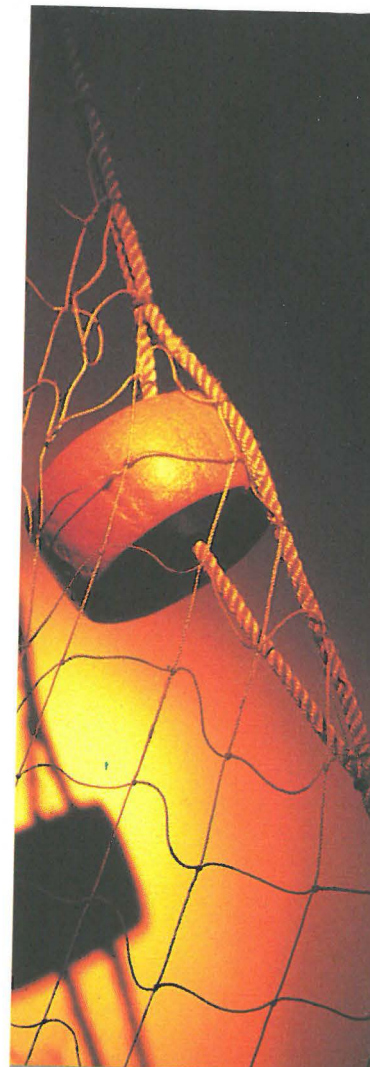


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Biblioteket*

REPORT
OF THE PLANNING GROUP FOR SURVEYS
OF THE NORWEGIAN SPRING SPAWNING HERRING AND
THE ENVIRONMENT OF THE NORWEGIAN SEA AND ADJACENT WATERS
DURING THE SPRING AND SUMMER OF 1996

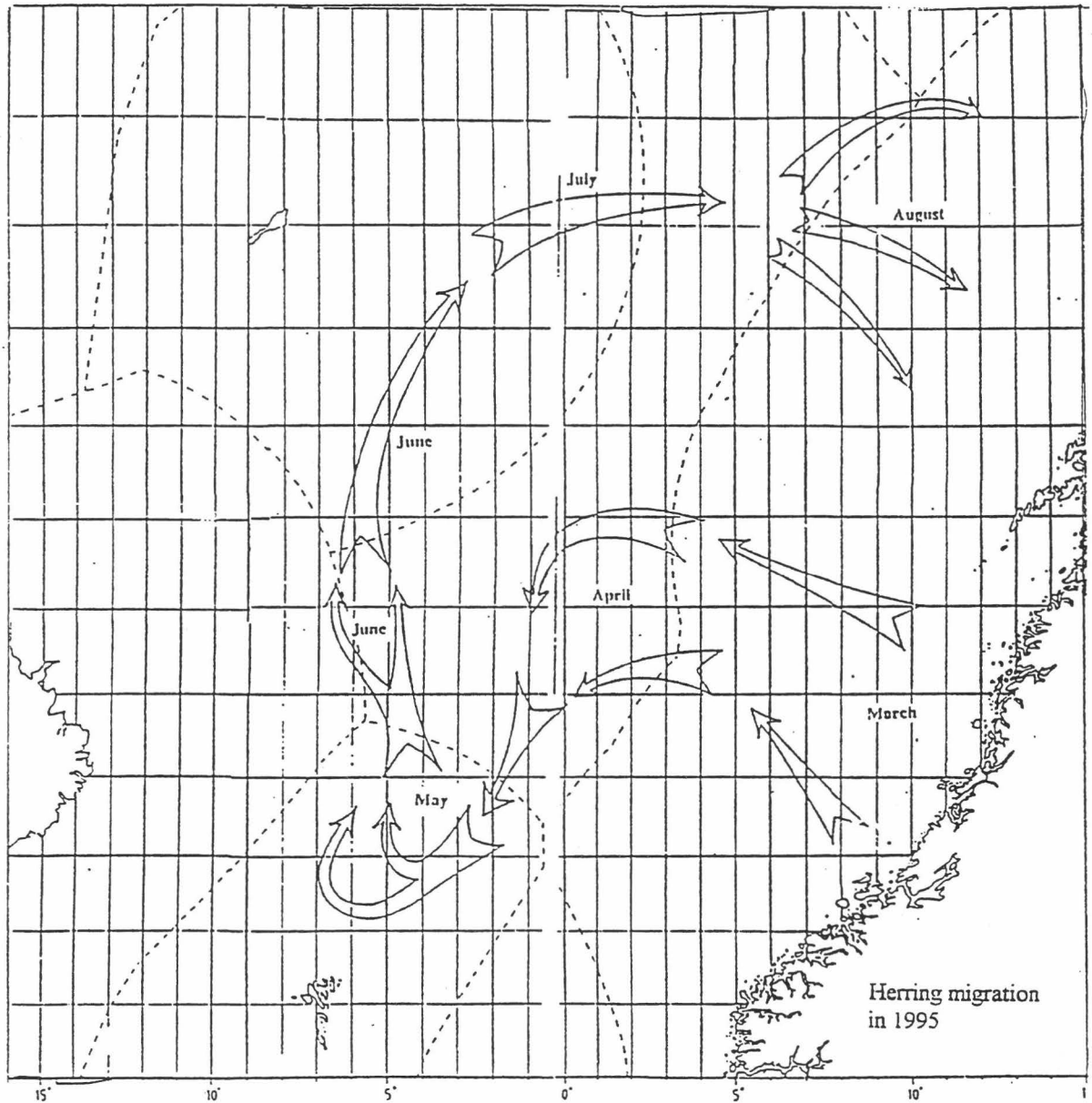
TORSHAVN 13-14 FEBR. 1996



HAVFORSKNINGSINSTITUTTET
INSTITUTE OF MARINE RESEARCH



Report of the planning group for surveys of the Norwegian spring spawning herring and the environment of the Norwegian Sea and adjacent waters during the spring and summer of 1996



Tórshavn 13-14 February 1996

Report of the planning group for surveys of the Norwegian spring spawning herring and the environment of the Norwegian Sea and adjacent waters during the spring and summer of 1996.

Meeting held in Tórshavn 13-14 February 1996

INTRODUCTION

In spring and summer of 1995, several surveys were conducted by research vessels from the Faroes, Iceland, Norway and Russia. These surveys were coordinated according to a procedure outlined by a planning group, which met in Bergen, Norway during 2-3 March 1995 (Anon. 1995a).

During 11-13 September 1995, a working group of scientists from all of these countries met in Reykjavik for contemplating the findings of the various surveys and to compile a joint research report (Anon. 1995b). In general, it was felt that the cooperative study of herring migrations and the environmental conditions of the Norwegian Sea and adjacent waters in spring and summer 1995 were successful.

At the Reykjavik meeting it was agreed that the multinational coordinated surveys of the Norwegian spring spawning herring should be continued. The biomass of the adult part of this potentially largest herring stock of the world has increased in the last few years. A further increase in stock abundance is expected in the coming years, mainly due to the recruitment of the year classes of 1991 and 1992. Therefore, an increased and coordinated research effort is vital for the effective monitoring of stock migrations, composition and abundance.

The Reykjavik meeting stressed the necessity for each participating institute to allocate vessel time as soon as possible and circulate information on such decisions to the other parties when they had been taken. Furthermore, it was agreed that, apart from monitoring stock movements and environmental conditions in the period March-August, the main aim should be to obtain an estimate of biomass. Given adequate vessel time, this should be possible either by applying the echo sounder/integration technique in May, or by sonar counting of schools in June-July, or by using both of these methods. NB!

The necessity of better coordination, in particular with regard to the presentation of survey results, was pointed out by all participants of the Reykjavik meeting. The general consensus was that most survey data should be computerized and recorded in tabular form. The results could then be assembled quickly and efficiently in a common data base, thus facilitating a more efficient compilation and comparison of survey data.

For these purposes, the Reykjavik meeting established a planning group (Appendix 1) and decided that the group should meet in Tórshavn during 13-15 February 1996.

INTER-SHIP COMMUNICATION

The group agreed that it was not advisable to develop procedures for the exchange of detailed data on echo abundance, biological samples and hydrography between survey vessels in operation in the Norwegian Sea in summer 1996. However, the group agreed that it is of vital importance that the survey vessels working in the Norwegian Sea at the same time establish contact by telex or radio. The respective cruises where such contact should be established are identified in Table 1. As for the 1995 cruises in the Norwegian Sea, the radio contacts between the vessels should be established at 2182 kHz at 0900 or 2100 UTC.

The information to be exchanged between the survey vessels should be fairly concentrated. The topics to be focused on are the area covered by own survey vessel, recordings of herring and other important pelagic fish, hydrographic conditions, and observations or information on the activity of fishing vessels.

CRUISE REPORT

From all cruises in the Norwegian Sea, identified in Table 1, a cruise report should be prepared. This report should be prepared during the respective surveys, and normally be finished at the end of the cruise. In each case, the cruise leader is responsible for preparing the cruise report. The scientists responsible for the herring investigations in the respective countries should then have the further responsibility for the cruise report. Within one week after the end of the cruises identified in Table 1, the cruise report should be mailed to the responsible scientists at the respective institutes participating in this planning group, i.e. the Faroes, Iceland, Norway and Russia. The responsible scientists at these institutes are:

Hjalti i Jákupsstovu	Fiskirannsóknarstofan, P.O.Box 3051 FR-110 Torshavn, Faroe Island
Hjalmar Vilhjalmsón	Marine Research Institute Skulagata 4, P.O.Box 1390 Rekjavik, Iceland
Sergei Belikov	PINRO 6 Knipovich Street 183763 Murmansk Russia
Ingolf Røttingen	Institute of Marine Research P.O. Box 1870 5024 Bergen, Norway

The cruise report should give a brief overview of the area investigated, the recordings obtained, and the sampling conducted. However, the cruise report should also contain a minimum of standard information as given in the Cruise Report Table (Appendix 2).

