



Serial No. 3012
(B.g. 14)

ICNAF Res.Doc. 73/65
(also ICES/ICNAF Salmon Doc. 73/4)

ANNUAL MEETING - JUNE 1973

Review of Atlantic salmon stocks in
major New Brunswick rivers in 1972

by

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INTRODUCTION

In 1972 the Federal Department of the Environment imposed a total commercial salmon fishing ban in water adjacent to and in the estuaries of the Miramichi, Restigouche and Saint John rivers of New Brunswick. In addition, certain angling season and/or bag limit restrictions were instituted on the freshwater stretches of these three river systems. The various restrictions were established because data collected from experimental traps and fences, juvenile salmon population investigations, sport and commercial salmon catch statistics, tagging studies, etc., demonstrated that spawning escapement to the river systems in recent years was critically low.

The results of the restrictive regulations in 1972 are discussed in some detail under the headings of the three river systems. In general, it can be stated that the 1972 monitoring results on these three rivers showed that spawning escapements of early-run large salmon have increased, angling catches of large salmon have been the highest recorded in recent years, the proportion of large salmon in the total run has increased and the grilse runs have continued to be very low.

MIRAMICHI RIVER SYSTEM

Adult Salmon Investigations

Large salmon and grilse have been trapped and tagged at the Millbank estuarial trapping site since 1954, and catches here are indicative of the run size, timing and composition to the system. The Millbank large salmon (2 sea-year and older) catch in 1972 was 1151. This was a significant increase over the 1970 and 1971 catches but much lower than the average yearly catch for the periods 1954 to 1960 and 1961 to 1970 (Table 1).

The total yearly grilse (1 sea-year) catch in 1972 was 2543, and shows a slight increase from the 1971 figure, but the catch is below the average for the period of 1954 to 1960 and 1961 to 1970 (Table 2).

On the basis on catch per fishing day per year (Table 3), the combined grilse and large salmon catch was 24.3 in 1972. This is the third lowest catch recorded, only the 1970 and 1971 catches were lower.

The run composition in 1972 at the Millbank trapping site was 31% large salmon and 69% grilse; in 1971 these percentages were 16.5 and 83.5, respectively, while the average percentages for the period 1961 to 1970 were 18 and 82, respectively. Prior to 1961, the percentage grilse and salmon was roughly 50-50. It is felt that these changes in 1972 were a direct result of the commercial fisheries closure. There is no indication that a larger run of salmon entered the Miramichi system than was expected. Had a commercial fishery been pursued, escapements would have been critically low as in 1971.

A more detailed look at estuarial trap catches during the early (May to August) and late (September to November) run periods is shown in Table 4. The most significant run increases occurred during the early period, with peak catches of large salmon being recorded for the months of July and August in 1972.

Both grilse and large salmon runs during the late-run period were very low.

In Figure 1, daily catches of large salmon at the estuarial trap have been plotted to demonstrate the relative river run size prior to the drastic declines of the late 1960's, during the decline and after commercial salmon restrictions were imposed. The 1957 graph of run size and timing is representative of catches at the trap between 1954 and 1962 when a commercial fishery was operating, and shows a small run of large salmon moving through the estuary during June, July and August and a significantly larger run during the September-October period. The 1970 graph depicts the critical low escapement obtained in that year. The early-run catches have declined further and the formerly large late-run catch has almost disappeared. The 1971 graph showed the benefits from a 7 to 12 day cutback in commercial fishing. Sampling trap catches illustrate the increased run into the river as a result of the partial closure in June. The 1972 graph shows the significant increase in trap catch in June, July and August as a result of total season ban on commercial salmon fishing.

Figure 2 illustrates the potential egg deposition from the Millbank trap catches each year since 1954 with a breakdown of the late-run component. This provides an index of the egg deposition to the system for the last nineteen years. The 1972 potential egg deposition index of 8.2 million is one of the lowest since 1954 but the proportion of early-run eggs is very high. This is a reversal of the situation seen during the period 1954 to 1968 when late-run egg deposition made up the largest proportion.

