

MSM 08/3 (18.06.08 – 18.07.08) Short Cruise Report Rostock-Tallinn-Kiel

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Cruise participants

1. Prof. Dr. Detlef E. Schulz-Bull*	Fahrtleiter / <i>Chief Scientist</i>	IOW
2. Dr. Joanna Waniek	Fahrtleiter / <i>Chief Scientist</i> CTD/ORP	IOW
3. Dr. Ralf Prien	Fe/Mn Sensor	IOW
4. Enrique Fernandez Otero	Trace metals	IOW
5. Dr. Christa Pohl	Trace metals	IOW
6. Prof. M. McKay*/M.Staubwasser*	Trace metals	BGSU/Univ. Köln
7. Prof. Gesine Witt*/ I. Weinberg*	PAH	HAW HH/GKSS
8. Dr. Klaus Nagel	Micro layer	IOW
9. Dr. Anne Löffler*/Dr. J. Beldowski*	CO ₂	IOW
10. Hildegard Kubsch / C. Berg	CO ₂ /Microbiology	IOW
11. Dr. Günther Nausch	Nutrients analyses	IOW
12. Dr. Monika Nausch	DOP	IOW
13. Siegfried Krüger	P-CTD, CTD	IOW
14. Peter Wlost	CTD	IOW
15. Dr. Rudolf Endler	Mapping/Geology	IOW
16. Gerald Nickel	Mapping/Geology	IOW
17. Nadja Taubert* / Nicole Kowalski*	Geochemistry	Univ. Bern/IOW
18. Uwe Hehl	Moorings/Geology	IOW
19. Doris Setzkorn	DOP/Microbiology	IOW
20. Dr. Mathias Labrenz* / Ch.Stolle*	Microbiology	IOW
21. Dr. Oliver Schmale	Methan	IOW
22. Birgit Sadkowiak	Nutrient analyses	IOW
23. Ines Hand	Organic Chemistry	IOW
24. Wolfgang Gerwinski*	Organic contaminants	BSH

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Scientific background:

The Baltic Sea has been intensively studied in the past decades. The present efforts concentrate on the understanding of the interplay between physical, chemical and biological mechanisms of the marine ecosystem of the Baltic Sea. In all activities the main underlying question was to determine if natural or anthropogenic causes or both are responsible for the observed changes in the ecosystem of the Baltic Sea. The cruise aimed to (1) improve our understanding of e.g. denitrification, dissolved organic phosphorus availability and speciation, and (2) to provide a Baltic Sea wide, basin-by-basin inventory of the biogeochemical properties. This inventory will allow to document changes during the last decade and to quantify the variability of the hydrographic and environmental conditions on the decadal scale by comparing the latest observations to the results of the studies carried out in the 1970s and 1980s

The hydrographic conditions determine to a great extent the biogeochemical characteristics of the Baltic Sea in general and of the individual basins in particular. Weak points in our understanding relate to the interplay between the physical processes and biological characteristics of the Baltic Sea. Therefore during the MSM08/03 leg the following specific aspects were investigated:

- The investigations of the distribution and temporal variability of trace metal concentrations (Hg, Cd, Pb, Cu, Zn, Ni, Co, Mn, Fe) in surface waters allow to compare the past (1982 & 1995) and present observations. The investigations in Bothnian Sea / Bothnian Bay and the Gulf of Finland were carried out for the first time.
- The denitrification as one of the most important sinks for nitrogen in the Baltic Sea, is difficult to quantify up to now. A new approach for the quantification of N₂ by denitrification was tested during the cruise, based on measurements of the total gas tension (= sum of the partial pressures of all dissolved gases) and the partial pressures of O₂ and CO₂.
- Only limited number of measurements of the availability of organic and inorganic phosphorus (DOP/DIP) as main phosphorus (P) sources that sustain phytoplankton and bacterial growth in aquatic ecosystems and DOP specification from the Baltic exist.
- Additionally the temporal and spatial variability of the density anomaly due to the inorganic load (CaCO₃) was studied and the mobility and the bioavailability of polycyclic aromatic hydrocarbons was measured and an inventory of organic pollutants calculated.
- Measurements were carried out to estimate the reservoir of the dissolved organic matter. The surface micro-layers (1-1000µm), its composition and its function in the air sea exchange and for the optical properties of the water column were studied. The overall control of the air – sea gas exchange by the surface films and its inhabiting organisms, and the consequences for the biogeochemistry of the euphotic zone has not been examined yet for the Baltic Sea.
- The redoxcline and the oxic-anoxic interface of the central Baltic Sea basins (Gotland Deep) is characterised by specialized bacterial communities that mediate significant biogeochemical transformations (e.g., within the nitrogen, sulphur and manganese cycles). Chemolithoautotrophic bacteria use nitrate, and possibly manganese oxides, to oxidize sulphide at the interface and in the upper anoxic layer. The metabolic

pathways and identity of participating organisms are only partly resolved and were intensively studied during that leg.

