Assessment of the Miramichi River Salmon Stock in 1982

by

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ABSTRACT

Preliminary data indicate that total 1982 salmon landings from the Miramichi commercial, Indian and recreational fishery were similar to 1981, and approximated 13,000 salmon and 19,000 grilse. Spawning escapement requirements for 1982 were estimated to be 13,400 salmon and 38,500 grilse. Actual spawning escapements in 1982 were estimated using three sets of data: angling catches and an angling exploitation rate, Millbank trap catch efficiency data, and spawner to adult count ratios, where spawners were back-calculated from parr densities. This analysis indicated that required spawning levels in 1982 were proabably not met; egg deposition may have been as low as 20-25% of the recommended values. Predictions for 1983 indicate a slightly higher salmon return in that year, but spawning escapements will not be met if 1983 harvests significantly exceed 1982 levels. Recommendations for areas of research that would improve this assessment are given.

RESUME

D'après les données préliminaires, les débarquements totaux de saumons des pêches commerciales, indiennes et récréatives de la Miramichi en 1982 ont été semblables à ceux de 1981, soit environ 13 000 saumons et 19 000 castillons. Le nombre de saumons échappant à la capture et nécessaires à la reproduction en 1982 a été estimé à 13 400 saumons et 38 500 castillons. Trois séries de données ont été utilisées pour estimer les nombres qui ont échappé à la capture pour se reproduire en 1982 : les prises des pêcheurs sportifs et le taux d'exploitation des cannes et lignes, les données sur l'efficacité de capture de trappes à Millbank et les rapports reproducteurs/adultes, là où le nombre de reproducteurs a pu être déterminé par rétrocalculs à partir de la densité des tacons. Cette analyse indique que les niveaux de ponte requis en 1982 n'ont probablement pas été atteints; le nombre d'oeufs déposés peut n'avoir été que de 20-25 % des valeurs recommandées. On prévoit en 1983 des retours de saumons légèrement plus élevés, mais l'échappement suffisant pour la reproduction ne sera pas réalisé si les récoltes de 1983 dépassent de façon significative les niveaux de 1982. Nous terminons par des recommandations quant au domaines de recherche susceptibles d'améliorer cette évaluation.

INTRODUCTION

During 1982, Atlantic salmon in Miramichi Bay, estuary and river proper were exploited by three user groups: commercial trap and drift net fishermen, recreational anglers and Indian Food Fisheries at Eel Ground and Red Bank. The commercial salmon fishery operated for the second year after a nine year ban from 1972 to 1980. Total salmon landings in 1982 were estimated to be 12,814 salmon and 19,243 grilse.[1]

This document describes: (i) an estimate of the required egg deposition to sustain Miramichi salmon stocks at optimal harvest levels (ii) estimated spawning escapement in 1982 and (iii) a preliminary forecast of salmon available for harvest in 1983. Present harvest levels are compared to historic commercial and recreational landings for the Miramichi River.

METHODS

Salmon Landings

Commercial salmon landings from the Miramichi Bay and estuary drift net and trap net fishery were summarized from log books submitted weekly by the fishermen. Catches were reported as grilse (1 SW salmon, < 63 cm) and salmon (2 SW and older salmon, > 63 cm). Food Fishery landings from the Eel Ground and Red Bank Indian Reserves were reported from the Band Council offices.

Angling statistics are available for the Miramichi River from two independent sources, the Department of Fisheries and Oceans, and the New Brunswick Department of Natural Resources. Both federal and provincial angling statistics, together with salmon and grilse counts at the Millbank Trap site, for the period 1969 to 1982 are provided in Table 1. Because of the method of estimation (numbers are collected from a subsample of "salmon kill records" provided voluntarily by anglers), N. B. angling statistics are considered here to be a more accurate record of the angling harvest. Both sets of data show similar trends however, since there is a significant correlation between both DFO and N. B. Salmon ($r = 0.91$ $P < 0.01$) and grilse ($r = 0.75$, $P < 0.01$).

Since N. B. angling statistics for 1982 were not available when this report was prepared, 1982 estimate of salmon and grilse were predicted from the regressions described above (See Table 1).

[1] All 1982 landings reported to this document are preliminary estimates.

Egg Deposition Requirements

Egg deposition requirements for the Miramichi River were estimated from the following data (references in parentheses):

Required egg deposition rate	=	2.4 eggs/m^2	(Elson 1975)
Miramichi accessible rearing area	=	48,262,000 m^2	(Anon 1978)
Female salmon - fecundity	=	1764 eggs/kg	(Elson 1974)
- mean weight	=	4.46 kg	(Table 2)
Female grilse - fecundity	=	1764 eggs/kg	(Elson 1974)
- mean weight	=	1.55 kg	(Table 2)
Salmon sex ratio	=	0.143/0.857	(Table 2)
Grilse sex ratio	=	0.756/0.244	(Table 2)
Grilse/salmon ratio	=	0.742/0.258	(Table 2)

1982 Escapement Estimates

The 1982 spawning escapement was estimated three ways. Method I used an angler exploitation rate and an estimate of losses to poaching and disease. The exploitation rate was obtained from five years of adult tagging at the Millbank trap. Only recaptures from May - July were considered as 80% of recreational harvest occured during this period. On average, 18.9% of tagged salmon and 19.9% of grilse were recaptured (Table 3). These values were adjusted upwards by 30% to account for non-reporting of tags. The final rates were, therefore, 24.6% for salmon and 25.7% for grilse. Losses due to poaching and disease were estimated to be 1,000 salmon and 4,000 grilse.

Method II used an efficiency estimate for counts of salmon and grilse at the Millbank trap. Based on a tagging experiment in 1973, from 3.5 to 4.0% of salmon and 3.5 to 4.4% of grilse were counted at Millbank (Turner and Schofield unpublished). In method II (a), the lower rates are used; in Method II (b), the higher rates are used. Estimates of poaching and disease are used as in Method II.

Method III for estimating the 1982 spawning escapement was calculated from a ratio of spawner per fish a) counted at Millbank or b) harvested in the recreational fishery. Spawners were estimated from densities of 1^+ parr, 1973-82. A significant relationship ($P < 0.01$) between large kelt angled in the Miramichi and 1^+ parr one year later ($r=0.78$, $df=11$; Figure 1) suggested the latter was an index of egg deposition. The survival rate from egg to 1^+ parr was assumed to be a constant 10% (Elson 1957, 1974; Chadwick, 1982.) Biological characteristics of spawning adults are in Table 2. The mean ratio's of spawner per salmon and grilse counted at Millbank were 5.2863 and 5.2865, respectively; the mean rates of spawner per salmon and grilse harvested in the recreational fishery was 0.8518 and 0.9064, respectively (Table 4).