Data collected from adult tagging studies show late-run bright fish were not harvested by anglers in 1972. In 1971, almost all late-run fish were protected from angling. This situation is a direct result of angling season cutbacks in both 1971 and 1972. Prior to 1971, anglers took a significant proportion of late-run bright fish.

Juvenile Salmon Investigations

Fry, small parr and large parr levels per 100 square yards for the period 1969 to 1972 are shown in Figure 3. It should be noted that the fry population of 4.4/100 sq. yd. was the lowest recorded for the period 1968 to 1972 (Table 5). Thus, the restrictive regulations on the Miramichi in 1971 which affected the commercial fishing for a relatively short time failed to provide an overall increase in fry in 1972. There were indications that one or two of the early-run streams had increased fry levels; however, the late-run streams showed drastically low fry levels -- indicative of a low late-run escapement of large salmon to the Miramichi in 1971.

Wild Smolt Tagging Investigations

Tagging studies on wild Miramichi smolt have been carried out since 1968 and results to date are summarized in Table 6. Greenland and Newfoundland fisheries have accounted for a significant proportion of recaptures. Returns to date show that the Greenland catch/1000 tagged from 1970 tagging has almost doubled that from 1968 and 1969 tagging; either more Miramichi tagged fish than normal were harvested in the 1971 Greenland fishery or tag reporting improved.

It should also be noted that recaptures in Newfoundland waters of 2 sea-year salmon from 1970 smolt tagging is down dramatically. This is possibly a result of the late start of the Newfoundland salmon fishery in 1972 as a result of heavy ice conditions in the spring. Previous tagging studies have shown that large salmon of Miramichi origin tend to be taken earlier in the season in Newfoundland than grilse.

Comparison of the Miramichi ("home river") returns per 1000 smolts tagged show a substantial drop between each succeeding year's tagged group. That is, recovery rate to the Miramichi system from the 1969 tagged smolts was lower

than the 1968 group, and the 1970 tagged smolt recovery were lower than the 1969 group. This declining recovery rate to the Miramichi system is mainly attributed to restrictions placed on the commercial fishing effort; in 1971 a 7 to 12 day reduction of commercial salmon season was imposed and in 1972 a complete ban on commercial salmon fishing was imposed.

In Table 7 percent recaptures of one and two sea-year salmon tagged as smolt in 1968, 1969 and 1970 by all commercial and sport fishing methods are shown. It is significant that the percent recapture of two sea-year fish by commercial fishing has changed from 96.4 and 98.8 for 1968 and 1969 tag returns to 57.1 for 1970 tag returns (fish caught in 1972). This change reflects the total home-water commercial ban in 1972.

RESTIGOUCHE RIVER SYSTEM

Detailed studies aimed at monitoring salmon run size, composition, timing and exploitation rates were started in the Restigouche River system in 1972. Therefore, comparative information over a period of years is not available.

It was apparent, however, from a study of angling and commercial catches over recent years that the situation with respect to spawning escapement was worsening as on the Miramichi. Thus, regulations banning commercial fishing in the Bay of Chaleur and a reduction of the anglers bag limit from 4 to 2 per day were introduced.

Juvenile Salmon Investigations

Fry, small parr and large parr populations were sampled at 22 stations throughout the Restigouche system and density levels were found to be extremely low (Table 8). No background juvenile salmon levels are available for the Restigouche River but if comparisons are made with the normal levels found in other New Brunswick rivers, it appears that the juvenile densities on the Restigouche are well below normal, thus indicating poor escapements in recent years to this system.

SAINT JOHN RIVER

A problem of inadequate salmon escapement to the Saint John River system was identified in 1968, and for the period of 1969 to 1971 partial restrictions were placed on commercial salmon fishing effort to improve the escapement and to provide broodstock for the newly constructed Mactaquac hatchery. Higher escapements were obtained in each of these years but returning stocks remained low, thus, broodstock requirements were reached but adequate numbers for natural seeding of the total system were not obtained. In 1972 the Saint John River was one of the areas included in the commercial salmon fishing ban, and angling on the main river and upper tributaries was closed for the first half of the season.

