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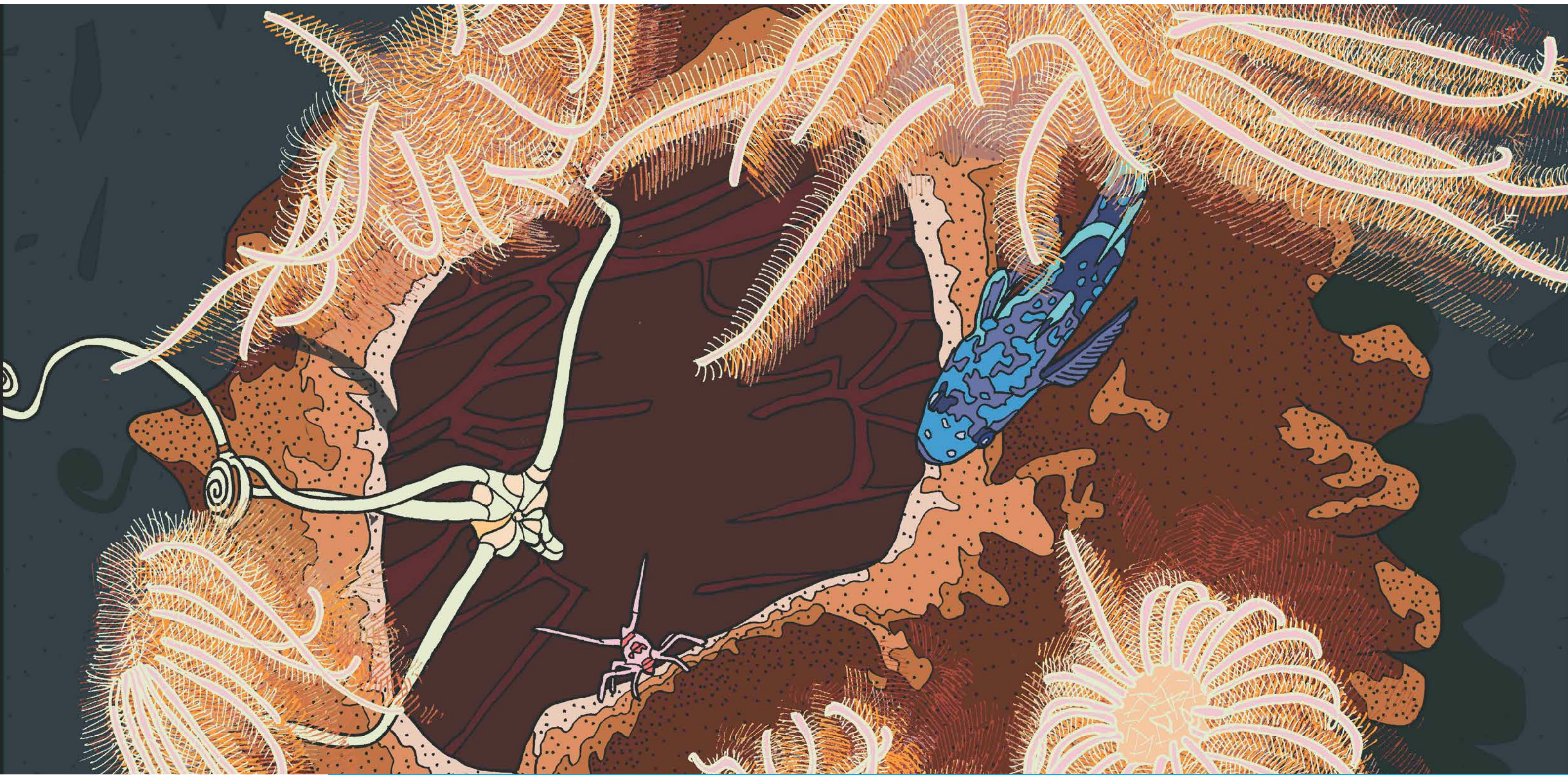

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Reports on Polar and Marine Research

The Expedition PS152 of the Research Vessel POLARSTERN to Maud Rise and the Weddell Sea in 2025/2026

Edited by Heike Link and
Felix Christopher Mark

with contributions of the participants

HELMHOLTZ

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Titel: *Auf allen Ebenen, von der galaktischen bis zur submikroskopischen... –*
ein abgegrenztes Ökosystem ist nur ein Bruchteil des Ganzen – 70° 55' 20" S, 10° 44' 27" O – 08:32 UTC – 13.01.26
Künstler: Autun Purser, AWI

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PS152
WOBEC

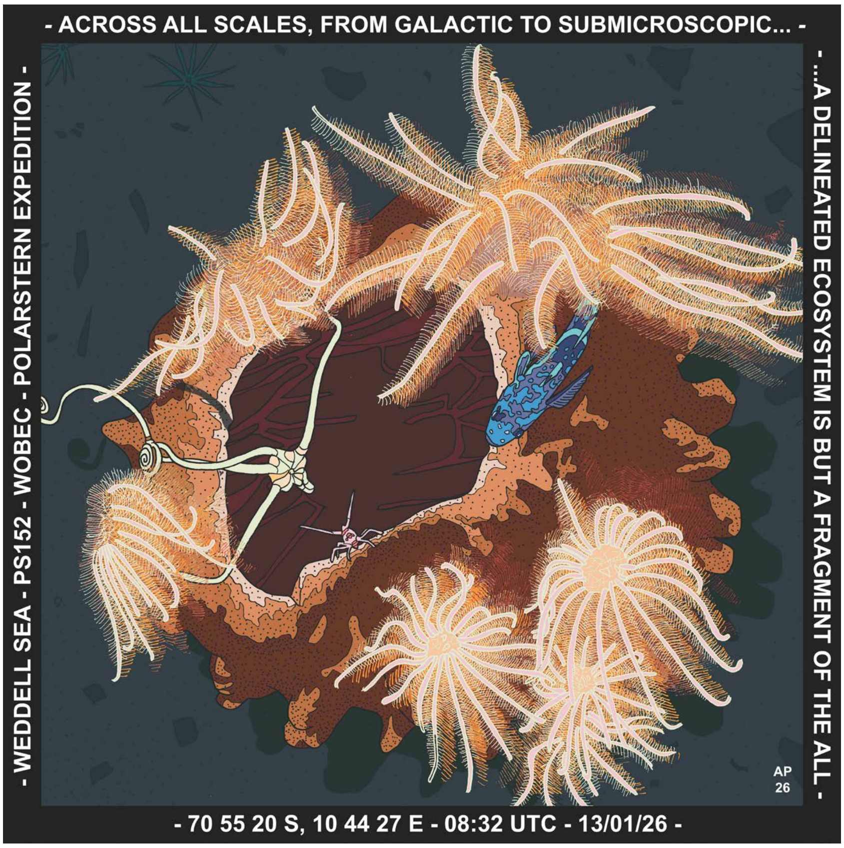
15 December 2025 – 02 Febuary 2026

Walvis Bay, Namibia – Punta Arenas, Chile

Chief scientist
Heike Link

Co-chief scientist
Felix Christopher Mark

Coordinator
Ingo Schewe



Titel: *Skizze einer Schwammkolonie im Weddellmeer;*
Künstler: Autun Purser, AWI

Title: *Sketch of Sponge Community, Weddell Sea*
Artist: Autun Purser, AWI

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Heike Link[1], Felix Christopher Mark[2],
Hauke Flores[2]

[1]DE.UNI-Rostock
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Überblick

Die Expedition PS152 WOBEC (Weddell Sea Observatory of Biodiversity and Ecosystem Change) lief am 15. Dezember 2025 mit 47 Wissenschaftlerinnen und Wissenschaftlern, 45 Besatzungsmitgliedern und 4 Hubschrauberbesatzungsmitgliedern von Walvis Bay, Namibia, in Richtung des östlichen Weddellmeers / König-Haakon-VII.-Meeres (EWS) aus. Nach erfolgreichem Abschluss des wissenschaftlichen Programms erreichten wir am 2. Februar 2026 Punta Arenas, Chile (Abb. 1.1).
Das übergeordnete Ziel bestand darin, einen Beitrag zu systematischen Langzeitstudien über Biodiversität und Ökosystemdynamik in der EWS zu leisten, da solche Untersuchungen allgemein als unverzichtbar gelten, um die ökologischen Auswirkungen von Umweltveränderungen zu ermitteln (Gutt et al. 2022). Die regelmäßige Beprobung durch autonome und schiffsgestützte Beobachtungen sowie die Erfassung von Veränderungen in der Ozeandynamik, der Geochemie, der Biodiversität und den Ökosystemfunktionen und - leistungen sind unerlässlich, um langfristige Datenverfügbarkeit und ein Verständnis des Ökosystems zu gewährleisten.

Die WOBEC-Initiative ist ein multinationales Projekt des teilweise EU-geförderten Forschungsprogramms Biodiversa+, das sich mit dem Bedarf an quantitativen Informationen über das antarktische Ökosystem in einem genau definierten Gebiet im östlichen Weddellmeer befasst (Teschke et al. 2024). Vor WOBEC wurde die Initiative „Eastern Weddell Sea Observing System“ (EWOS) als Proof-of-Concept auf der *Polarstern* (PS129, Hoppema et al. 2023) im März und April 2022 durchgeführt. An WOBEC sind Partner aus Deutschland (UROS, AWI), Belgien, Italien, den Niederlanden, Norwegen, Polen und Schweden beteiligt, die mit weiteren Partnern aus Spanien, dem Vereinigten Königreich und den Vereinigten Staaten sowie weiteren deutschen Universitäten zusammenarbeiten. Drei erfolgreiche Nebennutzerprojekte arbeiteten eng mit WOBEC zusammen: GOSAFAST (Jones et al., NOAA, USA) hat zum Ziel, Aufschluss über die Biogeografie, den Lebenszyklus und die Ökophysiologie des Antarktischen Seehechts und anderer Notothenioiden zu geben und war direkt in WP 4 integriert (Kapitel 2.4). ICELIGHT (Veyssière et al., BAS, UK) untersucht, wie die Eigenschaften von Schnee und Meereis die Lichtverhältnisse unter dem Eis in der Antarktis beeinflussen und wie dies wiederum die Funktionsweise des Ökosystems prägt (Kapitel 2.7). Für SeaCAT (AWI) holten wir Verankerungen ein, darunter seltene Zeitreihenproben zur Biogeochemie und mikrobiellen Biodiversität im WOBEC-Untersuchungsgebiet. Die WOBEC-Expedition unterstützte zudem die internationalen Programme Argo Float und SOCCOM (Southern Ocean Carbon and Climate Observations and Modelling), die die biogeochemischen Kreisläufe des Südlichen Ozeans beobachten und modellieren und damit einen wesentlichen Beitrag zur Klimamodellierung leisten. Die Beobachtungen erfolgen mithilfe von physikalisch oder biogeochemischen Profiling-Floats (BGC-Argo), die in internationalen Gewässern im gesamten Südlichen Ozean ausgebracht werden.

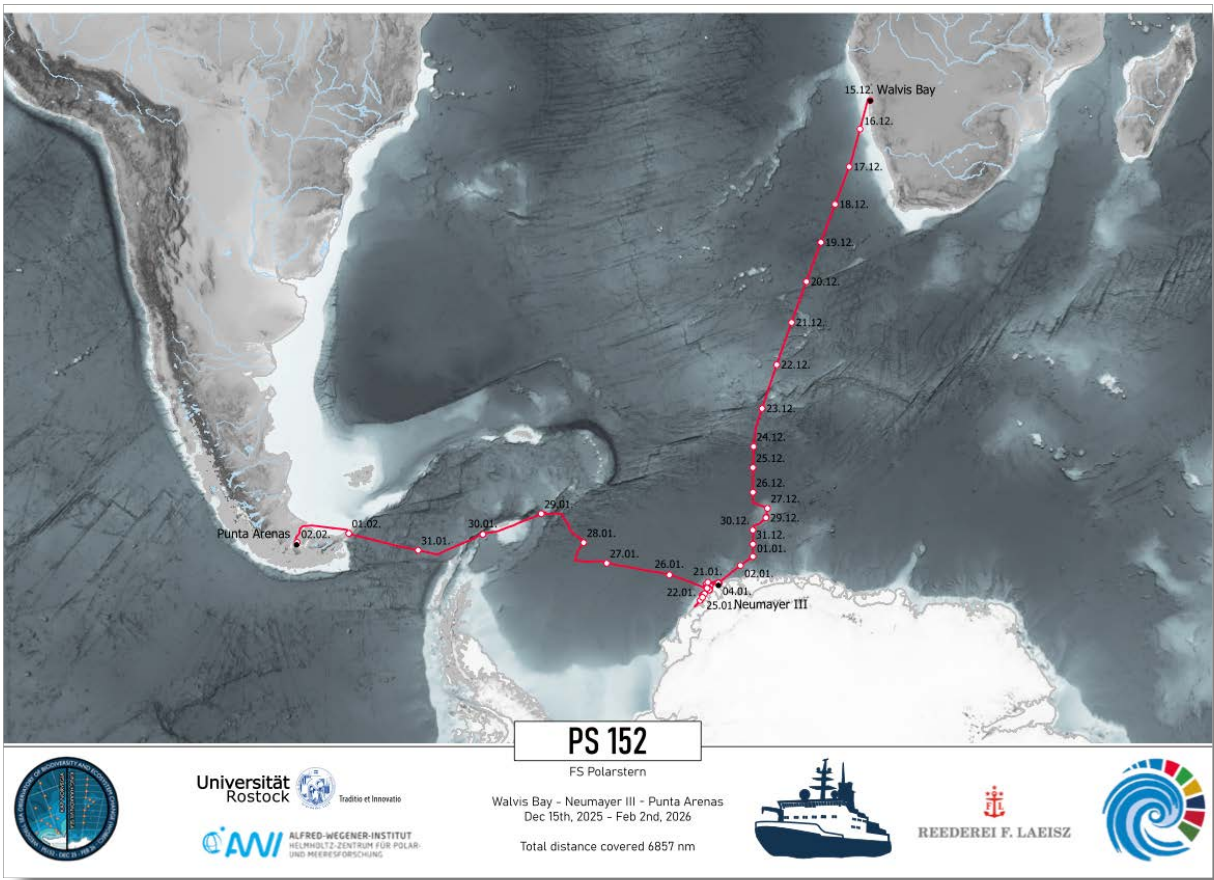


Abb. 1.1: Route der Expedition PS152 von Walvis Bay über die Neumayer-Station III nach Punta Arenas mit Überblick des zeitlichen Verlaufs; siehe https://doi.pangaea.de/10.1594/PANGAEA.993941 für eine Darstellung des master tracks in Verbindung mit der Stationsliste der Expedition PS152.

Fig. 1.1: Route of expedition PS152 from Walvis to Punta Arenas Bay via Neumayer Station III giving an overview of stations and timeline; please see https://doi.pangaea.de/10.1594/PANGAEA to display the master track in conjunction with the station list for expedition PS152.

Während PS152 führten wir Probenahmen zu den Eigenschaften des Meereises, der Biodiversität sowie zu Kohlenstoff- und Nährstoffflüssen zwischen Atmosphäre, Meereis, Wassersäule, Meeresboden, sowie zu den jeweiligen Biota durch, einschließlich mariner lebender Ressourcen wie Antarktischem Krill und Antarktischem Seehecht. Die erworbenen Daten werden mit Daten aus autonomen und ferngesteuerten Probenahmen verglichen und integriert. Unsere beiden Arbeitsgebiete waren: (i) der Nullmeridian-Transekt durch das König-Haakon-VII.-Meer südlich von 60° S mit dem Seeberg Maud Rise; (ii) das Schelf- vor Kapp Norvegia (Abb. 1.2). Entlang der Expeditionsroute wurden Unterwegs-Messungen durchgeführt. PS152 wurde zudem von einer Studie zu Kooperationswegen und -prozessen an Bord (Kapitel 2.6) sowie einer umfassenden und erfolgreichen Öffentlichkeitskampagne (Kapitel 2.9) begleitet. Zusätzlich zum eigentlichen wissenschaftlichen Programm leistete PS152 logistische Unterstützung für die deutsche Antarktisstation *Neumayer III*.

WOBEC stellt eine vertiefende Fortsetzung der kontinuierlichen Messungen entlang der zuvor von Deutschland und Norwegen beprobten Transekte in diesem Gebiet dar. Das Projekt liefert wertvolle quantitative Informationen zur Biodiversität und zu Ökosystemfunktionen wie Kohlenstoffexport und Sekundärproduktion aus einer selten untersuchten Region, die vom Klimawandel beeinflusst wird. Die Ergebnisse werden so auch die notwendigen Monitoringaktivitäten im Hinblick auf die mögliche Einrichtung eines Meeresschutzgebiets im Weddellmeer (WSMPA) durch die CCAMLR unterstützen.

Fahrtverlauf der Expedition

Die Überfahrt von Walvis Bay (Namibia) zur ersten Forschungsstation am Nullmeridian wurde von Wissenschaft und Besatzung intensiv für die Vorbereitungen und den Aufbau der Geräte und Arbeit auf See genutzt. Nach der erfolgreichen Bergung der ersten Verankerung bei 59°S am 24. Dezember 2025 (BGC_25_1) setzte PS152 das geplante Programm fort, beginnend bei 61°S mit pelagischen Untersuchungen unter Verwendung der CTD und von Zooplanktonnetzen (RMT, SUIT, Multinet). Am 27. Dezember wurde Maud Rise erreicht, und die erste vollständige Serie von Probenahmen vom pelagischen bis zum benthischen Habitat wurde erfolgreich durchgeführt. Zunehmender Wind und Seegang verhinderten den Einsatz aller geplanten Geräte an den folgenden beiden Stationen um Maud Rise. Zudem verhinderte der frühe Rückgang von Meereis jegliche Meereisarbeiten entlang des Nullmeridian-Transsekts. Die zweite Verankerung wurde am 30. Dezember südlich des Maud Rise unter schwierigen Wetterbedingungen geborgen (BGC_25_2). Das Wetter schränkte die Einsatzmöglichkeiten ein, und die Stationen auf dem Transekt südlich von 67°S wurden um 0,5° Breitengrad nach Süden verlegt, um stabilere Bedingungen zu erreichen. Der Nullmeridian-Transekt wurde am Abend des 1. Januar 2026 bei 68,5°S mit der Station PS152-23 abgeschlossen. Alle sechs Argo-Floats wurden entlang dieses Transektes ausgesetzt.

Bevor *Polarstern* zur Versorgung die *Neumayer-Station III (NM)* anlief, wetterte sie bis zum 2. Januar ab. Während sich Vorbereitungen an NM nach dem Sturm verzögerten, führte die Expedition zunächst eine Eisstation am Fest-Eis der Atka-Bucht durch, wo physikalische und biologische Daten erhoben, sowie das Unter-Eis-ROV eingesetzt wurden.

Die Expedition erreichte den *NM*-Eishafen am Nachmittag des 3. Januar 2026 und bereitete die Versorgungsaktivitäten vor. Die Logistikarbeiten dauerten drei Tage und wurden aufgrund schwieriger Bedingungen am Schelfeisrand bis zum Nachmittag des 6. Januar verlängert. Während der Versorgung der *NM* waren am 5. Januar gegenseitige Besuche zwischen den Besatzungen der *NM* und *Polarstern* möglich. Ebenso konnten opportunistische wissenschaftliche Arbeiten durchgeführt werden, darunter die Kalibrierung zweier autonomer Meereis-Observatorien, ein Apstein-Netz und ein Tauchgang des Unter-Eis-ROV. Leider ging das BlueROV Mick während dieses Tauchgangs verloren.

Die wissenschaftlichen Arbeiten im zweiten Arbeitsgebiet vor Kapp Norvegia wurden in der Nacht vom 6. Januar 2026 mit der Station PS152-26 wieder aufgenommen; von da an folgten wir für die nächsten 16 Tage einem engen wissenschaftlichen Zeitplan. Dank der guten Zusammenarbeit zwischen der Schiffsbesatzung und dem wissenschaftlichen Team konnte ein ambitioniertes wissenschaftliches Programm mit vertikalen Geräten, Schleppnetzen, benthischen Geräten, Langleinen-Verankerungen, Seehecht-Besenderung und Lander-Systemen umgesetzt werden. Der Schlüssel zum Erfolg lag sowohl in einer dynamischen Stationsplanung, einschließlich des Wechselns zwischen den Stationen je nach Wetterlage und Verfügbarkeit der Besatzung, als auch in der erweiterten Besatzung mit einer zusätzlichen Person an Deck und der hohen Flexibilität von Kapitän, Erstem Offizier, Offizieren und Bootsmann. So konnten zwei pelagische Schleppnetzfänge mit einer von Fischereiberater U. Grundmann hervorragend geschulten Besatzung durchgeführt werden, die wichtige Daten zu den unterschiedlichen Fangcharakteristika der verschiedenen pelagischen Fanggeräte liefern. Vom 17. bis 19. Januar traf uns ein weiterer Sturm, der jegliche Geräteeinsätze unmöglich machte. Die wissenschaftlichen Aktivitäten wurden am 19. Januar wieder aufgenommen, und am 22. Januar wurde das biologische Hauptprogramm in diesem Gebiet abgeschlossen.

Anschließend fuhren wir nach Süden, für Arbeiten an Meereis- und Unterschelfeis-Stationen. Wir mussten die wissenschaftlichen Aktivitäten jedoch für eine ungeplante logistische Unterstützung für *NM* unterbrechen, die bis zum 26. Januar andauerte. Danach verließen wir das Gebiet ohne weitere wissenschaftliche Aktivitäten und nahmen Kurs auf die Antarktische Halbinsel. Günstige Wetterbedingungen während der Überfahrt nach Punta Arenas, Chile, ermöglichte in den frühen Morgenstunden des 28. Januars die erfolgreiche Bergung der letzten BGC-Verankerung (BGC_26_1) als letzte wissenschaftliche Aktivität dieser Expedition. Wir überquerten die Drake-Passage bei gutem Wetter und erreichten den Hafen von Punta Arenas am Morgen des 2. Februar 2026.

Insgesamt konnte die PS152-Expedition alle im WOBEC- und Nebennutzer-Expeditionsvorschlag geplanten Standorte beproben, mit Ausnahme der Eisstationen (siehe Tab. 1.1 im Abschnitt Summary and Itinerary am Ende dieses Kapitels).

SUMMARY AND ITINERARY

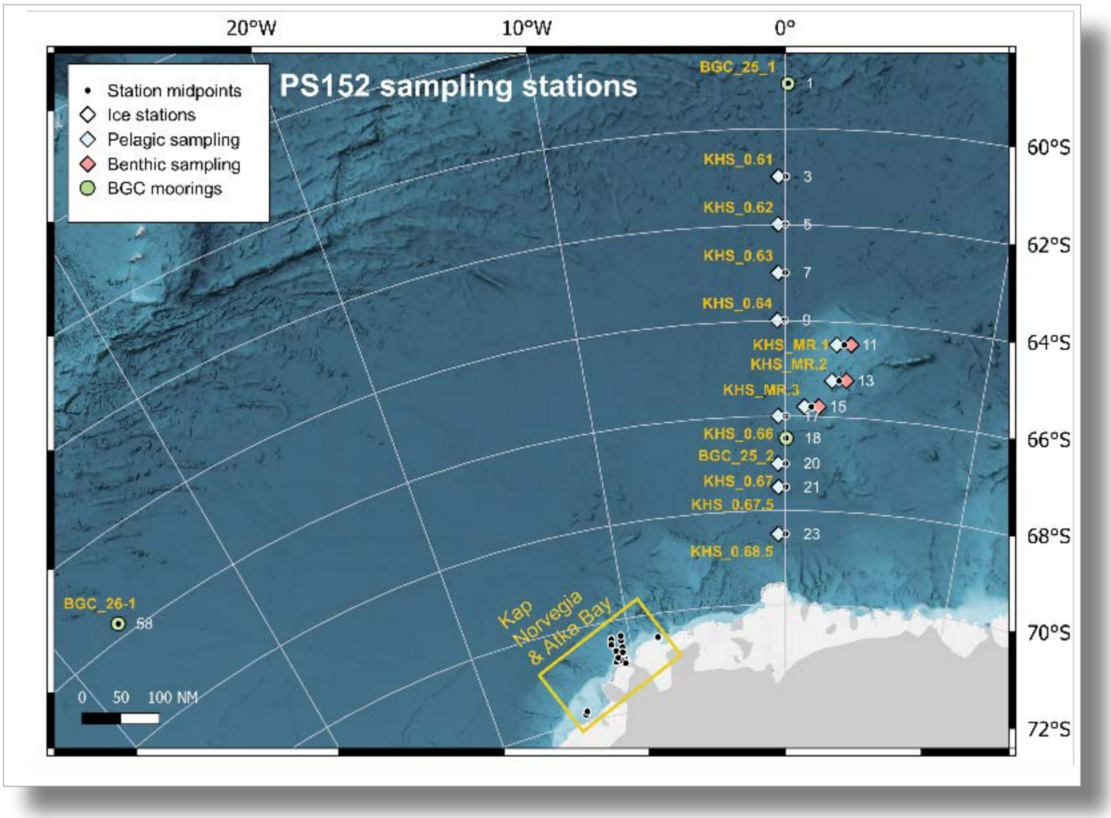
Overview

The expedition PS152 WOBEC (Weddell Sea Observatory of Biodiversity and Ecosystem Change) left Walvis Bay, Namibia, on 15 December 2025, heading for the Eastern Weddell Sea/ King Haakon VII Sea (EWS) with 47 science, 45 ship's and 4 helicopter crew participants. After successful completion of the scientific program we arrived in Punta Arenas, Chile, on 2 February 2026 (Fig. 1.1).

The overall goal was to contribute to systematic long-term studies on biodiversity and ecosystem dynamics in the EWS to identify the ecological impacts of environmental change over time (Gutt et al. 2022). To achieve this, monitoring and regular autonomous and ship-based observations of changes in ocean dynamics, geochemistry, biodiversity and ecosystem functions and services are essential for providing long-term data availability and ecosystem understanding.

The WOBEC initiative is a multinational, partly EU-funded project in the Biodiversa+ programme addressing the need for quantitative information on the Antarctic ecosystem within in a well-defined region in the Eastern Weddell Sea (Teschke et al. 2024). Prior to WOBEC, the Eastern Weddell Sea Observing System (EWOS) initiative was carried out as a proof of concept on *Polarstern* (PS129, Hoppema et al. 2023) from March to April 2022. WOBEC includes partners from Germany (UROS, AWI), Belgium, Italy, the Netherlands, Norway, Poland, Sweden, collaborating with additional partners from Spain, the United Kingdom, and the United States and further German universities. Three successful secondary user projects collaborated closely with WOBEC: GOSAFAST (Jones et al, NOAA, USA) aimed to shed light on the biogeography, life history and ecophysiology of Antarctic toothfish and other notothenioid fish and was directly integrated into the fish physiology group (Chapter 2.4). ICELIGHT (Veyssière et al., BAS, UK) studied how snow and sea ice properties affect the Antarctic under-ice light environment and how this, in turn, structures ecosystem functioning (Chapter 2.7). For SeaCAT (AWI), we recovered moorings including rare time-series samples on biogeochemistry and microbial diversity in the WOBEC study region. The WOBEC expedition further supported the international Argo Float and SOCCOM (Southern Ocean Carbon and Climate Observations and Modelling) programs, which are observing and modelling the biogeochemical cycles of the Southern Ocean as a key contribution to climate modelling. Observations are made using core or biogeochemical profiling floats (BGC-Argo) that are distributed in international waters throughout the Southern Ocean.

During PS152, we performed sampling of sea-ice properties, biodiversity, carbon and nutrient fluxes between atmosphere, sea-ice, water column, seafloor and the respective biota, including marine living resources, such as Antarctic krill and Antarctic toothfish, to be integrated with data collected from autonomous and remote sampling. Our two work areas were: (i) the Prime Meridian Transect through the King Haakon VII Sea south of 60 °S, including the seamount Maud Rise; (ii) the shelf and inflow region off Kapp Norvegia (Fig. 1.2). Along the expedition route, *en-route* measurements were collected, e.g., surface water eDNA and hydroacoustic backscatter profiles. PS152 was further accompanied by an onboard assessment of collaboration pathways and processes (Chapter 2.6) and a comprehensive and successful outreach campaign (Chapter 2.9). In addition to the immediate scientific program, this PS152 provided logistic support to the German Antarctic *Neumayer Station III*.



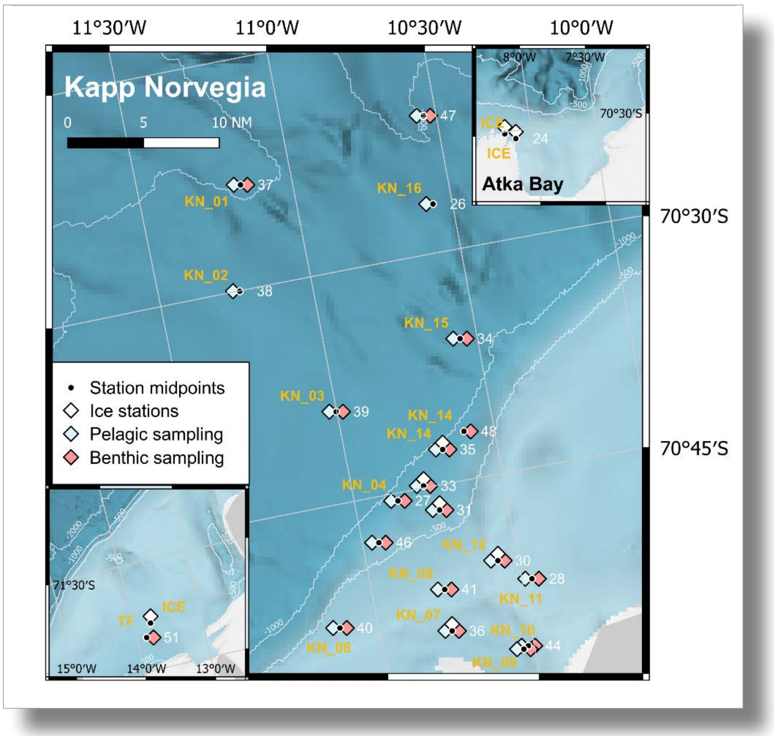


Abb. 1.2: Überblick der PS152-Beprobungsstationen (oben) mit Nahaufnahme des Kapp-Norvegia Untersuchungsgebietes (unten). Gelb: Bezeichnungen der WOBEC Beprobungspunkte und Verankerungspositionen: Weiß: PS152 Stationsnummern.

Fig. 1.2: Overview of the PS152 sampling stations (top) with close-up of Kapp Norvegia study area (bottom). WOBEC sampling site labels and BGC mooring sites are printed in yellow, PS152 station numbers are printed in white.

WOBEC represents a refined continuation of sustained measurements along the transects previously sampled by Germany and Norway, providing valuable quantitative information for biodiversity and ecosystem functions such as carbon export and secondary production from a rarely studied region bound for change. It will therefore also support the necessary monitoring efforts for the possible establishment of a Weddell Sea Marine Protected Area (WSMPA) by CCAMLR.

Itinerary and cruise narrative

The transit from Walvis Bay, Namibia, to the first scientific station at the Prime Meridian was intensively used by scientists and crew for field work preparations and setup. Following a successful mooring recovery at 59°S on 24 December 2025 (BGC_25_1), PS152 pursued its planned program of gear deployment starting at 61°S with pelagic studies, using the CTD and zooplankton nets (RMT, SUIT, Multinet). On 27 December, Maud Rise was reached and the first full set of pelagic-to-benthic sampling was successfully run. Increasing wind and deteriorating sea state conditions did not allow for full gear deployment on the following two Maud Rise stations. Moreover, the early absence of sea-ice prevented any sea-ice work along the Prime Meridian transect. The second mooring was recovered south of Maud Rise on 30 December under difficult sea-state conditions (BGC_25_2). Weather restricted deployment possibilities, and stations on the transect south of 67°S were shifted south by 0.5° of latitude towards more stable conditions. The Prime Meridian transect was concluded at 68.5°S with station PS152-23 on the evening of 1 January 2026. All six Argo floats were deployed along this transect.

Prior to approaching *Neumayer Station III (NM)* for supply, *Polarstern* weathered off in the area until 2 January. Waiting for *NM* preparations after the storm, PS152 first conducted an ice station at Atka Bay fast ice, sampling physical and biological data and deploying the under-ice ROV.

The expedition reached *NM* iceport on the afternoon of 3 January 2026, preparing the supply activities. Logistics continued for three days, prolonged by difficult conditions at the shelf-ice edge until the afternoon of 6 January. During *NM* supply, mutual visits between the crews of *NM* and *Polarstern* were possible on 5 January, and opportunistic scientific activities including transducer calibrations of two autonomous sea-ice observatories, an Apstein net and an under-ice ROV dive could be conducted. Unfortunately, the Blue ROV Mick was lost during that dive.

Scientific work in the second working area off Kapp Norvegia was resumed with Station PS152-26 in the night of 6 January 2026, from when we followed a dense scientific schedule for the next 16 days. Owing to a good collaboration between the ship's crew and the scientific party, an ambitious scientific program including vertical samplers, trawls, benthic gear, longline moorings, toothfish tagging and lander systems could be realised. The key to success relied on both a dynamic station planning, including switching between stations according to weather and crew availability, and the extended crew with an additional person on deck and high flexibility among master, chief mate, officers and boatswain. This included two pelagic trawls with a crew perfectly trained by fisheries advisor U. Grundmann, which provided important data on different catch characteristics between pelagic fishing gears. Another storm hit us from 17 to 19 January, forbidding any activity on the working deck. Scientific activities were resumed on 19 January, and we continued until 22 January, when the main biological program was concluded in this area.

We then headed south for additional sea ice and under shelf-ice ROV stations, but had to abandon scientific activity for unplanned logistic support for *NM*, lasting until 26 January. Afterwards, we left the area without further scientific activities and took course to the Antarctic Peninsula. Fair weather during the transit to Punta Arenas, Chile, allowed for a successfully recovery of the last BGC mooring (BGC_26_1) in the early morning hours of 28 January as the last scientific activity of this cruise. We crossed the Drake passage in good weather and reached the port of Punta Arenas in the morning of 2 February 2026.

Overall, PS152 could sample all sites planned in the WOBEC and side users' cruise proposal, except ice stations (Tab. 1.1).

Tab. 1.1: Zahl der erfolgreich beprobten Stationen pro Gerät im Vergleich zu ursprünglich geplanten Probenahmepunkten (laut WOBEC, ICELIGHT und SeaCAT Fahrtanträgen). Nur Stationen mit erfolgreichem Geräteeinsatz bzw. Probenahme wurden erfasst.

Tab. 1.1: Achieved versus planned stations sampled per gear according to WOBEC, ICELIGHT and SeaCAT expedition proposals. Only stations with successful gear deployment or sampling are considered.

Gear	# planned stations	# successful stations
AGT	5	4
Apstein net	0	20
Argo Floats	6	6
BC	6	2
Cryobenthos station	4	5*
CTD	30	30
EK80 calibration	1	1
Ice station	10	5
Lander	7	8
LOKI	7	0
Longline	4	4
MN	10	16
Moorings	3	3
Observatory Deployment	3	1**
OFOBS	18	18
Pelagic trawl	2	2
RMT/mRMT	21	19
Sediment traps	1	1
SUIT	13	13
TV-MUC	11	6
UVP	27	30

** Dive time was lower than planned (ca. 10 h) due to equipment failure, weather and time constraints*
*** Although deployment was successful, autonomous observatory was lost a few days after deployment*

WEATHER CONDITIONS DURING PS152

Mareike Pohling DE.DWD

15 December 2025 – 23 December 2025

Transit from Walvis Bay to the Prime Meridian transect through the King Haakon VII Sea

When *Polarstern* departed Walvis Bay in the afternoon of 15 December 2025, the harbour was situated between a low-pressure trough along the Namibian coast and a ridge of high pressure extending southeastward from a broad South Atlantic high. As a result, southwesterly winds of approximately 4 Beaufort prevailed. After leaving the coastal shelter, the vessel encountered a southerly to southwesterly swell of 1.5–2 m.

During the following days, *Polarstern* remained mainly under the influence of the extensive South Atlantic high, which slowly migrated eastward. Winds were predominantly from southerly to southeasterly directions at around 4 Beaufort, accompanied by a swell of 2–3 m from the south to southwest. At times, winds were funnelled along the west coast of South Africa and briefly increased to 6–7 Beaufort on 17 December 2025, while the swell rose to approximately 4 m. On 18 December 2025, the vessel passed through the high-pressure ridge, causing the wind to veer from southeasterly to southwesterly directions.

Subsequently, *Polarstern* approached a small-scale low-pressure system moving eastward toward the southern tip of South Africa. Upon crossing approximately 40°S during the night of 20 December 2025, the vessel passed the low and entered a high-pressure ridge connecting a high over the southeastern Atlantic with another high just south of South Africa. The initially southwesterly wind of 4–5 Beaufort backed to southerly directions on the rear side of the low, temporarily weakened, and then shifted to northwesterly directions along the southwestern flank of the ridge, strengthening again to 4–5 Beaufort. Sea state was around 2.5 m with a southwesterly swell. Periods of mist, fog, and drizzle occurred, resulting in poor to very poor visibility.

Between 21 and 23 December 2025, a partly stormy westerly flow developed between the ridge of high pressure over the South Atlantic and a deep low-pressure system moving eastward at around 65°S over the Southern Ocean. The associated cold front progressed eastward and temporarily developed a secondary low, which passed over the vessel during the night of 22 December 2025. The initially northwesterly wind of around 4 Beaufort increased to 6–7 Beaufort with gusts of 8–9 Beaufort, shifted to west to southwest behind the front, and only gradually decreased to 4–5 Beaufort. Significant wave heights temporarily increased to 3.5–4.5 m. Temporarily rain and on the rear of the front isolated snow showers occurred, leading to poor visibility at times.

24 December 2025 – 3 January 2026

Research at the Prime Meridian transect through the King Haakon VII Sea and Maud Rise

On 23 December 2025, *Polarstern* briefly entered the influence of a weak high-pressure ridge connecting a small high over the southeastern Atlantic with a high over Dronning Maud Land. During this period, westerly winds subsided and temporarily light and variable winds prevailed. Sea state decreased accordingly, leaving a residual westerly swell of approximately 0.5 m at the first research station on 24 December 2025.

At the same time, a low-pressure system moved from the northern tip of the Antarctic Peninsula toward the Weddell Sea. Its associated warm front extended northeastward and advanced only slowly southeastward, reaching the ship in the early hours of 25 December 2025. Ahead of the low, winds shifted to northerly directions and increased to around 5 Beaufort, while the sea state was approximately 1 m. As the front passed the ship, snowfall occurred and visibility deteriorated. The frontal system began to occlude, and on 26 December 2025 a secondary low formed and moved eastward over *Polarstern* until 28 December 2025. Meanwhile, the original controlling low weakened. The air mass remained moist, with intermittent snowfall and poor to moderate visibility, while winds abated. Sea state remained between 0.5 and 1 m.

Between 28 December 2025 and 2 January 2026, *Polarstern* was affected by two further low-pressure systems (informally referred to as “A Bit of Weather” and “Rather Unhelpful Depression”), both moving from the South Atlantic toward the south and southeast. At times, these systems caused stormy easterly winds in combination with sea states of around 4 m and an influx of very moist air masses. The second system (“Rather Unhelpful Depression”) was particularly significant.

On 30 December 2025, this low was located at approximately 52°S, 15°W. It moved slowly southward and by the evening of 1 January 2026 was situated about 300 nautical miles northwest of *Neumayer Station III*. The associated frontal system passed over the ship on 31 December 2025, advecting a very moist and relatively mild air mass. This resulted at times in wet snowfall or freezing rain, leading to ice accretion on the ship’s superstructures. Visibility was poor to very poor. Winds temporarily increased to 7–8 Beaufort, with gusts up to force 9, and the sea state at times reached nearly 5 m. In particular, the sea state severely restricted research operations on 31 December 2025 and 1 January 2026, requiring a temporary suspension of scientific activities. From the night of 2 January 2026 onwards, the low-pressure system moved westward toward the Weddell Sea.

3 January 2026 – 6 January 2026

Supply operations at *Neumayer Station III*

From the night of 2 January 2026 onward, the low gradually moved to the Weddell Sea and slowly filled until 8 January 2026. At the same time, a ridge of high pressure east of *Neumayer Station III* extended northward. Winds gradually weakened and, upon arrival at the northern landing site of *Neumayer Station III* on 3 January 2026, blew from northeasterly directions at 3–4 Beaufort. Sea state decreased, leaving a northerly swell of 0.5–1 m. Over the following days, the ridge migrated slowly westward, resulting in light and variable winds from 4 to 6 January 2026. At times, a moist boundary layer with low stratus clouds and poor visibility prevailed, restricting helicopter operations for station supply.

6 January 2026 – 22 January 2026

Research off Kapp Norvegia

On the afternoon of 6 January 2026, *Polarstern* departed from the northern landing site at the ice-shelf edge near Neumayer Station III and proceeded toward the research area off Kapp Norvegia. At that time, the vessel was located on the eastern flank of the ridge under weak southwesterly winds and a northerly swell of around 0.7 m. As the ridge shifted further westward, it temporarily developed into an independent high-pressure system ("Temporary Optimism") over the northeastern Weddell Sea and subsequently merged into the ridge of a high near the Falkland Islands. Elevated pressure over the northeastern Weddell Sea thus persisted until 10 January 2026.

At the same time, a trough ("Trough of No Great Surprise") developed somewhat inland of the ice-shelf edge. Between these systems, southwesterly winds of mostly 3–5 Beaufort prevailed in the Cape Norvegia research area, temporarily increasing to 6–7 Beaufort with gusts up to 8 Beaufort on 10 January 2026 as the trough intensified. Sea state was partly dampened by sea ice and remained mostly at or below 0.5 m, increasing to around 2 m with strengthening winds.

On 11 January 2026, the trough shifted slightly northwestward and directly affected the research area. Winds weakened by the evening, while fog and snow showers occurred within the moist air mass, resulting in very poor visibility. Significant wave heights were around 1 m. On 12 January 2026, a low developed from the trough and moved eastward. Subsequently, a weak high-pressure influence set in, establishing light southerly winds that advected a somewhat drier air mass and led to partial cloud clearance during the late afternoon.

From 13 to 16 January 2026, a low-pressure system ("Mild Concern") moved southeastward from the northeastern Weddell Sea, passing just north of the working area. Winds shifted to northeasterly directions during the afternoon of 13 January and increased from around 4 Beaufort to 7–8 Beaufort with gusts up to 9 Beaufort during the night to 15 January 2026. Sea state, dampened by surrounding ice, reached approximately 2 m. Thereafter, the low weakened and winds temporarily decreased to 4–5 Beaufort on the morning of 16 January 2026, before the next low ("THE THING") approached from the northwest.

This system formed during the night of 15 January 2026 just north of the Antarctic Peninsula and intensified into a severe storm while moving southeastward. On 17 January 2026, it reached a position approximately 300 nautical miles northwest of the research area off Cape Norvegia. During the following night, a secondary core developed farther east and became the dominant low. The system advanced slightly farther southward and remained between 200 and 300 nautical miles north of the research area from 18 to 20 January 2026. Central pressure reached a minimum just below 950 hPa during the first half of 18 January 2026.

Under the influence of this severe storm, easterly winds increased from around 5 Beaufort on 16 January to 10–11 Beaufort with gusts up to 12 Beaufort on 18 January (storm peak). The strongest gust, 79 kt, was measured on the afternoon of 18 January. Research operations were suspended on the afternoon of 17 January 2026, and the vessel sought shelter on the lee side of a large iceberg at approximately 70.92°S, 10.53°W. Local sea ice and land shielding reduced fetch and limited wave development, with significant wave heights reaching a maximum of 3–4 m. Periods of snowfall occurred, resulting in poor to very poor visibility.

Between 18 and 21 January 2026, the low gradually weakened and moved eastward. Winds decreased to around 4 Beaufort by the evening of 21 January and shifted to southeasterly directions, while significant wave heights decreased from around 3 m to 1–2 m. Research operations were resumed with restrictions around midday on 19 January 2026.

Research activities off Kapp Norvegia were completed on 22 January 2026 under the influence of a shallow high-pressure ridge extending northward over Dronning Maud Land. Weather conditions were characterized by southeasterly winds of around 3 Beaufort or light and variable winds, sea state below 0.5 m, a relatively dry air mass, and good visibility.

23 January 2026 – 25 January 2026

Logistical support of *Neumayer Station III*

Between 23 and 25 January 2026, *Polarstern* conducted logistical support operations for *Neumayer Station III* between the ice-shelf edge and the waters around Kapp Norvegia. During this period, a low-pressure system ("The Chill Cyclone") northeast of the Weddell Sea moved slowly eastward, while high pressure prevailed over the Weddell Sea. Winds shifted to easterly directions and increased to 6–7 Beaufort by the morning of 24 January 2026, with significant wave heights of approximately 1.5–2 m. Intermittent snow showers occurred, resulting in poor visibility. As the low moved farther eastward, winds veered to southerly directions from midday on 24 January and weakened to around 4 Beaufort. At the same time, the air mass stabilized and became somewhat drier, reducing shower activity. Sea state decreased to 0.5–1 m. On 25 January 2026, the pressure gradient between the high over the Weddell Sea and the low to the northeast relaxed, and winds subsided during the afternoon.

25 January 2026 – 2 February 2026

Transit to Punta Arenas including final mooring recovery

On the evening of 25 January 2026, *Polarstern* departed under light-wind conditions for the transit toward Punta Arenas. As the high-pressure system over the Weddell Sea continued to intensify on 26 January, winds increased along its periphery and the vessel initially proceeded northwestward in southerly winds of around 4 Beaufort. Below the subsidence inversion, a cloud-rich air mass dominated the weather conditions. Sea state was around 0.5 m.

The high shifted further northeastward, causing winds to veer to westerly directions during the night of 27 January 2026. During the following night, station operations were successfully completed with the recovery of a final mooring at approximately 60°43′S, 36°28′W. Ahead of a low-pressure system near the northern tip of the Antarctic Peninsula, winds increased to 5 – 6 Beaufort and shifted to northwesterly directions.

The low continued eastward and passed *Polarstern* slightly to the south during the night of 29 January 2026. At times, northerly winds of 7–8 Beaufort occurred, which shifted to west to southwest on the rear side of the low and subsequently weakened to 6–7 Beaufort. Sea state temporarily reached 3–3.5 m, while occasional snowfall led to poor visibility.

On the rear side of the low, *Polarstern* remained in westerly winds of around 6 Beaufort, situated between high-pressure systems over the southwestern Atlantic and the southeastern Pacific, and a low-pressure system over the Weddell Sea. The ship's course led westward south of the South Orkney Islands toward Elephant Island. During this period, *Polarstern* was under the direct influence of the polar front, within a very moist and increasingly mild air mass accompanied by fog or dense mist.

Not until the night of 31 January 2026 did the vessel move onto the rear side of an eastward-moving frontal wave and thus into a somewhat drier air mass. Subsequently, *Polarstern* transited the Drake Passage. During this period, the overall pressure pattern changed little and predominantly westerly winds of 5–6 Beaufort and a sea state of 2–3 m prevailed. A trough swinging eastward across the Drake Passage from the night of 1 February 2026 temporarily enhanced the pressure gradient. In combination with a Cape effect near Cape Horn, this led to a brief increase in winds to 7–8 Beaufort south of Tierra del Fuego. Showers occurred at times, and sea state temporarily increased to approximately 3.5–4 m.

Subsequently, a ridge extended from a high-pressure system over the southwestern Pacific toward Patagonia, allowing *Polarstern* to reach the port of Punta Arenas around midday on 2 February 2026 under southwesterly winds around 5 Beaufort.

Summary of radiosoundings during PS152

Radiosoundings were collected in collaboration with AWI (Milena Gottschalk) along the expedition track. A graphical summary of radiosoundings data is presented in Figs. 1.3 to 1.6.

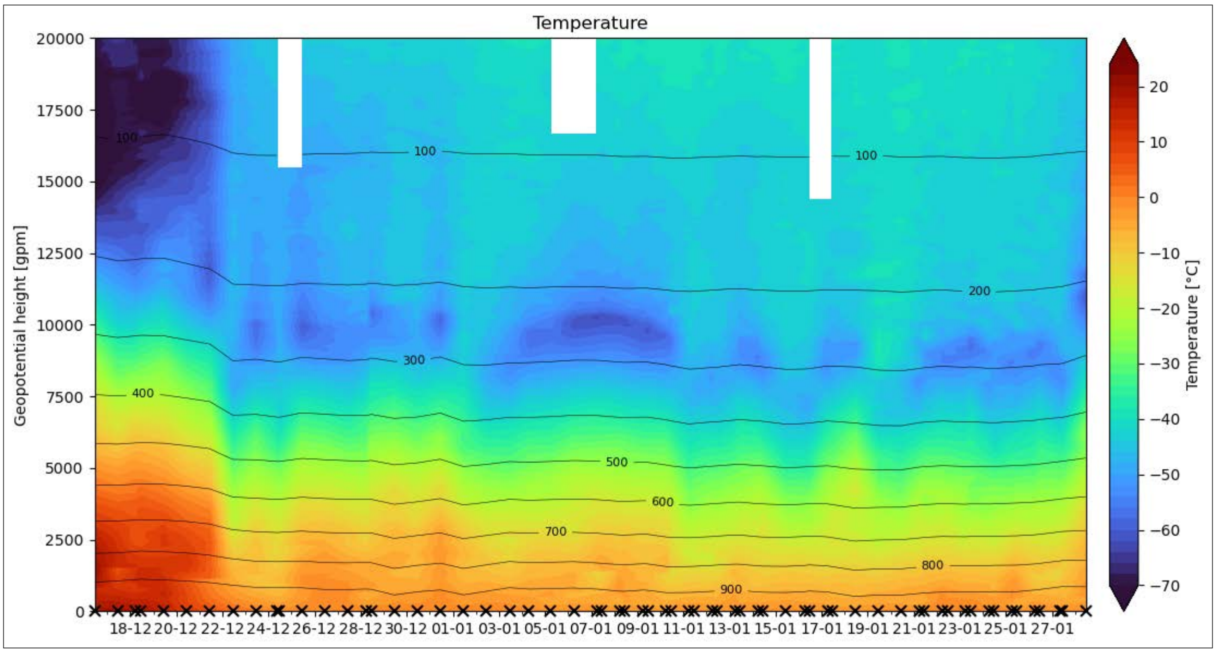


Fig. 1.3: Temperature and geopotential height from 16.12.2025 to 29.01.2026

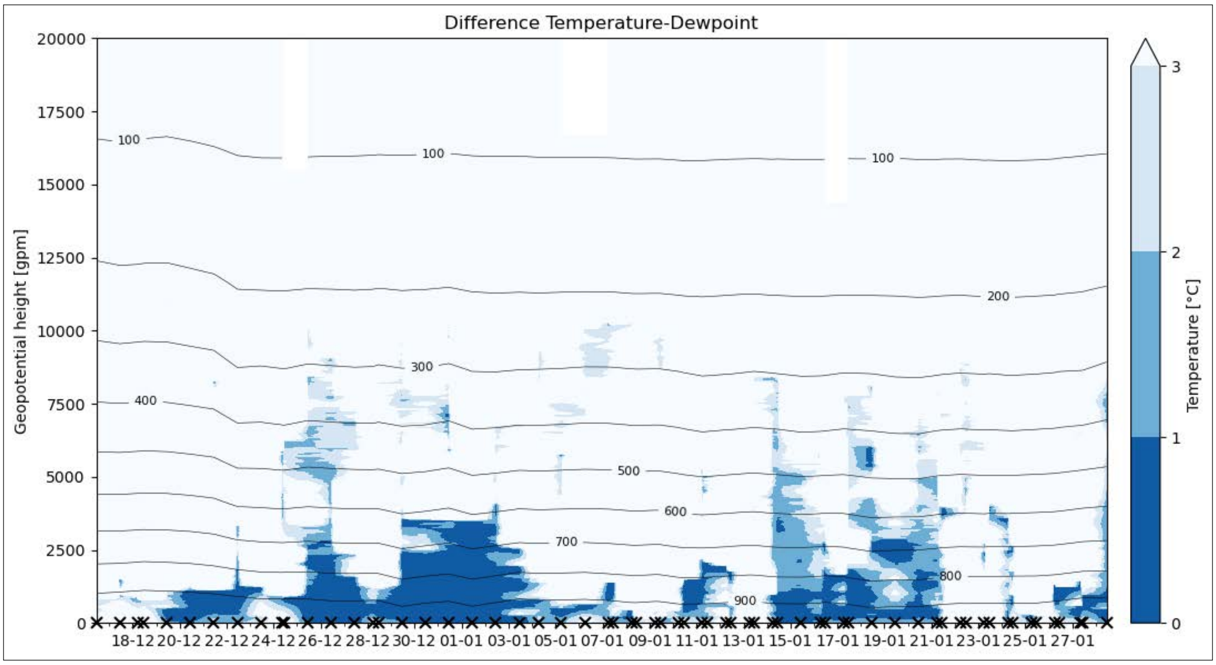


Fig. 1.4: Spread and geopotential height from 16.12.2025 to 29.01.2026

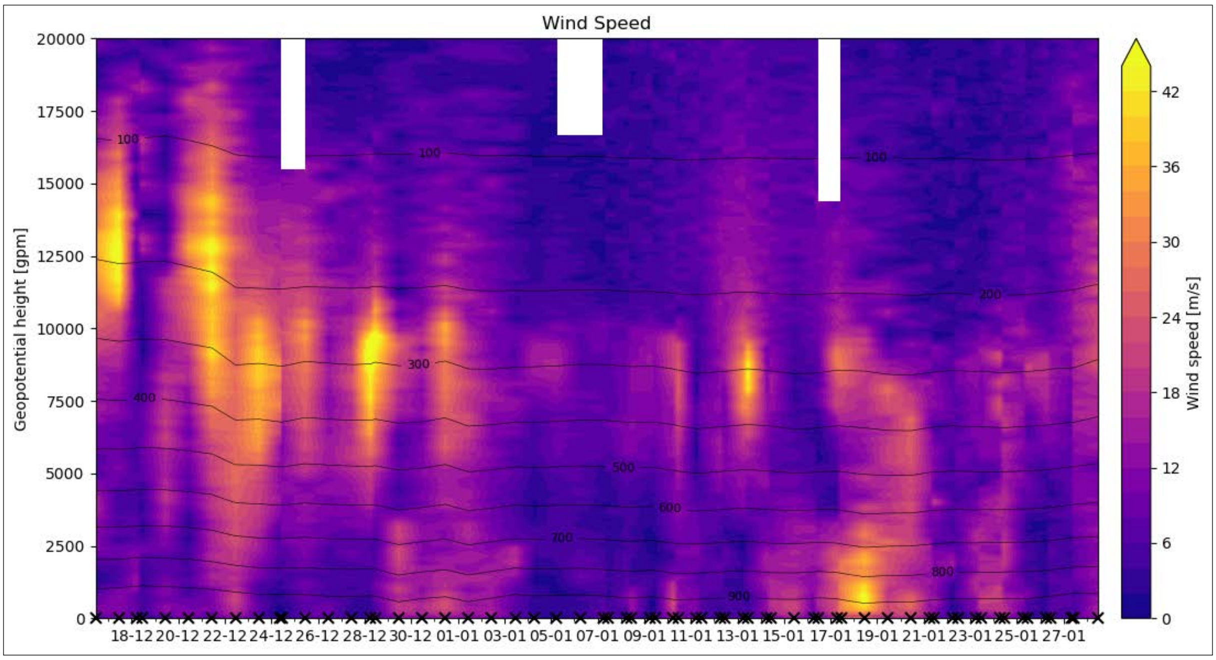


Fig. 1.5: Wind speed and geopotential height from 16.12.2025 to 29.01.2026

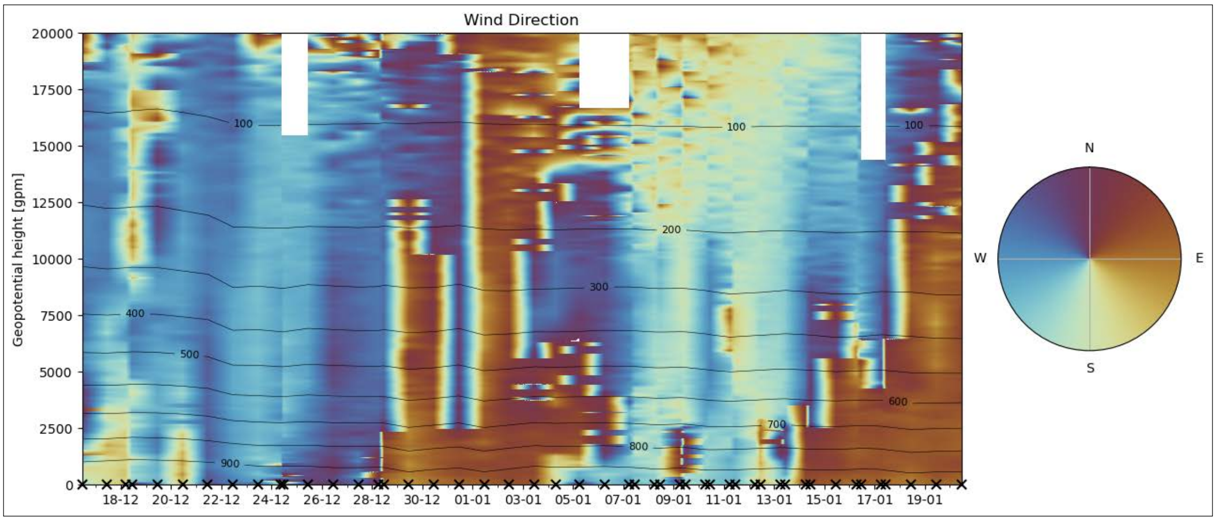


Fig. 1.6: Wind direction and geopotential height from 16.12.2025 to 29.01.2026

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2.1 PELAGIC AND SYMPAGIC HABITAT, PRIMARY PRODUCTION AND BIODIVERSITY AND ECOSYSTEM FUNCTIONS

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Grant-No. AWI_PS152_01 and AWI_PS152_07

Outline

The working groups of both grants worked together on different aspects including primary production, physical oceanography, light properties, cycling of climate-active gases such as CO_2 and DMS in both the pelagic and sympagic habitat.

