Canadian Atlantic Fisheries Scientific Advisory Committee

CAFSAC Research Document 85/101

Comité scientifique consultatif des pêches canadiennes dans l'Atlantique

CSCPCA Document de recherche 85/101

Assessment of the Nepisiguit River Salmon Stock in 1984

by

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ABSTRACT

This report is the second assessment of the Nepisiguit River salmon stock. Previously marked salmon returning as adults from hatchery distributions were used to provide an estimate of the numbers of Nepisiguit River salmon and grilse harvested in the mixed stock commercial salmon fishery of Nepisiguit Bay. Returning salmon displayed circular migration in the bay during the July 9-20 commercial fishery which resulted in multiple exposure of Nepisiguit salmon to specific commercial salmon traps in Statistical District (SD) 65 east of the mouth of the Nepisiguit River. Nepisiguit fish were absent from the commercial harvest of SD 64 west the mouth of the river. Commercial season restrictions and a grilse only harvest regulation in the sport fishery permitted an increased spawning escapement in 1984. There were 589 salmon and 941 grilse spawners which was insufficient to meet the spawing requirement of 1493 salmon and 2899 grilse. With no change in harvest patterns for 1985 both salmon and grilse components are expected to increase with major input from hatchery returns in the salmon component. Even without any homewater fisheries, escapement for the salmon component will not be sufficient to meet spawning requirements.

RESUME

Ce rapport est la seconde évaluation du stock de saumons de la rivière Nepisiguit. Les prises de saumons marqués qui étaient originaires d'alevinages artificielles ont servi dans l'évaluation des quantités de saumons et de castillons originaires de la rivière Nepisiguit capturés dans la pêche commerciale du stock mixte de la baie Nepisiguit. Le saumon qui est revenu a décrit un mouvement de migration circulaire dans la baie pendant la pêche commerciale du 9 au 20 juillet, s'exposant ainsi à plusieurs reprises à certaines trappes commerciales dans la zone statistique (ZS) 65 à l'est de l'embouchure de la rivière Nepisiguit. On n'a noté aucun poisson de la rivière Nepisiguit dans les prises commerciales de la ZS 64 à l'ouest de l'embouchure de la rivière. Les restrictions pour la saison commerciale et un règlement ne permettant que la pêche récréative des castillons ont permis d'augmenter l'échappement de frai en 1984. On a relevé 589 saumons et 941 castillons reproducteurs, ce qui était insuffisant pour répondre aux besoins évalués à 1493 saumons et 2899 castillons. Les tendances étant les mêmes pour la récolte de 1985, on s'attend à ce que les saumons et les castillons augmentent grâce à de nombreux retours de saumons aux aleviniers. Même sans aucune pêche dans les eaux de frai, les échappements de saumon ne seront pas suffisants pour répondre aux besoins du frai.

INTRODUCTION

The Nepisguit River has the potential to be the third largest producer of Atlantic salmon in the Gulf portion of the Maritimes (Anon. 1978). A barrier water fall at river kilometer 32 however, restricts potential production to only 18,000 fish. A counting fence has been operated five kilometers above the mouth of the river since 1981 (Figures 1A-B, Lutzac 1984).

Salmon runs to the Nepisiguit River in 1984 were influenced by a delay in the opening of commercial salmon fishing in parts of Newfoundland and a restriction of the local commercial fishery to a shortened season of approximately 25% of that which occurred in 1983. The commercial salmon fishery for the Restigouche Management Zone extended from July 9-20 with no quota in 1984 compared to June 14 through July 31 with a quota of 4,000 salmon and 4,000 grilse in 1983. In addition, the sport fishery in 1984 was limited to the harvest of grilse only in a June 15 - September 30 fishery.

This report is the second biological assessment of the Nepisiguit River salmon stock. Specifically, the following are estimated: 1) the egg deposition required to bring Nepisguit salmon to optimal harvest levels; 2)1984 homewater harvests and returns including an estimate of commercial catch in the mixed stock fishery of Nepisiguit Bay, bycatch and poaching; 3) spawning escapement in 1984; 4) a forecast of Atlantic salmon available for harvest in 1985; 5) recommendations for management of the Nepisiguit River salmon stock in 1985.

METHODS

1) Egg desposition requirement

Egg deposition requirements for the Nepisiguit River salmon stock were estimated from the following data:

Required egg deposition rate = 2.4 eggs/m^2 (Elson, 1975)

Accessible rearing area = 3,973,000 m^2 (Anon., 1978)

Fecundity = 1,760 eggs.kg^{-1} (Elson, 1974)

Salmon: mean weight = 4.3 kg
percent female = 73 percent

Grilse: mean weight = 1.4 kg
percent female = 18 percent

Percent salmon = 34 percent
Percent grilse = 66 percent

The mean weights were calculated from log 10 weight = -5.1803 + 3.2787 log 10 length (Elson and Tuomi 1975), using mean lengths of salmon (early n = 124, late n = 187) and grilse (early n = 81, late n = 197) sampled at the Nepisiguit River counting fence (1984). The Nepisguit fence is a portable design modified from Anderson and MacDonald (1978).

Sex ratios of salmon (n = 50) and grilse (n = 138) from June through the end of August, were estimated from internal sexing of angled samples (pooled data 1977-84). Sex ratios of salmon (n = 214) and grilse (n = 177) passing through the counting fence in the September - November interval were determined by external sexing (1984). Sex ratios of early and late run (after August) were different. All fish measured at the Nepisiguit River counting fence > 63.0 centimeters fork length were assumed to be salmon.

2) Homewater harvest in 1984

a) Commercial fishery:

Commercial catches of Atlantic salmon in Nepisiguit Bay from 1967-84 are given in Table 1. The commercial fishing season was July 9-20 in 1984. Trapnet landings in SD 64 and 65 were divided into those of Nepisiguit origin and those of non-Nepisiguit origin (Figure 1B). The catch of Atlantic salmon destined for the Nepisiguit River was determined by comparing the ratio of unmarked to marked salmon taken in the commercial fishery to the same ratio on the Nepisiguit River. It was assumed that fish arriving at the counting fence after the end of the first week in October were not available to the commercial fishery. Hatchery-reared juvenile salmon were marked in previous years with adipose fin clips. One of two licenses in SD 64 and four of five operating in SD 65 participated in the 1984 study. The number of marked salmon or grilse in the two trapnets not reporting was assumed to be the same percentage of catch as in adjacent traps.

b) Bycatch:

The following assumptions were made:

1) The mackerel fishery bycatch of salmon extended from early June through mid-October with the bulk of the salmon catch taking place during the commercial fishing season for salmon.

2) Those gill nets capable of catching salmon were set and hauled an average of four times during the July 9-20 interval.

3) The average catch of grilse based on four observations of fish gilled in mackerel nets applied to that portion of the mackerel gill net fishery which killed grilse in SD 65.

4) The percent of Nepisiguit River grilse killed in the mackerel gill net fishery was the same as that killed in the commercial salmon fishery of SD 65

It is probable that the bycatch of grilse in the mackerel fishery is large when all stocks are included.

c) Recreational fishery:

Angling data was provided by the Nepisiguit Salmon Association through membership poll and creel census.

d) Poaching:

A minimum poaching factor of 15 percent was applied. An attempt to calculate an accurate figure will be made in the 1985 assessment.

3) Spawning escapement in 1984

The number of spawners above the counting fence was calculated using the total number of salmon or grilse released from the traps, angling harvest data collected by the Nepisiguit Salmon Association, removal of fish for broodstock production, observed mortalities and the assumed minimum poaching factor of 15%.

Because of small sample size, the number of grilse angled above the counting fence was estimated by averaging the following: the percentage grilse taken above the counting fence from; 1) samples collected at a weigh-in station (n = 20); and 2) a poll of anglers in the Nepisiguit Salmon Association who said they angled on the Nepisiguit River.

It was estimated that 34% of angled grilse were harvested above the counting fence.

Total number of spawners below the counting fence was determined from redd counts. It was assumed that all salmon and grilse spawning below the fence were of late run origin and that the ratio of salmon to grilse and percent of females were the same as at the counting fence. The number of two redds per female was assumed to be similar to data collected on the Bartholomew River in 1977 (unpublished data).