Adult Salmon Investigations

Several fish counting and monitoring sites are operated on the Saint John River system and thus provide data on the composition, size and timing of the salmon run to the system. The Mactaquac Dam, located ten miles above Fredericton, is equipped with fish collection facilities so a direct count of the run is possible at this site. Salmon broodstock for the Mactaquac hatchery is obtained at this location and the remainder of the run is trucked upriver and released at various locations. Details on the counts taken at this facility and the subsequent distribution of the salmon for the period of 1968 to 1972 is shown in Table 9. The total 1972 salmon count was the highest recorded since the dam was completed in 1968 and over 80% of the run was large salmon (2 sea-years and older). In previous years, the large salmon component was less than 50% of the total run. The 1972 grilse count was the lowest recorded in this five-year period.

In 1972 a salmon counting fence was installed on the Nashwaak River, a major salmon tributary located below the Mactaquac Dam. This fence was only completed by mid-August and operated from August 18 to October 19. A total of 1147

salmon were counted through the fence of which 70% were large salmon and 30% grilse. This is the first year of fence operation so no previous comparison can be made.

Sampling traps have been fished in the estuary for a number of years to obtain fish for distribution studies. One sampling trap has been operated at the same location over a three-year period and provides data on the composition of the run over this period. The catches for the 1970 to 1972 period are shown below:

<u>Year</u>	<u>Salmon</u>	<u>Grilse</u>	<u>Total</u>
1970	64	214	278
1971	79	226	305
1972	98	57	155

This sampling site shows a similar trend in the composition of the run as noted at the upriver counting sites. There was a sharp drop in the grilse catch in 1972 and a notable increase in large salmon.

The increase run of large salmon to the river in 1972 is considered to be a direct result of the commercial fishing ban, as the commercial fishing operations exploited mainly the large salmon stock and took relatively few grilse. The decline in the 1972 grilse run to the river, particularly to the system above the Mactaquac Dam, is attributed to the extremely low recruitment resulting from the sharp drop in spawning escapement commencing in 1967.

Juvenile Salmon Investigations

Assessment of juvenile salmon have been made by electrofishing since 1968. In this period, fry and small parr densities were found to be well below normal abundance levels in all areas and to be extremely low in the Tobique River, a major tributary located above the three hydroelectric dams. No major improvements in juvenile densities were found in 1972. Therefore, adult runs are expected to remain low for the next three to four years.

Table 1. Summary of large salmon counts at the Millbank estuarial trap for the period 1954 to 1972 (bright fish only).

N/F - Trap not fished.

Year	NUMBER OF LARGE SALMON CAUGHT			Total for Year
	May-July Inclusive	August	Sept-Nov Inclusive	
1954	283	109	1,783	2,130
1955	94	5	2,747	2,846
1956	102	160	3,098	3,361
1957	137	383	3,345	3,865
1958	284	265	3,821	4,370
1959	112	95	4,114	4,321
1960	202	14	4,315	4,531
Average (7 yrs)	<u>167.1</u>	<u>147.5</u>	<u>3,317.6</u>	<u>3,632.0</u>
1961	269	86	2,634	2,989
1962	208	46	1,661	1,915
1963	128	56	1,455	1,639
1964	156	54	797	1,007
1965	335	64	1,402	1,801
1966	232	77	1,323	1,632
1967	53	19	928	1,000
1968	148	144	1,122	1,414
1969	290	49	328	667
1970	112	13	120	245
Average (10 yrs)	<u>193.1</u>	<u>60.8</u>	<u>1,177.0</u>	<u>1,430.9</u>
1971	368	2	24	394
1972	548	386	217	1,151

Table 2. Summary of grilse counts at the Millbank estuarial trap for the period 1954 to 1972 (bright fish only).

