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Preliminary observations on differences in fishery contributions of hatchery-reared Atlantic salmon (Salmo salar) smolts related to stock selection and release location

by

J.A. Ritter and D.B. Lister

Resource Development Branch
Fisheries Service
Department of the Environment of Canada
Halifax, Nova Scotia

SUMMARY

Three groups of hatchery-reared Atlantic salmon smolts were tagged and released in River Philip, Nova Scotia, and the Miramichi River, New Brunswick, during the spring of 1968. The experiment was undertaken to compare the distribution of tag returns and levels of fishery contributions in relation to the origin of stock and the release location.

The distributions of tag returns and levels of contributions to various fisheries were related to the origin of the stock. Both River Philip and Miramichi stocks released in River Philip made a major portion of their contributions to the distant fisheries of Newfoundland and Greenland. River Philip stock contributed proportionately more to the Greenland fishery and proportionately less to the Newfoundland fishery and the escapement than did the Miramichi stock. Apparent genetic differences between stocks in age at first maturity affected both the distribution and level of exploitation by fisheries. However, it is postulated that some of the differences between stocks were also due to genetic influence over timing and location of the ocean feeding and return migrations.

The distribution of tag returns from the three release groups indicated only negligible straying from the original river of release. The level and distribution of tag returns indicated that the release location affects both ocean survival and utilization by the commercial and sport fisheries in home waters.

INTRODUCTION

In 1968 the Resource Development Branch of the Canadian Fisheries Service launched a five-year Atlantic salmon smolt tagging program to measure the contribution of hatchery-reared salmon smolts to fisheries and to provide an information base for improving and expanding the Branch's salmon propagation program in New Brunswick and Nova Scotia. Nine hatcheries are involved in the evaluation study.

In this report we present preliminary results of tagging experiments being undertaken to determine the effect of stock origin and release location on contributions of hatchery-reared salmon smolts to various fisheries of the Maritime Provinces and the Northwest Atlantic. The specific objectives of this study were: (1) To compare both the distribution of tags recovered by the various fisheries and the levels of contributions to fisheries for two distinct stocks released into the same river; and (2) to compare the distribution of tags recovered by the various fisheries from releases of the same stock into two different rivers.

Three groups of hatchery-reared Atlantic salmon smolts were tagged and subsequently released in two Maritime rivers during the spring of 1968. Smolts of River Philip late-run stock were released in River Philip, Nova Scotia, while smolts of Miramichi late-run stock were released in both River Philip, Nova Scotia, and Miramichi River, New Brunswick. (Fig. 1). Background information on each group of tagged smolts is summarized in Table 1.

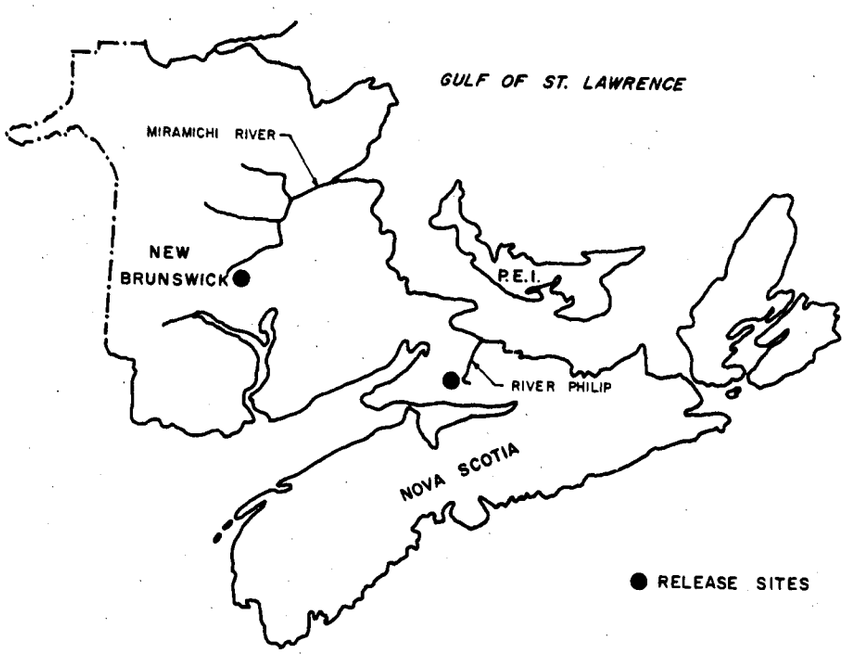

Figure 1. Release sites for tagged hatchery-reared smolts of River Philip and Miramichi late-run stocks in 1968.

