Northwest Atlantic Fisheries Organization

Serial No. N863

NAFO SCR Doc. 84/VI/74

SCIENTIFIC COUNCIL MEETING - JUNE 1984

Marine Environmental Data Service Report for 1983/84

by

J. R. Keeley

Marine Environmental Data Service, Fisheries and Oceans Canada
7th Floor West, 240 Sparks Street, Ottawa, Canada K1A 0E6

Introduction

During 1983, about 1800 classical hydrocast stations and some 1300 bathythermograph stations reached MEDS. Through MEDS connection to IGOSS, knowledge of approximately 1200 stations (mostly temperature vs depth data) was gained. From the reception of forms detailing the standard NAFO sections occupied during the year, a further 600 stations are reported. From ROSCOP forms and cruise reports MEDS is aware of 2100 more stations, all being CTD work from Canadian vessels. From our CAMDI holdings we are aware of a further 3000 stations where temperature and salinity data have been collected in the NAFO area.

This year, some data from along NAFO standard sections have been received by MEDS and vertical sections of the data are contoured. These are only a local representation of the environmental conditions which persisted throughout the NAFO area for this year. However, some progress can be reported in the efforts to provide a statement of the environmental conditions. Each month the National Weather Service in the United States issues sea surface temperature anomaly maps. Excerpts from these are reproduced this year.

During this past year MEDS has acquired the data from the Atlas of the World Ocean as compiled by S. Levitus. This atlas presents long term average estimates of temperature and salinity profiles for every 1 degree square at (US NODC) standard depths and by season. Although this is not fine resolution in either time or space, it does represent one of the more detailed atlases to date, with the added feature that the data composing the atlas are in computer compatible form and available to the general public. MEDS is currently attempting to make use of these data to help calculate anomaly maps of temperature and salinity seasonally and at a variety of depths.

1983 Data Not Yet Received By MEDS

Table 1. lists the known data collections from the NAFO area but which have not yet reached MEDS files. The list has been arranged by oceanographic cruises. Wherever possible, the observations have been divided into those sampling temperature only and those with salinity observations as well. The reference column indicates the source from which the information was derived. There are a total of about 5700 stations represented in table 1.

1983 Data Received And Processed

Table 2. presents the list of cruise data received at MEDS for the year 1983. There are about 3100 stations of hydrocast and bathythermograph data. Most of these cruises have been made by Canadians. The only other NAFO member from which data from 1983 have been received is the Soviet Union. MEDS has received about 700 stations from them. As in table 1., the data have been

divided into temperature observations only and those with salinity as well. The reference number is the cruise number assigned by MEDS when the data are received. The column labeled "Figure" indicates the figure number in Appendix A where the cruise track may be found. Where both BTs and bottle data have been collected on the same cruise, only a single track chart has been presented; that for the collection with the larger number of stations.

Because MEDS participates in the IGOSS program it receives data from ships transmitting these messages to the GTS system. An examination of the data received in 1983 yields upwards of 1200 stations. Many of these observations have been made by foreign vessels. These data are all logged in MEDS databases. Table 3. lists the information which is known about these collections. The messages have been combined into what appear to be "cruises" based on the separation in time between observations. Track charts have not been presented for these because of the large number. Instead, NAFO subareas have been included in table 3. The IGOSS messages are received with four character call signs identifying the ship making the observations. Where known, the ship name has been associated with the call sign. There are a further 84 messages from assorted ships not shown in table 3. In some cases the cruises of table 3 may duplicate those of tables 1 and 2. It was decided to present these in table 3 to indicate the volume of traffic on the IGOSS system at MEDS.

Of the data received, there are 6 occasions where data have been collected along NAFO standard sections. Contours of the available temperature and salinity data have been drawn for these sections and the results presented in Appendix B.

Historical Data Acquisition

Last year, as in the past, MEDS annual report identified a number of cruises which collected data from the NAFO area but which had not reached the archive. Of these cruises, only 2 have been received in the past year. MEDS did receive a number of cruises from the NAFO area but from earlier years. We have just received 13 cruises of upwards of 800 stations from the Federal Republic of Germany, a complete year of cruises from ICES, and 1 cruises of about 30 stations from the Soviet Union.

A number of the cruises from the past years may have reached the world data centres. During the next year MEDS will be exploring this avenue once more to try to update its holdings. Prompt receipt is only possible with the submission the data directly to MEDS.

Review of Environmental Conditions in 1983

In past years, environmental summaries were based upon the few observations of the water properties from standard sections, or the localized data collections of particular countries. These were welded together by the expertise of the individuals preparing the summary. The expertise and data available to MEDS has not always permitted the unification of the data to present a reliable estimate of the environmental conditions. In these cases it was decided to abandon the attempt rather than portray possibly misleading information.

The Department of Commerce in the United States publishes a document called the Oceanographic Monthly Summary. Each month, a map of the sea surface temperature anomalies in the Atlantic are presented. While the map does not always cover the entire NAFO area, it does portray information from the regions below 50 degrees north. The data on which these maps are based are both in situ and satellite observations. The map production uses climatology from the National Climatic Center in the United States. Appendix C shows selected portions of these maps for each month of 1983.

The maps show a large cold anomaly dominating the north Atlantic centred approximately at 50 N, 42 W. While there are changes in the southern regions covered by this anomaly, north of about 50 degrees, it appears to persist throughout the year. In

the early part of the year, there is a cold tongue of water offshore of Georges Bank. This, too, persists through most of 1983. At the beginning of 1983, a warm anomaly is situated south of the Grand Banks. As the year progresses, this tends to die away until by December it has vanished.

Just as in the past, not enough data have been received from standard sections to permit baseline conditions over the years and therefore anomalies to be calculated. At best however, the standard sections are local samples in both time and space of the oceanographic conditions extant during the year. A more complete picture of the environmental conditions can be gained if more or all of the data collected during the year may be utilized in assessing the conditions. Such a utilization is possible if one can compile the data into a form which matches the presentations of any of a number of atlases of the mean conditions of the oceans. In the past year, MEDS purchased the contents of the Atlas of the World Ocean compiled by S. Levitus from the data holdings of the NODC in the United States. What made this attractive is that the data are available on computer tape and therefore may be manipulated readily in comparisons of new data collections to the conditions represented in the atlas.

The atlas analysed temperature and salinity at a set of standard depths in each one degree square for the world ocean and in four seasons. While the resolution by season is not particularily fine, in the search for yearly departures from the mean conditions it may be adequate, since anomalies can persist for many months. The one degree resolution is fine enough to tempt the production of some of the longer NAFO standard sections to be contoured, but this was not done. The vertical resolution is typical of classical hydrocasts.

Initial attempts at calculating anomalies were made by using all of the available data from each of the four seasons and regardless of when the observations were made. The techniques of optimum interpolation were used to construct spacial correlation functions. Anomalies were calculated by subtracting the atlas values from the data. The anomalies were contoured at various depths making use of the correlation functions. The results were then compared to those of the National Weather Service at the surface. In areas where data were plentiful, comparisons were moderately good. In other areas, the comparisons were poor. The results were not good enough to present here. Work is continuing to try to arrive at reliable anomalies by accounting for the sampling in each season. It is hoped that results will be available in time for the September NAFO meeting. Should this analysis prove useful, it would be possible to provide contoured anomaly maps of temperature and salinity both at the surface and subsurface by season. While the atlas does not conform to NAFO recommendations of baseline periods, it would seem to be the only realistic way that uncoordinated data collections may be combined to arrive at a large scale picture of environmental conditions.

Table 1. Data collected in the NAFO area in 1983 but not received at MEDS.

Platform	Cruise Period	Sub Area	Stan. Sect.	#	Ref.
	FEDERAL REPUBLIC of GERMANY				
A. Dohrn	Oct	2	Seal Isl.	6	NAFO
A. Dohrn	24 Oct- 8 Nov	2,3		80	NAFO
W. Herwig	Nov	1	C. Farewell	4	NAFO
W. Herwig	Nov	1	C. Desolatn	4	NAFO
W. Herwig	Nov	1	Fredriskhb	4	NAFO
W. Herwig	Nov	1	Fylla	6	NAFO
W. Herwig	Nov	1	L. Helle.	6	NAFO
W. Herwig	8 Nov-19 Nov	1,2		153	NAFO

USSR

Gizhiga	10 Mar-29 Mar	4		48	C84079I04
Gizhiga	31 Mar- 4 May	4		117	C94079I03
Gizhiga	27 Apr-30 Apr	3,4		27	C84020I01
Gizhiga	7 May-18 May	3		30	C84079I01
Ekliptika	22 Sep-14 Oct	4		105	C84005I01
Passat	5 Oct'82-22 Jan	3,4		765	C84115I03
Ekliptika	15 Oct-15 Nov	4		71	C84005I02

POLAND

Wieczno	Jan - Mar	5,6		88	NAFO

DENMARK

A. Jensen	18 Jan	1	Fylla	5	NAFO
A. Jensen	11 May	1	Fylla	5	NAFO
A. Jensen	29 Jun	1	Fylla	1	NAFO
A. Jensen	Jul - Sep	1		63	NAFO
A. Jensen	8 Jul	1	Egdem.	5	NAFO
A. Jensen	9 Jul	1	Holstb.	5	NAFO
A. Jensen	10 Jul	1	L. Helle.	5	NAFO
A. Jensen	11 Jul	1	Fylla	5	NAFO
A. Jensen	25 Aug	1	Fylla	5	NAFO
A. Jensen	Oct - Dec	1		28	NAFO
A. Jensen	11 Oct	1	Fylla	5	NAFO
A. Jensen	27 Oct	1	Fylla	5	NAFO
A. Jensen	28 Oct	1	L. Helle.	5	NAFO
A. Jensen	29 Oct	1	Holst.	5	NAFO
A. Jensen	30 Oct	1	Egedm.	7	NAFO

CANADA

Dawson	5 Apr-12 Apr	3,4		29	ROSCOP
E.E.Prince	6 Apr-21 Apr	4		49	C84087I03
Dawson	12 Apr-18 Apr	4		83	C84093I04
Hudson	4 May-27 May	3,4		39	ROSCOP
Dawson	23 May-30 May	3		24	ROSCOP
Dawson	2 Jun-21 Jun	3		185	ROSCOP
Hudson	28 Jul- 6 Aug	2		36	ROSCOP
Dawson	2 Aug-12 Aug	4,5		1800	ROSCOP
G.Atlantica	6 Sep-19 Sep	4		-	C84095I01
Dawson	24 Oct-29 Oct	4		9	C84093I01

FRANCE

Cryos	18 Jan-17 Feb	3,4		114	C84115I02
Cryos	21 Feb-18 Mar	3,4		74	C84115I01
Cryos	30 Aug-15 Sep	4		91	C83340I01
Cryos	6 Sep	4	Halifax	10	NAFO
Cryos	18 Sep- 3 Oct	4		71	C83336I01
Cryos	Oct - Dec	3,4		88	NAFO

UNITED STATES

Delaware 2	17 Jan-11 Feb	4,5		102	C83343I01
Delaware 2	28 Feb- 9 Mar	5		70	C84076I01
Albatross 4	28 Mar- 8 Apr	5		105	C83340I02
Albatross 4	11 Apr-22 Apr	4,5		93	C83326I01
Albatross 4	25 Apr- 6 May	4,5		104	C83327I01
Albatross 4	23 May-22 Jun	4,5,6		177	C83332I01
Albatross 4	1 Jul-15 Jul	5,6		46	C83325I02
Albatross 4	18 Jul-22 Jul	6		65	C84095I02
Albatross 4	26 Jul- 5 Aug	6		49	C84095I03
Albatross 4	9 Aug-19 Aug	5,6		42	C84103I01
Delaware 2	15 Aug- 7 Sep	5		62	C84104I01
Albatross 4	22 Aug- 2 Sep	5		35	C84104I02
Albatross 4	17 Oct-28 Oct	5		198	C84004I02
Albatross 4	14 Nov- 9 Dec	5,6		46	C84016I01
Delaware 2	14 Nov-21 Dec	4,5,6		152	C84033I01

Ref. code: NAFO = information obtained from NAFO inventory forms
ROSCOP = information obtained from ROSCOP forms
C.... = information obtained from MEDS CAMDI database

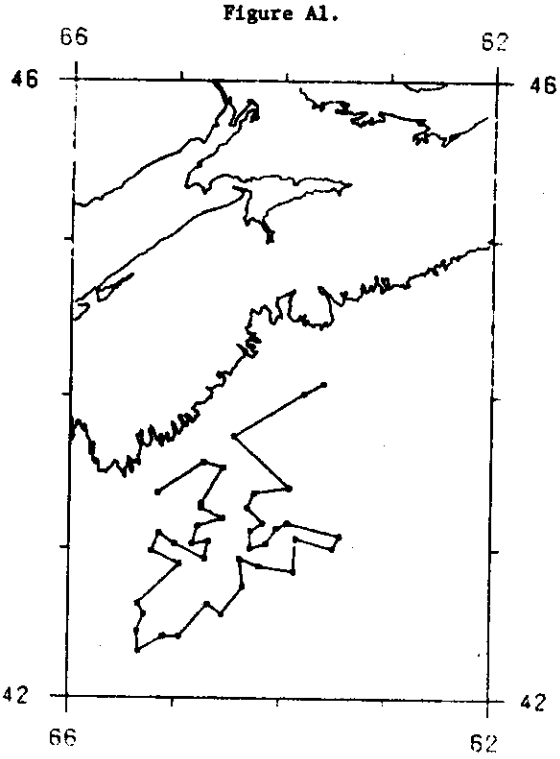
Table 2. Data collected in the NAFO area in 1983 and received by MEDS.