N/F - Trap not fished

Year	NUMBER OF GRILSE CAUGHT			Total for Year
	May-July Inclusive	August	Sept-Nov Inclusive	
1954	700	206	927	1,833
1955	601	45	1,161	1,807
1956	713	430	2,290	3,433
1957	574	761	2,706	4,041
1958	1,434	715	6,250	8,402
1959	586	116	1,400	2,102
1960	1,043	32	3,394	4,469
Average (7 yrs)	<u>807.7</u>	<u>329.3</u>	<u>2,589.7</u>	<u>3,726.7</u>
1961	1,901	312	4,639	6,852
1962	1,387	189	1,399	2,975
1963	2,302	463	11,343	14,108
1964	3,781	822	4,270	8,873
1965	3,966	1,056	10,559	15,581
1966	3,555	1,008	5,426	9,989
1967	1,038	467	6,215	7,720
1968	1,560	929	725	3,214
1969	2,631	593	1,116	4,340
1970	1,643	183	658	2,484
Average (10 yrs)	<u>2,376.4</u>	<u>602.2</u>	<u>4,635.0</u>	<u>7,613.6</u>
1971	1,778	71	113	1,962
1972	1,710	667	116	2,543

Table 3. Combined grilse and large salmon catch per fishing day per year and percentage composition of adult run, 1954-1972.

Year	Total Gr. & Lg. Sal. Catch/fishing day/year	Av. Catch/Fishing day/year		Percentage of Total Catch/fishing day/year	
		GR.	LG. SAL.	GR.	LG. SAL.
1954	26.1	12.1	14.0	46.4	53.6
1955	29.3	11.4	17.9	38.9	61.1
1956	47.2	23.8	23.3	50.5	49.5
1957	53.4	27.3	26.1	51.1	48.9
1958	84.0	55.3	28.75	65.8	34.2
1959	42.3	13.8	28.4	32.7	67.3
1960	53.5	26.5	27.1	49.4	50.6
7 year Average	<u>47.97</u>	<u>24.3</u>	<u>23.65</u>	<u>47.8</u>	<u>52.1</u>
1961	61.9	43.1	18.8	69.6	30.4
1962	28.3	17.2	11.1	60.8	39.2
1963	107.1	96.0	11.2	89.6	10.4
1964	64.6	58.0	6.6	89.8	10.2
1965	114.4	102.5	11.8	89.6	10.4
1966	76.4	65.7	10.7	86.0	14.0
1967	60.1	53.2	6.9	88.5	11.5
1968	29.9	20.7	9.1	69.4	30.6
1969	33.8	29.3	4.5	86.7	13.3
1970	18.6	16.9	1.7	90.8	9.2
10 year Average	<u>59.08</u>	<u>49.72</u>	<u>9.34</u>	<u>82.1</u>	<u>17.9</u>
1971	15.8	13.2	2.6	83.5	16.5
1972	24.3	16.7	7.6	68.7	31.3

Table 4. Catch per fishing day per month at the Miramichi estuarial sampling trap (Millbank) for the period 1954 to 1972.

N/F - not fished

		CATCH PER FISHING DAY			
Stage	Month	1972	1971	Average 1961-70	Average 1954-60
Large Salmon	May	0.9	0	0.6	1.5
	June	6.3	11.3	2.8	2.2
	July	11.8	1.5	4.0	3.6
	Aug.	12.4	0.1	2.2	5.3
	Sept.	6.5	0.4	33.1	83.1
	Oct.	1.3	0.4	10.7	34.1
	Nov.	N/F	0.1	0.2	2.5
Grilse	May	0	0	0.1	0.1
	June	8.7	17.2	18.0	10.3
	July	48.3	49.2	67.7	22.9
	Aug.	21.5	3.0	21.7	11.6
	Sept.	5.5	3.5	158.0	69.6
	Oct.	0.5	1.0	16.0	25.9
	Nov.	N/F	0.1	0.3	0.9

Table 5. Mean densities of Atlantic salmon as determined by electro-seining in the Miramichi River System.

