The International Ecosystem survey in the Nordic Seas in April/May 2012

R/V DANA Cruise No. 5/20120

Calibration of Echo-sounders

24/4 – 26/4 2012

International Acoustic Monitoring of Herring and Blue whiting

27/4 – 23/5 2012

Cruise participants

Calibration 24/4 – 26/4

Karl-Johan Staehr (Cruise leader)	DTU Aqua, Denmark
Torben Filt Jensen	DTU Aqua, Denmark
Peter Faber	DTU Aqua, Denmark
Thyge Dyrnesli	DTU Aqua, Denmark
Frank V. Knudsen	DTU Aqua, Denmark
Søren Boesen	DTU Aqua, Denmark
Dirk Burggraaf	IMARES, Netherlands

Acoustic monitoring 27/4 - 9/5

Karl-Johan Staehr (Cruise leader) (acoustics)	DTU Aqua, Denmark
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Stephen Warnes (plankton/fishlab)	CEFAS, UK
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Frank F. Knudsen (technician)	DTU Aqua, Denmark

Acoustic monitoring 10/5-23/5

Matthias Kloppmann (Cruise leader)	vTI-SF, Germany
Sven Gastauer (acoustics)	IMARES, Netherlands
Cormac Nolan (acoustics)	MI, Ireland
Joana Silva (plankton/fishlab)	CEFAS, UK
Helle Andersen (plankton/fishlab)	DTU Aqua, Denmark
Mikael Petterson	SLU, Sweden
Thyge Dyrnesli (technician)	DTU Aqua, Denmark

Cruise summary

Effective survey days	19
Mileage	3317
Number of trawl hauls	10
Number of CTD stations	35
Number of WP2 stations	35
Number of biological samples – herring	207
Number of biological samples – blue whiting	176
Remarks	No trawl hauls during 2nd part due to winch failure

Introduction

The Norwegian spring spawning herring is a highly migratory and straddling stock carrying out extensive migrations in the NE Atlantic. After spawning, the main spawning areas being along the Norwegian west coast from 62°N to 65°N in February – March, the herring migrates NW-wards towards the Norwegian Sea feeding grounds. In general, the main feeding has taken place along the polar front from the island of Jan Mayen and NE-wards towards Bear Island. During the latter half of the 1990's there has been a gradual shift of migration pattern with the herring migrations shifting north and eastwards. In 2002 - 2004 this development seems to have stopped and the herring had more southerly distribution at the end of the feeding season than in 2001. After feeding, the herring concentrated in August in the northern parts of the Norwegian Sea prior to the southern migration towards the Vestfjord wintering area (68°N, 15°E). Since the winter 2002-2003 most of the stock seems to winter in the Norwegian Sea off Lofoten. In January the herring start their southerly spawning migrations.

Besides herring, abundant stocks of blue whiting and mackerel exploit the Norwegian Sea as an important feeding area. The blue whiting stock is currently supporting one of the largest fisheries of the Northeast Atlantic. The main spawning areas are located along the shelf edge and banks west of the British Isles. The eggs and larvae drift both northwards and southwards, depending on location and oceanographic conditions. The northward drift spreads juvenile blue whiting to all warmer parts of the Norwegian Sea and adjacent areas from Iceland to the Barents Sea. Adult blue whiting carry out active feeding and spawning migrations in the same area. Blue whiting has consequently an important role in the pelagic ecosystems of the area, both by consuming zooplankton and small fish, and by providing a resource for larger fish and marine mammals.

Background and objective of the survey

This survey is carried out in order to investigate distribution and migrations of the Atlanto-Scandian herring, blue whiting and other pelagic fish and to produce a biomass index for herring and a recruitment index for blue whiting for the Working Group on Widely Distributed stocks (WGWIDE). Furthermore hydrographic conditions and plankton abundance in the Norwegian Sea and adjacent waters are monitored in order to investigate distribution and migration of herring and other pelagic fishes are influenced by environmental conditions.

This survey was coordinated with Norway as an international survey with participation of Norway, Iceland, Faroe Islands and EU, where the Danish R/V Dana conducted the EU survey part. The acoustic survey tracks of Dana are shown in figure 1.
With the exceptions of 2002 and 2003 the survey is carried out since 1997 with participation of EU countries together with Norway, Russia, Iceland and the Faeroese Islands.

Calibration

The echo sounders were calibrated immediately before the survey at Bornö Island in the Gullmar Fjord, Sweden, between 24 and 26 April 2012. The calibration was performed according to standard operational procedures as described in the WGNAPES/WGIPS manual for the three frequencies 18, 38 and 120 kHz. The calibration of the towed body split-beam transducer at 38 kHz was conducted against a 60 mm copper sphere. Calibration of the three hull-mounted split-beam transducers at 18, 38, and 120 kHz were carried out against 63mm, 60 mm, and 23 mm copper spheres, respectively.
The resulting calibration parameters are shown in Annex 1 and were used during the subsequent survey.

Materials and methods

Acoustic data

Acoustic data was collected with EK60 using a 38 kHz splitbeam transducer, mounted in a towed body (paravane). During trawling, acoustic data was collected by the EK60 using the hull mounted 38 kHz transducer: the recordings during trawling were only used for scrutiny of the echograms. Echo integration was conducted continuously and the data was scrutinized daily during the survey utilizing LSSS and, for backup purposes, SIMRAD BI500 softwares.

A biomass estimate will not be carried out based on data of this cruise alone, but the data will be included in the survey's database from all participating vessels from which a biomass index will be calculated. The final estimate methodology is presented in the report of the post cruise meeting in Reykjavik, late June 2012.

3317 NM were integrated and scrutinized along the cruise track.

Hydrographical and zooplankton data

Approximately every 60 nautical miles, in the northern survey area also further apart, plankton samples were taken by means of vertical tows from 200 m to the surface with a WP2 equipped with 180 µm mesh. The sample was fractioned into three size groups (180 µm, 1000 µm and 2000 µm) of zooplankton for biomass estimation. The biomass samples were oven-dried on board at 70 °C for 24 hours, and subsequently frozen for later weight determination at DTU Aqua.

