Mission Report for the Maritimes Region Atlantic Zone Monitoring Program 2025 Fall Survey (JC28302)

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by

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ABSTRACT

Beazley, L., Lawson, M., Colbourne, N., Cardoso, D., Gjerdrum, C., Moors-Murphy, H., and Upson, P. 2026. Mission Report for the Maritimes Region Atlantic Zone Monitoring Program 2025 Fall Survey (JC28302). Can. Tech. Rep. Hydrogr. Ocean Sci. 422: vii + 105 p. https://doi.org/10.60825/e9kq-q059

As part of a collaboration between Fisheries and Oceans Canada (DFO) and the National Oceanography Centre in the UK, an oceanographic monitoring mission was conducted on the UK-based Royal Research Ship *James Cook* from September 28 to October 21, 2025, off the coast of Nova Scotia and in the Gulf of Maine. This multidisciplinary mission was in support of three DFO programs and objectives: the Maritimes Region Atlantic Zone Monitoring Program 2025 fall survey, the DFO Cetacean Research and Monitoring Program, and a DFO-led project to evaluate the vertical structure of *Calanus* zooplankton for evaluation of the foraging habitat of the North Atlantic right whale.

The mission included participants from two federal government departments, as well as local and international research institutions and indigenous organizations. This mission supported the deployment of various oceanographic equipment across a network of fixed monitoring stations, including CTD-Rosette deployments for the collection of vertical profiles of e.g., temperature and salinity, and water samples from pre-determined depths, vertical ring net tows for zooplankton sample collection, Video Plankton Recorder deployments, and the collection of stratified zooplankton samples using a MultiNet system. Passive acoustic monitoring moorings designed to monitor the presence and distribution of cetaceans were recovered and deployed at various locations across the Scotian Shelf and in the Bay of Fundy, and opportunistic sightings were collected by marine mammal observers during transits.

This report provides an overview of the mission's objectives, achievements, gear operations and operational issues. A summary of the seabird and marine mammal observations collected during the mission is presented, as is the vertical structure in temperature, salinity, and dissolved oxygen for each station occupied.

RÉSUMÉ

Beazley, L., Lawson, M., Colbourne, N., Cardoso, D., Gjerdrum, C., Moors-Murphy, H., and Upson, P. 2026. Mission Report for the Maritimes Region Atlantic Zone Monitoring Program 2025 Fall Survey (JC28302). Can. Tech. Rep. Hydrogr. Ocean Sci. 422: vii + 105 p. https://doi.org/10.60825/e9kq-q059

Dans le cadre d'une collaboration entre Pêches et Océans Canada (MPO) et le National Oceanography Centre du Royaume-Uni, une mission de surveillance océanographique a été menée sur le navire royal de recherche *James Cook* du 28 septembre au 21 octobre. 2025, au large de la Nouvelle-Écosse et dans le golfe du Maine. Cette mission multidisciplinaire appuyait trois programmes et objectifs du MPO : le relevé d'automne 2025 du Programme de monitorage de la zone Atlantique de la région des Maritimes, le Programme de recherche et de surveillance des cétacés du MPO, et un projet dirigé par le MPO visant à évaluer la structure verticale du zooplancton Calanus aux fins de l'évaluation de l'habitat d'alimentation de la baleine noire de l'Atlantique Nord.

La mission comprenait des participants de deux ministères fédéraux, ainsi que d'institutions de recherche locales et internationales et d'organisations autochtones. La mission a soutenu le déploiement de divers équipements d'échantillonnage océanographique dans un réseau de stations de surveillance fixes, y compris le déploiement d'instruments de mesure de la conductivité, de la température et de la profondeur (CTP) et de rosettes pour recueillir des données sur les profils verticaux de la température et de la salinité, par exemple, et des échantillons d'eau à des profondeurs prédéterminés, des traits de filet verticaux pour recueillir des échantillons de zooplancton, des déploiements d'un enregistreur vidéo de plancton et la collecte d'échantillons de zooplancton stratifiés à l'aide d'un système de filets multiples. Des amarrages de surveillance acoustique passive conçus pour surveiller la présence et la répartition des cétacés ont été récupérés et déployés à divers endroits sur le plateau néo-écossais et dans la baie de Fundy, et des observations opportunistes ont été effectuées par des observateurs de mammifères marins pendant les transits.

Le présent rapport fournit une vue d'ensemble des objectifs, des réalisations, de l'utilisation des engins et des enjeux opérationnels de la mission. Un résumé des observations d'oiseaux de mer et de mammifères marins recueillies pendant la mission est présenté, tout comme la structure verticale de la température, de la salinité et de l'oxygène dissous pour chaque station utilisée.

1 Mission Overview

1.1 Background

As part of a collaborative agreement between Fisheries and Oceans Canada (DFO), Natural Resources of Canada (NRCan), and the National Oceanography Centre (NOC) based in Southampton, UK, the Royal Research Ship (RRS) *James Cook* was used to deliver a joint geological and oceanographic mission during the fall of 2025 in support of NRCan and DFO programs and initiatives. The survey, identified as JC283 (where 'JC' represents the *James Cook*), was divided into three legs, each with different objectives, chief scientists, and scientific teams:

1) **Leg 1** (referred to as JC28301, where '01' represents Leg 1): a geological survey on the Scotian Shelf led by NRCan (September 6 - 25, 2025)

2) **Leg 2** (JC28302, where '02' represents Leg 2): a multidisciplinary mission in support of DFO's Maritimes Region Atlantic Zone Monitoring Program (AZMP) and Cetacean Research and Monitoring Program (CRMP), and a DFO-led whale foraging habitat assessment project (September 28 - October 21, 2025)

3) **Leg 3** (JC28303, where '03' represents Leg 3): DFO's Newfoundland and Labrador Region fall AZMP survey (October 17 - November 17, 2025)

This report provides an overview of the JC28302 mission, achievements and impacts, and a summary of operations and data collected, with a focus on activities and outcomes in support of the Maritimes Region AZMP. Due to a vessel crew change scheduled on October 15, the JC28302 mission was executed in two different segments with slightly different scientific teams. The first segment was conducted from September 28 - October 15, 2025, with mobilization and demobilization occurring at the Bedford Institute of Oceanography (BIO) in Dartmouth, NS, while the second segment occurred from October 16 - 21, 2025, with mobilization occurring at BIO and final disembarkation occurring in Mulgrave, NS.

First launched in 2006, the RRS *James Cook* is a British RRS operated by the Natural Environment Research Council (NERC) to support multidisciplinary oceanographic missions led by both UK scientists and the international community. With a length of 89.2 m and breadth of 18.6 m, the RRS *James Cook* is outfitted with stern 'A' and mid-ship 'P' overboarding frames and a number of wet and dry laboratory spaces located on its upper working deck. The vessel's home port is the National Oceanography Centre in Southampton, UK. The RRS *James Cook* was previously used by DFO to deliver the Maritimes Region fall AZMP mission (mission ID JC24302) in 2022.

1.2 Objectives

The overall aim of the JC28302 Leg 2 mission was to collect data, samples, and observations in support of three DFO programs or projects:

1) The Maritimes Region Atlantic Zone Monitoring Program (PI: Lindsay Beazley)

2) The Maritimes Region Cetacean Research & Monitoring Program (PI: Hilary Moors-Murphy)

3) Right Whale Foraging Habitat Assessment Project (PI: Catherine Johnson)

The AZMP was initiated in 1998 with the aim to detect, track, and predict changes in the state and productivity of waters within the Canadian Exclusive Economic Zone of the northwest Atlantic Ocean. The AZMP's sampling strategy in the Maritimes Region is based on high-frequency (weekly, biweekly, monthly) data collection, and seasonal data collection on the winter and summer Ecosystem Trawl Surveys and dedicated oceanographic surveys that occur each spring and fall. These activities fall within the traditional and unceded territory of the Mi'kmaq, the original stewards of these waters.

Scientific activities conducted on the JC28302 mission in support of the AZMP included 1) CTD-Rosette deployments for the collection of vertical profile data from electronic sensors and water samples for nutrient, salinity, dissolved oxygen, pH, and chlorophyll *a* determination, along with phytoplankton monitoring, 2) vertical ring net tows for the collection of data on zooplankton abundance and biomass, and 3) the collection of continuous surface measurements and water samples along the mission track using a flow-through system.

The second primary objective of the mission was to recover and deploy passive acoustic monitoring (PAM) moorings in support of cetacean research and monitoring efforts, noise measurement and modelling studies, and in some cases oceanographic data collection, in the Maritimes Region. These moorings are equipped with autonomous acoustic recorders that collect data near continuously throughout the year. PAM data is used to assess the daily acoustic presence of cetacean species of interest including blue, fin, sei, minke, humpback and North Atlantic right whales, harbor porpoise, and in the case of deep water moorings (> 1000 m deep), northern bottlenose, Sowerby's, Cuvier's and True's beaked whales. PAM data is also used to characterize ambient and anthropogenic underwater noise at sites of interest, and to validate ocean noise models. Some moorings are also equipped with oceanographic equipment (e.g., ADCPs, Microcat CTDs) that collect environmental data to assist with interpretation of received sound measurements and provide insights into how oceanographic processes influence cetacean occurrence. Marine mammal observations were actively collected from the bridge by 1-2 marine mammal observers (MMOs) during most daylight hours while under transit. All sightings collected are added to the DFO Maritimes Region Whale Sightings Database – a repository for sightings data that support cetacean research, environmental, risk and impact assessments, and other initiatives (MacDonald et al. 2017). This work is supported by multiple programs including Marine Conservation Targets, Species at Risk Implementation, Whales 2.0, and NRCan's Offshore Wind Energy Area data collection campaign.

Finally, the third primary objective of the mission was to identify potential foraging habitat for North Atlantic right whale (NARW) on the Scotian Shelf by quantifying variation in abundance and fine-scale vertical distribution of *Calanus* spp. copepods (zooplankton). Vertical profiles of *Calanus* spp. abundance were obtained using a Video Plankton Recorder (VPR) and supplemented with depth-stratified zooplankton samples collected using a Multinet sampler and vertical CTD profiles. NARW prey concentrations and vertical distribution in Scotian Shelf areas used by NARW for foraging and migration have been identified by Maritimes Species at Risk Management as an information gap for developing advice on mitigating risks to NARW injury and mortality.

In addition to the survey's three primary objectives, data and samples were also collected in support of a number of ancillary research programs and initiatives led by both DFO and its external partners. This included eDNA sample collection in support of DFO marine conservation and monitoring efforts, the planned recovery of an acoustic telemetry receiver mooring from The Gully MPA in support of an Ocean Tracking Network-DFO project to evaluate tagged species in the area, participation by a wildlife observer to collect seabird observations in support of the Environment and Climate Change Canada (ECCC) Canadian Wildlife Service's (CWS) Eastern Canada Seabirds at Sea (ECSAS) program (Gjerdrum et al. 2012), and the passive collection of high-resolution images of phytoplankton from surface waters sampled along the mission track using an Imaging Flow Cytobot (IFCB), as part of a collaborative agreement between DFO and the Woods Hole Oceanographic Institution to improve understanding of the distribution of harmful algal bloom species and the processes impacting ocean health. Dalhousie University personnel also took part in the mission to collect data and samples in support of graduate student projects led by the laboratories of Drs. Carly Buchwald, Julie LaRoche, and Erin Bertrand. The focus of this research was on evaluating nitrate stable isotope signatures and variability in the nutrient supply of the Scotian Shelf (Buchwald); understanding phytoplankton growth, phytoplankton-bacterial interactions, and the role of cobalamin and other B-vitamins in phytoplankton community composition and productivity (Bertrand); and characterizing the microbial communities of the Scotian Shelf through the collection of eDNA samples (LaRoche). This research is considered complementary to the monitoring conducted by the AZMP, and aids in the understanding of the biogeochemical processes of the Scotian Shelf.

Below is a list of all primary and secondary objectives, along with those supporting external partnerships, that were established during the planning phase of the JC28302 mission. A total of 16 scientific objectives supporting two federal government departments (DFO, ECCC) and two research and academic institutions (Woods Hole Oceanographic Institution, Dalhousie University) were identified.

In addition to the mission's scientific objectives, the JC28302 survey supported collaborative ocean science between DFO and Mi'kmaq communities in Nova Scotia by enabling Indigenous participation and active contribution to mission activities, and fostering knowledge exchange, thereby strengthening partnerships. Activities in support of this relationship building are discussed further in the Mission Achievements section below.

1.2.1 Primary

1. Obtain fall observations on physical, chemical, and lower trophic-level biological oceanographic conditions at fixed sampling stations along core Atlantic Zone Monitoring Program sections within the Maritimes Region (Contact: Lindsay.Beazley@dfo-mpo.gc.ca) and underway data and samples at specified locations

2. Recover 11 and deploy 5 passive acoustic moorings in support of the Species at Risk (SAR), Marine Protected Areas (MPA), Marine Conservation Targets (MCT), and 3 Whales science programs in support of DFO's Whales Initiative (Contact: Hilary.Moors-Murphy@dfo-mpo.gc.ca)

3. Identify foraging habitat for North Atlantic Right Whales by quantifying variation and fine-scale vertical distribution of *Calanus* spp. copepods through the deployment of a Video Plankton

Recorder and Multinet systems (Contact: Catherine.Johnson@dfo-mpo.gc.ca)

1.2.2 Secondary

1. Recover one acoustic receiver mooring situated in an array at the head of the Gully MPA in support of a joint DFO-Ocean Tracking Network (OTN) project to evaluate how tagged species, particularly juvenile Atlantic halibut, utilize the MPA (Contact: Ryan.Stanley@dfo-mpo.gc.ca)
2. Nutrients and hydrography across the Northeast Channel and Gulf of Maine as part of NERACOOS Cooperative Agreement (Contacts: Emmanuel.Devred@dfo-mpo.gc.ca; Catherine.Johnson@dfo-mpo.gc.ca)
3. Carry out hydrographic, chemical and biological sampling at stations in The Gully in support of Marine Protected Area (MPA) monitoring (Contact: Lindsay.Beazley@dfo-mpo.gc.ca)
4. Carry out hydrographic, chemical and biological sampling at stations in the St. Anns Bank MPA as a continued monitoring effort in support of Marine Protected Area (MPA) monitoring (Contact: Lindsay.Beazley@dfo-mpo.gc.ca). St. Anns Bank is located in Unama'ki, one of the seven districts of Mi'kma'ki, the unceded ancestral territory of the Mi'kmaq
5. Conduct hydrographic, chemical and biological sampling across the mouth of the Laurentian Channel in support of DFO ocean modelling efforts (Contact: Zeliang.Wang@dfo-mpo.gc.ca)
6. Collect marine mammal observations/sightings data as part of DFO's Cetacean Research and Monitoring Program (Contact: Hilary.Moors-Murphy@dfo-mpo.gc.ca)

1.2.3 External to DFO

1. Collect seabird and other wildlife observations as part of ECCC-CWS Eastern Canada Seabirds at Sea (ECSAS) (Contact: Carina.Gjerdrum@canada.ca)
2. Collect high-resolution imagery of phytoplankton species while underway using an Imaging Flow Cytobot (IFCB) in collaboration with the Woods Hole Oceanographic Institution (Contacts: Dennis.McGillicuddy (dmcgillicuddy@whoi.edu); Emmanuel.Devred@dfo-mpo.gc.ca)
3. Collect data on the presence and quantity of biological toxins (specifically domoic acid) produced by harmful algal bloom species while underway using an Environmental Sample Processor in collaboration with the Woods Hole Oceanographic Institution (Contacts: dmcgillicuddy@whoi.edu; mbrosnahan@whoi.edu; Emmanuel.Devred@dfo-mpo.gc.ca)
4. Collect water samples for the Bertrand lab at Dalhousie University to evaluate microbial protein and metabolites from the Scotian Shelf to better understand phytoplankton growth, phytoplankton bacterial interactions, and the role of cobalamin and other B-vitamins in phytoplankton community composition and productivity (Contact: Erin.Bertrand@dal.ca)
5. Collect water samples for the LaRoche lab at Dalhousie University from strategic locations and depths to support microbial community analyses via metabarcoding and metagenomics (Contact: Julie.LaRoche@dal.ca)

6. Collect water samples for the Buchwald lab at Dalhousie University from strategic locations and depths to measure nitrate isotopes (d15N and d18O) to interpret changes in nutrient uptake and supply on the Scotian Shelf (Contact: cbuchwald@dal.ca)
7. Record observations of bats using an Autonomous Recording Unit in support of a Canadian Wildlife Service project to better understand the distribution and movements of bats in offshore Nova Scotia in relation to offshore wind turbine risk (Contact: Paul.Knaga@ec.gc.ca)

1.3 Mission Narrative & Participants

A detailed chronological narrative of vessel operations and scientific activities conducted during the mission is provided in Appendix A, while an overview of the scientific personnel who participated in the mission is provided in Appendix B. In total, 26 scientific personnel participated in the mission, including DFO and ECCC staff, students from Dalhousie University, two participants from the Unama'ki Institute of Natural Resources (UINR), and one participant from Kwilmu'kw Maw-lkusuaqn (KMK).

2 Achievements & Impacts

Upon completion of the JC28302 mission, nearly all planned objectives were either fully or partially achieved. All primary objectives were completed, including CTD-Rosette and ring-net deployments at all core AZMP stations, recovery and deployment of all PAM moorings, and sampling to characterize the vertical distribution of *Calanus* spp. using the VPR and MultiNet systems. Most secondary objectives were also completed, including hydrographic and biological sampling in the Northeast Channel, The Gully MPA, St. Anns Bank MPA, and the Laurentian Channel mouth. One objective, the recovery of the acoustic receiver mooring at the head of The Gully MPA, could not be completed due to failure of unit's release mechanism. All externally led objectives involving collaborations with ECCC, WHOI, and Dalhousie University were successfully completed.

The planned activities for the first segment of the mission were completed ahead of schedule, allowing additional scientific activities to be undertaken in support of other DFO initiatives. While operating along the Louisbourg Line, an opportunistic marine mammal survey of the Shortland Canyon critical habitat for northern bottlenose whales was conducted in support of DFO's Cetacean Research and Monitoring Program. The survey involved transiting north through the canyon and diagonally across the critical habitat boundaries at approximately seven knots while marine mammal observers conducted visual observations from the bridge. These observations contribute to improved knowledge of cetacean occurrence in the area outside the summer months, when survey effort is high from dedicated missions conducted by Dalhousie University's Whitehead lab, and also contributes to DFO's knowledge of the presence of cetaceans in deep waters along the shelf edge.

Three additional VPR and MultiNet stations located south of Cape Breton were also sampled to support the assessment of North Atlantic right whale foraging habitat through characterization of *Calanus* copepod distributions. During the transit back to BIO for the October 15 crew change, six historical monitoring stations within DFO's Eastern Shore Islands (ESI) Area of Interest (AOI) were occupied. This AOI was established in 2018 with the goal of conserving and protecting the ecological integrity of this highly naturalized area, which includes rich eelgrass beds, kelp, and salt marshes that provide important habitat for other species. CTD-Rosette deployments were conducted at these stations to collect near-bottom eDNA samples and accompanying physical, chemical, and biological oceanographic measurements in support of MPA science and Marine Conservation Target initiatives.

In collaboration with DFO's Marine Planning and Conservation (MPC) and Advancing Reconciliation through Science (ARtS) groups, a series of activities were planned to support collaborative ocean science between DFO and the Mi'kmaq communities of Nova Scotia. These activities included involving Indigenous participants as active contributors to sampling and data collection activities, and facilitating the cross-exchange of knowledge on the waters surrounding Nova Scotia. Presentations were hosted for all science staff and ship's crew by KMK and UINR participants on the Mi'kmaq communities of Nova Scotia, the concept of Netukulimk, and cultural significance of the St. Anns Bank MPA to the Mi'kmaq people.

Following completion of the planned activities for the second segment of the mission, remaining vessel time prior to disembarkation in Mulgrave, NS, was used to conduct a dedicated marine mammal survey of the Sydney Bight Wind Energy Area to document cetacean presence. The survey location was identified and planned collaboratively by DFO and UINR participants.

No significant delays or impacts due to inclement weather were incurred during the JC28302 mission. While no program time was lost due to inclement weather, the ring net operation was cancelled at station PL_06 due to poor weather conditions and wind speeds exceeding 30 knots.

3 Summary of Operations & Data Collected

Figure 1 provides an overview of the stations occupied during the 2025 fall AZMP mission (JC28302). A detailed log of all gear operations conducted during the mission is provided in Appendix C. A total of 233 gear operations (events) were conducted at 114 unique stations. The order of operations was influenced by use of the provisional 'cruisePlanning' R package (Layton, C. cruisePlanning: Oceanographic Cruise Planning, Version 0.1.0). This package generates a full mission itinerary based on station locations, operational time, and the between-station transit speed used. The package was developed as a tool to help chief scientists evaluate and select mission scenarios that result in maximum use of the allocated vessel time. Mission scenarios were routinely updated and re-generated throughout the mission and were used to make decisions on the order of stations and their activities. A conservative transit speed of 9 knots was used for planning between-station transits, although this was often exceeded.

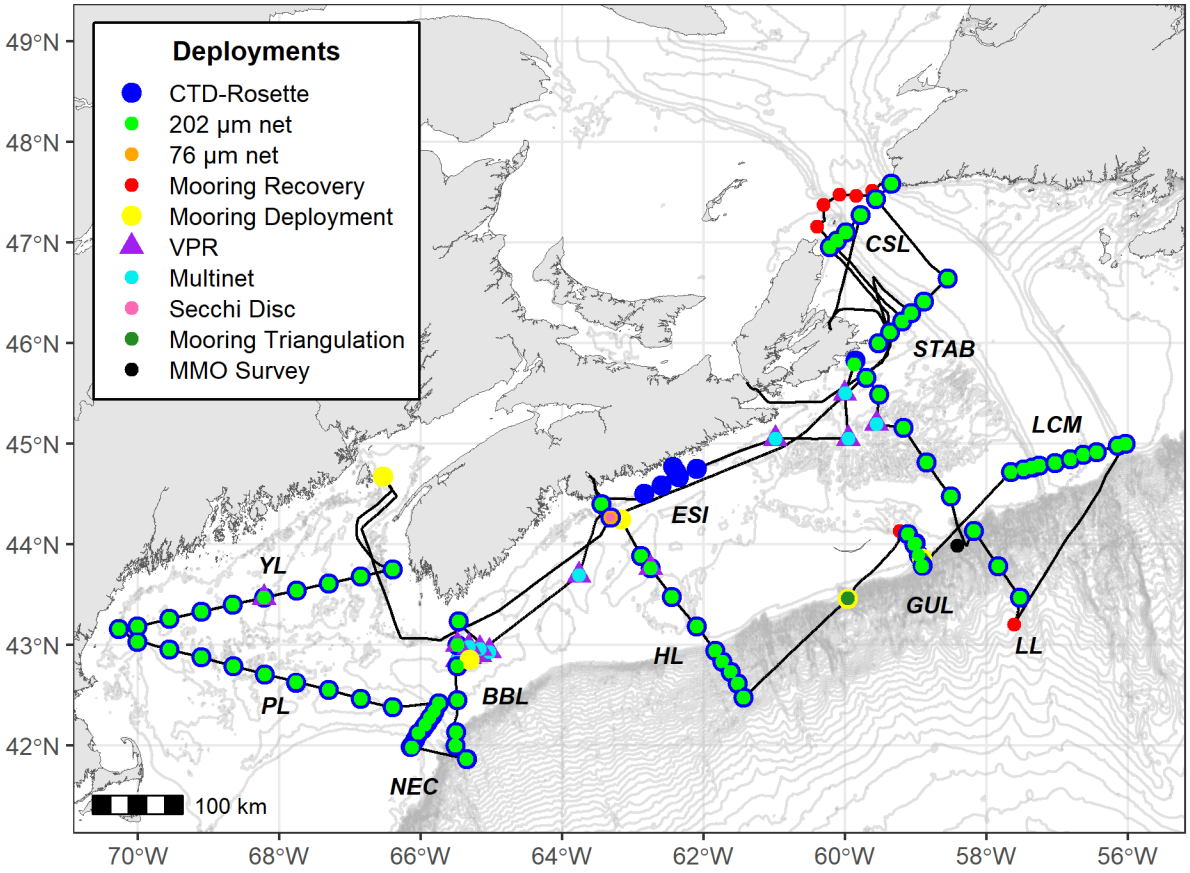

Figure 1. Stations and gear deployments conducting during the 2025 fall AZMP mission (JC28302). Multiple operations at single stations may not be fully reflected in the map due to overlapping labels. AZMP sections are labelled in bold italic font, where YL = Yarmouth Line, PL = Portsmouth Line, NEC = Northeast Channel, BBL = Browns Bank Line, HL = Halifax Line, GUL = The Gully, LL = Louisbourg Line, LCM = Laurentian Channel Mouth, STAB = St. Anns Bank, CSL = Cabot Strait Line, and ESI = Eastern Shore Islands.

3.1 CTD-Rosette Operations

3.1.1 CTD-Rosette Configuration

A SeaBird Electronics (SBE) 24, 10-L bottle CTD-Rosette system provided by the National Oceanography Centre was used for the duration of the JC28302 mission. The CTD was configured in a custom stainless steel rosette frame with a wing referred to as the vane, which is designed to minimize spinning during deployment and recovery. Table 1 shows a list of installed sensors on the CTD package along with their model numbers, date of last calibration, and owner. The CTD package included dual SBE temperature, conductivity, and dissolved oxygen sensors, a single Satlantic photosynthetically active radiation (PAR) sensor, a WET Labs C-Star transmissometer providing beam transmission and attenuation, and a Valeport altimeter. The secondary pump, temperature, conductivity, and oxygen sensors were mounted on the vane, and appeared to provide cleaner data than their corresponding primary sensors. Seapoint chlorophyll *a* and CDOM fluorometers, and a pH sensor were provided by DFO and mounted on the CTD package for the duration the mission.

A SBE Deep SUNA nitrate sensor was used to collect vertical profiles of nitrate and other optical parameters during the mission. The sensor was mounted in a vertical orientation on the vane, outside the rosette frame. The SUNA sensor was set up to log data internally (i.e., not in live mode), and required users to download and archive the data after each cast using its associated UCI software. The SUNA sensor was removed for all stations greater than 2000-m depth.

Several sensors were switched early in the mission after erroneous features were observed in their data. After the first deployment of the CTD-Rosette (station HL_02, Event 001), the primary and secondary oxygen sensor data were evaluated and found to have larger-than-expected differences. Winkler analysis of collected samples from this cast revealed that the secondary sensor was closer to the samples than the primary. The primary sensor was then changed prior to deployment at station YL_01 (Event 007). During the CTD-Rosette cast at station BBL_05, several spikes were observed in the secondary oxygen sensor. As these were not present in the primary oxygen sensor, the secondary was replaced before the next CTD cast (Event 069, station BBL_04), which corrected the issue.

3.1.2 CTD-Rosette Deployments

Figure 2 shows the CTD-Rosette system docked in the CTD hangar. The CTD-Rosette was deployed from the vessel's parallelogram (P) frame, which was extended prior to extension of the hydroboom and docked after recovery of the CTD-Rosette. The ship is equipped with two electromechanical cables for CTD operation: the main CTD cable and the Deep Tow cable. The main CTD cable was used for the entirety of the mission, which allowed for the hydroboom to drop the CTD-Rosette directly into the CTD hangar.

SBE Seasave acquisition software was operated using a shipboard acquisition computer and a SBE 11 deck unit situated in the Main Laboratory. Communication between the CTD computer operator and the winch operator was done via radio for the first 30 m after its launch, and for the final 30 m prior to its recovery. Once the CTD-Rosette was deployed, the CTD computer operator instructed the winch operator to lower the package to 10 m depth for a 3-minute soak period, which

served to trigger the pumps to turn on and allowed the sensors to acclimate. After the soak period, the CTD-Rosette was raised to the surface, and then sent on its downcast to approximately 5 m from bottom. During periods of inclement weather or high swell, the CTD package was lowered to within 7 to 10 m from the seabed. The CTD deck unit was powered off just prior to its recovery on deck. Once on deck, the CTD-Rosette was secured in its docking station inside the ship's hangar.

A total of 92 CTD casts were conducted during the JC28302 mission. Vertical profiles of temperature, salinity, and dissolved oxygen at each station are shown in Appendix D. One of these casts (Event 130) was aborted after realizing there was a miscommunication between the CTD computer operator and laboratory staff on which station was being conducted (i.e., station GUL_02 was prepared by the lab, but the vessel was positioned on station GULD_03). The CTD-Rosette worked very well throughout the mission, although several bottle misfires were noted (see Table C.1). Bottles that consistently misfired were either removed from the carousel or re-positioned. At station YL_06, the software associated with the CTD winch stopped functioning while the CTD was at 20 m depth on the upcast. The CTD remained there for approximately 50 minutes while the issue was remedied, and the CTD was recovered safely. It is thought that a ship-wide power outage the night prior was the issue. During recovery of the CTD after deployment on station LCM_01, a large swell impacted the CTD and caused the sea cable to lift out of its sheave. The crew and technicians worked to get the sea cable back into its sheave, but the sea cable was pinched in the process. The conductivity of the cable was thereafter monitored daily to ensure it was not losing conductive capacity, and a re-termination was planned for after the conclusion of the mission. See the Operational Considerations and Issues of Note section below for further details.

3.1.3 CTD Data Post-Processing

Once a CTD cast was completed, the raw CTD files (.hex, .hdr, .bl, and .xmlcon) were manually copied from the CTD acquisition computer to the ship's science network where they could be accessed from any networked computer on the vessel. From here, they were copied onto BIO's post-processing computer, where the CTD Data Acquisition and Processing System (CTDDAP, version 6.3), an in-house wrapper application to facilitate downloading and processing of CTD data from various SBE instruments, was used to post-process the .hex files from each cast. This allowed for the creation of ODF (Ocean Data Format) files, BIO's in-house CTD file format, and other files necessary for DFO's archival procedures. The CTD data in each ODF file was binned into 0.5 dbar bins.

Figure 2. SeaBird (SBE) 24-bottle CTD-Rosette system situated in the CTD hangar of the RRS *James Cook* during the 2025 fall AZMP mission (JC28302).

Table 1. List of sensors included on the CTD system used during the 2025 fall AZMP mission on board the RRS *James Cook* (JC28302). Model number and date of last calibration is shown. Blank entries indicate 'not applicable'.

Sensor	Model	Output Units	Output Variable Name	Serial No.	Calibration Date	Owner	Event Range
Primary CTD deck unit	SBE 11plus	NA	NA	11P-24680-0589	NA	NOC	1 - 231
CTD underwater unit	SBE 9plus			09P-77801-1182	NA	NOC	1 - 231
Digiquartz pressure sensor	Paroscientific	[dbar]	prDM	129735	9/17/2024	NOC	1 - 231
Primary temperature	SBE 3P	[deg C]	t090C	4782	11/26/2024	NOC	1 - 231
Primary conductivity	SBE 4C	[S/m]	c0S/m	2580	10/23/2024	NOC	1 - 231
Primary dissolved oxygen	SBE 43	[ml/l]	sbeox0	619 1882	9/6/2024 1/30/2025	NOC NOC	1 7 - 231
Secondary temperature	SBE 3P	[deg C]	t191C	6982	10/15/2024	NOC	1 - 231
Secondary conductivity	SBE 4C	[S/m]	c1S/m	2858	11/26/2024	NOC	1 - 231
Secondary dissolved oxygen	SBE 43	[ml/l]	sbeox1	2818 2575 1940	12/5/2024 12/5/2024 12/7/2024	NOC NOC NOC	1 7 - 67 69 - 231
pH	SBE 18	NA	ph	1244	3/6/2025	DFO (NL)	1 - 231
Chlorophyll fluorometer	Seapoint Fluorometer SCF	[micro g/L]	flSP	3668	3/1/2025	DFO	1 - 231
CDOM fluorometer	Seapoint Fluorometer SUVF		flSPuv0	6229	3/1/2025	DFO	1 - 231

Table 1. *(continued)*

Sensor	Model	Output Units	Output Variable Name	Serial No.	Calibration Date	Owner	Event Range
PAR/Log	Satlantic	[micromoles photons/m2/s]	par	1054	1/6/2021	DFO (NL)	1 - 231
Nitrate	Deep SUNA	[mg/L]	NA	NTR-2382	10/17/2024	DFO	1 - 231
Transmissometer	WET Labs C-Star	Beam attenuation [1/m], Beam transmission [%]	CStarAt0, CStarTr0	1718TR	9/19/2022	NOC	1 - 231
Altimeter	Valeport VA500	[m]	altM	96099	NA	NOC	1 - 231

3.1.4 Water Sampling

Water samples were collected using 24, 10-L Niskin bottles installed on the rosette. The number of water samples collected from each station depended on station depth and other characteristics, and is relatively consistent between missions. Standard AZMP depths (surface, 10, 20, 30, 40, 50, 60, 80, 100 m, and bottom) are consistently sampled at stations 100 m or less, while deeper bottles are typically collected at 500 m intervals (e.g., 1500, 2000 m). Water samples were processed according to the following protocols:

- nutrients, chlorophyll *a*, dissolved oxygen, and salinity: Mitchell et al. (2002);
- particulate organic carbon and nitrogen: Devred et al. (2026);
- coloured-dissolved organic matter (CDOM): Mannino et al. (2019);
- high-performance liquid chromatography (HPLC): Head and Harris (1992);
- phytoplankton absorption: Hoepffner and Sathyendranath (1992) & Hoepffner and Sathyendranath (1993); and
- flow cytometry: Li and Dickie (2001)

During occupation of AZMP high-frequency station HL_02 on the Halifax Line, integrated phytoplankton samples were collected by collating 50 mL of water from each of the 10 bottle depths sampled, and preserving the sample using 2% acid Lugol's preservative (Mitchell et al. 2002).

