

Herring Sub-Committee, 1952

Scottish Herring Tagging Experiments

by

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Since the last report on Scottish herring tagging experiments was submitted to the Herring Committee of I.C.E.S., 45 additional tags have been returned from the experiments made in 1951, bringing the total recoveries for that year to 125 and the percentage recovery to 1.43. Precise details were obtained concerning place and time of capture for 36 tags, which may be summarised as follows.

<u>LIBERATION</u>			<u>RECAPTURE</u>			
<u>Place</u>	<u>Month</u>	<u>Number</u>	<u>Place</u>	<u>Month</u>	<u>Days Free</u>	<u>Miles</u>
Off P'head	May	1	Fladen	Aug.	92	60
Off F'burgh	May	4	Fladen	Aug-Oct.	73-91	38-130
"	"	3	Gut	Jul-Aug.	66-98	83-130
"	"	1	off Tyne	Sept.	131	185
"	"	4	N. Dogger	Aug-Oct.	74-128	180-200
"	"	1	E. Anglia	Nov.	178	290
"	"	1	off Ostend	Jan.(52)	237	420
"	"	1	Skagerrak	Feb.(52)	263	420
"	June	6	Fladen	Jul-Aug.	17-71	30-80
"	"	1	Gut	Sept.	100	95
"	"	1	N. Dogger	Oct.	99	257
"	July	2	Fladen	Jul-Aug.	10-46	30-60
"	"	2	Gut	Aug.	18-46	100
E. of Fair Is.	"	1	N. Fladen	Aug.	20	22
Shetland	June	4	Fladen	Aug-Oct.	50-128	90-100
"	"	1	N. Dogger	Oct.	108	300
"	"	1	Skagerrak	Mar.(52)	238	400
"	July	1	Fladen	July	13	83

These results are in close agreement with those already reported for the 1951 experiments. Of special interest are the recaptures in the Skagerrak of other two herrings, one tagged at Shetland in June and one tagged off Fraserburgh in May, and of two herrings tagged off Fraserburgh in May, one recovered at East Anglia in November and one off Ostend in January. The two latter reveal the interesting possibility that some of the East Anglian herring may extend their range northwards during the principal feeding season to the North Western North Sea.

In the more extensive tagging programme carried out during 1952 the method of tagging employed was the same as in 1951, i.e. using Lea's and the Scottish Hydrostatic tags with the one-man toggle attachment on board commercial drift net and ring net vessels. The main tagging experiment was again conducted on the drift net grounds off the Scottish north east coast and at Shetland, but herrings have also been tagged on the west coast of Scotland, in the Firth of Forth, and on the Coral Bank.

On the west coast of Scotland 3,834 herrings were tagged between February and August and so far only 10 have been recovered, none of which had moved more than 30 miles in periods of liberty ranging from $1\frac{1}{2}$ to 48 days. The significance of the low number of returns from this region is not yet understood.

A ring net fishery for 1-group herring takes place in late autumn and winter in the Firth of Forth between Inchkeith and the Forth Bridge. Five hundred and twenty nine herring were tagged in this area in January and March, of which 5 were returned from the same grounds after 11-48 days, while 13 more were recaptured about 18 miles up-stream between 16 and 103 days later.

The tagging experiment on the Coral Bank in April was undertaken in the hope of obtaining direct confirmation of the presence of adult Scottish autumn spawners among the various herring types found in that area at that time. This hope was not fulfilled; but it might be added that, according to samples examined at the Marine Laboratory, autumn spawning herring were much less conspicuous on this ground in the spring of 1952 than is usually the case. The 5 returns, out of 1,308 herrings tagged, are of great interest. One herring was found 40 days later in a pound net in the innermost parts of the Nissum Broads in Denmark, and the other 4 were caught by Swedish trawlers on or near the Halsebank in the Skagerrak between 27th June and 8th July, 83-92 days after tagging. The only recaptured herring of which the maturity is known was at stage III-IV. The area in which the tagging took place and the direction of movement of the recaptured herrings are shown in Chart I.

