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A REVIEW OF RECENT SALMON MARKING EXPERIMENTS IN NORWAY.

BY

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IN the years 1935, 1936, and 1937 my assistant and collaborator cand. real. Sven Sømme cooperated with me in marking clean salmon in various localities of the coast of Norway. The results for 1935 and 1936 have been published in the papers of the Academy of Science in Oslo, and the report for 1937 is at present in the press[1].

In the first of these papers we discussed at some length the history of salmon marking, its purposes and results. For the details of this discussion the reader is referred to the paper in question and I intend here only shortly to touch on the main points in the development of salmon marking.

If we omit the earliest, primitive marking experiments we may say that the first systematic marking of salmon was the kelt marking, which was done almost contemporaneously in Norway and Scotland in the end of the 'nineties of the last century by Mr. A. Landmark and Mr. W. Archer.

The main object of this kelt marking was to study the homing instinct of salmon. The conceptions relating to this instinct are of old standing and originally arose as an explanation of the fact that various salmon rivers have peculiar and constant types or, as it were, races of salmon, a fact which after the introduction of the scale method in the first decade of this century has been amply confirmed by a long series of researches on salmon from various rivers in Norway, Great Britain, Iceland, Russia, Sweden, Finland, and Canada.

The next step was the marking of migrating smolts, and in Calderwood's Tay experiments, Dahl's smolt marking in the Os River in western Norway and Alm's marking experiments with smolts in the Indal and Ångerman Rivers in the Baltic, it was well established that the migrating smolts scatter widely over great stretches of ocean, and also that in every known case of recapture they have returned to their native river.

[1]) Knut Dahl and Sven Sømme: Experiments in Salmon Marking in Norway 1935. Oslo, 1936.
— Salmon Markings in Norway 1936. Oslo, 1937.
— Salmon Markings in Norway 1937. Oslo, 1938.

These results made it clear that is was of great importance to mark clean salmon in the sea in various localities.

Such marking was first done by Mr. A. Landmark in Norway, who also marked clean salmon in the island belt on the west coast of Norway in the same years as kelt were marked in the 'nineties of last century. But these experiments were not on a scale large enough to yield very decided results, although they have now become of value.

Clean salmon were first marked on a large scale under the leadership of Mr. W. L. Calderwood in Scotland, marking having been performed in 1913—15 and 1920—21. These experiments gave recaptures varying from 9 % to 38 %, far higher than in any kelt marking operations, and a range of migrations that in many respects resembled that exhibited in the old kelt experiments. Just as the kelt marking in Norway and Scotland gave no indication of salmon crossing between the two countries, so the experiments with clean salmon yielded not a single instance of salmon crossing the North Sea.

In 1934, when Mr. Sømme and I planned our present researches into the migrations of salmon, we were struck by the fact that all previous salmon marking experiments had been made with comparatively small marks only provided with a cryptic number. Our idea, however, was that better results would probably be gained by using larger and easily visible silver marks, large enough to hold the address of the marker besides the identification number.

In our experimental work in 1935 we accordingly used marks developed on this principle, the natural size of which and mode of attachment to the fish will be seen in Fig. 1.

In 1935 we marked 209 salmon and grilse at two stations situated on the open coasts of western and north-western Norway.

A full list of the experiments and their results has been published in our 1936 paper, where the results have also been discussed in detail. In this review we intend only to give prominence to the main features of these results.

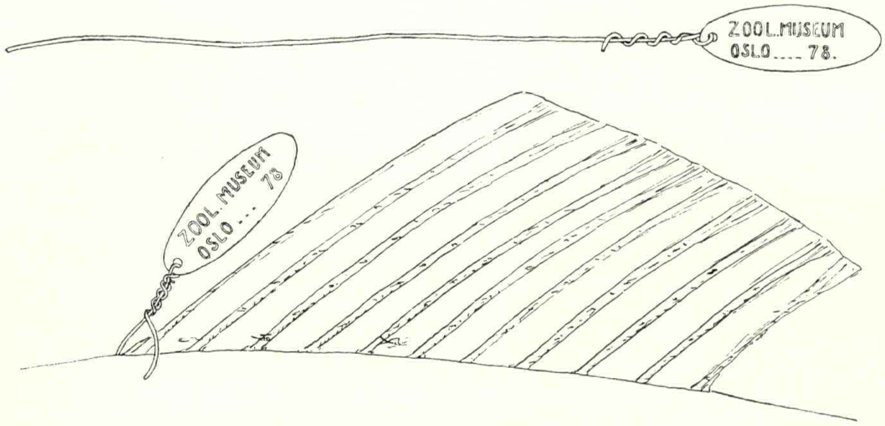

Fig. 1. Dorsal Fin of Salmon with Mark attached. Nat. size.
(From Dahl and Sømme, 1936).

1) The first point in these results to strike one is the high percentage of recaptures. Of the 209 fish marked no less than 99 fish were retaken, giving a percentage recapture as high as 47·3 %; in other words, almost every second fish was retaken. This is a rate of recapture far exceeding any previously known figures in salmon marking, and speaks strongly in favour of the new mark containing the address.

2) The second remarkable feature about these results is the range of the migrations. The charts in Figs. 2 and 3 show the lines of migration, drawn from the marking station to the position of recapture.

From these charts it is easily observed that although a great number of recaptures occur in fiords and rivers not very distant from the marking station, many fish travel very far, and it is open to question whether the fish retaken on the coast would not have travelled far greater distances if they had not been intercepted.

The tremendous extent of the migrations, which far exceeds all previous conceptions and marking records, is amply illustrated by the fact that of the 20 fish retaken from the marking at Rong and Bulandet no less than 2 (10 %) travelled as far as Scotland and the south of Sweden, being the first marked fish that have been proved to cross the North Sea from Norway to Scotland, and the Skagerak and Kattegat from Norway to Sweden.

The Titran experiments are also specially remarkable for the extremely long distances some of the fish travelled, the range of migrations from this station extending from Oslo Fiord to the River Wyg in the Gulf of Onega in the White Sea, showing a range of migration of more than 3600 kilometres.

The results proved for the first time that salmon do migrate between the waters of various countries adjacent to the Barents Sea.

