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R.V. "G.O. Sars" 30 June - 18 July 2000

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Sammendrag:

This report presents the results from the Norwegian coverage of the International Herring Acoustic Survey for 2000, by the RV "G.O.Sars". 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 2000), a sub group under the ICES Herring Assessment Working Group for the Area South of 62°N. In the recent years, the total survey area has been divided between the participating countries, represented by the vessels. The total biomass estimate of herring in the area covered by the Norwegian vessel is about 290 000 t. The estimated spawning stock biomass of North Sea herring was about 13 000 t which is significantly lower than last years estimate of abt 260 000 t. The estimated biomass of Baltic spring spawners in the North Sea, 50 000 tonnes, was lower than the estimates from 1999 and 1998 which were in the range of 75-90 000 tonnes. No juvenile or adult sprat were observed in the area. An intership calibration of the acoustic equipment took place between RV "Scotia" and RV "G.O.Sars"

Emneord - norsk:
1. Sild
2. Nordsjøen
3. Gytebestand

Emneord - engelsk:
1. Herring
2. North Sea
3. Spawning stock

Reidar Toresen
.....
Prosjektleder

.....
Seksjonsleder

SURVEY REPORT

RV "G.O. SARS" 30 June - 18 July 2000

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Objectives: Abundance estimation of herring and sprat in the area between latitudes 57°00'N and 62°00'N and east of 02°00'E. Map the general hydrographical regime and monitor the standard profiles Oksøy-Hanstholm, Hanstholm-Aberdeen, Utsira - Start Point and Feie - Shetland.

Participation: V. Anthonypillai, K. Gjertsen, A.-L. Johnsen, R. Johannesen (30.6.-4.7.), B.V. Svendsen, R. Toresen (cr.l.), Ø. Torgersen (4.-18.7), E. Torstensen, J. Wangensten.

Guest: Romas Statkus, Lithuania

NARRATIVE

This report presents the results from the Norwegian coverage of the International Herring Acoustic Survey for 2000. 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 2000), a sub group under the ICES Herring Assessment Working Group for the Area South of 62°N. In the recent years, the total survey area has been divided between the participating countries, represented by the vessels, as shown in Figure 1.

RV "G.O.Sars" departed from Bergen 30 June 2000. This was a delay of 3 days according to the plan, due to technical problems. A call was made in Aberdeen on 4 July, Egersund on 8 July, Haugesund on 11 July and in Lerwick, Shetland on 15 July. Intership calibration of acoustic equipment was carried out east of Shetland on 16 July with RV Scotia. A denser coverage (the horizontal transects abt 7 n.mi. apart) of the ICES rectangles 49E9 and 50E9 were done as part of an intercalibration exercise between the two vessels. The survey was finished in Bergen on 18 July.

The survey started on the hydrographic transect off Kristiansand and continued with systematic parallel transects in the east-west direction from south to north with a distance of

15-20 n.mi. between transects. The hydrographic transect Utsira-Start Point was not carried out due to shortage of time.

SURVEY EFFORT

The cruise track with fishing stations and the hydrographic profiles is shown in Fig. 2a-b. Nearly 3000 n.mi. was surveyed and the total number of trawl hauls was 70, 61 pelagic and 9 bottom trawls. The number of CTD stations for temperature, salinity and density measures were 99.

METHODS

The catches were sampled for species composition, by weight and numbers. Biological samples, i.e. length and weight compositions, were taken of the most important species. Otoliths of target species were taken for age determination. Herring were also examined for fat content and maturity stage in the whole area. In herring sampled east of 2°00'E, vertebral counts were taken for separation of autumn spawning herring and Baltic spring spawners.

The acoustic instruments applied for abundance estimation were a SIMRAD EK500 echo sounder and the Bergen Echo Integrator system (BEI). The setting of the instruments were as follows:

Absorption coeff.	10 dB/km
Pulse Length	Medium
Bandwidth	Wide
Max Power	2,000 W
Angle Sensitiv.	21.9
2-Way Beam Angle	-21.0 dB
Sv Transd. Gain	27.00 dB
TS Transd. Gain	27.11 dB
3 dB Beamwidth	7.1/6.9 deg
Alongship Offset	-0.10 deg
Athw. ship Offset	0.06 deg

Sounder: ES 38 B.

The weather conditions during the survey were acceptable for acoustic registrations.

The S_A-values were divided between the following categories on the basis of trawl catches and characteristics on the echo recording paper:

herring, sprat, demersal fish, plankton
The following target strength (TS) function was applied to convert S_A-values of herring and sprat to number of fish:

$$TS = 20 \log L - 71{,}2 \text{ dB} \quad (1)$$

or on the form: $$C_F = 1.05 \cdot 10^6 \cdot L^{-2} \quad (2)$$

where L is total length.

Toresen et al (1998) describes the acoustic method used for the abundance estimation in this survey.

In the Skagerrak and off the south west coast of Norway, North Sea autumn spawners and Western Baltic spring spawners mix during summer. No system for routine 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, WBaltic= ((56,5-VS(sample))/(56.5-55.8)) (ICES 1999).To calculate the maturing part of the two stocks in each age group, the observed maturity stages were applied for both stocks

RESULTS

Hydrography

The horizontal distributions of temperature at 5m, 50m and at bottom in the surveyed area are shown in Fig. 3a-c. The surface water in the eastern North Sea had temperatures ranging from 12°C in the open, mid areas to 15°C off the south west coast of Norway. The temperatures at 5 m depth along the Norwegian west coast were 2-3°C lower than last year. However, the temperature regime in 50m depths seems much the same as that of last year.