4) Predicted returns, 1985

To date there is no proven technique for predicting adult salmon returns to the Nepisiguit River. Samples of Atlantic salmon at the counting fence over the past three years, however, have shown a very high percentage of juveniles leave freshwater as two year old smolt (Table 2). Because the regression of the density of 0^+ parr in the Pabineau River on 0^+ parr in the mainstream of the

Nepisiguit River was highly significant ($p < 0.01$), Table 3, Figure 2), the two areas were combined and used to predict returns of wild Atlantic salmon to the Nepisiguit (Table 4).

It was assumed that hatchery-reared juveniles would also leave the river as age 2^+ smolts. The total numbers of marked hatchery-reared juvenile salmon released to the Nepisiguit River that could provide adult salmon returns with a freshwater age of 2 years in 1984 and 1985 are given in Table 5.

Estimation of 1985 returns for wild and hatchery salmon was by extrapolation of 1984 figures (Tables 4, 5).

RESULTS

1) Egg deposition requirement

Egg deposition requirements for salmon were calculated as follows:

	Eggs per kg.		Percent female		Mean Weight (kg)		Percent salmon or grilse	Egg deposition per fish
Salmon	1760	x	.73	x	4.3	x	0.34	1878
Grilse	1760	x	.18	x	1.4	x	0.66	293
Total egg deposition per fish								2171

Number of salmon and grilse required for spawning are 1,493 and 2,899 respectively based on a required egg deposition of 9,535,000 eggs.

2) Homewater harvest in 1984

a) Commercial fishery:

Commercial salmon catches in SD's 64 and 65 in the 1967-84 interval are found in Table 1. The calculated total kill of unmarked and marked Atlantic salmon by stand, appears in Table 6. Ratios of 2.22:1 and 5.87:1 were used for unmarked:marked salmon and unmarked:marked grilse respectively to determine the number of Nepisiguit River fish landed in the commercial salmon fishery of Nepisiguit Bay.

The total harvest of Nepisiguit River salmon was restricted to SD 65 and was calculated to be 68 salmon and 474 grilse in 1984 (Table 7).

b) Bycatch:

Number of Nepisiguit salmon killed = [No. of mackerel nets fishing in the range of salmon movement in Nepisiguit Bay during commercial salmon fishing] x no. of days fished/net x no. of grilse caught/net set x percent Nepisiguit salmon caught in the commercial salmon fishery of SD 65
= 95 x 4 x 7 x 0.075 = 200 grilse.

A bycatch was not calculated for salmon as none were observed in gill nets.

c) Recreational fishery:

Sport fishery statistics for the Nepisiguit indicate a kill of 600 grilse in 1984. The retention of salmon was not permitted. It was estimated that 150 salmon and 150 grilse were released (Table 8). Total fence counts were 412 salmon and 956 grilse (Tables 9, 10).

3) <u>Spawning escapement in 1984</u>

Potential number of salmon spawners above fence = fence count - [fish removed for broodstock production + observed river mortalities] =
412 - [92 + 1] = 319 salmon
and
956 - [4 + 7] = 945 grilse

Number of fish angled above the fence = 600 x .34 = 204 grilse

Number poached salmon 319 x 0.15 = 48

Number of poached grilse = [945 - 204] x 0.15 = 111

Actual number of salmon spawners above the fence = [number available - number poached] = 319 - 48 = 271

Actual number of grilse spawners above the fence = number available - [number poached + number angled] = 945 - [111 + 204] = 630.

A total of 564 Atlantic salmon redds were counted below the fence. At two redds per female there were 282 female spawners. A total of 218 salmon and 213 grilse were counted through the fence from September through November. Percent female was 74.2 and 14.7 percent respectively. The number of salmon and grilse which spawned below the fence were estimated from the equations below.

1) $x:y = 218:213 \qquad y = 0.977\ x$

2) $0.74x + 0.15y = 282$

Where x = number of spawning salmon
y = number of spawning grilse

Solving for x and y there were 318 salmon and 311 grilse spawners below the fence. Therefore the total number of spawners

= [271 + 318] = 589 salmon
and
[630 + 311] = 941 grilse.

4) Total returns

The estimate of total returns to New Brunswick coastal waters of Nepisiguit River Atlantic salmon can then be calculated as follows:

	Salmon		Grilse	
	1983	1984	1983	1984
Estimated commercial harvest	450	68	148	474
Estimated bycatch	-	-	-	200
Estimated sport fishing harvest	176	0	117	600
Non-fishing mortality	15	1	15	7
Estimated freshwater poaching	-	48	-	111
Broodstock production	-*	92	-*	4
Spawning escapement	444	589	653	941
Total returns	1085	798	933	2337
Required spawning escapement	1574	1493	2567	2899
Spawning surplus or deficit	-1130	-904	-1914	-1958

* Included in spawning escapement

The estimated composition by wild and hatchery fish for 1984 is shown in Table 11.

5) Predicted returns, 1985

1) Salmon:

Year-class strength in 1981 was only

$$\frac{2.2}{4.8} = 46\%$$ of that in 1980 (Table 4).

Return of wild salmon in 1985 = total 1984 wild returns x 0.46
= 605 x 0.46 = 278 wild salmon (Tables 4, 11).

Return of hatchery salmon in 1985 = total 1984 returns x hatchery stocking factor = $193 \times \frac{546,299}{188,921}$ = 558 hatchery salmon (Table 5).

Total predicted return of Nepisiguit River salmon to New Brunswick coastal waters in 1985 = 278 + 558
= 836 salmon.

2) **Grilse**

Year-class strength between 1981 and 1982 increased by:

$$\frac{3.9}{2.2} = 177\% \text{ (Table 4)}$$

Return of wild grilse in 1985 = 2049 x 1.77 = 3637 wild grilse (Tables 4, 11).

Return of hatchery grilse in 1985 = $288 \times \frac{315,446}{546,299}$
= 166 hatchery grilse (Table 5)

Total projected return of Nepisiguit River grilse to New Brunswick coastal waters in 1985 = 3627 + 166 = 3793 grilse.

DISCUSSION

A) Evaluation of predictions for 1984

The large salmon component of the 1984 run was down 36% compared to 1983. No attempt was made to divide returns into hatchery and wild components in 1983. If however, it is assumed that the composition by wild fish was the same for total returns as it was at the counting fence a comparison between years can be made (Table 9).

Composition of total returns by wild salmon =
$1085 \times \frac{264}{293}$ = 978 fish in 1983.

The wild portion of the 1984 run then, was down compared to 1983 (Lutzac, 1984). As a poaching factor was not included in the 1983 assessment the decline in the salmon component of the run was down at least 37%. No prediction was made for the grilse component of the run. This was up 250% in 1984 relative to 1983.

The required spawning escapement was 1493 salmon and 2899 grilse in 1984. As total returns were 798 salmon and 2337 grilse, spawning escapement would not have been met, even had there been no homewater fisheries (Lutzac, 1984). The calculated spawning deficit in 1984 was 904 salmon and 1958 grilse. Spawning escapements were nevertheless up 145 salmon or 133% and 788 grilse or 144% over 1983 values. This represents 39% and 32% of spawning targets for salmon and grilse respectively.

B) Stock assessment, 1984

Although only 7 of 8 commercial salmon licences eligible to fish in 1984 operated (Figure 1B) and potential fishing time was cut to approximately 25% of what it was in 1983, the commercial salmon catch in Nepisiguit Bay was up 524% from 1578 to 8262 pieces compared to 1983 values. Ninety-eight percent of the increase occurred in the commercial fishery in the eastern half of the Bay on the seaward approach to the Nepisiguit River with 86% of this as grilse (Table 1). However, only 5.0% of the salmon and 7.5% of the grilse catch in Nepisiguit Bay were of Nepisiguit River origin (Table 7). The lack of adipose clips in the commerical fishery of SD 64 (Tables 6, 7) and the movements of marked salmon and grilse of Nepisiguit River origin through the interval of the commercial fishery (Figures 1B, 3-5) show that the harvest of Nepisiguit fish was restricted to the eastern half of Nepisiguit Bay in 1984. Ultrasonic tracking investigations with methodology similar to Stasko (1975) suggested that Nepisiguit salmon in the Bay in the July 9-20 interval migrated off the mouth of the Nepisiguit River in an oval-shaped band 16 kilometers long extending from less than one half to four kilometers offshore. This band extended into District 64 but not as far as the commercial traps operating there (Figures 1B, 3-5). Several salmon stands in SD 65 however, were within this band of movement. The data suggests that Nepisiguit salmon and salmon bound for other Bay of Chaleur Rivers displayed a migratory pattern which lead to multiple exposure to three of the commercial salmon traps in SD 65. This accounts for the elevated commercial catches of the end traps numbered four and six in the series of three fishing in close proximity to one another (Figures 1B, 6; Tables 6, 12A-E).