Sample management included the assignment of unique 6-digit 'sticky IDs' to each Niskin bottle and sample vial. These IDs allow for unique identification of samples across the entire Maritimes Region AZMP time series. The ID range used for samples collected from the CTD-Rosette was 521277 to 522809.

Table 2 shows the total number of samples collected for each parameter measured and evaluated by the AZMP from CTD-Rosette deployments at each station. Bottle samples collected for salinity determination were analyzed at sea using a NOC-owned Guildline Autosal 8410A Salinometer set up in the Electronics Workshop inside the Main Laboratory. The associated Guildline software was used for analysis.

Dissolved oxygen samples were analyzed at sea after being stored in the fridge for at least one hour using a modified Winkler technique with automated electrical endpoint system. Chlorophyll samples were analyzed using a Turner Designs analog fluorometer after being stored for at least 24 hours in a -20°C freezer. Samples collected for all other parameters were either stored at room temperature, refrigerated, or frozen for subsequent analysis ashore.

Certain Niskin bottles did not seal properly during CTD-Rosette deployments on stations YL_08 (Bottle 3; sample ID 521514), YL_10 (Bottles 3 and 10; sample IDs 521434 and 521441), PL_01 (Bottle 3; sample ID 521452), and NEC_04 (Bottle 6; sample ID 521652). Bottle 3 was removed and replaced. On stations PL_06 and NEC_10, the Niskin bottle vents were not closed prior to deployment. The resulting dissolved oxygen, salinity, and chlorophyll data from these stations

were evaluated but did not appear erroneous. However, the data will be flagged following standard protocols prior to submission to BioChem, DFO's national repository for discrete and plankton data.

3.1.5 Data Accessibility

Upon completion of this mission, the CTD data will undergo various quality control checks to correct metadata errors and/or erroneous CTD values (e.g., data spikes), and the primary and secondary conductivity and oxygen sensor data will be calibrated using bottle measurements following SeaBird's 'Computing Temperature & Conductivity Slope & Offset Correction Coefficients from Lab Calibration and Salinity Bottle Samples' Application Note No. 31 (Scientific 2024a) and 'SBE 43 Dissolved Oxygen Sensor Calibration and Data Corrections' Application Note No. 64-2 (Scientific 2024b); also described in Beazley et al. (2024)). These final calibrated files are available in .ODF format by request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca, or can be downloaded directly in netCDF or other common formats from the Canadian Integrated Ocean Observing System (CIOOS) ERDDAP.

Bottle measurements can be extracted from DFO's national repository for discrete bottle and plankton data, BioChem, or can be made available by request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca.

Table 2. Summary of water samples collected for each parameter sampled on the 2025 fall AZMP mission (JC28302). Numbers represent the total number of samples per station, where O_2 = dissolved oxygen, NUTS = nutrients, SAL = salinity, CHL = chlorophyll, POC = particulate organic carbon, HPLC = high performance liquid chromatography, ABS = phytoplankton absorption, CDOM = coloured dissolved organic matter, CYTO = flow cytometry, and eDNA = environmental DNA.

Station	Event	O2	NUTS	SAL	CHL	POC/PON	HPLC	ABS	CDOM	CYTO	eDNA
HL_02	1	3	20	2	18	2	2	2	2	18	0
YL_01	7	3	16	2	16	2	1	1	1	0	0
YL_02	9	3	20	2	18	2	1	1	1	0	0
YL_03	11	3	22	2	18	2	1	1	1	0	0
YL_04	13	3	22	2	18	2	1	1	1	0	0
YL_05	15	3	22	2	18	2	1	1	1	0	0
YL_06	18	3	20	2	18	2	1	1	1	0	0
YL_07	20	3	20	2	18	2	1	1	1	0	0
YL_08	22	3	20	2	18	2	1	1	1	0	0
YL_09	24	3	16	2	16	2	1	1	1	0	0
YL_10	26	3	18	2	18	2	1	1	1	0	0
PL_01	28	3	20	2	18	2	1	1	1	0	0
PL_02	30	3	20	2	18	2	1	1	1	0	0
PL_03	32	3	22	2	18	2	1	1	1	0	0
PL_04	34	3	22	2	18	2	1	1	1	0	0
PL_05	36	3	20	2	18	2	1	1	1	0	0
PL_06	38	3	22	2	18	2	1	1	1	0	0
PL_07	40	4	24	3	18	2	1	1	1	0	2
PL_08	42	4	24	3	18	2	1	1	1	0	0
PL_09	44	4	24	3	18	2	1	1	1	0	2
NEC_01	46	3	18	2	18	2	1	1	1	0	2
NEC_02	48	3	26	2	0	0	0	0	0	0	2
NEC_03	51	3	26	2	0	0	0	0	0	0	2
NEC_05	52	3	26	2	0	0	0	0	0	0	3
NEC_04	53	3	26	2	18	2	1	1	1	0	2
NEC_06	55	3	26	2	18	2	1	1	1	0	2
NEC_07	57	3	26	2	0	0	0	0	0	0	2
NEC_08	58	3	26	2	18	2	1	1	1	0	0

Table 2. *(continued)*

Station	Event	O2	NUTS	SAL	CHL	POC/PON	HPLC	ABS	CDOM	CYTO	eDNA
NEC_09	60	3	18	2	0	0	0	0	0	0	0
NEC_10	61	3	18	2	18	2	1	1	1	0	0
BBL_07	63	5	32	4	18	2	2	2	2	24	2
BBL_06	65	4	30	3	18	2	1	1	1	20	2
BBL_05	67	3	22	2	18	2	2	2	2	18	2
BBL_04	69	3	18	2	18	2	1	1	1	18	2
BBL_03	76	3	18	2	18	2	2	2	2	18	0
BBL_02	78	3	18	2	18	2	1	1	1	18	0
BBL_01	80	3	14	2	14	2	2	2	2	14	0
HL_01	96	3	16	2	16	2	1	1	1	14	0
HL_02	98	3	20	2	18	2	2	2	2	18	0
HL_03	104	3	22	2	18	2	1	1	1	18	0
HL_03.3	106	3	20	2	18	2	2	2	2	0	0
HL_04	110	3	16	2	16	2	1	1	1	14	2
HL_05	113	3	18	2	18	2	2	2	2	18	2
HL_05.5	115	4	22	3	18	2	1	1	1	0	2
HL_06	117	9	30	8	18	2	2	2	2	20	0
HL_06.3	119	6	32	5	18	2	1	1	1	0	0
HL_06.7	121	12	34	11	18	2	1	1	1	0	0
HL_07	123	12	34	11	18	2	2	2	2	18	0
GUL_01	128	4	22	3	16	2	1	1	1	16	2
GUL_02	131	4	26	3	18	2	1	1	1	18	2
GULD_03	133	4	22	3	18	2	1	1	1	0	0
GUL_03	135	4	28	3	18	2	1	1	1	18	3
GUL_04	139	4	28	3	18	2	1	1	1	18	3
LCM_01	141	3	8	2	8	2	1	1	1	0	2
LCM_02	143	3	12	2	12	2	1	1	1	0	0
LCM_03	145	3	16	2	16	2	2	2	2	0	0
LCM_04	147	3	22	2	18	2	1	1	1	0	0
LCM_05	149	3	22	2	18	2	2	2	2	0	0
LCM_06	151	3	22	2	18	2	1	1	1	0	0

Table 2. *(continued)*

Station	Event	O2	NUTS	SAL	CHL	POC/PON	HPLC	ABS	CDOM	CYTO	eDNA
LCM_07	153	4	22	2	18	2	2	2	2	0	0
LCM_08	155	4	22	2	18	2	1	1	1	0	0
LCM_09	157	3	20	2	18	2	2	2	2	0	0
LCM_10	159	3	18	2	18	2	1	1	1	0	0
LL_09	163	5	34	3	18	2	2	2	2	20	2
LL_08	165	4	32	4	18	2	1	1	1	0	2
LL_07	167	4	26	3	18	2	2	2	2	18	2
LL_06	170	3	14	2	14	2	1	1	1	14	0
LL_03	178	3	20	2	18	2	2	2	2	18	0
LL_02	181	3	20	2	18	2	1	1	1	18	0
LL_01	183	3	18	2	18	2	2	2	2	18	0
ESI_4	192	3	18	2	16	0	0	0	0	0	2
ESI_8	193	3	18	2	16	0	0	0	0	0	2
ESI_7	194	3	16	2	16	0	0	0	0	0	2
ESI_6	195	3	6	2	4	0	0	0	0	0	2
ESI_12	196	3	18	2	16	0	0	0	0	0	2
ESI_16	197	3	18	2	16	0	0	0	0	0	2
CSL_03	207	4	24	3	16	2	1	1	1	16	0
CSL_04	209	4	28	3	18	2	1	1	1	18	0
STAB_03	215	3	16	2	16	2	1	1	1	0	2
STAB_06	227	3	26	2	18	2	1	1	1	0	2
STAB_05	229	3	26	2	18	2	1	1	1	0	2

3.2 Vertical Ring Net Tows

At each station, a 75-cm conical ring net rigged with 202 µm mesh (filtering ratio of 1:5) was towed vertically from near-bottom (to a maximum of 1000 m) to the surface to collect samples used by the AZMP to describe changes in mesozooplankton abundance and biomass across the Scotian Shelf. Ring net operations were conducted using the ship's starboard aft pedestal crane and a NOC-supplied Lebus winch secured to the aft deck. The diameter of the wire was 0.322" (~8 mm) and required crossbows compatible with a thicker-gauge wire. A weight was shackled to the termination of this cable and was designed to keep the net straight in the water column during deployment.

Initially, standard operating procedures were to deploy the ring net system at a speed of 30 m/min to within 10 m from the seabed based on total water column depth. However, starting on October 6, the operating procedure changed after realizing there was a larger-than-expected discrepancy between the sounder depth used for net operations, and the actual water depth measured from the CTD at the same station. An attempt was made to get a more accurate measurement of the length of the net assembly from the bottom of the weight to the top of the ring (where the winch is zeroed) by measuring the distance from the top of the ship's gunnel (side) to the bottom of the weight when the weight is deployed to the surface prior to adding the cod end to the wire. Adding this distance (6.7 m) to the length of the ring net from the ring to the cod end (4 m) totaled 10.7 m, suggesting that sending the net to ~10 m from bottom should allow the weight to hit the bottom during each deployment. To ensure this, the standard operating procedure was modified to intentionally deploy the weight on the seabed for all future deployments. For most stations, impact was confirmed by visual observation of the block slacking. However, for deeper stations, the visual cues of impact were harder to detect. In these cases, the net was simply deployed to within 10 m from bottom. The system was recovered at a rate of 50 m/min without slowing or stopping until the top of the net was out of the water, to prevent loss of its catch. An angle finder was used to assess wire angle during the net ascent, and typically ranged between 5 and 10°. This information was recorded in ELOG.

Ring nets were equipped with a KC Denmark flow meter, which was used to record the start and end flow for each cast. Upon recovery, the net was gently rinsed using a seawater from a hose, and the contents of the cod end were preserved in 4% buffered formaldehyde (10% formalin). At station HL_02, a second net system was deployed with a smaller mesh size (76 µm) to capture small and early-stage copepods. These samples were also preserved in formalin and will be used for future analysis.

A total of 88 ring net operations were conducted at 79 unique stations (see Table C.1), including a total of three 76 µm net deployments at station HL_02. At station PL_06, ring net operations were aborted after assessing the conditions and determining that the wind speed was above the gear's operational limit of approximately 30-35 knots. At station NEC_01, the ring net operation (Event 047) was aborted and the ring net re-deployed after presumably losing its catch after a pause to free the net from under the bottom of the vessel. At station LCM_04, the ring net sample was dropped after collection, and could not be saved. A new sample was not collected at this station due to time constraints.

3.2.1 Data Accessibility

The wet biomass of large (> 10 mm) and small (< 10 mm) zooplankton (separate and combined), the dry weight of small zooplankton, and abundances of large zooplankton taxa and a sub-sample of small zooplankton taxa will be uploaded and available in BioChem upon completion of the analysis of samples in the laboratory, and can also be provided upon request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca.

3.3 Mooring Operations

3.3.1 Description of Deployed Moorings

Mooring M2317 was deployed at station Grand Manan Basin (station GMB) on September 29, 2025 (Table 3). This mooring was five metres in length and consisted of a dual B3 SUBS flotation frame with two Ocean Instruments ST600 HF SoundTrap acoustic recorders, a XEOS Apollo Beacon, and a SeaBird SBE37-SM MicroCAT. This flotation package was moored five metres above the sea floor, with a swivel, single acoustic release, and two metres of anchor chain attached to an anchor below (Figure E.1).

Mooring M2316 was deployed in Roseway Basin (station ROBP) on October 05, 2025 (Table 3). This mooring was 33 m in length and consisted of a 750 metre rated syntactic foam Stablemoor Capsule flotation with a Jasco AMAR G4 PVC acoustic recorder, a SeaBird SBE37-SM MicroCAT, and two XEOS Beacons, plus one Apollo and one Petrel. An AMAR strongback mounting pole with two external AMAR battery packs were mounted to the strongback and connected to the AMAR. Twenty metres of faired Kevlar line separated the upper and lower mooring sections (Figure E.2).

Mooring M2315 was deployed in The Gully (station MGL) on October 09, 2025 (Table 3). This mooring was 55 m in length and consisted of a 1500 metre rated syntactic foam Stablemoor Capsule flotation package with a Jasco G4 AMAR Extended Deep acoustic recorder, a SeaBird SBE37-SM MicroCAT, and two XEOS Beacons, plus one Apollo and one Petrol. Forty-four metres of faired Kevlar line separated the upper and lower mooring sections (Figure E.3).

Mooring M2332 was deployed near AZMP station Halifax-2 (HL_02) on October 06, 2025 (Table 3). Mooring deployments at this location are generally referred to as the Nova Scotia Current Mooring (NSCM) for its proximity within the Nova Scotia Current. Mooring M2332 was five metres in length and consisted of a 36-inch syntactic foam sphere rated for 750 m depth with an upward looking Quartermaster ADCP five metres above the seafloor, a SBE37-SMP-ODO pumped MicroCAT with dissolved oxygen sensor, and XEOS Apollo beacon. A swivel, single acoustic release, and two metres of anchor chain attached to an anchor were connected below the mooring (Figure E.4).

Mooring M2323 was deployed in Logan Canyon (station LOC) on October 08, 2025 (Table 3). This mooring was 223 m in length and consisted of multiple flotation packages. The upper flotation package was comprised of a 1500 metre rated 36 inch syntactic foam sphere with a Jasco G4 AMAR Extended Deep acoustic recorder, and two XEOS beacons; one Sable and one Petrel. One-hundred and twenty metres of mooring wire separated the upper and middle flotation packages. The middle flotation package was comprised of a second 1500 metre rated 36 inch syntactic foam sphere with upward and downward looking Workhorse 300 kHz ADCP's, as well as an additional XEOS Sable beacon. A further 91 m of mooring wire separated the middle and lower mooring sections (Figure E.5).

Table 3. Metadata associated with passive acoustic monitoring moorings deployed during the 2025 fall mission (JC28302).

Mooring No.	Station	Location	Deployment Date and Time (UTC)	Lat. (DD)	Lon. (DD)	Water Depth (m)	Mooring Length (m)
M2317	GMB	Grand Manan Basin	29/09/2025 17:16	44 40.3863	66 31.8305	183	5
M2316	ROBP	Roseway Basin	5/10/2025 19:34	42 51.0792	65 18.8874	146	33
M2332	NSCM	Halifax-2	6/10/2025 15:41	44 14.9930	63 10.0281	172	5
M2323	LOC	Logan Canyon	8/10/2025 14:08	43 27.8327	59 57.0332	1430	223
M2315	MGL	The Gully	9/10/2025 14:34	43 51.5650	58 54.8380	1731	55

3.3.2 Mooring Deployment and Recovery Procedures

A total of 16 mooring operations took place aboard the RRS *James Cook* during the JC28302 fall mission and included five mooring deployments and 11 planned recoveries. One of the 11 moorings intended to be recovered, an OTN acoustic receiver mooring, was not recovered successfully. This was a non-DFO mooring nor part of the Team Whale or NRCan mooring programs. Prior to each mooring operation, a toolbox talk was held between the Captain, officers, deck crew, and science team to go over operations.

All five mooring deployments occurred on the first segment of the mission before the planned crew change on October 15, while the recoveries were split between the two segments of the mission. Mooring deployments occurred at the stern of the vessel and used the two pedestal cranes, the A-frame, and a general purpose (GP) winch located on the aft deck. The use of the GP winch was dependent on the length of the mooring, and was only used for one mooring deployment that contained two long mooring wire segments.

Two recovery methods were used throughout the mission to recover moorings. The primary method for larger and longer moorings involved using a line from the GP winch with a Boss-Hook routed through a block on the starboard pedestal crane, the A-frame, and around the starboard side of the vessel. This line connected to a lifting strap shackled to a snap-hook mounted on a pole used to hook the mooring at the surface. Two pole variations were used: an NRCan/DFO Sea-Catch hook (WLL 3.52 tons) for heavier flotation, and a ship-supplied Kong Mooring hook (WLL 2.6 tons) for lighter moorings. The secondary method, used on smaller moorings, involved using the P-frame to recover moorings in a single lift at the starboard side of the vessel in front of the CTD hangar.

When working at the stern of the vessel with the safety railings removed, DFO science and NOC crew members were required to wear fall restraint harnesses tethered to the bases of the pedestal cranes. This safety zone was marked with yellow paint on the deck and was located between the two pedestal cranes. Additional science members and NOC crew were present during operations, but remained outside of this area as per the vessel's safety protocols. A safety harness was not required in the designated zone for operations where the stern railings were in place.

Mooring interrogation typically began within two kilometres of the nominal mooring coordinates, with reliable acoustic communication typically achieved within one kilometre as the vessel slowed. The drop keel was used only during triangulation surveys. Recovery began by sending a wake up command to one acoustic release, followed by a series of status checks (for R-series releases only). Permission from the bridge was required before release. Optimal vessel positioning was 150–300 m broadside from the mooring position. Continuous ranging confirmed release and ascent rate, averaging 72 m/min. Surfacing times ranged from two minutes at 150 m depth to 57 minutes at 4,100 m.

Mooring Operations – Deployments Mooring M2315 at station MGL was the most challenging of the mission due to severe weather conditions, including three-metre seas and sustained winds exceeding 30 knots—the upper operational safety limit for both the deck crew and science team. The vessel experienced difficulty maintaining station and proper orientation, and at one point turned broadside to the waves resulting in significant rolling causing unsecured flotation, including two large Stablemoor capsules, to slide across the deck. The deck crew promptly

re-secured all loose equipment and advised the bridge to provide advance warning before future maneuvers. Due to these adverse conditions, the setup phase required approximately two hours, considerably longer than standard operations. Effective coordination between the science team and deck crew was critical; the deployment plan was reviewed multiple times to ensure clarity on procedures, critical points, and safety considerations. To minimize swing during deployment, the port pedestal crane (without whip) was utilized providing sufficient reach off the stern. Streaming the 44 m of Kevlar line proceeded without issue as the waves quickly moved the Stablemoor away from the vessel's stern. The lower flotation and anchor section, typically deployed in a single lift, was divided into two operations due to weather constraints. An additional two metres of chain were inserted between the anchor and dual acoustic releases to secure the anchor on deck while suspending flotation and releases over the stern. A slip line held the anchor until weight transfer was complete after which the anchor was lifted, lowered, and released. Despite significant challenges, the deployment was executed safely through meticulous planning and teamwork.

Mooring M2316 at station ROBP began with a modification to lower the placement of the mounting bracket for the XEOS Petrol beacon on the vertical tail fin of the Stablemoor. This was done to reduce potential damage to the beacon, which we experienced on a prior mooring recovery. Deployment began by lowering the Stablemoor into the water followed by the 20-metre faired Kevlar line. Excessive line was paid out at this point which caused entanglement around the AMAR strongback between its mounting pole and one of the battery packs. Multiple attempts to free the line were unsuccessful, and recovery was necessary to fix the entanglement. Upon retrieval, potential damage to the AMAR battery cable was suspected based on how the faired Kevlar line was wrapped between the battery and strongback. A laptop test was performed to test if the cable was compromised, which was inconclusive. The cable was removed from the mooring and a 'megger' test performed, confirming the cable was intact. The cable was re-installed and secured, and re-deployment proceeded with caution. During re-deployment the vessel maintained a forward speed of 1.5 knots to stream the Stablemoor astern and keep tension on the faired Kevlar line to avoid recurrence. The lower mooring section was then deployed using the pedestal crane and released without further incident.

Prior to the deployment of Mooring M2317 (station GMB), a positioning error was identified. The target location was one nautical mile southeast of the recovery site. Verification with Team Whale at BIO confirmed incorrect coordinates had been provided due to outdated data in the Team Whale database, which had not been updated following a 2022 recovery of mooring M2176 which was entangled in ghost gear. The correct position was confirmed before proceeding. During pre-deployment checks, the previous mooring diagram indicated no blue recovery line on the double SUBS frame. To reduce potential entanglement or noise this spliced rope was removed. However, upon recovering M2308 which this mooring was intended to replace, it was confirmed that the blue recovery line was required. This recovery line was quickly re-spliced and reattached, which proved beneficial as the original line was excessively long and was shortened during re-installation. Deployment was completed in a single lift using the starboard pedestal crane off the stern. The mooring was lifted by the ½-inch masterlink between the acoustic release and pivoting bail frame on the bottom of the double SUBS frame. The SUBS frame pivoted during lifting from the vertical to horizontal position and concerns arose that the anchor chain could snag on the SUBS frame or MicroCAT when the frame flipped in the water during deployment. This did not end up being the case and the long bail frame pushed the SUBS frame forward and away from the anchor chain, preventing interference. Once the bail frame returned to the horizontal position, the mooring was released, allowing the double SUBS frame to flip into its correct orientation without incident.

Mooring M2323 (station LOC) was the longest mooring deployed during the mission, and required the GP winch and three lifts following a standard top-to-bottom deployment procedure. Two mooring wires, 91 m and 120 m, were pre-spooled onto the winch with the longer cable on top. Instruments and hardware were pre-assembled and organized on deck to minimize time connecting sections during deployment. With no information on water currents readily available for Logan Canyon, mooring drift analysis during the descent was based on previous mooring operations in the nearby Gully submarine canyon. The deployment began 0.5 nautical miles (926 m) from the target location, with the vessel transiting slowly toward and overshooting the target by 0.25 nautical miles (426 m) to account for backward swing and potential mooring drift. Estimated setup time was 30 minutes. The top float was lifted and deployed using the GP winch and mooring wire through a crane block rather than using the quick release on the starboard pedestal crane. After paying out the 120 metre wire, the wire was stopped and secured to the deck using wire stoppers. The middle flotation sphere was then moved into place and connected at both ends to the 120 metre and 91 metre wires and deployed using the GP winch. The same procedure to pay out the 91 metre wire was followed and connected to the bottom mooring section. The mooring was fully assembled and ready for deployment earlier than anticipated with 800 m to go to the deployment location. As the vessel slowly transited to the target location, the anchor was hung off the stern. This was done too early, causing prolonged jostling and contact of the lower flotation with acoustic releases. Once deployed, a post-deployment triangulation survey was performed which confirmed the mooring landed only 75 m from the “anchors away” location — approximately one-third of its 223 m length — indicating little drift had occurred, suggesting that future deployments could occur directly over the target position.

Mooring M2332 (near Halifax-2) was a short mooring that could be lifted and deployed in a single lift. This mooring was lifted above the stern railings so a fall restraint harness was not required. During assembly on deck, the information sticker from the acoustic release was found to be missing. A test release was performed using a portable transducer to verify the receive frequency and release code. Once confirmed, the acoustic release was re-assembled and re-armed for deployment which proceeded quickly and without incident.

Mooring Operations - Recoveries The recovery for Mooring M2308 (station GMB) commenced two hours after low tide, with the vessel positioned 165 m from the mooring. Despite the mooring’s small size and short length, the primary recovery method through the A-frame was used, which aligned with the vessel’s preferred procedure as this was the first recovery of the mission. The mooring was hooked at the surface using the recovery loop spliced to the SUBS frame. During streaming, the Sea-Catch hook slid up the loop and latched onto the SUBS frame tail disengaging its safety latch and posing a risk of detachment. To mitigate this, constant tension was maintained on the line to prevent the hook from backing off. This precaution proved effective and the mooring was successfully lifted and recovered without incident. Once on deck, the mooring was disassembled and cleaned for storage.

Mooring M2309 (near station Halifax-2) used the secondary recovery method due to the short size of the mooring. At the surface this mooring floated on its side horizontally due to the heavy top end of the ADCP. This orientation of the mooring caused the beacon to be submerged and ineffective. The mooring was recovered by the P-frame and landed on deck on a tire situated on a pallet for each maneuvering and storage on deck.

For Mooring M2314 (station ROBP), the primary recovery method used required two lifts. The first lift

was of the Stablemoor flotation, followed by the lower section with acoustic releases. On the surface, the Stablemoor was floating on its side rather than vertically, leaving both beacons submerged and ineffective. One beacon was a new XEOS Petrel AIS unit marking its first operational use by OETS. Due to its submerged position, AIS functionality on the bridge could not be tested. Additionally, the Petrol beacon sustained damage and was suspected to have flooded. The cause of damage — whether during recovery, deployment in spring 2025, or at another time — remains unknown. Upon recovery, attempts to open the beacon's end cap failed indicating internal pressure buildup. After consultation with ship technicians and the Captain, the beacon was deemed a safety risk and was disposed of overboard.

Mooring M2300, which was recovered at station ECD within the Eastern Canyons Marine Refuge, used the primary recovery method requiring two lifts to bring the mooring on board. Prior to recovery, a triangulation survey was conducted to determine an accurate on-bottom position, as a previous attempt in 2024 after deployment had produced unreliable results. For a valid survey, the diameter of the survey area must be equal to or greater than the mooring depth. With a recorded sounding depth of 4,104 m, this required a diameter of 4,104 m (radius 2,052 m). A circle with a radius of 1.25 nautical miles (2,312 m) was established around the "anchors away" position, and four points approximately two nautical miles apart were selected to form a box survey. At each point, the vessel held station for five minutes and collected a minimum of 20 slant ranges. The first three points yielded excellent data, and the third point generated an accurate mooring position immediately. After verifying accuracy with additional ranges, the fourth point was omitted, and a final slant range was taken directly over the anchor position. This produced a highly accurate on-bottom position and confirmed depth. Once permission was granted by the bridge, the mooring was released. Based on depth, the estimated surfacing time was 57 minutes. Actual ascent time was 54 minutes, validating the estimated ascent rate calculation. Weather conditions complicated recovery, requiring multiple passes to position the vessel close enough to hook onto the mooring. Ultimately, it took an additional 50 minutes to hook on to the mooring to begin recovery. Despite these challenges, the mooring was successfully recovered using two lifts, and the operation demonstrated the effectiveness of triangulation for precise positioning and improved recovery planning.

The six Cabot Strait moorings were recovered during the second segment of the mission following a crew change. The new crew employed a slightly different recovery approach compared to the first segment. All moorings shared the same design and were recovered using the secondary method at the P-frame. The process began by throwing a grappling hook over the mooring to bring it alongside the vessel, followed by using a pole and snap-hook to secure and lift the mooring. All six recoveries were completed within a single day, with each operation taking 30 minutes or less from release to on deck recovery.

For Mooring M2301 (station CBN), the grappling hook snagged the hydrophone cage, tearing it from the mounting pole and exposing the hydrophone, which collided with the vessel. While the physical damage appeared to be minimal, post-calibration revealed significant performance issues and the hydrophone was subsequently decommissioned. For the recovery of Mooring M2302 (station CSW), operations went smoothly with no issues or damage noted. During recovery of Mooring M2303 (station CS1), the hydrophone cage detached during recovery using the P-frame, likely due to wave action, but the hydrophone remained undamaged. During recovery of Mooring M2304 (station CS2), the snap-hook was accidentally attached to the MicroCAT cage which is not designed for lifting and deformed when lifted. The mooring was lifted up high enough and its weight was transferred to a secondary winch line and Boss Hook on to a masterlink to prevent

further damage. For Mooring M2305 (station CS3), the grappling hook snagged the masterlink and hydrophone cable, though the cable's protective tubing prevented damage. During recovery of mooring M2306 (station CSE), difficulty was experienced when attaching the Kong Mooring hook, which resulted in the pole breaking. Recovery was completed using the NRCan/DFO Sea-Catch hook and pole. The grappling hook method expedited initial recovery by reducing the need for close vessel maneuvering and simplifying pole attachment. However, improper use poses a risk of equipment damage, as demonstrated by M2301. Future operations should refine grappling techniques and consider protective measures for sensitive components.

The only unsuccessful mooring operation of the mission was the recovery of an OTN acoustic receiver mooring situated at the head of The Gully MPA at station G03. Recovery of this mooring was originally attempted during the 2025 spring AZMP mission (Beazley et al. 2025a), but failed due to an incorrect release code that was provided. Unlike the core DFO and NRCan moorings, this mooring used an unfamiliar acoustic release system and deck set with an over the side transducer rather than Benthos hull-mounted system. Recovery attempts began once the vessel arrived on station late in the day with daylight fading, immediately creating time constraints. The mooring presented communication difficulties and multiple uncertainties arose regarding the mooring's presence, code accuracy, and battery status. Despite extended efforts continuing into nighttime, after two hours the decision was made to abandon recovery and declare the mooring lost.

3.3.3 Data Accessibility

The oceanographic measurements obtained from the SeaBird 37 microCAT sensors on each mooring will be processed by staff in the Ocean and Ecosystem Sciences Division (OESD) at BIO and can be made available upon request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca. All PAM recordings and associated metadata, processed data, and analysis results are stored and maintained within DFO Maritimes by the CRMP. For more information about how to access these data please contact dfo.marteamwhale-equipebaleinemar.mpo@dfo-mpo.gc.ca.

3.4 Video Plankton Recorder and MultiNet Operations

Data and samples characterizing the vertical distribution of *Calanus* spp. copepod abundance and associated environmental conditions (temperature, salinity, depth, fluorescence) were collected at pre-selected stations in the Roseway Basin Critical Habitat Zone for North Atlantic right whales (NARW), in LaHave Basin, on the AZMP's Halifax Line, and on the eastern Scotian Shelf. This work was in support of research on NARW foraging habitat under DFO's Whales Initiative and Species at Risk programs, with the overall goal of identifying potential foraging habitat for NARW by quantifying variation in abundance and fine-scale vertical distribution of *Calanus* spp. copepods. Observations will be incorporated into statistical and numerical models of *Calanus* 3-D spatial distribution and dynamics.

Vertical profiles of *Calanus* spp. abundance were collected using a Video Plankton Recorder (VPR) from Seascan, Inc., Falmouth, Massachusetts, US (Figure 3). The VPR is an underwater optical imaging system that takes microscopic images of plankton and particulate matter ranging between 50 µm and up to a few centimeters in size. The VPR was deployed vertically in 'yo-yo' mode, which involved repeatedly lowering the system to within 3 m from bottom and raising it to 1-2 m below surface for approximately 1 hour. A winch speed of 30 m/min was used for both descent and ascent. Deployments were conducted using the Lebus deck winch and starboard-side pedestal crane on the RRS *James Cook* and were overseen by Research Scientist Catherine Johnson (DFO Maritimes Region).

