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Report of the International Ice Patrol in the North Atlantic

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1992 Season
Bulletin No. 78
CG-188-47

U.S. Department of Transportation

United States Coast Guard

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2100 Second Street S.W
Washington, DC 20593-0001
Staff Symbol: G-NIO
Phone: (202) 267-1450

Bulletin No. 78

REPORT OF THE INTERNATIONAL ICE PATROL IN THE NORTH ATLANTIC

Season of 1992

CG-188-47

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Forwarded herewith is bulletin No. 78 of the International Ice Patrol, describing the Patrol's services, ice observations and conditions during the 1992 season.

W. J. ECKER
Chief, Office of Navigation Safety
and Waterway Services

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International Ice Patrol 1992 Annual Report

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Introduction

This is the 78th annual report of the International Ice Patrol (IIP). It contains information on Ice Patrol operations, environmental conditions, and ice conditions for the 1992 IIP season. The U.S. Coast Guard conducts the International Ice Patrol Service in the North Atlantic under the provisions of U.S. Code, Title 46, Sections 738, 738a through 738d, and the International Convention for the Safety of Life at Sea (SOLAS), 1974, regulations 5-8. This service was initiated shortly after the sinking of the RMS TITANIC on April 15, 1912 and has been provided seasonally since that time.

Commander, International Ice Patrol, working under Commander, Coast Guard Atlantic Area, directs the IIP from offices located in Groton, Connecticut. IIP analyzes ice and environmental data, prepares daily ice bulletins and facsimile charts, and responds to requests for ice information. IIP uses aerial Ice Reconnaissance Detachments and, when necessary, surface patrol cutters to survey the southeastern, southern, and southwestern regions of the Grand Banks of Newfoundland for icebergs. IIP operates an iceberg drift and deterioration model to produce twice-daily radio broadcasts to warn mariners of the limits of all known ice.

Vice Admiral P. A. Welling was Commander, Atlantic Area and Commander J. J. Murray was Commander, International Ice Patrol, until July 24, 1992, when he was relieved by Commander A. D. Summy.

Summary of Operations, 1992

The 1992 IIP year (October 1, 1991 - September 30, 1992) marked the 78th anniversary of the International Ice Patrol, which was established February 7, 1914. IIP's operating area is delineated by 40°N - 52°N, 39°W - 57°W (Figure 1).

IIP's first aerial Iceberg Reconnaissance Detachment (ICERECDET) of the year departed on February 10, and the 1992 IIP season was opened on March 07. From this date until September 26, 1992, an ICERECDET operated from Newfoundland one week out of every two. The season officially closed on September 26, 1992. Coast Guard HC-130H aircraft equipped with the AN/APS-135 Side-Looking Airborne Radar (SLAR) flew 50 ice reconnaissance sorties, logging over 297 flight hours, and Coast Guard HU-25B aircraft equipped with the AN/APS-131 SLAR flew 15 reconnaissance sorties, logging over 41 flight hours.

Table 1
Sources of Sightings Entered into IIP's Drift Model

Sighting Source	Percent of Total
Coast Guard (IIP)	21.6
Ships	23.5
Other Air Recon	47.1
DOD Sources	0.1
Canadian AES	5.0
BAPS	2.6
Other	0.1

Watchstanders at IIP's Operations Center in Groton, Connecticut analyzed the iceberg sighting information from the ICERECDETs, along with sighting information from ships and Atmospheric Environment Service (AES) of Canada sea ice/iceberg reconnaissance flights and other sources. Table 1 shows that air reconnaisance and ships were the major sources of iceberg sighting reports this season. Appendix A lists all ship initiated iceberg sighting reports, including reports of radar targets, regardless of the sighting location. In Appendix A,several targets may have been included in a single report.

As in 1991, AES flew few iceberg reconnaissance flights during 1992 because of a lack of funding. AES did acquire and relay to IIP a minimal amount of iceberg information obtained during sea ice reconnaissance flights. Atlantic Airways, the private company which provides aerial reconnaissance for the Canadian Department of Fisheries and Oceans (DFO) and the oil companies operating on the Grand Banks, continued to forward iceberg data acquired during flights to IIP. The largest concentration of iceberg reports for the 1992 Ice Season were received from Atlantic Airways.

During 1992, the IIP Operations Center received a total of 3170 target sightings within its operations area (40°N - 52°N, 39°W - 57°W) and away from the Newfoundland coast which were entered into IIP's drift model, compared to 4370 target sightings during 1991. Sighting sources and percent of total reports are in Table 1. The 3170 targets entered into IIP's drift model do not represent all of the total targets reported to IIP. Sightings of targets outside IIP's operations area, grounded targets or targets in areas of little or poorly

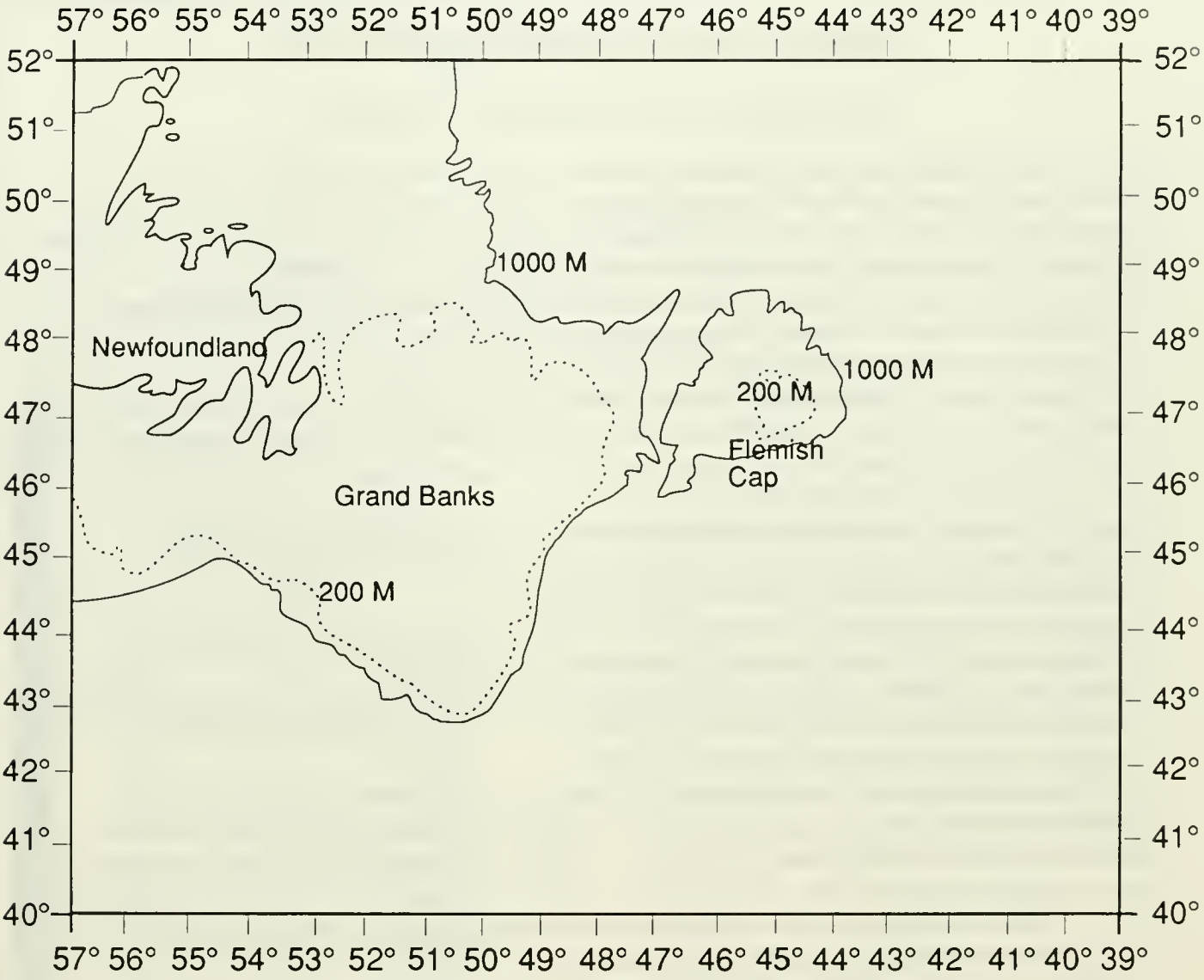

Figure 1
International Ice Patrol's Operation Area showing bathymetry of the Grand Banks of Newfoundland

defined current along the Newfoundland coast were not entered into the model.

Table 2 compares the detected number of icebergs crossing 48°N for each month of 1992 with the monthly mean number of icebergs crossing 48°N from 1983 - 1991, the period during which IIP has been patrolling with SLAR-equipped aircraft. During the 1992 ice year, an estimated 876 icebergs drifted south of 48°N; whereas, during 1991 approximately 1,974 icebergs drifted south of 48°N. Based on the historic iceberg counts of it's entire 78 year history IIP defines those ice years with less than 300 icebergs crossing 48°N as light ice years; those with 300 to 600 crossing 48°N as average; those with 600 to 900 crossing 48°N as heavy; and those with more than 900 crossing 48°N as extreme. Thus, 1992 was a heavy year when compared to the entire history but seems to be about average for the SLAR years.

IIP's computer model consists of one routine which predicts the drift of each iceberg and another which predicts the deterioration of each. The drift prediction program uses a historical current file which is modified weekly using satellite-tracked ocean drifting buoy data, thus taking into account local, short-term, current fluctuations. Murphy and Anderson (1985) described and evaluated the IIP drift model.

The IIP iceberg deterioration program uses daily sea surface temperature and wave height information from the U.S. Navy Fleet Numerical Oceanography Center (FNOC) to predict the melt of icebergs. Anderson (1983) and Hanson (1987) described the IIP deterioration model in detail. It is the combined ability of the SLAR to detect icebergs in all weather and IIP's computer models to estimate iceberg drift and deterioration which enables IIP to schedule aerial iceberg surveys every other week rather than every week.

Six satellite-tracked ocean drifting buoys were deployed to provide operational data for IIP's iceberg drift model. Five buoys were the small drifting buoys which IIP evaluated during the 1990 and 1991 IIP oceanographic cruises. One buoy was a World Ocean Circulation Experiment (WOCE) drifter. The WOCE buoy will be the standard used by IIP in the upcoming years. All buoys were equipped with temperature sensors and drogued at 50 meters. Drift data from the buoys are discussed in the IIP 1992 Drifting Buoy Atlas, which is available upon request.

Table 2
Number of Icebergs Detected

Number of icebergs South of 48°N during 1992 compared to the average for the period 1983-91, the SLAR reconnaissance period.

	Avg 1983-91	1991-92
OCT 91	1	0
NOV 91	1	0
DEC 91	2	0
JAN 92	2	0
FEB 92	31	69
MAR 92	89	53
APR 92	257	99
MAY 92	196	230
JUN 92	218	103
JUL 92	105	171
AUG 92	24	132
SEP 92	5	19
Era Average	931	876

Iceberg Reconnaissance and Communications

During the 1992 Ice Patrol year, 167 aircraft sorties were flown in support of IIP, 68 were transit flights to St. John's, Newfoundland, IIP's base of operations since 1989, and 65 were ice observation flights made to locate the southwestern, southern, and southeastern limits of icebergs. 34 logistics flights were required to support and maintain the patrol aircraft. Tables 3 and 4 show aircraft use during the 1992 ice year.

Aerial ice reconnaissance was conducted with SLAR-equipped U. S. Coast Guard HC-130H and HU-25B aircraft. The HC-130H aircraft deployed from Coast Guard Air Station Elizabeth City, North Carolina, and HU-25B aircraft deployed from Coast Guard Air Station Cape Cod, Massachusetts.

During the 1992 season, IIP successfully deployed 128 Air-deployable eXpendable BathyThermographs (AXBTs). The AXBT measures temperature with depth and transmits the data back to the aircraft. Temperature data from the AXBTs were sent to the Canadian Meteorological and Oceanographic Center (METOC) in Halifax, Nova Scotia, Canada, the U.S. Naval Eastern Oceanography Center (NEOC) in Norfolk, Virginia, and FNOC for use as inputs into ocean temperature models. IIP directly benefits from its AXBT deployments by having improved ocean temperature data provided to its iceberg deterioration model. To further enhance the quality of environmental data used in its iceberg models, IIP also provided weekly drifting buoy sea surface temperature (SST) and drift histories and SLAR ocean feature analyses to METOC and NEOC for use in water mass and SST analyses. Canada's Maritime Command/ Meteorological and Oceanographic Centre provided the AXBT probes for IIP use, significantly increasing the temperature data IIP could obtain.

On April 19, 1992, IIP paused to remember the 80th anniversary of the sinking of the RMS TITANIC. During an ice reconnaissance patrol, two memorial wreaths were placed near the site of the sinking to commemorate the nearly 1500 lives lost.

Table 3
Aircraft Used During The 1992 IIP Year

Sorties

Aircraft	Transit	Patrol	Research	Logistics	Total
HC-130H	57	50	0	19	126
HU-25B	11	15	0	15	41
Total	68	65	0	34	167

Flight Hours

Aircraft	Transit	Patrol	Research	Logistics	Total
HC-130H	165.1	307.2	0	62.8	525.1
HU-25B	17.5	41.0	0	30.0	88.5
Total	182.6	348.2	0	92.8	623.6

Table 4
Iceberg Reconnaissance Sorties By Month

	HU-25B		HC-130		TOTAL	
MONTH	SORTIES	FLIGHT HOURS	SORTIES	FLIGHT HOURS	SORTIES	FLIGHT HOURS
JAN	0	0	0	0	0	0
FEB	1	3.2	3	16.0	4	19.2
MAR	4	11.6	4	26.0	8	37.6
APR	0	0	7	46.5	7	46.5
MAY	0	0	8	53.0	8	53.0
JUN	0	0	8	47.1	8	47.1
JUL	10	26.2	5	27.3	15	53.5
AUG	0	0	8	50.5	8	50.5
SEP	0	0	7	40.8	7	40.8
TOTAL	**15**	**41.0**	**50**	**307.2**	**65**	**348.2**

Table 5
Iceberg and SST Reports

Number of ships furnishing Sea Surface Temperature (SST) reports	39
Number of SST reports received	212
Number of ships furnishing ice reports	259
Number of ice reports received	668
First Ice Bulletin	071200Z MAR 92
Last Ice Bulletin	261200Z SEP 92
Number of facsimile charts transmitted	204

The HC-130 'Hercules' aircraft has been the preliminary platform for Ice Patrol aerial reconnaissance since 1963. This was the fifth year for the HU-25B to serve as an Ice Patrol platform. The extended iceberg distribution throughout most of the season warranted the use of the HC-130 rather than the HU-25B. Thus the HU-25B logged significantly less IIP flight hours than the HC-130. The total number of flight hours and sorties increased slightly from 576.3 flight hours / 151 sorties in 1991 to 623.6 flight hours / 167 sorties in 1992.

Each day during the ice season, IIP prepared the 0000Z and 1200Z ice bulletins warning mariners of the southwestern, southern, and southeastern limits of icebergs. U. S. Coast Guard Communications Station Boston, Massachusetts, NMF/NIK, and Canadian Coast Guard Radio Station St. John's Newfoundland/VON were the primary radio stations responsible for the dissemination of the ice bulletins. Other transmitting stations for the bulletins included METOC Halifax, Nova Scotia/CFH, Canadian Coast Guard Radio Station Halifax/VCS, Radio Station Bracknel, UK/GFE, and U.S. Navy LCMP Broadcast Stations Norfolk/NAM, Virginia, and Key West, Florida.

IIP also prepared a daily facsimile chart graphically depicting the limits of all known ice for broadcast at 1600Z. U. S. Coast Guard Communications Station Boston assisted with the transmission of these charts. Canadian Coast Guard Radio Station St. John's/VON and U.S. Coast Guard Communications Station Boston/NIK provided special broadcasts as required.

As in previous years, The International Ice Patrol requested that all ships transiting the area of the Grand Banks report ice sightings, weather, and sea surface temperatures via Canadian Coast Guard Radio Station St. John's/VON or U. S. Coast Guard Communications Station Boston/NIK. Response to this request is shown in Table 5. Appendix A lists all contributors. IIP received relayed information from the following sources during the 1992 ice year: Canadian Coast Guard Marine Radio Station St. John's VON; Canadian Coast Guard Vessel Traffic Centre/Ice Operations St. John's; Ice Centre Ottawa; Canadian Coast Guard Marine Radio Halifax/VCS; ECAREG Halifax, Canada; U.S. Coast Guard Communications and Master Station Atlantic, Chesapeake, Virginia; and U.S. Coast Guard Automated Merchant Vessel Emergency Response/Operations Systems Center, Martinsburg, WV. Commander, International Ice Patrol extends a sincere thank you to all stations and ships which contributed reports. The CAST POLAR BEAR was the number one reporter.

Canadian Forces 727th Communications Squadron/St. John's Military Radio served as the primary facility for air ground communications, and the 726th Communications Squadron/Halifax Military Radio was the secondary facility.

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Discussion of Ice and Environmental Conditions

Background

The Labrador Current, aided by northwesterly winds in winter, is the main mechanism transporting icebergs south to the Grand Banks. In addition, the relatively cold water of the Labrador Current keeps the deterioration of icebergs in transit to a minimum.

The wind direction and intensity along the Labrador and Newfoundland coasts has a significant effect on iceberg drift. Icebergs can be accelerated along or driven out of the main flow of the Labrador Current (Figure 2). Departure from the Labrador Current normally slows their southerly drift and, in many cases, speeds up their rate of deterioration.