The commercial harvest of Nepisiguit salmon was down 85% or 328 fish from 1983 while the fence count of salmon was up 141% or 119 fish from 1983. This was due to a 237% increase in the number of late salmon compared to 1983 (Table 10). The early run component remained virtually unchanged.

The commercial harvest of Nepisiguit grilse was up 320% or 296 fish while the fence count of grilse was up 312% or 650 fish from 1983. This was due primarily to a 476% increase in the number of early grilse compared to 1983. The second half of the early run from mid July through the end of August was up a similar 328% and the late run was up 142% compared to 1983 (Tables 10, 13, 14).

These data suggest that the commercial fishery of Nepisiguit Bay took place after the bulk of the early run salmon had passed through the area and before the arrival of the late run. For grilse it appears that the fishery concentrated heavily on the latter half of the early run.

C) Predictions

The total return of Nepisiguit salmon to New Brunswick coastal waters is expected to be 836 salmon and 3793 grilse in 1985. These figures are up 105% and 162% respectively in comparison with 1984 values. This prediction assumes no changes in distant water exploitation patterns relative to 1984.

With no homewater fisheries in 1985 the salmon return is expected to be only 56% of spawning target while grilse is expected to exceed the spawning requirement by about 31%.

Recommendations for management of Nepisiguit River salmon stock in 1985

It is recommended that no commercial harvest of salmon take place in SD 64 and SD 65 and that the angling fishery be restricted to bright grilse only. Daily and seasonal bag limits should remain at 2 and 10 grilse respectively.

Recommendations for management of Nepisiguit River salmon stock in 1985 should a decision be made to allow a commercial salmon fishery to take place in SD 64 and 65.

Examination of the commercial salmon harvest in the Restigouche Management Zone in the four years previous to the ban on commercial salmon fishing shows the expected pattern of exploitation in Statistical Districts 63-65 (Table 15, 16). When the commercial salmon fishery extended from May 15 through August 15 and there were no quotas, 61 and 65 percent of the total harvest by weight in SD's 63 and 64 occurred in June. Fifty-eight percent of the total harvest in SD 65 occurred in July. The 1984 commercial data suggests that the peak period would be in the first half of July (Table 17).

The analysis presented in this assessment suggests that there was no harvest of Nepisiguit River salmon in SD 64 in 1984. It would therefore be recommended that a two week fishing season be continued in 1985 in approximately the same time frame as in 1984. The commercial salmon fishery should open Monday, July 8 and close effective July 19 with a two day Saturday-Sunday closure in effect in the middle of the period. It is important to note that commercial salmon gear set for fishing should not be capable of trapping salmon before 0600 hours on July 8, 1985.

Furthermore to assist with river escapements of other Bay of Chaleur stocks, it would be recommended that quotas for salmon and grilse be established within the recommended season for SD 64. The limits on the number of fish to be harvested should be equal to the averages of total commercial landings of salmon in the District over the previous three years (Table 1). The total allowable catch in SD 64 would then be restricted to 266 salmon and 236 grilse, up 8% for salmon and down 19% for grilse in 1985 from 1984 catches.

Nepisiguit River salmon and grilse were harvested however, in SD 65 in 1984. The salmon component of the Nepisiguit river run is the most important in terms of virtual egg deposition. In 1984, for example, the salmon component of the run accounted for 89% of the calculated egg deposition. Major increases in the hatchery return component in July 1985 are expected to offset declines in production of wild salmon. If commercial fishing for salmon were permitted in SD 65 in 1985 it would be recommended that a two week fishery be permitted as in 1984, but with the opening of the fishing season delayed by 13 days with opening on Monday, July 22 and closure effective Saturday, August 3. The standard two day, Saturday-Sunday closure would apply in the middle of the interval. It is important to note that salmon gear set for fishing should not be capable of trapping salmon before 0600 hours on Monday, July 22, 1985.

In addition, to assist with river escapements of other Bay of Chaleur stocks, it would be recommended that quotas for salmon and grilse be established within the recommended season for SD 65. The limits on the number of fish to be harvested should be equal to the averages of total commercial landings in the district for the years 1981-83 (Table 1). The total allowable catch in SD 65 would then be restricted to 552 salmon and 984 grilse, down 60% for salmon and down 85% for grilse in 1985 from 1984 catches.

Quotas should not be convertible to salmon from grilse or vice versa in either district or between districts. All fishing should stop as soon as the salmon quota is reached, in each district even if the grilse quota has not been filled at that time.

All commercial salmon fishermen in the two districts should be encouraged to submit their catch data to the Department of Fisheries and Oceans in the form of separate daily counts for marked and unmarked fish for each of the three weight categories on the "Salmon Catch and Effort Records" which they fill out.

It is further suggested, that an in depth study of salmon migrations through Nepisguit Bay be undertaken to improve assessment and predictive capacities for salmon stocks of the Restigouche Management Zone.

ACKNOWLEDGEMENTS

For the past four field seasons, the Nepisiguit Salmon Association has sponsored data collection projects focusing on the Nepisiguit River Atlantic salmon resource. These have provided much of the basic data summary used in the preparation of annual stock assessments. With Mr. Bob Baker as president, this organization was the first public group in the Maritimes to assume shared responsibility with this Department in the restoration and development of a potentially major salmon resource. The Employment Development Branch of Employment and Immigration Canada and Development and Research Branches of this Department have provided the necessary funding and administrative controls. Mr. Mark Hambrook provided the technical supervision. Doctors Mike Chadwick and Scott Campbell reviewed this manuscript.

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Table 1. Estimated numbers of Atlantic salmon landed in the commercial salmon fishery of Nepisiguit Bay, 1967-84. Numbers were taken from fishermen's logbook summaries or estimated from weight data contained in annual Atlantic Salmon Commercial Catch Statistics - Maritimes Provinces reports. Five stands operated in 1983 and 1984 in FSD 65. Three and two stands operated in FSD 64 in 1983 and 1984, respectively. Numbers in brackets show the average landings per stand.

	Fisheries Statistical District					
	64			65		
	Salmon	Grilse	Total	Salmon	Grilse	Total
1967			8,998			3,506
1968			4,240			3,996
1969			3,858			3,141
1970			3,668			1,287
1971			1,044			1,520
	Commercial ban in place 1972-80 inclusive					
1981			792			2,576
1982			551			940
1983	275(92)	141(47)	416	462	700	1,162
1984	246(123)	290(145)	536	1,365	6,361	7,726

Table 2. Smolt age for unmarked Atlantic salmon at the Nepisiguit River counting fence, 1982-84.

	Smolt age				Percent 2-year smolt		
	2		3				
	No.	%	No.	%	Large salmon	Grilse	Total
1982	632	82.8	131	17.2	13.0	69.9	82.9
1983	299	91.4	28	8.6	46.1	45.3	91.4
1984*	700	84.2	131	15.8	27.6	56.7	84.3

* Includes broodstock taken to Charlo Fish Culture Station.

Table 3. Mean density of age 0+ Atlantic salmon (number per 100 square metres of salmon habitat) in two streams in the Nepisiguit River system below Grand Falls.

Year	Mean density	
	Main Nepisiguit	Pabineau
1975	0.7	4.8
1976		
1977	17.2	55.9
1978	6.8	29.3
1979	5.4	17.0
1980	3.7	13.0
1981	2.0	5.1
1982	2.1	24.1
1983	5.3	7.5
1984	3.5	3.0

Table 4. Mean weighted density of age 0+ Atlantic salmon juveniles (number per 100 square meters of salmon habitat) as determined by electrofishing in the Nepisiguit River system below Grand Falls. Figures shown are the sum of densities weighted according to percent accessible nursery area per tributary and mainstream (Lutzac, 1984).

Year	Mean weighted density
1977	19.8
1978	9.3
1979	6.9
1980	4.8
1981	2.2
1982	3.9
1983	5.5
1984	3.3

Table 5. Numbers of juvenile salmon stocked in the Nepisiguit River with potential return of two-year-old smolt components in 1984 and 1985, and estimation of total marked salmon and marked grilse returning to mainland waters in 1985. Predicted numbers are shown in brackets.

