

Cruise Report HE-238, 1. – 11. September 2005

Re.: 7.3.05, 1-12.9.05, Jnr 05/5472

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Aim

The focus of this cruise was on plankton dynamics in the North Sea with a special emphasis on the role of the bacterioplankton and bacteria associated to suspended matter (marine snow) and the oxic sediment surface. We aimed to study the dynamics of phytoplankton at various conditions, i.e. bloom versus non-bloom conditions, and spatio-temporal patterns in the North Sea. We were particularly interested into two major bacterioplankton groups in the North Sea, the SAR11 clade and a narrow cluster of the *Roseobacter* group (RCA cluster), and into two bacterial groups associated to marine snow and the oxic sediment surface (SAMMIC Cluster, Myxobacteria).

Cruise track, stations, sampling and parameters studied.

As outlined in Figs. 1 and 2, the cruise track went from Bremerhaven to 59 °N and back south. We were lucky in hitting a situation with a pronounced plankton bloom in the German Bight and decreasing chlorophyll concentrations towards the North. In total 52 stations were visited at which various hydrographical, chemical and biological measurements, mainly in the water column, were carried out (see Tables on station overview and parameter overview).

Results

In the German Bight, the phytoplankton was dominated by diatoms and further north, at decreasing chlorophyll a concentrations, relatively more dinoflagellates were recorded. The zooplankton was always dominated by copepods but a remarkable feature was that radiolarians were only recorded at station 1374 (56° 40' N) and further north. The general gradient of decreasing concentrations of suspended matter and chlorophyll a from south to north is depicted on Fig. 3.

With respect to bacterioplankton dynamics we found that the SAR11 clade constituted between 5 and 25% of the total and the RCA cluster between 1 and 8%. Highest fractions both of the SAR11 clade and the RCA cluster appeared at the northern fringe and in the Wadden Sea. The particle- and sediment associated myxobacteria and SAMMIC cluster constituted always less than 5% of total bacteria, and their occurrence was restricted to the sediment surface (total transect) and the shallow and well mixed Wadden Sea and German Bight. These data were obtained by quantitative real time PCR with appropriate primer systems specific for the respective target groups.

Conclusions and outlook

An important result of this cruise was that we were able, as hypothesized, to detect the targeted bacterial groups throughout the transect, and it appears that the SAR11 clade and RCA cluster are somehow related to the distribution of the phytoplankton. Even though the SAR11 clade constituted always higher fractions than the RCA cluster, the latter was also a prominent component of the bacterioplankton.

To learn more about the seasonal dynamics of these bacterioplankton components it seems to be important to also include other seasonal phases. Therefore, we plan to revisit the stations in May 2006, which will give us the opportunity to complement our data with the seasonally important spring bloom aspect.

Acknowledgements:

We are most grateful to the captain and crew of RV Heincke for their excellent support on shipboard, to the Deutsche Forschungsgemeinschaft for financial support and to the responsible authorities of Denmark and Norway for giving us the permission to do research in the economic zones of their countries.