DISTRIBUTION AND ABUNDANCE OF HERRING AND SPRAT

HERRING

Fig. 4 gives the horizontal distribution of herring. Herring in the North Sea was mostly found in the southwestern part of the area.

The registrations were very scattered in the whole surveyed area and the recorded herring were mainly found close to the surface. Only few "real" herring schools were detected, mainly in 45F2. Most of the trawling positions were regularly chosen, by trawling every 20-30 n.mi., and not based on echo registration. Due to this behaviour herring may have been under-estimated during the survey.
The abundance by ICES statistical rectangles, divided in Western Baltic spring spawners and North Sea autumn spawners, are given in Table 1. The numbers are given age disaggregated. The numbers in age groups 2 and 3 are split in mature/immature parts. Surveyed squares with no herring recordings are not presented in the tables. Table 2 present the mean weights at age applied for biomass estimations. Total estimated number of herring by age and length are given in Table 3. The total estimated biomass per age group and stock is also shown in these tables.

The estimates of spawning stock biomass of North Sea herring and Baltic spring spawners, in the North Sea, are shown in the text table below. The total biomass estimate of herring in the area covered by the Norwegian vessel is about 290 000 t. The estimated spawning stock biomass of North Sea herring was about 13 000 t which is significantly lower than last year. The estimated biomass of Baltic spring spawners in the North Sea, 50 000 tonnes, was lower than the estimates from 1999 and 1998 which were in the range of 75-90 000 tonnes.

Year	Herring Biomass	(10^3 tonnes)
	North Sea herring SSB	Baltic Spring
1999	259	74
2000	13	51

Sprat

No juvenile or adult sprat was observed or caught in trawl catches No Sa-values were thus allocated to sprat.

INTERCALIBRATION

RV "GOSars" met RV "Scotia" (Scotland/UK) on the 16 July at ICES rectangle 49E9 for intership calibration of acoustic equipment. One of their survey transects were chosen for the calibration that started with GOSars ahead on the first 12.5 n.mi. and Scotia taking the lead for the next 12.5 n.mi. The integration interval was 2.5 n.mi. and the Sv-threshold was –70 dB. The tracks covered an area with low concentrations of fish. The results will be presented

to the next meeting in the Planning Group for Herring Surveys in IJmuiden, the Netherlands, in December 2000.

REFERENCES

ICES 1999. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES CM 1999/ACFM: 12

ICES 2000. Report of the Planning Group for Herring Surveys, Bergen, Norway, 1-4 February 2000. ICES CM 2000/G: 02.

Toresen, R., Gjøsæter, 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.

Table 1. HERRING-NORTH SEA. Estimated number by ICES stat squares divided in stocks and agegroups.

R/V 'G.O. Sars', 30 June - 18 July 2000

43F3	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	14,06	0,04										14,10
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
		0,10										0,10
43F6	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	382,63											382,63
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
43F7	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	260,34											260,34
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
43F8	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	531,01	5,36										536,38
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
44F2	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	375,99	15,67										391,66
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
44F3	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	83,15	3,46										86,62
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
44F4	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	307,28	37,26		1,62								346,16
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
		91,23		3,97		11,17		11,17		5,59		123,13

Table 1. Cont.

44F5	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	187,06	22,69		0,99								210,74
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
		55,54		2,41		6,80		6,80		3,40		74,96
44F6	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	35,85											35,85
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
		59,15	0,60	5,91	12,01	1,19	1,19			1,19		81,26
44F7	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	41,96											41,96
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
44F8	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	43,18	28,80	1,42	2,27	1,12							76,78
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
		62,02	3,05	0,73	0,36							66,15
45F2	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	1522,92	30,95										1553,87
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
45F3	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	629,50	12,79										642,29
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
					2,56							2,56
45F4	**North Sea Autumn spawners**											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	53,09	4,21										57,31
	Baltic Spring Spawner											
	1	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**

Table 1. Cont.

45F5	North Sea A	North Sea Autumn spawners										
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	17,57											17,57
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		9,22		0,43	0,21	0,86						10,72
45F6	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	1,59											1,59
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		1,14	0,01	0,08	0,13	0,08	0,01	0,02		0,02		1,51
46F3	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	0,16	0,50	4,51		5,64	5,79	3,13	0,63	0,31	0,31	0,16	21,14
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
46F4	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	85,60											85,60
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		37,56		1,76	0,86	3,49						43,67
46F5	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	5,16	0,29	0,01			0,16						5,62
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		6,48	0,20	0,72	0,18	0,12	0,18					7,88
47F2	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	0,02	0,05	0,48		0,60	0,61	0,33	0,07	0,03	0,03	0,02	2,23
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
47F3	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	0,32	1,03	9,26		11,58	11,90	6,43	1,29	0,64	0,64	0,32	43,42
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total

Table 1.Cont.

47F4	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	1,44	0,06	0,00	-0,01	0,00	0,11	0,08					1,67
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		3,83	0,12	0,47	0,13	0,08	0,06					4,70
48F3	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	13,06	13,26	2,16	3,78	1,62							33,87
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		38,30	6,24	18,25	7,82	12,47	8,90	4,75	1,19			97,91
48F4	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	2,20	2,24	0,36	0,64	0,27							5,71
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		6,46	1,05	3,08	1,32	2,10	1,50	0,80	0,20			16,51
49F3	North Sea Autumn spawners											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	6,71	6,81	1,11	1,94	0,83							17,40
	Baltic Spring Spawner											
	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
		19,67	3,20	9,37	4,02	6,40	4,57	2,44	0,61			50,29

Table 2. HERRING-NORTH SEA. Weight at age (g) for age groups and mature/immature fish in sub areas.