The VPR data were supplemented with depth-stratified zooplankton samples collected using a Hydro-Bios MultiNet Type Midi sampler system (Figure 3). The MultiNet system is a medium-sized sampler consisting of 5 nets with a 202 µm mesh size and a net opening of 0.25 m^2, which are closed at different depth intervals while the system is towed from near-bottom to the surface. The MultiNet was operated in 'live' mode during the JC28302 mission using the vessel's P-frame hydroboom and CTD conducting cable. The significant length of the MultiNet system (~7 m) called for use of an auxiliary winch and non-conducting wire on the P-frame to raise the system's cod end over the rail of the vessel. Once the MultiNet cleared the rail its cod end was released so that the system was fully vertical (see Figure 3) before being lowered to the surface. Once submerged, the winch was 'zeroed' and the MultiNet was lowered to within 10 m from the seabed based on sounder depth at a speed of 30 m/min (0.5 m/s). The system was then towed up at a speed of 30 m/min, while the nets were closed at different depth intervals. As a safety precaution, the system was stopped 1 m below the surface to close any open nets prior to recovering it on deck. Upon recovery, samples were washed into the cod end using seawater, transferred into 500 mL plastic jars, and preserved in 10% formalin.

Table 4 provides a summary of the MultiNet and VPR operations at each station sampled on the JC28302 mission. On each station, the MultiNet was deployed first and the VPR second, to optimize operations and allow for the nets of MultiNet to be washed and preserved after the VPR was deployed and in yo-yo mode. MultiNet operations at all planned stations were completed successfully, but VPR operations were initially aborted at stations RB_01, BBL_02, HL_03.3, and additional station CN_01 after the system's strobe light stopped functioning. Upon downloading the data collected at stations RB_01 and BBL_02, it was revealed that partial datasets were collected prior to the system's failure. The VPR was not redeployed at these stations. At stations HL_03.3 and CN_01, the VPR data cartridge was reformatted and the system was redeployed successfully. Upon arrival at station RB_D, the VPR's fault indicator lights turned on just prior to deployment,

indicating a fault in the system. Consequently, the VPR was not deployed at this station.

3.4.1 Data Accessibility

Taxonomic analysis of the MultiNet samples will be conducted at BIO and the resulting taxonomic data will be uploaded and available in BioChem or upon request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca. Imagery data collected by the VPR is available upon request to project PI Catherine.Johnson@dfo-mpo.gc.ca.

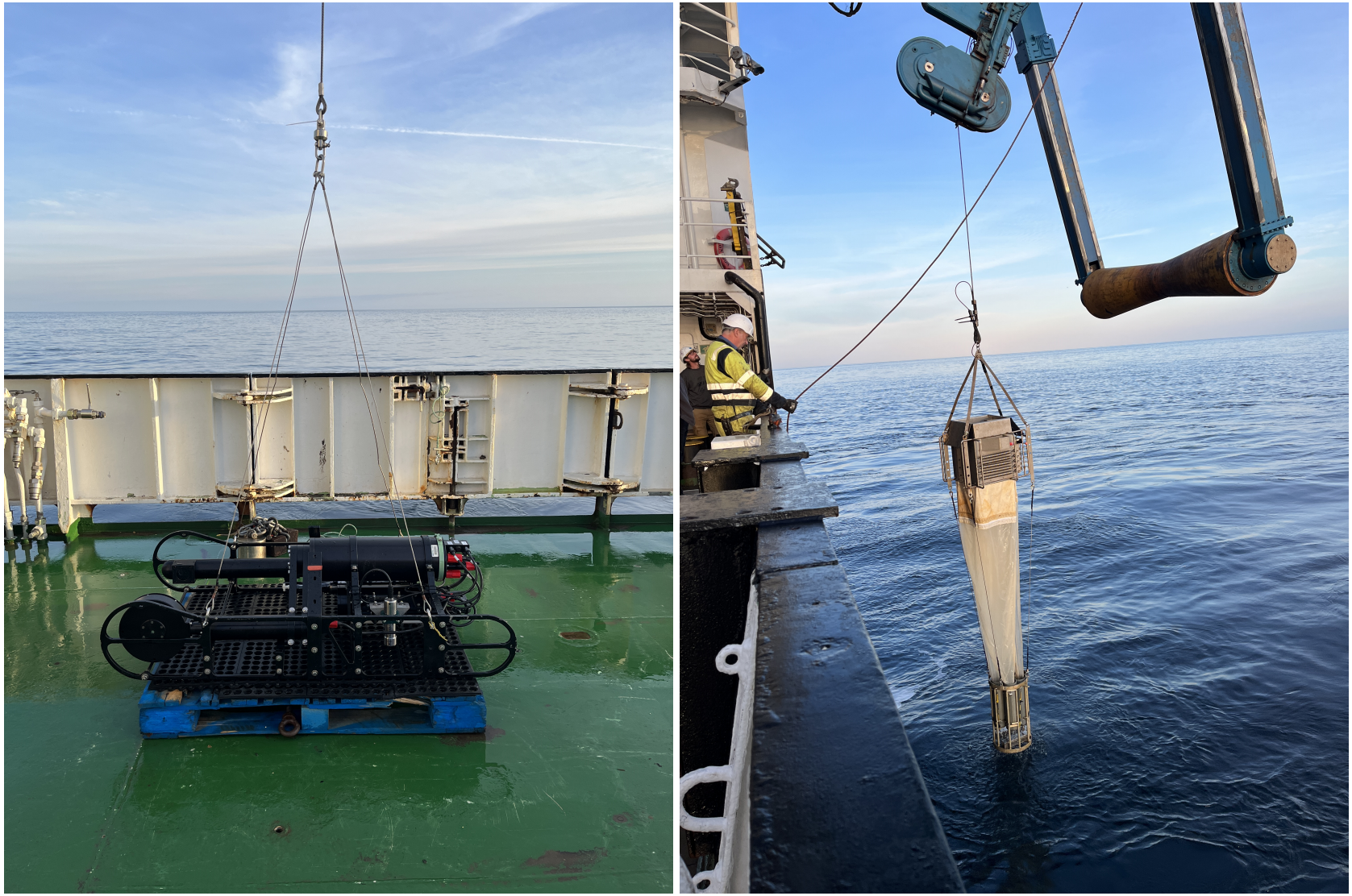

Figure 3. Video Plankton Recorder situated on a pallet before its deployment from the aft deck of the RRS *James Cook* during the JC28302 mission (Left). MultiNet being recovered using the P-frame of the RRS *James Cook* during JC28302 (Right).

Table 4. Summary of video plankton recorder (VPR) and MultiNet deployments on the Yarmouth Line (YL), in Roseway (RB) and LaHave (LH) Basins, on the Browns Bank (BBL), Halifax (HL) lines, and at two additional stations (A2, A3) sampled during the JC28302 mission. Note that VPR deployments do not have an associated Sample ID, and are deployed from near-surface to within 3 m from the seabed.

Station	Event	Date	Instrument	Start Lat.	Start Lon.	Sample ID	Depth Strata	Comment
YL_05	16	2025-09-30	MULTINET	43.46897	-68.21513	521378 521379 521380 521381	170 - 140 m 140 - 100 m 100 - 50 m 50 - 0 m	
RB_01	71			42.84996	-65.48237	521840 521841 521842	125 - 100 m 100 - 50 m 50 - 0 m	
	72		VPR		-65.48238			Aborted. Stopped strobing. Partial data collected.
RB_E	73	2025-10-04	MULTINET	42.87796	-65.31385	521843 521844 521845	145 - 100 m 100 - 50 m 50 - 0 m	
	74		VPR	42.87801	-65.31397			
RB_D	75		MULTINET	42.89932	-65.16448	521846 521847 521848	152 - 100 m 100 - 50 m 50 - 0 m	
RB_C	82			42.93557	-65.03318	521891 521892	102 - 50 m 50 - 0 m	
	83		VPR	42.92953	-65.03245			
RB_B	84		MULTINET	42.96299	-65.16587	521893 521894 521895	160 - 100 m 100 - 50 m 50 - 0 m	
	85		VPR	42.96320	-65.16585			

Table 4. *(continued)*

Station	Event	Date	Instrument	Start Lat.	Start Lon.	Sample ID	Depth Strata	Comment
RB_A	86	2025-10-05	MULTINET	42.97801	-65.31679	521896 521897 521898	152 - 100 m 100 - 50 m 50 - 0 m	
	87		VPR	42.97823	-65.31681			
BBL_02	88		MULTINET	43.00010	-65.47989	521899 521900	108 - 50 m 50 - 0 m	
	89		VPR	43.00003	-65.47981			Aborted. Stopped strobing after first ascent. Partial data collected.
	90			43.00002	-65.47983			Aborted. Stopped strobing. Partial data collected.
LH_01	94	2025-10-06	MULTINET	43.69008	-63.75963	521901 521902 521903 521904 521905	232 - 200 m 200 - 150 m 150 - 100 m 100 - 50 m 50 - 0 m	
	95		VPR	43.69007				
HL_03.3	108	2025-10-07	MULTINET	43.76349	-62.75269	521986 521987 521988 521989	201 - 150 m 150 - 100 m 100 - 50 m 50 - 0 m	
	109		VPR					Aborted. Stopped strobing during soak. Recovered and redeployed.

Table 4. *(continued)*

Station	Event	Date	Instrument	Start Lat.	Start Lon.	Sample ID	Depth Strata	Comment
HL_03.3	110	2025-10-07	VPR	43.76351	-62.75269			
A1	176	2025-10-13	MULTINET	45.19992	-59.55021	522450 522451	94 - 50 m 50 - 0 m	
	177		VPR	45.19991				
A2	185		MULTINET	45.49928	-60.00176	522494 522495 522496	151 - 100 m 100 - 50 m 50 - 0 m	
	186		VPR	45.50002	-59.99998			
T3	187		MULTINET	45.04999	-59.94999	522497 522498 522499	138 - 100 m 100 - 50 m 50 - 0 m	
	188		VPR	45.05037	-59.94933			
CN_01	189	2025-10-14	MULTINET	45.04994	-60.98498	522500 522501 522502	168 - 100 m 100 - 50 m 50 - 0 m	
	190		VPR		-60.98485			Aborted. Stopped strobing after 3rd profile. Recovered and redeployed.
	191			45.04993				

3.5 Flow-Through Systems

3.5.1 DFO-supplied TSG system and associated sensors

Continuous surface measurements of temperature, conductivity, salinity, dissolved oxygen, pH, chlorophyll *a*, and coloured dissolved organic matter (CDOM) were collected via a portable flow-through system installed in the Deck Laboratory on the RRS *James Cook*. This system is operated and maintained by BIO's Ocean Engineering and Technology Section (OETS), and was configured with two different tanks that hold various sensors. Tank 1 housed a SBE 21 SeaCAT Thermosalinograph (TSG), while Tank 2 held a SBE 18 pH sensor, Aanderaa optode dissolved oxygen sensor, and Seapoint UV CDOM and chlorophyll fluorometers. A debubbler system was installed to reduce air flow through the tanks. As the vessel is equipped with its own system to measure the partial pressure of carbon dioxide (pCO_2), the pCO_2 tank that is normally installed with this system was not installed on this mission. Instead, a SBE 63 dissolved oxygen sensor was installed for the first time and was plumbed in line with the system. The purpose of its installation was to compare the resulting data against that of the Aanderaa optode oxygen sensor and determine which sensor had higher accuracy relative to collected bottle samples. This flow-through system was connected to the vessel's uncontaminated science seawater dispersed throughout the vessel via an impeller pump. The seawater intake for this pump was located near the bow of the vessel at 6 m below the sea surface. Temperature at the intake was recorded using SBE 38 temperature sensors located at both the intake and on the ship's drop keel at 5.5 - 5.7 m depth.

A General Oceanics Model 8060 pCO_2 measuring system installed in the Chemistry Laboratory on the vessel was used to collect observations of surface carbon dioxide along the mission track. This system is calibrated using several gas standards at different concentrations, and also includes an Aanderaa optode dissolved oxygen sensor that records measurements of dissolved oxygen concentration at the same interval as the pCO_2 measurements (i.e., at 3-minute intervals). Standards for the pCO_2 system were run once daily.

The RRS *James Cook* also has a shipboard flow-through system installed in the CTD hangar on board, and was actively collecting data during the mission. This system is described further in the Shipboard Science Systems section below.

Daily underway system sampling Daily sampling of dissolved oxygen, chlorophyll, salinity, and CDOM samples were collected from the outflow of the BIO flow-through system throughout the mission (see Table 5). Samples were collected daily at approximately 12:00 starting on September 28 and ending on October 20. Samples that measure the carbonate chemistry system (pCO_2, total alkalinity and total inorganic carbon) were not collected due to laboratory sample processing constraints. Daily samples were assigned a unique sample ID for each day, which was recorded in the ELOG metadata logger. The sample ID range for daily underway samples collected during the mission was 521253 to 521274.

Table 5. Metadata associated with the collection of water samples from the underway system during the 2025 fall AZMP mission (JC28302). Date, time (UTC), latitude and longitude (in decimal degrees) of the ship's position were recorded in ELOG at the time of sample entry, while temperature (°C) and salinity were recorded from the thermosalinograph. 'X' and 'XX' indicate single and duplicate sampling, respectively. CDOM = coloured dissolved organic matter.

									Bottle Samples			
Date	**Time (UTC)**	**Lat. (DD)**	**Lon. (DD)**	**T [deg C]**	**Sal**	**Sample ID**	**TSG Flow Rate (L/min)**	**O2 Flow Rate (L/min)**	**Chl**	**Salts**	**O2**	**CDOM**
2025-09-28	16:43:00	44.1799	-63.3844	18.7	30.89	521253	20.6	1.73	XX	X	X	X
2025-09-29	14:12:00	44.4177	-66.4288	12.8	32.46	521254	23.3	2.51	XX	X	X	X
2025-09-30	13:52:00	43.5016	-67.9997	17.1	32.38	521255	23.2	2.78	XX	X	X	X
2025-10-01	15:08:00	42.9626	-69.6151	16.3	32.12	521256	23.7	2.52	XX	X	X	X
2025-10-02	16:06:00	42.4410	-66.7741	15.6	32.00	521257	23.3	2.46	XX	X	X	X
2025-10-03	15:30:00	41.9810	-66.1060	16.2	32.11	521258	23.9	2.71	XX	X	X	X
2025-10-04	16:26:00	42.8823	-65.2063	17.7	31.33	521259	23.6	2.42	XX	X	X	X
2025-10-05	15:45:00	42.9777	-65.4558	17.2	31.57	521260	23.3	2.51	XX	X	X	X
2025-10-06	14:54:00	44.2519	-63.1820	17.7	31.16	521261	23.5	2.43	XX	X	X	X
2025-10-07	16:55:00	42.8163	-61.7191	17.3	31.00	521262	23.5	2.41	XX	X	X	X
2025-10-08	15:41:00	43.4935	-59.9320	16.7	30.77	521263	23.5	2.57	XX	X	X	X
2025-10-09	16:44:00	43.8682	-58.9250	16.5	30.90	521264	23.3	2.61	XX	X	X	X
2025-10-10	16:06:00	44.8125	-57.0032	15.1	30.80	521265	23.7	2.42	XX	X	X	X
2025-10-11	16:31:00	43.1907	-57.5875	21.6	35.60	521266	23.4	2.68	XX	X	X	X
2025-10-12	15:07:00	44.0110	-58.3023	16.0	32.10	521267	23.3	2.43	XX	X	X	X
2025-10-13	17:23:00	45.4884	-59.9976	13.9	29.90	521268	24.6	2.41	XX	X	X	X
2025-10-14	14:54:00	44.7484	-62.4406	15.3	31.10	521269	23.5	2.42	XX	X	X	X
2025-10-16	15:12:00	44.3238	-63.4342	16.3	30.90	521270	19.9	1.90	XX	X	X	X
2025-10-17	15:05:00	46.0173	-59.3876	12.1	30.30	521271	20.4	2.22	XX	X	X	X
2025-10-18	17:20:00	46.3349	-60.0378	13.7	29.30	521272	20.3	2.43	XX	X	X	X
2025-10-19	15:20:00	47.4829	-60.0648	11.9	31.70	521273	20.1	2.37	XX	X	X	X
2025-10-20	16:30:00	46.3149	-59.0857	12.3	31.50	521274	20.2	2.49	XX	X	X	X

Data management and sensor validation The Advanced Serial Data Logger software installed on the BIO flow-through computer system records the sensor data, flow rate, NMEA data, and SBE 63 RS-232 serial data directly into text (.csv) files produced daily. A total of eight variables were logged in the daily TSG log files: intake temperature, TSG temperature, conductivity, UV fluorescence (CDOM), chlorophyll fluorescence, pH, calphase from the Anderaa optode sensor, and calculated salinity. The SBE 63 data were logged in a separate file using the same logging software, to facilitate comparisons of dissolved oxygen from the Aanderaa optode sensor. Logging for the TSG was stopped during port calls and transits through French national waters, and this was logged in the observations notebook of ELOG.

The frequency of measurements within each file type varies, with NMEA recordings occurring every second, TSG measurements every 5 seconds, and flow data approximately every second. A script was developed using R statistical software to collate the TSG and flow rate data with the corresponding positional data in the NMEA file. Measurements were interpolated in hourly bins and plotted to visualize spatial patterns and help validate the sensor outputs (see Figures 4 and 5 below). The optode calphase output is converted to dissolved oxygen concentration in ml/L whilst correcting for salinity (in the tank) using R.

Daily salinity and chlorophyll bottle measurements were plotted against the flow-through sensor data throughout the mission (see Figure 6) to validate the sensor outputs. There was relatively good congruence between sensor salinity values and bottle salinity measurements evaluated across the mission (mean difference = 0.0551 ± 0.3552 SD). An exception occurred on September 28, when the bottle salinity measurement (30.9157) was approximately one and a half units of measure lower than its corresponding sensor salinity measurement (32.4678). The source of this discrepancy is unknown. The fluorometer chlorophyll *a* sensor values were consistently higher than the corresponding Turner chlorophyll *a* replicates throughout the mission.

An R script was developed to correct the newly-integrated SBE 63 dissolved oxygen sensor data using measured salinity, and an evaluation was done to compare the resulting dissolved oxygen values between the Aanderaa optode and SBE 63 sensor, and between the two sensors and dissolved oxygen samples collected daily and analyzed using the Winkler titration method (see Figure 7). Both sensors showed comparable trends across the mission. The water samples were consistently over 0.2 ml/L higher than the sensor readings; however, the SBE 63 sensor read consistently closer to the Winkler bottle measurements than the Aanderaa optode sensor. The closer proximity of the SBE 63 values to the bottle measurements could be explained by slightly higher temperature in the tank (which would affect optode measurements) versus inline, where the SBE 63 was plumbed. While both sensors showed spikes in the data, spikes in the SBE 63 data were more frequent than the Aanderaa optode, and the frequency of corrupt data in the log files was also higher for the SBE 63.

3.5.2 Imaging Flow Cytobot and Environmental Sample Processor

As part of a collaborative agreement with the Woods Hole Center for Oceans and Human Health (WHCOHH), an Imaging FlowCytobot (IFCB) was installed in the Deck Laboratory for the duration of the mission. This system is designed to draw small seawater samples from its environment (or in this case, from the ship's science seawater system) every 23 minutes using a syringe pump, which then pushes a thin stream of the sampled water across a microscope objective. Cells and

other particles are detected by an in-line laser immediately upstream of the objective. Detections trigger a precisely-timed flash lamp that illuminates the cell/particle just as it passes in front of the microscope objective. Images of cells are captured by a charged-coupled device (CCD) camera and stored in data files that are associated with each seawater sample. Raw data includes gray-scale images of each particle and associated measurements of laser scatter and fluorescence. This system requires a minimum flow rate of approximately 2 L/min, and the total volume sampled is 15 mL per hour.

An Environmental Sample Processor (ESP) was also installed in the Deck Laboratory and was connected to the science seawater. The ESP is an autonomous, *in situ* instrument used for the collection and analysis of subsurface water samples. The system collects discrete water samples, concentrates microorganisms or particles, and applies molecular or antibody-based assays on board the instrument to detect target organisms, genes, or biological products. In this application, the ESP provided a means of monitoring for the presence of domoic acid-producing algal species or associated toxin signals over the course of the mission, supporting early detection and characterization of harmful algal bloom conditions.

3.5.3 Data Accessibility

The underway sensor data and daily water sample measurements were archived at BIO in the ODIS data server and are available by request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca. The images collected by the IFCB are accessible via an WHOI in-house IFCB dashboard.

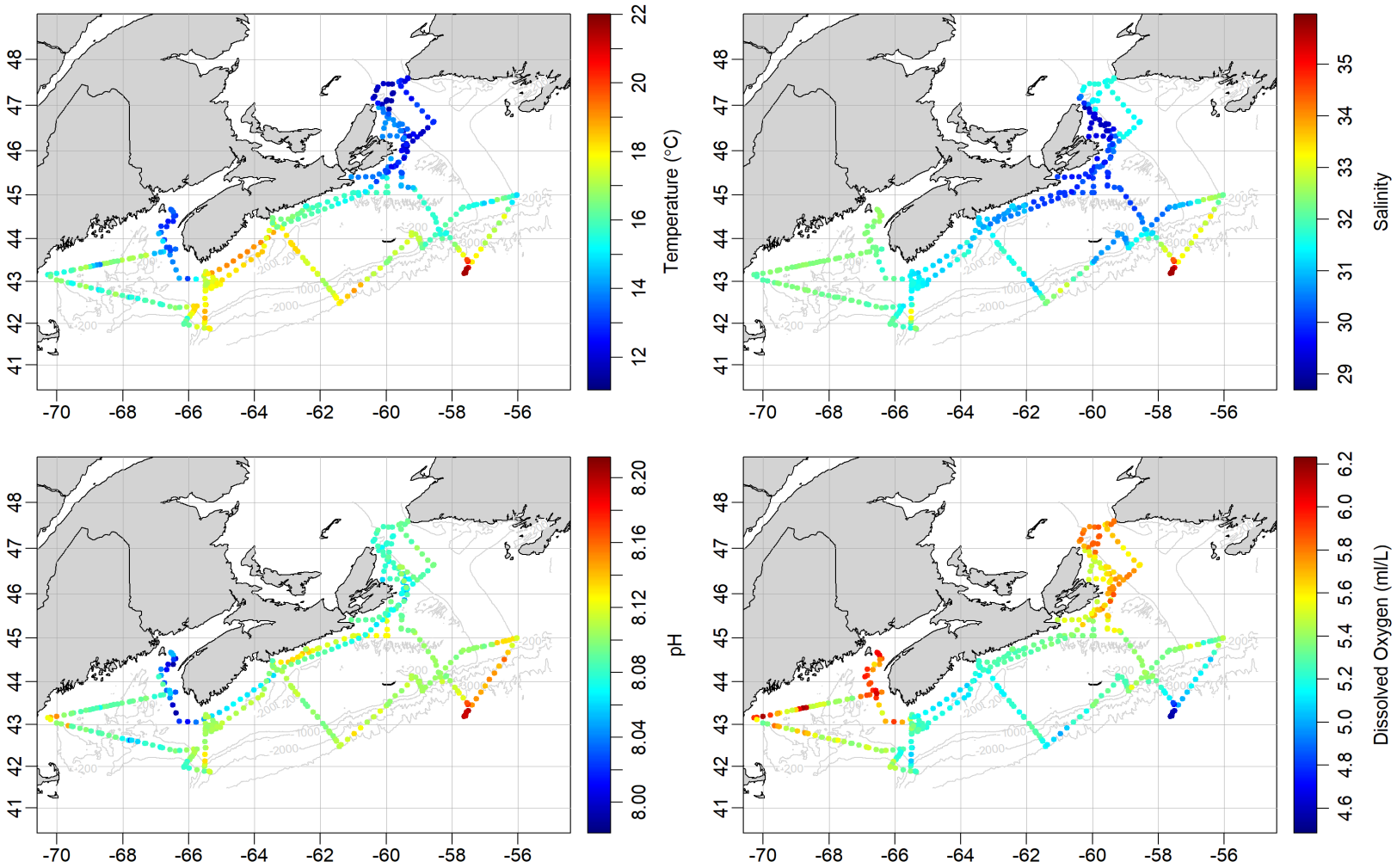

Figure 4. Surface temperature (°C; top left), salinity (top right), pH (lower left), and dissolved oxygen concentration from the Aanderaa optode sensor (ml/L; lower right) measured along the cruise track during the 2025 fall AZMP mission (JC28302). Data are measured at variable intervals and presented as hourly interpolations.

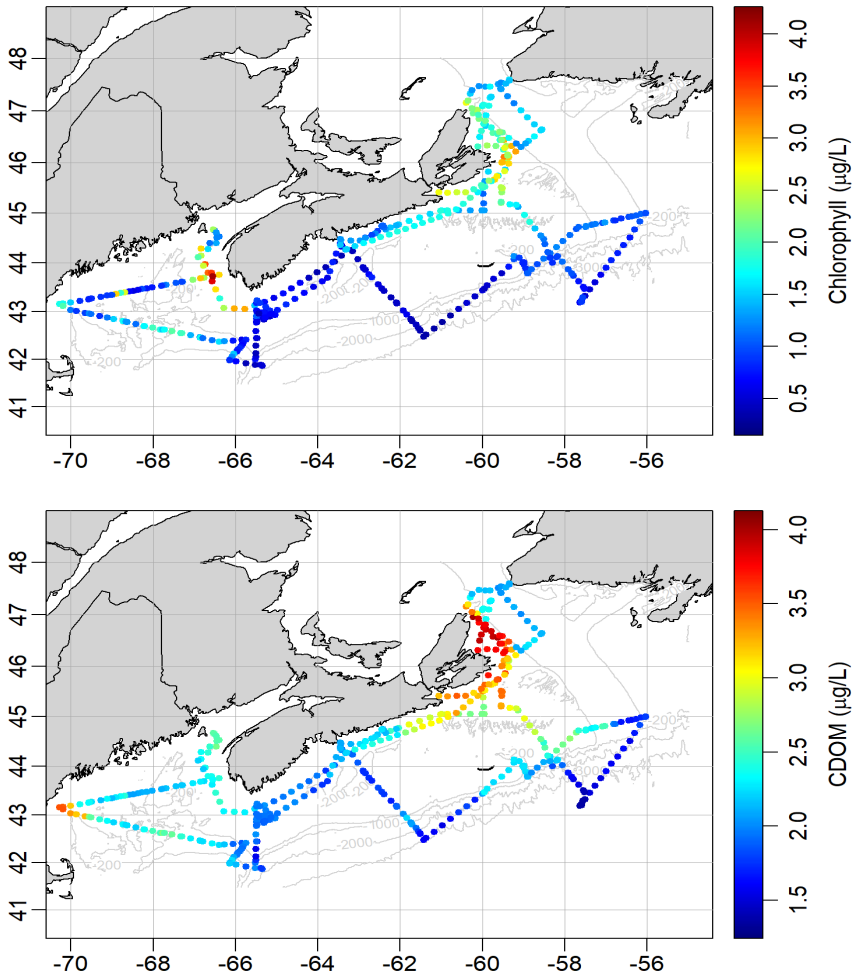

Figure 5. Chlorophyll fluorescence (μg/L; top), and CDOM (μg/L; bottom) measured along the cruise track during the 2025 fall AZMP mission (JC28302). Data are measured at variable intervals and presented as hourly interpolations.

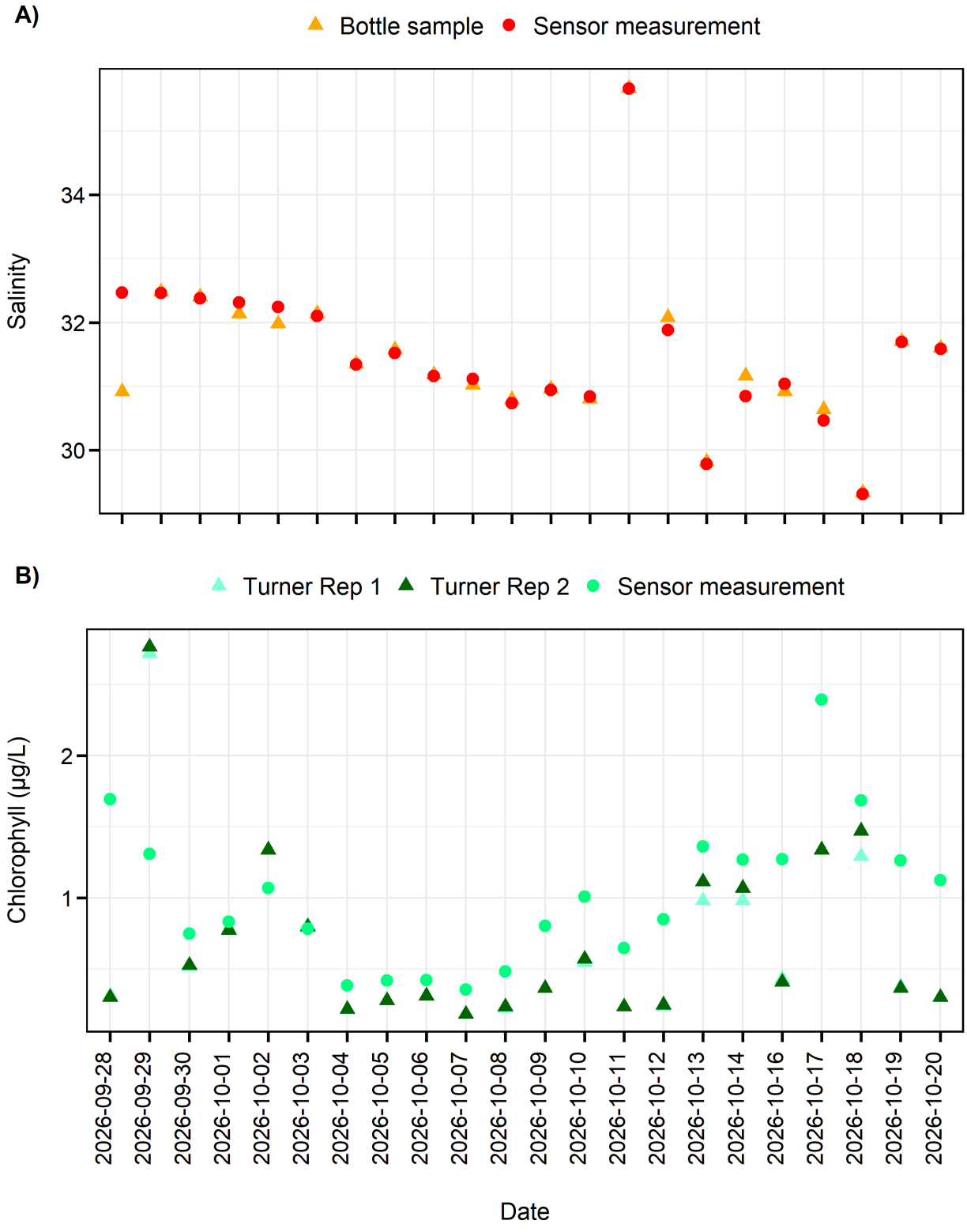

Figure 6. Comparison between bottle samples and sensor measurements of A) salinity and B) chlorophyll collected using BIO's portable flow-through system installed on the RRS *James Cook* during the 2025 fall AZMP survey.

