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Oceanography and Scientific Data
NAFO STACFEN Report 2015

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Abstract

The Oceans Science branch (OSB), as the Regional Environmental Data Center for NAFO, is required to provide an annual inventory of environmental data collected in the NAFO Convention Area to the NAFO subcommittee for the environment (STACFEN). Inventories and maps of physical oceanographic observations such as ocean profiles, near surface thermosalinographs, drifting buoys, currents, waves, tides and water level measurements for the calendar year 2015 are included.

It is important for STACFEN to encourage members to send data and information to the designated data center in order to get significant return for NAFO member countries.

Introduction

The Oceans Science branch (OSB) of DFO acts as Regional Environmental Data Center for NAFO. This role began in 1963 when the Canadian Oceanographic Data Centre started providing data management functions to ICNAF, and was subsequently formalized in 1975 by which time the CODC had become the Marine Environmental Data Service (MEDS). The unit within MEDS responsible for the NAFO Regional Environmental Data Center function was later transferred to DFO branches known as Integrated Science Data Management (2005-2013), Oceanography and Scientific Data (2013-2014), Oceanographic Services (2014-2015) and Oceans Science (2015-current).

In order for OSB to carry out its responsibility of reporting to the Scientific Council, the Designated National Representatives selected by STACFEN are requested to provide OS with all marine environmental data collected in the Northwest Atlantic for the preceding years.

Provision of a meaningful report to the Council for its meeting in June 2016 required the submission to OSB of a completed oceanographic inventory form for data collected in 2015, and oceanographic data pertinent to the NAFO Convention Area, for all stations occupied in the year prior to 2015. The data of highest priority are those from the standard sections and stations, as described in NAFO SCR DOC., No. 1, Serial N 1432, 9p.

Data that have been formatted and archived at OS are available to all members on request. Requests can be made by telephone (613) 990-6065, by e-mail to isdm-gdsi@dfo-mpo.gc.ca, by completing an on-line order

form on the OSB web site at http://www.Meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/request-commande/form-eng.asp or by writing to Oceanographic Services, Fisheries and Oceans Canada, 12th Floor, 200 Kent St., Ottawa, Ont. Canada K1A 0E6.

Data Processing and Management

In the NAFO Convention Area, a variety of oceanographic surface, near-surface and subsurface observations, including vertical profiles of parameters such as temperature, salinity, oxygen, nutrients and other chemical and biological variables, are being made every day by ships borne instruments and autonomous devices. The Oceans Science Branch of DFO (OSB) receives these data either in real-time or delayed mode.

Real-time or near real-time data are acquired either directly from instruments (for instance, Argo Canada profilers), from research ships or ships of opportunity, from universities, from DFO research institutes, from the Global Telecommunication System of the World Meteorological Organization and the NOAA's Geostationary Satellite Server. Some real-time data transmitted over satellite or low bandwidth communications are pre-formatted in a way that reduces their vertical resolution or significant figures. Such data receive some form of quality control but generally do not benefit from the calibration made possible after a cruise or an instrument's recovery (in the case of moored equipment or remote controlled devices).

Delayed mode data are acquired through exchanges with research institutes, universities and other ocean databases, such as the World Ocean Database (WOD, NOAA & WDS) and the ICES Oceanographic database. The delayed mode data generally takes from months to years to process after a cruise is over or after an instrument has been recovered. For this reason, OSB continually receives delayed mode data from years preceding the previous observation years and must also query the aforementioned international databases (ICES, WOD) for observational periods covering a number of years prior to the year elapsed.

Most real-time data are subject to be replaced with a delayed mode version when available, and even delayed mode data are sometimes subject to recalibration, at which point it must be updated in the archives.

Data processing at OSB begins by reformatting files from their original formats into a common format. Quality control is carried out by a combination of specially designed software and trained personnel. The quality control has four main functions. The first is to check and ensure that each data message is properly formatted, units are standardized, and parameter range checks are performed. The second is to identify any duplication, and select the best version based on data type, source of the data, and general qualities in analysis and reporting of the observations. The third is to identify and correct date/time and geographical positioning errors using computer tests and visual inspection of the track for each cruise. The final quality control procedure uses a series of algorithms to find and flag common instrument failures found in profiles or series of subsurface measurements. These algorithms depend on data, platform and/or observation program type.

Data Summary

The data collected in the NAFO Convention Area (NCA) can be grouped by a number of ways (variable type, sampling type, platform type, real-time vs. delayed mode, source, etc.). To facilitate table and geographical representation, the categorization behind tables and figures differs slightly. The following table summarizes counts for 2015 by data type with a correspondence to the figures (p. 10-15) and tables (p. 16-34) where more information can be found.

Data observed in NAFO Convention Area in 2015 and acquired in 2015

Data Type	Platform Type	Counts/Duration	Table #	Figure #
Oceanographic profiles	autonomous platforms	7926* profiles from 125 platforms	1	1
	ship**	6345 profiles (2877 +3441*) from over 28 platforms***	2	2
Surface/near-surface observations	ship (thermosalinograph)	5387* obs. from 1 ship	2	4
	drifting buoys	245744* obs. from 136 buoys	4	4
	moored buoys temp/waves	Over 47900* obs. from 10 buoys	4	4
	moored buoys temp/salt	108625* obs. from 15 buoys	4	4
	fixed platforms	90746* obs. from 3 platforms	4	4
	water level gauges	21 sites, avg. 1 year each	5	4
Sub-surface observations	Moored current-meter, CTD, thermograph, ADCP	18 time series at 7 sites, avg. 284 d each	6	5

*Data formatted for real-time transmission

**Statistics also include data measured by one Canadian helicopter

***Some ships do not identify themselves

Data observed prior to 2015 in NAFO Convention Area and acquired in 2015

Data Type	Platform Type	Counts/Duration	Table #	Figure #
Oceanographic profiles	Ship	6377 profiles** (6190 + 187*) from over 30 platforms	3	3
Sub-surface observations	Moored thermograph	61 time series at 36 sites, average of 104 days each	6	6

*Data formatted for real-time transmission

**The amount of bottle data profiles measured <u>prior</u> to 2015 and loaded in a DFO database called BioChem, in 2015, could not be assessed

Description

<u>Oceanographic profiles</u>

Argo (figure 1, table 1)

Argo is an international program which started in 2000 with aims to deploy profiling floats on a 3 by 3 degree grid in the oceans of the world. Each profiling float samples and reports both temperature and salinity from 2000 m to the surface every 10 days. Some of the floats also report oxygen. Data are distributed on the Global Telecommunications System (GTS) of WMO within 24 hours of collection and made available on two mirror Global servers located in France and in the USA.

OSB performs the data management duties of Argo Canada profilers from instrument to the GTS and global servers. OSB also decodes and stores all Argo data circulating on the GTS. Over 3900 Argo profiling floats are currently sampling the world oceans. The distribution of profiles measured by floats operated by four countries (25% Canada, 46% France, 4% UK and 25% USA) in the NCA, in 2015, highlights the success of Argo

as an international project.

A profiling instrument like the ones used in the Argo project, but not part of the Argo project, was deployed in the Gulf of St. Lawrence by the Institut des Sciences de la Mer (Université du Québec à Rimouski) in conjunction with DFO and Environment and Climate Change Canada.

Gliders (figure 1, table 1)
Underwater gliders are autonomous underwater vehicles following saw tooth-like profiles in the ocean while measuring various parameters, during missions that can last months and extend over thousands of kilometers.

DFO regularly acquires data from the Ocean Tracking Network (headquartered at Dalhousie University) owned gliders, both active in NCA, and OSB creates messages for transmission on the GTS after performing automatic quality control. OSB also decodes and stores all glider data circulating on the GTS.

Mammals (figure 1, table 1)
Among data decoded by OSB from the GTS are real-time data transmitted by the Sea Mammal Research Units of University of St Andrews. These data are measured by tags featuring miniaturized CTD sensors attached to marine mammals and transmitting oceanographic data in real-time when the animals surface. These devices are used by a variety of researchers worldwide. In 2015 a few observations were made in and around Disko Bay (Greenland).

Ships (figures 2a & 2b, tables 2 & 3)
OSB receives real-time (within 30 days of observation) messages containing temperature and salinity profile data (either from CTD or XBT) from various Canadian Coast Guard ships, helicopter or opportunity vessels performing research or monitoring activities. The messages are sometimes sent from the ships or shortly after the ship's return. The data are quality controlled (see reference, GTSPP QC manual) prior to transmission on the GTS (if within 30 days of observation) or ingestion in the archive.

OSB decodes and stores all ship based data circulating on the GTS, either CTD or XBT. Some of this data are sampled by ships of opportunity

OSB further receives delayed mode data from DFO institutes: Northwest Atlantic Fisheries Centre, Bedford Institute of Oceanography (BIO), Maurice-Lamontagne Institute (MLI), St. Andrews' Biological Station, Gulf Fisheries Center (GFC, indirectly through BIO or MLI) and the Freshwater Institute (FWI), which it then ingests after conversion and visual quality assurance.

OSB also receives delayed mode data from foreign institutes and queries the World Ocean Database and ICES Oceanographic Database for additional data in the NAFO Convention Area (NCA). This year, OSB also downloaded data from the Spanish Institute of Oceanography which had been made available on SeaDataNet, upon notification. Comparisons are made between various sources to ensure always store the most recently calibrated data and with the most available number of fields. BIO provides support to OSB in acquiring and reformatting data from the Woods Hole Oceanographic Institution.

<u>Near-surface observations</u>

Moored buoys and fixed stations (figure 4, table 4)
OSB continuously acquires data from meteorological buoys in Canadian waters equipped with ocean data acquisition systems. These buoys belong to Environment and Climate Change Canada and measure wind velocity, air and water temperature, pressure and wave spectral energy with estimated period and significant wave height. All data are currently acquired via the Geostationary Operational Environmental Satellite (GOES), on which the buoys transmit, but in some situations the data is acquired in delayed-mode or from the GTS. The wave data has quality flags assigned by a combination of automated algorithms and a visual inspection of the spectral shape.

OSB also acquires, in delayed mode, data from wave measuring buoys deployed collected near offshore oil and gas sites as per NEB Guidelines. In 2015, a data submission from year 2015 wave buoys at two locations was archived at OSB.

A number of US moored buoys and fixed stations in the NCA transmit data on the GTS, and those are also acquired by OSB. The stations belong to various institutions but their data management is coordinated by NOAA's National Data Buoy Center. Their positions are typically near the coast.

Drifting buoys (figure 4, table 4)
OSB decodes and stores all drifting buoy data circulating on the GTS. Like in Argo, these buoys are deployed by various countries. Most buoys are designed for the Surface Velocity Program and are drogued at 15 m depth. The data reported are temperature and sometimes salinity. The buoy calculated displacement, over time, provides an estimation of currents at the drogued depth.

Thermosalinographs (figure 4, table 2)
OSB decodes and stores all thermosalinograph data circulating on the GTS. In 2015, only one ship reported thermosalinograph data in the NCA.

Water level gauges (figure 4, table 6)
OSB processes and archives observed water level data collected from the gauge network maintained by the Canadian Hydrographic Service (CHS), plus a few stations operated by Environment and Climate Change Canada. Over 2 million new observations are archived every month. The historical tide and water level data archive has digital records with the earliest dating back before the turn of the century.

Sub-surface moorings (figures 5-6, table 5)

Current meters have been deployed in the NCA for many years. Depending on location, the data are processed and archived by the BIO or MLI.