3) The idea prevalent in the old days and still current among some authors that salmon do not travel very far from their native rivers was of course invalidated by the earlier smolt marking experiments. But our 1935 results show clearly the erroneousness of the assumption that salmon are restricted in their sea migrations to areas of ocean or sea in the vicinity of, or under the hydrographic or topographic influence of, their native rivers and their estuaries. Their feeding areas in the sea are obviously far larger, and some of them have enormous distances to travel in order to reach their native river.

One part of the mechanism which assists them in performing these homing migrations is demonstrated by our 1935 observations. It is the speed at which salmon are able to travel. Many of the fish apparently go at a leisurely speed, but in the case of fish which have long distances to cover we find a rate of travel which far exceeds all previous records. The chart in Fig. 4 illustrates this feature very clearly.

For instance, the Titran fish which went to the Oslo Fiord covered 1100 km. in 11 days travelling at least 100 km. a day. The fish from the same marking station, which was recaptured in the Wyg River, White Sea, spent 52 days at large and covered 2500 km., travelling at a speed of at least 48 km. per day.

These facts show that however far a salmon may have migrated from its native river during its period of sea feeding, it possesses a capacity for speed which will enable it to reach its home in a surprisingly short time.

4) The results give no support to the idea that the migrations of salmon are largely influenced by environmental factors such as hydrographical changes or ocean currents. On the contrary, the recaptures show that the fish have migrated towards their goal regardless of the various hydrographic changes and current systems which they must have encountered on their way.

The results of this first experiment encouraged us to undertake further research and marking operations. An extension of the experiments to other parts of the coast of Norway seemed necessary, and it also appeared desirable to repeat the experiments at our original stations in order to study possible variations from year to year in the trend of migration and the percentage recapture. Above all we deemed it necessary to mark more fish in order to strengthen the value of our observations.

Through the generosity of certain foundations

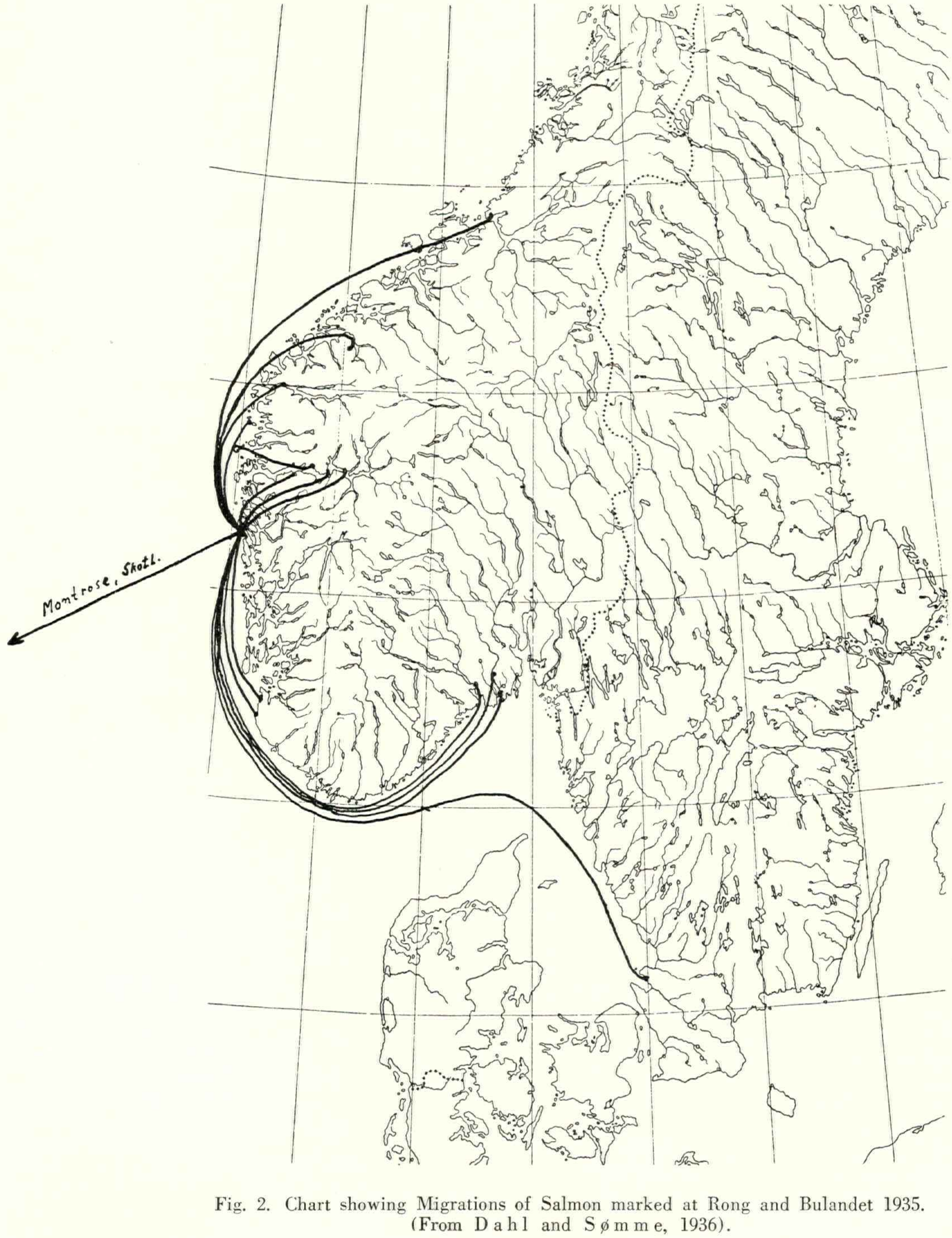

Fig. 2. Chart showing Migrations of Salmon marked at Rong and Bulandet 1935.
(From Dahl and Sømme, 1936).