Predicting 1983 Escapement Levels

Spawning escapements of large salmon and grilse in 1983 were also predicted using three methods, corresponding to the three methods outlined above.

Method I used N. B. angling data. 1983 salmon returns were estimated from a significant correlation between N. B. grilse in year n and N. B. Salmon in year n+1 (Table 1). Total returns of large salmon were estimated using an angler exploitation rate of 24.6%. Grilse catches were estimated from the 1969-82 mean values (Table 1). It was assumed that losses in home waters were in the same proportion to total returns as in 1982.

Method II used Millbank trap data. Large salmon returning in 1983 were estimated from a significant predictive equation relating salmon returns in year n to the number of grilse returning in year n-1, and to the percentage of females in the grilse run (Marshall et al 1982). Data from 1971 to 1979 were used because there was no commercial fishery for salmon during these years. The 1981 Millbank data were eliminated from the regression because dredging in Miramichi Bay probably affected the Millbank catches in that year. The multiple regression used, and the data it is based on, are given in Table 1; 878 salmon are predicted at Millbank in 1983. Spawning escapements were estimated by assuming an efficiency of 3.5% at Millbank trap and losses before Millbank (commercial fishery) were in the same proportion to total returns as in 1982.

Method III calculates the 1983 spawning escapement using the ratios of spawner per angled fish, and spawner per fish counted at Millbank (Table 4). These ratios were applied to the predicted counts at Millbank (1983) and predicted angled catch (Table 1). The total stock can be determined by adding the estimated spawning escapement to expected total removals assuming removals by fisheries are in same proportion to angling catch and Millbank counts as in 1982.

RESULTS

1982 Salmon Landings

Commercial salmon landings for 1982 are reported in Table 5. Forty-four trap net fishermen and 73 drift net fishermen were licensed to fish salmon in 1982, and of these 100% and 80% submitted log records for the trap and drift net fisheries, respectively. The trap net fishery was from 1 June to 31 July, while the drift net fishery started later - 15 June to 31 July. Preliminary landings indicated a total catch of 1898 grilse (1 SW) and 8319 salmon (2 SW). Reported landings therefore indicated that the 1982 quota (10,000 salmon and 4,000 grilse) was not reached. However, significant undereporting in the drift net fishery was suspected but this could not be quantified.

Preliminary catch reports from the Indian Food Fisheries indicated that 291 salmon and 567 grilse had been landed at the Eel Ground and Red Bank reserves (Table 6). These fisheries were not regulated by a quota.

Federal and provincial angling statistics for the period 1969 to 1981 are reported in Table 1. Preliminary DFO data for 1982 indicates a harvest of 2642 salmon and 9217 grilse.

Total recorded landings were about 87t in 1982 (this is broken down into number of fish in Table 7). These landings are about 20% of harvests in the mid-1960s (Table 8).

Age composition data for salmon sampled in the commercial and recreational fisheries are given in Figures 2 and 3. Similar data from the Millbank trap samples are given for comparison in Figure 4.

Egg Deposition Requirements

Egg deposition per fish, using mean weight, fecundity and sex ratio values cited in methods, is calculated as:

	eggs.kg-1		% Female		mean weight kg		% salmon or grilse		egg deposition per fish
Salmon	1764	x	0.857	x	4.46	x	0.258	=	1740
Grilse	1764	x	0.244	x	1.55	x	0.742	=	495
					Total egg deposition per fish			=	2235

Therefore, the total number of fish required for egg deposition can be estimated by: required deposition rate x rearing area/egg deposition per fish

= 2.4 X 48,262,000/2235
= 51,825 fish

From the grilse/salmon ratio, therefore, the numbers of salmon and grilse required for egg deposition are 13,371 (13,400) and 38,454 (38,500) respectively.

1982 Escapement

The 1982 returns calculated with Method I (angling exploitation rates, see Methods), are summarized below. These values suggest that adequate spawning was achieved:

	Salmon	Grilse
1. River escapement (4204 / 0.246 and 16778 /0.257)	17,089	65,284
2. Losses to commercial and food fisheries	8,610	2,465
3. Returns to homewaters	25,699	67,749
4. All losses		
fisheries:	12,814	19,243
poaching & disease	1,000	4,000
5. Spawning escapement	11,885	44,506
6. Spawning requirement	13,400	38,500
7. Surplus or deficit	-1,515	+6,006
8. Balance	+ 680 grilse	

Method II for estimating 1982 returns used a trapping efficiency estimate for counts of salmon and grilse at the Millbank trap (see Methods). Using these data, 1982 returns show a deficit in spawning ranging from 2,600 to 8,500 salmon or a deficit of about 9,100 to 29,800 grilse:

	Trap Efficiency 3.5% Salmon	3.5% Grilse	4.0% Salmon	4.4% Grilse
1. River escapement (trap count / trap efficiency)	11,657	76,143	10,200	60,568
2. Losses before Millbank	8,319	1,898	8,319	1,898
3. Returns to homewaters	19,976	78,041	18,519	62,466
4. All losses:				
fisheries	12,814	19,243	12,814	19,243
poaching & disease	1,000	4,000	1,000	4,000
5. Spawning escapement	6,162	54,798	4,705	39,223
6. Spawning requirement	13,400	38,500	13,400	38,500
7. Surplus or deficit	-7,238	+16,298	-8,695	+723
8. Balance	-2,602 or	-9,146	-8,489 or	-29,841

Finally, 1982 returns were estimated from the ratio of spawner per fish counted at Millbank or harvested in the angling fishery (Method III). The 1982 spawning escapements with 95% confidence limits are summarized below. These values suggest that egg deposition of large salmon was only 20 - 25% of the recommended value:

	Salmon	Grilse
1. Total removals	12,814	19,243
2. Spawning escapement		
a. using Millbank	2,157 ± 748	14,089 ± 4,874
b. using sports fishery	3,581 ± 895	15,208 ± 4,987
3. Spawning requirement	13,400	38,500
4. Surplus or deficit		
a)	-11,243	-24,411
b)	-9,819	-23,292

