ELISABETH MANN BORGESE-Berichte

Baltic Sea Long-term Observation Programme

Cruise No. EMB353

07.11.2024 – 22.11.2024
Rostock-Marienehe (Germany) – Rostock-Marienehe (Germany)
BalticObs

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2024

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1. Cruise summary

1.1 Summary in English

The cruise EMB353 was carried out in frame of the IOWs Baltic Sea long-term observation programme. The scientific programme is part of IOW's Baltic Sea long-term observation programme, related to the institutes research area 2 "Coastal Seas in Transition". The central task is a continuously ongoing data collection of time series at key stations spanning from the western to central Baltic Sea, initiated since 1969. The programme partly belongs to the national environmental monitoring in the German EEZ, which is performed in context with the Helsinki Commission (HELCOM) and federal programms to evaluate the status of the Baltic Sea (BMP). This work package is based on a contract between the Federal Maritime Agency (BSH) and IOW as administrative agreement since 1991. Since 1997 it is complemented by permanent moorings in the Eastern Gotland Basin. The gathered data are the back bone of research on the natural variability of the ecosystem and anthropogenic influences. During EMB353 101 CTD stations and 3 scanfish transects were measured for physical, chemical and biological parameters from the western to the central Baltic Sea. 52 of the CTD stations were measured along the so called "thalweg transect" describing the hydrographic and hydrochemical conditions on the pathway of saltwater inflows from the North Sea. Three moorings were maintained in the Eastern Gotland Basin. Weather conditions on the cruise were calm during the first 7 days and very windy during the second part of the cruise. From November 15th afternoon - 18th early morning we stayed in Visby harbor for getting provisions and waiting on improvement of weather conditions. The planned work programme was realised.

1.2 Zusammenfassung

Die Expedition EMB353 wurde im Rahmen des IOW Langzeitbeobachtungsprogramms der Ostsee durchgeführt. Das wissenschaftliche Programm ist Teil des Ostsee-Langzeitbeobachtungsprogramms des IOW, das sich auf den Forschungsbereich 2 „Küstenmeere im Wandel" bezieht. Zentrale Aufgabe ist die seit 1969 begonnene kontinuierliche Erfassung von Zeitreihen an Schlüsselstationen von der westlichen bis zur zentralen Ostsee. Das Programm beinhaltet auch die Felddatenerfassung für die nationale Umweltüberwachung in der deutschen AWZ, die im Rahmen der Helsinki-Kommission (HELCOM) und des nationalen Programmes zur Zustandsbewertung der Ostsee (BMP) durchgeführt wird. Diesem Arbeitspaket liegt ein Vertrag zwischen dem Bundesamt für Seeschifffahrt und Hydrographie (BSH) und dem IOW als Verwaltungsvereinbarung seit 1991 zugrunde. Seit 1997 wird das Programm durch permanente Verankerungen in der Gotland See ergänzt. Die gewonnenen Daten bilden die Basis der Forschung zur natürlichen Variabilität des Ökosystems und zu anthropogenen Einflüssen. Während der Reise EMB353 wurden 101 CTD-Stationen und 3 Scanfish-Transekte für physikalische, chemische und biologische Parameter von der westlichen bis zur zentralen Ostsee beprobt. 52 der CTD-Stationen wurden entlang des so genannten „thalweg-Transekts" gemessen, der die hydrographischen und hydrochemischen Bedingungen auf dem Weg der Salzwasserzuflüsse aus der Nordsee beschreibt. Drei Verankerungen wurden im östlichen Gotland-Becken gewartet. Die Wetterbedingungen während der Fahrt waren in den ersten 7 Tagen ruhig und im zweiten Teil der Fahrt sehr windig. Vom 15. November nachmittags bis zum 18. November frühmorgens lag das Schiff im Hafen von Visby um mit Proviant versorgt zu werden und auf eine Verbesserung der Wetterbedingungen zu warten. Das geplante Arbeitsprogramm wurde vollständig umgesetzt.

2. Participants

2.1 Principal Investigators

Name	Institution
Kube, Sandra, Dr.	IOW
Naumann, Michael, Dr.	IOW
Mohrholz, Volker, Dr.	IOW
Kuss, Joachim, Dr.	IOW
Zettler, Michael, Dr.	IOW
Kremp, Anke, Dr.	IOW
Dutz, Jörg, Dr.	IOW

2.2 Scientific Party

Name	Discipline	Institution
Kube, Sandra, Dr.	Biological Oceanography/ chief scientist	IOW
Naumann, Michael, Dr.	Physical Oceanography/ deputy chief scientist	IOW
Heene, Toralf	Physical Oceanography	IOW
Köhn, Josef (07.11.-10.11.)	Instrumentation	IOW
Schöne, Susanne	Marine Chemistry	IOW
Hand, Ines	Marine Chemistry	IOW
Dierken, Madleen	Marine Chemistry	IOW
Fechtel, Christin	Biological Oceanography	IOW
Schubert, Stefanie (07.11.-10.11.)	Biological Oceanography	IOW
Hehl, Uwe	Biological Oceanography	IOW
Sakpal, Harshada (07.11.-10.11.)	Marine Chemistry (PhD student)	IOW
Oppler, Jonna (07.11.-10.11.)	Biological Oceanography	IOW
Rummel, Karoline (10.11.-22.11.)	Physical Oceanography	IOW
Silvana Bodenstein (10.11.-22.11.)	Biology (student)	University of Rostock

2.3 Participating Institutions

IOW Leibniz Institute for Baltic Sea Research Warnemünde, Germany
Uni Rostock Institute for Biology

3. Research Programme

3.1 Description of the Work Area

The area under investigation of the cruise EMB353 covered the western and central Baltic Sea from the Kiel Bight to the northern Gotland Basin. An overview of the locations of CTD stations and the cruise track is given in Figure 3.1. A station list with all measured parameters is given in Table 7.1. The majority of stations was located along the "thalweg" transect of the Baltic Sea, describing the hydrographic and hydrochemical conditions on the pathway of saltwater inflows from the North Atlantic via the Belt Sea, Arkona Sea, Bornholm Sea, along the Słupsk Furrow to the eastern Gotland Basin and further to the northern Gotland Sea as well as the changing biodiversity along the resulting horizontal and vertical salinity gradients. These inflows are the source for haline, oxygen rich water for the central deep basins (MATTHÄUS et al. 2008).

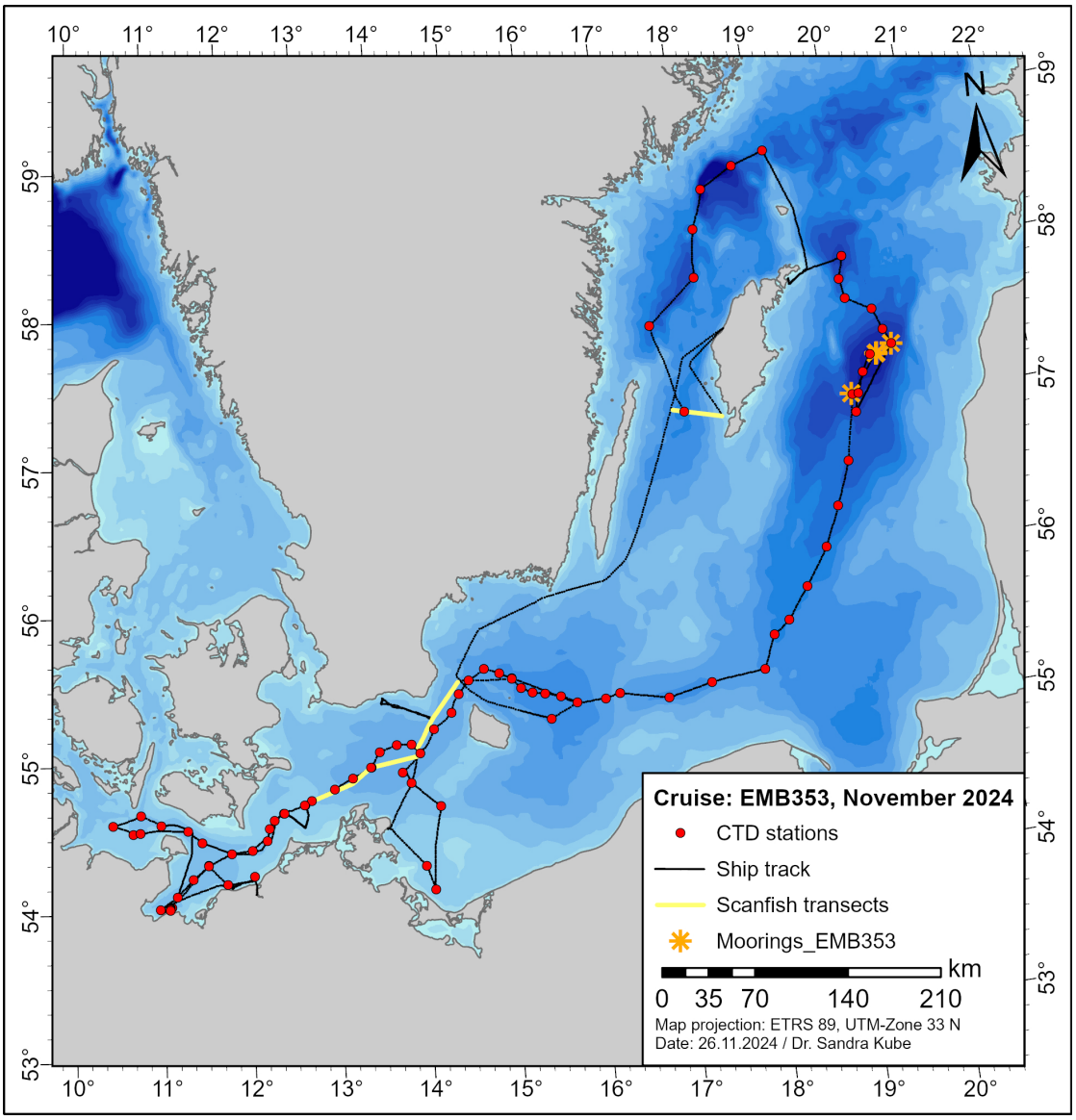

Fig. 3.1 Track chart of R/V ELISABETH MANN BORGESE of cruise EMB353 from 07. November – 22. November 2024. The bathymetry basemap was interpolated as 200x200 m grid from the dataset SEIFERT et al. 2008.

3.2 Aims of the Cruise

The cruise EMB353 was carried out to assess the meteorological, hydrographic, hydrochemical and biological conditions of the southwestern and central Baltic Sea in November 2024. It was the fifth cruise in a series of five expeditions performed annually as part of the long term environmental monitoring programme of the Leibniz-Institute for Baltic Sea Research Warnemünde (IOW) and the environmental monitoring programme of the Federal Maritime and Hydrographic Agency (BSH). The crucial aim is a continuously ongoing data collection of time series at key stations spanning from the southwestern to central Baltic Sea along the so called "thalweg", initiated since 1969. Since 1997 it is complemented by permanent moorings in the Eastern Gotland Basin, with maintenance work also during EMB353. The gathered data from a dense grid of sampling stations, scanfish transects and measurements on permanent moorings are the back bone of research on the natural variability of the ecosystem and anthropogenic influences. 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. 2024, Zettler et al. 2024), are analysed in numerous scientific publications and provide the scientific basis for measures to be taken for the protection of the ecosystem Baltic Sea.

3.3 Agenda of the Cruise

The work packages of the cruise were subsequently conducted. We started with the BSH environmental monitoring programme in the southwestern Baltic Sea, which was continued with the IOW's Baltic Sea long-term observation programme in the central Baltic Sea (Fig. 3.1).

The marine environment was less disturbed by performed scientific tasks during this cruise. No sampling in marine protected areas was done. Mainly sensor measurements and water sampling in the water column for chemical and biological parameters were performed. No chemicals were released in the water column, no devices were lost. Nets for plankton sampling as well as dredges and grabs for benthic sampling were carefully cleaned with freshwater in between the hauls to avoid transfer of organisms between areas.

The programme at the stations consisted of CTD casts for oceanographic parameters, water sampling for oxygene/hydrogene sulfide, nutrient, chlorophyll and phytoplankton analyses as well as trace gas and UV-filter measurements. For biodiversity analyses net sampling of phytoplankton, WP2 and Apstein net sampling of zooplankton, as well as vanVeen grab sampling and dredging for macrozoobenthos were conducted. Additionally, water samples for molecular microbiological analyses were collected. Three mooring stations in the eastern Gotland Basin were maintained to acquire the collected data from the previous 6 months and new deployed for the next 6 months. Additionally, scanfish transects for oceanographic conditions were measured from Bornholmsgat to Darss Sill on the return track of the cruise. Detailed station work is shown in Tables 7.1 and 7.2.

Additional programme:

- Long-term changes in the population dynamics of zooplankton

For the analysis of the long-term changes in the population dynamics of key copepod species in the Bornholm Basin, zooplankton nets (Apstein, mesh size 50 µm, WP-2 mesh size 100 µm) were deployed to quantitatively sample nauplii and copepodites (responsible scientist Jörg Dutz, IOW).

- 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. 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 Klaus Jürgens, IOW).

- DNA sampling for microbiological analyses

Sampling was done for building up an DNA-archive of samples for analysis the microorganism community at 11 stations in the western Baltic Sea (responsible scientist 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.

- 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 Kathrin Fisch (Julius Kühn-Institut, Berlin) and Marion Kanwischer (IOW). Water samples were taken at the surface, Chl a maximum, and bottom layer at 9 stations in the western Baltic Sea. The collection of samples from various depths will determine the variation in distribution of UV Filters in the Baltic Sea at different depths. Chl a max is being collected specifically to 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.

- Sampling for stable isotope analyses

In the Baltic Sea, the replacement of directly palatable nitrate-utilizing diatoms by largely unpalatable N_2-fixing filamentous cyanobacteria can fundamentally alter food web dynamics with a massive impact on higher trophic levels. The current understanding about the formation of the subsurface nitrate pools in different areas of the Baltic Sea in winter is limited, yet it is essential to understand biodiversity changes at higher trophic levels. Analyses of the subsurface nitrate pool is subject of the stable isotope investigations based on samples from cruise EMB 353. Water samples (250-750 ml) were filtered through precombusted GF-75 filters for later POM EA-IRMS analysis and uncombusted GF-75 filters for later Chlorophyll a analysis to estimate the quality of POM. The filtrate (50 ml) was collected for later δ15N-nitrate and δ18O-nitrate analysis. All samples were stored and kept frozen at -20 °C on board and in the lab, respectively, until analysis at the IOW (responsible scientist Natalie Loick-Wilde, Iris Liskow, IOW).

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 WP2 net, 100 µm mesh size (WP2)
- Secci desk (SD)
- VanVeen grab (VVG)
- Dredge (DRG)

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.

Mobilisation and installation of the laboratory equipment for the Baltic Sea monitoring cruise EMB353 was done on Wednesday, 6.11.2024.

Unfortunately, one crew member, intended for CTD operation during the first part of the cruise had to cancel the trip early in the morning of 7.11.2024 due to illness. Even if there were only 2 hours left until the planned departure, we were successful to find a replacement from the IOW Instrumentation Department and thus the cruise started as planned on Thursday, 7.11.2024 at 9 a.m.. The weather was calm with light northerly wind of 3 Bft, even easing to 1 to 2 Bft during the day when we headed to the southwestern Baltic Sea. The first station of the cruise was the TFO5 off Warnemünde. A CTD cast with water sampling for oxygen determinations, inorganic nutrients as well as for total dissolved nitrogen and phosphorus, and for natural organic matter analyses was done. The sampling for the UV filter analysis started at this station in the frame of a cooperation with the Julius Kühn-Institut Institute Berlin. This programme is running already for 3 years now and the cruise EMB353 was the last survey in this cooperation project. Additionally, the IOW working group Environmental Biology was collecting eDNA samples at this station for analysing the bacterial community. Next sampling station (TF0018), still very close to the coast off Kühlungsborn, was the start of the macrozoobenthos monitoring programme 2024. Van veen grab and dredge samples were taken as well as samples for nutrient analyses. In the central Mecklenburg Bay at the key monitoring station TF0012 a complex sampling programme including oceanographic parameters recorded by CTD, biological parameters (macrozoobenthos, phytoplankton, zooplankton, chlorophyll), chemical parameters (nutrients, total dissolved nitrogen and phosphorus, natural organic matter, oxygen) was carried out. Additionally, samples for UV-filter analyses and eDNA were taken. Before sampling the

Lübeck Bight (TF0022) for nutrients and UV-filter analyses, we took a high resolution CTD transect close to the coast off Boltenhagen. During a very calm night the transfer to the Kiel Bight was done.

