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Status of the Rocky River stock of Atlantic salmon (Salmo salar L.) in 1993

by

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¹La présente série documente les bases scientifiques des évaluations des ressources halieutiques sur la côte atlantique du Canada. Elle traite des problèmes courants selon les échéanciers dictés. Les documents qu'elle contient ne doivent pas être considérés comme des énoncés définitifs sur les sujets traités, mais plutôt comme des rapports d'étape sur les études en cours.

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Abstract

The Rocky River is the location of the second largest enhancement project within the Newfoundland Region. The Rocky River received stocking during the 1984 - 1987 period. This enhancement project is a colonization project (i.e. establishment of anadromous Atlantic salmon stock(s) in habitat not previously utilized by anadromous salmon) with a predetermined time frame for completion. Results obtained from fishway counts provided the basis for target egg deposition and a smolt fence on the Rocky River provided data on smolt to adult survival. The 1993 escapement on the Rocky River was 1.3 times the 1992 escapement and 1.3 times the previous 5 year mean.

Résumé

La rivière Rocky est le siège de la deuxième opération (en importance) de mise en valeur du poisson dans la région de Terre-Neuve. On y a implanté des stocks de poisson de 1984 à 1987. Le programme qui y a été entrepris est un programme de colonisation (c.-à-d. d'implantation de stocks de saumon de l'Atlantique anadrome dans un habitat qui n'était pas précédemment utilisé par ce poisson), se déroulant selon un échéancier donné. Les dénombrements effectués aux passes migratoires ont permis d'établir la ponte-cible, tandis qu'un barrage à saumoneaux a servi à recueillir des données sur la survie du stade de saumoneau à celui d'adulte. En 1993, les échappées de reproducteurs dans la Rocky étaient 1,3 fois supérieures à celles de 1992 ainsi qu'à la moyenne des cinq années antérieures.

Introduction

The Rocky River is the largest watershed on the Avalon Peninsula, encompassing a drainage area of 296 km² (Porter et al. 1974) flowing to the sea in SFA 9 (Fig. 1). A natural falls at the mouth of this river, overcome by fishway construction, made this watershed inaccessible to anadromous Atlantic salmon, prior to 1987. The Rocky River requires 3.4 million eggs to meet its target deposition (Bourgeois et al. 1991).

The intent of this document is to review the status of this enhanced stock in 1993 and to discuss any possible changes in stock status due to management changes affecting marine exploitation.

Background

For details of the stocking conducted on these watersheds refer to Table 2. The Rocky River, during its stocking phase, received between 23%-64% of its target egg requirement and since that time returns have provided 20%-47% of target egg deposition.

Management changes implemented in 1992 which were in place in 1993 that impacted marine exploitation of salmon are as follows:

1. Moratorium on commercial salmon fishing along the coast of insular Newfoundland.
2. Moratorium on the cod fishery in areas 2J, 3K and 3L implemented on July 15, 1992. This removed all cod traps from these NAFO areas.

Methods

Biological characteristic data, habitat determinations, and target spawning requirements are those determined by Bourgeois et al. (1992).

Target egg requirement was calculated based on 240 egg/m² of fluvial habitat and 7 smolts/ha of standing water. Smolt production of 7 smolt/ha was divided by 1.9% to convert this to eggs, (O'Connell et al., 1991).

In order to calculate the egg deposition in areas where stocking occurred, an estimate of egg-to-fry survival of 20% (Sturge, 1968) was used. The number of fry released was back calculated to indicate the required number of eggs to

produce those fry. Sturge (1968), in his work, gave a range of 10-30% for egg-to-fry survival and indicated that a figure of 20% appeared to be a reasonable value.

The smolt count was adjusted upwards, as follows, to provide an estimate of smolt production for 1993. The daily counts for the fence were broken down into morning, afternoon and evening counts from the fence data sheets. The fence count was lost at approximately 1130 hours, or just at the end of the morning count. The counts for the previous four days were averaged based on the three time frames. These averages were compared to the count for the morning the fence washed out, which was 2.05 times higher; the afternoon and evening counts were adjusted to reflect the morning count. For the following day, the average of the two days before and the two days after was applied, as the run had peaked.

Spawning escapement was calculated from fishway counts (no recreational fishery) without inclusion of an estimate for poaching and disease.

Results and Discussion

Table 1 details the accessible rearing area and target egg deposition for the Rocky River. The use of fixed parameters, such as 2.4 eggs m² and 7 smolts/ha of standing water, has certain limitations (see O'Connell & Dempson, 1991 for discussion on this topic).

The 1993 escapement to Rocky River was 1.3 times the 1992 escapement and 1.3 times the previous 5 year mean. This accounted for 41% of the required egg target (Table 2). Table 3 details smolt enumeration and age structure of this 1993 escapement. The 1993 returns, as determined from a sample of 32 adults, revealed that 97% of the run is based on returns from natural spawning, with 3% of the run resulting from stocked fry (i.e. 5⁺ smolt).

Smolt to adult returns to the river were 2.5%, 3.1% and 4.1% for the 1990, 1991 and 1992 smolts, respectively. The increase from 1990 to 1991 and 1992 can, in part, be attributed to the moratorium.

Table 4 provides insight into the egg/fry-to-smolt survival on the Rocky River. The egg-to-smolt figures compare favourably to other watersheds.

