River basin population) live along the

freshwater reaches of the Northwest Miramichi River basin above its confluence with the Little Southwest Miramichi River. There are no permanent inhabitants above Portage River on the main river or on the entire Sevogle River basin. Forest harvesting, base-metal mining, fisheries research and protection investigations and Atlantic salmon angling are the main activities in the basin. At present, the water is used as a rearing and spawning area for Atlantic salmon and as a convenient medium for waste disposal from the one operating mine and domestic sources. Exploration of two other ore bodies in different parts of the basin is continuing at present; one of these is in the Sevogle River basin.

3.0 Methods and materials

All significant streams in the basin were examined on foot for gross physical characteristics and in an attempt to quantify Atlantic salmon habitat. This phase of the survey required 115 man-days and covered a total of 320 linear miles of river and stream of which 130 linear miles were in the Sevogle River basin. Juvenile salmon densities were assessed in another 75 man-days at sampling sites located throughout the basin and 28 man-days were required to carry out a salmon spawning survey and redd count in the fall.

Physical Survey

The following data on physical features were collected during the foot surveys.

.01 Length was obtained from topographic maps of the area.

.02 Width was determined using a 100-foot engineer's steel chain.

.03 Depth was determined using a meter stick.

.04 Water velocity and volume of flow were calculated using a floating object which was timed as it travelled downstream over a known length stream. Widths and depths were taken at the same time and place in order to calculate the volume of flow. Three replications were made in each case.

.05 Temperature was measured using a Taylor fahrenheit pocket thermometer.

.06 Specific conductance was measured in micromhos per centimeter by an RB2 Solu Bridge meter.

.07 Gravel bottom types were appraised using a fabricated device consisting of four galvanized, circular grading trays, each 2 inches deep with a diameter of approximately 12 inches, and each with respective bottom hole sizes of 3 inches, 1 1/2 inches, 3/4 inches and 1/4 inches.

These trays fitted into each other for portability. Using a small portable shovel and a collapsible canvas bag 11 inches deep and 12 inches in diameter, a sample of approximately 0.9 cubic feet was collected and then graded. The percentage composition of each grade of gravel was determined by displacement in water.

.08 Rearing and spawning areas for salmon were quantitatively assessed according to size and subjectively appraised by the surveyor using his own value judgement and particular knowledge of Atlantic salmon habitat requirements.

.09 Pools were noted and appraised.

Biological Survey

.10 Underyearling and parr stages of Atlantic salmon were collected from selected sample areas using a variable voltage d-c electrofishing generator. Fish densities were obtained at 8 sites by delimiting the sample area through the use of 1/2-inch stretched mesh barrier nets with an 18-inch burlap sewed along the footrope. As a rule, five complete sweeps of the sample area (300-600 square yards) were made with the electric probe, apron seine and dip net, and estimates

of fish density were made (Delury, 1951). In addition to the quantitative assessments, 19 sites were sampled without barrier nets in order to determine the presence, relative abundance, and quality of fish. Samples for laboratory analysis were preserved in 10% formalin for a period of four to six months.

.11 Bottom fauna was sampled randomly on riffles at intervals of roughly five miles on all major streams of the basin using a one-foot square Surber sampler and on-site hand sorting. Organisms were preserved in 10% formalin.

.12 Salmon redds were counted and occasionally checked for the presence of eggs during part of the spawning season period October 18 - November 1. The selection of areas for checking was based in part on the results of the physical survey. Other areas were randomly selected and examined in an effort to gain more experience in the observation technique. Spawning activity within the basin is comparable on the basis of density: The size of the total area examined was estimated in the field and then divided by the number of redds observed.

.13 Obstructions to fish migration were noted and appraised.

.14 Miscellaneous

Sightings of fish predators and adult Atlantic salmon (grilse and large salmon) were noted as encountered. The presence of fish fauna other than Atlantic salmon was also recorded. For further information, a catalogue of photographs from this field survey has been prepared (Dominy MS 1972).

4.0 Inventory of streams.

Each river and stream in the drainage basin is given separate treatment below, beginning in each case with the headwaters. The order is as follows: (a) main Northwest Miramichi River, (b) main Northwest Miramichi tributaries, starting with those in upper reaches (excluding Sevogle River), (c) South Sevogle River (including main Sevogle), (d) South Sevogle tributaries stating with those in upper reaches, and (e) North Sevogle River (to Square Forks).

The general format for each river will begin with a complete physical description including any miscellaneous biological observations followed by separate sections on fish densities and growth, spawning activity and bottom fauna.

4.1 Main Northwest Miramichi River

Ganong (1904 b) and Elson (MS 1952) have provided physical descriptions of the main river but there is little duplication with the present study because of the attempt in 1966 to quantify as many aspects of the aquatic environment as possible.

.01 Length - 70 miles

.02 Widths - 45 feet (mile 63.5)
95 feet (mile 28)
200 feet (mile 5.5)

.03 Volume of flow (November 1, 1966)
- 30 cfs (mile 63.5)
- 150 cfs (mile 28)
- 570 cfs (mile 5.5)

.04 Velocity (November 1, 1966)
- 1.4 ft/sec (mile 63.5)
- 1.6 ft/sec (mile 28)
- 3.0 ft/sec (mile 5.5)

.05 Water level changes - Staff guages were situated at miles 63.5, 28, and 5.5 for the months of June, July, August and September. Readings were taken daily at Mile 5.5 and every two weeks at the other two sites. Readings for the period May through September inclusive were also obtained from the Fisheries Research Board fish counting fence at Curventon (Mile 8.5). The other two sites were checked less frequently and as a result the information is less representative of water level changes. The data are tabulated below.

4.1 Main Northwest Miramichi River (cont.)

Date	Mile 28 (inches)	Mile 63.5 (inches)
May 30		0.70
June 1	1.80	
6	1.25	
7	1.55	
8	1.35	
9	1.35	0.45
13	1.10	0.35
14	1.00	
15	1.00	
16	0.90	
17	0.80	
23		0.35
24	0.90	
July 7	0.40	0.30
18	0.25	0.15
Aug. 1	0.20	0.10
15	0.10	0.10
29	0.05	0.05
Sept.22	0.00	0.00
Oct.18	0.10	0.05

In summary, spring flooding occurred during the month of May and gradually receded through June. There was a small flood from July 20 to 23 and lowest water levels occurred from August 31 to September 2.

.06 Temperatures of both the air and water were

4.1 Main Northwest Miramichi River (cont.)

taken on a regular basis from June 6 to September 23 using a maximum-minimum thermometer at Mile 5.5. Sporadic readings were taken at Miles 28 and 63.5. Air temperatures above 32C (90F) at Mile 5.5 were recorded on June 27, August 1, 2 and 6, and September 9; while water temperatures rose above 26C (79F) on June 22, July 3, 6 and 18, and August 8. Water temperature was consistently below 21C (70F) prior to June 15 and after August 21.

.07 Specific Conductivity measurements were made at nine sites along the Northwest Miramichi River between the dates October 18 to October 28. Readings between 45 and 55 μ mhos/cm were recorded above the mouth of the Tomogonops tributary, reflecting the soft nature of the water. Below the Tomogonops tributary, values ranged from 73 to 120 μ mhos/cm. indicating the presence of more ionized material. A tabulation of these data appears below.

Main Northwest Miramichi River (cont.)

Site	Date (October 1966)	Specific Conductance (μ mhos/cm.)
Mile 63.5	21	45
51	28	45
32	28	45
23.5 (above Tomo-gonops)	27	55
22	27	120
14.5	28	90
5.5	18	73
5	28	73

.08 Spawning Gravel for Atlantic salmon is in ample supply throughout the main Northwest Miramichi. It varies in quality along the river from having a predominance of fine material at up-river locations to a predominance of stones greater than three inches in the lower part of the river. The best location is the seven mile stretch of river above Camp Adams (Mile 43.5 to 50.5) while the second best location was found to be the 11.5 miles of river immediately above head of tide. The data are tabulated below.

4.1 Main Northwest Miramichi River (Cont.)

Location (linear river miles)	Spawning gravel (Square yards x 10^3 per mile)
0 - 11.5	7.6
11.5 - 22.0	4.2
22.0 - 28.0	4.7
28.0 - 32.0	1.7
32.0 - 38.5	1.2
38.5 - 43.5	2.8
43.5 - 50.5	11.9
50.5 - 53.5	2.7
53.5 - 56.0	1.6
56.0 - 60.5	6.0
60.5 - 65.0	1.0
65.0 - 67.0	nil
Average	5.2
Total	350.0

Data are tabulated below on the quality of the gravel as described by its percentage composition.

Location (linear river miles)	Percentage composition of Gravel				
	<1/4"	>1/4"	>3/4"	>1 1/2"	>3"
4	20	11	26	25	18
20	20	14	17	20	29
50	33	21	21	22	3
63	31	30	22	12	5

4.1 Main Northwest Miramichi River (cont.)

.09 Pools. A total of 105 pools suitable for Atlantic salmon were noted during the survey. These features of the river were more abundant and of better quality in the upper part of the river above Dam Camp (Mile 38.5) than below. Pools occurred most frequently on the section of river between Little Bald Mountain and the mouth of the South Branch. However, these pools are generally small and their margins are obscured by dense growths of low bush and shrubs. Thirteen grilse were counted in these pools on August 19, 1966. (Note: Angling is prohibited on the main river above the mouth of the South Branch).

Best quality pools are located on the five mile section between Camp Adam and Dam Camp. Seventeen pools were counted along with a total of 20-30 grilse on September 14, 1966. This information is tabulated below.

4.1 Main Northwest Miramichi River (cont.)

Location (linear river miles)	No. Pools	Pool Names and Remarks
0 - 11.5	8	Wildcat, Craig's and Big Hole pools. Lowermost 3 miles deep and sluggish. Big Hole is renowned among anglers.
11.5 - 22	11	Wayerton and Flat Rock pools. Five stillwaters included.
22 - 28	6	Hawthorne Pool. Two stillwaters included. Poor.
28 - 32	4	Little River Pool. Fair.
32.0 - 38.5	8	Elbow, Island and Ash pools. Fair.
38.5 - 43.5	17	Stoney Brook and Dam Camp Pools. Observed 20-30 grilse in Stoney Brook Pool. Excellent.
43.5 - 50.5	3	Hook and Lose, American and Camp Pools. Poor.
50. 5 - 56.0	14	Crawford's, White Horse, Flat Rock, Split Rock and Forks Pools. Poor.
56.0 - 60.5	34	No angling permitted. Some excellent small pools. Many sections have banks cleared as former pulp landings.
60.5 - 63.5	10	No angling permitted.
63.5 - 67.0	Nil	No suitable pools above Fraser's Dam.

4.1 Main Northwest Miramichi River (cont.)

.10 Juvenile Atlantic Salmon Populations have been monitored by the Fisheries Research Board yearly since 1951 at regular stations using electro-seining equipment. These data (1951-1965 inclusive) are presented and discussed by Dominy (MS 1967). The upper portion of the river (above Mile 29) has consistently displayed the capacity to produce more juvenile salmon per unit area of river than the lower portion. This differential was true under natural conditions (prior to 1954) and has been accentuated since that time by the presence of pollutants, particularly D.D.T. and base-metal mine effluent, in the lower river. The mine waste has virtually eliminated, at least temporarily, the lower 24 miles of river as a spawning and rearing area for Atlantic salmon. Representative data for the years 1963, 1964 and 1965 are tabulated below. These data were provided by the FRB Biological Station, St. Andrews. Juvenile salmon were not sampled in the main river by Resource Development Branch staff in 1966.

4.1 Main Northwest Miramichi River (cont.)

Location		1963	1964	1965
		(No fish per 100 sq. yds.)		
LOWER RIVER - (below Mile 29)	7 stations; except 1963, 3 stations			
Underyearlings		4	4	5
Small Parr		3	2	0
Large Parr		0	3	1
UPPER RIVER - (above Mile 29)	5 stations;			
Underyearlings		22	19	21
Small Parr		30	21	20
Large Parr		10	21	17

Source: FRB Biological Station, St. Andrews, N. B.

