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A report on the smolt tagging carried out in European countries with particular reference to recaptures made off Greenland in 1972 and comparable home water recaptures[1]

by

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European Smolt Tagging

In 1972, 191 salmon tagged as natural smolts in European rivers were recaptured off Greenland where the commercial catch for that year amounted to 2,032 metric tons. Of these 191 fish, 163 were tagged as smolts in 1971 (4.4 per 1000 tagged) and a further 28 had been tagged in 1970.

In contrast, although the number of tagged hatchery-reared smolts released in 1971 was greater than the natural smolt release, only 14 (0.26 per 1000 tagged) were recaptured. None of the hatchery-reared smolts tagged in 1970 was recaptured off Greenland in 1972. In other words, 85% of the recaptures from natural smolts were 1 sea-winter fish and 15% were 2 sea-winter fish. All the recaptures off Greenland of hatchery-reared fish were 1 sea-winter in age.

All the smolts released in 1971 were anaesthetised with MS 222 before being tagged. Identical tags were used in Scotland and England and Wales, namely a modified Carlin tag consisting of a small oblong green plastic plate attached below the dorsal fin by means of a double black polyethylene thread. A few Scottish hatchery-reared smolts were tagged with small un-numbered beads. Carlin type tags were used in Sweden, Norway and Iceland. The French tag used in 1971 was also of the Carlin type with the double swivel stainless steel attachment. The tag itself was sky blue in colour. The Irish tags used were normally small plastic discs with a double swivel stainless steel attachment, although some Floy tags, using a 'gun' for insertion, were used in previous years and most of their recaptures off Greenland were of this type (including the one caught off Greenland in 1972).

1. Natural Smolts

In 1971, natural smolts were released into rivers in Scotland, England and Wales, France and Norway. A total of 36,661 were released and the figures are given in Table 1. Of the 163 recaptures taken off Greenland in 1972, all but 30 were Scottish fish. Over half the total number of smolts tagged were tagged in Scotland and the figures for the recaptures (per 1000 tagged) show that Scotland (6.4 per 1000) had a significantly higher proportion of tagged fish taken off Greenland in 1972 than did England and Wales (3.5 per 1000) or France (2.1 per 1000).

Although over 5,000 natural smolts were tagged and released in Norway, there were no recaptures off Greenland, thereby reducing the combined rate for all four countries to

[1] Presented to the ICES/ICNAF Joint Working Party on North Atlantic Salmon, ICES, Charlottenlund, March 1974.

Table I

Numbers of Natural Smolts Tagged in Europe in 1971 and Recaptured off Greenland in 1972 and 1973

Country	Number of Smolts Tagged	Greenland Recaptures 1972	1973	Unknown	Total
Scotland	20,706	133 (6.4)	2 (0.1)	2 (0.1)	137(6.6
England & Wales	5,680	20 (3.5)	0	0	20(3.5
France	4,702	10 (2.1)	0	0	10(2.1
Norway	5,573	0	0	0	0
TOTAL	36,661	163 (4.4)	2 (0.06)	2 (0.06)	167(4.6

4.4 per thousand.

In Scotland, natural smolts were tagged on nine different rivers which were part of five river systems and they were all on the east coast. In England and Wales each of the three rivers concerned was a separate system. Two of these rivers were in the south west of England and one in the north east. In France each of the three rivers were in widely separated systems. In Scotland, England and Wales and France, therefore, a total of 15 rivers were involved. The numbers of smolts tagged and recaptured are given in Table II and the locations of these rivers are shown on the maps at Figures 1, 2 and 3.

By examining the numbers of recaptures from the different river systems and indeed the individual rivers in each of the countries concerned it can be seen that the recapture rate varied considerably from river to river.

It can be seen that the recapture rate off Greenland for smolts tagged and released in the English rivers Axe, Exe and Ure are quite similar, being 4, 3 and 4 respectively. For France, all 10 recaptures off Greenland came from the River Adour in the south west of the country, giving a recapture rate of 6 per 1000.

It is with the Scottish rivers that wide variations in recapture rates occur. For example, in the Tay system smolts were tagged on the Rivers Tummel, Almond and Kinardachy. Avery high recapture rate of 21/1000 tagged was obtained for the Tummel. This was, in fact, the highest recapture rate for any individual river since tagged fish have been caught in Greenland waters. On the other hand, for the R. Almond in the same system, the recapture rate off Greenland waw 5/1000 tagged which is approaching the same order of magnitude as the figures for the English and French rivers. At the bottom end of the scale was the Kinardachy where no recaptures were reported from Greenland, although only a few smolts were tagged on this river.

A small number, however, waw also tagged in the River Bran on the Conon system but in this case a recapture rate of 11 per 1000 tagged was reported. The other river in the Conon system in which natural smolts were tagged was the Meig. Like the Kinardachy, there were no recaptures in Greenland waters of smolts released in the Meig, even though 5,900 were tagged.

The largest number of smolts was tagged on the River North Esk and the recapture rate off Greenland was high at 9 per 1000 tagged.