Sea ice protects the icebergs from wave action, the major agent of iceberg deterioration. If sea ice extends to the south and over the Grand Banks of Newfoundland, the icebergs will be protected longer as they drift south. When the sea ice retreats in the spring, large numbers of icebergs will be left behind on the Grand Banks. If this time of sea ice retreat is delayed by below normal air temperatures, the icebergs will be protected longer, and a longer than normal ice season can be expected. Less southerly sea ice extent or above normal air temperatures may result in a shorter season. Sea ice also acts to impede the transport of icebergs. The degree depends on the concentration of the sea ice and the size of the iceberg. The greater the sea ice concentration the greater the affect on iceberg drift. The larger the iceberg the less sea ice affects its drift. Sea ice is itself an active medium, causing iceberg movement, continually moving toward the ice edge where melt occurs. Icebergs in sea ice will eventually reach open water unless grounded.

The 1992 Season

The sea ice information was derived from the Thirty Day Ice Forecast for Northern Canadian Waters published monthly by Ice Centre Ottawa, Atmospheric Environment Service (AES) of Canada, and information on the mean sea ice extent was obtained from Ice Limits Eastern Canadian Seaboard, Ice Centre Ottawa, Atmospheric Environment Service, 1989. Figures 3 to 14 compare sea ice extents during the 1992 IIP year to mean sea ice extents. Environmental information was obtained from the Mariner's Weather Log and AES Thirty Day Ice Forecasts. Figures 15 to 29 show the Limits of All Known Ice and the sea ice edge for the 15th and 30th of each month of the ice season.

January and February

Sea ice growth along the Labrador Coast and in East Newfoundland was three to four weeks ahead of normal (Figures 6 and 7). The intensification of the usually weak Azores-Bermuda High in conjunction with stronger than normal Icelandic Low created a very steep pressure gradient from the Grand Banks to the Norwegian Sea. The winds over the region were predominantly westerly. The mean air temperatures were lower than normal, approximately minus 6.0°C.

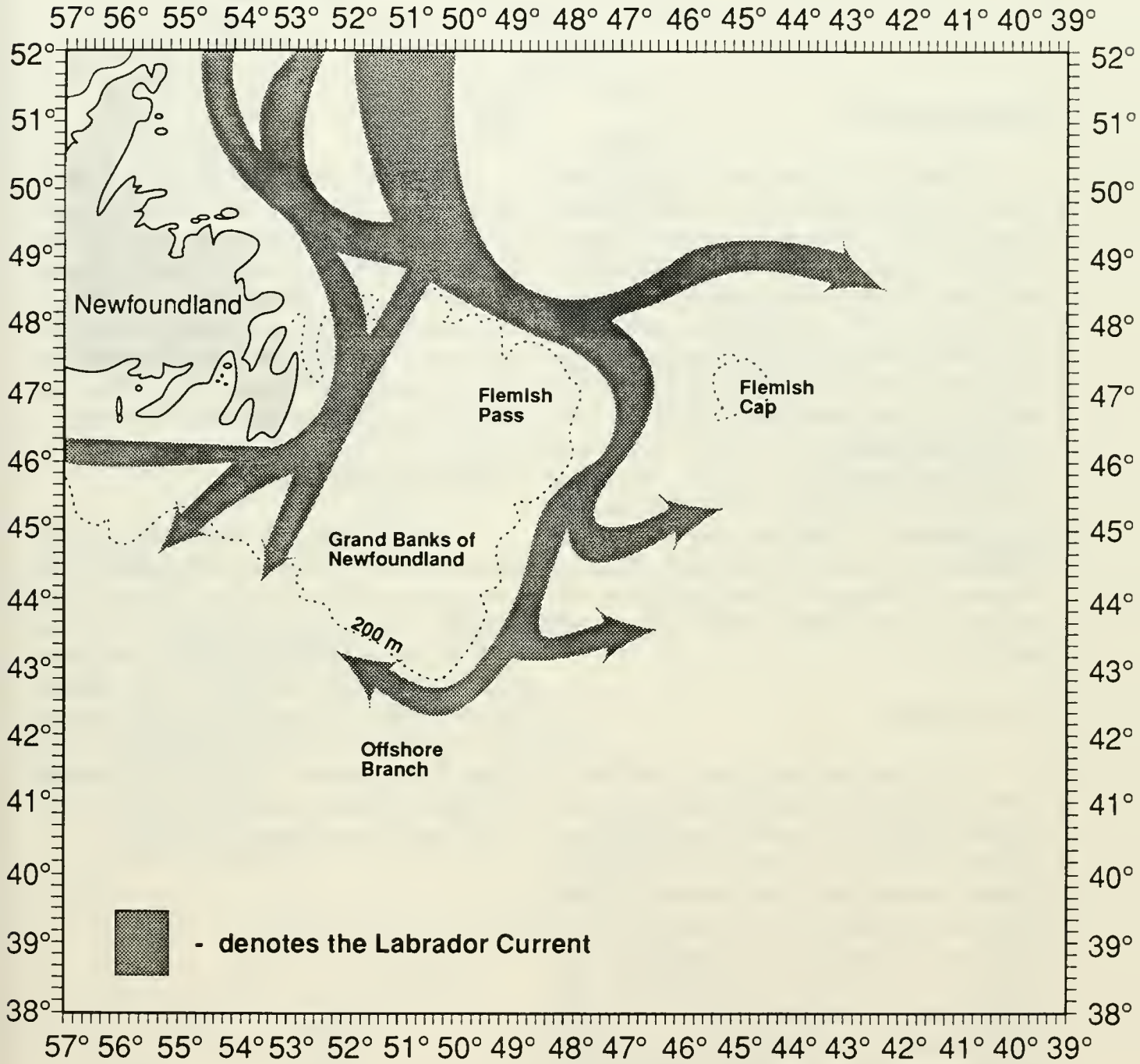

Figure 2
The Labrador Current, the main mechanism for transporting icebergs South to the Grand Banks.

March and April

The sea ice cover was more extensive than normal (Figures 8 and 9). There were 53 icebergs South of 48°N at the end of March and 99 icebergs South of 48°N at the end of April. Mean air temperatures remained below normal (minus 4°C) as cold air persisted over East Newfoundland waters. The gradient between the Azores-Bermuda High and the Icelandic Low remained steep. Storm tracks reflect this gradient and moved, in general, from northeastern North America northeastward to Iceland. The 1992 season opened March 07, 1992 with the IIP Limits of All Known Ice (LAKI) at 44-50°N 40-40°W (Figures 15, 16 and 17). The LAKI at the end of April were 42-10°N 41-50°W (Figures 18 and 19).

May and June

The sea ice continued to extend to 48°N, far beyond the norm for this time of year (Figures 10 and 11). Iceberg distribution and numbers continued to increase through the typically busiest part of the year for the IIP. Southern and Eastern LAKI extended as far south as 41°N and as far east as 39°W (Figures 20, 21, 22 and 23). There were 230 icebergs south of 48°N at the end of May and 103 icebergs south of 48°N at the end of June. A light westerly flow prevailed over most of eastern Newfoundland waters. The mean air temperatures increased steadily and were near mean seasonal values.

July

The sea ice retreated rapidly to north of 55°N (Figure 12). The LAKI retreated as well on 15 July 1992 (Figure 24) and then expanded to 41-20°N on 30 July 1992 (Figures 24 and 25). There was still some evidence of the Icelandic Low between Labrador and Iceland and a light easterly wind prevailed over most of eastern Newfoundland. Mean air temperatures were slightly below normal.

August and September

Sea ice retreated well north of 55°N (Figure 13 and 14). LAKI on 30 August 1992 extended to 44°N and 40°W (Figures 26, 27 and 28). There were 132 icebergs south of 48°N at the end of August. The LAKI were north of 47-20°N and 46-00°W. The 1992 Ice Season closed 26 September 1992 (Figure 29). The Azores-Bermuda High covered most of the North Atlantic. Winds were generally very light and temperatures were near normal in the Grand Banks region.

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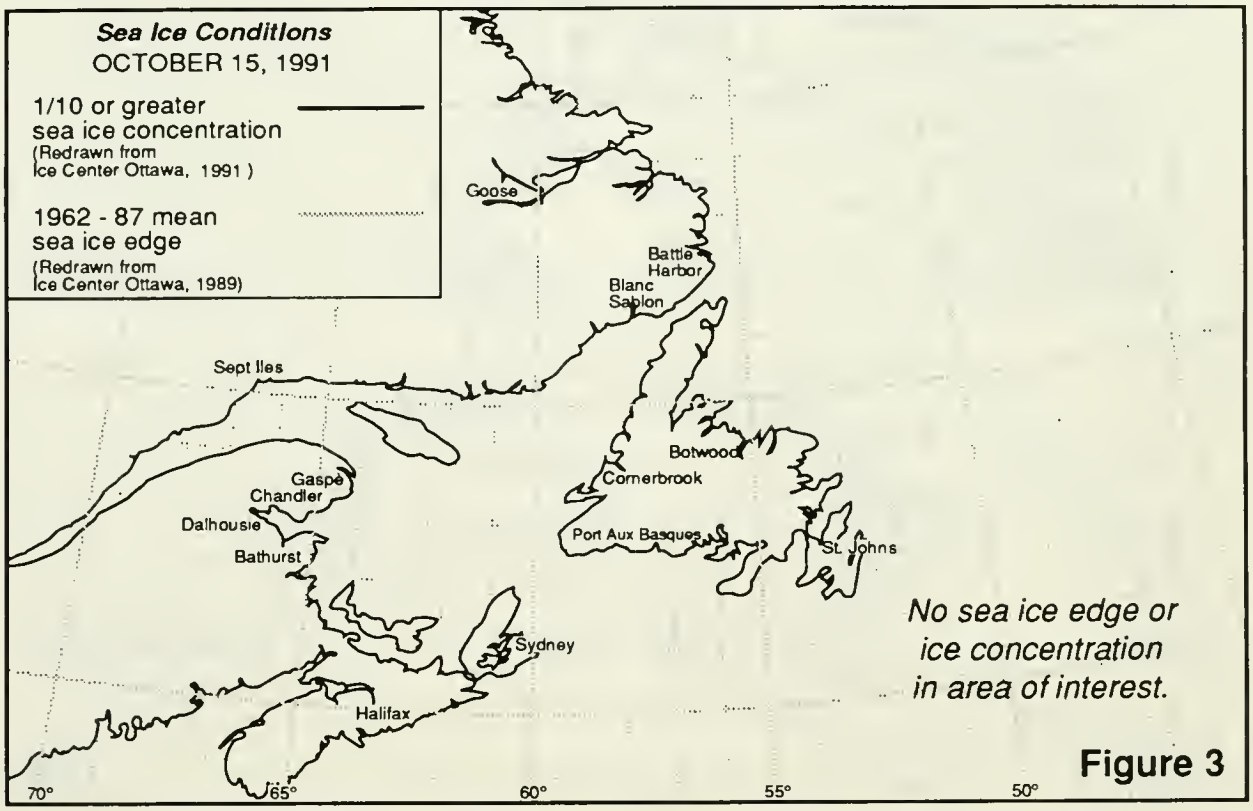
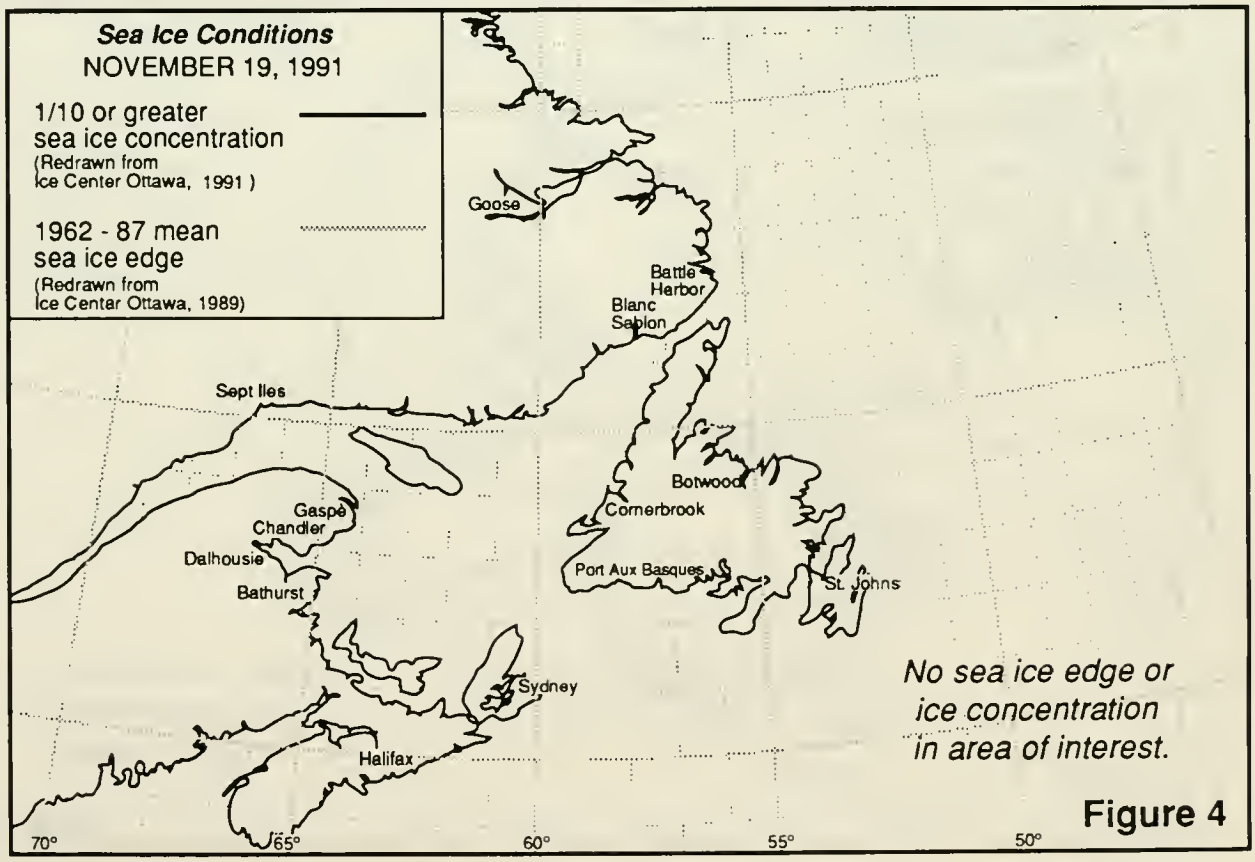


Figure 3



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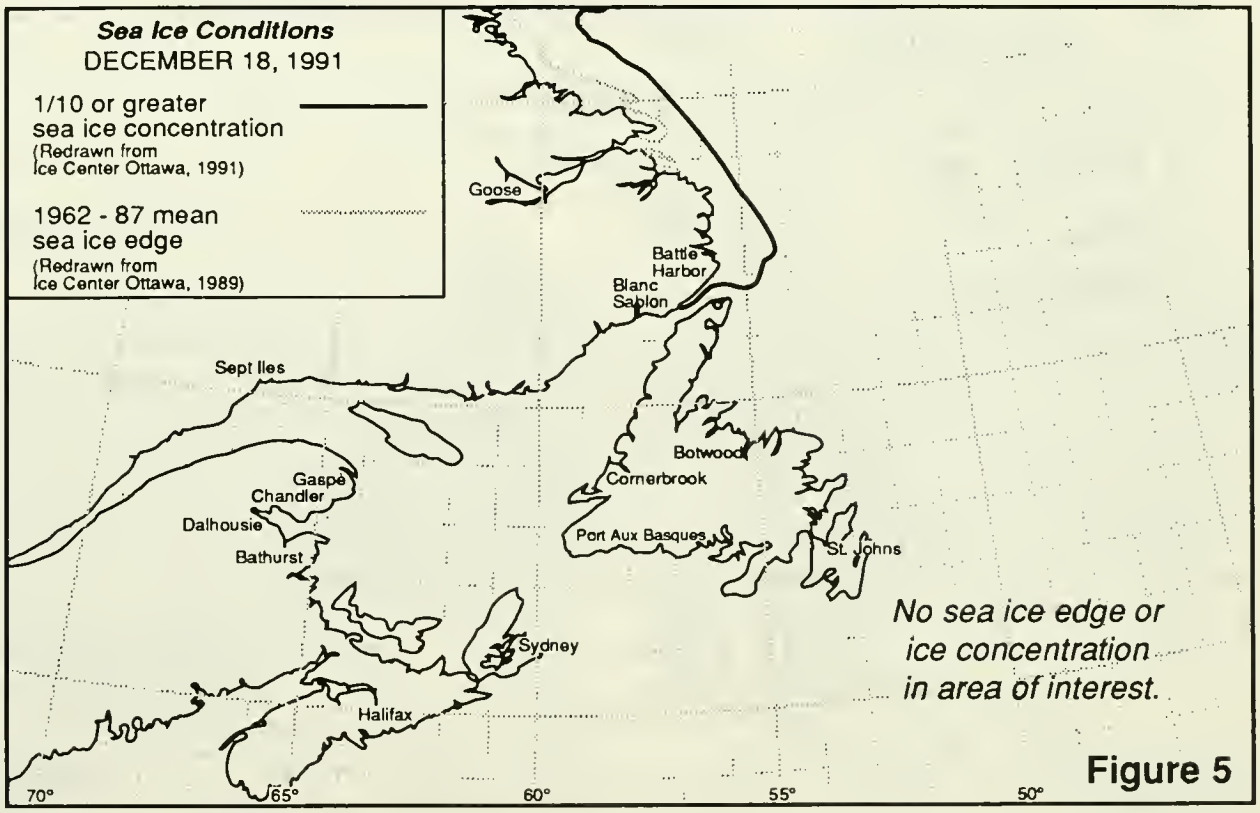
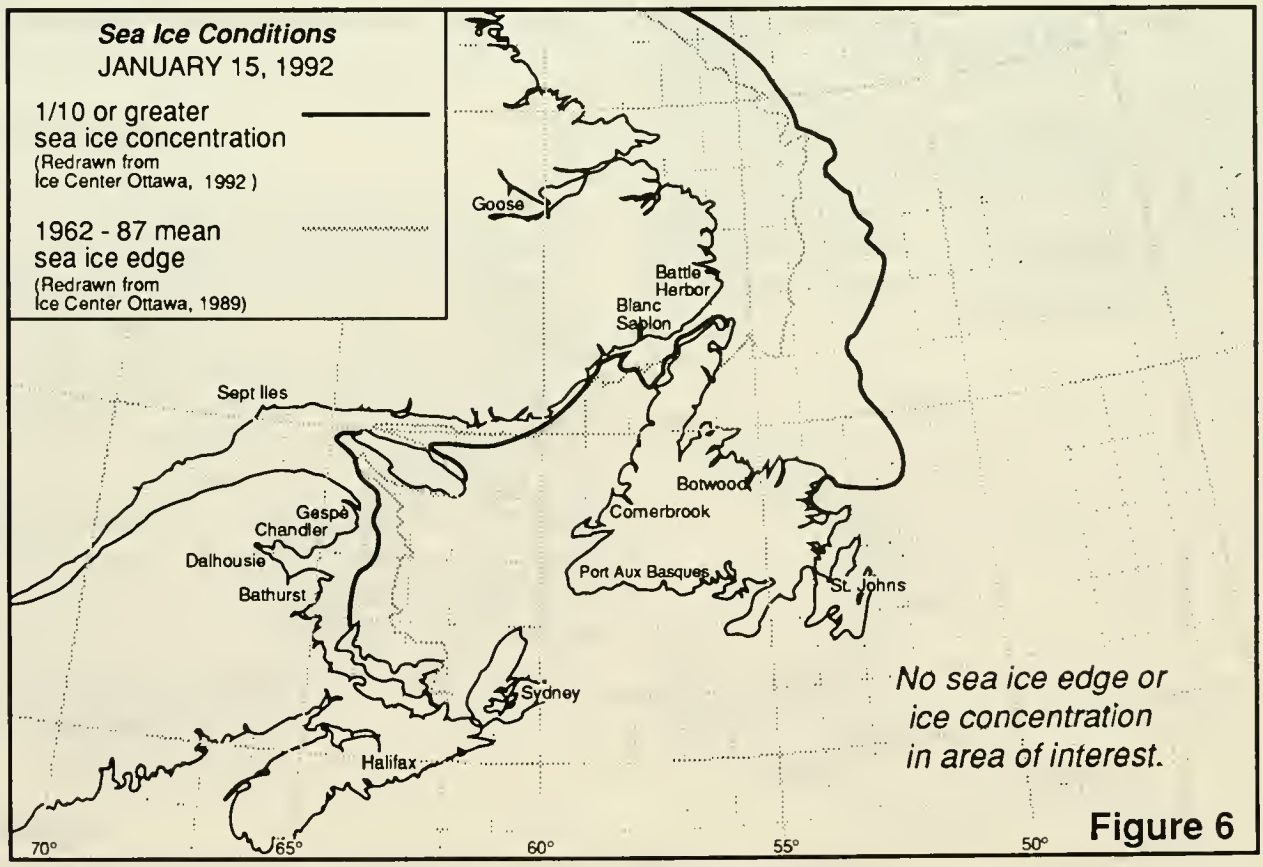