R/V 'G.O. Sars', 30 June - 18 July 2000

49F4												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	80,40	91,80	133,00	117,10	153,20	141,50	155,50	175,60	136,00			111,80
49F3												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	80,40	91,80	133,00	117,10	153,20	141,50	155,50	175,60	136,00			111,80
48F4												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	80,40	91,80	133,00	117,10	153,20	141,50	155,50	175,60	136,00			111,80
48F3												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	80,40	91,80	133,00	117,10	153,20	141,50	155,50	175,60	136,00			111,80
47F4												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	80,40	82,50	128,00	86,40	141,50	125,00	119,00					86,50
47F3												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	60,00	111,30	163,40		197,40	193,20	203,40	222,30	261,50	252,00	250,00	189,80
47F2												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	60,00	111,30	163,40		197,40	193,20	203,40	222,30	261,50	252,00	250,00	189,80
46F5												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	72,70	81,90	128,00	90,40	141,50	125,00	119,00					81,80
46F4												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	64,40	77,40		107,00	106,00	126,30						70,70

46F3												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	60,00	111,30	163,40		197,40	193,20	203,40	222,30	261,50	252,00	250,00	189,80
45F6												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	61,00	71,80	74,00	88,40	96,00	126,90	103,00	175,20		157,50		70,80
45F5												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	64,40	77,40		107,00	106,00	126,30						70,70
45F4												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	48,50	81,80			130,00							52,10
45F3												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	44,80	86,00			130,00							44,80

Table 2. Cont.

45F2												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	44,80	86,00			130,00							44,80
44F8												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	53,20	66,20	75,30	76,50	152,00							63,70
44F7												
0	**1**	**2I**	**2M**	**3I**	**3M**	**4**	**5**	**6**	**7**	**8**	**9+**	**Total**
	51,20											51,20

44F6												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	58,30	70,20	74,00	89,40	95,00	89,00	103,00			183,00		71,30
44F5												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	57,80	69,70		76,00	147,00		175,00		132,00			67,10
44F4												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	57,80	69,70		76,00	147,00		175,00		132,00			67,10
44F3												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	57,80	78,00										58,60
44F2												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	57,80	78,00										58,60
43F8												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	46,00	61,00										46,20
43F7												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	51,20											51,20
43F6												
0	1	2I	2M	3I	3M	4	5	6	7	8	9+	Total
	51,20											51,20
43F3												

Table 3. HERRING-NORTH SEA. Estimated number and biomass by age and length groups.
Totals also divided in stocks. RV GO Sars, 30 June-18 July 2000.

Length						Age groups					N (mill)	Ton
(cm)		1	2	3	4	5	6	7	8	9+		(10^3)
6.0-6.9												
7.0-7.9												
8.0-8.9												
9.0-9.9												
10.0-10.9												
11.0-11.9												
12.0-12.9												
13.0-13.9												
14.0-14.9												
15.0-15.9		106,27									106	2,74
16.0-16.9		385,87									386	12,31
17.0-17.9		747,00	0,14								747	28,85
18.0-18.9		919,33									919	42,24
19.0-19.9		789,95	5,87								796	43,14
20.0-20.9		892,81	114,89								1008	62,84
21.0-21.9		152,12	158,85	1,15							312	22,20
22.0-22.9		32,07	133,34	12,36							178	14,55
23.0-23.9		2,25	47,12	15,80	2,21						67	6,89
24.0-24.9			10,62	20,69	1,15	1,00					33	3,71
25.0-25.9			24,77	21,22	7,69	2,15	9,00	1,00	9,00		75	10,50
26.0-26.9			4,29	6,97	19,33	6,35		1,00			38	5,52
27.0-27.9			6,93	14,08	19,60	6,47					47	7,91
28.0-28.9			2,48	7,94	6,43	2,97	3,49		1,21		25	4,82
29.0-29.9				4,47	5,45	3,97	11,49				25	5,39
30.0-30.9				0,49	1,49	1,49	1,49	0,49	0,49	0,49	6	1,59
31.0-31.9							2,00		0,49		2	0,59
32.0-32.9						2,00					2	0,42
N (mill)		4028	509	105	63	26	27	2	11	0	4774	276
NS herring		4028	169	29	19	10	2	1	1	0		
Baltic spr			340	76	45	16	26	2	10			
								NS herring (millions)				4259,35
								SSB, NS herring (tonnes 10^3)				13,43
								Baltic spr (tonnes ^3)				50,50

