

78-07

Preliminary Results of the International Herring Tagging Program
Conducted on the Northeast Coast of the United States in 1977

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Introduction

At the annual ICNAF Meeting in 1976, an ad hoc Planning Group met on 31 May to organize a herring tagging program. Participants included representatives from Canada, FRG, Poland, USSR, and USA.

As a result, the Planning Group recommended an international herring tagging program to delineate feeding, spawning, and overwintering areas; recruitment migrations from the juvenile fisheries; proportions of inter-mixing stocks in feeding and overwintering areas; and to provide mortality estimates.

As part of the cooperative International Herring Tagging Program, 29,403 herring were tagged on Georges Bank during 16-28 September 1976, and 10,693 herring were tagged on Jeffreys Ledge during 7-29 October 1976. Preliminary results of these experiments are analyzed by Burns (1977).

On 1 May 1977, 10,973 herring were tagged near Jeffreys Ledge. In the Great South Channel area, a total of 22,882 fish were tagged during 7-15 May 1977. Between 23-25 September 1977, 943 fish were tagged in the area approximately 12 miles east of Chatham, Massachusetts.

One goal of the 1977 tagging program was to determine the destination of fish migrating from overwintering grounds by tagging herring in the offshore waters of southern New England and the Middle Atlantic during the spring. In the fall, the primary goal was to tag spawning herring in the areas of Stellwagen Bank and Jeffreys Ledge and on the spawning grounds of Georges Bank and Nantucket Shoals. The following is a report and analysis of tag returns received as of 31 December 1977.

Methods and Materials

All tagging operations were conducted utilizing purse seiners provided by the USSR. During 19 April-20 May 1977, the R/V NOGLIKI was used to locate and capture herring near Jeffreys Ledge and in the Great South Channel. Participating scientists included personnel from the National Marine Fisheries Service, Woods Hole, Massachusetts, and Sandy Hook, New Jersey, Laboratories, USA; Environment Canada, Fisheries and Marine Service, St. Andrews, New Brunswick, and Halifax, Nova Scotia, Biological Stations, Canada; and AtlantNIRO, Kaliningrad, USSR.

Tagging conducted between 5 September and 4 October off Chatham, Massachusetts, utilized the R/V YUBILEINIY. Participating scientists on this vessel included personnel from the National Marine Fisheries Service, Woods Hole, Massachusetts, USA; Environment Canada, Fisheries and Marine Service, St. Andrews, New Brunswick, Canada; and AtlantNIRO, Kaliningrad, USSR.

The tagging procedure was similar to that described by Stobo (1976), but differed in that no skiff was employed during any of the tagging operations in 1977. The tagging guns and tags were the same as those used during the 1976 International Herring Tagging Program. The seining vessels utilized were large and used commercial-size nets, approximately 160 m deep and 750 m in length.

Tagging operations were conducted from the deck of the research vessels using 3-4 tagging teams usually consisting of five men each: one tagger, two holders, and two persons handling the dip net. Herring were dip-netted from a large pocket of the purse seine (approximately 4 m in width, 15 m in length) running parallel to the starboard side of the ship. Herring were tagged and released continuously until the condition of the fish deteriorated to an unacceptable level indicated by a 5-10% scale loss.

During each successful set, a random sample of at least 100 fish were measured, and 30 fish were frozen and returned to the NMFS Woods Hole Laboratory for age and growth analysis. A random sample of approximately 10 stomachs were also excised and preserved for food chain analysis.

Results

A summary of 1977 release data and recaptures to 31 December 1977 is presented in Table 1 and corresponding distributions plotted in Figures 1-8.

From fish tagged near Jeffreys Ledge on 1 May 1977, 464 tags (4.23%) have been returned (Table 1 and Figure 1). One tagged fish was recaptured within 50 km and 30 days of the release site and was excluded from further analysis. Based on a random sample of 200 fish, the total length of tagged fish at this site ranged from 24.7-34.5 cm, with a mean length of 30.1 cm (Table 2).

In the Great South Channel area there were four tagging sites (Figures 2-5) between 7-15 May 1977, all within 11 km of each other. For stock-movement analysis purposes, these sites have been combined and considered as one (Figure 6). This was done not only because of the proximity of the individual tagging sites in distance and time but also because of the similarity in length frequency data and sexual maturity of fish examined from each site.

A combined total of 208 tags (0.91%) have been returned from those fish tagged in the Great South Channel. All recaptures of fish tagged in this area were made at least 50 km from the tagging site. Based on a minimum sample of 100 fish, the total length of these tagged fish ranged from 16.6-33.7 cm, with a mean length of 27.1 cm (Table 2).

In the area off Chatham, Massachusetts, no returns of tagged fish have been reported (Table 1 and Figures 7 and 8). Based on a minimum sample of 100 fish, the range of tagged fish in this area was 25.6-35.3 cm, with a mean length of 30.0 cm (Table 2). Fish tagged in this area were all in a spawning condition.

Tables 3-7 include monthly summaries, by recapture area and recapture date, of all tags recovered from 1 May to 31 December 1977. In Appendix I, Tables 1-5 include the number of tags returned, by recapture date and location.

Discussion

Jeffreys Ledge

Herring tagged near Jeffreys Ledge on 1 May 1977 were apparently part of a migrating population that tended to move toward the north as summer approached (Figure 1). Tags were recovered in the Jeffreys Ledge-Cape Ann region in late summer and fall, but in the more northerly regions along the Maine coast around Grand Manan Island, New Brunswick, and the southwest Nova Scotian coast (recapture areas 6-13), tagged fish were recaptured in every month from June to October. Those fish caught along the Maine coast and north were caught as part of the summer juvenile fishery extending from Portland, Maine, to St. John's, New Brunswick. Fish caught in the Grand Manan area and from southwest Nova Scotia were part of the juvenile fishery conducted in those areas between August and October (Anthony 1976). A large percentage of the returns came from fish caught in stop seines and weirs, along with purse seiners operating relatively close inshore.

By late summer and fall, tag returns were reported near Jeffreys Ledge in the general vicinity of the tagging site in the spring. These fish were

possibly headed for the spawning grounds on Jeffreys Ledge and possibly to their overwintering grounds, although there were relatively few tags returned during the spawning season from August to October.

Great South Channel

Tag returns from fish released in the Great South Channel show movement and distributional patterns similar to those fish tagged near Jeffreys Ledge (Figures 2-6). These fish were located after search operations were conducted in the southern New England-Middle Atlantic region between 19-30 April 1977.

Herring tagged in this area may have been the remnants of a population of fish that overwinter in the Middle Atlantic region and migrate north onto Georges Bank and probably into the Gulf of Maine. The smaller number of returns as compared to fish tagged at the Jeffreys Ledge site may indicate that only a portion of the group moved toward the Maine coast. No returns were reported from Georges Bank, a result which may have been related to the collapse of the autumn fishery in that area.

There were no returns from the Jeffreys Ledge-Cape Ann area in spring and early summer, but returns were reported as far north as St. John's Bay, New Brunswick, in September, and on the spawning grounds of Trinity Ledge and in the southwest Nova Scotia area from June, July, and also October. Again, returns were reported further south in the late summer; 29 tags were recaptured from ripening and spawning fish in the Ipswich Bay-Cape Ann area between mid-August and mid-October.

It will be interesting to see whether or not any returns are reported during the winter fishery in 1978 off Point Judith, Rhode Island. This

would indicate that those fish tagged in the Great South Channel may indeed be members of a population that overwinters in Middle Atlantic waters.

These experiments have indicated some intermixture between the herring stocks populating the waters from the Middle Atlantic to southwest Nova Scotia, but the returns and analysis to date are inadequate to indicate the extent of intermixing that occurs. In the future, the overwintering populations south of Rhode Island and herring spawning on Georges Bank should be tagged. Recaptures of these fish, combined with continued tagging along the coast of Maine and in the Canadian provinces, will lead to a better understanding of intermixing between the herring stocks populating these regions.

References

- Anthony, V. C. 1976. Estimation of numbers of herring to be tagged in addressing the herring stock intermixture problem. Int. Comm. Northw. Atlant. Fish. Res. Doc. 76/VI/66. Ser. No. 3854 (mimeo).
- Burns, T. S. 1977. Preliminary results of the International Herring Tagging Program conducted on Georges Bank and Jeffreys Ledge. Int. Comm. Northw. Atlant. Fish. Working Paper 77/IV/10 (mimeo).
- Stobo, W. T. 1976. Some techniques and procedures used to tag herring in ICNAF Subarea 4. Int. Comm. Northw. Atlant. Fish. Res. Doc. 76/VI/101. Ser. No. 3924 (mimeo).