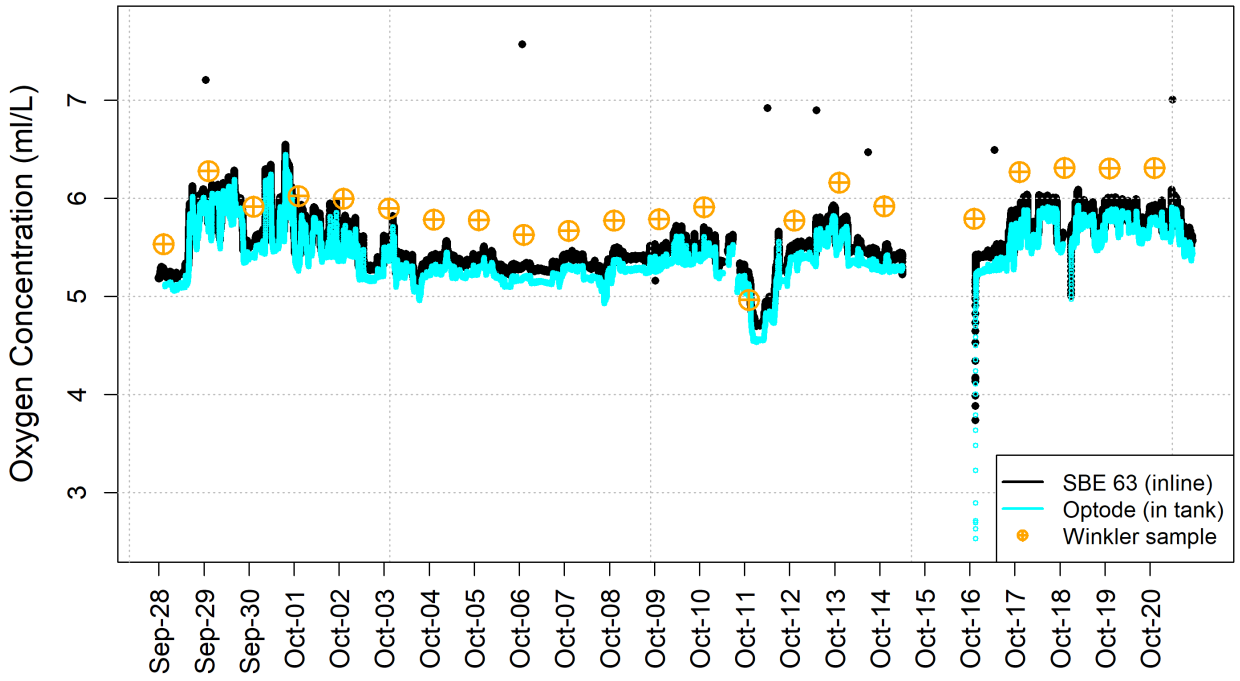

Figure 7. Comparison between dissolved oxygen values from the SBE 63 (black circles), Aanderaa optode (open cyan circles), and dissolved oxygen from bottle measurements (orange circle plus cross) collected while underway during the JC28302 mission. The water to the underway system was shut off on October 15 and re-started on October 16, likely resulting in the erroneously-low values of dissolved oxygen observed on October 16.

3.6 Shipboard Science Systems

3.6.1 Vessel-Mounted Acoustic Doppler Current Profiler (VMADCP)

Ocean currents were continuously measured throughout the JC28302 mission using a dual vessel-mounted Acoustic Doppler Current Profiler (ADCP) system consisting of 75 kHz and 150 kHz Ocean Surveyor ADCPs. The 75 kHz ADCP can reach to 600-800 m in good weather in its deep-profiling mode, while the 150 kHz has a maximum range of ~400 m depth. In bad weather, low scattering conditions, or some speed/heading/sea state conditions that entrain bubbles under the transducer, the range decreases. Data acquisition and the requisite ancillary navigation streams occur via the VmDas manufacturers software. An Ocean Surveyor is capable of running in either broadband mode (higher resolution at the expense of penetration) or narrow-band mode (slightly deeper profiling but lower resolution). It is also capable of interleaving these pings. Data were processed and available for viewing in real time via the Teledyne RDI VmDas software.

The ADCP system was configured by Ship Scientific Systems (SSS) technician Mark Maltby and DFO data manager Diana Cardoso according to the settings described in Table 6 below. The alignment angle (EA) of the 75 kHz system was -6.62°, while the 150 kHz was 0.60°. Both ADCPs were run continuously for the entire mission with the exception of stops in ports, a 30 minute power failure, during transits through MPA regions and French national waters and to turn on/off the bottom tracking. Bottom track was turned on at the start of the mission, and turned off on September 29.

The SSS technician noted that lowering the vessel's second drop keel blocked one beam of the 75 kHz ADCP. However, the data could still be post-processed using a 3-beam solution. The lowering and raising of the starboard drop keel was logged by the bridge personnel.

A detailed digital log for the ADCP systems was maintained by the SSS technician, and collected data were archived at the Bedford Institute of Oceanography via the BIO Data Services group.

Table 6. Configuration settings for the 75 and 150 kHz VMADCP units on the RRS *James Cook* for the 2025 fall AZMP mission (JC28302).

ADCP	Start Day	End Day	Ping	No. Bins	Bin Size (m)	Blank Distance (m)
75 kHz	2025-09-28 11:32:42	2025-10-21 11:22:58	Narrow band	48	16	8
150 kHz	2025-09-28 11:32:42	2025-10-21 11:22:58	Water profile	96	4	4

3.6.2 Echosounders and Multibeam

The RRS *James Cook* is equipped with a Kongsberg EA640 single-beam echosounder with 10 and 12 kHz transducers that were used for depth estimation during CTD and ring net operations. The vessel's other echosounders - a Kongsberg SBP27 sub-bottom profiler with frequency outputs that

range from 3.5 to 10 kHz, a Kongsberg EK80, and two multibeam systems (Kongsberg EM710 and EM122) were not turned on for the duration of the mission. While multibeam echosounders are traditionally used on the *James Cook* to enhance the precision of depth measurements during CTD and net operations, they remained off to prevent possible behavioral avoidance of the vessel by certain marine mammals, which could introduce bias into marine mammal observations.

3.6.3 SurfMet

The Surface Meteorological (SurfMet) system of the RRS *James Cook* was used to measure, process, and display weather and sea-state data at the ship's location. It incorporates various sensors on the meteorological mast (i.e., Met Tower) and from the vessel's flow-through system. The Met component consisted of an air temperature and humidity probe, ambient light sensors (PAR, TIR), a barometer, and anemometer.

The ship-board flow-through system was installed in the CTD hangar of the vessel, and consisted of a SBE 45 thermosalinograph (TSG), WetLab CStar transmissometer, WetLabs fluorometer, and SBE 38 temperature sensors located at both the intake (6 m depth) and on the ship's drop keel at 5.5 - 5.7 m depth. Note that while the TSG was being cleaned (logged as 'INstCln' in the ship's log), the transmissometer laser was blocked. These instances were noted in the log as a 'vdark' reading when the transmissometer was blocked, and 'vair' when readings were taken in free air.

SurfMet data were accessible in real-time through the vessel's National Marine Facilities display system. A detailed digital log for the flow-through system was maintained by the SSS and was archived along with the collected data at the Bedford Institute of Oceanography via the BIO Data Services group. The SurfMet system was run throughout the mission, except during short periods where the system was cleaned; when entering and leaving French waters, and while alongside.

3.6.4 Navigation System

Table 7 below lists the instruments used as part of the navigation system of the RRS *James Cook*. Navigational data for this mission is archived at the Bedford Institute of Oceanography via the BIO Data Services group.

3.6.5 Availability of Shipboard Data

All shipboard environmental and navigational data collected during the JC28302 mission were archived at BIO in the ODIS data server and are available by request to DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca.

Table 7. Instruments used as part of the navigation system of the RRS *James Cook*.

Instrument	**Purpose**	**Outputs**	**Positional Accuracy**
Applanix PosMV	Primary GPS and attitude	Serial NMEA to acquisition systems and multibeam	within 20 cm
Kongsberg Seapath 330+	Secondary GPS and attitude	Serial and UDP NMEA to acquisition systems and multibeam	within 1 m
Oceaneering CNav X3	Correction for primary and secondary GPS and dynamic positioning	DGPS to primary and secondary GPS	within 2 cm
Meinberg NTP Clock	Provide network time	NTP protocol over the local network	

4 Data Management Summary

The data collected during the mission is from a combination of DFO, NOC, and WHOI instrumentation. DFO instruments included profiling CTD, SUNA, Secchi disk, MultiNet, VPR ring nets, moorings, shipboard and BIO TSG data, and readings of salinity, oxygen and chlorophyll *a* from water samples. The shipboard instrumentation included the 75 kHz and 150 kHz Ocean Surveyor ADCPs, a transmissometer, TSG and pCO_2 flow-through systems, EA640 echosounder with 10 and 12 kHz transducers, and GIS and meteorological sensors.

In addition to sensor and water sample data, digital and paper logs were used to record sample and event metadata. Digital logs included a Nitrate SUNA log, ELOG, and filter log. ELOG software was used for event metadata and TSG sampling record, filter log .csv files were used for sample metadata and SUNA log is an excel file to record event, battery and file metadata. The *James Cook* used a digital log for shipboard instrumentation and a bridge log. Paper logs included CTD 'deck' sheets, and logs for ring nets, MultiNet, VPR, moorings, chlorophyll *a* analysis and sampling from the underway system. Chlorophyll *a* readings from water samples were recorded in a hard copy logbook and entered manually into an excel spreadsheet.

All digital data collected were backed up at least daily on the network and on an external hard drive. At the end of the mission all data and scanned logs were sent to BIO Data Services for upload and archival into their protected server with the exception of the WHOI Flow Cytobot and ESP data.

For more information on the data collected please contact DFO.BIODataServices-BIOServicesdeDonnees.MPO@dfo-mpo.gc.ca. For access to CTD and moorings data see https://www.cioos.ca/. For access to chemical and biological data please see https://www.dfo-mpo.gc.ca/science/data-donnees/biochem/index-eng.html. For shipboard ADCP data see https://www.soest.hawaii.edu/soestwp/research/data/shipboard-adcp-archive/.

4.1 Digital Logs

ELOG, an electronic logbook system for collecting event metadata, was used to log the date, time, ship's position, and sounding associated with certain logistical aspects of each gear deployment (e.g., deployed, on bottom, and recovered). This electronic logbook was accessible on the ship's network and mobile devices. In addition, an ELOG observations log was used to record detailed notes and observations on shipboard instrumentation and other systems, and an underway log was used to record the date, time and position when daily samples were collected. The ELOG configuration, deployment and backup was managed using Git locally, and was pushed to GitHub upon return (https://github.com/dfo-mar-odis/azmp_elog/tree/2025_Fall_AZMP_JC28302). The recording of metadata in ELOG facilitates the upload of discrete and plankton data to the BioChem national repository.

ELOG was run from a Windows 10 laptop in the Main Laboratory. A second laptop was placed in the Deck Laboratory for the ring net operator's use. The GPS and sounder data for ELOG from the ship's network were read using Python scripts called from the ELOG config file. Tablets were used to access ELOG when working on deck.

Digital filtration logs were used by laboratory staff for logging details associated with the processing of collected water. These filtration logs are generated using the R statistical software in .csv format. At the end of the mission, a summary of filter volumes and other metadata is typically generated for use in laboratory analyses. A laptop was placed in the Main Laboratory to access the digital filtration logs.

A digital log was used for logging details associated with the SUNA deployment, including data file naming and size, battery voltage, and event meta data. The log is in excel format and manually filled in.

4.2 DFO At-sea Reporting Template (DART)

The in-house DFO At-sea Reporting Template (DART) was used to compile and reformat all discrete data collected and analyzed at sea (dissolved oxygen, chlorophyll, and salinity) to check the data and facilitate later processing and archiving. This process involved loading the ELOG files, the CTD bottle (.btl) files containing the discrete bottle measurements. DART was also used to produce reports of the linked bottle and sensor measurements, to facilitate the quality control of both sensor and bottle measurements while at sea. Upon return DART is used to load discrete and net data to the DFO national database BioChem.

4.3 Data Submission to Global Telecommunications Systems

The World Meteorological Organization Global Telecommunications Systems (GTS) disseminates meteorological and oceanographic data for the primary purpose of supporting weather forecasting. However, the data are also available for modellers to assimilate into their climate forecasting. DFO's pathway to providing data on the GTS is via Environment and Climate Change Canada.

AZMP submits CTD data to GTS via MEDS (Marine Environmental Data Section, Ocean Sciences Division, DFO) at regular intervals throughout each mission to MEDS-SDMM.XNCR@dfo-mpo.gc.ca. The data must be sent within 30 days of collection. The files submitted are a customized .txt file called an IGOSS file, which is generated using the in-house CTD post-processing software CTDDAP.

5 Marine Mammal Observations

5.1 Methods

Visual surveys were conducted throughout the JC28302 mission by one or two marine mammal observers (MMOs) stationed on the bridge. Two different types of visual survey effort were used, depending on vessel speed, activities, and weather conditions. Full survey effort was used during transit occurring in daylight hours, when vessel speed was greater than 5 knots, Beaufort Sea State less than 6, and visibility greater than 1 km. This effort consisted of 1-2 MMOs on duty, with the primary MMO stationed on starboard, and the secondary (when applicable) stationed on port. The primary MMO was responsible for recording all sightings, effort, and weather conditions. MMOs scanned from 0 degrees (relative to ship's heading) to 90 degrees on their respective sides of the vessel, using naked eye and handheld binoculars. Effort was reduced to "limited/opportunistic" effort whenever environmental conditions deteriorated beyond the minimum conditions listed above, including during all CTD and mooring station operations. During both types of survey effort, off-duty science staff and ship's crew often assisted voluntarily, and all sightings were recorded, regardless of whether they were initially seen by the on-duty MMOs or others.

Marine mammal sightings data were recorded on a laptop using a custom-written MATLAB-based data entry program developed by H. Whitehead of Dalhousie University, and customized by J. Stanistreet and W. Beslin prior to the cruise. Information collected for each sighting included the following: 1) Date and time, in UTC; 2) latitude and longitude of the vessel, obtained from a USB GPS unit connected to the laptop; 3) estimated bearing to sighting relative to the ship's current heading; 4) approximate distance to sighting, estimated using range sticks when a clear horizon was visible; 5) species identification and species ID certainty (definite, probable, or possible); 6) minimum, maximum, and best estimate of group size; 7) number of calves or juveniles present; 8) animal behaviour, if known; 9) camera frame numbers corresponding to any photographs taken; 10) additional comments about the sighting; and 11) the name of the MMO who initially saw the animal. Information on survey effort was recorded anytime the survey effort changed, either due to change in MMOs on duty or a change in vessel activity. Environmental conditions were recorded every 30 minutes when possible and whenever there was a notable change in environmental conditions.

Surveys were conducted throughout daylight hours on 22 days during the JC28302 mission (September 28 to October 20, 2025). In total, there were 115 hours of full survey effort which occurred while transiting between CTD and mooring stations, and 79 hours of limited/opportunistic effort which occurred during CTD and mooring station operations and poor weather conditions. Weather was variable throughout the trip, and sea state was a limiting factor on several days, where a Beaufort sea state of greater than 5 limited sighting probability. Three designated marine mammal surveys were completed during the mission. These occurred in Shortland Canyon on October 12, Eastern Shore Islands on October 14 (between stations), and Sydney Bight on October 20. During these surveys, vessel speed was reduced to approximately 7-8 knots and two MMOs were stationed on both sides of the bridge. MMOs followed full survey effort procedures as described above.

5.2 Results

There were 257 unique sightings of cetaceans, seals, turtles, sharks, and other fish recorded during the cruise (Table 8, Figures 8 to 11). Eleven different marine mammal species were identified, along with many sightings of unidentified whales and dolphins. Humpback whales (*Megaptera novaeangliae*) were the most commonly encountered baleen whale species, with 43 confirmed sightings. Among odontocetes, common dolphins (*Delphinus delphis*), long-finned pilot whales (*Globicephala melas*), and northern bottlenose whales (*Hyperoodon ampullatus*) were the most commonly encountered species, with 33, 15, and 14 confirmed sightings respectively. Non-marine mammal sightings included basking sharks (*Cetorhinus maximus*), ocean sunfish (*Mola mola*), tuna (*Thunnus* spp.), leatherback turtle (*Dermochelys coriacea*), and unidentified sharks. There were several sightings of species at risk, including blue whale (*Balaenoptera musculus*; 1 confirmed sighting), northern bottlenose whales (14 confirmed sightings), fin whales (*Balaenoptera physalis*; 4 confirmed sightings), basking sharks (7 confirmed sightings) and leatherback turtle (1 confirmed sighting; Table 8). No North Atlantic right whale (*Eubalaena glacialis*) were sighted. Additionally, there were 29 records of marine debris collected throughout the cruise, which included plastic (sheets/bags), free-floating fishing gear, containers (watering can, margarine container, and buckets), balloons, a beverage cooler, and a wooden pallet (Figure 11).

All survey data including effort, environmental conditions, sightings, and photographs will be archived and maintained by Team Whale (DFO Maritimes). Information on marine mammal sightings will additionally be entered in the Whale Sightings Database maintained by DFO Maritimes.

Table 8. Summary of cetacean, turtle, and fish sightings. The number of distinct sightings at each species ID certainty level is provided (note that the number of individuals in each sighting is not shown here).

		Number of Sightings		
Species	**Scientific Name**	**Definite**	**Probable**	**Possible**
Blue whale	*Balaenoptera musculus*	1	0	0
Common dolphin	*Delphinus delphis*	33	3	0
Fin whale	*Balaenoptera physalis*	3	1	0
Fin/sei whale	*Balaenoptera physalis/B. borealis*	14	6	1
Grey seal	*Halichoerus grypus*	3	0	0
Humpback whale	*Megaptera novaeangliae*	43	5	5
Leatherback turtle	*Dermochelys coriacea*	1	0	0
Long-finned pilot whale	*Globicephala melas*	15	0	0
Minke whale	*Balaenoptera acutorostrata*	4	0	0
Northern bottlenose whale	*Hyperoodon ampullatus*	14	0	0
Risso's Dolphin	*Grampus griseus*	1	0	0
Sperm whale	*Physeter macrocephalus*	2	0	0
Basking shark	*Cetorhinus maximus*	7	1	0
Ocean sunfish	*Mola mola*	16	0	0

Table 8. *(continued)*

Species	Scientific Name	Number of Sightings		
		Definite	**Probable**	**Possible**
Tuna	*Thunnus spp.*	1	0	0
Other		4	0	0
Unknown dolphin		12	0	0
Unknown seal		1	0	0
Unknown shark		1	0	0
Unknown whale		56	0	0
Total sightings = 257				

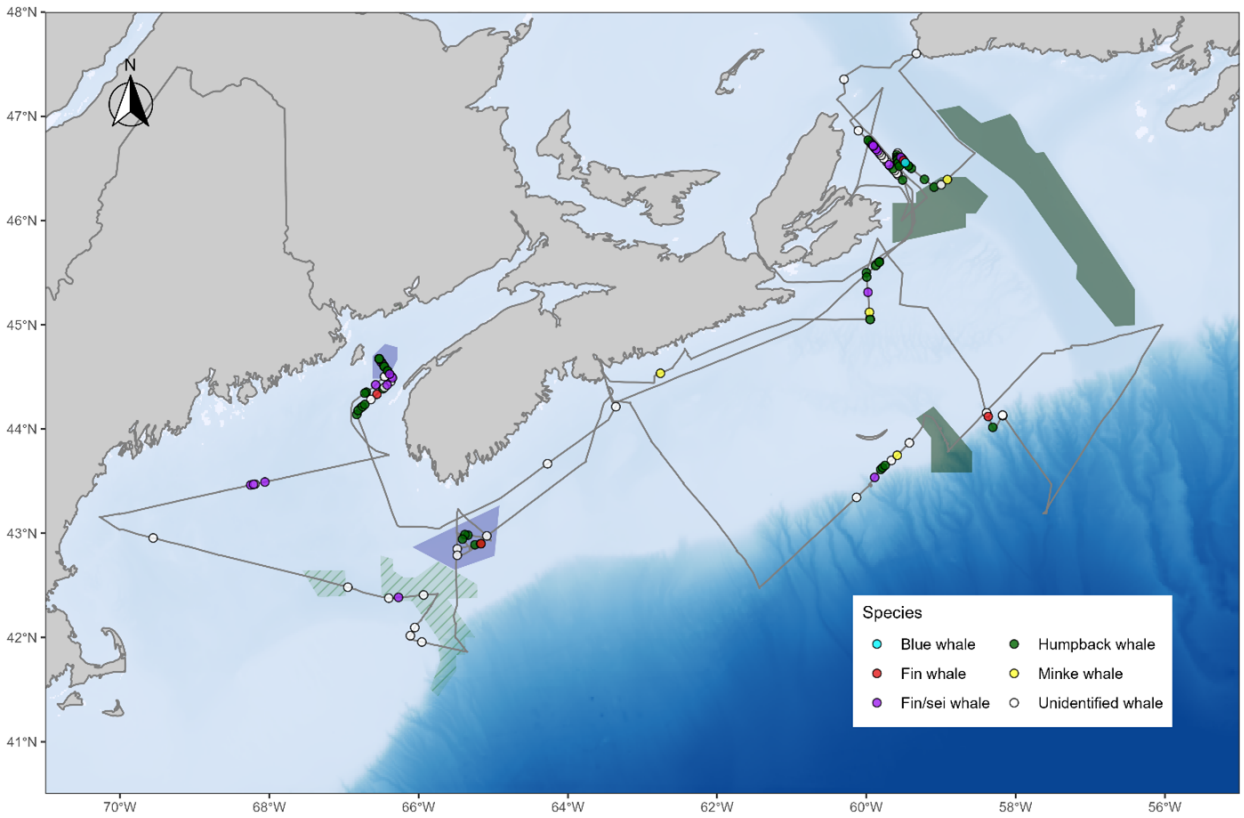

Figure 8. Ship track and locations of baleen whale sightings (including those with definite, probable, and possible species IDs and unidentified whales) made during the JC28302 mission.

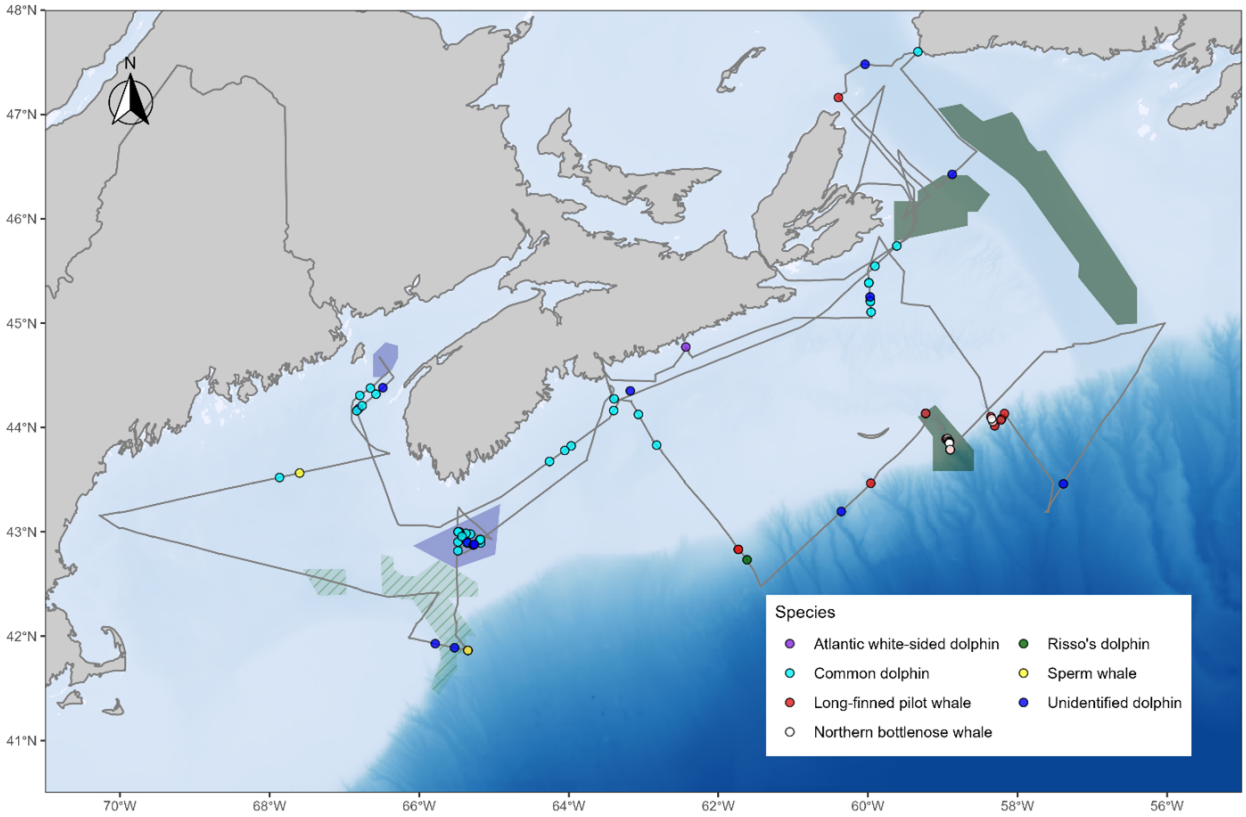

Figure 9. Ship track and locations of dolphin, pilot whale, northern bottlenose whale, and sperm whale sightings (including those with definite, probable, and possible species IDs and unidentified dolphins) made during the JC28302 mission.

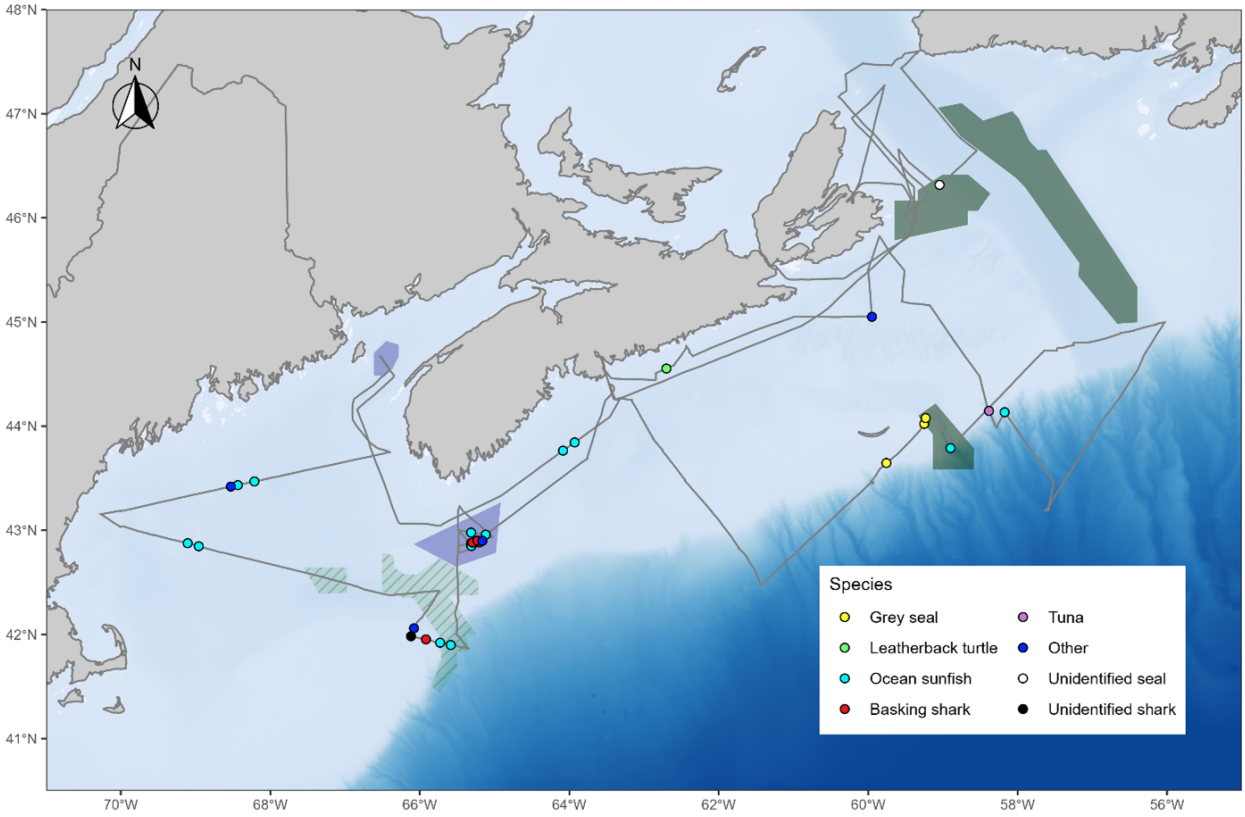

Figure 10. Ship track and locations of seal, turtle, shark, and other fish sightings (including those with definite, probable, and possible species IDs and unidentified fish, sharks, and turtles) made during the JC28302 mission.

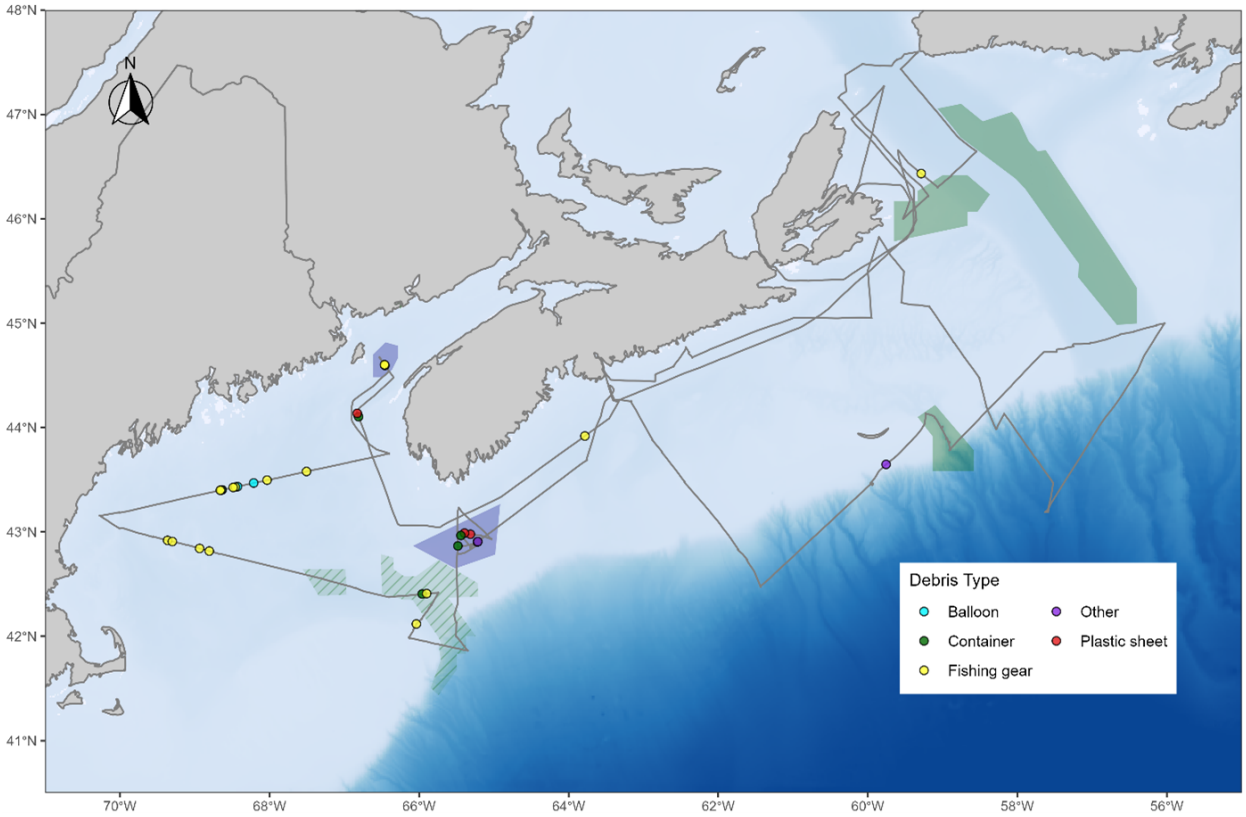

Figure 11. Ship track and locations of all marine debris sightings made during the JC28302 mission. The 'Other' category included a beverage cooler and a wooden pallet.

6 Seabird Observations

6.1 Background

The east coast of Canada supports millions of breeding marine birds as well as migrants from the southern hemisphere and the eastern North Atlantic. In 2005, the Canadian Wildlife Service (CWS) of Environment and Climate Change Canada initiated the Eastern Canada Seabirds at Sea (ECSAS) program with the goal of identifying and minimizing the impacts of human activities on birds in the marine environment. Since that time, a scientifically rigorous protocol for collecting data at sea and a sophisticated geodatabase have been developed, relationships with various industries and DFO to support offshore seabird observers have been established, and over 300,000 km of ocean track have been surveyed by CWS-trained observers. These data are now being used to quantify seabird abundance and distribution at sea and identify and mitigate any threats. In addition, data are collected on marine mammals, sea turtles, sharks, and other marine organisms when they are encountered.