<u>MIRAMICHI TOTAL</u>												
<u>Year</u>	<u>n</u>	<u>Fry</u>		<u>mean</u>	<u>n</u>	<u>Small parr</u>		<u>mean</u>	<u>n</u>	<u>Large parr</u>		<u>mean</u>
		<u><1</u>	<u>range</u>			<u><1</u>	<u>range</u>			<u><1</u>	<u>range</u>	
1969	14	<1	25.1	5.19	14	<1	42.2	11.64	13	<1	6.2	2.38
1970	50	<1	129.8	10.50	50	<1	14.0	2.67	50	<1	16.3	3.97
1971	73	<1	71.0	12.48	73	<1	45.0	4.62	73	<1	12.5	1.66
1972	71	<1	50.8	4.42	71	<1	38.6	4.04	71	<1	16.2	1.88
Overall	208	1	129.8	8.76	208	1	45.0	4.38	207	1	16.3	2.34

Table 6. Total recaptures and number recaptured per 1000 tagged at Millbank on the Miramichi estuary, 1968 to 1971. Returns of 2 sea year fish tagged in 1970 and grilse tagged in 1971 effected by commercial fishing ban.

* - Returns considered incomplete at this time. () number tagged.

		YEAR TAGGED					
		1968 (3,421)		1969 (8,684)		*1970 (6,835)	
Recapture Site	Sea Age at Recapture	Total Number	no./1000	Total Number	no./1000	Total Number	no./1000
Greenland	1	13	3.8	30	3.5	47	6.9
	2	2	0.6	3	0.3	3	0.4
Newfoundland	1	8	2.3	32	3.7	24	3.5
	2	8	2.3	38	4.4	5	0.7
Miramichi System	1	34	9.9	47	5.4	27	3.9
	2	46	13.4	27	3.1	11	1.6
	3	2	0.6	1	0.1	-	-
Misc.	1	2	0.6	1	0.1	0	-
	2	0	-	2	0.2	2	0.3
TOTAL		115	33.6	181	20.8	119	17.4

Table 7. Exploitation rate of wild Miramichi Atlantic salmon tagged as smolt at Millbank between 1968 and 1970 by commercial (home and distant waters) and sport fisheries. Percentage based on total recaptures.

SEA AGE AT RECAPTURE				
Year Tagged	1		2	
	Commercial Catch	Sport Catch	Commercial Catch	Sport Catch
1968	69.5	30.5	96.4	3.6
1969	75.0	25.0	98.8	1.2
1970	80.2	19.8	57.1	42.9

Table 8. Mean densities of Atlantic salmon per 100 square yards, as determined by electroseining in the Restigouche River System, 1972.

Stream	# Sites	Mean Densities/100 sq. yd.		
		Fry	Sm. Parr	Lg. Parr
Main Restigouche R.	7	7.9	3.6	<1
NW Upsalquitch R.	1	2.9	<1	<1
Falls Bk.	2	<1	<1	<1
Kedgwick R.	4	9.3	<1	<1
Belle Kedgwick R.	1	2.6	<1	<1
N. Kedgwick R.	2	3.6	6.0	2.2
S. Kedgwick R.	2	<1	<1	1.6
Gounamitz R.	3	5.8	1.4	<1
N. Gounamitz R.	1	<1	1.6	<1
Five Fingers Bk.	1	<1	2.6	1.2
Jardine Bk.	1	<1	1.2	<1
Little Main Restigouche R.	2	1.1	<1	<1
Overall Means:		4.0	1.6	0.8
Total Number of Estimates:		22	22	22

Table 9. Salmon distribution from Mactaquac, Saint John, N.B.

