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Report of the Planning Group on North Sea Cod and Plaice Egg Surveys in the North Sea (PGEGGS)

By Correspondence

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Executive summary

In 2009 a North Sea wide ichthyoplankton survey was conducted to sample cod and plaice eggs. In December and January the Southern North Sea and English Channel were sampled, whereas in February almost the entire North Sea was covered. In March only part of the southern North Sea could be sampled. A total of 1523 plankton samples and CTD measurements were collected over the entire period. The plankton samples are currently analysed for fish eggs and larvae.

As 2009 was the survey year the Planning Group on North Sea Cod and Plaice Egg Surveys in the North Sea [PGEGGS] worked by correspondence to review where and when sampling was carried out. Results of the survey will be discussed and reported at the 2010 meeting of PGEGGS.

The next meeting will be held at ICES secretariat in Copenhagen from 9–12 November, 2010.

1 Introduction

1.1 Terms of reference

The Planning Group on North Sea Cod and Plaice Egg Surveys in the North Sea [PGEGGS] (Chair: Cindy van Damme, the Netherlands) will meet by correspondence in 2009 to:

a) review where and when sampling was carried out;

PGEGGS will report by 15 August 2009 for the attention of SCICOM and TGISUR.

2 North Sea wide ichthyoplankton survey in 2009

In 2009 six countries participated in the North Sea wide ichthyoplankton survey for cod and plaice eggs. Only one country, Scotland, committed ship resources specifically for plankton sampling under PGEGGS (Table 2.1) whilst other countries made additional sampling under other running programs.

Table 2.1. Sampling undertaken in 2009 for PGEGGS.

	Sampling			
Country	**PGEGGS**	**Egg malformation**	**Additional IBTS sampling**	**IHLS Herring larvae survey**
Netherlands				15–18 December; southern North Sea and English Channel; Gulf VII
Germany				13–14 January; English Channel; Nackthai
Netherlands				19–22 January; southern North Sea and English Channel; Gulf VII
France			17 January to 13 February; Southern and Central North Sea and English Channel; CUFES, WP2	
Denmark			31 Janaury – 17 February; Central North Sea; Bongo	
Germany		27 February – 17 March; southern North Sea; Nackthai		
Scotland	20th February — 6 March: central and nothern North Sea; Gulf VII, Bongo			

	Sampling			
Country	**PGEGGS**	**Egg malformation**	**Additional IBTS sampling**	**IHLS Herring larvae survey**
Norway			8-21 February; central and northern North Sea; Gulf VII	

In December and January the southern North Sea and English Channel were covered by Germany and the Netherlands (Figures 2.1 and 2.2). In February almost the entire North Sea and English Channel were covered by France, Denmark, Norway and Scotland (Figure 2.3). Only 10 ICES rectangles in the central North Sea were not sampled in this period. In March part of the southern North Sea was covered by Germany (Figure 2.4).

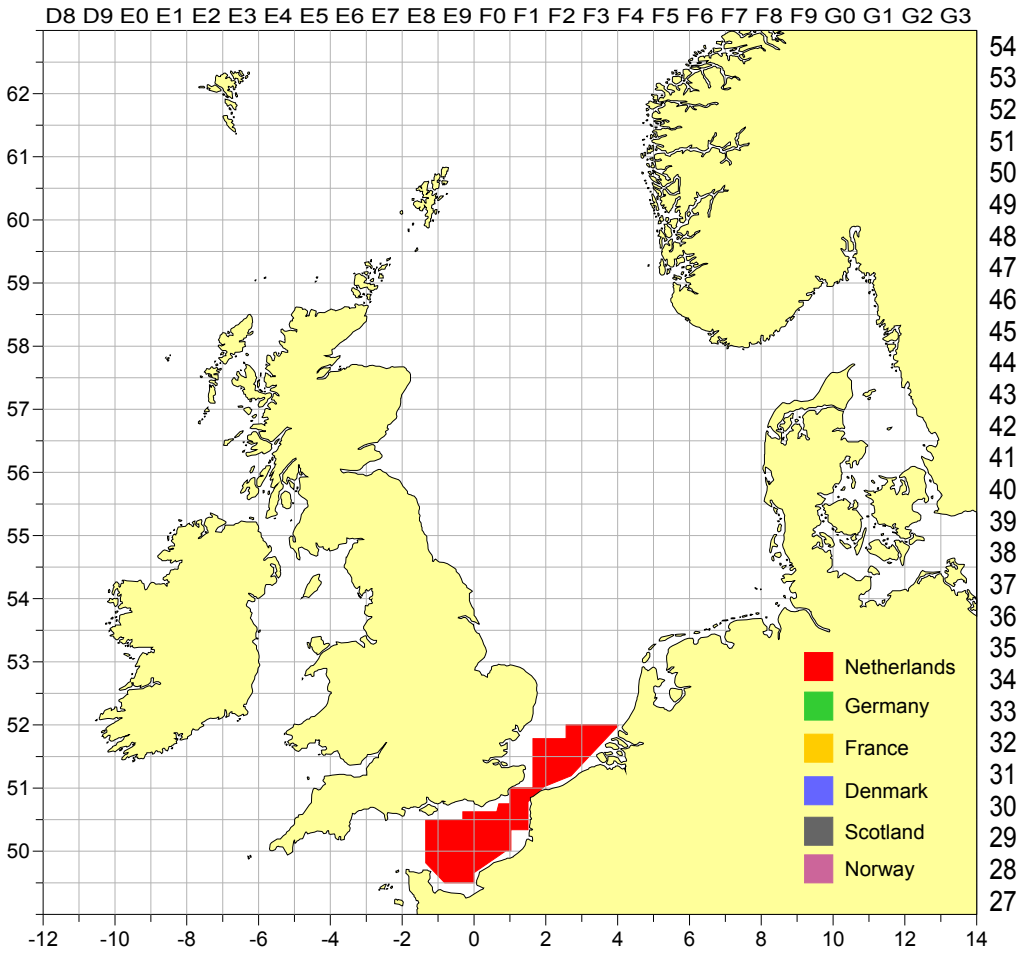

Figure 2.1. Cod and plaice eggs survey coverage in December 2008.

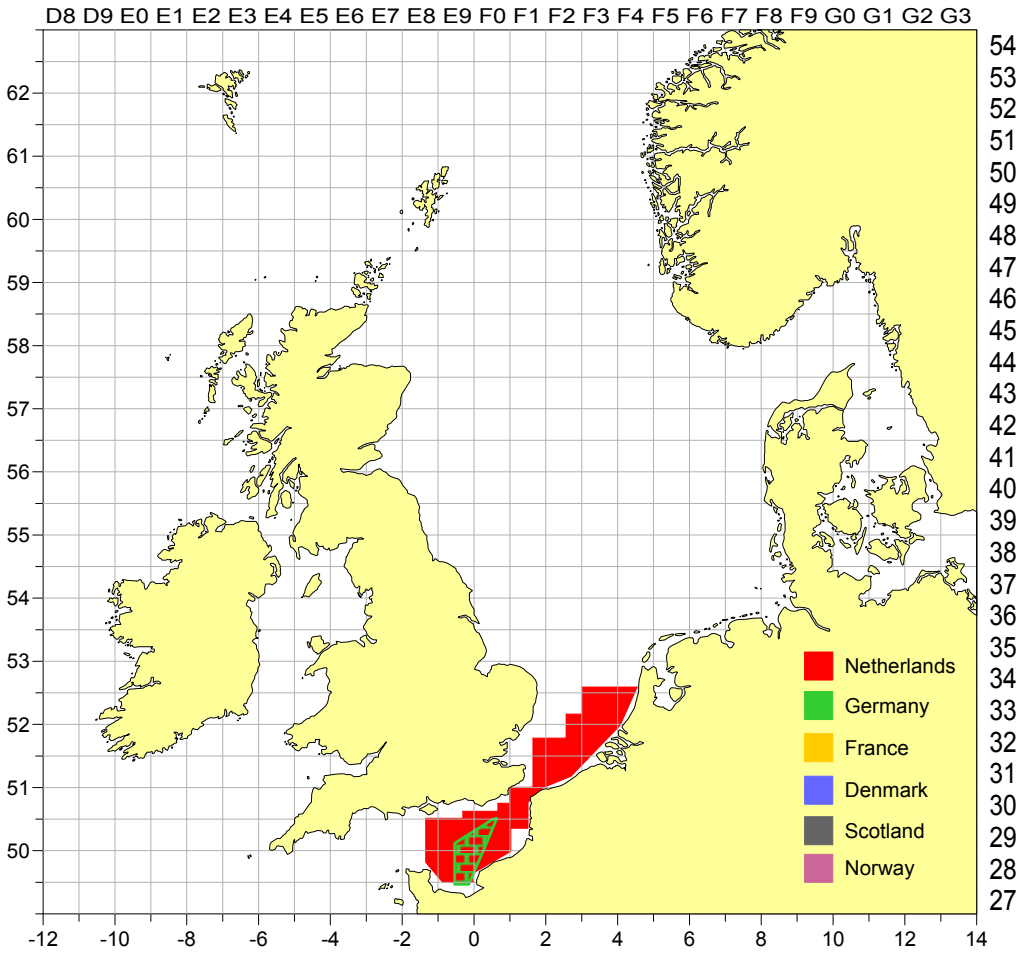

Figure 2.2. Cod and plaice eggs survey coverage in January 2009.

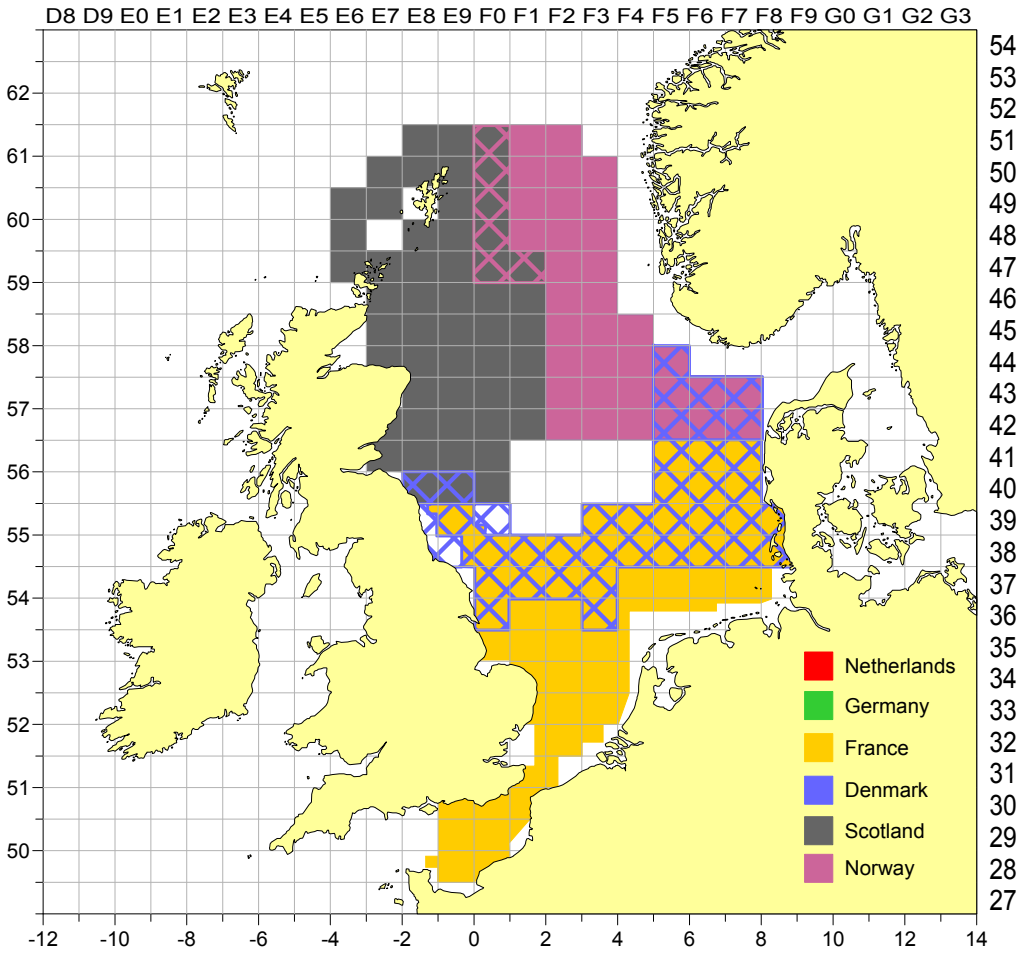

Figure 2.3. Cod and plaice eggs survey coverage in February 2009.

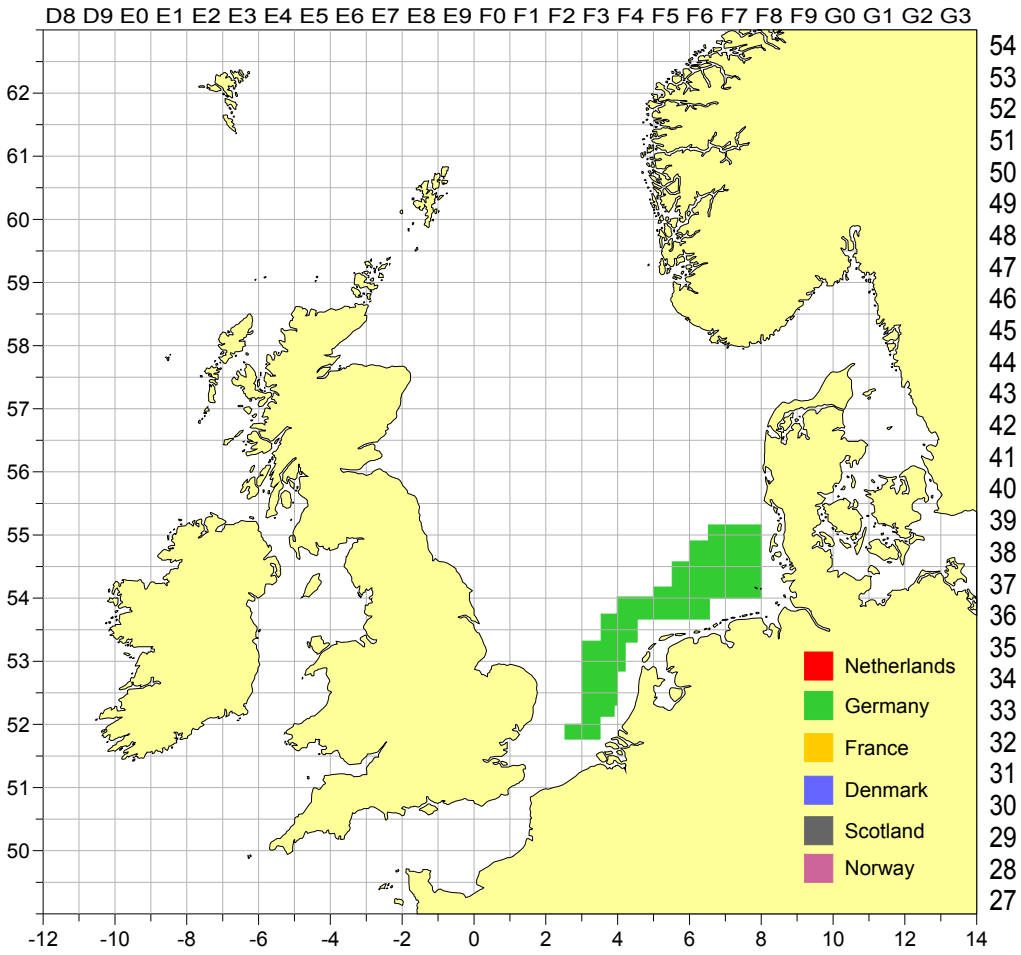

Figure 2.4. Cod and plaice eggs survey coverage in March 2009.

In total 1523 plankton samples were collected over the period December to March. All samples will be analysed for fish egg and larvae according to the agreed protocol (ICES, 2009). The remaining plankton will not be analysed because no one responded to our request for these data. In addition to plankton sampling CTD measurements were taken at all plankton stations. Also in February female cod were sampled for estimating fecundity and atresia.

Samples are currently worked up and results will be presented in the report of the PGEGGS meeting in 2010.

3 References

ICES. 2009. Report of the planning group on North Sea cod and plaice eggs surveys (PGEGGS). CM 2009/LRC: 01, 36 pp.

Annex 1: Individual survey reports

Survey report Dutch International Herring larvae surveys

December 2008 and January 2009

Survey

In December 2008 and January 2009 "Tridens" participated in international herring larvae surveys in the North Sea. The main goal of these surveys is the sampling of herring larvae in the southern North Sea and English Channel for assessing the herring spawning-stock biomass. A second objective was to sample fish eggs and larvae as part of the ICES coordinated PGEGGS surveys for plaice and cod eggs.

Survey members

Kees Bakker (survey leader)

André Dijkman-Dulkes

Harbours and dates

Scheveningen 15–12–2008	Scheveningen 18–12–2008
Scheveningen 19–1–2009	Scheveningen 22–1–2009

Fishing gear

Gulf VII sampler with a 280 μm net with an attached Seabird CTD and Valeport flowmeters.

Samples and data

December survey

78 plankton samples were collected.

A CTD profile through the water column was made at all stations.

January survey

83 plankton samples were collected.

A CTD profile through the water column was made at all stations.

Sampling and data

December survey

The "Tridens" left Scheveningen harbour on Monday 15 December at 11.30.

A total of 78 stations were sampled (Figure 1). The fishing speed was 5 knots/hour and the towing speed of the torpedo was such that every 10 m of the water column is sampled for 3 minutes. At each station a double-oblique tow was carried out.

The weather was OK and all planned stations could be sampled. A few stations with large numbers of larvae were found near the spawning areas north of the Seine Bay. All other stations no herring larvae were caught.

January survey

The "Tridens" left Scheveningen harbour on Monday 19 January at 11.00.

Due to the prospect of bad weather some northern stations were not sampled (Figure 2). The fishing speed was 5 knots/hour and the towing speed of the torpedo was such that every 10 m of the water column is sampled for 3 minutes. At each station a double-oblique tow was carried out.

Sampling was started in front of the entrance to Scheveningen harbour. In order to reach the southern area before the approaching bad weather some stations in the north were not sampled. At haul 24 the torpedo hit a ship wreck and was lost. Due to this unfortunate incident some time was lost, getting a new torpedo ready for sampling. 4 planned stations could not be sampled because of these circumstances. Lots of larvae were found throughout the area.

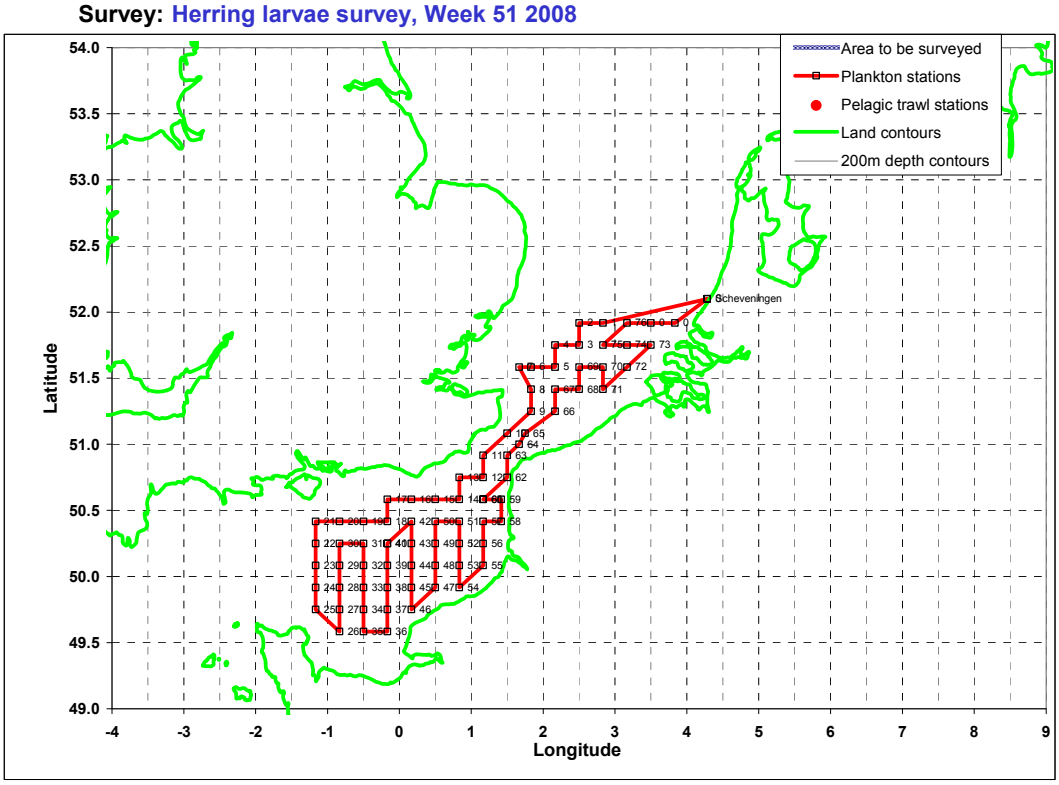

Figure 1. Herring larvae survey December 2008: Realised station grid.

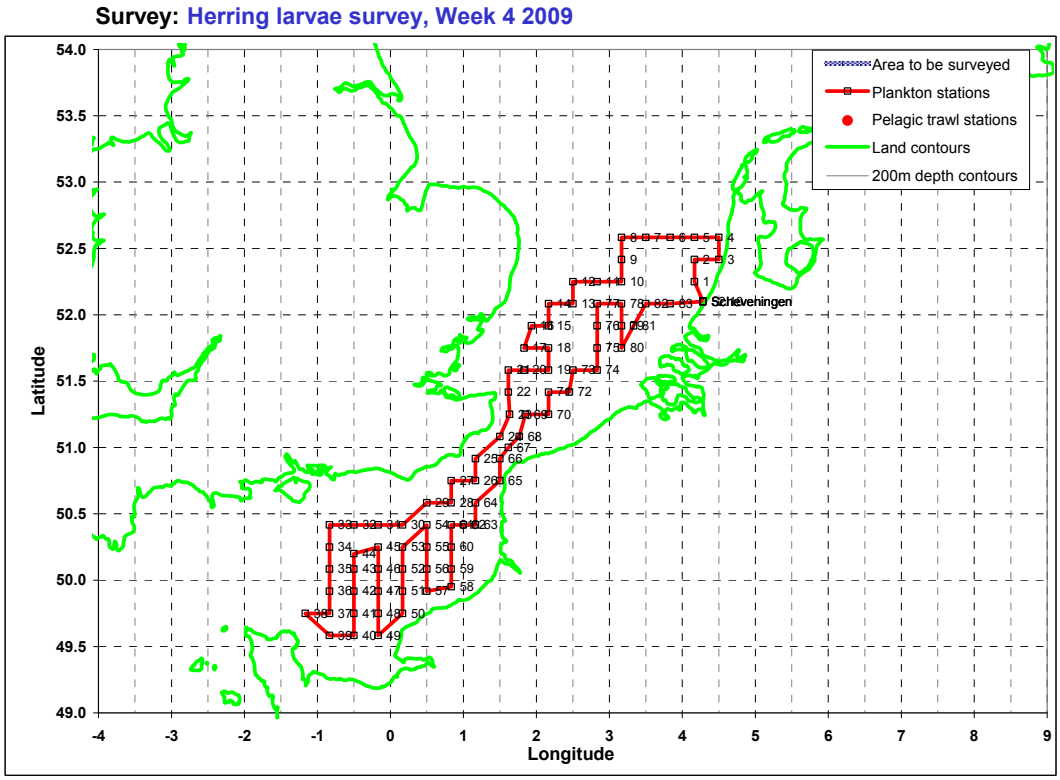

Figure 2. Herring larvae survey January 2009: Realised station grid.