1983 Escapement and Potential Harvest

As explained in Methods, 1983 escapement was estimated using three methods:

Method I - N. B. angling statistics and angler exploitation rates. These data indicate a potential harvest of 27,800 salmon and 30,600 grilse:

	Salmon	Grilse
1. River escapement	27,524	66,646
2. Losses in commercial and food fisheries	13,762	2,533
3. Total returns	41,286	69,179
4. Spawning requirement	13,400	38,500
5. Potential harvest	27,886	30,679

Method II - Millbank trap data indicate a potential harvest of 29,500 salmon and 42,400 grilse:

	Salmon	Grilse
1. Returns to Millbank	25,086	78,714
2. Homewater losses before Millbank	17,903	1,968
3. Total returns	42,989	80,682
4. Spawning requirement	13,400	38,500
5. Potential harvest*	29,589	42,182

* If the higher rates of trap efficiency are used (4.0% for salmon and 4.4% for grilse), potential harvest are 24,165 salmon and 25,679 grilse.

Method III - Ratios of spawner per angled fish and spawner per fish counted at Millbank, indicated a potential harvest of 13,000 to 18,800 salmon:

a) Using ratio of spawner per angled fish:

	Salmon	Grilse
1. Spawning escapement	5,767	15,525
2. Removals		
a. angled	6,771	17,128
b. commercial and food	13,867	2,516
3. Total stock - 1983	26,405	35,169
4. Spawning requirement	13,400	38,500
5. Potential harvest	13,005	-3,331

b) Using ratio of spawners per fish counted at Millbank trap:

	Salmon	Grilse
1. Spawning escapement	4,641	14,564
2. Removals all fisheries	27,575	19,893
3. Total stock - 1983	32,216	34,457
4. Spawning requirement	13,400	38,500
5. Potential harvest	18,816	-4,043

DISCUSSION

Preliminary 1982 reported catches from both the recreational and commercial salmon fisheries in the Miarmichi River indicate that total 1982 landings were similar to 1981 (Table 7). Estimated egg deposition requirements were apparently not achieved in 1982, however. Two of the three methods used for estimating the 1982 returns (Methods II and III) indicated that salmon spawning escapement was insufficient, and was only 20-50% of the levels estimated to be optimal for adequate recruitment. The other method (Method I) was more encouraging, and suggested that egg deposition requirements were met, with a possible surplus of over 500 grilse. All three methods used for estimating 1982 returns use parameters that are sensitive and are potentially subject to error. These parameters include angling exploitation, efficiency of the Millbank trap and egg to parr survival rates. Because of these uncertainties, no one method is preferable to the others, and none of the methods provide reliable absolute numbers. We feel there is sufficient evidence here to conclude, however, that the Miramichi River received inadequate spawning escapement in 1982 to optimize production.

Predictions of the magnitude of the 1983 salmon run indicate a potentially higher 2-sea-year and other salmon run in 1983 than in 1982. Salmon spawning escapement should be sufficient for egg deposition requirements, but this will not be the case if the 1983 Miramichi salmon harvest significantly exceeds the 1982 landings. Grilse are expected to return in 1983 in comparable numbers to previous years, in sufficient numbers for spawning and with a potential surplus for harvest equal to or possibly exceeding the 1982 harvest levels.

Total salmon harvest in recent years is compared to historic catch levels in Table 8. Commercial and angling landings in 1981 and 1982 are substantially below harvest levels common in the pre-ban years. Juvenile salmon densities in the Miramichi generally increased somewhat during the 1970s after the ban (Table 9) but average numbers of fry and parr are still often below what Elson (1967) considers normal. Adequate spawning escapement has apparently not been achieved in recent years (1971-1982). Reasons for the slow rebound of Atlantic salmon in the Miramichi River since the

commercial ban are discussed in the Atlantic Salmon Review Task Force (Anon 1978).

Future assessments of the Miramichi River salmon stock would be improved if research is conducted in the following areas:

(1) verification of the angler exploitation rates used here.

(2) the efficiency of the Millbank trap needs confirmation. It appears to be an index of escapements, but magnitude and annual variation needs refinement.

(3) egg to parr survival rates in the Miramichi River need to be defined accurately.

(4) parr densities obtained from electrofishing may only be an index of parr abundance in the river. The use of these data as a absolute index of parr abundance should be tested.

(5) interception in the drift net fishery in Miramichi Bay is not accounted for, although the delayed opening for the drift net fishery probably reduced interception.

(6) documentation of removals is still a problem. Unrecorded removals appear very high; these include underecording in the commercial fishery, incidental catches, and poaching.

(7) the Miramichi River consists of a large number of stocks but this assessment treats the system as one stock. Separate descriptions of the biological characteristics of the early and late run stocks are needed.

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Table 1. New Brunswick Department of Natural Resources and Department of Fisheries and Oceans angling statistics, 1969 to 1982. Catches of salmon and grilse at the Millbank trap site during the same period are also shown. Values in parentheses are estimated, as indicated in the footnotes.

	N. B. Angling			DFO Angling			Millbank		
Year	Black Salmon	Grilse	Salmon	Black Salmon	Grilse	Salmon	Grilse	Salmon	Millbank Grilse%F
1969	1828	24284	3804	-	26715	2827	4350	667	-
1970	1647	19610	3268	1940	19662	2057	2484	245	-
1971	1352	13727	1792	1660	8464	1247	1962	399	11.0
1972	547	19101	8933	832	15472	5456	2543	1151	22.0
1973	2970	13857	5977	5349	9033	4881	2450	1132	16.9
1974	3037	18232	7184	5746	19757	5895	4038	1791	30.2
1975	3111	15598	6288	4547	9730	3756	3548	1208	27.4
1976	1446	27128	7374	5110	14749	5319	4939	943	24.1
1977	2156	13590	11617	11515	8244	14344	1505	1934	22.8
1978	2126	8265	4893	5694	5353	4196	1268	693	37.4
1979	1668	14508	2656	7360	7625	2422	2500	318	27.4
1980	1504	11997	6546	4472	7533	5422	2139	1093	19.3
1981	2118	22716	3238	6594	7031	1602	2174	199	* 25.1
1982		(16778)[1]	(4204)[2]	516	9217	2642	2665	408	29.5
1983		(17128)[6]	(6771)[4] (5463)[5]				(2755)[7]	(878)[3]	

* : Millbank salmon count (1981) probably affected by dredging.

