

Survey report for FRV "Walther Herwig III" cruise 265 International Herring Acoustic Survey in the North Sea 28 Jun 2003 – 19 Jul 2004

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1. INTRODUCTION

Context: "Walther Herwig III" cruise 265 was conducted in the framework of the international hydroacoustic survey on pelagic fish in the North Sea, which is co-ordinated by the ICES Planning Group for Herring Surveys (PGHERS). Further contributors to the quasi-synoptic survey are the national fisheries research institutes of Scotland, Norway, Denmark and The Netherlands. The results are delivered to the ICES herring assessment working group. Since 1984 they represent the most important fishery independent data (i.e. biomass estimate) for the assessment of herring stocks in the area.

The working area for "Walther Herwig III" was confined to the Southern and South-Eastern North Sea. This area is regarded to be one of the main distribution areas for juvenile herring. Since 2001, PGHERS calculates a juvenile biomass index for the North Sea herring assessment, mainly based on the survey results from the SE North Sea and the Kattegat/Skagerrak area. Last year, the survey area was significantly extended to the south (to about 52°N) in an attempt to reach the southern distribution limit of sprat, and this area was again covered this year. Survey intensity therefore had to be reduced in most of the area.

Objectives: Hydroacoustic recording of pelagic fish stocks for abundance and biomass estimation, biological sampling for the verification of echoes, calibration of the hydroacoustic equipment, hydrographic investigations, sampling of data and specimens for a number of national and international projects (BFA Fi: Univ. Aberdeen/ISH and IFÖ; FTZ Büsum, IfM Kiel).

2. SURVEY DESCRIPTION & METHODS

2.1 Personnel

Dr.-Ing. E. Bethke	scientist in charge, hydroacoustics	IFF
M. Drenckow	hydroacoustics	IFF
Mrs. G. Gentschow	fishery biology	ISH
A. Baer	fishery biology	ISH
S. Bednarz	fishery biology	ISH
Mrs. A. Enge	fishery biology	ISH
Mrs. P. Jantschik	fishery biology	ISH
K. Kumpart	fishery biology	ISH
J. Menking	fishery biology	ISH
M. Bernreuther	guest researcher	Univ. Hamburg (GLOBEC Germany)
Mrs. M. Blume	guest researcher	FTZ/Univ. Kiel (cetaceans)
Mrs. D. Risch	guest researcher	FTZ/Univ. Kiel (cetaceans)

2.2 Narrative

FRV "Walther Herwig III" left the port of Bremerhaven on June 28^h, and calibrated the hydroacoustic equipment under reasonable conditions until June 29th noon off Helgoland. Therefore, it was again not necessary to sail to Kristiansand. Recording of hydroacoustic measurements started immediately in the river Elbe estuary (Fig. 1). The work in the southern part of the survey's eastern half could be completed with east-west-transects

by July 5th, interrupted only by an unscheduled port call due to illness of a crew member. The vessel then surveyed the central and western survey area, and work in the "overlap area" (see below) was conducted between July 10th and 12th. Thereafter, the survey commenced with transects south of the Dogger Bank. The northern part was surveyed with double intensity (15 n.mi. transect spacing) to account for the importance of that area for the calculation of juvenile herring abundance. Most of the remaining area was surveyed with 30 n.mi. transect spacing. After excellent weather during last year's survey, it was back to normal this year, and work had to be stopped for half a day due to strong winds. "Walther Herwig III" reached Bremerhaven at July 19th 2004 in the afternoon, having sailed 3199 n.mi.

2.3 Survey design

As in last year, the working area for the German vessel contributing to the survey was extended to the west and the south, aiming at defining a southern distribution limit of sprat in July. This would be a prerequisite for the development of a sprat biomass index in the near future using this acoustic survey. The survey area was confined to the southern and south-eastern North Sea between 51.5°N and the 20 m depth contour off Frisia to the south, the 20 m depth line off the English coast to the west and off the German and Danish coast to the east, and 57°N (eastern part) and 54.5°N (western part) to the north, respectively.

Hydroacoustic measurements were conducted on east-west or north-south transects with 15 or 30 n.mi. intertransect distance (as done by other research vessels participating in the survey) on fixed longitudes (mostly 7.5 n.mi. distance to upper and lower limits of statistical rectangle). In general, each ICES statistical rectangle was surveyed with at least one transect, and with two transects where historically a high abundance or variability of abundance of juvenile herring had been detected. Fishing activities had to be kept at a minimum to account for the extension of the survey area.