Less than 400 smolts were tagged on the Tweed in 1971 and there were no recaptures off Greenland.

The two remaining Scottish smolt taggingsites in 1971 were on the R. Feardar and the R. Girnoch - both rivers being part of the Dee system. Although far more smolts were

tagged on the Girnoch than on the Feardar, the recapture rates off Greenland were very similar (9 per 1000 for the Feardar and 8 per 1000 for the Girnoch)

(The River Boyne in Eire has been included in Table II because although no smolts were tagged in 1971, there was a recapture off Greenland in 1972 of a smolt tagged in 197

Before one can say that certain rivers contribute proportionately more salmon to the Greenland fishery than others a number of factors should be examined more closely. These would include the individual handling and tagging techniques, the sites of tagging and the degree of predation in freshwater and the respective estuaries, etc. Also whether certain rivers are predominantly grilse rivers or whether other rivers produce smolts of a certain age which are found to be uncommon among the Greenland catch. A study of the recaptures in home waters could give some of this information. These figures are also given in Table II. It will be seen that in all but two of the rivers (North Esk and Almond), the recapture rate off Greenland was equal to or greater than the rate for salmon (i.e. excluding grilse) recaptured in home waters. In many cases this must reflect the relative fishing efforts off Greenland and in home waters.

1A. Scotland

On the Tummel, the home water recaptures of salmon were almost the same as the recapture rate off Greenland. On the other hand the recapture rate of grilse was only about one third of that number which would suggest that the Tummel was more of a salmon river than a grilse one.

By far the highest number of recaptures came from the North Esk taggings, for in addition to the recapture rate as grilse being 54/100 tagged, the recapture rate as salmon was 20/1000, the same as on the Tummel. The R. Almond on the same system as the Tummel had a higher recapture rate as grilse than any other river - with 58/1000 tagged. On the other hand very few or relatively few(6/1000 tagged) were caught as older fish.

On the Dee system, the recapture rates for the Feardar and Girnoch smolts were far lower and similar to those for the English and French rivers.

On the Conon system, the two rivers differed quite considerably. For the Meig, not only were there no recaptures off Greenland but the recapture rate in home waters, particularly of salmon, was low compared with the Bran.

An examination of the results of smolt tagging experiments carried out in years before and after the 1971 taggings are particularly interesting.
No smolt tagging was reported from the R. Tweed since 1966 and only a few smolts were tagged on the R. Kinardochy. None of these was taken off Greenland and only a few fish were recaptured in home waters.

The recapture rates off Greenland of smolts tagged on the Tummel (Tay system) and the Girnoch (Dee system) from 1967 to 1971 were consistently high relative to the returns from the other rivers..

With the Scottish rivers generally the recapture rate of smolts, not only off Greenland but in home waters, has increased significantly from 1969 onwards. Whereas the overall recapture rate off Greenland was 1/1000 or 2/1000 up to and including 1968, the figure increased steadily up to 7/1000 for the 1971 smolts and could be slightly higher than this for the 1972 smolts when all the recaptures are reported. The commercial catch off Greenland has not shown this degree of increase over these years.

It would appear that one of the main contributing factors was the change in the type of tag used. Up to 1967, the smolt tag consisted of a small darkened silver plate attached to the fish by means of a single silver wire. In 1967, when some of the results of a comparative tagging test carried out in Sweden were known, an informative

test was carried out with the North Esk smolts. Almost equal numbers of smolts were tagged with the darkened silver tag and with a modified Carlin tag attached by means of a double polyethylene monofilament - a type which the Canadian fishery workers had been using during the previous few years. The recapture rate in home waters of the Carlin type tag was approximately twice that of the silver plate. Rates of recaptures off Greenland, however, were no higher than in previous years for either tag.
In the following year, both types of tag were used on two other rivers, the Almond and the Tummel in the Tay system. On the Almond, where similar numbers of each type of tag were used, the silver plate produced the higher recapture rate in home waters. There were no returns from Greenland. On the Tummel, where the ratio of Carlin type to silver plate was about 3 to 1, the Carlin tag produced all the recaptures. There were no returns at all from the smolts tagged with the silver plate.
From 1969 onwards, the only tag used for smolts on all rivers was the modified Carlin tag.

1B England and Wales

In England and Wales natural smolts were tagged on only three rivers in 1971. These were the Axe and Exe in south west England and the Ure in Yorkshire in north east England. The smolts on the Axe and the Exe were truly native smolts whereas those on the Ure, although described as natural smolts, had actually been planted as fry. They were later trapped as smolts, tagged and transported below a belt of pollution on the R. Ouse of which the Ure is a tributary, and released at Brough on the north bank of the Humber. The smolts on the Axe and the Exe were released near the top of the tideway. All the smolts were tagged with the green modified Carlin tag with the double polyethylene attachment.

The recapture rate of these smolts off Greenland were rather similar being 4/1000, 3/1000 and 4/1000 for the Axe, Exe and Ure respectively. These figures, together with the recapture rates in home waters are given in Table II. For home waters, the recapture rate for the Axe, although not so high as on some of the Scottish rivers, was larger than those for the Exe and Ure because the majority of the returning fish were taken on a fixed trap near the top of the tideway. The numbers taken by nets and rods in the Axe area were comparatively few in number.

