ELISABETH MANN BORGESE-Berichte

***Baltic Sea Long-term Observation Programme***

Cruise No. EMB365

03. – 24. May 2025
Rostock – Rostock
BMP


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2025

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# 1 Cruise Summary

## 1.1 Summary in English

The cruise EMB365 was carried out in frame of the IOWs Baltic Sea long-term observation program. The work program consisted of field data acquisition for the national environmental monitoring in the German EEZ, which is performed in context with the Helsinki Commission (HELCOM) and federal programs to evaluate the status of coastal regions in North and Baltic Sea (BMLP). This work package is based on contract between the Federal Maritime Agency (BSH) and IOW as administrative agreement since 1991. The second work package is part of IOW's Baltic Sea long-term observation program, related to the institutes research area two "Coastal Seas in Transition" of the new research program "Perspectives of Costal Seas", running from 2024 to 2033. 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. Since 2024 it is complemented by an extension of observations into the Gulf of Bothnia. The gathered data are the back bone of research on the natural variability of the ecosystem, anthropogenic influences and the impact of climate change on the Baltic Sea. The planned scientific program of the cruise was implemented in full. Weather-related downtimes were limited to a few short wind events. The majority of the measurements were carried out along the thalweg of the Baltic Sea from the Darss Sill to the northern Bothnian Bay. As part of the cooperation with the Umeå Marine Sciences Centre, two Swedish scientists took part in the expedition between the port calls in Umeå and Gävle.

## 1.2 Zusammenfassung

Die Expedition EMB365 wurde im Rahmen des Ostsee Langzeitbeobachtungsprogramms durchgeführt. Das wissenschaftliche Programm beinhaltet die Felddatenerfassung für die nationale Umweltüberwachung in der deutschen AWZ, die im Rahmen der Helsinki-Kommission (HELCOM) und des nationalen Programmes zur Zustandsbewertung von Küstenregionen in Nord- und Ostsee (BMLP) durchgeführt wird. Dieses Arbeitspaket basiert auf einem Vertrag zwischen dem Bundesamt für Seeschifffahrt und Hydrographie (BSH) und dem IOW als Verwaltungsvereinbarung seit 1991. Das zweite Arbeitspaket der Expedition ist Teil des Ostsee-Langzeitbeobachtungsprogramms des IOW, das im Rahmen des IOW Forschungsgebietes "Küstenmeere im Wandel" bearbeitet wird. Zentrales Element des Programmes ist eine seit 1969 initiierte, kontinuierlich durchgeführte Datenerhebung von Schlüsselparametern an Stationen in der westlichen und zentralen Ostsee. Seit 2024 wird das Programm durch eine Erweiterung in den Bottnischen Meerbusen ergänzt. Die gewonnenen Daten bilden die Basis der Forschung zur natürlichen Variabilität des Ostsee-Ökosystems, zu anthropogenen Einflüssen und zu den Auswirkungen des Klimawandels auf die Ostsee. Das vorgesehene wissenschaftliche Programm der Reise wurde vollständig umgesetzt. Wetterbedingte Ausfallzeiten waren auf wenige kurze Windereignisse beschränkt. Der Großteil der Messungen erfolgte entlang des Talweges der Ostsee von der Darßer Schwelle bis zur nördlichen Bottenwiek. Im Rahmen der Kooperation mit dem Umeå Marine Sciences Centre nahmen zwei schwedische Wissenschaftlerinnen zwischen den Hafenaufenthalten in Umeå und Gävle an der Reise teil

# 2 Participants

## 2.1 Principal Investigators

| Name | Program | Institution |
|---|---|---|
| Mohrholz, Volker, Dr. | Hydrography | IOW |
| Kuss, Joachim, Dr. | Marine Chemistry | IOW |
| Palmbo Bergmann, Anna | Marine Chemistry | UMF |
| Dutz, Jörg, Dr. | Biology | IOW |
| Rehder, Gregor, Prof. | Trace gasses | IOW |
| Labrenz, Matthias, Prof. | eDNA sampling | IOW |

## 2.2 Scientific Party

| Name | Discipline | Institution |
|---|---|---|
| Mohrholz, Volker, Dr. | Phys. Oceanogr. / Chief Scientist | IOW |
| Benterbusch-Brockmöller, Heike | Biology | IOW |
| Dagberg, Nina | Marine Chemistry / Biology | UMF |
| Dierken, Madleen | Marine Chemistry | IOW |
| Fechtel, Christin | Biology | IOW |
| Floth-Petersen, Mareike | Marine Chemistry | IOW |
| Heene, Toralf | Phys. Oceanogr. | IOW |
| Kähler, Kim Marijke | Phys. Oceanogr. | IOW |
| Kolbe, Martin | Instrumentation | IOW |
| Kreuzer, Lars | Marine Chemistry | IOW |
| Oppler, Jonna | Biology | IOW |
| Palmbo Bergmann, Anna | Marine Chemistry / Biology | UMF |

On 5$^{th}$ May Heike Benterbusch-Brockmöller and Jonna Oppler disembarked in Sassnitz after finishing the eDNA sampling in German waters. Anna Palmbo Bergman and Nina Dagberg joined the cruise from 14$^{th}$ to 19$^{th}$ May, Umeå to Gävle.

## 2.3 Participating Institutions

IOW Leibniz-Institute for Baltic Sea Research Warnemünde, Germany
UMF Umeå Marine Sciences Centre Norrbyn, Umeå University, Sweden

# 3 Research Program

## 3.1 Description of the Work Area

The data collected during the cruise EMB365 covered the western, central and northern Baltic from the Kiel Bight to the Gotland Basin, and further on to the Bothnian Bay. The majority of stations was located along the thalweg transect of the Baltic Sea, crossing the Arkona basin, the Bornholm Basin, the Slupsk Furrow and the Gotland Basin. The station work in the southern Baltic was extended to the western part of the Pomeranian Bight, and some additional stations in the Arkona Basin. In the northern Baltic the Bothnian Sea and the Bothnian Bay were covered.

A core area of the cruise was the Eastern Gotland Basin (EGB). Along its southern rim an east-west transect of CTD stations was worked, in order to gather information about the cross-basin distribution of hydrographic parameters in the largest basin of the Baltic proper. Here also a high resolution ScanFish transects was performed. Additional CTD casts were carried out at some key stations in the western Gotland Basin, namely in the Karlsö Deep and the Landsort Deep. An overview of the locations of CTD stations, ScanFish transects, and the cruise track is given in Fig. 3.1. A station list is given in Table 7.1.

## 3.2 Aims of the Cruise

The cruise EMB356 was carried out as a joined cruise of the Baltic Sea long term observation program of the Leibniz-Institute for Baltic Sea Research Warnemünde (IOW) and the environmental monitoring program of the Federal Maritime and Hydrographic Agency (BSH). It was the third cruise in a series of five expeditions performed annually.

The data acquired are used for the regular national and international assessments of the state of the Baltic Sea, and provide the scientific basis for measures to be taken for the protection of the Baltic Sea ecosystem. For this purpose, hydrographic, chemical and biological data were gathered along the Baltic thalweg transect. The major focus was on the state of ecosystem during spring conditions when the different stages of phytoplankton bloom can be observed along the thalweg. At the time of the cruise the bloom spring bloom in the southern Baltic is close to its final stage whereas the bloom in the northern Baltic just started. Since no larger barotropic inflows were observed during the previous winter, the observations will deliver undisturbed data about the onset and early development of the seasonal stratification. The observation program of the cruise was extended to the Gulf of Bothnia to gather additional data about the impact of climate change to the boreal parts of the Baltic, where the amplitude of climate relates changes is enhanced.

Another goal of the cruise was to continue and enhance the collaboration with the Umeå Marine Science Centre of Umeå University. Thus, two Swedish scientists from Umeå Marine Science Centre joined the cruise between the port calls of Umeå and Gävle.

## 3.3 Agenda of the Cruise

The work packages of the cruise were subsequently conducted. We started with the BSH environmental monitoring program in the western Baltic, which was continued with the IOW's Baltic Sea long-term observation program in the southern and central Baltic Sea. Both consist mainly of CTD casts, water sampling for nutrient analysis and net sampling of phytoplankton and zooplankton. Additional sampling for eDNA investigations were taken in German waters. In the eastern Gotland Basin the program was complemented by a high resolution ScanFish transect from the Latvian coast to the Gotland Island crossing the Gotland Deep. Each year in May the IOW Baltic Sea long-term observation program is extended to the Gulf of Bothnia. Here mainly CTD stations were performed along Thalweg transect. Additionally, some key stations of the Swedish long term observation program in the Gulf of Bothnia were covered. At these stations comparison measurements with CTD and plankton nets were performed together with scientist from UMF.

On the way back to Rostock a few key stations in the western Gotland Basin were worked, namely the Landsort Deep and the Karlsö Deep. Some CTD stations of the long-term observation program in the southern Baltic were repeated to increase the temporal resolution of the long-term data. An extra sampling programs was conducted for trace gas long term observations at the Baltic main stations in the Arkona Basin, the Bornholm basin, the Eastern Gotland basin, and in the Faro Deep.

The marine environment was less disturbed by performed scientific tasks. No sampling in marine protected areas was carried out. Mainly sensor measurements and water sampling in the water column for chemical analysis were done. Any waste of chemical analysis and other scientific work was collected and processed onshore after the cruise. High frequency hydro acoustic measurements were done by current profilers along the ship. Due to the high frequency (>150kHz) of the used devices Marine mammals were not affected by these measurements.

***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 (SCF)
- EK80 water column echo sounder
- Phytoplankton net (APNET)
- Zooplankton net (WP2)
- In-Situ Pump (ISP)
- Secci desk (SD)
- Microstructure Profiler (MSS)

(The abbreviations in brackets indicate the device short names used in the DSHIP data base)

Continuous measurements:

- Vessel mounted ADCP 150kHz Ocean Surveyor (at selected transects)
- Vessel mounted ADCP 300kHz WorkHorse (at selected transects)
- Underway measurements of surface water properties
- Ship weather station

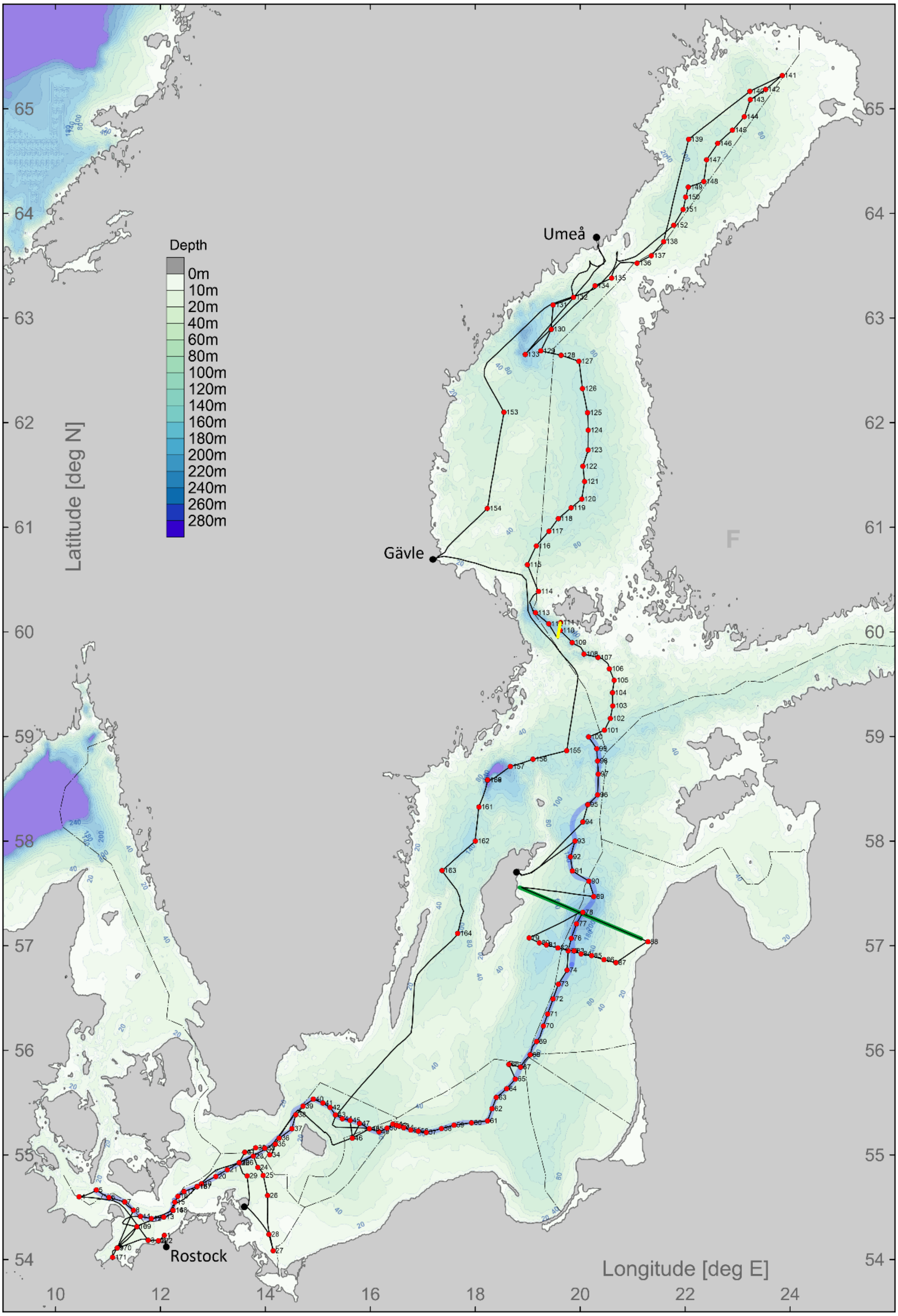


**Fig. 3.1** Map of stations and ship track of cruise EMB365 from 03. – 24. May 2025. Red dots and black labels indicate the positions and names of CTD stations. The green sections along the cruise track depict the ScanFish transects in the Gotland basin. The yellow line marks the location of the MSS transect across the southern Åland Deep.

# 4 Narrative of the Cruise

The cruise EBM365 was the third cruise of IOW Baltic Long-term Observation Program in 2025. On 2nd May 2025 the final preparations for the cruise started with the loading of scientific equipment and with installing the lab devices on the ship in port of Rostock. On the next morning at 9:00 am the ship left the port of Rostock heading to the Belt Sea. After the test station TFO5 a safety drill was performed. The weather was calm and sunny. However due to the expected increase in wind strength we decided to steam directly to station TF0360 in the Kiel Bight and work the first stations in eastward direction. We arrived at TF0360 in the early evening. The wind and sea state allowed the normal device operations. During the night to Sunday, we passed the Fehmarn Belt and proceeded with station work in the Mecklenburg Bight. The wind strength increased continuously to $15 ms^{-1}$. Thus, we stopped the work for some hours and found shelter near Fehmarn Island. We resumed the station work around noon when the wind started to calm down. In the evening we reached the MarNET station Darss Sill. From here we continued with station work into the southern Arkona Basin. The wind increased again but did not hamper the observations. On 5th May we performed the planned observations in the Pomeranian Bight and finished the work of the eDNA program that is confined to German waters. We called the port of Sassnitz in the afternoon and disembarked two scientist who were responsible for the eDNA sampling. Afterwards we continued the station work in the southern Arkona basin along the Baltic thalweg transect. The wind conditions and sea state were good.

Since the begin of the cruise the signals we got from the par sensor of the CTD were somehow suspicious. A deeper inspection revealed a defect connection cable. It was replaced by a spare one. Also, the surface values for chlorophyll-a fluorescence and turbidity measured with the SMB underway system were not reliable. However, there was no obvious reason for a malfunction. We finished the station work in the Arkona Basin in the late evening and passed the Bornholm gat around midnight. There were no signs of an inflow of saline waters from the Arkona basin into the Bornholm basin. However, the surface water temperatures dropped significantly. The wind increased again to about 6 Bft. During the 6th May we worked the stations along the thalweg through the Bornholm basin. The central station TF0213 of the basin was reached in the afternoon. Here, an extended sampling program with phytoplankton and zooplankton nets was performed. We found the deep water well oxygenated, most probably due to some miner inflows during the late winter. The decreasing wind supported a smooth operation of the used devices. The station was finished in the evening and we proceeded with station work.

We crossed the Slupsk Sill around midnight. No active overflow of the sill was observed. During the night the wind was further decreasing to 3 Bft. However, a strong swell from northeasterly directions caused some movement of the ship. During the day we continued the station work along the Baltic thalweg transect in Polish waters. Despite of the sunny weather, the air temperature decreased slowly to about 5 to 6°C which compared very well to the SST. Also, in the Slupsk Furrow the deep-water layer was well ventilated. At noon we passed the eastern Sill of the Slupsk Furrow. There we turned to the north east and arrived the entrance to the southern Gotland basin in the afternoon. During the evening and following night we proceeded with station work along the Baltic thalweg transect. The swell decreased while we traveled northward. So far, we had no problems with any device except the CDOM fluorometer of the CTD. At noon we arrived at the Gotland Deep. Here we started the extended station work at the central station of the Eastern Gotland Basin (TF0271). Beside the standard observations of physical parameters, nutrients and phytoplankton we performed sampling for trace gasses, methan and microbiological sampling at the redox cline. Additionally, a device test for new configurations of the microstructure profiler (MSS) was performed here. We could finish the work in the early evening and went to south east. At midnight we arrived at the western end of the planned CTD transect across the southern part of the EGB. The weather conditions were quite good. We finished this CTD transect at 10am on 9$^{th}$ May near the Latvian coast.

There is a second transect across the center of the EGB that is also part of the IOW long term observation program. This transect was covered with an undulating CTD system (ScanFish). We started the ScanFish observations on the eastern rim of the EGB, heading westward shortly after lunch time. The wind calmed further down to about 1 to 3 Bft. In the late afternoon the pump system of the ScanFish CTD depicted a malfunction. We interrupted the ScanFish transect for an inspection of the problem. After exchange of pump cable and the CTD pump of the ScanFish we could continue the measurements without further technical problems. The transect was finished near the coast of Gotland in the early morning of 10$^{th}$ May. During the night the wind increased slightly to about 4 Bft. After breakfast we arrived at station TF0276 where we resumed the station work along the thalweg transect. The Fårö Deep was reached at 3pm. After performing the two CTD cast planned for this station we had to interrupt the scientific program because a medical case. Thus, we turned back towards Gotland Island and called the port of Slite, that we arrived at 8:30 pm. A crew member was disembarked and we left the port immediately to resume our scientific work. We arrived the next station shortly after midnight and continues the CTD deployments along the thalweg. The wind was calm and the day started with a cloud free sky. At station TF0282 we tested the CDOM fluorometer with the repaired connection cable, that work without problems. At noon we left the Swedish EEZ and entered Finish waters. During the rest of the day we proceeded towards north. In the late evening we reached the southern rim of the Åland Deep. After performing a CTD station we started on 12$^{th}$ May at 1:30am with a Microstructure Profiler Transect across the Åland Basin. The transect was aligned in north to south direction. The work on this transect was successfully finished at around noon. We proceeded northward and entered the Bothnian Sea in the afternoon. The weather conditions were still calm and stable. Thus, we could continue our CTD station work along the northern part of the Baltic thalweg transect. In the morning of 13$^{th}$ May the wind increased slightly and the sky become cloud covered. The SST and also the surface salinity dropped significantly along our track towards north. At station TF0603 we detected a SST and SSS of 5.3°C and 5.2, respectively. During the day we performed again some CTD stations along the northern Thalweg in the central and northern part of the Bothnian Sea. Till the late afternoon wind and sea state were low, but both increased significantly afterwards. At 11 pm we finished the last CTD station in the Bothnian Sea and started our approach to Umeå. The wind increased continuously and reached 6 to 7 Bft in the early morning. At 8am we reached the port of Holmsund near Umeå.

The scientific crew was invited to visit the Umeå Marine Science Centre (UMF) of Umeå University which is located in Norrbyn, about 30 kilometer south of Umeå. At 9:30am we were picked up by a bus and had a nice stay at the research station. The we visited the labs and discussed with colleagues the opportunities for future collaborations in the Gulf of Bothnia. At 3pm we were back at the ship. The wind was still strong and occasionally it rained. In the late afternoon two UMF scientist embarked on the EMB for joining our cruise during the next four days.

In the morning of 15th May we left the port of Holmsund to continue with our scientific program. Due to the weather forecast we changed the order of planned stations. We head south and started with station C3 in the northern Bothnean Sea. The strong wind that lasted during the previous day decreased slowly and the clouds disappeared. We reached station at C3 at Ulvön Trench in the late afternoon and performed two CTD casts and a number of plankton net hauls. This was done twice for sampling by the IOW and the UMF colleagues for intercalibration of the sampling methods. The station was finished shortly after dinner, then we went north to the Kvark. The wind and sea state calmed down during the evening. We arrived at the first station in the Kvark (F18/B5) at midnight and started again with our CTD profiling program. Till 7am on the 16th May we worked 5 CTD stations in the transition between the Bothnian Sea and the Bothnian Bay. Afterwards we proceeded to the station F9/A13 in the central Bothnian Bay. This station is part of the long-term monitoring program of UMF. We performed here comparison measurements between the sampling methods used by IOW and UMF. Also, the next station F3/A5, that was worked in the early evening, is part of the UMF long-term monitoring program. We arrived at the northern end of the Baltic Thalweg transect in the Bothnian Bay at 9:30pm. This was also the northern most point of our scientific program. From here we started again with performing CTD station of along the thalweg transect. During the night and the following day, we covered 12 CTD stations in the Bothnian Bay. On 17th May at 2am we finished the last station of the entire Thalweg transect through the Baltic. The next task was the work at three stations in the Bothnian Sea. However, the weather forecast for the 18th May predicted strong winds and high sea state that would not allow safe device operations at the intended stations. We decided to seek shelter behind Holmöarna Island located in the Kvark.

