

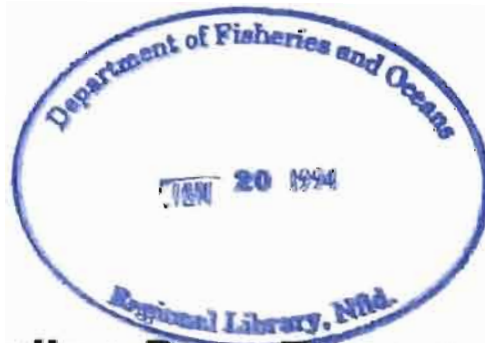
Scientific Excellence • Resource Protection & Conservation • Benefits for Canadians
Excellence scientifique • Protection et conservation des ressources • Bénéfices aux Canadiens

Data from the Black River fish counting fence, Kouchibouguac National Park, from 1984 to 1992

G. Delaney, E. Tremblay, F. Leblanc, A. Locke¹
and G. Atkinson¹

Kouchibouguac National Park
Kouchibouguac, New Brunswick, E0A 2A0
Canada

1993



Canadian Data Report of Fisheries and Aquatic Sciences 919

¹Science Branch, Department of Fisheries and Oceans,
P.O. Box 5030, Moncton, New Brunswick E1C 9B6



Fisheries
and Oceans

Pêches
et Océans

Canada

Canadian Data Report of Fisheries and Aquatic Sciences

Data reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of data reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Data reports are not intended for general distribution and the contents must not be referred to in other publications without prior written authorization from the issuing establishment. The correct citation appears above the abstract of each report. Data reports are abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

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 introduced with the publication of report number 161.

Data reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport statistique canadien des sciences halieutiques et aquatiques

Les rapports statistiques servent à classer et à archiver les compilations de données pour lesquelles il y a peu ou point d'analyse. Ces compilations auront d'ordinaire été préparées à l'appui d'autres publications ou rapports. Les sujets des rapports statistiques reflètent la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports statistiques ne sont pas destinés à une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports statistiques sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros 1 à 25 de cette série ont été publiés à titre de relevés statistiques, Services des pêches et de la mer. Les numéros 26 à 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 actuel de la série a été établi lors de la parution du numéro 161.

Les rapports statistiques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Data Report of Fisheries and Aquatic Sciences 919

1993

**DATA FROM THE BLACK RIVER FISH COUNTING FENCE,
KOUCHIBOUGUAC NATIONAL PARK, FROM 1984 TO 1992**

by

G. Delaney, E. Tremblay, F. Leblanc, A. Locke and G. Atkinson

Kouchibouguac National Park
Kouchibouguac, New Brunswick E0A 2A0

Science Branch, Department of Fisheries and Oceans, P.O. Box 5030,
Moncton, New Brunswick E1C 9B6

© Minister of Supply and Services Canada 1993
Cat. No. Fs 97-13/919E ISSN 0706-6465

Correct citation for this publication:

Delaney, G., E. Tremblay, F. Leblanc, A. Locke and G. Atkinson. 1993. Data from the Black River fish counting fence, Kouchibouguac National Park, from 1984 to 1992. Can. Data Rept. Fish. Aquat. Sci. 919: v+33 p.

TABLE OF CONTENTS

List of tables.....	iii
List of figures.....	iv
Abstract.....	v
Introduction.....	1
Methodology.....	1
Results.....	2
Atlantic Salmon.....	3
Rainbow Smelt.....	3
Gaspereau.....	4
Acknowledgements.....	4
References.....	5

LIST OF TABLES

- Table 1: Species list.
- Table 2 to 10: Results of upstream and downstream fish counts for 1984-1992.
- Table 11: Black River fish counting fence 1984-1992 data.
- Table 12: Rainbow Smelt length frequencies, 1989-1992.
- Table 13: Rainbow Smelt sex ratio, average length, average weight summaries 1989-1992
- Table 14: Rainbow Smelt age class data.
- Table 15: Distribution of gaspereau, by species and sex from mortalities collected at Black River.
- Table 16: Age class summaries for Alewife and Blueback mortalities at Black River fish fence - 1989.
- Table 17: Age class summaries for Alewife and Blueback mortalities at Black River fish fence - 1990.
- Table 18: Age class summaries for Alewife and Blueback mortalities at Black River fish fence - 1992.

LIST OF FIGURES

- Figure 1: Location of Black River fish fence, Kouchibouguac National Park.
- Figure 2: Dates of Operation and Washouts at the Black River Fish Fence 1984-92.
- Figure 3: Timing of Salmon run 1984-92.
- Figure 4: Atlantic Salmon adult and grilse 1984-92.
- Figure 5: Water level/Salmon run 1984-92.
- Figure 6 to 10: Length frequencies - Rainbow Smelt 1989-1992.
- Figure 11 to 14: Rainbow Smelt - timing of migration 1989-1992.
- Figure 15: Rainbow Smelt counts 1984-92.
- Figure 16 to 19: Gaspereau - timing of migration 1989-1992.
- Figure 20: Gaspereau counts 1984-92.

ABSTRACT

Parks Canada and the Science Branch of the Department of Fisheries and Oceans have been operating a fish counting fence at Black River, within Kouchibouguac National Park, New Brunswick, from 1984 to 1992. Black River has assumed "index river" status and the data obtained here will assist in managing anadromous and catadromous stocks in this area of the Gulf Region. This research will provide the data required to develop a management plan for the harvest of fish species within Kouchibouguac National Park.

Daily counts of upstream and downstream movements for 21 species of fish, and various environmental conditions at the site were also recorded. Gaspereau (*Alosa pseudoharengus* and *A. aestivalis*) and rainbow smelt (*Osmerus mordax*) samples were retained for analysis in order to obtain species composition, determine age from scale samples, length, weight, and sex.

Other species which were observed at the fish counting fence included: Atlantic salmon (*Salmo salar*); brook trout (*Salvelinus fontinalis*); four species of stickleback: threespine (*Gasterosteus aculeatus*), black-spotted (*G. wheatlandi*); fourspine (*Apeltes quadracus*); ninespine (*Pungitius pungitius*); mummichog (*Fundulus heteroclitus*); banded killifish (*Fundulus diaphanus*); Atlantic silversides (*Menidia menidia*); white sucker (*Casostomus commersonii*); winter flounder (*Pseudopleuronectes americanus*); smooth flounder (*Liopsetta putnami*); striped bass (*Morone saxatilis*); white perch (*Roccus americanus*); golden shiner (*Notemigonus crysoleucas*); sea lamprey (*Petromyzon marinus*); Atlantic tomcod (*Microgadus tomcod*); American eel (*Anguilla rostrata*).

RÉSUMÉ

Une barrière à poisson fut maintenue en opération par Parcs Canada et Pêches et Océans au parc national Kouchibouguac au Nouveau-Brunswick, de 1984 à 1992. La rivière Black est considérée comme étant une "rivière indicatrice" par Pêches et Océans et les données recueillies à cet endroit serviront à la gestion des stocks d'espèces anadromes et catadromes de cette partie de la région du Golfe. Ce projet de recherche est nécessaire à la mise sur pied d'un plan de gestion de la pêche commerciale au parc national Kouchibouguac.

Un suivi quotidien des migrations ascendantes et descendantes de 21 espèces de poissons fut effectué. De plus, d'autres paramètres environnementaux furent mesurés au site. Des échantillons de gaspareaux (*Alosa pseudoharengus* et *A. aestivalis*) et d'éperlans (*Osmerus mordax*) furent recueillis dans le but d'obtenir des données de base sur la composition des espèces, la longueur, le poids, le sexe et la détermination de l'âge par lecture des écailles.

Plusieurs autres espèces furent observées lors de leur migration. Ces espèces sont les suivantes; le saumon atlantique (*Salmo salar*), la truite (*Salvelinus fontinalis*), quatre espèces d'épinoches: à trois épines (*Gasterosteus aculeatus*), à points noirs (*G. wheatlandi*), à quatre épines (*Apeltes quadracus*), à neuf épines (*Pungitius pungitius*), le choquemort (*Fundulus heteroclitus*), le fondule barré (*F. diaphanus*), la capucette (*Menidia menidia*), le meunier noir (*Catostomus commersonii*), la plie rouge (*Pseudopleuronectes americanus*), la plie lisse (*Liopsetta putnami*), le bar rayé (*Morone saxatilis*), le bar-perche (*Roccus americanus*), la chatte de l'est (*Notemigonus crysoleucas*), la lamproie marine (*Petromyzon marinus*), le poulamon atlantique (*Microgadus tomcod*), et l'anguille d'amérique (*Anguilla rostrata*).



INTRODUCTION

In April 1984, a co-operative research project was approved between Environment Canada - Canadian Parks Service and the Fisheries Research Branch of the Department of Fisheries and Ocean (DFO). The project involved monitoring upstream and downstream movements of all fish species at the Black River site. Black River thus assumed an "index river" status, whereby data obtained will be used to manage anadromous and catadromous stocks in the Gulf Region.

The project involved monitoring upstream and downstream movements of all fish species at the Black River site (Delaney et. al., 1992). Black River is a small, low gradient, well protected, and relatively inaccessible watershed. It drains an area of 51 km², 8.5 km² (16.8%) of which is located within Park boundaries (Ambler, 1975) and is well suited to the successful operation of a fish counting fence.

In 1989 the fish counting fence was re-located to a site approximately 1 km downstream (46°50'22"N 65°00'28"W). The original location had deteriorated to the point where it was no longer feasible to operate due to undercutting of the river bank, an increased channelling effect, and low water levels during much of the operating season.

This research provides Environment Canada - Canadian Parks Service with data required to develop a rational management plan for the harvest of fish species within Kouchibouguac National Park.

The objectives of this programme are as follows;

- a) To estimate spawning escapements;
- b) To predict homewater returns one or more years in advance;
- c) To estimate spawning requirements for each species;
- d) Calculate optimal spawning requirements from stock-recruitment relationships
- e) To obtain accurate counts of fish movements and random samples of their biological attributes, such as age structure, sex ratios, etc.

METHODOLOGY

The materials for the fish counting fence were provided by the Department of Fisheries and Oceans. The fence was operational from late April to late November (Figure 2).