Platform	Cruise Period	Subarea	Data Type Bot	Bt	Cruise Number	Fig
		CANADA				
Lady Hammond	1 Jan-11 Jan	4X	41	38	180383001	A1
Lady Hammond	12 Jan-18 Jan	4X	52	48	180383002	A2
Fraser	21 Jan- 6 Mar	6B-E		26	181883001	A3
Annapolis	26 Jan-11 Feb	6D,E		14	181883012	A4
Lady Hammond	9 Feb-18 Feb	4X,5Ze	53		180383007	A5
Assiniboine	14 Feb-11 Mar	4X,5Y,Ze,6A-E		19	181883013	A6
Algonquin	15 Feb- 9 Mar	6B-E		17	181883004	A7
Nipigon	28 Feb- 3 Mar	4W,X		7	181883017	A8
EE Prince	3 Mar- 6 Mar	4W,X	12	8	180383003	A9
Lady Hammond	6 Mar-17 Mar	4X,5Ze	50		180383008	A10
Huron	15 Mar-18 Mar	4W,X		15	181883015	A11
EE Prince	15 Mar-27 Mar	4X,5Y,Ze	159	19	180383004	A12
Nipigon	16 Mar-28 Mar	3N,O,Ps,4Vs,W		14	181883018	A13
Lady Hammond	21 Mar-30 Mar	4Vs,W	68	67	180383005	A14
Lady Hammond	5 Apr-14 Apr	4W,X,5Y,Ze	74	80	180383006	A15
Athabaskan	14 Apr-16 Apr	3M,6H		7	181883006	A16
Algonquin	14 Apr-21 Apr	4T,W		8	181883005	A17
Nipigon	6 May-19 May	4X		15	181883019	A18
Ottawa	10 May-19 May	4X		11	181883002	A19
Alf. Needler	25 May- 3 Jun	4X,5Y,Ze	83	84	180383009	A20
Alf. Needler	21 Jun-29 Jun	4X,5Y,Ze		70	180383013	A21
Alf. Needler	5 Jul-14 Jul	4W,x,5Y,Ze	72	85	180383015	A22
Alf. Needler	19 Jul-27 Jul	3Ps,4Vn,Vs,W	74	81	180383016	A23
Alf. Needler	27 Jul-28 Jul	4W	2	2	180383017	A24
Lady Hammond	2 Aug-10 Aug	4X,5Y,Ze		61	180383014	A25
Saguenay	24 Aug-31 Aug	3Ps,Pn,4R-X		5	181883009	A26
Alf. Needler	30 Aug- 9 Sep	4X,5Y,Ze	83	83	180383018	A27
Saguenay	12 Sep-16 Sep	4T,W		12	181883010	A28
Alf. Needler	12 Sep-28 Sep	3Ps,Pn,4Vn, 4Vs,W,X,5Y,Ze	76		183183006	A29
Saguenay	19 Sep-22 Sep	4T,W		8	181883011	A30
Algonquin	19 Sep-29 Sep	4X		8	181883007	A31
Iroquois	19 Sep-30 Sep	4X		25	181883008	A32
Alf. Needler	4 Oct-13 Oct	3Ps,4Vn,Vs,W	90	25	180383019	A33
Alf. Needler	18 Oct-27 Oct	4W,X,5Y,Ze	98	95	180383020	A34
EE Prince	1 Nov-12 Nov	4X,5Y,Ze	159	159	180383021	A35
		USSR				
Suloy	14 Oct(82)-20 Feb	2G,H,J,3K,L 3M,N,O	139		90SU82026	A36
Kokashaisk	1 Mar-19 Apr	3L,M,N	117		90KK83002	A37
Suloy	16 Apr- 4 Aug	3K,L,M,N,O	179		90SU83027	-
Gemma	24 May-31 May	3L,M,N	42		90GE83027	A38
Suloy	1 Nov-10 Jan(84)	-	61	74	90SU83004	-
Poisk	9 Nov- 9 Dec	2J,3K,L,M,N,O	42	48	90PK83046	A39

Table 3. IGOSS data received at MEDS during 1983.

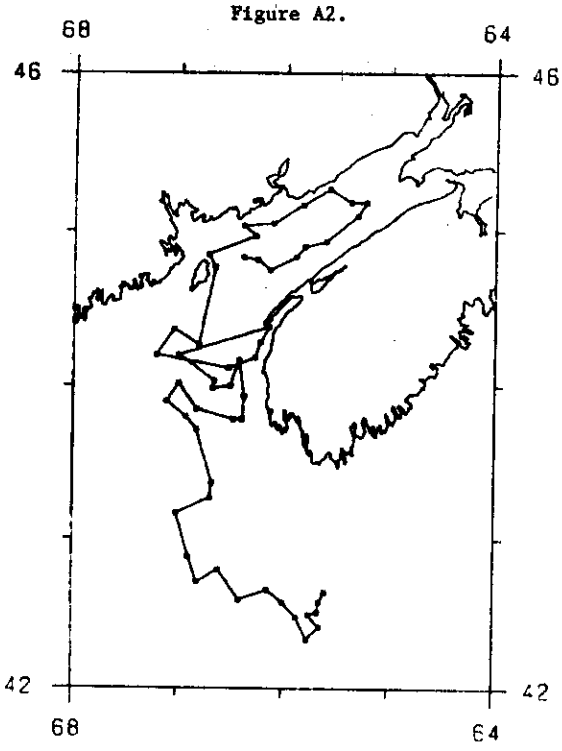
Ship Name	Country	Call Sign	Cruise Period	Msg Bathy	Type Tesac	NAFO Subarea
Hudson	Canada	CGDG	12 Nov-18 Nov	10		2J, 3K
A. Dohrn	FRG	DBFR	24 Oct-13 Nov	109		2J, 3K-M
Monsoon	USSR	EREA	14 Feb- 3 Mar	38	13	3MN, 6H
Poryv	USSR	ERES	16 Dec-31 Dec	32	11	3MN, 6H
Poryv	USSR	ERET	16 Apr-13 May	55	15	3KMN, 6H
Poryv	USSR	ERET	23 May-26 May	5	1	3K
Poryv	USSR	ERET	27 Aug-19 Sep	63	16	3MN, 6H
Poryv	USSR	ERET	7 Oct-25 Oct	35	20	3MN, 6H
Poryv	USSR	ERET	27 Dec-31 Dec	11	4	3M
E.Krenkel	USSR	EREU	2 Jun- 7 Jun	9	1	3M
Cryos	France	FNBA	1 Sep- 2 Oct	126		4VsWX, 5Ze
Cryos	France	FNBA	27 Oct- 4 Nov	29		3Ps
Cryos	France	FNBA	9 Nov-15 Nov	44		3PsPn
Thalassa	France	FNIB	5 Jul- 6 Jul	5		3LPs, 4T
		NJHD	14 Jun-21 Jun	8		5Ze, 6ABC
		NJSP	11 Apr-20 Apr	22		6BC
		NJSP	26 Apr- 3 May	16		6BC
Hamilton	USA	NMAG	1 Jun- 5 Jun	5		5Ze, 6DE
Duane	USA	NRDB	1 Jun- 8 Jun	19		5Ze, 6B-E
Duane	USA	NRDB	16 Jun-17 Jun	6		5Ze, 6DE
Duane	USA	NRDB	10 Jul-14 Jul	9		6BC
Duane	USA	NRDB	17 Aug-20 Aug	6		6B
Taney	USA	NRDT	23 Jun- 1 Jul	22		5Y-Zw, 6B-D
Taney	USA	NRDT	8 Jul-21 Jul	16		5Zw, 6B-E
Northwind	USA	NRFJ	16 Mar- 5 Apr	24		3L, 4VsWX, 5Ze, 6B-D
Northwind	USA	NRFJ	15 Jun-25 Jun	14		1D-F, 2J, 3KLO 4VsWX, 5Ze, 6B-D
Northwind	USA	NRFJ	1 Jul-13 Jul	8		1A
Northwind	USA	NRFJ	30 Jul- 4 Sep	13		1A, 2J, 6BC
Oleander	Nethlands	PJYG	15 Jan-17 Jan	8		6AB
Oleander	Nethlands	PJYG	28 Jan- 3 Feb	24		6ABC
Oleander	Nethlands	PJYG	18 Feb-19 Feb	14		6AB
Oleander	Nethlands	PJYG	10 Jun-16 Jun	62		6AB
Oleander	Nethlands	PJYG	5 Aug-11 Aug	5		6AB
Oleander	Nethlands	PJYG	18 Nov-19 Nov	18		6ABD
		SHIP	23 Aug-20 Sep	19		3M-O, 4VsWX 5ZeZw, 6A-G
Passat	USSR	UZGH	4 Mar-15 Mar	24	9	3L-N, 6GH
Passat	USSR	UZGH	21 Aug-30 Aug	18	3	3L-Ps
G.Atlantica	Canada	VC9450	30 Jul- 2 Aug		20	2HJ
L.Hammond	Canada	VC9616	7 May-13 May	59		4X, 5Ze
L.Hammond	Canada	VC9616	4 Jun-11 Jun	58		4X, 5Ze
L.Hammond	Canada	VC9616	28 Nov-29 Nov	8		4W
Albatross4	USA	WMVF	13 Apr-18 Apr	11		5Ze
Albatross4	USA	WMVF	10 May-11 May	8		5Ze
G.Chalenger	USA	WNCU	16 Aug-22 Sep	13		3L, 4WX, 6AB

Figure A1.



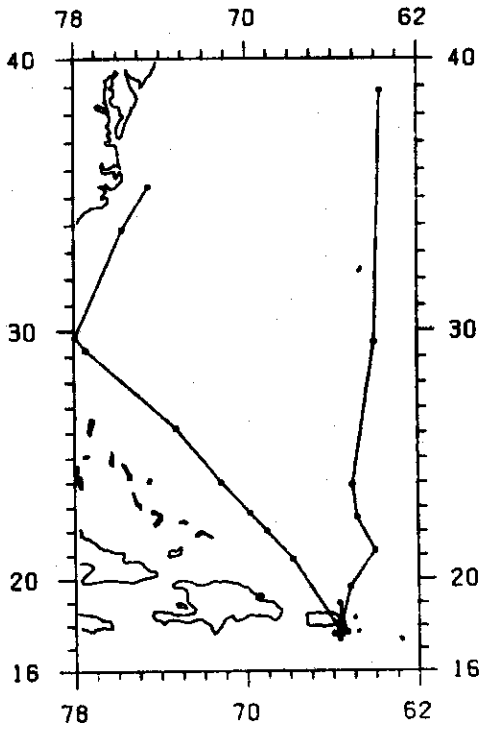
CRUISE 180383001 6/ 1/83 - 11/ 1/83 41 STATIONS

Figure A2.



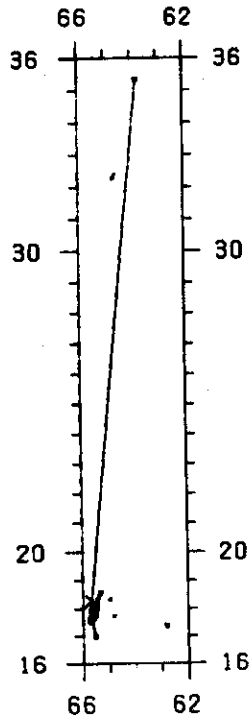
CRUISE 180383002 12/ 1/83 - 18/ 1/83 52 STATIONS

Figure A3.



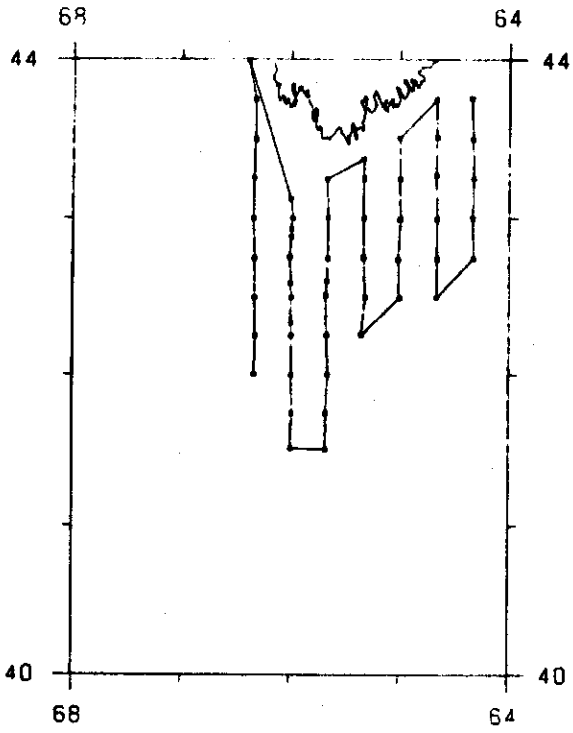
CRUISE 181883001 26/ 1/83 - 6/ 3/83 26 STATIONS

Figure A4.



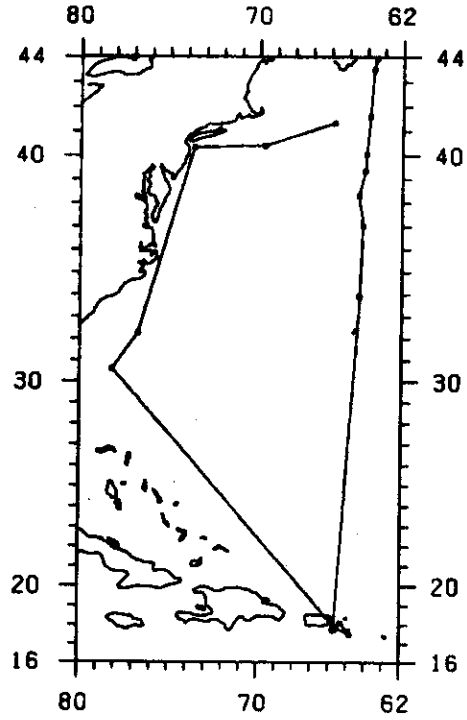
CRUISE 181883012 26/ 1/83 - 11/ 2/83 14 STATIONS

Figure A5.



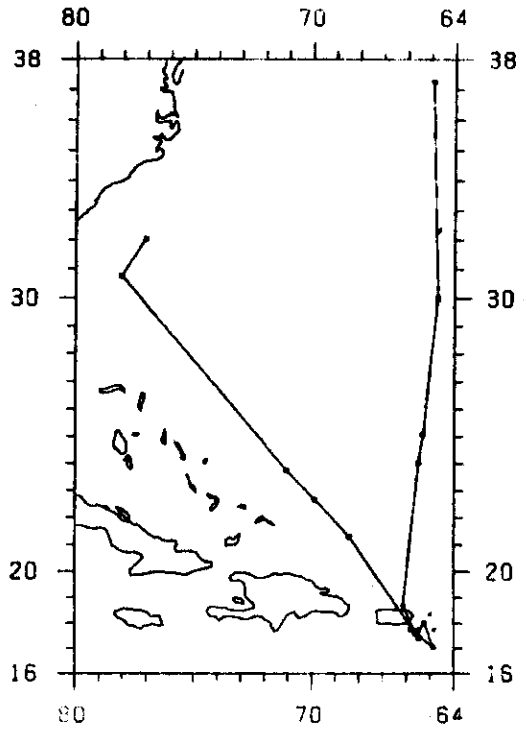
CRUISE 180383007 9/ 2/83 - 18/ 2/83 52 STATIONS

Figure A6.



