ELISABETH MANN BORGESE-Berichte

Baltic Monitoring Programme (BMP) of HELCOM and IOW's long-term observations, western Baltic to central Baltic Proper

Cruise No. EMB 213

06.05.19 – 18.05.2019
Rostock-Marienehe (Germany) – Rostock-Marienehe (Germany)
ACRONYM: HELCOM/long-term

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2019

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1 Cruise Summary

1.1 Summary in English

A series of regular short-term cruises serve to monitor the hydrographic, chemical and biological situation in the western, central and northern Baltic Sea. The work is conducted in the framework of the COMBINE Program of the Helsinki Commission (HELCOM) and the long-term data program of the Leibniz Institute for Baltic Sea Research. It provides the scientific basis for research aiming at the understanding of climatic and anthropogenic forcing of environmental changes and associated ecosystem responses as well as the assessment of the environmental state of the Baltic Sea. The cruise in May generally serves to describe the post spring-bloom situation.

During the expedition, research was conducted at 139 stations aiming at the description of the hydrographic and chemical situation along a transect from the western Baltic Sea (Kiel Bight, Bay of Mecklenburg) to the northern Baltic Sea via the major Basins (Arkona Sea, Bornholm Basin, Gotland Sea including Farö Channel, Landsort Deep, Karlsö Deep). Four additional traverse transects were conducted in the western and eastern Gotland Basin in order to investigate the lateral transport of water into the deeper basin. At selected stations, samples were taken to determine nutrient concentrations and various biological parameters describing the phyto- and zooplankton taxonomic composition/ abundance. These serve the scientific interest for the study of the timing and composition of the spring phytoplankton bloom and the associated dynamics of heterotrophic zooplankton with regard to eutrophication effects and the impact of climatic change on the pelagic ecosystem. Despite one day of interrupted work due to bad weather conditions, the full cruise program was conducted. The first results indicate the continuation of a stagnation period without inflows of saline oxygen-rich water at the bottom and increasing hydrogen sulfide concentrations in the deep basins.

1.2 Zusammenfassung

Im Rahmen des langzeitlichen Monitorings der hydrographischen, chemischen und biologischen Situation werden jährlich fünf Ausfahrten in der westlichen, zentralen und nördlichen Ostsee durchgeführt. Diese erfolgen im Rahmen des COMBINE Programms der Helsinki Kommission (HELKOM) und des Langzeitprogramms des Leibniz Institut für Ostseeforschung in der zentralen Ostsee. Die Daten bilden die Basis zur Erforschung des langzeitlichen Einflusses von Klimaveränderung und anthropogener Aktivität auf die Ökosystemdynamik und den Umweltzustand der Ostsee.

Während der Ausfahrt wurde die Beprobung auf insgesamt 139 Stationen durchgeführt um die hydrographische und chemische Situation entlang eines Schnittes von der Kieler Bucht in die zentrale und nördliche Ostsee zu beschreiben. Zusätzlich wurden in der Gotland See vier Querschnitte zur Beschreibung des lateralen Transports von Wasser aus den Küstenregionen in das Becken zu erfassen. An ausgewählten Stationen in den Becken wurden zudem Proben zur Nährstoffverfügbarkeit und zur Beschreibung der Zusammensetzung und Abundanz der pelagischen Gemeinschaften (Phyto- und Zooplankton) gewonnen. Trotz einer wetterbedingten Unterbrechung der Arbeit konnte das volle Fahrtprogramm umgesetzt werden. Erste Ergebnisse weisen auf ein Andauern der seit 2017 bestehenden Stagnationsphase mit ausbleibenden großen Einströmen von salzigen, sauerstoffreichen Tiefenwasser hin, die zum Anstieg der Schwefelwasserstoffkonzentration in den bodennahem Wasserschichten der Becken führt.

2 Participants

2.1 Principal Investigators

Name	Institution
Dutz, Jörg, Dr.	IOW

2.2 Scientific Party

Name	Discipline	Institution
Dierken, Madleen	Marine Chemistry	IOW
Donath, Jan	Physical Oceanography	IOW
Dutz, Jörg, Dr.	Biol. Oceanography	IOW
Kremp, Anke, Dr.	Biol. Oceanography	IOW
Krüger, Siegfried	Physical Oceanography	IOW
Pötzsch, Michael	Biol. Oceanography	IOW
Sadkowiak, Birgit	Marine Chemistry	IOW
Uchtmann, Friederike	Marine Chemistry	IOW

2.3 Participating Institutions

IOW Leibniz-Institute for Baltic Sea Research Warnemünde

2.4 Crew

Name	Rank
Scholz, Uwe	Kapitän / Master
Herning, Tim	1st Officer
Sauerland, Oliver	2nd Officer
Klück, Torsten	Chief
Renken, Bernd	Electrician
Wagner, Knut	Bosun
Nevermann, Hartmut	Seaman
Schlewitt, Rene	Seaman
Wurm, Wolfgang	Seaman
Becker Braunschweig, Detlef-Ulrich	Seaman
Güse, Kurt	Cook

3 Research Program

3.1 Aims of the Cruise

The cruise contributes to the international environmental monitoring program of the Helsinki Commission (HELCOM) carried out by the Leibniz-Institute for Baltic Sea Research in Warnemünde (IOW). Within the German Exclusive Economic Zone (EEZ), monitoring is undertaken on behalf of the Federal Maritime and Hydrographic Agency (BSH). In the central

Baltic Proper, long-term data is collected by the Leibniz Institute for Baltic Sea Research Warnemünde (IOW). The monitoring program was initiated in 1979 and run by the IOW's predecessor institute and is continued by the IOW since 1992 in the framework of the COMBINE Programme of the Helsinki Commission (HELCOM). The acquired data will be used for the regular national and international assessments of the state of the Baltic Sea (e.g. HELCOM 2018) and the assessment of long-term trends in the hydrographical and biological data.

The spring cruises are of particular scientific interest for the study of the timing and composition of the spring phytoplankton bloom and the associated dynamics of heterotrophic zooplankton with regard to eutrophication effects and the impact of climatic change on the pelagic ecosystem.

Additional program:

- For the taxonomic analysis of zooplankton in the Baltic Sea using molecular metabarcoding, samples from Kiel Bight, Bay of Mecklenburg, Arkona Sea, Bornholm and Gotland Basin were conserved in ethanol for later analysis in the laboratory (responsible scientist: Dr. J Renz, Senckenberg Gesellschaft für Naturfotschung).
- For experimental studies of the physiological tolerance of calanoid copepods and their adaptation potential to changing environmental conditions, specimen of two copepod genera were isolated from live catches and used to start cultures on the board the ship (responsible scientist: Dr. J. Dutz, IOW).
- To support the analysis of the long-term changes in the population dynamics of key copepod species in the Bornholm Basin, zooplankton nets (Apstein, mesh size 50 µm, WP-2 mesh size 100 µm) were deployed to quantitatively sample nauplii and copepodites (responsible scientist Dr. Jörg Dutz, IOW).

3.2 Equipment

Data and sample acquisition was conducted using the following devices and measuring platforms.

At stations and transects:

- CTD SBE 911+ with rosette water sampler
- Phytoplankton nets:
  Apstein-Net: 0.25 m diameter, 20 µm mesh size
  Apstein-Net: 0.18 m diameter, 10 µm mesh size
- Zooplankton nets:
  Apstein Net: 0.18 cm diameter, 50 µm mesh size
  WP2-Net: 0.52 cm diameter, 100 µm mesh size
- Secci disk

Continuous measurements:

- Underway measurements of surface water properties
- Ship weather station

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

3.2 Description of the Work Area

The area under investigation of the cruise EMB-213 covered the western and the central Baltic from the Kiel Bight to the northern Gotland Basin (Fig. 3.1). The majority of stations were located along a transect, describing the hydrographic conditions in all basins on the pathway of saltwater inflows from the North Atlantic and the change in biodiversity associated with the gradient in salinity from mesohaline to oligohaline surface water (Hernroth & Ackefors 1979). The deep inflows are the solely source for ventilation of the deep basins (Matthäus et al. 2008).

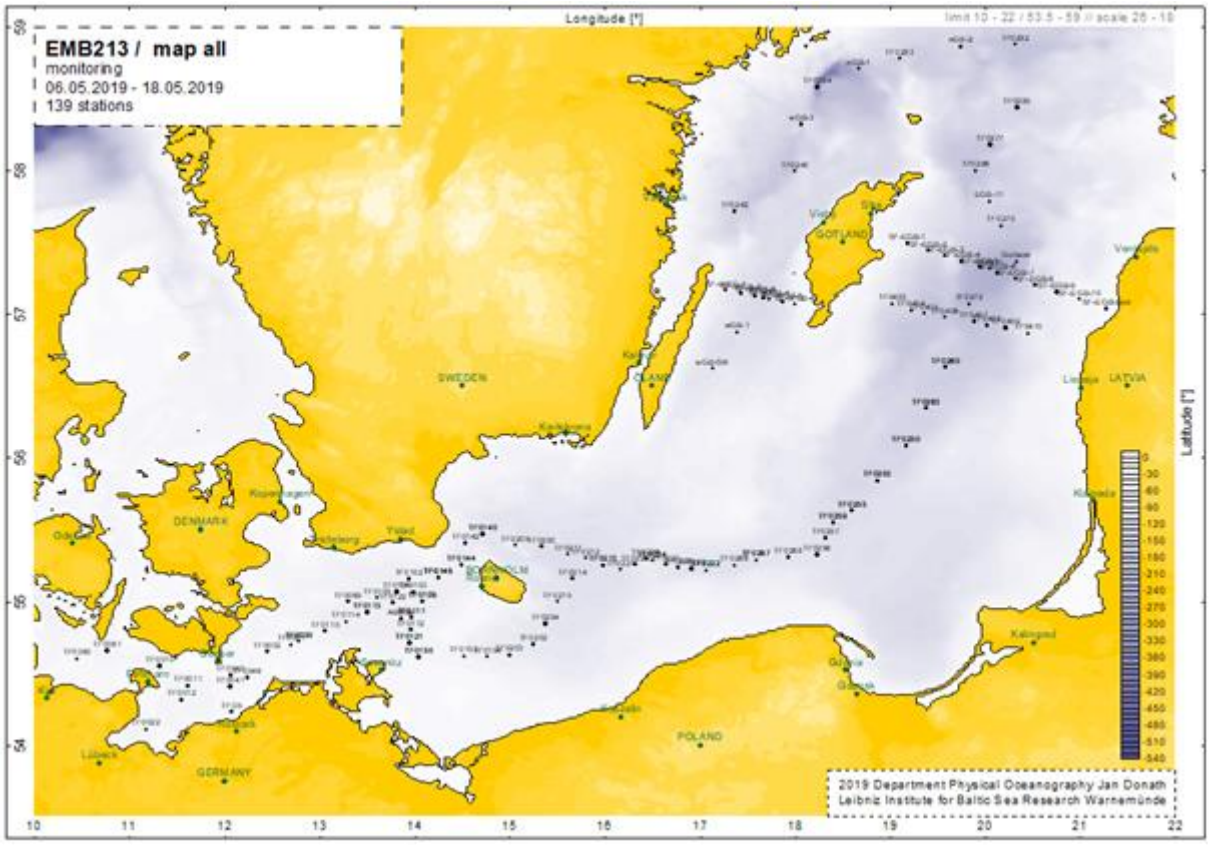

Fig. 3.1 Track chart of R/V ELISABETH MANN BORGESE Cruise EMB 213. Bathymetry from Seifert et al. 2008