Area of Release	1972		1971		1970		1969		1968					
	Salmon	Grilse Total	Salmon	Grilse Total	Salmon	Grilse Total	Salmon	Grilse Total	Salmon	Grilse Total				
Brookstock at S.														
Esk														
Spring Collection			323	8	331	354	23	377	263	48	311	190	21	211
Summer Collection			209	132	341	450	62	512	553	146	699	359	239	598
Fall Collection			88	93	181	95	23	118	104	26	130	68	12	80
Sub-total (Brood-stock)	270	49	319	233	853	899	108	1007	920	220	1140	617	272	889
Tobique River	2431	316	2747	802	2119	1184	2061	3245	691	1843	2534	74	346	420
Hartland-Woodstock area	2498	597	3095	961	1276	346	759	1105	116	497	613	74	556	630
Headpond at Mactaquac Dam	269	36	305	1	3	-	2	2	-	-	-	1	14	15
Sub-total (upriver stock)	5198	949	6147	1633	3398	1530	2822	4352	807	2340	3147	149	916	1065
Released below Mactaquac Dam	-	-	-	2	34	36	14	18	32	-	-	-	-	-
Mortalities and Experimental	42	16	58	21	28	49	6	26	22	12	34	5	14	19
Up hatchery trans. channel	196	118	314	4	132	136	-	-	-	-	-	-	-	-
Total by salmon trap net												19	-	19
Total salmon through F'way	5314	896	6210	2272	1928	4200	2249	5417	1749	2572	4321	752	1203	1954
Total captured in Mactaquac area	5510	1014	6524	2276	2060	4336	2249	5417	1749	2572	4321	771	1202	1973

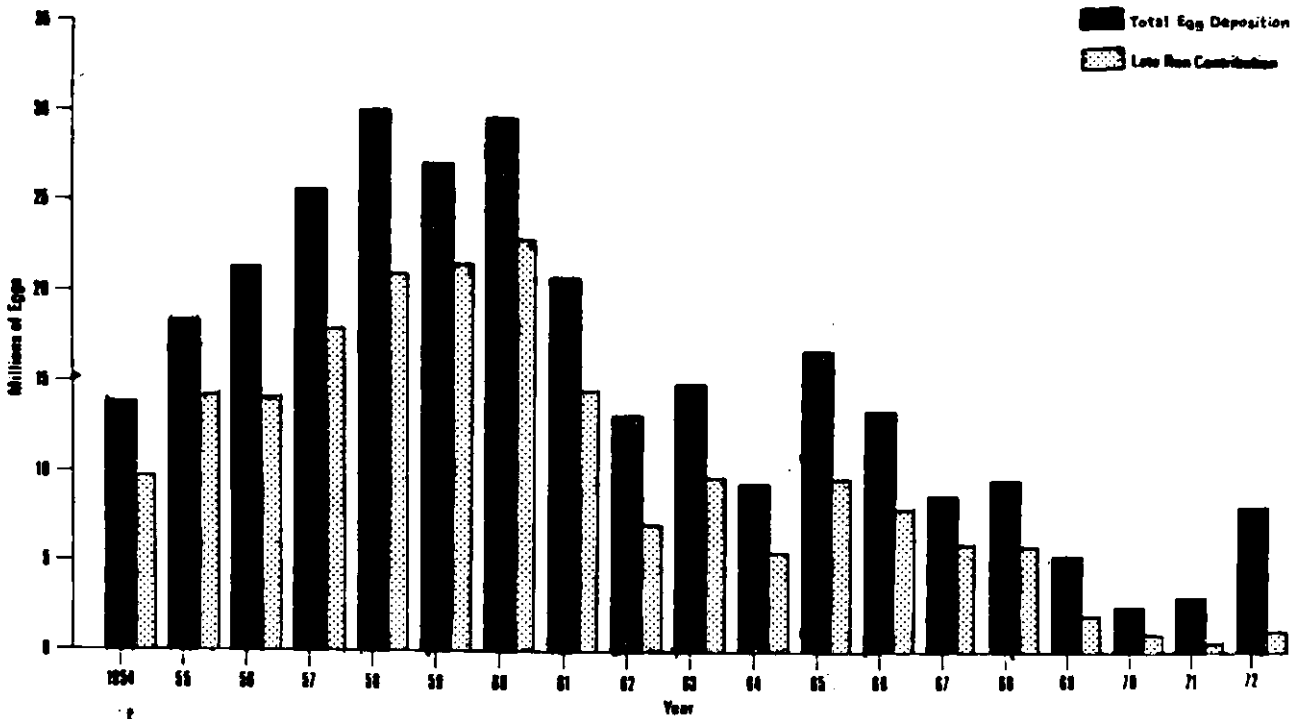


Figure 2 . Potential egg deposition represented by grilse and large salmon passing through Millbank, 1954 to 1972.