Figure 5



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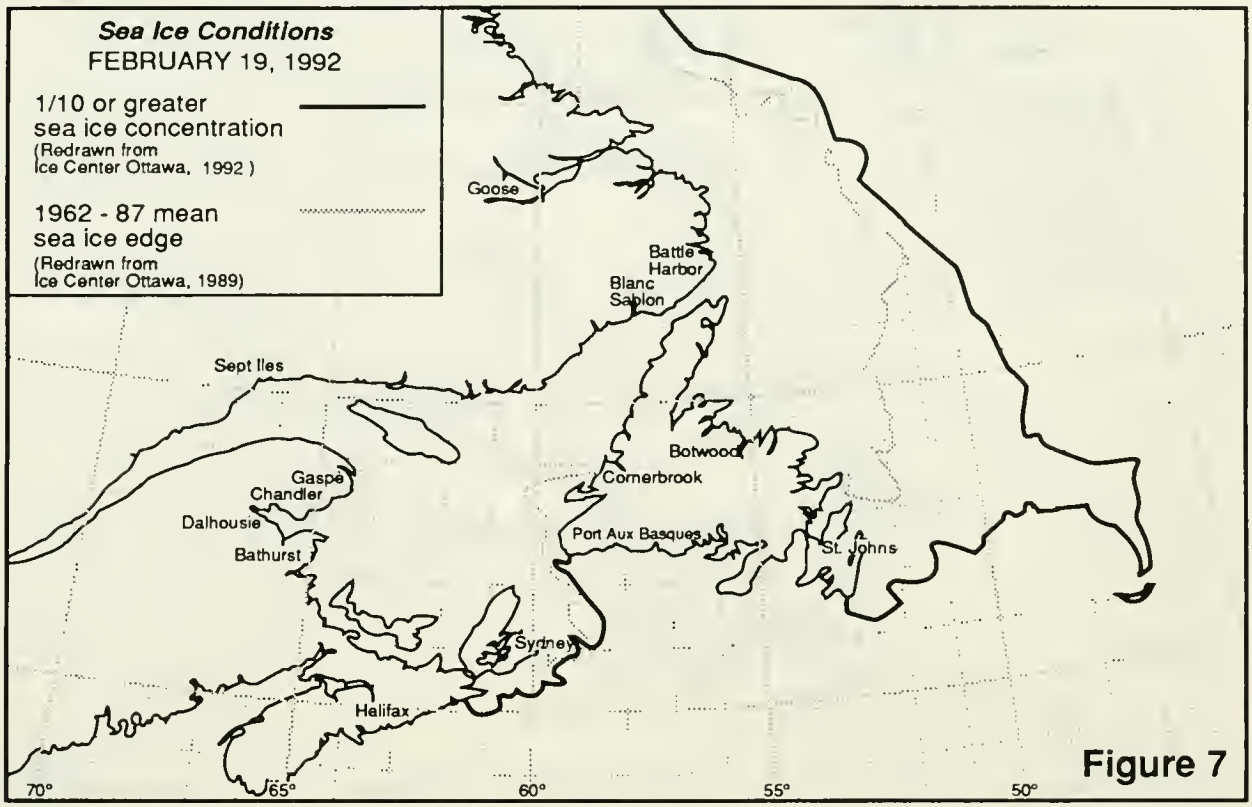

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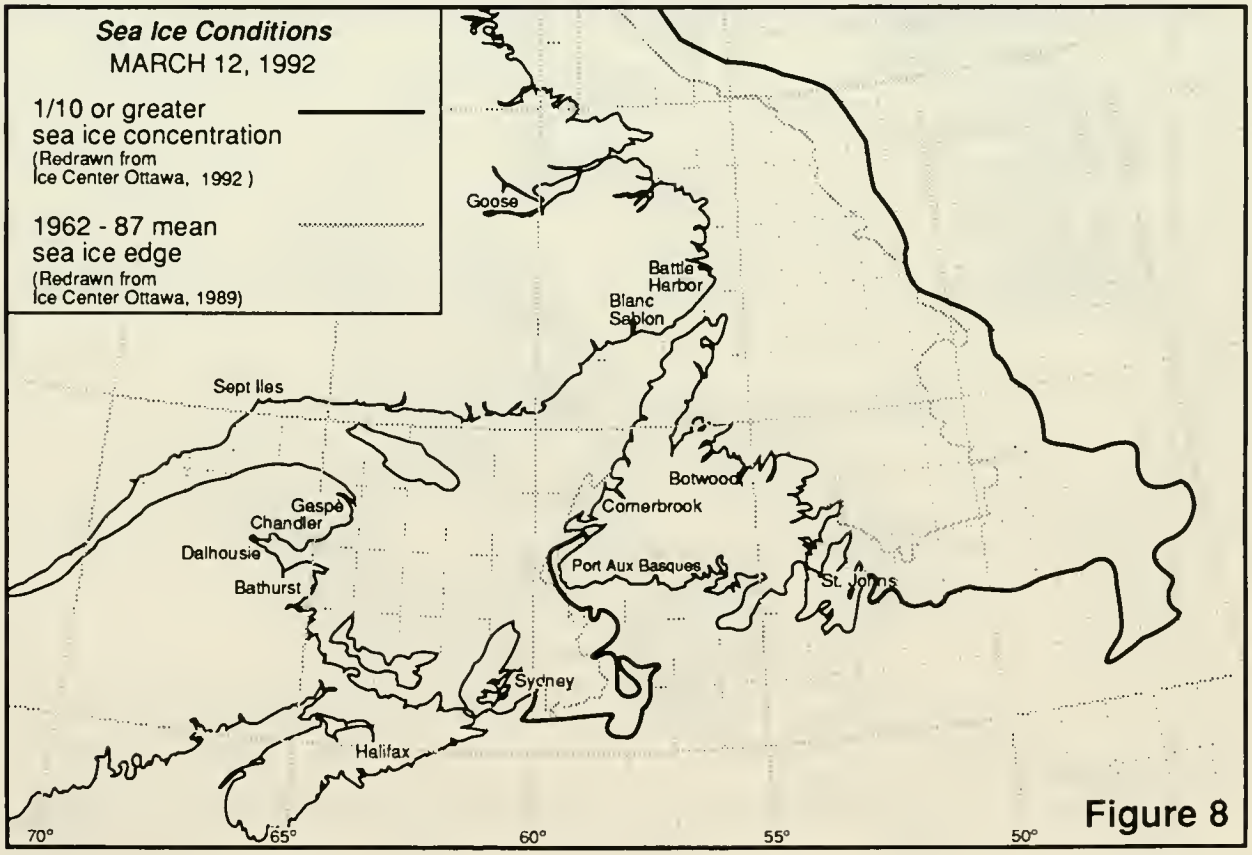
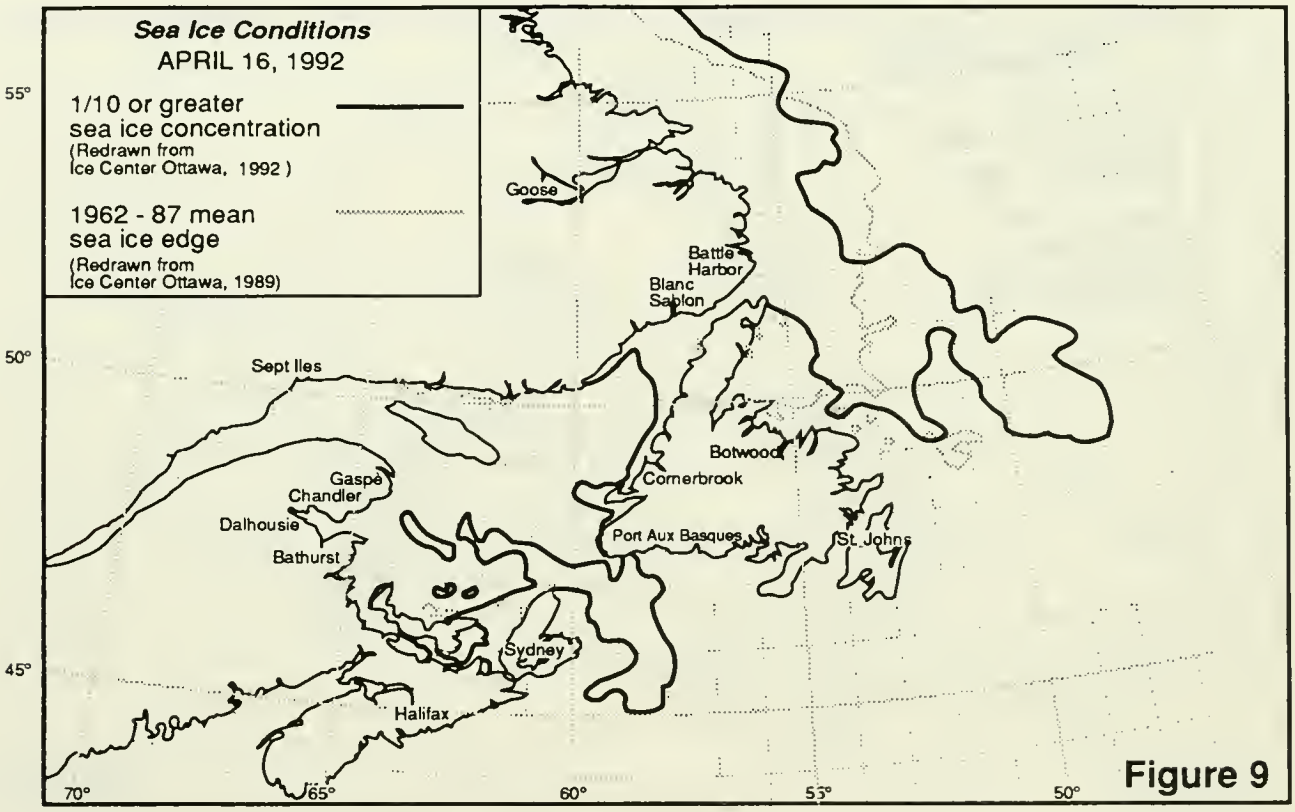


Figure 8



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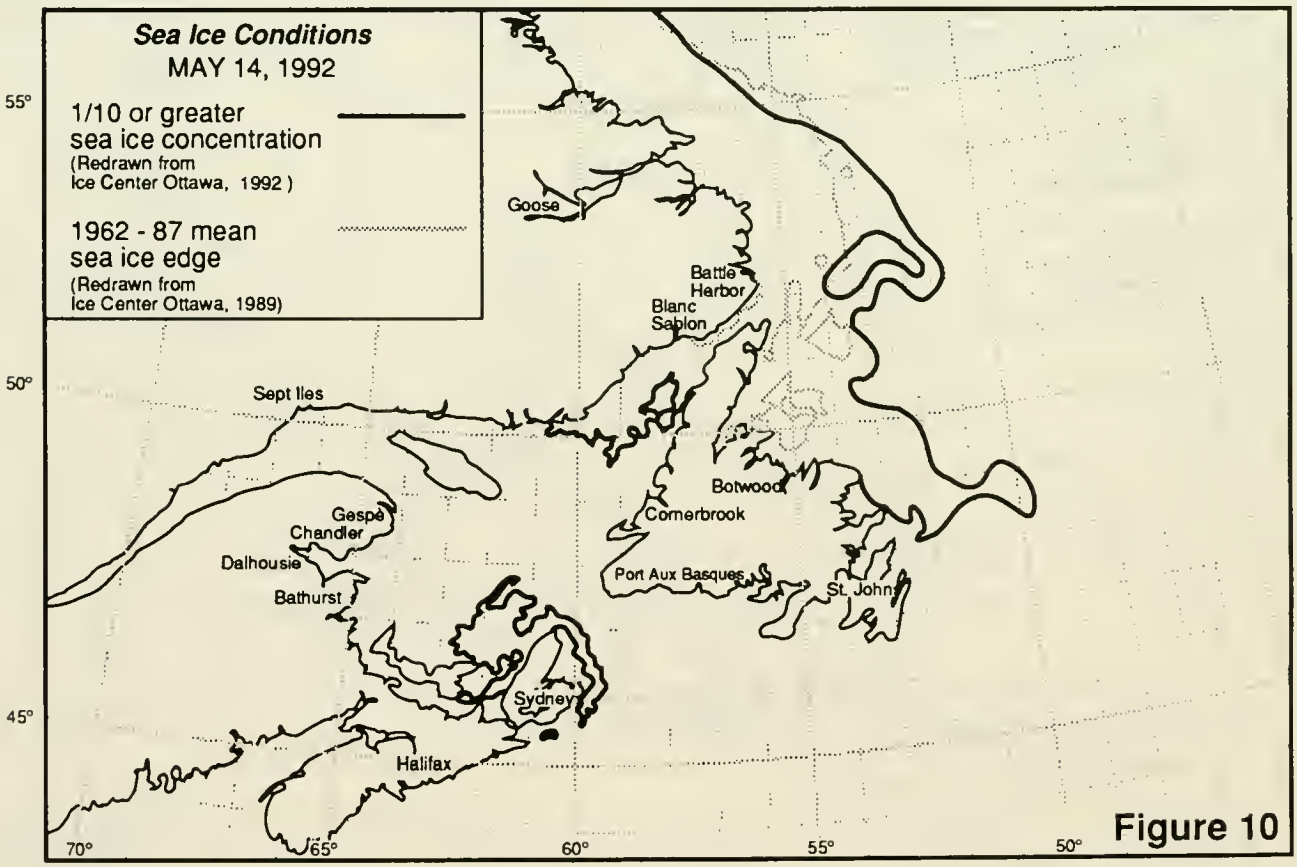
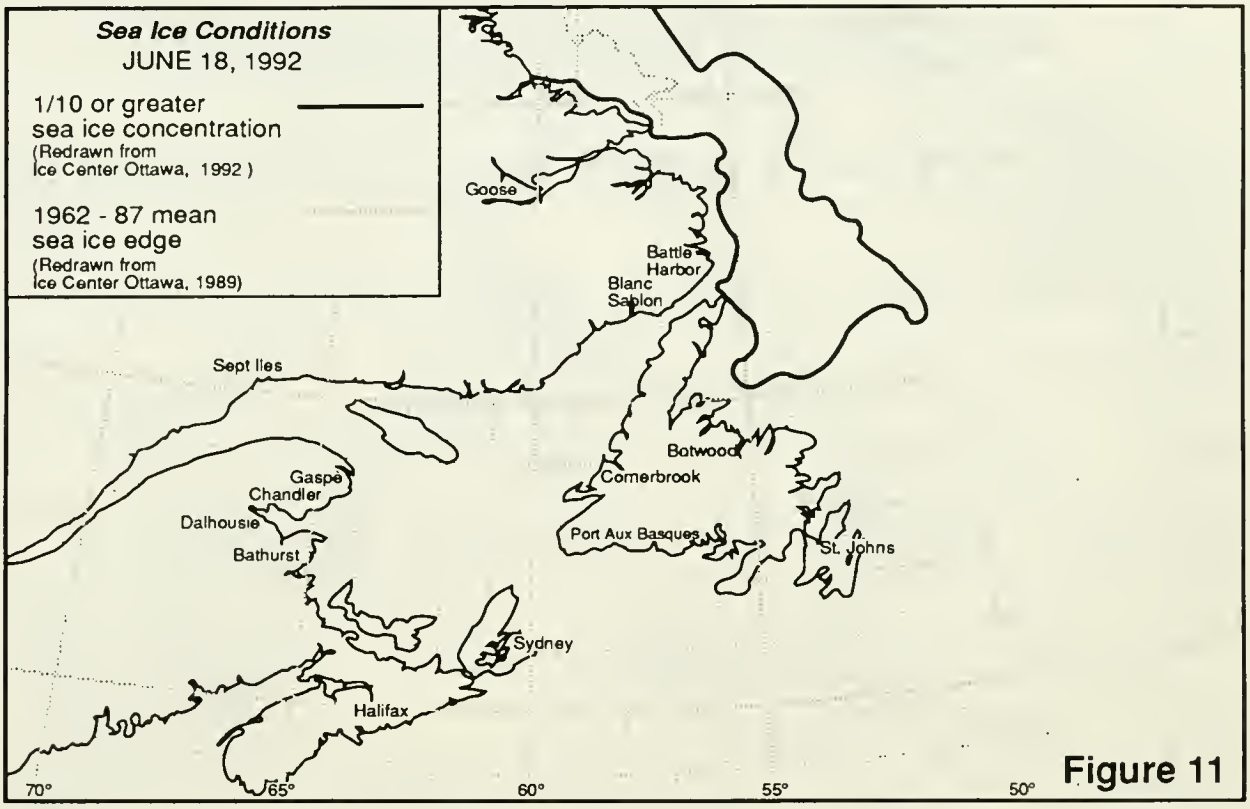