Table 1. Summary of release dates and resulting recaptures (1 May-31 December 1977) for herring tagged during the 1977 International Herring Tagging Program.

Tagging site	Location		ICNAF Division	Date	Fish Tagged		Recaptures				Total	%
	Latitude	Longitude			Number	Series	<50 km and 30 days Number	%	>50 km and 30 days Number	%		
Jeffreys Ledge												
1	42°41'N	70°29'W	5Y	1 May 77	10,973	40501-51500	1	0.01	463	4.22	464	4.23
Total (1)			5Y	1 May 77	10,973		1	0.01	463	4.22	464	4.23
Great South Channel												
2	40°31'N	69°12'W	5Ze	7 May 77	6,430	51501-58000	0	0.00	91	1.42	91	1.42
3	40°28'N	69°09'W	5Ze	11 May 77	2,507	58001-60000 60476-61000	0	0.00	23	0.92	23	0.92
4	40°33'N	69°20'W	5Ze	13 May 77	3,508	60001-60475 61001-64050	0	0.00	36	1.03	36	1.03
5	40°27'N	69°20'W	5Ze	15 May 77	10,437	64051-74500	0	0.00	58	0.56	58	0.56
Total (2-5)			5Ze	7-15 May 77	22,802		0	0.00	208	0.91	208	0.91
off Chatham, MA												
6	41°38'N	69°41'W	5Ze	23 Sep 77	645	74551-75200	0	0.00	0	0.00	0	0.00
7	41°38'N	69°45'W	5Ze	25 Sep 77	298	75201-75500	0	0.00	0	0.00	0	0.00
Total (6-7)			5Ze	23-25 Sep 77	943		0	0.00	0	0.00	0	0.00

Note: Discrepancies between numbers tagged and tag series resulted from damaged or missing tags.

Table 2. Length-frequency samples, by tagging site, for herring tagged during the 1977 International Herring Tagging Program.

Length (cm)	Tagging Site						
	Jeffreys Ledge 1	2	Great South Channel 3 4 5			off Chatham, MA 6 7	
15							
16				1			
17							
18							
19							
20							
21							
22				3	1		
23		1		5	1		
24	1	2	6	31	1		
25		7	7	44	4	1	
26	3	17	23	44	29	2	1
27	15	56	30	37	67	16	9
28	29	58	24	20	54	35	22
29	21	29	8	10	19	39	22
30	27	9	2	2	10	32	18
31	59	13		3	8	19	3
32	38	8			3	31	10
33	6				3	21	10
34	1					7	5
35						4	
36							
Total	200	200	100	200	200	207	100
Mean	30.1	28.0	26.9	25.9	27.7	30.1	29.8
Range	24.7-34.5	23.5-32.6	24.3-30.7	16.6-31.9	22.9-33.7	25.6-35.3	26.7-34.7

Table 3. Monthly summary of tag returns, by recapture area, of fish released on 1 May 1977 during the (International) Herring Tagging Program.

Location	1977							Total	
	May	Jun	Jul	Aug	Sep	Oct	Nov		Dec
Area 2									
Plymouth Harbor, MA								1	
Total								1	1
Area 3									
Cape Ann, MA					5	2			
Ipswich Bay, MA				5					
Total				5	5	2			12
Area 4									
Jeffreys Ledge				4	2	3			
Total				4	2	3			9
Area 5									
Doon Island, ME	1								
Total	1								1
Area 6									
Chebeague Island, ME						1			
Orrs Island, ME		1				1			
Total		1				2			3
Area 7									
Indiantown Island, ME					1				
Mill Cove, ME		2							
New Harbor, Long Cove, ME						1			
Pumpkin Island, ME					11				
Pumpkin Ledges					3				
Monhegan Island, ME		30		2					
Total		32		2	15	1			50
Area 8									
Rockland, ME			3						
Metinic Island, ME					4	2			
Matinicus Island, ME			3	8	11	1			
Seal Island, ME	4	3	13	33	12				
Matinicus-Seal area		12	4	2	3				
3-Fathom Ledge			3	20					
Criehaven, ME				4					
Total	4	15	26	67	30	3			145

Table 3 (cont.)

Location	1977						Total	
	May	Jun	Jul	Aug	Sep	Oct		Nov
Area 9								
Millbridge Bay, ME			2					
Total			2					2
Area 10								
Machias Bay, ME			4					
Cutler, ME					4			
Sand Cove, Trescott, ME				5	1			
Perry, ME				1				
Boot Cove, ME					4			
Grand Manan, N.B.	1	20	55	14	2			
North Head, Grand Manan, N.B.	2	5						
Patt's Cove, Grand Manan, N.B.			2					
Castalia, Grand Manan, N.B.			2					
Campobello, N.B.	3	1	5	10	1			
East Side, Campobello, N.B.	1	7	12	4	1			
Deer Island, N.B.		7	1		2			
Bliss Island, N.B.			10					
West Isles, N.B.			1					
Eagle Island, N.B.			2	1				
Fry's Island, N.B.			1					
Wolves Island, N.B.				1				
Pocologan, N.B.			3					
St. Andrews Bay (Mascarene Shore), N.B.			2					
Total	7	44	102	39	6			198
Area 12								
Parker's Cove			1					
Total			1					1
Area 13								
Digby, N.S.			1					
Long Island, N.S.	3							
St. Mary's Bay, N.S.	5	1	1					
Culloden, N.S.	1							
Cape St. Mary, N.S.	2							
Sandy Cove, N.S.			2					
Trinity Ledge-Lurcher Shoals			3	4				
Tusket Island, N.S.				1				
Southwest Nova Scotia	1	2	9	1	1			
Total	12	4	15	6	1			38
Unknown			3	1				4

Table 4. Monthly summary of tag returns, by recapture area, of fish released on 7 May 1977 during the International Herring Tagging Program.

Location	1977					Total
	May	Jun	Jul	Aug	Sep	
Area 1						
Stellwagen Bank				1		
Total				1		1
Area 3						
Cape Ann, MA					2	
Ipswich Bay, MA				5	1	
Total				5	2	8
Area 4						
Jeffreys Ledge				1		
Total				1		1
Area 6						
Dalley Island, ME					1	
Water Cove, Harpswell, ME		1				
Total		1			1	2
Area 7						
Townsend Gut, ME					1	
Indiantown Island, ME					1	
Loves Cove, Boothbay Harbor, ME						1
Christmas Cove, ME		1			1	
Pumpkin Ledges					1	
Monhegan Island, ME		18		1		
Total		19		1	4	1
Area 8						
Spruce Head, ME			1			
Metinic Island, ME					1	
Matinicus Island, ME			1	5	5	
Seal Island, ME		2		10	5	
Matinicus-Seal areas		3				
Vinalhaven Island, ME			2			
Isle au Haut, ME		2				
Total		7	4	15	11	37

Table 4 (cont.)

Location	1977							Total	
	May	Jun	Jul	Aug	Sep	Oct	Nov		Dec
Area 10									
Grand Manan, N.B.				4					
East Side, Campobello, N.B.			3	1					
Wilson's Beach, Campobello, N.B.					1				
Bliss Island, N.B.				1					
Pocologan, N.B.				1					
Total			3	7	1				11
Area 11									
St. John's Bay, N.B.					1				
Total					1				1
Area 13									
Long Island, Misconugus Bay, N.S.						1			
St. Mary's Bay, N.S.			1						
Cape St. Mary, N.S.		1							
Yarmouth, N.S.			1						
Trinity Ledge		1							
Total		2	2			1			5

Table 5. Monthly summary of tag returns, by recapture area, of fish released on 11 May 1977 during the International Herring Tagging Program.

