**Assessment of Atlantic salmon,
Salmo salar, in the Margaree River,
Nova Scotia, 1986**

by

R.R. Claytor and C. Léger
Science Branch, Gulf Region
Department of Fisheries and Oceans
P.O. Box 5030
Moncton, New Brunswick
E1C 9B6

ABSTRACT

The 1986 1SW and MSW salmon sport catch surpassed 1985 values, and the MSW sport catch was the greatest recorded since 1947. Nineteen eighty-four and 1985 sport catch estimated from license stub returns were 1.5 to 3.5 times the DFO values reported for these years. Most MSW salmon were taken in the fall portion of the run, while most 1SW salmon were caught in the summer portion.

In 1986, spawning requirements were met for the first time since 1947. Confidence in this conclusion is based on: (1) egg deposition estimated with a conservative measure of sport catch (DFO statistics); (2) egg deposition requirements have been met using the higher (37.9%) exploitation rate in the calculation; (3) even if an exploitation rate as high as 80% is used to calculate egg deposition, spawning requirements have been met; (4) MSW salmon entering the river after the angling season will also contribute to egg deposition.

MSW returns in 1987 are predicted to be similar to 1985 and 1986.

RÉSUMÉ

Les prises sportives pour l'année 1986 de saumons unibermarins et rédibermarins ont surpassé celles de 1985, et les prises de rédibermarins ont été les plus importantes enregistrées depuis 1947.

Pour les années 1984 et 1985, les évaluations des prises sportives calculées d'après les retours de talons de permis de pêche furent de 1.5 à 3.5 fois supérieures aux évaluations émises par le MPO pour ces mêmes années. La plupart des prises de saumons rédibermarins eurent lieu pendant l'automne et celles des unibermarins s'effectuèrent surtout pendant l'été.

En 1986, les besoins minimaux en géniteurs pour le maintien du stock ont été réalisés pour la première fois depuis 1947. Cette conclusion se fonde sur les facteurs suivants: (1) l'importance de la ponte fut évaluée d'après l'estimation la plus prudente des prises sportives (les données du MPO); (2) les calculs effectués avec le plus haut des taux estimatifs d'exploitation (37.9%) indiquent que le niveau minimal requis de ponte a été réalisé; (3) même si l'importance de la ponte eût été calculée d'après un taux d'exploitation de 80%, le niveau minimal requis de ponte serait réalisé; (4) la contribution d'oeufs des saumons rédibermarins étant arrivés en eau douce après la fin de la saison de pêche sportive n'apparaît pas dans les calculs.

On prévoit que les retours de rédibermarins en 1987 seront semblables à ceux de 1985 et 1986.

INTRODUCTION

The purpose of this paper is to provide an assessment of the Margaree River Atlantic salmon stock in 1986. The number of spawners required to meet egg deposition requirements has assumed all egg deposition will come from MSW (two-sea-winter and older) salmon. Spawning escapement is estimated using sport catch as an index of abundance. Forecasts concerning 1987 returns are reported.

The Margaree River is located on Cape Breton Island, Inverness County, Nova Scotia. Two principal branches, the Northeast Margaree and Southwest Margaree, meet at Margaree Forks to form the Main Margaree which flows into the Gulf of St. Lawrence. Most of the Atlantic salmon angling occurs in the Main Margaree and Northeast Margaree rivers. Margaree River salmon stocks are composed of two runs: the summer run enters the river up to the end of August; and the fall run, after September 1.

Since 1979, efforts to increase the summer component of the Atlantic salmon stock has consisted of regulatory restrictions and introduction of hatchery-reared progeny from early-run fish. Anglers have been required to release MSW salmon during the early-run (before September 1) since 1979. In 1985 and 1986, all MSW salmon were released regardless of date caught. In 1984, there was a reduction in the commercial fishery from eight to three weeks. There was no commercial fishery in 1985 and 1986.

METHODS

Landings

Angling records from 1947-1986 were provided by fishery officers, Department of Fisheries and Oceans, Margaree Forks, Nova Scotia. Sport catches for 1984 and 1985 were also obtained from Nova Scotia license stub returns (O'Neil et al. 1985b, 1986). Commercial landings (1947-1984) have been included (Claytor and Chadwick 1985).

Spawning requirements

The required number of spawners was calculated using the method (Method 2) recommended by Randall (1985) for the Miramichi River. The number of spawners required to meet egg deposition requirements was calculated presuming that all egg deposition came from MSW salmon. The numbers of 1SW salmon required were calculated assuming that at least one male spawner was needed for each female MSW salmon.