For Friday 08.11.2024, the DWD marine weather forecast predicted light and variable winds from southeast 2 to 3 Bft, increasing slowly to about 4 to 5 Bft in the afternoon in the western Baltic Sea. Misty weather with coastal fog patches dominated the day. The wave hight in the morning was 0,2 m and air temperature 8 °C. In order to start the station TF0360 in Kiel Bight not before daylight, the ship's speed was reduced in the second half of the night. This Kiel Bight station is part of the macrozoobenthos monitoring programme, which means that night sampling should be avoided due to migration behaviour of some macrozoobenthic species such as some crustaceans which move to the water column during darkness. Sampling of the station started at 7:30 a.m. with CTD casts for nutrients, oxygen, chlorophyll and phytoplankton sampling. Moreover, water was sampled for UV-filter analyses. Afterwards phytoplankton net sampling, zooplankton net sampling and benthic sampling with the vanVeen grab and dredge were done. Two additional stations in the Fehmarn Belt area were sampled for macrozoobenthic community with the van Veen grab as a service for the DAM project “Exclusion of mobile bottom-contact fishing in marine protected areas” which is coordinated at IOW. At one of these stations intercomparison measurements for oxygen, salinity, temperature, and pressure were done to secure the correctness and stability of the CTD sensors. Another station in the Fehmarn Belt (TF0010) was sampled in the afternoon for the macrozoobenthos monitoring programme and the regular nutrient monitoring sampling as well as for the UV-filter project and the eDNA project. Afterwards we headed along the thalweg to the east, with CTD casts at TF0013, TF0017 and TF0041, to reach the key monitoring station TF0046 in the Kadet Trench in the evening. There the regular CTD, chemistry and biological plankton sampling was done as planned for the monitoring programme. Additionally, UV-filter and eDNA samples were taken. During the night the ship headed further east along the thalweg, sampling TF0083, TF0033, TF0002. At the latter the second intercomparison measurement for the sensor readings was done.

During the night, the ship speed was reduced to reach TF0001 and the MARNET station Darss Sill in the morning light of 09.11.2024. The day started misty with southeast to south winds of 3 to 4 Bft and wave height of 0,4 – 0,6 m. Thus, the deployment of the working boat to enter the MARNET station Darss Sill was possible. The reason for this additional operation was maintenance work. During the MARNET cruise that took place just before our cruise, there were problems with the positioning of the measuring chain in the water column. To fix this and to adjust the positioning of the measuring chain, two of our crew members went to the MARNET station with the working boat and climbed onto the station. The MARNET measuring chain could be precisely aligned at the intended depth levels. The operation was successfully accomplished at 8:45 a.m.. Afterwards the cruise continued as planned to the monitoring station TF0030, were besides CTD measurement sampling of nutrients, phytoplankton, macrozoobenthos as well as eDNA was done. Along the thalweg were measured TF0115, TF0114 and reached TF0113 in the afternoon, which is again a key monitoring station in the Arkona Basin with the entire set of biological plankton and chemical sampling. The cruise then followed the thalweg in eastern direction with CTD stations TF0105, TF0104, TF0103 to the next key station TF0109. There again the entire set of nutrients, phytoplankton, zooplankton,

macrozoobenthos as well as UV-filter was sampled. The cruise then headed south to the Arkonaboje station and then towards Oder Bay.

In the very early morning of Sunday 10.11.2024 the macrozoobenthos sampling continued at TF0152. Unfortunately this station had to be sampled in darkness in order to keep the schedule and realise the planned change of personnel in Sassnitz on Sunday at noon. The weather stayed calm with southeasterly wind of about 3 Bft and at times misty with fog patches, sea 0,5 m. The benthos programme was completed in Oder Bay with sampling at TF0160. Thus, the annual macrozoobenthos monitoring programme 2024 could be completed successfully. At noon we had the planned change of personnel in Sassnitz, realised with the rescue boat to safe time. The persons responsible for the eDNA programme of the Environmental Microbiology group, UV-filter analyses as well as macrozoobenthos sampling left the cruise. Furthermore, one person of the CTD team also left the cruise and another person was joining the CTD team. Additionally one person responsible for nitrogen isotope samples joined the cruise in Sassnitz. At 13:00 we could continue in northeasterly direction to the Bornholmsgat, were we sampled several stations along the track during the night.

In the morning of 11.11.2024 we reached the monitoring key station TF0213 in the Bornholm Deep were a comprehensive sampling for all disciplines was done. We still had very good working conditions in the southern Baltic Sea with wind from southwest 3 to 4 Bft, sea 0,5 m. However, the weather forecast predicted strong winds in the central Gotland Basin for the next week. One of the extra tasks on this cruise was to do maintenance work at three mooring stations in the Gotland Basin (Gotland SW, Gotland Central and Gotland NE). To do that work, calm weather conditions and daylight are obligatory. Therefore, we calculated and adjusted the further measurement across the thalweg with enhanced speed by skipping some CTD stations that were very close to each other from the track to save time and to reach the mooring positions before the predicted storm. We subsequently worked very time-efficiently when continuing CTD measurements in the Bornholm Basin (TF0225), crossing the Slupsk Sill (TF0224) and went further along the thalweg through the Slupsk Furrow (TF0222-TF0256). We reached the eastern end of Slupsk Furrow in the evening of 11.11.2024. The station work along the thalweg transect was continued towards north, to the Eastern Gotland Basin (EGB). In the late evening we reached the southern part of the eastern Gotland Basin and we sampled TF0259, which belongs to the monitoring key stations.

During the night and the morning of 12.11.2024 we measured the thalweg stations through the southern part of the EGB in north-eastern direction (TF0255 – TF0260). The weather stayed calm with light and variable winds from the south about 3 Bft, later veering north, at times misty, sea 0,5 m. Due to the time-saving cruise plan during the last day, we could start the mooring work at station Gotland SW (GOSW) at 10:45 on 12.11.2024. The work was successfully done within less than 2 hours and we could deploy the maintained station already after at 12:15. After finishing the work we immediately headed to the next mooring station Gotland central (GOCE) to do the maintenance at this station on the same day. The calm weather conditions as well as the very well prepared working process enabled us to do this work within 2 hours. The maintained mooring was successfully put back into the water in the afternoon for continuing the autonomous measurements and biological sampling for the next six month until the next maintenance in March 2025. We started the excessive sampling and measuring at the monitoring key station TF0271 in the late afternoon until midnight. At this location in the central eastern Gotland Basin

we detected the first hydrogen sulfide in the bottom water layer on this cruise. Since we saved time by very time efficient work at the two mooring stations we headed back during the night in southern direction to catch up some more stations on the thalweg (TF0275, TF0272, TF0273).

We reached the third mooring Gotland NE with daylight in the morning of 13.11.2024. Very calm sea, no swell at all and southwesterly wind of about 3 Bft supported the work on the last mooring which was done within one hour. The weather forecast showed increasing wind to about 5 Bft, shifting northwest and the prediction of increasing swell to 2 m for the evening of the 13.11.2024. Thus we unfortunately had to skipp the planned scanfish transect in the eastern Gotland Basin and continued the thalweg in northeasterly direction (TF0276, TF0270, TF0287, TF0290). We reached the Farö Deep (TF0286) in the afternoon and did the CTD casts and the chemical sampling. After finishing that we decided that the forecasted weather conditions on the track to the northern Gotland Basin would not allow to work further at the transect stations since wind and swell increased. For that reason, we went to the northern tip of Gotland for shelter until next morning.

On 14.11.2024 we started at 04:00 a.m. in northern direction towards TF0283, which means we canceled the thalweg stations TF0277 to TF0288. We reached TF0283 at 11:00 a.m. and resumed station work. The weather forecast showed bad weather conditions north of Gotland with northwesterly winds of about 5 Bft, increasing to 6 and shifting west, and a swell of 1 to 2 m. Under wind protection from the coast we could work the extensive station programme at the monitoring key station Landsort Deep TF0284 in the afternoon. After the Landsort Deep station we were heading southward across the western Gotland Basin (wGB-3, TF0240, TF0242).

We finished the station work with TF0245 in the Karlsö Deep in the early morning of 15.11.2024 and started the scanfish transect measurement at 07:00 a.m. at SF025WGB from west to east to SF032WGB. After successful deployment of the scanfish we headed northwards to Visby harbour which we entered at 3 p.m.. The weather forecast predicted increasing wind to 6 to 7 Bft and the sea increasing 3 m in the central, southeastern and southern Baltic Sea. The bad weather continued over the next two days with strong wind about 7 Bft from southwest to west and 3 m wave height in the central Baltic Sea as well as in our destination area in the southern Baltic Sea. Thus we had to stay for shelter on 16. and 17.11.2024.

In the morning of 18.11.2024 at 08:00 a.m. we left Visby harbour. The weather had improved slightly with westerly winds of 5 to 6 Bft and swell about 1 m. Thus we headed southwards to stay overnight in the Hanö Bay for shelter again.

Very early in the morning of 19.11.2024 we used the improving wind conditions to arrive at station TF0214 at 5:45 a.m. for sampling and directly continued to station TF0213. There the entire programme including extensive biological sampling of zooplankton could be successfully done. Since the weather stayed relatively stable we went north to TF0208 were we deployed the multicorer for obtaining sediment cores, which were transported in a cooling system to IOW for zooplankton investigations. Afterwards we deployed the scanfish across Bornholmsgat until 19:30 p.m..

The weather forecast for the night 19./20.11.2024 predicted again strong wind of 6 Bft from the north and thus we went for shelter south off Ystad until 20.11.2024 at 06:00 a.m.. Back on the position we stopped the evening before, we deployed the scanfish again from 8:00 a.m. to 10:30 a.m. to complete the Bornholmsgat track. Next sampling station with the entire set of biological sampling in the Arkona Basin was TF0109, before the scanfish was deployed again on

the track to TF0113. Northwesterly winds about 5 Bft and about 1 m swell made station work possible even with WP2 nets for zooplankton. Thus we were able to resample both stations in the Arkona basin on this return cruise part. We continued the scanfish track to TF0030 were we finished the track and sampled the station as planned.

During the following night and morning of 21.11.2024 the last sampling stations in the Kadet Trench and Mecklenburg Bight could be sampled successfully. Thus, all back-trip resampling stations from Bornholm Deep to Mecklenburg Bight could be sampled successfully on this cruise. Additionally, the hydrogaphical track which was performed from Bornholmsgat to the Darss Sill by scanfish deployment during the last days was now continued by several CTD casts along the track to Lübeck Bight. Afterwards we turned east to measure again the high resolution CTD transect for the Boltenhagen near-shore programme. The weather conditions were still feasible. We finished the scientific observations of the cruise in the evening of 21.11.2024 at station F1 Boltenhagen. In the afternoon we headed eastwards off Kühlungsborn, were we filled 1 m^3 seawater into a big tank for laboratory work at IOW. Afterwards we started the transit back to Rostock.

On 22.11.2024 at 9 a.m. we arrived at the Pier in Marienehe. After custom procedure we were packing and discharging the scientific equipment. The cruise was finished with the disembarking of scientific crew in the late afternoon.

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. The aim of this section is to give a first impression on the collected data set. An advanced data analysis will be conducted after all validated data sets are available.

5.1 Meteorological Conditions

The weather conditions during the cruise were divided into two phases. The first 7 days were characterized by calm weather conditions with wind speeds below 5 Bft which supported efficient station work on the track from the southwestern Baltic Sea to the northeastern Gotland Basin across the thalweg (Figure 5.1). After that calm period, the air pressure dropped down and the weather changed to very windy conditions during the night of 13./14. November (Figure 5.1, 5.2) which made safe device operations impossible on the planned track further north. Thus, the vessel spend the night in shelter at the east coast of Farø. The weather stayed windy with 5 to 6 Bft from north/south west directions on 14./15. November, but working on the main stations in the western Gotland Basin from Landsort Deep to Karlsö Deep was doable. However, on November 15th afternoon until November 18th morning we had to stay for shelter in Visby harbor. Originally, the plan was to only stay in harbor on November 16th for getting provisions for the second part of the cruise. The wind conditions improved only slighty on November 18th which we used for transfer to the Bornholm Basin on November 18th under land protection from the Swedish coast. On November 19th we used the small window of relatively calm wind and swell in the morning to work in the Bornholm Basin and succeeded to deploy plankton nets as well as MUC. The weather stayed very unstable during the return track to Mecklenburg Bight with changing wind conditions of up to 6 Bft. Nevertheless it was possible to work all return

stations before the end of the cruise due to adjusted time planning. Altogether during almost 50% of the cruise time the windspeed was above 5 Bft and 16% of the time ≥ 6 Bft.

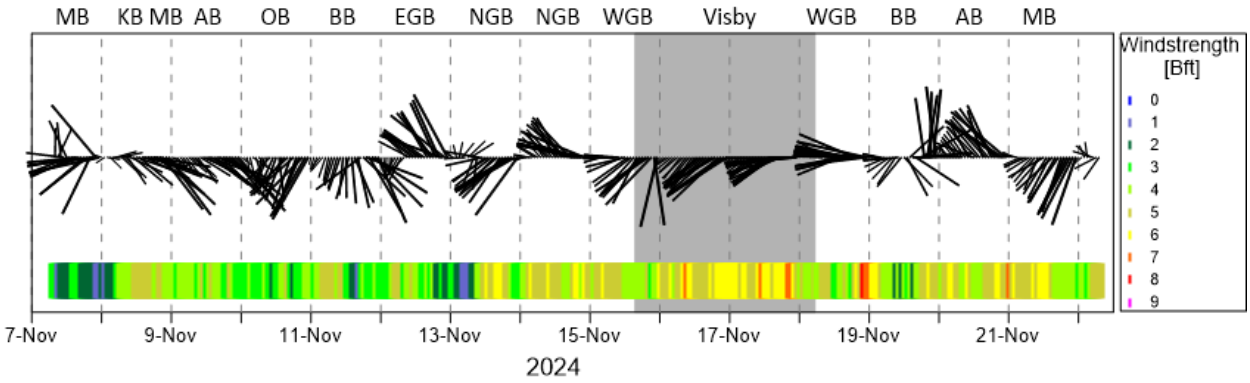

Fig. 5.1 Stick plot of wind vector measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly values). The grey shaded areas indicate the stay in the port of Visby. Abbreviations for the main sea area of each day are marked on top (MB – Mecklenburg Bight, KB – Kiel Bight, AB – Arkona Basin, OB – Oder Bight, BB – Bornholm Basin, EGB – Eastern Gotland Basin, NGB – Northern Gotland Basin, WGB – Western Gotland Basin).

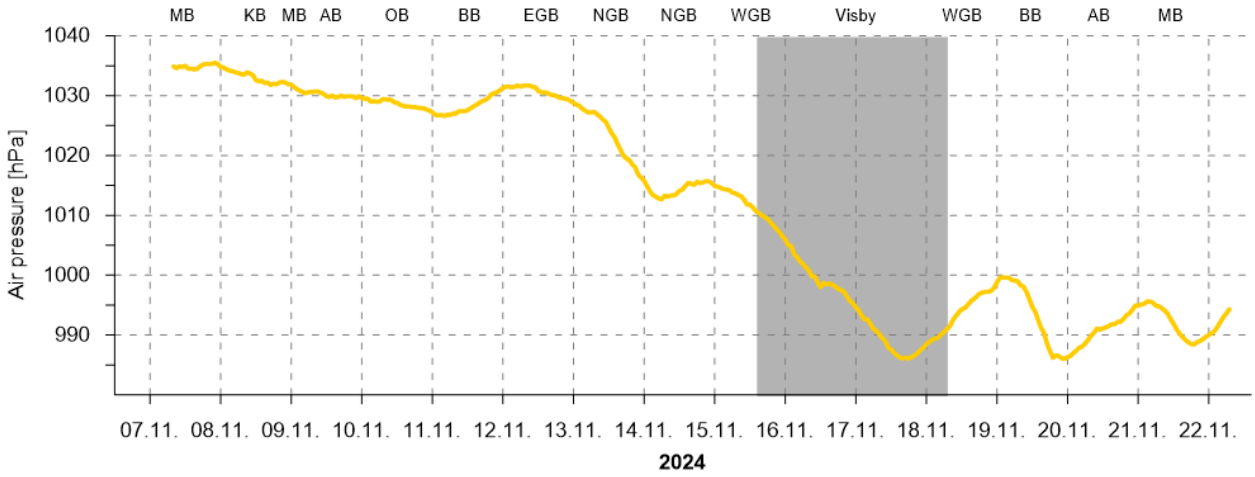

Fig. 5.2 Air pressure measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly mean values). The grey shaded areas indicate the stay in the port of Visby. Abbreviations for the main sea area of each day are marked on top (for abbreviations see Fig. 5.1).