We expected decreasing winds for the late afternoon of 18th May. Thus, we left from Holmöarna Island on the next morning and sailed southward close to the Swedish coast to reach the first station as soon as the conditions will allow the operation of CTD and plankton nets. The wind speed and wave height decreased as predicted. We started or work on station MS4/C14 at 8 pm. Also, at this station comparison measurements with UMF and IOW devices were performed. At 9pm we finished the work and proceeded to our last station in the Bothnian Sea. Station SR3/C24 was reached at 2:20 am on the 19th March. We worked the program here as planned and started our approach to the port of Gävle that we arrived at 8:30 am.

In Gävle the two Swedish scientists were disembarked. We left the port at 11am and took course to the northern Gotland Basin. The weather was very calm and sunny. In the evening we crossed the Åland Sea and used the calm and sunny weather for a barbeque on deck. During the following night the wind increased slightly due to a low pressure system that passes us in the north. We reached our next station in the northern Gotland Basin at 6 am on 20th May. Here we resumed our CTD work. Till then the wind has increased to 6 Bft from northerly directions. The station Landsort Deep was started at 1:30pm. At this station an extended program of sampling was performed. This consisted of five CTD casts, net sampling and a few test measurements with the microstructure profiler. After the first CTD cast the communication with the instrument was lost and we tried to identify the reason for the malfunction. After some tests it became clear that most probably water in the cable termination of the CTD winch caused the failure. Since this could not be fixed immediately, we used the spare CTD in combination with the ScanFish winch for further CTD operations and deployed the CTD via the A-frame. After finishing the station in the early evening, we started the repair of the cable termination. However, that took some time, so that we performed the CTD cast at the following station also with the spare CTD and the

ScanFish winch. After midnight the cable termination was fixed and successfully tested. Thus, station TF0240 could be operated with the standard CTD. The weather forecast for Wednesday and Thursday predicted the passage of strong low-pressure systems. This limited the time window for good working conditions in the southern Baltic. To use this time window predicted for the night we skipped the planned ScanFish transect in the western Gotland Basin and take course to the central Bornholm Basin. We reached station TF0213 at 2am on 22$^{nd}$ May. The station work lasted till the early morning. Afterwards we were seeking shelter behind Bornholm waiting for improving of wind conditions and sea state.

At 8pm we started from our shelter near Bornholm to the central Arkona Basin. Sea state and wind speed were still high, but expected to decrease during the next hours. We arrived station TF0113 at 4am of 23$^{rd}$ May. The working conditions were close to the limit of safe device operation. However, we could perform all planned measurements. We proceeded to station TF0001 at the Darss Sill, where we start the work at 8am. The wind speed has decreased to 5Bft. During the day we worked tree further stations between the Darss Sill and the Fehmarnbelt. These stations, already covered in the beginning of the cruise were repeated to follow the fast changes in the transition area between the North Sea and the Baltic typical for the spring. In the evening we arrived in the Mecklenburg Bight. Here we performed another CTD station and a short Microstructure Profiler transect off the coast of Boltenhagen. This transect crossed the measuring site of the Thünen-Institut Rostock. The aim was to gather high resolution hydrographic data to investigate the small-scale dynamics of the area. We finished the scientific observations of the cruise in the early morning of the 24$^{th}$ May at station NHBoje. Afterwards we started the short transit back to Rostock.

At 8am we arrived at the Pier in Marienehe. After custom procedure we were packing and unloading the scientific equipment. The cruise was finished with the disembarking of scientific crew at noon.

## 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 follow after all validated data sets are available.

### 5.1 Meteorological Conditions

The meteorological conditions during the cruise were characterized by weak to moderate wind conditions and less cloud coverage, typical for spring conditions in May.

The cruise started on 3$^{rd}$ May with a short pulse of higher wind that lasted till the early morning of the following day. Maximum wind speed of about 15 ms$^{-1}$ was reached shortly after midnight. Afterwards a longer period of weak to moderate wind speed followed. Till the 13$^{th}$ May the mean wind speed ranged between 4 and 8 ms$^{-1}$ with mostly westerly and northerly wind directions (Fig. 5.1). When we reached the northern Bothnian Sea the wind increased again and reached about 15 ms$^{-1}$ in the evening of 13$^{th}$ May. On 14$^{th}$ May when we called the port of Umeå the wind increased up to 8Bft. This is not reflected in the wind records of the EMB, due to the shelter in port. The pulse of high winds was caused by a passing low pressure system. The wind speed decreased again when we left the port during the morning of 15$^{th}$ May. Till the 18$^{th}$ May northerly winds of to 6 to 10 ms$^{-1}$ were observed during our work in the Bothnian Bay. This was only interrupted by weak southerly winds on the 16$^{th}$ May.

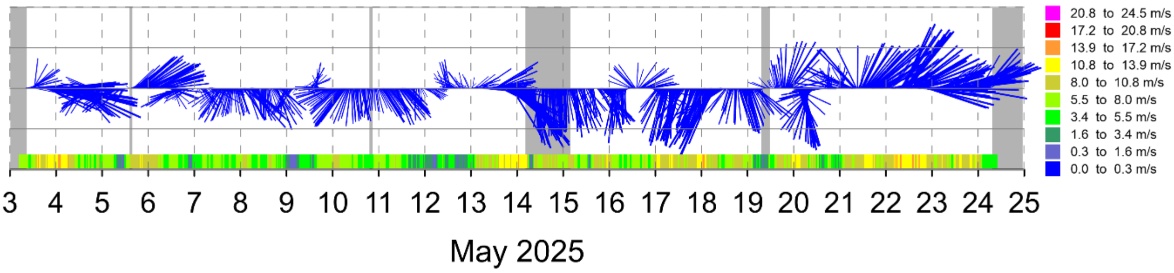


**Fig. 5.1** Stick plot of wind vector measured by the ship weather station of RV ELISABETH MANN BORGESE. The grey shaded areas indicate periods when the ship was in port.

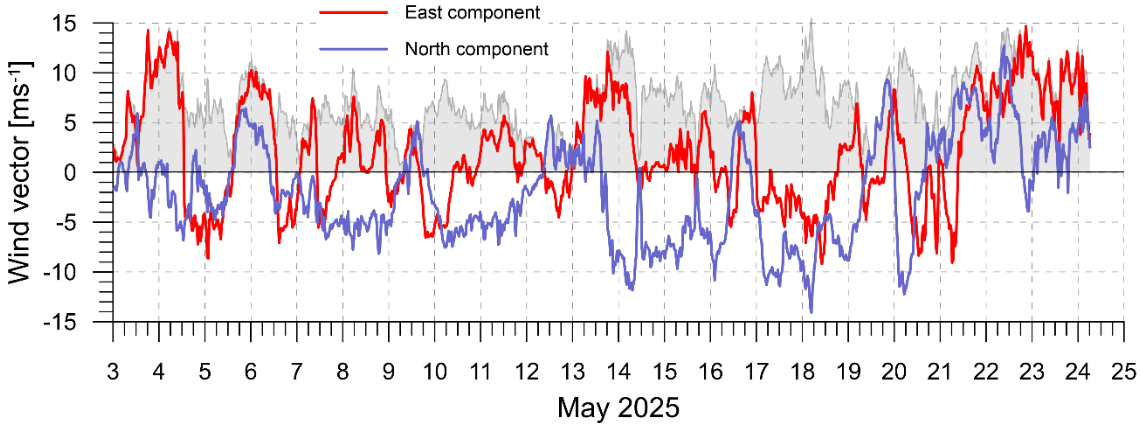


**Fig. 5.2** Wind vector east and north measured by the ship weather station of RV ELISABETH MANN BORGESE (30 min averaged values).

On 19$^{th}$ May, after the port call in Gävle the wind changed to south to southwesterly directions and increased in strength. On 22$^{nd}$ May another passing low-pressure cell caused high wind conditions with maximum wind speeds of 17 to 18 ms$^{-1}$. This lasted till the late evening of this day (Fig. 5.2). On 23$^{rd}$ May the wind speed decreased significantly to 8 to 10 ms$^{-1}$. Till the end of the cruise.

The air temperature in the Baltic was slightly below the long-term average for May, especially during the times of the cruise with northerly wind directions. In the western Baltic air temperature ranged between 8 and 12°C with a pronounced daily cycle. The air temperature dropped significant while cruising north. In the central Baltic values of 4 to 6°C were observed. Despite of the sunny weather no strong diurnal cycle of air temperature was present (Fig. 5.3). The air temperature increased slightly when the ship reached the area of the Kvark between Bothnian Sea and Bothnian Bay. Here the air temperatures ranged between 8 and 8°C. Around midnight of 16$^{th}$ May the minimum air temperature of about 3°C was detected when the ship reached its northern most position, close to remains of sea ice cover in the Bothnian Bay. On the way back to Rostock the air temperature increased slowly. During the port stay in Gävle the maximum value of 16°C was observed. However, this reading was heavily influenced by the sheltered conditions in port. On 23$^{rd}$ May when the ship was back in the western Baltic the noon temperature reached about 14°C.

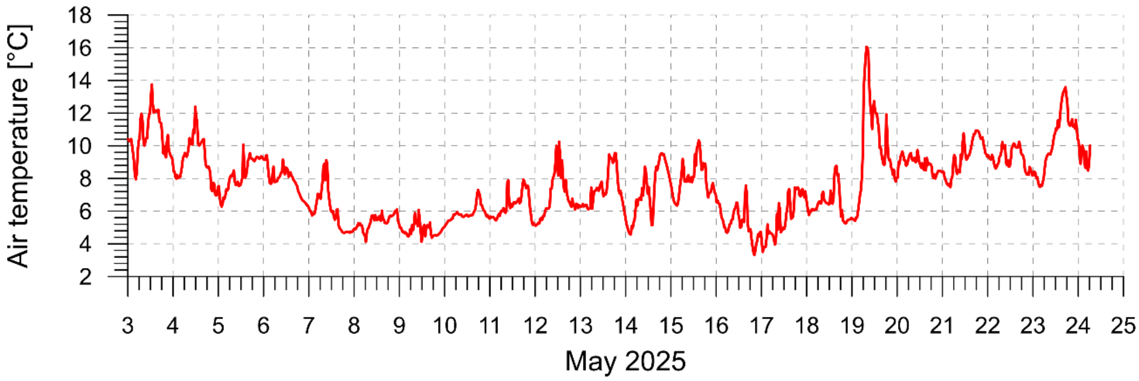


**Fig. 5.3** Air temperature measured by the ship weather station of RV ELISABETH MANN BORGESE (30 min averaged values).

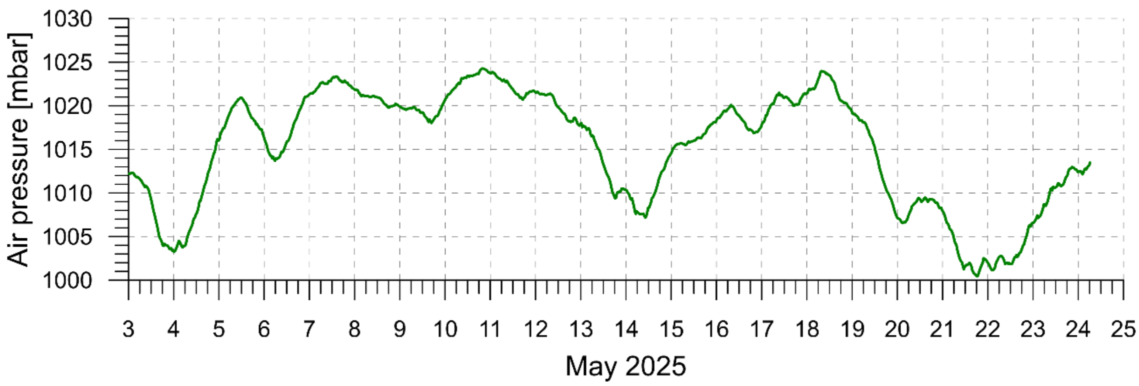


**Fig. 5.4** Air pressure measured by the ship weather station of RV ELISABETH MANN BORGESE (30 min averaged values).

The air pressure variations during the cruise were characterized by two long periods of high pressure during the first and the second half of the cruise. Interrupted by passing low-pressure systems. The cruise started during such a phase with minimum air pressure of 1004mbar on 4th May. Afterwards the air pressure increased rapidly to values between 1015 and 1024mbar. The longer period of high air pressure was interrupted by a passing low-pressure system on 13th and 14th May, that caused high wind speeds. The minimum air pressure of this event was reached around noon of 14th May with 1008mbar. On 15th May the second high pressure period started. It's maximum was reached on 18th May with 1024mbar. On 19th May a strong drop in air pressure finished this period. Two closely following low pressure systems lead to windy conditions. The air pressure minimum was observed an 21st May with 1000mbar. Towards the end of the cruise the air pressure increased again to about 1014mbar.

The humidity depicted a pronounced variability and ranged between 40 and nearly 90% (Fig. 5.5), with high night values and minimum values during the afternoons. Remarkably were the low values on 5th and 19th May. The latter was caused by the strong temperature increase. A period of higher humidity was observed during our work in the Åland Sea and the Bothnian Sea with mean values of 80%. Fog was not detected during the entire cruise. Rainy weather lasted on 13th and 14th May.

The global radiation was strongly related to the cloud coverage and the latitude. In the first week of the cruise the sky was relatively open, and the sunny conditions led to higher values of global radiation of about 800Wm$^{-2}$ at noon. On the 9th and 10th May the cloud coverage increased. Thus, the global radiation dropped rapidly to low daily peak values of 500 and 700Wm$^{-2}$, respectively. Tow sunny days were following till the cloud coverage increase again on 13th and 14th May. After passage of the low-pressure system the global radiation increased again to noon values between 750 and 800 Wm$^{-2}$. The maximum global radiation of 900Wm$^{-2}$ was observed at noon on 23rd May. During the cruise the long wave radiation ranged between 280 and 350 Wm$^{-2}$ (Fig. 5.6). The lower values were observed on sunny days with less clouds. Generally, the overall radiation budget was positive and supported the seasonal warming of the surface water.

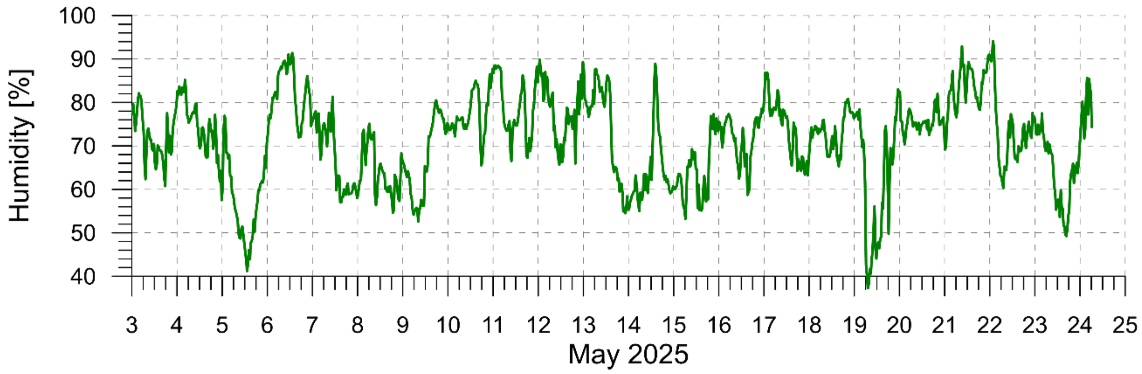


**Fig. 5.5** Air humidity measured by the ship weather station of RV ELISABETH MANN BORGESE (30 min averaged values).

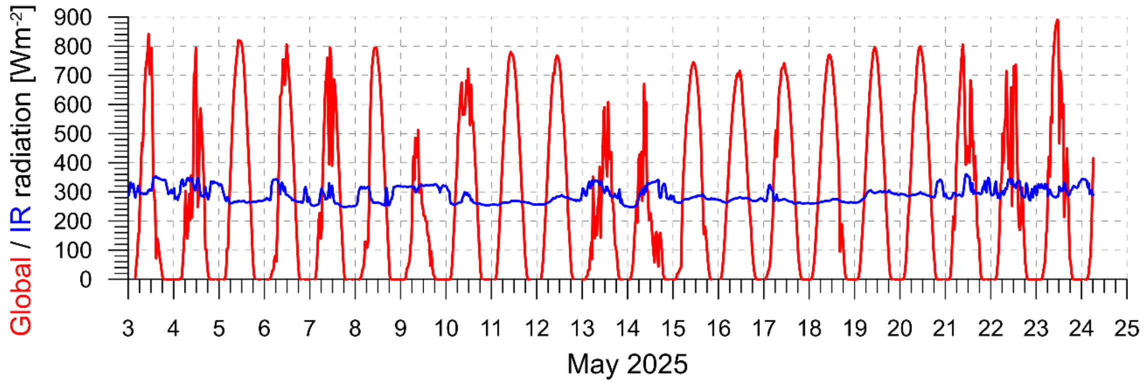


**Fig. 5.6** Global and infrared radiation measured by the ship weather station of RV ELISABETH MANN BORGESE (10 min averaged values).

## 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. 5.7 and Fig. 5.10 are based on unvalidated data. As expected for spring conditions there was a strong temperature gradient along the Thalweg from the entrance of the Baltic to the Bothnian Bay in the north. The north eastern rim of the Bothnian Bay was still ice covered. However, due to the exceptional warm winter and spring the sea surface temperatures (SST) exceed the climatological mean value for May throughout the Baltic, except in the Bothnian Bay. From the Kiel Bight and the Mecklenburg Bight to the Darss Sill the SST ranged between 10.5 to 12.8 °C in the first week of May. Similar values were also observed in the shallow areas of the Pomeranian Bight. It decreased towards the Arkona basin to about 7°C. The southern Baltic, namely the Bornholm Basin, Slupsk Furrow and southern Gotland Basin depicted a SST of 6 to 7°C (Fig. 5.7). Towards north the SST dropped very slowly along the Baltic Thalweg. The steepest SST gradient was observed in the Kvark. Here the SST changed from 5°C in the northern Bothnian Sea to about 2.5°C in the Bothnian Bay (Fig. 5.8). The minimum SST of about 1°C was in the northern Bothnian Bay.

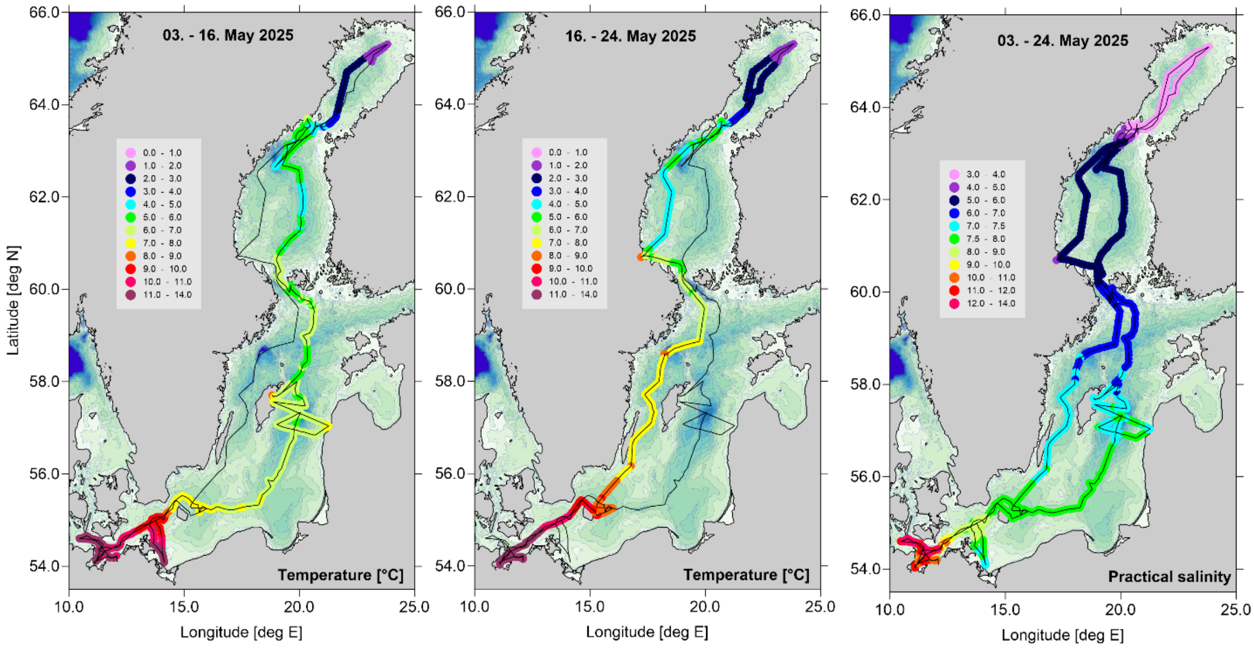


**Fig. 5.7** Surface temperature distribution (left and middle panel) and surface salinity distribution of cruise EMB356 (right panel). Based on 30 min averaged values.

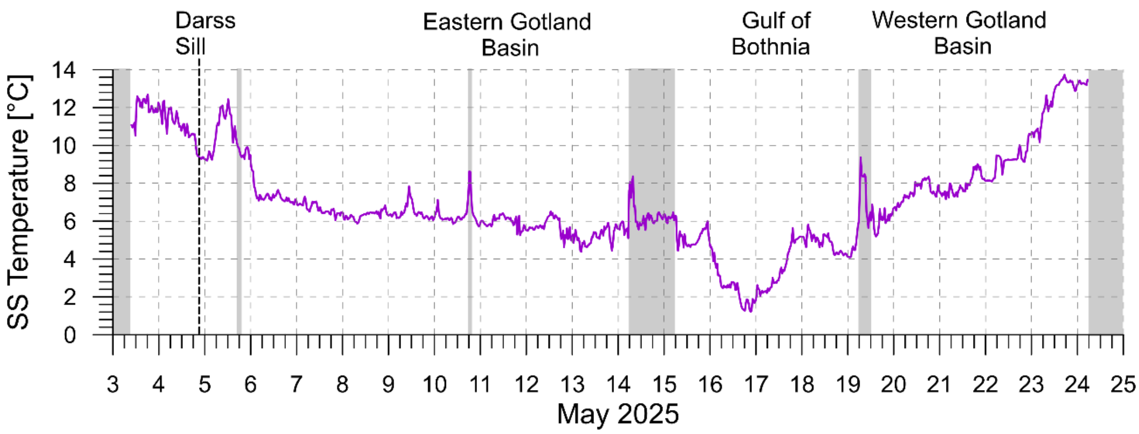


**Fig. 5.8** Surface temperature measured with the ship thermosalinograph of RV ELISABETH MANN BORGESE. The gray shaded area indicates the range below the density maximum at the sea surface.