The characteristics used to determine the spawning requirements were essentially those given by Gray and Chadwick (1984) and are repeated below:

Egg deposition rate	=	2.4 eggs/m^2 (Elson 1975)
Rearing area	=	2,797,600 m^2 (Marshall 1982)
Fecundity MSW	=	1,764 eggs/kg (Elson 1975)
1SW	=	1,764 eggs/kg (Elson 1975)
Mean weight MSW	=	4.9 kg (Marshall 1982)
1SW	=	1.7 kg (Marshall 1982)
Eggs per MSW	=	6,482 eggs = 1,764 x 4.9 x .75
1SW	=	330 eggs = 1,764 x 1.7 x .11
Eggs per fish	=	(6,482 x .75) + (330 x .25) = 4,945
Sex ratio male/female MSW	=	25:75 (Marshall 1982)
1SW	=	89:11 (Marshall 1982)
1SW/MSW salmon ratio	=	25:75 (described below)

Sex and 1SW/MSW salmon ratios were reevaluated using data obtained from hatchery broodstock collections made in August and September 1982-1986. The 1SW:MSW ratio in the sport catch from 1947-1978 was derived using 6.0 pounds as the division between 1SW and MSW salmon (Claytor and Chadwick 1985). All fish in the angling catch less than or equal to 6.0 pounds were considered 1SW salmon; those over 6.0 pounds, MSW salmon.

From 1979-1985, the 1SW salmon component of the sport catch has increased dramatically (1SW:MSW = 71:29). This increase has probably resulted from an increasing influence of hatchery stocking (Gray and Chadwick 1984). It is felt that the sport catch composition from 1947-1978 is a better representation of the wild stock.

Spawning escapements

Spawning escapement has been derived from DFO angling catch statistics using exploitation rates from previous assessments, 20.6 and 37.9% (Hayes 1949; Marshall 1982; Gray and Chadwick 1984). The possibility of using juvenile densities as a method of estimating spawning escapement was investigated by examining correlations with DFO sport catch. 1+ parr densities from sites sampled in 1986 were added to the data set used to examine correlations with DFO sport catch in Claytor and Chadwick (1985). Correlations between sport catch (year i-2) and 1+ parr densities (year i) were determined using SAS (1986). Sites used in 1986 were chosen with the assistance of Leslie Ingraham, Margaree Valley, Nova Scotia, a member of electrofishing crews from 1957-1969, 1975-1979. Hence, sites are as similar as possible to those previously sampled. Initially, correlations between DFO MSW salmon sport catch and 1+ parr densities at each site were determined. A pooled 1+ parr density was calculated by dividing the sum of estimated numbers by sum of areas.

Egg deposition

Total egg deposition from 1SW and MSW salmon was calculated as described below:

$$\frac{\text{Sport catch (SC)}}{\text{Sport catch (SC) + Spawners}} = \text{Exploitation rate (ER)}$$

$$\frac{\text{SC (1 - ER)}}{\text{ER}} = \text{Spawners}$$

For years in which there were hook-and-release regulations, 1979-1986, the MSW salmon caught and released were added to the number of spawners calculated as above.

For all years, egg deposition was calculated as the number of 1SW or MSW spawners times the eggs per 1SW or MSW fish (see above). The eggs obtained from broodstock collections were subtracted from the above egg deposition values.

Forecast

The regression equation (MSW catch year [i+5] = 112.49 + 0.23 x [year i angling catch]) (Claytor and Chadwick 1985) was used to predict MSW returns in 1987. This equation is based on DFO sport catch statistics for years (1947-1984) prior to closure of the commercial fishery and implementation of universal hook-and-release regulations for MSW salmon.

RESULTS

Landings

Commercial landings (1967-1984) are presented in Table 1, DFO sport catch statistics (1947-1986) in Table 2, and Nova Scotia license returns (1984-1985) in Table 3. 1SW sport catch based on license returns was 1.5-2.0 times DFO estimates in 1984 and 1985. MSW sport catch based on license returns was 2.5-3.5 times DFO estimates in 1984 and 1985 (Tables 2, 3). Nineteen eighty-six MSW sport catch as estimated by DFO was the greatest since 1947 (Table 2).

MSW salmon sport catch steadily declined from 1947-1961 (R^2 = 0.63, P < 0.01) and again from 1962-1976 (R^2 = 0.74, P < 0.01), and remained relatively constant between 1977-1984. Substantial increases in MSW salmon sport catch occurred in 1985 and 1986 (Fig. 1). 1SW sport catch was relatively constant from 1947-1978. Higher than average 1SW catches have occurred since 1979, with the exception of 1983 (Fig. 1).

Most of the MSW salmon caught in 1986 were taken in the fall run, and proportions are very similar to those for long-term trends (1947-1978) (Table 4). However, most 1SW salmon were caught during the summer run. The complete MSW:1SW salmon ratio in the angling catch was very similar to long-term trends (1947-1978) (Table 4).

Spawning requirements

The spawning requirements of the Margaree River were found to be 1,036 MSW and 579 1SW salmon. These figures were derived as given below:

(1) egg requirements   = 2.4 eggs m^{-2} x $2,797,600$ m^2
                        = $6,714,600$ eggs

(2) eggs/MSW salmon   = $8,643$ eggs/MSW x $.75$ (females)
                        = $6,482$

(3) required number of MSW = $6,714,600 \div 6,482$
                            = $1,036$

   number of female MSW   = $1,036$ x $.75$
                           = 776

   number of male MSW   = $260 = 1,036 - 776$

   number of male 1SW   = $516 = 776-260$

   number of 1SW   = $579 = 516 \div .89$

Using the above requirements, MSW salmon account for 100% of the egg deposition requirements and 97% of the total egg deposition.

