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Cruise Report
FRV Walther Herwig, WH 352
05-30 March 2012

EU Project "VECTORS"

Cruise Leaders: Dr. Anne Sell, Dr. Friedemann Keyl

Summary

This cruise was designed to investigate the distribution of demersal fish species in relation to abiotic and biotic habitat parameters. The survey area covered the western and southern North Sea, with a large portion of stations placed along transects from shore to offshore, perpendicular to the depth contours. Further transects were included around the Dogger Bank and the English Channel to cover additional areas of interest for fish distribution and migration.
On daytime stations, fisheries hauls with a GOV otter board trawl were coupled with hauls with a 2-m beam trawl for epibenthos, and with hydrographic measurements. During night time, operation with the newly obtained sampling platform "TRIAXUS" were planned, but had to be terminated after an instrument damage at the end of the first night of sampling. From then on, hauls with the MIK net were conducted during night to obtain data on zooplankton distribution.

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1 Cruise objectives and tasks

The cruise was conducted as a contribution to the EU-FP7 project “VECTORS” in which TI-SF participates in several work packages dedicated to explain present and potential future distribution and productivity of North Sea fish resources. Main target species of the cruise was whiting (*Merlangius merlangus*) as one of the “key” organisms in the modelling approaches of TI-SF in VECTORS. Therefore, the assessment of physical and biological habitat in relation to the distribution of whiting and other demersal fish was of main concern. The cruise was scheduled with 59 stations on 7 transects in the study area in the western and southern North Sea. The study area was selected on the basis of published studies on whiting and the catches in the ICES NS-IBTS survey program from 2009 to 2011.

Specific objectives of the cruise were to:

(1) assess distribution and abundances of whiting and other groundfish species,
(2) assess composition of the epibenthic communities,
(3) measure the hydrographic conditions and describe dynamic processes, particularly the inflow from the Atlantic into the northern North Sea,
(4) assess the distribution of macrozooplankton and the relationship to the hydrographic conditions, particularly to the inflow from the Atlantic,
(5) collect stomach and tissue samples of selected fish species to understand trophic interactions,
(6) collect samples for the establishment of the genetic analyses on whiting,
(7) conduct a trial-run of the towed instrument TRIAXUS to gain operating experience and test new retractable beam on the aft deck for TRIAXUS deployment.

2 Sampling scheme and data

We collected samples and data from 69 stations on 10 transects that allow the participating working groups to study the fish, macrozooplankton and benthic communities in the study area together with oceanographic data using an array of methods.

The following gear was employed during the cruise (Figure 1):

(1) the bottom trawl net GOV (Chalut á Grande Ouverture Verticale),
(2) 2-m beam trawl (BT),
(3) CTD with rosette sampler,
(4) TRIAXUS,
(5) Methot Isaac Kidd plankton net (MIK),
(6) echosounder EK500 with 18, 38 and 120 kHz.

Sampling stations were chosen in dependence of (i) the topography and (ii) the actual hydrographic situation during the cruise in order to cover relevant physical habitats.

At each fishing station, a GOV-haul, a beam trawl haul and a CTD cast were conducted during the day. Night-time sampling was scheduled for either TRIAXUS tows or alternatively MIK hauls. All hauls and successive work on board were conducted according to the ICES IBTS methodology to secure comparability of the cruise data and samples to the existing data. The echosounder was operating at all times.

Dates and number of stations sampled during WH 352 are listed in the following table. For a detailed list of sampling stations and map, see Annex and Figure 1.

Table 1: Numbers of valid hauls during WH352, listed by transect. For location of transects see Figure 1.

Transect	Date	Hauls GOV	CTD casts with nutrient samples	Hauls 2-m beam trawl	Hauls MIK plankton	TRIAXUS
Leg 1						
1		14	15	14	16	-
2		3	3	3	3	-
3		6	6	6	3 (+2 cal. hauls)	day & night run (14:13 h, accident)
4		5	6	5	-	2 test runs during day (0:36 h,1:56 h)
Leg 2						
5		10	10	10	10	-
5A		7	7	7	7	-
6		5	5	5	5	-
7		7	7	7	7	-
8		4	4	4	5	-
9		6	6	6	6	-
total		**67**	**69**	**67**	**64**	**16:47 h**

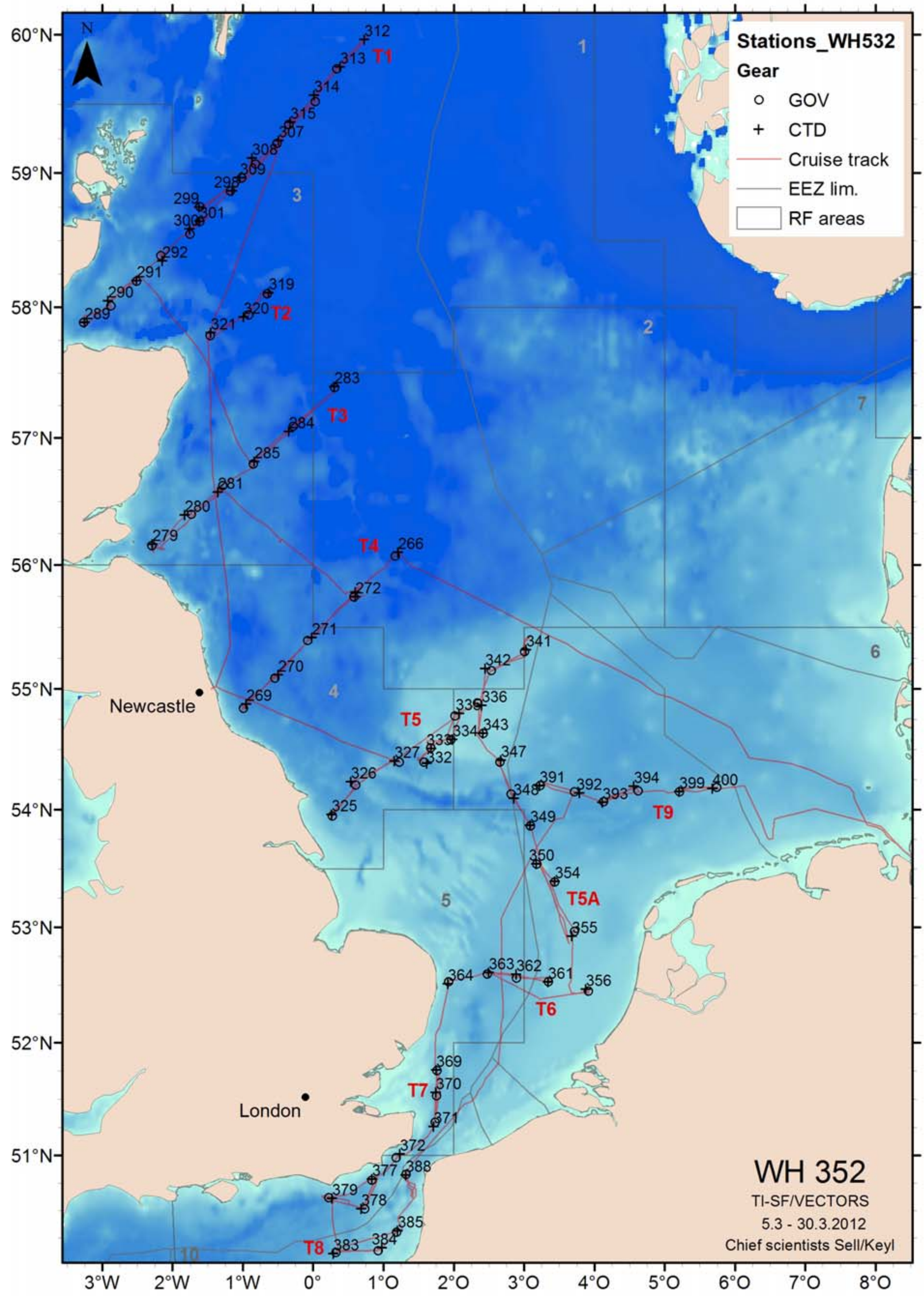

Figure 1: Cruise track of WH 352, cruise for the EU project "VECTORS", 05/03 to 03/30/2012; RF: ICES roundfish areas (numbered in grey).