[1] 1982 N. B. grilse catch estimated from correlation between Millbank grilse (x) and N. B. grilse (y) from 1969 to 1981; $y = 7109.4 + 3.63(x)$ $r = 0.76$ $n = 13$; $y\ (1982) = 16778$.

[2] Estimated from regression of DFO salmon (x) with N. B. salmon (y), 1969-81; $y = 2222.8 + 0.75(x)$ $r = 0.91$, $n = 13$; $y(1982) = 4204$.

[3] Estimated from multiple regression of Millbank salmon (y, year n) with Millbank grilse (x_1, year n-1) and percent female grilse (x_2, year n-1); $\log y = 0.67 + 0.91 \log x_1 + (-0.03 \text{ arc sin } x_2)$ 1971-79, $r = -0.94$, $n = 9$; $y\ (1983) = 878$.

[4] Estimated from regression of N. B. grilse (x, year n) with N. B. salmon y (year n+1), 1972-81; $y = -108.3 + 0.41(x)$, $r = 89$, $n = 10$; $y(1983) = 6771$.

[5] Estimated from regression of Millbank salmon (x) with N. B. salmon (y) 1969-80; $y = 1450.9 + 4.57(x)$, $r = 88$, $n = 12$; $y(1983) = 5463$.

[6] Estimated from mean of N. B. grilse, 1969-81. Mean = 17,128; SD = 5351.5.

[7] Estimated from mean of Millbank grilse, 1969-81, mean = 2755; SD = 1073.9

Table 2. Mean length, weight and sex ratios of salmon and grilse captured at Millbank, 1971 to 1982 (Samples sizes in parenthesis)

	SALMON (2 SW and older)				GRILSE (1 SW)				TOTAL NUMBER CAUGHT	PERCENT	
YEAR	NUMBER CAUGHT	MEAN LENGTH(cm)	MEAN WEIGHT(kg)	%F	NUMBER CAUGHT	MEAN LENGTH(cm)	MEAN WEIGHT(kg)	%F		SALMON	GRILSE
1971	399	71.0(317)	4.27(321)	91.7(12)	1962	51.1(250)	1.41(250)	11.0(73)	2361	16.9	83.1
1972	1151	71.3(521)	4.05(520)	72.9(137)	2543	52.0(686)	1.56(682)	22.0(268)	3694	31.2	68.8
1973	1132	73.9(722)	4.38(723)	82.4(483)	2450	53.7(742)	1.49(741)	16.9(616)	3582	31.6	68.4
1974	1791	74.4(666)	4.71 (666)	84.9(332)	4038	52.5(1390)	1.57(1391)	30.2(603)	5829	30.7	69.3
1975	1208	74.7(342)	4.81(343)	88.0(259)	3548	51.4(1026)	1.58(1026)	27.4(478)	4756	25.4	74.6
1976	943	75.1(197)	4.50(101)	87.1(132)	4939	51.9(988)	1.51(436)	24.1(435)	5882	16.0	84.0
1977	1934	73.0(524)	4.36(138)	91.4(385)	1505	51.9(421)	1.60(125)	22.8(202)	3439	56.2	43.8
1978	693	74.6(291)	4.78(138)	85.9(192)	1268	51.6(387)	1.57(128)	37.4(174)	1961	35.3	64.7
1979	318	74.6(103)	4.59(39)	88.3(60)	2500	51.8(728)	1.59(222)	27.4(402)	2818	11.3	88.7
1980	1093	73.9(335)	4.55(114)	90.3(217)	2139	52.0(593)	1.67(166)	19.3(290)	3232	33.8	66.2
1981	199	72.4(54)	4.27(15)	64.5(31)	2174	51.4(605)	1.50(186)	25.1(219)	2373	8.4	91.6
1982	408	75.9(43)	4.61(43)	86.1(43)	2665	52.7(321)	1.59(321)	29.5(207)	3073	13.3	86.7
Mean			4.46(3161)	85.7(2283)			1.55(5674)	24.4(3967)		25.8	74.2

Table 3. Recreational fishery exploitation rates for adults tagged at Millbank and judged available to fishery. Number of tags returned in parentheses.

	1 - S.W.		2 - SW and older	
YEAR	MAY-JUNE	JULY	MAY-JUNE	JULY
1971	0.288(15)	0.267(23)	0.145(25)	0.400(4)
1972	0.179(10)	0.218(57)	0.209(19)	0.178(28)
1973	0.189(7)	0.158(15)	0.184(26)	0.164(24)
1974	0.189(30)	0.189(96)	0.152(14)	0.120(16)
1975	0.189(23)	0.133(54)	-	-
Mean*	0.199		0.189	

*Calculated with (arc sine $\sqrt{\bar{x}}$) transformation.

Table 4. Spawner to angled fish (N. B. statistics Table 1) and spawner to fish counted at Millbank trap (Table 1).

Year	No. small parr n+2	No. eggs per fish	Spawners		N. B. stats		Millbank	
			Salmon	Grilse	Salmon	Grilse	Salmon	Grilse
1971	1.9	1395	1111	5462	0.6200	0.3979	2.7845	2.7839
1972	10.0	2041	7378	16268	0.8259	0.8517	6.4101	6.3972
1973	14.6	2316	9614	20810	1.6085	1.5018	8.4929	8.4939
1974	11.8	2745	6369	14378	0.8866	0.7886	3.5561	3.5607
1975	10.0	2466	4971	14600	0.7906	0.9360	4.1151	4.1150
1976	9.4	1645	4413	23165	0.5985	0.8522	4.6797	4.6422
1977	7.3	4232	4679	3646	0.4028	0.2683	2.4193	2.4226
1978	6.3	3227	3326	6096	0.6797	0.7376	4.7994	4.8076
1979	9.2	1490	3367	26432	1.2677	1.8219	10.5881	10.5728
1980	9.5	2826	5484	10740	0.8378	0.8952	5.0174	5.0210
1981	(2.6)[1]	1016						
1982								
Mean					0.8518	0.9064	5.2863	5.2865
SD					0.3497	0.4588	2.5642	2.5590

[1] Predicted from y = 0.63 + 0.00374 X where y = small parr and x = kelt x(1982) = .516.