The fish counting fence consists of 2 separate traps designed to capture fish moving upstream or downstream. Fish were guided into the holding traps by fencing. The fence was constructed by placing 1/2" conduit pipe into pre-drilled angle-iron sections. The holding traps were designed so that fish could enter easily and circulate within the traps until released in the migration direction. The traps are of wooden frame construction with 1 cm mesh screening used to allow flow of water without passage of most fish.

The trap was checked at least once a day and every four hours as required during the peak of the salmon run and fall flooding conditions. Upstream and downstream movement of all fish species were recorded in a daily log. Figure 2

provides an overview of the dates when the fish counting fence was operational, and periods when the trap was not operating due to washout, absence of any fish activity in mid-summer or due to the end of the operational season.

The original site, UTM 46°50'19"N/65°00'32"W, was utilised from 1984 to 1988. The site was approximately 13.4m wide. Average depth at the site of the upstream trap was 63cm while the average depth for the downstream trap was 50cm.

The second site (Figure 1), UTM 46°50'22"N/65°00'28"W, has operated from 1988 to 1992. This site is approximately 18.3m wide with an average depth of 60cm. Both sites were subject to tidal effects, the second site moreso than the first due to closer proximity to the Kouchibouguac Lagoon.

All smolt, parr and adult salmon were counted and measured for fork length (cm). Salmon were considered grilse (<63 cm) or adult (>63 cm).

Gaspereau and smelt mortalities which occurred at the trap were retained for laboratory analysis. Specimens were measured (cm), weighed (gm), sexed and aged.

In 1989, T-Bar Floy tags were applied to 434 gaspereau. Up to 50 downstream migrants were tagged daily in order to assess gaspereau movement and subsequent homewater returns. Tagged fish were measured, scale sampled and released downstream.

Samples of downstream smelt migrants were obtained in order to collect biological data. Length frequency data were collected daily on a sample of up to 200 fish. A sub-sample of 2 fish from every 0.5 cm length group was retained and frozen for laboratory analysis. The fish from these samples, along with fence mortalities, were measured, weighed, sexed and aged.

Other species such as brook trout, eel, sticklebacks, and mummichog were counted and released in the direction of travel. Brook trout were measured for length (cm) only.

Air temperature, water temperature and water level were recorded daily at approximately 8:00 AM and at each subsequent visit. Water level was recorded by observing the depth from a meter stick placed on the downstream trap. Water level was recorded at each visit and tidal variations which occurred between visits are not reflected in the data.

RESULTS

General

Twenty one species of fish have been identified at Black River from 1984 to 1992 (Table 1). Upstream and downstream counts from 1984 to 1992, for all species are presented in Table 11 whereas monthly summaries by species are presented in Tables 2 to 10.

Anadromous species of commercial importance which spawn at Black River include gaspereau (alewife, and blueback herring), and rainbow smelt. Important recreational species which spawn at Black River include Atlantic salmon and brook trout. Striped bass have been recorded in limited quantities since 1990, but are not known to spawn here.

Upstream counts have shown that sticklebacks have been the most common species caught between 1984 and 1992, with an average of 8,052 per year. Rainbow smelt were the second most common with an average of 6,996 fish per year. Closer proximity to the brackish water environment since the trap was relocated in 1989, would account for increases in the number of stickleback and other species associated with the estuarine environment (eg. Atlantic silversides).

Atlantic salmon

Salmon migrate upstream to spawn at Black River very late in the season (Figure 3). The migration appears to be driven by higher water levels (Figure 5), especially those associated with run-off from heavy autumn rains. Changes in water levels were associated with the relocation of the trap in 1989.

The correlation between water level and salmon migration has yet to be established for rivers in the Gulf Region (Chadwick and Claytor, 1989). However, minimum water levels for the rivers in that study ranged from 130 to 230 cm depths, whereas the minimum water level for Black River averaged 30 cm or less. Lower water levels could be an environmental factor affecting salmon run timing, and may be more critical at Black River than for larger rivers in the Gulf Region.

From 1984 to 1988, most salmon moved upstream when water levels at the trap reached 30 cm in depth. However major wash-outs of the fence occurred when water levels surpassed the 30 cm level. Relocation of the trap in 1989 provided results that show upstream migration beginning at 30 cm water level and peaking between 50 and 70 cm. Similar wash-out problems have been encountered at the new site with water levels exceeding 70 cm. It is probable that a portion of the salmon run went through the fence during these wash-out periods.

The highest number of adult salmon and grilse recorded in upstream migration was 31 in 1986 while the lowest was 2 in 1991 (Figure 4).

An average of 518 smolt and 123 parr have been recorded in downstream migration at Black River from 1984 to 1992 (Table 11). Downstream counts of smolt and parr in the spring are considered accurate (Table 11).

Rainbow Smelt

Rainbow smelt migrate upstream at Black River from late April to late June, peaking in late May (Figure 11 - 14). This is consistent with early migration runs identified in the Miramichi River by Chadwick and Claytor (1989).

Fluctuations in population levels are shown in Figure 15. The lowest counts were recorded between 1988 and 1990, with increases in 1991 and 1992. Most smelt measure between 12 and 18 cm in length (Table 12 and Figures 6 - 10). Scale analysis conducted on the 1991 sample shows that most spawning smelt were between 2 and 5 years of age and, within the same age group, females tended to be slightly larger than males (Table 14). Males tended to outnumber females for most years (Table 13) and over the 4 years of sampling, males outnumbered females by 1.38:1. Most smelt spawning in the Miramichi River were also found to be in the 2 - 5 year age classes and males outnumbered females by 3:1 (McKenzie, 1964). A substantial portion of the smelt samples were not sexed (Table 13) and

could account for the sex-ratio discrepancy at Black River, relative to the Miramichi.

Gaspereau

Upstream migration of gaspereau at Black River occurs from early June to mid-July (Figures 16 - 19). This timing is consistent with run timing of the Miramichi River gaspereau populations identified by Chaput and LeBlanc (1991).

Since 1984, an average of 1130 gaspereau per year have been recorded in upstream migration while 1010 were recorded in downstream migration. A sharp decrease in numbers has been observed since 1990 (Table 11 and Figure 20).

In 1989, a total of 434 gaspereau were tagged by inserting a T-Bar Floy tag in up to 50 downstream migrants per day. However, 108 of the 434 tagged fish (24.9%), were subsequently recaptured in upstream migration. This shows that gaspereau are drifting around the fish trap. This may be due to tidal or photoperiod effects.

The proportion of alewife to blueback herring at Black River was determined from mortalities collected at the fish counting fence (Tables 15 - 17) and from length frequency samples collected from the commercial fishery at Black River. The proportion of alewife to blueback herring for 1989-90 was found to be 1.92:1 (Delaney, 1990). Studies of Miramichi River fish showed that blueback herring were more abundant than alewife (Chaput and LeBlanc, 1991).

Initial results collected from the Black River gaspereau fishery suggest that up to 80% of potential spawners in that system are being captured (Delaney et al, 1992).

Due to the reduction in gaspereau numbers since 1990 (Table 11), only mortalities were retained for analysis from the fish counting fence. The results of this analysis are summarized in Tables 15 - 18.

ACKNOWLEDGEMENTS

Sincere thanks are extended to Fisheries and Oceans personnel who have been involved in the Black River Fish counting fence study. Many thanks to Mike Chadwick, Phil Gallop, Simon Courtenay, Gerald Chaput, Claude LeBlanc, Dave Moore, Ross Claytor, Colin MacDougald and Mark Hambrook.

Many thanks to Harry Beach and Michel Savoie who initiated the study in conjunction with Fisheries and Oceans.

Sincere thanks are also extended to the Resource Conservation Section at Kouchibouguac National Park and the technicians and assistants that ensured the smooth and successful operation of the fish counting fence over the years. Thanks to Firmin LeBlanc for his hard work and dedication over the years. Thanks to Park Wardens Arnold Vautour, Jean Guy Gaudet, Harold Sock, Noël Fontaine, J. Edouard Daigle, Gilles LeBel, Gregoire Daigle, Benoit Richard, Léophane LeBlanc, Maurice Daigle and Guy DesRoches.

REFERENCES

- Amber, D.C., (1975), Hydrological Inventory of Kouchibouguac National Park, N.B. Canada, Inlands Water Directorate, Water Resources Branch, Environment Canada, 190 pages.
- Chadwick, E.M.P. and R.R. Claytor, (1989), Run Timing of Pelagic Fishes in the Gulf of St-Lawrence: Area and Species Effects, *J. Fish Biol.*, 35:215-223
- Chaput, G.J and C.H. LeBlanc, (1991), Les pêches commerciales de poissons dans les baies, estuaires et rivières du sud-ouest du Golfe du St-Laurent, *In* J.C. Therriault (Ed), *Le Golfe du St-Laurent: Petit océan ou grand estuaire ?*, Publ. Spéc. Can. Sci. Halieut. Aquat. 113: 293-301
- Delaney, G., (1990), Gaspereau Stock Assessment: Kouchibouguac National park, A Progress Report, Environment Canada, CPS, Kouchibouguac National Park, Natural Resource Conservation, Unpublished report, 16 pages.
- Delaney, G., H. Beach, M. Savoie and F. LeBlanc, (1992), Commercial Fishery Studies Within Kouchibouguac National Park, NB, Canada, *In* Development in Landscape Management and Urban Planning, 7. Science and the Management of Protected Areas. J.H. Martin-Willison, Soren Bundrop-Neilsen, Clifford Drysdale, Tom Herman, Neil W.P. Munro, Tom L. Pollock (Editors), Elsevier, Amsterdam, pp:283-286.
- McKenzie, R.A., (1964), Smelt Life History and Fishery in the Miramichi River, New Brunswick, *Bull. Fish. Res. Board Can.* No.144, 77 pages