2.1 Groundfish (Thünen Institute of Sea Fisheries, TI-SF, and University of Hamburg, UHAM)

GOV, the main gear of the cruise was employed to obtain the groundfish abundances for future studies on their spatial abundance in relation to physical and biological factors. Gear operation followed the standards for the International Bottom Trawl Survey (IBTS).
The hauls were processed according to the IBTS-manual: weights were taken by species and individuals were length measured, if necessary a sub-sample was taken. For whiting and cod, individual biological data (weight, length, liver weight, sex, maturity, gonad weight) were taken aboard or entire specimens were frozen for later analyses ashore.
Material was taken from the following species for subsequent analyses:

- whiting: stomachs and tissue samples for genetic analyses, otoliths, tissue for stable isotope analysis
- cod: stomachs, otoliths, tissue for stable isotope analysis
- grey gurnard: stomachs, tissue for stable isotope analysis, specimens for parasite analysis
- herring, sprat, sandeel, mackerel, sardine and anchovy: stomachs
- dab: samples for genetic analysis
- cephalopods: all specimens or sub-samples for community analysis (TI-OF)
- additionally: intact species of all species for teaching purposes (TI-FI)

Where necessary (time saving), entire specimens were frozen directly for later analyses. Additional biological data (sex, maturity, gonad and liver weights) were taken from the sampled cod and whiting to improve understanding of these species in their ecological context. For the parasites analysis of MRI, a total of 199 individuals of grey gurnard (47 kg) larger than 30 cm were collected from the GOV hauls.

Table 2: Overview on samples collected from GOV for different analyses and use

N	Species	Use	Institute
356 ind	whiting	genetic analysis	TI-FI
36.8 kg	dab	genetic analysis	DZMB Wilhelmshaven
46.8 kg	grey gurnard >30 cm	parasites analysis	MRI Hamburg
10 kg	lemon sole, plaice, sole	ecological study	IFREMER France
13.1 kg	cephalopods	course material	Rostock University, TI-OF
50 kg	species mix with cod, haddock, flatfish, whiting, ray, ling, weever, sandeel, sea scorpion, bullhead etc	course material	Kiel University, TI-SF

2.2 Physical Oceanography (TI-SF)

The CTD used for conventional deployments at hydrographic stations was of type Sea-Bird Electronics SBE 911pIus. The CTD was supplemented by an oxygen sensor type SBE 43, a turbidity meter (Seapoint), a chlorophyll-sensitive fluorometer (Seapoint Ultraviolet Fluorometer), and an altimeter (Teledyne-Benthos) to measure the distance to the sea floor. The CTD and peripheral instruments were attached to a multi-bottle water sampler type Sea-Bird SBE 32 Carousel holding nominally 12 1.7-liter bottles. Water samples were taken for the oxygen and chlorophyll concentrations and sensor calibration. At most CTD stations, chlorophyll a was measured in water samples from 10 m depth, filtered onto GF/F glass microfibre filters. Salinity derived from the CTD measurements was calibrated by comparison to salinity samples, taken from the water bottles, which were analysed by use of a Guildline-Autosal-8400A salinometer that was adjusted to IAPSO Standard Seawater. The temperature sensor was calibrated at the factory prior to the cruise.

2.3 Epibenthos (TI-SF)

The communities of the epibenthos were sampled with a 2-m beam trawl by 5-min hauls at ≈2 knots over ground following the standard method used during other TI-SF cruises. A total of 67 stations were sampled, from which fish species and invertebrates were analyzed aboard, and selected samples were preserved for later identification in cooperation colleagues at Senckenberg am Meer.

2.4 TRIAXUS

The TRIAXUS is a towed semiautonomous vehicle equipped with CTD, oxygen sensor, LOPC and sidescan sonar to simultaneously and continuously investigate oceanographic conditions, substrate and particles in the water column. It was planned to use the system for the first time in routine night operation and furthermore test a new way of deployment of the vehicle aboard WH III.

2.5 Zooplankton (TI-SF)

Zooplankton was sampled at night with the MIK at 3 kn in an oblique or double oblique haul of minimum 10 minutes to 5 m from the ground. Maximum depth of the plankton hauls in deeper waters was 100 m. All material was transferred to 4 % buffered formalin for fixation. Gelatinous plankton if present was separated in an extra container. A total of 64 plankton samples were collected for ecological analysis at TI-SF and UHAM (jellyfish) in relation to oceanographic conditions.

3 Cruise schedule

3.1 Cruise narrative

Walther Herwig III sailed from Bremerhaven at 12 noon on 5 March 2012 heading NW to reach the outer station 266 of transect 4 (T4, Figure 1) situated roughly off Newcastle that was decided to be the first transect sampled due to bad weather conditions further north. The sampling of the transects of the first leg as a consequence was conducted in the order 4, 3, 1 and 2 before reaching Newcastle for a partial crew change.

With the exception of the first day, weather conditions during the entire cruise allowed work according to and exceeding the original cruise program. The favourable conditions allowed us to extend our survey program to 10 transects and lengthen transect 1 to 14 stations. In leg 2, we were able to cover the Dogger Bank and the area south and east of it more detailed. Between 2 and 5 stations were sampled per day, depending on the distance between stations and transects.

After covering the six fishing stations of transect 4, we conducted two test deployments with the TRIAXUS. Unfortunately, sampling with the TRIAXUS, planned to be conducted regularly during night-time, had to be terminated after the damage of the towed vehicle at the end of the first full night of sampling (see below). After the TRIAXUS accident that occurred in the first half of T3, it was decided to sample zooplankton with the MIK at night.

The following transect 1 was extended over the originally planned length in order to cover the Atlantic water inflow from the north, and to investigate groundfish and benthic communities in relation to it. The transect traversed the Fladden Ground region at its northern edge allowing to relate fish assemblages to the specific substrates in the area (mud to sandy mud). 3 stations were fished at transect 2, before the crew change in Newcastle, where the ship arrived in the morning of the 16.3.12 and left again on the afternoon of the 17.3.12.

On transect 5, 10 stations were sampled, reaching onto the western part of the Dogger Bank. Transect 5A connecting T5 and T6 with 7 stations was included in order to study one of the areas of highest whiting abundance in the south western North Sea expected in the deeper waters south of the Dogger Bank.