6.2 Methods

Seabird surveys were conducted from the port side of the bridge of the RRS *James Cook* from September 28 to October 21, 2025, and during daylight hours on October 22 during the transit from Mulgrave, NS to St. John's, NL. Surveys were conducted while the ship was moving at speeds greater than 4 knots, looking forward and scanning a 90° arc to one side of the ship. All birds observed on the water within a 300 m-wide transect were recorded, and we used the snapshot approach for flying birds (intermittent sampling based on the speed of the ship) to avoid overestimating abundance of birds flying in and out of transect. Distance sampling methods were incorporated to address the variation in bird detectability. Marine mammal and other marine wildlife observations were also recorded, although surveys were not specifically designed to detect marine mammals. Details of the methods used can be found in the CWS standardized protocol for pelagic seabird surveys from moving platforms (Gjerdrum et al. 2012).

6.3 Results

A total of 1887.1 km of ocean was surveyed over the course of the mission, and included surveys conducted off southern Newfoundland during the transit from Mulgrave, NS to St. John's Newfoundland. A total of 3214 marine birds were observed in transect (4219 in total; Table 9). Bird densities averaged 7.6 birds/km^2 (ranging from 0 – 2185.5 birds/km^2). The highest densities of birds (> 150 birds/km^2) were observed at the eastern point of the Cabot Strait line, in Sydney Harbour, north of Browns Bank, and in US waters of the Gulf of Maine (Figure 12).

Great Shearwater was the most abundant species (52% of the sightings) followed by the Herring Gull and Great Black-backed Gulls, Northern Fulmar, and Dovekie (Table 9). An additional 13 terrestrial birds were observed offshore, either migrating overseas or blown off course (Table 10).

6.4 The Gully and St. Ann's Bank MPAs

Surveys took place in The Gully MPA on October 8th and 9th (Figure 12), where a total of 77 marine birds were observed, including Great Shearwater, Herring and Great Black-backed Gulls, Northern Fulmar, and one unidentified storm-petrel (Table 11). Surveys in St. Ann's Bank MPA took place on October 17th, 18th, and 20th, where 97 marine birds were sighted (Table 12).

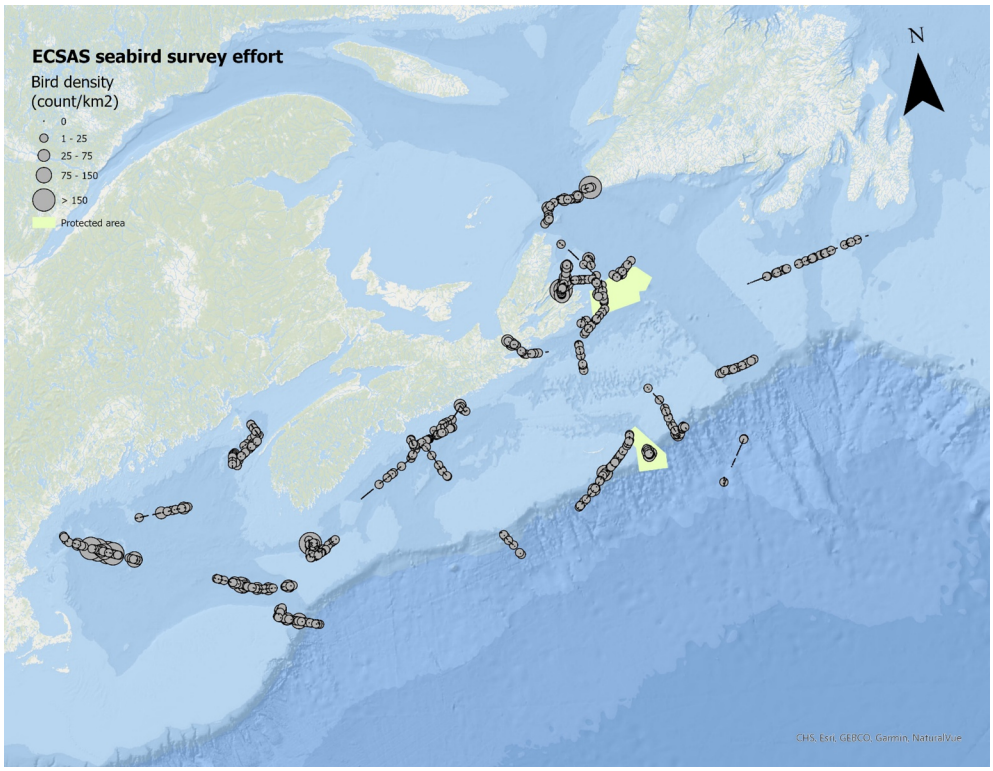

Figure 12. Density of birds (all species combined) observed during surveys on the 2025 fall AZMP survey (JC28302) from September 28 to October 21, 2025, and during the transit from Mulgrave to St. Johns on October 22, 2025. The Gully and St. Anns Bank Marine Protected Areas are represented by the yellow polygons.

Table 9. List of marine bird species observed during surveys completed on the JC28302 mission from September 28 to October 21, 2025, and during the transit from Mulgrave, NS, to St. Johns, NL on October 22, 2025.

Common Name	Latin	Total No.	No. Obs. in Transect
Marine birds			
Great Shearwater	*Ardenna gravis*	1987	1673
Herring Gull	*Larus argentatus*	343	183
Great Black-backed Gull	*Larus marinus*	338	321
Northern Fulmar	*Fulmarus glacialis*	284	156
Dovekie	*Alle alle*	241	188
Red Phalarope	*Phalaropus fulicarius*	158	133
Unidentified Phalaropes	*Phalaropus*	149	121
Double-crested Cormorant	*Phalacrocorax auritus*	124	55
Northern Gannet	*Morus bassanus*	117	73
Black-legged Kittiwake	*Rissa tridactyla*	111	90
Unidentified Ducks	*All duck genera*	102	37
Cory's Shearwater	*Calonectris borealis*	54	44
Unidentified Cormorants	*Phalacrocorax*	54	20
Canada Goose	*Branta canadensis*	30	30
Atlantic Puffin	*Fratercula arctica*	29	29
Unidentified Jaegers	*Stercorarius Jaegers*	12	6
Great Skua	*Stercorarius skua*	11	0
Unidentified Gulls	*Larus*	10	2
Unidentified Auks	*Alcidae*	10	6
Common Eider	*Somateria mollissima*	9	8
Sooty Shearwater	*Ardenna grisea*	6	3
Common Murre	*Uria aalge*	5	5
Unidentified Shearwaters	*Puffinus, Calonectris, or Ardenna*	5	5
Unidentified Skuas	*Stercorarius Skuas*	4	3
Red-necked Phalarope	*Phalaropus lobatus*	4	4
Common Loon	*Gavia immer*	4	2
Parasitic Jaeger	*Stercorarius parasiticus*	3	3
Pomarine Jaeger	*Stercorarius pomarinus*	3	3
Unidentified Storm-Petrels	*Hydrobatidae*	3	3
Manx Shearwater	*Puffinus puffinus*	3	2
Leach's Storm-Petrel	*Hydrobates leucorhous*	2	2
Balearic Shearwater	*Puffinus mauretanicus*	2	2
Ring-billed Gull	*Larus delawarensis*	1	1
Razorbill	*Alca torda*	1	1
Total		**4219**	**3214**

Table 10. List of terrestrial bird species observed during surveys completed on the JC28302 mission from September 28 to October 21, 2025, and during the transit from Mulgrave, NS, to St. Johns, NL on October 22, 2025

Common Name	**Latin**	**Total No.**
Terrestrial birds		
Unidentified songbirds	*Passeriformes*	5
Merlin	*Falco columbarius*	3
Peregrine Falcon	*Falco peregrinus*	2
Mourning Dove	*Zenaida macroura*	1
Dark-eyed Junco	*Junco hyemalis*	1
American Kestrel	*Falco sparverius*	1
Total		**13**

Table 11. List of marine bird species observed during surveys within The Gully Marine Protected Area on October 8-9, 2025 during the JC28302 mission.

Common Name	**Latin**	**Total No.**
Unidentified Murres	*Uria*	9
Unidentified Auks	*Alcidae*	8
Common Murre	*Uria allge*	8
Black-legged Kittiwake	*Rissa tridactyla*	5
Black Guillemot	*Cepphus grylle*	4
Great Black-backed Gull	*Larus marinus*	4
Atlantic Puffin	*Fratercula arctica*	3
Common Eider	*Somateria mollissima*	2
Thick-billed Murre	*Uria lomvia*	1
Total		**44**

Table 12. List of marine bird species observed during surveys within the St. Anns Bank Marine Protected Area on October 17, 18, and 20, 2025, during the JC28302 mission.

Common Name	**Latin**	**Total No.**
Unidentified Murres	*Uria*	54
Black-legged Kittiwake	*Rissa tridactyla*	35
Unidentified Auks	*Alcidae*	26
Herring Gull	*Larus argentatus*	11
Northern Fulmar	*Fulmarus glacialis*	9
Common Murre	*Uria aalge*	8
Northern Gannet	*Morus bassanus*	8
Ring-billed Gull	*Larus delawarensis*	5
Unidentified Gulls	*Larus*	8
Thick-billed Murre	*Uria lomvia*	3
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	1
Razorbill	*Alca torda*	1
Sooty Shearwater	*Ardenna griseus*	1
Unidentified Terns	*Sterna*	1
Great Black-backed Gull	*Larus marinus*	1
Total		**172**

7 Operational Considerations and Issues of Note

This section contains a brief summary of the various operational considerations or issues encountered with science equipment and/or data and sample post-processing during the JC28302 mission. This information should help to guide both CTD and laboratory post-processing procedures, and future interpretation of the data collected on the mission.

7.1 CTD Operations

1. During the CTD-Rosette cast on station YL_06 (Event 018), the CTD winch experienced issues associated with its software while the CTD-Rosette was at 20 m on its upcast. The CTD remained suspended for approximately 50 minutes until the issue was fixed. The issue is believed to have been caused from an earlier power outage on the vessel, and did not reoccur.

2. The Niskin bottle air vents were not closed prior to the CTD-Rosette deployment at stations PL_06 (Event 038) and NEC_10 (Event 061; bottles 1-9 and 14 only), which may have caused mixing at depth. The resulting salinity and dissolved oxygen samples collected did not appear to be negatively affected.

3. Upon recovery of the CTD-Rosette at station LCM_01 (Event 141), a large swell caused the CTD sea cable to jump its sheave. While the NMF technicians and crew were able to re-position the sea cable back into its sheave, physical inspection of the cable revealed that it had been pinched. Thereafter, the NMF CTD technicians conducted an electrical test each day on the cable to determine if the cable's conducting power was decreasing. The cable continued to function for the remainder of the mission and a switch to the secondary sea cable ('Deep Tow') was not required.

7.2 Ring Net Operations

1. The ring net operation at station PL_06 was aborted due to inclement weather. The ring net sample collected at station LCM_04 was accidentally dropped on deck, and was lost. The ring net was not re-deployed due to time constraints.

2. The NOC livedata.science url used to provide real-time position information while at sea, has historically used multibeam for depth estimation. As multibeam was not used during the JC28302, the source of depth in livedata.science url was the 12 kHz echosounder, which is considered less accurate than multibeam as the 12 kHz is a single-beam sensor that collects data over a 60 degree angle, whereas the multibeam is straight/direct measurement from the ship, which explains its higher accuracy. The livedata.science url is used during ring net operations to provide a ring net deployment target depth to the winch operator, which is typically 10 m off seabed depth from livedata.science. The lower accuracy of the 12 kHz echosounder may have resulted in a higher discrepancy between the bottom of the ring net assembly and the actual seabed depth. A work-around was established where the ring net operator would ask the winch operator to send the ring net assembly to approximately 10 m

from seabed depth. Once this target was reached, the winch operator would slowly continue to payout cable until the winch block slacked, which indicated that the weight of the ring net assembly touched the seabed. The ring net assembly was then recovered. This procedure worked well in water depths < 200 m. At depths greater than this, it became difficult to observe slack in the block.

7.3 Mooring Operations

1. Upon recovery of the mooring in Grand Manan Basin (GMB, Event 005), it was discovered that the AIS radio mooring beacon was non-operational. An attempt to unscrew the end cap of the beacon was abandoned after realizing it was extremely difficult to unscrew. The mooring team deduced that the beacon was flooded, which may have caused erosion of its lithium batteries, and sub-sequent off-gasing. As a pre-caution, the mooring team called the bridge and the captain came to assess. They determined that the best course of action was to discard the unit at sea, to avoid it becoming a projectile and causing injury.

2. Upon arrival at the OTN Acoustic Mooring in the Gully MPA (station GUL03) at 17:30 local time, the mooring team attempted to interrogate the mooring from an initial distance of 100 m away from the mooring's nominal location. After receiving no response, the ship was repositioned directly over the mooring site and eventually obtained an autoscan response indicating the mooring was 297 m away at a depth of approximately 311 m. The vessel was then moved slightly off-position to allow for safe release and recovery. Once the release command was sent, confirmation of release was not received. A second attempt was made after repositioning the ship up to 358 m away—again with no confirmation returned. Attempts to scan for the VR4 serial number (250521) resulted in errors, and an alternate number (520521) produced no detections. By 18:30, the captain advised that operations would need to cease within ten minutes due to diminishing daylight. The mooring team attempted to obtain a health status update to determine whether the release was vertical and functioning, which would allow for a possible recovery attempt the following day. However, repeated autoscan and health-status queries produced no response. The lack of communication from the release serial suggested the line might have been cut and the AR4 was no longer present. Shortly after 19:00, following multiple unsuccessful attempts, the team abandoned operations at GUL03, and the mooring was not recovered.

7.4 Other

1. Occupation of station BBL_03 occurred 1-2 nautical miles off its nominal station coordinates due to the presence of fishing gear.

2. Carbonate chemistry samples (pCO_2, TIC/TA) were not collected on the JC28302 survey due to a backlog in the laboratory that processes these samples.

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APPENDIX A Mission Narrative

The mobilization of scientific equipment for the JC28302 mission began at 08:00 ADT on Friday, September 26. Laboratory equipment was loaded first to allow laboratory staff to set up their equipment and spaces, and was followed by a mooring container and other mooring equipment. A ship's familiarization meeting for all Segment 1 participants was held that afternoon from 14:00 - 16:00, where staff were familiarized with the safety procedures of the vessel and conducted a vessel tour. The set up of some laboratory equipment along with the WHOI Imaging Flow Cytobot and Environmental Sample Processor continued on the following day, Saturday September 27.

On Sunday September 28, the day of departure, all science staff boarded the vessel by 07:00 ADT, and departure from BIO occurred at 08:00 ADT. A life boat drill was scheduled for 10:30 ADT, just after the Halifax Harbour pilot disembarked and just prior to arrival at high-frequency AZMP station HL_02 at 11:00. Sampling at HL_02 consisted of a CTD-Rosette deployment, two ring net deployments, and a Secchi disc deployment. At this point, the chief scientist assessed the weather conditions for the next few days, and the vessel was directed to begin its ~13 hour transit to Grand Manan Basin to conduct a mooring recovery and re-deployment.

The vessel arrived at the Grand Manan Basin mooring station (GMB) on Monday, September 29, and began interrogating the mooring release at 16:28 UTC. The mooring was then released and recovered at 16:58 UTC, exactly 30 minutes later. The vessel relocated to approximately one nautical mile from the mooring recovery point to deploy the new mooring at the original site coordinates. After a successful deployment of the new mooring at station GMB, the vessel headed to the first AZMP station on the Yarmouth Line (YL), YL_01, arriving at 01:06 UTC on Tuesday, September 30.

CTD-Rosette and ring net operations along the YL went smoothly. However, the vessel experienced a power outage just prior to arrival at station YL_02, resulting in a loss of 30 minutes to the program. While conducting operations on the YL, the NMF technicians and DFO science staff discussed the benefits of conducting a test of the MultiNet system to get a better understanding of its safe operating procedures and to ensure the system would clear the rail. A test was planned and executed at station YL_05, after the CTD-Rosette operation was complete. The MultiNet was deployed using the vessel's P-frame and sea cable, while an auxiliary winch was used to carry the cod end of MultiNet over the rail. The test deployment was considered successful.

While on station YL_06, the CTD winch experienced issues with its software while the CTD-Rosette was suspended at 20 m and on its upcast. The CTD-Rosette remained suspended there for approximately 50 minutes until the issue was fixed. The issue was believed to have been caused by the power outage that occurred earlier in the mission.

Operations were completed at the last station on the YL (station YL_10) at 10:30 UTC on Wednesday, October 1, and the vessel proceeded to the adjacent station on the Portsmouth Line (PL), station PL_01. Conditions significantly worsened throughout the day, but operations were still possible until the vessel reached station PL_06. Here, it was was determined that the weather conditions were too poor to deploy the ring net assembly. Conditions slightly improved when sampling stations PL_07 through PL_09, permitting ring net operations at each station. Replicate eDNA samples were collected from the bottom waters at stations PL_07 and PL_09, which provided the opportunity to train other staff on eDNA sample collection. The PL was

completed at 19:17 UTC on Thursday, October 2, and the vessel began its 29 nm transit towards the start of the Northeast Channel Line (NEC), starting with station NEC_01.

CTD operations at station NEC_01 started at 22:39 UTC on Thursday, October 2. The ring net operation at station NEC_01 was aborted and was re-deployed after the system went under the ship during its ascent, invalidating its catch. The second ring net at NEC_01 was conducted successfully, as were all other operations on this line. While in the Northeast Channel, a plan for sampling upcoming stations on the AZMP Browns Bank Line (BBL) and at the VPR and MultiNet stations in nearby Roseway Basin (RB) that would allow for the VPR and MultiNet stations to occur during the 24:00 - 12:00 shift when VPR operator Catherine Johnson was on watch. After completion of operations in the NEC, CTD-Rosette and ring net operations at AZMP stations BBL_07 through BBL_04 were conducted before breaking off the line and heading to VPR and MultiNet station RB_01. The intention was to complete VPR and MultiNet operations at stations RB_01, RB_e, and RB_d before heading back to Browns Bank to finish AZMP stations BBL_03 through BBL_01. This adaptation was required to ensure VPR and MultiNet stations occurred during 24:00 - 12:00, when the VPR operator was on shift.

On Saturday, October 4, the RRS *James Cook* arrived at station RB_01 and started with the MultiNet deployment. Starting with the MultiNet first maximized station operations by allowing for the VPR operator to assist with washing the MultiNet nets once the VPR was in the water. The MultiNet operation at RB_01 was completed successfully and the VPR was deployed. However, after 50 minutes in “yo-yo” mode the VPR stopped strobing, and was subsequently recovered. Upon recovery and subsequent data download, it was discovered that the data file on the data cartridge connected to the VPR was faulty. The data cartridge was switched prior to deployment at station RB_e, and VPR operations were successful at this station. At station RB_d, the VPR was readied for deployment and turned on. Shortly after it was turned on, a fin whale was sighted on the bridge within 50 m of the vessel. The protocol was to cease operations and wait until the whale was at least 400 m from the vessel. The whale did not re-surface nearby, but out of an abundance of caution, deployment was delayed by another 10 minutes. The VPR was checked after delay, and all indicator lights were on, indicating a fault had occurred. The system was shut off and restarted, but the indicator lights came on again. A decision was made not to deploy it at station RB_d, and to move on to AZMP stations BBL_03 through BBL_01 while the VPR was troubleshooted. Operations at BBL_01 were completed at 00:28 UTC on Sunday, October 5, and the vessel proceeded back to Roseway Basin to complete the remaining VPR and MultiNet stations, starting with RB_c.

The data cartridges of the VPR were both reformatted and the VPR’s batteries were changed prior to arrival in Roseway Basin. The system was deployed at stations RB_c, RB_b, RB_a, and BBL_02. As data download was slow, the VPR operator downloaded the data directly from the VPR’s computer. The VPR continued to work properly until station BBL_02, where it stopped strobing on its first ascent and was subsequently recovered. A battery change and data reformatting were done, and it was redeployed. The system appeared to work for four yo-yos, and then stopped strobing again. A decision was made to leave this station and move on, but aim to deploy it at a secondary station in LaHave Basin, when on route to the Halifax Line. The last operation in Roseway was the mooring recovery at station ROBP. Upon recovery of the mooring, the AIS beacon was noticed to be non-operational. An attempt to remove the beacon’s end cap was aborted after finding it was too difficult to twist off. From there, the mooring team deduced that the beacon had flooded, which possibly resulted in corrosion of its lithium batteries. Out of an abundance of caution and in consultation with the Captain and crew, the beacon was

disposed of at sea to avoid the potential for it to become a projectile. A new PAM mooring was deployed in Roseway Basin before the vessel departed and headed towards the Halifax Line, with plans to stop at a secondary VPR and MultiNet station in LaHave Basin.

Multinet and VPR operations began at station LH_01 in LaHave Basin at 03:58 UTC on Monday, October 6. The VPR operated without issue, and once recovered, the vessel continued on towards Halifax Line station HL_01. Prior to arriving, the bridge notified the science team on duty that there was a Notice to Mariners (NOTMAR) warning regarding an array of acoustic moorings situated in close proximity (within 264 m) to HL_01. The bridge took care to watch the drift of the vessel during operations at this station, and repositioned in between deployments.

While conducting operations along the Halifax Line, science staff noted a discrepancy of ~ 3-4 m between the total water column depth from the 12 kHz sounder, and that indicated by the CTD package (whilst accounting for the altimeter height). While the position of the CTD-Rosette when deployed is likely slightly different than the position of the ship's echosounders, this discrepancy was attributed to the relative inaccuracy of the 12 kHz echosounder. Historically, the livedata.science URL used by the ring net operators has provided real-time position and depth information from multibeam data. Because multibeam was not used during the JC28302 mission, the depth displayed on livedata.science instead was provided by the 12 kHz sounder. The 12 kHz system is a single-beam sensor with a 60° footprint and is considered less accurate than multibeam, which provides a direct, narrow measurement beneath the ship. Consequently, the depth information used to evaluate the deployment target depth were less reliable, and potentially increased the gap between the bottom of the ring-net assembly and the true seabed. To address this, a workaround was implemented, where the ring-net operator instructed the winch operator to lower the net to roughly 10 m above the seabed (based on livedata.science). The winch operator then slowly continued to pay out cable until the winch block went slack, indicating that the ring-net weight had contacted the seabed. The assembly was then retrieved. This method worked effectively in water shallower than ~200 m, but in deeper water it became difficult to detect slack in the block.

Operations were completed on the final station of the Halifax Line (HL_07) on Wednesday, October 8 at 05:25 UTC, and the vessel then made its way to Logan Canyon, a deep submarine canyon located on the edge of Sable Island Bank. As part of a collaboration between DFO's Cetacean Research and Monitoring group and NRCan's Offshore Wind Energy Area data collection campaign, a passive acoustic/oceanographic mooring was deployed in Logan Canyon. Upon completion of its deployment, the mooring was triangulated to get a more accurate depiction of its actual location on the sea bed. After the triangulation was completed, the vessel proceeded east towards The Gully MPA. The initial plan while in The Gully MPA was to start with the occupation of AZMP's CTD-Rosette and ring net stations there. However, a review of the forecast showed that a storm would pass through the area on October 9, and would affect the recovery of the single remaining OTN acoustic receiver mooring situated at the head of The Gully. Consequently, the chief scientist made the decision to head towards the OTN acoustic receiver mooring (station G03) at the head of The Gully, and attempt its recovery during the remaining daylight hours on October 8 and before the conditions worsened.

The vessel arrived at G03 at 20:30 UTC on October 8, and the mooring team began communicating with the mooring from an initial distance of 100 m from its nominal coordinates. After receiving no response, the vessel was repositioned directly over the site and eventually obtained an autoscan response indicating the mooring was 297 m away at a depth of

approximately 311 m. The vessel was then moved slightly off-position to allow for a safe release and resurfacing, but no confirmation of release was received. A second attempt was made after repositioning the ship to 358 m away. Again, no confirmation was returned from the mooring release. Attempts to scan for the VR4 serial number (250521) resulted in errors, and an alternate number (520521) produced no detections. By 21:30 UTC, the captain advised that operations would need to cease within ten minutes due to diminishing daylight. The mooring team attempted to obtain a health status update to determine whether the release was vertical and functioning, which would allow for a possible recovery attempt the following day. However, repeated autoscan and health-status queries produced no response. The lack of communication from the release serial suggested the line might have been cut and the floatation was no longer attached, which would prevent its recovery. Following multiple unsuccessful attempts, the team abandoned the mooring recovery, and proceeded to the first AZMP station in the MPA, GUL_01. Activities at GUL_01 through GUL_03 were completed successfully.

The Gully MPA included a planned deployment of a PAM mooring at a station referred to as the 'Mid-Gully' (MGL). The mooring team and crew found it challenging to move all the mooring components on deck given the poor sea state (~3 m), and the deployment of the mooring was challenging given the conditions. The entire deployment operation began at 14:18 UTC and ended at 15:00 UTC on October 9. After allowing enough time to pass for the mooring to reach the seabed, the vessel was directed to move in a semi-circle around the deployment location, to allow for the mooring team to triangulate its position. Although a mooring position was received, it was deemed fairly low accuracy by the deck unit. Given the inclement conditions and the low likelihood of getting a more accurate position, the chief scientist made the decision to move on to the final AZMP station in The Gully MPA, GUL_04, and completed operations at 21:00 UTC. The vessel then proceeded to its next work location at the mouth of the Laurentian Channel.

Arrival at the first station on the Laurentian Channel Mouth (LCM) line was later than anticipated due to inclement conditions and slower transit speeds (~8.5 nautical miles). Upon recovery of the CTD-Rosette at LCM_01, high swells caused the sea cable to jump its sheave. While the cable was put back into its sheave, it had been pinched in the process. Thereafter, the NMF CTD technicians conducted an electrical test each day on the cable to determine if the cable's conducting power was decreasing. The cable continued to function for the remainder of the mission and a switch to the secondary sea cable ('Deep Tow') was not required. Operations continued across the LCM line, and the line was completed with the final station, LCM_10, on Saturday, October 11 at 03:48 UTC. From there, the vessel began its transit southwest, towards mooring station 'ECD' (Eastern Canyons Deep). The ECD mooring was deployed one year prior during the 2024 fall AZMP mission on the RRS *Discovery* (Beazley et al. 2025b). This mooring was deployed as part of a collaboration between DFO and NRCan to assess the presence of cetaceans and benthic processes in relatively deep, unexplored waters within DFO's Eastern Canyons Marine Refuge. Recovery of the ECD mooring was allocated 6 hours of operational time given the mooring's length and complexity. However, recovery, including a triangulation prior to the mooring's release, was completed within approximately 3 hours.

Upon completion of the ECD mooring operation, the vessel then proceeded to the end of the AZMP Louisbourg Line to begin CTD-Rosette and ring net operations. As the end of Segment 1 and the October 15 crew change was quickly approaching, the chief scientist reviewed the upcoming activities relative to the time remaining, and realized there was time in the program to add additional science operations. After consultation with DFO staff both on board and ashore, several additional activities were planned, which included a dedicated marine mammal survey

of the Shortland Canyon Critical Habitat for northern bottlenose whales, VPR and MultiNet deployments at secondary stations located on the eastern Scotian Shelf, and the collection of eDNA and other oceanographic data from the Eastern Shore Islands Area of Interest. See the section on Mission Achievements below for more details.

The additional marine mammal survey of Shortland Canyon was completed while on route from Louisbourg Line stations LL_07 to LL_06, and was considered successful with confirmed sightings of northern bottlenose whales and other species. The vessel rejoined the Louisbourg Line and continued AZMP sampling activities. The last station on the line, LL_01, was completed at 13:12 UTC on Monday, October 13, marking the end of the planned operations for Segment 1 of JC28302. From here, the vessel proceeded to three secondary MultiNet and VPR stations (A2, T3, and CN_01) on the eastern Scotian Shelf, south of Cape Breton. The MultiNet and VPR systems were deployed at each station, although the VPR experienced issues on stations T3 and CN_01, and stopped strobing after three ascents of its yo-yo period. It was re-deployed successfully on CN_01.

Upon completion of CN_01, the vessel transited west towards DFO's Eastern Shore Islands Area of Interest. A suite of 16 monitoring stations separated into 4 transects (4 stations per transect) running from the coast to the offshore edge of the AOI boundary have been historically sampled in support of characterizing the benthic biodiversity of the AOI. Of these 16 stations, the four outer-most stations of each of the 4 transects (stations ESI_4, ESI_8, ESI_12, and ESI_16), as well as ESI_7 and ESI_6, which run north towards the coast, were identified as priorities for the collection of eDNA samples. The CTD-Rosette was deployed at each station, and replicate eDNA samples were collected from the bottom depths in order to capture the species diversity of the area in support of Marine Conservation Targets (MCT) initiatives.

Upon completion of the final selected station in the Eastern Shore Islands AOI, the vessel began its final transit towards Halifax for crew change. Since the transit to Halifax was progressing ahead of schedule, the pilot was booked early for 20:30 ADT on Tuesday, October 14. Once the pilot boarded, the vessel began its transit through the harbour, and arrived at BIO at ~ 22:00 ADT. At this point, science staff were permitted to disembark for the evening or stay on board. On the following morning, collected samples and recovered mooring equipment were offloaded to simplify the final mission demobilization after Segment 2, and a vessel crew change was conducted. The chief scientist met with the incoming Captain, Commanding Officer John Leask, along with the lead NMF technician Jade Garner, to review the science activities planned for Segment 2 and departure times. A familiarization meeting was held that afternoon for the eight new science staffing joining Segment 2.

On Thursday, October 16, the RRS *James Cook* departed BIO at 09:00 ADT, marking the start of Segment 2 of JC28302. AZMP high-frequency station HL_02 was occupied before the vessel headed towards the next work location in the Cabot Strait. The initial plan was to start operations with the recovery of a PAM mooring array situated across Cabot Strait, if the vessel arrived to the area during daylight hours. This mooring array was deployed during the 2024 fall AZMP survey to monitor the migration of North Atlantic right whales in and out of the Gulf of St. Lawrence as part of DFO's Whales Initiative. However, on Friday, October 17, the vessel arrived in the Cabot Strait after daylight hours, at approximately 22:00 UTC. Instead, the Cabot Strait Line (CSL) AZMP stations were occupied during the overnight hours, starting with station CSL_01. Meanwhile, a science staff member began suffering from severe seasickness. After consultation with the Captain and medical officer on board, a decision was made to disembark the staff

member at the earliest point possible on the following day, Saturday, October 18. Stations CSL_01 through CSL_04 were sampled, and the vessel then departed the Cabot Strait area and made way towards the nearest large port, in Sydney, NS.

On the morning of Saturday, October 18, the RRS *James Cook* tied up at the Main Wharf in the Port of Sydney, to disembark the ill science staff member, as a boat could not be arranged to conduct the transfer at sea. The vessel departed the wharf shortly after 15:00 UTC. Various scenarios were evaluated to see whether all planned activities for Segment 2 could be completed. As there wasn't enough time to reach the Cabot Strait during daylight hours to start recovering moorings, the chief scientist had planned to instead sample a few stations on the AZMP St. Anns Bank (STAB) line, before breaking off and respositioning the vessel on the mooring array at first light to attempt recovery on Sunday, October 19. The vessel arrived at the first station, STAB_01, at 21:30 UTC and began CTD-Rosette operations. Stations STAB_02 and STAB_03 were completed overnight, before breaking off the line to head north to the Cabot Strait.

The vessel arrived at the first mooring station, called 'Cape Breton North' (CBN) in Cabot Strait at 11:07 UTC and the mooring team began communicating with the mooring release. The mooring was released shortly thereafter and once at the surface, was recovered at 11:33 UTC using the vessel's P-frame. The vessel moved on to the next mooring station, 'Cabot Strait West' (CSW), and recovered the mooring there. The other four moorings in the array (CS1, CS2, CS3, and CSE, for 'Cabot Strait East') were recovered efficiently, and mooring operations were finished at 20:33 UTC on Sunday, October 19. The plan after this was to complete the outstanding AZMP stations on the Cabot Strait Line. The vessel repositioned on CSL_06 and completed the CTD-Rosette and ring net operations there. CSL_05 was then occupied and operations were completed at 01:43 UTC on Monday, October 20. The vessel then made its way to St. Anns Bank to complete the outstanding stations on the AZMP St. Anns Bank line.