No. juveniles stocked	Year of return	Stage	Total no. marked adult returns
188,921	1984	Salmon	193
546,299	1985	Salmon	(558)
546,299	1984	Grilse	288
315,446	1985	Grilse	(166)

Table 6. Total landings of unmarked and marked salmon and grilse by stand in the commercial salmon fishery of Nepisiguit Bay, July 9-20, 1984. The number of adipose fin- clipped salmon or grilse in the two trap nets not reporting was estimated by determining adipose clips as a percentage of total catch for two traps in the immediate vicinity and using the average percentage determined to calculate a value. These figures appear in brackets in the table.

		Salmon			Grilse		
FSD	Stand No.	Unmarked	Marked	Total	Unmarked	Marked	Total
64	1	92	(0)	92	40	(0)	40
64	3	154	0	154	250	0	250
65	4	541	0	541	3,145	12	3,157
65	5	129	0	129	674	6	680
65	6	321	10	331	1,392	18	1,410
65	7	132	(4)	136	631	(16)	647
65	8	221	7	228	450	17	467

Table 7. Reported total landings of unmarked and marked Atlantic salmon in the commercial trap net fishery of Nepisiguit Bay and estimated landings of the Nepisiguit River salmon and grilse portions. Marked fish with adipose fin clips were released as juveniles in the Nepisiguit River. One of two licences in District 64 reported and four of five in District 65. The number of adipose fin-clipped salmon and grilse for the two trap nets not reporting was estimated by determining adipose fin clips as a percentage of total catch for traps in the immediate vicinity and using the average percentage determined to calculate the appropriate value.

Statistical District		Total commercial			Estimated Nepisiguit		
		Unmarked	Marked	Total	Unmarked	Marked	Total
64	Salmon	246	0	246	0	0	0
	Grilse	290	0	290	0	0	0
65	Salmon	1,344	21	1,365	47	21	68
	Grilse	6,292	69	6,361	405	69	474

Table 8. Numbers of bright Atlantic salmon angled in the Nepisiguit River system below Grand Falls and percent composition of large salmon, 1965-83. Numbers reported by Nepisiguit Salmon Association 1974-84 appear in brackets. For the years 1980-83, an additional 100, 75, 104, and 60 Atlantic salmon were respectively released. DFO statistics were used in the assessment of the Nepisiguit salmon stock in 1983.

Year	Large salmon	Grilse	Total	Percent large salmon
1965	20	473	493	4.1
1966	38	407	445	8.5
1967	46	410	456	10.1
1968	5	189	194	2.6
1969	5	38	43	11.6
1970	0	2	2	0
1971	1	16	17	5.9
1972	10	16	26	38.5
1973	95	0	95	100.0
1974	140(15)	28(110)	168(125)	83.3(12.0)
1975	95(20)	77(160)	172(180)	55.2(11.1)
1976	100(50)	335(385)	435(435)	23.0(11.5)
1977	38(25)	28(125)	66(150)	57.6(16.7)
1978	69(25)	40(95)	109(120)	63.3(20.8)
1979	6(10)	44(40)	50(50)	12.0(20.0)
1980	103(70)	135(530)	238(600)	43.3(11.7)
1981	179(40)	130(285)	309(325)	57.9(12.3)
1982	187(95)	130(629)	317(724)	59.0(13.1)
1983	176(60)	117(240)	293(300)	60.1(20.0)
1984	(150)[1]	(750)[2]	(600)	N/A
Overall averages	69.1(41.0)	137.6(259.9)	206.7(300.9)	33.4(13.6)

[1]All released

[2]Include 150 released

Table 9. Salmon and grilse returns to the Nepisiguit River counting fence, 1982-84.

	Salmon			Grilse		
	Unmarked	Marked	Total	Unmarked	Marked	Total
1982	236	141	377	784	211	995
1983	264	29	293	235	70	305
1984	310	102	412	831	125	956

Table 10. Contribution of marked and unmarked early (May-August) and late run (September-November) salmon to returns at the Nepisiguit River counting fence, 1982-84. The fence is located 4.5 km above tidehead and 1.7 km below the mouth of the Pabineau River tributary slightly above Gray and Sucker Pools. All fish > 63.0 cm fork length were assumed to be salmon.

Year	Period	# Large Salmon	% Hatchery	# Grilse	% Hatchery	% Marked salmon of total hatchery
1982	May-Aug.	182	53.8(98)	523	21.2(111)	46.9
	Sept.-Nov.	195	22.1(43)	472	21.2(100)	30.1
	Total	377	37.4(141)	995	21.2(211)	40.1
1983	May-Aug.	201	10.0(20)	156	31.4(49)	29.0
	Sept.-Nov.	92	9.8(9)	150	14.0(21)	30.0
	Total	293	9.9(29)	306	22.9(70)	29.3
1984	May-Aug.	194	31.4(61)	743	15.7(117)	34.3
	Sept.-Nov.	218	18.8(41)	213	3.8(8)	83.7
	Total	412	24.8(102)	956	13.1(125)	44.9

Table 11. Estimated contribution to homewater returns by marked and unmarked Nepisiguit River Atlantic salmon, 1984.

	Salmon		Grilse	
	Unmarked	Marked	Unmarked	Marked
Commercial harvest	47	21	405	69
By-catch	0	0	170	30
Sport fishing harvest	0	0	519	81
Non-fishing mortality	1	0	7	0
Freshwater poaching	10	3	97	14
Broodstock production	64	28	4	0
Spawning escapement	483	141	847	94
TOTAL RETURNS	605	193	2,049	288

Table 12A. Daily landings of unmarked and marked salmon and grilse from selected stands during the commercial salmon fishery of Nepisiguit Bay, July 9-20, 1984. Stand No. 3, Statistical District 64, Figure 2.

	Salmon		Grilse	
Date	Unmarked	Marked	Unmarked	Marked
July 9	29	0	25	0
July 10	47	0	35	0
July 11	14	0	55	0
July 12	13	0	39	0
July 13	9	0	10	0
July 14	0	0	0	0
July 15				
July 16	16	0	25	0
July 17	8	0	18	0
July 18	7	0	16	0
July 19	3	0	18	0
July 20	3	0	9	0

Table 12B. Daily landings of unmarked and marked salmon and grilse from selected stands during the commercial salmon fishery of Nepisiguit Bay, July 9-20, 1984. Stand No. 4, Statistical District 65, Figure 2.

	Salmon		Grilse	
Date	Unmarked	Marked	Unmarked	Marked
July 9	190	0	618	2
July 10	40	0	230	0
July 11	58	0	655	3
July 12	32	0	319	1
July 13	82	0	458	2
July 14	6	0	52	0
July 15				
July 16	28	0	282	1
July 17	40	0	198	2
July 18	4	0	42	0
July 19	47	0	227	1
July 20	14	0	64	0

Table 12C. Daily landings of unmarked and marked salmon and grilse from selected stands during the commercial salmon fishery of Nepisiguit Bay, July 9-20, 1984. Stand No. 5, Statistical District 65, Figure 2.

	Salmon		Grilse	
Date	Unmarked	Marked	Unmarked	Marked
July 9	29	0	209	0
July 10	16	0	87	1
July 11	16	0	77	0
July 12	9	0	34	0
July 13	19	0	96	2
July 14	1	0	8	1
July 15				
July 16	19	0	73	1
July 17	7	0	15	0
July 18	4	0	2	0
July 19	7	0	51	0
July 20	2	0	22	1

Table 12D. Daily landings of unmarked and marked salmon and grilse from selected stands during the commercial salmon fishery of Nepisiguit Bay, July 9-20, 1984. Stand No. 6, Statistical District 65, Figure 2.

Date	Salmon		Grilse	
	Unmarked	Marked	Unmarked	Marked
July 9	68	1	201	1
July 10	24	5	104	2
July 11	27	0	79	1
July 12	30	0	201	2
July 13	67	1	207	2
July 14	10	0	12	1
July 15				
July 16	26	2	208	3
July 17	14	0	103	2
July 18	31	1	97	2
July 19	18	0	88	1
July 20	6	0	92	1

Table 12E. Daily landings of unmarked and marked salmon and grilse from selected stands during the commercial salmon fishery of Nepisiguit Bay, July 9-20, 1984. Stand No. 8, Statistical District 65, Figure 2.