At the same positions as for standard plankton sampling, CTD casts were carried out to a maximum depth of 1000 m or 5 m above the seabed with a Seabird CTD and rosette water sampler. The following parameters were measured: depth (pressure), temperature,

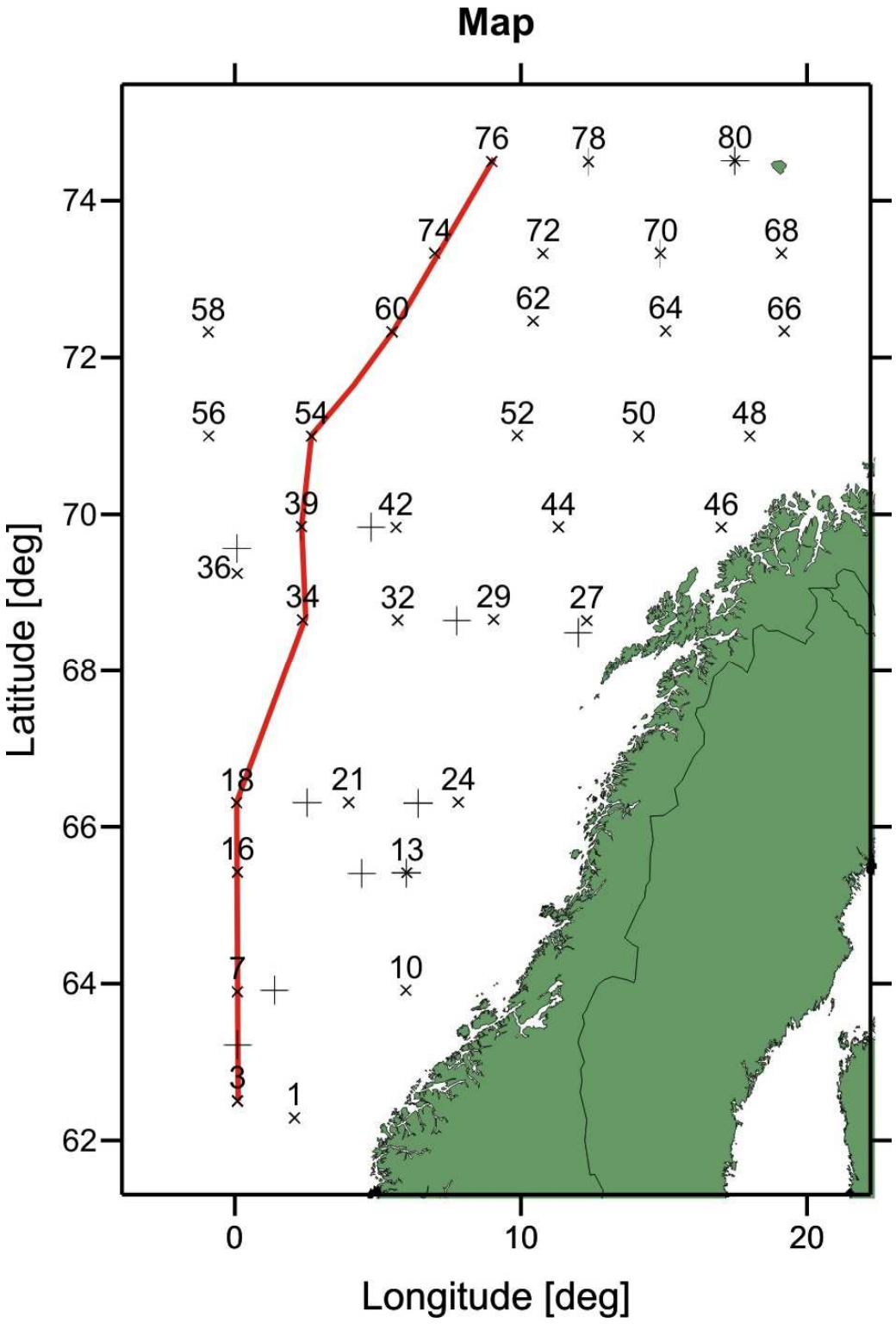

Figure 1. Combined CTD- and WP2-stations (x) taken by R/V Dana from 26 April to 19 May 2012. The red lines indicate the CTD transect chosen for the characterization of the vertical hydrogaphic structure. Crosses (+) denote the 10 fishery stations.

conductivity (salinity) and oxygen. All together Dana carried out 46 combined CTD and WP2 stations (Table 1 and 2, Figure 1).

Water samples were taken regularly close to the surface and at 1000 m depth in order to calibrate the conductivity sensor of the CTD unit. Additionally, sea surface temperature, salinity and fluorescence were continuously monitored from the ship's bow intake and were stored along with information on meteorological conditions (e.g. wind direction, wind speed etc.) utilizing R/V Dana's hydrographic and meteorological analysis system.

Biological data

During the first part of the survey, fishing was carried out regularly on acoustic registrations to verify the species scrutinized and to give information about the size composition to be used in the biomass estimation. A pelagic trawl "*Turbo*", was used either at the surface or in midwater down to a maximum of 450 m depth. A total of 10 trawl stations were carried out during the first part of the survey (Table 3, Figure 1). Due to the breakdown of one of the trawl winches at the end of the first part of the survey, no trawling could be done during the second part.

Catches were sorted and weighed by species. Length measurements were taken for all species. For herring and blue whiting samples of 50 fish were also randomly taken in order to determine individual length to weight relationships as well as age, sex and maturity. For age determination in herring and blue whiting also otoliths were sampled. Otoliths will be read at Aqua DTU. In total 207 samples of individual herring and 176 samples of individual blue whiting were taken.