Location	1977						Total
	May	Jun	Jul	Aug	Sep	Oct	
Area 3							
Gloucester, MA					1		
Marblehead Neck, MA				1			
Ipswich Bay, MA				2			
Total				3	1		4
Area 7							
Townsend Gut, ME					2		
Sawyer Island, ME			1				
Johns Bay, ME			1				
Monhegan Island, ME		3					
Total		3	2		2		7
Area 8							
Rockland, ME			1				
Graffam Island, ME					1		
Metinic Island, ME					1		
Matinicus Island, ME			1	5	1		
Matinicus-Seal area		2					
Total		2	2	5	3		12

Table 6. Monthly summary of tag returns, by recapture area, of fish released on 13 May 1977 during the International Herring Tagging Program.

Location	1977								Total	
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Area 3										
Cape Ann, MA					2					
Ipswich Bay, MA				3						
Total				3	2					5
Area 4										
Jeffreys Ledge				2		1				
Total				2		1				3
Area 6										
Harpwell, ME						1				
Total						1				1
Area 7										
Townsend Gut, ME					1					
Sheepscot River, ME		1			1					
Monhegan Island, ME		2								
Total		3			2					5
Area 8										
Matinic Island, ME					1					
Matinicus Island, ME			1	3	2					
Seal Island, ME				3	1					
Matinicus-Seal area		2			1					
J-Fathom Ledge				1						
Criehaven, ME				1						
Vinalhaven Island, ME			2	1						
Isle au Haut, ME			1							
Total		2	4	9	5					20
Area 10										
North Head, Grand Manan, N.B.			1	1						
Total			1	1						2

Table 7. Monthly summary of tag returns, by recapture area, of fish released on 15 May 1977 during the International Herring Tagging Program.

Location	1977						Total
	May	Jun	Jul	Aug	Sep	Oct	
Area 3							
Cape Ann, MA					1		
Ipswich Bay, MA				11			
Total				11	1		12
Area 4							
Jeffreys Ledge				3		2	
Total				3		2	5
Area 6							
Casco Bay, ME						1	
Total						1	1
Area 7							
Boothbay Harbor, ME					1		
Cedarbush Island, ME						1	
Pumpkin Island, ME					3		
Pumpkin Ledges				4			
Monhegan Island, ME		1		1			
Total		1		5	4	1	11
Area 8							
Matinic Island, ME					1		
Matinicus Island, ME				4	2		
Seal Island, ME			2	6	1		
Matinicus-Seal area		5			1		
3-fathom Ledge				1			
Total		5	2	11	5		23
Area 10							
Grand Manan, N.B.				2	1		
Campobello, N.B.					1		
Total				2	2		4
Area 11							
Long Island, Muscongus Bay, N.S.						1	
Total						1	1
Unknown							1

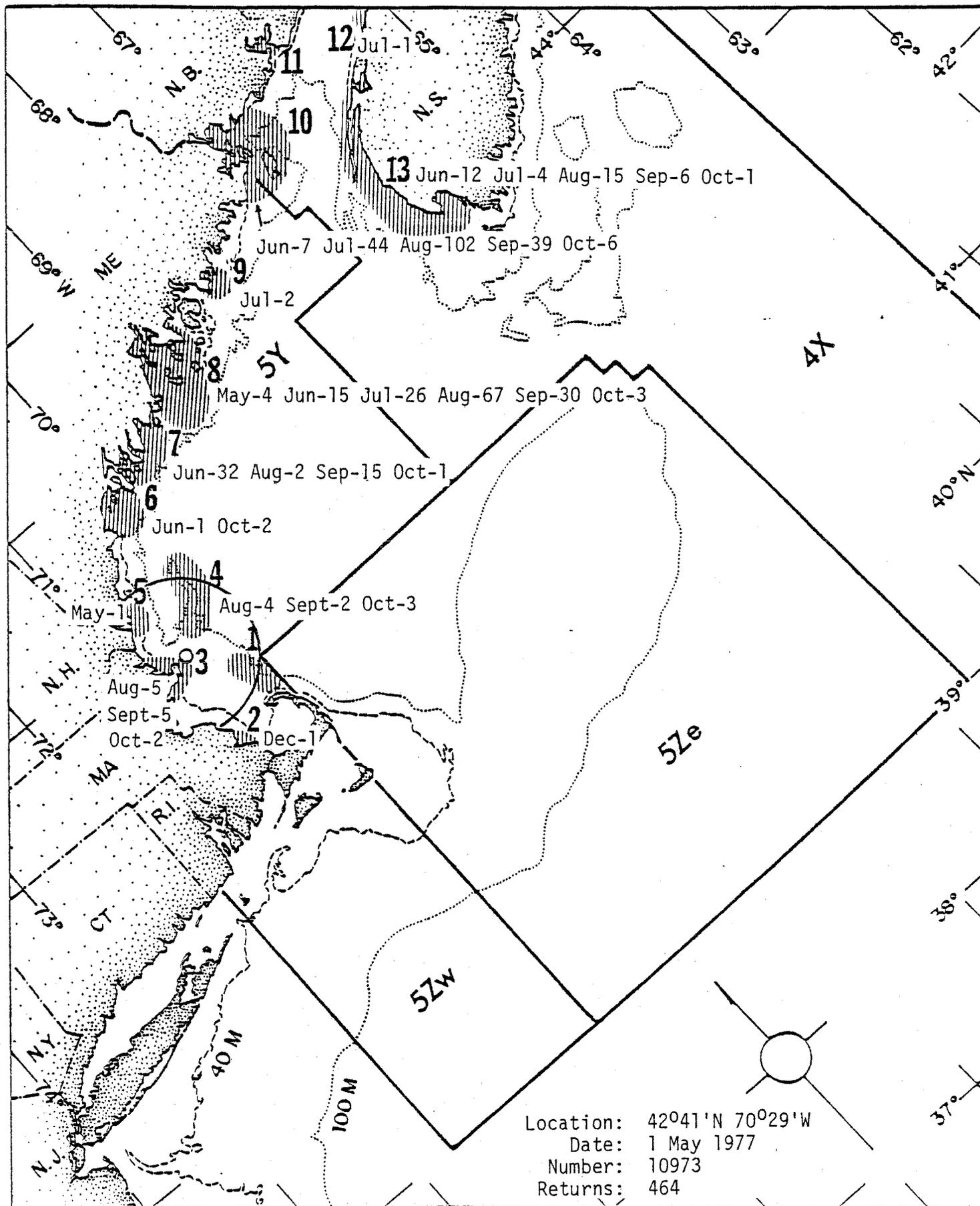


Figure 1. Distribution of recaptured herring tagged on Jeffreys Ledge and recovered as of 31 December 1977. Number of recaptures, by area, are indicated after each month. Large circle indicates radius of 50 km from tagging site.