Table 1. Background information on tagged, hatchery-reared smolts released into River Philip, N.S., and Miramichi River, N.B., in 1968. Age of smolts at release was 2 + years.

Release Location	Stock	Tagging Date	Mean Fork Length at Tagging (cm)	Release Date	Number Released	Rearing Location
River Philip, Collingwood Corner, N.S.	River Philip (Late Run)	April 26-May 6, 1968	17.3	May 6, 1968	4983	Cobequid Fish Culture Station, N.S.
River Philip, Collingwood Corner, N.S.	Miramichi (Late Run)	April 6-24, 1968	16.3	May 3, 1968	4796	Antigonish Fish Culture Station, N.S.
Southwest Miramichi R., Boiestown, N.B.	Miramichi (Late Run)	May 7 - 15, 1968	15.7	May 29 - June 3, 1968	6758	Miramichi Fish Culture Station, N.B.

Smolts were tagged with blue, laminated-plastic Carlin tags (4.8 x 14.2 mm) attached with polyethylene monofilament. All fish were transported by tank trucks from the rearing stations and released directly into the rivers. At River Philip, the total adult escapement was trapped at a weir located 1.8 km upstream of tidal influence. The actual adult escapement from Miramichi stock released in the Miramichi River is unknown.

COMPARISON BETWEEN STOCKS

The two stocks released in River Philip produced markedly different results, both in terms of their actual contributions to fisheries (Table 2) and their distributions between fisheries (Fig. 2). A very high proportion of all fishery contributions by these two groups (R. Philip - 92%; Miramichi - 81%) were to distant commercial fisheries in Newfoundland and Greenland (Fig. 3).

River Philip stock made a greater overall contribution to fisheries than did the Miramichi stock (1.3% vs 0.6% of tags released). Also, River Philip stock made proportionately more of its total fishery contributions to the Greenland fishery (67% vs 30%) and proportionately less to the Newfoundland fishery (26% vs 52%) than did the Miramichi stock.

The differences in exploitation of hatchery-reared smolts from River Philip and Miramichi stocks are largely due to differences in their ages at first maturity. Miramichi stock exhibited the greater tendency to mature as grilse (1-sea-winter). Grilse comprised 84% of the escapement from Miramichi stock and only 48% of that produced from River Philip stock. Return to the home stream at the grilse stage would certainly have lessened the total exposure to net fisheries and would have precluded the possibility of contributing to the Greenland fishery, which exploits salmon destined to spend at least 2 winters at sea before maturing. Elson (1971) has shown that within a particular stock age at first maturity is at least partially under genetic control.

Table 2. Contributions to various fisheries and to the escapement as indicated by tag returns from three groups of hatchery-reared salmon smolts released in the Miramichi River, N.B., and River Philip, N.S., in 1968.

			NOVA SCOTIA, NEW BRUNSWICK AND QUEBEC WATERS				DISTANT WATERS			GRAND TOTAL	
Release Location	Stock	Year of Return	Angling	Escapement	Commercial	Total	Newfoundland	Greenland	Total	Number	Percent of Number Released
River Philip	River Philip Late-Run	1969	0	11	0	11	9	42	51	62	1.24
		1970	3	12	2	17	8	2	10	27	0.54
		1969-70	3	23	2	28	17	44	61	89	1.78
River Philip	Miramichi Late-Run	1969	4	27	0	31	12	8	20	51	1.06
		1970	0	5	1	6	2	0	2	8	0.17
		1969-70	4	32	1	37	14	8	22	59	1.23
Miramichi River, Southwest Branch	Miramichi Late-Run	1969	15	4*	11	30	41	17	58	88	1.30
		1970[BL]	11	0	0	11	-	-	-	11	0.16
		1970	2	0	32	34	18	2	20	54	0.80
		1969-70	28	4	43	75	59	19	78	153	2.26

[BL] Returned as black salmon (post-spawners)

* Fish recovered in a sampling trap. The number is not indicative of total escapement.