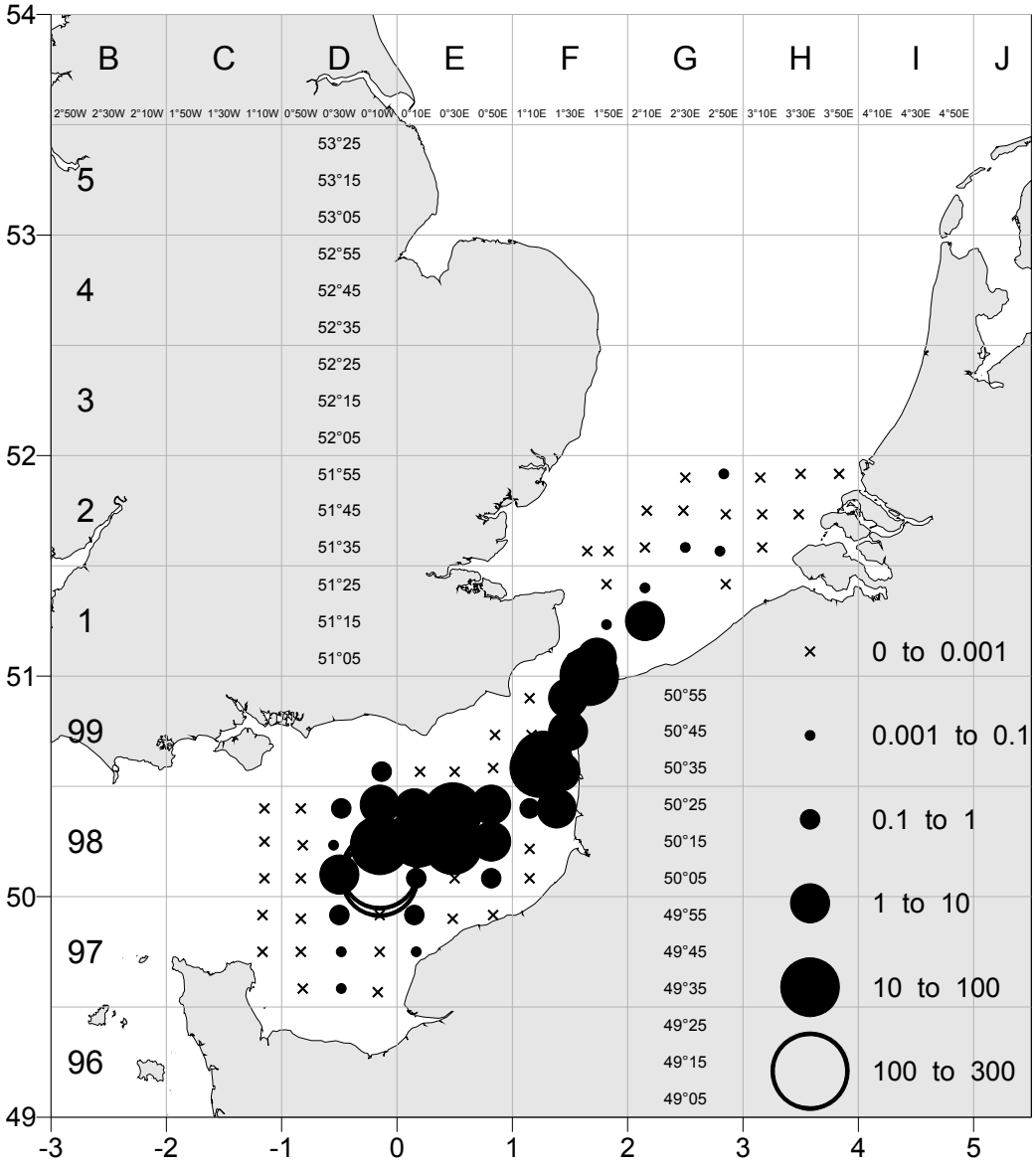

Figure 3. Number of herring larvae per m³ caught during the December 2008 survey.

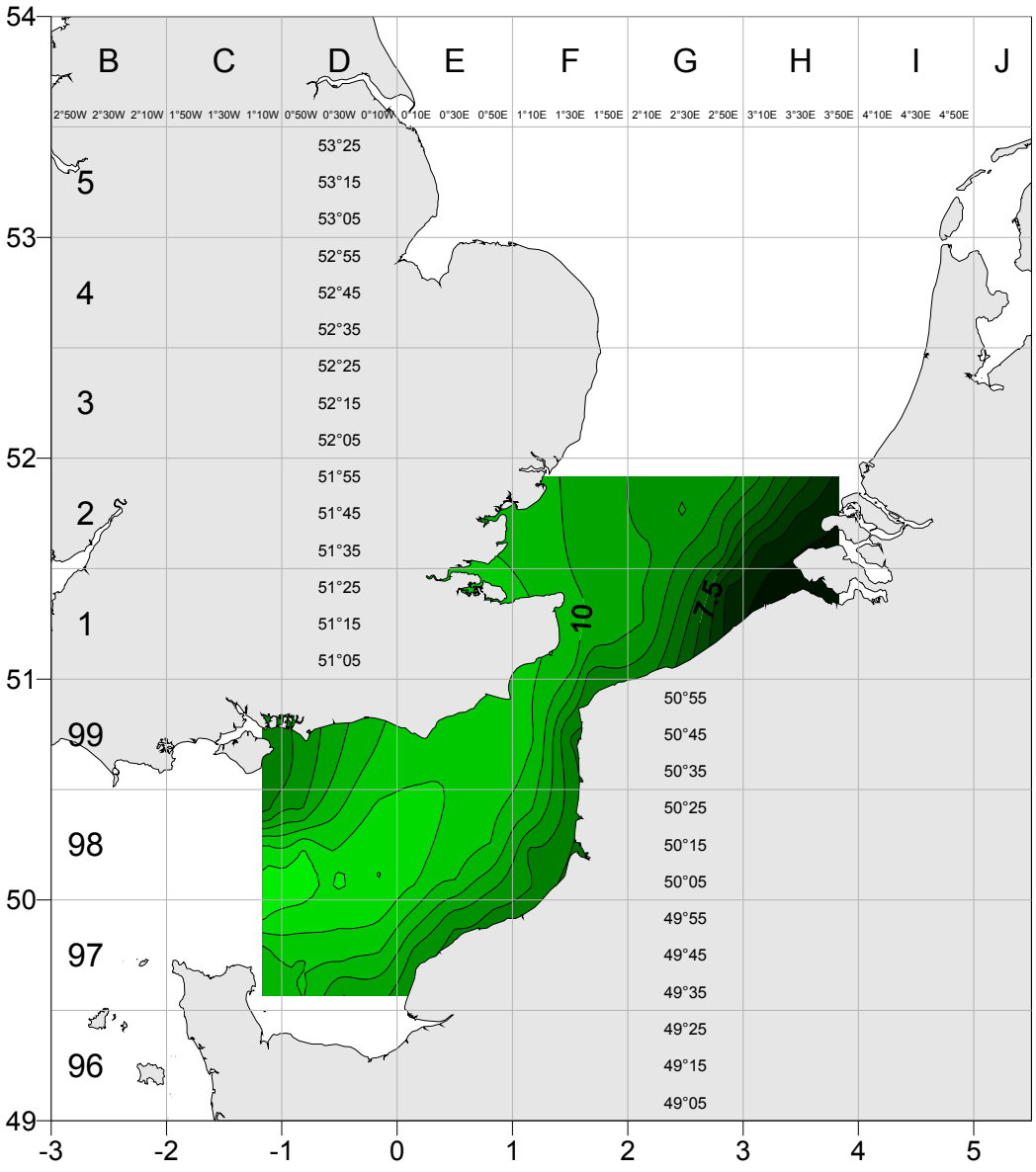

Figure 4. Bottom temperature measured during the December 2008 survey.

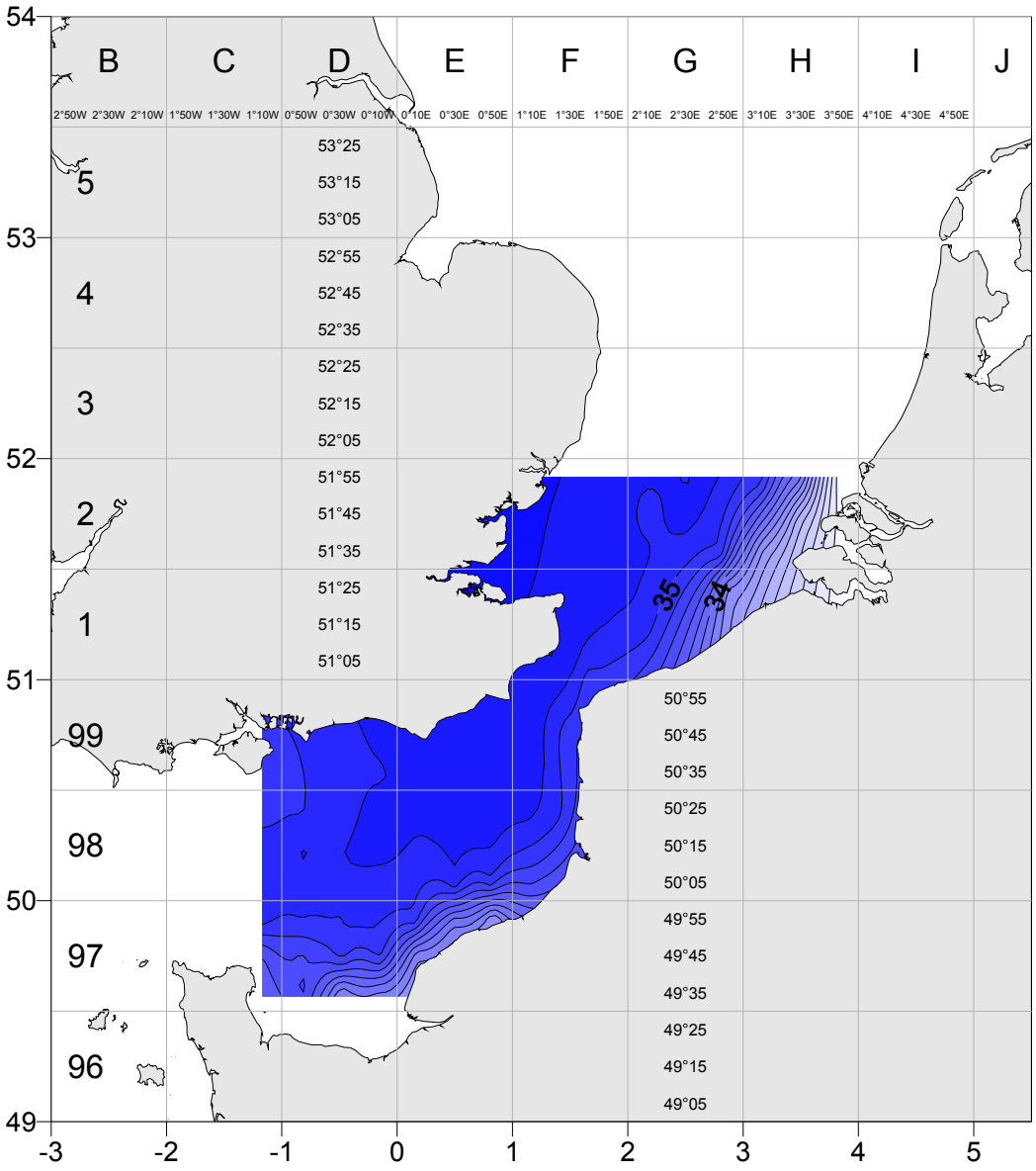

Figure 5. Bottom salinity measured during the December 2008 survey.

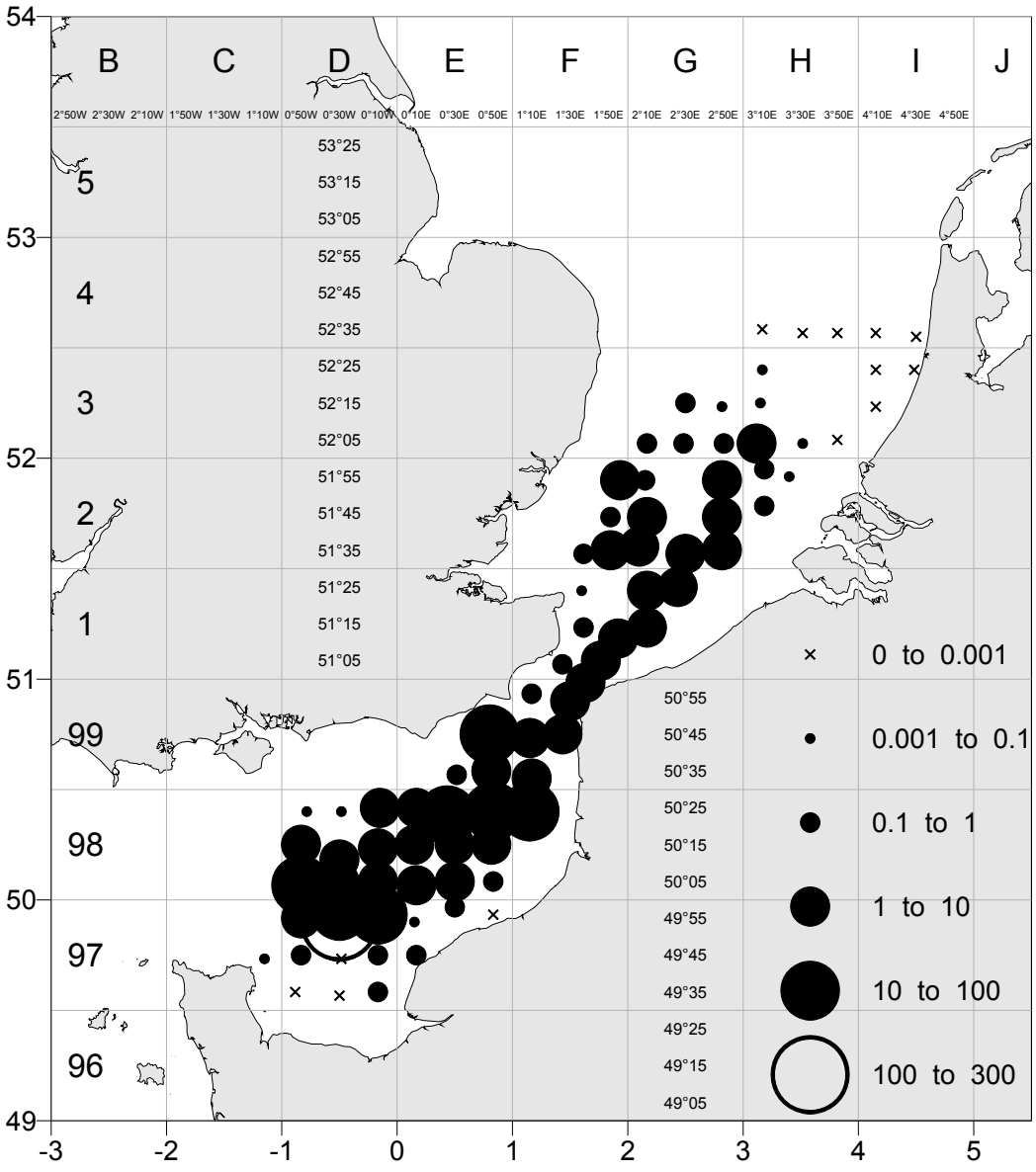

Figure 6. Number of herring larvae per m³ caught during the January 2009 survey.

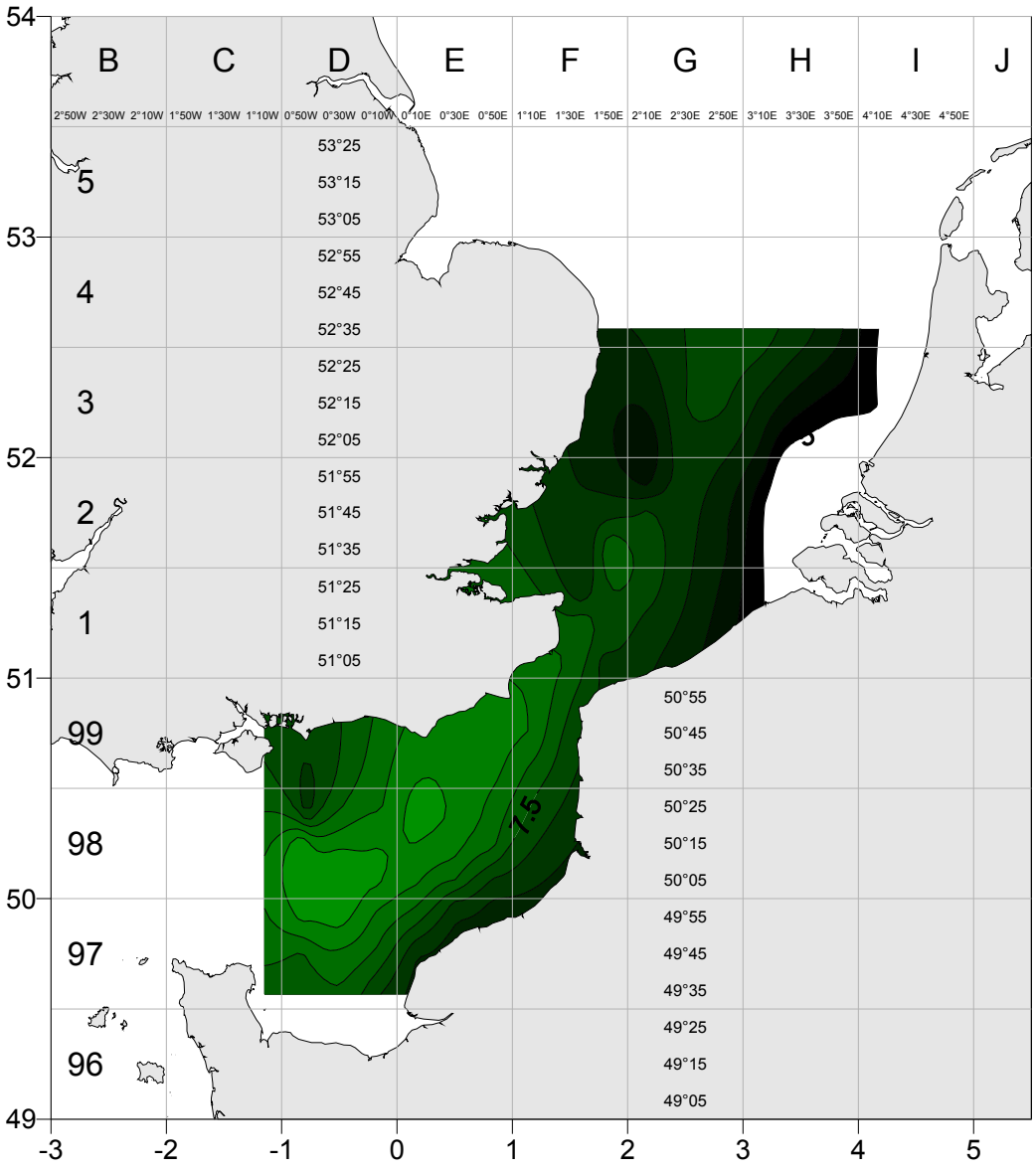

Figure 7. Bottom temperature measured during the January 2009 survey.

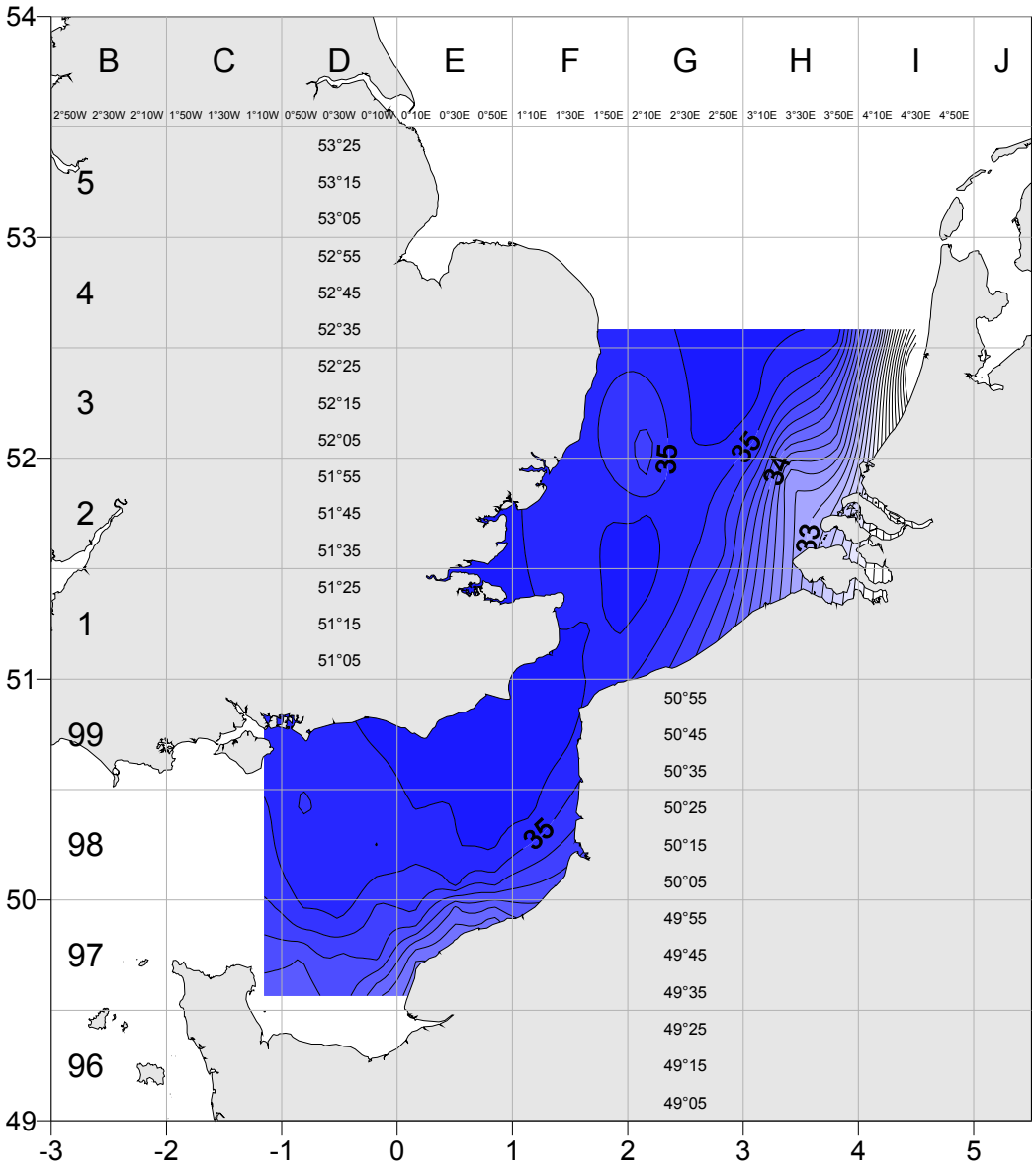

Figure 8. Bottom salinity measured during the January 2009 survey.