TABLES

TABLE 1
Species List

Common Name	Latin Name
Atlantic Salmon	<u>Salmo salar</u>
Gaspereau - Alewife	<u>Alosa pseudoharengus</u>
- Blueback Herring	<u>Alosa aestivalis</u>
Brook Trout	<u>Salvelinus fontinalis</u>
Rainbow Smelt	<u>Osmerus eperlanus mordax</u>
Sticklebacks - 3-spine	<u>Gasterosteus aculeatus</u>
- Black spotted	<u>Gasterosteus wheatlandi</u>
- Fourspine stickleback	<u>Apeltes quadracus</u>
- Ninespine stickleback	<u>Pungitius pungitius</u>
Mummichog	<u>Fundulus heteroclitus</u>
Banded Killifish	<u>Fundulus diaphanus</u>
Atlantic Silversides	<u>Menidia menidia</u>
White Sucker	<u>Catostomus commersonii</u>
Winter Flounder	<u>Pseudopleuronectes americanus</u>
Smooth Flounder	<u>Liopsetta putnami</u>
Striped Bass	<u>Morone saxatilis</u>
White perch	<u>Roccus americanus</u>
Golden Shiner	<u>Notemigonus crysoleucas</u>
Sea Lamprey	<u>Petromyzon marinus</u>
Atlantic Tomcod	<u>Microgadus tomcod</u>
American Eel	<u>Anguilla rostrata</u>

TABLE 2

Results of upstream and downstream fish counts for 1984

Upstream	Number of fish counted at fence						
	MONTH						ALL
	May	Jun	Jul	Sep	Oct	Nov	
SPECIES							
gaspereau	4	663	56	.	.	.	723
salmon (parr)	9	2	.	.	10	11	32
salmon (large)	.	.	.	.	.	3	3
trout	25	19	11	3	2	14	74
smelt	8152	2031	2	.	.	2	10187
stickleback	102	292	148	11	.	.	553
flounder	.	.	.	2	.	.	2
ALL	8292	3007	217	16	12	30	11574

Downstream	Number of fish counted at fence						
	MONTH						ALL
	May	Jun	Jul	Sep	Nov	ALL	
SPECIES							
gaspereau	1	548	90	.	.	.	639
salmon (parr)	97	2	.	.	1	.	100
salmon (smolt)	272	43	.	.	.	.	315
trout	69	30	4	1	15	.	119
smelt	7320	4308	2	.	1	.	11631
chub	.	1	.	.	.	.	1
sucker	2	.	.	.	.	.	2
eel	.	1	.	.	.	.	1
mummichog	1	.	.	.	.	.	1
stickleback	151	256	102	.	.	.	509
ALL	7913	5189	198	1	17	.	13318

TABLE 3

Results of upstream and downstream fish counts for 1985

Upstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Sep	Oct	Nov		
SPECIES								
gaspereau	2	934	69	.	.	2	1007	
salmon (parr)	2	.	.	.	.	3	5
salmon (smolt)	21	1	1	.	.	15	38	
salmon (grilse)	.	.	.	.	.	1	1
salmon (large)	.	.	.	.	.	12	12
trout	12	18	7	.	.	16	53	
smelt	8659	2398	.	.	1	2	11060	
sucker	.	1	.	.	.	.	1
munnichog	1	1	1	.	.	.	3	
stickleback	513	788	240	9	4	1	1555	
ALL	9210	4141	318	9	5	52	13735	

Downstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	2	1708	40	.	.	1	7	1758
salmon (parr)	21	.	.	.	1	1	1	24
salmon (smolt)	795	17	1	.	.	1	1	815
salmon (large)	.	.	.	.	.	.	1	1
trout	29	10	2	.	.	10	3	54
smelt	7189	2788	.	.	.	11	1	9989
eel	2	.	.	.	.	2	.	4
munnichog	4	1	.	.	.	2	.	7
stickleback	502	531	27	3	2	10	1	1076
ALL	8544	5055	70	3	3	38	15	13728

TABLE 4

Results of upstream and downstream fish counts for 1986

Upstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	152	432	18	.	.	.	.	602
salmon (parr)	2	3	2	.	1	2	4	14
salmon (smolt)	.	.	1	.	.	.	.	1
salmon (grilse)	.	.	.	1	.	2	12	15
salmon (large)	.	.	.	.	.	3	13	16
trout	9	18	.	.	.	5	2	34
smelt	6198	68	.	1	.	.	.	6267
sunmichog	45	1	.	.	.	.	.	46
stickleback	1181	2900	142	.	.	.	.	4223
ALL	7587	3422	163	2	1	12	31	11218

Downstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	155	393	10	.	.	.	.	558
salmon (parr)	.	2	.	.	5	11	2	20
salmon (smolt)	264	2	1	.	.	.	.	267
salmon (large kelt)	.	.	.	.	.	.	2	2
trout	53	14	1	6	3	11	6	94
smelt	14351	239	.	1	.	.	.	14591
eel	.	.	.	2	.	.	.	2
sunmichog	29	6	2	.	.	.	.	37
stickleback	981	1139	48	18	3	8	.	2197
ALL	15833	1795	62	27	11	30	10	17768

TABLE 5

Results of upstream and downstream fish counts for 1987

Upstream	Number of fish counted at fence									
	MONTH									ALL
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov		
SPECIES										
sea lamprey	1	.	1
gaspereau	.	14	216	1	3	234
salmon (parr)	.	2	1	5	.	.	22	14	44	
salmon (grilse)	.	.	.	.	.	.	4	1	5
salmon (large)	.	.	.	.	.	.	7	2	9
trout	.	10	6	3	1	2	6	4	32	
smelt	19	5999	576	.	3	6	1	.	6604	
banded killifish	.	1	.	14	54	.	.	.	69	
mummichog	.	2	.	.	1	.	.	.	3	
stickleback	.	822	1874	97	11	6	.	.	2810	
tomcod	.	.	.	.	.	.	.	1	1
ALL	19	6850	2673	120	73	14	41	22	9812	

Downstream	Number of fish counted at fence									
	MONTH									ALL
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov		
SPECIES										
gaspereau	.	45	208	12	1	1	.	1	268	
salmon (parr)	1	51	1	6	.	.	20	62	141	
salmon (smolt)	.	117	13	.	.	.	.	.	130
trout	9	29	4	.	.	.	15	13	70	
smelt	297	9038	3015	.	.	1	1	.	12352	
sucker	.	2	.	.	.	.	.	.	2
eel	.	3	.	.	.	.	5	.	8
banded killifish	.	.	1	6	60	13	3	.	83	
mummichog	.	3	.	2	16	.	.	.	21	
stickleback	2	751	863	119	19	95	31	24	1904	
tomcod	.	.	.	.	.	.	.	1	1
ALL	309	10039	4105	145	96	110	75	101	14980	

TABLE 6

Results of upstream and downstream fish counts for 1988

Upstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct		
SPECIES								
gaspereau	29	3041	33	3	1	2	3109	
salmon (parr)	3	4	1	1	.	4	13	
salmon (smolt)	.	3	.	.	.	.	3
salmon (grilse)	.	.	.	.	.	3	3
salmon (large)	.	.	.	.	.	7	7
trout	2	66	3	1	1	2	75	
smelt	1367	925	3	.	3	1	2299	
banded killifish	.	2	.	.	.	450	452	
mummichog	4	.	11	143	.	103	261	
stickleback	1127	10336	618	3	4	7	12095	
striped bass	.	.	10	.	.	.	10	
ALL	2532	14377	679	151	9	579	18327	

Downstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	10	2781	63	1	.	1	.	2856
salmon (parr)	288	16	1	.	.	15	1	321
salmon (smolt)	493	89	.	.	.	.	.	582
trout	13	4	.	4	.	1	.	22
smelt	1250	2263	3	.	3	.	.	3519
sucker	1	.	.	.	.	.	.	1
banded killifish	1	3	.	.	.	156	.	160
mummichog	28	3	36	137	4	64	.	272
stickleback	1737	4820	842	66	32	34	2	7533
silverside	.	1	.	.	.	.	.	1
ALL	3821	9980	945	208	39	271	3	15267

TABLE 7

Results of upstream and downstream fish counts for 1989

Upstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	97	3251	125	.	12	.	.	3485
salmon (parr)	6	2	.	.	1	2	33	44
salmon (smolt)	7	6	.	.	.	.	.	13
salmon (grilse)	.	.	.	.	.	.	6	6
salmon (large)	.	.	.	.	.	1	6	7
trout	6	26	17	.	1	4	32	86
smelt	5148	231	3	1	5	2	2	5392
sucker	.	.	.	.	.	.	2	2
banded killifish	.	1	6	21	379	13	6	426
mummichog	3	2	3	19	163	7	2	199
stickleback	2682	22376	904	1	4	3	15	25985
tomcod	.	.	.	.	.	.	1	1
silverside	1	.	.	.	2	46	14	63
flounder	1	.	.	.	.	.	.	1
ALL	7951	25895	1058	42	567	78	119	35710

Downstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	42	1244	1098	.	4	.	.	2388
salmon (parr)	202	.	1	.	1	.	1	205
salmon (smolt)	718	123	2	.	.	.	.	843
trout	39	4	2	.	4	2	1	52
smelt	4468	448	1	.	5	2	.	4924
eel	5	.	1	.	.	3	.	9
banded killifish	.	.	1	1	23	31	8	64
mummichog	4	.	2	17	312	15	4	354
stickleback	924	2569	669	4	12	18	4	4200
tomcod	2	.	.	.	.	.	.	2
silverside	.	.	.	.	20	51	58	129
ALL	6404	4388	1777	22	381	122	76	13170

TABLE 8

Results of upstream and downstream fish counts for 1990

Upstream	Number of fish counted at fence							ALL
	MONTH							
	May	Jun	Jul	Sep	Oct	Nov		
SPECIES								
gaspereau	1	299	108	.	.	.	408	
salmon (parr)	7	2	.	1	.	.	10	
salmon (smolt)	6	.	.	.	.	.	6
salmon (grilse)	.	.	.	.	1	.	1
salmon (large)	.	.	.	.	1	1	2
trout	4	18	3	2	10	14	51	
smelt	2276	972	1	8	1	.	3258	
sucker	.	.	3	.	.	.	3	
shiner	.	.	2	3	1	.	6	
banded killifish	.	2	4	2	1	.	9	
mummichog	1	2	5	52	5	.	65	
stickleback	34	4165	369	2	4	.	4574	
silverside	.	.	.	.	8	1	9
white perch	.	.	1	.	.	.	1	
striped bass	.	.	.	1	1	.	2	
flounder	.	.	.	1	.	.	1	
ALL	2329	4460	496	72	33	16	8406	