.11 Counts of Spawning Salmon and Redds in the main river were made during the period October 21 to November 1, 1966. A known area of representative gravel was checked for spawning activity at 13 sites along the river; some were checked twice. Heaviest spawning took place within the first five miles of river above head of tide while the second ranking area appeared to be in the headwaters above Mile 63. It is noteworthy that although large quantities of good quality spawning gravel occur between the mouths of the Tomogonops and Sevogle Rivers, no salmon were

4.1 Main Northwest Miramichi River (cont.)

seen on these grounds and no redds were counted. Base-metal mine effluent has been emanating from the Tomogonops River continuously since 1960.

Location (linear river miles)	Date	No. Redds per 100 sq. yds.	No. Adult Salmon
2.5	28/X	1.9	2
4.0	28/X	1.6	1
5.5	19/X	0.4	Nil
10.0	19/X	Nil	Nil
10.0	1/XI	Nil	Nil
18.0	28/X	Nil	Nil
22.0	28/X	Nil	Nil
32.5	28/X	0.3	Nil
49.5	28/X	0.4	Nil
50.5	28/X	0.1	Nil
56.0	21/X	0.2	1
56.0	31/X	0.4	Nil
63.0	21/X	0.9	7
63.0	31/X	1.3	2
64.5	31/X	1.0	Nil

.12 Bottom fauna was sampled from September 19 to 21 at eight sites along the main river. Greatest volumes were found at Miles 63.5 and 11.0; and the average volumes of samples taken above and below the source of mine pollution were identical. Only a single sample was taken at each site.

4.1 Northwest Miramichi River (Cont.)

Group	Mile 5.5	Mile 11	Mile 22	Mile 24	Mile 32.0	Mile 43.5	Mile 50.0	Mile 63.5
Plecoptera	4	9	1	23	25	9	29	8
Ephemeroptera		2		15	16	17	32	33
Idonata				1	2	1		
Trichoptera	54	130	17	25	17	7	30	171
Diptera	3	2			4	8	1	27
Coleoptera					3	1		3
Mollusca				2				
Nematode							1	
Unidentified				1	2		1	
Total No.	61	143	18	67	69	43	94	243
Total Vol.(ml.)	1.2	1.7	0.2	0.4	0.8	1.0	0.6	2.1

.13 Obstructions. A former pulp wood driving dam at Mile 63.5 owned by Fraser Companies remains open continuously to permit passage of anadromous fish. Atlantic salmon were observed above this structure.

A small beaver dam is located at Mile 67.5 but it is not classed as an obstruction to fish.

An eight foot falls at Dam Camp (Mile 38) is an effective barrier to suckers and cyprinids but presents no problem for migrating salmon.

4.1 Main Northwest Miramichi River (concluded).

.14 Miscellaneous. The watershed of the Northwest Miramichi River drainage basin above Mile 34 has been extensively cut for timber and pulpwood during the period 1954 to 1961; approximately 200,000 cords were cut - equivalent to one-fith of the initial forest resource in this part of the river (pers. comm., New Brunswick Forest Service, Newcastle, N. B.)

Recent former logging camps along the main river were located at Little Bald (Mile 61), the Depot (Mile 50) and Camp Adam (Mile 43.5).

A total of 25 Sportsmen's Camps are situated along the Northwest Miramichi: 8 above Mile 35, 8 between Mile 35 and Mile 20, and 9 in the lower-most 20 miles.

No mergansers were sighted.

100 North Branch

.01 Length - One linear mile of main stream and two minor branches each two miles long.

.02 Width - 16 feet at mouth

.03 Volume of Flow - (August 22, 1966): 13 cfs at mouth.

.04 Velocity - (August 22, 1966): 1.6 ft/sec at mouth.

.05 Water Level Changes - No data available.

.06 Temperature - Water temperature in this small spring-fed tributary on August 22 was 9C., compared with a reading of 12C. at the same time in the main Northwest Miramichi.

.07 Specific Conductivity - (October 21, 1966): 43 μ mhos/cm at mouth.

.08 Spawning Gravel - An estimated 1000 square yards of relatively fine gravel with some sand interspersed is available in this small tributary. This material is probably better suited for speckled trout rather than Atlantic salmon.

.09 Pools - A total of four pools ranging in depth from 2.5 feet to 4 feet are present in the one mile of main stream. Visual counts during the survey indicated that more speckled trout than salmon parr were present in these pools.

.10 Juvenile Atlantic Salmon Populations were not

100 North Branch (cont.)

.10 sampled in this stream. Visual observations attest to the presence of fry and small and large parr up to the forks at mile 1.

.11 Counts of Spawning Salmon and Redds were made on two occasions in 1966 in the North Branch from the mouth upstream approximately one-quarter mile (1000 sq. yds. spawning gravel). The results tabulated below indicate that redd density was relatively low:

Date (1966)	No. Redds Per 100 sq. yd.	No. Adult Salmon
21/X	0.3	1
31/X	0.5	Nil

.12 Bottom Fauna was sampled on September 19, 1966 at a point near the mouth of the stream and the results are given below:

Plecoptera	5	individuals
Ephemeroptera	28	individuals
Trichoptera	21	"
Diptera	4	"
Acari	1	"
Total No:	59	
Total Vol.: (ml.)	0.7	

100 North Branch (cont.)

.13 Obstructions - The ruin of a former pulpwood driving dam is present at mile 0.6. Salmon fry were seen above this site.

.14 Miscellaneous - The watershed of this small drainage basin has been extensively cut over for pulpwood and as a consequence marginal vegetation is absent in several places and shade is poor. Two dilapidated buildings of a former logging camp were present near the dam ruin mentioned above.

No predators to salmon and trout were encountered.

101 South Branch

.01 Length: 7 linear miles

.02 Width - 44 feet (one-quarter mile from mouth)

.03 Volume of Flow - (July 21, 1966): 80 cfs near mouth.

.04 Velocity - (July 21, 1966): 2.3 ft/sec near mouth.

.05 Water Level Changes - A staff guage was situated at the road bridge near the mouth of the river (1/2 mile upstream) for the period May 30 to October 18 and readings were taken approximately every two weeks during that time. The data are presented below and serve to indicate gross changes in water levels at this site.

Date (1966)	Water Level Changes (feet)	Water Temperature (C)
May 30	1.45	11.0
June 9	0.85	11.0
13	0.65	13.0
23	0.60	11.0
July 7	0.25	11.0
18	0.10	15.5
August 1	0.55	15.0
15	0.05	14.5
29	0.00	18.0
Sept.22	0.00	6.5
Oct.18	0.00	5.5

101 South Branch (cont.)

.06 Temperatures were taken irregularly and are presented above in section .05. The highest reading of 18.0 C. was recorded in the mid-afternoon of August 29. (All other summer temperatures at this site were taken before noon.)

.07 Specific Conductivity - (October 21, 1966): 43 μ mhos/cm near mouth.

.08 Spawning Gravel - An estimated 9000 square yards of gravel suitable for Atlantic salmon spawning is available in the South Branch; 90 per cent of it is located within two miles of the river's mouth. Because it is relatively fine-grained, the quality of this gravel is perhaps more suited to speckled trout, particularly in the upper reaches of the river. However, salmon fry and parr were observed at mile 4, far above the best quality gravel.

.09 Pools - At least 27 pools ranging in depth from two to four feet were noted; all except two were upstream from mile 1.

.10 Juvenile Atlantic Salmon Populations - One quantitative assessment of fish populations was made in this tributary on July 11 and it revealed the presence of a high density of small parr and a relatively normal density of large parr. Few

. 101 South Branch (cont.)

fry were present. The calculated densities of juvenile salmon at this site are as follows:

Fry - 3 per 100 square yards

Small Parr - 65 per 100 square yards

Large Parr - 14 per 100 square yards

Growth of the parr in length and weight was as follows:

	Age 1^+	Age 2^+
Length (mm)	70.7 (50)	98.8 (12)
Weight (grams)	4.7 (50)	12.8 (12)

.11 Counts of spawning Salmon and Redds - Observations were made on the section of stream within one-quarter mile of the mouth and a total of 2000 square yards of gravel were covered. Fourteen redds and two salmon were recorded on October 21 and no new activity was observed when the same area was re-checked on October 31. It is concluded that spawning activity was light.

.12 Bottom Fauna was sampled on September 19, 1966 at a point near the road bridge and the results are given below. The volume of organisms at this site was greater than the majority (80 per cent) of samples taken from other areas in the Northwest Miramichi River basin.

101 South Branch (cont.)

Plecoptera	14	individuals
Ephemeroptera	53	"
Trichoptera	83	"
Diptera	19	"
Coleoptera	9	"
Acari	2	"
Nematodes	1	"
Total Number	181	
Total Volume (ml)	1.6	

.13 Obstructions - Two natural waterfalls are located at mile 3.5 with respective heights of 12 feet and 10 feet. No juvenile salmon were observed above this point. Several beaver dams were found along the river, but they did not act as barriers to anadromous fish.

.14 Miscellaneous - The upper reaches of this tributary appear to be generally better suited for speckled trout than Atlantic salmon; temperatures are relatively low and spawning gravel consists of finely-divided material. During electro-seining in the lower reaches near the mouth, 176 speckled trout were captured, 91 of which were fry.

101 South Branch (concl.)

.14 Forest cutting occurred in this basin in the past as evidenced by an old logging road which crosses the river above the Goodwin Lake tributary.

Goodwin Lake supports some angling for speckled trout, although road access to the lake is poor.

Two fish-eating birds, the heron and kingfisher, were encountered. One eel was captured during the electro-seining operation.

During the fall spawning survey, several dead fish were collected from the South Branch, including: one large male parr, two unsexed small parr and two speckled trout.

102 Stoney Brook

.01 Length - 4 linear miles

.02 Width - 16 feet (one-half mile from mouth)

.03 Volume of Flow - No information

.04 Velocity - no information

.05 Water Level Changes - no information

.06 Temperature - Water temperature was 18 C in the mid-afternoon of July 22, 1966 (one-half mile from mouth). A small tributary to Stoney Brook entering near this site registered 16 C.

.07 Specific Conductivity (October 28, 1966): 28 μ mhos/cm one-half mile from mouth. This is the second lowest of a total of 55 readings taken throughout the Northwest Miramichi drainage basin.

.08 Spawning Gravel - No foot survey of Stoney Brook was made but observations at two sites located within one-half mile of the mouth revealed coarse bottom types of large stones and boulders along with some surficial bedrock. Little spawning gravel for salmon or trout was observed.

.09 Pools - No information on quantity available. One pool was sampled for the presence of fish and its dimensions were 25 feet long, 10 feet wide and a maximum depth of 5 feet.

102 Stoney Brook (cont.)

.10 Juvenile Atlantic Salmon were sampled using electro-seining equipment on July 22, 1966. One sweep without barrier nets was made over an estimated stream area of 180 square yards and the following numbers of salmon were recorded: 3 fry, 29 small parr and 12 large parr. A rough comparison of the parr data with results from other New Brunswick salmon streams indicates that these densities are less than one-half the normal index (Elson 1967). Bottom types in the area sampled were mostly unsuitable for salmon fry. Growth of the parr in length and weight was as follows:

	Age 1+	Age 2+	Age 3+	Age 4+
Fork Length (mm)	74.0 (9)	94.5 (10)	109.3 (3)	121.0 (1)
Weight (grams)	5.4 (9)	11.2 (10)	18.0 (3)	23.0 (1)

.11 Counts of Spawning Salmon and Redds - A check of this stream on October 28, 1966 revealed one redd over an area of 1000 square yards (one-half from the mouth). No adult salmon were present.

.12 Bottom Fauna - No information.

.13 Obstructions - No information.

102 Stoney Brook (cont.)

.14 Miscellaneous - Electro-seining for fish on July 22, 1966 involved an approximate area of 180 square yards and included 75 per cent riffle and 25 per cent pool area. The following numbers of other species were recorded: 5 speckled trout fry; 33 speckled trout (other than fry); 3 common shiners (Notropis cornutus); 3 shiny sculpins (Cottus cognatus); and one blacknose dace (Rhinichthys atratulus).