FRV "Walther Herwig III"

Cruise 318

5.1.–16.1.2009

German Small-scale Bottom Trawl Survey in the German Bight and International Herring Larvae Survey in the North Sea

Scientist in charge:

Cruise leg 1 - Dr Anne Sell

Cruise leg 2 – Dr Norbert Rohlf

Summary

As part of the German Small-scale Bottom Trawl Survey (GSBTS), the first leg of WH 318 continued the long-term investigation of winter bottom fish assemblages through sampling of the standard area of investigation „Box A", in the German Bight. Within the 10-by-10 nautical mile area, the small-scale survey with a GOV bottom trawl was accompanied by monitoring of the benthic epifauna with a 2-m beam trawl. In addition, sediment and nutrient samples were taken, as well as hydrographic profiles.

The second part of the cruise monitored the abundance and distribution of herring larvae on the spawning grounds in the southern North Sea and the English Channel. The survey was part of the German contribution to the international herring larvae surveys (IHLS). The results are used as an important estimator of autumn spawning herring stock biomass in the North Sea and thus provide valuable information for herring stock assessment and the fixation of fishing quotas.

2. Research programme

2.1 Monitoring (vTI-SF)

22 GOV hauls were taken to qualitatively and quantitatively analyse the development of abundance and diversity in the bottom fish assemblages. Methods are in accordance with the International Bottom Trawl Survey, in order to allow comparison of results between the two surveys. Epibenthos sampling with a 2-m beam trawl complemented the GOV hauls in order to allow simultaneous investigations of benthic invertebrates and bottom fish.

2.2 Measurement of relevant environmental parameters (vTI-SF, University of Hamburg)

17 temperature and salinity profiles were taken with a Seabird CTD, and on 5 stations, additional water samples were obtained with a rosette sampler for nutrient analyses at the University of Hamburg.

2.3 Epibenthos (Senckenberg Research Institute; Wilhelmshaven)

The 2-m beam trawl for the sampling of epibenthos had a mesh size of 20 x 20 mm in the main net and 4 x 4 mm in the codend and was applied with 5-min towing duration at 1.5 knots. Samples were sieved over 5 and 2 mm, before the > 5-mm fraction was sorted on board, and the 2–5 mm fraction preserved in 4-% formaldehyde for later analyses in the laboratory. Sediment samples were taken with a van Veen-grab

(0.1 m²) for the analysis of sediment composition and benthic infauna, the latter in relation to investigations of fish stomach contents. In total, 12 (11 valid) beam trawl hauls and 12 grab samples were obtained.

2.4 Herring larvae survey

The second cruise leg was part of the International Herring Larvae Surveys (IHLS). Within the scope of the International Council for the Exploration of the Sea (ICES) since 1972 a continuous research on distribution and abundance of herring larvae has been undertaken in the North Sea and adjacent waters. The main herring spawning grounds in the North Sea are object to this annual survey programme which is known as the "International Herring Larvae Surveys in the North Sea" (IHLS). Almost all countries surrounding the North Sea have participated in the history of the IHLS, whereas in recent years the Netherlands and Germany contribute most to the surveys.

The results of the surveys are used as an important estimator of herring spawning-stock biomass and thus are of value for the stock assessment and the fixation of fishing quotas.

For some reason available time at sea had to be shortening during the cruise, so the planned area could not be covered completely. Instead, we concentrated in an area which is traditionally well known to contain larger quantities of herring larvae. Here we made 21 plankton tows in total, from which fish larvae were sorted and measured. Physical measurements were conducted via a CTD mounted directly onto the gulf sampler. Sampling was achieved according to the manual of the herring larvae surveys.

3. Narrative

Due to a winch failure, the "Walther Herwig III" could depart from Bremerhaven only in the morning of January 6, instead of 01/05. During the afternoon of 01/06, the ship reached the investigation area in Box A and sampled the first two stations. Between 01/07 and 01/09, the programme could be completed as planned for Box A, but the crew exchange and start of the second leg had to be moved from to the 9th to the 10–11 January. In total, 23 randomly assigned stations were fished, 22 of those with the GOV:

Leg 1					
Number of stations	**GOV**	**2-m Beam trawl**	**Hydrography**	**Nutrients**	**Sediment + Infauna**
11	**X**	**X**	**X**	**X**	**X**
5	**X**		**X**		
6	**X**				
1		**X**	**X**	**X**	**X**

The second cruise leg started on Sunday, 11th of January, after it had to be postponed by one day due to the exchange of an injured crew member. Unfortunately, the air high-pressure area started to collapse the same day and weather conditions changed rapidly. Thus steaming into the investigation area had to be done against strong winds and waves. Consequently, the passage took one day longer than expected.

Having made 21 hauls in the English Channel, FFV "Walther Herwig III" steamed back to Bremerhaven during January, 15th and finished cruise 318 in the morning of the 16th.

4. Preliminary results

4.1 Bottom fish (SF - vTI)

The mean total catch of all bottom fish in Box A amounted to 94 kg per 30-min haul, which was equal t 2008 values and again considerably higher than 2007 (ca. 50 kg), although only ca. 2/3 of the catches in the preceding years. Apart from the two pelagic species herring (*Clupea harengus*) and sprat (*Sprattus sprattus*), dab (*Limanda limanda*) dominated the catches with on average 20 kg/ haul. Yet, dab did not reach the biomass of the early 2000's when it often exceeded 50 kg/ haul (Figure 2). Cod (*Gadus morhua*), plaice (*Pleuronectes platessa*) and flounder (*Platichthys flesus*) were caught with on average between 2.9 and 4.4 kg/ haul. Whiting abundance in 2009 was only about 20% of the 2008 abundance. Within the non-commercial fish species, the species assemblage had shifted between 2008 and 2009. The potential reasons are currently being investigated.

4.2 Epibenthos (Senckenberg, Wilhelmshaven)

12 beam trawl hauls and 12 van Veen grab samples were taken in Box A. The sediment consisted of muddy fine sand. The epifauna in Box A was dominated by large numbers of juvenile starfish, *Asterias rubens*. Solenette (*Buglossidium luteum) and gobies* (*Pomatoschistus minutus*) were the most abundant fish species in the 2-m beam trawl. In comparison to the preceding years, fewer shrimp (*Crangon* spp.) and swimming crabs (*Liocarcinus holsatus*) were caught. As in 2008, the brittlestar *Ophiura albida*, which was very abundant from 1998–2001, was almost absent from Box A.

The infauna in Box A was characterized by the presence of the polychaete worm *Magelona* spp., nematods and copepods. In addition, a high abundance of juvenile bivalves and very large numbers (> 1000 individuals per haul at station 13) of the worm *Phoronis* spp. occurred.

4.3 Ichthyoplankton (vTI-SF)

In total, 6420 herring larvae were caught in the 21 plankton tows. Sampling positions and spatial distribution of herring larvae is given in Figure 3. Herring larvae length–frequency is shown in Figure 4. Almost 60% of the caught herring larvae were in the relevant size range for the SSB index estimation (< 11 mm TL).

5. Participants

Name Institution Function

Cruise leg 1

1) Dr Anne Sell vTI-SF Cruise leader, hydrography
2) Hermann Neumann Senckenberg Res. Inst. Benthology
3) Dr Norbert Rohlf vTI-SF Fisheries biology
4) Dr Gerold Rahmann vTI-OEL Fisheries biology
5) Dr Ingo Naberhaus BfN Fisheries biology
6) Christine Pedersen-Frey Juhas vTI-SF Fish. biol., data management
7) Piet Linde vTI-SF Fisheries biology
8) Maik Tiedemann vTI-SF Fisheries biology
9) Christoph Deeg vTI-SF (Intern) Fisheries biology
10) Sabine Schückel Senckenberg Res. Inst. Fisheries biology, benthology
11) Ulrike Schückel Senckenberg Res. Inst. Benthology

Cruise leg 2

1) Dr Norbert Rohlf vTI-SF Cruise leader
2) Annika Elsheimer vTI-SF Fisheries biology
3) Piet Linde vTI-SF Fisheries biology
4) Maik Tiedemann vTI-SF Fisheries biology
5) Christoph Deeg vTI-SF (Intern) Fisheries biology

6. Acknowledgements

We would like to thank Captain Jürgen Vandrei and his crew for their helpful support and cooperation. Thanks go to the scientific crew for their care and interest and to all participants for their effort to compensate lack of manpower due to illnesses.

Dr Norbert Rohlf and Dr Anne Sell, cruise leaders

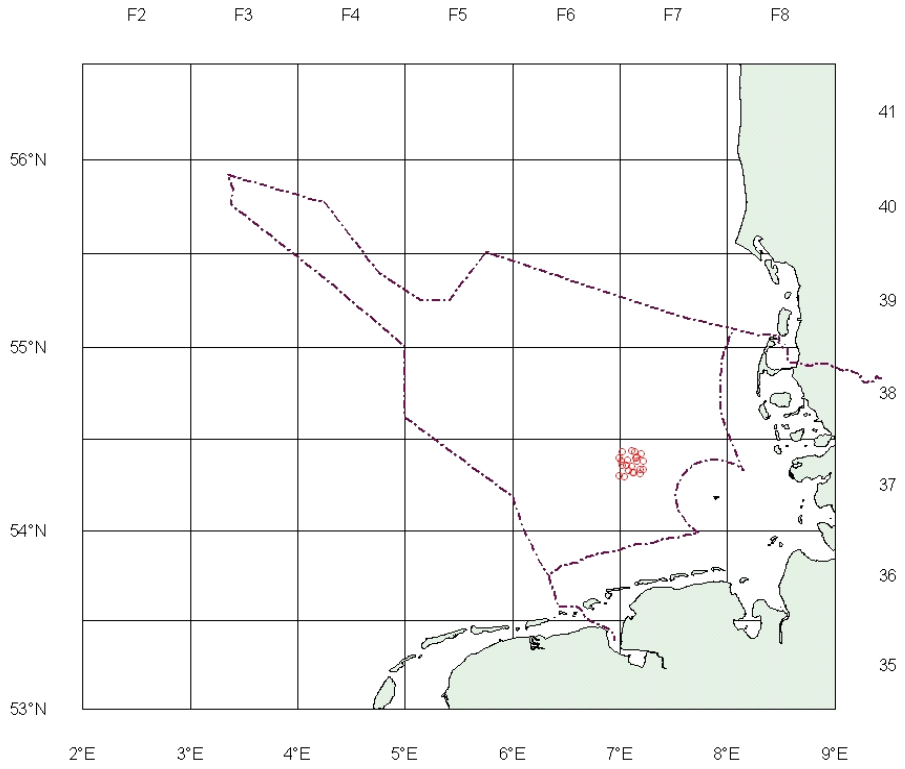

Figure 1. Trawl positions (red dots) in Box A in the German exclusive economic zone (EEZ).

IBTS 2009 – IFREMER, France

1. General overview

The North Sea IBTS Q1 survey aims to collect data on the distribution, relative abundance and biological information on a range of fish species in ICES area IIIa and IV and VIId and to obtain annual forecasts of recruitment of the various commercial fish species of the North Sea. These estimates are used by ICES working groups to assess theses various stocks, and to propose management measures for the following year. Seven countries bordering the North Sea contribute to the "International Bottom Trawl Survey" program which has been initiated in the 1970's: The Netherlands, Germany, Denmark, Norway, Sweden, UK (England and Scotland) and France. This program is coordinated by the International Council for Exploration of the Sea (ICES).

France has been participated to this program since 1976 and samples each year the southern part of the North Sea in January/February.

For several years, additional works are carried out during the French IBTS survey. For example, the CUFES device (Continuous Underwater Fish Eggs Sampling) is deployed since 2006 during all the survey in order to study the fish spawning areas.

2. IBTS 2009

Dates:

14/01: Brest - Echo sounders calibration (ER60 and EM70) in Bay of Douarnenez.

15 and 16/1: Cherbourg

17 – 22/01: Works in the English Channel

- Acoustic transects (single and multi beam Echo sounders)
- Bottom hauls (GOV.
- CUFES,
- MIK stations

23 – 30/1: Works in the central and Western part of the North Sea

- Acoustic records (single beam Echo sounder)
- Bottom hauls (GOV.
- CUFES,
- MIK stations

31/01: IJmuiden

01 – 12/02: Works in the central and Eastern part of the North Sea

- Acoustic records (single beam Echo sounder)
- Bottom hauls (GOV.
- CUFES,
- MIK stations

13/02: Boulogne sur mer. End of Survey

3. Continuous Fish eggs sampler – Preliminary results

During the survey the CUFES (Figure 1) was carried out day and night and samples were taken every 30 minutes. Figure 2 shows the way followed by the ship and the eggs samples collected. At the total, 1 103 samples were taken and eggs were sorted on board.

After the survey samples are identified at the laboratory.

More 600 samples were already analysed, scanned with the zooscan device and counted by stage. The main species found are: whiting, cod, plaice (stage 1A, 1B, 2, 3, 4, 5) and dab, flounder, American plaice, rocklings sp., (stage 1, 2, 3+).

Scarce species: common sole, brill.

Figure 1. The Continuous Underwater Fish Eggs Sampler.

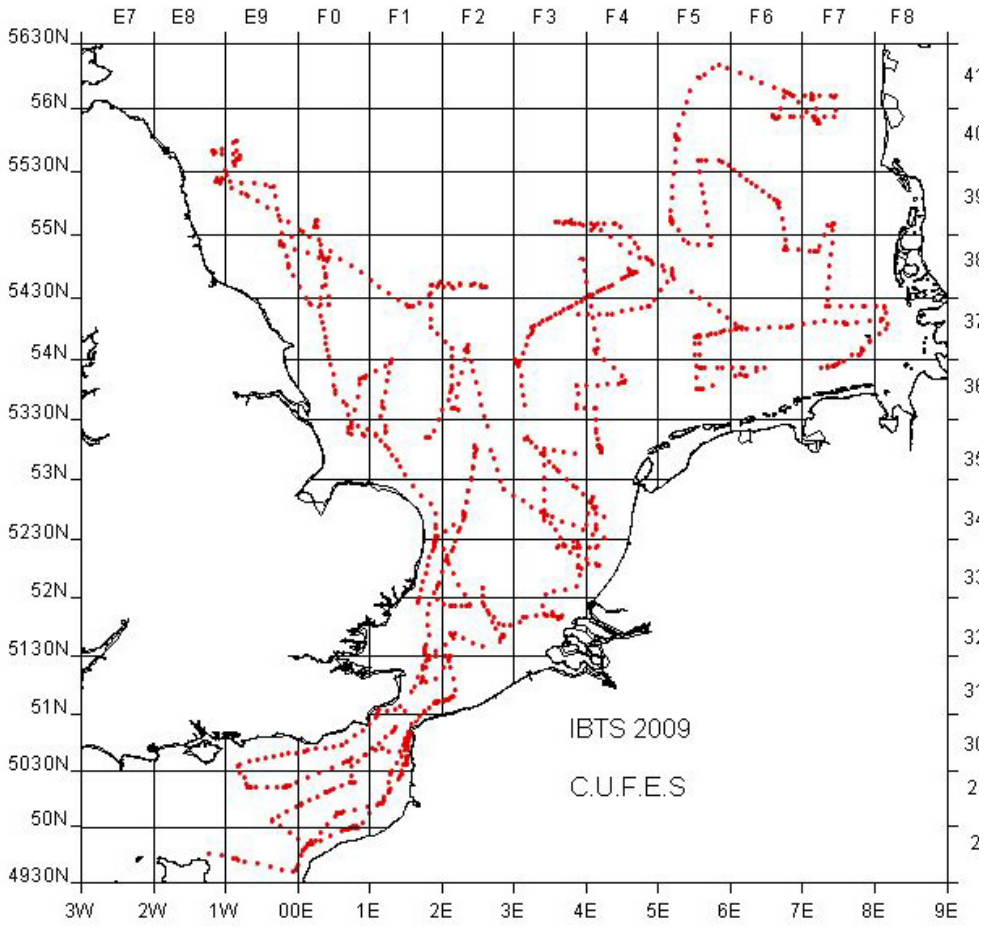

Figure 2. IBTS 2009 – Position of CUFES samples.

IBTS – Cruise, 31 January to 17 February, 2009, RV "Dana" (Denmark)

Bongo – Sampling PGEGGS

Cruise and participants

The cruise with RV "Dana" took place from 31 January to 17 February 2009, in two legs.

Leg 1: Hirtshals – Esbjerg 31 January to 9 February

Participants: Aage Thaarup/Helle Rasmussen, togtleder DTU
Niels Jørgen Pihl, DTU (MIK)
Reinhardt Jensen DTU Fiskelab
Tommy Henriksen DTU Fiskelab
Tom Svoldgaard DTU Fiskelab
Hannes Höffle DTU (bongo)
Zeren Gürkan (Guest)

Leg 2: Esbjerg – Hirtshals 9 January to 17 February

Participants: Kai Wieland, togtleder DTU
Niels Jørgen Pihl, DTU (MIK)
Lise Sindahl, DTU Fiskelab
Tom Svoldgaard, DTU Fiskelab
Gert Holst, DTU Fiskelab
Dirk Tijsen Fiskelab
Hannes Höffle DTU (bongo)

Sampling was requested for the central/southern North Sea in a roughly U-shaped corridor between Denmark and the north of England (Figure 1). The sampling area overlapped with the French sampling area and in the Northeast with the Norwegian sampling area. The cruise was planned with two extra days as a buffer and for additional Bongo Hauls. These days were used up due to bad weather.

The overall objective was to determine the distribution and abundance of gadoid and plaice eggs in the central/southern North Sea. Additionally the progress of the spawning season for Cod (*Gadus morhua)* was to be determined by sampling ovaries.

Methods

Cod ovaries were sampled during the dayshift in conjunction with trawling for adult fish. Plankton sampling took place during the nightshift in conjunction with the MIK ringnet hauls for herring larvae. Plankton sampling was done using a Bongo net, with mesh sizes of 500 µm and 330 µm. A Seascan depth sounder and a Seabird-MicroCAT – CTD were lashed to the towing cable in front and above the frame. The CTD was left to run continuously and was read out and reset every third day of the cruise.

Flow meters were attached across the openings of both nets and read out before and after each tow. Samples were taken in double oblique trawls of ca. 10 minutes duration with the cable paid out at a speed of 0.4 ms^{-1} and hauled in at 0.25 ms^{-1}. Ship speeds varied between 2.5 and 3 knots, depending on the weather. In shallow waters the gear was paid out and hauled in between two and a maximum four times in order to sample for sufficient time. Samples from the 500 μm net were sieved through a 200 μm sieve then preserved in 96% Ethanol; the 330 μm samples were fixed in 4% BORAX buffered Formol/Seawater Solution. At stations where sampling for single eggs was requested the 330 μm sample was filtered into seawater and put on ice. It was then checked under a binocular for the presence of Cod-like eggs, which were then measured, staged and put into single vials. The rest of the sample was then preserved in Formol/Seawater. As the time between sampling stations was limited, not every sample could be thoroughly checked.

The cod ovaries were either preserved as a whole or if they were too big, a slice was cut out for preservation. The ovary samples were then staged after a simple four stage scale (immature, maturing, spawning, and spent) and fixed in 4% Formol/Seawater (BORAX buffered).

Samples available

Cod ovaries

A total of 35 Cod ovaries was sampled, the majority of which were in an immature state. The few fish in a Spawning state were mostly taken towards the end of the cruise northwest of Jutland.

Plankton samples

In total 68 stations were sampled, except the last two only during the night (Figure 1; Table 1). Usually one Bongo Haul per MIK-trawl was conducted, but time constrictions prevented this in parts of the area, were only one haul in each ICES square was done.

Generally the abundance of adult Cod as well as Cod eggs was very low. The eggs found were mostly in the earliest stage indicating that the spawning season of Cod has not much progressed yet. Plaice seemed to be well into the spawning season with eggs distributed over all stage but still the most in stage IA.

Up to now 35 samples from the 330 μm net were examined. Many eggs belonged to gadoids and plaice; other eggs were under the size limit for gadoid eggs and were grouped as Small eggs. Other identifiable species were *Hippoglossoides platessoides* and *Trigla lucerna*. The highest abundances of eggs were found south of the Dogger Bank as was the case in the 2004 survey (Figure 2).

Analysis of the 330 μm samples is at present continuing and will be finished around the end of July.

Table 1. Information about Bongo sample stations during the Danish IBTS 1Q 2009 cruise.