By request of vTI-SF in Hamburg all by-caught redfish were examined for stomach contents, maturity, parasites and aberrant pigmentation. Otoliths were taken as well. In total 4 specimens have been caught and sampled.

All trawl data were entered into the Babelfisk database and validated. The data were also stored in the WGNAPES formats and sent by email to the WGNAPES database at the Faeroes at the end of the survey.

Itinerary of the survey

Dana left Hirtshals 24 April 2012 at 06.00 UTC for calibration of acoustic equipment at Bornö in Sweden. All transducers were calibrated and Dana arrived in Hirtshals again 26 April 2012 at 17.00 UTC.

Dana left Hirtshals to start the acoustic survey on 27 April 2012 at 11.00 UTC.

Due to a large number of new crew members especially on the bridge a test haul with the "turbo" midwater trawl were conducted on 28 April at 10.00 UTC on the position 59° 23 N, 03° 25E. This operation was originally not planed at did delay the steaming for the starting point with 1.5 hours.

Data monitoring started at 04.00 UTC of 29 April at 62°17 N, 02°05 E with a CTD and a WP2 and continued with integration along the planned cruise track.

Weather conditions during first half only gave few days with wind speed less than 10 m/s most of the time the wind sped were 13-16 m/s. Unless the wind condition the program could be followed as planned and additional 100 NM were added to the planned cruise track.

At the 10th trawl station at 7th May at 69°50N, 04°46E the portside trawl winch broke during hiving. Luckily the trawls doors were nearly home before the failure occurred as thee fishery had been conducted at 350-400 m depth with 1800 m wire out.

First inspection of the winch shoved that it could not be fixed at sea and fishing was curtailed after that haul. The survey were continued with integration and CTD/WP2 stations on the way for Tromsø

Integration on first half on the survey was ended 08 May 2012 at 14,45 UTC at 69°50N, 11°21E. Tromsø was entered on the next day, 9th May, at 06.30 UTC for change of crew and the inspection of the broken winch.

Inspection of the winch revealed that it could not be repaired in due time to be used during the remaining part of the cruise. It was thus decided to carry on with the program while omitting fishing. In liaison with the survey coordinator it was decided to change the cruise plan, insert an additional transect and to prolong the southernmost transect further west to Jan Mayen in order to utilize the available ship time that has increased due to omission of fishing stations.

Dana left Tromsø on the 10th of may at 1700 UTC. The paravane was put in the water at 69.51N 17.02E - 20.02 UTC after a combined CTD/WP2 station. Weather conditions were good in the beginning of the 2nd half but deteriorated quickly on 11 May and the following day with wind speeds up to more than 20 ms^{-1}. Ship's speed had to be slowed down to 4 – 6 knots and considerable time was lost. Again, in liaison with the survey coordinator, the 2 southernmost transects were shortened at 0°55' W to escape another low pressure field. However, that low reached Dana on 14 May, again with wind speeds up to > 20 ms^{-1} forcing Dana to again reduce speed to 3 – 4 knots, and valuable ship time was lost. That necessitated a further shortening of the proposed cruise track and the penultimate and final transects were cut at 7 and 9° E, respectively.

The survey ended on 19 May at 74.30 N 18.15E – 12.42 UTC.

Results

Catch composition

The catch composition of all trawl hauls are presented in Table 4, Table 3 gives information on trawling position and depth. Distribution of trawl hauls is shown in Figure 1.

Distribution and density of herring and blue whiting

Distribution and densities of herring and blue whiting along the survey track are presented in Figure 2 and 4.

Herring was found in the south western part of the survey area and in relatively small schools above the shelf edge during the 1st part of the cruise (Fig. 2). During the 2nd half of the survey higher abundances of herring were encountered in the eastern halves of the 2 southern transect (71 N, 72.20 N, Fig. 2). However, these high densities are exclusively owed to dense scattering layers in the surface (Fig. 3) that have to be scrutinized at threshold values between -60 and -54 dB as herring. Due to the winch breakdown, validation hauls could not be carried out in these layers. In the Barents Sea, southwest of Bear Island the echograms showed relatively high concentrations of presumably Haddock.

Blue whiting occurred almost everywhere, but in larger amounts close to the shelf edge in the eastern part of the survey area (Fig. 3). Most blue whiting schools were detected in the eastern halves of the transects on 71 and 72.20 N (Fig. 3). Also during the 2nd part, scattered schools of presumably blue whiting of the first year class where encountered in the eastern part of the survey area as far up north as the final transect on 74.30 N.

