ELISABETH MANN BORGESE-Berichte

Baltic Sea Long-term Observation Programme

Cruise No. EMB340

25.04.2024 – 15.05.2024
Rostock-Marienehe (Germany) – Rostock-Marienehe (Germany)
BalticObs.

Michael Naumann, Sandra Kube, Martin Sass, Sebastian Neubert, Birgit Sadkowiak, Susanne Schöne, Lars Kreuzer, Christin Fechtel, Julia Wickenhäuser, Levi Grundmann, Siv Huseby, Anna Palmbo Bergman, Harshada Sakpal, Laura Catalina Torres Martin

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2024

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1. Cruise summary

1.1 Summary in English

This campaign of measurements is the third one in a series of five annual cruises to study the spatial and temporal variations of the Baltic Sea ecosystem. The work programme consisted of field data acquisition for the national environmental monitoring in the German EEZ as contract work for the Federal Maritime Agency (BSH). The second work package is part of IOW's Baltic Sea long-term observation program, performed since 1969 by this institute and its predecessor. The data acquired are the back bone of research on the natural variability as well as anthropogenic influences and are used for the regular national and international assessments of the state of the Baltic Sea (HELCOM 2023, NAUMANN et al. in review).

During this expedition 200 stations (239 CTD casts, water sampling for hydrochemical and hydrobiological parameters) were measured from the western to the central Baltic Sea and further northwards to the Bothnian Sea. The cruise was performed in perfect to appropriate weather conditions, all 21 days showed conditions mostly below 6 Bft (mean: 6.8 m/s; 4 Bft). Only 15 hours of 7 Bft occurred, but led not to "waiting on weather". The northernmost parts of the Quark and Bothnian Bay could not be sampled due to icing. Nearly all of the planned work programme were realised, but the scanfish profiles have to be skipped because of technical issues. In addition, in the western Eastern Gotland Basin two dense CTD transects were measured to follow the midsized Major Baltic Inflow of December 2023.

1.2 Zusammenfassung

Die Messkampagne ist die Dritte von fünf jährlichen Expeditionen zur Erfassung der räumlich-zeitlichen Variabilität des Ökosystems Ostsee. Das wissenschaftliche Programm beinhaltet die Felddatenerfassung für die nationale Umweltüberwachung in der deutschen AWZ, basierend auf einem Vertrag mit dem Bundesamt für Seeschifffahrt und Hydrographie (BSH). Das zweite Arbeitspaket ist Teil des Ostsee-Langzeitbeobachtungsprogramms des IOW, das kontinuierlich seit 1969 vom Institut und seines Vorgängerinstituts durchgeführt wird. Die gewonnenen Daten bilden die Basis der Forschung zur natürlichen Variabilität sowie anthropogenen Einflüssen und werden für regelmäßige nationale und internationale Bewertungen des Umweltzustandes der Ostsee verwendet (HELCOM 2023, NAUMANN et al. in review).

Im Verlauf der Expedition wurden 200 Stationen (239 CTD casts, Wasserbeprobung für hydrochemische und meeresbiologische Parameter) im Gebiet von der westlichen Ostsee bis in die zentrale Ostsee und auch weiter nördlich bis in die Bottnische See gemessen und beprobt. Die Expedition war hauptsächlich von guten bis sehr guten Witterungsverhältnissen geprägt. Alle 21 Seetage hatten Arbeitsbedingungen von meistens unter 6 Bft Wind (Mittelwert: 6,8 m/s; 4 Bft). Nur 15 Stunden hatten eine Windstärke von 7 Bft, aber führten nicht zu Ausfallzeiten. Die geplanten nördlichsten Arbeitsgebiete im Quark und der Bottenwiek konnten aufgrund von Eisgang des ausgehenden Winters nicht beprobt werden. Fast das gesamte geplante Arbeitsprogramm konnte umgesetzt werden, mit Ausnahme der Scanfish-Transekte. Zusätzlich wurden im östlichen Gotland Becken zwei hochaufgelöste CTD-Schnitte gemessen, um die Ausbreitung des mittelstarken Salzwassereinbruchs vom Dezember 2023 in diesem Gebiet zu verfolgen.

2. Participants

2.1 Principal Investigators

Name	Institution
Naumann, Michael, Dr. (Physical Oceanography)	IOW
Mohrholz, Volker, Dr. (Physical Oceanography)	IOW
Kuss, Joachim, Dr. (Marine Chemistry – nutrients)	IOW
Waniek Joanna J., Prof. (Marine Chemistry)	IOW
Kremp, Anke, Dr. (Marine Biology – phytoplankton)	IOW
Dutz, Jörg, Dr. (Marine Biology – zooplankton)	IOW
Huseby, Siv, Dr. (Marine Biology)	Umea University

2.2 Scientific Party

Name	Discipline	Institution
Naumann, Michael, Dr.	Physical Oceanography/chief scientist	IOW
Kube, Sandra, Dr.	Biological Oceanography/deputy chief scientist	IOW
Sass, Martin	Instrumentation group	IOW
Neubert, Sebastian, Dr.	Instrumentation group	IOW
Sadkowiak, Birgit	Marine Chemistry	IOW
Schöne, Susanne	Marine Chemistry	IOW
Kreuzer, Lars	Marine Chemistry	IOW
Fechtel, Christin	Biological Oceanography	IOW
Wickenhäuser, Julia (25.04.-11.05.)	Physical Oceanography	IOW
Grundmann, Levi (25.04.-11.05.)	Physical Oceanography	IOW
Huseby, Siv, Dr. (03.-06.05.)	Biological Oceanography	Uni Umea
Palmbo Bergman, Anna (03.-06.05.)	Marine Chemistry	Uni Umea
Sakpal, Harschada (11.-15.05.)	Biological Oceanography	IOW
Torres Martin, Laura Catalina (11.-15.05.)	Pharmacy	Uni Greifswald

2.3 Participating Institutions

IOW	Leibniz Institute for Baltic Sea Research Warnemünde, Germany
EMAU	Ernst Moritz Arndt University Greifswald, Germany
Uni Umea	Marine Science Centre, Umea University, Sweden

3. Research Program

3.1 Description of the Work Area

The area under investigation of the cruise EMB340 covered the western, central and northern Baltic from the Kiel Bight to the northern parts of the Bothnian Sea. An overview of the locations of CTD stations and the cruise track is given in Figure 3.1. A station list is given in Table 7.1.

The majority of stations is located along the thalweg transect of the Baltic Sea (stations: EMB340_1 to EMB340_121), describing the hydrographic, hydrochemical and biological conditions in all basins on the pathway of saltwater inflows from the North Atlantic (Fig. 5.15 to Fig. 5.19). These inflows are the solely source for ventilation of the deep basins (MATTHÄUS et al. 2008). During this cruise the transect was extended to the northern regions unaffected by these inflows, but of interest for the general situation of the Baltic Sea's ecosystem state (see IOW's new research programme 2024-2033 – "Perspectives of Coastal Seas", research area two "Coastal Seas in Transition", https://www.io-warnemuende.de/research-programme-2024-2033.html). The Aland Sill was crossed measuring stations northwards along the deepwater pathway through Bothnian Sea. The northernmost parts of the Quark and Bothnian Bay could not be sampled due to icing. The situation of icing is mapped in Figure 3.1 based on data of the ice chart of April 28th published by the Finish Meteorological Institute (FMI) and Swedish Meteorological and Hydrological Institute (SMHI).

In the centre of the Eastern Gotland Basin two west-east transects of dense CTD stations were measured (April 29th-30th: Station EMB340-53 to EMB340_75; May 8th-9th: Station EMB340_142 to EMB340_150) and in addition a west-east transect in the Western Gotland Basin (April 8th: station EMB340_133 to EMB340_141) to gather information about the cross basin distribution of hydrographic parameters in the main basin of the Baltic proper. These perpendicular transects of high-resolution measurements contributes to the understanding of small-scale processes on the basin wide dynamics. They were initially planned to measure by the towed and undulating Scanfish-CTD system. Four times (April 29th, May 5th, cf table 7.1) Scanfish profiling was tried, but the device worked not properly, showing no constant data connection to the deck unit and trials of repairing failed. The dense hydrographic data acquisition in the Eastern Gotland Basin were performed, in order to gather information about the inflowing saline waters of the recent midsized Major Baltic Inflow (MBI) of December 2023, and their mixing with the ambient warm water masses from the barocline summer inflows 2023.

3.2 Aims of the Cruise

The performed meteorological, hydrographic, hydrochemical and hydrobiological sampling and measurements lead to an assessment of the actual spring situation of the Baltic Sea ecosystem from Kiel Bight to the northern parts of the Bothnian Sea. EMB340 is the third cruise in the year 2024 of five annually expeditions.

In the frame of the COMBINE Programme of the Helsinki Commission (HELCOM), national monitoring demands to evaluate the status of Germany's coastal regions in North and Baltic Sea (BMLP) are conducted as contract work for the Federal Maritime and Hydrographic Agency (BSH) in German territorial waters and the Exclusive Economic Zone as well as bordering sea areas of Denmark and Sweden in the western Baltic Sea. Due to scientific interests, analysing variations and trends of the Baltic ecosystem as a whole, the IOW extends the investigated sites

by its long-term observation programme. Stations in Danish, Swedish, Polish, and Latvian territorial waters and their respective Exclusive Economic Zones are continuously sampled within this programme since the year 1969. From the year 2024 onwards, once a year IOW's long-term data programme is extended the northernmost parts of the Bothnian Bay to focus on the spring stage, focus on hydrographic conditions after ice melt. For measurements in this region colleagues from Umea University joined our team temporarily, who run a programme of long term observations at five key stations ten times a year since the beginning of the 1990s.

The acquired data are used for regular national and international assessments of the state of the Baltic Sea (e.g. HELCOM 2023, NAUMANN et al. in review), are analysed in numerous publications and provide the scientific basis for measures to be taken for the protection of the ecosystem Baltic Sea.

The recent scientific interest is to follow the spreading of midsized Major Baltic Inflow (MBI) which occurred in December 2023 and imported about 85 km^3 saline water with a salt mass of 1.7 Gt (salinity >15 g/kg) into the deep water of the Arkona Basin (calculations and classification after MOHRHOLZ 2018). It was known from measurements of previous cruises in March 22nd – April 8th (R/V METEOR, M200) that saline waters of this inflow entered the Eastern Gotland Basin. The focus of our measurements related to this topic was the further spreading in the deep-water layer of these inflow waters in space and time in this subregion.

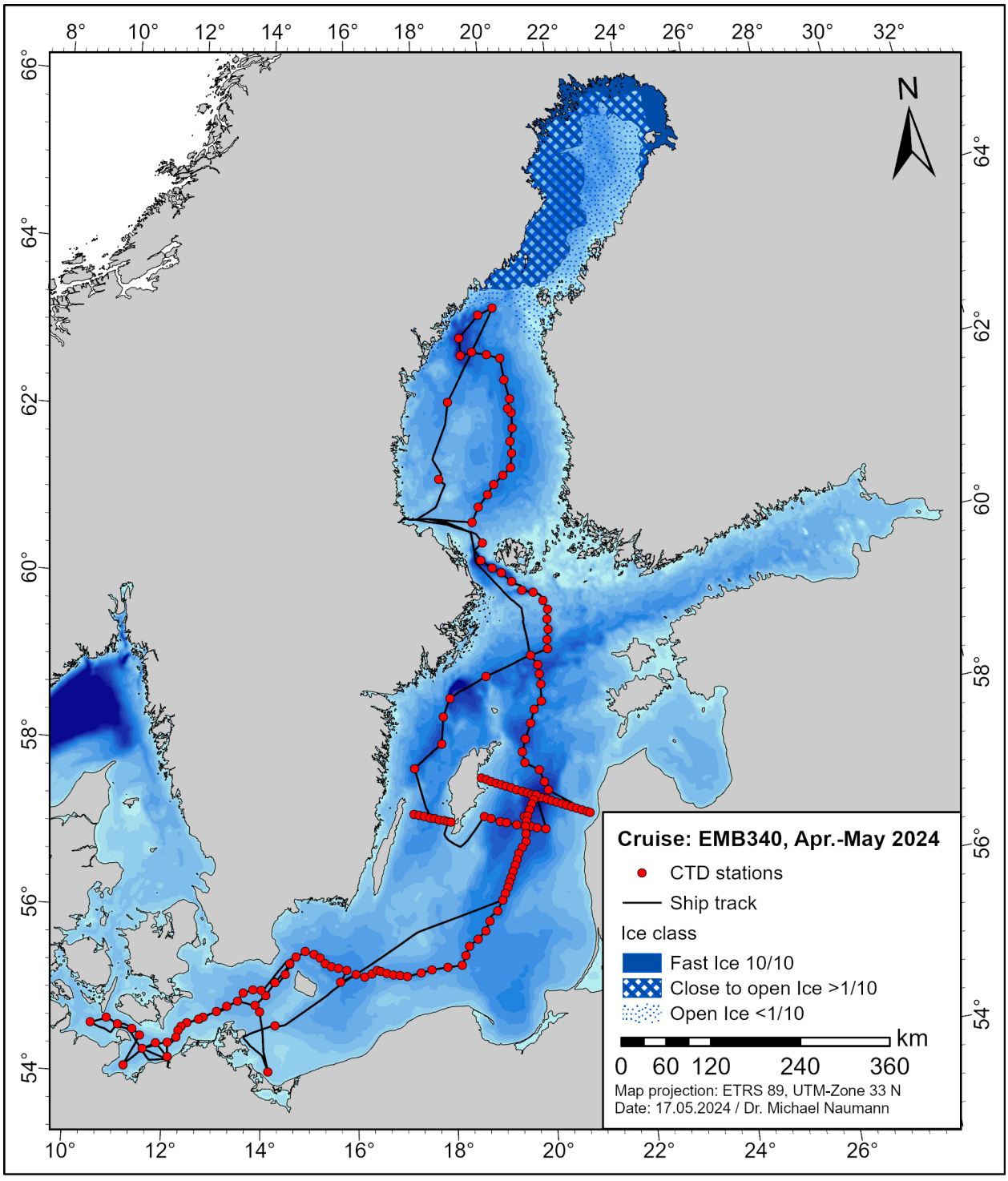

Fig. 3.1 Track chart of RV ELISABETH MANN BORGESE and map of stations of cruise EMB340 from 25. April – 15. May 2024. CTD stations are marked by red points, ship track as black line and the icing situation in the Bothnian Bay and The Quark was digitalized in 3 ice classes on the basis of FMI /SMHI ice map No. 177 from May 3rd (FMI /SMHI 2024). The bathymetry basemap was interpolated as 200x200 m grid from the dataset SEIFERT et al. 2008).

3.3 Agenda of the Cruise

The work packages of the cruise were subsequently conducted. We started with the BSH environmental monitoring program and took first measurements and sampling at the three key stations Mecklenburg Bight, Darss Sill and Arkona Basin in the western Baltic (April 25th), the so called “repetition measurements”, normally done at the tour back home of these cruises to compare what happened within these two weeks of shiptime. The main part of this program should be conducted in the month of May (at the end of this cruise), because of reasons for comparison to be in the same time slot with long-term measurements always done in the first two weeks of this month. From April 26th onwards up to May 1st we continued with the IOW’s Baltic Sea long-term observation program from the Arkona Basin to the Northern Gotland Basin. Afterwards we measured the new for the season 2024 and subsequent years “once a year north extension” of this program up to the Bothnian Sea in collaboration with colleagues of Umea University in the time span May 1st – 6th. The planned measurements in the Bothnian Bay and The Quark had to be skipped due to icing. Moving back to the central Baltic Sea we measured the stations Western Gotland Basin for the long-term program. Afterwards we turned back to the Eastern Gotland Basin for dense CTD transects to follow the inflow activity, because of time left due to the icing in the north up to May 10th. At the end of the cruise we measured the main part of the national monitoring program in the Pommeranian Bay, Arkona Basin, Darss Sill, Mecklenburg Bight, Lübeck Bight, Fehmarn Belt and Kiel Bight.

Both programs consist mainly of CTD casts, water sampling for nutrient analysis, trace gas measurements and net sampling of phytoplankton and zooplankton, described below in detail.

The standard measurements

The work on the stations usually started with a CTD cast and programmed sampling during the down cast on standard depth levels for chemical and biological parameters. Manual releases in near-bottom waters and close to the sea surface completed the sampling. At key stations for example the Bornholm Deep, Gotland Deep and so on multiple CTD casts followed on demand to meet the additional water sample requirements. A detailed list of all CTD measurements are given in table 7.1. At these key stations, water sampling was carried out for dissolved oxygen, basic dissolved inorganic nutrients, total nutrient concentrations, as well as net sampling for phytoplankton and zooplankton species were carried out. Moreover, determinations of chlorophyll and the depth of visibility by means of a Secci disk were also done. For the detailed list of sampling see table 7.2.

Additional programme:

Saline inflow

Some extra hydrographic stations were covered in the Eastern Gotland Basin to explore the spreading of saline inflow from December 2023 in more detail. (Responsible scientist: Dr. Volker Mohrholz, Dr. Michael Naumann).

Long-term observation of the microbiological habitat of the redoxcline

Insights into the changes of the microbial food web of the redoxcline is obtained by well resolved sampling of the range of the redoxcline at Gotland Deep (TF0271) and Landsort Deep (TF0284) stations on each monitoring cruise. During this cruise TF0284 could not be sampled for reasons of permissions. Therefore, in the redoxcline as well as 6 depths above and below,

respectively, in depth intervals of 2 m, samples were taken by CTD/water sampling bottles and prepared for microbiological analysis (FISH and DNA) and determination of pigments (Responsible scientist: Prof. Klaus Jürgens).

UV-Filter

Sampling of ten stations in the western Baltic Sea for the PhD Thesis "Identification of UV Filter enrichment areas in the Baltic Sea - Investigation of transport processes and long-term sinks in water and sediment" done by Harshada Sakpal and supervised by Prof. Detlef Schulz-Bull (IOW), Dr. Kathrin Fisch (Julius Kühn-Institut, Berlin) and Dr. Marion Kanwischer (IOW). Water samples were taken at the surface, ChlAmax, and bottom layer for the following stations (Fig. 1). The collection of samples from various depths will assist us in determining the variation in distribution of UV Filters in the Baltic Sea at different depths. ChlAmax is being collected specifically to help us correlate the UV Filter concentration in algae and whether they act as a link for UV Filter deposition in sediment. Solid phase extraction was used to analyze the UV Filters. The samples were filtered using Chromabond cartridges on board and further, extracted and analyzed using LC-MS/MS at Julius Kühn-Institut, Berlin.

eDNA sampling

Sampling for building up an eDNA-archive of samples for analysis of metazoan and microorganisms. The water sampling was done at 11 stations in the western Baltic by Laura C. Torres Martin (Greifswald University), supervised by Matthias Labrenz (IOW). Water samples were taken at the surface (2 l) and bottom (2 l) and filtered with mesh sizes of 0.45 µm Filter (Whatman), 0.45 µm filter from Sartorius and 0.2 µm (Isopore) and stored in Eppendorf safe-lock tubes and freeezed to -20 °C.

Sustainability and mitigation

The marine environment was less disturbed by performed scientific tasks during this cruise. No sampling in marine protected areas was done. Only sensor measurements and water sampling in the water column for chemical and biological parameters were performed. No chemicals were released in the water column (e.g. tracer experiments), no devices were lost (marine trash) and no hydroacoustic measurements were performed (underwater noise).

Equipment

Data acquisition was carried out using the following devices and measuring platforms.

At stations and transects:

- CTD SBE 911+ with rosette water sampler (CTD)
- Towed CTD Scanfish MKIII (SCF)
- Phytoplankton net, 10 µm mesh size (PLA)
- Zooplankton Apstein net, 55 µm mesh size (APNET)
- Zooplankton net, 100 µm mesh size (WP2)
- Secci desk (SD)

Continuous measurements:

- Underway measurements of surface water properties
- Ship weather station

This ship based data set consists of one minute averages of: time (UTC), latitude and longitude, ships heading, depth, air pressure, wind direction, wind speed, air temperature, humidity, global radiation, infrared radiation, surface conductivity, surface salinity, surface water temperature, surface chlorophyll-a fluorescence, surface turbidity.

4. Narrative of the Cruise

This paragraph is aimed to give an impression of the work on board during the campaign. It is a day by day report that includes the weather conditions and sea state. All times are given in UTC.

Wednesday, 24thApril 2024: Loading and transport of equipment started at 06:00. Depacking was finished around 10:30 and all devices and laboratories were prepared at 13:30. The cook of the crew had a work accident and was broad to the hospital. A replacement was found quickly by the shipping company, but arrived late in the evening. Departure was postponend one hour to 07:00 at 25th April due to reasons of onboarding the new cook at this ship, at which he had never worked before.