2.1.1 Pelagic habitat, primary production and biodiversity and ecosystem functions

Objectives

This WP investigated the role of the Weddell Sea in the global climate system via the biological carbon pump (BCP) and the production of sulfur-containing climate gases (i.e., DMS). These processes are driven by microbial primary production and carbon transfer and linked to their biodiversity.

Work at sea

2.1.1.1. CTD casts

At all WOBEC stations, we deployed a Conductivity, Temperature, Depth probe (SBE911plus CTD system) equipped with a water sampling rosette (24 Niskin bottles), an oxygen probe, a transmissometer and a fluorescence sensor to obtain automated data on physical-chemical properties, particle distribution, Chlorophyll *a* (Chl *a*) concentration, and water samples (Tab. 2.1.4). To determine the distance to the bottom, an altimeter was mounted. Additionally, we sampled the vertical distribution of particles and organisms using an Underwater Vision Profiler (UVP) mounted on the CTD rosette (Grant-No. AWI_PS152_02). A first CTD section (N=12) was conducted along the prime meridian, between 59.05° and 68.5° South, including 3 stations at Maud Rise (Fig. 2.1.1). At Kapp Norvegia, two CTD transects (N=18) were carried out from the coastal ice shelves to offshore (Fig. 2.1.2), aiming at delineating the distribution of water masses, biogeochemical cycles, and upper ocean carbon and plankton dynamics. The CTD was operated by a crew of two (winch operator and deck hand) in collaboration with two scientists.

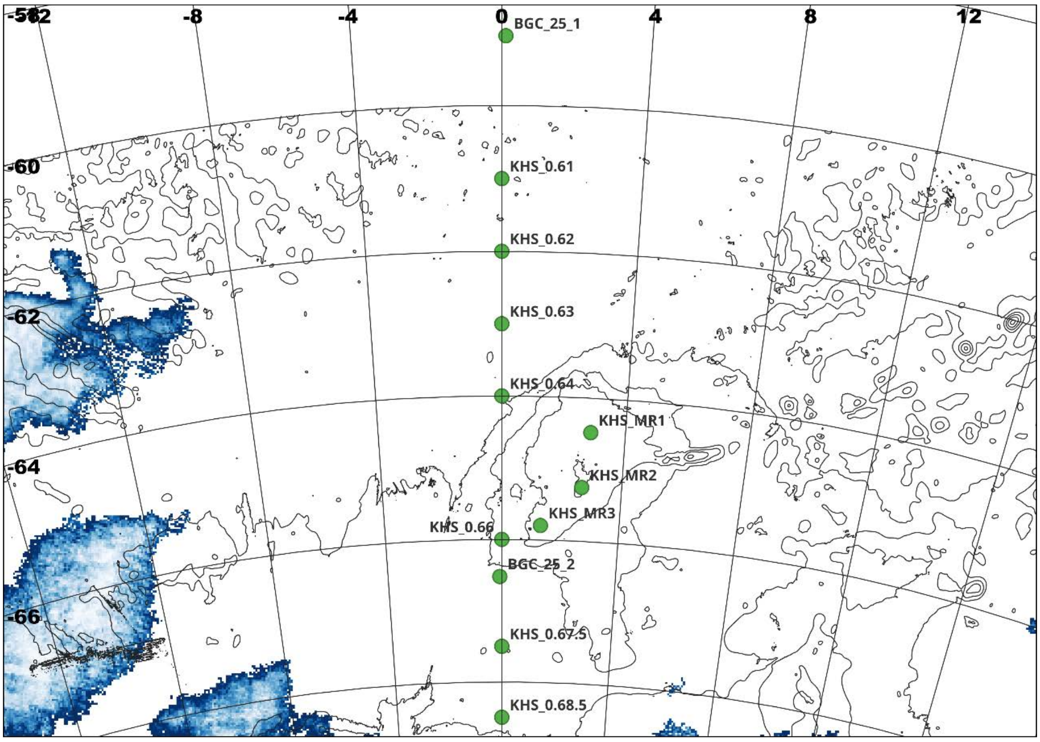

Fig. 2.1.1: CTD stations along the prime meridian along with satellite derived AMSR2 sea-ice concentration (%) (Spreen et al. 2008) on 29 December 2025

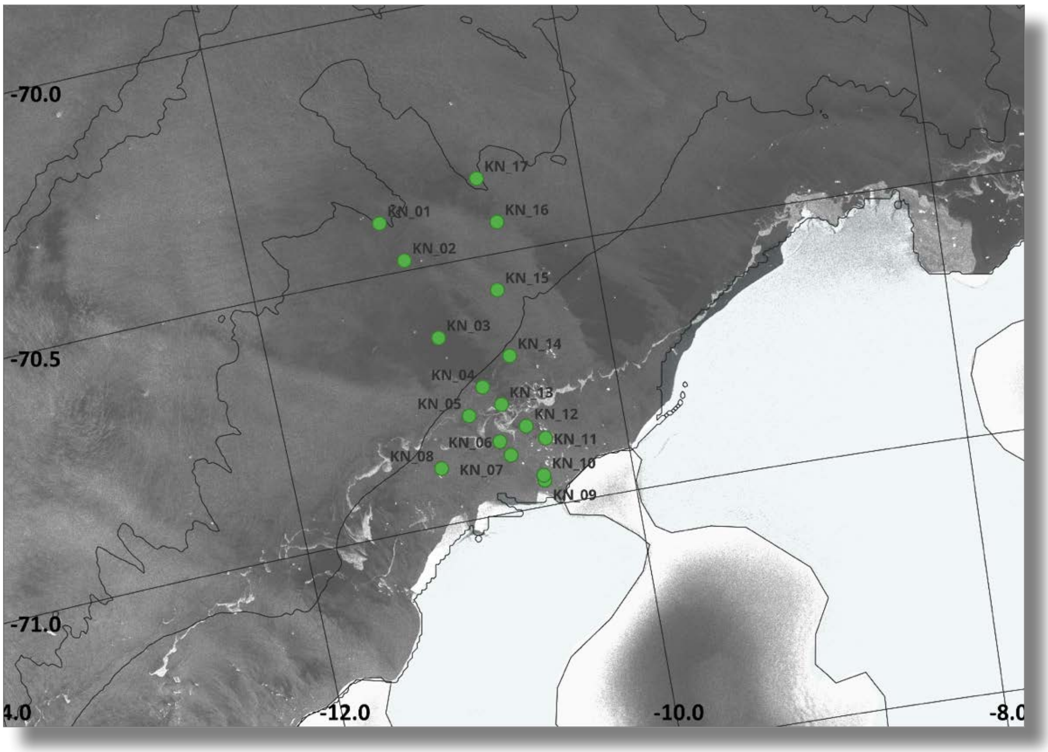

Fig. 2.1.2:. CTD stations in the Kapp Norvegia area along with the Sentinel 1 Single-Aperture Radar image on 21 January 2026

Water samples from discrete depths were sampled to calibrate and validate the CTD fluorescence (Chl *a*) and beam attenuation sensor data, as well as to sample for: Dissolved Inorganic Carbon (DIC) and Total Alkalinity (AT), δ^{13}C isotopic fractionation of DIC (δ^{13}C DIC), methane (CH_4), dissolved organic carbon (DOC), oxygen isotopic fractionation (δ^{18}Oxygen), macronutrients (Nutrient: NO_3, NO_2, PO_4, dissolved Si), δ^{15}N-NO_3 isotopic fractionation (δ^{13}N-NO_3), salinity, particulate organic matter (POM and δ^{13}C-POC and δ^{15}N-PON isotopic fractionation), biogenic silica (BSi), sulfur compounds (total and dissolved dimethylsulfide (DMS) and dimethylsulfoniopropionate (DMSP)), microbial and phytoplankton species composition (flow cytometry (FCM), phytoplankton taxonomy (microscopy), algal pigment composition (HPLC)), photosynthetic fluorescence (PAM), mycosporine-like amino acids (MAAs), extracellular polymeric substances (EPS), particulate absorption, molecular biodiversity assessments through eDNA (Grant-No. AWI_PS152_13) and lipid biomarkers (Grant-No. AWI_PS152_02). For a summary see Table 2.1.1.

In addition, at each CTD station, and whenever the weather permitted, a 20 µm hand-net sample was deployed down to 20 m depth to collect fresh taxonomy samples to look at under the microscope onboard. For *in situ* taxonomic analyses, a Zeiss Axio Vert. A1 inverted microscope was utilized. A single drop of each non-preserved sample was placed onto a microscope slide and secured with a coverslip. Species identification was performed at magnifications of 100x, 200x, and 400x (using 10x, 20x, and 40x objectives).

Samples for the determination of the Chl *a* concentration were extracted in 90% acetone overnight and measured onboard by fluorometry. In addition, salinity samples were measured onboard from deep and homogenous water masses. Comparisons between salinometer-based salinity measurements of water samples and concurrent *in situ* CTD data exhibited negligible offsets for both CTD conductivity sensors (0.004 and 0.003 in average). Besides Chl *a* and salinity, all other samples were preserved, packed and stored for further analyses ashore. All sampling, preservation and storing protocols are described in Van den Steen et al. (2025) and references therein.

Tab. 2.1.1: Sample types taken from the CTD/rosette

Parameter	Storage container/filter	Fixative	Storage
DIC	10 mL glass vial	2.4 µL HgCl2	Room temp, dark
AT	10 mL glass vial	2.4 µL HgCl2	Room temp, dark
Methane (CH_4)	60 mL glass serum bottle	60 µL HgCl2	+4°C, dark
δ^{13}C-DIC	20 mL glass amber bottle	30 µL HgCl2	Room temp, dark
DOC	40 mL amber vials Furnaced GF/F	100 µL 2N HCl	+4°C, dark
δ^{18}O	20 mL plastic scint. vial	None	+4°C, dark
Nutrients	20 mL plastic scint. vial Clean syringe Syringe filter	None	-20°C, dark
δ^{15}N-NO_3	60 mL glass HDPE bottle	None	-20°C, dark
Salinity	Glass salinometer bottle	None	Room temp, dark
Sulfur compounds	10 mL glass vial	NaOH	-20°C, dark
Pigments by HPLC	GF/F	None	Frozen at -80°C
δ^{13}C-POC, acidified	Furnaced GF/F	None	-20°C, dark
Chl a GFF	GF/F	10 mL 90% acetone 24h	+4°C in the dark

Parameter	Storage container/filter	Fixative	Storage
Chl a > 3 µL	3 µm polycarbonate membrane filter	10 mL 90% acetone 24h	+4°C in the dark
Chl a > 20 µL	3 µm polycarbonate membrane filter	10 mL 90% acetone 24h	+4°C in the dark
$\delta^{13}C$-POC and $\delta^{15}N$-PON Stable isotopes	Furnaced GF/F Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
BSi	0.6 µm polycarbonate membrane filter Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
MAAs	GF/F Aluminum foil packet	None	Frozen at -80°C
Absorption	GF/F Aluminum foil packet	None	Frozen in -80°C
EPS	0.4 µm polycarbonate filter Aluminum foil pocket	None	-20°C
FCM	4.5 mL cryovial *In duplicates*	90 µL glutaraldehyde	-80°C
Phytoplankton taxonomy	200 mL brown plastic bottle	2 mL premade Lugol solution	Room temp, dark
Ice algal taxonomy	100 mL brown plastic bottle	1 mL premade Lugol solution	Room temp, dark
Hand net phytoplankton taxonomy	100 mL brown plastic bottle	3 mL strontium chloride 1 mL premade Lugol solution	Room temp, dark

2.1.1.2. Experiments

Stable-isotope (^{13}C) and oxygen-optode incubation experiments were run aboard the ship to assess gross primary production rates and production of DMSP, which is the precursor of the climate-active gas dimethylsulfide (DMS) (Stefels et al. 2009), as well as net community production (Campbell et al. 2016), respectively. From the CTD casts, these rates were mainly determined for the surface and deep chlorophyll maximum (Tab. 2.1.7).

2.1.1.2.1. Production by means of ^{13}C-incoporation

To each sample (or ice section; see section 2.1.2), ^{13}C-$NaHCO_3$ was added. This sample was subdivided into 7 subsamples that were incubated in 1L Teflon bags or tissue culture flasks for 8 – 10 hours at a light range from 0 – 350 µmol photons m^{-2} s^{-1}. The incubation was terminated by filtration of the samples over GFF Whatman filters, using a low vacuum pressure (-20 kpa) under dim light conditions. Filters for POC analyses were packed in aluminum foil and stored at -20°C. Filters for DMSPp analyses were stored in 10ml milli-Q water in 20ml vials, to which a NaOH pellet was added; samples were stored at -20°C.

2.1.1.2.2. Production via oxygen optodes

For each sample (or ice section; see Tab. 2.1.7), a portion of the sample was for oxygen optode incubations to determine net community production (NCP). A sub-sample of pooled cores were transferred to glass incubation bottles with a peristaltic pump to reduce bubbles and placed in temperature-controlled incubation chambers set for 1 °C for open ocean samples and -1.5 °C for sea ice and under-ice water. These chambers contained ten 150 mL bottles (nine clear and one black) with a light source in front. The bottle furthest from the light source was taped solid black to simulate darkness and measure respiration. Each bottles oxygen concentration was logged with a Pyroscience robust O_2 optode sensor at two-second intervals for 8 – 24 h under continuous illumination (e.g., Fig. 2.1.3). Sample bottles had consistent mixing with stir bars in each individual bottle. Immediately following the experiments, three measurements of photosynthetically active radiation (PAR) were made using a Walz US-SQS/L spherical micro quantum sensor in each bottle and averaged to provide a value of light for each bottle. This data will be further analysed to retrieve an estimate of NCP.

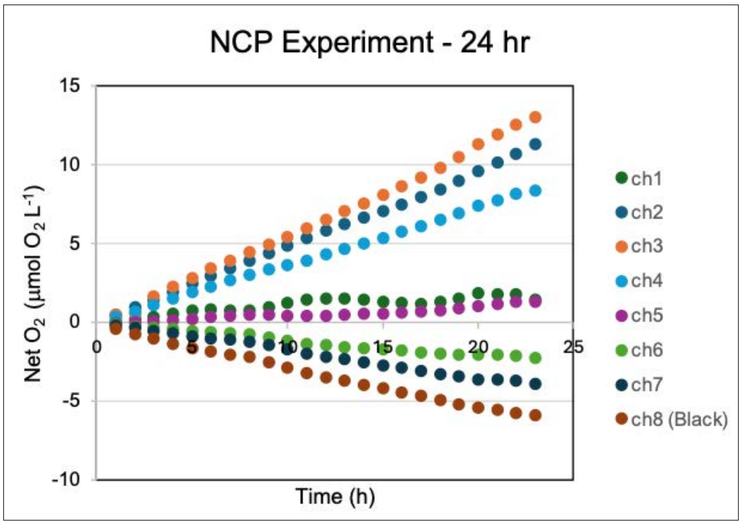

Fig.2.1.3: Net oxygen over the time of an incubation of the chl max at station 46

2.1.1.3. Short term sediment traps

A short-term sediment trap (KC Denmark A/S) with 10 sampling cups placed at 5 depths was deployed from the near surface to 200 m depth (i.e., at 40, 60, 100, 150 and 200 m depth) twice during the cruise. The traps were tied to the moored long lines on both deployments. The first deployment on Maud Rise was successful, but on the second deployment at Kapp Norvegia the trap was not retrieved as it was possibly damaged by sea ice. The equipment was unfortunately lost. From the first deployment, samples were retrieved from the trap to study the deep export of Chl *a*, particulate organic matter (POM), BSi, EPS, dissolved organic matter (DOM), flow cytometry, and taxonomy (Tab. 2.1.2).

Tab. 2.1.2: Sample types taken from short term sediment traps deployments

Parameter	Storage container/filter	Fixative	Storage
Chl a GFF	GF/F	10 mL 90% acetone 24h	+4°C in the dark
Chl a > 3 µL	3 µm polycarbonate membrane filter	10 mL 90% acetone 24h	+4°C in the dark
Chl a > 20 µL	3 µm polycarbonate membrane filter	10 mL 90% acetone 24h	+4°C in the dark
δ^{13}C-POC and δ^{15}N-PON Stable isotopes	Furnaced GF/F Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
BSi	0.6 µm polycarbonate membrane filter Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
EPS	0.4 µm polycarbonate filter Aluminum foil pocket	None	-20°C
FCM	4.5 mL cryovial *In duplicates*	90 µL glutaraldehyde	-80°C
Phytoplankton taxonomy	200 mL brown plastic bottle	2 mL premade Lugol solution	Room temp, dark
DOC	40 mL amber vials Furnaced GF/F	100 µL 2N HCl	+4°C, dark

2.1.1.4. Underway sampling

At 10 stations along the prime meridian, the surface water from the Ferrybox was sampled for Chl *a*, POM, nutrients (NO_3, NO_2, PO_4, dissolved Si), BSi, microbial and phytoplankton species composition (flow cytometry, microscopy), and molecular biodiversity assessments through eDNA (Tab. 2.1.3).

Tab. 2.1.3: Sample types taken from underway sampling

Parameter	Storage container/filter	Fixative	Storage
Inorganic nutrients	20 mL plastic scint. vial Clean syringe Syringe filter	None	-20°C, dark
Chl a GFF	GF/F	10 mL 90% acetone 24h	+4°C in the dark
δ^{13}C-POC and δ^{15}N-PON Stable isotopes	Furnaced GF/F Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
BSi	0.6 µm polycarbonate membrane filter Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
Absorption	GF/F Aluminum foil packet	None	Frozen in -80°C
Phytoplankton taxonomy	200 mL brown plastic bottle	2 mL premade Lugol solution	Room temp, dark

2.1.1.5 CTD measurements – preliminary results

Prior to the WOBEC campaign and throughout December 2025, sea ice retreated early from both the prime meridian and the Kapp Norvegia study area as illustrated by the sea-ice concentration anomaly in December 2025 (Fig. 2.1.4). Possibly due to this early and fast disappearance of the sea ice throughout December 2025, the surface ocean only showed a relatively weak meltwater layer with minimum salinity around 33.8 (Fig. 2.1.5).

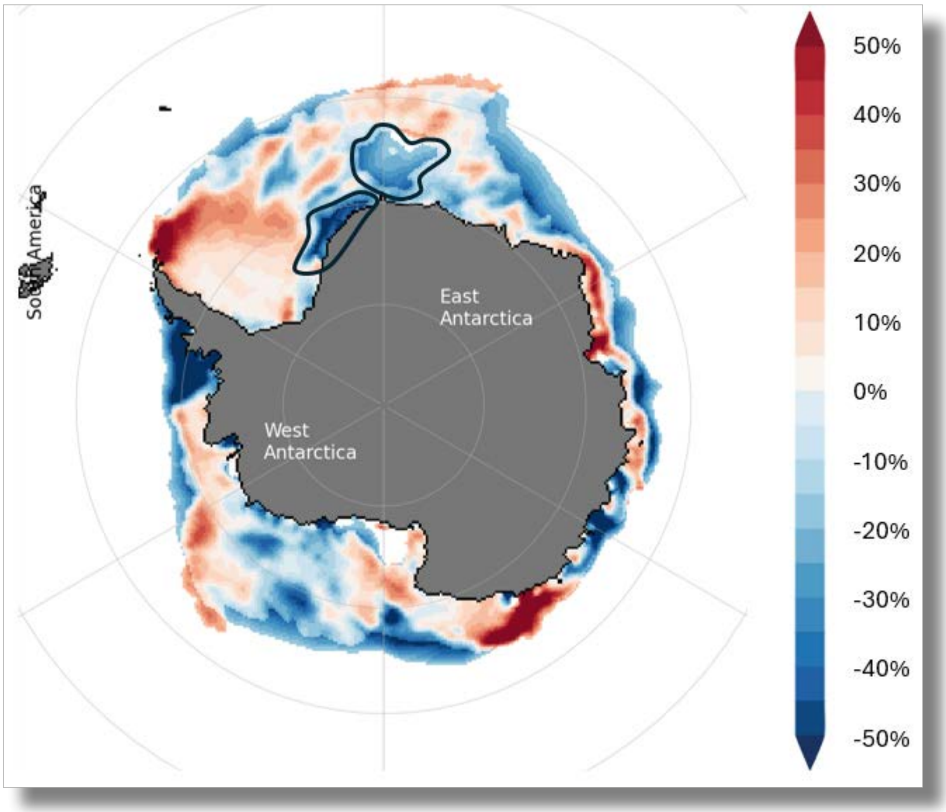

Fig. 2.1.4: Sea-ice concentration anomalies Dec 2025 versus 1978-2010 (NSDIC). Total anomaly = -0.5 million km^2.

As shown by the ocean temperature transects (Fig.2.1.6), the prime meridian transect was characteristic of the general upwelling throughout the Southern Ocean (Tamsitt et al. 2017) with the Warm Deep Water shallowing from 59.05° and 68.5° South (Reeve et al. 2019) at the location of the Biogeochemical Divide (Marinov et al. 2006). Also characteristic of the Southern Ocean is the Slope Front, as depicted from the deepening of density isopycnals towards the continental slope in both cross-shelf transects at Kapp Norvegia (Figs. 2.1.5 and 2.1.6).

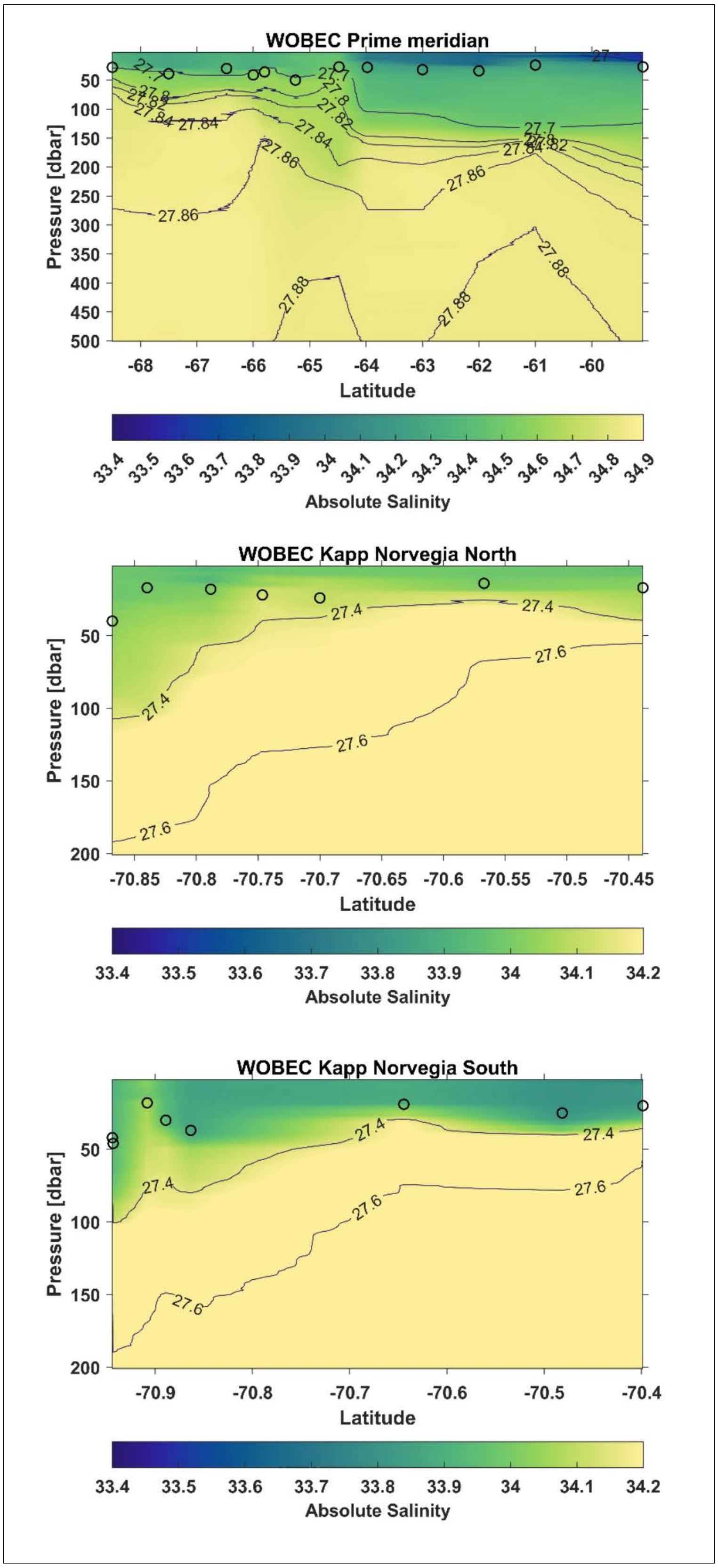

Fig. 2.1.5: Absolute salinity transects across the Prime Meridian and Kapp Norvegia (North of South)

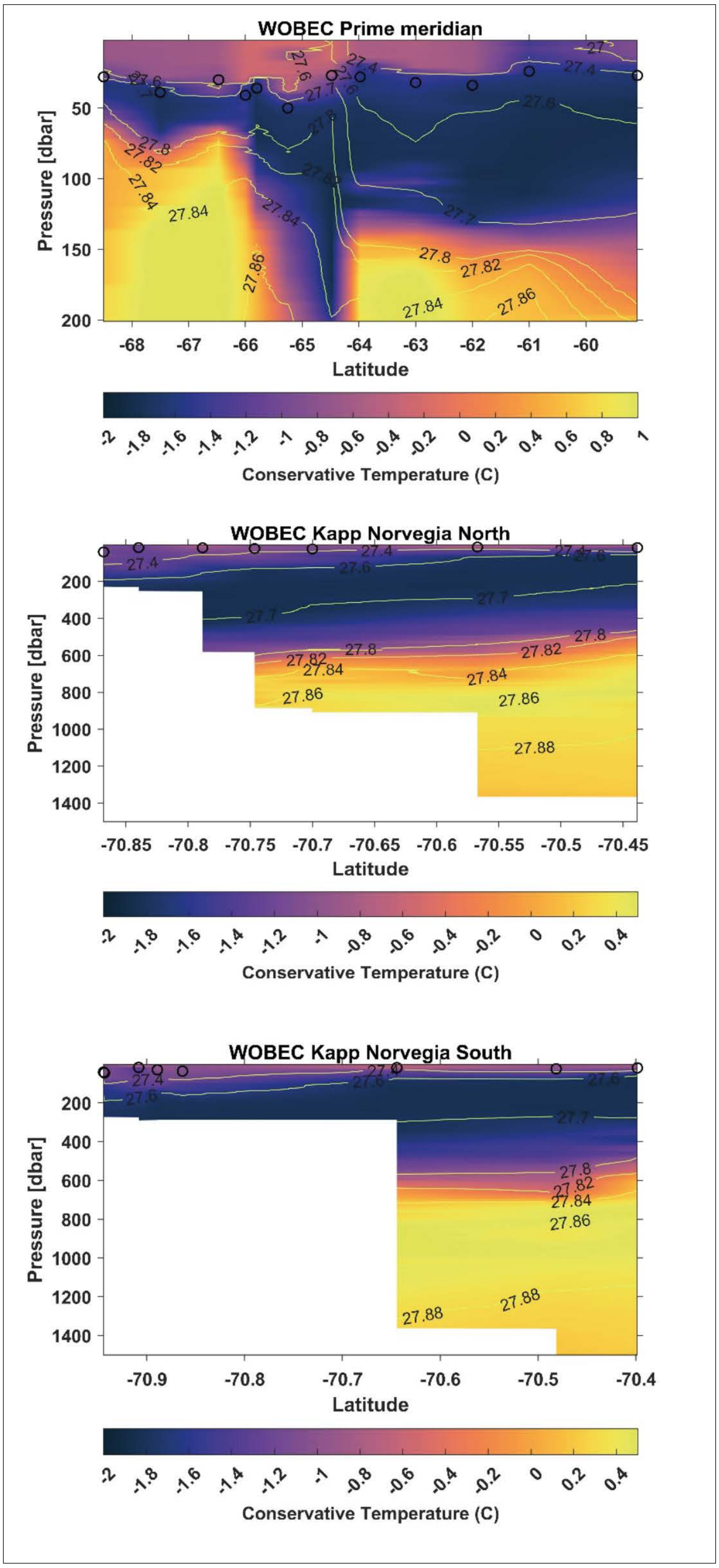

Fig. 2.1.6: Conservative temperature (°C) transects along the prime meridian and Kapp Norvegia (North to South)

The phytoplankton biomass was relatively low along the prime meridian, expect in the southern end of the transect towards the Biogeochemical Divide (Fig. 2.1.7). On the contrary, we observed a strong phytoplankton bloom at Kapp Norvegia with Chl *a* concentrations up to 7 µg l^{-1}. This stronger biomass at Kapp Norvegia was also detected from satellite observations beginning in December and was ongoing during our visit to the area.

The phytoplankton biomass showed signs of deep export on the continental shelf, seemingly following the down sloping of density isopycnals (Fig. 2.1.7). Preliminary analyses suggest that this could be attributed to the weaker stratification of the upper ocean as suggested by the weaker Brunt-Väisälä frequency on the continental shelf compared to the offshore waters (Fig. 2.1.8). This weakly stratified upper ocean was likely the result of the disappearance of the sea-ice cover in early December, exposing the surface ocean to wind stress.

Despite that the phytoplankton bloom was relatively weak along the Prime Meridian, we observed high diatom diversity, with approximately 32 different species identified per sample (Fig. 2.1.9). The community was dominated by *Fragilariopsis kerguelensis*, *Chaetoceros dichaeta*, *Chaetoceros* sp., *Banquishia belgicae*, and the *Pseudo-nitzschia lineola/heimii* complex, as well as the *Proboscia* and *Rhizosolenia* groups. Dinophyceae were represented mainly by *Protoperidinium* sp., while the Dictyochophyceae were represented by *Dictyocha speculum*. Smaller phytoplankton cells were not present in the samples due to the mesh size of the net, however we observed few small colonies of *Phaeocystis antarctica* in the Southern end of the transect.

Taxonomy samples from hand nets (20µm) revealed that, at Kapp Norvegia, the phytoplankton community was exclusively dominated by the haptophyte *Phaeocystis antarctica*, while the species diversity decreased, with 10 to 25 taxa per station. Besides the dominance of *Pleuragramma antarctica*, we observed a high abundance of the centric diatom *Corethron pennatum*. Aditionally, we noted sporadic occurences of *Actinocyclus actinochilus*, *Stellarima microtrias*, *Odontella weissflogii*, *Thalassiosira* sp. *Fragilariopsis kerguelensis*, *Eucampia antarctica*, *Coscinodiscus radiatus*, *Pseudo-nitzschia subcurvata*, and other *Chaetoceros* species. The dinophyceae group was represented by a single species of *Protoperidinium* sp. We also observed the formation of auxospores indicating intense sexual reproduction in the centric diatom *Corethron pennatum* (Fig. 2.1.10). This event appears to be very important for the vertical silica flux in the Southern Ocean, in the form of downward transport of empty diatom frustules (Crawford 1995).

P. antarctica frequently dominates in the Ross and Amundsen Sea (DiTullio et al. 2000) but is not known to dominate phytoplankton assemblages to the same extent in the Weddell Sea and the Kong Haakon VII Sea (Kauko et al. 2021; Lenss et al. 2024). According to Smith and Trimborn (2024), *P. antarctica* frequently dominates early season blooms in the Southern ocean following sea-ice retreat and can benefit from deep-mixing of the surface ocean. While iron together with manganese or vitamin B12 can be co-limiting for Southern Ocean phytoplankton, *P. antarctica* is not as susceptible as diatoms to co-limitation by iron and vitamin B12 (Bertrand et al. 2007) or iron and manganese (Balaguer et al. 2022), and may have the ability to cope with low manganese concentrations (Balaguer et al. 2023). *P. antarctica* is also found to enhance deep carbon export as observed in the Ross Sea (DiTullio et al. 2000). However, most of *P. antarctica* biomass is remineralized in the upper few hundred meters except for rare occasions of strong wind mixing (Smith and Trimborn 2024), which is consistent with our observations at Kapp Norvegia.

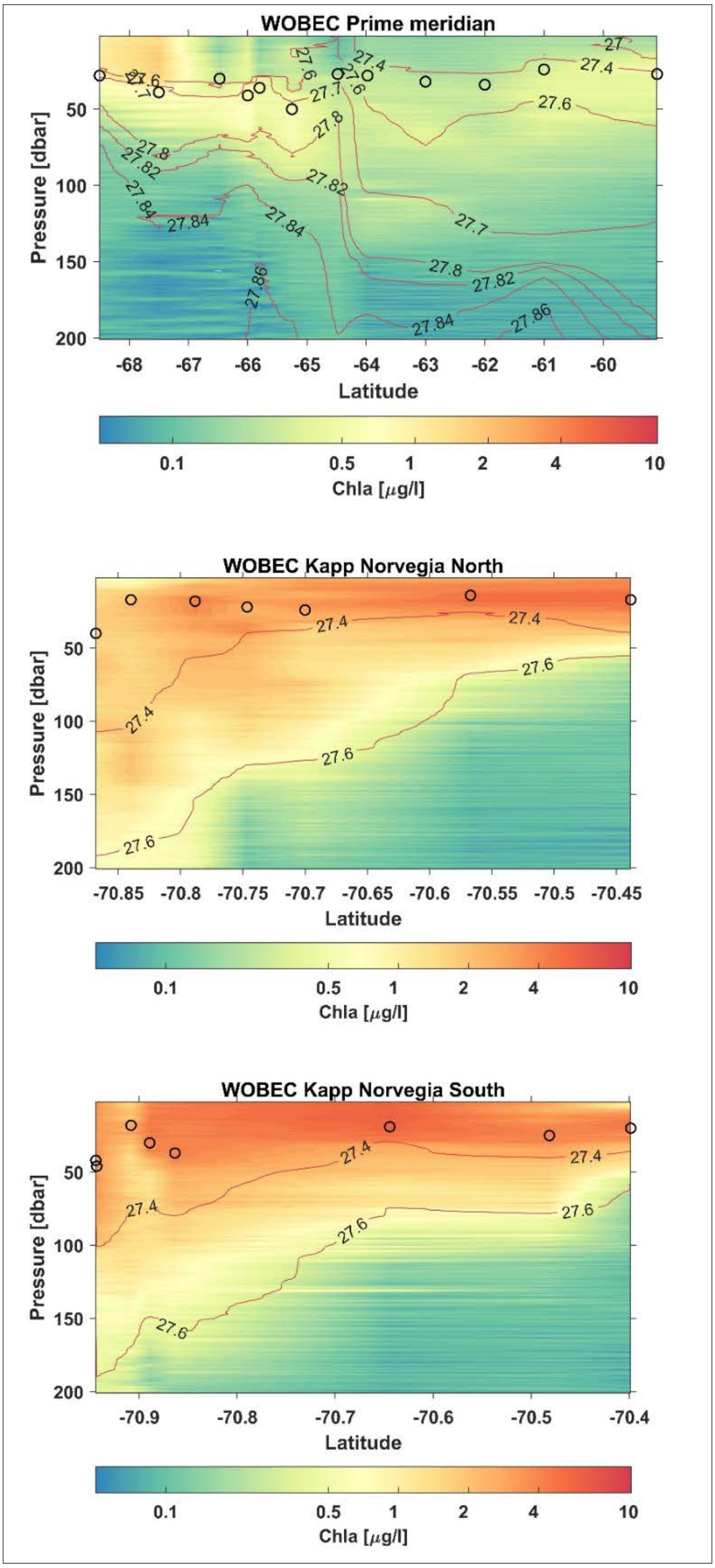

Fig. 2.1.7: Chl a concentration (µg l^{-1}) transects along the prime meridian and Kapp Norvegia (North of South). The CTD fluorescence was calibrated using Chl a concentration measured onboard (r^2 = 0.83, N=139) and corrected for non-photochemical quenching as in (Moreau et al. 2023).

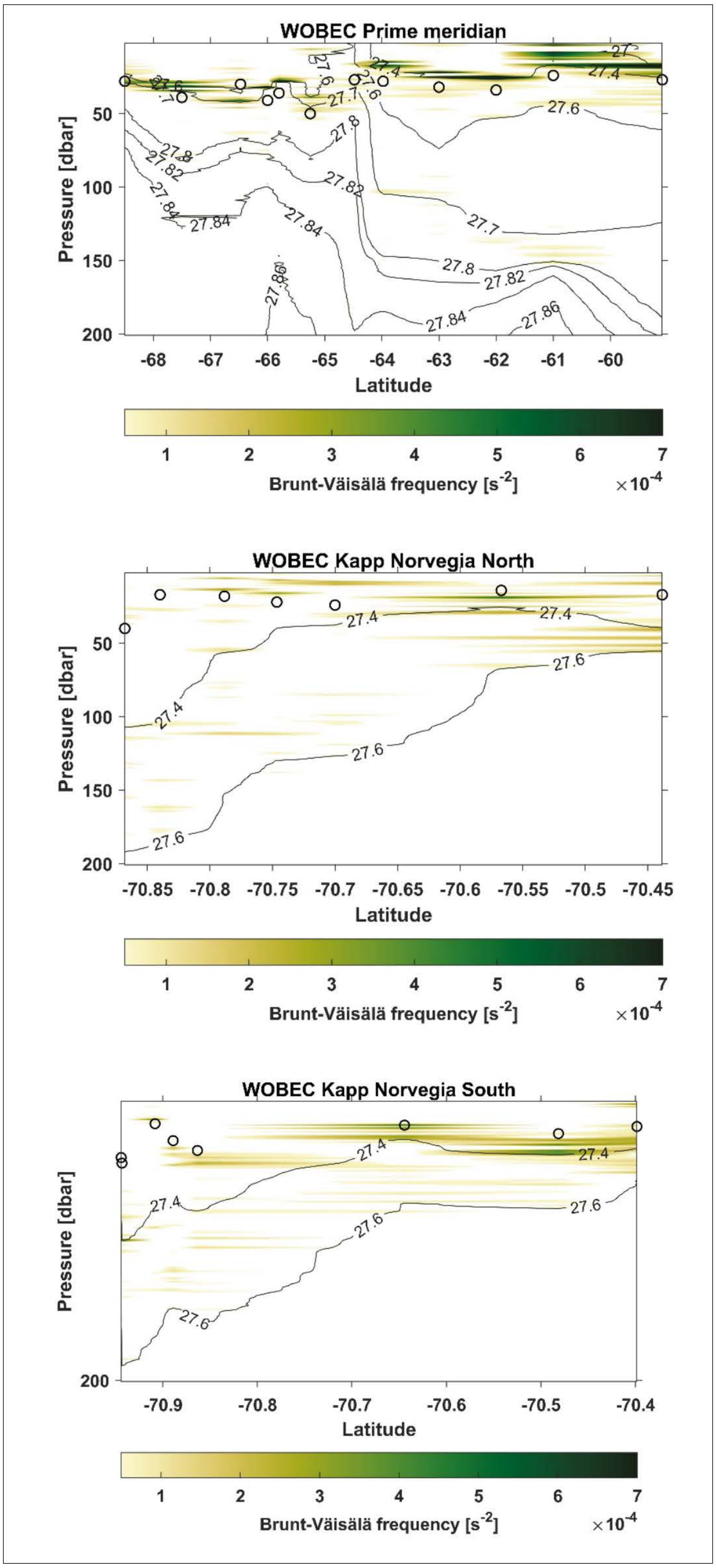

Fig. 2.1.8: Brunt-Väisälä frequency (s^{-2}) transects along the prime meridian and Kapp Norvegia (North of South)

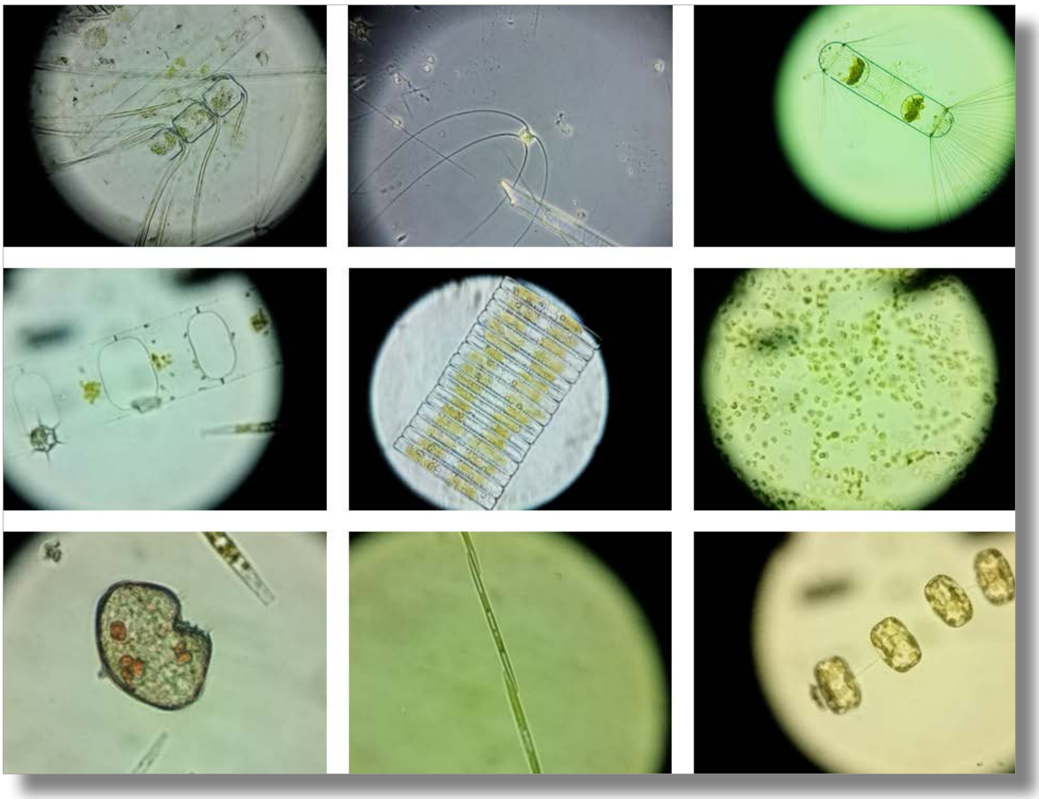

Fig.2.1.9: Phytoplankton species observed under the microscope from hand net samples. From top-left to top-right are: Chaetoceros convolotus var. concavicornis, C. peruvianus and Proboscia sp., Corethron pennatum. From middle-left to middle-right are: Eucampia antarctica, F. kerguelensis, P. antarctica. From bottom-left to bottom-right are: Protoperidinium sp., Pseudo-nitzschia sp., and Thalassiosira sp.

Fig.2.1.10: Sexual reproduction and auxospore formation in Corethron pennatum

Tab. 2.1.4: CTD casts during PS152

Station	Date	Latitude	Longitude	Depth EK80 (m)	Depth CTD (m)	Pressure CTD (dbar)	Niskin depths (m)
1	24.12.2025	-59,09	0,10	4681,0	4629,0	4723,8	4629-4000-3000-2000-700-400-100-75-25-5
3	25.12.2025	-61,00	0,00	5386,0	*	1011,9	1000-700-400-200-100-75-55-25-15-5
5	25.12.2025	-62,00	0,00	5366,0	*	1012,3	1000-700-400-200-100-50-25-15-5
7	26.12.2025	-63,00	0,00	5308,6	*	1013,3	1000-700-400-200-100-75-50-25-15-5
9	26.12.2025	-63,98	-0,04	5202,3	*	1013,1	1000-700-400-200-90-75-60-25-15-5
11	27.12.2025	-64,48	2,87	2159,5	2097,0	2131,1	2097-1500-1000-700-400-150-100-75-50-30-15-5
13	28.12.2025	-65,25	2,67	1249,5	1207,0	1223,7	1207-1000-700-400-200-100-75-55-25-15-5
15	29.12.2025	-65,80	1,32	2763,5	2699,0	2745,5	2699-2000-1500-1000-700-400-200-100-75-50-40-20-10
17	30.12.2025	-66,00	0,00	3408,7		1013,5	1000-700-400-200-100-60-50-35-20-10
18	30.12.2025	-66,47	0,04	4473,2	4420,0	4512,2	4420-3870-3000-2000-1500-1000-700-400-222-100-75-50-50-50-44-20-10

Station	Date	Latitude	Longitude	Depth EK80 (m)	Depth CTD (m)	Pressure CTD (dbar)	Niskin depths (m)
21	31.12.2025	-67,50	0,00	4629,8	*	1012,6	1000-700-400-200-100-75-50-50-20-10
23	01.01.2026	-68,50	0,00	4265,6	*	1014,5	1000-700-400-200-100-75-45-20-10
26	06.01.2026	-70,44	-10,53	1779,0	1726,0	1750,7	1726-1500-1000-700-400-150-100-75-50-30-15-5
27	07.01.2026	-70,75	-10,79	914,8	873,0	884,2	873-700-400-200-100-100-75-75-50-50-35-15-5-5
28	08.01.2026	-70,87	-10,48	245,2	225,0	227,7	225-200-100-75-60-25-15-5
30	09.01.2026	-70,84	-10,58	268,7	247,0		247-200-100-75-50-25-5
31	09.01.2026	-70,79	-10,71	593,2	575,0	580,6	575-400-200-100-75-75-50-20-5
34	11.01.2026	-70,57	-10,60	1402,8	1347,0	1365,5	1347-1000-700-400-200-100-75-50-30-15-5
35	12.01.2026	-70,70	-10,60	930,6	896,0	907,0	896-700-400-200-100-75-50-20-5
36	13.01.2026	-70,91	-10,77	342,3	318,0	321,8	318-200-97-75-50-20-5
37	13.01.2026	-70,40	-11,20	2048,1	1988,0	2017,7	1988-1500-1000-700-400-200-100-75-50-20-5
38	14.01.2026	-70,48	-11,11	1806,3	1756,0	1781,8	1756-1500-1000-700-400-200-100-75-50-25-5
39	14.01.2026	-70,64	-10,99	1394,1	1345,0	1363,0	1345-1000-700-400-200-100-75-50-25-5
40	15.01.2026	-70,89	-11,11	316,2	287,0	290,7	287-200-100-75-50-25-10
41	16.01.2026	-70,86	-10,76	307,1	281,0	288,1	281-200-100-75-50-25-10
44	17.01.2026	-70,94	-10,53	281,6	270,0	273,3	270-20
45	17.01.2026	-70,94	-10,53	301,6	283,0	286,3	283-200-100-75-50-20-10
46	20.01.2026	-70,80	-10,90	577,3	552,0	559,6	552-400-200-100-75-50-25-10
47	21.01.2026	-70,35	-10,60	2080,6	2019,0	2054,1	2019-1500-1000-700-400-130-100-75-50-25-10
50	22.01.2026	-70,94	-10,54	310,8	288,0	291,7	288-200-150-100-75-50-25-5

** CTD cast only to 1,000 m depth*

2.1.2 Sympagic habitat, primary production and biodiversity and ecosystem functions

Objectives

This WP focused on sea-ice biology and biogeochemistry in the Weddell Sea, and its role in the global climate system (i.e., its contribution to the BCP and to DMS(P)), linked to the biodiversity of microbial communities, their primary productivity, and their transfer to higher trophic levels.

Work at sea

2.1.2.1. Sea-ice stations including sea ice coring and light measurements

During 5 short-term sea-ice stations (Fig. 2.1.11), physical and bio-optical properties of sea ice were sampled in the ice and the underlying water using 9 cm Kovacs ice corers, under-ice water pumps, and hyperspectral imagers (RAMSES; TRiOS, Germany). Ice cores and under-ice water samples were used for analysis of temperature, salinity, DOM, oxygen isotopic fractionation, nutrients (NO_3, NO_2, PO_4, dissolved Si), BSi, Chl *a* concentration, POM, microbial and algal species composition (flow cytometry, microscopy, DNA, HPLC pigment analysis), extracellular polymeric substances (EPS), mycosporine-like Amino Acids (MAAs), sulfur compounds (total and dissolved DMS and DMSP) and PAM fluorescence. In addition, stable-isotope (^{13}C) and oxygen-optode incubation experiments were run aboard the ship to assess gross primary production rates and rates of DMSP production (Stefels et al. 2009), and net community production (Campbell et al. 2016), respectively.

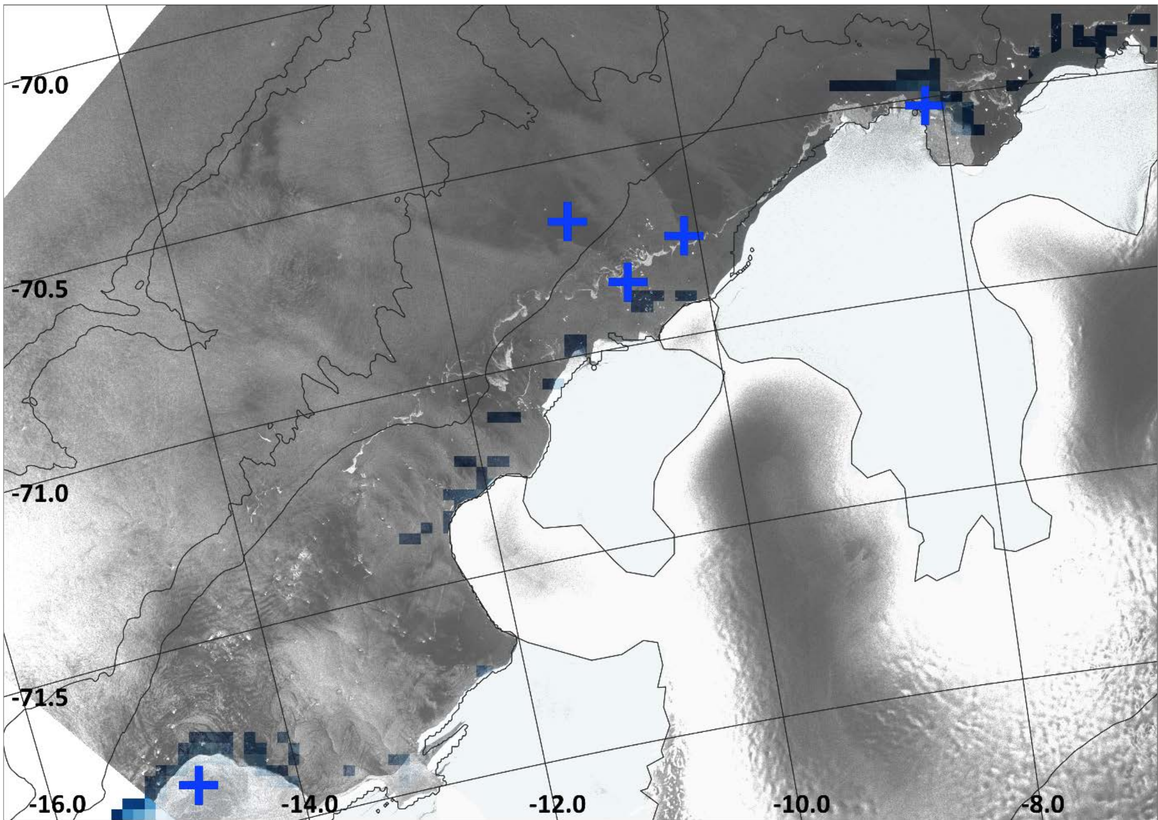

Fig. 2.1.11:Sea-ice stations in the Kapp Norvegia area along with the Sentinel 1 Single-Aperture Radar image and AMSR2 sea-ice concentration (%) (Spreen et al. 2008) on 21 January 2026

The first sea-ice core retrieved at each station was taken for temperature measurements. Using a Testo thermometer, temperature in degrees Celcius was measured at every 5 cm from the top to bottom. This core was then placed in a bag and stored at -20°C for further analyses. A second core was retrieved and cut every 10 cm from top to bottom for the analysis of salinity, DOC and macronutrient concentrations. 10 cm core sections for these analyses were melted unbuffered.

Four sea-ice cores were also retrieved and cut for biological analyses at each station. Biological sections had predefined lengths: 0-10 cm at the surface, 20 cm sections in the internal horizons, 15 to 5 cm from the bottom, and the bottom 5 cm. The four biological ice cores were pooled and melted in pre-filtered (on 0.2 um polycarbonate filters), deep seawater (bottom section only) and buffered pre-filtered, deep seawater to which NaCl was added to a final salinity of 65 PSU (all other sections). The cores were melted in their respective buffer solution in a room temperature water bath in large Whirl-Pak bags to ensure a gentle temperature change and avoid cellular damage to the microbial communities.

For each sea-ice core, the top 10 cm and two bottom sections (0–5 cm and 5–15 cm) were sampled for taxonomic analyses. After melting was completed, 100 ml subsamples were taken and preserved with a Lugol-glutaraldehyde solution for further analysis. On board the ship, *in situ* microscopic observations were performed to examine the algal composition; however, these preliminary analyses focused exclusively on the two bottom sections. Similarly to the phytoplankton samples, identification was carried out using a Zeiss Axio Vert. A1 inverted microscope.

In addition, at most stations, other sea-ice cores were retrieved for further analyses aboard or back ashore. These analyses consist of thick sections and oxygen isotopic fractionation as in (Lenss et al. 2025), total gases (Crabeck et al. 2025) and gypsum (Wollenburg et al. 2018).

Tab. 2.1.5: Sample types taken from sea ice cores

Parameter	Storage container/filter	Fixative	Storage
DOC	40 mL amber vials Furnaced GF/F	100 µL 2N HCl	+4°C, dark
$\delta^{18}O$	20 mL plastic scint. vial	None	+4°C, dark
Nutrients	20 mL plastic scint. vial Clean syringe Syringe filter	None	-20°C, dark
DNA	Suport 0.2 µm PES	None	Frozen at -80°C
Pigments by HPLC	GF/F	None	Frozen at -80°C
Sulfur compounds	10 mL glass vial	NaOK	-20°C, dark
$\delta^{13}C$-POC, acidified	Furnaced GF/F	None	-20°C, dark
PAM Fluorescence	Analyzed onboard		
Chl a GFF	GF/F	10 mL 90% acetone 24h	+4°C in the dark
Chl a > 3 µL	3 µm polycarbonate membrane filter	10 mL 90% acetone 24h	+4°C in the dark
Chl a > 20 µL	3 µm polycarbonate membrane filter	10 mL 90% acetone 24h	+4°C in the dark

Parameter	Storage container/filter	Fixative	Storage
δ^{13}C-POC and δ^{15}N-PON Stable isotopes	Furnaced GF/F Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
BSi	0.6 µm polycarbonate membrane filter Filter holder/petri dish	None	Dried at +60°C, then stored at room temp
MAAs	GF/F Aluminum foil packet	None	Frozen at -80°C
Absorption	GF/F Aluminum foil packet	None	Frozen in -80°C
EPS	0.4 µm polycarbonate filter Aluminum foil pocket	None	-20°C
FCM	4.5 mL cryovial *In duplicates*	90 µL glutaraldehyde	-80°C
Ice algal taxonomy	100 mL brown plastic bottle	1 mL premade Lugol solution	+4°C, dark

An underwater hyperspectral imager (UHI) was deployed next to the ice coring site to estimate sea-ice algal distribution and optical properties on millimeter-to-meter scale (Fig. 2.1.12). The UHI is a pushbroom hyperspectral imager with a 60° field-of-view across and 0.4° along track with a spectral resolution of approximately 1.7 nm. The UHI was deployed through a 25 cm auger hole using an L-arm that allows the positioning of the UHI in an upward facing manner to survey the underside of the sea ice. The survey area was kept undisturbed at the surface, and the instrument was held at a 100 cm distance from the bottom of the ice and 110 cm from the deployment hole. The arm was rotated 360° around itself and the deployment hole, resulting in a “doughnut” shaped survey. Simultaneous surface downwelling irradiance measurements were conducted by Gaëlle Veyssiere and Jeremy Wilkinson (Grant-No. AWI_PS152_07) for calculating transflectance (Nicolaus and Katlein 2013). The UHI survey was not possible at ice station 5 due to the large amount of platelet ice clogging the auger hole.

A full ice core was extracted in the middle of the survey (110 cm from the middle of the deployment hole) for validation of the bio-optical relationship. The core was sectioned as follows: bottom 0-5 cm, bottom 5-15 cm and top 10 cm (top = sea ice/air interface). The rest of the core, the “mid” section, was also collected and melted separately. The bottom 0-5 cm was diluted using 750 mL of filtered deep seawater and the bottom 5-15 cm and top 10 cm were diluted in hypersaline solution (see melt procedure of pooled biology cores). The mid-section was crushed using a rubber mallet and rapidly melted to avoid osmotic stress of the algae. The melted samples were filtered for particle absorbance, MAAs and HPLC.

An additional full ice core was extracted from the sea-ice physics site from the L-arm swath (Grant-No. AWI_PS152_02), and the bottom 0-5 cm was diluted with 750 mL filtered deep seawater and the rest of the core was crushed and rapid melted. The bottom section was processed for particle absorbance, MAAs and HPLC whereas the rest of the core was processed for particle absorbance and HPLC. At station 1, only particle absorbance and HPLC was sampled, and at station 5 all parameters were sampled from the entire core, as no UHI core was taken at this site.