BONGOHAUL							
Area of Bongo net opening:				0.28 m^2			
Revolutions per Meter:				33.00			
Station Number	Bongo Haul	Date dd.mm.yy	Time start UTC	A-Volume filtered (m^3)	B-Volume filtered (m^3)	average Volume (m^3)	ICES Square
12007	1	31.01.09	0023	370	364	367	**42F7**
12010	2	31.01.09	0216	292	278	285	**42F6**
12012	3	31.01.09	0358	588	591	590	**42F6**
12014	4	31.01.09	0605	323	287	305	**43F6**
12022	5	31.01.09	2000	413	348	380	**41F7**
12025	6	31.01.09	2056	240	229	234	**41F7**
12027	7	31.01.09	2228	354	350	352	**40F7**
12029	8	01.02.09	0010	346	280	313	**40F7**
12031	9	01.02.09	0150	384	439	412	**40F6**
12033	10	01.02.09	0335	416	162	289	**41F6**
12036	11	01.02.09	0555	460	466	463	**41F6**
12045	12	01.02.09	1933	195	189	192	**40F6**
12054	13	03.02.09	1833	328	323	325	**38F5**
12056	14	03.02.09	1902	229	223	226	**38F4**
12058	15	03.02.09	2033	353	345	349	**39F4**
12060	16	03.02.09	2207	256	252	254	**39F4**
12062	17	03.02.09	2332	430	420	425	**39F3**
12064	18	04.02.09	0100	424	413	419	**39F3**
12066	19	04.02.09	0305	455	454	454	**38F4**
12068	20	04.02.09	0605	268	261	265	**38F4**
12076	21	04.02.09	2016	322	308	315	**38F3**
12078	22	04.02.09	2325	173	168	171	**37F2**
12080	23	05.02.09	0013	419	424	421	**37F3**
12082	24	05.02.09	0200	446	442	444	**37F3**
12084	25	05.02.09	0333	295	272	283	**36F3**
12086	26	05.02.09	0504	174	173	174	**36F3**
12095	27	05.02.09	1733	423	420	422	**37F2**
12097	28	05.02.09	1957	541	540	540	**37F1**
12099	29	05.02.09	2141	360	354	357	**37F1**
12101	30	05.02.09	2315	435	429	432	**37F0**
12103	31	06.02.09	0055	367	360	363	**37F0**
12105	32	06.02.09	0245	188	307	248	**36F0**
12107	33	06.02.09	0456	218	211	215	**36F0**
12116	34	06.02.09	1730	207	203	205	**38F1**
12118	35	06.02.09	1855	286	283	284	**38F1**
12120	36	06.02.09	2027	337	330	334	**38F2**
12122	37	06.02.09	2202	374	379	376	**38F2**
12124	38	07.02.09	0714	267	268	268	**39F5**
12133	39	07.02.09	1904	275	270	273	**40F5**
12135	40	07.02.09	2032	245	249	247	**40F5**
12137	41	07.02.09	2211	299	293	296	**39F5**
12139	42	08.02.09	0043	296	296	296	**39F6**
12141	43	08.02.09	0121	343	340	342	**38F5**
12143	44	08.02.09	0259	344	329	336	**39F6**
12145	45	08.02.09	0511	103	327	215	**39F6**
12153	46	09.02.09	1825	160	252	206	**39F8**
12156	47	09.02.09	2025	226	366	296	**39F7**
12159	48	09.02.09	2335	253	240	247	**37F7**
12162	49	10.02.2009	0215	233	224	229	**38F8**
12172	50	10.02.2009	1733	234	233	233	**38F6**
12180	51	11.02.2009	1842	586	578	582	**38F0**
12184	52	11.02.09	2227	475	470	472	**39F0**
12187	53	12.02.09	0142	123	367	245	**39E9**
12197	54	12.02.09	1832	372	603	488	**38E9**
12201	55	12.02.09	2150	852	845	848	**39E8**
12204	56	13.02.09	0054	383	374	378	**40E8**
12208	57	13.02.09	0515	653	636	645	**40E9**
12221	58	14.02.09	1759	400	396	398	**41F5**
12223	59	14.02.09	1938	326	319	323	**41F5**
12225	60	14.02.09	2114	398	387	392	**42F5**
12227	61	14.02.09	2251	418	410	414	**42F5**
12229	62	15.02.09	0025	328	279	303	**43F5**
12231	63	15.02.09	0157	240	305	273	**43F5**
12233	64	15.02.09	0442	598	517	558	**43F6**
12243	65	15.02.09	1954	5	687	346	**44F5**
12245	66	15.02.09	2147	30	604	317	**44F5**
12249	67	16.2.09	0650	32	270	151	**42F7**
12250	68	16.2.09	0832	270	262	266	**43F7**

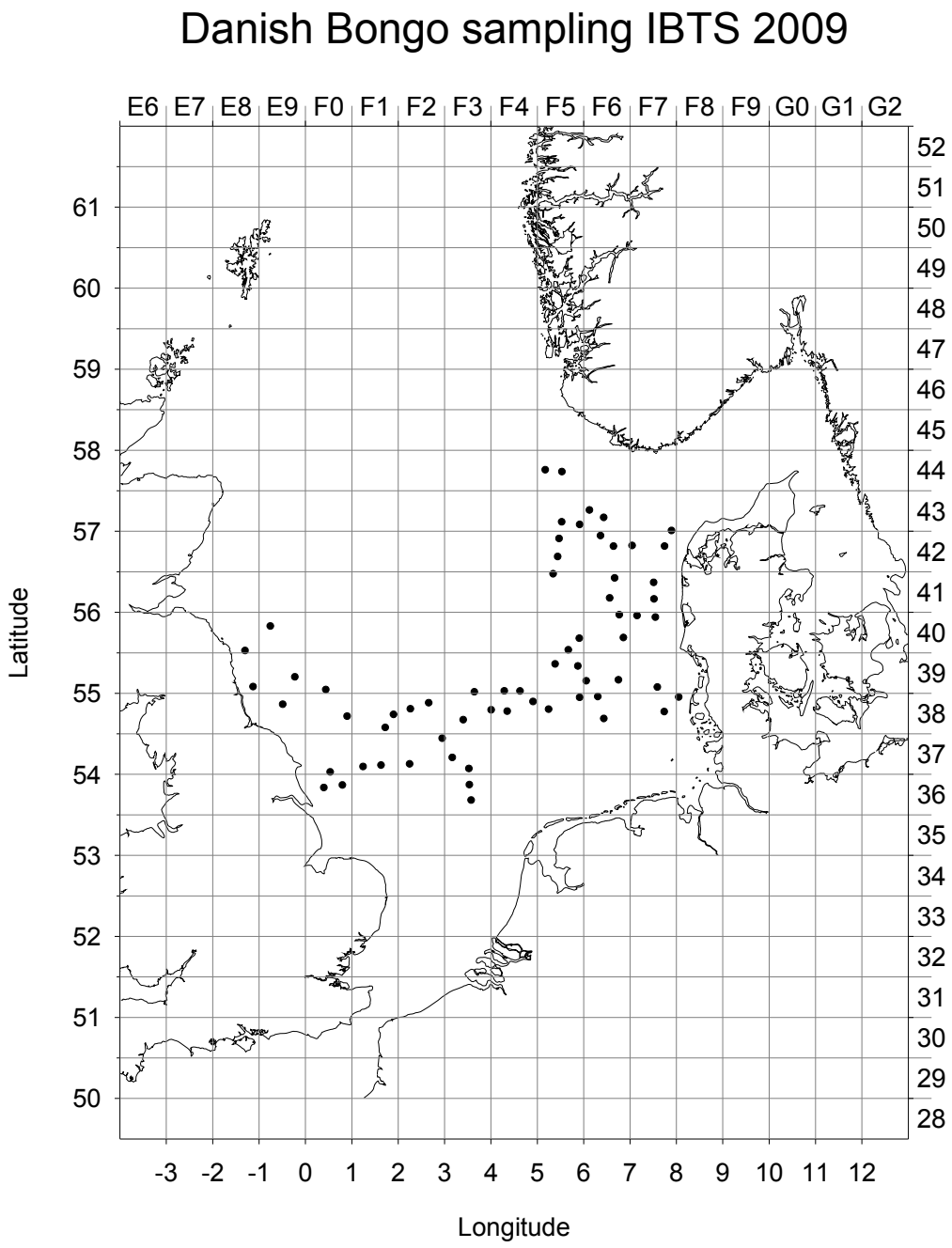

Figure 1. Sampling stations of the Danish Bongo samples.

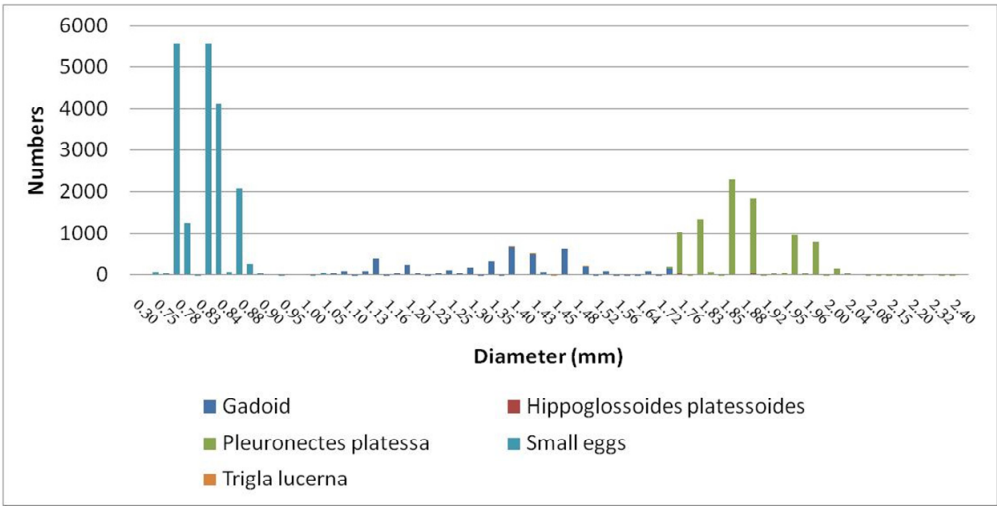

Figure 2. Size distribution of eggs from the Bongo Hauls 1–35.

Not to be cited without prior reference to FRS Marine Laboratory, Aberdeen

FRV Scotia

Cruise 0309S

REPORT

20 February – 6 March 2009

Ports

Loading: Aberdeen, 17 February 2009

Unloading: Aberdeen, 6 March 2009

Personnel

Peter Wright (SIC 20 February – 3 March)

Iain Gibb (20–25 February)

Francis Neat (SIC 3–6 March)

Martha O'Sullivan

Julian Augley

Dorota Demain

Declan Tobin (University of Aberdeen)

Alastair Cook (CEFAS)

Project: MF760 – 15 days

Fishing Gear

BT186 trawl with 20mm blinder

SCANMAR

Other Equipment

40 cm Bongo 350μm nets (x2)

Gulf VII plankton nets (x2)

Bongo (x1) and Scripps (x2) depressors

Minilogger and data storage tags

4 fish tanks

Seabird 19 CTD

Objectives

To conduct an ichthyoplankton survey of the northwest North Sea. This survey will form part of the ICES coordinated PGEGGS 2009 survey.

- To biologically sample all cod (whiting and haddock from two areas) for length, sex and maturity. Otoliths, genetic samples and ovary sections will be extracted at sea and preserved in vials for later analysis.
- To tag spawning cod from one area for investigations of their movements. Tagging will involve both conventional and data storage tags.
- To screen cod for haemoglobin types from a coastal and offshore site.
- To sample male cod for the CODEND project.

Days Per Project: 15 days MF760

Narrative

Scotia departed from Aberdeen at 10:00h on 20 February heading east and after a trial deployment of the new Bongo gear began a grid of plankton stations, generally located in the centre of an ICES rectangle (Figure 1). A vertical CTD cast was undertaken at each plankton station and water samples were taken at the surface and bottom for salinity calibration. Surface salinity and temperature were recorded continuously throughout the cruise using the thermosalinograph. A minilogger was attached to the plankton gear to measure temperature during sampling. Plankton was sampled with a double oblique tow of the Bongo net at approximately 2 knots to within 5 m of the bottom, except for depths > 100m where the maximum depth sampled was 100m in accordance with PGEGGS guidelines. The vertical profile of the tow was monitored using SCANMAR. The vertical rate of deployment was within the range 10–15m.min^{-1} depending on depth. Volume filtered was determined using a flowmeter inside the mouth of one Bongo that was calibrated from 3 horizontal tows without the net. The mean volume sampled per 1m depth strata was approximately 4.5 m^3 for the 2 nets. Plankton stations were conducted throughout the day and night. Fish eggs and larvae were separated from zooplankton then plaice and cod like eggs were staged. A subsample of up to 50 cod like eggs within the range 1.1–1.7 mm were measured using a calibrated eye piece graticule then fixed in 100% ethanol for later molecular identification of species using the method of Taylor *et al.* (2002). Samples from both Bongo nets were only sorted where there were less than the required number of stage I cod like eggs and fewer than 100 other eggs. In one sample with a very large number of eggs, the sample from one net was split. After sorting, remaining eggs and fish larvae were fixed in observation fluid. Any unsorted samples were also fixed in observation fluid.

Trawl sampling to obtain biological samples of cod and haddock was conducted on 21, 23, 27, and 28 February in the Moray Firth, Papa Bank, Bressay grounds and Long Hole, respectively. The vessel returned to fishing off the east mainland coast on the 4–5 March to obtain further biological samples of cod and whiting from the only region where spawning cod had been recorded. Due to concerns over the trawl's bottom contact by the Fishing Master, additional chain was added to the groundgear and some of the floats removed from the headline prior to the Long Hole fishing ground. This modification improved net stability as indicated by SCANMAR readings and increased the catches of cod and flatfish.

Deployment of the Bongo gear required a moderate sea state and so sampling was suspended in conditions of high swell and winds at or above a Force 8. Poor weather led to a short delay in plankton sampling on the 22 February. Westerly plankton stations from Orkney to Shetland were then undertaken. A severe gale led to a further delay with Scotia having to take shelter off the southeast Shetland coast at 10:30 on the 25 February. To avoid any further delays Iain Gibb was put ashore at Lerwick just

prior to taking shelter, rather than the planned later date. Scotia then sailed to the Bressay ground station at 13:15 on the 26 February when the gale subsided. Due to delays caused by weather and the high risk of further weather disruption in the north of the survey area, 4 plankton stations along the northeastern edge of the survey were dropped. The choice of these stations was based on information received about the sampling distribution of the recently completed Norwegian PGEGGS survey. An additional station that the Norwegian survey had not managed to survey was also sampled. Sampling continued off the east coast of Scotland with trawl sampling undertaken at the long hole (110 miles holes region) where 17 cod were tagged and released with data storage tags. Peter Wright was put ashore in the morning of 3 March at Montrose in order to attend a funeral. The southern plankton station were completed and trawl stations were completed at locations off the Bell Rock, the Dog Hole (east of Aberdeen) and in the Moray Firth. The ship returned to Aberdeen following the final trawl at 16:00h on 5 March and docked at 21:00 h for unloading the next morning.

Results

A total of 53 plankton and CTD stations were completed although 9 CTD readings were lost due to either software or battery failure (Figure 1). Eggs and larvae were sorted from both nets in 43 stations. A total of 11007 eggs were caught from which 4488 were staged and 1215 cod like eggs were extracted for later genetic identification of cod, haddock and whiting ratios. Gill tissue from Norway pout was also taken in the hope that the method of Taylor *et al.* (2002) could be extended to consider this species.

The densities of Stage I cod like eggs is given in Figure 2. The frequency composition of stage I cod like eggs suggested the presence of two major modes, at 1.1 and at 1.4 mm. The lower mode was consistent with the upper diameter range of Norway pout, which were found to be spawning in the northern part of the study area. The highest densities of stage I eggs in the main size range for cod and haddock (i.e. 1.3–1.6 mm) were at stations off the Moray Firth, west of Orkney and northeast of Shetland. Samples from these locations also contained stage V cod eggs. Only 15 spawning cod were caught in total and all but 1 came from the Moray Firth. Spawning haddock were caught on the Bressay grounds. Spawning Norway pout were also recorded in this area.

Mean water column temperatures ranged from 5.7 to 9.7ºC. The warmest water temperatures were recorded in the northwest of the survey area and the coldest in the coastal waters of the Scottish east coast. The high salinity areas in the north and west of the surveyed area were consistent with Atlantic water (> 35.3º/₀₀; Figure 4).

The numbers of cod, haddock and whiting obtained for biological sampling are given in Table 1. Eleven male cod were obtained for the CEFAS CODEND project. During the Long Hole trawling 17 cod were tagged with G1 CEFAS data storage tags and released. A further 2 cod caught were similarly tagged in the Moray Firth and off Aberdeen.

Screening for cod haemoglobin types proved to be impossible due to vessel movement.

P. Wright

17 March 2009

Seen in draft:

Captain A. OIC, *FRV "Scotia"*

Table 1. Numbers of fish measured and mature ovaries sampled by trawl location.

Region	Number of hauls	Number of cod	Cod ovary samples	Number of haddock	Haddock ovary samples	Whiting
Bressay ground	3	15		180	32	
Papa Bank	2	7		21	8	
Long Hole	4	77	8	7	6	
Southern Trench	4	20	6	28	26	
Hole of Pittoulie	1	8	5			
Dog Hole	1	4				87
Broch square						25

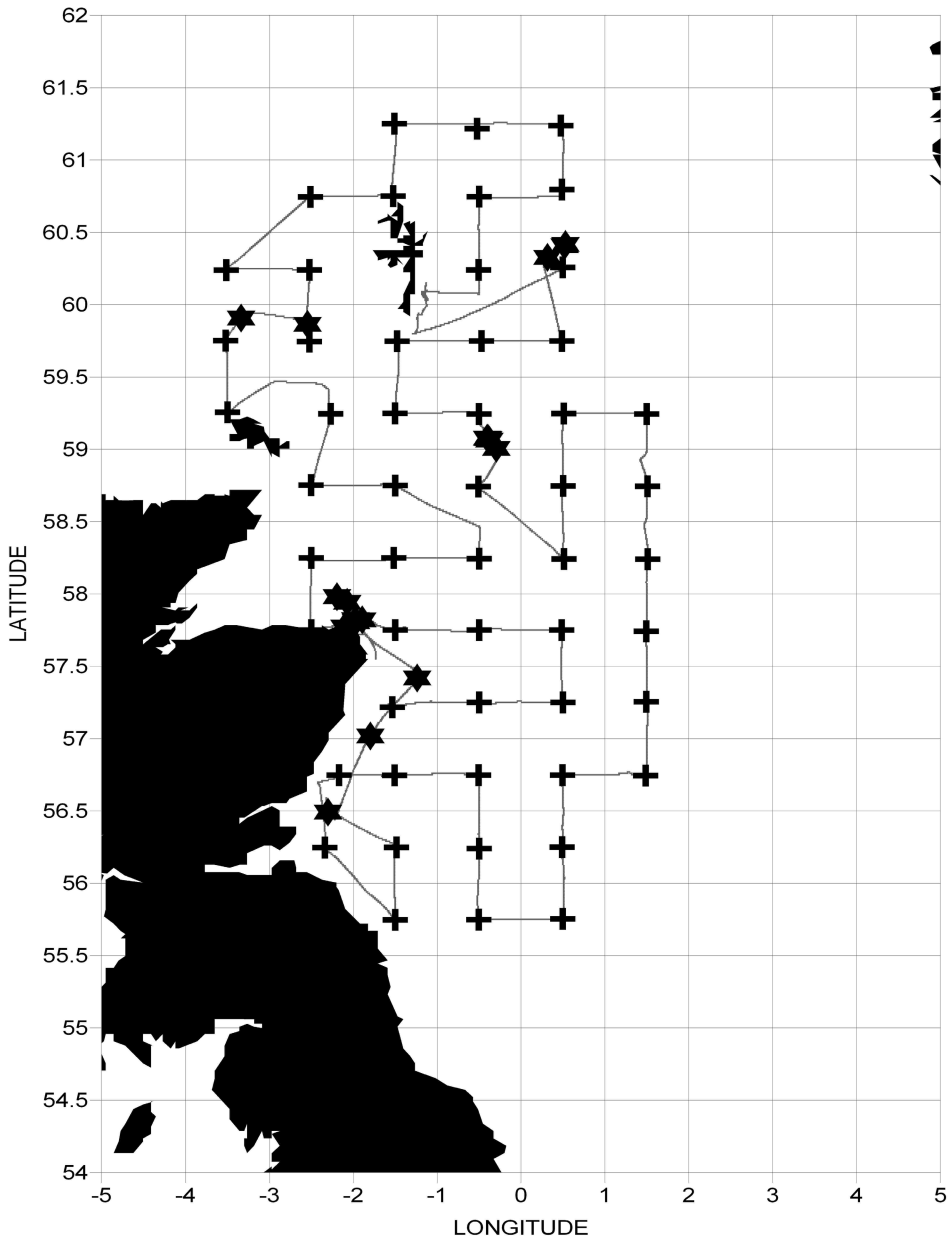

Figure 1. Location of plankton stations (+), trawl stations (stars) and cruise track.