	Salmon		Grilse	
Date	Unmarked	Marked	Unmarked	Marked
July 9	48	2	44	0
July 10	14	1	33	1
July 11	14	1	50	2
July 12	27	2	51	4
July 13	14	0	57	2
July 14	26	0	40	0
July 15				
July 16	28	0	87	5
July 17	8	0	9	1
July 18	21	1	33	2
July 19	14	0	35	0
July 20	7	0	11	0

Table 13. Nepisiguit River Atlantic salmon run. Weekly counts of wild and hatchery returns to monitoring facilities in 1983. (Counting fence located 4.5 kilometers above head of tide and 1.7 kilometers below mouth of Pabineau River, slightly upstream from Gray and Sucker Pools. First fished in week 4, May 22-28).

			Numbers of fish					
			Large salmon			Grilse		
Week	Interval		Wild	Hatchery	Total	Wild	Hatchery	Total
4	May	22-28	2		2			
5		29-04						
6	June	05-11	27	1	28	1		1
7		12-18	55	3	58	2	1	3
8		19-25	24	1	25	3	1	4
9		26-02	10	1	11	3		3
10	July	03-09	6		6	3		3
11		10-16	6		6		2	2
12		17-23	20		20	14	18	32
13		24-30	19	8	27	29	10	39
14		31-06	7	5	12	38	13	51
15	Aug.	07-13	5	1	6	7	4	11
16		14-20				3		3
17		21-27				3		3
18		28-03				1		1
19	Sept.	04-10	2		2	1		1
20		11-17	5	1	6	12	4	16
21		18-24	21	2	23	34	7	41
22		25-01	11	1	12	22	5	27
23	Oct.	02-08	1		1	9	3	12
24		09-15	10	1	11	31	1	32
25		16-22	18	2	20	14		14
26		23-29	10	2	12	5	1	6
27		30-05	5		5	1		1
TOTAL			264	29	293	236	70	306

Table 14. Nepisiguit River Atlantic salmon run. Weekly counts for wild and hatchery returns to monitoring facilities in 1984. (Counting fence located 4.5 kilometers above head of tide and 1.7 kilometers below mouth of Pabineau River, slightly upstream from Gray and Sucker Pools. First fished in week 7, June 12-18.)

Week	Interval		Large salmon			Grilse		
			Wild	Hatchery	Total	Wild	Hatchery	Total
4	May	22-28						
5		29-04						
6	June	05-11						
7		12-18	6	1	7	1		1
8		19-25	13	3	16	3		3
9		26-02	22	6	28	25	5	30
10	July	03-09	17	10	27	104	19	123
11		10-16	27	15	42	99	32	131
12		17-23	23	5	28	114	24	138
13		24-30	11	13	24	83	16	99
14		31-06	6	4	10	47	7	54
15	Aug.	07-13	3	1	4	53	8	61
16		14-20	3	1	4	39		39
17		21-27	2	2	4	52	4	56
18		28-03	1		1	10	2	12
19	Sept.	04-10				10		10
20		11-17				6	1	7
21		18-24	1		1	7	1	8
22		25-01	8	4	12	29		29
23	Oct.	02-08	1		1	16		16
24		09-15	27	5	32	41	4	45
25		16-22	57	21	78	39	2	41
26		23-29	65	9	74	48		48
27		30-05	12	1	13	4		4
28	Nov.	06-12	5	1	6	1		1
GRAND TOTAL			310	102	412	831	125	956

Table 15. Monthly weights (kg) of commercial salmon landings in the Restigouche Salmon Management Zone, 1968-71. The fishing season extended from May 15-August 15 in these years.

Statistical District	Year	MONTH May	June	July	August
63	1968	2,094.1	28,816.3	11,782.3	13,307.3
	1969	2,233.6	22,000.9	5,910.0	2,609.1
	1970	2,239.1	18,255.0	4,037.3	725.0
	1971	1,074.5	7,009.5	2,861.4	636.4
64	1968	1,556.4	17,436.4	4,722.7	2,409.1
	1969	1,350.4	12,954.1	5,515.9	440.9
	1970	1,427.3	11,656.4	4,556.8	448.6
	1971	566.4	3,449.1	1,488.6	84.1
65	1968	76.8	5,722.3	10,018.2	3,150.9
	1969	0.0	3,643.6	7,319.5	1,094.1
	1970	88.4	2,677.5	2,783.6	325.0
	1971	9.1	1,410.4	4,935.7	278.2

Table 16. Mean monthly weights (kg) of commercial salmon landings and percent composition in the Restigouche Salmon Management Zone, 1968-71. The fishing season extended from May 15-August 15 in these years.

Statistical District		MONTH May	June	July	August
63	Weight	1,910.3	19,020.4	6,147.8	17,277.8
	Percent	6.0	60.6	19.6	13.8
64	Weight	1,225.1	11,374.0	4,071.0	845.7
	Percent	7.0	65.0	23.2	4.8
65	Weight	43.6	3,363.5	6,264.3	1,212.1
	Percent	0.4	30.9	57.6	11.1

Table 17. Weekly weights (kg) of commercial salmon landings and percent composition in the Restigouche Bay, 1984. The fishing season extended from July 9-July 20.

Statistical District		Week 1	Week 2
64	Weight	1,177.3	485.7
	Percent	70.8	29.2
65	Weight	10,595.9	4,442.3
	Percent	70.5	29.5

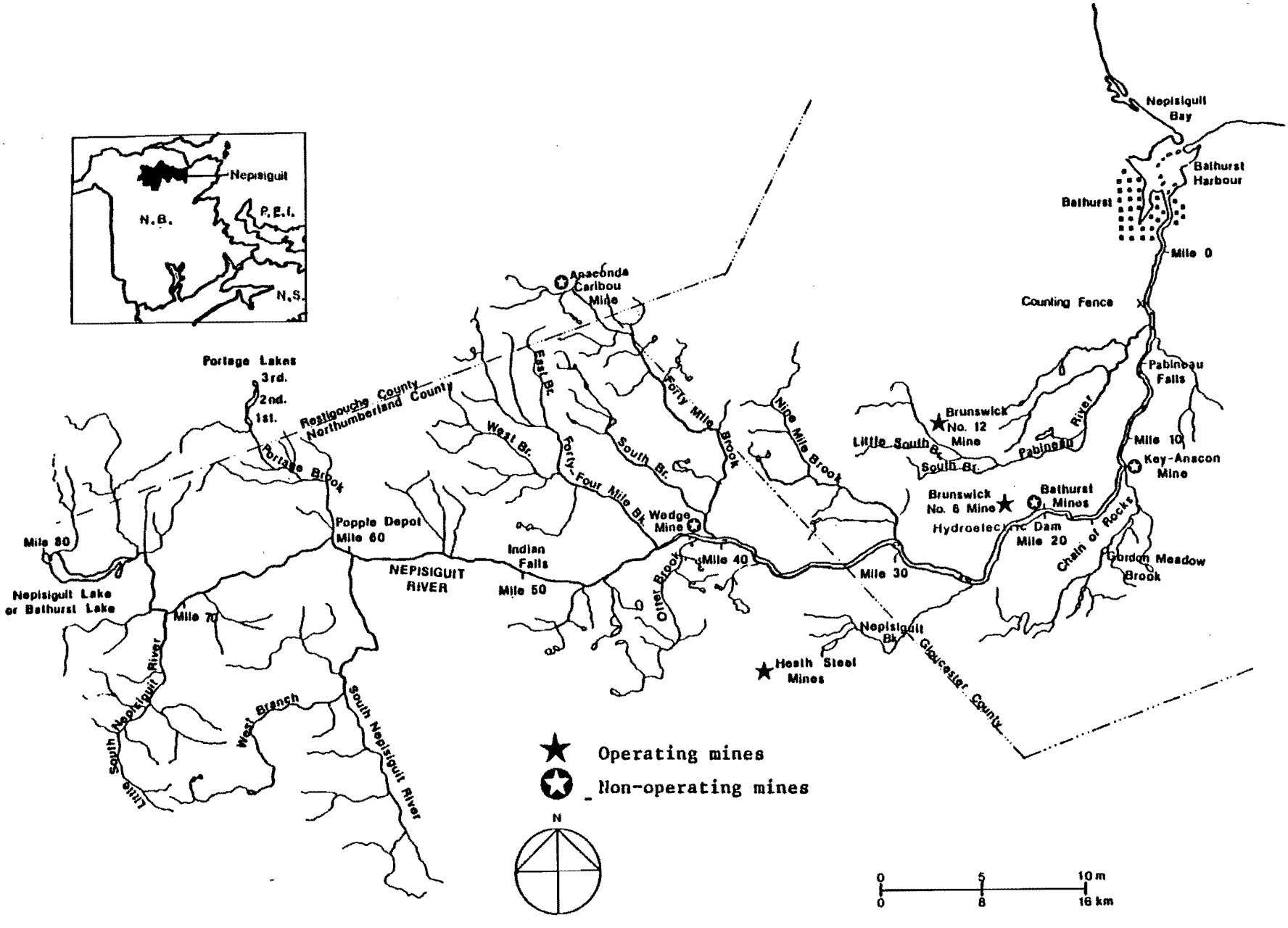

Figure 1A. Map of Nepisiguit River system showing location of hydroelectric dam, heavy metal mining and counting fence.