- Samples for determination of methane concentration were taken from the CTD casts, including fast detection of methane and sampling of the dissolved gases for later stable isotope characterisation, as well as sampling for high accuracy concentration measurement using a purge and trap technique ashore. The overall aim of the investigation was to get first insight into the methane distribution in all major basins of the Baltic Sea.
- The locations of the working areas, extending from the Baltic Sea entrance in the west up to the Gulf of Bothnia and the Gulf of Finland in the east enable the study of the sediment forming processes in relation to the depositional environment. Small scale sea-bottom morphology, distribution patterns, properties and internal structures of modern sediments were mapped during the cruise by high resolution sediment echo sounding, with special interest on accumulations of free gas in sediments and pockmark structures. Multicorer – sample and long gravity cores were recovered at selected places with high sediment layer thickness in order to identify the layer sequence. The analyses of the sediment cores will be performed later on land.

Work program

The cruise was based on two complementary components a) comprehensive underway surface sampling combined with CTD casts every 30 nm and b) basin-by-basin process studies at 13 selected stations (Fig.1).

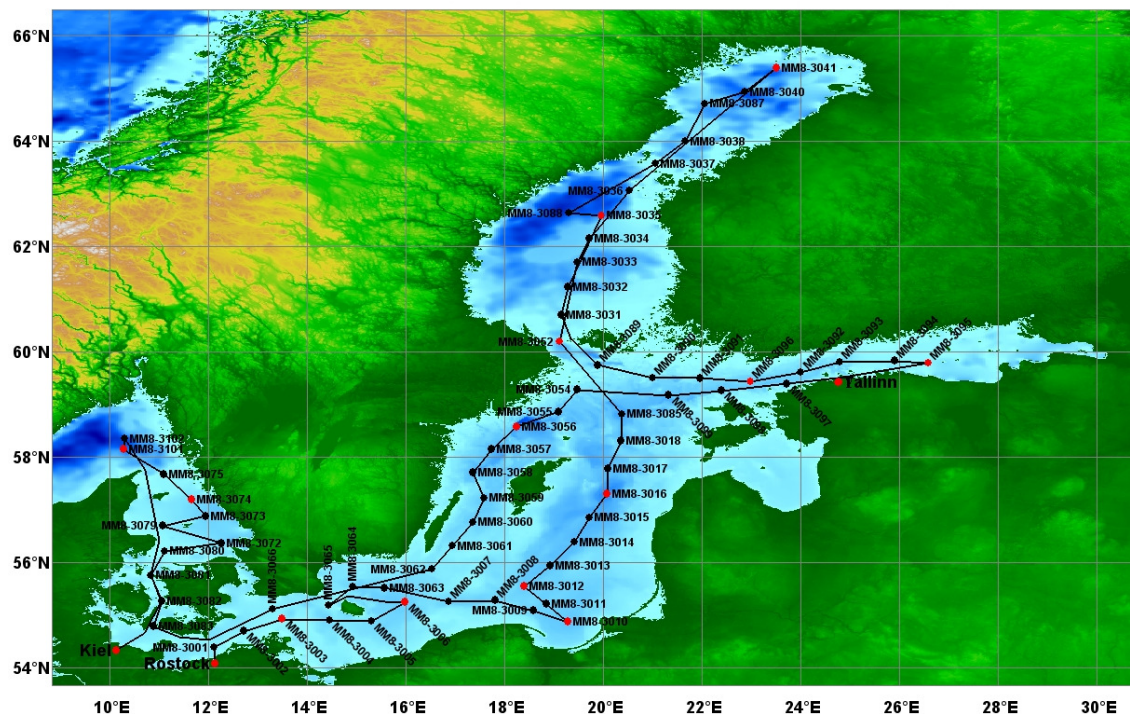


Fig. 1. Cruise track and stations of the MSM0803.

a) Comprehensive underway sampling: Along the cruise track, underway sampling every 30 nm based on water supply through the "Kieler Pumpsystem" in combination with CTD casts was carried out (Fig. 1). The surface measurements included sampling for

trace metal distribution (Hg, Cd, Pb, Cu, Zn, Ni, Co, Mn, Fe), PCB, PAH in both dissolved and particulate phase, pCO₂ and basic properties (T, S, O₂, Chlorophyll a, nutrients, organic matter). The CTD cast allow to relate the hydrographic conditions in the water column below to the surface measurements and to increase the overall spatial resolution regarding the basic physical (temperature, salinity), chemical (nutrients) and biological properties (chlorophyll a, oxygen). The underway sampling comprised also continuous registrations of temperature and salinity at surface and registrations of the meteorological parameters (air temperature, humidity, wind speed and direction). Small scale sea bottom morphology, distribution patterns, properties and internal structures of modern sediments were mapped during the cruise by high resolution sediment echo-sounding with special emphasis on accumulations of free gas in sediments and pockmark structures. The measurements will be performed during transit but also at stations.

b) Basin-by-basin process studies: Extensive studies were carried out in Skagerrak, Kattegat, Arkona Sea, Bornholm Sea, eastern & western Gotland Sea, Bothnian Bay & Bothnian Sea, Bay of Finland and Gdansk Basin (Fig. 1). At those 13 basin-by-basin process studies sites the work comprised a series of CTD casts, trace metal measurements by means of Pump-CTD, sediment sampling using multi corer and long gravity cores, in-situ pumps deployments and plankton net hols. By means of multi corer the mobility of PAH's in the surface sediments was investigated. At all main stations of the first part of the cruise between Rostock and Tallinn the sampling was carried out by means of the P-CTD system and/or the rosette for the analysis of Mo, Mo-Isotope, Mn, sulfate, 34-S/32-S and 18-O/16-O of dissolved sulphate and sulfide and 34-S of sulphide in the anoxic basin. Additionally at all main stations one core of every MUC was taken for geochemical analyses of sediments (2 cm resolution): TOC, TIC, main, minor, and trace elements. Pore water sampling via rhizons was obtained from a second MUC core for the analyses of metals, sulphide, sulphate and nutrients). Surface fluff layer from a third core was used for the analyses of the structure of Mn and Fe oxides.