4 Narrative of the Cruise

Date	Time UTC	Task
2019-05-03	06:00	Loading of equipment, preparing devices for the cruise
2019-05-06	05:00	Embarking of scientific crew
	05:30	Safety instructions
	06:00	Departure from port Rostock-Marienehe Weather: sunny, moderate wind, W, BF 4, 4-8 m/s
	09:15	Start of work in the Bay of Mecklenburg at Station TF05 Equipment test w/o problems Weather: sunny, moderate, W, BF 4, 4-8 m/s Air temperature: 7.5°C, 1013.4 hPa SST: 9.0 °C, surface salinity: 13.85
	09:50 - 22:00	Station work continued: transect via Bay of Mecklenburg and Fehmarn Belt to Kiel Bight (TF0011 - TF0360); CTD casts, O_2, nutrients, total N/P and POM/DOM measurements, phyto-plankton and zooplankton nets, live catches for the isolation of zooplankton at TF0360, transfer to Bay of Mecklenburg Weather: sunny, strong wind, W, BF 6-7, 10.1-16.2 m/s Air temperature: 7,5°C, 1013.4 hPa SST: 8.9 – 9, 5 °C, surface salinity: 14.12 - 16,38
	22:00 - 24:00	Station work in the Bay of Mecklenburg (TF-0022) Weather: continuously strong winds, W, BF 6-7 14-16 m/s
2019-05-07	00:00 – 09:30	Station work in the Bay of Mecklenburg and Darss Sill (TF-0012 – TF-0030) Weather: cloudy-sunny, strong wind, W, BF 6-7, 9.1-11.6 m/s Air temperature: 6.7-8.0°C, 1014.7 hPa SST: 8.8-9.6 °C, surface salinity: 9.66 – 13.62
	09:30 – 24:00	Station work in the Arkona Basin (TF-0115 – TF0104) and Arkona Basin Buoy Weather: cloudy to sunny, strong wind, W, BF 5-6, decreasing to BF 4 and turning south, 6.9 – 13.7 m/s Air temperature: 7.5 -8.1°C, 1013.7 hPa SST: 7.2-8.9 °C, surface salinity: 7.56 – 8.33
2019-05-08	00:00- 09:15	Continuation of station work in the Arkona Basin (TF-0102 - TF-0145) and Bornholm Channel (TF-0144 - TF-0140), Weather: sunny, moderate wind, SE, BF 4-5, 5.9-9.0 m/s Air temperature: 7.5°C, 1011.8 hPa SST: 6.9-10.1°C, surface salinity: 7.55-7.70
	09:15- 18:45	Station work in the Bornholm Basin (TF-0200 – TF0221), isolation of zooplankton at TF0213, Weather: sunny, moderate wind, SE, BF 4-5, 5.9-8.0 m/s Air temperature: 10.6°C, 1010.8 hPa SST: 6.9-7.4°C, surface salinity: 7.48-7.64

Date	Time UTC	Task
	18:45- 24:00	Station work in the Stolpe Channel (TF-0224 – TF0222), Weather: moderate wind, SE, BF 4-5, 5.8-8.9 m/s Air temperature: 7.6°C, 1008.4 hPa SST: 6.4-7.4°C, surface salinity: 7.44-7.79
2019-05-09	00:00- 06:00	Station work in the Stolpe Channel contd. (TF-0267 – TF0256), Weather: sunny-cloudy, strong wind, E, BF 7, 17.2 m/s, Air temperature: 7.4°C, 1003.8 hPa SST: 6.3-6.4°C, surface salinity: 7.48-7.50
	06:00- 16:50	Station work in the southern Gotland Basin (TF-0259 – TF0260), Weather: sunny-cloudy, strong wind, E, BF 7, 14.7-16.3 m/s, Air temperature: 8.2°C, 1004.5 hPa SST: 6.5-7.0°C, surface salinity: 7.37-7.54
	16:50- 24:00	Transect in the eastern Gotland Basin (TF-0403 – TF-406), CTD casts Weather: cloudy, moderate wind, S, BF 4, 16.1 m/s, Air temperature: 8.8°C, 1005.2 hPa SST: 6.3-6.7°C, surface salinity: 7.24-7.28
2019-05-10	00:00- 04:20	Transect continued (TF-0407 – TF-410) Weather: cloudy, moderate wind, S, BF 4, 14.5 m/s, Air temperature: 8.4°C, 1004.8 hPa SST: 6.5-6.8°C, surface salinity: 7.31-7.44
	04:20- 19:50	Station work in the central Gotland Basin (TF-0272, -0271) Station 271 with 5 CTD casts for hydrography, chemistry, biology in the water column and at the redox-cline, phyto- and zooplankton nets Weather: cloudy, moderate wind, SE, BF 3-4, 4.6-7.2 m/s, Air temperature: 8.1°C, 1003.8 hPa SST: 6.4-6.1°C, surface salinity: 7.30-7.31
	19:50- 24:00	Transect in the eastern Gotland Basin (TF-EGB-1 – EGB4), CTD-casts Weather: cloudy, moderate wind, W, BF 3, 4.1 m/s, Air temperature: 6.1°C, 1008.4 hPa SST: 6.4-6.7°C, surface salinity: 7.10-7.20
2019-05-11	00:00- 07:40	CTD-casts for transect in the eastern Gotland Basin contd. (TF-EGB-5 – TF-EGB-End), Weather: foggy, moderate wind, W, BF 3, 3.8 m/s, Air temperature: 5.6°C, 1009.1 hPa SST: 6.8-8.3°C, surface salinity: 7.10-7.38
	7:40- 20:30	Station work in the Faro Channel (Gotland NE - TF-0285) Weather: foggy, moderate wind, W, BF 3, 4.4 m/s, Air temperature: 7.2°C, 1009.6 hPa SST: 6.2-7.9°C, surface salinity: 6.87-7.26

Date	Time UTC	Task
	20:30- 24:00	Station work in the northern Gotland Basin (TF-282) SST: 6.4°C, surface salinity: 6.95
2019-05-12	00:00- 08:30	Continuation of station work in the northern Gotland Basin (nGB2 – nGB1) Weather: sunny, moderate wind, W, BF 4, 6.4 m/s, Air temperature: 7.4°C, 1014.5 hPa SST: 5.7-5.8°C, surface salinity: 6.29-6.60
	08:30- 13:00	Station work in the Landsort Deep (TF-0284) 4 CTD casts for hydrography, chemistry, biology in the water column and at the redox-cline Weather: sunny, moderate wind, W, BF 3-5, 5.0 -8.4 m/s, Air temperature: 6.7-8.0°C, 1016.8-1021.7 hPa SST: 6.4°C, surface salinity: 6.46
	13:00- 24:00	Station work in the western Gotland Basin (wGB3 – TF-0242) Start transect in the western Gotland Basin (SF-wGB-1) Weather: sunny, moderate wind, W, BF 4, 6.5 -7.4 m/s, Air temperature: 6.7-7.4°C, 1016.8-1019.5 hPa SST: 6.4-7.0°C, surface salinity: 6.59-7.05
2019-05-13	00:00- 05:20	Continuation of the transect in the western Gotland Basin, (SF-wGB-1 - SF-wGB-6), CTD casts from west to east Weather: moderate wind, W, BF 4-5, 7.4-9.0 m/s, Air temperature: 6.5-7.1°C, 1027.0-1028.3 hPa SST: 5.9-6.7°C, surface salinity: 6.98-7.06
	05:20- 09:50	Station work in the western Gotland Basin (wGB1 – wGB-SW) Weather: cloudy, moderate to strong wind, NW, BF 4-6, 9.4-11.6 m/s, air temperature: 6.4°C, 1029.8 hPa SST:6.4 °C, surface salinity: 5.58
	09:50- 16:30	Transit to the eastern Gotland Basin Weather: cloudy, with sunny periods, moderate wind, N, BF 5, 9.7 m/s, air temperature: 8°C, 1030.1 hPa
	16:50- 24:00	Transect in the eastern Gotland Basin (TF-0403 – TF-409), CTD casts across the central Gotland Basin Weather: cloudy, strong wind, N, BF 6, 12.3-14.2 m/s, Air temperature: 6.9°C, 1031.8 hPa SST: 6.8-7.1°C, surface salinity: 7.25-7.47
2019-05-14	00:00- 01:00	Continuation of the transect (TF-410) Weather: strong wind, N, BF 6-7, 17.6 m/s, Air temperature: 6.8 °C, 1032.1 hPa SST: 6.4°C, surface salinity: 7.4