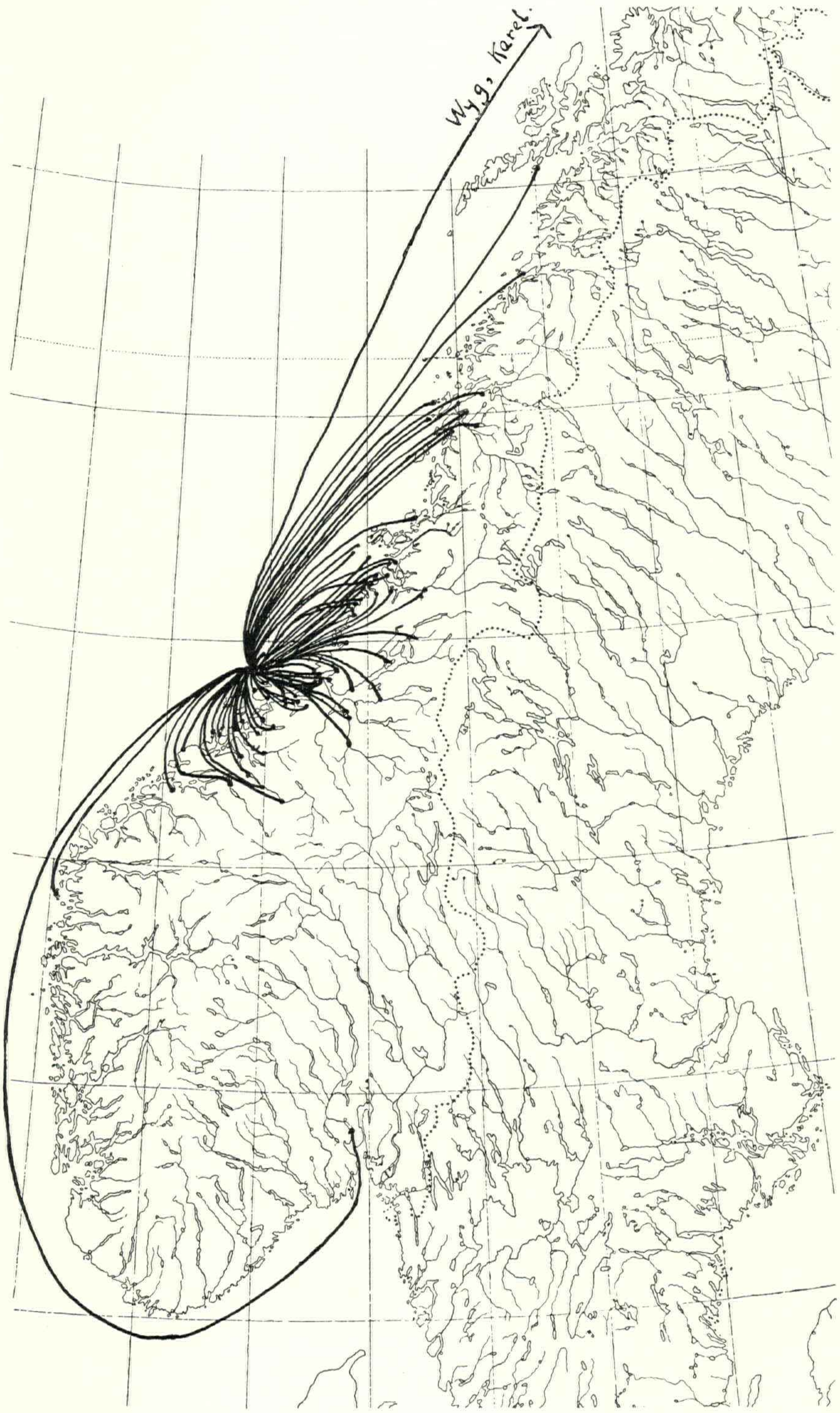

Fig. 3. Chart showing Migrations of Salmon marked at Titran 1935.
(From D a h l and S ø m m e, 1936).

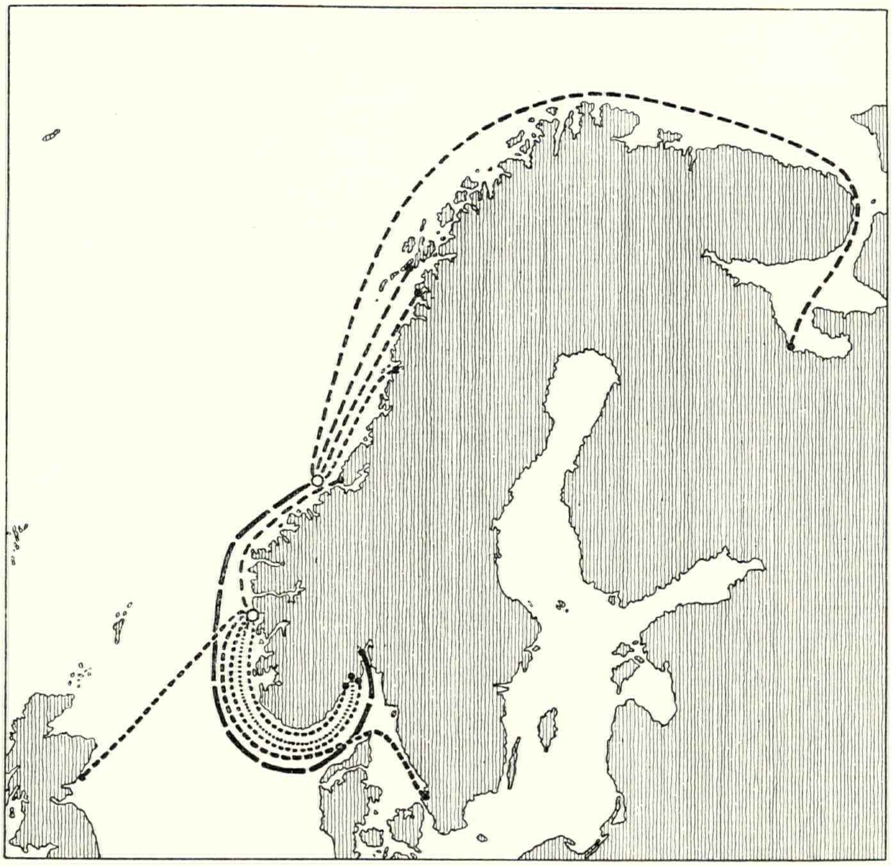

Fig. 4. Chart of the whole Area of Migration of Recaptured Fish showing some of the most extraordinary Migrations (exceeding 400 km.) Number of days at liberty indicated by breaks in the lines. (From D a h l and S ø m m e, 1936).

concerned with marine and salmon research we have been able to continue our marking operations in both 1936 and 1937 and may hope to continue them for some years to come.