Stoney Brook is accessible at two points: (a) one-half mile from the mouth and (b) at river-mile 3 on the road to Dam Camp.

103 Little River

.01 Length - 17.5 linear river miles to North Little River Lake.

.02 Width - 30 feet (almost one mile from mouth)
20 feet (five miles from mouth)
15 feet (twelve miles from mouth)

.03 Volume of Flow - (August 15, 1966) 19 cfs (almost one mile from mouth)

.04 Velocity - (August 15, 1966): 0.8 ft/sec. (almost one mile from mouth).

.05 Water Level Changes - A staff guage was situated at a readily accessible point in the river near the Heath Steele Mines road. This point was almost one linear river mile from the mouth. Readings were taken at approximately two week intervals during the period May 31 to October 18. The data are presented below and serve to indicate gross changes of water levels in Little River.

103 Little River (Cont.)

Date (1966)	Water Level Changes (feet)	Water Temperature (C)
May 31	1.6	13.2
June 6	1.1	11.5
9	1.2	14.0
13	1.1	11.2
14	1.0	15.0
24	0.9	13.5
July 7	0.4	13.5
18	0.3	18.0
Aug. 1	0.3	21.5
15	0.1	20.0
29	0.0	14.0
Sept. 22	0.0	9.0
Oct. 18	0.1	8.0

.06 Temperatures were taken irregularly as may be seen in the tabulation in section .05. The highest reading of 21.5 C was recorded in the mid-afternoon of August 1.

.07 Specific Conductivity - (October 24, 1966): 79 μ mhos/cm about one mile from mouth.

.08 Spawning Gravel for Atlantic salmon is not abundant in Little River and it decreases as the distance upstream from the mouth of the river is increased. For the most part, bottom types are coarse boulders and ledge rock. Other areas are

103 Little River (cont.)

unsuitable because of beaver activity, including dam building and associated pool formation. The gradient is slight throughout the upper drainage basin and as a result, many deadwater areas have been created.

Location (linear river miles)	Spawning Gravel (sq. yd. per linear mile)
0.0 - 4.9	350
5.0 - 9.9	200
10.0 - 14.9	70
15.0 - 17.5	60
Total: 3400 square yards	

.09 Pools - A total of 54 relatively small, shallow pools were noted in Little River.

Location (linear river miles)	No. of Pools
0.0 - 4.9	28
5.0 - 9.9	15
10.0 - 14.9	9
15.0 - 17.5	2

.10 Juvenile Atlantic Salmon Populations - Salmon were found to extend upstream about five miles from the mouth of the river. Increasing numbers of beaver dams and less suitable habitat probably

103 Little River (Cont.)

limit the penetration of salmon beyond this point. Indices of salmon density in Little River are available from the Fisheries Research Board. Annual assessments of juvenile salmon populations have been made since 1951 and representative data for the years 1963, 1964 and 1965 are presented below. No quantitative samples of salmon were taken by the Resource Development Branch in 1966.

Juvenile Stage	1963	1964	1965
	(No. Fish Per 100 sq. yds.)		
Underyearlings	7	36	13
Small Parr	4	2	10
Large Parr	7	15	12

Effluent from base metal mining operations at Heath Steele Mines is believed to have entered the river via North and South Little River Lakes in 1961, 1962 and 1963, thereby causing reductions in the salmon population. Aerially sprayed DDT entered the river in 1954, 1956, 1957 and 1958, also causing reductions in the numbers of salmon.

Gibson (1966) has studied the habitat preference of juvenile Atlantic salmon and brook trout in Little River.

103 Little River (cont.)

.11 Counts of Spawning Salmon and Redds were made at three locations on October 24, 1966. Average activity was noted at two of these sites.

Location (linear river miles)	No. Redds Per 100 sq. yds.	No. Adult Salmon
2.0	2.0	Nil
4.0	1.4	Nil
5.0	0.3	Nil

.12 Bottom Fauna was sampled on September 16, 1966 at two locations and a comparison of the results with other parts of the Northwest Miramichi indicates above average densities.

Faunal Group	No. Individuals Linear Mile 5	Linear Mile 12
Plecoptera	22	46
Ephemeroptera	41	28
Idonata	5	8
Trichoptera	55	40
Diptera	14	2
Unidentified	2	2
Total Nos.	139	126
Total Volume (ml)	1.7	1.9

.13 Obstructions - Thirty-three beaver dams were counted on the main river during the survey. One was located at Mile 3.0 upstream from the mouth while the remainder were above Mile 5.0. Juvenile salmon and adult salmon spawning activity occurred

103 Little River (concl.)

between miles 3.0 and 5.0. The only man-made dam present was located at the outlet of North Little River Lake.

.14 Miscellaneous - Speckled trout are present throughout the river. One heron was seen at Mile 5.0.

The river is accessible by road at: (a) the mouth; (b) Mile 1.0 to Mile 3.0 inclusive; (c) Mile 4.0; (d) Mile 5.0; (e) Mile 11.8; (f) North Little River Lake.

A sportsman's fishing camp is located at the mouth on the Northwest Miramichi River.

104 Tomogonops River

.01 Length - Main stem: 17 miles

South Tomogonops: 9 miles

Little South Tomogonops: 8 miles

Lake Brook: 3 miles

.02 Width - 45 feet at mouth of main river

20 feet at mile 10 on main river

(above confluence with Little South Branch)

.03 Volume of Flow (August 15, 1966) - 52 cfs at mouth of main river.

.04 Velocity (August 15, 1966) - 1.8 ft/sec. at mouth of main river.

.05 Water Level Changes - No data available.

.06 Temperature - (July 22, 1966 @ 1330 hours) 19.5 C. at Mile 13 on the Main Tomogonops River.

.07 Specific Conductivity (October 24, 1966)

Main stem at mouth:	240 μ mhos/cm
Main stem at Mile 13:	38 " " "
Little South Branch above mine:	38 " " "
South Branch South (not polluted):	85 " " "
Little South Branch below mine:	>1000 " " "
South Branch below tailings pond:	880 " " "

.08 Spawning Gravel for Atlantic salmon is abundant in the first five miles of main river above the mouth, as it is in the South Branch tributary, but the quantity becomes severely reduced in the main river above Lake Brook tributary.

104 Tomogonops River (Cont.)

Location (linear river miles)	Spawning Gravel (sq. yd. per linear mile)
0.0 - 5.2 (main river)	700
7.5 - 12.5 (main river)	35
0.0 - 2.5 (South Branch)	250
Total included in survey:	4300 sq. yds.

.09 Pools - The 41 pools observed were mostly small and best suited for trout.

Location (linear river miles)	No. Pools	Beaver Ponds
0.0 - 5.2 (main river)	13	2
7.5 - 12.5 (main river)	11	3
0.0 - 2.5 (South Branch)	17	1

.10 Juvenile Atlantic salmon populations - No salmon were observed or sampled in this river (see item 14 for location of fish sampling stations).

.11 Counts of spawning salmon and redds - No completed redds or adult salmon were observed in this river on October 24, 1966.

.12 Bottom fauna was sampled on September 16, 1966 at three sites, one of which was above the source of pollution. The total biomass recorded at the unpolluted location was the highest for any of the 36 samples taken throughout the Northwest Miramichi system. Two possible contributing

104 Tomogonops River (Cont.)

factors to this occurence include (a) the site was in the narrow, headwater reaches of the river, and (b) the watershed in this area had been burned over in the summer of 1965.

Faunal Group	No. Individuals		
	At Mouth	Mile 13	South Branch
Plecoptera	-	9	-
Ephemeroptera	1	54	-
Idonata	-	9	-
Trichoptera	2	32	-
Diptera	-	2	-
Mollusca	1	4	-
Nematodes	-	1	-
Cyclops	-	-	1
Unidentified	-	1	-
Total Nos.	4	112	1
Total Volume (ml.)	Trace	2.5	Trace

.13 Obstructions - At least six beaver dams were present in the river during 1966.

Base metal mining pollution in this river has acted as a chemical barrier to migrating fish since 1960.

.14 Miscellaneous - Adult trout and trout fry were sighted in beaver dam ponds along the lowermost five miles of main river and in the South Branch. Qualitative fish sampling with electro-seining

Tomogonops River (Concl.)

equipment at three locations in the river basin produced the following results (no barrier nets were used):

Fish Species	Location		
	Main River (Mile 13) Unpolluted	N. Branch South Tom. Polluted	S. Branch South Tom. Unpolluted
Speckled Trout	5	-	41
White Sucker	11	-	-
Golden Shiner	35	-	-
Blacknose Dace	59	-	30
Common Shiner	-	-	7
Eel	1	-	1

Two small white suckers and several common shiners were collected at the mouth of the Tomogonops River in polluted water. Difficulty was experienced in operating the electro-seining equipment because of the high ionic content of the water. (The generator was operated at relatively high current reading of 3 amperes to produce a maximum of 400 volts.)

105 Portage River

.01 Length - Main stem: 4 miles

East branch: 12 miles

West branch: 10 miles

Tozer Brook: 4 miles

McKay Brook: 3 miles

.02 Width - 35 feet at mouth of main stem.

.03 Volume of Flow (August 15, 1966) 19 cfs at mouth of main stem.

.04 Velocity (August 15, 1966) - 1.1 ft./sec. at mouth of main stem.

.05 Water Level Changes - A staff guage was situated at the road bridge near the mouth of the main stem for the period June 6 to October 18 and readings were taken approximately every two weeks during that time. The data are presented below and they serve to indicate gross changes in water levels.

Date	Water Level Changes (feet)	Water Temp. (C.)
June 6	2.50	14.8
9	2.65	16.0
14	2.40	18.0
21	1.05	18.5
24	1.20	16.5
July 15	0.00	-
18	0.00	21.0
Aug. 1	0.00	23.5
29	1.30	16.0
Sept. 22	1.30	10.0
Oct. 18	1.70	9.0

105 Portage River (cont'd)

.06 Water Temperature was recorded irregularly in this river as shown in the above tabulation. The highest reading (23.5 C) was recorded on August 1, 1966 at 1530 hours.

.07 Specific Conductivity (October 27, 1966)

Main stem at mouth:	47 μ mhos/cm.
West branch:	44 μ mhos/cm.
Tozer Brook:	40 μ mhos/cm.

.08 Spawning Gravel - An estimated 3,000 square yards of gravel suitable for Atlantic salmon spawning is available in the lowermost two miles of the main stem. Although the substrate itself is suitable for spawning, other conditions, namely water velocity and silting, are not attractive to salmon. For the most part, this tributary flows through low-lying marshland and, as a result, there are many areas of deadwater and numerous beaver dams.

.09 Pools - No suitable pools for salmon were observed.

.10 Juvenile Atlantic salmon populations - One quantitative assessment of fish population was made just above the mouth on July 19, 1966. Numbers of fry (35 per 100 sq. yds.) were high; while indices for small and large parr were low (5 and 7 per 100 sq. yds. respectively.)

105 Portage River (cont'd)

A sample of 23 of the 152 juvenile salmon seined was taken to the laboratory for examination and measurement. The fish were 53 per cent female and growth in length and weight was as follows:

	Age 1+	Age 2+
Fork Length (millimeters)	79.4 (13)	112.7 (10)
Weight (grams)	7.2 (13)	19.6 (10)

.11 Counts of spawning salmon and redds - A search for salmon redds on October 27, 1966 revealed two in 600 yards of suitable gravel within a few hundred yards upstream from the mouth of the tributary. No adult salmon were seen at that time.

.12 Bottom fauna was sampled on September 13, 1966 near the mouth of the stream. The results given below indicate a low volume of available food organisms:

Plecoptera	6	individuals
Ephemeroptera	12	"
Trichoptera	54	"
Diptera	2	"
Total Number	74	"
Total Volume (ml.)	0.7	"

13. Obstructions - Many beaver dams were present; no

105 Portage River (concl.)

natural obstructions were observed.