Date	Time UTC	Task
	01:00- 16:15	Station work in the southern Gotland Basin (TF-0260 – 0256) Weather: cloudy, strong wind, N, BF5-7, 8.2-14.6 m/s, Air temperature: °6.9-7.4°C C, 1032.6-1029.7hPa SST: 6.9-7.2°C, surface salinity: 7.38-7.54
	16:15- 24:00	Station work in the Stolpe Channel (TF-0268 – TF-0228) Weather: cloudy, strong wind, N, BF 5-6, 9.1-12.6 m/s, Air temperature: 7.1°C, 1029.1 hPa SST: 7.5-7.6°C, surface salinity: 6.34-7.66
2019-05-15	00:00- 05:30	Station work in the Stolpe Channel (TF-0227 – TF-0226) Weather: strong wind, N, BF5-6, 9.1-10.6m/s, Air temperature: 7.2°C, 1028.9 hPa SST: 7.5-7.8°C, surface salinity: 7.57-7.63
	05:30- 19:00	Station work in the central and southern Bornholm Basin (TF-0225 – TF-0250) Weather: cloudy with sunny periods, moderate-strong wind, N to NE, BF 5-6, 8.8-11.4 m/s, Air temperature: 7.7-9.4°C, 1025.4-1028.4 hPa SST: 7.8-9.6°C, surface salinity: 7.52-8.06
	19:00- 00:00	Station work in the Arkona Basin (TF-0121 – TF-0109) Weather: cloudy, strong wind, NE, BF 5-6, 7.8-11.3 m/s, Air temperature: 7.7-9.4°C, 1025.7 hPa SST: 8.9-9.5°C, surface salinity: 7.84-7.98
2019-05-16	00:00 07:00	Station work in the Bornholm Channel (TF-0144 – TF-0205) Weather: cloudy, strong wind, NE, BF 6-8, 10.4-17.6 m/s, Air temperature: 7.8°C, 1021.3 hPa SST: 8.1-9.0°C, surface salinity: 7.53-7.87
	07:30-	Due to increasing wind conditions > BF 8 and the forecast of stormy weather with wind up to 30 m/s from NE, interruption of work, Transit to the north of Hiddensee for shelter.
2019-05-17	04:00-	Transit to the Arkona Basin to resume work
	06:30- 16:50	Station work the Arkona Basin (TF-0113), Darss Sill (TF-0030, - 0001) and the Bay of Mecklenburg (TF-0046, -0012) Weather: cloudy, moderate-strong wind, NE turning S, BF 5-6, 9.9-12.6 m/s, declining to BF 3-4, 5.1-6.6 m/s Air temperature: 8.6-10.0°C, 1009.6-1012.7 hPa SST: 8.7-11.0°C, surface salinity: 8.70-10.96
	-20:00	Transit to port Rostock-Marienehe
2019-05-18	07:45- 12:00	Arrival at port Rostock-Marienehe Unloading of scientific equipment Disembarking of scientific crew End of cruise EMB-213

5 Preliminary Results

The following results are only preliminary and not comprehensive, since they are based in most cases on unevaluated raw data or are descriptive. Their presentation aims at providing a first overview and general evaluation of the hydrographic, chemical and biological data. A final assessment requires the advanced analysis of data and samples and the validation.

5.1 Hydrographical conditions

5.1.1 Surface Temperatures

Surface temperatures decreased along the cruise track from Kiel Bight to the northern Baltic Proper (Fig. 5.1). Relatively warm temperatures between 8 and 10 °C were recorded in Kiel Bight and in the Arkona Basin, respectively. In the deeper areas, it dropped to 6.1-7.6 °C in the Bornholm Basin and to 6.3-6.9 °C in the central Gotland Basin. The minimum surface temperature of 5.9 °C occurred in in the western Gotland Basin. These values fit the general long-term trend of elevated spring temperatures in the Baltic Sea well (Tab. 5.1). Especially in the western Baltic Sea (Bay of Mecklenburg, Arkona Sea) surface water, temperatures were at the upper end of the range that was previously observed. This relates to the warm winter temperature anomalies observed in 2019. In contrast, surface water temperatures in the Baltic Proper did not appear to be unusually elevated (Tab. 5.1).

Table 5.1 Temperature in the surface layer (°C) in 2019 in comparison with former years.

Area:	2019	2018	2017	2016	2015	2014	2013	1971-1990
Mecklenburg Bay	9.2	8.2	8.1	11.3	9.7		8.2	2.6
Arkona Basin	7.4	7.1	7.0	9.8	8.2		6.2	2.1
Bornholm Basin	7.4	8.4	6.1	8.9	8.0		4.5	2.4
Gotland Deep	6.6	7.4	5.8	8.7	7.0		4.8	2.6
Farö Deep	7.2	8.6	5.0	7.9	4.3		5.3	2.3
Karlsö Deep	6.4	8.1	7.0	8.1	6.6		4.6	2.2

5.1.2 Salinity in the Surface Water

The sea surface salinity ranges from 16.36 in the Kiel Bight to 6.29 in the central Baltic Proper (Fig 5.1). The salinity recorded in the Kiel Bight was likely elevated above the usual observed level and is likely explained by the strong westerly winds observed before and during the first days of the cruise. Nevertheless, surface salinity in the Bay of Mecklenburg dropped to those values typical for the area (10.58-13.62.). East of the Darss Sill, surface further decreased below 10 and did not show large variation along the cruise track.

5.1.3 Deep Water Temperatures

The vertical profiles showed a vertical mixed water column in the Kiel Bight and the Bay of Mecklenburg with bottom temperatures only slightly lower than in the surface (Fig. 5.1). The beginning of the seasonal thermal stratification was, in contrast, visible in the Arkona Sea, Bornholm Basin and Gotland Sea. Here, warming of the surface layer eroded the intermediate cold winter water (<6°C) in a layer below 40 m. Towards the north the thermocline was shallowing due

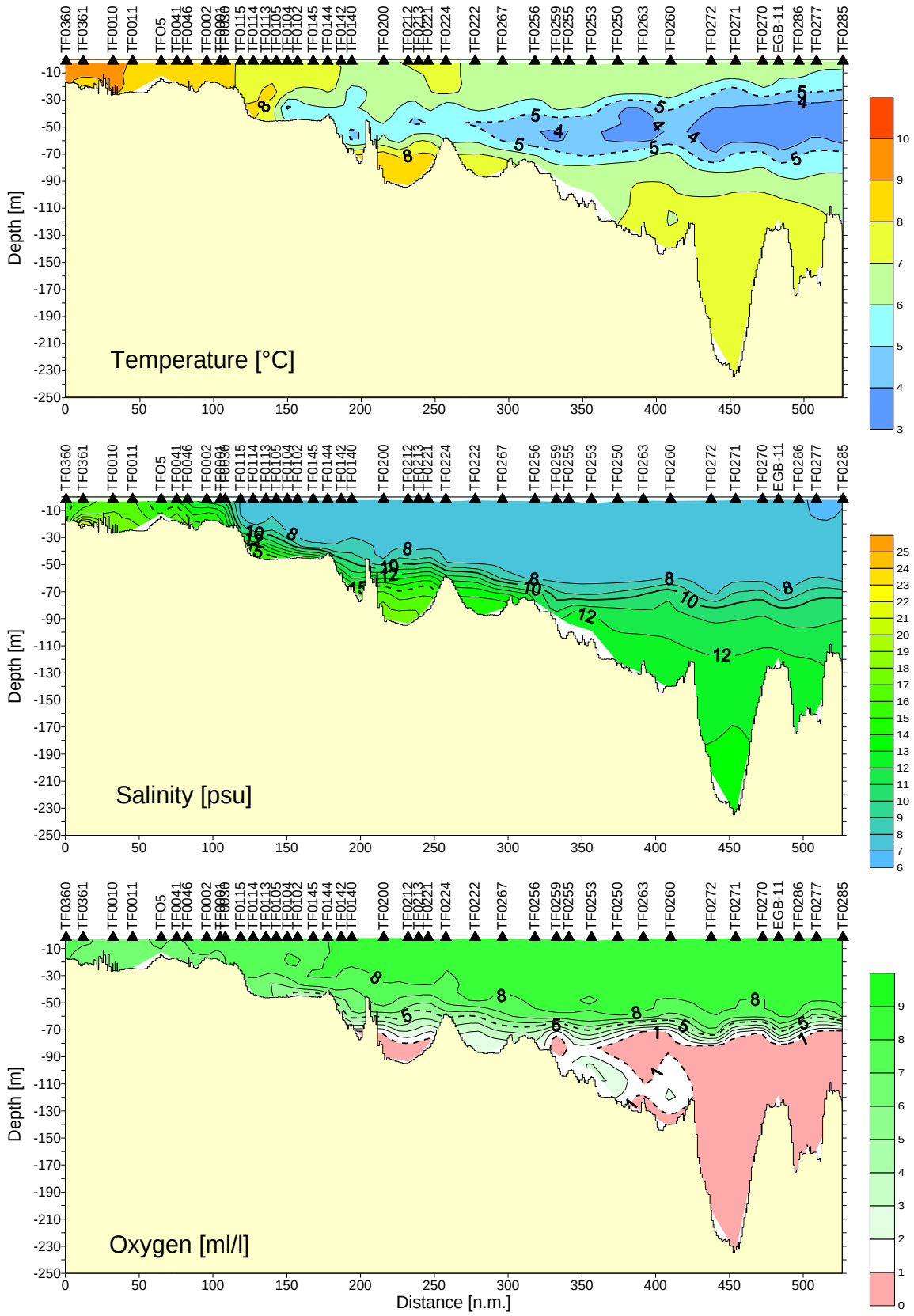

Fig. 5.1 Cross section from Kiel Bight to eastern Gotland Basin showing the hydrographic parameters temperature, salinity and oxygen on the "Talweg" of Major Baltic Inflows (location see map Fig. 3.1).

to the delayed spring warming. At depth, residuals of the baroclinic inflow events of warm summer water in late 2018 were visible in the Bornholm Basin, but were eroded in the Gotland Basin.

The long-term trend of increasing water temperature, unbiased by short-term variations, is reflected in the deep-water layers of the central deeps of the Baltic Proper (Table 5.2). Despite reductions in deep-water temperature in the Bornholm Deep in 2016 and in the Gotland Deep in 2017/2018, the trend of increasing temperature is visible in the Bornholm, Gotland, Faro and Landsort Deep.

Table 5.2 Temperature in the bottom layer (°C) in comparison with former years

Area:	2019	2018	2017	2016	2015	2014	2013	1971-1990
Bornholm Deep	8.64	6.93	6.92	6.24	7	5.6	5.12	6.12
Gotland Deep	7.45	6.91	7.14	7.53	6.88	6.62	6.41	5.62
Farö Deep	7.24	6.77	7.07	6.81	6.5	5.71	5.94	5.2
Landsort Deep	6.39	6.27	n.d.	5.85	5.42	5.32	5.39	4.76
Karlsö Deep	5.67	5.66	5.51	5.21	5.01	4.99	5.33	4.18

5.1.4 Salinity in the Bottom Layer

Due to the strong westerly winds prevailing before and during the cruise, the bottom salinity in the western areas (Kiel Bight, Mecklenburg Bight) were slightly elevated in comparison to the winter cruises in 2019 (Fig. 5.1). However, past the Darss sill little changes occurred with deep-water salinities of 16.29, 17.14 and 13.32 in the Arkona Sea, Bornholm Basin and the Gotland Deep, respectively.