The vessel arrived at station STAB_06 on Monday, October 20, at 08:10 UTC and completed the CTD-Rosette and ring net operations there. The vessel continued west, to complete STAB_05 and STAB_04. An additional ring net deployment was conducted at STAB_04 to collect a live sample for taxonomic assessment on board. All operations were completed at 16:02 UTC that day. As the planned disembarkation time in Mulgrave, NS wasn't until the following day (October 21) at 08:00 ADT, this gave a few additional hours to conduct another opportunistic marine mammal survey. The survey location, an area known as the Sydney Bight, a recently identified Wind Energy Area, was collaboratively chosen through discussions between DFO's Cetacean Monitoring and Research team members and Mi'kmaw partners from UINR. Approximately two hours were spent conducting the survey while the vessel transited north, and a number of baleen whales were sighted. Once completed, the vessel transited south and towards Mulgrave. The vessel arrived at the Mulgrave pilot station at 07:00 ADT. Once the pilot boarded, the vessel made its transit through the Canso canal, and arrived at the Mulgrave Marine Terminal at 08:30 ADT. Once the vessel was secured, demobilization activities began. Most scientific and equipment were loaded into two 20' ISO containers on board, which were offloaded onto a flatbed truck provided by the Canadian Coast Guard, and transported back to BIO. Science staff boarded a mini passenger bus and returned to BIO to offload samples and equipment, marking the conclusion of the 2025 fall JC28302 mission.

APPENDIX B Participants

A total of 26 scientific personnel participated in the JC28302 mission (see Table B.1). The first segment was staffed by 18 personnel, including 14 from DFO, one seabird observer from Environment and Climate Change Canada's Canadian Wildlife Service, and three students representing the laboratories of Drs. Carolyn Buchwald, Julie LaRoche at Dalhousie University in Halifax, Nova Scotia. The chief scientist was Lindsay Beazley (DFO), with Catherine Johnson (DFO) as night shift captain. DFO mooring technician Matthew Lawson led all mooring operations and also assisted with CTD operations and sample analysis.

Upon conclusion of the first segment of the mission, four DFO personnel disembarked and eight new participants joined for the second segment, including five DFO personnel, one representative of Kwilmu'kw Maw-lkusuaqn (KMK) in Millbrook, Nova Scotia, and two representatives of the Unama'ki Institute of Natural Resources (UINR) located in Eskasoni, Cape Breton, Nova Scotia.

Science staff were organized into 12-hour shifts to support continuous operations. Most staff supporting AZMP activities were organized into 12:00-24:00 or 24:00-12:00 shifts, while mooring personnel operated from 6:00-18:00, and wildlife activities observers took watch from 07:00-19:00.

A total of 14 ship's crew and six National Marine Facility (NMF) technicians supported vessel and scientific operations. The lead marine technician was Jade Garner (24:00 - 12:00). Commanding Officer James Gwinnell served as captain of the RRS *James Cook* during the first segment, while Commanding Officer John Leask assumed command for the second segment.

Table B.1. Science personnel of Segments 1 and 2 of the 2025 fall mission (JC28302). Role and shift schedule is also shown. Affiliations are as follows: DFO = Fisheries and Oceans Canada, ECCC = Environment and Climate Change Canada, Dalhousie = Dalhousie University, KMK = Kwilmu'kw Maw-lkusuaqn, UINR = Unama'ki Institute of Natural Resources.

Role	Aff.	Shift	Segment 1	Segment 2
Chief Scientist	DFO	06:00-18:00	Lindsay Beazley	Lindsay Beazley
CTD acquisition/moorings	DFO	24:00-12:00	Katie Warman	Katie Warman
CTD acquisition	DFO	24:00-12:00	Patrick Upson	Patrick Upson
Lab filtration	DFO	12:00-24:00	Tim Perry	Kristen Wilson
Lab filtration	DFO	24:00-12:00	Peter Thamer	Peter Thamer
Ring net operator/filtration	DFO	12:00-24:00	Melanie Hardy	Emmanuel Devred
Ring net operator/night shift captain	DFO	24:00-12:00	Catherine Johnson	Catherine Johnson
Lab support/filtration	DFO	24:00-12:00	Benoit Casault	Benoit Casault
Lab support/development	DFO	12:00-24:00	-	Emily O'Grady
Mooring technical lead	DFO	06:00-18:00	Mat Lawson	Mat Lawson

Table B.1. *(continued)*

Role	Aff.	Shift	Segment 1	Segment 2
Mooring technician	DFO	06:00-18:00	Adam Hartling	Adam Hartling
Marine mammal observer/moorings	DFO	06:00-18:00	Mike Adams	Mike Adams
Marine mammal observer	DFO	07:00-19:00	Natalie Colbourne	Hilary Moors-Murphy
Data manager	DFO	12:00-24:00	Diana Cardoso	Diana Cardoso
Communications lead	DFO	08:00-16:00	Rachael Mahoney	-
Seabird observer	ECCC	07:00-19:00	Jeannine Winkel	Jeannine Winkel
Water sampling/filtration	DAL	16:00-06:00	Steph Duffy	Steph Duffy
Water sampling/filtration	DAL	12:00-24:00	Sofia Dragoti	Sofia Dragoti
Water sampling/filtration	DAL	24:00-12:00	Katie Halloran	Katie Halloran
Indigenous MPA science/eDNA	KMK	08:00-16:00	-	Bec Borchert
Indigenous MPA science/eDNA	UINR	08:00-16:00	-	Joef Bernard
Indigenous MPA science/eDNA	UINR	08:00-16:00	-	Morgan Denny
Indigenous science/liaison	DFO	08:00-20:00	-	Raven Elwell

APPENDIX C Detailed Gear Operations Conducted during the JC28302 Mission

This appendix provides a detailed log of all gear deployments and recoveries conducted during the JC28302 mission. Operations are listed sequentially by event number and include the station identifier, gear type, deployment position, date, mean water depth from the 12 kHz echosounder, duration of activity, and associated operational comments. These records were generated from the shipboard electronic log (ELOG) system and provide a complete operational record of sampling activities conducted during the mission.

Table C.1. Operations conducted at each station during the 2025 fall AZMP mission (JC28302), ordered sequentially by Event number. Event coordinates (in decimal degrees - DD) reflect the ship's position at the time of deployment, as recorded using the ELOG meta-data logger. Mean depth (m) is calculated as the average water depth recorded by the ship's echosounder at the time each action was recorded for each station. Comments are associated with the 'action' on which they were entered for each event: Aborted (failed event), Deployed (gear deployment), Bottom (gear at the bottom), and Recovered (gear recovery). Note that multiple comments/actions can be present for a single event.

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
1	HL_02	CTD-Rosette	44.2673	-63.3154	2025-09-28	152	00:43:51	
2	HL_02	202 µm net	44.2673	-63.3154	2025-09-28	152	00:07:51	
3	HL_02	76 µm net	44.2673	-63.3154	2025-09-28	152	00:08:07	
4	HL_02	Secchi Disc	44.2673	-63.3154	2025-09-28	152	00:04:01	
5	GMB	Mooring Recovery	44.6732	-66.5288	2025-09-29	183	00:18:43	Attempted Comms: soundtraps used not amars Release: soundtraps used not amars On Deck: soundtraps used not amars
6	GMB	Mooring Deployment	44.6730	-66.5310	2025-09-29	183	00:18:42	Start Deployment: soundtraps used not amars Other: soundtraps used not amars
7	YL_01	CTD-Rosette	43.7501	-66.4000	2025-09-30	74	00:33:38	
8	YL_01	202 µm net	43.7502	-66.4000	2025-09-30	74	00:06:55	Deployed: 2 sample bottles
9	YL_02	CTD-Rosette	43.6799	-66.8512	2025-09-30	123	00:32:47	
10	YL_02	202 µm net	43.6799	-66.8512	2025-09-30	130	00:06:25	
11	YL_03	CTD-Rosette	43.6097	-67.3022	2025-09-30	211	00:34:11	
12	YL_03	202 µm net	43.6097	-67.3022	2025-09-30	212	00:11:57	
13	YL_04	CTD-Rosette	43.5391	-67.7533	2025-09-30	245	00:45:33	Bottom: Forgot to submit. Using time from bottom bottle
14	YL_04	202 µm net	43.5391	-67.7533	2025-09-30	244	00:12:08	
15	YL_05	CTD-Rosette	43.4689	-68.2133	2025-09-30	185	00:43:55	
16	YL_05	Multinet	43.4690	-68.2151	2025-09-30	181	00:20:25	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
17	YL_05	202 µm net	43.4695	-68.2173	2025-09-30	185	00:11:25	
18	YL_06	CTD-Rosette	43.3985	-68.6641	2025-09-30	146	01:24:57	Bottom: bottom recorded late : actual time 20:08:44.99 changed time field Recovered: CTD winch stopped working when at 20 m coming up. Took 50 mins to resolve while CTD hung at 20 m from 17:25-18:15
19	YL_06	202 µm net	43.3985	-68.6641	2025-09-30	147	00:08:59	Deployed: 2 sample bottles
20	YL_07	CTD-Rosette	43.3284	-69.1063	2025-09-30	155	00:46:04	
21	YL_07	202 µm net	43.3284	-69.1063	2025-10-01	155	00:09:09	Deployed: 2 sample bottles
22	YL_08	CTD-Rosette	43.2580	-69.5578	2025-10-01	157	00:31:00	Recovered: Bottle 3 didn't seal completely
23	YL_08	202 µm net	43.2580	-69.5585	2025-10-01	159	00:07:24	Recovered: 2 sample bottles
24	YL_09	CTD-Rosette	43.1861	-70.0099	2025-10-01	94	00:25:14	Deployed: entered wrong IDs. Should have been 521 not 421 Bottom: entered wrong IDs. Should have been 521 not 421 Recovered: entered wrong IDs. Should have been 521 not 421
25	YL_09	202 µm net	43.1861	-70.0099	2025-10-01	90	00:06:45	
26	YL_10	CTD-Rosette	43.1566	-70.2727	2025-10-01	127	00:30:21	Recovered: Bottles 3 and 10 didn't seal completely.

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
27	YL_10	202 µm net	43.1567	-70.2727	2025-10-01	126	00:09:03	Recovered: Cod end was detached from sandwich clamp at end of tow. Sample looks OK.
28	PL_01	CTD-Rosette	43.0334	-70.0086	2025-10-01	138	00:38:50	Recovered: Very choppy out. 5 m was the best we could do for surface bottle. Bottle 3 didn't seal. CTD techs will swap it out.
29	PL_01	202 µm net	43.0334	-70.0085	2025-10-01	139	00:08:19	Recovered: cod end detached from clamp. sample looks OK. 3 jars.
30	PL_02	CTD-Rosette	42.9545	-69.5579	2025-10-01	169	00:36:06	Deployed: Deployed submitted late! fixed time field from 155459.0011 to 15:43:20.95 Bottom: Bottom recorded late! fixed time field; 01-OCT-2025 15:53:22.77
31	PL_02	202 µm net	42.9545	-69.5579	2025-10-01	169	00:09:05	
32	PL_03	CTD-Rosette	42.8758	-69.1065	2025-10-01	186	00:39:40	
33	PL_03	202 µm net	42.8759	-69.1071	2025-10-01	186	00:10:20	
34	PL_04	CTD-Rosette	42.7893	-68.6555	2025-10-01	202	00:45:04	
35	PL_04	202 µm net	42.7892	-68.6553	2025-10-01	202	00:12:06	
36	PL_05	CTD-Rosette	42.7022	-68.2044	2025-10-02	135	00:44:11	
37	PL_05	202 µm net	42.7022	-68.2052	2025-10-02	189	00:09:43	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
38	PL_06	CTD-Rosette	42.6226	-67.7646	2025-10-02	206	00:42:30	Deployed: Cable on station. We deployed 500m south. Sounder recorded 17.79m. Used recovery sounding for depth Bottom: Forgot to submit bottom. Depth recorded as 18.79m. Used bottom bottle for time and recovery for depth. Recovered: Air vent knobs on bottles weren't tightened before cast
39	PL_06	202 µm net	42.6258	-67.7651	2025-10-02	207	00:00:00	Aborted: Weather was too intense.
40	PL_07	CTD-Rosette	42.5525	-67.3023	2025-10-02	301	00:51:15	Deployed: Sounder isn't working. Bridge gave us a depth of 297 to start with. Sounder recorded 16.89m. Bottom: Forgot to hit bottom. Used bottom bottle for time
41	PL_07	202 µm net	42.5525	-67.3022	2025-10-02	303	00:16:08	
42	PL_08	CTD-Rosette	42.4623	-66.8515	2025-10-02	329	00:52:15	
43	PL_08	202 µm net	42.4623	-66.8515	2025-10-02	329	00:17:30	
44	PL_09	CTD-Rosette	42.3777	-66.3996	2025-10-02	270	00:51:59	
45	PL_09	202 µm net	42.3771	-66.4018	2025-10-02	270	00:15:58	
46	NEC_01	CTD-Rosette	42.4183	-65.7434	2025-10-02	102	00:36:17	Bottom: LATE BOTTOM SUBMISSION changed field from225514.0003 to 22:51:13.07

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
47	NEC_01	202 µm net	42.4183	-65.7434	2025-10-02	134	00:06:25	Deployed: true depth 100m Aborted: stopped net mid way up due to going under ship
48	NEC_01	202 µm net	42.4188	-65.7432	2025-10-02	102	00:06:59	
49	NEC_02	CTD-Rosette	42.3367	-65.8083	2025-10-03	206	00:48:00	
50	NEC_02	202 µm net	42.3367	-65.8083	2025-10-03	206	00:12:15	
51	NEC_03	CTD-Rosette	42.3000	-65.8397	2025-10-03	220	00:40:48	
52	NEC_04	CTD-Rosette	42.2715	-65.8695	2025-10-03	229	00:38:01	Recovered: Bottle 6 didn't seal completely and is leaking. accidently marked this as event 53 on deployed CTD. Fixed file names and header to event 52.
53	NEC_04	202 µm net	42.2703	-65.8703	2025-10-03	229	00:15:11	Deployed: 2 deployed events logged, removed deployed with message ID 158
54	NEC_05	CTD-Rosette	42.2333	-65.9025	2025-10-03	239	00:39:58	
55	NEC_06	CTD-Rosette	42.2000	-65.9383	2025-10-03	232	00:42:03	
56	NEC_06	202 µm net	42.2000	-65.9401	2025-10-03	229	00:12:37	Recovered: 2 sample bottles
57	NEC_07	CTD-Rosette	42.1633	-65.9713	2025-10-03	226	00:37:33	Deployed: Buggered the deployment up fixing an e-log error. Will get the correct deployment time from bridge log.
58	NEC_08	CTD-Rosette	42.1183	-66.0374	2025-10-03	209	00:42:43	
59	NEC_08	202 µm net	42.1183	-66.0374	2025-10-03	208	00:11:37	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
60	NEC_09	CTD-Rosette	42.0583	-66.0833	2025-10-03	111	00:31:56	
61	NEC_10	CTD-Rosette	41.9824	-66.1411	2025-10-03	96	00:31:42	Recovered: Air vent knobs weren't closed on CTD Bottles.
62	NEC_10	202 µm net	41.9805	-66.1303	2025-10-03	95	00:06:14	
63	BBL_07	CTD-Rosette	41.8641	-65.3500	2025-10-03	1884	01:46:26	Bottom: LATE BOTTOM SUBMISSION
64	BBL_07	202 µm net	41.8629	-65.3532	2025-10-03	1881	00:52:16	
65	BBL_06	CTD-Rosette	42.0000	-65.5100	2025-10-03	1086	01:27:49	
66	BBL_06	202 µm net	42.0000	-65.5100	2025-10-04	1084	00:54:24	Recovered: 7lb helmet jellyfish!!!!!!
67	BBL_05	CTD-Rosette	42.1333	-65.5000	2025-10-04	192	00:42:42	Recovered: CTD techs will swap out a noisy secondary oxygen sensor
68	BBL_05	202 µm net	42.1303	-65.5012	2025-10-04	191	00:13:35	
69	BBL_04	CTD-Rosette	42.4498	-65.4830	2025-10-04	103	00:27:14	Deployed: New secondary oxygen sensor on this cast Recovered: Oxygen sensor looks good on this cast
70	BBL_04	202 µm net	42.4483	-65.4852	2025-10-04	103	00:06:59	
71	RB_01	Multinet	42.8500	-65.4824	2025-10-04	135	00:09:43	
72	RB_01	VPR	42.8500	-65.4824	2025-10-04	135	00:51:42	Aborted: no longer strobing. recovered
73	RB_E	Multinet	42.8780	-65.3139	2025-10-04	155	00:17:13	
74	RB_E	VPR	42.8780	-65.3140	2025-10-04	155	01:08:25	
75	RB_D	Multinet	42.8993	-65.1645	2025-10-04	162	00:15:12	
76	BBL_03	CTD-Rosette	42.7886	-65.4817	2025-10-04	121	00:33:39	
77	BBL_03	202 µm net	42.7880	-65.4819	2025-10-04	121	00:08:06	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
78	BBL_02	CTD-Rosette	42.9989	-65.4850	2025-10-04	119	00:36:24	Bottom: LATE BOTTOM SUBMISSION changed from 212733.0028 to 21:07:01.03
79	BBL_02	202 µm net	42.9986	-65.4872	2025-10-04	120	00:08:17	
80	BBL_01	CTD-Rosette	43.2315	-65.4683	2025-10-04	68	00:29:30	Deployed: Approx 1.2nm SW of station due to fishing buoys.
81	BBL_01	202 µm net	43.2314	-65.4684	2025-10-05	70	00:05:56	
82	RB_C	Multinet	42.9356	-65.0332	2025-10-05	112	00:12:11	
83	RB_C	VPR	42.9295	-65.0324	2025-10-05	112	01:15:31	
84	RB_B	Multinet	42.9630	-65.1659	2025-10-05	170	00:16:44	
85	RB_B	VPR	42.9632	-65.1659	2025-10-05	170	01:13:30	
86	RB_A	Multinet	42.9780	-65.3168	2025-10-05	162	00:16:14	
87	RB_A	VPR	42.9782	-65.3168	2025-10-05	162	01:10:00	
88	BBL_02	Multinet	43.0001	-65.4799	2025-10-05	118	00:14:15	
89	BBL_02	VPR	43.0000	-65.4798	2025-10-05	118	00:13:56	Aborted: Strobe light no working after first ascend
90	BBL_02	VPR	43.0000	-65.4798	2025-10-05	118	00:37:48	Aborted: stopped strobing
91	ROBP	Mooring Recovery	42.8482	-65.3091	2025-10-05		00:38:03	Attempted Comms: sounding , actual recovery 2.12.00
92	ROBP	Mooring Deployment	42.8495	-65.3141	2025-10-05		00:33:47	On Deck: retry rope pulling on battery pack
93	ROBP	Mooring Deployment	42.8496	-65.3149	2025-10-05	146	00:10:00	
94	LH_01	Multinet	43.6901	-63.7596	2025-10-06	240	00:19:29	
95	LH_01	VPR	43.6901	-63.7596	2025-10-06	242	01:29:41	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
96	HL_01	CTD-Rosette	44.4002	-63.4500	2025-10-06	94	00:29:00	Deployed: Aiming for 7m BTM instead of 5m because of new DRDC acoustic moorings 1m off floor at a nearby location
97	HL_01	202 µm net	44.4002	-63.4500	2025-10-06	90	00:06:35	
98	HL_02	CTD-Rosette	44.2674	-63.3158	2025-10-06	152	00:38:26	
99	HL_02	202 µm net	44.2673	-63.3162	2025-10-06	151	00:08:20	Recovered: wire out set at weight touching bottom
100	HL_02	76 µm net	44.2671	-63.3162	2025-10-06	151	00:07:38	Recovered: inside label says event 100
101	HL_02	Secchi Disc	44.2670	-63.3163	2025-10-06	152	00:02:45	
102	NSCM	Mooring Recovery	44.2503	-63.1676	2025-10-06	172	00:17:54	
103	NSCM	Mooring Deployment	44.2498	-63.1675	2025-10-06	172	00:07:23	
104	HL_03	CTD-Rosette	43.8835	-62.8830	2025-10-06	269	00:44:05	
105	HL_03	202 µm net	43.8835	-62.8830	2025-10-06	270	00:16:06	Deployed: ctd depth bottom 263
106	HL_03.3	CTD-Rosette	43.7635	-62.7527	2025-10-06	211	00:37:24	Bottom: LATE BOTTOM SUBMISSION changed from 214946.0034 to 21:26:15.19
107	HL_03.3	202 µm net	43.7635	-62.7527	2025-10-06	211	00:13:28	
108	HL_03.3	Multinet	43.7635	-62.7527	2025-10-07	211	00:20:31	
109	HL_03.3	VPR	43.7635	-62.7527	2025-10-07	211	00:27:51	Deployed: faulted on start Aborted: stopped strobing after first dip
110	HL_03.3	VPR	43.7635	-62.7527	2025-10-07	211	01:15:44	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
111	HL_04	CTD-Rosette	43.4786	-62.4504	2025-10-07	87	00:28:25	Recovered: Leak on bottle 16. Bottom cap didn't close properly
112	HL_04	202 µm net	43.4786	-62.4504	2025-10-07	87	00:06:59	Bottom: weight to bottom
113	HL_05	CTD-Rosette	43.1825	-62.0983	2025-10-07	104	00:30:56	
114	HL_05	202 µm net	43.1825	-62.0983	2025-10-07	104	00:08:35	Bottom: weight on bottom
115	HL_05.5	CTD-Rosette	42.9398	-61.8333	2025-10-07	444	00:55:57	
116	HL_05.5	202 µm net	42.9399	-61.8333	2025-10-07	461	00:26:30	
117	HL_06	CTD-Rosette	42.8317	-61.7332	2025-10-07	1098	01:28:13	Deployed: 2025-10-07 | 141327.0033 | 42 49.90518 N | 61 43.98889 W
118	HL_06	202 µm net	42.8312	-61.7332	2025-10-07	1106	00:50:52	
119	HL_06.3	CTD-Rosette	42.7334	-61.6166	2025-10-07	1675	01:42:14	
120	HL_06.3	202 µm net	42.7314	-61.6166	2025-10-07	1681	00:53:22	
121	HL_06.7	CTD-Rosette	42.6183	-61.5167	2025-10-07	2309	02:14:38	
122	HL_06.7	202 µm net	42.6183	-61.5167	2025-10-07	2309	00:51:19	
123	HL_07	CTD-Rosette	42.4749	-61.4332	2025-10-08	2758	02:27:21	Bottom: Forgot to hit bottom, corrected time to bottom bottle.
124	HL_07	202 µm net	42.4747	-61.4333	2025-10-08	2755	00:55:10	Recovered: 2 sample bottles
125	LOC	Mooring Deployment	43.4576	-59.9621	2025-10-08	1476	00:38:12	Start Deployment: updated deployment time to ships log depolyment
126	LOC	Mooring Triangulation	43.4630	-59.9566	2025-10-08	1420	00:31:58	Other: communicated, then triangulating, looking for a CEP50 of approx. 10

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
127	G03	Mooring Recovery	44.1344	-59.2282	2025-10-08	18	01:27:42	Aborted: Tried to release but no confirmation. Can see it via autoscan but will not release. unable to get tilt status.
128	GUL_01	CTD-Rosette	44.0979	-59.1061	2025-10-08	654	01:02:45	
129	GUL_01	202 µm net	44.0979	-59.1061	2025-10-09	697	00:36:05	
130	GULD_03	CTD-Rosette	43.9998	-59.0200	2025-10-09	522	00:19:12	Deployed: Ended up at the wrong station Aborted: Samples were set up for Gul_02 and it was close so we went to Glu_02 first.
131	GUL_02	CTD-Rosette	44.0098	-59.0001	2025-10-09	1216	01:16:20	
132	GUL_02	202 µm net	44.0035	-59.0001	2025-10-09	1219	00:50:50	
133	GULD_03	CTD-Rosette	43.9985	-59.0215	2025-10-09	423	00:43:49	
134	GULD_03	202 µm net	43.9994	-59.0199	2025-10-09	420	00:23:55	
135	GUL_03	CTD-Rosette	43.8885	-58.9537	2025-10-09	1696	01:41:41	Deployed: Sounding was NA. Used bottom sounding.
136	GUL_03	202 µm net	43.8878	-58.9536	2025-10-09	1748	00:59:40	
137	MGL	Mooring Deployment	43.8578	-58.9133	2025-10-09	1584	00:41:49	On Bottom: 1600 - 1700 m approx depth, sounder off
138	MGL	Mooring Triangulation	43.8533	-58.9132	2025-10-09		00:50:06	
139	GUL_04	CTD-Rosette	43.7867	-58.9002	2025-10-09	1946	02:13:37	
140	GUL_04	202 µm net	43.7828	-58.9102	2025-10-09	2076	00:52:53	Bottom: Sounding was NA. Used depolyed sounding. Recovered: Sounding was NA. Used depolyed sounding

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
141	LCM_01	CTD-Rosette	44.7195	-57.6542	2025-10-10	33	00:20:31	Bottom: Forgot to hit bottom. Such a short cast. Recovered: Sounding is all over the place. This should be about 30 metres
142	LCM_01	202 µm net	44.7195	-57.6546	2025-10-10	62	00:13:07	Deployed: weight on bottom. sounding from ctd is 31 m.
143	LCM_02	CTD-Rosette	44.7448	-57.4745	2025-10-10	45	00:23:50	Deployed: Sounder isn't giving an accurate reading. We expect it to be about 54m deep here. Bottom: Using deployed sounding Recovered: Using deployed sounding
144	LCM_02	202 µm net	44.7447	-57.4748	2025-10-10	53	00:05:04	Deployed: sounding from ctd Bottom: weight on bottom
145	LCM_03	CTD-Rosette	44.7623	-57.3486	2025-10-10	73	00:26:43	
146	LCM_03	202 µm net	44.7620	-57.3501	2025-10-10	77	00:05:57	Deployed: sounding from ctd 72 m Recovered: inside label says event 145 in error
147	LCM_04	CTD-Rosette	44.7800	-57.2503	2025-10-10	405	00:56:15	
148	LCM_04	202 µm net	44.7800	-57.2515	2025-10-10	405	00:22:22	Recovered: dropped sample, not saved or repeated.
149	LCM_05	CTD-Rosette	44.8086	-57.0265	2025-10-10	430	00:52:39	
150	LCM_05	202 µm net	44.8072	-57.0288	2025-10-10	433	00:22:51	Bottom: ctd altimeter 423. Sounder was off using sounding from surface.

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
151	LCM_06	CTD-Rosette	44.8473	-56.8077	2025-10-10	429	00:47:29	
152	LCM_06	202 µm net	44.8462	-56.8095	2025-10-10	428	00:22:01	Bottom: ctd altimeter 425
153	LCM_07	CTD-Rosette	44.8900	-56.6300	2025-10-10	414	00:46:44	Bottom: Late Bottom Submission. Edited.
154	LCM_07	202 µm net	44.8900	-56.6300	2025-10-10	413	00:20:51	Bottom: ctd altimeter 405
155	LCM_08	CTD-Rosette	44.9200	-56.4400	2025-10-10	393	00:44:54	
156	LCM_08	202 µm net	44.9200	-56.4400	2025-10-10	393	00:21:04	Bottom: ctd altimeter 390
157	LCM_09	CTD-Rosette	44.9800	-56.1416	2025-10-11	231	00:43:14	
158	LCM_09	202 µm net	44.9800	-56.1408	2025-10-11	232	00:12:50	Bottom: ctd altimeter 220
159	LCM_10	CTD-Rosette	45.0000	-56.0299	2025-10-11	105	00:31:02	Bottom: ctd altimiter 100
160	LCM_10	202 µm net	44.9995	-56.0299	2025-10-11	106	00:08:08	Bottom: weight at bottom
161	ECD	Mooring Triangulation	43.2008	-57.6111	2025-10-11	3888	01:30:46	Attempted Comms: Initial comms and survey. Other: Success communication 16:01 , Survey Started 16:08, Location obtained at 16:58. Transiting over location before ending survey.
162	ECD	Mooring Recovery	43.2012	-57.6037	2025-10-11	4040	01:44:59	Release: comms and survey done before during event 161 On Deck: on water 18:50:13 GMT,
163	LL_09	CTD-Rosette	43.4732	-57.5267	2025-10-11	3684	02:01:29	Recovered: Bottle 24 did not seal
164	LL_09	202 µm net	43.4727	-57.5267	2025-10-12	3700	00:50:09	
165	LL_08	CTD-Rosette	43.7833	-57.8329	2025-10-12	3527	02:34:21	Bottom: ctd altimiter 2883m Recovered: Leak on Bottle 10
166	LL_08	202 µm net	43.7833	-57.8329	2025-10-12	2874	00:54:37	Recovered: 2 sample bottles

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
167	LL_07	CTD-Rosette	44.1335	-58.1751	2025-10-12	744	01:02:00	Bottom: ctd altimiter 750m Recovered: Bottle 3 leaked
168	LL_07	202 µm net	44.1335	-58.1755	2025-10-12	735	00:38:51	
169	MMO_END	MMO Survey	43.9859	-58.4170	2025-10-12	2167	02:05:06	Other: 2168.80 at start
170	LL_06	CTD-Rosette	44.4749	-58.5077	2025-10-12	131	00:23:28	
171	LL_06	202 µm net	44.4749	-58.5077	2025-10-12	87	00:04:21	Bottom: ctd altimeter 62
172	LL_05	CTD-Rosette	44.8167	-58.8500	2025-10-12	239	00:36:14	
173	LL_05	202 µm net	44.8162	-58.8515	2025-10-12	245	00:13:15	Bottom: ctd altimeter 239
174	LL_04	CTD-Rosette	45.1583	-59.1750	2025-10-13	98	00:34:32	
175	LL_04	202 µm net	45.1583	-59.1753	2025-10-13	106	00:06:49	Bottom: ctd altimeter 90
176	A1	Multinet	45.1999	-59.5502	2025-10-13	103	00:13:02	
177	A1	VPR	45.1999	-59.5502	2025-10-13	104	01:02:58	Started: wire out target based on weight test
178	LL_03	CTD-Rosette	45.4917	-59.5167	2025-10-13	141	00:32:33	Bottom: ctd altimiter 136m
179	LL_03	202 µm net	45.4917	-59.5167	2025-10-13	141	00:08:24	
180	LL_03	202 µm net	45.4917	-59.5167	2025-10-13	141	00:08:26	
181	LL_02	CTD-Rosette	45.6583	-59.7017	2025-10-13	144	00:29:44	Bottom: ctd altimiter 136m
182	LL_02	202 µm net	45.6583	-59.7017	2025-10-13	142	00:09:29	
183	LL_01	CTD-Rosette	45.8251	-59.8501	2025-10-13	93	00:31:06	Bottom: ctd altimiter 90m
184	LL_01	202 µm net	45.7871	-59.8673	2025-10-13	96	00:23:33	
185	A2	Multinet	45.4993	-60.0018	2025-10-13	161	00:15:06	
186	A2	VPR	45.5000	-60.0000	2025-10-13	162	01:08:28	Started: max wire out from weight. target 3 m above max wire out
187	T3	Multinet	45.0500	-59.9500	2025-10-13	143	00:14:07	
188	T3	VPR	45.0504	-59.9493	2025-10-13	148	01:05:52	Recovered: stopped strobing after 3 profiles
189	CN_01	Multinet	45.0499	-60.9850	2025-10-14	183	00:15:54	

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
190	CN_01	VPR	45.0499	-60.9848	2025-10-14	179	00:41:31	Recovered: Stopped strobing after 3rd profile. Recovered and shut down. Redeployed on Event 191.
191	CN_01	VPR	45.0499	-60.9848	2025-10-14	179	00:50:50	
192	ESI_4	CTD-Rosette	44.7523	-62.0982	2025-10-14	106	00:29:06	Bottom: ctd altimiter 98m
193	ESI_8	CTD-Rosette	44.6707	-62.3468	2025-10-14	115	00:30:40	Bottom: ctd altimiter 104m
194	ESI_7	CTD-Rosette	44.7221	-62.3913	2025-10-14	78	00:25:19	
195	ESI_6	CTD-Rosette	44.7712	-62.4350	2025-10-14	41	00:16:23	
196	ESI_12	CTD-Rosette	44.5884	-62.5943	2025-10-14	112	00:32:33	Deployed: LATE DEPLOYED SUBMISSION - Corrected
197	ESI_16	CTD-Rosette	44.5057	-62.8410	2025-10-14	121	00:38:36	
198	HL_02	CTD-Rosette	44.2682	-63.3092	2025-10-16	139	00:43:59	Deployed: Bridge indicated that station is directly over a bottom cable. Deployed 0.3 nm away from nominal station coordinates. Bottom: ctd altimiter 150m
199	HL_02	202 µm net	44.2682	-63.3091	2025-10-16	153	00:10:25	Deployed: weight on bottom Recovered: lower crossbow clip came undone but net came up straight
200	HL_02	76 µm net	44.2682	-63.3091	2025-10-16	153	00:09:55	
201	HL_02	Secchi Disc	44.2682	-63.3091	2025-10-16	153	00:02:00	
202	CSL_01	CTD-Rosette	46.9584	-60.2173	2025-10-17	111	00:28:23	
203	CSL_01	202 µm net	46.9584	-60.2173	2025-10-17	83	00:09:38	
204	CSL_01	202 µm net	46.9584	-60.2173	2025-10-17	83	00:08:18	
205	CSL_02	CTD-Rosette	47.0230	-60.1173	2025-10-18	169	00:48:18	Bottom: LATE BOTTOM SUBMISSION corrected

