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Timing of migration of  
Atlantic salmon (Salmo salar)  
within the Miramichi River  
system, New Brunswick

by

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#### SUMMARY

Data collected from 1- and 2-sea-winter Atlantic salmon tagged from 1966 to 1974, as they entered the Miramichi River system showed a definite difference in migration timing through the estuary and into freshwater. Early-run salmon (mid-May to August 15) were slower reaching up-river recapture locations than those salmon entering the river during the late-run period (August 16-November 15). Moreover during the early-run period 1-sea-winter salmon tended to move more quickly through the estuary than 2-sea-winter salmon; with the same observation being true for 1 and 2-sea-winter salmon entering during the late-run period. These facts have important implications on exploitation during operation of a commercial trap and gill net fishery for salmon in the estuary.

#### INTRODUCTION

A commercial salmon fishing ban and certain angling cutbacks were imposed by Environment Canada in 1972 in most areas of New Brunswick, including the Miramichi River (Figure 1). The

commercial fishing ban is scheduled to be reviewed in 1976. It is possible that a commercial fishery of significant size will therefore, be pursued on the Miramichi system in 1977, in order to manage more scientifically the Atlantic salmon stocks of this river system and others when fisheries are re-instituted, the Fisheries and Marine Service has expended considerable effort to determine more accurately exploitation rates as well as routes and timing of salmon migration in distant and home waters. Much of the work has been accomplished through tagging wild salmon smolts and adults in rivers such as the Miramichi.

This paper describes some important differences in migration timing by 1-and 2-sea-winter Atlantic salmon tagged as they entered the river estuary and migrated into freshwater, during the early-run period (May to August 15) or the late-run period (August 16-November 15). These differences are important to fisheries managers wrestling with the problem of controlling the commercial salmon fishery while maintaining adequate river escapement.

Adult salmon have been trapped and tagged at an estuarial sampling trap (Millbank) each year since 1966 by Resource Development Branch (Figure 1). Some 1-and 2-sea-winter or older salmon were tagged each year during the entire migration period, mid-May to November. Tags utilized were modified Carlin tags, tied with fine stainless steel wire.

Recapture data, which were used to indicate migration timing differences within the Miramichi system were collected from commercial trap net fishermen, a counting fence and anglers. In 1972 and 1973, concurrent recapture data were collected from special recapture traps operated by Resource Development Branch on the Northwest and Southwest Miramichi Rivers just below head-of-tide (Figure 1). Only that recapture information considered accurate because of personal contact with fishermen or because of the detailed nature of information mailed in was used for analyses. Recapture data from Branch recapture traps used to make river population estimates in 1972 and 1973 and data from the Curventon fence operated by the Research and Development Directorate (formerly Fisheries Research Board) were the most concise and accurate information available.

## RESULTS

From 1966 to 1974, a total of 4,600 one-sea-winter and 3,252 two-sea-winter and older salmon was tagged at Millbank. By August

1, 1975, there were 1,454 one-sea-winter and 1,120 two-sea-winter tagged recaptures from all sources.

Preliminary analyses of Miramichi system recapture data, used as an indicator of migration timing within the river (Table 1), showed marked differences in mean time to recapture between the early and late-run 1-sea-winter salmon and the early and late-run 2-sea-winter salmon. With only one exception, at Curventon fence (Figure 1), 1-sea-winter salmon tagged during the early-run period and subsequently recaptured took longer to reach the upriver recapture location than those tagged in the late-run period. Late-run tagged 1-sea-winter salmon were 1 to 4 times as fast travelling from the tagging trap to the recapture locations.

Commercial and angling recaptures of tagged 2-sea-winter salmon at the same sites demonstrated the identical pattern noted above. That is, with only one exception, at South Nelson (Figure 1), early-run tagged 2-sea-winter salmon took considerably longer to be caught at up-river locations than did late-run 2-sea-winter salmon. Late-run 2-sea-winter salmon were 2 to 8.7 times as fast reaching the recapture locations.

Tag return data from the recapture traps operated on the Southwest and Northwest Miramichi Rivers in 1972 and 1973 demonstrated the same pattern observed with commercial and angling returns discussed earlier (Table 2). Without exception, early-run 1-and 2-sea-winter salmon took longer to be recaptured at up-river recapture traps on both tributaries than did late-run 1-and 2-sea-winter salmon.

