ELISABETH MANN BORGESE – Report

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

Cruise No. EMB-206

2019-01-30 – 2019-02-11
Rostock-Marienehe to Rostock-Marienehe (Germany)
ACRONYM: HELCOM/long-term

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2019

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1 Cruise Summary

1.1 Summary in English

This campaign of measurements is the first one in a series of five annual cruises to study the spatial and temporal variations of the Baltic Sea ecosystem by numerous hydrographic, hydrochemical and hydrobiological parameters. It is conducted in the frame of the COMBINE Programme of the Helsinki Commission (HELCOM) as well as measurements ouside the German territorial waters for the IOW's long term data programme, performed since 1969. In key areas moorings and autonomous platforms are used to gain higher temporal resolution of data, which are maintained by these cruises. 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 ecosystem Baltic Sea.

During this expedition 90 stations (129 CTD casts) were measured from the western to the central Baltic Sea. Water sampling in discrete depths were done for measuring numourus paremters of nutrients and pollutants, as well as extraction of zooplankton samples. Transects of 300 l surface water were filtered for analysing organic pollutants at nine subareas. In addition, in situ pumps filtered water in two discrete depths at the Gotland Deep. Sediment sampling of the uppermost 3-5 cm were done at 12 stations for a project comparing microplastic pollution between South China Sea and Baltic Sea. At the Slupsk Sill a short-term mooring was installed and recovered (February 2nd-9th) to measure bottom-near hydrographic parameters to quantify the overflow of warm water from baroclinic saltwater inflows, which occurred in late summer 2018. The profiling moring at the Gotland Deep, called GODESS, was recovered for maintanence at February 4th but could not be deployed again (an battery steering the winch was to weak and could not be exchanged). The mooring "Gotland – central" equipped with sediment trap and hydrographic sensors was recovered, maintained and deployed again at February 4th.

The cruise was performed in permanently windy weather conditions, 10 out of 13 days with 6-9 Bft (one day waiting on weather in bay at the eastern coastline of Gotland – February 5th). Nearly all of the planned work programme were realised, but the scanfish profiles in the eastern and western Gotland Basin could not be done because of bad weather /lack of time.

1.2 Zusammenfassung

Die Messkampagne ist eine von fünf jährlichen Expeditionen zur Erfassung der räumlich-zeitlichen Variabilität des Ökosystems Ostsee mit einer Vielzahl hydrographischer, chemischer und biologischer Parameter. Die Arbeiten sind eingebettet in das COMBINE Programme der Helsinki Kommission (HELCOM) zur Überwachung der Meeresumwelt sowie Messungen außerhalb der deutschen Territorialgewässer für das IOW Langzeitdatenprogramm, das seit 1969 fortlaufend vom Institut durchgeführt wird. An Schlüsselstationen werden Verankerungen und autonome Messplattformen eingesetzt und mit Hilfe dieser Expeditionen gewartet, um die zeitliche Datenauflösung zu verbessern. Die gewonnenen Daten werden für regelmäßige nationale und internationale Bewertungen des Umweltzustandes der Ostsee verwendet und bilden die wissenschaftliche Basis für zu ergreifende Maßnahmen zum Schutz der Meeresumwelt.

Im Gebiet der westlichen bis zentralen Ostsee wurden an 90 Stationen 129 CTD Einsätze gefahren zur Erkundung der aktuellen hydrographischen Situation. Wasserproben wurden für die Messung einer Vielzahl an Nährstoff- und Schadstoffparametern entnommen, sowie Zooplanktonproben daraus extrahiert. Netze wurden für die Beprobung von Zoo- und Phytoplankton gefahren. In 9

Seegebieten wurden 300 Liter Oberflächenwasser für die Analyse organischer Schadstoffe entnommen und zusätzlich im Gotland Tief in zwei Wassertiefen in situ Pumpen zu diesem Zweck eingesetzt. An 12 Stationen wurden Sedimentproben der Meeresbodenoberfläche und Wasserproben entnommen für eine projektbezogene Vergleichsstudie der Verbreitung von Mikroplastik zwischen Südchinesischen Meer und der Ostsee. Auf der Stolper Schwelle wurde zwischen 2.-9. Februar eine Kurzzeitverankerung abgesetzt zur Messung des Überstroms der warmen baroklinen Einströme aus dem Sommer 2018. Die GODESS Verankerung wurde im Gotland Tief geborgen und konnte technisch bedingt (interner Steuerakku der Winde zu schwach) nicht erneut ausgebracht werden (4.2.2019). Die Verankerung Gotland Zentral (Sedimentfalle, Physikparameter) konnte geborgen und erneut verankert werden (4.2.2019).

Die Expedition war von permanent windigen bis starkwindigen Witterungsverhältnissen geprägt (10 von 13 Schiffstagen mit 6-9 Bft). Am 5. Februar mussten die Arbeiten eingestellt und im Schutz an der Ostküste der Insel Gotland abgewettert werden. Ein Großteil der geplanten Arbeiten konnten durchgeführt werden, jedoch fielen die beantragten Scanfish Transekte im östlichen und westlichen Gotland Becken der schlechten Witterung /Zeitmangel zum Opfer.

2 Participants

2.1 Principal Investigators

Name	Institution
Naumann, Michael, Dr.	IOW

2.2 Scientific Party

Name	Discipline	Institution
Naumann, Michael, Dr.	Physical Oceanography/chief scientist	IOW
Krüger, Siegfried	Physical Oceanography	IOW
Donath, Jan	Physical Oceanography	IOW
Schöne, Susanne	Marine Chemistry	IOW
Kruzer, Lars	Marine Chemistry	IOW
Hand, Ines	Marine Chemistry	IOW
Jeschek, Jenny	Marine Chemistry	IOW
Pötzsch, Michael	Marine Geology	IOW
Zhou, Qian	Marine Chemistry	IOW
Sommer, Mike (30.1.-1.2.2019)	Physical Oceanography	IOW
Matthäus, Claas Torben (30.1.-1.2.2019)	Physical Oceanography	IOW
Matthäus, Wolfgang, Dr. (30.1.-1.2.2019)	Physical Oceanography	IOW
Floth-Peterson, Mareike (1.-11.2.2019)	Marine Chemistry	IOW

Hehl, Uwe (1.-11.2.2019)	Biological Oceanography	IOW

2.3 Participating Institutions

IOW Leibniz Institute for Baltic Sea Research Warnemünde, Germany

2.4 Crew

Name	Rank
Kaufmann, Tino	Kapitän / Master
Kasch, Gunnar	1st Officer
Henning, Tim	2nd Officer
Klück, Torsten	Chief
Renken, Bernd	Electrician
Wagner, Knut	Bosun
Schlewitt, Rene	Seaman
Wurm, Wolfgang	Seaman
Nevermann, Hartmut	Seaman
Martens, Ulf	Seaman
Langhof, Mike	Cook

3 Research Program

3.1 Aims of the Cruise

The performed meteorological, hydrographic, hydrochemical and hydrobiological sampling and measurements lead to an assessment of the actual winter situation of the Baltic Sea ecosystem from Kiel Bight to the northern Gotland Basin in the central part. A special scientific interest is the impact of the meterological oustanding warm, dry and less windy year 2018.
In the frame of the COMBINE Programme of the Helsinki Commission (HELCOM), national monitoring demands and scientific interest in long-term variations /trends (IOW's long-term data programme 1969-2019), the acquired data will be used for regular national and international assessments of the state of the Baltic Sea (e.g. HELCOM 2018, NAUMANN et al. 2018), are analysed in numerous publications, and provide the scientific basis for measures to be taken for the protection of the ecosystem Baltic Sea.

Additional program:
For the analysis of microplastic pollution and comparison with the South China Sea 11 sediment samples of the sea surface (upper 3 cm) were taken in all subareas. At each site watersampling was done at the surface layer, deep water layer below the halocline and near bottom (responsible scientist: Qian Zhou, Prof. J. Waniek).
A pilot study of modern organic pollutants ware done by water sampling of 11 stations in all subareas (responsible scientist: Dr. K. Fisch, Prof. D. Schulz-Bull).
At five stations in the western Baltic to Bornholm Basin additional sediment sampling of 3 sea surface samples (upper 2 cm) was done for the RESERVOIR project - seed banks as reservoirs

of diversity driving evolutionary dynamics and persistence of Baltic phytoplankton in a changing environment (responsible scientist: Dr. A. Kremp).
A short-term mooring was deployed and recovered at the Slupsk Sill to measure near bottom hydrographic parameters (temperature, salinity, dissolved oxygen and currents) for volume estimates of baroclinic inflows occurring in late summer 2018 (responsible scientist: Dr. V. Mohrholz, Dr. M. Naumann).

3.2 Equipment

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

At stations and transects:

- CTD SBE 911+ with rosette water sampler
- Oceanographic moorings (Slupsk Sill, GODESS, Gotland central)
- Surface water pumps and filtering system for organic pollutants
- In situ pumps and filtering system for organic pollutants in discrete depths
- Phytoplankton nets
- Zooplankton net (WP2)
- Secci desk
- Frahmlot sediment corer, multicorer

Continuous measurements:

- Underway measurements of surface water properties
- Ship weather station

This ship based data set consists of one minute averages of: time (UTC), latitude and longitude, ships heading, depth, air pressure, 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-206 covered the western and central Baltic from the Kiel Bight to the northern Gotland Basin (Fig. 3.1). The majority of stations is located along the thalweg transect of the Baltic Sea, describing the hydrographic conditions in all basins on the pathway of saltwater inflows from the North Atlantic (Fig. 5.2; 5.5). These inflows are the solely source for ventilation of the deep basins (Matthäus et al. 2008).