Unlike the Scottish returns where the recapture rates off Greenland reached their peak with the returns from the 1971 and 1972 smolt tagging years, the rates for the Axe were at their peak following the 1968 and 1969 smolt tagging years, i.e. recaptures taken off Greenland in 1969 and 1970 (6.4/1000 and 8.5/1000 respectively). The recapture rates off Greenland of the Exe and Ure smolts tagged in 1969 were also the highest for these rivers.

The tagging of natural smolts has been undertaken every year on the R. Axe from 1960 onwards although no truly native smolts were tagged after 1971.
One of the first few tagged fish to be caught off Greenland was one which had been tagged as a smolt in the Axe in 1960. Since then, recaptures off Greenland have been reported from every tagging year. The complete list of recaptures is shown in Table III and the rates of recapture off Greenland and as salmon (non-grilse) in home waters, together with the commercial catch off Greenland for each succeeding year has been plotted in Figure 4. There are the usual seasonal fluctuations with the home water catches and the recapture rate off Greenland increased with the commercial catch until 1970. The recapture rate off Greenland has, however, decreased during the past two years.

No comparative tagging involving the modified Carlin tag and the silver plate tag in the same season was carried out in England and Wales. The silver plate tag was used up to and including 1967 and then all the smolts from 1968 onwards were tagged with the modified Carlin tag. As in Scotland, there was an immediate increase in the recapture rate both for recaptures off Greenland and in home waters and this was maintained and. in the case of Greenland recaptures, increased in the following year.

The reasons for these increased recapture rates are perhaps not so well-defined as might appear at first sight, for at that time the Greenland commercial catch increased considerably - the 1969 catch being almost double that for 1968. Furthermore, increased rewards were being offered for the return of tags.

Recaptures from the 1970 and 1971 smolt taggings showed a decrease in the recapture rates but recaptures in home waters were affected by the prevalence of U.D.N.

On the R. Axe it was found that age and size of salmon smolts had little or no influence on the sea age of returning adults. However, adult production of 1, 2 and 3 year old smolts have been estimated at 1.04%, 3.26% and 4.93% respectively. The mean fork length of 1 yearold migrants is generally smaller than the mean fork length of those which return; but the reverse is the case for the 2 and 3 year old smolts.

The proportion of 1, 2 and 3 year old smolts in the annual runs on the R. Axe from 1966 to 1971 is given in Table IV. It can be seen that in 1970 and 1971 there was a much higher proportion of 1 year old smolts in the run compared with earlier years and this was most likely to be a contributary factor for the rather low recapture rate resulting from the taggings in those years.

Table IV

R. Axe - Percentage of One, Two and Three Year Old Smolt in the Annual Runs

Year	% 1-Year Old Smolts	% 2-Year Old Smolts	% 3-Year Old Smolts	Mean Fork Length of Smolts (cm)
1966	9.0	88.0	2.0	16.43
1967	10.0	86.0	4.0	16.69
1968	5.0	87.0	8.0	16.34
1969	22.0	69.0	9.0	16.14
1970	46.3	49.2	4.5	16.12
1971	50.0	46.7	3.3	15.49

2. Hatchery-Reared Smolts

The numbers of hatchery smolts tagged in 1971 totalled 53,377 and they were released in six different European countries - Scotland, England and Wales, Eire, Iceland, Sweden and Norway. Although hatchery smolts were tagged in Denmark in previous years and in France in the following year, no hatchery smolts were tagged in the two countries in 1971.

Unless there have been some late reportings, there were no recaptures off Greenland from the Irish, Icelandic or Swedish tagging experiments.

Details of the numbers of smolts tagged in each country and the recaptures off Greenland and in home waters are given in Table V. It can be seen immediately that there were only 14 recaptures off Greenland, amounting to 0.3/1000 tagged. Nine came from two rivers in England and Wales, the Avon and the Usk and two from the R. North Esk in Scotland. The remaining three were from Norway.

2a. Scotland.

All the hatchery smolts tagged in Scotland in 1971 were released into the R. North Esk. There were three separate batches. One batch came from the Kinnaber Fish Farm and these were tagged with the modified Carlin Tag. The other two batches were tagged by the Freshwater Fisheries Laboratory but one of these lots was tagged with numbered beads, the other batch with a modified Carlin Tag. Both Greenland recaptures were fish from the Kinnaber Farm.

Comparing the recaptures, both off Greenland and in home waters with the returns of wild smolts tagged in the North Esk in 1971 (see Table II), it can be seen that the recapture rate of the hatchery fish is very small. However, it compares favourably with rates obtained for wild smolts on the Girnoch and Feardar and is indeed better than the returns of wild smolts tagged on the Meig.