Spawning escapement, egg deposition and exploitation rate

A significant correlation between MSW salmon sport catch and juvenile densities at individual sites was found only for MacLeod's (Table 5). Correlations between pooled densities and MSW sport catch were significant when data from 1957-1960, 1975-1979 and 1986 were included. However, when data from 1957 was eliminated, these correlations were not significant (Fig. 2). As a result, the 12.9% exploitation rate previously derived using pooled 1+ parr densities (year i) to determine number of spawners (year i-2) (Claytor and Chadwick 1985) was not used in this assessment. For the first time since 1947, egg deposition requirements have been met using either the 20.6 or 37.9% rate (Table 6; Fig. 3).

Forecast

The 1987 angling catch predicted from 1982 catch is 154. However, as discussed below, returns in 1987 are expected to be at least twice this value.

DISCUSSION

Landings

Sport catch using license stub returns in 1984 and 1985 have been based on 90% angler response (O'Neil et al. 1985b; O'Neil et al. 1986) and are 1.5-3.5 times DFO estimates. There is potential bias associated with both estimates. Because of under-reporting DFO statistics may underestimate catch and returns. License returns may overestimate catch and returns as a result of variability among anglers in defining a hooked and potentially landed fish. A means of resolving the difference between these estimates will be very important for future assessments.

DFO statistics have been used in this assessment for two reasons: (1) they are assumed to represent a consistent measure of catch among years and (2) there are insufficient years of license return data to investigate correlations between estimating methods.

Spawning requirements, escapement and egg deposition

A combination of factors contribute to a relatively high degree of confidence in the statement that spawning requirements have been met. (1) Egg deposition has been calculated using DFO statistics, a conservative estimate of sport catch. (2) For the first time since 1947, egg deposition requirements have been met using the higher (37.9%) estimate of exploitation rate in the calculations. (3) Even if the exploitation rate is as high as 80%, egg deposition requirements have been met. (4) MSW salmon entering the river after the angling season will also contribute to egg deposition.

Additional research is still required to determine the exploitation rate over the entire angling season, the number of fish entering the river after angling season, and an independent method of estimating the number of MSW fish returning to the river.

Forecast

Management strategies affecting returns to the Margaree River are release of progeny from early-run parents (Tables 7, 8, 9), release of all MSW salmon hooked in the sport fishery and closure of the commercial fishery. Returns to Margaree River are predicted from a regression between MSW sport catch (year i) and MSW sport catch (year i+5) (Claytor and Chadwick 1985). This regression was calculated using years (1947-1984) prior to universal hook-and-release regulations and closure of the commercial fishery, and predicts returns similar to 1985 and 1986 in 1987. DFO sport catch in 1985 was twice the predicted value while 1986 sport catch was five times the value predicted from this equation. Returns to nearby Chéticamp River in 1986 (555) were three times 1984-1985 means (215). Hence, it is concluded that if management practices for 1987 remain the same as 1985 and 1986 that

MSW salmon returns in 1987 will be similar to the past two years. Because the forecasting method is based on returns resulting from a management plan that is different from the one currently in effect, finding a reliable method of predicting returns will be important for future assessments.

Hatchery contribution and broodstock characteristics

The sex ratio of male/female 1SW salmon taken in broodstock collections since 1982 has been 96:4 and 24:76 for MSW salmon. The wild 1SW/MSW salmon ratio has been 23:77 (Table 9). These ratios are similar to values used in past assessments (Marshall 1982). The proportion of hatchery return/wild fish in these collections has been nearly 50:50 (Table 9) suggesting that hatchery returns are a substantial segment of early returns to the river. Broodstock collections are typically made from mid-August to mid-September at relatively few sites and are a limited sampling of the run. Hence, additional research is required to determine sex ratios and proportion of hatchery to wild fish over the entire run.

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Table 1. Commercial landings for Zone 6 (1967-1984) in kg.

	Northumberland Strait-NS Fisheries Statistical District				Gulf Cape Breton-NS Fisheries Statistical District			Gulf NS
Year	11	12	13	Subtotal	2	3	Subtotal	Zone 6 total (kg)
1967		10,503	29,885	40,388	10,728	2,124	12,852	53,240
1968	1,175	9,495	14,949	25,619	10,480	2,057	12,537	38,156
1969		9,968	11,050	21,018	7,831	1,598	9,429	30,447
1970		4,605	13,015	17,620	12,760	114	12,874	30,494
1971		1,689	5,597	7,286	4,485	255	4,740	12,026
1972		5,155	18,714	23,869	7,026	996	8,022	31,891
1973		2,562	15,788	18,350	8,043	1,297	9,340	27,690
1974		5,742	17,437	23,179	11,213	3,045	14,258	37,437
1975		2,080	9,824	11,904	10,670	1,057	11,727	23,631
1976		1,606	5,845	7,451	9,954	956	10,910	18,361
1977		4,137	9,171	13,308	11,490	1,423	12,913	26,221
1978		2,940	15,907	18,847	10,691	678	11,369	30,216
1979		169	4,549	4,718	3,117	82	3,199	7,917
1980		2,534	11,932	14,466	9,088	858	9,946	24,412
1981		1,822	8,283	10,105	4,978	479	5,457	15,562
1982		2,805	13,680	16,485	8,704	1,475	10,179	26,664
1983		1,863	9,770	11,633	11,621	1,026	12,647	24,280
1984		1,097	7,850	8,947	5,291	902	6,193	15,140

Table 2.   Angling catch on Margaree River (1947-1986) as compiled by Department of Fisheries and Oceans.