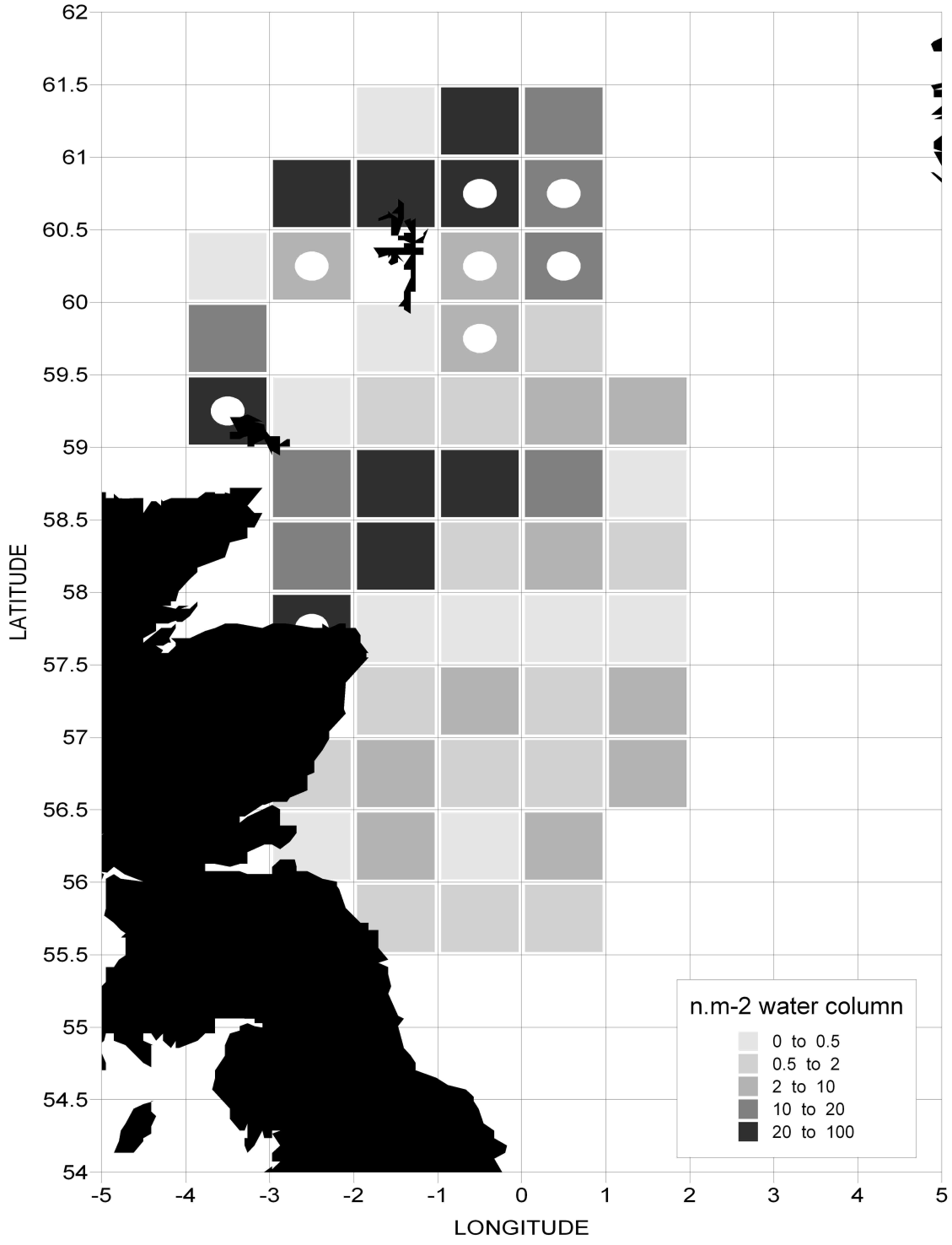

Figure 2. Density distribution of cod like eggs 1.1–1.7 mm diameter in the water column. White circles represent stations containing stage V cod eggs.

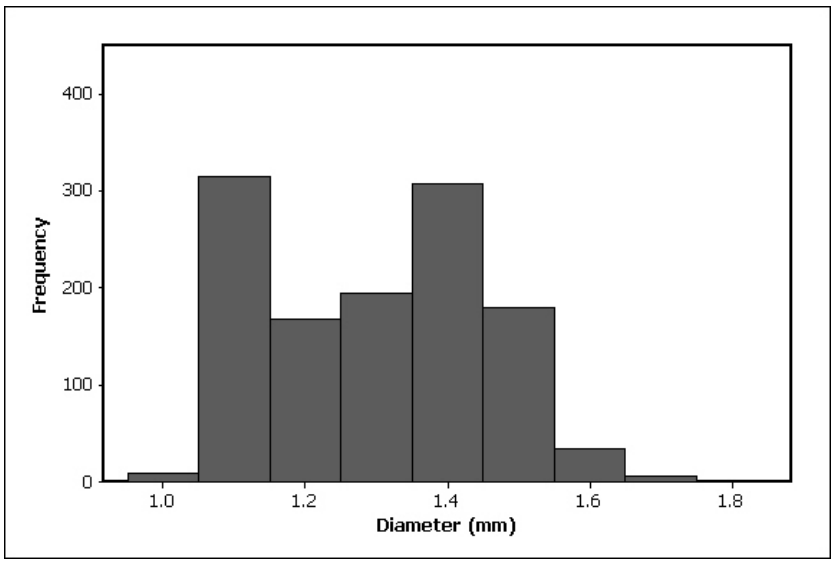

Figure 3. Frequency composition of cod like eggs preserved in ethanol for genetic identification.

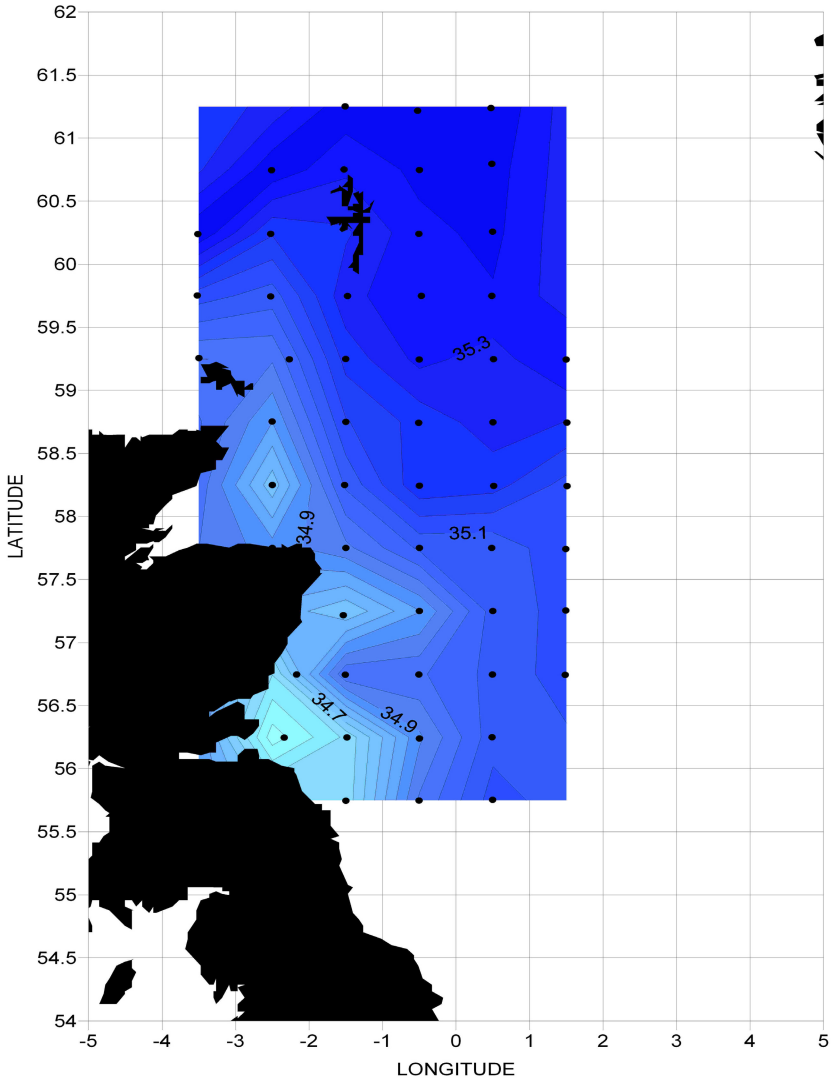

Figure 4. Near bottom salinities during survey.

Gulf VII sampling – PGEGGS: "GO Sars" (Norway)

(8–21 February 2009)

Objectives

Determine the distribution and abundance of cod eggs in the northeastern North Sea in 2009. In addition, determine the stage of the spawning season of cod at the time of sampling in the northeastern North Sea from samples of running female fish (see separate report).

Requested sampling

PGEGGS requested sampling over the northeast of the northern North Sea (see Figure 1) and for this to be done in conjunction with sampling being undertaken by FRS, Aberdeen. Samples were to be obtained of pelagic cod-like and plaice eggs and samples of cod ovaries to determine the progression of the spawning season at the time of sampling the pelagic eggs.

There are two molecular methods for identifying whether gadoid eggs are cod (*Gadus morhua*), the first utilizes material stored in ethanol (Taylor *et al.*, 2002) and the second can utilize formalin preserved eggs (Goodsir *et al.*, 2008). The former method was used in the surveys undertaken in 2004 (Fox *et al.*, 2008). FRS will undertake the genetic analyses of the eggs from the northern North Sea and will work with the ethanol preserved material. Therefore eggs need to be staged and measured at sea and stored in individual vials. The request was for primarily early stage (essentially stage I) eggs.

It was agreed with FRS that IMR would undertake the screening of the cod ovaries. This material is to be transferred to Olav S. Kjesbu and Merete Fonn at IMR.

Methods

The requested sampling procedure for pelagic eggs is laid out in Appendix 1. In this instance sampling utilized a 76 cm diameter frame, Gulf VII high-speed plankton sampler with the Pro-Net monitoring system (see Nash *et al.*, 1998). A 30 cm aperture nose cone and a 280 μm mesh net was used. All samples were obtained using a double oblique tow with the towing cable paid out and hauled at either 0.2 $m.s^{-1}$ for depths greater than 50 m and 0.1 $m.s^{-1}$ for stations where depths were < 50m. The Pro-Net system was used to give the depth profile, volume of water filtered and the efficiency of filtration. A General Oceanics flowmeter was also attached in the nose cone of the Gulf VII sampler, however, this was placed back in the nose cone. This was calibrated against the Valeport flowmeters used in the Pro-Net system and adjusted volume estimates used when there was a failure in the Pro-Net system. The majority of the sampling was undertaken at night, in conjunction with the MIK sampling for larval herring.

All fish eggs and larvae were sorted from the sample and counted. The remainder of the sample was subjected to standard protocols for zooplankton samples conducted by IMR. The sample was divided in to half and one portion preserved in buffered formalin. The other half was sieved into 2, 1 and 0.18mm size fractions. All Euphausids and large macroplankton (fish, shrimp, amphipods etc) were identified enumerated and measured. Each size fraction was dried for dry weight estimations.

Whole or subsamples of the fish eggs were identified as either gadoid-like or plaice-like. Samples or subsamples were staged and measured and placed in individual vials. Diameters were measured using an ocular micrometre. From sample 11 onward

whole or subsamples of eggs were photographed using an Olympus E-1 camera on fixed focus to obtain a representative image of the egg sample plus the opportunity to measure a range of eggs using image analysis systems in laboratory.

The density of eggs was estimated from the volume of water filtered.

CTD casts were taken with each bottom trawl, during the day. Each CTD cast was designated a reference station which essentially corresponded to an ICES rectangle. Each of the Gulf samples was nominally associated with a rectangle and as such each CTD was matched to a Gulf sample. The one exception was for reference station 39 where the CTD data were corrupted, here reference station 38 was used instead. These physical data (water column temperature and salinity) were used to estimate development times of cod and plaice eggs for each station. The development formulae were taken from Geffen *et al.* (2006) for cod eggs and Fox *et al.* (2003) for plaice eggs.

Results

Sampling

The egg sampling was to be undertaken on the IMR's "G.O. Sars" in conjunction with the 1st quarter IBTS sampling (bottom trawls and MIKs) along with three standard transects that traverse the northern North Sea. At the outset it was determined that there was insufficient time to undertake sampling in statistical rectangles marked with 'a' (see Figure 1). These areas were also outside the standard IBTS sampling area. In addition, time constraints brought about through the course of the survey meant that the additional samplings in rectangles marked 'x' could also not be undertaken.

A total of 59 samples were obtained from 40 ICES rectangles (standard set for the Norwegian contribution to the 1st quarter IBTS; see Figure 1). In all cases a single double oblique tow was undertaken, in all instances this resulted in approximately 2 m^3 of water filtered per 1 m depth band (up and down combined) and an efficiency of around 88%.

Use of General Oceanics flowmeter readings for volume filtered

Because the General Oceanics flowmeter was not mounted in the entrance of the nose cone there was expected to be an underestimation of the actual flow and hence estimation of volume filtered. However, it was assumed that in the event of a failure of the Pro-Net system to record the volumes of water filtered the GO meters would provide an estimate which could be corrected to the flow estimated by the Pro-Net system (using Valeport flowmeters). Paired Pro-Net and GO estimates of volumes of water filtered (see Figure 2) were compared using a least-squares regression. Because the objective was to be able to estimate the flow from the Pro-Net system from the GO readings the regression was in the following format:

Valeport = 14.3342 + GenOcean * 1.0264 (N=52; R^2=0.886)

Physical environment

Mean water column temperature ranged from 4.86 to 8.53°C (Figure 3a, Table 2). The warmest mean water column temperature occurred in the northwestern section of the sampling area and the coldest in the shallowest southeastern area sampled. Mean water column salinity varied over the area sampled (see Figure 3b, Table 2). The lower salinities generally occurred in the shallower water, near land in the southeastern part of the sampling area.

Biological samples

A total of 4,284 pelagic fish eggs and 94 larvae were caught. The greatest concentration of eggs was in the northeastern part of the survey area (see Figure 4). The egg densities in these areas were between 234 and 366 individuals m^{-2} (see Table 1). Eggs occurred over nearly all the area but at much lower densities.

A total of 732 eggs were measured and put in to individual vials. Of these 606 were classed as potential gadoid eggs and 126 as either Pleuronectid or potentially large gadoid eggs. The size (diameter) distribution of the eggs is given in Figure 5.

In Table 2 the number of days to the end of stage (stages 1A, 1B, II, III, IV and V (hatch)) for cod and plaice has been estimated for the mean water column temperature at each station. In general where cod Stage 1 eggs occurred spawning occurred less 4.5 days prior to sampling and less than 4 days prior to sampling in plaice.

In addition to the fish eggs the larvae were sorted from the samples. The larvae consisted of herring (*Clupea harengus*), crystal gobies (*Crystallogobius linearis*) and a number of small larvae that need to be identified. The fish larvae were patchily distributed (see Figure 6) with larvae being absent at many locations. There herring in particular appeared to occur from Northwest (just south of the Shetlands to the southeast, toward the Skagerrak (see Figure 7).

Discussion

The measured eggs (those destined for molecular analyses) indicated three modes in the diameter frequency. Because cod eggs are reported to have a size distribution ranging from 1.16 to 1.89 mm (see Russell, 1976), and there was a suggestion in the Irish Sea that some cod eggs were actually smaller than the lower bound range reported, the sampled range went as low as 1.1mm. Eggs larger than 2mm were also sorted for molecular analyses just to ensure that these were in fact plaice. An examination of the modes suggests that the lower mode, around 1.2 mm was probably predominately made from Norway pout (*Trispoterus esmarkii*), Pollack (*Pollachius pollachius*), saithe (*Pollachius virens*) and whiting (*Merlangius merlangus*; see Figure 8). Both saithe and Norway pout larvae were found in the March sampling in 2004 (PLACES notes from Petter Fossum, IMR). The central mode, centred on 1.5mm was probably mainly made up from cod and haddock (*Melanogrammus aeglefinus*). Larvae of both species occurred in the 2004 sampling in the area sampled in 2009.

The larger group, predominantly larger than 2mm diameter almost certainly was plaice (*Pleuronectes platessa*). However, in the northern area the majority of the larger eggs (generally not sampled for molecular studies) had a large perivitelline space indicating they were long rough dab (*Hippoglossoides platessoides*). The northern distribution of these eggs coincides with the larvae distributions seen in the 2004 samples. The larger eggs in the southeastern part of the sampling area (toward the Danish coast were most probably plaice, however, care needs to be taken to ensure that some long rough dab eggs, especially stage I eggs, are not misidentified.

Due to the limited number of personnel on board undertaking the egg sampling, representative samples of essentially stage I 'gadoid' type eggs were taken. To raise these samples to whole samples then the rest of the preserved egg samples need to be examined. In addition, there is a need to measure the rest of the eggs and identify them to species as this was not possible at sea. Additional information on 'live' egg-sizes distributions can be obtained from the egg photographs. These photos were taken from station 12 onward.

There are data on zooplankton. The data on the dry weight of the different size fractions (>2mm, >1mm and >180/280μm) will be available after the cruise. Similarly there are data available on the larger macro-zooplankton). Zooplankton samples in formalin have been stored and can be examined if necessary.

Samples were collected from the ovaries of cod during the standard IBTS sampling. These samples will be screened to determine the progression of the spawning season at the time of pelagic egg sampling. The stage development rates given in Table 2 can also be used to interpret the egg vs. spawning progression data.

This sampling is feasible on the standard IBTS, along with the MIK sampling at night. The addition of being able to sample eggs during daytime allowed a certain amount of flexibility in the timing of sampling. There is definitely a need to have the Gulf VII samplers equipped with at least logging flow and depth sensors. Here we used the Pro-Net system but this is aging and probably cannot be repaired if there is a major failure in future. There are some alternatives but future requirements need to be discussed.

To undertake this task in future there is definitely a need for at least two specialists to work full time on the egg samples. The addition of the zooplankton specialists was an asset as the non-fish portion of the samples could be processed and archived properly and efficiently. In regard to equipment, the ability to photograph samples of eggs for measurement in a dry land laboratory is useful. In future we should have the provision for being able to photograph as well as measure individual eggs. Even with a small amount of motion measuring eggs is not easy and can be time consuming. The addition of a photograph would make checking of identification etc much easier.

In regard to sampling protocol, on this trip we utilized the CTD from the IBTS stations. In retrospect it would probably have been advisable to take additional CTD casts at each egg sampling station, however, this does add in additional sampling time which may not be feasible in the general cruise plan. An alternative is to have a fully functional CTD system on the plankton sampler (breakages on the temperature and salinity probes for the Pro-Net system meant these data were not available) then use these data.

Acknowledgements

RDMN is grateful for the enormous help provided by Julio Erices and Jon Rønning by sorting the eggs and larvae out of the samples then processing the remainder of the sample through the zooplankton protocols. Without their help this sampling regime would not have been possible.

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Table 1. Summary of egg and larvae densities in Gulf VII samples from the Northern North Sea (8–21 February 2009).

Haul no.	Lat (decimal)	Long (decimal)	Sample depth (m)	Vol filtered (cub m)	Total Eggs	Total larvae	Eggs (cub m)	Larvae (cub m)	Eggs (sq m)	Larvae (sq m)
1	60.823	3.498	100	245.0	0	1	0.000	0.004	0.000	0.408
2	60.879	2.945	100	232.7	25	0	0.107	0.000	10.743	0.000
3	60.868	2.393	100	163.8	29	7	0.177	0.043	17.705	4.274
4	61.048	2.193	109	207.6	0	0	0.000	0.000	0.000	0.000
5	61.066	0.686	101	176.6	99	0	0.561	0.000	56.619	0.000
6	61.041	1.085	99	149.1	130	0	0.872	0.000	86.318	0.000
7	60.954	1.420	98	191.0	75	2	0.393	0.010	38.482	1.026
8	60.889	1.231	100	190.0	111	0	0.584	0.000	58.421	0.000
9	60.742	0.593	99	236.7	90	0	0.380	0.000	37.643	0.000
10	60.713	0.631	100	206.4	175	0	0.848	0.000	84.787	0.000
11	59.951	3.672	101	239.4	0	1	0.000	0.004	0.000	0.422
12	59.789	2.927	102	231.6	10	0	0.043	0.000	4.404	0.000
13	59.899	2.952	98	239.9	12	0	0.050	0.000	4.902	0.000
14	60.084	3.061	100	186.4	1	2	0.005	0.011	0.536	1.073
15	60.404	2.979	99	115.7	18	4	0.156	0.035	15.402	3.423
16	60.369	2.797	92	155.2	39	2	0.251	0.013	23.119	1.186
17	60.277	1.913	100	198.9	147	0	0.739	0.000	73.906	0.000
18	60.251	1.720	90	197.8	514	1	2.599	0.005	233.873	0.455
19	60.096	0.857	100	174.5	623	0	3.570	0.000	356.988	0.000
20	60.094	0.814	99	201.3	744	0	3.695	0.000	365.853	0.000
21	59.751	0.750	100	198.8	0	0	0.000	0.000	0.000	0.000
22	59.656	0.663	100	216.9	2	1	0.009	0.005	0.922	0.461
23	59.559	1.112	89	220.2	74	1	0.336	0.005	29.909	0.404
24	59.536	1.278	98	245.7	224	1	0.912	0.004	89.345	0.399
25	59.460	1.402	95	199.5	154	1	0.772	0.005	73.333	0.476
26	59.218	0.928	102	259.8	329	4	1.266	0.015	129.169	1.570
27	59.420	3.158	98	223.2	46	0	0.206	0.000	20.197	0.000
28	58.913	3.128	104	171.4	21	0	0.123	0.000	12.743	0.000
29	58.963	2.944	99	279.6	31	0	0.111	0.000	10.976	0.000
30	59.018	3.485	100	182.9	87	0	0.476	0.000	47.567	0.000
31	57.906	3.200	69	114.2	11	4	0.096	0.035	6.646	2.417
32	58.083	3.101	65	141.4	37	3	0.262	0.021	17.008	1.379
33	58.019	2.825	55	144.9	10	4	0.069	0.028	3.796	1.518
34	57.747	2.806	57	125.7	3	0	0.024	0.000	1.360	0.000
35	57.485	2.773	61	144.4	58	3	0.402	0.021	24.501	1.267
36	56.981	2.628	66	150.4	7	0	0.047	0.000	3.072	0.000
37	56.944	3.083	58	117.8	7	0	0.059	0.000	3.447	0.000
38	57.213	3.387	53	115.4	4	1	0.035	0.009	1.837	0.459
39	56.885	4.187	49	86.3	27	1	0.313	0.012	15.330	0.568
40	56.967	4.355	55	95.0	23	0	0.242	0.000	13.316	0.000
41	57.258	4.448	49	93.6	23	1	0.246	0.011	12.041	0.524

Haul no.	Lat (decimal)	Long (decimal)	Sample depth (m)	Vol filtered (cub m)	Total Eggs	Total larvae	Eggs (cub m)	Larvae (cub m)	Eggs (sq m)	Larvae (sq m)
42	57.434	4.471	69	153.7	28	7	0.182	0.046	12.570	3.142
43	57.555	4.485	71	156.1	11	5	0.070	0.032	5.003	2.274
44	57.752	4.441	76	176.1	6	4	0.034	0.023	2.589	1.726
45	58.014	4.552	94	175.4	9	0	0.051	0.000	4.823	0.000
46	57.278	5.150	43	94.5	20	0	0.212	0.000	9.101	0.000
47	57.113	5.229	43	98.2	44	1	0.448	0.010	19.267	0.438
48	56.933	5.269	46	102.8	13	0	0.126	0.000	5.817	0.000
49	56.907	5.584	40	78.1	6	0	0.077	0.000	3.073	0.000
50	56.898	6.003	47	110.3	17	0	0.154	0.000	7.244	0.000
51	56.989	6.268	53	96.1	25	5	0.260	0.052	13.793	2.759
52	57.165	6.289	57	129.6	31	12	0.239	0.093	13.634	5.278
53	57.346	6.158	69	139.7	35	13	0.251	0.093	17.287	6.421
54	57.520	5.987	85	183.4	4	1	0.022	0.005	1.854	0.463
55	57.680	5.800	99	218.9	2	0	0.009	0.000	0.905	0.000
56	56.973	7.263	26	121.3	1	0	0.008	0.000	0.214	0.000
57	57.142	7.407	37	112.2	7	0	0.062	0.000	2.308	0.000
58	57.128	7.756	37	110.6	2	0	0.018	0.000	0.669	0.000
59	56.976	7.757	37	120.5	3	1	0.025	0.008	0.921	0.307

Table 2. Mean water column temperature and salinity and days to end of stage at each station based on water temperature for (a) cod (using formulae in Geffen *et al.,* 2006) and (b) plaice (using formulae in Fox *et al.,* 2003).