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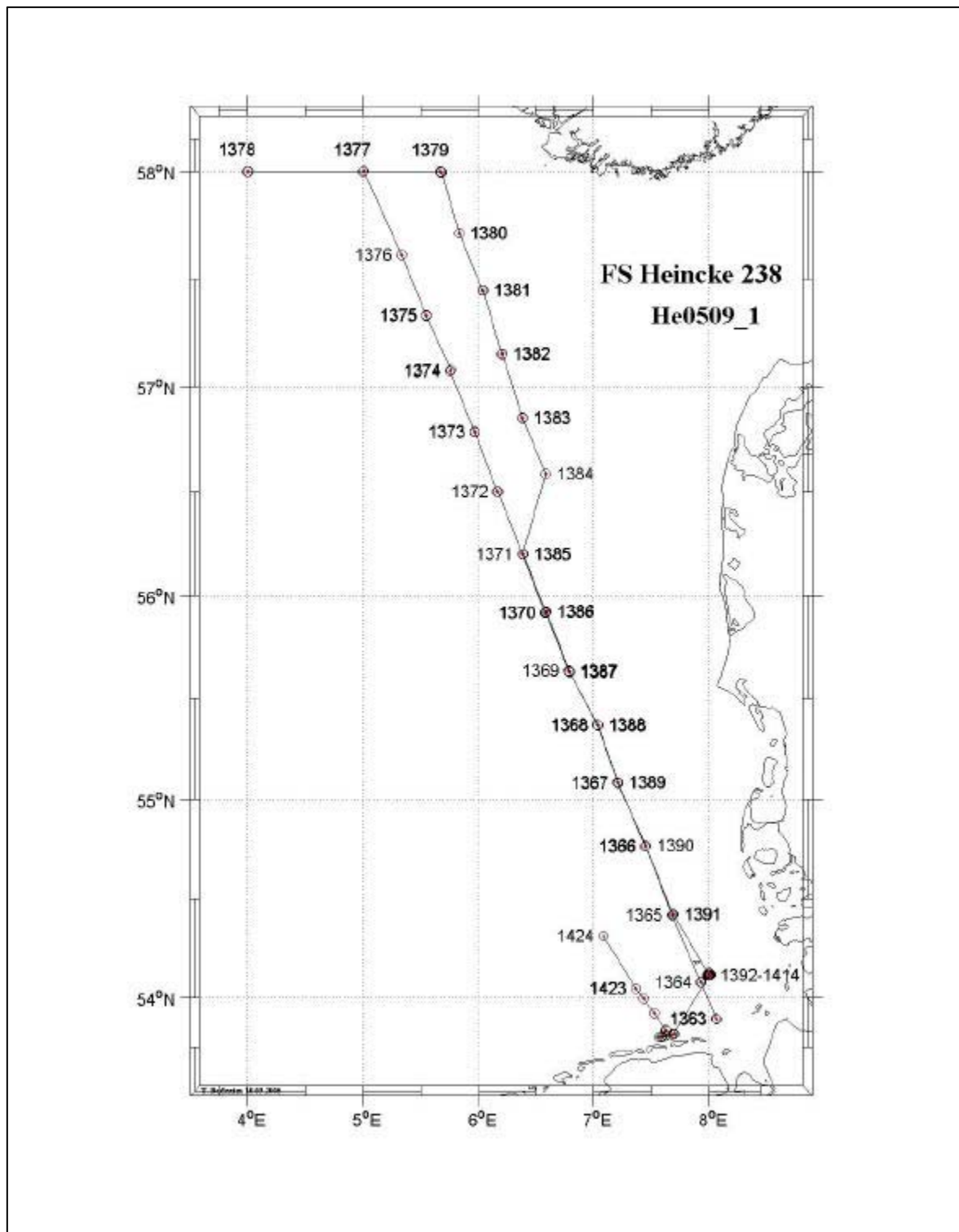