In 2015, 2014-2015 moored micro-cat CTD and Acoustic Current Doppler Profiler data at the Ocean Tracking Network sites 1-3 were recovered, processed and made available by and at BIO. BIO also processed and made available data from 2013-2015 ADCP, moored micro-cat CTD and thermograph data at OSNAP (international project: Overturning in the Subpolar North Atlantic Program) sites. Data from current meters deployed as part of the the Labrador Sea and Scotian Slope (2009-2010) components of the Atlantic Off-Shelf Monitoring Program were also processed at BIO. Finally, some older Scotian Shelf moored thermograph data from 1967 and 1968 were recalibrated by BIO.

Other Activities

Atlantic Zone Monitoring Program

The DFO Atlantic Zone Monitoring Program (AZMP) activities include regular sampling for 7 fixed stations and 14 standard sections, and research cruises in the AZMP area to collect other physical, chemical and biological data. As part of ISDM' activities in data management, OS continues to build and maintain the AZMP web site: http://www.Meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/azmp-pmza/index-eng.html.

The wealth of data and information on the site includes:

- Physical and chemical data from 1999 to the present such as CTD, bottle and bathythermograph measurements
- Climate indices showing long term trends of physical variables in the water and atmosphere.
- Remote Sensing links for Ocean Colour, SST and Primary Productivity product

The data collected as part of AZMP is also compiled in figures and tables pertaining to ship observations. A

climate index of area vs. bottom temperature-range distribution of bottom waters calculated for four NAFO sub-areas (4X, 4W, 4Vn, 4Vs), for the Northern Gulf and Magdalen Shallows, is made available along with other climate indices on the AZMP website.

Aquatic Invasive Species (AIS)

Aquatic Invasive Species are a major threat to Canada's fisheries and aquaculture industry and have been entering Canadian waters for centuries but never as rapidly as today. Every decade, some 15 alien species establish themselves in our coastal or inland waters. In the absence of their natural predators, the most aggressive of them spread rapidly. They can radically alter habitat, rendering it inhospitable for native species. The zebra mussel and sea lamprey are examples of such species that have greatly affected the Great Lakes.

The most effective approach to dealing with this threat involves managing the pathways through which invasive species enter and spread through Canadian waters. For aquatic species these pathways are shipping, recreational and commercial boating, the use of live bait, the aquarium/water garden trade, live food fish, unauthorized introductions and transfers, and canals and water diversions. The shipping pathway is considered the largest single source of new aquatic invasive species. Ballast water that is taken on in foreign ports, for ship stability and safety at sea, is discharged in Canadian waters, along with undesirable "hitchhikers" - foreign species ranging from bacteria to larger organisms.

The Canadian Aquatic Invasive Species database and web application was developed in 2004-5. The main objective was to provide a geo-referenced repository for all invasive species observations gathered in Canada by DFO scientists, provincial departments, other federal or municipal departments and the general public. The second objective was to create a decision making tool that would allow the production of augmented value products that would illustrate trends and movements over time and various locations and thus allow the department to be proactive rather than reactive to observations made.

Currently there is data from the Great Lakes, the Maritimes and some from the Vancouver area. Most of the data are observations of location name, long-lat, species name, date, and any metadata provided. It was not possible at the time of this report to obtain counts of new observations added in 2015.

Offshore Oil and Gas Environmental Monitoring Data

OSB also acquires, in delayed mode, monitoring physical oceanographic data collected near offshore oil and gas sites as per NEB Guidelines. Data submissions from year 2015 contained wave buoy and environmental reports at two locations. The wave data are tagged for inclusion in the OSB wave archives and are reported in table 3.

Data Access

Argo data are sent to the global data centers within 24 hours of collection and a national website (http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/Argo/index-eng.html) presents products and statistics on Argo Canada profilers along with links to the data.

GTS-decoded or otherwise acquired real-time oceanographic profiles, US costal mooring and US fixed platform data from the GTS are forwarded three times a week to the Global Temperature Salinity Profile Programme's Continuously Managed Database (http://www.nodc.noaa.gov/GTSPP/access_data) and to the Copernicus Environment Monitoring Service (formerly MyOcean) where they are made available in "near real time in situ" products (http://marine.copernicus.eu/web/69-myocean-interactive-catalogue.php). The GTS thermosalinograph data are forwarded to Ifremer's France data center (http://www.gosud.org).

Delayed-mode Canadian oceanographic profile data are exchanged bilaterally with the ICES Oceanographic Database (http://www.ices.dk/marine-data/data-portals/Pages/ocean.aspx) and the World Ocean Database (https://www.nodc.noaa.gov/OC5/WOD/pr_wod.html). Synchronization is however a work in progress and one may need to allow from months to more than a year for Canadian data to become available from these databases after it has been collected.

Selected ocean profiles along AZMP sections can be viewed and downloaded from the AZMP website (http://www.Meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/azmp-pmza/index-eng.html). OSB sends updates of data acquired to DFO research institutes on a monthly basis. Canadian oceanographic profiles data can otherwise always be requested through this form: http://www.Meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/request-commande/form-eng.asp.

GTS-decoded drifting buoy and equatorial moored buoy data are sent to the US NODC (now part of National Centers for Environmental Information, NOAA) Ocean Archive System on a yearly basis (http://www.nodc.noaa.gov/cgi-bin/OAS/prd/text/query).

Canadian moored buoy data are made available on a national website within days of collection (updates on business days): http://www.Meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/waves-vagues/index-eng.htm

Canadian water level data are available from two national websites: http://waterlevels.gc.ca (last 24 hours); http://www.Meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/twl-mne/index-eng.htm (validated, historical). Relevant stations data are shared with international initiatives such as the Permanent Service for Mean Sea Level, Global Sea Level Observing System and IOC Sea Level Station Monitoring facility.

Canadian moorings data are available from BIO (http://www.bio.gc.ca/science/data-donnees/base/index-en.php) or MLI (http://slgo.ca/app-sgdo/en/accueil.html) depending on the site locations.

Aquatic Invasive Species data can be queried through an application (http://www.meds-sdmm.dfo-mpo.gc.ca/ais-eae) or viewed as a geoportal gallery (http://geoportal.gc.ca/eng/Gallery/MapProfile/3).

References

List of NAFO Standard Oceanographic Sections and Stations. The reprint of NAFO SCR DOC., NO. 1, Serial N1432, 9p. Printed and distributed by: NAFO, P.O. Box 638, Dartmouth, Nova Scotia, Canada B2Y 3Y9.

GTSPP Real-Time Quality Control Manual First Revised Edition. UNESCO-IOC 2010. (IOC Manuals and Guides No. 22, Revised Edition.) (IOC/2010/MG/22Rev.)

