

# **SURVEY REPORT / TOKTRAPPORT**

## **Acoustic Survey for North Sea Herring and Sprat**

**RV "G.O SARS" 27 June – 20 July 2002**

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## **1. INTRODUCTION**

The report presents the results from the Norwegian coverage of the International Herring Acoustic Survey for 2002 (Fig. 1). The time series of this survey extends back to 1984. Five countries cooperate to survey the North Sea and the Skagerrak for an acoustic abundance estimation of herring and sprat. The surveys are planned in the Planning Group for Herring Surveys (ICES 2002), a sub group under the ICES Herring Assessment Working Group for the Area South of 62°N.

Objectives: To estimate the abundance of herring and sprat in the area between latitudes 56°30'N and 62°00'N and 02°00'-06°00'E. Map the general hydrographical regime and monitor the standard profiles Oksøy - Hanstholm, Hanstholm - Aberdeen, Utsira - Start Point and Feie - Shetland.

## **2. SURVEY DESCRIPTION AND METHODS**

### **2.1 Personell**

Valantine Anthonypillai	(Fish.lab)
Karen Gjertsen (11 – 20 July)	(Fish.lab)
Anne-Liv Johnsen	(Fish.lab)
Sigmund Myklevoll	(Fish.lab)
Henrik Myran (27 June – 11 July)	(Fish.lab)
Einar Osland	(Acoustic technician)
Bjørn Vidar Svendsen	(Fish.lab)
Øyvind Torgersen	(Acoustic expert)
Else Torstensen	(Cruise leader)
Exchange of staff with “Scotia”:	

Eric Armstrong, Marine Lab, Aberdeen, 4 - 17 July.

## **2.2 Narrative**

RV “G.O. Sars” sailed at 1400 UTC on 27 June 2002. The vessel made passage to Uggedalseide/Tysnes and anchored at 1800 UTC to calibrate the acoustic instruments. The conditions appeared to be unfavourable for calibration and the vessel continued to the Førdesfjord, north of Haugesund. Entered at 0240 UTC without anchoring. Was positioned for a while and left the area at 0610 UTC. Again, the condition was not satisfactory for calibration as there were too much fish/jellyfish in the sea. On 28 June the vessel anchored in Rosfjord, 58° 04’ N and 7° 00’ E at 2040 UTC to calibrate the acoustic instruments on all scientific sounders. At 0500 UTC RV “G.O.Sars” left the fjord following a successful calibration of all scientific sounders and commenced the survey at 0920 UTC at 58° 3’ N and 8° 5’ E, the first CTD-station on the Oksøy – Hanstholm transect.

The survey continued with transects from south to north. The weather conditions were good except for the last two days. Due to rough weather and few, small acoustic registrations in the ICES rectangles 50F2 and 51F”, the rectangle 51F3 was not covered.

A call was made in Egersund on 28 June, in Aberdeen on 3 July, in Haugesund on 11 July and in Lerwick, Shetland on 17 July. The survey finished in Bergen on 20 July 2002 at 2015 hrs UTC. About 3.600 n.mi. were covered by the survey and 100 trawl hauls and 168 CTD stations were taken. Two pelagic nets were seriously damaged.

## **2.3 Survey design**

The survey was carried out in systematic parallel transects in the east-west direction with a distance of 13-17 n.mi. spacing progressing from south to north. Additional short transects were made in the overlapping area east of Shetland, with 7-8 n.mi. transects spacing. North of 60° 45’ transects in a south – north direction were performed. The cruise tracks with fishing stations and CTD-stations are shown in Figures 2 and 3, respectively.

## **2.4 Calibration**

The acoustic sounders, Simrad EK500 18, 38 and 120 kHz, were controlled and calibrated before the actual survey started. A standard sphere calibration was carried out. For calibration of the 38kHz sounder a 60 mm copper sphere (CU60), Ts -33,7 dB, was used. Agreement between means of the calibrations this year and value from last year on the same systems, was better than 0.1 dB.

## **2.5 Acoustic data collection**

Acoustic data were collected 24 hours per day using a SIMRAD EK500 38 kHz echo sounder with an ES38B transducer mounted on the drop keel. Additional data were collected at 18 and 120 kHz but these were not used for the present assessment. Echo integrator data was collected from 10 m below the surface (transducer at 5-7.5 m

depth, depending on weather conditions and the keel in use) to 1 m above the seabed. The main settings of the acoustic instruments are given in Table 1. The speed of the vessel during the acoustic sampling was 10-11 knots. The acoustic data were archived to tape. The acoustic recordings were scrutinized twice per day using the IMR BEI/SIMRAD BI500 Scientific Post Processing System (The Bergen Echo Integrator) (Foote et al. 1991). Paper records were kept for acoustic data at 38 kHz. Herring were separated from other recordings by using catch information and characteristics of the recordings..

## **2.6 Biological data - fishing trawls**

Trawling was carried out for supporting the species identifications of acoustic scatters and for biological sampling. The survey started with using a “Fotø” trawl (16 x 20 m) for pelagic trawling and a Campelen 1800 equipped with a Rock hopper gear used for bottom trawling. To be able to handle pelagic trawling close to bottom as well as at surface, a “Fotø”-trawl was used.. Half-way through the survey the “Fotø”-trawl was damaged and replaced by a “Åkra”-trawl. The bottom trawl hauls were monitored using Simrad TS150 scanning net-sonde and the pelagic trawl hauls monitored by Scanmar TE40, and depth sensor D1200.

Biological samples (length, weight) were taken of the most important species according to the IMR fish sampling manual (Fotland et.al. 2000). Target species were also examined for age, sex, maturity (8 point scale), fat, stomach contents and macroscopic evidence of *Ichthyophonus* infection. Off the south-west coast of Norway, North Sea autumn spawners (NSAS) and Western Baltic spring spawners (WBSS) mix during summer. No system for routine stock discrimination on individual herring during the survey, is available. East of 2°00'E vertebral counts were therefor taken for stock separation.

## **2.7 Hydrographic data**

CTD stations for temperature, salinity and density measures, were taken regularly in addition to the four standard hydrographical profiles, Oksøy-Hanstholm, Hanstholm-Aberdeen, Utsira - Start Point and Feie – Shetland.

## **2.8 Data analysis**

Echogram scrutiny was made per 5 n.mi, in a Bergen Echo Integrator System (BEI). The  $S_A$  values were allocated to the following categories: herring, sprat, pelagic and demersal fish, plankton and other. To calculate integrator conversion factors the target strength of clupeids in the mixture were estimated using the following TS/length relationship:

$$TS = 20\log_{10}L - 71.2 \text{ dB}$$

The abundance estimation is made by ICES rectangles and summed up for the whole area. Toresen et al (1998) describes the acoustic method used for the abundance estimation in this survey.

North Sea autumn spawners and Western Baltic spring spawners (WBSS) are mixed during summer in the southern part of the area covered by RV "GOSars". No system for routinely stock discrimination on individual herring during the survey is available. The proportion of Baltic spring spawners and North Sea autumn spawners by age were calculated by applying the formula,  $WBSS = ((56,5 - VS(\text{sample})) / (56,5 - 55,8))$  (ICES 1999). All samples were worked up on board. Sampling procedures are described in Fotland et al. 2000. The length-at age and weight-at age were assumed to be the same in the two stocks. The measured proportions of mature fish were applied equally to calculate the maturing part of each age group in both stocks

### **3. RESULTS & DISCUSSION**

#### **3.1 Hydrological data**

Altogether 168 CTD-stations were taken (Fig. 3). The horizontal temperature distributions at 5m, 50m and bottom, are shown in Figure 4a-c. The surface water in the North Sea had temperatures ranging from 12-14° C in west to 15-16° C along the Norwegian west coast. The temperatures at 5 m depth in the south eastern area were about 2°C lower than at the same time in 2001 (Torstensen, 2001). At 50 m and at bottom the temperature regime was about 1-2° C higher than last year.

#### **3.2 Acoustic data**

##### **3.2.1 Herring**

The geographical distribution of the mean- $S_A$  values assigned to herring are presented in Figure 5. The main areas of concentration were the south western corner of the surveyed area and off the south-western Norwegian coast (Figure 6). High densities were also recorded in the ICES rectangles 47E8-E9 and 49E9, 50E9-F0, but are not included in the present estimates. While few or no schools of herring have been observed during the last surveys, large and smaller herring schools were recorded this year. The majority of the trawling positions were, however, regularly chosen with trawling at surface every 20-30 nautical miles; i.e not based on echo registration. Due to the behaviour to keep close to the surface during day-time, herring may have been under-estimated.

The abundance by ICES statistical rectangles, divided in Western Baltic spring spawners and North Sea autumn spawners, are given in Table 2. The numbers are given age disaggregated. The numbers in age groups 1, 2 and 3 are split in mature/immature parts. Table 3 presents the mean weights at age applied for biomass estimations. Total estimated number of herring by age and length are given in Table 4. The total estimated biomass per age group and stock is also given in the table.

### 3.2.2 Sprat

Small values of sprat were measured in the shallow areas near Hanstholm, Denmark, in ICES square 43F8. No sprat were recorded in the target area of the Norwegian survey.