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Year	1SW	MSW			Total	Rod-days[1]	CUE
		Retained	Released	Total			
1947	37	363			400		
1948	106	704			810		
1949	50	332			382		
1950	119	320			439		
1951	46	424			470	2,610	0.212
1952	87	204			291	2,265	0.143
1953	57	291			348	2,145	0.179
1954	78	298			376	1,965	0.224
1955	53	258			311	1,650	0.209
1956	29	90			119	1,380	0.110
1957	36	136			172	1,215	0.152
1958[2]	N/A	N/A			334	1,275	0.762
1959[2]	N/A	N/A			235	1,110	0.212
1960[2]	N/A	N/A			140	1,050	0.133
1961	40	49			89	1,035	0.142
1962	46	410			456	1,240	0.407
1963	87	212			299	1,190	0.281
1964	120	289			409	2,243	0.185
1965	86	254			340	2,769	0.128
1966	92	165			257	2,482	0.113
1967	92	210			302	2,801	0.133
1968	63	197			260	3,274	0.082
1969	206	136			342	2,762	0.129
1970	85	214			299	2,612	0.116
1971	21	92			113	2,332	0.050
1972	41	106			147	1,985	0.074
1973	165	116			281	2,402	0.117
1974	59	107			166	2,203	0.076
1975	36	64			100	1,529	0.065
1976	95	82			177	2,108	0.084
1977	68	140			208	2,055	0.101
1978	25	158			183	2,543	0.072
1979	605	62	19	81	686	3,733	0.183
1980	169	138	2	140	309	2,978	0.110
1981	899	105	34	139	1,038	4,936	0.213
1982	692	103	76	179	871	5,160	0.156
1983	72	106	43	149	221	3,100	0.056
1984	148	12	109	121	269	N/A	N/A
1985	222	0	314	314	536	N/A	N/A
1986	294	0	749	749	1,043	N/A	N/A

[1] Rod-days is defined as one angler fishing for any portion of one day.
[2] Information regarding 1SW and MSW salmon for 1958-1960 are not available.

Table 3. Angling catch on Margaree River, 1984-1985, based on Nova Scotia license stubs.

| | | 1SW | | | MSW | | | | Effort | | Percentage | |
		Retain	Release	Total	Retain	Release	Total	Unknown	Rod-days[1]	CUE	1SW	MSW
1984	Obs	184	48	232	9	285	294	4	5,956	0.089		
	Est	191	50	241	9	294	303	4	6,669	0.082	44%	56%
1985	Obs	371	102	473	0	1,130	1,130	3	7,324	0.219		
	Est	399	110	509	0	1,215	1,215	3	7,824	0.221	30%	70%

[1] Rod-days are defined as one angler fishing for any portion of one day.

Table 4. The number and percentage of 1SW and MSW salmon taken in the summer (June-August), fall (September-October), and complete portions of the sport fishery season on the Margaree River from 1947-1986. The 1947-1961 seasons were from June 1-September 30, the 1962-1978 seasons were from June 14- October 15, and the 1979-1985 seasons were from June 1-October 15. 1979, 1981 and 1982 were the years in which there was a large increase in the 1SW salmon contribution to the summer catch. Numbers in parentheses indicate percentage of MSW or 1SW salmon taken in the various portions of the angling season (i.e. for 1947-1978, 69.9 of the salmon caught in the summer were MSW, but 39.0% of the MSW salmon caught during the 1947-1978 seasons were taken in the summer portion of the season).

Run timing	1947-1978		1979-1984		1985		1986	
	Mean	%	Mean	%	No.	%	No.	%
MSW salmon								
Summer	78	69.9(39.0)	32	8.3(23.4)	146	52.6(46.5)	270	58.1(36.1)
Fall	122	78.9(61.0)	19	55.7(76.6)	168	60.9(53.5)	479	82.9(63.9)
Complete	200	75.1	51	23.8	314	58.6	749	71.8
1SW salmon								
Summer	34	30.1(50.6)	349	91.7(80.9)	114	43.9(51.4)	195	41.9(66.3)
Fall	33	21.1(49.4)	82	44.3(19.1)	108	39.1(48.7)	99	17.1(33.7)
Complete	67	24.9	431	76.2	222	41.4	294	28.2

Table 5. Correlations between 1+ parr (year i+2) densities and DFO sport catch (year i). * indicates significant correlations.

