

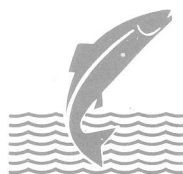
THE EFFECT OF OCEAN FISHING ON THE SALMON
RUN IN LAXÁ Í ADALDAL, ICELAND, IN 1989

Preliminary report

Tumi Tómasson

Hólar, Oct. 1989

VMST-N/89017



VEIÐIMÁLASTOFNUN
Norðurlandsdeild

THE EFFECT OF OCEAN FISHING ON THE SALMON
RUN IN LAXÁ Í AÐALDAL, ICELAND, IN 1989

Preliminary report

Tumi Tómasson

Hólar, Oct. 1989

VMST-N/89017

Institute of Freshwater Fisheries
Northern Division
Hólar í Hjaltadal
551 Sauðárkrókur
ICELAND



VEIÐIMÁLASTOFNUN - NORÐURLANDSDEILD
Hólum, Hjaltadal, 551 Sauðárkróki.

INTRODUCTION

Since ocean fishing for salmon developed in the mid-sixties and especially since the expansion of the Faroese fishery from 1979, there has often been speculation in Iceland as to the effect these fisheries might have on Icelandic salmon stocks. The debate has usually livened up when catches in Icelandic rivers have been poor.

The debate on the effect of the ocean fisheries on Icelandic stocks is based on scant information. Tagging programs have been regional and have not always been carried out with any regularity. Yet tagging information is the only indication Icelanders have on the distribution and return rate of their stocks.

In 1988 three tags from Icelandic salmon were recovered at West Greenland, two from the Kollafjörður Fish Farm and one from the River Laxá í Aðaldal in Northern Iceland. In addition, fifteen Icelandic tags were recovered from the Faroese fishery. All those tags originated from rivers in northern Iceland, nine being from Laxá í Aðaldal.

The purpose of this report is a **preliminary evaluation** of the effect the ocean catches have had on the salmon catches in Laxá í Aðaldal in 1989. Such an evaluation must draw on a wider context and thus the trend in catches for the past 15 years will be considered.

REVIEW OF PREVIOUS TAGGING EVIDENCE OF OCEAN FISHING OF ICELANDIC STOCKS

Despite the inadequacies of tagging programs in Iceland, salmon smolts have been tagged for over two decades and in increasingly large numbers, especially since the advent of microtagging in Iceland in 1974. The programs have largely been centred on hatchery reared smolts from the Kollafjörður State Experimental Fish Farm and other ranching stations in the southwest of Iceland. The vast majority of the smolts in these ranching stations become sexually mature after feeding in the ocean for one year and return as grilse, thus they are not as vulnerable to ocean capture as salmon stocks in northern rivers where 40-60% of the runs consist of multi-seawinter (MSW) fish.

In most years the Faroese fishery is concentrated on potential multi-seawinter (MSW) salmon and such fish is exclusively caught at West Greenland. Guðjónsson (1988) judged potential migration routes from geography and ocean currents and felt that salmon from rivers in the south and west of Iceland would be more likely to be caught off West Greenland, while salmon from the north and the east of Iceland would be more vulnerable to the Faroese fishery. The recent tag returns mentioned above support this view.

Up to 1988 ten Icelandic tags had been recovered from the fishery at West Greenland, including two from smolt releases into rivers in the north. In addition one tagged salmon from an eastern river was caught in a survey at East Greenland. Five Icelandic tags had been recovered from the Faroese fishery, including two from the north and east.

Exact data on the total numbers of tagged smolts and recaptures in Iceland over the last fifteen years are not available at the time of writing. But to put recaptures in the ocean fisheries into perspective we need some estimate of recapture rate in rivers. In the south and west of Iceland, recaptures probably run into several thousands, dominated by grilse (about 90%), while recoveries from rivers in the north and east might only number a few hundred in total, and the grilse:salmon ratio is on average closer to 50:50.

CATCHES IN LAXÁ Í ADALDAL

The salmon runs in Laxá consist of grilse and 2 seawinter salmon (2SW), as well as a minor (usually 5-10%) part of 3 seawinter salmon and repeat spawners. Two tributaries which support salmon fisheries join the River Laxá. They are River Mýrarkvísl and River Reykjadalssá and their stocks contribute a substantial (approximately 20-40%) but variable proportion of the catches in Laxá. Angling is the only method of salmon fishing permitted in Laxá.