Downstream	Number of fish counted at fence							ALL
	MONTH							
	May	Jun	Jul	Sep	Oct	Nov		
SPECIES								
gaspereau	1	114	88	1	1	.	205	
salmon (parr)	190	.	1	2	2	2	197	
salmon (smolt)	533	4	.	.	.	.	537
trout	6	10	1	1	5	.	23	
smelt	1399	1248	1	7	1	.	2656	
sucker	2	.	2	.	.	.	4	
eel	.	.	.	.	4	.	4
banded killifish	.	1	2	.	4	1	8	
mummichog	2	6	12	106	11	.	137	
stickleback	31	980	302	4	5	8	1330	
silverside	.	.	.	.	.	3	3
striped bass	.	.	.	1	1	.	2	
flounder	.	.	.	2	.	.	2	
ALL	2164	2363	409	124	34	14	5108	

TABLE 9
Results of upstream and downstream fish counts for 1991

Upstream	Number of fish counted at fence							ALL
	MONTH							
	May	Jun	Jul	Sep	Oct	Nov		
SPECIES								
gaspereau	.	225	.	.	.	.	.	225
salmon (parr)	3	.	.	.	1	1	.	5
salmon (smolt)	4	.	.	.	.	.	.	4
salmon (grilse)	.	.	.	.	1	.	.	1
salmon (large)	.	.	.	1	.	.	.	1
trout	4	39	5	6	4	8	.	66
smelt	7639	1291	1	4	1	.	.	8936
sucker	.	1	.	.	.	.	.	1
shiner	1	1	7	1	.	.	.	10
banded killifish	.	.	12	1	.	.	.	13
mummichog	5	5	21	3	.	.	.	34
stickleback	2536	10664	1024	3	.	.	.	14227
silverside	1	.	92	11	.	.	.	104
white perch	.	.	2	.	.	.	.	2
striped bass	.	.	.	1	.	.	.	1
flounder	.	1	.	1	.	.	.	2
ALL	10193	12227	1164	32	7	9	.	23632

Downstream	Number of fish counted at fence							ALL
	MONTH							
	May	Jun	Jul	Sep	Oct	Nov		
SPECIES								
gaspereau	.	110	23	.	.	.	.	133
salmon (parr)	79	1	.	.	3	2	.	85
salmon (smolt)	532	10	.	.	.	.	.	542
trout	25	14	4	1	7	1	.	52
smelt	6373	1878	.	1	.	.	.	8252
sucker	.	.	.	.	2	1	.	3
shiner	2	2	1	1	1	.	.	7
eel	2	.	.	.	1	.	.	3
banded killifish	.	1	10	2	.	.	.	13
mummichog	18	6	34	41	.	.	.	99
stickleback	2052	4380	398	3	.	.	.	6833
silverside	1	.	52	.	.	.	.	53
white perch	.	.	1	.	.	.	.	1
flounder	.	.	.	1	.	.	.	1
ALL	9084	6402	523	50	14	4	.	16077

TABLE 10

Results of upstream and downstream fish counts for 1992

Upstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct	Nov	
SPECIES								
gaspereau	.	319	37	.	.	.	.	356
salmon (parr)	2	3	.	.	.	5	1	11
salmon (smolt)	3	4	.	.	.	.	.	7
salmon (grilse)	.	.	.	.	.	5	.	5
salmon (large)	.	.	.	.	.	6	.	6
trout	2	25	4	.	.	5	.	36
smelt	5571	2811	1	.	1	10	.	8394
redbelly dace	1	.	.	.	.	.	.	1
sucker	.	1	.	.	.	.	.	1
shiner	4	1	1	1	.	.	.	7
banded killifish	.	1	.	.	2	.	.	3
mummichog	5	6	1	.	1	1	.	14
stickleback	731	14041	1540	2	5	.	.	16319
silverside	.	4	.	.	.	1	.	5
striped bass	.	.	.	.	1	28	.	29
ALL	6319	17216	1584	3	10	61	1	25194

Downstream	Number of fish counted at fence							
	MONTH							ALL
	May	Jun	Jul	Aug	Sep	Oct		
SPECIES								
gaspereau	.	91	207	1	.	.	.	299
salmon (parr)	14	13	.	.	.	.	.	27
salmon (smolt)	279	366	2	.	.	.	.	647
trout	50	7	2	.	1	.	.	60
smelt	9115	3460	3	1	.	11	.	12590
sucker	1	.	8	.	.	.	.	9
shiner	3	1	1	1	3	.	.	9
eel	.	.	1	.	.	.	.	1
banded killifish	.	3	1	.	2	.	.	6
mummichog	16	30	7	4	3	7	.	67
stickleback	749	5148	363	21	12	1	.	6294
silverside	.	3	.	.	.	22	.	25
striped bass	.	.	.	.	1	3	.	4
ALL	10227	9122	595	28	22	44	.	20038

TABLE 11

Black River counting fence 1984-1992 data

	SPECIES	Number of fish counted at fence								
		YEAR								
		1984	1985	1986	1987	1988	1989	1990	1991	1992
upstream	sea lamprey	.	.	.	1	.	.	.	.	.
	gaspereau	723	1007	602	234	3109	3485	408	225	356
	salmon (parr)	32	5	14	44	13	44	10	5	11
	salmon (smolt)	.	38	1	.	3	13	6	4	7
	salmon (grilse)	.	1	15	5	3	6	1	1	5
	salmon (large)	3	12	16	9	7	7	2	1	6
	trout	74	53	34	32	75	86	51	66	36
	smelt	10187	11060	6267	6604	2299	5392	3258	8936	8394
	redbelly dace	.	.	.	.	.	.	.	.	1
	sucker	.	1	.	.	.	2	3	1	1
	shiner	.	.	.	.	.	.	6	10	7
	banded killifish	.	.	.	69	452	426	9	13	3
	mummichog	.	3	46	3	261	199	65	34	14
	stickleback	553	1555	4223	2810	12095	25985	4574	14227	16319
	tomcod	.	.	.	1	.	1	.	.	.
	silverside	.	.	.	.	.	63	9	104	5
	white perch	.	.	.	.	.	.	1	2	.
	striped bass	.	.	.	.	10	.	2	1	29
	flounder	2	.	.	.	.	1	1	2	.
downstream	gaspereau	639	1758	558	268	2856	2388	205	133	299
	salmon (parr)	100	24	20	141	321	205	197	85	27
	salmon (smolt)	315	815	267	130	582	843	537	542	647
	salmon (large)	.	1	.	.	.	.	.	.	.
	salmon (large kelt)	.	.	2	.	.	.	.	.	.
	trout	119	54	94	70	22	52	23	52	60
	smelt	11631	9989	14591	12352	3519	4924	2656	8252	12590
	chub	1	.	.	.	.	.	.	.	.
	sucker	2	.	.	2	1	.	4	3	9
	shiner	.	.	.	.	.	.	.	7	9
	eel	1	4	2	8	.	9	4	3	1
	banded killifish	.	.	.	83	160	64	8	13	6
	mummichog	1	7	37	21	272	354	137	99	67
	stickleback	509	1076	2197	1904	7533	4200	1330	6833	6294
	tomcod	.	.	.	1	.	2	.	.	.
	silverside	.	.	.	.	1	129	3	53	25
	white perch	.	.	.	.	.	.	.	1	.
	striped bass	.	.	.	.	.	.	2	.	4
	flounder	.	.	.	.	.	.	2	1	.
TOTAL		24892	27463	28986	24792	33594	48880	13514	39709	45232

TABLE 12

Rainbow Smelt Length Frequencies, 1989-1992
Black River Fish Fence, Kouchibouguac National Park

LENGTH	1989		1990		1991		1992	
	NO.	AVERAGE WEIGHT	NO.	AVERAGE WEIGHT	NO.	AVERAGE WEIGHT	NO.	AVERAGE WEIGHT
8.0- 8.49	1	3.7	0	---	0	---	0	---
8.5- 8.99	1	5.2	0	---	0	---	0	---
9.0- 9.49	4	5.8	0	---	0	---	0	---
9.5- 9.99	0	---	0	---	0	---	8	6.5
10.0-10.49	0	---	0	---	0	---	3	7.3
10.5-10.99	0	---	0	---	0	---	1	8.7
11.0-11.49	3	9.4	0	---	3	12.2	10	9.0
11.5-11.99	5	10.7	9	10.1	13	10.8	22	10.6
12.0-12.49	16	11.3	25	13.2	31	12.2	52	11.9
12.5-12.99	29	12.7	76	13.0	52	13.4	59	13.9
13.0-13.49	43	14.5	70	15.2	73	15.5	61	15.0
13.5-13.99	48	17.1	58	16.9	72	17.0	54	17.1
14.0-14.49	40	18.4	59	19.4	44	18.9	46	18.6
14.5-14.99	43	21.2	44	21.1	40	21.3	36	21.3
15.0-15.49	38	24.0	34	23.7	21	23.4	41	23.7
15.5-15.99	33	26.1	29	26.0	29	27.7	33	26.4
16.0-16.49	35	28.5	26	29.1	22	29.7	43	28.4
16.5-16.99	21	30.8	28	30.3	32	30.9	35	30.4
17.0-17.49	20	33.9	17	33.5	19	34.7	41	33.7
17.5-17.99	16	35.5	8	36.2	10	36.5	15	36.1
18.0-18.49	10	42.1	5	41.3	6	43.2	13	39.1
18.5-18.99	6	42.4	2	46.3	3	42.4	14	45.6
19.0-19.49	3	50.9	2	38.6	1	48.7	5	49.1
19.5-19.99	1	49.5	2	30.1	2	50.4	1	50.5
20.0-20.49	1	55.1	3	58.2	2	57.4	0	---
20.5-20.99	0	---	1	64.7	2	61.9	2	60.7
21.0-21.49	0	---	0	---	0	---	1	68.6
21.5-21.99	0	---	0	---	1	74.9	0	---
22.0-22.49	0	---	1	22.2	0	---	0	---

NOTE: Data is obtained from sub-sample retained from length frequency data.