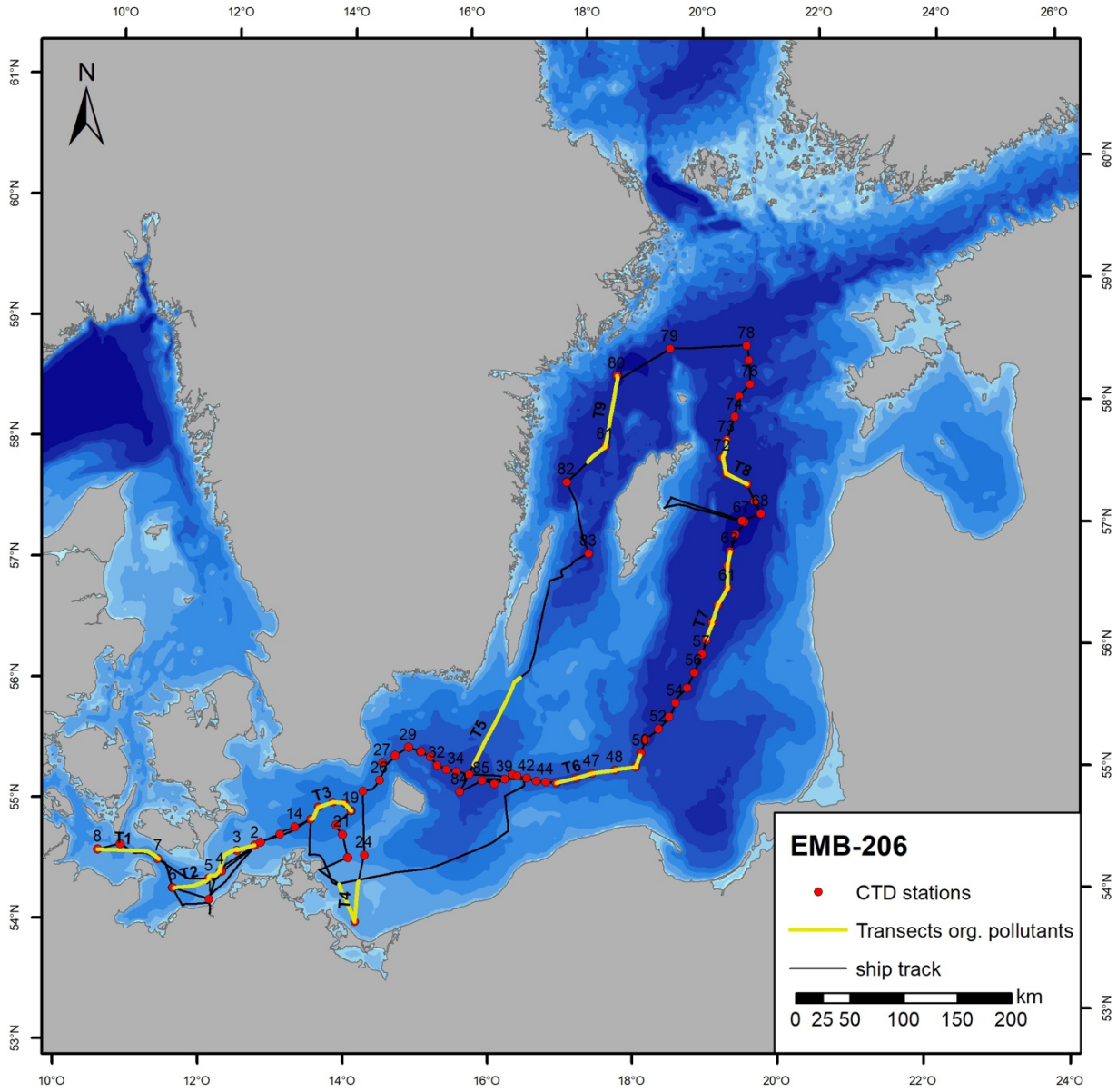


Fig. 3.1 Track chart of R/V Elisabeth Mann Borgese of cruise EMB-206 (bathymetry from Seifert et al. 2008). CTD stations are marked by red points (label number corresponds to table 7.1) and yellow track sections show transects of surface water sampling for organic pollutants (ID corresponds to table 7.3).

4 Narrative of the Cruise

Date	Time [UTC]	Task
2019-01-29	07:00	loading of equipment, preparing devices for the cruise
2019-01-30	06:00	Embarking of scientific crew
	06:30	Safety instructions
	07:00	Departure from port Rostock-Marienehe, weather: sunny, moderate to strong wind SE
	09:25	Start of station work in the Mecklenburg Bight, station TF005
	13:45 - 15:20	Station TF001 - MARNET automated station Darss Sill, maintenance electricity wind turbine, CTD for data validation
	16:25 - 24:00	Station work westward in the Mecklenburg Bight, stations TF002 - TF012

2019-01-31	00:00 - 24:00	Station work westward in the Fehmarn Belt, Kiel Bight, eastward again Mecklenburg Bight, Darss Sill, Arkona Basin, stations TF0010 - TF0113, weather: cloudy, strong wind SE
2019-02-01	00:00 - 08:45	Station work in the Arkona Basin, stations TF105 - TF150, weather: cloudy, moderate to strong wind SE
	10:25 - 12:00	Port stay Saßnitz - Isle of Rügen, exchange of scientific staff
	12:35 - 24:00	Station work in the Pommeranian Bight, Arkona Basin, Bornholm Gat, stations OBBoje - TF145
2019-02-02	00:00 - 10:40	Station work in the Bornholm Gat, Bornholm Basin, stations TF144 - TF212, transit Slupsk Sill, weather: cloudy, moderate to strong winds SE
	15:30 - 15:00	Slupsk Sill (station TF227), deployment of mooring, transit back to central Bornholm Basin
	18:20 - 24:00	Station work in the Bornholm Basin, stations TF213 - TF225, weather: snowfall
2019-02-03	00:00 - 24:00	Station work in the Bornholm Basin, Slupsk Sill, Slupsk Channel, eastern Gotland Basin, stations TF226 - TF261, weather: cloudy, moderate to strong winds SE
2019-02-04	00:00 - 06:40	Station work in the eastern Gotland Basin, stations TF260 - TF275, weather: weak to moderate winds NW
	08:00 - 09:15	Mooring GODESS (profiling moring, physical and chemical parameters): recovery
	10:15 - 13:30	Mooring Gotland - central (sediment trap, physical parameters): recovery, maintenance, deploment
	13:30 - 19:30	Station work TF271 (Gotland Deep): 8 CTD casts, nets
	19:50 - 23:00	Station work TF271: 2 in situ pumps organic pollutants, 23:00 stop because of stormy weather from southern direction, swell 2.5 m quick increasing, transit in the cover of Östergarn island, sheltered bay at the eastcoast of Gotland
2019-02-05	07:00 - 22:00	Anchored in the bay close to Östergarn, waiting on weather
	22:00 - 00:00	staying in the bay on standby, waiting on weather
2019-02-06	04:00 - 08:00	Transit back to the Gotland Deep station
	08:00 - 24:00	Station work in the eastern Gotland Basin, Farö Deep and northern Gotland Basin, stations TF271 - TF285, weather: cloudy, moderate to strong winds SW
2019-02-07	00:00 - 24:00	Station work in the northern Gotland Basin, Landsort Deep and western Gotland Basin, stations TF279 - TF242, weather: cloudy to sunny, strong wind S
2019-02-08	00:00 - 05:10	Station work in the western Gotland Basin, Karlsö Deep, station TF245, weather: strong wind SW
	05:10 - 16:30	Transit to Bornholm Basin, slowed down because of swell
	16:30 - 22:10	Transect of surface water sampling for organic pollutants
	22:00 - 24:00	Transit to Slupsk Sill, weather: strong wind S, increasing prediction
2019-02-09	00:50 - 04:00	Station work in the central Bornholm Basin, stations TF214 - TF213
	08:00 - 09:00	Recovery of mooring at the Slupsk Sill
	09:00 - 24:00	Transit to Arkona Basin close to the southern coastline, sheltered wind and swell conditions
2019-02-10	07:00 - 21:15	Station work in the Arkona Basin, Darss Sill, Mecklenburg Bight, stations TF113 - TF012, weather: cloudy, strong wind SW
	21:15 - 24:00	Transit to port
2019-02-11	08:00	Arrival at port Rostock-Marienehe
	08:00 - 11:00	Deinstallation, unloading of scientific equipment
	11:00	Disembarking of scientific crew, end of cruise EMB-206

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 Surface temperatures

Surface temperatures varied only slightly along the cruise track between 2.23 °C (Landsort Deep) in the western Gotland Basin and 4.24 °C and southern part of the eastern Gotland Basin (cf. Tab. 5.1). These warm water temperatures are the result of so far warm winter weather with conntinnous positive terrestrial temperature anomalies since October 2018. For example Warnemünde showed +2.3 K in October, +0.9 K in November, +2.9 K in December, +0.9 K in January 2019 and 3.5 K in February 2019 (data DWD). The water column is mixed down to the halocline (cf. Fig. 5.2) showing temperatures between 2-4 °C.

5.2 Deep water layer temperatures

(bottom near depths) showed at all key stations from the western to the central Baltic Sea increased values at the upper edge of the long-term data series (c.f. Fig. 5.4). The warming began in the central Baltic Proper since 2014, the start of an intensive inflow period of several events up to beginning of 2017. In between short stagnation phases and a cold winter inflow of January-February 2016 lead to slightly decrease in the Bornholm Basin and eastern Gotland Basin during 2017-2018. Beside this barotropic driven inflow events, a next warming phase has started due to several baroclinic inflow events of warm summer water in late 2018. A consequence of nearly windless, long-lasting high-pressure periods across Northern Europe. These warm saline water bodies are on their pathway to the central Baltic Sea and had actually arrived at the Gotland Deep. At the “Talweg” transect this propagation is visualized (c.f. Fig. 5.2). A second volume of up to 10 °C has passed the Slupsk Channel.

Location	Feb '13	Feb '14	Feb '15	Feb '16	Feb '17	Feb '18	Feb '19
Bornholm D.	5.82 °C	8.65 °C	7.15 °C	8.39 °C	6.96 °C	6.85 °C	8.96 °C
Gotland Deep	6.41 °C	6.36 °C	6.71 °C	7.86 °C	7.19 °C	6.91 °C	7.65 °C
Farö Deep	5.98 °C	5.76 °C	6.17 °C	not sampled	6.73 °C	6.80 °C	6.81 °C
Landsort D.	5.58 °C	5.34 °C	not sampled	5.84 °C	5.98 °C	6.24 °C	6.19 °C
Karlsö Deep	5.29 °C	5.08 °C	5.03 °C	5.22 °C	5.53 °C	5.58 °C	5.62 °C

More distant basins on the “Talweg” of saltwater intrusions showed more or less constant bottom temperatures in the last two years. Figure 5.3 (left part) shows a temperature-salinity plot of all gathered data. The key areas are marked by symbols and different colours.

5.3 Salinity in the bottom layer

The major Baltic inflow from December 2014 and the following barotropic inflow events up to 2017 increased the salinity in the bottom layer in the central Baltic Proper rapidly to a maximum of 13.84 at the Gotland Deep in February 2016. Afterwards a slightly decrease had started in the eastern Gotland Basin and Bornholm Basin, showing actually a next phase of increasing bottom salinities by the baroclinic events of summer 2018. The salinity at the northerly Farö Deep and Landsort Deep increased during the years 2017-2018 in order of 1 g/kg, actually slightly

decreasing. The western Gotland Basin (Landsort Deep, Karlsö Deep) stay nearly stagnant with only a slight increase of 0.5 g/kg.

