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(B.g.14)ICNAF Res.Doc. 72/49ANNUAL MEETING - JUNE 1972ADULT SALMON RECAPTURES FROM
A 1968 SMOLT STOCKING PROGRAMBertrand Tétreault¹ & Wilfred Carter²1. Introduction

Following the discovery of sea feeding pastures for Atlantic salmon of North American and European origin near the west coast of Greenland in 1963, catches by commercial fishermen there have increased steadily (see Table 1). From 1,027,300 pounds in 1963, catches rose to nearly 5 million pounds in 1969, equivalent to 660,000 salmon. The great majority of fish taken are in their second sea year and weigh an average of 7.4 pounds.

The traditional Greenland fishing industry had previously been dependent upon the cod, but suddenly the salmon fishery assumed major importance, and just as quickly it precipitated a major international fishery conflict. As catches in Greenland increased dramatically, the fishery in some of the countries producing the salmon being taken there showed signs of distress. In 1971 the salmon fishery in North America proved to be one of the worst on record. Catch decrease are attributed, at least to a substantial degree, to the commercial fishery operating

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in the Greenland area. In Quebec the 1971 commercial catch was down 42% over the years 1970 and 1969, and 64% over the year 1966 (see Table II). The 1971 recreational fishery followed the same trend with a diminution of 56% in the angling success over the 1966 figure. (See Table III).

Although a number of countries are involved in the fishery off Greenland, the major proportion of the catch has consistently been reported by fishermen from Denmark and the native Greenlanders. Since 1967 the salmon producing countries have sought to have the salmon fishery banned on the high sea and the catch in the inshore fishery at Greenland reduced.

Denmark has consistently declined to recognize the validity of the claims of salmon producing countries, and in this stand she has been supported by the Federal Republic of Germany and Sweden. The arguments advanced by those countries have been a) no scientific evidence exists to prove conclusively that the highsea fishery for salmon at Greenland is damaging to stocks in homewater fisheries, and b) a ban on highseas fishing is contrary to the principle of freedom of the seas, and would therefore be discriminatory. For these reasons, resolutions passed by the International Commission for the Northwest Atlantic Fisheries and the Northeast Atlantic Fisheries Commission to ban the highseas fishery have never been implemented. Norway too, still continues a highseas fishery for salmon, implying that she will not become a party to the prohibition resolutions as long as Denmark refuses to abandon her position and discontinue the fishery by its nationals.

In an attempt to provide additional scientific data to support the proposals for a total ban on highseas fishing, the Quebec Wildlife Service and the Salmon Council have participated in smolt tagging experiments with the Fisheries Research Board of Canada since 1968.

2. General Objectives of the Tagging Program

Tags recovered from salmon in the sea or upon return to their river of origin enable biologists to gather important data on growth, migratory pattern, survival ratio and exploitation by the commercial and the recreational fisheries. The particular interest of the Quebec

Wildlife Service and The Salmon Council in these experiments is to ascertain what proportion of smolts emigrating from Quebec rivers are subsequently captured in fisheries off Greenland and Newfoundland, and how many succeed in returning as adult salmon to be captured by the local fishery in or near the rivers of origin.

3. Method

The tagging program began in 1968 and will continue through 1972. A total of 121,656 two-year-old, tagged, hatchery reared smolts have been liberated to date in Quebec rivers (see Table IV). Of this number, 5000 tagged smolts were liberated annually in each of four rivers, two on the Gaspé Peninsula and two draining into the Gulf of St. Lawrence on the north shore.

Tags used are the Carlin type, affixed to the anaesthetized smolt near the base of the dorsal fin. Each tag is serially or individually numbered. Following tagging, smolts were kept under observation in the hatchery for at least a month in order to verify the physical condition of each fish and assure that injuries caused by tagging healed before stocking.

Each year the smolts used in these experiments come from the same hatcheries, one operated by the Government of Quebec at Gaspé and the other a private hatchery operated by Domtar Limited.