Table 5. 1982 Landings for the Miramichi Driftnet and Trapnet Fishery

Drift net fishery

	Reported (80%)		Total [1]	
	No.	Kg.	No.	Kg.
62 cm	142	245.3	178	306.6
63-85 cm	5013	22968.7	6266	28710.9
85 cm	71	615.5	89	769.4
	5226	23829.5	6533	29786.9

[1] Landings after 20% unreported fishermen were estimated.

Trap net fishery

	Reported (100%)	
	No.	Kg.
63 cm	1720	2884.2
63-85 cm	1815	7905.6
85 cm	149	1529.1
	3684	12318.9

Total commercial landings, 1982

	No.	Kg.	Quota
63 cm	1898	3190.8	4,000
63-85 cm	8081	36616.5	10,000
85 cm	238	2298.5	
	10217	42105.8	14,000

Table 6. Number of salmon and grilse landed in the Miramichi Indian Fisheries 1982 (preliminary data)

EEL GROUND

Date	Grilse	Salmon	No. Nets
June 6 - 12		5	13
June 13 - 19	12	4	15
June 20 - 26		44	16
June 27 - July 3	34		16
July 4 - 10	123	32	15
July 11 - 17	105	16	15
July 18 - 24	17	2	5
July 25 - August 1	7	1	5
August 2 - 7	17	1	8
August 8 - 15	10	1	7
August 16 - 22	13	2	8
August 23 - 29	5	1	7
August 30 - September 5	1	-	6
September 6 - 12	1	-	1
September 13 - 18	1	-	2
September 19 - 26	-	-	-
Total	346	109	

RED BANK

Date			No. nets
June 1 - 30	113	90	
July 1 - August 15	108	93	Unknown
Total	221	182	

Table 7. Preliminary 1982 landings in the Miramichi River by commercial, Indian and recreational fisheries. 1981 landings are given for comparison.

	1982		1981	
	Salmon	Grilse	Salmon	Grilse
Commercial trap net	1,964	1,720	3,010	1,259
drift net *	6,355	178	3,927	216
Indian	291	567	500	1,000
Recreational **	4,204	16,778	3,238	22,716
Total	12,814	19,243	10,675	25,191

* Adjusted 20% for unreporting.

** Adjusted DFO stats based on significant relationship between DFO stats and N. B. stats for salmon and Millbank trap counts for grilse (See Table 1).

Table 8. Summary of commercial and recreational salmon landings in the Miramichi River, 1951 to 1982. Kelts angled in year n are added to landings in year n-1. Commercial data for 1951 to 1967 are from May & Lear (1971) and assume salmon average 4.46 kg. Commercial 1968 to 1981 are from Redbooks.* Angling data are from Smith (1981) for 1951 to 1979; 1980 and 1981 are from Redbooks. 1982 data are preliminary. All data on numbers $X10^3$.

YEAR	COMMERCIAL			RECREATIONAL						GRAND TOTAL
				KELTS (yr n+1)			BRIGHT (yr n)			
	GRILSE	SALMON	TOTAL	GRILSE	SALMON	TOTAL	GRILSE	SALMON	TOTAL	
1951		27.6	27.6			12.0			9.6	49.2
1952		27.1	27.1			11.3			15.9	54.3
1953		24.2	24.2			10.1			18.2	52.5
1954		50.4	50.4			11.2			23.5	85.1
1955		15.2	15.2			8.9			14.7	38.8
1956		24.7	24.7			9.3			28.9	62.9
1957		29.8	29.8			8.4			19.5	57.7
1958		25.1	25.1			10.2			36.7	72.0
1959		37.2	37.2			9.5			10.3	57.0
1960		30.7	30.7			5.6			4.5	40.8
1961		30.0	30.0			9.5			11.0	50.5
1962		41.7	41.7			7.3			10.3	59.3
1963		40.6	40.6			5.2			50.9	96.7
1964		69.7	69.7			9.0			35.1	113.8
1965		69.5	69.5			16.0	38.7	3.9	42.6	128.1
1966		72.9	72.9			20.0	51.7	5.9	57.6	150.5
1967		102.2	102.2			14.1	41.8	4.1	45.8	162.1
1968		49.3	49.3			6.9	7.0	1.5	8.5	64.7
1969		41.3	41.3	1.9	4.2	6.1	26.7	2.8	29.5	76.9
1970		39.7	39.7	1.7	2.7	4.3	19.7	2.1	21.7	65.7
1971		18.6	18.6	0.8	1.5	2.3	8.5	1.2	9.7	30.6
1972				5.3	1.8	7.1	15.5	5.5	20.9	28.0
1973				5.7	2.4	8.1	9.0	4.9	13.9	22.0
1974				4.5	1.3	5.8	18.0	5.9	23.9	29.7
1975				5.1	3.7	8.8	9.7	3.8	13.5	22.3
1976				11.5	10.1	21.6	14.7	5.3	20.1	41.7
1977				5.7	1.9	7.6	8.2	14.3	22.6	30.2
1978				7.4	1.2	8.6	5.4	4.2	9.5	18.1
1979				4.5	1.6	6.0	7.6	2.4	10.0	16.0
1980				6.6	2.3	8.9	7.5	5.4	13.0	21.9
1981			9.0	0.6	0.8	1.4	7.0	1.6	8.6	19.0
1982	1.9	8.3	10.2				9.2	2.6	11.9	22.1

*Atlantic salmon commercial statistics compiled by Freshwater and Anadromous Division, Fisheries Research Branch, Halifax, N.S.