Day 1, Thursday, 25th April 2024: Mecklenburg Bight – Kadet Trench – Darss Sill – Arkona Basin

Embarking of the scientific crew was done at 06:30 followed by safety instructions 06:30 to 07:00. Departure of the peer Rostock-Marienehe and start of the cruise was in time at 07:00 (09:00 local time). At 10:00 - 10:55 started the station work at TF0012 (CTD, plankton nets, secchi disk), the key station of the Mecklenburg Bay. The weather situation in the Mecklenburg Bay was 6.7 °C air temperature, 1004 hPa air pressure, 76 % humidity, sunny to cloudy and northnorthwesterly wind of 340°, 2-3 m/s (2 Bft) with a glassy sea state. The sea surface temperature was 7.9 °C and a surface salinity of 10.7 g/kg was measured. It followed a turn to eastward directed routeing for measurements at the stations TF0046 (Kadet Trench) as well with CTD, plankton nets, secchi disk and stations of CTD casts at TF0002, TF0001 (Darss Sill), TF0030. At 17:00 the weather situation at the Darss Sill was 9.6 °C air temperature, 1004 hPa air pressure, sunny and easterly wind of 90°, 6.5 m/s (4 Bft) with a sea state of 0.3-0.5 m. The sea surface water showed a temperature of 9.6 °C and a salinity of 7.9 g/kg. At 20:20 we reached TF0115, the first station in the Arkona Basin and TF0114 and TF0113 followed at 23:30. TF0113 is the key station of this region and was sampled beside CTD casts as well with plankton nets.

Day 2, Friday, 26th April 2024: Arkona Basin – Bornholm Gatt – Bornholm Basin

At 02:00 we reached ABBOJE, the autonomous MARNET station. Another key station of the Arkona Basin is TF0109, which was reached at 03:45 and measured by CTD. The next stations of the Bornholm Gatt were TF0145_DK (05:30), TF0144 (07:10). During these measurements in the early morning, the CTD operators noticed damages at our CTD cable strands at the first 3-4 m after the connection to the CTD probe. We called our instrumentation team on land for help. They already had known this issue and decided that we should move on with our cruise. The CTD cable can handle loads up to 11 tons, the probe weighs 300-400 kgs so the cable will last up to the end of the cruise if it is not worsening. We continued the transect of CTD stations in the Bornholm Gatt with TF0142_DK (08:45) and TF0140 (CTD and nutrient sampling) in the northeast, measured at 10:10.

Afterwards we reached the northwestern part of the Bornholm Basin and measured further stations in eastern direction at the so called "Thalweg transect", crossing all basins from the western to the central Baltic Sea. The stations TF0206 (11:25), TF0207, TF0208, TF0200 (14:50, CTD and nutrient sampling) were measured. At 14:30 the weather situation at the northwestern Bornholm Basin was 6 °C air temperature, 1008 hPa air pressure, 91 % humidity, sunny and easterly wind of 97°, 9.5 m/s (5 Bft) with a sea state of 0.3-0.5 m. The sea surface water showed a temperature of 7.8 °C and a salinity of 7.2 g/kg. During the late afternoon to evening hours the stations TF0209, TF0211, TF0212, TF0214 (CTD and nutrient sampling) were measured. The key station TF0213 – Bornholm Deep of 95 m water depth were reached at 22:00 and measured by two CTD casts, nutrient sampling, trace gas, zoo- and phytoplankton (7x net sampling).

Day 3, Saturday, 27th April 2024: Bornholm Basin – Slupsk Channel

At 01:30 the station work at TF0213 was finished and we moved on in eastern direction measuring the stations TF0221, TF0225 at the eastern slope of the Bornholm Basin. The Slupsk Sill (58 m water depth) was reached at 04:00 and the stations TF0226 and TF0224 were measured by CTD. We continued our "Thalweg transect" in eastern direction through the Slupsk Channel by measuring the stations TF0227, TF0228, TF0229, TF0222 (key station, CTD and nutrients), TF0266, TF0267, TF0268 and TF0256 (15:05). The weather situation was calm, sunny and a glassy water surface. Afterwards we turned to northeastern direction and entered the southwestern part of the Eastern Gotland Basin. CTD measurements were done at station TF0257 and key station TF0259 were reached at 17:50 (CTD, nutrients and plankton sampling). The weather conditions at 17:00 at were 8.4 °C air temperature, 1016 hPa air pressure, 82 % humidity, sunny and northeasterly wind of 69°, 3-3.6 m/s (2-3 Bft) with a sea state of 0-0.3 m. The sea surface temperature was 8.4 °C and a surface salinity of 7.3 g/kg was measured.
The transect was continued with northeastward routing at the eastern slope of Eastern Gotland Basin measuring the stations TF0255, TF0258, TF0253, TF0265 (CTD and hydrogen sulphide sampling) up to midnight.

Day 4, Sunday, 28th April 2024: southern Eastern Gotland Basin to Gotland Deep

We continued our northeastward directed routing and measured the stations TF0250, TF0262 (hydrogen sulphide sampling). The weather situation at 07:00 was sunny with 6.8 °C air temperature, 1020 hPa air pressure, 86 % humidity. A southeasterly wind of 135° blew with 7-8 m/s (4 Bft) and the sea state was around 0.3 m. The sea surface temperature was 7.2 °C and a surface salinity of 7.5 g/kg was measured. The next stations at the eastern slope of the Eastern Gotland Basin were TF0260 at 07:30 (CTD, nutrients and hydrogen sulphide sampling), TF0274, TF0407, TF0272 (nutrients), GB_SW (reference CTD at our mooring position), TF0275. At 16:30 we reached key station TF0271 – Gotland Deep and measured and sampled various parameters up to midnight (6 CTD casts, Phytoplankton, nutrients, hydrogen sulphide, environmental DNA, trace gas).

Day 5, Monday, 29th April 2024: Eastern Gotland Basin – western to central part

Leaving the Gotland Deep station with westward routing, the ship reached the eastern coast of Gotland island at 05:30 and a scanfish transect crossing the basin perpendicular from West to East to the Latvian coast was planned. At the starting location of the transect (SF001EGB) we did a vertical CTD for intercomparison, before we deployed the scanfish system at 06:40. Due to

technical problems (data connection between deck box and towed fish) we recovered the system 15 min later, did a second preflight check on deck and deployed the system again. Unfortunately, the issue was not solved and the data connection from cable to scanfish failed again. We had to cancel scanfish profiling and did the perpendicular West-East transect by dense stations of the vertical CTD system (SF001EGB to SF014EGB).

Day 6, Tuesday, 30th April 2024: Eastern Gotland basin – central to eastern and northern part
At 00:00 the ship was in the centre of the Eastern Gotland Basin and moved eastwards to the Latvian coast measuring CTD stations SF015EGB to SF023EGB (04:15). The morning started with sunny weather with wind around 4 Bft and calm sea state. We turned northwestwards back to the eastern slope of the Eastern Gotland Basin. Next station "Gotland NE", a position of a permanent mooring, was reached 08:00 and a reference CTD measurements were done for quality management of the sensors mounted at the mooring. We followed again the "thalweg transect" in northern direction measuring TF0276 and TF0270 (both sampled for hydrogen sulphide) and moved to the sill between Eastern Gotland Basin and Farö Deep (stations TF0287, TF0290). At 16:00 we reached TF0286, the key station of the Farö Deep, and sampled various chemical parameters (nutrients, trace gas). The weather conditions at 18:00 were 6.7 °C air temperature, 1028 hPa air pressure, 77 % humidity. The sea surface temperature was 7.1 °C and surface salinity 7.2 g/kg. The wind blew with 6-7 m/s (4 Bft) from northeastern direction (50°) and a sea state of 0.3 m swell. During the evening we moved father north reaching the Northern Gotland Basin and measuring stations TF0277, TF0278, TF0285 (hydrogen sulphide sampling), TF0279 up to midnight.

Day 7, Wednesday, 1st May 2024: Northern Gotland Basin – Aland Sea
After midnight we continued in northward direction measuring TF0289, TF0282 (both with hydrogen sulphide sampling) up to 04:35. Now we had reached the northernmost station of our "classic" tour in IOW's long-term data programme and moved father north because we applied in the shiptime proposal 2024-2028 to extend every time in May our tour to the Bothnian Sea and Bothnian Bay to gather once a year a hydrographic overview of all Baltic Sea beasins up to the northernmost areas. On our tour crossing the Aland Sill we measured DB0101, DB0102, AD-1, AD-2, AD-3, AD-5 (12:05) by vertical CTD measurements. Afterwards we reached the Aland Deep measuring the stations DB0103 (13:35), DB0104 (nutrients). The halocline in this region was found much lower in around 150 m water depth compared to the central Baltic Sea (70-80 m halocline depth). The weather in the Aland Sea at 14:00 was sunny, air pressure of 1028 hPa, air temperature of 6.8 °C and 72 % humidity. The sea surface temperature showed 3.3 °C and was much lower than in the northern Gotland Basin, the surface salinity of 6.8 g/kg showed only a slightly lower value. Moderate winds of 5 m/s (4 Bft) blew from eastnortheastern direction (80°) forming a sea state of 0.5 m swell. During the afternoon and evening we followed the deep-water way between the islands to the north measuring DB0105, DB0106, DB0107 by CTD. At station TF0604 we took in addition to CTD measurements nutrient samples.

Day 8, Thursday, 2nd May 2024: Bothnian Sea – Gävle harbour
At midnight we reached station DB0201 in the south of the Bothnian Sea. Afterwards we turned westwards and transit to Gävle harbour in Sweden. Originally Umea was planned at the northwestern coast of the Bothnian Sea and transition to the Quark, but because of crushed icing in this harbour we had to adjust our plans and changed to Gävle in the southwest. We reached the

harbour at 07:00 to take our Swedish colleagues from Umea university on board, which run a long-term data program in these northern basins since the year 1990. A collaborative sampling with them as local specialists was planned in advance. We used the time in the harbour to reorganize our laboratories, because the Swedish team will take their own equipment onboard for intercalibration of methods. In addition, we organized spare parts for our scanfish system, which will be send from Warnemünde with the help of colleagues from our instrumentation group. Hopefully the parts will reach us at our second harbour stay in a few days.

Day 9, Friday, 3rd May 2024: Gävle harbour - Bothnian Sea

At 09:00 our colleagues Siv Huseby and Anna Palmbo Bergman arrived from their six hours car travel from Umea. At 10:00 we restarted our expedition heading eastwards to the southern entrance of the Bothnian Sea to complement the CTD transect through the deep-water way of the basins farther north. We used the transit time for scientific talks in the messroom to get to know the aims of both teams in detail. At 16:00 we reached our first station DB0108 measuring a CTD profile. The weather situation was calm. Next stations at the transect were DB0109, DB0110, before we reached key station TF0604 (CTD, nutrient sampling) at 20:40. This station of the southern Bothnian Sea was already measured by former cruises of the institute in the 80ies and is as well part of the swedish and finnish programmes (named C4 and SR5). Up to midnight DB0111 and BS-7 were measured.

Day 10, Saturday, 4th May 2024: Bothnian Sea - northwards

We continued our tour to the north measuring DB0112, BS-9, BS-10, DB0113 by CTD up to 06:25. The weather conditions in the central part of the Bothnian Sea were sunny with northerly winds of 8-9 m/s (5 Bft) forming a slight swell of 0.5-0.75 m. At 07:00 we reached key station F26 /C15 (SWE /FIN) where both teams measured CTD and nutrients. During the morning we had to decide in the cruise planning how far we can move with our ship northwards because of icing in the Bothnian Bay and Quark region. We studied the latest ice map from May 3rd of FMI /SMHI (digitalized and marked in Fig. 3.1) and decided with the captain to stay away of crushed ice at least 10 nautical miles. Station DB0117 at 63° 11.85’ N will be our northernmost station of this cruise. We continued with CTD measurements at BS-11, DB0114, TF0603 and during the afternoon the stations DB0115, DB0116. At 17:00 we reached key station UMCS_C3 of 240 m water depth at the northwestern part of the Bothnian Sea to sample with both teams CTD, nutrients and plankton in parallel up to 19:45. The weather conditions at 17:30 were 4.2 °C air temperature, 1015 hPa air pressure, 85 % humidity, sunny and northerly wind of 358°, 3.8 m/s (3 Bft) with a glassy sea surface. The sea surface temperature was 5.0 °C and a surface salinity of 5.4 g/kg was measured. We moved farther north during the evening and reached CTD station DB0SGS70 at 21:15.

Day 11, Sunday, 5th May 2024: Bothnian Sea – southwards

After midnight we measured DB0118 and reached the northernmost station DB0117 at 01:50 close to the Quark and crushed ice margin. Afterwards we headed southwards with 8 hours transit to the the central /western part of the Bothnian Sea to sample stations in Swedish waters of the long-term data programme of Umea university. At 10:00 we arrived at UMSC_C14 of 93 m water depth (key station of the swedish programme) and sampled again twice in both teams several physical, chemistry and biological parameters for intercalibration. The weather conditions in the central Bothnian Sea were at 13:00 cloudy and calm, air pressure of 1016 hPa,

air temperature of 3.2 °C and 81 % humidity. The sea surface temperature showed 4.7 °C and a surface salinity of 5.5 g/kg. Moderate winds of 7.5 m/s (4 Bft) blew from eastnortheastern direction (58°) forming a sea state of 0.3 m swell. At 18:00 we reached the last station in this region named UMSC_C24 which was measured by CTD of both systems, but water sampling was done only by the swedish team for their programme. 19:00 sampling was finished and transit to the southwest back to Gävle harbour began.

Day 12, Monday, 6th May 2024: Gävle harbour - Bothnian Sea - Aland Sea

We reached Gävle harbour at 07:00 and unloading of swedish scientific equipment and disembarking of the swedish colleagues was done at 08:00. Fresh food supplies and our ordered spare items of the scanfish system were delivered at 09:00. The ship left Gävle at 10:00 with transit to the Northern Gotland Basin. The time was used to repair the scanfish system, measuring nutrient samples of the last days and preparing the laboratories for the next leg through the Western Gotland Basin. The 16:00 weather situation in the southern Bothnian Sea was sunny with swell of 1-1.25 m. Air pressure stayed constant at 1016 hPa, air temperature of 3.5 °C and 73 % humidity. The sea surface temperature showed 6.3 °C and a surface salinity of 5.5 g/kg. Strong winds of 11 m/s (6 Bft) blew from northnortheastern direction (12°).

Day 13, Tuesday, 7th May 2024: Northern Gotland Basin – Western Gotland Basin

At midnight the ship is at the Aland Sill heading south to the Northern Gotland Basin. We reached station TF0288 at 05:40 measuring CTD and did sampling for hydrogen sulphide in the deepwater. Afterwards we tested the repaired scanfish system and deployed it at 06:20, but recovered at 07:10 because of data connection issues. The engineers assumed an empty battery in the controlling unit, because this spare part was used at a RV Meteor expedition in the central Baltic shortly before our cruise and worked fine that time. Transit to next station was used for charging this internal battery. The weather conditions at 08:30 were sunny, air pressure of 1021 hPa, air temperature of 3.9 °C and 78 % humidity. The sea surface temperature showed 7.2 °C and a surface salinity of 7 g/kg. Moderate winds of 8 m/s (4 Bft) blew from tnorthern direction (355°) forming a swell of 1 m. Station TF0283 was measured at 11:20 and afterwards the scanfish was deployed for two more trials (12:00 – 12:10 and 12:30 – 12:40) on the way to the Landsort Deep. The system failed again and we had no other option to solved the problem. At 16:00 we reached the key station Landsort Deep – TF284 in the Western Gotland Basin and deepest station of the Baltic Sea (460 m). We measured 5 CTD's to take water samples for several chemical and biological parameters and left after four intensive hours. The weather conditions at the Landsort Deep (19:30) were sunny and calm with glassy water surface. Air pressure was at 1025 hPa, air temperature of 5.1 °C and 74 % humidity. The sea surface temperature showed 7.4 °C and a surface salinity of 6.7 g/kg. Low winds of 1.9 m/s (2 Bft) blew from southern direction (179°). Station wGB-3 was measured by CTD at 21:45.

Day 14, Wednesday, 8th May 2024: Western Gotland Basin - south

Our tour to the south continued reaching TF0240 in the centre of the Western Gotland Basin after midnight doing a CTD cast and hydrogen sulphide sampling. Next CTD stations in southern direction were TF0242 (04:20) and TF0245 – Karlsö Deep (08:55). Afterwards we turned westwards to the coast of Öland island, the start of a West-East transect. It was originally planned as scanfish measurement, but due to the technical problems with this towed system, we did it by nine vertical CTD's in short distances (SF025WGB to SF032WGB) from 10:45 to

17:30. The weather situation in the southern part of the Western Gotland Basin were cloudy with phases slight precipitation. The condition stayed nearly constant to the previous day in the northern part. Air pressure was at 1026 hPa, air temperature of 5.7 °C and 88 % humidity. The sea surface temperature showed 7.3 °C and a surface salinity of 6.8 g/kg. Moderate winds of 9.5 m/s (5 Bft) blew from southern direction (186°) forming a swell of 0.5 – 0.75 m. Due to icing in the Bothnian Bay some spare ship time was generated which we used for following the propagation and spreading of the Major Baltic Inflow of December 2023 in the Eastern Gotland Basin in more detail. After the cruises for the long-term data programme in February and May (EMB356, EMB337) and the cruise M200 at RV Meteor (central Baltic Sea) we wanted to complement these datasets about the inflow activity in the Baltic dep water layer. So, we turned around the southern coast of Gotland back to this Basin and started a second perpendicular West – East CTD transect southerly of SF001EGB to SF023EGB (April 30th). At 23:00 we reached the start at the western slope of the Eastern Gotland Basin measuring TF0402.

Day 15, Thursday, 9th May 2024: Eastern Gotland Basin – central part – Gotland Deep

We continued this West – East transect with another eight CTD stations finishing at the eastern slope at 09:20 (TF0403 – TF0409). Afterwards we turned northwest with transit to station TF0271 – Gotland Deep. The weather conditions at 12:00 in the Eastern Gotland Basin were sunny to cloudy, air pressure of 1022 hPa, air temperature of 8.6 °C and 83 % humidity. The sea surface temperature showed 6.8 °C (slightly lower than a week before with 7.1 °C, April 30th), the surface salinity of 7.5 g/kg. Low winds of 4 m/s (3 Bft) blew from southwestern direction (248°) forming a sea state of 0.5 m swell. The key station Gotland Deep was measured at 12:20, starting a CTD transect of higher resolution in southwestern direction by stations every hour (around 9 nautical miles distance between the measurements). It repeats a part of the "Thalweg transect" from April 28th, where the new water mass of December 2023 spreads in the deep-water. Up to midnight we measured ten CTD stations in southern direction (TF0271 to 274s).

Day 16, Friday, 10th May 2024: Eastern Gotland Basin – southern part

The North-South transect at the eastern slope of the Eastern Gotland Basin was continued with another nine stations (TF0260 to TF0250) and finished at 120 m water-depth at 09:30. The weather conditions in this region (07:00) were cloudy, air pressure was at 1018 hPa, air temperature of 7.7 °C and 97 % humidity. The sea surface temperature showed 7.1 °C and a surface salinity of 7.5 g/kg. Moderate winds of 7 m/s (4 Bft) blew from northwestern direction (325°) forming 0.75 m swell with some white caps. After finishing the CTD transect we had a transit reach of 13 hours to the Bornholm Deep. At 22:00 we reached TF0213 for repeated measurements (hydrography, chemistry, biology) of April 26th on our tour back in the western Baltic Sea.

Day 17, Saturday, 11th May 2024: Bornholm Basin – Bornholm Deep – Sassnitz harbour

Transit to Rügen island /Sassnitz harbour began at 01:00 after finishing the sampling at the Bornholm Deep and we measured CTD at station TF0152 at the "Adlergrund" /southwestern Rönnebank at 10:40. The weather conditions in the Pomeranian Bay were calm with glassy water and dense fog, that we had to reduce velocity for safety reasons. We reached Sassnitz harbour at 14:00 to change staff. Our students and trainees Julia Wickenhäuser and Levi Grundmann left, because we needed the berths for our colleagues, who had planned additional sampling for UV-filters and eDNA in the western Baltic Sea. Harshada Sakpal (IOW) and Laura Torres Martin

(Greifswald University) came onboard at 15:00 and reorganisation of the wet lab and dry lab started. We stayed at Sassnitz for the night.

Day 18, Sunday, 12th May 2024: Sassnitz harbour – Oder Bank – Arkona Basin

Departure of Saßnitz harbour /Rügen island at 07:00 with routeing southeastwards to Oder Bank and reached station OBBoje (MARNET station Oder Bank) at 09:50 and did a reference CTD at the autonomous platform and water sampling for nutrients and analaysis of UV-filters. The weather conditions at Pomeranian Bight (11:00): cloudy to sunny, air temperature 10.8 °C, air pressure of 1026 hPa, 66 % humidity, 13.4 °C sea surface temperature, salinity of 6.5 g/kg, 9-10 m/s wind (5 Bft) from northeastern direction (55°) and a sea state of 0.75 m swell. At 15:00 we reached station TF0112 at the southern rim of the Arkona Basin sampling nutrient parameters and eDNA with two CTD casts. A reference CTD at the autonomous platform ABBoje was done at 16:30 and key station TF0109 was reached at 18:10 measuring hydrography and sampling nutrients and biological parameters. Afterwards we moved northeastwards into the Bornholm Gatt measuring TF0145, TF0142DK up to midnight.