(a)

				Cod (days to end of stage)					
Gulf Stat No	Ref Stat No	Mean Temperature	Mean Salinity	1A	IB	II	II	IV	V
1	7	7.499	34.949	2.50	3.09	4.57	8.28	10.22	12.44
2	6	7.276	35.365	2.57	3.17	4.70	8.53	10.52	12.86
3	6	7.276	35.365	2.57	3.17	4.70	8.53	10.52	12.86
4	3	8.467	35.379	2.27	2.79	4.07	7.36	9.09	10.86
5	1	8.528	35.434	2.26	2.77	4.04	7.31	9.03	10.78
6	2	8.269	35.410	2.31	2.85	4.16	7.53	9.30	11.16
7	5	7.863	35.389	2.41	2.97	4.36	7.91	9.76	11.80
8	5	7.863	35.389	2.41	2.97	4.36	7.91	9.76	11.80
9	4	8.307	35.416	2.31	2.84	4.14	7.50	9.26	11.10
10	4	8.307	35.416	2.31	2.84	4.14	7.50	9.26	11.10
11	15	7.780	35.194	2.43	2.99	4.41	7.99	9.86	11.94
12	14	7.283	35.077	2.56	3.16	4.69	8.52	10.51	12.84
13	14	7.283	35.077	2.56	3.16	4.69	8.52	10.51	12.84
14	11	7.272	35.141	2.57	3.17	4.70	8.53	10.53	12.86

				Cod (days to end of stage)					
Gulf Stat No	Ref Stat No	Mean Temperature	Mean Salinity	1A	IB	II	II	IV	V
15	10	7.200	35.307	2.59	3.19	4.75	8.61	10.63	13.00
16	10	7.200	35.307	2.59	3.19	4.75	8.61	10.63	13.00
17	9	7.315	35.338	2.56	3.15	4.67	8.48	10.47	12.78
18	9	7.315	35.338	2.56	3.15	4.67	8.48	10.47	12.78
19	8	7.876	35.393	2.41	2.96	4.36	7.89	9.75	11.78
20	8	7.876	35.393	2.41	2.96	4.36	7.89	9.75	11.78
21	12	7.360	35.354	2.54	3.14	4.65	8.43	10.40	12.69
22	12	7.360	35.354	2.54	3.14	4.65	8.43	10.40	12.69
23	13	7.050	34.981	2.63	3.25	4.84	8.79	10.85	13.31
24	13	7.050	34.981	2.63	3.25	4.84	8.79	10.85	13.31
25	17	7.016	35.335	2.65	3.26	4.87	8.84	10.90	13.38
26	16	7.186	35.249	2.59	3.20	4.75	8.63	10.65	13.03
27	19	7.209	35.204	2.59	3.19	4.74	8.60	10.61	12.99
28	21	6.805	35.268	2.71	3.35	5.01	9.10	11.22	13.84
29	20	6.852	35.236	2.70	3.33	4.98	9.04	11.15	13.73
30	18	8.086	35.281	2.36	2.90	4.25	7.69	9.50	11.44
31	26	5.998	35.221	3.02	3.73	5.66	10.30	12.69	15.88
32	23	6.667	35.225	2.76	3.41	5.11	9.29	11.45	14.15
33	22	6.317	34.594	2.89	3.57	5.38	9.79	12.07	15.01
34	25	6.136	34.526	2.96	3.66	5.54	10.08	12.42	15.49
35	29	6.244	35.208	2.92	3.61	5.44	9.90	12.21	15.20
36	35	6.212	35.185	2.93	3.62	5.47	9.95	12.27	15.29
37	36	5.811	35.074	3.10	3.84	5.84	10.63	13.10	16.44
38	30	6.164	35.202	2.95	3.65	5.51	10.03	12.36	15.42
39	37	5.587	35.102	3.21	3.98	6.07	11.06	13.62	17.17
40	37	5.587	35.102	3.21	3.98	6.07	11.06	13.62	17.17
41	31	5.367	35.116	3.32	4.12	6.31	11.51	14.17	17.94
42	31	5.367	35.116	3.32	4.12	6.31	11.51	14.17	17.94
43	27	6.289	35.197	2.90	3.58	5.41	9.83	12.12	15.08
44	27	6.289	35.197	2.90	3.58	5.41	9.83	12.12	15.08
45	24	6.844	35.130	2.70	3.33	4.98	9.05	11.16	13.75
46	32	5.336	35.127	3.34	4.14	6.35	11.58	14.26	18.06
47	32	5.336	35.127	3.34	4.14	6.35	11.58	14.26	18.06
48	38	5.277	34.933	3.37	4.18	6.42	11.71	14.42	18.28
49	38	5.277	34.933	3.37	4.18	6.42	11.71	14.42	18.28
50	38	5.277	34.933	3.37	4.18	6.42	11.71	14.42	18.28
51	38	5.277	34.933	3.37	4.18	6.42	11.71	14.42	18.28
52	33	4.881	34.797	3.62	4.49	6.94	12.68	15.60	19.93
53	33	4.881	34.797	3.62	4.49	6.94	12.68	15.60	19.93
54	28	6.911	35.168	2.68	3.31	4.94	8.97	11.06	13.60
55	28	6.911	35.168	2.68	3.31	4.94	8.97	11.06	13.60
56	40	4.855	34.687	3.63	4.52	6.98	12.75	15.69	20.05
57	34	4.894	34.807	3.61	4.48	6.92	12.64	15.56	19.87

				Cod (days to end of stage)					
Gulf Stat No	Ref Stat No	Mean Temperature	Mean Salinity	1A	IB	II	II	IV	V
58	34	4.894	34.807	3.61	4.48	6.92	12.64	15.56	19.87
59	40	4.855	34.687	3.63	4.52	6.98	12.75	15.69	20.05

(b)

				Plaice (days to end of stage)					
Gulf Stat No	Ref Stat No	Mean Temperature	Mean Salinity	1A	IB	II	II	IV	V
1	7	7.499	34.949	1.94	2.88	4.56	9.12	11.12	14.79
2	6	7.276	35.365	1.99	2.96	4.69	9.37	11.40	15.22
3	6	7.276	35.365	1.99	2.96	4.69	9.37	11.40	15.22
4	3	8.467	35.379	1.74	2.58	4.07	8.14	9.99	13.03
5	1	8.528	35.434	1.73	2.56	4.04	8.08	9.92	12.93
6	2	8.269	35.410	1.78	2.64	4.16	8.33	10.21	13.38
7	5	7.863	35.389	1.86	2.76	4.37	8.74	10.68	14.10
8	5	7.863	35.389	1.86	2.76	4.37	8.74	10.68	14.10
9	4	8.307	35.416	1.77	2.62	4.14	8.30	10.16	13.31
10	4	8.307	35.416	1.77	2.62	4.14	8.30	10.16	13.31
11	15	7.780	35.194	1.88	2.79	4.41	8.83	10.77	14.26
12	14	7.283	35.077	1.99	2.96	4.68	9.36	11.39	15.21
13	14	7.283	35.077	1.99	2.96	4.68	9.36	11.39	15.21
14	11	7.272	35.141	1.99	2.96	4.69	9.37	11.40	15.23
15	10	7.200	35.307	2.00	2.99	4.73	9.45	11.49	15.37
16	10	7.200	35.307	2.00	2.99	4.73	9.45	11.49	15.37
17	9	7.315	35.338	1.98	2.95	4.66	9.32	11.35	15.14
18	9	7.315	35.338	1.98	2.95	4.66	9.32	11.35	15.14
19	8	7.876	35.393	1.86	2.76	4.36	8.73	10.66	14.08
20	8	7.876	35.393	1.86	2.76	4.36	8.73	10.66	14.08
21	12	7.360	35.354	1.97	2.93	4.64	9.27	11.29	15.06
22	12	7.360	35.354	1.97	2.93	4.64	9.27	11.29	15.06
23	13	7.050	34.981	2.04	3.04	4.82	9.62	11.69	15.68
24	13	7.050	34.981	2.04	3.04	4.82	9.62	11.69	15.68
25	17	7.016	35.335	2.05	3.05	4.84	9.66	11.74	15.75
26	16	7.186	35.249	2.01	2.99	4.74	9.47	11.51	15.40
27	19	7.209	35.204	2.00	2.98	4.72	9.44	11.48	15.35
28	21	6.805	35.268	2.09	3.13	4.96	9.91	12.02	16.19
29	20	6.852	35.236	2.08	3.11	4.93	9.85	11.96	16.09
30	18	8.086	35.281	1.82	2.69	4.25	8.51	10.41	13.70
31	26	5.998	35.221	2.30	3.45	5.48	10.93	13.20	18.01
32	23	6.667	35.225	2.13	3.18	5.04	10.07	12.21	16.48
33	22	6.317	34.594	2.21	3.32	5.27	10.51	12.71	17.26
34	25	6.136	34.526	2.26	3.39	5.38	10.74	12.99	17.68

				Plaice (days to end of stage)					
Gulf Stat No	**Ref Stat No**	**Mean Temperature**	**Mean Salinity**	**1A**	**IB**	**II**	**II**	**IV**	**V**
35	29	6.244	35.208	2.23	3.35	5.31	10.60	12.82	17.43
36	35	6.212	35.185	2.24	3.36	5.33	10.64	12.87	17.50
37	36	5.811	35.074	2.35	3.53	5.61	11.18	13.49	18.47
38	30	6.164	35.202	2.25	3.38	5.37	10.71	12.94	17.62
39	37	5.587	35.102	2.41	3.63	5.77	11.50	13.86	19.03
40	37	5.587	35.102	2.41	3.63	5.77	11.50	13.86	19.03
41	31	5.367	35.116	2.48	3.73	5.93	11.82	14.23	19.61
42	31	5.367	35.116	2.48	3.73	5.93	11.82	14.23	19.61
43	27	6.289	35.197	2.22	3.33	5.28	10.54	12.76	17.33
44	27	6.289	35.197	2.22	3.33	5.28	10.54	12.76	17.33
45	24	6.844	35.130	2.09	3.12	4.94	9.86	11.97	16.10
46	32	5.336	35.127	2.49	3.75	5.96	11.87	14.29	19.69
47	32	5.336	35.127	2.49	3.75	5.96	11.87	14.29	19.69
48	38	5.277	34.933	2.50	3.78	6.00	11.96	14.39	19.86
49	38	5.277	34.933	2.50	3.78	6.00	11.96	14.39	19.86
50	38	5.277	34.933	2.50	3.78	6.00	11.96	14.39	19.86
51	38	5.277	34.933	2.50	3.78	6.00	11.96	14.39	19.86
52	33	4.881	34.797	2.63	3.98	6.32	12.59	15.12	20.98
53	33	4.881	34.797	2.63	3.98	6.32	12.59	15.12	20.98
54	28	6.911	35.168	2.07	3.09	4.90	9.78	11.88	15.96
55	28	6.911	35.168	2.07	3.09	4.90	9.78	11.88	15.96
56	40	4.855	34.687	2.64	3.99	6.34	12.63	15.17	21.06
57	34	4.894	34.807	2.63	3.97	6.31	12.57	15.09	20.94
58	34	4.894	34.807	2.63	3.97	6.31	12.57	15.09	20.94
59	40	4.855	34.687	2.64	3.99	6.34	12.63	15.17	21.06

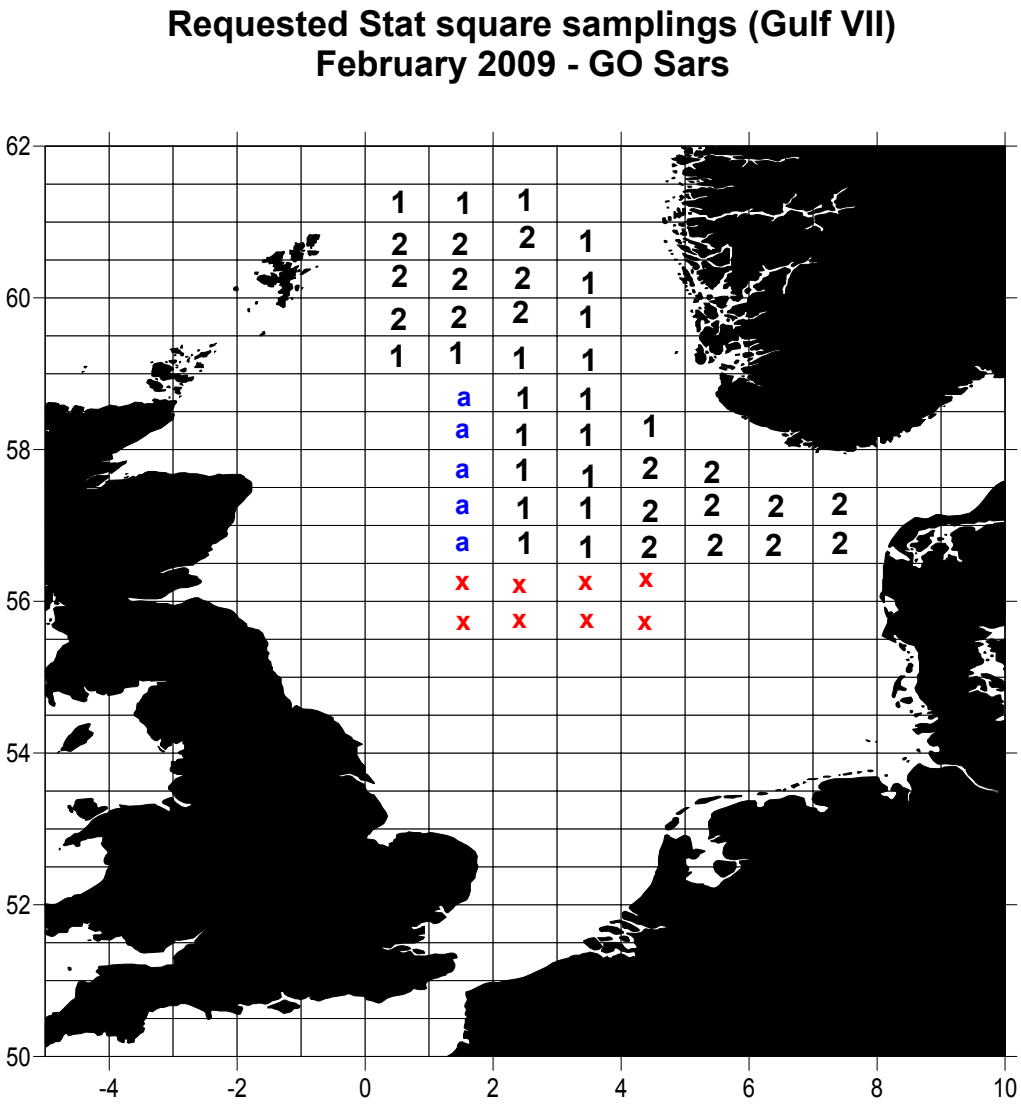

Figure 1. Requested Norwegian contribution to sampling, by ICES rectangle, of pelagic eggs in the northern North Sea.

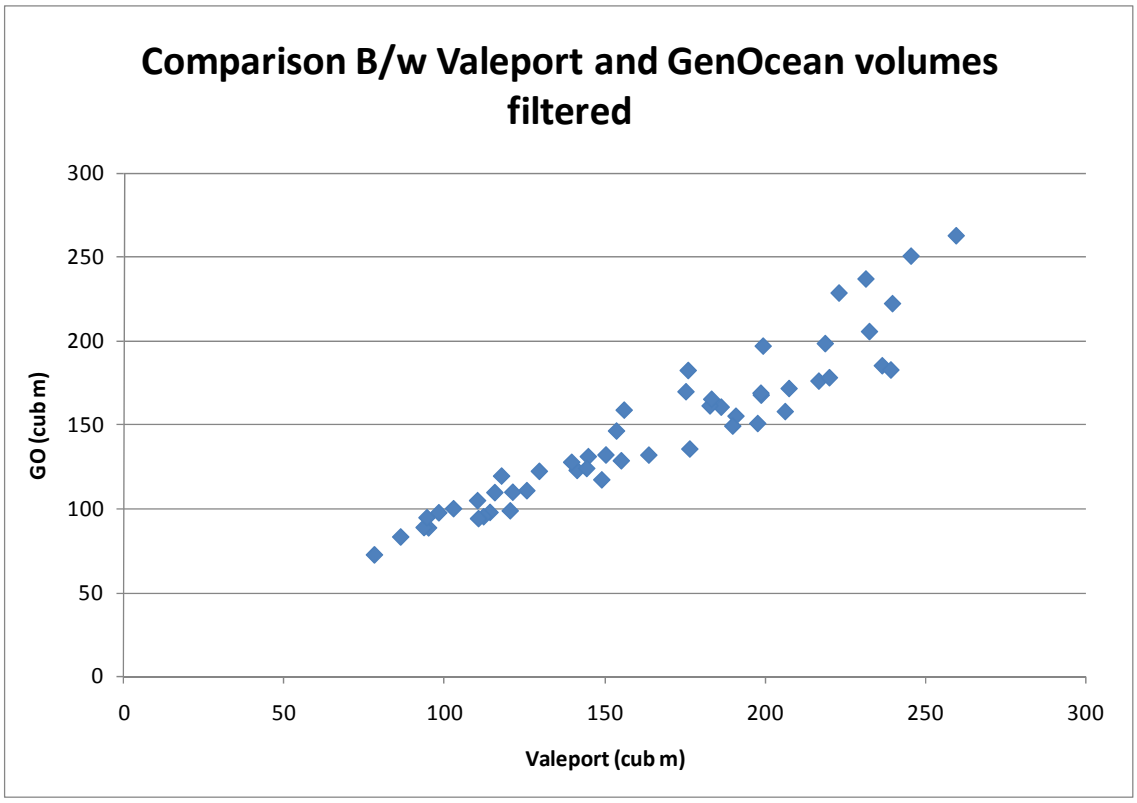

Figure 2. Comparison between volumes estimated by the Pro-Net system (using Valeport flowmeters) and a mechanical General Oceanic flowmeter. Both flowmeters were in the nose cone of the Gulf VII sampler.

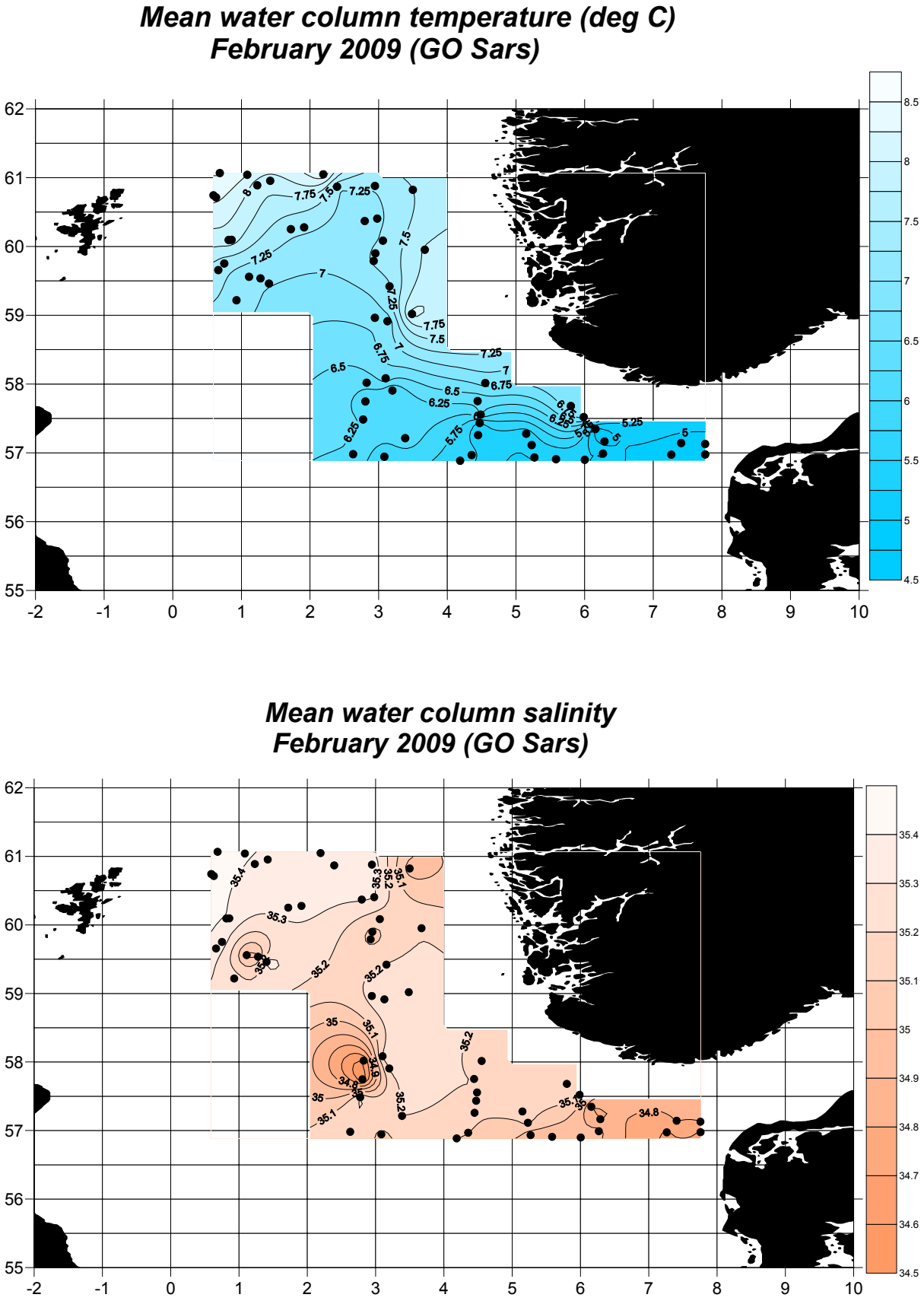

Figure 3. Distributions of a. mean water column temperature and mean water column salinity in the Northern North Sea over the period 8–21 February 2009. Dots indicate Gulf VII high-speed plankton sampler samples.