DATABASE

With the intention of standardizing the information collected during the surveys by the respective countries, Hjalti i Jákupsstovu proposed to establish a **common data base for the Norwegian Sea surveys**. The data base should contain the most vital information regarding sampling activity, acoustic recordings, biological samples of fish, hydrography, and plankton. The information should be recorded in a standard format that makes the data accessible to all of the participating institutes. An important motivation for establishing such a database is that maps of fish distribution, plankton abundance and the hydrographic regime could easily and quickly be prepared during annual evaluation meetings. During the evaluation meeting in Reykjavik in 1995 it was found that compiling the information on fish distribution and hydrography from standard maps and tables from several cruises of the different participants was rather labourous. Another motivation for a common database on a standard format is that this will increase the amount of available data on the Norwegian Sea ecosystem substantially. This will enable future special studies on the dynamics and interactions within this ecosystem that can be based on more complete information obtained by a more extensive and complete surveying of the Norwegian Sea in space and time.

DATABASE WORKSHEETS

The planning group agreed to develop standards for EXCEL worksheets that should contain the most vital information gathered during the respective cruises in the Norwegian Sea in 1996. The worksheets are based on the original suggestions by Hjalti i Jákupsstovu. The planning group developed standards for a **Logbook** worksheet, an **Acoustic** worksheet, a **Length Distribution** worksheet, a **Temperature** worksheet, and a **Plankton** worksheet. The standards of these worksheets are given in the Appendix 3.

The respective worksheets should be prepared during surveys of the Norwegian Sea and adjacent waters in 1996. After each cruise, the worksheets should be copied on diskettes and sent along with the cruise report to the participating institutes in the respective countries. A list of content should be taped to each diskette.

The leaders of the respective cruises should have the responsibility to prepare the worksheets and copy them on diskettes, and the responsible scientist should have the responsibility mailing the diskettes to the other responsible scientists in the other participating institutes in the respective countries.

USE OF SONAR FOR MAPPING DISTRIBUTION OF SCHOOLS

In summer, the main part of the herring is feeding in the near surface layer of the Norwegian Sea, often in the upper blind zone of the echo sonar. A traditional echo integrator survey will thus underestimate the stock, both in biomass and distribution surveys. However, sonar recordings seem to have the potential to give a correct picture of the relative distribution of Norwegian spring spawning herring during the summer period (Misund et al., 1995).

As in 1995, the planning group recommend that sonar is used regularly to count schools during the surveys in the Norwegian Sea in 1996. The working procedure is slightly modified from the 1995-procedure, and is as follows:

- 1) *The sonar is set in a fixed position at 90° to the ships course*
- 2) *All schools along a 5 nautical mile distance and within a range of 50 - 300 m from the vessel should be counted. The recordings should be filled in the SCHOOLS-column of the ACOUSTIC worksheet (Appendix 1).*
- 3) *As a basic rule, a tilt angle of one half of the vertical beam width should be applied.*

The planning group recommend that the results from the intership sonar calibration in June 1995 in the Norwegian Sea are properly analysed. This will be done by O.A.Misund at IMR, Norway, and reported to the ICES Statutory Meeting in Reykjavik in September 1996.

SURVEYS

The following surveys have been planned for 1996.

Table 1. List of planned surveys in the Norwegian Sea and adjacent waters in 1996, including names of cruiseleaders and inter-ship contact (see text for further explanation).

Country	Vessel	Period	Cruise leader	Contact
N1	"Michael Sars"	15.02 - 30.03	Dommasnes	R1
R1	"Professor Martv"	10.02 - 25.03	Dolgoienko	N1
N2	"G.O. Sars"	21.03 - 02.04	Melle	None
N3	"G.O. Sars"	03.04 - 18.04	Misund	None
N4	"G.O. Sars"	29.04 - 28.05	Misund	F1,I1,R2
F1	"Magnus Heinason"	01.05 - 28.05	Jákupsstovu	N4,I1,R2
I1	"Arni Fridriksson"	02.05 - 23.05	Vilhjalmsson	F1,N4,R2
I2	"Biarni Sæmundsson"	18.05 - 06.06	Malmberg	I1
R2	"Fridtjof Nansen"	25.05 - 28.07	Kryzov	N4,F1,I1,I3,N5
I3	"Arni Fridriksson"	28.05 - 14.06	Vilhjalmsson	R1,F1,F2
N5	"G.O. Sars"	19.07 - 15.08	Monstad	None R2
N6	"Johan Hjort"	09.07 - 19.07	Hassel	None
N7	"Johan Hjort"	20.07 - 05.08	Rev	None

13 total
10.02-05.0

The main objectives and areas to be covered during the above surveys (Table 1) are listed below.

- N1. Mainly to survey the spawning area. No plans to follow the postspawning migration (Figure 1).
- R1. The survey area of R/V Professor Marty in the period 10.02 - 25.03 is shown in Figure 2. The main objective is herring investigations on the banks of the west and north coasts of Norway between 62°N and 71°N.
- N2. The survey will cover the spawning grounds off Lofoten and the edge of the continental shelf of western Norway (Figure 3).
- N3. Surveying the herring migration area, and a continuation of the Mare cognitum investigations conducted during the previous cruise (N2; Figure 4).
- N4. The main objective will be to investigate the eastern part of the Norwegian Sea, i.e. the NEZ, where concentrations of young herring will be surveyed. Sections will be worked from the Norwegian zone into the international, the Icelandic and the Faroes economical zones (Figure 5).
- F1. The Faroese survey is a combined blue whiting and herring survey mainly confined to the Faroese EEZ. R/V "Magnus Heinason" starts in the area southeast of the isles and works in this area during the first week of May. From 8-28 May the area north of the Faroes will be investigated (Figure 6). The expectation is that if the herring follows the same migration pattern as in 1995 the movements of the herring in the Faroese area should be observed during this survey.
- I1. The main objective is to locate and map herring migrations, assess stock composition and abundance as well as to measure hydrographic conditions and zooplankton abundance. The survey will begin with a section running east along 65°N to the 0° meridian and continue in the general area as shown in Figure 7.
- I2. The survey is part of the Icelandic programme for the quarterly monitoring of hydrobiological conditions of Icelandic and adjacent waters. It will reach the eastern boundary of the East Icelandic Current east and northeast of Iceland (Figure 8). Acoustic records of pelagic fish will be kept and samples taken.
- R2. The main objective of this survey is to record hydrobiological conditions and the distribution of / herring and blue whiting in the southern and central part of the Norwegian Sea (Figure 9). The survey will begin in the southern part of the area on about 2 June and continue north from there to finish in the area east of Jan Mayen near the end of July.
- I3. The main objective is to locate and map the progress of herring migrations, assess stock composition and abundance if possible, as well as to measure hydrographic conditions and zooplankton abundance. The survey will be conducted in the general area shown in Figure 10.
- N5. Main object of this survey of the eastern part of the Norwegian Sea (NEZ and international waters) is the recording of herring concentrations, collection of assessment parameters and Mare cognitum investigations. The area can eventually be extended farther to the west into the Icelandic and Jan Mayen zones (Figure 11).
- N6. Main objectives are the hydrographic sections, Svinøy-NW with extension into international zone and from Helgeland to Jan Mayen, and plankton sampling for the Mare cognitum project. Also the recording of herring schools (Figure 12).
- N.7. The survey is mainly based on hydrographic sections with collection of sediments (CARDEEP) and on Mare cognitum investigations. Also to record herring schools on these routes and, eventually, to survey the hatched area (Figure 12).

FUTURE MEETINGS

The participants of the Tórshavn meeting unanimously agreed that a meeting for evaluating the results of surveys of the Norwegian Sea and adjacent waters, conducted by the research institutes of the Faroes, Iceland, Norway and Russia, should be held in Reykjavik in September 1996, preferable just before the ICES Annual Science Conference.

ICES COORDINATION

The Planning Group agreed that ICES should be asked to take the responsibility for coordinating the surveys of the Norwegian spring spawning herring and the environment of the Norwegian Sea and adjacent waters in the future. The host of the the Planning Group should make the formal address to the General Secretary of ICES about this issue.

REFERENCES

- Anon. 1995a. Report of the planning group for surveys on Norwegian spring spawning herring and the environment in the Norwegian Sea in summer 1995. Bergen, 2-3 March 1995.
- Anon. 1995b. Report on surveys of the distribution and migrations of the Norwegian spring spawning herring and the environment of the Norwegian Sea and adjacent waters during spring and summer of 1995. Reykjavik, 11-13 September 1995.
- Misund, O. A., J. Hamre, E. Ona, I. Røttingen, D. W. Skagen and J. W. Valdemarsen 1995. Mapping of schooling fish near the surface by sonar, echo integrator and surface trawling. Paper presented at the Fisheries and Plankton Acoustics, Aberdeen 12-16 June 1995.

Addendum and errata.

The length distribution worksheet should include mean weight by length group.
For each specie a age/length key should be produced.

APPENDIX I.