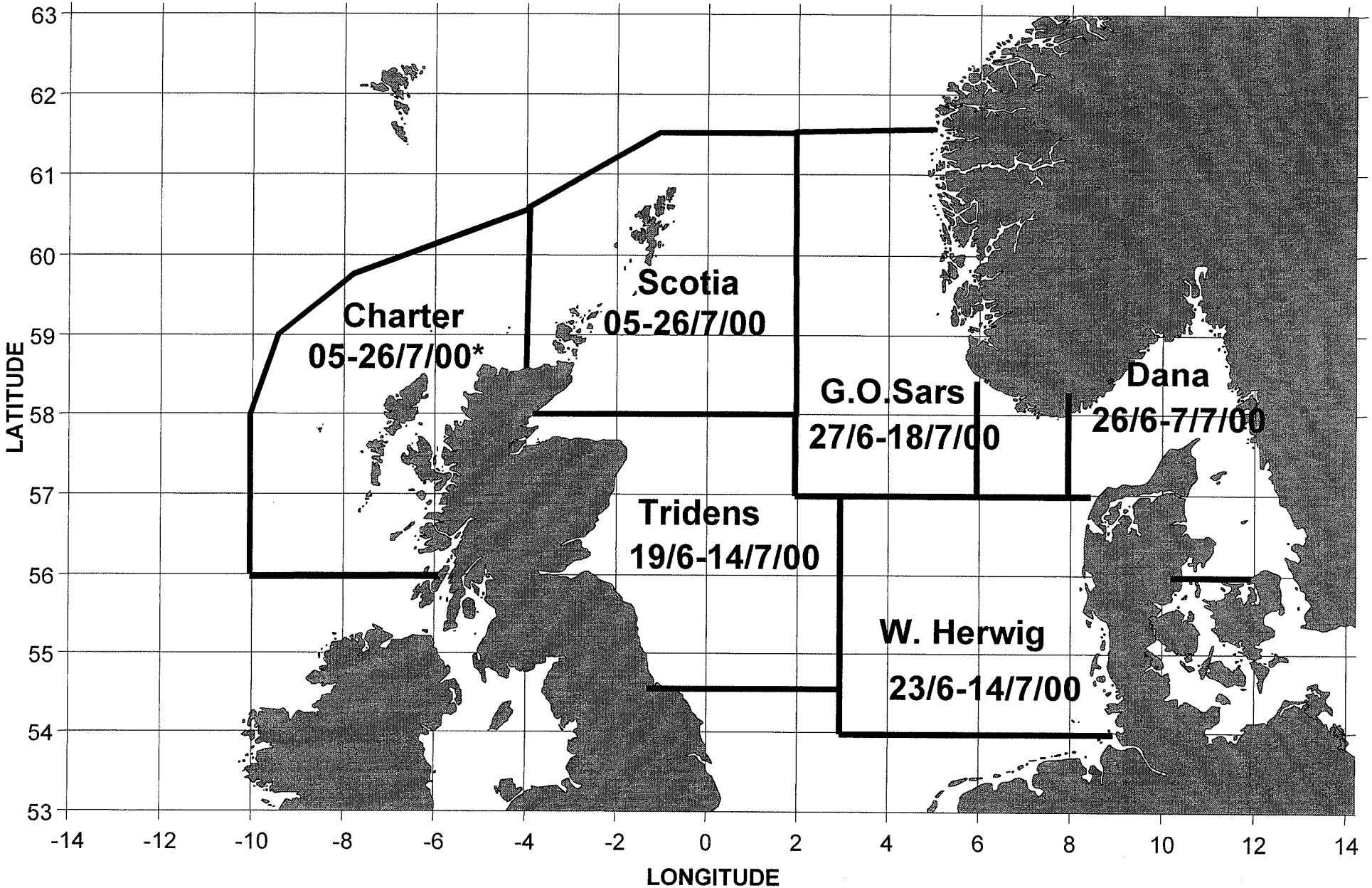
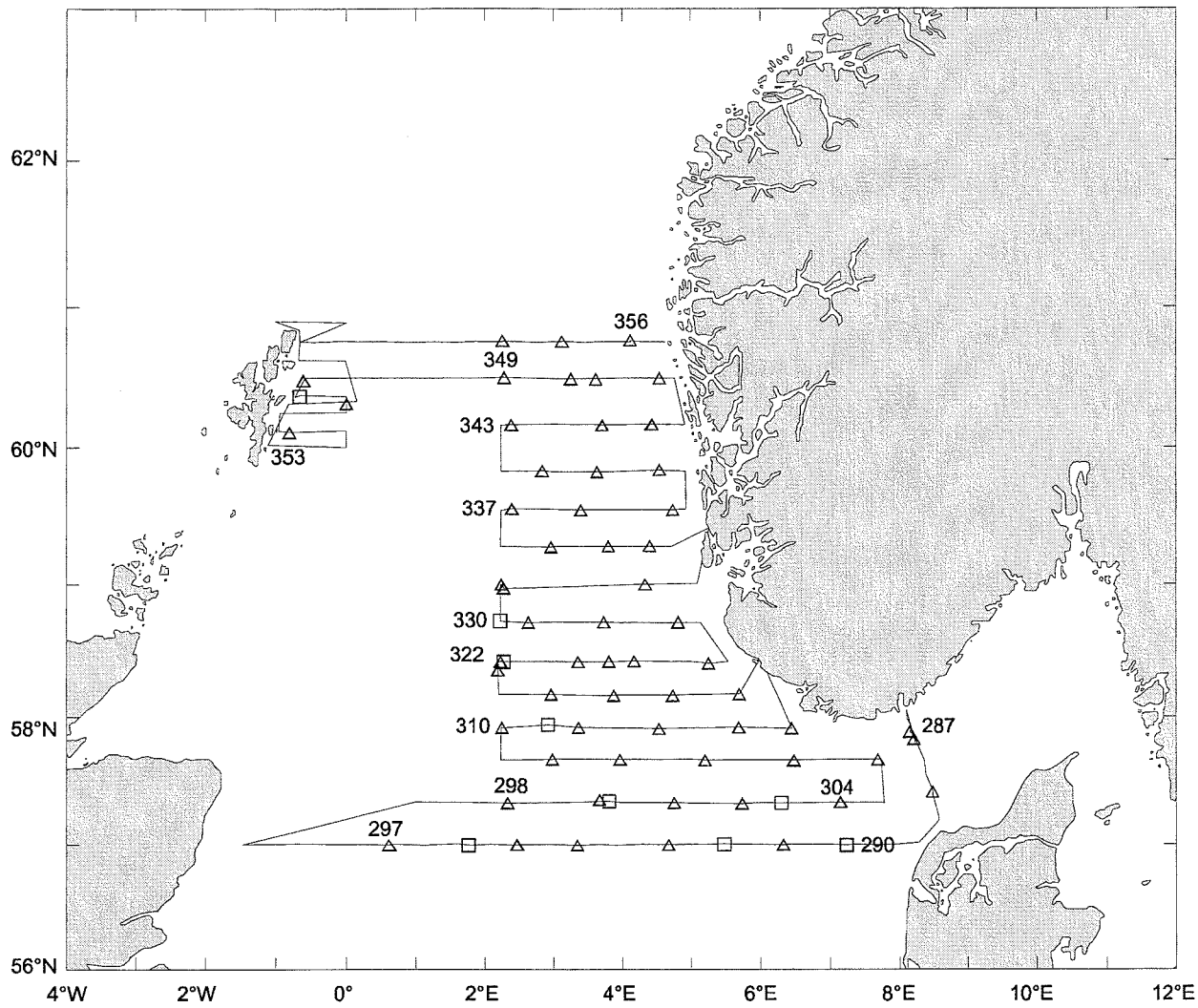