Table 9. Junenile salmon densities in the Miramichi River, 1969-1982

Year	n	FRY	Small Parr	Large Parr
1969	14	6.2	13.9	2.9
1970	50	12.6	3.2	4.8
1971	73	15.0	5.5	2.0
1972	72	5.3	4.8	2.3
1973	80	16.8	1.9	1.8
1974	98	22.6	10.0	2.3
1975	89	31.7	14.6	3.8
1976	80	22.3	11.8	3.4
1977	86	34.4	10.0	4.1
1978	87	23.5	9.4	3.5
1979	48	13.2	7.3	2.7
1980	46	20.0	6.3	3.0
1981	47	40.9	9.2	3.0
1982	85	9.3	9.5	2.7

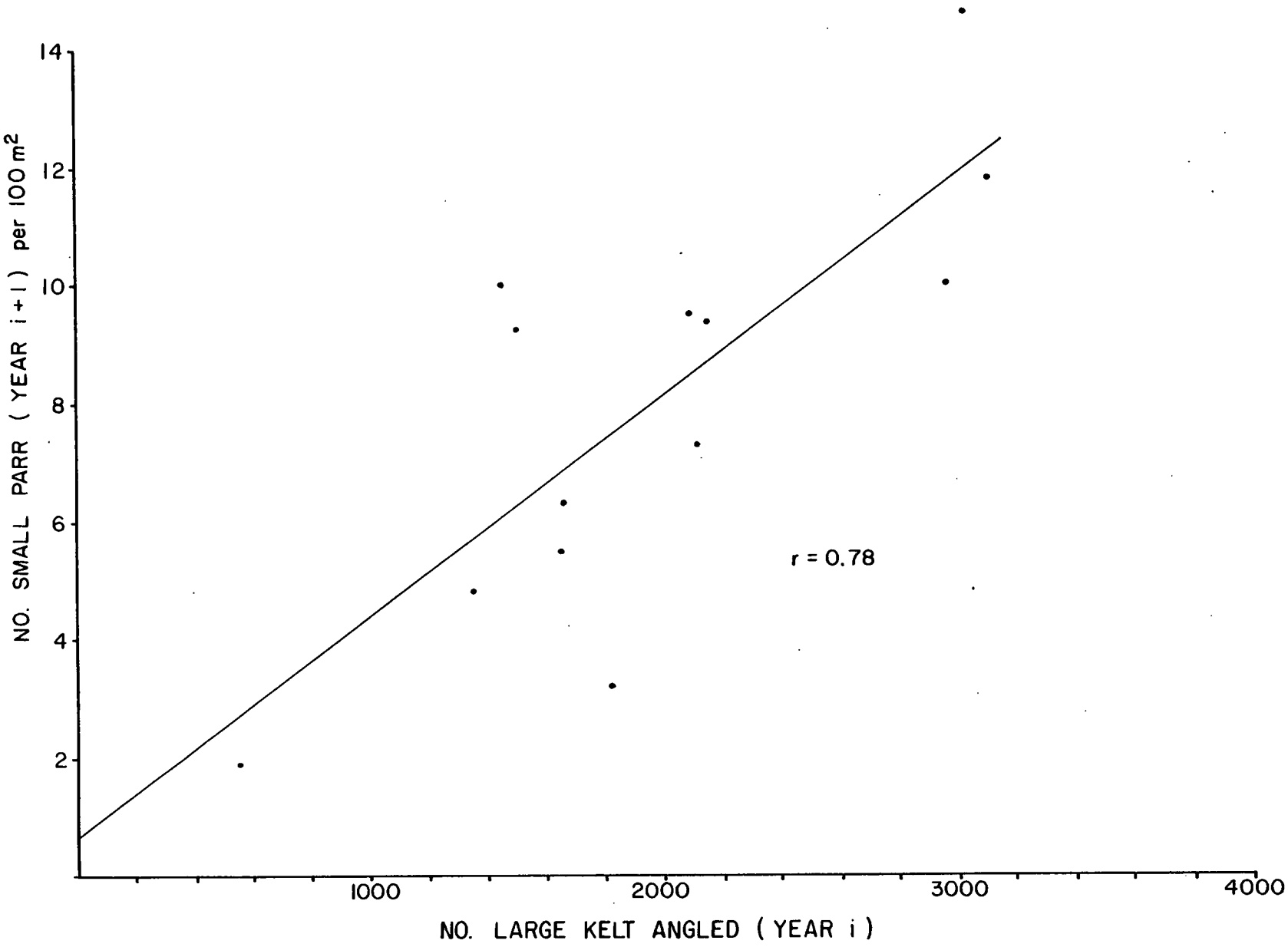

Figure 1: - Relationship between stock (harvested kelts) and recruitment (density of small parr) on the Miramichi River, 1969 - 1981.