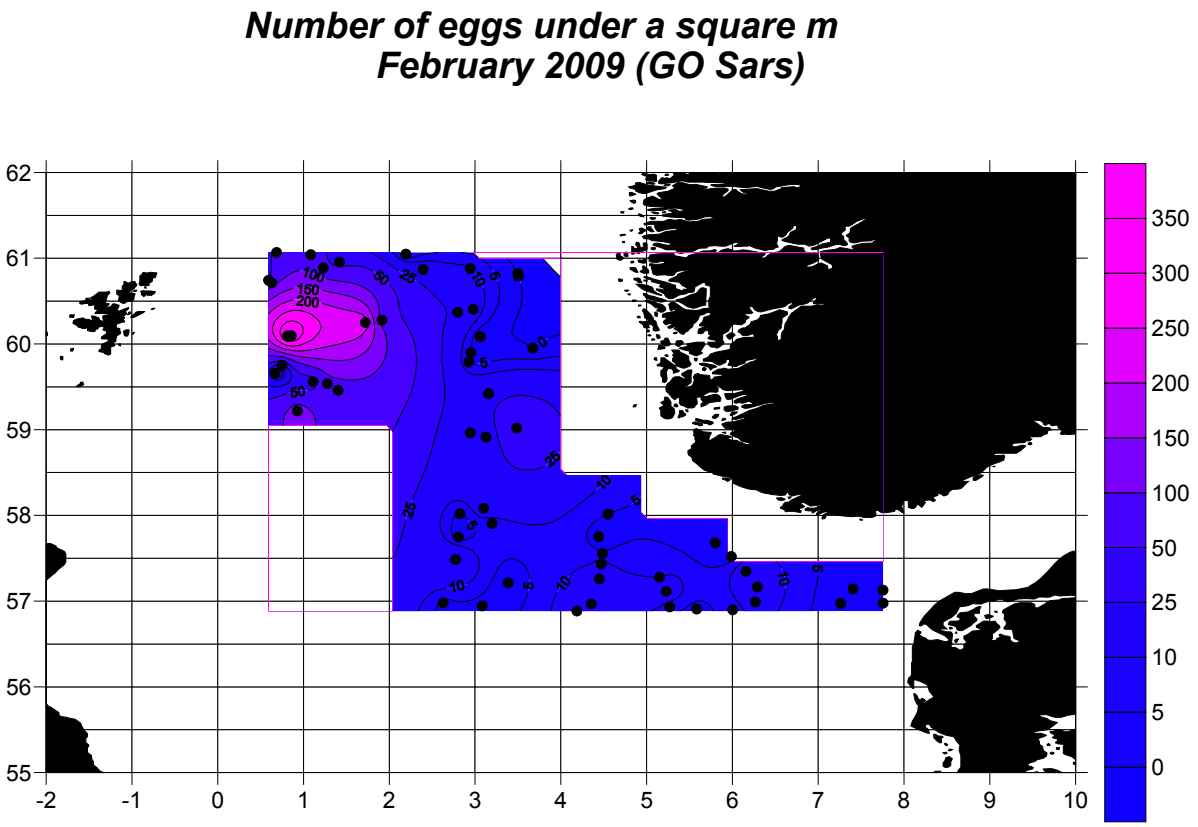

Figure 4. Distribution of pelagic eggs in the northern North Sea (8–21 February 2009).

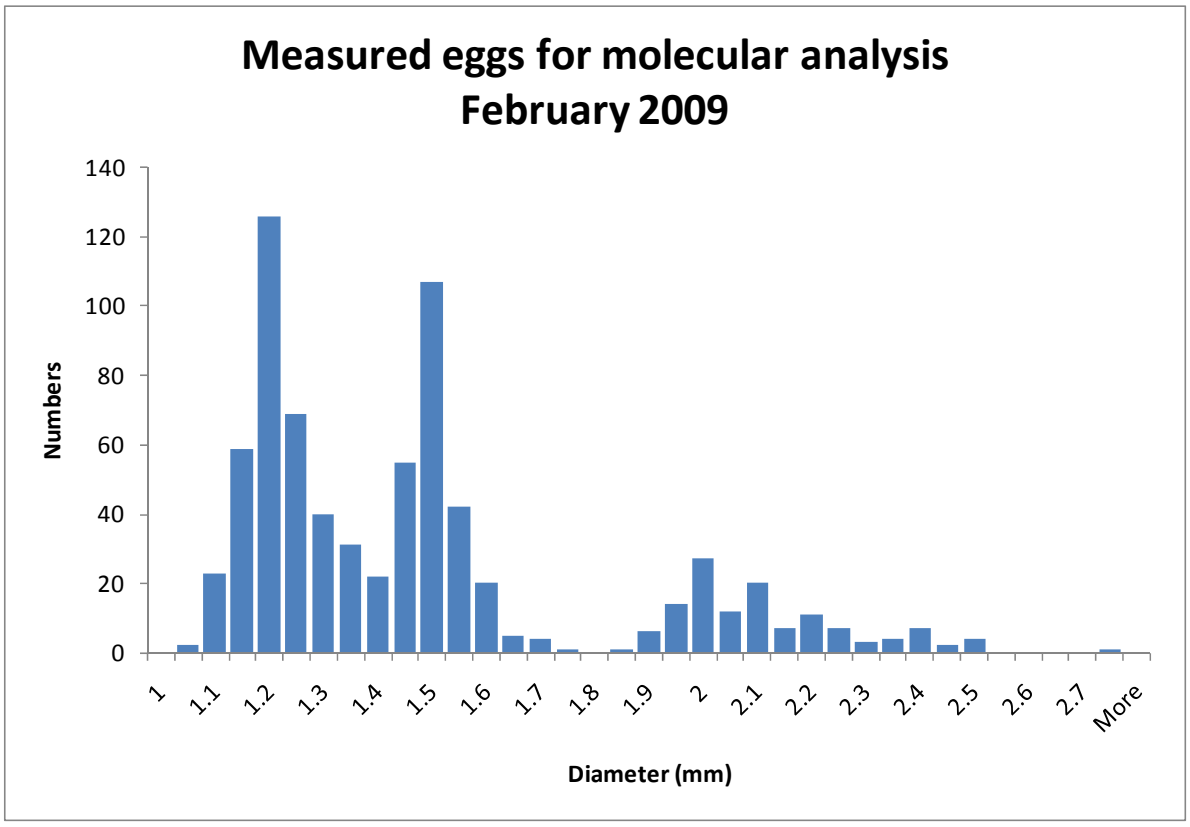

Figure 5. Size (diameter) distribution of eggs measured in the northern North Sea (8–21 February 2009) and individually stored in separate vials for molecular analyses.

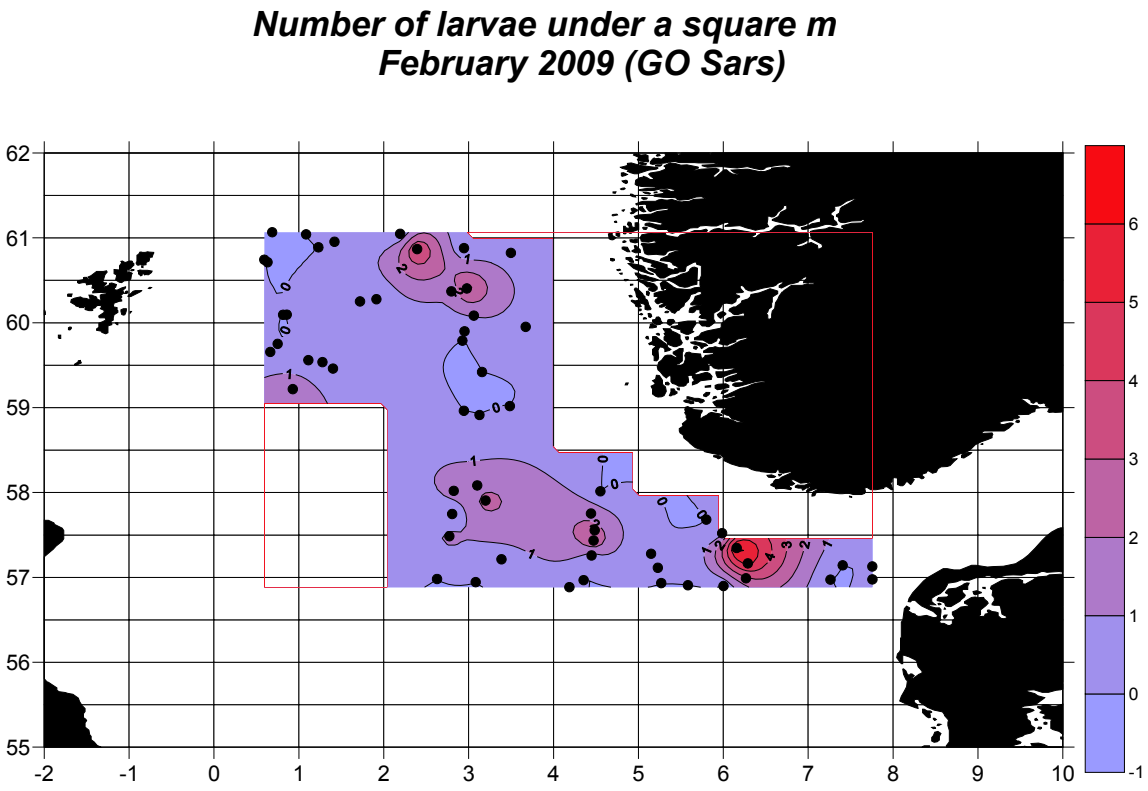

Figure 6. Distribution of larvae in the northern North Sea (8–21 February 2009).

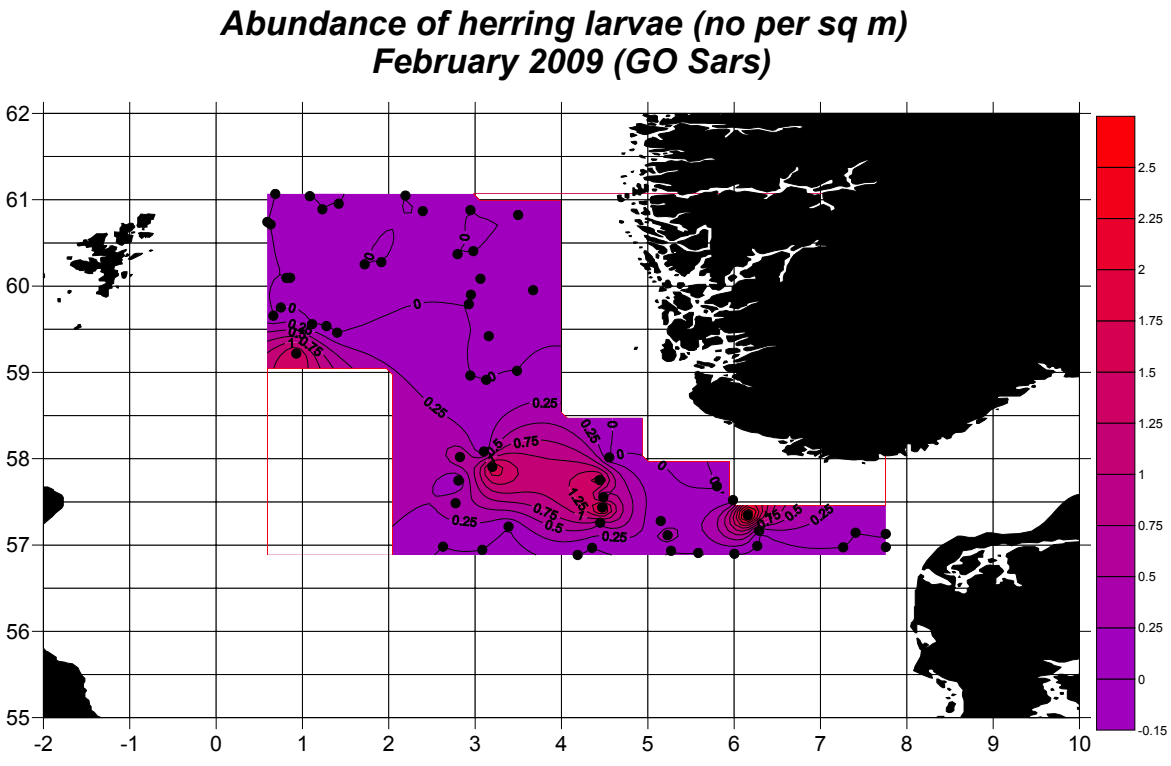

Figure 7. Distribution of herring larvae (no. m^{-2}) in the Northern North Sea 8–21 February 2009.

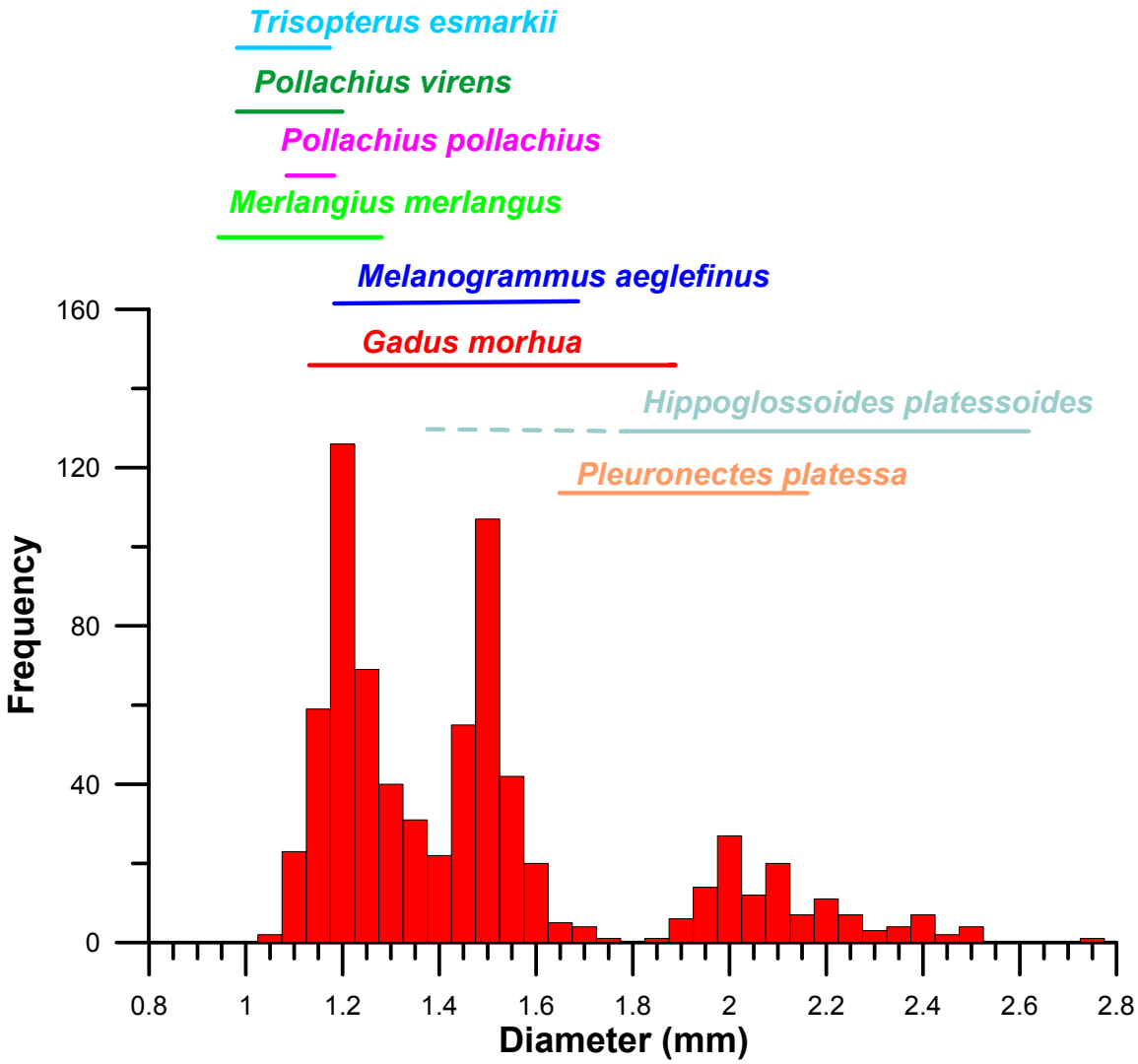

Figure 8. Diameter size distribution of measured eggs. Size ranges of selected species taken from Russell (1976).

Appendices

Methodology for fish egg sampling and identifying and staging of the eggs and larvae (abstracted from PGEGGS report (ICES 2009))

Samplers

GULF III or VII samplers will be used

The Gulf VII high-speed plankton sampler should have a 50cm diameter body fitted with a 40cm or 20 cm diameter aperture, conical nosecone. The standard net of this gear will be made of 280µm aperture mesh. ***Note that IMR has 76cm diameter frames with the options of 30 and 40cm diameter aperture nose cones.***

At sea

Deployment of samplers:

The plankton samplers should be deployed on a double oblique tow, from the surface to within 2 metres of the bottom (or as near as bottom topography will allow) and return to the surface. Speed when hauling should be 5 knots. At shallow stations, multiple double-oblique dives may be necessary to allow a sufficient volume of water

to be filtered. At deep stations the sampler should be deployed down to 100 m. A minimum sampler deployment time of 10 minutes is recommended.

The standard procedure for recovery of the plankton sample will be as follows:

Gently wash down the net playing the deck hose over the outer surface of the net from both ends of the sampler, taking care to wash any accumulated material on the lower surface of the net just in front of the end bucket.

Remove the end bag and place in the jug for transfer into the wet lab on the ship. This jug must be kept free from formaldehyde so should be clearly labelled.

Make sure the net is clean, using more than one end bag and repeating the first 3 steps if necessary.

Check the plankton net for tears, replace if necessary

Make sure that a clean end bag is left on the sampler ready for the next station.

Move the jug containing the end-bags and plankton samples into the ship's laboratory and proceed with the presorting of cod-sized eggs.

Fixing plankton samples

If genetic analysis requires the eggs to be preserved in ethanol (analysis by FRS, Scotland), a subsample of 50 cod-like eggs will be sorted from the fresh sample and fixed in 100% ethanol for later molecular identification. The remainder of the plankton will be fixed and preserved.

Cruise Report 320 RV "WALTHER HERWIG III"

27.02. to 17.03.2009

Chief Scientist: Michael Vobach

Investigations on malformation rates of pelagic fish embryos

Summary

Species composition of pelagic fish embryos deviated not from that of former years. The most frequently occurring species are dab (*Limanda limanda*), plaice (*Pleuronectes platessa*), flounder (*Platichthys flesus*), cod (*Gadus morhua*), whiting (*Merlangius merlangus*) and rockling *(Rhinonemus cimbrius*). Some preliminary findings indicate that malformations of pelagic fish embryos are low. Preliminary results of the investigation of prevalence and distribution of malformations of pelagic fish embryos are shown in the annex.

Programme

1) Investigation of prevalence and distribution of malformations of pelagic fish embryos
2) Bottom trawls to obtain adult dab for spawning material for exposure
3) Phytoplankton research
4) CTD
5) Determination of chlorophyll
6) Isolation of bacteria from the skin of different fish species
7) PGEGGS investigations

Dates of Cruise and Preliminary Results

Bremerhaven was left on 27 February 2009. The cruise was terminated at 17 March 2009. Details of the cruise are given in Figure 3 and Table 1.

The following equipment was used:

Phytoplankton net (62 hols)
CTD (62 samples)
Ringtrawl larvae-net (118 hols)
GOV - Bottom Trawl (6 hols)
Water surface (4 samples)
Plankton collector "Nackthai" (124 hols)

Hydrography

Surface temperature and salinity in the study area are shown in Figure 1and 2.

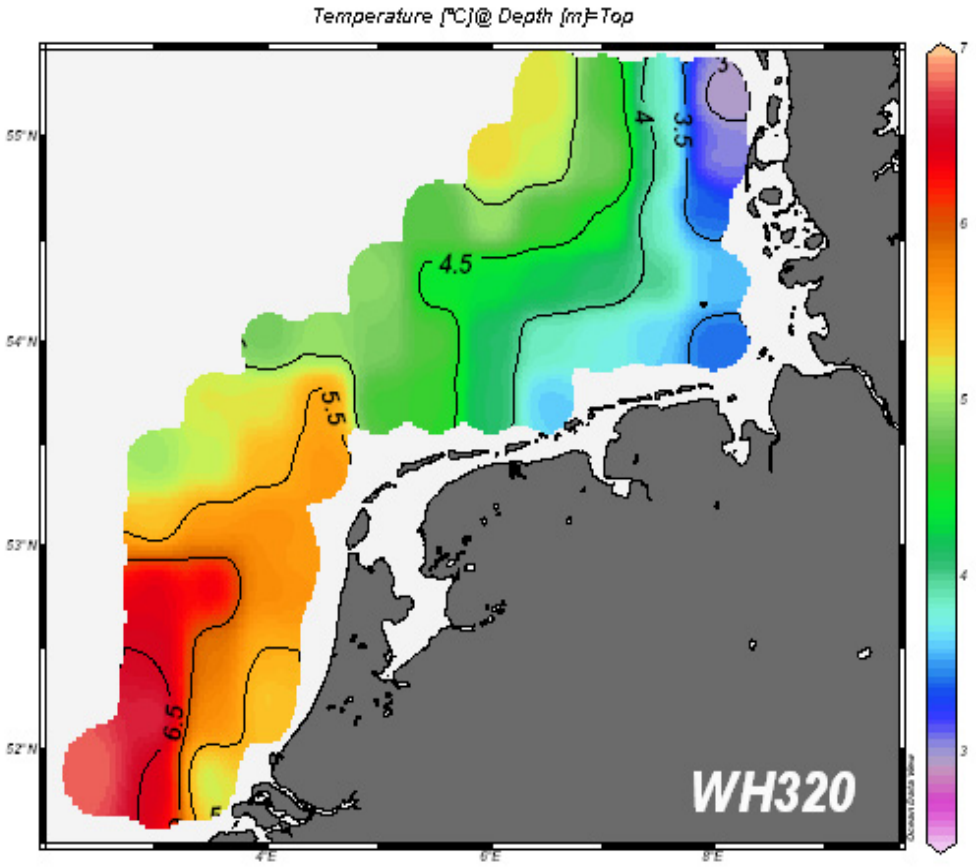

Figure 1. Surface temperature (°C).