The maximum surface salinity (SSS) in the western Baltic was only 13gkg$^{-1}$, indicating an outflow of brackish surface water in the transition zone to the North Sea. Between the Fehmarn Belt and the Darss Sill surface salinities ranged between 9 and 13 gkg$^{-1}$ (Fig. 5.9). The SSS dropped rapidly to about 8 gkg$^{-1}$at the Darss Sill. The Arkona Basin depicted an SSS about

8 gkg$^{-1}$ whereas it decreased to 7 gkg$^{-1}$ in the southern part of the Pomeranian Bight. Along the Thalweg from the eastern Arkona Basin till the southern Gotland Basin SSS values decreasing northward from 7.8 to 7.1 gkg$^{-1}$. In the Åland Sea the SSS amounted to about 6 gkg$^{-1}$. The Bothnian Sea and the Bothnian Bay depicted mean surface salinities of 5.5 and 3.2 gkg$^{-1}$, respectively. The minimum surface salinity was observed in the northern Bothnian Bay with about 3.0 gkg$^{-1}$

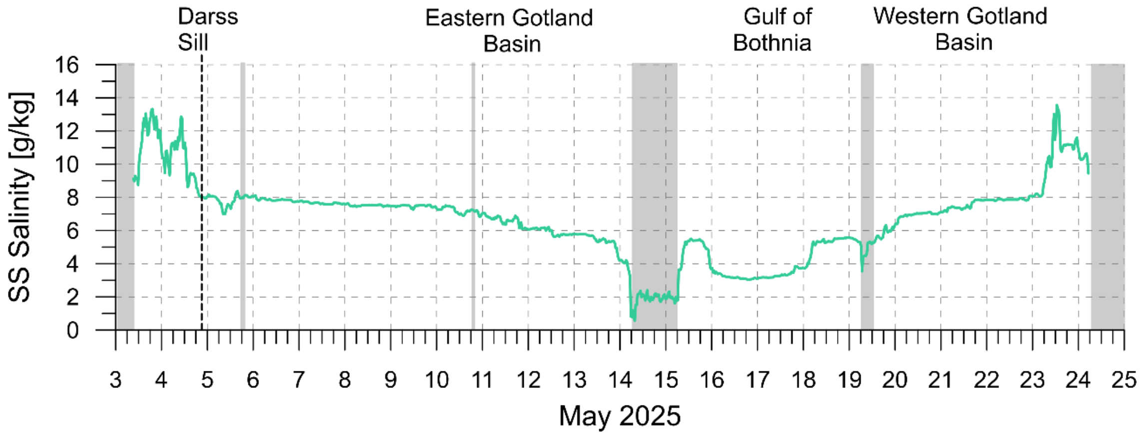


**Fig. 5.9** Surface salinity measured with the ship thermosalinograph of RV ELISABETH MANN BORGESE.

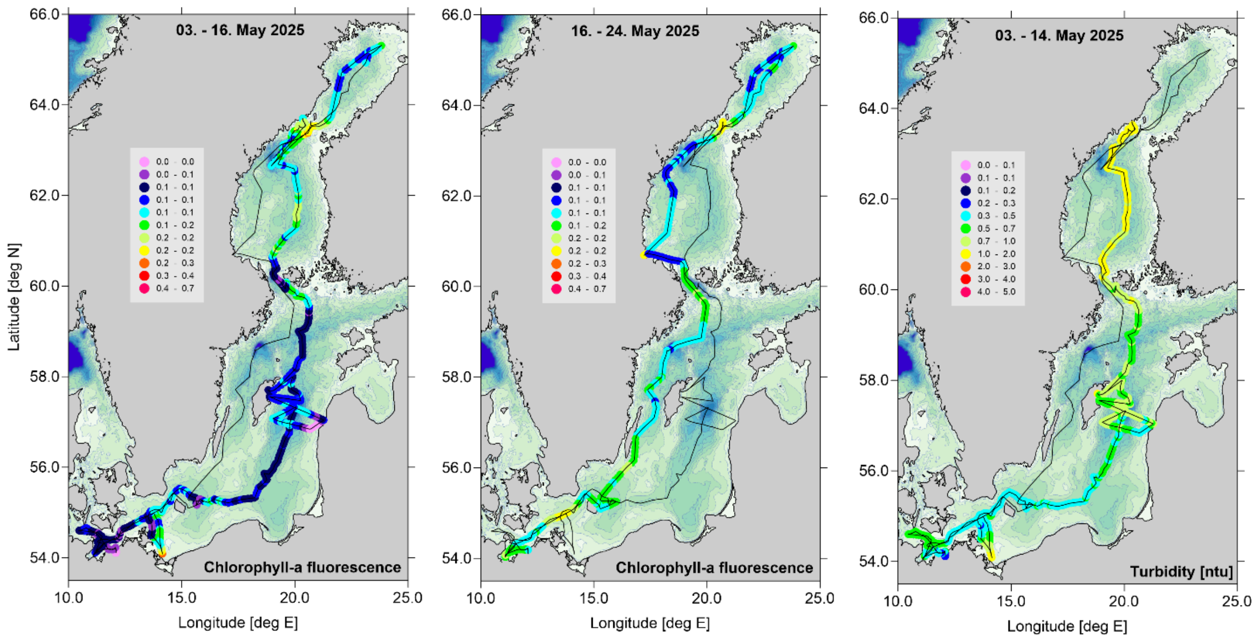


**Fig. 5.10** Surface chlorophyll-a fluorescence distribution (left and middle panel) and distribution of surface turbidity (right) along the cruise track of EMB356 in the Baltic (30 min averaged values).

The surface distribution of Chlorophyll-a fluorescence depicts the usual pattern for late spring conditions (Fig. 5.10 and Fig. 5.11). In the western and southern Baltic the peak of spring bloom has already passed. Thus, the surface Chlorophyll-a fluorescence was generally low. Only in the southern Pomeranian Bight significant levels of Chlorophyll-a fluorescence were observed. There were some patches of slightly increased Chlorophyll-a fluorescence in the Arkona Basin and Bornholm Basin. The Slupsk Furrow and the southern Gotland Basin depicted low primary productivity in the surface layer. In these areas the nitrate was exhausted in the surface layer. The eastern Gotland Basin depicted a patchy distribution of Chlorophyll-a fluorescence. Towards north the Chlorophyll-a fluorescence increased and reached local maxima in the Åland Sea, the Bothnian Sea and the Kvark. In the Bothnian Bay the spring bloom has just started at the time of the cruise. The surface turbidity was low in the western and southern Baltic, except in the southern Pomerania Bight. It increased northward until we reached the port of Umeå. After leaving the port on the next morning the turbidity readings were more that twice as high as before (Fig. 5.12). This is most probably a bias. However, we could not detect the reason for it. Thus, the turbidity data has to be used with caution.

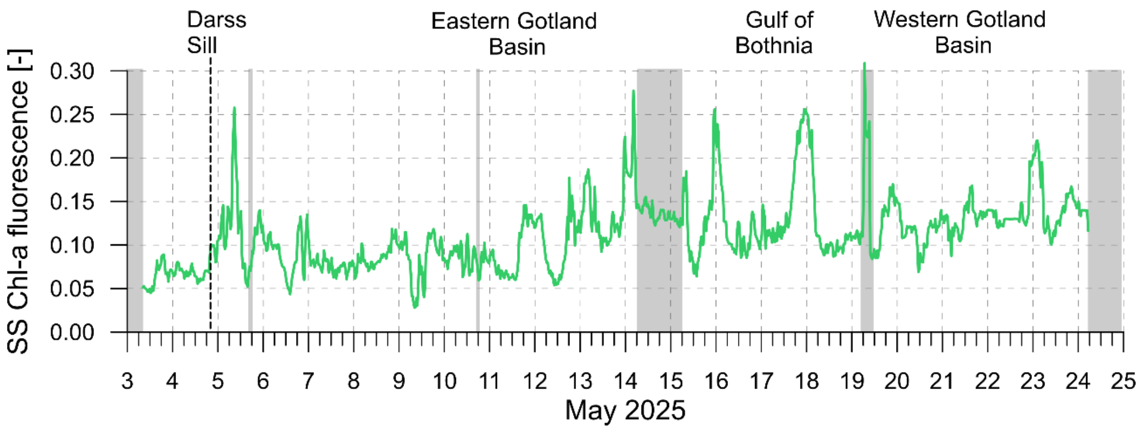


**Fig. 5.11** Surface chlorophyll-a fluorescence measured with the flow through fluorometer of RV ELISABETH MANN BORGESE.

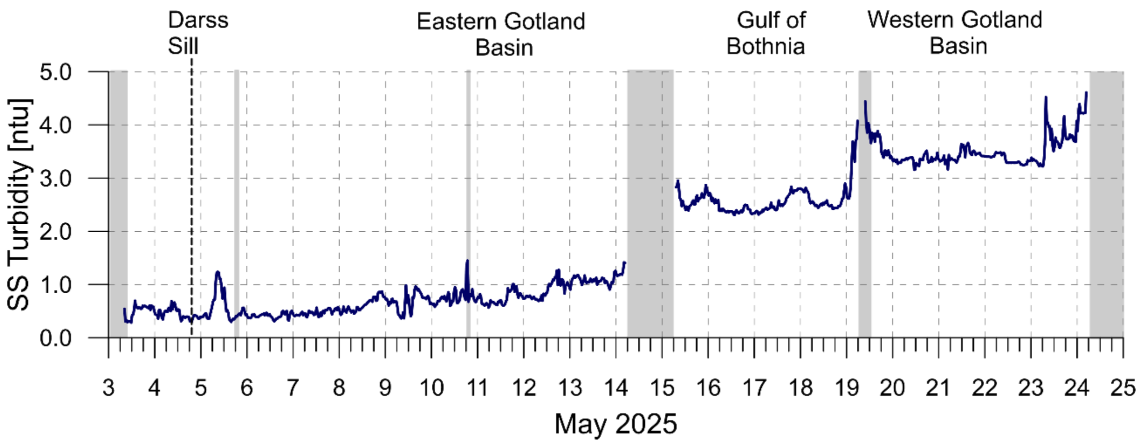


**Fig. 5.12** Surface turbidity measured with the flow through fluorometer of RV ELISABETH MANN BORGESE.

## 5.3 Observations at Main 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 main stations of the Baltic long term observation program. For positions of the particular stations refer to Fig. 3.1 and Table 7.1. In the depth-column the italic number in brackets shows the BottleID of the corresponding sample. Blue colored values in the oxygen column are hydrogen sulfide concentrations. The italic oxygen values in brackets depict the raw readings of the CTD oxygen sensor 0.

Conversion factors:

$\mu mol\ l^{-1}\ H_2S$ * -0.0448 = negative oxygen equivalent $ml\ l^{-1}\ O_2$

$\mu mol\ l^{-1}\ O_2$ * 0.0224 = $ml\ l^{-1}\ O_2$

The low nutrient concentrations in the western and central Baltic depicted the typical late spring conditions in surface water after the peak of the spring bloom. The nitrate is completely exhausted. The phosphate concentrations from the Kiel Bight to the Darss Sill remain at low level. Whereas the Arkona Basin, the Bornholm Basin and the Slupsk Furrow are characterized by higher excess phosphate. In the eastern Gotland Basin the phosphate concentration dropped slightly. The surface phosphate concentration in the Gulf of Bothnia were much lower, pointing to a low eutrophication of the Basin. In the Bothnian Sea the nitrate is also exhausted in the surface water. In contrast the Bothnian depicted high nitrate concentrations due to the early state of the spring bloom. Here the primary production appeared limited by the available phosphate.

Silicate concentrations in the Kiel Bight and the Mecklenburg Bight were low in surface waters. East of the Darss Sill the silicate surface concentrations increased significantly to a level of 14 to 16 µmol $l^{-1}$ that was observed throughout the central Baltic and in the Bothnian Sea. The Bothnian Bay depicted higher surface silicate concentrations of about 39 µmol $l^{-1}$.

**Table 5.1** Surface values of main hydrographic parameters at the main stations.

| **Area**<br>**Date** | **St. name**<br>**St. no.** | **Depth**<br>**[m]** | **Temp**<br>**[°C]** | **Sal**<br>**[psu]** | **$O_2$ / $H_2S$**<br>**[µmol $l^{-1}$]** | **$PO_4$**<br>**[µmol $l^{-1}$]** | **$NO_3$**<br>**[µmol $l^{-1}$]** | **$SiO_4$**<br>**[µmol $l^{-1}$]** |
|---|---|---|---|---|---|---|---|---|
| Kiel Bight<br>03.05.2025 | TF0360<br>EMB365_4 | 1.7<br>*(101)* | 12.38 | 11.56 | 316<br>*(319)* | 0.11 | 0.02 | 2.8 |
| Meckl. Bight<br>04.05.2025 | TF0012<br>EMB365_10 | 2.5<br>*(301)* | 11.97 | 11.10 | 323<br>*(320)* | 0.13 | 0.0 | 4.6 |
| Darss Sill<br>04.05.2025 | TF0001<br>EMB365_18 | 6.8<br>*(526)* | 10.12 | 10.91 | 341<br>*(340)* | 0.12 | 0.0 | 6.8 |
| Arkona Basin<br>04.05.2025 | TF0113<br>EMB365_22 | 1.7<br>*(651)* | 9.36 | 7.83 | 366<br>*(358)* | 0.34 | 0.0 | 14.0 |
| Bornholm Deep<br>06.05.2025 | TF0213<br>EMB365_48 | 1.6<br>*(1426)* | 7.29 | 7.77 | 375<br>*(372)* | 0.47 | 0.01 | 16.6 |
| Slupsk Furrow<br>07.05.2025 | TF0222<br>EMB365_57 | 2.08<br>*(1676)* | 6.88 | 7.68 | 386<br>*(382)* | 0.43 | 0.0 | 16.5 |
| SE Gotland Basin<br>07.05.2025 | TF0259<br>EMB365_63 | 1.9<br>*(1876)* | 7.01 | 7.57 | 390<br>*(383)* | 0.22 | 0.0 | 14.5 |
| SC Gotland Basin<br>08.05.2025 | TF0260<br>EMB365_73 | 2.1<br>*(2126)* | 6.00 | 7.52 | 392<br>*(383)* | 0.28 | 0.0 | 14.7 |
| Gotland Deep<br>08.05.2025 | TF0271<br>EMB365_78 | 1.8<br>*(2377)* | 6.46 | 7.43 | 397<br>*(393)* | 0.21 | 0.0 | 14.6 |
| Fårö Deep<br>10.05.2025 | TF0286<br>EMB365_93 | 1.4<br>*(2851)* | 6.04 | 6.85 | 394<br>*(390)* | 0.25 | 0.02 | 16.9 |
| Landsort Deep<br>20.05.2025 | TF0284<br>EMB365_160 | 0.9<br>*(4876)* | 8.26 | 7.02 | 387<br>*(376)* | 0.24 | 0.01 | 16.7 |
| W Gotland Basin<br>20.05.2025 | TF0240<br>EMB365_162 | 1.7<br>*(4951)* | 7.89 | 6.98 | 390<br>*(381)* | 0.21 | 0.01 | 17.0 |
| Karlsö Deep<br>21.05.2025 | TF0245<br>EMB365_164 | 1.5<br>*(5001)* | 7.27 | 7.28 | 380<br>*(373)* | 0.46 | 0.01 | 19.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Åland Deep<br>12.05.2025 | TF0605<br>EMB365_113 | 1.5<br>*(3367)* | 6.17 | 5.92 | -<br>*(400)* | 0.19 | 0.07 | 17.5 |
| S Bothnian Sea<br>12.05.2025 | TF0604<br>EMB365_118 | 1.2<br>*(3501)* | 4.87 | 5.66 | -<br>*(422)* | 0.13 | 0.02 | 19.9 |
| C Bothnian Sea<br>13.05.2025 | BS-10<br>EMB365_123 | 1.3<br>*(3676)* | 3.90 | 5.67 | -<br>*(428)* | 0.11 | 0.0 | 18.8 |
| Ulvön Trench<br>15.05.2025 | C3<br>EMB365_133 | 1.53<br>*(3926)* | 4.72 | 5.30 | 417<br>*(411)* | 0.03 | 0.0 | 17.6 |
| S Bothnian Bay<br>17.05.2025 | TF0602<br>EMB365_148 | 14<br>*(4426)* | 2.44 | 3.07 | 423<br>*(424)* | 0.06 | 5.01 | 39.1 |
| N Bothnian Bay<br>16.05.2025 | BoB-15<br>EMB365_143 | 1.4<br>*(4276)* | 1.88 | 3.05 | 428<br>*(423)* | 0.05 | 5.36 | 39.3 |

The bottom concentrations of nutrients are controlled mainly by the vertical position of the redox cline and the oxygen conditions. In the shallow areas of the western Baltic the bottom water depicted low nutrient concentrations, since the outflow brackish surface water dominated the area in early May. In the Bornholm Deep, the Slupsk Furrow and the southern Gotland Basin the nitrate and phosphate bottom concentration were at a high level. The silicate concentrations here were twice as heigh as in the Arkona Basin or the Mecklenburg Bight. In the anoxic basins of the central Baltic the phosphate bottom concentration increased heavily, and reached the maximum of 6.25µmol $l^{-1}$ in the Gotland Deep, where also the highest silicate concentrations were detected. The nitrate was completely removed from waters below the redox cline in the central Baltic. From the Åland Deep to the northern Bothnian Sea the nitrate and phosphate bottom concentrations were about 1.3 and 7 µmol $l^{-1}$ respectively. In the Bothnian Bay the bottom phosphate concentrations are at very low level although the nitrate concentration depicted the similar values as in the Bothnian Sea.

**Table 5.2** Bottom values of main hydrographic parameters at the main stations.

| **Area**<br>**Date** | **St. name**<br>**St. no.** | **Depth**<br>**[m]** | **Temp**<br>**[°C]** | **Sal**<br>**[psu]** | **$O_2$ / $H_2S$**<br>**[µmol $l^{-1}$]** | **$PO_4$**<br>**[µmol $l^{-1}$]** | **$NO_3$**<br>**[µmol $l^{-1}$]** | **$SiO_4$**<br>**[µmol $l^{-1}$]** |
|---|---|---|---|---|---|---|---|---|
| Kiel Bight<br>03.05.2025 | TF0360<br>EMB365_4 | 17.31<br>*(103)* | 5.86 | 17.73 | 250<br>*(246)* | 0.45 | 0.08 | 8.2 |
| Meckl. Bight<br>04.05.2025 | TF0012<br>EMB365_10 | 23.77<br>*(304)* | 5.78 | 20.66 | 207<br>*(197)* | 0.71 | 3.11 | 21.6 |
| Darss Sill<br>04.05.2025 | TF0001<br>EMB365_18 | 20.4<br>*(528)* | 7.42 | 14.02 | 307<br>*(305)* | 0.25 | 0.0 | 4.4 |
| Arkona Basin<br>04.05.2025 | TF0113<br>EMB365_22 | 44.87<br>*(657)* | 5.06 | 17.68 | 99<br>*(88)* | 0.84 | 0.88 | 28.3 |
| Bornholm Deep<br>06.05.2025 | TF0213<br>EMB365_48 | 87.8<br>*(1435)* | 8.21 | 15.85 | 55<br>*(56)* | 2.00 | 7.95 | 57.2 |
| Slupsk Furrow<br>07.05.2025 | TF0222<br>EMB365_57 | 89.5<br>*(1682)* | 8.66 | 13.88 | 47<br>*(46)* | 2.23 | 9.93 | 55.6 |
| SE Gotland Basin<br>07.05.2025 | TF0259<br>EMB365_63 | 87.6<br>*(1884)* | 7.05 | 11.58 | 39<br>*(36)* | 2.41 | 5.06 | 58.1 |
| SC Gotland Basin<br>08.05.2025 | TF0260<br>EMB365_73 | 140.6<br>*(2134)* | 7.28 | 12.19 | **144**<br>*(0)* | 5.00 | 0.0 | 72.25 |
| Gotland Deep<br>08.05.2025 | TF0271<br>EMB365_78 | 233.8<br>*(2311)* | 7.25 | 12.54 | **184**<br>*(0)* | 6.25 | 0.0 | 99.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Fårö Deep<br>10.05.2025 | TF0286<br>EMB365_93 | 189.5<br>*(2838)* | 7.24 | 11.98 | **117**<br>*(0)* | 4.90 | 0.0 | 80.5 |
| Landsort Deep<br>20.05.2025 | TF0284<br>EMB365_158 | 437.0<br>*(4812)* | 6.54 | 10.72 | **41**<br>*(0)* | 3.85 | 0.0 | 67.5 |
| W Gotland Basin<br>20.05.2025 | TF0240<br>EMB365_162 | 160.7<br>*(4960)* | 6.06 | 10.15 | **81**<br>*(0)* | 5.60 | 0.0 | 79.5 |
| Karlsö Deep<br>21.05.2025 | TF0245<br>EMB365_164 | 106.9<br>*(5008)* | 5.81 | 9.86 | **60**<br>*(0)* | 5.55 | 0.0 | 74.5 |
| Åland Deep<br>12.05.2025 | TF0605<br>EMB365_113 | 284.8<br>*(3388)* | 4.71 | 7.10 | 253<br>*(249)* | 1.31 | 6.68 | 34.4 |
| S Bothnian Sea<br>12.05.2025 | TF0604<br>EMB365_118 | 122.0<br>*(3508)* | 3.78 | 6.72 | -<br>*(248)* | 1.30 | 7.13 | 41.4 |
| C Bothnian Sea<br>13.05.2025 | BS-10<br>EMB365_123 | 122.8<br>*(3683)* | 3.84 | 6.70 | -<br>*(206)* | 1.24 | 6.91 | 43.0 |
| Ulvön Trench<br>15.05.2025 | C3<br>EMB365_133 | 194.7<br>*(3937)* | 3.75 | 6.57 | 223<br>*(202)* | 1.36 | 7.35 | 46.3 |
| S Bothnian Bay<br>17.05.2025 | TF0602<br>EMB365_148 | 103.6<br>*(4432)* | 0.74 | 3.89 | 394<br>*(388)* | 0.28 | 7.25 | 39.7 |
| N Bothnian Bay<br>16.05.2025 | BoB-15<br>EMB365_143 | 89.6<br>*(4282)* | 1.46 | 3.27 | 388<br>*(384)* | 0.15 | 6.85 | 41.5 |

The spatial distribution of bottom oxygen conditions derived from water bottle samples is given in Fig. 5.13. Due to the barocline summer and autumn inflows of 2024 the bottom water in the western Baltic was still oxygenated. Bottom oxygen concentrations in the Bornholm basin, the Slupsk Furrow and in the Southern Gotland Basin were on a low level. The bottom waters in the central Baltic were anoxic, containing high concentrations of hydrogen sulphide. Highest $H_2S$ concentrations were found in the Eastern Gotland Basin with about 184 µmol $l^{-1}$ in the Gotland Deep. In contrast the deep layers of the Åland Sea and the Gulf of Bothnia were well oxygenated (Table 5.2). Here the deep-water renewal during winter prevents long lasting stagnation periods.