### 3.3 Biological data

The total number of valid trawl hauls were 99, 84 pelagic and 15 bottom trawl hauls (Fig. 2, Table 5). Of the pelagic hauls, 7 were midwater hauls, 6 hauls were taken close to the bottom and 71 were performed with large buoys for fishing in the surface. In general 30 min hauls were made. Herring was present in 54 trawl hauls (Table 6) of which 41 had sample size >20 herring. Length distribution of herring by trawl haul east of 2°E are given in Table 7. Age-length key with total number of otoliths by age and length class is given in Table 5. The data on age, length weight and maturity stages, were made for both stocks combined; the North Sea autumn spawners and the Western Baltic Spring Spawners. 3.678 fish were length measured and 2.047 fish were aged (otoliths).

### 3.4 Biomass estimates

#### 3.4.1 Herring

Total estimates of the spawning stock biomass of North Sea herring and Western Baltic spring spawners for 1997-2002, are given in the text table below. The total herring biomass in the area was 503,000 t. Though some differences in the ICES-rectangles covered in the south-south east, the herring biomass was substantially increased from 273,000 t in 2001. This was mainly caused by high abundance of 1-ringers (2000 year class). The estimated spawning stock biomass of North Sea herring was about 90 200 t which is an increase of abt 76 % compared to the 2001-estimate. There was a minor increase in the estimated biomass of Baltic spring spawners in the North Sea, 96 700 tonnes.

Year	Herring Biomass (10 <sup>3</sup> tonnes)	
	North Sea herring SSB	Western Baltic Spring Spawners
1997	50	160
1998	73	88
1999	259	74
2000	13	51
2001	51	89
2002	90	97

#### 4. REFERENCES

- Fotland, AA., Borge, A., Gjørseter, H. and Mjanger, H. 2000. Manual for sampling of fish and shellfish. (In Norwegian). Ver. 3.14. Institute of Marine Research.
- Footo, K.G., Knudsen, H.P., Korneliussen, R.J., Nordbø, P.E. and Røang, K. 1991. Postprocessing system for echo integrator data. *J. Acoust. Soc. Am.*, 90, 37-47.
- ICES 1999. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES CM 1999/ACFM: 12
- ICES 2002. Report of the Planning Group for herring surveys. 2002/G:02
- Toresen, R., Gjørseter, H. and de Barros, P. 1998. The acoustic method as used in the abundance estimation of capelin (*Mallotus villosus* Müller) and herring (*Clupea harengus* Linné) in the Barents Sea. *Fisheries Research*, 34: 27-37.
- Torstensen, E. 2001. Survey Report, RV "Michael Sars" 29 June- 23 July 2001. IMR. Internal Survey Reports. 9pp.

**Table 1.** Simrad EK500 and analysis settings used on the GOS2002009 herring acoustic survey.

<b>Transceiver 1 Menu</b>	
Absorption coefficient	10 dB.km <sup>-1</sup>
Pulse length	Medium
Bandwidth	Wide
Max. Power	2000 W
Equivalent two-way beam angle	-21.0 dB
3 dB Beamwidth	7.3/7.0 deg
Alongship offset	-0.05 deg
Althw.Ship Offset	-0.01 deg
<b>Calibration details</b>	
TS of sphere	-33.6 dB (cupper 60 mm diameter)
Range to sphere in calibration	23.3
Selected (sA) NASC value for calibration	4372
<b>Log Menu</b>	
GPS	
<b>Operation Menu</b>	
Ping interval	0.0 (all ranges)
<b>Display / Printer Menu</b>	
TVG	20 log R
Integration line	1000
TS colour min.	-50 dB
Sv colour min.	-70 dB







Table 2. Cont.

<b>45F4</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	47.56	2.13	3.05	0.38	0.77	2.06	0.00	0.00	0.00	0.00	0.00	0.00	55.96
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	12.97	0.58	12.21	1.53	1.94	5.16	0.00	0.00	0.00	0.00	0.00	0.00	34.38
<b>45F5</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	38.11	4.48	1.64	2.30	0.00	0.00	2.82	0.00	0.00	0.00	0.00	0.70	50.06
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	10.39	1.22	2.46	3.45	3.00	8.26	0.00	0.00	0.00	0.00	0.00	0.00	28.80
<b>46F2</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	3.26	0.00	5.72	40.07	1.26	21.46	6.22	0.00	0.00	0.00	0.00	0.00	77.99
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	2.96	0.00	0.49	3.45	0.81	13.77	0.00	0.00	0.00	0.00	0.00	0.00	21.49
<b>46F3</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	1.77	9.74	6.14	56.77	3.12	32.28	3.12	3.12	1.56	0.00	0.00	0.00	117.63
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	1.61	8.86	0.53	4.89	2.00	20.71	0.00	0.00	0.00	0.00	0.00	0.00	38.60
<b>46F4</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	333.78	20.03	11.44	4.00	0.00	0.00	18.69	0.00	0.00	0.00	0.00	0.00	387.95
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	98.90	5.93	55.30	19.36	30.23	39.30	0.00	0.00	0.00	0.00	0.00	2.23	251.26
<b>46F5</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	5.84	0.46	0.26	0.09	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.05	7.06
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	1.21	0.10	1.24	0.43	0.60	0.86	0.00	0.00	0.00	0.00	0.00	0.00	4.43
<b>47F2</b>	<b>North Sea Autumn spawners</b>												<b>Total</b>
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	0.45	0.23	0.00	9.91	0.20	7.09	0.00	0.00	0.00	0.00	0.00	0.00	17.88
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	0.15	0.07	0.00	0.00	0.21	7.50	3.60	2.40	1.80	1.20	0.30	0.00	17.24

Table 2. Cont.

<b>47F3 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	4.39	3.13	1.69	44.68	1.19	37.99	28.56	11.43	0.00	0.00	0.00	0.00	133.05
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	1.41	1.01	0.00	0.00	0.54	17.41	0.41	0.17	5.80	4.97	0.83	0.00	32.54

<b>47F4 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	224.98	2.88	17.66	5.89	14.39	15.29	14.87	2.18	0.70	0.00	0.00	0.00	298.83
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	37.50	0.48	44.14	14.71	20.34	21.61	21.02	3.08	0.99	0.00	0.00	0.00	163.88

<b>48F2 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	9.79	0.09	2.18	1.09	0.33	0.91	3.10	1.22	0.73	0.31	0.05	0.21	20.01
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	1.09	0.01	0.87	0.44	1.22	3.32	1.24	0.49	0.29	0.12	0.02	0.08	9.20

<b>48F3 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	84.35	0.81	18.75	9.38	2.86	7.81	26.75	10.54	6.28	2.69	0.45	1.79	172.46
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	9.37	0.09	7.50	3.75	10.50	28.64	10.70	4.21	2.51	1.08	0.18	0.72	79.25

<b>48F4 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	114.75	1.05	2.15	0.00	1.12	0.32	0.00	0.00	0.00	0.00	0.00	0.00	119.39
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	0.00	0.00	16.70	0.00	7.57	2.16	5.68	0.99	0.00	0.00	0.00	0.00	33.10

<b>49F2 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	10.38	0.18	0.48	0.36	0.26	1.40	1.01	0.19	0.06	0.25	0.00	0.00	14.57
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	0.00	0.00	0.64	0.48	0.12	0.69	0.35	0.07	0.02	0.09	0.00	0.00	2.46

<b>49F3 North Sea Autumn spawners</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	28.37	0.34	0.82	0.61	0.51	2.24	1.37	0.37	0.09	0.37	0.00	0.00	35.08
<b>Baltic Spring Spawner</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
0.00	2.18	0.03	1.09	0.82	0.27	1.17	0.72	0.19	0.05	0.19	0.00	0.00	6.70



Table 3. HERRING NORTH SEA. Weight at age and maturity by ICES rectangles. RV "G.O.Sars", 27 June-20 July 2002. (I=immature, M=mature)

<b>51F3</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	93.00		113.50	126.14	127.44	156.08	155.20	188.33	142.00	226.00			144.00
<b>51F2</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	93.00		113.50	126.14	127.44	156.08	155.20	188.33	142.00	226.00			144.00
<b>50F3</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	64.35	106.00	107.28	117.64	117.08	149.06	140.22	195.00	161.50	225.00			93.20
<b>50F2</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	64.35	106.00	107.28	117.64	117.08	149.06	140.22	195.00	161.50	225.00			92.80
<b>50F0</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
			148.00	173.90		187.50	181.40	211.70	229.90	271.40			193.60
<b>50E9</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
			148.00	174.20		184.40	176.80	207.90	245.80	211.00			188.30
<b>49F4</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	66.50	93.50	98.10	124.20	88.60	136.80	129.10	211.80	181.00	229.50			81.60
<b>49F3</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	66.50	93.50	98.10	124.20	88.60	136.80	129.10	211.80	181.00	229.50			81.60
<b>49F2</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	67.40	93.50	98.10	124.20	93.80	136.80	129.10	225.30	181.00	229.50			92.80
<b>49E9</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
			148.00	174.20		184.40	176.80	207.90	245.80	211.00			188.30
<b>48F4</b>													
<b>0</b>	<b>1</b>	<b>1M</b>	<b>2I</b>	<b>2M</b>	<b>3I</b>	<b>3M</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9+</b>	<b>Total</b>
	63.80	101.00	86.30		101.30	108.00	121.80	111.00					71.00





Table 4. HERRING – NORTH SEA. Estimated number and biomass by age and length groups. Totals also divided by stocks. RV “G.O.Sars” 27 June –20 July 2002.