Narrative of the cruise:

Rostock/Warnemünde 18.06.2008: Cruise MSM0803 starts at 11:00 am. Maria S. Merian sails from Warnemünde lead by chief scientist Prof. D. Schulz-Bull. In the afternoon the first CTD cast was measured and the first process study station of the cruise was successfully occupied. From now on every 30 nm a CTD cast will be carried out.

19.06.2008: The second process study station lasted the entire day.

20.06.-21.06.2008: Every 30 nm a CTD cast and surface sampling. All systems work fine.

22.06.-23.06.2008: Both days are filled with the work on two process study stations. In the evening Merian arrives in the Gotland Basin.

23.06.-27.06.2008: We work intensively in the basin, all instruments are deployed for several times, moorings for projects at IOW are recovered and one is deployed again at TF271.

27.06.-30.06.2008: We are working station by station and moving towards North. In the night to 30.06 we have our most northern station. The night is warm and relatively bright. In the morning the search for the mooring starts, at this point we are very optimistic.

01.07.2008: Unfortunately, in the morning, after 24 hours of search we have to

abandon the position. The mooring was not recovered.

01.07.-02.07.2008: Regular work, with CTD casts and plankton net holes every 30nm. In the evening of the 2nd July we have deployed a new mooring.

02.07.-04.07.2008: The work continues. We are looking forward to the short break in Tallinn.

Tallinn 05.07.2008: In the early morning hours Merian arrives in Tallinn. In the afternoon scientist from the institute and members of the German consulate visit the scientists on board and the ship. Few members of the scientific crew departure today, some new members join us on the ship for the second part of the cruise. For the next leg Dr. J. Waniek is the new chief scientist on board.

Tallinn 07.07.2008: At 08:00am Merian sails from Tallinn, our research program continuous. On this leg we have only three process study stations, but more geological/acoustical surveys to carry out.

07.07.-08.07.2008: Samples from the surface layer every 30 nm, continuous registrations of surface temperature, salinity and chlorophyll a and meteorological parameters continue. Again every 30nm CTD cast and plankton net holes are carried out.

08.07.-10.07.2008: The station in the Landsort Tief will be occupied over nearly 48 hours with extensive hydrographical and geological sampling.

11.07.-14.07.2008: Our work continues partly in very shallow water as Merian passes the Belts towards the North Sea. In the evening of the 14th of July we are on our last station. CTD, MUC and gravity corer are deployed for the last time during that cruise.

15.07.2008: In the morning the scientific work ends and Maria S. Merian sails to Kiel. We start our preparation for leaving the ship. Equipment is being packed, data archived and last analyses run.

17.07.2008: We are packing our four container and cleaning the laboratories. Merian is already in Kiel.

Kiel 18.07.2008: Cruise ends with the departure of the scientific crew at 10:00 am.

Abbreviations used in Appendix 1:

CAT-SML	catamaran for sampling of surface micro film
CTD/RO	conductivity, temperature and depth device combined with a rosette
DR-IGL	dredging gear
EM 120	acoustical system
GC	gravity corer
ISP	in situ pump
MOR	mooring
MUC	multi corer
P-CTD	pump CTD
PLA	plankton net
SCF	trace metal fish
SES2000	acoustical system
SNO	snorkel
VGRAB	vertical grab, gravity corer

Appendix (1):