Mortalities averaged less than 1% during the period the tagged fish were held in the hatchery. Stocking was carried out as near the natural migratory time as possible, determined from previous observations.

To encourage return of tags from captured fish a reward is paid to the fisherman.

4. Results

The average life cycle of hatchery produced salmon is 3 to 5 years. Two years are needed for the fish to become smolts, although some do smoltify in one year. A further year at sea produces a small

salmon, commonly referred to as a grilse. Most fish stay a second and sometimes a third year at sea, before beginning the return migration to the same river where they had been released as smolts.

This report therefore only discusses returns from the 1968 stocking. Not until 1975 will it be possible to complete a final analysis of data from the complete series of experiments. Nevertheless, preliminary returns provide significant data on captures as indicated in the accompanying Tables V to VII.

Of the 20,456 smolts tagged and released in 1968, one hundred and five (105) tags were returned (0.51%). Distribution of the recaptures was as follows: (see also Table V and VI).

<u>Recovery area</u>	<u>Number recovered</u>	<u>%</u>
Greenland	44	42
Newfoundland	44	42
Quebec (commercial fisheries)	12	11
Quebec (recreational fisheries)	<u>5</u>	<u>5</u>
	105	100

Further examination of data on the recaptured fish indicated that those taken in the Greenland fishery were in their second sea year while tags taken in the Newfoundland and Quebec fishery were from larger salmon having already completed two full years at sea. (See Table VI).

5. Discussion

Assuming that there is a homogeneous distribution in the sea between tagged and untagged salmon smolts, and that the fishery is not selective for either group, it is reasonable to conclude on the basis of these results that of the total proportion of salmon from these four rivers captured in any fishery, 42% are captured in Greenland and 42% in Newfoundland, with only 16% being cropped by the local fishery (commercial and recreational) in Quebec.

It is significant to note that tag returns from the Greenland fishery in this experiment came almost exclusively from the inshore fishery (inside the 3 mile zone from the Greenland coast). From 1969 to 1971 inclusively, out of forty-four (44) Greenland returns, only six (6) originated from the offshore fishery. As both the offshore and inshore fishery are known to exploit the same stocks of salmon and assuming

a homoneneous distribution of our stocks along and off the Greenland Coast, the inescapable conclusion is that the offshore fishermen do not often bother to return tags on salmon they capture. This assertion has in fact been confirmed by scientists observing the fishery, and is no doubt the result of the international controversy surrounding the highseas salmon fishery off Greenland.

It is a reasonable and logical conclusion then that the total recapture in the Greenland region from the 1968 and subsequent year stockings is even higher than the figures indicated in this report.

Simple extrapolation of the 1969 Greenland inshore fishery (1000 metric tons, 33 tags returned) and the 1969 Greenland offshore fishery (1200 metric tons, 3 tags returned) suggest that at least an additional thirty-seven (37) tagged salmon from these stockings were captured in the offshore fishery. This would bring the total of the Greenland offshore returns up to forty (40), but only three (3) tags were actually reported in 1969.

From experimental studies on the viability of sockeye salmon escaping from gillnets (Thompson and Hunter 1971) we learn that approximately 79% of salmon exposed to a gillnet fishery become entangled. Of these, 48% escaped, and of those which did become disentangled 75% were dead within 6 days. Applying these same results to the Atlantic salmon fishery in Greenland, one is led to conclude that the annual fishery kill statistics reported there each year represented in fact only 59% of the total actual mortality directly attributable to the fishery.

Table VII therefore is a more accurate representation of the distribution of the capture of salmon originating from the four rivers used in this experiment, and in fact may portray more accurately the catch distribution of all salmon originating from rivers in Quebec.

In assessing this recapture data it should be borne in mind that we do not know whether recaptures reported in the recreational fishery represent the same proportion of the total tagged and untagged salmon present there as in the case of the commercial fishery.

