International Council for the
Exploration of the Sea

C.M. 1977/M:37
Anadromous and Catadromous
Fish Committee

An Evaluation of Two Release Methods in a Productive and Nonproductive Stream In Iceland.

by

1) 2) 3)
Árni Ísaksson, Tony J. Rasch and Patrick Poe

Abstract

Microtagged Atlantic salmon smolts of hatchery origin were released into a productive and nonproductive stream using two release methods. On one hand the smolts were adapted to the stream water in a release pond on the river bank for 2-3 weeks. Alternatively the smolts were planted directly into the stream after transportation from the hatchery. Downstream migrants were also microtagged in the productive stream for comparison with the hatchery smolts.

It was found that the release pond doubled to quadrupled the oceanic survival as compared to a direct plant method. Considerable straying of hatchery fish from the nonproductive stream to the hatchery was observed which was of no importance in case of the productive stream.

Wild smolts had very high survival rates (20-25%) relative to their small size at tagging. They also went further upstream than their hatchery counterparts.

1) Institute of Freshwater Fisheries, Reykjavík, Iceland.
2) Washington Department of Fisheries, Olympia, Washington, U.S.A.
3) Fisheries Research Institute, University of Washington, Seattle, Washington, U.S.A.

Rough estimate of egg to smolt survival in the productive stream was 0.4%.

Introduction

One possibility of enchancing salmon runs in rivers is to release smolts ready for seaward migration. This has been done for several years in Iceland but it has been suspected that the rates of return of these smolts were not as high as they should be compared to returns to the Kollafjörður Fish Farm.

Results from pilot experiments at Andakílsá river had indicated that survival could be considerably increased by means of a release pond built on the river bank, where the salmon smolts feed for a month before release. In the following experiments this method was compared to the conventional direct plant method used commonly in Iceland.

It was decided to test these release methods both in a productive river system (Elliðaár) and a barren stream which has never produced salmon (Ártúnsá) The latter experiment was designed to see if hatchery smolts could be profitably transported to any stream and harvested there upon return either by trap or a sport fishery. Since the salmon would not be able to propagate in those streams, a steady supply of smolts would have to be at hand every year. It is evident that the developement of techniques for this kind of fishery in Iceland would be a great boost for the smolt production in the country.

Release of smolts into a non-productive stream

In the spring of 1975 a total of 6000 microtagged two-year hatchery smolts were released into Ártúnsá which flows into Faxa Bay about 10 km from the Kollafjörður Fish Farm. Of these, 4000 smolts were released from a release pond but only 2000 via direct plant due to smolt shortage at the Kollafjörður Fish Farm. The smolts in the release pond had been fed dry feed for 2 weeks before release using an automatic feeder.

In the early summer of 1976 a trap was constructed on the river to collect returning adults. About the middle of August after collecting 30 adults the trap was washed out during heavy rains and the remainder of the run had to be harvested with a sports fishery. The fisherman brought their catch to Elliðaár for the retrieval of microtags.

Results from the experiment are shown in tables 1 and 2. The main conclusions drawn were as follows:

1. The survival of smolts kept in a release pond (2.3%) was much superior to that of smolts planted directly (0.6%).

2. The smolts released into Ártúnsá had a great tendency to stray to Kollafjörður Fish Farm as their place of hatching and rearing. Similar water chemistry at Kollafjörður and Ártúnsá might be responsible for this or the salmon might be attracted by the smell of young salmon at Kollafjörður which is practically absent at Ártúnsá.

3. The overall return rates were comparable to the return rates obtained with the same kind of smolts at the Kollafjörður Fish Farm. Provided that the straying problem can be solved the release of hatchery smolts into barren streams has great potential.

Release of smolts into a productive stream

The Elliðaá river was very suitable for these experiments in a number of ways. It was located very close to the Institute of Freshwater Fisheries which facilitated field work. A salmon trap with a counter is located on the river which offered possibilities of regular checks for tagged salmon. Finally, there was a concrete raceway situated on the river banks which was very well suited for a release pond.