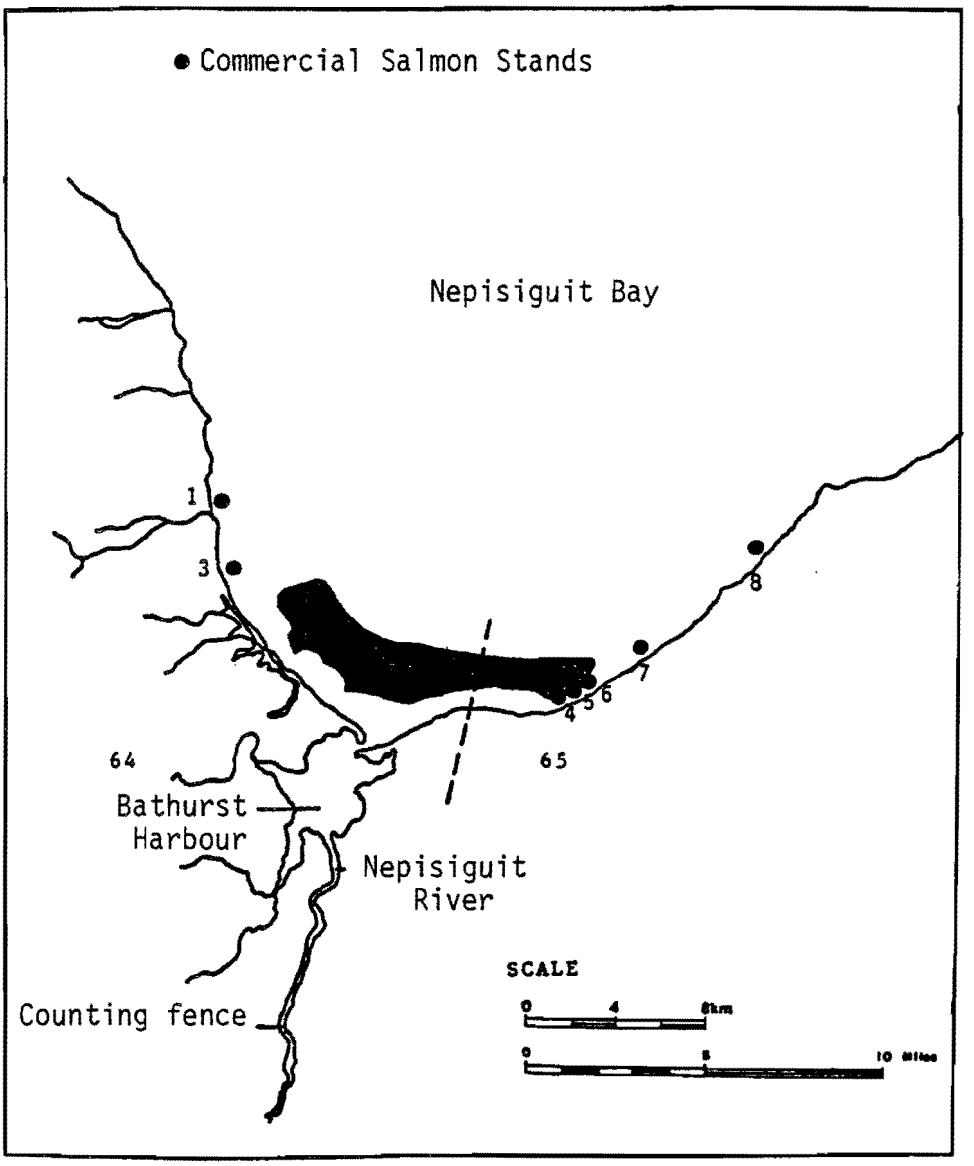

Fig.1B Location of operational commercial salmon stands in Statistical Districts 64 and 65, in 1984. The dashed line divides the two areas. Shaded area shows movements of two salmon and one grilse of Nepisiguit River origin fitted with ultrasonic tags and tracked during the commercial salmon fishery July 9-20, 1984. Individual fish were tracked over periods of 15 hours to 2.5 days with hourly locations recorded for continuous intervals of 8 to 61 hours.

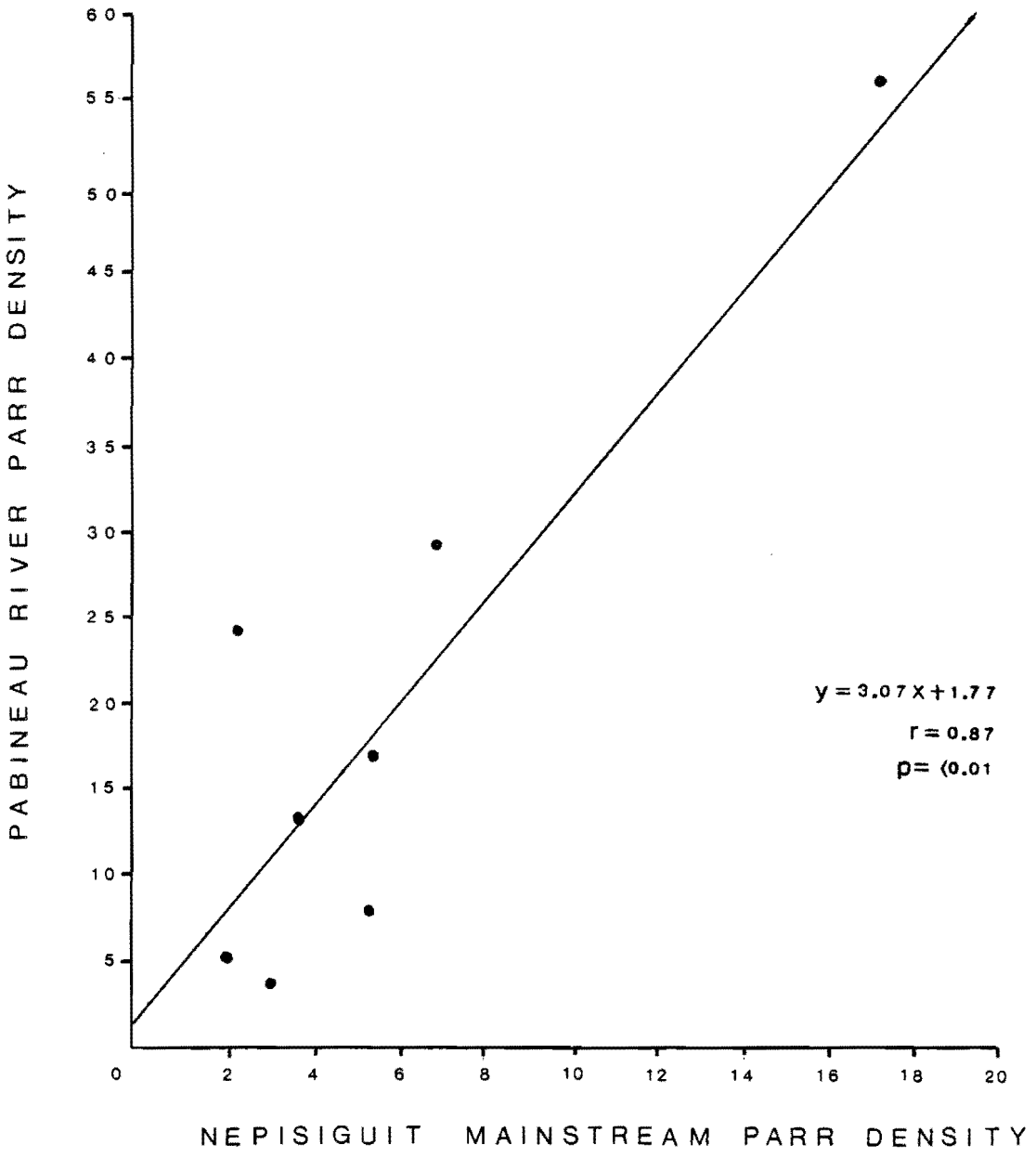

Fig. 2 Relationship between density of age 0+ salmon parr on the Nepisiguit mainstream below Grand Falls and Pabineau tributary, 1977-1984.