When compared with earlier years, the recapture rate in home waters of hatchery reared smolts released into the North Esk in 1971 was appreciably higher than for the 1970 release and very much higher than the returns from the 1966 to 1969 smolt taggings. In those years the rate/1000 tagged for grilse and salmon was usually less than 1.0. However, the recapture rates off Greenland were low throughout except for the 1970 releases, when a batch of smolts tagged by the Freshwater Fisheries Laboratory produced a recapture rate of 5.6/1000 and a larger batch of smolts reared at the Invergarry Hatchery gave a rate of 1.0/1000.

2b. England and Wales

The returns of hatchery smolts released in the three rivers were low. The best results in home waters were from the R. Usk but even here the total rate did not exceed 1.7/1000. The Usk smolts were all two year old fish and were reared from both local and Scottish eggs. Unfortunately, it was not possible to keep the two batches separate right through to the smolt stage.

On the Avon, both 1 year old and 2 year old smolts were released. They all originated from local eggs. Although recapture rates were low for both age groups, the 2 year old fish gave the higher returns.

There were no returns from the Axe fish which were all introduced as 1 year old smolts reared from Scottish eggs

Returns from earlier taggings, both in home waters and off Greenland were very low except in one year from the Avon. In 1968, a mere 432 smolts were tagged but 2 (4.6 per 1000) were caught off Greenland.

2c. Eire

In Eire, all the hatchery smolts tagged in 1971 were released into the R. Shannon. They were all two year old smolts but one batch was derived from Irish eggs while the other was derived from Canadian eggs. Only one recapture was reported - a grilse in home waters and that fish was one of those reared from Irish eggs.

For the tagging years 1966 to 1970, only 3 fish were reported from Greenland even though over 30,000 hatchery smolts were tagged. One of these fish was tagged as a 1 year old smolt in the R. Shannon in 1967, a recapture rate of 0.2/1000 and the other two were tagged in the Burrishoole in 1969 - a recapture rate of 1.1/1000. This batch of smolts also gave the best return for home waters for those years - 10.8/1000 as grilse. These smolts were all two years old but the eggs were from Scotland. Nearly all the recaptures of tagged smolts in Eire were taken as grilse.

2d. Iceland

There were no recaptures off Greenland in 1972 from the Icelandic smolt tagging of 1971. No information is available on home water recaptures from that year. From previous smolt tagging years only 1 recapture off Greenland was reported and that was tagged as a smolt in 1966 (0.1/100 tagged). The home water recaptures in the years from 1966 onwards were mainly as grilse with an extraordinary high recapture rate of 32/1000 from the 1969 smolts compared with a figure of 3 to 8/1000 for other years.

2e. Sweden

No recaptures were reported off Greenland in 1972 although for every smolt year from 1966 to 1970 recaptures have been made off Greenland, the rates varying from 0.2 to 1.2/1000.

Most of the home waters recaptures were taken as grilse with some exceedingly high recapture rates - as much as 122/1000 from the 1968 smolt year.

2f. Norway

Three Norwegian tagged fish were caught off Greenland in 1972 representing 0.2/1000 of the smolts tagged in 1971. A similar rate was recorded for the 1969 and 1970 smolt years.

Although several thousand hatchery smolts were tagged from 1963 onwards, no recaptures were made off Greenland until 1968 (from the 1967 smolt year).

The recapture rate for salmon in home waters in earlier years varied from 4 to 10 per 1000 with the grilse rate about twice this figure.

Summary

There is obviously a wide variation from country to country, from river to river and from year to year in the recapture rates of hatchery-reared smolts. The quality, size and the age of the smolts and the nature of the sites at which they are released must have a significant influence on their viability and survival to the adult stage.

In Scotland, England and Wales and Eire, returns, both in home waters and off Greenland were very low compared with the wild smolts. There has been a marked tendency for the recapture rate to increase over the past two or three years, particularly in Scotland and with the 1972 releases on the R. Usk in England and Wales. There is considerable evidence that 1 year old smolts do not return so well as 2 year olds.

The survival rates in Iceland, Norway and particularly Sweden are greater, with remarkably high recapture rates, especially as grilse, in home waters. Considering this along with the Greenland recapture rate it would seem that the Scandinavian countries contribute considerably less, proportionately, to the Greenland fishery than the other European countries.

Geographical Distribution of Smolts Recaptured off Greenland

Complete information is not available but it would appear that fish from individual countries have been caught throughout the whole length of the Greenland salmon fishery area from Disko Bay in the north to Julianehåb in the south.

A typical example is shown in Figure 5 where the positions of recaptures in 1972 of smolts tagged in England and Wales in 1971 are plotted. Of the 33 recaptures from smolts tagged in five different rivers, the positions of 8 were unknown. Fish tagged on the Avon and Usk were hatchery-reared and those on the Axe, Exe and Ure were natural smolts.