Day 19, Monday, 13th May 2024: Arkona Basin – Darss Sill – Kadet Trench

After midnight we measured TF0140 in the north of Bornholm island. We had to measure all these stations again, because nutrient sampling for our national monitoring to have these measurements comparable to values of previous years and decades all measured in the beginning of May. At the beginning of this cruise we measured them to have the hydrography in a time line for our “Thalweg transect”. We returned back to the central Arkona Basin measuring TF0103, TF0104, TF0105. At 08:00 we reached key station TF0113 measuring hydrography and sampling nutrients and biological parameters. The weather conditions in this region (09:00) were calm and sunny, air pressure was at 1022 hPa, air temperature of 9.8 °C and 84 % humidity. The sea surface temperature showed 9.9 °C and a surface salinity of 7.3 g/kg. Light to moderate winds of 5 m/s (3-4 Bft) blew from east southeastern direction (103°) forming 0.5 m swell. At the beginning of the cruise this area showed a sea surface temperature of 9.6 °C, so the very warm weather phase at the mainland with daily max. sometimes above 20 °C showed no significant impact on the warming of the open water during the last three weeks. We continued westwards with stations TF0114, TF0115, TF0030 and reached the Darss Sill station TF0001 – the MARNET autonomous platform at 14:50 for reference measurements. In the western Baltic Sea most of the stations are sampled for nutrient and biological parameters (cf. table 7.1). Next stations on the “Thalweg transect” were TF0002, TF0033 and then followed the stations of the Kadet Trench TF0083, TF0046 (key station) and TF0041 (20:30) during the evening. Now we left the Thalweg transect by heading south to measure the key station TF05 in front of Warnemünde at 22:00, so that we do not have sampling very shortly before reaching the harbour and putting some time in between biological sampling stations to give some time to prepare for the next station (TF0012). Afterwards we moved northwestwards and reached TF0017 at 23:45.

Day 20, Tuesday, 14th May 2024: Mecklenburg Bight – Lübeck Bight – Fehmarn Belt – Kiel Bight

At 01:30 we started CTD measurements with chemical and biological sampling at TF0012, the key station of the Mecklenburg Bight. Afterwards we moved southwestwards to the Lübeck Bight to measure and sample TF0022 (key station). Then we turned back northwards to the Fehmarn Belt measuring TF0013, TF0010 (key station) and TF0014. The weather conditions in

this region were at 06:00: sunny and windy, air temperature 12.9 °C, air pressure of 1014 hPa, 77 % humidity, 12.3 °C sea surface temperature, salinity of 9.2 g/kg, 11-13 m/s wind (6 Bft) from eastern direction (90°) and a sea state of 0.5 m swell. Afterwards we reached the Kiel Bight measuring TF0361 at the entrance of the Great Belt and TF0360 close to Kiel Lighthouse as the key station for this region. We ended our sampling programme at this cruise at the westernmost station at 14:25 with station number 200, a new record for a cruise of RV ELISABETH MANN BORGESE. During the evening hours the last samples were measured in the laboratories and the clearing up started.

Day 21, Wednesday, 15th May 2024: Mecklenburg Bight – Rostock Marienehe harbour
Afterwards we had transit to the harbour Rostock-Marienehe (07:00). In the time frame 07:00 to 12:00 deinstallation, unloading of scientific equipment and disembarking of scientific crew was done. End of cruise EMB328 at 12:00. Later on, equipment was depacked and stored in the institute in Warnemünde and IOW storage at Marienehe up to 14:00 UTC.

5. Preliminary Results

The results presented in the following section are preliminary and not comprehensive, since they are based in most cases on unevaluated raw data. CTD data is quality checked and validated within two weeks after the cruise. The aim of this section is to give a first impression on the collected data set. An advanced data analysis will be integrated follow after all validated data sets are available.

5.1 Meteorological Conditions

The weather conditions during the cruise were generally “perfect to appropriate” and no time gaps of “waiting on weather” occurred during these 21 days from April 25th to May 15th. In chapter 4 are daily notes of the conditions described once or two times a day in the different subregions of the ship track. The wind conditions are shown in figure 5.1 with a stick plot for an overview of the development windspeed and wind direction as well as a colour bar of the windspeed. Eastern wind directions dominated (mean: 128° SE) and wind strength was mostly below 6 Bft (Fig. 5.1 - blueish, greenish and yellow colours) with a mean windspeed of 6.8 m/s; 4 Bft). Only 15 hours of 7 Bft occurred after harbour stop two in Gävle on the transit tour to the Northern Gotland Basin, but led not to “waiting on weather”.

The air temperature ranged between 3 °C in the northern region of the Bothnian Sea (May 5th-6th) to 12-15 °C during the last days in the area Mecklenburg Bight to Kiel Bight at May 14th (Fig. 5.2). The harbor stop one in Gävle (May 2nd-3rd) showed the same high values, but this time slot is influenced by the weather conditions on land. The mean air temperature during the cruise was about 7.6 °C and the highest value was reached in the rivermouth of the Warnow on our tour back to Rostock-Marienehe at May 15th.

Air pressure varied from 1003.5 hPa (April 25th) to 1029.8 hPa (April 30th) and the cruise was generally under high pressure conditions with a mean of 1019.4 hPa (Fig. 5.3). The humidity was generally high with in mean 79.7 % and ranged between 60-90 % (Fig. 5.4). Outliers with a low of 44 % occurred in the harbour of Gävle and a phase of very high humidity of over 90 % at May 10th-11th on our tour from the Bornholm Basin to the Pomeranian Bight and Sassnitz harbour, characterized by very low windspeed and dense fog.

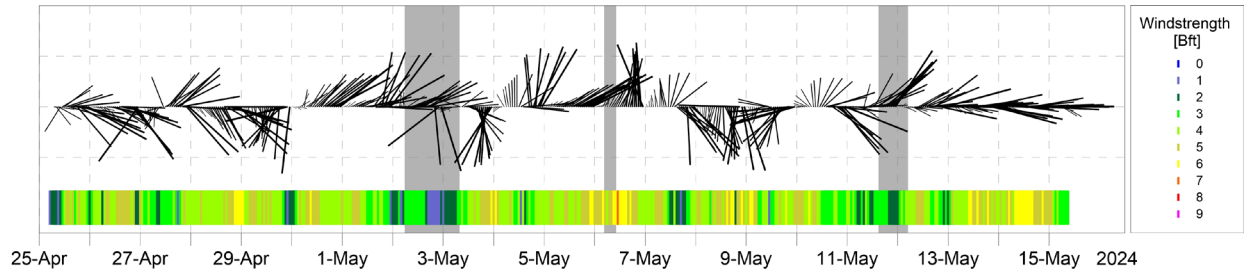

Fig. 5.1 Stick plot of wind vector measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly mean values). The grey shaded areas indicate periods when the ship was in port.

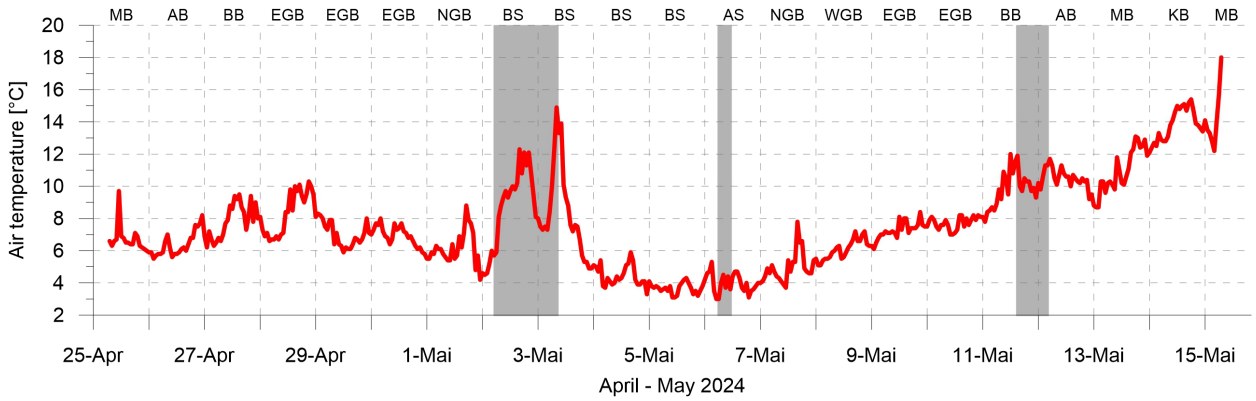

Fig. 5.2 Air temperature measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly mean values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top (KB – Kiel Bight, MB – Mecklenburg Bight, AB – Arkona Basin, BB – Bornholm Basin, EGB – Eastern Gotland Basin, NGB – Northern Gotland Basin, WGB – Western Gotland Basin, AS – Aland Sea, BS – Bothnian Sea).

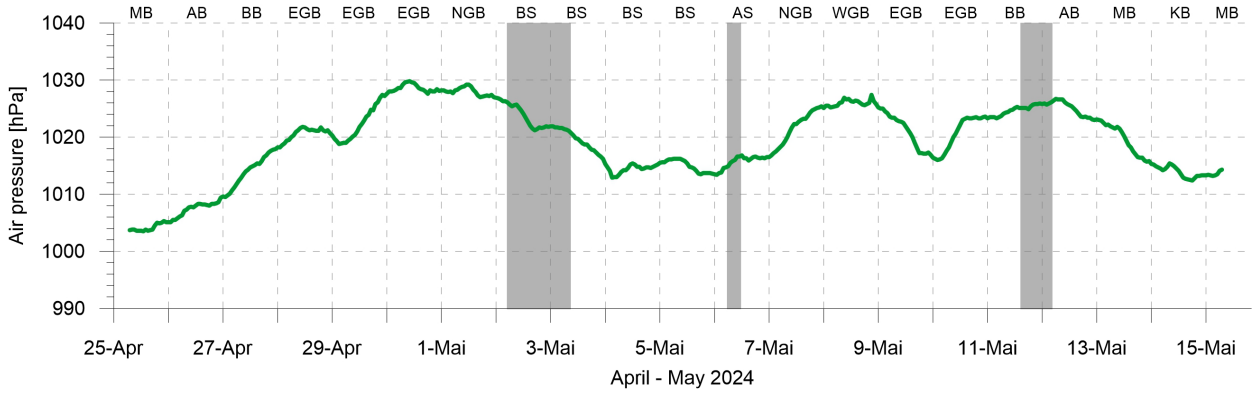

Fig. 5.3 Air pressure measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly mean values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top.

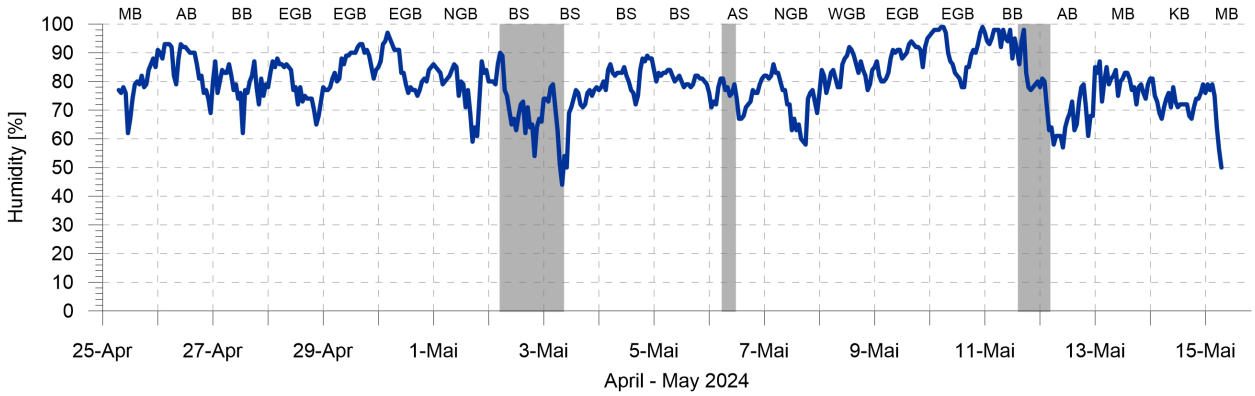

Fig. 5.4 Air humidity measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly mean values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top.

5.2 Properties of Surface Waters

Sea surface temperature, salinity, chlorophyll-a fluorescence and turbidity distributions in the investigation area were compiled from data gathered with the Surface water Monitoring Box (JSMB). The distributions shown in Fig. 5.5 to Fig. 5.12 are based on unvalidated data.

At the beginning of the cruise the sea surface temperatures (SST) ranged in the western Baltic (Mecklenburg Bight – Arkona Basin) between 6-9 °C and in the southern to central Baltic 4-7 °C from Bornholm Basin to Northern Basin in the time span April 25th to May 1st (Fig. 5.7). Passing the Aland Sill colder surface water of 2.5-4 °C. During the harbour stay in Gävle the water was much warmer. Limited water exchange between the semi enclosed harbour basin surrounded by small islands at the entrance to the open part of the Bothnian Sea caused a accelerated warming after the winter. The northern parts of the Bothnian Sea showed the lowest SST of 1.9 °C at May 4th (Fig. 5.5) around 10 nautical miles southern of slightly icing in The Quark area (Fig.3.1). Turning back to the central Baltic a warming of 1-1.5 K was obvious during the last week and the Eastern Gotland Basin showed a SST of 5-8 °C (May 9th – 11th) due to the calm and sunny weather of the last days. The western Baltic showed an even larger SST increase of up to 4 K at the end of the cruise. The warmest SST of the cruise was measured at the Oder Bank between Rügen island and Bornholm island with 13.8 °C at May 12th. It is the result of three weeks of sunny calm and warm weather. On the mainland of Mecklenburg Vorpommern air temperatures of above 20 °C occurred during the cruise time. Table 5.1 provides an overview of hydrographic and hydrochemical parameters measured at key stations of all subareas of this cruise.

The surface salinity (SSS) depicted its maximum of 13.3 g/kg (May 14th) in the Kiel Bight and Belt Sea west of Fehmarn in the transition zone to the North Sea (Fig. 5.6, Fig. 5.8). In the Mecklenburg Bight, between the Fehmarn Belt and the Darss Sill, surface salinities of 11-8 g/kg were detected at the beginning of the cruise and a drop to around 7-9 g/kg at the end (Fig. 5.8). The Arkona Basin and the western part of the Pomeranian Bight depicted SSS values between 7-8 g/kg, which is in the usual range for these subregions. The eastern located areas from Bornholm Basin till the Eastern Gotland Basin depicted slightly lower SSS values of about 7.0-7.5 g/kg (Fig. 5.6, Table 5.1). The Northern and Western Gotland Basin showed values 6.7-7.0 g/kg. Passing the Aland Sill to the Bothnian Sea, the surface salinity reduced further to values below 6 g/kg.

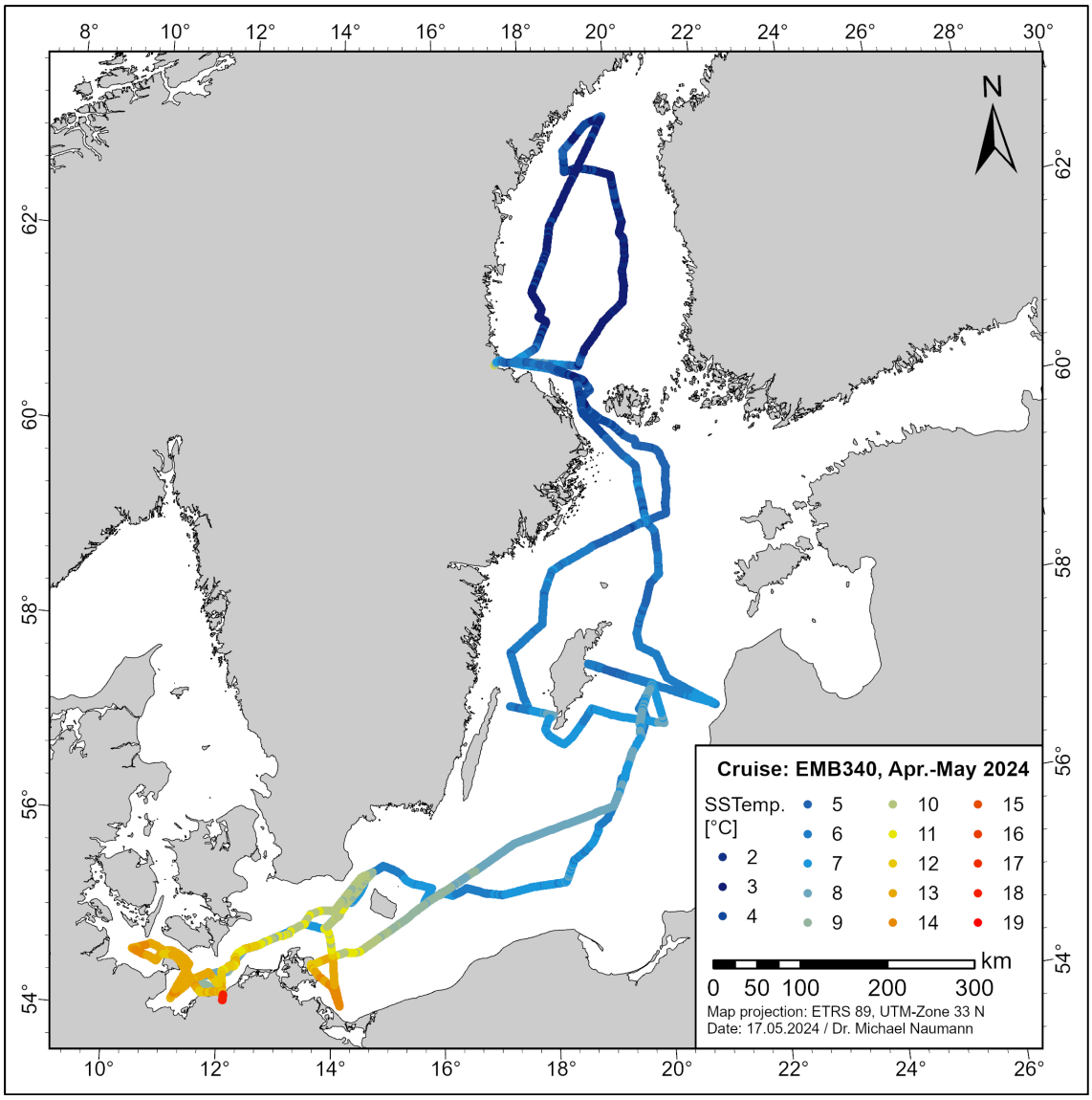

Fig. 5.5 Sea surface temperature distribution along the cruise track of EMB340 measured with the ship thermosalinograph (5 min averaged values).

The surface distribution of chlorophyll-a fluorescence and turbidity depicts a sensory information about the biological activity of plankton in the surface water (Fig. 5.9, Fig. 5.10, Fig. 5.11, Fig. 5.12) despite our water sampling at key stations and extensive time-consuming laboratory analysis. The fluorescence sensor shows along more or less constant values between 0.4 and 1, which are higher values (more or less doubled) than in the winter and early spring cruises in February and March. Only the northern part of the Bothnian Sea during the middle of the cruise showed increased values between 1-2. The maximum chlorophyll-a fluorescence values were measured as a short peak of 3.2 at April 27th in the eastern part of the Slupsk Channel (Fig. 5.11).

The surface turbidity distribution was low (below 5 ntu) but with a slight increase from values below 3 ntu in the Western Baltic to 3-4 ntu in the central part during the first week of the cruise (Fig. 5.12). It raised quickly to around 10 ntu in the Bothnian Bay and stayed on this level turning back again to the central Baltic Sea. A further increase to 14-15 ntu occurred during the last days measuring in the Arkona Basin to Kiel Bight (Fig. 5.10). This development over a

period of three weeks is a marker of increased biological activity in the surface water layer due to warming and increased daylight in spring compared to the winter season.