Tab. 2.1.6: Underwater hyperspectral imaging (UHI) surveys conducted and the corresponding validation ice core

Station	Date	Time (UTC)	Filenames	Corresponding core IDs
Ice1	3.1.2026	08:02-08:06	AB320260103_080242 AB420260103_080628	JO1, BAS1
Ice2	8.1.2026	22:49-22:52	Kn11_2_20260801_224904 Kn11_3_20260801_225234	JO2, BAS2
Ice3	10.1.2026	12:51-12:55	Ice3_2_20260110_125137 Ice3_3_20260110_125535	JO3
Ice4	13.1.2026	11:34-11:40	Ice4_1_20260113_113436 Ice4_2_20260113_114010	JO4
Ice5	-	-	No UHI	BAS3

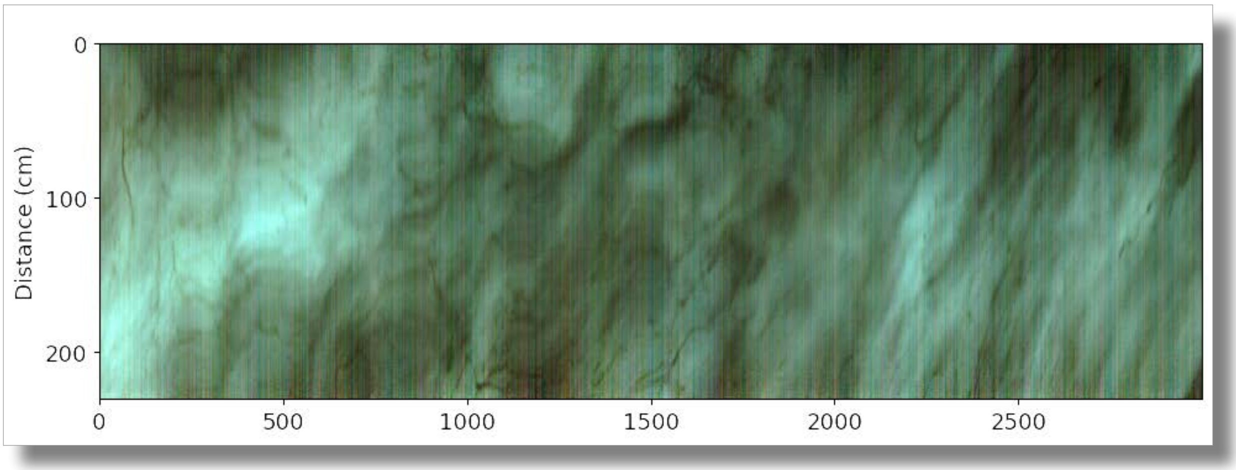

Fig. 2.1.12:The image showing RGB (red, green and blue) composite hyperspectral image from Ice station 3, showcasing algal filaments. is preliminary and has not been spatially corrected.

Onboard absorbance measurements

Particle absorbance on filter pads was measured on board using a QE pro spectrometer (Ocean optics, USA) following the quantitative filter technique (QFT) (Mitchell 1990). Briefly, the method entails concentrating particles on a GF/F filter and measuring the absorbance of algal and non-algal particles following a 24 h methanol extraction. Blanks of filtered seawater and MilliQ were produced by filtering the same volume as the samples and treating the blanks in the exact same way as the samples. Samples were analysed in batches of 25 and kept at -80°C and in the dark until analysis. All analyses were completed in a dark room and samples were kept on ice for as long as possible to avoid degradation of algal pigments. A total of 134 samples were collected and analysed. Correction of light intensities, influence of different temperatures between the batches and scattering properties of the glass fibre filter will be corrected for during post processing.

2.1.2.2. Experiments

After melt, subsamples were taken for production experiments, as described under 2.1.1.2.

Tab. 2.1.7: List of experiments gross primary production (GPP), DMSP, and net community production (NCP) carried out in seawater and sea ice.

Station_ID	Station_alias	Station_Date	Depth (m)	SampleType	
PS152_3_3	KHS_61	25/12/2025	5	GPP and DMSP	NCP
PS152_3_3	KHS_61	25/12/2025	55	GPP and DMSP	NCP
PS152_7_1	KHS_63	26/12/2025	5	GPP and DMSP	NCP
PS152_7_1	KHS_63	26/12/2025	75	GPP and DMSP	NCP
PS152_11-1	KHS_MR1	27/12/2025	5	GPP and DMSP	NCP
PS152_11-1	KHS_MR1	27/12/2025	30	GPP and DMSP	NCP
PS152_13-1	KHS_MR2	28/12/2025	5	GPP and DMSP	NCP
PS152_13-1	KHS_MR2	28/12/2025	55	GPP and DMSP	NCP
PS152_15-1	KHS_MR3	29/12/2025	10	GPP and DMSP	NCP
PS152_15-1	KHS_MR3	29/12/2025	40	GPP and DMSP	NCP
PS152_21-3	KHS_67.5	31/12/2025	10	GPP and DMSP	NCP
PS152_21-3	KHS_67.5	31/12/2025	20	GPP and DMSP	NCP
PS152_23_2	KHS_68.5	01/01/2026	20	GPP and DMSP	NCP
PS152_24	ICE1	03/01/2026	interface	GPP and DMSP	NCP
PS152_24	ICE1	03/01/2026	bot 0-5	GPP and DMSP	NCP
PS152_27_1	KN_04	07/01/2026	5	GPP and DMSP	NCP
PS152_27_1	KN_04	07/01/2026	35	GPP and DMSP	NCP
PS152_28_1	KN_11	08/01/2026	25	GPP and DMSP	NCP
PS152_29_	ICE2	08/01/2026	interface	GPP and DMSP	NCP
PS152_29_	ICE2	08/01/2026	bot 0-5	GPP and DMSP	NCP
PS152_29_	ICE2	08/01/2026	bot 5-15	GPP and DMSP	NCP
PS152_33_	ICE3	10/01/2026	interface	GPP and DMSP	NCP
PS152_34_2	KN_15	11/01/2026	15	GPP and DMSP	-
PS152_33_	ICE3	10/01/2026	bot 0-5	GPP and DMSP	NCP
PS152_33_	ICE3	10/01/2026	bot 5-15	GPP and DMSP	NCP
PS152_36_	ICE4	13/01/2026	interface	GPP and DMSP	NCP
PS152_37_1	KN_01	13/01/2026	20	GPP and DMSP	NCP
PS152_39_2	KN_03	14/01/2026	5	GPP and DMSP	NCP
PS152_36_	ICE4	13/01/2026	bot 0-5	GPP and DMSP	NCP
PS152_36_	ICE4	13/01/2026	bot 5-15	GPP and DMSP	NCP
PS152_40_2	KN_08	15/01/2026	25	GPP and DMSP	NCP
PS152_41_2		16/01/2026	25	-	NCP
PS152_45_1	KN_10	17/01/2026	20	GPP and DMSP	NCP
PS152_46_1	KN_05	20/01/2026	10	GPP and DMSP	NCP
PS152_46_1	KN_05	20/01/2026	25	GPP and DMSP	-

Station_ID	Station_alias	Station_Date	Depth (m)	SampleType	
PS152_47_1	KN_17	21/01/2026	10	GPP and DMSP	NCP
PS152_47_1	KN_17	21/01/2026	25	GPP and DMSP	NCP
PS152_52	ICE5	22/01/2026	interface	GPP and DMSP	NCP
PS152_52	ICE5	22/01/2026	platelet water	GPP and DMSP	NCP
PS152_52	ICE5	22/01/2026	bot 0-5	GPP and DMSP	NCP
PS152_52	ICE5	22/01/2026	bot 5-15	GPP and DMSP	NCP

2.1.2.3. Preliminary results

Due to the relatively low sea-ice concentration in the investigation area for this time if the year (Fig. 2.1.11), we were only able to sample 5 ice stations of the originally 10 planned (Tab. 2.1.8). All floes investigated consisted of fast ice that was either attached to the land ice (Ice1 and Ice5) or recently broken off (Ice2, 3 and 4).

Tab. 2.1.8: List of ice stations sampled during WOBEC

Station	Latitude (decimals)	Longitude (decimals)	Sampling date	Ice thickness (cm)	Snow thickness (cm)	Freeboard (cm)
PS152_24	-70.52	-8.13	03/01/2026	140.25	30.00	-10
PS152_29	-70.84	-10.60	08/01/2026	180.67	30.00	5.5
PS152_33	-70.66	-10.97	10/01/2026	182.63	24	12
PS152_36	-70.75	-10.11	13/01/2026	204.14	23.60	11.5
PS152_52	-71.85	-14.81	23/01/2026	160.85	50.00	0

The cores were characterized by relatively warm temperatures and low bulk salinities (Fig. 2.1.13), indicating that drainage of the brine channels had taken place. The higher bulk salinity of the bottom section indicated the connectivity between the underlying sea water and the brine channels.

In all cores the bottom 15 cm were very rich in algal biomass, with typically high contributions from the filament-forming diatom *Berkeleya* cf. *adeliensis* in the 5-15cm bottom section.

At the first station in Atka Bay, the extracted cores were transparent, and no algal layer was visible to the naked eye. Under the microscope, we observed solitary cells of *Entomoneis* sp., *Pleuro/Gyrosigma*, *Fragilariopsis cylindrus*, and *F. kerguelensis*. In contrast, at the remaining four stations, visible algal biomass occurred primarily in the bottom 0–5 cm, with even more intense coloration observed in the 5–15 cm section. The dominant species was *Berkeleya* cf. *adeliensis*, followed by long chains of *Entomoneis* sp., *F. cylindrus*, and *F. kerguelensis*; other observed algae included *Odontella weissflogii* and the *Pleuro/Gyrosigma* complex (Fig. 2.1.14).

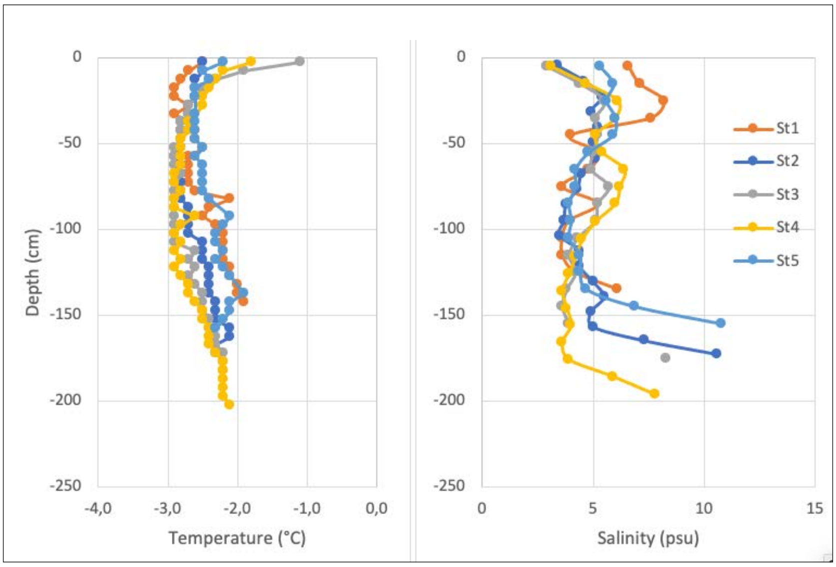

Fig. 2.1.13:Sea-ice temperature (degrees Celcius) and salinity for sea-ice stations ICE1-5.

Fig. 2.1.14:Algal species observed under the microscope from sea-ice samples. From top-left to top-right are: Berkeleya cf. adeliensis, Entomoneis sp., Coscinodiscus radiatus. From middle-left to middle-right are: Entomoneis sp., Eucampia antarctica, Fragiliariopsis kerguelensis. From bottom-left to bottom-right are: Odontella weissflogii, Pleuro/Gyrosigma sp., and Thalassiosira sp.

At ICE5, while the dominant species remained *Berkeleya* cf. *adeliensis*, we also observed the centric diatoms *Stellarima microtrias*, *Coscinodiscus radiatus*, and *Eucampia antarctica*, the latter of which had already formed winter-stage cells. Pennate diatoms were represented mainly by long, healthy chains of *F. cylindrus*, *F. kerguelensis*, and *Entomoneis* sp., as well as epifitic species of *Synedra* sp. and *Synedropsis* sp.

Preliminary data on photosynthetic activity in the ice of station PS152_51 showed high values in the bottom 5 cm of the ice core (Fig. 2.1.15). These high values were linked to the higher algal biomass, illustrating an active algal community. However, the equally high biomass in the 5-15 cm bottom section showed a much lower maximum quantum yield, indicated a deteriorating community. Enhanced Fv/Fm higher up in the ice core are indicative of a relatively healthy surface community, although the biomass was very low. Evaluation of all ice data will give us an indication whether these features are characteristic of land-fast sea ice of the WOBEC area.

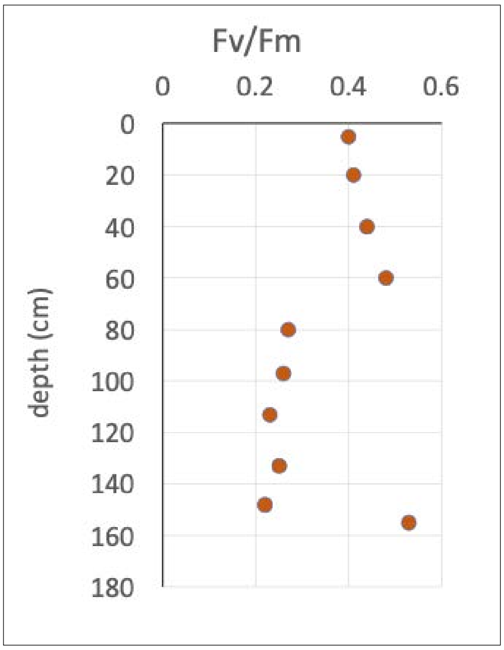

Fig. 2.1.15:Photosynthetic activity expressed as the maximum quantum yield of photosynthesis (F_v/F_m); in the biocores of the 5. ice station.

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2.2 PELAGIC METAZOAN BIODIVERSITY AND ECOSYSTEM FUNCTIONS

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Objectives

The WOBEC project aims to develop the basic framework of a transnational multidisciplinary distributed observatory of biodiversity and ecosystem change in the eastern Weddell Sea. Our work builds on the experiences of the Eastern Weddell Sea Observation System (EWOS) study conducted during PS129 (2022). On PS152, the team *Pelagic metazoan biodiversity and ecosystem functions* contributed to this overarching aim by collecting data on pelagic metazoan communities in order to (1) contribute to the baseline understanding of the Eastern Weddell Sea ecosystem to be tested against the effects of future climate change; (2) test a new autonomous observatory of biodiversity and ecosystem functions; (3) ground-truth data from autonomous devices with ship-based measurements. Specifically, we aimed to assess the abundance, biomass and biodiversity of pelagic and under-ice fauna and their ecosystem functions.

Work at sea

Automated sampling

As on PS129, we used the broadband mode of the EK80 in four frequency ranges (around 38, 70, 120 and 200 kHz) to achieve higher taxonomic resolution and greater accuracy of biomass estimates than with single-band echosounders. Imaging profiles of particles and zooplankton were obtained from an Underwater Vision Profiler (UVP) at 29 CTD stations within the WOBEC research area (Fig. 2.2.1). In addition, we intended to deploy an autonomous bio-physical sea-ice observatory (provided by AWI; Flores et al. 2023; collaboration with secondary user proposal Icelight, Chapter 2.7) equipped with a multifrequency echosounder and various environmental sensors on an ice floe in the Weddell Gyre. The observatory was designed to record data for up to one year during its drift, and transmit the data to AWI at regular intervals. The observatory could not be deployed due to technical problems and the absence of suitable ice floes during PS152.

Surface and Under-Ice Trawl (SUIT)

The abundance and community composition of under-ice zooplankton and micronekton in the upper 2 m of the water column were sampled with a Surface and Under-Ice Trawl (SUIT). A sensor array mounted on SUIT collected real-time data on sea-ice and water-column properties during each deployment. The sensor array included an Acoustic Doppler Current Profiler (ADCP) and a CTD with built-in fluorometer (Castellani et al. 2020).

Rectangular Midwater Trawls (RMT)

In order to sample Antarctic krill, other macrozooplankton and mesopelagic fish in the water column (0–800 m), two distinct Rectangular Midwater Trawl (RMT) configurations were assembled using the gear available onboard: a standard single RMT 8 and a multiple RMT (mRMT 8+1). The single RMT consisted of a nominal 8 m² net with a 5 mm mesh size and was utilized during the initial stations while the releaser unit was being prepared, subsequently serving as a backup system. The mRMT setup integrated 3 x 8 m² nets (5 mm mesh) mounted below 3 x 1 m² nets (0.3 mm mesh). This configuration was designed to perform stratified sampling across three standard strata: 800–400 m, 400–200 m, and 200–0 m. The upper stratum (200–0 m) was maintained to ensure consistency with CCAMLR-recommended sampling procedures. In shallower shelf areas, the maximum depth of the deepest stratum was adjusted to approximately 50 m above the seafloor. Figures 2.2.2 A) and 2.2.2 B) demonstrate mRMT set up on deployment and recovery, respectively.

Multinet

The mesozooplankton community was sampled with a Multinet (Hydrobios, 0.25 m^2 opening, 150 µm mesh) at 5 standard depths (1,000-750, 750-500, 500-200, 200-50, 50-0 m). In shallower waters, the maximum sampling depth was set to 10 m above the seafloor, provided that sea state allowed. The deck command unit was used to communicate with the Multinet to open the nets manually at depth according to the integrated pressure sensor. Flowmeter readings were recorded for estimations of sampled water volume.

The species and size composition of animals caught with the various nets will be used in combination with hydroacoustic profiles and taxonomic composition derived from eDNA sequencing (in collaboration with secondary user proposal SeaCaT, Chapter 2.8) to estimate the species composition, abundance and biomass of the pelagic and under-ice fauna at various overlapping spatial scales and taxonomic resolutions.

Specific sampling

We also sampled animals, particulate organic matter from sea ice and from the water column for trophic marker analysis (fatty acid profiles, highly branched isoprenoid lipids (HBI), sterols, bulk- and compound-specific stable isotope composition) to quantify the flux of carbon into the pelagic food web from ice algae and phytoplankton, respectively (Helmholtz Young Investigators Group Double Trouble). PFAS samples were prioritized in the sequence of handling a catch, as they are sensitive to contamination. They were handled with nitrile gloves, if necessary, temporarily covered in aluminium foil and only handled with stainless steel tweezers and in glass petri dishes. Biomarker samples were taken next, as they are time sensitive due to onsetting degradation of lipids and stomach contents. Nitrile gloves were used to avoid contamination with allochthonous fatty acids.

Seasonally migrating copepods were opportunistically sampled for lipid and carbon composition as part of the UK (NERC) funded program BIOPOLE. In addition, we aimed to collect samples of Antarctic zooplankton and fish for pollutant analyses on behalf of the German Environmental

Agency (UBA) and to complement pre-existing datasets of the Helmholtz Young Investigator Group Double-Trouble.

Furthermore, the sea-ice team (Chapter 2.1) collected two ice cores for cryogenic mineral analysis at station 29 and station 52.

All sampling procedures, laboratory treatments and measurements necessary to estimate the sampled parameters followed the Standard Operating Procedures (SOPs) developed by the WOBEC consortium in line with international standards and based on previously established SOPs for investigations of sea-ice influenced ecosystems, including the preceding EWOS and MOSAiC expeditions, and the Nansen Legacy.

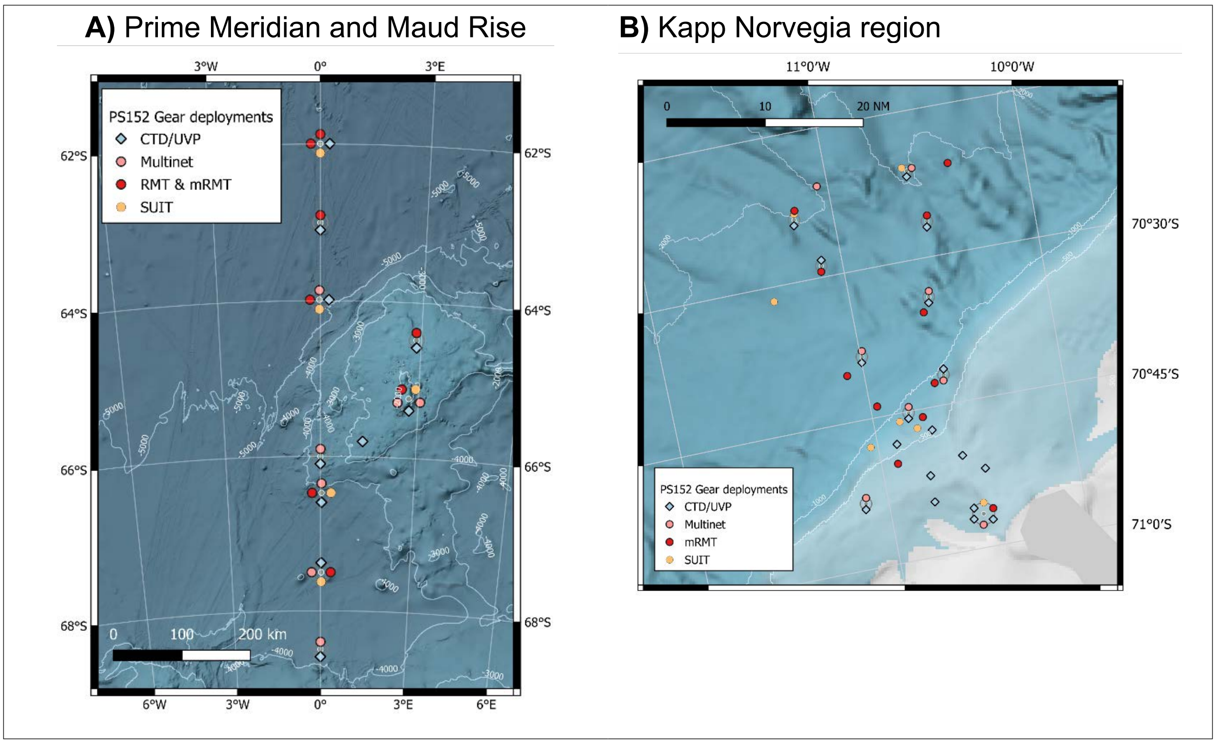

Fig. 2.2.1: The distribution of sampling locations for deployments of CTD and UVP, RMT and mRMT, Multinet and SUIT is displayed in:
***A)** the Prime Meridian and Maud Rise area, and **B**) in the Kapp Norvegia area.*

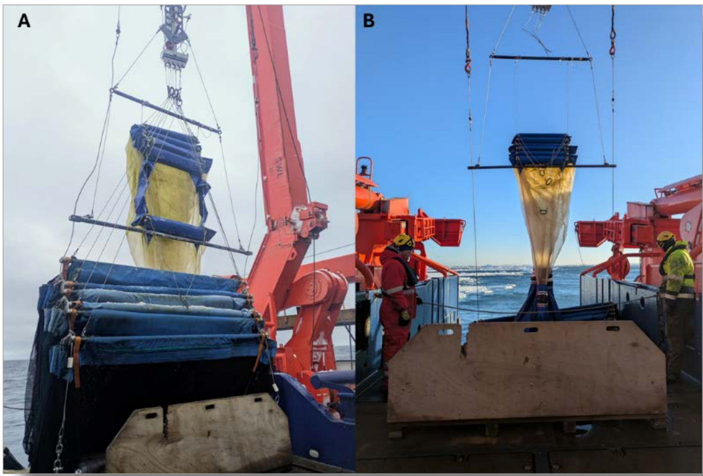

Fig. 2.2.2: mRMT set up on deployment, noting the open bottom RMT 1 net (A) and on recovery, noting all nets released and closed (B). Photos: Jennifer Freer.

Preliminary results

EK80

The EK80 echosounder was active throughout the study area, only interrupted during sampling with vertically operated gear (according to UBA permit), and periods of technical failure. Between 55°S and the end of sampling in the Kapp Norvegia region, we recorded altogether 2,100 nm of hydroacoustic profiles during 434 hours, equalling 4.8 TB of data. To facilitate visualisation of this big dataset, the data in the study area were divided in three sections (Tab. 2.2.1).

In section 1 (55-65°S), echograms show a very shallow near-surface layer in the upper ~20 – 50 m. This feature appeared shallower in the more southern section, locally rising to ~20 – 30 m. It may reflect organisms associated with the surface productive layer or chlorophyll maximum. Below this, a deeper and more diffuse scattering structure extended roughly between 200 and 700 m and showed a clear diel vertical migration pattern. Latitudinally, consistent with the expected patchiness of the Southern Ocean, substantial horizontal heterogeneity was evident, with biomass concentrated in broad patches. Several distinct scattering layers were visible, potentially resulting from different vertically structured communities (Fig. 2.2.3 A). Occasionally, we observed potential krill swarms (Fig. 2.2.4). The highest backscatter density of the expedition was recorded at about 58°S, close to the first biogeochemical mooring. This area had many icebergs and had been covered by sea ice until shortly before *Polarstern* crossed the area.

In section 2 (65-70°S), the near-surface backscatter maximum remained present at similarly shallow depths as in the previous section, while the dominant deep scattering layer was centred between ~400 and 600 m. In contrast to the sections farther north, clear diel vertical migration was no longer evident, and the scattering field appeared more vertically stable (Fig. 2.2.3 B).

In section 3 (Kapp Norvegia region), the near-surface backscatter maximum also persisted. A deep scattering layer was found between about 400 and 700 m depth, which ended where it met the shelf slope and did not follow the bottom topography onto the shelf (Fig. 2.2.3 C). The spatial distribution of potential krill swarms showed that the densest aggregations were found near the continental slope (Fig. 2.2.5).

The EK80 echosounder system used during the WOBEC 2026 expedition in the Southern Ocean was calibrated on 10 January 2026. Calibration results were exported for the 38 kHz CW and FM channels, the 70 kHz FM channel, the 120 kHz CW and FM channels, and the 200 kHz FM channel. All calibrations were processed in EK80 software version 25.2.3.0 using a 38.1 mm tungsten carbide (WC-Co) sphere.

The calibration constants and recommended Sa correction values were summarized in Table 2.2.2.

Tab. 2.2.1: Overview of hydroacoustic recordings during PS152

	Start (UTC) - End (UTC)	**Distance (nm)**	**Size (TB)**	**No of files**	**Duration (hours)**	**Area**
Section 1	23/12/2025 08:30 to 28/12/2025 05:00	700	1.18	4070	114	Prime Meridian & Maud Rise, 55°S to 65°S
Section 2	28/12/2025 05:00 to 03/01/2026 00:30	550	1.08	3734	116	Prime Meridian & Maud Rise, 65°S to 70°S
Section 3	03/01/2026 00:30 to 23/01/2026 00:00	750	2.53	9031	304	Kapp Norvegia

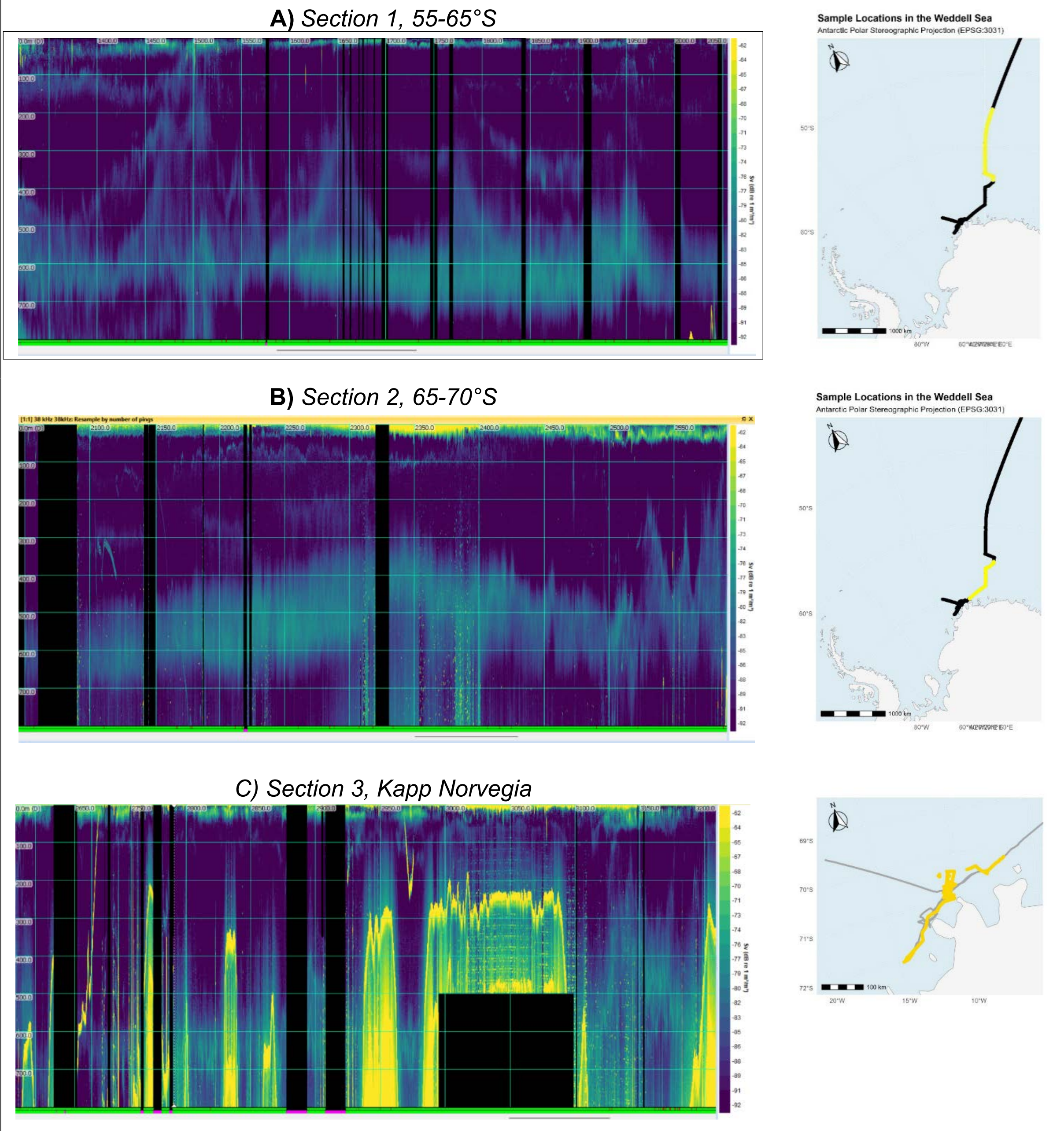

*Fig. 2.2.3: **A)** Compressed 38 kHz echogram of section 1 from 55°S to 65°S, covering approximately 700 nautical miles between 2025-12-23 at 08:30 UTC and 2025-12-28 at 05:00 UTC. A continuous shallow scattering layer is visible in the upper ~50–150 m, and shallowing to the south, overlying a deeper scattering layer between ~200 and 700 m that shows a clear diel vertical migration pattern. Scattering is horizontally patchy, consistent with Southern Ocean pelagic structure.*
***B)** Section 2 from 65°S to 70°S, covering approximately 550 nautical miles between on 2025-12 -28 at 05:00 and on 2026-01-03 at 00:30 UTC. A continuous near-surface scattering layer remains visible, while the dominant deep scattering layer is centered between ~400 and 600 m and shows little clear diel vertical migration at this scale. Compared with the preceding section, the vertical structure appears simpler and more depth-stable. At approximately 68.3°S, around 350 nmi along the echogram, the transect departs from the 0° meridian and turns southwest, ending at the shelf slope.*
***C)** Echogram showing the section covered in the Kapp Norvegia region, spanning approximately 750 nautical miles between 2026-01-03 at 00:30 UTC and 2026-01-23 at 00:00 UTC. Areas of strong yellow backscatter correspond to the seabed, while the region beneath the detected bottom does not represent interpretable water-column backscatter. Black gaps indicate noisy sections masked during post-processing.*

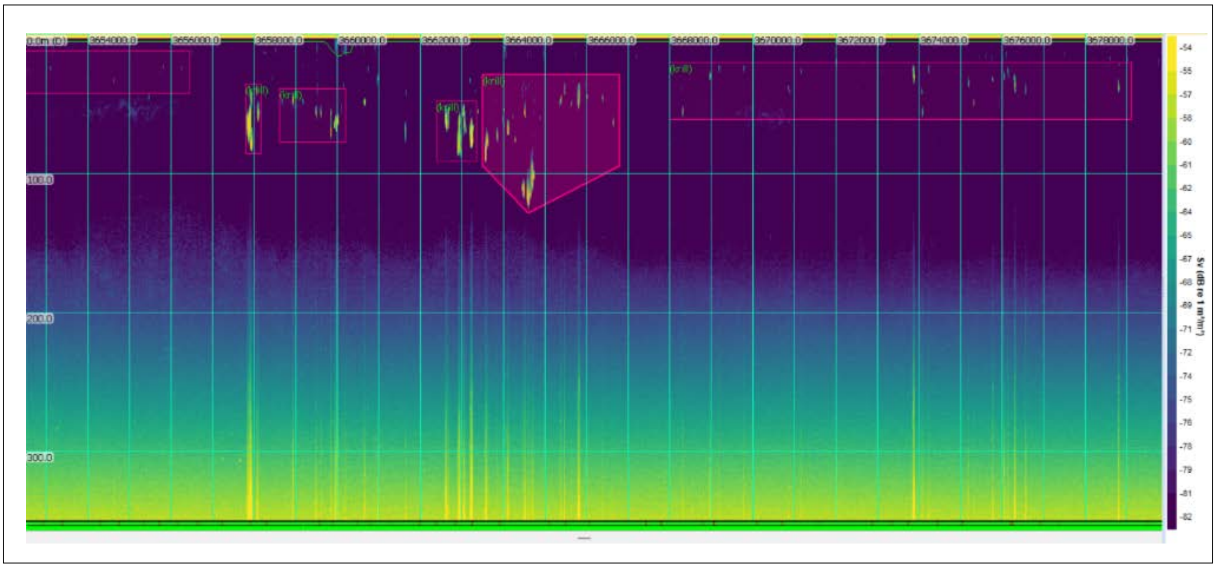

Fig. 2.2.4: Echogram showing a deep krill aggregation recorded on 2025-12-27 at 07:50 UTC, at 64.35°S, 2.09°E. The representative aggregation is centered at approximately 112 m depth and spans about 22 m vertically. Vertical grid lines indicate 1 km intervals and horizontal grid lines indicate 100 m depth intervals.

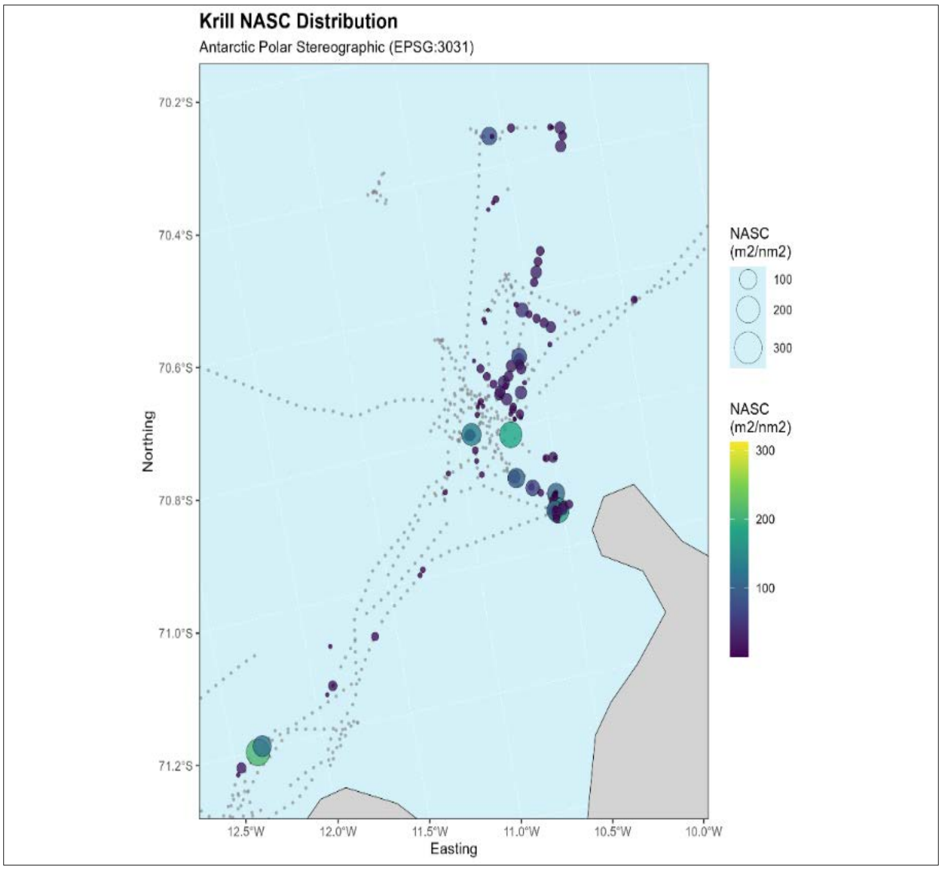

Fig. 2.2.5: Map of representative krill aggregations. Circle size and colour represent krill NASC ($m^2\ nmi^{-2}$), grey dots indicate the survey track, and land is shown in grey.

Tab. 2.2.2: Adopted EK80 calibration constants for PS152

Channel	Pulse mode	Transducer	Adopted frequency (kHz)	Gain (dB)	Sa correction (dB)	Beam width alongship (°)	Athwartship angle offset (°)	TS RMS error	No. of hits
38	CW	ES38-7	38.000	26.43	-0.0478	7.71	0.12	0.0729	1752
38	FM	ES38-7	37.961	26.48	0.0000	6.88	0.21	0.1508	1844
70	FM	ES70-7C	69.887	25.83	0.0000	6.30	0.02	0.2233	1505
120	CW	ES120-7C	120.000	26.00	0.0227	6.16	0.08	0.1295	1813
120	FM	ES120-7C	119.803	25.77	0.0000	6.64	0.06	0.2113	1474
200	FM	ES200-7C	199.789	23.85	0.0000	6.41	0.09	0.2833	1835

Zooplankton sampling

SUIT

We conducted 6 SUIT deployments on the Prime Meridian and Maud Rise, and 7 deployments in the Kapp Norvegia region (Tab. 2.2.3). Due to the mere absence of sea-ice, only one of the deployments in the Kapp Norvegia region was performed under the edge of a drifting former land-fast sea-ice floe, and all other SUIT deployments were performed in open water. SUIT catches were mostly dominated by Antarctic krill, albeit at low abundances compared to previous years. On the Prime Meridian and at Maud Rise, also the smaller euphausiid *Thysanoessa macrura* was locally abundant. In the Kapp Norvegia region, the coastal krill *Euphausia crystallorophias* was present on the shelf, and fish larvae (predominantly *Pleuragramma antarcticum*) were locally abundant (Fig. 2.2.6 A). In particular, high numbers of nototheniid fish larvae were caught at the one station sampled under the edge of a drifting former land-fast ice floe. The size distribution of Antarctic krill caught with the SUIT in the 0 – 2 m surface layer was dominated by very small individuals (15–25 mm length), as compared to Antarctic krill caught with the RMT, which were mostly between 41 and 48 mm length. Altogether, we collected 423 animal and tissue samples from SUIT catches.

RMT

Throughout the expedition, 3 single RMT hauls and 17 mRMT hauls were conducted. All single RMT hauls took place on the Prime Meridian between 61 and 62°S, while mRMT operations were split between the Prime Meridian (6 deployments) and Kapp Norvegia (11 deployments; Tab. 2.2.3). A central technical objective was the testing and validation of a new releaser unit for the mRMT. While the unit demonstrated reliable communication and mechanical execution throughout the deployment cycles, technical challenges arose regarding the wire lengths for the bottom nets of the RMT 8 and RMT 1. Initial deployments indicated that these wires were too short, creating excessive tension on the releaser unit. This tension resulted in the premature opening of the bottom nets before they entered the water and reached their target depths. Because this issue persisted, several deployments were conducted with the bottom nets open on the way down. While this meant the first nets partially sampled the 0–800 m range, the resulting bias is considered negligible for the overall abundance estimates and a specific column has been added to the station table to identify these instances. To mitigate this tension in subsequent hauls, a shackle was added to the RMT 8 wires to increase their length, which effectively resolved the issue. For the RMT 1, the bottom net continued to be left open as further mechanical adjustments were deemed infeasible during the cruise.

RMT and mRMT catches across the survey area were characterized by notably low abundances of Antarctic krill (*Euphausia superba*), a trend particularly striking along the Prime Meridian. These stations were instead dominated by high densities of salps and a diverse assemblage of jellyfish (Fig. 2.2.6 B-D). The nekton community was primarily composed of various mesopelagic fish – particularly myctophids – and squid, which were consistently captured during deep-stratified hauls (Fig 2.2.7). An exceptional catch of Antarctic giant jellyfish *Desmonema glaciale* (volume 16 L) was caught from the MRMT 8-3 net during the Prime Meridian station work (Fig. 2.2.7).

In the Kapp Norvegia region, distinct differences in catch composition were observed between on-shelf and off-shelf environments. Coastal and shelf-bound stations exhibited a higher proportion of neritic species, whereas oceanic stations were dominated by gelatinous zooplankton and the mesopelagic community (Fig. 2.2.6 B-D). Detailed taxonomic breakdowns indicate that the Deep Scattering Layer (DSL), typically located between 400 m and 700 m, served as a hotspot for mesopelagic fish diversity. Altogether, we collected 1,604 animal and tissue samples from RMT nets.

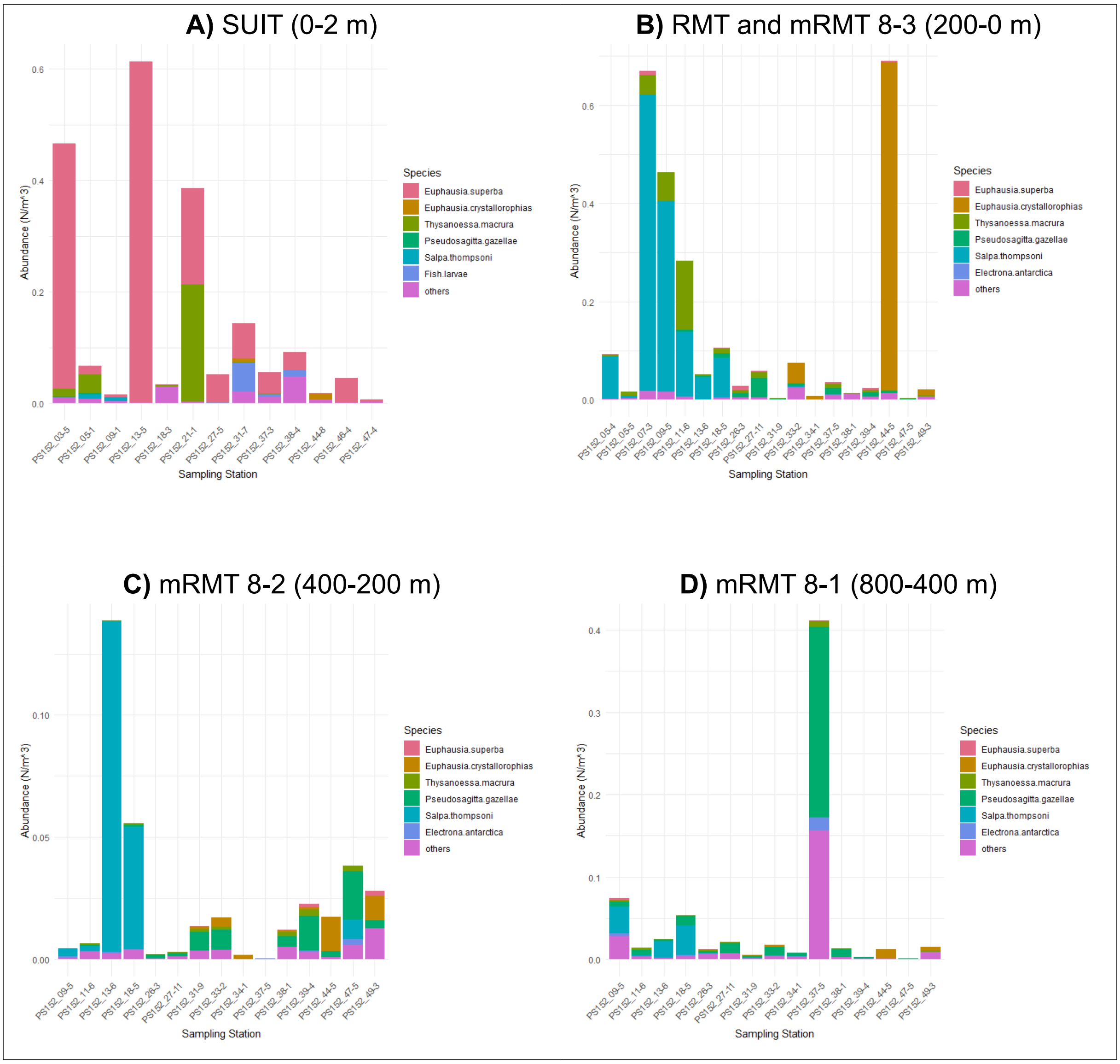

*Fig. 2.2.6: Abundance and taxonomic composition of catches from (m)RMT (**A-C**) and SUIT (**D**).*

Fig. 2.2.7: Examples of mRMT catches including mesopelagic fish, squid, small jellyfish and an exceptional catch of Desmonema glaciale. Photos: Kira Kremer (L), Anton Van de Putte (R).

Tab. 2.2.3: Device operations for zooplankton and fish sampling with SUIT, (m)RMT and Multinet

Device Operation	Optional label	Sampling Device	Sampling Date (UTC)	Latitude (°N)	Longitude (°E)	Bottom depth (m)
PS152_3-1	KHS_0.61	Multinet	2025-12-25	-61.001	-0.003	5385
PS152_3-2	KHS_0.61	RMT	2025-12-25	-61.002	0.008	5392
PS152_3-5	KHS_0.61	SUIT	2025-12-25	-60.998	0.000	5394
PS152_5-1	KHS_0.62	SUIT	2025-12-25	-61.995	-0.007	5366
PS152_5-4	KHS_0.62	RMT	2025-12-25	-62.000	0.000	5366
PS152_5-5	KHS_0.62	RMT	2025-12-25	-61.981	-0.009	5363
PS152_7-3	KHS_0.63	mRMT	2025-12-26	-62.997	-0.001	5309
PS152_9-1	KHS_0.64	SUIT	2025-12-26	-63.998	-0.009	5199
PS152_9-4	KHS_0.64	Multinet	2025-12-26	-63.979	-0.037	5202
PS152_9-5	KHS_0.64	mRMT	2025-12-26	-63.986	-0.034	5200
PS152_11-6	KHS_MR.1	mRMT	2025-12-27	-64.474	2.841	2167
PS152_13-3	KHS_MR.2	Multinet	2025-12-28	-65.252	2.670	1251
PS152_13-5	KHS_MR.2	SUIT	2025-12-28	-65.226	2.693	1265
PS152_13-6	KHS_MR.2	mRMT	2025-12-28	-65.224	2.725	1293
PS152_13-8	KHS_MR.2	Multinet	2025-12-29	-65.219	2.770	1376
PS152_17-2	KHS_0.66	Multinet	2025-12-30	-65.999	0.000	3411
PS152_18-3	BGC_25_2	SUIT	2025-12-30	-66.467	0.030	4482
PS152_18-4	BGC_25_2	Multinet	2025-12-31	-66.472	0.036	4473
PS152_18-5	BGC_25_2	mRMT	2025-12-31	-66.471	0.036	4473
PS152_21-1	KHS_0.67.5	SUIT	2025-12-31	-67.502	0.011	4630
PS152_21-2	KHS_0.67.5	mRMT	2025-12-31	-67.492	0.071	4630
PS152_21-4	KHS_0.67.5	Multinet	2025-12-31	-67.501	0.006	4631
PS152_23-2	KHS_0.68.5	Multinet	2026-01-01	-68.500	0.001	4266
PS152_26-3	KN_16	mRMT	2026-01-07	-70.442	-10.551	1746
PS152_27-3	KN_04	Multinet	2026-01-07	-70.757	-10.834	913
PS152_27-5	KN_04	SUIT	2026-01-07	-70.764	-10.866	906

Device Operation	Optional label	Sampling Device	Sampling Date (UTC)	Latitude (°N)	Longitude (°E)	Bottom depth (m)
PS152_27-11	KN_04	mRMT	2026-01-08	-70.732	-10.965	1158
PS152_31-7	KN_13	SUIT	2026-01-09	-70.781	-10.784	707
PS152_31-9	KN_13	mRMT	2026-01-10	-70.764	-10.746	790
PS152_33-2	KN_14	mRMT	2026-01-10	-70.711	-10.654	962
PS152_34-1	KN_15	mRMT	2026-01-11	-70.590	-10.642	1322
PS152_34-4	KN_15	Multinet	2026-01-11	-70.565	-10.601	1398
PS152_35-1	KN_14	Multinet	2026-01-12	-70.700	-10.603	937
PS152_37-3	KN_01	SUIT	2026-01-13	-70.393	-11.193	2058
PS152_37-5	KN_01	mRMT	2026-01-14	-70.381	-11.187	2064
PS152_37-6	KN_01	Multinet	2026-01-14	-70.348	-11.053	1969
PS152_38-1	KN_02	mRMT	2026-01-14	-70.480	-11.104	1827
PS152_38-4	KN_02	SUIT	2026-01-14	-70.525	-11.377	1776
PS152_39-4	KN_03	mRMT	2026-01-15	-70.671	-11.086	1430
PS152_39-5	KN_03	Multinet	2026-01-15	-70.645	-10.996	1397
PS152_40-5	KN_08	Multinet	2026-01-15	-70.889	-11.121	319
PS152_44-2	KN_09	Multinet	2026-01-16	-70.944	-10.529	286
PS152_44-5	KN_09	mRMT	2026-01-17	-70.943	-10.512	262
PS152_44-8	KN_09	SUIT	2026-01-17	-70.940	-10.537	300
PS152_46-4	KN_05	SUIT	2026-01-20	-70.798	-11.037	907
PS152_47-2	KN_17	Multinet	2026-01-21	-70.351	-10.599	2078
PS152_47-4	KN_17	SUIT	2026-01-21	-70.350	-10.585	2056
PS152_47-5	KN_17	mRMT	2026-01-21	-70.350	-10.386	1950
PS152_49-3	KN_05	mRMT	2026-01-22	-70.833	-10.916	446

Fig. 2.2.8: Multinet samples from station 47-2 sorted by sampling depth. From left to right 1,000-750, 750-500, 500-200, 200-50, 50-0 m. Photo: Insa Kaphegyi.

Multinet

With the multinet, we sampled mesozooplankton at 16 stations (Tab. 2.2.3), yielding 77 sample. The Multinet surface samples from Kapp Norvegia were characterised by high densities of *Phaeocystis antarctica* in the samples *(Fig. 2.2.8)*. The net samples were preserved in a 4% formaldehyde-seawater solution, and will later be analysed at AWI.

Specific sampling

Trophic biomarkers and PFAS

Target samples for trophic biomarker analyses and pollutant (PFAS, microplastics) analyses were subsampled from various gear deployed throughout the expedition. This included SUIT, mRMT, Pelagic Trawl, Lander, OFOBS net, longlines, AGT and CTD (Tab. 2.2.4). Samples comprised phytoplankton, gelatinous zooplankton including jellyfish, salps and chaetognaths, crustaceans such as krill, amphipods and copepods, mesopelagic, pelagic and benthic fish and squids (Fig. 2.2.9). Full organisms were sampled, photographed and stored in glass vials and Falcon tubes at -80°C. Furthermore, nine samples from three ice-cores were taken during an ice station for PFAS measurements, and a further seven ice-core samples from five ice stations were melted and filtered for trophic biomarker analyses of sympagic algae. Finally, five sediment samples for PFAS measurements were collected from the TV-MUC and the Box Corer.

Organisms prioritised for biomarker sampling were the taxa commonly present in the mesopelagic realm (200-1,000m), mostly myctophids and squids, but also included mesopelagic crustaceans, polychaetes, other molluscs and gelatinous zooplankton (Fig. 2.2.9). Larger fish from the pelagic net were dissected directly aboard for their stomach, liver and muscle tissue.

A total of 520 trophic biomarker samples were collected for lipid and fatty acid analyses, stable isotope analyses and 28 fish stomachs for metabarcoding of stomach contents. Analyses will be carried out at the AWI in Bremerhaven and the University of Bremen. The total amount of PFAS samples taken is 80 and will also be analysed at AWI (Tab. 2.2.4).

Fig. 2.2.9: Exemplary target organisms for trophic biomarker analyses from the mesopelagic zone, caught by mRMT. L: Mesopelagic fish, crustaceans and jellyfish. R: Mesopelagic squids Galiteuthis glacialis and Psychroteuthis glacialis. Photos: Kira Kremer.

Copepods

The lipid rich copepod species *Calanoides acutus* was sampled opportunistically from two SUIT nets (PS152_38-4 and PS152_47-4) as part of the NERC funded project BIOPOLE. Approximately 60 individuals were identified, staged (CV and Female retained only) and photographed for prosome and lipid sac area (see Fig. 2.2.10 as example). Samples were placed within pre-weighed tin capsules and dried at 60 degrees C and stored at +4 degrees C for subsequent CHN analysis.

Fig. 2.2.10: Example photograph of Calanoides acutus CV, sampled for body size, lipid sac and elemental analysis. Photo: Jennifer Freer.

Tab. 2.2.4: Numbers of animal-, particulate organic matter (POM), PFAS and stomach samples

Dev. Op.	Device	Animals	POM	PFAS	Stomachs
PS152_5-2	CTD		1		
PS152_5-4	RMT8	24		5	
PS152_7-1	CTD		1		
PS152_9-2	CTD		1		
PS152_9-5	MRMT8	30		6	
PS152_9-1	SUIT	13			
PS152_11-1	CTD		1		
PS152_11-6	MRMT	12		2	
PS152_13-1	CTD		1		
PS152_13-6	MRMT	13		1	
PS152_13-5	SUIT	20		3	
PS152_15-1	CTD		1		
PS152_17-1	CTD		1		
PS152_18-2	CTD		1		
PS152_18-5	MRMT	26		4	
PS152_21-3	CTD		1		
PS152_21-1	SUIT	20			
PS152_23-1	CTD		1		
PS152_26-1	CTD		1		
PS152_26-3	MRMT	25		6	
PS152_27-1	CTD		1		
PS152_27-11	MRMT	29		4	
PS152_27-5	SUIT	15			
PS152_28-1	CTD		1		
PS152_30-3	CTD		1		
PS152_31-3	CTD		1		
PS152_31-10	Lander			1	
PS152_31-9	MRMT	13			
PS152_31-7	SUIT	9		1	
PS152_33-2	MRMT	47		1	
PS152_34-2	CTD		1		
PS152_34-1	MRMT	9		3	
PS152_34-7	MUC			2	
PS152_34-5	PSN	61		8	19
PS152_35-2	CTD		1		
PS152_35-4	PSN	38		14	8
PS152_36-2	CTD		1		
PS152_36-5	MUC			2	
PS152_37-1	CTD		1		

Dev. Op.	Device	Animals	POM	PFAS	Stomachs
PS152_37-5	MRMT	28		3	
PS152_37-3	SUIT	10			
PS152_38-2	CTD		1		
PS152_38-4	SUIT	6			
PS152_39-2	CTD		1		
PS152_39-7	Lander			1	
PS152_39-4	MRMT	11			
PS152_40-2	CTD		1		
PS152_40-4	OFOBS			4	
PS152_41-2	CTD		1		
PS152_42-1	Longline	4		1	
PS152_43-4	Box corer			1	
PS152_44-5	MRMT	11			
PS152_44-8	SUIT	6			
PS152_45-1	CTD		1		
PS152_46-4	SUIT	4			
PS152_47-5	MRMT	24		3	1
PS152_49-3	MRMT	13		1	
PS152_24-1	Ice corer		2		
PS152_29-1	Ice corer		1		
PS152_35-5	Ice corer		1		
PS152_36-7	Ice corer		2		
PS152_52-1	Ice corer		1	9	
Total		489	31	80	28

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2.3 BENTHIC HABITAT, BIODIVERSITY AND FUNCTIONS

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Outline

The work on benthic habitat, biodiversity and functions will combine non-invasive approaches assessing epifauna, bathymetry and topography of the seafloor (Purser et al., Chapter 2.3.2._09) and the underlying infauna as well as sediment biogeochemistry and processes (Link et al., Chapter 2.3.1._03).

2.3.1 Biodiversity and function in sediment habitats in relation to their biogeochemistry

Objectives

Primary production at the euphotic zone generates a sinking flux of biogenic particles such as organic matter (e.g., organic carbon) and biogenic silica, which ultimately settle onto the sea floor, where they accumulate. The accumulation of these particles has climatic implications because this process contributes to immobilize atmospheric carbon in the sediment column for long-term periods (e.g., centuries). Interactions between infauna communities and their environment, ecological processes driving the benthic ecosystem and processes driven by infauna communities in the Southern Ocean remain poorly understood (Gutt et al. 2019). Ongoing alterations in the input from surface primary production with changes in sea-ice dynamics stress the need to understand fauna-environment interactions now. Understanding these relations will allow to quantify the productivity (biomass) and functions of seafloor habitats along the Antarctic continental shelves. Repeatedly sampled sites from PS129 and/or PS96 subject to a changing environment allow us to disentangle biotic and abiotic effects (Link et al. 2023).

The project "benthic soft-bottom habitat, biodiversity and function" worked with the project Carbon dynamics in the High-latitude Weddell SeA continental shelf SEdiment at the onset of ecosystem change (CHASE, Isla and Rossi) during the WOBEC expedition. We investigated the organic carbon accumulation and degradation rates at the seafloor, community composition of meio- and macrofuna, fluxes at the sediment-water interface, carbon stored in biomass of epibenthic suspension feeders, as well as bioturbation and bioirrigation patterns on Maud Rise as well as along two transects off Kapp Norvegia. We will thus contribute to setting a baseline on the ongoing status of the organic carbon dynamics, including long-term retention (e.g., centuries) in the eastern Weddell Sea continental shelf ecosystem.

