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Status of Atlantic Salmon Stocks  
of Scotia-Fundy Region, 1988

by

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**ABSTRACT**

The status of 1SW and MSW Atlantic salmon stocks in Salmon Fishing Areas (SFA's) 19, 20, and 21 of the Atlantic coast of Nova Scotia and SFA's 22 and 23 of the Bay of Fundy, Nova Scotia and New Brunswick, 1988 was reviewed.

Counts of 1SW fish at the LaHave and Saint John River fishways were 31 and 34% above the 1984-1987 mean count and those at Liscomb Falls fishway were 45% below the mean count. Survival of hatchery reared smolts returning as 1SW fish were similar to the 1986 and 1987 values.

Recreational catches of 1SW fish were equal to the 1984-1987 average in SFA 19, 32% above in SFA 20, equal to the average in SFA 21, 38% below in SFA 22 and 22% below in SFA 23.

The 1989 forecast of wild 1SW returns to the Saint John River above Mactaquac is for 8,197 fish, 2% greater than the 1988 estimate. The MSW forecast above Mactaquac is for 6,232 fish, a 137% increase over the 1988 return.

**RESUME**

On discute de la situation des stocks de saumons unibermarins et pluribermarins des zones de pêche du saumon (ZPS) 19, 20 et 21, situées sur la côte atlantique de la Nouvelle-Ecosse, et des ZPS 22 et 23, situées dans les secteurs néo-écossais et néo-brunswickois de la baie de Fundy, en 1988.

Le nombre de saumons unibermarins recensé aux passes migratoires de la rivière LaHave et du fleuve Saint-Jean est supérieur de 31 et 34 % respectivement au nombre moyen recensé dans la période 1984-1987, tandis qu'aux chutes Liscomb il est inférieur de 45 % à la moyenne. Les taux de survie des saumoneaux d'élevage revenant dans leurs eaux à l'état d'unibermarins sont comparables à ceux de 1986 et de 1987.

Les prises sportives de saumons unibermarins sont égales à la moyenne de la période 1984-1987 dans la ZPS 19, lui sont supérieures de 32 % dans la ZPS 20, lui sont égales dans la ZPS 21 et lui sont inférieures de 38 % et 22 % respectivement dans les ZPS 22 et 23.

La prévision de remontées d'unibermarins sauvages dans la partie du fleuve Saint-Jean située en amont de Mactaquac est de 8 197 poissons pour 1989, soit 2 % de plus que le nombre estimé de 1988. On prévoit que 6 232 pluribermarins remonteront en amont de Mactaquac, ce qui représente une augmentation de 137 % par rapport aux remontées de 1988.

## INTRODUCTION

This document is background to the status of Atlantic salmon stocks of the five Salmon Fishing Areas (SFA's) 19 to 23 of Scotia-Fundy Region and as such documents sport landings, fishway counts and forecast of returns in 1989.

## METHODS

Sport fishery data for 1988<sup>1</sup> in SFA's 19 to 22 (Nova Scotia) were derived from an analysis of Nova Scotia Salmon license stubs. Landings in SFA 23 (South Western N.B.) for 1988 were those of Department of Fisheries and Oceans (DFO) fishery officers and biologists of the New Brunswick Department of Natural Resources and Energy (DNRE).

Recreational landings, 1974-1986, for all SFA's of Scotia-Fundy Region appear in the "Redbook" series (DFO, Halifax) and O'Neil et al. (1985; 1986; 1987). Sport landings for SFA's 19-22, 1974-1982, were adjusted upwards to a Nova Scotia license stub equivalency (1983-1987) based on a DFO:license stub comparison in 1983 because DFO-derived catches for that earlier period were found to be underestimated.

Monitoring of upstream migrating wild and hatchery origin adult salmon, over a significant time frame, is limited to four counting facilities in Scotia-Fundy Region: 1) Liscomb River (SFA 20), 2) LaHave and 3) Tusket rivers (SFA 21), and 4) Saint John River (SFA 23).

Forecast of wild multi sea-winter (MSW) returns for 1989 were based on regressions of wild MSW counts on wild one sea-winter (1SW) counts of the same smolt class at the Liscomb and LaHave facilities. The entire MSW run destined to Mactaquac, Saint John River, was forecasted as the product of the mean of the MSW/1SW ratio for returns 1981-1983 and 1986-1988 and the 1988 estimated 1SW return (Marshall MS 1989).