Figure 10



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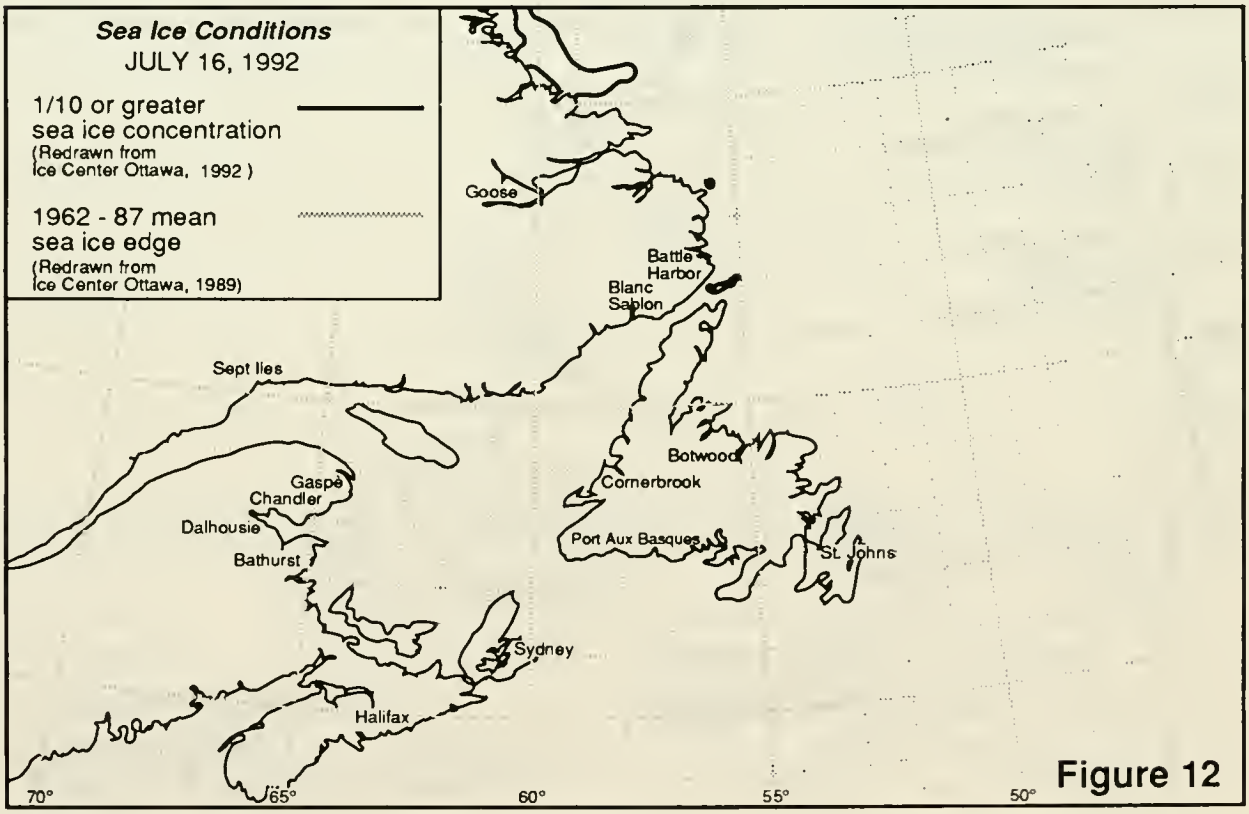


Figure 12

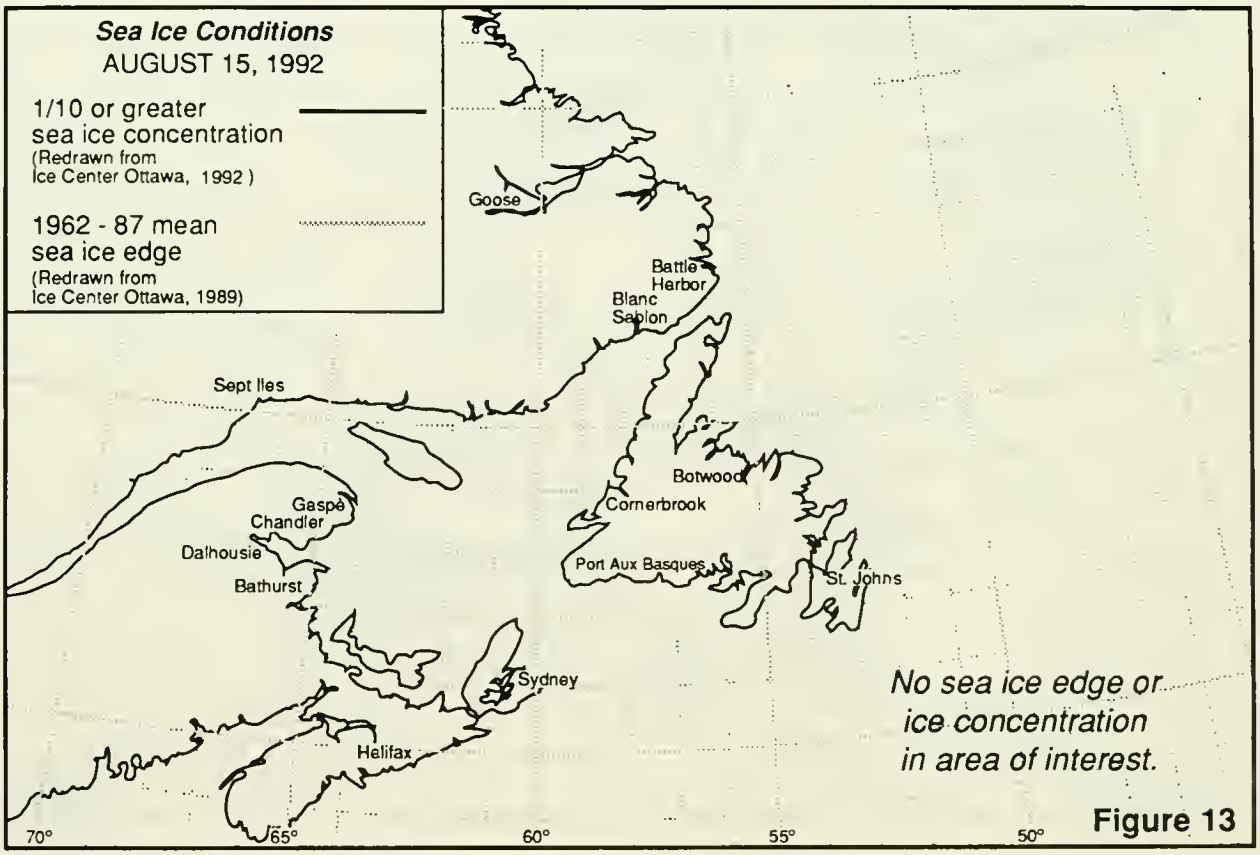


Figure 13

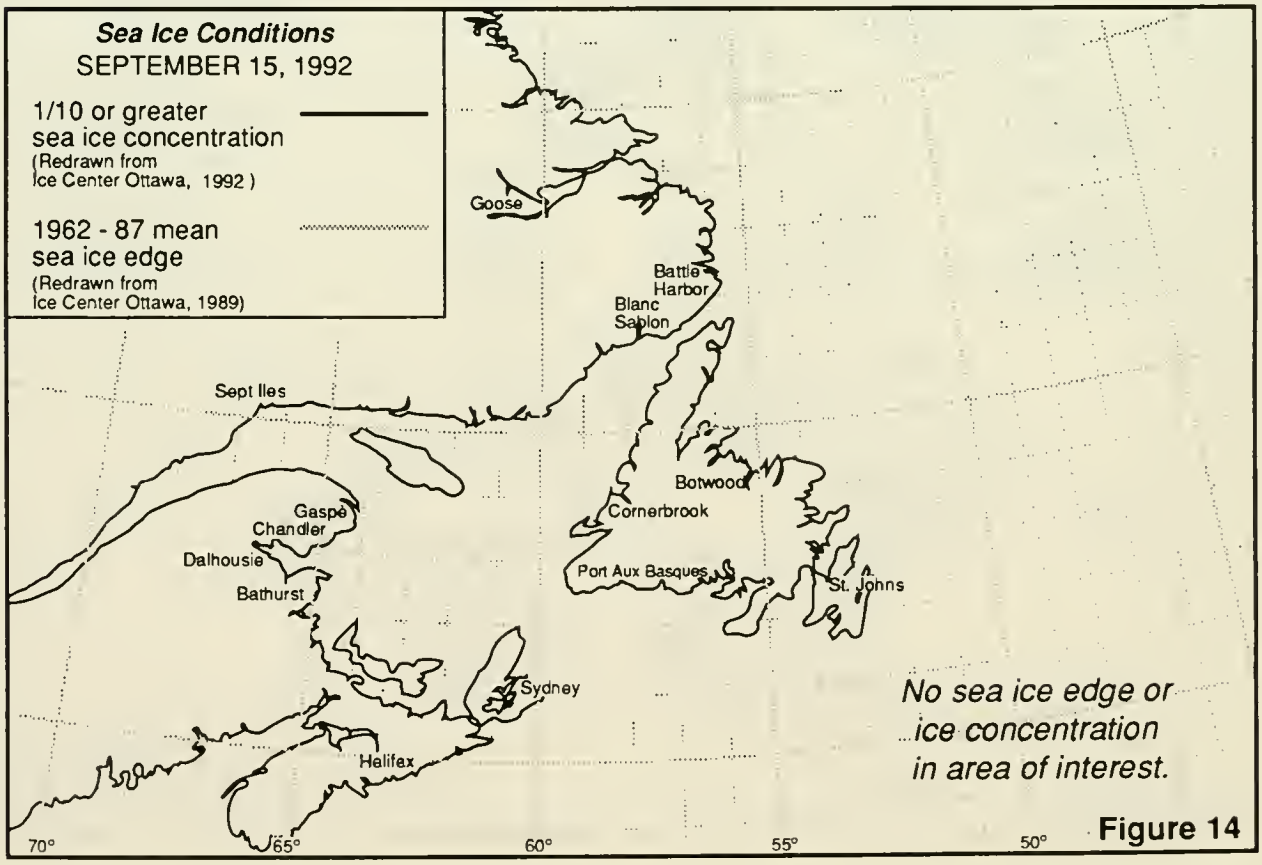
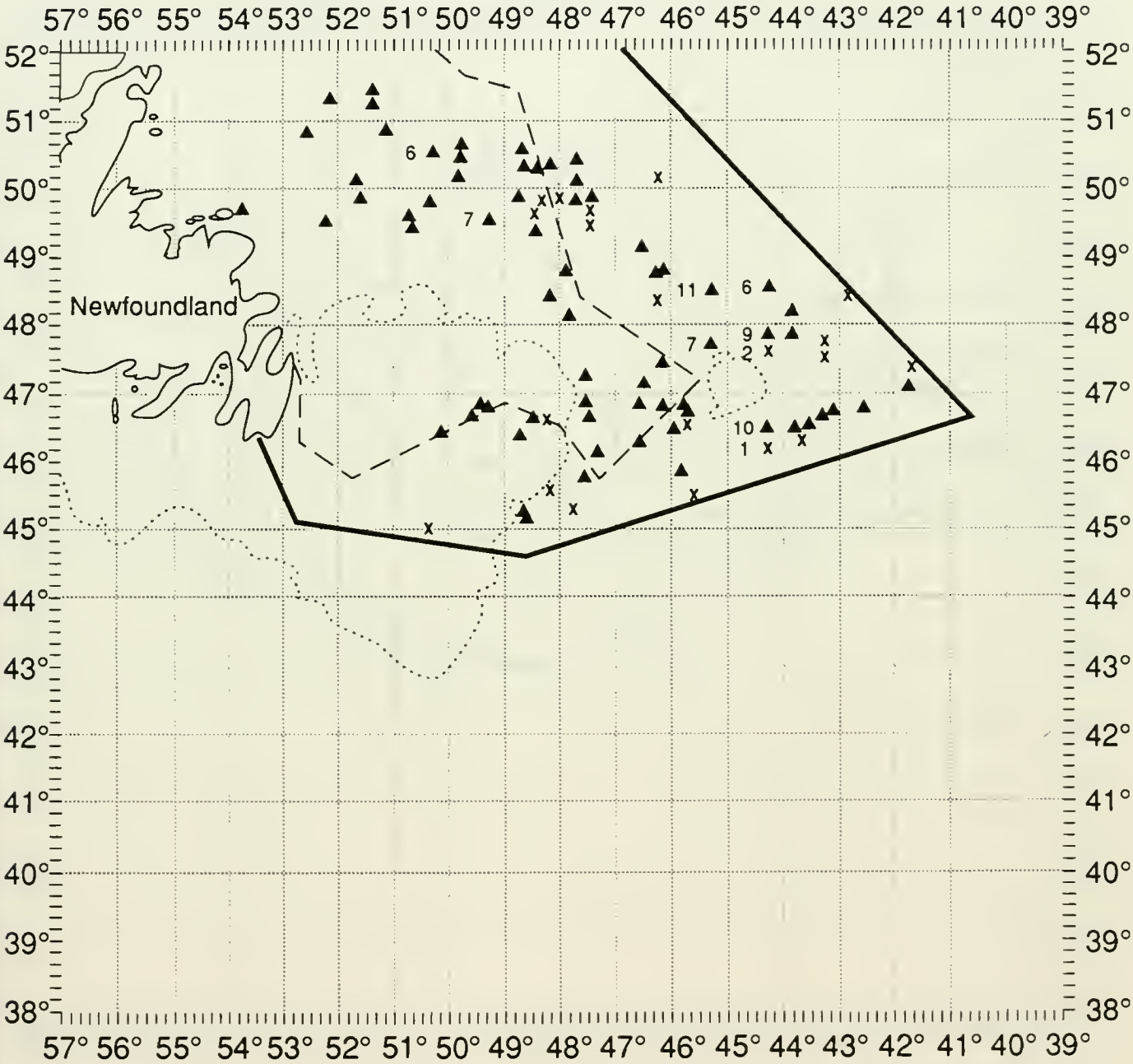


Figure 14

Figure 15

International Ice Patrol Ice Plot for **1200 GMT 07 Mar 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