In 1936 we retained our old stations at Rong and Titran and added a new station, Melvær, on the Island of Bulandet, a little north of the mouth of the Sognefiord. A couple of smaller stations inside the island belt were established, at Stavøy at the mouth of the Trondheim Fiord, and at Boge in the entrance to the Sørfiord near Bergen.

The results of these experiments are discussed in detail in our papers published in 1937 and 1938, and in the present paper I intend only to draw attention to the main features of these results.

In 1936 we marked altogether 505 Salmon and grilse, of which 241 were recaptured, yielding a percentage recapture of 47·7 %, which compares very well with the 1935 percentage of 47·3 %.

As regards the range of migrations, the results were very similar to those of 1935, though the extreme distances from the marking stations to the places at which the fish were retaken were less than in 1935. The distribution of the recaptures is roughly represented in the following table, for the three main stations.

Number of Recaptures.

Station	Romsdal—Trondheim Area	Hordaland—Sogn Area	Northern Norway	Southern and eastern Norway	Sweden	Scotland	Total
Titran	47	4	3	2	—	1	57
Melvær	9	77	—	8	3	1	98
Rong	11	49	—	5	1	—	66

Titran is situated in the Romsdal—Trondheim area, Melvær and Rong in the Hordaland—Sogn area, and as will be seen from the figures the bulk of the recaptures from the various stations have been made in the fiords and rivers of the respective areas. A number of long migrations occurred, however, and it is interesting to note the long migrations of 400 km. or more shown in Fig. 5.

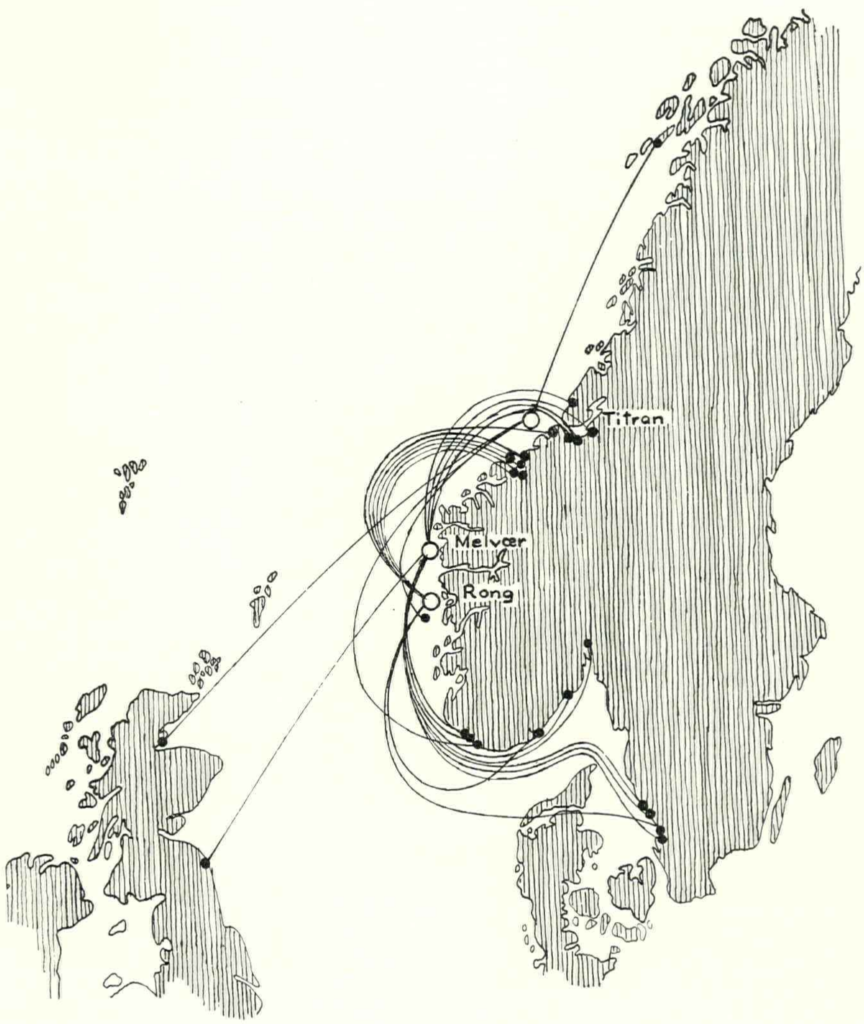

Fig. 5. Chart of the whole Area of Migration of Recaptured Salmon 1936 showing Migrations of 400 km. or more. (From Dahl and Sømme).

Except that there were no recaptures in northern Russia the results resemble those of 1935.

A very interesting point was etablished in 1936. It happened twice that fish marked at Melvær were retaken in the nets employed at the marking station at Rong. Both these fish were merely examined and again liberated with the same mark attached. They were both recaptured and the curious and interesting routes followed by them are depicted in Fig. 6.

The fish which made the longer journey was marked on 14th June, retaken and liberated on 18th June and finally recaptured on 4th July. The other was marked on 21st June, retaken and liberated on 4th July and finally recaptured on 9th July. What these fish could do in less than 3 weeks is a good instance of the fact that migrating salmon do not necessarily take the shortest path towards their goal.

Another important fact is borne out, as far as the material goes, by our marking experiments inside the island belt at the mouth of fiords. These were not on a very large scale, but still give useful information. This point is exemplified in Fig. 7.

18 fish were marked at this station on 20th to 22nd June 1936 and of these 9 were recaptured. With one exception all the recaptured fish made straight for the Trondheim Fiord and its rivers, which obviously suggests that when the fish have reached the inside of the island belt and approach the fiord mouths they are near the end of their migration. We find a great dissimilarity in the general trend of the migrations as compared with the charts from the coastal marking experiments.