Table II

Recaptures in Home Waters and off west Greenland of Natural Smolts Tagged in European Waters in 1971

Recaptures per 1000 Tagged in Brackets

River	Smolts Tagged	RECAPTURES Home Waters Grilse	Salmon	Total	Greenland- 1972 From 1971 Tagging	From 1970 Tagging
Scotland						
Bran (Conon)	278	5(18)	2(7)	7(25)	3(11)	
Meig (Conon)	5,900	31(5)	3(<1)	34(6)	0	
Feardar (Dee)	231	0	1(4)	1(4)	2(9)	
Girnock (Dee)	2,129	9(4)	15(7)	24(11)	18(8)	
North Esk	7,399	403(54)	151(20)	554(75)	69(9)	16(<1)
Almond (Tay)	2,685	155(58)	15(6)	170(63)	13(5)	
Tummel (Tay)	1,467	10(7)	29(20)	39(27)	31(21)	
Kinardochy (Tay)	220	2(9)	0	2(9)	0	
Tweed	397	0	0	0	1(2)	
TOTAL	20,706	615(30)	216(10)	831(40)	133(6) (+2 caught 1973 +2 unknown)	16(<1)
England and Wales						
Axe	2,494	26(10)	10(4)	36(14)	9(4)	2(1)
Exe	2,215	0	6(3)	6(3)	7(3)	1(1)
Ure	971	4(4)	0	4(4)	4(4)	2(<1)
TOTAL	5,680	30(5)	16(3)	46(8)	20(4)	5(<1)
France						
Adour	1,813	0	5(3)	5(3)	10(6)	6(2)
Bresle	1,589	0	0	0	0	
Elle	1,300	0	0	0	0	
TOTAL	4,702	0	5(1)	5(1)	10(2)	6(2)
Eire						
Boyne	0	-	-	-	-	1(2)
Norway	5,573	290(52)	?	?	0	
TOTAL ALL RIVERS	36,561	935(26)	237	882 ?	163(4)	

Table III

RIVER AXE - DEVON

Recaptures of Tagged Smolts off Greenland and in Home Waters

(Recaptures per thousand tagged in brackets)

Smolt Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
No. Tagged	3467	5266	7179	2854	2896	5873	3219	4117	3261	2478	1821	2494
Grilse	6(1.7)	30(5.7)	52(7.2)	8(2.8)	14(4.8)	35(6.0)	28(8.7)	23(5.6)	42(12.9)	28(11.3)	13(7.1)	26(10.4)
Salmon	17(4.9)	64(12.2)	120(16.7)	20(7.0)	39(13.5)	57(9.7)	37(11.5)	56(13.6)	48(14.7)	26(10.5)	21(11.5)	10(4.0)
Greenland 1+	1(0.3)	1(0.2)	2(0.3)	1(0.4)	1(0.4)	12(2.0)	5(1.6)	10(2.4)	21(6.4)	21(8.5)	5(2.8)	9(3.6)
" 2+										1(0.4)	3(1.6)	2(0.8)
Greenland Catch												
(M.Tons)	127	244	466	1539	861	1370	1601	1127	2210	2146	2689	2032
Year Catch	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972

Table V

Recaptures in Home Waters and off West Greenland of Hatchery Smolts Tagged in European Waters in 1971

Recaptures per 1000 Tagged in Brackets

River	Smolts Tagged	RECAPTURES Home Waters Grilse	Salmon	Total	Recaptured in Greenland, 1972
Scotland					
a North Esk	4,073	33(8.1)	11(2.7)	44(10.8)	2 (0.5)
b North Esk	1,174	6(5.1)	3(2.6)	9(7.7)	0
c North Esk	958	6(6.3)	6(6.3)	12(12.5)	0
TOTAL	6,205	45(7.2)	20(3.2)	65(10.5)	2 (0.3)
England and Wales					
d Axe	1,261	0	0	0	0
e Avon (Hants)	3341	0	1(0.3)	1(0.3)	3(0.9)
f Avon (Hants)	1,581	1(0.6)	1(0.6)	2(1.3)	2(1.3)
g Usk	5,847	7(1.2)	3(0.5)	10(1.7)	4(0.7)
TOTAL	12,030	8(0.7)	5(0.4)	13(1.2)	9(0.7)
Eire					
h Shannon	636	1(1.6)	0	0	0
i Shannon	1,645	0	0	0	0
TOTAL	2,281	1(0.4)	0	0	0
Iceland	11,087	?	?	?	0
Sweden	4,967	232(46.4)	?	?	0
Norway	16,777	164(9.8)	?	?	3(0.2)
TOTAL	53,377	450(8.4)			14(0.3)