The air pressure variations during the cruise were characterized by a period of high pressure during the first 7 days. From November 14th onwards the air pressure dropped down and ranged between 985 and 995 hPa until the end of the cruise (Figure 5.2).

The air temperature ranged between 5 and 9 °C from in the western Baltic Sea during the first part of the cruise (Figure 5.3). Only within the Oder Bight air temperature dropped to 2 °C. During the second half of the cruise air pressure and temperature dropped down to 2 to 4 °C during the last days in the southwestern Baltic Sea.

Weather conditions during the cruise were generally cloudy and misty. The humidity was constantly high and ranged between 60 and 90% (Figure 5.4).

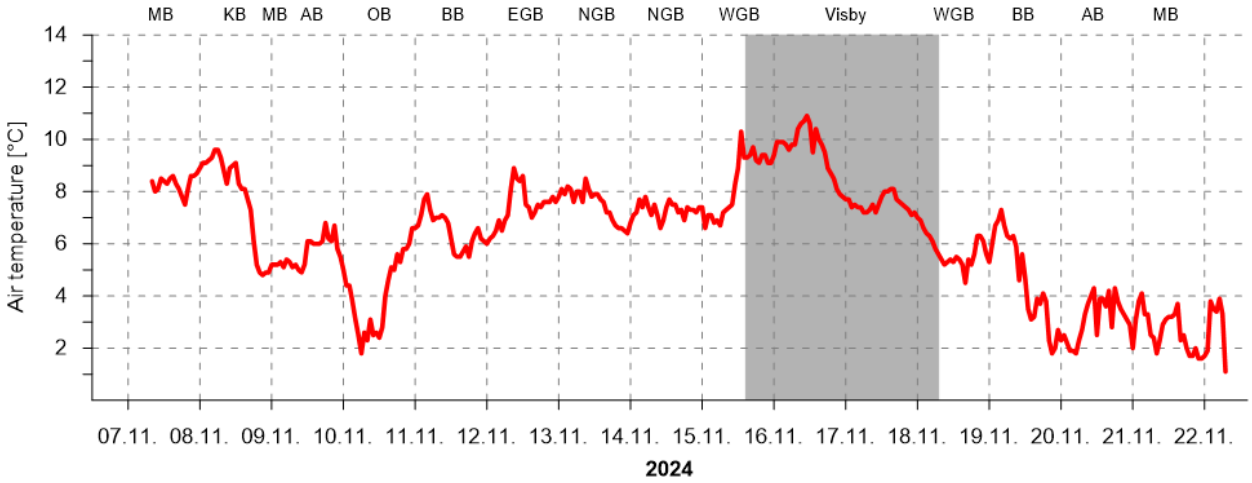

Fig. 5.3 Air temperature measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly values). The grey shaded areas indicate the stay in the port of Visby. Abbreviations for the main sea area of each day are marked on top (for abbreviations see Fig. 5.1).

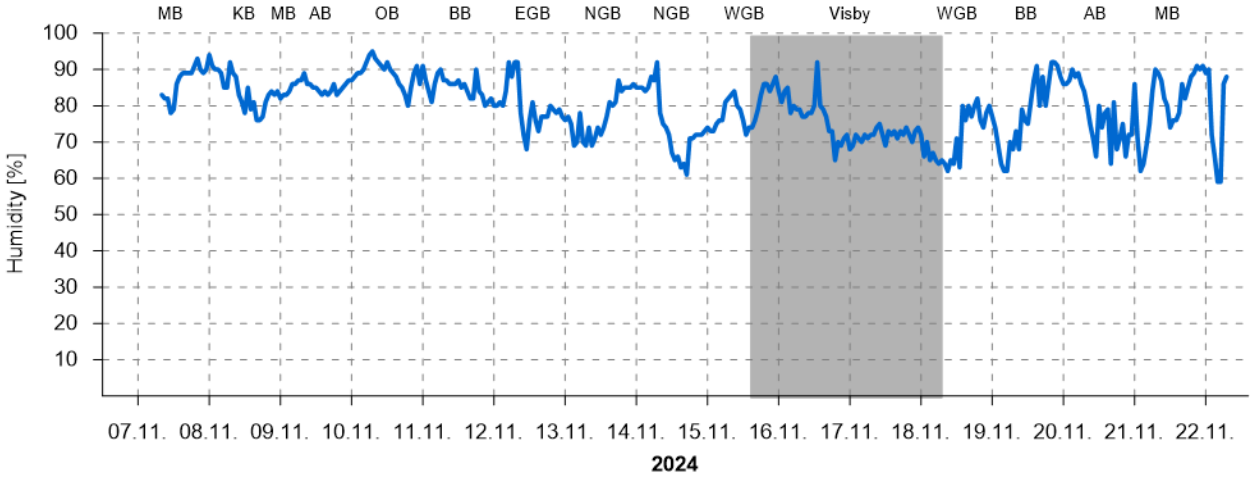

Fig. 5.4 Air humidity measured by the ship weather station of RV ELISABETH MANN BORGESE (hourly mean values). The grey shaded areas indicate the stay in the port of Visby. Abbreviations for the main sea area of each day are marked on top (for abbreviations see Fig. 5.1).

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. 5.10 are based on unvalidated data.

The sea surface temperature (SST) distribution for the cruise track is shown in Fig. 5.5. The SST ranged between 9 °C and 14 °C from Kiel Bight to Bornholm Basin during the first part of the cruise. The temperature fluctuated daily by 4 °C. In the central Baltic Sea the SST ranged between 7 °C and 12 °C. During the last days of the cruise, back in the southwestern Baltic Sea, the SST had decreased to 8 °C - 11 °C (Fig. 5.7).

The sea surface salinity (SSS) ranged between 16 – 12 PSU from Kiel Bight to Darss Sill. From Darss Sill to Arkona Basin SSS ranged between 12 – 8 PSU. For the southwestern Baltic Sea the lowest salinity was observed with 6 PSU in Oder Bight. From Bornholm Basin to Gotland Deep (EGB) the SSS was constantly at 7 PSU. Further north as well as in the western Gotland Basin SSS ranged between 7 and 8 PSU (Fig. 5.6, Fig. 5.7).

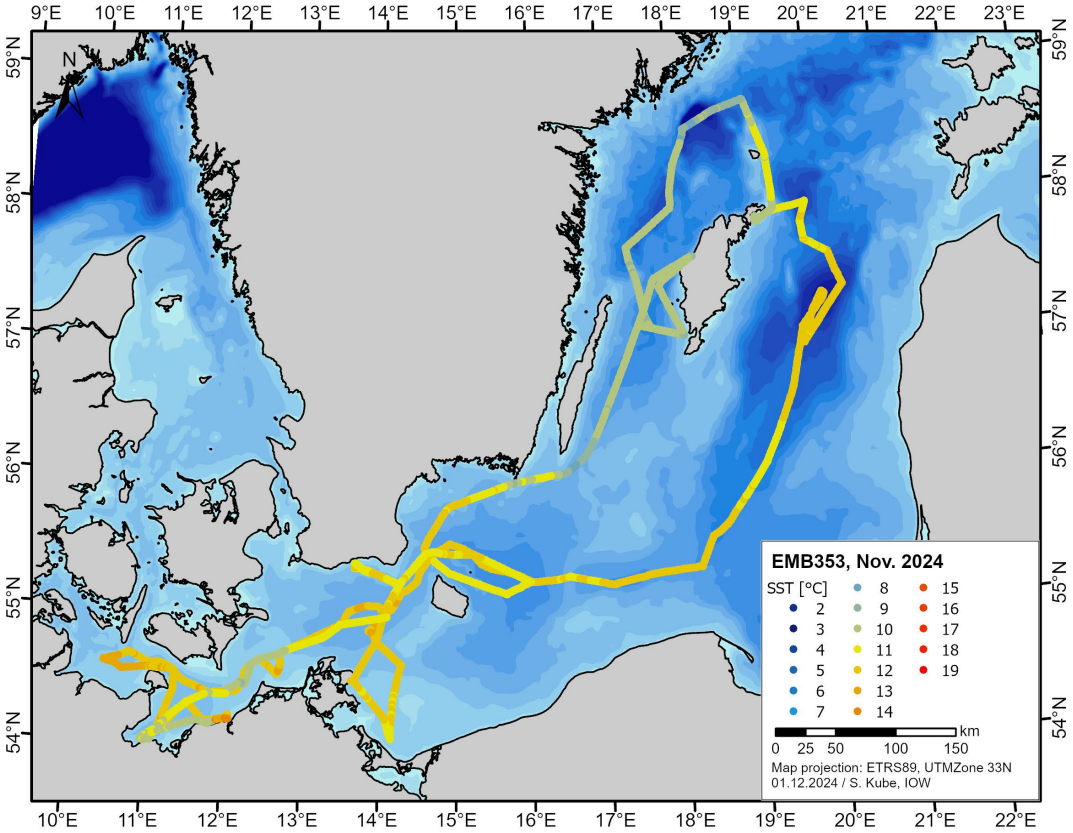

Fig. 5.5 Sea surface temperature distribution along the cruise track of EMB353 measured with the ship thermosalinograph (5 min averaged values).

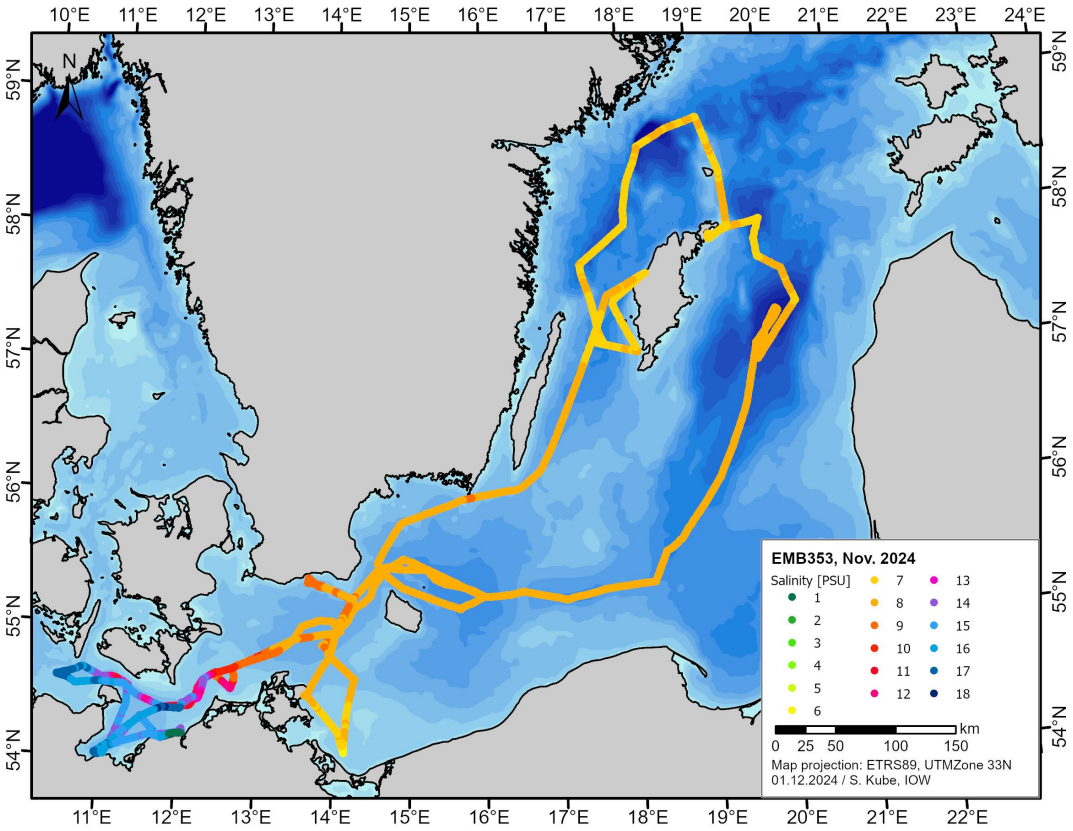

Fig. 5.6 Surface salinity distribution along the cruise track of EMB353 measured with the ship thermosalinograph (5 min averaged values).

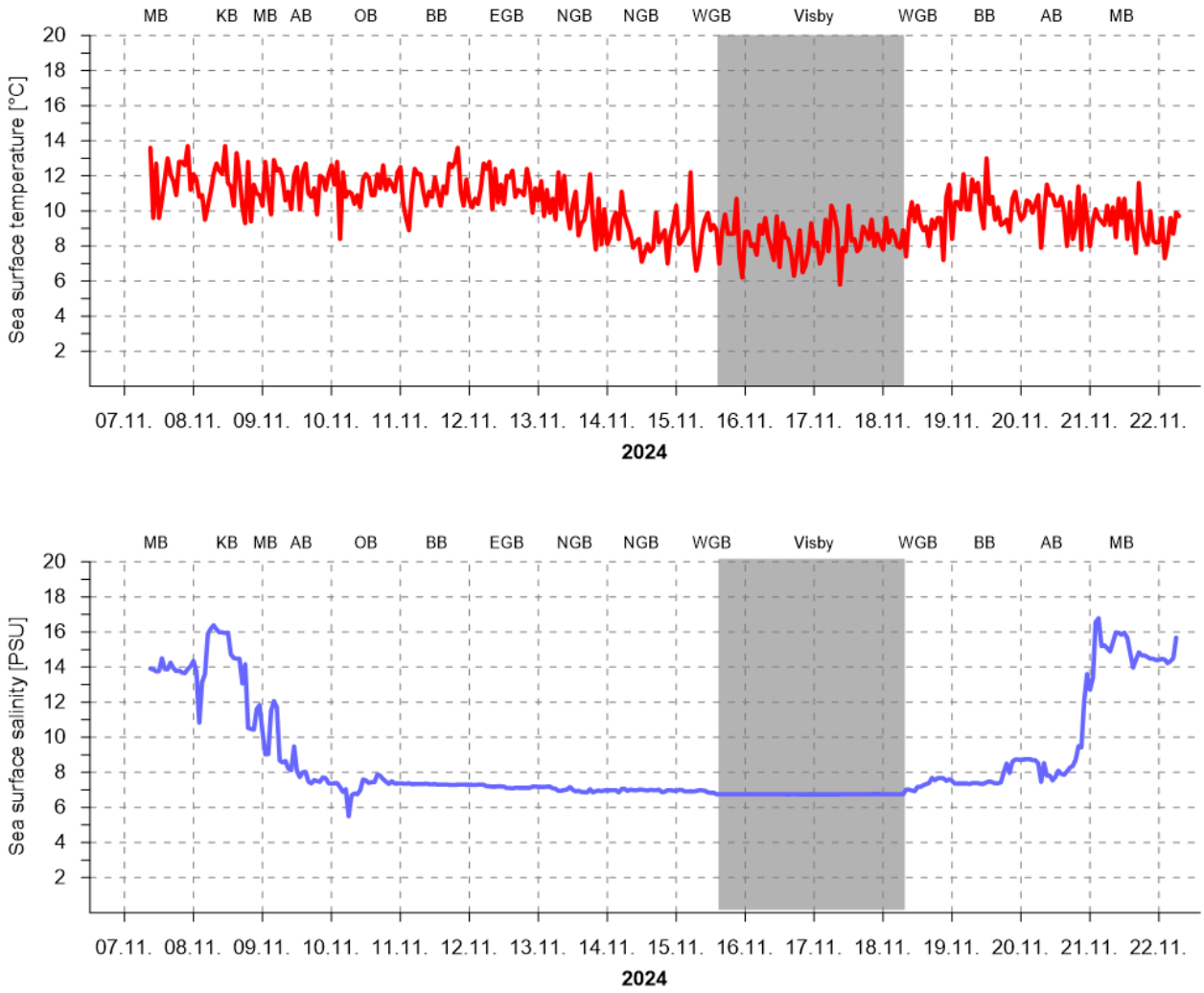

Fig. 5.7 Above: Surface temperature measured with the ship thermosalinograph of RV ELISABETH MANN BORGESE (5 min averaged values). Below: Surface salinity measured with the ship thermosalinograph of RV ELISABETH MANN BORGESE (5 min averaged values). The grey shaded areas indicate the stay in the port of Visby. Abbreviations for the main sea area of each day are marked on top (for abbreviations see Fig. 5.1).