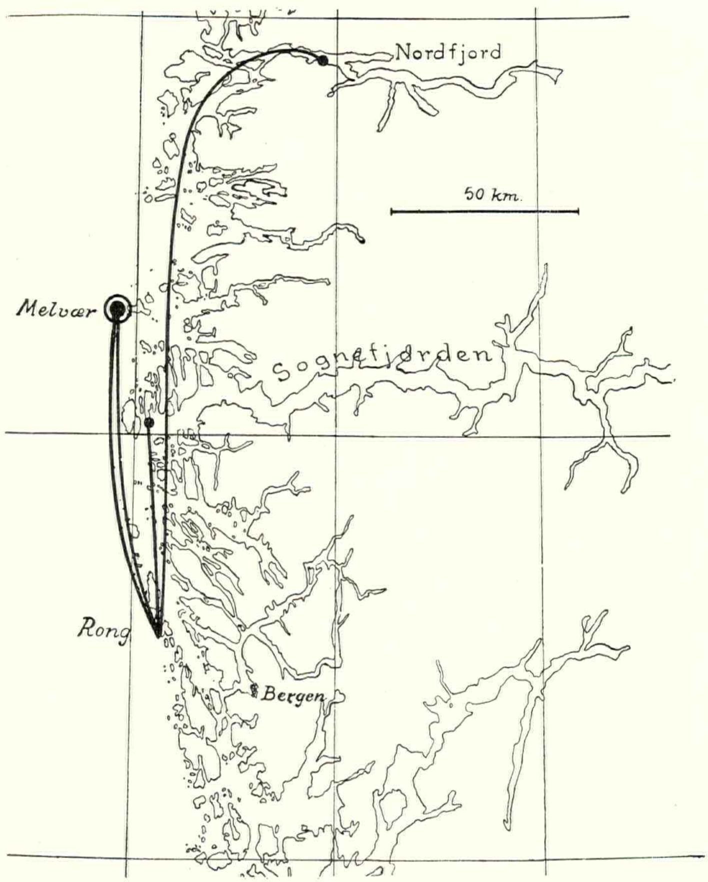

Fig. 6. Migrations of two Salmon marked at Melvær, recaptured at Rong and again liberated. (From Dahl and Sømme, 1937).

For instance, referring to the chart for the Rong marking in 1935, Fig. 2, we see that a small number of fish (37) marked on the open coast gave recaptures over an enormous area, ranging from Trondheim to the south of Sweden and even to Scotland. The coastal fish are mainly seeking their way to distant grounds, while the fish which have entered the inner waters seem to be making the final approach to their goal.

In 1936 Mr. W. J. M. Menzies, Inspector of Salmon Fisheries for Scotland, communicated to us his intention to resume the marking of clean salmon in Scotland. He also told us that he should like to test the type of addressed mark that we had introduced in 1935, and in his 1936 marking operations on the north-west coast of Scotland he employed a certain number of our type of mark. As a result of this we had that year the pleasure of being able to forward to Mr. Menzies a grilse taken at the mouth of the Sognefiord. This fish had been marked a little south of Cape Wrath on the north-west coast of Scotland, on 8th June 1936, and was retaken on 29th July in the same year, and was the first salmon proved to have crossed the North Sea in the direction from Scotland to Norway.

A very interesting point about this fish was, as Menzies pointed out[2]), that its scales showed that it had not spent its parr life in any Scottish or English river. The parr part of the scale indicates a type of growth very like that observable in western Norway.

In 1937 we abondoned the Rong station, continued our operations at the old stations of Melvær and Titran, and eventually started a new station in arctic Norway at Breivik, on the island of Sørøy in west Finnmark. The small station at Stavøy was also continued. The following numbers of salmon and grilse were marked at these stations in 1937:—

Melvær	Titran	Breivik	Stavøy	Total
219	130	464	11	824 fish

[2]) W. J. M. Menzies: The Movements of Salmon marked in the Sea. The North West Coast of Scotland in 1936. Fisheries, Scotland, Salmon Fisheries 1937 No. 1.