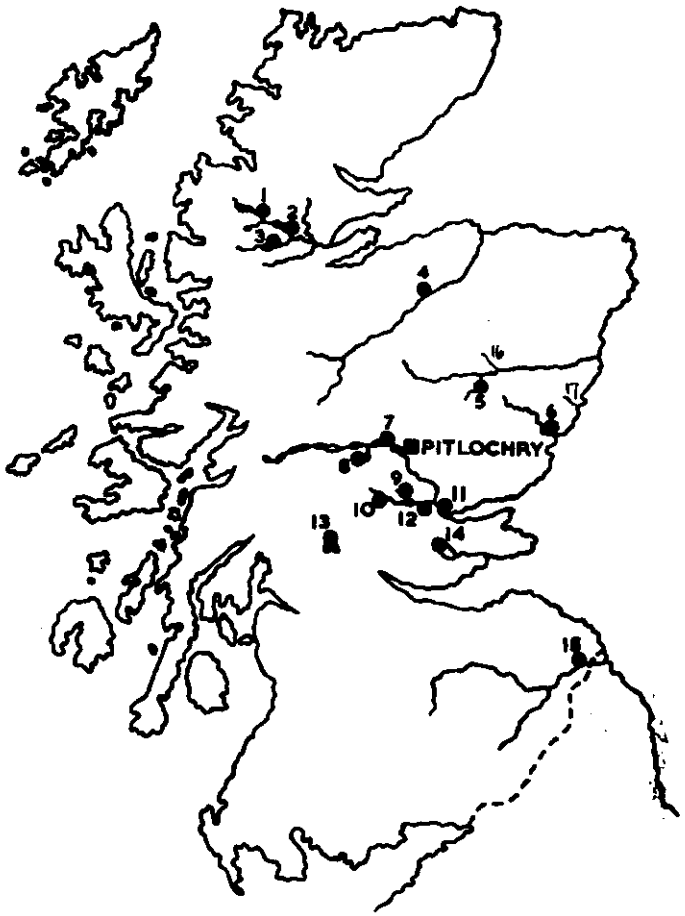
a = Fish from Kinnaber Fish Farm. Tagged with modified Carlin Tag.
b = Tagged by Freshwater Fisheries Laboratory. Tagged with Carlin Tag.
c = " " " " " . Tagged with un-numbered bands.

d = All 1 year old smolts and eggs of Scottish origin.
e = All 1 year old smolts.
f = All 2 year old smolts.
g = All 2 year old smolts.
h = From Irish eggs.
i = From Canadian eggs.

Figure 1

Smolt Tagging Investigations - Rivers etc underlined

SITES OF FIELD INVESTIGATIONS



1. River Bran
2. Luichart Dam
3. Meig Dam
4. River Spey
5. Girnock Burn
6. River North Esk
7. Clunie Dam
8. Loch Kinardochy
9. Shelligan Burn
10. River Almond
11. River Tay
12. Almondbank
13. Lake of Menteith
14. Loch Leven
15. River Tweed
16.
17.

137

D 12

Figure 2

Key to rivers in which salmon smolts were tagged.

(1) Recaptures off Greenland.

(2) No recaptures off Greenland.