Appendix

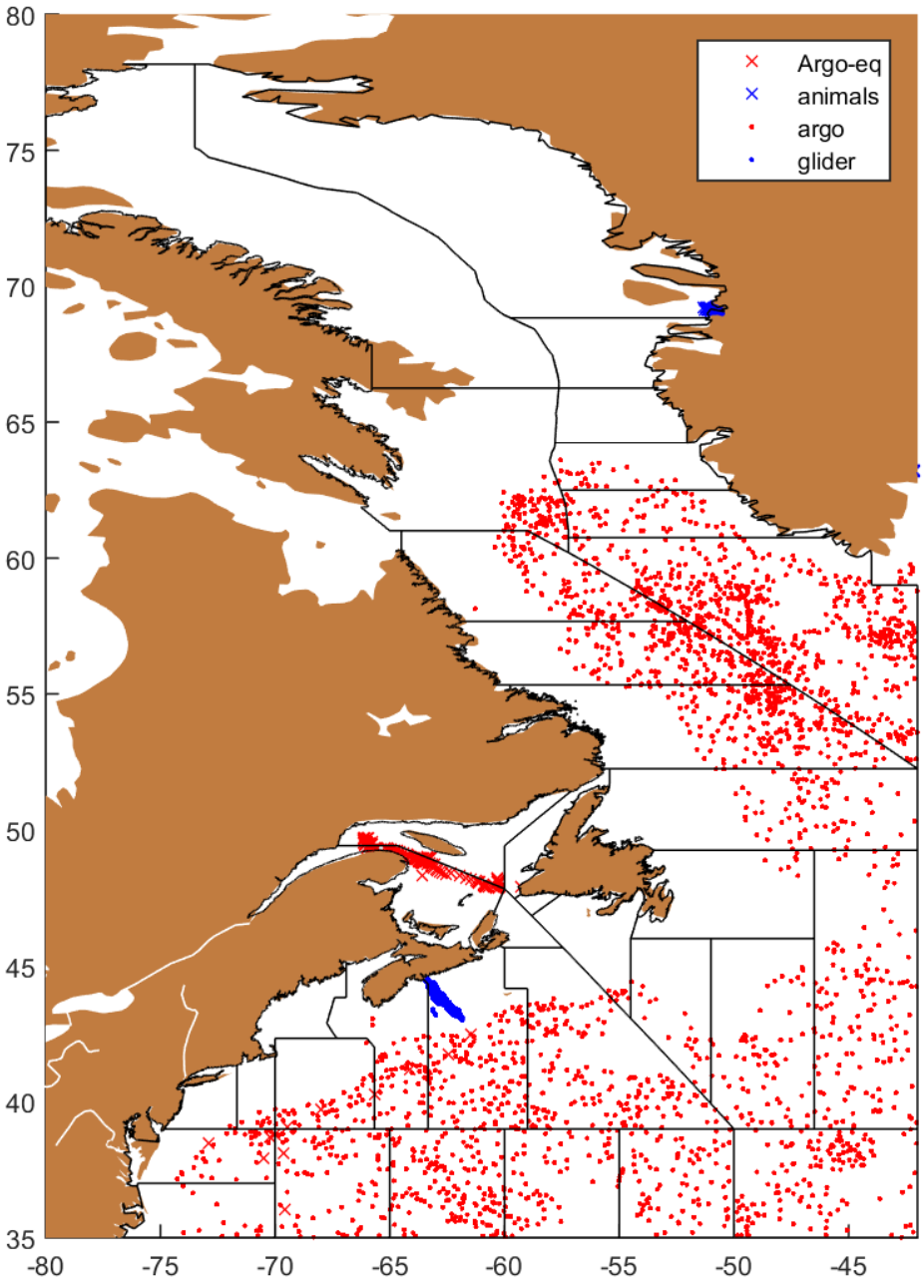

Fig. 1. Position of profiles sampled by autonomous platforms in 2015

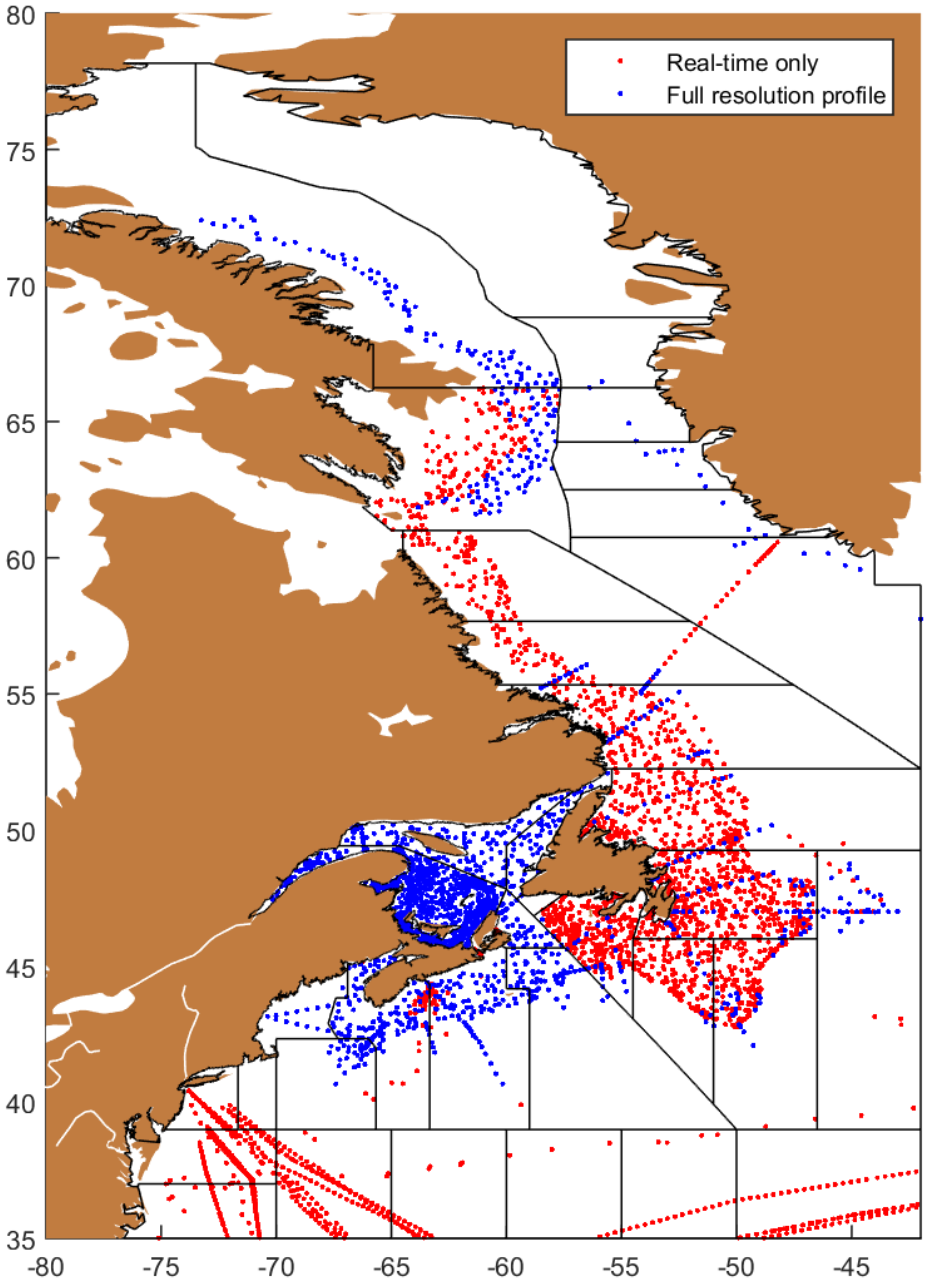

Fig. 2. Position of profiles sampled by ships (+1 helicopter) in 2015

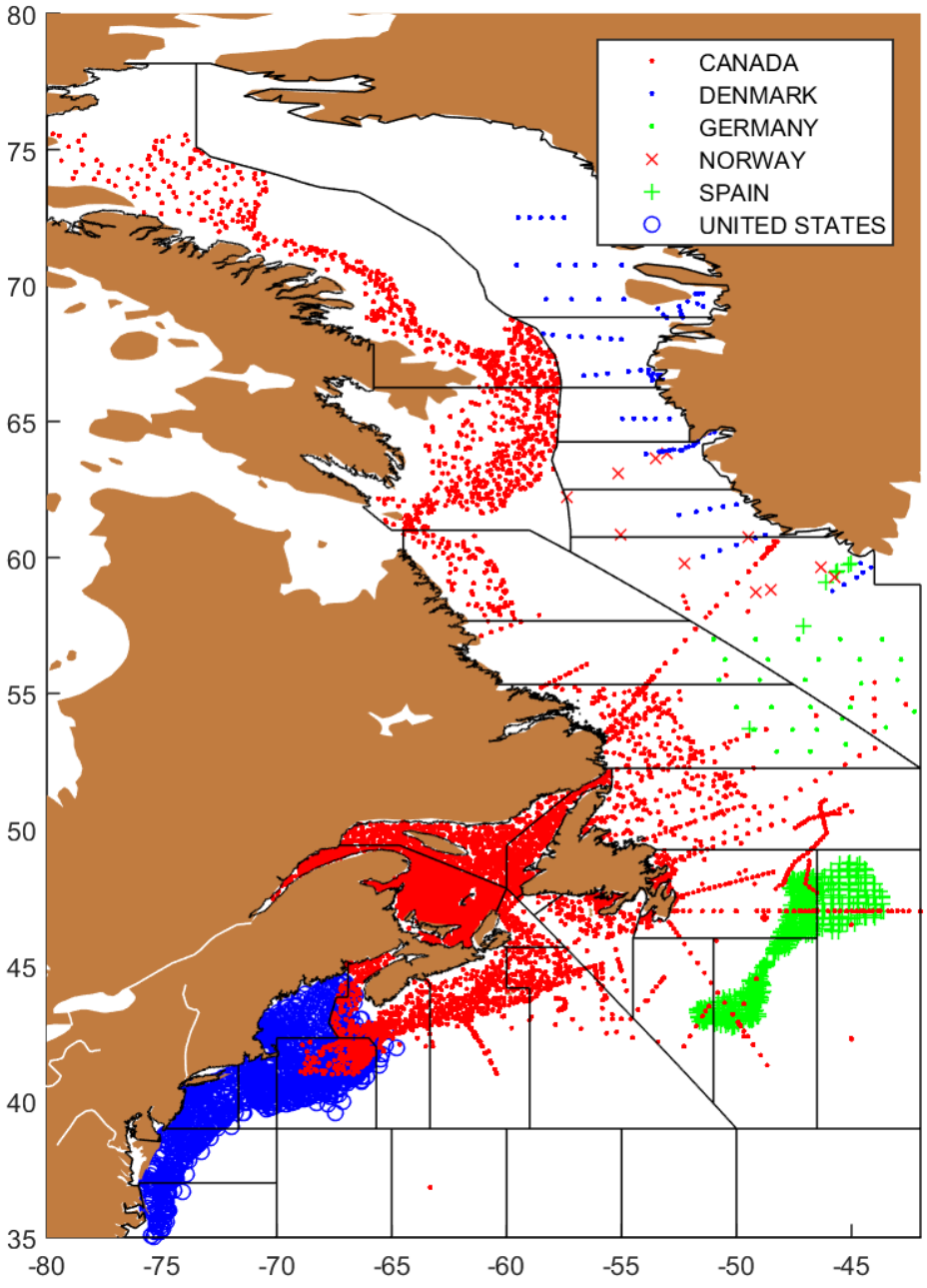

Fig. 3. Position of profiles sampled by ships before 2015 and acquired in 2015

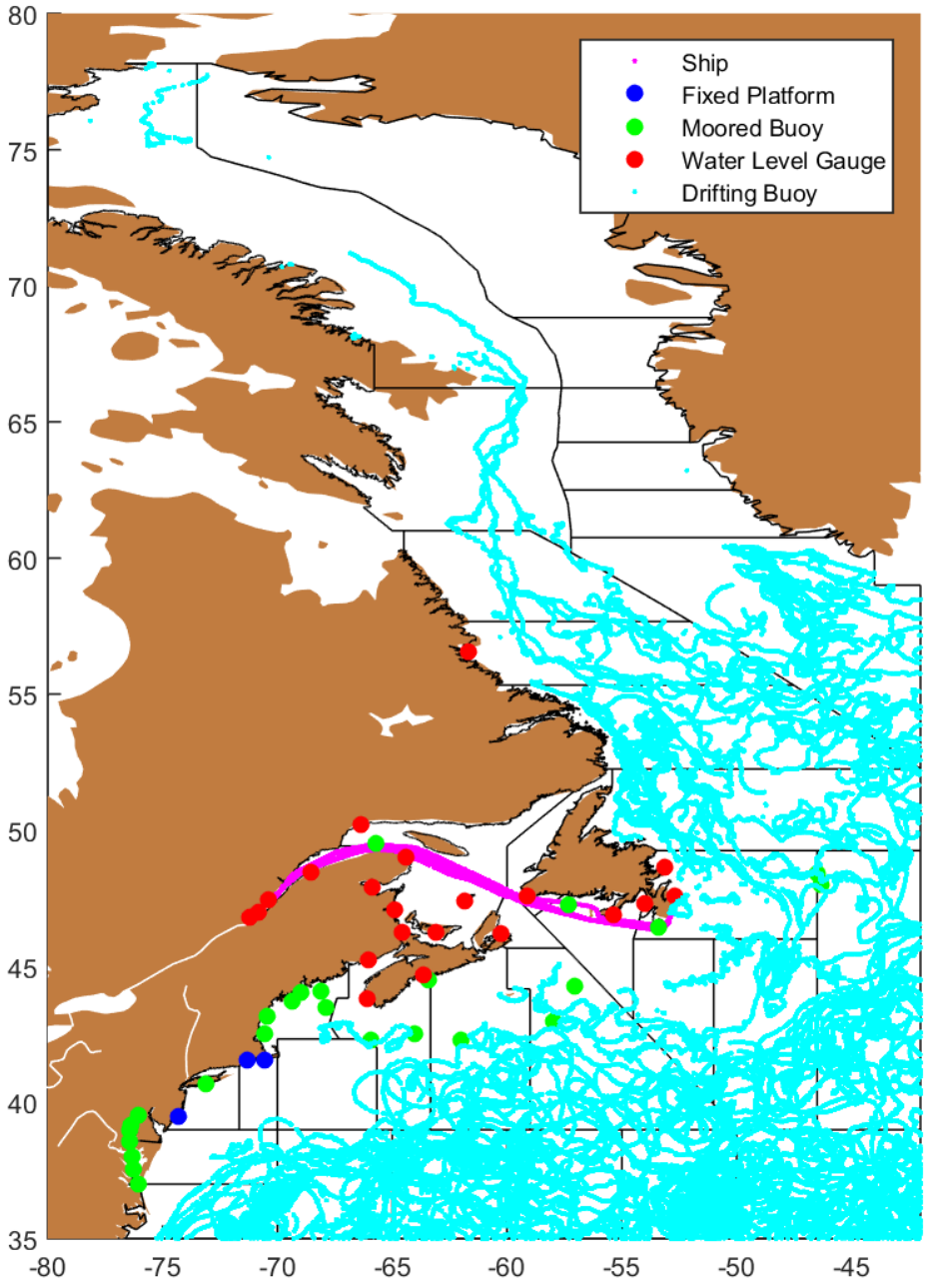

Fig. 4. Position of near surface observations made in 2015 and acquired in 2015

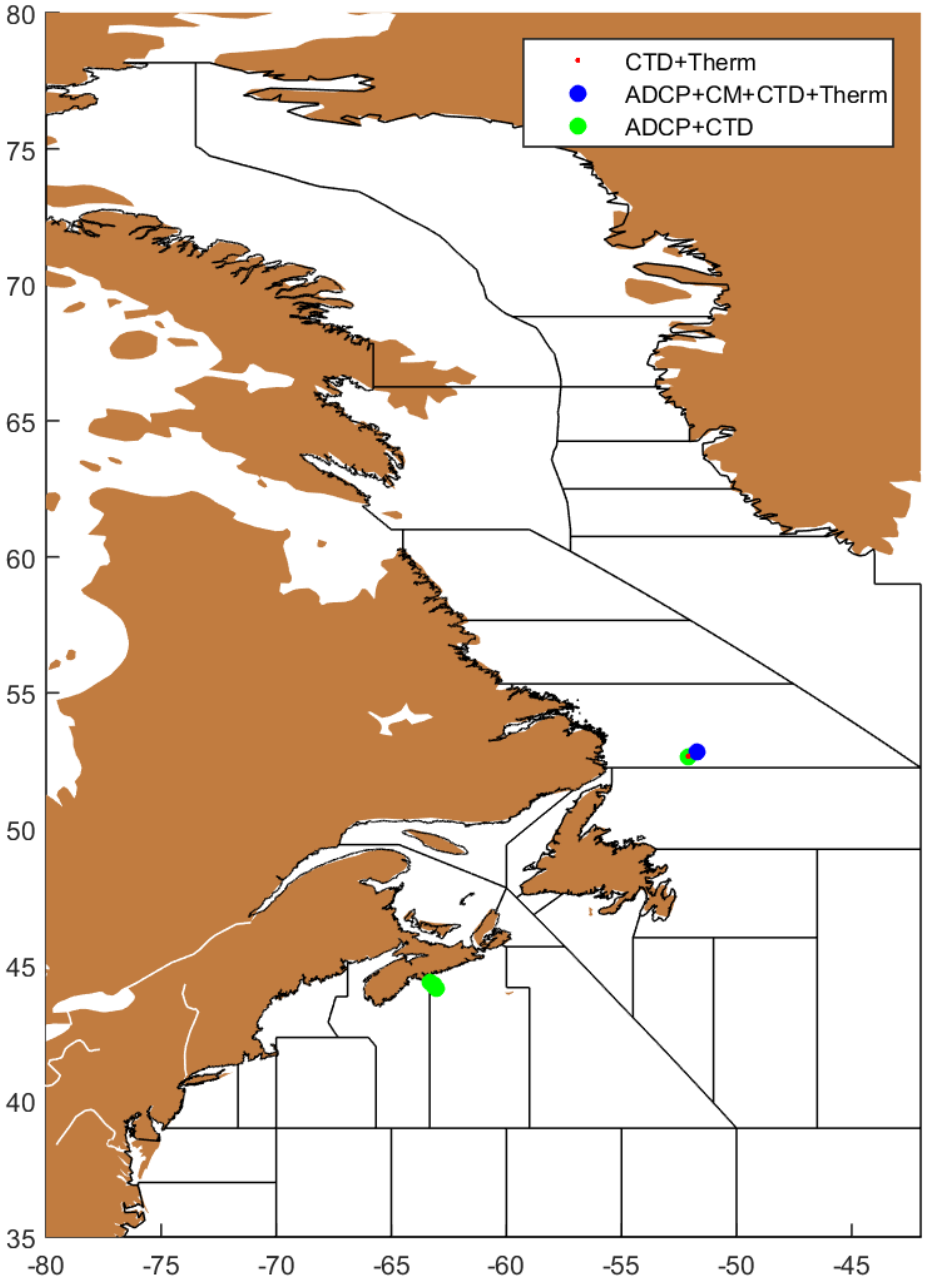

Fig. 5. Position of subsurface moorings with data measured in 2015 and processed in 2015 (therm=Thermograph, CTD=Conductivity-Temperature-Depth, ADCP = Acoustic Doppler Current Profiler, CM = Current meter)

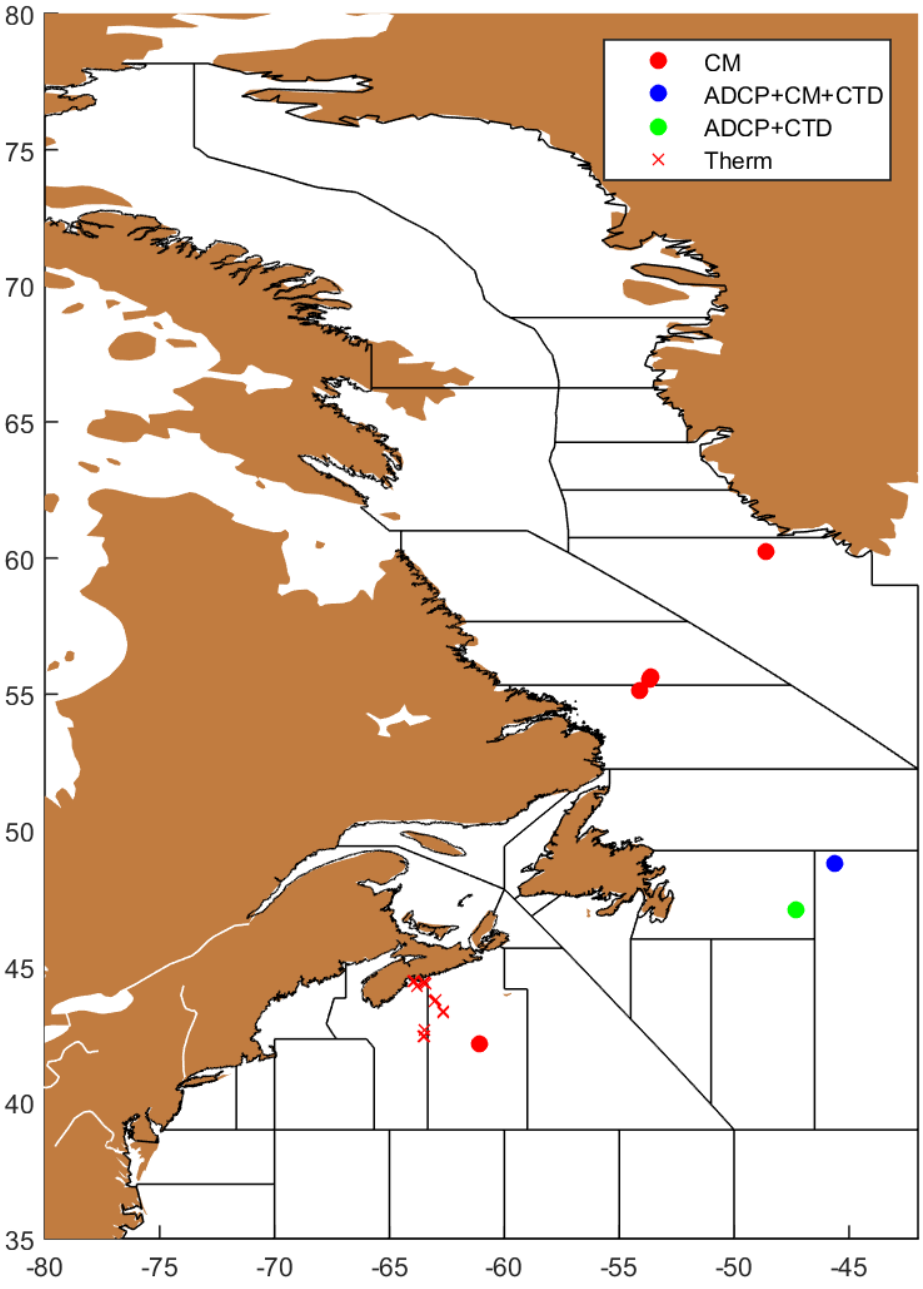

Fig. 6. Position of subsurface moorings with data measured before 2015 and processed or reprocessed in 2015 (therm=Thermograph, CTD=Conductivity-Temperature-Depth, ADCP = Acoustic Doppler Current Profiler, CM = Current meter)

Table 1: Real-time temperature and /or salinity profiles from autonomous platforms collected and processed in 2015

Platform Type	Platform Name	Country	WMO ID	Reporting period (months)	Profiles	NAFO Subareas
Glider	OTN201	Canada	48922	Sep-Nov	850	4W
Glider	OTN200	Canada	48923	Jan-Aug	3905	4W 4X
Argo		France	1901208	Jan-May	14	6H
Argo		France	1901210	Jan-Dec	35	1F 2G 2H 2J
Argo		France	1901217	Jan-Dec	37	1F 2H 2J
Argo		UK	1901294	Jan-Dec	36	0B 1D 1E 1F 2G
Argo		USA	1901465	Jan-Dec	19	2J 3M 3N 3O
Argo		USA	1901534	Mar-Dec	22	4W 4X 5Ze 5Zw 6A 6B 6D 6E
Argo		USA	4901057	Jan-Dec	32	4Vs 4W 4X 6D 6E 6F 6G
Argo		Canada	4901192	Jan-Dec	34	1F 2J 3K
Argo		Canada	4901193	Jan-Dec	35	1D 1E 1F 2G 2H
Argo		Canada	4901198	Apr-Dec	27	1F 2J 3K
Argo		Canada	4901199	Jan-Sep	10	3N 3O 4Vs 6G
Argo		Canada	4901201	Jan-Oct	21	3M 6H
Argo		USA	4901278	Jan-Jun	16	6D 6E
Argo		USA	4901285	Jun-Dec	19	3N 3O 4Vs 6G
Argo		USA	4901290	Mar-May	5	6H
Argo		USA	4901298	Jan-Nov	17	3M 3N 3O 4Vs 6F 6G
Argo		USA	4901400	Jan-Dec	17	6C 6D 6E 6F
Argo		France	4901417	Jan-Dec	36	1F 2G 2H
Argo		France	4901418	Jan-Dec	37	1F 2H 2J
Argo		France	4901419	Oct-Dec	10	1E 1F 2G
Argo		USA	4901450	Mar-Jul	2	6G 6H
Argo		USA	4901461	Jan-Mar	7	3M 3N