Location	1SW			MSW			1SW + MSW		
	No.	R	P	No.	R	P	No.	R	P
Tributary									
Forest Glen #2	9	-0.06	0.88	9	-0.32	0.40	10	0.32	0.37
Ingraham Brook #1	5	0.68	0.20	5	-0.44	0.46	5	0.44	0.46
Gallant Brook #1	4	0.62	0.38	4	-0.87	0.13	4	0.40	0.60
Lake O'Law #2	6	0.30	0.57	6	0.64	0.17	6	0.49	0.33
Big Brook #2	5	0.87	0.05	5	0.34	0.58	5	0.77	0.13
Northeast Margaree									
MacLeod's	8	-0.41	0.31	8	0.82	0.01*	9	0.64	0.06
Below Old Bridge	9	0.31	0.42	9	0.38	0.32	10	0.58	0.08

Table 6. Estimated Atlantic salmon egg deposition in the Margaree River from 1947-1985. Exploitation rates used in past assessments have been used to estimate potential MSW and 1SW salmon spawners. Fecundity rates used to calculate egg deposition were 6,482 eggs/MSW and 330 eggs/1SW. Egg deposition requirements are 6,710,000 eggs. An * indicates years in which spawning requirements have been met. For 1957, 1958, 1959, 1975-1979 and 1986, egg depositions calculated from 1+ parr densities have been used. N/C, no collection made; N/A, data not available.

				Eggs X10^6			
Year	Collected for hatchery	MSW (20.6)	1SW (20.6)	Total	MSW (37.9)	1SW (37.9)	Total
1947	5.00	9.07	0.05	4.12	3.86	0.02	-
1948	4.50	17.58	0.13	13.21*	7.48	0.06	3.04
1949	2.80	8.30	0.64	6.14	3.58	0.03	0.76
1950	N/C	7.99	0.15	8.14*	3.40	0.06	3.46
1951	N/C	10.59	0.58	11.17*	4.50	0.02	4.52
1952	N/C	5.09	0.11	5.20	2.16	0.05	2.21
1953	N/C	7.27	0.73	8.00*	3.09	0.03	3.12
1954	N/C	7.45	0.99	8.44*	3.16	0.04	3.20
1955	0.50	6.44	0.67	6.61	2.74	0.03	2.27
1956	3.50	2.25	0.76	-	0.95	0.02	-
1957	0.90	3.40	0.46	2.96	1.45	0.02	0.50
1958	1.00	N/A	N/A	N/A	N/A	N/A	N/A
1959	0.50	N/A	N/A	N/A	N/A	N/A	N/A
1960	1.50	N/A	N/A	N/A	N/A	N/A	N/A
1961	2.00	1.23	0.51	-	0.52	0.02	-
1962	0.30	10.24	0.51	10.45*	4.36	0.02	4.08
1963	1.10	5.30	0.11	4.31	2.25	0.05	1.20
1964	0.40	7.22	0.15	6.97*	3.07	0.07	2.74
1965	0.60	6.35	0.11	5.86	2.70	0.05	2.15
1966	0.40	4.12	0.12	3.84	1.75	0.05	1.40
1967	0.20	5.24	0.12	5.16	2.23	0.05	2.08
1968	0.40	4.92	0.08	4.60	2.09	0.03	1.72
1969	0.35	3.40	0.26	3.31	1.45	0.11	1.21
1970	0.20	5.35	0.11	5.26	2.28	0.05	2.13
1971	0.05	2.30	0.03	2.28	0.98	0.01	0.94
1972	0.10	2.65	0.05	2.60	1.13	0.02	1.05
1973	0.10	2.90	0.21	3.01	1.23	0.09	1.22
1974	N/C	2.67	0.07	2.74	1.13	0.03	1.16
1975	0.05	1.60	0.05	1.60	0.68	0.02	0.65
1976	N/C	2.05	0.12	2.17	0.87	0.05	0.92
1977	N/C	3.50	0.09	3.59	1.48	0.04	1.52
1978	0.10	3.95	0.03	3.88	1.68	0.01	1.59
1979	N/C	2.15	0.77	2.92	0.99	0.33	1.32
1980	0.10	3.51	0.21	3.62	1.50	0.09	1.49
1981	0.05	3.69	1.14	4.78	1.70	0.50	2.15
1982	0.20	4.97	0.88	5.65	2.39	0.37	2.56
1983	0.10	4.00	0.09	3.99	1.86	0.04	1.80
1984	0.10	3.73	0.19	3.82	1.99	0.08	1.97
1985	0.15	9.88	0.28	10.01*	5.37	0.12	5.34
1986	0.15	23.57	0.38	23.80*	12.81	0.15	12.81*

Table 7. Smolt and parr released to Margaree River since 1976. MAR, Margaree; RB, Rocky Brook; COB, Cobequid; MER, Mersey.

Year	Rearing location	Smolt 2+		Smolt 1+		Parr 1+		Parr 0+	
		MAR	RB	MAR	RB	MAR	RB	MAR	RB
1976	MAR	8,971							
1977	MAR					5,022			
1978	COB		15,250						
1979	COB		15,927[1]						
1980	COB		14,960						
1981	COB		15,950						
1982	MER			8,481		1,098			
1983	COB	13,486						9,853	
	MAR	3,783							
1984	MAR				10,195[2]				
	MER			14,483					
	COB	11,210							
1985	MAR			2,669	1,303		834		
	COB	13,660				7,820	5,860		
1986	MAR			2,105		8,754		25,000	
	COB	8,820	9,684					6,750	

[1] Millbank broodstock
[2] Rocky Brook x Margaree broodstock

Table 8.   Numbers of wild, hatchery, 1SW and MSW salmon caught during broodstock collections from 1982-1986.