Location	Feb '13	Feb '14	Feb '15	Feb '16	Feb '17	Feb '18	Feb '19
Bornholm D.	15.62	15.99	19.81	19.19	17.93	17.14	17.79
Gotland Deep	12.07	12.23	12.31	13.84	13.50	13.3	13.37
Farö Deep	11.43	11.60	11.81	not sampled	12.68	12.79	12.62
Landsort D.	10.43	10.45	not sampled	11.03	11.18	11.38	11.30
Karlsö Deep	10.10	9.75	9.78	9.97	10.34	10.32	10.33

5.4 Oxygen situation in the deep water

Thus, the oxygen situation in the deep water of central basins (>100 m water depth) documents recently a stagnation period, which has started after the phase of several ventilations due to the inflow events 2014-2017. This inflow activity is mirrored in measurements of former years. Hydrogen sulphide concentrations (expressed as negative oxygen equivalents) in the near-bottom layer were high in November 2013 as maximum stage of the stagnation period 2004-2013 and decreased in the eastern Gotland Basin and Farö Deep completely and oxic periods occurred in these areas. At the Landsort Deep and Karlsö Deep in the western Gotland Basin hydrogen sulphide varied only slightly during 2013-2018, but is actually increasing to -2.25 ml/l. These more distant basins show no major changes induced by the last saltwater intrusions. The oxygen situation at the bottom of the Bornholm Basin is more dynamic, showing short term changes even by weak inflows. Figure 5.2 visualize the situation along the “Talweg”. In the western basins up to the Slupsk Channel oxic deep water conditions were detected. A slight oxygenized water body (still hypoxic, below 2 ml/l) is on the pathway to the Gotland Deep caused by the latest baroclinic inflows. An areal overview of measured bottom near values at key stations is shown in figure 5.1.

Location	Feb '13	Feb '14	Feb '15	Feb '16	Feb '17	Feb '18	Feb '19
Bornholm D.	3.4 ml/l	0.84 ml/l	5.38 ml/l	1.47 ml/l	2.24 ml/l	0.05 ml/l	1.87 ml/l
Gotland Deep	-8.75 ml/l	-1.71 ml/l	-0.92 ml/l	1.7 ml/l	-1.09 ml/l	-0.87 ml/l	-3.02 ml/l
Farö Deep	-7.74 ml/l	-2.41 ml/l	-1.07 ml/l	not sampled	0.20 ml/l	-0.71 ml/l	-2.49 ml/l
Landsort D.	-1,32 ml/l	-0.95 ml/l	not sampled	-1.28 ml/l	-0.89 ml/l	-1.13 ml/l	-1.82 ml/l
Karlsö Deep	-1,20 ml/l	-1.25 ml/l	-0.86 ml/l	-0.90 ml/l	-1.12 ml/l	-1,64 ml/l	-2.25 ml/l

5.5 Nutrient situation

The nutrient situation in the surface layer is typical for the winter season. In all key areas phosphate and nitrate values are on a higher winter level, because the biological production like the diatom bloom has not been started (Tab. 5.1). In the western Baltic Sea the silicate values are on a high level, but slightly lower than in 2018. For example Mecklenburg Bight 11.3 µM (2017), 21.6 µM (2018) and 15.9 µM (2019).

In the deep waters of the central basins (>100 m water depth), the hydrographic situation is mirrored. The ventilation of the Eastern Gotland Basin since summer 2014 caused decreasing phosphate, ammonium and silicate concentrations and rising nitrate concentrations during the inflow years. The values were halved or even more decreased since November 2013. Also silicate concentrations have decreased from 126.8 µmol/l to 43.7 µmol/l in February 2016. During the last years the situation at the bottom water of the Gotland Deep has changed back into stagnation. Nitrate concentration are reduced and bound in the sediment, phosphate is released.

Phosphate values were more or less stable during the last two years at the station Gotland Deep, 4.97 µmol/l (Feb. 2017), 4.32 µmol/l (Feb. 2018) and actual 4.55 µmol/l, as well as silicate from 64 µmol/l (Feb. 2017), 65.4 µmol/l (Feb. 2018) to actual 64 µmol/l (c.f. Tab. 5.2). After a nitrate release at the Farö Deep in February 2017 (7.46 µmol/l) it is bound again in the sediment and phosphate increased to 3.95 µmol/l.

5.6 Biological sampling

Samples for phyto- and zooplankton were collected for later analysis in the laboratory.

Tables and figures:

Tab. 5.1 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	PO4 µM	NO3 µM	SiO4 µM
Kiel Bight /2019-01-31	TF0360/08	3,02	19,52	8,05	8,09	0,43	1,64	9,30
Meckl.Bight /2019-01-30	TF0012/06	2,40	11,41	8,58	8,62	0,58	2,75	15,90
Darss Sill /2019-01-31	TF0030/12	3,31	8,22	8,53	8,50	0,64	2,69	15,80
Arkona Basin /2019-01-31	TF0113/15	3,18	8,03	8,59	8,59	0,59	2,61	16,40
Bornholm Deep /2019-02-02	TF0213/37	3,98	7,66	8,34	8,37	0,64	2,62	13,90
Stolpe Channel /2019-02-03	TF0222/45	3,89	7,70	8,35	8,42	0,52	2,42	12,40
SE Gotland Basin /03.02.19	TF0259/51	4,24	7,48	8,20	8,26	0,61	2,84	14,90
Gotland Deep /2019-02-04	TF0271/66	3,34	7,21	8,38	8,42	0,70	3,97	18,40
Farö Deep /2019-02-06	TF0286/73	2,97	7,00	8,47	8,65	0,73	3,93	19,20
Landsort Deep /2019-02-07	TF0284/80	2,23	6,53	8,65	8,93	0,72	3,99	22,70
Karlsö Deep /2019-02-08	TF0245/83	3,30	7,21	8,34	8,52	0,67	1,25	19,80

Tab. 5.2 Deep water layer (bottom near depths) - hydrographic and hydrochemical properties

Area /Date	Station Name /No.*	Temp. °C	Sal. g/kg	O_2 (sensor) ml/l	O_2 (titration) ml/l	PO4 µM	NO3 µM	SiO4 µM
Kiel Bight /2019-01-31	TF0360/08	4,65	22,67	6,99	not measured	0,58	3,60	13,30
Meckl.Bight /2019-01-30	TF0012/06	4,74	20,88	6,90	6,95	0,73	3,91	17,90
Darss Sill /2019-01-31	TF0030/12	4,23	10,72	7,94	not measured	0,64	3,69	16,40
Arkona Basin /2019-01-31	TF0113/15	5,90	18,07	6,24	6,42	0,85	5,76	20,90
Bornholm Deep /2019-02-02	TF0213/37	8,96	17,79	1,82	1,87	3,08	7,79	46,50
Stolpe Channel /2019-02-03	TF0222/45	7,99	13,98	4,90	not measured	1,35	6,08	26,60
SE Gotland Basin /03.02.19	TF0259/51	6,91	11,78	0,25	not measured	2,98	1,40	50,30
Gotland Deep /2019-02-04	TF0271/66	7,65	13,37	0,00	-3,02	4,55	0,00	64,00
Farö Deep /2019-02-06	TF0286/73	6,81	12,62	0,00	-2,49	3,95	0,00	60,40
Landsort Deep /2019-02-07	TF0284/80	6,19	11,30	0,00	-1,82	4,15	0,00	57,40
Karlsö Deep /2019-02-08	TF0245/83	5,62	10,33	0,00	-2,25	3,10	0,00	57,30

* hydrogen sulphide was converted into negative oxygen equivalents

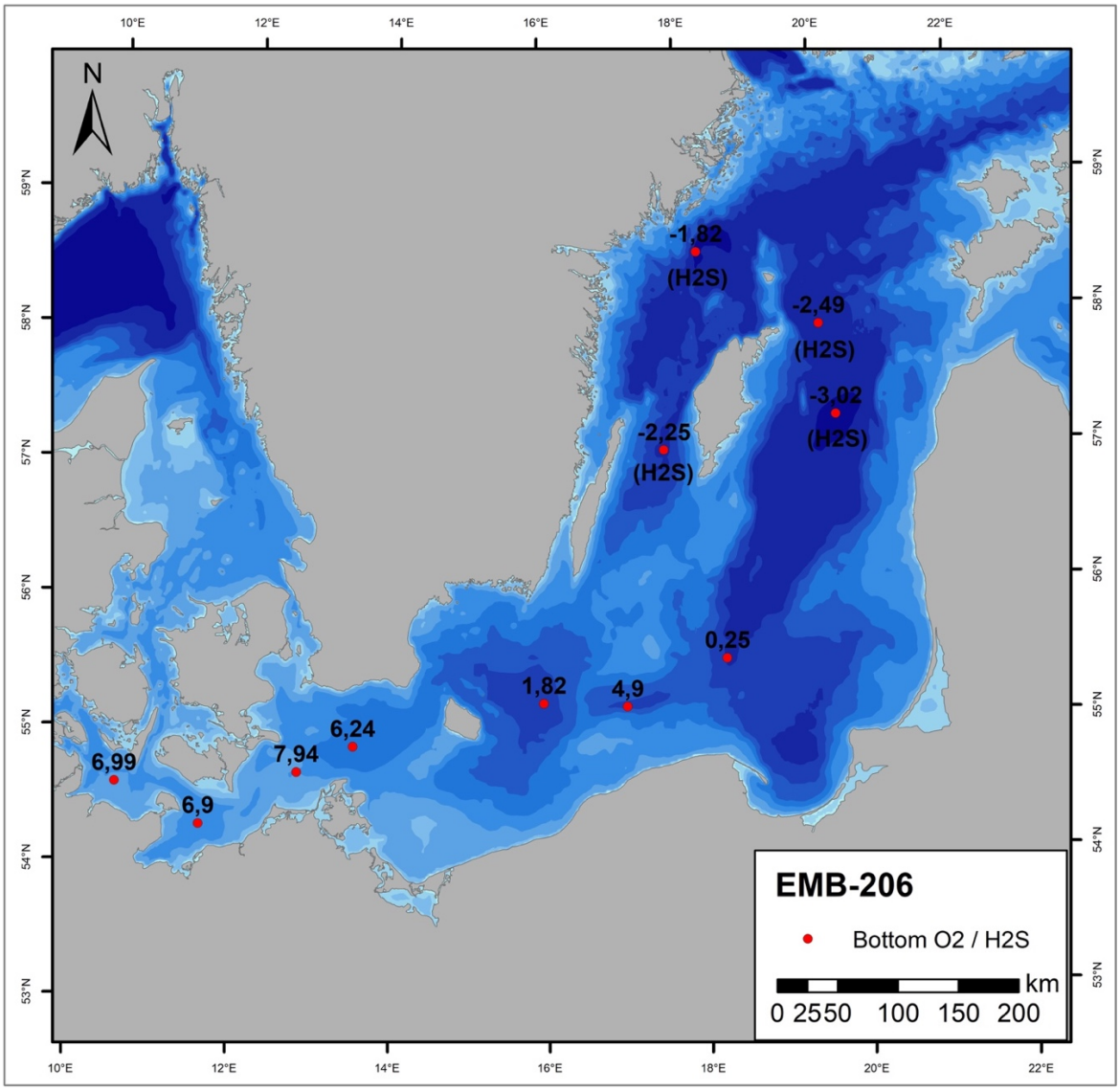


Fig. 5.1 Oxygen/hydrogen sulphide conditions in the bottom near layer for selected key stations (hydrogen sulphide was converted into negative oxygen equivalents).