Participants:

Name	Address	Telephone	Telex	e-mail
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APPENDIX 2

Cruise report content:

Name of ship	Comments
Call sign	
Cruise number	
Responsible laboratory	
Cruise leader	
Cruise period	
Echo sounder equipment	
Echo integrator equipment	
Instrument calibration date	
Sampling equipment (trawl)	
Sampling equipment (plankton)	
Type of CTD sonde	
Number of trawl stations	
Number of CTD stations	
Cruise lines and stations	On map (including EEZ) and Database
Echo integrator values (9 groups, see Appendix)	Distribution maps and worksheets
Sonar recordings	Database
Length distributions	Table and worksheets
Age distribution	Table and worksheets
Temperature	Horizontal distribution maps: Surface, 20, 50, 100, 200, 400, 500m, and worksheets
Plankton	Plankton biomass distribution map and worksheets

HEADING	DESCRIPTION
Logbook sheet:	
VESSEL	ICES-list
STATION	National st. numbers
STTYPE	Gear/activity: one line per activity at the same station
LOG	min 4 digits
DATE	YYMMDD
TIME	GMT four digits TTMM
LAT	Decimal degrees
LON	Decimal degrees, negative LON west of 0
WINDIR	Compass deg. or N,NNE,NE (give units in heading)
WINFORCE	m/s or beaufort (give units in heading)
STDEPTH	metres
TOWTIME	minutes
WIRELENGTH	metres
HERRING	Species catch list: Always start with herring (Catch in kg)
BLUE WHITING	
CAPELIN	
MACKEREL	
HMACKEREL	
SALMON	
LUMPSUCKER	
MESOPEL	

Acoustic sheet:

VESSEL	ICES-list
LOG	min 4 digits
DATE	yyymmdd
TIME	GMT four digits TTMM
LAT	Decimal degrees
LON	Decimal degrees, negative LON west of 0
SCHOOLS	No of schools counted each interval
HESUM	Species list: Always start with herring
HE1	sa value channel 1: 5 - 50 m
HE2	sa value channel 2: 50 - 100 m
HE3	sa value channel 3: 100 - 150 m
HE4	sa value channel 4: 150 - 200 m
HE5	sa value channel 5: 200 - 250 m
HE6	sa value channel 6: 250 - 300 m
HE7	sa value channel 7: 300 - 350 m
HE8	sa value channel 8: 350 - 400 m
HE9	sa value channel 9: 400 - 500 m
BWSUM	blue whiting
BW1	
BW2	
BW3	
BW4	
BW5	
BW6	
BW7	
BW8	
BW9	

Temperature sheet:

VESSEL	ICES-list
STATION	National st. numbers
LAT	Decimal degrees
LON	Decimal degrees, negative LON west of 0
SURFACE	Temperature at standard depths, starting from the surface
T20	
T50	
T100	
T200	
T400	
T500	

Plankton sheet:

VESSEL	ICES-list
STATION	National st. numbers
STTYPE	Geartype/activity: one line per activity at the same station
LAT	Decimal degrees
LON	Decimal degrees, negative LON west of 0
PLSUM	Plankton mg dry weight/m ³ (or mg wet weight/m ³) in each interval
PL 0-50	
PL 50-200	

Length sheet:

VESSEL	ICES-list
STATION	Station number
SPECIES	Species - see other worksheets
CM group	No of fish in each cm group
MEANWT	Mean weight in the sample (g)

ICES-lis	National st.	Geartype/	min 4 di	YYMMDD	GMT f	Decimal degrees		Compas	m/s or be	metres	minutes	metres	Species catch list: Always start with herring (Catch in kg)								
						LAT	LON						HERRING	BLUE WHI	CAPELI	MACKE	HMACK	SALM	LUMPS	MESOPE	
VESSE	STATION	STTYPE	LOG	DATE	TIME			WINDIR	WINFOR	STDEP	TOWTI	WIRELE									
20	95060083	CTD	56886	950613	0200	64,33	3,00	V	3												
20	95060083	WP2	56886	950613	0200	64,33	3,00	V	3												
20	95060084	CTD	56905	950613	0500	64,67	3,00	V	3												
20	95060084	WP2	56905	950613	0500	64,67	3,00	V	3												
20	95060085	CTD	56924	950613	0740	65,00	3,00	V	3												
20	95060085	WP2	56924	950613	0740	65,00	3,00	V	3												
20	95060086	PT	56936	950613	1040	65,13	3,02	V	3	61	45	90		400							
20	95060087	CTD	56954	950613	1355	65,33	3,00		0												
20	95060087	WP2	56954	950613	1355	65,33	3,00		0												
20	95060088	PT	56961	950613	1550	65,37	3,00		0	168	200	364		20							
20	95060089	CTD	56982	950613	2045	65,67	3,00	SV	7												
20	95060089	WP2	56982	950613	2045	65,67	3,00	SV	7												
					0000																
20	95060092	PT	57278	950615	1000	67,00	4,20	NV	3	44	65	73									
20	95060093	CTD	57283	950615	1140	67,00	4,38	SV	5												
20	95060093	WP2	57283	950615	1140	67,00	4,38	SV	5												
20	95060094	PT	57313	950615	1710	67,02	5,58	S	10	51	100	72									
20	95060095	CTD	57325	950615	2100	67,00	5,83	S	12												
20	95060095	WP2	57325	950615	2100	67,00	5,83	S	12												
20			57355	950615	2400	67,00	7,27	S	12												
20			57361	950616	3500	67,00	7,50	S	5												
20			57391	950616	0400	67,57	7,50	S	5												
20			57396	970616	0440	67,67	7,50	S	5												
20			57426	950616	0800	67,67	6,00	S	10												
20	95060096	PT	57460	950616	1230	67,63	4,60	S	10	250	185	545									
20	95060097	CTD	57471	950616	1605	67,65	4,58	S	10												
20	95060097	WP2	57471	950616	1605	67,65	4,58	S	10												
20			57483	950616	1800	67,67	4,00	S	10												
20			57500	950616	2000	67,47	4,58	S	12												
20	95060098	PT	57510	950616	2140	67,38	4,75	S	12	200	35	405									
20			57523	950616	0000	67,28	5,18	S	12												

CES-lis	min 4	yymmdd	GMT f	Decimal degrees,		No of s	Speces list: Always start with herring										blue whiting									
/ESSE	LOG	DATE	TIME	LAT	LON	SCHO	HESUM	HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	BWSUM	BW1	BW2	BW3	BW4	BW5	BW6	BW7	BW8	BW9
0	7230	950615	2,51	66,83	3,00		3	3																		
0	7235	950615	3,26	66,92	3,00		16	16																		
0	7240	950615	4,01	67,00	3,03	4	4	2	2								32					2	20	10		
0	7245	950615	4,37	67,00	3,27		4	1	3								32					2	10	20		
0	7250	950615	5,13	67,00	3,48												1					1				
0	7255	950615	5,48	67,00	3,72												2					2				
0	7260	950615	6,24	67,00	3,97		2	2																		
0	7265	950615	6,59	67,00	4,18		3	3																		
0	7270	950615	7,34	67,00	4,42		18	17	1																	
0	7275	950615	8,08	67,00	4,18	2	1001	1000	1																	
0	7280	950615	9,30	67,00	4,28	1	4	2	2																	
0	7285	950615	11,25	67,00	4,45		17	0	1	1			15													
0	7290	950615	12,00	67,00	4,68																					
0	7295	950615	12,34	67,00	4,92																					
0	7300	950615	13,10	67,00	5,15		1	1																		
0	7305	950615	13,46	67,00	5,38		45	45																		
0	7310	950615	14,26	67,00	5,57		63	8					10	45												
0	7315	950615	15,17	67,00	5,60		93	93																		
0	7320	950615	16,46	67,00	5,65	1	1277	1277																		
0	7325	950615	19,00	67,00	5,85		626	626																		
0	7330	950615	19,55	67,00	6,03		142	142																		
0	7335	950615	20,30	67,00	6,27	3	354	348				2	4													
0	7340	950615	21,05	67,00	6,50		581	581																		
0	7345	950615	21,40	67,00	6,73																					

ICES-list	National st.	Decimal degrees, n		Temperature at standard depths, starting from the surface						
		LAT	LON	SURFAC	T20	T50	T100	T200	T400	T500
20	95060083	66,83	3,00	3,03	2,9	2	1,1	0,05	-0,02	-0,98
20	95060084	67,00	3,03	2	1,4	1	0,3	0	-0,2	-1,1
20	95060084	67,00	3,27							
20	95060085	67,00	3,48							
20	95060086	67,00	3,97							
20	95060087	67,00	4,18							
20	95060088	67,00	4,18							
20	95060089	67,00	4,28							

VESSEL	National st.	Gear type/a	Decimal degrees, n		Plankton mg dry weight/m ³ (or mg wet weight/m ³) in each interval					
			LAT	LON	PLSUM	PL 0-50	PL 50-200			
0	95060083	WP2	66,83	3,00	70	60	10			
0	95060084	WP2	67,00	3,27	34	33	1			
0	95060085	WP2	67,00	3,72	41	35	6			
0	95060087	WP2	67,00	4,42						
0	95060089	WP2	67,00	4,45	14	10	4			

VESSEL:	20	20,00
STATION:	95060086	95060086
SPECIES:	HERRING	BLUE WHITING
21	1	
22		
23	4	4
24	5	5
25		22
26	1	32
27	5	5
28	22	
29	12	
30	45	
31	3	1
32		1
33	4	2
34	4	2
35	1	
36	2	
37	1	
SUM	110	74
MEANWT	205	187

