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Inventory of environmental data collected in the NAFO Convention Area, 2018

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Abstract

The Marine Environmental Data Section (MEDS) of the Oceans Science branch, 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 2018 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 Marine Environmental Data Section (MEDS) of the Oceans Science branch of DFO acts as Regional Environmental Data Center for NAFO. This role began in 1965 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). MEDS underwent several name changes from 2005 to 2017, it was known in the interim under acronyms such as ISDM and OSD.

In order for MEDS to carry out its responsibility of reporting to the Scientific Council, the Designated National Representatives selected by STACFEN are requested to provide MEDS 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 2019 required the submission to MEDS of a completed oceanographic inventory form for data collected in 2018, and oceanographic data pertinent to the NAFO Convention Area, for all stations occupied in the year prior to 2018. 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 MEDS are available to all members on request, or are available from DFO institutes. Requests can be made by telephone (613) 990-6065, by e-mail to info@dfo-mpo.gc.ca, by completing an on-line order form on the MEDS web site at http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-

gdsi/request-commande/form-eng.asp or by writing to Oceans Science branch, 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 Marine Environmental Data Section (MEDS) of the Oceans Science Branch of DFO 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 (GTS) of the World Meteorological Organization Information System and the NOAA's Geostationary Operational Environmental Satellite system. 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) 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, MEDS 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.

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 MEDS 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 2018 by data type with a correspondence to the figures (p. 9-13) and tables (p. 14-33) where more information can be found.

Data observed in NAFO Convention Area in 2018

Data Type	Platform Type	Counts/Duration	Table #	Figure #
Oceanographic profiles	autonomous drifting (Argo)	4876* profiles from 197 platforms	1	1
	Moorings (Viking)	2214* profiles from 7 platforms**	1	1
	Gliders	19132* profiles from 7 platforms	1	1
	Ship	5879 profiles (4547 CTD; 247 CTD*; 215 bottle, 346 XBT and 524 XBT* profiles) from at least 32 ships and one helicopter	2	2a
Surface/near-surface observations	ship (thermosalinograph)	44923* obs. from 3 ships	2	3
	drifting buoys	359173* obs. from 155 buoys	4	3
	moored buoys	116885* obs. from 21 buoys**	4	3
	fixed platforms	84691* obs. from 3 platforms	4	3
	water level gauges	12 sites, avg. ~1 year each	6	3
Sub-surface observations	moored CTD, ADCP, O2	8 moorings	5	4

*Data formatted for real-time transmission

**all Canadian wave buoys described in this report measure waves, and the moorings measuring CTD oceanographic profiles in this table are also equipped with surface buoys measuring waves

Data observed prior to 2018 in NAFO Convention Area and acquired between January 2018 and May 2019

Data Type	Platform Type	Counts/Duration	Table #	Figure #
Oceanographic profiles	Ship	1867 profiles (1430 CTD + 219 bottle + 217 XBT profiles) from 14 ships	3	2b

*Data formatted for real-time transmission

**The amount of bottle data profiles measured prior to 2018 and loaded in BioChem in 2018 could not be fully assessed

Description

Oceanographic profiles

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 GTS within 24 hours of collection and made available on two mirror Global servers located in France and in the USA.

MEDS performs the data management duties of Argo Canada profilers from instrument to the GTS and global servers. MEDS also decodes and stores all Argo data circulating on the GTS. Over 3800 Argo profiling floats are

currently sampling the world oceans. The distribution of countries (USA' Canada, France, Germany, UK and Norway) owning floats who were present in the NCA in 2018, highlights the success of Argo as an international project.

Argo-equivalent (figure 1, table 1)

Autonomous profiling floats who do not follow the aforementioned Argo sampling pattern are often designated Argo-equivalent. In 2018, no Argo-equivalent sampled data in the NCA.

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 deployed four gliders on the Scotian Shelf and Newfoundland Shelf in 2018.

MEDS regularly acquires data from the Coastal Environmental Observation Technology and Research (CEOTR) group (headquartered at Dalhousie University) owned gliders, both active in NCA, and creates messages for transmission on the GTS after performing automatic quality control. The full data set can be accessed from CEOTR.

Mammals (figure 1, table 1)
Among data decoded and acquired from the GTS by MEDS are real-time data transmitted by the Sea Mammal Research Units of University of St Andrews (Scotland). 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.

Ships (figures 2a & 2b, table 2)
MEDS 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.

MEDS 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

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

MEDS also receives delayed mode data from foreign institutes, either directly or through BIO. This year, MEDS received data directly from the Spanish Institute of Oceanography. MEDS periodically queries the World Ocean Database and ICES Oceanographic Database for additional data in the NAFO Convention Area (NCA). Comparisons are made between various sources to ensure always store the most recently calibrated data and with the most available number of fields.

<u>Near-surface observations</u>

Moored buoys and fixed stations (figure 3, table 3)
MEDS continuously acquires data from meteorological buoys in Canadian waters equipped with ocean data acquisition systems. These buoys belong to Environment and Climate Change Canada (Meteorological Service of 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.

MEDS also acquires, in delayed mode, data from wave measuring buoys deployed near offshore oil and gas sites as per NEB Guidelines.

BIO, NAFC and MLI maintained surface buoys, most of which are equipped with subsurface moored instruments such as ADCPs (see mooring section) and a CTD profiler. Those buoys are informally known as "Viking" buoys. MEDS transmitted data from the CTD profiler those buoys on the GTS in 2018. The data can otherwise be requested to MLI, NAFC and BIO.

A number of U.S. moored buoys and fixed stations in the NCA transmit data on the GTS, and those are also acquired by MEDS. The stations belong to various institutions, such as the National Estuarine Research Reserve System, the University of North Carolina (including the Coastal Ocean Research and Monitoring Program) and the Chesapeake Bay Interpretive Buoy System. Their data management is coordinated by NOAA's National Data Buoy Center. Their positions are typically near the coast.

Drifting buoys (figure 3, table 3)
MEDS 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 3, table 2)
MEDS decodes and stores all thermosalinograph data circulating on the GTS. In 2018, three ships (two from France, one from Canada) reported thermosalinograph data in the NCA.

Sub-surface moorings (figures 4a-4b, table 4)
Current meters and other instruments such as CTDs and thermistors have been deployed in the NCA along mooring lines, under the surface, for many years. Depending on location, the data are processed and archived by the BIO or MLI.

Water level gauges (figure 3, table 5)
MEDS 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 Canada (Water Survey of Canada). Over 2 million new observations are archived every month.

Other Activities

Atlantic Zone Monitoring Program

The DFO Atlantic Zone Monitoring Program (AZMP) activities include regular sampling at 5 fixed stations and 16 standard sections, various monitoring and survey activities and research cruises in the AZMP area to collect other physical, chemical and biological data. MEDS 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.

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.

Offshore Oil and Gas Environmental Monitoring Data

As mentioned in the near-surface observations section, MEDS also acquires, in delayed mode, monitoring physical oceanographic data collected near offshore oil and gas sites as per NEB Guidelines. No data submissions were received in 2018.

Data Access

Argo data are sent to the global data centers within 24 hours of collection. Global Argo data can be downloaded from various points (http://www.argo.ucsd.edu/Argo_data_and.html).

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 (https://www.nodc.noaa.gov/GTSPP/access_data) and to the Copernicus Environment Monitoring Service where they are made available in "near real time in situ" products (http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&view=details&product_id=INSITU_GLO_NRT_OBSERVATIONS_013_030). The GTS thermosalinograph data are forwarded to the Global Ocean Surface Underway Data archive (http://www.gosud.org). The latter two databases are harvested by the EMODnet Physics portal (http://emodnet-physics.eu/Map).

Canadian bottle and plankton data are available from the BioChem Database (https://www.dfo-mpo.gc.ca/science/data-donnees/biochem/index-eng.html).

Delayed-mode Canadian oceanographic profile data are exchanged bilaterally with 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). MEDS 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 NOAA National Centers for Environmental Information Ocean Archive System on a yearly basis (https://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) and 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) and MLI (https://slgo.ca/app-sgdo/en/accueil.html) depending on the site locations.

Full resolution glider data from measured by CEOTR can be accessed from their website : http://ceotr.ocean.dal.ca/

Information on DFO glider deployments can be accessed from the "Everyone's Glider Observations" website: https://www.ego-network.org/dokuwiki/doku.php and the data can be accessed from a DFO FTP server:

ftp://ftp.meds-sdmm.dfo-mpo.gc.ca/pub/glider.

Observations perfored by sensors mounted on marine mammals can be accessed from the MEOP website : http://www.meop.net/

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.)

