Harvest at selected sport camps as an
index of river escapement on Restigouche River

by

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ABSTRACT

Statistical analyses indicate a yearly relationship between catches at selected sport camps on the Restigouche River and total angling harvest for the river. A correlation between the sport camp harvest and subsequent parr densities suggest that the sport camp data may be an index of spawning escapement.

RÉSUMÉ

Des analyses statistiques ont indiqué qu'il existe un rapport annuel entre les prises à certains camps de pêche sportive sur la rivière Restigouche et le total des prises sportives pour cette rivière. Une corrélation entre les prises aux camps susmentionnés et les densités de tacons dans la rivière deux ans plus tard suggèrent que les données sur les prises aux camps serviraient d'indices sur l'échappement des géniteurs.

INTRODUCTION

On the Restigouche River, it has been possible to predict river escapements using data from the sports harvest of multi-sea-winter (MSW) salmon (Chadwick and Randall 1982; Randall and Pickard 1983). These data became unavailable as of 1984, however, when conservation measures prohibiting the harvest of MSW salmon were introduced. In this report, the 1984 river escapements are estimated using data from four Restigouche River sport camps where the catch, harvest, and release of salmon have been recorded for many years.

METHODS

Historical data were obtained from the logbooks of four Restigouche River sport fishing lodges: Runnymede, Kedgwick, Brandy Brook and Camp Harmony. The records extend back to the turn of the century or beyond (Table 1) and include numbers of grilse and salmon caught and released and the weight (in lbs; 1 lb = 454 g) of those which were killed. In the latter case, we considered fish whose weight was four pounds (4 lbs) or less as being grilse. The data were summarized using FORTRAN programs SALTAB1 and SALTAB5 on an HP3000 computer.

Data on total recreational landings of salmon from the Restigouche River were obtained from Randall and Pickard (1983). Complete data extend back only to 1970 because of the absence of separate totals for salmon and grilse in the Québec data from 1965 to 1969, and in the New Brunswick data prior to 1965.

Data from the Millbank trap site were obtained from Randall and Schofield (1983) and from Randall (pers. comm.).

Table 1 is a list of the time series of data among which correlation analyses were carried out using the SAS procedure CORR (SAS 1982).

The SAS procedure CORR was then used to obtain a regression equation between the summed totals of the four camps for salmon (X) and the Restigouche total angling harvest for salmon, excluding the camp totals (Y). From this equation, the predicted Restigouche total angling catch for 1984 was calculated.

Finally, data on parr densities in the Restigouche from 1972 to 1983 were obtained from Randall and Pickard (1983). A correlation analysis was carried out between these data (Y) and the summed totals of the four camps for salmon two years before.

RESULTS AND DISCUSSION

The data used in our analyses are listed in Table 2. Results of the correlation analyses are presented in matrix form in Table 3 for grilse and Table 4 for salmon. With one exception in each of the grilse and the salmon tables, the correlations among the four camps are all statistically significant. Also, for both grilse and salmon, all four camps are significantly correlated to the summed totals of the four camps. Shaded boxes contain those sets which are not significantly correlated (P > 0.05).

In the salmon table (Table 4), all four camps are significantly correlated to the total angling catch in Restigouche River. In the grilse table (Table 3), however, only one camp, Brandy Brook, is significantly correlated to the Restigouche angling totals.

The summed totals of the four camps and the Restigouche angling totals are significantly correlated for salmon (r = 0.95, P = 0.0001) (Table 4), but not for grilse (Table 3).

When the camp totals are excluded from the Restigouche totals, to remove the possibility of auto correlation, the result is: r = 0.94, P << 0.01.

The regression equation to predict the total angled catch of salmon in Restigouche River, excluding the sport camps, (Y) from the summed catch of salmon from the four sport camps (X) was as follows:

$$Y = -368 + 6.5X.$$

The predicted Restigouche angling catch for 1984, excluding the four sport camps, was 2,818 salmon. The predicted total Restigouche angling catch for 1984 then becomes 2,818 + 490 (actual) = 3,308, with 95% confidence intervals of 1,881 and 4,735 salmon.

Finally, the yearly parr densities were significantly correlated to the total catch of salmon at the four camps two years before (r = 0.62, P < 0.05).

The results of this study indicate that catch and release data from four sport camps, which represent about 15% of the total catch in Restigouche River, can be useful to estimate angling harvest for the entire river. The significant correlation between the camp totals and parr densities two years later, suggests that the sport camp data may also be an index of spawning escapement in much the same way as was found for total sports catch (Chadwick and Randall 1983).

Brandy Brook and Kedgwick probably have the most useful camp data, because they had the greatest number of significant correlations (Tables 3 and 4). This may be because Kedgwick and Brandy Brook have resting pools while the other two camps do not. It is more appropriate, however, to use the total (or the mean) of the four camps, because this tends to minimize the effect of local annual variations. For example, variations in water levels compounded by river characteristics (i.e., pools, runs) at the different camp locations can have differential effects on salmon numbers at these locations.