Following the major Baltic inflow in December 2014 and subsequent inflow events, a maximum in the bottom salinity of 13.77 occurred in 2016. Since then, the trend reversed and a salinity of 13.32 constitutes a stagnation in this decline (Tab. 5.3). This stagnation is also visible in the salinity of the deep-water in Faro, Landsort and Karlsö Deep after the maxima observed in 2017 and 2018, respectively.

Table 5.3 Salinity in the bottom layer in May 2019 in comparison with former years.

Area	2019	2018	2017	2016	2015	2014
Gotland Deep	13.32	13.29	13.45	13.77	13.54	12.21
Farö Deep	12.65	12.69	12.90	12.70	12.11	11.42
Landsort Deep	11.29	11.46	no data	10.99	10.54	10.32
Karlsö Deep	10.43	10.40	10.24	9.87	9.60	9.48

5.1.5 Oxygen Situation in the Bottom Layer

The measurements of the oxygen and hydrogen sulfide concentrations in the deep water reinforces the observation of a recent stagnation period in the transport of oxygen rich water into the Baltic Proper following the ventilation phase in 2014-2017. This is illustrated by the zone with hydrogen sulfide formation in the Bornholm Basin Deep (Fig. 5.1) which eroded the oxygen availability after the winter observed in February. Similarly, hydrogen sulfide concentrations increased in the Gotland, Faro, Landsort and Karlsö Deep in comparison to previous years and depict a recent maximum since 2015 (Tab. 5.4). In the Karlsö Deep, a considerable increase since 2013 occurred

that illustrates that the ventilation during 2014-2017 barely reached the distant deep basins in the western Gotland Sea.

The situation in the Slupsk Channel and the southern Gotland Sea, however, differed from this general picture. Here, hydrogen sulfide formation observed during the winter cruised vanished and oxygen concentrations amounted to more than 4 ml/l (Fig. 5.1). The salinity and temperature characteristics of the water suggest that this water originates likely from the Bornholm Basin. This water from the upper halocline has been potentially pushed through the Slupsk channel into the southern Gotland Sea by the strong westerly winds prevailing prior to the cruise.

Table 5.4 Oxygen concentrations in the bottom layer (ml/l). Hydrogen sulphide was converted into negative oxygen equivalents.

Area:	2019	2018	2017	2016	2015	2014	2013
Gotland Deep	-5.47	-3.26	-3.44	0.08	2.09	-6.03	-7.59
Farö Deep	-2.53	-2.53	0.38	0.05	-1.18	-3.58	-3.57
Landsort Deep	-1.33	-0.16	n.d.	-1,05	-0.73	-3.13	-0.78
Karlsö Deep	-2.55	-2.1	-1.56	-1.13	-0.84	-0.74	-0.7

5.2 Nutrient Situation

The nutrient situation encountered in the surface layer was typical for the post spring bloom period in the entire Baltic Sea as indicated by the observations of the phytoplankton composition in the surface layer (see also chapter 5.4). Nitrate was completely consumed relative to the phosphate and silicate concentrations (see Anhang Table 11.1) Phosphate was reduced to 0.08-0.15 µmol/L in the Kiel Bight and the Bay of Mecklenburg and ranged from 0.20-0.33 µmol/L in the Arkona Basin to the Gotland Sea, respectively. Silicate, in contrast, was still available in large quantities, especially in the Gotland Basin. This generally matches with a phytoplankton composition typically dominated by dinoflagellates in the Arkona to the Gotland Sea.

The nutrient situation in the deep water mirrored the hydrographic characteristics of the deep basins since the inflow period 2014-2017. While nitrate and nitrite levels increased during the inflow period due to release from the sediment up to 12.53 µmol/L, concentrations decreased below detection limit since the years 2017/2018 (Table 5.5).

Table 5.5 Nitrate and nitrite concentrations in the bottom layer (µM)

Area	2019	2018	2017	2016	2015	2013
Gotland Deep	0.00	0.00	0.00	12.53	10.53	0.14
Farö Deep	0.00	0.00	7.91	4.89	0.25	0.52
Landsort Deep	0.00	0.00	n.d.	0.00	0.35	0.18
Karlsö Deep	0.00	0.00	0.00	0.00	0.34	0.11

In contrast, ventilation of the Eastern Gotland Basin since summer 2014 caused decreasing phosphate concentrations to 1.95 µmol/L, a trend that reversed following the inflow period (Table 5.6). The phosphate concentration remained stable in the Gotland Deep (4.70-4.87 µmol/L) and the Karlsö Deep (3.40-3.50 µmol/L) during the years 2018-2019, but displayed an increasing trend in the Farö and the Landsort Deep (4.45-5.07 µmol/L).

Table 5.6 Phosphate concentrations in the bottom layer (µM)

Area	2019	2018	2017	2016	2015	2013
Gotland Deep	4.70	4.87	5.2	2.46	1.95	9.45
Farö Deep	5.07	4.25	2.63	2.59	3.3	7.45
Landsort Deep	4.45	2.85	n.d.	3.23	3.7	4.95
Karlsö Deep	3.40	3.50	3.65	4.75	3.95	3.5

5.3 Biological Sampling

Samples for the investigation of the seasonal and long-term variation of the phytoplankton and zooplankton were collected on selected station for the later analysis in the laboratory. The first live inspection of the collected material showed a spatial variation in the composition that was related to the salinity gradient in the Baltic Sea. The composition reflected the occurrence of groups typical for the post-spring bloom period in May and an eastward delay to the state of progression of the seasonal development.

In the Kiel Bight (TF-0360), the phytoplankton consisted of a mix of diatoms and dinoflagellates. Diatoms dominated the phytoplankton, with *Proboscia alata* and pennate diatoms as the most abundant species. Among the dinoflagellates, *Ceratium fusus, C. furca* and *C. tripos* were conspicuous because of their large size. *Dinophysis norvegica* and *D. acuta*, *Prorocentrum minimum* and *Heterocapsa* spp. were frequently observed together with heterotrophic dinoflagellates mostly of the genus *Protoperidiniu*. The zooplankton in the Kiel Bight reflected the species composition from preceding years. Meroplankton was rare, only few cladocera of the genera *Evadne* and *Podon* were observed. *Acartia bifilosa* was the dominating species among the calanoid copepods, together with *Pseudocalanus* spp. *Oithona similis* appeared to be less abundant than usual. *Temora longicornis* and *Centropages hamatus* were minor species.

The plankton encountered in the Bay of Mecklenburg (TF0012, TF0046) differed only marginally from the composition in Kiel Bay, likely due to the strong western winds preceding and during the cruise. Diatoms still dominated the phytoplankton, with *Proboscia alata* as a major species and large *Coscinodicus* spp. among others. Dinoflagellates (*Ceratium tripos*, *C. furca*, *Protoperidinium depressum* and *Dinophysis* spp.), however, were less frequent. The zooplankton was dominated mainly by *Acartia bifilosa*, while only few *Acartia longiremis*, *Temora longicornis*, *Pseudocalanus* spp, *Centropages hamatus* and *Oithona* spp were encountered. Cladocerans were generally rare. *Evadne nordmanni* and *Podon* spp were the main species.

Phytoplankton in the Arkona Basin generally resembled the community of the Bay of Mecklenburg. However, dinoflagellates became more prominent in relation to diatoms. Common taxa included *Heterocapsa spp* and *Protoperidinium* species. *Mesodinium rubrum* was also present. The zooplankton composition in the western part of the Arkona Basin (TF-0113) also remained largely similar to the Bay of Mecklenburg. Copepods generally dominated the composition. *Acartia bifilosa* were still the major species in the surface, but *Acartia longiremis* and *Pseudocalanus* spp. became more abundant in the deeper layer below the thermocline. *Temora longicornis* and *Centropages hamatus* remained rare, as did the cladocerans *Podon* spp and *Evadne nordmanni*. Towards the east (TF-0109), however, the rotifer *Synchaeta* spp. together with the cladocerans became abundant in the surface layer and *T. longicornis* got more frequent.

The Bornholm and Gotland Basins were characterized by a typical brackish water late spring bloom community, consisting mainly of dinoflagellates. The chain forming cold water species *Peridiniella catenata* was the dominant species and appeared in different stages of life cycle transition. Newly formed cysts were particularly abundant in Bornholm basin. Besides *P. catenata, Dinophysis* spp. consisted a large part of the community, appearing together with the ciliate *Mesodinium rubrum*. Also heterotrophic dinoflagellates, mainly of the genus *Protoperidinium* and typical for late stages of the spring bloom were abundant. Diatoms were a minor component of the bloom. Filamentous cyanobacteria occurred in the northern parts of Gotland Basin. A large shift in the composition of the zooplankton occurred during the transit to the Bornholm Basin. *Acartia longiremis* and *Temora longicornis* were considerably more frequent than in the western stations, the rotifer *Synchaeta* spp. and the cladoceran *Evadne nordmanni* remained abundant, while the abundance of *A. bifilosa* decreased considerably. Pseudocalanus spp. was still rarely observed. The composition changed only little in the southern and central Gotland Basin. However, while in the Bornholm Basin the copepods consisted of later copepodites stages, nauplii and early copepodites stages occurred in the Gotland Basin mainly. In addition, meroplanktonic polychaete larvae were numerous, indicating that the seasonal development in the Gotland Basin was delayed.

6 Ship's Meteorological Station

The weather situation was variable during the two weeks cruise due to strongly changing wind conditions influenced by low-pressure cells above the British Isles and the Mediterranean Sea and high-pressure cells located in northern Europe. Moderate to strong westerly wind increasing from BF 4 to 7 (4-17 m/s) prevailed during the work in the Kiel Bight, the Bay of Mecklenburg and the Arkona Sea (6^{th}-7^{th} May). The weather was mostly sunny with air temperatures of 7.5-8.1 °C and the air pressure was rather constant (1013.4-1014.7 hPa).