Fig. 1: Cruise track HE-238

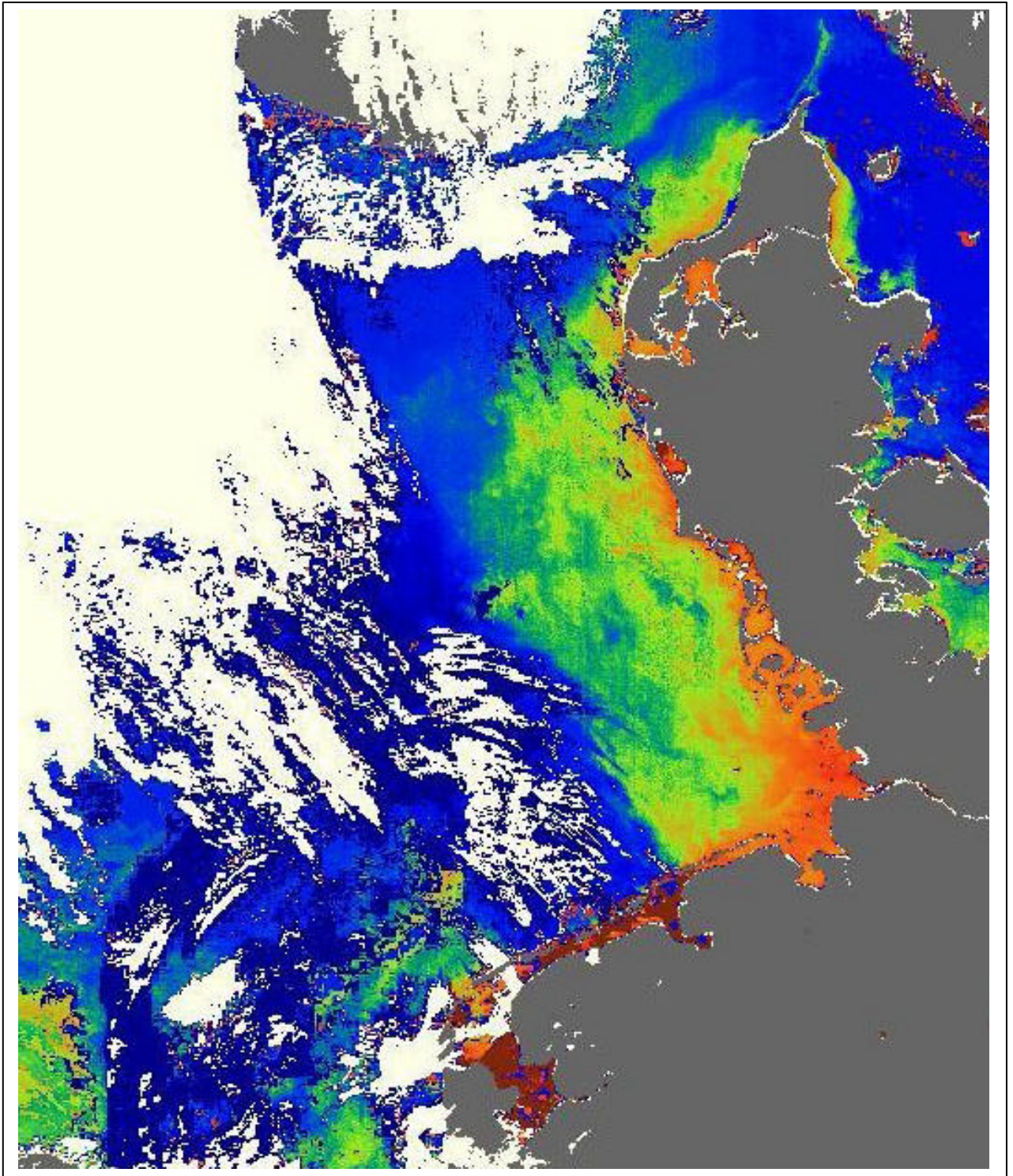


Fig. 2: Satellite image of chlorophyll distribution in the North Sea on Sep 1 2005 (Courtesy of GKSS).