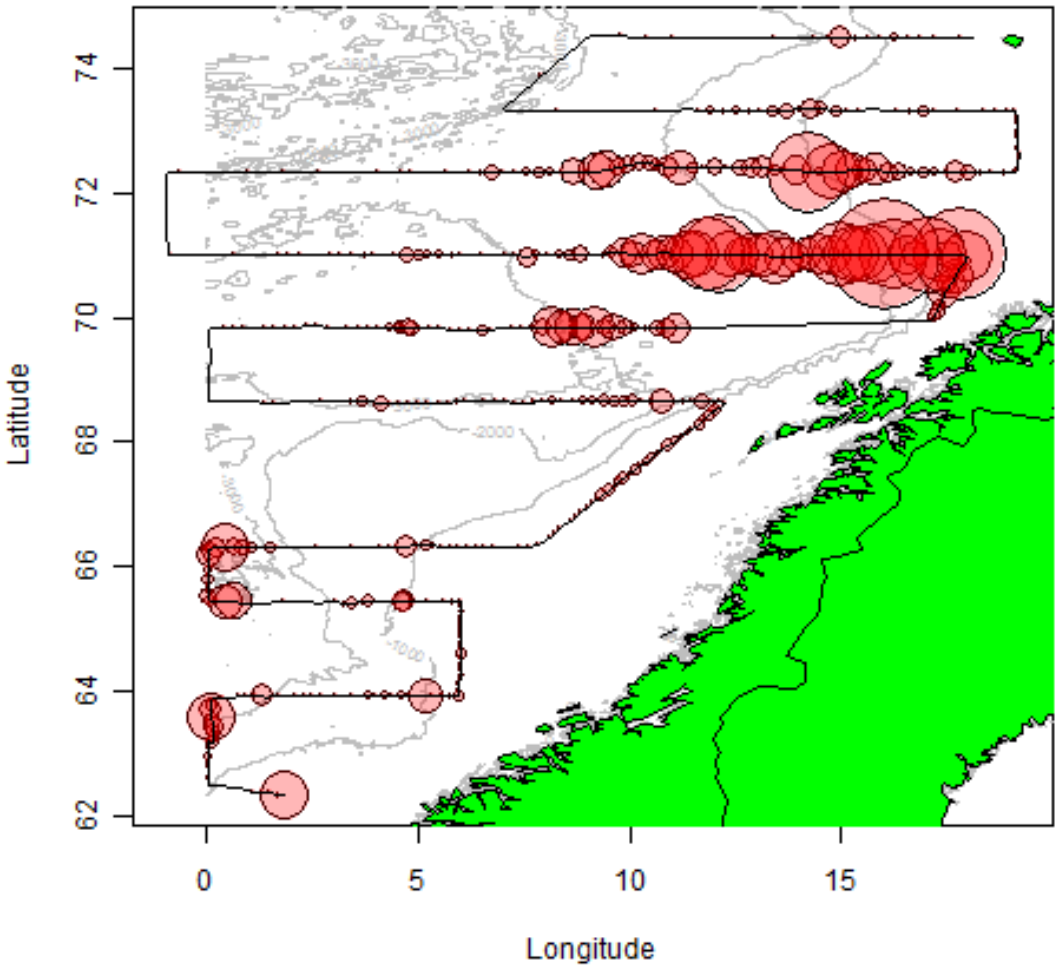

Figure 2: Distribution and densities of herring, S_A values per 5 nm, recorded by R/V Dana during 27 April to 23 May 2012. The size of the bubbles represents the square root of the 10th part of the respective S_A value. The largest bubbles correspond to an S_A value of 7972.

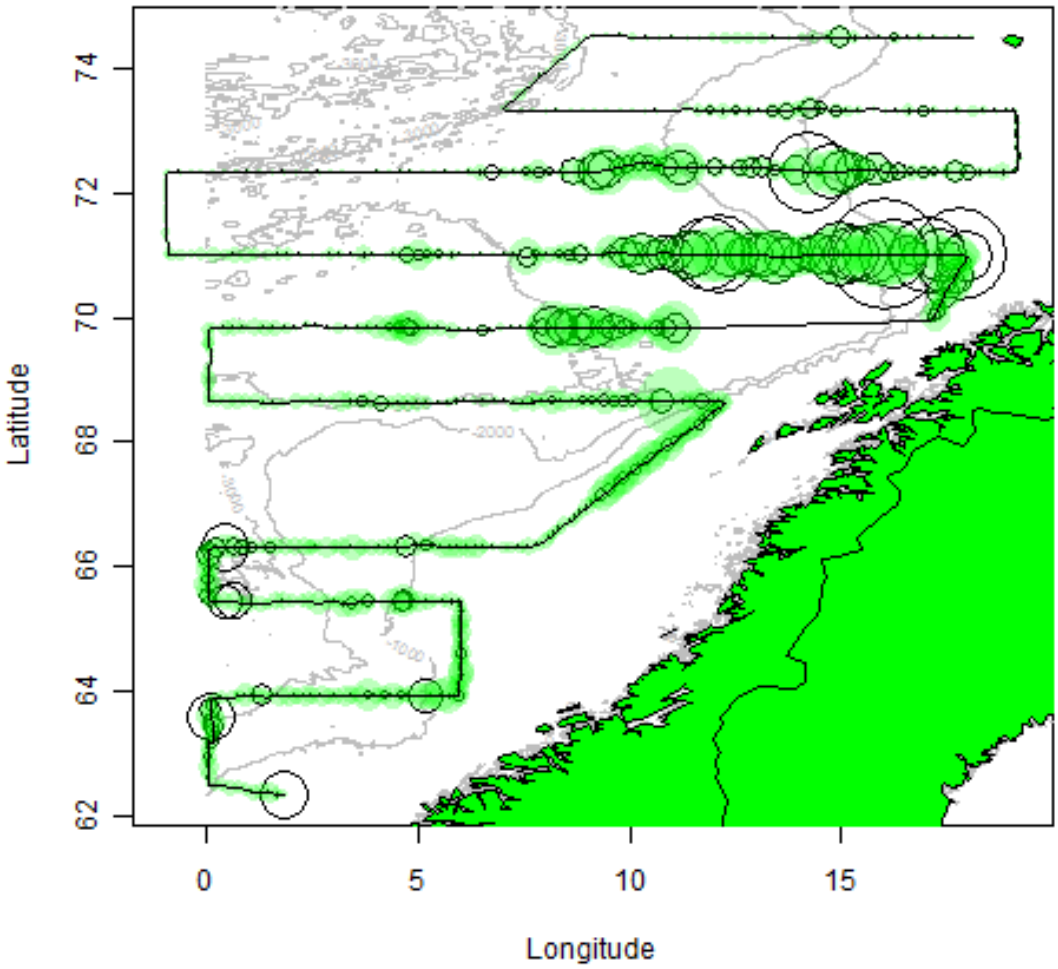

Figure 3: Distribution and densities of herring (open circles) and plankton (green bubbles), S_A values per 5 nm, recorded by R/V Dana during 27 April to 23 May 2012. The size of the bubbles represents the square root of the 10th part of the respective S_A value. The largest bubbles correspond to an S_A value of 6093.