The conditions changed with the onset of the work in the Bornholm Basin and the Slupsk Channel (8^{th}-9^{th} May). The air pressure dropped to 1003.8 hPa, it became more cloudy. The wind turned south-east with a speed of BF 7 (up to 17.2 m/s), the air temperature increased to 10.1 °C. During the work in the eastern and northern Gotland Basin the weather situation calmed down (10^{th}-11^{th} May). The wind speed dropped (BF 3-4, 3.4-7.4 m/s), the air pressure slightly increased to 1009.6 hPa and it was foggy with air temperatures of 6.1-7.2 °C.

High pressure conditions over northern Europe determined the weather during the beginning of the second week when work commenced in the western/south-eastern Gotland Basin (12^{th}-14^{th} May). The air pressure increased to 1032.1 hPa in cloudy weather with sunny periods. The wind turned north, the wind speed increased to BF 6-7 (17.6 m/s), while the air temperature dropped to 6.4 °C. The air pressure dropped to 1021.3 during the work in the Slupsk Channel, Bornholm Basin, Arkona Sea and Bornholm Channel (15^{th}-16^{th} May). The weather was mainly cloudy, with air temperatures of 7.2-9.4 °C and strong wind from north-east (BF 5-6, 7.8-12.6 m/s).

Stormy weather with wind > BF8 and up to 30 m/s in gust of wind interrupted the work in the Arkona Basin on the 16^{th} May. The last day of the cruise in the Arkona Sea and the Bay of Mecklenburg was first characterized by strong wind from north-east (BF 5-6, 9.9-12.6 m/s) turning south (BF 3-4, 5.1-6.6 m/s) during the day. Air pressure was 1009.6-1012.7 hPa and the air temperature increased to 10.0 °C.

7 Station List EMB213

7.1 Station List – CTD measurements, 139 stations, 159 casts

Date	Latitude [numerical]	Longitude [numerical]	Institute-Station-Number	Station No. EMB213	Begin [UTC]	End [UTC]	Water Depth [m] Start	Water Depth [m] End	Dataset [file name]
2019-05-06	54°13.9075N	12°04.5798E	TF05	EMB213_1-1	7:19	7:33	12.43	13.34	V001F01
2019-05-06	54°24.7801N	11°37.0458E	TF0011	EMB213_2-1	9:46	9:52	24.83	24.97	V002F01
2019-05-06	54°33.0627N	11°19.3585E	TF0010	EMB213_3-1	11:30	11:42	27.99	28.21	V003F01
2019-05-06	54°39.4669N	10°46.2097E	TF0361	EMB213_4-1	14:02	14:12	22.84	22.64	V004F01
2019-05-06	54°35.9837N	10°27.1147E	TF0360	EMB213_5-1	16:00	16:20	27.86	17.96	V005F01
2019-05-07	54°06.6059N	11°10.5533E	TF0022	EMB213_6-1	22:09	22:15	23.33	23.24	V006F01
2019-05-07	54°18.8716N	11°33.0488E	TF0012	EMB213_7-1	0:22	0:31	24.51	24.47	V007F01
2019-05-07	54°24.3858N	12°03.7464E	TF0041	EMB213_8-1	02:52	02:55	16.69	19.04	V008F01
2019-05-07	54°24.3858N	12°03.7464E	TF0041	EMB213_8-2	03:01	03:06	19.08	19.18	V008K02
2019-05-07	54°24.3858N	12°03.7464E	TF0041	EMB213_8-3	03:06	03:08	18.79	18.69	V008K03
2019-05-07	54°29.2829N	12°03.9368E	TF0040	EMB213_9-1	4:20	4:24	11.68	11.68	V009F01
2019-05-07	54°28.1962N	12°14.5021E	TF0046	EMB213_10-1	5:38	6:01	28.12	28.82	V0010F01
2019-05-07	54°38.9918N	12°27.0789E	TF0002	EMB213_11-1	7:25	7:36	18.01	17.82	V0011F01
2019-05-07	54°41.8039N	12°42.0963E	TF0001	EMB213_12-1	8:37	8:42	20.64	20.92	V0012F01
2019-05-07	54°43.4021N	12°47.0842E	TF0030	EMB213_13-1	9:19	9:32	22.22	22.68	V0013F01
2019-05-07	54°47.7127N	13°03.5615E	TF0115	EMB213_15-1	10:35	10:48	30.17	29.78	V0014F01
2019-05-07	54°51.5920N	13°16.6210E	TF0114	EMB213_16-1	11:52	12:02	45.14	44.76	V0015F01
2019-05-07	54°59.9935N	13°18.0081E	TF0069	EMB213_17-1	13:06	13:14	46.50	46.28	V0016F01
2019-05-07	54°55.5087N	13°30.0250E	TF0113	EMB213_18-1	14:13	14:24	47.15	47.10	V0017F01
2019-05-07	54°36.6784N	14°02.6107E	TF0150	EMB213_19-1	17:30	17:38	21.91	21.52	V0018F01
2019-05-07	54°42.5948N	13°56.8019E	TF0121	EMB213_19-1	18:30	18:42	30.05	29.95	V0019F01
2019-05-07	54°48.2047N	13°57.4878E	TF0112	EMB213_20-1	19:23	19:34	40.40	40.45	V0020F01
2019-05-07	54°53.3844N	13°58.1340E	TF0111	EMB213_21-1	20:16	20:22	44.51	44.81	V0021F01
2019-05-07	54°52.8279N	13°51.5353E	ArkonaBoje	EMB213_22-1	20:57	21:06	45.77	45.47	V0022F01
2019-05-07	54°59.3152N	13°46.3085E	TF0122	EMB213_23-1	21:53	22:01	47.31	47.41	V0023F01
2019-05-07	55°01.5103N	13°36.4520E	TF0105	EMB213_24-1	22:47	22:56	46.25	46.25	V0024F01
2019-05-07	55°04.1295N	13°48.7763E	TF0104	EMB213_25-1	23:58	0:09	46.44	46.44	V0025F01
2019-05-08	55°09.3231N	13°56.5663E	TF0102	EMB213_26-1	1:02	1:11	44.99	44.72	V0026F01
2019-05-08	55°03.7970N	13°59.2649E	TF0103	EMB213_27-1	2:01	2:07	46.83	46.74	V0027F01
2019-05-08	55°03.7970N	13°59.2649E	TF0103	EMB213_27-2	2:14	2:16	46.88	46.88	V0027K02
2019-05-08	55°03.7970N	13°59.2649E	TF0103	EMB213_27-3	2:18	2:21	46.88	46.88	V0027K03
2019-05-08	55°00.0299N	14°04.9808E	TF0109	EMB213_28-1	3:24	3:34	48.04	47.92	V0028K01
2019-05-08	55°09.9948N	14°15.0466E	TF0145	EMB213_29-1	5:13	5:24	46.85	46.65	V0029F01
2019-05-08	55°15.2983N	14°29.4790E	TF0144	EMB213_30-1	6:39	6:48	44.63	44.25	V0030F01
2019-05-08	55°24.3031N	14°32.2186E	TF0142	EMB213_31-1	7:58	8:08	60.14	60.14	V0031F01
2019-05-08	55°28.0287N	14°43.0345E	TF0140	EMB213_32-1	9:11	9:23	67.55	69.23	V0032F01
2019-05-08	55°23.0068N	15°20.0107E	TF0200	EMB213_33-1	11:29	11:40	91.07	91.69	V0033F01
2019-05-08	55°19.8162N	15°36.8630E	TF0211	EMB213_34-1	12:49	13:01	95.46	95.46	V0034F01
2019-05-08	55°18.0949N	15°47.8066E	TF0212	EMB213_35-1	13:53	14:03	95.26	95.05	V0035F01
2019-05-08	55°15.0110N	15°58.9838E	TF0213	EMB213_36-1	15:01	15:10	90.02	89.83	V0036F01
2019-05-08	55°15.0110N	15°58.9838E	TF0213	EMB213_36-2	15:28	15:36	89.64	89.83	V0036F02
2019-05-08	55°13.3081N	16°09.9752E	TF0221	EMB213_37-1	18:45	18:54	82.78	82.87	V0037F01
2019-05-08	55°17.0214N	16°29.9735E	TF0224	EMB213_38-1	20:13	20:22	63.46	62.75	V0038F01
2019-05-08	55°13.0124N	17°03.9652E	TF0222	EMB213_39-1	22:29	22:41	91.12	91.03	V0039F01
2019-05-09	55°17.1858N	17°35.5730E	TF0267	EMB213_40-1	0:52	0:58	84.10	83.75	V0040F01
2019-05-09	55°17.1830N	17°35.6193E	TF0267	EMB213_40-2	1:08	1:10	83.36	83:65	V0040K02
2019-05-09	55°17.1849N	17°35.6192E	TF0267	EMB213_40-3	1:12	1:14	84.04	84.94	V0040K03
2019-05-09	55°19.6244N	18°14.0369E	TF0256	EMB213_41-1	5:16	5:27	77.21	77.85	V0041F01
2019-05-09	55°33.0236N	18°23.9320E	TF0259	EMB213_42-1	7:06	7:27	89.27	89.30	V0042F01
2019-05-09	55°38.0207N	18°35.9395E	TF0255	EMB213_43-1	8:44	8:54	95.73	95.41	V0043F01
2019-05-09	55°50.4164N	18°51.9337E	TF0253	EMB213_44-1	10:32	10:43	101.07	101.13	V0044F01
2019-05-09	56°05.0050N	19°09.9908E	TF0250	EMB213_45-1	12:40	12:50	123.81	123.88	V0045F01
2019-05-09	56°20.7897N	19°22.7098E	TF0263	EMB213_46-1	14:40	14:48	132.34	132.45	V0046F01
2019-05-09	56°37.9998N	19°34.9908E	TF0260	EMB213_47-1	16:49	17:10	143.23	143.15	V0047F01
2019-05-09	57°04.4059N	19°01.4858E	TF0403	EMB213_48-1	20:17	20:28	113.85	113.66	V0048F01
2019-05-09	57°01.7279N	19°13.1843E	TF0404	EMB213_49-1	21:17	21:34	159.43	160.56	V0049F01