Sampling of the stations of the following transects 6 and 7 was completed without further problems. The added transect 8 had to be interrupted in the morning of the 27.3.12 with only 4 GOV hauls due to intense coastal fishing activity with gillnets and lack of suitable haul sites. Transect 9 that was also added allowed sampling of another area of typically high whiting abundance in the southern North Sea.

Overall, we conducted 67 valid GOV hauls, 67 beam trawl hauls, 69 CTD casts and 64 MIK hauls. Although we did not succeed with the intended program for TRIAXUS, we were still able to test the altered launching-beam at the stern for TRIAXUS casts and similar towed vehicles. Both crew and scientific personnel gathered experience in the handling and operation of TRIAXUS on deck and in the water. Aside from the TRIAXUS accident, we experienced only minor problems. We had no gear loss although the bottom netting of the

GOV was torn twice, the netting of the beam trawl once. All damage was repaired immediately aboard.

3.2 TRIAXUS test

TRIAXUS was tested for the first time on the 6.3.12 during daytime and again on the 8.3.12 (stations 267 and 273 on transect 4). During the first and second test, voltage dropped leading to the failure of power supply of the vehicle. A leak in the connector of the cable to the vehicle was identified and repaired on board during the 8.3.12 by members of the scientific crew. In addition, the breakage of one of the snap rings of the main winch shaft was discovered and repaired.
The third trial on 9.3.12 unfortunately ended with an uncontrollable bottom contact, which caused damage of the TRIAXUS and prevented further deployments during this cruise. After over 14 h of relative stable tow an accident occurred in the morning when depth control failed leading to an uncontrollable bottom contact of the vehicle. The TRIAXUS was recovered and examined for damages, accompanied by intense communication with the manufacturer. Due to the still unclear reasons for the accident, it was decided that the TRIAXUS was not to be used again during the cruise and the entire system was therefore dismantled and stowed.

4 Preliminary Results

4.1 Total abundance and biomass of groundfish

A total of 67 valid GOV hauls were carried out to investigate whiting and the groundfish communities of the western and southern North Sea. Total biomass of fish caught was between 9.4 and 1531.3 kg per 30-min haul. Total numbers of fish species per haul were between 8 and 24, bycatch of macro-invertebrates in the GOV raised the maximum number to 29 species overall. The total number of fish per haul was between 85 and 33125 individuals.

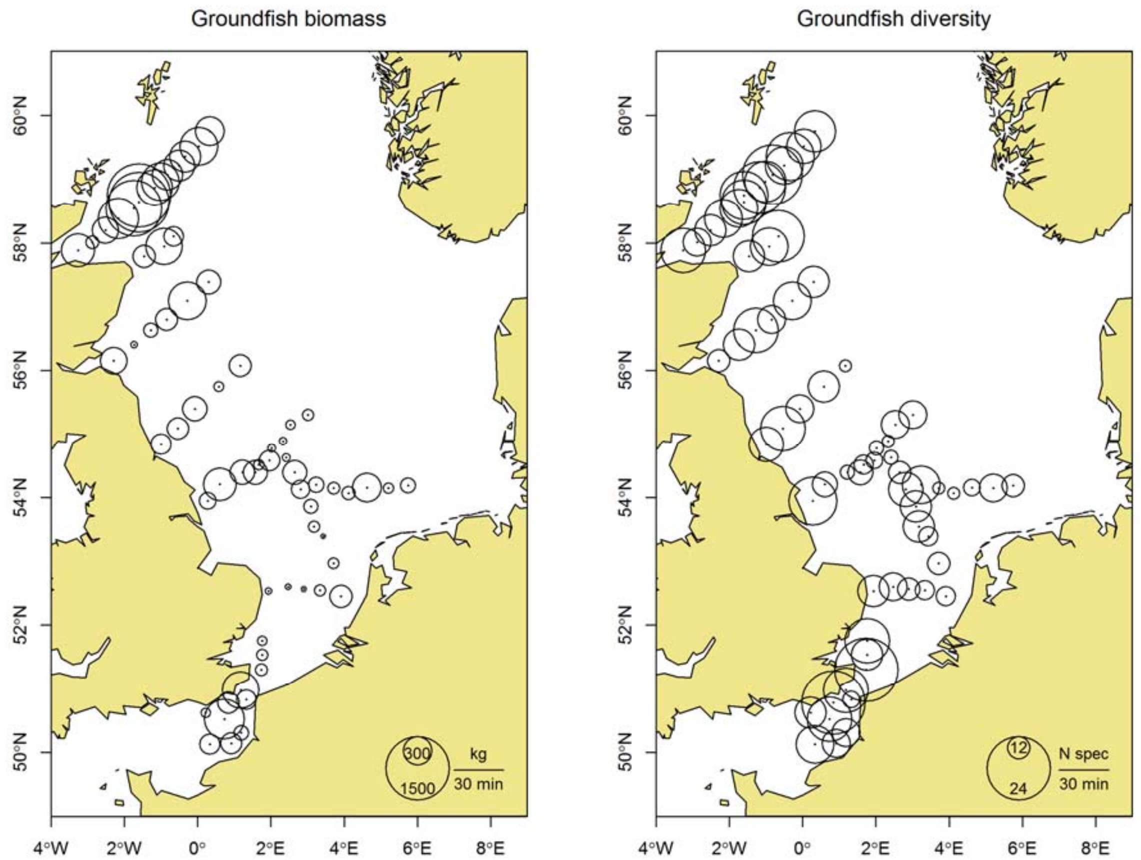

Figure 2: Left panel: biomass of groundfish [kg] standardized to 30-min haul; right panel: groundfish diversity [N species/30 min haul], note that N was raised to third power for clarity of illustration.

By far the highest biomass of fish was found on the northernmost transect on the stations in the central area of the Atlantic inflow, followed by biomass on nearby stations, both on the same transect, as well as on the two neighbouring transects to the south (Figure 2, left panel).

In contrast, groundfish diversity was more evenly distributed over all transects (Figure 2, right panel). Nevertheless, the highest numbers of species per haul were again found in inflow of Atlantic water in the north and in the English Channel, indicating the mixing of the North Sea communities with those of the Atlantic.

Results for the catches of groundfish in the 2-m beam trawl are not presented in this report.

4.2 Abundance and biomass by groundfish species

Total GOV catches by weight and numbers of the 8 most abundant species plus cod are given in Table 2. The schooling clupeid species and the small gadoid Norway pout were most abundant by number as are the two middle-sized gadoids whiting and haddock that gave the highest total weights in the catches.

Table 2: Total number and biomass of selected species caught during WH 352.