Details of Recaptured Herrings tagged off the Scottish N.E. Coast and at Shetland

Details of the recaptured herrings tagged in May, June, July and August are given in the summary below in which the points of liberation and recapture are given as off some fishing port or on some well-known fishing ground. Fishing and tagging were carried out generally at greater distances from the coast than in 1951, and the limits given for the tagging areas in last year's report have had to be extended to the eastwards. Shetland taggings were all on the east side of the island up to 70 miles from land. The Fraserburgh grounds have been taken as lying between $58^{\circ}40'$ and $57^{\circ}40'N$ and the Peterhead grounds from $57^{\circ}40'$ to $57^{\circ}15'N$, in both cases extending from the coast to $00^{\circ}30'E$. The movements of the herrings detailed in the summary, except those tagged in August, are shown in Charts I-III in which the points of liberation are denoted by the chart reference numbers given in the summary. To avoid confusion on the charts, recoveries from within an area between $57^{\circ}45'$ and $59^{\circ}00'N$ and between $00^{\circ}00'$ to $02^{\circ}00'E$ are not shown individually but are summarised under the months of recapture within a rectangle enclosing most of the Fladen area. Recoveries from outside this rectangle are shown individually by a line joining the points of liberation and recapture and giving the month of recapture. No returns have been charted where the period at liberty was less than three days or where the position of recapture is doubtful, as for example when the vessel making the capture had been fishing on two grounds during the trip.

SUMMARY OF RETURNS

<u>LIBERATION</u>		<u>RECAPTURE</u>				
<u>Chart ref.</u>	<u>Period</u>	<u>No.</u>	<u>Position</u>	<u>Period</u>	<u>Days Free</u>	<u>Miles</u>
<u>May</u>		<u>Tagged off Peterhead</u>				
1	May 23rd	2	Fladen	June 22nd-July 25th	30-63	56-70
		1	Off Tyne	June 28th	36	140
		<u>Tagged Off Fraserburgh</u>				
2,3,4,5,6	May 8th-16th	9	Fladen	July 8th-Aug. 2nd	55-78	24-72
		1	Off Tyne	Aug. 29th	113	118
		1	N. Dogger	Aug. 19th	97	115
		1	Off F'burgh	Sept. 4th	118	34
		3	Denmark	July 12th-23rd	Found on Hirtshal Beach	
7,8,9,10	May 21st-28th	10	Fladen	July 24th-Aug. 3rd	58-74	30-80
		2	N. Dogger	Aug. 5th-22nd	69-92	138-153
		<u>Tagged Off Shetland</u>				
11,12,13	May 29th-31st	4	Fladen	July 3rd-Aug. 15th	34-77	100-118
		1	Off P'head	Aug. 2nd	63	185
<u>June</u>		<u>Tagged Off Peterhead</u>				
1	June 4th	7	Fladen	July 10th-Aug. 14th	36-71	45-100
		<u>Tagged Off Fraserburgh</u>				
2,3,4,5,6,7,8,9	June 6th-13th	2	Off P'head	June 11th-17th	1-7	20-36
		7	Off F'burgh	June 10th-July 10th	0-28	0-36
		19	Fladen	June 21st-Aug. 21st	8-70	23-80
		2	Gut	June 20th	7	48-87
		2	Fladen or Gut	Aug. 16th-25th	70-75	-
		1	Off Berwick	Aug. 5th	60	108
10,11,12,13	June 17th-21st	18	Fladen	June 22nd-Aug. 6th	17-47	35-93
		1	Fladen or Gut	Aug. 10th	54	-
		1	N. Dogger	July 17th	29	150
		1	Off F'burgh	Aug. 1st	43	24
		<u>Tagged Off Shetland</u>				
14,15	June 4th-5th	2	Shetland	June 7th-16th	3-12	0-5
		7	Fladen	July 7th-Aug. 25th	32-81	40-100
16,17,18,19	June 10th-13th	16	Fladen	July 9th-Aug. 17th	28-68	66-105