Date	Latitude [numerical]	Longitude [numerical]	Institute-Station-Number	Station No. EMB213	Begin [UTC]	End [UTC]	Water Depth [m] Start	Water Depth [m] End	Dataset [file name]
2019-05-09	57°00.5095N	19°21.2773E	TF0405	EMB213_50-1	22:10	22:21	174.23	174.90	V0050F01
2019-05-09	56°58.8168N	19°34.5530E	TF0406	EMB213_51-1	23:16	23:28	165.37	166.06	V0051F01
2019-05-10	56°57.0020N	19°52.9967E	TF0407	EMB213_52-1	0:45	0:55	175.02	175.33	V0052F01
2019-05-10	56°55.3888N	20°01.1128E	TF0408	EMB213_53-1	1:39	1:49	164.05	163.86	V0053F01
2019-05-10	56°55.3835N	20°01.1357E	TF0408	EMB213_53-2	1:59	2:01	164.05	164.05	V0053K02
2019-05-10	56°55.3909N	20°01.1241E	TF0408	EMB213_53-3	2:03	2:05	164.05	164.05	V0053K03
2019-05-10	56°54.3282N	20°12.9782E	TF0409	EMB213_54-1	3:06	3:14	144.11	143.82	V0054F01
2019-05-10	56°52.0010N	20°27.2614E	TF0410	EMB213_55-1	4:16	4:26	61.33	60.82	V0055F01
2019-05-10	57°04.2974N	19°49.7789E	TF0272	EMB213_56-1	6:49	7:19	204.98	206.14	V0056F01
2019-05-10	57°19.2065N	20°02.9259E	TF0271	EMB213_57-1	9:01	9:24	236.41	236.41	V0057F01
2019-05-10	57°19.2107N	20°02.8349E	TF0271	EMB213_57-2	10:04	10:17	236.72	236.72	V0057F02
2019-05-10	57°19.2505N	20°02.8961E	TF0271	EMB213_57-3	10:55	11:03	236.72	236.72	V0057F03
2019-05-10	57°19.2530N	20°02.8456E	TF0271	EMB213_57-4	12:41	12:58	236.72	236.72	V0057F04
2019-05-10	57°19.2542N	20°02.8363E	TF0271	EMB213_57-5	13:00	16:20	236.72	236.72	V0057F05
2019-05-10	57°29.7275N	19°10.7792E	SF-EGB-1	EMB213_58-1	19:52	19:59	43.66	43.05	V0058F01
2019-05-10	57°26.7313N	19°23.9526E	SF-EGB-2	EMB213_59-1	20:59	21:11	95.91	96.01	V0059F01
2019-05-10	57°24.4346N	19°34.3862E	SF-EGB-3	EMB213_60-1	22:01	22:08	89.21	89.96	V0060F01
2019-05-10	57°22.1086N	19°44.9208E	SF-EGB-4	EMB213_61-1	22:58	23:16	173.43	172.09	V0061F01
2019-05-10	57°19.6258N	19°56.8025E	SF-EGB-5	EMB213_62-1	0:09	0:24	224.42	224.13	V0062F01
2019-05-11	57°17.3851N	20°07.7591E	SF-EGB-6	EMB213_63-1	1:16	1:35	239.18	239.18	V0063F01
2019-05-11	57°14.8729N	20°18.8024E	SF-EGB-7	EMB213_64-1	2:41	2:50	173.43	173.11	V0064F01
2019-05-11	57°12.2723N	20°31.4069E	SF-EGB-8	EMB213_65-1	3:47	3:58	96.94	96.46	V0065F01
2019-05-11	57°09.3105N	20°45.3853E	SF-EGB-9	EMB213_66-1	5:08	5:23	59.24	58.86	V0066F01
2019-05-11	57°06.3128N	20°59.4610E	SF-EGB-10	EMB213_67-1	6:21	6:30	21.06	21.03	V0067F01
2019-05-11	57°02.4773N	21°16.4669E	SF-EGBEnd	EMB213_68-1	7:33	7:40	21.71	21.99	V0068F01
2019-05-11	57°21.9604N	20°19.8601E	Gotland NE	EMB213_69-1	10:58	11:15	217.06	218.50	V0069F01
2019-05-11	57°37.0486N	20°10.0163E	TF0270	EMB213_70-1	13:06	13:16	142.76	142.76	V0070F01
2019-05-11	57°47.1601N	20°02.6988E	EGB-11	EMB213_71-1	14:28	14:38	120.69	121.36	V0071F01
2019-05-11	57°59.9952N	19°53.9836E	TF0286	EMB213_72-1	16:13	16:45	192.96	190.94	V0072F01
2019-05-11	58°11.0030N	20°03.0266E	TF0277	EMB213_73-1	18:26	18:40	160.68	160.47	V0073F01
2019-05-11	58°26.5230N	20°20.0489E	TF0285	EMB213_74-1	20:29	20:43	122.65	122.18	V0074F01
2019-05-11	58°52.9843N	20°19.0053E	TF0282	EMB213_75-1	23:14	23:26	162.66	162.84	V0075F01
2019-05-12	58°51.9574N	19°44.6472E	nGB-2	EMB213_76-1	1:22	1:32	160.82	160.82	V0076F01
2019-05-12	58°51.9413N	19°44.6306E	nGB-2	EMB213_76-2	1:45	1:47	160.80	161.47	V0076K02
2019-05-12	58°51.9410N	19°44.6243E	nGB-2	EMB213_76-3	1:49	1:51	161.28	160.99	V0076K03
2019-05-12	58°46.9835N	19°06.0068E	TF0283	EMB213_77-1	4:11	4:27	125.08	124.61	V0077F01
2019-05-12	58°42.7478N	18°40.1858E	nGB-1	EMB213_78-1	5:59	6:38	237.95	229.10	V0078F01
2019-05-12	58°34.9964N	18°14.0070E	TF0284	EMB213_79-1	8:23	9:14	439.29	439.29	V0079F01
2019-05-12	58°34.9873N	18°14.0054E	TF0284	EMB213_79-2	10:24	10:35	440.56	440.56	V0079F02
2019-05-12	58°34.9913N	18°13.9954E	TF0284	EMB213_79-3	11:23	11:25	440.56	440.56	V0079F03
2019-05-12	58°35.0009N	18°13.9963E	TF0284	EMB213_79-4	12:23	12:47	440.56	440.56	V0079F04
2019-05-12	58°19.5618N	18°04.1210E	wGB-3	EMB213_80-1	14:38	14:50	155.27	155.27	V0080F01
2019-05-12	57°59.9891N	17°59.9895E	TF0240	EMB213_81-1	17:14	17:33	166.22	166.49	V0081F01
2019-05-12	57°42.9862N	17°22.0359E	TF0242	EMB213_82-1	20:02	20:23	140.10	138.16	V0082F01
2019-05-12	57°10.1008N	17°16.3168E	SF-WBG-1	EMB213_83-1	23:42	23:47	59.27	60.23	V0083F01
2019-05-12	57°10.1004N	17°16.3088E	SF-WBG-1	EMB213_83-2	23:54	23:56	60.52	60.80	V0083K02
2019-05-12	57°10.0996N	17°16.2873E	SF-WBG-1	EMB213_83-3	23:58	0:00	60.80	61.19	V0083K03
2019-05-13	57°08.8441N	17°25.7359E	SF-WGB-2	EMB213_84-1	0:51	1:03	71.15	74.21	V0084F01
2019-05-13	57°07.6183N	17°34.7208E	SF-WGB-3	EMB213_85-1	1:44	1:59	104.97	106.31	V0085F01
2019-05-13	57°06.8423N	17°39.8129E	TF0245	EMB213_86-1	2:31	2:55	109.09	109.84	V0086F01
2019-05-13	57°06.3620N	17°43.6619E	SF-WGB-4	EMB213_87-1	3:23	3:34	100.25	100.21	V0087F01
2019-05-13	57°05.2874N	17°52.0589E	SF-WGB-5	EMB213_88-1	4:28	4:38	82.10	82.04	V0088F01
2019-05-13	57°04.1891N	18°00.0325E	SF-WGB-6	EMB213_89-1	5:20	5:28	45.46	45.07	V0089F01
2019-05-13	56°52.6520N	17°23.3323E	wGB-1	EMB213_90-1	7:46	7:59	95.36	96.10	V0090F01
2019-05-13	56°37.5017N	17°07.8209E	wGB-SW	EMB213_91-1	9:39	9:46	77.99	77.99	V0091F01
2019-05-13	57°04.3885N	19°01.4548E	TF0403	EMB213_92-1	16:53	17:06	112.88	113.42	V0092F01
2019-05-13	57°01.7048N	19°13.2593E	TF0404	EMB213_93-1	18:04	18:20	160.17	160.61	V0093F01
2019-05-13	57°00.4780N	19°21.2623E	TF0405	EMB213_94-1	18:56	19:15	174.57	174.27	V0094F01
2019-05-13	56°58.7819N	19°34.5956E	TF0406	EMB213_95-1	20:05	20:23	165.22	165.98	V0095F01
2019-05-13	56°56.9759N	19°52.9688E	TF0407	EMB213_96-1	21:31	21:47	174.45	175.74	V0096F01
2019-05-13	56°55.3999N	20°01.0813E	TF0408	EMB213_97-1	22.26	22:37	164.17	163.88	V0097F01