The low smolt count in 1993 can, in part, be attributed to the egg deposition in 1989. While the egg deposition was at its lowest in 1989, the 1993 portion of 3⁺ smolts is the lowest on record, suggesting a freshwater influence on the low number of smolt in 1993. It should also be noted that the fence washed out on the peak day of the smolt run.

Repeat spawners accounted for 16.7%, 7.7%, 12.5% and 9.4% of the returns to Rocky River for the years 1990 - 1993 respectively.

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Table 1: Rearing area and target egg deposition, Rocky River.

Riverine habitat (m ²)	Lacustrine habitat (ha ²)	Target egg deposition
10,823	2,191	3,404,730

Table 2. Details of egg deposition Rocky River 1983-1993.

Year	No. Released Fry	Fry to Egg Equiv.	Released Adults	Fishway Count	Total Eggs	% Target Egg
1983	0	153887 5	0	*	153887 5	45
1984	307775	217250 0	0	*	217250 0	64
1985	434500	970000	0	*	970000	28
1986	194000	199822 5	0	*	199822 5	59
1987	399645	0	124	81	799687	23
1988	0	0	0	319	123243 1	36
1989	0	0	0	177	683825	20
1990	0	0	0	418	161491 0	47
1991	0	0	0	227	876996	26
1992	0	0	0	283	109334 8	32
1993	0	0	0	364	140628 5	41

* indicates no data

Table 3. Details of smolt enumeration 1990-1993.

Year	Smolt Count	Percentage at Age			
		2 ⁺ 5 ⁺	3 ⁺	4 ⁺	4
1990	8,287	1	66	29	4
1991	7,732	16	70	13	1
1992	7,813	2	75	21	2
1993	5,115 [*]	13	56	25	6

^{*} Smolt count is an estimate due to fence washout

Table 4. Details of egg/fry to smolt survival 1985 - 1990.

Year	egg to smolt survival (%)	fry to smolt survival (%)	smolt classes
1985		0.08	5 ⁺
1986		1.3	4 ⁺ & 5 ⁺
1987		1.6	3 ⁺ , 4 ⁺ & 5 ⁺
1987	0.93		2 ⁺ , 3 ⁺ , 4 ⁺ & 5 ⁺
1988	0.69		2 ⁺ , 3 ⁺ & 4 ⁺
1989	0.44		2 ⁺ & 3 ⁺
1990	0.04		2 ⁺

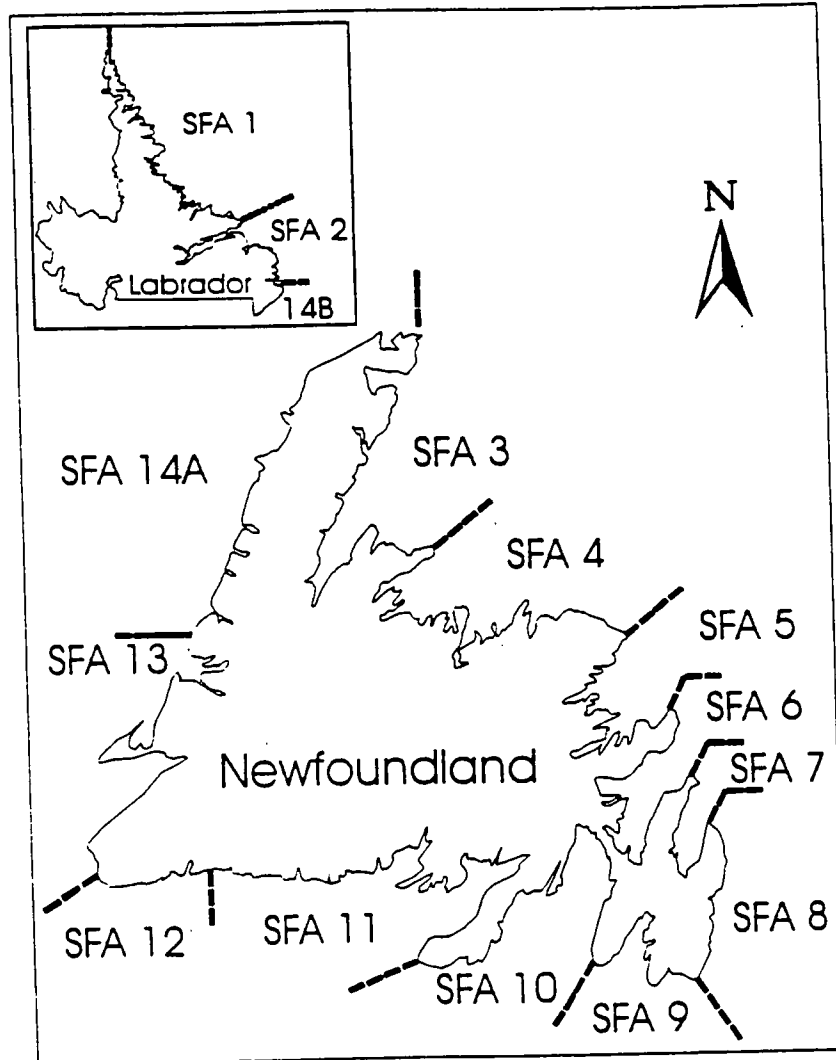


Fig. 1. Map showing the 14 Salmon Fishing Areas of the Newfoundland Region.