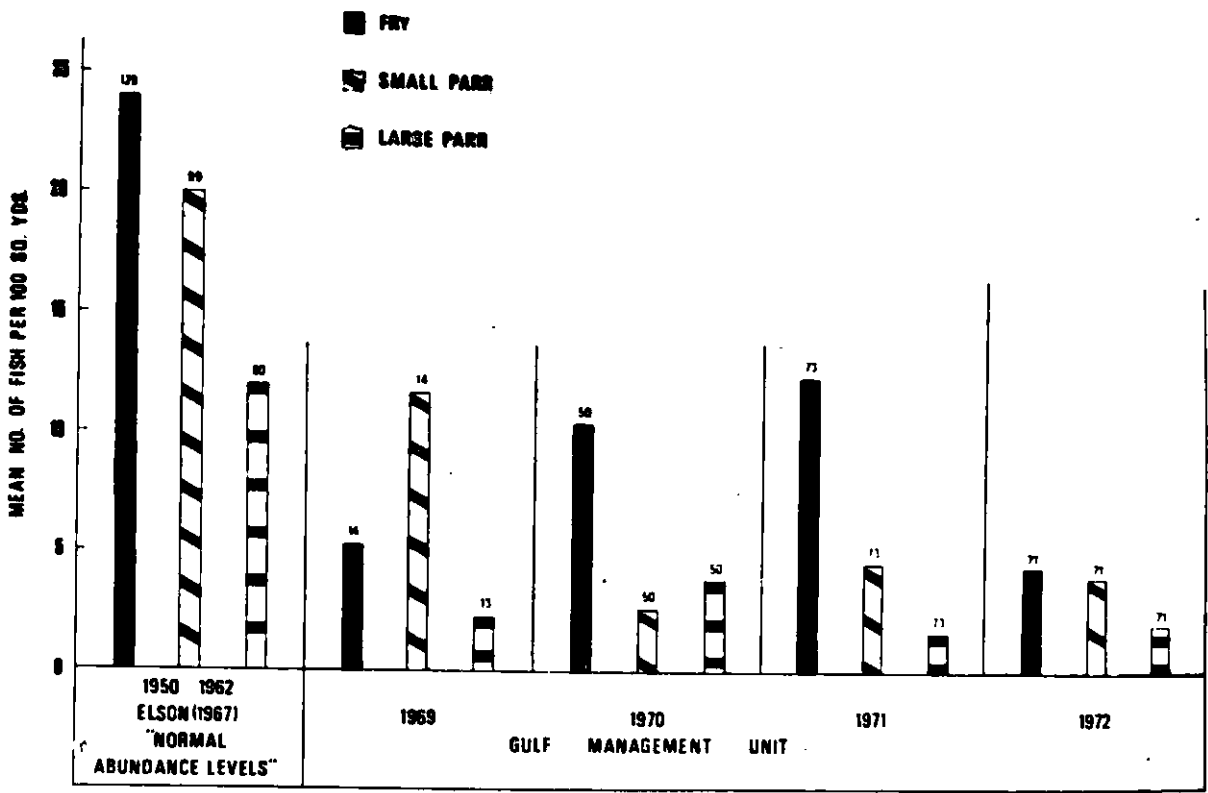


Figure 3 . Juvenile salmon population levels Miramichi River, 1969 to 1972, compared with levels attained by Elson (1967) for the Miramichi.