Station No.	Date	St. Name	Time UTC	Position Lat	Position Lon	Gear	Remark
MSM8/248-1	18.06.08	MM8-3001	12:28	54° 23,22' N	12° 6,27' E	CTD/RO	
MSM8/249-1	18.06.08	MM8-3002	15:40	54° 41,53' N	12° 42,68' E	CTD/RO	
MSM8/249-2	18.06.08		16:01	54° 41,53' N	12° 42,68' E	SNO	start sampling
MSM8/250-1	18.06.08		18:34	54° 55,03' N	13° 28,58' E	MUC	
MSM8/250-2	18.06.08		18:54	54° 55,09' N	13° 28,64' E	MUC	
MSM8/250-3	18.06.08		19:14	54° 55,22' N	13° 28,78' E	MUC	
MSM8/250-4	18.06.08		19:26	54° 55,22' N	13° 28,78' E	MUC	
MSM8/250-5	18.06.08	MM8-3003	20:21	54° 55,55' N	13° 30,05' E	CTD/RO	
MSM8/250-6	18.06.08		20:59	54° 55,55' N	13° 30,06' E	P-CTD	
MSM8/251-1	19.06.08	MM8-3004	02:43	54° 53,74' N	14° 27,27' E	CTD/RO	
MSM8/252-1	19.06.08	MM8-3005	05:51	54° 51,41' N	15° 23,06' E	CTD/RO	
MSM8/253-1	19.06.08	MM8-3006	09:28	55° 15,05' N	15° 58,93' E	CTD/RO	
MSM8/253-2	19.06.08		10:12	55° 15,05' N	15° 58,93' E	CAT-SML	
MSM8/253-3	19.06.08		11:07	55° 15,05' N	15° 58,93' E	PLA	
MSM8/253-4	19.06.08		11:19	55° 15,05' N	15° 58,93' E	PLA	
MSM8/253-5	19.06.08		11:39	55° 15,05' N	15° 58,93' E	P-CTD	
MSM8/253-6	19.06.08		15:11	55° 15,05' N	15° 58,92' E	CTD/RO	
MSM8/253-7	19.06.08		15:53	55° 15,05' N	15° 58,92' E	ISP	
MSM8/253-8	19.06.08		23:29	55° 15,04' N	15° 58,95' E	ISP	
MSM8/253-9	20.06.08		06:24	55° 15,04' N	15° 58,96' E	MUC	
MSM8/254-1	20.06.08		07:54	55° 15,96' N	16° 1,90' E	SCF	into the water
MSM8/254-3	20.06.08		10:47	55° 8,09' N	15° 36,39' E	SCF	into the water
MSM8/255-1	20.06.08	X_0007	17:08	55° 14,13' N	15° 41,44' E	CTD/RO	
MSM8/255-1	21.06.08	MM8-3065	09:21	55° 11,07' N	14° 26,09' E	CTD/RO	
MSM8/255-2	21.06.08		09:47	55° 11,07' N	14° 26,09' E	PLA	
MSM8/256-1	21.06.08	MM8-3064	12:11	55° 31,97' N	14° 55,18' E	CTD/RO	
MSM8/257-1	21.06.08	MM8-3063	14:46	55° 31,01' N	15° 34,12' E	CTD/RO	
MSM8/259-1	22.06.08	MM8-3007	02:07	55° 15,28' N	16° 51,73' E	CTD/RO	
MSM8/260-1	22.06.08	MM8-3008	05:10	55° 16,71' N	17° 48,45' E	CTD/RO	
MSM8/261-1	22.06.08	MM8-3009	07:58	55° 4,88' N	18° 34,51' E	CTD/RO	
MSM8/262-1	22.06.08		10:53	54° 51,99' N	19° 17,01' E	PLA	
MSM8/262-2	22.06.08		11:04	54° 51,99' N	19° 17,01' E	PLA	
MSM8/262-3	22.06.08		11:10	54° 51,99' N	19° 17,01' E	PLA	
MSM8/262-4	22.06.08	MM8-3010	11:16	54° 51,99' N	19° 17,01' E	CTD/RO	
MSM8/262-5	22.06.08		12:13	54° 51,99' N	19° 17,01' E	P-CTD	
MSM8/262-6	22.06.08		16:19	54° 51,99' N	19° 17,01' E	CTD/RO	
MSM8/262-7	22.06.08		16:45	54° 51,99' N	19° 17,01' E	MUC	
MSM8/262-8	22.06.08		16:59	54° 51,99' N	19° 17,01' E	VGRAB	
MSM8/263-1	22.06.08	MM8-3011	19:32	55° 12,47' N	18° 50,47' E	CTD/RO	
MSM8/264-1	22.06.08		22:31	55° 33,00' N	18° 24,03' E	P-CTD	
MSM8/264-2	23.06.08	MM8-3012	02:36	55° 33,01' N	18° 24,03' E	CTD/RO	
MSM8/264-3	23.06.08		03:05	55° 33,01' N	18° 24,03' E	PLA	
MSM8/264-4	23.06.08		03:14	55° 33,01' N	18° 24,03' E	PLA	
MSM8/264-5	23.06.08		03:31	55° 33,00' N	18° 24,03' E	MUC	
MSM8/264-6	23.06.08		03:50	55° 33,00' N	18° 24,03' E	CTD/RO	
MSM8/266-1	23.06.08	MM8-3013	07:48	55° 55,98' N	18° 55,64' E	CTD/RO	
MSM8/267-1	23.06.08	MM8-3014	10:50	56° 22,92' N	19° 25,07' E	CTD/RO	