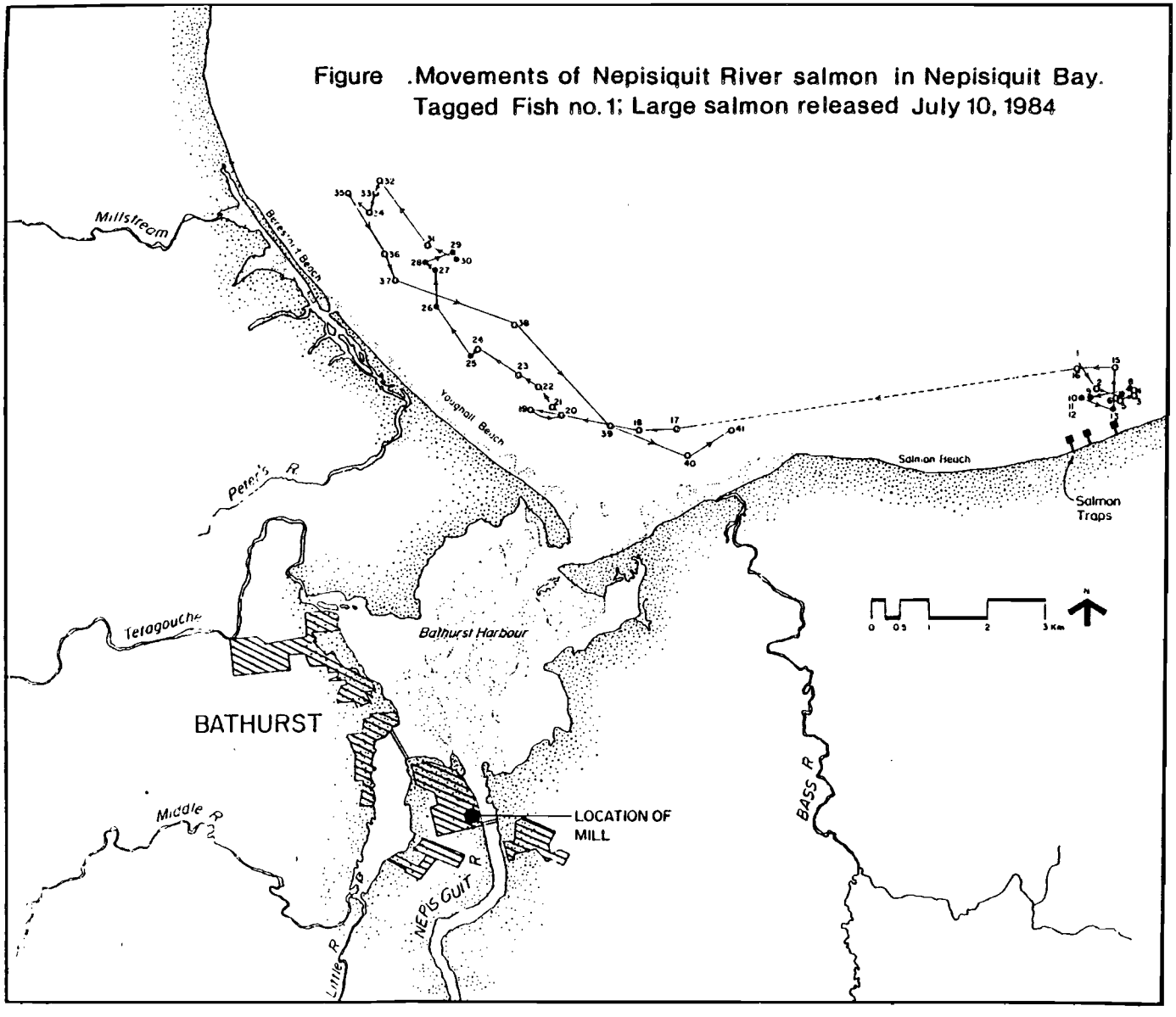

Fig. 3

Salmon Movement Study in Nepisiguit Bay, 1984

TAGGED FISH No 1
DATE TAGGED: 10 JULY 1984

LEGEND

- 16 LOCATION REFERENCE (TABLE I)
- • NIGHT TIME OBSERVATION
- ◦ DAYLIGHT OBSERVATION
- ---- DISCONTINUOUS TRACKING
- ——→ CONTINUOUS TRACKING & DIRECTION OF MOVEMENT