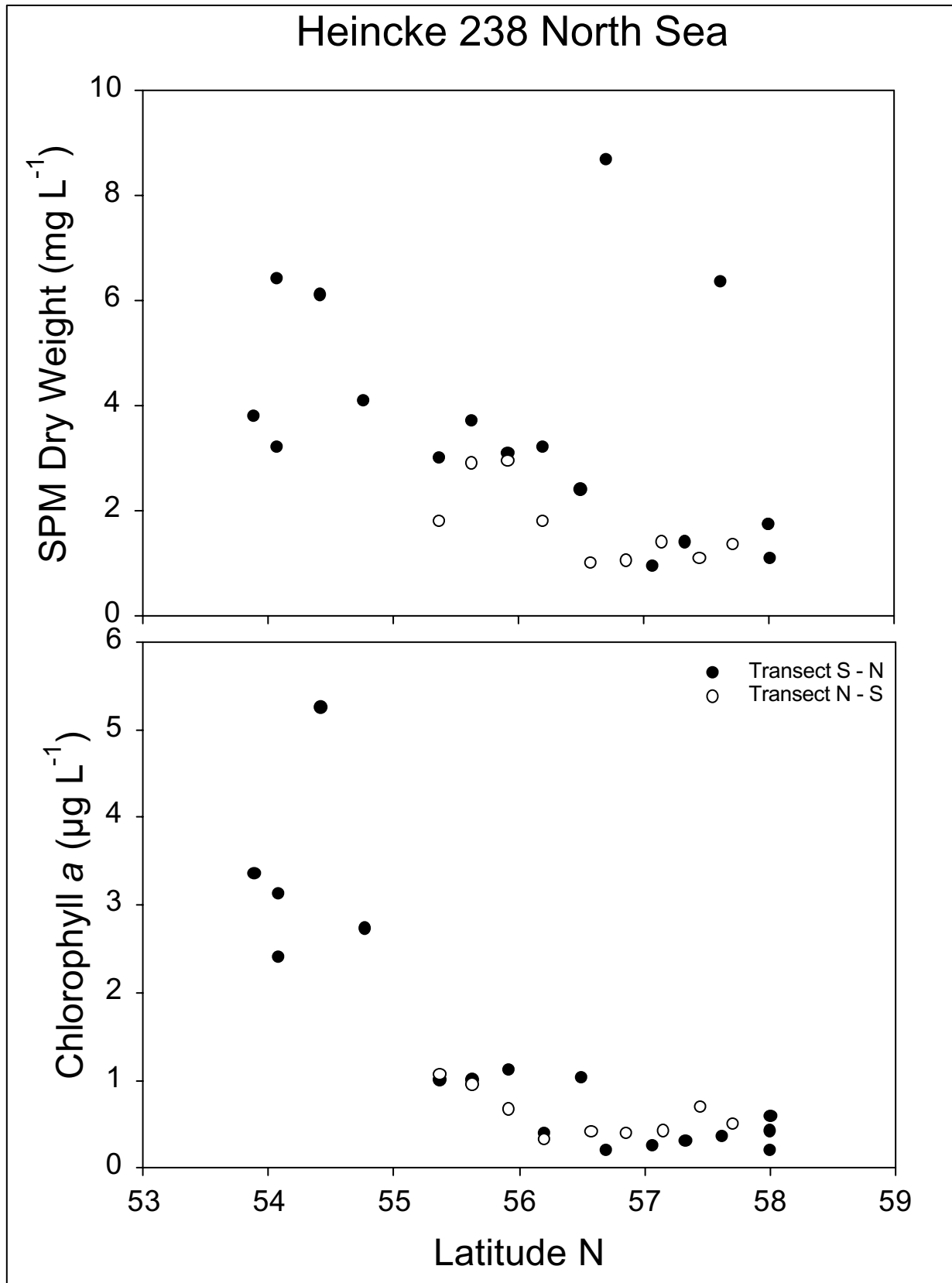


Fig. 3: Suspended particulate matter (SPM, upper panel) and chlorophyll *a* (lower panel) on transects (S – N, N – S) during cruise HE-238. Given are values of the mixed layer (0 m to appr. 20 m depth).