Station No.	Date	St. Name	Time UTC	Position Lat	Position Lon	Gear	Remark
MSM8/268-1	23.06.08	MM8-3015	13:39	56° 50,82' N	19° 42,53' E	CTD/RO	
MSM8/268-2	23.06.08		14:08	56° 50,82' N	19° 42,53' E	MUC	
MSM8/269-1	23.06.08		17:20	57° 17,03' N	20° 7,26' E	GC	
MSM8/270-1	23.06.08	MM8-3016	18:16	57° 18,33' N	20° 4,47' E	CTD/RO	
MSM8/270-2	23.06.08		18:58	57° 18,33' N	20° 4,47' E	PLA	
MSM8/270-3	23.06.08		19:06	57° 18,33' N	20° 4,47' E	PLA	
MSM8/270-4	23.06.08		19:24	57° 18,33' N	20° 4,47' E	CTD/RO	
MSM8/270-5	23.06.08		20:12	57° 18,33' N	20° 4,48' E	ISP	
MSM8/270-6	24.06.08		03:02	57° 18,37' N	20° 4,72' E	ISP	
MSM8/270-7	24.06.08		10:02	57° 18,38' N	20° 4,72' E	P-CTD	
MSM8/270-8	25.06.08		02:12	57° 18,37' N	20° 4,71' E	P-CTD	
MSM8/271-1	25.06.08		04:57	57° 18,92' N	20° 9,91' E	MOR	released
MSM8/271-1	25.06.08		06:17	57° 18,79' N	20° 8,89' E	MOR	mooring on deck
MSM8/273-1	25.06.08		08:30	57° 19,00' N	20° 4,57' E	MOR	released
MSM8/273-1	25.06.08		13:47	57° 20,85' N	20° 7,81' E	MOR	mooring on deck
MSM8/274-1	25.06.08	MM8-3016	14:20	57° 18,34' N	20° 4,69' E	CTD/RO	
MSM8/275-1	25.06.08		15:23	57° 19,08' N	20° 3,60' E	MOR	released
MSM8/275-1	25.06.08		17:44	57° 18,56' N	20° 6,12' E	MOR	mooring on deck
MSM8/276-1	25.06.08		18:01	57° 18,30' N	20° 4,69' E	P-CTD	
MSM8/277-1	26.06.08		12:23	57° 17,02' N	20° 7,29' E	MUC	
MSM8/277-2	26.06.08		12:51	57° 17,02' N	20° 7,28' E	MUC	
MSM8/277-3	26.06.08		13:12	57° 17,02' N	20° 7,29' E	MUC	
MSM8/278-1	26.06.08	MM8-3016	13:57	57° 18,40' N	20° 4,65' E	CTD/RO	surface
MSM8/279-1	27.06.08		09:33	57° 29,53' N	20° 21,12' E	P-CTD	surface
MSM8/280-1	27.06.08		11:27	57° 17,45' N	20° 21,02' E	P-CTD	surface
MSM8/281-1	27.06.08		13:50	57° 5,55' N	19° 52,99' E	P-CTD	surface
MSM8/282-1	27.06.08		15:09	57° 11,56' N	19° 47,51' E	P-CTD	surface
MSM8/283-1	27.06.08	MM8-3017	18:48	57° 47,02' N	20° 5,33' E	CTD/RO	
MSM8/283-2	27.06.08		19:34	57° 47,02' N	20° 5,34' E	CTD/RO	
MSM8/284-1	27.06.08	MM8-3018	22:52	58° 18,50' N	20° 21,08' E	CTD/RO	
MSM8/285-1	28.06.08	MM8-3085	01:49	58° 48,72' N	20° 23,19' E	CTD/RO	
MSM8/285-2	28.06.08		02:25	58° 48,71' N	20° 23,51' E	MUC	
MSM8/286-1	28.06.08		03:10	58° 48,99' N	20° 25,08' E	MUC	
MSM8/286-2	28.06.08		03:43	58° 48,99' N	20° 25,07' E	GC	
MSM8/287-1	28.06.08	MM8-3052	11:35	60° 11,50' N	19° 7,03' E	CTD/RO	
MSM8/287-2	28.06.08		12:12	60° 11,59' N	19° 7,09' E	PLA	
MSM8/287-3	28.06.08		12:26	60° 11,59' N	19° 7,10' E	PLA	
MSM8/287-4	28.06.08		13:21	60° 11,59' N	19° 7,09' E	P-CTD	
MSM8/287-5	28.06.08		21:33	60° 11,60' N	19° 7,14' E	CTD/RO	
MSM8/287-6	28.06.08		22:10	60° 11,65' N	19° 7,21' E	MUC	
MSM8/287-7	28.06.08		22:42	60° 11,65' N	19° 7,21' E	GC	
MSM8/288-1	29.06.08	MM8-3033	05:35	61° 42,20' N	19° 28,07' E	CTD/RO	
MSM8/289-1	29.06.08	MM8-3034	08:06	62° 8,66' N	19° 43,14' E	CTD/RO	
MSM8/290-1	29.06.08	MM8-3036	12:49	63° 3,58' N	20° 30,87' E	CTD/RO	
MSM8/291-1	30.06.08	MM8-3041	00:34	65° 23,49' N	23° 29,95' E	CTD/RO	
MSM8/291-2	30.06.08		01:03	65° 23,54' N	23° 30,02' E	PLA	
MSM8/291-3	30.06.08		01:10	65° 23,54' N	23° 30,02' E	PLA	
MSM8/291-4	30.06.08		01:30	65° 23,54' N	23° 30,02' E	CTD/RO	
MSM8/292-1	30.06.08	MM8-3040	04:08	64° 55,83' N	22° 51,69' E	CTD/RO	
MSM8/293-1	30.06.08		06:57	64° 42,82' N	22° 1,58' E	DR-IGL	searching harness to water
MSM8/293-3	30.06.08		18:09	64° 43,01' N	22° 2,51' E	DR-IGL	harness on Deck