Length (cm)	Age groups (yr)										N (mill)	Ton (10 <sup>3</sup> )
	1	2	3	4	5	6	7	8	9+			
13.0-13.9	8.98										8.98	0.18
14.0-14.9	149.34										149.34	3.25
15.0-15.9	1082.34										1082.34	27.41
16.0-16.9	1554.81										1554.81	46.38
17.0-17.9	1363.21										1363.21	50.77
18.0-18.9	999.15	10.41									1009.56	46.62
19.0-19.9	813.75		4.54								818.30	44.91
20.0-20.9	738.34	10.35	2.86								751.55	49.38
21.0-21.9	540.58	113.73	36.86			1.56					692.73	52.10
22.0-22.9	204.98	137.92	54.77	7.26							404.93	34.47
23.0-23.9	30.98	98.34	92.86	6.29	1.13						229.60	22.20
24.0-24.9	7.21	75.87	112.24	27.85							223.17	26.05
25.0-25.9	3.75	50.49	60.61	36.38	0.76			1.13		2.99	156.09	21.26
26.0-26.9	3.12	33.06	39.98	30.30	4.52						110.98	18.22
27.0-27.9	3.24	18.16	42.81	32.63	4.53	1.56					102.94	19.04
28.0-28.9	1.56	10.37	41.35	24.88	12.56	5.78	3.74				100.24	21.28
29.0-29.9		4.94	5.31	7.06	11.38	5.67	6.49	1.13			41.99	10.22
30.0-30.9			3.21			6.53	4.50	2.70	0.70		17.65	4.41
31.0-31.9				1.05	3.85	5.19	1.46				11.55	3.13
32.0-32.9								1.13		2.80	3.93	1.24
N (mill)		7505	564	497	174	47	23	17	2	6	8834	503
NS herring		7135	318	214	126	34	11	8	1	3		
Baltic spr		370	245	283	48	13	12	9	1	3		
<b>NS herring (millions)</b>											<b>7850</b>	
<b>SSB, NS herring (tonnes 10<sup>3</sup>)</b>											<b>90.21</b>	
<b>Baltic spr (tonnes <sup>3</sup>)</b>											<b>96.65</b>	



Table 5. RV "GOSars" 27 June - 20 July 2002. Details of trawl stations during the acoustic survey on North Sea herring and sprat.

Trawl haul no	Date	Lat	Lon	Time UTC	Water depth (m)	Trawl depth (m)	Duration min
PT470	29.jun	57°56'	8°02' E	10:48	534	70	30
PT471	29.jun	57°23'	8°28' E	17:06	37	0	38
BT472	29.jun	57°11'	8°32' E	20:07	31	31	23
PT473	30.jun	57°00'	8°02' E	23:58	32	0	30
PT474	30.jun	57°00'	7°31' E	03:04	35	0	30
PT475	30.jun	57°00'	6°14' E	09:04	61	0	30
PT476	30.jun	57°00'	5°07' E	13:49	120	0	30
PT477	30.jun	57°00'	4°32' E	16:36	64	22	29
PT479	30.jun	57°00'	4°14' E	19:10	63	0	13
BT480	30.jun	57°00'	4°12' E	19:58	63	63	26
PT481	30.jun	57°00'	3°38' E	23:08	64	0	30
PT482	01.jul	57°00'	2°58' E	02:15	67	0	30
PT483	02.jul	56°48'	2°06' E	08:11	88	0	30
PT484	02.jul	56°48'	4°32' E	16:30	60	0	28
PT485	02.jul	56°46'	5°51' E	21:45	57	0	30
PT486	02.jul	56°40'	4°59' E	02:33	65	0	30
BT487	02.jul	56°35'	3°54' E	07:06	72	72	30
PT488	02.jul	56°37'	2°00' E	14:42	87	0	30
BT489	02.jul	56°54'	1°46' E	17:16	94	94	30
PT490	02.jul	57°00'	0°38' E	23:03	91	0	30
PT491	03.jul	57°00'	0°03' E	02:05	83	0	30
PT492	04.jul	57°10'	1°07' W	14:57	59	40	24
BT493	04.jul	57°11'	0°47' W	17:13	69	65	31
PT494	05.jul	57°13'	2°02' E	02:49	87	0	30
PT495	05.jul	57°13'	2°17' E	04:25	83	83	30
PT496	05.jul	57°13'	3°06' E	08:17	66	30	12
PT497	05.jul	57°12'	3°06' E	08:57	66	66	29
BT498	05.jul	57°13'	5°34' E	17:43	55	55	30
PT499	05.jul	57°27'	5°50' E	21:14	83	0	30
PT500	06.jul	57°27'	4°53' E	01:02	81	0	30
BT501	06.jul	57°27'	3°45' E	05:25	66	65	30
BT502	06.jul	57°27'	3°00' E	09:19	65	65	29
PT503	06.jul	57°27'	2°24' E	12:05	80	40	13
PT504	06.jul	57°27'	2°15' E	14:17	81	81	32
PT505	06.jul	57°41'	2°39' E	18:46	70	0	29
PT506	06.jul	57°41'	3°34' E	22:15	64	0	30
PT507	07.jul	57°40'	4°22' E	01:32	77	0	30
BT508	07.jul	57°41'	5°33' E	06:16	114	113	30
PT509	07.jul	57°55'	3°48' E	16:40	88	0	29
PT510	07.jul	57°55'	2°17' E	22:13	75	0	30
PT511	08.jul	58°09'	2°40' E	02:29	70	0	30
BT512	08.jul	58°09'	3°19' E	05:36	81	81	30
PT513	08.jul	58°09'	3°46' E	07:35	91	0	30
PT514	08.jul	58°11'	5°51' E	15:29	332	0	30
PT515	08.jul	58°24'	4°43' E	23:21	287	0	30
PT516	09.jul	58°23'	3°18' E	04:35	114	0	30
PT517	09.jul	58°23'	3°17' E	05:31	116	45	28
PT518	09.jul	58°36'	3°02' E	14:32	104	0	30
PT519	09.jul	58°36'	4°14' E	19:03	285	0	35

Table 5. Cont.

<b>Trawl haul no</b>	<b>Date</b>	<b>Lat</b>	<b>Lon</b>	<b>Time UTC</b>	<b>Water depth (m)</b>	<b>Trawl depth (m)</b>	<b>Duration min</b>
PT520	09.jul	58°36'	5°02' E	22:14	251	0	30
PT521	10.jul	58°51'	5°16' E	02:24	116	0	30
PT522	10.jul	58°50'	4°38' E	05:11	238	0	30
PT523	10.jul	58°51'	4°08' E	07:44	287	30	30
PT524	10.jul	58°51'	3°58' E	09:47	279	0	30
PT525	10.jul	58°51'	2°58' E	14:10	120	0	30
BT526	10.jul	58°51'	2°28' E	16:33	115	115	31
PT527	10.jul	59°04'	2°43' E	21:29	127	0	30
PT528	11.jul	59°04'	3°21' E	00:18	171	0	30
PT529	11.jul	59°04'	3°02' E	04:16	264	0	30
PT530	11.jul	59°04'	5°00' E	06:58	247	0	31
PT531	12.jul	59°17'	4°19' E	17:12	266	0	31
PT532	12.jul	59°17'	3°38' E	20:55	246	0	30
PT533	13.jul	59°17'	2°58' E	00:22	116	0	30
PT534	13.jul	59°17'	2°18' E	03:35	128	122	30
BT535	13.jul	59°17'	0°39'W	15:08	128	124	31
PT536	13.jul	59°17'	1°36' W	19:14	94	82	12
PT537	14.jul	59°32'	2°12' E	11:18	124	0	31
PT538	14.jul	59°31'	3°16' E	15:13	154	0	30
BT539	14.jul	59°31'	3°25' E	16:35	206	206	32
PT540	14.jul	59°32'	4°46' E	22:22	239	0	30
PT541	15.jul	59°50'	4°53' E	01:28	235	0	30
PT542	15.jul	59°49'	4°19' E	03:51	283	0	31
PT543	15.jul	59°49'	3°25' E	07:29	253	0	29
PT544	15.jul	59°49'	3°18' E	08:46	220	220	25
PT545	15.jul	59°49'	2°18'E	12:58	112	0	30
PT546	15.jul	60°07'	3°02' E	18:43	121	0	31
PT547	15.jul	60°07'	4°02' E	22:33	293	0	30
PT548	16.jul	60°10'	4°53' E	01:53	221	0	30
PT549	16.jul	60°27'	4°33' E	05:01	315	0	31
PT550	16.jul	60°27'	3°28' E	09:06	307	0	30
PT551	16.jul	60°27'	2°15' E	13:26	112	0	30
PT552	16.jul	60°27'	0°50' E	18:45	136	135	30
PT553	16.jul	60°27'	0°1' W	23:38	93	0	31
PT554	17.jul	60°18'	0°46' W	02:18	94	0	30
BT555	17.jul	60°36'	0°38' W	19:57	133	133	35
PT556	17.jul	60°36'	0°11' E	23:02	136	0	30
PT557	18.jul	60°54'	0°27' E	02:57	123	0	30
PT558	18.jul	60°54'	0°13' W	05:26	164	0	29
BT559	18.jul	60°45'	0°22' W	11:24	135	135	29
PT560	18.jul	60°46'	2°15' E	20:52	327	0	36
PT561	19.jul	61°22'	2°17' E	01:36	302	0	30
PT562	19.jul	61°50'	2°31' E	06:03	391	0	44
PT563	19.jul	61°38'	2°46' E	08:44	390	0	30
PT564	19.jul	61°05'	2°46' E	12:46	281	0	29
PT565	19.jul	60°45'	3°09' E	18:09	254	0	30
PT566	19.jul	61°02'	3°17' E	23:03	358	0	30
PT567	20.jul	61°21'	3°45' E	06:44	366	0	33
PT568	20.jul	60°53'	3°46' E	10:14	340	0	30
PT569	20.jul	60°45'	4°08' E	14:44	320	0	30



Table 6. RV "G.O.Sars" 27 June - 20 July 2002. Species composition in the trawl hauls.