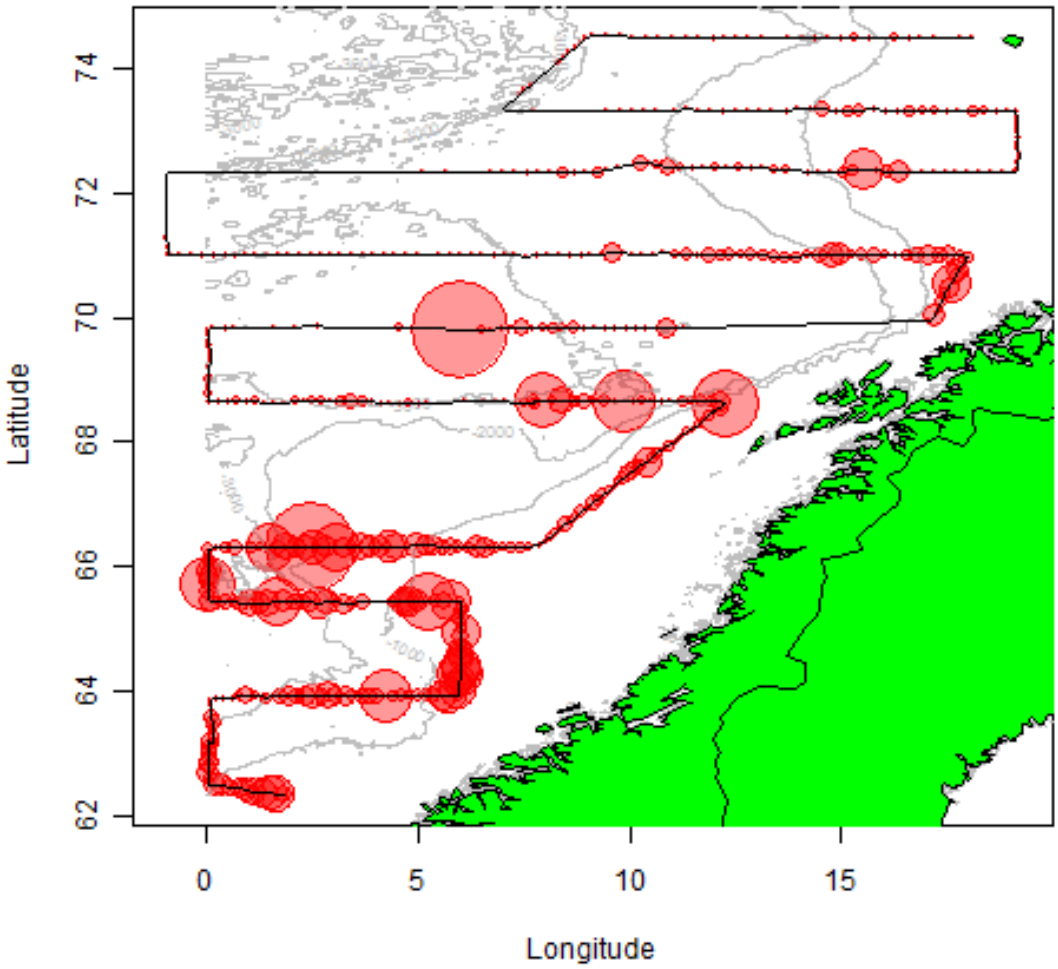

Figure 4: Distribution and densities of blue whiting, S_A values per 5 nm, recorded by R/V Dana during 27 April to 23 May 2012. The size of the bubbles represents the square root of the 10th part of the respective S_A value. The largest bubbles correspond to an S_A value of 6093.

Hydrographic conditions

The observed temperature range during the cruise was again similar to that of previous cruises with surface values between 5 and > 8°C in the eastern part of the survey area decreasing to values < 3°C in the Northwest. However and despite the similar range, temperatures in the North were cooler than in the preceding years. In the surface, the 7°C isothermal reached only up to slightly north of 68°N in a comparatively narrow tongue (figure 5) while in the past it could be encountered over a wider longitudinal range and in earlier years (before 2007) also far beyond the 70° latitude. Waters in the surface layer closer to the coast were cooler than at 50 m and also considerably fresher, indicating a higher discharge of cold waters from the land. In the top 200 m the warmer Atlantic waters appeared to be closer to the Norwegian coast.

Over most of the survey area, the water column was clearly vertically structured into warmer water masses of Atlantic origin in the upper layers and cold Arctic waters at depth (figure 6). The magnitude of these layers varied with latitude. In the southern part of the survey area, Atlantic water could be detected down to about 300 m. At first this layer became shallower but deepened towards > 900 m at about 70°00' N. North of that Latitude the layer of Altantic water quickly became shallower and the influence of Arctic water became more prominent throughout the water column (figure 6). The frontal area between cold arctic water and warmer Atlantic water was only apparent at all depths from the surface and down to 200 m only in the northwest of the survey area.

Concluding remarks

The survey was severely compromised by the failure of the portside trawl winch in that fishing was not possible during the entire second part. Particularly during that part, there were various occasions, when validation of echogram interpretation was desirable, e.g. the dense surface near scattering layers, several schools of shallow (between 100 and 200 m) occurring young blue whiting, and the presumable haddock occurrences in the Barents Sea. The ship's administrators should consider equipping Dana with new winches or at least winches of a newer built, because the current, 30 year old winches have in many occasions proven to be too slow, particularly when deep trawls at depths > 300 m are to be done. Shooting and hauling of the net then consumes a considerable amount of ship time, and may lead cruise leader to relinquish deep hauls when ship time is in danger of running out.