Argo		USA	4901462	Jan-Dec	36	4Vs 6F 6G 6H
Argo		USA	4901464	Jun-Jun	1	6H
Argo		USA	4901466	Jan-Dec	35	3M 3N 4Vs 6F 6G 6H
Argo		USA	4901467	Jan-Nov	31	4Vs 4W 4X 6D 6E 6F
Argo		USA	4901469	Jan-Jun	17	6G 6H
Argo		USA	4901591	May-Dec	13	4Vs 4W 6C 6D 6E
Argo		USA	4901594	Jan-Dec	24	4W 6E 6F
Argo-eq		USA	4901605	Jul-Nov	5	4X 5Ze 6C
Argo		USA	4901621	Dec-Dec	2	6B 6D
Argo		USA	4901628	Jan-Nov	23	4X 5Ze 6B 6C 6D 6E
Argo		USA	4901629	Jan-Sep	24	4Vs 4W 6E 6F 6G
Argo		USA	4901630	Jan-Mar	4	6C 6D
Argo		USA	4901631	Jan-Dec	33	4Vs 4X 6D 6E 6F

Argo	USA	4901701	May-Dec	11	6H
Argo	USA	4901704	Jan-Dec	33	3M 3N 4Vs 6F 6G 6H
Argo	USA	4901705	Jan-Dec	35	3M 3N 4Vs 4W 6E 6F 6G 6H
Argo	USA	4901707	Jan-Dec	61	4Vs 4W 6E 6F
Argo	Canada	4901744	Jan-Dec	37	0B 1E 1F 2G
Argo	Canada	4901745	Mar-Dec	29	3M 3N 4Vs
Argo	Canada	4901747	Jan-Dec	35	2J 3K 3L 3M
Argo	Canada	4901748	Jan-Dec	35	0B 1E 1F 2G
Argo	Canada	4901750	Jan-Dec	33	2H 2J
Argo	Canada	4901751	Jan-Dec	37	1F 2H
Argo	Canada	4901752	Jan-Dec	35	1F 2H 2J 3K
Argo	Canada	4901753	Jan-Aug	23	1F 2H 2J 3K 3L 3M
Argo	Canada	4901755	Jan-Dec	37	3M 3N 4Vs 4W 6E 6F 6G
Argo	Canada	4901758	Feb-Apr	6	3N 6H
Argo	Canada	4901762	Jan-Dec	37	2G 2H 2J 3K 3L 3M 3N
Argo	Canada	4901763	Jan-Dec	35	5Ze 6B 6C 6D 6E
Argo	Canada	4901765	Jan-Aug	22	3N 6G 6H
Argo	Canada	4901778	Apr-Sep	15	4Vs 4W
Argo	Canada	4901779	May-Sep	12	1F 2H
Argo	Canada	4901780	May-Dec	20	1F 2G 2H 2J
Argo	Canada	4901781	May-May	2	1F 2H
Argo	Canada	4901782	May-Dec	24	1F 2G 2H
Argo	Canada	4901783	May-Dec	24	1F 2H 2J
Argo	Canada	4901787	Nov-Dec	4	3N
Argo	Canada	4901788	Nov-Dec	5	3N 3O
Argo-eq	Canada	4901789	Aug-Dec	147	4S 4T
Argo	Canada	4901798	Apr-Dec	25	4W 4X 5Ze 6A 6B
Argo	Canada	4901799	Apr-Apr	1	4Vs
Argo	Canada	4901800	Apr-Jul	10	4Vs 4W
Argo	Canada	4901807	Nov-Dec	5	3O 3Ps
Argo	USA	4902099	Nov-Dec	6	3Ps 4Vs
Argo	USA	4902100	Nov-Dec	2	4Vs
Argo	USA	4902102	Dec-Dec	1	4X
Argo	USA	4902288	Aug-Aug	1	4X
Argo	France	5902297	Jan-Apr	11	1F
Argo	France	5902304	Jan-Jan	1	2H
Argo	USA	5903377	Jan-Mar	13	6H
Argo	USA	5903390	Jan-Dec	36	1F 2H 2J 3K
Argo	USA	5903397	Jan-Feb	5	3K
Argo	USA	5903399	May-Jun	3	3M
Argo	USA	5903889	Jan-Dec	37	4X 5Ze 5Zw 6B 6D
Argo	USA	5903997	Jan-Feb	4	6C 6D
Argo	France	5904989	Sep-Dec	20	1E 1F