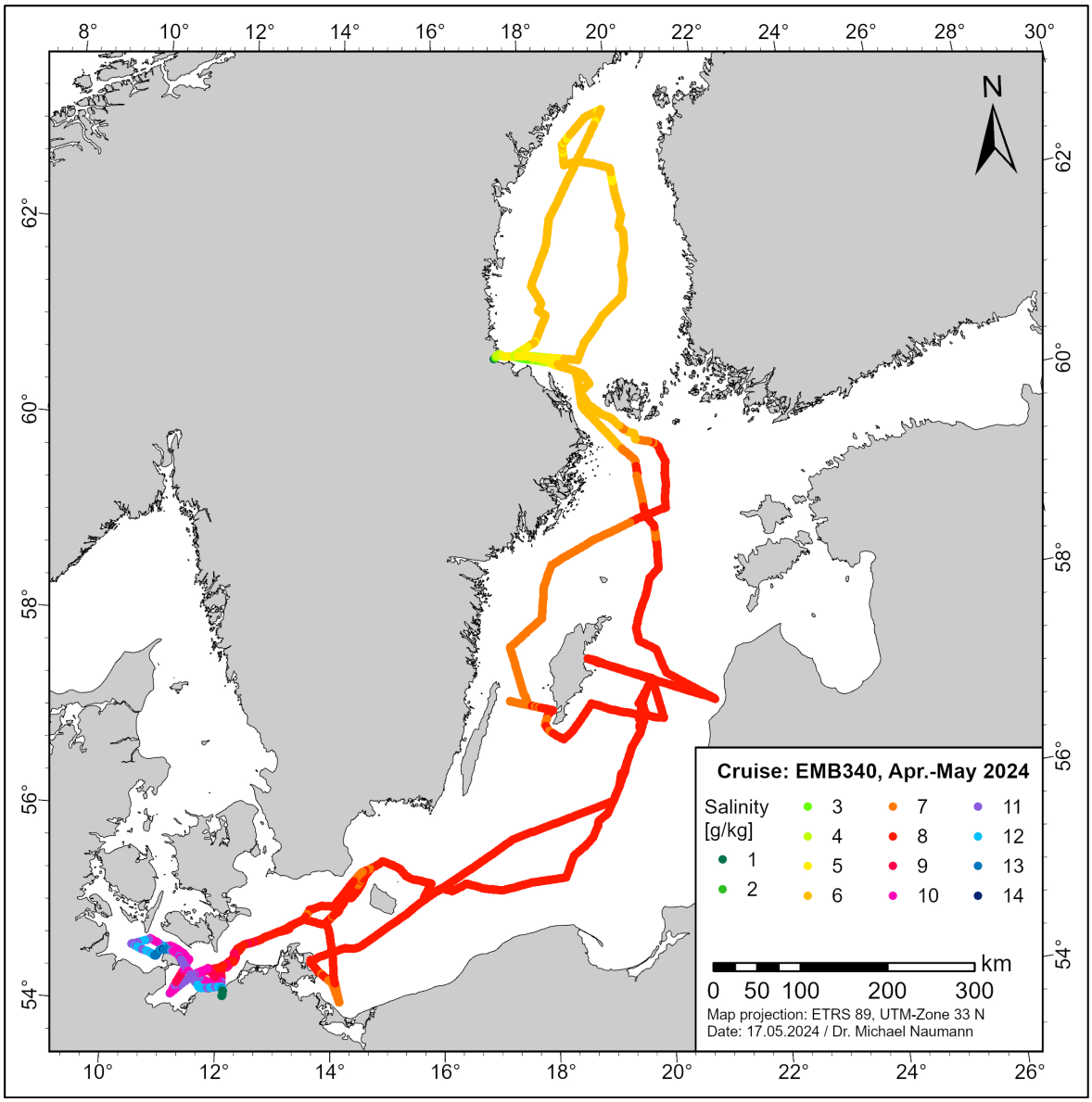

Fig. 5.6 Surface salinity distribution along the cruise track of EMB340 measured with the ship thermosalinograph (5 min averaged values).

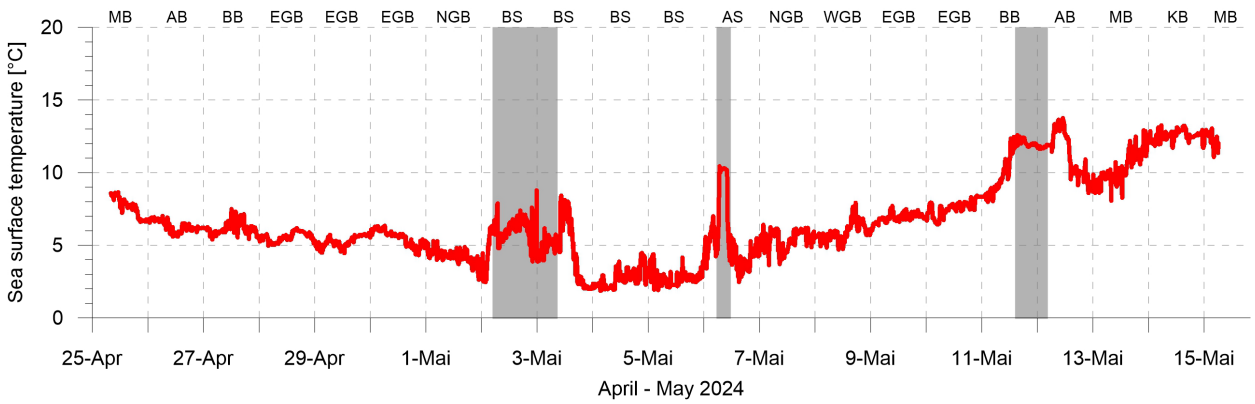

Fig. 5.7 Surface temperature measured with the ship thermosalinograph of RV ELISABETH MANN BORGESE (5 min averaged values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top.

Fig. 5.8 Surface salinity measured with the ship thermosalinograph of RV ELISABETH MANN BORGESE (5 min averaged values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top.

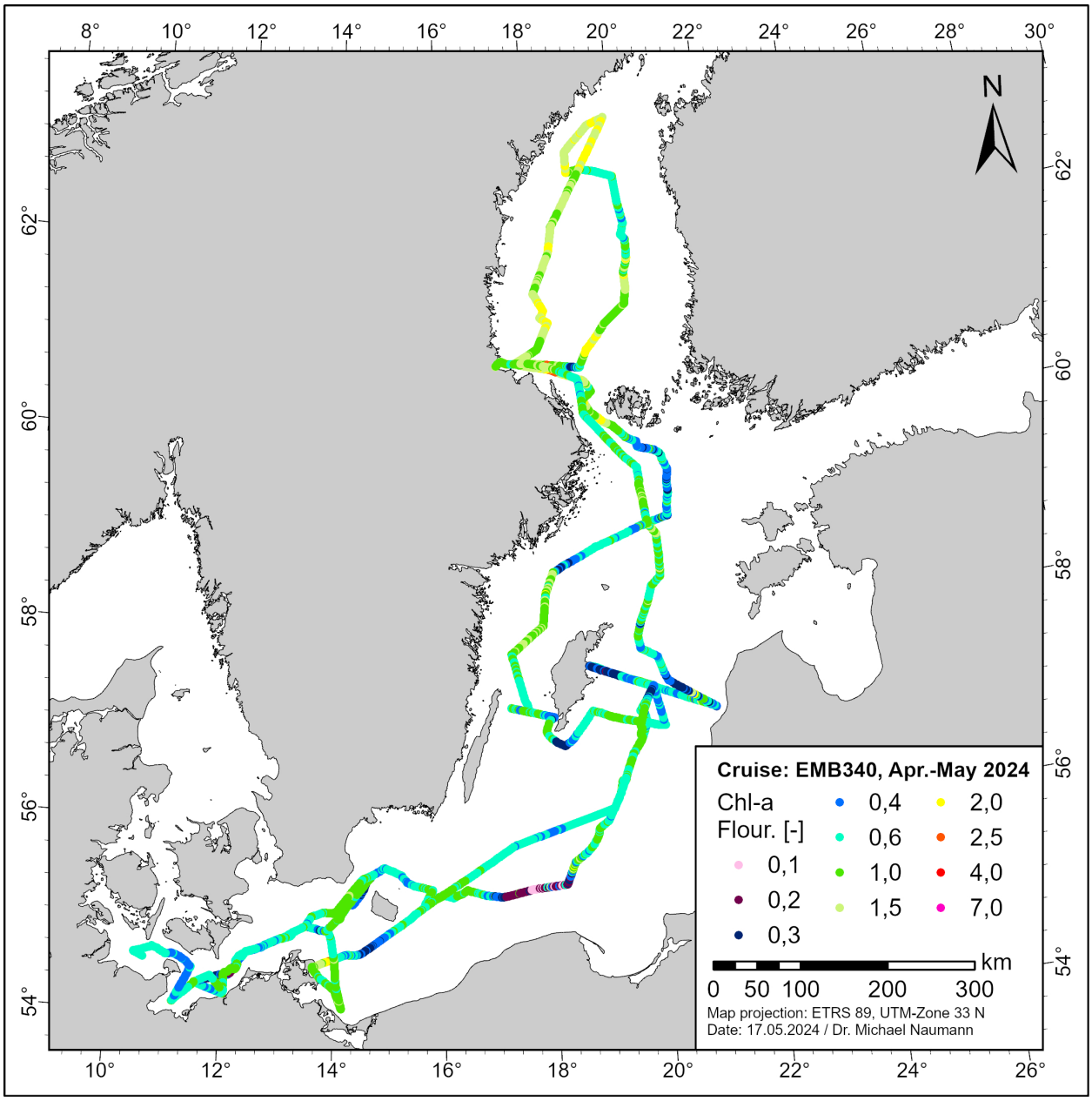

Fig. 5.9 Surface chlorophyll-a fluorescence along the cruise track of EMB340 measured with the ship thermosalinograph (5 min averaged values).

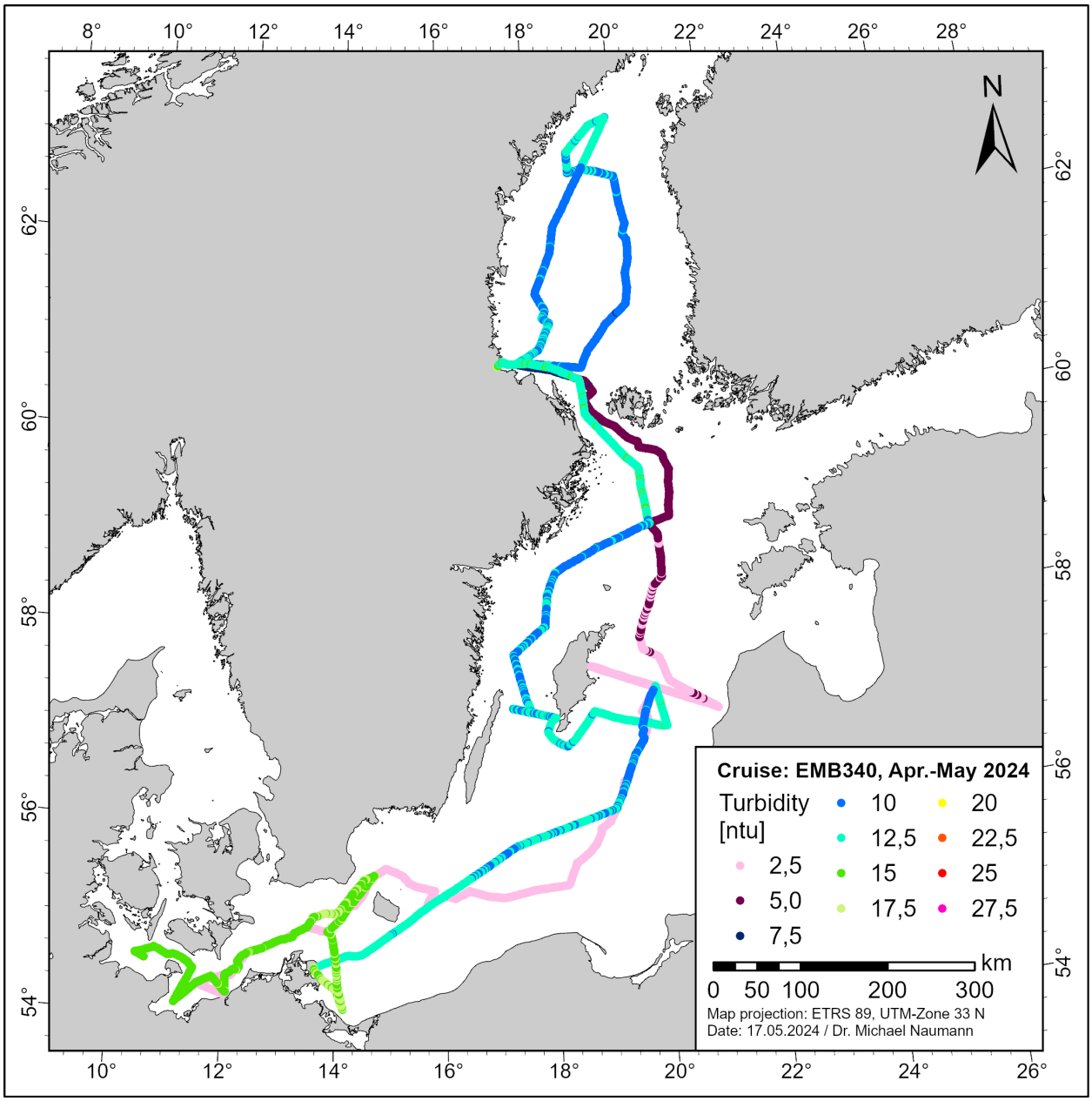

Fig.5.10 Surface turbidity along the cruise track of EMB340 measured with the ship thermosalinograph (5 min averaged values).

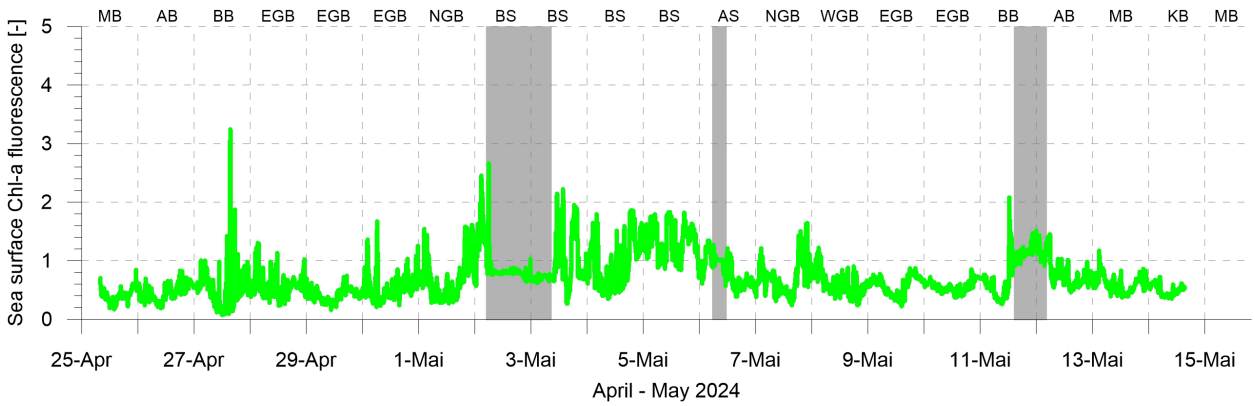

Fig.5.11 Surface chlorophyll-a fluorescence measured with the flow through fluorometer of RV ELISABETH MANN BORGESE (5 min averaged values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top.

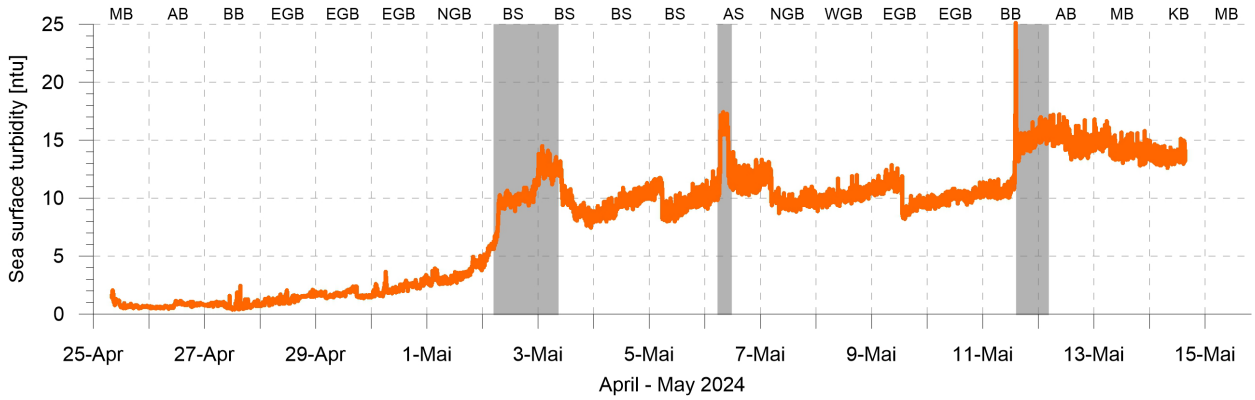

Fig.5.12 Surface turbidity measured with the flow through fluorometer of RV ELISABETH MANN BORGESE (5 min averaged values). The grey shaded areas indicate periods when the ship was in port. Abbreviations for the main sea area of each day are marked on top.

5.3 Observations at key Stations

The following tables list the surface (Table 5.1) and bottom values (Table 5.2) of the most important hydrographic and chemical parameters measured at the key stations of the Baltic long term observation program. For positions of the particular stations refer to Fig. 5.13 and Table 7.1.

The physical conditions of the surface water layer are described in chapter 5.2 and dissolved oxygen showed in all subregions high concentrations and ranged between 322 µmol/l in the Kiel Bight (to the end of the cruise in warm water of 12.5 °C) and 454 µmol/l in the Aland Sea (SST 3.5 °C). The nutrient concentrations depicted the typical for spring in the surface water. The phosphate concentrations are generally much lowered by 50-80 % compared to the winter situation in February 2024 (cruise EMB356) and ranged between 0.03 µM at Kiel Bight to slightly higher values in the central Baltic of 0.16-0.41µM. Nitrate concentrations at the surface are as well low, ranging between 0.0-0.35 µM. Silicate concentrations stayed nearly the same compared to February 2024. In general, the surface values show the typical spring situation compared to observations of the last years.

The bottom water concentrations of nutrients are controlled mainly by the vertical position of the redox cline and the oxygen conditions. In the Bornholm Deep and the Slupsk Furrow the nitrate bottom concentration were with values of 9.09 µM and 6.57 µM much higher compared to values below one in the Western Baltic (Table 5.2). The only exception was the Mecklenburg Bight with 4.76 µM. In the central Baltic Basins around the isle of Gotland nitrate is zero in the near bottom layer and bound in the surface sediments due to hypoxic conditions in the deep water. The Aland Deep and Bothnian Sea with oxic bottom water show high nitrate values between 4.77-8.26 µM. Phosphate showed values below 1 µM in the western part, slight increased values in the Bornholm Basin and Slupsk Channel and high values above 4 µM under hypoxic conditions in the central part. Silicate shows a significant increase in the western Baltic compared to the winter situation in February 2024 and stayed nearly constant under stagnation conditions in the bottom near water of the central basins.

The spatial distribution of bottom oxygen conditions and hypoxia /hydrogen sulphide is derived from laboratory analysis from water samples and given in Fig. 5.13. The hydrographic highly dynamic conditions from Kiel Bight to Mecklenburg Bight showed oxygen concentrations

between 200-250 µmol/l in near bottom waters. The deep water conditions from Arkona Basin to the central basins are influenced by inflow activity from the North Sea or stagnation pariods.

Due to the latest inflow (midsized MBI) from December 2023 the bottom water stayed well oxic from Arkona Basin to Slupsk Channel. At the southwestern part of the Eastern Gotland Basin oxygen concentrations fall below the hypoxic limit with 43.77 µmol/l and at all other stations of the deep basins around Gotland anoxic conditions with hydrogen sulphide concentrations between 63.9 µmol/l H2S (Karlsö Deep) and 355.74 µmol/l H2S (Gorland Deep) were found. The northern regions of the Aland Sea and Bothnian Sea showed well oxygenized near bottom waters of 359.9 µmol/l and 218.74 µmol/l.

Table 5.1 Sea surface water values (1-5 m water depths) of main hydrographic and hydrochemical properties at the key stations. Location of selected key stations see Fig. 5.13.

Area /Date	Station Name /No.*	Sampl. Depth [m]	Temp. [°C]	Sal. [g/kg]	$O_{2\ (titration)}$ [µmol/l]	$O_{2\ (titration)}$ [ml/l]	$O_{2\ (sensor)}$ [ml/l]	PO4 [µM]	NO3 [µM]	SiO4 [µM]
Kiel Bight /2024-05-14	TF0360/200	1.20	12.51	10.93	332.27	7.44	7.21	0.03	0.01	10.50
Lübeck Bight /2024-05-14	TF0022/195	1.67	11.90	10.12	344.77	7.72	7.38	not sampled	not sampled	not sampled
Meckl.Bight /2024-05-14	TF0012/194	1.67	11.58	10.22	343.43	7.69	7.37	0.04	0.00	11.40
Darss Sill /2024-05-13	TF0001/186	6.81	10.35	7.67	368.89	8.26	7.83	0.14	0.05	13.90
Arkona Basin /2024-05-13	TF0113/182	1.5	9.31	7.37	384.07	8.60	8.37	0.13	0.00	14.70
Bornholm Deep /2024-04-26	TF0213/023	1.01	5.71	7.22	411.76	9.22	9.05	0.29	0.61	17.50
Stolpe Channel /2024-04-27	TF0222/031	1.12	5.49	7.23	421.59	9.44	9.18	0.30	0.14	20.00
SE Gotland Basin /2024-04-27	TF0259/037	1.24	5.32	7.36	413.10	9.25	8.94	0.39	0.35	20.00
Gotland Deep /2024-04-28	TF0271/052	1.24	5.23	7.49	413.99	9.27	9.10	0.41	0.00	16.70
Farö Deep /2024-04-30	TF0286/081	1.47	4.37	7.06	438.56	9.82	9.51	0.26	0.00	9.90
Landsort Deep /2024-05-07	TF0284a/128	2.27	5.45	6.7	430.97	9.65	9.38	0.16	0	10.3
Karlsö Deep /2024-05-08	TF0245/132	1.71	5.04	6.94	426.50	9.55	9.14	0.32	0.00	13.40
Aland Deep /2024-05-01	TF0605/100	0.8	3.46	5.45	454.37	10.17	10.26	0.00	0.03	16.70
Bothnian Sea /2024-5-04	UMSC_C3/118	1.28	2.43	5.40	not sampled	not sampled	10.56	0.08	0.06	20.90

Table 5.2 Deep-water layer (near bottom depths) of main hydrographic and hydrochemical properties at the key stations. Location of selected key stations see Fig. 5.13.