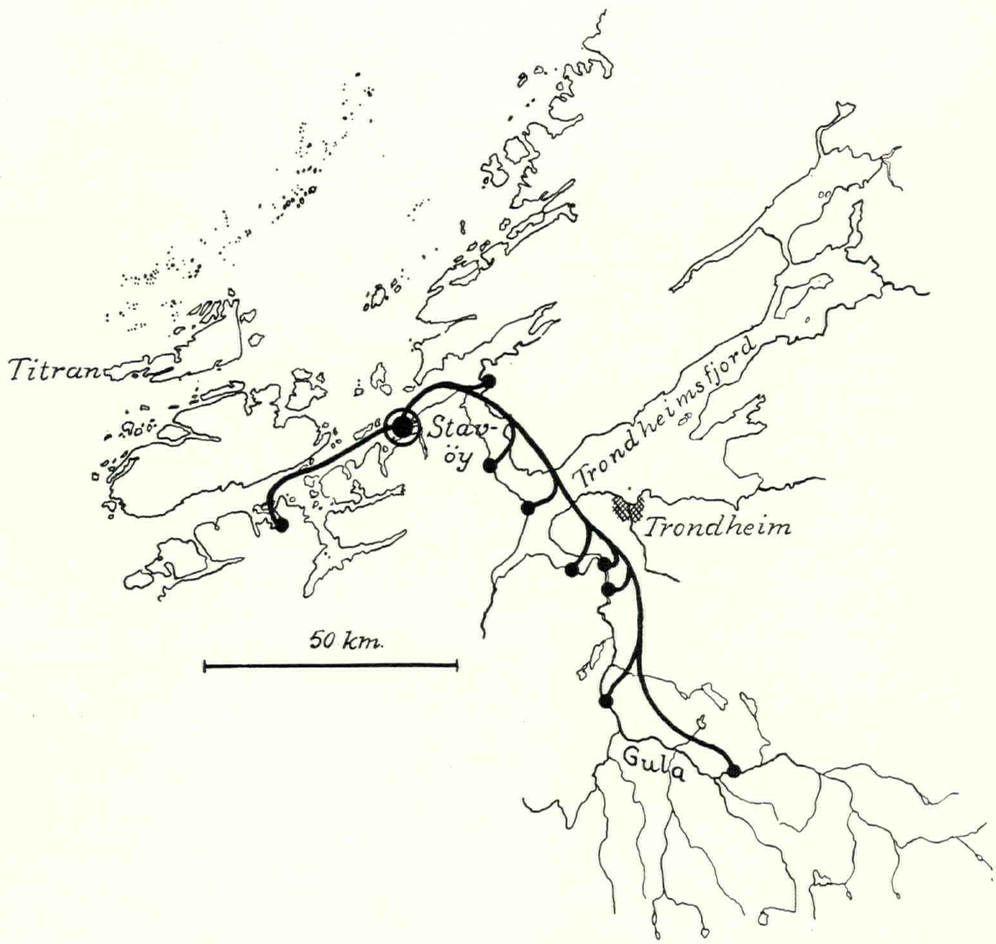

Fig. 7. Migrations of Salmon marked at Stavøy, Agdenes 1936.
(From Dahl and Sømme, 1937).

Of the total of 360 fish marked at the southern stations 143 fish were recaptured, yielding a percentage recapture of 39·7 %, against 47·3 % and 47·7 % for 1935 and 1936.

Of the 464 fish marked at the new station in arctic Norway (Breivik) 137 recaptures were recorded, giving a percentage recapture of 29·5 %. The probable reason for this comparatively low percentage recapture may be either that sea fishing in Finnmark is less developed, or that there was some difference in the method of marking adopted at Sørøy, as will be described later. The distribution of the recaptures from the marking stations at Melvær and Titran on the whole resembled that of the previous years. The Melvær fish were, as in 1936, mainly recaptured in the Hordaland—Sogn districts, especially in the Sognefiord with its branches and rivers. 7 fish were retaken as far south as between Karmøy and Lista (against 6 in 1936), 2 fish were retaken in eastern Norway (against 2 in 1936), and 3 fish were taken in Sweden (3 in 1936). Northwards along the coast the recaptures were fewer than in 1936 but a couple of fish were retaken farther north, at 65°56′ N. Lat. (against 64°30′ N. Lat. in 1936). In 1937 the recaptures from Scotland amounted to 3. There was also 1 recapture from the English side of the River Tweed and finally one doubtful recovery from Sidmouth in the south of England.

The Titran results in the main corroborate the results from previous years. The majority of recaptures occur in the Trøndelag districts. Towards the south the recaptures decrease through Romsdal to Sogn and Fjordane, from which latter only one recapture was recorded. North of the Trøndelag we find 2 recaptures in Nordland and 1 in Troms. Excepting the long migrations to Oslo Fiord and the White Sea in 1935 and the migration to Scotland in 1936 the results from the Titran station have been very much alike in all years.

The Stavøy station at the mouth of Trondheim Fiord gave practically the same results as

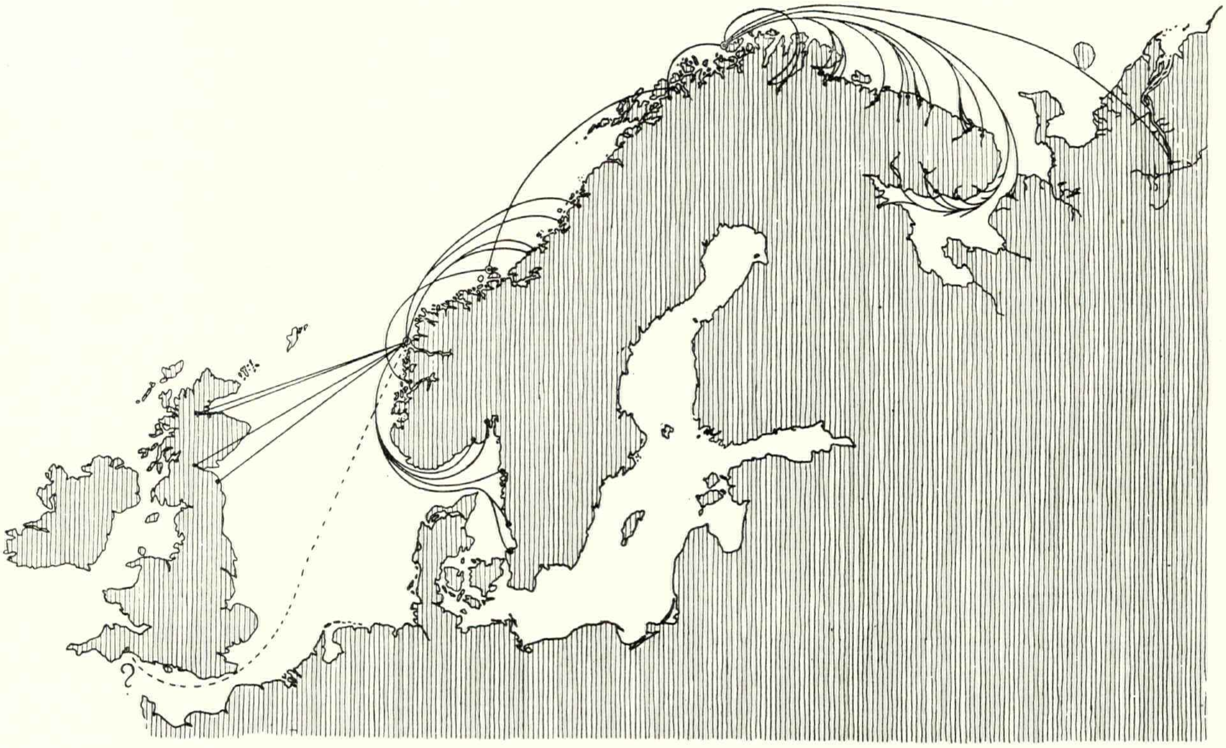

Fig. 8. Chart of the whole Area of Migration of Salmon recaptured 1937, showing Migrations of 400 km. or more. A number of long migrations have been omitted. (From Dahl and Sømme, 1938).

were obtained in 1936; the majority of the fish were retaken in the inner parts of Trondheim Fiord and its rivers. As a curiosity, I may mention that on the day I arrived at this station to begin my marking work, a fish marked by me 5 days previously at Titran had been retaken in the net I was about to use. On the following day I marked 4 fish and 1 of these was retaken in the inner parts of the Trondheim Fiord 2 days after, which is about the same time it took me to reach Trondheim by steamer.