6. Conclusions

From these preliminary data we are able to make the following observations:

- a) Salmon smolts originating from some rivers in Quebec grow to maturity on sea feeding grounds near Greenland.
- b) These same salmon are exposed to a distant commercial fishery near Greenland and Newfoundland.
- c) The Greenland fishery captures these salmon before they are fully grown, while the Newfoundland fishery harvests them at a larger stage, when they are older and heavier.

In conclusion, two factors should be noted. These figures cannot be used as a measurement of the survival rate of hatchery reared salmon smolts because: a) we know that all recaptured tagged fish are not reported, and b) we do not know the total number of tagged but unreported salmon returning to the river systems.

Secondly, the substantial proportion of salmon produced in Quebec rivers and subsequently captured as adults in distant fisheries is alarming, and can only discourage costly programs of hatchery operation and river rehabilitation projects until the effect of these distant fisheries is substantially reduced.

REFERENCES

- THOMPSON, R. and C. HUNTER. 1971. International North Pacific Fisheries Commission report in North Pacific Fisheries Research Center Monthly Report, September 1971.

TABLE I

Greenland Salmon Catch 1963 - 1971 *

YEAR	POUNDS (x 1000)
1963	1027.3
1964	3392.9
1965	1894.2
1966	3014.0
1967	3922.2
1968	2479.4
1969	4862.0
1970	4721.2
1971	5720.0

* Reference: ICES - ICNAF Joint Working Party Report

TABLE II

Quebec Commercial Catch 1966 - 1971 *

YEAR	POUNDS (x 1000)
1966	590.0
1967	501.0
1968	424.0
1969	381.0
1970	383.0
1971	219.9

* Reference: Quebec Salmon Council

TABLE III

Rod Catch and Angling Success *

Year	Reported number of fish caught	Angling Success
1966	12,873	1.10
1967	13,424	0.93
1968	8,603	0.61
1969	14,132	0.76
1970	14,846	0.69
1971	8,801	0.49

* Reference: Quebec Salmon Council

TABLE IV

Tagged Smolts Stocked 1968 - 1971

Year	Agency	Number	Total
1968	Quebec Wildlife Service	20,456	20,456
	Domtar Hatchery	---	
1969	Quebec Wildlife Service	19,800	29,300
	Domtar Hatchery	9,500	
1970	Quebec Wildlife Service	21,500	37,600
	Domtar Hatchery	16,100	
1971	Quebec Wildlife Service	20,000	34,300
	Domtar Hatchery	14,300	
Total	Quebec Wildlife Service	81,756	121,656
	Domtar Hatchery	39,900	

TABLE V

Recaptures from 1968 Smolt Stocking

Rivers Stocked	Commercial Fisheries			Recreational Fishery (in river of origin)
	Greenland	Newfoundland & Labrador	Quebec	
Grand Cascadepia River (Gaspé)	20	14	7	2
Escoumains River (North Shore)	11	12	0	1
Ste. Anne River (Gaspé)	9	6	2	2
Franquelin River (North Shore)	4	12	3	0
TOTAL	44	44	12	5

TABLE VI

Annual Distribution of Tag Recoveries
1968 Tagging

Location of recapture	1969		1970		1971	
	Number of tag returns	Cumulative %age	Number of tag returns	Cumulative %age	Number of tag returns	Cumulative %age
Greenland (offshore and inshore)	36	71	6	45	2	42
Newfoundland	12	24	30	43	2	42
Quebec (commercial)	0	0	7	7	5	11
Quebec (recreational)	3	5	1	5	1	5
TOTAL	51	100	44	100	10	100

TABLE VII

Corrected Distribution of Recaptures
from 1968 Smolt Stocking
(extrapolation)

Location of recapture	No. before correction	% before correction	No. after correction	% after correction
Greenland (inshore)	38	36	38	27
Greenland (offshore)	6	6	40	29
Newfoundland	44	42	44	32
Quebec (commercial)	12	11	12	9
Quebec (recreational)	5	5	5	3
TOTAL	105	100	139	100