Trawl station		470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493
Total catch (kg)		4.85	10.19	181.01	1.12	0.11	69.01	37.02	4.70	0.00	27.00	162.14	133.39	272.02	1.89	3.14	137.65	0.31	275.10	7.20	95.49	11.34	22.14	26.05	240.34
Herring	<i>Clupea harengus</i>			1.82							27.00	26.08	121.64	217.66			103.84		174.00		59.40	2.00	7.41		
Sprat	<i>Sprattus sprattus</i>			2.08																					
Pilchard	<i>Sardina pilchardus</i>		0.09				0.37																		
Anchovy	<i>Engraulis encrasicolus</i>																								
Mackerel	<i>Scombrus scombrus</i>		0.97	0.62	1.09	0.10	68.30	37.02					10.97	46.84	1.89	2.42	33.10	0.31		6.28	0.88	6.73	1.12		
Horse mackerel	<i>Tracurus tracurus</i>			8.28													0.46								
Norway pout	<i>Trisopterus esmarkii</i>																				5.15		13.03		1.84
Haddock	<i>Melanogrammus aeglefinus</i>	0.00										7.60							5.20		23.33	0.06	0.03	0.03	194.24
Whiting	<i>Merlangius merlangus</i>	0.01	0.04	16.50	0.03	0.01						4.10	0.78			0.00					2.41	0.06		0.01	13.56
Blue-whiting	<i>Micromesistius poutassou</i>																								
Saithe	<i>Pollachius virens</i>																								7.44
Hake	<i>Merluccius merluccius</i>			3.00																					
Pollack	<i>Pollachius pollachius</i>																								
Torsk	<i>Brosme brosme</i>																								
Cod	<i>Gadus morhua</i>			24.42															0.80						1.41
Poor cod	<i>Trisopterus minutus</i>																								
Ling	<i>Molva molva</i>																								
Strømsild	<i>Argentina sphyraena</i>																								
Sandeels	<i>Ammodytidae</i> spp			0.76																		0.01		25.00	
Gurnard	<i>Trigla</i> spp		0.05				0.35									0.21	0.25		2.20		1.94	0.31			3.00
Dab	<i>Limanda limanda</i>			36.12								90.40							82.40		0.20				2.04
Plaice	<i>Pleuronectes platessa</i>			64.80																					
Witch	<i>Glyptocephalus cynoglossus</i>																								
Lomre	<i>Microstomus kitt</i>			17.28															1.70						1.68
Long rough dab	<i>Hippoglossoides platessoides</i>											31.20							8.80		2.18				3.16
Wolffish	<i>Anarhichas lupus</i>											1.60													
Lumpsucker	<i>Cyclopterus lumpus</i>								2.71											0.92					
Monkfish	<i>Lophius piscatorius</i>																								
Norway haddock	<i>Sebastes marinus</i>																								
Jellyfish		4.84	9.04						1.00							0.50						2.18	0.55	1.00	
Other				5.34					0.99			1.16		7.52								0.01			11.97





Table 6. Cont.

Trawl station		519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	
Total catch (kg)		221.77	145.84	52.94	49.81	15.01	60.74	4.76	131.18	36.17	49.41	0.00	84.92	5.73	200.00	20.49	15.00	212.05	185.71	1.34	5.75	563.14	180.10	148.20	66.51	
Herring	Clupea harengus	0.15	4.61	2.72	0.28		47.00		5.99		32.02		20.00	4.70	200.00	1.37		7.88	17.46		0.18	76.08	91.49	38.50	45.00	
Sprat	Sprattus sprattus																									
Pilchard	Sardina pilchardus																									
Anchovy	Engraulis encrasicolus																									
Mackerel	Scombrus scombrus	21.28	17.12	35.20	2.49		3.06			0.89	5.64		4.76	0.13		18.54			0.68	0.52	0.58		36.47	24.50	0.41	
Horse mackerel	Tracurus tracurus																									
Norway pout	Trisopterus esmarkii																		132.53	81.84	0.05		127.60			
Haddock	Melanogrammus aeglefinus	0.10			0.02	0.01	0.02		64.94	0.03	0.01		0.01	0.05		0.00		41.85	40.62	0.30		0.20				
Whiting	Merlangius merlangus	0.09	0.11	0.02	0.03	0.01	0.00	0.01	2.87	0.12	0.04		0.03	0.07		0.58		13.76	32.55	0.00		13.68	0.01	0.20	0.00	
Blue-whiting	Micromesistius poutassou		24.00																			315.20	1.19			
Saithe	Pollachius virens					0.99			30.10																	
Hake	Merluccius merluccius																						0.52			
Pollack	Pollachius pollachius																									
Torsk	Brosme brosme																									
Cod	Gadus morhua																	4.64								
Poor cod	Trisopterus minutus																									
Ling	Molva molva																									
Strømsild	Argentina sphyraena																									
Sandeels	Ammodytidae spp																									
Gurnard	Trigla spp								0.95												0.12					
Dab	Limanda limanda								0.33																	
Plaice	Pleuronectes platessa																									
Witch	Glyptocephalus cynoglossus																							8.20		
Lomre	Microstomus kitt								0.37								2.59	0.80	0.19			2.34				
Long rough dab	Hippoglossoides platessoides								6.54								5.44					1.30				
Wolffish	Anarhichas lupus																									
Lumpsucker	Cyclopterus lumpus	0.15					0.65						0.11	0.79												1.06
Monkfish	Lophius piscatorius																									0.04
Norway haddock	Sebastes marinus																									
Jellyfish		200.00	100.00	15.00	47.00	14.00	10.00	4.75		35.00	10.00		60.00				15.00				5.00		50.83	85.00	20.00	
Other									2.34	0.13	0.20							3.38	11.76	0.16		18.02	0.10			





Table 6. Cont.

Trawl station		543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	
Total catch (kg)		56.01	598.04	0.30	10.03	363.16	172.31	30.50	11.72	5.96	687.06	1.65	2.54	872.43	29.96	3.56	1.00	384.03	15.06	52.45	7.15	19.57	4.65	1.02	35.25	
Herring	Clupea harengus	40.00	6.88			249.17	150.00		9.32		427.20			5.82	7.74	0.17		0.55							0.21	
Sprat	Sprattus sprattus																									
Pilchard	Sardina pilchardus																									
Anchovy	Engraulis encrasicolus																									
Mackerel	Scombrus scombrus	15.85	8.31		1.01	43.56	6.38	0.50	1.20	5.72		0.91				22.01	3.39		0.94							25.34
Horse mackerel	Tracurus tracurus																			48.94	2.15	14.52	4.57			0.59
Norway pout	Trisopterus esmarkii		54.82									48.70	0.01		590.40				168.84							
Haddock	Melanogrammus aeglefinus		5.14			0.07								12.70			0.00	90.90		0.00			0.01			
Whiting	Merlangius merlangus		8.08				0.01					8.30		108.60			0.00	61.56	0.06	0.00	0.01					0.01
Blue-whiting	Micromesistius poutassou		322.49			2.52								6.30												1.68
Saithe	Pollachius virens		159.02			9.00						178.40							12.65		1.26					2.16
Hake	Merluccius merluccius		3.34																14.04							
Pollack	Pollachius pollachius																									
Torsk	Brosme brosme																									
Cod	Gadus morhua		0.87																12.74							
Poor cod	Trisopterus minutus																									
Ling	Molva molva																			10.54						
Strømsild	Argentina sphyraena		13.29											0.96	0.01		2.25			4.28						
Sandeels	Ammodytidae spp																									
Gurnard	Trigla spp															0.21				1.85						
Dab	Limanda limanda														1.20											
Plaice	Pleuronectes platessa																									
Witch	Glyptocephalus cynoglossus																									
Lomre	Microstomus kitt													9.60						1.78						
Long rough dab	Hippoglossoides platessoides													12.15						3.23						
Wolffish	Anarhichas lupus																									
Lumpsucker	Cyclopterus lumpus	0.16				0.51		1.20	0.24													0.04				
Monkfish	Lophius piscatorius																						0.07	0.02		
Norway haddock	Sebastes marinus																									
Jellyfish				0.30	2.00	58.82	15.00	30.00					2.54				1.00		15.00		5.00	5.00		1.00	5.00	
Other			15.80		7.03	0.02	0.41				4.50	0.72		3.21				0.14		0.05						0.27

Table 6. Cont.