It is recognized that since the 1984 regulations oblige sport fishermen to release all MSW salmon, the catch, and therefore the predicted escapement, may be somewhat overestimated because individual salmon could be caught and counted more than once.

REFERENCES

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Table 1. Time series of data used in the correlation analyses
(grilse and MSW salmon considered separately).
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Location	Years
1. Kedgwick Camp	1894-1984
2. Runnymede Camp	1893-1917, 1940-1975, 1977-1984
3. Harmony Camp	1895-1984
4. Brandy Brook Camp	1908-1984
5. Total of four camps	1908-1917, 1940-1975, 1977-1984
6. Restigouche total angling harvest	1970-1983*
7. Restigouche NB data only	1965-1983*
8. Millbank trap site	1954-1984

*Data no longer available for MSW salmon as harvest is
 prohibited.

Table 2. Catch of salmon (S) and grilse (G) at four sport camps*, summed total of the four camps, Restigouche harvest (NB), Restigouche total harvest (NB & Qué.) and Millbank trap totals.

Year	Runnymede G	S	Kedgwick G	S	Brandy Brook G	S	Harmony G	S	Total of four camps G	S	Rest. NB (x 1000) G	S	Rest. Tot. (x 1000) G	S	Millbank G	S
1908	7	207	3	255	2	116	1	150	13	728	.	.	.	.	.	.
1909	29	200	13	114	6	75	5	104	53	493	.	.	.	.	.	.
1910	20	286	34	223	4	45	3	222	61	776	.	.	.	.	.	.
1911	66	570	41	281	3	65	6	276	116	1192	.	.	.	.	.	.
1912	0	246	12	239	2	125	13	276	27	886	.	.	.	.	.	.
1913	24	398	17	266	1	140	2	291	44	1095	.	.	.	.	.	.
1914	33	300	29	329	0	129	9	317	71	1075	.	.	.	.	.	.
1915	36	354	33	339	6	162	27	403	102	1258	.	.	.	.	.	.
1916	35	267	29	339	3	118	12	332	79	1056	.	.	.	.	.	.
1917	1	26	21	158	3	220	27	560	52	964	.	.	.	.	.	.
1940	73	214	379	358	0	170	75	396	527	1138	.	.	.	.	.	.
1941	63	228	266	833	11	237	25	201	365	1499	.	.	.	.	.	.
1942	29	162	114	743	22	170	24	320	189	1395	.	.	.	.	.	.
1943	75	289	133	594	13	333	12	301	233	1517	.	.	.	.	.	.
1944	18	260	72	660	10	374	5	334	105	1628	.	.	.	.	.	.
1945	89	238	216	483	27	211	66	266	398	1198	.	.	.	.	.	.
1946	50	155	232	681	16	221	15	164	313	1221	.	.	.	.	.	.
1947	0	168	80	342	2	177	33	212	115	899	.	.	.	.	.	.
1948	56	171	85	699	8	201	17	189	166	1260	.	.	.	.	.	.
1949	27	247	96	556	23	197	41	290	187	1290	.	.	.	.	.	.
1950	83	161	183	402	2	126	120	260	388	949	.	.	.	.	.	.
1951	24	139	120	488	0	108	51	191	195	926	.	.	.	.	.	.
1952	19	175	106	456	5	187	39	398	169	1216	.	.	.	.	.	.
1953	84	103	109	532	29	112	153	155	375	902	.	.	.	.	.	.
1954	62	111	93	292	13	106	47	106	215	615	.	.	.	.	1823	2130
1955	84	56	237	209	15	76	24	55	360	396	.	.	.	.	1807	2846
1956	55	102	235	291	20	111	80	108	390	612	.	.	.	.	3434	3361
1957	83	153	150	208	64	129	108	162	405	652	.	.	.	.	3879	3865
1958	97	119	396	180	86	161	133	285	712	745	.	.	.	.	8463	4429
1959	17	26	28	542	42	79	6	77	93	724	.	.	.	.	1828	3596
1960	51	38	59	384	125	76	17	27	252	525	.	.	.	.	4502	4605
1961	32	89	107	261	48	114	23	89	210	553	.	.	.	.	6871	2989
1962	30	58	39	291	38	107	4	92	111	548	.	.	.	.	2963	1915
1963	39	28	532	331	160	16	63	61	794	436	.	.	.	.	14124	1651
1964	66	78	234	268	73	115	186	214	559	675	.	.	.	.	8964	1009
1965	97	132	208	472	77	108	122	155	504	867	3.9	3.0	.	.	15650	1801
1966	29	54	195	338	134	52	6	67	364	511	1.7	1.7	.	.	9989	1632
1967	21	95	80	424	54	128	9	135	164	782	1.1	2.4	.	.	7723	997
1968	0	11	45	135	8	45	2	22	55	213	0.4	0.6	.	.	3239	1414
1969	11	29	174	171	77	39	12	48	274	287	1.4	1.2	.	.	4350	667
1970	2	18	124	173	28	54	5	32	159	277	1.4	1.7	1.6	2.0	2484	245
1971	5	16	72	125	44	47	2	6	123	194	1.0	0.8	1.2	1.0	1962	399
1972	218	17	36	361	9	125	19	98	282	601	1.0	3.8	1.1	5.0	2543	1151
1973	8	27	30	422	28	56	17	66	83	571	1.4	3.8	1.6	4.9	2450	1132
1974	15	136	27	394	17	201	30	228	89	959	1.0	4.8	1.1	6.0	4038	1791
1975	272	38	33	308	49	85	18	63	372	494	1.1	2.2	1.3	2.9	3548	1208
1976	.	.	71	306	63	184	12	39	.	.	2.3	4.5	2.7	5.5	4939	943
1977	20	143	37	338	51	274	27	154	135	909	2.4	5.1	2.8	6.7	1505	1934
1978	6	63	25	306	34	152	4	94	69	615	1.3	3.4	1.6	5.0	1268	693
1979	5	33	128	209	71	64	24	47	228	353	2.0	1.0	2.6	1.8	2500	318
1980	37	119	26	427	92	231	34	128	189	905	2.8	4.1	3.2	6.2	2139	1093
1981	38	91	45	237	83	156	41	118	207	602	3.0	2.8	3.6	4.2	2174	199
1982	76	106	69	173	92	109	32	65	269	453	2.5	1.6	2.9	2.6	2665	408
1983	31	68	44	172	32	93	29	76	136	409	0.7	1.5	0.9	2.0	810	245
1984	18	85	83	200	33	124	15	81	149	496	.	.	.	.	1010	333