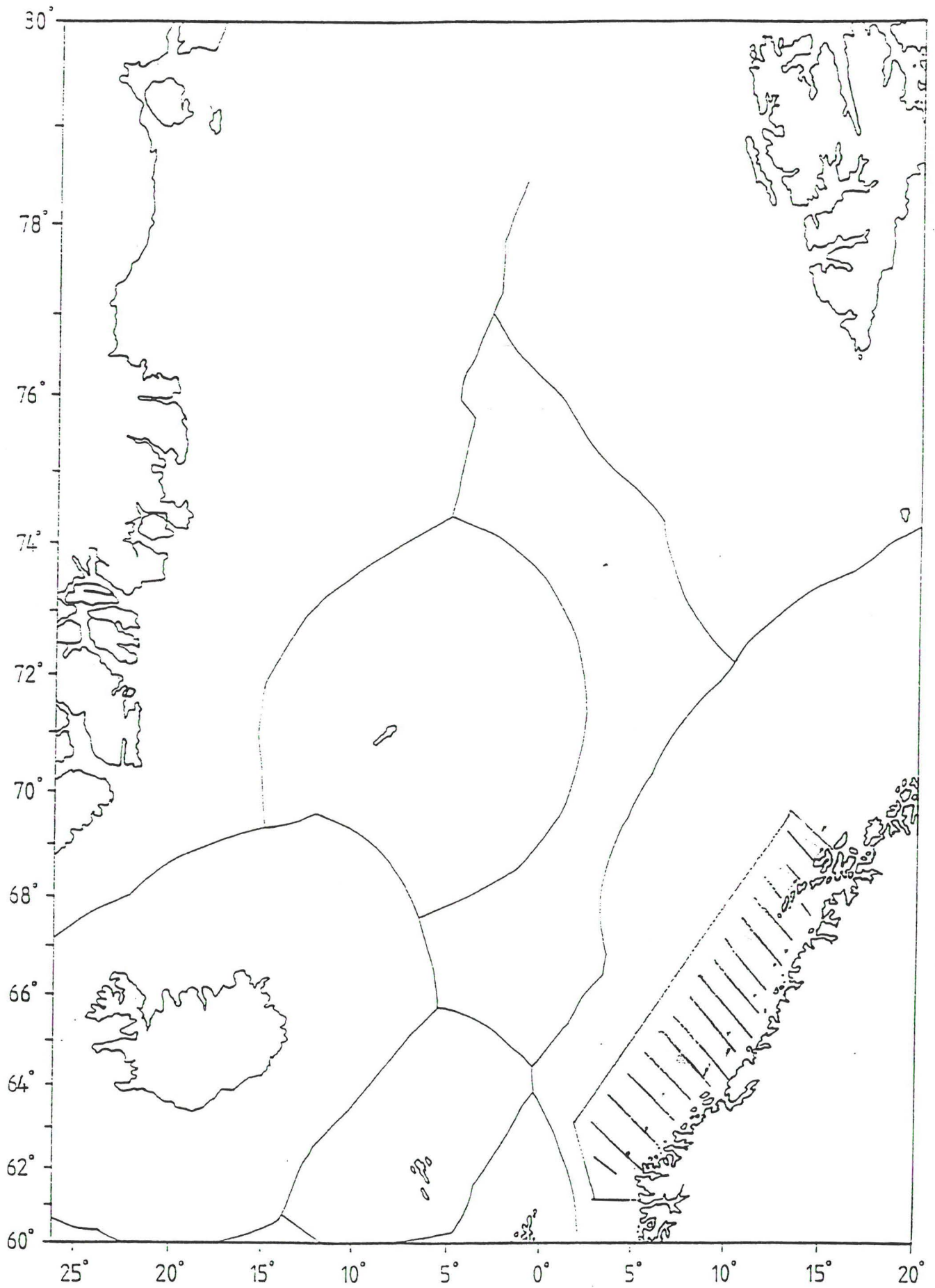
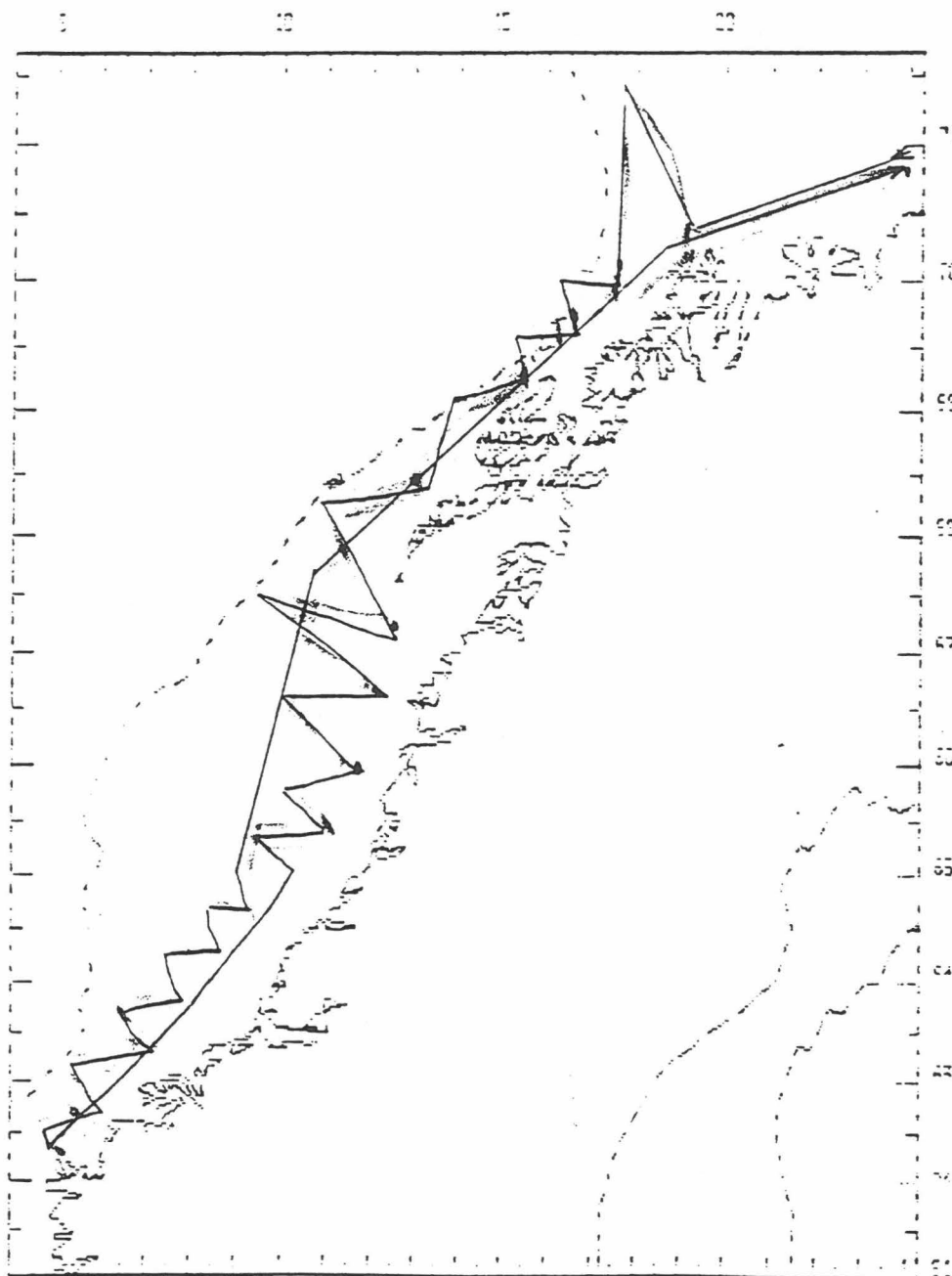


Figure 1. Planned survey area for R/V "Michael Sars" (N1), 15.02 - 30.03 1996. The survey will start in the south



ES 1.750000 00 10.0000

Figure 2. Planned survey tracks for R/V "Professor Marty" (R1) 10.02 - 25.03 1996. The survey will begin and end at approximately 70°30'N, 20°E as indicated on the map.