TABLE 13

Rainbow Smelt - Sex Ratio Average Length, Average Weight
Summaries 1989-1992, Black River Fish Fence

	1989	1990	1991	1992
SAMPLE SIZE	616	481	470	411
No. of Females	202	93	106	180
Ave. Length (cm)	14.1	14.1	14.8	14.9
Ave. Weight (g)	19.7	19.9	23.0	22.6
Ave. Age	N/A	N/A	2	N/A
No. of Males	296	209	158	136
Ave. Length (cm)	14.6	14.4	14.4	15.2
Ave. Weight (g)	22.8	22.3	21.1	25.3
Ave. Age	N/A	N/A	2	N/A
Records not sexed	118	179	206	95
Ave. Length (cm)	14.8	14.6	14.5	14.4
Ave. Weight (g)	21.9	20.5	20.2	19.2
Ave. age	N/A	N/A	2	N/A
Female:Male	1:1.47	1:2.25	1:1.49	1.32:1

TABLE 14

Rainbow Smelt - Age Class Data
Black River Fish Fence 1991

AGE CLASS	NO. OF SPECIMENS		AVG LENGTH (cm)		AVG LENGTH (g)	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
1	0	0	--	--	--	--
2	37	25	13.0	13.3	15.1	15.7
3	42	24	14.0	14.0	20.4	18.7
4	28	19	15.3	16.5	25.5	30.8
5	12	6	16.7	16.4	29.1	30.0
6	1	2	17.1	18.9	43	51.1
7	0	1	--	20.6	--	64.7

TABLE 15

Distribution of Gaspereau by species and sex
from mortalities collected at Black River

SUB-SPECIES	SEX RATIOS	1989	1990	1991	1992
ALEWIFE	Male	14	13	0	0
	Female	12	2	0	0
	TOTAL	26	15	0	0
BLUEBACK	Male	53	5	0	24
	Female	91	2	0	21
	TOTAL	144	7	0	45

TABLE 16

Age Class Summaries for Alewife and Blueback
Mortalities at Black River Fish Fence - 1989

AGE CLASS					AVERAGE LENGTH (cm)				AVERAGE WEIGHT (g)			
	ALEWIFE		BLUEBACK		ALEWIFE		BLUEBACK		ALEWIFE		BLUEBACK	
	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	2	0	0	0	24.4	0	0	0	174	0	0	0
4	1	2	18	16	26.5	24.5	24.7	24.1	251	202	155	143
5	3	8	55	25	26.7	25.8	26.2	24.9	259	220	184	159
6	4	2	10	3	27.7	25.5	26.9	26.2	315	224	214	186
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
not aged	2	2	8	5	24.1	25.5	25.7	25.2	206	224	143	140

TABLE 17

Age Class Summaries for Alewife and Blueback
Mortalities at Black River Fish Fence - 1990

AGE CLASS	ALEWIFE		BLUEBACK		AVERAGE LENGTH (cm)				AVERAGE WEIGHT (g)			
					ALEWIFE		BLUEBACK		ALEWIFE		BLUEBACK	
	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	1	6	0	1	25.9	23.8	0	21.7	193.4	161.4	0	108.9
4	0	0	0	1	0	0	0	23	0	0	0	146.8
5	0	1	1	3	0	26.8	25.8	25.6	0	212.5	206.7	180.6
6	1	2	1	0	27.4	27.2	26.9	0	273.1	210.1	235.8	0
7	0	2	0	0	0	27.0	0	0	0	212.2	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
not aged	0	2	0	0	0	25.2	0	0	0	187.4	0	0

TABLE 18

Age Class Summaries for Alewife and Blueback
Mortalities at Black River Fish Fence - 1992

AGE CLASS	ALEWIFE				BLUEBACK				AVERAGE LENGTH (cm)				AVERAGE WEIGHT (g)			
	ALEWIFE		BLUEBACK		ALEWIFE		BLUEBACK		ALEWIFE		BLUEBACK		ALEWIFE		BLUEBACK	
	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	8	11	0	0	21.9	23.7	0	0	167.6	141.7				
5	0	0	6	8	0	0	26.2	25.4	0	0	179.3	172.4				
6	0	0	0	1	0	0	0	26.3	0	0	0	205.0				
7	0	0	4	1	0	0	27.9	26.7	0	0	224.4	187.3				
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
not aged	0	0	3	3	0	0	26.2	24.0	0	0	169.2	127.8				

FIGURES

FIGURE 1: Location of Black river Fish Fence
Kouchibouguac National park

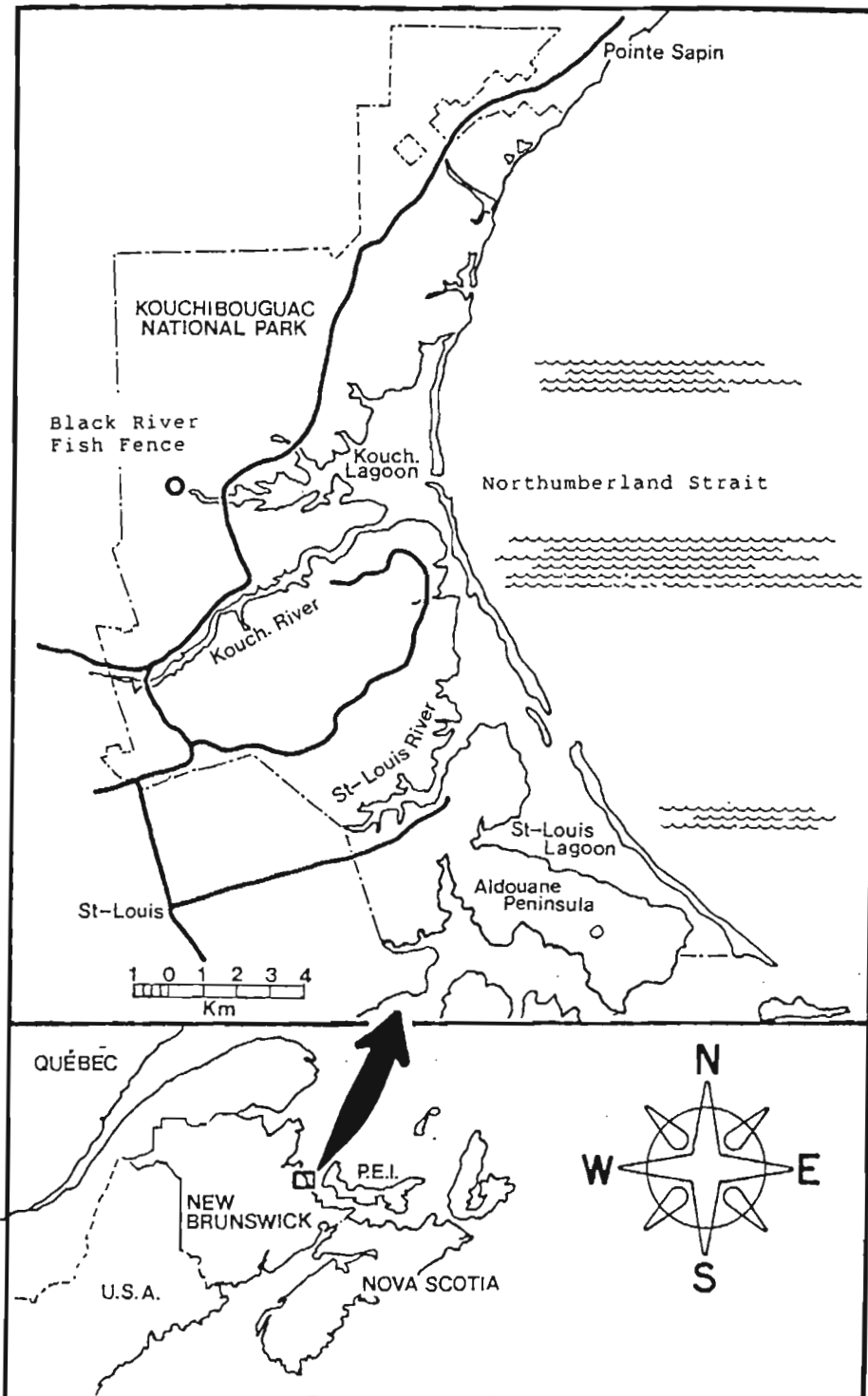
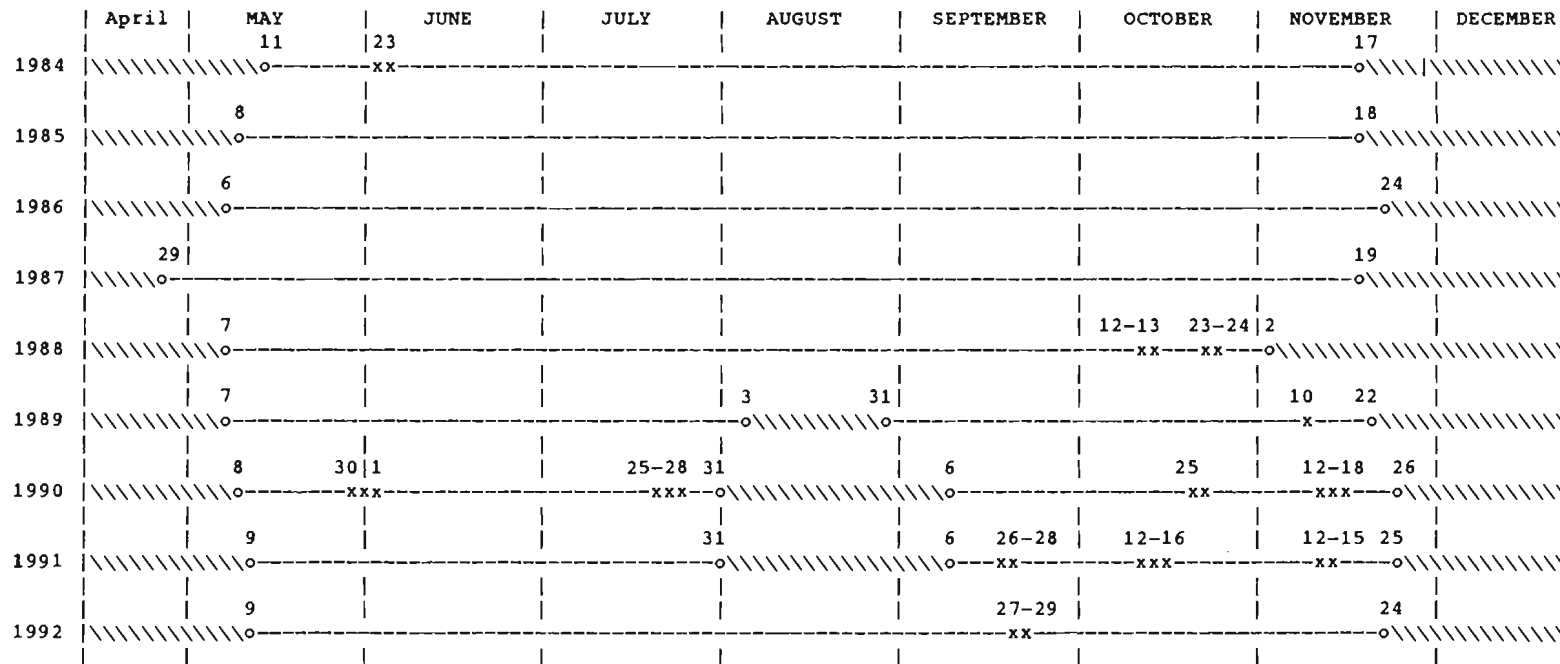