Remains of the autumn phytoplankton bloom were maybe detected in Mecklenburg Bight during the first day of the cruise (Fig. 5.8, Fig. 5.10). This signs of fluorescence had disappeared 14 days later when the cruise returned to this area again. The fluorescence signal was very low in surface waters during the rest of the cruise indicating no signs of phytoplankton primary production (Fig. 5.10). Low turbidity of surface waters reflected very calm conditions during the first part of the cruise. Slightly higher values during the return track within the southwestern Baltic Sea might have been related to the storm and resuspension during the cruise (Fig. 5.9, Fig. 5.10).

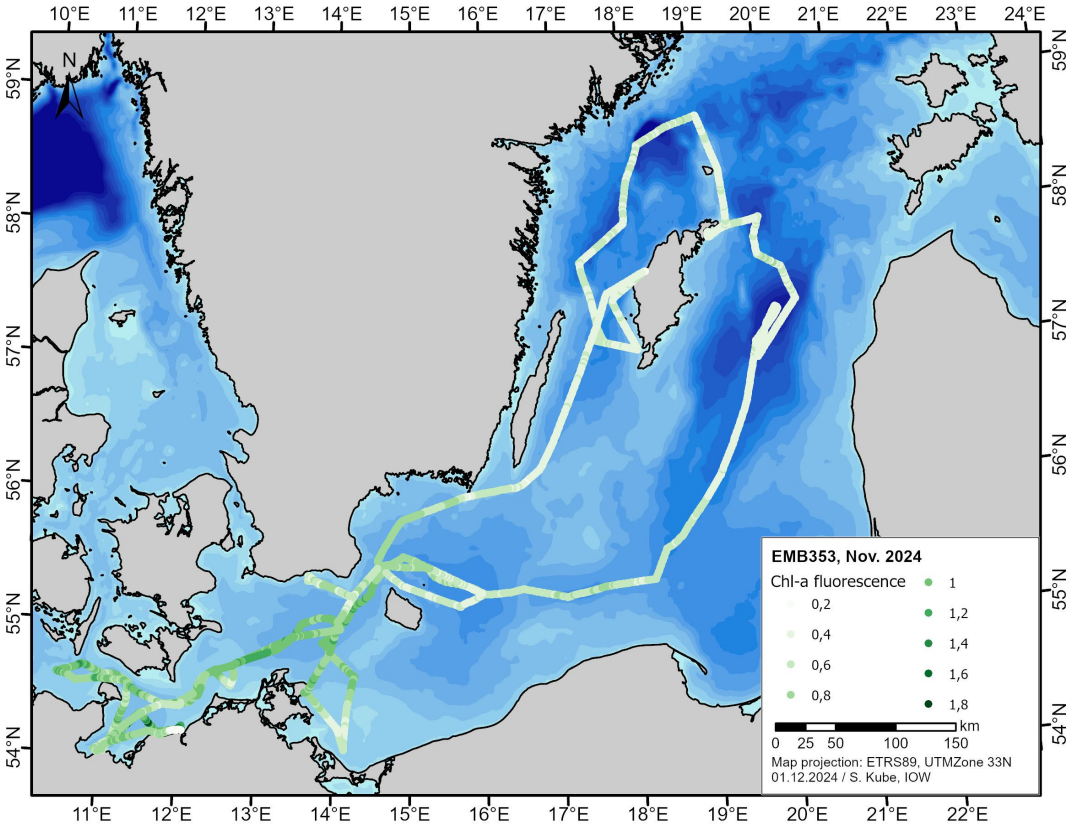

Fig. 5.8 Surface chlorophyll-a fluorescence along the cruise track of EMB353 measured with the ship thermosalinograph (5 min averaged values).

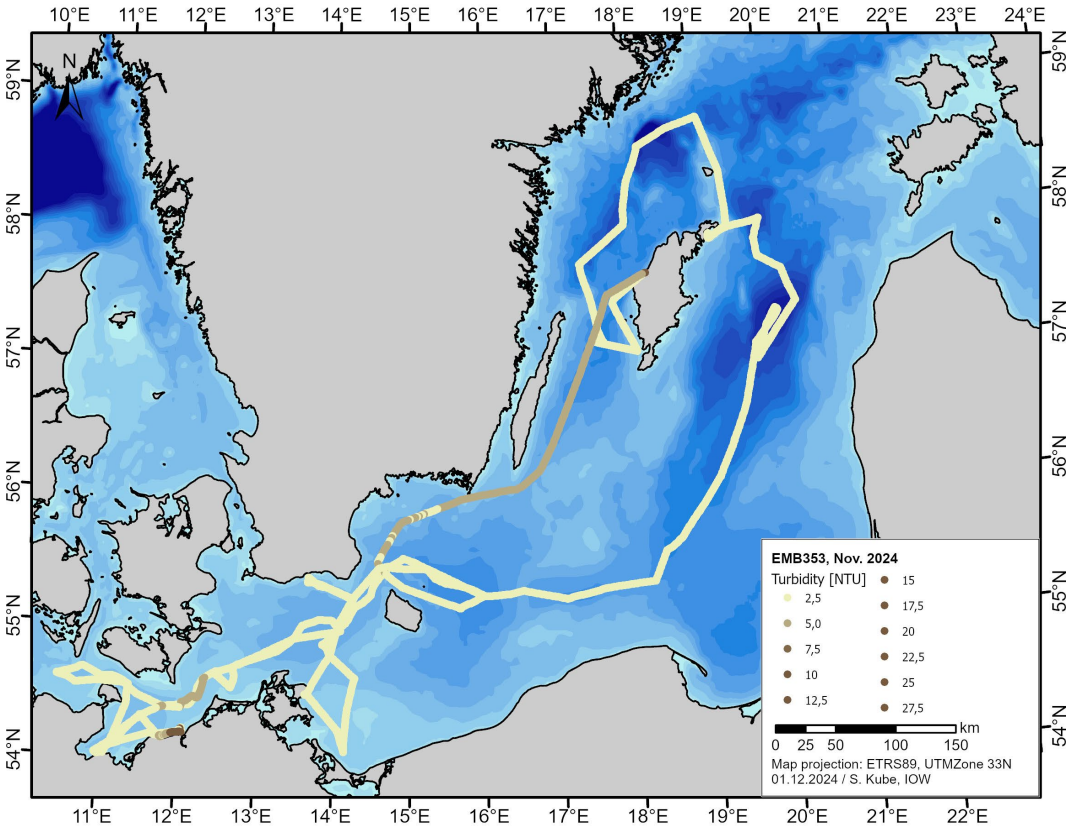

Fig.5.9 Surface turbidity along the cruise track of EMB353 measured with the ship thermosalinograph (5 min averaged values).

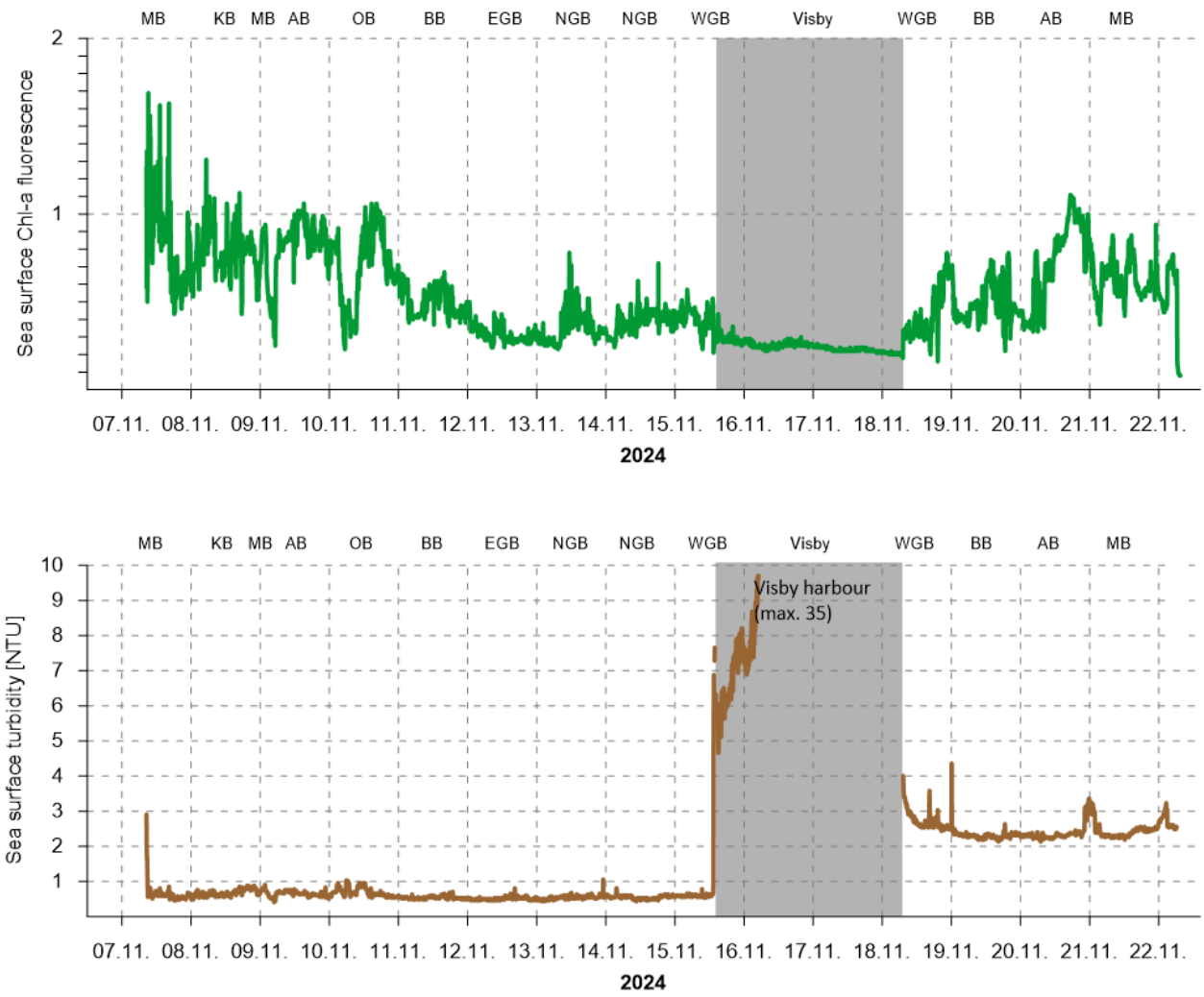

Fig.5.10 Above: Surface chlorophyll-a fluorescence measured with the flow through fluorometer of RV ELISABETH MANN BORGESE (5 min averaged values). Below: Surface turbidity measured with the flow through fluorometer of RV ELISABETH MANN BORGESE (5 min averaged values). The grey shaded areas indicate the stay in the port of Visby. Abbreviations for the main sea area of each day are marked on top (for abbreviations see Fig. 5.1).

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 programme. For positions of the particular stations refer to Fig. 5.11 and Table 7.1. Blue colored values in the oxygen column are hydrogen sulfide concentrations.

Conversion factors:

µmol l^{-1} H_2S	* -0,0448	= negative oxygen equivalent ml l^{-1} O_2
µmol l^{-1} O_2	* 0,0224	= ml l^{-1} O_2

In the surface water layer, dissolved oxygen showed in all subregions high concentrations above 300 µmol l^{-1}. The phosphate concentrations showed the lowest values in the surface water of the central Baltic Sea (from Slupsk Furrow 0,15 µM to Farö Deep 0,16 µM). Highest phosphate concentrations were detected in Lübeck Bight (0,48 µM). In general, the Western Baltic showed higher values than the central parts, which is consistent to the previous years. Nitrate

concentrations at the surface were very low compared to previous years, ranging between 0 and 1,68 µM. Silicate concentrations of surface water were within the usual range with values from 10,8 µM (Bornholm Deep) to 15,6 µM (Mecklenburg Bight).

The spatial pattern of oxygen in the bottom water showed a good oxygenation from Kiel Bight to Arkona Basin (Fig. 5.11). As in the year before, the Bornholm Deep showed hypoxia close to anoxia with 2 µmol l^{-1}. The Slupsk Furrow and the SE Gotland Basin showed low values close to hypoxia (60 µmol l^{-1} and 55 µmol l^{-1}). In the central Baltic Sea, hydrogen sulphide was detected in usual concentrations compared to the previous year (Fig. 5.11). In the hypoxic/anoxic basins from the SE Gotland Basin to Farö Deep the phosphate bottom concentration increased and reached the maximum of 7,89µmol l^{-1} in the SE Gotland Basin.

Table 5.1 Sea surface water values (1-5 m water depths) of main hydrographic and hydrochemical parameters at the key stations. Location of selected key stations see Fig. 5.11.

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]	PO_4 [µM]	NO_3 [µM]	SiO_4 [µM]
Kiel Bight 2024-11-08	TF0360 EMB353_13	0,9	11,5	16,4	306,5	6,86	6,85	0,48	0,01	14,8
Lübeck Bight 2024-11-07	TF0022 EMB353_10	0,8	11,3	13,9	311,8	6,98	6,99	not sampled	not sampled	not sampled
Meckl.Bight 2024-11-07	TF0012 EMB353_3	0,7	11,2	13,9	317,9	7,12	7,17	0,38	0,05	15,6
Darss Sill 2024-11-09	TF0001 EMB353_24	7,3	11,3	8,6	314,7	7,05	7,11	not sampled	not sampled	not sampled
Arkona Basin 2024-11-09	TF0113 EMB353_28	1,1	11,6	8	322,7	7,23	7,25	0,2	0	11,1
Bornholm Deep 2024-11-11	TF0213 EMB353_49	1,4	10,9	7,3	321,9	7,21	7,20	0,27	0	10,8
Slupsk Furrow 2024-11-11	TF0222 EMB353_52	1	10,6	7,3	331,5	7,42	7,31	0,15	0,03	11,1
SE Gotland Basin 2024-11-11	TF0259 EMB353_55	1,3	10,5	7,3	323,4	7,24	7,28	0,21	0,12	11,3
Gotland Deep 2024-11-12	TF0271 EMB353_63	1,1	11,1	7,1	319,8	7,16	7,15	0,23	0,68	11
Farö Deep 2024-11-13	TF0286 EMB353_72	1,4	9,9	6,9	331,4	7,42	7,44	0,16	0,2	7,5
Landsort Deep 2024-11-14	TF0284 EMB353_75	0,8	7,4	7	339,2	7,59	7,9	0,39	0,33	13,8
Karlsö Deep 2024-11-15	TF0245 EMB353_79	1,1	8,7	6,9	335,5	7,51	7,58	0,28	0,14	12,7

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. 5.11.