Station No.	Date	St. Name	Time UTC	Position Lat	Position Lon	Gear	Remark
MSM8/294-1	30.06.08	MM8-3087	18:34	64° 42,46' N	22° 3,14' E	CTD/RO	
MSM8/294-2	30.06.08		19:02	64° 42,52' N	22° 3,25' E	PLA	
MSM8/294-3	30.06.08		19:10	64° 42,52' N	22° 3,26' E	PLA	
MSM8/294-4	30.06.08		19:35	64° 42,47' N	22° 3,21' E	MUC	
MSM8/294-5	30.06.08		19:56	64° 42,47' N	22° 3,21' E	GC	
MSM8/294-6	30.06.08		20:25	64° 42,47' N	22° 3,21' E	CAT-SML	
MSM8/293-4	30.06.08		21:52	64° 42,40' N	22° 3,99' E	DR-IGL	searching harness to water
MSM8/293-4	30.06.08		22:34	64° 42,41' N	22° 4,08' E	DR-IGL	start dredging
MSM8/293-4	01.07.08		05:40	64° 42,21' N	22° 3,73' E	DR-IGL	start heaving
MSM8/293-4	01.07.08		06:31	64° 42,25' N	22° 5,10' E	DR-IGL	search harness on Deck
MSM8/295-1	01.07.08	MM8-3038	10:14	64° 0,02' N	21° 38,92' E	CTD/RO	
MSM8/296-1	01.07.08	MM8-3037	13:54	63° 34,35' N	21° 3,59' E	CTD/RO	
MSM8/296-2	01.07.08		14:18	63° 34,30' N	21° 3,70' E	PLA	
MSM8/296-3	01.07.08		14:26	63° 34,30' N	21° 3,70' E	PLA	
MSM8/297-1	01.07.08	MM8-3088	21:42	62° 37,85' N	19° 17,47' E	CTD/RO	
MSM8/298-1	02.07.08	MM8-3035	00:59	62° 35,22' N	19° 58,15' E	CTD/RO	
MSM8/298-2	02.07.08		01:51	62° 35,23' N	19° 58,13' E	PLA	
MSM8/298-3	02.07.08		02:03	62° 35,24' N	19° 58,13' E	PLA	
MSM8/298-4	02.07.08		02:19	62° 35,24' N	19° 58,13' E	P-CTD	
MSM8/298-5	02.07.08	MM8-3035	10:58	62° 35,21' N	19° 58,09' E	CTD/RO	
MSM8/298-6	02.07.08		11:36	62° 35,21' N	19° 58,15' E	MUC	
MSM8/298-7	02.07.08		12:05	62° 35,21' N	19° 58,14' E	MUC	
MSM8/298-8	02.07.08		12:42	62° 35,21' N	19° 58,13' E	MUC	
MSM8/298-9	02.07.08		13:29	62° 35,21' N	19° 58,13' E	P-CTD	
MSM8/299-1	02.07.08		19:06	62° 25,12' N	19° 2,50' E	MOR	slipped
MSM8/300-1	03.07.08	MM8-3032	00:19	61° 13,54' N	19° 17,04' E	CTD/RO	
MSM8/301-1	03.07.08	MM8-3031	02:56	60° 41,83' N	19° 8,79' E	CTD/RO	
MSM8/302-1	03.07.08	MM8-3089	08:19	59° 45,00' N	19° 52,97' E	CTD/RO	
MSM8/302-1	03.07.08		08:47	59° 44,99' N	19° 53,00' E	PLA	
MSM8/302-1	03.07.08		08:56	59° 44,99' N	19° 53,00' E	PLA	
MSM8/303-1	03.07.08	MM8-3090	12:19	59° 29,97' N	21° 0,03' E	CTD/RO	
MSM8/303-2	03.07.08		12:43	59° 29,98' N	21° 0,03' E	PLA	
MSM8/303-3	03.07.08		12:52	59° 29,98' N	21° 0,03' E	PLA	
MSM8/303-4	03.07.08		12:59	59° 29,98' N	21° 0,03' E	PLA	
MSM8/304-1	03.07.08	MM8-3091	15:43	59° 30,01' N	21° 58,02' E	CTD/RO	
MSM8/305-1	03.07.08	MM8-3096	19:07	59° 26,15' N	22° 58,33' E	CTD/RO	
MSM8/305-2	03.07.08		19:38	59° 26,15' N	22° 58,39' E	PLA	
MSM8/305-3	03.07.08		19:47	59° 26,15' N	22° 58,39' E	PLA	
MSM8/305-4	03.07.08		20:10	59° 26,15' N	22° 58,39' E	P-CTD	
MSM8/305-5	04.07.08		02:39	59° 26,09' N	22° 58,40' E	MUC	
MSM8/306-1	04.07.08	MM8-3092	05:29	59° 37,00' N	23° 59,96' E	CTD/RO	
MSM8/306-2	04.07.08		05:53	59° 36,97' N	23° 59,90' E	PLA	
MSM8/306-3	04.07.08		06:04	59° 36,97' N	23° 59,90' E	PLA	
MSM8/307-1	04.07.08	MM8-3093	08:26	59° 47,88' N	24° 46,75' E	CTD/RO	
MSM8/308-1	04.07.08	MM8-3094	11:19	59° 50,02' N	25° 54,06' E	CTD/RO	
MSM8/309-1	04.07.08	MM8-3095	13:47	59° 46,97' N	26° 35,05' E	CTD/RO	
MSM8/309-2	04.07.08		14:13	59° 46,97' N	26° 35,05' E	PLA	
MSM8/309-3	04.07.08		14:29	59° 46,97' N	26° 35,05' E	P-CTD	
MSM8/309-4	04.07.08		19:23	59° 46,97' N	26° 35,05' E	MUC	
MSM8/249-2	05.07.08		02:30	59° 40,80' N	24° 40,79' E	SNO	Stop sampling