Analyses of data in Tables 1 and 2 also showed that with few exceptions (commercial recapture sites in Table 1), 2-sea-winter and older salmon tagged during the early-run period took longer to reach recapture sites than tagged early-run 1-sea-winter salmon. Although a similar pattern is not as apparent in Table 1 for late-run tagged 1-and 2-sea-winter fish, Table 2 data does indicate that late-running 1-sea-winter salmon move through the estuary more quickly than the 2-sea-winter salmon.

Further detailed statistical analyses of the above data are necessary but the implications of these findings respecting management of Miramichi salmon stocks at least are great. Approval of location of commercial nets, possibly beginning in 1977, and determination of the fishing periods for these nets will have to be considered carefully. There appears to be a staging area in the Miramichi estuary where salmon mill around

before moving into freshwaters for spawning. It is also evident that the 2-sea-winter or older salmon, the fish with the highest egg deposition potential because of greater weight and higher percentage of females, stay longer in these areas. Under the traditional fishing regime in the Miramichi salmon arriving in the early-run period have been subject to a considerably higher exploitation rate at least in home waters than those arriving later in the season for a number of reasons - an important one being their delayed migration through the estuary and into freshwater.

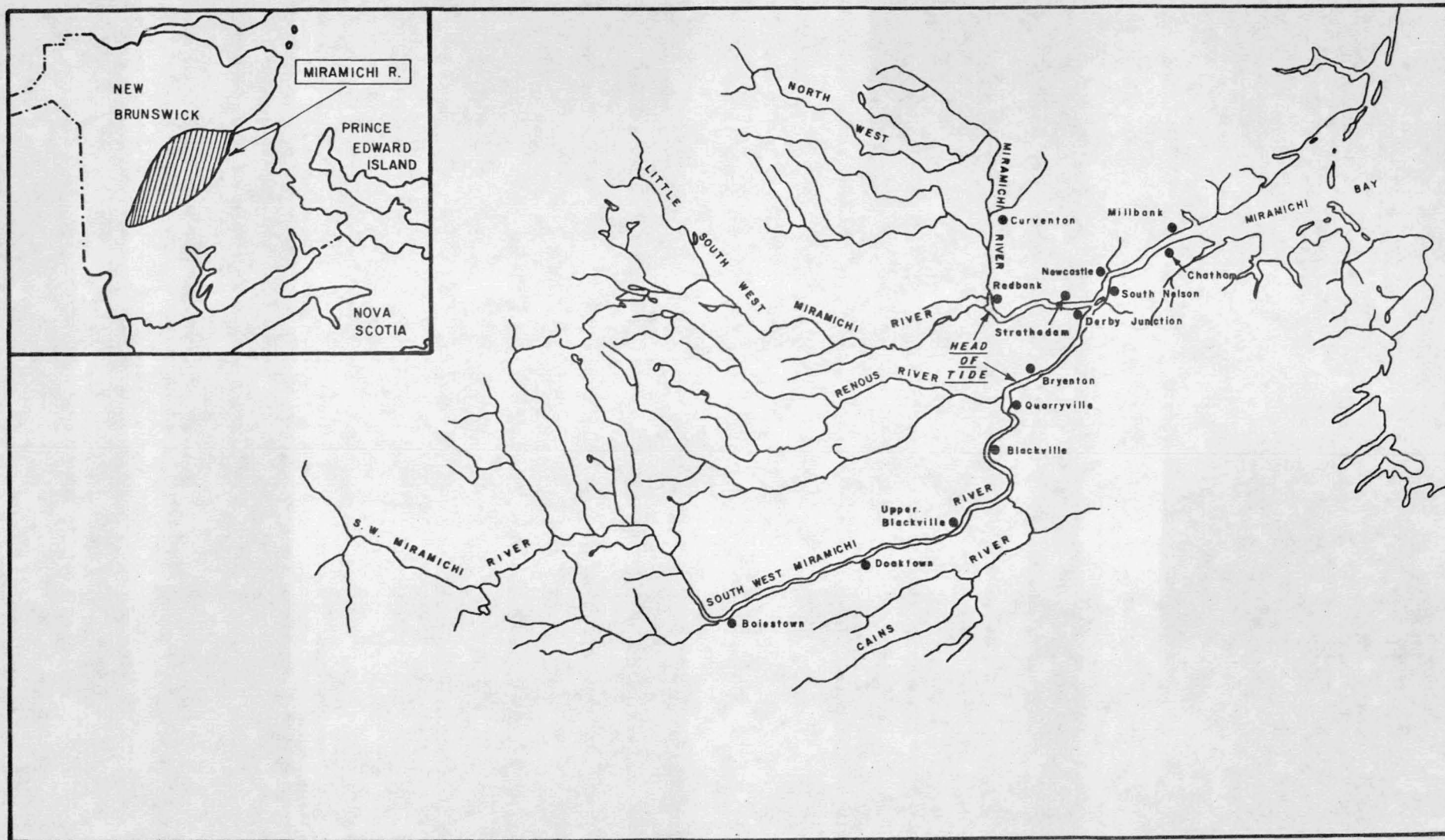


Figure 1 Location map for Miramichi River system adult salmon tagging and recapture sites.

Table 1. Mean time to recapture for 1-and 2-sea-winter Atlantic salmon tagged as bright adult salmon at the Miramichi estuarial sampling trap (Millbank) between 1966 and 1974. Only returns from the tagging year taken up-river of the tagging site were considered. Figures in parentheses ( ) indicates sample size. N.W. - Northwest Miramichi, S.W. - Southwest Miramichi.