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 2024-11-08	TF0360 EMB353_13	17,2	12,3	24	234,5	5,25	5,21	0,69	2,32	16,8
Lübeck Bight 2024-11-07	TF0022 EMB353_10	22,4	13,1	22,3	2,2	0,05	0,07	not sampled	not sampled	not sampled
Meckl.Bight 2024-11-07	TF0012 EMB353_3	23,5	12,4	20,1	240,4	5,38	5,12	0,83	1,66	21,7
Darss Sill 2024-11-09	TF0001 EMB353_24	19,7	12,6	15,5	239,8	5,37	5,2	not sampled	not sampled	not sampled
Arkona Basin 2024-11-09	TF0113 EMB353_28	45,1	12,1	19,3	258,4	5,79	5,72	0,56	1,76	14,9
Bornholm Deep 2024-11-11	TF0213 EMB353_49	87,5	9	16,1	2,2	0,05	0,06	2,06	7,53	61,4
Slupsk Furrow 2024-11-11	TF0222 EMB353_52	88,3	8,3	13,9	60	1,34	1,36	1,79	9,71	45,1
SE Gotland Basin 2024-11-11	TF0259 EMB353_55	86,5	7,7	13	55,1	1,23	1,32	7,89	7,68	45
Gotland Deep 2024-11-12	TF0271 EMB353_63	233,7	7,2	12,6	H_2S 294	neg O_2 -13,17		6,4	0	104
Farö Deep 2024-11-13	TF0286 EMB353_72	188,8	7,3	11,9	H_2S 139,3	neg O_2 -6,24		5,05	0	83,5
Landsort Deep 2024-11-14	TF0284 EMB353_75	435,9	6,8	10,9	H_2S 66,3	neg O_2 -2,97		4,1	0	70,5
Karlsö Deep 2024-11-15	TF0245 EMB353_79	106,8	6	10,1	H_2S 75,9	neg O_2 -3,4		4,2	0	75,5

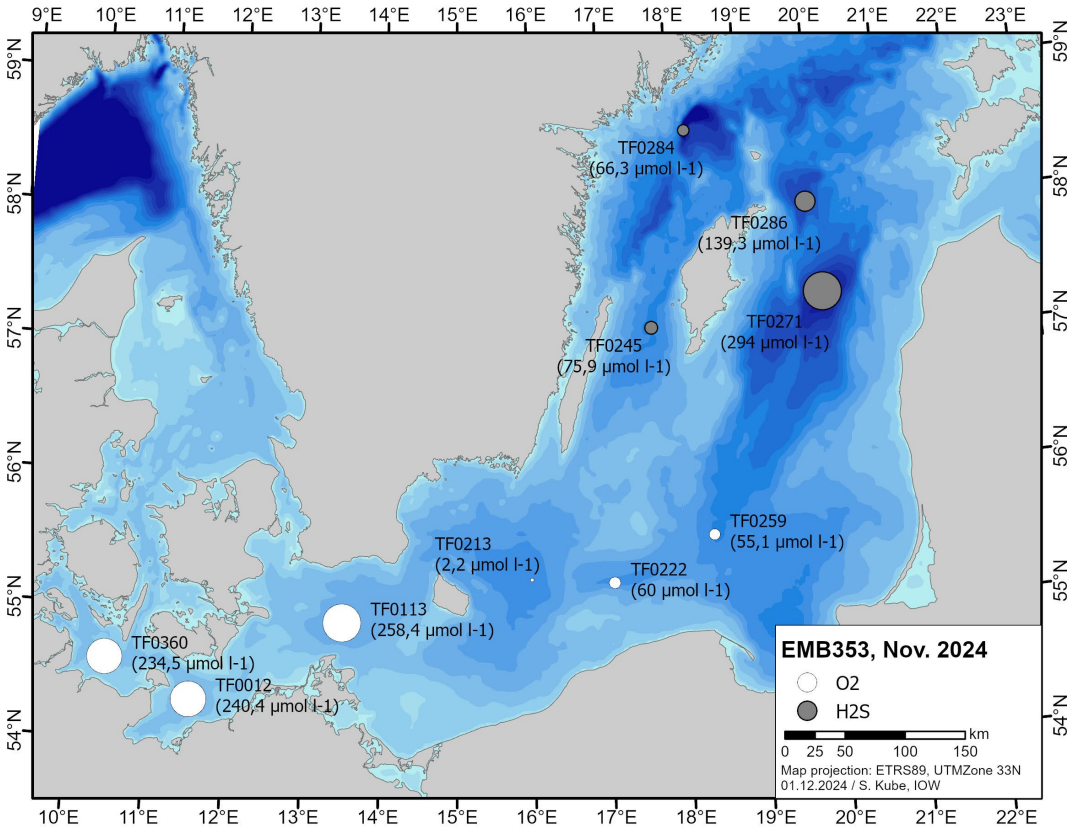

Fig. 5.11 Distribution of dissolved oxygen and hydrogen sulfide concentrations in the near bottom layer at key stations of the long-term observation programme (TF0360 – Kiel Bight; TF0012 – Mecklenburg Bight; TF0113 – Arkona Basin; TF0213 – Bornholm Deep; TF0222 – Stolpe Channel; TF0259 – SE Gotland Basin; TF0271 – Gotland deep; TF0286 – Farö Deep; TF0284 – Landsort Deep; TF0245 – Karlsö Deep, for details see Table 5.2).

5.4 Baltic Thalweg Transect

During the cruise 52 CTD stations were aligned along the thalweg transect from the Kiel Bight, in the western Baltic Sea, towards the Farö Deep, northern Gotland Basin (Fig.5.14). Due to the expected worse wind conditions the thalweg section from the Slupsk Sill to the Farö Deep was sampled with reduced spatial resolution. The northern part of the Transect between the Farö Deep and station TF0288 was not covered with CTD observations.

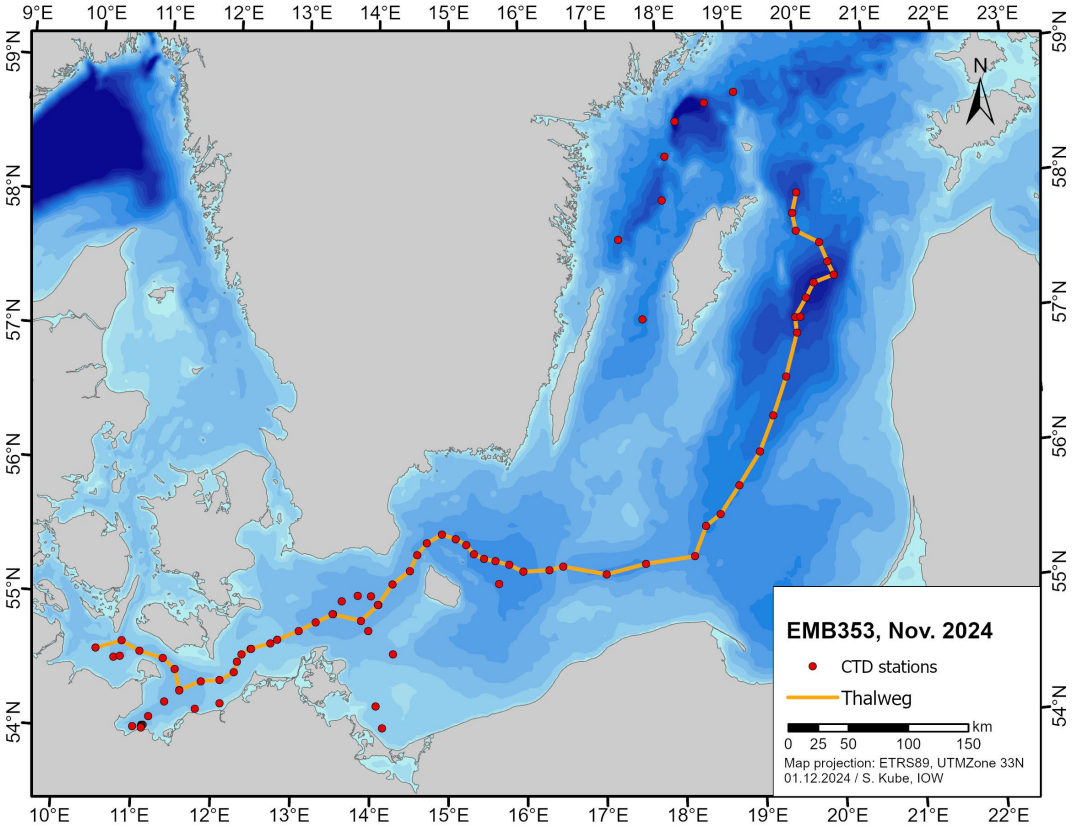

Fig. 5.14 Location of measured CTD stations (Table 7.1) and the "thalweg"-transect crossing all deep basins on the pathway of saltwater inflows (hydrographic parameters visualized as cross sections in Fig. 5.15 – 5.16).

The distribution of temperature, salinity and oxygen concentration along the thalweg transect is shown in Fig. 5.15. In the Danish Straits and the western Baltic the surface layer was covered by relatively warm surface water of about 11°C to 11.5°C. Towards the central Baltic the surface temperature depicted a slight decrease. However, due to the patchy distribution also warm surface water bodies of 11.5°C were observed in the eastern Gotland basin. The year 2024 was the warmest year in the meteorological records since the begin of regular observations in 19th century. Consequently, also the observed surface temperatures in the Baltic were well above the climatological mean. The long-term climatiological mean (1900-2005) of SST in the western and central Baltic varies regionally between 8.0 and 8.7°C. Thus, the SST in November 2024 was about 3K warmer than usual. The thermocline was found at 10 to 20m depth in the western Baltic and at about 50m depth further east and north. The upper layer convection due to the cooling at the surface has deepen the thermocline but not reached the halocline yet. There are still significant amounts of winter water, with core temperatures of 5°C in the central and eastern

Bornholm Basin. In the eastern Gotland basin the cool winter water layer covered the depth range between 50 and 70m with minimum temperatures of 4.5°C.

During summer and autumn baroclinic inflow events transported significant amounts of warme saline water into the western Baltic. In November 2025 these warm waters covered the bottom layer of the Danish Straits and the Arkona Basin depicting maximum temperatures of about 13°C. This inflow water has reached already the Bornholm basin and filled the deep layer below 50m with warm saline water. Only minor amounts of the inflow water has passed the Slupsk Sill.

Below the halocline deep water in the Slupsk Furrow temperatures of 8 to 8.5°C were observed. The Deep water in the Eastern Gotland Basin depicted a vertical gradient from about 6.0°C near the halocline to 7.24°C at the bottom (Gotland Deep).

The warm and saline waters originating from the baroclinic inflows govern also the salinity patterns along the thalweg. In the Fehmarn Belt a strong vertical salinity gradient was found, with 13.3 at the surface and 23.8 at the bottom. The thin saline bottom layer in the Arkona Basin depicted maximum salinities of about 19.8 (TF0113). The maximum bottom salinity in the central Bornholm basin was 16.7. The Slupsk Furrow deep layer was filled with older less saline water. At the eastern Sill of the furrow an active overflow was observed, indicating an eastward advection of the Slupsk Furrow halocline water. In the eastern Gotland basin the inflow of saline water below the halocline was indicated by the tilted 12gkg-1 isohaline. The bottom salinity at the Gotland Deep was 12.6. The surface layer east of the Darss Sill was covered with the usual brackish surface water. Its salinity ranged between 7 and 8, with an eastward directed gradient.

The oxygen saturation (Fig. 5.15) in the upper layer of the Baltic Sea was close to 100%. It is controlled by the exchange with the atmosphere, since the primary production is at a low level during this season. The autumn inflow water that covered the deep layer in the western Baltic till the center of the Arkona basin were also well oxygenated. The inflow water from the summer month that reached the Bornholm basin depicted a lower oxygen concentration between 50 and 200 µmol kg-1. The bottom layer at the Bornholm deep was nearly anoxic (~3 µmol kg-1), pointing to a high oxygen demand of the sediments. The deep water in the Slupsk Furrow was also oxygen depleted. Here the minimum oxygen concentration was about 60 µmol kg-1. The inflowing saline waters in the southern Gotland basin carries significant amounts of oxygen into the eastern Gotland basin. This water ventilated the deep-water layer between 90 and 140m. North of the Gotland Deep the entire deep layer below the halocline was still anoxic.

The density distribution shown in Fig. 5.16 resembles the temperature and salinity patterns along the thalweg transect. It illustrates the increase of halocline depth from west to northeast with concurrently decreasing vertical density gradients.

The fluorescence measurement showed generally very low values indicating no signs of phytoplankton primary production. The turbidity was generally low along the transect. Only in the deep layer of the eastern Gotland Basin some patches of enhance turbidity were found. These patches are confined to either the bottom or to the redoxcline (Fig. 5.16).

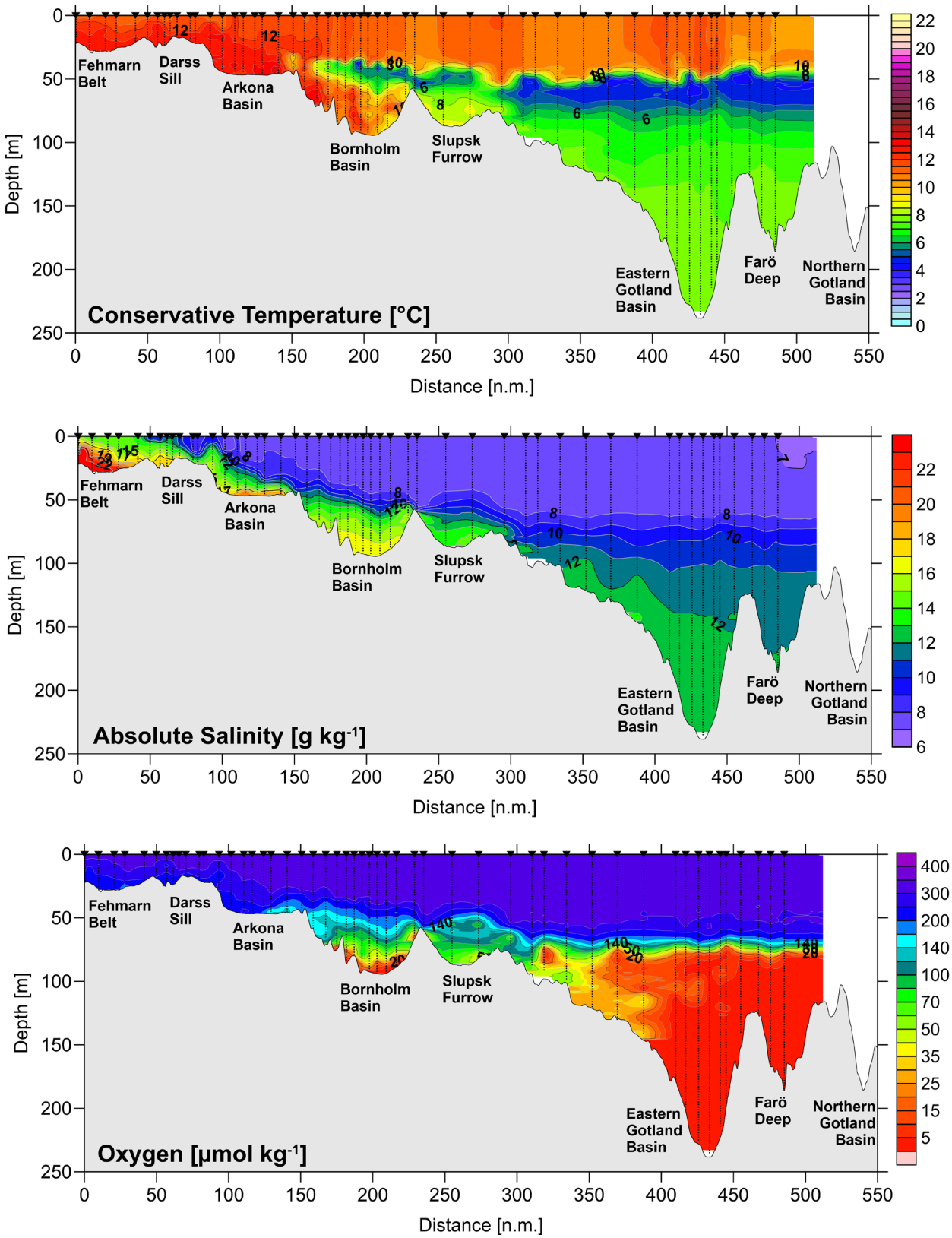

Fig. 5.15 Distribution of conservative temperature (above), absolute salinity (middle), and dissolved oxygen (below) along the thalweg of the Baltic Sea from the Kiel Bight to the Farö Deep. The figure is based on the preliminary CTD data gathered from 08.11.-13.11.2024.

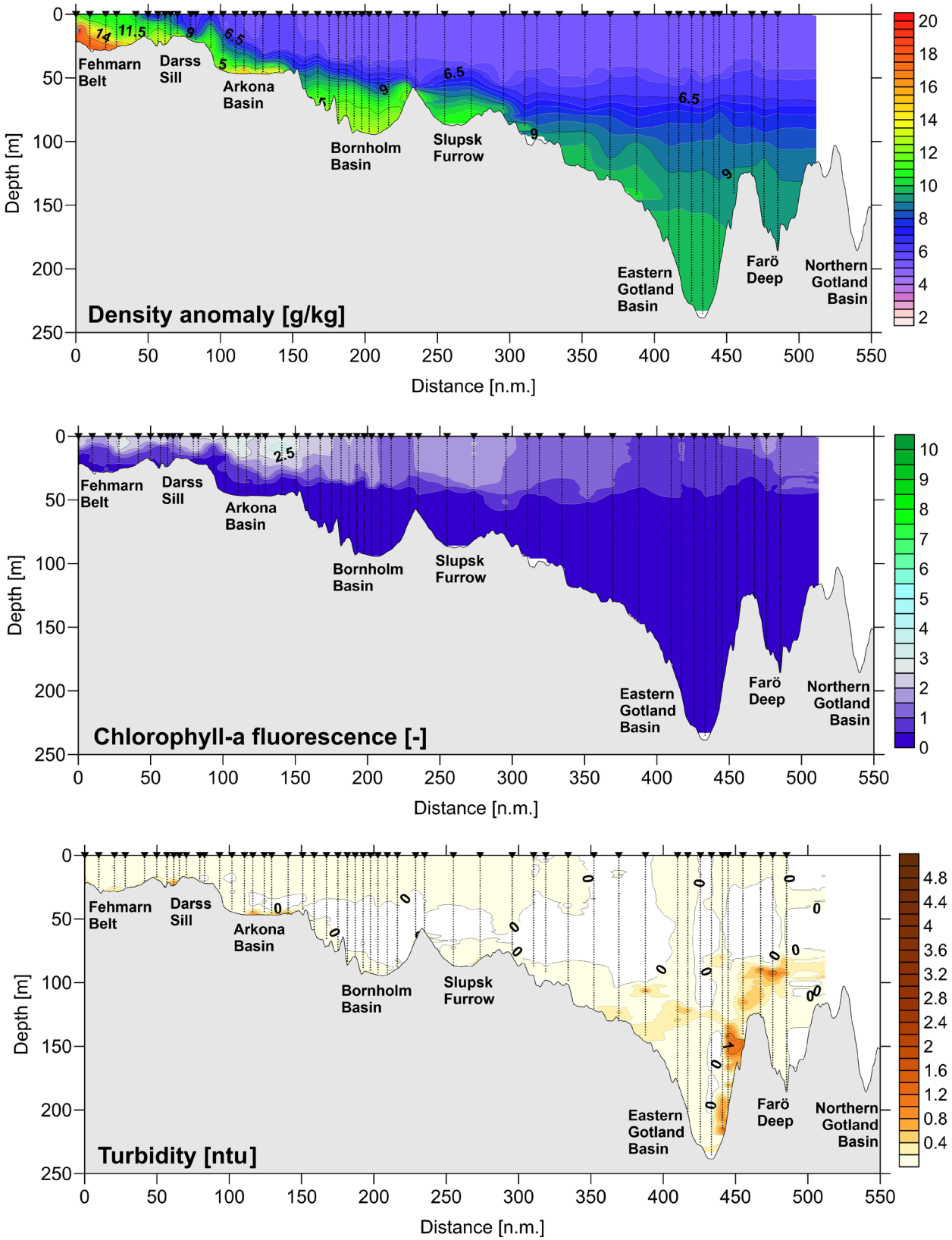

Fig. 5.16 Distribution of density anomaly (above), chlorophyll-a fluorescence (middle), and turbidity (below) along the thalweg of the Baltic Sea from the Kiel bight to the Farö Deep. The figure is based on the preliminary CTD data gathered from 08.11.-13.11.2024.