Area /Date	Station Name /No.*	Sampl. Depth [m]	Temp. [ºC]	Sal. [g/kg]	O_2 (titration) [µmol/l]	O_2 (titration) [ml/l]	O_2 (sensor) [ml/l]	PO4 [µM]	NO3 [µM]	SiO4 [µM]
Kiel Bight /2024-05-14	TF0360/200	16.8	6.69	18.51	220.62	4.94	4.69	0.37	0.54	23.20
Lübeck Bight /2024-05-14	TF0022/195	22.0	6.82	21.05	199.63	4.47	4.10	not sampled	not sampled	not sampled
Meckl.Bight /2024-05-14	TF0012/194	23.3	6.65	22.05	206.77	4.63	3.84	0.67	4.76	27.40
Darss Sill /2024-05-13	TF0001/186	19.8	7.08	15.33	252.77	5.66	5.46	0.35	0.63	14.20
Arkona Basin /2024-05-13	TF0113/182	45.5	6.65	17.22	155.42	3.48	3.31	0.71	0.43	26.40
Bornholm Deep /2024-04-26	TF0213/023	87.6	6.61	15.71	81.28	1.82	1.69	1.41	9.09	45.80
Stolpe Channel /2024-04-27	TF0222/031	89.0	6.41	12.78	195.16	4.37	4.18	1.36	6.57	37.80
SE Gotland Basin /2024-04-27	TF0259/037	87.3	6.26	10.59	43.77	0.98	1.08	2.34	4.91	54.60
Gotland Deep /2024-04-28	TF0271/052	234.2	7.24	12.62	H2S 355.74	H2S 7.97	0.01	6.52	0.00	102.20
Farö Deep /2024-04-30	TF0286/081	189.7	7.30	11.94	H2S 138.66	H2S 3.11	0.02	5.03	0.00	81.50
Landsort Deep / 2024-05-07	TF0284a/128	358.05	6.45	10.71	H2S 71.99	H2S 1.61	0.00	4.25	0.00	69.50
Karlsö Deep /2024-05-08	TF0245/132	107.1	5.78	9.84	H2S 63.9	H2S 1.43	0.04	4.25	0.00	71.30
Aland Deep /2024-05-01	TF0605/100	285.2	2.53	7.06	not sampled	not sampled	8.07	0.84	4.77	21.4
Bothnian Sea /2024-5-04	UMSC_C3/118	195.2	3.70	6.49	218.74	4.89	4.78	1.39	8.26	50.2

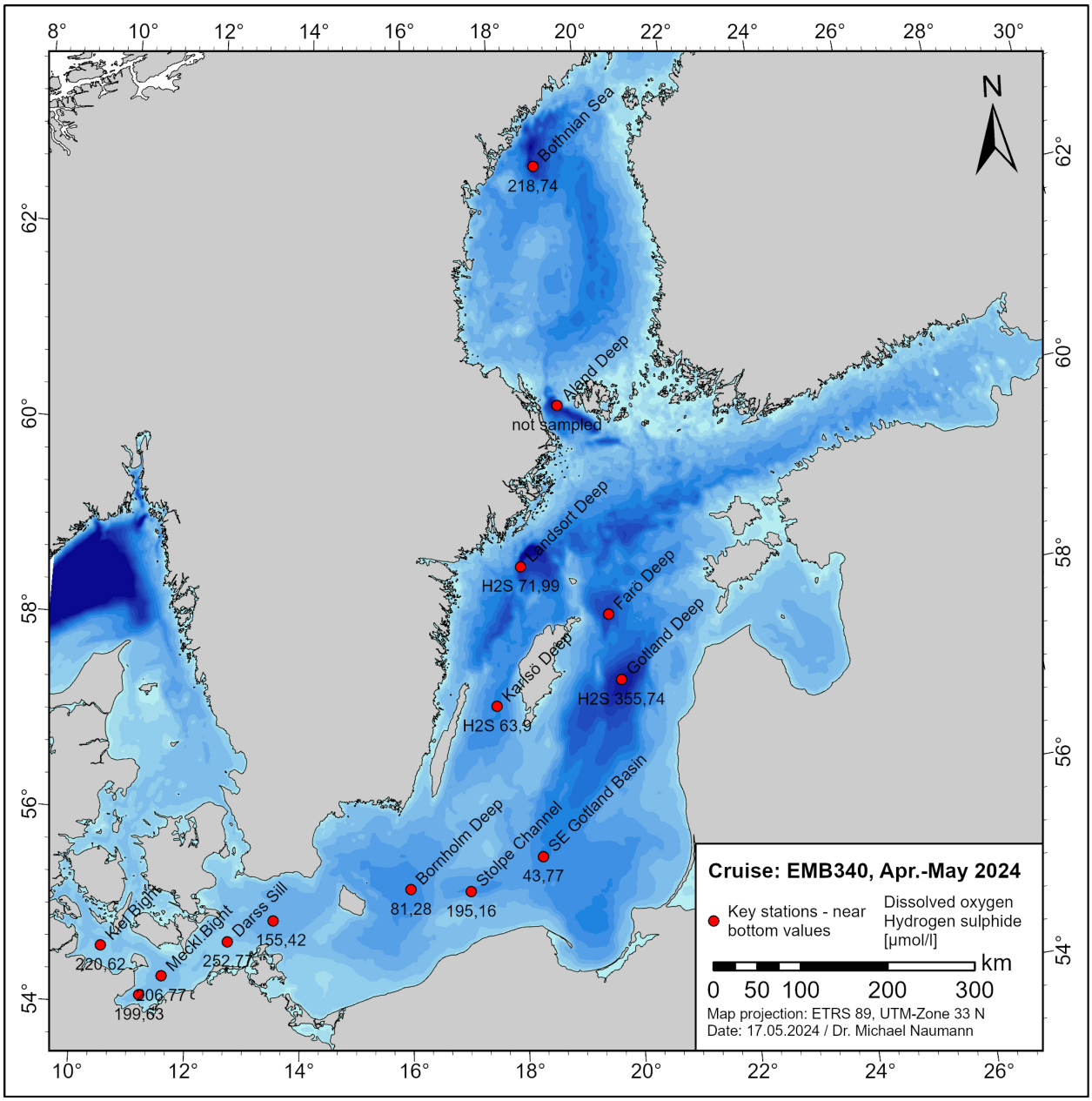

Fig. 5.13 Distribution of dissolved oxygen and hydrogen sulfide concentrations in the near bottom layer at key stations of the long-term observation program (table 5.2).

5.4 Baltic Thalweg Transect

During the cruise 99 CTD stations were aligned along the thalweg transect from the Mecklenburg Bight, in the western Baltic Sea, towards the central Baltic, Aland Sea and Bothnian Sea (Fig.5.14). Originally the transect was planned up to the northernmost parts of the Bothnian Bay to generate a cross section through all main subregions of the Baltic Sea, but icing in The Quark and farther north hampered measurements in the northern parts. This transect supplies an excellent overview about the hydrographic and environmental state of the entire Baltic Sea. And thus, it is worked as standard transect of the IOW long term observation program. The CTD measurements were done as continuous sequence of stations, beginning at April 25th (TF0012) to May 5th (DB0117) with only two days of timely interruptions for a perpendicular West-East transect of 22 stations in the Eastern Gotland Basin (April 29th) and a

harbour stay in Gävle (May 2nd). The data supplies a quasi-synoptic picture of the hydrographic patterns along the thalweg.

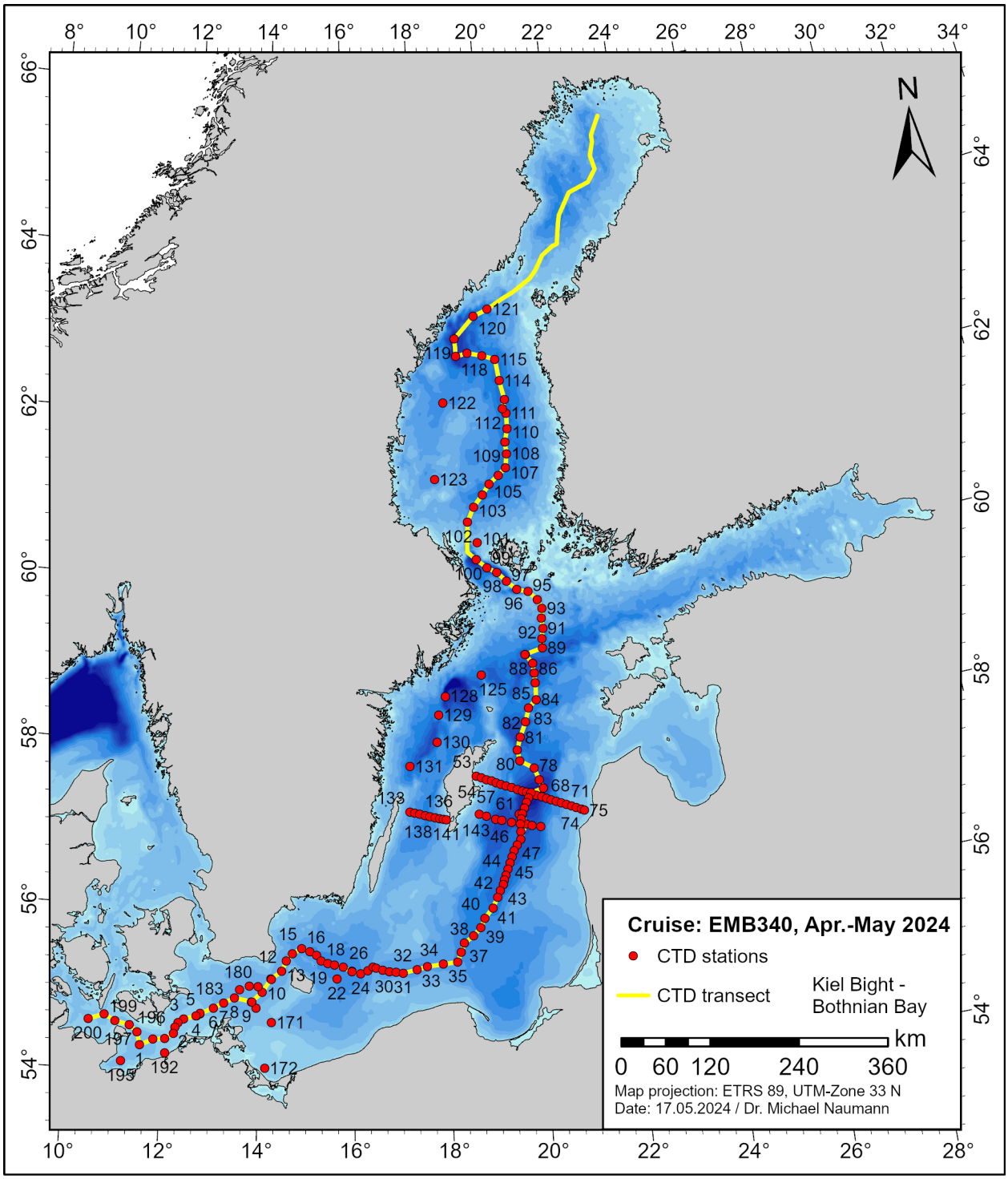

Fig. 5.14 Location of measured CTD stations (table 7.1) and the "Thalweg"-transect crossing all deep basins on the pathway of saltwater inflows (hydrographic parameters visualized as cross sections in Fig. 5.15 – 5.19).

The observations show the spring conditions after the start of the spring bloom in the southern to central Baltic (Fig.5.15 to Fig. 5.19). The temperature in the upper layer (above the permanent halocline) depicted a horizontal gradient from warmer waters of 8-9 °C in the Southwest to coo1 waters of 1-2 °C close to the icing in the Northeast. It shows the spring warming phase in the southwest to central Baltic and the end of the wintertime in the Bothnian Bay. Slightly warming of the upper 10 m is already visible there. The situation in the uppermost part of the surface water layer (SST) was described in chapter 5.2, but the cross section figure 5.15 delivers a complete view of the water column. Below the halocline the deep water water temperature had increased in the central Baltic during the last months by a mixture of the extreme warm water that entered the Baltic with barocline summer inflows and the saline inflow water from the medium size MBI in December 2023. A decrease after this warming phase, triggered by these inflowing water bodies, are already visible in the subareas of the Bornholm Basin to southern Eastern Gotland Basin. Deep water temperatures decreased from February to May from 7.39 °C to 6.61 °C at the Bornholm Deep, 7.66 °C to 6.41 °C at the Slupsk Channel and 6.61 °C to 6.26 °C at TF0259. The Gotland Deep, Farö Deep and Landsort Deep near bottom temperatures stayed constant, with no signs of arrival of new water bodies in the lowermost meters of the water column. The deep water of the Aland Sea to Bothnina Sea is much colder compared to the central Baltic, which is influenced by inflows from the North Sea and shows values from 2-4 °C.

The salinity distribution (Fig. 5.16) shows nearly the same pattern of gradients like temperature. In the surface water a horizontal gradiant 11 g/kg at Darss Sill to 5.4 g/kg at the Bothnian Bay. The surface salinity reduction is driven by freshwater runoff with increasing influence to the Northeast, the most distal areas from the entrance to the North Sea / North Atlantic. In contrast the deep water conditions are steered by lateral inflow activity and shows the same horizontal gradiant, but on higher salinity level. In addition, a strong vertical salinity gradiant characterizes the Baltic Sea with its permanent halocline. During the February cruise EMB356 an early evaluation of the inflow activity of MBI December 2023 was done and the fresh water had not fully replaced the deep water of the Bornholm Basin. In the meantime, the bottom salinity slightly increased from 14.93 g/kg in February to 15.71 g/kg in May. At the northeastward located areas at the talweg of the Slupsk Channel the bottom salinity decreased from 13.51 g/kg to 12.78 g/kg (TF0222) and stayed nearly constant at the southwestern Eastern Gotland Basin (10.57 g/kg to 10.59 g/kg at TF0259) as well as at the Gotland Deep (12.68 g/kg to 12.62 g/kg). The inflow water had reached its equilibrium density interface in the area of the southwestern Eastern Gotland Basin and has spreaded just below the halocline layer of the Eastern Gotland Basin. In the northern part we observed the same horizontal salinity gradient in the deep water from the Aland Sea to the Bothnian Sea, but of much less salinity levels from 7.06 g/kg to 6.49 g/kg.

The oxygen distribution along the transect is shown in Fig. 5.17. The inflow of December 2023 had fully ventilated the deep water of the western Baltic and the oxygen rich inflow waters were mixed up with the former bottom water in the Bornholm Basin in February. This process led to increased oxygen concentrations of 154 µmol/l at the Bornholm Deep, 191 µmol/l at the Slupsk Channel, but had not reached the southwestern entrance of Eastern Gotland Basin to that time (9 µmol/l H2S at station TF0259). Oxygen depletion started soon and decreased these concentrations to 81 µmol/l at the Bornholm Deep in May 2024. The Slupsk Channel stayed more or less constant with 195 µmol/l, but is mostly a well oxygenized area. At station TF0259 –

SE Gotland Basin, hydrogen sulphide was gone and oxygen concentrations have increased to 44 µmol/l, but are still hypoxic. Figure 5.17 shows patches of oxygenized water in water depths between 60 m and 120 m in the Eastern Gotland Basin. Near bottom waters were not ventilated and stayed euxinic with hydrogen sulphide concentration of 356 µmol/l at the Gotland Deep (376 µmol/l H2S in February).

Farther north in the Farö Deep and Northern Gotland Basin hydrogen sulphide concentration stayed as well constant compared to the beginning of this year. In the northeastern part high oxygen concentrations are dominating the deep water. The surface water layer shows very high oxygen values between 300-400 µmol/l along the whole transect.

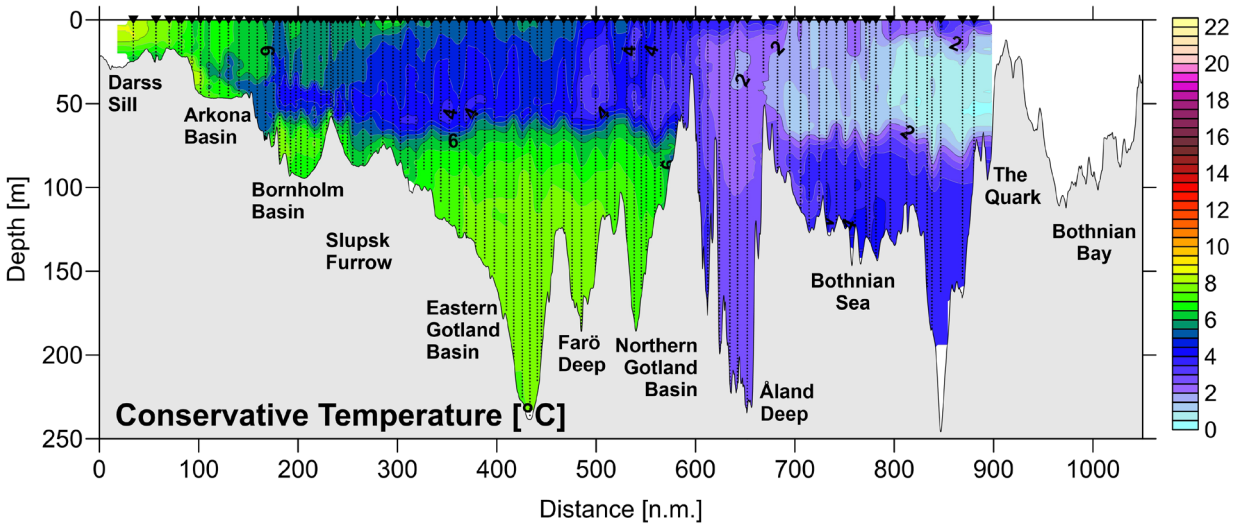

Fig. 5.15 Distribution of conservative temperature along the thalweg of the Baltic Sea from the Kiel bight to the Bothnian Sea. The figure is based on the preliminary CTD data gathered from 25.04-05.05.2024.

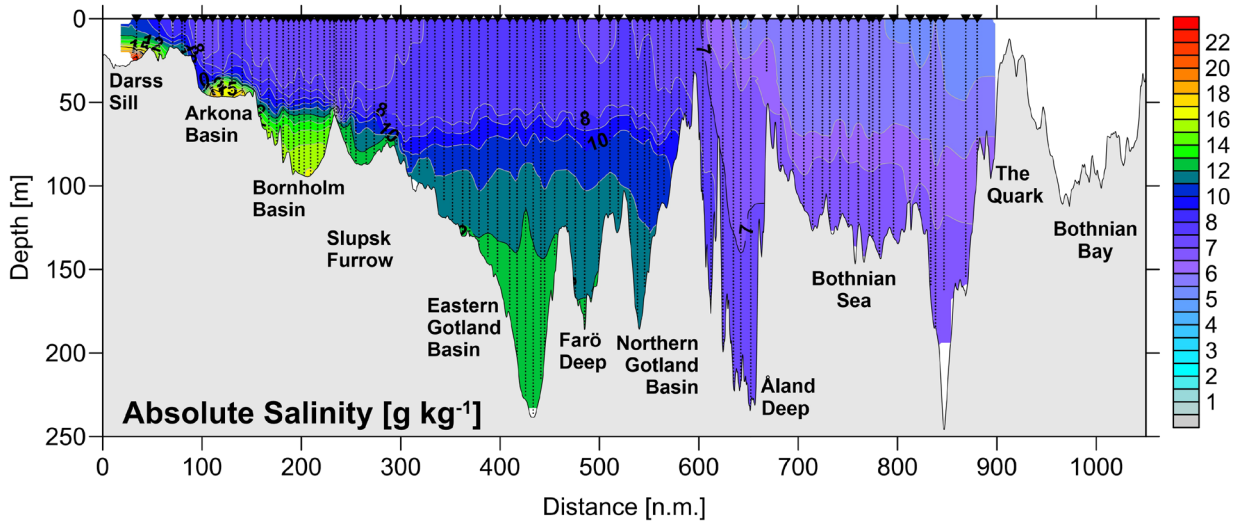

Fig. 5.16 Distribution of absolute salinity along the thalweg of the Baltic Sea from the Kiel bight to the Bothnian Sea. The figure is based on the preliminary CTD data gathered from 25.04-05.05.2024.