Origin	1SW			MSW			Total
	♂	♀	Total	♂	♀	Total	
1982 Wild	0	1	1	6	11	17	18
Hatchery	31	4	35	0	15	15	50
1983 Wild	11	0	11	6	11	17	28
Hatchery	27	0	27	1	3	4	31
1984 Wild	11	0	11	5	12	17	28
Hatchery	27	0	27	3	3	6	33
1985 Wild	0	0	0	2	7	9	9
Hatchery	8	0	8	0	2	2	10
1986 Wild	6	0	6	3	33	36	42
Hatchery	0	0	0	9	12	21	21

Table 9.   Sex ratios (%) of wild and hatchery-return 1SW and MSW salmon caught during broodstock collections from 1982-1986.

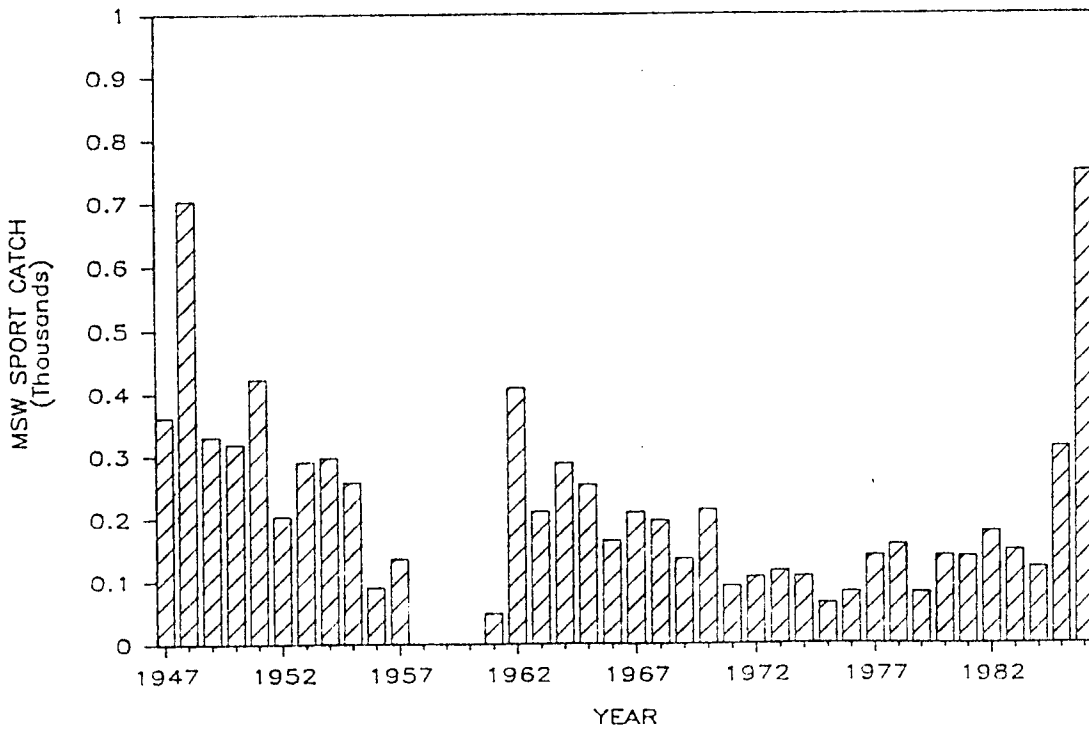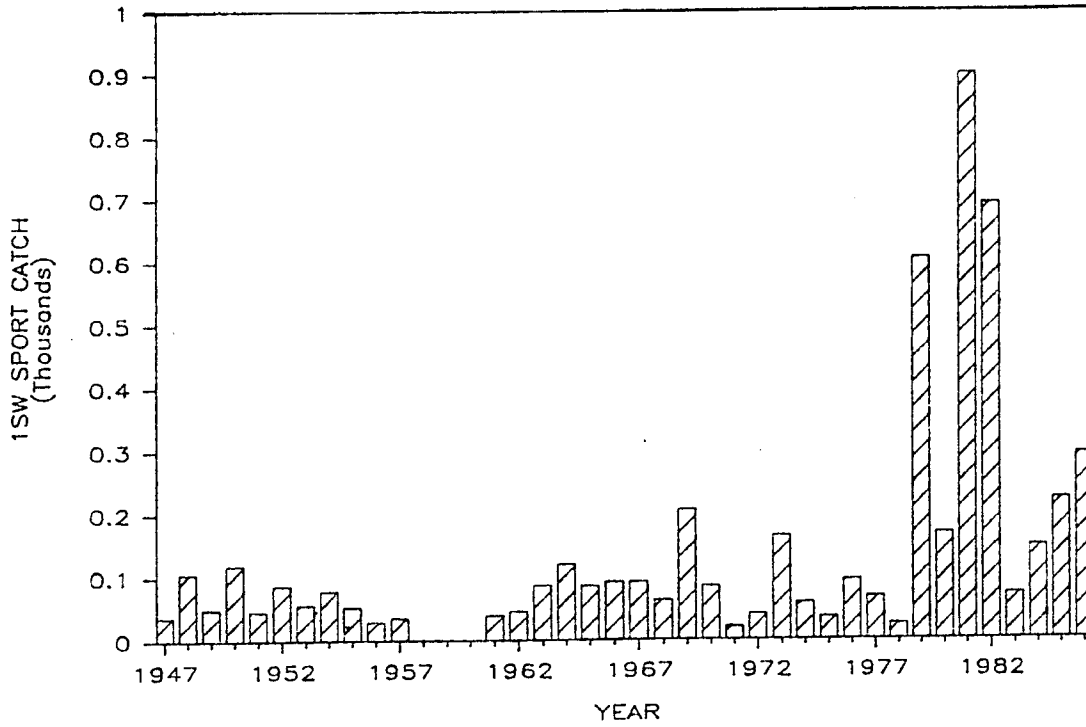| | Percentage | | | | | 1SW:MSW |
| | 1SW | | MSW | | | |
Origin	σ	$\female$	σ	$\female$	Total	ratio
Wild	97	3	23	77	47	23:77
Hatchery	96	4	27	73	53	40:60
Combined	96	4	24	76		32:68