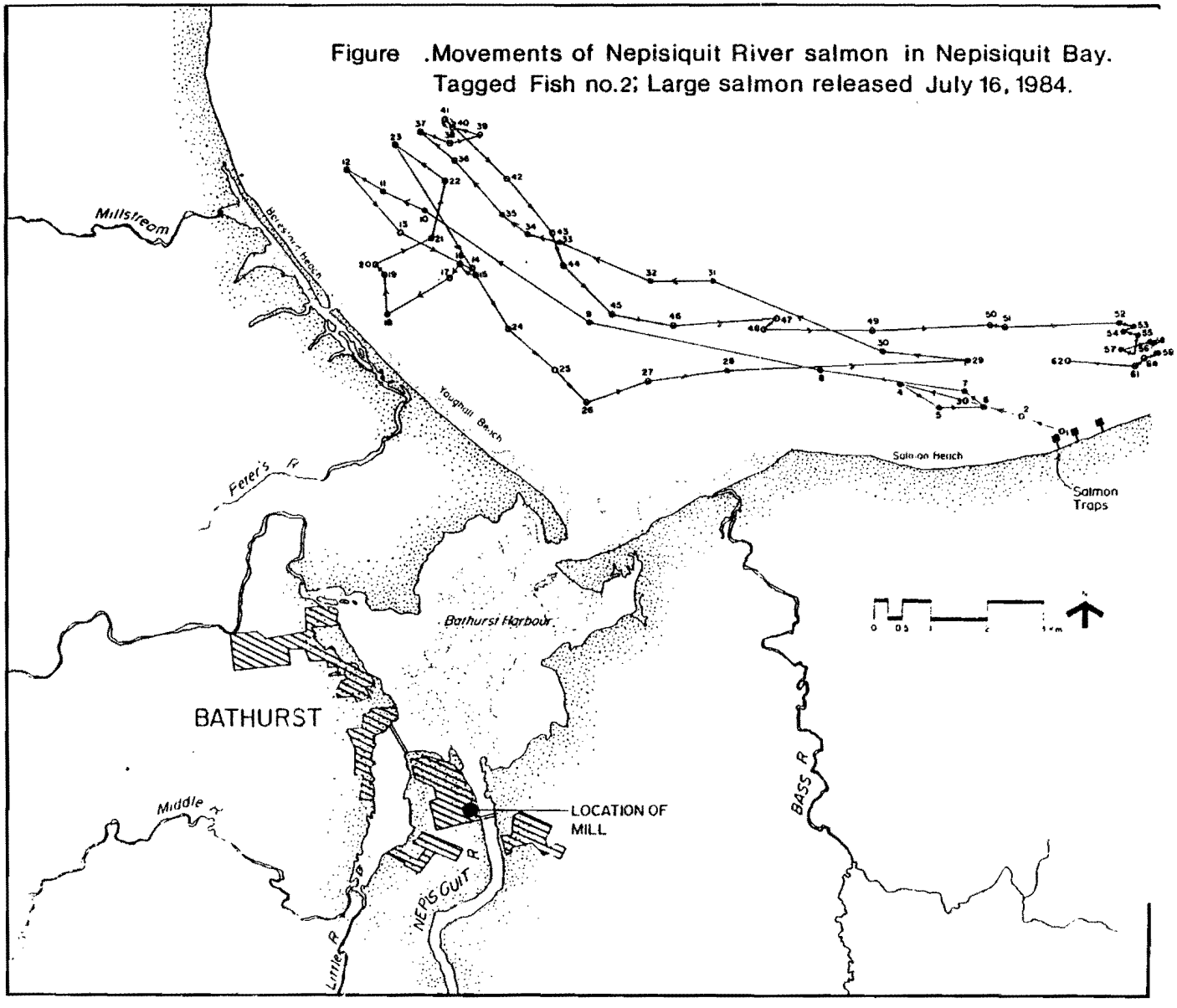

Fig. 4

Salmon Movement Study in Nepisiguit Bay, 1984

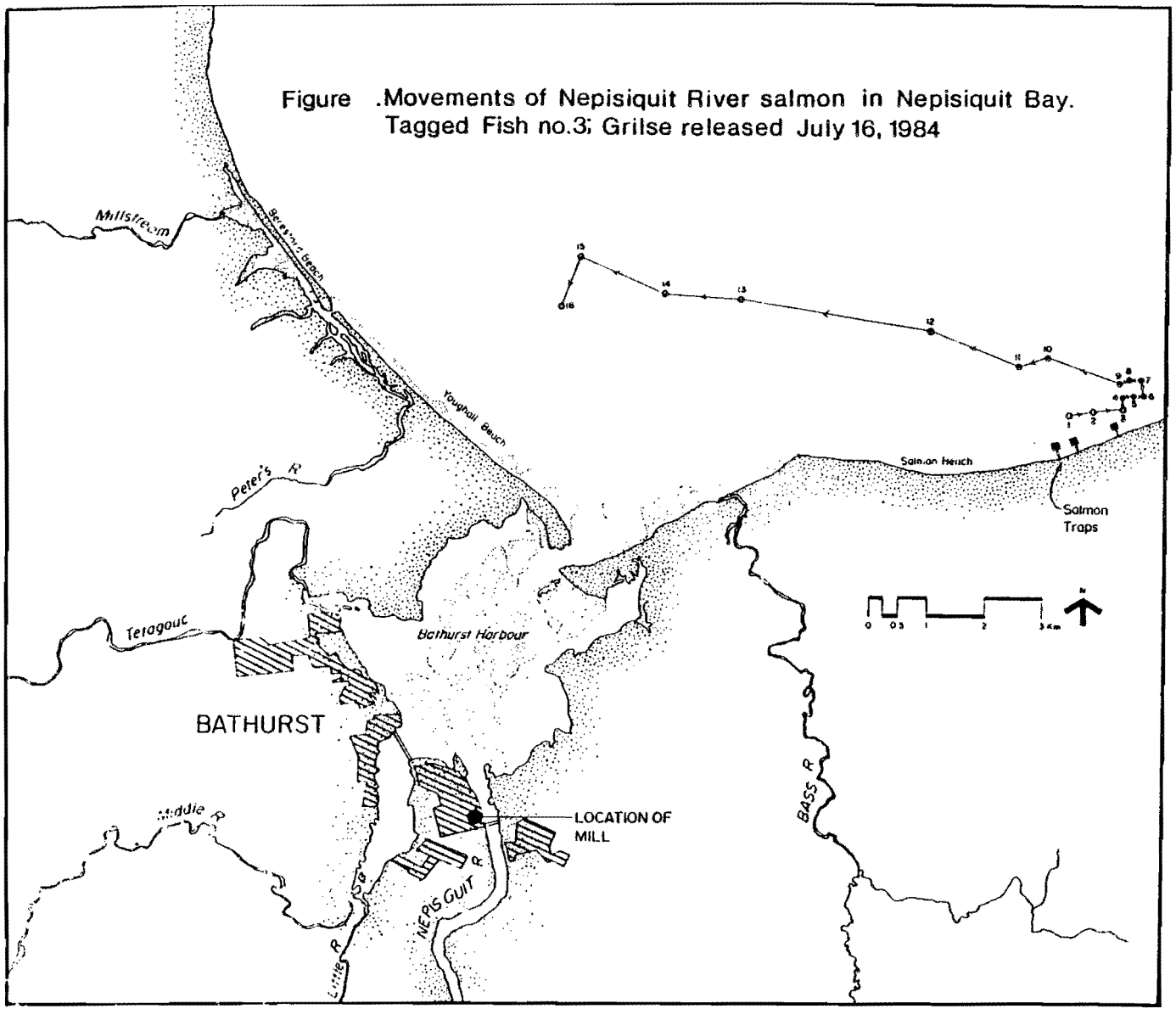

Fig. 5

Salmon Movement Study in Nepisiguit Bay, 1984

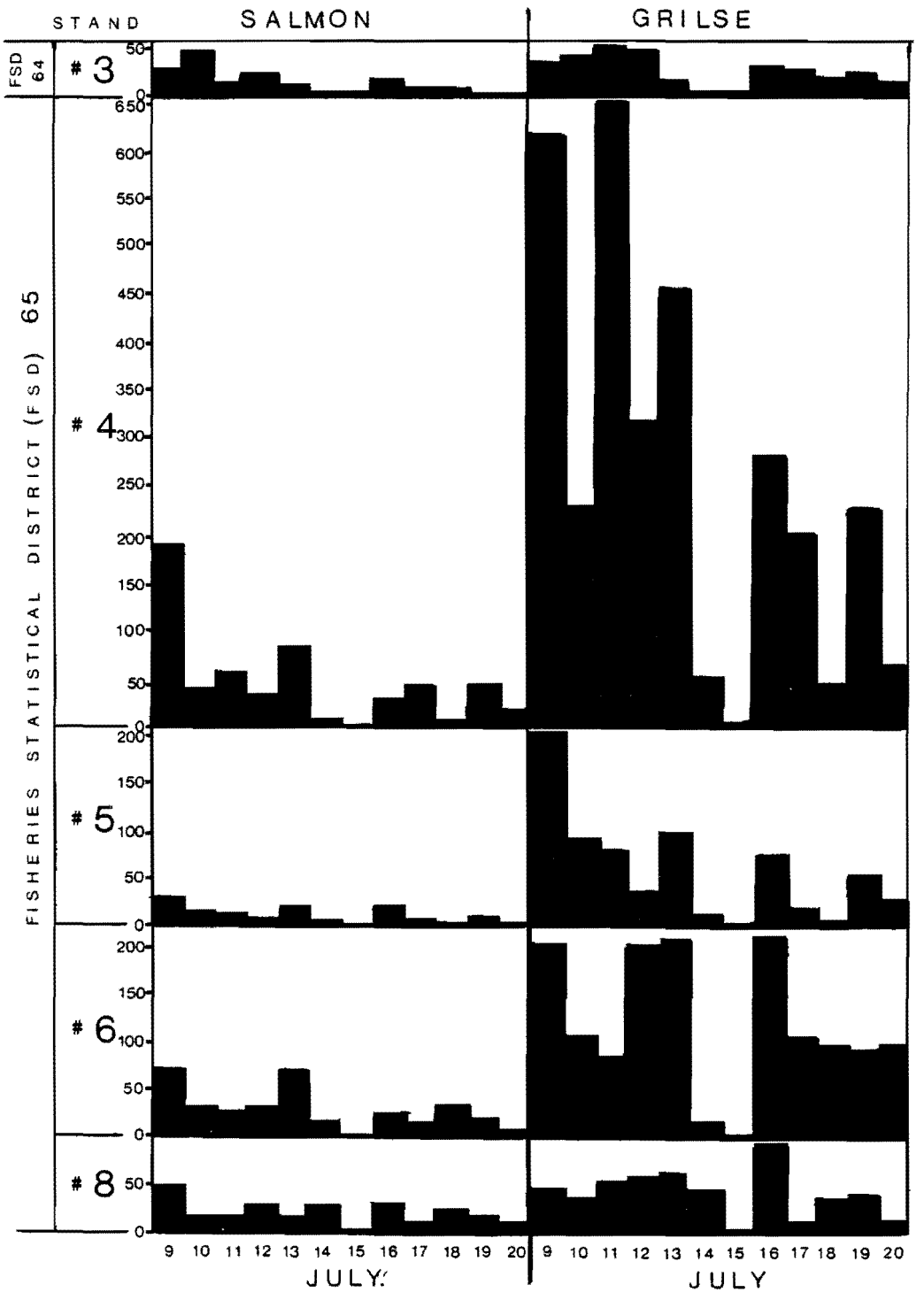

Fig. 6 Daily salmon and grilse landings from selected stands during the commercial salmon fishery in Nepisiguit Bay, July 9-20, 1984. (one of 2 stands reported in FSD 64 and 4 of 5 in FSD 65). See figure 2 for individual locations.