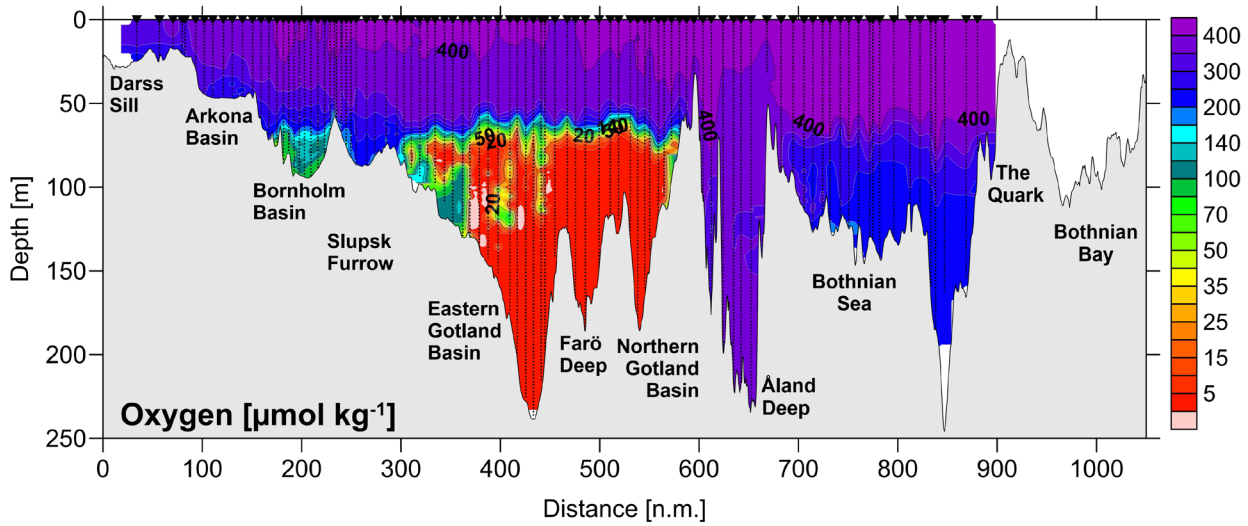

Fig. 5.17 Distribution of dissolved oxygen the thalweg of the Baltic Sea from the Kiel bight to the Bothnian Sea. The figure is based on the preliminary CTD data gathered from 25.04-05.05.2024.

The chlorophyll-a fluorescence along the transect was very low in the deep water up 1. The Aland Sea deep water was patchy with values up to 2 (Fig. 5.18). In the surface water the spring bloom had started and a more patchy pattern of values up to 3.2 was measured and already described in chapter 5.2.

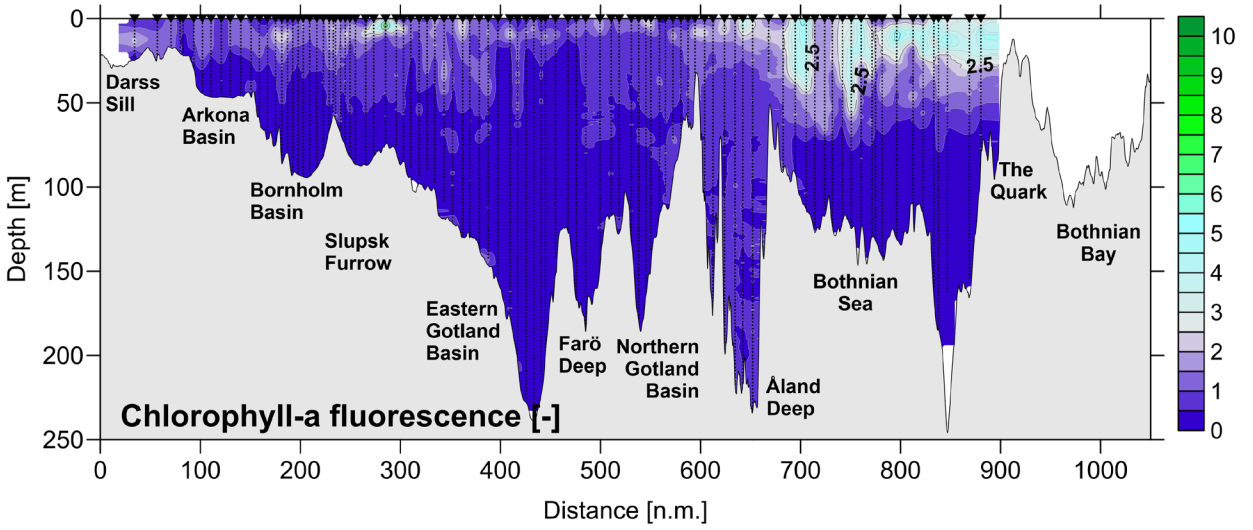

Fig. 5.18 Distribution of chlorophyll-a fluorescence along the thalweg of the Baltic Sea from the Kiel bight to the Bothnian Sea. The figure is based on the preliminary CTD data gathered from 25.04-05.05.2024.

The turbidity distribution along the transect is shown in figure 5.19 and the surface water (upper 4 m) is shown in more detail in the figures 5.10 and 5.12. The surface values are changing between 3-4 ntu up to 15 ntu showing signs of biological activity (see chapter 5.2). The water layer below has much less turbity up to 0.4 ntu and spans in the central Baltic and northern areas up to 80 m water depth (Fig. 5.19). The deep water layer, especially the lowermost 10-20 m of the near bottom water shows much higher values up to 4 ntu in the Bothnian Sea. Patches of higher turbidity in the Eastern Gotland Basin between 120 m and 160 m show the inflow water,

marking locations of interfaces between oxic, suboxic and anoxic waters. The turbidity increase between 80 m and 100 m indicate the depth level of the redoxcline.

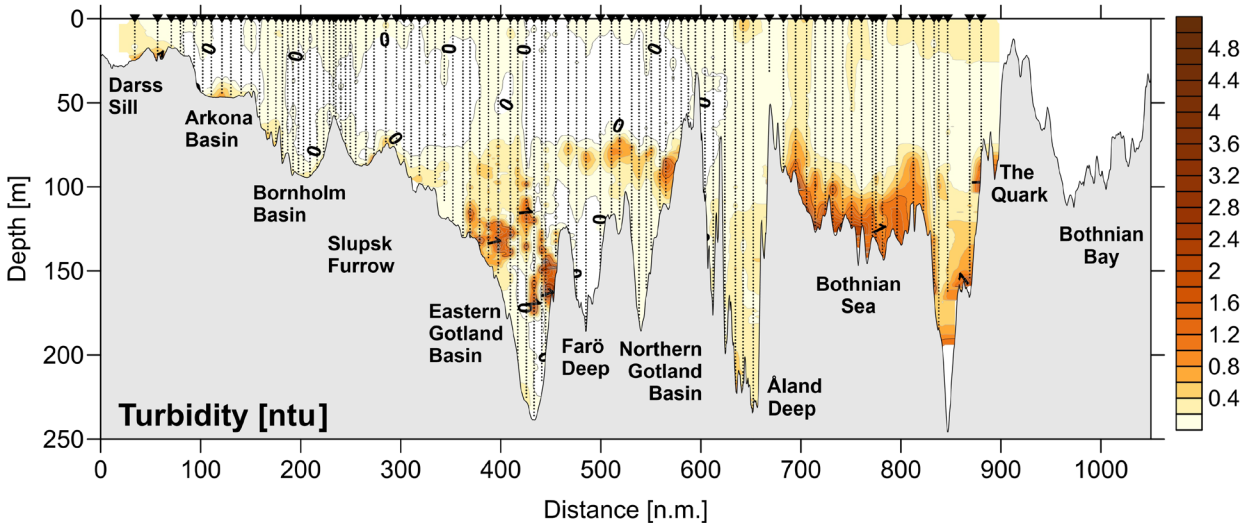

Fig. 5.19 Distribution of turbidity along the thalweg of the Baltic Sea from the Kiel bight to the Bothnian Sea. The figure is based on the preliminary CTD data gathered from 25.04-05.05.2024.

An overview of the hydrographic conditions at six key stations spanning from the Arkona Basin to the central Baltic Sea is given by vertical profiles of temperature, salinity and dissolved oxygen concentration in figure 5.20. These plots shows the main characteristics of the different subregions very impressive. The temperature plot shows the slightly warmed surface water (4.5-6.2 °C), characterizing the spring. Below the water temperature reduces to the winter values up to the thermocline, which can be found in depths between 30 m and 70 m depending on the local area. These water depths coincide more or less with the depths of the halocline and oxycline. The salinity plot shows the permanent stratified water column of lower values in the surface layer and higher salinity in the deep water very clear. The general oxygen deficiency and stagnant conditions of the central Baltic deep water is impressive shown at stations Gotland Deep, Farö deep, Landsort Deep and Karlsö Deep. The different water masses observed during the cruise can be clearly identified using its temperature, salinity and oxygen signature (Fig. 5.21). The left temperature – salinity plot shows the different subregions colour coded for an spatial overview, whereas in the right plot dissolved oxygen concentrations are marked by colour.

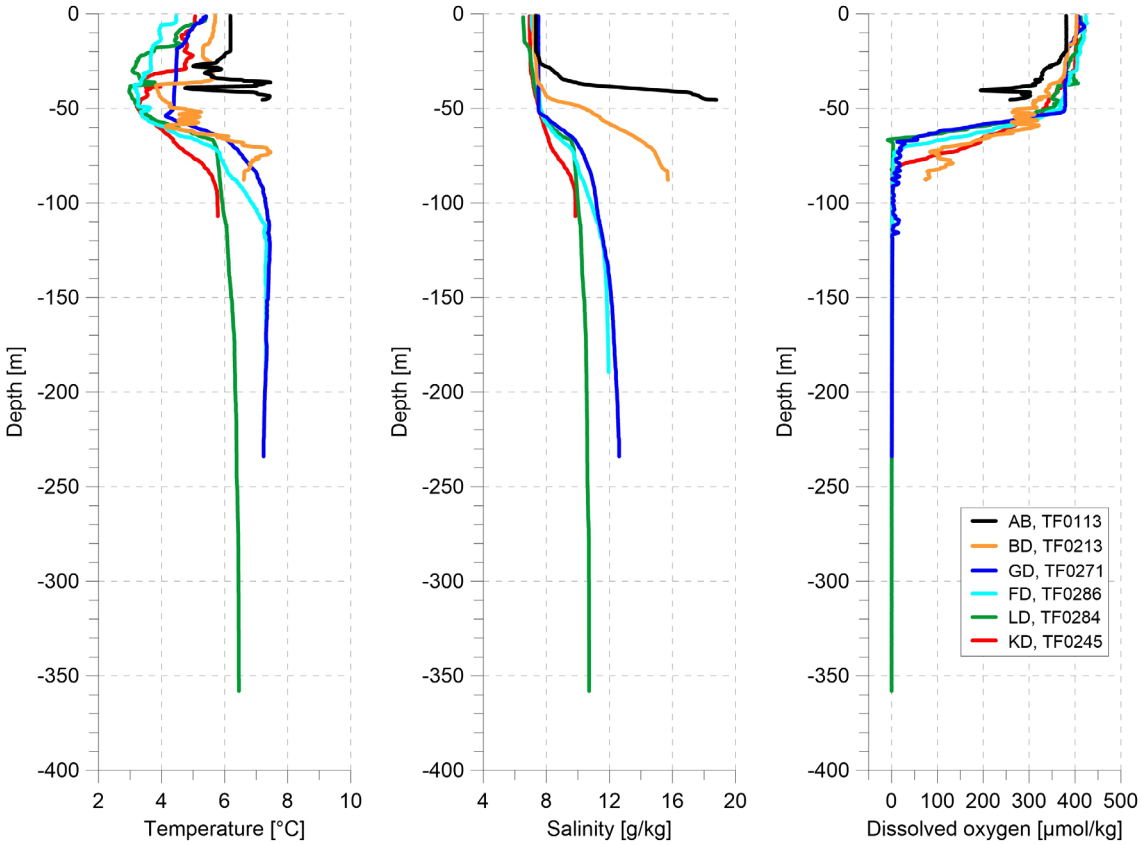

Fig. 5.20 Vertical profiles of temperature, salinity and oxygen concentration (CTD data) at the main stations in the central Baltic. Gotland Deep TF0271 (blue), Farö Deep TF0286 (cyan), Landsort Deep TF0284 (green), and Karlsö Deep TF0245 (red).

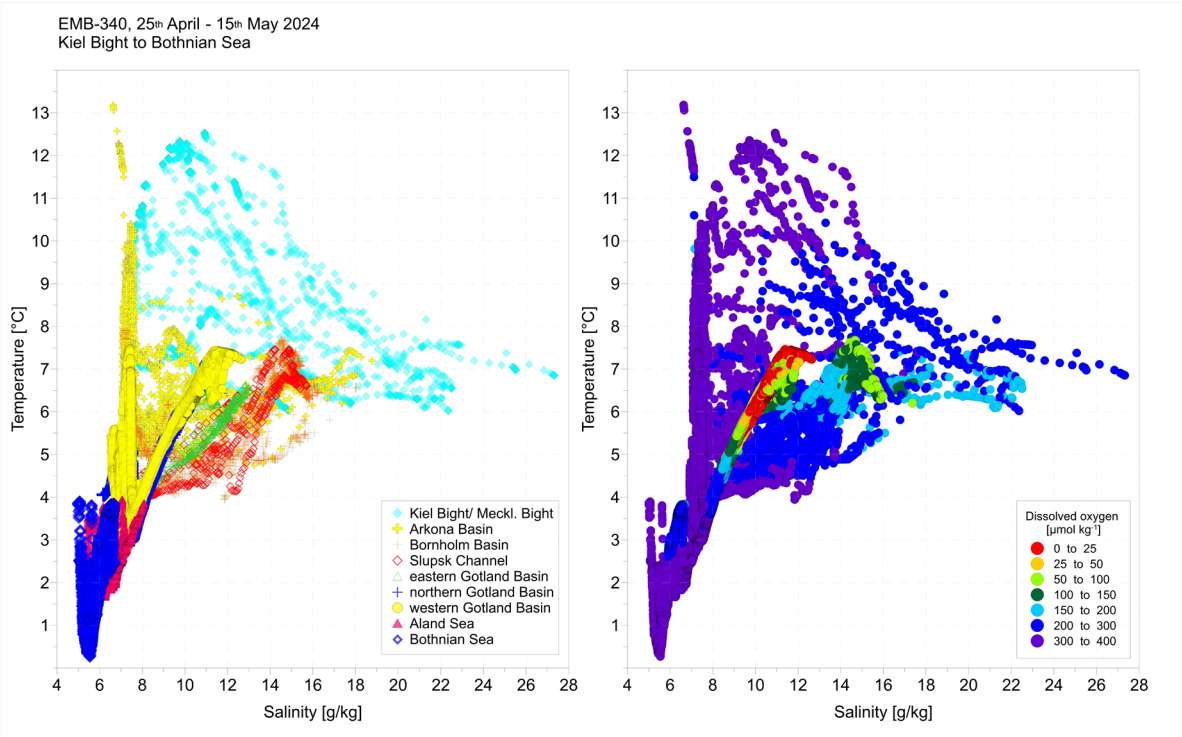

Fig. 5.21 Temperature-salinity diagram of all stations (left). Temperature – salinity values and dissolved oxygen classified in color [µmol/kg].

5.5 Biological Investigations

Sampling for phytoplankton as well as chlorophyll analyses were collected from the rosette water sampler from different depths in the euphotic zone from surface to max. 20 m water depths. Additionally phytoplankton net samples were taken. Phytoplankton samples were preserved for later microscopic analyses of the species composition and chlorophyll samples were filtered and deep frozen. The standard zooplankton WP2 net was used to sample mesozooplankton above and below the halocline. Additional Apstein net samples were collected for analyses of small developmental stages of zooplankton. All samples were preserved for later microscopic analyses of the zooplankton community composition. Responsible scientists at IOW are Dr. Anke Kremp (phytoplankton) and Dr. Jörg Dutz (zooplankton).

Insights into the changes of the microbial food web of the redoxcline is obtained by vertical high resolution sampling of the range of the redoxcline at Gotland Deep (TF0271) and Landsort Deep (TF0284a) stations on each monitoring cruise. Therefore, in the redoxcline as well as 6 depths above and below, respectively, in depth intervals of 2 m, samples were taken by CTD/water sampling bottles and prepared for microbiological analysis (FISH and DNA) and determination of pigments. The responsible scientist at IOW is Prof. Dr. Klaus Jürgens.

Water samples for eDNA extraction were taken with the aim of building up a microbiological DNA archive. Samples were taken in the southwestern Baltic Sea at 11 stations. This programme is done in cooperation with the University of Greifswald since 3 years and is planned to continue. The responsible scientist at IOW is Prof. Dr. Matthias Labrenz.

The analysis of all biological samples will be performed after the cruise. Thus, no preliminary results of this program are presented here.

6. Ship’s Meteorological Station

Not applicable on EMB. The meteorological conditions during the cruise are described in section 5.1, based on data of the automatic weather station of the ship.

7. Station List EMB340

7.1 Overall Station List, 200 CTD Stations, 239 Casts

Date / Time	Station No.	Station Name	Water Depth	Latitude	Longitude	Gear
[UTC]	EMB	IOW	[m]			
25.04.2024 10:04	EMB340_1-1	TF0012	22	54° 18,9129' N	011° 32,9260' E	CTD
25.04.2024 10:04	EMB340_1-2	TF0012	22	54° 18,9189' N	011° 32,9234' E	PLA
25.04.2024 10:04	EMB340_1-3	TF0012	22	54° 18,9172' N	011° 32,9198' E	SD
25.04.2024 10:28	EMB340_1-4	TF0012	22	54° 18,9074' N	011° 32,9685' E	WP2
25.04.2024 14:01	EMB340_2-1	TF0046	26	54° 28,1935' N	012° 14,5033' E	CTD
25.04.2024 14:03	EMB340_2-2	TF0046	26	54° 28,1941' N	012° 14,4971' E	PLA
25.04.2024 14:03	EMB340_2-3	TF0046	26	54° 28,1940' N	012° 14,4952' E	SD
25.04.2024 14:25	EMB340_2-4	TF0046	26	54° 28,1827' N	012° 14,4894' E	WP2
25.04.2024 14:31	EMB340_2-5	TF0046	26	54° 28,1853' N	012° 14,4925' E	WP2
25.04.2024 16:27	EMB340_3-1	TF0002	15	54° 39,0113' N	012° 26,9896' E	CTD
25.04.2024 17:56	EMB340_4-1	TF0001	18	54° 41,7962' N	012° 42,3757' E	CTD
25.04.2024 18:47	EMB340_5-1	TF0030	20	54° 43,3886' N	012° 46,9212' E	CTD
25.04.2024 20:22	EMB340_6-1	TF0115	27	54° 47,6850' N	013° 03,4219' E	CTD
25.04.2024 21:48	EMB340_7-1	TF0114	43	54° 51,6012' N	013° 16,5444' E	CTD
25.04.2024 23:31	EMB340_8-1	TF0113	45	54° 55,5031' N	013° 29,9513' E	PLA
25.04.2024 23:31	EMB340_8-2	TF0113	45	54° 55,5038' N	013° 29,9531' E	CTD
25.04.2024 23:55	EMB340_8-3	TF0113	45	54° 55,5002' N	013° 30,0047' E	WP2
26.04.2024 00:01	EMB340_8-4	TF0113	45	54° 55,5067' N	013° 30,0007' E	WP2
26.04.2024 01:58	EMB340_9-1	ABBoje	44	54° 52,7622' N	013° 51,4061' E	CTD
26.04.2024 03:43	EMB340_10-1	TF0109	46	55° 00,0009' N	014° 05,0059' E	CTD
26.04.2024 05:33	EMB340_11-1	TF0145DK	45	55° 09,6690' N	014° 15,6828' E	CTD
26.04.2024 07:13	EMB340_12-1	TF0144	43	55° 15,4204' N	014° 29,5110' E	CTD
26.04.2024 08:45	EMB340_13-1	TF0142DK	70	55° 22,9084' N	014° 35,2013' E	CTD
26.04.2024 10:10	EMB340_14-1	TF0140	68	55° 28,0346' N	014° 43,0028' E	CTD
26.04.2024 11:27	EMB340_15-1	TF0206	76	55° 31,9914' N	014° 54,9313' E	CTD
26.04.2024 12:38	EMB340_16-1	TF0207	85	55° 29,7491' N	015° 05,5281' E	CTD
26.04.2024 13:42	EMB340_17-1	TF0208	92	55° 27,2023' N	015° 14,0042' E	CTD
26.04.2024 14:54	EMB340_18-1	TF0200	91	55° 23,0221' N	015° 19,9662' E	CTD
26.04.2024 15:56	EMB340_19-1	TF0209	93	55° 20,8358' N	015° 27,8168' E	CTD
26.04.2024 17:00	EMB340_20-1	TF0211	95	55° 19,8158' N	015° 36,8293' E	CTD
26.04.2024 18:16	EMB340_21-1	TF0212	95	55° 18,1316' N	015° 47,7254' E	CTD
26.04.2024 19:51	EMB340_22-1	TF0214	94	55° 09,6178' N	015° 39,5587' E	CTD
26.04.2024 21:59	EMB340_23-1	TF0213	90	55° 15,0508' N	015° 58,9262' E	CTD
26.04.2024 22:05	EMB340_23-2	TF0213	90	55° 15,0615' N	015° 58,9053' E	PLA
26.04.2024 22:53	EMB340_23-3	TF0213	90	55° 15,0418' N	015° 58,9902' E	WP2
26.04.2024 23:05	EMB340_23-4	TF0213	89	55° 15,0387' N	015° 58,9859' E	WP2
26.04.2024 23:17	EMB340_23-5	TF0213	89	55° 15,0275' N	015° 58,9563' E	WP2
26.04.2024 23:25	EMB340_23-6	TF0213	90	55° 15,0098' N	015° 58,9641' E	WP2
26.04.2024 23:51	EMB340_23-7	TF0213	90	55° 14,9948' N	015° 58,9335' E	CTD
27.04.2024 00:09	EMB340_23-8	TF0213	89	55° 14,9892' N	015° 58,9515' E	APNET