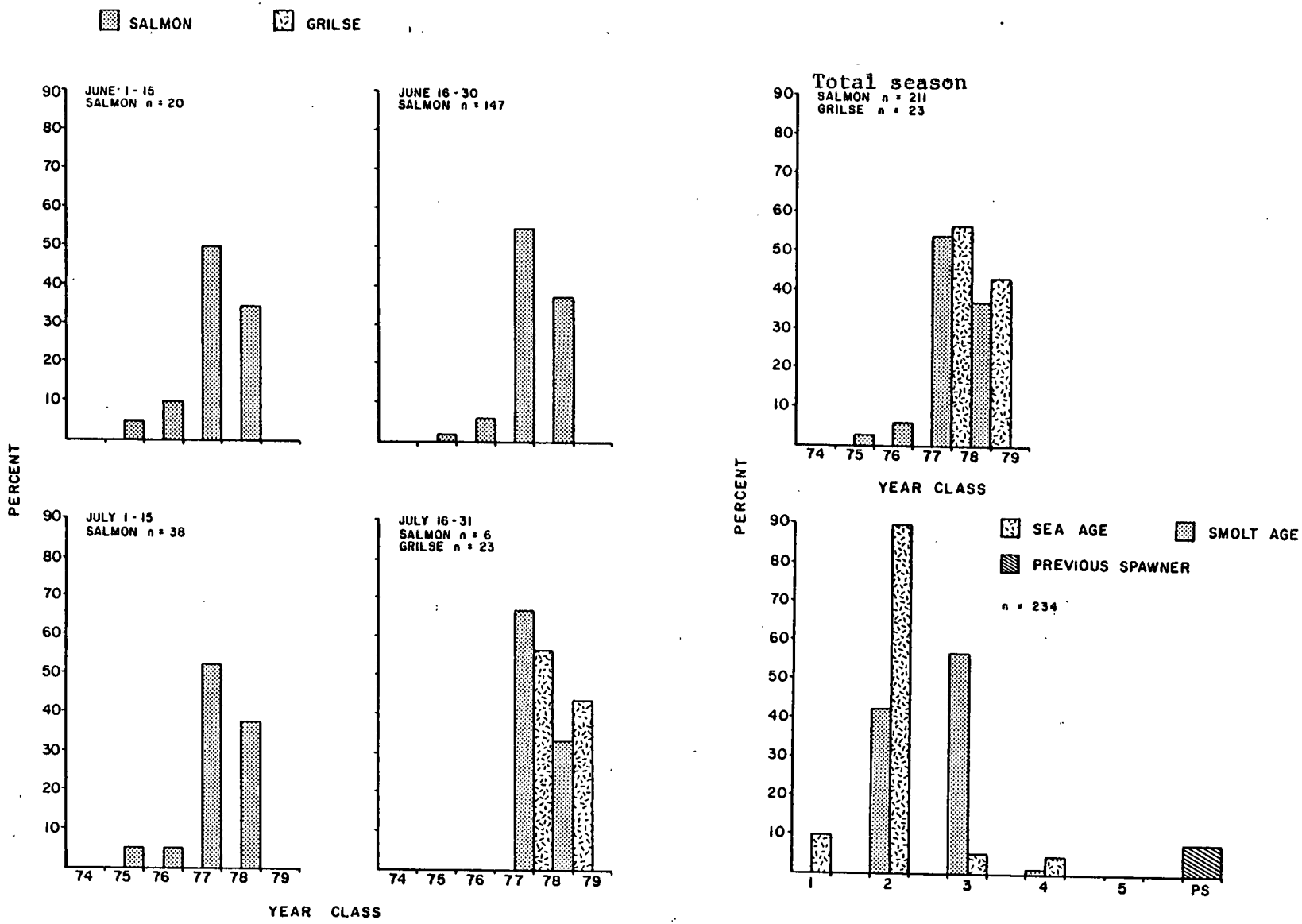

Figure 2: - Bi-monthly breakdown of the year-class composition of adult salmon samples collected in the drift net fishery, Miramichi Bay, 1982.

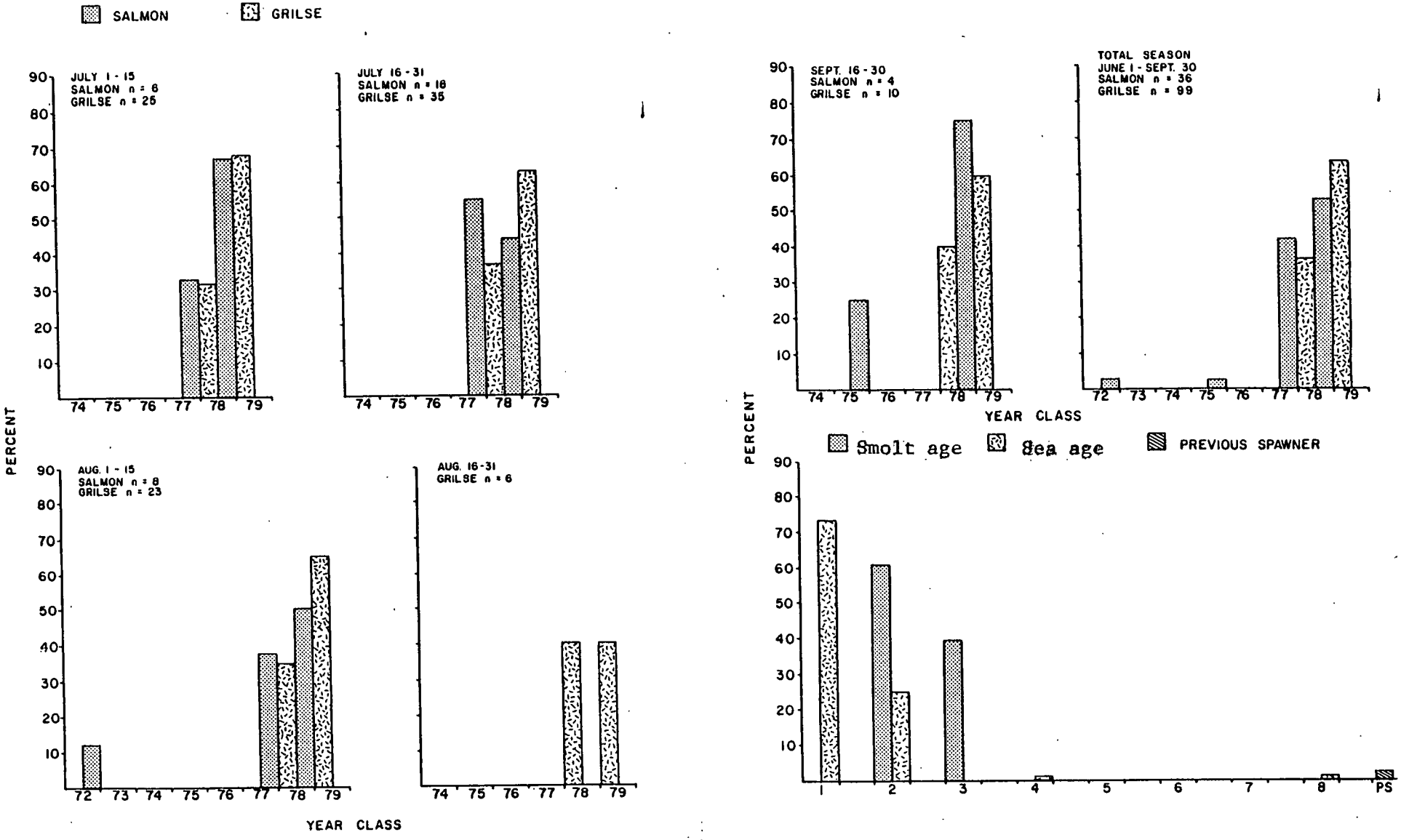

Figure 3: - Bi-monthly breakdown of the year-class composition of adult salmon samples collected from an angling camp on the main S. W. Miramichi, in 1982.