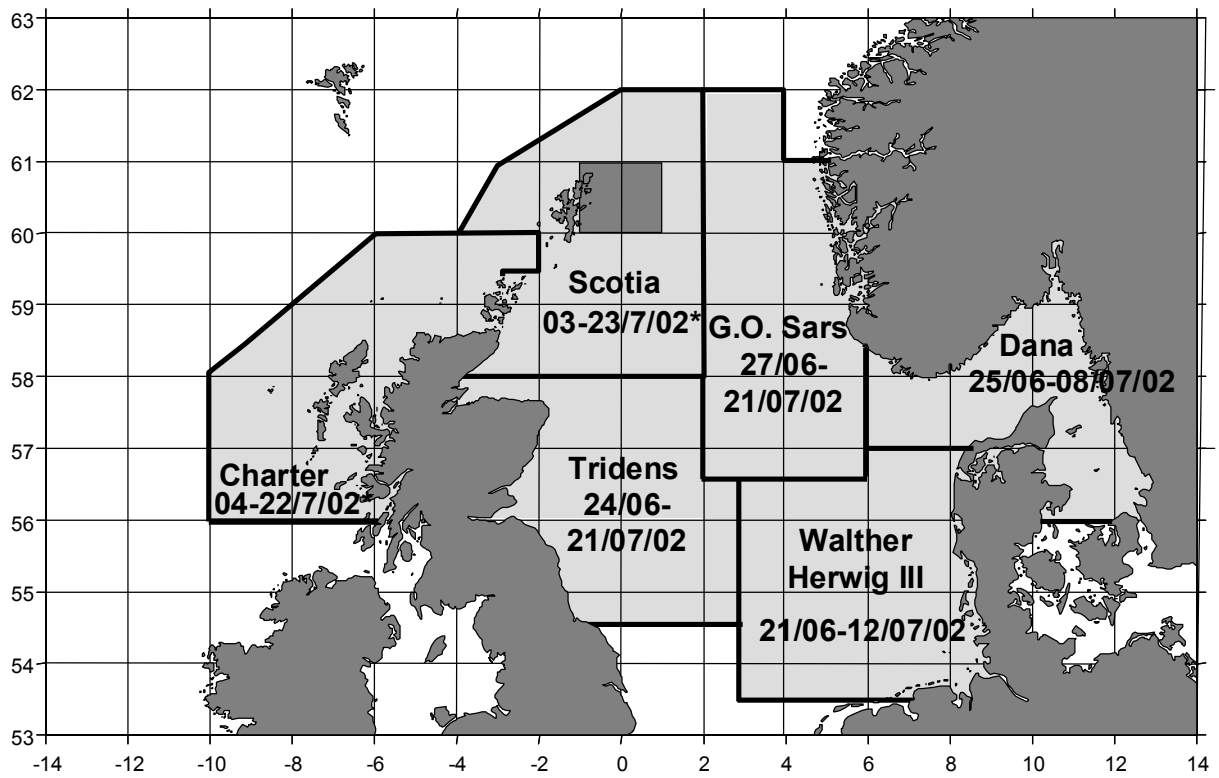
<b>Trawl station</b>		<b>567</b>	<b>568</b>	<b>569</b>
<b>Total catch (kg)</b>		<b>27.08</b>	<b>11.31</b>	<b>61.58</b>
Herring	<i>Clupea harengus</i>	0.13	8.27	2.24
Sprat	<i>Sprattus sprattus</i>			
Pilchard	<i>Sardina pilchardus</i>			
Anchovy	<i>Engraulis encrasicolus</i>			
Mackerel	<i>Scombrus scombrus</i>	6.95	3.03	59.30
Horse mackerel	<i>Tracurus tracurus</i>			
Norway pout	<i>Trisopterus esmarkii</i>			
Haddock	<i>Melanogrammus aeglefinus</i>			0.04
Whiting	<i>Merlangius merlangus</i>	0.01	0.01	0.00
Blue-whiting	<i>Micromesistius poutassou</i>			
Saithe	<i>Pollachius virens</i>			
Hake	<i>Merluccius merluccius</i>			
Pollack	<i>Pollachius pollachius</i>			
Torsk	<i>Brosme brosme</i>			
Cod	<i>Gadus morhua</i>			
Poor cod	<i>Trisopterus minutus</i>			
Ling	<i>Molva molva</i>			
Strømsild	<i>Argentina sphyraena</i>			
Sandeels	<i>Ammodytidae</i> spp			
Gurnard	<i>Trigla</i> spp			
Dab	<i>Limanda limanda</i>			
Plaice	<i>Pleuronectes platessa</i>			
Witch	<i>Glyptocephalus cynoglossus</i>			
Lomre	<i>Microstomus kitt</i>			
Long rough dab	<i>Hippoglossoides platessoides</i>			
Wolffish	<i>Anarhichas lupus</i>			
Lumpsucker	<i>Cyclopterus lumpus</i>			
Monkfish	<i>Lophius piscatorius</i>			
Norway haddock	<i>Sebastes marinus</i>			
Jellyfish		20.00		
Other				

Table 7. RV "GOSars" 27 June-20 July 2002. Herring length (cm) distribution in trawl hauls where sample size > 20 herring

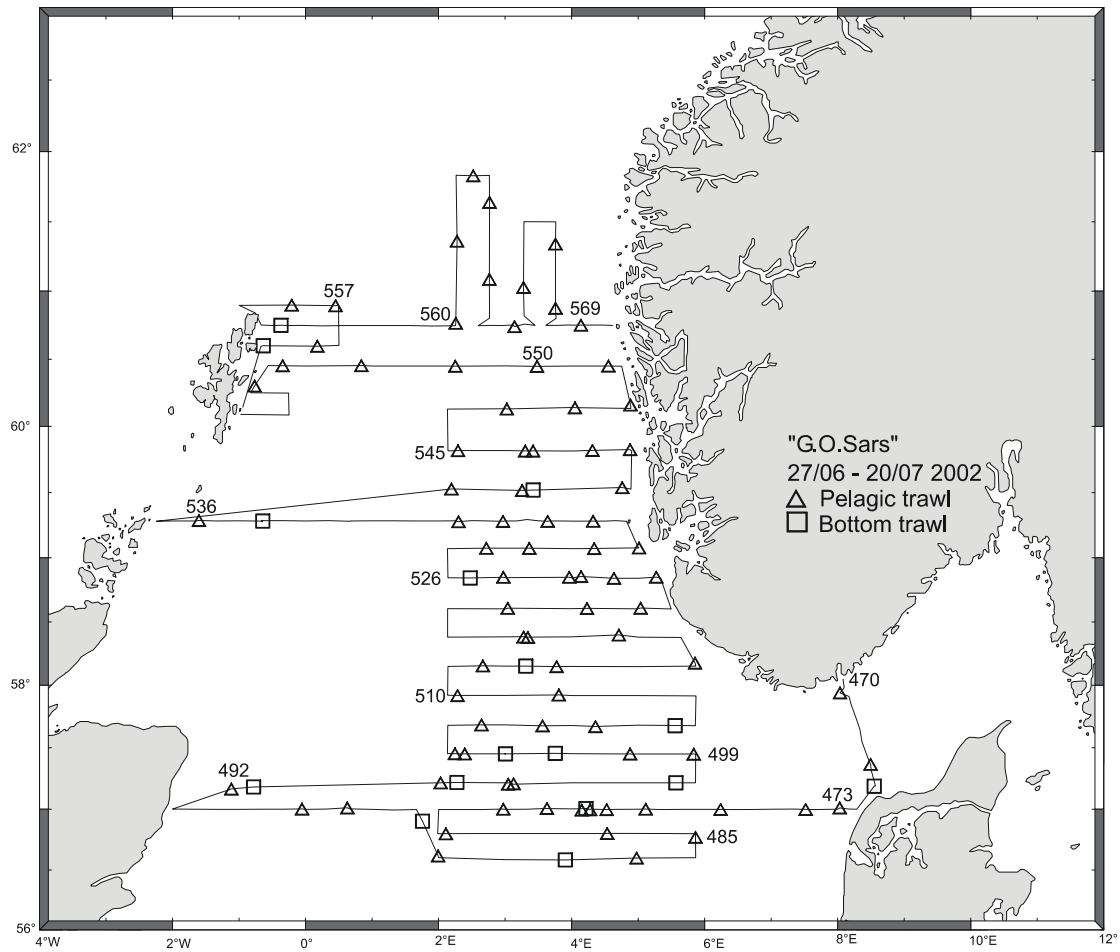
Trawl st	472	479	480	481	482	485	487	489	495	497	501	502	503	506	510	513	514	515	520	521	524	526	528	
ICES rect	43F8	43F4	43F4	43F3	43F2	42F5	42F3	42F1	43F2	43F3	43F3	43F2	43F2	44F3	44F2	45F2	45F5	45F4	46F5	46F5	46F3	46F2	47F3	
8.0																								
8.5	1																							
9.0																								
9.5	5																							
10.0	6																							
10.5	10																							
11.0	3																							
11.5	2																							
12.0	17																							
12.5	16																							
13.0	18		1																					
13.5	14	1	1			1																		
14.0	6	3	4	1		1		6																
14.5	1	7	8	3	2	2	17					1												
15.0	1	24	37	23	2	4	36			11	2	4												
15.5		38	21	19	8	2	29			14	1	2	1											
16.0		11	11	26	23	7	6	3		21	10	4											1	
16.5		8	10	17	15	16	4	12		17	19	1												1
17.0		5	2	7	20	28	1	13		14	21	6	1			1								5
17.5		1	1	3	17	20		8	1	8	9	17	2	1				3						4
18.0		2	4		5	10	1	11		3	7	20	4	4			9	6						7
18.5					1	5		3	5	6	15	17	6	7			14	7	10					3
19.0				1	1	3		2	8	4	11	11	10	18	1		14	1	6					3
19.5					3	1		5	14	1		5	6	24	3	2	15		6					
20.0					1			8	28		4	4	13	22	7	7	12		4			1		1
20.5								6	25	1		5	8	10	25	15	11	1	3					2
21.0					1			6	13		1		18	10	25	18	9		5		2			4
21.5								4	4			3	15	4	12	19	5	4	2					5
22.0								3	2				6		15	19	8		6	3				8
22.5					1			2					4		4	5			4					5
23.0								3					4		2	8	1		1					5
23.5															1	5			2	1				7
24.0								3							2	2	1		1					14
24.5								2					2		2			1	1	2				16
25.0								3										2	1	10				7
25.5								3							1					1				7
26.0																			1					4
26.5																				4				2
27.0																		1		1				3
27.5																								1
28.0																				1				1
28.5																								2
29.0																								5
29.5																		1						4
30.0																								1
30.5																								
31.0																								2
31.5																								
32.0																								1
32.5																								
33.0																								
Total N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	21	72	40	100	48	100	
mean W(g)	15.6	28.6	27.5	26.9	35.7	34.0	24.3	62.4	65.9	31.4	39.7	46.3	66.5	61.6	75.7	81.1	56.9		64.0	68.0	122.4	124.8	182.3	
mean L(cm)	12.4	15.8	15.7	16.1	17.1	17.2	15.4	19.7	20.4	16.8	17.2	18.4	20.7	20.0	21.5	21.8	20.1	19.5	20.2	20.2	24.3	24.7	27.0	