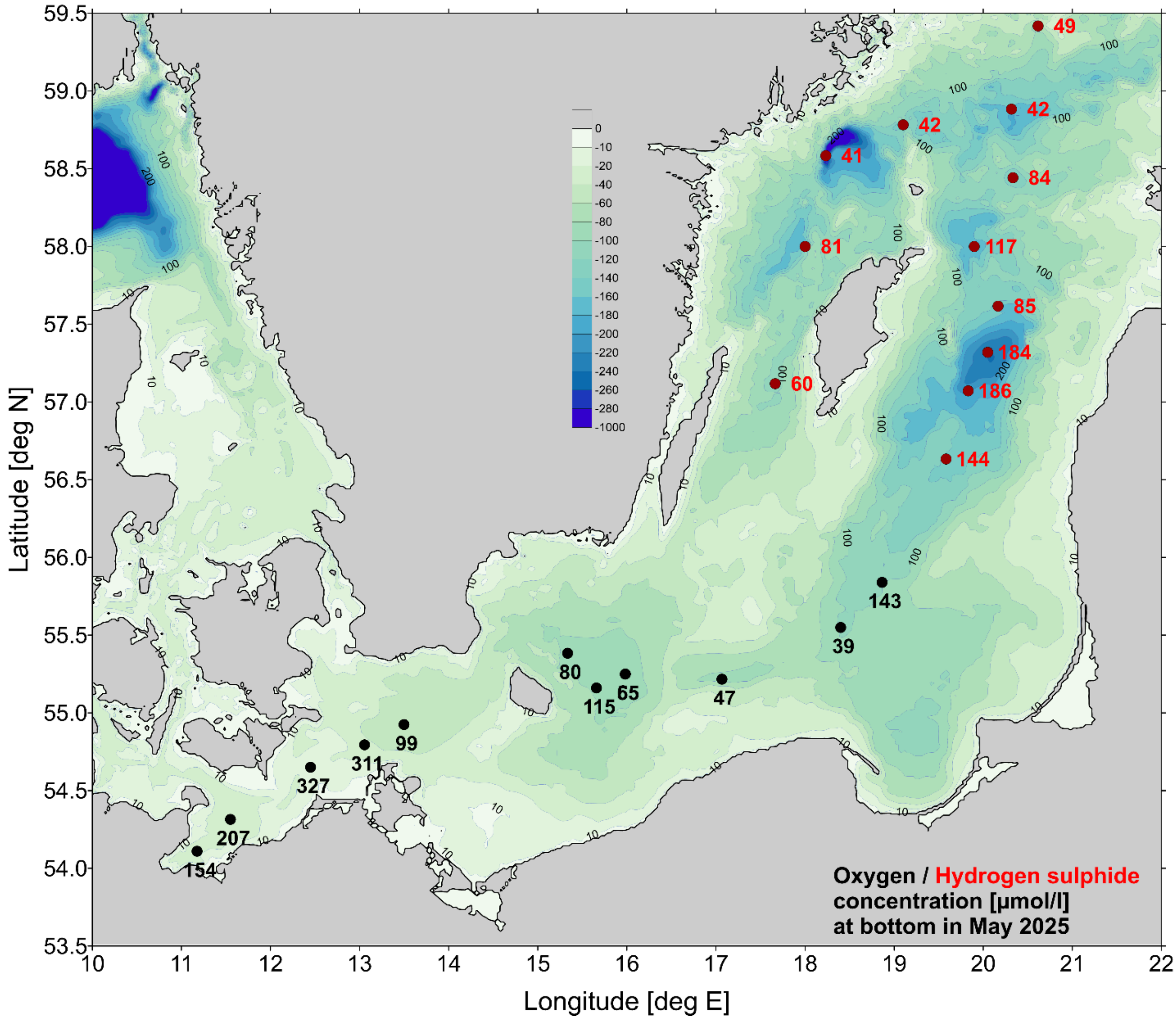


**Fig. 5.13** Distribution of oxygen (black labels) and hydrogen sulfide concentrations (red labels) near bottom at main stations of the long-term observation program.

## 5.4 Baltic Thalweg Transect

During the cruise 68 CTD stations were aligned along the thalweg transect from the Danish straits, through the western Baltic Sea, and further towards the northern Gotland basin. This transect supplies an excellent overview about the hydrographic and environmental state of the western and central Baltic Sea. And thus, it is worked as standard transect of the IOW long term observation program. The transect was worked as a nearly continuous sequence of stations, starting on 3$^{th}$ May in the Belt Sea and finished at 12$^{th}$ May in the northern Gotland Basin. The data supplies a quasi-synoptic picture of the hydrographic patterns along the Thalweg.

The observations of this cruise cover the late spring conditions after the peak of spring bloom in April (Fig. 5.14 and Fig. 5.15). The seasonal thermocline which separated the surface layer from the intermediate winter water was well developed all along the transect. Since the winter 2024/2025 was warmer than usual also the surface temperatures of the southern and central Baltic were well above the long year mean for May. In the western Baltic from the Fehmarn Belt to the Arkona Basin the thermocline was relatively shallow at about 12 to 15 m depth. Here the surface water temperature ranged from 12.1°C in the Belt Sea to 9.4°C in the Arkona Basin. The climatological mean is about 9.4°C in the Kiel Bight and 7.5°C for the Arkona Basin, which is roughly 2K lower than the observed values. The temperatures in the surface layer decreasing slightly towards east and north and the thermocline depth increased to about 35m. SST of about 7.3°C was found in the Bornholm basin, 1K above the climatological mean. The upper layer temperature in the eastern Gotland Basin dropped to 6.2°C at the station TF0271 (long-term mean: 5.7°C). At the Fårö Deep and in the northern Gotland Basin about 6°C were measured in the surface layer, which was about 1.5K above the climatological mean. Below the thermocline the water temperature ranged between 5 and 8°C in the wester Baltic. East of the Bornholmgat the temperature dropped in the core of intermediate winter water to 4.5°C in the Bornholm Basin and the eastern Gotland Basin and to 4.0°C in the northern Gotland Basin. Below the halocline the water temperature increased and varied between 6 and nearly 10°C. The highest temperatures were observed in the upper deep water of the Bornholm Basin (9.4°C) and at the bottom of the of the Slupsk Furrow with about 8.7°C. These water bodies are a mixture of the warm water that entered the Baltic with barocline summer inflows and the former saline deep waters of the Bornholm Basin.

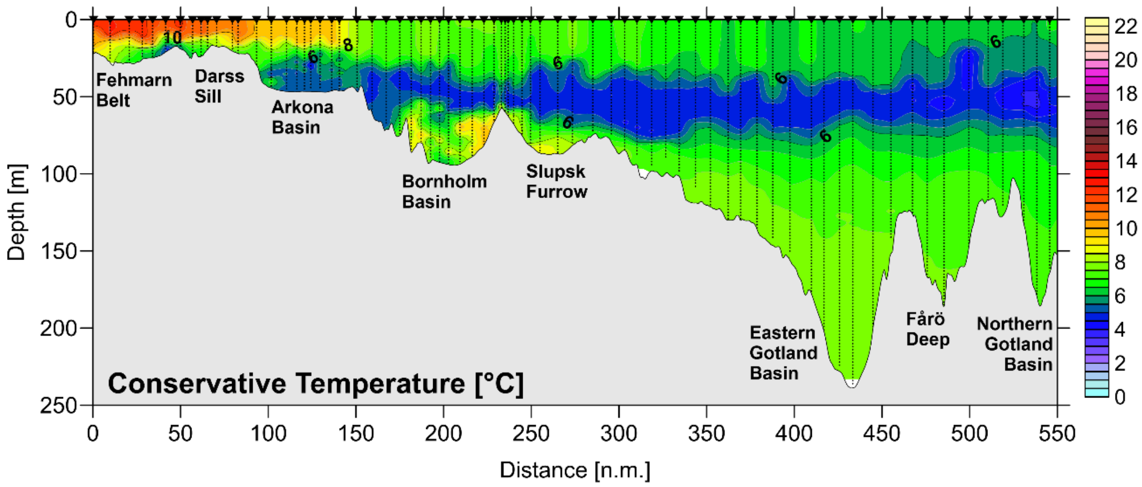


**Fig. 5.14** Distribution of conservative temperature along the talweg of the Baltic Sea from the Kiel bight to the northern Gotland Basin. The figure is based on the preliminary CTD data gathered from 03.05. - 11.05.2025.

In the eastern Gotland Basin the isotherms in the upper deep water were tilted towards north, indicating an ongoing inflow of warm saline water from the Slupsk furrow. The temperature maximum in the eastern Gotland Basin was found at 162m with 7.33°C. Towards the bottom the temperature decreased very slightly and was constant at 7.25°C in a 12m thick bottom layer of the Gotland deep. This value was rather persistent during the recent month, indicating long lasting stagnation. The bottom water in the Fårö Deep depicted a similar value of 7.24°C in a 14m thick bottom layer. This was also the maximum temperature observed below the cold intermediate water layer.

The salinity distribution in the western Baltic depicted the typical pattern for a baroclinic circulation, with outflowing brackish surface water and high saline water in the deep layer. The highest salinity along the thalweg was observed in the Fehmarn Belt at station TF0014 with a bottom salinity of 23.5 $gkg^{-1}$. Towards the Darss Sill the salinity decreased to about 14.1 $gkg^{-1}$. There were signs of a weak overflow at the Darss Sill towards the Arkona Basin. In its center

(Station TF0113) a patch of dense saline water bottom water of 10m thickness was found. Showing a maximum bottom salinity of 18.5 $gkg^{-1}$. The low temperature of the water body of 4.5°C indicated an origin of these water mass from an inflow in the early spring.

Although there was a small MBI (1.1Gt salt) the Bottom salinity in the Bornholm Basin was only slightly increased. The inflow waters could not replace the former bottom water completely (Fig. 5.15). The Bornholm Basin deep water consisted of a mixture of old deep water, warm halocline water and new inflow water. The temperature signature indicates an increasing fraction of inflow water in the center of the Bornholm Basin. Here the bottom salinity was about 15.8 $gkg^{-1}$. The halocline in the Bornholm Basin was found at about 55m which compares with the sill depth of the Slupsk Sill. Thus, we found only weak overflow of the Slupsk Sill. A small part of the warm halocline water has passed the Slupsk Sill and covers the bottom layer of the Slupsk Furrow. There were no signs of overflow at the eastern outlet of the Slupsk Furrow at the time of the cruise.

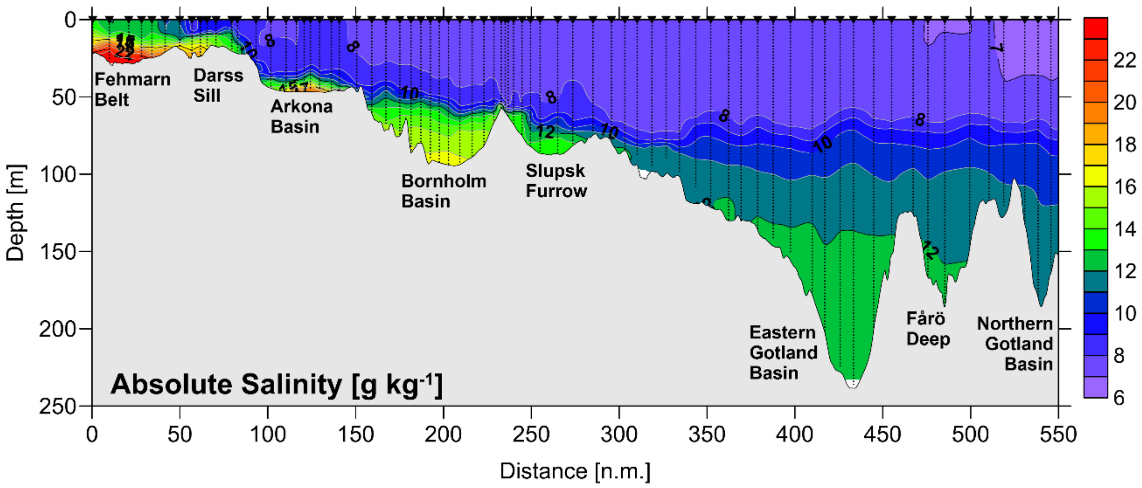


**Fig. 5.15** Distribution of Absolute salinity along the talweg of the Baltic Sea from the Kiel bight to the northern Gotland Basin. The figure is based on the preliminary CTD data gathered from 03.05. - 11.05.2025.

The deep and bottom layer of the eastern Gotland basin is covered by high saline waters from inflow series of the recent years. In the Gotland Deep bottom salinity of 12.6 $gkg^{-1}$ was observed. This is 0.2 $gkg^{-1}$ less than a year ago. The bottom salinity in the Gotland Deep decreases slowly, but continuously by mixing with the less saline deep water above. In the Fårö Deep the bottom salinity was about 12.0 $gkg^{-1}$.

The halocline in the central Baltic was found at a depth 60m in the eastern Gotland Basin and at about 65m in the western Gotland Basin (Landsort Deep). The vertical salinity gradient of the halocline decreases towards northern end of the transect.

The oxygen distribution along the central transect is shown in Fig. 5.16. Due to the minor barotropic inflow in December 2024 the western Baltic was well ventilated. The oxygen rich inflow waters mixed up with the halocline and bottom waters in the Bornholm Basin and caused a patchy distribution of oxygen concentration. The deep layer in the Bornholm basin depicted a highly variable oxygen concentration between 160 and 30 µmol $kg^{-1}$ dissolved oxygen. A similar patchy oxygen distribution was also found in the Slupsk Furrow deep water. Here the bottom oxygen concentrations ranged between 30 µmol $kg^{-1}$ in the western part and 60 to 90 µmol $kg^{-1}$ near the eastern outlet of the Slupsk Furrow.

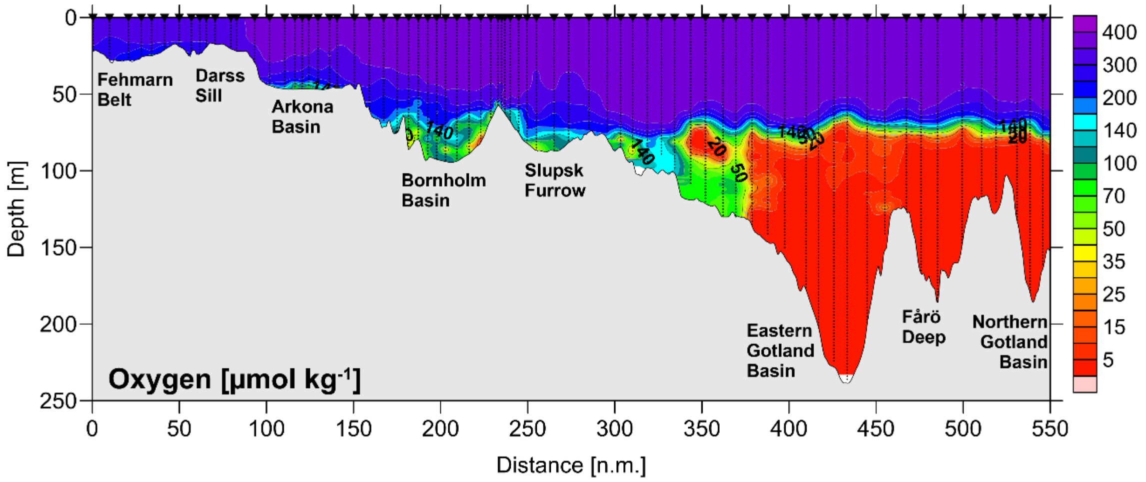


**Fig. 5.16** Distribution of oxygen concentration along the talweg of the Baltic Sea from the Kiel bight to the northern Gotland Basin. The figure is based on the preliminary CTD data gathered from 03.05. - 11.05.2025.

The front of eastward traveling inflow water has reached the rim of the eastern Gotland Basin. The highest bottom water oxygen concentrations were found in the southern Gotland Basin at station TF0258 with 150 µmol kg$^{-1}$. In the eastern Gotland Basin an extremely sharp oxycline was observed that coincided with the upper halocline. Within about ten meters the conditions changed from saturated upper layer to anoxic conditions below the upper halocline. At station Gotland Deep (TF0271) oxygen was exhausted below 70m depth. Free hydrogen sulfide was detected in deeper water samples. In the Fårö Deep and the northern Gotland Basin the anoxic waters start also at the upper halocline at about the same depth as in the Gotland Deep.

The surface layer of the Baltic is well ventilated, due to wind induced deep mixing during the winter and spring season.

The chlorophyll-a fluorescence along the transect was relatively low. In the western Baltic the Chlorophyll-a maximum was found at the bottom of the halocline. This indicated the end of the spring bloom when the nutrients were exhausted in the surface layer (Fig. 5.17). Chlorophyll-a fluorescence decreased along the thalweg towards the northern Gotland Basin.

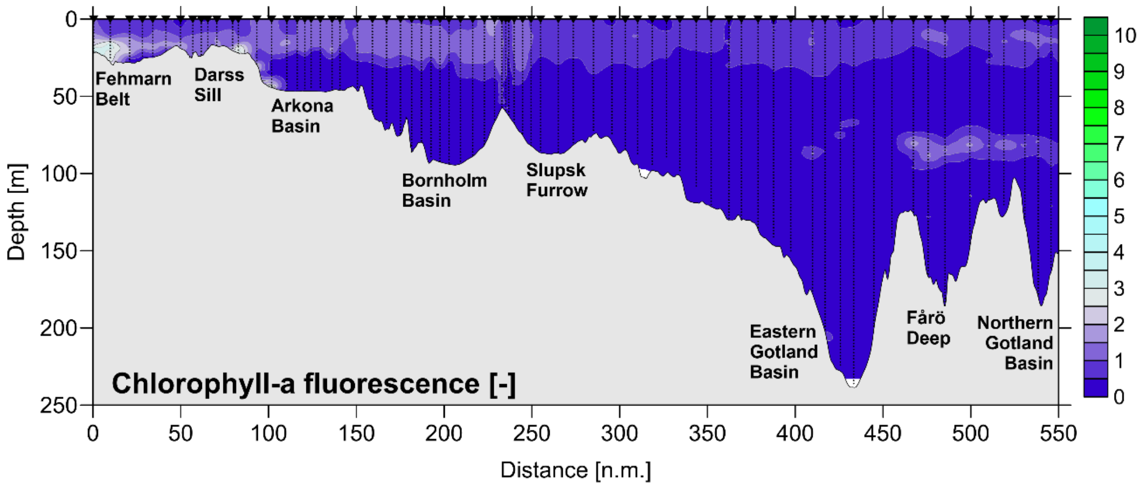


**Fig. 5.17** Distribution of Chlorophyll-a fluorescence along the talweg of the Baltic Sea from the Kiel bight to the northern Gotland Basin. The figure is based on the preliminary CTD data gathered from 03.05. - 11.05.2025.

The turbidity distribution in the Fehmarn Belt and Darss Sill area is confined to the pattern of high saline water. High turbidity values indicate the inflow water. This continued to the east where high turbidity indicated the spreading of inflow water along the bottom of the Slupsk Furrow and further into the southern Gotland Basin. In the in the central Baltic the patterns of high turbidity were found below the halocline at locations of interfaces between oxic, suboxic and anoxic waters. These turbidity patches indicate the depth level of the redoxcline between 80 and 140m. (Fig. 5.18).