A forecast of maiden 1SW fish to the Stewiacke River sport fishery (SFA 22) was by way of a regression of sport-caught recruit/spawner ratio on July to October precipitation at Stewiacke in the year in which recruits were pre-smolts (Amiro MS 1987). Sport catch of 1SW fish on the Big Salmon River (SFA 23) was forecast by the regression of sport-caught 1SW fish on September discharges in the Point Wolfe River during the year in which recruits were pre-smolts and July sea-surface temperatures at St. Andrews during the year in which recruits were smolts (Amiro MS 1987).

A 1989 wild 1SW return destined for Mactaquac (SFA 23) was forecast from a regression of 1SW returns on egg depositions from which they were derived (Marshall MS 1989).

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<sup>1</sup> Finalized since the writing of CAFSAC Advisory Document 88/26.

## RESULTS and DISCUSSION

### SFA 19 (Cape Breton East)

The 1988 estimated catch of 1SW fish was 873 or 99% of the 1984-1987 mean (Table 1). An estimated 1,580 MSW salmon were reported released or 139% of the 1984-1987 mean. Total estimated catch including MSW and 1SW releases increased by 6% to 2,584 fish. Estimated effort for SFA 19 increased 28% to 10,359 rod days in 1988.

### SFA 20 (Eastern Shore)

The 1988 estimated catch of 1SW fish was 2,758 or 132% of the 1984-1987 mean (Table 1). An estimated 1,280 MSW salmon were reported released in 1988 or 119% of the 1984-1987 mean. Total estimated catch including MSW and 1SW releases is 62% higher than 1987. Estimated effort for SFA 20 increased 62% to 21,434 rod days in 1988.

The count of wild 1SW fish at the Liscomb Falls fishway was lower than recent years but was not significantly different than the mean of 1984-1987 (Table 2). The estimated 1SW recreational catch in Liscomb River was 145 fish (Table 4). Hatchery return rate to the fishway was 1.38% to the 1SW stage, 50% of that observed in 1986 and 1987 (Table 3). Nominal exploitation, using total catch (no legal exploitation above the fishway) and counts at the fishway, by the recreational fishery was 23% in 1988, down from the 29% experienced in 1987.

A total of 76 wild MSW salmon were counted at the Liscomb River fishway which was 89% of the 1984-1987 mean. The MSW count at the fishway was far short of the 235 forecast in 1987 from the regression of MSW on 1SW counts. Estimated releases of MSW salmon from the Liscomb River sport fishery were 23 MSW salmon, 85% of the 1987 value.

The regression ( $Y = 0.15X - 7.37$ ;  $r=0.88$  ;  $p < 0.01$ ) used in 1987 and the 477 1SW fish counted at the Liscomb Falls fishway during 1988, forecasts a count of 64 MSW salmon in 1989.

### SFA 21 (Southwest N.S.)

The 1988 estimated retained catch of 1SW fish was 3,022 or 97% of the 1984-1987 mean (Table 1). An estimated 846 MSW salmon were reported released in 1988 or 84% of the 1984-1987 mean. Total estimated catch including releases is 27% lower than 1987. Estimated effort for SFA 21 increased by 11% to 27,222 rod days.

A count of 2,449 wild 1SW fish at the Morgan Falls fishway (LaHave River) was 131% of the 1984-1987 mean (Table 2). The LaHave River estimated recreational catch of 1SW fish was 1,585 (Table 4) or 62% of the 1987 catch. The hatchery return rate of 1SW fish to the fishway was

2.09%, 71% of the 1986-1987 average (Table 3).

A total of 386 wild MSW salmon were counted at Morgan Falls during 1988, 72% of the 1984-1987 mean (Table 2). The wild MSW count at the fishway is 55% of the forecasted 700 MSW salmon based on a regression of MSW on 1SW counts and does not fall within the 95% confidence limits of the estimate. Estimated releases of MSW salmon in the LaHave River recreational fishery were 323 or 70% of the 1987 MSW releases.

The regression ( $Y = 0.27X + 11.35$ ;  $r = 0.89$ ;  $p < 0.001$ ) used in 1987 and the 2,449 1SW fish counted at Morgan Falls during 1988 forecasts a count of 672 MSW salmon in 1989.