In order to evaluate the effect of the ocean fishery on the Laxá stocks, we need to look at the difference between the predicted and actual catches in the river. To find this difference we can look at the data on actual grilse and salmon catches for the last fifteen years (Table 1). There is a good positive relationship between the number of grilse and 2SW salmon caught from the same cohort of smolts leaving the river. This relationship is not directly proportional, and has been found to be:

$$\text{Expected 2SW salmon} = (\text{Number of grilse caught} * 0.52) + 698$$

This formula is based on catches of smolt classes from 1973 - 1986 ($n=15$, $r=0.74$, $p=0.007$). In principle this formula should be based only on catches from before the expansion of the Faroese fishery in 1979. An attempt will be made to modify the formula in a later version of this report, but a similar general trend is expected. The actual catches and the expected catch are presented in Table 1.

The 2SW salmon catch was 27-36% below the predicted catch for the 1979-1981 smolt cohorts. This coincides with the development of the Faroese fishery which in 1980 had risen to 718 tonnes from 51 tonnes two years earlier. However the Faroese catches remained high from 1983 to 1987. The catches of 2SW salmon in Laxá from 1983 to 1986 exceeded the expected value.

EVIDENCE FROM TAGGING STUDIES

Hatchery reared salmon smolts of Laxá stock have been released in Laxá for several years. For five years these have been microtagged. The number of tags recovered in the rivers are given in Tables 2 and 3.

It is noteworthy that not a single tagged individual was recovered from the ocean fisheries in 1982-1985, although total recoveries of tagged 2SW salmon from those years were equal to those from the 1987 release when 10 tags were returned from the ocean fisheries. In 1982-85 catches of 2SW salmon in Laxá were good in relation to the numbers of grilse caught the previous year (Table 1).

Catches of 2SW salmon in 1989 were disappointingly poor and generally 40-50% below the expected values for rivers in North Iceland. This coincided with the returns of 10 tags from the oceanic fisheries. In using these returns to estimate the effect of the oceanic fisheries on the salmon catches in Laxá in 1989, several assumptions have to be made: These assumptions are:

1. The reporting rate in Laxá is 50% and the same in 1988 and 1989. In 1988 a manager of a fishery accounting for approximately 20% of the total catch recorded 45 adipose fin-clipped grilse (the outward sign of microtagged fish), but only the snouts of 23 of these were returned to the Institute of Freshwater Fisheries for analysis.
2. It is assumed that the salmon originating from hatchery releases and natural smolt production in the river system is equally vulnerable to capture in their feeding migration in the ocean. The fact that the grilse:salmon ratio for tagged and untagged fish caught in Laxá is nearly the same lends support to this assumption (1.71 vs 1.57).
3. The exploitation rate by anglers in Laxá is taken to be 50%. This had not been studied in Laxá, but has been found to vary greatly in other Icelandic rivers, generally from 30-70%.
4. It is assumed that 30% of the Faroese catch and 8% of the West Greenland catch was scanned for microtags i.e. a similar proportion to that in previous years (Anon., 1989).
5. It is assumed that non-catch fishing mortality in the oceanic fisheries is 20% and that annual natural mortality in the ocean is 10%. These are estimates used by the ICES North Atlantic Salmon Working Group (Anon., 1989).

According to these assumptions, the Faroese fishery has reduced the run of tagged salmon by 33 and the Greenland fishery has reduced it by 12.

The estimated total catch of 70 tagged salmon would therefore have been 92 in the absence of the oceanic fisheries.

Therefore the reduction in 2SW salmon in the Laxá catch, based on the above assumptions, is 24%.

DISCUSSION AND CONCLUSIONS

The data presented in this report indicates that the ocean fisheries of Atlantic salmon in 1988-89 **may** have had a pronounced effect on the catches of 2SW salmon in River Laxá in 1989.

However, the absence of returned tags from ocean fisheries from the 1982-1985 tagging experiments, as well as the deviation from the grilse:salmon relationship indicates that the exploitation of Laxá stock in the ocean fisheries is variable among years.

The average annual catch at the Faroes has been around 600 tonnes in recent years and 900 tonnes at West Greenland. Salmon catches in north and east Iceland generally vary from 20 to 50 tonnes.

The question is thus not what proportion of the oceanic catch is of Icelandic origin, but rather what proportion of the Icelandic stocks are being taken by those fisheries and under what conditions they are most likely to be caught.

