Correlations between MSW salmon and 1SW Grilse the previous year in the Fisheries Statistical Districts, fishways and Salmon Management Zones of the Scotia-Fundy Region

by

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ABSTRACT

Correlations between numbers of 1 sea-winter in year i and two sea-winter Atlantic salmon in year i+1 in and between the sport and commercial fisheries for Fisheries Statistical Districts, two fishways and the five salmon management zones of the Scotia-Fundy Region are reported for the years 1970 to 1984. Multi sea-winter salmon were significantly correlated with 1 sea-winter grilse for the Liscomb Falls and Morgan Falls (LaHave River) fishways and within 12 separate districts and one salmon management zone.

RESUME

Le rapport établit les corrélations de 1970 à 1984 entre le nombre de saumons d'un hiver en mer pendant l'année i et le nombre de saumons deux hivers en mer pendant l'année i+1 dans et entre les pêches sportives et commerciales pour les zones statistiques de pêche, deux couloirs à poissons et cinq zones d'exploitation rationnelle du saumon de la région Scotia-Fundy. La corrélation était très importante entre les saumons de plusieurs hivers en mer et les castillons des couloirs à poissons de Liscomb Falls et de Morgan Fall (rivière LaHave) et dans 12 zones séparées de pêche et une zone d'exploitation rationnelle du saumon.

INTRODUCTION

Stock strength of next year's returning two sea-winter Atlantic salmon is of interest to fisheries managers because fisheries may be adjusted to ensure target levels of spawning escapement are achieved. Many stocks are dependent on two sea-winter and older salmon for most of the egg deposition and therefore conservation and stock stability are dependent on these salmon. Because grilse in year i and two sea-winter salmon in year i+1 are components of the same smolt migration year the utility of using enumeration statistics of 1 sea-winter (1SW) grilse to forecast the number of 2 sea-winter salmon the following year in and between the sport and commercial fisheries and two counting facilities and Salmon Management Zones (SMZ) of the Scotia-Fundy Region (SFR) (Figs. 1, 2) was examined.

METHODS

The estimated number of MSW and 1SW fish landed by district include licensed salmon gear, by-catch and unauthorized removals for both sport (freshwater) and commercial (marine) fisheries. Data reported by Cutting (1984) were further updated and corrected for errors and omissions (publ. pending).

Data for the commercial fisheries by district were classified and reported by 1SW for 1970 to 1984 and two sea-winter (2SW) 1970 to 1984. The sport fisheries reported by district were classified as 1SW, 1967 to 1983, and multi sea-winter (MSW), 1967 to 1983.

Data for Zones 3, 5, 7, 8 and 9 were classified and reported for the commercial fisheries as 1SW, 1970 to 1984 and 2SW, 1970 to 1984 and the sport fisheries as 1SW, 1967 to 1983 and 2SW, 1967 to 1983.

Counts for both hatchery and wild 1SW and MSW fish at Liscomb Falls fishway (Fig. 1), 1979 to 1985, (Table 1) and Morgan Falls (LaHave) fishway (Table 2), (Fig. 1), 1970 to 1985, provide the only consistent time series of data for fish passage facilities for the Scotia-Fundy Region outside of Mactaquac, Saint John River (See Marshall, 1984).

Pearson correlation coefficients were calculated for districts and zones between sport salmon in year i+1 and sport grilse in year i; commercial salmon in year i+1 and commercial grilse in year i; commercial salmon in year i+1 and sport grilse in year i; and sport salmon in year i+1 and commercial grilse in year i. Correlation coefficients were calculated separately for counts of wild and hatchery fish at each fishway.

RESULTS

At Liscomb Falls fishway, counts of MSW salmon were significantly correlated with 1SW fish the year previous for wild ($r=0.939$, $p=0.0176$) but not for hatchery fish ($r=0.548$, $p=0.260$) (Table 1).

Morgan Falls fishway counts had similar results with wild fish highly correlated (r=.917, p=0.0000098) and hatchery fish not significantly correlated (r=-0.168) (Table 2).

Correlation coefficients were computed for forty-eight districts of which twelve districts had at least one significant (p.05) relationship in the four comparisons made (Table 3). Among the comparisons made, commercial salmon on grilse had nine significant correlations while the sport fishery had three. Across sport and commercial fisheries for salmon and grilse, two significant (p.05) correlations in each set were found, but all were for different districts. Strong correlations within districts were noted for district 27 with three of four comparisons significant (2 @ p.01 and 1 @ p.05), district 35 with two at p.08 and district 58 with two (1 @ p.05 and 1 @ p.01).

Within SMZ's, only zone 9, Southwest Nova Scotia, had significant correlations with three of the four comparisons significant (1 @ p.01 and 2 @ p.05) (Table 4).