27.04.2024 00:29	EMB340_23-9	TF0213	90	55° 14,9859' N	015° 58,9442' E	APNET
27.04.2024 00:49	EMB340_23-10	TF0213	89	55° 15,0120' N	015° 58,9298' E	APNET
27.04.2024 02:04	EMB340_24-1	TF0221	82	55° 13,3199' N	016° 10,0119' E	CTD
27.04.2024 03:12	EMB340_25-1	TF0225	65	55° 15,5468' N	016° 19,2178' E	CTD
27.04.2024 04:09	EMB340_26-1	TF0226	56	55° 17,8034' N	016° 25,8399' E	CTD
27.04.2024 04:51	EMB340_27-1	TF0224	61	55° 17,0062' N	016° 29,9351' E	CTD
27.04.2024 05:55	EMB340_28-1	TF0227	69	55° 15,6560' N	016° 38,3688' E	CTD
27.04.2024 06:55	EMB340_29-1	TF0228	77	55° 14,2291' N	016° 46,3815' E	CTD
27.04.2024 07:53	EMB340_30-1	TF0229	85	55° 13,7051' N	016° 54,8196' E	CTD
27.04.2024 08:50	EMB340_31-1	TF0222	91	55° 13,0061' N	017° 04,0147' E	CTD
27.04.2024 10:25	EMB340_32-1	TF0266	89	55° 15,1205' N	017° 21,6599' E	CTD
27.04.2024 11:58	EMB340_33-1	TF0267	83	55° 17,1403' N	017° 35,4921' E	CTD
27.04.2024 13:44	EMB340_34-1	TF0268	75	55° 18,4374' N	017° 55,8278' E	CTD
27.04.2024 15:08	EMB340_35-1	TF0256	76	55° 19,4584' N	018° 13,1604' E	CTD
27.04.2024 16:34	EMB340_36-1	TF0257	87	55° 26,4480' N	018° 19,2017' E	CTD
27.04.2024 17:52	EMB340_37-1	TF0259	90	55° 32,9950' N	018° 23,9458' E	CTD
27.04.2024 17:54	EMB340_37-2	TF0259	90	55° 32,9973' N	018° 23,9653' E	PLA
27.04.2024 19:16	EMB340_38-1	TF0255	95	55° 37,9977' N	018° 35,9782' E	CTD
27.04.2024 20:33	EMB340_39-1	TF0258	90	55° 43,6872' N	018° 45,8699' E	CTD
27.04.2024 21:49	EMB340_40-1	TF0253	101	55° 50,4122' N	018° 51,9294' E	CTD
27.04.2024 23:27	EMB340_41-1	TF0265	111	55° 57,5587' N	019° 02,8342' E	CTD
28.04.2024 01:02	EMB340_42-1	TF0250	125	56° 05,0385' N	019° 10,0344' E	CTD
28.04.2024 02:35	EMB340_43-1	TF0262	132	56° 14,0977' N	019° 18,0155' E	CTD
28.04.2024 04:21	EMB340_44-1	TF0263	134	56° 20,8621' N	019° 22,6391' E	CTD
28.04.2024 05:53	EMB340_45-1	TF0261	144	56° 29,5721' N	019° 28,8722' E	CTD
28.04.2024 07:36	EMB340_46-1	TF0260	145	56° 38,0270' N	019° 35,0160' E	CTD
28.04.2024 09:10	EMB340_47-1	TF0274	154	56° 46,0711' N	019° 45,0657' E	CTD
28.04.2024 10:57	EMB340_48-1	TF0407	178	56° 57,0414' N	019° 53,0379' E	CTD
28.04.2024 12:17	EMB340_49-1	TF0272	210	57° 04,3282' N	019° 49,8276' E	CTD
28.04.2024 13:19	EMB340_50-1	GB_SW	214	57° 04,1924' N	019° 45,6359' E	CTD
28.04.2024 15:00	EMB340_51-1	TF0275	231	57° 12,6011' N	019° 55,7750' E	CTD
28.04.2024 16:32	EMB340_52-1	TF0271	241	57° 19,1992' N	020° 02,8947' E	CTD
28.04.2024 16:39	EMB340_52-2	TF0271	241	57° 19,1777' N	020° 02,9537' E	SD
28.04.2024 16:40	EMB340_52-3	TF0271	241	57° 19,1761' N	020° 02,9564' E	PLA
28.04.2024 17:39	EMB340_52-4	TF0271	241	57° 19,1978' N	020° 02,9601' E	CTD
28.04.2024 18:37	EMB340_52-5	TF0271	241	57° 19,2152' N	020° 02,9913' E	CTD
28.04.2024 19:19	EMB340_52-6	TF0271	241	57° 19,2130' N	020° 02,9740' E	CTD
28.04.2024 20:00	EMB340_52-7	TF0271	241	57° 19,2057' N	020° 03,0024' E	CTD
28.04.2024 20:37	EMB340_52-8	TF0271	241	57° 19,2292' N	020° 02,9899' E	CTD
29.04.2024 06:05	EMB340_53-1	SF001EGB	17	57° 33,8092' N	018° 50,8927' E	CTD
29.04.2024 06:40	EMB340_53-2	SF001EGB	19	57° 33,7901' N	018° 50,9657' E	SCF
29.04.2024 07:27	EMB340_53-2	SF001EGB	26	57° 33,1203' N	018° 53,8396' E	SCF
29.04.2024 09:07	EMB340_54-1	SF002EGB	27	57° 32,4856' N	018° 57,6905' E	CTD
29.04.2024 09:54	EMB340_55-1	SF003EGB	40	57° 31,0082' N	019° 04,2444' E	CTD
29.04.2024 10:45	EMB340_56-1	SF004EGB	39	57° 29,6650' N	019° 10,9109' E	CTD
29.04.2024 11:34	EMB340_57-1	SF005EGB	77	57° 28,2374' N	019° 17,4109' E	CTD
29.04.2024 12:25	EMB340_58-1	SF006EGB	96	57° 26,9213' N	019° 23,7142' E	CTD

29.04.2024 13:20	EMB340_59-1	SF007EGB	120	57° 25,4373' N	019° 30,4341' E	CTD
29.04.2024 14:17	EMB340_60-1	SF008EGB	45	57° 24,0360' N	019° 37,3963' E	CTD
29.04.2024 15:08	EMB340_61-1	SF009EGB	153	57° 22,4861' N	019° 44,6788' E	CTD
29.04.2024 16:10	EMB340_62-1	SF010EGB	211	57° 20,9213' N	019° 51,6945' E	CTD
29.04.2024 17:18	EMB340_63-1	SF011EGB	230	57° 19,8893' N	019° 57,0097' E	CTD
29.04.2024 18:25	EMB340_64-1	TF0271	243	57° 18,8368' N	020° 02,7467' E	CTD
29.04.2024 19:31	EMB340_65-1	SF012EGB	246	57° 17,1674' N	020° 09,8941' E	CTD
29.04.2024 20:38	EMB340_66-1	SF013EGB	194	57° 15,7173' N	020° 17,0227' E	CTD
29.04.2024 21:38	EMB340_67-1	SF014EGB	147	57° 14,3492' N	020° 23,0535' E	CTD
29.04.2024 22:37	EMB340_68-1	SF015EGB	88	57° 12,9289' N	020° 29,3963' E	CTD
29.04.2024 23:32	EMB340_69-1	SF016EGB	96	57° 11,4901' N	020° 36,0650' E	CTD
30.04.2024 00:24	EMB340_70-1	SF017EGB	68	57° 10,0458' N	020° 42,3489' E	CTD
30.04.2024 01:12	EMB340_71-1	SF018EGB	47	57° 08,6458' N	020° 49,1546' E	CTD
30.04.2024 02:00	EMB340_72-1	SF019EGB	22	57° 07,1758' N	020° 55,8140' E	CTD
30.04.2024 02:47	EMB340_73-1	SF020EGB	22	57° 05,8989' N	021° 02,2740' E	CTD
30.04.2024 03:36	EMB340_74-1	SF021EGB	27	57° 04,2773' N	021° 08,7956' E	CTD
30.04.2024 04:18	EMB340_75-1	SF023EGB	19	57° 03,3853' N	021° 12,5298' E	CTD
30.04.2024 08:05	EMB340_76-1	Gotland NE	220	57° 22,0331' N	020° 19,9577' E	CTD
30.04.2024 09:25	EMB340_77-1	TF0276	209	57° 28,1458' N	020° 15,5090' E	CTD
30.04.2024 11:09	EMB340_78-1	TF0270	144	57° 37,0032' N	020° 09,9139' E	CTD
30.04.2024 13:03	EMB340_79-1	TF0287	128	57° 42,8683' N	019° 51,1219' E	CTD
30.04.2024 14:23	EMB340_80-1	TF0290	172	57° 50,9639' N	019° 48,9635' E	CTD
30.04.2024 16:00	EMB340_81-1	TF0286	196	57° 59,9610' N	019° 53,9476' E	CTD
30.04.2024 16:05	EMB340_81-2	TF0286	196	57° 59,9954' N	019° 53,9987' E	SD
30.04.2024 17:09	EMB340_81-3	TF0286	196	58° 00,0108' N	019° 53,9961' E	CTD
30.04.2024 18:46	EMB340_82-1	TF0277	163	58° 10,9779' N	020° 02,9805' E	CTD
30.04.2024 20:33	EMB340_83-1	TF0278	121	58° 20,9901' N	020° 08,7255' E	CTD
30.04.2024 21:57	EMB340_84-1	TF0285	123	58° 26,5145' N	020° 20,0098' E	CTD
30.04.2024 23:44	EMB340_85-1	TF0279	165	58° 38,4918' N	020° 20,6879' E	CTD
01.05.2024 01:06	EMB340_86-1	TF0289	196	58° 45,9918' N	020° 19,7753' E	CTD
01.05.2024 02:24	EMB340_87-1	TF0282	166	58° 52,9806' N	020° 18,9766' E	CTD
01.05.2024 04:01	EMB340_88-1	TF0288	146	58° 59,7762' N	020° 09,5050' E	CTD
01.05.2024 06:01	EMB340_89-1	DB0101	145	59° 03,5917' N	020° 34,4707' E	CTD
01.05.2024 07:15	EMB340_90-1	DB0102	105	59° 10,3568' N	020° 34,4673' E	CTD
01.05.2024 08:26	EMB340_91-1	AD-1	72	59° 17,6396' N	020° 37,1397' E	CTD
01.05.2024 09:37	EMB340_92-1	AD-2	65	59° 25,0740' N	020° 36,8259' E	CTD
01.05.2024 10:51	EMB340_93-1	AD-3	161	59° 32,2456' N	020° 38,7963' E	CTD
01.05.2024 12:08	EMB340_94-1	AD-5	57	59° 38,8808' N	020° 33,2234' E	CTD
01.05.2024 13:35	EMB340_95-1	DB0103	189	59° 45,2775' N	020° 20,3184' E	CTD
01.05.2024 15:10	EMB340_96-1	DB0104	194	59° 47,2783' N	020° 04,2845' E	CTD
01.05.2024 16:53	EMB340_97-1	DB0105	203	59° 53,9230' N	019° 50,7439' E	CTD
01.05.2024 18:32	EMB340_98-1	DB0106	227	60° 00,8177' N	019° 37,2395' E	CTD
01.05.2024 19:57	EMB340_99-1	DB0107	229	60° 04,4630' N	019° 23,9395' E	CTD
01.05.2024 21:35	EMB340_100-1	TF0605	297	60° 10,9248' N	019° 08,8206' E	CTD
01.05.2024 23:52	EMB340_101-1	DB0201	32	60° 23,2871' N	019° 12,2923' E	CTD
03.05.2024 16:00	EMB340_102-1	DB0108	95	60° 38,5262' N	018° 59,5585' E	CTD
03.05.2024 17:43	EMB340_103-1	DB0109	99	60° 49,2579' N	019° 09,7553' E	CTD

03.05.2024 19:18	EMB340_104-1	DB0110	122	60° 57,7331' N	019° 24,3036' E	CTD
03.05.2024 20:40	EMB340_105-1	TF0604	127	61° 05,0046' N	019° 34,9932' E	CTD
03.05.2024 22:10	EMB340_106-1	DB0111	117	61° 11,1270' N	019° 49,7722' E	CTD
03.05.2024 23:43	EMB340_107-1	BS-7	130	61° 16,1819' N	020° 01,8548' E	CTD
04.05.2024 01:15	EMB340_108-1	DB0112	130	61° 26,3047' N	020° 05,1169' E	CTD
04.05.2024 02:38	EMB340_109-1	BS-9	129	61° 34,9857' N	020° 03,9308' E	CTD
04.05.2024 04:11	EMB340_110-1	BS-10	128	61° 44,3264' N	020° 09,0745' E	CTD
04.05.2024 06:01	EMB340_111-1	DB0113	136	61° 55,6318' N	020° 09,0621' E	CTD
04.05.2024 06:57	EMB340_112-1	F26/C15	142	61° 58,9041' N	020° 04,0936' E	CTD
04.05.2024 08:12	EMB340_113-1	BS-11	151	62° 05,6961' N	020° 08,3815' E	CTD
04.05.2024 10:14	EMB340_114-1	DB0114	139	62° 19,5692' N	020° 02,3822' E	CTD
04.05.2024 12:22	EMB340_115-1	TF0603	214	62° 35,2202' N	019° 58,4638' E	CTD
04.05.2024 14:00	EMB340_116-1	DB0115	111	62° 38,6422' N	019° 38,0185' E	CTD
04.05.2024 15:41	EMB340_117-1	TF0116	167	62° 41,1506' N	019° 14,9948' E	CTD
04.05.2024 17:12	EMB340_118-1	UMCS_C3	206	62° 39,1150' N	018° 57,2682' E	CTD
04.05.2024 18:13	EMB340_118-2	UMCS_C3	204	62° 39,1661' N	018° 57,1639' E	CTD
04.05.2024 18:58	EMB340_118-3	UMCS_C3	204	62° 39,2064' N	018° 57,0983' E	SD
04.05.2024 19:03	EMB340_118-4	UMCS_C3	204	62° 39,2225' N	018° 57,0752' E	WP2
04.05.2024 19:25	EMB340_118-5	UMCS_C3	204	62° 39,1089' N	018° 57,1333' E	WP2
04.05.2024 21:14	EMB340_119-1	DB0SGS70	171	62° 51,9598' N	018° 56,5232' E	CTD
05.05.2024 00:05	EMB340_120-1	DBO118	161	63° 07,5552' N	019° 28,9875' E	CTD
05.05.2024 01:50	EMB340_121-1	DB0117	100	63° 11,8680' N	019° 52,2660' E	CTD
05.05.2024 09:59	EMB340_122-1	UMSC_C14	90	62° 05,9758' N	018° 32,7966' E	CTD
05.05.2024 11:01	EMB340_122-2	UMSC_C14	89	62° 05,9922' N	018° 32,8709' E	CTD
05.05.2024 11:22	EMB340_122-3	UMSC_C14	90	62° 05,9853' N	018° 32,8479' E	WP2
05.05.2024 11:36	EMB340_122-4	UMSC_C14	89	62° 05,9819' N	018° 32,8538' E	WP2
05.05.2024 11:49	EMB340_122-5	UMSC_C14	89	62° 05,9731' N	018° 32,8436' E	WP2
05.05.2024 18:12	EMB340_123-1	UMSC_C24	74	61° 10,7950' N	018° 13,7836' E	CTD
05.05.2024 18:44	EMB340_123-2	UMSC_C24	74	61° 10,7880' N	018° 13,8421' E	WP2
07.05.2024 05:38	EMB340_124-1	TF0288	143	58° 59,7932' N	020° 09,5722' E	CTD
07.05.2024 06:20	EMB340_124-2	TF0288	142	58° 59,9564' N	020° 09,5170' E	SCF
07.05.2024 11:21	EMB340_125-1	TF0283	162	58° 47,0134' N	019° 05,7768' E	CTD
07.05.2024 11:57	EMB340_126-1	TF0283	120	58° 47,1719' N	019° 06,2872' E	SCF
07.05.2024 12:28	EMB340_127-1	TF0283	152	58° 46,6133' N	019° 04,1667' E	SCF
07.05.2024 16:00	EMB340_128-1	TF0284a	313	58° 32,6936' N	018° 14,1510' E	CTD
07.05.2024 17:33	EMB340_128-2	TF0284a	296	58° 32,7069' N	018° 14,1875' E	CTD
07.05.2024 18:36	EMB340_128-3	TF0284a	346	58° 32,7024' N	018° 14,0961' E	CTD
07.05.2024 19:02	EMB340_128-4	TF0284a	312	58° 32,6953' N	018° 14,1640' E	CTD
07.05.2024 19:35	EMB340_128-5	TF0284a	306	58° 32,7192' N	018° 14,1917' E	CTD
07.05.2024 21:45	EMB340_129-1	wGB-3	159	58° 19,5668' N	018° 04,0613' E	CTD
08.05.2024 00:21	EMB340_130-1	TF0240	170	57° 59,9997' N	017° 59,9489' E	CTD
08.05.2024 04:23	EMB340_131-1	TF0242	142	57° 43,0418' N	017° 22,0113' E	CTD
08.05.2024 08:57	EMB340_132-1	TF0245	111	57° 07,0252' N	017° 40,0336' E	CTD
08.05.2024 10:45	EMB340_133-1	SF025WGB	67	57° 09,8025' N	017° 19,5543' E	CTD
08.05.2024 11:33	EMB340_134-1	SF026WGB	75	57° 08,9595' N	017° 25,9220' E	CTD
08.05.2024 12:24	EMB340_135-1	SF027WGB	102	57° 08,0423' N	017° 32,6524' E	CTD
08.05.2024 13:18	EMB340_136-1	TF0245	111	57° 07,0500' N	017° 40,0330' E	CTD