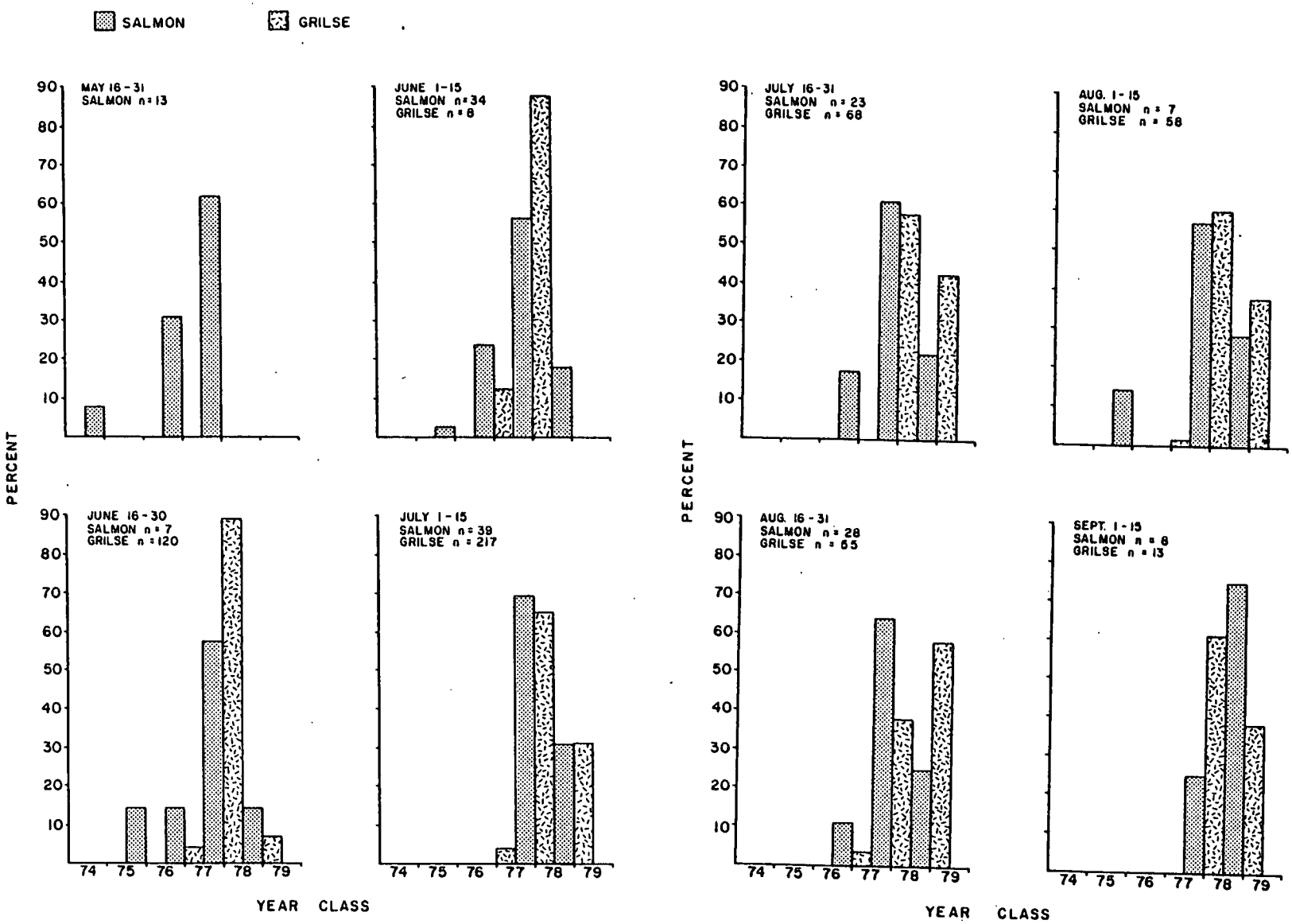

Figure 4: - Bi-monthly breakdown of the year-class composition of adult salmon samples collected at Millbank in 1982.

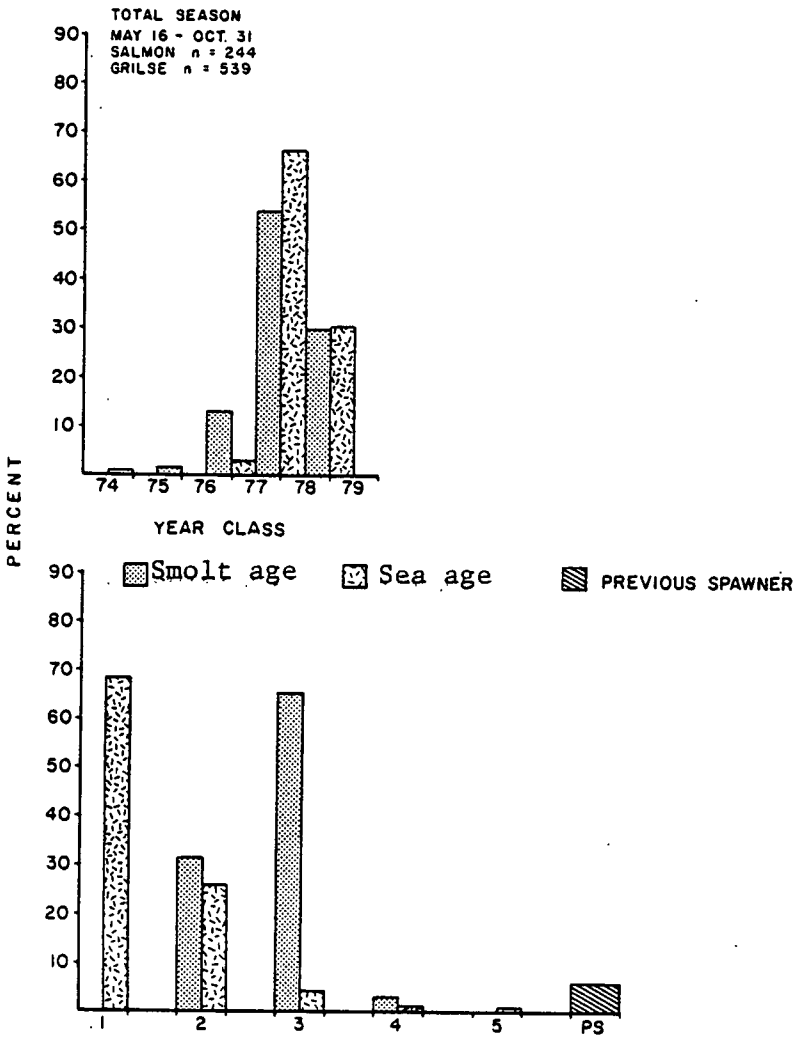

Fig. 4 Cont'd. Upper - percent year-class composition of adult salmon collected at Millbank during the 1982 sampling season. Lower - percent sea age, smolt age and percent previous spawners of salmon caught at Millbank.