Figure 1 Survey areas for all participating vessels 2000. (ICES 2000)



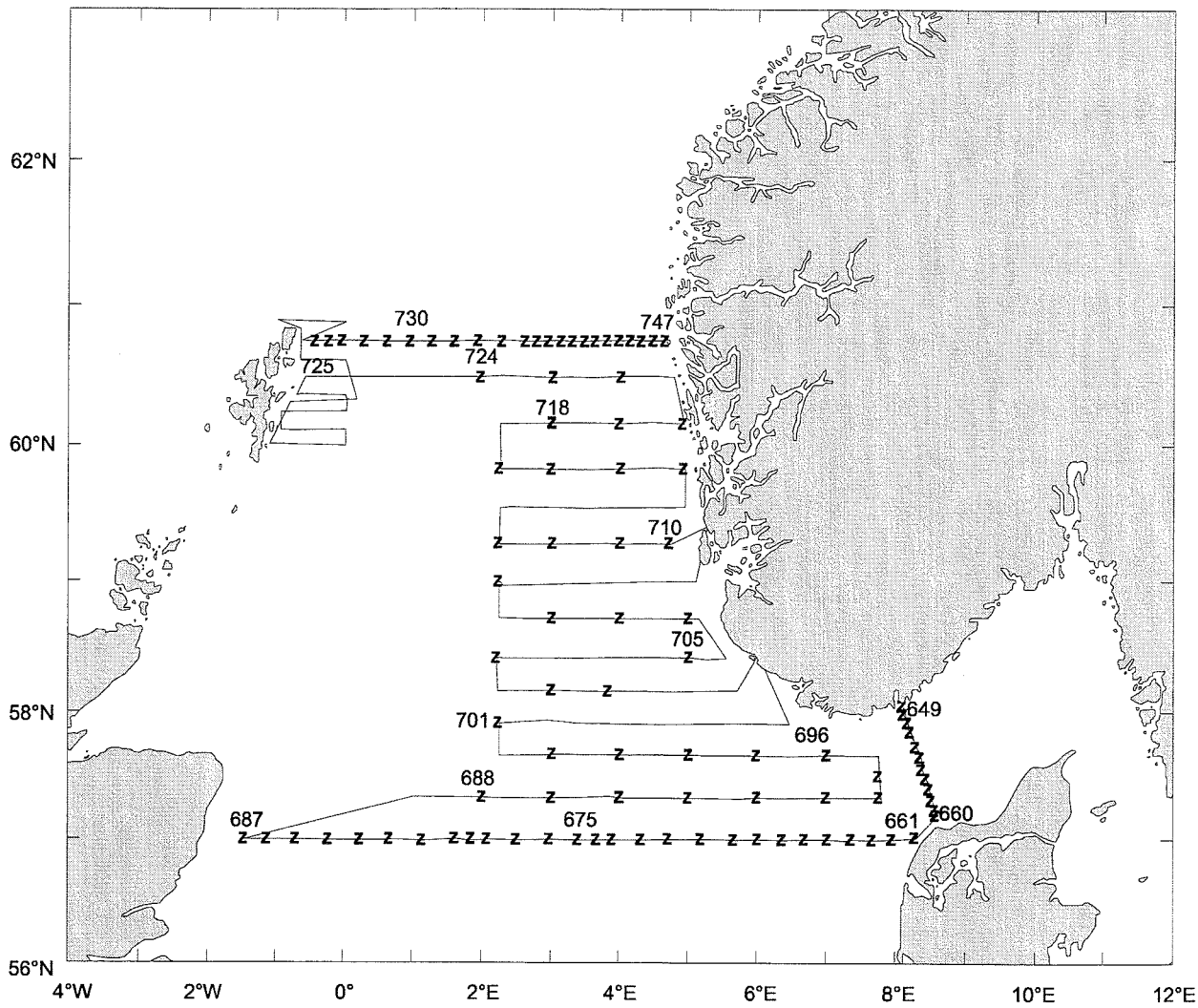
30 June - 18 July 2000 TRAWL st.no 287 - 356 "G.O. Sars"

Cruise no 2000007

□ Bottom tr.