2.4 Calibration

The hull mounted transducer ES38B (starboard blister) was calibrated at the start of the survey (June 29th) at open sea east of Helgoland under reasonable conditions. The calibration procedure required less than 6 hrs. It was carried out with the PC program "Calibrate" (Bethke 2000) which gives equivalent results as the "Lobe" (Simrad) program and the methods described in the 'Manual for Herring Acoustic Surveys in ICES Divisions III, IV and VI' (ver. 3.1, ICES CM 2003/G:03, Appendix 4). Important parameters and settings are listed in Tab. 1. The difference to the last calibration on "Herwig" (conducted in the Western Baltic in early June 2004 under good conditions and recalculated for the North Sea environment) was found to be minimal and it was decided to use the new values.

2.5 Intercalibration/Overlap area

Instead of an intercalibration with different vessels participation in the survey, "Walther Herwig III" surveyed an overlap area at the same time with the Norwegian vessel "Johan Hjort" and the Danish vessel "Dana". ICES rectangles 42F6-F7 and 41F6-F7 were surveyed by different tracks between July 10th and 12th. This area was chosen because it was close to the survey areas of each vessel, and there was a reasonable amount of herring schools found in recent years. This year, however, there appeared to be significantly less herring schools in the area. A detailed analysis of the results of the three vessels for the overlap area can be found in the main body of the PHERS report.

2.6 Acoustic data collection

The acoustic investigations were performed during daylight (0400 to 2000 hrs UTC), using a Simrad EK500 echosounder with a standard frequency of 38 kHz. The echo telegrams were continuously recorded with the Bergen integrator BI500. The specific

settings of the hydroacoustic equipment were used as described in the 'Manual for Herring Acoustic Surveys in ICES Divisions III, IV and VI' (ver. 3.1, ICES CM 2003/G:03, Appendix 4). Basic settings are documented in Table 1. The transducer ES38B was mounted on starboard in the vessel's hull. The vessel was running at a speed of 10-11 knots. During cruise 265, "Herwig" sailed 3199 n.mi. Of these, 2324 n.mi. could be used for acoustic data sampling.

2.7 Biological data - fishing trawls

For the identification of echo traces and further biological sampling, 32 trawl hauls were conducted either on specific large schools (after turning the ship) or, if small schools occurred frequently, continuing the survey track. On "Walther Herwig III", a small pelagic trawl (PSN205, approx. 13 m vertical opening, mesh size in the codend 10 mm) was used both in the midwater and close to the bottom. The net was equipped with a Krupp-Atlas net sonde. Standard tow periods were 30 mins; however, they varied between 9 and 61 mins depending on the indications of net filling.

From each trawl, the mass of the total catch and species composition (on subsamples, if needed) was determined. Length frequency distributions were produced for each species. Length-stratified samples (10 samples per half cm class per ICES stat rectangle) of herring and sprat were taken for the determination of maturity (using a 4 point scale), sex and individual body mass, and otoliths were removed for age reading (from 930 herring, 995 sprat, 61 anchovies and 26 sardines). If conditions did not allow conducting this work immediately after the haul, fish was frozen for further processing at the institute.

2.8 Hydrographic data

After each of the hauls and on additional hydrographic stations, vertical profiles of temperature, salinity and depth were recorded using a "Seabird 911- multiprobe" CTD-water sampler rosette (Fig. 1). Water samples for calibration have been taken close to the bottom.

2.9 Data analysis

The echo integration, i.e. the allocation of the nautical area backscattering cross section (NASC) to the species herring and sprat was done using a Bergen integrator BI500, using information from trawl hauls usually targeting specific schools. Herring and sprat were exclusively found in characteristic "pillars". The NASC attributed to clupeoids was estimated for each ESDU of 1 nautical mile. Contributions from air bubbles, bottom structures and scattering layers were manually removed from the echogram using the BI500.

As it was not possible to distinguish between herring and sprat within clupeid schools and to allocate the integrator readings to a single species, species composition was based on the trawl catch results (see above).

For each rectangle the species composition and length distribution of herring and sprat were determined as the weighted mean of all trawl results in this rectangle. For rectangles without valid hauls a mean of the catch results of the neighbouring rectangles was used. From these distributions the mean cross section σ was calculated according to the following target strength-length (TS) relationship:

$$TS = 20 \log L \text{ (cm)} - 71.2 \quad (\text{ICES 1983/H:12})$$

The total number of fish (total N) in one rectangle was estimated to be the product of the mean area scattering cross section NASC and the rectangle area (or more precisely the area with a water depth of more than 20 m), divided by the corresponding mean cross section. This total number was divided into species and age/maturity classes according to the trawl catch results.