In the spring of 1975 four groups of two-year smolts were microtagged for the experiments. Each group had 2 replicates of about 1000 fish each bringing the total number of smolts tagged to 8000. One group consisted of wild smolts fyke-netted on their downstream migration, a second group consisted of hatchery fish

held and tagged at Elliðaár; a third group were hatchery smolts tagged at Kollafjörður Fish Farm and released directly into Elliðaár. Finally there was a group of hatchery fish tagged at Kollafjörður and held at Elliðaár prior to release.

The recovery of microtags at Elliðaár in 1976 was primarily from the sports fishery although a considerable number of tags was obtained from trap closures. Every salmon caught on hook and line was brought to the fishing hut at the end of each half-day fishing period. A representative of the Institute of Freshwater Fisheries was always present at that time to retrieve the tags. The plugs containing the tag were subsequently taken to the Institute for excision and identification.

In order to be able to estimate the total return rates for the tagged smolts, it was necessary to know the escapement fairly accurately. This was done by marking upstream migrants in the adult trap and getting a Peterson estimate when brood stock was seined in the fall.

The data obtained offered the possibilities to calculate the egg to smolt survival. This was done using the escapement in 1971 and the total run of wild salmon in 1976.

The results from these tagging experiments are shown in tables 1 and 2. The main findings are as follows:

1. The survival of hatchery smolts kept in a release pond (6.7%) is much better than that of a direct plant (2.9%).

2. The survival of wild smolts is between 20 and 25% which is phenomenal considering the small size at tagging.

3. Hatchery smolts were 3-500 grams heavier at return than the wild smolts which can be related to different sizes at release.

4. There was no excessive desire observed in the hatchery smolts to go to Kollafjörður in contrast with the findings at

Ártúnsá. Difference in water chemistry between Kollafjörður and Elliðaár and/or the presence of young salmon in the Elliðaár water shed are likely explanations.

5. The egg to smolt survival was calculated to be 0.4% which is fairly high probably due to limited freshwater predation in Icelàndic streams.

6. The wild fish went farther upstream than the hatchery fish, probably due to the location of the release pond close to the estuary.

Table 1. Experimental design and results for the 1975 Elliðaár and Ártúnsá tagging experiments.

Smolt group	Number released	Number recovered **	Estimated escapement	Estimated total run	Estimated % return	Size at release (cm)	Mean weight at return	% caught by rod below dam
Elliðaár								
Direct plant	1,000	25	13	58	2.9	15.5	2.7	88.9
Tagged at Kollafjörður	1,000	20						
Release pond	1,000	42	43	133	6.7	14.1	2.7	93.9
Tagged at Kollafjörður	1,000	48						
Release pond	1,000	35	35	101	5.4	14.0	2.5	84.4
Tagged at river	873	31						
Wild smolts	1,059	110	224	437	20.8 *	12.5	2.2	33.5
Tagged at river	1,042	103						
Ártúnsá								
Direct plant	2,000	12	0	12	0.6	13.4	2.8	-
Tagged at Kollafjörður	No replicate							
Release pond	2,000	42	0	91	2.3	13.5	2.5	-
Tagged at Kollafjörður	2,000	49						

* 25.8% survival when handling effect has been taken into account.
** Only grilse returning in 1976 are included. A considerable number of salmon has returned in 1977.

Table 2. Amount of straying from Ártúnsá, Elliðaár, and Kollafjörður in the 1975 tagging experiment.

Place of release	Kollafjörður		Elliðaár		Ártúnsá		Leirvogsá		Total strays	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Kollafjörður	958	94.9	39	3.9	4	0.4	9	0.9	52	5.2
Elliðaár Direct plant	1	2,2	44	97.8	0	0	0	0	1	2.2
Elliðaár release pond	5	3.2	151	96.8	0	0	0	0	5	3.2
Ártúnsá direct plant	4	33.3*	1	8.3	7	58.3	0	0	5	41.6
Ártúnsá release pond	22	24.2*	4	4.4	65	71.4	0	0	26	28.6

* No significant difference at the .05 level.