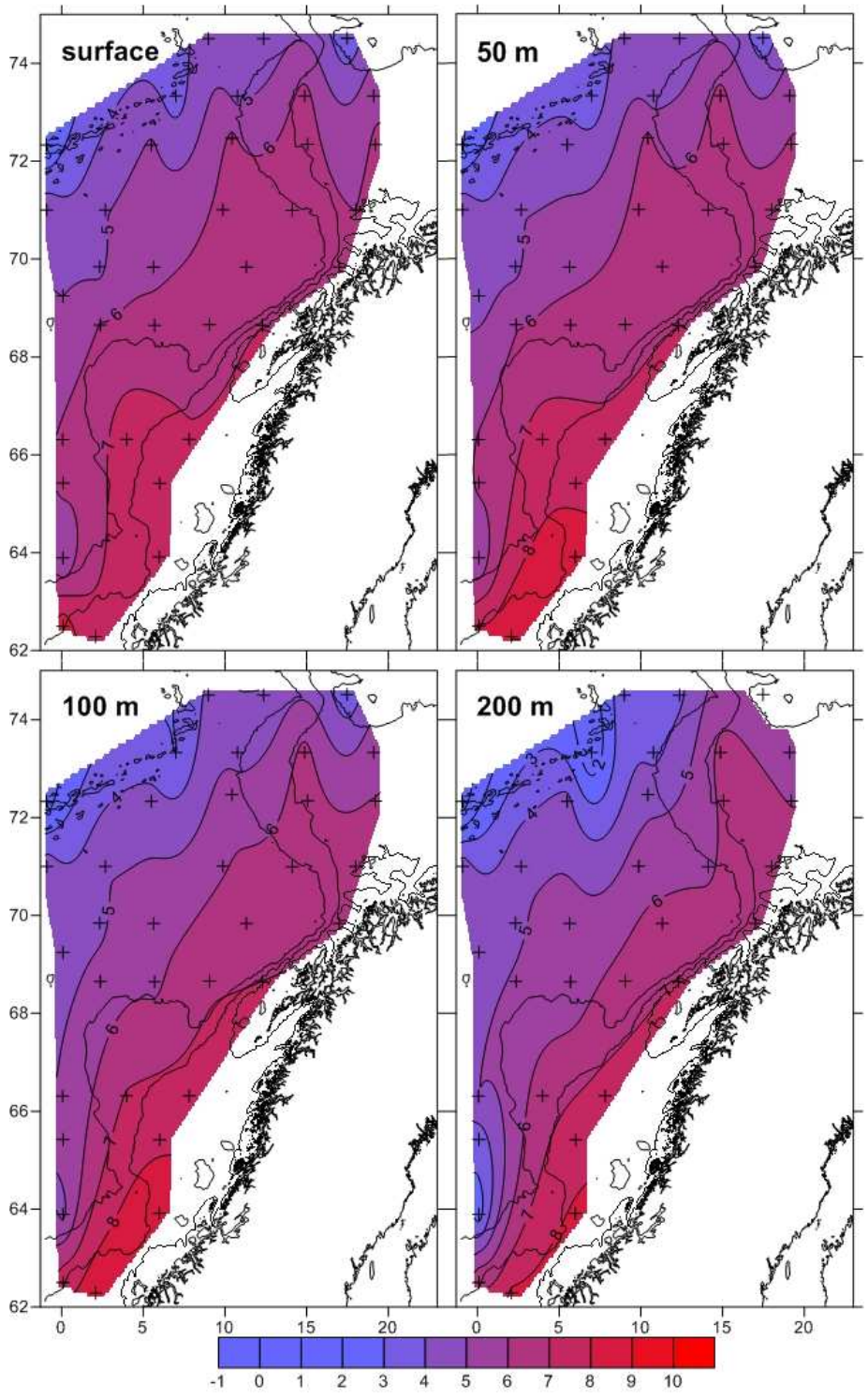

Figure 5: Horizontal temperature distribution in the survey area at the surface, and at 50m, 100m and 200m depth.

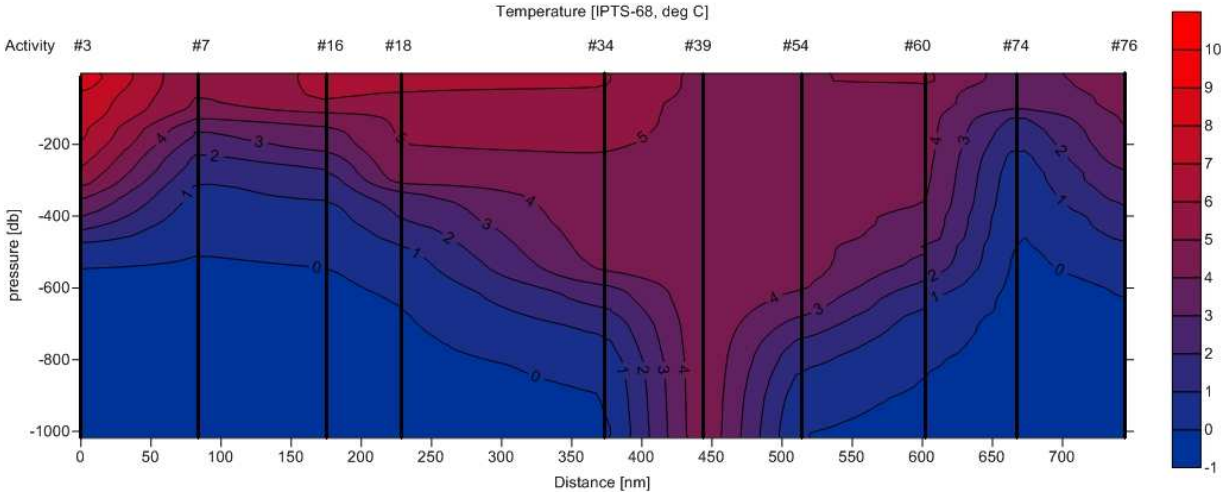

Figure 6: Vertical temperature distribution from South to North along approximately 0 - 10Eº (see Figure 1).