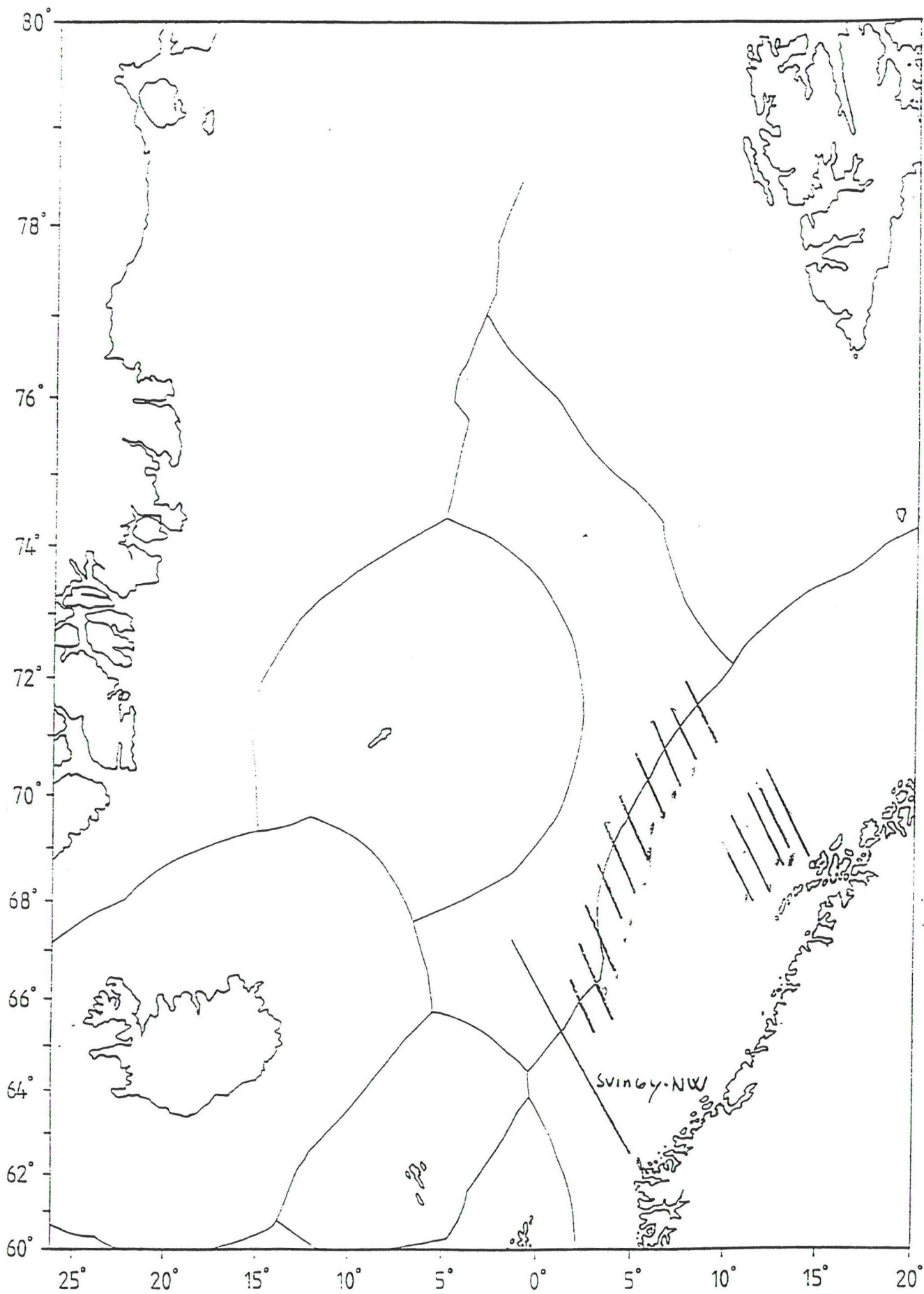


Figure 3. Planned survey area for R/V "G.O. Sars" (N2) 21.03 - 02.04 1996. The survey will

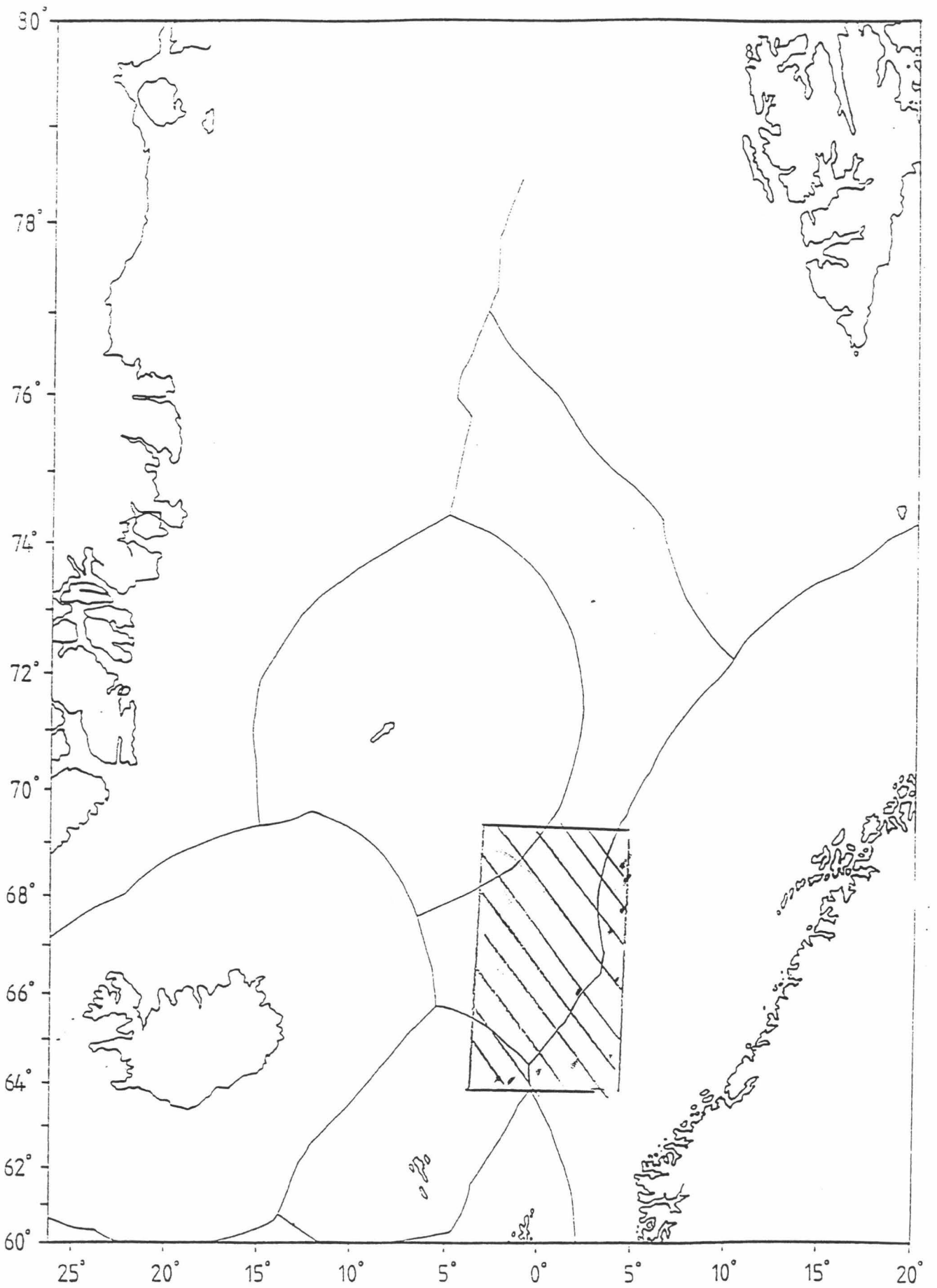


Figure 4. Planned survey area for R/V "G.O. Sars" (N3) 03.04 - 18.04 1996.

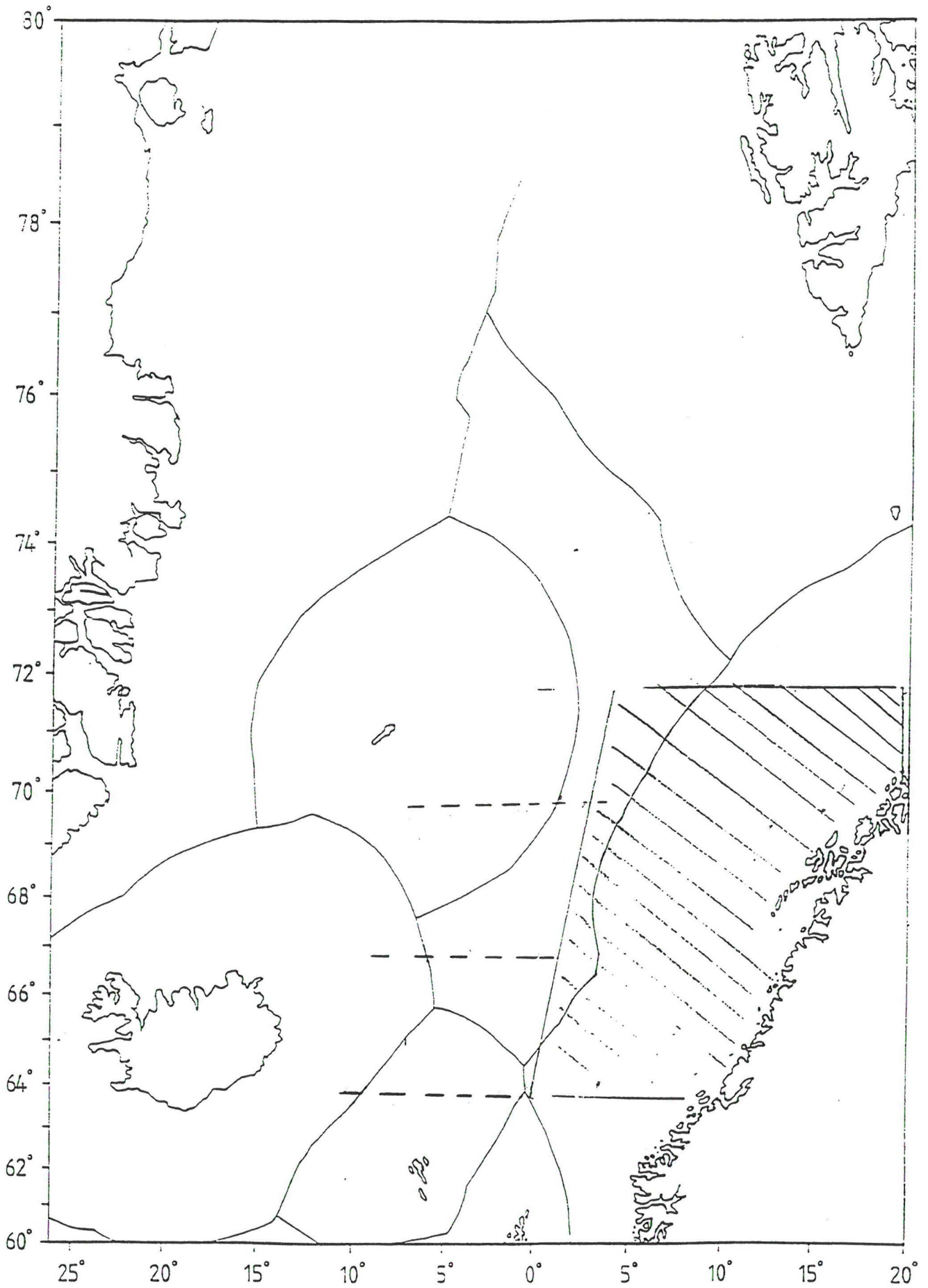


Figure 5. Planned survey area for R/V "G.O. Sars" (N4) 29.04 - 28.05, 1996. The survey will begin in the south of the area and proceed northwards. Eventual transects