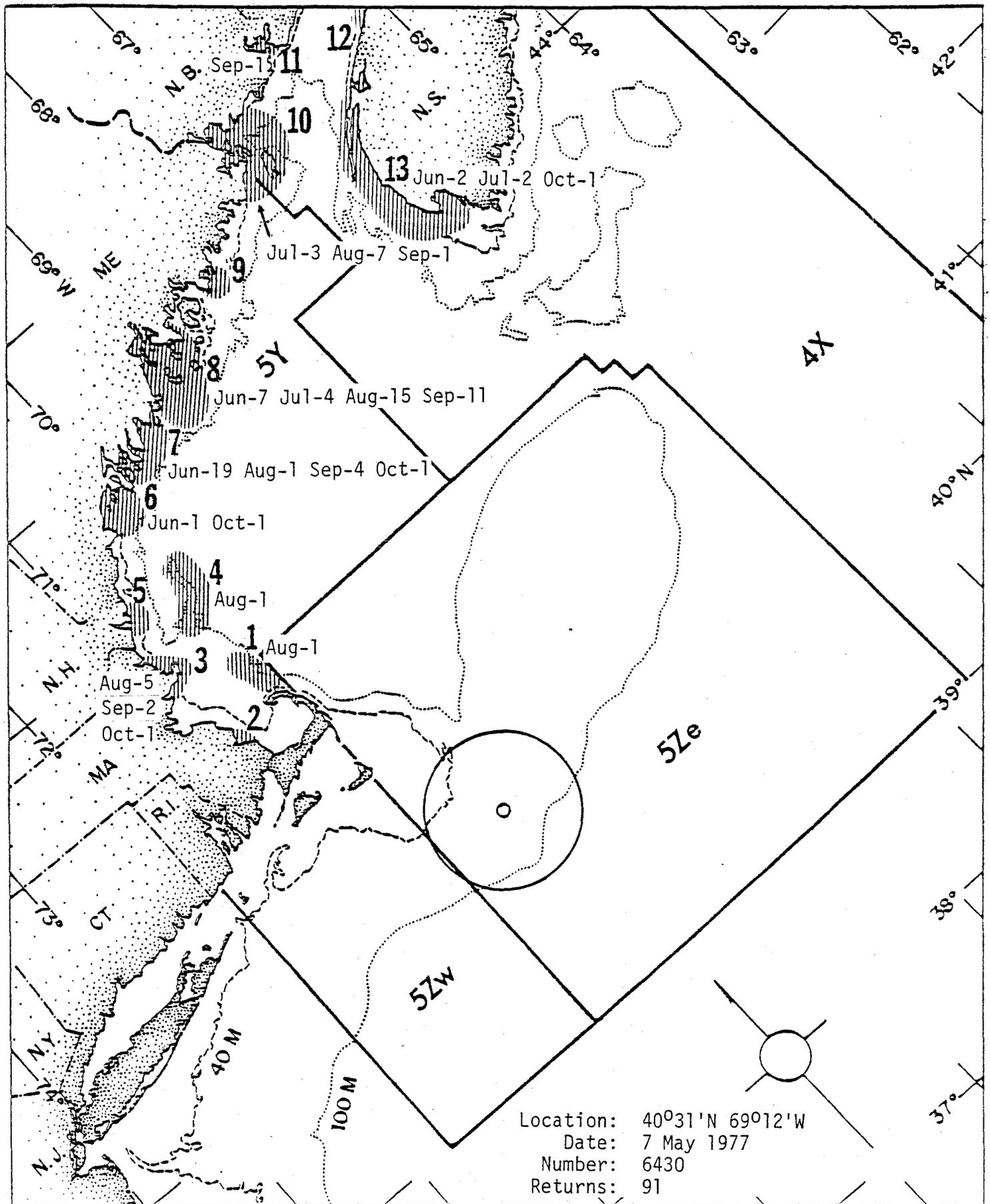


Figure 2. Distribution of recaptured herring tagged in the Great South Channel and recovered as of 31 December 1977. Number of recaptures, by area, are indicated after each month. Large circle indicates radius of 50 km from tagging site.

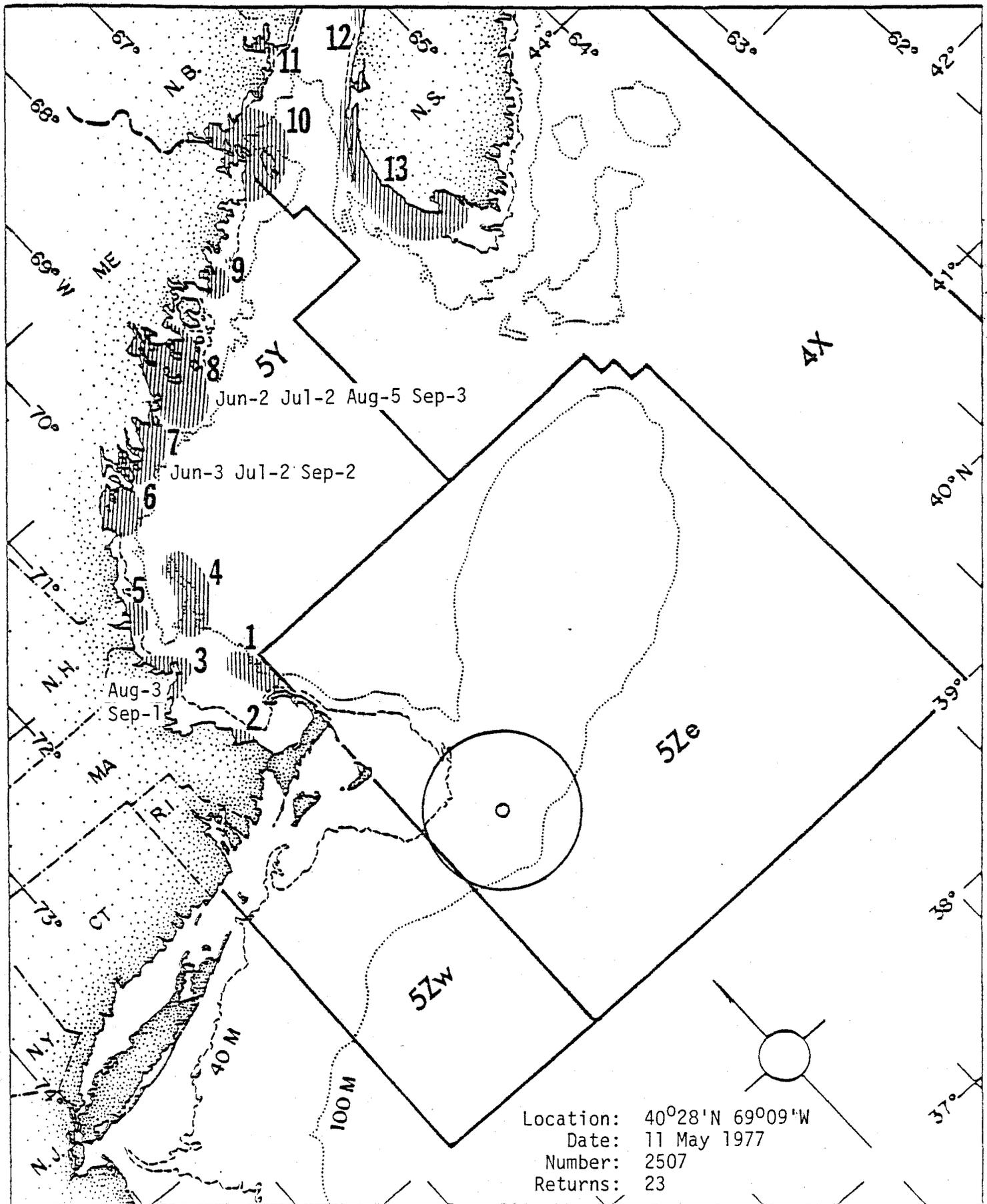


Figure 3. Distribution of recaptured herring tagged in the Great South Channel and recovered as of 31 December 1977. Number of recaptures, by area, are indicated after each month. Large circle indicates radius of 50 km from tagging site.