Table 7. Cont.

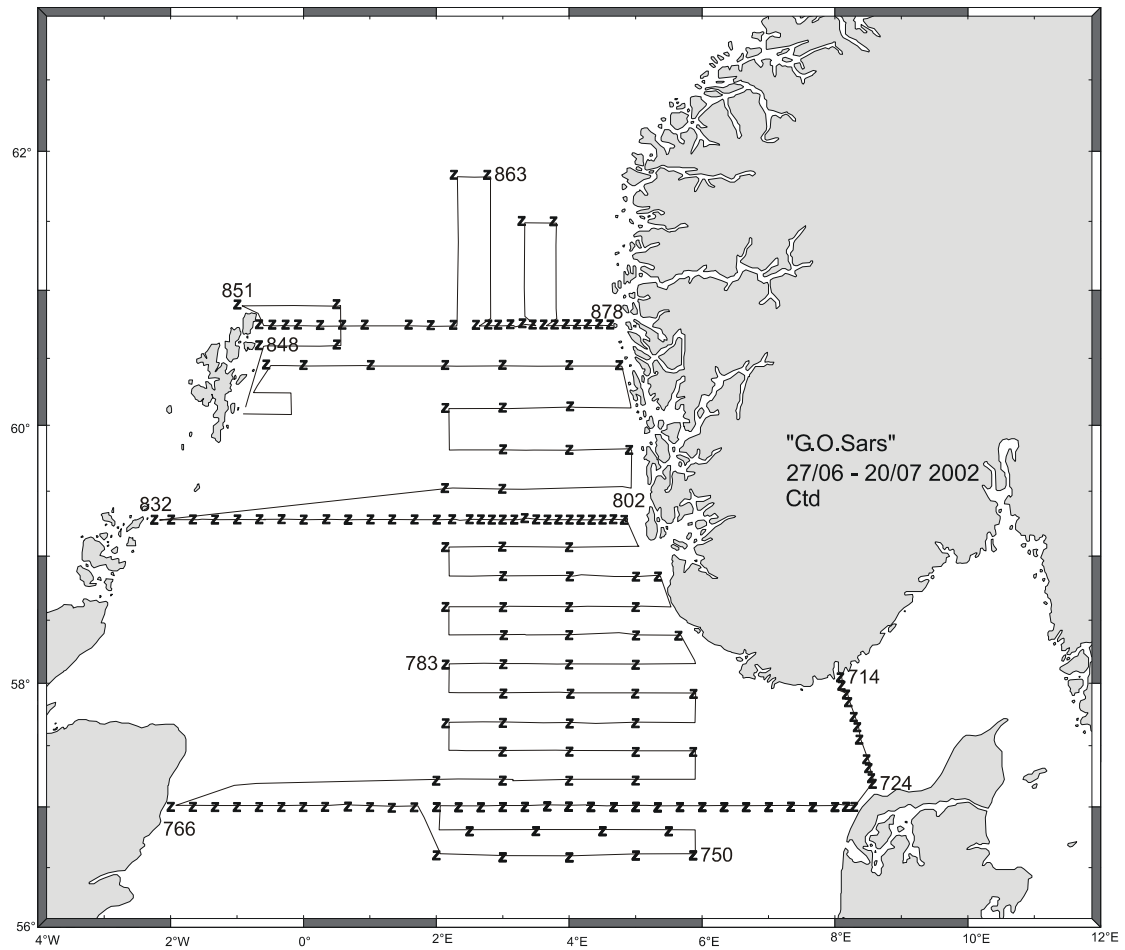
Trawl st	529	530	531	532	535	536	539	540	541	542	543	547	548	550	552	555	556	568
ICES rect	47F4	47F5	47F4	47F3	47E9	47E8	48F2	48F4	48F4	48F4	48F3	49F4	49F4	49F3	49F0	50E9	50F0	50F3
8.0																		
8.5																		
9.0																		
9.5																		
10.0																		
10.5																		
11.0																		
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13.0																		
13.5																		
14.0																		
14.5																		
15.0																		
15.5																		
16.0																		
16.5		1																
17.0								1					1					
17.5		1	1					7	1			1	3					
18.0		5	5					18	1			1	13	2				
18.5		25	2					20	11			3	23	12				
19.0	3	10	13					16	12	5		6	17	5				
19.5	2	10	15					16	16	5		14	11	8				
20.0	2	5	13					8	16	3		11	9	8				
20.5	8	3	11		1			4	5	3	2	11	4	8				
21.0	8	4	8					4	10	10	1	12	6	2				
21.5	5	14	3	1	2			4	8	15	8	7	5	4				
22.0	9	8	1	1	3			4	5	12	10	8	4	8				3
22.5	6	4		2	2			2	7	4	8	1	3	4				1
23.0	3	3	1	7	2				6	12	12	3		8				3
23.5	6	1		1	3	1			2	10	9	5		2				5
24.0	1	1		6	2	4			1	7	11	3		10				4
24.5	4	2	1	6	4	1			1	5	4	3		1				8
25.0		2		5	2	8				3	13			5	1			8
25.5	9			5	2	10				2	3			3	1	1	3	8
26.0	4			6	1	11	1				3			2	2		3	5
26.5	8		1	8		17	2			4	2	2		1	12	6	9	3
27.0	7			9		18	5				6	2	1	2	25	2	9	4
27.5	7			8	1	12	16				2	2		19	7	7	6	
28.0	4			13		12	9				1	1		1	17	2	4	2
28.5	2	1		14		2	18		1		1	1		1	8	6	2	2
29.0	1			3		3	11				1	1		9	4	5	1	
29.5	1			2			9				1	2		1	2		2	1
30.0				2		1	8							2	2			
30.5							7				1					1		
31.0				1			5								1			1
31.5							5								1			
32.0							1				1							
32.5							3											
33.0																		
Total N	100	100	75	100	25	100	100	104	103	100	100	100	100	100	100	29	43	59
mean W(g)	122.5	63.5	62.6	173.4	111.2	174.6	237.2	55.4	67.6	90.7	117.8	92.5	59.0	93.2	200.1	200.6	180.0	140.2
mean L(cm)	24.2	20.5	20.2	26.7	23.9	26.9	29.3	19.4	20.8	22.6	24.4	21.9	19.7	22.3	27.9	28.0	27.6	25.5



**Figure 1.** Survey area layouts and dates for all participating vessels in the 2002 acoustic survey of the North Sea and adjacent areas. Shaded areas indicate areas of overlap.



**Figure 2.** Cruise track and positions of fishing trawls undertaken during the acoustic survey on RV "G.O.Sars", 27 June-20 July 2002.



**Figure 3.** Cruise track and positions of CTD-stations undertaken during the acoustic survey on RV "G.O.Sars", 27 June-20 July 2002.