.14 Miscellaneous - Portage River is a sluggish, meandering tributary in which suitable spawning and nursery grounds for salmon are in limited supply. Angling is not popular in this river.

In addition to salmon, the following other species were sampled (total area 330 sq. yds.): 143 dace, 25 eels, 6 lampreys, 5 speckled trout fry, 4 shiners and 3 suckers.

A qualitative fish sample, using electro-seining gear, was taken from Tozer Brook on July 11, 1966 and revealed the following (total area: 155 sq. yds.): 4 speckled trout fry; 17 older speckled trout; 6 shiners; 6 dace; 2 lampreys.

106 Smoker Brook

This small stream meanders for about 4 miles through low-lying land on the left bank of the Northwest Miramichi approximately 20 miles above tidehead. It has an average width of about 6 feet and the specific conductivity on October 27, 1966 was 48 μ mhos/cm. No other physical information is available for this stream. On July 11, 1966, a qualitative sample of fish was taken using electro-seining gear - one sweep without barrier nets over an estimated stream area of 115 square yards. The following fish were recorded: 22 speckled trout fry; 16 speckled trout yearlings; 8 larger speckled trout; 25 sculpins; 10 dace; 5 shiners; 1 fallfish; 4 threespine sticklebacks; and 2 lampreys. No salmon were present.

107 Lee Brook

This stream has a total length of 6 miles and enters the main Northwest Miramichi on the left bank at Wayerton, about 15 miles above tidehead. The average width is approximately 6 feet and the specific conductivity on October 28, 1966 was 62 μ mhos/cm; this reading is relatively high for the Miramichi basin. No other physical information is available for this stream. On July 11, 1966, a qualitative sample of fish was taken using electro-seining gear - one sweep without barrier nets over an estimated stream area of 100 square yards. The following fish were recorded: 3 small salmon parr; 23 speckled trout fry; 2 yearling speckled trout; 3 older speckled trout; 8 dace, 8 shiners; 3 fallfish; 1 sucker; 4 threespine sticklebacks and 19 lampreys. Growth of the salmon parr in length and weight was as follows:

	Age 1+
Fork length (mm)	90.3 (3)
Weight	9.7 (3)

108 Trout Brook

.01 Length - Main stem: 11 miles
East branch: 3 miles

.02 Width - 13 feet at a point 6 miles from the mouth.

.03 Volume of flow (August 15, 1966) 4 cfs at a point 6 miles from the mouth.

.04 Velocity (August 15, 1966) 0.6 ft/sec (see item 13 for location).

.05 Water Level Changes - FRB, St. Andrews began long-term studies of this stream in 1966; J. W. Saunders has more data.

.06 Temperature - See item 5.

.07 Specific Conductivity (October 28, 1966) 95 μ mhos/cm one and one-half miles from mouth. This reading is the highest in the Northwest Miramichi drainage basin, except for those streams receiving base metal mine effluent.

.08 Spawning Gravel - An estimated 1,300 square yards of suitable spawning gravel for salmon and trout is available in the lower six miles of stream which were surveyed.

.09 Pools - A total of 52 small pools, mostly suitable for trout, were noted along the lower six miles of stream. Six of these pools were suitable for salmon.

108 Trout Brook (cont.)

.10 Juvenile salmon - One sweep with electro-seining gear (no barrier nets) was made on July 11, 1966 over an area of 180 square yeards at a point 6 miles from the mouth of the stream. Eleven juvenile salmon were captured. Seventy per cent of these were males and growth-length and weight was as follows:

	Age 1+	Age 2+	Age 3+
Fork length (mm)	87.5 (4)	119.0 (2)	129.2 (5)
Weight (grams)	8.7 (4)	19.0 (2)	27.4 (5)

.11 Counts of spawning salmon and redds were made at two locations between mile 1.5 and mile 2.0 (FRB Stake #84) on October 28, 1966. A total of 800 square yards of suitable spawning gravel was examined; 10 redds were counted and two salmon were seen, both bearing FRB red Peterson tags. In the study year a counting fence at the mouth of the stream revealed that no adult salmon entered Trout Brook voluntarily; FRB personnel transported a number by truck from Curventon on the main Northwest Miramichi.

108 Trout Brook (concl.)

.12 Bottom fauna was sampled on September 13, 1966 at a point six miles upstream from the mouth and the results are as follows:

Ephemeroptera	13	individuals
Trichoptera	2	"
Diptera	12	"
Coleoptera	1	"
Acari	2	"
Nematodes	3	"
Total No.	33	
Total Vol. (ml)	0.1	

.13 Obstructions - None were recorded.

.14 Miscellaneous - Other fish captured in the sample described above in item .10 are as follows: 4 speckled trout; 20 sculpins; 24 dace, 2 fallfish; and 1 lamprey. The continuing FRB studies on Trout Brook salmon and trout have been alluded to in items .05 and .11. A two-way counting fence was placed across the stream mouth for the first time in 1966.

109 Little Sevogle River

.01 Length - Main stem: 24 miles
South Branch: 9 miles
McNeal Brook: 4 miles
Gillice Brook: 3 miles
Big Brook: 2 miles

.02 Width - Main stem at mile 4.5: 45 feet

.03 Volume of Flow: (August 16, 1966): 9 cfs at mile 4.5.

.04 Velocity (August 16, 1966): 0.8 ft/sec. at mile 4.5.

.05 Water Level Changes: A staff gauge was placed in the river at mile 4.5 for the period June 1 to October 18, 1966, and readings were taken approximately every two weeks during that time. As presented below, the data serve to indicate gross changes in water levels:

Date (1966)	Water Level Changes (feet)	Water Temp. (C)
June 1	1.00	11.0
8	1.05	-
14	0.95	16.5
21	0.67	21.9
24	0.70	14.5
27	0.50	20.0
30	0.40	-
July 18	0.10	22.5
Aug. 1	0.20	24.5
15	0.05	18.5
29	0.00	19.0
Sept. 22	0.30	10.5
Oct. 18	0.70	8.5

109 Little Sevogle River (cont.)

.06 Water Temperature - As seen from the above tabulation, water temperature in this stream reached a recorded maximum of 24.5 C (76 F) on the afternoon of August 1, 1966.

.07 Specific Conductivity (October 27)

Main stem at mile 4.5:	51 μ mhos/cm
Main stem (at mile 8):	46 μ mhos/cm
McNeal Brook:	62 μ mhos/cm.
Gillice Brook:	40 μ mhos/cm
Big Brook:	41 μ mhos/cm

.08 Spawning Gravel - Approximately 10,000 square yards of suitable spawning gravel for salmon were recorded, three-quarters of which was in the lowermost seven miles, including McNeal Brook. This latter tributary contains some of the best quality and most abundant gravel in the entire Northwest Miramichi River basin.

.09 Pools - A total of 70 salmon resting pools were counted during the field survey; six of these were classed as very good due to adequate depth and velocity.

.10 Juvenile salmon populations - One quantitative estimate of salmon abundance was made at mile 8.5 on July 12. Unfortunately, the area selected was marginal salmon rearing grounds consisting of large boulders and sluggish flow. No fry were present and estimates

109 Little Sevogle River (cont.)

of 4.4 small parr and 2.2 large parr per 100 square yards were the lowest recorded anywhere in the Northwest Miramichi basin. No growth data is available for these fish.

In addition to the quantitative estimate, one sweep was made with electro-seining gear (no barrier nets) on July 27 over an area of 330 square yards at a point 4.4 miles from the mouth of the stream. One hundred and twenty-seven salmon were taken, among which were 110 fry, 13 small parr and 4 large parr. Growth of the parr in length and weight was as follows:

	Age 1+	Age 2+
Fork Length (mm)	84.2 (12)	119.3 (3)
Weight (grams)	8.1 (12)	24.0 (3)

Big Brook was the only tributary to the Little Sevogle that was sampled for fish. An area of 170 square yards near the mouth was sampled on July 27. No fry, 11 small parr and 17 large parr were recorded in this small stream. Rough substrate conditions appeared not to be suitable for fry. Growth of the parr in length and weight was as follows:

	Age 1+	Age 2+
Fork Length (mm)	77.4 (10)	102.2 (18
Weight (grams)	5.8 (10)	13.8 (18)

109 Little Sevogle River (cont.)

.11 Counts of spawning salmon and redds - Two sites were checked in the lowermost 7.5 miles. One near the mouth totalled 800 square yards and contained 61 salmon redds on November 1. The other site was near mile 7.5 and contained 13 redds in 440 square yards of gravel on October 27. In all, 5 adult salmon were sighted. One site on McNeal Brook covered 1150 square yards in which 37 redds and 28 salmon were observed on October 27.

.12 Bottom fauna - Three samples were taken from this stream on July 14 and the results are as follows:

Order	Mile 0	Mile 7.5	Mile 8.4
Plecoptera	0	3	0
Ephemeroptera	1	10	2
Idonata	3	0	1
Hemiptera	0	5	0
Trichoptera	19	0	0
Diptera	142	3	6
Acari	1	0	0
Mollusca	0	0	1
Nematoda	0	1	0
Total Number	166	22	11
Total Vol. (ml)	0.8	0.1	-

109 Little Sevogle River (cont.)

.13 Obstructions - A number of beaver dams were present above the forks at mile 16.2.

.14 Miscellaneous - In addition to juvenile salmon, the following numbers of other species were collected from this stream: (1) at mile 8.5 - 490 dace and shiners, 5 suckers, 27 lamprey, and 2 eels. (2) at mile 4.4 - one brook trout, 23 golden shiners, 13 common shiners, 9 dace and 6 lamprey. (3) at Big Brook - 10 brook trout and 2 slimy sculpins.

During the fall spawning survey, several dead fish were collected from the Little Sevogle, including: three small male parr, one large male parr, one male grilse, two brook trout, and three shiners.

The forest of the Little Sevogle basin was sprayed with DDT in 1966.

Local residents reported that it has been about 20 years since the Little Sevogle basin was logged.

Water in this river drops to noticeably low levels during the months of August and September in most years when visually compared with other streams in the area.

There is no angling for salmon in this river, even though the regulations do not prohibit sport fishing here.

One merganser duck was sighted at mile 10 on June 16.

110 Wildcat Brook

This small stream has three tributaries totalling eleven miles in length and has an average summer width of six feet near the mouth. It enters the left bank of the Northwest Miramichi approximately four miles above head of tide at Sunny Corner. The specific conductance on October 27 was 50 μ mhos/cm. in the main Wildcat and 60 μ mhos/cm. in the upper (north) Wildcat. No other physical information is available for this stream. A qualitative fish sample from a 100 square yard section of the main Wildcat using electro-seining gear without barrier nets was collected on July 11. Forty-five juvenile salmon were collected including 4 fry, 38 small parr and 3 large parr. Growth of the parr in length and weight was as follows:

	Age 1+	Age 2+
Fork Length (mm)	79.1 (10)	121.3 (3)
Weight (grams)	7.2 (10)	25.7 (3)

Other fish species taken in this sample included 5 brook trout, 1 sucker, 1 fallfish, 18 dace, 13 shiners, 1 eel, 2 sculpins and 12 lampreys. Another qualitative fish sample was taken from

110 Wildcat Brook (concl.)

a 75 square yard section of the upper Wildcat on July 11. Twenty-one juvenile salmon were collected including three fry and 18 small parr. Growth of the parr in length and weight was as follows:

	Age 1+
Fork Length (mm)	88.0 (17)
Weight (grams)	9.6 (17)

Other fish species taken from the upper Wildcat included 16 brook trout, 2 dace and 10 lamprey. A spawning survey on October 27 revealed five redds on a 200 square yard section of the main Wildcat and one redd on a 400 square yard section of the upper Wildcat. A dead salmon parr and a dead dace were found at this time on the latter stream. No adult salmon were observed.

111 Castor Brook

This brook has a total length of approximately eight miles and its width averages six feet near the mouth. Castor Brook enters the right bank of the Northwest Miramichi River about two miles above head of tide at Sunny Corner. The short section which was examined at mile one had a sluggish flow and a substrate of fine sand and mud. The specific conductance on October 27 was recorded at 56 μ mhos/cm. No other physical information is available for this stream.