### **SFA 22 (Upper Bay of Fundy)**

The 1988 estimated retained catch of 1SW fish was 574, 62% of the 1984-1987 mean (Table 1). An estimated 175 MSW salmon were reported released or 35% of the 1984-1987 mean of 497 1SW fish. The 1988 catch was significantly ( $p < 0.05$ ) lower than the mean. Total estimated catch including releases is 32% higher than 1987, a near record low year. Estimated effort for SFA 22 declined 7% to 6,788 rod days in 1988.

The Stewiacke River recreational catch of 274 1SW fish (Table 4) was 52% under the forecast in spite of the good to excellent angling conditions during the fishing season. While the predictor, a recruit/spawner index modified by precipitation the summer previous to smoltification, correctly indicated the downward trend that catches followed in 1986 and 1987, the magnitude of the declines was underestimated.

Juvenile densities in the Stewiacke remained relatively stable for the years contributing to the 1986-1988 recruits, and remains so for the 1989 recruits (Amiro et al. 1989).

The equation ( $\ln R/S = 2.34X - 11.52$ ) forecasts an angling fishery of 844 1SW fish (license stub equivalents) in the Stewiacke for the 1989 season. However given the trend in recent years for all rivers of SFA 22 and the smaller rivers of SFA 23 emptying into inner Fundy, a recovery of such magnitude seems unlikely.

### **SFA 23 (South Western N.B.)**

Inner Bay of Fundy rivers in SFA 23 like those of SFA 22 had low yields in 1988 with fewer than 50 1SW fish reported caught or released in the sport fishery. Fall diver observations on the Big Salmon River (Pettigrew pers. com.)<sup>2</sup> indicates a total escapement of 300-400 fish or

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<sup>2</sup> T. Pettigrew, N.B. Dept. of Natural Resources and Energy, Hampton, N.B. E0B 1Z0

30 to 40% of an average escapement.

Diver counts on the Point Wolfe River, conducted by Parks Canada staff annually since 1985, indicate a continued decline in grilse or smaller fish thought to be 1SW maiden fish and the passing of a peak in numbers of salmon or larger fish thought to be repeat spawners (Table 5) ( F.Granger pers. com.)<sup>3</sup>.

Recreational catches in the Big Salmon River were estimated by the N.B. DNRE to be only 30 fish. A predictor for the Big Salmon River sport catch (Amiro MS 1987), which utilizes log<sub>e</sub> September discharge from the Point Wolfe River the year previous to smoltification and sea-surface temperature at St. Andrews in July of the year of smoltification, correctly forecasted the trend in the fishery in 1987 but not the magnitude of the decline. The same predictor forecasted an improvement in catches for 1988 to about average levels i.e. 398 1SW fish which, as in all rivers of SFA 22, was not realized. Temperature data were not available for a 1989 forecast.

Outer Bay of Fundy rivers, represented mainly by the Saint John, experienced low summer discharges and lower catches in 1988. A 1SW sport catch of 2,991 is down from that of 1987 (Table 1). The wild 1SW count at Mactaquac for 1988 was up by 58% from that of 1987. Total estimated returns of 1SW fish destined to Mactaquac in 1988 (Marshall MS 1989) were 24% over the forecast. Return of 1SW fish of smolts originating from Mactaquac was 0.67%, the lowest of record (Table 3).

A count of 1,930 wild MSW salmon at Mactaquac in 1988 was down 40% from 1987 (Table 2). Estimates of MSW fish destined for Mactaquac (2,625) were only 38% of the 1988 forecast (Marshall MS 1988). Spawning requirements above Mactaquac are estimated at 4,400 MSW fish.

Forecasts of wild 1SW fish returning to the Saint John and destined for Mactaquac in 1989 were derived from the equation  $\ln 1SW = 6.507 + 0.478 \ln X$  ( $r = 0.69$ ;  $p = 0.006$ ) where X is the adjusted number of eggs five years previous. Forecasts are for 8,197 wild 1SW fish destined for Mactaquac in 1989. The forecast of MSW fish returning to Mactaquac in 1989 based on the mean of the MSW and 1SW ratios for returns in 1981-83 and 1986-88, but scaled to 1SW returns in 1988 is for 6,232 MSW fish.