An overview of the hydrographic conditions at 9 key stations spanning from the southwestern to the central Baltic Sea is given by vertical profiles of temperature, salinity and dissolved oxygen concentration in Fig 5.17 and 5.18. These plots shows the main characteristics of the different subregions. Temperature profiles show warm surface water of about 11 – 11,5 °C in the south western Baltic Sea and 8 – 11 °C in the central Baltic Sea. The relatively shallow stations in the south western Baltic Sea did not have a thermocline, whereas a thermocline had developed at the deeper stations from Bornholm Deep to the central and northern Basins. The vertical salinity profiles showed a gradual increase of salinity with depths in the southwestern Baltic Sea and steep haloclines in 50 – 75 m depths in the deep Basins from Bornholm to central and northern Baltic Sea. Oxygenation in the shallow Baltic Sea was between 200 – 300 µmol kg^{-1} from surface to bottom. In the deep central basins oxygen vanished in 50 – 75 m water depths.

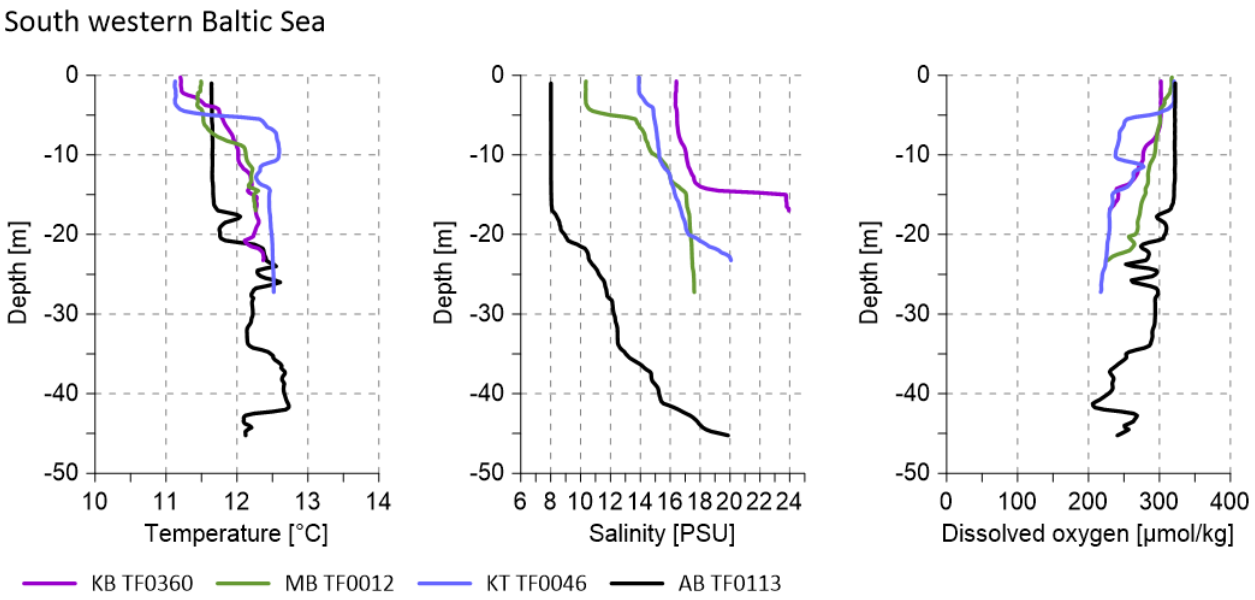

Fig. 5.17 Vertical profiles of temperature, salinity and oxygen concentration (CTD data) at the main stations in the south-western Baltic Sea. KB (TF0360) – Kiel Bight, MB (TF0012) – Mecklenburg Bight, KT (TF0046) – Kadet Trench, AB (TF0113) – Arkona basin.

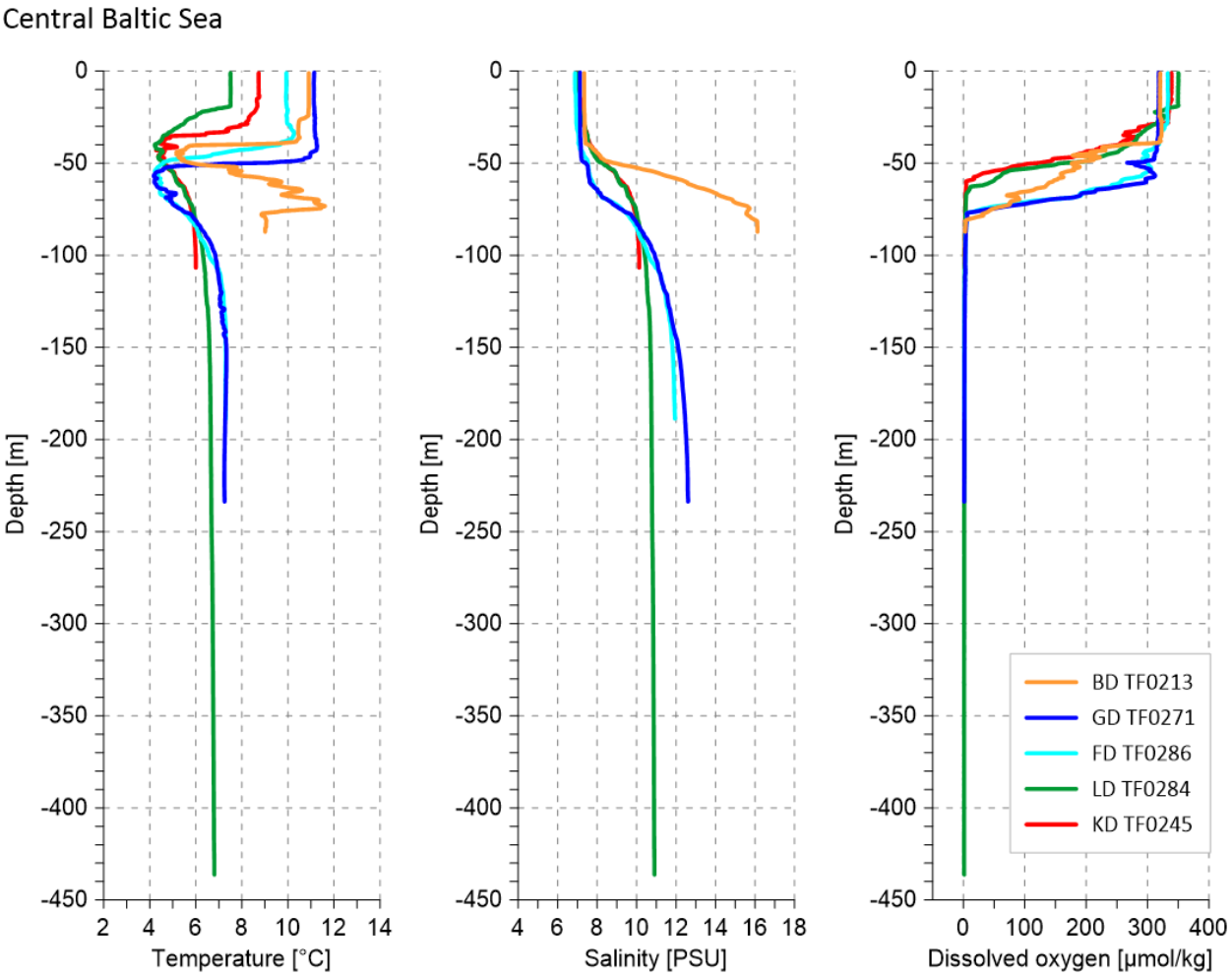

Fig. 5.18 Vertical profiles of temperature, salinity and oxygen concentration (CTD data) at the main stations in the central Baltic Sea. BD (TF0213) – Bornholm Deep, GD (TF0271) - Gotland Deep, FD (TF0286) - Farö Deep, LD (TF0284) - Landsort Deep, KD (TF0245) - Karlsö Deep.

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.

Insights into the changes of the microbial food web of the redoxcline was obtained by vertical high resolution sampling of the range of the redoxcline at Gotland Deep (TF0271) and Landsort Deep (TF0284). 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.

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.

The analysis of all biological samples will be performed after the cruise. Thus, no preliminary results of this programme 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 EMB353

7.1 Overall Station List

Date / Time	Station No.	Station Name	Water Depth	Latitude	Longitude	Gear
[UTC]	EMB	IOW	[m]			
07.11.2024 09:18	EMB353_1-1	TF05	10	54° 13,8834' N	012° 04,5067' E	CTD
07.11.2024 09:26	EMB353_1-2	TF05	10	54° 13,9111' N	012° 04,5067' E	SD
07.11.2024 11:12	EMB353_2-1	TF0018	17	54° 10,9990' N	011° 45,8854' E	CTD
07.11.2024 11:42	EMB353_2-2	TF0018	17	54° 11,0074' N	011° 45,9926' E	VVG
07.11.2024 11:50	EMB353_2-3	TF0018	17	54° 10,9993' N	011° 45,9997' E	VVG
07.11.2024 11:58	EMB353_2-4	TF0018	17	54° 10,9875' N	011° 46,0045' E	VVG
07.11.2024 12:06	EMB353_2-5	TF0018	17	54° 10,9876' N	011° 45,9934' E	VVG
07.11.2024 12:20	EMB353_2-6	TF0018	17	54° 10,9873' N	011° 45,8735' E	DRG
07.11.2024 13:51	EMB353_3-1	TF0012	22	54° 18,9577' N	011° 33,0554' E	CTD
07.11.2024 13:53	EMB353_3-2	TF0012	22	54° 18,9757' N	011° 33,0748' E	SD
07.11.2024 14:00	EMB353_3-3	TF0012	22	54° 19,0224' N	011° 33,0956' E	PLA
07.11.2024 14:22	EMB353_3-4	TF0012	22	54° 18,9070' N	011° 32,9691' E	WP2
07.11.2024 14:29	EMB353_3-5	TF0012	22	54° 18,9141' N	011° 32,9663' E	WP2
07.11.2024 14:37	EMB353_3-6	TF0012	22	54° 18,9181' N	011° 32,9894' E	VVG
07.11.2024 14:44	EMB353_3-7	TF0012	22	54° 18,9112' N	011° 32,9882' E	VVG
07.11.2024 14:52	EMB353_3-8	TF0012	22	54° 18,9066' N	011° 32,9803' E	VVG
07.11.2024 14:59	EMB353_3-9	TF0012	22	54° 18,9037' N	011° 32,9788' E	VVG
07.11.2024 15:12	EMB353_3-10	TF0012	22	54° 18,9382' N	011° 32,9473' E	DRG
07.11.2024 18:09	EMB353_4-1	E1 Boltenhagen	7	54° 01,5160' N	011° 05,3135' E	CTD
07.11.2024 18:31	EMB353_5-1	D1 Boltenhagen	8	54° 01,7160' N	011° 05,4373' E	CTD
07.11.2024 19:00	EMB353_6-1	C1 Boltenhagen	11	54° 02,0058' N	011° 05,4328' E	CTD
07.11.2024 19:24	EMB353_7-1	B1 Boltenhagen	16	54° 02,2909' N	011° 05,4509' E	CTD
07.11.2024 19:46	EMB353_8-1	A1 Boltenhagen	21	54° 02,5527' N	011° 05,5242' E	CTD
07.11.2024 20:13	EMB353_9-1	A3 Boltenhagen	22	54° 02,5513' N	011° 06,4758' E	CTD
07.11.2024 21:06	EMB353_10-1	TF0022	20	54° 06,6209' N	011° 10,4878' E	CTD
08.11.2024 03:15	EMB353_11-1	TF0014	24	54° 35,6891' N	011° 00,7939' E	CTD
08.11.2024 04:45	EMB353_12-1	TF0361	21	54° 39,9223' N	010° 46,6984' E	CTD
08.11.2024 06:25	EMB353_13-1	TF0360	15	54° 35,9598' N	010° 27,0250' E	CTD
08.11.2024 06:29	EMB353_13-2	TF0360	15	54° 35,9872' N	010° 27,0087' E	SD
08.11.2024 06:31	EMB353_13-3	TF0360	15	54° 35,9944' N	010° 27,0075' E	PLA
08.11.2024 06:52	EMB353_13-4	TF0360	15	54° 36,0205' N	010° 27,0603' E	WP2
08.11.2024 07:00	EMB353_13-5	TF0360	15	54° 36,0468' N	010° 27,0529' E	VVG
08.11.2024 07:05	EMB353_13-6	TF0360	15	54° 36,0417' N	010° 27,0836' E	VVG
08.11.2024 07:10	EMB353_13-7	TF0360	15	54° 36,0187' N	010° 27,1065' E	VVG
08.11.2024 07:15	EMB353_13-8	TF0360	15	54° 36,0027' N	010° 27,1108' E	VVG
08.11.2024 07:19	EMB353_13-9	TF0360	15	54° 35,9945' N	010° 27,1187' E	VVG
08.11.2024 07:30	EMB353_13-10	TF0360	15	54° 35,9813' N	010° 27,0883' E	DRG
08.11.2024 08:53	EMB353_14-1	Bio FB2	20	54° 32,5050' N	010° 41,1471' E	CTD
08.11.2024 09:24	EMB353_14-2	Bio FB2	20	54° 32,5006' N	010° 41,1736' E	VVG
08.11.2024 09:30	EMB353_14-3	Bio FB2	20	54° 32,4983' N	010° 41,2056' E	VVG