3. RESULTS & DISCUSSION

3.1 Acoustic data

As in previous years, clupeids were exclusively found in characteristic schools which appeared in single clusters of some n.mi. extension. Echoes attributed to plankton were not considered to be problematic for the identification of fish schools.

The highest nautical area scattering coefficients (NASCs) have been found in the south and the south-east of the investigation area. 75% of all measured 1 n.mi.-intervals contained no clupeid schools (44% of 5 n.mi.-intervals). The highest value for 5 n.mi.-intervals occurred off the coast of East Anglia (3818 m²n.mi.⁻²). Fig. 2 gives the NASC distribution for clupeids on 5 n.mi. EDSUs.

Note that only little indications for the presence of clupeids were found south of 52.5°N, which could indicate that the southern distribution limit of sprat was reached this year. It should, however, be noted that the one rectangle in the south where the highest abundance of sprat was found in 2003 (33F1 off Lowestoft) was unfortunately not surveyed this year (see Fig. 6 for a detailed comparison of the 2004 and 2003 surveys).

3.2 Biological data

32 hauls with the pelagic trawl PSN205 have been deployed. Due to time constraints caused by the extension of the survey area, 27 statistical rectangles out of 46 covered during the survey could not be sampled with trawl hauls (Fig. 1 and Tab. 2; 2003: 28 unsampled rectangles out of 49 covered by acoustics) – 17 of these without or with only minimal NASCs. 13 rectangles have been sampled successfully (with more than 200 clupeids per hour trawling; 2003: 16 rectangles) and were used for raising unsampled rectangles. The limited amount of valid trawl hauls appears to be increasingly problematic: While there were only 6 rectangles with almost no NASCs where no sampling information in the neighboring rectangles was available for raising in 2003, the number of these increased to 8 this year, and 3 of them contained significant NASCs. The effect becomes obvious for the westernmost rectangle (37E9 off Flamborough Head): While most of the clupeids in that rectangle appeared to be mature herring in 2003, NASCs were interpreted to be almost exclusively 0-group sprat, based on successful sampling some 60 n.mi. away. Data for the south-western part of the survey area should therefore be treated with extreme care – the high number of juvenile sprat may reflect a sampling artefact (see Fig. 6).

The total catch varied between 0.1 and 2831 kg. Herring was mainly found in the eastern part of the area, but also in two rectangles in the south (between 52.5° and 53.5°N), while sprat was clearly concentrated in warmer water close to the Frisian, English and Dutch coasts.

26 species have been caught (mean 5 species per haul). Highest presence was recorded for mackerel (in 24 of 32 hauls), whiting (23), sprat (21) and grey gurnard (20). The main share of the total catch of approx. 8 tons could be attributed to sprat (67%, 583'000 ind) and herring (24%, 103'000 ind), followed by mackerel and horse mackerel (Tab. 3).

3.3 Biomass and abundance estimates

The total biomass estimates for the survey:

Total herring	173'700 t	(2003: 110'900 t)
Spawning stock biomass	2'400 t / 1.4 %	(2003: 49'900 t / 45 %)
Total sprat	359'600 t	(2003: 266'100 t tonnes)
Spawning stock biomass	174'200 t / 48 %	(2003: 158'500 t / 59 %)

The total abundance estimates for the survey:

Total herring	13'800 mill.	(2003: 4'100 mill.)
Spawning stock abundance	0.02 mill. / 0.2 %	(2003: 1'200 mill. / 31%)
Total sprat	51'600 mill.	(2003: 29'600 mill.)
Spawning stock abundance	14'300 mill. / 28 %	(2003: 14'700 mill. / 50 %)

Note that these values are not directly comparable to values prior to 2003 as the survey area has been significantly expanded. Compared to last year, herring abundance has tripled. The age composition has again slightly changed to previous years' results. However, the vast majority (>99%) of herring in this area still consists of 0- and 1-wr (Age 1 and 2). The fraction of older, mature herring is back to the low level known from previous years, possibly because no sampling was conducted close to Flamborough Head where almost all mature herring was found last year. These findings may therefore reflect an insufficient sampling and should therefore be treated with caution. Sprat biomass and abundance have been increased as compared to last year. This may be caused by a more northerly distribution of the sprat stock (and thus a better accessibility to the survey) this year. Note that 0-group sprat has been recorded for the first time since 1998, and that 34% of the total sprat abundance (but only 5% of the total biomass) have been attributed to 0-group fish. However, these fish are so small that they have probably not been caught representatively.