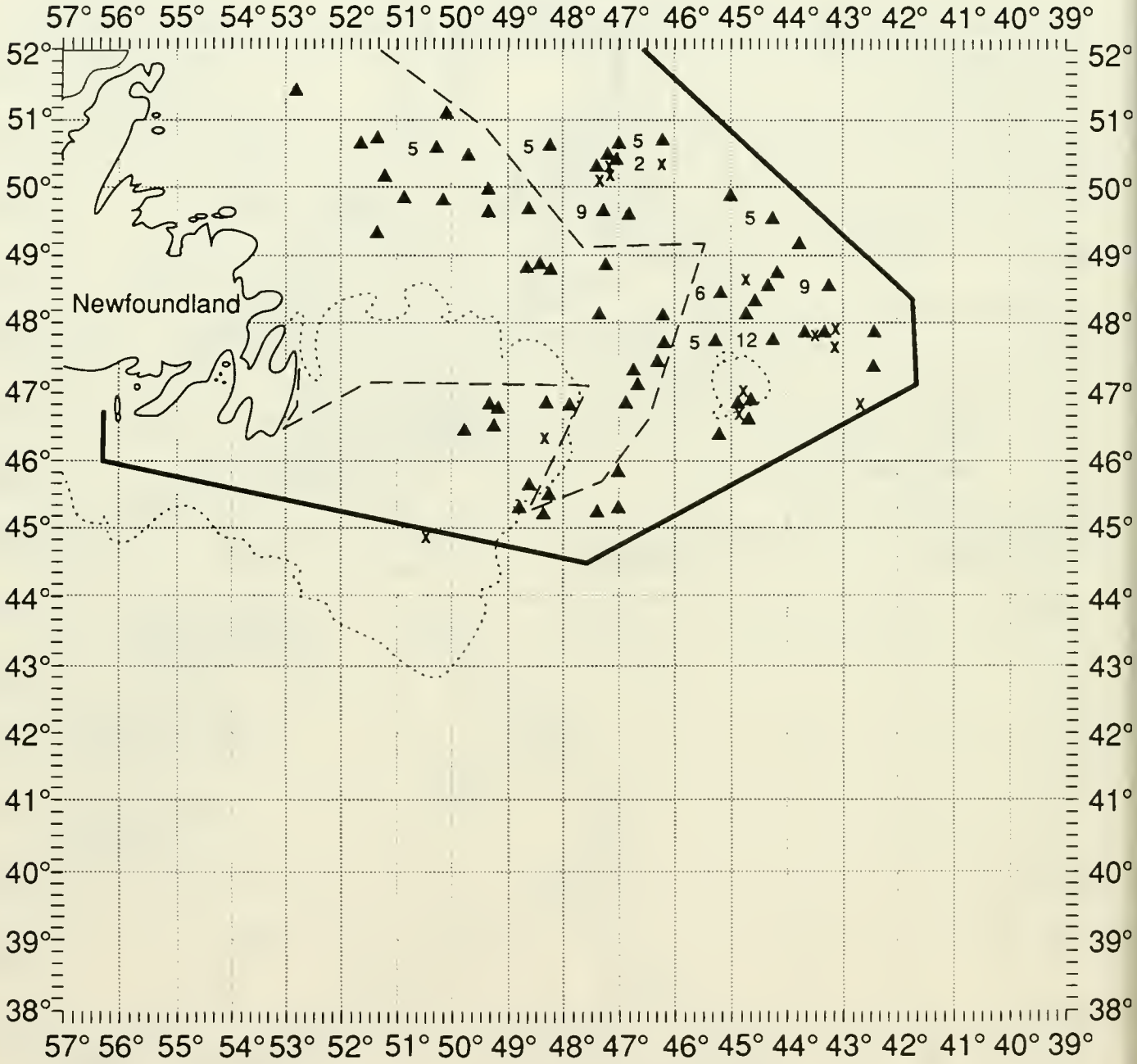
Estimated limit of all known ice

Estimated limit of sea ice

200 Meter bathymetric curve

Figure 16

International Ice Patrol Ice Plot for **1200 GMT 15 Mar 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

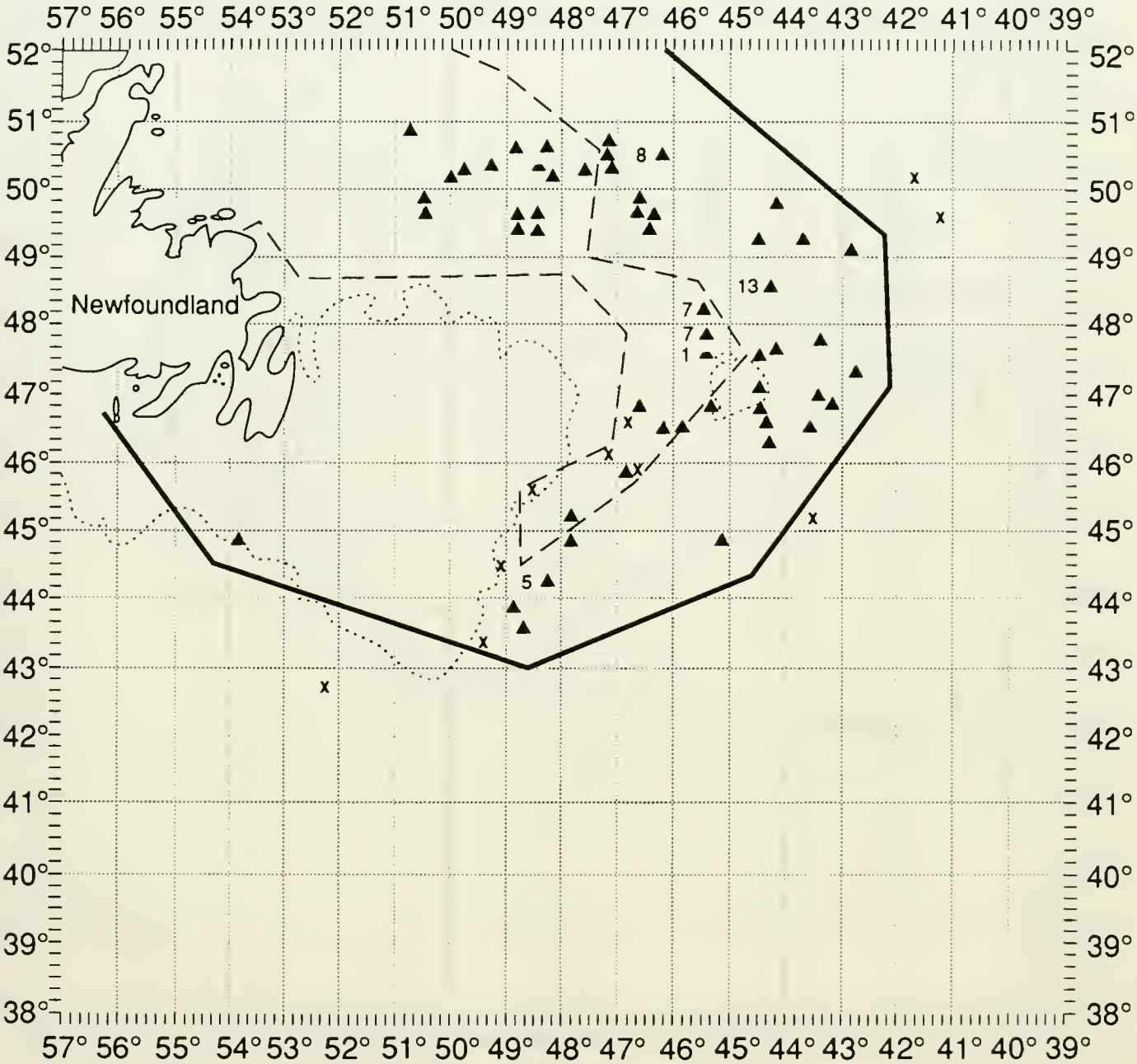
Estimated limit of all known ice

Estimated limit of sea ice

200 Meter bathymetric curve

Figure 17

International Ice Patrol Ice Plot for **1200 GMT 30 Mar 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

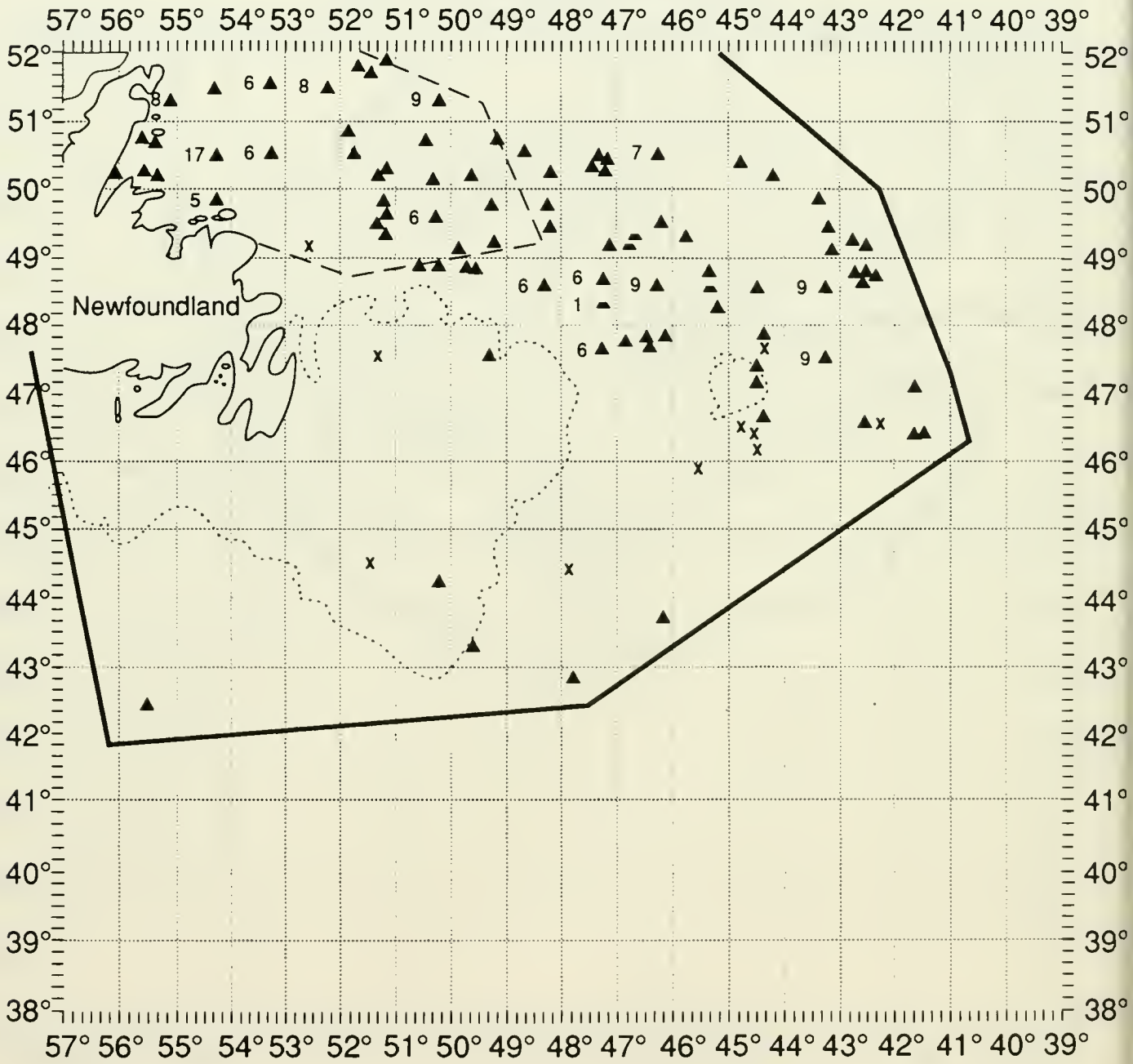
Estimated limit of all known ice

Estimated limit of sea ice

200 Meter bathymetric curve

Figure 18

International Ice Patrol Ice Plot for **1200 GMT 15 Apr 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

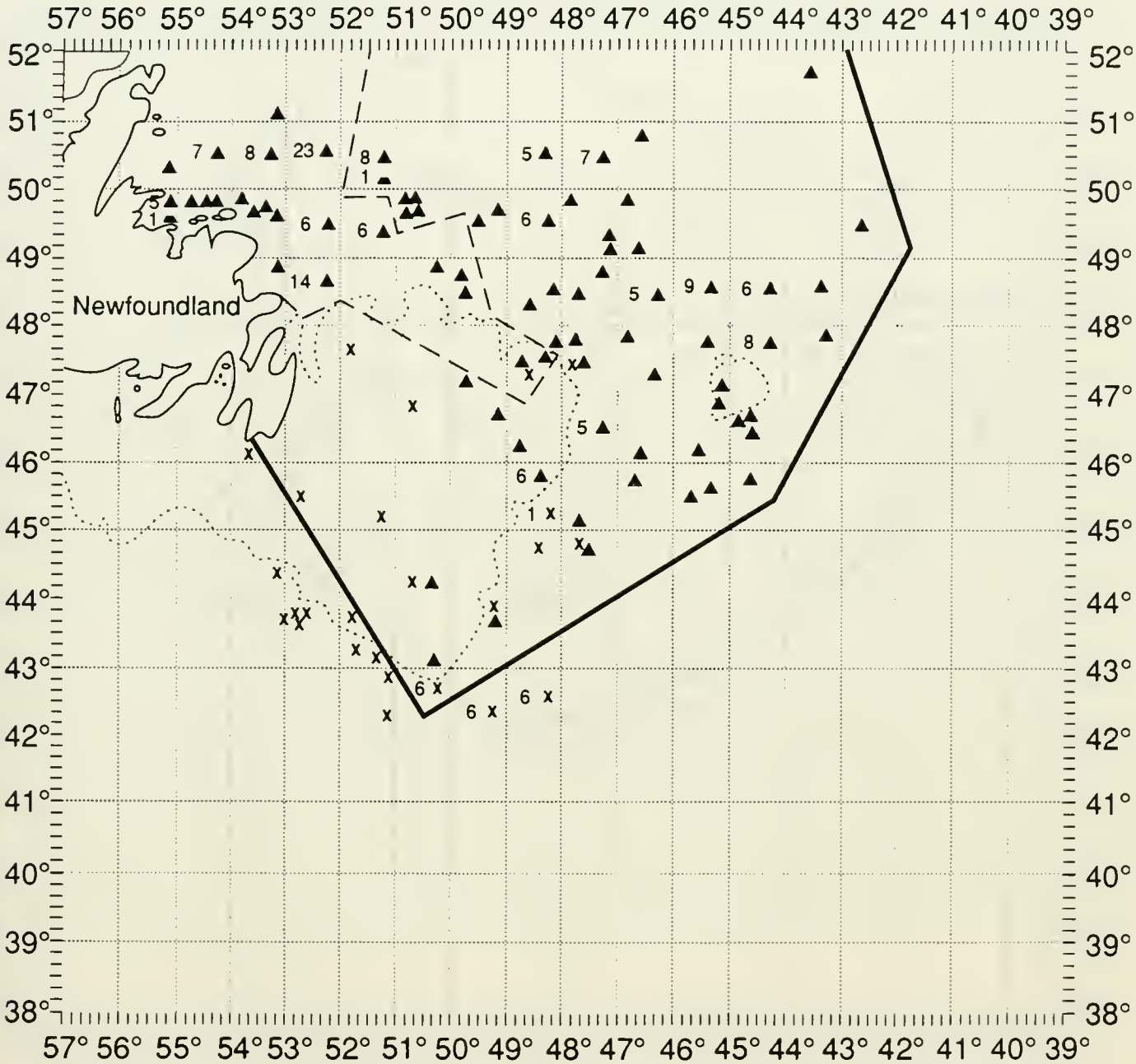
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 19

International Ice Patrol Ice Plot for **1200 GMT 30 Apr 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

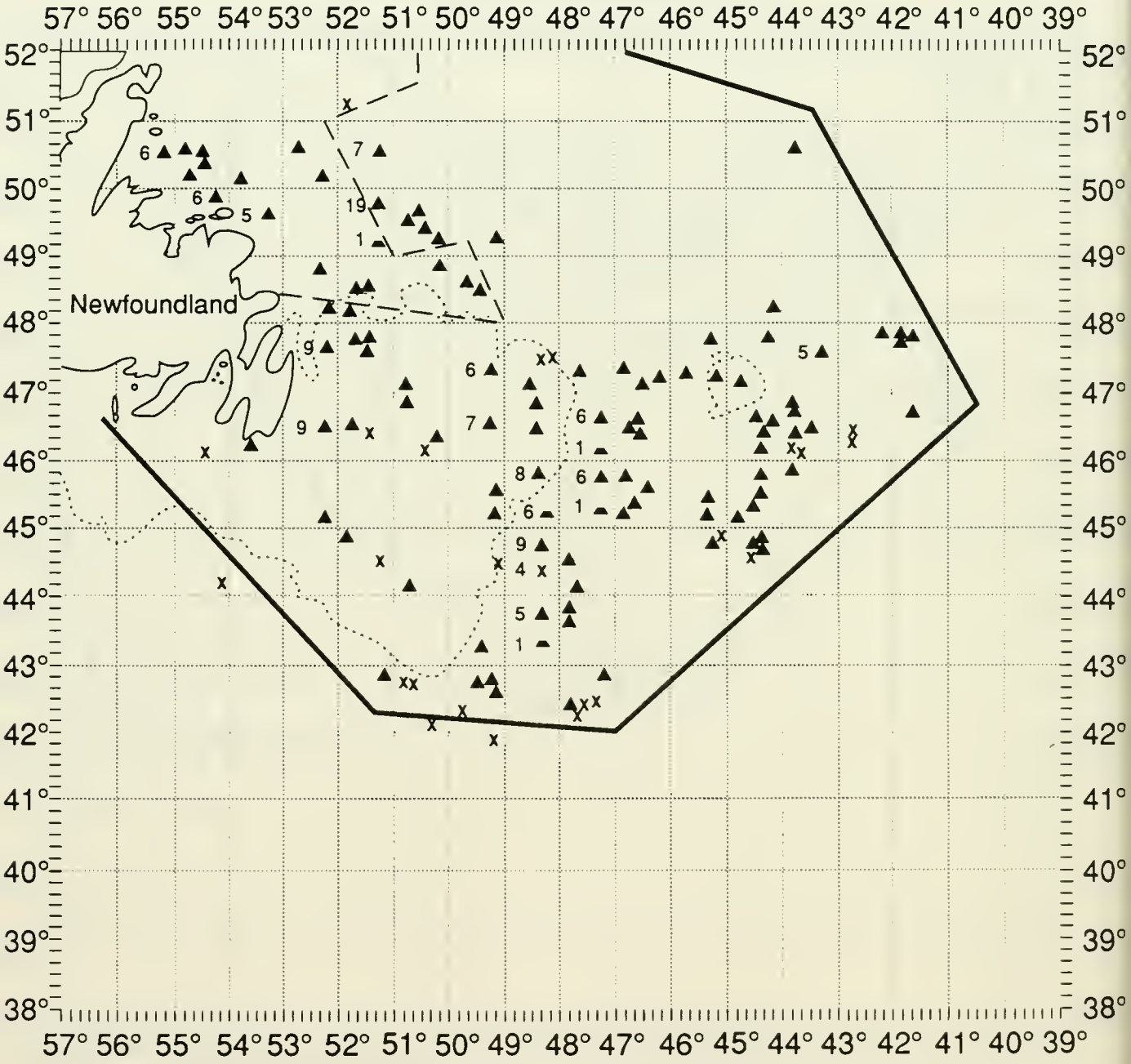
Estimated limit of all known ice

Estimated limit of sea ice

200 Meter bathymetric curve

Figure 20

International Ice Patrol Ice Plot for **1200 GMT 15 May 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