08.11.2024 09:36	EMB353_14-4	Bio FB2	20	54° 32,4896' N	010° 41,1857' E	VVG
08.11.2024 09:41	EMB353_14-5	Bio FB2	20	54° 32,4944' N	010° 41,1671' E	VVG
08.11.2024 10:55	EMB353_15-1	Bio FB1	20	54° 32,9253' N	010° 46,1111' E	CTD
08.11.2024 11:09	EMB353_15-2	Bio FB1	20	54° 32,9066' N	010° 46,0974' E	VVG
08.11.2024 11:17	EMB353_15-3	Bio FB1	20	54° 32,8999' N	010° 46,0924' E	VVG
08.11.2024 11:22	EMB353_15-4	Bio FB1	20	54° 32,8953' N	010° 46,1093' E	VVG
08.11.2024 11:29	EMB353_15-5	Bio FB1	20	54° 32,9022' N	010° 46,0774' E	VVG
08.11.2024 14:03	EMB353_16-1	TF0010	25	54° 33,1197' N	011° 19,1084' E	CTD
08.11.2024 14:26	EMB353_16-2	TF0010	25	54° 33,0981' N	011° 19,2009' E	VVG
08.11.2024 14:31	EMB353_16-3	TF0010	25	54° 33,0961' N	011° 19,2238' E	VVG
08.11.2024 14:36	EMB353_16-4	TF0010	25	54° 33,0986' N	011° 19,2206' E	VVG
08.11.2024 14:42	EMB353_16-5	TF0010	25	54° 33,0902' N	011° 19,2314' E	VVG
08.11.2024 15:01	EMB353_16-6	TF0010	25	54° 33,0895' N	011° 19,2576' E	DRG
08.11.2024 16:10	EMB353_17-1	TF0013	24	54° 28,6218' N	011° 28,5596' E	CTD
08.11.2024 18:09	EMB353_18-1	TF0017	19	54° 23,5317' N	011° 49,3183' E	CTD
08.11.2024 19:29	EMB353_19-1	TF0041	16	54° 24,3974' N	012° 03,6796' E	CTD
08.11.2024 20:44	EMB353_20-1	TF0046	25	54° 28,2007' N	012° 14,5234' E	CTD
08.11.2024 20:48	EMB353_20-2	TF0046	25	54° 28,1999' N	012° 14,5347' E	PLA
08.11.2024 21:08	EMB353_20-3	TF0046	25	54° 28,1704' N	012° 14,5886' E	WP2
08.11.2024 22:05	EMB353_21-1	TF0083	23	54° 32,9892' N	012° 16,4531' E	CTD
08.11.2024 22:57	EMB353_22-1	TF0033	17	54° 36,3649' N	012° 19,9128' E	CTD
08.11.2024 23:55	EMB353_23-1	TF0002	15	54° 39,0332' N	012° 26,9058' E	CTD
09.11.2024 07:07	EMB353_24-1	TF0001	18	54° 41,8190' N	012° 41,8976' E	BOAT
09.11.2024 07:54	EMB353_24-2	TF0001	18	54° 41,7752' N	012° 41,9825' E	CTD
09.11.2024 08:55	EMB353_25-1	TF0030	20	54° 43,3838' N	012° 46,9806' E	CTD
09.11.2024 08:57	EMB353_25-2	TF0030	20	54° 43,3838' N	012° 46,9883' E	PLA
09.11.2024 09:11	EMB353_25-3	TF0030	20	54° 43,3556' N	012° 46,9786' E	VVG
09.11.2024 09:16	EMB353_25-4	TF0030	20	54° 43,3433' N	012° 46,9682' E	VVG
09.11.2024 09:20	EMB353_25-5	TF0030	20	54° 43,3257' N	012° 46,9799' E	VVG
09.11.2024 09:25	EMB353_25-6	TF0030	20	54° 43,3136' N	012° 46,9451' E	VVG
09.11.2024 09:36	EMB353_25-7	TF0030	20	54° 43,2722' N	012° 46,9716' E	DRG
09.11.2024 11:08	EMB353_26-1	TF0115	27	54° 47,6830' N	013° 03,4241' E	CTD
09.11.2024 12:21	EMB353_27-1	TF0114	42	54° 51,6232' N	013° 16,5591' E	CTD
09.11.2024 13:37	EMB353_28-1	TF0113	45	54° 55,4818' N	013° 29,9829' E	CTD
09.11.2024 13:39	EMB353_28-2	TF0113	45	54° 55,4676' N	013° 29,9988' E	SD
09.11.2024 13:42	EMB353_28-3	TF0113	45	54° 55,4776' N	013° 30,0297' E	PLA
09.11.2024 14:03	EMB353_28-4	TF0113	45	54° 55,4656' N	013° 30,1481' E	WP2
09.11.2024 14:11	EMB353_28-5	TF0113	44	54° 55,4555' N	013° 30,2042' E	WP2
09.11.2024 14:17	EMB353_28-6	TF0113	45	54° 55,4359' N	013° 30,1938' E	WP2
09.11.2024 14:40	EMB353_28-7	TF0113	45	54° 55,4604' N	013° 29,9883' E	CTD
09.11.2024 15:45	EMB353_29-1	TF0105	44	55° 01,4770' N	013° 36,2647' E	CTD
09.11.2024 16:57	EMB353_30-1	TF0104	44	55° 04,0750' N	013° 48,6846' E	CTD
09.11.2024 18:02	EMB353_31-1	TF0103	45	55° 03,8229' N	013° 59,1085' E	CTD
09.11.2024 19:00	EMB353_32-1	TF0109	46	54° 59,9979' N	014° 05,0043' E	CTD
09.11.2024 19:00	EMB353_32-2	TF0109	46	54° 59,9952' N	014° 05,0068' E	PLA
09.11.2024 19:23	EMB353_32-3	TF0109	46	54° 59,9945' N	014° 05,0073' E	WP2
09.11.2024 19:32	EMB353_32-4	TF0109	46	55° 00,0033' N	014° 05,0582' E	WP2

09.11.2024 19:50	EMB353_32-5	TF0109	46	55° 00,0146' N	014° 05,0185' E	VVG
09.11.2024 19:58	EMB353_32-6	TF0109	46	55° 00,0069' N	014° 04,9951' E	VVG
09.11.2024 20:04	EMB353_32-7	TF0109	46	54° 59,9820' N	014° 04,9738' E	VVG
09.11.2024 20:11	EMB353_32-8	TF0109	46	54° 59,9722' N	014° 04,9637' E	VVG
09.11.2024 20:22	EMB353_32-9	TF0109	45	54° 59,9623' N	014° 04,9817' E	DRG
09.11.2024 21:54	EMB353_33-1	ABBoje	43	54° 52,8740' N	013° 51,7080' E	CTD
09.11.2024 23:02	EMB353_34-1	TF0112	38	54° 48,2350' N	013° 57,4703' E	CTD
10.11.2024 01:16	EMB353_35-1	TF0152	28	54° 38,0324' N	014° 16,9130' E	CTD
10.11.2024 01:32	EMB353_35-2	TF0152	28	54° 38,0074' N	014° 16,9749' E	VVG
10.11.2024 01:39	EMB353_35-3	TF0152	28	54° 38,0037' N	014° 16,9983' E	VVG
10.11.2024 01:44	EMB353_35-4	TF0152	28	54° 38,0012' N	014° 16,9850' E	VVG
10.11.2024 01:51	EMB353_35-5	TF0152	28	54° 38,0063' N	014° 16,9915' E	VVG
10.11.2024 02:06	EMB353_35-6	TF0152	28	54° 37,9986' N	014° 17,0570' E	DRG
10.11.2024 06:10	EMB353_36-1	OBBoje	12	54° 04,6726' N	014° 09,2903' E	CTD
10.11.2024 07:40	EMB353_37-1	TF0160	12	54° 14,3986' N	014° 04,0888' E	CTD
10.11.2024 07:55	EMB353_37-2	TF0160	11	54° 14,4042' N	014° 04,0617' E	VVG
10.11.2024 07:58	EMB353_37-3	TF0160	11	54° 14,3998' N	014° 04,1055' E	VVG
10.11.2024 08:03	EMB353_37-4	TF0160	11	54° 14,3759' N	014° 04,1255' E	VVG
10.11.2024 08:07	EMB353_37-5	TF0160	11	54° 14,3537' N	014° 04,1184' E	VVG
10.11.2024 08:19	EMB353_37-6	TF0160	11	54° 14,3313' N	014° 04,1610' E	DRG
10.11.2024 16:30	EMB353_38-1	TF0145	44	55° 09,3393' N	014° 16,0903' E	CTD
10.11.2024 18:02	EMB353_39-1	TF0144	42	55° 15,4032' N	014° 29,4862' E	CTD
10.11.2024 19:16	EMB353_40-1	TF0142DK	66	55° 22,6902' N	014° 35,4078' E	CTD
10.11.2024 20:24	EMB353_41-1	TF0140	67	55° 27,9991' N	014° 43,1162' E	CTD
10.11.2024 21:40	EMB353_42-1	TF0206	75	55° 31,9855' N	014° 54,9994' E	CTD
10.11.2024 22:43	EMB353_43-1	TF0207	84	55° 29,7842' N	015° 05,5588' E	CTD
10.11.2024 23:40	EMB353_44-1	TF0208	91	55° 27,2067' N	015° 14,0928' E	CTD
11.11.2024 00:39	EMB353_45-1	TF0200	91	55° 23,0302' N	015° 20,0392' E	CTD
11.11.2024 01:43	EMB353_46-1	TF0209	93	55° 20,8764' N	015° 28,0044' E	CTD
11.11.2024 02:39	EMB353_47-1	TF0211	94	55° 19,8286' N	015° 36,8424' E	CTD
11.11.2024 03:44	EMB353_48-1	TF0212	94	55° 18,1208' N	015° 47,7798' E	CTD
11.11.2024 04:57	EMB353_49-1	TF0213	89	55° 15,0567' N	015° 59,0574' E	CTD
11.11.2024 05:43	EMB353_49-2	TF0213	89	55° 14,9696' N	015° 59,0148' E	CTD
11.11.2024 05:44	EMB353_49-3	TF0213	89	55° 14,9692' N	015° 59,0159' E	PLA
11.11.2024 06:09	EMB353_49-4	TF0213	89	55° 15,0128' N	015° 58,9875' E	WP2
11.11.2024 06:22	EMB353_49-5	TF0213	89	55° 14,9854' N	015° 59,0468' E	WP2
11.11.2024 06:33	EMB353_49-6	TF0213	89	55° 14,9974' N	015° 58,9937' E	WP2
11.11.2024 06:41	EMB353_49-7	TF0213	89	55° 14,9854' N	015° 59,0343' E	WP2
11.11.2024 07:04	EMB353_49-8	TF0213	89	55° 15,0001' N	015° 59,0328' E	APNET
11.11.2024 07:25	EMB353_49-9	TF0213	89	55° 14,9868' N	015° 59,0359' E	APNET
11.11.2024 07:46	EMB353_49-10	TF0213	89	55° 15,0032' N	015° 59,0227' E	APNET
11.11.2024 09:34	EMB353_50-1	TF0225	65	55° 15,5388' N	016° 19,2571' E	CTD
11.11.2024 10:34	EMB353_51-1	TF0224	61	55° 17,0408' N	016° 30,0398' E	CTD
11.11.2024 13:01	EMB353_52-1	TF0222	90	55° 12,9932' N	017° 03,9844' E	CTD
11.11.2024 15:20	EMB353_53-1	TF0267	83	55° 17,2189' N	017° 35,5193' E	CTD
11.11.2024 18:07	EMB353_54-1	TF0256	77	55° 19,6170' N	018° 14,0265' E	CTD
11.11.2024 20:04	EMB353_55-1	TF0259	89	55° 33,0012' N	018° 24,0069' E	CTD

11.11.2024 20:05	EMB353_55-2	TF0259	89	55° 33,0005' N	018° 24,0111' E	PLA
11.11.2024 20:41	EMB353_55-3	TF0259	89	55° 32,9884' N	018° 23,9960' E	CTD
11.11.2024 21:52	EMB353_56-1	TF0255	95	55° 38,0238' N	018° 35,9965' E	CTD
11.11.2024 23:49	EMB353_57-1	TF0253	101	55° 50,4145' N	018° 51,9939' E	CTD
12.11.2024 02:12	EMB353_58-1	TF0250	124	56° 05,0043' N	019° 09,9561' E	CTD
12.11.2024 04:25	EMB353_59-1	TF0263	134	56° 20,7966' N	019° 22,7657' E	CTD
12.11.2024 06:55	EMB353_60-1	TF0260	145	56° 38,0394' N	019° 35,0128' E	CTD
12.11.2024 09:48	EMB353_61-1	GOSW	214	57° 04,2692' N	019° 45,5498' E	MOOR recov
12.11.2024 10:24	EMB353_61-2	GOSW	214	57° 04,2546' N	019° 45,5823' E	CTD
12.11.2024 11:03	EMB353_61-3	GOSW	213	57° 04,2144' N	019° 45,5735' E	MOOR depl.
12.11.2024 13:55	EMB353_62-1	GOCE	246	57° 18,3641' N	020° 04,7679' E	MOOR recov
12.11.2024 15:02	EMB353_62-2	GOCE	246	57° 18,4151' N	020° 04,8170' E	MOOR depl.
12.11.2024 15:24	EMB353_63-1	TF0271	241	57° 19,1683' N	020° 03,0472' E	CTD
12.11.2024 16:26	EMB353_63-2	TF0271	241	57° 19,2028' N	020° 02,9863' E	CTD
12.11.2024 17:17	EMB353_63-3	TF0271	241	57° 19,2013' N	020° 03,0092' E	CTD
12.11.2024 18:16	EMB353_63-4	TF0271	241	57° 19,2125' N	020° 02,9734' E	CTD
12.11.2024 18:44	EMB353_63-5	TF0271	241	57° 19,2198' N	020° 02,9686' E	PLA
12.11.2024 18:50	EMB353_63-6	TF0271	241	57° 19,2127' N	020° 02,9414' E	CTD
12.11.2024 19:16	EMB353_63-7	TF0271	241	57° 19,2056' N	020° 02,9508' E	CTD
12.11.2024 19:54	EMB353_63-8	TF0271	241	57° 19,2040' N	020° 02,9382' E	CTD
12.11.2024 21:17	EMB353_64-1	TF0275	231	57° 12,5809' N	019° 55,8138' E	CTD
12.11.2024 23:06	EMB353_65-1	TF0272	209	57° 04,2726' N	019° 49,8341' E	CTD
13.11.2024 00:52	EMB353_66-1	TF0273	183	56° 57,0674' N	019° 46,2028' E	CTD
13.11.2024 06:18	EMB353_67-1	Gotland NE	220	57° 21,9811' N	020° 19,9603' E	CTD
13.11.2024 07:27	EMB353_67-2	Gotland NE	219	57− 22,0168' N	020− 20,4903' E	MOOR recov
13.11.2024 07:56	EMB353_67-3	Gotland NE	219	57° 21,9874' N	020° 20,5003' E	MOOR depl.
13.11.2024 08:50	EMB353_68-1	TF0276	207	57° 28,2232' N	020° 15,6348' E	CTD
13.11.2024 10:28	EMB353_69-1	TF0270	144	57° 36,9993' N	020° 10,0661' E	CTD
13.11.2024 12:16	EMB353_70-1	TF0287	128	57° 42,9240' N	019° 51,2684' E	CTD
13.11.2024 13:36	EMB353_71-1	TF0290	169	57° 51,0387' N	019° 49,1248' E	CTD
13.11.2024 15:01	EMB353_72-1	TF0286	195	57° 59,9697' N	019° 54,0823' E	CTD
13.11.2024 16:03	EMB353_72-2	TF0286	196	57° 59,9803' N	019° 53,9056' E	CTD
14.11.2024 09:55	EMB353_73-1	TF0283	129	58° 46,9453' N	019° 06,0997' E	CTD
14.11.2024 12:03	EMB353_74-1	nGB-1	244	58° 42,7323' N	018° 40,2043' E	CTD
14.11.2024 14:31	EMB353_75-1	TF0284	453	58° 34,9624' N	018° 14,0491' E	CTD
14.11.2024 15:15	EMB353_75-4	TF0284	453	58° 35,0014' N	018° 13,9861' E	SD
14.11.2024 15:46	EMB353_75-2	TF0284	453	58° 34,9964' N	018° 13,9799' E	CTD
14.11.2024 16:44	EMB353_75-3	TF0284	453	58° 34,9881' N	018° 13,9800' E	CTD
14.11.2024 17:14	EMB353_75-5	TF0284	453	58° 34,9805' N	018° 13,9848' E	CTD
14.11.2024 19:27	EMB353_76-1	wGB-3	148	58° 19,5247' N	018° 04,2274' E	CTD
14.11.2024 21:58	EMB353_77-1	TF0240	166	57° 59,9629' N	018° 00,0646' E	CTD
15.11.2024 00:52	EMB353_78-1	TF0242	140	57° 42,9515' N	017° 22,1596' E	CTD
15.11.2024 04:45	EMB353_79-1	TF0245	110	57° 07,0269' N	017° 40,0949' E	CTD
15.11.2024 06:00	EMB353_80-1	Scanfish	100	57° 08,0390' N	017° 32,1416' E	SCF start
15.11.2024 09:20	EMB353_80-1	Scanfish	11	57° 03,1585' N	018° 07,5934' E	SCF end
19.11.2024 04:50	EMB353_81-1	TF0214	93	55° 09,5236' N	015° 39,6465' E	CTD
19.11.2024 06:33	EMB353_82-1	TF0213	89	55° 14,9454' N	015° 59,0623' E	CTD