Detailed information on abundance and biomass by statistical rectangle can be found in Fig. 4 and 5; they are further split into age group and maturity in Tab. 5a and 6 for herring, and in Tab. 5b and 7 for sprat.

3.4 Hydrographic data

To promote an analysis of the influence of bottom water temperature on clupeid distribution, 93 vertical profiles have been recorded at stations spread over the whole area, with a maximum distance of about 30 n.mi. between any station. The water column was clearly stratified on most of the offshore stations; surface temperatures ranged between 13.0 and 17.4°C (2003: 12.7 and 18.0°C) and bottom temperatures between 8.2 and 16.9°C (at 29-49 m water depth; 2003: 6.9 and 17.7° at 24-63 m water depth).

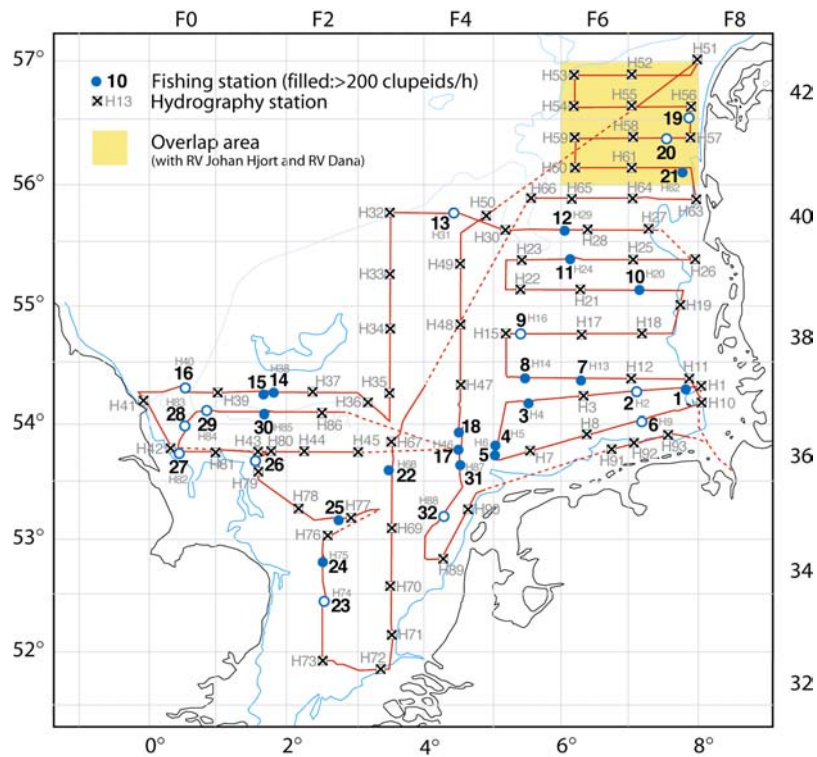


Figure 1. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Cruise track, fishing stations and hydrographic stations. 20 and 50 m depth contour drawn.