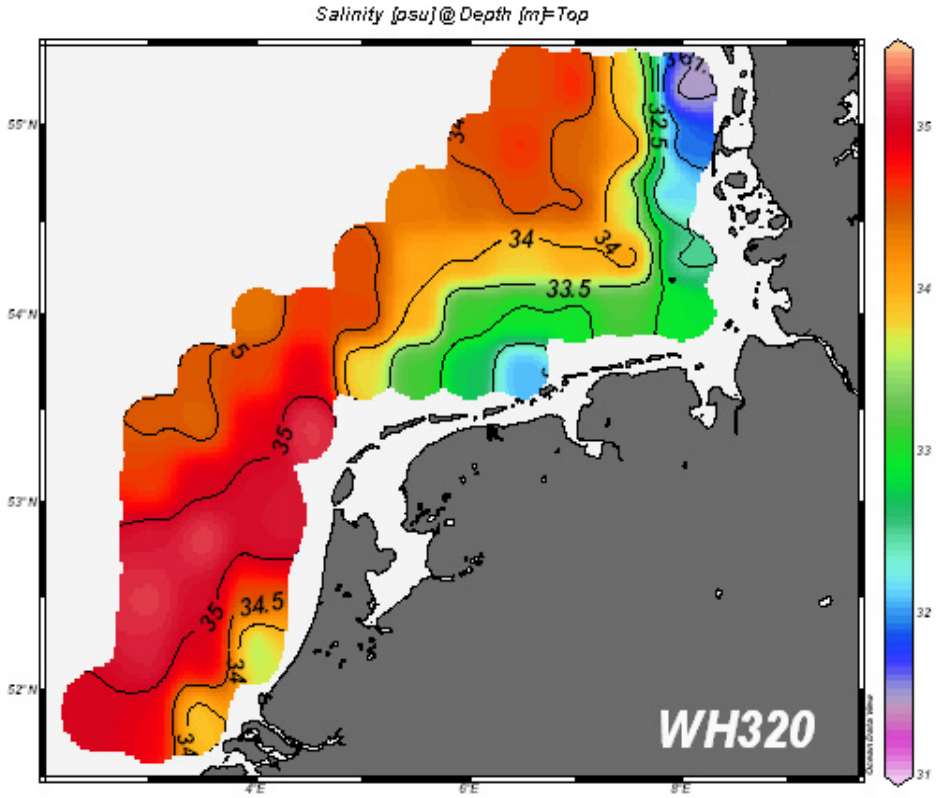

Figure 2. Salinity at the water surface (psu).

Phytoplankton research

Preliminary results of harmful substances and toxic algae on fish embryos and isolation of bacteria are not yet available.

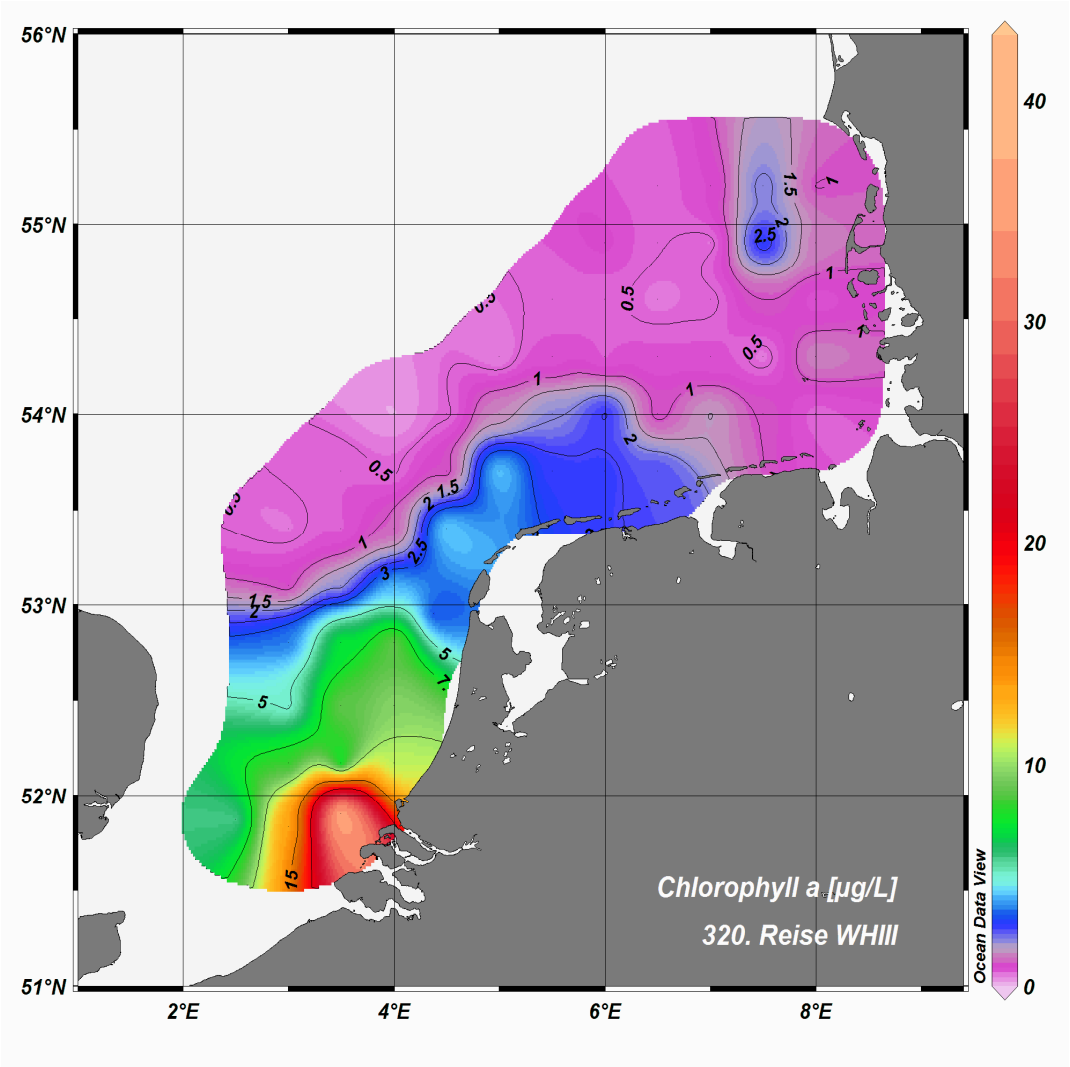

Figure 3. Chlorophyll concentration at the surface 2009.

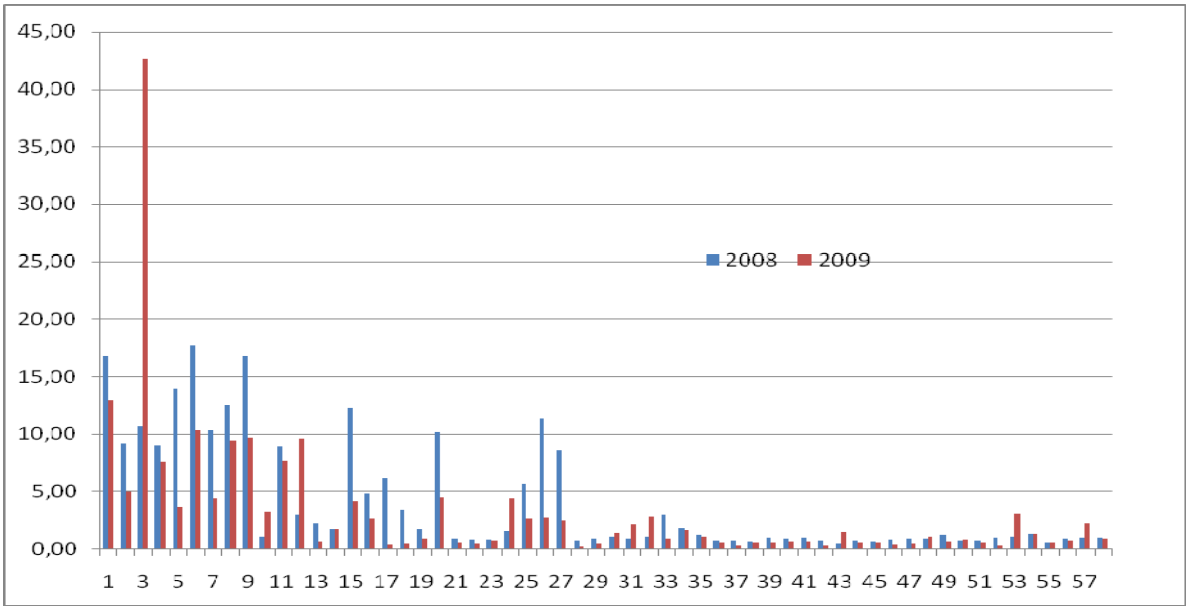

Figure 4. Values of Chlorophyll concentration in the years 2008 and 2009.

The values of the year 2008 are much higher than in 2009 (excepting Stat. 3).

Embryos

40893 embryos, belonging to 13 different species, were investigated for malformations.

The most frequently occurring species are dab (*Limanda limanda*) with 81%, plaice (*Pleuronectes platessa*) with 5.8%, flounder (*Platichthys flesus*) with 5.3%, cod (*Gadus morhua*) with 3.5%, whiting (*Merlangius merlangus*) with 1.8% and rockling (*Rhinonemus cimbrius*) with 1.3%. In the German Bight embryos of dab (*Limanda limanda*) were prevailing. On average 0.3% of the embryos of dab were malformed.

Preliminary findings indicate that malformation rates from all species can be considered to be very low (see Table 2). Malformation rates according to developmental stages of the quantitatively important species are given in Table 3.

Participants

01	Michael Vobach, Dipl.-Biol.,	FOE - Hamburg, (Chief scientist)
02	Manfred Trenk, Techn. Angest.,	FOE - Hamburg
03	Thomas Tepperies, Techn. Angest.,	FOE - Hamburg
04	Professor Dr Marcus Baumann,	FH - Aachen
05	Jens Fischer, Dipl. Ing.,	FH – Aachen
06	Sandra Wiegand, Stud. Biol.,	FH – Aachen
07	Natalie Raede, Stud. Biol.,	FH – Aachen
08	Lars Kruse, Stud. Biol.,	FOE – Hamburg
09	Marthe Otto	SF – Hamburg
10	Thurid Otto	SF – Hamburg

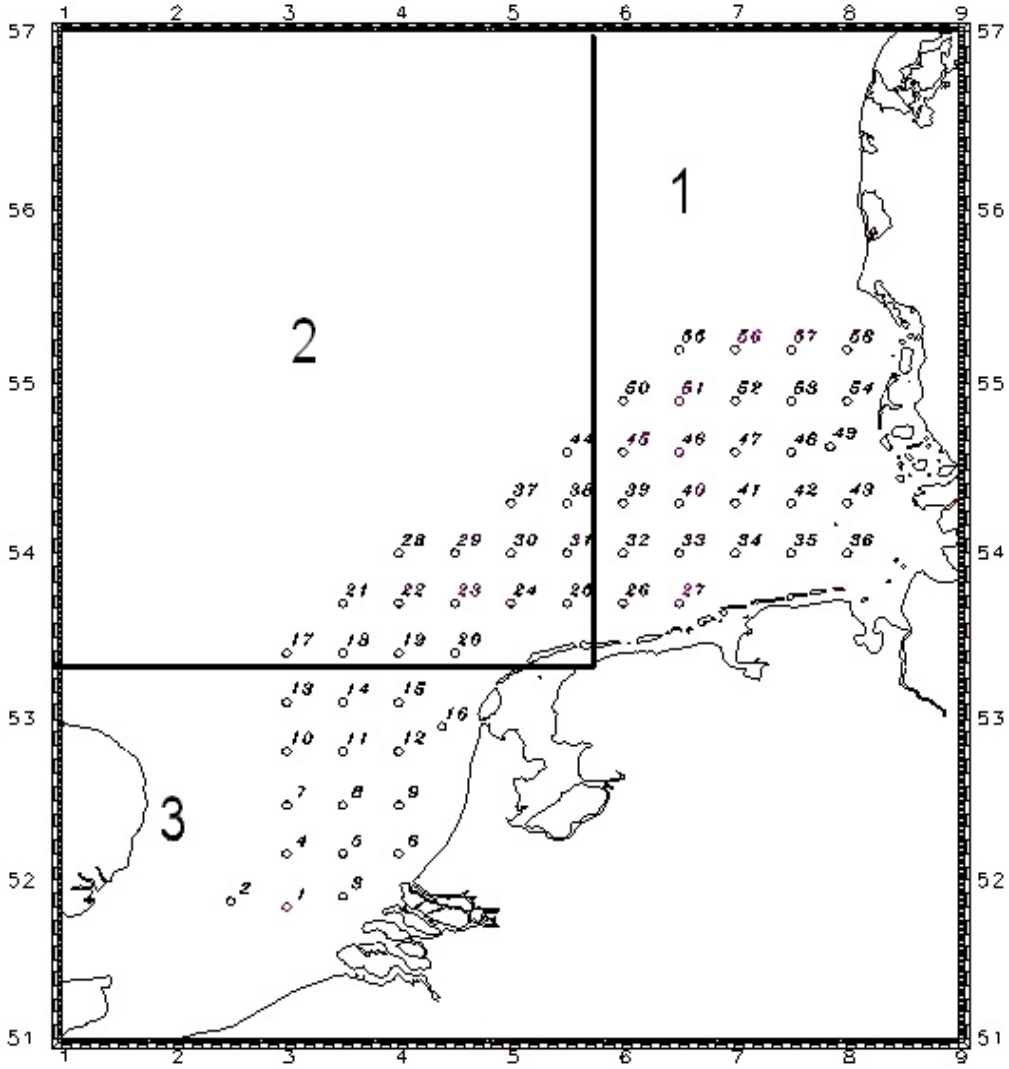

Figure 5. Stations of cruise 320 RV "Walther Herwig III".

Table 1. Cruise 320 RV "Walther Herwig III" (27.2 – 17.3.2009).

List of stations

STATION	COORDINATES	
1	51°50'N	03°00'E
2	51°52'N	02°30'E
3	51°54'N	03°30'E
4	52°10'N	03°00'E
5	52°10'N	03°30'E
6	52°10'N	04°00'E
7	52°28'N	03°00'E
8	52°28'N	03°30'E
9	52°28'N	04°00'E
10	52°48'N	03°00'E
11	52°48'N	03°30'E
12	52°48'N	04°00'E
13	53°06'N	03°00'E
14	53°06'N	03°30'E
15	53°06'N	04°00'E
16	52°57'N	04°23'E
17	53°24'N	03°00'E
18	53°24'N	03°30'E
19	53°24'N	04°00'E
20	53°24'N	04°30'E
21	53°42'N	03°30'E
22	53°42'N	04°00'E
23	53°42'N	04°30'E
24	53°42'N	05°00'E
25	53°42'N	05°30'E
26	53°42'N	06°00'E
27	53°42'N	06°30'E
28	54°00'N	04°00'E
29	54°00'N	04°30'E
30	54°00'N	05°00'E
31	54°00'N	05°30'E
32	54°00'N	06°00'E
33	54°00'N	06°30'E
34	54°00'N	07°00'E
35	54°00'N	07°30'E
36	54°00'N	08°00'E
37	54°18'N	05°00'E
38	54°18'N	05°30'E
39	54°18'N	06°00'E
40	54°18'N	06°30'E
41	54°18'N	07°00'E
42	54°18'N	07°30'E
43	54°18'N	08°00'E

STATION	COORDINATES	
44	54°36'N	05°30'E
45	54°36'N	06°00'E
46	54°36'N	06°30'E
47	54°36'N	07°00'E
48	54°36'N	07°30'E
49	54°36'N	08°00'E
50	54°54'N	06°00'E
51	54°54'N	06°30'E
52	54°54'N	07°00'E
53	54°54'N	07°30'E
54	54°54'N	08°00'E
55	55°12'N	06°30'E
56	55°12'N	07°00'E
57	55°12'N	07°30'E
55°12'N		

Table. 2. Cruise 320 RV "Walther Herwig" III (27.2. – 17.3.2009).

Frequency of malformation rates of the important species.

N: number; FL: low malformed; F: malformed; FS: bad malformed.

Art	N	%	FL	%	F	%	FS	%
Kliesche	33093	80.92	27	0.08	61	0.18	12	0.04
Wittling	751	1.83	7	0.93	5	0.67	2	0.27
Flunder	2188	5.35	3	0.14	4	0.18	0	0.00
Kabeljau	1446	3.54	7	0.48	9	0.62	3	0.21
Scholle	2395	5.86	1	0.04	10	0.42	1	0.04
Seequappe	557	1.36	1	0.18	4	0.72	0	0.00
Vipernqueise	2	0.005	0	0.00	0	0.00	0	0.00
Sprott	90	0.22	0	0.00	0	0.00	1	1.11
Seezunge	39	0.09	0	0.00	0	0.00	1	2.56
Doggerscharbe	211	0.51	0	0.00	2	0.95	0	0.00
Leierfisch	12	0.02	0	0.00	0	0.00	0	0.00
Steinbutt	1	0.002	0	0.00	0	0.00	0	0.00
Franzosendorsch	3	0.007	0	0.00	1	33.33	0	0.00
Unbekannt	105	0.26	0	0.00	0	0.00	0	0.00

Table 3. Cruise 320 RV "Walther Herwig III" (27.2. – 17.3.2009).

Malformation rates according to developmental stages.

Art	N	Ia N	Ia N %	Ib N	Ib N %	II N	II N %	III N	III N%	IV N	IV N %
Kliesche	33093	2412	7.29	2552	7.71	8031	24.27	19685	59.48	413	1.25
Wittling	751	32	4.26	9	1.2	68	9.05	634	84.42	8	1.06
Flunder	2188	140	6.4	228	10.42	472	21.57	1321	60.37	27	1.23
Kabeljau	1446	252	17.43	147	10.16	349	24.13	591	40.87	107	7.4
Scholle	2395	142	5.93	226	9.44	613	25.59	1215	50.73	199	8.31
Seequappe	557	132	23.7	44	7.9	82	14.72	287	51.52	12	2.15
Vipernqueise	2	0	0	1	50	0	0	1	50	0	0
Sprott	90	4	4.44	3	3.33	5	5.55	49	54.44	29	32.22
Seezunge	39	8	20.51	10	25.64	3	7.69	11	28.2	7	17.95
Doggerscharbe	211	31	14.69	57	27.01	81	38.39	42	19.9	0	0
Leierfisch	12	1	8.33	1	8.33	2	16.67	8	66.67	0	0
Steinbutt	1	1	100	0	0	0	0	0	0	0	0
Franzosendorsch	3	0	0	0	0	2	66.67	1	33.33	0	0
Unbekannt	105	27	25.71	53	50.48	12	11.42	8	7.62	5	4.76

Key for Tables 2 and 3:

Kliesche – dab – *Limanda limanda*

Scholle – plaice – *Pleuronectes platessa*;

Wittling – whiting – *Merlangius merlangus*;

Flunder – flounder – *Platichthys flesus*;

Kabeljau – cod – *Gadus morhua;*

Doggerscharbe – american place – *Hippoglossoides platessoides;*

Sprott – sprat – *Sprattus sprattus*;

Seequappe – rockling – *Rhinonemus cimbrius*;

Leierfisch – dragonet – *Callionymus lyra*;

Seezunge – common sole – *Solea vulgaris*;

Glattbutt – brill – *Scophthalmus rhombus*;

Franzosendorsch – pout – *Trisopterus luscus*.

Annex 2: PGEGGS terms of reference for the 2010 meeting

The **Planning Group on North Sea Cod and Plaice Egg Surveys in the North Sea** [PGEGGS] (Chair: Cindy van Damme, The Netherlands) will meet at ICES HQ, Copenhagen, Denmark from 9–12 November 2010 to:

b) analyse and review the results of the 2009 North Sea cod and plaice egg surveys;

c) compare the results from the 2004 and 2009 surveys to assess whether there has been a change in spawning distribution of the target species;

d) review archiving of the 2004 and 2009 North Sea ichthyoplankton survey data within the ICES DATRAS database.

PGEGGS will report by 4 January 2011 to the attention of SCICOM and TGISUR.

Supporting Information

Priority:	The planned 2009 surveys are important in that they will confirm findings from 2004 in relation to locations of cod spawning and further investigate whether cod in the northern North Sea are actively spawning. These results are important in relation to ongoing management issues with these two key commercial stocks. Consequently, these activities are considered to have a high priority.
Scientific justification and relation to action plan:	Action Plan: 1.2.1, 1.2.2, 1.8, 1.10 **Terms of reference a)** The rationale for establishing coordinated international North Sea ichthyoplankton surveys was presented in the report of PGEGGS which met in IJmuiden from 24-26 June 2003 and endorsed by the LRC. A successful survey was planned and undertaken in 2004 under the direction of PGEGGS. The results confirmed reduced egg production for plaice compared with earlier surveys and raised important scientific questions regarding effective cod spawning areas. **Terms of reference b)** Particularly for cod the 2004 results need to be confirmed and in particular the apparent low egg production of northerly areas investigated. The situation should be monitored by regular surveys. Because of the cost of undertaking such surveys, PGEGGS has recommended that they be undertaken every 5 years. Monitoring spawning areas of main fish species has been recommended as a high priority for Ecosystem Based Approach to Management by the Bergen Declaration Meeting of Scientific Experts. **Terms of reference c)** Data of the 2004 survey are stored in the CEFAS database and the 2009 data will be stored in the IMARES database. The data need to be transferred to the ICES DATRAS database.
Resource requirements:	ICES secretariat support for PGEGGS reports only, some advice from the ICES Data Centre is required to facilitate preparation of data collected in 2004 and 2009 for archival.
Participants:	The Group is normally attended by some 5–10 members and guests.
Secretariat facilities:	None.

Financial:	No financial implications.
Linkages to advisory committees:	Data are required by the ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak.
Linkages to other committees or groups:	No formal linkages.
Linkages to other organizations:	No formal linkages.

Annex 3: Recommendations

Recommendation	For follow up by:
1. PGEGGS recommends to plan a theme session on added values of ichthyplankton surveys at the ICES Annual Science Conference for 2010	SCICOM
3. PGEGGS should meet in 2010 to discuss results of the 2009 survey	All PGEGGS participants
4. PGEGGS should compare the results from the 2004 and 2009 surveys in order to assess whether there has been a change in spawning distribution of target species	All PGEGGS participants
5. PGEGGS to archive the 2004 and 2009 North Sea ichthyoplankton survey data with ICES Data centre	IMARES