Date	Latitude [numerical]	Longitude [numerical]	Institute-Station-Number	Station No. EMB213	Begin [UTC]	End [UTC]	Water Depth [m] Start	Water Depth [m] End	Dataset [file name]
2019-05-13	56°55.4099N	20°01.0789E	TF0408	EMB213_97-2	22:47	22:50	163.81	163.81	V0097K02
2019-05-13	56°55.4218N	20°01.1170E	TF0408	EMB213_97-3	22:52	22:53	163.91	164.10	V0097K03
2019-05-13	56°54.9193N	20°12.9925E	TF0409	EMB213_98-1	23:53	0:01	144.82	144.61	V0098F01
2019-05-14	56°51.9788N	20°27.1834E	TF0410	EMB213_99-1	1:01	1:12	62.61	61.93	V0099F01
2019-05-14	56°37.9724N	19°34.9955E	TF0260	EMB213_100-1	4:20	4:33	142.98	143.65	V0100F01
2019-05-14	56°20.7869N	19°22.6945E	TF0263	EMB213_101-1	6:32	6:47	133.05	133.11	V0101F01
2019-05-14	56°04.9814N	19°09.9934E	TF0250	EMB213_102-1	8:31	8:46	124.08	123.72	V0102F01
2019-05-14	55°50.3551N	18°51.9955E	TF0253	EMB213_103-1	10:25	10:37	98.91	101.22	V0103F01
2019-05-14	55°37.9769N	18°35.9966E	TF0255	EMB213_104-1	12:14	12:24	95.06	95.00	V0104F01
2019-05-14	55°32.9494N	18°24.1645E	TF0259	EMB213_105-1	13:20	13:38	89.71	90.03	V0105F01
2019-05-14	55°26.3057N	18°19.3110E	TF0257	EMB213_106-1	14:31	14:48	86.38	87.14	V0106F01
2019-05-14	55°19.5784N	18°15.0896E	TF0256	EMB213_107-1	16:02	16:15	78.50	77.72	V0107F01
2019-05-14	55°18.4597N	17°55.7659E	TF0268	EMB213_108-1	17:37	17:47	74.46	75.94	V0108F01
2019-05-14	55°17.2001N	17°35.6531E	TF0267	EMB213_109-1	19:03	19:14	84.00	84.37	V0109F01
2019-05-14	55°15.1368N	17°21.6056E	TF0266	EMB213_110-1	20:11	20:20	88.51	88.78	V0110F01
2019-05-14	55°12.9728N	17°04.0004E	TF0222	EMB213_111-1	21:31	21:41	90.89	91.74	V0111F01
2019-05-14	55°13.5715N	16°54.9748E	TF0229	EMB213_112-1	22:21	22:36	85.96	85.21	V0112F01
2019-05-14	55°14.2507N	16°46.3802E	TF0228	EMB213_113-1	23:20	23:29	77.22	77.22	V0113F01
2019-05-15	55°15.5374N	16°38.5885E	TF0227	EMB213_114-1	0:14	0:29	68.18	68.30	V0114F01
2019-05-15	55°16.9873N	16°30.0037E	TF0224	EMB213_115-1	1:24	1:32	61.96	62.50	V0115F01
2019-05-15	55°17.7397N	16°25.8140E	TF0226	EMB213_116-1	2:05	2:17	57.59	57.72	V0116F01
2019-05-15	55°15.5237N	16°19.2323E	TF0225	EMB213_117-1	03:20	03:24	66.29	65.91	V0117F01
2019-05-15	55°15.5245N	16°19.2286E	TF0225	EMB213_117-2	03:29	03:32	55.01	66.02	V0117K02
2019-05-15	55°15.5300N	16°19.2391E	TF0225	EMB213_117-3	03:33	03:35	66.31	65.92	V0117F03
2019-05-15	55°15.0379N	15°58.8926E	TF0213	EMB213_118-1	5:39	6:31	89.52	89.71	V0118F01
2019-05-15	55°09.6134N	15°39.6072E	TF0214	EMB213_119-1	9:07	9:18	93.57	93.96	V0119F01
2019-05-15	55°00.0062N	15°29.9600E	TF0215	EMB213_120-1	10:28	10:41	76.95	74.55	V0120F01
2019-05-15	54°50.7097N	15°22.4424E	TF0204	EMB213_121-1	11:55	12:01	70.31	70.56	V0121F01
2019-05-15	54°41.9943N	15°14.9824E	TF0202	EMB213_122-1	13:10	13:19	64.97	65.14	V0122F01
2019-05-15	54°37.6708N	14°59.8870E	TF0203	EMB213_123-1	14:29	14:33	51.56	51.92	V0123F01
2019-05-15	54°36.9095N	14°45.9277E	TF0154	EMB213_124-1	15:32	15:47	46.52	46.99	V0124F01
2019-05-15	54°37.0099N	14°30.9667E	TF0153	EMB213_125-1	16:56	17:01	28.77	29.75	V0125F01
2019-05-15	54°36.7022N	14°02.6059E	TF0150	EMB213_126-1	18:44	18:51	21.93	22.23	V0126F01
2019-05-15	54°42.6164N	13°56.7973E	TF0121	EMB213_127-1	19:39	19:44	30.86	30.13	V0127F01
2019-05-15	54°53.3885N	13°58.1050E	TF0111	EMB213_128-1	20:52	21:00	44.65	45.42	V0128F01
2019-05-15	54°52.7724N	13°51.4500E	ABBoje	EMB213_129-1	21:34	21:45	45.62	45.63	V0129F01
2019-05-15	54°59.9870N	14°04.9531E	TF0109	EMB213_130-1	22:51	23:04	48.54	48.51	V0130F01
2019-05-16	55°10.0079N	14°14.9923E	TF0145	EMB213_131-1	0:47	0:51	46.86	46.77	V0131F01
2019-05-16	55°10.0040N	14°14.9958E	TF0145	EMB213_131-2	1:00	01:02	46.85	46.85	V0131K02
2019-05-16	55°10.0063N	14°15.0034E	TF0145	EMB213_131-3	1:04	1:05	46.85	46.76	V0131K03
2019-05-16	55°15.1897N	14°29.3696E	TF0144	EMB213_132-1	2:21	2:32	44.43	44.68	V0132F01
2019-05-16	55°28.0166N	14°43.0102E	TF0140	EMB213_133-1	4:34	4:42	70.45	69.93	V0133F01
2019-05-16	55°23.4136N	15°03.3712E	TF0205	EMB213_134-1	6:35	6:45	77.07	73.88	V0134F01
2019-05-17	54°55.4993N	13°29.9705E	TF0113	EMB213_135-1	6:36	6:48	46.94	47.54	V0135F01
2019-05-17	54°43.4066N	12°46.9081E	TF0030	EMB213_136-1	9:44	9:51	23.10	23.14	V0136F01
2019-05-17	54°41.7917N	12°41.8025E	TF0001	EMB213_137-1	10:42	10:48	20.91	21.32	V0137F01
2019-05-17	54°27.8635N	12°13.5821E	TF0046	EMB213_138-1	12:50	13:04	26.77	25.66	V0138F01
2019-05-17	54°18.9107N	11°32.9776E	TF0012	EMB213_139-1	16:11	16:31	24.79	24.90	V0139F01

7.2 Sample Station List

Station No. EMB213_xxx	Institute-Station-Number	Sichtiefe	O_2	H_2S	PO_4	NO_3	NO_2	SiO_4	NH_4	P-Total	N-Total	POM/DOM	P+G, Betain	DNA	FISH	Phyto-WS	Chla	Phyto-Netz	Zooplalnkton
1	TFO5	1	1	-	3	3	3	3	2	2	2	2	-	-	-	-	-	-	-
2	TF0011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	TF0010	-	1	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-
4	TF0361	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
5	TF0360	1	1	-	3	3	3	3	3	3	3	3	-	-	-	3	5	2	4
6	TF0022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	TF0012	1	1	-	4	4	4	4	4	3	3	3	-	-	-	2	6	1	1
8	TF0041	-	9	-	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
9	TF0040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	TF0046	1	1	-	4	4	4	4	-	-	-	-	-	-	-	2	5	2	1
11	TF0002	-	3	-	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
12	TF0001	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	TF0030	1	1	-	4	4	4	4	-	-	-	-	-	-	-	2	6	2	-
14	TF0115	-	4	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-
15	TF0114	-	-	-	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-
16	TF0069	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	TF0113	1	5	-	5	5	5	5	5	4	4	4	-	-	-	2	5	3	3
18	TF0150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	TF0121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	TF0112	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-
21	TF0111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	ArkonaBoje	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	TF0122	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	TF0105	-	1	-	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-
25	TF0104	-	-	-	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-
26	TF0102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	TF0103	-	9	-	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-
28	TF0109	1	-	-	5	5	5	5	5	4	4	4	-	-	-	2	6	1	2
29	TF0145	-	1	-	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-
30	TF0144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	TF0142	-	-	-	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-
32	TF0140	-	-	-	6	6	6	6	-	-	-	-	-	-	-	-	-	-	-
33	TF0200	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	TF0211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	TF0212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
36	TF0213	1	7	1	7	7	7	7	7	6	6	6	-	-	-	10	5	1	12
37	TF0221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	TF0224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	TF0222	-	1	-	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-
40	TF0267	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	TF0256	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	TF0259	1	7	2	7	7	7	7	7	-	-	-	-	-	-	-	-	1	1
43	TF0255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	TF0253	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	TF0250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	TF0263	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	TF0260	-	9	1	9	9	9	9	-	-	-	-	-	-	-	-	-	-	-
48	TF0403	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	TF0404	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	TF0405	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	TF0406	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	TF0407	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53	TF0408	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
54	TF0409	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	TF0410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	TF0272	-	1	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	TF0271	1	24	21	34	34	34	34	34	12	12	12	52	52	26	2	6	3	3