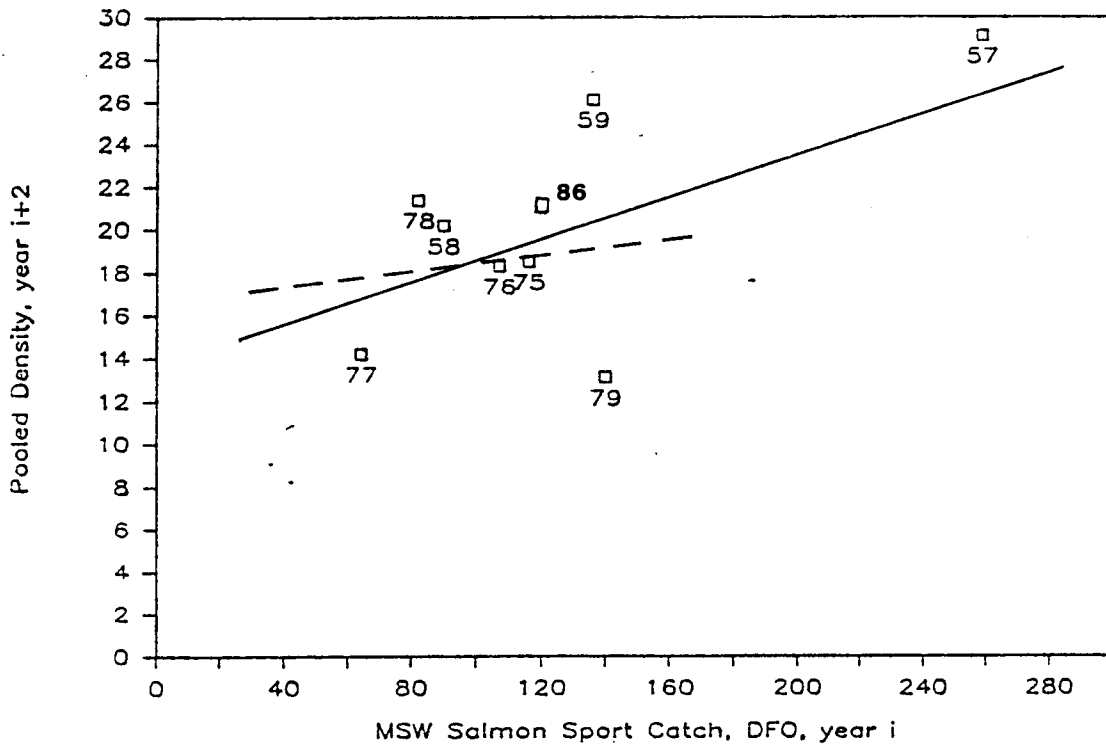Fig. 1. 1SW and MSW salmon sport catch using DFO statistics, 1947-1986.