A qualitative fish sample from a 100 square yard section of the brook using electro-seining gear without barrier nets was collected on July 27. One salmon fry and two large parr were taken along with six brook trout, two shiners, three ninespine sticklebacks and three lamprey.

4.2 South and Main Sevogle Rivers

.01 Length - 40 miles (Main Sevogle - 8 miles)
(South Sevogle - 32 miles)

.02 Widths - 15 feet (Mile 38)
30 feet (Mile 32)
50 feet (Mile 28)
100 feet (Mile 10)
160 feet (at mouth)

.03 Volume of Flow - 85 cfs (Mile 28, July 14)
110 cfs (at mouth, August 16)
195 cfs (at mouth, November 1)

.04 Velocity - 2.1 ft./sec. (mile 28, July 14)
1.0 ft./sec. (at mouth, August 16)
2.0 ft./sec. (at mouth, November 1)

.05 Water Level Changes - A staff gauge was situated at the mouth of the river from June 7 to October 18. Readings were taken irregularly as is indicated in the tabulation below. These data show only gross changes in water levels during the study period.

Date (1966)	Water Level Changes (feet)	Water Temp. (C)
June 7	1.5	10.0
14	1.0	18.0
24	0.8	16.5
July 18	0.1	no reading
Aug. 1	0.1	25.5
16	0.0	no reading
29	0.0	18.0
Sept.22	0.1	11.5
Oct. 18	0.4	8.0

4.2 South and Main Sevogle Rivers (cont'd)

.06 Temperatures were taken irregularly as shown in the tabulation in section .05. The highest reading of 25.5 C was recorded in the mid-afternoon of August 1.

.07 Specific Conductivity (October 26)

Mile 3.5 - 44 μ mhos/cm

Mile 9.5 - 37 μ mhos/cm

Mile 21.0 - 41 μ mhos/cm

Mile 30.0 - 35 μ mhos/cm

.08 Spawning Gravel - Good gravel for spawning was found to be most abundant in the upper reaches of the river (see tabulation below). There is no shortage of spawning gravel throughout the river except that it is scattered in patches in the section from mile 8 to mile 21.

Location (Linear river miles)	Spawning Gravel (sq. yd./mile)
0 - 8	1500
8 - 21	600
21 - 35	1200
35 - 39	fine sand unsuitable for salmon
Total - 36,300 square yards	

4.2 South and Main Sevogle Rivers (cont'd)

The tabulation below of gravel size composition indicates that quality, as sampled by the method described, was most suitable at the mouth and miles 26 and 33. Spawning activity (section .11) was greatest at the first two sites.

Location (Linear River Miles)	Percentage Composition of Gravel				
	<1/4"	>1/4"	>3/4"	>1 1/2"	>3"
Mouth	17	19	18	30	16
9	5	6	10	12	67
26	6	15	17	37	25
33	22	18	22	28	10

.09 Pools - Fifty percent of the 44 pools noted were located on the section between mile 8 and mile 21; of the remainder, ten were counted downstream from this section and twelve above it. The earliest sighting of adult salmon in these pools was on July 4 at mile 5. Additional observations of fish were made at mile 21 on July 8 and mile 28 on July 14. The greatest concentration of adult fish was recorded on August 15 when 25 grilse were counted in the Narrows pool at mile 11.

.10 Juvenile salmon population estimates were made at two sites and it was found that numbers of parr

4.2 South and Main Sevogle Rivers (cont'd)

were low while fry populations were greater than the normal index (Elson 1967). The results (in number of fish per 100 square yards) are as follows:

	Mile 4	Mile 28
Fry	39	26
Small Parr	6	7
Large Parr	6	7

A tabulation of data on parr growth in length and weight is given below for mile 4:

	Age 1+	Age 2+
Fork length (mm)	67.0 (15)	110.1 (10)
Weight (grams)	3.5 (15)	15.4 (10)

and for mile 30:

	Age 1+	Age 2+	Age 3+
Fork length (mm)	70.3 (13)	100.8 (9)	127.0 (1)
Weight (grams)	4.8 (13)	13.6 (9)	27.0 (1)

Growth at mile 30 is similar to other samples taken in the upper reaches of streams in the Northwest Miramichi basin (e.g. South Branch of

4.2 South and Main Sevogle Rivers (cont'd)

the main river). However, growth at mile 4 appears to be remarkably slow during the first year of life while excellent growth is demonstrated during the second year.

.11 Counts of spawning salmon and redds - Eight sites were examined on this river during the period October 18 to November 1. No spawning activity was observed above mile 32 where the river becomes less suitable for salmon and upstream passage is more difficult. The tabulation below shows that best spawning took place in the lower two-thirds of the river. Compared with the remainder of the Northwest Miramichi basin, this river ranks first with more redds per unit area than any other tributary. Five redds near the mouth of the river were carefully measured to give an indication of the depth of water and area covered by representative redds. They ranged in size from 0.4 to 2.5 square yards and in water depth from 9 inches to 17 inches; the most common size was 0.8 square yards at a water depth of 14 inches. Water velocity at this time was 2.0 ft/sec.

4.2 South and Main Sevogle Rivers (cont'd)

Location (Linear river miles)	Date	No. Redds Per 100 sq. yards	No. Adult Salmon
0 (mouth)	18/X	2.7	13
	1/XI	3.4	1
3.5	26/X	0.7	2
9	25/X	3.2	nil
26	26/X	4.1	12
29	29/X	1.1	1
31	26/X	2.0	8
32	18/X	nil	1
	26/X	1.2	2
34	29/X	nil	nil

.12 Bottom fauna was sampled at five sites along the river on July 19 (mile 8, 26 and 30) and September 7 (mile 3 and 4). The volume of organisms was not high at any of these locations.

Group	Location (linear river miles) 3	4	8	26	30
Plecoptera	13	4	2	2	4
Ephemeroptera	12	14	8	16	22
Trichoptera	20	38	10	10	11
Diptera	0	1	26	19	4
Acari	0	0	1	0	0
Unidentified	0	1	0	0	6
Total Numbers	45	58	47	47	47
Total Volume (ml)	0.3	0.5	0.3	0.5	0.6

4.2 South and Main Sevogle Rivers (cont'd)

.13 Obstructions - The remains of a road bridge is present at mile 32 and a partial obstruction is created by the large amount of debris retained upstream. However, a small side channel was beginning to form at the time of survey. A series of beaver dams and ponds extend over most of the river upstream from mile 34.

.14 Miscellaneous - Pulpwood harvesting was being carried out in this watershed in the vicinity of mile 21 to mile 30 during the time of survey. The lowermost 23 miles of this river (mouth to Clearwater Stream) are leased for private use. Very little public angling for salmon was noticed by the survey crew in the pools above this point. Four sportsmen's camps are located along the river. Among the predators sighted were the following: (1) merganser with brood of three at mile 2, (2) kingfisher at mile 4, (3) small hawk which dropped 8 1/2 inch long speckled trout when disturbed at mile 27, and (4) kingfisher at mile 31. An illegal trapping device of chicken-wire forming a complete barrier to fish migration was discovered on July 4 at Mile 5.

In addition to salmon, the following other species of fish were collected: (1) at mile 4 (total area

4.2 South and Main Sevogle Rivers (concl.)

sampled 405 square yards)- 68 dace and 14 eels; (2) at mile 28 (total area sampled 329 square yards) - 8 speckled trout fry, 2 dace and 2 eels. Excellent speckled trout populations were present (visual observations) in the headwaters above mile 32.

200 Little South Sevogle River

This tributary is five miles long and enters the South Sevogle at mile 31. It is 20 feet wide at its mouth and a foot survey revealed 100 square yards of spawning gravel for salmon; one redd was recorded here in October. The remains of two log driving dams were found along with four beaver dams.

The water temperature in this tributary was not very much lower than that in the main river on August 4, viz, 13.0 C compared with 13.5 C. The specific conductance of the water was 36 μ mhos/cm on October 29. Visual observations of fish indicated that speckled trout is the most abundant species.

201 Barracks Brook

This brook is four miles long and enters the main river at mile 29.5. No foot survey of the brook was carried out.

Fish were sampled by electro-seining (one sweep without barrier nets) over an area of 240 square yards near the mouth. Fish captured were: 9 large salmon parr, and 60 speckled trout (5 of which were fry). Physically, the riffle area sampled had a bottom of coarse rock and boulders with scattered patches of rubble and gravel. Growth of the parr in length and weight was as follows:

	Age 2+
Fork length (mm)	107.9 (9)
Weight (grams)	17.8 (9)

A beaver dam was present across the mouth of the brook (width: 13 feet) at the time of survey. Specific conductance on October 29 was 29 μ mhos/cm.

202 North Branch South Sevogle River

This tributary extends for eight miles before entering the South Sevogle at mile 28. On August 5 the river width near the mouth was 25 feet with a volume of flow of 25 cfs. Specific conductance on October 29 was 44 μ mhos/cm at the mouth. A foot survey was carried out on August 5th. About 1300 square yards of spawning gravel were present in the lowermost three miles. Salmon parr and speckled trout seemed to be present in about equal numbers at mile 3. Two beaver dams were present in this section of river.

203 Travis Brook

This small tributary is three miles long and enters the South Sevogle River at mile 25.5. No foot survey was made of Travis Brook although spot checks at the road crossing and at the mouth revealed coarse bottom types of heavy rock and boulders. The stream is about 15 feet wide at the mouth and the specific conductance on October 29 was 36 μ mhos/cm.

Fish were sampled by electro-seining (one sweep without barrier nets) over an area of 160 square yards at the road bridge near the mouth of the stream. Fish captured were:

12 large salmon parr
7 small salmon parr
1 salmon fry
42 speckled trout fry
28 speckled trout yearling and older

Growth of the parr in length and weight was as follows:

	Age 1+	Age 2+
Fork length (mm)	75.4 (7)	111.6 (13)
Weight (grams)	5.9 (7)	20.8 (13)

204 Clearwater Stream

.01 Length - 13 miles

.02 Widths - 16 feet (mile 6)

20 feet (mouth)

.03 Volume of Flows - no data available

.04 Velocity - no data available

.05 Water Level Changes - no data available

.06 Temperatures - 15.5 C at mile 8 on August 8

18.0 C at mile 5 on July 25

.07 Specific Conductivity (October 24)

70 μ mhos/cm at mile 5

70 μ mhos/cm at mile 4.3 (at mining exploration site)

.08 Spawning Gravel - A foot survey extending from mile 8 to the mouth revealed that spawning gravel for salmon is not abundant in this stream. No suitable gravel is present in the three mile section from mile 2 to mile 5. In the lowermost two miles, gravel is present at an average of about 650 square yards per mile, whereas in the three mile section from mile 5 to mile 8, the quantity is reduced to about 100 square yards per mile.

A great deal of exposed bedrock is present in the streambed.

204 Clearwater Stream (cont)

Gravel size composition at mile 5 was as follows:

<1/4" - 7 per cent

>1/4" - 15 per cent

>3/4" - 11 per cent

>1 1/2" - 36 per cent

>3" - 31 per cent

.09 Pools - Thirteen pools suitable for salmon were recorded during foot surveys of the lowermost eight miles of stream; more were found above mile five than below. In addition to these, about 30 smaller pools were present in the lower eight miles. Speckled trout were invariably present in the pools on Clearwater Stream.

.10 Juvenile Salmon - An area of 280 square yards at mile 5 was sampled for fish by electro-seining (one sweep without barrier nets) on July 25. Bottom types in this section of river were mostly coarse boulders and large stones over bedrock, some of which was exposed. The area was approximately two-thirds fast flowing water while the remainder was a pool 2 to 3 feet in depth. Fourteen large salmon parr were taken and the growth of these fish in length and weight was as follows:

	Age 2+	Age 3+
Fork length (mm)	114.7 (11)	126.0 (2)
Weight (grams)	21.4 (11)	28.0 (2)

204 Clearwater Stream (cont)

.11 Counts of spawning salmon and redds - A check of several suitable gravel patches at mile 4 and mile 5 on October 24 revealed no completed salmon redds. No adult salmon were found in this part of the stream on that date.