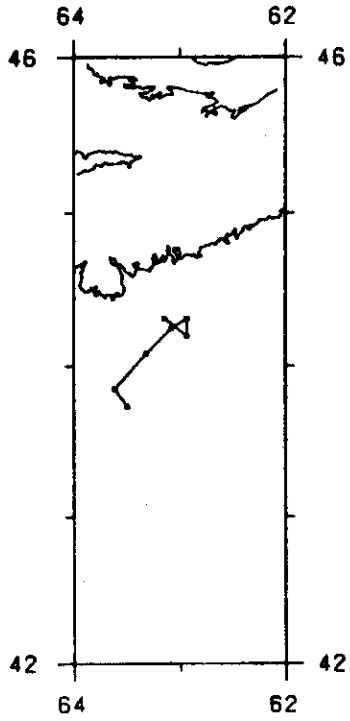
CRUISE 181883013 14/ 2/83 - 11/ 3/83 19 STATIONS

Figure A7.



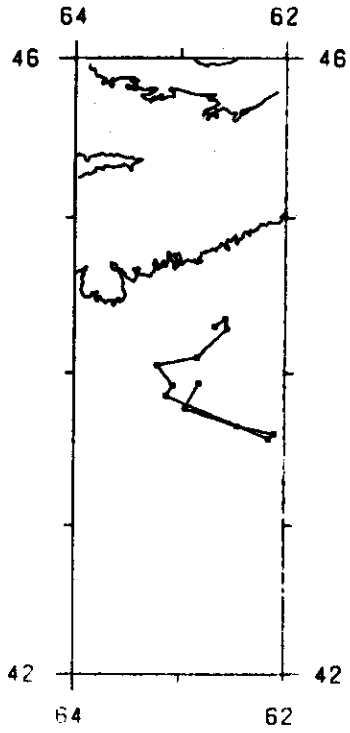
CRUISE 181883004 15/ 2/83 - 9/ 3/83 17 STATIONS

Figure A8.



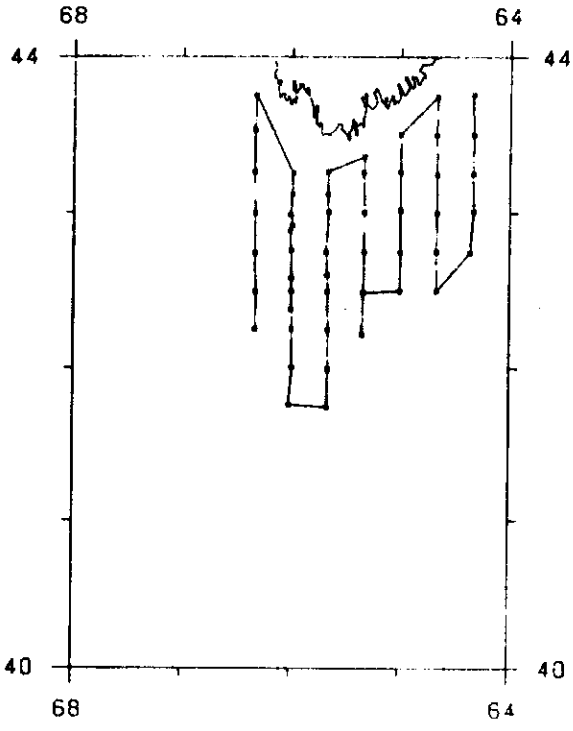
CRUISE 181883017 28/ 2/83 - 3/ 3/83 7 STATIONS

Figure A9.



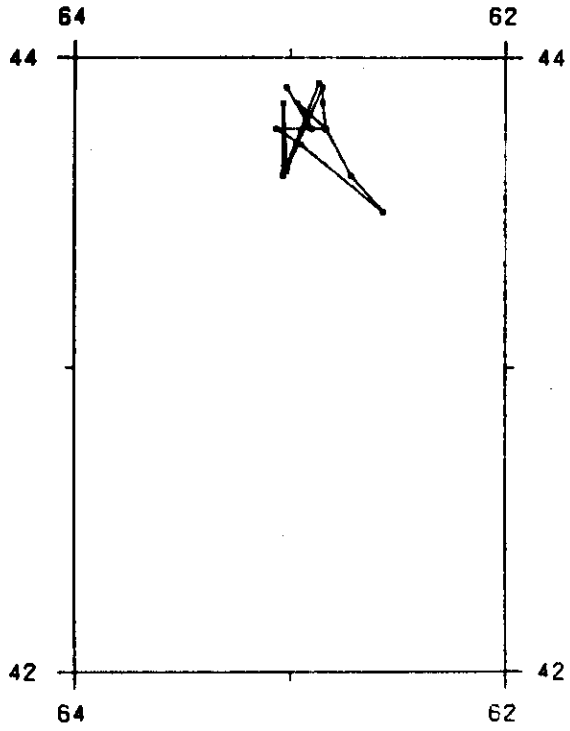
CRUISE 180383003 3/ 3/83 - 6/ 3/83 12 STATIONS

Figure A10.



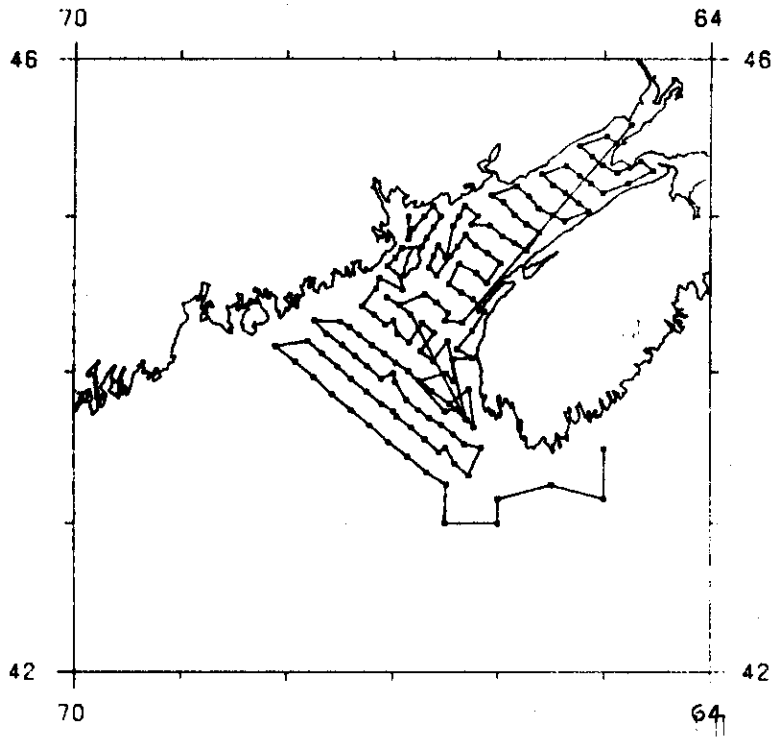
CRUISE 180383008 6/ 3/83 - 17/ 3/83 50 STATIONS

Figure A11.



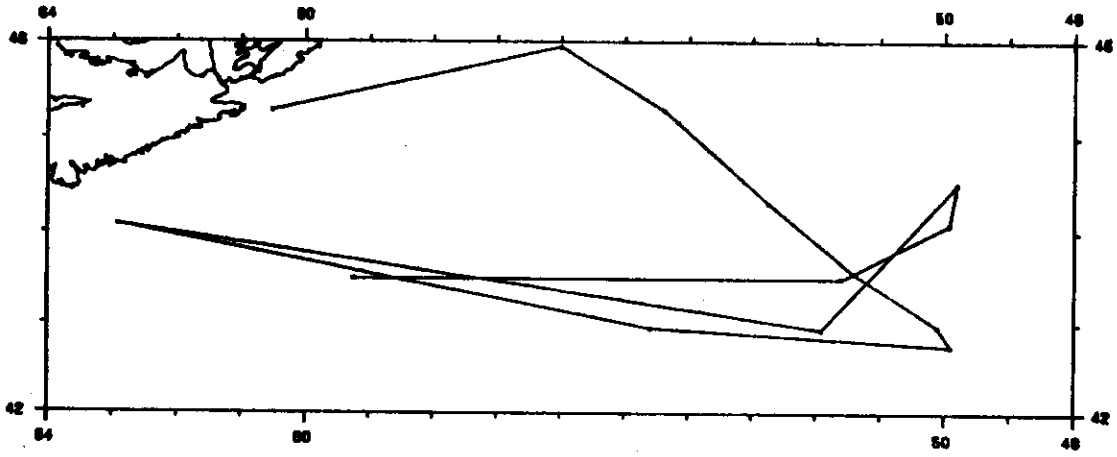
CRUISE 181883015 15/ 3/83 - 18/ 3/83 15 STATIONS

Figure A12.



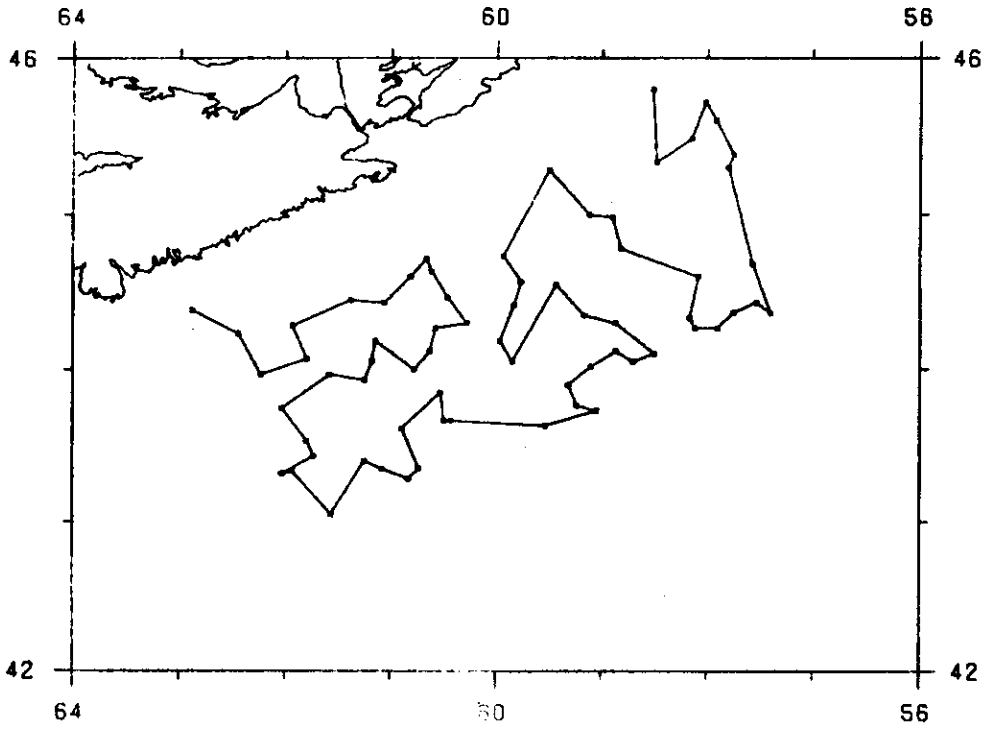
CRUISE 180383004 15/ 3/83 - 27/ 3/83 159 STATIONS

Figure A13.



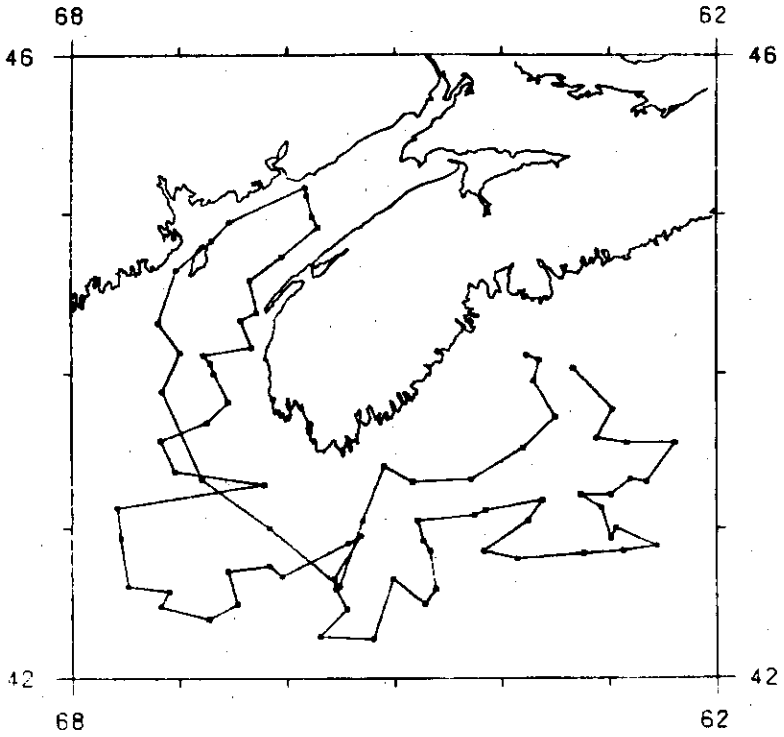
CRUISE 181883018 18/ 3/83 - 28/ 3/83 14 STATIONS

Figure A14.