FIGURE 2:
Dates of Operation and Washouts at Black River Fish Fence
1984 - 1992



LEGEND

Start/End = o
 Not operational = \
 Wash out = x
 Operational = --

Fig. 3 - Timing of Salmon Run
1984-92

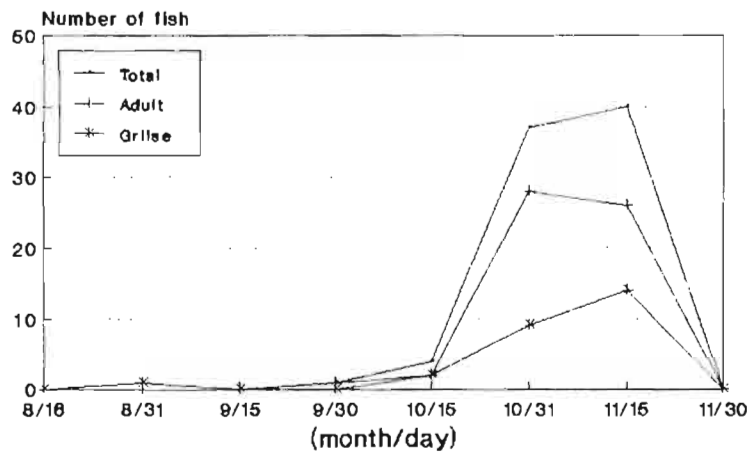


Fig.4 Atlantic Salmon
Adult and Grilse, 1984-92

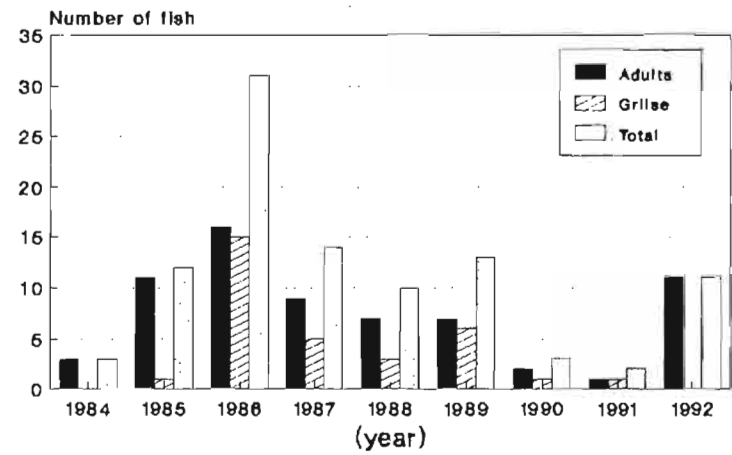
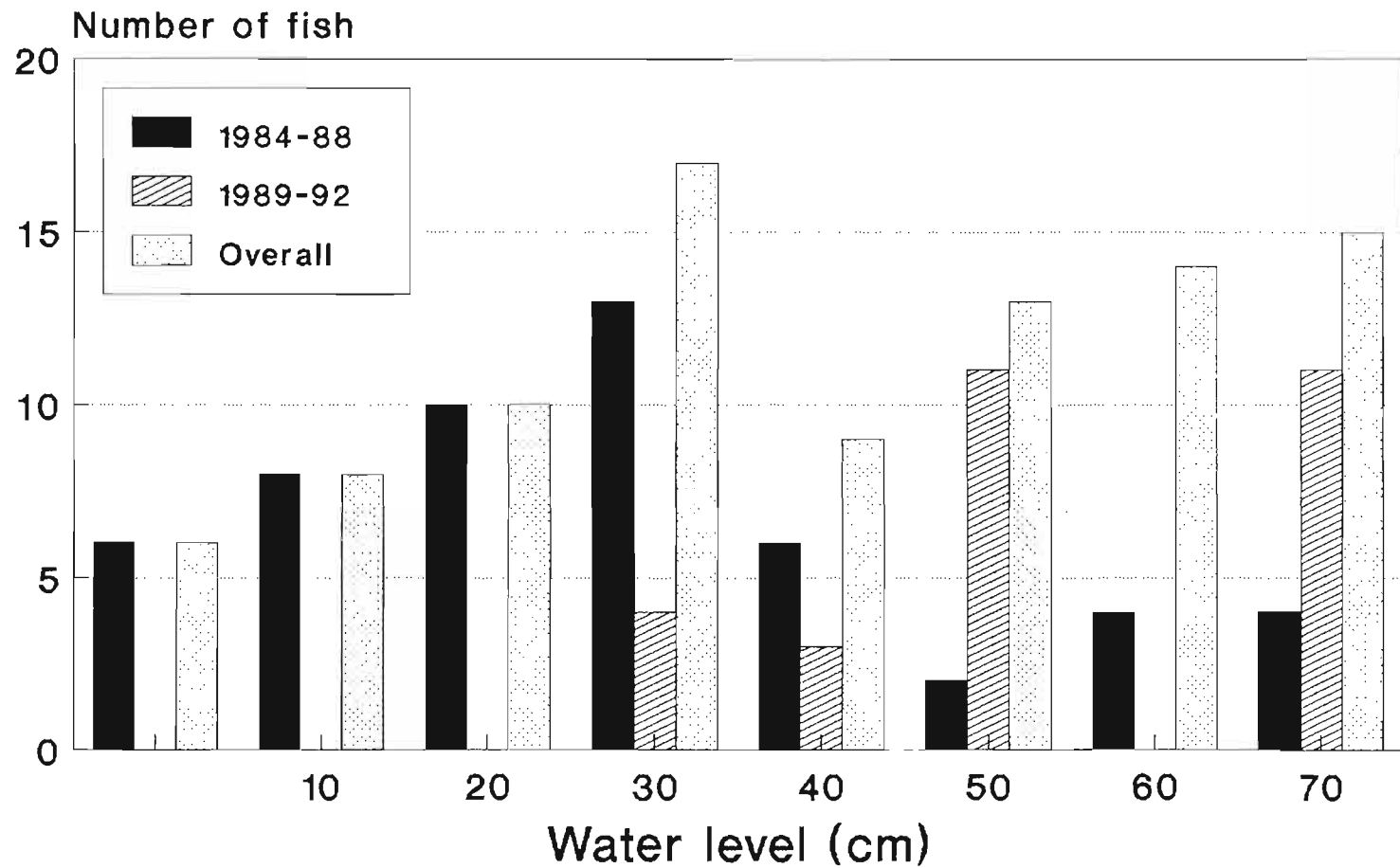
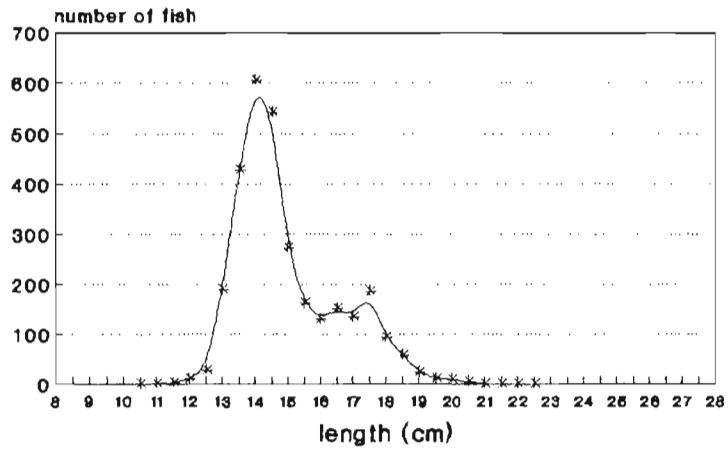