.12 Bottom fauna was sampled at two sites along the river on September 13. The volume of organisms was not high at either location.

Group	Mile 4	Mile 5
Plecoptera	9	4
Ephemeroptera	26	18
Idonata	2	0
Trichoptera	8	8
Diptera	3	3
Coleoptera	2	0
Nematode	0	1
Unidentified	1	0
Total Numbers	51	34
Total Volume (ml)	0.3	0.2

.13 Obstructions - Three fresh beaver dams were present, one at miles 2.0, 2.5 and 6.0. These probably form partial obstructions during periods of low water.

204 Clearwater Stream (concl)

.14 Miscellaneous - The water in this stream is remarkably clear compared with the other streams surveyed in 1966 and because it is well shaded and fed by numerous springs along its length, the water temperature remains low throughout the summer season. These environmental conditions provide excellent habitat for speckled trout as evidenced from the fish sample referred to in section .10 in which the following fish were taken:

14 large salmon parr
20 speckled trout yearlings and older
2 speckled trout fry
1 dace

Considerable mining exploration activity was in progress on either side of the river at mile 4 at the time of survey. A ford for vehicle traffic was present and many test drill holes into the underlying bedrock were observed; one of these was directly in the streambed. Debris in the form of empty oil cans, refuse and slash was in the water. Some good sized speckled trout were seen in a pool immediately downstream from this site.

The breached remains of two former log driving dams were noted at mile 2 and mile 7.

205 Sheephouse Brook

.01 Length - 14 miles

.02 Widths - 11 feet (mile 12.3)
15 feet (mouth)

.03 Volume of Flow - 6 cfs at mouth (July 6)

.04 Velocity - one ft/sec at mouth (July 6)

.05 Water Level Changes - no data available

.06 Temperatures - 19.2 C at mile 12.3 (July 25)
19.0 C at mouth (July 6)

.07 Specific Conductivity (October 29)
34 μ mhos/cm at mile 12.3

.08 Spawning Gravel - A foot survey extending from mile 4.5 to the mouth revealed that spawning gravel for salmon is in very poor supply in this stream. Fifteen scattered patches of gravel were recorded totalling 560 square yards (125 square yards per linear mile).

.09 Pools - Seventeen pools suitable for salmon and trout were counted during the survey. Speckled trout were present in all of these.

.10 Juvenile salmon - A sample of fish was taken at mile 12.3 using electro-seining gear without barrier nets on July 25 but no salmon were found. Some salmon fry and parr were observed visually during the foot survey of the lowermost 4.5 miles.

205 Sheephouse Brook (cont)

.11 Counts of spawning salmon and redds - no data available.

.12 Bottom fauna was sampled at the mouth of the stream on September 14. The volume of organisms per square foot was relatively low.

Group	Number of Organisms
Plecoptera	10
Ephemeroptera	21
Trichoptera	26
Diptera	12
Coleoptera	1
Acari	2
Mollusca	3
Total numbers	75
Total volume (ml.)	0.4

.13 Obstructions - A beaver dam was present at mile 13 in the headwaters. It is expected that more beaver dams are present in the unsurveyed section between miles 4.5 and mile 12.3. This part of the brook flows through low land with little gradient and would be attractive to beavers.

.14 Miscellaneous - This river appears to be better suited for speckled trout than for salmon. Electro-seining

205 Sheephouse Brook (concl)

without barrier nets over a 120 square yard area of stream at mile 12.3 on July 25 resulted in the following species and numbers of fish:

23 speckled trout fry
32 speckled trout yearlings and older
49 blacknose dace
10 common shiners
1 slimy sculpin

Water levels in Sheephouse Brook dropped noticeably lower than in any neighbouring streams of comparable size.

206 Mullin Stream

.01 Length - Main stream - 20 miles

North branch - 6 miles

.02 Widths - 18 feet (mile 19)

30 feet (mile 11)

35 feet (mile 3)

North Branch - 20 feet wide at mile 1.

.03 Volume of Flow - 38 cfs (mile 3, July 13).

.04 Velocity - 1.8 ft./sec. (mile 3, July 13).

.05 Water Level Changes - A staff gauge was situated at mile 2.8 from June 1 to October 18. Readings were taken irregularly as is indicated in the tabulation below and as a result the data show only gross changes in water levels during the study period.

Date	Water Level Changes (feet)	Water Temp. (C)
June 1	1.85	11.9
14	1.30	17.0
21	0.75	21.0
23	0.60	-
24	0.95	15.5
27	0.60	18.5
30	0.50	-
July 18	0.20	21.5
Aug. 1	0.35	25.5
16	0.10	19.5
29	0.00	20.0
Sept. 22	0.35	10.5
Oct. 18	0.90	7.0

206 Mullin Stream (cont.)

.06 Temperatures - were taken irregularly as shown in the above tabulation. The highest reading of 25.5 C was recorded in the mid-afternoon of August 1.

.07 Specific Conductivity (October 26)

Mile 19 - 25 μ mhos/cm

Mile 6 - 36 μ mhos/cm

Mile 3 - 36 μ mhos/cm

North Branch - 47 μ mhos/cm

.08 Spawning gravel is present in ample supply throughout the stream as the following tabulation shows:

Location (Linear river miles)	Spawning Gravel (sq. yds/mile)
0 - 6	200
6 - 11	300
11 - 20	190
North Branch	20
Total: 4,500 square yards	

.09 Pools - Thirty-nine pools were counted during the foot survey of this river. They were distributed along the river as follows:

Location (Linear river miles)	Number of Pools
0 - 6	24
6 - 11	10
11 - 20	5
North Branch	17 beaver ponds

206 Mullin Stream (cont.)

.10 Juvenile salmon populations - One quantitative estimate of salmon abundance was made at mile 2.8 on Mullin Stream. Fry were present in extremely high numbers while other sizes were below normal.

	Number of Fish per 100 sq. yd.
Fry	54
Small Parr	2
Large Parr	4

The growth of these fish in length and weight is given below:

	Age 1+	Age 2+	Age 3+
Fork Length (mm)	76.0 (1)	107.3 (10)	108.0 (1)
Weight (grams)	7.0 (1)	18.4 (10)	18.0 (1)

Fish samples were also taken at mile 19.0 on the main river and at mile 1.3 on the North Branch. No salmon were present at either site (see sections .13 and .14 for further comment).

.11 Counts of spawning salmon and redds - Checks were made on October 26 at Mile 6 and on October at Mile 1 and indicated relatively high densities of redds.

Location (Linear river miles)	Number Redds per 100 sq. yd.	Number Adult Salmon
1	3.1	5
6	2.0	7

206 Mullin Stream (cont.)

.12 Bottom fauna was sampled at one site on the main river and one site on the North Branch on July 19. The volume of organisms found was higher in the North Branch than in the main river.

Group	Location (Linear river miles)	
	Mile 19	Mile 1 (N. Branch)
Plecoptera	5	5
Ephemeroptera	18	20
Trichoptera	82	13
Diptera	10	16
Mollusca	0	1
Total Numbers	115	55
Total Volume (ml)	0.6	1.6

.13 Obstructions - A high natural barrier falls is present at the confluence of the North Branch and the main river (mile 11.2). The dimensions of this falls are: 11 feet high, 15 feet wide and a pool depth of about 15 feet. No salmon were found above this falls.

.14 Miscellaneous - The central and upper portion of Mullin Stream watershed has been heavily cut over for pulpwood harvesting in recent years and a loggers' base camp was present in the headwaters (river mile 19) at the time of survey.

206 Mullin Stream (cont.)

In addition to salmon, the following other species of fish were taken at mile 2.8 on the main river (total area was 500 square yards):

2 common shiners
40 blacknose dace
1 common sucker
10 eels

A fish sample was taken at mile 19 on the main river using electro-seining gear without barrier nets over a total area of 300 square yards. The results were:

5 speckled trout fry
4 speckled trout yearlings and older
17 common shiners

In the North Branch at mile 1 a similar sample was taken over a total area of 230 square yards. The results were:

68 speckled trout fry
62 speckled trout yearlings and older

Two predacious birds were encountered; a merganser with a brood of three near the mouth of the main river, and a kingfisher at mile 16.

207 North Sevogle River

.01 Length - 32 miles

.02 Widths - 15 feet (mile 28)
35 feet (mile 20)
50 feet (mile 13)
65 feet (at mouth)

.03 Volume of Flow - 60 cfs (at mouth, July 28)

.04 Velocity - 1.4 ft/sec. (at mouth, July 28)

.05 Water Level Changes - A staff gauge was situated at mile 13 from May 30 to October 18. Readings were taken irregularly and the data show only gross changes in water levels during the study period.

Date (1966)	Water Level (feet)	Water Temp. (C)
May 30	2.05	9.5
June 9	1.15	13.0
13	0.90	11.5
23	0.75	12.0
July 7	0.40	13.5
18	no reading	17.0
21	0.55	11.0
Aug. 1	0.20	22.0
9	0.15	13.0
15	0.10	21.0
29	0.05	20.0
Sept. 22	0.00	7.5
Oct. 18	0.15	7.5

207 North Sevogle River (cont.)

.06 Water Temperatures were recorded at the same time that the staff gauge was read (section .05). Temperatures were invariably two to three degrees cooler in this tributary compared to other parts of the Sevogle and Northwest Miramichi Rivers. A high of 22.0 C was recorded in the mid-afternoon of August 1.

.07 Specific Conductivity -

at mouth (Oct. 25): 53 μ mhos/cm

mile 13 (Oct. 24) : 63 μ mhos/cm

Mile 28 (Oct. 22): 53 μ mhos/cm

.08 Spawning Gravel - The streambed of this river contains much exposed bedrock and an abundance of emergent boulders. There are few sections where extensive beds of spawning gravel for salmon are present.

Location (Linear river miles)	Spawning Gravel (sq.yd./mile)
0-16	560
16-23.5	1170
23.5-29	520
29-32	unsuitable for salmon
Total: 19,380 square yards	

207 North Sevogle River (cont.)

The quality of spawning gravel, as expressed by the proportion of particle size present, is tabulated below:

Location (Linear-river miles)	Percentage Composition of Gravel <1/4"	<1/4"	<3/4"	<1 1/2"	<3"
13	11	15	11	56	7
20	4	18	14	22	42

.09 Pools - The North Sevogle River contains some of the most picturesque series of salmon pools and river runs in the entire Northwest Miramichi River system. Eighty-six suitable pools for salmon were noted and during the survey (August 9-18) a total of 539 grilse and large salmon were sighted.

Location (Linear river miles)	Number of Pools (per mile)	Number of Salmon (total)
0 - 6.5	5.4	81
6.5 - 13	2.2	110
13 - 16	2.6	27
16 - 20	3.0	287
20 - 23.5	2.0	31
23.5 - 29	1.8	3

.10 Juvenile salmon population estimates were made at two sites on this river and in both cases all year classes were at average and above-average densities

207 North Sevogle River (cont.)

(c.f. Elson 1967). The results in numbers of fish per 100 square yards are as follows (normal index in brackets).

	At Mouth	Mile 13
Fry (24)	21	36
Small Parr (20)	42	68
Large Parr (12)	12	11

Data on parr and fry growth in length and weight is tabulated below (at the mouth):

	Age 1+	Age 2+
Fork Length (mm)	68.8 (16)	103.6 (11)
Weight (grams)	4.6 (16)	14.2 (11)

At Mile 13:

	Age 0+	Age 1+	Age 2+
Fork length (mm)	46.0 (1)	61.9 (40)	101.2 (15)
Weight (grams)	1.0 (1)	3.2 (40)	13.2 (16)

From the data available, it appears that water temperature in this river is an important environmental feature which contributes to slower fish growth. At locations where water temperature is colder (i.e. South Branch of the Northwest Miramichi River), the growth of fish is slower than in the North Sevogle River.

.11 Counts of spawning salmon and redds - Seven checks of spawning activity were made on the North Sevogle River from October 22 to 25. Redd density was found to be

207 North Sevogle River (cont.)

relatively high in all parts of the river up to mile 23. No activity was recorded at mile 29.