Species	N Hauls	Total catch [kg]	Total N
haddock	28	5463	24527
Whiting	67	3248	23604
Herring	59	2893	51155
Norway pout	22	1438	43774
Sprat	59	1038	122218
Dab	63	601	10701
grey gurnard	55	417	4255
Cod	38	364	225
lesser sandeel	19	95	11023

Whiting, the species of main interest during this cruise, was caught at all 67 stations sampled by GOV. Highest abundances were found in the hauls in the Moray Firth (transect 1) where we also observed the highest abundance of cod (Figure 3). There whiting seemed to prefer the hauls located in the central area of the Atlantic waters inflow and cod those further offshore, south of the Shetland Islands. Abundances of whiting per 30-min haul were between 1 and 1711 individuals (mean = 352.3), biomass between 12 g and 429 kg (average 48.5 kg per 30-min haul).
Cod was caught in 38 of the GOV hauls with abundances between 1 and 28 individuals (mean = 5.9). Mean biomass of cod in the 30-min hauls was 9.6 kg with a minimum of 88 g and a maximum of 45.3 kg.
Haddock as expected was restricted to the northern stations of transects 1 to 3 and caught in only 28 hauls. Mean abundance was 876 ind per 30-min haul with a range from 1 to 3989 individuals. The mean biomass of haddock in the hauls was 195 kg; the minimum was 246 g and the maximum 914 kg.

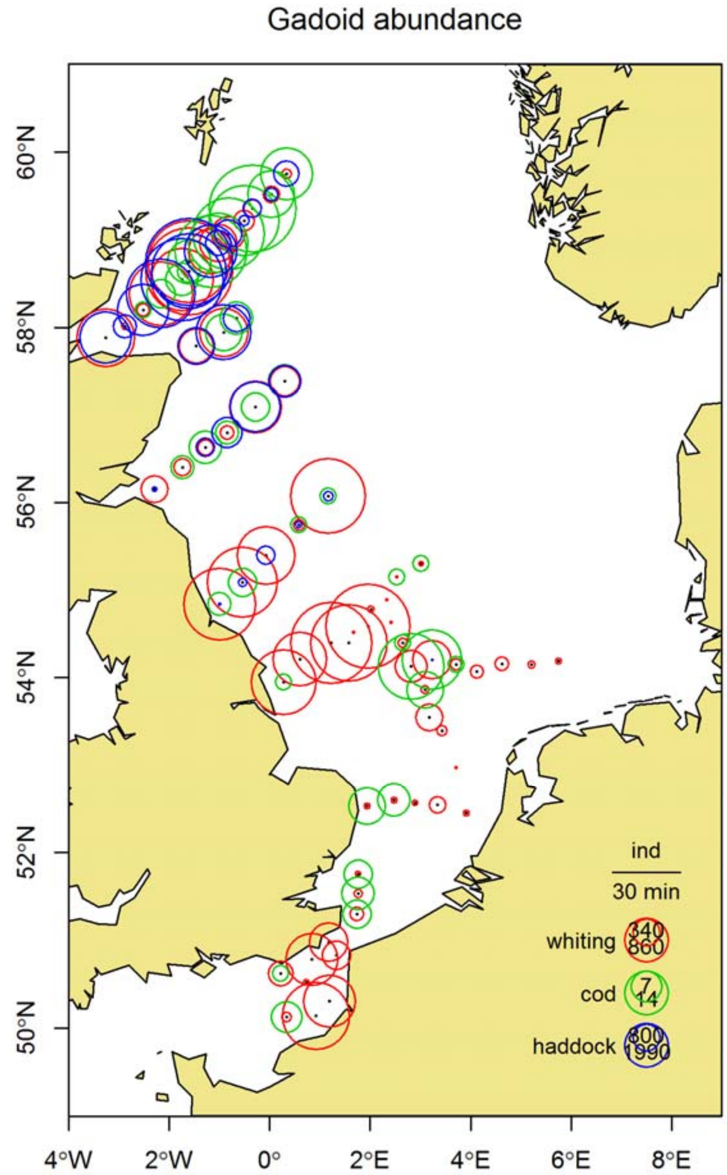

Figure 3: Abundances [ind/30 min haul] of whiting (red), cod (green) and haddock (blue).

Grey gurnard was found in 55 of the 67 GOV hauls, dab even in 63 hauls, indicating the importance both species have in groundfish communities in the North Sea at present. Both grey gurnard (*Eutrigla gurnardus*) and dab (*Limanda limanda*) were found in high abundances in the hauls taken in shallow waters of the Dogger Bank area where they dominated the groundfish communities. Grey gurnard in general was more abundant in the northern and central parts of the study area, and occurred only in low numbers in the south and in the English Channel (Figure 4). High abundances of dab apart from the Dogger Bank were restricted to the Moray Firth.
Abundances of grey gurnard were between 1 and 339 individuals with a mean of 77. Catch weight was between 15 g (1 individual with 12.5 cm TL) and 40.4 kg (N = 311) with a mean of 7.6 kg. Dab abundances were between 1 and 1243 (mean = 170). Catch weights were between 33 g and 62 kg, the mean weight was 9.5 kg.

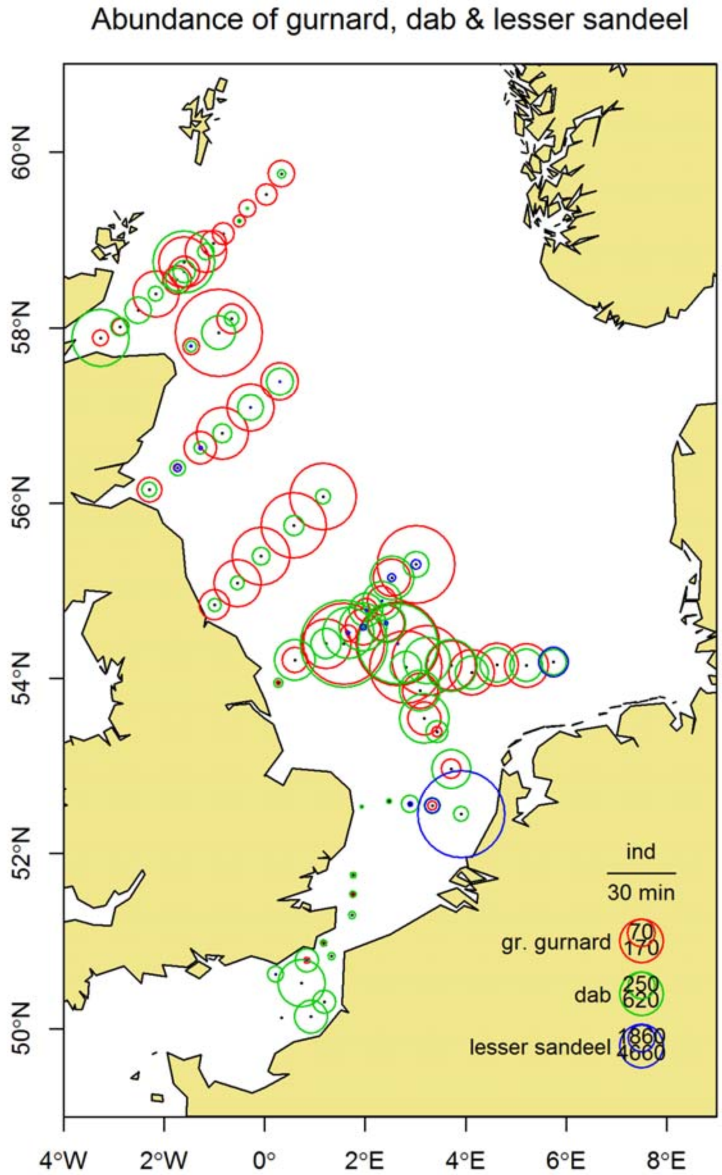

Figure 4: Abundances [ind/30 min haul] of grey gurnard (red) and dab (green).