*Data prior to 1908 and for the period 1918-1939 have been omitted from the Table. In those years data were not available at all four camps.

Table 3. Results of correlation analyses for grilse. RUNNY -
Runnymede; KEDGE - Kedgwick; BRANDY - Brandy Brook; HARMB -
Harmony; TOT4 - Summed total from the four camps; RGNB - Total
angling catch on Restigouche, New Brunswick side only; RGTOT -
Total angling catch on Restigouche (NB + Qué.); MILLB - Total
catch at Millbank.
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CORRELATION COEFFICIENTS / PROB > !R! UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	GRUNNY	GKEDGE	GBRANDY	GHARMB	GTOT4	GRGNB	GRGTOT	GMILLB
GRUNNY								
GKEDGE	0.28663							
	0.0178							
	68							
GBRANDY	0.07668	0.39783						
	0.5816	0.0003						
	54	77						
GHARMB	0.36496	0.54936	0.27515					
	0.0024	0.0001	0.0154					
	67	90	77					
GTOT4	0.49743	0.89809	0.53933	0.71590				
	0.0001	0.0001	0.0001	0.0001				
	54	54	54	54				
GRGNB	0.01894	0.33729	0.62793	0.74041	0.53722			
	0.9405	0.1579	0.0040	0.0003	0.0215			
	18	19	19	19	18			
GRGTOT	-0.23258	0.13057	0.87150	0.52425	-0.16979	0.99514		
	0.4445	0.6564	0.0001	0.0543	0.5792	0.0001		
	13	14	14	14	13	14		
GMILLB	0.11444	0.68872	0.60012	0.52395	0.73084	0.42918	0.05898	
	0.5471	0.0001	0.0004	0.0025	0.0001	0.0667	0.8413	
	30	31	31	31	30	19	14	

Table 4.   Results of correlation analyses for salmon.   RUNNY – Runnymede; KEDGE – Kedgwick; BRANDY – Brandy Brook; HARMB – Harmony; TOT4 – Summed total from the four camps; RGNB – Total angling catch on Restigouche, New Brunswick side only; RGTOT – Total angling catch on Restigouche (NB + Qué.); MILLB – Total catch at Millbank.

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CORRELATION COEFFICIENTS / PROB > !R! UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	SRUNNY	SKEDGE	SBRANDY	SHARMB	STOT4	SRGNB	SRGTOT	SMILLB
SRUNNY								
SKEDGE	0.21081							
	0.0804							
SBRANDY	0.34171	0.49335						
	0.0114	0.0001						
	54·	77						
SHARMB	0.59869	0.40898	0.53859					
	0.0001	0.0001	0.0001					
	67	90	77					
STOT4	0.70268	0.75694	0.77494	0.78231				
	0.0001	0.0001	0.0001	0.0001				
	54	54	54	54				
SRGNB	0.61686	0.72769	0.83599	0.68390	0.87656			
	0.0064	0.0004	0.0001	0.0012	0.0001			
	18	19	19	19	18			
SRGTOT	0.62642	0.86700	0.84970	0.71979	0.95126	0.98114		
	0.0220	0.0001	0.0001	0.0037	·0.0001	0.0001		
	13	14	14	14	13	14		
SMILLB	0.26790	0.26146	0.06651	0.32325	0.32479	0.51959	0.77537	
	0.1533	0.1554	0.7222	0.0761	0.0800	0.0226	0.0011	
	30	31	31	31	30	19	14	