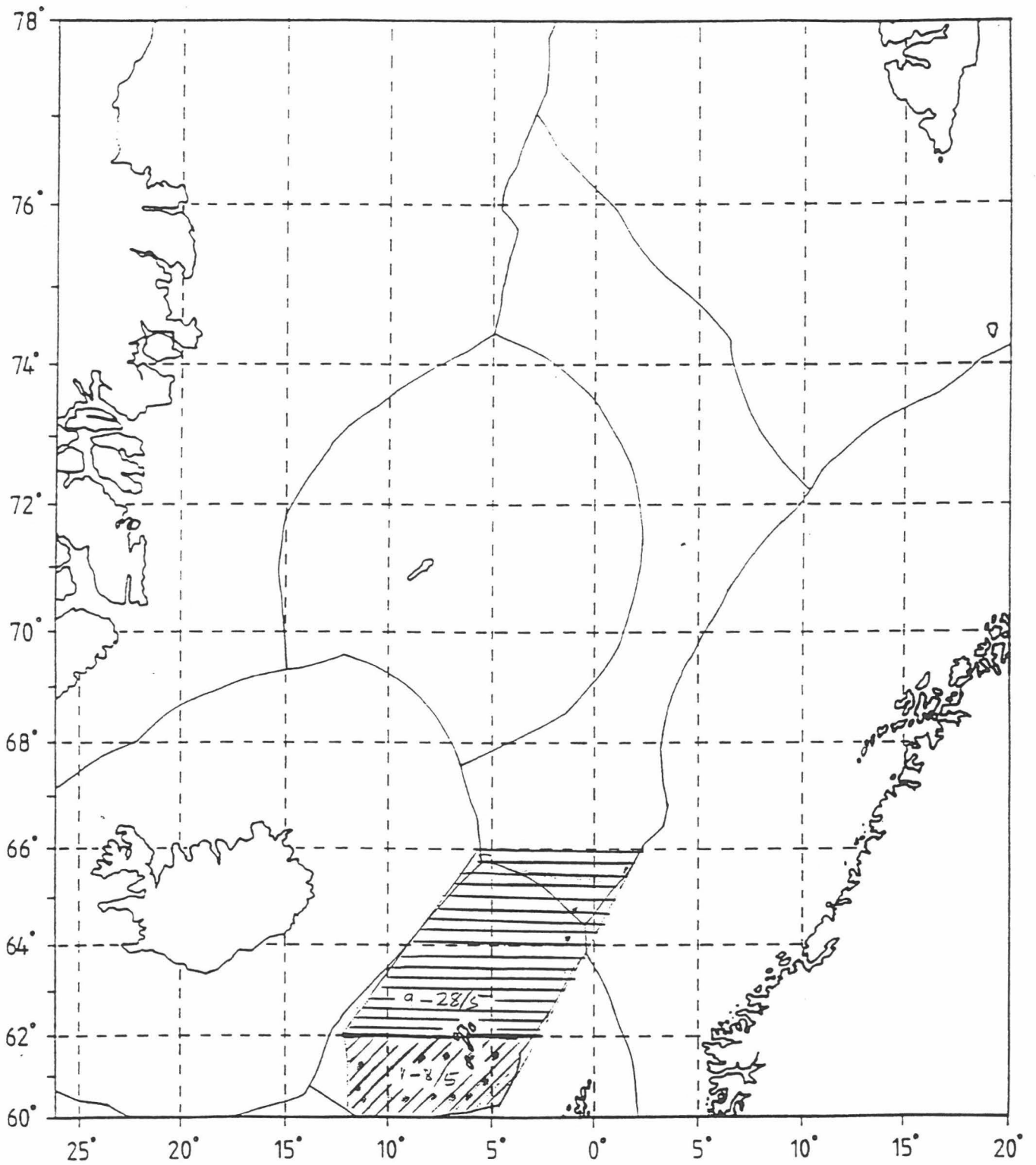


Figure 6. Planned survey area for R/V "Magnus Heinason" (F1), 01.05 - 28.05 1996. The division of the survey area in two parts is indicated by different hatching. Surveying will begin in the respective areas as indicated by the dates given.

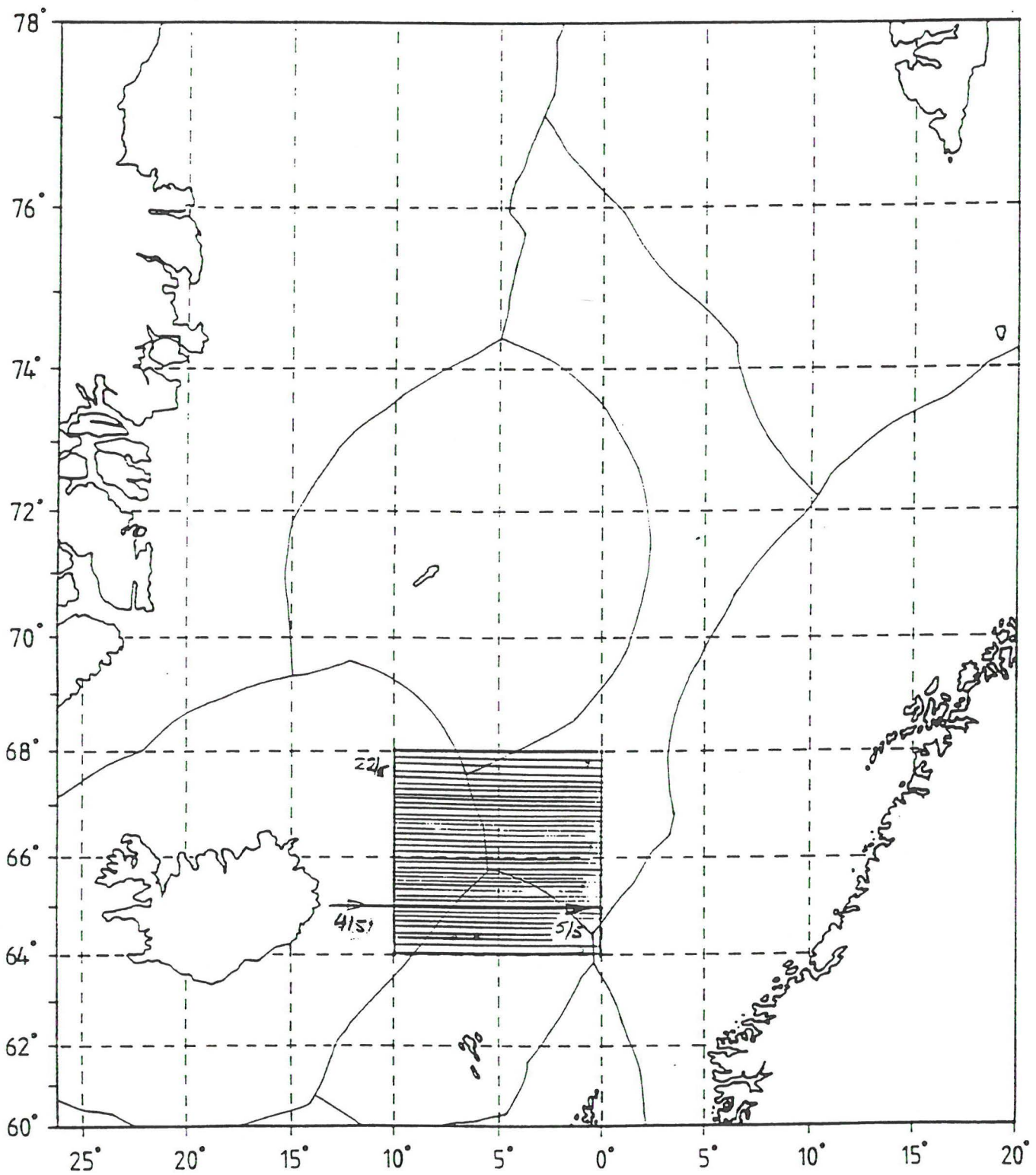


Figure 7. Planned survey area for R/V "Arni Fridriksson" (II) 02.05 - 23.05 1996. The survey will begin with a section along 65°N and proceed as indicated by the dates given.