Table 1: CTD stations taken by R/V Dana during 27 April to 23 May 2012

Cruise	Station	year	Month	Day	Hour	Min	Latitude	Longitude	WinDir	WinSpeed
201205	1	2012	4	29	4	11	62.17.296 N	002.05.090 E	196,6	9,35
201205	3	2012	4	29	11	53	62.30.237 N	000.05.488 E	196,6	14,2
201205	7	2012	4	30	1	43	63.53.772 N	000.05.286 E	310,6	6,66
201205	10	2012	4	30	21	56	63.54.912 N	005.58.806 E	246,4	3,15
201205	13	2012	5	1	12	1	65.24.932 N	006.00.648 E	217,2	15,65
201205	16	2012	5	2	16	15	65.25.498 N	000.05.447 E	312,5	7,35
201205	18	2012	5	2	23	17	66.18.535 N	000.03.857 E	318,8	3,83
201205	21	2012	5	3	14	7	66.18.938 N	003.58.917 E	9,3	4,74
201205	24	2012	5	4	3	39	66.18.987 N	007.48.838 E	33,2	5,33
201205	27	2012	5	5	0	36	68.38.617 N	012.18.194 E	71,1	12,08
201205	29	2012	5	5	9	0	68.39.442 N	009.02.863 E	48,3	12,54
201205	32	2012	5	5	21	39	68.38.810 N	005.41.518 E	24,9	10,52
201205	34	2012	5	6	7	29	68.39.158 N	002.21.933 E	359,5	11,95
201205	36	2012	5	6	18	40	69.14.704 N	000.05.220 E	344,9	8,6
201205	39	2012	5	7	8	20	69.50.653 N	002.19.762 E	22,4	6,26
201205	42	2012	5	7	23	26	69.49.986 N	005.38.047 E	31,4	5,43
201205	44	2012	5	8	13	21	69.50.192 N	011.18.826 E	277,6	3,69
201205	46	2012	5	10	19	4	69.50.052 N	017.00.184 E	261,8	2,96
201205	48	2012	5	11	3	14	70.59.934 N	017.59.891 E	259,9	6,32
201205	50	2012	5	11	12	45	70.59.773 N	014.06.907 E	287,7	8,45
201205	52	2012	5	11	23	28	71.00.374 N	009.52.330 E	257,3	15,81
201205	54	2012	5	12	20	29	70.59.924 N	002.40.712 E	297,1	7,41
201205	56	2012	5	13	5	1	70.59.969 N	000.54.746 W	58	3,45
201205	58	2012	5	13	14	47	72.19.703 N	000.55.574 W	17,8	10,5
201205	60	2012	5	14	4	29	72.19.819 N	005.29.591 E	84,6	8,44
201205	62	2012	5	15	2	41	72.28.017 N	010.25.662 E	60,4	18,31
201205	64	2012	5	15	17	49	72.20.660 N	015.03.495 E	147,4	8,29
201205	66	2012	5	16	2	44	72.20.259 N	019.12.147 E	143,9	6,17
201205	68	2012	5	16	9	10	73.19.787 N	019.06.245 E	129,6	3,56
201205	70	2012	5	16	17	27	73.19.846 N	014.52.578 E	110,7	5,32
201205	72	2012	5	17	1	10	73.19.670 N	010.46.152 E	118,5	6,56
201205	74	2012	5	17	10	2	73.19.887 N	006.59.213 E	208,2	2,42
201205	76	2012	5	17	17	48	74.30.149 N	008.58.980 E	132,7	4,15
201205	78	2012	5	18	0	35	74.29.979 N	012.21.646 E	104,8	2,72
201205	80	2012	5	18	10	20	74.30.689 N	017.28.623 E	54,5	9,58

Table 2: WP2 stations taken by R/V Dana during 27 April to 23 May 2012

Cruise	Station	year	Month	Day	Hour	Min	Latitude	Longitude	WinDir	WinSpeed
201205	2	2012	4	29	4	47	62.17.749 N	002.05.329 E	187,1	9,58
201205	5	2012	4	29	12	58	62.31.104 N	000.05.224 E	197,2	13,77
201205	8	2012	4	30	3	13	63.53.540 N	000.08.555 E	299,3	6,89
201205	11	2012	4	30	22	22	63.54.987 N	005.59.040 E	276,9	3,8
201205	14	2012	5	1	12	32	65.25.577 N	006.00.996 E	229,5	15,81
201205	17	2012	5	2	17	25	65.25.245 N	000.06.592 E	323,5	5,67
201205	19	2012	5	3	0	33	66.18.400 N	000.05.926 E	332,6	5,61
201205	22	2012	5	3	15	15	66.18.504 N	003.59.527 E	344,1	3,85
201205	25	2012	5	4	4	20	66.18.557 N	007.49.379 E	27,1	4,84
201205	28	2012	5	5	1	6	68.38.262 N	012.17.741 E	73,7	10,75
201205	30	2012	5	5	10	15	68.38.617 N	009.03.293 E	41,8	10,4
201205	33	2012	5	5	23	21	68.36.763 N	005.45.213 E	19,1	11,66
201205	35	2012	5	6	8	48	68.39.271 N	002.24.533 E	350,8	13,93
201205	37	2012	5	6	19	48	69.14.435 N	000.07.532 E	350,6	10,36
201205	40	2012	5	7	9	36	69.51.170 N	002.20.999 E	28,1	11,47
201205	43	2012	5	8	0	50	69.48.240 N	005.38.402 E	31,2	5,98
201205	45	2012	5	8	14	28	69.49.896 N	011.20.301 E	290,6	2,79
201205	47	2012	5	10	19	35	69.50.146 N	017.00.766 E	232,2	3,55
201205	49	2012	5	11	3	46	71.00.332 N	018.00.845 E	309,1	6,54
201205	51	2012	5	11	14	1	70.59.237 N	014.08.884 E	307,6	9,93
201205	53	2012	5	12	0	44	71.01.626 N	009.54.307 E	265,6	12,73
201205	55	2012	5	12	21	37	70.59.927 N	002.43.064 E	280,5	8,27
201205	57	2012	5	13	6	12	70.59.251 N	000.53.777 W	70,3	4,18
201205	59	2012	5	13	15	58	72.19.571 N	000.54.385 W	18,7	11,17
201205	61	2012	5	14	5	33	72.19.483 N	005.32.376 E	77,9	10,87
201205	63	2012	5	15	3	49	72.27.464 N	010.27.571 E	64,6	16,2
201205	65	2012	5	15	18	41	72.20.830 N	015.01.810 E	137,6	8,03
201205	67	2012	5	16	3	12	72.20.425 N	019.11.817 E	143,5	6,9
201205	69	2012	5	16	9	45	73.19.708 N	019.05.861 E	127,4	3,34
201205	71	2012	5	16	18	13	73.20.190 N	014.52.159 E	103,2	6,48
201205	73	2012	5	17	2	17	73.19.819 N	010.45.023 E	121,7	6,89
201205	75	2012	5	17	13	42	73.51.841 N	007.53.871 E	201,6	2,05
201205	77	2012	5	17	18	57	74.30.708 N	008.55.710 E	141,7	2,85
201205	79	2012	5	18	1	43	74.29.850 N	012.19.578 E	132,8	3,25
201205	81	2012	5	18	10	37	74.30.607 N	017.28.243 E	63	12,12