08.05.2024 14:10	EMB340_137-1	SF028WGB	99	57° 06,2398' N	017° 46,0303' E	CTD
08.05.2024 15:00	EMB340_138-1	SF029WGB	78	57° 05,3085' N	017° 52,6009' E	CTD
08.05.2024 15:50	EMB340_139-1	SF030WGB	57	57° 04,4455' N	017° 59,0620' E	CTD
08.05.2024 16:28	EMB340_140-1	SF031WGB	27	57° 03,7375' N	018° 03,4956' E	CTD
08.05.2024 17:05	EMB340_141-1	SF032WGB	9	57° 03,1026' N	018° 08,0780' E	CTD
08.05.2024 23:00	EMB340_142-1	TF0402	69	57° 06,0449' N	018° 52,1982' E	CTD
09.05.2024 00:19	EMB340_143-1	TF0403	114	57° 04,4548' N	019° 01,4313' E	CTD
09.05.2024 01:35	EMB340_144-1	TF0404	162	57° 01,7842' N	019° 13,2496' E	CTD
09.05.2024 02:36	EMB340_145-1	TF0405	177	57° 00,5573' N	019° 21,2869' E	CTD
09.05.2024 04:08	EMB340_146-1	TF0406	168	56° 58,8702' N	019° 34,5196' E	CTD
09.05.2024 05:21	EMB340_147-1	TF0273	184	56° 57,1512' N	019° 46,1452' E	CTD
09.05.2024 06:25	EMB340_148-1	TF0407	177	56° 57,0306' N	019° 53,0560' E	CTD
09.05.2024 07:35	EMB340_149-1	TF0408	166	56° 55,3696' N	020° 01,1837' E	CTD
09.05.2024 08:55	EMB340_150-1	TF0409	145	56° 54,3726' N	020° 13,0958' E	CTD
09.05.2024 12:19	EMB340_151-1	TF0271	241	57° 19,2933' N	020° 02,9543' E	CTD
09.05.2024 13:31	EMB340_152-1	271s	241	57° 15,9438' N	019° 59,4252' E	CTD
09.05.2024 14:41	EMB340_153-1	TF0275	231	57° 12,6326' N	019° 55,8315' E	CTD
09.05.2024 15:57	EMB340_154-1	275s	230	57° 08,6257' N	019° 52,9538' E	CTD
09.05.2024 17:15	EMB340_155-1	TF0272	210	57° 04,3713' N	019° 49,8917' E	CTD
09.05.2024 18:25	EMB340_156-1	272s	195	57° 00,7547' N	019° 48,0246' E	CTD
09.05.2024 19:40	EMB340_157-1	TF0273	184	56° 57,1731' N	019° 46,2056' E	CTD
09.05.2024 21:01	EMB340_158-1	273s	176	56° 51,6469' N	019° 45,6695' E	CTD
09.05.2024 22:20	EMB340_159-1	TF0274	155	56° 46,0728' N	019° 45,2571' E	CTD
09.05.2024 23:29	EMB340_160-1	274s	146	56° 42,0351' N	019° 40,2036' E	CTD
10.05.2024 00:40	EMB340_161-1	TF0260	145	56° 38,0125' N	019° 35,0792' E	CTD
10.05.2024 01:47	EMB340_162-1	260s	146	56° 33,7177' N	019° 32,0608' E	CTD
10.05.2024 02:54	EMB340_163-1	TF0261	144	56° 29,5394' N	019° 28,8937' E	CTD
10.05.2024 04:00	EMB340_164-1	261s	140	56° 25,1406' N	019° 25,8842' E	CTD
10.05.2024 05:06	EMB340_165-1	TF0263	134	56° 20,8057' N	019° 22,8186' E	CTD
10.05.2024 06:05	EMB340_166-1	263s	132	56° 17,3909' N	019° 20,3864' E	CTD
10.05.2024 07:00	EMB340_167-1	TF0262	132	56° 14,0362' N	019° 18,1887' E	CTD
10.05.2024 08:05	EMB340_168-1	262s	129	56° 09,5093' N	019° 14,0878' E	CTD
10.05.2024 09:07	EMB340_169-1	TF0250	124	56° 04,9767' N	019° 10,0553' E	CTD
10.05.2024 22:04	EMB340_170-1	TF0213	89	55° 15,0203' N	015° 59,0063' E	PLA
10.05.2024 22:04	EMB340_170-2	TF0213	89	55° 15,0189' N	015° 59,0078' E	CTD
10.05.2024 22:29	EMB340_170-3	TF0213	89	55° 14,9975' N	015° 59,0382' E	WP2
10.05.2024 22:40	EMB340_170-4	TF0213	89	55° 14,9838' N	015° 59,0306' E	WP2
10.05.2024 22:50	EMB340_170-5	TF0213	90	55° 14,9853' N	015° 59,0643' E	WP2
10.05.2024 22:56	EMB340_170-6	TF0213	89	55° 15,0181' N	015° 59,0848' E	WP2
10.05.2024 23:07	EMB340_170-7	TF0213	89	55° 15,0212' N	015° 59,0881' E	WP2
10.05.2024 23:17	EMB340_170-8	TF0213	89	55° 15,0109' N	015° 59,0938' E	WP2
10.05.2024 23:32	EMB340_170-9	TF0213	89	55° 15,0086' N	015° 59,0582' E	CTD
11.05.2024 00:08	EMB340_170-10	TF0213	89	55° 14,9815' N	015° 59,0751' E	APNET
11.05.2024 00:29	EMB340_170-11	TF0213	89	55° 14,9520' N	015° 59,0807' E	APNET
11.05.2024 00:50	EMB340_170-12	TF0213	89	55° 15,0075' N	015° 59,0594' E	APNET
11.05.2024 10:43	EMB340_171-1	TF0152	28	54° 38,0126' N	014° 16,9738' E	CTD
12.05.2024 09:55	EMB340_172-1	OBBoje	12	54° 04,6635' N	014° 09,0994' E	CTD

12.05.2024 15:03	EMB340_173-1	TF0112	38	54° 48,2152' N	013° 57,4950' E	CTD
12.05.2024 15:32	EMB340_173-2	TF0112	38	54° 48,2216' N	013° 57,4732' E	CTD
12.05.2024 16:38	EMB340_174-1	ABBoje	43	54° 52,8180' N	013° 51,7418' E	CTD
12.05.2024 18:11	EMB340_175-1	TF0109	46	54° 59,9805' N	014° 04,9537' E	CTD
12.05.2024 18:12	EMB340_175-2	TF0109	46	54° 59,9893' N	014° 04,9581' E	SD
12.05.2024 18:15	EMB340_175-3	TF0109	46	55° 00,0035' N	014° 04,9711' E	PLA
12.05.2024 18:56	EMB340_175-4	TF0109	46	54° 59,9775' N	014° 04,9546' E	CTD
12.05.2024 19:20	EMB340_175-5	TF0109	46	55° 00,0008' N	014° 05,0144' E	WP2
12.05.2024 19:26	EMB340_175-6	TF0109	46	54° 59,9925' N	014° 05,0081' E	WP2
12.05.2024 21:12	EMB340_176-1	TF0145	45	55° 09,4114' N	014° 16,4368' E	CTD
12.05.2024 23:25	EMB340_177-1	TF0142_DK	71	55° 23,0046' N	014° 35,1241' E	CTD
13.05.2024 00:33	EMB340_178-1	TF0140	68	55° 28,0602' N	014° 43,0646' E	CTD
13.05.2024 04:36	EMB340_179-1	TF0103	45	55° 03,8212' N	013° 59,3045' E	CTD
13.05.2024 05:50	EMB340_180-1	TF0104	44	55° 04,1038' N	013° 48,6977' E	CTD
13.05.2024 07:02	EMB340_181-1	TF0105	44	55° 01,5078' N	013° 36,3350' E	CTD
13.05.2024 08:08	EMB340_182-1	TF0113	45	54° 55,4953' N	013° 29,9269' E	CTD
13.05.2024 08:12	EMB340_182-2	TF0113	45	54° 55,4933' N	013° 29,9970' E	PLA
13.05.2024 08:34	EMB340_182-3	TF0113	45	54° 55,4822' N	013° 30,0731' E	WP2
13.05.2024 08:42	EMB340_182-4	TF0113	44	54° 55,4944' N	013° 30,0461' E	WP2
13.05.2024 08:49	EMB340_182-5	TF0113	45	54° 55,5172' N	013° 30,0578' E	WP2
13.05.2024 08:56	EMB340_182-6	TF0113	45	54° 55,5181' N	013° 30,0871' E	WP2
13.05.2024 09:10	EMB340_182-7	TF0113	45	54° 55,4932' N	013° 30,1503' E	CTD
13.05.2024 09:32	EMB340_182-8	TF0113	45	54° 55,5059' N	013° 30,1844' E	WP2
13.05.2024 10:38	EMB340_183-1	TF0114	43	54° 51,6437' N	013° 16,5786' E	CTD
13.05.2024 12:00	EMB340_184-1	TF0115	27	54° 47,6666' N	013° 03,4180' E	CTD
13.05.2024 13:28	EMB340_185-1	TF0030	20	54° 43,4894' N	012° 46,9035' E	CTD
13.05.2024 13:30	EMB340_185-2	TF0030	20	54° 43,4966' N	012° 46,9083' E	PLA
13.05.2024 13:56	EMB340_185-3	TF0030	20	54° 43,4546' N	012° 46,9368' E	CTD
13.05.2024 14:50	EMB340_186-1	TF0001	18	54° 41,7984' N	012° 41,8637' E	CTD
13.05.2024 16:11	EMB340_187-1	TF0002	15	54° 38,9589' N	012° 26,9468' E	CTD
13.05.2024 17:04	EMB340_188-1	TF0033	17	54° 36,2975' N	012° 19,8619' E	CTD
13.05.2024 17:53	EMB340_189-1	TF0083	23	54° 33,0042' N	012° 16,3531' E	CTD
13.05.2024 19:00	EMB340_190-1	TF0046	25	54° 28,1810' N	012° 14,3303' E	CTD
13.05.2024 19:02	EMB340_190-2	TF0046	25	54° 28,1811' N	012° 14,3452' E	PLA
13.05.2024 19:22	EMB340_190-3	TF0046	26	54° 28,1836' N	012° 14,4221' E	WP2
13.05.2024 19:27	EMB340_190-4	TF0046	26	54° 28,1846' N	012° 14,4389' E	WP2
13.05.2024 20:36	EMB340_191-1	TF0041	16	54° 24,4142' N	012° 03,5766' E	CTD
13.05.2024 22:08	EMB340_192-1	TF05	10	54° 13,9155' N	012° 04,2920' E	CTD
13.05.2024 23:48	EMB340_193-1	TF0017	19	54° 23,5213' N	011° 49,3410' E	CTD
14.05.2024 01:32	EMB340_194-1	TF0012	22	54° 18,9651' N	011° 32,9697' E	PLA
14.05.2024 01:32	EMB340_194-2	TF0012	22	54° 18,9660' N	011° 32,9765' E	CTD
14.05.2024 01:51	EMB340_194-3	TF0012	22	54° 18,9484' N	011° 33,0117' E	WP2
14.05.2024 02:00	EMB340_194-4	TF0012	22	54° 18,9342' N	011° 33,0244' E	WP2
14.05.2024 02:06	EMB340_194-5	TF0012	22	54° 18,9297' N	011° 33,0073' E	WP2
14.05.2024 02:24	EMB340_194-6	TF0012	22	54° 18,9155' N	011° 33,0656' E	CTD
14.05.2024 04:41	EMB340_195-1	TF0022	20	54° 06,6281' N	011° 10,4514' E	CTD
14.05.2024 07:45	EMB340_196-1	TF0013	24	54° 28,4014' N	011° 28,8147' E	CTD

14.05.2024 08:50	EMB340_197-1	TF0010	25	54° 33,1178' N	011° 19,1609' E	CTD
14.05.2024 10:21	EMB340_198-1	TF0014	24	54° 35,6985' N	011° 00,7494' E	CTD
14.05.2024 11:37	EMB340_199-1	TF0361	21	54° 40,0202' N	010° 46,5848' E	CTD
14.05.2024 13:16	EMB340_200-1	TF0360	15	54° 36,0716' N	010° 26,8832' E	CTD
14.05.2024 13:20	EMB340_200-2	TF0360	15	54° 36,0520' N	010° 26,8942' E	SD
14.05.2024 13:20	EMB340_200-3	TF0360	15	54° 36,0514' N	010° 26,8922' E	PLA
14.05.2024 13:54	EMB340_200-4	TF0360	15	54° 36,0004' N	010° 26,9851' E	WP2
14.05.2024 14:00	EMB340_200-5	TF0360	15	54° 36,0058' N	010° 26,9794' E	WP2
14.05.2024 14:08	EMB340_200-6	TF0360	15	54° 36,0014' N	010° 26,9609' E	WP2

7.2 Water Sampling – Parameters and Number of Samples

Station No. EMB340_xxx	Station name	O2	H2S-Best.	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM+DOM	CH4_N2O	CO2	DNA-Filter	FISH Filter	P+G	Phyto-Netz	APSTEI Netz	Chlorophyll	Phytoplankton	Zooplankton + Zoo.-DNA	UV-Filter	Filter Greifswald Dürwald	eDNA DAM
1	TF0012	1	-	-	-	-	-	-	-	-	-						1		6		1			
2	TF0046	1	-	-	-	-	-	-	-	-	-						1		5		2			
4	TF0001	3	-	-	-	-	-	-	-	-	-													
7	TF0114	9	-	-	-	-	-	-	-	-	-													
8	TF0113	1	-	-	-	-	-	-	-	-	-						1		6		2			
9	AB-Boje	3	-	-	-	-	-	-	-	-	-													
14	TF0140	1	-	6	6	6	6	-	-	-	-													
18	TF0200	2	-	7	7	7	7	-	-	-	-													
20	TF0211	1	-	-	-	-	-	-	-	-	-													
22	TF0214	1	-	7	7	7	7	-	-	-	-													
23	TF0213	19	-	10	10	10	10	10	6	6	6	10	10				1	3	5		4			
25	TF0225	1	-	-	-	-	-	-	-	-	-													
27	TF0224	1	-	-	-	-	-	-	-	-	-													
29	TF0228	1	-	-	-	-	-	-	-	-	-													
31	TF0222	7	-	7	7	7	7	7	-	-	-													
33	TF0267	1	-	-	-	-	-	-	-	-	-													
35	TF0256	1	-	-	-	-	-	-	-	-	-													
37	TF0259	7	-	7	7	7	7	7	-	-	-						3		6	3				
40	TF0253	1	-	-	-	-	-	-	-	-	-													
41	TF0265	2	1	-	-	-	-	-	-	-	-													
43	TF0262	2	1	-	-	-	-	-	-	-	-													
45	TF0261	-	3	-	-	-	-	-	-	-	-													
46	TF0260	9	4	9	9	9	9	9	-	-	-													
49	TF0272	1	3	-	-	-	-	-	-	-	-													
52	TF0271	23	22	21	21	21	21	21	12	12	12	24	20	52	26	52	3		5	3				
77	TF0276	1	3	-	-	-	-	-	-	-	-													
78	TF0270	1	3	-	-	-	-	-	-	-	-													
79	TF0287	1	-	-	-	-	-	-	-	-	-													
81	TF0286	8	8	16	16	16	16	16	6	6	6	16	16											
84	TF0285	1	3	-	-	-	-	-	-	-	-													
86	TF0289	1	1	-	-	-	-	-	-	-	-													
87	TF0282	1	3	-	-	-	-	-	-	-	-													
89	DB0101	1	-	-	-	-	-	-	-	-	-													
91	AD-1	1	-	-	-	-	-	-	-	-	-													
93	AD-3	1	-	-	-	-	-	-	-	-	-													
95	DB0103	1	-	-	-	-	-	-	-	-	-													
96	DB0104	1	-	10	10	10	10	-	-	-	-													
98	DB0106	1	-	-	-	-	-	-	-	-	-													
100	TF0605	1	-	13	13	13	13	13	-	-	-													
105	TF0604	1	-	8	8	8	8	8	-	-	-													
106	DB0111	9	-	-	-	-	-	-	-	-	-													
112	F26/C15	1	-	9	9	9	9	9	-	-	-													
114	DB0114	1	-	-	-	-	-	-	-	-	-													

116	DB0115	1	-	-	-	-	-	-	-	-	-													
118	UMSC_C3	2	-	8	8	8	8	8	-	-	-								1	1				
122	UMSC_C14	10	-	7	7	7	7	7	-	-	-								1	1				
124	TF0288	1	3	-	-	-	-	-	-	-	-													
125	TF0283	1	3	-	-	-	-	-	-	-	-													
128	TF0284a	12	16	15	15	15	15	15	10	10	10			52	26	52								
130	TF0240	14	5	-	-	-	-	-	-	-	-													
132	TF0245	6	2	-	-	-	-	-	-	-	-													
142	TF0402	9	-	-	-	-	-	-	-	-	-													
147	TF0273	1	-	-	-	-	-	-	-	-	-													
151	TF0271	1	-	-	-	-	-	-	-	-	-													
155	TF0272	1	-	-	-	-	-	-	-	-	-													
159	TF0274	1	-	-	-	-	-	-	-	-	-													
165	TF0263	1	-	-	-	-	-	-	-	-	-													
169	TF0250	1	-	-	-	-	-	-	-	-	-													
170	TF0213	16	-	7	7	7	7	-	-	-	-			3			3	3	6	3	6			
172	OB-Boje	2	-	2	2	2	2	-	-	-	-											5		
173	TF0112	1	-	4	4	4	4	-	-	-	-												2	2
174	AB-Boje	2	-	-	-	-	-	-	-	-	-													
175	TF0109	1	-	5	5	5	5	5	4	4	4			3			3		5	2	2	6		
176	TF0145	1	-	4	4	4	4	-	-	-	-													
177	TF0142	1	-	5	5	5	5	-	-	-	-													
178	TF0140	1	-	6	6	6	6	-	-	-	-													
179	TF0103	1	-	5	5	5	5	-	-	-	-													
180	TF0104	1	-	5	5	5	5	-	-	-	-													
181	TF0105	1	-	5	5	5	5	-	-	-	-													
182	TF0113	7	-	7	7	7	7	7	4	4	4	7	7	3			5		6	3	4	5	2	2
183	TF0114	1	-	5	5	5	5	-	-	-	-													
184	TF0115	1	-	4	4	4	4	-	-	-	-												2	2
185	TF0030	-	-	-	-	-	-	-	-	-	-						3		5	2				2
186	TF0001	3	-	3	3	3	3	-	-	-	-												2	2
187	TF0002	3	-	3	3	3	3	-	-	-	-												2	2
190	TF0046	1	-	4	4	4	4	-	-	-	-			3			3		6	2	2	5	2	2
191	TF0041	1		3	3	3	3	-	-	-	-													
192	TFO5	1	-	3	3	3	3	3	2	2	2											6	2	2
194	TF0012	4	-	4	4	4	4	4	3	3	3			3			5		5	2	3	5	2	2
195	TF0022	4	-	-	-	-	-	-	-	-	-											5		
197	TF0010	1	-	4	4	4	4	-	-	-	-											5		2
198	TF0014	-	-	-	-	-	-	-	-	-	-													2
200	TF0360	3	-	3	3	3	3	3	3	3	3			3			5		5	3	2	5		
	Samples	252	84	251	251	251	251	152	50	50	50	57	53	122	52	104	37	6	73	25	28	47	16	22
	Stations	80	17	37	37	37	37	17	9	9	9	4	4	8	2	2	13	2	15	11	10	9	8	11

O2	H2S-Best.	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	** POM+DOM	CH4_N2O	CO2	DNA-Filter	FISH Filter	P+G	Phyto-Netz	APSTEI Netz	Chlorophyll	Phytoplankton	Zooplankton + Zoo.-DNA	UV-Filter	Filter Greifswald Dürwald	eDNA DAM

7.3 List – Scanfish Profiles

Profile	Region	Begin [UTC]	Latitude [WGS84]	Longitude [WGS84]	End [UTC]	Latitude [WGS84]	Longitude [WGS84]	Length [NM]
SF1; EMB340_53	Eastern Gotland Basin, Gotland to Latvian coast	29.04.2024 06:40:00	57° 33,7901' N	018° 50,9657' E	29.04.2024 07:02:20	57° 33,1894' N	018° 53,7847' E	2 NM; no data
SF2; EMB340_53	Eastern Gotland Basin, Gotland to Latvian coast	29.04.2024 07:27:29	57° 33,1203' N	018° 53,8396' E	29.04.2024 08:30:45	57° 30,8160' N	019° 03,6689' E	4 NM; incomplete data
SF3; EMB340_124	Northern Gotland Basin, TF0288 to TF0283	07.05.2024 06:20:07	58° 59,9564' N	020° 09,5170' E	07.05.2024 07:08:54	58° 58,8620' N	020° 03,7283' E	4 NM; no data
SF4; EMB340_126	Northern Gotland Basin, TF0283 to TF0284a	07.05.2024 11:57:08	58° 47,1719' N	019° 06,2872' E	07.05.2024 12:11:40	58° 46,8841' N	019° 05,2937' E	1 NM; no data
SF5; EMB340_127	Northern Gotland Basin, TF0283 to TF0284a	07.05.2024 12:28:03	58° 46,6133' N	019° 04,1667' E	07.05.2024 12:38:04	58° 46,1665' N	019° 02,7406' E	1 NM; no data

8. Data and Sample Storage and Availability

All data gathered will be stored on a data repository in the IOW immediately after the cruise. The processed and validated data will be stored in the ODIN data base (https://odin2.io-warnemuende.de). According to the IOW data policy and to facilitate the international exchange of data, all metadata will be made available under the international ISO 19115 standards for georeferenced metadata. Date from German waters will be stored additionally in the BSH MUDAB data base.

The access to the data itself will be restricted for three years after data acquisition to protect the research process, including scientific analysis and publication. After that period the data becomes openly available to any person or any organization who requests them, under the international Creative Commons (CC) data license of type CC BY 4.0 (https://creativecommons.org/licenses/by/4.0/). For further details refer to the IOW data policy document.

Table 8.1 Data availability and responsible scientists.

Type	Database	Available	Free Access	Contact
Hydrographic measurements	IOW DB, MUDAB, HELCOM, ICES	July 2024	June 2026	Naumann, Michael, Dr. michael.naumann@io-warnemuende.de
Nutrient measurements	IOW DB, MUDAB, HELCOM, ICES	September 2024	June 2027	Kuss, Joachim, Dr. joachim.kuss@io-warnemuende.de
Phytoplankton measurements	Personal contact	November 2024	June 2027	Kremp, Anke, Dr. anke.kremp@io-warnemuende.de
Zooplankton measurements	Personal contact	November 2024	June 2027	Dutz, Jörg, Dr. joerg.dutz@io-warnemuende.de

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11. Abbreviations

Defined in the text.

12. Appendices

none