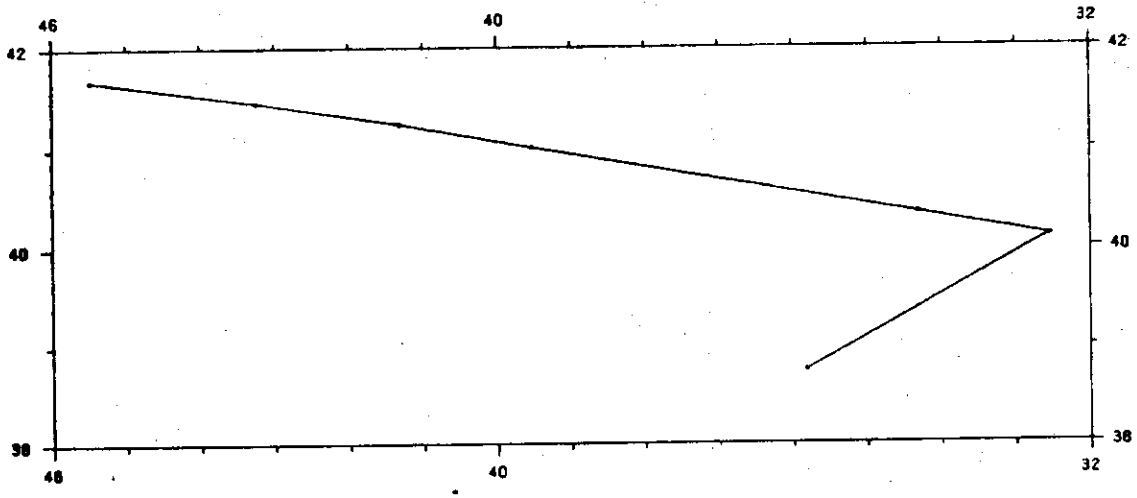
CRUISE 180383005 21/ 3/83 - 30/ 3/83 68 STATIONS

Figure A15.



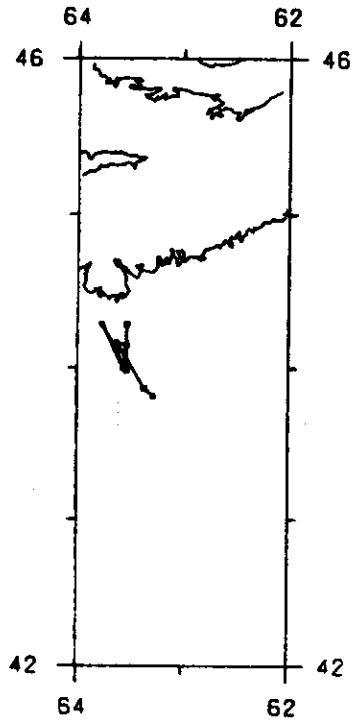
CRUISE 181883006 5/ 4/83 - 14/ 4/83 80 STATIONS

Figure A16.



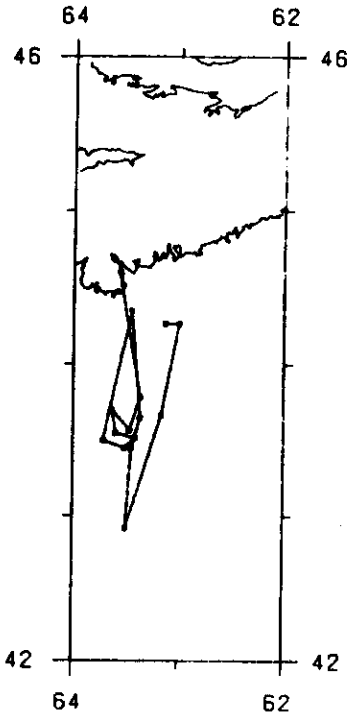
CRUISE 181883006 14/ 4/83 - 15/ 4/83 7 STATIONS

Figure A17.



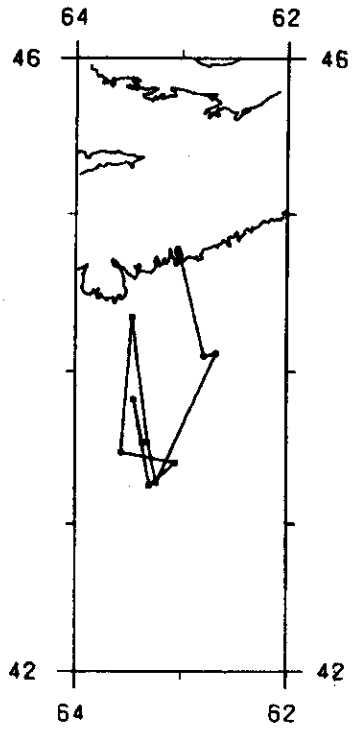
CRUISE 181883005 14/ 4/83 - 21/ 4/83 8 STATIONS

Figure A18.



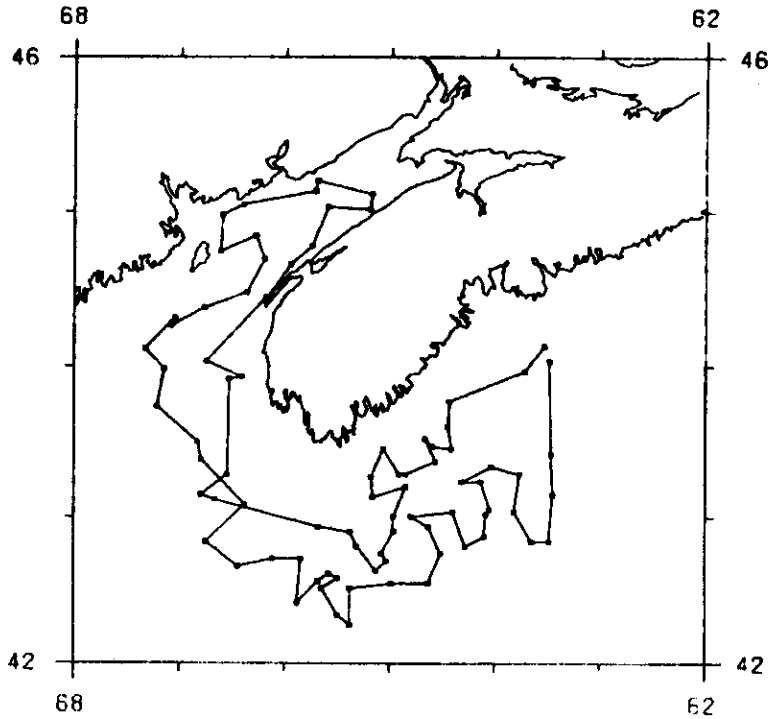
CRUISE 181883019 6/ 5/83 - 19/ 5/83 15 STATIONS

Figure A19.



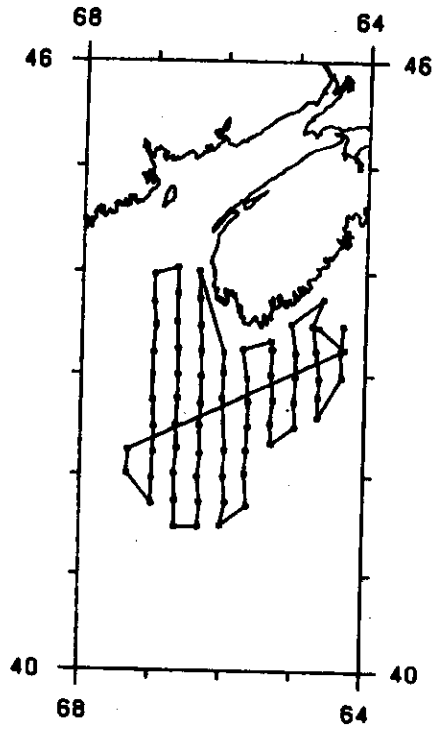
CRUISE 181883002 10/ 5/83 - 19/ 5/83 11 STATIONS

Figure A20.



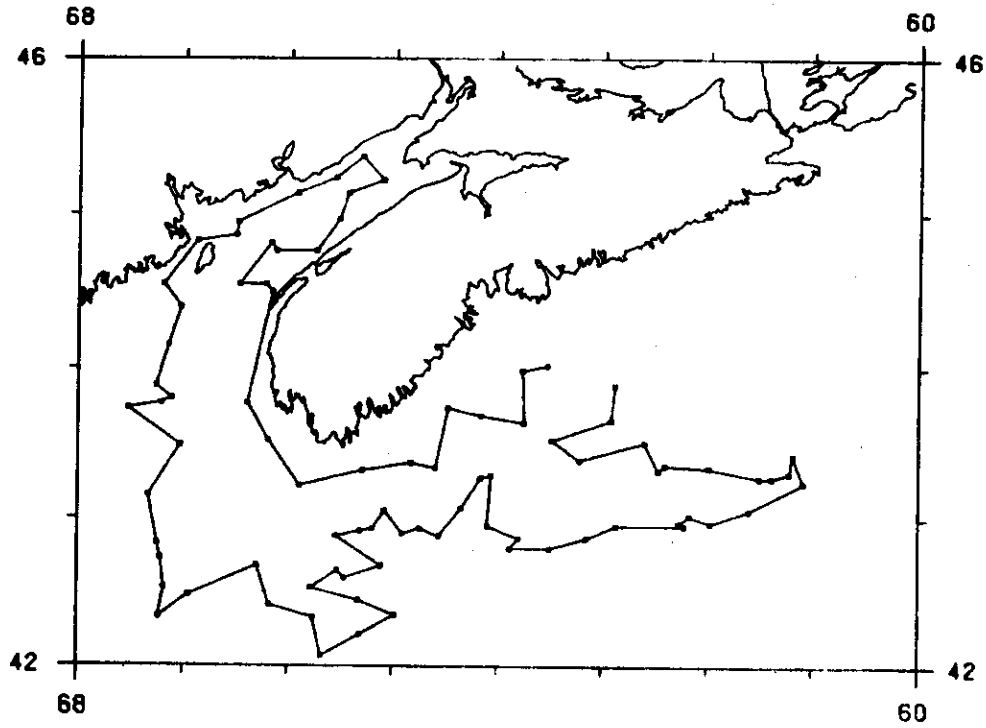
CRUISE 180383009 25/ 5/83 - 3/ 6/83 84 STATIONS

Figure A21.



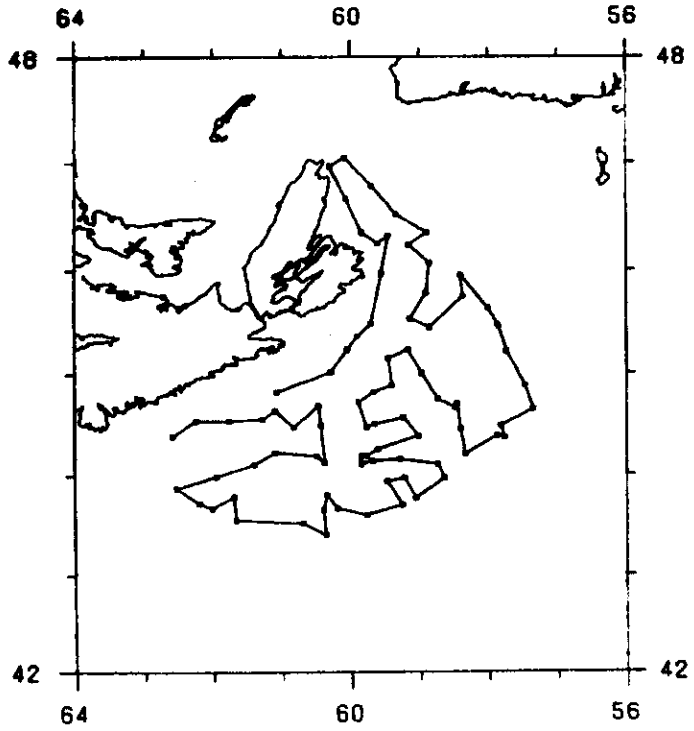
CRUISE 180383013 22/ 6/83 - 29/ 6/83 70 STATIONS

Figure A22.



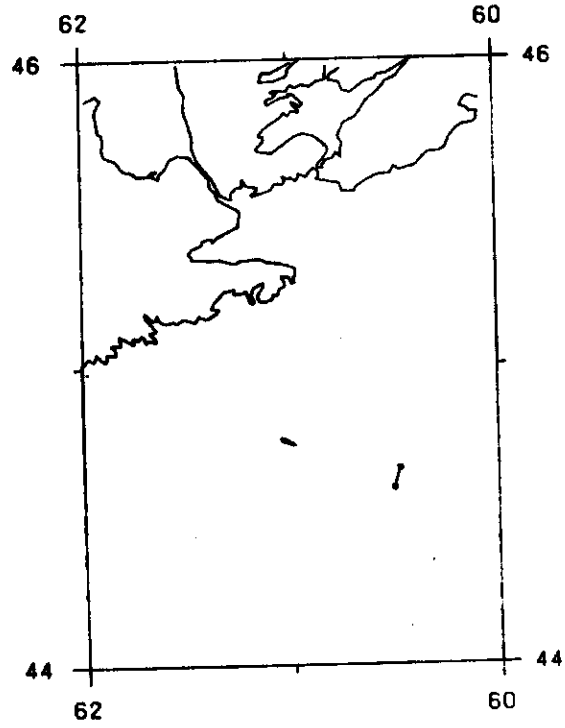
CRUISE 180383015 5/ 7/83 - 14/ 7/83 85 STATIONS

Figure A23.



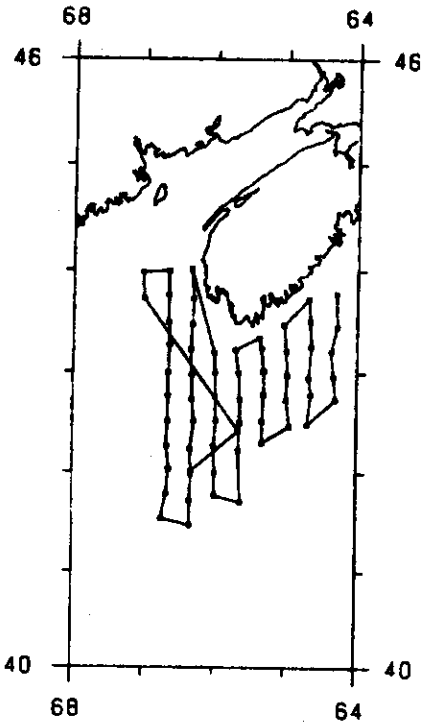
CRUISE 180383016 18/ 7/83 - 27/ 7/83 81 STATIONS

Figure A24.