Table 3: Fishing stations taken by R/V Dana during 27 April to 23 May 2012

Cruise	Station	year	Month	Day	Hour	Min	Latitude	Longitude	WinDir	WinSpeed	GroundSpeed	wireLength	net opening (m)	door spread (m)	Towtime (min)	Trawldepth (m)	total catch (kg)
201205	6	2012	4	29	18	39	63.13.273 N	000.05.802 E	213,5	11,7	1,3	1600	32	128	70	290	119,97
201205	9	2012	4	30	7	22	63.55.063 N	001.24.239 E	320,0	9,0	3,64	300	23	99	61	10	0,24
201205	12	2012	5	1	9	14	65.23.135 N	005.59.187 E	233,2	15,3	1,46	1100	22	126	76	172	45,71
201205	15	2012	5	1	18	50	65.24.495 N	004.26.503 E	277,5	7,4	1,99	550	23	111	96	31	640,01
201205	20	2012	5	3	7	41	66.18.710 N	002.32.099 E	311,0	4,7	4,27	1600	16	125	71	250	304,08
201205	23	2012	5	3	22	4	66.18.317 N	006.24.892 E	34,7	9,5	3,69	300	1,3	91	62	10	880,99
201205	26	2012	5	4	21	23	68.29.520 N	012.00.896 E	73,5	13,4	3,6	300	1,4	89	59	10	0,93
201205	31	2012	5	5	14	27	68.38.851 N	007.45.669 E	42,5	13,3	3,43	1460	23	126	61	305	192,88
201205	38	2012	5	6	22	58	69.34.113 N	000.05.294 E	359,9	8,4	4,08	300	0	88	59	10	0,28
201205	41	2012	5	7	17	32	69.50.273 N	004.46.458 E	17,7	13,5	3,07	1800	25	126	86	335	7,28

Table 4: Catch composition in trawl stations taken by R/V Dana during 27 April to 23 May 2012

Station	Latitude	Longitude	fishing depth [m]	*Arctozenus risso*	*Benthosema glaciale*	*Caridea sp.*	*Cephalopoda sp.*	*Clupea harengus*	*Cyclopterus lumpus*	*Euphausiidae sp.*	*Maurolicus muelleri*	*Melanogrammus aeglefinus*	*Micromesistius poutassou*	*Notoscopelus kroyeri*	*Salmo salar*	*Scomber scombrus*	*Scyphozoa sp.*	*Sebastes mentella*	Grand Total
6	63.13.273 N	000.05.802 E	290	2,06		0,03	0,01	0,79					104,90	3,30		8,46	0,41		119,97
9	63.55.063 N	001.24.239 E	14					0,24											0,24
12	65.23.135 N	005.59.187 E	172							0,35	0,59				0,80	43,90	0,07		45,71
15	65.24.495 N	004.26.503 E	31					535,11								104,90			640,01
20	66.18.710 N	002.32.099 E	250	0,05				22,96			0,00	1,16	279,65				0,26		304,08
23	66.18.317 N	006.24.892 E	3	0,24				618,76								261,99			880,99
26	68.29.520 N	012.00.896 E	4					0,36	0,57										0,93
31	68.38.851 N	007.45.669 E	305	0,24	0,04			177,98			0,00	2,83	9,19					2,59	192,88
38	69.34.113 N	000.05.294 E	0				0,28												0,28
41	69.50.273 N	004.46.458 E	335	1,08	0,14		0,13		0,29	0,05	0,00		1,01				3,16	1,41	7,28
grand total				3,68	0,18	0,03	0,42	1356,21	0,86	0,40	0,60	3,99	394,75	3,30	0,80	419,25	3,91	4,00	2192,37

Annex 1 - Calibration report.

Transceiver Menu	
Frequency	38 kHz
Sound speed	1462 $m.s^{-1}$
Max. Power	2000 W
Equivalent two-way beam angle	-20.5 dB
Default Transducer Sv gain	25.17 dB
3 dB Beamwidth	6.8°
TS of sphere	-33.6 dB
Range to sphere in calibration	9.0 m
Measured NASC value for calibration	22100 m^2/nmi^2
Calibration factor for NASCs	1.00
Absorption coeff	6.862 dB/km
Log Menu	
Distance	1,0 n.mi. using GPS-speed
Operation Menu	
Ping interval	1 s
Analysis settings	
Bottom margin (backstep)	1.0 m
Integration start (absolute) depth	7 - 9 m
Range of thresholds used	-70 dB