The migrations from the Breivik station in arctic Norway yielded very striking and peculiar results. Only two recaptures were made in more southern districts, these having migrated 215 and 240 km. in a south-westerly direction to the coast of Troms Fylke.

The main trend of the migrations was eastward, the great majority of recaptures being recorded from the western and eastern coasts of Finnmark with its fiords, and mainly from its long rivers, the great Tana River accounting for most of them. In addition, 5 recaptures were recorded from the short Finnish coast adjoining the Barents Sea, the Petsamo and the Fisher Peninsula, and from the Murman coast, the Tersky coast and the White Sea, mainly from estuaries and rivers. 26 recaptures were recorded and reported to us by various Soviet authorities. One recapture was recorded even from the River Petchora, which is considered as the eastern limit of *salmo salar*, the fish having travelled 1870 km. in 55 days (the maximum speed in the year in question was 99 km. a day — 1085 km. in 11 days). The distribution of the recaptures from the Breivik station may be seen from the following table:—

Number of Recaptures.

Station	Troms	Finn-mark[1])	Fin-land	Soviet Russia	Total
Breivik	10	95	5	27	137

A very interesting illustration of the extent of the migrations of salmon from the coasts of Norway in 1937 will be found in the chart in Fig. 8, which shows the long migrations of salmon from our various stations. It must be noted, however, that a number of long migrations from Breivik to Finnmark have been omitted, to avoid overcrowding the chart with lines.

[1]) Including the Finnish shore of the Tana.

As will clearly be seen from this chart, in 1937 salmon marked on the coast of Norway extended their migrations to the greater part of the coastal area of Europe inhabited by the salmon.

Another interesting instance corroborating the existence of the homing instinct is connected with our Scottish recaptures this year. In some instances these recaptures were recorded from rivers. From the Rivers Tweed and Forth the returns were accompanied by scale samples from the fish. Mr. W. J. M. Menzies who has had great experience of salmon scales from Scottish rivers, has kindly examined these scale samples and states in a letter to me that the parr growth of the scales in question in every way conformed to the parr growth of the rivers in which the fish were recaptured.

As regards the distribution of the recaptured fish in sea and river recaptures we have tabulated the proportion found each year. The few fish whose locality of recapture was unknown have been omitted. The figures obtained are given in the following table:—

Percentage Recaptures in Estuaries and Rivers.

All Stations 1935	18·6 %
,, ,, 1936	14·1 %
Southern stations 1937	14·8 %
Breivik station 1937	49·2 %

We see from this that the stations on the west coast of Norway and in the Trondheim district show a low percentage of fish recaptured in rivers and river mouths, which is very similar to the low percentage found in our statistics relating to the quantities of salmon taken in the rivers as compared with those taken in the sea. The results from the Sørøy markings show, however, an almost equal distribution between sea and river, in good accordance with the fact that sea fishing in Finnmark is far less developed than in more southern parts of Norway. Indeed, in northern Russia the main fishery seems to be in estuaries and rivers. Nearly all the Russian recaptures for which the locality of recapture was recorded were made in rivers or river mouths.

In reviewing our results from the various stations we have almost invariably found that fish marked early in the fishing season are more liable to recapture than fish marked towards the end of the season. In other words, the chances of the fish escaping capture increase with the advancing season. We have recorded in our papers what we have found in the various years, and will here state only what we found in 1937.

Percentage Recapture by Periods of the Season when marked. 1937.

	Titran	Melvær	Breivik
4. V—21. VI	45·4 %	51·3 %	29·6 %
22. VI—5. VII	37·2 %	33·9 %	29·4 %
6. VII—7. VIII	10·3 %	33·8 %	28·3 %

At the southern stations, Titran and Melvær, we notice a considerable decrease in the relative occurrence of the recaptures. This is due to the fact that the commercial fishery, which in the southern and middle parts of the Norwegian coast is mainly a sea fishery, practically ceases by the middle of July. In Finnmark, however, we find no such effects of the advancing season. The percentage recapture is almost the same at whatever part of the season the fish were marked. This is no doubt due to the preponderance of river netting and a fishing season which lasts till autumn, features which are common to both Finnmark and northern Russia.

We may remark briefly upon our methods of marking the fish. We must first emphasize the fact that success is largely dependent on the condition in which the fish leave the marker. In our first experiments, during the marking process we held the fish either on the bottom of the boat, in a fold of the net, or in a man's lap or between his knees. We soon found out, however, that to keep the fish quiet, it was necessary to let the fish lie on their belly. We soon constructed a kind of narrow cradle of smooth zinc plate, in the bottom of which a centimetre gauge was stamped. In this cradle the fish lie very quiet and the length can be easily read off. Various devices have also been adopted, such as using the eyed and grooved needles from the large cobbler's sewing machines for pushing the silver wire through the frontal cartilage of the dorsal fin. By such contrivances the time taken in marking the fish is reduced to a minimum and I should think that most fish are marked in less than half a minute.

Moreover the condition of the fish that we have used for marking purposes has always been most carefully watched and it has been a rule rigorously kept that all fish showing signs of being the worse for the handling in the nets should be rejected. We have thus only used fish which we deemed certain to live. But even after this severe sorting we have graded the fish according to condition: Prime (Max.), Middle (Med.), and Weakest (Min.). Tabulating the recaptures for each of these 3 grades, of which, however, the two lower grades contained comparatively few fish, we find no marked difference in the recaptures for the various grades of condition, a fact which to us justifies the belief that our rejection of the unfit fish has been severe enough. In 1937, at the Breivik station Sømme tried the experiment of not subjecting the fish to such severe criticism as usual, rejecting only the definitely moribund fish, so that net-marked fish which were not absolutely sure to die were employed for marking. All the fish were graded (Max. Med. and Min.), as at our other stations.

A comparison between the Melvær, where all doubtful fish were ruthlessly rejected, and the Breivik (Sørøy) results gives the following figures.