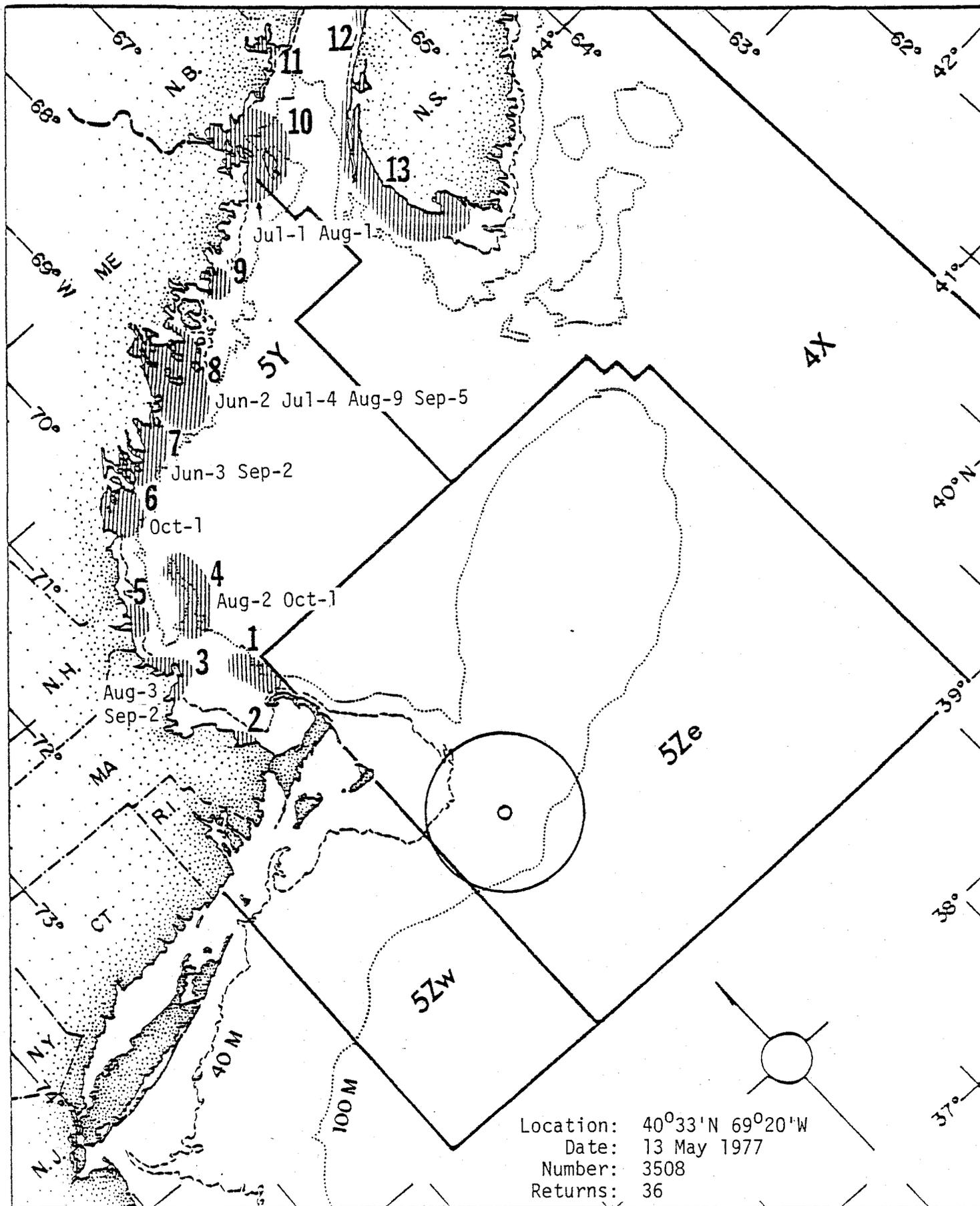


Figure 4. Distribution of recaptured herring tagged in the Great South Channel and recovered as of 31 December 1977. Number of recaptures, by area, are indicated after each month. Large circle indicates radius of 50 km from tagging site.

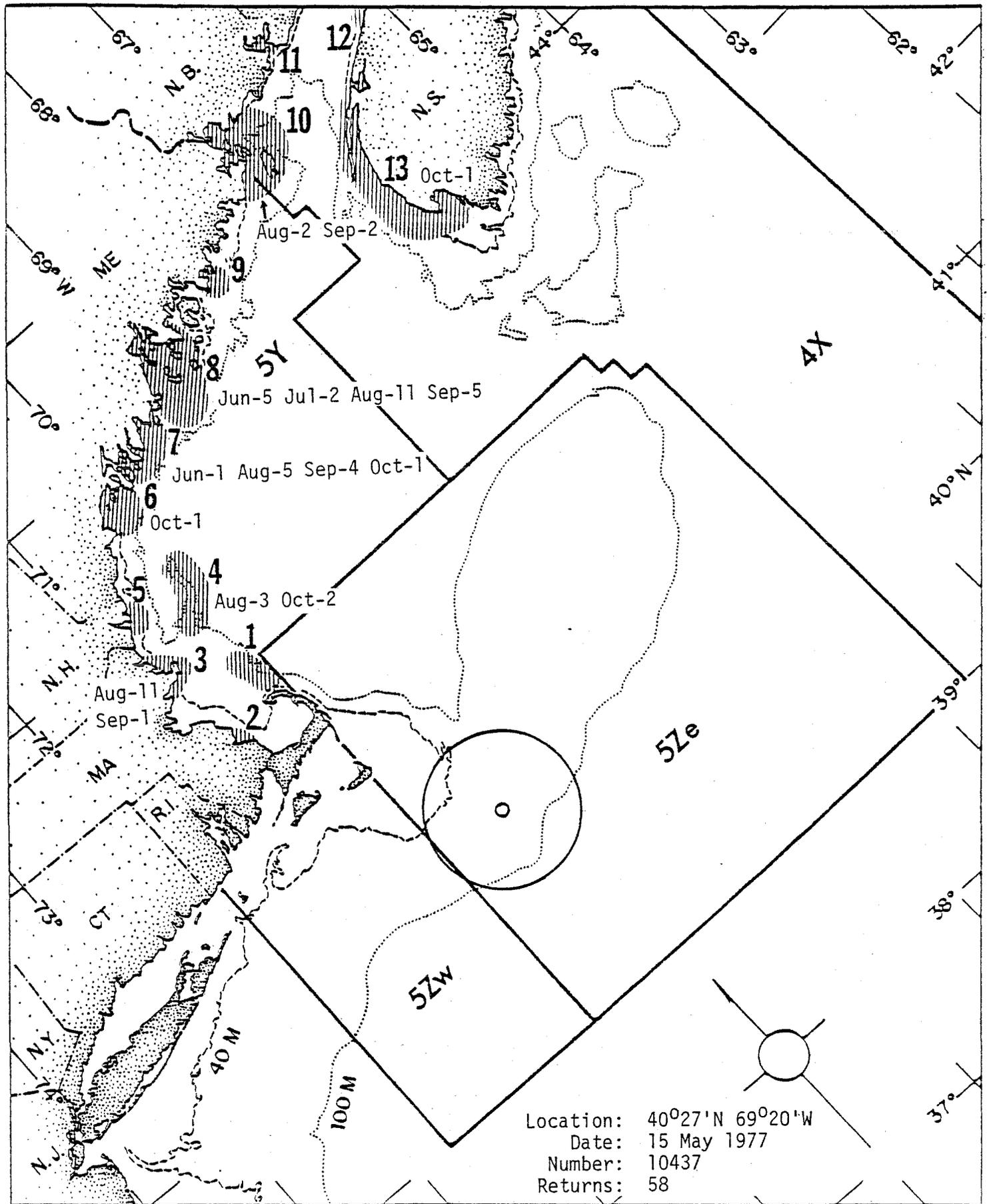


Figure 5. Distribution of recaptured herring tagged in the Great South Channel and recovered as of 31 December 1977. Number of recaptures, by area, are indicated after each month. Large circle indicates radius of 50 km from tagging site.