The objectives were:

- Estimate the organic carbon accumulation and degradation rates in the sea floor.
- Identify biodiversity patterns of benthic ecosystems to investigate how micro-, meio- and macrofauna communities differ in their composition (abundances, taxa and functional groups) with environmental conditions (e.g., sea ice)
- Assess ecosystem functions: investigate the influence of ice cover vs shelf-to-slope habitat on the benthic ecosystem functions of oxygen and nutrient fluxes at the sediment-water interface.
- Quantify sediment mixing processes: analyze the benthic bioturbation and biorrigation in shelf and slope habitats and the effect of infauna communities on these processes.
- Quantify how climate change may impact on the capability of epibenthic suspension feeders to immobilize carbon during long time periods

Work at sea

We carried out TV-MUC10 (Fig. 2.3.1) and GKG deployments at stations where bottom topography allowed safe use of the gear (Tab. 2.3.1). We collected information on sediment composition and bottom topography by following the OFOBS deployment (Ocean Floor Observing and Bathymetry System) and information from previous expedition (PS129, Link et a. 2023). This will also allow for later combined analysis of epifauna and infauna.

Environmental sediment parameters, including Chl*a* and grain size, were collected for a better ecological understanding of the pelagic-benthic coupling. At all possible stations on Maud Rise (2 stations) and Kapp Norvegia (8 stations), we deployed the TV-guided multicorer (TV-MUC10) to collect sediment cores for incubation and bioturbation studies on board. Stations included sampling the area of the former BENDEX disturbance experiment (see Fig. 2.3.2 and Fig. 2.3.5). At each MUC deployment, bottom water data and characteristics concerning CTD casts (water temperature, salinity) were collected. Macrofauna (in particular infauna) were sampled by a giant box corer (GKG) at stations 43 and 44 for additional fauna classification.

Deployments at KHS_MR. 3, KN_11, and KN_8 were not successful. Seafloor and hydrodynamic conditions: rocky seafloor and high, intense waves were the main causes of this failed catch. During the second deployment at WOBEC sites KN_10, a screw on the main releaser part of the MUC became loose, causing failure in the release of the MUC's arms. Therefore, we strongly recommend inspecting the MUC and testing the live camera system with telemetry to the MUC before every deployment.

Experimental approaches including incubations for flux measurements and luminophore tracer studies will be performed on board in temperature-controlled laboratory containers (2°C).

In addition, three sediment cores each are sliced and frozen directly into subsamples for later analysis in grain size, organic carbon, biogenic silica, ^{210}Pb and ^{14}C, Chl*a* concentration as well as genetic diversity. Different suspension feeders and deposit feeders will be collected with the AGT. Several representative species will be selected to calculate its biovolume, and a piece of the animal will be stored at -20 °C pending analysis (e.g. C/N, Stable Isotopes, biochemical balance, etc.). With previously recorded images and some of the OFOBS images taken in this cruise, we will make an extrapolation of the density and size class of these representative species. Such data will be used to calculate the total biomass and the carbon associated to the studied population.

Fig. 2.3.1: TV-MUC deployed over the side of Polarstern (Foto: H. Link/ Uni Rostock)

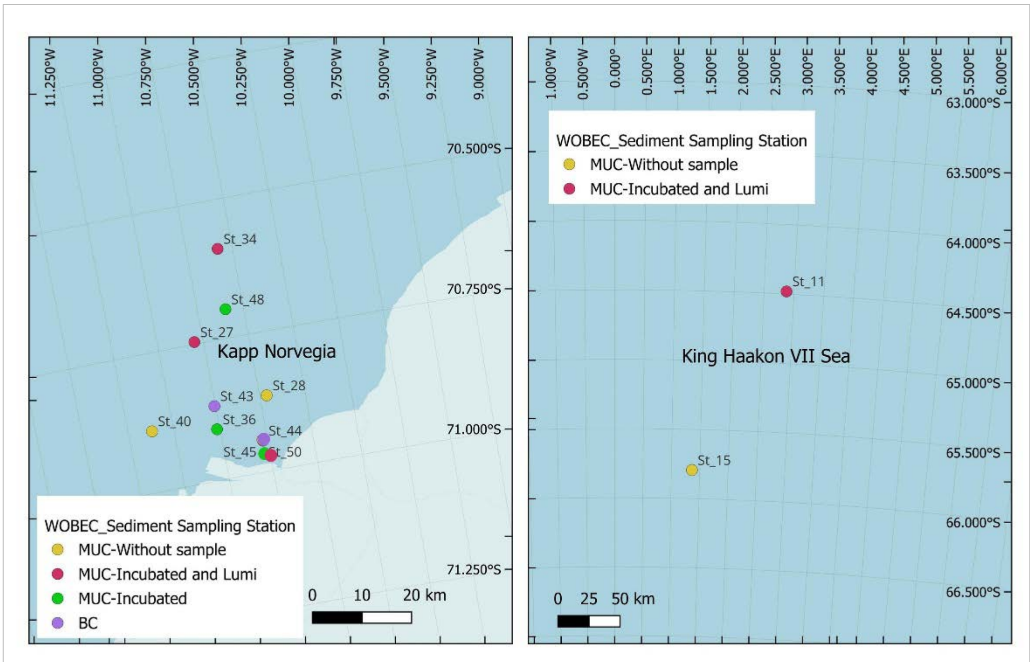

Fig. 2.3.2: Map of TV-MUC and Box corer deployments during PS152

2.3.1.1 Assessment of the benthic processes oxygen consumption, solute fluxes, and bioirrigation in relation to the benthic community

Replicated sediment cores were successfully retrieved from TV-MUC deployments at WOBEC sites KHS_MR. 1, KN_04, KN_7, KN_10, KN_14, and KN_15 (Tab. 2.3.1).

Prior to TV-MUC deployment, 5 core liners were prepared of which four were equipped with O2 sensor spots and pore water ports, one with only O2 sensor spots. Right after retrieval, cores were prepared for sediment core incubation, including mounting the air-tight PVC-bottom stopper, and placing the sediment cores into dark, temperature-controlled laboratory containers (2°C). One was used as bioirrigation control and immediately defaunated using a heating approach. The core was placed in a water bath at 65 °C and heated until the temperature in the core's water column plateaued (usually > 45 °C). After defaunation, this core was cooled down and transferred to the other cores for acclimatisation.

Prior to the start of incubation, we pushed the sediment cores up such that 15-20 cm overlying water was left to the top. Three control cores with an O2 sensor containing only respective bottom water (from CTD) mixed with leftover bottom water from the sediment cores (spill-over water during water column adjustment) were additionally prepared. We then oxygenated all cores with bubble stone for 2-3 hours to reach oxygen saturation.

At the onset of incubation water samples for nutrients were taken with 60 ml syringes (acid-washed from all cores and we added 1 M NaBr (a tracer for bioirrigation) for a final concentration of 10 mM NaBr to 4 cores. After closing the cores, we measured the water column temperature and O2 concentration in each core. Water samples were then filtered for 14 ml with 2 replicates per core for nutrients and 1.5 ml with 3 replicates per core for biorrigation. Water samples were stored in a -20 °C cool room.

The water overlying the sediment was stirred with a magnetic stirrer during incubation. Temperature and O_2 concentration were then measured every 3-4 hours with a thermometer and a Fibox-LCD optical sensor.

When the O_2 concentration reached approximately 90% and 80% saturation – or latest after 48 and 96 h, respectively, we took additional water samples. At 90% sampling, bottom water was added to the cores to replace the water that was sampled.

At the end of incubation, the height of the water column and sediment were measured for later flux calculation. Sediment cores that were subject of a bioirrigation measurement were drained and their pore water was extracted with the Rhizons system (Fig. 2.3.3). Pore water was collected in a depth interval of 0-1,1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 8-9, 9-10,10-12, 2 replicates of 2 ml per depth. Samples were frozen at -20 °C.

After pore water extraction, sediment cores were sub-sampled with 10 ml cut-off syringes in 0 – 5, 5-10, 10-15 cm depth intervals (n=1 per depth) for later assessment of sediment properties (porosity, Chl*a*, C/N, grain size, and Total Organic Carbon (TOC)), that were stored at -20 °C. The remaining sediment core was then sliced into 0-2, 2-5, and 5-rest cm for biodiversity assessment of macro-meiofauna. At an interval of 5 cm-rest, sediment was sieved with a 500 µm sieve. Sediment sliced and sieved material was filled into Kautex bottles and preserved with 99% Ethanol to reach a final concentration of 70% Ethanol. Samples were stored on board in a 4 °C cool room until arrival at the home lab of the University of Rostock.

Fig. 2.3.3: Pore water extraction and distinctives difference between sediment cores in KHS.MR_1 (left) and KN_14 (middle and right) (Foto: W. Werna / Uni Rostock)

Oxygen and nutrient fluxes will be computed based on the change in concentration (in the overlying water) per areal surface of the sediment core per time. The distribution of bromide from overlying water into pore water will be used to quantify transport of dissolved substance (diffusively) and asses the local transport through the fauna irrigation (modelling approach). Sample analyses of nutrient and bromide concentration as well as sediment properties and biodiversity will be performed later at the University of Rostock.

Tab. 2.3.1: Overview of sediment cores subject to direct sub sampling (sediment properties, biodiversity and geochemistry), incubation for benthic fluxes bioirrigation, and luminophore experiments to find in the following station description.

For further information please find Table 2.3.1 at the end of the chapter.

2.3.1.2 Bioturbation (sediment reworking) experiment

At four stations, six additional cores were obtained, usually from an additional TV-MUC10 deployment for experimental work. The experiments will determine the role of macrofauna on particle transport using luminophores in the area.

From each station half of the cores were heated up for several hours in a 65 °C water bath in order to obtain azoic control cores without living metazoan (sediment surface temperature > 40 °C). Then, incubation procedure followed the same protocol for both, the azoic control and the natural cores: All cores were kept in the dark lab container at 2 °C. After an acclimation phase of at least three days, 2 g luminophore particle tracers per core were injected on top of the sediment. Luminophores – inert, fluorescently labelled sediment particles within the size range of 63-125 µm – were incubated in bottom seawater for 4-5 days prior the experiment to ease suspension. Cores were then incubated for 14 days with oxygen saturation in the water kept near 100 % by using a simple bubble stone aeration system. At the end of the incubation time, water was drained and all cores were sliced in layers 0-0.5, 0.5-1, 1-1.5, 1.5-2 cm and 1 cm slices down to 10 cm, and then 10-12 cm and 12-15 cm sediment layers. The sediment was homogenized carefully by hand and 3 (control cores) to 5 (natural cores) subsamples were taken from each slice for tracer fluorescence measurements at the University of Rostock. The remaining sediment was preserved in whirl packs for macrofauna analysis. All samples were stored at -20 °C.

Fig. 2.3.4: Luminophore layer on top of the sediment surface (left) and incubation setup with aeration (right) (Fotos: C. Abraham / Uni Rostock)

2.3.1.3 Direct sediment, Chl*a*, Radionuclides and Geochemistry sampling

A total of 18 cores from 7 TV-MUC stations and 1 box corer (GKG) stations were collected on the region off Kapp Norvegia, the main WOBEC study area on the continental shelf, and Maud Rise. Most of the samples were collected on the continental shelf and the remaining stations were located on the slope. The samples collection covered a bathymetric gradient from 287 m water depth in the eastern Weddell Sea to 2,160 m water in the vicinity of Maud Rise.

For Radionuclides and geochemistry, sediment cores were subsampled on board in slices 0.5 cm (the uppermost 10 cm), 1 cm (from cm 10 to 20) and 2 cm (from cm 20 to 30) thick to a maximum core length of 30 cm. Overall, 488 multicorer samples were obtained after slicing. All samples were stored at -20 °C until analysis in the home lab at ICSM, Spain.

At each station, 1 core was subsampled with 0.5 slices that were directly frozen for later meiofauna analysis. From this half slice, 1 subsample for later Chl *a* profile determination was collected in 12 ml centrifuge vials (Tab. 2.3.1 subsample RNG).

2.3.1.4 Preliminary results

For the upper 10 cm horizon, first observations showed that the sediment was mainly constituted by gravel and a greenish sandy mud. Below this layer, grey silt and clay appeared to be predominant towards the base of the cores. Some stations showed what they seemed to be – small amphipods and polychaete tubes.

Fig. 2.3.5: Rack with sediment cores from the continental shelf off Kapp Norvegia at the former BENDEX disturbance area: The upper part of the cores shows macrobenthic fauna debris.

The total uptake of oxygen was, compared to that from slopes (station 27, 34 and 48) and Maud Rise sediments, in shelf sediments the highest.

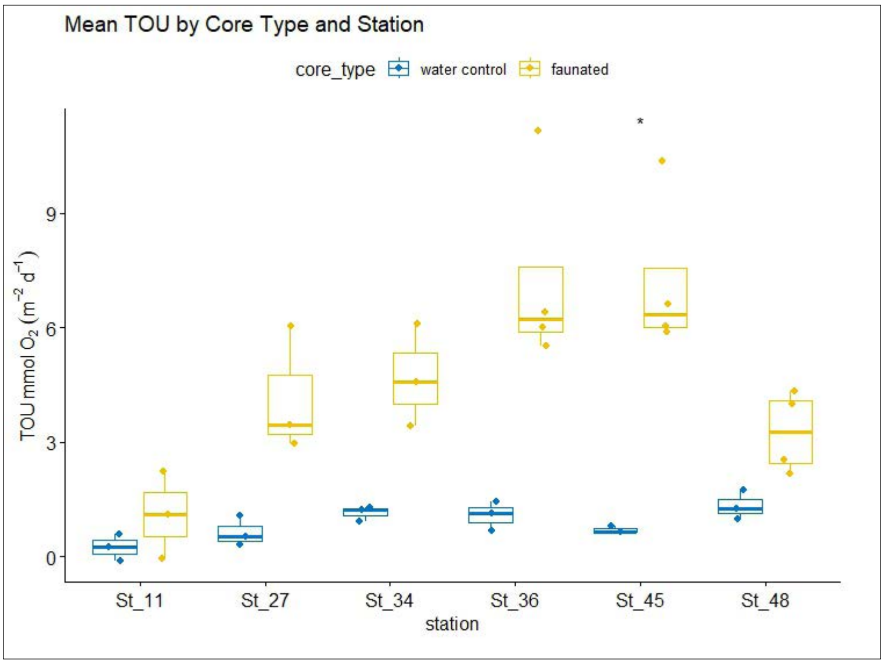

Fig. 2.3.6: Preliminary results of total oxygen uptake (TOU) by sediment cores during PS152

2.3.2 Biodiversity and habitat structure of the seafloor

Objectives

The Ocean Floor Observation and Bathymetry System (OFOBS; Fig. 2.3.7) is a towed camera platform, capable of imaging (in still image and video) seafloor communities and structure from a height of 1.5 m above the seafloor (Purser et al. 2019). The device is also equipped with forward sonar, sidescan sonar, a new sampling net, 22 l of water sampling capability and a CTD system. The device was used to discover the *Neopagetopsis ionah* colony of Weddell Sea icefish in 2021 (Purser et al. 2022a), and generate collections of regional, publicly accessible data from ice covered regions (Purser et al. 2022b). The device is the latest iteration of camera sled employed in Antarctica (and elsewhere) by AWI, replacing the more basic Ocean Floor Observation System (OFOS), which was used extensively in the collection of regional data used to determine habitat and fauna distributions across the Weddell Sea (Piepenburg et al. 2017).

Fig. 2.3.7: The Ocean Floor Observation and Bathymetry System (OFOBS) of the Alfred Wegener Institute (Foto: Autun Purser)

Work at sea

During the PS152 expedition the system was used to characterise the seafloor habitats and communities across the WOBEC stations. 27 successful deployments of the system were made. Tab. 2.3.2 gives an overview of the locations and durations of all deployments made during PS152.

Tab. 2.3.2: Table showing details of the Ocean Floor Observation and Bathymetry System (OFOBS) deployments made during PS152. Station number, OFOBS dive number, Transect start and end times, start and end latitude and longitudes, whether or not the net, water sampler or sidescan system were also used are all indicated.

For further information please find Table 2.3.2 at the end of the chapter.

Work at sea comprised:

1. The OFOBS system deployed to visually and acoustically image and map the focus stations of the WOBEC project at 27 stations, with 4 of these stations surveying the Maud Rise, and 23 surveying the Kapp Norvegia region.
2. The OFOBS was equipped with a sampling net and used to directly sample benthic and epibenthic fauna at 6 stations, as requested by onboard collaborators. This sampling was carried out by gently lowering the OFOBS and net to the seafloor under a slow speed of 0.3 to 0.4 kt, to directly scoop up the target fauna.
3. The new 22 l water sampler system was used on 18 deployments to supplement the water sample requirements of onboard participants. Both 11 l and 22 l configurations were used, as detailed in Tab. 2.3.2.

Preliminary results from the OFOBS work

The 27 deployments of the OFOBS during PS152 highlighted the extreme topological and faunal complexity of the WOBEC station regions on the ecosystem scale. The sidescan data showed the extreme influence iceberg movement can have on the benthic communities and seafloor structure, with the BENDEX stations indicating that even decades after light disturbance, seafloor communities across the region do not begin to regenerate a faunal community reminiscent of that present before disturbance, or still extant on the surrounding undisturbed seafloor.

Numerous observations were made of interesting and / or unexpected fauna across the deployments – both in the lower water column and on the seafloor. The majority of these observations will only be quantified after analysis post-cruise. Some observations on key organisms at stations, unusual features etc are addressed in the station overview descriptions below. In all cases the images contain three red sizing laser points, with a spacing of 50 cm between lasers.

The expectation is to produce the first full image and sidescan data sets from each of the WOBEC stations of interest. The fauna within the data will be quantified after the expedition, and allow changes in distributions between 2026 and subsequent cruises gauged. Data collected will be used to support the ongoing development of a Weddell Sea Marine Protected Area (WSMPA) (Teschke et al. 2021).

Station overview: PS152_11-3 – Average depth (Profile Start+Profile End /2): 2,172.15 m

Substrate: Pale, soft sediment (mud/silt?) with many signs of infaunal activity

Notable fauna: pink/purple sea urchins decorated with polychaete tubes, brittle stars, etc, large black holothurians, large pale holothurians, large pycnogonids, 8-armed pink brittle stars (?), 8-armed pale sea star, small crocodile icefish, many ctenophores (combed but resting on bottom, transparent with purple internal organs), grenadiers.

Other notes: Slope of Maud Rise

Fig 2.3.8: SW_RELEASER_2025_12_27 at 14_52_52 IMG_0111.JPG

Station overview: PS152_13-7 – Average depth (Profile Start+Profile End/2): 1,356.95 m

Substrate: Basalt boulders, platforms and ledges with sand/silt accumulating in channels, with intervening basins of sand/silt with dark pebbles and fragments of basalt.

Notable fauna: Crinoids, Large and small brittle stars, anemones, many armoured holothurians, a few large 10-legged sea stars, grenadiers, soft pink holothurians, occasional Umbellula corals, gorgonians (?), pink urchins, small polychaete tubes embedded in rock surfaces

Other notes: Top of Maud Rise. Signs of strong current. Water very clear, holothurians clustered on downstream side of boulders. Substantial heave during this dive (6 m). Fauna sparser than expected given the availability of hard substrate, perhaps because of current? Has a "swept-clean" appearance.

Fig. 2.3.9: TIMER_2025_12_28 at 22_11_55 IMG_0780.JPG

Fig. 2.3.10: TIMER_2025_12_28 at 22_10_52 IMG_0776.JPG

Station overview: PS152_13-9 – Average depth (Profile Start+Profile End /2):1,358.25 m

Substrate: basalt platforms and ledges, including rows of rib-like rocks, with intervening basins and channels filled with pale sand/silt sediment, tiny pebbles and basalt fragments. Also, platforms of pale rock (sandstone?) beneath basalt.

Notable fauna: large brittle stars, grenadiers, occasional gorgonians (?), occasional hexactinellid sponges, armoured holothurians, occasional sea stars, *Umbellula* corals,

Other notes: Similar to 13-9. Slope of Maud Rise. 'Drifts' of broken polychaete tubes in sheltered places. Substantial heave on this dive (6 m).

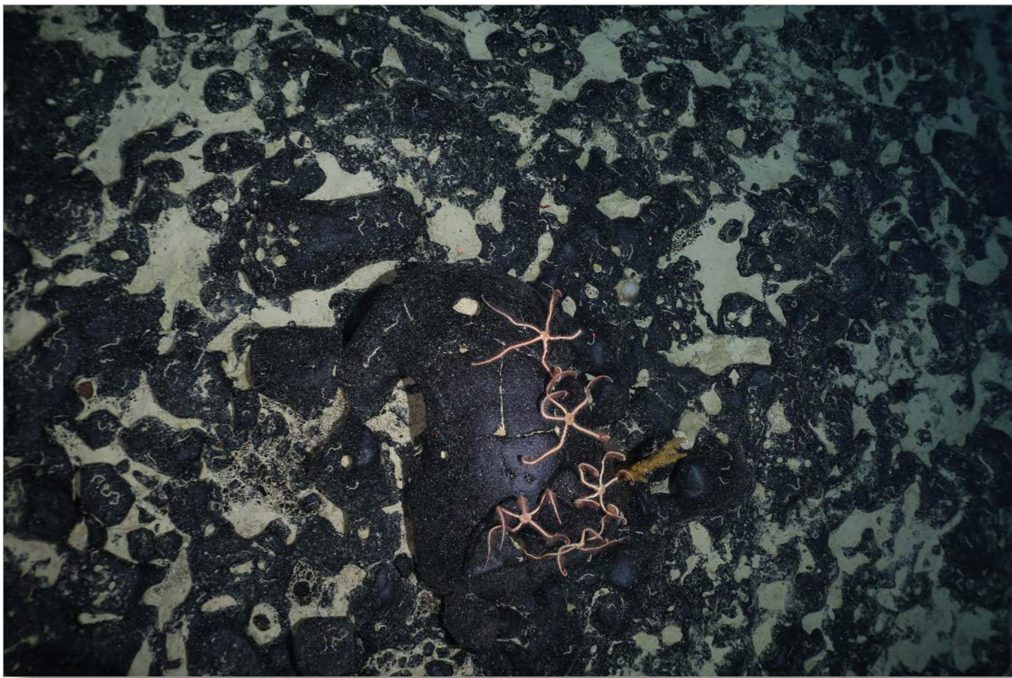

Fig. 2.3.11: SW_RELEASER_2025_12_29 at 03_13_48 IMG_0251.JPG

Station overview: PS152_15-2 – Average depth (Profile Start+Profile End /2): 2,757 m

Substrate: Sand / silt with much evidence of infaunal activity.

Notable fauna: A few Venus flytrap-like hydrozoans (?), pale anemones on single rocks/ dropstones. Generally sparse.

Other notes: **Whale fall** (Fin/Sei?) at images 0278-0280 with associated fauna. Appears very old. Cirrate octopus at image 0317. Heave was intense and often did not allow close approach to seafloor – “like bungee jumping across the seafloor”.

Fig. 2.3.12: SW_RELEASER_2025_12_29 at 20_30_43 IMG_0317.JPG

Station overview: PS152_27-7 – Average depth (Profile Start+Profile End /2): 966.8 m

Substrate: Soft silt with many scattered boulders/dropstones and smaller pebbles and rocks.

Notable fauna: red benthic shrimp, glass sponges, armoured and soft holothurians inc. *Bathyplotes gourdoni*, grenadiers, many fluffy white gorgonians (??), ascidians, eelpouts, hydrozoans, echiuran (?) “tongue worms”, pencil urchins, *Pogonophryne lanceobarbata* (lancebeard plunderfish?)

Other notes: Much algae sitting on seafloor in drifts and piles.

Fig. 2.3.13: SW_RELEASER_2026_01_07 at 16_05_23 IMG_0097.JPG

Station overview: PS152_28-4 Average depth (Profile Start+Profile End /2): 250.4 m

Substrate: Mostly dark gravel and pale sand with pockets of silt and large dropstones. Carpets of bryozoans

Notable fauna: Many large sun stars, brittle stars, widely varied sponges, abundant gorgonians, holothurians, sea stars, tunicates, icefish, anthozoans, bryozoans, Gersemia corals (?), pycnogonids, crinoids

Other notes: Lush life. Much organic material (clumps of greenish-yellow fallen algae?) on seafloor. Possible fish nests (not occupied). This dive seemed particularly diverse and rich, and one of the shallowest of the cruise.

Fig. 2.3.14: TIMER_2026_01_08 at 16_0_11 IMG_0260.JPG

Station overview: PS152_28-5 – Average depth (Profile Start+Profile End /2): 251.55 m

Substrate: See Dive 28_4. Thick mats of bryozoans, brittle stars, polychaetes, etc.

Fauna: See Dive 28_4; same location, depth and general faunal composition.

Other Notes: This dive was first attempt on this cruise to use the OFOBS' net. (Target was fish; not successful). Image 82 features a strange organism beneath an icefish we cannot identify. Very rich and diverse.

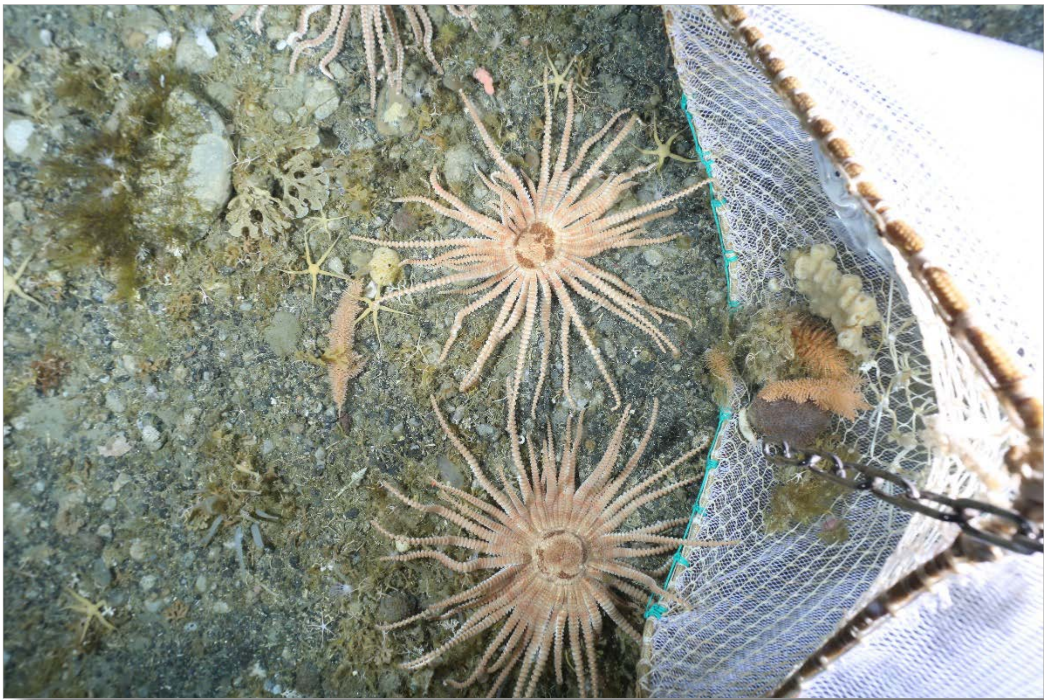

Fig. 2.3.15: SW_RELEASER_2026_01_08 at 17_07_44 IMG_0065.JPG

Station overview: PS152_30-1 – Average depth (Profile Start+Profile End /2): 246.4 m

Substrate: Soft bottom with many dropstones, intermittent deposits of gravel and sand.

Notable fauna: icefish, crinoids, gorgonians, bryozoans (many), many sponges including lollipop sponges and "walking" sponges, sea stars, brittle stars, corals, anthozoans, solitary and colonial ascidians inc. *Distaplia* sp., multiple species of crinoids, nudibranchs.

Other notes: Generally, a very rich and diverse site. Much yellow-green organic material (algae?) present in drifts and clumps on seafloor. Several likely/clear fish nests (not occupied). Many icefishes were infested with pink and yellow fish leeches. Some places obviously scoured, nearly devoid of visible life.

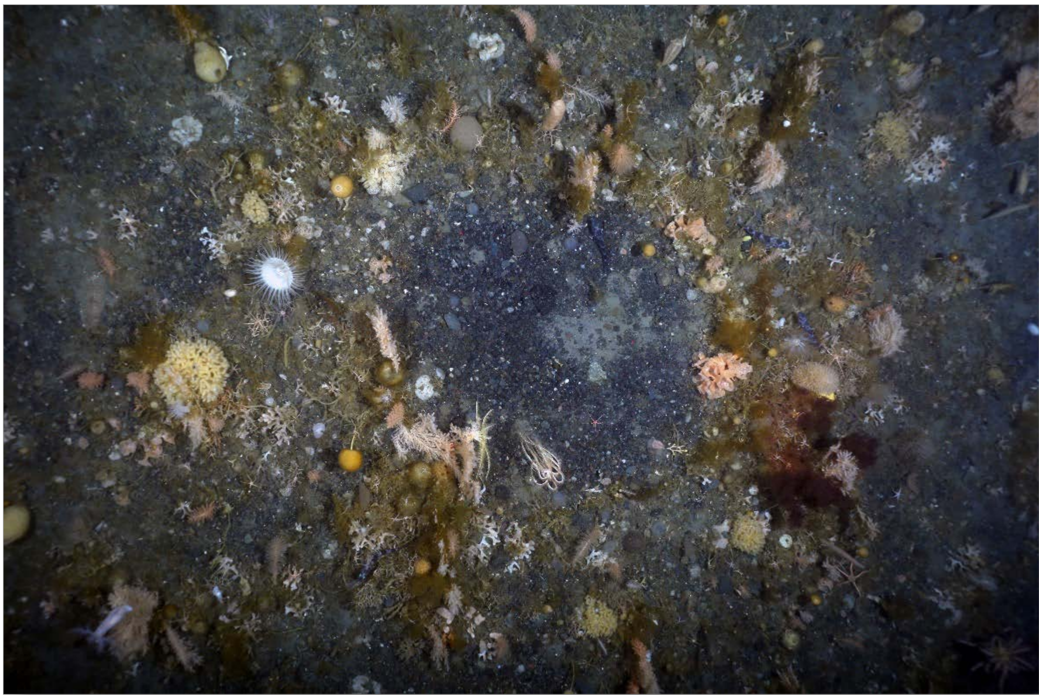

Fig. 2.3.16: SW_RELEASER_2026_01_09 at 05_50_21 IMG_0131.JPG; central to the image is an unoccupied icefish nest.

Station overview: PS152_30-2 – Average depth (Profile Start+Profile End /2): 227.65 m

Substrate: Soft bottom, mostly scoured (recently?) by icebergs.

Notable fauna: Sparse, due to scour, with occasional patches of less disturbed area similar to 30-1. Skate.

Other notes: Abundant organic debris. This was a dive with the OFOBS net on behalf of other teams to catch fish (some success); the net obscured more than half the frame. Much of this dive revealed a massive iceberg-scoured area adjacent to the previous dive (30-1). Some fish nests (unoccupied).

Fig. 2.3.17: TIMER_2026_01_09 at 08_07_30 IMG_0018.JPG

Station overview: PS152_31-6 – Average depth (Profile Start+Profile End /2): 672.25 m

Substrate: Pebbles/gravel with large boulders/dropstones.

Notable fauna: Large (and small) sponges, brittle stars, bryozoans, icefish, urchins (pencil and otherwise).

Other notes: Brief dive with net to catch fish.

Fig. 2.3.18: SW_RELEASER_2026_01_09 at 18_23_56 IMG_0079.JPG

Station overview: PS152_31-8 – Average depth (Profile Start+Profile End /2): 626.35 m

Substrate: same as 31-6.

Notable fauna: similar to 31-6 but sparser in places, increasing in richness as it proceeds. Holothurians, sponges large and small, brittle stars, *Umbellula* corals, bryozoans (dense in patches), gastropods (alive?), gorgonians, scale worms, multiple "hedgehog" nudibranchs, pycnogonids, icefish, anthozoans, skate, crinoids

Other notes: None

Fig. 2.3.19: TIMER_2026_01_09 at 23_48_33 IMG_0247.JPG

Station overview: PS152_33-3 – Average depth (Profile Start+Profile End /2): 741.2 m

Substrate: Variable from boulder fields to scattered drop stones to pebbly bottom to soft bottom.

Notable fauna: Abundant sea pigs, icefish, other holothurians, sea stars, 'walking' and other sponges including many small sponges encrusting dropstones, red benthic shrimp, skate, pycnogonids, nudibranchs.

Other notes: Many tubes of unknown origin in seafloor, perfectly round with "chimneys" extending several centimetres above the seafloor. Polychaetes perhaps? Iridescent, sand eel-like dish followed the OFOBS throughout much of the dive. Possible fish nests here.

Fig. 2.3.20: SW_RELEASER_2026_01_11 at 00_12_49 IMG_0346.JPG

Station overview: PS152_34-6 – Average depth (Profile Start+Profile End /2): 1,363.1 m

Substrate: Soft, silty bottom.

Notable fauna: Stalked crinoids, red benthic shrimp, brittle stars, holothurians, Paraliparis (?)

Other notes: Fairly sparse but consistent fauna – oddly “tropical beach” look to this dive with the pale bottom like a sandy beach and crinoids like palm trees, with shrimp and brittle stars resting beneath as if enjoying a sunny day.

Fig. 2.3.21: SW_RELEASER_2026_01_11 at 20_26_58 IMG_0263.JPG

Station overview: PS152_36-1 – Average depth (Profile Start+Profile End /2): 354.25 m

Substrate: Soft, silty.

Notable fauna: Crinoids (many species and individuals), many large sponges (smaller species also present) and “walking” sponges on spicule mats/trails, holothurians, icefish, urchins, tunicates, bryozoans, brittle stars, polychaetes, anemones, gorgonians, sea stars, nudibranchs, benthic ctenophore

Other notes: Image 241 includes a benthic ctenophore *Lyrocteis* sp. Sheer number of comatulid crinoids was striking on this dive. Notable for diversity and richness despite absence of much visible hard substrate. “Photogenic” dive.

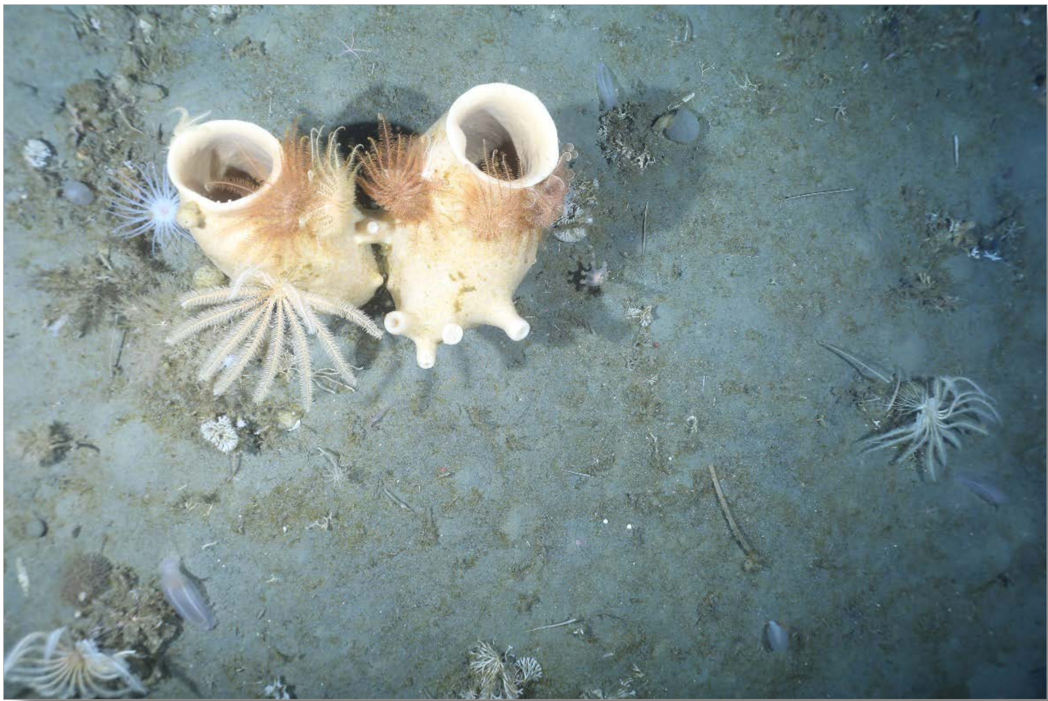

Fig. 2.3.22: TIMER_2026_01_13 at 06_48_20 IMG_0128.JPG

Station overview: PS152_37-4 – Average depth (Profile Start+Profile End /2): 1,971 m.

Substrate: Extremely soft sediment, very occasional dropstones.

Notable fauna: A range of ca. 15 cm holothurians, shrimp, occasional crinoids.

Other notes: Evidence of surface reworking, numerous concentrations of algal detritus on the seafloor.

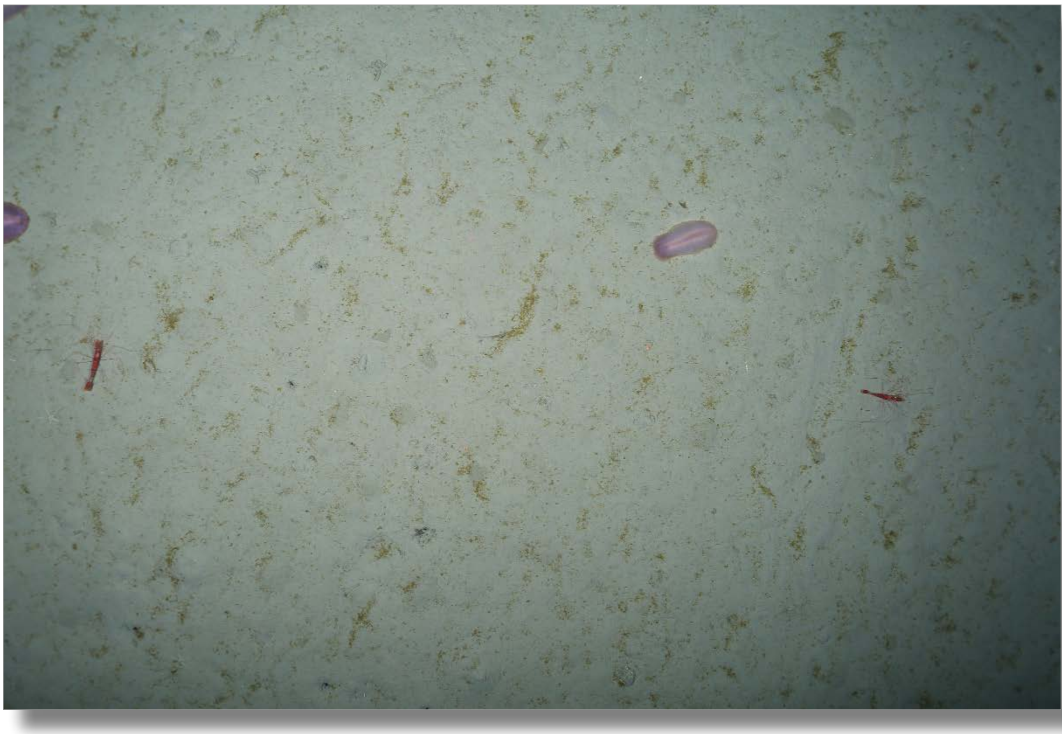

Fig. 2.3.23: TIMER_2026_01_14 at 01_12_40 IMG_0720.JPG

Station overview: PS152_39-3 – Average depth (Profile Start+Profile End /2): 1,349.75 m

Substrate: Soft, silty/muddy, pale, with occasional dropstones

Notable fauna: Stalked crinoids, red benthic shrimp, brittle stars, urchins, tunicates (on dropstones), icefish, anemones, octopus, eelpout, scleractinian solitary corals, carnivorous sponge

Other notes: Generally sparse and reminiscent of 34-6. Many curious clusters of slot-shaped holes/burrows made by unknown organisms (as in reference image below). Much evidence of infaunal activity.

Fig. 2.3.24: SW_RELEASER_2026_01_14 at 23_19_45 IMG_0161.JPG

Station overview: PS152_40-3 – Average depth (Profile Start+Profile End /2): 349.15 m

Substrate: Small pebbles and grit with some silty patches, occasional dropstones, rocky ledges and iceberg-scoured areas

Notable fauna: Sponges (many, large and small), bryozoans, sea stars, polychaetes, echiuran “tongue worms”, urchins, anthozoans, sea stars, nudibranchs, gorgonians, tunicates, brittle stars, icefish, gastropods,

Other notes: Diverse and rich. Fish nests (unoccupied), drifts and mats of dead bryozoans.

Fig. 2.3.25: SW_RELEASER_2026_01_15 at 16_28_19 IMG_0192.JPG

Station overview: PS152_40-4 – Average depth (Profile Start+Profile End /2): 396.95 m

Substrate: Similar to 40-3, pebbles and grit with patches of silt, dropstones, iceberg scour.

Notable fauna: Similar to 40-3.

Other notes: Brief net dive to catch fish, also catches many crinoids. Net obscures about half of frame. Frequent “crashes” as we attempt to catch fish.

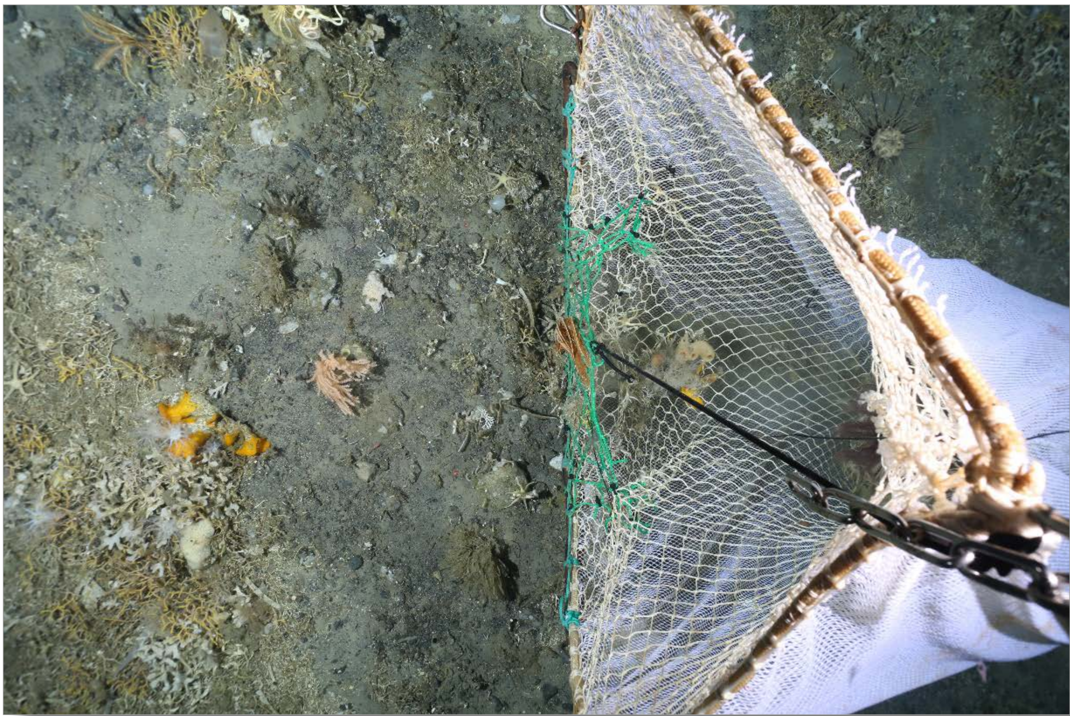

Fig. 2.3.26: TIMER_2026_01_15 at 20_29_29 IMG_0146.JPG

Station overview: PS152_43-1a – Average depth (Profile Start+Profile End /2): 297.7 m

Substrate: Soft with pebbles and grit, dropstones.

Notable fauna: Crinoids, many sponges (incl. many 'walking' sponges and extensive/long spicule mats), brittle stars, sea stars, polychaetes (sibellids?), anemones, urchins, holothurians, gorgonians, tunicates

Other notes: BENDEX station. Substantial heave on this dive. A few of the mysterious perfectly round "tubes" present as well, rising a few cm above seafloor. Image 377 is "the scream" sponge assemblage. Appears to be substantial organic material (algae?) entangled in mats of fragmented bryozoans and spicules.

Fig. 2.3.27: TIMER_2026_01_16 at 13_15_40 IMG_0373.JPG

Station overview: PS152_43-1b – Average depth (Profile Start+Profile End /2): 287.3 m

Substrate: See 43-1a

Notable fauna: See 43-1a

Other notes: BENDEX station. Net dive on same location as 43-1a.

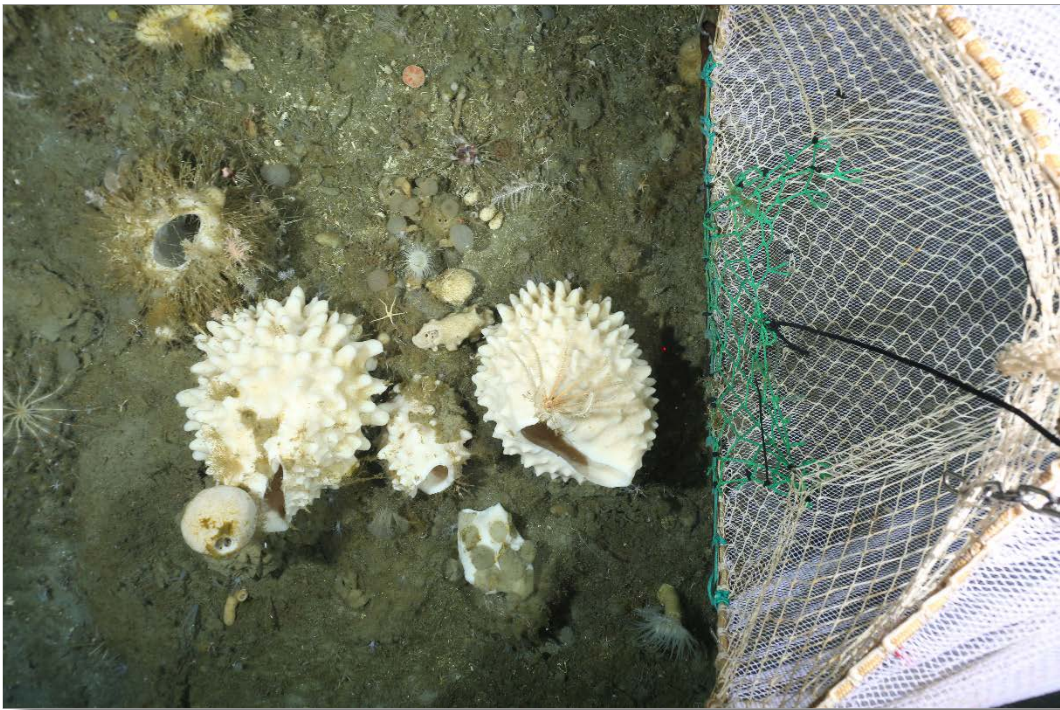

Fig. 2.3.28: TIMER_2026_01_16 at 14_57_48 IMG_0067.JPG

Station overview: PS152_44-6 – Average depth (Profile Start+Profile End /2): 299.45 m

Substrate: Compacted mud with grit and sand, occasional dropstones, organic material (fallen algae?)

Notable fauna: Many sponges of all shapes and sizes, brittle stars, holothurians, tunicates, anthozoans, icefish, bryozoans,

Other notes: BENDEX station. Image #44 has benthic ctenophore (*Lyrocteis* sp.). Mats of broken bryozoans.

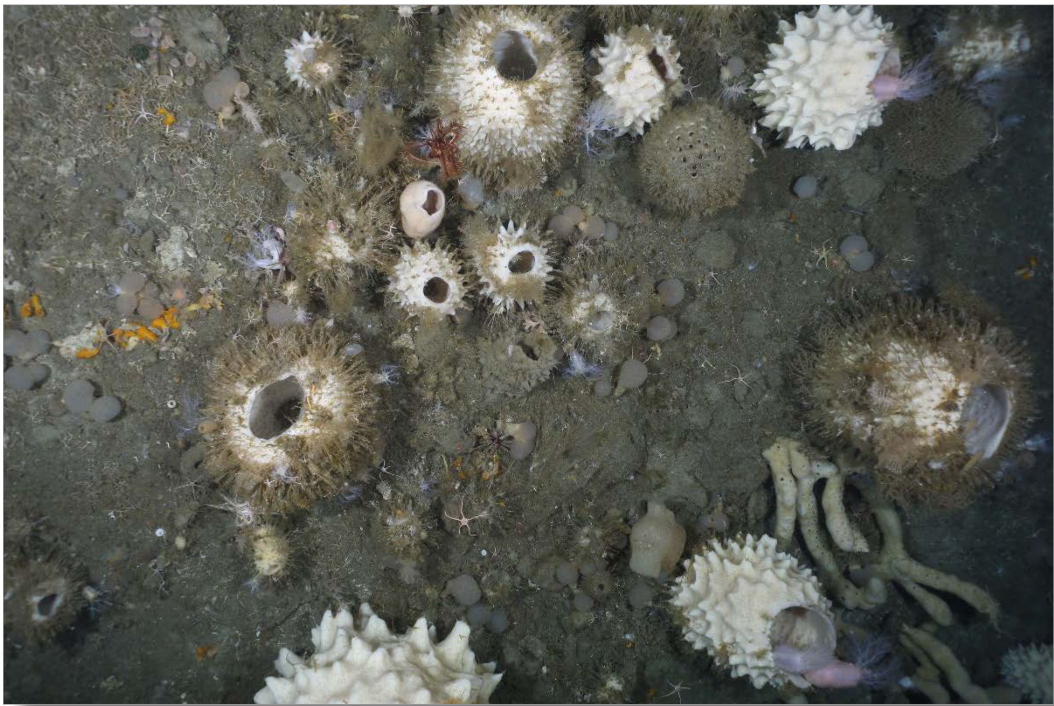

Fig. 2.3.29: SW_RELEASER_2026_01_17 at 04_26_57 IMG_0077.JPG

Station overview: PS152_44-7 – Average depth (Profile Start+Profile End /2): 300.3 m

Substrate: Similar to 44-6

Notable fauna: Similar to 44-6, inc. hydrozoans, many large and small sponges, tunicates, sea stars.

Other notes: BENDEX station. Image #31 contains benthic ctenophore (*Lyrocteis* sp.). A photogenic dive, especially for large sponges. Patchy but abundant life.

Fig. 2.3.30: SW_RELEASER_2026_01_17 at 06_08_07 IMG_0077.JPG

Station overview: PS152_45-2 – Average depth (Profile Start+Profile End /2): 309.45 m

Substrate: Mainly soft sediment with loosely distributed dropstones.

Notable fauna: Various sponge species (small and large) regularly distributed throughout the dive, including *Rossella* and stalked sponges (*Isodictya*?); holothurians and crinoids were the dominant megafauna that frequently occupied the sponges. Further observed taxa include gorgonians; brittle stars; octopuses; nudibranchs (incl. "hedgehog" nudibranch); various bryozoans; corals and other anthozoans; ascidians; and icefish.

Other notes: A very rich and diverse site. Large amounts of yellow-green organic material were present in drifts and clumps on the seafloor. At times, extensive mats of bryozoans were observed. An Antarctic krill swarm was present just above the seafloor.

Fig. 2.3.31: SW_RELEASER_2026_01_17 at 14_37_57 IMG_0353.JPG

Station overview: PS152_45-6 – Average depth (Profile Start+Profile End /2): 310.65 m

Substrate: Variable substrate ranging from loosely distributed dropstones to soft sediment.

Notable fauna: Various sponge species (small and large), including *Rossella*; crinoids; gorgonians; brittle and sea stars; sea pigs; various bryozoans; corals and other anthozoans; large isopods; icefish.

Other notes: A very rich and diverse site. Large amounts of yellow-green organic material were present in drifts and clumps on the seafloor. Extensive mats of bryozoans were observed. An Antarctic krill swarm was present just above the seafloor.

Fig. 2.3.32: SW_RELEASER_2026_01_19 at 14_39_03 IMG_0518.JPG

Station overview: PS152_46-2 – Average depth (Profile Start+Profile End /2): 633.65 m

Substrate: Variable substrate ranging from scattered dropstones to pebbly bottom and soft sediment. Dropstones occur regularly across the seafloor.

Notable fauna: Various sponge species; brittle stars; icefish; crinoids; red benthic shrimp; echinoid species; various bryozoans; corals and gorgonians; anthozoans; sea stars; solitary ascidians; large pycnogonids; benthic ctenophores (see images 0087(?), 0102).

Other notes: A very rich and diverse site. Large amounts of yellow-green organic material were present in drifts and clumps on the seafloor. Extensive mats of bryozoans were observed. Dropstones covered by sponges, bryozoans, and colonial ascidians.

Fig. 2.3.33: SW_RELEASER_2026_01_20 at 07_37_07 IMG_0058.JPG

Station overview: PS152_46-3 – Average depth (Profile Start+Profile End /2): 794.05 m

Substrate: Variable substrate ranging from scattered drop stones to pebbly bottom and soft sediment. Drop stones occur regularly across the seafloor.

Notable fauna: Octopuses; anthozoans; various sponge species, including “walking” sponges; brittle stars; icefish; crinoids; sea pigs; red benthic shrimp; grenadiers; eelpouts; echinoids; bryozoans; sea stars; solitary ascidians; large pycnogonids; soft-bodied holothurians, including *Bathyplotes gourdoni*.

Other notes: Generally, a very rich and diverse site. Large amounts of yellow-green organic material present in drifts and clumps on the seafloor.

Fig. 2.3.34: TIMER_2026_01_20 at 10_18_58 IMG_0306.JPG

Station overview: PS152_47-3 – Average depth (Profile Start+Profile End /2): 1,981.45 m

Substrate: Pale, soft sediment (mud/silt?) with clear signs of infaunal activity. Notably, approximately 10 cm large, clusters of slot-shaped holes/burrows made by unknown organisms. Dropstones loosely distributed across the seafloor.

Notable fauna: Abundant sea pigs and red benthic shrimp; icefish; crinoids; octopuses (at least two different species); a swimming holothurian; a swimming appendicularian; hydrozoans from the genus *Benthocodon*.

Other notes: Substantial heave during this dive.

Fig. 2.3.35: SW_RELEASER_2026_01_21 at 09_43_32 IMG_0315.JPG

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Tab. 2.3.1: Overview of sediment cores subject to direct sub sampling (sediment properties, biodiversity and geochemistry), incubation for benthic fluxes bioirrigation, and luminophore experiments to find in the following station description.

							Direct							Incubated					Lumi
								#subsamples							#subsamples				
Station	WOBEC Site ID	DEVICE	Event Time	Depth (m)	Latitude (dd)	Longitude (dd)	#Core	SPD	MeioD	MacD	MacDNA	RNG	Chl a-dec	#Core	Nut	Br	SPI	Macro-meiol	#Core
PS152_11-4	KHS_MR.1	TV-MUC	2025-12-27	2159	-64.4811	2.8750	3	41	6		7	79	33	4	39	131	12	12	
PS152_11-5	KHS_MR.1	TV-MUC	2025-12-27	2159	-64.4806	2.8743													6
PS152_15-3	KHS_MR.3	TV-MUC	2025-12-30	2749	-65.7939	1.3640													
PS152_27-9	KN_04	TV-MUC	2026-01-08	924	-70.7460	-10.7982					8			3	38	65	7	9	3
PS152_27-10	KN_04	TV-MUC	2026-01-08	922	-70.7461	-10.7976	2	32	6			56	26						3
PS152_28-6	KN_11	TV-MUC	2026-01-08	252	-70.8646	-10.4617													
PS152_28-7	KN_11	TV-MUC	2026-01-08	249	-70.8652	-10.4632													
PS152_34-7	KN_15	TV-MUC	2026-01-12	1355	-70.5885	-10.5798	2	20	8			32	24	4	38	104	9	9	
PS152_34-8	KN_15	TV-MUC	2026-01-12	1356	-70.5887	-10.5790													6
PS152_36-4	KN_07	TV-MUC	2026-01-13	342	-70.9082	-10.7653	3	33	8			73		5	44	127	14	12	
PS152_36-5	KN_07	TV-MUC	2026-01-13	343	-70.9086	-10.7653													
PS152_36-6	KN_07	TV-MUC	2026-01-13	345	-70.9097	-10.7640													
PS152_40-6	KN_08	TV-MUC	2026-01-15	318	-70.8895	-11.1198													
PS152_40-7	KN_08	TV-MUC	2026-01-15	318	-70.8895	-11.1199													
PS152_40-8	KN_08	TV-MUC	2026-01-16	318	-70.8896	-11.1211													
PS152_43-3	KN_06	GKG_PS	2026-01-16	298	-70.8663	-10.7559	2	42	8	6		70	6						
PS152_43-4	KN_06	GKG_PS	2026-01-16	299	-70.8659	-10.7571													
PS152_44-3	KN_09	GKG_PS	2026-01-17	282	-70.9437	-10.5273	3	14	8	12	3								
PS152_45-3	KN_10	TV-MUC	2026-01-17	287	-70.9418	-10.5288		24				86		5	44	127	13	12	
PS152_48-1	KN_14	TV-MUC	2026-01-21	938	-70.6982	-10.5978	3	42	8		1	92		5	44	127	15	12	
PS152_50-3	KN_10	TV-MUC	2026-01-22	284	-70.9417	-10.5283			8										5

Tab. 2.3.2: Table showing details of the Ocean Floor Observation and Bathymetry System (OFOBS) deployments made during PS152. Station number, OFOBS dive number, Transect start and end times, start and end latitude and longitudes, whether or not the net, water sampler or sidescan system were also used are all indicated.