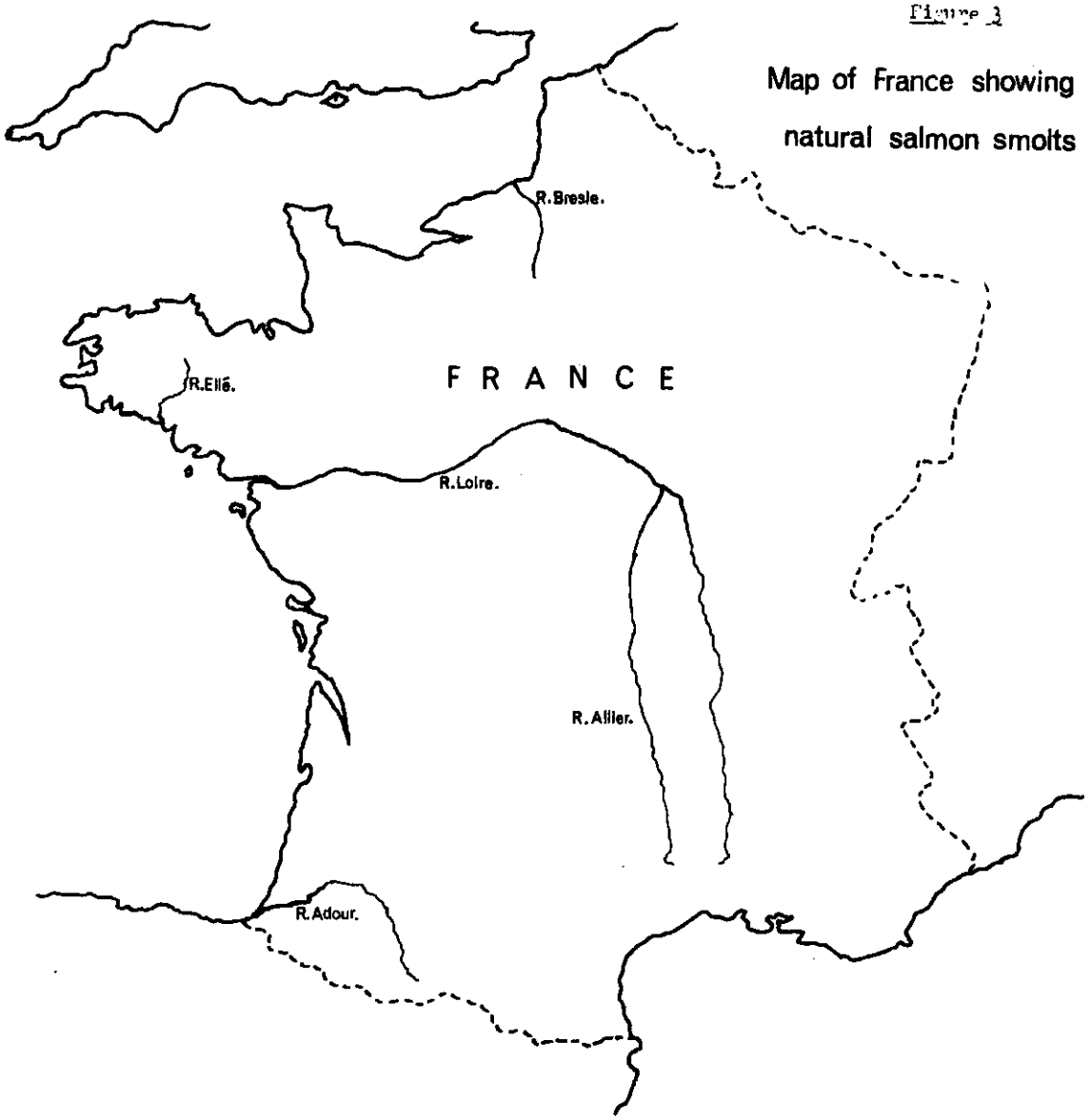
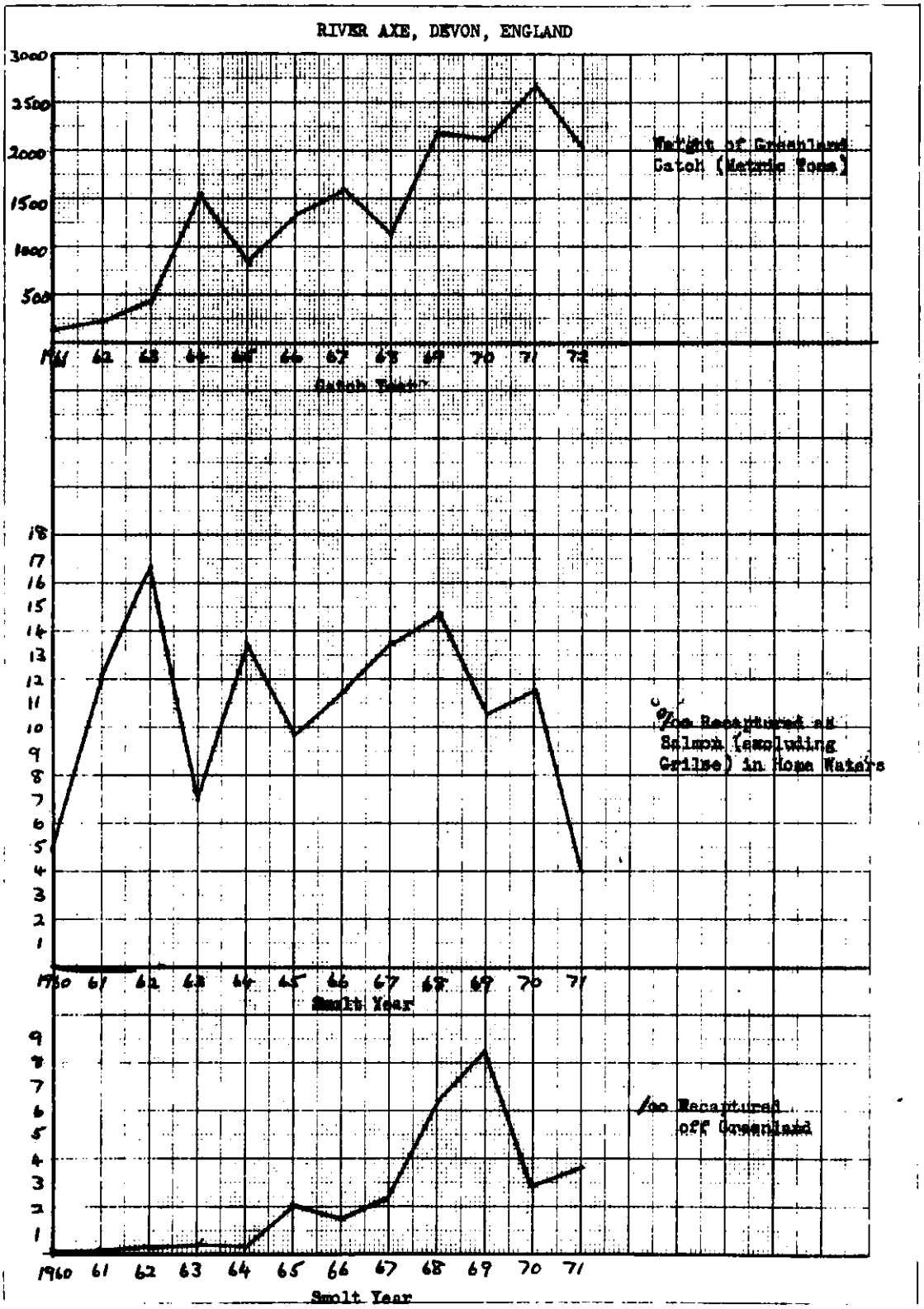


Figure 3

Map of France showing rivers where natural salmon smolts were tagged.