### SYNOPSIS

The apparent higher marine survival in the 1986 smolt class first seen in the 1987 1SW returns in SFAs 20 and 21 did not continue through to the 1988 MSW return. Wild MSW returns to three counting facilities were 32-55% of the forecast numbers. Counts of MSW salmon at these same

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<sup>3</sup> F. Granger, Parks Canada, Fundy National Park, Alma N.B.  
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facilities were 11-62% below the 1984-1987 mean counts. Recreational catches of MSW salmon, comparable only to catches after the mandatory hook-and-release regulation and initiation of the angler license stub return cards in Nova Scotia, were 39% above the 1984-1987 mean in SFA 19, 19% above the mean in SFA 20, 16% below the mean in SFA 21, 65% below the in SFA 22. Releases in SFA 23, New Brunswick, are unknown.

Survival of hatchery reared smolts released in 1987, to 1SW returns at counting facilities, was down from most 1986 values and all 1987 values. Counts of wild 1SW fish were 45% below the 1984-1987 mean at Liscomb, a river strongly influenced by hatchery releases, but 31% above average at LaHave and 34% above at Mactaquac where stocks are less dependant on hatchery input.

Recreational catches were equal to the 1984-1987 average in SFA 19, 32% above in SFA 20, equal to the average in SFA 21, 38% below in SFA 22 and 22% below in SFA 23.

Forecasts of MSW salmon in 1989 is 72% lower than the 1988 forecast to Liscomb Falls fishway counting facility, 4% lower to the Morgan Falls facility and 10% lower to Mactaquac. However it remains to be seen if survival to MSW will behave as the historical models indicate. Such was not the case in 1988 when forecasts were 306% over the 1988 counts at Liscomb, 81% over at Morgan Falls and 263% over at Mactaquac.

The decline in the Inner Bay of Fundy stocks is noteworthy in that the stock side of the stock/recruitment models has been strong throughout the three year decline and environmental variables historically influencing survival had shown signs of ameliorating. The 1988 catch of 1SW fish in the Stewiacke River was 45% of the forecast while that of the Big Salmon River was 7% of the forecast number. Expected declines in repeat spanners, following declines in recruits, are being observed in the Point Wolfe River.

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Table 1. Numbers of 1SW and MSW salmon retained and released by SFA in the sport fisheries of Scotia-Fundy Region, 1974-1988.

Year	SFA 19			SFA 20			SFA 21			SFA 22			SFA 23		
	1SW		MSW	1SW		MSW	1SW		MSW	1SW		MSW	1SW		MSW
	Ret.	Rel.		Ret.	Rel.		Ret.	Rel.		Ret.	Rel.		Ret.		
1974	416	588		3,462	434		2,462	397		2,004	714		1,312	1,798	
1975	117	213		694	94		1,416	656		818	293		1,888	1,691	
1976	278	445		2,652	219		2,474	321		1,931	537		3,150	2,498	
1977	768	561		1,639	422		3,434	643		296	898		2,040	2,553	
1978	257	456		396	272		460	481		1,681	334		843	924	
1979	281	304		2,178	267		2,969	374		1,258	490		3,034	927	
1980	997	795		3,555	469		2,773	1,104		151	526		2,734	2,860	
1981	1,265	496		2,556	581		4,324	1,248		1,045	379		1,963	1,473	
1982	857	523		1,657	201		1,847	494		983	444		3,129	2,361	
1983	330	426		1,363	400		524	326		2,402	386		2,210	1,103	
1984	822	108	358	1,745	128	282	2,159	232	316	966	29	257	2,891	0	
1985	1,016	0	833	2,559	0	1,715	2,790	0	1,567	1,634	0	578	4,485	0	
1986	804	0	1,976	2,271	0	1,622	3,110	0	1,583	830	0	843	4,033	0	
1987	890	0	1,390	1,773	0	686	4,395	0	799	255	0	311	3,870	0	
1988	873	0	1,580	2,758	0	1,280	3,022	0	846	574	0	175	2,991	0	
Mean															
1974-83	557	481		2,015	336		2,268	604		1,257	500		2,230	1,819	
Mean															
1984-87	883		1,139	2,087		1,076	3,114		1,066	921		497	3,820		

\* SFA's 19-22 based on DFO estimates 1974-1982 adjusted by differential between DFO and Nova Scotia licence stub returns, 1983; i.e., 1.52, 1.32, 1.36, and 1.04 and licence stub returns since 1983. SFA 23 based on DFO estimates.