Argo	UK	6900446	Jan-Jan	3	1F
Argo	UK	6900614	Aug-Aug	2	1F
Argo	UK	6900653	Jan-Feb	9	0B
Argo	France	6900897	Jan-Jan	2	1F
Argo	France	6900910	Jan-Dec	38	4Vs 4W 4X 5Ze 6E 6F 6G
Argo	France	6900973	Jan-Dec	36	1F 2J 3K 3L 3M
Argo	France	6901027	Jun-Nov	14	1F 2J 3K
Argo	France	6901030	Jan-Dec	39	0B 1E 1F 2H
Argo	UK	6901147	Jan-Dec	35	0B 1E 1F 2G 2H
Argo	UK	6901149	Oct-Dec	8	1E 1F
Argo	France	6901217	Jan-Feb	4	6F
Argo	France	6901218	Jan-Mar	6	6E 6F
Argo	France	6901480	Jan-Dec	78	2G 2H 2J
Argo	France	6901482	Jan-Jan	4	1F
Argo	France	6901485	Jan-Dec	67	0B 1D 1E 2G 2H
Argo	France	6901486	Jan-Dec	118	1F 2G 2H
Argo	France	6901489	Jan-Feb	12	1F 2G
Argo	France	6901494	Mar-Mar	3	5Ze 6D
Argo	France	6901508	Jan-Dec	36	3M 3N
Argo	France	6901523	Jun-Jun	5	1F
Argo	France	6901524	Mar-Dec	48	1F
Argo	France	6901525	Jan-Dec	26	3M
Argo	France	6901527	Jan-Dec	105	1F 2H 2J
Argo	France	6901589	Jan-Dec	38	1F 2G 2H 2J
Argo	France	6901758	Oct-Dec	5	1F 2J 3K
Argo	France	6902563	Jan-Dec	36	4V s4W 4X 5Ze 6D
Argo	France	6902564	Jan-Dec	35	4Vs 4W 4X 5Ze 5Zw 6D 6E
Argo	France	6902565	Jan-Nov	34	4Vs 4W 6D 6E 6F 6G 6H
Argo	France	6902566	Jan-Dec	37	4Vs 4W 4X
Argo	France	6902567	Jan-Dec	37	3N 4Vs 4W 6F 6G 6H
Argo	France	6902584	Sep-Dec	10	1E 1F
Argo	France	6902586	Jan-Dec	33	1F
Argo	France	6902587	Jan-Jan	1	1F
Argo	France	6902589	Jan-Dec	35	1F 2G 2H 2J
Argo	France	6902632	Oct-Dec	8	4Vs 4W
Argo	France	6902633	Oct-Dec	9	4Vs 4W
Argo	France	6902634	Oct-Dec	8	4Vs 4W
Argo	France	6902635	Oct-Dec	9	3Ps 4Vs
Argo	France	6902636	Oct-Dec	9	4W 4X
Argo	France	6902659	Sep-Dec	10	2H 2J 3K
Argo	France	6902660	Sep-Dec	10	1F 2G
Animals	U.K.	9900725	Jan-Mar	87	1A
Animals	U.K.	9900787	Sep-Dec	291	1A

Animals	U.K.	9900788	Sep-Oct	13	1A
Animals	U.K.	9900789	Sep-Nov	7	1A

*Dates are of first and last data reports within the NAFO Convention Area

Table 2. 2015 Temperature (XBT) and/or salinity (CTD, bottle) profile and surface (thermosalinograph: TSG) data collected aboard ships, processed in 2015

Platform Name	Country	Cruise Number	First Date	Last Date	CTD	Bottle	XBT	TSG	NAFO_Subareas
(various)	Canada		20150101	20151022	17*	0	214*	0	3K 3M 3N 4T 4Vn4W 4X 5Ze6B 6C 6D 6E 6F 6G
Sigma-Theta	Canada	18VA15667	20150107	20151216	50	50	0	0	4W
Teleost	Canada		20150107	20150119	84*	0	4*	0	3L 3N
(various)	Canada	189015001	20150118	20151218	44	0	0	0	4T
Teleost	Canada	18TL15142	20150121	20150121	0	1	0	0	3L
Viola M. Davidson	Canada	18VA15669	20150122	20151221	11	11	0	0	4X
Teleost	Canada		20150122	20150201	62*	0	0	0	3K 3L
Sigma-Theta	Canada	18VA15666	20150130	20151217	10	10	0	0	4W
Teleost	Canada	18TL15143	20150202	20150202	2*	1	0	0	3L
Maersk Visby			20150217	20150422	0	0	96*	0	5Zw6A 6B 6C 6D 6E
Helicopter	Canada	18HE15002	20150303	20150312	75	73	0	0	4R 4S 4T 4Vn
Cma Cgm Racine			20150303	20150520	0	0	92*	0	6H
Alfred Needler	Canada	18NE15002	20150305	20150327	29	28	0	0	4W 5Ze
Teleost	Canada	18TL15155	20150320	20150320	0	1	0	0	3L
Alfred Needler	Canada		20150407	20150511	186*	0	6*	0	3O 3Ps
Oleander	USA		20150410	20151122	0	0	280*	0	6A 6B 6D
Teleost	Canada	18TL15144	20150410	20150427	27*	71	36*	0	3L 3M 3N 3O 3Ps
Hudson	Canada	18HU15004	20150417	20150427	57	55	0	0	3Ps4Vn4Vs4W 4X 5Ze
Shippan Island			20150422	20150627	0	0	78*	0	6B 6C
Teleost	Canada		20150429	20150505	48*	0	0	0	3L 3Ps 4W
Celtic Explorer	Canada / Ireland	45CE15003	20150430	20150430	1	1	0	0	3M
Beluga II	Canada	18BG15008	20150501	20150511	2	0	0	0	4T
Leim	Canada	18LO15005	20150502	20150507	19	0	0	0	4S
Hudson	Canada		20150503	20150503	1*	0	0	0	4W
Vladykov	Canada	18VD15040	20150504	20150504	0	1	0	0	3L
Hudson	Canada	18HU15006	20150505	20150518	40*	16	0	0	1F 2H 2J 3L 4W
Teleost	Canada	18TL15146	20150507	20150511	0	2	0	0	3L
Leim	Canada	18LO15006	20150510	20150511	2	0	0	0	4T
Teleost	Canada		20150512	20150526	28*	0	78*	0	3K 3L
Alfred Needler	Canada	18NE15452	20150512	20150512	0	1	0	0	3L
Alfred Needler	Canada		20150514	20150525	98*	2*	0	0	3N 3O
Vladykov	Canada	18VD15041	20150516	20150516	0	1	0	0	3L

Cap Breton	Canada	18VA15668	20150521	20151209	5	5	0	0	4T
Hudson	Canada		20150522	20150920	2*	0	0	0	4W
Alfred Needler	Canada	18NE15453	20150526	20150526	0	1	0	0	3L
Alfred Needler	Canada	18NE15454	20150528	20150528	0	1	0	0	3L
Alfred Needler	Canada		20150529	20150617	99*	0	4*	0	3L 3N
Vladykov	Canada		20150530	20150809	43*	0	0	0	3K 3L 3Ps
Vizconde de Eza	Spain	29VE15260	20150531	20150619	20	0	0	0	3N 3O
Teleost	Canada	18TL15016	20150531	20150620	129	0	0	0	3Pn4R 4S 4T 4Vn
F.G. Creed	Canada	18FC15025	20150607	20150616	34	0	0	0	4T
L'Alliance	Canada	18K815001	20150610	20151015	41	0	0	0	4T
Alfred Needler	Canada	18NE15455	20150619	20150619	0	1	0	0	3L
F.G. Creed	Canada	18FC15022	20150620	20150627	5	0	0	0	4T
Vizconde de Eza	Spain	29VE15240	20150625	20150722	20	0	0	0	3M
Alfred Needler	Canada	18NE15015	20150625	20150625	1	1	0	0	4W
Alfred Needler	Canada	18NE15017	20150629	20150817	216	216	0	0	3Ps4Vn4Vs4W 4X 5Y 5Ze
Walther Herwig III	Germany	06NI15385	20150708	20150708	1	1	0	0	1F
Jean Mathieu	Canada	182P15001	20150709	20151015	229	0	0	0	4T
Teleost	Canada	18TL15148	20150709	20150727	73*	78	130*	0	2H 2J 3K 3L 3M
M. Perley	Canada	18MU15021	20150715	20150808	110	0	0	0	4T
Cma Cgm Moliere			20150716	20151009	0	0	128*	0	6F 6G 6H
Maersk Vilnius			20150720	20151125	0	0	236*	0	5Zw6A 6B 6D 6E
Vizconde de Eza	Spain	29VE15280	20150728	20150817	20	0	0	0	3L
Teleost	Canada	18TL15031	20150802	20150901	122	0	0	0	3Pn4R 4S 4T 4Vn
F.G. Creed	Canada	18FC15023	20150803	20150811	5	0	0	0	4S 4T
Leim	Canada	18LO15032	20150806	20150816	6	0	0	0	4T
Vladykov	Canada	18VD15046	20150813	20150813	1*	1	2*	0	3L
Vladykov	Canada		20150813	20151104	96*	0	0	0	3K 3L
Katsheshuk II	Canada		20150819	20150921	235*	0	0	0	0B 2G
Teleost	Canada	18TL15133	20150905	20150927	171	170	0	0	4T 4Vn
Alfred Needler	Canada		20150909	20150914	39*	0	0	0	3Ps
Paamiut	Canada	26PA15007	20150911	20151010	177	0	0	0	0A 0B
Oceanex Connaigra	Canada		20150913	20151231	0	0	0	5387	3L 3Pn3Ps4R 4S 4T 4Vn
Alfred Needler	Canada	18NE15456	20150915	20150915	0	1	0	0	3L
Alfred Needler	Canada		20150918	20150919	3*	0	0	0	3L

Hudson	Canada	18HU15030	20150920	20151011	116	106	0	0	3Pn3Ps4Vn4Vs4W 4X 5Y 5Ze
Alfred Needler	Canada	18NE15457	20150920	20150920	0	1	0	0	3L
Alfred Needler	Canada	18NE15458	20150924	20151002	37*	2	4*	0	3L 3O
M. Perley	Canada	18MU15029	20150925	20151012	21	0	0	0	4T
Conrad S			20150926	20151220	0	0	160*	0	6A 6B 6C
Alfred Needler	Canada		20151004	20151009	38*	0	0	0	3N 3O
Teleost	Canada	18TL15150	20151007	20151007	0	1	0	0	3L
Teleost	Canada		20151008	20151215	332*	0	30*	0	2H 2J 3K 3L
Alfred Needler	Canada	18NE15459	20151010	20151010	0	1	0	0	3L
Alfred Needler	Canada		20151013	20151201	199*	0	14*	0	3L 3N 3O
Hudson	Canada	18HU15041	20151019	20151105	77	0	0	0	3Pn4R 4S 4T 4Vn
Leim	Canada	18LO15039	20151020	20151020	3	0	0	0	4T
Walther Herwig III	Germany	06NI15389	20151025	20151105	22	22	0	0	1B 1C 1D 1E 1F
Hudson	Canada	18HU15115	20151115	20151206	35*	94	22*	0	2J 3K 3L 3M 3N 3O 3Ps

* Messages formatted for transmission on the GTS. These messages are lower vertical resolution and uncalibrated versions of the data, to be replaced in the future.
** In each case the reporting period corresponds to the period associated with the profiles measured in the NCA only.