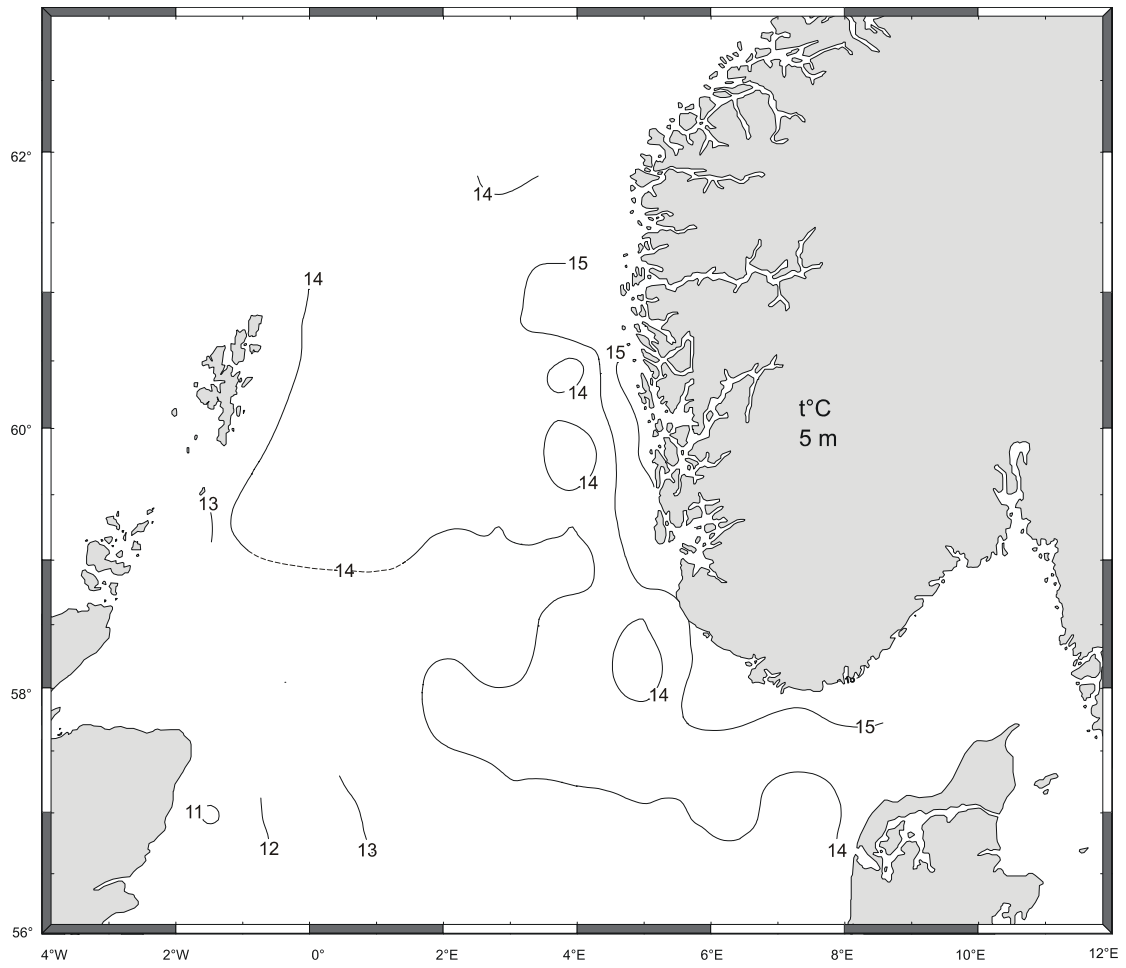


Figure 4a. The horizontal distribution of temperature (°C) at 5 m depth.



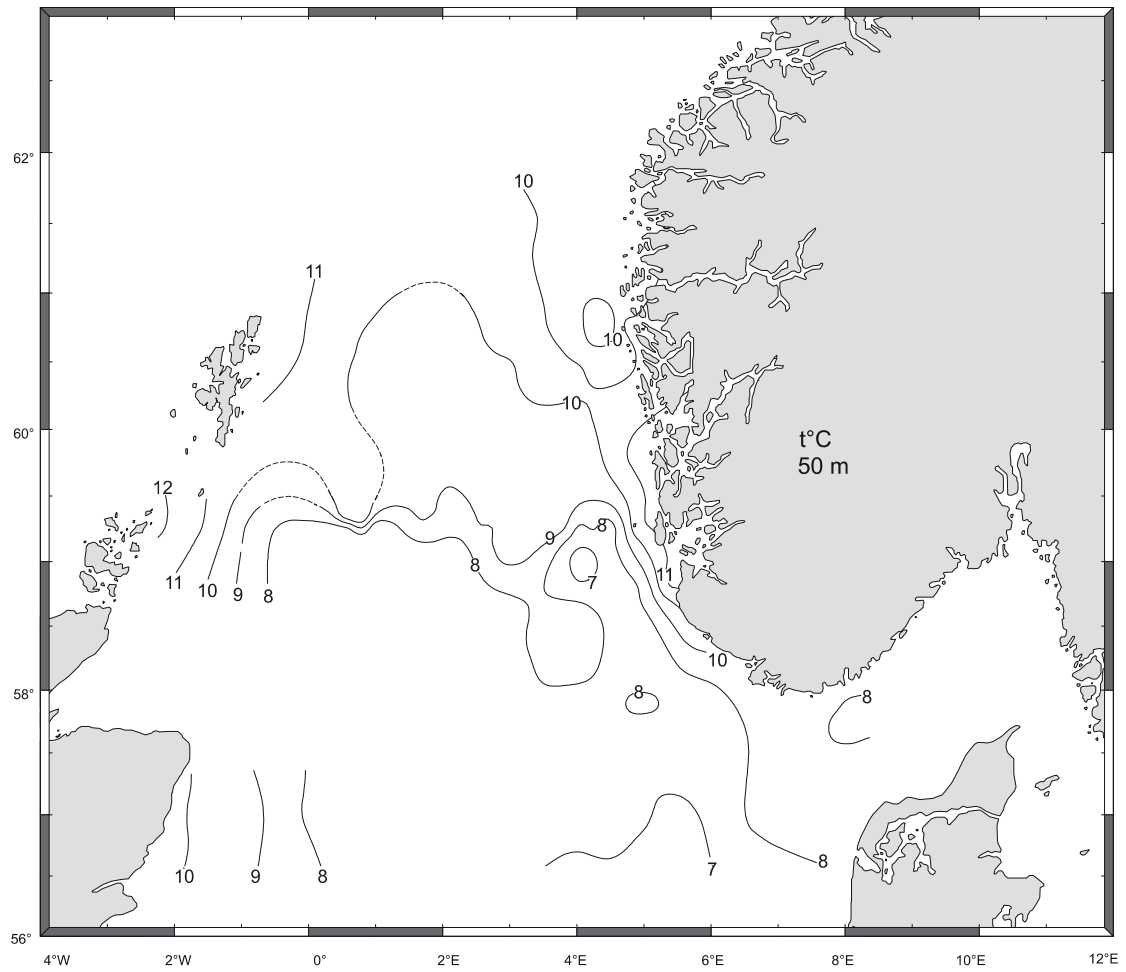


Figure 4b. The horizontal distribution of temperature (°C) at 50 m depth.