Lesser sandeel (*Ammodytes marinus*) occurred in 19 hauls with up to 9314 individuals per haul. The great majority however was caught in two hauls (356 and 400, see Figure 4) in the southern North Sea. Maximum weight per haul was 80.4 kg of lesser sandeel.

The small pelagic species herring (*Clupea harengus*), sprat (*Sprattus sprattus*) and Norway pout (*Trisopterus esmarkii*) (Figure 5), as expected for schooling fish, had high maximal abundances with 12791, 22592 and 8074 individuals per standardized 30-min haul, respectively. Herring was caught in 59 hauls; the mean number in the hauls was 867. The catch weights of herring were between 2 g and 524 kg (N = 4471) with a mean of 49 kg.

High abundances of sprat were restricted to the southern and central part of the study areas and the shallower hauls in the Moray Firth although it was also found in 59 hauls. Mean number in the hauls was 2071.5, the highest mean of all species caught during the cruise. The catch weights ranged from 18 g to 131 kg (N = 6400) and had a mean weight of 17.6 kg.

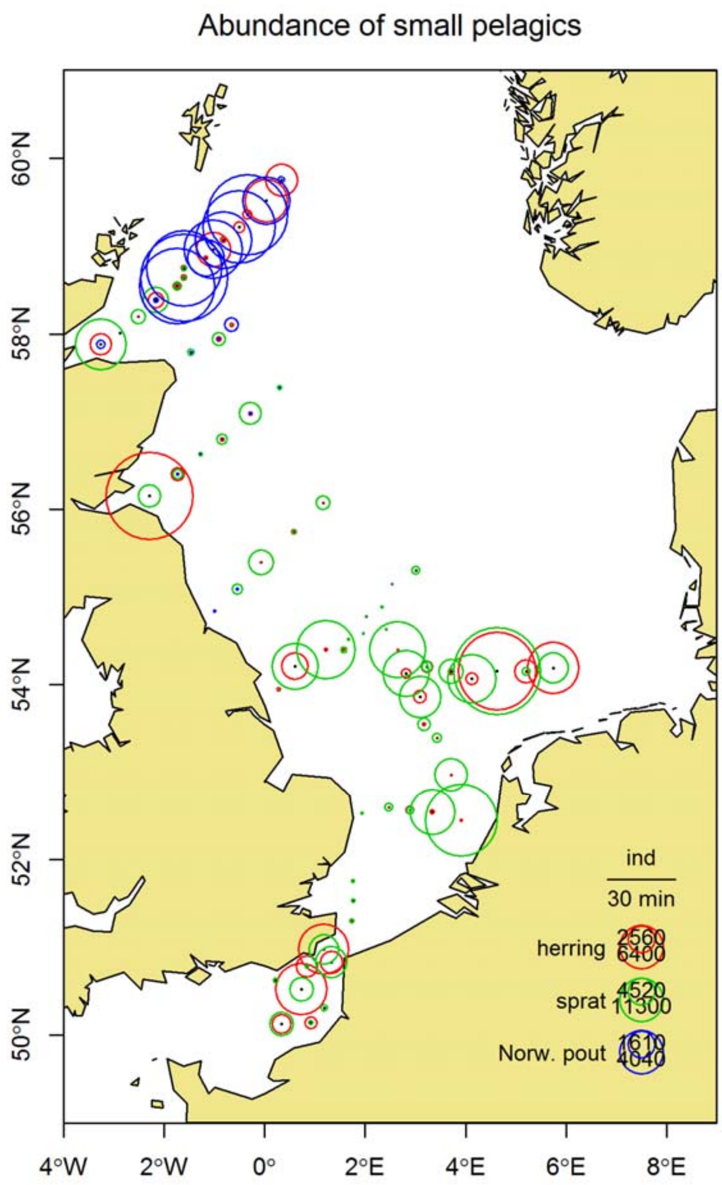

Figure 5: Abundances [ind/30 min haul] of herring (red), sprat (green) and Norway pout (blue).

The Norway pout was even more than haddock restricted to the northernmost stations, where it was caught in 22 hauls in the region of the inflow of Atlantic water. Catch weights were between 12 g and 265 kg with a mean of 65 kg.

4.3 Trophic analyses

A total of 898 kg of specimens and stomachs was sampled from the 67 valid GOV hauls for the analysis of the trophic system of the western and southern North Sea that is conducted in cooperation with the University of Hamburg (UHAM). Focus of on-going trophic studies (stomach content analysis and stable isotopes analysis) is on whiting, cod and grey gurnard. Additionally, the trophic interactions and positions of herring, sprat, mackerel and sandeels are assessed.

Table 3: Overview of samples collected for trophic studies

Quantity [kg]	Species	Institute
28.5	cod stomachs, small specimens complete	UHAM, TI-SF
427.9	Whiting	UHAM, TI-SF
171.4	grey gurnard	UHAM, TI-SF
270.4	herring, sprat, mackerel, sandeels	UHAM, TI-SF

Preliminary results of feeding of whiting and grey gurnard reveal that the stomach contents of both species were highest in the southern NS off the Dutch Coast and in the Channel.

4.4 Physical Oceanography

Altogether, 69 CTD casts were conducted. All CTD stations were organized in a grid made up of ten sections running across the eastern British Coast (Figure 1 and Table 1). The waters of the North Sea observed in this study were classified into different water masses according to their temperature and salinity characteristics. In our nomenclature, we mostly follow the definitions of Lee (1980; Lee, A.J., North Sea: physical oceanography, In F.T. Banner et al. (eds.), The northwest European Shelf seas: the sea bed and the sea motion, Elsevier). The inspection of the sea surface temperature and sea surface salinity charts (Figure 6) clearly shows the influence of warm and saline North Atlantic Water that entered the North Sea via the Fair Isle Current off northern Scotland (T_{Max}>8.0°C, S_{Max}=35.35) and through the English Channel (T_{Max}>8.6°C, S_{Max}=35.45). The near-shore stations along transect 3 reveal the presence of Scottish Coastal Water, influenced by river runoff leading to a surface salinity minimum of S_{Min}<33.9. Further south, the English Coastal Water was characterized by a second surface salinity minimum S_{Min}<34.1 at the westernmost stations of transect 6.

The daily mean composites of the surface chlorophyll a concentration reveal the development of an early spring phytoplankton bloom in major parts of the western North Sea.