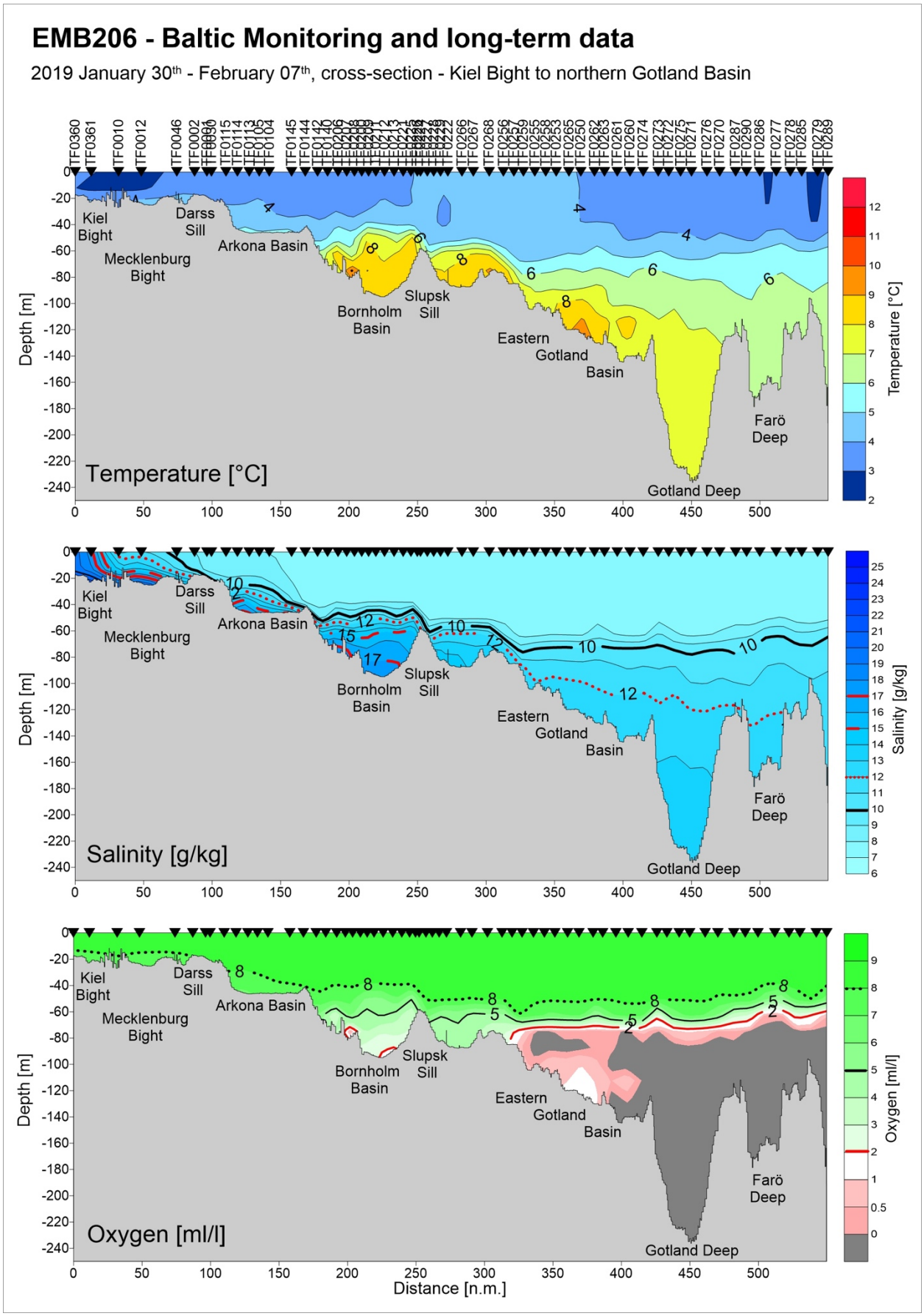


Fig. 5.2 Cross section from Kiel Bight to eastern Gotland Basin showing the hydrographic parameters temperature, salinity and oxygen on the "Talweg" of Major Baltic Inflows (for location see map Fig. 3.5).