Cruise Heincke-238, 1.- 11. September 2005

Station overview

Station	Date	Time (UTC)	Position		Temp 0 m (°C)	Depth (max) (m)
			N	E		
1363	01.09.	12:30	53° 53.459'	08° 04.143'	17.6	14
1364	01.09.	13:45	54° 04.877'	07° 56.029'	17.6	33
1365	02.09.	06:35	54° 25.314'	07° 40.733'	17.2	21
1366	02.09.	09:50	54° 45.918'	07° 26.847'	16.9	20
1367	02.09.	13:20	54° 04.788'	07° 12.620'	16.6	26
1368	02.09.	16:18	55° 22.057'	07° 02.021'	16.5	26
1369	03.09.	06:30	55° 37.974'	06° 47.046'	15.9	31
1370	03.09.	10:40	55° 55.000'	06° 34.848'	16.0	37
1371	03.09.	13:40	56° 11.995'	06° 22.971'	16.0	39
1372	03.09.	16:15	56° 29.970'	06° 10.043'	16.5	31
1373	04.09.	06:35	56° 41.900'	05° 58.032'	15.6	50
1374	04.09.	09:20	57° 04.080'	05° 44.975'	15.7	45
1375	04.09.	13:25	57° 20.025'	05° 33.040'	15.0	70
1376	04.09.	16:10	57° 37.015'	05° 20.049'	14.8	85
1377	05.09.	06:00	58° 00.360'	05° 00.412'	14.1	127
1378	05.09.	11:55	58° 00.051'	04° 00.061'	14.8	94
1379	05.09.	17:45	57° 59.933'	05° 40.111'	15.5	258
1380	06.09.	06:00	57° 42.850'	05° 49.950'	15.4	137
1381	06.09.	09:00	57° 27.040'	06° 02.670'	15.1	84
1382	06.09.	11:20	57° 09.130'	06° 12.160'	15.8	63
1383	06.09.	14:45	56° 51.312'	06° 23.115'	16.2	47
1384	06.09.	17:00	56° 35.038'	06° 35.057'	16.1	30
1385	07.09.	06:05	56° 12.055'	06° 23.019'	16.2	40
1386	07.09.	09:15	55° 55.475'	06° 35.422'	16.7	36
1387	07.09.	11:15	55° 37.914'	06° 47.163'	16.7	31
1388	07.09.	14:50	55° 22.032'	07° 02.071'	16.8	27
1389	07.09.	17:20	55° 06.014'	07° 12.683'	17.4	25
1390	08.09.	6:15	54° 46.132'	07° 27.121'	17.3	19
1391	08.09.	09:45	54° 25.406'	07° 41.001'	17.6	21
1392	08.09.	20:00	54° 07.034'	08° 00.276'	17.9	26
↓	↓	↓	54° 07.034'	08° 00.276'	hourly	CTD Profiles
1403	09.09.	07:00	54° 07.034'	08° 00.276'	18.0	26
1404	09.09.	08:20	54° 07.034'	08° 00.276'	18.0	26
1405/06	09.09	9/10:25	54° 07.034'	08° 00.276'	18.0	26
1407/08	09.09	11:22	54° 07.034'	08° 00.276'	18.0	26
1409	09.09	12:50	54° 07.034'	08° 00.276'	18.0	26
1410	09.09	14:33	54° 07.034'	08° 00.276'	18.2	26
1411	09.09	15:54	54° 07.034'	08° 00.276'	18.2	26
1412	09.09	17:0-18:0	54° 07.034'	08° 00.276'	18.3	26
1413	09.09.	19:00	54° 07.034'	08° 00.276'	18.3	26
1414	09.09.	20:51	54° 07.034'	08° 00.276'	18.1	26
1415	10.09.	Transect	wt CTD in fr	of Spiekeroog	18.3-18.9	
1416	10.09.	Transect	wt CTD in fr	of Spiekeroog	18.3-18.9	
1417	10.09.	Transect	wt CTD in fr	of Spiekeroog	18.3-18.9	
1418	10.09.	6:15	53° 48.389'	07° 36.990'	18.9	9
1419	10.09.	6:50	53° 48.171'	07° 35.340'	18.8	9
1420	10.09.	Transect	wt CTD to	N of Sp'oog	18.8-17.7	
1421	10.09.	8:15	53° 50.005'	07° 38.056'	17.7	15
1422	10.09.	Transect	wt CTD to	N of Sp'oog	17.7-17.5	
1423	10.09.	12:15	54° 03.021'	07° 22.087'	17.5	30
1424	10.09.	16:00	54° 18.590'	07° 04.589'	17.6	36