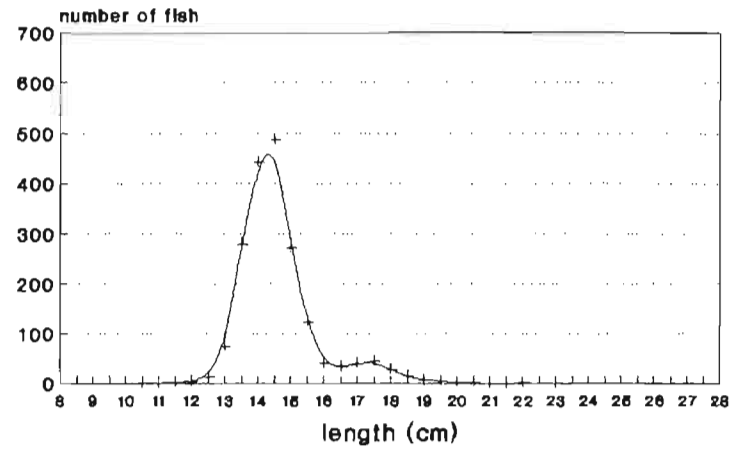
Fig.5 - Water Level/Salmon Run 1984-92



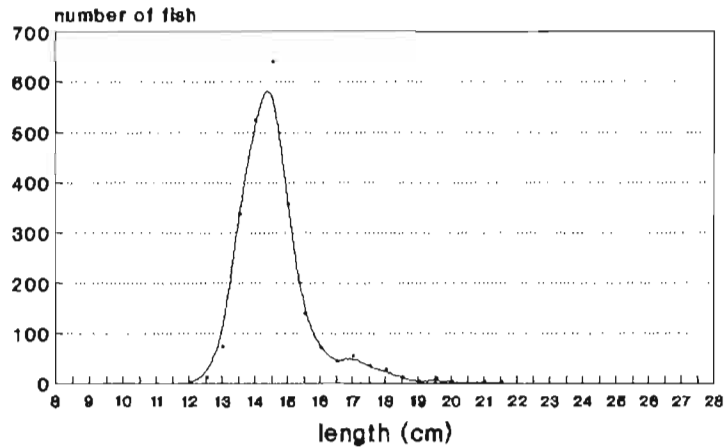
**Fig. 6 - Length Frequencies
Rainbow Smelt 1989**