19.11.2024 06:35	EMB353_82-2	TF0213	89	55° 14,9622' N	015° 59,0356' E	SD
19.11.2024 06:36	EMB353_82-3	TF0213	89	55° 14,9624' N	015° 59,0266' E	PLA
19.11.2024 07:02	EMB353_82-4	TF0213	89	55° 14,9487' N	015° 58,9703' E	WP2
19.11.2024 07:13	EMB353_82-5	TF0213	89	55° 14,9344' N	015° 58,9536' E	WP2
19.11.2024 07:24	EMB353_82-6	TF0213	89	55° 14,9197' N	015° 58,9607' E	WP2
19.11.2024 07:31	EMB353_82-7	TF0213	89	55° 14,8995' N	015° 58,9677' E	WP2
19.11.2024 07:51	EMB353_82-8	TF0213	89	55° 14,9182' N	015° 58,9112' E	APNET
19.11.2024 08:14	EMB353_82-9	TF0213	89	55° 14,8982' N	015° 58,9042' E	APNET
19.11.2024 08:37	EMB353_82-10	TF0213	89	55° 14,8836' N	015° 58,9154' E	APNET
19.11.2024 12:16	EMB353_83-1	TF0208	91	55° 27,2068' N	015° 14,1610' E	CTD
19.11.2024 12:39	EMB353_83-2	TF0208	91	55° 27,1467' N	015° 14,0404' E	MUC
19.11.2024 15:15	EMB353_84-1	Scanfish	62	55° 27,3892' N	014° 35,4916' E	SCF start
19.11.2024 18:20	EMB353_84-1	Scanfish	41	55° 13,5379' N	014° 14,9850' E	SCF end
20.11.2024 07:00	EMB353_85-1	Scanfish	42	55° 13,4970' N	014° 15,5650' E	SCF start
20.11.2024 09:09	EMB353_85-1	Scanfish	46	55° 02,5550' N	014° 03,6320' E	SCF end
20.11.2024 09:40	EMB353_86-1	TF0109	46	54° 59,9727' N	014° 05,0329' E	CTD
20.11.2024 10:10	EMB353_87-1	Scanfish	45	54° 59,0788' N	014° 05,4729' E	SCF start
20.11.2024 13:39	EMB353_87-1	Scanfish	45	54° 55,4106' N	013° 29,8786' E	SCF end
20.11.2024 13:45	EMB353_88-1	TF0113	45	54° 55,4794' N	013° 29,7259' E	CTD
20.11.2024 13:49	EMB353_88-2	TF0113	45	54° 55,4983' N	013° 29,7538' E	PLA
20.11.2024 13:52	EMB353_88-3	TF0113	45	54° 55,5064' N	013° 29,7580' E	SD
20.11.2024 14:11	EMB353_88-4	TF0113	45	54° 55,5597' N	013° 29,7596' E	WP2
20.11.2024 14:17	EMB353_88-5	TF0113	45	54° 55,5594' N	013° 29,7417' E	WP2
20.11.2024 14:36	EMB353_89-1	Scanfish	45	54° 55,4757' N	013° 29,4355' E	SCF start
20.11.2024 19:12	EMB353_89-1	Scanfish	20	54° 43,1298' N	012° 46,4653' E	SCF end
20.11.2024 19:24	EMB353_90-1	TF0030	20	54° 43,3747' N	012° 46,9870' E	CTD
20.11.2024 20:10	EMB353_91-1	TF0001	18	54° 41,7311' N	012° 41,7715' E	CTD
20.11.2024 21:32	EMB353_92-1	TF0002	15	54° 38,9498' N	012° 27,0365' E	CTD
20.11.2024 22:28	EMB353_93-1	TF0033	17	54° 36,2799' N	012° 19,9750' E	CTD
20.11.2024 23:58	EMB353_94-1	TF0046	25	54° 28,1916' N	012° 14,6051' E	CTD
20.11.2024 23:59	EMB353_94-2	TF0046	26	54° 28,1870' N	012° 14,6028' E	PLA
21.11.2024 00:20	EMB353_94-3	TF0046	26	54° 28,1612' N	012° 14,3515' E	WP2
21.11.2024 01:32	EMB353_95-1	TF0041	17	54° 24,3383' N	012° 03,8195' E	CTD
21.11.2024 02:58	EMB353_96-1	TF0017	19	54° 23,4370' N	011° 49,4372' E	CTD
21.11.2024 04:38	EMB353_97-1	TF0012	22	54° 18,8960' N	011° 33,0427' E	CTD
21.11.2024 04:48	EMB353_97-2	TF0012	22	54° 18,8867' N	011° 33,0398' E	PLA
21.11.2024 05:04	EMB353_97-3	TF0012	22	54° 18,8963' N	011° 33,0025' E	WP2
21.11.2024 06:21	EMB353_98-1	MB2	19	54° 13,6219' N	011° 22,0892' E	CTD
21.11.2024 07:52	EMB353_99-1	TF0022	20	54° 06,6421' N	011° 10,5795' E	CTD
21.11.2024 09:13	EMB353_100-1	MB3	18	54° 01,7706' N	010° 58,5796' E	CTD
21.11.2024 10:10	EMB353_101-1	A3 Boltenhagen	22	54° 02,6003' N	011° 06,4906' E	CTD
21.11.2024 11:00	EMB353_102-1	A1 Boltenhagen	23	54° 02,5950' N	011° 05,5636' E	CTD
21.11.2024 11:18	EMB353_103-1	B1 Boltenhagen	16	54° 02,3276' N	011° 05,4401' E	CTD
21.11.2024 11:34	EMB353_104-1	C1 Boltenhagen	11	54° 02,0480' N	011° 05,4347' E	CTD
21.11.2024 11:48	EMB353_105-1	D1 Boltenhagen	8	54° 01,7684' N	011° 05,4048' E	CTD
21.11.2024 12:03	EMB353_106-1	E1 Boltenhagen	6	54° 01,4826' N	011° 05,3775' E	CTD
21.11.2024 12:19	EMB353_107-1	F1 Boltenhagen	5	54° 01,2192' N	011° 05,3534' E	CTD

7.2 Water Sampling – Parameters and Number of Samples

Station No. EMB340_xxx	Station name	CTD quality assurance	O2	H2S measurement	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM+DOM	CH4+N2O	CO2	UV-filter concentration	Mikrobiology eDNA (Filter)	Mikrobiology DNA (Filter)	Mikrobiology (FISH Filter)	Cell counts (Flowcytometry)	Stable isotopes (δ15N, δ18O)	Chlorophyll	Phytoplankton	Phytoplankton (DNA Filter)	Phytoplankton (Handnetz)	Zooplankton (Apstein Net)	Zooplankton (WP2-Net)
1	TFO5		1		3	3	3	3	3	2	2	2			3	1										
2	TF0018		1		2	2	2	2																		
3	TF0012		4		4	4	4	4	4	3	3	3			3	2					6	2	3	3		2
4	E1 Boltenhagen																									
5	D1 Boltenhagen																									
6	C1 Boltenhagen																									
7	B1 Boltenhagen																									
8	A1 Boltenhagen																									
9	A3 Boltenhagen																									
10	TF0022		3												3											
11	TF0014															1										
12	TF0361																									
13	TF0360		3		3	3	3	3	3	3	3	3			3						4	3	3	3		1
14	Bio FB2	x	9																							
15	Bio FB1		1																							
16	TF0010		2		4	4	4	4							3	1										
17	TF0013																									
18	TF0017																									
19	TF0041		1		3	3	3	3																		
20	TF0046		1		4	4	4	4							3	1					6	2	3	3		1
21	TF0083																									
22	TF0033																									
23	TF0002	x	12		3	3	3	3								1										
24	TF0001		3		3	3	3	3								1										
25	TF0030		2													2					5	2		3		

Station No. EMB340_xxx	Station name	CTD quality assurance	O2	H2S measurement	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM+DOM	CH4+N2O	CO2	UV-filter concentration	Mikrobiology eDNA (Filter)	Mikrobiology DNA (Filter)	Mikrobiology (FISH Filter)	Cell counts (Flowcytometry)	Stable isotopes (δ15N, δ18O)	Chlorophyll	Phytoplankton	Phytoplankton (DNA Filter)	Phytoplankton (Handnetz)	Zooplankton (Apstein Net)	Zooplankton (WP2-Net)
26	TF0115		4		4	4	4	4								1										
27	TF0114		1		5	5	5	5																		
28	TF0113		7		7	7	7	7	7	4	4	4	7	7	3	1					6	2	3	3		3
29	TF0105		1		5	5	5	5																		
30	TF0104		1		5	5	5	5																		
31	TF0103		1		5	5	5	5																		
32	TF0109		2		5	5	5	5	5	4	4	4			3						5	2	3	3		2
33	AB-Boje		2																							
34	TF0112	x	10		4	4	4	4								2										
35	TF0152		4		4	4	4	4																		
36	OB-Boje		2		2	2	2	2							3											
37	TF0160		3		3	3	3	3																		
38	TF0145		1		5	5	5	5												3						
39	TF0144																									
40	TF0142		1		5	5	5	5												3						
41	TF0140		1		6	6	6	6												4						
42	TF0206																									
43	TF0207																									
44	TF0208																									
45	TF0200	x	10		7	7	7	7																		
46	TF0209																									
47	TF0211																									
48	TF0212																									
49	TF0213		9	1	10	10	10	10	10	6	6	6	10	10						3	6	2		3	3	4
50	TF0225																									
51	TF0224	x	8																							

Station No. EMB340_xxx	Station name	CTD quality assurance	O2	H2S measurement	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM+DOM	CH4+N2O	CO2	UV-filter concentration	Mikrobiology eDNA (Filter)	Mikrobiology DNA (Filter)	Mikrobiology (FISH Filter)	Cell counts (Flowcytometry)	Stable isotopes (δ15N, δ18O)	Chlorophyll	Phytoplankton	Phytoplankton (DNA Filter)	Phytoplankton (Handnetz)	Zooplankton (Apstein Net)	Zooplankton (WP2-Net)
52	TF0222		6		7	7	7	7																		
53	TF0267																									
54	TF0256																									
55	TF0259		7		7	7	7	7													5	2		3		
56	TF0255																									
57	TF0253	x	8																							
58	TF0250																									
59	TF0263																									
60	TF0260		9		9	9	9	9	9											4						
61	Gotland SW																									
62	Gotland CE																									
63	TF0271		20	18	21	21	21	21	21	12	12	12	18	15			52	26	52		6	2		3		
64	TF0275																									
65	TF0272	x	10	3																						
66	TF0273																									
67	Gotland NE																									
68	TF0276																									
69	TF0270		1	3																						
70	TF0287																									
71	TF0290																									
72	TF0286		9	8	16	16	16	16	16	6	6	6	16	16						9						
73	TF0283		1	3																						
74	nGB-1	x	9	2																						
75	TF0284		9	21	16	16	16	16	16	10	10	10					52	26	52							
76	wGB-3																									
77	TF0240		5	5	10	10	10	10	10																	

Station No. EMB340_xxx	Station name	CTD quality assurance	O2	H2S measurement	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM+DOM	CH4+N2O	CO2	UV-filter concentration	Mikrobiology eDNA (Filter)	Mikrobiology DNA (Filter)	Mikrobiology (FISH Filter)	Cell counts (Flowcytometry)	Stable isotopes (δ15N, δ18O)	Chlorophyll	Phytoplankton	Phytoplankton (DNA Filter)	Phytoplankton (Handnetz)	Zooplankton (Apstein Net)	Zooplankton (WP2-Net)
78	TF0242	x	9																							
79	TF0245		5	3	8	8	8	8	8																	
80	SF025WGB																									
81	TF0214	x	11																							
82	TF0213		7	1	7	7	7	7													5			1	3	4
83	Scanfish																									
84	Scanfish																									
85	TF0145																									
86	TF0109				3	3	3	3	3											3	6			1		
87	Scanfish																									
88	TF0113	x	9		3	3	3	3	3											3	5			1		2
89	Scanfish																									
90	TF0030		1																		6					
91	TF0001		3																							
92	TF0002																									
93	TF0033																									
94	TF0046		1																		5			1		1
95	TF0041																									
96	TF0017																									
97	TF0012		1																		6			1		1
98	MB2																									
99	TF0022																									
100	MB3																									
101	F1 Boltenhagen																									
102	E1 Boltenhagen																									
103	D1 Boltenhagen																									

Station No. EMB340_xxx	Station name	CTD quality assurance	O2	H2S measurement	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM+DOM	CH4+N2O	CO2	UV-filter concentration	Mikrobiology eDNA (Filter)	Mikrobiology DNA (Filter)	Mikrobiology (FISH Filter)	Cell counts (Flowcytometry)	Stable isotopes (δ15N, δ18O)	Chlorophyll	Phytoplankton	Phytoplankton (DNA Filter)	Phytoplankton (Handnetz)	Zooplankton (Apstein Net)	Zooplankton (WP2-Net)
104	C1 Boltenhagen																									
105	B1 Boltenhagen																									
106	A1 Boltenhagen																									
107	A3 Boltenhagen																									

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 IOW 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. Data 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 parameter	IOW DB, MUDAB, HELCOM, ICES	January 2025	December 2026	Naumann, Michael, Dr. michael.naumann@io-warnemuende.de
Nutrients	IOW DB, MUDAB, HELCOM, ICES	March 2025	January 2028	Kuss, Joachim, Dr. joachim.kuss@io-warnemuende.de
Phytoplankton	IOW DB MUDAB	June 2025	February 2028	Kremp, Anke, Dr. anke.kremp@io-warnemuende.de
Zooplankton	MUDAB	June 2025	Personal contact	Dutz, Jörg, Dr. joerg.dutz@io-warnemuende.de
Macrozoobenthos	MUDAB	August 2025	Personal contact	Zettler, Michael, Dr. joerg.dutz@io-warnemuende.de

9. Acknowledgements

We thank the captain Dirk Thürsam and the crew of RV ELISABETH MANN BORGESE as well as the cruise participants for their support of this successful cruise. We are also grateful to all people who helped to prepare the cruise. This cruise is part of HELCOM's Baltic Sea monitoring programme. The IOW's long-term observation programme was funded by institutional funds of the IOW and the Federal Maritime and Hydrographic Agency, Hamburg and Rostock.

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11. Abbreviations

Defined in the text.

12. Appendices

Mooring Protocols GOSW, GOCE, GONE

Briese Schiffahrts Gmb & Co. KG
Abtlg. Forschungsschifffahrt
FS "Elisabeth Mann Borgese"

VERANKERUNGSPROTOKOLL

Datum: 12.11.2024 **Beginn:** 11:00 **Ende:** 11:15 **UTC**

Gerät: **GOSW-09 11/24** **Reise EMB** **353**

Code Name:

Lottiefe: 217 m

Wetter: Wind: 290° 6 m/s
Strömung: - -

Absetzposition: **Breite:** 57° 04,211'N (WGS 84, DGPS)
Gerät **Länge:** 019° 45,602'E
KrK: 295°

Grundleine: **Breite:**
(Ende) **Länge:**
KrK:

Richtung: (vom Gerät)
Länge:

Oberfläche:

Bemerkungen:

Kapitän

Exp.-Leiter

Verteiler:

EMB
IOW

Briese Schiffahrts Gmb & Co. KG
Abtlg. Forschungsschifffahrt
FS "Elisabeth Mann Borgese"

VERANKERUNGSPROTOKOLL

Datum:	12.11.2024	**Beginn:**	14:00	**Ende:**	14:30 **UTC**
Gerät:	**Sinkstofffalle**			**Reise EMB**	**353**
Code Name:	**GOCE - GotI.BL-2024-11**				
Lottiefe:	250 m				
Wetter:	Wind:	310°		7 m/s	
	Strömung:	-		-	
Absetzposition:	**Breite:**	57° 18.410'N		(WGS 84, DGPS)	
Gerät	**Länge:**	020°04.858'E			
	KrK:	310°			
Grundleine:	**Breite:**	-			
(Ende)	**Länge:**	-			
	KrK:	-			
	Richtung:	-		(vom Gerät)	
	Länge:	-			
Oberfläche:	ohne				

Bemerkungen:

Kapitän	Exp.-Leiter

Verteiler:

EMB
IOW

Briese Schiffahrts Gmb & Co. KG
Abtlg. Forschungsschifffahrt
FS "Elisabeth Mann Borgese"

VERANKERUNGSPROTOKOLL

Datum: 08.11.2023 **Beginn:** 15:05 **Ende:** 15:25 **UTC**

Gerät: **GONE-46** **Reise EMB** **353**

Code Name:

Lottiefe: 218m

Wetter: Wind: 200° 2 m/s
Strömung:

Absetzposition: **Breite:** 57°22,000'N (WGS 84, DGPS)
Gerät **Länge:** 020° 20,500'E
KrK: 210°

Grundleine: **Breite:**
(Ende) **Länge:**
KrK:

Richtung: (vom Gerät)
Länge:

Oberfläche:

Bemerkungen:

Kapitän

Exp.-Leiter

Verteiler:

EMB
IOW