△ Pel tr.

Fig. 2a.



30 June - 18 July 2000
Cruise no 2000007

z CTD st.no 649-747

"G.O. Sars"

Standard sections: Oksø-Hanstholm st.no 649-660
Hanstholm-Aberdeen st.no 661-687
Feie Shetland st.no 725-747

Figure 2b.

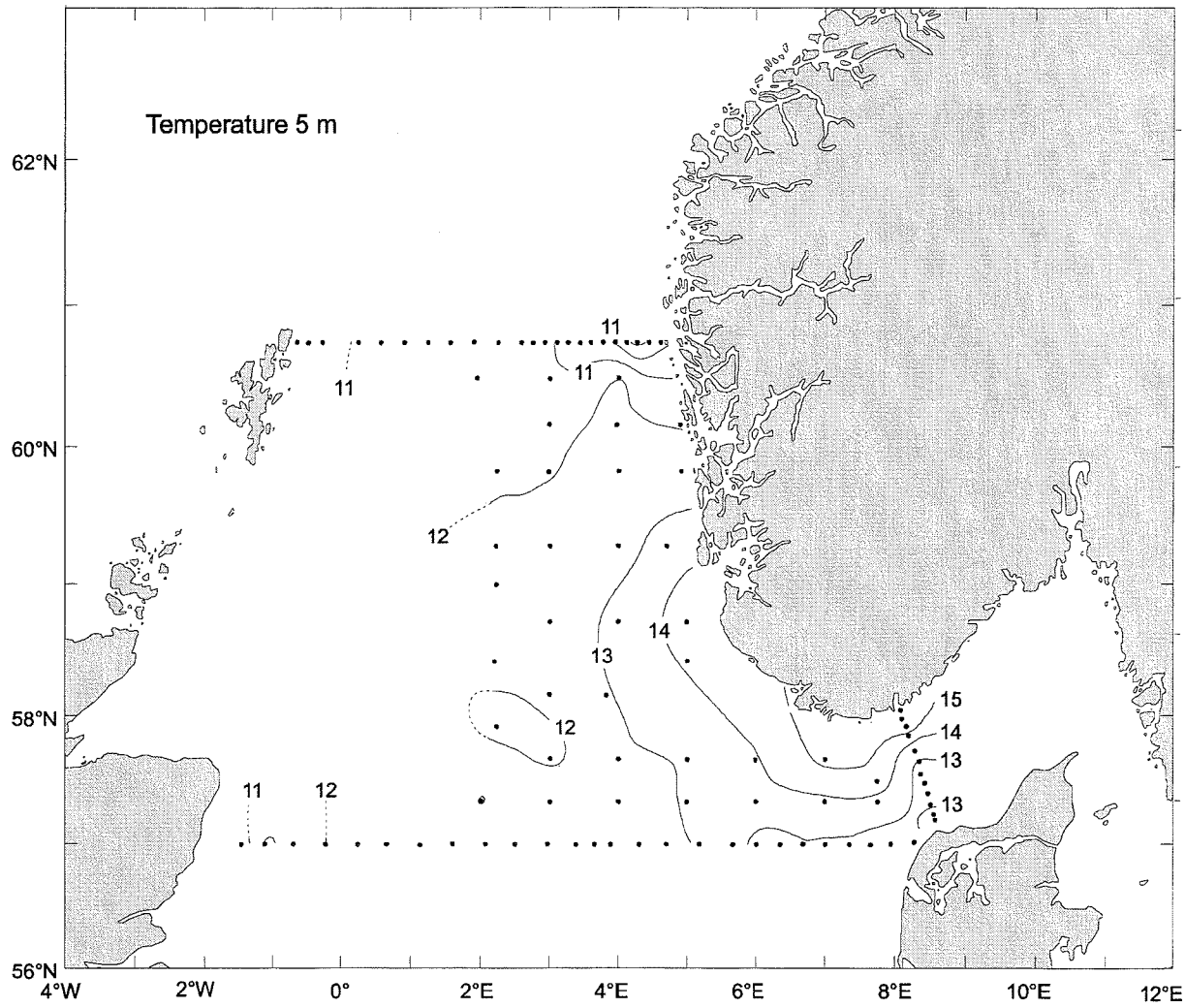


Fig. 3a. The horizontal distribution of temperature at 5 m. 30 June-18 July 2000.