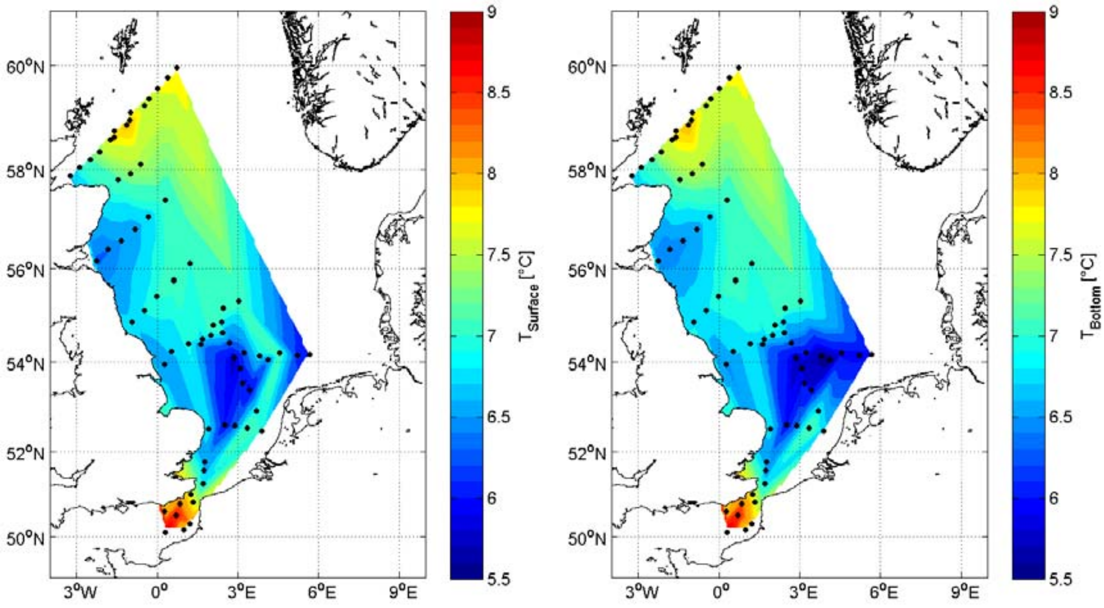

Figure 6a Horizontal distribution of the sea surface temperature (left panel) and bottom temperature (right panel) derived from the CTD measurements over the course of WH 352.

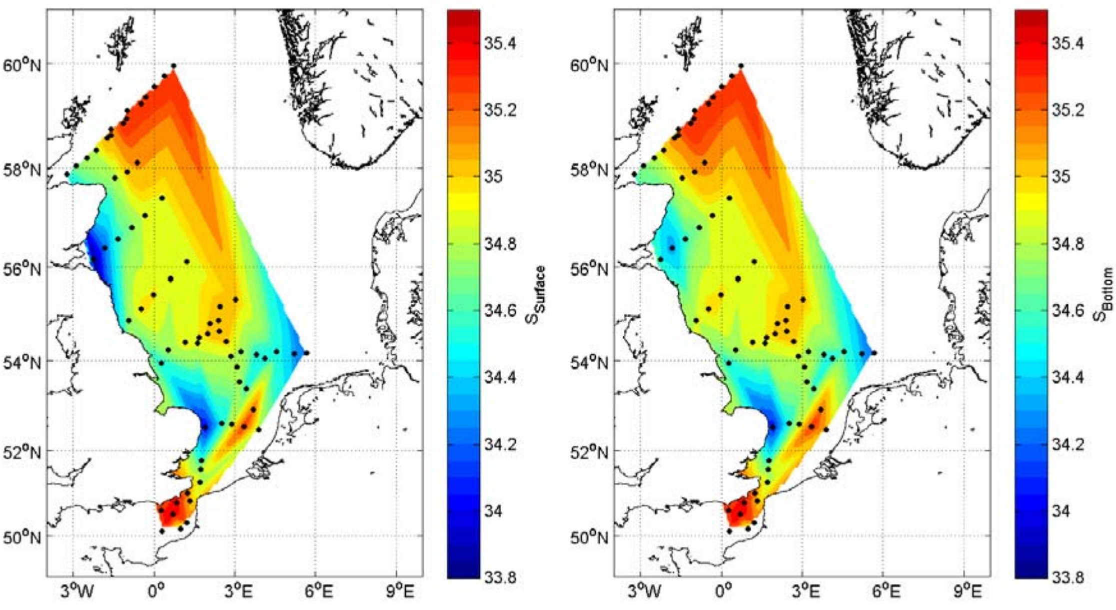

Figure 6b Horizontal distribution of the sea surface salinity (left panel) and bottom salinity (right panel) derived from the CTD measurements over the course of WH 352.

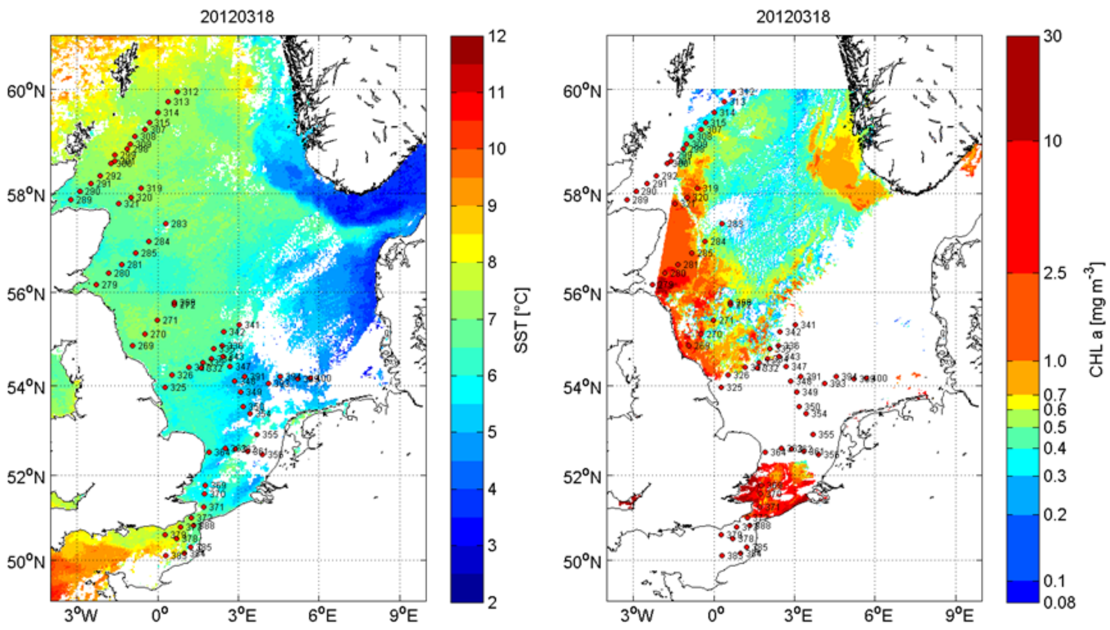

Figure 6c Daily mean sea surface temperature, March 18, 2012 (BSH, left panel) and daily mean surface concentration of Chlorophyll a, March 18, 2012 (HZG, right panel.)

5 Cruise participants

	Task	Leg 1 5.3. – 17.3.2012	leg 2 17.3. – 30.3.2012
1	Chief scientist	Anne Sell	Friedemann Keyl
2	Triaxus/ Oceanography	Andriy Martynenko	Andriy Martynenko
3	Triaxus	Peter Schael	-
4	Triaxus / Oceanography	Boris Cisewski	Torsten Schulze
5	Fish laboratory / Data	Jörg Appel	Jörg Appel
6	Fish laboratory	Sven Hammann	Sven Hammann
7	Fish laboratory / Data	Sarah Simons	Sarah Simons
8	Fish laboratory	Rebecca Lauerburg (UHAM)	Rebecca Lauerburg
9	Fish laboratory	Friedemann Keyl	Tim Kirchner (UHAM)
10	Fish laboratory	Cátia Cardoso (TI guest sci.)	Cátia Cardoso
11	Benthos	Inken Rottgardt	Inken Rottgardt
12	Hydroacoustics / Benthos	Matthias Schaber	Tim Dudeck (UHAM)

6 Acknowledgements

We thank our scientific team for their tireless effort and Captain Hannes Janssen and the crew of FRV Walther Herwig III for their support and commitment to make things happen, including special arrangements to allow deployment of the TRIAXUS. We gratefully acknowledge the support provided by the remote sensing groups of the Helmholtz-Zentrum Geesthacht (HZG) and of the Bundesamt für Seeschifffahrt and Hydrographie (BSH) who supplied daily mean chlorophyll a and sea surface temperature charts.