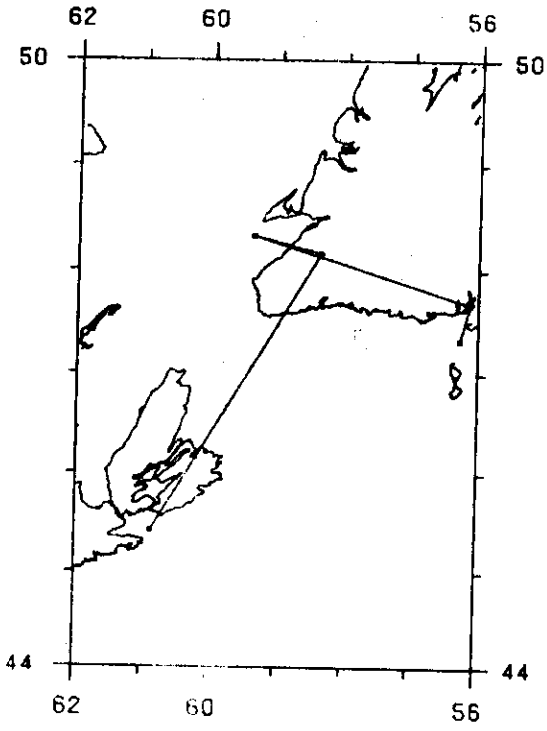
CRUISE 180383017 27/ 7/83 - 28/ 7/83 2 STATIONS

Figure A25.



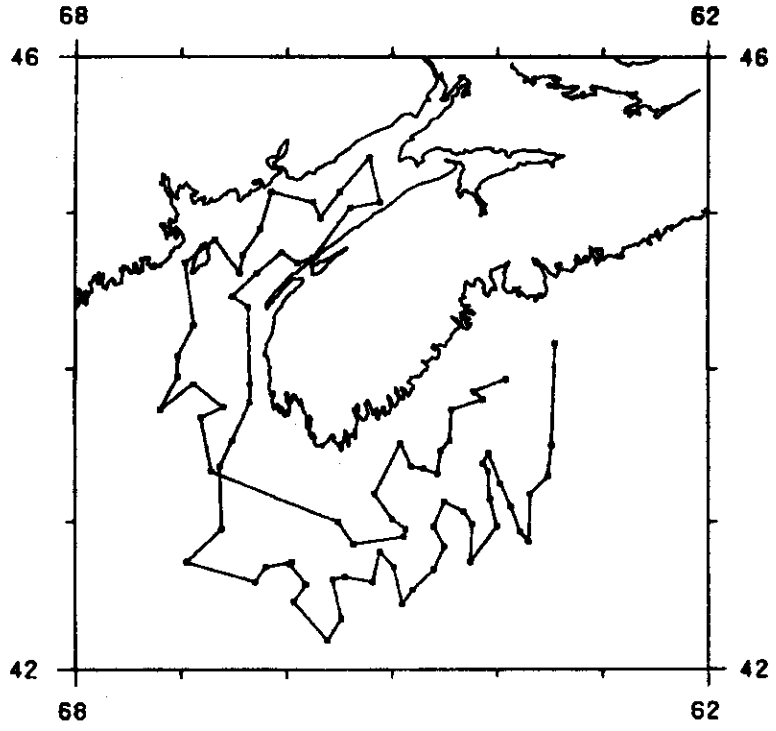
CRUISE 180383014 2/ 8/83 - 10/ 8/83 61 STATIONS

Figure A26.



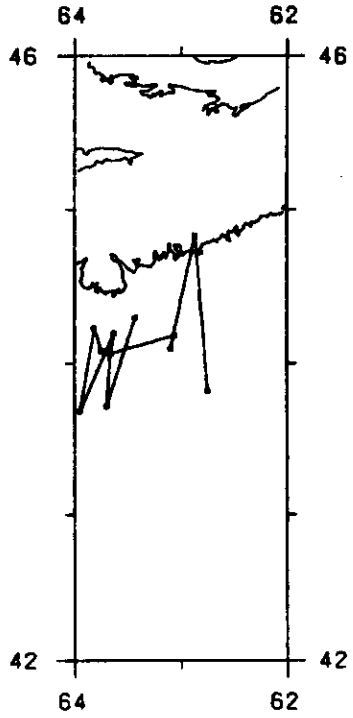
CRUISE 181883009 24/ 8/83 - 31/ 8/83 5 STATIONS

Figure A27.



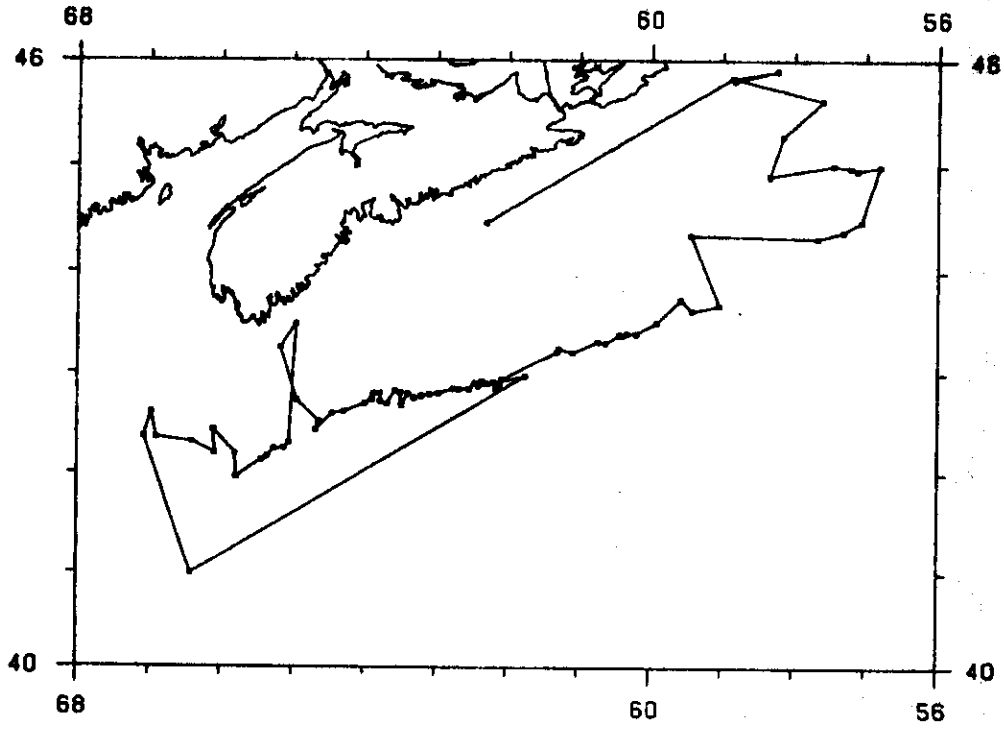
CRUISE 180383018 30/ 8/83 - 9/ 9/83 83 STATIONS

Figure A28.



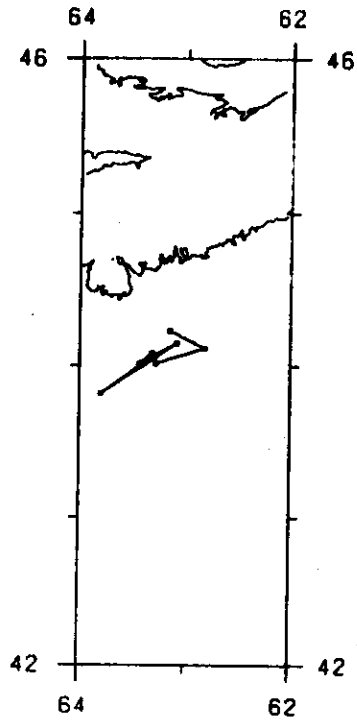
CRUISE 181883010 12/ 9/83 - 16/ 9/83 12 STATIONS

Figure A29.



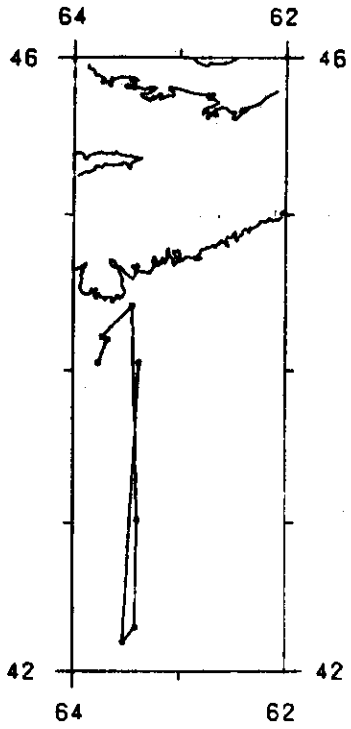
CRUISE 183183006 12/ 9/83 - 28/ 9/83 76 STATIONS

Figure A30.



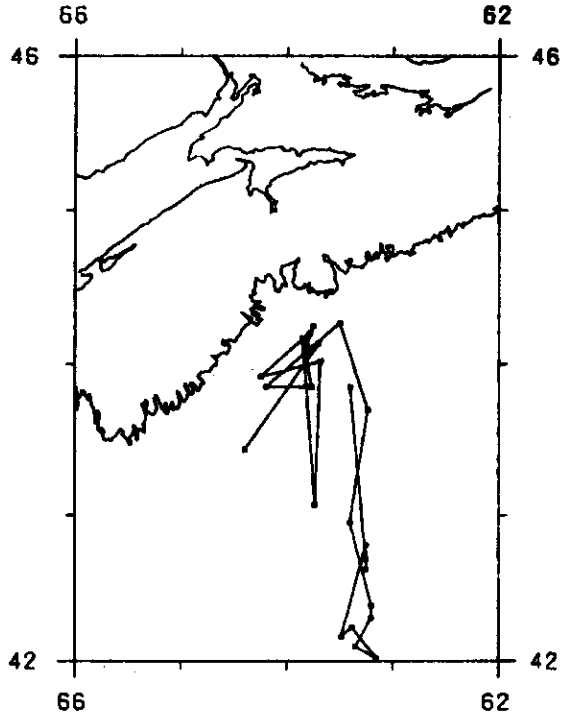
CRUISE 181883011 19/ 9/83 - 22/ 9/83 8 STATIONS

Figure A31.



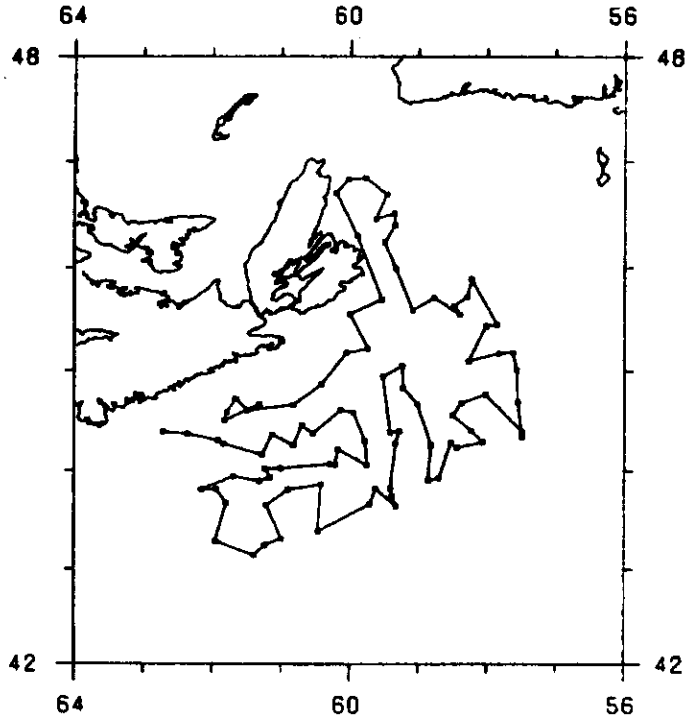
CRUISE 181883007 19/ 9/83 - 29/ 9/83 8 STATIONS

Figure A32.



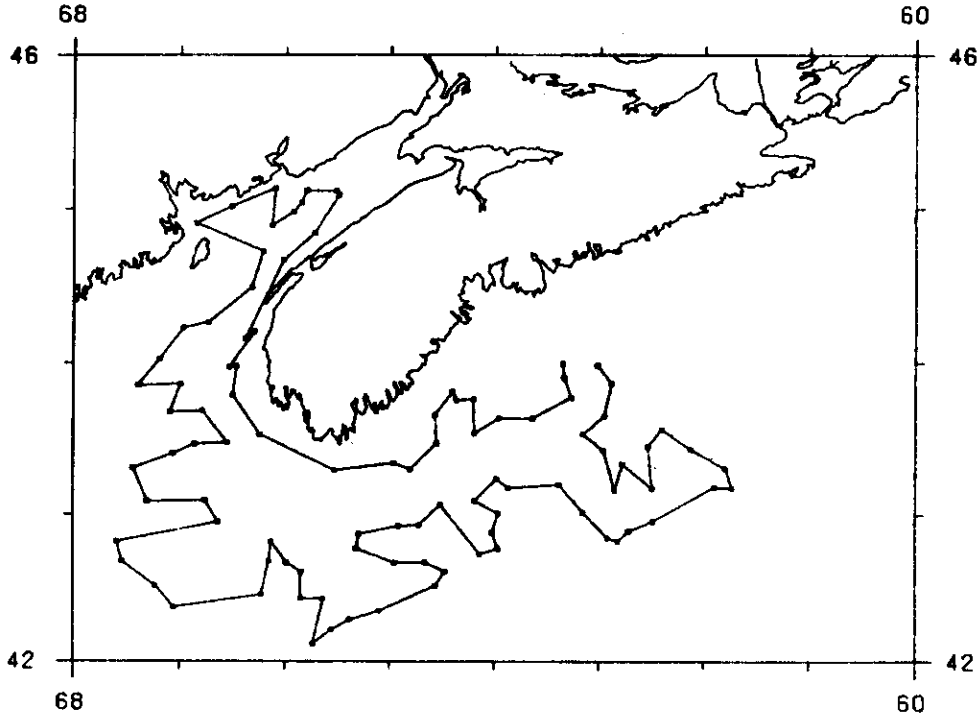
CRUISE 181883008 19/ 9/83 - 30/ 9/83 25 STATIONS

Figure A33.