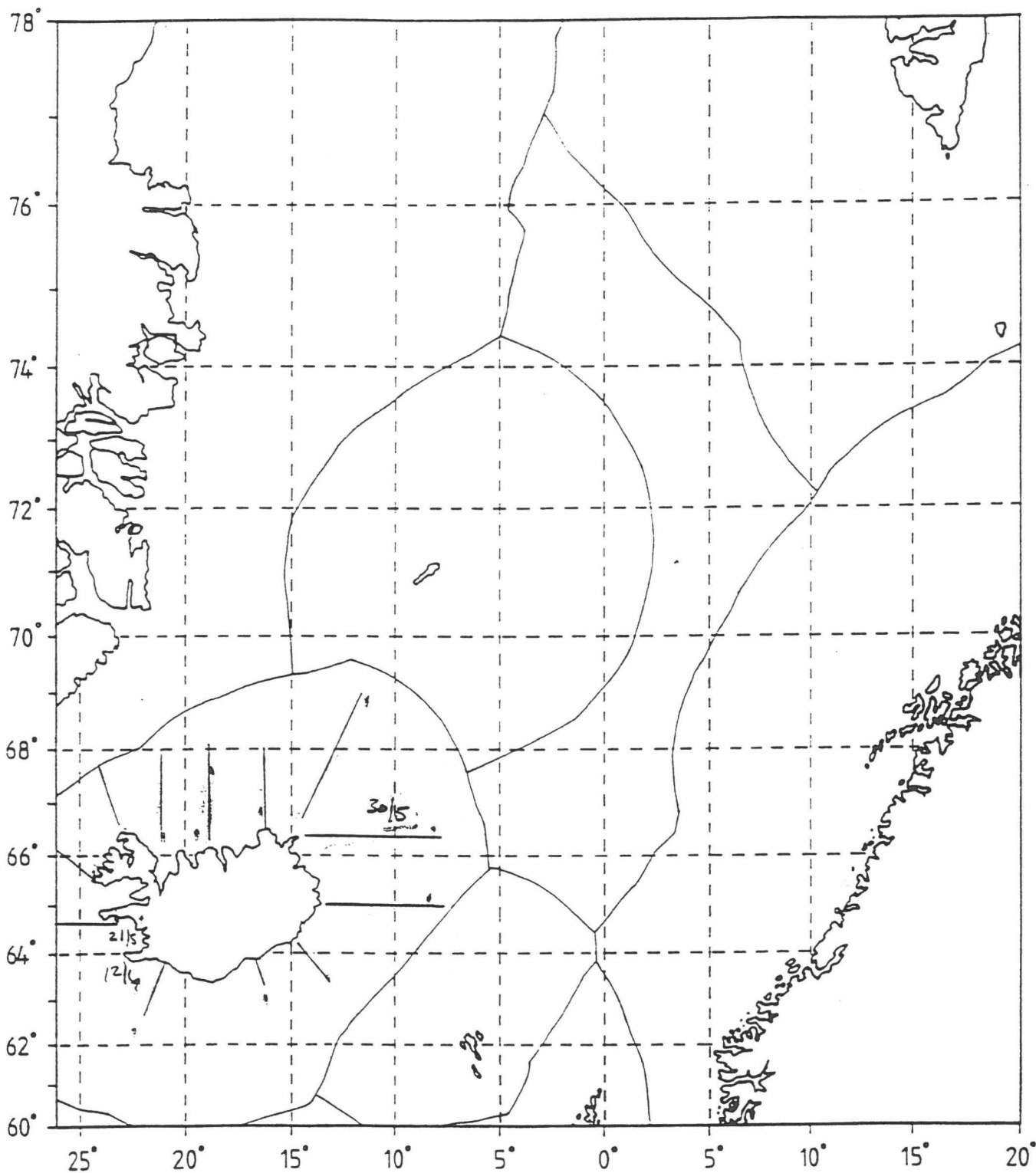


Figure 8. Planned survey transects for R/V "Bjarni Saemundsson" (I2), 18.06 - 06.07 1996.

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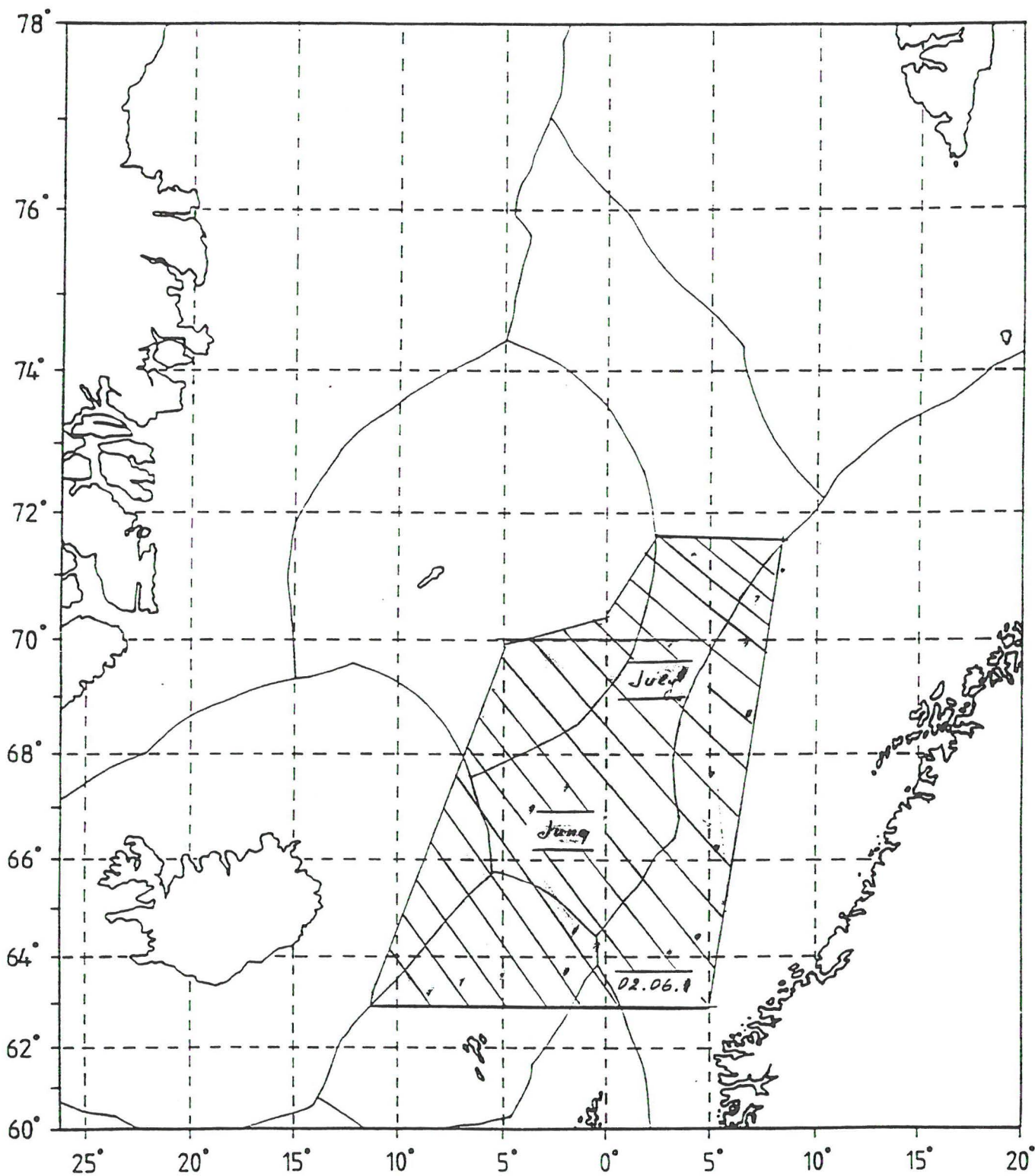


Figure 9. Planned survey area for R/V "Fridtjof Nansen" (R2) 25.05 - 28.07 1996. The survey will begin in the southern part of the area and proceed as indicated by the dates given.