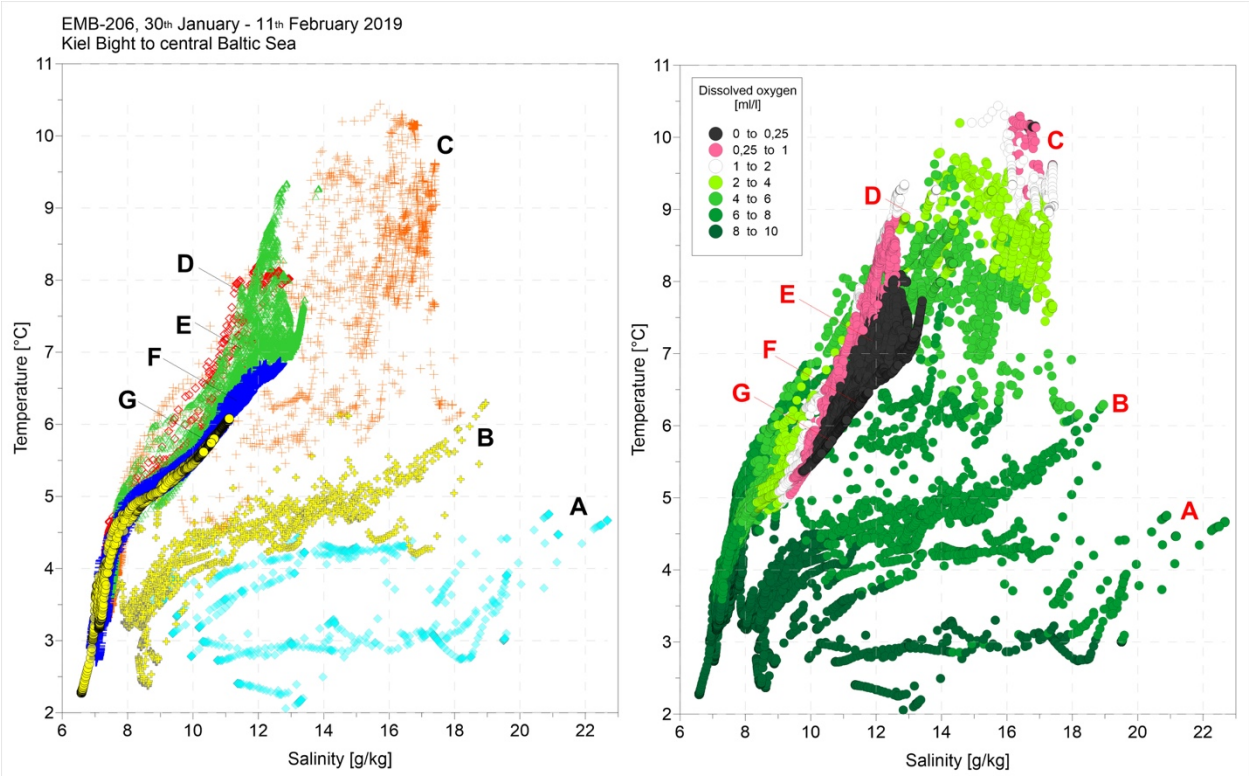
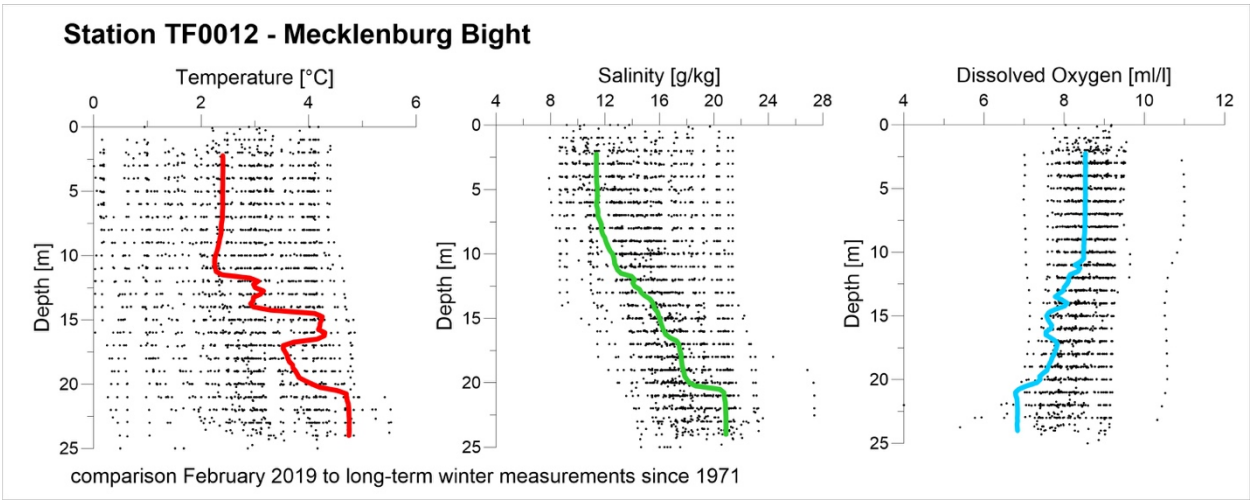
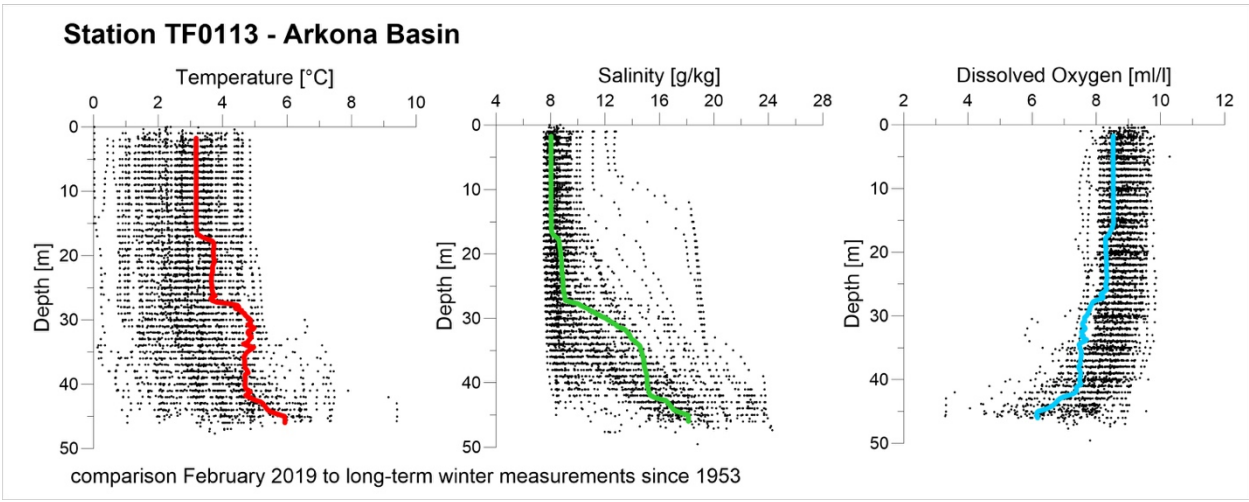
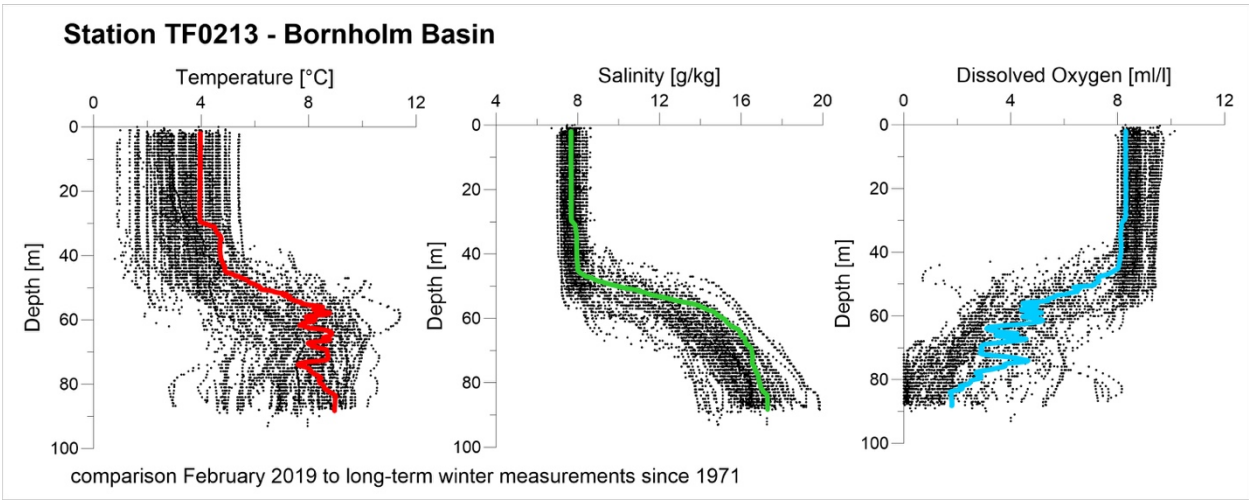
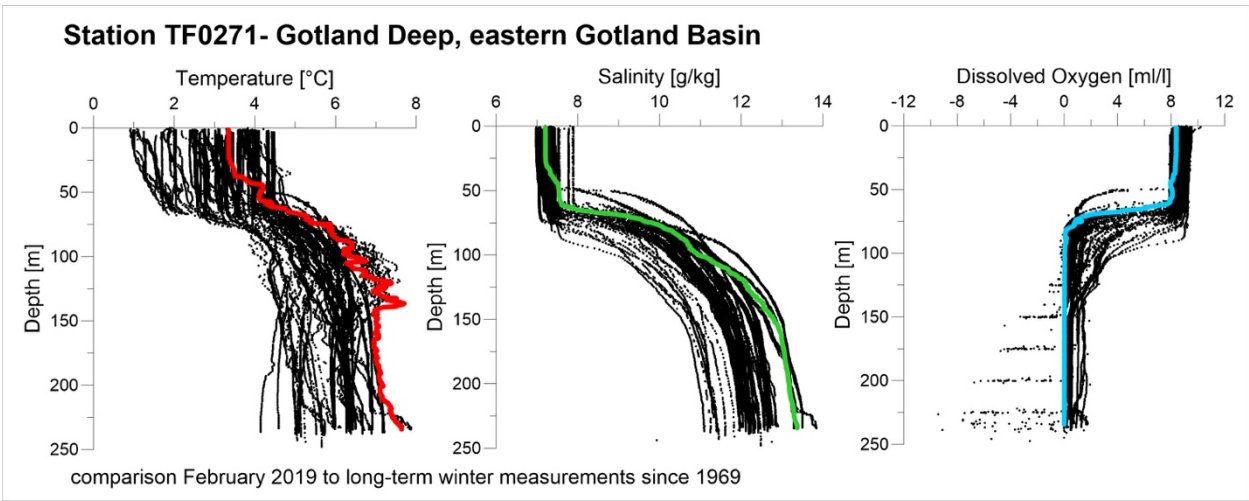


Fig. 5.3 Temperature-Salinity diagram (left) of all stations, A – Kiel Bight – Mecklenburg Bight (yellow); B – Arkona Basin (yellow); C – Bornholm Basin (orange); D – Slupsk Channel (red); E – Eastern Gotland Basin (green); F – Northern Central Basin (blue); G – Western Gotland Basin (black). Diagram on right side shows all temperature – salinity values and dissolved oxygen classified in color.




Station TF0113 - Arkona Basin
Temperature [°C]
Salinity [g/kg]
Dissolved Oxygen [ml/l]
Depth [m]
comparison February 2019 to long-term winter measurements since 1953


Station TF0213 - Bornholm Basin
Temperature [°C]
Salinity [g/kg]
Dissolved Oxygen [ml/l]
Depth [m]
comparison February 2019 to long-term winter measurements since 1971


Station TF0271- Gotland Deep, eastern Gotland Basin
Temperature [°C]
Salinity [g/kg]
Dissolved Oxygen [ml/l]
Depth [m]
comparison February 2019 to long-term winter measurements since 1969

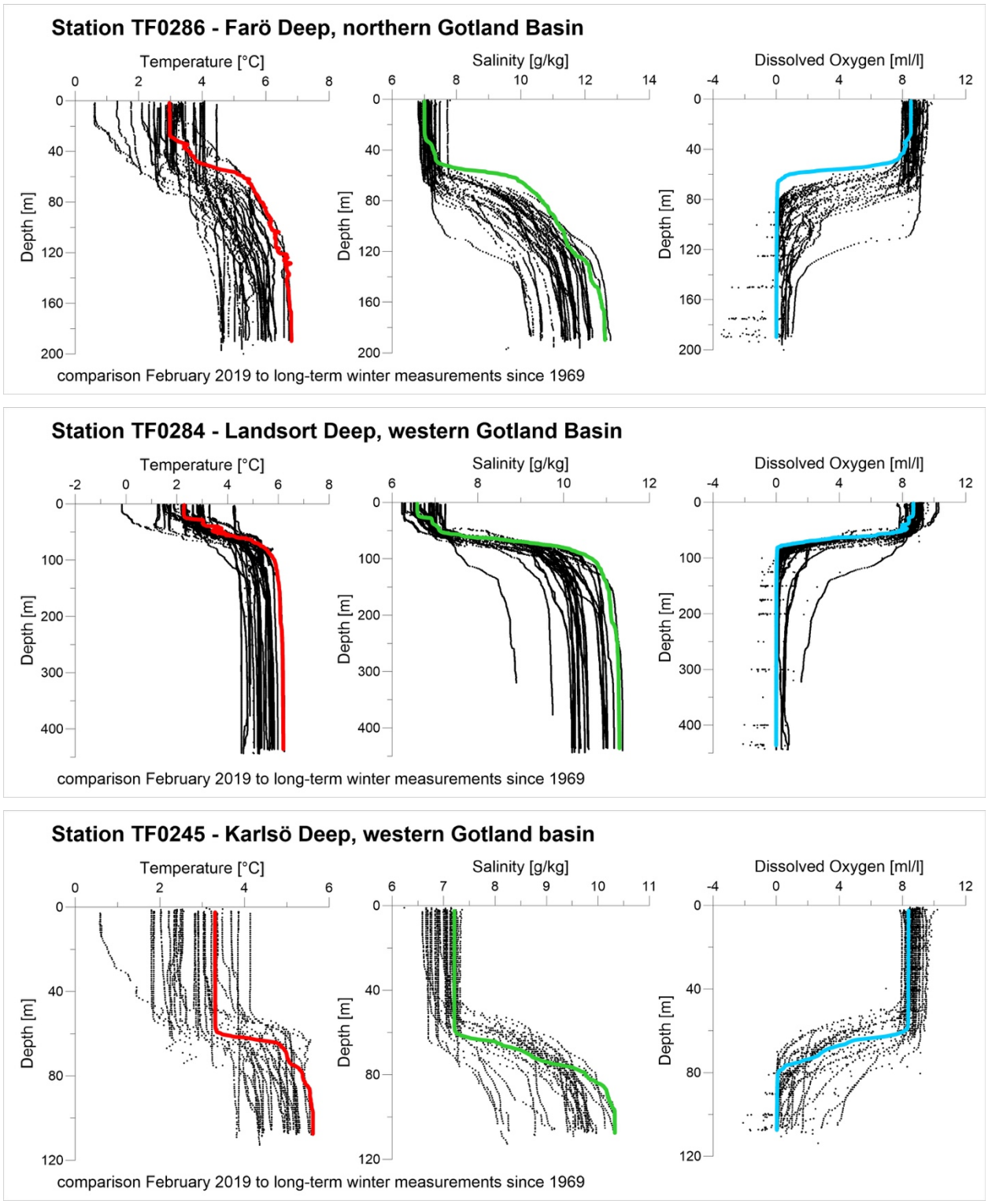


Fig. 5.4 Recent hydrographic conditions compared to long-term data of the winter situation at key stations of the Baltic Sea (for location see map Fig. 3.5).