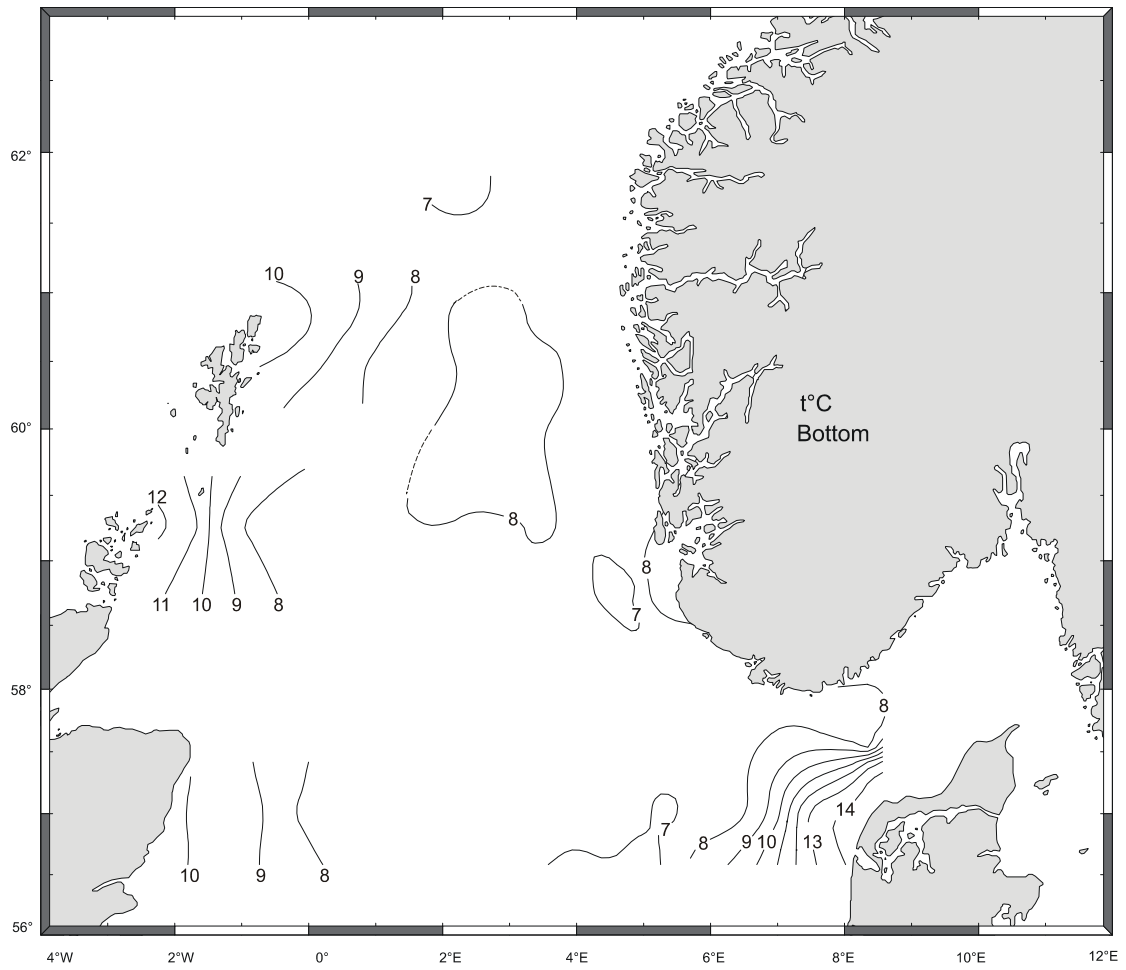
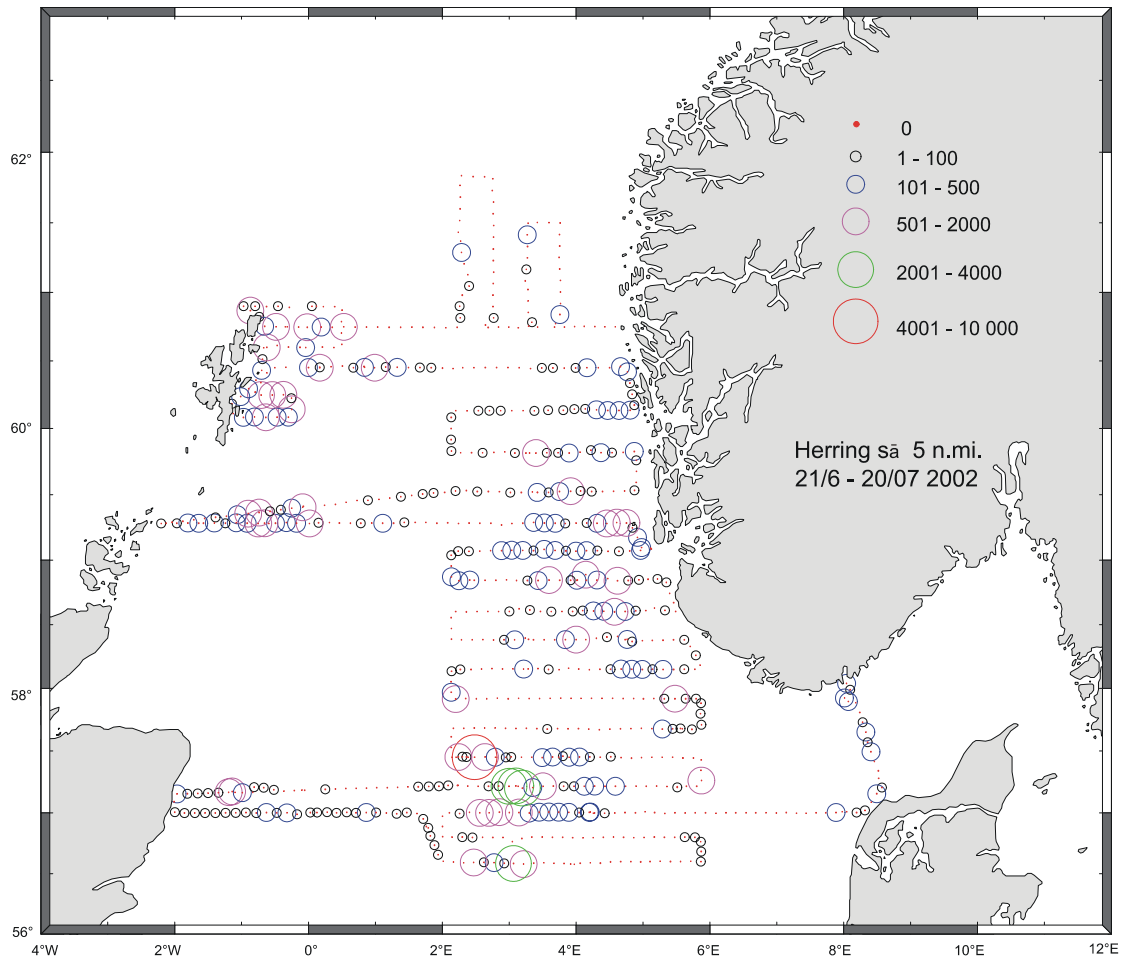
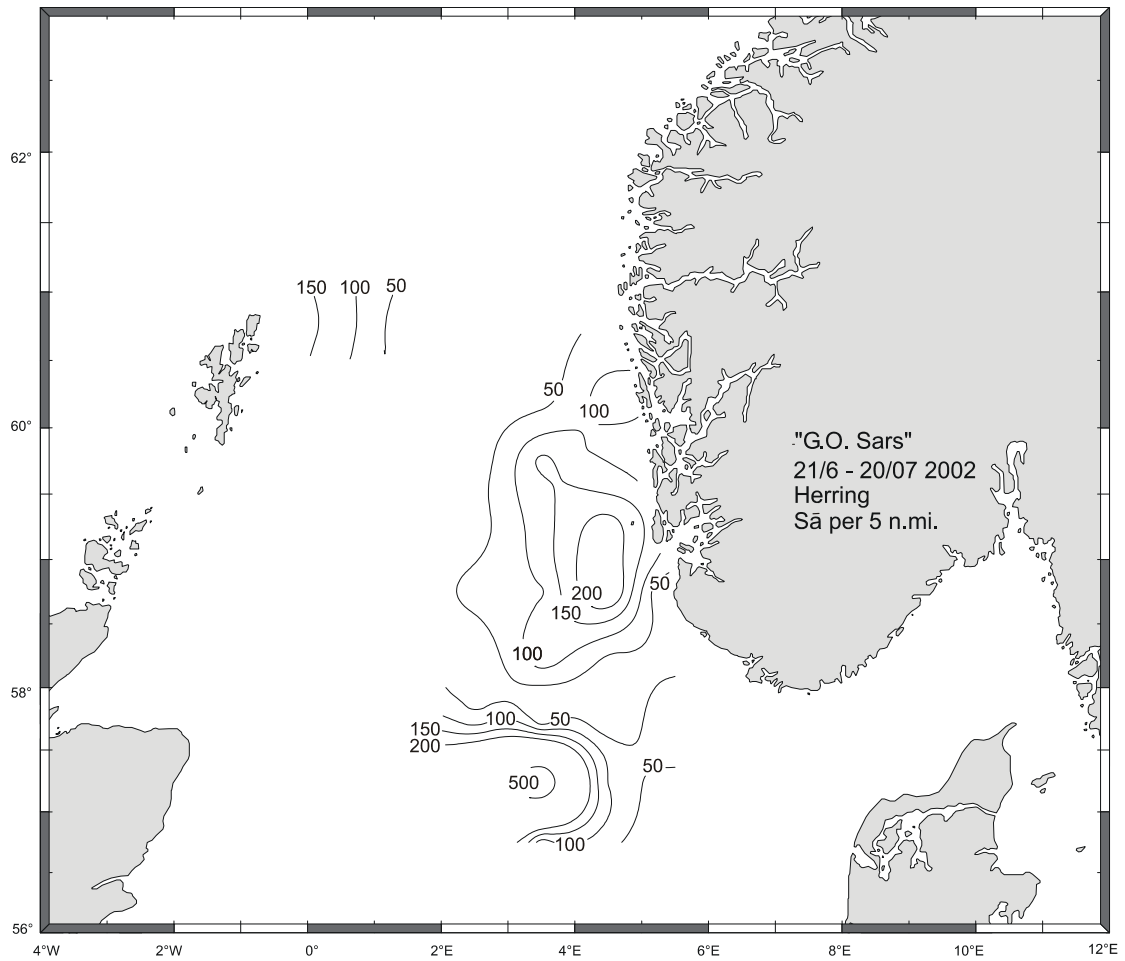


Figure 4c. The horizontal distribution of temperature ( $^{\circ}\text{C}$ ) at bottom.



**Figure 5.** Mean  $S_A$ -values attributed to herring per 5 n.mi., during the acoustic survey on RV “G.O.Sars”, 27 June-20 July 2002.



**Figure 6.** Isolines of  $S_A$  -values attributed to herring during the acoustic survey on RV "G.O.Sars", 27 June-20 July 2002.