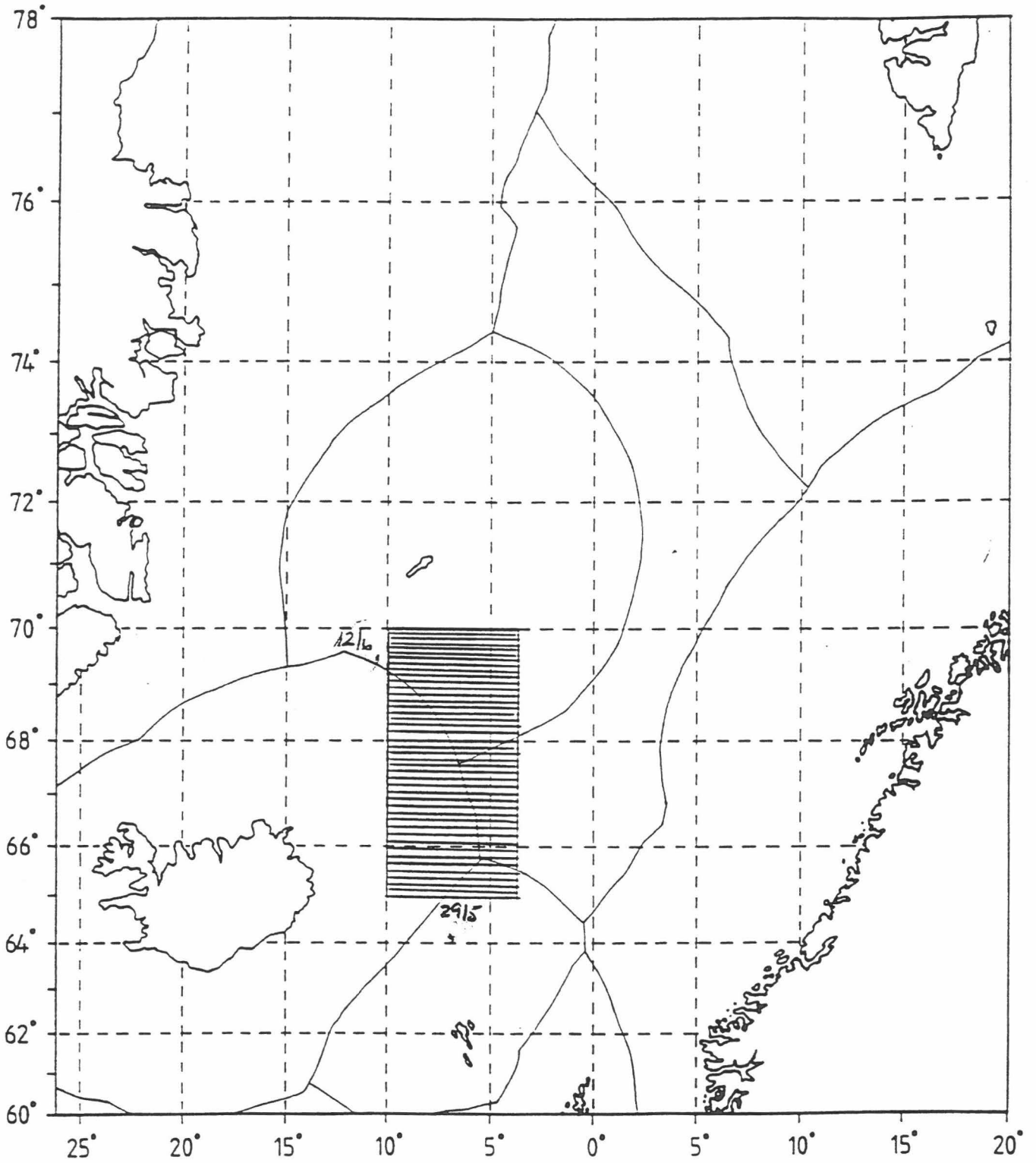


Figure 10. Planned survey area for R/V "Arni Fridriksson" (13), 28.05 - 14.06 1996. The survey will proceed as indicated by the dates given.

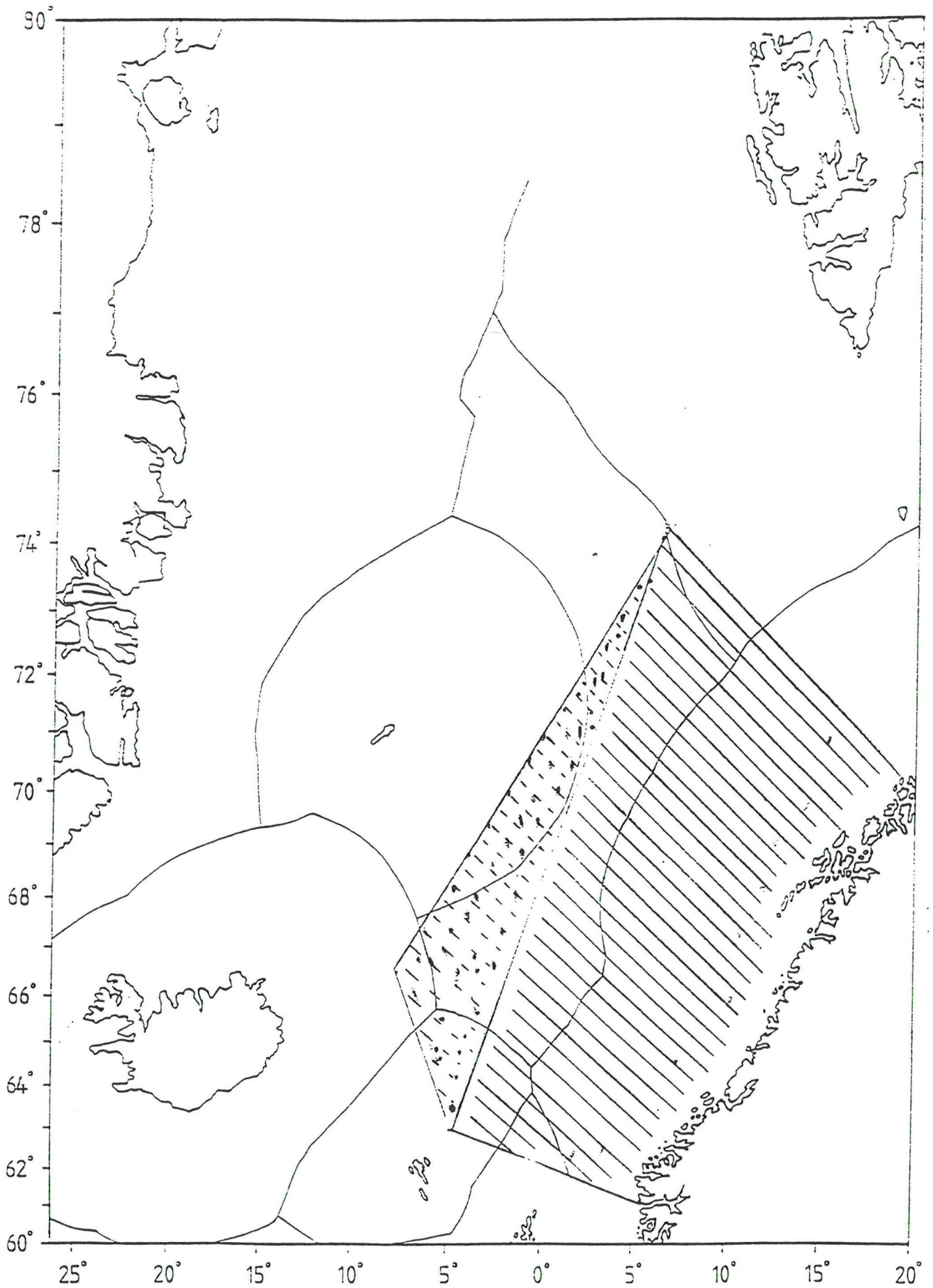


Figure 11 Planned survey area (diagonal hatching) for R/V "G.O. Sars" (N5), 19.07-15.08 /

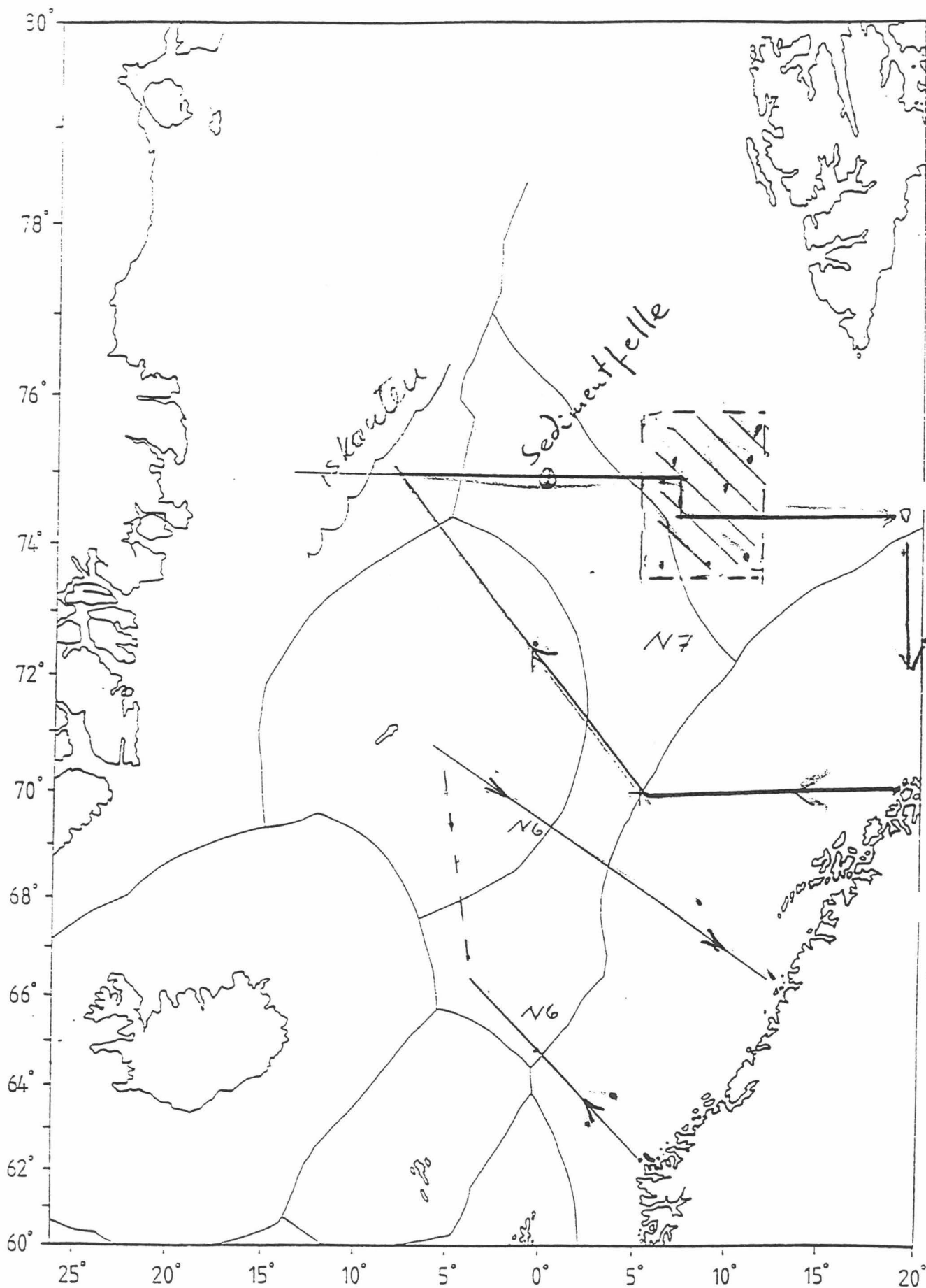


Figure 12. Planned survey tracks and sediment study area for R/V "Johan Hjort" (N6, N7), 09.07 - 05.08 1996. The progress of the surveys is indicated by the arrows and dates given.



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