Map reference location (Figure 1)	Miles-tagging site to recapture location	Method of recapture	Mean time to recapture (days)			
			1-sea-winter salmon		2-sea-winter salmon	
			Early-run <sup>1</sup>	Late-run <sup>2</sup>	Early-run	Late-run
South Nelson-Main Miramichi	7.5	Commercial	17.7 (26)	5.5 (21)	10.8 (19)	11.3 (6)
Derby Junction-Forks of N.W. & S.W. Miramichi	9.0	Commercial	11.8 (68)	4.6 (35)	10.9 (32)	6.8 (14)
Bryenton-S.W.	16.5	Commercial	16.1 (11)	4.1 (36)	26.2 (18)	6.9 (15)
Quarryville-S.W.	22.5	Angling	23.4 (28)	6.9 (10)	34.6 (9)	4.0 (6)
Blackville-S.W.	33.0	Angling	24.2 (49)	8.1 (9)	31.0 (26)	4.6 (5)
Upper Blackville-S.W.	45.0	Angling	17.1 (21)	16.4 (5)	25.4 (10)	5.0 (3)
Doaktown-S.W.	59.3	Angling	19.5 (23)	7.8 (6)	32.7 (14)	6.2 (5)
Boiestown-S.W.	75.8	Angling	31.6 (13)	11.7 (3)	31.7 (4)	13 (1)
Strathadam-N.W.	10.5	Commercial	8.7 (15)	7.8 (25)	20.8 (13)	10.6 (14)
Redbank-N.W.	22.5	Angling	13.2 (27)	3.5 (2)	12.6 (16)	11.3 (4)
Curventon-N.W.	30.0	Fence	18.4 (30)	41 (4)	67.5 (10)	35.3 (4)

1 - May to August 15, inclusive

2 - August 16 - November 15, inclusive

Table 2. Mean time to recapture for 1-and 2-sea-winter Atlantic salmon tagged as bright salmon in 1972 and 1973 at the Miramichi estuarial sampling trap (Millbank) and recaptured the same years at sampling traps near tide-head on the Northwest and Southwest Miramichi Rivers. Figures in parentheses ( ) indicate sample size.

Year tagged	Recapture location	Miles - tagging site to recapture location	Mean time of recapture (days)			
			1-sea-winter salmon		2-sea-winter salmon	
			Early-run <sup>1</sup>	Late-run <sup>2</sup>	Early-run	Late-run
1972	Southwest Miramichi	14.3	3.5 (4)	2 (1)	50.5 (4)	6.5 (2)
	Northwest Miramichi	13.5	24.3 (3)	3.3 (3)	59.8 (4)	13.5 (2)
1973	Southwest Miramichi	16.1	24.2 (5)	4.4 (49)	31.9 (14)	5.4 (21)
	Northwest Miramichi	13.5	18.0 (3)	7.4 (22)	37.8 (4)	13.6 (16)

1 - May to August 15, inclusive

2 - August 16 - November 15, inclusive