LIBERATION

RECAPTURE

Chart ref	Period	No.	Position	Period	Days Free	Miles
			<u>Tagged Off Fraserburgh</u>			
1,2,3	July 1st-4th	2	Off F'burgh	July 3rd	1	15-20
		8	Fladen	July 17th-Aug. 22nd	15-52	30-79
		1	Gut	?	?	120
		1	Off Tyne	Aug. 25th	52	140
4,5,6,7	July 8th-12th	1	Off P'head	July 19th	8	25
		10	Fladen	July 9th-Aug. 16th	1-46	14-62
		2	Gut	Aug. 5th-23rd	25-45	100-105
8,9,10	July 15th-18th	1	Off F'burgh	July 17th	0	29
		8	Fladen	July 15th-Aug. 6th	1-22	11-78
			<u>Tagged Off Shetland</u>			
11	July 31st	1	Fladen	Aug. 6th	6	75
			<u>Tagged Off Fraserburgh</u>			
	Aug. 1st	3	Off F'burgh	Aug. 1st-2nd	0-1	0-5
	Aug. 12th	1	Off F'burgh	Aug. 14th	2	15
	Aug. 19th	1	Off P'head	Aug. 19th	41	9
	Aug. 21st	1	Off P'head	Aug. 22nd	1-2	20
			<u>Tagged Off Shetland</u>			
	Aug. 1st	1	Fladen	Aug. 6th	5	70

Analysis of Returns

Clearly the ultimate assessment of returns must take into account varying fishing intensity on the various grounds at different seasons. Between April and 28th August 1952, 12,099 herring were tagged off the Scottish N.E. coast and at Shetland, and 182 or 1.50% have been returned up to 8th September. There is no definite information about the position of recapture of 21 of these returns, and three tags were found lying loose on the beach south of Hirtshal in Denmark. The method and position of recapture and the month of liberation of the remaining 158 herrings are summarised below:-

RECAPTURE		MONTH OF LIBERATION				TOTAL
Method	Ground	May	June	July	Aug.	
So. Seine Net	Off Scottish N.E. Coast		1		2	3
So. Drifters	Off Scottish N.E. and Shetland Coasts	2	7	4	4	17
Dutch Drifters	Off Scottish N.E. Coast		1			1
	Fladen		1	2		3
	Gut		2			2
Trawlers	Off Shetland		2			2
	Off Scottish N.E. Coast		1			1
	Fladen	25	66	25	1	117
	Gut		1	3		4
	Off Berwick		1			1
	Off Tyne	2		1		3
	N. Dogger	3	1			4
		32	84	35	7	158

The number of tagged herrings recaptured by drifters and seine net vessels on the Peterhead and Fraserburgh grounds is even lower than from last year's tagging and 16 out of the 21 so caught had been at liberty for three days or less. While some tagged herrings must have been lost in the large number processed into meal and oil during 1952 the indications are that the majority of the tagged herrings did not remain on the drift net grounds for long.

This year's tagging has confirmed that there is a movement from the drift net grounds at Shetland and off the N.E. of Scotland on to the Fladen Ground between June and July and also that some of the herring present on the Shetland grounds in May-June find their way to the Fraserburgh-Peterhead drift net grounds by August. Interesting returns include those of the three tags found lying loose on the beach $1\frac{1}{2}$ to 3 miles south of Hirtshal in Jutland between 12th and 23rd July. They had been attached to herrings on the 14th and 15th May 60 miles ENE and 63 miles NE $\frac{1}{2}$ E from Fraserburgh. There is no evidence as to how they reached Denmark but one of the finders noted some decomposed herring lying near one of the tags.