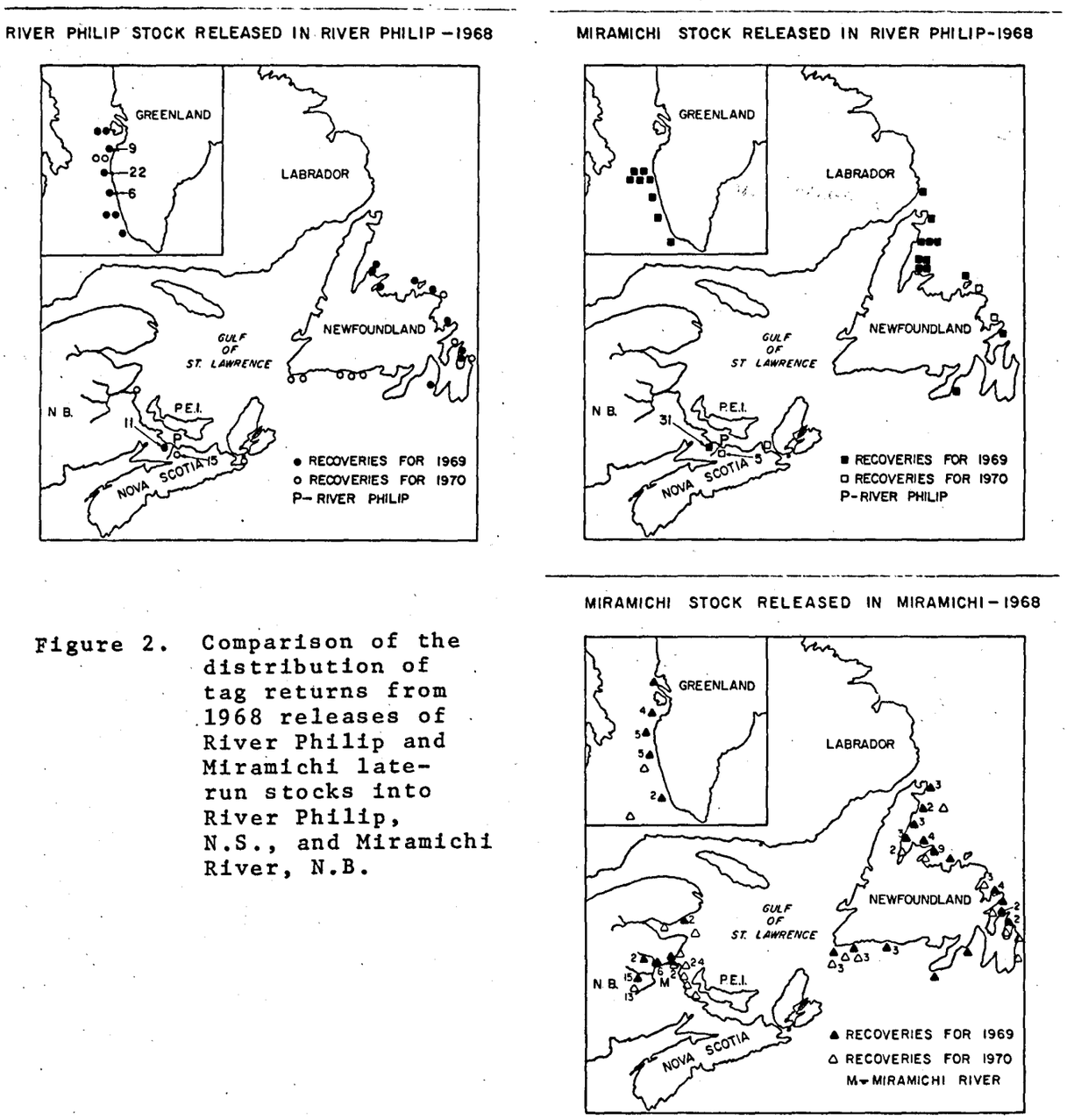

Figure 2. Comparison of the distribution of tag returns from 1968 releases of River Philip and Miramichi late-run stocks into River Philip, N.S., and Miramichi River, N.B.