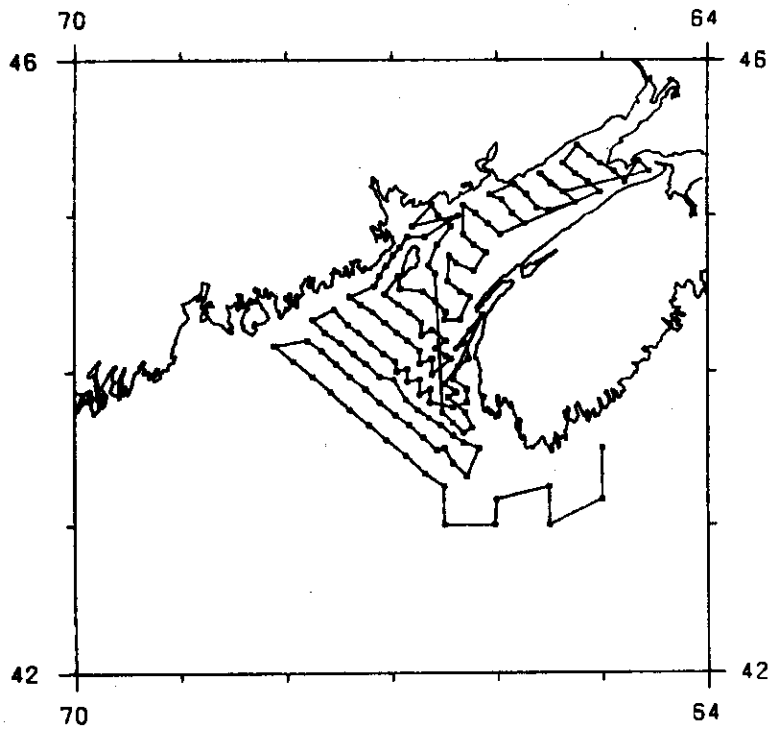
CRUISE 180383019 4/10/83 - 13/10/83 90 STATIONS

Figure A34.



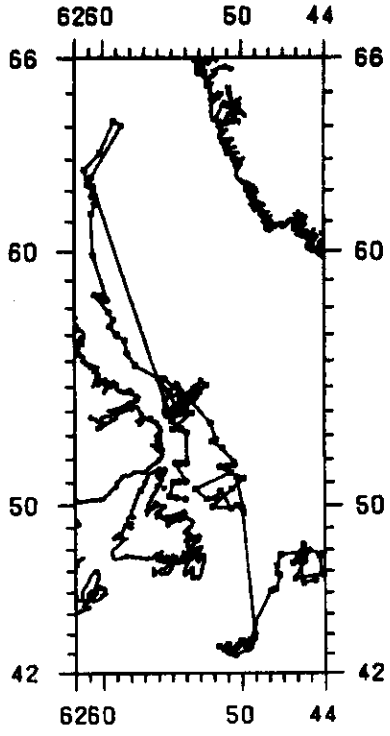
CRUISE 180383020 18/10/83 - 27/10/83 98 STATIONS

Figure A35.



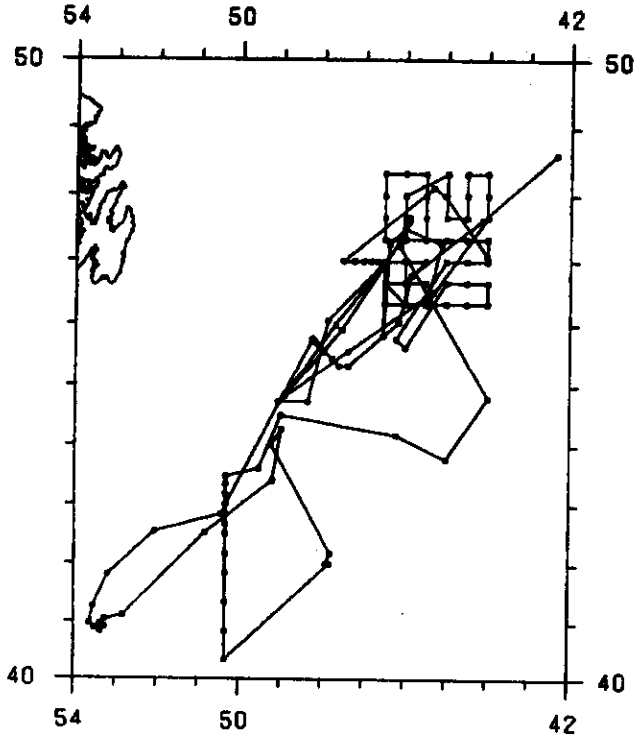
CRUISE 180383021 1/11/83 - 12/11/83 159 STATIONS

Figure A36.



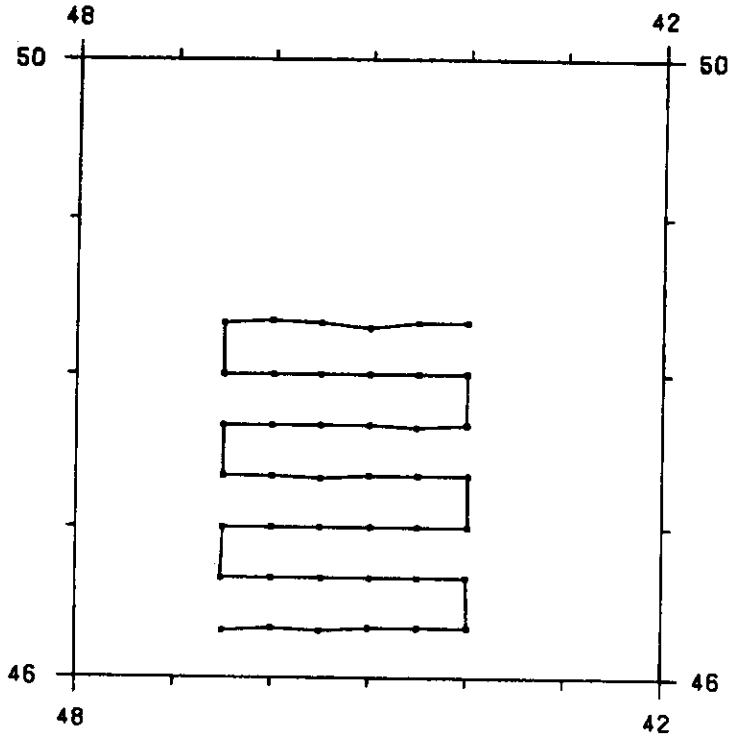
CRUISE 90SU82026 14/10/82 - 20/ 2/83 139 STATIONS

Figure A37.



CRUISE 90KK83002 1/ 3/83 - 19/ 4/83 117 STATIONS

Figure A38.



CRUISE 90GE83027 24/ 5/83 - 31/ 5/83 42 STATIONS

Figure A39.

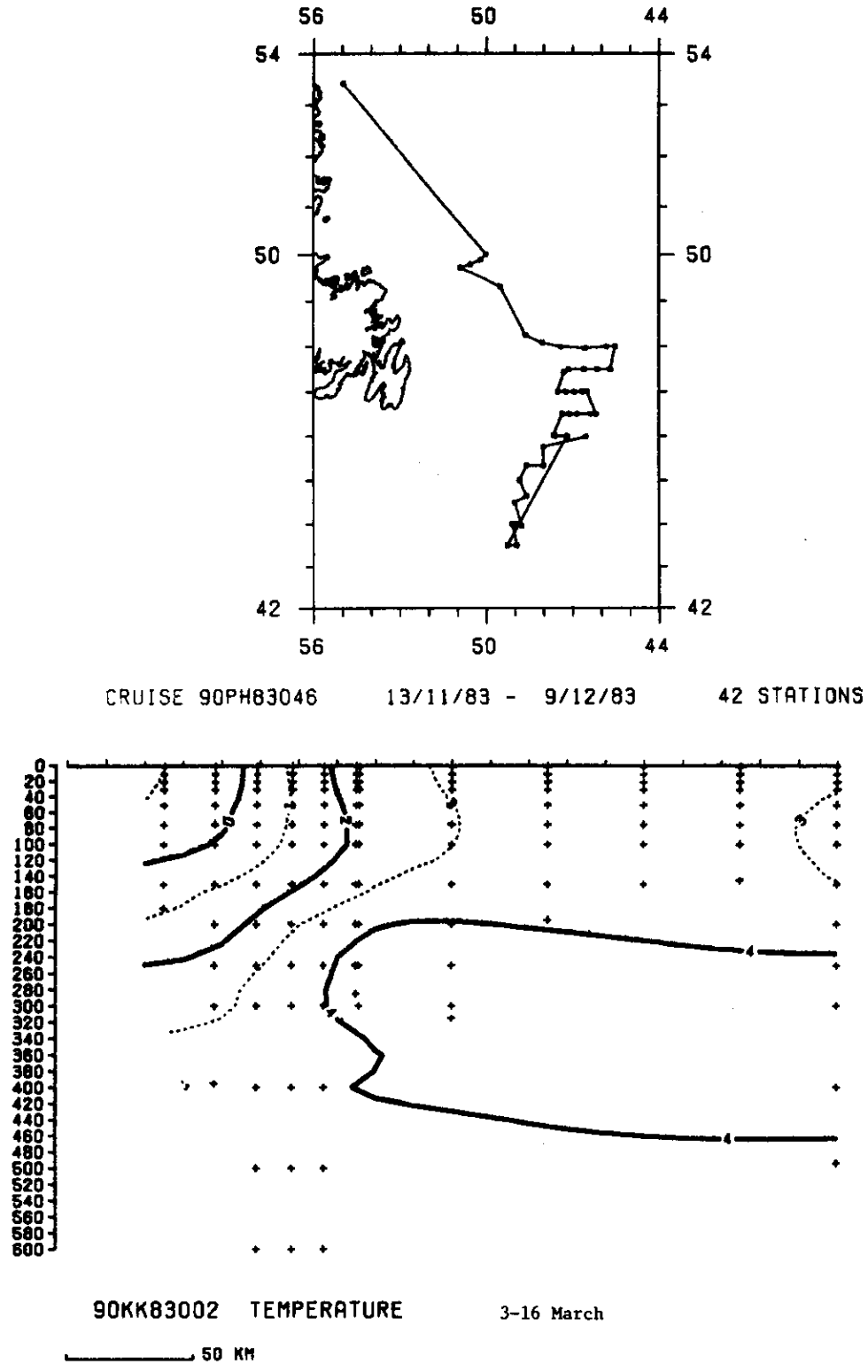


Figure B1. Stations along the NAFO Flemish Cap standard section.
Left to right is west to east for standard stations 7 to 18.

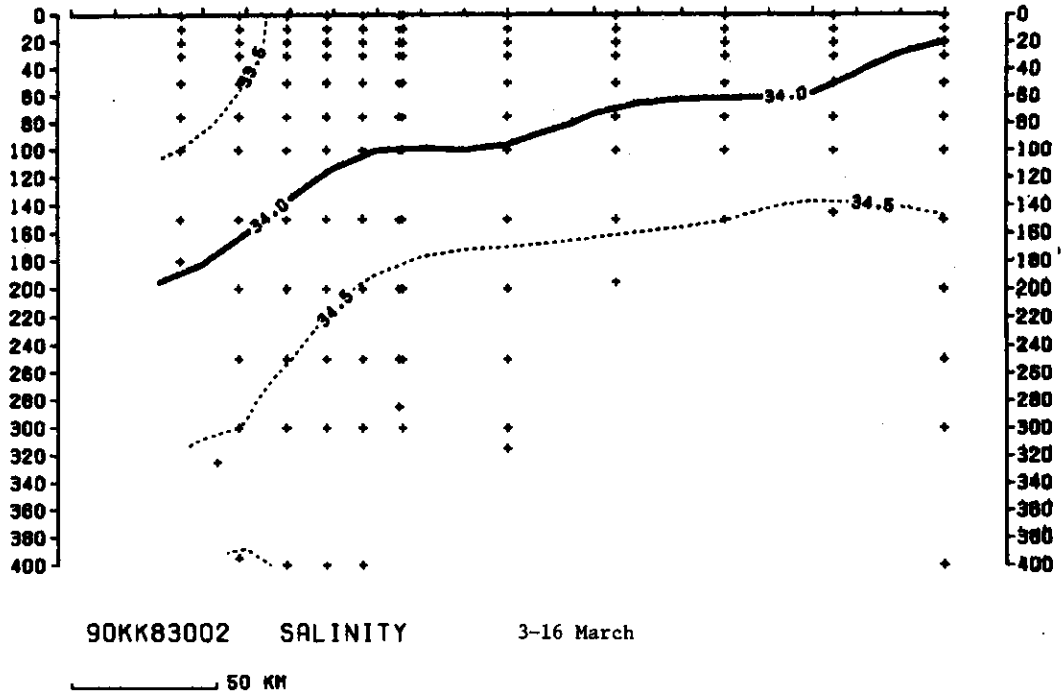


Figure B2. Stations along the NAFO Flemish Cap standard section.
Left to right is west to east for standard stations 7 to 18.

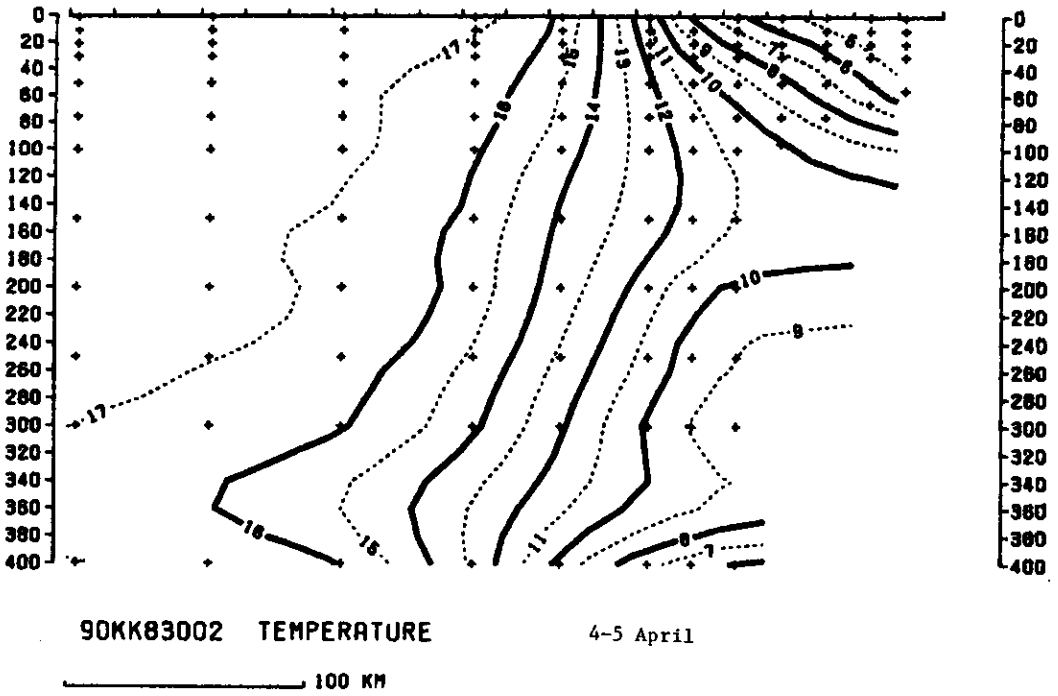


Figure B3. Stations along NAFO standard section CG-4 (Soviet 2-A).
Left to right is south to north for standard stations 7 to 16.