Dr. Anne Sell
(Cruise leader - leg 1)

Dr. Friedemann Keyl
(Cruise leader - leg 2)

Annex

Table 4: Station list with gear deployed, depth and temperature

Station #	Date	d/n	Transect	Gear	Lat	Lon	Depth [m]	SST [°C]
Brhv	05.03.12	-	-	-	-	-	-	-
266	06.03.12	D	T4	GOV, 2 m BT, CTD	56.07	1.17	82.0	6.9
267	06.03.12	D	T4	TRIAXUS	56.11	1.22	85.5	6.9
268	06.03.12	N	T4	CTD	55.78	0.61	78.4	7.0
269	07.03.12	D	T4	GOV, 2 m BT, CTD	54.84	-0.99	63.0	6.4
270	07.03.12	D	T4	GOV, 2 m BT, CTD	55.09	-0.54	74.5	6.8
271	07.03.12	D	T4	GOV, 2 m BT, CTD	55.39	-0.08	76.5	6.8
272	08.03.12	D	T4	GOV, 2 m BT, CTD	55.75	0.58	81.0	7.0
273	08.03.12	D	T4	TRIAXUS	55.83	0.70	81.0	6.9
274	08.03.12	D	MIK cal	MIK	56.21	-0.45	64.5	6.3
275	08.03.12	D	MIK cal	MIK	56.19	-0.47	76.4	6.3
276	08.03.12	N	T3	MIK	56.58	-1.31	64.1	6.3
277	08.03.12	N	T3	MIK	56.37	-1.74	41.0	6.2
278	08.03.12	N	T3	MIK	56.14	-2.18	63.0	6.2
279	09.03.12	D	T3	GOV, 2 m BT, CTD	56.15	-2.30	61.0	6.3
280	09.03.12	D	T3	GOV, 2 m BT, CTD	56.40	-1.73	45.0	6.3
281	09.03.12	D	T3	GOV, 2 m BT, CTD	56.63	-1.28	69.4	6.4
282	09.03.12	D/N	T3	TRIAXUS	56.56	-1.38	68.0	6.4
283	10.03.12	D	T3	GOV, 2 m BT, CTD	57.39	0.30	78.6	6.9
284	10.03.12	D	T3	GOV, 2 m BT, CTD	57.09	-0.28	82.6	6.7
285	10.03.12	D	T3	GOV, 2 m BT, CTD	56.80	-0.85	71.9	6.4
286	10.03.12	N	T1	MIK	58.24	-2.49	57.3	7.1
287	11.03.12	N	T1	MIK	58.03	-2.89	57.5	6.9
288	11.03.12	N	T1	MIK	57.87	-3.23	70.1	6.6
289	11.03.12	D	T1	GOV, 2 m BT, CTD	57.89	-3.27	61.0	6.6
290	11.03.12	D	T1	GOV, 2 m BT, CTD	58.01	-2.88	52.0	6.8
291	11.03.12	D	T1	GOV, 2 m BT, CTD	58.20	-2.51	57.5	7.1
292	11.03.12	D	T1	GOV, 2 m BT, CTD	58.39	-2.16	85.4	7.3
293	11.03.12	D	T1	MIK	58.39	-2.14	85.4	7.3
294	11.03.12	N	T1	MIK	58.57	-1.77	110.4	7.6
295	11.03.12	N	T1	MIK	58.65	-1.57	112.1	7.7
296	11.03.12	N	T1	MIK	58.75	-1.59	109.1	7.6
297	12.03.12	N	T1	MIK	58.87	-1.23	114.9	7.8
298	12.03.12	D	T1	GOV, 2 m BT, CTD	58,87	-1,17	113,0	7,8
299	12.03.12	D	T1	GOV, 2 m BT, CTD	58,75	-1,61	105,6	7,7
300	12.03.12	D	T1	GOV, 2 m BT, CTD	58,55	-1,75	112,5	7,6
301	12.03.12	D	T1	GOV, 2 m BT, CTD	58,64	-1,61	114,1	7,7

302	12.03.12	D	T1	MIK	58,95	-0,99	125,1	7,8
303	12.03.12	N	T1	MIK	59,08	-0,82	135,0	7,5
304	12.03.12	N	T1	MIK	59,21	-0,51	142,0	7,5
305	13.03.12	N	T1	MIK	59,36	-0,35	140,0	7,6
306	13.03.12	N	T1	MIK	59,52	0,02	134,7	7,6
307	13.03.12	D	T1	GOV, 2 m BT, CTD	59,22	-0,51	143,0	7,5
308	13.03.12	D	T1	GOV, 2 m BT, CTD	59,07	-0,82	135,0	7,5
309	13.03.12	D	T1	GOV, 2 m BT, CTD	58,96	-1,02	125,0	7,9
310	13.03.12	D	T1	MIK	59,53	0,04	136,6	7,6
311	13.03.12	N	T1	MIK	59,77	0,37	117,5	7,7
312	13.03.12	N	T1	MIK	59,99	0,76	129,0	7,7
312	14.03.12	N	T1	CTD	59,96	0,74	132,0	7,7
313	14.03.12	D	T1	GOV, 2 m BT, CTD	59,76	0,33	117,6	7,7
314	14.03.12	D	T1	GOV, 2 m BT, CTD	59,52	0,03	134,0	7,6
315	14.03.12	D	T1	GOV, 2 m BT, CTD	59,35	-0,34	140,0	7,6
316	14.03.12	N	T2	MIK	57,75	-1,50	76,4	7,0
317	15.03.12	N	T2	MIK	57,94	-0,99	93,9	7,2
318	15.03.12	N	T2	MIK	58,10	-0,66	109,0	7,4
319	15.03.12	D	T2	GOV, 2 m BT, CTD	58,10	-0,65	110,6	7,3
320	15.03.12	D	T2	GOV, 2 m BT, CTD	57,94	-0,92	101,5	7,3
321	15.03.12	D	T2	GOV, 2 m BT, CTD	57,78	-1,47	76,0	7,0
Newcastle	16.03.12	-	-	-	-	-	-	-
322	18.03.12	N	T5	MIK	54,41	1,13	62,4	6,7
323	18.03.12	N	T5	MIK	54,20	0,61	63,4	6,6
324	18.03.12	N	T5	MIK	53,96	0,29	52,0	6,4
325	18.03.12	D	T5	GOV, 2 m BT, CTD	53,95	0,28	51,0	6,3
326	18.03.12	D	T5	GOV, 2 m BT, CTD	54,21	0,61	61,5	6,6
327	18.03.12	D	T5	GOV, 2 m BT, CTD	54,40	1,23	56,0	6,7
328	18.03.12	N	T5	MIK	54,80	2,12	22,5	6,9
329	18.03.12	N	T5	MIK	54,61	1,99	24,0	6,7
330	18.03.12	N	T5	MIK	54,53	1,69	21,3	6,8
331	18.03.12	N	T5	MIK	54,42	1,51	57,3	6,4
332	19.03.12	D	T5	GOV, 2 m BT, CTD	54,40	1,58	57,9	6,4
333	19.03.12	D	T5	GOV, 2 m BT, CTD	54,52	1,67	18,5	6,7
334	19.03.12	D	T5	GOV, 2 m BT, CTD	54,58	1,96	23,8	6,8
335	19.03.12	D	T5	GOV, 2 m BT, CTD	54,78	2,02	28,3	6,8
336	19.03.12	D	T5	GOV, 2 m BT, CTD	54,88	2,34	26,4	6,8
337	19.03.12	D	T5A	MIK	54,63	2,35	21,4	6,6
338	19.03.12	N	T5A	MIK	54,86	2,40	24,8	6,7
339	19.03.12	N	T5A	MIK	55,15	2,52	32,0	6,8
340	20.03.12	N	T5A	MIK	55,29	3,00	30,3	6,9