Boyer, T.P., J. I. Antonov, O. K. Baranova, C. Coleman, H. E. Garcia, A. Grodsky, D. R. Johnson, R. A. Locarnini, A. V. Mishonov, T.D. O'Brien, C.R. Paver, J.R. Reagan, D. Seidov, I. V. Smolyar, and M. M. Zweng, 2013: World Ocean Database 2013, NOAA Atlas NESDIS 72, S. Levitus, Ed., A. Mishonov, Technical Ed.; Silver Spring, MD, 209 pp., http://doi.org/10.7289/V5NZ85MT

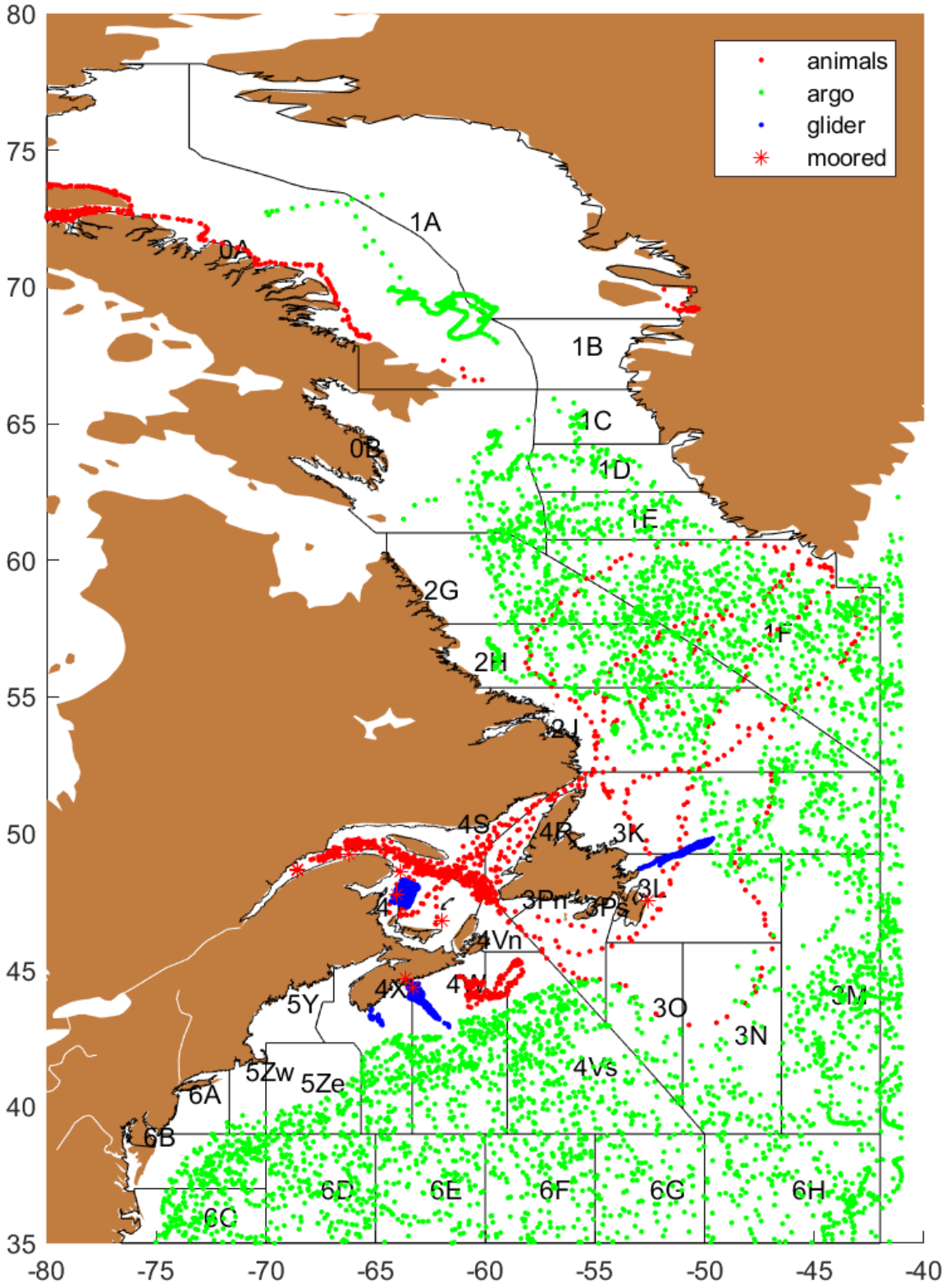

Figure 1. Position of profiles sampled by autonomous platforms in 2018

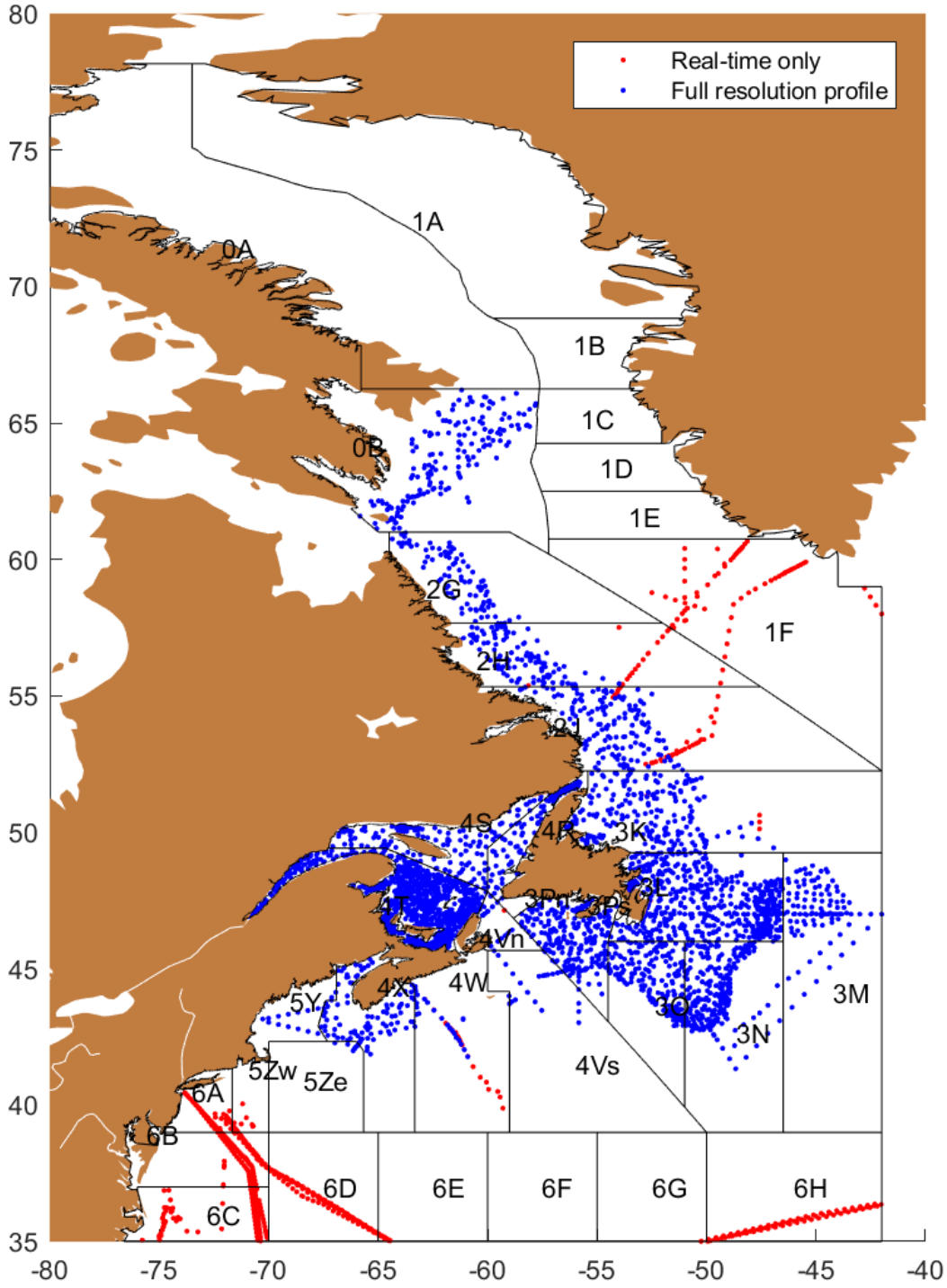

Figure 2a Position of profiles sampled by ships (and one helicopter)

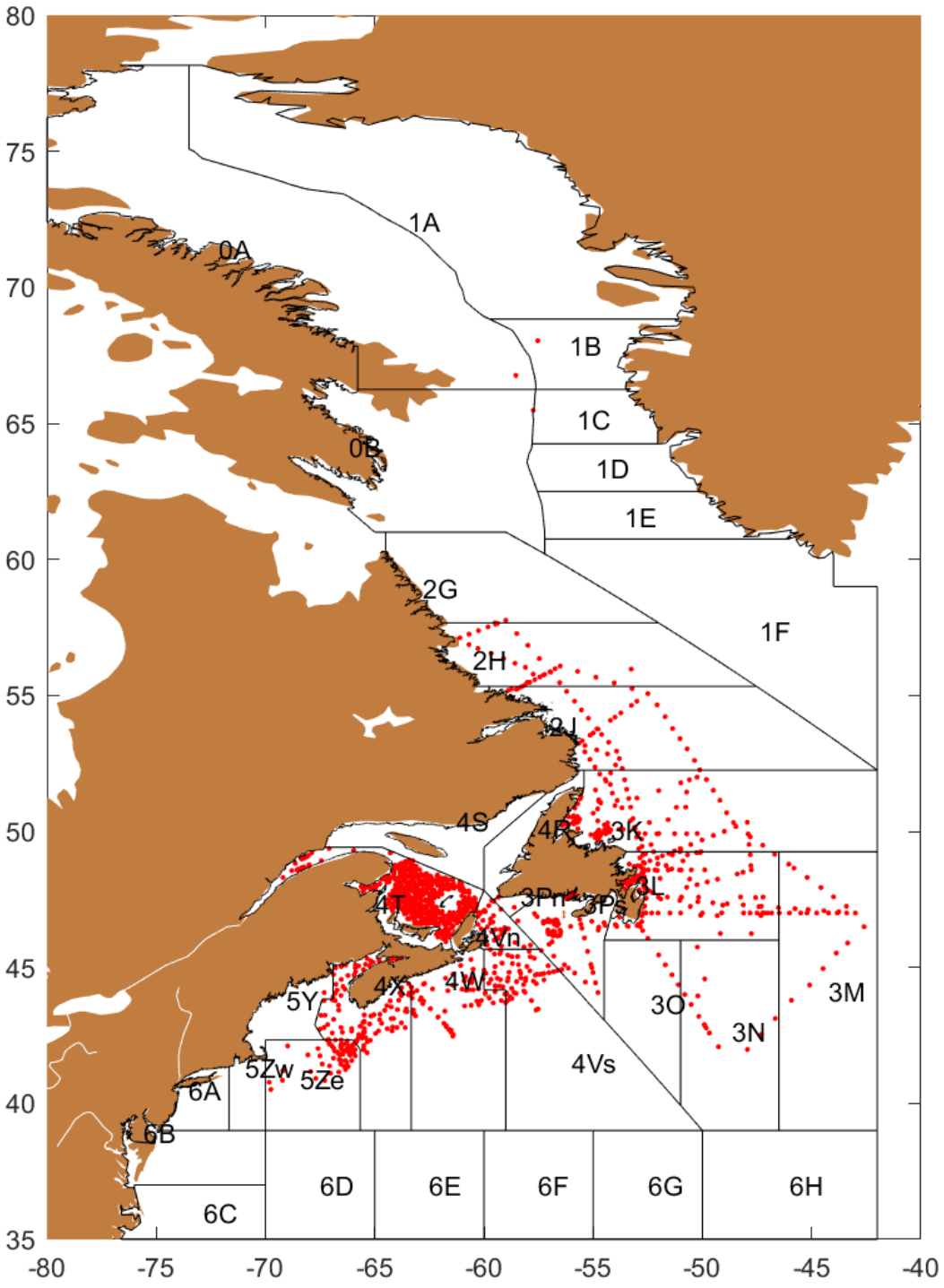

Figure 2b. Position of profiles sampled by ships before 2018 and acquired in 2018/2019