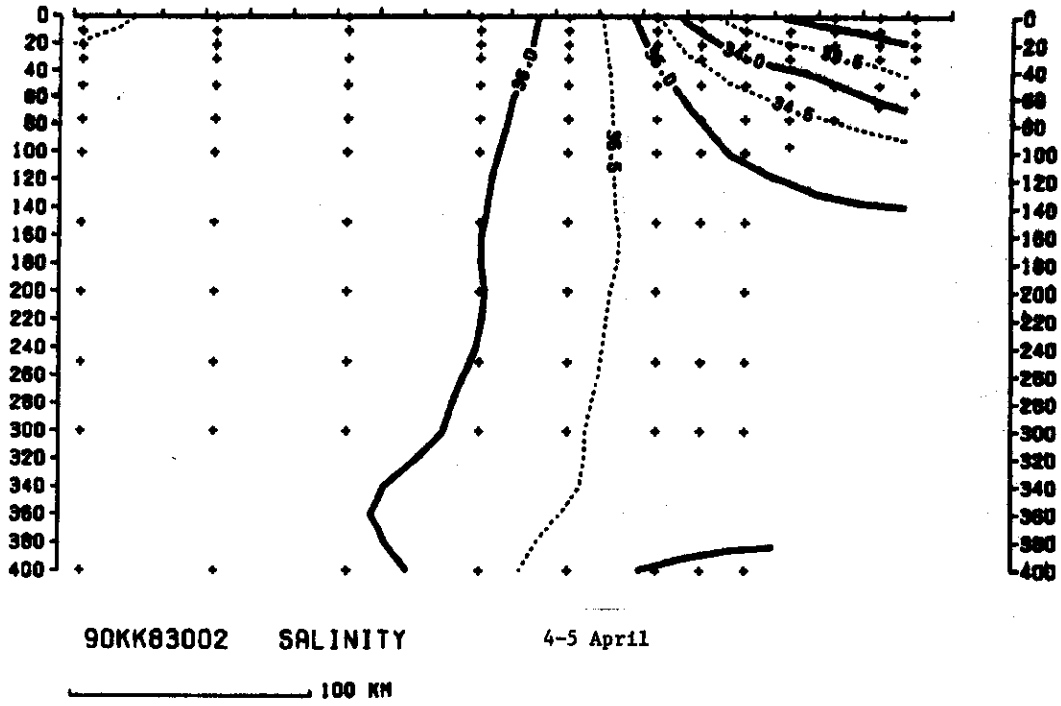


Figure B4. Stations along NAFO standard section CG-4 (Soviet 2-A).
Left to right is south to north for standard stations 7 to 16.

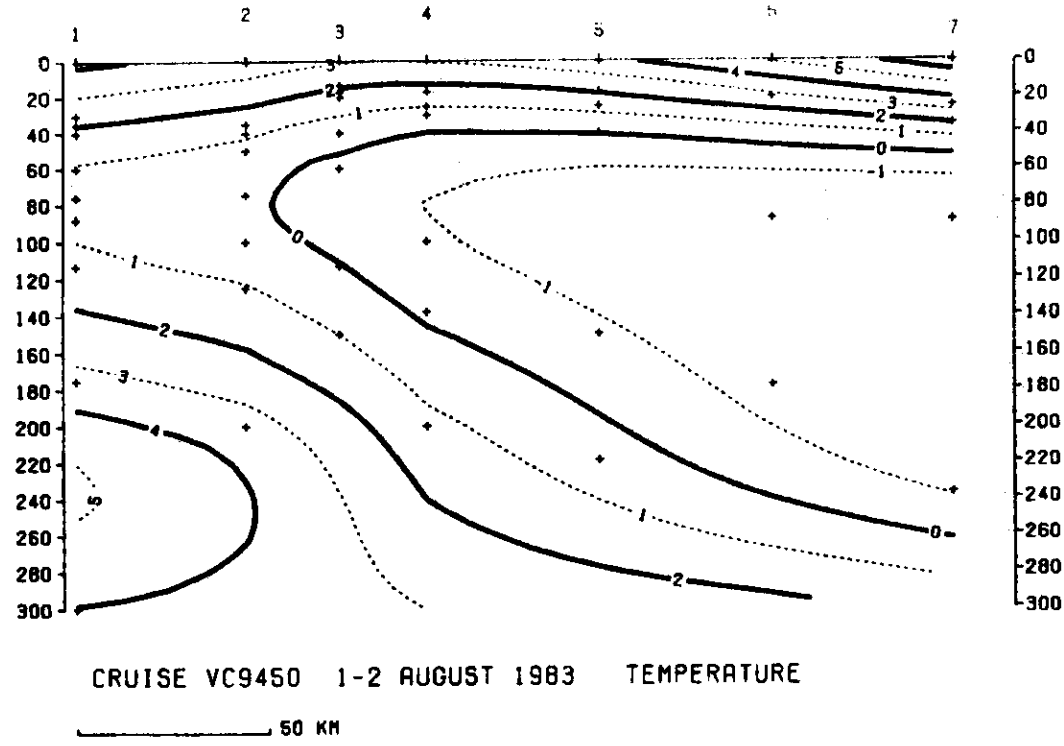


Figure B5. Stations along the NAFO Seal Island standard section.
Left to right is west to east for standard stations 1 to 9.

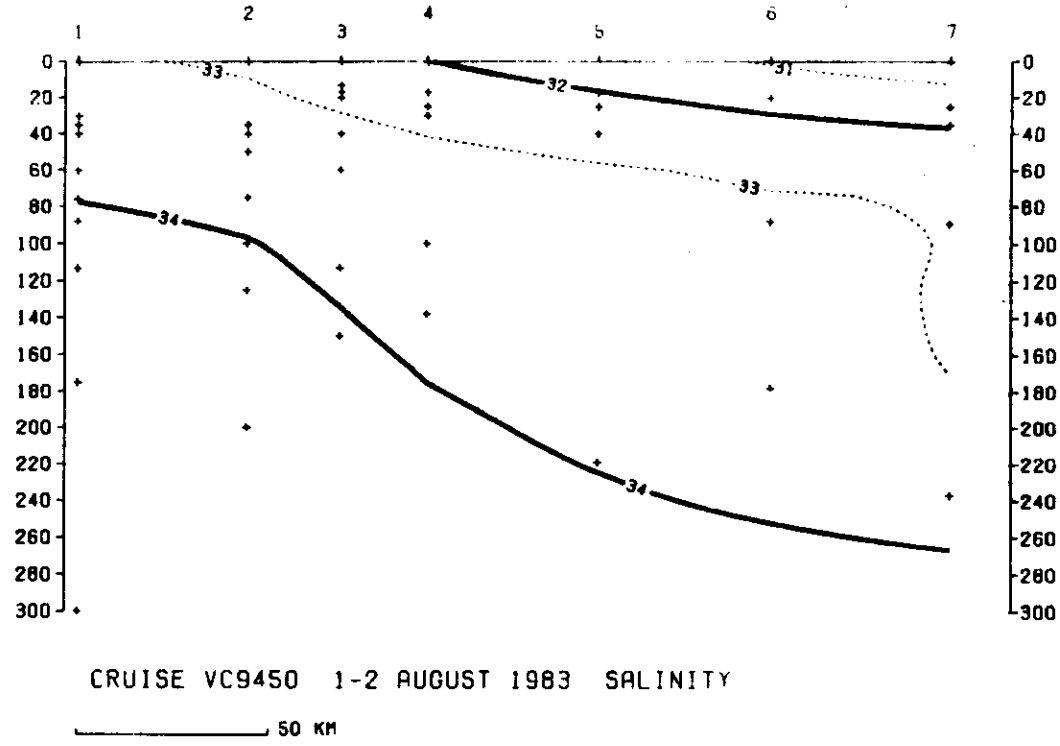


Figure B6. Stations along the NAFO Seal Island standard section.
Left to right is west to east for standard stations 1 to 9.

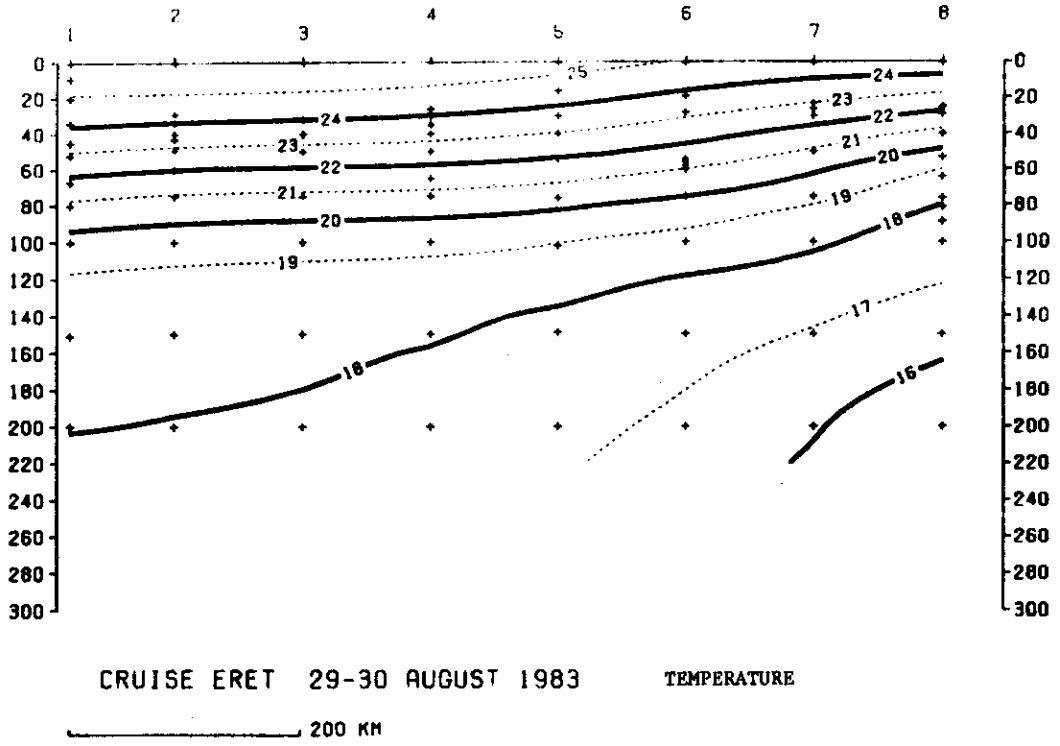


Figure B7. Stations along NAFO standard section CG-4 (Soviet 2-A).
Left to right is south to north.

Figure B8. Stations along the NAFO Seal Island standard section.
Left to right is west to east for standard stations 1 to 9.

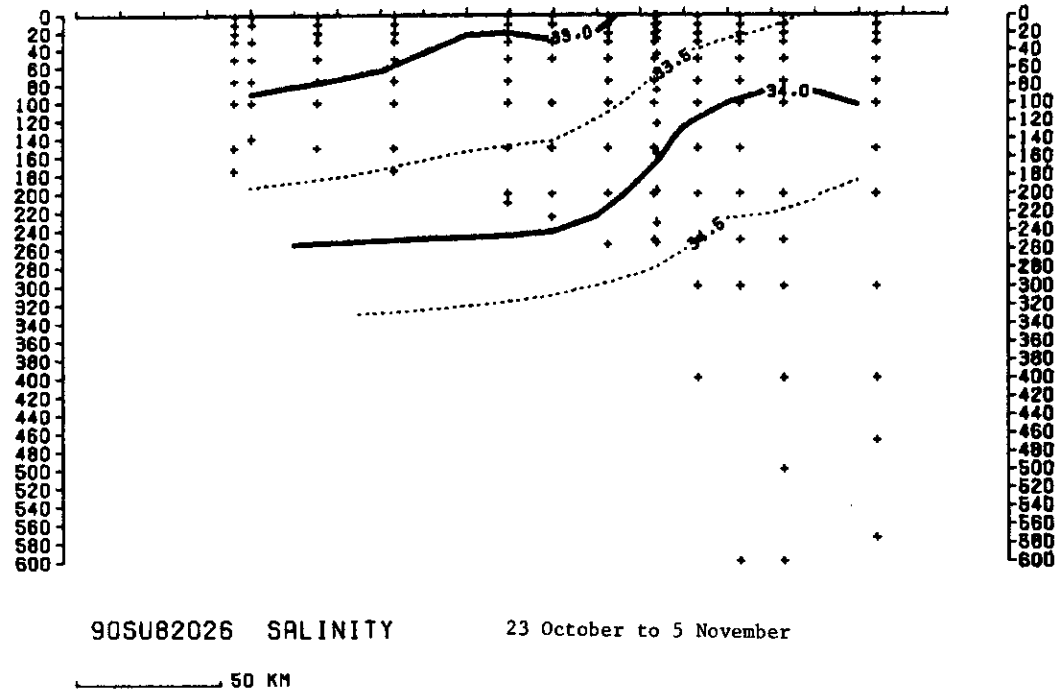


Figure B9. Stations along the NAFO Seal Island standard section.
Left to right is west to east for standard stations 1 to 9.