Overview of sampling depths in the water column, sediment und net tow 55 µm

Station	Date	Sampling depths (m)		Sediment	Net tow Phytoplankton	Net tow Zooplankton
		Water column				
1363	01.09.	0, 16		-	Diatoms, diverse, Rhizosolenia setigera dominant	
1364	01.09.	0, 25, 37		+	Diatomeenblüte, very diverse, wenige Dinoflagellaten	
1365	02.09.	0, 17		-	Diatomeenblüte, more Dinoflagellaten	
1366	02.09.	0, 22		+	no protocoll	
1367	02.09.	0, 22, 28.4		-	Less than in 1365, but similar	Copepods, Noctiluca, Jelly fish
1368	02.09.	0, 15, 27		+	poor, Dinoflagellates dominate	Copepods
1369	03.09.	0, 10, 34		-	Diverse Diatoms	Copepods, Nauplii, Appendiculariens (Fritillaria)
1370	03.09.	0, 15, 35		+	Rhizosolenia spp, Ceratium spp, Skeletonema sp	Copepods, Nauplii, Appendiculariens, Chaetognaths
1371	03.09.	0, 15, 30		-	Rhizosolenia spp, Skeletonema, Ceratium spp	Copepods, Nauplii
1372	03.09.	0, 18, 32		+	Rhizosolenia spp, Skeletonema, Ceratium spp	Copepods, Nauplii
1373	04.09.	0, 12, 22, 30, 40, 52		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Mysis/Euphausiids, many Copepods, Cladocerans
1374	04.09.	0, 33, 48		+ crash	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1375	04.09.	0, 20, 35, 50, 70		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1376	04.09.	0, 20, 35, 60, 89		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1377	05.09.	0, 10, 30, 45, 80, 125		+	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1378	05.09.	0, 10, 39, 79, Bottom		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1379	05.09.	0, 10, 30, 60, 255		+	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1380	06.09.	5, 25, 50		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1381	06.09.	10, 34, 48, 85		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods
1382	06.09.	10, 35, 50		-	Rhizosolenia spp, Ceratium spp	Radiolarians, Copepods

Station	Date	Sampling depths (m)		Net tow Phytoplankton	Net tow Zooplankton
		Water column	Sediment		
1383	06.09.	10, 35, 42	-		
1384	06.09.	5, 15, 25	-	Rhizosolenia, Skeletonema, Dinoflagellates	Radiolarians, Copepods
1385	07.09.	0, 15, 30	-	Rhizosolenia, Skeletonema, Dinoflagellaten	Copepods, Nauplii,
1386	07.09.	0, 15, 25	-	Rhizosolenia, Skeletonema, Dinoflagellaten	Copepods, Nauplii, Cladocerans
1387	07.09.	0, 10, 33	-	Dinoflagellates (Ceratium spp), Diatoms (Rhizosolenia, Skeletonema, Chaetoceros)	Copepods, Nauplii, Cladocerans, Cephalopodenlarve (?)
1388	07.09.	0, 15, 27	-	Dinoflagellates (Ceratium spp Diatoms (Rhizosolenia, Skeletonema, Chaetoceros)	Copepods, Nauplii, Cladocerans,
1389	07.09.	No bottle samples	-	Diverse, Diatoms (Rhizosolenia, Chaetoceros, Eukampia), Dinoflagellates (Ceratium spp, Dinophysis)	Diverse Copepods, Cladocerans, Chaetognates, Medusae
1390	08.09.	2, 12	-	Diverse, Diatoms, Dinoflagellates	Copepods, Appendiculariens etc.
1391	08.09.	0 (for satellite)	-	No net tow	
1392	08.09.	only CTD	-	No net tow	
↓	↓				
1403	09.09.	only CTD	-	No net tow	
1404	09.09.	5, 18, 22, 26	-	No net tow	
1405/06	09.09.	only CTD	-	No net tow	
1407	09.09.	5, 18, 22, 26	-	No net tow	
1408	09.09.	Multicorer	+		
1409	09.09.	only CTD	-	No net tow	
1410	09.09.	5, 18, 22, 26	-	No net tow	
1411	09.09.	only CTD	-	No net tow	

Station	Date	Sampling depths (m)		Sediment	Net tow Phytoplankton	Net tow Zooplankton
		Water column				
1412	09.09.	5, 18, 22, 26		-	very diverse Diatom community, a few Dinoflagellates, high biomass	
1413	09.09.	Nur CTD		-	No net tow	
1414	09.09.	5, 18, 22, 26		-	No net tow	
1415-17	10.09.	Nur CTD		-	No net tow	
1418	10.09.	Nur CTD		-	No net tow	
1419	10.09.	0, 8		+	No net tow	
1420	10.09.	Transekt, nur CTD		-	No net tow	
1421	10.09.	0, 13		+	No net tow	
1422	10.09.	Transekt, nur CTD		-	No net tow	
1423	10.09.	0, 25		+	No net tow	
1424	10.09.	0, 25, 32		+	No net tow	