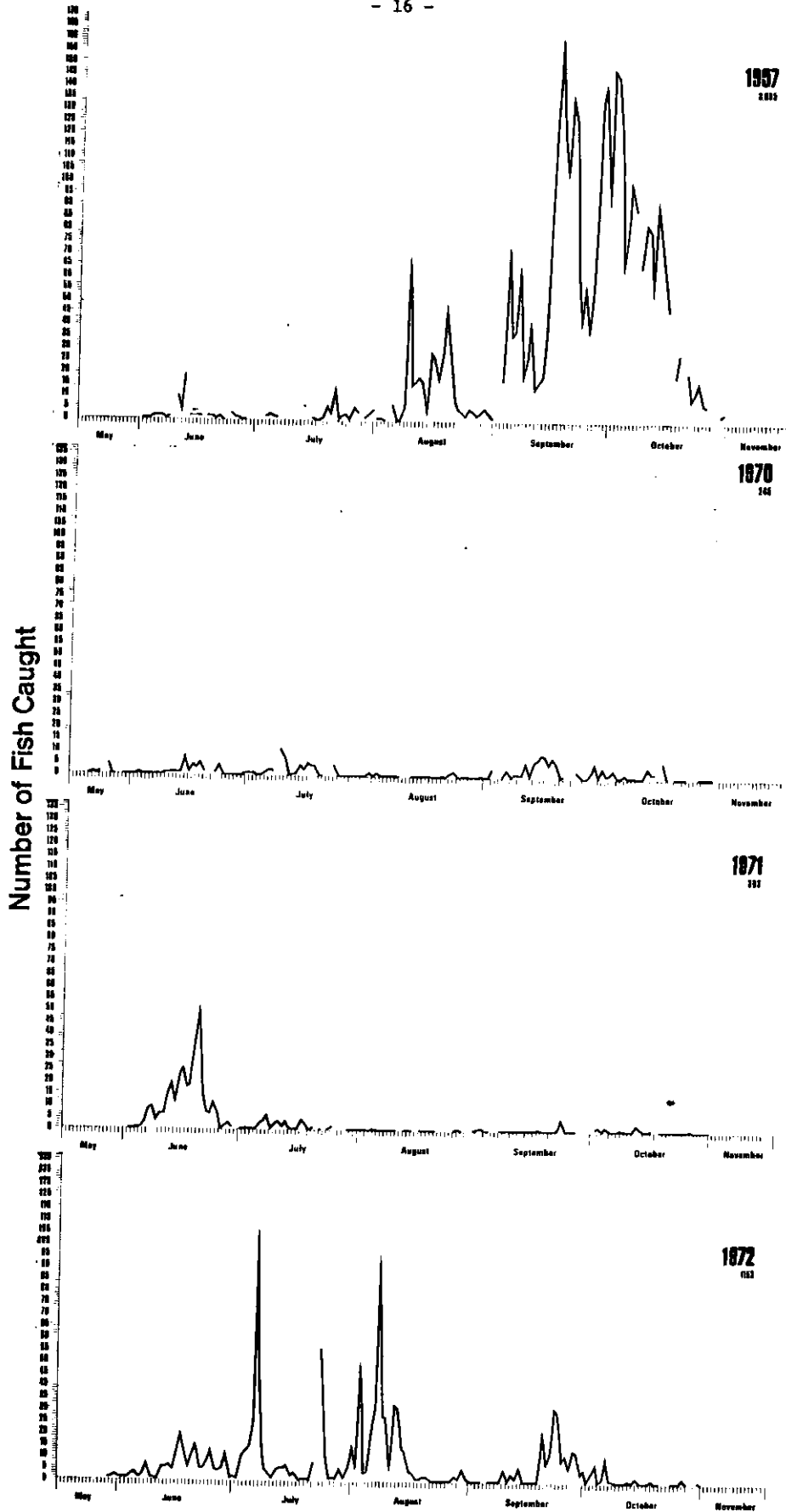


Figure 1. Daily large salmon catches at the Millbank estuarial trap for four selected years. The 1957 graph represents a typical year's catch in the 1950's and the 1970 graph represents a year of severe declines in late run stocks, both prior to any commercial restrictions. The 1971 graph shows the catch with a two week commercial close in June and the 1972 graph shows the catch with multiple peaks.