Table 3. Pre-2015 temperature (XBT) and/or salinity (CTD, bottle) profile data collected aboard ships, processed in 2015

Platform Name	Country	Cruise Number	First Date**	Last Date**	CTD	Bottle	XBT	NAFO Subareas
Teleost	Canada	18TL14141	20141211	20141221	0	2	0	3L
Teleost	Canada		20141126	20141220	171*	0	8*	3K 3L
Maersk Visby			20141216	20141217	0	0	8*	6A 6B
Beluga II	Canada	18BP14001	20140422	20141216	28	0	0	4T
Hudson	Canada	18HU14114	20141116	20141207	94	69	0	2J 3K 3L 3M 3N 3O
Teleost	Canada	18TL14137	20141113	20141124	76	0	0	2J 3K
Pisces	USA	334B14005	20141103	20141119	177	0	0	4X 5Y 5Ze 5Zw 6A 6B 6C
Viola M. Davidson	Canada	18AU14003	20141113	20141113	2	0	0	5Y
Henry B. Bigelow	USA	33HH14005	20140910	20141113	364	0	0	4X 5Y 5Ze 5Zw 6A 6B 6C
Hudson	Canada	18HU14037	20141019	20141110	141	0	0	3Pn 4R 4S 4T 4Vn
Teleost	Canada	18TL14136	20141030	20141110	69	0	0	2J 3K
Vladykov	Canada	18VD14038	20141031	20141031	1	1	0	3L
Teleost	Canada	18TL14135	20141018	20141027	48	0	0	2J
Paamiut	Canada	26PA14007	20140922	20141019	142	0	0	0A 0B
Pandora II	Canada	18P214009	20140709	20141012	328	0	0	4T
Vladykov	Canada	18VD14036	20140930	20141005	13	0	0	3L
Teleost	Canada	18TL14134	20141004	20141004	1	1	0	3L
Vladykov	Canada	18VD14035	20140919	20140930	15	0	0	3L
Kinguk	Canada	18KU14109	20140716	20140924	251	0	0	0B 2G 2H
Hugh R. Sharp	USA	33H514002	20140904	20140915	32	0	0	5Y 5Ze 5Zw 6B
Vladykov	Canada	18VD14034	20140827	20140911	24	0	0	3K
Alfred Needler	Canada	18NE14448	20140908	20140908	1	1	0	3L
F.G. Creed	Canada	18FC14011	20140807	20140825	13	0	0	4S 4T
Vladykov	Canada	18VD14033	20140814	20140820	18	1	0	3L

Vizconde de Eza	Spain	29VE14007	20140730	20140819	90	0	0	3L 3M
Alfred Needler	Canada	18NE14018	20140628	20140816	179	188	0	4Vn 4Vs 4W 4X 5Y 5Ze
Vladykov	Canada	18VD14032	20140804	20140812	16	0	0	3L
Vladykov	Canada	18VD14031	20140727	20140802	16	0	0	3L
Henry B. Bigelow	USA	33HH14003	20140725	20140730	15	0	0	5Ze 5Zw
Teleost	Canada	18TL14132	20140709	20140728	105	72	0	2H 2J 3K 3L 3M
Hugh R. Sharp	USA	33H514001	20140701	20140724	70	0	0	5Ze 6A 6B
Vizconde de Eza	Spain	29VE14006	20140625	20140723	66	0	0	3L 3M
Vladykov	Canada	18VD14030	20140702	20140705	2	0	0	3K 3L
Beluga II	Canada	18BP14013	20140623	20140623	1	0	0	4T
Teleost	Canada	18TL14140	20140612	20140623	2	2	0	3L
Vladykov	Canada	18VD14029	20140616	20140622	16	0	0	3L
Vizconde de Eza	Spain	29VE14005	20140602	20140621	121	0	0	3N 3O
Alfred Needler	Canada	18NE14447	20140607	20140619	3	2	0	3L
Teleost	Canada	18TL14139	20140529	20140611	1	2	0	3L
Vladykov	Canada	18VD14028	20140526	20140605	26	0	0	3Ps
Henry B. Bigelow	USA	33HH14001	20140402	20140531	297	0	0	4X 5Y 5Ze 5Zw 6A 6B
Teleost	Canada	18TL14131	20140513	20140525	3	2	0	3L
Hudson	Canada	18HU14007	20140502	20140524	1	1	0	3L 4W
Teleost	Canada	18TL14130	20140501	20140511	2	2	0	3L
Ann Harvey	Canada	18AV14005	20140305	20140503	1	1	0	3L
Knorr	USA	316N14021	20140502	20140502	0	3	0	5Zw
Teleost	Canada	18TL14129	20140411	20140429	96	67	0	3K 3L 3M 3N 3O 3Ps
Gordon Gunter	USA	33GG14002	20140311	20140426	193	0	0	4X 5Ze 5Zw6A 6B 6C
Alfred Needler	Canada	18NE14451	20140423	20140423	1	0	0	3Ps
Alfred Needler	Canada	18NE14446	20140417	20140418	12	0	0	3Ps
Alfred Needler	Canada	18NE14445	20140404	20140415	67	1	0	3L 3Ps

Gordon Gunter	USA	33GG14001	20140301	20140308	73	0	0	4X 5Y 5Ze
Teleost	Canada	18TL14127	20140203	20140203	3	2	0	3L
Hudson	Canada	18HU13113	20131118	20131208	0	78	0	2J 3K 3L 3M 3N 3O 3Ps
Beluga II	Canada	18BP13005	20130409	20131203	26	25	0	4T
Alfred Needler	Canada	18NE13440	20131028	20131028	0	1	0	3L
Alfred Needler	Canada	18NE13439	20131015	20131015	0	1	0	3L
Paamiut	Canada	26PA13008	20130922	20131014	88	0	0	0B
Alfred Needler	Canada	18NE13438	20130918	20131001	0	2	0	3L
F.G. Creed	Canada	18FC13018	20130811	20130821	6	0	0	4S 4T
Vizconde de Eza	Spain	29VE13008	20130730	20130819	101	0	0	3L
Vladykov	Canada	18VD13023	20130813	20130813	0	1	0	3L
Teleost	Canada	18TL13117	20130709	20130728	0	64	0	2H 2J 3K 3L 3M
Vizconde de Eza	Spain	29VE13007	20130626	20130723	68	0	0	3L 3M
Walther Herwig III	Germany	06NI13024	20130630	20130710	28	28	0	1F 2H 2J
Vladykov	Canada	18VD13014	20130613	20130624	0	2	0	3L
Alfred Needler	Canada	18NE13435	20130531	20130621	0	2	0	3L
Vizconde de Eza	Spain	29VE13006	20130601	20130621	120	0	0	3N 3O
G.O. Sars	Norway	58GS13107	20130520	20130530	13	13	0	1D 1E 1F
Teleost	Canada	18TL13116	20130511	20130527	0	2	0	3L
Alfred Needler	Canada	18NE13434	20130517	20130526	0	2	0	3L
Alfred Needler	Canada	18NE13433	20130506	20130514	0	2	0	3L
Teleost	Canada	18TL13115	20130430	20130510	0	2	0	3L
Vladykov	Canada	18VD13011	20130503	20130509	95	0	0	3Ps
Teleost	Canada	18TL13114	20130410	20130429	0	74	0	3K 3L 3M 3N 3O 3Ps
Teleost	Canada	18TL13113	20130403	20130409	0	3	0	3L
Alfred Needler	Canada	18NE13430	20130325	20130325	0	1	0	3L
Teleost	Canada	18TL13124	20130308	20130308	0	1	0	3L

Teleost	Canada	18TL12112	20121221	20121221	0	1	0	3L
Hudson	Canada	18HU12112	20121120	20121209	0	71	0	2J 3K 3L 3M 3N 3O 3Ps
Beluga II	Canada	18BP12009	20120403	20121127	26	25	0	4T
Alfred Needler	Canada	18NE12425	20121018	20121030	0	2	0	3L
Paamiut	Canada	26PA12007	20120929	20121027	194	0	0	0A
Alfred Needler	Canada	18NE12424	20120929	20121013	0	2	0	3L
Vladykov	Canada	18VD12003	20120820	20120820	0	1	0	3L
Knorr	USA	316N12019	20120815	20120816	0	3	0	5Zw
Teleost	Canada	18TL12104	20120709	20120727	0	71	0	2H 2J 3K 3L 3M
Sarmiento de Gamboa	Spain	29AH12581	20120718	20120720	0	8	0	1F 2J
Paamiut	Denmark	26PA12019	20120610	20120701	39	39	0	1A 1B
Alfred Needler	Canada	18NE12421	20120613	20120620	0	2	0	3L
Shamook	Canada	18OK12611	20120618	20120618	0	1	0	3L
Tulugaq	Denmark	26TU12020	20120608	20120618	53	53	0	1B 1C 1D 1E 1F
Martha L. Black	Canada	18MF12001	20120601	20120612	46	13	0	1F 2H 2J 4W
Alfred Needler	Canada	18NE12420	20120531	20120612	0	2	0	3L
Teleost	Canada	18TL12103	20120510	20120529	0	2	0	3L
Alfred Needler	Canada	18NE12419	20120516	20120516	0	1	0	3L
Teleost	Canada	18TL12102	20120501	20120509	0	2	0	3L
Alfred Needler	Canada	18NE12418	20120502	20120502	0	1	0	3L
Alfred Needler	Canada	18NE12417	20120501	20120501	0	1	0	3L
Teleost	Canada	18TL12101	20120411	20120430	0	85	0	3K 3L 3M 3N 3O 3Ps
Alfred Needler	Canada	18NE12415	20120330	20120330	0	1	0	3L
Ann Harvey	Canada	18AV12003	20120324	20120324	0	1	0	3L
Teleost	Canada	18TL12111	20120304	20120304	0	1	0	3L
Teleost	Canada	18TL12100	20120107	20120107	0	1	0	3L
Teleost	Canada	18TL11098	20111213	20111213	0	1	0	3L