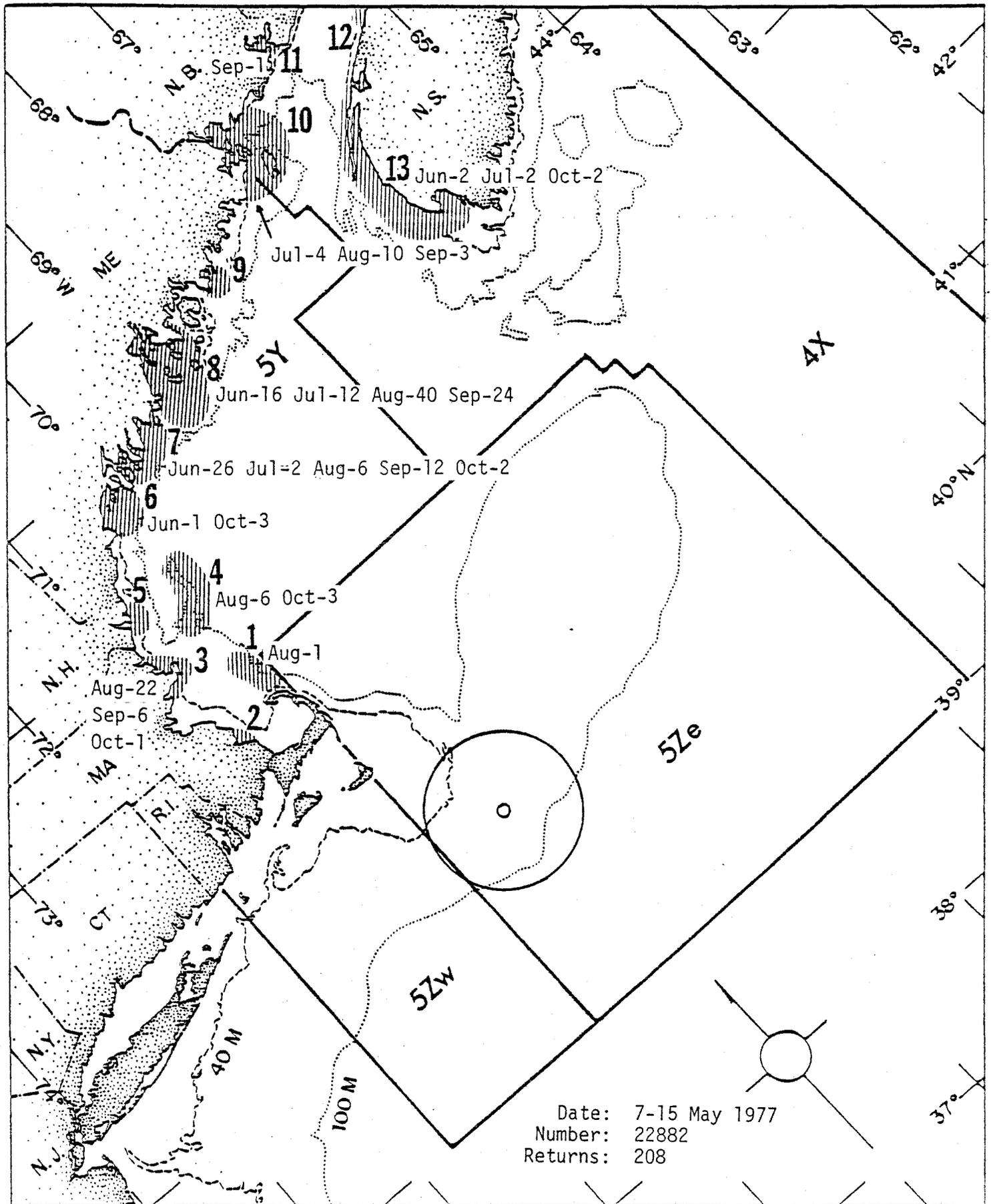


Figure 6. Distribution of recaptured herring tagged in the Great South Channel and recovered as of 31 December 1977 using cumulative totals of fish tagged 7-15 May 1977. Number of recaptures, by area, are indicated after each month. Large circle indicates radius of 50 km from tagging site.

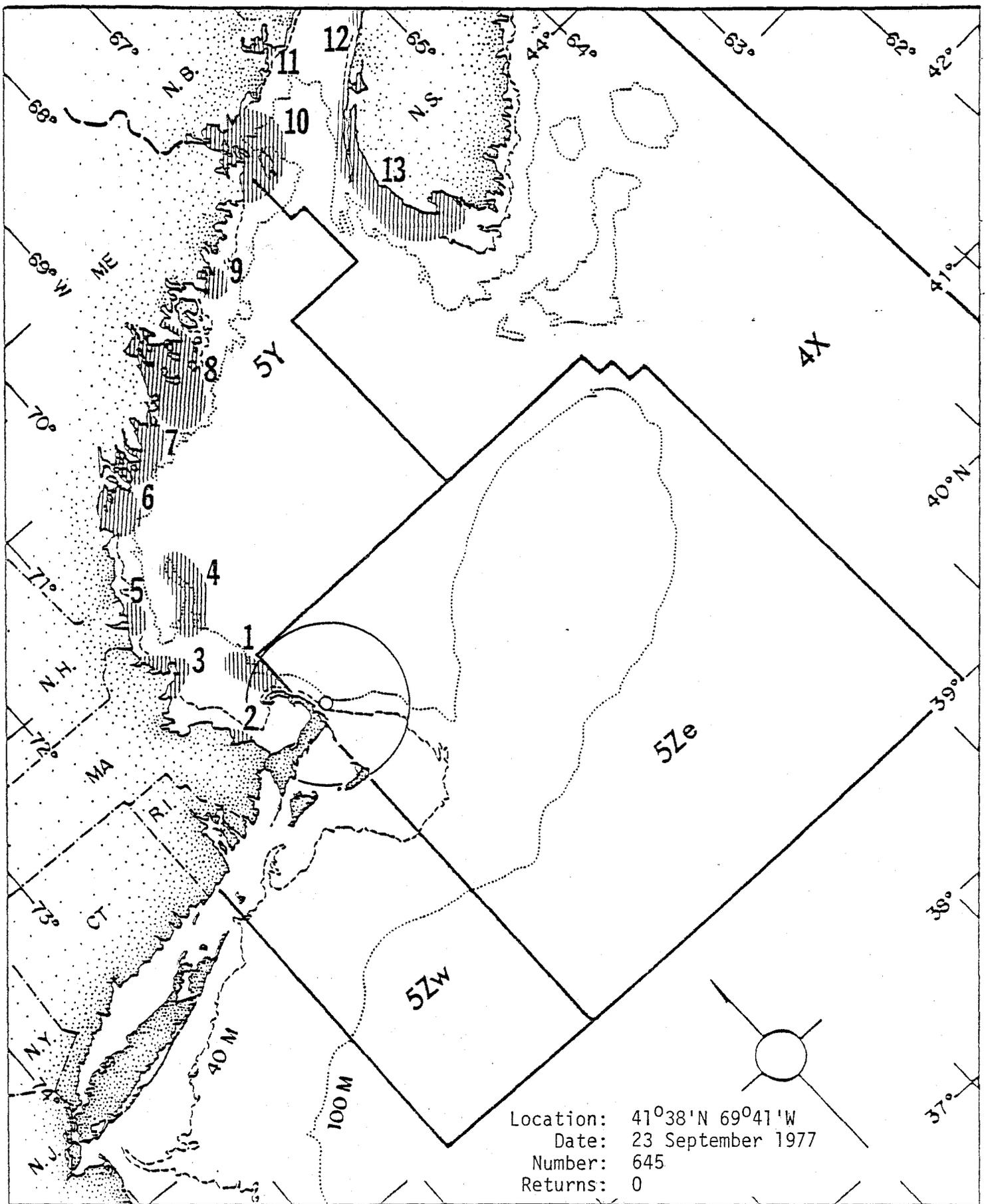


Figure 7: No recaptured herring have been reported, from those tagged 23 September 1977, 12 miles east of Chatham, Massachusetts. Large circle indicates radius of 50 km from the tagging site.