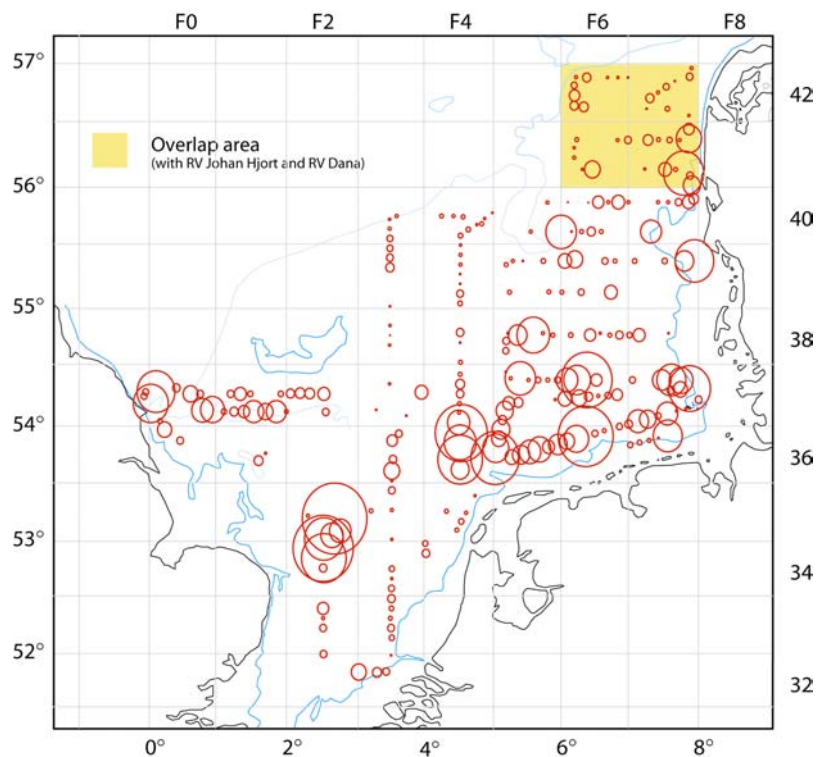


Figure 2. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Post plot showing the distribution of total NASC values attributed to clupeoids (sum per 5 n.mi., on a proportional sq. root scale relative to the largest value of 3818 $m^2 n.mi.^{-2}$). Smallest dots indicate zero values.

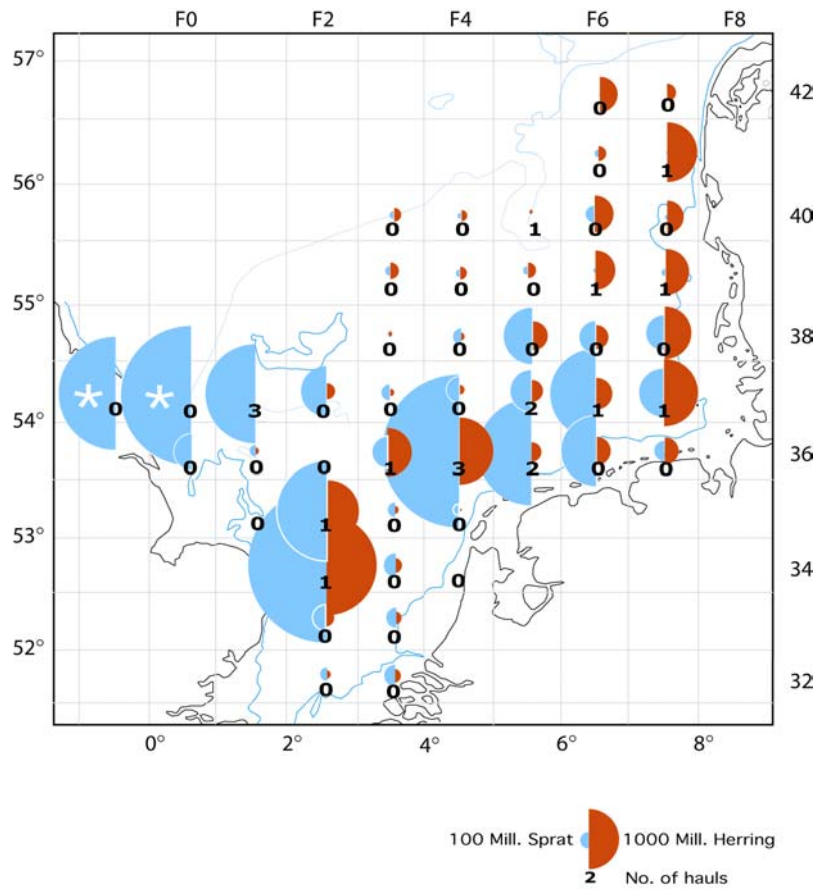


Figure 3. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Abundance of herring and sprat (circle diameter is proportional to abundance), proportion of the two clupeoid species, and number of valid hauls per statistical rectangle. * marks rectangles for which information is derived from distant catches, and where information is considered highly uncertain based on last year's survey results.