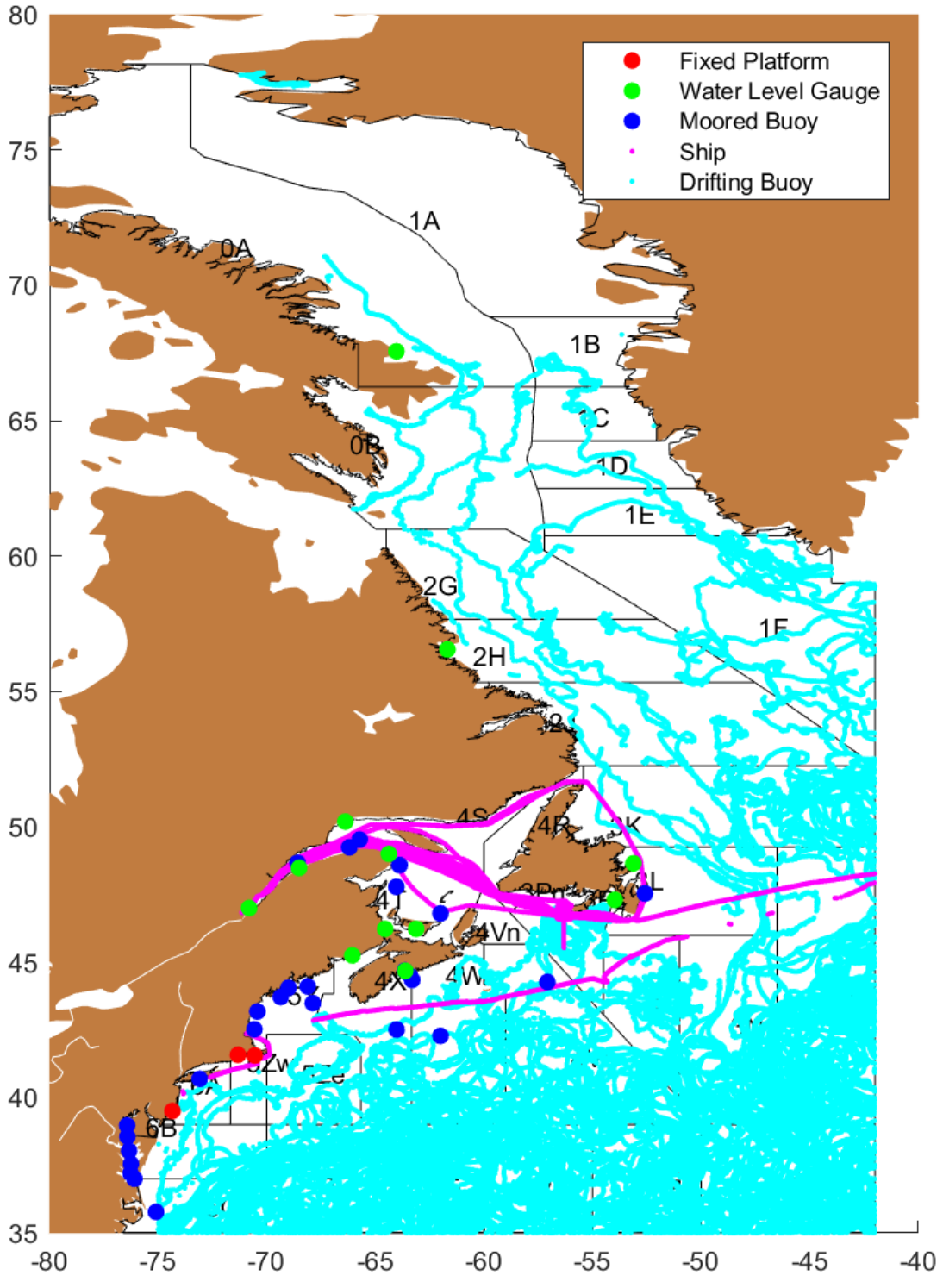

Figure 3. Position of near surface observations made in 2018

Water level gauges are described in table 6.

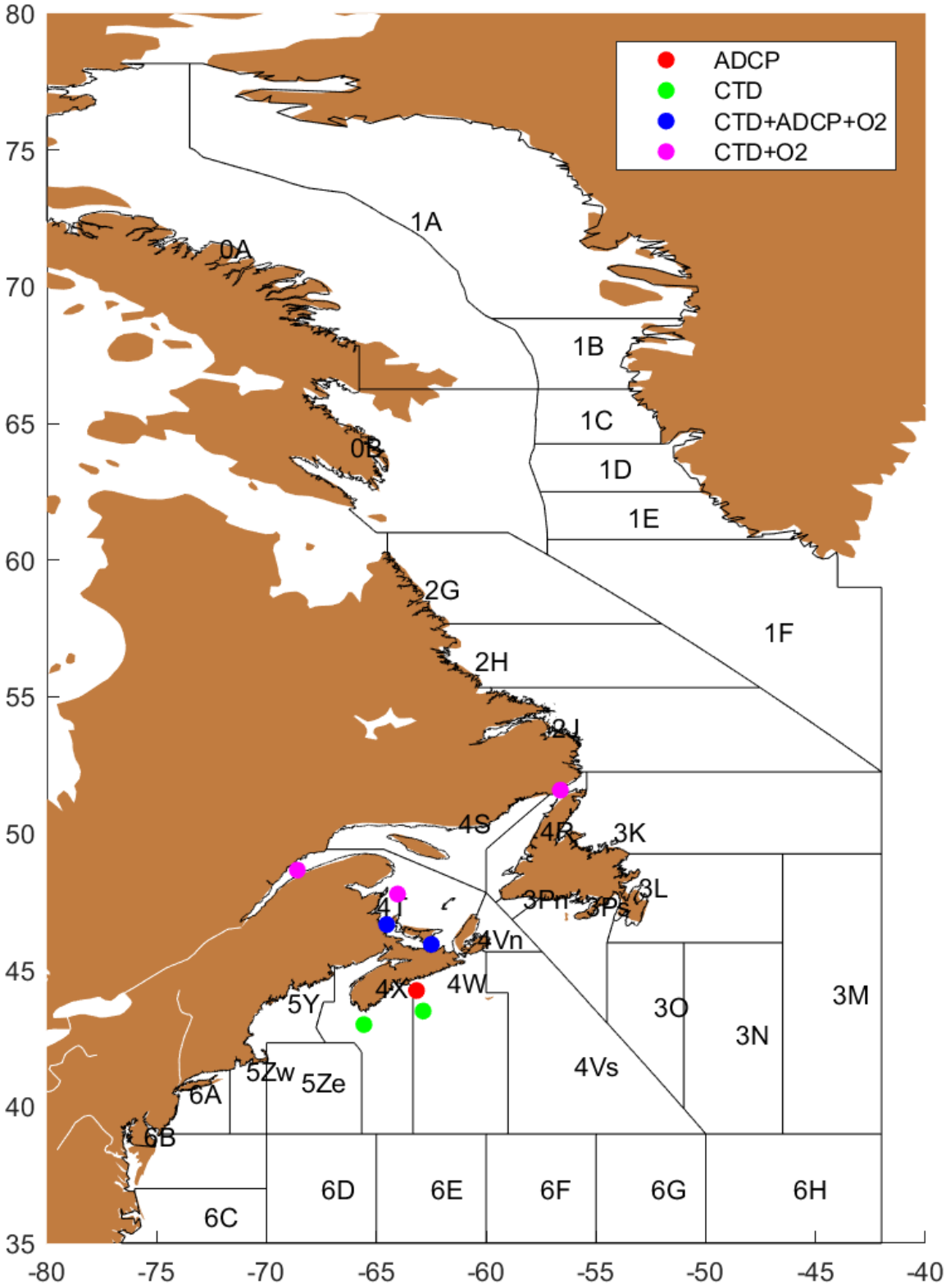

Figure 4. Position of moorings with subsurface instruments whose were processed in 2018/2018 (CTD=Conductivity-Temperature-Depth, ADCP = Acoustic Doppler Current Profiler)

Table 1. Real-time temperature and /or salinity profiles from autonomous platforms collected and processed in 2018