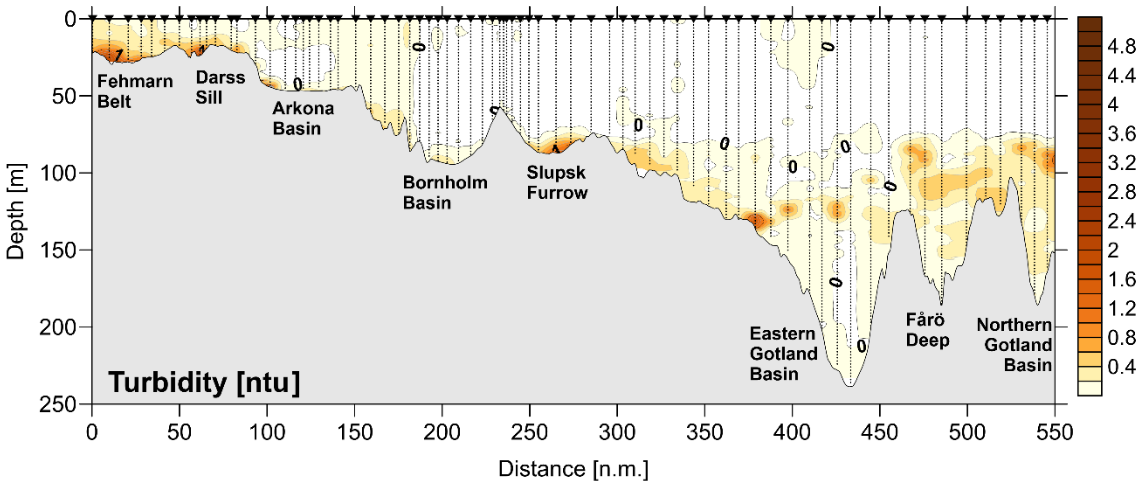


**Fig. 5.18** Distribution of turbidity along the talweg of the Baltic Sea from the Kiel bight to the northern Gotland Basin. The figure is based on the preliminary CTD data gathered from 03.05. - 11.05.2025.

Fig. 5.19 depicts the vertical profiles of temperature, salinity and oxygen concentration at the four main stations in the central Baltic. The surface water temperature increases from 6°C in the eastern Gotland basin and Fårö Deep to 7.2°C in the western Gotland Basin (Landsort Deep). This difference was caused by the temporal delay of two weeks between the observations in the eastern and western Gotland Basin. The depth of the thermocline varied between 25 and 45m. The core of the winter water layer was found between 55 and 60m depth (A). An extreme thermohaline gradient was established at the bottom of the mixed layer at the Gotland Deep and the Karlsö Deep. This was caused by wind driven mixing in the upper layer. The surface layer at the Fårö Deep and the Landsort Deep depicted a significant vertical gradient. Here the surface is covered by slightly less saline water. The vertical gradients in the halocline layer varied strongly between the four stations (B). The weakest vertical Gradient was found at Karlsö Deep. The highest salinity gradient was observed at the Gotland Deep. The current hydrographic conditions in the deep water of the central Baltic were established in the course of moderate inflow events during the recent years. However, since 2017 no fresh saline water has reached the deep water of the eastern Gotland Basin. The bottom temperatures and salinities at all stations are considerably higher than average (C). Recent inflows have only reached the halocline layer down to 150m depth, indicated by the higher variability of temperature and oxygen e.g. at the Gotland deep (D). The oxycline was found between 60m at Gotland deep and 80m depth in the western Gotland basin (Landsort Deep and Karlsö Deep). The deep-water layer in the central Baltic is characterized by the long-lasting stagnation and euxinic conditions (E).

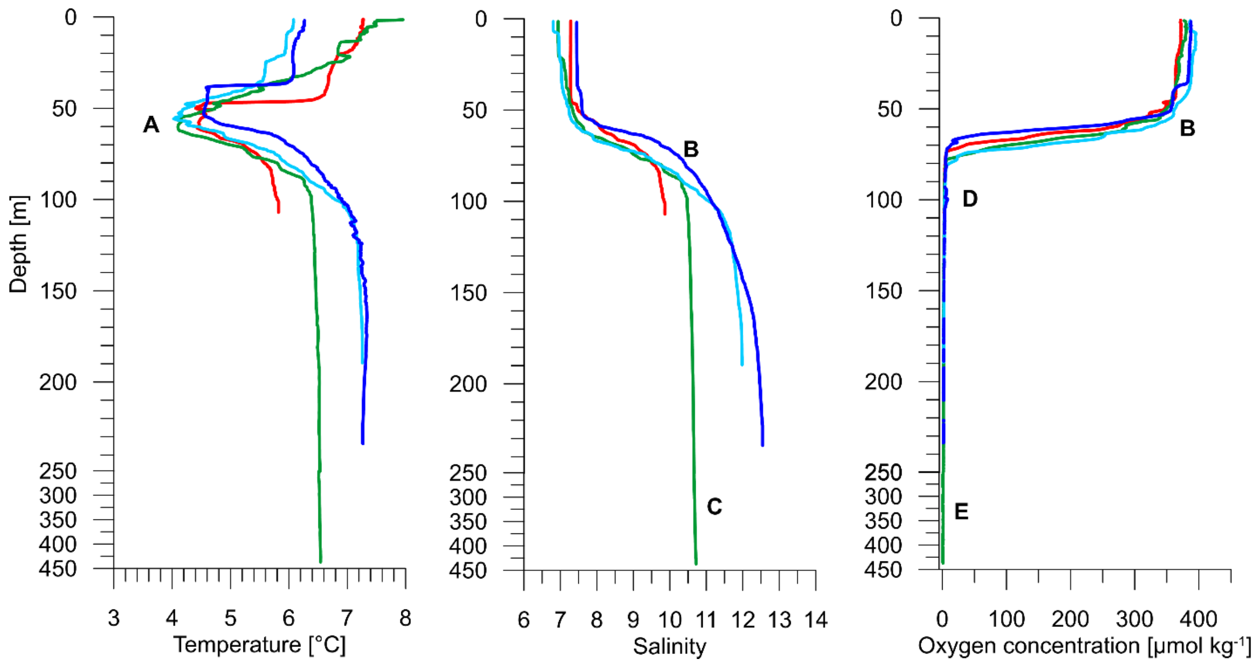


**Fig. 5.19** Vertical profiles of temperature, salinity and oxygen concentration (CTD data) at the main stations in the central Baltic. Gotland Deep TF0271 (blue), Fårö Deep TF0286 (cyan), Landsort Deep TF0284 (green), and Karlsö Deep TF0245 (red).

The different water masses observed during the cruise can be clearly identified using its temperature, salinity and oxygen signature. Fig. 5.20 gives an overview about the different water masses in two state diagrams. The following water bodies were identified and depicted in the figure:

A - Western Baltic surface water
B – Fehmarn Belt bottom water
C - Central Baltic surface water
D - Bornholm Basin bottom water
E - Bornholm Basin halocline water

F - Slupsk Furrow bottom water
G - EGB halocline water
H - EGB deep water
I - EGB bottom water

The waters of the December 2024 inflow cannot be clearly distinguished from ambient water bodies since they were mixed up with the former deep water of the Bornholm Basin. However, the Bornholm Basin bottom water (D) and the Slupsk Furrow bottom water (F) depicted a relatively high fraction of saline water from the December 2024 MBI (D). The water mass with highest density was found at the bottom of the Fehmarn Belt (B). The highest temperature change was found in the surface water from the western Baltic (A) towards the central Baltic (C). The stagnant deep and bottom waters in the eastern Gotland Basin were aligned as a straight mixing line with almost no fluctuations in the TS-diagram (G, H, I), indicating long lasting stable conditions.

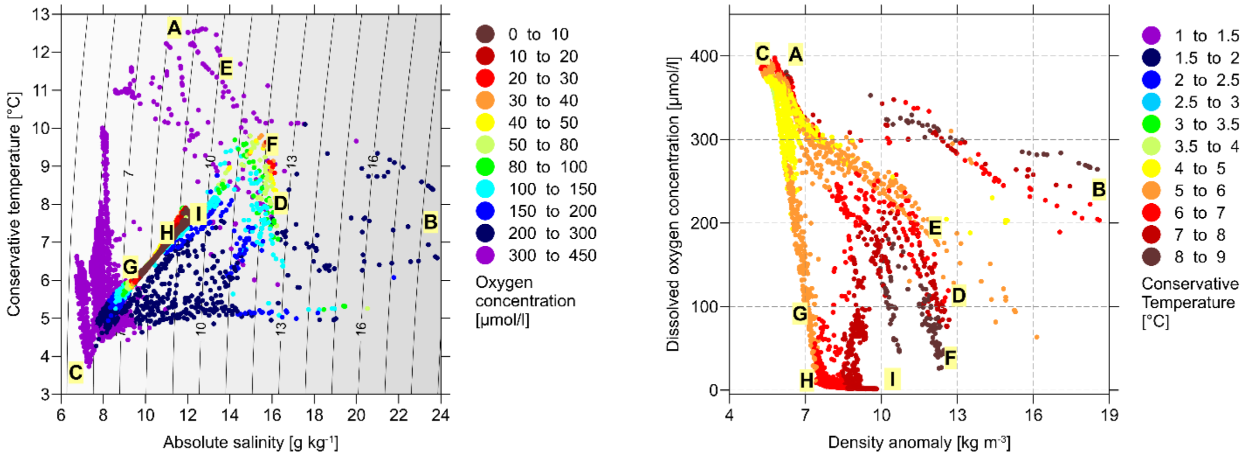


**Fig. 5.20** TS-diagram (left) and Oσ-diagram (right) of the Baltic transect. The capital letters indicate the different water masses (see text).

## 5.5 Southern Gotland Basin Transect

At the southern rim of the Eastern Gotland Basin (compare Fig. 3.1) a zonal CTD transect was performed during the night from 8$^{th}$ to 9$^{th}$ May, to obtain information about the hydrographic conditions at the entrance of the Eastern Gotland Basin. The surface water layer of about 30 to 35m thickness depicted a temperature of 6 and 7°C. The development of the seasonal thermocline was forced by the unusual warm spring. Below the thermocline the winter water core temperature was close to 4.5°C, which is also well above the long term mean. The halocline was found at 70m depth, separating the intermediate winter from the warm and salty deep water, that depicted a temperature and salinity of 7.3°C and 10 to 12.5 gkg$^{-1}$, respectively (Fig. 5.21). At the eastern rim of the transect weak signs of intrusions were indicated by a warm water plume of 7.5°C at 130m depth. This water originated from smaller inflows events of saline water from the North Sea during the previous summer and autumn. Along the entire section only weak horizontal gradient were observed.

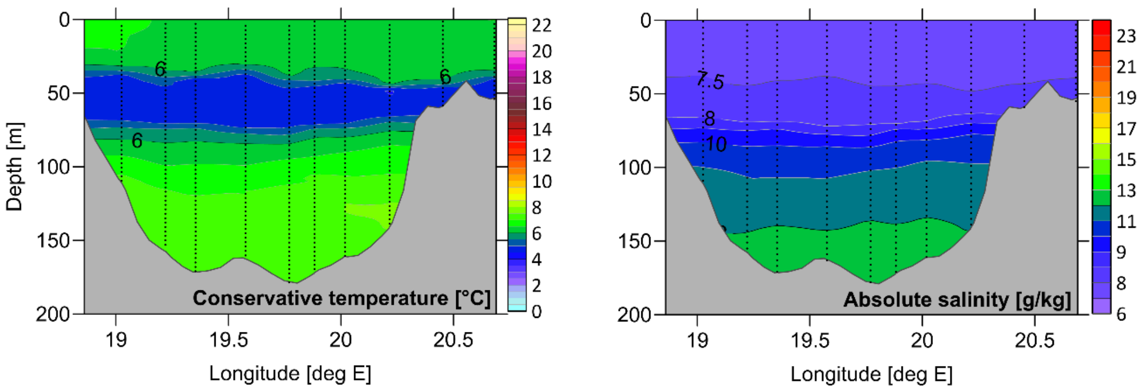


**Fig. 5.21** Temperature and salinity distribution along the zonal transect at the southern rim of the Eastern Gotland Basin (based on preliminary CTD data, 08.05. to 09.05.2025).

The patterns of the oxygen concentration was dominated by the position of the halocline that hampers the diapycnal mixing. The surface layer is well saturated due to the phytoplankton spring bloom and the exchange with the atmosphere. Also, the winter water layer was well ventilated. At the halocline at about 70m depth the oxygen concentration dropped rapidly to values below 5 µmol kg$^{-1}$ at 100m. The deep water was anoxic below 110m depth. Only at the eastern rim of the basin the oxygen concentration was above zero at this depth, indicating the inflow of a new water body. The Chlorophyll-a fluorescence values in the surface layer were still high, indicating that the spring bloom is well developed. A second layer of enhanced Chlorophyll-a fluorescence was found directly below the halocline (80 to 100m depth). This indicates the accumulation of sinking biomass from the spring bloom (Fig. 5.22).

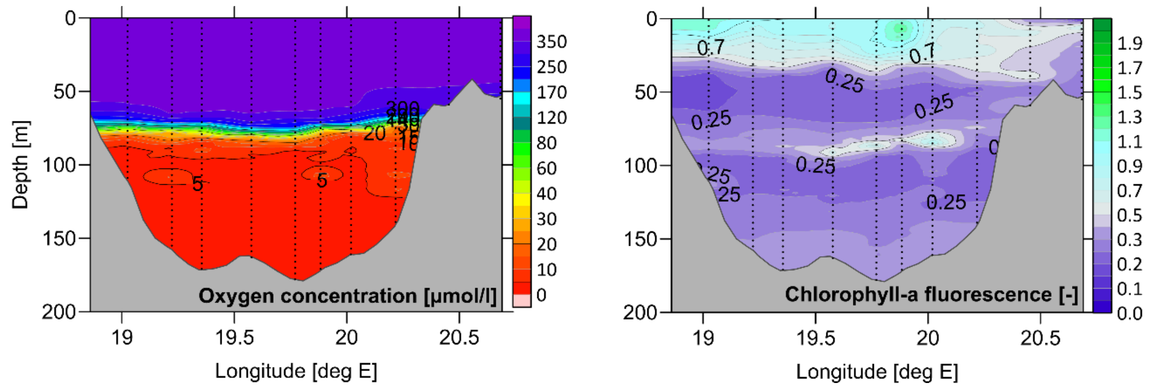


**Fig. 5.22** Dissolved oxygen and Chlorophyll-a fluorescence distribution along the zonal transect at the southern rim of the Eastern Gotland Basin (based on preliminary CTD data, 08.05. to 09.05.2025).

## 5.6 Gotland ScanFish Transect

Part of IOWs long term observation program are also high-resolution measurements of the hydrography in the Gotland Basin. Thus, a ScanFish transect was performed in the eastern Gotland basin crossing the Klintsbank and the Gotland Deep. This meridional cross section provided a spatially high-resolution distribution of hydrographic parameters. These data will be not discussed in detail here, but the main parameters are depicted in Fig. 5.23 and Fig. 5.24 to illustrate the high variability on scales, smaller than the usual CTD grid distance of 5 to 10 nautical miles.

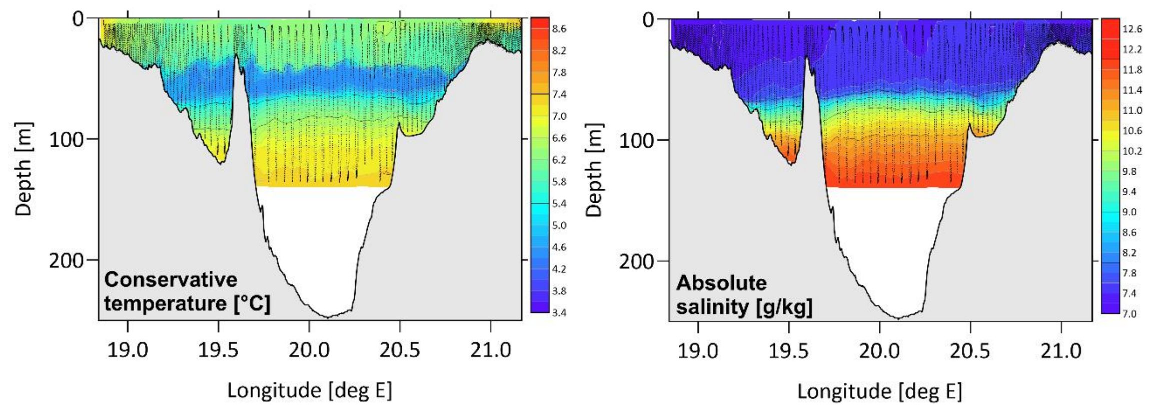


**Fig. 5.23** Temperature (left) and salinity distribution (right) along the ScanFish transect across the eastern Gotland basin, performed on 09./10.05.2025.

As expected, the highest temperature variability was found in the surface layer, with warm waters in the shallow coastal areas and lower surface temperatures in the central Basin. The thermocline at the bottom of the mixed layer depicted numerous vertical displacements, which hint to a high activity of mesoscale processes in the surface layer. The halocline showed a dome like structure caused by a basin scale cyclonal eddy. The same structure is seen in the distribution of dissolved oxygen and the shape of the oxycline. The chlorophyll-a distribution depicted highest concentrations in the surface layer with a slightly decreasing trend from west to east. Near the halocline the density gradient led to accumulation of sinking organic material the showed an enhanced Chlorophyll-a fluorescence.

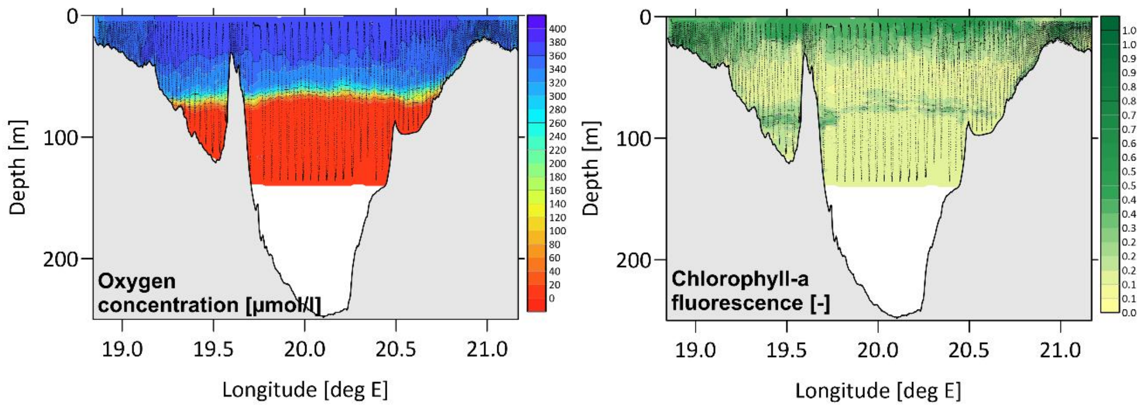


**Fig. 5.24** Distribution of dissolved oxygen (left) and Chlorophyll-a fluorescence (right) along the ScanFish transect across the eastern Gotland basin, performed on 09./10.05.2025.

## 5.7 Gulf of Bothnia

One of the major aims of EMB365 cruise was the extension of the long-term observation program to the Gulf of Bothnia. The Baltic thalweg transect, that usually ends in the northern Gotland Basin, was prolonged to the northern Bothnian Bay. About 50 additional CTD stations were performed in the Gulf of Bothnia. The observations were carried out between the 13th and the 17th May. Here the CTD data along the transect are briefly discussed. Due to their location in higher latitude and the long distance to the western Baltic temperature and salinity are significantly lower than in the Baltic proper. The surface temperature in the Bothnian Sea ranged between 4 to 5.5°C and between 3.5 and 1.5°C in the Bothnian Bay (Fig. 5.25). In the latter the surface temperature was well below the temperature of maximum density. Thus, in contrast to the Bothnian Sea the warming of the surface layer cause vertical convection and ventilation of the deeper layers in the Bothnian Bay. However, due to the higher bottom salinity the bottom layer was not reached by this process. In the Bothnian Sea the seasonal warming has established a seasonal thermocline at about 20 to 30m depth that hampered the deep mixing and supported a fast warming of the surface layer.

In the Bothnian Sea a pronounced winter water layer was found between 40 and 80m depth with core temperatures of about 2.5 to 3.0°C. The depth of the winter water core increased from north to south. The deepest parts of the Bothnian Sea were covered by warmer (4°C) and saltier water. The general stratification in the Bothnian Sea depicts large similarities to that of the Baltic Propper. The salinity distribution showed in both basins the typical patterns of estuarine circulation.

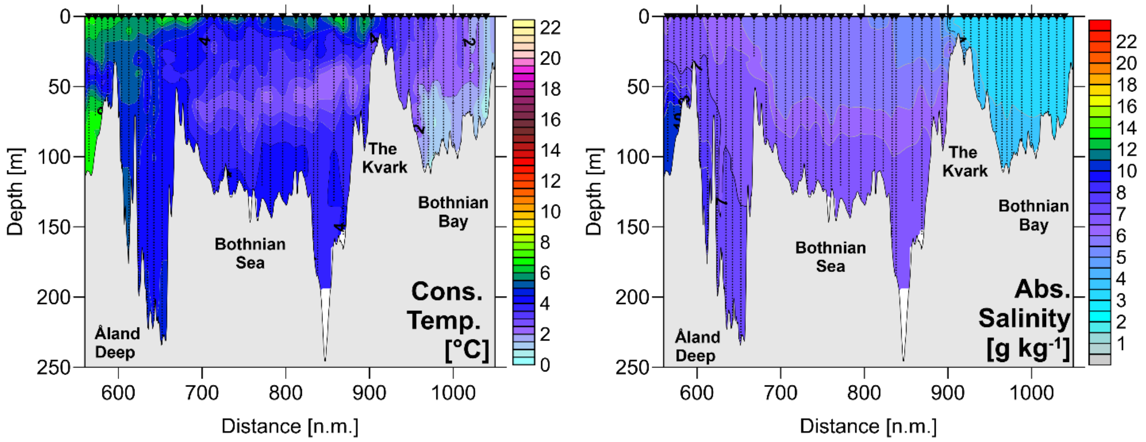


**Fig. 5.25** Temperature and salinity distribution along the thalweg transect from the Aland Deep to the Bothnian Bay (based on preliminary CTD data, 13.05. and 17.05.2025).