Station number	No.	Date	Transect Time Start (UTC)	Transect Time End (UTC)	Transect Lati-tude Start	Transect Longitude Start	Transect Latitude End	Transect Longitude End	Depth Avg. (m)	Net/Water Sample (liters)	Side-scan?
PS152_11-3	1	27/12/2025	13:34	17:00	64° 28,693'S	2° 52,597'E	64° 27,408'S	2° 53,266'E	2172	No/0	No
PS132_13-7	2	28/12/2025	19:23	23:28	65° 15,078'S	2° 42,683'E	65° 13,283'S	2° 46,326'E	1356	No/22	No
PS152_13-9	3	29/12/2025	02:49	06:39	65° 13,121'S	2° 46,074'E	65° 12,021'S	2° 47,043'E	1358	No/22	No
PS152_15-2	4	29/12/2025	18:45	22:47	65° 48,012'S	1° 19,231'E	65° 47,357'S	1° 22,011'E	2757	No/11	No
PS152_27-7	5	07/01/2026	15:56	19:32	70° 44,474'S	10° 47,896'W	70° 44,542'S	10° 51,834'W	967	Yes/0	No
PS152_28-4	6	08/01/2026	14:03	16:31	70° 51,822'S	10° 27,992'W	70° 52,494'S	10° 27,367'W	250	No/11	Yes
PS152_28-5	7	08/01/2026	16:52	17:48	70° 52,482'S	10° 27,227'W	70° 52,797'S	10° 27,380'W	252	Yes/0	Yes
PS152_30-1	8	09/01/2026	05:17	07:42	70° 50,327'S	10° 34,998'W	70° 50,781'S	10° 33,306'W	246	No/0	Yes
PS152_30-2	9	09/01/2026	08:04	09:20	70° 50,807'S	10° 33,269'W	70° 51,021'S	10° 32,240'W	228	Yes/11	Yes
PS152_31-6	10	09/01/2026	18:13	19:03	70° 46,851'S	10° 46,957'W	70° 47,137'S	10° 46,244'W	672	Yes/0	Yes
PS152_31-8	11	09/01/2026	22:51	01:31	70° 47,004'S	10° 46,496'W	70° 47,401'S	10° 43,924'W	626	No/11	Yes
PS152_33-3	12	10/01/2026	22:55	03:11	70° 41,920'S	10° 35,804'W	70° 43,179'S	10° 32,547'W	741	No/11	Yes
PS152_34-6	13	11/01/2026	19:33	23:26	70° 34,057'S	10° 36,011'W	70° 35,305'S	10° 34,761'W	1363	No/11	Yes
PS152_36-1	14	13/01/2026	06:36	09:31	70° 54,591'S	10° 45,782'W	70° 55,416'S	10° 43,254'W	354	No/11	Yes
PS152_37-4	15	13/01/2026	22:05	02:01	70° 25,019'S	11° 09,022'W	70° 23,834'S	11° 12,550'W	1971	No/11	Yes
PS152_39-3	16	14/01/2026	23:01	02:33	70° 39,859'S	10° 55,981'W	70° 38,764'S	11° 00,257'W	1350	No/11	Yes
PS152_40-3	17	15/01/2026	15:45	19:20	70° 53,394'S	11° 07,154'W	70° 52,635'S	11° 09,730'W	349	No/11	Yes
PS152_40-4	18	15/01/2026	19:46	20:34	70° 52,629'S	11° 09,741'W	70° 52,419'S	11° 10,265'W	397	Yes/0	Yes
PS152_43-1a	19	16/01/2026	11:46	14:13	70° 53,653'S	10° 42,183'W	70° 52,938'S	10° 44,549'W	298	No/11	Yes
PS152_43-1b	20	16/01/2026	14:46	15:33	70° 52,951'S	10° 44,652'W	70° 52,603'S	10° 45,457'W	287	Yes/0	Yes
PS152_44-6	21	17/01/2026	04:00	05:19	70° 56,649'S	10° 31,654'W	70° 56,393'S	10° 32,985'W	299	No/0	Yes
PS152_44-7	22	17/01/2026	05:56	08:00	70° 56,840'S	10° 32,750'W	70° 56,300'S	10° 31,443'W	300	No/11	Yes
PS152_45-2	23	17/01/2026	12:51	15:57	70° 56,964'S	10° 32,852'W	70° 56,077'S	10° 32,034'W	309	No/11	Yes
PS152_45-6	24	19/01/2026	12:27	15:31	70° 56,880'S	10° 32,534'W	70° 56,237'S	10° 32,533'W	311	No/11	Yes
PS152_46-2	25	20/01/2026	07:26	08:30	70° 48,148'S	10° 54,165'W	70° 47,958'S	10° 56,902'W	634	No/0	Yes
PS152_46-3	26	20/01/2026	09:13	11:43	70° 47,936'S	10° 55,575'W	70° 47,275'S	11° 00,500'W	794	No/11	Yes
PS152_47-3	27	21/01/2026	08:42	11:11	70° 21,157'S	10° 36,131'W	70° 20,227'S	10° 39,186'W	1981	No/11	Yes

2.4 DEMERSAL FISH PHYSIOLOGY AND PHYLOGEOGRAPHY INCLUDING CRYOBENTHOS

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Outline

The Weddell Sea (WS) features complex sea-ice dynamics and rich and diverse ecosystems. It plays an important role for global ocean circulation, sea-level dynamics, and carbon sequestration, that will change with its response to climate change. Benthic community shifts in response to climate change are already underway in the Southern Ocean (SO, Pineda-Metz et al. 2020), which also affect biodiversity and biogeography of demersal fish species but have not been documented systematically in the WS. To assess ecosystem diversity and functionality under a changing climate with coordinated and systematic observations of the benthic realm on the shelf of the ecosystem, WOBEC will act as a nucleus for the international research and monitoring activities to be carried out under the proposed Weddell Sea Marine Protected Area (WSMPA). This chapter will study the biodiversity as well as resilience, adaptation and acclimation capacities of demersal and bentho-pelagic fish, and cryobenthos. From a conservation perspective, we also aim to fathom direct and global human impacts on the ecosystem. Two work areas are foreseen: (i) the shelf and inflow region off Kapp Norvegia, and (ii) stations around Maud Rise.

Objectives

The main goal was to determine the abundance, biomass, and diversity of demersal fish fauna on the shelf and the shelf break in relation to organic carbon availability, seafloor substrate, and bottom topography as a baseline to compare future change against. With the collected data from PS152, we aim to assess and explain taxonomic and functional biodiversity and composition of ice-associated, pelagic and benthic macrobiota, such as fish and invertebrates.

We identified key species for monitoring (ecologically important, all trophic levels), observed their stress response and also assess their adaptive scope: genetic diversity, gene flow, and ecophysiological plasticity, adaptive strategies and capacities. This will result in an assessment of the robustness or sensitivity of Weddell Sea ecosystems with respect to changes in biodiversity and energy flow.

We collected information to understand life history characteristics, movement, and habitat preferences of Antarctic toothfish (*Dissostichus mawsoni*), as well as initiated research and monitoring within the proposed Weddell Sea Marine Protected Area (WSMPA) through satellite tagging of Antarctic toothfish. We collected otoliths of Antarctic notothenioid finfish species to undertake age, growth, and microchemistry research to address key gaps in relation to the Weddell Sea notothenioid life histories and relationships to the proposed WSMPA. This objective serves to further address whe ther Antarctic notothenioid finfish occurring in the southern Weddell Sea contribute to other aggregations over the northern regions of the Weddell Sea, and whether ecosystem services could be provided in the form of fish exported from the proposed WSMPA to habitats downstream. In addition, population dynamics in the form of shared or divergent spawning grounds will be assessed in the home labs by comparing trace element compositions of material laid down during species' early life stages in the otolith nucleus.

Another objective involved the collection of tissue samples for genomic, transcriptomic and phylogenetic studies currently being undertaken at AWI, University of Padova, University of Nottingham, Yale University, the University of Chicago, and the Institute Pierre-Simon Laplace. With the collected samples, we will assess genetic variation among species of Southern Ocean fishes that are distributed in the Scotia Arc, Weddell Sea, and Ross Sea. This research targets 25 species to assess the role of life history on population connectivity. We will construct a DNA sequence dataset from ~1,000 ultraconserved elements (UCEs) to investigate the phylogenetic relationships of notothenioids and the timing of their evolutionary diversification. In addition, samples of Antarctic toothfish, in particular, will be used to assess the extent to which adaptive genomic change is linked to environmental features and thus can be used as an index of climate change vulnerability.

We also aimed to characterize the diet of Antarctic toothfish and other notothenioid finfish species to study the variation in food intake. This analysis will address ecosystem condition gaps and provide baseline data for this region as well as foraging ecology variations between sub-adult and adult populations of notothenioids, aiding to the proposed WSMPA. This baseline information could be used to address the impacts of fishing within the region and document changes in trophic interconnections between understudied fish species.

The cryobenthos team focused on organisms inhabiting the marine cavities underneath the floating shelf ice tongues. These are almost entirely unknown, mostly due to the extreme difficulties in accessing this unique Antarctic habitat. The PS152 expedition was expected to complement the species inventory of the cryobenthic fauna of the Eastern Weddell Sea and adjacent seas thus continuing similar efforts from previous expeditions (SEAROSE, PS129, SEAEIS, SEAEIS II).

Work at sea

Information on key taxa was collected by means of various methodological approaches. According to hydrographic, sonar and OFOBS observations (see Chapter 2.3.) along the transect from the ice edge to deep water, we deployed 8 benthic landers equipped with a small CTD device and carrying baited traps for benthopelagic fish and invertebrates between 240 and 1,400 m depth (Tab. 2.4.1). We carried out four Agassiz trawls (AGT) between 220 and 1,060 m depth and two pelagic trawls in the deep scattering layer between 500 and 700 m depth. For all deployments, we chose areas of suitable biological diversity outside of the 'Special Protection Zone' identified in the WSMPA Phase 1 proposal. Direct sampling provided comparative data regarding the analysis of fish populations sampled during EWOS PS129. Adult specimens of the Antarctic toothfish *D. mawsoni* were caught with long-lines deployed in depths of 600, 700, 900, 1200 and 1,400 m at Maud Rise and in the Kapp Norvegia area.

Caught specimens were measured according to CCAMLR specifications and 3 individuals tagged with pop-off satellite tags (PSAT) and released to study their migration and reproductive behaviour. The PSAT objective provides insight into movements between various regions of the Weddell Sea, potentially including different zones of the proposed WSMPA, habitat preferences, environmental characteristics, and vertical movements of Antarctic toothfish in the water column.

From the AGTs, longlines, fish traps and pelagic trawls, we sampled a total of >700 specimens and took >1,300 molecular grade samples to assess connectivity among fish populations by analysing genetic variability and ecological parameters of specimens (analysis to be performed at home institutes of participants). Onboard assessment of fish physiological performance at different temperatures occurred by isolating cells and mitochondria from fish (larval and adult individuals) and measurement via high-resolution respirometry techniques. Further specimens were scanned in a microCT for morphological trait analysis. 65 individual fish were transported alive in the aquarium container onboard *Polarstern* to the home institutes for further physiological experiments (Tab. 2.4.5).

The cryobenthos team launched a remotely operated vehicle (BlueROV, heavy configuration) from the working deck of *Polarstern*, transmitting the data of video transects of the cryobenthic fauna via its tether cable to the command center on the surface on two stations. The ROV team also flew out by helicopter on three occasions and launched the ROV independently from the ship from a suitable patch of sea ice in the vicinity of shelf ice. Organisms and water samples were collected using bespoke suction devices on the BlueROV. The collected organisms were preserved and eDNA from the water samples extracted under a portable sterile bench.

Tab. 2.4.1: Station list with station times and coordinates for all gear deployments relevant for this chapter**.** Depth is bottom depth in m, coordinates are presented in decimal degrees.

For further information please find Table 2.4.1 at the end of the chapter.

Sampling

Table 2.4.2 provides an overview of all physical specimens collected during the expedition per each gear and station not considered suitable for aquarium, and the numbers of samples retained from these specimens. During the expedition, we also collected individuals that were considered suitable for aquarium (alive) that were further euthanized and processed for molecular analysis that imply high DNA and RNA quality. This type of samples can be obtained only from freshly euthanized individuals quickly sampled and tissues snap frozen in liquid nitrogen. Tab. 2.4.3 gives an overview of these samples. Tab. 2.4.4 provides a list of different species collected in all stations and gears.

Fish were collected from 14 stations during the expedition, with the majority collected from Stations PS152_34-5 and PS152_35-5 (pelagic nets) (Tab. 2.4.1). Collected fish were used for both physiology studies and stored for subsequent genetic and further physiology work back on shore. In station PS152_28-5 (OFOBS) and PS152_44-1, PS152_44-1 (AGT), we collected and fully sampled 2 sponges and a hemichordate. In stations PS152_31-5 and PS152_27-8 (AGT) we collected 3 cephalopods of the genus *Pareledone* (17 samples).
All four AGT catches were sampled either in total or by subsampling depending on catch size with the help of the full team and further volunteers. Organisms were separated into taxon groups and subsamples of them preserved at -80 °C, -20 °C and in ethanol, where possible. Further identification towards species level and comparison with the catches of PS129 will take place in the home laboratories.

Tab. 2.4.2: Summary of fish samples collected during PS152 for ecological sampling. The station indicates the station number, the gear indicates the type of fishery method used (LL longline, AGT Agassiz Trawl, OFOBS Ocean Floor Observation and Bathymetry System, LANDER fish trap, PN pelagic net), number of species indicates the number of different species caught by the specific gear/station, number of specimens indicates how many individuals were collected in the single deployment, and number of samples indicates how many tissues samples were collected for further analysis. Only stations that provided fish/samples are reported. The total number of species is the number of different species observed in total.

Stations	Gear	N. of Species	N. of Specimens	N. of Samples
PS152_13-10	LL	1	1	11
PS152_27-8	AGT	4	8	88
PS152_28-8	AGT	8	24	54
PS152_30-2	OFOBS	2	2	2
PS152_31-10	LANDER	1	1	11
PS152_31-11	LL	4	16	138
PS152_31-5	AGT	3	7	7
PS152_31-6	OFOBS	2	7	17
PS152_34-5	PN	11	347	339
PS152_35-4	PN	11	260	318
PS152_42-1	LL	3	7	20
PS152_44-1	AGT	2	2	11
PS152_49-1	LL	3	3	29
Totals		32	685	1045

Tab. 2.4.3: Summary of fish samples collected during PS152 that were alive and further processed for molecular analysis (e.g. transcriptomics). The station indicates the station number, the gear indicates the type of fishery method used (LL longline, AGT Agassiz Trawl, OFOBS Ocean Floor Observation and Bathymetry System, LANDER fish trap, PN pelagic net), number of species indicates the number of different species caught by the specific gear/station, number of specimens indicates how many individuals were collected in the single deployment, and number of samples indicates how many tissues samples were collected for further analysis. Only stations that provided fish/samples are reported. The total number of species is the number of different species observed in total

Stations	Gear	N. of Species	N. of Specimens	N. of Samples
PS152_27-12	LANDER	1	1	45
PS152_27-8	AGT	1	2	90
PS152_28-8	AGT	4	11	495
PS152_31-10	LANDER	2	2	90
PS152_31-11	LL	1	1	45
PS152_34-5	PN	1	1	45
PS152-39-7	LANDER	2	2	90
PS152_40-4	OFOBS	1	1	45
PS152_40-9	LANDER	3	4	180
PS152_42-1	LL	2	2	90

Stations	Gear	N. of Species	N. of Specimens	N. of Samples
PS152_43-5	LANDER	1	2	90
PS152_45-5	LANDER	1	1	45
Totals		9	30	1350

Tab. 2.4.4: Total species count of fish collected during PS152

Species	N. of Specimens
Aethotaxis mitopteryx	1
Artedidraco orianae	2
Bathylagus antarcticus	70
Bathyraja maccaini	2
Chaenodraco wilsoni	36
Chionobathyscus dewitti	10
Chionodraco spp. juvenile stage	20
Chionodraco hamatus	5
Chionodraco myersi	33
Chionodraco rastrospinosus	1
Cygnodraco mawsoni	1
Dacodraco hunteri	4
Dissostichus mawsoni	5
Dolloidraco longedorsalis	3
Gymnoscopelus sp.	13
fish larvae (undetermined)	13
Lepidonotothen squamifrons	2
Macrourus withsoni	198
Muraenolepis microps	10
Myctophidae	1
Notolepis coatsi	33
Pachycara brachycephalum	39
Pagetodes antarcticus	3
Pagetopsis macropterus	1
Pagetopsis maculata	1
Paraliparis sp.	1
Pleuragramma antarcticum	213
Racovitzia glacialis	3
Prionodraco evansii	20
Trematomus eulepidotus	1
Trematomus hansoni	7
Trematomus spp. larval stage	3
Trematomus lepidorhinus	7
Trematomus loennbergii	3
Trematomus pennellii	1
Total	763

Tab. 2.4.5: Live fish in transport

Species	N. of Specimens
Artedidraco orianae	2
Cygnodraco mawsoni	2
Dolloidraco longedorsalis	1
Pachycara brachycephalum	33
Prionodraco evansii	14
Racovitzia glacialis	2
Trematomus eulepidotus	5
Trematomus lepidorhinus	2
Trematomus loennbergii	4
Trematomus pennellii	1
Total	65

Preliminary results

GOSAFAST

The GOSAFAST secondary user proposal consisted of four overall objectives. Of these, we were able to accomplish most or all, though there is considerable lab work on land to be undertaken. We successfully released three pop-up satellite tags on live Antarctic toothfish (*Dissostichus mawsoni*) to understand life history characteristics, movement, and habitat preferences, as well as initiate research and monitoring within the proposed Weddell Sea Marine Protected Area (WSMPA). Two of these tags are programmed to pop off on 26 December 2026, and one on 2 February 2027. We collected otoliths of Antarctic notothenioid finfish species to undertake age, growth, and microchemistry research to address key gaps in life histories, and whether ecosystem services could be provided in the form of fish exported from the proposed WSMPA to habitats downstream. We collected tissue samples from 32 species of fish to assess the extent to which adaptive genomic change is linked to environmental features and thus can be used as an index of climate change vulnerability. Finally, we characterized the diet of notothenioid finfish species to study the variation in food intake, address ecosystem condition gaps, and provide baseline data for this region as well as foraging ecology variations between sub-adult and adult populations of notothenioids. 111 stomachs were sampled from both ecological and molecular sampling, and 41 of the sampled stomachs had >1 stomach fullness and degree of digestion. Within 5 samples, full fish were found still intact and otoliths were extracted.

microCT

A microCT scanner was brought on board the *Polarstern* and tested for suitability at sea during the PS 152 expedition for the examination of fresh animal material in order to avoid measurement artifacts caused by transport, storage, and preservation of the material.
In a first step, various organisms caught with classic gears such as RMT and AGT were measured under different weather conditions, such as wind speed and wave heights, and checked for the quality of the recordings. Up to wave heights of 4.5 m and wind forces of 9-10 Bft, no significant deterioration in image contrast or motion artifacts could be detected.

Over the entire duration of the expedition, more than 50 fish of different species, various sponges, and crustaceans were measured directly on board. The measurement time varied depending on the size of the object, ranging from 30 minutes to 2.5 hours. In addition, three sediment samples were examined for their suitability and applicability for three-dimensional volume and density investigations in the microCT scanner. The recorded data of all objects complied with or even exceeded the expected accuracy and quality of the measurements. In terms of fish studies, morphological comparisons were made on fresh samples in comparison to frozen samples and samples preserved in ethanol of typical Antarctic Notothenioidei. For the notothenioid *Artedidraco sp.*, the influence of size class on skeletal morphology was investigated using three-dimensional microCT scans. In the Antarctic silverfish *Pleuragramma antarcticum*, the lipid distribution of different ontogenetic stages was determined. In the Myctophidae, the Antarctic lanternfish *Electrona antarctica*, the presence of a swim bladder and the lipid content of different size classes were investigated using microCT.

Fish physiology

TEMPOL experiments

Fish samples were analysed to complement the studies conducted by Professor Lisa Chakrabarti aboard PS129 & PS146. Prof. Chakrabarti conducted high resolution respirometry on a range of notothenioid species, analysing their mitochondrial capacity under varying temperatures.

Heart, liver, white muscle and red muscle tissues were homogenised in MiR05 containing 0.0025M TEMPOL to assay for free radical formation (https://doi.org/10.1101/2025.11.29.691160). In short, mitochondrial free radical detection is achieved by the modulation of photoluminescence from nitrogen vacancies in nano-diamonds. This method allows the mitochondria to be probed whilst tracking free radical formation *in situ* at the quantum level. Tissue homogenates were prepared for 3 different temperatures, 0, 4 and 10 °C, and ran in duplicate for “Leak” (Digitonin) and “CI OXPHOS” (Digitonin, ADP) measurements. Overall, for this analysis 448 samples were prepared to be analysed using Optics and Photonics Group’s instruments at University of Nottingham. These analyses are expected to add more context to the previous studies, with free radical formation being an informative marker for dysfunctional or functional mitochondria, as it is formed in the electron transport system under normal functioning and unbalanced when dysfunctional, as the primary component of reactive oxygen species (ROS). This will help acquire new information on notothenioid physiology, adaptation and forecast potential effects of ocean warming, more specifically to help understand the adaptations that haemoglobinless fish have evolved and their mitochondrial plasticity in comparison to their red-blooded relatives.

Tab. 2.4.6: Notothenioid sampling information. Table showing fish sample number, predicted species, haemoglobin state and temperature for TEMPOL experiments

Fish No	Species	HB-	Temperature (°C)
2	*C. dewitti*	-	0 vs 10
3	*C. dewitti*	-	0 vs 10
4	*T. lepidorhinus*	+	0 vs 10
5	*T. hansoni*	+	0 vs 10
6	*C. hamatus*	-	0 vs 10
7	*C. hamatus*	-	-
8	*T. lepidorhinus*	+	0 vs 10
9	*C. myersi*	-	0 vs 10
10	*C. hamatus*	-	0 vs 10
11	*C. dewitti*	-	0 vs 10
12	*P. brachycephalum*	+	

Fish No	Species	HB-	Temperature (°C)
13	*C. dewitti*	-	0 vs 10
14	*T. loennbergii*	+	0 vs 10
15	*C. hamatus*	-	0 vs 10
16	*D. mawsoni*	+	0 vs 4
17	*C. hamatus*	-	-
18	*C. dewitti*	-	0 vs 4
19	*C. dewitti*	-	0 vs 4
20	*T. loennbergii*	+	0 vs 10
21	*T. hansoni*	+	0 vs 10
22	*T. loennbergii*	+	0 vs 10
23	*T. lepidorhinus*	+	0 vs 10
24	*T. hansoni*	+	0 vs 10
25	*T. lepidorhinus*	+	0 vs 4
26	*T. hansoni*	+	0 vs 4
27	*T. hansoni*	+	0 vs 4
4284_1	Hemichordate	N/A	0 vs 10
4286_1	Sponge	N/A	0 vs 10
28	*T. hansoni*	+	0 vs 4
29	*T. hansoni*	+	0 vs 4
30	*C. myersi*	-	0 vs 4
31	*P. maculata*	-	0 vs 4

Primary cell culture

Primary cell culture was prioritised for juvenile fish for these experiments to ensure the likelihood of successful tissue explants. Experiments consisted of comparing varying techniques for explanting, with collagenase digestion and sterile explants directly in culture media. Furthermore, various tissues were used to evaluate which tissues are most viable for future experiments, assessing ease of explant, protocol complexity, risk of contamination, and rate of growth as time is limited on the cruise. Preliminarily, these experiments showed that collagenase digestion was the most effective method of tissue explant and gills and liver garnered the best results when compared to red muscle, white muscle and the caudal fin.

Blood analysis

Blood smears of the notothenioid fish were prepared to be used for immunohistochemistry at University of Nottingham to analyse blood content, protein concentration and cell type/ morphology. The blood was preliminarily analysed using the microscope on *Polarstern* and formulated interesting results of varying cell types that have potentially not been described before in the blood. These initial results will be used in tandem with imaging and staining techniques to validate these cell types specifically within the Channichthyidae family.

Sponge/Hemichordate physiology

Sponge & hemichordate tissues were dissected to be placed in the micro-CT scanner to assess the densitometry and morphology, internally of these organisms. Sections were cut to understand how colonial hemichordate's form both anteriorly and posteriorly. Sponges were treated similarly, whereby two subsections of the sponge were analysed to observe deep rooted and posterior structures. To complement this, free radical analysis samples were prepared to observe the rate of formation at both 0 and 10 °C. Overall, these experiments will add more information to hemichordate physiology, regarding their metabolic rate, mitochondrial function and microstructure. Sponge studies will be used to supplement previous data showing their mitochondrial function.

Mitochondrial capacities

We compared mitochondrial capacities of red blooded and white blooded Notothenioids using substrate-inhibitor titration protocols in high-resolution respirometers (Oroboros oxygraphs) at three different temperatures, 0, 6 and 12 °C. Heart and liver mitochondria of a total of 20 individuals of *Trematomus hansoni*, *Chionobathyscus dewitti*, *Chionodraco hamatus*, and *Chionodraco myersi* were extracted in ice-cold MiR05 buffer (osmolarity adjusted to notothenioids) and subjected to a titration protocol identifying the thermal capacities of the individual complexes of the mitochondrial electron transport system. We measured respiration as a measure of substrate turnover and simultaneously quantified mitochondrial ATP synthesis using a fluorometric approach with the fluorophore Magnesium Green® to establish mitochondrial ATP/O ratios under all experimental conditions. Measurements of mitochondrial membrane potential via TPP^+ electrodes further substantiated the data set and allowed to quantify mitochondrial energetic efficiency at different temperatures.

Preliminary results indicate that Notothenioid fish have developed peculiar mitochondrial capacities during their radiation into Antarctic waters that differ from temperate fish species. As such, mitochondrial complex I function appears to be compromised in all species examined. Liver and heart metabolism differ in substrate preferences and involvement of metabolic pathways, and due to their higher mitochondrial densities, Antarctic icefish show significantly higher oxidative potential. As hypothesized, mitochondrial membrane potential is dependent on temperature and decreases in the warmth, leading to elevated metabolic rates and a high thermal sensitivity of cellular metabolism.

Cryobenthos

The cryobenthos ROV team explored 5 stations (of which 4 were unique) with 'BlueROV' remotely operated vehicle (ROV) dives under the shelf ice, performing seven dives with a total of 6hours 43min dive time (Tab. 2.4.7). Two similar BlueROV units were carried (Fig. 2.4.1), which allowed for a backup vehicle if one was damaged or lost. These were configured slightly differently over time as needed. The ROV was used to inspect the vertical ice cliff and the underside of the ice shelf at all 4 sites using three main tools: 1) a visual inspection using the ROV camera recording video in HD, 2) a bespoke slurp gun (suction sampler) capable of collecting animals up to approx. 8 cm in length and 3) one water sample of up to 1 litre per dive.

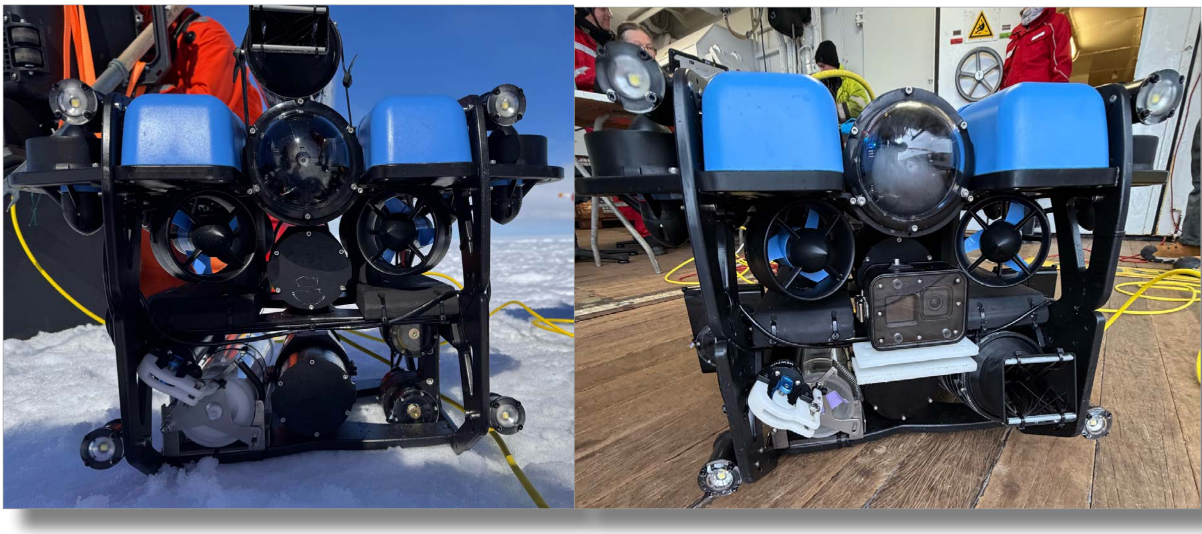

Fig. 2.4.1: BlueROVs used in PS152. ROV Mick (left), with high-res camera central (in front of dual battery), slurp gun bottom right and water sampler bottom left, was used for the first two dives (under seasonal sea ice, then the first under shelf ice). ROV (right), note the slurp gun in dorsal position and lasers bottom right, was used for dives 3 onwards.

Camera video footage was stored on the local hard drive of the laptop and decoded with the attached ROV after the dive yielding an *.mkv video file. The BlueROV Mick was lost on the second dive (first under ice-shelf dive, see below), the locally stored chunks were unreadable but crucially could be restored manually.
Whilst the ROV camera could be tilted up or down depending on the orientation of the ice surface to be inspected, our initial lighting setup consisting of four forward looking LED lights. This was found in need of improvement when the ROV was under the shelf ice looking up and thus a pair of additional LEDs angled approximately 40 degrees up were installed. The improved evenness of illumination was found to be worth the trade-off of a slightly increased power consumption (and thus reduced battery running time).

Once the ship was in position, the ROV and workstation was set up for field deployment by connecting up battery, priming and checking all functionality, turning on lasers (checking they are parallel) and setting up the laptop-based piloting screen. Two of the team placed the ROV into water, checking air left the water sampler and slurp gun and that slush ice did not enter, the third piloted it. Of the 8 dives undertaken, shown in Tab. 2.4.7, the first was trials and the last was logistic in support of the ship to aid iceberg stability estimation. The remaining 6 dives from 4 deployments focused on the ice shelf scientific mission.

Tab. 2.4.7: Individual ROV stations

Date	Site	Lat	Lon	Depth	Deployment	Platform	Duration	Notes
03.01.26	Atka Bay	70.5209	8.1236	223	Mummychair	floe	56	Trials under seaice
04.01.26	Nordanleger	70.5045	8.2063	63	Ship	deck	40	ROV lost
08.01.26	Y inlet	71.0215	10.973	TBC	Helicopter	Fast ice	83	Back up ROV
09.01.26	Y inlet	71.0215	10.973	TBC	Helicopter	Fast ice	82	water + suction sample

Date	Site	Lat	Lon	Depth	Deployment	Platform	Duration	Notes
09.01.26	Y inlet	71.0215	10.973	TBC	Helicopter	Fast ice	35	water + suction sample
12.01.26	Austasen	70.9151	10.039	TBC	Helicopter	floe	56	water + suction sample
12.01.26	Austasen	70.9151	10.039	TBC	Helicopter	floe	54	Water sample
22.01.26	Off Rampen	72.0393	14.671	TBC	Ship	deck	53	video only

The collection of animals on the ice was time-consuming, mostly because of the parallax between the camera angle and the angle and position of the slurp gun. Animals caught with the slurp gun (if any), were collected immediately after the dive and transferred into seawater from the site.

The water sampler was sterilized with 1:10 hydrochloric bleach diluted 1:10 prior to the dive and rinsed with MilliQ water four times. After the dive, the water sample was extracted with an adapter with an attached hose (both sterile) and filled into a sterile water bottle and immediately stored in a dark Zarges box. During the recovery of the water sample, sterile nitril gloves were worn at all times. Back on the ship, these water samples were filtered under a clean bench sterilized using bleach and UV light, the Sterivex filters were subsequently sealed with combicaps and frozen at -80 °C. When the volume collected permitted, a single water sample was split and filtered in duplicate over two Sterivex filters (on 09.01.2026). For every day with water samples collected in the field, a negative control using approx. 900 ml of the ships MilliQ water was filtered using the same procedure described above. On return to AWI Bremerhaven, the environmental DNA (eDNA) on these will be sequenced and be used to detect the presence of cryobenthic organisms.

On the second dive (the first under ice shelf dive), a communication loss made the ROV temporarily unresponsive. This loss of positioning and knowledge of position was further exacerbated by the increased lateral intake area around the thrusters, due to proximity of the ship moored to the iceshelf during cargo operations. This combination led to the loss of the BlueROV “Mick” as its tether was severed by the running thrusters. Together with the ROV, the auxiliary GoPro camera in a separate housing running at a higher resolution than the ROVs own camera as well as a bespoke slurp gun got lost in the incident.

Once the backup ROV was built up, we deployed it to three stations adjacent to the ice shelf edge based from fast ice or drifting sea ice floes using a helicopter. To ensure safety, insulated watertight immersion suits and inflatable life vests with integrated D-rings were worn at all times. Persons operating near the ice edge were attached to a rope to which the other end (of the 30 m long line) was secured to the fast/floe ice with ice screws.

One training dive under seasonal sea ice was conducted whilst the first sea ice station was carried out (on 03.01.2026). There was a tabular iceberg within sight and skidoos available but we deemed the condition of the seasonal sea ice to be travelled on unsafe (which would need to be crossed in order to reach the nearest iceberg in approximately 1km). A final dive (25.01.2026) was requested by the ship to determine the keel depth and composition of a drifting iceberg. This was carried out by the cryobenthos team using the ship’s BlueROV in order to ensure safe operation of the ship’s logistics.

Conclusions

From all samples taken on PS152, we expect to obtain a comprehensive dataset of the distribution and diversity of demersal and pelagic fish fauna, epibenthos as well as cryobenthos in the different areas of investigation. Molecular barcodes from the collected organisms will be added to the growing list of species known to populate the Antarctic cryo- and epi-benthos. Sequencing of the extracted eDNA serves as an independent data source documenting the presence of known benthic and benthopelagic species and basis for a phylogenetic analysis to resolve which taxonomic groups may be expected to occur across the different areas of investigation. Our results shall thus help to establish insight into population connectivity, dispersal and physiological resilience of selected species and protect the benthic and cryopelagic ecosystems as potential refugia for benthic fish and invertebrates, in order to maintain and/or enhance their resilience and ability to adapt to the effects of climate change.

Acknowledgements

We would like to thank Captain Felix Kentges and the entire crew of *Polarstern* as well as Chief Scientist Heike Link, the crew and the scientific party (in particular Autun Purser, Katharina Teschke, Jonathan Meiburg) for their support, help with providing fish samples with OFOBS and team spirit during the WOBEC expedition PS152 of *Polarstern* to the Weddell Sea in 2025/2026. We would particularly like to thank Mario La Mesa of the Italian Polar Institute (ISP, Ancona) for his help in species identification

Tab. 2.4.1: Station list with station times and coordinates for all gear deployments relevant for this chapter**.** Depth is bottom depth in m, coordinates are presented in decimal degrees.

PS152 station	Cast	Device Operation	Station name	DEVICE	START DATE TIME	START LAT DEC	START LONG DEC	START DEPTH	END DATE TIME	END LAT DEC	END LONG DEC	END DEPTH	O2A_id
13	4	PS152_13-4	KHS_MR.2	LongLine 1 D	2025-12-28 11:43	-65,250938	2,672562	1249	2025-12-28 12:27	-65,239152	2,649198		8640
13	10	PS152_13-10	KHS_MR.2	LongLine 1 R	2025-12-29 08:00	-65,238201	2,642007	1230,6	2025-12-29 11:06	-65,237843	2,654147	1166	8640
24	1	PS152_24-1	ICE	ship_icestation ROV test	2026-01-03 06:51	-70,520981	-8,126685	217,9	2026-01-03 12:43	-70,520933	-8,12669	217	
25	2	PS152_25-2	ICE	rovmick ROV 1	2026-01-04 21:47	-70,504421	-8,206707	251,5	2026-01-04 23:07	-70,504428	-8,206774	252	
27	2	PS152_27-2	KN_04	LAND_PS 1 D	2026-01-07 06:22	-70,745971	-10,792231	918,2	2026-01-07 06:23	-70,746028	-10,791762	918	3175
27	4	PS152_27-4	KN_04	LongLine 2 D	2026-01-07 08:36	-70,758501	-10,834516	907,2	2026-01-07 11:47	-70,788198	-10,861226	702	8640
27	8	PS152_27-8	KN_04	AGT_3m 1	2026-01-07 21:57	-70,75696	-10,954264	1065,2	2026-01-07 22:08	-70,756824	-10,953863	1065	8641
27	12	PS152_27-12	KN_04	LAND_PS 1 R	2026-01-08 06:38	-70,744172	-10,789762		2026-01-08 06:49	-70,744447	-10,788676	922	3175
27	13	PS152_27-13	KN_04	LongLine 2 R	2026-01-08 08:59	-70,78665	-10,862574		2026-01-08 10:41	-70,784698	-10,858695	744	8640
28	3	PS152_28-3	KN_11	LAND_PS 2 D	2026-01-08 13:33	-70,864892	-10,472155	243,2	2026-01-08 13:35	-70,864914	-10,472071	243	3175
28	8	PS152_28-8	KN_11	AGT_3m 2	2026-01-08 20:38	-70,874204	-10,47565	247,5	2026-01-08 20:49	-70,873919	-10,479049	246	8641
28	9	PS152_28-9	KN_11	LAND_PS 2 R	2026-01-09 04:03	-70,865999	-10,476765		2026-01-09 04:22	-70,864938	-10,469981		3175
28	10	PS152_28-10	Heli_icestation	Heli ice station ROV 2	2026-01-08 16:05	-71,021576	-10,973052		2026-01-08 17:28	-71,021576	-10,973052		
29	1	PS152_29-1	ICE	ship_icestation	2026-01-08 22:33	-70,841942	-10,595016	259,8	2026-01-09 03:17	-70,83801	-10,597121	262	
31	1	PS152_31-1	KN_13	LAND_PS 3 D	2026-01-09 11:22	-70,788075	-10,673238	571,9	2026-01-09 11:45	-70,7826	-10,675265	615	3175
31	2	PS152_31-2	KN_13	LongLine 3 D	2026-01-09 12:24	-70,766567	-10,672911	708,2	2026-01-09 13:50	-70,763516	-10,672333	723	8640
31	5	PS152_31-5	KN_13	AGT_3m 3	2026-01-09 16:15	-70,779899	-10,799348	722,5	2026-01-09 16:15	-70,779899	-10,799348	722	8641
31	10	PS152_31-10	KN_13	LAND_PS 3 R	2026-01-10 05:36	-70,786431	-10,674206		2026-01-10 05:44	-70,786013	-10,674199	587	3175
31	11	PS152_31-11	KN_13	LongLine 3 R	2026-01-10 06:54	-70,76064	-10,671833		2026-01-10 08:32	-70,763895	-10,669369	718	8640
31	12	PS152_31-12	Heli_icestation	Heli ice station ROV 3	2026-01-09 15:11	-71,021576	-10,973052		2026-01-09 17:41	-71,0215760	-10,973052		
32	1	PS152_32-1	KN_04	LongLine 2 R	2026-01-10 09:20	-70,783466	-10,852964		2026-01-10 10:41	-70,780932	-10,886481	810	8640
34	5	PS152_34-5	KN_15	PSN_PS 1	2026-01-11 16:39	-70,642899	-10,478449	959,9	2026-01-11 16:59	-70,632721	-10,519702	1109	3229

PS152 station	Cast	Device Operation	Station name	DEVICE	START DATE TIME	START LAT DEC	START LONG DEC	START DEPTH	END DATE TIME	END LAT DEC	END LONG DEC	END DEPTH	O2A_id
35	4	PS152_35-4	KN_14	PSN_PS 2	2026-01-12 10:33	-70,748973	-10,617523	676,8	2026-01-12 10:55	-70,763111	-10,649461	684	3229
35	5	PS152_35-5	KN_14 ICE	ship_icestation	2026-01-12 17:29	-70,650687	-10,967126	1360,3	2026-01-13 04:16	-70,671333	-10,946653	1297	
35	6	PS152_35-6	Heli_icestation	Heli ice station ROV 4	2026-01-12 10:08	-70,9151610	-10,039639		2026-01-12 12:33	-70,9151610	-10,039639		
39	1	PS152_39-1	KN_03	LAND_PS 4 D	2026-01-14 19:45	-70,642997	-10,987765	1390,5	2026-01-14 19:46	-70,64312	-10,988424	1391	3175
39	6	PS152_39-6	KN_03	LongLine 4 D	2026-01-15 10:22	-70,642761	-11,013032	1413,4	2026-01-15 10:28	-70,642838	-11,013307	1413	8640
39	7	PS152_39-7	KN_03	LAND_PS 4 R	2026-01-15 11:22	-70,643805	-10,993734	1394,9	2026-01-15 11:37	-70,645688	-10,988563	1387	3175
40	1	PS152_40-1	KN_08	LAND_PS 5 D	2026-01-15 13:59	-70,876767	-11,113215	367,8	2026-01-15 14:02	-70,87712	-11,119089	364	3175
40	9	PS152_40-9	KN_08	LAND_PS 5 R	2026-01-16 02:36	-70,876844	-11,118957	366,7	2026-01-16 02:42	-70,877663	-11,124985	364	3175
41	1	PS152_41-1	KN_06	LAND_PS 6 D	2026-01-16 03:39	-70,862873	-10,753498	310,9	2026-01-16 03:40	-70,862772	-10,753975	312	3175
42	1	PS152_42-1	KN_03	LongLine 4 R	2026-01-16 06:35	-70,641688	-11,014957	1418,3	2026-01-16 09:14	-70,641162	-11,008449	1413	8640
43	5	PS152_43-5	KN_06	LAND_PS 6 R	2026-01-16 17:52	-70,86379	-10,760605	306,7	2026-01-16 18:08	-70,865575	-10,760835	302	3175
44	1	PS152_44-1	KN_09	AGT_3m 4	2026-01-16 19:33	-70,933183	-10,485933	223,8	2026-01-16 19:44	-70,933504	-10,487025	225	8641
45	4	PS152_45-4	KN_10	LAND_PS 7 D	2026-01-17 18:20	-70,945887	-10,526578	286,4	2026-01-17 18:21	-70,945781	-10,526749	287	3175
45	5	PS152_45-5	KN_10	LAND_PS 7 R	2026-01-19 10:55	-70,945984	-10,537184		2026-01-19 11:13	-70,947557	-10,545	323	3175
46	5	PS152_46-5	KN_05	LongLine 5 D	2026-01-20 14:36	-70,797633	-10,900176		2026-01-20 14:58	-70,800516	-10,908419		
46	6	PS152_46-6	KN_05	LAND_PS 8 D	2026-01-20 15:17	-70,80091	-10,898539		2026-01-20 15:17	-70,800945	-10,899806		3175
46	7	PS152_46-7	KN_05	LongLine 2 R	2026-01-20 15:48	-70,801568	-10,922082	602,2	2026-01-20 17:36	-70,800143	-10,983297	764	
49	1	PS152_49-1	KN_05	LongLine 5 R	2026-01-21 21:55	-70,799397	-10,964452	729,6	2026-01-21 23:47	-70,804578	-10,998819	749	
49	2	PS152_49-2	KN_05	LAND_PS 8 R	2026-01-22 00:11	-70,798049	-10,906151		2026-01-22 00:19	-70,798318	-10,908689		3175
51	1	PS152_51-1	KN_05 Toothfish	LongLine fish release	2026-01-22 13:45	-71,845287	-13,854825	415,3	2026-01-22 13:47	-71,845547	-13,855087	416	
52	2	PS152_52-2	ICE	rovsusu ROV 5	2026-01-22 22:17	-72,039383	-14,671508	417,8	2026-01-22 22:52	-72,039313	-14,671675	418	
52	3	PS152_52-3	ICE	BlueROV	2026-01-25 12:41	-71,444143	-12,465047	381,7	2026-01-25 12:49	-71,444187	-12,465175	382	

2.5 TOP PREDATOR DISTRIBUTION AND BIODIVERSITY

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Outline

Top predator surveys are part of the inter-disciplinary field study focussing on the interconnection of sea ice physics, sea ice biology, biological oceanography and top predator ecology. Pelagic food webs in the Antarctic sea ice zone can depend significantly on carbon produced by ice-associated microalgae. Future changes in Antarctic sea ice habitats will affect sea ice primary production and habitat structure, with unknown consequences for Antarctic ecosystems. Species feeding in the ice-water interface layer may play a key role in transferring carbon from sea ice into the pelagic food web, up to the trophic level of birds and mammals. To investigate the role of sea ice in structuring Antarctic marine ecosystems, distribution and density of marine mammals and birds were studied. In the Southern Ocean, the exploitation of marine living resources and the conservation of ecosystem health are tightly linked to each other in the management framework of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). Antarctic krill is important in this context, both as a major fisheries resource, and as a key carbon source for Antarctic fishes, birds, and mammals. Similar to Antarctic krill, several abundant endothermic top predators have been shown to concentrate in pack ice habitats in spite of low water column productivity. Investigations on the association of krill and other key species with under-ice habitats were complemented by systematic top predator censuses in order to develop robust statements on the impact of changing sea ice habitats on polar marine resource management and conservation objectives. Novel threats such as the emergence of high pathogenic avian flu (HPAI) were found to affect seabirds in the Southern Ocean. Sample collection can enhance our understanding of spread and evolution of the virus in the Antarctic environment.

Objectives

The distribution and abundance of top predators in the Southern Ocean are an essential part of the pelagic ecosystem. We aimed for a better understanding of the role of top predators in fluxes of organic matter and carbon. Changes in space and time of the surrounding environment, were related to top predator density, abundance and behaviour. In addition the collected data can provide population estimates (including non-breeders) in addition to seabird colony work on land. Finally, we aimed to evaluate the occurrence of active HPAI virus and antibodies indicating previous HPAI infections.

Work at sea

During steaming, surveys of top predator densities were conducted from observation posts installed on the flying bridge. Standard band transect methods were applied, with snapshot methodology for birds in flight, and line-transect methods for marine mammals. In addition, helicopter transect surveys were conducted to cover larger areas. The helicopter counts were band transects only, set on 250 meters bandwidth. Under certain weather conditions seabirds occasionally collide with the ship structures. Most birds are unharmed and can be released. Live birds could be swabbed (cloaca and trachea) while in deceased birds, additional blood and brain samples can be taken. All activities are conducted in accordance with the 'Guidelines with respect to Highly Pathogenic Avian Influenza (HPAI) in Antarctica and the Southern Ocean'.

Preliminary results

After leaving Walvis Bay in Namibia, (22 °S and 14.5 °E) at 15 December 2025, the ship set a course to pick the prime meridian for the first station at 61 °S. Top predator observations started on 18 December 2025 at 33.9 °S and 11.1 °E in order to calibrate methods between the observers.

The region of interest south of 50 °S was reached on 22 December 2025. Sightings of fauna other than birds were limited, probably due to strong southerly winds in the south Atlantic. A group of 3-4 Killer whales was seen outside the official counts.

Shy albatrosses, Atlantic yellow-nosed albatrosses and Grey-headed albatrosses were found in the south Atlantic together with different petrel species like Soft- plumaged, White-chinned, Spectacled and Great-winged petrel. Skua species such as Pomarine, Arctic and Long-tailed skuas were encountered in low numbers. At 40 °S of the African continent, the weather conditions were relatively good. North of the Polar Front, Kerguelen petrel, Little and Subantarctic shearwaters, Great shearwater, Sooty shearwater, Wandering albatross, Sooty and Light-mantled sooty albatrosses, Black-browed albatross, Diving petrels, Northern giant petrel, Subantarctic and Brown skua's and also groups of Prions were found. Fin whales, Sei whales, Long-finned pilot whales were seen and a small group of Hourglass dolphins stayed bow-riding for a moment. As *Polarstern* crossed the Polar Front at approx. 52.5 °S, also Sperm whales were encountered. In the northern Weddell-gyre with big icebergs large groups of Humpback whales were seen. There, also the first sea-ice stretches were located including associated Antarctic breeding birds like Southern fulmar, Antarctic petrel, Snow petrel and Wilson's storm petrel. Antarctic minke whales supplemented the sea-ice adapted species list.

As we proceeded south the number of top predators decreased and remained low when crossing Maud Rise and leaving the prime meridian on course to the Neumayer station. A helicopter survey confirmed the low abundance of top predators in this region. Only when the sea-ice band near the shelf was reached, top predators were found in larger quantities. Adelie and Emperor penguins, both adults and juveniles, and reasonable amounts of Crabeater-, Ross- and Weddell seals were sighted close to *Neumayer Station III*.

After supplying *Neumayer Station III*, the ship proceeded to the WOBEC/EWOS-box near Kapp Norvegia. Short transits between research stations restricted the possibilities to survey top predators from the ship. Therefore, five helicopter surveys were conducted to cover the area. As a highlight, Blue whales were found inside this research area.

After leaving the WOBEC/EWOS box the ship headed for an ice-station SW off Kapp Norvegia at 72 °S. During the ship-based counts along the ice-shelf several Fin whales and Killer whales were found. In the dense sea/fast ice area, high numbers of seals were counted. After leaving the shelf towards the northern Weddell Sea, large baleen whales were observed on the continental slope and into the deep-sea. Fin whales, Sei Whales, Humpback whales and Blue whales as well as Antarctic minke whales were sighted in the ice-free part of the Weddell Sea. Continuous ship-based counts and three additional Heli flights were conducted to cover the area. The Northern part of the Weddell Sea was partly covered in sea-ice with several icebergs. The numbers of top predators in that area were found low. Remarkably many Ross seals were encountered in comparison with earlier surveys while in contrast only one single Leopard seal was seen outside the surveys. During PS152, no seabirds were found on board, therefore no avian flu samples could be retrieved.

Tab. 2.5.1: Overview of helicopter censuses for top predators. Censuses above sea ice usually consisted of two parallel 40 nm tracks with ca. 5 nm in between, while open water surveys consisted of 4 legs of ca. 15 nm.

Flight number	Date	Start position Lat	Start position Lon	Surveyed nm	Notes
1	24-Dec-2025	-59.09	0.23	50	First flight open water
2	28-Dec-2025	-65.25	2.88	42	Maud Rise open water
3	6-Jan-2026	-70.47	-8.20	80	Neumayer I E-W
4	7-Jan-2026	-70.78	-10.83	80	WOBEC box E-W
5	9-Jan-2026	-70.83	-10.92	80	WOBEC box N-S
6	11-Jan-2026	-70.62	-10.17	80	WOBEC box E-W
7	13-Jan-2026	-70.90	-10.75	80	WOBEC box N-S
8	16-Jan-2026	-70.60	-11.00	50	WOBEC box E-W; aborted due to weather
9	24-Jan-2026	-70.43	-8.22	80	Neumayer II E-W
10	26-Jan-2026	-69.50	-17.50	67	Weddell Sea open water
11	27-Jan-2026	-66.87	-30.87	66	Central Weddell Sea

Between 18 December 2025 to 30 January 2026, more than 300 hours of ship-based top predator surveys were conducted. In total, 11 top predator helicopter surveys were conducted during PS152 (Tab. 2.5.1), of which one had to be aborted due to decreasing weather conditions. Three flights took place above open water, while during all other flights variable sea ice concentrations were encountered. Flights confirmed the general impressions made from the ship, showing higher abundances of top predators in the vicinity of sea ice. During the 11 helicopter flights, 755 nm were surveyed and flight time was 20 hours. This is considerably less than in earlier surveys, mostly caused by suboptimal weather conditions and the absence of sea ice.

In total, 56 taxa were encountered during the surveys from the ship and the helicopter. This includes 41 bird taxa and 15 marine mammal species, of which 11 whale species and 7 seal species. All species are listed in Table 2.5.2. Based on the collected data, the distribution and the abundance of species can be calculated. With this knowledge, energy requirements by top predators can be linked to food availability, which can be retrieved from fishing activities and EK80 data collected during PS152. We collected a comprehensive dataset of the distribution and diversity of marine top predators in the Weddell Sea, improving our understanding of the role of sea-ice on Antarctic top predators. In combination with SUIT and RMT data we are able to map food web relationships with sea-ice associated fauna and increase our knowledge on carbon fluxes in the Southern Ocean.

Tab. 2.5.2: Seabird and marine mammal taxa (English and scientific names) encountered during the top predator censuses both from ship and helicopter. In some cases closely related species are grouped, as identification at sea is challenging.

Seabirds	
Emperor penguin	*Aptenodytes forsteri*
Chinstrap penguin	*Pygoscelis antarctica*
Adelie penguin	*Pygoscelis adeliae*
Wandering albatross	*Diomedea exulans*
White-capped albatross	*Diomedea cauta*
Atlantic yellow-nosed albatross	*Thalassarche chlororhynchos*
Black-browed albatross	*Diomedea melanophris*
Grey-headed albatross	*Diomedea chrysostoma*
Light-mantled sooty albatross	*Phoebetria palpebrata*
Sooty albatross	*Phoebetria fusca*
Northern giant petrel	*Macronectes halli*
Southern giant petrel	*Macronectes giganteus*
Southern fulmar	*Fulmarus glacialoides*
Antarctic petrel	*Thalassoica antarctica*
Cape petrel	*Daption capense*
Snow petrel	*Pagodroma nivea*
Antarctic prion	*Pachyptila desolata*
Thin-billed prion	*Pachyptila belcheri*
Blue petrel	*Halobaena caerulea*
Great-winged petrel	*Pterodroma macroptera*
Kerguelen petrel	*Pterodroma brevirostris*
Soft-plumaged petrel	*Pterodroma mollis*
Atlantic petrel	*Pterodroma incerta*
Grey petrel	*Procellaria cinerea*
White-chinned petrel	*Procellaria aequinoctialis*
Prion sp.	*Pachyptila spp*
White-headed petrel	*Pterodroma lessonii*
Cory's shearwater	*Calonectris borealis*
Sooty shearwater	*Puffinus griseus*
Great shearwater	*Puffinus gravis*
Subantarctic shearwater	*Puffinus assimilis*
Wilson's storm petrel	*Oceanites oceanicus*
Black-bellied storm petrel	*Fregetta tropica*
White-bellied storm petrel	*Fregatta grallaria*
White/black-bellied storm petrel	*Fregetta spp*
Diving petrel sp.	*Pelecanoides sp.*
Tern sp.	*Sterna sp.*
Arctic tern	*Sterna paradisaea*
Antarctic tern	*Sterna vittata*
South polar skua	*Catharacta maccormicki*
Brown skua	*Catharacta (skua) lonnbergi*

Marine Mammals	
Crabeater seal	*Lobodon carcinophaga*
Leopard seal*	*Hydrurga leptonyx*
Weddell seal	*Leptonychotes weddellii*
Ross seal	*Ommatophoca rossii*
Southern elephant seal	*Mirounga leonina*
Subantarctic fur seal	*Arctocephalus tropicalis*
Antarctic fur seal	*Arctocephalus gazella*
Antarctic minke whale	*Balaenoptera bonaerensis*
Sei whale	*Balaenoptera borealis*
Fin whale	*Balaenoptera physalus*
Humpback whale	*Megaptera novaeangliae*
Sperm whale	*Physeter macrocephalus*
Long-finned pilot whale	*Globicephala melaena*
Hourglass dolphin	*Lagenorhynchus cruciger*
Orca	*Orcinus orca*
Southern bottlenose whale	*Hyperoodon planifrons*
**only observed once outside the survey*	

2.6 ASSESSMENT OF MULTINATIONAL AND INTERDISCIPLINARY COLLABORATION PATHWAYS AND PROCESSES IN THE FIELD

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Grant-No. AWI_PS152_06

Objectives

To suggest a multinational monitoring network for the EWS that is co-designed together with key stakeholders to ensure its social relevance, legitimacy and legacy is one of the main objectives of the WOBEC project. As a first step towards fulfilling this objective, stakeholder priorities were scoped by sending a questionnaire on research and monitoring priorities to selected WOBEC stakeholder groups in early 2025. This questionnaire was followed by the first online workshop that was focused on scoping for key research questions, data needs and spatial priorities. The second online workshop, with a focus on ecosystem services, was hosted just prior the WOBEC expedition in November 2025. How stakeholder preferences can shape monitoring priorities, and what feasibility factors, barriers and enablers exist for the practical integration of such co-produced knowledge into a monitoring programme, was studied during the planning phase and onboard the WOBEC expedition.

Work at sea

Susa Niiranen from the Stockholm Resilience Centre (Stockholm University) attended the PS152 expedition. During the expedition two online surveys were issued to the entire scientific team. The first survey was issued at the beginning of the expedition (18 December 2025, week 1-2), when still in transit towards the first sampling station. This survey mapped the different levels of collaboration between members of the scientific team on board (Tab. 2.6.1), and was answered by 43 out of 47 members of the scientific team (answer frequency 91 percent). The responses to the first collaboration survey were preliminary analysed onboard using directed network analysis. Network indicators preliminary explored were degree (i.e., the total number of edges/links), centrality (i.e., the number of edges/links that connect a specific node), and betweenness (i.e., how important a node is in providing a shortest path between two other nodes in a network). Preliminary results of the first survey were presented and discussed at the general science meeting. Only results related to “sample sharing” were shared, in order not to bias the responses of the second survey.

Tab. 2.6.1: Questions included in both online surveys. Participants were asked to identify which individuals on board each statement in this table applied to.

- I have strong ongoing collaboration with this researcher, they are central to the success of my research and/or we have planned the sampling program together.
- I have ongoing collaboration with this researcher and I work with them on some aspects of sampling.
- I have potential collaboration with this researcher that has been discussed, but not clearly planned yet.
- I think this researcher's work would be relevant for my research question, but no discussions have been had yet.
- I share my samples with this researcher.
- this researcher shares their samples with me.

The second survey was issued after the scientific programme was completed (25 January 2026, Tab. 2.6.2). This survey repeated the question about scientific collaboration (Tab. 2.6.1), with the aim to study how collaborations potentially change in time. Also, some additional unstructured (open-ended) questions on communication and collaboration onboard, as well as the suitability of the scientific programme of this expedition as the foundation of the WOBEC observatory, were added to the second survey. The second survey was answered by 41 out of 47 members of the scientific team (answer frequency 87 percent).