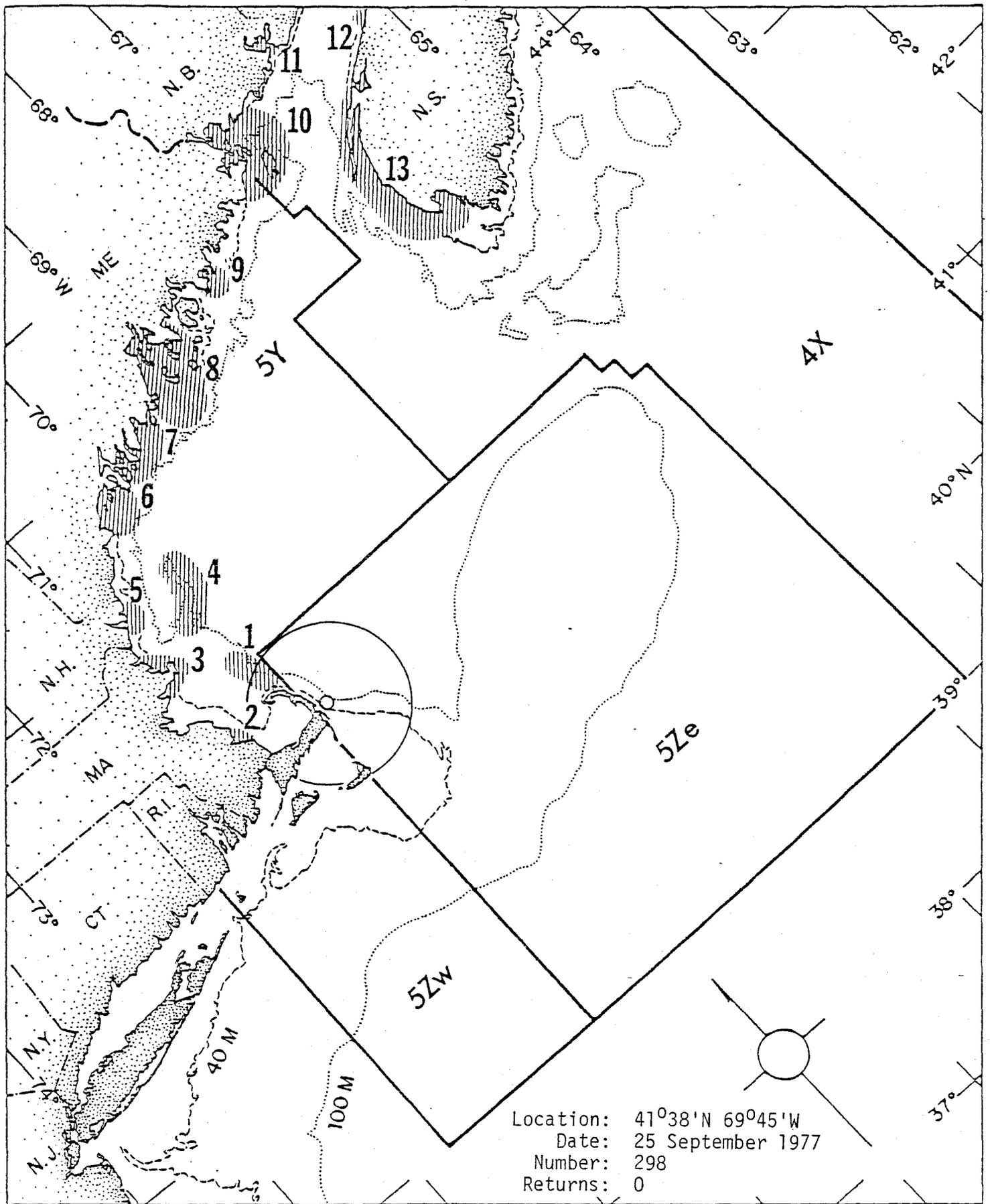


Figure 8. No recaptured herring have been reported, from those tagged 25 September 1977, 12 miles east of Chatham, Massachusetts. Large circle indicates radius of 50 km from the tagging site.

Table 1. Herring tag returns, released 1 May 1977 during the International Herring Tagging Program and recaptured to 31 December 1977.

A. Release Data.

Date	Latitude	Longitude	Area	ICNAF Div.	Vessel	Participating countries	Number tagged
05/01/77	42°41'N	70°29'W	Jeffreys Ledge	5Y	USSR R/V NOGLIKI	USA Canada USSR	10,973

B. Recapture Data.

Area	Date	Number	Area	Date	Number
Plymouth Harbor, MA	12/01/77	1	Long Cove, New Harbor, ME	10/03/77	1
Cape Ann, MA	09/08/77	2	Pumpkin Is., ME	09/01/77	4
	09/18/77	1		09/12/77	4
	09/19/77	2		09/13/77	3
	10/11/77	2			
Ipswich Bay, MA	08/18/77	2	Pumpkin Ledges	09/01/77	3
	08/20/77	1			
	08/31/77	2	Monhegan Is., ME	06/08/77	4
Jeffreys Ledge	08/17/77	1		06/09/77	5
	08/27/77	1		06/11/77	1
	08/28/77	1		06/16/77	1
	08/31/77	1		06/19/77	4
	09/08/77	2		06/20/77	2
	10/06/77	1		06/21/77	4
	10/07/77	1		06/22/77	3
	10/08/77	1		06/28/77	6
Boon Is., ME	05/17/77	1		08/17/77	1
				08/20/77	1
Chebeague Is., ME	10/19/77	1	Rockland, ME	07/07/77	1
				07/12/77	1
Orrs Is., ME	06/10/77	1		07/13/77	1
	10/22/77	1	Metinic Is., ME	09/14/77	1
Indiantown Is., ME	09/26/77	1		09/16/77	3
				10/30/77	1
Mill Cove, Boothbay Harbor, ME	06/17/77	2		10/31/77	1

Area	Date	Number	Area	Date	Number		
Matinicus Is., ME	07/03-06/77	1	Seal-Matinicus area, ME	06/21/77	1		
	07/06/77	1		06/22/77	1		
	07/12/77	1		06/24/77	4		
	08/09/77	3		06/27/77	2		
	08/11/77	2		06/28/77	4		
	08/12/77	2		07/11/77	4		
	08/18/77	1		08/09/77	2		
	09/07/77	2		09/01/77	1		
	09/12/77	4		09/07/77	1		
	09/15/77	1		09/08/77	1		
	09/16/77	3		3-Fathom Ledge	07/11/77	1	
	09/20/77	1			07/20/77	1	
	10/28/77	1			07/27/77	1	
	Seal Is., ME	05/27/77			2	08/03/77	5
		05/28/77			1	08/04/77	1
		05/29/77			1	08/08/77	3
06/20/77		1	08/10/77		5		
06/22/77		2	08/11/77		1		
07/22/77		4	08/15/77		5		
07/28/77		8	Criehaven, ME		08/16/77	2	
07/29/77		1		08/19/77	2		
08/01/77		1	Milbridge Bay, ME	07/11/77	1		
08/02/77		1		07/13/77	1		
08/03/77		4		Machias Bay, ME	07/20/77	3	
08/04/77		3	07/22/77		1		
08/05/77		1	Perry, ME	08/12/77	1		
08/08/77		6		Sand Cove, Trescott, ME	08/01/77	2	
08/09/77		1	08/05/77		2		
08/10/77		1	08/09/77		1		
08/11/77	2	09/06/77	1				
08/12/77	3	Cutler, ME	09/01/77		3		
08/19/77	1		09/07/77	1			
08/24/77	2	Boot Cove, ME	09/16/77	4			
08/25/77	1						
08/28/77	1						
08/31/77	5						
09/07/77	1						
09/08/77	1						
09/09/77	4						
09/12/77	4						
09/13/77	1						
09/23/77	1						

Area	Date	Number	Area	Date	Number	
Grand Manan, N.B.	06/24/77	1	Patt's Cove, Grand Manan, N.B.	08/02/77	2	
	07/05/77	2		Campobello, N.B.	06/28/77	1
	07/15/77	2	06/30/77		2	
	07/17/77	1	07/10/77		1	
	07/18/77	2	08/01/77		4	
	07/19/77	2	08/10/77		1	
	07/21/77	1	09/13/77		5	
	07/22/77	2	09/16/77		3	
	07/25/77	5	09/23/77		1	
	07/28/77	2	09/24/77		1	
	07/29/77	1	10/04/77		1	
	08/01/77	1	East Side, Campobello, N.B.		06/30/77	1
	08/03/77	7			07/01/77	2
	08/04/77	1			07/05/77	1
	08/05/77	1			07/06/77	3
	08/06/77	1		07/24/77	1	
	08/08/77	5		08/03/77	1	
	08/09/77	3		08/04/77	2	
	08/10/77	3		08/08/77	3	
	08/11/77	1		08/10/77	3	
	08/15/77	5		08/17/77	2	
	08/16/77	7		08/19/77	1	
	08/17/77	1		09/09/77	1	
	08/18/77	4		09/12/77	1	
	08/19/77	4		09/20/77	1	
	08/21/77	1		09/29/77	1	
	08/22/77	1		10/04/77	1	
	08/24/77	1		Deer Is., N.B.	07/13/77	1
	08/28/77	1	07/18/77		1	
	08/29/77	2	07/19/77		2	
	08/30/77	2	07/20/77		2	
08/31/77	3	07/21/77	1			
09/02/77	2	08/10/77	1			
09/04/77	1	10/18/77	1			
09/06/77	3	10/26/77	1			
09/07/77	1	Bliss Is., N.B.	08/04/77		1	
09/08/77	2		08/15/77		1	
09/09/77	4		08/16/77	4		
09/12/77	1		08/17/77	1		
10/01/77	1		08/18/77	2		
10/11/77	1		08/22/77	1		
Castalia Banks, Grand Manan, N.B.	08/12/77	1	West Isles, N.B.	08/10/77	1	
	08/17/77	1				
North Head, Grand Manan, N.B.	06/23/77	2				
	07/12/77	1				
	07/13/77	1				
	07/18/77	3				

Area	Date	Number	Area	Date	Number
Eagle Is., N.B.	08/15/77	2	Unknown	07/11/77	1
	09/17/77	1		07/20/77	1
Wolves Is., N.B.	09/17/77	1		07/26/77	1
				08/10/77	1
Fry's Is., N.B.	08/15/77	1			
Pocologan, N.B.	08/11/77	2			
	08/15/77	1			
St. Andrews Bay (Mascarene Shore), N.B.	08/30/77	2			
Parkers Cove, N.S.	07/16/77	1			
Digby, N.S.	07/12/77	1			
Long Is., N.S.	06/28/77	2			
	06/29/77	1			
St. Mary's Bay, N.S.	06/04/77	1			
	06/08/77	1			
	06/28/77	1			
	06/30/77	2			
	07/06/77	1			
	08/16/77	1			
Cape St. Mary, N.S.	06/15/77	1			
	06/20/77	1			
Colloden, N.S.	06/25/77	1			
Sandy Cove, N.S.	08/09/77	2			
Trinity Ledge-Lurcher Shoals	08/10/77	1			
	08/15/77	1			
	08/18/77	1			
	09/06/77	1			
	09/09/77	3			
Tusket Is., N.S.	09/16/77	1			
Southwest Nova Scotia	06/22/77	1			
	07/20/77	1			
	07/21/77	1			
	08/05/77	1			
	08/18/77	2			
	08/22/77	1			
	08/26/77	2			
	08/31/77	3			
	09/25/77	1			
	10/14/77	1			

Table 2. Herring tag returns, released 7 May 1977 during the International Herring Tagging Program and recaptured to 31 December 1977.