Most of the tags (13) recovered from the Faroese fishery came in a relatively short period of time, in November and December 1988. If the salmon stocks from north and east Iceland roam the ocean as a loosely knit group, then one could imagine an intensive fishery for a short period of time having a considerable effect, although the benefit to that fishery would be by comparison of little significance.

If oceanic fisheries continue then it is imperative that a comprehensive long-term tagging program on natural and hatchery reared salmon smolts in Iceland be initiated. We need the information on capture times and localities in the oceanic fisheries and on return rates to the rivers to reliably estimate the effect of ocean fisheries on our stocks. Without this information we are not in a position to propose management options to reduce any such effect.

REFERENCES

- Anon. 1989. Report of the Working Group on North Atlantic Salmon. Copenhagen 15-22 March 1989. ICES, Doc. C.M. 1989/Assess:12.
- Guðjónsson, Þór. 1988. Oceanic migration of Atlantic salmon. In Gunnarsson, V. (ed.). 1988. Proceedings of a conference on ocean ranching, held in Reykjavík, 7-9 April 1988, pp. 44-61. (In Icelandic.)

TABLE 1 Catches of grilse and 2SW salmon in Laxá í Aðaldal, originating from smolt runs in 1973-1987, and expected catch of 2SW salmon¹.

Year of smolt outmigration	Number of grilse (following year)	No. of 2SW salmon (two years later)	Exp.catch of 2SW	Deviation of exp. from obs.
1973	517	1274	967	+32%
1974	1043	1268	1240	+2%
1975	667	1406	1045	+35%
1976	1510	1432	1483	-3%
1977	1666	1344	1564	-14%
1978	1080	2192	1260	+74%
1979	218	505	811	-36%
1980	941	862	1187	-27%
1981	429	595	921	-35%
1982	564	1143	991	+15%
1983	209	877	807	+9%
1984	1026	1370	1232	+11%
1985	1349	1640	1399	+17%
1986	735	968	1080	-10%
1987	1276	815	1362	-40%

¹Expected catch is based on the formula

$$\text{Expected 2SW salmon} = (\text{No. of grilse caught} * 0.52) + 698.$$

where $n = 15$, $r = 0.74$, $p = 0.007$)

TABLE 2 Summary of releases of microtagged smolts and recoveries of tags in River Laxá in 1982-1985.

Year of release	Smolts released	Tags recovered in Laxá		Tags in other rivers		Total
		Grilse	2SW Salmon	Grilse	2SW Salmon	
1982	6400	1	5	-	-	6 (0.1%)
1983	6019	1	10	-	1	12 (0.2%)
1984	5002	16	11	3	1	31 (0.6%)
1985	5003	22	10	5	-	37 (0.7%)
Total	22424	40	36	8	2	86 (0.4%)

TABLE 3 Returns of microtagged hatchery reared smolts released in Laxá in 1987. Groups 1 and 2 were released near the estuary and groups 3 and 4 13 km upstream.

Group	Numbers released	Recaptures		Faroese	W.Greenland
		Grilse	Salmon		
1	2347	24	12	3	1
2	1658	11	4	2	-
3	1901	16	6	3	-
4	2106	9	13	1	-
Total	8012	60	35	9	1

In addition, 14 grilse and 1 2SW salmon were caught in other rivers in north and east Iceland, and one tagged grilse was captured in Laxá in 1989.

TABLE 2 Summary of releases of microtagged smolts and recoveries of tags in River Laxá in 1982-1985.

Year of release	Smolts released	Tags recovered in Laxá		Tags in other rivers		Total
		Grilse	2SW Salmon	Grilse	2SW Salmon	
1982	6400	1	5	-	-	6 (0.1%)
1983	6019	1	10	-	1	12 (0.2%)
1984	5002	16	11	3	1	31 (0.6%)
1985	5003	22	10	5	-	37 (0.7%)
Total	22424	40	36	8	2	86 (0.4%)

TABLE 3 Returns of microtagged hatchery reared smolts released in Laxá in 1987. Groups 1 and 2 were released near the estuary and groups 3 and 4 13 km upstream.

Group	Numbers released	Recaptures		Faroese	W.Greenland
		Grilse	Salmon		
1	2347	24	12	3	1
2	1658	11	4	2	-
3	1901	16	6	3	-
4	2106	9	13	1	-
Total	8012	60	35	9	1

In addition, 14 grilse and 1 2SW salmon were caught in other rivers in north and east Iceland, and one tagged grilse was captured in Laxá in 1989.