Platform Type	Platform Name	Country	WMO ID	Reporting Period (months)	Profiles	NAFO Subareas
moored	PMZA-RIKI**	Canada	4400481	Apr-Sep	332	4T
moored	IML-7**	Canada	4400482	May-Nov	232	4T
moored	IML-BA**	Canada	4400483	May-Nov	395	4T
moored	AZMP-ESG**	Canada	4400484	Jun-Oct	325	4T
moored	PMZA-VAS**	Canada	4400485	May-Nov	298	4T
moored	AZMP-STA27**	Canada	4400486	Jul-Nov	185	3L
moored	AZMP-HLX**	Canada	4400487	Mar-Dec	447	4W
glider	OTN200	Canada	4800922	Aug-Aug	516	4X
glider	SEA019	Canada	4800925	Mar-Aug	695	4W 4X
glider	SEA021	Canada	4800926	Mar-Dec	2931	4W 4X
glider	SEA022	Canada	4800993	Jun-Nov	1123	3K 3L 4W 4X
glider	SEA024	Canada	4800994	Jun-Oct	455	4W 4X
glider	DAL556	Canada	4800998	Jun-Nov	7973	4T
glider	Fundy	Canada	4800999	May-Oct	4606	4T 4W 4X
argo		UK	1901294	Jan-Aug	23	3K 3M
argo		USA	1901597	Jan-Feb	5	3K 3M
argo		USA	3901219	Jan-Dec	37	3N 3O 4Vs6G 6H
argo		Germany	3901601	Jan-Dec	36	3O 3Ps4Vs4W 4X
argo		Germany	3901602	Jan-Dec	37	4Vs4W 6E 6F
argo		Germany	3901603	Jan-Nov	23	3M 6H
argo		Germany	3901604	Mar-Dec	31	4X 6B 6C 6D 6E
argo		Germany	3901605	Jan-Oct	30	4W 4X 5Ze6B 6C 6D
argo		Germany	3901629	Feb-May	9	1F 2J 3K
argo		Germany	3901637	Jan-Dec	34	4Vs4W 4X 5Ze6B 6D
argo		Germany	3901638	Jan-Dec	37	4Vs4W
argo		Germany	3901639	Jan-Dec	35	4Vs4W 4X
argo		Germany	3901640	Jan-Dec	37	4Vs4W 4X 5Ze6B 6D
argo		Germany	3901641	Jan-Dec	37	4Vs4W 4X 5Ze6D 6E 6F 6G
argo		Germany	3901642	Jan-Dec	37	4Vs4W
argo		Germany	3901656	Jun-Dec	18	6C 6D 6E
argo		Germany	3901657	Aug-Dec	14	6E 6F
argo		Germany	3901658	Mar-Jun	9	6G 6H
argo		Germany	3901659	Jan-May	9	6H
argo		Germany	3901660	May-Dec	22	1F 2J
argo		Germany	3901661	May-Jul	7	2J 3K 3M
argo		Germany	3901662	Oct-Dec	6	3K
argo		Germany	3901665	May-Dec	24	1F 2J

argo	Germany	3901667	Jun-Dec	24	1F 2G 2H
argo	Germany	3901668	Jun-Dec	29	1F 2G 2H
argo	Germany	3901669	Jun-Dec	31	2H 2J
argo		3901856	Jan-Sep	9	6E 6F
argo	Canada	4901195	Jan-Mar	8	3M 3N
argo	USA	4901462	Jan-Dec	37	3M 3N 6G 6H
argo	USA	4901466	Jan-Feb	4	3N 4Vs6G
argo	USA	4901467	Jan-Dec	37	3N 3O 3Ps4Vs6F 6G 6H
argo	USA	4901594	Jan-Dec	37	3N 4Vs4W 6D 6E 6F 6G 6H
argo	USA	4901621	Jan-Nov	27	4W 6E 6F
argo	USA	4901630	Feb-Dec	33	4Vs4W 6B 6C 6D 6E 6F 6G
argo	USA	4901631	Jan-Dec	37	4Vs4W 4X 6F
argo	USA	4901701	Jan-Sep	27	6F 6G
argo	USA	4901704	Feb-Dec	35	3K 3M 3N
argo	USA	4901721	Mar-Dec	13	6C 6D
argo	Canada	4901745	Jan-Sep	26	4X 5Ze5Zw6B 6C
argo	Canada	4901747	Jan-Dec	37	1F 2G 2H
argo	Canada	4901755	Jan-Oct	29	3Ps4Vs4W
argo	Canada	4901762	Jan-Apr	10	4W 4X
argo	Canada	4901763	Jan-Jun	18	4W 4X
argo	Canada	4901765	Jan-Dec	36	4Vs4W 5Ze6B 6C 6D 6E 6F
argo	Canada	4901787	Jan-Mar	7	6B 6C
argo	Canada	4901788	Jan-Dec	36	4W 4X 5Ze6B 6D
argo	Canada	4901798	Jan-Dec	37	5Ze5Zw6B 6C 6D
argo	Canada	4901805	Jan-Aug	11	0A 1A
argo	Canada	4901809	Jan-Jun	18	1F
argo	Canada	4901812	Jan-Mar	8	6D
argo	Canada	4901813	Jan-Dec	37	4W 4X 5Ze6D 6E 6F
argo	Canada	4901815	Jan-Jun	17	3N 3O 4Vs6G
argo	Canada	4901816	Jan-May	10	6F 6G
argo	Canada	4901817	Jan-Dec	36	1F 2G
argo	Canada	4901827	Jan-Sep	25	3M 3N 4Vs6H
argo	Canada	4901828	Jan-Mar	8	4Vs
argo	USA	4902099	Jan-Dec	37	4W 4X 5Ze6B 6C 6D 6E
argo	USA	4902100	Jan-Jul	21	3N 4Vs6G 6H
argo	USA	4902102	Jan-Apr	11	6F 6G 6H
argo	USA	4902104	Jan-Feb	5	6H
argo	USA	4902108	Jan-Sep	25	4Vs6D 6E 6F 6G
argo	USA	4902109	Jan-Jan	1	6G
argo	USA	4902112	Jun-Oct	13	6B 6C 6D 6E
argo	USA	4902114	Jan-Nov	19	6B 6C 6D
argo	USA	4902115	Jan-May	12	3M 3N 6H
argo	USA	4902116	Aug-Dec	16	1F 2J 3K
argo	USA	4902120	Jan-Dec	27	6B 6C 6D 6E

argo	USA	4902121	Jan-Jun	13	6F 6G
argo	USA	4902122	Jan-Dec	35	4Vs4W 4X
argo	USA	4902337	Dec-Dec	3	6G
argo	USA	4902338	Jan-Jan	3	6H
argo	USA	4902339	Jul-Dec	14	6H
argo	USA	4902344	Oct-Dec	10	4X 6C 6D 6E
argo	USA	4902346	Feb-Dec	32	4X 5Ze6B 6C 6D 6E
argo	USA	4902347	Jan-Dec	30	3M 3N 4Vs4W 6D 6E 6F 6G 6H
argo	USA	4902348	Jan-Dec	37	3O 4Vs4W 5Ze6D 6E 6F 6G
argo	Canada	4902382	Feb-Dec	31	4Vs4W 6E 6F 6G 6H
argo	Canada	4902383	Jan-Jan	3	2H 2J
argo	Canada	4902390	Jan-Jan	3	4Vs
argo	Canada	4902391	Jan-Dec	33	4X 5Ze5Zw6A 6B 6C 6D
argo	Canada	4902392	Jan-Dec	37	4Vs4W 4X 5Ze6B 6D 6E
argo	Canada	4902393	Jan-Dec	36	4Vs4X 6B 6C 6D 6E 6F 6G 6H
argo	Canada	4902394	Jan-Dec	35	3N 3O 4Vs4W 4X 6G
argo	Canada	4902395	Jan-Dec	36	0B 1E 1F 2G 2H 2J
argo	Canada	4902396	Jan-May	13	1F 2G 2H
argo	Canada	4902397	Jan-Dec	37	2G 2H 2J 3K
argo	Canada	4902398	Jan-Nov	13	3M
argo	Canada	4902399	Mar-Dec	25	1F 2J 3K 3M
argo	Canada	4902400	Jan-Dec	37	0B 1E 1F 2G 2H 2J 3K 3L
argo	Canada	4902409	Jan-Dec	37	1F 2H
argo	Canada	4902410	Jan-Dec	37	0B 1D 1E 1F 2G 2H
argo	Canada	4902412	Jan-Dec	36	1E 1F 2G 2H 2J 3K
argo	Canada	4902413	Jan-Nov	32	1F 2G 2H 2J 3K 3L
argo	Canada	4902415	Jan-Apr	11	1F 2H
argo	Canada	4902419	Jan-Dec	36	1D 1E 1F 2G
argo	Canada	4902420	May-Dec	20	2J 3K 3L 3M
argo	Canada	4902422	May-Dec	24	1F 2G 2H
argo	Canada	4902423	May-Dec	24	1F 2H
argo	Canada	4902424	May-Dec	24	1F 2H 2J
argo	Canada	4902425	May-Dec	22	1F 2H
argo	Canada	4902426	Jan-Nov	229	2H 2J
argo	Canada	4902432	Aug-Oct	55	0A 1A
argo	Canada	4902433	Jul-Oct	58	0B
argo	Canada	4902438	May-Dec	25	1F 2H 2J
argo	Canada	4902439	May-Dec	26	2H 2J
argo	Canada	4902440	Sep-Dec	11	4W 4X 5Ze6D
argo	Canada	4902441	Sep-Dec	11	4Vs
argo	Canada	4902442	Oct-Dec	10	3O 4Vs
argo	Canada	4902448	Aug-Oct	7	2H 2J
argo	Canada	4902450	Dec-Dec	2	1F
argo	Canada	4902452	Oct-Dec	7	1F