A. Release Data.

Date	Latitude	Longitude	Area	ICNAF Div.	Vessel	Participating countries	Number tagged
05/07/77	40°31'N	69°12'W	Great South Channel	5Ze	USSR R/V NOGLIKI	USA Canada USSR	6,430

B. Recapture Data.

Area	Date	Number	Area	Date	Number
Stellwagen Bank	08/15/77	1	Monhegan Is., ME	06/05/77	1
				06/07/77	1
Cape Ann, MA	09/08/77	1		06/08/77	2
	09/29/77	1		06/09/77	4
	10/12/77	1		06/11/77	4
				06/19/77	1
Ipswich Bay, MA	08/15/77	1		06/20/77	2
	08/20/77	2		06/21/77	2
	08/31/77	2		06/22/77	1
				08/02/77	1
Jeffreys Ledge	08/31/77	1	Spruce Head, ME	07/20/77	1
Bailey Is., ME	10/20/77	1	Metinic Is., ME	09/22/77	1
Water Cove, Harpwell, ME	06/10/77	1	Matinicus Is., ME	07/18/77	1
				08/02/77	1
Townsend Gut, ME	09/07/77	1		08/09/77	2
				08/10/77	1
Indiantown Is., ME	09/27/77	1		08/12/77	1
				09/12/77	2
Loves Cove, Boothbay Harbor, ME	10/18/77	1		09/13/77	1
				09/16/77	1
				09/23/77	1
Christmas Cove, Boothbay Harbor, ME	06/23/77	1			
	09/26/77	1			
Pumpkin Ledges	09/01/77	1			

Area	Date	Number	Area	Date	Number
Seal Is., ME	06/28/77	1			
	06/29/77	1			
	08/01/77	1			
	08/12/77	2			
	08/19/77	2			
	08/28/77	1			
	08/29/77	1			
	08/30/77	1			
	08/31/77	2			
	09/08/77	2			
	09/09/77	1			
	09/14/77	1			
	09/23/77	1			
Seal-Matinicus area, ME	06/28/77	3			
Vinalhaven, ME	07/19/77	1			
	07/27/77	1			
Isle au Haut, ME	06/22/77	1			
	06/24/77	1			
Grand Manan, N.B.	08/03/77	1			
	08/10/77	1			
	08/18/77	1			
	08/24/77	1			
East Side, Campobello Is., N.B.	07/05/77	1			
	07/14/77	1			
	07/25/77	1			
	08/04/77	1			
Wilson's Beach, Campobello, N.B.	09/30/77	1			
Bliss Is., N.B.	08/18/77	1			
Pocologan, N.B.	08/15/77	1			
St. Johns, N.B.	09/14/77	1			
Long Is., N.S.	10/04/77	1			
Cape St. Mary, N.S.	06/30/77	1			
St. Mary's Bay, N.S.	07/20/77	1			
Yarmouth, N.S.	07/30/77	1			
Trinity Ledge	06/10/77	1			

Table 3. Herring tag returns, released 11 May 1977 during the International Herring Tagging Program and recaptured to 31 December 1977.

A. Release Data.

Date	Latitude	Longitude	Area	ICNAF Div.	Vessel	Participating countries	Number tagged
05/11/77	40 ⁰ 28'N	69 ⁰ 09'W	Great South Channel	5Ze	USSR R/V NOGLIKI	USA Canada USSR	2,507

B. Recapture Data.

Area	Date	Number	Area	Date	Number
Cape Ann, MA	09/18/77	1	Rockland, ME	07/12/77	1
Marblehead Neck, MA	08/14/77	1	Graffam Is., ME	09/14/77	1
Ipswich Bay, MA	08/15/77	1	Metinic Is., ME	09/16/77	1
	08/31/77	1	Matinicus Is., ME	07/06/77	1
Townsend Gut, ME	09/07/77	2		08/02/77	1
Sawyers Is., ME	07/06/77	1		08/09/77	4
				09/13/77	1
John's Bay, ME	07/03/77	1	Seal-Matinicus area, ME	06/28/77	2
Monhegan Is., Me	06/09/77	1			
	06/21/77	1			
	06/22/77	1			

Table 4. Herring tag returns, released 13 May 1977 during the International Herring Tagging Program and recaptured to 31 December 1977.

A. Release Data.

Date	Latitude	Longitude	Area	ICNAF Div.	Vessel	Participating countries	Number tagged
05/13/77	40°33'N	69°20'W	Great South Channel	5Ze	USSR R/V NOGLIKI	USA Canada USSR	3,508

B. Recapture Data.

Area	Date	Number	Area	Date	Number
Cape Ann, MA	09/19/77	1	Seal Is., ME	08/30/77	1
	09/29/77	1		08/31/77	2
				09/19/77	1
Ipswich Bay, MA	08/15/77	2	Seal-Matinicus area, ME	06/21/77	1
	08/18/77	1		06/28/77	1
Jeffreys Ledge	08/30/77	1			09/01/77
	08/31/77	1	3-Fathom Ledge	08/03/77	1
	10/06/77	1			
Harpswell, ME	10/11/77	1	Criehaven, ME	08/16/77	1
Townsend Gut, ME	09/07/77	1	Vinalhaven, ME	07/11/77	1
Sheepscot River, ME	06/23/77	1		07/13/77	1
	09/06/77	1		08/25/77	
Monhegan Is., ME	06/11/77	1	Isle au Haut, ME	07/22/77	1
	06/15/77	1	North Head, Grand Manan, N.B.	07/18/77	1
Metinic Is., ME	09/14/77	1			08/10/77
Matinicus Is., ME	07/27/77	1			
	08/08/77	1			
	08/09/77	1			
	08/10/77	1			
	09/14/77	1			
	09/28/77	1			

Table 5. Herring tag returns, released 15 May 1977 during the International Herring Tagging Program and recaptured to 31 December 1977.

A. Release Data.

Date	Latitude	Longitude	Area	ICNAF Div.	Vessel	Participating countries	Number tagged
05/15/77	40°27'N	69°20'W	Great South Channel	5Ze	USSR R/V NOGLIKI	USA Canada USSR	10,437

B. Recapture Data.

Area	Date	Number	Area	Date	Number
Cape Ann, MA	09/28/77	1	Matinicus Is., ME	08/02/77	1
				08/09/77	1
Ipswich Bay, MA	08/15/77	6		08/22/77	1
				08/20/77	4
				08/31/77	1
Jeffreys Ledge	08/26/77	2	Seal Is., ME	07/28/77	2
				08/31/77	1
				10/06/77	2
Casco Bay, ME	10/17/77	1		08/24/77	2
				08/25/77	1
Boothbay Harbor, ME	09/26/77	1		08/31/77	2
				09/07/77	1
Cedarbush Is., Sheepscot River, ME	10/25/77	1	Seal-Matinicus area, ME	06/27/77	3
				06/28/77	1
				06/29/77	1
Pumpkin Is., ME	09/01/77	1	3-Fathom Ledge	09/01/77	1
				09/12/77	1
				09/13/77	1
Pumpkin Ledges	08/25/77	1	Grand Manan, N.B.	08/04/77	1
				08/27/77	2
				08/31/77	1
Monhegan Is., ME	06/28/77	1	Campobello, N.B.	08/03/77	1
				08/16/77	1
Metinic Is., ME	09/20/77	1	Long Is., N.S.	09/30/77	1
				10/04/77	1
			Unknown	11/08/77	1