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
206	CSL_02	202 µm net	47.0230	-60.1173	2025-10-18	187	00:12:41	
207	CSL_03	CTD-Rosette	47.1003	-59.9909	2025-10-18	230	00:59:31	Recovered: Bottle 10 leaked. No 30m water left.
208	CSL_03	202 µm net	47.0997	-59.9911	2025-10-18	336	00:19:42	
209	CSL_04	CTD-Rosette	47.2719	-59.7832	2025-10-18	319	00:58:52	Bottom: ctd altimiter 461m Recovered: Bottle 24 leaked
210	CSL_04	202 µm net	47.2719	-59.7832	2025-10-18	471	00:27:05	Recovered: 2 sample bottles
211	STAB_01	CTD-Rosette	45.9994	-59.5278	2025-10-18	61	00:25:41	
212	STAB_01	202 µm net	45.9994	-59.5279	2025-10-18	63	00:05:38	
213	STAB_02	CTD-Rosette	46.1081	-59.3642	2025-10-19	63	00:25:13	
214	STAB_02	202 µm net	46.1082	-59.3642	2025-10-19	68	00:03:08	
215	STAB_03	CTD-Rosette	46.2151	-59.1943	2025-10-19	95	00:30:41	
216	STAB_03	202 µm net	46.2151	-59.1943	2025-10-19	97	00:07:16	
217	CBN	Mooring Recovery	47.1596	-60.3961	2025-10-19	181	00:26:08	
218	CSW	Mooring Recovery	47.3766	-60.3033	2025-10-19	121	00:21:44	
219	CS1	Mooring Recovery	47.4780	-60.0825	2025-10-19	488	00:25:53	
220	CS2	Mooring Recovery	47.4658	-59.8395	2025-10-19	446	00:28:11	Release: communications established, 16:23
221	CS3	Mooring Recovery	47.5187	-59.6175	2025-10-19	490	00:32:50	Attempted Comms: 489.65 sounding Release: 489.65 sounding, communication successful 18:02,
222	CSE	Mooring Recovery	47.5976	-59.3376	2025-10-19		00:37:57	Release: 239 m sounding, communications successful 20:01:00

Table C.1. *(continued)*

Event	Station	Gear	Start Lat. (DD)	Start Lon. (DD)	Date	Mean Depth (m)	Duration	Comments
223	CSL_06	CTD-Rosette	47.5843	-59.3416	2025-10-19	263	00:47:09	
224	CSL_06	202 µm net	47.5843	-59.3416	2025-10-19	263	00:14:22	
225	CSL_05	CTD-Rosette	47.4328	-59.5584	2025-10-20	480	01:01:49	Bottom: LATE BOTTOM SUBMISSION changed from 00:40 to 00:30
226	CSL_05	202 µm net	47.4328	-59.5588	2025-10-20	481	00:25:55	Recovered: 2 sample bottles. flowmeter end originally written as 41458 but corrected to 41548
227	STAB_06	CTD-Rosette	46.6454	-58.5478	2025-10-20	417	00:54:26	Bottom: ctd altimiter 410m
228	STAB_06	202 µm net	46.6454	-58.5477	2025-10-20	422	00:26:14	Recovered: 2 sample bottles
229	STAB_05	CTD-Rosette	46.4162	-58.8834	2025-10-20	382	00:56:11	Bottom: ctd altimiter 361m
230	STAB_05	202 µm net	46.4162	-58.8834	2025-10-20	375	00:21:50	
231	STAB_04	CTD-Rosette	46.2996	-59.0649	2025-10-20	194	00:36:23	
232	STAB_04	202 µm net	46.2996	-59.0649	2025-10-20	160	00:11:09	
233	STAB_04	202 µm net	46.2996	-59.0649	2025-10-20	160	00:10:17	

APPENDIX D Vertical Profiles of Temperature, Salinity, Dissolved Oxygen

This appendix illustrates the vertical profiles of temperature, salinity, and dissolved oxygen for each station sampled during the JC28302 mission. Profile plots are organized by hydrographic section (e.g., Halifax Line). These plots were generated routinely throughout the mission and compared against the corresponding bottle salinity and dissolved oxygen measurements obtained via Winkler titrations as a tool to A) evaluate any discrepancies between the dual sensors, B) evaluate which of the dual sensors more closely reflected the corresponding bottle measurements generated at sea, a task which helps guide the final sensor calibration process, and C) evaluate the laboratory measurements for visual outliers. Outliers in the bottle data were identified based on their divergence from replicate samples, when collected, or whether they fell far from the CTD profile data, and were assigned quality control flags according to the quality control flag schema applied to data submitted in DFO's National Repository, BioChem (Devine et al. 2014).

For the majority of the casts conducted during the mission there was excellent congruence between both the primary and secondary dissolved oxygen and conductivity sensors, and between the sensor and bottle data. Although data from the primary and secondary oxygen sensors were comparable, the secondary sensor was closer to the corresponding Winkler titration values than the primary.

Although bottle chlorophyll *a* measurements are not used to calibrate the sensor data, they were routinely compared against the chlorophyll fluorometer sensor data throughout the mission to evaluate the reliability of the sensor, and to ensure that all bottle sample IDs for parameters measured at sea were accounted for. The discrepancy between the sensor data and bottle measurements was higher, especially at the depth of the chlorophyll *a* maximum, where the sensors underestimated chlorophyll concentration relative to the bottle measurements. Consequently, outliers were assigned to bottle measurements based only on their deviation from replicate bottle values, and not the sensor data.

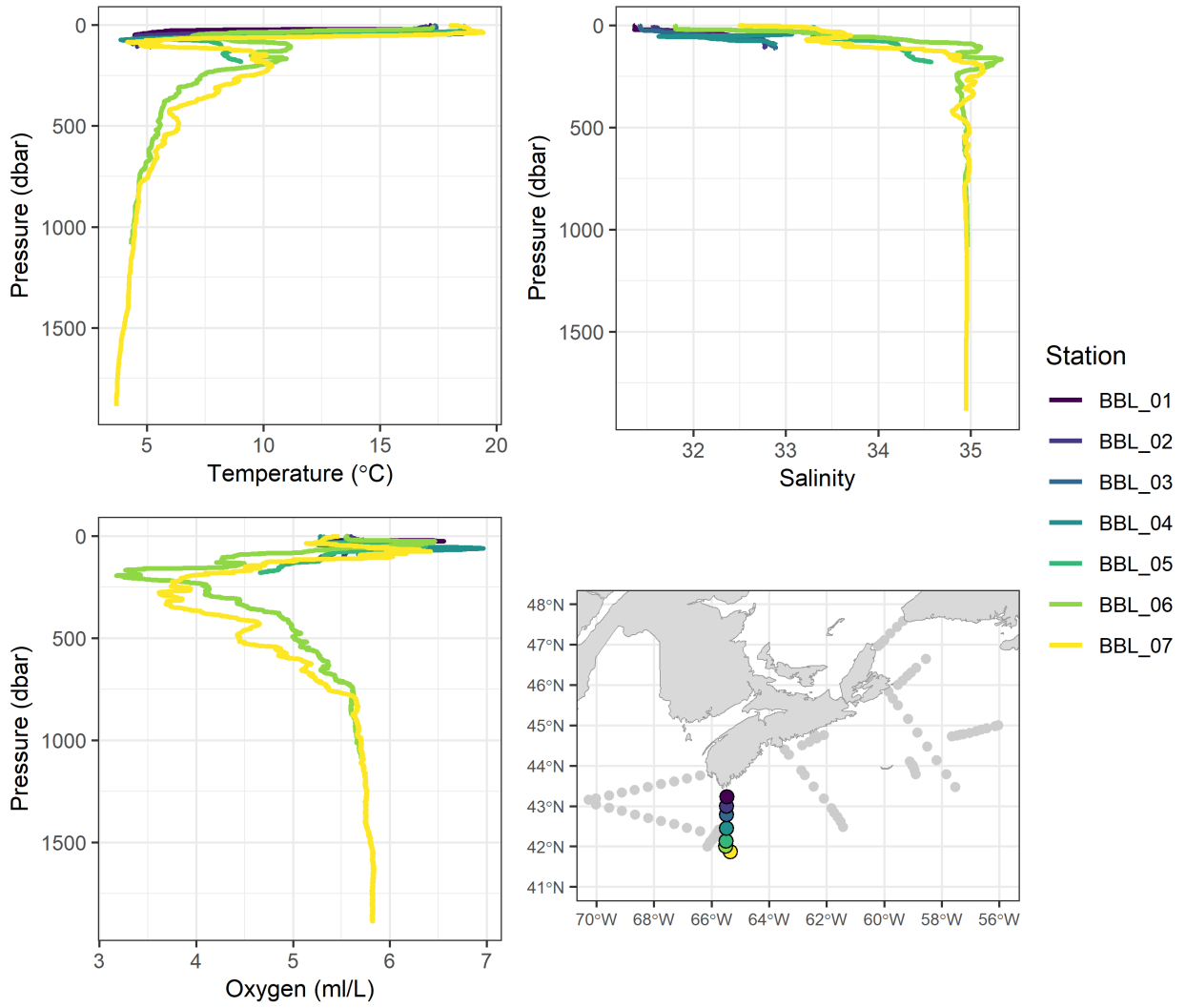


Figure D.1. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled on the Browns Bank Line (BBL; bottom right) during the 2025 fall AZMP mission (JC28302).

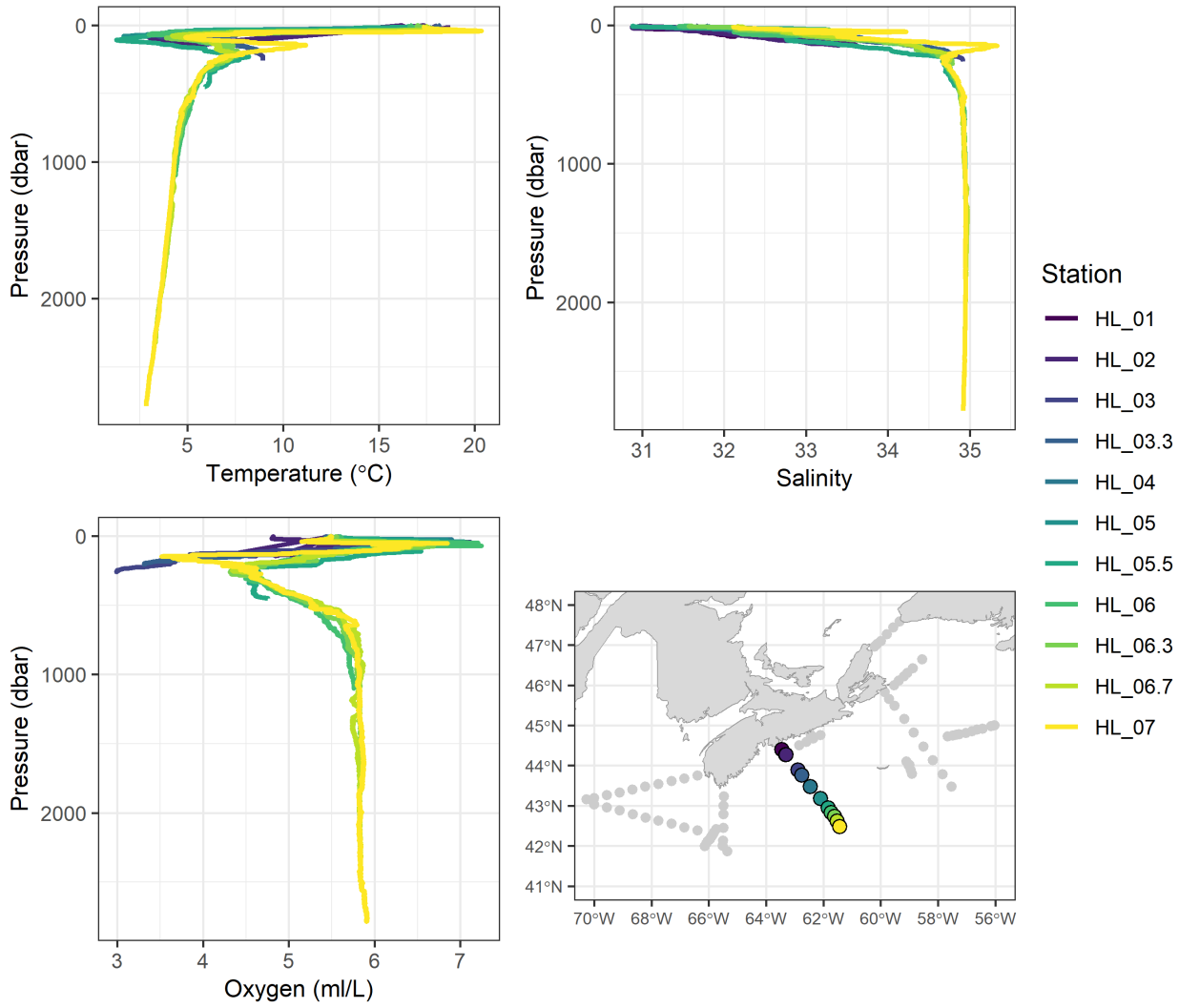


Figure D.2. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled on the Halifax Line (HL; bottom right) during the 2025 fall AZMP mission (JC28302).

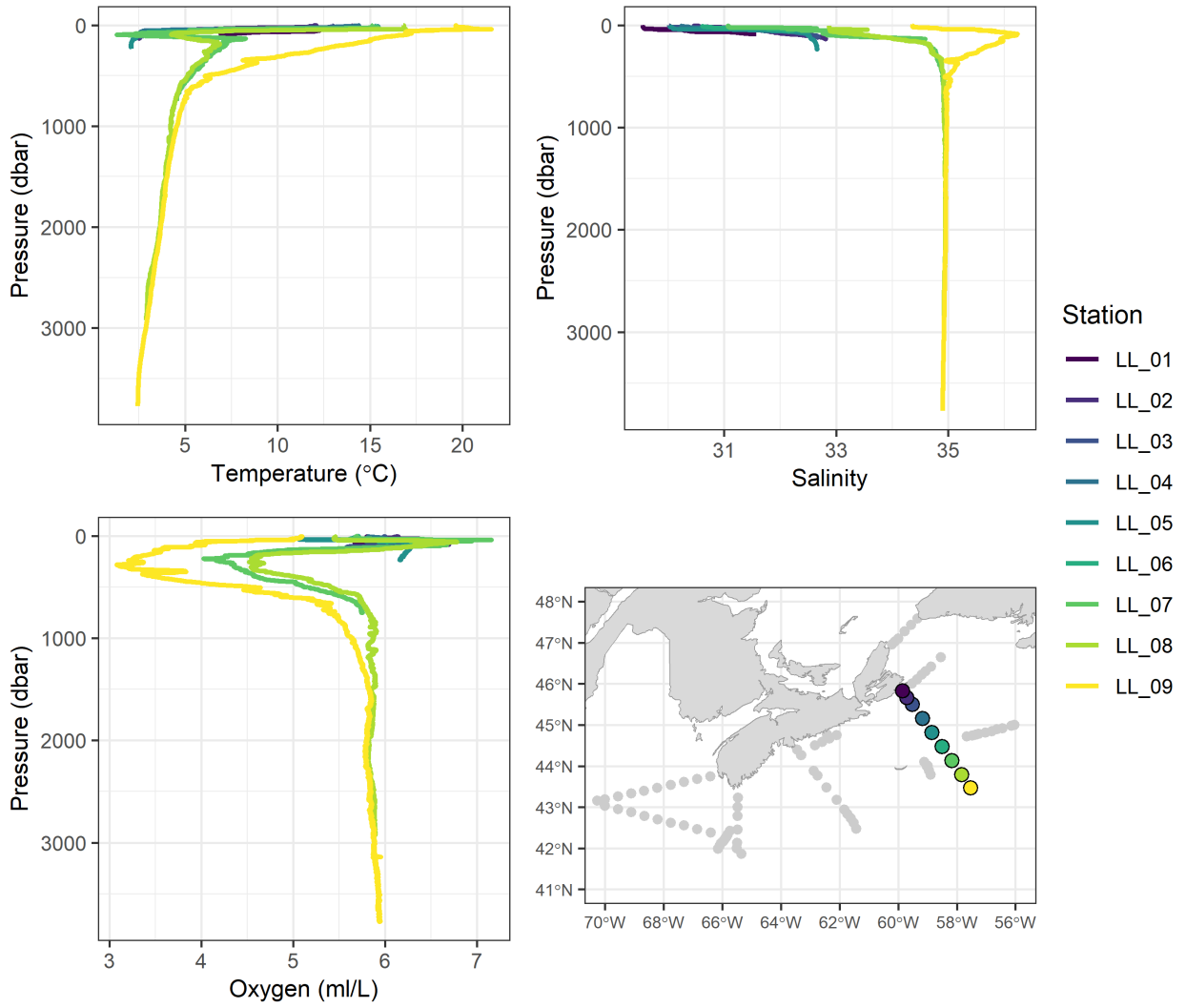


Figure D.3. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled on the Louisbourg Line (LL; bottom right) during the 2025 fall AZMP mission (JC28302).

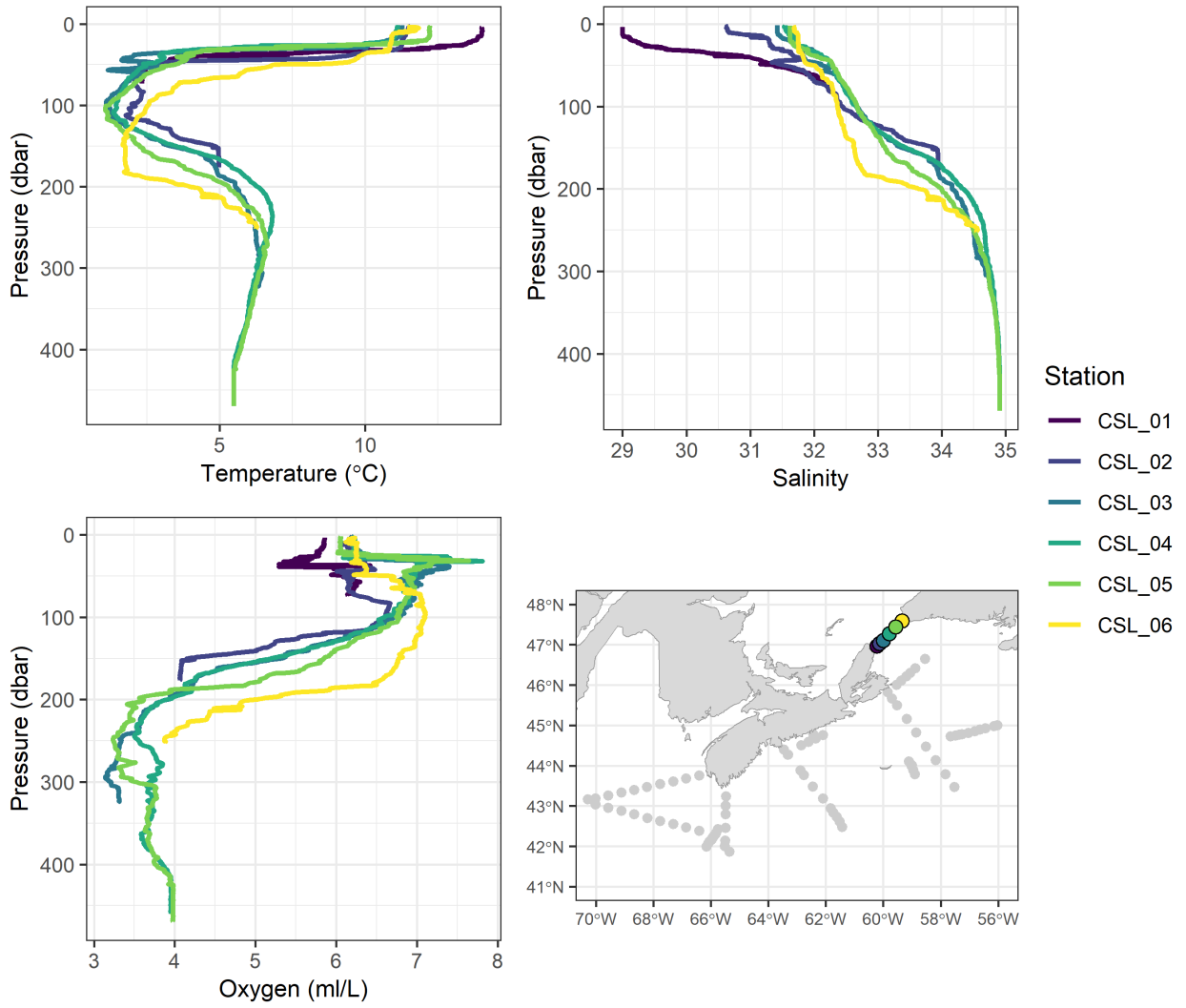


Figure D.4. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom rleft) from stations sampled on the Cabot Strait Line (CSL; bottom right) during the 2025 fall AZMP mission (JC28302).

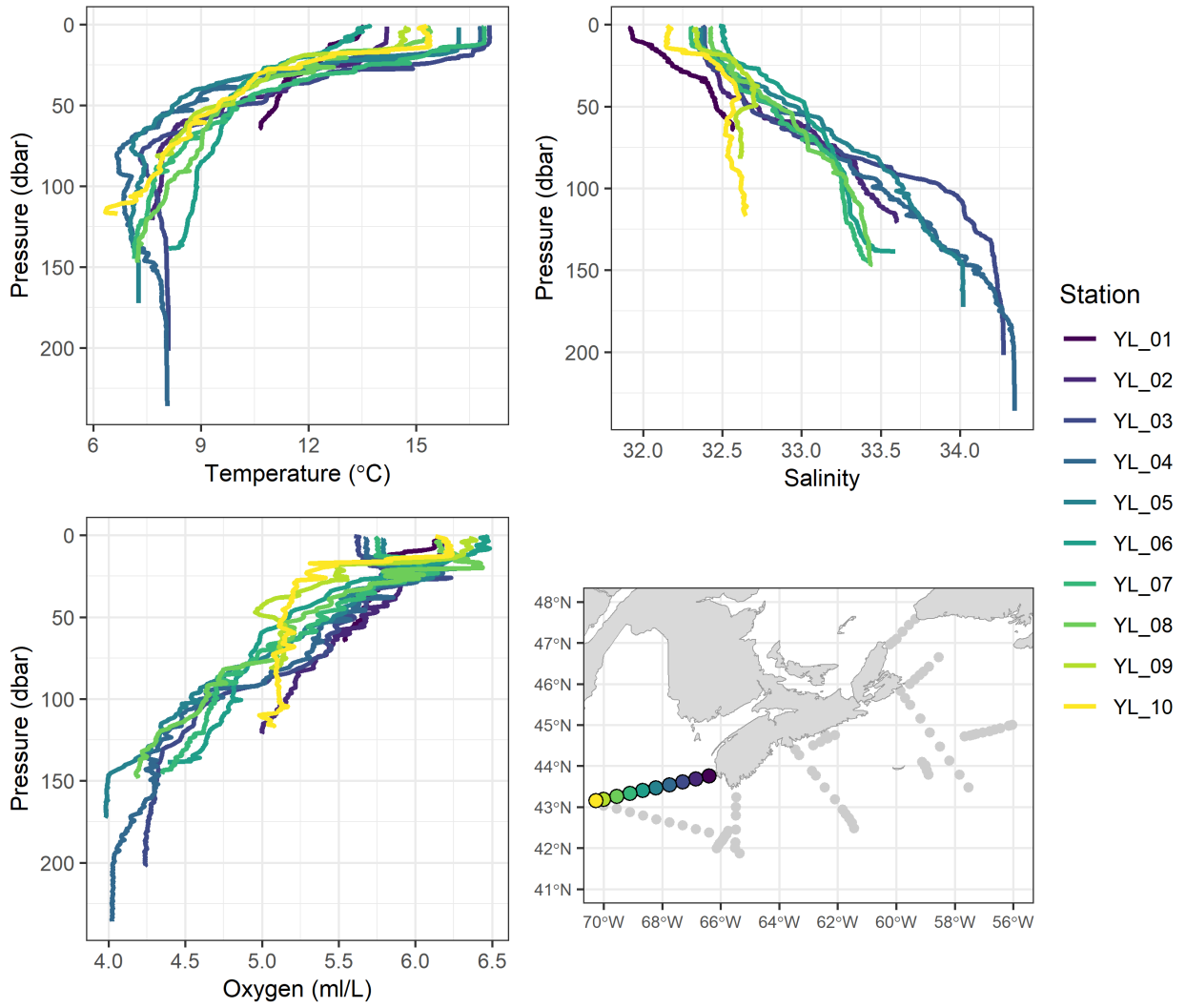


Figure D.5. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled on the Yarmouth Line (YL; bottom right) during the 2025 fall AZMP mission (JC28302).

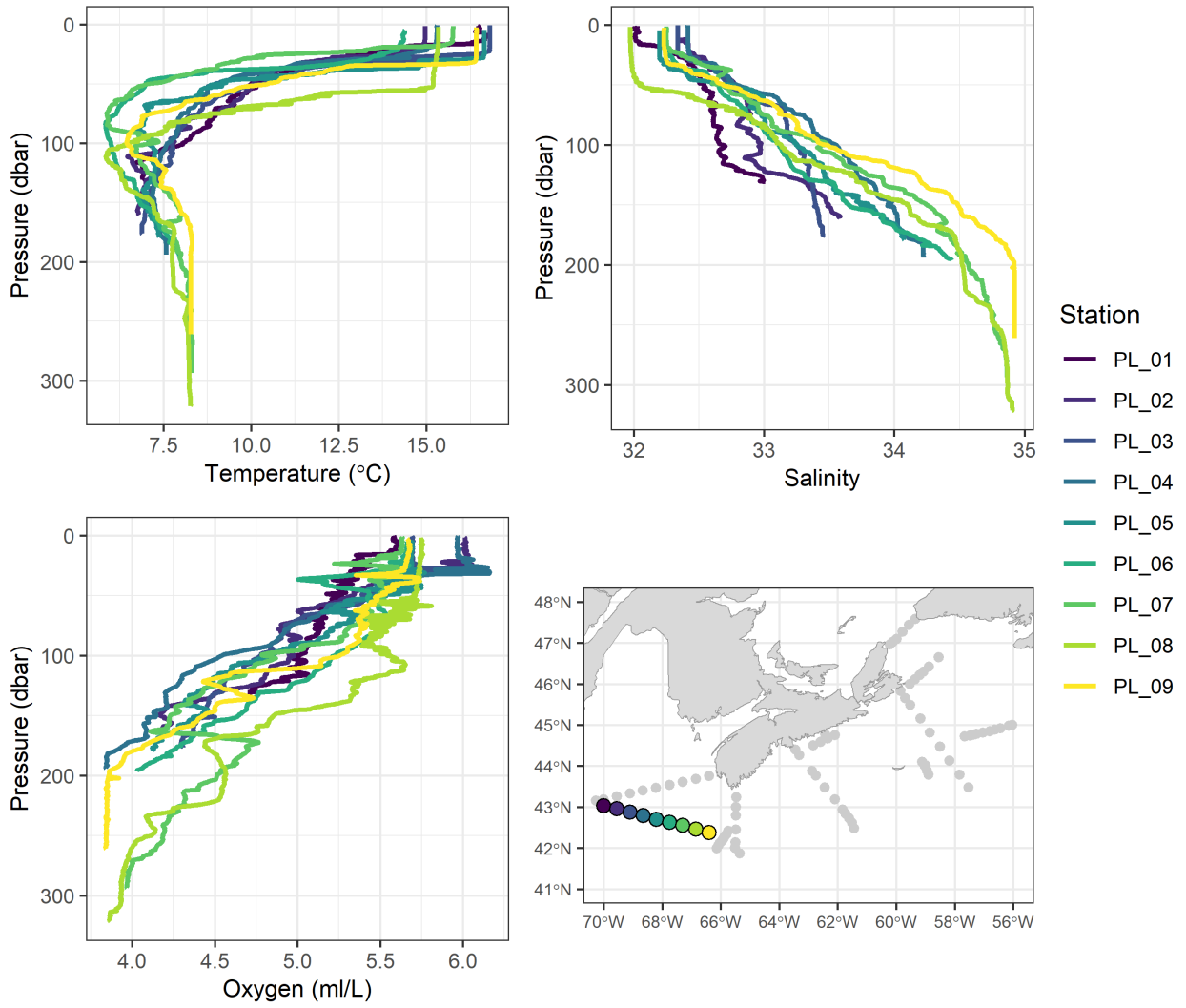


Figure D.6. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled on the Portsmouth Line (PL; bottom right) during the 2025 fall AZMP mission (JC28302).

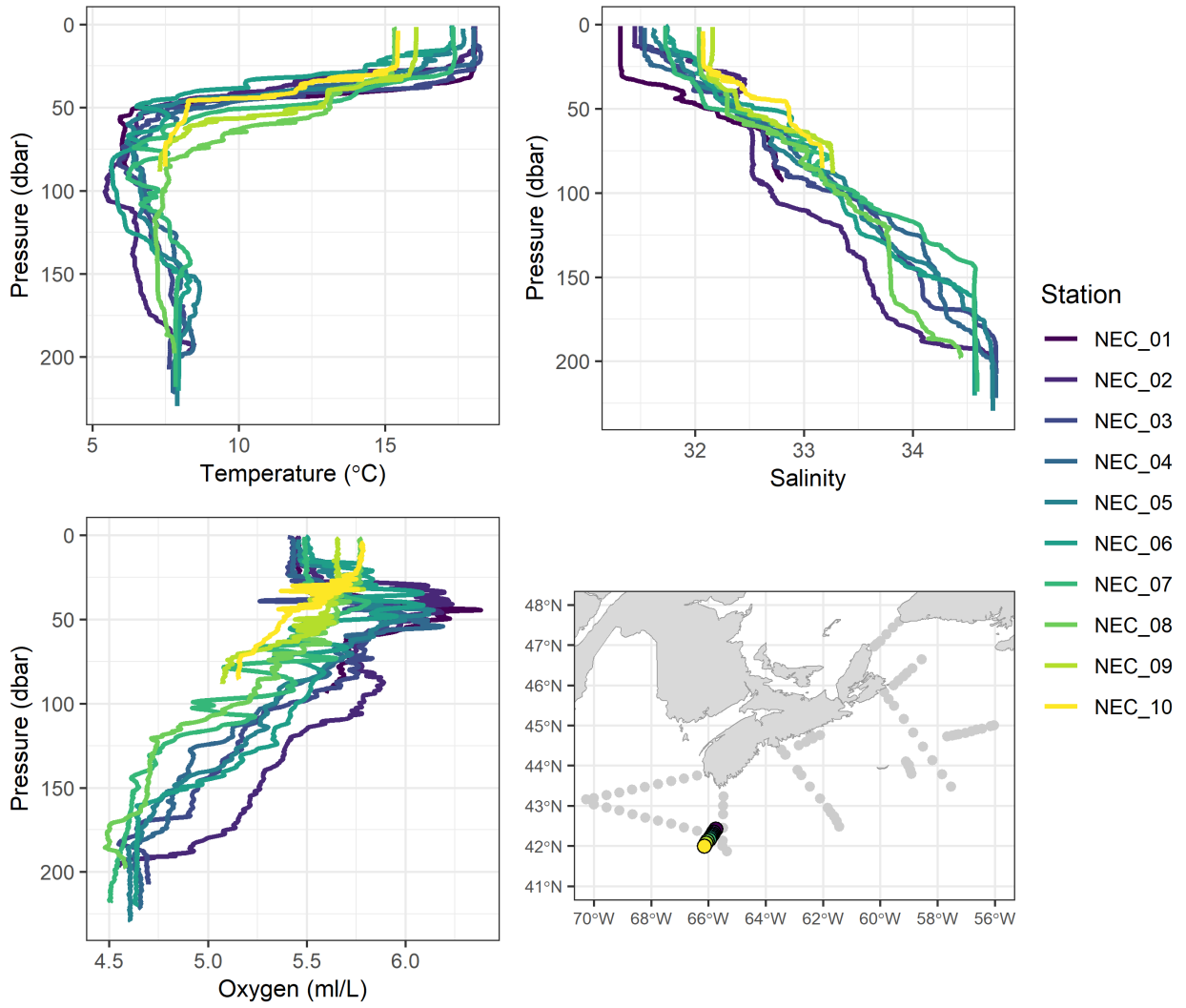


Figure D.7. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled in the Northeast Channel (NEC; bottom right) during the 2025 fall AZMP mission (JC28302).