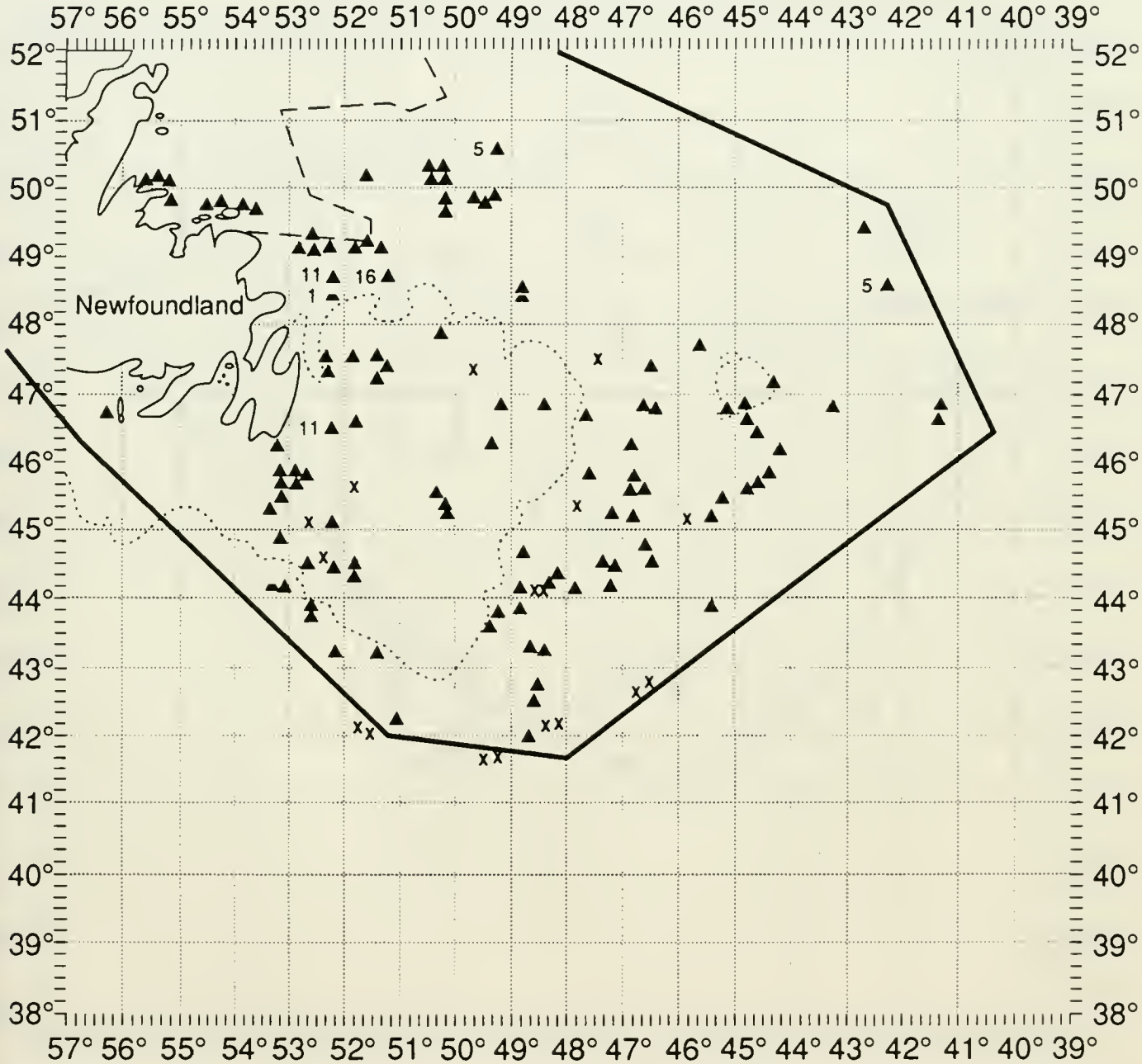
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 21

International Ice Patrol Ice Plot for **1200 GMT 30 May 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

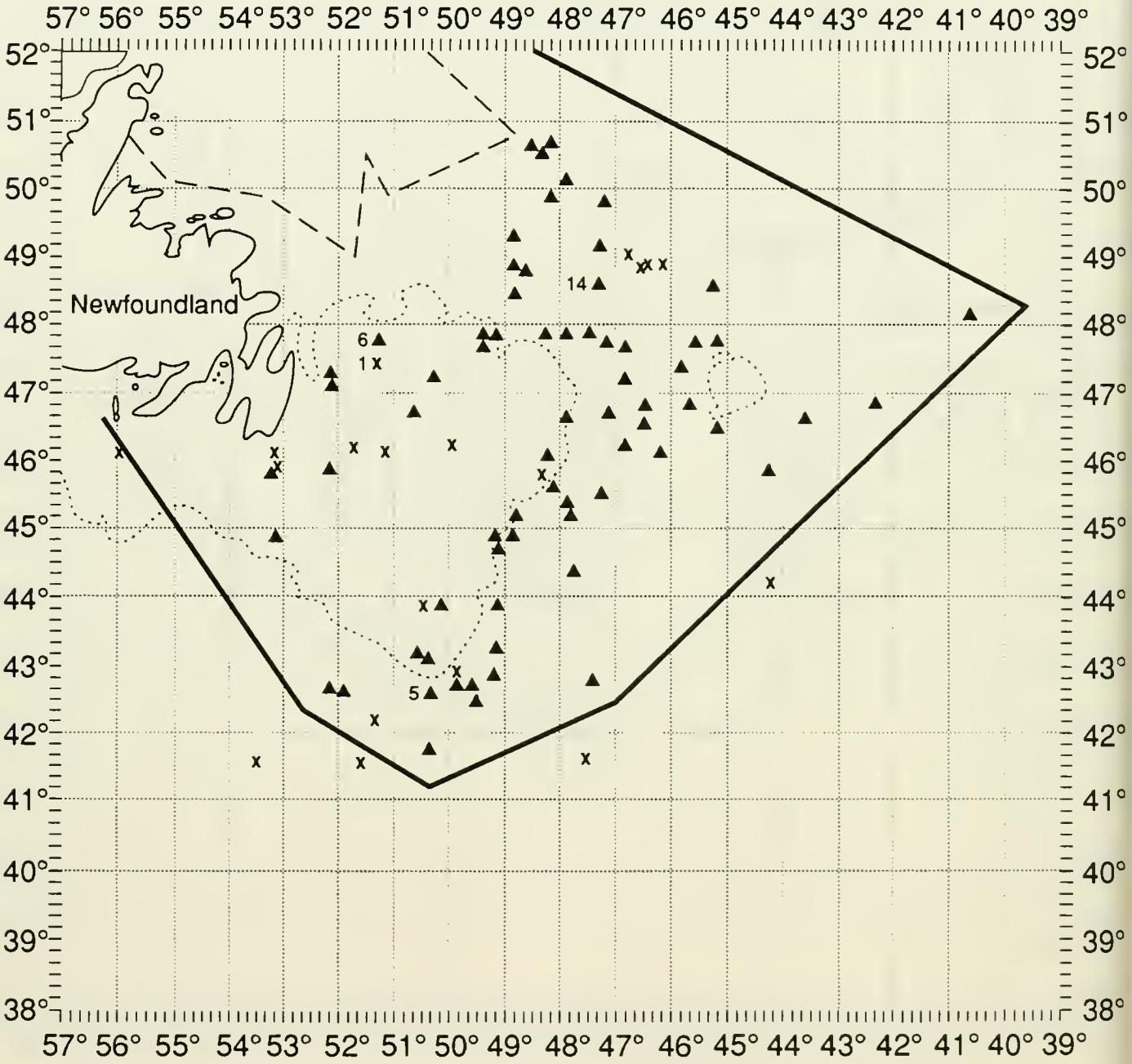
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 22

International Ice Patrol Ice Plot for **1200 GMT 15 Jun 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

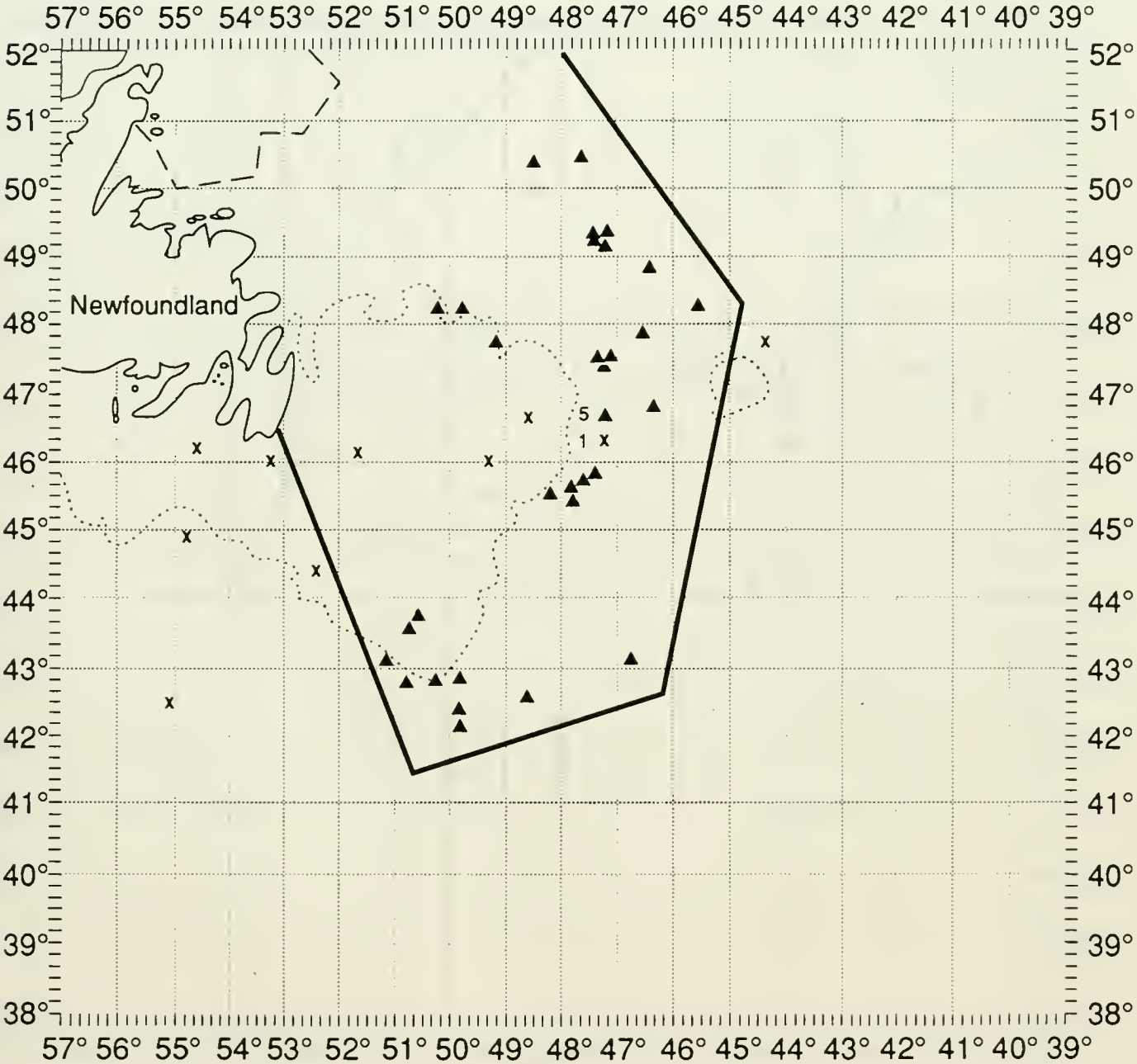
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 23

International Ice Patrol Ice Plot for **1200 GMT 30 Jun 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

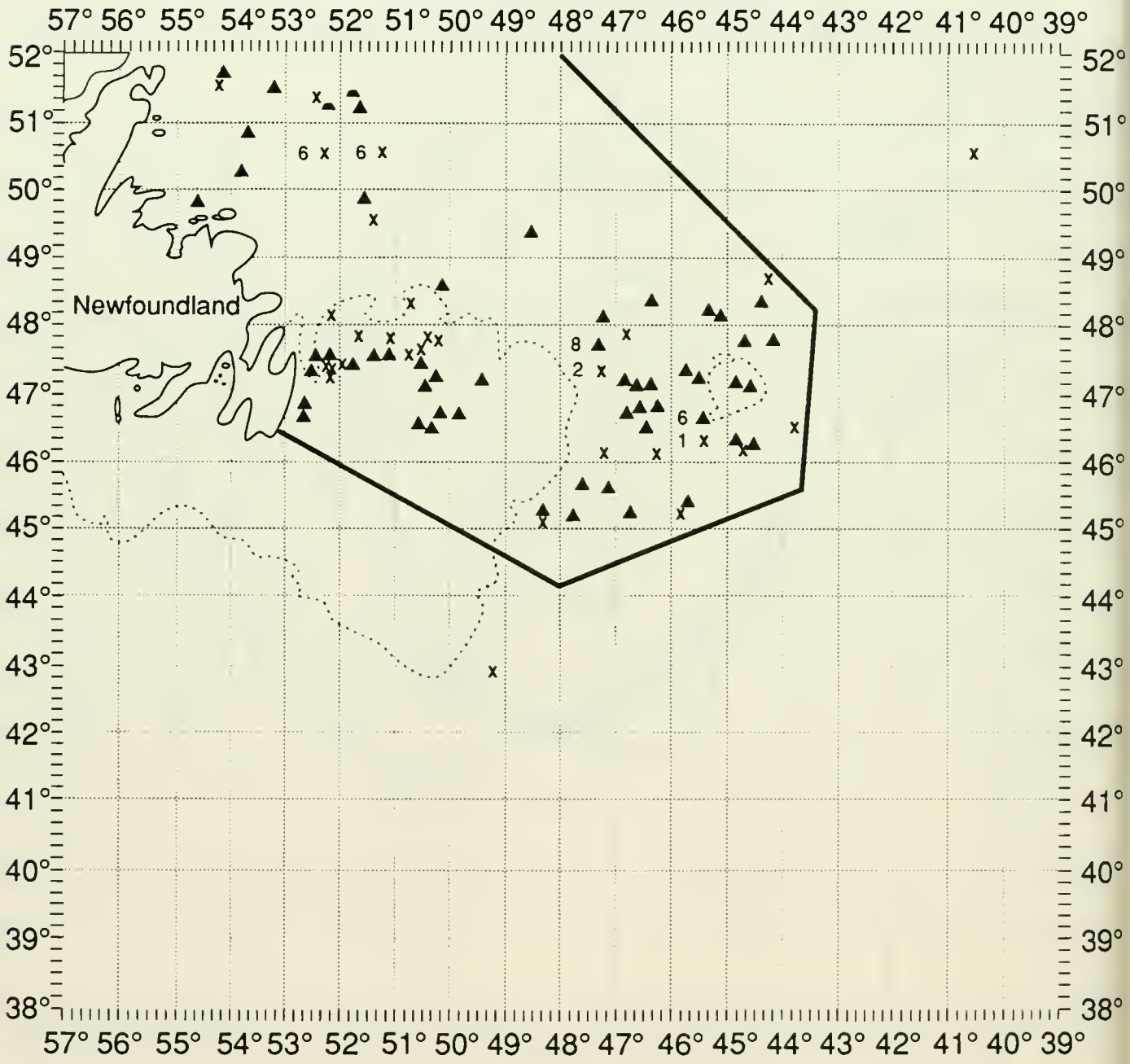
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 24

International Ice Patrol Ice Plot for **1200 GMT 15 Jul 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