The deep water in the basins is formed by the surface water of the southward adjacent basin with higher salinity. Due to the short distances and traveling times, the ventilation of deep water in the Bothnian Sea and Bothnian Bay is quite effective compared to the Gotland Basin. Even in the deepest parts with 200m water depth and more the oxygen concentration exceeded 200 µmol $kg^{-1}$. Surface oxygen concentrations were found well above 400 µmol $kg^{-1}$ (Fig. 5.26). However, comparisons with long term time series hint to a decreasing trend of bottom water oxygen concentrations in the Bothnian Sea. The distribution of Chlorophyll-a fluorescence indicates the onset of spring bloom. The highest values were observed in the shallow areas of the Åland Sea and the Kvark, which depicted also the highest surface temperatures and a stronger thermal stratification.

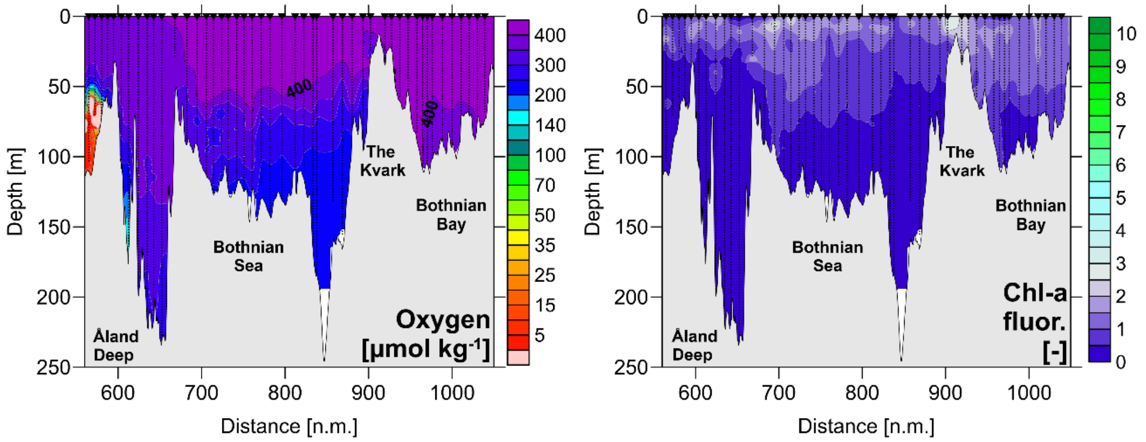


**Fig. 5.26** Dissolved oxygen and Chlorophyll-a fluorescence distribution along the thalweg transect from the Aland Deep to the Bothnian Bay (based on preliminary CTD data, 13.05. and 17.05.2025).

## 5.8 Microstructure Observations (Åland Deep Transect)

The hydrographic conditions in the Åland Deep at the transition from the Baltic Proper to the Gulf of Bothnia were investigated with a microstructure profiler (MSS). A high resolution transect across the southern Åland Basin was performed on 12th May. It consists of 70 profiles that cover the entire depth range from the surface to the sea bed. The Åland Basin is the first oxygenated Basin north of the anoxic areas of the central Baltic. The deep water in the Åland

Sea is formed from the surface water in the Baltic Propper. Our observations depicted a decreasing oxygen concentration towards the deep water (Fig. 5.27). The lowest oxygen concentrations were found in the center of the transect. At the rim of the Basin the eddy viscosity was enhanced. This indicated an enhanced diapycnal mixing at the rims. This mixing caused a downward oxygen transport that supported also by the higher oxygen concentration at the basin rim.

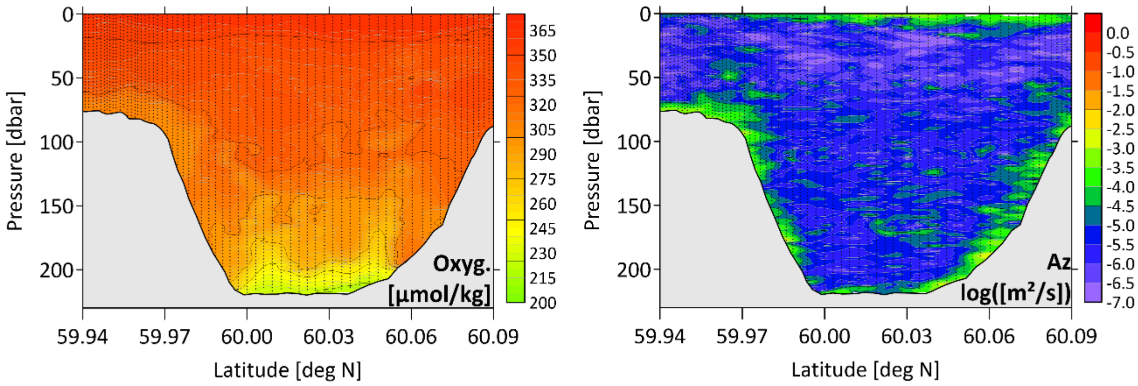


**Fig. 5.27** Oxygen distribution and patterns of eddy diffusivity along the microstructure transect across the southern Åland Sea.

## 5.9 Long-Term Investigations of $CH_4$, $N_2O$ and $CO_2$ Distribution

Sampling for simultaneous $CH_4$, $N_2O$ and $CO_2$ observation was carried out in frame of an extension to the long-term data collection program at the four central stations of the Arkona Basin, the Bornholm Basin, the Eastern Gotland Basin and the Fårö Deep. The sampled stations are indicated in Table 7.1 with the abbreviation "TG". One complete depth profile was sampled at station TF0271 for the long-term data collection of CT, AT, and pH.
These samples were fixed with 500 µL saturated $HgCl_2$-solution to prevent microbiological activity and stored dark.

## 5.10 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 vertical high resolution sampling of the redoxcline at Gotland Deep (TF0271) and Landsort Deep (TF0284) 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.

## 5.11 Plankton Sampling

Plankton sampling was performed by means of a rosette sampler (combined with CTD) as well as with small phytoplankton nets (PLA, APNET) and a zooplankton net (WP2). Samples were taken from different depths in order to get representative data from the euphotic zone. Additionally, samples for micro biological analyses were taken at some stations in the central Baltic. The analysis of these samples will be performed after the cruise. Thus, no preliminary results of this program are presented here. Responsible scientists at IOW are Dr. Anke Kremp (phytoplankton) and Dr. Jörg Dutz (zooplankton).

In the northern Baltic at three stations comparison measurements of phyto- and zooplankton were performed. At the station C3, C24 and A13 plankton samples and samples for Chlorophyll-a analysis were taken by the IOW and the UMF stuff with the same nets and methods.

## 5.12 eDNA Sampling

During the cruise, samples were collected in German territorial waters and in the EEZ for the analysis of environmental DNA (eDNA).

Prokaryotic microbes, bacteria, including cyanobacteria and archaea, are important drivers of carbon and nutrient biogeochemistry and account for a large proportion of pelagic biomass and productivity. However, with the exception of filamentous cyanobacteria (see e.g. HELCOM), which are mainly monitored for their socio-economic importance, microbes and the fundamental processes they drive are generally ignored as environmental indicators in the Baltic Sea. Microbes are present in the pelagic in an annually recurring spatial and temporal pattern, which has been convincingly demonstrated by current molecular methods. Due to the different growth requirements and the high turnover rate of microorganisms, marine microbial communities react dynamically and rapidly to environmental changes. As the combined gene pool maintained and expressed by the microbes can now be identified using modern molecular techniques, biogeochemical pathways and informative indicator genes can be identified that are closely linked to environmental conditions and nutrient biogeochemistry in the different basins of the Baltic Sea. The aim of the eDNA sampling is to utilise this information in future monitoring approaches and to use the microbial characteristics as an indicator for the health status of the German Baltic Sea.

For the eDNA Bioarchive, surface and deep-water samples are filtered via 0.45 µm cellulose acetate filters (Ø47 mm) and 0.2 µm polycarbonate filters (Ø47 mm) using either Nalgene Bottletop filtration units or the 'SciFi' (= the simple scientific filtration device). Two filters of each filter size were collected per station and water depth. The 0.45 µm filter filters 1 litre and the 0.2 µm filter filters 250 mL of water. In addition, a metazoan bioarchive is set up, for which 2x 2 litres of surface water per station were filtered through 0.45 µm nitrocellulose filters. The water volumes for the filtration were obtained from the regular station CTD; no additional CTD cast was performed.

To establish a microbiome bioarchive of the Baltic Sea for the metaproteomic recording of anthropogenic environmental changes, 60 litres of surface water were filtered sequentially through 10 µm, 3 µm and 0.2 µm polycarbonate filters (Ø142 mm). This filtration was operated in parallel with three compressed air pumps. For this large volume of water, an extra CTD was performed. This sampling was conducted at three stations.

All collected filters were frozen at -20 °C on the research vessel and then stored at -80 °C. The processing and analysis of the filters will be performed after the cruise at the IOW. The stations where eDNA was sampled are indicated in Table 7.1.

# 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 Lists EMB356

## 7.1 Overall Station List

Table 7.1 list all stations and deployments carried out during the cruise EMB365. Standard sampling consisted of a single CTD cast. Nutrient samples at fixed standard depth were taken at selected stations, indicated by N. At some stations a number of additional chemical and biological samplings were performed. These tasks are indicated in the last column of Table 7.1.

***Used gears:***

- CTD - CTD probe with rosette water sampler
- SD - Secci disk
- PLA - Phytoplankton net
- WP2 - WP2 net for Zooplankton sampling
- SCF - ScanFish undulating CTD deployment
- MSS - Microstructure profiler

***Additional sampling program on selected stations:***

- CC - Comparison measurements for CTD data quality assurance
- N - Nutrient sampling ($NO_3$, $NO_4$, $NH_4$, $PO_4$, $SiO_4$, $O_2$)
- HS - $H_2S$ sampling
- TG - Trace gas sampling ($CH_4$, $N_2O$ and $CO_2$)
- eDNA - environmental DNA sampling

**Table 7.1** List of stations and gears

| Station No. | Station name | Gear | Date/Time | Latitude | Longitude | Water Depth | Remarks |
|---|---|---|---|---|---|---|---|
| EMB | IOW | | [UTC] | | | [m] | |
| EMB365_1-1 | TFO5 | CTD | 03.05.2025 08:12 | 54° 13.90'N | 012° 04.49'E | 10.0 | N, eDNA |
| EMB365_1-2 | TFO5 | SD | 03.05.2025 08:12 | 54° 13.89'N | 012° 04.49'E | 9.0 | |
| EMB365_2-1 | NHBoje | CTD | 03.05.2025 09:17 | 54° 10.70'N | 011° 57.60'E | 8.0 | |
| EMB365_3-1 | TF0018 | CTD | 03.05.2025 10:26 | 54° 11.02'N | 011° 46.08'E | 17.0 | |
| EMB365_4-1 | TF0360 | CTD | 03.05.2025 16:45 | 54° 35.99'N | 010° 27.02'E | 15.0 | |
| EMB365_4-2 | TF0360 | SD | 03.05.2025 16:46 | 54° 35.98'N | 010° 27.01'E | 15.0 | |
| EMB365_4-3 | TF0360 | PLA | 03.05.2025 16:50 | 54° 35.98'N | 010° 27.01'E | 15.0 | |
| EMB365_4-4 | TF0360 | WP2 | 03.05.2025 17:07 | 54° 35.97'N | 010° 27.01'E | 15.0 | |
| EMB365_5-1 | TF0361 | CTD | 03.05.2025 18:47 | 54° 39.88'N | 010° 46.75'E | 21.0 | N |
| EMB365_6-1 | TF0014 | CTD | 03.05.2025 20:04 | 54° 35.61'N | 011° 01.02'E | 24.0 | eDNA |
| EMB365_7-1 | TF0010 | CTD | 03.05.2025 21:38 | 54° 33.07'N | 011° 19.27'E | 25.0 | N, eDNA |
| EMB365_8-1 | TF0013 | CTD | 03.05.2025 22:56 | 54° 28.32'N | 011° 29.11'E | 24.0 | |

| Station No. | Station name | Gear | Date/Time | Latitude | Longitude | Water Depth | Remarks |
|---|---|---|---|---|---|---|---|
| EMB | IOW | | [UTC] | | | [m] | |
| EMB365_9-1 | TF0022 | CTD | 04.05.2025 02:26 | 54° 06.60'N | 011° 10.55'E | 20.0 | CC |
| EMB365_10-1 | TF0012 | CTD | 04.05.2025 04:51 | 54° 18.88'N | 011° 33.03'E | 22.0 | N, eDNA |
| EMB365_10-2 | TF0012 | SD | 04.05.2025 04:54 | 54° 18.87'N | 011° 33.03'E | 21.0 | |
| EMB365_10-3 | TF0012 | PLA | 04.05.2025 04:55 | 54° 18.86'N | 011° 33.03'E | 21.0 | |
| EMB365_10-4 | TF0012 | WP2 | 04.05.2025 05:10 | 54° 18.90'N | 011° 33.00'E | 22.0 | |
| EMB365_10-5 | TF0012 | WP2 | 04.05.2025 05:16 | 54° 18.90'N | 011° 33.00'E | 22.0 | |
| EMB365_10-6 | TF0012 | CTD | 04.05.2025 05:29 | 54° 18.90'N | 011° 33.00'E | 21.0 | |
| EMB365_11-1 | TF0011 | CTD | 04.05.2025 10:03 | 54° 24.70'N | 011° 37.13'E | 22.0 | |
| EMB365_12-1 | TF0017 | CTD | 04.05.2025 11:11 | 54° 23.57'N | 011° 49.54'E | 19.0 | |
| EMB365_13-1 | TF0041 | CTD | 04.05.2025 12:20 | 54° 24.42'N | 012° 03.82'E | 16.0 | N |
| EMB365_14-1 | TF0046 | CTD | 04.05.2025 13:34 | 54° 28.18'N | 012° 14.43'E | 26.0 | N, eDNA |
| EMB365_14-2 | TF0046 | SD | 04.05.2025 13:35 | 54° 28.19'N | 012° 14.43'E | 26.0 | |
| EMB365_14-3 | TF0046 | PLA | 04.05.2025 13:39 | 54° 28.20'N | 012° 14.43'E | 26.0 | |
| EMB365_14-4 | TF0046 | WP2 | 04.05.2025 13:51 | 54° 28.22'N | 012° 14.47'E | 25.0 | |
| EMB365_15-1 | TF0083 | CTD | 04.05.2025 14:39 | 54° 32.96'N | 012° 16.46'E | 23.0 | |
| EMB365_16-1 | TF0033 | CTD | 04.05.2025 15:24 | 54° 36.26'N | 012° 19.79'E | 17.0 | |
| EMB365_17-1 | TF0002 | CTD | 04.05.2025 16:12 | 54° 39.01'N | 012° 26.99'E | 15.0 | N, eDNA |
| EMB365_18-1 | TF0001 | CTD | 04.05.2025 17:28 | 54° 41.83'N | 012° 41.73'E | 19.0 | N, eDNA |
| EMB365_19-1 | TF0030 | CTD | 04.05.2025 18:07 | 54° 43.44'N | 012° 46.86'E | 20.0 | |
| EMB365_19-2 | TF0030 | PLA | 04.05.2025 18:11 | 54° 43.43'N | 012° 46.89'E | 20.0 | |
| EMB365_19-3 | TF0030 | CTD | 04.05.2025 18:33 | 54° 43.40'N | 012° 47.01'E | 20.0 | eDNA |
| EMB365_20-1 | TF0115 | CTD | 04.05.2025 19:58 | 54° 47.67'N | 013° 03.34'E | 27.0 | N, eDNA |
| EMB365_21-1 | TF0114 | CTD | 04.05.2025 21:16 | 54° 51.58'N | 013° 16.50'E | 43.0 | N, eDNA |
| EMB365_22-1 | TF0113 | CTD | 04.05.2025 22:43 | 54° 55.48'N | 013° 29.92'E | 45.0 | N, TG |
| EMB365_22-2 | TF0113 | CTD | 04.05.2025 23:26 | 54° 55.50'N | 013° 30.06'E | 46.0 | eDNA |
| EMB365_23-1 | TF0122 | CTD | 05.05.2025 00:46 | 54° 59.32'N | 013° 46.19'E | 46.0 | CC |
| EMB365_24-1 | ABBoje | CTD | 05.05.2025 02:01 | 54° 52.82'N | 013° 51.38'E | 44.0 | |
| EMB365_25-1 | TF0112 | CTD | 05.05.2025 03:03 | 54° 48.26'N | 013° 57.47'E | 38.0 | N, eDNA |
| EMB365_25-2 | TF0112 | CTD | 05.05.2025 03:25 | 54° 48.19'N | 013° 57.63'E | 38.0 | |
| EMB365_26-1 | TF0150 | CTD | 05.05.2025 04:58 | 54° 36.67'N | 014° 02.54'E | 19.0 | |
| EMB365_27-1 | OBBoje | CTD | 05.05.2025 08:36 | 54° 05.05'N | 014° 08.86'E | 12.0 | |
| EMB365_28-1 | TF0160 | CTD | 05.05.2025 10:10 | 54° 14.46'N | 014° 04.09'E | 11.0 | |
| EMB365_29-1 | TF0123 | CTD | 05.05.2025 15:38 | 54° 47.98'N | 013° 39.12'E | 41.0 | |
| EMB365_30-1 | TF0113 | CTD | 05.05.2025 17:04 | 54° 55.52'N | 013° 30.04'E | 45.0 | |
| EMB365_30-2 | TF0113 | SD | 05.05.2025 17:07 | 54° 55.52'N | 013° 30.02'E | 45.0 | |
| EMB365_30-3 | TF0113 | PLA | 05.05.2025 17:08 | 54° 55.52'N | 013° 30.01'E | 45.0 | |
| EMB365_30-4 | TF0113 | WP2 | 05.05.2025 17:19 | 54° 55.48'N | 013° 30.03'E | 45.0 | |
| EMB365_30-5 | TF0113 | WP2 | 05.05.2025 17:27 | 54° 55.48'N | 013° 29.98'E | 45.0 | |
| EMB365_31-1 | TF0105 | CTD | 05.05.2025 18:30 | 55° 01.51'N | 013° 36.51'E | 44.0 | N |
| EMB365_32-1 | TF0104 | CTD | 05.05.2025 19:40 | 55° 04.08'N | 013° 48.88'E | 44.0 | N |
| EMB365_33-1 | TF0103 | CTD | 05.05.2025 20:41 | 55° 03.88'N | 013° 59.39'E | 44.0 | N |
| EMB365_34-1 | TF0109 | CTD | 05.05.2025 21:38 | 55° 00.05'N | 014° 05.05'E | 46.0 | N |
| EMB365_34-2 | TF0109 | PLA | 05.05.2025 21:39 | 55° 00.04'N | 014° 05.05'E | 46.0 | |
| EMB365_34-3 | TF0109 | WP2 | 05.05.2025 22:02 | 55° 00.01'N | 014° 05.05'E | 46.0 | |
| EMB365_35-1 | TF0146 | CTD | 05.05.2025 23:29 | 55° 06.15'N | 014° 11.30'E | 46.0 | |
| EMB365_36-1 | TF0145 | CTD | 06.05.2025 00:23 | 55° 09.65'N | 014° 15.82'E | 45.0 | N |
| EMB365_37-1 | TF0144 | CTD | 06.05.2025 01:46 | 55° 15.02'N | 014° 30.49'E | 44.0 | CC |
| EMB365_38-1 | TF0142 | CTD | 06.05.2025 03:10 | 55° 23.02'N | 014° 34.85'E | 70.0 | N |
| EMB365_39-1 | TF0140 | CTD | 06.05.2025 04:15 | 55° 27.97'N | 014° 43.02'E | 68.0 | N |
| EMB365_40-1 | TF0206 | CTD | 06.05.2025 05:25 | 55° 32.03'N | 014° 54.85'E | 75.0 | |
| EMB365_41-1 | TF0207 | CTD | 06.05.2025 06:42 | 55° 29.77'N | 015° 05.68'E | 85.0 | |
| EMB365_42-1 | TF0208 | CTD | 06.05.2025 07:46 | 55° 27.19'N | 015° 14.05'E | 92.0 | |
| EMB365_43-1 | TF0200 | CTD | 06.05.2025 08:45 | 55° 23.00'N | 015° 20.09'E | 91.0 | N |