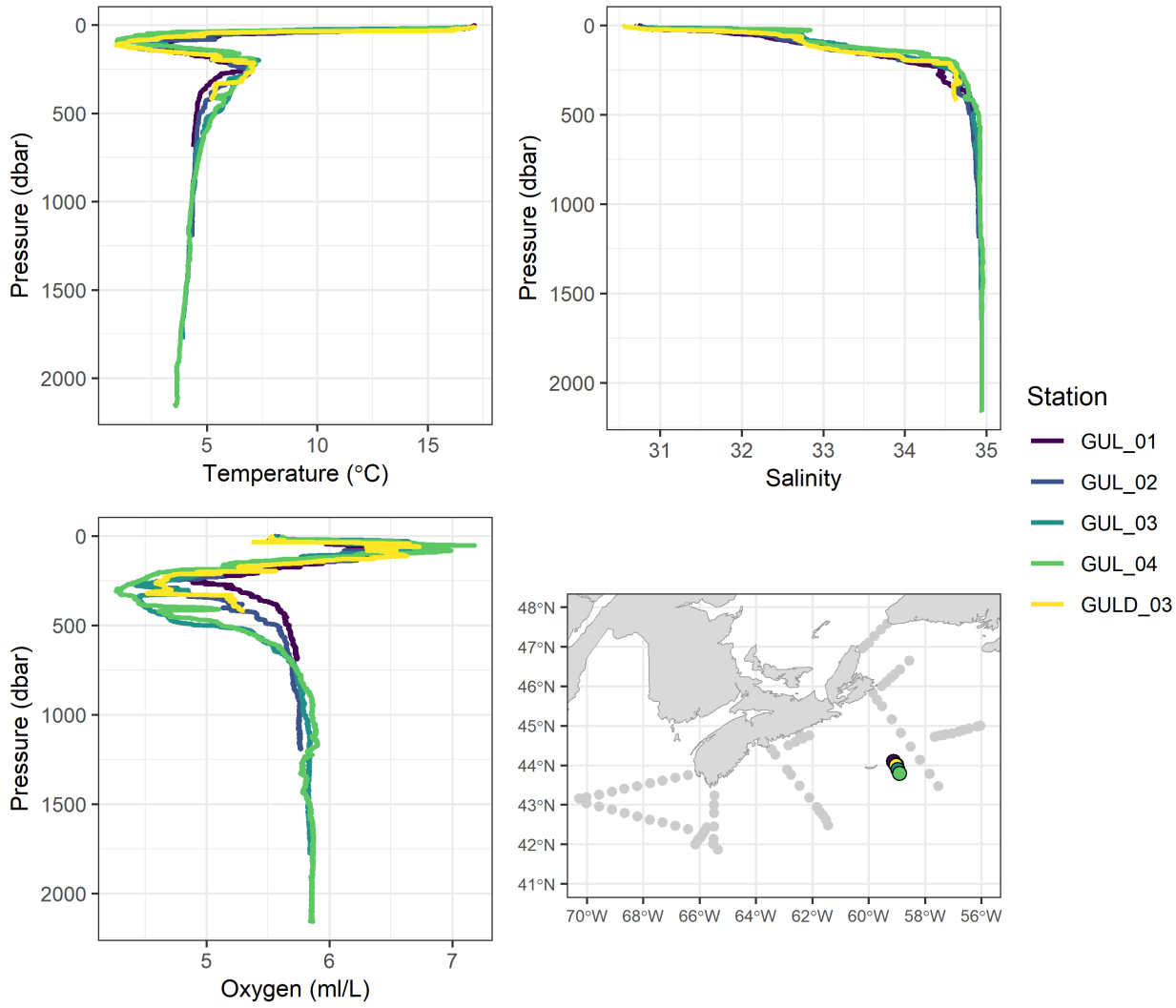


Figure D.8. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled in the Gully (GUL; bottom right) during the 2025 fall AZMP mission (JC28302).

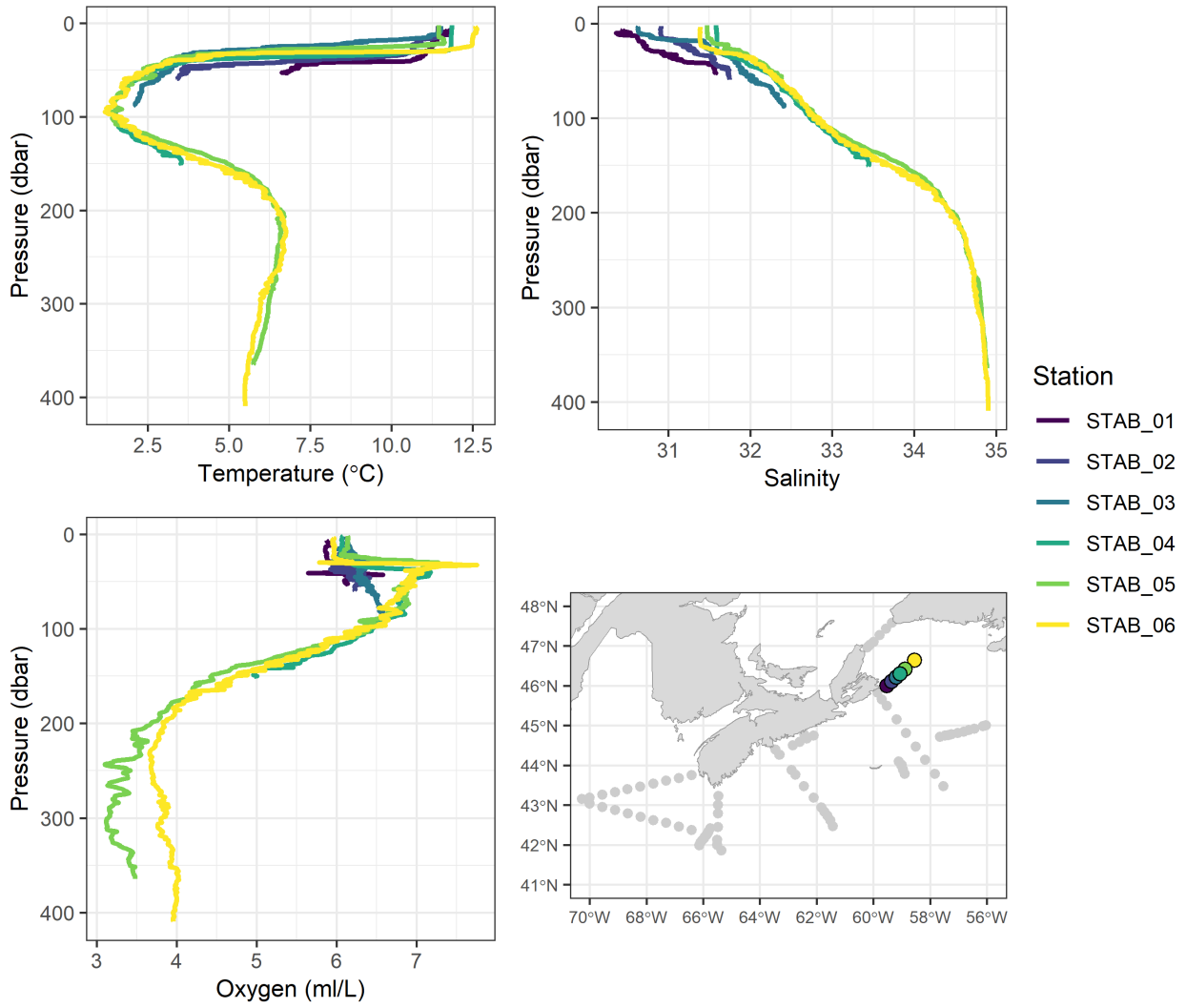


Figure D.9. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled on St. Anns Bank (STAB; bottom right) during the 2025 fall AZMP mission (JC28302).

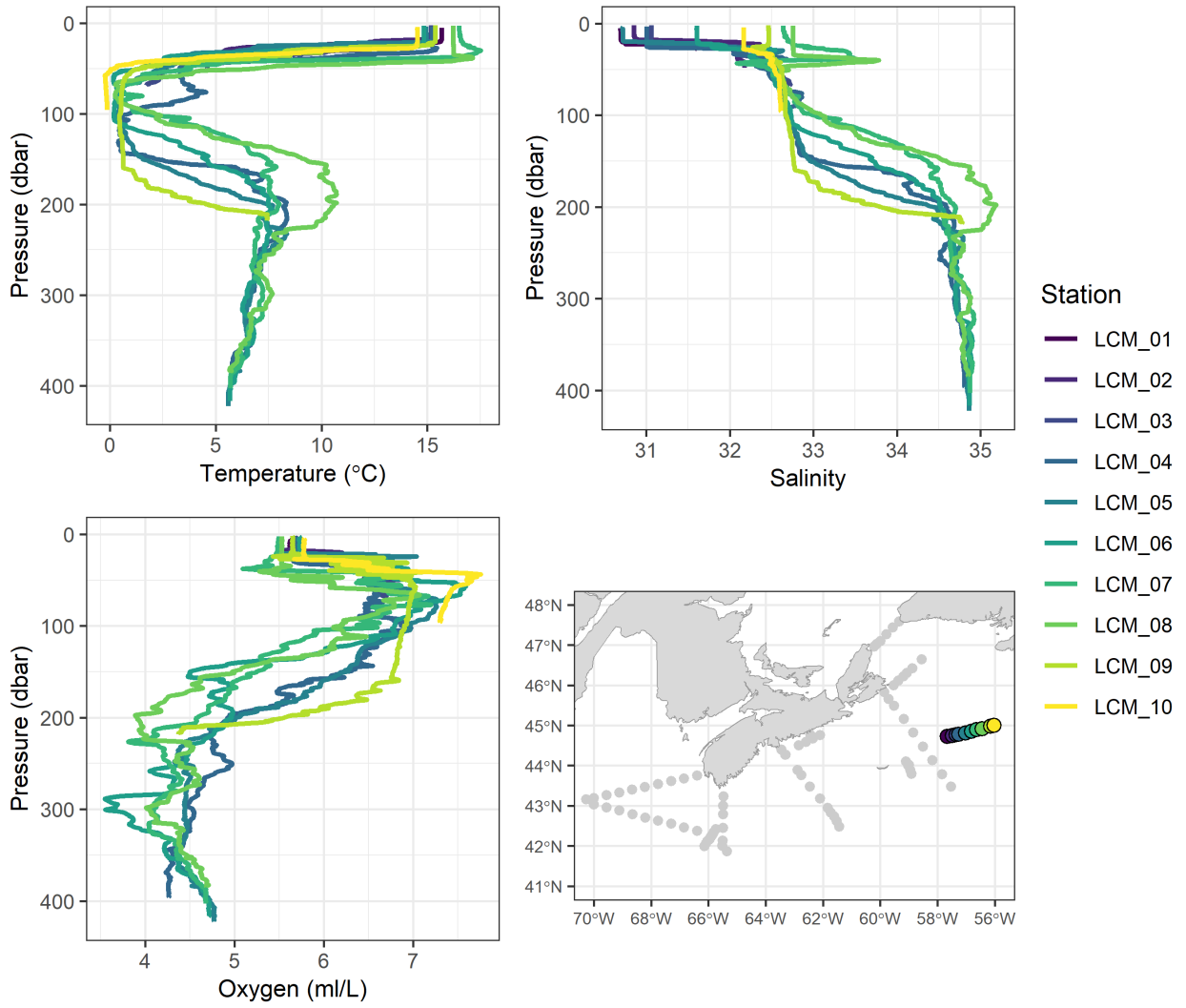


Figure D.10. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled in the Laurentian Channel Mouth (LCM; bottom right) during the 2025 fall AZMP mission (JC28302).

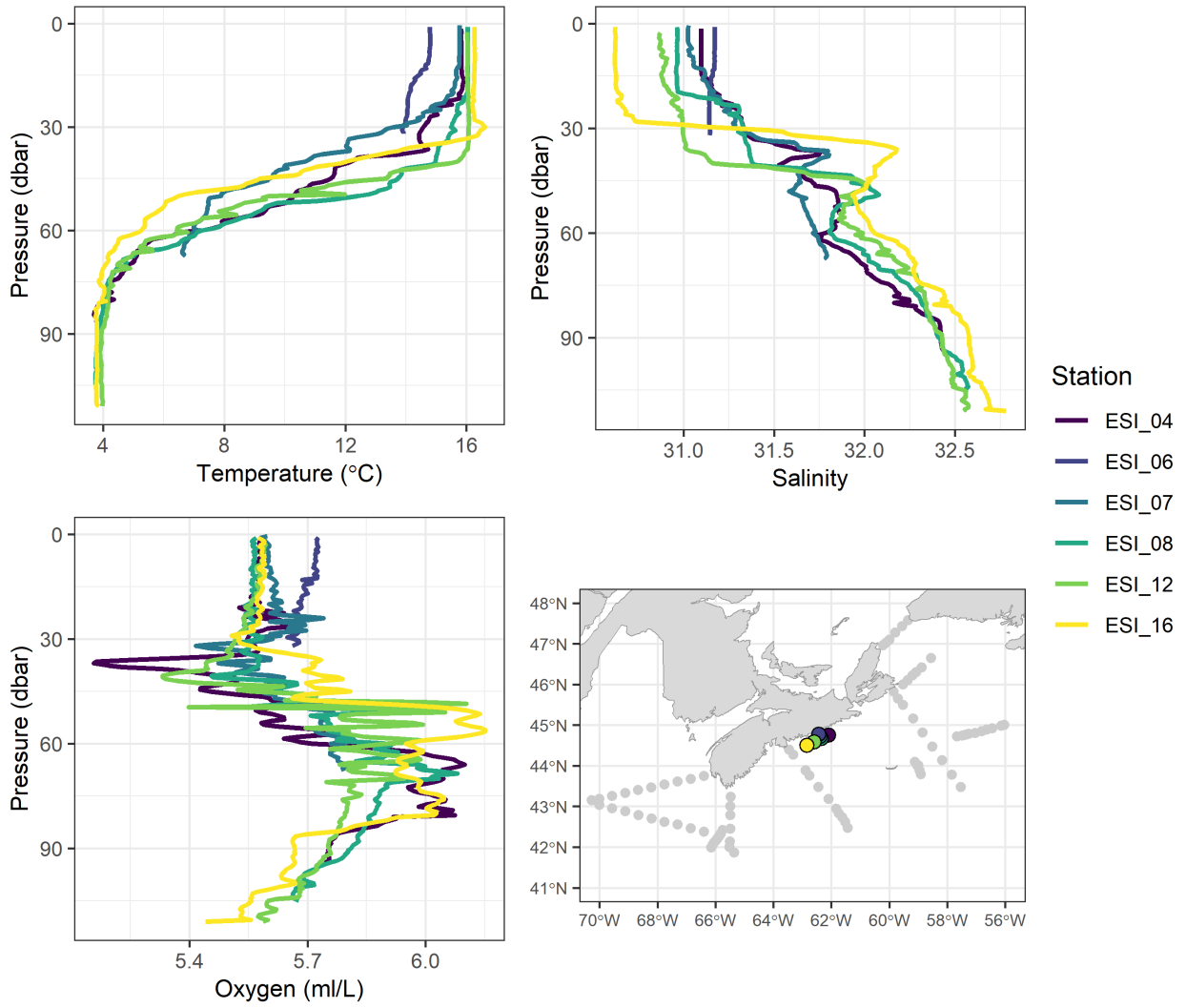
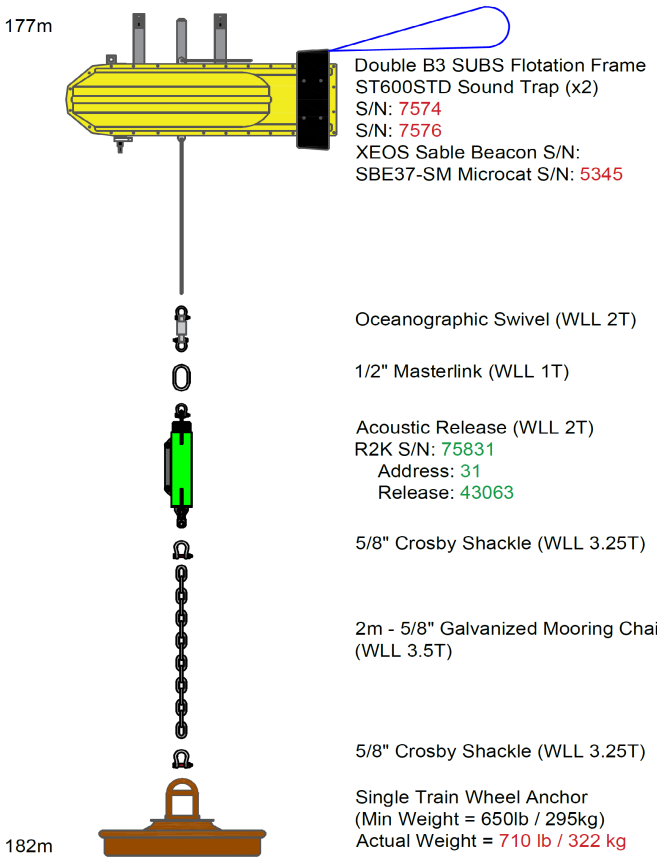


Figure D.11. Vertical profiles of temperature (top left), salinity (top right), and dissolved oxygen (bottom left) from stations sampled from the Eastern Shore Islands (ESI) Area of Interest (bottom right) during the 2025 fall AZMP mission (JC28302).

APPENDIX E Diagrams of Moorings Deployed during the 2025 Fall Mission (JC28302)



M2317 GMB Grand Manan Basin

INFORMATION

Program: Cetacean PAMS Mooring
Scientist: Dr. H. Moors-Murphy
Deployment Date: Fall 2025
Intended Duration: 1 year

LOCATION

Geographic Location: Bay of Fundy
Depth: 182m
Latitude:
Longitude:

MOORING

Mooring Length: 5 m
Net Buoyancy: + 166lb / 75 kg
Weight (in air): 244lb / 110kg
(not including anchor)

DRAWING

Model: M2308
Revision: A4
Drawn By: M. Lawson
Last Revision:
Date: Aug 01, 2025

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Figure E.1. Diagram of Mooring M2317 deployed at station GMB (Grand Manan Basin) during the 2025 fall mission (JC28302).

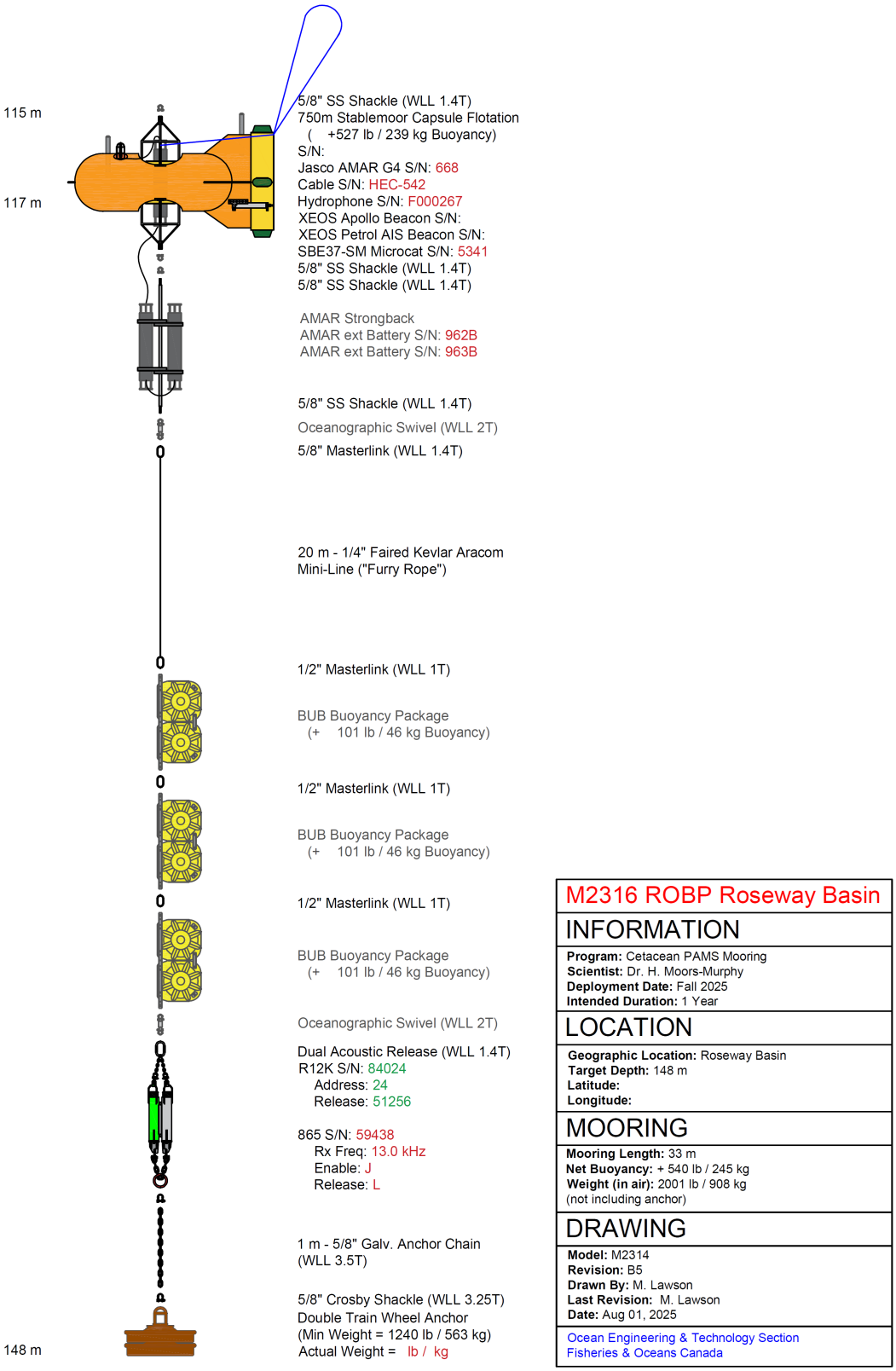
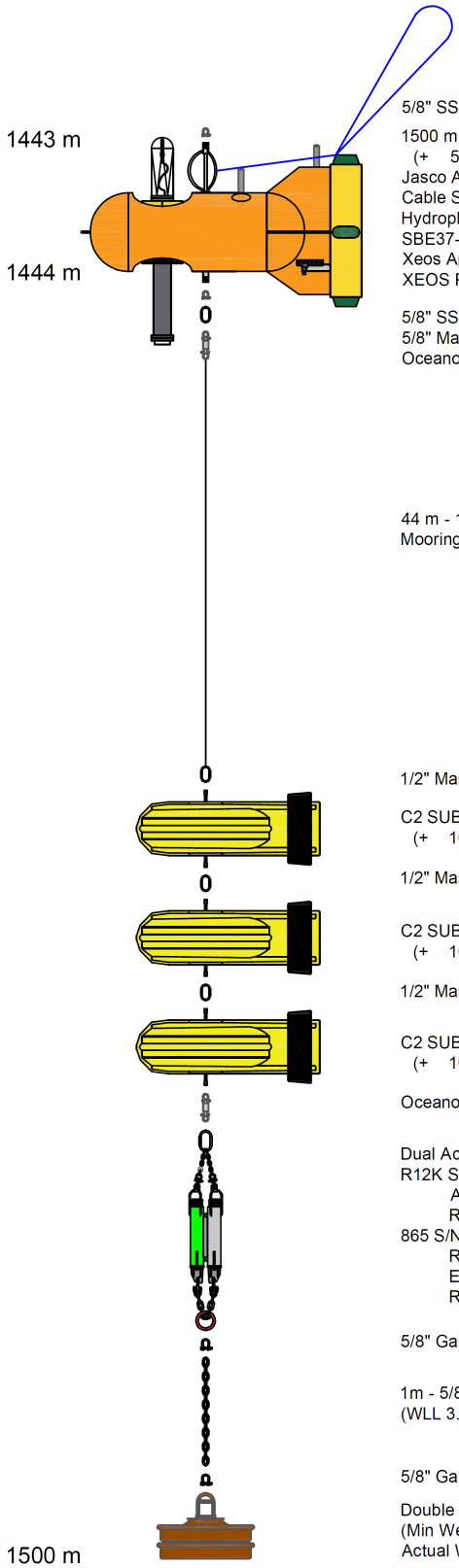


Figure E.2. Diagram of Mooring M2316 deployed at station ROBP (Roseway Basin) during the 2025 fall mission (JC28302).



5/8" SS Shackle (WLL 1.4T)

1500 m Stablemoor Capsule S/N:
(+ 580 lb / 263 kg Buoyancy)
Jasco AMAR G4 ED S/N: 672
Cable S/N: HEC-556
Hydrophone S/N: I001823
SBE37-SM Microcat S/N: 2415
Xeos Apollo Beacon S/N:
XEOS Petrol AIS Beacon S/N:

5/8" SS Shackle (WLL 1.4T)
5/8" Masterlink (WLL 1.4T)
Oceanographic Swivel (WLL 2T)

44 m - 1/4" Kevlar Aracom Faired
Mooring Line (WLL xx)

1/2" Masterlink (WLL 1T)

C2 SUBs
(+ 106 lb / 48 kg Buoyancy)

1/2" Masterlink (WLL 1T)

C2 SUBs
(+ 106 lb / 48 kg Buoyancy)

1/2" Masterlink (WLL 1T)

C2 SUBs
(+ 106 lb / 48 kg Buoyancy)

Oceanographic Swivel (WLL 2T)

Dual Acoustic Release (WLL 1.5T)
R12K S/N: 80289
Address: 89
Release: 47521
865 S/N: 59434
Rx Freq: 8.5 kHz
Enable: J
Release: L

5/8" Galv. Crosby Shackle (WLL 3.25T)

1m - 5/8" Galv. Mooring Chain
(WLL 3.5T)

5/8" Galv. Crosby Shackle (WLL 3.25T)

Double Train Wheel Anchor
(Min Weight = 1456 lb / 660 kg)
Actual Weight = 1500 lb / 682 kg

M2315 MGL Mid-Gully

INFORMATION

Program: Cetacean PAMS Mooring
Scientist: Dr. H. Moors-Murphy
Deployment Date: Fall2025
Intended Duration: 1 Year

LOCATION

Geographic Location: The Gully
Target Depth: 1500 m
Latitude:
Longitude:

MOORING

Mooring Length: 53 m
Net Buoyancy: + 633 lb / 287 kg
Weight (in air): + 1963 lb / 890 kg
(not including anchor)

DRAWING

Model: M2258
Revision: A5
Drawn By: M. Lawson
Last Revision: M. Lawson
Date: Aug 01, 2025

Ocean Engineering & Technology Section
Fisheries & Oceans Canada

Figure E.3. Diagram of Mooring M2315 deployed at station MGL (Mid-Gully) during the 2025 fall mission (JC28302).

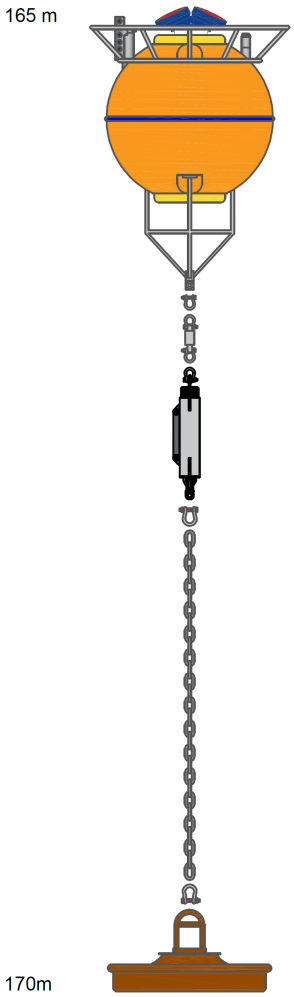


Figure E.4. Diagram of Mooring M2332 deployed near station Halifax-2 during the 2025 fall mission (JC28302).

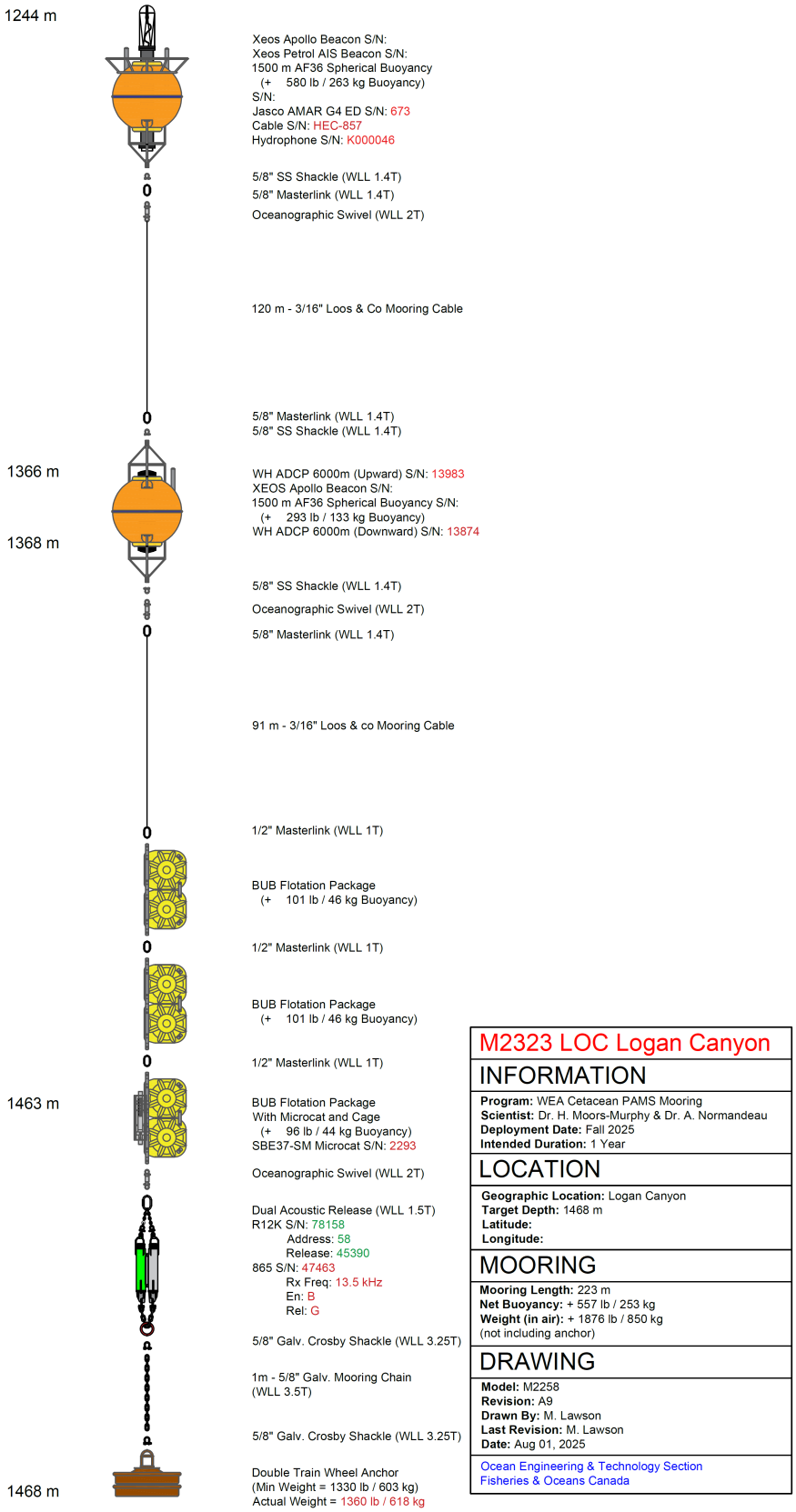


Figure E.5. Diagram of Mooring M2323 deployed at station LOC (Logan Canyon) during the 2025 fall mission (JC28302).