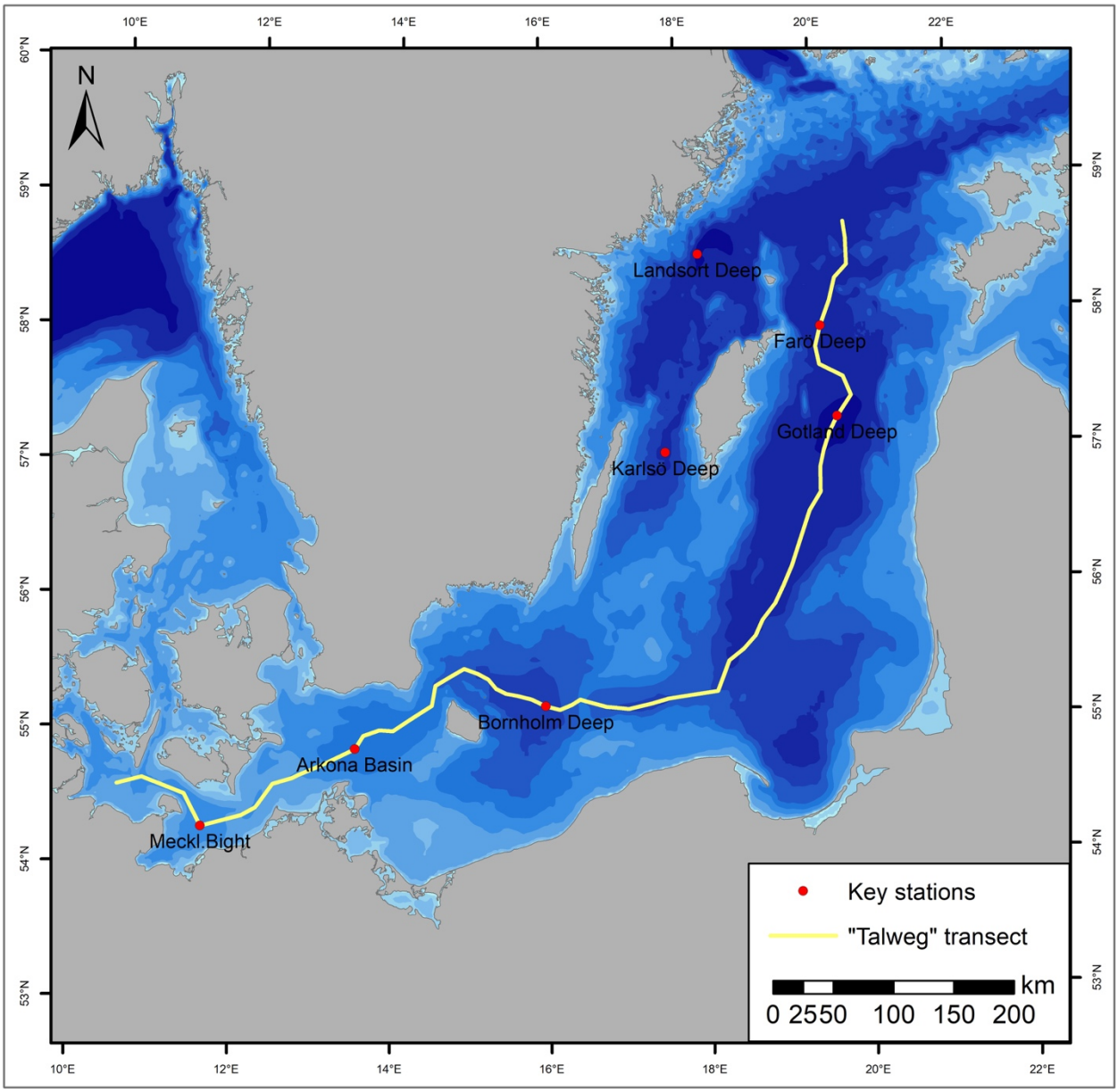


Fig. 5.5 Location of selected key stations and the "Talweg"-transect crossing all deep basins on the pathway of saltwater inflows.

6 Ship's Meteorological Station

The weather situation during the cruise was most of the time srong windy under influence of the large low pressure cells "Pirmin", "Rainer", "Stefan", "Thomas" crossing northern Europe and long-time persisting, extensive high pressure cell "Chloe" (1035 hPa), which moved slowly from southern to eastern Europe. A mean windspeed of 19.8 kn (max. 43 kn, 9 Bft) was measured during the cruise and most of the time the ship moved against the swell. Air pressure varied from 984 hPa (February 10th) to 1022 hPa (February 4th). Some notes of the daily weather situation are given in section 4. The air temperature showed a minimum of -2.1 °C (February 6th) in the northern Gotland Basin to a maximum of 7.5 °C (February 10th) in the western Baltic. A mean temperature of 2.5 °C was measured during the cruise. This temperature is around the average for the this warm winter-season 2018-2019. The global radiation was strongly related to the cloud coverage. Maximum values, at noon on sunny days (January 31st, February 8th-9th) were about 400-450 Wm^2.

7 Station List EMB-206

7.1 Station List – CTD measurements, 90 stations, 129 casts

Date	Latitude [decimal]	Longitude [decimal]	Station	No.	Cast	Begin [UTC]	End [UTC]	Water Depth [m]	Max Depth [m]	Dataset [file name]
2019-01-30	54,2315	12,0750	TFO5	1	1	8:35	8:40	13,62	12,2	V0001F01.hex
2019-01-30	54,6963	12,6974	TF0001	2	1	13:16	13:22	21,44	20,3	V0002F01.hex
2019-01-30	54,6495	12,4486	TF0002	3	1	15:30	15:33	18,13	17,2	V0003F01.hex
2019-01-30	54,4667	12,2158	TF0046	4	1	17:40	17:50	25,19	26,1	V0004F01.hex
2019-01-30	54,4074	12,0617	TF0041	5	1	19:31	19:36	19,42	18,3	V0005F01.hex
2019-01-30	54,3149	11,5478	TF0012	6	1	22:07	22:14	24,66	23,7	V0006F01.hex
2019-01-30	54,3151	11,5490	TF0012	6	2	22:40	22:48	24,95	23,6	V0006F02.hex
2019-01-31	54,5521	11,3191	TF0010	7	1	0:45	0:48	28,68	27,6	V0007F01.hex
2019-01-31	54,6003	10,4498	TF0360	8	1	4:37	4:40	18,64	17,7	V0008F01.hex
2019-01-31	54,6002	10,4497	TF0360	8	2	5:04	5:06	18,62	9,8	V0008K02.hex
2019-01-31	54,6001	10,4498	TF0360	8	3	5:07	5:08	18,43	2	V0008K03.hex
2019-01-31	54,6000	10,4498	TF0360	8	4	5:10	5:12	18,62	0,1	V0008K04.hex
2019-01-31	54,6586	10,7662	TF0361	9	1	7:27	7:32	23,24	22,3	V0009_01.hex
2019-01-31	54,5521	11,3179	TF0010	10	1	9:59	10:05	28,71	27,4	V0010F01.hex
2019-01-31	54,4700	12,2417	TF0046	11	1	14:11	14:14	28,9	27,7	V0011_01.hex
2019-01-31	54,7238	12,7822	TF0030	12	1	16:54	17:02	23,14	21,9	V0012F01.hex
2019-01-31	54,7948	13,0582	TF0115	13	1	18:39	18:45	30,23	28,8	V0013F01.hex
2019-01-31	54,8599	13,2746	TF0114	14	1	19:53	20:00	44,9	42,9	V0014F01.hex
2019-01-31	54,9251	13,5003	TF0113	15	1	21:08	21:22	47,25	45,7	V0015F01.hex
2019-01-31	54,9250	13,5006	TF0113	15	2	21:51	22:01	47,74	45,4	V0015F02.hex
2019-01-31	54,9249	13,5001	TF0113	15	3	22:02	22:03	47,17	1,8	V0015K03.hex
2019-01-31	55,0251	13,6062	TF0105	16	1	23:58	0:05	46,4	44,8	V0016F01.hex
2019-02-01	55,0684	13,8128	TF0104	17	1	1:10	1:16	46,79	44,7	V0017F01.hex
2019-02-01	55,0633	13,9879	TF0103	18	1	2:13	2:19	47,01	45,5	V0018F01.hex
2019-02-01	55,0004	14,0822	TF0109	19	1	3:06	3:14	48,26	46,4	V0019F01.hex
2019-02-01	55,0003	14,0827	TF0109	19	2	3:34	3:36	48,1	4,9	V0019K02.hex
2019-02-01	55,0002	14,0826	TF0109	19	3	3:38	3:39	48,1	0,1	V0019K03.hex
2019-02-01	54,8802	13,8665	ABBoje	20	1	5:09	5:14	45,99	44,1	V0020F01.hex
2019-02-01	54,8039	13,9571	TF0112	21	1	6:02	6:08	40,65	39,2	V0021F01.hex
2019-02-01	54,6117	14,0431	TF0150	22	1	7:38	7:41	22,46	21	V0022_01.hex
2019-02-01	54,0766	14,1538	OBBoje	23	1	14:51	14:54	15,11	14,2	V0023F01.hex
2019-02-01	54,6338	14,2819	TF0152	24	1	18:31	18:37	31,28	29,9	V0024_01.hex
2019-02-01	55,1657	14,2500	TF0145	25	1	21:41	21:48	46,93	45,2	V0025F01.hex
2019-02-01	55,2557	14,4926	TF0144	26	1	23:05	23:09	44,61	43,1	V0026F01.hex
2019-02-02	55,4053	14,5365	TF0142	27	1	0:25	0:32	60,93	58,2	V0027F01.hex
2019-02-02	55,4668	14,7164	TF0140	28	1	1:39	1:47	69,42	67,3	V0028F01.hex
2019-02-02	55,5333	14,9144	TF0206	29	1	2:52	2:57	75,69	73,9	V0029_01.hex
2019-02-02	55,4963	15,0911	TF0207	30	1	3:53	3:58	85,54	82,8	V0030F01.hex
2019-02-02	55,4961	15,0917	TF0207	30	2	4:05	4:08	85,73	11,9	V0030K02.hex
2019-02-02	55,4961	15,0920	TF0207	30	3	4:10	4:12	84,96	0,1	V0030K03.hex