Hudson	Canada	18HU11111	20111120	20111210	0	76	0	2J 3K 3L 3M 3N 3O 3Ps
Alfred Needler	Canada	18NE11414	20111129	20111129	0	1	0	3L
Alfred Needler	Canada	18NE11413	20111116	20111128	0	2	0	3L
Alfred Needler	Canada	18NE11411	20111020	20111020	0	1	0	3L
Alfred Needler	Canada	18NE11410	20111004	20111018	0	2	0	3L
Paamiut	Canada	26PA11007	20110923	20111015	95	0	0	0B 1C
Beluga II	Canada	18BG11033	20110413	20111012	19	0	0	4T
Teleost	Canada	18TL11094	20110913	20111009	0	77	0	3L 4T 4Vn
Alfred Needler	Canada	18NE11409	20111002	20111002	0	1	0	3L
Alfred Needler	Canada	18NE11408	20110923	20110927	0	2	0	3L
Alfred Needler	Canada	18NE11407	20110910	20110910	0	1	0	3L
Shamook	Canada	18OK11600	20110816	20110816	0	1	0	3L
Half Moon Bay	USA	32OC11018	20110802	20110802	0	2	0	5Zw
Teleost	Canada	18TL11093	20110708	20110725	0	53	0	2G 2H 2J 3K 3L 3M
Alfred Needler	Canada	18NE11406	20110614	20110623	0	2	0	3L
Shamook	Canada	18OK11595	20110619	20110619	0	1	0	3L
Alfred Needler	Canada	18NE11405	20110601	20110614	0	2	0	3L
Alfred Needler	Canada	18NE11404	20110519	20110531	0	2	0	3L
Teleost	Canada	18TL11092	20110506	20110527	0	30	0	3K 3L
Alfred Needler	Canada	18NE11403	20110517	20110517	0	1	0	3L
Teleost	Canada	18TL11091	20110426	20110502	0	24	0	3L 3M 3N 3O
Teleost	Canada	18TL11090	20110405	20110405	0	2	0	3L
Celtic Explorer	Canada Ireland	45CE11002	20110303	20110303	0	1	0	3L
Celtic Explorer	Canada Ireland	45CE11001	20110206	20110206	0	1	0	3L
Shamook	Canada	18OK11964	20110123	20110123	0	1	0	3L
Beluga II	Canada	18BG10033	20100312	20101130	29	29	0	4T
Paamiut	Canada	26PA10009	20101017	20101108	153	0	0	0A

Atlantis	USA	33AT10017	20101010	20101010	0	3	0	5Zw
Hudson	Canada	18HU10014	20100513	20100530	56	26	0	1F 2H 2J 3K 3L 4W
Hudson	Canada	18HU10009	20100501	20100512	51	0	0	3K 3L 3Ps4Vs4W
Teleost	Canada	18TL10971	20100415	20100504	129	0	0	3K 3L 3M 3N 3O 3Ps
Hudson	Canada	18HU09015	20090517	20090531	46	20	0	1F 2H 2J 3K 3L 4W
Teleost	Canada	18TL09886	20090425	20090515	107	0	0	3K 3L 3M 3N 3O 3Ps
Paamiut	Canada	26PA08007	20081008	20081104	170	0	0	0A 0B
Paamiut	Canada	26PA07007	20071025	20071030	31	0	0	0B 2G
Martha L. Black	Canada	18MF98014	19980618	19980618	1	0	0	4S

* Messages formatted for transmission on the GTS. These messages are lower vertical resolution and uncalibrated versions of the data, to be replaced in the future.
** In each case the reporting period corresponds to the period associated with the profiles in the NCA only.

Table 4: Real-time air/water temperature, atmospheric parameters and wave* data from buoys, collected and processed in 2015

Platform Type	Buoy Type / Platform Name	Country	WMO / NDBC ID	First Date**	Last Date**	NAFO Subareas
Drifting Buoy		USA	13527	20150101	20150722	6G 6H
Drifting Buoy		USA	13598	20151006	20151015	6E
Drifting Buoy		USA	13634	20151104	20151104	6F
Drifting Buoy		USA	13635	20150923	20151019	6E 6F
Drifting Buoy		USA	13636	20151019	20151220	6F 6G
Drifting Buoy		USA	13640	20151114	20151117	6F
Drifting Buoy			25535	20150210	20150210	1A
Drifting Buoy		USA	41501	20150101	20150609	6F 6G
Drifting Buoy		USA	41503	20150101	20150925	4Vs4W 6D 6E 6F 6G
Drifting Buoy		USA	41504	20150101	20150518	6G 6H
Drifting Buoy		USA	41506	20150902	20151005	6B 6C 6D
Drifting Buoy		USA	41553	20150127	20150517	3M 3N 4Vs6E 6F 6G
Drifting Buoy		USA	41575	20150608	20150614	6C
Drifting Buoy		USA	41576	20150101	20150822	6C 6D
Drifting Buoy		USA	41604	20150410	20150416	6H
Drifting Buoy		USA	41606	20151119	20151231	4W 4X 6B 6C 6D 6E
Drifting Buoy		USA	41608	20150101	20150217	3M 6H
Drifting Buoy		USA	41609	20150101	20150609	3M 3N 3O 4Vs4W 6F 6G 6H
Drifting Buoy		USA	41619	20150407	20151020	3O 4Vs6D 6E 6F
Drifting Buoy		USA	41622	20150809	20151231	3M 3N 3O 4Vs4W 4X 5Ze5Zw6B 6C 6D 6E 6G 6H
Drifting Buoy		EU	41644	20150131	20150319	6H
Drifting Buoy		EU	41646	20150926	20151231	3N 4Vs6F 6G
Drifting Buoy		EU	41648	20150831	20151004	6D 6E
Drifting Buoy		EU	41651	20150223	20150331	6H
Drifting Buoy		EU	41653	20150128	20150201	6F
Drifting Buoy		USA	41669	20150816	20151028	6E 6F 6G
Drifting Buoy		USA	41670	20150328	20150401	6H
Drifting Buoy		USA	41680	20150101	20150125	6G 6H
Drifting Buoy		USA	41705	20150315	20150504	6G 6H
Drifting Buoy			41725	20150222	20150728	3N 6G 6H
Drifting Buoy		EU	41739	20150126	20150127	6C
Drifting Buoy		USA	41855	20150101	20150313	3M 3N 3O 4Vs6G 6H
Drifting Buoy		USA	41918	20150101	20150802	6G 6H
Drifting Buoy		USA	41925	20151008	20151231	6E 6F 6G
Drifting Buoy		USA	41926	20150101	20150104	6H
Drifting Buoy		USA	41933	20150205	20150605	6F 6G 6H
Drifting Buoy		USA	41936	20150213	20151002	6D 6E 6F 6G
Drifting Buoy		USA	41938	20150101	20150114	6E 6F
Drifting Buoy		USA	41939	20150523	20150716	6G 6H
Drifting Buoy		USA	41954	20150412	20150730	6G 6H
Drifting Buoy		USA	41956	20150101	20150217	3M 3N 3O
Drifting Buoy		USA	41975	20150101	20150505	3M 3N 6G 6H
Drifting Buoy		USA	41976	20150128	20150321	6H
Drifting Buoy		USA	41981	20150106	20151231	6F 6G 6H
Drifting Buoy		USA	41983	20150101	20150130	3M
Drifting Buoy		USA	42501	20150101	20150808	4Vs4W 6D 6E 6F 6G 6H

Drifting Buoy	USA	42502	20150101	20150302	3M 3N 3O 4Vs
Drifting Buoy	USA	42503	20150114	20150423	3M 3N 4W 6B 6C 6D 6E 6F 6G 6H
Drifting Buoy	USA	43518	20150101	20150301	3M
Drifting Buoy	USA	43555	20150704	20151231	3M 3N 4Vs4W 6B 6C 6D 6E 6F 6G 6H
Drifting Buoy	USA	43556	20150101	20150602	4W 6E 6F 6G 6H
Drifting Buoy	USA	43565	20151022	20151231	4Vs4W 4X 5Ze6B 6C 6D 6E
Drifting Buoy	USA	43577	20150520	20151222	3M 3N 3O 4Vs4W 6B 6C 6D 6E 6F
Drifting Buoy	USA	44502	20150512	20150807	3K 3L 3M
Drifting Buoy	USA	44503	20150622	20150808	3L 3M 3N
Drifting Buoy	USA	44506	20150326	20150825	3L 3N
Drifting Buoy	USA	44507	20150413	20150416	3M
Drifting Buoy	USA	44508	20150413	20150420	3L 3M
Drifting Buoy	USA	44509	20150506	20150627	3L
Drifting Buoy	USA	44510	20150506	20150627	3L
Drifting Buoy	USA	44514	20150601	20150814	4X 5Y 5Ze
Drifting Buoy	EU	44515	20150307	20150603	4Vs
Drifting Buoy	USA	44516	20150705	20151231	3M 3N 3O 4Vs4W 4X 6C 6D 6E 6G
Drifting Buoy	USA	44519	20150718	20150813	1F 2J
Drifting Buoy	USA	44520	20150101	20150201	6H
Drifting Buoy	USA	44521	20150714	20151231	6B 6C 6D 6E 6F
Drifting Buoy	EU	44548	20150101	20150216	1F
Drifting Buoy	KARS	44553	20150101	20150126	3M 6H
Drifting Buoy	KARS	44558	20150211	20150529	6F 6G 6H
Drifting Buoy	KARS	44559	20150717	20150901	3M 6H
Drifting Buoy	KARS	44562	20150831	20150929	3M 3N
Drifting Buoy	EU	44603	20150101	20150307	4Vs4W
Drifting Buoy	EU	44604	20150101	20150602	3L 3M 3N 3O
Drifting Buoy	EU	44609	20150209	20150223	3M 3N
Drifting Buoy	Canada	44670	20150721	20151231	2J 3K
Drifting Buoy	Canada	44671	20150730	20151022	2J 3K 3L
Drifting Buoy	Canada	44672	20150724	20151104	2J 3K 3L
Drifting Buoy	EU	44739	20150101	20150603	3M 3N 3O 4Vs
Drifting Buoy	EU	44760	20150516	20150603	1F
Drifting Buoy	EU	44761	20150209	20150227	1F 2J 3K
Drifting Buoy	EU	44762	20150209	20150603	3K 3L 3M
Drifting Buoy	EU	44764	20150317	20150506	1F 2J 3K
Drifting Buoy	EU	44766	20150317	20150329	3L
Drifting Buoy	EU	44768	20150523	20150603	4Vs4W
Drifting Buoy	EU	44769	20150523	20150603	4W 6E 6F
Drifting Buoy	EU	44774	20150101	20150603	4Vs4W 4X 5Ze6B 6D 6E 6F
Drifting Buoy	EU	44775	20150511	20150603	6B 6C 6D
Drifting Buoy	EU	44776	20150101	20150531	3M 3N 3O 4Vs6F 6G
Drifting Buoy	EU	44777	20150101	20150216	6H
Drifting Buoy	EU	44778	20150101	20150522	6G 6H
Drifting Buoy	EU	44779	20150101	20150203	3M
Drifting Buoy	EU	44866	20150101	20150106	1F
Drifting Buoy	EU	44867	20150101	20150123	3K
Drifting Buoy	EU	44872	20150101	20150224	3M 3N 3O 3Ps4Vs
Drifting Buoy	EU	44876	20150101	20150317	6G 6H