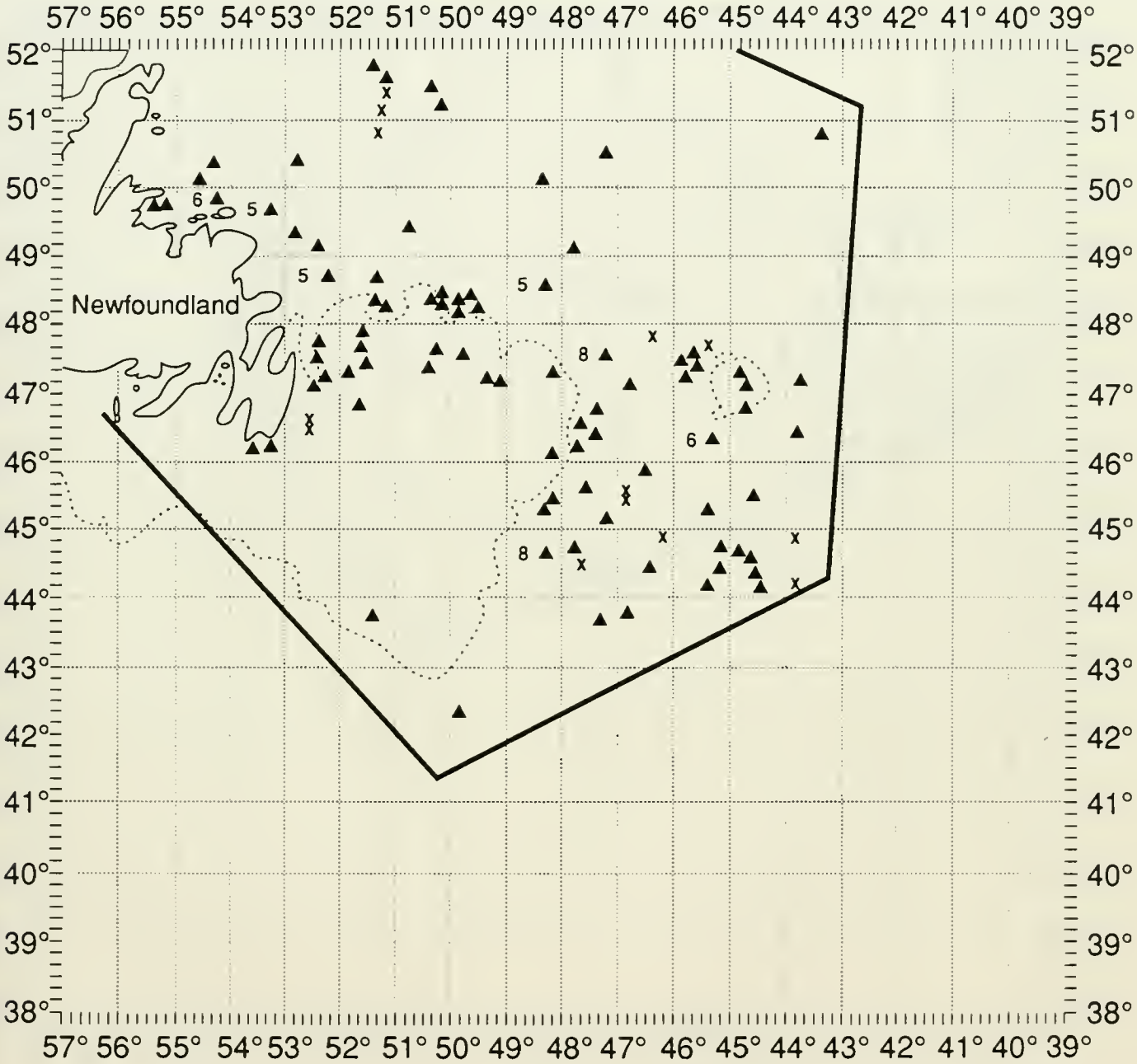
Estimated limit of all known ice

Estimated limit of sea ice

200 Meter bathymetric curve

Figure 25

International Ice Patrol Ice Plot for **1200 GMT 30 Jul 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

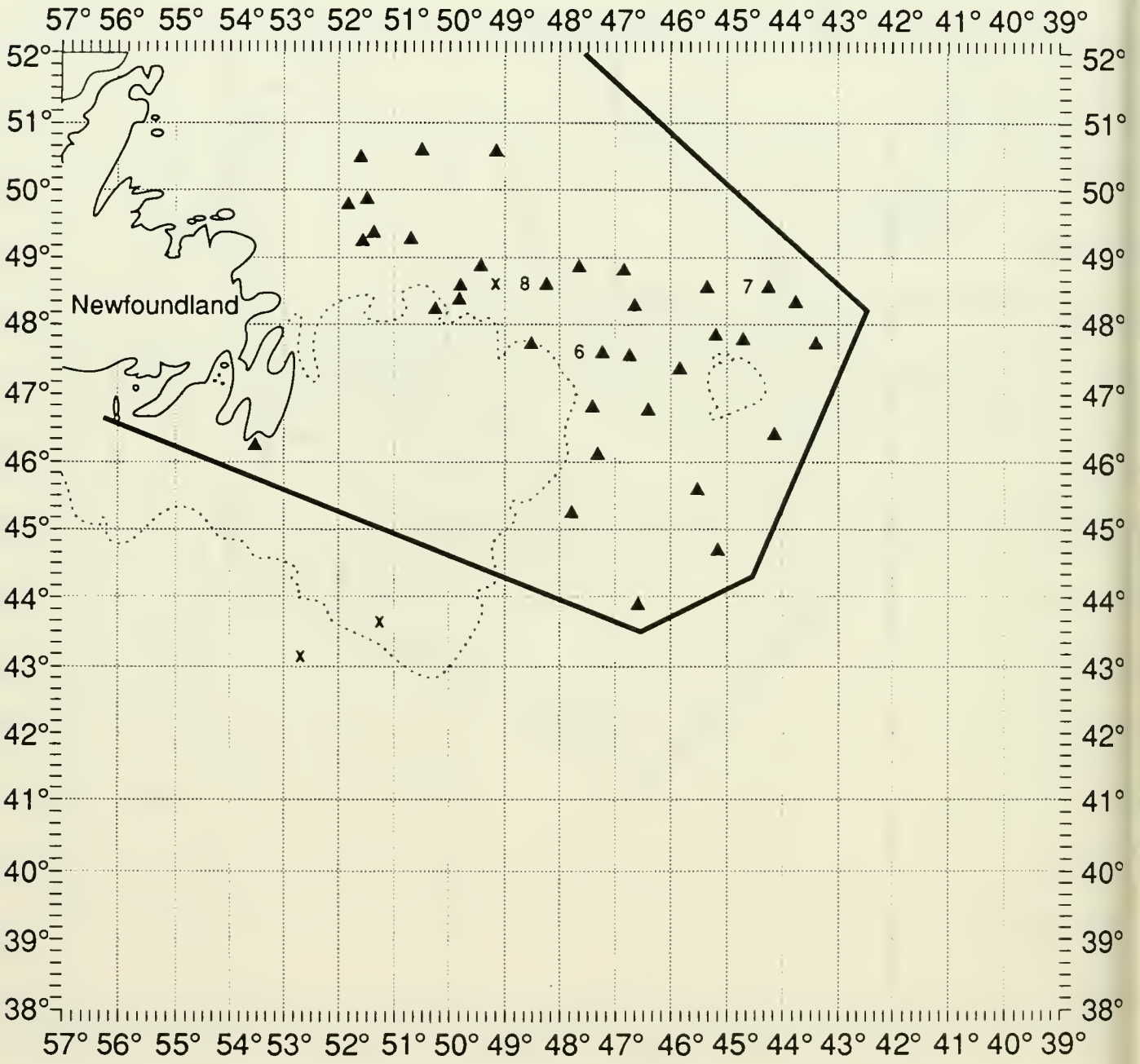
Estimated limit of all known ice

Estimated limit of sea ice

200 Meter bathymetric curve

Figure 26

International Ice Patrol Ice Plot for **1200 GMT 15 Aug 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

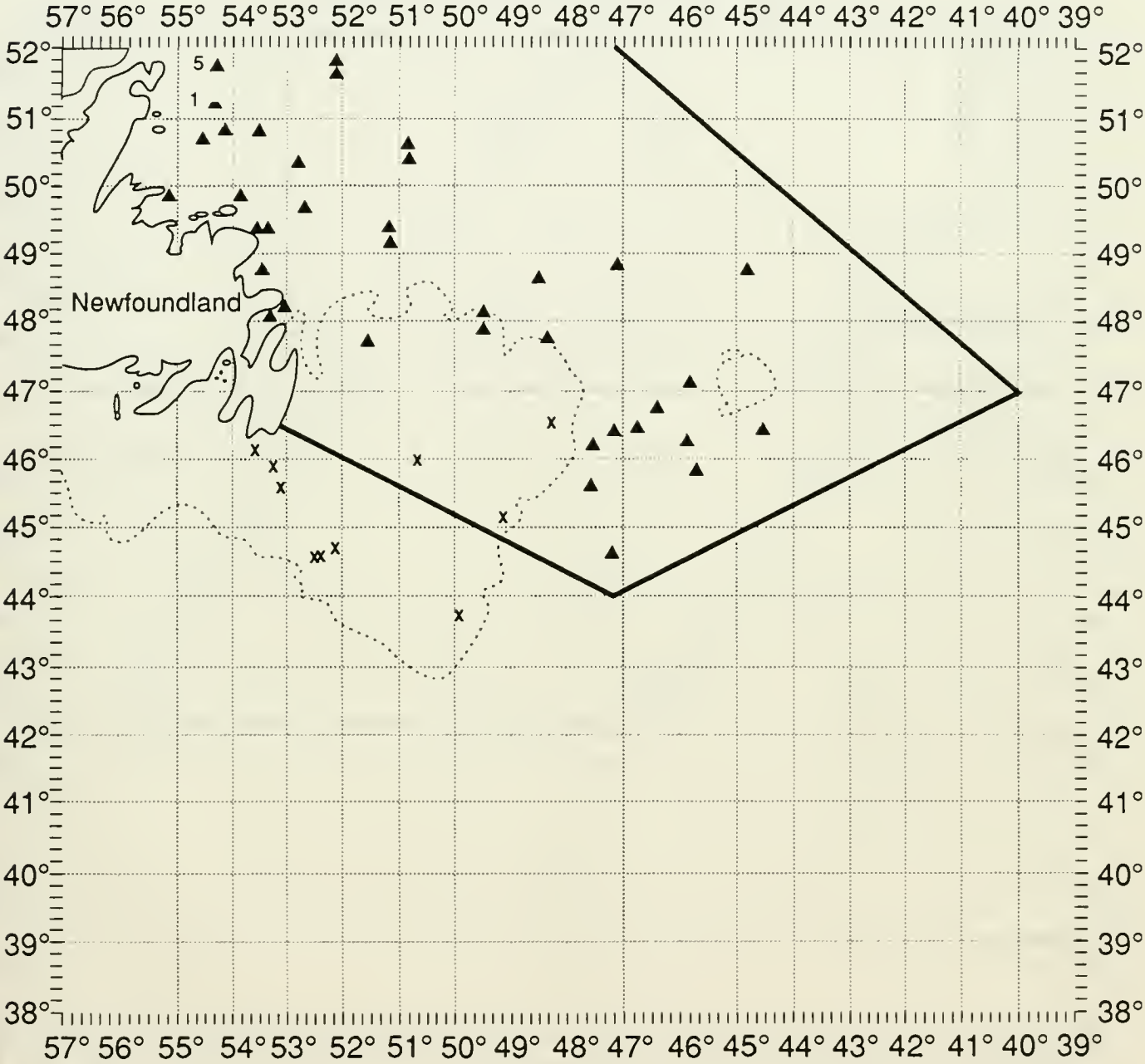
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 27

International Ice Patrol Ice Plot for **1200 GMT 30 Aug 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

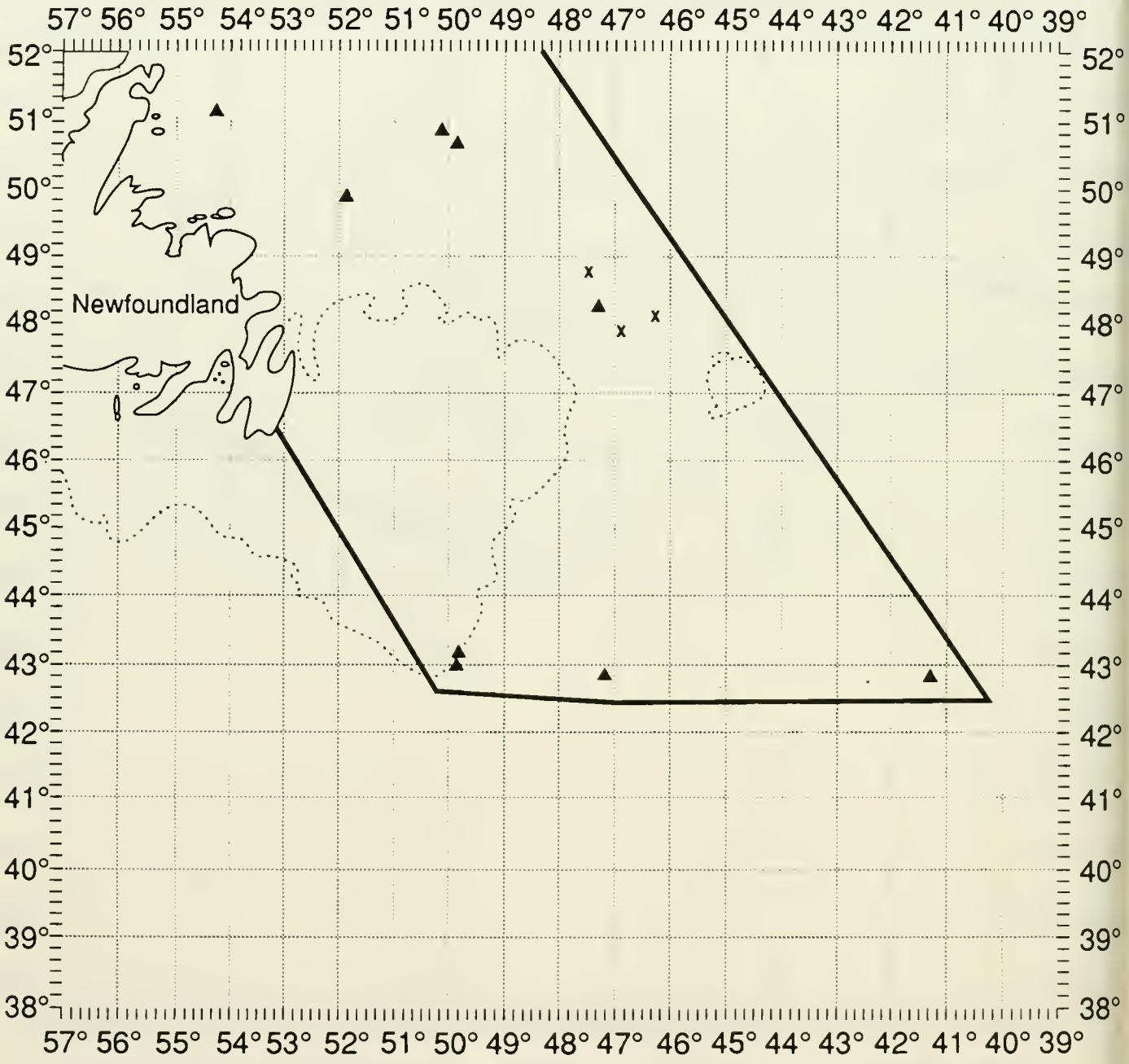
——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

····· 200 Meter bathymetric curve

Figure 28

International Ice Patrol Ice Plot for **1200 GMT 15 Sep 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



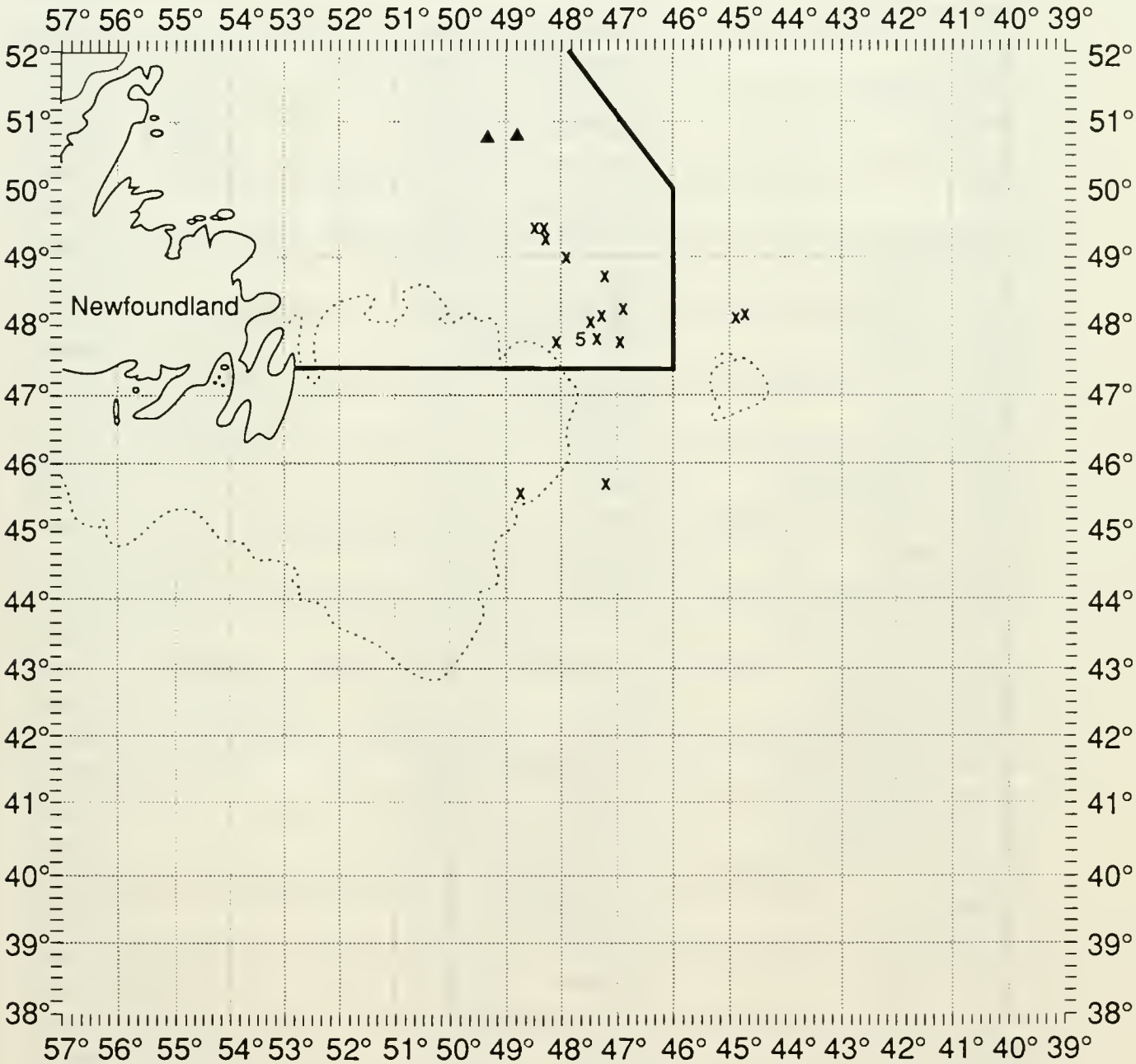
N ▲ Berg
N ▲ Growler
N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