Comparative Tagging Experiments

In order to increase the scope of the tagging experiments and to avoid the necessity of using research vessels the toggle attachment was designed in 1951 with which one man could tag herrings on board commercial fishing vessels without any equipment other than bandoliers to hold the tags conveniently to his hand. It was realised that this technique of tagging would probably lead to a greater mortality among tagged herring than certain other techniques used by other scientists. It was considered, however, that the greater number of herring which could be tagged with the one-man toggle attachment would compensate for this increased mortality by giving a greater absolute number of returns at an appreciably lower cost.

The results from the tagging experiments during 1951 were very encouraging since not only was the number of returns increased by over a hundred, but the percentage return also increased and was, in fact, nearly four times the percentage return from the tagging in 1950.

The technique of one-man tagging with the toggle attachment was again employed in 1952 and a comparative tagging experiment was undertaken at Saltvik in Sweden to test the Scottish one-man toggle technique against the Swedish technique which avoided manhandling of the herring and used the Lea bridle. A report on this experiment will be given later by the scientists concerned, but it is of interest that Scottish returns to date are 21 out of a total of 341 herring tagged and the percentage return of 6.16% is the highest from any Scottish herring tagging experiment. Two factors can be suggested to account for this higher percentage. The first is that the herrings tagged in Sweden were caught by pound net and were probably tagged in better condition than the gilled herrings caught by drift nets. The other is that the herrings were tagged and recaptured within a limited area, none of the recaptures so far being made outside the limits of the Skagerrak.

Other comparative tagging experiments were conducted to test the relative merits of the Lea's and Scottish Hydrostatic tags and the relative merits of different colours of Scottish Hydrostatic tags. The toggle attachment was employed throughout and the tags used were:-

- (1) Lea's Hydrostatic
- (2) Scottish Hydrostatic - red
- (3) " " - amber
- (4) " " - yellow
- (5) " " - red and yellow
- (6) " " - blue and yellow

Each group of six tags was mixed and the tags picked out at random to avoid any bias. The experiments were carried out at the following areas and periods:-

- (1) At Saltvik in April-May
- (2) With the Fraserburgh herring fleet in May
- (3) With the Peterhead herring fleet in May-June
- (4) With the Shetland herring fleet in May-June.

In these experiments 5,514 herrings were tagged and 133 have been recovered to date (8th September). The numbers of recoveries for the various types are set out in the following table:-

<u>Type</u>	<u>No. of Herrings</u>		<u>%age Return</u>
	<u>Tagged</u>	<u>No. of Returns</u>	
Lea's Hydrostatic - blue-yellow	920	24	2.61
Scottish Hydrostatic - red	920	16	1.74
" " - amber	919	14	1.52
" " - yellow	918	26	2.83
" " - red-yellow	918	33	3.59
" " - blue-yellow	919	20	2.18