Figure 4


RIVER AXE, DEVON, ENGLAND
3000
2500
2000
1500
1000
500
Weight of Greenland Catch (Metric Tons)
Catch Year
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
% Recaptured as Salmon (ascending Grilse) in Home Waters
1960 61 62 63 64 65 66 67 68 69 70 71
Smolt Year
9
8
7
6
5
4
3
2
1
/oo Recaptured off Greenland
1960 61 62 63 64 65 66 67 68 69 70 71
Smolt Year

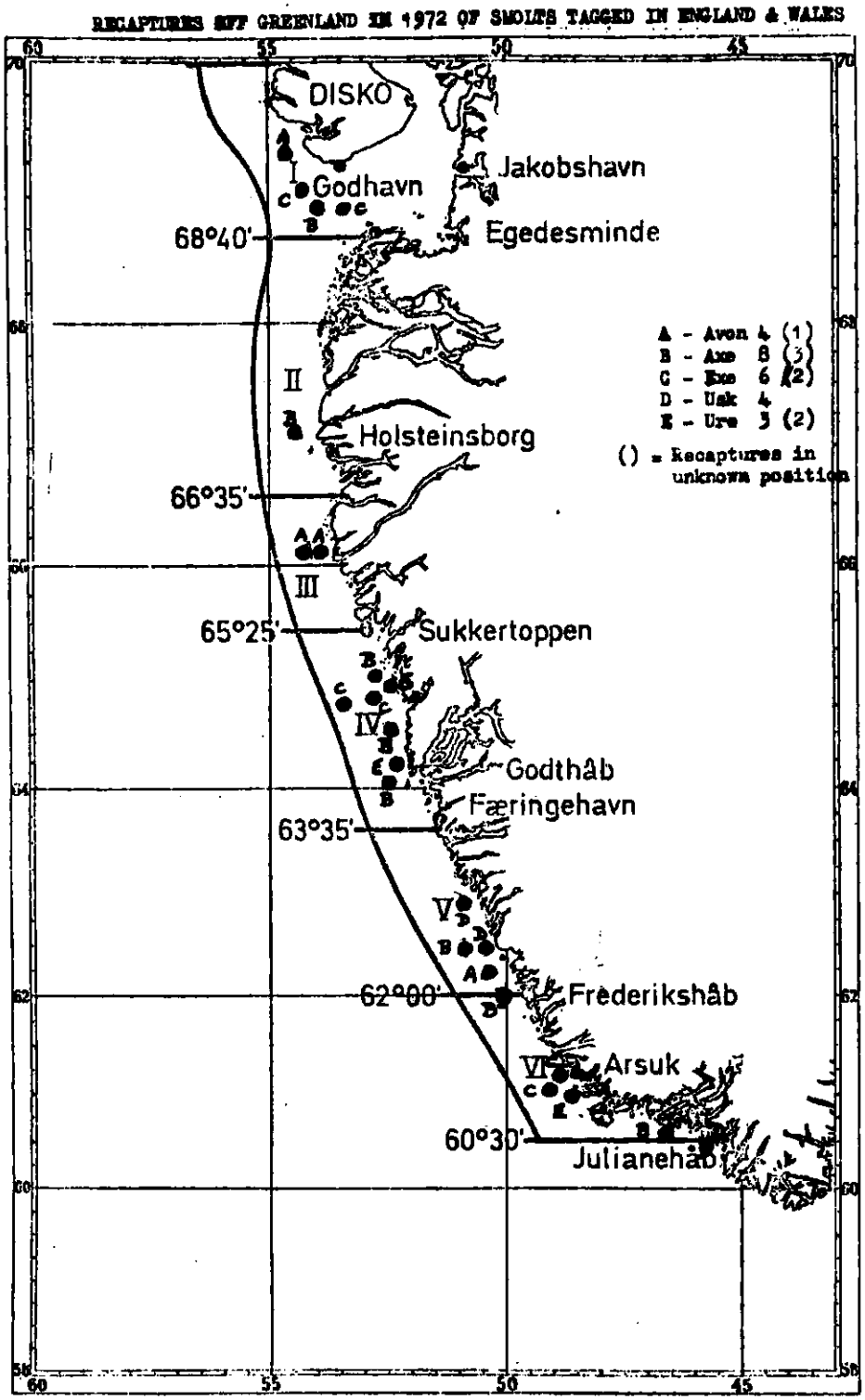

RECAPTURES OFF GREENLAND IN 1972 OF SMOLTS TAGGED IN ENGLAND & WALES
DISKO
Godhavn
Jakobshavn
Egedesminde
68°40'
Holsteinsborg
66°35'
Sukkertoppen
65°25'
Godthåb
Færingehavn
63°35'
Frederikshåb
62°00'
Arsuk
60°30'
Julianehåb
II
III
IV
V
VI
A - Avon 4 (1)
B - Axe 8 (3)
C - Exe 6 (2)
D - Usk 4
E - Ure 3 (2)
() = Recaptures in unknown position

Figure 5