Condition	Melvær Recaptures	Breivik, Sørøy Recaptures
Max.	41·7 %	33·4 %
Med.	39·4 %	19·8 %
Min.	40·0 %	7·1 %

It may be seen, then, that what we considered inferior fish at Melvær were retaken at just the same rate as the prime fish, but this was not so at Breivik. The fish classed as inferior there were really not so suitable as the best, and the dwindling percentages prove that they should have been rejected.

At Breivik Sømme also kept a record of net-marked fish. For fish in the best condition (Max.) the experiment gave the following results:—

Condition	Number of fish Breivik		
Max.	Marked	Recaptured	
Not netmarked	283	101	35·7 %
Net-marked	67	16	23·9 %

The percentage recapture is thus about 10 % lower in case of the net-marked, but otherwise well-conditioned fish. These experiments show on the one hand that the comparatively low percentage recapture from the Breivik markings must to a certain extent be due to the lower standard of sorting the fish employed for marking, and on the other hand they clearly demonstrate the necessity of the rigorous rejection of unsuitable fish which we have practised at our other stations.

One of the problems regarding the method of marking in which we have been greatly interested is to make the mark as visible as possible and so to attract the attention of the fisherman himself. In this way we should obtain first-hand information about the fish and the exact place of capture. When the addressed silver marks, described in our 1936 paper, were employed, it happened in a ccertain number of cases that the mark has escaped the fisherman's notice and has been received only after having passed through the hands of the fisherman to the fish buyer, the exporter or the retail merchant. In such cases we miss valuable information which can only be obtained at first hand. It also happens sometimes that fishermen who catch marked salmon forward the mark without detailed information as to the capture and the fish.

At the time when the results were coming in from our experiments with addressed marks in 1935 and 1936, Mr. Einar Lea, the well-known biologist, conceived the idea of developing still more suitable types of marks not only for salmon but also for other fish. Mr. Lea's idea was to employ celluloid instead of silver, thereby gaining the advantage of a lighter mark, which by reason of their size and bright colouring would be more easily observed by the fisherman. These marks will be described by Mr. Lea in a paper in the publications of the Academy of Science, Oslo.

In the summer of 1937 we accordingly made some experimental markings with two types of Mr. Lea's marks, both made from celluloid.

One of the marks, called *the A. mark*, is a cylinder of a total length of 30 mm. and a diameter of 5·5 mm. In one end is a little plate with a perforated ridge where the silver wire is fastened. The colour is bright yellow with violet ends. The cylinder is stamped on the outside with a number and the following text:—

Zool. Museum, Oslo, A No.....
Skjær av endene
brev inni.
Cut ends
letter inside.

Inside the cylinder a paper band 215 mm. long and 19 mm. broad is rolled up. It is stamped with a serial number and contains a printed request addressed to the fisherman.

The other one is a flat, oval celluloid mark, described as *the B. mark*, length 31 mm., breadth 13 mm. On one side the following legend is printed on a yellow label:—

B. *(no.)* Send til
Zool. Museum Oslo
Præmie 5 Kr.

On the other side, also on a yellow label, is printed:—

Opgi sted, tid, redskab, lengde,
vegt, vedlegg skjæl (risp).

The edges of the mark are painted a bluish violet colour.

In order to see whether these marks are now returned to a greater extent than the original silver marks or lead to better information about the recapture, we have periodically employed these new marks alternately with silver marks. Over a definite period we therefore marked every other fish with silver marks and with either A. or B. marks.

The results are shown in the following table:—

(See following column).

In regard to the *A. mark*, which has been tried as an alternative at Melvær and Breivik, it will be seen that at Melvær this mark gave a better percentage recapture than the silver mark (46·7 % for the A. mark and 35·9 % for silver). But at Breivik, where a similar number of alternate markings were made, the silver mark was slightly superior (33 % for silver and 30 % for A.). The B. mark was tried at Titran, Stavøy, and Breivik,

Comparison of Recaptures for Marks of different Types used alternately.

I. Titran

Date	Number marked	Type of mark	Number recaptured	% recaptures	Remark
V/23—V/24	6	silver	5	83·3	
V/30—VII/5	40	B.	23	57·5	marked alter-
	40	silver	9	22·5	nately
VII/5—VII/30	44	silver	9	20·4	
Total	130	both	46	35·4	
Of these	90	silver	23	25·6	

II. Melvær

Date	Number marked	Type of mark	Number recaptured	% recaptures	Remark
V/10—VII/16	107	A.	50	46·7	marked alter-
	106	silver	38	35·9	nately
VII/17—VII/19	6	silver	1	16·7	
Total	219	both	89¹)	40·7	
Of these	112	silver	39	34·8	

III. Breivik

Date	Number marked	Type of mark	Number recaptured	% recaptures	Remark
V/29—VI/20	100	A.	30	30·0	marked alter-
	100	silver	33	33·0	nately
VI/20—VI/27	105	silver	30	28·6	
VI/28—VII/5	30	B.	9	30·0	marked alter-
	30	silver	6	20·0	nately
VII/10—VII/25	99	silver	28	28·3	
Total	464	all	136²)	29·3	
Of these	334	silver	97	29·1	

IV. Stavøy

Date	Number marked	Type of mark	Number recaptured	% recaptures	Remark
VI/13—VI/27	5	B.	4	80·0	marked alter-
	6	silver	3	50·0	nately
Total	11	both	7	63·6	

[1]) Total number of recaptures 90 (41·1 %); of these 1 was of unknown type.

[2]) Total number of recaptures 137 (29·5 %); of these 1 was of unknown type.

and has everywhere appeared superior to the silver marks. How far this superiority goes is very difficult to decide. If we scrutinize the figures closely, we can easily see that we should be careful how we trust them. For instance, it is significant that at Titran the highest percentage recapture falls to the silver marks employed alone. At Breivik silver employed alone gives only a slightly smaller percentage recapture than the B. mark alternating with silver. At Stavøy the figures are so small that the recapture of only one or two more fish with silver marks would nullify the superiority of the B. mark. More certain conclusions can only be attained by continuing the experiments.