| Station No. | Station name | Gear | Date/Time | Latitude | Longitude | Water Depth | Remarks |
|---|---|---|---|---|---|---|---|
| EMB | IOW | | [UTC] | | | [m] | |
| EMB365_44-1 | TF0209 | CTD | 06.05.2025 09:46 | 55° 20.80'N | 015° 27.92'E | 94.0 | N |
| EMB365_45-1 | TF0211 | CTD | 06.05.2025 10:46 | 55° 19.78'N | 015° 36.91'E | 96.0 | |
| EMB365_46-1 | TF0214 | CTD | 06.05.2025 12:19 | 55° 09.61'N | 015° 39.52'E | 94.0 | N |
| EMB365_47-1 | TF0212 | CTD | 06.05.2025 13:52 | 55° 18.03'N | 015° 47.75'E | 95.0 | |
| EMB365_48-1 | TF0213 | CTD | 06.05.2025 15:13 | 55° 14.96'N | 015° 58.90'E | 89.0 | N, TG |
| EMB365_48-2 | TF0213 | SD | 06.05.2025 15:15 | 55° 14.97'N | 015° 58.92'E | 89.0 | |
| EMB365_48-3 | TF0213 | PLA | 06.05.2025 15:17 | 55° 14.98'N | 015° 58.93'E | 89.0 | |
| EMB365_48-4 | TF0213 | WP2 | 06.05.2025 15:32 | 55° 15.03'N | 015° 58.93'E | 89.0 | |
| EMB365_48-5 | TF0213 | WP2 | 06.05.2025 15:43 | 55° 15.01'N | 015° 58.96'E | 90.0 | |
| EMB365_48-6 | TF0213 | WP2 | 06.05.2025 15:54 | 55° 15.01'N | 015° 58.96'E | 89.0 | |
| EMB365_48-7 | TF0213 | WP2 | 06.05.2025 16:03 | 55° 15.02'N | 015° 58.97'E | 89.0 | |
| EMB365_48-8 | TF0213 | WP2 | 06.05.2025 16:17 | 55° 15.02'N | 015° 58.99'E | 89.0 | |
| EMB365_48-9 | TF0213 | CTD | 06.05.2025 16:26 | 55° 15.01'N | 015° 59.01'E | 89.0 | |
| EMB365_48-10 | TF0213 | APNET | 06.05.2025 16:41 | 55° 15.00'N | 015° 59.07'E | 89.0 | |
| EMB365_48-11 | TF0213 | APNET | 06.05.2025 17:03 | 55° 15.00'N | 015° 59.07'E | 89.0 | |
| EMB365_48-12 | TF0213 | APNET | 06.05.2025 17:27 | 55° 14.99'N | 015° 59.08'E | 89.0 | |
| EMB365_49-1 | TF0221 | CTD | 06.05.2025 18:40 | 55° 13.29'N | 016° 09.94'E | 82.0 | |
| EMB365_50-1 | TF0225 | CTD | 06.05.2025 19:38 | 55° 15.43'N | 016° 19.14'E | 65.0 | |
| EMB365_51-1 | TF0226 | CTD | 06.05.2025 20:29 | 55° 17.70'N | 016° 25.67'E | 57.0 | |
| EMB365_52-1 | TF0224 | CTD | 06.05.2025 21:06 | 55° 16.95'N | 016° 30.02'E | 60.0 | |
| EMB365_53-1 | SSmoor | CTD | 06.05.2025 21:39 | 55° 16.54'N | 016° 32.94'E | 64.0 | |
| EMB365_54-1 | TF0227 | CTD | 06.05.2025 22:24 | 55° 15.68'N | 016° 38.12'E | 68.0 | |
| EMB365_55-1 | TF0228 | CTD | 06.05.2025 23:25 | 55° 14.22'N | 016° 46.30'E | 76.0 | |
| EMB365_56-1 | TF0229 | CTD | 07.05.2025 00:24 | 55° 13.72'N | 016° 54.67'E | 85.0 | |
| EMB365_57-1 | TF0222 | CTD | 07.05.2025 01:26 | 55° 12.99'N | 017° 04.02'E | 91.0 | N |
| EMB365_58-1 | TF0266 | CTD | 07.05.2025 02:55 | 55° 15.08'N | 017° 21.40'E | 89.0 | CC |
| EMB365_59-1 | TF0267 | CTD | 07.05.2025 04:20 | 55° 17.12'N | 017° 35.64'E | 84.0 | |
| EMB365_60-1 | TF0268 | CTD | 07.05.2025 05:56 | 55° 18.47'N | 017° 55.78'E | 74.0 | |
| EMB365_61-1 | TF0256 | CTD | 07.05.2025 07:24 | 55° 19.55'N | 018° 14.10'E | 76.0 | |
| EMB365_62-1 | TF0257 | CTD | 07.05.2025 08:31 | 55° 26.49'N | 018° 19.24'E | 87.0 | |
| EMB365_63-1 | TF0259 | CTD | 07.05.2025 10:01 | 55° 32.95'N | 018° 24.00'E | 90.0 | N |
| EMB365_63-2 | TF0259 | SD | 07.05.2025 10:05 | 55° 32.96'N | 018° 23.95'E | 89.0 | |
| EMB365_63-3 | TF0259 | PLA | 07.05.2025 10:05 | 55° 32.95'N | 018° 23.95'E | 90.0 | |
| EMB365_64-1 | TF0255 | CTD | 07.05.2025 11:26 | 55° 37.96'N | 018° 35.85'E | 96.0 | |
| EMB365_65-1 | TF0258 | CTD | 07.05.2025 12:42 | 55° 43.56'N | 018° 45.81'E | 91.0 | |
| EMB365_66-1 | TF0252 | CTD | 07.05.2025 14:07 | 55° 51.96'N | 018° 38.36'E | 114.0 | |
| EMB365_67-1 | TF0253 | CTD | 07.05.2025 15:21 | 55° 50.35'N | 018° 51.88'E | 102.0 | |
| EMB365_68-1 | TF0265 | CTD | 07.05.2025 16:54 | 55° 57.45'N | 019° 02.75'E | 111.0 | |
| EMB365_69-1 | TF0250 | CTD | 07.05.2025 18:21 | 56° 04.99'N | 019° 10.02'E | 125.0 | |
| EMB365_70-1 | TF0262 | CTD | 07.05.2025 20:12 | 56° 14.01'N | 019° 17.96'E | 131.0 | |
| EMB365_71-1 | TF0263 | CTD | 07.05.2025 21:36 | 56° 20.76'N | 019° 22.69'E | 134.0 | |
| EMB365_72-1 | TF0261 | CTD | 07.05.2025 23:16 | 56° 29.46'N | 019° 28.90'E | 144.0 | |
| EMB365_73-1 | TF0260 | CTD | 08.05.2025 00:51 | 56° 37.97'N | 019° 34.97'E | 145.0 | N, HS |
| EMB365_74-1 | TF0274 | CTD | 08.05.2025 02:31 | 56° 45.97'N | 019° 45.06'E | 155.0 | CC |
| EMB365_75-1 | TF0273 | CTD | 08.05.2025 04:28 | 56° 57.03'N | 019° 46.22'E | 184.0 | |
| EMB365_76-1 | TF0272 | CTD | 08.05.2025 06:00 | 57° 04.27'N | 019° 49.85'E | 210.0 | HS |
| EMB365_77-1 | TF0275 | CTD | 08.05.2025 07:37 | 57° 12.58'N | 019° 55.83'E | 231.0 | |
| EMB365_78-1 | TF0271 | CTD | 08.05.2025 09:01 | 57° 19.14'N | 020° 03.02'E | 241.0 | N, HS, TG |
| EMB365_78-2 | TF0271 | SD | 08.05.2025 09:07 | 57° 19.17'N | 020° 02.99'E | 241.0 | |
| EMB365_78-3 | TF0271 | MSS | 08.05.2025 09:50 | 57° 19.23'N | 020° 02.98'E | 241.0 | |
| EMB365_78-4 | TF0271 | CTD | 08.05.2025 11:18 | 57° 19.19'N | 020° 02.98'E | 241.0 | |
| EMB365_78-5 | TF0271 | MSS | 08.05.2025 11:42 | 57° 19.21'N | 020° 02.94'E | 241.0 | |

| Station No. | Station name | Gear | Date/Time | Latitude | Longitude | Water Depth | Remarks |
|---|---|---|---|---|---|---|---|
| EMB | IOW | | [UTC] | | | [m] | |
| EMB365_78-6 | TF0271 | CTD | 08.05.2025 13:08 | 57° 19.19'N | 020° 02.97'E | 241.0 | |
| EMB365_78-7 | TF0271 | MSS | 08.05.2025 13:26 | 57° 19.19'N | 020° 02.99'E | 241.0 | |
| EMB365_78-8 | TF0271 | CTD | 08.05.2025 14:43 | 57° 19.16'N | 020° 02.99'E | 241.0 | |
| EMB365_78-9 | TF0271 | PLA | 08.05.2025 15:09 | 57° 19.18'N | 020° 02.98'E | 241.0 | |
| EMB365_78-10 | TF0271 | CTD | 08.05.2025 15:18 | 57° 19.19'N | 020° 02.99'E | 241.0 | TG |
| EMB365_78-11 | TF0271 | CTD | 08.05.2025 15:43 | 57° 19.22'N | 020° 02.95'E | 241.0 | |
| EMB365_78-12 | TF0271 | MSS | 08.05.2025 16:28 | 57° 19.21'N | 020° 03.01'E | 241.0 | |
| EMB365_79-1 | TF0403 | CTD | 08.05.2025 22:00 | 57° 04.43'N | 019° 01.57'E | 115.0 | |
| EMB365_80-1 | TF0404 | CTD | 08.05.2025 23:14 | 57° 01.70'N | 019° 13.28'E | 163.0 | |
| EMB365_81-1 | TF0405 | CTD | 09.05.2025 00:15 | 57° 00.49'N | 019° 21.24'E | 177.0 | |
| EMB365_82-1 | TF0406 | CTD | 09.05.2025 01:37 | 56° 58.78'N | 019° 34.58'E | 168.0 | CC |
| EMB365_83-1 | TF0407 | CTD | 09.05.2025 03:18 | 56° 56.98'N | 019° 53.02'E | 178.0 | |
| EMB365_84-1 | TF0408 | CTD | 09.05.2025 04:16 | 56° 55.36'N | 020° 01.10'E | 166.0 | |
| EMB365_85-1 | TF0409 | CTD | 09.05.2025 05:25 | 56° 54.28'N | 020° 12.99'E | 145.0 | |
| EMB365_86-1 | TF0410 | CTD | 09.05.2025 06:43 | 56° 51.98'N | 020° 27.23'E | 60.0 | |
| EMB365_87-1 | TF0411 | CTD | 09.05.2025 07:55 | 56° 50.23'N | 020° 40.83'E | 55.0 | |
| EMB365_88-1 | SF022EGB | SCF | 09.05.2025 10:42 | 57° 02.21'N | 021° 17.33'E | 16.0 | |
| EMB365_89-1 | TF0276 | CTD | 10.05.2025 06:55 | 57° 28.16'N | 020° 15.58'E | 209.0 | |
| EMB365_90-1 | TF0270 | CTD | 10.05.2025 08:34 | 57° 36.97'N | 020° 09.97'E | 145.0 | HS |
| EMB365_91-1 | TF0287 | CTD | 10.05.2025 10:23 | 57° 42.87'N | 019° 51.17'E | 129.0 | |
| EMB365_92-1 | TF0290 | CTD | 10.05.2025 11:46 | 57° 50.93'N | 019° 49.00'E | 172.0 | |
| EMB365_93-1 | TF0286 | CTD | 10.05.2025 13:15 | 57° 59.98'N | 019° 53.94'E | 196.0 | N, HS, TG |
| EMB365_93-2 | TF0286 | SD | 10.05.2025 13:23 | 58° 00.01'N | 019° 53.98'E | 196.0 | |
| EMB365_93-3 | TF0286 | CTD | 10.05.2025 14:10 | 58° 00.02'N | 019° 54.04'E | 196.0 | |
| EMB365_94-1 | TF0277 | CTD | 10.05.2025 23:28 | 58° 10.98'N | 020° 03.06'E | 163.0 | |
| EMB365_95-1 | TF0278 | CTD | 11.05.2025 01:09 | 58° 20.96'N | 020° 08.73'E | 121.0 | |
| EMB365_96-1 | TF0285 | CTD | 11.05.2025 02:34 | 58° 26.51'N | 020° 19.97'E | 123.0 | CC, HS |
| EMB365_97-1 | TF0279 | CTD | 11.05.2025 04:26 | 58° 38.46'N | 020° 20.66'E | 165.0 | |
| EMB365_98-1 | TF0289 | CTD | 11.05.2025 05:43 | 58° 45.95'N | 020° 19.80'E | 195.0 | |
| EMB365_99-1 | TF0282 | CTD | 11.05.2025 07:06 | 58° 52.99'N | 020° 19.01'E | 166.0 | HS |
| EMB365_100-1 | TF0288 | CTD | 11.05.2025 08:35 | 58° 59.78'N | 020° 09.61'E | 142.0 | |
| EMB365_101-1 | DB0101 | CTD | 11.05.2025 10:08 | 59° 03.56'N | 020° 27.79'E | 131.0 | |
| EMB365_102-1 | DB0102 | CTD | 11.05.2025 11:25 | 59° 10.35'N | 020° 34.58'E | 106.0 | |
| EMB365_103-1 | AD-1 | CTD | 11.05.2025 12:38 | 59° 17.58'N | 020° 37.27'E | 72.0 | |
| EMB365_104-1 | AD-2 | CTD | 11.05.2025 13:48 | 59° 25.09'N | 020° 36.94'E | 77.0 | N, HS |
| EMB365_105-1 | AD-3 | CTD | 11.05.2025 14:57 | 59° 32.24'N | 020° 38.87'E | 122.0 | |
| EMB365_106-1 | AD-5 | CTD | 11.05.2025 16:10 | 59° 38.81'N | 020° 33.34'E | 58.0 | |
| EMB365_107-1 | DB0103 | CTD | 11.05.2025 17:35 | 59° 45.28'N | 020° 20.35'E | 187.0 | |
| EMB365_108-1 | DB0104 | CTD | 11.05.2025 19:08 | 59° 47.29'N | 020° 04.25'E | 193.0 | N |
| EMB365_109-1 | DB0105 | CTD | 11.05.2025 20:59 | 59° 53.92'N | 019° 50.85'E | 203.0 | |
| EMB365_110-1 | DB0106 | CTD | 11.05.2025 22:38 | 60° 00.85'N | 019° 37.31'E | 224.0 | |
| EMB365_111-1 | AS_2a | MSS | 11.05.2025 23:43 | 60° 05.42'N | 019° 37.56'E | 83.0 | |
| EMB365_112-1 | DB0107 | CTD | 12.05.2025 10:11 | 60° 04.60'N | 019° 23.96'E | 233.0 | |
| EMB365_113-1 | TF0605 | CTD | 12.05.2025 11:48 | 60° 10.98'N | 019° 08.95'E | 299.0 | N |
| EMB365_114-1 | DB0201 | CTD | 12.05.2025 14:13 | 60° 23.22'N | 019° 12.33'E | 25.0 | |
| EMB365_115-1 | DB0108 | CTD | 12.05.2025 16:17 | 60° 38.51'N | 018° 59.68'E | 91.0 | |
| EMB365_116-1 | DB0109 | CTD | 12.05.2025 18:01 | 60° 49.27'N | 019° 09.80'E | 99.0 | |
| EMB365_117-1 | DB0110 | CTD | 12.05.2025 19:36 | 60° 57.74'N | 019° 24.25'E | 121.0 | |
| EMB365_118-1 | TF0604 | CTD | 12.05.2025 21:03 | 61° 04.95'N | 019° 34.94'E | 127.0 | N |
| EMB365_119-1 | DB0111 | CTD | 12.05.2025 22:37 | 61° 11.13'N | 019° 49.71'E | 116.0 | |
| EMB365_120-1 | BS-7 | CTD | 12.05.2025 23:51 | 61° 16.16'N | 020° 01.75'E | 130.0 | |
| EMB365_121-1 | DB0112 | CTD | 13.05.2025 01:24 | 61° 26.26'N | 020° 05.00'E | 130.0 | |

| Station No. | Station name | Gear | Date/Time | Latitude | Longitude | Water Depth | Remarks |
|---|---|---|---|---|---|---|---|
| **EMB** | **IOW** | | **[UTC]** | | | **[m]** | |
| EMB365_122-1 | BS-9 | CTD | 13.05.2025 02:55 | 61° 34.97'N | 020° 03.13'E | 126.0 | |
| EMB365_123-1 | BS-10 | CTD | 13.05.2025 04:24 | 61° 44.36'N | 020° 09.03'E | 128.0 | N |
| EMB365_124-1 | DB0113 | CTD | 13.05.2025 05:59 | 61° 55.64'N | 020° 09.18'E | 133.0 | |
| EMB365_125-1 | BS-11 | CTD | 13.05.2025 07:32 | 62° 05.73'N | 020° 08.45'E | 149.0 | |
| EMB365_126-1 | DB0114 | CTD | 13.05.2025 09:35 | 62° 19.59'N | 020° 02.59'E | 130.0 | |
| EMB365_127-1 | TF0603 | CTD | 13.05.2025 11:41 | 62° 35.22'N | 019° 58.52'E | 213.0 | N |
| EMB365_128-1 | DB0115 | CTD | 13.05.2025 13:20 | 62° 38.62'N | 019° 38.15'E | 120.0 | |
| EMB365_129-1 | DB0116 | CTD | 13.05.2025 14:55 | 62° 41.13'N | 019° 15.09'E | 166.0 | |
| EMB365_130-1 | DB0119 | CTD | 13.05.2025 16:47 | 62° 53.55'N | 019° 26.84'E | 139.0 | |
| EMB365_131-1 | DB0118 | CTD | 13.05.2025 18:44 | 63° 07.51'N | 019° 28.99'E | 161.0 | N |
| EMB365_132-1 | DB0117 | CTD | 13.05.2025 20:34 | 63° 11.87'N | 019° 52.42'E | 94.0 | |
| EMB365_133-1 | C3 | CTD | 15.05.2025 14:20 | 62° 39.16'N | 018° 57.17'E | 204.0 | N |
| EMB365_133-2 | C3 | WP2 | 15.05.2025 14:48 | 62° 39.15'N | 018° 57.13'E | 204.0 | |
| EMB365_133-3 | C3 | WP2 | 15.05.2025 15:10 | 62° 39.17'N | 018° 57.16'E | 204.0 | |
| EMB365_133-4 | C3 | CTD | 15.05.2025 15:31 | 62° 39.16'N | 018° 57.18'E | 204.0 | |
| EMB365_133-5 | C3 | WP2 | 15.05.2025 16:08 | 62° 39.19'N | 018° 57.10'E | 204.0 | |
| EMB365_134-1 | F18/B5 | CTD | 15.05.2025 21:58 | 63° 18.54'N | 020° 16.85'E | 106.0 | N |
| EMB365_135-1 | BS-14 | CTD | 15.05.2025 23:27 | 63° 22.94'N | 020° 36.01'E | 24.0 | |
| EMB365_136-1 | F16/B1 | CTD | 16.05.2025 01:44 | 63° 31.50'N | 021° 04.92'E | 43.0 | |
| EMB365_137-1 | DB0209 | CTD | 16.05.2025 03:02 | 63° 35.79'N | 021° 21.43'E | 27.0 | |
| EMB365_138-1 | BoB-1 | CTD | 16.05.2025 04:25 | 63° 43.83'N | 021° 35.44'E | 59.0 | N |
| EMB365_139-1 | F9/A13 | CTD | 16.05.2025 11:02 | 64° 42.49'N | 022° 03.97'E | 129.0 | N |
| EMB365_139-2 | F9/A13 | SD | 16.05.2025 11:05 | 64° 42.50'N | 022° 03.99'E | 129.0 | |
| EMB365_139-3 | F9/A13 | PLA | 16.05.2025 11:06 | 64° 42.50'N | 022° 03.99'E | 129.0 | |
| EMB365_139-4 | F9/A13 | WP2 | 16.05.2025 11:27 | 64° 42.51'N | 022° 03.98'E | 129.0 | |
| EMB365_139-5 | F9/A13 | WP2 | 16.05.2025 11:49 | 64° 42.52'N | 022° 03.99'E | 129.0 | |
| EMB365_140-1 | F3/A5 | CTD | 16.05.2025 16:52 | 65° 10.06'N | 023° 14.10'E | 91.0 | |
| EMB365_140-2 | F3/A5 | WP2 | 16.05.2025 17:13 | 65° 10.01'N | 023° 13.95'E | 100.0 | |
| EMB365_141-1 | DB0126 | CTD | 16.05.2025 19:22 | 65° 19.13'N | 023° 50.97'E | 21.0 | |
| EMB365_142-1 | DB0125 | CTD | 16.05.2025 20:54 | 65° 11.09'N | 023° 32.08'E | 71.0 | |
| EMB365_143-1 | BoB-15 | CTD | 16.05.2025 22:19 | 65° 05.21'N | 023° 14.45'E | 93.0 | N |
| EMB365_144-1 | DB0124 | CTD | 16.05.2025 23:52 | 64° 55.44'N | 023° 07.61'E | 76.0 | |
| EMB365_145-1 | DB0123 | CTD | 17.05.2025 01:17 | 64° 47.79'N | 022° 54.10'E | 79.0 | |
| EMB365_146-1 | BoB-12 | CTD | 17.05.2025 02:45 | 64° 40.14'N | 022° 37.18'E | 95.0 | |
| EMB365_147-1 | BoB-8 | CTD | 17.05.2025 04:24 | 64° 30.73'N | 022° 24.54'E | 100.0 | |
| EMB365_148-1 | TF0602 | CTD | 17.05.2025 06:04 | 64° 18.27'N | 022° 21.42'E | 109.0 | N |
| EMB365_149-1 | BoB-3 | CTD | 17.05.2025 07:30 | 64° 15.07'N | 022° 03.58'E | 111.0 | |
| EMB365_150-1 | BoB-2 | CTD | 17.05.2025 08:40 | 64° 09.37'N | 022° 00.56'E | 111.0 | |
| EMB365_151-1 | DB0122 | CTD | 17.05.2025 09:58 | 64° 02.33'N | 021° 57.65'E | 85.0 | |
| EMB365_152-1 | DB0121 | CTD | 17.05.2025 11:28 | 63° 53.26'N | 021° 46.93'E | 59.0 | |
| EMB365_153-1 | MS4/C14 | CTD | 18.05.2025 17:48 | 62° 05.96'N | 018° 32.82'E | 88.0 | N |
| EMB365_153-3 | MS4/C14 | SD | 18.05.2025 18:10 | 62° 06.01'N | 018° 32.83'E | 85.0 | |
| EMB365_153-2 | MS4/C14 | WP2 | 18.05.2025 18:14 | 62° 06.02'N | 018° 32.86'E | 86.0 | |
| EMB365_154-1 | SR3/C24 | CTD | 19.05.2025 00:19 | 61° 10.78'N | 018° 13.78'E | 74.0 | N |
| EMB365_154-2 | SR3/C24 | PLA | 19.05.2025 00:22 | 61° 10.78'N | 018° 13.82'E | 73.0 | |
| EMB365_154-3 | SR3/C24 | WP2 | 19.05.2025 00:42 | 61° 10.78'N | 018° 13.81'E | 74.0 | |
| EMB365_154-4 | SR3/C24 | WP2 | 19.05.2025 00:55 | 61° 10.78'N | 018° 13.80'E | 74.0 | |
| EMB365_154-5 | SR3/C24 | CTD | 19.05.2025 01:08 | 61° 10.79'N | 018° 13.81'E | 74.0 | CC |
| EMB365_155-1 | nGB-2 | CTD | 20.05.2025 03:59 | 58° 51.90'N | 019° 44.60'E | 166.0 | |
| EMB365_156-1 | TF0283 | CTD | 20.05.2025 06:53 | 58° 46.94'N | 019° 06.06'E | 132.0 | HS |
| EMB365_157-1 | nGB-1 | CTD | 20.05.2025 09:01 | 58° 42.77'N | 018° 40.16'E | 241.0 | |
| EMB365_158-1 | TF0284 | CTD | 20.05.2025 11:30 | 58° 35.01'N | 018° 13.99'E | 453.0 | N, HS |