Table 2. Counts of wild Atlantic salmon from fishway traps in SFA's 20, 21, and 23, Scotia-Fundy Region.

Year	SFA 20 Liscomb		SFA 21 LaHave		SFA 23 Saint John	
	1SW	MSW	1SW	MSW	1SW	MSW
1974			29	2	3,389	4,775
1975			38	5	5,725	6,200
1976			178	23	6,797	5,511
1977			292	25	3,504	7,247
1978			275	67	1,584	3,034
1979	60		856	67	6,234	1,993
1980	111	0	1,637	288	7,555	8,157
1981	76	6	1,866	366	4,571	2,441
1982	252	10	799	256	3,932	2,262
1983	520	15	1,129	213	3,623	1,712
1984	606	48	2,043	384	7,353	7,011
1985	507	87	1,343	638	5,331	6,391
1986	736	117	1,579	584	6,347	3,656
1987	1,614	88	2,529	532	5,097	3,088
1988	477	76	2,449	386	8,062	1,930
Mean (1) to 1983	204	8	710	131	4,691	4,333
Mean (2) 1984 - 87	866	85	1,874	535	6,032	5,037
% change						
1988 of (1)	234%	981%	345%	294%	172%	45%
1988 of (2)	55%	89%	131%	72%	134%	38%
1988 of 1987	30%	86%	97%	73%	158%	63%

Table 3. Percent return from hatchery-reared salmon smolts released to rivers of SFA's 20, 21, and 23, 1975-1988.

Return Year	1SW				MSW			
	SFA 20	SFA 21		SFA 23	SFA 20	SFA 21		SFA 23
	Liscomb	LaHave	Tusket	Saint John	Liscomb	LaHave	Tusket	Saint John
1975				1.89				
1976				2.80				0.68
1977		2.12		2.35				0.84
1978		0.70		1.04		0.34		0.85
1979	1.02	1.32		1.95		0.06		0.41
1980	1.61	0.94		4.42	0.11	0.48		1.53
1981	0.90	1.70	0.97	2.04	0.08	0.32	0.17	1.07
1982	1.95	1.90	0.37	1.44	0.15	0.15	0.11	0.66
1983	1.35	1.32	0.64	0.78	0.15	0.20	0.05	0.29
1984	0.57	1.10	0.08	0.97	0.10	--	0.04	0.56
1985	0.35	0.71	0.51	0.92	0.08	0.27	0.03	0.55
1986	2.59	2.60	0.31	0.87	0.22	0.34	0.08	0.35
1987	2.75	3.32	1.32	1.57	0.18	0.80	0.04	0.45
1988	1.38	2.09	1.15	0.67	0.23	0.51	0.26	0.35

Table 4. Recreationally caught and retained 1SW and MSW bright salmon 1974 - 1988.\*

Year	Liscomb		LaHave		Tusket		Stewiacke	
	1SW	MSW	1SW	MSW	1SW	MSW	1SW	MSW
1974	47	0	850	92	26	6	1,087	355
1975	4	1	581	224	11	21	442	180
1976	66	9	1,012	110	10	10	940	198
1977	67	2	1,468	232	21	12	104	370
1978	9	0	175	167	8	8	545	75
1979	85	1	1,365	107	5	0	681	239
1980	233	11	1,273	520	76	58	41	203
1981	46	7	1,637	442	138	68	531	89
1982	79	6	785	180	35	2	307	97
1983	52	6	259	200	29	15	1,341	237
1984	66	0	1,486	0	104	0	351	0
1985	88	0	1,686	0	60	0	829	0
1986	262	0	1,844	0	181	0	428	0
1987	316	0	2,562	0	463	0	114	0
1988	142	0	1,585	0	174	0	222	0

\* Numbers for years 1974-82 adjusted to N.S. license stub equivalents by factors; SFA 20 1.32 (Liscomb); SFA 21 1.36 (LaHave and Tusket); SFA 22 1.04 (Stewiacke).

Table 5. Number of Atlantic salmon, grilse and salmon counted by under-water observation in the Point Wolfe River, 1985-1988. (F. Granger, pers.com.)

Year	Number counted		
	Grilse	Salmon	Total
1985	196	4	200
1986	66	29	95
1987	36	39	75
1988	25	24	48