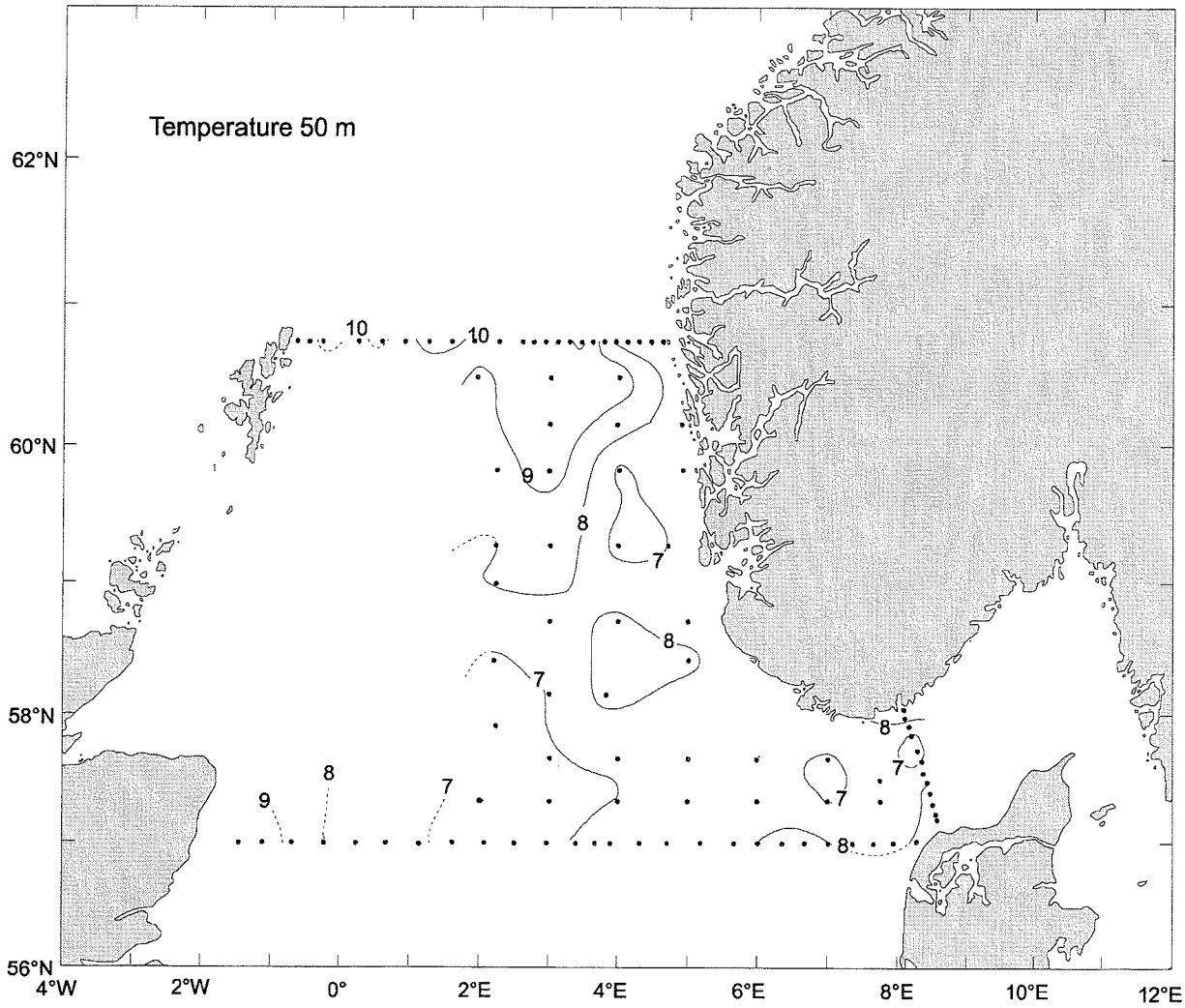


Fig. 3b. The horizontal distribution of temperature at 50 m. 30 June-18 July 2000.