Tab. 2.6.2: Open-ended questions included in the second online survey

- Where does the data/samples you have collected onboard PS152 end up to (e.g., which countries, research groups, repositories)?
- How would you freely describe the collaboration onboard PS152? Is there anything that you would suggest to do differently in order to improve the collaboration or communication?
- Would you be open to align your research more towards stakeholder (i.e. individuals or organisations that have direct or indirect interest in the WOBEC research area) needs/priorities? If yes, how do you see this could happen in practice? If no, why is this so?

In addition, 31 semi-structured Interviews, i.e. predefined open-ended questions with the flexibility to include additional, more in-depth, questions based on interviewee's responses, were carried out with 15 scientists onboard. The interviews were mainly directed towards lead-scientists and PIs, but also researchers with some specific expertise or previous experience from research expeditions. Most individuals were interviewed twice during the expeditions, at the beginning (week 1-2) and after the scientific programme was completed (week 7). The first interviews focused on research priorities and goals, planned collaboration onboard, as well as stakeholder engagement (Tab. 2.6.3).

Tab. 2.6.3: Interview 1 questions to all study participants and the lead scientific team

- What are you working with onboard, and what is your role on this cruise?
- What is the key research question that you are answering with your data? Does this have any connection to stakeholder interests (have you communicated with stakeholders? Maybe request from funders?)
- Who are you working most closely with?
- Who are you sharing samples with? What about analysis? Workspaces?
- Is there any other team that you would benefit working with to reach you research questions?
- Is there any other team that you would benefit working with to reach you research questions?
- How long has the cruise been planned for? How flexible is the plan? (*mainly to lead scientific team*)
- How did you put the different team together? Because they work towards similar aims? Take similar samples? Can work well together? (*mainly to lead scientific team*)
- What is the biggest limitation in regards to resources when it comes to sampling?
- Where does the initiative for working together between groups come from? (Previous collaboration? Suggested by the chief scientist out of necessity?)
- Is there a contingency plan in case plans need to be changed in the science plan?

The second round of interviews focused on how the expedition had been conducted, i.e., whether the scientific goals were met and how collaboration and communication was carried out between different research groups, and research groups and the scientific lead team (Tab. 2.6.4). In addition, participants were asked to give their feed-back on the scientific plan of the expedition, and its suitability as basis for a long-term observatory.

Tab. 2.6.4: Interview 2 questions to all study participants and the lead scientific team

- Now after the scientific programme on PS152 has been completed, how do you think about the following:
    - Were you and your team successful in completing the scientific goals set for this expedition?
    - What was the biggest change/modification you had to make to your science plan and how was this handled or communicated?
    - Is there anything you would have liked to do differently?
    - How did this cruise compare with your previous experiences onboard. Things that were done better/worse?
    - How did the communication between the different research groups and the lead scientific team work throughout the cruise?
    - Would there have been room for new collaborations during this cruise? What about after?
    - Is the setup, where information is shared via certain central individuals (e.g. PIs) a good model for such an expedition? Are there vulnerabilities? (here, one can also add a more personalized questions based on the network results)
    - How do you see your role in the information flow when you look back at the cruise. Some key role?
- What about the set-up of WOBEC observatory? What are your thoughts about this – how appropriate is the WOBEC science plan carried out as a blue print for observatory?
    - Are we looking at a suitable study area?
    - Are we using the best possible sampling gear? Should something be replaced?
    - In the future, how do you see your participation/commitment to WOBEC observatory
- In the future, how do you see your participation/commitment to WOBEC observatory
- Is there room in your current work to accommodate for stakeholder interaction?
    - If yes, what enables this?
    - If not, what are the obstacles?
- What could you as a researcher do to make data or your research more available/usable to stakeholders?

During the period of most intensive scientific work onboard (weeks 3-6), some individual interviews were conducted with the science leads, as well as some other individual researchers, to get an understanding on how different aspects of expedition (e.g., communication, collaboration, science programme) were progressing. During this period, also the workflows and practices were observed within and between the different research groups. Relevant insight was also obtained in daily general science meetings, PI-meetings and other science group meetings.

All interviews were recorded for further analysis. Every interviewee was also asked to sign a consent form, where it was explained how the collected data will be stored and used. If not otherwise agreed, anonymity of the participants and their responses will be safeguarded. No questionnaire or interview results are distributed outside the core research team (listed at the beginning of this chapter) without consent from participants. The participants can withdraw from the process at any time.

Preliminary (exected) results

The preliminary network analysis results of the first survey clearly indicated a network structure, where the leads (PIs) of certain research teams were very well connected, both within their teams, as well as with other research groups, while other groups remained more in the margins of the network, potentially indicating differences in information flow. Also, certain individuals, with no PI-role, positioned very centrally in the collaboration networks. These findings will be further analysed within the context of the results of the second survey, as well as the interview findings. Parameters the network findings can be analysed in relation to include, for example, specific (scientific) expertise, career stage and previous collaboration. The interviews will be transcribed and analysed using text analysis to identify key themes and terms. Also, more qualitative content analysis will be carried-out.

Some of the key aspects that will be addressed based on the research carried out onboard, include

1. information flows between the different research groups and their efficiency/ vulnerability, as well as contribution towards adaptability
2. factors that contribute towards preferable (as perceived by the participants) modes of collaboration and achievement of scientific goals set,
3. recommendations towards the WOBEC observatory, including stakeholder relevance.

Finally, findings from this expedition will be combined with the outcome of the WOBEC stakeholder workshops.

2.7 ICELIGHT

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Grant-No. AWI_PS152_12

Outline

Icelight is a secondary user project on PS152 which proposes to enhance our understanding of how snow and sea ice properties affect the Antarctic under-ice light environment and how this, in turn, structures ecosystem functioning. By combining sea ice tethered autonomous assets with local *in situ* measurements during ice stations, we will address knowledge gaps on the seasonal and spatial variability of light transmission and its potential impacts on primary production and zooplankton dynamics. The project is designed to complement and extend the WOBEC main user program, providing local measurements of the sea ice physical and optical properties and deploy sea ice-tethered autonomous systems meant to measure several variables across a year.

Objectives

The overall objective is to assess the linkages between snow and sea ice variability, light availability, and ecosystem response across the Eastern Weddell Sea. Specifically, we aim to:

- Quantify the temporal and spatial variability in snow, sea ice, and upper-ocean properties and their role in modulating solar partitioning and light transmission.
- Evaluate how the under-ice lightscape shapes ecosystem function by assessing phytoplankton and zooplankton responses across an annual cycle using the autonomous assets throughout a year-round monitoring plan.

Our aim is to evaluate how the under-ice lightscape shapes ecosystem function by assessing phytoplankton and zooplankton responses across an annual cycle using the autonomous assets throughout a year-round monitoring plan.

Work at sea

Ice stations

PS152's work at sea was divided between two areas. The Greenwich Meridian region with a transect of open ocean stations including Maud Rise, followed by stations in the Kapp Norvegia area. In the eastern Weddell Sea, the sea ice conditions started to deteriorate late November 2025 with a decrease of sea ice concentration around Maud rise and near the coast to the west of *Neumayer Station III*. As the sea ice opened up, the melt rate increased leading to a wider open ocean area in this region. A first ice station happened just before the *Neumayer* resupply in Atka Bay. The other ice stations happened in the Kapp Norvegia area. Table 2.7.1 summarizes the ice stations together with their GPS location and activities.

Tab. 2.7.1: List of the ice stations visited during the cruise, their locations and activities from Icelight

Ice station number	Date	Latitude Start (°N)	Longitude Start (°E)	Latitude end (°N)	Longitude end (°E)	Activities
PS152_24-1	03.01.2026	-70.520	-8.128	-70.521	-8.128	Local measurements, transducers's calibration
PS152_29-1	08.01 and 09.01.2026	-70.841	-10.604	-70.838	-10.598	Local measurements
PS152_33-4	10.01.2026	-70.721	-10.346	-70.790	-10.959	Local measurements, helicopter based
PS152_35-5	12.01 and 13.01.2026	-70.678	-10.928	-70.703	-10.927	EM sled test, drone flight, buoy deployment
PS152_36-7	13.01.2026	-70.924	-10.721	-70.880	-10.821	Team did not participate to this station
PS152_52-1	22.01.2026	-72.0486	-14.812	-72.047	-14.802	Local measurements and drone flight

Before all ice stations, the sea ice conditions near a potential station were assessed using satellite Synthetic Aperture Radar (SAR) imagery either from Sentinel-1 or TerraSAR-X. The conditions from the imagery for each ice station where Icelight participated in activities are illustrated in Fig. 2.7.1.

Local measurements and sea-ice tethered autonomous systems deployments

Four of the ice stations (IS1, IS2, IS3, IS6) visited by the ICELIGHT team were focusing on collecting local measurements of the snow and sea ice physical and optical properties.

For all sites, the planned protocol of measurements was to:

- Extract a core to measure salinity and temperature of the ice
- Deploy radiometers to monitor the downwelling and upwelling solar irradiance
- Deploy radiometer under the ice with L-arm
- Measure the solar partitioning in snow with the apogee
- Measure the snow density, temperature and depth
- Measure sea ice thickness
- Clear 2 m x 2 m snow above L-arm measurement
- Redeploy the L-arm to measure the under-ice light without snow
- Extract core for bio HPLC
- Extract core near bio core for the lightbox experiment

Measure the transmitted irradiance through different parts of the core in the light box

Some steps were not achieved for some sites due to the conditions. The report from the stations are provided thereafter together with first data (first results) overview.

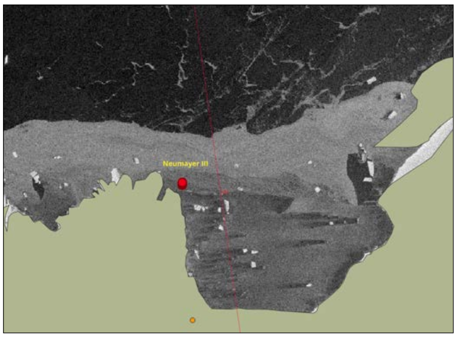
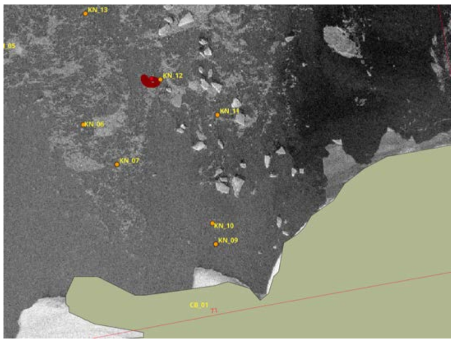
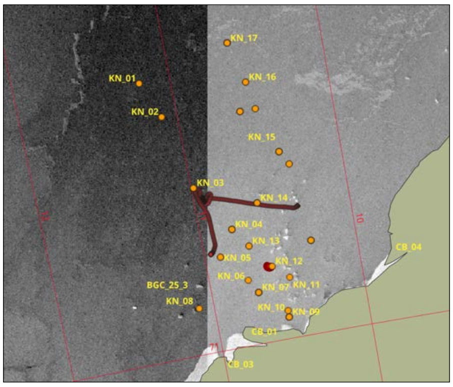
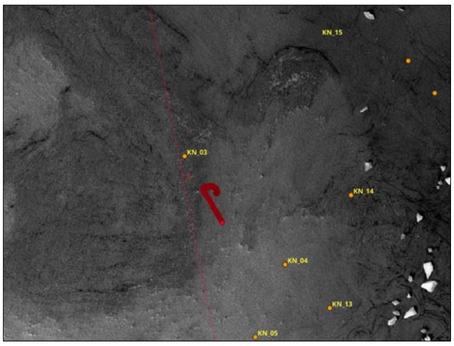
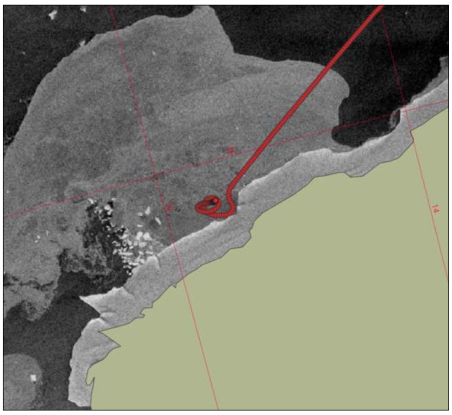
Ice station	**SAR imagery and station position**	**Ice station**	**SAR imagery and station position**
PS152_ 24-1		PS152_ 29-1	
PS152_ 33-4		PS152_ 35-5	
PS152_ 36-7	Did not participate	PS152_ 52-1	

Fig. 2.7.1: SAR imagery related to the ice stations visited during PS152

Preliminary results

PS152_24-1

Saturday, 3 January 2026

Brief description: on 3 January, we had our first ice station where *Polarstern* got close enough to sea ice for teams to be transferred to the ice via mummy chair. The station was located on the west side of Atka Bay, near the *Neumayer* resupply location. A team of three (Jeremy, Sebastien and Jacqueline) went to survey the ice and choose an adequate location for the sea ice teams measurements.

Weather: Cloudy, foggy and warm. Visibility was rather low. Wind very low.

Air temperature: wasn't measured as the thermometer battery was dead.

GPS location of the site: start at 9:14; latitude = -70° 31.443'; longitude = -8° 7.737'

Salinity core

Fig. 2.7.2: Left picture: Top of core with snow;
right picture: top core with snow removed + slush from coring + bottom core

Fig.2.7.3:Total core with snow and slush removed

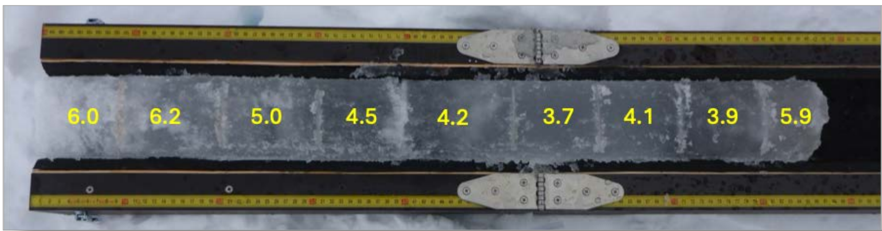


Fig. 2.7.4:Total core with 10 cm sections and respective salinity values (psu)

Tab. 2.7.2: Salinity values measured for every 10 cm part of the salinity core

Top to bottom section (cm)	Top to bottom salinity (psu)
0-10	5.957
10-20	6.217
20-30	5.034
30-40	4.519
40-50	4.166
50-60	3.693
60-70	4.132
70-80	3.939
80-85	5.865

Note: No core temperature was recorded as thermometer's battery was dead.

Total salinity core length: 87 cm

Snow measurements: 48, 45, 45, 44 cm snow depth measured around site.

Total snow and ice thickness: 115 cm + offset of scissors

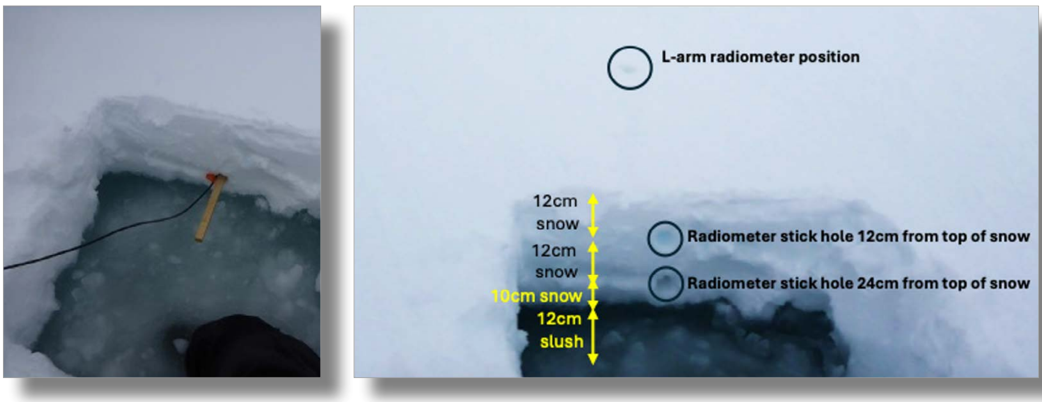


Fig. 2.7.5: Left picture: apogee radiometer in first snow hole (bottom); right picture: Overall picture of the location of the L-arm measurement and the two apogee snow measurements.

Tab. 2.7.3: Solar irradiance measured at the different respective snow depths

Depth from top of snow to measurement (cm)	**Broadband solar irradiance (W m-2, avg of 100 measurements)**
0	508.84
12	33.13
24	16.65

L-arm core

Fig. 2.7.6: Top picture: Top of core with snow;
bottom picture: top core with snow removed + bottom core

Total core length: 87cm (Note: bottom 3 cm missing from photo)

The downwelling, upwelling and transmitted solar irradiances were measured at the location with snow untouched. The downwelling and upwelling were set up to monitor continuously during the time on ice and the transmitted irradiance.

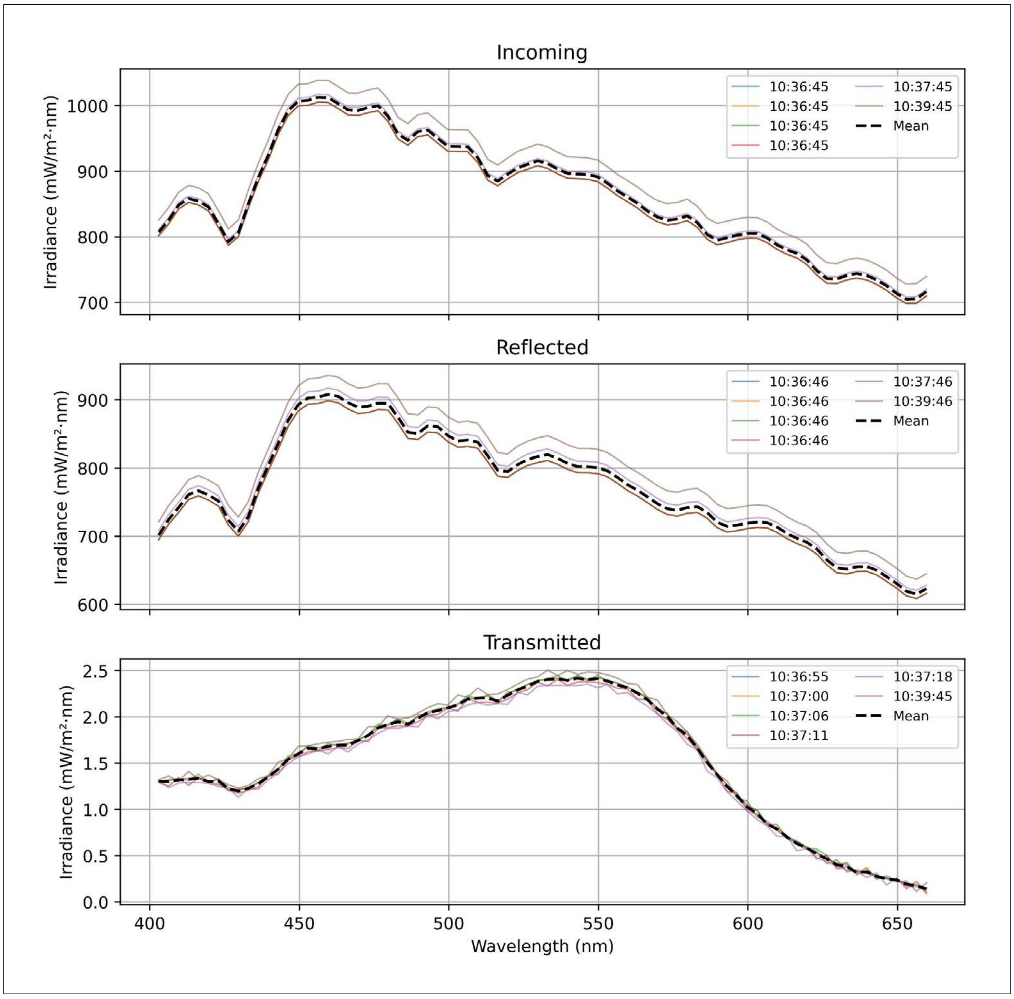


Fig. 2.7.7: Solar irradiance measured with TriOS radiometers
Top panel: incoming solar irradiance; middle panel: reflected solar irradiance; bottom panel: transmitted solar irradiance.

PS152_29-1

Thursday and Friday, 8 and 9 January 2026

Brief description: on 8 January at 23:00, *Polarstern* stopped against sea ice floe near KN_11 and KN_12. Several icebergs around. A team of three went to survey the ice for the teams measurements and we finished the station around 3:15am on Friday 9 January.

Weather: Clear sky. Low winds. Low sun (midnight). Visibility was rather low. Wind very low.

GPS location of the site: start at 23:1, 8 January; latitude = -70.84; longitude = -10.60

Salinity core

Note: The core was extracted in 3 parts.

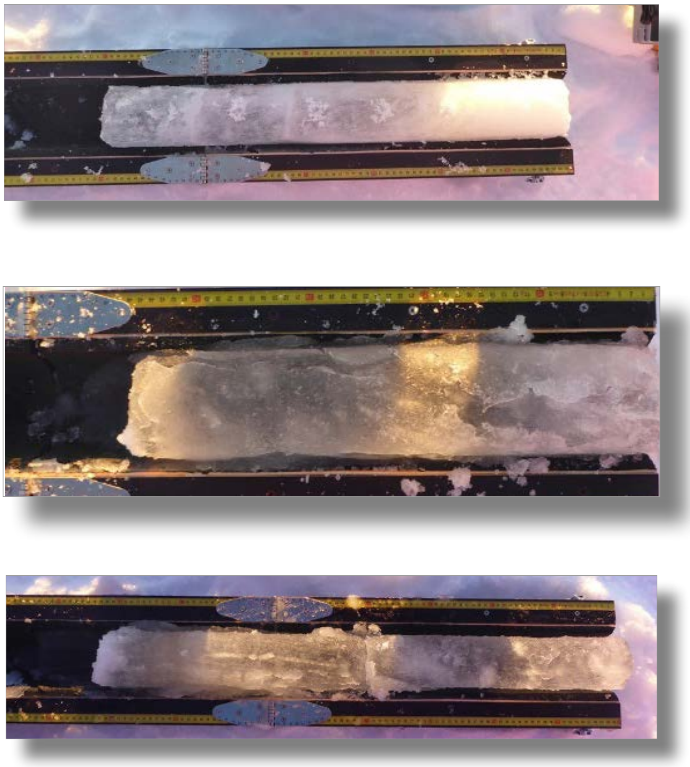


Fig. 2.7.8: Top picture: Top of salinity core (70cm); middle picture: middle part of salinity core (45 cm); bottom picture: bottom part of salinity core (85 cm)

Air temperature: 9 January 00:07, 19 cm snow, -2.5°C air temp

Tab. 2.7.4: Salinity values measured for every 10 cm part of the salinity core. The colors highlight which part are the sections from, top section (red), middle section (blue), bottom section (no color).

Top to bottom section (cm)	Sea ice temperature (°C)	Top to bottom salinity (psu)
0 (top)	-2.1	3.570
10	-2.1	4.770
20	-2.2	4.903
30	-2.3	4.336
40	-2.4	5.267
50	-2.5	4.029 (unsure due to bag leaking)
60	-2.7	3.790
70(bottom)	-2.8	
70-80	-2.7 (Air temp: -3.2)	4.174
80-90	-2.4	1.430 (unsure due to bag leaking)

Top to bottom section (cm)	Sea ice temperature (°C)	Top to bottom salinity (psu)
90-100	-2.2	3.662
100-114	-2.5	2.207
114-124	-2.7	4.691
124-134	-2.5	3.715
134-144	-2.5	3.965
144-154	-2.4	0.592 (unsure due to bag leaking)
154-164	-2.4	6.957
164-174	-2.2	5.881
174-184	-2.2	4.121
184-195	-2.3	0.444 (unsure due to bag leaking)

Note: salinity core part 1 is 70 cm length and temp was measured at top and bottom and at each 10 cm.

Total core length to sea surface: 175 cm from sea ice bottom to top of slush layer. Note sea surface could not be seen, so it is likely an overestimation.

Total core length: 182 cm from sea ice bottom to top of sea ice

Total snow/ice length: 202 cm from sea ice bottom to top of snow.

Total snow depth: 19 cm

Light measurements with snow

After extracting the salinity core and measuring the sea ice thickness, the L-arm was deployed to measure the transmitted light field under sea ice. The figure below also shows the downwelling and upwelling irradiances closest in time to the transmitted irradiance.

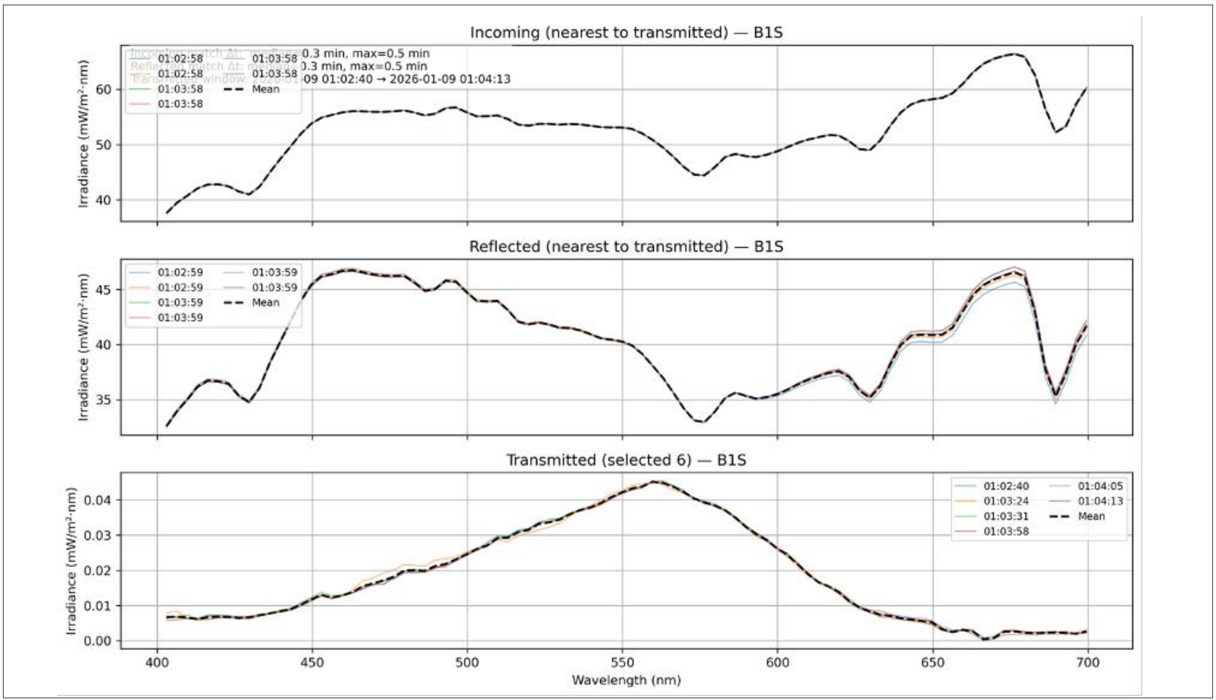


Fig. 2.7.9: Solar irradiance measured with TriOS radiometers. Top panel: incoming solar irradiance; middle panel: reflected solar irradiance; bottom panel: transmitted solar irradiance.

Snow measurements

Time: 01:13

Snow depth: 20 cm

Snow temperature

Tab. 2.7.5: Temperature for respective snow depths measured.

Depth (cm)	Temperature (°C)
air	-3.2 (start); -4.0 (end)
20	-2.8
15	-2.9
10	-2.1
Bottom of snowpack	-2.0

Snow light

Tab. 2.7.6: Solar irradiance measured at the different snow depths

Depth (cm)	Broadband solar irradiance (W m^{-2}, avg of 100 measurements)
Above snow	75.03
12-5-17.5	5.41
7.5-12.5	3.07
5-Bottom of snow	2.55

Snow density

Note: Volume of tube: 274.89 cm3

Tab. 2.7.7: Snow density measured at different depths.

Depth (cm)	Weight (g)	Density (g cm-3)
Bottom ~15	91	0.33
Middle ~10	102	0.37
Top ~0-5	117	0.43

Light measurements without snow

After measuring the snow depth, density and temperature as well as using the apogee radiometer at different depths, a 2m x 2m snow bit was removed above the previous measurement and the L-arm was deployed again to measure the transmitted light field under sea ice without snow. The figure below also shows the downwelling and upwelling irradiances closest in time to the transmitted irradiance.

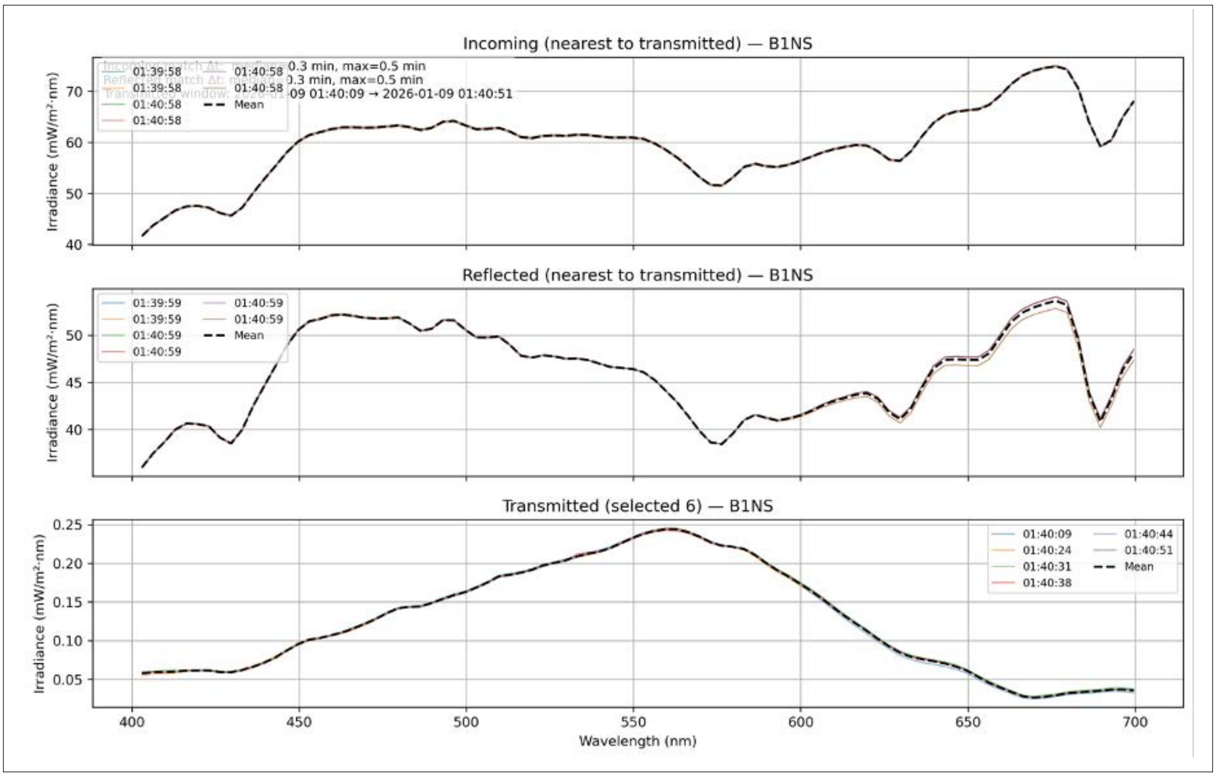
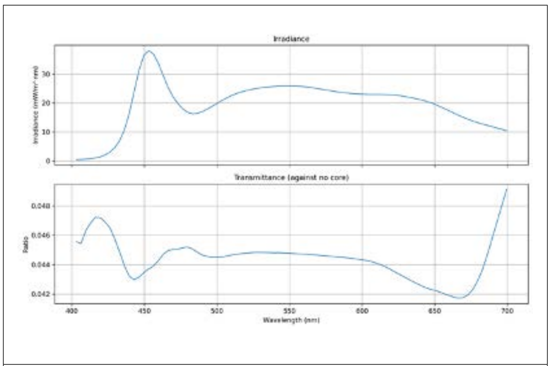
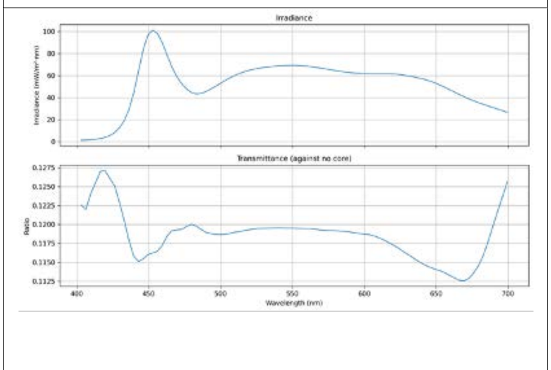


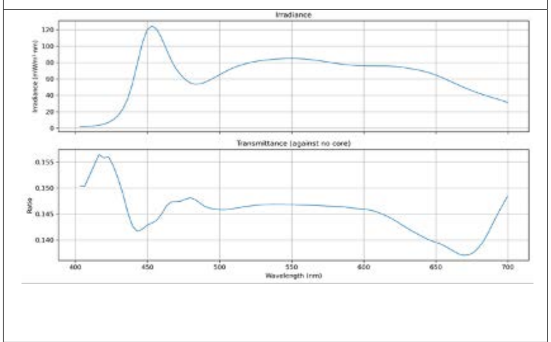
Fig. 2.7.10: Solar irradiance measured with TriOS radiometers after removing 2mx2m of snow around the L-arm measurement. Top panel: incoming solar irradiance; middle panel: reflected solar irradiance; bottom panel: transmitted solar irradiance.

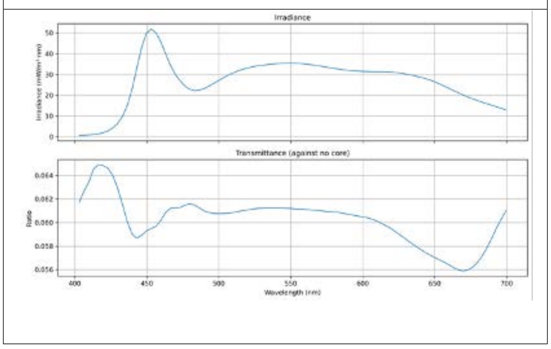
Lightbox experiment

During site B, we used the lightbox to perform one experiment with a core extracted next to the biocore. The full core was extracted and sections already naturally separated were put in the light box to measure the irradiance transmitted through each piece.









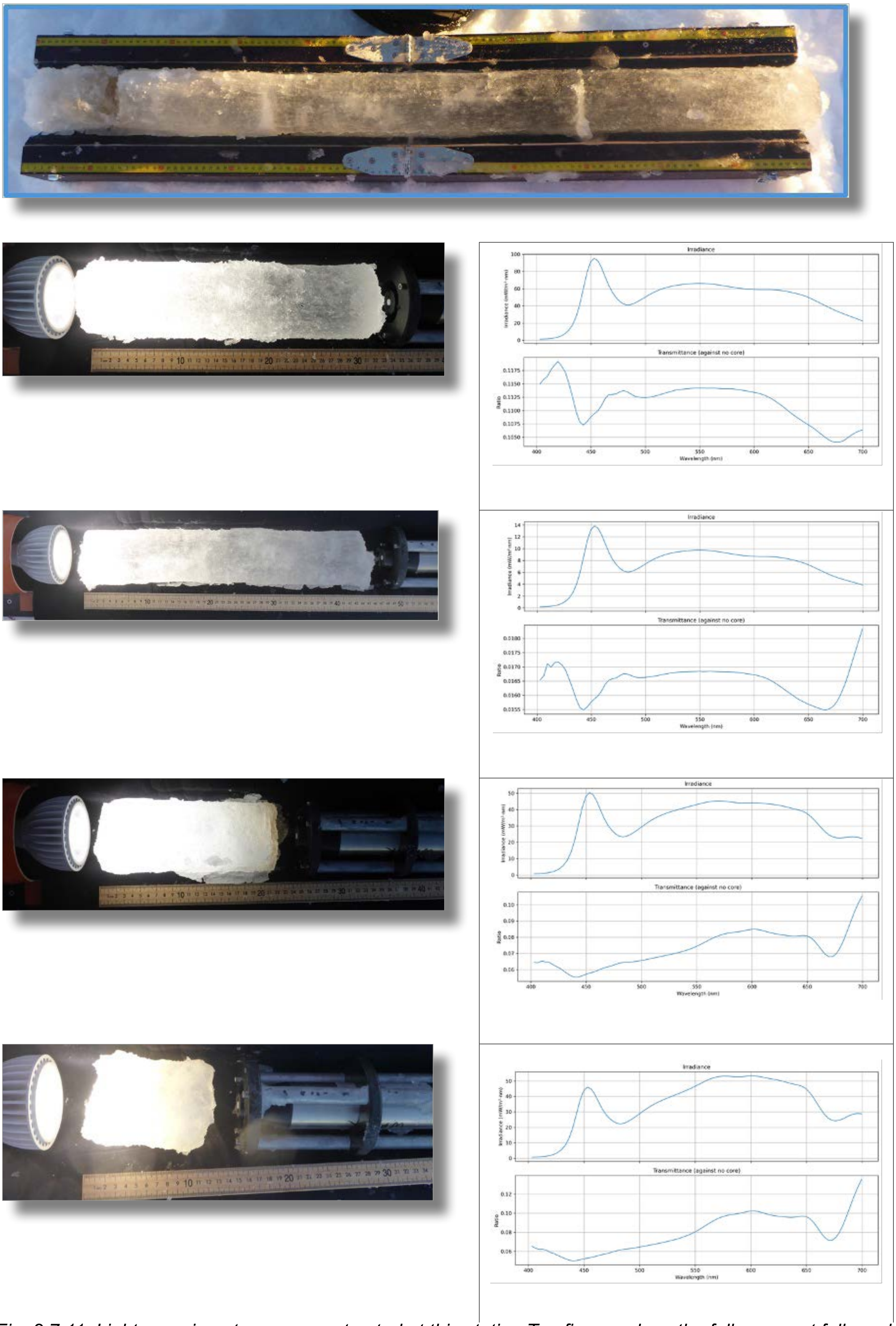


Fig. 2.7.11: Light experiment on cores extracted at this station.Top figures show the full core part followed by two columns. The left column shows the part of the core where light transmitted through is measured in the box; the right column shows the irradiance measured (top plot) and the transmittance (bottom plot).

PS152_33-4

Saturday, 10 January 2026

Brief description: on 10 January at 11:00, a team of two (Jeremy and Gaelle) went to find a floe where two teams (light teams and bio coring team) could work. When the floe was found, we were joined by Janina and Laura.

Weather: Cloudy sky. Sun came out later on. Wind.

GPS location of the site: TBC

Salinity core

Note: The core was extracted in 2 parts

Core length salinity core part 1: 86 cm

Core length salinity core part 2: 102 cm

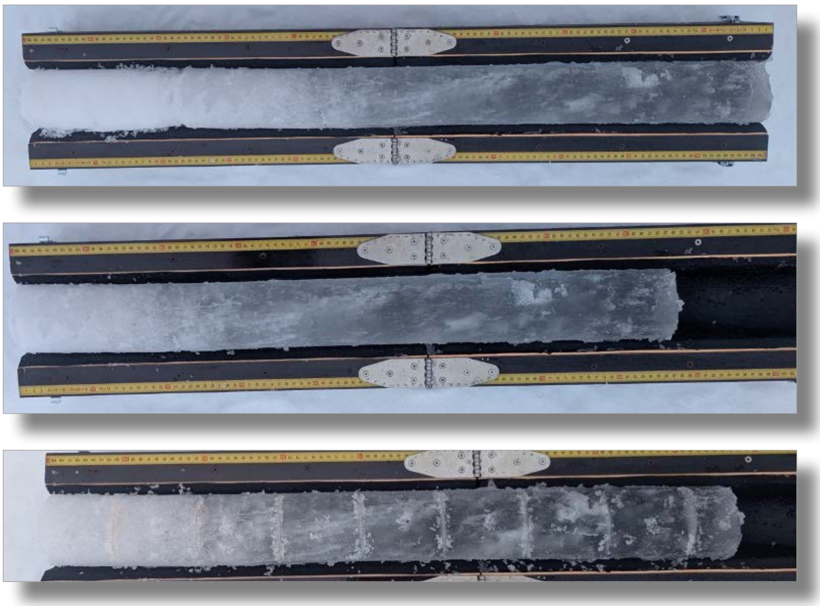


Fig. 2.7.12: Salinity core part 1. Top picture: core with snow; Middle picture: core without snow; Bottom picture: core with sections marked

Fig. 2.7.13:Salinity core part 2

Air temperature: 10 January 12:40, 23 cm snow, -1.4°C air temp; 10th Jan 13:20, -1.9°C air temp.

Tab. 2.7.8: Salinity values measured for every 10 cm part of the salinity cores. The colors highlight which part are the sections from, core 1 (red), core 2 (blue).

Top to bottom section (cm)	Sea ice temperature (°C)	Top to bottom salinity (psu)
0-10	-1.9	3.589
10-20	-2.0	2.358
20-30	-2.1	6.632
30-40	-2.2	4.141
40-50	-2.4	6.326
50-60	-2.5	5.594
60-70	-2.5	5.530
70-80	-2.5	5.619
80-86	-2.5	5.237
86-96	-2.4	3.831
96-106	-2.5	0.537
106-116	-2.5	3.593
116-126	-2.5	4.313
126-136	-2.5	3.892
136-146	-2.4	4.338
146-156	-2.4	3.110
156-166	-2.3	3.819
166-176	-2.3	5.172
176-188	-2.4	9.487

Total core length to sea surface: 162 cm from sea ice bottom to top water level.

Total snow/ice length: 198 cm from sea ice bottom to top of snow

Total snow depth: 23 cm

Note: at 14:34 sun was out but clouds came in again at 14:45.

Snow measurements

Snow light

Snow depth was about 25 cm where a snow pit was dug to use the apogee stick for the light measurements in snow.

Tab. 2.7.9: *Solar irradiance measured at the different snow depths*

Depth	Broadband solar irradiance (W m^{-2}, avg of 100 measurements)
Above snow	260.99
Top (~5 cm of snow atop)	45.28
Middle (~13 cm of snow atop)	16.06
Bottom of snow (~20 cm of snow atop)	9.25

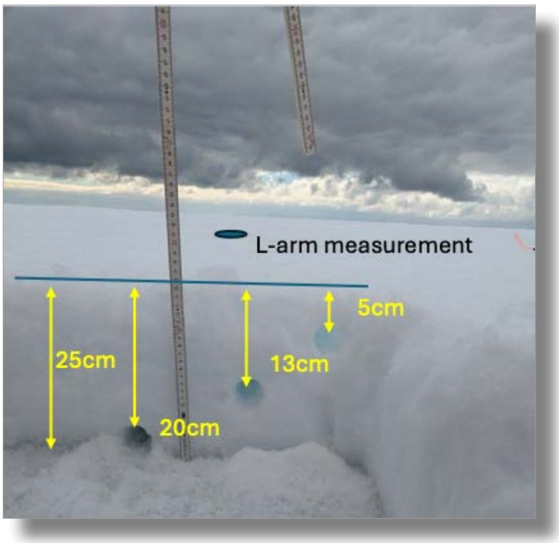


Fig. 2.7.14: Picture of the apogee holes in the snow pit together with respective snow depths and location of the L-arm measurement.

Snow depth: 25 cm

Snow temperature

Tab. 2.7.10: *Snow temperature measured at the different snow depths.*

Depth (cm)	Temperature (°C)
Air temp	-1.8
25	-1.5
20	-1.6
15	-1.9
10	-2.0
5	-2.1
0 Bottom of snow	-2

Snow density

Volume of tube: 274.89 cm3

Tab. 2.7.11: Snow density measured at the different snow depths.

Location of measurement	Weight (g)	Density (g cm-3)
Top of snowpack	114	0.41
Middle of snowpack	118	0.43
Bottom of snowpack	100	0.36

Light measurements

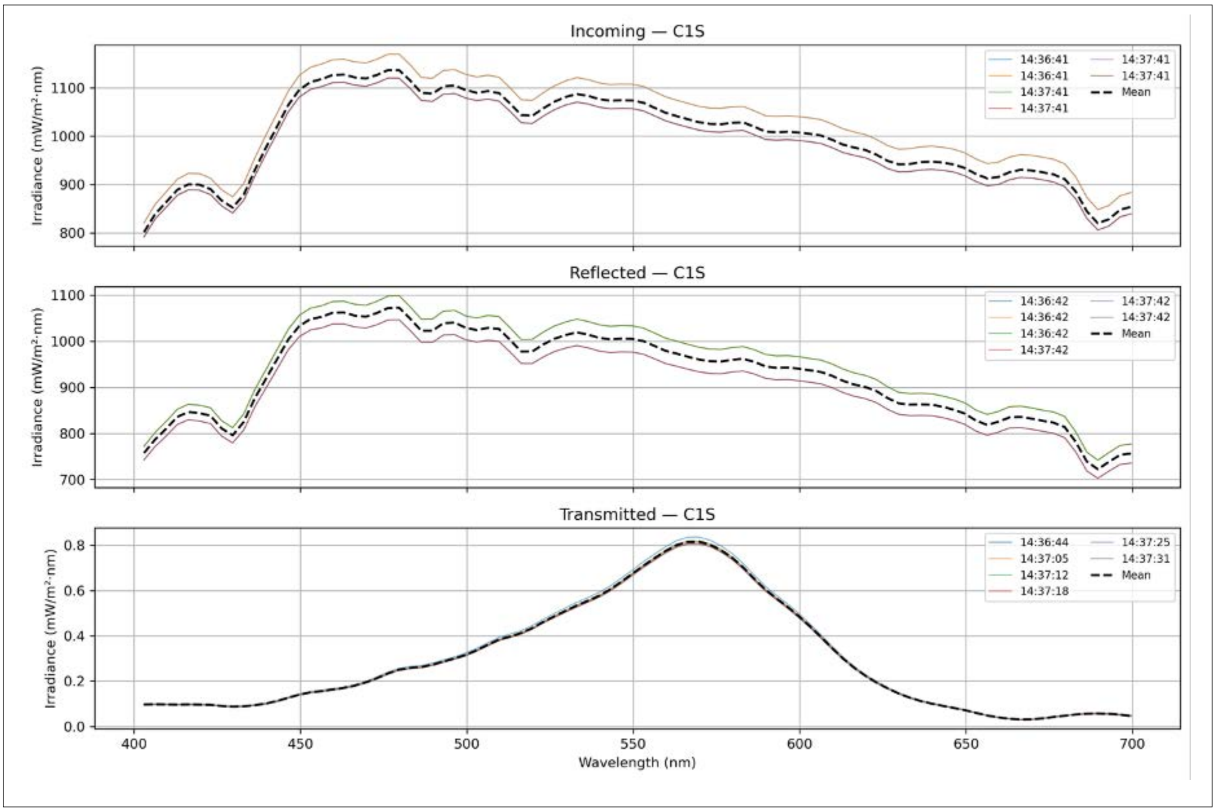


Fig. 2.7.15: Solar irradiance measured with TriOS radiometers. Top panel: incoming solar irradiance; middle panel: reflected solar irradiance; bottom panel: transmitted solar irradiance.

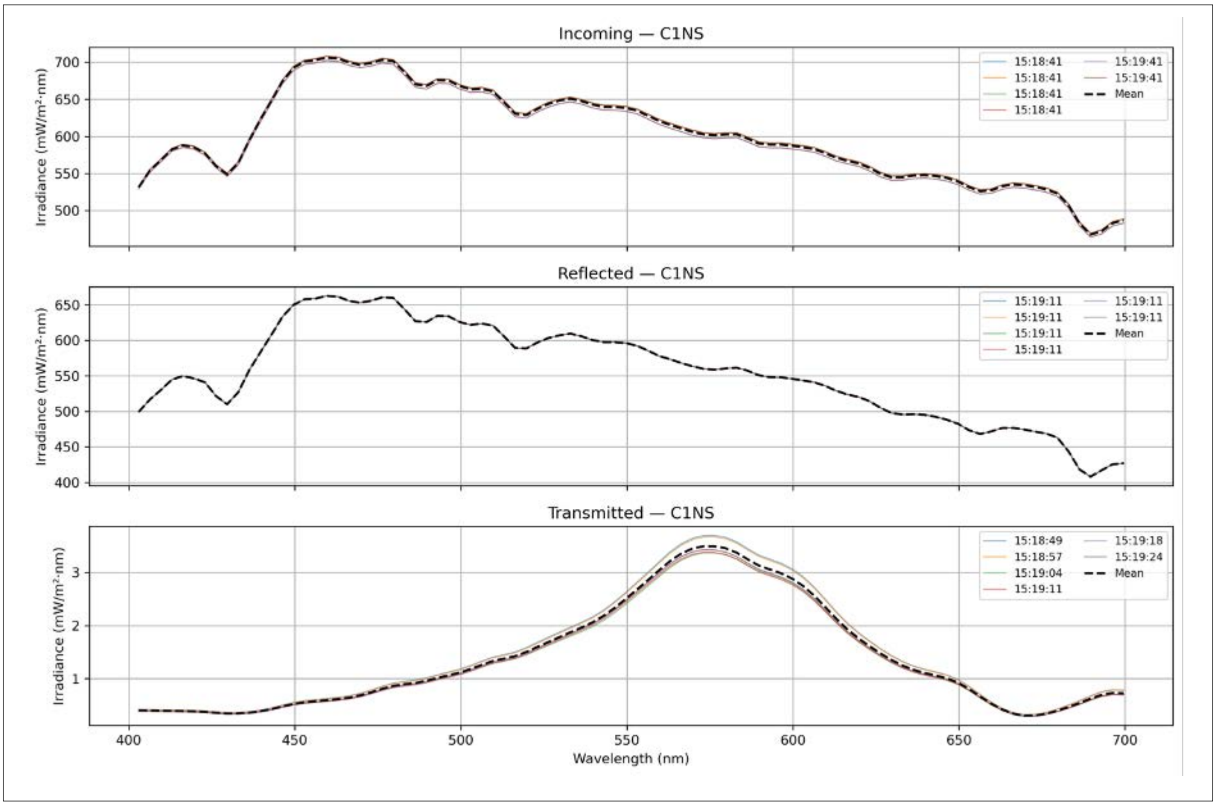


Fig. 2.7.16: Solar irradiance measured with TriOS radiometers after removing 2mx2m of snow around the L-arm measurement. Top panel: incoming solar irradiance; middle panel: reflected solar irradiance; bottom panel: transmitted solar irradiance.

Sea ice thickness (repeat near L-arm measurement)

Sea ice thickness: 175 cm

Freeboard: 12 cm

PS152_52-1

Thursday, 22 January

Brief description: team of 3 (Jeremy, Ante, Gaelle) went on the fast ice early on with the helicopter to do the light measurements for the last ice station. When we tried to use the L-arm, we realised there was a layer of unknown depth of platelet ice. The L-arm could be brought to 90° but the radiometer under the ice would not settle upward. The decision was made to move about 50-70m away towards the edge of the fast ice. The salinity core was not extracted again, a core was removed to make a hole for the L-arm to try again the light measurements. Platelets were also present at this location, but after shaking the arm a few times we managed to collect under-ice light data WITH SNOW ON were the radiometer had a tilt of about 11°. We carried on with the rest of the measurements at this location, however, we did not measure the under-ice light without snow.

Weather: Weather was good, low wind, some high altitude clouds. Turn a little bit cloudier later on.

GPS location of the site: TBC

Salinity core

Note: 1st location as we had to moved because of platelets. The salinity core was extracted in 3 parts

Core length salinity core part 1: 35 cm

Core length salinity core part 2: 82 cm

Core length salinity core part 3: 54 cm

Fig. 2.7.17: Salinity core part 1. Top picture: core with snow; Middle picture: core without snow; Bottom picture: core with sections marked.

Fig. 2.7.18: Salinity core part 2. Top picture: as extracted; Bottom picture: core with sections marked.

Fig. 2.7.19: Salinity core part 3.
Top picture: as extracted;
Bottom picture: core with sections marked.

Total snow/ice length: 190 cm from sea ice bottom to top of snow

Total snow depth: 37-40 cm

Freeboard: 0 cm

Air temperature: 23rd Jan

Air temp at core 1: -0.8°C

Air temp at core 2: -1.3°C

Air temp at core 3: -0.7°C (at 14:41)

Sea ice temperature and salinity

Tab. 2.7.12: Salinity values measured for every 10 cm part of the salinity core. The colors highlight which part are the sections from, top section (red), middle section (blue), bottom section (no color).

Top to bottom section (cm)	Sea ice temperature (°C)	Top to bottom salinity (psu)
top	-1.4	NA
0-10	-1.1	4.712
10-20	-1.2	4.547
20-30	-1.4	5.165
30-35	-1.4	4.448
bottom	-0.8 (maybe not real)	NA
35-45	-1.4	5.588
45-55	-1.6	4.770
55-65	-1.7	4.799
65-75	-1.8	4.119
75-85	-1.8	3.613
85-95	-1.7	3.410
95-105	-1.7	3.465
105-117	-1.7	3.367
bottom	-1.4	NA
117-127	-1.2	3.586

Top to bottom section (cm)	Sea ice temperature (°C)	Top to bottom salinity (psu)
127-137	-1.3	3.822
137-147	-1.4	4.140
147-157	-1.4	5.417
157-167	-1.6	9.279
167-171 (bottom)	-1.6	10.48

Total snow/ice length: 190 cm from sea ice bottom to top of snow

Total snow depth: 37-40 cm

Freeboard: 0 cm

Snow measurements

Snow light

Snow depth was about 43 cm where a snow pit was dug to use the apogee stick for the light measurements in snow (first hole is the bottom one).

Tab. 2.7.13: *Solar irradiance measured at the different snow depths*

Depth	Broadband solar irradiance ($W\ m^{-2}$, avg of 100 measurements)
Air – before top hole	529.23
Air – after third hole	307.31
Air – after second bole	353.57
Air – before first hole	387.15
Top (~3cm of snow atop)	100.46
Third hole (~13 cm of snow atop)	17.39
Second hole (~23 cm of snow atop)	8.09
First hole (~39 cm of snow atop)	4.36

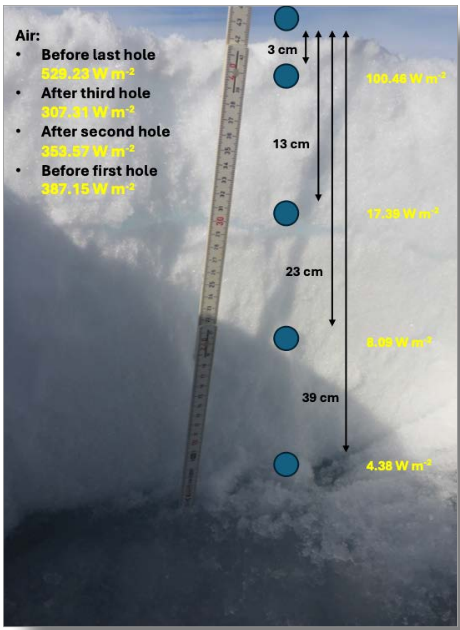


Fig. 2.7.20: Picture of the snow pit with added locations of apogee holes and broadband solar irradiance measurements.

Snow depth: 43 cm

Snow temperature (from bottom to top)

Tab. 2.7.14: *Snow temperature at the different snow depths.*

Depth	Temperature °C
Air temp	-0.1
~0/2cm	-2.2
~10cm	-2.6
~20cm	-2.5
~30cm	-2.1
~42cm	-0.1

Snow density

Volume of tube: 274.89 cm3

Tab. 2.7.15: Snow density at the different snow depths.

Depth	Weight	Density
Top	95	0.35

Note: Other densities were not measured because the scale stopped functioning.

Light measurements

Because of the presence of platelet ice under the sea ice, the location where we collected the salinity core had to be abandoned as to light measurements could be performed. Instead, we moved about 100 meters away towards the edge to continue the measurements. After moving, we were able to collect the light measurements with snow untouched but it remained complicated to adjust the tilt of the radiometer underneath the ice (i.e., could not get the radiometer's tilt under 11°). The decision was taken to not try to repeat the light measurements with snow removed.