Station No. EMB213_xxx	Institute-Station-Number	Sichtiefe	O_2	H_2S	PO_4	NO_3	NO_2	SiO_4	NH_4	P-Total	N-Total	POM/DOM	P+G, Betain	DNA	FISH	Phyto-WS	Chla	Phyto-Netz	Zooplalnkton
58	SF-EGB-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	SF-EGB-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	SF-EGB-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	SF-EGB-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	SF-EGB-5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	SF-EGB-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	SF-EGB-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	SF-EGB-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	SF-EGB-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
67	SF-EGB-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	SF-EGBEnd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
69	Gotland NE	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	TF0270	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
71	EGB-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	TF0286	1	6	6	11	11	11	11	11	6	6	6	-	-	-	-	-	-	-
73	TF0277	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
74	TF0285	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
75	TF0282	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	nGB-2	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	nGB-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	nGB-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
77	TF0283	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
78	nGB-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	TF0284	1	12	20	29	29	29	29	29	10	10	10	-	52	26	52	-	2	-
80	wGB-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
81	TF0240	-	5	5	10	10	10	10	10	-	-	-	-	-	-	-	-	-	-
82	TF0242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	SF-WBG-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	SF-WBG-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83	SF-WBG-1	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
84	SF-WGB-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85	SF-WGB-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	TF0245	-	1	3	8	8	8	8	8	-	-	-	-	-	-	-	-	-	-
87	SF-WGB-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88	SF-WGB-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	SF-WGB-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	wGB-1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
91	wGB-SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
92	TF0403	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	TF0404	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	TF0405	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	TF0406	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	TF0407	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	TF0408	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
98	TF0409	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
99	TF0410	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	TF0260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
101	TF0263	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	TF0250	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
103	TF0253	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	TF0255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	TF0259	1	7	2	7	7	7	7	7	-	-	-	-	-	2	5	1	-	-
106	TF0257	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	TF0256	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
108	TF0268	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
109	TF0267	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
110	TF0266	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
111	TF0222	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	TF0229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Station No. EMB213_xxx	Institute-Station-Number	Sichtiefe	O_2	H_2S	PO_4	NO_3	NO_2	SiO_4	NH_4	P-Total	N-Total	POM/DOM	P+G, Betain	DNA	FISH	Phyto-WS	Chla	Phyto-Netz	Zooplalnkton
113	TF0228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
114	TF0227	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
115	TF0224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
116	TF0226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
117	TF0225	-	9	-	9	9	9	-	-	-	-	-	-	-	-	-	-	-	-
118	TF0213	1	7	2	7	7	7	7	7	-	-	-	-	-	-	2	6	1	9
119	TF0214	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120	TF0215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
121	TF0204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
122	TF0202	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
123	TF0203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
124	TF0154	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125	TF0153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
126	TF0150	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
127	TF0121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
128	TF0111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	ABBoje	-	2	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
130	TF0109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	TF0145	-	9	-	9	9	9	-	-	-	-	-	-	-	-	-	-	-	-
132	TF0144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
133	TF0140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
134	TF0205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
135	TF0113	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2	5	1	2
136	TF0030	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2	6	2	1
137	TF0001	-	3	-	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
138	TF0046	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2	5	2	1
139	TF0012	1	2	-	2	2	2	-	-	-	-	-	-	-	-	2	6	2	1
Σ		19	223	74	218	243	243	243	139	50	50	50	104	104	52	37	77	29	41

8 Data and Sample Storage and Availability

Data is validated and will be freely available in the IOW DB by the online search and data download tool ODIN2 (https://odin2.io-warnemuende.de/#/). Afterwards the data will be imported into national and international databases (MUDAB, HELCOM, ICES)..

Table 8.1 Overview of data availability

Type	Database	Available	Free Access	Contact
hydrography		Date	Date	E-Mail
raw data CTD, ADCP	IOW DB	30.06.2020		Michael.Naumann@io-warnemuende.de
nutrients	MUDAB	30.06.2020		Detlef.Schulz-Bull@io-warnemuende.de
Phytoplnakton	MUDAB	30.06.2020		Anke.Kremp@io-warnemuende.de
Zooplankton	MUDAB	30.06.2020		Joerg.Dutz@io-warnemuende.de

9 Acknowledgements

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10 References

HELCOM, 2018. State of the Baltic Sea - Second HELCOM holistic assessment 2011-2016. Baltic Sea Environment Proceedings 155. https://www.helcom.fi/Lists/Publications/ BSEP155. pdf

Hernroth, L., Ackefors, H., 1979. The zooplankton of the Baltic Proper. A long-term investigation of the fauna, its biology and ecology. Fish. Board Sweden, Institute of Marine Research, Report No. 2. 172 pp

Matthäus, W., Nehring, D., Feistel, R., Nausch, G., Mohrholz, V., Lass, H.-U., 2008. The Inflow of Highly Saline Water into the Baltic Sea. - in: FEISTEL, R.; NAUSCH, G.; WASMUND N. (EDS.): State and evolution of the Baltic Sea, 1952-2005, John Wiley & Sons, Inc. Hoboken, New Jersey, pp. 265-309.

Seifert, T., Tauber, F., Kayser, B., 2008. http://www.io-warnemuende.de/topografie-derostsee. html, (Date of access: 08/03/2015)

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11 Anhang

Supplementing Tables and Figures

Tab. 11.1 Surface water layer (about 3 m depth) - hydrographic and hydrochemical properties.

Area /Date	Station Name /No.*	Temp °C	Sal. g/kg	O_2 (sensor) mL/L	O_2 (titration) mL/L	PO_4 [µM]	NO_3 [µM]	SiO_4 [µM]
Kiel Bight /06.05.	TF0360/005	9.53	14.12	7.13	n.d	0.08	0.09	1.8
Meckl.Bight /07.05.	TF0012/007	9.21	12.66	7.12	n.d	0.15	0.05	6.7
Darss Sill/07.05.	TF0030/013	8.80	9.66	7.36	n.d	n.d	n.d	n.d
Arkona Basin/07.05.	TF0113/017	7.40	7.80	7.94	8.13	0.24	0.01	9.6
Bornholm Deep/08.05.	TF0213/036	7.40	7.56	8.17	8.41	0.33	0.01	11.3
Stolpe Channel/08.05.	TF0222/039	6.64	7.56	8.23	n.d	0.26	0.01	10.9
SE Gotland Basin/09.05.	TF0259/042	6.31	7.50	8.34	8.45	0.24	0.02	12.2
Gotland Deep/10.05.	TF0271/057	6.61	7.31	8.60	8.81	0.27	0.07	15.2
Farö Deep/11.05.	TF0286/072	7.24	7.13	8.77	8.95	0.24	0.02	15.0
Landsort Deep/12.05.	TF0284/079	6.43	6.47	8.60	8.90	0.20	0.01	15.8
Karlsö Deep/13.05.	TF0245/086	6.38	7.05	8.40	8.71	0.25	0.01	17.0

Tab. 11.2 Deep water layer - hydrographic and hydrochemical properties. Hydrogen sulphide was converted into negative oxygen equivalents.

Area /Date	Station Name /No.*	Temp °C	Sal. g/kg	O_2 (sensor) mL/L	O_2 (titration) mL/L	PO_4 [µM]	NO_3 [µM]	SiO_4 [µM]
Kiel Bight /06.05.	TF0360/005	9.31	14.81	7.07	n.d	0.10	0.07	2.7
Meckl.Bight /07.05.	TF0012/007	8.96	16.44	6.82	n.d	0.14	0.05	8.4
Darss Sill/07.05.	TF0030/013	8.79	14.36	6.97	n.d	n.d	n.d	n.d
Arkona Basin/07.05.	TF0113/017	7.69	16.29	6.42	6.61	0.26	0.01	6.0
Bornholm Deep/08.05.	TF0213/036	8.64	17.14	0.04	0.05	3.60	5.95	67.0
Stolpe Channel/08.05.	TF0222/039	7.47	14.38	2.52	n.d	1.90	7.17	40.4
SE Gotland Basin/09.05.	TF0259/042	6.55	12.05	1.02	0.51	2.61	3.01	46.4
Gotland Deep/10.05.	TF0271/057	7.45	13.32	0.01	-5.47	4.70	0.00	72.7
Farö Deep/11.05.	TF0286/072	7.24	12.65	0.01	-2.53	5.07	0.00	60.0
Landsort Deep/12.05.	TF0284/079	6.39	11.29	0.00	-1.33	4.45	0.00	57.2
Karlsö Deep/13.05.	TF0245/086	5.67	10.43	0.03	-2.55	3.40	0.00	58.6

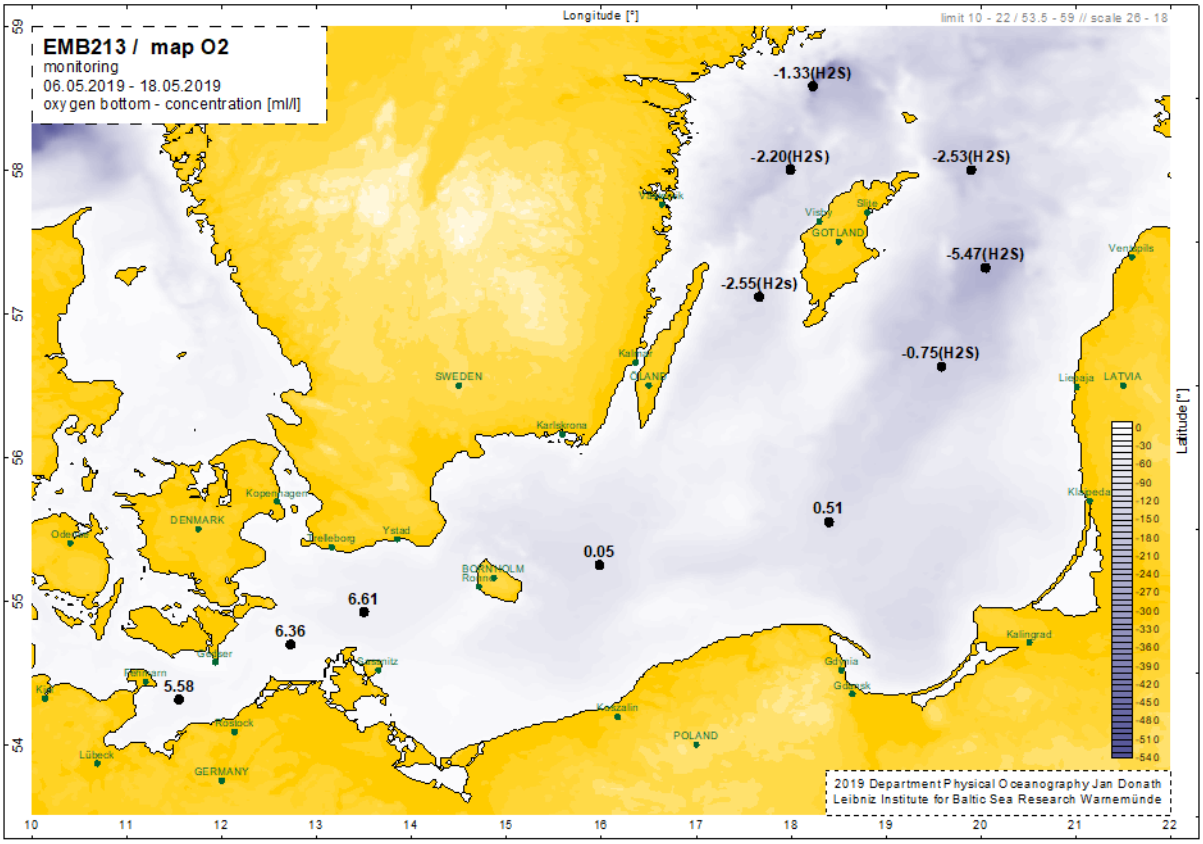

Fig. 11.1 Oxygen concentrations (ml/L) at the bottom of selected stations.