**Fig.7 - Length Frequencies
Rainbow Smelt 1990**



**Fig.8 - Length Frequencies
Rainbow Smelt 1991**



**Fig.9 - Length Frequencies
Rainbow Smelt 1992**

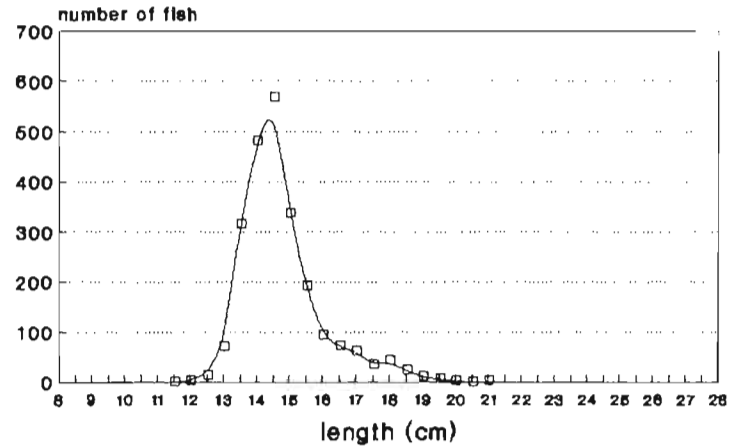


Fig. 10 - Length Frequencies
Rainbow Smelt 1989 -1992

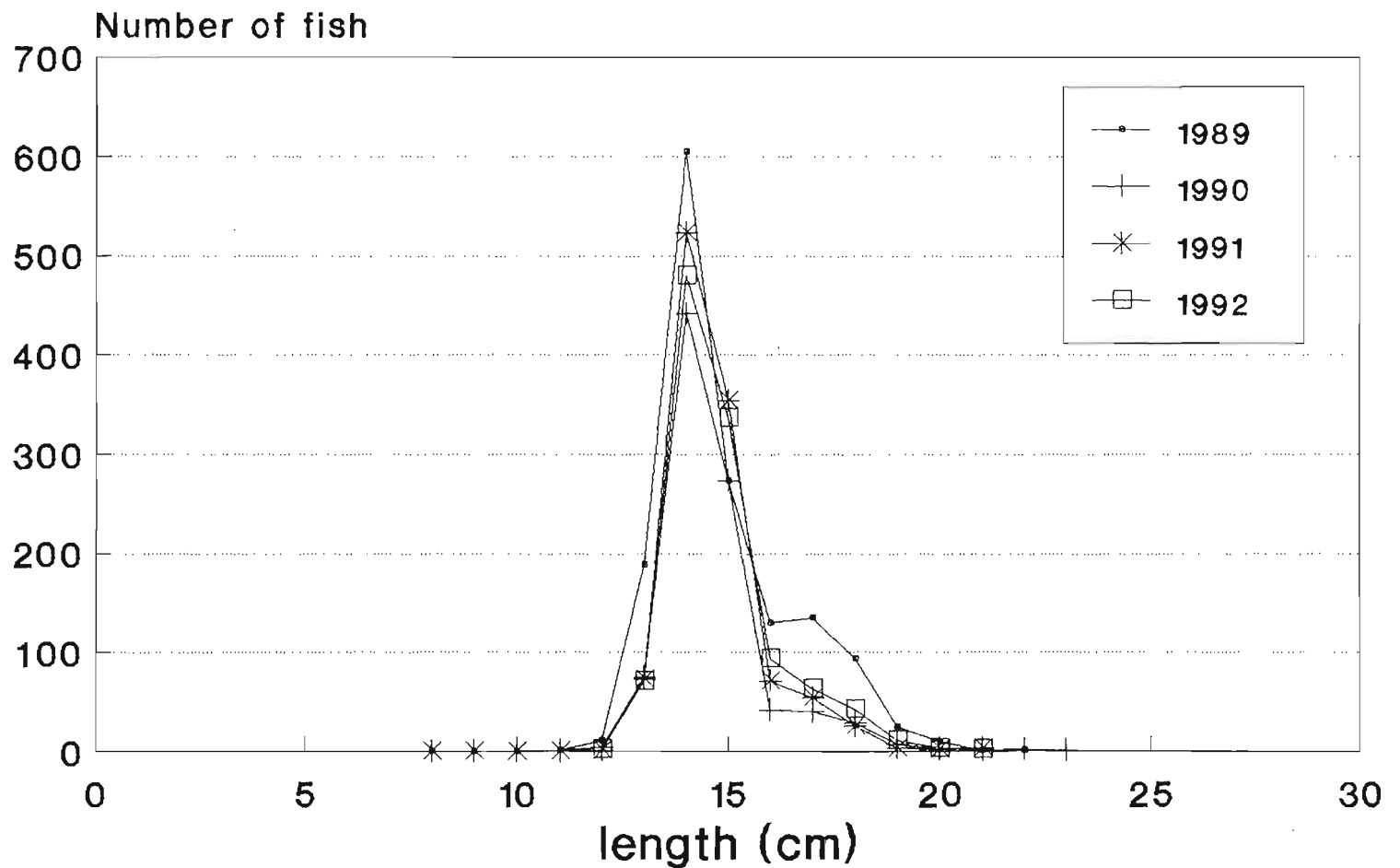


Fig.11 - Rainbow Smelt
Timing of 1989 Migration

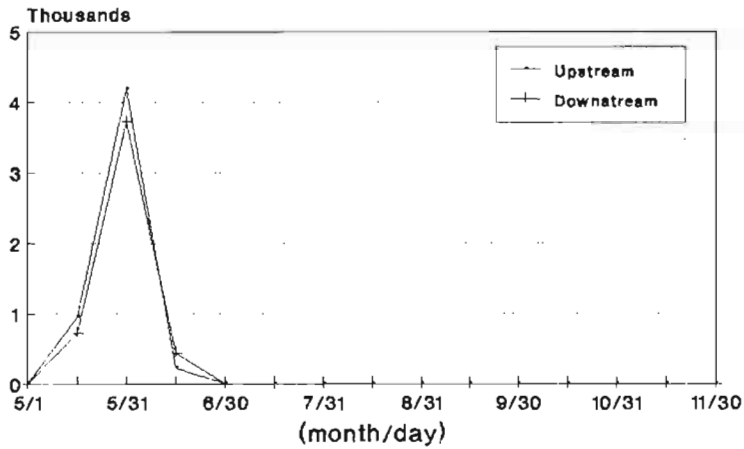


Fig.12 - Rainbow Smelt
Timing of 1990 Migration

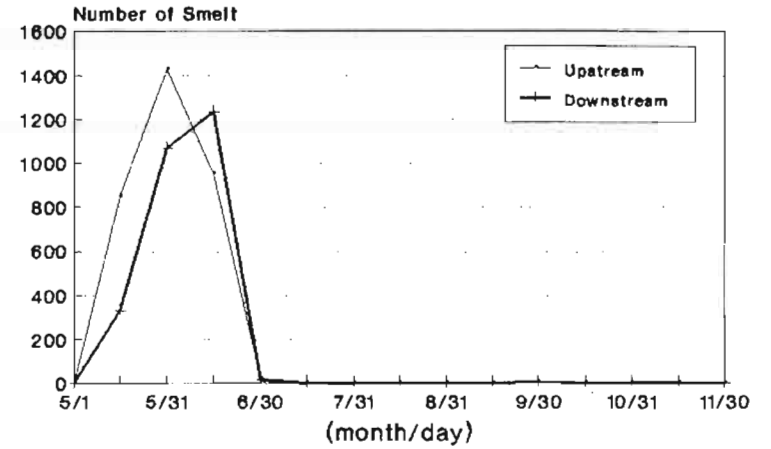


Fig.13 - Rainbow Smelt
Timing of 1991 Migration

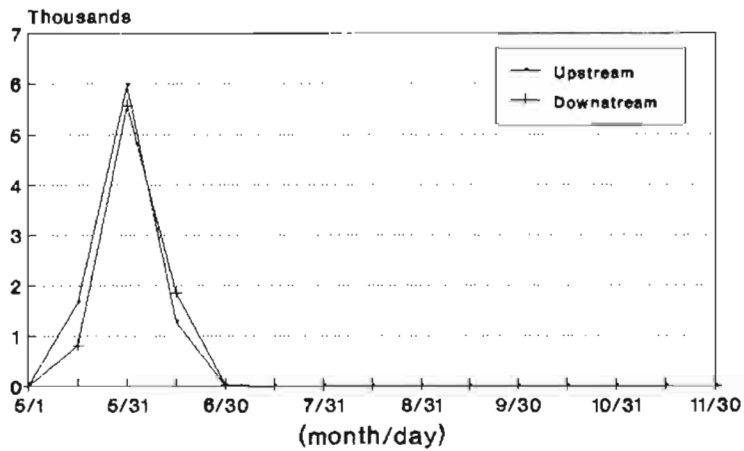


Fig.14 - Rainbow Smelt
Timing of 1992 Migration

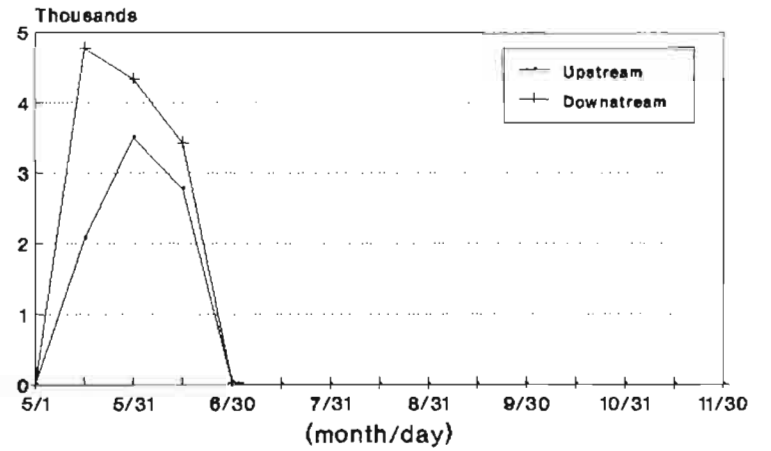


Fig.15 Rainbow Smelt Counts 1984-92

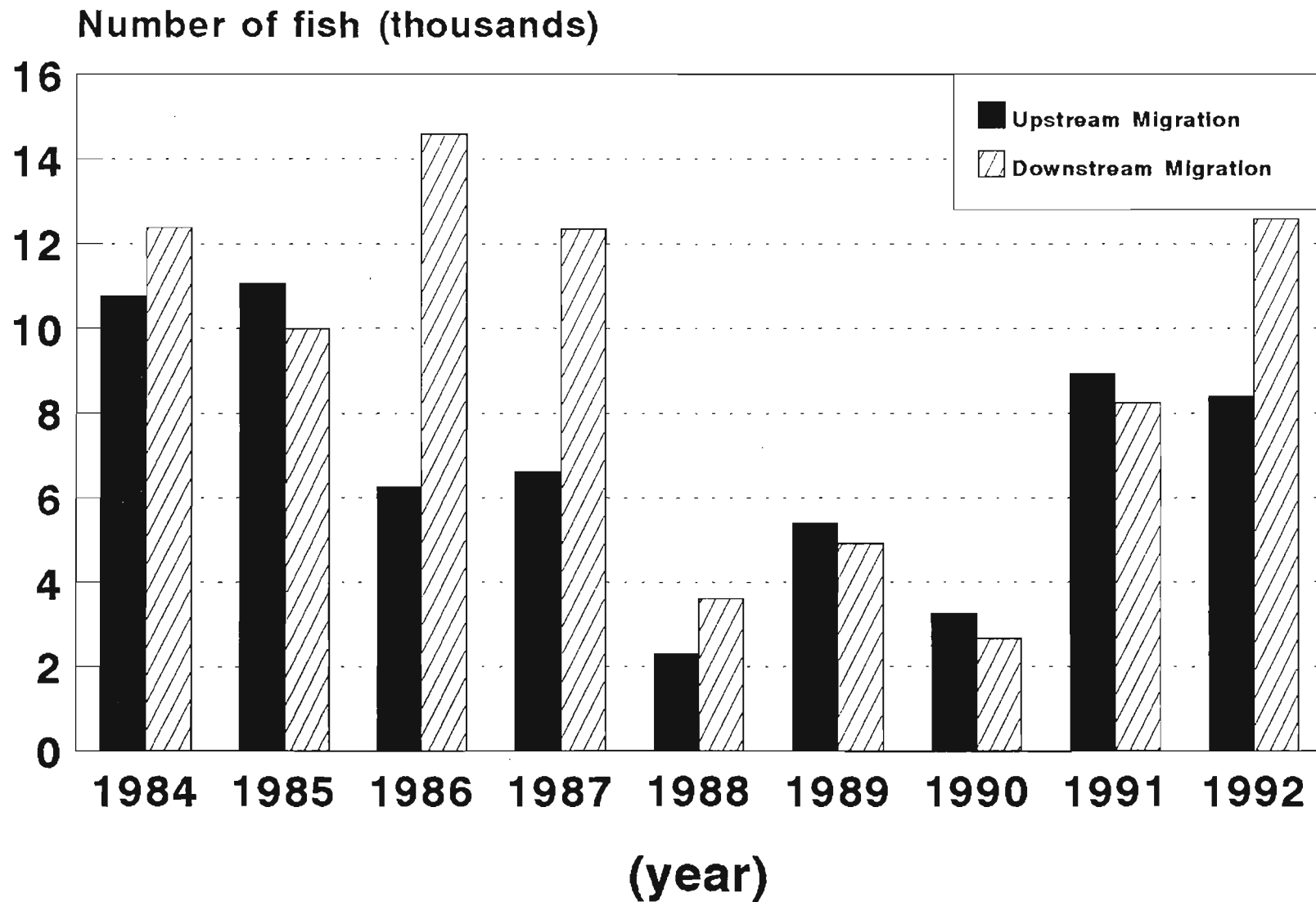


Fig.16 - Gaspereau
Timing of 1989 Migration

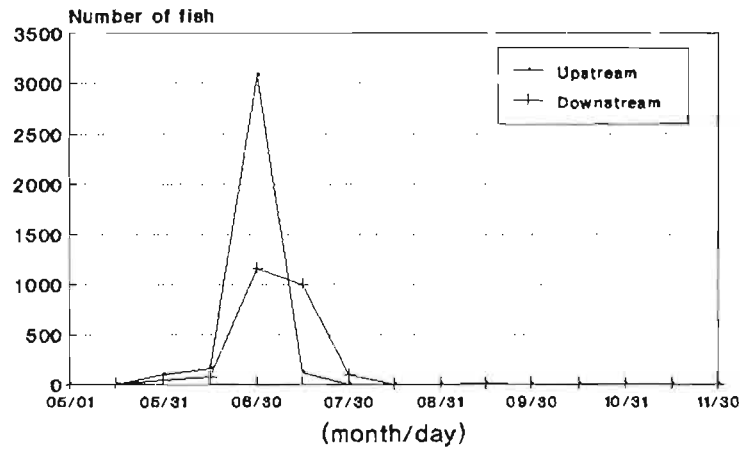


Fig.17 - Gaspereau
Timing of 1990 migration

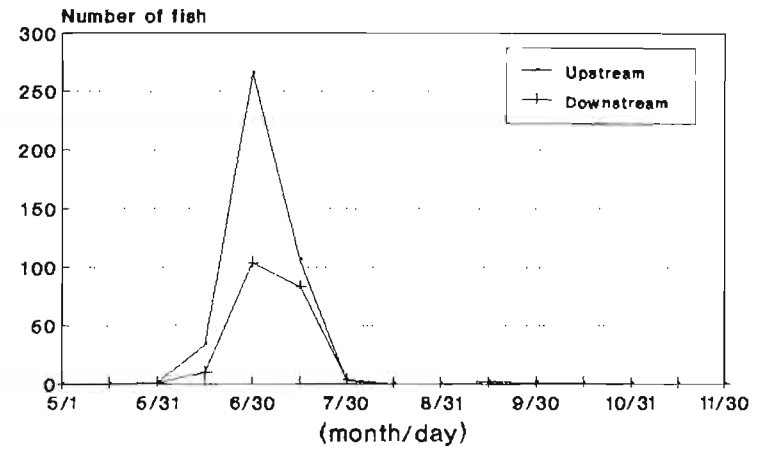


Fig.18- Gaspereau
Timing of 1991 Migration

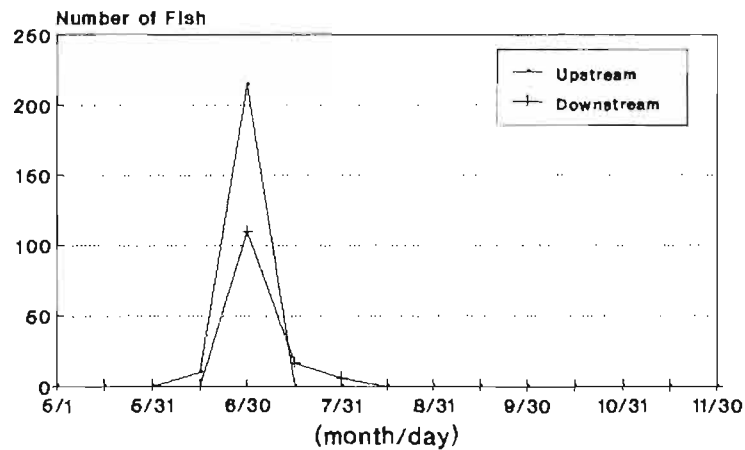


Fig.19 - Gaspereau
Timing of 1992 Migration

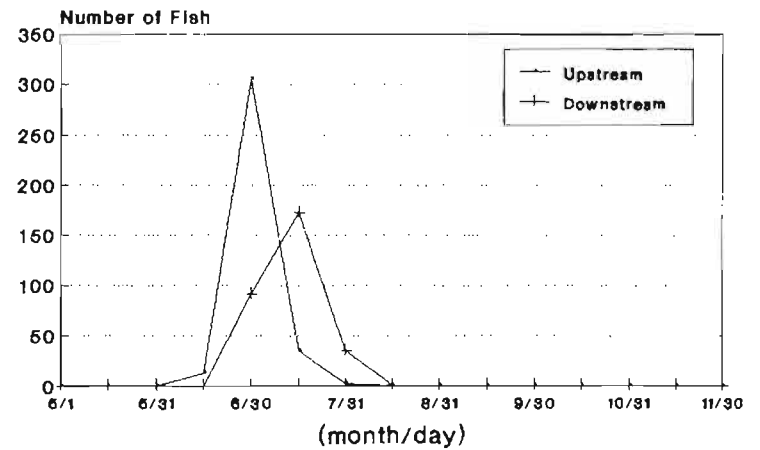


Fig.20 - Gaspereau Counts 1984-92