DISCUSSION

Predictive equations, Table 1 and 2, were developed for wild salmon returns to Liscomb Falls and Morgan Falls fishways based on 1SW counts the previous year.

The results for districts and zones indicated that predictive equations could be developed for zone 9 and districts 27, 35 and 58 with the possibility of utilization of more than one independant variable. Further analysis for the remaining nine districts is required before predictive equations may be developed. Inclusion of catches in adjacent intercepting districts may significantly improve or result in predictive equations for other districts, but required correlation matrices for cross districts not included in this analysis.

REFERENCES

Cutting, R.E. MS 1984. Summary tables of recreational and commercial Atlantic salmon harvests of the Scotia-Fundy Region, 1967-1983. CAFSAC Res. Doc. 84/53. 27p.

Marshall, T.L. MS 1984. Status of Saint John River, N.B., Atlantic salmon in 1984 and Forecast of Returns in 1985. CAFSAC Res. Doc. 84/84. 24p.

TABLE 1. Counts of Atlantic salmon at Liscomb Falls, Liscomb River, 1979-85.

Year	1 SW		MSW		Total	
	H	W	H	W	H	W
1979	485	60	2	2	487	62
1980	931	111	51	0	982	111
1981	241	76	49	6	290	82
1982	827	252	41	10	868	262
1983	594	520	63	15	657	535
1984	331	606	42	48	373	654
1985	175	507	49	87	224	594

(H) HATCHERY (1979 - 1985)

$$M\text{-}SW = 40.1042 + 0.016X_{1\text{-}SW}$$

$n = 6$, $r = 0.5482$, $t = 1.3109$, $p = 0.260$

(W) WILD (1980 - 1985)

$$M\text{-}SW = -9.0033 + 0.1348X_{1\text{-}SW}$$

$n = 5$, $r = 0.9397$, $t = 4.759$, $p = 0.0176$

TABLE 2. Stock origins and sea-age composition of salmon returns to the Morgan Falls fishway, 1970-1985.

Year	Hatchery		Wild		Total		
	Grilse	Salmon	Grilse	Salmon	Grilse	Salmon	Combined
1970	---	---	2	4	2	4	6
1971	---	---	3	---	3	---	3
1972	---	---	10	2	10	2	12
1973	147	11	11	7	158	18	176
1974	314	25	40	2	354	27	381
1975	503	71	39	5	542	76	618
1976	523[1]	104	199	24	722	128	850
1977	974	83[1]	289	25	1,263	108	1,371
1978	553	208	285	66	838	274	1,112
1979	1,079	99	857	67	1,936	166	2,102
1980	335	515	1,618	287	1,953	802	2,755
1981	1,180	215	1,814	354	2,994	569	3,563
1982	627	230	793	258	1,420	488	1,908
1983	31	103	1,124	210	1,155	313	1,468
1984	250	36	2,043	384	2,293	420	2,713
1985	102	77	1,343	638	1,445	715	2,160

[1] Data include 1-SW salmon returns (1976) and 2-SW salmon returns (1977) from fall fingerlings released in 1973.

HATCHERY (1973 - 85 without 83/84)

$$M\text{-}SW = 279.337 - 0.0258X_{1\text{-}SW}$$

$n = 11$, $r = -0.1686$, $t = -0.513$, p = undetermined

WILD (1972 - 1984)

$$M\text{-}SW = 6.7125 + 0.2455X_{1\text{-}SW}$$

$n = 13$, $r = 0.9177$, $t = 7.6609$, $p = 0.0000098$

TABLE 3. Correlation coefficients for multi-sea-winter (sport) and two sea-winter (commercial) numbers of salmon in year i+1 and grilse in year i by districts.

District	Sport	Commercial	Comm. Sal.+1 Sport Gr	Sport S+1 Comm G.
1	-.197	.227	-.239	.454
4	-.066	.535*	.190	.175
6	-.066	.390	-.141	-.024
7	.154	.201	.023	.460
8	.442	.238	.282	.196
9	.364	-.142	-.233	.200
14	.089	.497	.067	.514
15	---	.010	---	---
16	-.106	.459	.178	-.020
17	.234	-.062	.330	.154
18	---	.570*	-.210	---
19	.014	-.203	.436	-.295
20	-.056	-.376	-.084	-.346
21	---	---	---	---
22	---	.045	---	---
23	.490	-.036	.117	-.236
24	.192	-.127	-.167	-.275
25	.575*	.258	.094	.320
26	---	.029	---	---
27	.675**	.613*	.451	.715**
28	.306	.108	.614*	-.059
30	---	-.361	---	---
31	---	.182	-.187	---
32	---	.612*	---	---
33	.060	.048	-.005	.489
34	---	.268	---	---
35	-.192	.635*	-.297	.673*
36	-.110	.146	-.231	-.155
37	---	-.421	---	---
38	---	---	---	---
39	---	---	---	---
40	---	.616*	---	---
41	.407	---	---	---
42	.478	.003	-.209	-.175
43	.405	.682**	-.155	.006
44	---	.827**	---	---
48	.012	.240	-.137	.247
49	---	.246	---	---
50	---	.078	---	---
51	---	.081	---	---
52	.355	.295	.020	-.322
53	-.120	.154	-.161	-.025
55	.730**	.160	-.406	-.460
56	---	-.287	---	---
57	---	.216	---	---
58	-.001	.571*	.777*	.200
79	.072	---	---	---
81	---	.405	---	---
Df.	14	12	13	11
p.05	.497	.532	.514	.553
p.01	.623	.661	.641	.684
YEARS	1967-1983	1970-1984	1969-1984	1970-1983