341	20.03.12	D	T5A	GOV, 2 m BT, CTD	55,30	3,01	30,1	7,0
342	20.03.12	D	T5A	GOV, 2 m BT, CTD	55,15	2,53	31,5	6,9
343	20.03.12	D	T5A	GOV, 2 m BT, CTD	54,63	2,42	21,8	6,9
344	20.03.12	N	T5A	MIK	53,90	3,06	59,0	5,8
345	20.03.12	N	T5A	MIK	54,11	2,84	46,4	5,8
346	21.03.12	N	T5A	MIK	54,39	2,65	28,0	6,2
347	21.03.12	D	T5A	GOV, 2 m BT, CTD	54,40	2,65	28,3	6,2
348	21.03.12	D	T5A	GOV, 2 m BT, CTD	54,13	2,82	47,5	5,7
349	21.03.12	D	T5A	GOV, 2 m BT, CTD	53,86	3,09	54,3	6,0
350	21.03.12	D	T5A	GOV, 2 m BT, CTD	53,54	3,18	35,4	6,4
351	21.03.12	N	T5A	MIK	52,87	3,64	30,4	6,9
352	22.03.12	N	T5A	MIK	53,35	3,37	27,9	5,8
353	22.03.12	N	T5A	MIK	53,54	3,21	34,5	6,0
354	22.03.12	D	T5A	GOV, 2 m BT, CTD	53,39	3,44	30,4	5,8
355	22.03.12	D	T5A	GOV, 2 m BT, CTD	52,97	3,72	27,8	6,8
356	22.03.12	D	T6	GOV, 2 m BT, CTD	52,45	3,92	27,3	6,6
357	22.03.12	D	T6	MIK	52,43	3,91	26,1	6,4
358	23.03.12	N	T6	MIK	52,61	2,50	48,0	5,8
359	23.03.12	N	T6	MIK	52,58	2,90	37,4	6,2
360	23.03.12	N	T6	MIK	52,53	3,35	38,3	7,2
361	23.03.12	D	T6	GOV, 2 m BT, CTD	52,53	3,35	35,3	7,1
362	23.03.12	D	T6	GOV, 2 m BT, CTD	52,57	2,89	37,8	6,6
363	23.03.12	D	T6	GOV, 2 m BT, CTD	52,60	2,50	47,9	6,0
364	23.03.12	D	T6	GOV, 2 m BT, CTD	52,53	1,93	29,1	6,7
365	23.03.12	D	T6	MIK	52,52	1,93	31,9	6,6
366	23.03.12	N	T7	MIK	51,72	1,76	36,1	6,3
367	24.03.12	N	T7	MIK	51,55	1,76	43,0	6,2
368	24.03.12	N	T7	MIK	51,32	1,73	43,3	6,7
369	24.03.12	D	T7	GOV, 2 m BT, CTD	51,76	1,76	34,4	6,4
370	24.03.12	D	T7	GOV, 2 m BT, CTD	51,53	1,76	38,0	6,4
371	24.03.12	D	T7	GOV, 2 m BT, CTD	51,30	1,74	44,4	6,7
372	24.03.12	D	T7	GOV, 2 m BT, CTD	50,98	1,18	30,4	7,6
373	24.03.12	D	T7	MIK	50,97	1,18	29,1	7,6
374	24.03.12	N	T7	MIK	50,80	0,87	36,0	7,6
375	24.03.12	N	T7	MIK	50,52	0,66	51,9	8,6
376	25.03.12	N	T7	MIK	50,62	0,13	53,5	7,8
377	25.03.12	D	T7	GOV, 2 m BT, CTD	50,78	0,84	34,4	8,2
378	25.03.12	D	T7	GOV, 2 m BT, CTD	50,52	0,73	49,4	8,4
379	25.03.12	D	T7	GOV, 2 m BT, CTD	50,62	0,22	59,4	7,8
380	25.03.12	D	T8	MIK	50,12	0,32	37,5	8,8
381	25.03.12	N	T8	MIK	50,14	0,93	31,0	7,8

382	25.03.12	N	T8	MIK	50,32	1,23	36,0	7,8
383	26.03.12	N	T8	GOV, 2 m BT, CTD	50,12	0,33	37,4	8,8
384	26.03.12	D	T8	GOV, 2 m BT, CTD	50,14	0,92	27,4	7,7
385	26.03.12	D	T8	GOV, 2 m BT, CTD	50,31	1,19	35,0	7,8
386	26.03.12	D	T8	MIK	50,80	1,31	28,8	7,7
387	26.03.12	N	T8	MIK	50,64	1,39	34,4	7,7
388	27.03.12	D	T8	GOV, 2 m BT, CTD	50,83	1,32	25,3	7,6
389	28.03.12	N	T9	MIK	54,14	3,71	43,3	6,8
390	28.03.12	N	T9	MIK	54,22	3,28	42,0	6,4
391	28.03.12	N	T9	GOV, 2 m BT, CTD	54,20	3,23	41,3	6,3
392	28.03.12	D	T9	GOV, 2 m BT, CTD	54,14	3,79	46,5	6,8
393	28.03.12	D	T9	GOV, 2 m BT, CTD	54,07	4,13	49,0	6,5
394	28.03.12	D	T9	GOV, 2 m BT, CTD	54,16	4,62	47,4	6,6
395	28.03.12	D	T9	MIK	54,07	4,15	48,3	6,7
396	28.03.12	N	T9	MIK	54,15	4,64	47,5	6,4
397	28.03.12	N	T9	MIK	54,15	5,21	42,5	6,3
398	29.03.12	N	T9	MIK	54,18	5,67	39,3	5,9
399	29.03.12	N	T9	GOV, 2 m BT, CTD	54,15	5,21	42,5	6,1
400	29.03.12	D	T9	GOV, 2 m BT, CTD	54,19	5,74	36,5	5,9
Brhv	30.3.12	-	-	-	-	-	-	-