2019-02-02	55,4533	15,2327	TF0208	31	1	5:00	5:09	92,27	90,2	V0031_01.hex
2019-02-02	55,3834	15,3317	TF0200	32	1	6:02	6:14	91,87	89	V0032F01.hex
2019-02-02	55,3468	15,4661	TF0209	33	1	7:17	7:37	93,62	91,3	V0033_01.hex
2019-02-02	55,3300	15,6148	TF0211	34	1	8:37	8:47	95,66	93,1	V0034_01.hex
2019-02-02	55,3016	15,7960	TF0212	35	1	9:50	10:00	95,84	92,8	V0035_01.hex
2019-02-02	55,2616	16,6383	TF0227	36	1	14:31	14:37	69,01	66,7	V0036_01.hex
2019-02-02	55,2504	15,9820	TF0213	37	1	17:32	17:45	89,58	87,4	V0037F01.hex
2019-02-02	55,2505	15,9831	TF0213	37	2	18:15	18:25	89,39	87,3	V0037F02.hex
2019-02-02	55,2213	16,1666	TF0221	38	1	21:44	21:53	82,83	80,4	V0038_01.hex
2019-02-02	55,2575	16,3215	TF0225	39	1	22:47	22:53	67,12	64,4	V0039_01.hex
2019-02-02	55,2968	16,4319	TF0226	40	1	23:36	23:41	58,04	56,1	V0040_01.hex
2019-02-03	55,2831	16,5004	TF0224	41	1	0:12	0:17	62,11	60,4	V0041_01.hex
2019-02-03	55,2613	16,6374	TF0227	42	1	0:58	1:04	68,66	67	V0042_01.hex
2019-02-03	55,2373	16,7722	TF0228	43	1	1:45	1:50	76,48	74,7	V0043_01.hex
2019-02-03	55,2285	16,9138	TF0229	44	1	2:33	2:39	85,37	83,2	V0044_01.hex
2019-02-03	55,2163	17,0707	TF0222	45	1	3:34	3:43	91,09	88,4	V0045F01.hex
2019-02-03	55,2165	17,0674	TF0222	45	2	3:56	3:58	91,17	13,4	V0045K02.hex
2019-02-03	55,2165	17,0670	TF0222	45	3	4:00	4:02	91,27	0,1	V0045K03.hex
2019-02-03	55,2519	17,3614	TF0266	46	1	5:14	5:22	88,29	86,5	V0046_01.hex
2019-02-03	55,2862	17,5953	TF0267	47	1	6:22	6:32	83,78	82	V0047F01.hex
2019-02-03	55,3076	17,9316	TF0268	48	1	7:50	7:59	74,26	73,8	V0048_01.hex
2019-02-03	55,3264	18,2357	TF0256	49	1	9:14	9:25	76,67	74,9	V0049F01.hex
2019-02-03	55,4413	18,3210	TF0257	50	1	10:53	10:58	87,08	84,3	V0050_01.hex
2019-02-03	55,5499	18,4006	TF0259	51	1	11:58	12:08	89,33	87,2	V0051F01.hex
2019-02-03	55,6333	18,6008	TF0255	52	1	13:07	13:13	94,62	91,9	V0052_01.hex
2019-02-03	55,7271	18,7650	TF0258	53	1	14:13	14:20	89,49	88,7	V0053_01.hex
2019-02-03	55,8402	18,8679	TF0253	54	1	15:19	15:25	100,32	97	V0054_01.hex
2019-02-03	55,9588	19,0464	TF0265	55	1	16:35	16:45	110,76	107,8	V0055_01.hex
2019-02-03	56,0827	19,1673	TF0250	56	1	17:46	17:58	123,32	119,9	V0056F01.hex
2019-02-03	56,2339	19,3019	TF0262	57	1	19:12	19:15	130,68	6,9	V0057_01.hex
2019-02-03	56,2340	19,3018	TF0262	57	1	19:16	19:38	130,2	127,6	V0057_01.hex
2019-02-03	56,3467	19,3782	TF0263	58	1	20:39	20:53	132,91	129,4	V0058_01.hex
2019-02-03	56,4912	19,4810	TF0261	59	1	22:03	22:19	142,3	138,5	V0059_01.hex
2019-02-03	56,6333	19,5834	TF0260	60	1	23:29	23:42	143,75	139,8	V0060F01.hex
2019-02-04	56,7672	19,7516	TF0274	61	1	0:51	0:57	152,73	149,1	V0061_01.hex
2019-02-04	56,9515	19,7697	TF0273	62	1	2:18	2:25	179,36	177,2	V0062_01.hex
2019-02-04	57,0710	19,8298	TF0272	63	1	3:29	3:46	205,89	201,6	V0063F01.hex
2019-02-04	57,0713	19,8290	TF0272	63	2	4:04	4:07	205,95	16,6	V0063K02.hex
2019-02-04	57,0715	19,8291	TF0272	63	3	4:08	4:10	205,95	0,3	V0063K03.hex
2019-02-04	57,2093	19,9294	TF0275	64	1	5:18	5:38	226,77	222,3	V0064_01.hex
2019-02-04	57,3066	20,0812	X_0065	65	1	11:06	11:07	241,26	50,9	V0065K01.hex
2019-02-04	57,3199	20,0499	TF0271	66	1	12:59	13:14	236,63	232,3	V0066F01.hex
2019-02-04	57,3204	20,0498	TF0271	66	2	13:48	13:55	237,58	111,4	V0066F02.hex
2019-02-04	57,3200	20,0498	TF0271	66	3	14:23	14:31	237,87	70,4	V0066F03.hex
2019-02-04	57,3204	20,0498	TF0271	66	4	14:54	14:57	237,68	11,9	V0066K04.hex
2019-02-04	57,3197	20,0501	TF0271	66	5	15:21	15:42	237,68	232,4	V0066F05.hex

2019-02-04	57,3199	20,0492	TF0271	66	6	16:06	16:09	237	12	V0066K06.hex
2019-02-04	57,3203	20,0492	TF0271	66	7	16:11	16:18	236,71	232,3	V0066F07.hex
2019-02-04	57,3191	20,0502	TF0271	66	8	16:57	16:59	237,78	0,3	V0066K08.hex
2019-02-04	57,3199	20,0486	TF0271	66	9	17:09	17:32	236,43	232,3	V0066F09.hex
2019-02-04	57,3196	20,0506	TF0271	66	10	17:55	18:11	237,87	176,1	V0066F10.hex
2019-02-06	57,3181	20,0473	TF0271	67	1	7:59	8:31	236,71	227,3	V0067F01.hex
2019-02-06	57,3632	20,3415	MoorGONE	68	1	9:46	10:08	215,01	209,9	V0068_01.hex
2019-02-06	57,4698	20,2600	TF0276	69	1	11:06	11:18	202,68	200,3	V0069_01.hex
2019-02-06	57,6166	20,1665	TF0270	70	1	12:32	12:41	143,49	139,3	V0070F01.hex
2019-02-06	57,7151	19,8533	TF0287	71	1	14:02	14:10	128,55	126,5	V0071_01.hex
2019-02-06	57,8504	19,8162	TF0290	72	1	15:13	15:23	168,05	164,5	V0072_01.hex
2019-02-06	58,0006	19,9028	TF0286	73	1	16:32	16:53	192,02	188,2	V0073F01.hex
2019-02-06	58,0004	19,9005	TF0286	73	2	17:29	17:49	193,1	188,3	V0073F02.hex
2019-02-06	58,1843	20,0541	TF0277	74	1	19:29	19:48	160,4	156,3	V0074_01.hex
2019-02-06	58,3503	20,1505	TF0278	75	1	21:02	21:13	120,41	116,8	V0075_01.hex
2019-02-06	58,4432	20,3358	TF0285	76	1	22:14	22:26	124,21	121,6	V0076F01.hex
2019-02-06	58,6415	20,3463	TF0279	77	1	23:45	23:55	162,79	158,2	V0077_01.hex
2019-02-07	58,7659	20,3321	TF0289	78	1	0:54	1:02	190,82	187	V0078F01.hex
2019-02-07	58,7653	20,3310	TF0289	78	2	1:14	1:17	191,08	11,7	V0078K02.hex
2019-02-07	58,7655	20,3308	TF0289	78	3	1:19	1:21	190,4	0,2	V0078K03.hex
2019-02-07	58,7836	19,1015	TF0283	79	1	5:36	5:48	120,03	113,6	V0079F01.hex
2019-02-07	58,5833	18,2342	TF0284	80	1	8:56	9:44	436,91	431,7	V0080F01.hex
2019-02-07	58,5835	18,2324	TF0284	80	2	10:14	10:33	442,84	155,2	V0080F02.hex
2019-02-07	58,5829	18,2335	TF0284	80	3	11:09	11:19	440,14	84,9	V0080F03.hex
2019-02-07	58,5833	18,2326	TF0284	80	4	11:42	12:25	441,49	433	V0080F04.hex
2019-02-07	58,5836	18,2327	TF0284	80	5	12:39	12:51	440,14	97,4	V0080F05.hex
2019-02-07	58,0000	18,0002	TF0240	81	1	17:20	17:38	168,52	161,9	V0081F01.hex
2019-02-07	58,0001	17,9990	TF0240	81	2	17:59	18:18	166,69	162,7	V0081F02.hex
2019-02-07	57,7180	17,3667	TF0242	82	1	21:58	22:15	139,12	133,7	V0082F01.hex
2019-02-07	57,7175	17,3670	TF0242	82	2	22:24	22:36	141,34	12,4	V0082K02.hex
2019-02-07	57,7168	17,3670	TF0242	82	3	22:38	22:39	141,44	0,1	V0082K03.hex
2019-02-08	57,1172	17,6678	TF0245	83	1	3:50	4:01	109,92	106,5	V0083F01.hex
2019-02-08	55,1608	15,6608	TF0214	84	1	23:56	0:03	92,51	91,1	V0084F01.hex
2019-02-09	55,2503	15,9835	TF0213	85	1	1:50	1:59	89,84	87,2	V0085F01.hex
2019-02-09	55,2501	15,9835	TF0213	85	2	2:25	2:28	90,08	12,2	V0085K02.hex
2019-02-09	55,2501	15,9835	TF0213	85	3	2:29	2:32	89,89	0,1	V0085K03.hex
2019-02-10	54,9253	13,5006	TF0113	86	1	6:06	6:12	47,08	45,3	V0086F01.hex
2019-02-10	54,7235	12,7829	TF0030	87	1	9:24	9:29	22,54	21,5	V0087F01.hex
2019-02-10	54,4701	12,2428	TF0046	88	1	12:40	12:46	28,63	27,3	V0088F01.hex
2019-02-10	54,2322	12,0747	TFO5	89	1	15:19	15:21	12,52	11,8	V0089_01.hex
2019-02-10	54,2318	12,0749	TFO5	89	2	15:31	15:34	12,87	6,5	V0089K02.hex
2019-02-10	54,2317	12,0751	TFO5	89	3	15:37	15:39	13,06	0	V0089K03.hex
2019-02-10	54,3127	11,5515	TF0012	90	1	19:54	19:59	24,71	23,7	V0090F01.hex