argo	Canada	4902453	Sep-Dec	10	4W 4X 5Ze
argo	Canada	4902454	Sep-Nov	5	4W 4X 5Ze
argo	Canada	4902455	Oct-Dec	9	4Vs
argo	Canada	4902456	Oct-Dec	9	4Vs4W
argo	Canada	4902457	Nov-Dec	5	3N 3O
argo	Canada	4902458	Nov-Dec	5	3M 3N
argo	Canada	4902466	Nov-Nov	1	3N
argo	USA	4902911	Jan-Nov	24	6C 6D 6E 6F
argo	USA	4902912	Jan-Dec	62	4Vs4W 6C 6D 6E 6F
argo	USA	4902913	Jan-Dec	29	3N 4Vs6G 6H
argo	USA	4902918	May-Dec	14	6H
argo	USA	4902919	Jan-Mar	5	6H
argo	USA	4902927	Jan-Jul	24	6B 6C 6D
argo	USA	4902928	Feb-Dec	33	4Vs4W 4X 6B 6C 6D 6E
argo	USA	4903035	Jan-Dec	49	4X 5Ze6B 6C 6D 6E
argo	USA	4903036	Jan-Dec	39	4Vs4X 5Ze6B 6C 6D 6E 6F 6G
argo	USA	4903047	Nov-Dec	7	6B 6C 6D
argo	USA	4903048	Nov-Dec	8	6B 6C 6D
argo	USA	4903049	Nov-Dec	8	6C 6D
argo	USA	5903102	Jan-May	25	1F
argo	USA	5903106	Jan-May	25	3K 3M
argo	USA	5903107	Jan-Dec	71	3K 3M
argo	USA	5903108	Jan-Dec	78	3M 6H
argo	USA	5903109	Jan-Sep	107	3M 3N
argo	USA	5903390	Jan-Dec	36	1F
argo	USA	5903395	Sep-Dec	12	1E 1F
argo	USA	5904175	Jan-Jun	14	3K 3L 3M
argo	USA	5904749	Feb-Dec	75	0B 1D 2G 2H
argo	USA	5904771	Jan-Dec	37	1F 2J 3K
argo	USA	5904772	Sep-Dec	11	1E 1F 2G
argo	USA	5904773	Jan-Jan	3	1F
argo	Norway	5904989	Jan-Jun	36	0B 1E 2G 2H
argo	UK	6900447	Jan-Jun	18	2G 2H 2J 3K
argo	France	6900966	Jan-Jan	1	1D
argo	France	6901022	Jan-Jan	2	3N
argo	France	6901023	Jan-Apr	11	3K 3L
argo	UK	6901147	Jan-Oct	22	1F
argo	UK	6901149	Jan-Dec	37	1F 2H 2J
argo	UK	6901166	Jan-May	13	1F 2J
argo	UK	6901168	Jan-Jul	15	1F
argo	UK	6901169	Apr-Dec	26	1F 2H
argo	UK	6901171	Jul-Dec	18	0B 1E 1F 2G
argo	UK	6901173	Jan-Dec	36	1E 1F 2G 2H 2J 3K 3L 3M
argo	UK	6901178	Jan-Dec	36	0B 1D 1E 1F 2G

argo	UK	6901190	Aug-Dec	14	1D 1E 1F
argo	UK	6901192	Sep-Nov	2	1F
argo	France	6901566	Aug-Dec	15	0B 1E 1F
argo	France	6901568	Jul-Dec	18	1E 1F 2G 2H
argo	France	6901719	Mar-May	5	1F
argo	France	6901721	Jan-Dec	35	0B 1C 1D
argo	France	6901722	Feb-Dec	27	1E 1F
argo	France	6901726	Jan-Dec	34	0B 2G 2H 2J 3K 3L 3M
argo	France	6901751	Jan-Dec	37	1F 2G 2H
argo	France	6901753	Jan-Dec	37	0B 1E 2G 2H 2J 3K 3L 3M
argo	France	6901754	Jan-Dec	37	0B 1E 2G 2H
argo	Germany	6901911	May-Dec	24	1D 1E 1F
argo	Germany	6902563	Jan-Jan	1	4Vs
argo	Germany	6902564	Jan-Jul	19	4Vs4W 6E
argo	Germany	6902566	Jan-Aug	22	4W 4X 5Ze
argo	Germany	6902632	Aug-Dec	16	4Vs4W 6B 6C 6D
argo	Germany	6902633	Jan-Dec	37	3M 3N 3O 4Vs6G 6H
argo	Germany	6902634	Nov-Dec	5	6C 6D 6E
argo	Germany	6902635	Jan-Dec	37	4Vs4W 4X 6A 6B 6C 6D 6E
argo	France	6902659	Jul-Sep	7	3M
argo	France	6902660	Jan-Jul	13	1F
argo	France	6902661	Jan-Dec	37	2H 2J 3K 3L 3M 3N
argo	France	6902671	Jan-Oct	63	0A
argo	France	6902686	Sep-Dec	10	1F
argo	France	6902696	Jan-Dec	36	0B 2G 2H 2J 3K 3L 3M
argo	France	6902702	Jan-Mar	4	3K 3M
argo	France	6902707	May-Dec	23	1E 1F 2G 2H 2J
argo	France	6902708	Jan-Dec	36	1F 2G 2H 2J
argo	France	6902709	Jan-Dec	36	0B 1D 1E 2G
argo	France	6902753	Aug-Dec	13	1D 1E 1F
argo	France	6902794	Jun-Dec	14	3K 3M
argo	France	6902795	Jun-Sep	8	3K 3M
argo	France	6902796	Jun-Oct	13	3K 3L 3M
argo	France	6902802	Sep-Dec	10	1F
argo	France	6902829	Jan-Apr	4	0A
argo	France	6902862	Nov-Dec	4	3K 3L 3M
argo	France	6902863	Nov-Dec	4	3K 3L 3M
argo	France	6902864	Nov-Dec	4	3K 3L
argo	France	6902865	Nov-Dec	4	3K 3L 3M
argo	France	6902884	Nov-Dec	3	3K 3L
argo	France	6902896	Jul-Oct	100	0A 1A
argo	France	6902897	Jul-Oct	99	0A 1A
animals		9901057	Mar-May	173	1E 1F 2G 2H 2J 3K 4R 4S 4T
animals		9901058	Mar-May	169	1F 2H 2J 3K 3L 3O 3Pn3Ps4R 4S 4T 4Vn

animals	9901059	Mar-Apr	100	3K 4R 4S 4T
animals	9901060	Mar-Mar	11	4T
animals	9901061	Mar-Jun	178	1F 2H 2J 3K 3L 3N 3O 3Pn3Ps4R 4S 4T 4Vn4Vs
animals	9901062	Mar-May	175	1F 2H 2J 3K 4R 4S 4T
animals	9901063	Mar-May	166	1F 2J 3K 3L 3Pn3Ps4R 4S 4T
animals	9901088	Jul-Aug	43	1A
animals	9901089	Jul-Sep	21	1A
animals	9901090	Jul-Nov	79	1A
animals	9901097	Aug-Nov	565	0A
animals	9901098	Sep-Oct	165	0A
animals	9901124	Oct-Dec	123	4Vs4W
animals	9901125	Nov-Dec	117	4Vs4W

*Dates are of first and last data reports within the NAFO Convention Area; when empty, reporting period was from January through December

**Moorings equipped with fixed profiling CTDs, mounted with Viking buoys. The coverage period corresponds to the time at which MEDS started transmitting this data on the GTS, which started late in the season. Deployments were seasonal and the full data are available at the MLI.

Table 2. Oceanographic profiles collected by ships in 2018 and ingested in 2018/2019

Platform	Country	Mission	First Date	Last Date	CTD	CTD RT*	XBT	XBT RT*	Bottle	TSG**		NAFO_Subareas
Oceanex Connaigra	CAN		20180101	20181231	0	0		0	0	0	40646	3K 3L 3Pn3Ps4R 4S 4T 4Vn
unknown	CAN		20180103	20181219	0	50		0	0	0	0	4W
Hudson	CAN	18HU18118	20180112	20181211	376	87		33	0	72	0	1F 2H 2J 3K 3L 3M 3N 3O 3Pn3Ps4R 4S 4T 4Vn4Vs4W 4X 5Y 5Ze
Various Small Vessels	CAN	18VA18669	20180116	20181211	127	0		57	0	0	0	2G 2H 2J 3K 3L 3M 4T 4W 4X
Maersk Vilnius			20180122	20181225	0	0		0	175	0	0	5Zw6A 6B 6D 6E
CMA CGM Amber	UK		20180202	20180506	0	0		0	49	0	0	6G 6H
Various Small Vessels	CAN	18VA18666	20180207	20181221	127	0		57	0	0	0	2G 2H 2J 3K 3L 3M 4T 4W 4X
Amundsen	CAN		20180214	20180214	0	1		0	0	0	0	4T
Global Leader			20180224	20180705	0	0		0	161	0	0	6A 6B 6C
C-GCGP Helicopter	CAN	184118005	20180226	20180313	96	0		0	0	0	0	3Pn4R 4S 4T 4Vn
Various Small Vessels	CAN	18VA18010	20180308	20180308	0	0		1	0	0	0	3L
Multiple Ships	CAN	189018004	20180312	20181206	32	0		0	0	0	0	4T
Hudson	CAN	18HU18004	20180406	20180423	85	0		0	0	0	0	3Pn3Ps4Vn4Vs4W 4X 5Y 5Ze
Teleost	CAN	18TL18185	20180406	20180424	69	3		42	0	55	0	3K 3L 3M 3N 3O 3Ps
Alfred Needler	CAN	18NE18493	20180414	20180418	2	0		2	0	0	0	3L 3Ps
Frederick G. Creed	CAN	18FC18016	20180426	20180509	56	0		0	0	0	0	4T
Teleost	CAN	18TL18186	20180426	20180501	11	0		0	0	1	0	3L
Alfred Needler	CAN	18NE18494	20180427	20180507	78	0		0	0	0	0	3L 3Ps
Teleost	CAN	18TL18187	20180502	20180522	38	0		43	2	1	0	3K 3L
Leim	CAN	18LO18011	20180510	20180518	19	0		0	0	0	0	4S
Alfred Needler	CAN	18NE18495	20180510	20180519	82	0		8	0	0	0	3L 3Ps4Vs