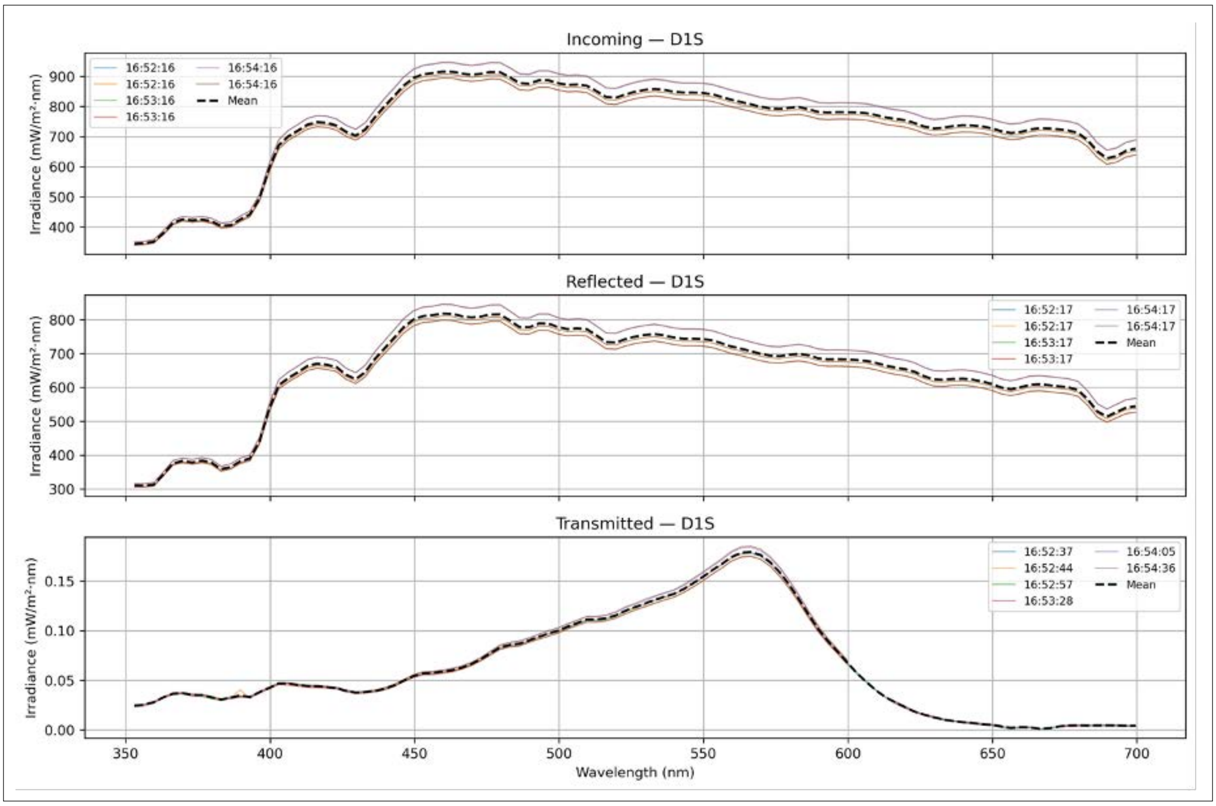
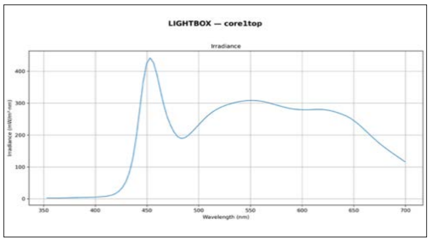
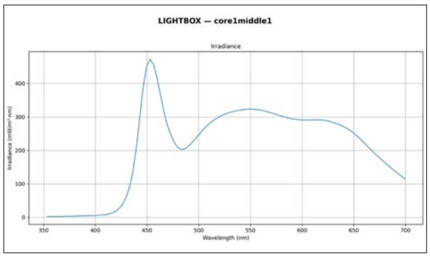


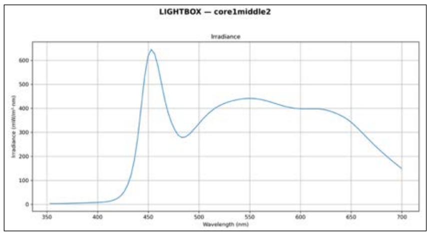
Fig. 2.7.21: Solar irradiance measured with TriOS radiometers. Top panel: incoming solar irradiance; middle panel: reflected solar irradiance; bottom panel: transmitted solar irradiance.

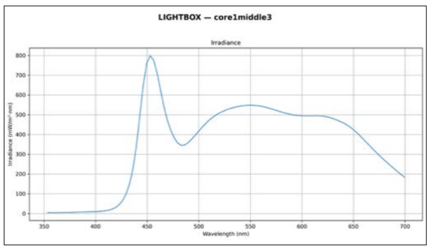
Lightbox experiment

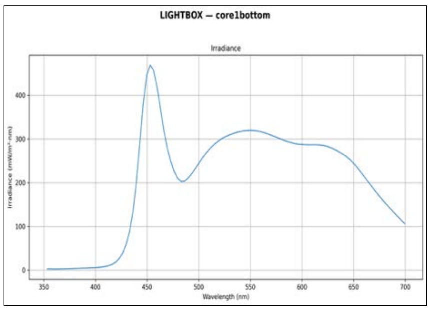
During site D, the lightbox was used to perform two experiments with cores extracted at the site next to the biocore and around 10m away from the site. The full core was extracted and and sections already naturally separated were put in the light box to measure the irradiance transmitted through each piece.











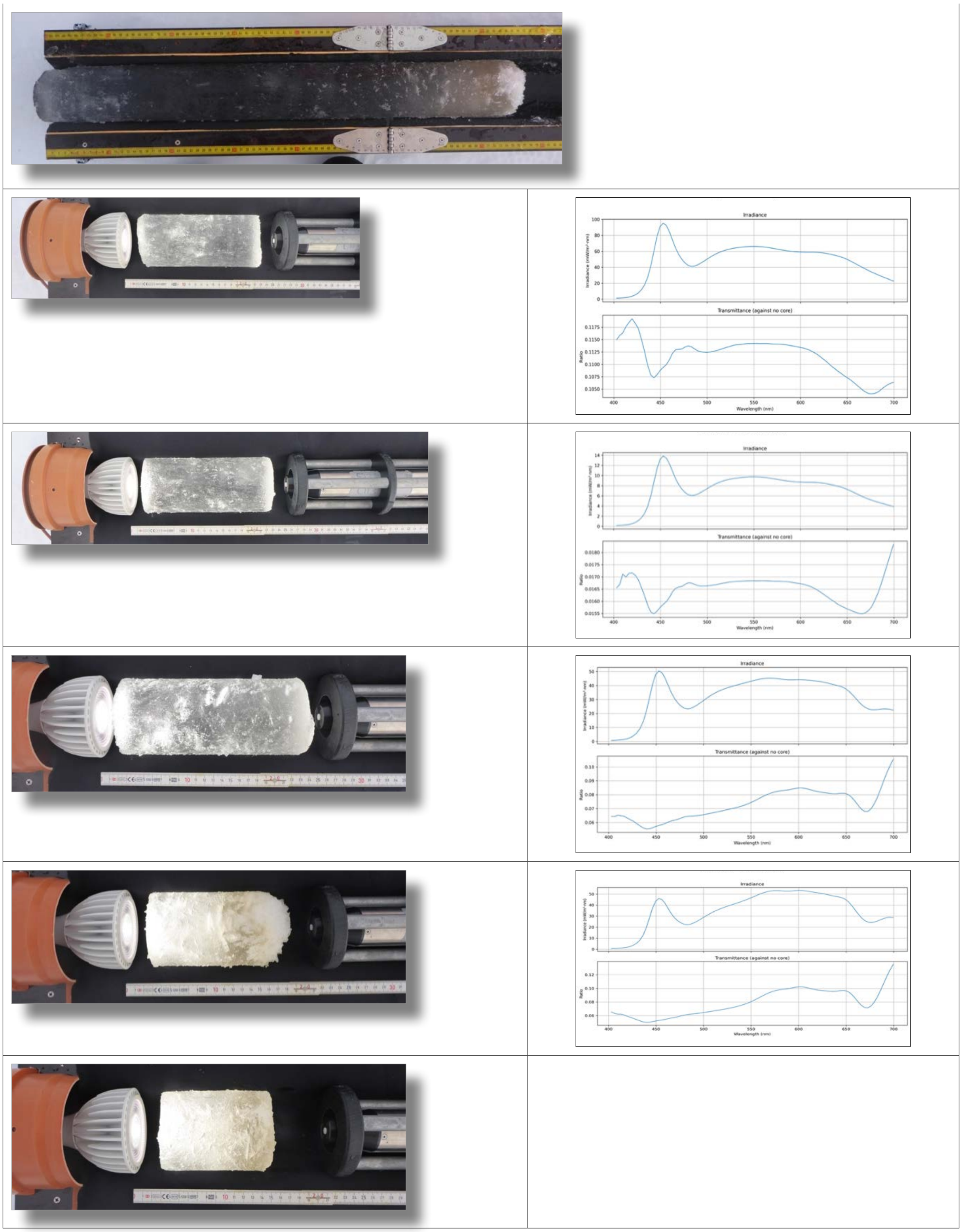


Fig. 2.7.22: Light experiment on core extracted at this station. Top figures show the full core part followed by two columns. The left column shows the part of the core where light transmitted through is measured in the box; the right column shows the irradiance measured (top plot) and the transmittance (bottom plot).

PS152_35-5

EM Sled experiment

Polarstern-based

British Antarctic Survey: Jeremy Wilkinson, Gaelle Veyssiere

PulsarLabs: Ante Medic

Shore-based:

University of Manchester: Liam Marsh, Becan Lawless, Danny Hills, Rauan Khangerey

Other than drilling the ice there is no single technology which can return accurate, high resolution, snow depth and sea ice thickness measurements under a range of sea ice conditions. The UK's EPSCR funded a project called TRaNSMIT which aims to develop a towable system (mounted on a sled) for non-invasive sensing and measurement of Arctic sea ice thickness and the depth of the overlying snow cover. This is achieved by fusing two technologies, electromagnetic induction (EMI) and ground penetration radar (GPR). These modalities are sensitive to different aspects of the environment (EMI delivers total snow+ice thickness, whilst GPR delivers just snow depth). The new sensor will be incorporated into a sled so that it can easily maneuverer over the sea ice.

These tests represent the first tests of the EMI part of the sled on sea ice. These tests were performed on the same floe as the one the buoys were deployed on. We flew the helicopter to the floe and whilst we were waiting for the *Polarstern* to arrive to deliver the buoys we performed four experiments. These are elaborated below.

12 January 2026: Many of the floes had broken up from the previous day as there was a slight swell running. This made it difficult to find a bigger floe, the one we picked was about 80 m by 50 m with a 30 cm snow cover and a thickness of around 170 cm. The same floe was used for the buoy deployment. Note:

- All times are in UTC from our GPS unit in 1 minute increments.
- All metal was removed for persons near sled. However, the survival suits we were wearing had metal zippers on them.

Experiment 1: Nulling and height measurements

The aim of this experiment was to null the sled in both a vertical and a horizontal position to see if the different orientations produced different results. Nulling is the process of cancelling out the powerful magnetic field generated by the sensor's own transmitter. By doing this we can create a clean baseline so that the less powerful magnetic field generated by the sea water stands out. By "zeroing out" the transmitted signal the sensor becomes more sensitive, allowing to detect the target (in our case the seawater at the ice-ocean interface) at greater distances. It is expected that the vertical nulling will be better.

After a nulling experiment was completed we performed height experiments for that nulling. These height measurements are need to accurately determine the sensor's distance from the seawater (at the ice-ocean interface), in this case the total snow+ice thickness. By performing measurements at known heights we can develop a look-up table of how the EMI signal relates to the distance from the seawater (i.e. the total snow+ice thickness).

Ideally these height measurement experiments would be determined over thin ice, so that your look up table starts with thin sea ice thickness and then increases in height. Given the small size of the floe and that is was pretty uniformly thick we did not have access to thin ice.

Times associated with our vertical nulling

15:41 First two switches on

15:42 flashing

Turned sled vertically so it sat on its tail

15:43 Nulling turned on

15:44 Nulling complete

15:45 Turned 4th switch on

Fig. 2.7.23: Nulling in the vertical position i.e. sled standing on its tail.

Vertical Height measurements

Staring with the sled on the ground we raised the sled in 10 cm increments up to 180 cm. At each time we held the height for ten seconds trying to ensure the sled was flat i.e. roll and pitch was within range. At each height movement we measured the distance between the top of the snow and the bottom of the sled (need to add the offset to the coil) with an avalanche pole, which was made of thin aluminum (so we hope it does not impact the readings).

Tab. 2.7.16 and Tab. 2.7.17: *Time and height on way up (Tab. 2.7.16) and way down (Tab .2.7.17) of system vertical calibration.*

Time	Height (way up)
15:47	snow
15:48	10
15:48	20
15:48	30
15:49	40
15:49	50
15:49	60
15:49	70
15:49	80
15:50	90
15:50	100
15:50	110
15:50	120

Time	Height (way down)
15:52	180
15:52	170
15:53	160
15:53	150
15:53	140
15:53	130
15:53	120
15:53	110 (may have been slight lower)
15:54	100
15:54	90
15:54	80
15:55	70
15:55	60

Time	Height (way up)
15:51	130
15:51	140
15:51	150
15:51	160
15:51	170
15:52	180

Time	Height (way down)
15:55	50
15:55	40
15:56	30
15:56	20
15:56	10
15:57	snow

Horizontal Nulling

For this part of the experiment we repeated the nulling, but this time with sled on the snow, as can be seen in the following picture.

After the nulling we switched the 4th switch on 16:01 so that the recording started and we could start the height measurements with the system that was nulled in the horizonal mode.
Data on the height measurements are in the following table.

Tab. 2.7.18 and Tab. 2.7.19: *Time and height on way up (Tab. 2.7.16) and way down (Tab. 2.7.17) of system horizontal calibration.*

Time	Height (way up)
16:04	snow
16:05	10
16:05	20
16:05	30
16:05	40
16:06	50
16:06	60
16:06	70
16:06	80
16:06	90
16:07	100
16:07	110
16:07	120
16:08	130
16:08	140
16:08	150
16:08	160
16:09	170
16:09	180

Time	Height (way down)
16:09	180
16:09	170
16:09	160
16:10	150
16:10	140
16:10	130
16:10	120
16:11	110
16:11	100
16:11	90
16:11	80
16:11	70
16:12	60
16:12	50
16:12	40
16:12	30
16:13	20
16:13	10
16:13	snow

This site in near Experiment 3: Site 0m, which corresponds to total ice-snow thickness of 198 cm, which breaks down to a snow thickness of 30 cm and an ice thickness of 168 cm.

Experiment 2: Battery test

This experiment was to determine if the location of the battery in relation to the sled impacted the EMI readings. We started by vertically nulling the system. The timings are below:

Vertical Nulling

16:15 First two switches on

16:15 flashing and turned sled vertically so it sat on its tail

16:16 Nulling

16:17 turned 4th switch on to start the system recording

We then started with placing the battery 200 cm away from the nose of the sled and moved it in 50 cm increments closer to the sled. We tried to keep the sled in position for about 60 seconds.

16:18 200 cm from sled

16:19 150 cm from sled

16:20 100 cm from sled

16:21 50 cm from sled

16:22 0 cm from sled

16:23 in sled halfway between the front and the electronic box

Experiment 3 Static measurement test along a transect line

The aim of this experiment w56 EM sled measurements coincident with total ice-snow thickness readings. This was achieved along a 25 m section of the floe. Starting at 0 m (near the Experiment 1 site) and running in 5 m increments out to about 25 m. All distances are approximate, as they were paced out. This gives a total 6 independent measurements. The EM sled stopped at each site twice, once on the way out to 25m mark and then again on the way back to 0m mark. We drew a line in the snow at each measurement site to ensure measurements were in the same location, and thus were over the same snow+ice thickness. At some sites the snow topography made it difficult to level the system, and we had to move the sled around so the pitch and roll were within acceptable bounds. We tried to keep the sled in position for about 60 seconds.

Obtaining snow+ice thickness by drilling along the transit line at 0, 5, 10, 15, 20, 25 m.

Tab. 2.7. 20: *Table with characteristics of static measurement test along a transect line*

Distance	Time (from 0-25m)	Time (from 25-0m)	Thickness Snow+ice	Snow depth	Ice Thickness	Freeboard*
0	16:30	16:42	198	30	168	3
5	16:31	16:41	200	30	170	5
10	16:32	16:40	205	32	173	3
15	16:33	16:39	205	38	167	-3**
20	16:34	16:38	216	42	174	4
25	16:35	16:37	206	32	174	4

** the freeboard was difficult the determine as we did not remove the snow from the ice, because of this we did not have a clear view of the sea surface as it was too down the hole. Thus, these values should be used with caution.*

*** no evidence of flooding was seen*

Experiment 4: Long static measurement test

Once experiment 3 was completed, we moved the sled to corner area of the floe and left it running there. After several hours we moved the sled closer to the centre of the floe. Unfortunately, we did not note the time of this move but we can most likely identify this from the change in pitch and roll. At some time later we turned off the system. The battery still seemed fine, but did not check the voltage.

Salinity:

The agreement was for the bio-team to come on the floe to take ice cores after the buoy deployment. However, with the buoy deployment running over time and a piece of the floe breaking off, it was not possible for the bio-team to come on the ice. Therefore the following is the salinity of a different floe (SiteB), but with similar ice thickness and snow depth.

From Site B

- Total core length: 182 cm from sea ice bottom to top of sea ice
- Total snow/ice length: 202 cm from sea ice bottom to top of snow.
- Total snow depth: 19 cm

Ice temperature and salinity from Site B. Average salinity (with unreliable measurements removed) of the core is: 4.4.

Tab. 2.7.21: *Table with salinity measurements by Icelight from station PS152_29-1.*

Section from Top (cm)	Sea ice temperature (°C)	Top to bottom salinity (psu)
0 (top)	-2.1	3.6
10	-2.1	4.8
20	-2.2	4.9
30	-2.3	4.3
40	-2.4	5.3
50	-2.5	4.0 (little water left so unreliable)
60	-2.7	3.8
70(bottom)	-2.8	N/A
70-80	-2.7 (Air temp: -3.2)	4.2
80-90	-2.4	1.4 (little water left so unreliable)
90-100	-2.2	3.7
100-114	-2.5	2.2
114-124	-2.7	4.7
124-134	-2.5	3.7
134-144	-2.5	4.0
144-154	-2.4	0.6 (little water left so unreliable)
154-164	-2.4	7.0
164-174	-2.2	5.9
174-184	-2.2	4.1
184-195	-2.3	0.4 (little water left so unreliable)

PS152_35-5

Buoy work and 096 and 097 deployment

Status and deployment of buoys

To improve observations of air – ice – ocean – ecosystem interactions in the Antarctic sea-ice area, several ice-tethered buoys were prepared for deployment as part of the PS152 secondary user project ICELIGHT. These systems were designed to operate together as integrated drifting sea-ice observatories, measuring complementary physical, variables from the atmosphere, snow, sea ice and ocean together with biological variables while drifting with the ice. Instrumentation included measurements of atmospheric conditions, snow and ice mass balance, ocean temperature and salinity, solar radiation at the surface, waves, light transmission, fluorescence and zooplankton backscatter.

Prior to deployment, all buoy systems underwent extensive onboard assembly, testing, and soak testing to verify sensor performance, power stability, and satellite communications. This process identified several engineering issues, most notably incorrectly rated fuses in lithium battery packs supplied for the SIMRAD buoys and installation challenges associated with battery packs, connectors, and sensor wiring. Despite partial remediation, these battery issues could not be fully resolved in the field, rendering both SIMRAD buoys non-deployable. The two mini-WIMBO buoys were also stood down to preserve the integrity of the multi-platform observatory concept.

As a result, the original deployment plan was revised. Instead of a fully integrated bio-physical observatory, the team proceeded with deployment of two DEFIANT buoys (096 and 097), shifting the scientific focus toward a physics-oriented sea-ice observatory. These buoys have the ability to provide continuous measurements of atmospheric forcing, snow accumulation, sea-ice thermodynamics, wave conditions, and upper-ocean physical structure, enabling year-round monitoring of air – ice – ocean interactions.

Deployment of DEFIANT buoys 096 and 097 took place on 12 January 2026 following helicopter reconnaissance to locate a suitable ice floe. Fragmented ice conditions limited available options, and a smaller-than-ideal floe (~80 × 50 m, ~1.7 m ice thickness) was selected as the best available site. Installation was technically challenging due to thick ice, difficult drilling conditions, and the complexity of the buoy systems, particularly the 120 m temperature-salinity chain on buoy 097. After approximately 10 hours of work, both buoys were successfully installed and confirmed operational, with the exception of the underwater camera on buoy 097, which could not be deployed due to time and energy constraints.

Fig. 2.7.25: DEFIANT buoys installation site, showing system 097 before installation with T/S chain preparation before installation and deployment

Fig. 2.7.26: 096 system deployed, before batteries and underwater sensors installation

Fig. 2.7.27: Both systems 097 on the left and 096 on the right, fully deployed on the floe

Drone flights during PS152_35-5 and PS152_52-1

When preparing for PS152, BAS acquired a Yuneec H520 drone and the ICELIGHT team seized the opportunity to bring that drone to Antarctica to allow pictures to be taken of the nearby sea ice conditions when deploying the buoys. The drone was used on two occasions, first before the buoys deployment during the EM-sled testing and before *Polarstern* reach the team on the ice, and second during the last ice station.

In both cases, the drone was used to take pictures of the nearby sea ice conditions from above and to survey the floes.

Fig. 2.7.28: Drone image of the ICELIGHT team on the ice on 12 January with Jeremy and Ante working with the EM sled and Gaelle flying the drone

2.8 SEASONALITY OF CARBON TURNOVER IN THE WEDDELL SEA (SEACAT)

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Grant-No. AWI_PS152_13

Objectives

The seasonal dynamics of the biological carbon pump in the Weddell Sea, including the spatiotemporal distribution and diversity of its microbial drivers, remain understudied. SeaCaT combines year-round and shipboard sampling to study microbial composition and functions over time and space, establishing a comprehensive eDNA archive of the WOBEC area and the Weddell Gyre. The project concentrates on (i) continuous records of biodiversity, biogeochemistry and oceanography from moored sensors and samplers, and (ii) eDNA sampling along PS152 followed by molecular diversity studies (expanding on PS146 and to be continued on future campaigns). Similar endeavors have successfully elucidated annual and biogeographical ecosystem structuring in the Arctic (von Appen et al. 2021; Wietz et al. 2024; Priest et al. 2025) and Antarctic Oceans (Hellmer & Holtappels 2021; also see current DFG project by M. Wietz).

On PS152, SeaCaT aimed to recover three moorings which have sampled microbial and environmental parameters since their deployment on PS146. Moorings carry autonomous water samplers, particle imagers, sensors, and sediment traps for a detailed seasonal picture of the biological carbon pump. In addition, water samples will be analyzed via eDNA metabarcoding to elucidate biogeographic and hydrographic drivers of microbial diversity.

In summary, SeaCaT establishes a comprehensive portrait of:

- Microbial diversity throughout the Weddell Sea, across water masses and biogeographic provinces
- Seasonal primary production, particle export, and carbon sequestration
- Keystone microbial taxa and genes that drive seasonal and spatial ecosystem structuring and biogeochemical processes

Work at sea

Moorings

SeaCaT has recovered three moorings (see details in Tab. 2.8.1). From BGC-25-1, we successfully recovered the mixed-layer extension, reaching from the terminal upper end (approx. 250 m depth) of a HAFOS mooring into surface waters (approx. 40 m depth). The extension carried a package of sensors that measured conductivity, temperature, depth, O_2, pH, pCO_2, and chlorophyll since deployment on PS146. A releaser allowed the separate recovery of the extension, while the HAFOS "mooring base" remained on site. BGC-25-2 and BGC-25-4 were standalone moorings where the sensor packages were complemented by autonomous Remote Access Samplers (RAS) and sediment traps, which have both successfully collected water and sinking matter, respectively, throughout the year of deployment. Biological samples had been preserved *in-situ* directly after sampling, and are now stored at 4°C for later analysis in the home lab. The stand alone moorings furthermore carried autonomous camera systems (Underwater Vision Profiler) for high-resolution particle imaging.

Fig. 2.8.1: Pictures of the mooring recoveries of BGC-25-1, BGC-25-2, and BGC-25-4 (from left to right) Picture credits (from left to right): Sergio Rossi, Christoph Held, Miriam Seifert

Tab. 2.8.1: BGC moorings recovered on PS152

SeaCaT Mooring-ID	HAFOS Mooring-ID	Latitude / Longitude	Comment	Deployed	Recovered
BGC-25-1	AWI227-17	59° 04,490' S 0° 06,058' E	mixed-layer extension	04.01.2025	24.12.2025
BGC-25-2	AWI231-15	66° 28,910' S 0° 02,884' E	stand-alone	20.01.2025	30.12.2025
BGC-25-4	AWI208-11	65° 43,100' S 36° 37,749' W	stand-alone	19.02.2025	27.01.2026

Water column sampling

Aligned with the WOBEC CTD program, SeaCaT has sampled all major water masses for later eDNA sequencing of biological communities (Tab. 2.8.2 and Tab. 2.8.3). As a continuation of CTD sampling during PS146, this establishes a multiannual biodiversity inventory of the WOBEC area. In total, we took 181 samples from 28 CTD casts (9 casts on the meridional transect, 17 casts in the WOBEC box, and 2 casts at the mooring locations, Tab. 2.8.3) covering all major water masses. Combined with the sampled other parameters such as POC, DIC, DOC, Chl-a, and BSi by other WOBEC participants (see Chapter 2.1), this establishes a holistic picture of water column processes. Furthermore, we took bottom water samples from 18 Ocean Floor Observation and Bathymetry System (OFOBS) transects (see Chapter

2.3; Tab. 2.8.3) which add to the understanding of microbial diversity close to the seafloor. CTD- and OFOBS-derived samples were filtered on Sterivex cartridges, and frozen at -20°C for later metabarcoding in the home lab. For an additional picture of pelagic microbial diversity between the stationary sampling, underway water samples were autonomously filtered by the AUTOFIM system on 47mm polycarbonate filters (Metfies et al. 2016); resulting in 8 filters on the meridional transect and 10 filters on the transect between Kapp Norvegia and 60°S (Tab. 2.3). While SeaCaT focuses on bacterial and microeukaryotic diversity, the resulting DNA will be shared in collaborative studies across trophic levels, for instance fish (in cooperation with Chiara Papetti) and zooplankton (in cooperation with Hauke Flores). Furthermore, we integrate with molecular and biogeochemical studies in sea-ice (with Jacqueline Stefels and Maria van Leeuwe) as well as sediment (with Heike Link). Together, these efforts establish a comprehensive biological portrait from surface to seafloor.

Tab. 2.8.2: Summary of eDNA samples

Sampling device	Number of samples
CTD	181
OFOBS	32
AUTOFIM	18

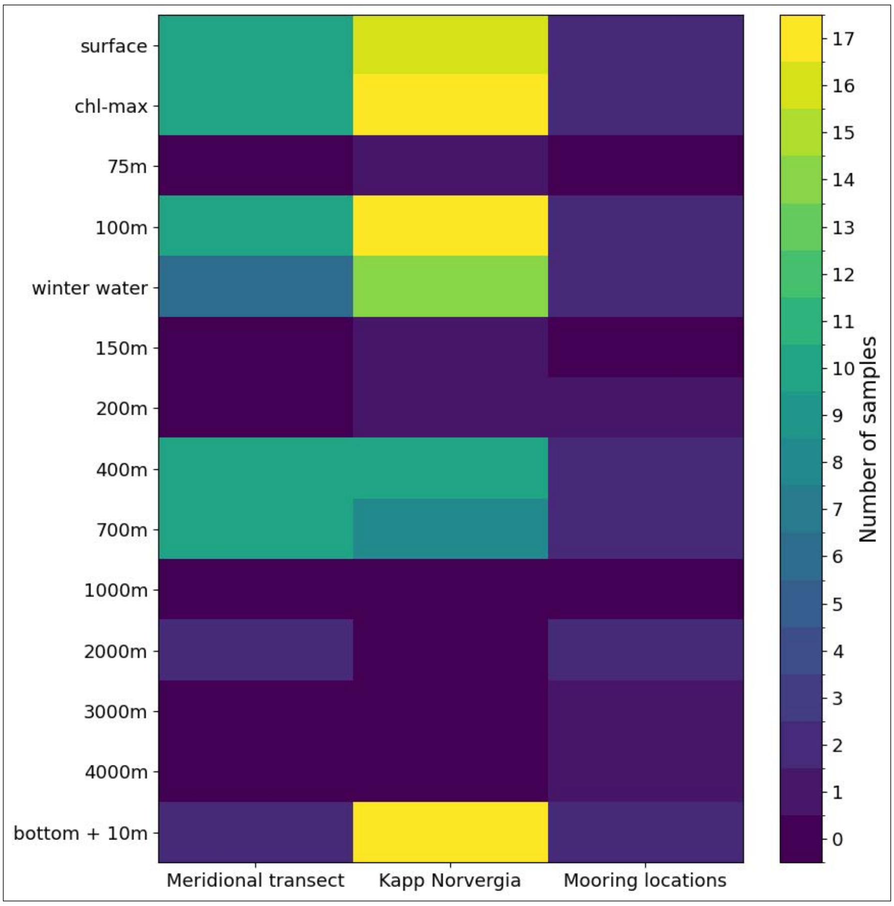

Fig. 2.8.2: Number of eDNA samples per depth from CTD casts at the three major sampling regions (meridional transect, Kapp Norvegia, and mooring locations)

Tab. 2.8.3: Station table of eDNA samples

Device operation	Date	Depth													
CTD															
		surface	chl-max	75m	100m	winter water	150m	200m	400m	700m	1,000m	2,000m	3,000m	4,000m	Botttom + 10m
PS152_1-2	2025-12-24	x	x		x	x			x	x		x	x		x
PS152_3-3	2025-12-25	x	x			x			x	x					
PS152_5-2	2025-12-25	x	x			x			x	x					
PS152_7-1	2025-12-26	x	x			x			x	x					
+PS152_9-2	2025-12-26	x	x			x			x	x					
PS152_11-1	2025-12-27	x	x		x	x			x	x		x			
PS152_13-1	2025-12-28	x	x		x	x			x	x					x
PS152_15-1	2025-12-29	x	x		x	x			x	x		x			x
PS152_17-1	2025-12-30	x	x			x			x	x					
PS152_18-2	2025-12-30	x	x		x	x		x	x	x		x		x	x
PS152_21-3	2025-12-31	x	x		x	x			x	x					
PS152_23-1	2026-01-01	x	x		x	x			x	x					
PS152_26-2	2026-01-07	x	x		x	x			x	x					x
PS152_27-1	2026-01-07	x	x		x	x			x	x					x
PS152_28-1	2026-01-08	x	x		x										x
PS152_30-3	2026-01-09	x	x		x	x									x
PS152_31-3	2026-01-09	x	x		x	x			x						x
PS152_34-2	2026-01-11	x	x			x			x	x					x
PS152_35-2	2026-01-12	x	x		x	x			x	x					x
PS152_36-2	2026-01-13	x	x		x	x									x
PS152_37-1	2026-01-13	x	x		x	x			x	x					x
PS152_38-2	2026-01-14	x	x		x	x			x	x					x
PS152_39-2	2026-01-14	x			x	x			x	x					x
PS152_40-2	2026-01-15	x	x		x	x									x
PS152_45-1	2026-01-17	x	x		x	x									x
PS152_46-1	2026-01-20	x	x		x	x			x						x
PS152_47-1	2026-01-21	x	x		x	x			x	x					x
PS152_50-1	2026-01-22	x	x	x	x		x	x							x
OFOBS															
PS152_13-7	2025-12-29	1,374 m													
PS152_13-9	2025-12-29	1,394 m													
PS152_15-2	2025-12-29	2,749 m													
PS152_27-7	2026-01-07	1,007 m													

Device operation	Date	Depth													
CTD															
		surface	chl-max	75m	100m	winter water	150m	200m	400m	700m	1,000m	2,000m	3,000m	4,000m	Botttom + 10m
PS152_28-5	2026-01-08	251 m													
PS152_30-2	2026-01-09	226 m													
PS152_31-8	2026-01-10	580 m													
PS152_33-3	2026-01-11	550 m													
PS152_36-1	2026-01-13	1,351 m													
PS152_37-4	2026-01-14	2,049 m													
PS152_39-3	2026-01-15	1,402 m													
PS152_40-3	2026-01-15	385 m													
PS152_43-1	2026-01-16	409 m													
PS152_44-7	2026-01-17	276 m													
PS152_45-2	2026-01-17	291 m													
PS152_45-6	2026-01-19	303 m													
PS152_46-3	2026-01-20	932 m													
PS152_47-3	2026-01-21	2,169 m													
AUTOFIM															
PS152_2-1	2025-12-24	Flow-through intake of the ship													
PS152_4-1	2025-12-25	Flow-through intake of the ship													
PS152_8-1	2025-12-26	Flow-through intake of the ship													
PS152_10-1	2025-12-27	Flow-through intake of the ship													
PS152_12-1	2025-12-28	Flow-through intake of the ship													
PS152_14-1	2025-12-29	Flow-through intake of the ship													
PS152_19-1	2025-12-31	Flow-through intake of the ship													
PS152_22-1	2025-12-31	Flow-through intake of the ship													
PS152_53-1	2026-01-26	Flow-through intake of the ship													
PS152_54-1	2026-01-26	Flow-through intake of the ship													
PS152_56-1	2026-01-27	Flow-through intake of the ship													
PS152_57-1	2026-01-27	Flow-through intake of the ship													
PS152_59-1	2026-01-28	Flow-through intake of the ship													
PS152_60-1	2026-01-28	Flow-through intake of the ship													
PS152_61-1	2026-01-29	Flow-through intake of the ship													
PS152_62-1	2026-01-29	Flow-through intake of the ship													
PS152_63-1	2026-01-30	Flow-through intake of the ship													
PS152_64-1	2026-01-30	Flow-through intake of the ship													

Preliminary (expected) results

Biological samples and sensor data from the recovered moorings will substantially advance the understanding of the seasonal biological carbon pump, expanding upon the already established evidence within SeaCat and the DFG project by M.Wietz. Furthermore, the PS152 water sampling continues the microbial-biogeographic assessment across the Weddell Sea, started on PS146 where equivalent water masses and locations have been sampled. Hence, PS146 and PS153 are the joint foundation for a microbial diversity archive of the Weddell Sea, to be expanded during future campaigns (e.g. PS153, HAFOS-2028, InSync). Microbial metabarcoding (16S / 18S rRNA genes) of PS146 samples is underway, and PS152 samples will follow directly once these are available in the home lab. At the end of 2026, all samples will have been sequenced, and sequences made available within the WOBEC consortium. In parallel, DNA will be shared with collaborating groups as soon as possible for molecular studies of other taxa and trophic levels. This combined seasonal-biogeographic archive contributes to the spatiotemporal biological understanding of the WOBEC area, representing a strong foundation for long-term insights into molecular biodiversity and its changes.

References

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Priest T, Oldenburg E, Popa O, Dede, B, Metfies K, von Appen W-J, et al. Seasonal recurrence and modular assembly of an Arctic pelagic marine microbiome. Nat Commun 16: 1326, https://doi.org/10.1038/s41467-025-56203-3

Wietz M, Engel A, Ramondenc S, Niwano M, von Appen WJ, Priest T, von Jackowski A, Metfies K, Bienhold C and Boetius A (2024) The Arctic summer microbiome across Fram Strait: Depth, longitude, and substrate concentrations structure microbial diversity in the euphotic zone. Environmental Microbiology, 26(2). https://doi.org/10.1111/1462-2920.1656SSSS

2.9 OUTREACH AND MEDIA ACTIVITIES

Heike Link[1]; Tamara Spiegl[1], Hauke Flores[2]
Not on board: Kirstin Werner*[1]
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Grant-No. AWI_PS152_01

Objectives

Knowledge transfer on the Weddell Sea biodiversity and ecosystem is one of WOBECs key objectives. Apart from the co-design with stakeholders, communication and outreach formats for public audiences are important pillars in the WOBEC project. Expeditions such as PS152 offer the excellent opportunity to engage the public and society with science through people at work.

Communication and outreach activities were led by the Media Department of the University of Rostock in collaboration with the Communications and Media Relations department of the Alfred Wegener Institute. A concept for communication activities was developed prior to the cruise, including plans for social media, media contacts, and school outreach. International partner institutions of WOBEC were consulted in advance and, where possible, actively involved into communication activities during the cruise. A press release (15 December 2025) and two media invitations (for preparations, 22 September 2025 and 21 October 2025; and for one of the school events, 13 January 2026) were issued to raise interest in regional and national media prior to the expedition.

Work at sea

Activities during PS152 were led by Kirstin Werner from the land-based press office (University of Rostock) and Tamara Spiegl onboard. All WOBEC participants contributed to communication activities, while Tamara Spiegl coordinated contributions and produced especially social media items. Activities were conducted in German and English, addressing the general public, schools, and the media (Fig. 2.9.1).

Live and recorded interviews for national broadcast media from *Polarstern* were given by Heike Link, Hauke Flores, Jacqueline Stefels, Clemens Abraham, Capt. Felix Kentges.

Social media activities were primarily conducted via *Polarstern* App https://follow-polarstern.awi.de and the University of Rostock's Instagram channel @unirostock, shared with the @awiexpedition and @wobec_ Instagram accounts; additional posts were published on the University of Rostock's LinkedIn channel and shared with AWI LinkedIn.

School outreach activities were mainly organized by the University of Rostock and included five live ship-to-school connections reaching about 420 German schoolchildren (grades 1 to 12).

Examples

2.9.1. Press release

15 Dezember 2025
Research icebreaker *Polarstern* sets sail for the Antarctic Weddell Sea

Joint press release by the University of Rostock and the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI)

An international research team is investigating the impact of climate change on biodiversity in Antarctica. The expedition is being led by the University of Rostock: https://www.uni-rostock.de/en/university/news-and-publications/press-releases/details/n/forschungseisbrecher-polarstern-bricht-auf-ins-antarktische-weddellmeer-260466/

2.9.2 Broadcast Media coverage

- 15 December 2025, ARD Audiothek/Bayern 2

  Expedition ins Weddellmeer: *Polarstern* erkundet Hotspot des Lebens
  https://www.ardaudiothek.de/episode/urn:ard:episode:2ab732c237d40674/

- 15 December 2025, Tagesschau.de (podcast, 4 min)

  "*Polarstern*" startet Expedition zur Antarktis
  https://www.tagesschau.de/wissen/forschung/forschungsreise-polarstern-100.html

- 15 December 2025, Stockholm Resilience Centre/Stockholm University

  Voyage to the Weddell Sea: Establishing a baseline for one of Earth's last pristine ecosystems
  https://www.stockholmresilience.org/research/research-stories/2025-12-15-voyage-to-the-weddell-sea-establishing-a-baseline-for-one-of-earths-last-pristine-ecosystems.html

- 15 December 2025, NDR DAS! Rote Sofa

  Von Rostock in die Antarktis: Polarforscherin Dr. Heike Link (UR)
  https://www.ndr.de/fernsehen/sendungen/das_rote_sofa/von-rostock-in-die-antarktis-polarforscherin-dr-heike-link,dasrotesofa-948.html

- 15 December 2025, SWR Wissen aktuell

  Forschungsschiff *Polarstern* untersucht Artenvielfalt in der Antarktis
  https://www.swr.de/swrkultur/wissen/wissen-aktuell-impuls-2025-12-15-100.html

- 15 December 2025, Nachrichten Bayern 2 und BR24
  https://www.br.de/radio/live/bayern2/programm/2025-12-15/3679404/#t=17:25:10

- 24 December 2025, NDR Info, ca. 8:20 AM

  Interview mit Antarktisforscherin Dr. Heike Link

- 27 December 2025, Bayern 2 am Samstagvormittag

  Antarktisforscher Dr. Hauke Flores im Interview

- 27. December 2025, NDR nordmagazin, 7.30 PM (TV and online)

  Polarforscherin feiert Weihnachten in der Antarktis
  https://www.ndr.de/fernsehen/sendungen/nordmagazin/polarforscherin-feiert-weihnachten-in-der-antarktis,nordmagazin-6196.html

- 6 January 2026, rbb radio3 – rbb radio3 am Nachmittag – Ist die Welt noch zu retten? Das radio3 Klimagespräch 06.01.2026

  Gespräch mit Heike Link live von der „*Polarstern*" in der Antarktis
  https://www.radiodrei.de/programm/schema/sendungen/radio3_am_nachmittag/archiv/20260106_1600/radio3_aktuell_1810.html

- 14 January 2026, Nordkurier.de

  Rostocker Polarforscher wagen sich dorthin, wo nur wenige Menschen je waren
  https://www.nordkurier.de/regional/rostock/rostocker-polarforscher-wagen-sich-dorthin-wo-nur-wenige-menschen-je-waren-4265259

- 16 January 2026, NOS Radio 1 Journaal (6–9.30 AM)

  Jacqueline Stefels (Rijksuniversiteit Groningen) about the Antarctic expedition
  https://www.nporadio1.nl/uitzendingen/nos-radio-1-journaal/019b3208-3a74-72da-8967-011b02152569/2026-01-16-nos-radio-1-journaal

- 22 January 2026, dpa-Kindernachrichten

  Antarktis erleben: Kinder fragen Forschende auf Expedition, u.a. in Main-Echo.de https://www.main-echo.de/magazine/mami-papi-ich/aktuelles/antarktis-erleben-kinder-fragen-forschende-auf-expedition-art-8655637

- 24 January 2026, Ostsee-Zeitung (print und online)

  Print: „Ein Kapitän bricht das Eis" (Titelseite) and **„Rostocker steuert Forschungsschiff in die Antarktis" („Magazin" MV-weit)**

  Online: Rostocker Kapitän arbeitet monatelang in der Antarktis: „Führe zwei unterschiedliche Leben"
  https://www.ostsee-zeitung.de/lokales/rostock/rostocker-kapitaen-ist-monatelang-auf-forschungsreise-in-der-antarktis-6C5DLH4D4ND27B3YJH7JJOEQF4.html?utm_medium=social&utm_source=app_ios&utm_campaign=share_button

- 28 January 2026, Norddeutsche Neueste Nachrichten (online and video)

  Live aus dem ewigen Eis: Schüler per Live-Schalte mit Eisbrecher verbunden
  https://www.nordkurier.de/regional/rostock/live-aus-dem-ewigen-eis-schueler-per-live-schalte-mit-eisbrecher-verbunden-4300607

2.9.3 Social Media activities

Polarstern App (German and English)

- 17 December 2025: Next Destination: Antarctica
- 19 December 2025: Setting up on board: When research takes shape underway
- 23 December 2025: Critter of the Week I – Antarctic Krill
- 25 December 2025: Christmas on board: Between scientific activity and festive reflection
- 26 December 2025: A last look at the night sky
- 29 December 2025: Critter of the Week II – Tomopteris
- 01 January 2026: New Year's Eve on board
- 03 January 2026: Ascent into the stratosphere
- 05 January 2026: Critter of the Week III – Southern Giant Petrel
- 09 January 2026: Reaching and supplying *Neumayer Station III*
- 16 January 2026: Ice cores: Life in the frozen ocean
- 17 January 2026: Critter of the Week IV – Ice algae
- 19 January 2026: The Weight Watchers Club: A Small Bet for a Big Cause
- 22 January 2026: Critter of the Week V – Antarctic Toothfish
- 23 January 2026: Life on the ocean floor: Hidden beauty
- 25 January 2026: Bendex Area: How icebergs shape the seafloor
- 28 January 2026: Critter of the Week VI – Antarctic Sponges
- 30 January 2026: The pelagic ecosystem: migration, food and global warming
- 01 February 2026: Antarctic ecosystem under surveillance – Insights from the WOBEC expedition in a phase of unusually low sea-ice cover
- 02 February 2026: Between Ice and World

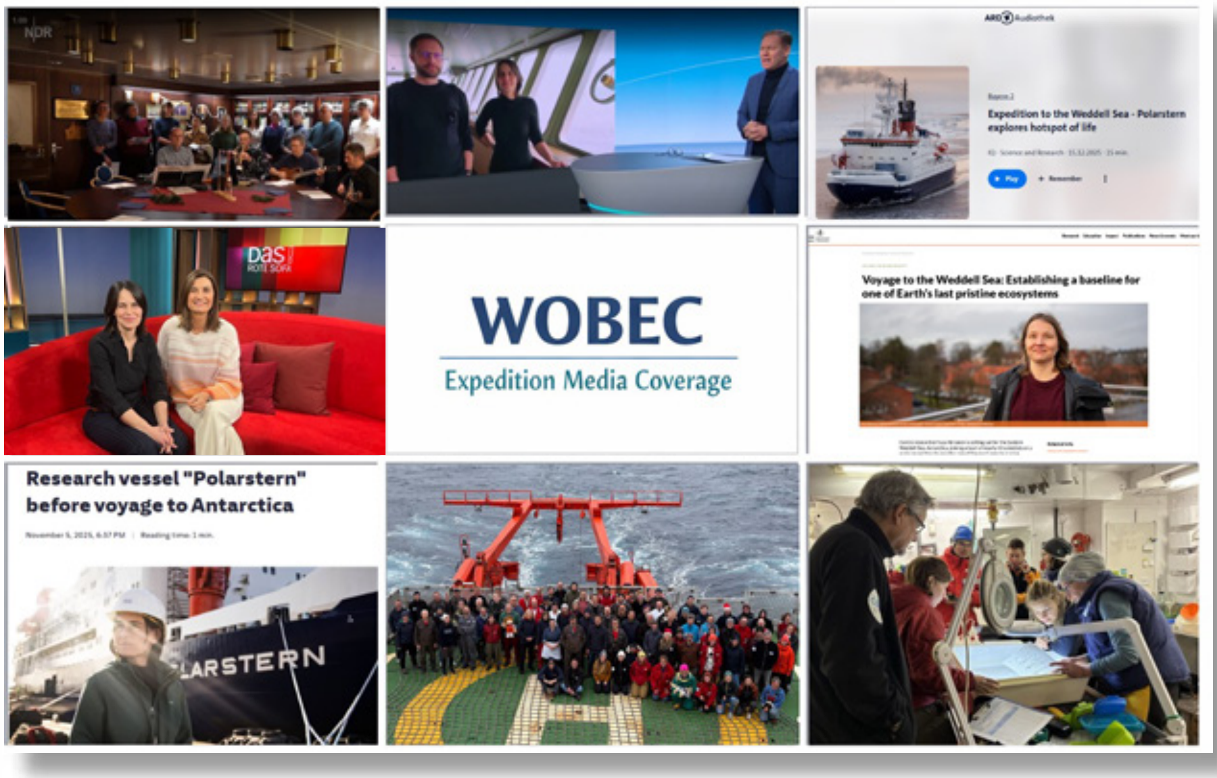

Fig. 2.9.1: Impressions from Media coverage of the WOBEC expedition

Instagram @unirostock (German), (shared with @wobec_ and @awiexpedition)

Reels: (further posts according to *Polarstern* App)

- 14 November 2025: Start of WOBEC expedition in about a month, with University of Rostock chief scientist Heike Link
- 15 December 2025: Start of WOBEC expedition today, with University of Rostock chief scientist Heike Link
- 17 December 2025: Next Destination Antarctica
- 20 December 2025: Aufbau der Labore an Bord
- 24 December 2025: Merry Christmas from aboard
- 07 January 2026: Hot Spot unter dem Eis – Maud Rise
- 15 January 2026: Versorgung der *Neumayer-Station III*

Linkedin University of Rostock (German)

- 15 December 2025: Jetzt geht es endlich los!
- 18 December 2025: Aufbruch ins Weddellmeer
- 20 December 2025: Aufbau der Labore an Bord (Video)
- 23 December 2025: Critter of the Week I – Antarctic Krill
- 26 December 2025: Ein letzter Blick in den Sternenhimmel
- 29 December 2025: Critter of the Week II – Tomopteris
- 05 January 2026: Aufstieg in die Stratosphäre
- 07 January 2026: Critter of the Week III – Sturmvogel
- 07 January 2026: Maud Rise – ein biologischer Hot Spot unter dem Eis (Video)
- 09 January 2026: Erreichen und Versorgung der *Neumayer-Station III*
- 15 January 2026: Versorgung der Neumayer-Station III (Video)
- 16 January 2026: Meereisbohrkerne – Forschung auf dem Eis
- 17 January 2026: Critter of the Week IV – Eisalgen
- 23 January 2026: Critter of the Week V – Antarktischer Seehecht
- 26 January 2026: Leben auf dem Ozeanboden – verborgene Schönheit
- 27 January 2026: Wie Eisberge den Meeresboden prägen
- 28 January 2026: Critter of the Week VI – Antarktische Schwämme
- 03 February 2026: Antarktisches Ökosystem unter Beobachtung: Erste Einblicke der WOBEC-Expedition in einer Phase ungewöhnlich geringer Meereisbedeckung
- 03 February 2026: Forschung im Antarktischen Meereis – warum winzige Algen eine riesige Rolle spielen
- 03 February 2026: Zwischen Eis und Welt

2.9.4 School interactions (live *Polarstern*-to-school broadcasts)

- 13 January 2026, Eschbach-Gymnasium Stuttgart Freiberg, approx. 20 schoolchildren, upper secondary school
- 20 January 2026, Primary School (Veernschule), Bremerhaven, 3rd grade, approx. 25 schoolchildren
- 22 January 2026, CJD Christopherus-Gymnasium Rostock, approx. 200 schoolchildren, grades 5 to 12

- 27 January 2026, Primary School (Astrid-Lindgren-Schule Niestetal), Heiligenrode bei Kassel, approx. 130 schoolchildren
- 28 January 2026 Primary School (Grundschule Gehlsdorf), Rostock, approx. 44 schoolchildren, 3rd grade (±9 years old)

Preliminary results

Media coverage, in total about 80 media items, included television, newspaper, radio, and online formats, with interviews conducted both prior to and during the cruise, including live interviews from onboard *Polarstern*. Overall, the work invested, has greatly improved visibility of the WOBEC expedition, the WOBEC project, *Polarstern* – and value as well as challenges of Southern Ocean ecology.

3. DATA MANAGEMENT

Environmental data and their corresponding metadata will be archived, published and disseminated according to the FAIR principle and international standards, such as DarwinCore, by the World Data Center PANGAEA Data Publisher for Earth & Environmental Science (https://www.pangaea.de) and similar national data centres within two years after the end of the expedition. By default, the CC-BY license will be applied.

All data belonging to the WOBEC project will be structured, stored and published according to the **WOBEC data management plan**, which builds on the principles set forth in "Alignment of Polar Data Policies – Recommended Principles" (2021), the SCAR data Policy (2022) and the MOSAIC data policy.

For biological data, templates were developed in line with the Darwin Core standard used by the Ocean Biodiversity Information System (www.OBIS.org), the Global Biodiversity Information Facility (www.GBIF.org), and the Nansen Legacy (https://arvenetternansen.com/). Biological data will be made available through the SCAR Antarctic Biodiversity Portal.

Molecular data (DNA and RNA data) will be archived, published and disseminated within one of the repositories of the International Nucleotide Sequence Data Collaboration (INSDC, www.insdc.org) comprising of EMBL-EBI/ENA, GenBank and DDBJ). Sensor data, UVP counts (particle and taxonomic plankton abundances), as well as biogeochemical measurements from sediment traps will be submitted to PANGAEA (for SeaCAT). UVP image and particle data will furthermore be made publicly accessible under CC-BY license at the web-based platforms Ecotaxa (https://ecotaxa.obs-vlfr.fr/) and Ecopart (https://ecopart.obs-vlfr.fr/). These platforms allow global synthesis of plankton images and particle distributions by combining fully intercalibrated and quality-checked UVP datasets.

Any other data will be submitted to an appropriate long-term archive that provides unique and stable identifiers for the datasets and allows open online access to the data and FAIR data sharing.

This expedition was supported by the Helmholtz Research Programme "Changing Earth – Sustaining our Future" Topic 6, Subtopics 6.1, 6.2, 6.3, 6.4, the Helmholtz Association's Young Investigators Group "DoubleTrouble", the Biodiversa+ project "Weddell Sea Observatory of Biodiversity and Ecosystem Change" (WOBEC), the Dutch Statutory Research Antarctica Programme, and the British NERC project BIOPOLE.

In all publications based on this expedition, the **Grant No. AWI_PS152_XX (according to the working groups, see chapters)** will be quoted and the following publication will be cited:

Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (2017) Polar Research and Supply Vessel POLARSTERN Operated by the Alfred-Wegener-Institute. Journal of large-scale research facilities, 3, A119. http://dx.doi.org/10.17815/jlsrf-3-163.

APPENDIX

A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTES

A.2 FAHRTTEILNEHMER:INNEN / CRUISE PARTICIPANTS

A.3 SCHIFFSBESATZUNG / SHIP‘S CREW

A.4 STATIONSLISTE / STATION LIST

A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTES

Affiliation	Address
On board	
BE.IRSNB	Institut Royal des Sciences Naturelles de Belgique Rue Vautier, 29 1000 Brussels Belgium
BE.ULB	Université Libre de Bruxelles Avenue F.D. Roosevelt, 50 1050 Brussels Belgium
BR.UFC	Labomar-Universidade Federal do Ceará Av Abolicao 3207 60165-081, Fortaleza Brasil
CR.BRUNCIN	BRUNCIN Lastovska 4 10000 Zagreb Croatia
DE.AWI	Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung Postfach 120161 27515 Bremerhaven Germany
DE.DRF	DRF Luftrettung gAG Laval Avenue E312 77836 Rheinmünster Germany
DE.DWD	Deutscher Wetterdienst Seewetteramt Bernhard Nocht Str. 76 20359 Hamburg Germany
DE.NHC	Northern HeliCopter GmbH Gorch-Fock-Str., 103 26721 Emden Germany

Affiliation	**Address**
On board	
DE.UNI-Bremen	Universität Bremen Leobener Straße, NW2a 28359 Bremen Germany
DE.UOL	Carl von Ossietzky Universität Oldenburg Carl-von-Ossietzky-Strasse 9-13 26132 Oldenburg Germany
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A.2 FAHRTTEILNEHMER:INNEN / CRUISE PARTICIPANTS

Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession	Fachrichtung/ Discipline
Abraham	Jan Clemens	DE.UNI-Rostock	Student (Master)	Biology
Barnes	David	UK.BAS	Scientist	Biology
Barz	Jakob	DE.AWI	Technician	Chemistry
Bock	Christian	DE.AWI	Scientist	Biology
Dalman	Laura	BE.ULB	Scientist	Biology
Feij	Bram	NL.Pagodroma	Other	Biology
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Freer	Jennifer	UK.BAS	Scientist	Biology
Gischler	Michael	DE.NHC	Pilot	Helicopter Service
Gottschalk	Milena	DE.UNI-Potsdam	Student (Master)	other geo sciences
Harding	Jack	DE.NHC	Pilot	Helicopter Service
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Kremer	Kira Izabela	DE.AWI	PhD student	Biology
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Meiburg	Jonathan	US.Knopf DoubledayRights	Journalist	Public Outreach
Moreau	Sebastien	NO.NPOLAR	Scientist	Oceanography
Niiranen	Susa	SE.SU	Scientist	Biology

Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession	Fachrichtung/ Discipline
Osanen	Janina Emilia	NO.NTNU	PhD student	Biology
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Rode	Jörg	DE.DRF	Engineer	Helicopter Service
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Różańska-Pluta	Magdalena	PL.PAS	Scientist	Biology
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Schröder	Henning	DE.AWI	Engineer	Biology
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Spiegl	Tamara	DE.UNI-Rostock	Scientist	Public Outreach
Stefels	Jacqueline	NL.RUG	Scientist	Biology
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Van de Putte	Anton	BE.IRSNB	Scientist	Biology
van Dorssen	Michiel	NL.DORSSEN	Technician	Biology
van Leeuwe	Maria	NL.RUG	Scientist	Biology
Veyssiere	Gaelle	UK.BAS	Scientist	Oceanography
Vortkamp	Martina	DE.AWI	Technician	Biology
Werna	Werna	DE.UNI-Rostock	Scientist	Biology
Werner	Melina	DE.AWI	PhD student	Biology
Wilkinson	Jeremy	UK.BAS	Scientist	Oceanography
Wold	Anette	NO.NPOLAR	Scientist	Biology

A.3 SCHIFFSBESATZUNG / SHIP'S CREW

No	Nachname / Last name	Vorname / First name	Rang/ Rank
1	Kentges	Felix	Master
2	Langhinrichs	Jacob	Chief Mate
3	Grafe	Jens	Chief
4	Janik	Michael	2nd Mate
5	Peine	Lutz	2nd Mate
6	Stelljes	Daniel	2nd Mate
7	Gößmann-Lange	Petra	Doctor
8	Domann	Franz	2nd Eng.
9	Farysch	Tim	2nd Eng.
10	Krinfeld	Oleksandr	2nd Eng.
11	Zivanov	Stefan	E-Eng.
12	Hofmann	Jörg Walter	ELO
13	Kliemann	Olaf	ELO
14	Hüttebräucker	Olaf	ELO
15	Pliet	Johannes Oliver	ELO
16	Sedlak	Andreas Enrico	Bosun
17	Neisner	Winfried Wolfgang	Carpenter
18	Ackenhausen	Hendrik	MP Rat.

No	Nachname / Last name	Vorname / First name	Rang/ Rank
19	Fischer	Sascha	MP Rat.
20	Kespelher	Ole Johan	MP Rat.
21	Klähn	Anton	MP Rat.
22	Klee	Philipp	MP Rat.
23	Röth	Benedikt Konrad	MP Rat.
24	Bäcker	Andreas	Able Seaman
25	Burzan	Gerd-Ekkehard	Able Seaman
26	Kryszkiewicz	Maciej Waldemar	Able Seaman
27	Niebuhr	Tim	Able Seaman
28	Preußner	Jörg	Storekeeper
29	Dethloff	Michael	MP Rat.
30	Klinger	Dana	MP Rat.
31	Hänert	Ove	MP Rat.
32	Rolofs	Nils Christian Timo	MP Rat.
33	Schneider	Denise	MP Rat.
34	Hofmann	Werner	1st Cook
35	Hammelmann	Louisa	2nd Cook
36	Pieper	Daniel	1st Steward
37	Schwantes	Andrea	Nurse
38	Arendt	René	2nd Steward
39	Chen	Dansheng	2nd Steward
40	Cheng	Qi	2nd Steward
41	Dibenau	Torsten	2nd Steward
42	Fabian	Laura	2nd Stewardess

No	Nachname / Last name	Vorname / First name	Rang/ Rank
43	Hinz	Nina Irene	2nd Stewardess
44	Möhle	Steffi	2nd Stewardess
45	Grundmann	Uwe	Ext. Crew.

A.4 STATIONSLISTE / STATION LIST PS152

Station list of expedition PS152 from Walvis Bay – Punta Arenas; the list details the action log for all stations along the cruise track. This list contains only stations taken onboard *Polarstern*. See https://www.pangaea.de/expeditions/events/PS152 to display the entire station (event) list for expedition PS152 including all stations taken on and from the ice.This version contains Uniform Resource Identifiers for all sensors listed under https://sensor.awi.de. See https://www.awi.de/en/about-us/service/computing-centre/data-flow-framework.html for further information about AWI's data flow framework from sensor observations to archives (O2A).