7.2 Water sampling – parameters and number of samples

No.	Station	O2	H2S	PO4	NO3	NO2	SIO4	NH4	P-Total	N-Total	POM + DOM	CH4	CO2	CKW / PAK	Microplastic	PPCPS	DNA-Filter	Fish-Filter	P+G, Betain	Phyto-Net	Chlorophyll	Phytoplankton	Zooplankton
1	TFO5	3		3	3	3	3	3	2	2	2				3	1							
2	TF0001	2			-	-	-	-		-	-			2									
3	TF0002	1			-	-	-	-		-	-												
4	TF0046	1		4	4	4	4	-		-	-									1	6	2	1
5	TF0041	1		3	3	3	3	-		-	-												
6	TF0012	4		4	4	4	4	4	3	3	3				3	1				1	6	2	1
7	TF0010	1		3	3	3	3	-		-	-												
8	TF0360	10		3	3	3	3	3	3	3	3				3	1				1	4	3	
10	TF0010				-	-	-	-		-	-			1	3								
11	TF0046				-	-	-	-		-	-					1							
12	TF0030	1		4	4	4	4	-		-	-									1	6	2	
13	TF0115	1			-	-	-	-		-	-												
14	TF0114	1			-	-	-	-		-	-												
15	TF0113	7		7	7	7	7	7	4	4	4	7	7	2	3					2	5	3	2
16	TF0105	1		5	5	5	5	-		-	-												
17	TF0104	1		5	5	5	5	-		-	-												
18	TF0103	1		5	5	5	5	-		-	-												
19	TF0109	14		5	5	5	5	5	4	4	4									1	6	2	1
20	ABBoje	2		2	2	2	2	-		-	-												
21	TF0112	1		4	4	4	4	-		-	-												
23	OBBoje	2		2	2	2	2	-		-	-					1							
25	TF0145	1		5	5	5	5	-		-	-					1							
27	TF0142	1		5	5	5	5	-		-	-												
28	TF0140	1		6	6	6	6	-		-	-												
30	TF0207	9			-	-	-	-		-	-												
32	TF0200	1		7	7	7	7	-		-	-												
37	TF0213	10		10	10	10	10	10	6	6	6	10	10		4	1							
45	TF0222	10		7	7	7	7	-		-	-			1									
49	TF0256	1			-	-	-	-		-	-				4	1							
51	TF0259	1		7	7	7	7	-		-	-									1	6	2	

57	TF0262	1	3		-	-	-	-		-	-												
58	TF0263		2		-	-	-	-		-	-			1									
59	TF0261		3		-	-	-	-		-	-												
60	TF0260	1	3	9	9	9	9	-		-	-												
63	TF0272	9	3		-	-	-	-		-	-												
66	TF0271	22	17	30	30	30	30	30	12	12	12	24	21	3	9	1	52	26	52	2	5	2	
70	TF0270	1	4		-	-	-	-		-	-			1									
73	TF0286	7	9	16	16	16	16		6	6	6	16	16		8								
76	TF0285	1	2		-	-	-	-		-	-												
78	TF0289	9	2		-	-	-	-		-	-												
79	TF0283		2		-	-	-	-		-	-												
80	TF0284	13	17	29	29	29	29	29	10	10	10			1	11	1	52	26	52				
81	TF0240	1	4		-	-	-	-		-	-				5								
82	TF0242	9			-	-	-	-		-	-				4								
83	TF0245	1	3		-	-	-	-		-	-												
84	TF0214	1			-	-	-	-		-	-												
85	TF0213	16			-	-	-	-		-	-									1	6	2	2
86	TF0113	1			-	-	-	-		-	-									1	5	2	2
87	TF0030	2			-	-	-	-		-	-									2	6	2	
88	TF0046	1			-	-	-	-		-	-									2	5	2	1
89	TFO5	2			-	-	-	-		-	-												
90	TF0012	9			-	-	-	-		-	-									2	6	2	1
	Samples	**197**	**74**	**190**	**190**	**190**	**190**	**91**	**50**	**50**	**50**	**57**	**54**	**12**	**60**	**10**	**104**	**52**	**104**	**18**	**72**	**28**	**11**
	Stations sampled	**47**	**14**	**26**	**26**	**26**	**26**	**8**	**9**	**9**	**9**	**4**	**4**	**8**	**12**	**10**	**2**	**2**	**2**	**13**	**13**	**13**	**8**

7.3 Profile List – organic pollutants

Transect	Region	Date	Begin [UTC]	Latitude [decimal]	Longitude [decimal]	End [UTC]	Latitude [decimal]	Longitude [decimal]	Length [NM]
T1	Kiel Bight - Fehmarn Belt	31.01.19	00:30	54,5494	11,3343	4:50	54,6002	10,4501	60.1
T2	Mecklenburg Bight - Darss Sill	30.01.19	14:20	54,6958	12,6987	21:52	54,3123	11,5655	100.4
T3	Arkona Sea	31.01.19	22:55	54,9251	13,5004	3:20	55,0002	14,0827	48.5
T4	Pommeranian Bight	01.02.19	12:38	54,3878	13,9241	17:05	54,4173	14,2004	75.9
T5	Bornholm Sea	08.02.19	16:35	56,1032	16,5782	22:10	55,3821	15,8635	92.6
T6	central Baltic Sea	03.02.19	04:00	55,2165	17,0668	10:30	55,4228	18,3081	90.5
T7	eastern Gotland Sea, South	03.02.19	21:00	56,3516	19,3815	3:20	57,0704	19,8315	86.9
T8	eastern Gotland Sea, North	06.02.19	12:30	57,6167	20,1664	17:38	58,0003	19,9004	56.3
T9	western Gotland Sea	07.02.19	13:50	58,5825	18,2321	20:10	57,8785	17,7070	89.7

7.4 Station List – sediment sampling

Date	Latitude [decimal]	Longitude [decimal]	Station	No.	UTC	Water Depth [m]	Sediment sampling
2019-01-30	54,2315	12,0750	TFO5	1	8:40	13,62	4 Frahmlot, no sediment
2019-01-30	54,4667	12,2158	TF0046	4	17:50	25,19	2 Frahmlot
2019-01-31	54,6000	10,4498	TF0360	8	5:12	18,62	5 Frahmlot
2019-01-31	54,5521	11,3179	TF0010	10	10:05	28,71	1 Frahmlot
2019-01-31	54,7238	12,7822	TF0030	12	17:02	23,14	1 Frahmlot, no sediment
2019-01-31	54,9249	13,5001	TF0113	15	22:03	47,17	5 Frahmlot
2019-02-02	55,2505	15,9831	TF0213	37	18:25	89,39	4 Frahmlot
2019-02-03	55,3264	18,2357	TF0256	49	9:25	76,67	1 Frahmlot
2019-02-06	58,0004	19,9005	TF0286	73	17:49	193,1	1 Multicorer, (4 cores)
2019-02-07	58,5836	18,2327	TF0284	80	12:51	440,14	1 Multicorer, (4 cores)
2019-02-07	58,0001	17,9990	TF0240	81	18:18	166,69	1 Frahmlot
2019-02-07	57,7168	17,3670	TF0242	82	22:39	141,44	2 Frahmlot
2019-02-10	54,7235	12,7829	TF0030	87	9:29	22,54	1 Multicorer, (4 cores)
2019-02-10	54,2322	12,0747	TFO5	89	15:21	12,52	1 Multicorer, (4 cores)

7.5 List – mooring work

Date	Latitude [decimal]	Longitude [decimal]	Begin [UTC]	End [UTC]	Water Depth [m]	Action
2019-01-30	54,6963	12,6974	13:45	15:20	21,44	MARNET station Darss Sill, maintenance
2019-02-02	55,2616	16,6383	15:50		69,01	Mooring Slupsk Sill, deployment
2019-02-04	57,3066	20,0812	9:15		241,26	Mooring GODESS, recovery
2019-02-04	57,3201	20,1286	11:00	13:30	240,5	Mooring Gotland - central, recovery, maintenance, deployment
2019-02-09	55,2616	16,6383		9:00	69,01	Mooring Slupsk Sill, recovery

8 Data and Sample Storage and Availability

Data is intensively 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).

9 References

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Naumann, M., Umlauf, L., Mohrholz, V., Kuss, J., Siegel, H., Waniek, J., Schulz-Bull, D., 2018. Hydrographic-hydrochemical assessment of the Baltic Sea 2017. – Meereswissenschaftliche Berichte (Marine Science Reports) 107, 91 pages. https://www.io-warnemuende.de/tl_files/forschung/meereswissenschaftliche-berichte/mebe107_2018_assessment-hc.pdf

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

10 Appendices

Deployed mooring “Gotland – central” at the Gotland Deep, positioning:

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

VERANKERUNGSPROTOKOLL

Datum:	04.02.2019	**Beginn:**	12:00	**Ende:**	12:26 **UTC**
Gerät:	**Sedimentfalle**			**Reise EMB**	**206**
Code Name:	**Gotland BA - 2019 - 02**				
Lottiefe:	Wassertiefe 250 m				
Wetter:	Wind: 265°		11,4 m/s		
	Strömung: 180°		0,4 kn		
Absetzposition:	**Breite:**	**57° 18,378' N**	(WGS 84, DGPS)		
	Länge:	**20° 04,868' E**			
	KrK:	300°			
Grundleine: (Ende)	**Breite:**	keine			
	Länge:				
	KrK:				
	Richtung:		(vom Gerät)		
	Länge:				
Oberfläche:	keine				
Bemerkungen:					

Kapitän

Exp.-Leiter

Verteiler: Reederei
EMB
IOW
Fahrtltr.