Kildir	CAN	187818025	20180515	20180517	83	0	0	0	0	0	4T
Frederick G. Creed	CAN	18FC18015	20180520	20180609	20	0	0	0	0	0	4R 4S
Teleost	CAN	18TL18194	20180524	20180604	56	0	0	0	0	0	3L 3O
Alfred Needler	CAN	18NE18496	20180525	20180605	63	0	5	0	0	0	3L 3N 3O 3Ps
Maria S. Merian	DEU		20180526	20180615	0	85	0	0	0	0	1F 2H 2J
Vladykov	CAN	18VD18092	20180527	20180602	16	0	0	0	0	0	3Ps
Mysis	CAN	184H18021	20180528	20180528	1	0	0	0	0	0	4T
Vizconde de Eza	SPAIN	29VE180602	20180602	20180621	107	0	0	0	0	0	3N 3O
Leim	CAN	18LO18013	20180603	20180611	38	0	0	0	0	0	4S
Coriolis II	CAN	18OL18014	20180605	20180624	145	0	0	0	0	0	3Pn4R 4S 4T 4Vn
Alfred Needler	CAN	18NE18497	20180606	20180618	94	0	2	0	2	0	3L 3N 3O
Teleost	CAN	18TL18195	20180606	20180618	81	0	2	0	0	0	3L 3N
Pourquoi pas?	FRA		20180610	20180730	0	3	0	0	0	32012	3K 3L 3M 3Ps
Alfred Needler	CAN	18NE18498	20180620	20180621	6	0	0	0	0	0	3L
CMA CGM Coral	UK		20180623	20180624	0	0	0	27	0	0	6H
Vizconde de Eza	SPAIN	29VE180626	20180626	20180723	74	0	0	0	0	0	3L 3M
Okeanos Explorer	USA		20180626	20181007	0	0	0	59	0	0	5Zw6A 6B 6C
Colvert	CAN	18ZG18043	20180630	20181009	64	0	0	0	0	0	4T
Leim	CAN	18LO18033	20180701	20180701	1	0	0	0	0	0	4S
Colvert	CAN	18ZG18032	20180705	20181027	61	0	0	0	0	0	4T
Vladykov	CAN	18VD18095	20180706	20180706	1	0	0	0	0	0	3L
M. Perley	CAN	18MU18041	20180710	20180730	101	0	0	0	0	0	4T
Teleost	CAN	18TL18023	20180714	20180728	84	0	0	0	0	0	4W 4X 5Y 5Ze
(unknown)	CAN		20180715	20180729	0	13	0	1	0	0	2H 2J 3K 3L 3M
Coriolis II	CAN	18OL18011	20180715	20180802	0	0	0	0	81	0	2G 2H 2J 3K 3L 3M
(multiple)	CAN	18VA18011	20180715	20180802	103	0	56	0	0	0	2G 2H 2J 3K 3L 3M 4X
Mysis	CAN	184H18042	20180717	20180717	1	0	0	0	0	0	4T

L'Alliance	CAN	18K818001	20180717	20181015	43	0	0	0	0	0	4T
Jean Mathieu	CAN	182P18001	20180719	20180916	352	0	0	0	0	0	4T
Aqviq	CAN	18QQ18113	20180722	20180825	244	0	0	0	0	0	0B 2G 3K
Vladykov	CAN	18VD18097	20180725	20180801	13	0	0	0	0	0	3L
Vizconde de Eza	ESP	29VE180730	20180730	20180819	93	0	0	0	0	0	3L
Teleost	CAN	18TL18041	20180803	20180901	110	0	0	0	0	0	4R 4S 4T 4Vn
Vladykov	CAN	18VD18098	20180803	20180805	10	1	0	0	0	0	3L
Oregon II	USA		20180805	20180805	0	1	0	0	0	0	6C
Various Small Vessels	CAN	18VA18668	20180806	20180806	1	0	0	0	0	0	4T
Frederick G. Creed	CAN	18FC18035	20180809	20180825	8	0	0	0	0	0	4S 4T
Leim	CAN	18LO18029	20180811	20180814	24	0	0	0	0	0	4T
M. Perley	CAN	18MU18042	20180813	20180821	32	0	0	0	0	0	4T
Vladykov	CAN	18VD18100	20180817	20180819	15	0	0	0	0	0	3L
Leim	CAN	18LO18034	20180818	20180819	3	0	0	0	0	0	4T
Kildir	CAN	187818047	20180821	20180824	11	0	0	0	0	0	4T
Vladykov	CAN	18VD18101	20180826	20180828	12	0	0	0	0	0	3K
Alfred Needler	CAN	18NE18499	20180830	20180910	44	2	7	1	0	0	3L 4R
Rosborough C11962NS	CAN		20180905	20180905	0	1	0	0	0	0	4W
Teleost	CAN	18TL18196	20180907	20181002	104	0	0	0	0	0	4T 4Vn
Vladykov	CAN	18VD18102	20180907	20180916	20	0	0	0	0	0	3K
Alfred Needler	CAN	18NE18500	20180912	20180925	79	0	8	0	1	0	3L 3N 3O
Hudson	CAN	18HU18030	20180915	20181005	105	0	0	0	0	0	3Pn3Ps4Vn4Vs4W 4X 5Y 5Ze
Vladykov	CAN	18VD18103	20180923	20180926	17	0	0	0	0	0	3L
Colvert	CAN	18ZG18052	20180924	20180928	9	0	0	0	0	0	4T
Tara	FRA		20180924	20181012	0	0	0	0	0	3004	3L 3M 3N 3O 3Ps4Vs4W 4X 5Y 5Ze5Zw6A
Kildir	CAN	187818053	20180925	20180927	64	0	0	0	0	0	4T
Alfred Needler	CAN	18NE18501	20180926	20181009	95	0	1	0	0	0	3L 3N 3O

M. Perley	CAN	18MU18043	20180927	20181007	6	0	0	0	0	0	4T
Vladykov	CAN	18VD18104	20181003	20181003	2	0	0	0	0	0	3L
Leim	CAN	18LO18048	20181006	20181012	16	0	0	0	0	0	4T
Alfred Needler	CAN	18NE18502	20181010	20181023	69	0	6	0	0	0	3L
Teleost	CAN	18TL18189	20181011	20181118	149	0	3	0	0	0	2H 2J 3L
Hudson	CAN	18HU18051	20181014	20181022	30	0	0	0	0	0	4T
Vladykov	CAN	18VD18105	20181015	20181015	2	0	0	0	1	0	3L
Vladykov	CAN	18VD18106	20181020	20181028	3	0	0	0	0	0	3L
Hudson	CAN	18HU18028	20181023	20181101	56	0	0	0	0	0	3Pn4R 4S 4T 4Vn
Alfred Needler	CAN	18NE18503	20181024	20181103	60	0	2	0	0	0	3K 3L
Teleost	CAN	18TL18190	20181026	20181104	59	0	0	0	0	0	2H 2J
Alfred Needler	CAN	18NE18504	20181108	20181121	20	0	2	0	0	0	3K 3L
Teleost	CAN	18TL18191	20181109	20181119	23	0	3	0	0	0	2J
Horizon Leader			20181110	20181111	0	0	0	49	0	0	6A 6B 6C
Alfred Needler	CAN	18NE18505	20181121	20181128	27	0	3	0	0	0	2J 3K
Teleost	CAN	18TL18192	20181122	20181203	58	0	1	0	0	0	2J 3K
Teleost	CAN	18TL18193	20181207	20181218	61	0	2	0	1	0	2J 3K 3L

* Messages formatted for transmission on the GTS. These messages are of lower vertical resolution and uncalibrated versions of the data, to be replaced in the future.
**TSG counts are not number of profiles, but number of point thermosalinograph observations
Dates are of first and last data reports within the NAFO Convention Area.
Additional full resolution CTD profiles from some of these cruises were received at MEDS but could not be ingested and counted in time for this report

Table 3. Pre-2018 temperature (XBT) and/or salinity (CTD, bottle) profile data collected aboard ships, entered or updated in 2018/2019

Platform	Mission Number	First Date	Last Date	CTD	Bottle	XBT	NAFO_Subareas
Hudson	18HU03005	20030412	20030419	26	0	0	4Vs4W 4X
Louis S. St-Laurent	18SN08029	20080707	20080709	0	4	0	0A 0B 1B 2H
Shamook	18OK09872	20090618	20090623	91	0	0	3Ps
Hudson	18HU13013	20130604	20130616	68	0	0	4W 4X
Jean Mathieu	182P09014	20140709	20141012	328	0	0	4T
George R. Pearkes	18GP16002	20160121	20160121	0	1	0	3L
Vladykov	18VD16053	20160415	20160415	0	3	0	3L
Vladykov	18VD16054	20160426	20160426	0	1	0	3L
Vladykov	18VD16058	20160706	20160706	0	1	0	3L
(various)	18VA17667	20170104	20171220	51	0	0	4W
Alfred Needler	18NE17102	20170302	20170304	3	0	0	4W 4X
Alfred Needler	18NE17002	20170304	20170308	8	0	0	4W 4X 5Ze
George R. Pearkes	18GP17003	20170307	20170325	0	0	17	3K 3L
Teleost	18TL17002	20170321	20170330	36	0	0	4W 4X 5Ze
Teleost	18TL17173	20170406	20170423	0	77	30	3K 3L 3M 3N 3O 3Ps
Alfred Needler	18NE17476	20170409	20170409	0	0	1	3Ps
Coriolis II	18OL17001	20170418	20170503	100	0	0	3Pn3Ps4Vn4Vs4W 4X 5Ze
Teleost	18TL17174	20170426	20170501	7	1	0	3L
Teleost	18TL17175	20170507	20170523	8	0	25	3K 3L
Alfred Needler	18NE17480	20170524	20170603	2	1	0	3L
Alfred Needler	18NE17481	20170608	20170617	2	1	0	3L
Vladykov	18VD17073	20170609	20170609	1	0	0	3L
Alfred Needler	18NE17482	20170622	20170622	1	1	0	3L
Teleost	18TL17184	20170622	20170623	1	0	8	3L 3Pn3Ps4Vn
Alfred Needler	18NE17020	20170628	20170805	201	0	0	4Vn4Vs4W 4X 5Y 5Ze
Teleost	18TL17176	20170708	20170728	0	80	70	2G 2H 2J 3K 3L 3M
Leim	18LO17026	20170709	20170720	21	0	0	4T
Jean Mathieu	182P17001	20170710	20170922	350	0	0	4T
Vladykov	18VD17075	20170710	20170716	3	0	0	3K 3L