Station No.	Date	St. Name	Time UTC	Position Lat	Position Lon	Gear	Remark
		Tallinn					
MSM8/310-2	07.07.08		05:44	59° 38,80' N	24° 22,83' E	SNO	Start sampling
MSM8/311-1	07.07.08	MM8-3097	07:50	59° 22,97' N	23° 43,14' E	CTD/RO	
MSM8/311-2	07.07.08		08:14	59° 22,98' N	23° 42,95' E	PLA	
MSM8/311-3	07.07.08		08:24	59° 22,98' N	23° 42,95' E	PLA	
MSM8/312-1	07.07.08	MM8-3098	11:32	59° 16,04' N	22° 23,53' E	CTD/RO	
MSM8/313-1	07.07.08	MM8-3099	14:38	59° 9,98' N	21° 18,95' E	CTD/RO	
MSM8/313-2	07.07.08		15:09	59° 10,05' N	21° 18,18' E	PLA	
MSM8/313-3	07.07.08		15:16	59° 10,05' N	21° 18,18' E	PLA	
MSM8/314-1	07.07.08	MM8-3054	19:32	59° 17,09' N	19° 27,59' E	CTD/RO	
MSM8/314-2	07.07.08		19:56	59° 17,19' N	19° 26,77' E	PLA	
MSM8/314-3	07.07.08		20:02	59° 17,20' N	19° 26,76' E	PLA	
MSM8/315-1	07.07.08	MM8-3055	22:28	58° 51,60' N	19° 5,78' E	CTD/RO	
MSM8/316-1	07.07.08		23:29	58° 48,36' N	18° 56,26' E	EM120	Start profile
MSM8/316-1	08.07.08		00:06	58° 45,32' N	18° 47,94' E	EM120	change of course
MSM8/316-1	08.07.08		00:33	58° 47,93' N	18° 50,29' E	EM120	change of course
MSM8/316-1	08.07.08		01:03	58° 44,92' N	18° 54,34' E	EM120	end of profile
MSM8/317-1	08.07.08	MM8-3056	02:58	58° 35,00' N	18° 13,98' E	CTD/RO	
MSM8/317-2	08.07.08		04:08	58° 35,00' N	18° 13,98' E	ISP	
MSM8/317-3	08.07.08		10:45	58° 35,00' N	18° 13,98' E	PLA	
MSM8/317-4	08.07.08		10:52	58° 35,00' N	18° 13,98' E	PLA	
MSM8/317-5	08.07.08		11:04	58° 35,00' N	18° 13,98' E	CTD/RO	
MSM8/317-6	08.07.08		11:46	58° 35,00' N	18° 13,98' E	P-CTD	
MSM8/317-7	09.07.08		10:52	58° 34,99' N	18° 14,02' E	CTD/RO	
MSM8/317-8	09.07.08		11:39	58° 35,00' N	18° 14,01' E	ISP	
MSM8/318-1	09.07.08		16:57	58° 35,00' N	18° 14,01' E	CTD/RO	
MSM8/319-1	09.07.08		18:13	58° 33,19' N	18° 13,77' E	P-CTD	
MSM8/319-2	09.07.08		18:42	58° 33,19' N	18° 13,77' E	P-CTD	
MSM8/319-3	09.07.08		19:42	58° 33,52' N	18° 13,84' E	MUC	
MSM8/319-4	09.07.08		20:42	58° 33,51' N	18° 13,83' E	MUC	
MSM8/319-5	09.07.08		21:27	58° 33,51' N	18° 13,83' E	GC	
MSM8/320-1	10.07.08	MM8-3057	00:16	58° 9,09' N	17° 44,19' E	CTD/RO	
MSM8/320-2	10.07.08		00:48	58° 9,06' N	17° 44,23' E	PLA	
MSM8/321-1	10.07.08		01:09	58° 8,83' N	17° 44,58' E	SES 2000	Start grid
MSM8/321-1	10.07.08		04:08	57° 41,68' N	17° 21,58' E	SES 2000	Stop grid
MSM8/321-2	10.07.08	MM8-3058	04:25	57° 41,99' N	17° 21,21' E	CTD/RO	
MSM8/322-1	10.07.08	MM8-3059	07:18	57° 13,41' N	17° 34,88' E	CTD/RO	
MSM8/323-1	10.07.08	MM8-3060	10:03	56° 45,60' N	17° 21,23' E	CTD/RO	
MSM8/323-2	10.07.08		10:28	56° 45,64' N	17° 21,19' E	PLA	
MSM8/323-3	10.07.08		10:32	56° 45,64' N	17° 21,19' E	PLA	
MSM8/324-1	10.07.08	MM8-3061	12:55	56° 19,20' N	16° 57,05' E	CTD/RO	
MSM8/325-1	10.07.08		18:16	55° 57,16' N	18° 48,76' E	EM120	Start Profile
MSM8/325-1	10.07.08		18:58	55° 59,53' N	18° 56,59' E	EM120	change of course
MSM8/325-1	10.07.08		19:43	55° 56,37' N	18° 49,08' E	EM120	change of course
MSM8/325-1	10.07.08		20:32	55° 58,97' N	18° 57,07' E	EM120	change of course
MSM8/325-1	10.07.08		21:19	55° 55,93' N	18° 50,25' E	EM120	change of course
MSM8/325-1	10.07.08		22:05	55° 58,41' N	18° 57,88' E	EM120	change of course