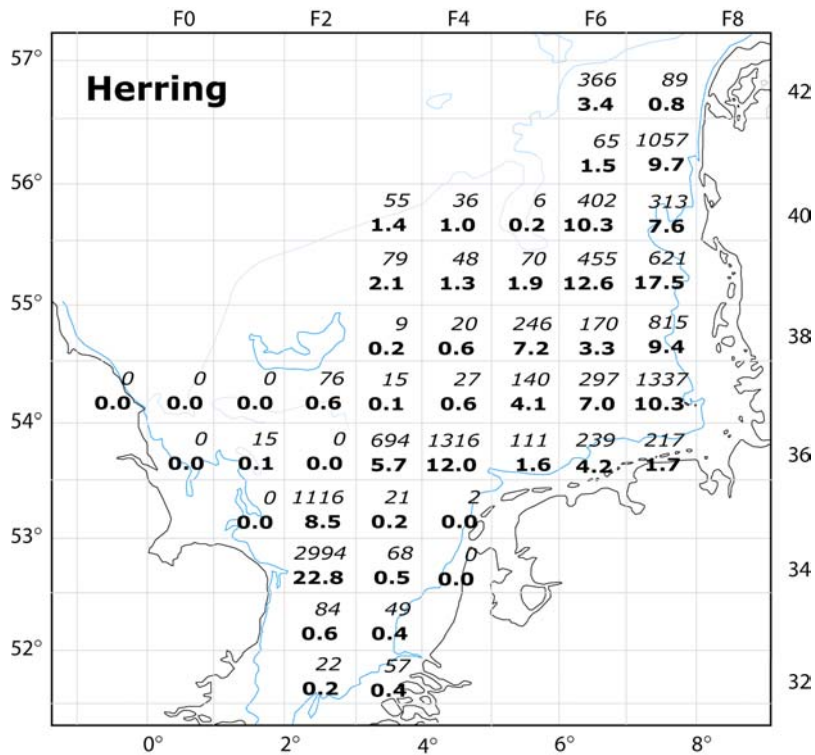


Figure 4. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Abundance (Mill. individuals, upper value in italics) and biomass (thousand t, lower value in bold) of **herring** per statistical rectangle.

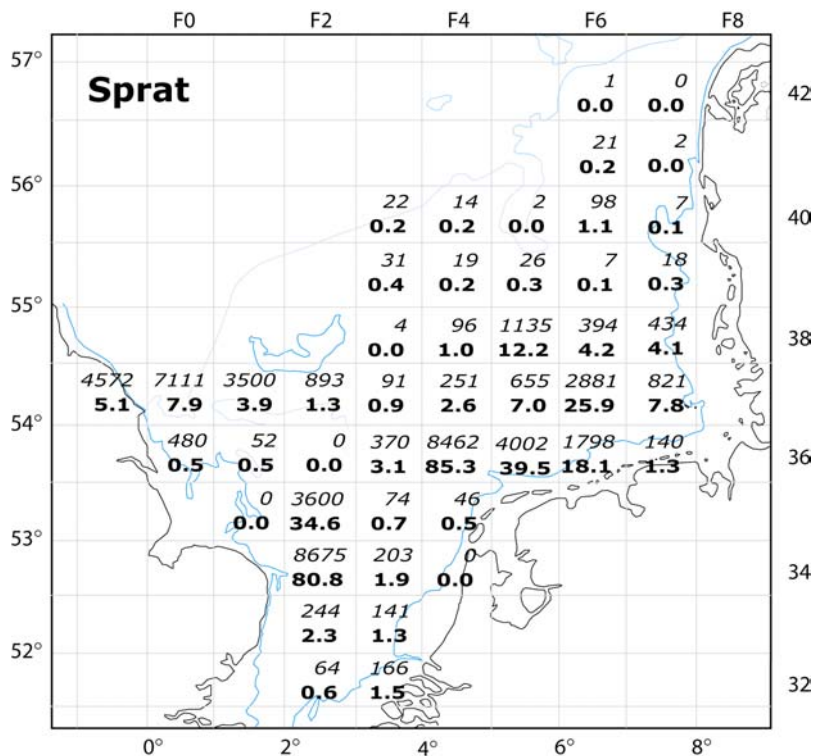


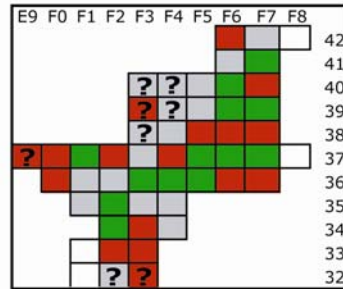
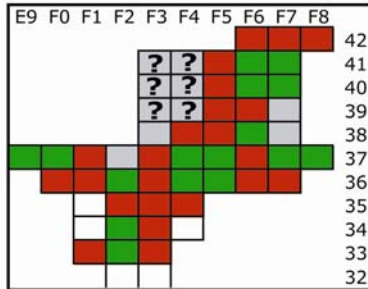
Figure 5. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Abundance (Mill. individuals, upper value in italics) and biomass (thousand t, lower value in bold) of **sprat** per statistical rectangle.