Vladykov	18VD17076	20170725	20170725	1	0	0	3L
Vladykov	18VD17077	20170802	20170810	18	0	0	3L
Clears Cove Pride	188E17008	20170815	20170815	1	0	0	2H
Frederick G. Creed	18FC17032	20170815	20170827	7	0	0	4T
Vladykov	18VD17078	20170817	20170819	16	0	0	3L
Vladykov	18VD17079	20170828	20170904	17	0	0	3K
Alfred Needler	18NE17483	20170903	20170911	34	0	1	3L 3Ps
Alfred Needler	18NE17484	20170913	20170925	2	1	0	3L
Vladykov	18VD17080	20170914	20170917	14	0	0	3K
Vladykov	18VD17082	20171002	20171002	1	0	0	3L
Alfred Needler	18NE17485	20171011	20171011	1	0	0	3L
Teleost	18TL17179	20171011	20171011	1	0	0	3L
Alfred Needler	18NE17486	20171012	20171023	1	1	4	3L 3N
Alfred Needler	18NE17487	20171025	20171106	2	2	0	3L
Alfred Needler	18NE17488	20171108	20171121	2	1	9	3K 3L
Fugro Discovery	PADS17009	20171111	20171216	0	43	49	2J 3K 3L 3M
Alfred Needler	18NE17489	20171122	20171204	2	0	2	3K 3L
Alfred Needler	18NE17491	20171206	20171214	1	0	2	3K 3L
Teleost	18TL17183	20171207	20171207	1	0	0	3L

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

Table 4. Real-time surface water, air, atmospheric parameters and wave* data from buoys, collected and processed in 2018

Country	Type	Name	ID	Reporting Period	NAFO Subareas
USA	Fixed Platform	Jacques Cousteau Reserve, NJ	JCTN4	Dec-Dec	6A
USA	Fixed Platform	Narragansett Bay Reserve, RI	NAQR1	Dec-Dec	5Zw
USA	Fixed Platform	Waquoit Bay Reserve, MA	WAQM3	Dec-Dec	5Zw
USA	Moored Buoy	Hatteras Bay	4100062	Jan-Mar	6C
USA	Moored Buoy	Massachusetts Bay	4400029	Dec-Dec	5Y
USA	Moored Buoy	Western Maine Shelf	4400030	Dec-Dec	5Y
USA	Moored Buoy	Central Maine Shelf	4400032	Dec-Dec	5Y
USA	Moored Buoy	Penobscot Bay	4400033	Dec-Dec	5Y
USA	Moored Buoy	Eastern Marine Shelf	4400034	Jan-Dec	5Y
USA	Moored Buoy	Jordan Basin	4400037	Dec-Dec	5Y
USA	Moored Buoy	Potomac, MD	4400042	Dec-Dec	6B
USA	Moored Buoy	Stingray Point, VA	4400058	Dec-Dec	6B
USA	Moored Buoy	Gooses Reef, MD	4400062	Dec-Dec	6B
USA	Moored Buoy	Annapolis, MD	4400063	May-Nov	6B
USA	Moored Buoy	First Landing, VA	4400064	Dec-Dec	6B
USA	Moored Buoy	Great South Bay	4400069	Jun-Dec	6A
USA	Moored Buoy	York Spit, VA	4400072	Dec-Dec	6B
Canada	Moored Buoy*	East Scotia Slope	4400137	Jan-Jun; Aug-Dec	4W
Canada	Moored Buoy*	Banquerau Banks	4400139	Jan-Dec	4Vs
Canada	Moored Buoy*	La Have Bank	4400150	Jan-Dec	4X
Canada	Moored Buoy*	Halifax Harbour	4400258	Oct-Dec	4W
Canada	Moored Buoy*	Mont-Louis	4500138	May-Dec	4S
	Drifting Buoy		1300529	Jun-Oct	3M 3N 3O 4Vs6E 6F 6G 6H
	Drifting Buoy		1300602	Jan-Jan	6E
	Drifting Buoy		1300624	Jan-Dec	3N 6G 6H
	Drifting Buoy		1300871	Jun-Oct	6C 6D 6E 6F
	Drifting Buoy		1300872	Jan-Feb	3M 3N 6G 6H

	Drifting Buoy	2500622	Jan-Jan	1F 2H
	Drifting Buoy	2601561	Jan-Feb	1F 2G 2H
UK	Drifting Buoy	3100735	Aug-Dec	4W 4X 6D 6E
USA	Drifting Buoy	3201558	Oct-Nov	6D 6E
USA	Drifting Buoy	3201560	Oct-Dec	4Vs4W 6B 6C 6D 6E 6F
USA	Drifting Buoy	4101513	Jan-Jan	4X 5Ze6D
USA	Drifting Buoy	4101515	Mar-Mar	6H
USA	Drifting Buoy	4101516	Jan-May	3M 3N 4Vs4W 4X 6D 6E 6F 6G 6H
USA	Drifting Buoy	4101522	Jan-Feb	4Vs4W 6E 6F 6G
	Drifting Buoy	4101528	Jun-Oct	3M 3N 3O 4Vs4W 4X 6D 6E 6H
	Drifting Buoy	4101529	Jan-Jan	6D 6E
	Drifting Buoy	4101531	Jun-Aug	3M 3N
	Drifting Buoy	4101532	Jul-Dec	3M 6H
	Drifting Buoy	4101533	Aug-Dec	1F 2J 3K 3M 3N 3O
	Drifting Buoy	4101534	Sep-Sep	3K
	Drifting Buoy	4101535	Jun-Dec	4Vs4W 4X 5Ze6E
	Drifting Buoy	4101538	Jan-May	4Vs6D 6E 6F 6G 6H
	Drifting Buoy	4101539	Aug-Dec	4X 6B 6C 6D 6E
USA	Drifting Buoy	4101540	Jan-Jun	3M 3N 4Vs6G 6H
USA	Drifting Buoy	4101541	Jan-Dec	4Vs6F 6G 6H
USA	Drifting Buoy	4101542	Jan-May	6H
USA	Drifting Buoy	4101544	Feb-Dec	3N 3O 4Vs4W 6C 6D 6E 6F 6G 6H
USA	Drifting Buoy	4101545	Jan-Feb	6B 6C
USA	Drifting Buoy	4101548	Jan-Apr	6E 6F
	Drifting Buoy	4101556	Jan-Feb	6H
	Drifting Buoy	4101557	Jan-Feb	6H
USA	Drifting Buoy	4101559	Apr-Dec	3M 3N 3O 3Ps4Vs4W 6B 6C 6D
	Drifting Buoy	4101560	Sep-Dec	6H
	Drifting Buoy	4101562	Jan-Oct	6F 6G 6H
	Drifting Buoy	4101565	May-May	6H

	Drifting Buoy	4101567	Feb-Dec	6F 6G 6H
	Drifting Buoy	4101568	Mar-Dec	3M 3N 3O 4Vs4W 4X 5Ze6B 6C 6D 6E 6G 6H
	Drifting Buoy	4101571	Aug-Aug	3K 3M
	Drifting Buoy	4101573	Jan-Dec	4Vs4W 4X 6B 6C 6D 6E 6F 6G
	Drifting Buoy	4101574	Jan-Nov	6C 6D 6E 6F
	Drifting Buoy	4101575	Feb-Dec	4W 4X 6B 6C 6D 6E 6F
USA	Drifting Buoy	4101586	Dec-Dec	4W 6B 6C 6D 6E
	Drifting Buoy	4101596	Jun-Jun	3K
	Drifting Buoy	4101619	Jun-Jun	3K
	Drifting Buoy	4101623	Oct-Dec	0B 1E 1F 2G
USA	Drifting Buoy	4101637	Jul-Dec	4Vs4W 4X 6B 6C 6D 6E 6F
USA	Drifting Buoy	4101638	Feb-Oct	3M 3N 3O 4Vs4W 5Ze5Zw6A 6B 6D 6E 6F 6G
USA	Drifting Buoy	4101639	Feb-Jul	3M 3N 3O 4Vs4W 4X 6F 6H
USA	Drifting Buoy	4101647	Aug-Dec	4Vs4X 6B 6C 6D 6E 6F 6G
USA	Drifting Buoy	4101649	May-Dec	4W 4X 6B 6C 6D 6E
USA	Drifting Buoy	4101650	May-Dec	3N 3O 4Vs4W 4X 6B 6C 6D 6E 6F 6G 6H
France	Drifting Buoy	4101702	Apr-Jun	6F
	Drifting Buoy	4101705	Mar-Apr	6H
	Drifting Buoy	4101710	Jan-Jan	6G
	Drifting Buoy	4101712	Jan-May	3M 3N 4Vs4W 6F 6G 6H
	Drifting Buoy	4101713	Mar-Nov	6D 6E 6F 6G
	Drifting Buoy	4101714	Aug-Aug	6H
France	Drifting Buoy	4101742	Oct-Dec	6B 6C 6D 6E
USA	Drifting Buoy	4100540	Jan-May	3M 3N 4Vs
	Drifting Buoy	4100541	Jan-Jun	3N 4Vs6G 6H
USA	Drifting Buoy	4100545	Jan-Jun	3N 4Vs4W 4X 6C 6D 6E 6F 6G 6H
	Drifting Buoy	4100558	Jan-May	6G 6H
USA	Drifting Buoy	4100575	Jun-Sep	6C 6D
	Drifting Buoy	4100690	Jan-Sep	6F 6G 6H
	Drifting Buoy	4100730	Jan-Apr	3M 3N 4Vs6G 6H