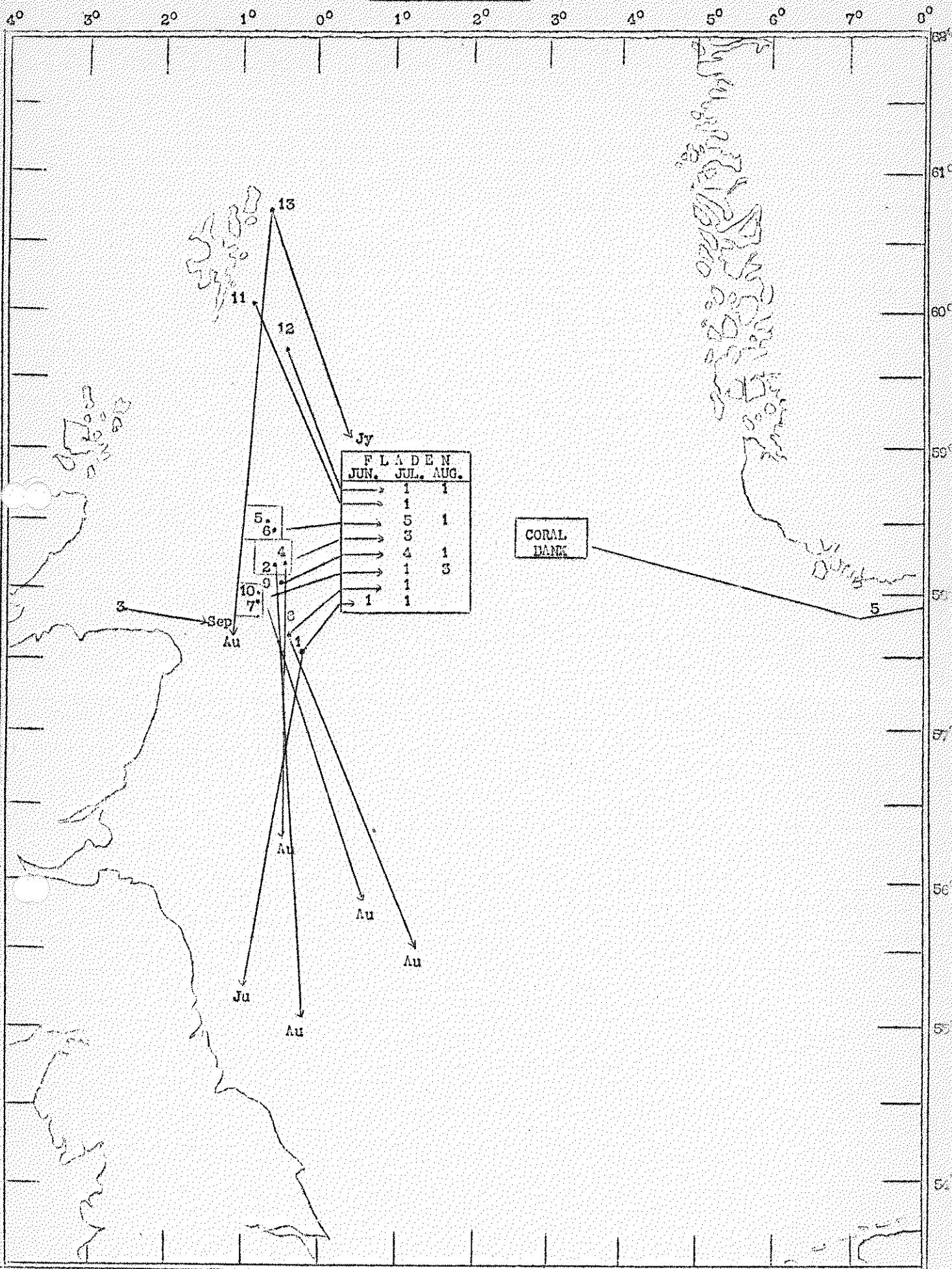
2.35

Statistical analysis shows that there is no significant difference between the percentage returns for the Lea's Hydrostatic tag and all the Scottish Hydrostatic tags taken as a group.

The numbers of returns for the various colours of the Scottish tag differ considerably and on inspection it is obvious that the three types containing yellow have been more successful than the other two types (red and amber). Analysis shows that there is no significant difference between the returns for the types which include yellow or between the returns for the "non-yellow" types (i.e. red and amber), but that there is a highly significant difference between the returns for the two groups compared with each other. Inclusion of the blue and yellow Lea's Hydrostatic tag in the "yellow" group does not alter these findings.

Returns relative to colour suggest that yellow tags or tags with a yellow component are more conspicuous to the human eye in a mass of herring than tags of the other colours used. At the same time the colour perception of predatory birds and fishes may be a factor of some importance in affecting returns, and there is clearly room for further investigation.