2003/WH 253

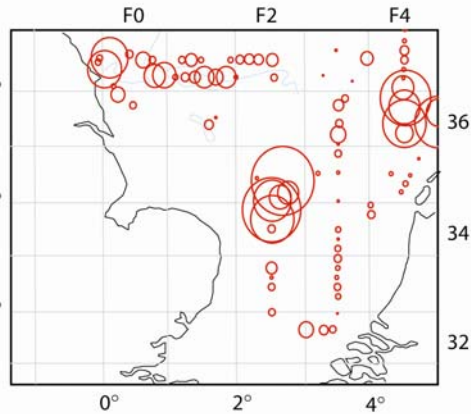
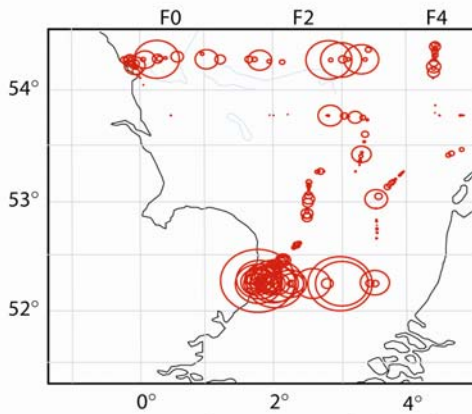
2004/WH265

Sampling by rectangle

(green: successfully sampled, grey: not sampled with only little clupeids, red: not sampled with indications of clupeids, ?: no neighboring rectangle sampled)



NASCs (note different reference scale for NASCs, 2003: sprat only)



Herring/sprat abundance (note different reference scale)

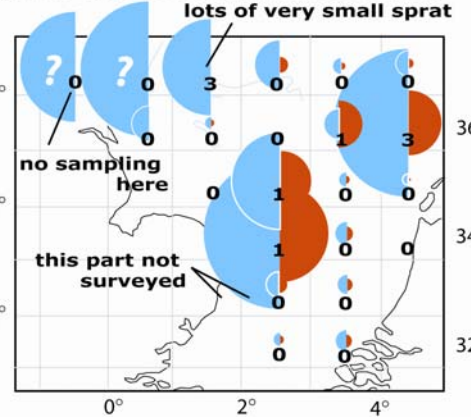
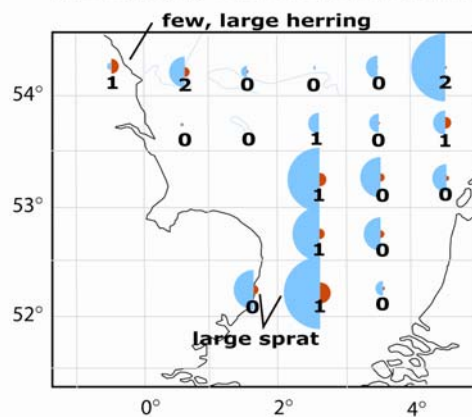


Figure 6. FRV "Walther Herwig III", International hydroacoustic survey on herring in the North Sea. Comparison of various aspects of cruise 253 in 2003 (left) and cruise 265 in 2004 (right).

Table 1. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Simrad EK500 and analysis **settings** used.

Transceiver Menu	
Frequency	38 kHz
Transducer	FL1 STB-Blister ES38B
Sound speed	1502 ms ⁻¹
Max. Power	2000 W
Equivalent two-way beam angle	-20.2 dB
Default Transducer Sv gain	24.9 dB
Calibration details	
TS of sphere	-33.6 dB
Range to sphere in calibration	13.5 m
Measured NASC value for calibration	9374.5
Log Menu	
Speed	1 n.mi.
Operation Menu	
Ping interval	1 s
Analysis settings	
Bottom margin (backstep)	0.5 m
Integration start (absolute) depth	9.5 m
Range of thresholds used	-50 dB

Table 2. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 - 19 July 2004:
Trawl station data