Location (Linear river miles)	Number of Redds per 100 sq. yds.	Number of Adult Salmon
At mouth	1.3	4
0.2	1.0	nil
3.5	4.2	10
13.0	1.0	5
19.0	1.2	4
23.0	3.3	41
29.0	nil	nil

.12 Bottom fauna was sampled at four sites on this river on September 12. The volume of organisms was higher at the two upriver locations.

Group	Mile 0	Mile 6	Mile 14	Mile 21
Plecoptera	13	11	24	17
Ephemeroptera	24	14	98	37
Idonata	1	0	2	0
Trichoptera	19	24	84	63
Diptera	0	7	4	16
Coleoptera	2	0	0	0
Acari	1	0	0	1
Mollusca	1	5	0	2
Unidentified	0	0	0	1
Total Numbers	61	61	212	137
Total Volume (ml)	0.3	0.5	2.0	1.0

207 North Sevogle River (cont.)

.13 Obstructions - No man-made or natural barriers to anadromous salmon were found on the North Sevogle River. A series of small falls located one-half mile from the mouth appears to limit the upstream distribution of coarse fish such as dace and shiners. The total drop at this point is 13 feet over a horizontal distance of 125 feet; four separate small falls are present with respective drops of 3 feet, 3 feet, 1 foot and 6 feet. At mile 17 a falls is present measuring 8 feet high and 12 feet wide. The pool at the base of the falls is 10 feet deep. Many salmon were found above this point.

.14 Miscellaneous - Two kingfishers (fish-eating birds) were encountered; one at mile 0.2 and the other at mile 8.0. No pulpwood harvesting was being carried out during the year of survey and it has been some years since any forest harvesting activities were carried out in the watershed.

The following species of fish other than salmon were taken at the mouth of the river (total area sampled: 295 square yards);

28 speckled trout fry
2 speckled trout yearlings and older
41 blacknose dace
2 common shiners
2 eels

207 North Sevogle River (cont.)

At mile 13, the only other fish taken apart from salmon was a large speckled trout.

During the fall spawning survey, speckled trout were observed spawning at mile 3.5 and mile 23.

Two angling leases control eleven miles of the North Sevogle River from the mouth to mile 4 and from mile 16.5 to mile 23.5. Crown Angling Reserve waters extend for 12.5 miles from mile 4 to mile 16.5 and are subject to restricted fishing under the Provincial Daily Rod License. Unrestricted angling subject to normal licensing practive is permitted on the river above mile 23.5.

Two sport camps are present at mile 4, one at mile 18, and two at mile 23.

5.0 Discussion and summary

This inventory found that in 1966 not all streams of the Northwest Miramichi River Basin contain juvenile Atlantic salmon. Twenty-seven stations on a total of 20 streams (Fig. 1) were sampled for fish and the results (Figs. 2 and 3) reveal that 4 of these streams do not have any salmon. These are Tozer Brook, Smoker Brook, Sheephouse Brook and the Tomogonops River. Very low numbers of salmon were present in 8 other streams: Trout Brook, Portage River, Lee Brook, Big Brook, Clearwater Stream, Travis Brook, Barracks Brook and Castor Brook. It is clear that the best streams and rivers for salmon include the Northwest Miramichi (main stem), Northwest Miramichi (South Branch), main Sevogle River, South Sevogle River, North Sevogle River, Little Sevogle River, Mullin Stream, Wildcat River and Stoney Brook.

Two important points emerge from this information:

1) As a result of base metal mining pollution, there are no salmon present in the Tomogonops River and its tributaries, and

2) The Sevogle River and its tributaries is an excellent producer of salmon. Information from the Fisheries Research Board on their juvenile salmon sampling in the main stem of the Northwest Miramichi indicates that the upper portion of the river is a better producer of salmon than the lower portion (below mile 29). This difference might also be related to the mining pollution in the lower reaches of the main stem.

Of the 7 streams sampled quantitatively for the abundance of salmon, 2 of these had less than the normal index for abundance of salmon fry, 5 had less than the normal index for abundance of small parr and 5 had less than the normal index for abundance of large parr (Fig. 4). The normal index of abundance is taken from Elson (1967) who used juvenile salmon estimates from New Brunswick streams over several years to derive the indices. The North Sevogle River and the South Branch of the Northwest Miramichi River are the most productive of the streams sampled.

The spot check sampling data (Fig. 2) indicate that Wildcat River and Stoney Brook were the better producers of salmon among the small tributaries.

The growth-in-length of juvenile salmon in the Northwest Miramichi River Basin showed wide variation in the different streams sampled. Generally speaking, growth was faster in the tributaries and main rivers of the lower reaches of the basin (Fig. 5). Water temperature is one important environmental factor that differs from the upper to the lower reaches of the basin and a correlation coefficient of +0.50 ($P > 10$) was obtained between length at age 2+ and mean July water temperature. Similarly, specific conductance increases in the lower reaches of the basin; the correlation coefficient between specific conductance and length at age 2+ was +0.46 ($.10 > p > .05$). The presence of fish species other than salmon in these streams appears to have little influence on salmon growth. The correlation coefficient for trout abundance against salmon growth-in-length at age 2+ is low ($r = +0.24$; $p > .30$), while the coefficient for all non-salmon species against the same salmon growth data is similarly low ($r = +0.25$; $p > .30$) . This suggests that the species other than salmon do not compete seriously with salmon for food or territory in these streams.

Straight line age-length curves from 4 portions of the Northwest Miramichi River Basin (lower basin

tributaries, upper basin tributaries, Sevogle River [main stem] and Sevogle River [tributaries]) and one from the lower Gander River in Newfoundland show that salmon grow better in the tributaries to the lower Northwest Miramichi and Sevogle Rivers,,and in the main stem of the Sevogle River (Fig. 6). The slope of the curves decreases substantially in the cases of salmon in tributaries of the upper Northwest Miramichi River and in the lower Gander River indicating that growth is similar in these 2 areas and that it is much slower than the growth in the other 3 areas. As a result, salmon in the upper Northwest Miramichi and lower Gander Rivers would tend to be one year older as smolts than those in the other 3 areas.

Acknowledgments

The author is deeply grateful to Mr. Robert Dunfield who provided expert technical assistance in the office and in the field and proved to be an amicable companion throughout an arduous but rewarding field season.

My thanks are also extended to Dr. Paul F. Elson of St. Andrews Biological Station who provided advice and guidance on the conduct and interpretation of this inventory. He was especially helpful in matters of historical background.

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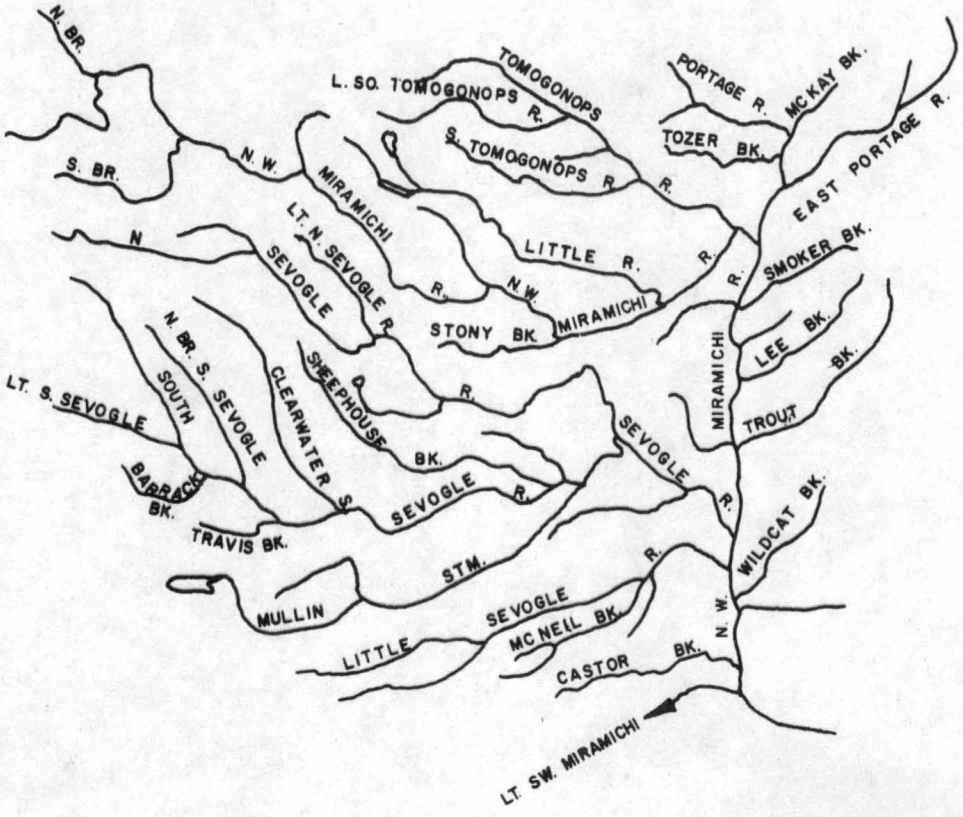
Fig. 1. Location map of the Northwest Miramichi River Basin.



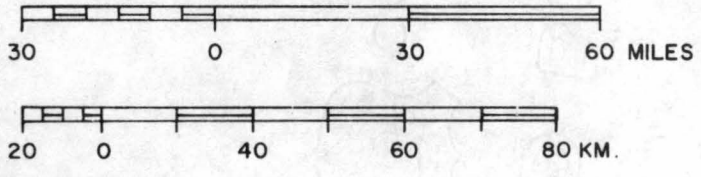


Fig. 2. Relative fish abundance in the tributaries to the Northwest Miramichi and Sevogle rivers. Data obtained from spot checks (single sweep) using electroseining equipment without barrier nets.

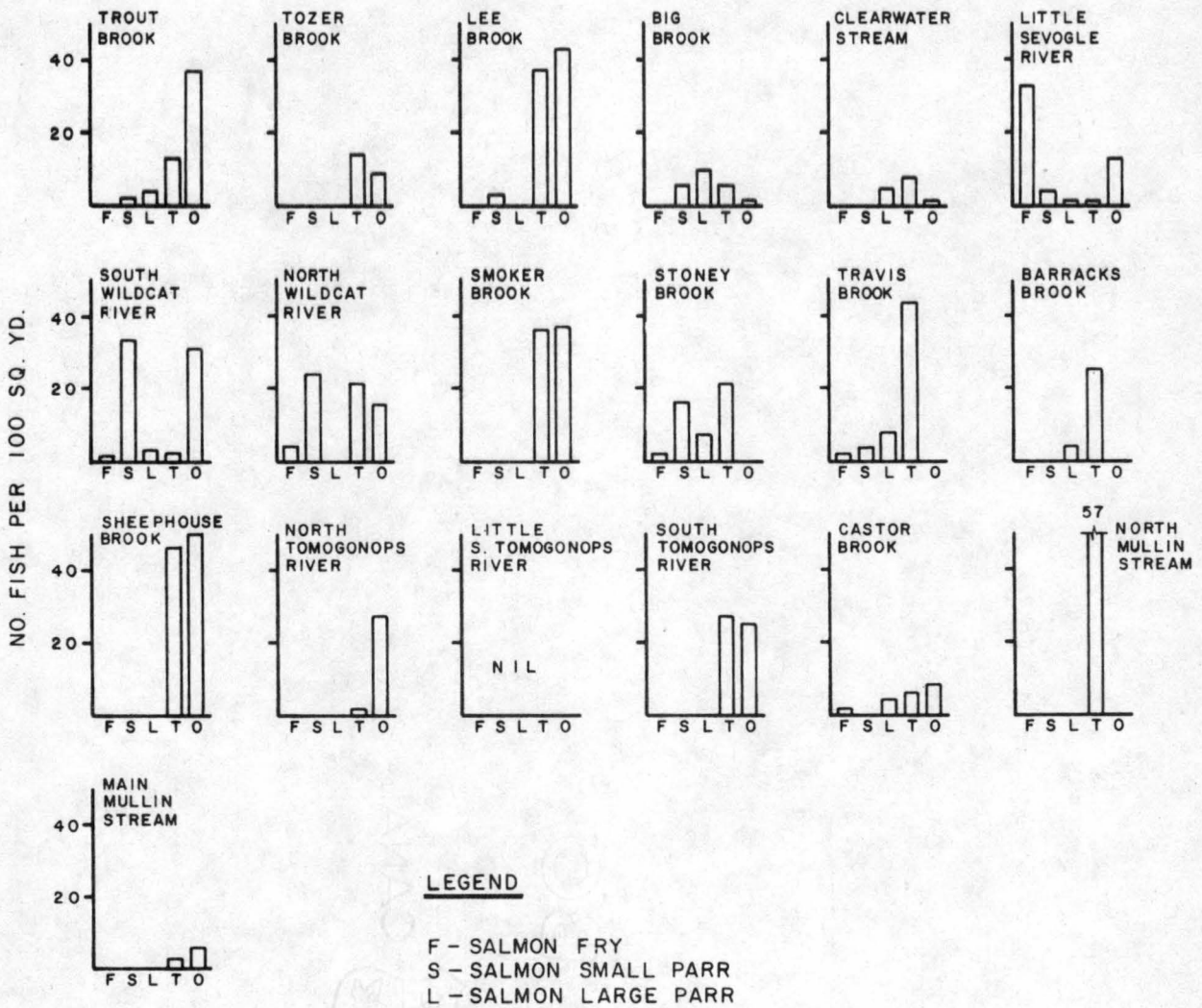


Fig. 3 Quantitative fish abundance in the tributaries to the Northwest Miramichi and Sevogle rivers. Data obtained from quantitative assessments using barrier nets and 5 sweeps with electroseining equipment.