Station No.	Date	St. Name	Time UTC	Position Lat	Position Lon	Gear	Remark
MSM8/325-1	10.07.08		22:41	55° 55,73' N	18° 50,84' E	EM120	end profile
MSM8/326-1	10.07.08		23:07	55° 56,89' N	18° 50,55' E	P-CTD	
MSM8/327-1	11.07.08	MM8-3062	08:20	55° 51,92' N	16° 30,78' E	CTD/RO	
MSM8/327-2	11.07.08		08:40	55° 51,92' N	16° 30,78' E	PLA	
MSM8/327-3	11.07.08		08:49	55° 51,93' N	16° 30,78' E	PLA	
MSM8/327-4	11.07.08		08:55	55° 51,93' N	16° 30,78' E	PLA	
MSM8/328-1	11.07.08	MM8-3066	18:19	55° 6,69' N	13° 18,04' E	CTD/RO	
MSM8/328-2	11.07.08		18:40	55° 6,69' N	13° 18,04' E	PLA	
MSM8/328-3	11.07.08		18:44	55° 6,69' N	13° 18,06' E	PLA	
MSM8/329-1	12.07.08	MM8-3083	03:02	54° 47,27' N	10° 52,75' E	CTD/RO	
MSM8/329-2	12.07.08		03:20	54° 47,27' N	10° 52,75' E	PLA	
MSM8/329-3	12.07.08		03:25	54° 47,27' N	10° 52,75' E	PLA	
MSM8/330-1	12.07.08	MM8-3082	05:56	55° 16,12' N	11° 3,15' E	CTD/RO	
MSM8/331-1	12.07.08	MM8-3081	08:42	55° 44,89' N	10° 48,84' E	CTD/RO	
MSM8/331-2	12.07.08		09:00	55° 44,89' N	10° 48,84' E	PLA	
MSM8/331-3	12.07.08		09:05	55° 44,89' N	10° 48,84' E	PLA	
MSM8/332-1	12.07.08	MM8-3080	11:44	56° 12,68' N	11° 6,64' E	CTD/RO	
MSM8/333-1	12.07.08	MM8-3072	15:33	56° 21,60' N	12° 15,81' E	CTD/RO	
MSM8/333-2	12.07.08		15:43	56° 21,60' N	12° 15,81' E	PLA	
MSM8/334-1	12.07.08	MM8-3079	20:10	56° 41,53' N	11° 4,35' E	CTD/RO	
MSM8/335-1	12.07.08	MM8-3073	23:10	56° 52,61' N	11° 55,97' E	CTD/RO	
MSM8/336-1	13.07.08	MM8-3074	01:40	57° 11,50' N	11° 40,01' E	CTD/RO	
MSM8/336-2	13.07.08		02:06	57° 11,50' N	11° 40,01' E	PLA	
MSM8/336-3	13.07.08		03:16	57° 11,49' N	11° 40,02' E	P-CTD	
MSM8/336-4	13.07.08		10:22	57° 11,49' N	11° 40,02' E	MUC	
MSM8/337-1	13.07.08	MM8-3075	13:52	57° 40,50' N	11° 5,53' E	CTD/RO	
MSM8/337-2	13.07.08		14:11	57° 40,51' N	11° 5,53' E	PLA	
MSM8/337-2	13.07.08		14:21	57° 40,51' N	11° 5,53' E	PLA	
MSM8/338-1	13.07.08		14:30	57° 40,51' N	11° 5,53' E	SES 2000	Start sounding
MSM8/338-1	14.07.08		00:47	58° 8,76' N	10° 16,53' E	SES 2000	Stop sounding
MSM8/339-1	14.07.08	MM8-3101	00:52	58° 8,74' N	10° 16,51' E	CTD/RO	
MSM8/339-2	14.07.08		01:26	58° 8,74' N	10° 16,51' E	PLA	
MSM8/339-3	14.07.08		01:46	58° 8,74' N	10° 16,51' E	ISP	
MSM8/339-4	14.07.08		08:57	58° 8,74' N	10° 16,51' E	P-CTD	
MSM8/341-1	14.07.08	MM8-3102	19:36	58° 21,26' N	10° 18,11' E	CTD/RO	
MSM8/341-2	14.07.08		20:25	58° 21,26' N	10° 18,12' E	MUC	
MSM8/341-3	14.07.08		21:06	58° 21,25' N	10° 18,12' E	GC	
MSM8/310-2	15.07.08		08:29	58° 12,47' N	10° 32,66' E	SNO	finish sampling

Appendix (2):