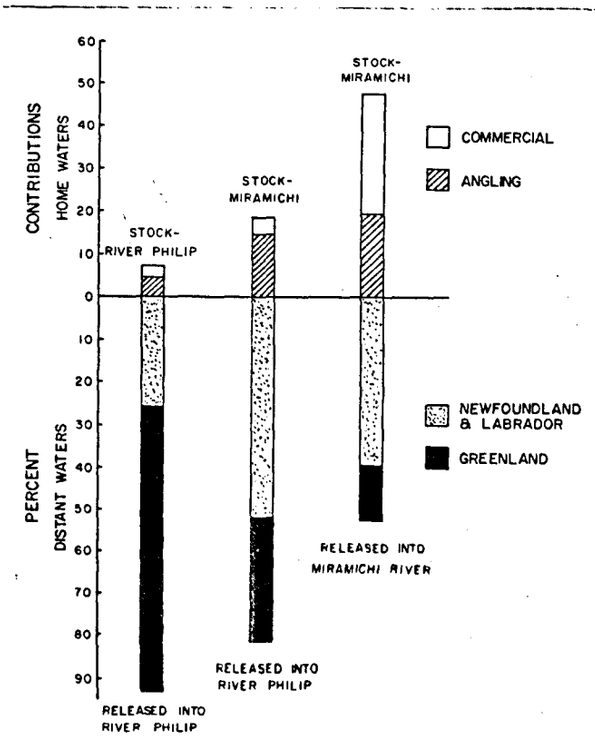

Figure 3. Proportionate contributions to various fisheries made by smolts of River Philip and Miramichi late-run stocks released in 1968 into River Philip, N.S., and Miramichi River, N.B. Home waters include coastal fisheries of Nova Scotia, New Brunswick and Quebec.

However, not all the differences in the exploitation of the two stocks can be attributed to possible genetic differences in age at maturity. The data from the 1968 smolt release in River Philip indicate that among those recaptures of salmon not destined to mature as grilse, i.e. all 1970 tag returns plus 1969 returns from the Greenland fishery, the River Philip stock was exploited more heavily than Miramichi stock by the distant fisheries of Newfoundland and Greenland. Considering only those recaptures of salmon not maturing as grilse, the contribution of River Philip stock to Newfoundland and Greenland fisheries per unit of escapement (4.3) amounted to more than twice that of Miramichi stock (2:0). These results suggest that there could well be genetic differences in the ocean feeding migration and in the return migration of particular salmon stocks, in terms of both location and timing, which would result in exposure to different levels of exploitation by ocean net fisheries.

COMPARISON BETWEEN RELEASE LOCATIONS

Tag returns from anglers and from weirs at River Philip and the Northwest Miramichi River (Curventon fence - Fisheries Research Board of Canada) indicated that returning adults of Miramichi stock strayed from the original release river, i.e. R. Philip and S.W. Miramichi R., to a negligible extent (Fig. 2). The only exceptions were two recoveries in the N.W. Miramichi River, of which one was taken by an angler and one was taken at the Curventon fence.

The release of Miramichi stock in River Philip, outside its native stream, produced a much lower total contribution to fisheries (0.6%) than did the release in the S.W. Miramichi River (2.2%) (Table 2). The fact that the River Philip release of Miramichi stock produced lower contributions to all fisheries would suggest that its ocean survival rate was much lower than that of the Miramichi release.

Location of release also influenced greatly the utilization of Miramichi stock in Nova Scotia and New Brunswick fisheries.

The release of Miramichi stock in River Philip experienced proportionately lower utilization than did the release in Miramichi in both home waters commercial fisheries (4% vs 29% of fishery returns) and sport fisheries (15% vs 19% of fishery returns). This difference in the utilization of the two releases in home waters reflects the relatively high intensity of all fisheries in the Miramichi River area.

CONCLUSIONS

The data presented in this report suggest that both stock origin and release location influence to a considerable extent the distribution of hatchery-reared Atlantic salmon at sea and their contributions to various fisheries. The results indicate that there is a significant potential for improved selection and distribution of hatchery-reared Atlantic salmon.

Present summaries of North American Atlantic salmon tag return information published through the International Commission for Northwest Atlantic Fisheries provide information on the location of tagged salmon smolt releases but make no reference to stock origin. The information provided on releases of hatchery-reared smolts should be interpreted with caution, bearing in mind that genetic differences between stocks released in a given year in the same river may have a major effect on both the level and distribution of fishery contributions.

REFERENCES

Elson, P.F., 1971. Some aspects of Canadian Atlantic Salmon fisheries in relation to the new Greenland and high seas fisheries. Submitted to International Commission for the Northwest Atlantic Fisheries for Annual Meeting, June, 1971. Serial No. 2533, ICES/ICNAF Salmon Doc. 71/17.