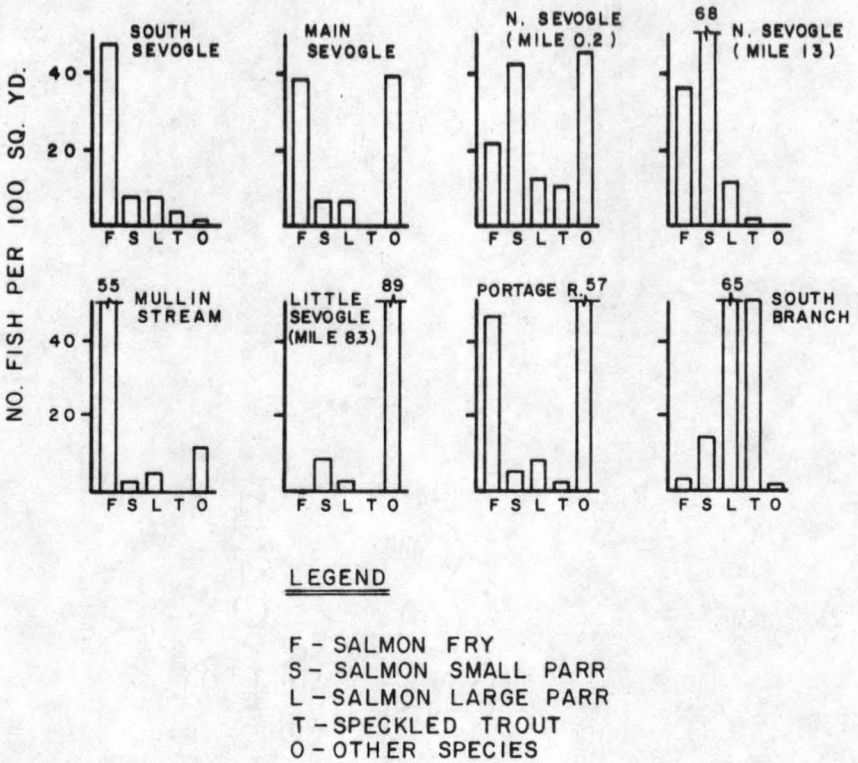


Fig. 4. Quantitative abundance of fry, small parr and large parr in tributaries to the Northwest Miramichi and Sevogle rivers. Data obtained from quantitative assessments using barrier nets and 5 sweeps with electroseining equipment.

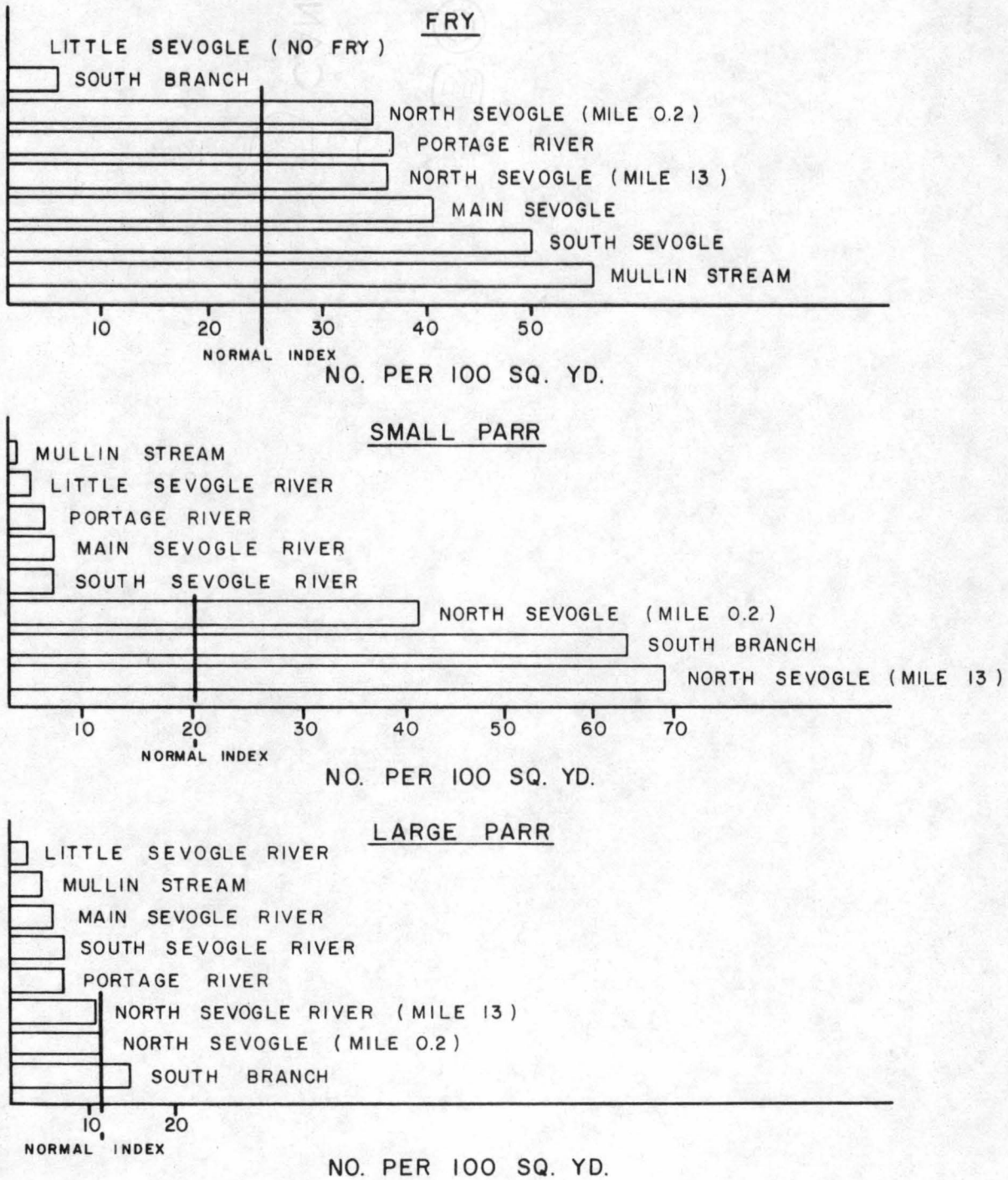


Fig. 5. Comparative lengths of juvenile salmon at age 2+ from tributaries to the Northwest Miramichi and Sevogle rivers.

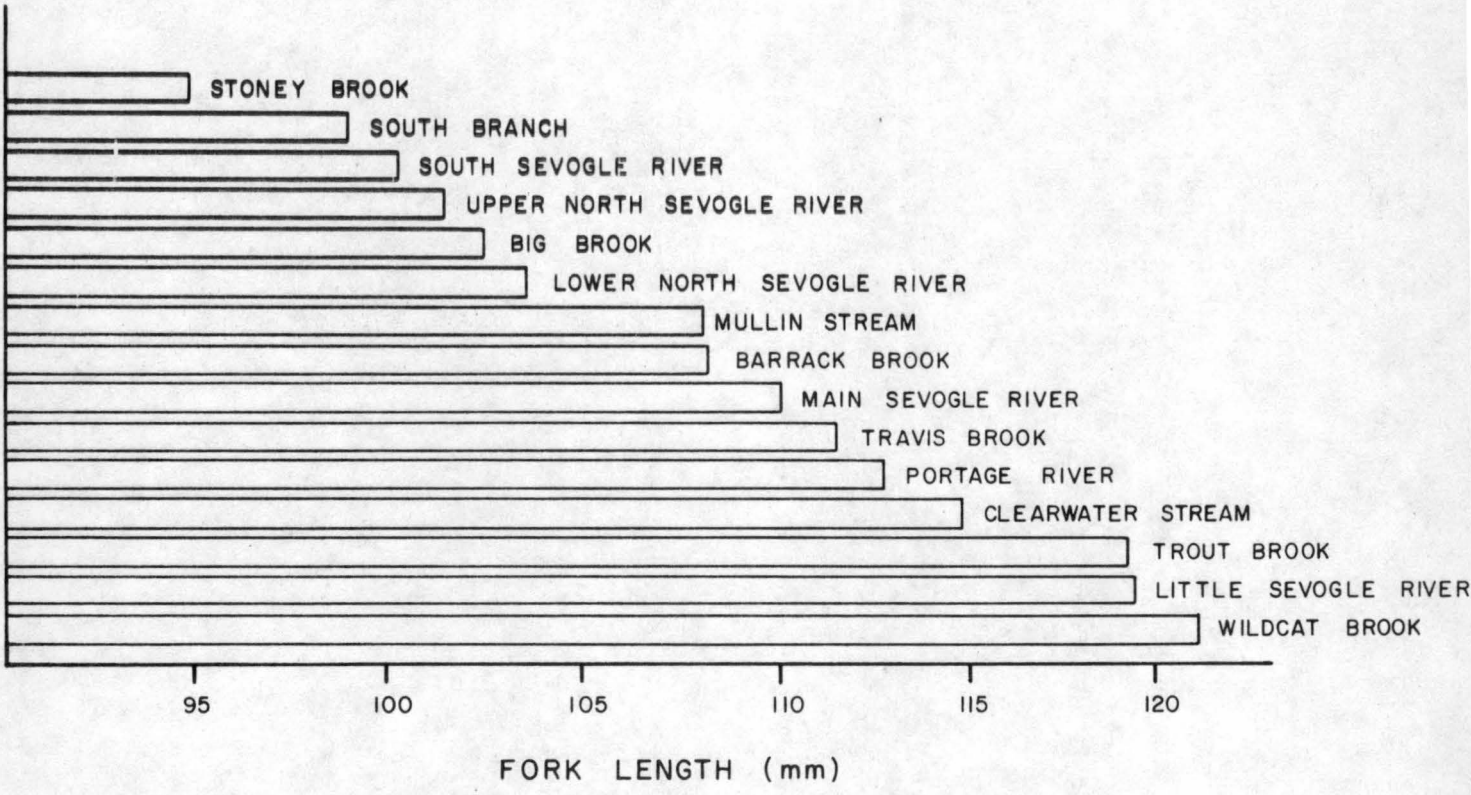


Fig. 6. Relationship between age and length of juvenile salmon from tributaries of the Northwest Miramichi and Sevogle rivers and the lower Gander River. (Gander River data from Andrews 1965).