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152-track		2025-12-15T08:00:00	-22.94975	14.49775		CT	Station start	Walvis Bay - Punta Arenas
PS152-track		2026-02-02T10:59:14	-52.66985	-69.98174		CT	Station end	Walvis Bay - Punta Arenas
PS152_0_Underway-1		2025-12-15T13:15:17	-22.94975	14.49775		SWEAS	Station start	
PS152_0_Underway-1		2026-01-31T18:45:29	-57.77475	-60.57545	3460.7	SWEAS	Station end	
PS152_0_Underway-2		2025-12-15T13:16:23	-22.94975	14.49775		SNDVELPR	Station start	
PS152_0_Underway-2		2026-01-31T18:45:00	-57.77475	-60.57545	3461.0	SNDVELPR	Station end	
PS152_0_Underway-3		2025-12-16T07:24:00	-25.38999	13.63476		ADCP	Station start	
PS152_0_Underway-3		2026-01-31T18:45:00	-57.77475	-60.57545	3461.0	ADCP	Station end	
PS152_0_Underway-4		2025-12-16T07:24:00	-25.38999	13.63476		FBOX	Station start	
PS152_0_Underway-4		2026-01-31T18:45:00	-57.77475	-60.57545	3461.0	FBOX	Station end	
PS152_0_Underway-5		2025-12-16T07:24:00	-25.38999	13.63476		TSG	Station start	
PS152_0_Underway-5		2026-01-31T18:45:00	-57.77475	-60.57545	3461.0	TSG	Station end	
PS152_0_Underway-6		2025-12-16T07:24:00	-25.38999	13.63476		TSG	Station start	
PS152_0_Underway-6		2026-01-31T18:45:00	-57.77475	-60.57545	3461.0	TSG	Station end	
PS152_0_Underway-7		2025-12-16T07:24:00	-25.38999	13.63476		pCO2	Station start	
PS152_0_Underway-7		2026-01-31T18:45:00	-57.77475	-60.57545	3461.0	pCO2	Station end	

** Comments are limited to 130 characters. See https://www.pangaea.de/expeditions/events/PS152 to show full comments in conjunction with the station (event) list for expedition PS152*

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_1-1	AWI227-BGC; BGC_25_1	2025-12-24T07:26:19	-59.07380	0.10226	4954.0	MOOR	Station start	Recovery
PS152_1-1	AWI227-BGC; BGC_25_1	2025-12-24T08:48:19	-59.07813	0.11058	4675.0	MOOR	Station end	Recovery
PS152_1-2	BGC_25_1	2025-12-24T10:43:51	-59.09366	0.09591	4669.4	CTD-RO	max depth /	
PS152_1-3	BGC_25_1	2025-12-24T11:12:05	-59.09342	0.09496	4680.7	APN	Station start	
PS152_1-3	BGC_25_1	2025-12-24T11:15:16	-59.09346	0.09537	4682.0	APN	Station end	
PS152_2-1	UDW1	2025-12-24T23:43:33	-60.32981	0.00534	5354.7	FBOX	Station start	AutoFim- sampling
PS152_2-1	UDW1	2025-12-24T23:45:19	-60.33418	0.00592	5356.0	FBOX	Station end	AutoFim- sampling
PS152_3-1	KHS_0.61	2025-12-25T06:37:47	-61.00055	-0.00297	5385.3	MSN	Station start	
PS152_3-1	KHS_0.61	2025-12-25T07:26:05	-61.00086	-0.00064	5381.0	MSN	Station end	
PS152_3-2	KHS_0.61	2025-12-25T08:21:18	-61.00210	0.00752	5392.3	RMT	Station start	
PS152_3-2	KHS_0.61	2025-12-25T08:59:46	-60.98544	0.04508	5395.0	RMT	Station end	
PS152_3-3	KHS_0.61	2025-12-25T10:09:59	-61.00011	0.00012	5385.7	CTD-RO	max depth /	
PS152_3-4	KHS_0.61	2025-12-25T10:22:40	-61.00054	0.00015	5385.9	APN	Station start	
PS152_3-4	KHS_0.61	2025-12-25T10:25:53	-61.00060	-0.00002	5385.0	APN	Station end	
PS152_3-5	KHS_0.61	2025-12-25T11:18:13	-60.99803	-0.00036	5393.7	SUIT	Station start	
PS152_3-5	KHS_0.61	2025-12-25T11:50:30	-60.97671	-0.00572	5385.0	SUIT	Station end	
PS152_3-6	KHS_0.61	2025-12-25T12:22:20	-60.97352	-0.00145	5384.9	ARGOFL	Station start	
PS152_3-6	KHS_0.61	2025-12-25T12:23:08	-60.97430	-0.00093	5384.0	ARGOFL	Station end	
PS152_4-1	UDW2	2025-12-25T15:49:15	-61.53388	0.01135	5046.3	FBOX	Station start	AutoFim- sampling
PS152_4-1	UDW2	2025-12-25T15:55:04	-61.54947	0.01056	4959.0	FBOX	Station end	AutoFim- sampling
PS152_5-1	KHS_0.62	2025-12-25T18:56:17	-61.99474	-0.00656	5366.4	SUIT	Station start	
PS152_5-1	KHS_0.62	2025-12-25T19:26:39	-61.97300	-0.01500	5368.0	SUIT	Station end	
PS152_5-2	KHS_0.62	2025-12-25T20:41:03	-62.00030	-0.00027	5366.5	CTD-RO	max depth /	
PS152_5-3	KHS_0.62	2025-12-25T20:42:27	-62.00027	-0.00035	5365.9	APN	Station start	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_5-3	KHS_0.62	2025-12-25T20:44:49	-62.00021	-0.00035	5366.0	APN	Station end	
PS152_5-4	KHS_0.62	2025-12-25T22:00:45	-61.99951	0.00014	5366.4	RMT	Station start	
PS152_5-4	KHS_0.62	2025-12-25T22:33:11	-61.98187	-0.00957	5366.0	RMT	Station end	
PS152_5-5	KHS_0.62	2025-12-25T22:42:11	-61.98142	-0.00867	5363.1	RMT	Station start	
PS152_5-5	KHS_0.62	2025-12-26T00:16:05	-61.92818	-0.02162	5368.0	RMT	Station end	
PS152_6-1	UDW3	2025-12-26T03:43:02	-62.49998	0.00003	5345.6	FBOX	Station start	
PS152_6-1	UDW3	2025-12-26T03:48:25	-62.51572	-0.00035	5343.0	FBOX	Station end	
PS152_7-2	KHS_0.63	2025-12-26T06:48:02	-63.00050	-0.00168	5308.4	APN	Station start	
PS152_7-2	KHS_0.63	2025-12-26T06:50:20	-63.00068	-0.00151	5309.0	APN	Station end	
PS152_7-1	KHS_0.63	2025-12-26T07:10:45	-63.00050	-0.00135	5308.8	CTD-RO	max depth /	
PS152_7-3	KHS_0.63	2025-12-26T09:43:23	-62.99726	-0.00138	5309.4	M-RMT	Station start	
PS152_7-3	KHS_0.63	2025-12-26T10:20:24	-62.97913	-0.02153	5308.0	M-RMT	Station end	
PS152_7-4	KHS_0.63	2025-12-26T11:08:14	-62.98925	-0.01983	5308.4	ARGOFL	Station start	
PS152_7-4	KHS_0.63	2025-12-26T11:09:32	-62.99107	-0.01785	5309.0	ARGOFL	Station end	
PS152_8-1	UDW4	2025-12-26T13:13:12	-63.34389	-0.00009	5256.4	FBOX	Station start	AutoFim- sampling
PS152_8-1	UDW4	2025-12-26T13:20:11	-63.36270	0.00012	5254.0	FBOX	Station end	AutoFim- sampling
PS152_9-1	KHS_0.64	2025-12-26T17:22:38	-63.99779	-0.00946	5199.4	SUIT	Station start	
PS152_9-1	KHS_0.64	2025-12-26T17:52:18	-63.98183	-0.03129	5202.0	SUIT	Station end	
PS152_9-3	KHS_0.64	2025-12-26T18:44:44	-63.97860	-0.03777	5203.0	APN	Station start	
PS152_9-3	KHS_0.64	2025-12-26T18:47:29	-63.97851	-0.03806	5203.0	APN	Station end	
PS152_9-2	KHS_0.64	2025-12-26T19:04:00	-63.97859	-0.03858	5200.1	CTD-RO	max depth /	
PS152_9-4	KHS_0.64	2025-12-26T20:58:40	-63.97867	-0.03713	5202.3	MSN	Station start	
PS152_9-4	KHS_0.64	2025-12-26T21:47:07	-63.97865	-0.03727	5203.0	MSN	Station end	
PS152_9-5	KHS_0.64	2025-12-26T23:03:53	-63.98632	-0.03414	5200.3	M-RMT	Station start	
PS152_9-5	KHS_0.64	2025-12-27T01:13:22	-63.99471	-0.19391	5197.0	M-RMT	Station end	
PS152_10-1	UDW5	2025-12-27T06:15:16	-64.25000	1.49063	3349.1	FBOX	Station start	AutoFim- sampling
PS152_10-1	UDW5	2025-12-27T06:15:32	-64.25031	1.49226	3354.0	FBOX	Station end	AutoFim- sampling

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_11-2	KHS_MR.1	2025-12-27T10:17:42	-64.48071	2.87394	2159.9	APN	Station start	
PS152_11-2	KHS_MR.1	2025-12-27T10:21:05	-64.48070	2.87431	2160.0	APN	Station end	
PS152_11-1	KHS_MR.1	2025-12-27T10:59:07	-64.48064	2.87381	2158.8	CTD-RO	max depth /	
PS152_11-3	KHS_MR.1	2025-12-27T13:34:03	-64.47821	2.87662	2161.6	OFOBS	Station start	
PS152_11-3	KHS_MR.1	2025-12-27T17:00:14	-64.45679	2.88776	2183.0	OFOBS	Station end	
PS152_11-4	KHS_MR.1	2025-12-27T19:14:25	-64.48106	2.87497	2158.8	TVMUC	max depth /	
PS152_11-5	KHS_MR.1	2025-12-27T21:20:33	-64.48056	2.87433	2159.2	TVMUC	max depth /	
PS152_11-6	KHS_MR.1	2025-12-27T23:53:15	-64.47436	2.84065	2166.9	M-RMT	Station start	
PS152_11-6	KHS_MR.1	2025-12-28T01:01:20	-64.45805	2.74255	2176.0	M-RMT	Station end	
PS152_11-7	KHS_MR.1	2025-12-28T01:27:43	-64.45227	2.72547	2177.9	ARGOFL	Station start	
PS152_11-7	KHS_MR.1	2025-12-28T01:27:55	-64.45214	2.72559	2178.0	ARGOFL	Station end	
PS152_12-1	UDW6	2025-12-28T03:50:10	-64.85543	2.73537	2234.9	FBOX	Station start	AutoFim- sampling
PS152_12-1	UDW6	2025-12-28T04:19:00	-64.93944	2.73085	1962.0	FBOX	Station end	AutoFim- sampling
PS152_13-1	KHS_MR.2	2025-12-28T06:46:41	-65.25310	2.67124	1249.5	CTD-RO	max depth /	
PS152_13-3	KHS_MR.2	2025-12-28T08:23:03	-65.25239	2.67030	1250.5	MSN	Station start	
PS152_13-3	KHS_MR.2	2025-12-28T09:09:21	-65.25175	2.67093	1249.0	MSN	Station end	
PS152_13-2	KHS_MR.2	2025-12-28T09:25:25	-65.25400	2.67185	1252.2	APN	Station start	
PS152_13-2	KHS_MR.2	2025-12-28T09:39:19	-65.25398	2.67162	1252.0	APN	Station end	
PS152_13-4	KHS_MR.2	2025-12-28T11:43:07	-65.25094	2.67256	1249.0	LLDEP	Station start	Deployment
PS152_13-4	KHS_MR.2	2025-12-28T12:27:56	-65.23915	2.64920		LLDEP	Station end	Deployment
PS152_13-5	KHS_MR.2	2025-12-28T14:01:39	-65.22583	2.69339	1264.6	SUIT	Station start	
PS152_13-5	KHS_MR.2	2025-12-28T14:30:17	-65.22568	2.73481	1330.0	SUIT	Station end	
PS152_13-6	KHS_MR.2	2025-12-28T16:39:00	-65.22391	2.72545	1293.3	M-RMT	Station start	
PS152_13-6	KHS_MR.2	2025-12-28T17:47:43	-65.23724	2.84523	2192.0	M-RMT	Station end	
PS152_13-7	KHS_MR.2	2025-12-28T19:23:36	-65.25130	2.71139	1340.2	OFOBS	Station start	
PS152_13-7	KHS_MR.2	2025-12-28T23:28:11	-65.22139	2.77211	1374.0	OFOBS	Station end	
PS152_13-8	KHS_MR.2	2025-12-29T00:50:42	-65.21925	2.76960	1376.0	MSN	Station start	
PS152_13-8	KHS_MR.2	2025-12-29T01:35:17	-65.21944	2.76634	1328.0	MSN	Station end	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_13-9	KHS_MR.2	2025-12-29T02:49:05	-65.21868	2.76790	1323.0	OFOBS	Station start	
PS152_13-9	KHS_MR.2	2025-12-29T06:01:31	-65.20035	2.78404	1394.0	OFOBS	Station end	
PS152_13-10	KHS_MR.2	2025-12-29T08:00:00	-65.23820	2.64201	1230.6	LLDEP	Station start	Recovery
PS152_13-10	KHS_MR.2	2025-12-29T11:06:37	-65.23784	2.65415	1166.0	LLDEP	Station end	Recovery
PS152_13-11	KHS_MR.2	2025-12-29T11:36:00	-65.24585	2.71168	1323.7	ARGOFL	Station start	
PS152_13-11	KHS_MR.2	2025-12-29T11:36:09	-65.24592	2.71223	1328.0	ARGOFL	Station end	
PS152_14-1	UDW7	2025-12-29T14:01:07	-65.52471	2.01248	2553.5	FBOX	Station start	AutoFim- sampling
PS152_14-1	UDW7	2025-12-29T14:08:08	-65.53862	1.97698	2572.0	FBOX	Station end	AutoFim- sampling
PS152_15-1	KHS_MR.3	2025-12-29T17:32:16	-65.79990	1.32125	2763.4	CTD-RO	max depth /	
PS152_15-2	KHS_MR.3	2025-12-29T18:45:48	-65.80020	1.32052	2763.4	OFOBS	Station start	
PS152_15-2	KHS_MR.3	2025-12-29T22:47:09	-65.78929	1.36685	2750.0	OFOBS	Station end	
PS152_15-3	KHS_MR.3	2025-12-30T01:37:19	-65.79390	1.36403	2749.2	TVMUC	max depth /	one Muck tube triggered by ship movement
PS152_16-1	UDW8	2025-12-30T04:39:19	-65.90000	0.66173	3192.7	FBOX	Station start	
PS152_16-1	UDW8	2025-12-30T04:39:51	-65.90053	0.65819	3193.0	FBOX	Station end	
PS152_17-1	KHS_0.66	2025-12-30T06:53:02	-65.99913	-0.00012	3410.4	CTD-RO	max depth /	
PS152_17-2	KHS_0.66	2025-12-30T08:34:11	-65.99949	0.00010	3411.0	MSN	Station start	
PS152_17-2	KHS_0.66	2025-12-30T09:23:03	-65.99988	-0.00068	3411.0	MSN	Station end	
PS152_17-3	KHS_0.66	2025-12-30T09:40:46	-65.99943	0.00034	3410.8	ARGOFL	Station start	
PS152_17-3	KHS_0.66	2025-12-30T09:56:10	-66.00134	0.02701	3371.0	ARGOFL	Station end	
PS152_18-1	AWI231-BGC; BGC_25_2	2025-12-30T13:01:01	-66.48180	-0.05294	4518.8	MOOR	Station start	Recovery
PS152_18-1	AWI231-BGC; BGC_25_2	2025-12-30T17:11:02	-66.47688	0.03809	4477.0	MOOR	Station end	Recovery
PS152_18-2	BGC_25_2	2025-12-30T19:44:02	-66.47204	0.03595	4473.3	CTD-RO	max depth /	
PS152_18-3	BGC_25_2	2025-12-30T22:26:47	-66.46739	0.02990	4481.9	SUIT	Station start	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_18-3	BGC_25_2	2025-12-30T22:55:45	-66.45230	0.02419	4477.0	SUIT	Station end	
PS152_18-4	BGC_25_2	2025-12-31T01:16:41	-66.47189	0.03618	4473.0	MSN	Station start	
PS152_18-4	BGC_25_2	2025-12-31T02:08:41	-66.47182	0.03647	4473.0	MSN	Station end	
PS152_18-5	BGC_25_2	2025-12-31T03:02:27	-66.47062	0.03634	4473.0	M-RMT	Station start	
PS152_18-5	BGC_25_2	2025-12-31T05:13:39	-66.39762	0.09891	4108.0	M-RMT	Station end	
PS152_19-1	UDW10	2025-12-31T06:56:45	-66.60790	0.08292	4673.1	FBOX	Station start	AutoFim- sampling
PS152_19-1	UDW10	2025-12-31T07:01:55	-66.62289	0.07952	4664.0	FBOX	Station end	AutoFim- sampling
PS152_20-1	KHS_0.67	2025-12-31T09:02:16	-66.98457	-0.00595	4707.1	ARGOFL	Station start	
PS152_20-1	KHS_0.67	2025-12-31T09:13:26	-67.00884	0.00298	4708.0	ARGOFL	Station end	
PS152_20-2	UDW11	2025-12-31T09:16:40	-67.01580	0.00264	4705.5	FBOX	Station start	
PS152_20-2	UDW11	2025-12-31T09:16:50	-67.01626	0.00258	4706.0	FBOX	Station end	
PS152_21-1	KHS_0.67.5	2025-12-31T12:21:02	-67.50190	0.01117	4629.9	SUIT	Station start	
PS152_21-1	KHS_0.67.5	2025-12-31T12:51:15	-67.50088	0.05323	4628.0	SUIT	Station end	
PS152_21-2	KHS_0.67.5	2025-12-31T13:45:19	-67.49194	0.07133	4630.1	M-RMT	Station start	aborted due to the weather
PS152_21-2	KHS_0.67.5	2025-12-31T15:00:22	-67.47926	0.10291	4630.0	M-RMT	Station end	aborted due to the weather
PS152_21-3	KHS_0.67.5	2025-12-31T18:20:21	-67.50164	0.00483	4631.9	CTD-RO	max depth /	
PS152_21-4	KHS_0.67.5	2025-12-31T19:38:46	-67.50119	0.00644	4630.8	MSN	Station start	
PS152_21-4	KHS_0.67.5	2025-12-31T20:28:12	-67.50113	0.00903	4631.0	MSN	Station end	
PS152_22-1	UDW12	2025-12-31T23:23:41	-68.00014	-0.00065	4514.3	FBOX	Station start	AutoFim- sampling
PS152_22-1	UDW12	2025-12-31T23:25:16	-68.00470	-0.00034	4512.0	FBOX	Station end	AutoFim- sampling
PS152_23-1	KHS_0.68.5	2026-01-01T21:11:50	-68.50007	0.00021	4265.8	CTD-RO	max depth /	
PS152_23-2	KHS_0.68.5	2026-01-01T22:39:05	-68.49972	0.00078	4266.2	MSN	Station start	
PS152_23-2	KHS_0.68.5	2026-01-01T23:24:01	-68.50156	0.00148	4264.0	MSN	Station end	
PS152_24-1	Ice1	2026-01-03T06:51:50	-70.52098	-8.12669	217.9	ICE	Station start	Ship-supported ice station

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_24-1	Ice1	2026-01-03T12:43:57	-70.52093	-8.12669	217.0	ICE	Station end	Ship-supported ice station
PS152_25-1		2026-01-04T16:22:41	-70.50442	-8.20678	250.5	APN	Station start	
PS152_25-1		2026-01-04T16:27:02	-70.50442	-8.20679	250.0	APN	Station end	
PS152_25-2	ROVice2	2026-01-04T21:47:10	-70.50442	-8.20671	251.5	ROVMICK	Station start	ROV rope torn off
PS152_25-2	ROVice2	2026-01-04T23:07:28	-70.50443	-8.20677	252.0	ROVMICK	Station end	ROV rope torn off
PS152_25-3		2026-01-05T15:00:06	-70.50443	-8.20677	249.5	SIOBS	Station start	calibration
PS152_25-3		2026-01-05T19:28:55	-70.50442	-8.20675	252.0	SIOBS	Station end	calibration
PS152_26-2	KN_16	2026-01-06T22:36:49	-70.43917	-10.53090	1778.0	APN	Station start	
PS152_26-2	KN_16	2026-01-06T22:42:39	-70.43922	-10.53060	1778.0	APN	Station end	
PS152_26-1	KN_16	2026-01-06T22:57:57	-70.43933	-10.53081	1777.3	CTD-RO	max depth /	
PS152_26-3	KN_16	2026-01-07T01:03:05	-70.44157	-10.55126	1746.2	M-RMT	Station start	
PS152_26-3	KN_16	2026-01-07T02:57:43	-70.48012	-10.68771	1630.0	M-RMT	Station end	
PS152_27-1	KN_04	2026-01-07T05:19:28	-70.74720	-10.79309	914.2	CTD-RO	max depth /	
PS152_27-2	KN_04	2026-01-07T06:22:28	-70.74597	-10.79223	918.2	B_LANDER	Station start	Deployment
PS152_27-2	KN_04	2026-01-07T06:23:10	-70.74603	-10.79176	918.0	B_LANDER	Station end	Deployment
PS152_27-3	KN_04	2026-01-07T07:52:21	-70.75731	-10.83354	912.9	MSN	Station start	
PS152_27-3	KN_04	2026-01-07T08:33:10	-70.75837	-10.83455	908.0	MSN	Station end	
PS152_27-4	KN_04	2026-01-07T08:36:28	-70.75850	-10.83452	907.2	LLDEP	Station start	Deployment
PS152_27-4	KN_04	2026-01-07T11:47:26	-70.78820	-10.86123	702.0	LLDEP	Station end	Deployment
PS152_27-5	KN_04	2026-01-07T12:57:48	-70.76428	-10.86642	906.2	SUIT	Station start	
PS152_27-5	KN_04	2026-01-07T13:28:03	-70.74988	-10.83615	951.0	SUIT	Station end	
PS152_27-6	KN_04	2026-01-07T14:09:58	-70.74510	-10.79696	926.5	APN	Station start	
PS152_27-6	KN_04	2026-01-07T14:13:20	-70.74519	-10.79705	926.0	APN	Station end	
PS152_27-7	KN_04	2026-01-07T15:56:15	-70.74541	-10.79827	926.4	OFOBS	Station start	
PS152_27-7	KN_04	2026-01-07T19:31:09	-70.74237	-10.86389	1007.0	OFOBS	Station end	
PS152_27-8	KN_04	2026-01-07T21:57:50	-70.75696	-10.95426	1065.2	AGT	Station start	
PS152_27-8	KN_04	2026-01-07T22:08:48	-70.75682	-10.95386	1065.0	AGT	Station end	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_27-9	KN_04	2026-01-08T00:24:44	-70.74596	-10.79824	923.8	TVMUC	max depth /	
PS152_27-10	KN_04	2026-01-08T01:45:23	-70.74609	-10.79757	922.4	TVMUC	max depth /	
PS152_27-11	KN_04	2026-01-08T03:30:39	-70.73173	-10.96545	1158.4	M-RMT	Station start	
PS152_27-11	KN_04	2026-01-08T05:20:19	-70.77274	-11.12422	1207.0	M-RMT	Station end	
PS152_27-12	KN_04	2026-01-08T06:38:58	-70.74417	-10.78976		B_LANDER	Station start	Recovery
PS152_27-12	KN_04	2026-01-08T06:49:40	-70.74445	-10.78868	922.0	B_LANDER	Station end	Recovery
PS152_27-13	KN_04	2026-01-08T08:59:41	-70.78665	-10.86257		LLDEP	Station start	
PS152_27-13	KN_04	2026-01-08T10:41:42	-70.78470	-10.85870	744.0	LLDEP	Station end	
PS152_28-1	KN_11	2026-01-08T12:18:03	-70.86747	-10.47667	244.7	CTD-RO	max depth /	
PS152_28-2	KN_11	2026-01-08T12:20:59	-70.86736	-10.47649	244.7	APN	Station start	
PS152_28-2	KN_11	2026-01-08T12:25:00	-70.86721	-10.47634	245.0	APN	Station end	
PS152_28-3	KN_11	2026-01-08T13:33:50	-70.86489	-10.47216	243.2	B_LANDER	Station start	Deployment
PS152_28-3	KN_11	2026-01-08T13:35:09	-70.86491	-10.47207	243.0	B_LANDER	Station end	Deployment
PS152_28-4	KN_11	2026-01-08T14:03:51	-70.86369	-10.46653	249.6	OFOBS	Station start	
PS152_28-4	KN_11	2026-01-08T16:30:58	-70.87491	-10.45612	251.0	OFOBS	Station end	
PS152_28-10	ROVice3	2026-01-08T16:05:00	-70.87278	-10.45726	251.7	ICE	Station start	Helicopter-supported ice station
PS152_28-10	ROVice3	2026-01-08T17:28:00	-70.87795	-10.45525	251.0	ICE	Station end	Helicopter-supported ice station
PS152_28-5	KN_11	2026-01-08T16:52:12	-70.87470	-10.45378	252.4	OFOBS	Station start	
PS152_28-5	KN_11	2026-01-08T17:47:03	-70.87996	-10.45633	251.0	OFOBS	Station end	
PS152_28-6	KN_11	2026-01-08T19:05:53	-70.86456	-10.46168	252.4	TVMUC	max depth /	
PS152_28-7	KN_11	2026-01-08T19:34:58	-70.86517	-10.46320	249.1	TVMUC	max depth /	
PS152_28-8	KN_11	2026-01-08T20:38:44	-70.87420	-10.47565	247.5	AGT	Station start	
PS152_28-8	KN_11	2026-01-08T20:49:27	-70.87392	-10.47905	246.0	AGT	Station end	
PS152_29-1	Ice2	2026-01-08T22:33:24	-70.84194	-10.59502	259.8	ICE	Station start	Ship-supported ice station

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_29-1	Ice2	2026-01-09T03:17:12	-70.83801	-10.59712	262.0	ICE	Station end	Ship-supported ice station
PS152_28-9	KN_11	2026-01-09T04:03:02	-70.86600	-10.47677		B_LANDER	Station start	Recovery
PS152_28-9	KN_11	2026-01-09T04:22:52	-70.86494	-10.46998		B_LANDER	Station end	Recovery
PS152_30-1	KN_12	2026-01-09T05:17:02	-70.83878	-10.58331	266.3	OFOBS	Station start	
PS152_30-1	KN_12	2026-01-09T07:41:03	-70.84635	-10.55511	226.0	OFOBS	Station end	
PS152_30-2	KN_12	2026-01-09T08:04:38	-70.84679	-10.55448	226.7	OFOBS	Station start	
PS152_30-2	KN_12	2026-01-09T09:19:39	-70.85035	-10.53733	229.0	OFOBS	Station end	
PS152_30-4	KN_12	2026-01-09T10:16:00	-70.83977	-10.58130	268.5	APN	Station start	
PS152_30-4	KN_12	2026-01-09T10:18:46	-70.83982	-10.58136	269.0	APN	Station end	
PS152_30-3	KN_12	2026-01-09T10:21:23	-70.83977	-10.58154	269.2	CTD-RO	max depth /	
PS152_31-1	KN_13	2026-01-09T11:22:45	-70.78808	-10.67324	571.9	B_LANDER	Station start	Deployment
PS152_31-1	KN_13	2026-01-09T11:45:47	-70.78260	-10.67526	615.0	B_LANDER	Station end	Deployment
PS152_31-2	KN_13	2026-01-09T12:24:23	-70.76657	-10.67291	708.2	LLDEP	Station start	Deployment
PS152_31-2	KN_13	2026-01-09T13:50:48	-70.76352	-10.67233	723.0	LLDEP	Station end	Deployment
PS152_31-4	KN_13	2026-01-09T14:16:04	-70.78828	-10.71109	594.2	APN	Station start	
PS152_31-4	KN_13	2026-01-09T14:24:09	-70.78785	-10.71065	596.0	APN	Station end	
PS152_31-3	KN_13	2026-01-09T14:36:33	-70.78763	-10.70887	601.4	CTD-RO	max depth /	
PS152_31-12	ROVice4	2026-01-09T15:11:00	-70.78752	-10.70486	598.0	ICE	Station start	Helicopter-supported ice station
PS152_31-12	ROVice4	2026-01-09T17:41:00	-70.78223	-10.78579	694.0	ICE	Station end	Helicopter-supported ice station
PS152_31-5	KN_13	2026-01-09T16:15:45	-70.77963	-10.79572	722.5	AGT	Station start	
PS152_31-5	KN_13	2026-01-09T16:15:45	-70.77990	-10.79935	722.0	AGT	Station end	
PS152_31-6	KN_13	2026-01-09T18:13:13	-70.78085	-10.78262	703.1	OFOBS	Station start	
PS152_31-6	KN_13	2026-01-09T19:02:32	-70.78562	-10.77073	641.0	OFOBS	Station end	
PS152_31-7	KN_13	2026-01-09T20:49:56	-70.78058	-10.78379	707.3	SUIT	Station start	
PS152_31-7	KN_13	2026-01-09T21:08:47	-70.78759	-10.80936	658.0	SUIT	Station end	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_31-8	KN_13	2026-01-09T22:50:46	-70.78340	-10.77493	673.2	OFOBS	Station start	
PS152_31-8	KN_13	2026-01-10T01:31:00	-70.79002	-10.73207	580.0	OFOBS	Station end	
PS152_31-9	KN_13	2026-01-10T03:42:09	-70.76379	-10.74583	789.7	M-RMT	Station start	
PS152_31-9	KN_13	2026-01-10T04:40:43	-70.78571	-10.83932	711.0	M-RMT	Station end	
PS152_31-10	KN_13	2026-01-10T05:36:35	-70.78643	-10.67421		B_LANDER	Station start	Recovery
PS152_31-10	KN_13	2026-01-10T05:44:01	-70.78601	-10.67420	587.0	B_LANDER	Station end	Recovery
PS152_31-11	KN_13	2026-01-10T06:54:37	-70.76064	-10.67183		LLDEP	Station start	Recovery
PS152_31-11	KN_13	2026-01-10T08:32:38	-70.76390	-10.66937	718.0	LLDEP	Station end	Recovery
PS152_32-1	KN_04	2026-01-10T09:20:20	-70.78347	-10.85296		LLDEP	Station start	Recovery
PS152_32-1	KN_04	2026-01-10T10:41:39	-70.78093	-10.88648	810.0	LLDEP	Station end	Recovery
PS152_33-1	KN_14	2026-01-10T11:20:28	-70.78004	-10.89165	827.6	EK60_EK80	Station start	ROV Seebieber Test
PS152_33-1	KN_14	2026-01-10T18:16:05	-70.78860	-10.96202	858.0	EK60_EK80	Station end	ROV Seebieber Test
PS152_33-4	Ice3	2026-01-10T11:30:00	-70.77970	-10.89218	831.3	ICE	Station start	Helicopter-supported ice station
PS152_33-4	Ice3	2026-01-10T17:00:00	-70.78910	-10.95087	834.0	ICE	Station end	Helicopter-supported ice station
PS152_33-5	Ice3	2026-01-10T17:00:00	-70.78910	-10.95087	833.5	ICE	Station start	Helicopter-supported ice station
PS152_33-5	Ice3	2026-01-10T20:00:00	-70.70679	-10.64138	967.0	ICE	Station end	Helicopter-supported ice station
PS152_33-2	KN_14	2026-01-10T20:10:28	-70.71088	-10.65357	961.5	M-RMT	Station start	
PS152_33-2	KN_14	2026-01-10T21:31:28	-70.74890	-10.74332	868.0	M-RMT	Station end	
PS152_33-3	KN_14	2026-01-10T22:55:58	-70.69867	-10.59674	932.0	OFOBS	Station start	
PS152_33-3	KN_14	2026-01-11T03:10:57	-70.71966	-10.54245	550.0	OFOBS	Station end	
PS152_34-1	KN_15	2026-01-11T05:36:39	-70.59038	-10.64237	1321.7	M-RMT	Station start	
PS152_34-1	KN_15	2026-01-11T07:08:27	-70.63353	-10.75174	1341.0	M-RMT	Station end	
PS152_34-2	KN_15	2026-01-11T08:24:47	-70.56564	-10.60101	1397.1	CTD-RO	max depth /	
PS152_34-3	KN_15	2026-01-11T08:42:09	-70.56544	-10.60097	1397.4	APN	Station start	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_34-3	KN_15	2026-01-11T08:47:16	-70.56551	-10.60118	1397.0	APN	Station end	
PS152_34-4	KN_15	2026-01-11T10:06:31	-70.56529	-10.60076	1397.8	MSN	Station start	
PS152_34-4	KN_15	2026-01-11T10:51:57	-70.56562	-10.60196	1398.0	MSN	Station end	
PS152_34-5	KN_15	2026-01-11T16:39:07	-70.64290	-10.47845	959.9	FTRW-P	Station start	
PS152_34-5	KN_15	2026-01-11T16:59:33	-70.63272	-10.51970	1109.0	FTRW-P	Station end	
PS152_34-6	KN_15	2026-01-11T19:33:05	-70.56762	-10.60018	1375.3	OFOBS	Station start	
PS152_34-6	KN_15	2026-01-11T23:26:20	-70.58841	-10.57935	1351.0	OFOBS	Station end	
PS152_34-7	KN_15	2026-01-12T01:19:29	-70.58851	-10.57978	1354.7	TVMUC	max depth /	
PS152_34-8	KN_15	2026-01-12T03:00:35	-70.58873	-10.57904	1355.7	TVMUC	max depth /	
PS152_35-1	KN_14	2026-01-12T05:07:24	-70.69976	-10.60313	937.1	MSN	Station start	
PS152_35-1	KN_14	2026-01-12T05:41:08	-70.69989	-10.60127	933.0	MSN	Station end	
PS152_35-3	KN_14	2026-01-12T06:02:59	-70.70008	-10.60087	930.8	APN	Station start	
PS152_35-3	KN_14	2026-01-12T06:06:47	-70.70012	-10.60082	931.0	APN	Station end	
PS152_35-2	KN_14	2026-01-12T06:22:27	-70.69985	-10.60084	932.4	CTD-RO	max depth /	
PS152_35-6	ROVice5	2026-01-12T10:08:00	-70.72650	-10.59012	726.9	ICE	Station start	Helicopter-supported ice station
PS152_35-6	ROVice5	2026-01-12T12:33:00	-70.77655	-10.70947	683.0	ICE	Station end	Helicopter-supported ice station
PS152_35-4	KN_14	2026-01-12T10:33:51	-70.74897	-10.61752	676.8	FTRW-P	Station start	
PS152_35-4	KN_14	2026-01-12T10:55:05	-70.76311	-10.64946	684.0	FTRW-P	Station end	
PS152_35-5	KN_14 ICE	2026-01-12T17:29:25	-70.65069	-10.96713	1360.3	ICE	Station start	Ship-supported ice station
PS152_35-5	KN_14 ICE	2026-01-13T04:16:16	-70.67133	-10.94665	1297.0	ICE	Station end	Ship-supported ice station
PS152_36-1	KN_07	2026-01-13T06:36:32	-70.90985	-10.76303	344.6	OFOBS	Station start	
PS152_36-1	KN_07	2026-01-13T09:30:38	-70.92360	-10.72090	364.0	OFOBS	Station end	
PS152_36-7	Ice4	2026-01-13T09:30:00	-70.92356	-10.72107	364.0	ICE	Station start	Helicopter-supported ice station

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_36-7	Ice4	2026-01-13T14:00:00	-70.87959	-10.82078	286.0	ICE	Station end	Helicopter-supported ice station
PS152_36-3	KN_07	2026-01-13T10:15:29	-70.90788	-10.76467	341.6	APN	Station start	
PS152_36-3	KN_07	2026-01-13T10:19:00	-70.90785	-10.76442	342.0	APN	Station end	
PS152_36-2	KN_07	2026-01-13T10:23:13	-70.90798	-10.76417	342.7	CTD-RO	max depth /	
PS152_36-4	KN_07	2026-01-13T11:48:22	-70.90817	-10.76530	342.2	TVMUC	max depth /	
PS152_36-5	KN_07	2026-01-13T12:34:04	-70.90856	-10.76525	342.8	TVMUC	max depth /	
PS152_36-6	KN_07	2026-01-13T13:25:36	-70.90965	-10.76400	344.5	TVMUC	max depth /	
PS152_37-2	KN_01	2026-01-13T17:26:24	-70.39826	-11.20069	2049.0	APN	Station start	
PS152_37-2	KN_01	2026-01-13T17:28:13	-70.39825	-11.20066	2049.0	APN	Station end	
PS152_37-1	KN_01	2026-01-13T17:58:10	-70.39945	-11.20077	2047.1	CTD-RO	max depth /	
PS152_37-3	KN_01	2026-01-13T19:32:28	-70.39324	-11.19271	2058.2	SUIT	Station start	
PS152_37-3	KN_01	2026-01-13T20:02:24	-70.37519	-11.16020	2076.0	SUIT	Station end	
PS152_37-4	KN_01	2026-01-13T22:05:30	-70.41698	-11.15036	2020.5	OFOBS	Station start	
PS152_37-4	KN_01	2026-01-14T02:00:57	-70.39724	-11.20917	2049.0	OFOBS	Station end	
PS152_37-5	KN_01	2026-01-14T07:00:00	-70.38090	-11.18657	2064.3	M-RMT	Station start	
PS152_37-5	KN_01	2026-01-14T08:25:26	-70.34783	-11.05490	1974.0	M-RMT	Station end	
PS152_37-6	KN_01	2026-01-14T09:40:18	-70.34767	-11.05295	1968.9	MSN	Station start	
PS152_37-6	KN_01	2026-01-14T10:27:51	-70.34801	-11.05441	1972.0	MSN	Station end	
PS152_38-1	KN_02	2026-01-14T12:30:30	-70.48028	-11.10352	1827.2	M-RMT	Station start	
PS152_38-1	KN_02	2026-01-14T13:30:53	-70.48207	-11.01734	1895.0	M-RMT	Station end	
PS152_38-3	KN_02	2026-01-14T14:28:56	-70.48064	-11.11257	1810.7	APN	Station start	
PS152_38-3	KN_02	2026-01-14T14:31:25	-70.48037	-11.11296	1812.0	APN	Station end	
PS152_38-2	KN_02	2026-01-14T15:14:08	-70.47639	-11.12688	1809.5	CTD-RO	max depth /	
PS152_38-4	KN_02	2026-01-14T17:28:24	-70.52466	-11.37658	1775.8	SUIT	Station start	
PS152_38-4	KN_02	2026-01-14T17:48:19	-70.51773	-11.34587	1749.0	SUIT	Station end	
PS152_39-1	KN_03	2026-01-14T19:45:08	-70.64300	-10.98776	1390.5	B_LANDER	Station start	Deployment
PS152_39-1	KN_03	2026-01-14T19:46:17	-70.64312	-10.98842	1391.0	B_LANDER	Station end	Deployment

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_39-2	KN_03	2026-01-14T20:41:50	-70.64437	-10.99198	1393.6	CTD-RO	max depth /	
PS152_39-3	KN_03	2026-01-14T23:00:03	-70.66432	-10.93301	1297.4	OFOBS	Station start	
PS152_39-3	KN_03	2026-01-15T02:32:45	-70.64607	-11.00428	1402.0	OFOBS	Station end	
PS152_39-4	KN_03	2026-01-15T04:43:22	-70.67141	-11.08554	1429.7	M-RMT	Station start	
PS152_39-4	KN_03	2026-01-15T05:43:19	-70.66416	-10.96713	1330.0	M-RMT	Station end	
PS152_39-5	KN_03	2026-01-15T07:06:30	-70.64477	-10.99555	1396.7	MSN	Station start	
PS152_39-5	KN_03	2026-01-15T07:45:47	-70.64504	-10.99559	1396.0	MSN	Station end	
PS152_39-6	KN_03	2026-01-15T10:22:39	-70.64276	-11.01303	1413.4	LLDEP	Station start	Deployment
PS152_39-6	KN_03	2026-01-15T10:28:26	-70.64284	-11.01331	1413.0	LLDEP	Station end	Deployment
PS152_39-7	KN_03	2026-01-15T11:22:10	-70.64381	-10.99373	1394.9	B_LANDER	Station start	Recovery
PS152_39-7	KN_03	2026-01-15T11:37:13	-70.64569	-10.98856	1387.0	B_LANDER	Station end	Recovery
PS152_40-1	KN_08	2026-01-15T13:59:09	-70.87677	-11.11322	367.8	B_LANDER	Station start	Deployment
PS152_40-1	KN_08	2026-01-15T14:02:28	-70.87712	-11.11909	364.0	B_LANDER	Station end	Deployment
PS152_40-2	KN_08	2026-01-15T14:33:12	-70.88980	-11.11689	307.0	CTD-RO	max depth /	
PS152_40-3	KN_08	2026-01-15T15:45:00	-70.88989	-11.11924	313.7	OFOBS	Station start	
PS152_40-3	KN_08	2026-01-15T19:20:01	-70.87725	-11.16217	385.0	OFOBS	Station end	
PS152_40-4	KN_08	2026-01-15T19:46:06	-70.87716	-11.16235	385.1	OFOBS	Station start	
PS152_40-4	KN_08	2026-01-15T20:34:17	-70.87364	-11.17109	409.0	OFOBS	Station end	
PS152_40-5	KN_08	2026-01-15T21:37:18	-70.88950	-11.12098	318.7	MSN	Station start	
PS152_40-5	KN_08	2026-01-15T21:55:53	-70.88959	-11.12012	318.0	MSN	Station end	
PS152_40-6	KN_08	2026-01-15T22:39:43	-70.88952	-11.11985	318.2	TVMUC	max depth /	
PS152_40-7	KN_08	2026-01-15T23:05:43	-70.88951	-11.11995	318.0	TVMUC	max depth /	
PS152_40-8	KN_08	2026-01-16T00:03:51	-70.88965	-11.12111	318.2	TVMUC	max depth /	
PS152_40-9	KN_08	2026-01-16T02:36:10	-70.87684	-11.11896	366.7	B_LANDER	Station start	Recovery
PS152_40-9	KN_08	2026-01-16T02:42:30	-70.87766	-11.12499	364.0	B_LANDER	Station end	Recovery
PS152_41-1	KN_06	2026-01-16T03:39:32	-70.86287	-10.75350	310.9	B_LANDER	Station start	Deployment
PS152_41-1	KN_06	2026-01-16T03:40:09	-70.86277	-10.75398	312.0	B_LANDER	Station end	Deployment

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_41-2	KN_06	2026-01-16T04:11:45	-70.86357	-10.76505	308.3	CTD-RO	max depth /	
PS152_42-1	KN_03	2026-01-16T06:35:51	-70.64169	-11.01496	1418.3	LLDEP	Station start	Recovery
PS152_42-1	KN_03	2026-01-16T09:14:02	-70.64116	-11.00845	1413.0	LLDEP	Station end	Recovery
PS152_43-1	KN_06	2026-01-16T11:46:57	-70.89423	-10.70305	311.5	OFOBS	Station start	
PS152_43-1	KN_06	2026-01-16T15:33:54	-70.87671	-10.75762	288.0	OFOBS	Station end	
PS152_43-2	KN_06	2026-01-16T16:03:06	-70.86605	-10.75477	297.0	APN	Station start	
PS152_43-2	KN_06	2026-01-16T16:08:00	-70.86616	-10.75521	298.0	APN	Station end	
PS152_43-3	KN_06	2026-01-16T16:24:01	-70.86629	-10.75591	297.5	GKG	max depth /	
PS152_43-4	KN_06	2026-01-16T17:06:33	-70.86595	-10.75711	298.7	GKG	max depth /	
PS152_43-5	KN_06	2026-01-16T17:52:57	-70.86379	-10.76060	306.7	B_LANDER	Station start	Recovery
PS152_43-5	KN_06	2026-01-16T18:08:07	-70.86558	-10.76084	302.0	B_LANDER	Station end	Recovery
PS152_44-1	KN_09	2026-01-16T19:33:17	-70.93318	-10.48593	223.8	AGT	Station start	
PS152_44-1	KN_09	2026-01-16T19:44:56	-70.93350	-10.48702	225.0	AGT	Station end	
PS152_44-2	KN_09	2026-01-16T21:19:57	-70.94382	-10.52860	286.2	MSN	Station start	
PS152_44-2	KN_09	2026-01-16T21:36:30	-70.94403	-10.52340	279.0	MSN	Station end	
PS152_44-3	KN_09	2026-01-17T00:15:50	-70.94369	-10.52732	281.8	GKG	max depth /	
PS152_44-4	KN_09	2026-01-17T01:08:46	-70.94358	-10.52904	287.1	CTD-RO	max depth /	
PS152_44-5	KN_09	2026-01-17T02:49:48	-70.94298	-10.51164	261.9	M-RMT	Station start	
PS152_44-5	KN_09	2026-01-17T03:07:45	-70.94048	-10.49058	226.0	M-RMT	Station end	
PS152_44-6	KN_09	2026-01-17T04:14:01	-70.94415	-10.52756	283.7	OFOBS	Station start	
PS152_44-6	KN_09	2026-01-17T05:19:18	-70.93989	-10.54974	315.0	OFOBS	Station end	
PS152_44-7	KN_09	2026-01-17T05:56:28	-70.94733	-10.54584	324.2	OFOBS	Station start	
PS152_44-7	KN_09	2026-01-17T08:01:19	-70.93834	-10.52405	276.0	OFOBS	Station end	
PS152_44-8	KN_09	2026-01-17T09:22:26	-70.94032	-10.53713	300.0	SUIT	Station start	
PS152_44-8	KN_09	2026-01-17T09:52:07	-70.93664	-10.47686	205.0	SUIT	Station end	
PS152_45-1	KN_10	2026-01-17T11:32:45	-70.94415	-10.53455	301.2	CTD-RO	max depth /	
PS152_45-2	KN_10	2026-01-17T12:51:56	-70.94940	-10.54754	328.3	OFOBS	Station start	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_45-2	KN_10	2026-01-17T15:56:21	-70.93462	-10.53391	291.0	OFOBS	Station end	
PS152_45-3	KN_10	2026-01-17T17:42:37	-70.94178	-10.52878	286.6	TVMUC	max depth /	drifting iceberg
PS152_45-4	KN_10	2026-01-17T18:20:12	-70.94589	-10.52658	286.4	B_LANDER	Station start	Deployment
PS152_45-4	KN_10	2026-01-17T18:21:43	-70.94578	-10.52675	287.0	B_LANDER	Station end	Deployment
PS152_45-5	KN_10	2026-01-19T10:55:26	-70.94598	-10.53718		B_LANDER	Station start	Recovery
PS152_45-5	KN_10	2026-01-19T11:13:28	-70.94756	-10.54500	323.0	B_LANDER	Station end	Recovery
PS152_45-6	KN_10	2026-01-19T12:26:47	-70.94800	-10.54224	317.9	OFOBS	Station start	
PS152_45-6	KN_10	2026-01-19T15:31:08	-70.93728	-10.54222	303.0	OFOBS	Station end	
PS152_46-1	KN_05	2026-01-20T06:24:33	-70.80007	-10.90109	585.0	CTD-RO	max depth /	
PS152_46-2	KN_05	2026-01-20T07:26:43	-70.80247	-10.90275	566.3	OFOBS	Station start	
PS152_46-2	KN_05	2026-01-20T08:30:36	-70.79929	-10.94837	701.0	OFOBS	Station end	
PS152_46-3	KN_05	2026-01-20T09:13:14	-70.79893	-10.92625	656.4	OFOBS	Station start	
PS152_46-3	KN_05	2026-01-20T11:43:18	-70.78791	-11.00833	932.0	OFOBS	Station end	
PS152_46-4	KN_05	2026-01-20T12:57:02	-70.79757	-11.03712	906.8	SUIT	Station start	
PS152_46-4	KN_05	2026-01-20T13:26:00	-70.79894	-10.99296	802.0	SUIT	Station end	
PS152_46-5	KN_05	2026-01-20T14:36:53	-70.79763	-10.90018		LLDEP	Station start	Deployment
PS152_46-5	KN_05	2026-01-20T14:58:22	-70.80052	-10.90842		LLDEP	Station end	Deployment
PS152_46-6	KN_05	2026-01-20T15:17:04	-70.80091	-10.89854		B_LANDER	Station start	Deployment
PS152_46-6	KN_05	2026-01-20T15:17:48	-70.80094	-10.89981		B_LANDER	Station end	Deployment
PS152_46-7	KN_05	2026-01-20T15:48:10	-70.80157	-10.92208	602.2	LLDEP	Station start	Recovery
PS152_46-7	KN_05	2026-01-20T17:36:13	-70.80014	-10.98330	764.0	LLDEP	Station end	Recovery
PS152_47-1	KN_17	2026-01-21T04:50:21	-70.34977	-10.59976	2075.9	CTD-RO	max depth /	
PS152_47-2	KN_17	2026-01-21T06:48:57	-70.35104	-10.59933	2077.8	MSN	Station start	
PS152_47-2	KN_17	2026-01-21T07:30:33	-70.35015	-10.59952	2076.0	MSN	Station end	
PS152_47-3	KN_17	2026-01-21T08:42:17	-70.35261	-10.60219	1793.7	OFOBS	Station start	
PS152_47-3	KN_17	2026-01-21T11:10:34	-70.33712	-10.65310	2169.0	OFOBS	Station end	
PS152_47-4	KN_17	2026-01-21T12:44:23	-70.34995	-10.58504	2056.4	SUIT	Station start	

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_47-4	KN_17	2026-01-21T13:14:14	-70.35840	-10.51872	1965.0	SUIT	Station end	
PS152_47-5	KN_17	2026-01-21T15:21:55	-70.34986	-10.38624	1949.8	M-RMT	Station start	
PS152_47-5	KN_17	2026-01-21T16:43:52	-70.36018	-10.20803	1959.0	M-RMT	Station end	
PS152_48-1	KN_14	2026-01-21T19:50:59	-70.69819	-10.59778	938.2	TVMUC	max depth /	
PS152_49-1	KN_05	2026-01-21T21:55:35	-70.79940	-10.96445	729.6	LLDEP	Station start	Recovery
PS152_49-1	KN_05	2026-01-21T23:47:49	-70.80458	-10.99882	749.0	LLDEP	Station end	Recovery
PS152_49-2	KN_05	2026-01-22T00:11:40	-70.79805	-10.90615		B_LANDER	Station start	Recovery
PS152_49-2	KN_05	2026-01-22T00:19:15	-70.79832	-10.90869		B_LANDER	Station end	Recovery
PS152_49-3	KN_05	2026-01-22T01:41:08	-70.83340	-10.91559	446.4	M-RMT	Station start	
PS152_49-3	KN_05	2026-01-22T02:19:30	-70.85597	-10.92073	361.0	M-RMT	Station end	
PS152_50-2	KN_10	2026-01-22T03:48:25	-70.94446	-10.53651	308.1	APN	Station start	
PS152_50-2	KN_10	2026-01-22T03:50:24	-70.94485	-10.53641	307.0	APN	Station end	
PS152_50-1	KN_10	2026-01-22T03:49:10	-70.94461	-10.53647	307.8	CTD-RO	max depth /	
PS152_50-3	KN_10	2026-01-22T04:48:38	-70.94169	-10.52834	283.8	TVMUC	max depth /	
PS152_51-1	KN_05 Toothfish	2026-01-22T13:45:40	-71.84529	-13.85482	415.3	MOOR	Station start	Release Toothfish
PS152_51-1	KN_05 Toothfish	2026-01-22T13:47:17	-71.84555	-13.85509	416.0	MOOR	Station end	Release Toothfish
PS152_52-1	Ice5	2026-01-22T17:12:00	-72.04718	-14.80166	380.5	ICE	Station start	Ship-supported ice station
PS152_52-1	Ice5	2026-01-22T21:06:57	-72.04715	-14.80188	382.0	ICE	Station end	Ship-supported ice station
PS152_52-2	ROVice6	2026-01-22T22:17:45	-72.03938	-14.67151	417.8	ROVSUSU	Station start	
PS152_52-2	ROVice6	2026-01-22T22:52:09	-72.03931	-14.67168	418.0	ROVSUSU	Station end	
PS152_52-3		2026-01-25T12:41:56	-71.44414	-12.46505	381.7	BlueROV	Station start	
PS152_52-3		2026-01-25T12:49:42	-71.44419	-12.46518	382.0	BlueROV	Station end	
PS152_53-1	UDW13	2026-01-26T10:50:00	-69.32242	-18.40077	4730.6	FBOX	Station start	AutoFim- sampling
PS152_53-1	UDW13	2026-01-26T10:50:24	-69.32175	-18.40439	4741.0	FBOX	Station end	AutoFim- sampling
PS152_54-1	UDW14	2026-01-26T22:50:00	-68.19082	-24.82085	4822.7	FBOX	Station start	AutoFim- sampling

Event label	Optional label	Date/Time	Latitude	Longitude	Depth [m]	Gear	Action	Comment
PS152_54-1	UDW14	2026-01-26T22:50:10	-68.19052	-24.82227	4825.0	FBOX	Station end	AutoFim- sampling
PS152_55-1	UDW15	2026-01-27T10:50:00	-66.93970	-30.54414	4705.9	FBOX	Station start	
PS152_55-1	UDW15	2026-01-27T10:50:11	-66.93918	-30.54547	4706.0	FBOX	Station end	
PS152_56-1	UDW16	2026-01-27T18:50:00	-66.26831	-33.95898	4748.7	FBOX	Station start	AutoFim- sampling
PS152_56-1	UDW16	2026-01-27T18:50:01	-66.26829	-33.95914	4749.0	FBOX	Station end	AutoFim- sampling
PS152_57-1	UDW17	2026-01-27T23:30:31	-65.75743	-36.38125	4766.9	FBOX	Station start	AutoFim- sampling
PS152_57-1	UDW17	2026-01-27T23:30:38	-65.75723	-36.38227	4767.0	FBOX	Station end	AutoFim- sampling
PS152_58-1	AWI208-BGC	2026-01-28T00:43:28	-65.72084	-36.63103		MOOR	Station start	Recovery
PS152_58-1	AWI208-BGC	2026-01-28T03:24:22	-65.71881	-36.64219	4766.0	MOOR	Station end	Recovery
PS152_59-1	UDW18	2026-01-28T03:45:16	-65.71247	-36.63806	4766.6	FBOX	Station start	AutoFim- sampling
PS152_59-1	UDW18	2026-01-28T03:45:17	-65.71246	-36.63802	4767.0	FBOX	Station end	AutoFim- sampling
PS152_60-1	UDW19	2026-01-28T13:45:14	-64.34744	-33.97647	4921.1	FBOX	Station start	AutoFim- sampling
PS152_60-1	UDW19	2026-01-28T13:58:26	-64.31345	-34.05768	4920.0	FBOX	Station end	AutoFim- sampling
PS152_61-1	UDW20	2026-01-29T03:45:29	-61.80808	-35.63258	1914.4	FBOX	Station start	AutoFim- sampling
PS152_61-1	UDW20	2026-01-29T03:50:07	-61.79874	-35.65597	2506.0	FBOX	Station end	AutoFim- sampling
PS152_62-1	UDW21	2026-01-29T15:45:00	-61.15253	-40.51386	2397.8	FBOX	Station start	AutoFim- sampling
PS152_62-1	UDW21	2026-01-29T15:50:00	-61.15436	-40.55193	2392.0	FBOX	Station end	AutoFim- sampling
PS152_63-1	UDW22	2026-01-30T03:45:00	-60.95545	-45.87697	229.5	FBOX	Station start	AutoFim- sampling
PS152_63-1	UDW22	2026-01-30T03:50:00	-60.94657	-45.90450	210.0	FBOX	Station end	AutoFim- sampling
PS152_64-1	UDW23	2026-01-30T14:55:00	-60.46350	-50.19579	3500.0	FBOX	Station start	AutoFim- sampling
PS152_64-1	UDW23	2026-01-30T15:45:00	-60.45469	-50.57355	2855.1	FBOX	Station end	AutoFim- sampling

** Comments are limited to 130 characters. See https://www.pangaea.de/expeditions/events/PS152 to show full comments in conjunction with the entire station (event) list for expedition PS152*

Abbreviation	Method/Device
ADCP	Acoustic Doppler Current Profiler
AGT	Agassiz Trawl
APN	Apstein plankton net
ARGOFL	Argo float
BUOY_SI	Sea ice buoy
B_LANDER	Bottom lander
BlueROV	Remote operated vehicle, Blue Robotics Inc
CORE	Core
CT	Underway cruise track measurements
CTD-RO	CTD/Rosette
EK60_EK80	Fish finder echolot, EK60 / EK80
EM_sled	Electromagnetic sounding on sled
FBOX	FerryBox
FTRW-P	Pelagic fish trawl
GKG	Giant box corer
IC	Ice corer
ICE	Ice station
LIOP	Light/Optics
LLDEP	Longline deployment
M-RMT	Multiple rectangular midwater trawl
MOOR	Mooring
MSN	Multiple opening/closing net
OFOBS	Ocean Floor Observation and Bathymetry System
pCO2	pCO2 sensor
PYRA	Pyranometer
RAMSES_ACC-VIS	Hyperspectral UV-VIS Radiometer, TriOS, RAMSES-ACC-VIS
RMT	Rectangular midwater trawl
ROVMICK	Remote operated vehicle MICK, Blue Robotics Inc
ROVSUSU	Remote operated vehicle SUSU, Blue Robotics Inc
SIOBS	Sea-ice observatory
SNDVELPR	Sound velocity probe
SUIT	Surface and under ice trawl
SWEAS	Ship Weather Station
TSG	Thermosalinograph
TVMUC	Multicorer with television
UAV	Unmanned aerial vehicle
UHI	Underwater hyperspectral imager
UICE_Pump	Under ice pump
WS	Water sample

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