| Station No. | Station name | Gear | Date/Time | Latitude | Longitude | Water Depth | Remarks |
|---|---|---|---|---|---|---|---|
| EMB | IOW | | [UTC] | | | [m] | |
| EMB365_158-2 | TF0284 | SD | 20.05.2025 11:33 | 58° 35.01'N | 018° 13.99'E | 453.0 | |
| EMB365_158-3 | TF0284 | MSS | 20.05.2025 12:23 | 58° 35.11'N | 018° 14.00'E | 456.0 | |
| EMB365_158-4 | TF0284 | CTD | 20.05.2025 13:23 | 58° 35.01'N | 018° 13.96'E | 453.0 | |
| EMB365_158-5 | TF0284 | MSS | 20.05.2025 13:46 | 58° 35.03'N | 018° 13.99'E | 453.0 | |
| EMB365_159-1 | TF0284 | MSS | 20.05.2025 14:48 | 58° 35.03'N | 018° 13.98'E | 453.0 | |
| EMB365_160-1 | TF0284 | CTD | 20.05.2025 16:42 | 58° 35.05'N | 018° 14.13'E | 453.0 | N, HS |
| EMB365_160-2 | TF0284 | CTD | 20.05.2025 17:48 | 58° 34.94'N | 018° 14.06'E | 451.0 | |
| EMB365_160-3 | TF0284 | CTD | 20.05.2025 18:18 | 58° 35.04'N | 018° 14.03'E | 453.0 | |
| EMB365_161-1 | wGB-3 | CTD | 20.05.2025 20:32 | 58° 19.58'N | 018° 04.21'E | 144.0 | |
| EMB365_162-1 | TF0240 | CTD | 20.05.2025 23:06 | 57° 59.98'N | 018° 00.04'E | 167.0 | N, HS |
| EMB365_163-1 | TF0242 | CTD | 21.05.2025 02:23 | 57° 43.08'N | 017° 22.03'E | 139.0 | |
| EMB365_164-1 | TF0245 | CTD | 21.05.2025 07:20 | 57° 07.04'N | 017° 39.91'E | 111.0 | N, HS |
| EMB365_165-1 | TF0213 | CTD | 22.05.2025 00:10 | 55° 14.99'N | 015° 59.01'E | 89.0 | N |
| EMB365_165-2 | TF0213 | PLA | 22.05.2025 00:13 | 55° 14.98'N | 015° 59.01'E | 89.0 | |
| EMB365_165-3 | TF0213 | WP2 | 22.05.2025 00:33 | 55° 14.99'N | 015° 59.00'E | 89.0 | |
| EMB365_165-4 | TF0213 | WP2 | 22.05.2025 00:43 | 55° 14.99'N | 015° 59.02'E | 89.0 | |
| EMB365_165-5 | TF0213 | WP2 | 22.05.2025 00:55 | 55° 14.99'N | 015° 59.01'E | 89.0 | |
| EMB365_165-6 | TF0213 | WP2 | 22.05.2025 01:02 | 55° 14.99'N | 015° 59.01'E | 89.0 | |
| EMB365_165-7 | TF0213 | CTD | 22.05.2025 01:22 | 55° 14.98'N | 015° 59.02'E | 89.0 | |
| EMB365_165-8 | TF0213 | APNET | 22.05.2025 01:41 | 55° 14.99'N | 015° 59.00'E | 89.0 | |
| EMB365_165-9 | TF0213 | APNET | 22.05.2025 02:03 | 55° 14.99'N | 015° 59.02'E | 89.0 | |
| EMB365_165-10 | TF0213 | APNET | 22.05.2025 02:24 | 55° 14.98'N | 015° 59.03'E | 89.0 | |
| EMB365_166-1 | TF0113 | CTD | 23.05.2025 02:00 | 54° 55.51'N | 013° 30.11'E | 45.0 | |
| EMB365_166-2 | TF0113 | SD | 23.05.2025 02:02 | 54° 55.49'N | 013° 30.12'E | 45.0 | |
| EMB365_166-3 | TF0113 | WP2 | 23.05.2025 02:24 | 54° 55.48'N | 013° 30.06'E | 45.0 | |
| EMB365_167-1 | TF0001 | CTD | 23.05.2025 06:02 | 54° 41.81'N | 012° 42.19'E | 18.0 | |
| EMB365_168-1 | TF0046 | CTD | 23.05.2025 09:15 | 54° 28.26'N | 012° 14.53'E | 25.0 | |
| EMB365_168-2 | TF0046 | SD | 23.05.2025 09:18 | 54° 28.25'N | 012° 14.54'E | 25.0 | |
| EMB365_168-4 | TF0046 | PLA | 23.05.2025 09:20 | 54° 28.25'N | 012° 14.54'E | 25.0 | |
| EMB365_168-3 | TF0046 | WP2 | 23.05.2025 09:34 | 54° 28.21'N | 012° 14.50'E | 26.0 | |
| EMB365_169-1 | TF0012 | CTD | 23.05.2025 13:07 | 54° 18.88'N | 011° 33.06'E | 22.0 | |
| EMB365_169-2 | TF0012 | SD | 23.05.2025 13:08 | 54° 18.88'N | 011° 33.06'E | 21.0 | |
| EMB365_169-3 | TF0012 | PLA | 23.05.2025 13:08 | 54° 18.87'N | 011° 33.07'E | 22.0 | |
| EMB365_169-4 | TF0012 | WP2 | 23.05.2025 13:28 | 54° 18.87'N | 011° 33.06'E | 22.0 | |
| EMB365_170-1 | TF0022 | CTD | 23.05.2025 15:53 | 54° 06.62'N | 011° 10.64'E | 20.0 | |
| EMB365_171-1 | Bolt_F1 | MSS | 23.05.2025 16:58 | 54° 01.25'N | 011° 05.36'E | 6.0 | |
| EMB365_172-1 | NHBoje | CTD | 24.05.2025 00:59 | 54° 10.75'N | 011° 57.66'E | 9.0 | |

## 7.2 Microstructure Profiler Deployments

**Table 7.2** List of MSS-90 microstructure profiler deployments during the cruise EMB356

| Deployment | | time | Latitude | Longitude | Depth | Remarks |
|---|---|---|---|---|---|---|
| EMB | | [UTC] | [UTC] | No. | [m] | |
| EMB365_78-3 | begin | 08.05.2025 09:50 | 57° 19.23'N | 020° 02.98'E | 241.0 | Test protection cage |
| | end | 08.05.2025 10:59 | 57° 19.91'N | 020° 02.97'E | 240.0 | Profiles 001-006 |
| EMB365_78-5 | begin | 08.05.2025 11:42 | 57° 19.21'N | 020° 02.94'E | 241.0 | Test protection cage |
| | end | 08.05.2025 12:51 | 57° 19.94'N | 020° 02.92'E | 240.0 | Profiles 007-015 |
| EMB365_78-7 | begin | 08.05.2025 13:26 | 57° 19.19'N | 020° 02.99'E | 241.0 | Test protection cage |
| | end | 08.05.2025 14:28 | 57° 19.87'N | 020° 02.94'E | 240.0 | Profiles 016-022 |
| EMB365_78-12 | begin | 08.05.2025 16:28 | 57° 19.21'N | 020° 03.01'E | 241.0 | Test protection cage |

| | | | | | | |
|---|---|---|---|---|---|---|
| | end | 08.05.2025 17:42 | 57° 19.99'N | 020° 02.99'E | 240.0 | Profiles 023-029 |
| EMB365_111-1 | begin | 11.05.2025 23:43 | 60° 05.42'N | 019° 37.56'E | 83.0 | Åland Deep Transect |
| | end | 12.05.2025 09:00 | 59° 55.90'N | 019° 34.41'E | 68.0 | Profiles 030-101 |
| EMB365_158-3 | begin | 20.05.2025 12:23 | 58° 35.11'N | 018° 14.00'E | 456.0 | Test protection cage |
| | end | 20.05.2025 13:05 | 58° 35.84'N | 018° 14.10'E | 461.0 | Profiles 102-104 |
| EMB365_158-5 | begin | 20.05.2025 13:46 | 58° 35.03'N | 018° 13.99'E | 453.0 | Test protection cage |
| | end | 20.05.2025 14:27 | 58° 35.82'N | 018° 14.09'E | 461.0 | Profiles 105-107 |
| EMB365_159-1 | begin | 20.05.2025 14:48 | 58° 35.03'N | 018° 13.98'E | 453.0 | Test protection cage |
| | end | 20.05.2025 15:35 | 58° 35.83'N | 018° 14.11'E | 461.0 | Profiles 108-111 |
| EMB365_171-1 | begin | 23.05.2025 16:58 | 54° 01.25'N | 011° 05.36'E | 6.0 | Boltenhagen Transect |
| | end | 23.05.2025 20:20 | 54° 05.00'N | 011° 05.27'E | 21.0 | Profiles 112-222 |

## 7.3 ScanFish Deployment List

**Table 7.3** List of ScanFish deployments during the cruise EMB365

| Deployment | | time | Latitude | Longitude | Depth | Remarks |
|---|---|---|---|---|---|---|
| EMB | | [UTC] | [UTC] | No. | [m] | |
| EMB365_88-1 | begin | 09.05.2025 10:42 | 57° 02.21'N | 021° 17.33'E | 16.0 | Transect 1 – Part 1 |
| | end | 09.05.2025 16:36 | 57° 14.80'N | 020° 19.56'E | 170.0 | (001 – 006) |
| EMB365_88-1 | begin | 09.05.2025 17:25 | 57° 14.15'N | 020° 22.46'E | 147.0 | Transect 1 – Part 2 |
| | end | 10.05.2025 01:41 | 57° 33.58'N | 018° 51.78'E | 24.0 | (007 – 015) |

# 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** Overview of data availability

| Type | Database | Available | Free Access | Contact |
|---|---|---|---|---|
| Hydrographic data | ODIN | 01.05.2024 | 01.03.2026 | volker.mohrholz@io-warnemuende.de |
| Nutrient samples | ODIN | 01.05.2024 | 01.03.2027 | joachim.kuss@io-warnemuende.de |
| Biological samples | ODIN | 01.10.2024 | 01.03.2027 | joerg.dutz@io-warnemuende.de |

The underway sampling data set of navigation, meteorological and surface water sensors will be public available shortly after the cruise from the DSHIP webpage of the BSH (http://dship.bsh.de).

## 9 Acknowledgements

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# 11 Appendix

## 11.1 Station Labels

A station name and a station number were assigned to all stations, where scientific equipment was used. The station name, also referred as position alias, identifies a geographical position. The station number is an alphanumerical value that is incremented for each new station. Each device deployment is indicated by numerical extension of the station number. The station number was applied according the station number rules of the DSHIP. For the cruise EMB365 the first station number is EMB365_1.

## 11.2 CTD-Operation

The CTD-system "SBE 911plus", SN-1385, (SEABIRD-ELECTRONICS, USA) was used to measure the variables:

- Pressure
- Temperature (2x SBE 3)
- Conductivity (2x SBE 4)
- Oxygen concentration (2x SBE 43)
- Chlorophyll-a fluorescence (683nm)
- Turbidity
- CDOM fluorescence
- Nitrate concentration (SUNA, OPUS)
- PAR
- SPAR

The CTD was equipped with a redundant sensor system sensor system for temperature, conductivity and oxygen. The temperature is given in ITS-90 temperature scale. Salinity is calculated from the Practical Salinity Scale (1978) equations. To minimize salinity spiking, temperature- (SBE 3), conductivity (SBE 4) and oxygen sensors (SBE 43) are arranged within a tube system, where seawater is pumped through with constant velocity. Fluorescence and turbidity are measured with a downward looking WET Labs fluorometer. CDOM fluorescence was obtained by an additional WET Labs fluorometer. Pressure is determined with a Paroscientific Digiquartz pressure sensor, maximum range 6800 dbar.

Data were monitored during the casts and stored on hard disk with Seasave Version 7. For each station a configuration file (stationname.xmlcon) was written which contains the complete parameter set, especially sensor coefficients used for the conversion of raw data (frequencies) to standard output format.

The CTD-probe was equipped with a Rosette water sampler with 13 Free Flow bottles of 5l volume each. This design allows for closing of bottles automatically at predefined depths during down-casts. Closing depth and sensor values are aligned by appropriate choice of parameters of the CTD software generating the “bottle files”. Additionally, a self-contained SUNA nitrate sensor was mounted on the rosette frame. The CTD is attached to a heave-compensating winch, enabling the CTD during a cast to be nearly completely decoupled from the ships heave and roll movements.

***Sampling***

A CTD cast was started below the sea surface with the pressure sensor usually at about 5m depth to prevent a contamination of the CTD pumping system with air bubbles. Data were collected down to 0.3m above the bottom at all stations. An attached altimeter and a down-facing underwater camera including LED spotlights and laser were used to determine the bottom distance. The usual vertical speed during the down cast was $0.3ms^{-1}$. Sampling rate of the CTD probe was 24Hz. Data were displayed online to determine appropriate sampling depth and stored on a PC hard drive.

The probe sheds water in its wake over a long distance. Hence, only downcast registration was reliable. Upcast registration was used only for water sampling, if the closing depth was determined during the downcast. At downcast bottles were closed while fiering in an auto-fire mode. For sampling during upcast, the CTD was stopped and bottles closed manually after a 30 second adjustment period. When the device was back on deck oxygen and/or hydrogen sulfide samples were taken first, followed by water samples for salinity, nutrients and water for several biogeochemical analyses.

***Field sensor check***

The CTD sensors were checked during the cruise by comparison measurements. At stations with well mixed water layers temperature was measured with a high precision thermometer SBE 35. Salinity samples were taken every day. The samples were stored in white glass bottles and will be analyzed after the cruise by means of a salinometer AUTOSAL Model 8400B (accuracy of 0.002). Most samples were taken from near surface layers, only a few deep well mixed layers could be found.

Slope and offset of the oxygen sensors SBE 43 were determined by help of water samples. Oxygen content of the samples was determined with a titration set (Winkler method, accuracy of 0.02ml/l). Oxygen concentration is calculated using Seasoft, oxygen formula "1",

The pressure sensor was checked by measuring pressure on deck before the cast. Calibration measurements for the fluorometer data have not been done, since no quantitative phytoplankton analysis was performed, and no SPM samples were taken during the cruise.

**Table 11.1** Type and serial numbers of mounted CTD sensors

| Sensor | Type | SN | Last calibration |
|---|---|---|---|
| Pressure | Digiquartz | 126946 | 30.10.2014 |
| Temperature 0 | SBE 3 | 4525 | 17.12.2024 |
| Temperature 1 | SBE 3 | 6038 | 17.12.2024 |
| Conductivity 0 | SBE 4 | 3724 | 17.12.2024 |
| Conductivity 1 | SBE 4 | 4447 | 17.12.2024 |
| Oxygen 0 | SBE 43 | 1341 | 02.10.2024 |
| Oxygen 1 | SBE 43 | 0157 | 12.10.2024 |
| Chl-a fluorescence / Turbidity | WET Labs - FLNTURTD | 2029 | 28.09.2010 |
| CDOM fluorescence | WET Labs ECO CDOM | 5638 | unknown |
| PAR sensor | Biospherical Licor Chelsea | 4350 | 23.04.2019 |
| SPAR | SPAR/Surface Irradiance | 6307 | 27.02.2017 |
| SUNA | SBE | | |

The termination of the winch cable failed after CTD cast 192. Starting with profile 193 we used the spare CTD with sensor configuration given in (Table 11.2). This CTD was deployed using the ScanFish winch with the A-frame at the stern. The ScanFish winch has no heave-compensation. Thus, profiles with the spare CTD were stopped in a safe distance to the bottom, usually 3m above the sea bed.

**Table 11.2** Type and serial numbers of mounted CTD sensors at spare CTD

| Sensor | Type | SN | Last calibration |
|---|---|---|---|
| Pressure | Digiquartz | 0384 | 05.11.2002 |
| Temperature 0 | SBE 3 | 4451 | 18.12.2023 |
| Temperature 1 | SBE 3 | 6382 | 25.01.2024 |
| Conductivity 0 | SBE 4 | 4007 | 18.12.2023 |
| Conductivity 1 | SBE 4 | 4497 | 13.01.2024 |
| Oxygen 0 | SBE 43 | 1993 | 22.01.2025 |
| Oxygen 1 | SBE 43 | 2204 | 22.01.2025 |
| Chl-a fluorescence / Turbidity | WET Labs - FLNTURTD | 1582 | 10.06.2016 |
| PAR sensor | Biospherical Licor Chelsea | 70101 | 10.09.2006 |
| SPAR | SPAR/Surface Irradiance | 6307 | 27.02.2017 |

## 11.3 Vessel Mounted ADCPs

Two VMADCPs were used during the cruise. The ships own vessel mounted current meter OceanSurveyor 150kHz and a 300kHz Acoustic Doppler Current Profiler (Work Horse, beam angle 20deg), manufactured by RD-Instruments. The 300kHz ADCP was mounted downward looking at the ships moon pool. The data output of the ADCPs were merged online with the corresponding navigation data and stored on the hard disc using the program VMDAS. Pitch, roll and heading data are converted from TCP/IP to UDP protocol with an own program, running on the VMADCP control PC. Current data are collected in beam coordinates to apply all corrections during post processing. The VMADCPs were operated on selected transects along the cruise track. The following configurations were used for data acquisition in the western and central Baltic.

**Table 11.3** Configuration of 150kHz and the 300kHz VMADCP

| Command | Parameter | 150kHz | 300kHz |
|---|---|---|---|
| WP | Broad band pings | 1 ping/ens | 1 ping/ens |
| WN | number of depth cells | 65 | 80 |
| WS | bin length | 4m | 2m |
| WF | blank after transmit | 2m | 1m |
| WV | Ambigiuity velocity | 6.5m/s | 6.5m/s |
| BP | bottom track | 1 ping/ens | 1 ping/ens |
| BX | max bottom distance | 300m | 260m |
| WD | data output | u, corr, amp, PG | u, corr, amp, PG |
| TP | time between pings | 0 | 0 |
| EZ | sensor source | temp | temp |
| EX | co-ordinates (ENX) | beam | beam |
| ED | transducer depth | 4m | 4m |

| | | | |
|---|---|---|---|
| ES | salinity | 10 | 10 |
| Data option dialog of VMDAS software | heading source | Ext. Gyro | Ext. Gyro |
| | pitch / roll source | Ext. Phins | Ext. Phins |
| | navigation source | Ext. GPS | Ext. GPS |
| | time per ensemble | 2s | 2s |
| | time between pings | 1s | 1s |
| | heading alignment | 0 deg | 0 deg |
| | heading bias | 0 deg | 0 deg |
| | short term average | 60s | 60s |
| | long term average | 300s | 300s |
| | data screening | off | off |

Post-processing of the VMADCP data was carried out using the Matlab® ADCP toolbox of IOW. The final profiles are 120s and 300s averages of the single ping profiles. At sections where bottom tracking was available the heading bias of the instrument was calculated. This value and the magnetic deviation were applied during post processing.

## 11.4 ScanFish Towed CTD

A high resolution hydrographic transect with the ScanFish towed CTD (SF) was performed at two transects in the eastern and western Gotland Basin. The ScanFish consists of a Seabird 911+ CTD mounted on a wing shaped body undulating between sea surface and about 130m depth when towed behind the ship. Additionally, to the usual CTD sensors, the probe is equipped with sensors for dissolved oxygen concentration, turbidity and Chlorophyll-a fluorescence. The details of the used sensors are given in Table 11.4.
Hydrographic data are transmitted via a multi-conductor cable and stored in the lab on a computer disc. The instrument was be deployed over the stern of the ship and was operated with a separate winch, mounted at the aft deck. The cable is guided by a pulley block mounted below the A-crane. The A-crane will be used for deployment and recovery. The device is towed with about 6 knots, the undulation depth is steered from the lab. Control commands are transmitted via the cable.

**Table 11.4** Type and serial numbers of CTD sensors and the ADCP mounted on ScanFish

| Sensor | Type | SN | Calibration date |
|---|---|---|---|
| Pressure | Digiquartz | 0616 | 06.10.2000 |
| Temperature 0 | SBE 3 | 5491 | 08.01.2025 |
| Temperature 1 | SBE 3 | 1589 | 01.12.2024 |
| Conductivity 0 | SBE 4 | 3722 | 08.01.2025 |
| Oxygen 0 | SBE 43 | 0016 | 18.10.2024 |
| Fast Oxygen | PyroSense | | |
| Chl-a fluorescence / Turbidity | WET Labs - FLNTURTD | 3274 | 10.06.2009 |

## 11.5 Underway Measurements

The RV ELISABETH MANN BORGESE is equipped with numerous sensors, which continuously provide important environmental and navigation parameters. The available data set consists of weather parameters, surface water properties, navigation information, rope length, winch speed and more. The data are collected by a data acquisition system DSHIP3 manufactured by WERUM. All data are stored in a data base and can be extracted by a web interface. A description of all collected parameters is given in the ship specific DSHIP3 manual. All data are snapshots taken and stored every second. After the cruise the full data set was extracted. During the cruise a subset of the parameters was processed.

This data set consists of 30 minutes averages of:

- time (UTC)
- latitude and longitude
- ships heading
- depth
- air pressure
- air temperature
- humidity
- global radiation
- infrared radiation
- Surface conductivity
- Surface salinity (SSS)
- Surface water temperature (SST)
- Surface chlorophyll-a fluorescence
- Surface turbidity
- Wind direction
- Wind speed