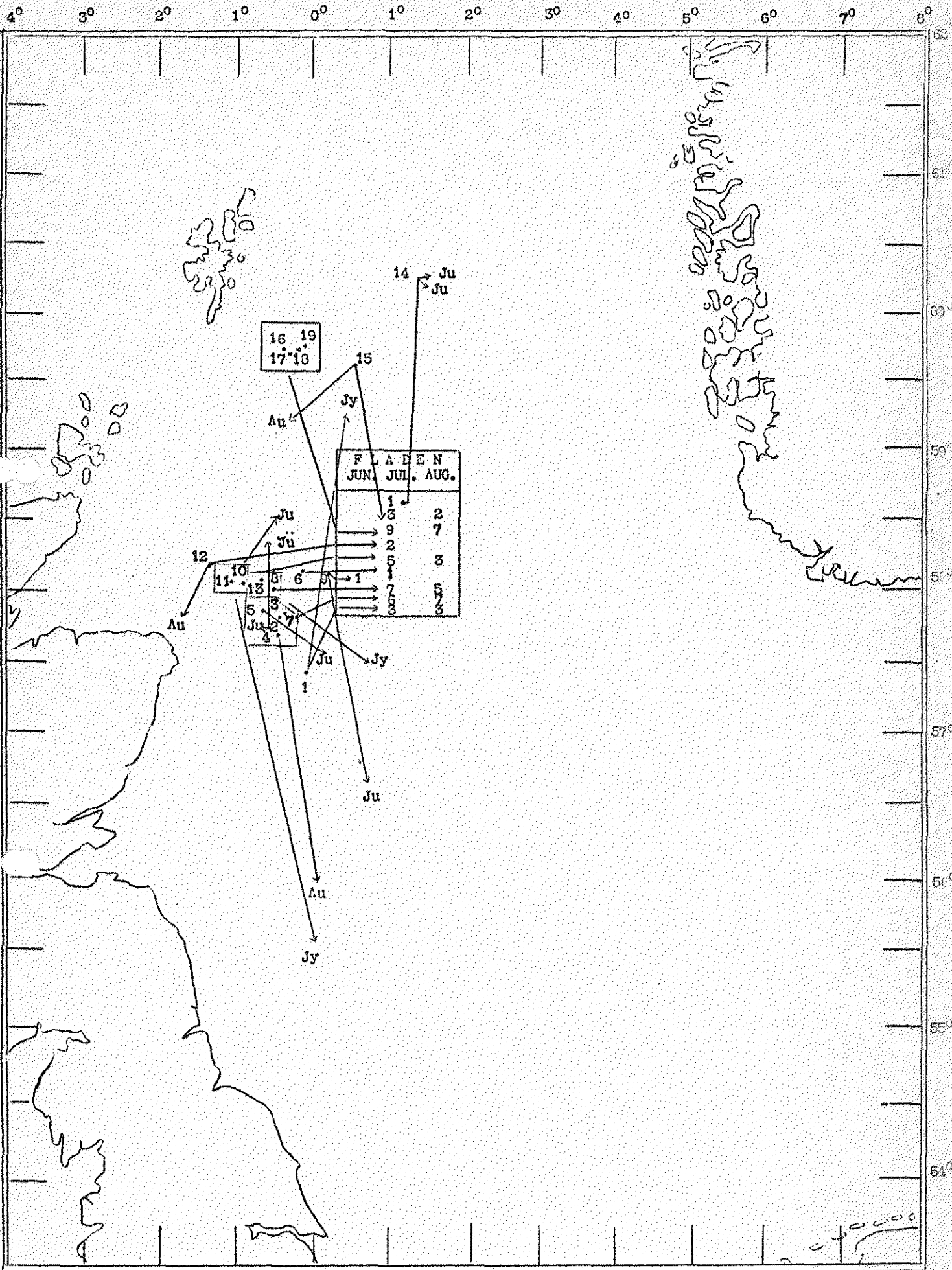
C H A R T I



RECAPTURES FROM APRIL (CORAL BANK) AND MAY

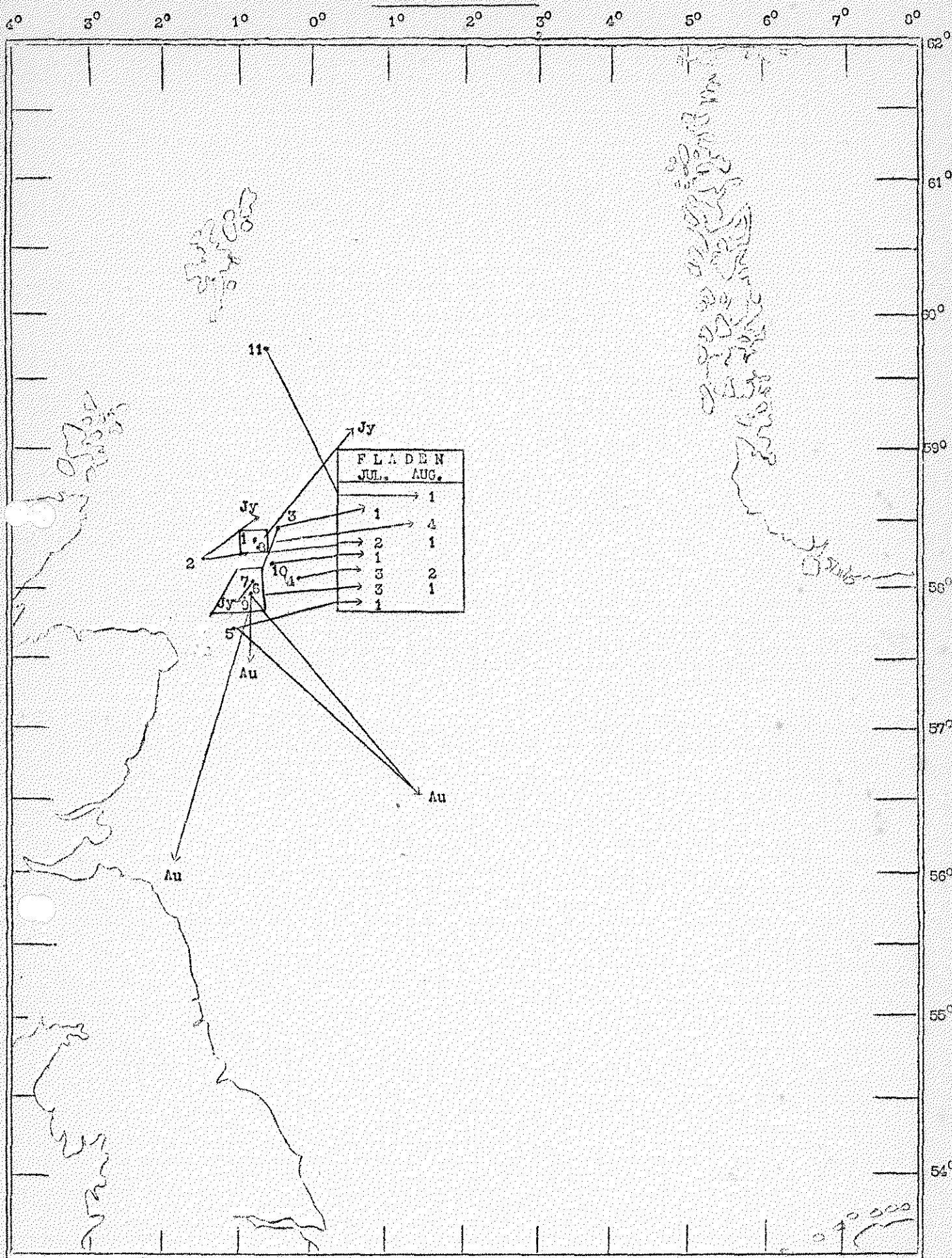
1952 LIBERATIONS

CHART II



RECAPTURES FROM JUNE 1952 LIBERATIONS

C H A R T III



RECAPTURES FROM JULY 1952 LIBERATIONS