——— Estimated limit of all known ice
– – – – Estimated limit of sea ice
····· 200 Meter bathymetric curve

Figure 29

International Ice Patrol Ice Plot for **1200 GMT 26 Sep 92**
Showing Observed and Modeled Iceberg Positions
and Forecast Sea Ice Conditions



N ▲ Berg
N ▲ Growler
N X Radar Target / Contact

Estimated limit of all known ice
Estimated limit of sea ice
200 Meter bathymetric curve

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

Appendix A
Ship Reports

VESSEL NAME	FLAG	SST	ICE REPORTS
ABITIBI MACADO	GERMANY		1
ACONIT	FRANCE		1
ADA GORTHON	BAHAMAS		1
ADAMAS	GREECE	1	1
AGRARI	CYPRUS		2
AIVIK	CANADA		5
AKRANES	CYPRUS		1
ALANDIA SURF	BAHAMAS		1
ALIBAK JOSEFSEN	GREENLAND		1
ALSYTA SMITS	NETHERLANDS		4
AMAMI	CYPRUS		3
AMARYLLIS	GREECE		1
AMBER PACIFIC	LIBERIA		1
AMELIA DESGAGNES	CANADA		2
ANAMELI	GREECE		1
ANITA SMITS	NETHERLANDS		1
ARABIAN BREEZE	JAPAN		1
ARCHANGELGRACHT	NETHERLANDS		1
ARKTIKA	U. S. S. R.		1
ATLANTA FOREST	MALTA		5
ATLANTIC CARTIER	FRANCE		4
ATLANTIC CONVEYOR	UNITED KINGDOM		1
ATLANTIC ODYSSEY	CANADA		1
ATLANTIC PURSUIT	CANADA		1
BACESTI	ROMANIA		3
BAHAMAS	BAHAMAS		1
BALEARES	NORWAY		1
BARRA HEAD	IRELAND		3
BARTLETT	UNITED STATES	7	1
BERGE CHARLOTTE	NORWAY		1
BICKERSGRACHT	NETHERLANDS		1
BILLYJEANNE A.	LIBERIA		1
BIOKOVO	YUGOSLAVIA		4
BLUE SKY	ANTIGUA-BARBUDA		1
BOW GERD	NORWAY	1	1

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
BRETT	GERMANY		2
BRIGIT MAERSK	SINGAPORE		1
BRISTER	CANADA		1
BRITISH STEEL	HONG KONG		2
CALGA	LIBERIA		1
CALYPSO	NETHERLANDS		1
CAMELLIA	PANAMA		1
CAMILLA	FINLAND		3
CANMAR AMBASSADOR	UNITED KINGDOM		14
CANMAR EUROPE	BELGIUM		3
CANMAR TRIUMPH	UNITED KINGDOM		6
CANMAR VICTORY	UNITED KINGDOM		1
CAPETAN GIORGIS	LIBERIA		1
CARLITA	PANAMA		2
CASECO	CANADA		1
CAST HUSKY	BAHAMAS		1
CAST MUSKOX	BAHAMAS		1
CAST OTTER	BAHAMAS		4
CAST POLARBEAR	YUGOSLAVIA	46	48
CECELIA DESGAGNES	CANADA		6
CHEMICAL VENTURE	LIBERIA	1	1
CHICKASAW	UNITED KINGDOM		2
CHIMO	NORWAY		1
CIKAT	YUGOSLAVIA		3
CLARITA	HONG KONG	6	
CLINK	SWEDEN		4
CLOVER ACE	JAPAN	2	2
CMB MERKUR	CYPRUS		2
CONSTANCE	NETHERLANDS		1
CORNER BROOK	LIBERIA		17
CRYSTAL B	CYPRUS		4
DANIA PORTLAND	DENMARK	1	1
DAR MLODZIEZY	POLAND	3	
DARNITSA	U. S. S. R.		3
DELORIS	BELGIUM		4
DESNOGORSK	CYPRUS		2

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
DETTIFOSS	CYPRUS		6
DIAPOROS	GREECE	1	3
DOBROTA	ST. VINCENT GRENADIN		2
DOCEORION	BRAZIL	6	
DOCEVIRGO	BRAZIL	9	
DONAU	LIBERIA		1
DORA OLDENDORFF	SINGAPORE		1
DRAGOMIRESTI	ROMANIA	3	
DUBROVNIK	YUGOSLAVIA		4
DUKE OF TOPSAIL	UNITED KINGDOM		1
EIRINI L	GREECE		3
ELIKON	BAHAMAS	2	3
ENERCHEM ASPHALT	CANADA		1
ERNST HAECKEL	GERMANY		6
EURO PRIDE	SINGAPORE	1	1
EUROPA	GERMANY		2
EUROPEAN	PANAMA		1
F. V. CONCORDIA	CANADA		2
FALCON	NORWAY		3
FALKONERA	GREECE		2
FEDERAL AGNO	PHILIPPINES		1
FEDERAL CALUMET	LIBERIA	1	1
FEDERAL DANUBE	CYPRUS		1
FEDERAL FUJI	JAPAN		2
FEDERAL MAAS	CYPRUS		2
FEDERAL MACKENZIE	BAHAMAS		2
FEDERAL OTTAWA	BELGIUM		2
FEDERAL SAGUENAY	LIBERIA		1
FEDERAL THAMES	CYPRUS		11
FINLITH	DENMARK		1
FINNFIGHTER	FINLAND		1
FJORD LAND	PANAMA		2
FLAG MARINA	GREECE		1
FRANGISKOS C. K.	GREECE		1
FRASER	CANADA		1

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
GALLANT TIGER	HONG KONG		1
GARDEN STATE	MALTA	4	4
GOLAR ROSEMARY	LIBERIA		3
GONOSAN	PHILIPPINES	1	
GREENLAND SAGA	DENMARK		3
GUS W. DARNELL	UNITED STATES		1
HAFNIA	CYPRUS		1
HANDY JACK	PHILIPPINES		1
HANDYMARINER	LIBERIA		1
HARP	CANADA		5
HELEN	LUXEMBOURG	4	3
HELLENIC SPIRIT	MEXICO		2
HENRY LARSEN	CANADA		1
HERCEGOVINA	YUGOSLAVIA	15	15
HOFSJOKULL	ICELAND	3	
HONSHU SPIRIT	BAHAMAS	3	12
HUBERT GAUCHER	CANADA		2
HUDSON	CANADA		13
HUMBER ARM	LIBERIA		5
IKAN SELAYANG	SINGAPORE		2
IMPERIAL ACADIA	CANADA		4
IRENES EMERALD	GREECE		2
IRON MASTER	BAHAMAS		1
IRVING ARCTIC	CANADA		7
IRVING CANADA	CANADA		3
IRVING CEDAR	UNITED KINGDOM		1
IRVING NORDIC	CANADA		3
IVAN GORTHON	BAHAMAS		2
J. C. PHILLIPS	CANADA		3
J. E. BERNIER	CANADA		1
JEAN-COLETTE	CANADA		1
JIN TIAN HAI	CHINA		6
JO BIRK	NETHERLANDS		1
JOHN C. HELMSING	CYPRUS		2
JOSE ANTONIO ECHEVERRIA	CUBA		1

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
JUNIPER	LIBERIA		1
KAAPGRACHT	NETHERLANDS		1
KAPITAN BURMAKIN	U. S. S. R.		1
KAPITAN KHLEBNIKOV	U. S. S. R.		3
KAPITAN SPIVAK	U. S. S. R.		1
KEENWN	CANADA	1	
KHUDOZHNIK ROMAS	U. S. S. R.		3
KIHU	FINLAND		1
KILCHEM ADRIATIC	MALTA		2
KING	UNITED STATES		2
KINGUK	CANADA		2
KOSMAJ	YUGOSLAVIA		1
L. ROCHETTE	CANADA		1
LADY FRANKLIN	CANADA		1
LADY OLIVE MARIE	UNKNOWN		1
LARINA	LIBERIA		10
LAVENDER	NORWAY	7	
LENINSK	U. S. S. R.		4
LEROS PROGRESS	CYPRUS	2	2
LOTILA	BAHAMAS		5
LUCKY MAN	CYPRUS		1
MAERSK TAIKUNG	SINGAPORE		2
MAIN ORE	LIBERIA		1
MALIK II	NEW HEBRIDES		5
MALINSKA	YUGOSLAVIA		1
MANFRED SKAUN	GERMANY		1
MARCHEN MAERSK	DENMARK		1
MARGAREE	CANADA	11	
MARIA GORTHON	BAHAMAS		1
MARINE CLIPPER 2	CANADA		1
MARINE PACER	TURKEY		1
MARTHA 2	NORWAY		1
MASTER	UNITED STATES		1
MATHILDA DESGAGNES	CANADA		1
MITERA VASSILIKI	CYPRUS		1

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
MOSEL ORE	LIBERIA		3
MSC ALEXANDRA	PANAMA		1
NADA V	PANAMA		1
NANCY ORR GAUCHER	CANADA		1
NARA	LUXEMBOURG		3
NEWARK BAY	UNITED STATES		1
NEWFOUNDLAND ALERT	CANADA		1
NEWFOUNDLAND LYNX	CANADA		1
NEWFOUNDLAND OTTER	CANADA		2
NICHOLSON	UNITED STATES	6	6
NIKOLAY GOLOVANOV	U. S. S. R.		1
NISHIURA MARU	JAPAN		1
NOMADIC PATRIA	NORWAY		1
NOMADIC POLLUX	NORWAY		2
NORDEN	FINLAND		1
NORDIC	LIBERIA		4
NORTHERN ENTERPRISE	CANADA		1
NORTHERN PRINCESS	CANADA		1
NUKA ITTUK	DENMARK		1
NUNGU ITTUK	DENMARK		1
OCEAN STAR	BAHAMAS	10	
ODET	FRANCE		1
OOCL ASSURANCE	UNITED KINGDOM		5
OOCL CHALLENGE	UNITED KINGDOM		3
ORAGREEN	BAHAMAS		1
ORIOLUS	GERMANY		4
ORJEN	YUGOSLAVIA		1
PAN FIR	ITALY		1
PANACHE	MEXICO		1
PARIZEAU	CANADA		1
PATSY AND SONS	CANADA		1
PETKA	YUGOSLAVIA	4	4
PETROBULK LION	BELGIUM		6
PHOLUS	UNITED KINGDOM		2
PIERRE	ARGENTINE REPUBLIC		1

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
PLUTO	LIBERIA		1
POKKINEN	BAHAMAS		3
POLAR CRYSTAL	PANAMA		1
POLAR SEA	UNITED STATES	2	5
POLLUX I	PANAMA		2
POMORZE ZACHODNIE	POLAND		1
PORTLAND CARRIER	CANADA		3
PRINSENGRACHT	NETHERLANDS		1
PROSPEROUS	HONG KONG		2
PUHOS	BAHAMAS		6
RADIANT VENTURE	LIBERIA	1	2
RAVENSCRAIG	BAHAMAS		4
RED ROSE	CYPRUS		1
REGINE	GERMANY		1
RELIANT	GREECE		2
RESOLUTE II	MALTA		6
RESOLUTION BAY	UNITED KINGDOM		1
RIO TRUANDO	COLUMBIA		1
ROYAL VIKING SUN	BAHAMAS	1	
RYAN LEET	CANADA		1
S. J. MAGALIE	CANADA		1
SAAR ORE	LIBERIA		1
SAINT PIERRE	FRANCE		1
SAN LORENZO	UNITED KINGDOM		2
SAPANCA	TURKEY		2
SARGASSO	PANAMA		1
SAUDI HAIL	ITALY		1
SAUNIERE	CANADA		1
SEABOURN PRIDE	NORWAY	4	
SEAGRACE II	UNKNOWN		1
SELNES	CYPRUS		1
SIBYL W	CANADA		2
SIDI DAOUI	MOROCCO		2
SILVAPLANA	SWITZERLAND	5	
SIR JOHN	GREECE	1	3

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
SIR ROBERT BOND	CANADA		1
SIR W. ALEXANDER	CANADA		6
SKAFTAFELL	NORWAY		1
SKEENA	CANADA	21	5
SKOGAFOSS	ANTIGUA-BARBUDA		3
SLOTERSRACHT	NETHERLANDS		1
SPEEDBOAT CONCORD 2	UNKNOWN		1
STAVANGER	NORWAY	4	29
STEFEN STARZYNSKI	POLAND		1
STEPHEN B	CANADA		1
STOLT CASTLE	LIBERIA		2
SUMY	U. S. S. R.		5
TEVERA	NORWAY		2
THALASSINI AVRA	GREECE		1
THULELAND	SWEDEN		1
TIMUR MERCURY	BAHAMAS		5
TROLL FOREST	NORWAY		1
VANRI	PHILIPPINES	7	
VARJAKKA	BAHAMAS		2
VERGO	GREECE		1
VESTLANDIA	FAEROES		1
VIRANA	NORWAY		2
WAVE	CYPRUS		2
WESTWARD	UNITED STATES		1
WILFRED TEMPLEMAN	CANADA		6
WIND CHALLENGER	NORWAY		1
WORLD DUET	LIBERIA	4	1
ZIEMIA CHELMINSKA	POLAND		3

SST = SEA SURFACE TEMPERATURE

Appendix B

Commanders of International Ice Patrol

Year of Command	Name of Commander
1914	CAPT J.H.Quinan
1915 -16	CAPT F.A.Levis
1919	CAPT H.G.Fisher
1920	LCDR O.F.A. DeOtte
1921	CDR A.L. Gambe
1922 - 23	CDR B.M. Chiswell
1924	LCDR W.J. Wheeler
1925 - 26	CDR H.G.Fisher
1927 - 28	CDR W.H. Munter
1929	CDR T.M. Molloy
1930	CAPT C. M. Gabbett
1931	LCDR N.G. Ricketts
1932	CAPT W.T. Stromberg
1933	LT R.M. Hoyle
1934	CDR W. J. Keester
1935	CDR E.D. Jones
1936	CDR R.L.Lucas
1937	CDR G.W. MacLane
1938	CDR C.H. Dench
1939 - 40	CDR E. H. Smith
1941	CDR P.K.Perry
1942 - 43	LCDR C.A. Barnes
1944 - 45	LT E.R. Challender
1946 - 47	Commodore L.W. Perkins
1948	CAPT D.G. Jacobs
1949	CAPT J.F. Jacot
1950	CAPT J.A. Glynn
1951 - 54	CAPT G. Van A. Graves
1955 - 58	CAPT K.S. Davis
1959	CAPT V.F. Tydlacka
1960 - 62	CAPT R.P. Bullard
1963	CAPT J. E. Richey
1964	CDR G. O. Thompson
1965-66	CAPT R. L. Fuller
1967-68	CDR J. E. Murray
1969-70	CDR J. R. Kelley
1971-73	CAPT E. A. Delaney
1974-77	CDR A. D. Super
1978	CAPT T. C. Volkle
1979-80	CDR J. C. Bacon
1981-83	CDR J. J. McClelland, Jr.
1983	LCDR A. D. Summy
*1983-86	CDR N. C. Edwards, Jr.
1987-89	CDR S. R. Osmer
1989-92	CDR J. J. Murray
1992 to present	CDR A.D. Summy

* International Ice Patrol first became a distinct command in October, 1983. Thus, CDR N. C. Edwards, Jr. was technically the first Commander, International Ice Patrol, and those prior to 1984 were senior International Ice Patrol officers.

Appendix C

Nations Currently Supporting International Ice Patrol

BELGIUM	NORWAY
CANADA	PANAMA
DENMARK	POLAND
FINLAND	SPAIN
FRANCE	SWEDEN
GREECE	UNITED KINGDOM
ISRAEL	UNITED STATES
ITALY	WEST GERMANY
JAPAN	YUGOSLAVIA
NETHERLANDS	

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Navy / NOAA Joint Ice Centre
U.S. Naval Fleet Numerical Oceanography Center
U.S. Naval Eastern Oceanography Center
U.S. Coast Guard Research and Development Center
Coast Guard Atlantic Area Staff
First Coast Guard District Communications Center

We extend our sincere appreciation to the staffs of these organizations for their excellent support during the 1992 International Ice Patrol season:

Canadian Coast Guard Radio Station St. John's, Newfoundland/VON
Ice Operation St John's, Newfoundland
Air Traffic Control Gander, Newfoundland
Canadian Forces Gander and St John's, Newfoundland
St. John's Weather Offices
U.S. Coast Guard Air Station Elizabeth City
U.S. Coast Guard Air Station Cape Cod
U.S. Coast Guard Communications Station Boston

It is also important to recognize the efforts of the personnel at the International Ice Patrol:

CDR J. J. Murray
CDR A. D. Summy
LCDR I. Anderson
Dr. D. L. Murphy
Mr. G. F. Wright
LT A. T. Ezman
LT G. A. Trivers
MSTCS D. R. Kennedy
YN2 C. B. Peters
MST1 R. S. Taylor
MST1 P. S. Johnson
MST2 C. D. Quigg
MST2 V. L. Fogt
MST2 R. V. Klarmann
MST2 C. L. Channel
MST2 M. W. Bauer
MST3 J. A. Jordan
MST3 J. F. Cole
MST3 W. S. Barton