Fig. 2. Correlations with 1+ parr densities (year i+2) and DFO MSW sport catch (year i). Year shown corresponds to year of juvenile sampling without 1957 --- R^2 = 0.03, P = 0.71; with 1957 --- R^2 = 0.43, P = 0.04.
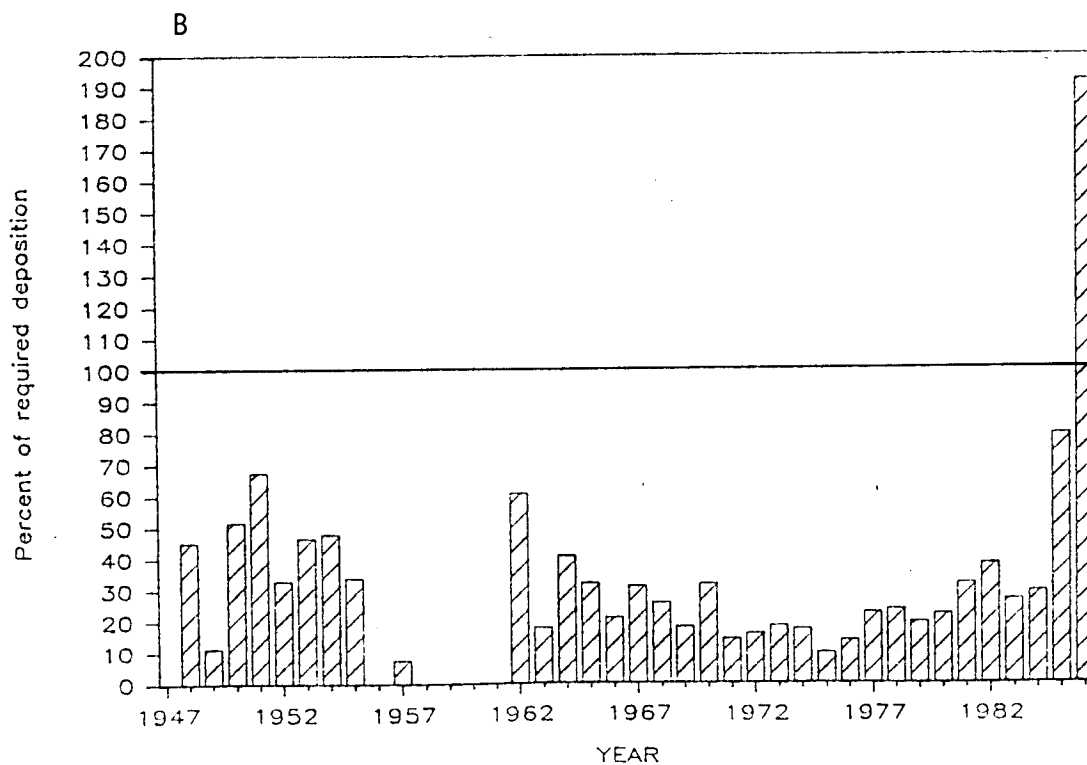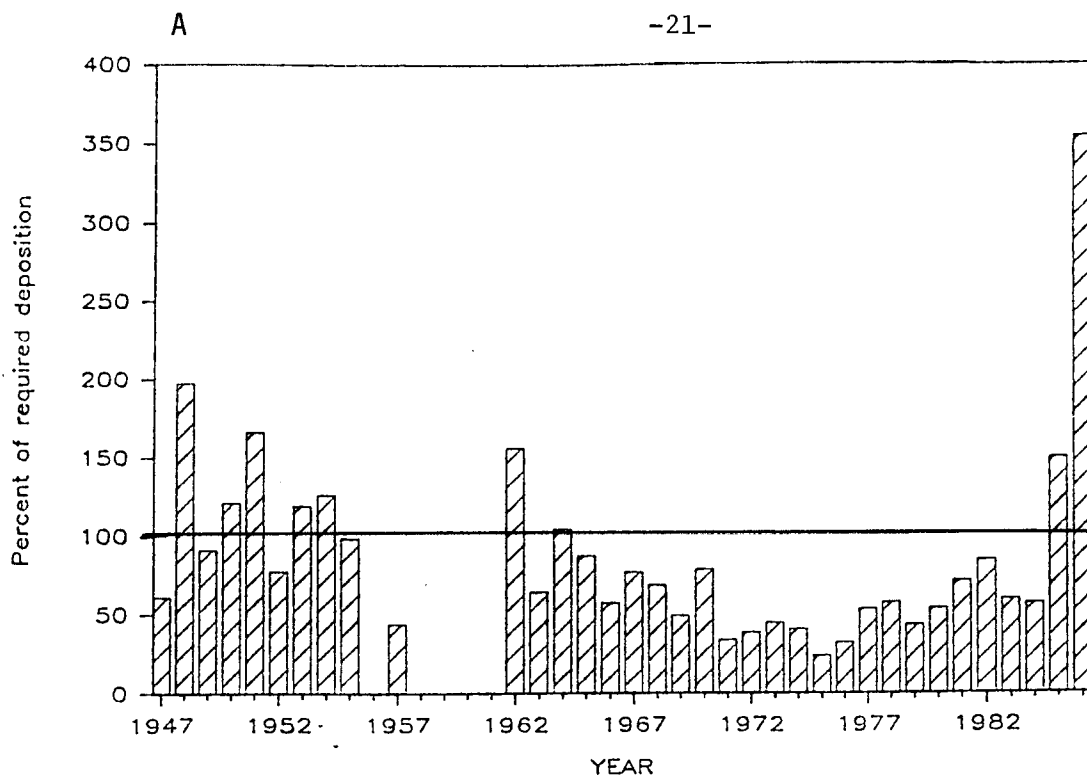
Fig. 3. The percentage of required Atlantic salmon egg deposition achieved
on the Margaree River, 1947-1986. A) Using a 20.6% exploitation
rate; B) Using a 37.9% exploitation rate. No data is available
for 1958-1960. Horizontal line denotes when 100% of required egg
deposition has been achieved.