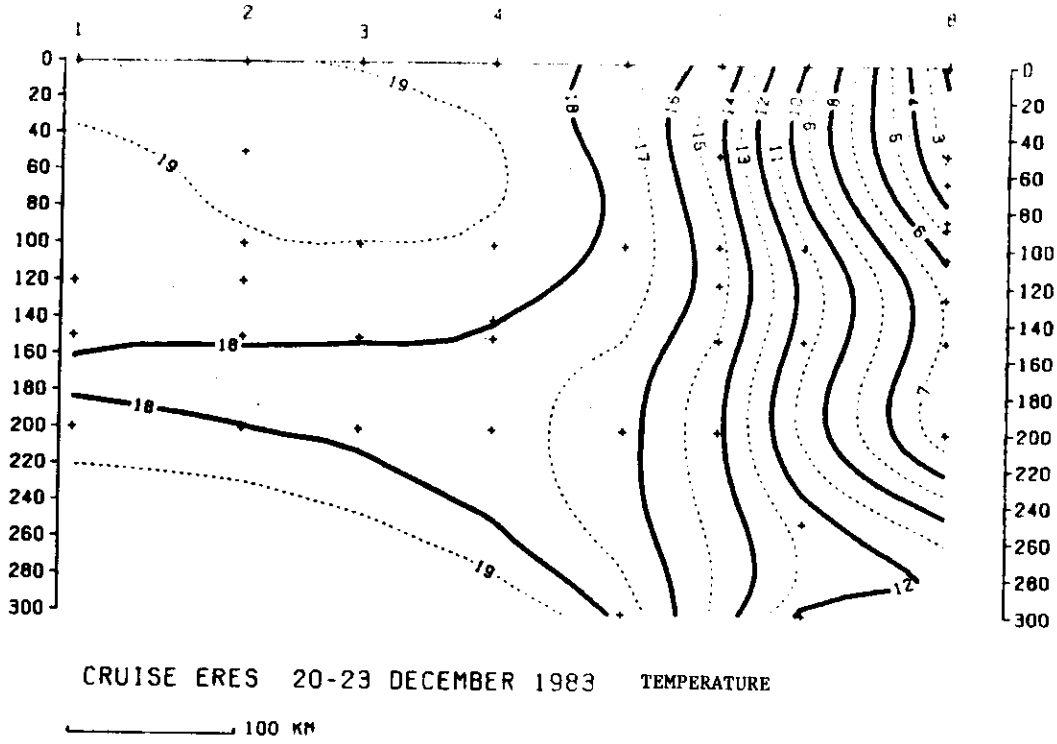


Figure B10. Stations along the NAFO standard section CG-4 (Soviet 2-A). Left to right is south to north.

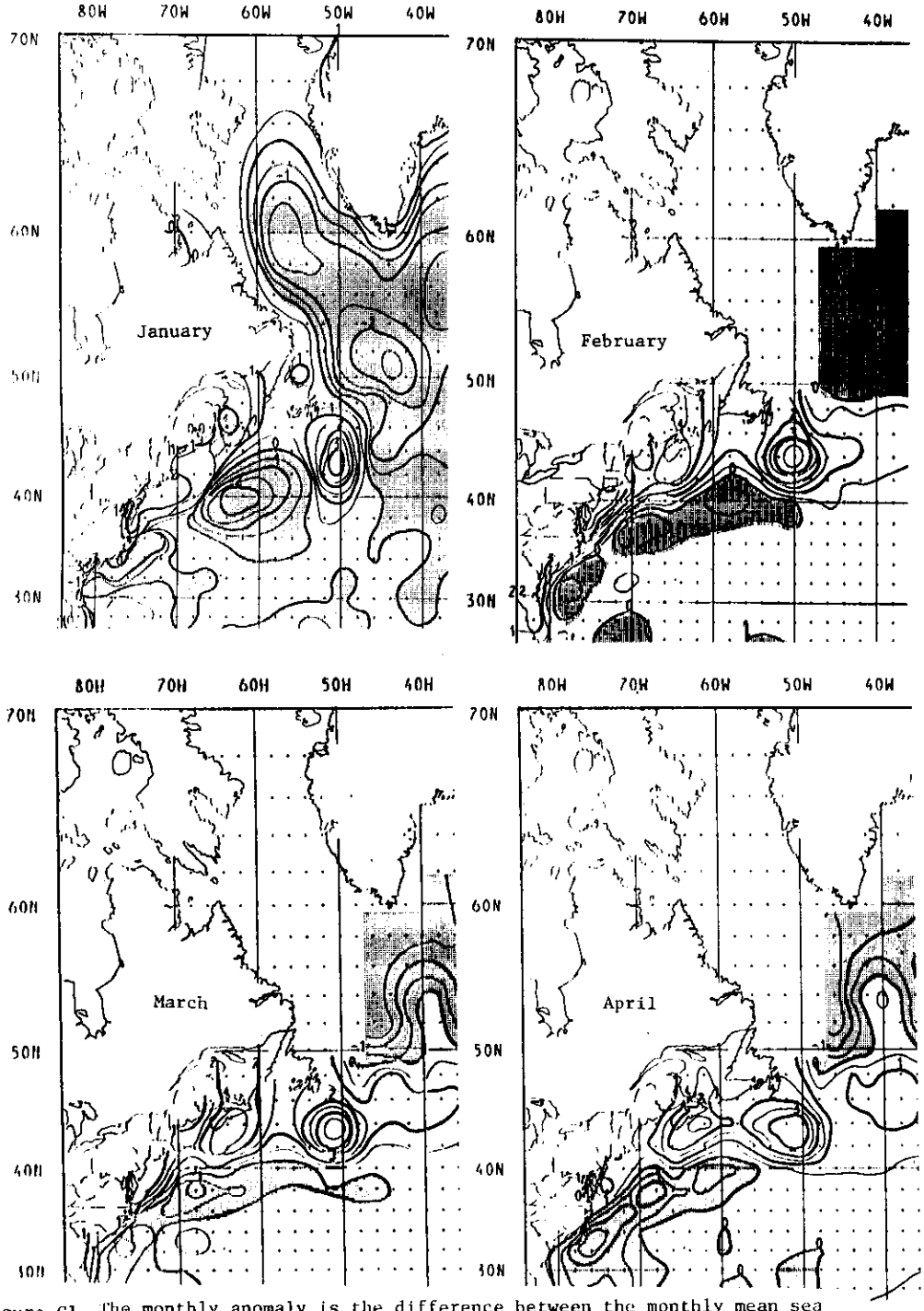


Figure C1. The monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value. The shading shows where the monthly mean is colder than climatology. The contour interval is 0.5 degrees C.

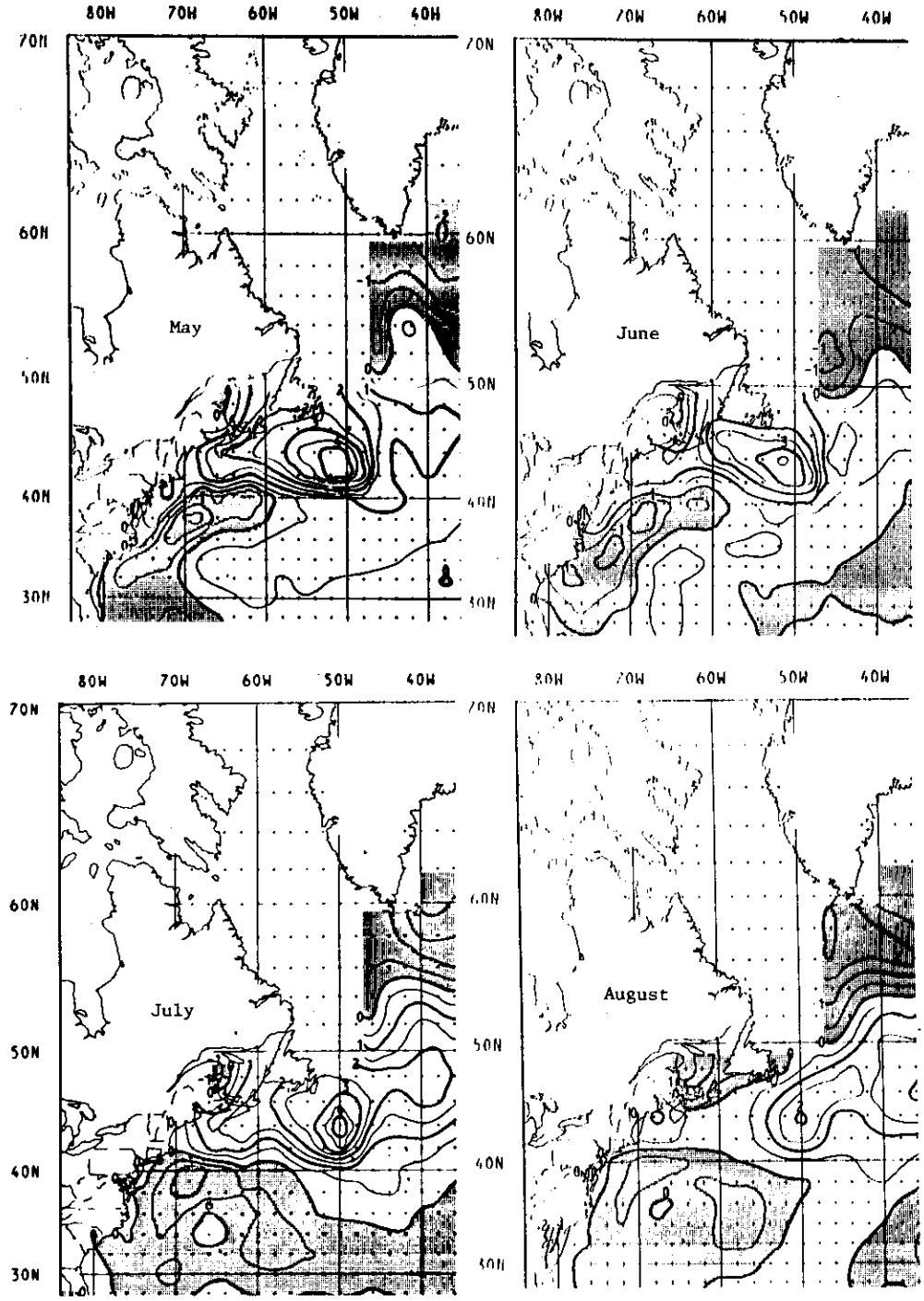


Figure C2.

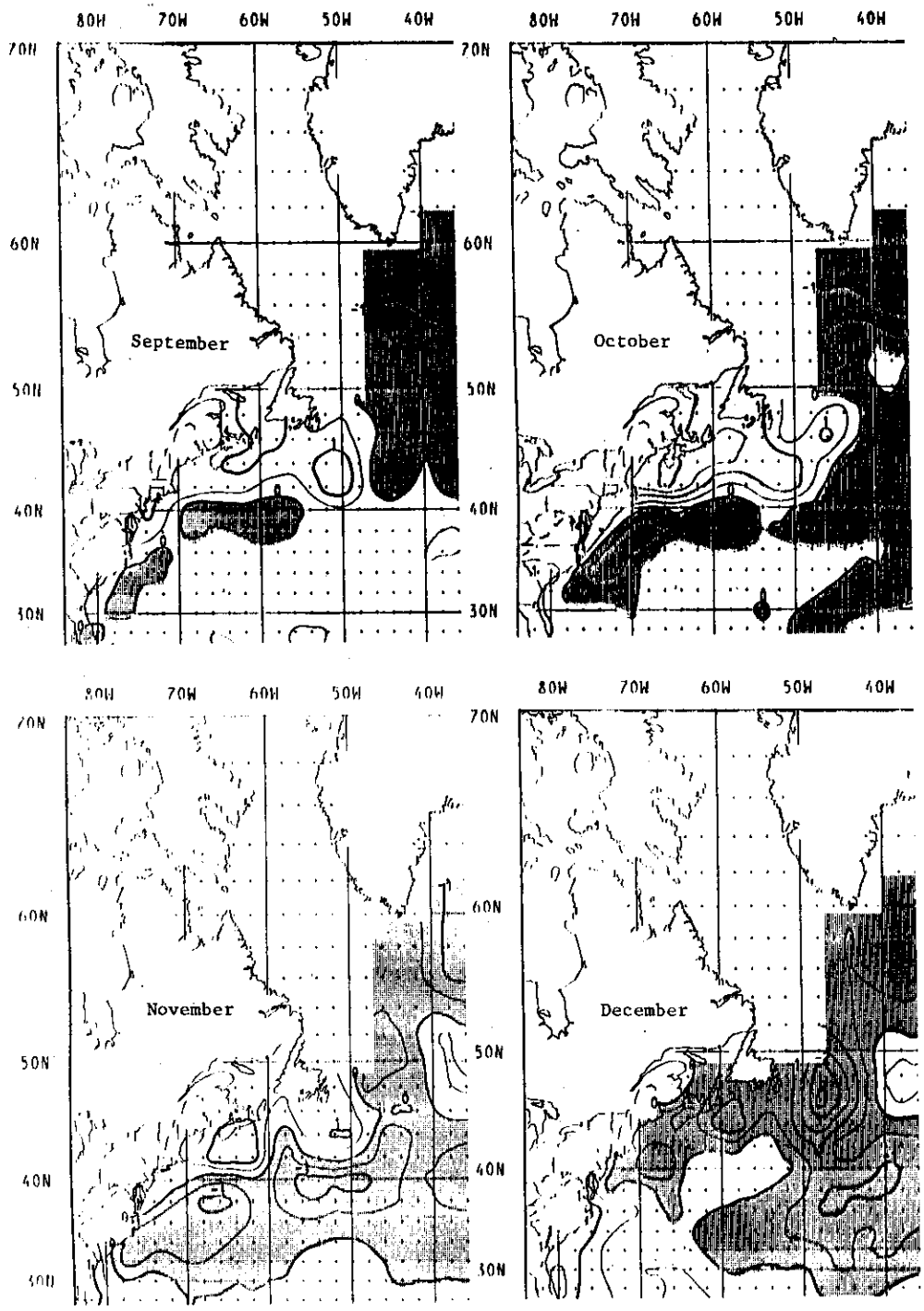

80W
70W
60W
50W
40W
70N
60N
50N
40N
30N
September
October
November
December

Figure C3.