TABLE 4. Correlation coefficients (r) for multi sea-winter (angling) and two sea-winter (commercial), numbers of salmon in year i+1 and grilse in year i by salmon management zones.

Zone	Angling	Commercial	Comm. Salmon Ang. Grilse	Ang. Salmon Comm. Grilse
3	-.035	.325	.197	-.304
5	.225	.195	-.181	.160
7	.215	-.083	.498	.138
8	.412	.249	-.149	-.228
9	.543*	.036	.580*	.701**
Df.	14	12	13	11
p.05	.497	.532	.514	.553
p.01	.623	.661	.641	.684
YEARS	1967-1983	1970-1984	1969-1984	1970-1983

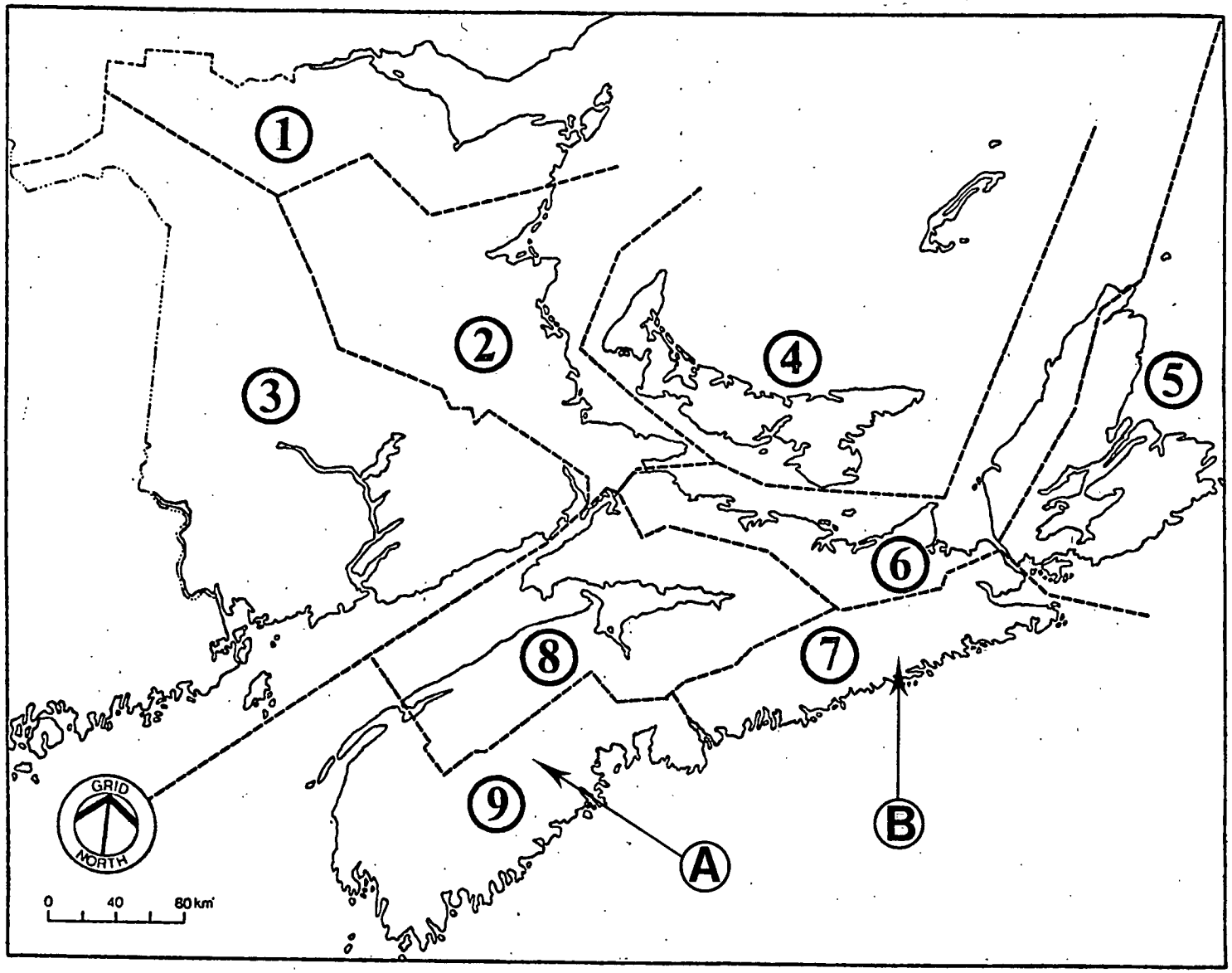

Fig. 1. Map of Maritime Provinces showing location of eight salmon management zones, Morgan Falls fishway (A) and the Liscomb Falls fishway (B).

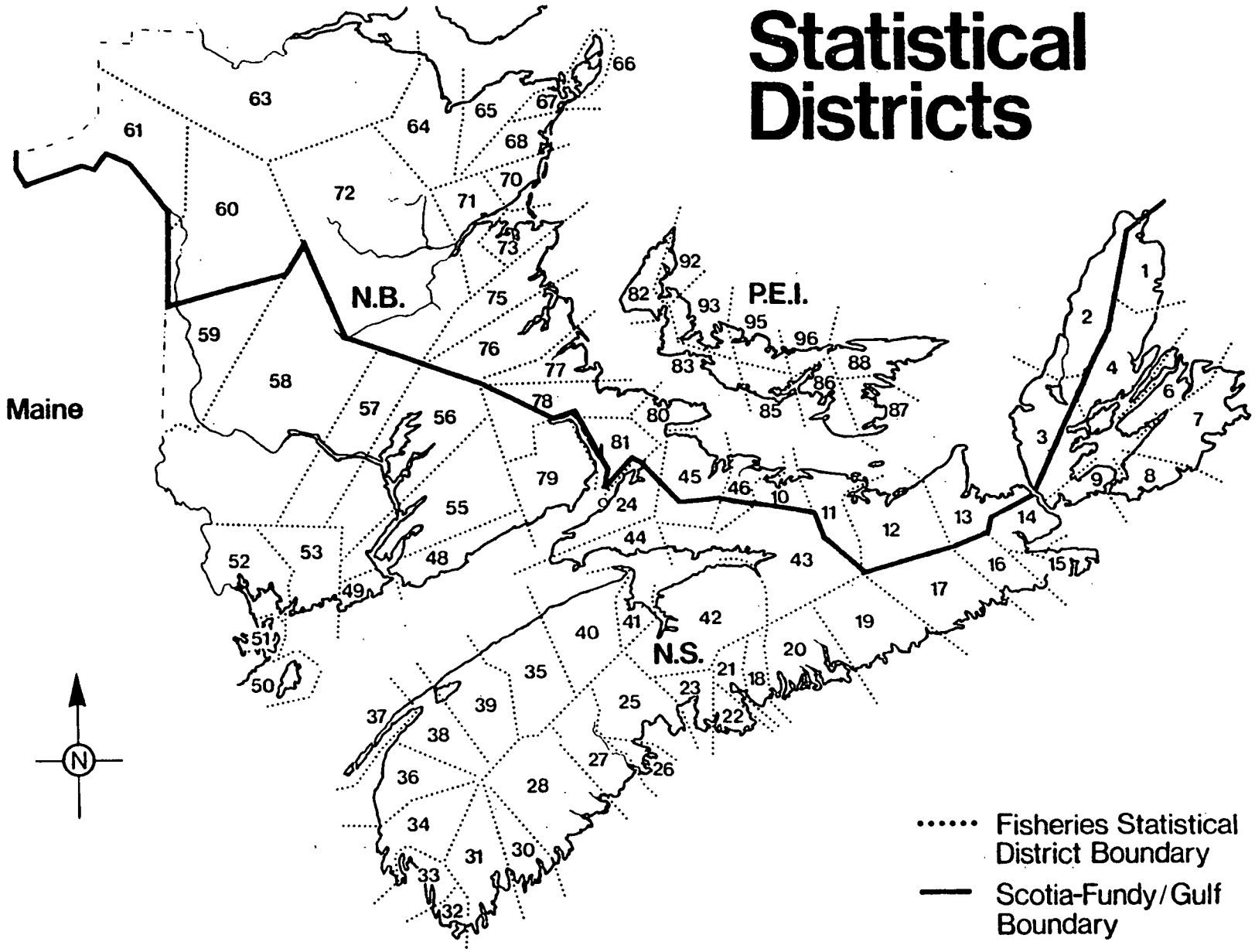

Fig. 2. Map of Maritime Provinces showing the Scotia-Fundy/Gulf Regional boundary and the Fisheries Statistical Districts.