Drifting Buoy		EU	44880	20150101	20150330	3L 3M 3N 3O
Drifting Buoy		EU	44887	20150101	20150421	6G 6H
Drifting Buoy		EU	44890	20150101	20150117	6F
Drifting Buoy		EU	44892	20150101	20150107	3M 3N
Drifting Buoy		Canada	47537	20150101	20151031	0A 0B 1F 2G 2H 2J 3K
Drifting Buoy		Canada	47539	20151006	20151231	2J 3K 3L 3N
Drifting Buoy		Canada	47540	20151006	20151231	2J 3K
Drifting Buoy		Canada	47546	20151006	20151231	2H 2J 3K 3L
Drifting Buoy		Canada	47549	20151006	20151231	2H 2J 3K 3L
Drifting Buoy		Canada	47550	20150101	20150414	0A
Drifting Buoy		Canada	47551	20151001	20151231	0A 0B 2G 2H
Drifting Buoy		Canada	47552	20151022	20151231	0A
Drifting Buoy		Canada	47555	20151101	20151231	3K 3L
Drifting Buoy		Canada	47557	20151101	20151231	2J 3K
Drifting Buoy		Canada	47560	20151101	20151231	2J 3K 3L
Drifting Buoy		Canada	47562	20151006	20151231	2H 2J 3K
Drifting Buoy		Canada	47567	20151006	20151231	2J 3K
Drifting Buoy		Canada	47568	20151006	20151231	1D 2J 3K 3L
Drifting Buoy		Canada	47569	20151006	20151231	2J 3K 3L 3N
Drifting Buoy		Canada	47574	20151101	20151231	2J 3K
Drifting Buoy		Canada	47582	20150329	20150906	0A 1F 2G 2H 2J 3K
Drifting Buoy		Canada	47584	20151006	20151231	2J 3K 3L
Drifting Buoy		Canada	47585	20150101	20151101	0A
Drifting Buoy		Canada	47586	20150101	20150618	0B 1F 2G 2H 2J 3K
Drifting Buoy		Canada	47589	20151022	20151231	0A
Drifting Buoy		Canada	47590	20150911	20151127	0A 0B 1A 2G
Drifting Buoy		USA	48568	20150619	20151006	1F
Drifting Buoy		USA	48779	20150625	20150927	1F
Drifting Buoy			64532	20150321	20151023	1F 2H 2J
Drifting Buoy			64533	20150324	20150327	1F
Drifting Buoy			64535	20150730	20150922	1F
Drifting Buoy		EU	64546	20150517	20150525	1F
Drifting Buoy		EU	64670	20150316	20150317	3K
Drifting Buoy		EU	64691	20150101	20150306	2H 2J 3K
Drifting Buoy		USA	64938	20150101	20150529	3K 3L 3M
Drifting Buoy		EU	65595	20150101	20150603	1F 2G 2H 2J
Drifting Buoy		EU	65596	20150101	20150603	1F 2J
Drifting Buoy		EU	65599	20150511	20150603	1F
Drifting Buoy		EU	65600	20150512	20150603	1F
Drifting Buoy		EU	65601	20150513	20150603	1F
Drifting Buoy		EU	65602	20150518	20150603	1F
Moored Buoy	Northeast Channel	USA	44024	20150101	20151231	4X
Moored Buoy	Mass. Bay/Stellwagen	USA	44029	20150101	20151231	5Y
Moored Buoy	Western Maine Shelf	USA	44030	20150101	20151231	5Y
Moored Buoy	Central Maine Shelf	USA	44032	20150101	20151231	5Y
Moored Buoy	West Penobscot Bay	USA	44033	20150101	20151231	5Y
Moored Buoy	Eastern Maine Shelf	USA	44034	20150101	20151231	5Y
Moored Buoy	Jordan Basin	USA	44037	20150101	20151231	5Y
Moored Buoy	Potomac, MD	USA	44042	20150101	20151231	6B

Moored Buoy	Patapsco, MD	USA	44043	20150101	20151208	6B
Moored Buoy	Susquehanna, MD	USA	44057	20150411	20151202	6B
Moored Buoy	Singray Point, MD	USA	44058	20150101	20151231	6B
Moored Buoy	Gooses Reef, MD	USA	44062	20150119	20151231	6B
Moored Buoy	Annapolis	USA	44063	20150101	20151208	6B
Moored Buoy	First Landing	USA	44064	20150101	20151231	6B
Moored Buoy	Great South Bay	USA	44069	20150422	20151231	6A
Moored Buoy	East Scotian Slope*	Canada	44137*	20150101	20151231	4W
Moored Buoy	Banquereau Bank*	Canada	44139*	20150101	20151231	4Vs
Moored Buoy	Laurentian Fan*	Canada	44141*	20150101	20151231	4Vs
Moored Buoy	La Have Bank*	Canada	44150*	20150101	20151231	4X
Moored Buoy	Nickerson Bank*	Canada	44251*	20150101	20151231	3L
Moored Buoy	NE Burgeo Bank*	Canada	44255*	20150101	20151231	3Ps
Moored Buoy	Halifax Harbour*	Canada	44258*	20150101	20151231	4W
Moored Buoy	Mont-Louis*	Canada	45138*	20150422	20151117	4S
Moored Buoy	Bay du Verde F-67*	Canada		201411__	201502__	3M
Moored Buoy	Terra Nova*	Canada		201401__	201402__	3L
Fixed Platform	Buoy 126, Jacques Cousteau Reserve	USA	JCTN4	20150101	20151231	6A
Fixed Platform	T-Wharf Bottom, Narragansett Bay Reserve	USA	NAQR1	20150101	20151231	5Zw
Fixed Platform	Menauhant, Waquoit Bay Reserve	USA	WAQM3	20150101	20151231	5Zw

*Buoys marked by this symbol measure waves

** In each case the reporting period corresponds to the period associated with measurements in the NCA only.

Table 5. Water level data collected in 2015

Number	Name	Reporting period (months)	Longitude	Latitude	NAFO Subarea
65	Saint John	Jan-Dec	66.0630	45.2510	3L
365	Yarmouth	Jan-Dec	66.1167	43.8333	4X
491	Bedford Institute	Jan-Dec	63.6167	44.6833	4W
612	North Sydney	Jan-Dec	60.2500	46.2167	4Vn
665	Port aux Basques	Jan-Dec	59.1333	47.5667	3Pn
755	St. Lawrence	Jan-Dec	55.3901	46.9168	3Ps
835	Argentia	Mar-Dec	53.9833	47.3000	3Ps
905	St. John's	Jan-Dec	52.7167	47.5667	3L
990	Bonavista	Jan-Dec	53.1150	48.6510	3L
1430	Nain	Jan-Dec	61.6833	56.5500	2H
1700	Charlottetown	Jan-Dec	63.1167	46.2333	4T
1805	Shediac Bay	Jan-Dec	64.5460	46.2270	4T
2000	Lower Escuminac	Jan-Dec	64.8833	47.0833	4T
2145	Belledune	Jan-Dec	65.8500	47.9000	4T
1970	Cap-aux-Meules	Jan-Dec	61.8573	47.3789	4T
2330	Rivière-au-Renard	Jan-Dec	64.3805	48.9970	4T
2780	Sept-Îles	Jan-Dec	66.3768	50.1948	4S
2985	Rimouski	Jan-Dec	68.5137	48.4783	4T
3057	Saint-Joseph-de-la-Rive	Jan-Dec	70.3655	47.4488	4T
3100	Saint-Francois Île d'Orléans	Jan-Dec	70.8082	46.9965	4T
3248	Vieux-Québec	Jan-Dec	71.2019	46.8111	4T

Table 6. Mooring data processed in 2015

Mooring/ Project	Longitude (W)	Latitude (N)	First Date	Last Date	Instruments	NAFO Sub area
Scotian Shelf - St. Anns Bank	63.1703	44.2482	20140929	20150923	ADCP, CTD	4W
OSNAP - 53N Line #1874	51.6937	52.8187	20140704	20150515	ADCP, CTD, RCM, MTR	2J
OSNAP - 53N Line #1872	52.1010	52.6656	20140703	20150507	CTD, MTR	2J
OSNAP - 53N Line #1881	52.1029	52.6655	20140703	20150507	ADCP, CTD	2J
OTN Mooring Site 1	63.3044	44.3470	20140919	20150421	ADCP, CTD	4W
OTN Mooring Site 2	63.1701	44.2486	20140920	20150421	ADCP, CTD	4W
OTN Mooring Site 3	63.0335	44.1347	20140920	20150421	ADCP, CTD	4W
OSNAP - Sackville Spur, Flemish Pass North Grand Banks	47.2813	47.0959	20130701	20140711	ADCP, CTD	3L
OSNAP - Sackville Spur, Flemish Cap North Flank	45.5998	48.7877	20130704	20140707	ADCP, CTD, RCM	3M
Labrador Sea - Slope	54.0873	55.1144	20130511	20140514	RCM	2J
Labrador Sea - Slope West	53.6363	55.6282	20131105	20140428	RCM	2H
Labrador Sea #1823	53.6862	55.5583	20120610	20130519	RCM	2H
Labrador Sea #1824	54.0920	55.1197	20120605	20130519	RCM	2J
Labrador Sea #1822	48.6178	60.2167	20120610	20130516	RCM	1F
Scotian Slope - RAPID	61.0703	42.1636	20090930	20100906	RCM	4W
Scotian Shelf - Station 3*	62.6758	43.3333	19681018	19681215	MTR	4W
Scotian Shelf - Station 2*	62.9892	43.7485	19681024	19681212	MTR	4W
Scotian Shelf - Station 13*	63.8252	44.2618	19681017	19681128	MTR	4X
Scotian Shelf - Station 3*	63.4983	42.6733	19680913	19681025	MTR	4W
Scotian Shelf - Station 2*	62.9948	43.7530	19680906	19681024	MTR	4W
Scotian Shelf - Station 3*	62.6800	43.3400	19680907	19681018	MTR	4W
Scotian Shelf - Station 12*	63.9467	44.4383	19680905	19681017	MTR	4X
Scotian Shelf - Station 13*	63.8300	44.2700	19680905	19681017	MTR	4X
Scotian Shelf - Station 3*	63.5033	44.4083	19680905	19681016	MTR	4W
Scotian Shelf - Station 12*	63.9333	44.4365	19680603	19680813	MTR	4X
Scotian Shelf - Station 13*	63.8283	44.2683	19680603	19680813	MTR	4X
Scotian Shelf - Station 2*	62.9966	43.7616	19680604	19680813	MTR	4W
Scotian Shelf - Station 3*	63.5023	44.4007	19680604	19680813	MTR	4W
Scotian Shelf - Sambro*	63.5033	44.4100	19671114	19680104	MTR	4X
Scotian Shelf - Station 4*	63.5000	42.6666	19670826	19671101	MTR	4W
Scotian Shelf - Station 3*	62.6583	43.2883	19670827	19671029	MTR	4W
Scotian Shelf - Sambro*	63.5050	44.4133	19670705	19670902	MTR	4X

Scotian Shelf - Station 2*	63.0117	43.7616	19670706	19670828	MTR	4W
Scotian Shelf - Station 4*	63.5000	42.6666	19670707	19670826	MTR	4W
Scotian Shelf - Station 5*	63.5167	42.4100	19670810	19670825	MTR	4W
Scotian Shelf - Station 5*	63.5033	42.4200	19670803	19670810	MTR	4W
Scotian Shelf - Station 4*	63.5000	42.6666	19670514	19670707	MTR	4W
Scotian Shelf - Station 3*	62.6583	43.2883	19670514	19670706	MTR	4W
Scotian Shelf - Station 3*	62.6745	43.3380	19670514	19670706	MTR	4W
Scotian Shelf - Sambro*	63.5050	44.4133	19670514	19670705	MTR	4X
Scotian Shelf - Station 2*	63.0143	43.7658	19670514	19670705	MTR	4W
Scotian Shelf - Station 2*	63.0172	43.7336	19670129	19670603	MTR	4W
Scotian Shelf - Sambro*	63.4370	44.3700	19670313	19670514	MTR	4X
Scotian Shelf - Sambro*	63.4370	44.3700	19670313	19670403	MTR	4X
Scotian Shelf - Station 3*	62.6583	43.2883	19670121	19670310	MTR	4W

*Recalibration / reprocessing