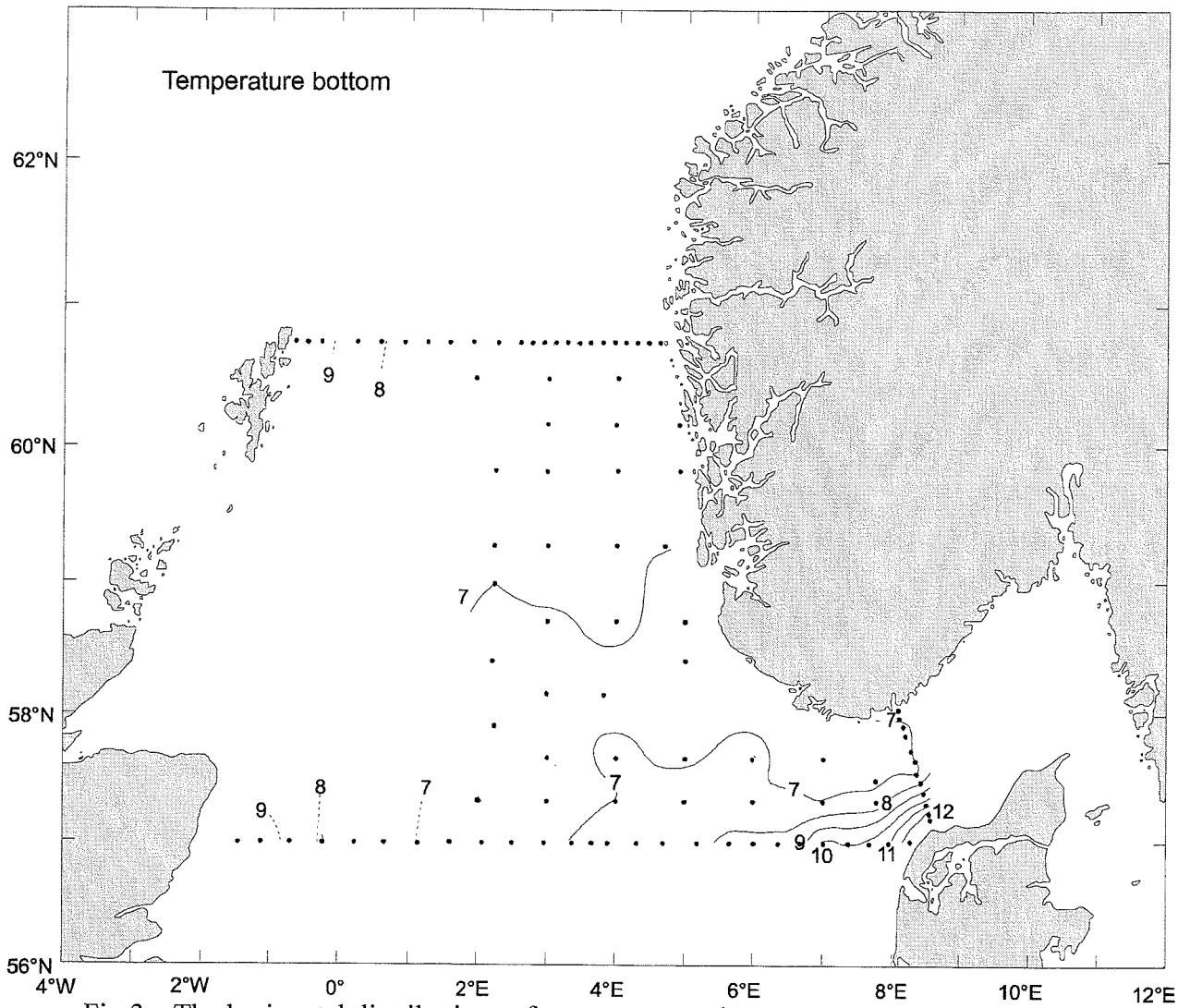


Fig.3c. The horizontal distributions of temperature at bottom. 30 June- 18 July 2000.

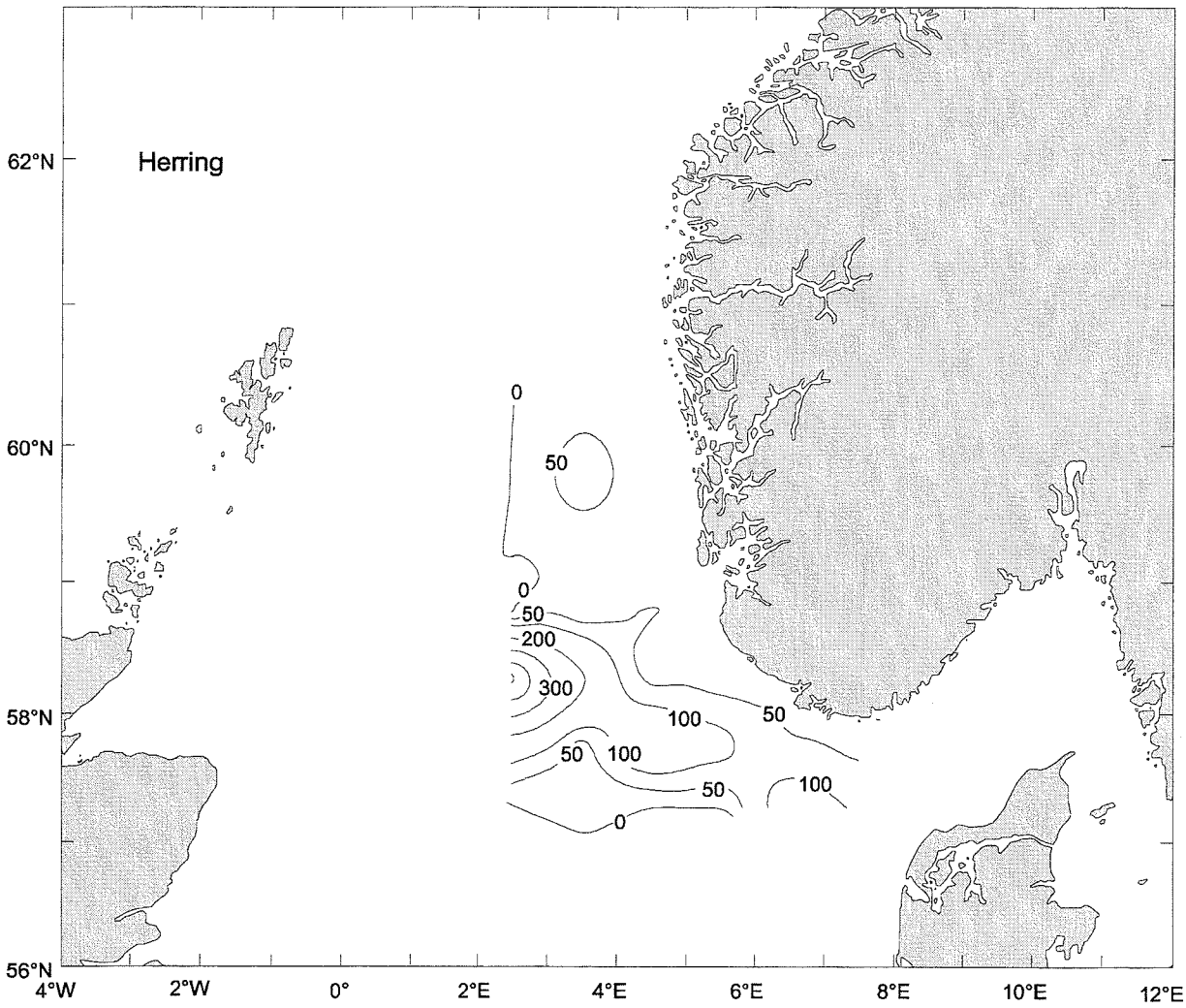


Fig. 4. Horizontal distribution of herring in the North Sea, 30 June-18 July 2000.