Station	Date	SPM	Chl	C/N	DNA	FISH	BP/AA/ Glc	MAR- FISH	Bact	Phyto	DOC	DAA/ DCHO	inorg. nutr	Metals	Gelbstoff	Methane
↓	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
1403	09.09.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
1404	09.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1405/06	09.09.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
1407	09.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1408/09	09.09.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
1410	09.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1411	09.09.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
1412	09.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1413	09.09.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
1414	09.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1419	10.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1421	10.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1423	10.09.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
1424	10.09.	+	+	+	+	-	-	-	+	-	+	-	+	+	+	+

Parameter overview sediment

Station	Date	POC	FISH	DNA	Bacteria	Pore water	Gelbstoffe
1364	01.09.	+	+	+	+	+	+
1366	02.09.	+	+	+	+		
1368	02.09.	+	+	+	+	-	-
1370	03.09.	+	+	+	+	-	-
1372	03.09.	+	+	+	+	-	-
1376	04.09.	+	+	+	+	-	-
1379	05.09.	+	+	+	+	+	+
1408	09.09.	+	+	+	+	+	+
1419	10.09.	+	+	+	+	+	+
1421	10.09.	+	+	+	+	+	+
1423	10.09.	+	+	+	+	+	+
1424	10.09.	+	+	+	+	+	+

CRUISE SUMMARY REPORT

FOR COLLATING CENTRE USE

Centre: **DOD** Ref. No.:

Is data exchange

 restricted Yes In part
 No

SHIP enter the full name and international radio call sign of the ship from which the data were collected, and indicate the type of ship, for example, research ship; ship of opportunity, naval survey vessel; etc.

Name: **Heincke**Call Sign: **HE**Type of ship: **Research Vessel**CRUISE NO. / NAME **HE 238**

enter the unique number, name
or acronym assigned to the cruise
(or cruise leg, if appropriate).

CRUISE PERIOD start **01/09/2005** to **11/09/2005** end
 (set sail) day/ month/ year day/ month/ year (return to port)

PORT OF DEPARTURE (enter name and country) **Bremerhaven, Germany**PORT OF RETURN (enter name and country) **Bremerhaven, Germany**

RESPONSIBLE LABORATORY enter name and address of the laboratory responsible for coordinating the scientific planning of
the cruise

Name: **ICBM, University of Oldenburg**Address: **POBox 2503, D-26111 Oldenburg**Country: **Germany**

CHIEF SCIENTIST(S) enter name and laboratory of the person(s) in charge of the scientific work (chief of mission) during the cruise.

Dr. Meinhard Simon, ICBM, University of Oldenburg

OBJECTIVES AND BRIEF NARRATIVE OF CRUISE enter sufficient information about the purpose and nature of the cruise so

as to provide the context in which the report data were collected.

To study bacterioplankton dynamics in the the North Sea

PROJECT (IF APPLICABLE) if the cruise is designated as part of a larger scale cooperative project (or expedition), then enter the name of the project, and of organisation responsible for co-ordinating the project.

Project name:

Coordinating body:

TRACK CHART: You are strongly encouraged to submit, with the completed report, an annotated track chart illustrating the route followed and the points where measurements were taken.

Insert a tick (✓) in this box if a track chart is supplied



GENERAL OCEAN AREA(S): Enter the names of the oceans and/or seas in which data were collected during the cruise – please use commonly recognised names (see, for example, International Hydrographic Bureau Special Publication No. 23, 'Limits of Oceans and Seas').

North Sea

SPECIFIC AREAS: If the cruise activities were concentrated in a specific area(s) of an ocean or sea, then enter a description of the area(s). Such descriptions may include references to local geographic areas, to sea floor features, or to geographic coordinates.

Please insert here the number of each square in which data were collected from the below given chart

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