USA	Drifting Buoy	4201507	Jan-May	4Vs6E 6F 6G 6H
USA	Drifting Buoy	4201510	Feb-Oct	3M 3N 3O 4Vs4W 4X 6B 6C 6D 6E 6H
USA	Drifting Buoy	4201517	Jan-Dec	4W 4X 5Ze6D 6E
USA	Drifting Buoy	4201518	Mar-Oct	4Vs4W 6E 6F 6G
	Drifting Buoy	4401503	Aug-Dec	4Vs4W 6E 6F 6G
France	Drifting Buoy	4401527	Sep-Dec	4Vs4W 6E 6F 6G 6H
France	Drifting Buoy	4401531	May-Dec	4Vs6E 6F 6G
USA	Drifting Buoy	4401536	Feb-Feb	3K
	Drifting Buoy	4401539	Jan-May	6F 6G 6H
	Drifting Buoy	4401540	Jul-Dec	4Vs4W 6E 6F
	Drifting Buoy	4401541	Jan-Feb	3M 3N
	Drifting Buoy	4401544	Jul-Dec	4Vs6D 6E 6F 6G
	Drifting Buoy	4401551	Jan-Feb	3M 6H
	Drifting Buoy	4401558	Jan-Jan	3K 3M
	Drifting Buoy	4401561	Jan-Feb	3M 3N 3O 4Vs
	Drifting Buoy	4401567	Nov-Dec	1F 2J
	Drifting Buoy	4401568	Nov-Dec	3K 3L 3M 3N
	Drifting Buoy	4401569	Nov-Dec	2J
	Drifting Buoy	4401570	Jun-Jun	3K
	Drifting Buoy	4401571	Jun-Jun	3K
	Drifting Buoy	4401572	Nov-Dec	3K 3L
	Drifting Buoy	4401573	Nov-Dec	3K 3L 3N
Canada	Drifting Buoy	4401601	Jan-Jan	1F 2J
Canada	Drifting Buoy	4401602	Jan-Apr	3M 3N 3O 3Ps4Vs6H
Canada	Drifting Buoy	4401609	Jan-Jan	6H
Canada	Drifting Buoy	4401611	Jan-Dec	3L 3O 3Ps4Vn4Vs
USA	Drifting Buoy	4401756	Jan-Dec	0B 2G 2H 2J 3K 3L 3M
USA	Drifting Buoy	4401759	Sep-Nov	3M 6H
USA	Drifting Buoy	4401771	Jan-May	6H
USA	Drifting Buoy	4401774	Apr-May	3M 6H
USA	Drifting Buoy	4401775	Mar-Aug	1F 2J 3K 3M

USA	Drifting Buoy	4401785	Mar-May	3M 6H
USA	Drifting Buoy	4401787	Mar-Jun	3M 3N 6H
USA	Drifting Buoy	4401788	Mar-Mar	3M
USA	Drifting Buoy	4401790	May-Nov	3M
USA	Drifting Buoy	4401792	Jun-Oct	3M 3N 3O 4Vs4W 4X 6B 6C 6D 6E 6H
USA	Drifting Buoy	4401793	Jan-Jun	6H
USA	Drifting Buoy	4401794	Jun-Dec	3M 3N 4Vs4W 4X 6B 6C 6D 6E 6G 6H
USA	Drifting Buoy	4401797	Jan-Jan	3K 3M
Canada	Drifting Buoy	4401802	Jan-Apr	3M 3N 4Vs6F 6G 6H
	Drifting Buoy	4401803	Jun-Aug	1F 2J 3K
USA	Drifting Buoy	4401806	Oct-Oct	2J
USA	Drifting Buoy	4401813	Jul-Nov	3N 3O 4Vs4W 6F 6G 6H
USA	Drifting Buoy	4401815	May-Dec	3M 3N 4Vs4W 4X 5Ze5Zw6A 6B 6D 6H
USA	Drifting Buoy	4401816	Aug-Dec	5Zw6A 6B 6C 6D
USA	Drifting Buoy	4401817	Aug-Aug	6B 6C
	Drifting Buoy	4401818	Aug-Sep	5Ze5Zw
Canada	Drifting Buoy	4401904	Jan-Jun	3K 3L 3M 3N
Canada	Drifting Buoy	4401905	Jan-Mar	3K 3L 3M 3N
	Drifting Buoy	4402510	Oct-Dec	4T 4W
	Drifting Buoy	4402511	Oct-Dec	4T 4Vs4W
	Drifting Buoy	4402512	Oct-Dec	3M 3N 3O 4T 4Vs4W 6G 6H
	Drifting Buoy	4400768	May-Oct	3M 3N 3O 4Vs6D 6E 6F 6G 6H
	Drifting Buoy	4400843	Feb-Feb	6C
	Drifting Buoy	4400874	Apr-May	6H
USA	Drifting Buoy	4400887	Feb-Nov	3M 6G 6H
USA	Drifting Buoy	4400891	Feb-Dec	3N 4Vs6E 6F 6G 6H
	Drifting Buoy	4400893	Apr-Aug	6G 6H
	Drifting Buoy	4400905	Jul-Jul	6H
Canada	Drifting Buoy	4701662	Jan-Jan	0A
Canada	Drifting Buoy	4701668	Jan-Nov	3Ps4Vn4Vs4W 4X 5Y 5Ze5Zw6A 6B

Canada	Drifting Buoy	4701669	Jan-Dec	3M 3N 3O
Canada	Drifting Buoy	4701673	Jan-Aug	0A 0B
Canada	Drifting Buoy	4701674	Jan-Aug	0A
	Drifting Buoy	4701675	Jan-Dec	3M 3N 3O
	Drifting Buoy	4701676	Jan-Feb	2G 2H 2J
	Drifting Buoy	4701677	Jan-Jul	2J 3K 3L 3M 3N
	Drifting Buoy	4700552	Dec-Dec	0A 0B 2G 2H 2J 3K 3L
USA	Drifting Buoy	5102559	Mar-Mar	6C
USA	Drifting Buoy	5401508	May-May	3N 4Vs6F 6G
USA	Drifting Buoy	5401560	May-May	3K
USA	Drifting Buoy	5401561	May-May	3M 3N 3O 4Vs4W 5Ze5Zw
USA	Drifting Buoy	5401562	Jun-Jun	3N
USA	Drifting Buoy	5401641	Dec-Dec	6H
	Drifting Buoy	6203504	Nov-Nov	6C 6D
	Drifting Buoy	6203518	Jun-Sep	1F 2J 3K
USA	Drifting Buoy	6203524	Jan-Jan	1B
	Drifting Buoy	6203602	Jul-Dec	0A 0B 1B 1C 1D 1E 1F
	Drifting Buoy	6200940	Jul-Nov	6H
USA	Drifting Buoy	6401531	Oct-Dec	1F
USA	Drifting Buoy	6401534	Jan-Jan	1F
USA	Drifting Buoy	6401539	Nov-Dec	0B 1D 1E 1F
USA	Drifting Buoy	6401544	Nov-Dec	1F
	Drifting Buoy	6401557	Jan-Sep	1F 2G 2H 2J 3K 3L 3M
France	Drifting Buoy	6401683	May-Jul	1F
France	Drifting Buoy	6401690	Jan-Apr	1F 2H 2J
France	Drifting Buoy	6401693	Jan-Mar	1E 1F 2J
France	Drifting Buoy	6401697	Mar-Mar	1F
	Drifting Buoy	6501551	Jan-Feb	3K
	Drifting Buoy	6501555	Jan-Dec	1C

*Buoys marked by this symbol also measure waves

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

Viking buoys are not shown in this table; see Table 1

Table 5. Mooring data processed in 2018

Ref	Institute	Mooring Name	Longitude (W)	Latitude (N)	First Date	Last Date	Instruments	NAFO Sub-Area
IML1814	IML	NS3	62.4989	45.9390	20180621	20181024	CTD+ADCP+O2	4T
IML1748	IML	Rimouski	68.5978	48.6557	20171108	20181101	CTD+O2	4T
IML1814	IML	Shediac Valley	64.0333	47.7788	20171128	20181023	CTD+O2	4T
LLTMP2017	IML	Belle-Isle	56.6195	51.5802	20171118	20180612	CTD+O2	4R
IML1814	IML	NS1	64.5263	46.6643	20180618	20180920	CTD+ADCP+O2	4T
EN606	BIO	NSCMP 2024	63.1698	44.2482	20171124	20180915	ADCP,CTD	4W
PER2018011	BIO	AMAR 2062	62.8700	43.4976	20180501	20180923	CTD	4W
PER2018011	BIO	AMAR 2063	65.5653	43.0026	20180430	20180916	CTD	4X

Table 6. Water level data collected in 2018

Station ID	Name	Reporting period (months)	Longitude (W)	Latitude (N)	NAFO Sub-Area
65	Saint John	Jan-Dec	66.063	45.251	4X
365	Yarmouth	Jan-Dec	66.1167	43.8333	-
491	Bedford Institute	Jan-Dec	63.6167	44.6833	4W
612	North Sydney	Jan-Dec	60.25	46.2167	-
665	Port aux Basques	Jan-Dec	59.1333	47.5667	-
755	St. Lawrence	Jan-Nov	55.3901	46.9168	-
835	Argentia	Mar-Dec	53.9833	47.3	3Ps
905	St. John's	Jan-Dec	52.7167	47.5667	-
990	Bonavista	Jan-Dec	53.115	48.651	-
1430	Nain	Jan-Dec	61.6833	56.55	-
1700	Charlottetown	Jan-Dec	63.1167	46.2333	4T
1805	Shediac Bay	Jan-Dec	64.546	46.227	4T
1970	Cap-aux-Meules	Jan-Dec	61.8573	47.3789	-
2000	Lower Escuminac	Jan-Dec	64.8833	47.0833	4T
2145	Belledune	Jan-Dec	65.85	47.9	-
2330	Rivière-au-Renard	Jan-Dec	64.3805	48.997	4T
2780	Sept-Îles	Jan-Dec	66.3768	50.1948	-
2985	Rimouski	Jan-Dec	68.5137	48.4783	4T
3057	Saint-Joseph-de-la-Rive	Jan-Dec	70.3655	47.4488	4T
3075	Banc du Cap Brûlé	Mar-Dec	70.8965	46.9157	4T
3100	Saint-Francois Île d'Orléans	Jan-Dec	70.8082	46.9965	4T
3110	Saint-Laurent île d'Orléans	Mar-Dec	71.0033	46.8582	4T
3248	Vieux-Québec	Jan-Dec	71.2019	46.8111	-
3980	Qikiqtarjuaq	Jan-Oct	64.0667	67.5167	0A