Stat	Haul	Rect	Dat	Time of day (hhmm UTC)	Trawl	ShotPosLat (°MM,MM)	Shot PosLon (°MM,MM)	Water Depth (m)	Catch Depth (m)	Catch time (min)
781	1	37F7	20040629	1212	PSN388	541745N	0074883E	23.3	16.8	9
783	2	37F7	20040629	1528	PSN205	541565N	0070787E	38.5	32.0	32
788	3	37F5	20040630	0627	PSN205	541082N	0053390E	39.8	33.3	30
790	4	36F5	20040630	1048	PSN205	534998N	0050314E	36.0	29.5	30
792	5	36F5	20040630	1219	PSN205	534250N	0050052E	33.0	26.5	30
801	6	37F7	20040701	0612	PSN205	540213N	0071460E	33.8	27.3	60
810	7	37F6	20040702	0620	PSN205	542185N	0061086E	40.5	34.0	40
812	8	37F5	20040702	1039	PSN205	542209N	0052552E	42.3	35.8	30
816	9	38F5	20040702	1707	PSN205	544501N	0052800E	44.0	37.5	39
827	10	39F7	20040703	1446	PSN205	550770N	0070424E	36.0	29.5	30
836	11	39F6	20040704	1144	PSN205	552211N	0060048E	49.5	43.0	61
846	12	40F5	20040705	0930	PSN205	553740N	0055992E	49.0	42.5	30
850	13	40F4	20040705	1651	PSN205	554511N	0042316E	38.0	31.5	31
866	14	37F1	20040706	0641	PSN205	541525N	0014355E	49.8	43.3	45
868	15	37F1	20040706	0844	PSN205	541501N	0013641E	38.5	32.0	30
872	16	37F0	20040706	1343	PSN205	541604N	0003302E	61.5	55.0	30
885	17	36F4	20040709	0444	PSN205	534891N	0042947E	41.3	34.8	30
887	18	36F4	20040709	0642	PSN205	535666N	0043109E	43.8	37.3	30
910	19	41F7	20040711	0722	PSN205	562964N	0074979E	28.8	22.3	30
914	20	41F7	20040711	1047	PSN205	562204N	0072790E	35.0	28.5	30
925	21	41F7	20040712	0733	PSN205	560647N	0074332E	28.5	22.0	20
937	22	36F3	20040713	1018	PSN205	533406N	0032882E	36.5	30.0	30
949	23	33F2	20040714	1319	PSN205	522410N	0023025E	43.5	37.0	43
951	24	34F2	20040714	1637	PSN205	524988N	0023047E	43.3	36.8	30
958	25	35F2	20040715	0647	PSN205	530985N	0024120E	34.8	28.3	30
964	26	36F1	20040715	1400	PSN205	534199N	0013446E	26.5	20.0	30
971	27	36F0	20040716	0518	PSN205	534487N	0002192E	34.8	28.3	31
973	28	36F0	20040716	0733	PSN205	535665N	0003142E	48.5	42.0	30
975	29	37F0	20040716	1014	PSN205	540616N	0005476E	48.3	41.8	30
979	30	37F1	20040716	1451	PSN205	540514N	0014346E	90.0	83.5	37
984	31	36F4	20040717	0521	PSN205	533662N	0043012E	31.3	24.8	30
986	32	35F4	20040717	0937	PSN205	531027N	0041314E	29.3	22.8	45

Table 3. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Species distribution per haul (catch in kg), relative composition of the clupeid catch, and total raised number of clupeids. Stations marked yellow were used for verification of echo traces.

Station	Haul	Agonys cataphractus	Callionymus lyra	Clupea harengus	Mlosa fallax	Echlichthys vipera	Engraulis encrasicolus	Entelurus aequornus	Eutrigla gurnardus	Gadus morhua	Hyperoplus immaculatus	Hyperoplus lancoelatus	Lampraetra fluvialilis	Limanda limanda	Melanogrammus aeglefinus	Melanogobius melanocephalus	Merlangius merlangus	Myoxocephalus scorpius	Pleuronectes platessa	Argentina sphyraena	Pomatoschistus minutus	Salmo trutta	Sardina pilchardus	Scomber scombrus	Sprattus sprattus	Trachurus trachurus	Trigla lucerna	Trisopterus minutus	Total	No of Species	Herring (n in 60 min haul)	Herring (% of clupeid catch)	Sprat (n in 60 min haul)	Sprat (% of clupeid catch)	Number of clupeids/60 min
781	1	0.03		81.2	0.49		0.51	0.86	0.05		1.00		4.15			0.15	0.44						0.76	55.8	2.40	0.25		1.6	13	69280	62%	42373	38%	111853	
783	2		0.02	3.6				0.04	0.04		0.02					0.12	0.00		0.01				7.42	48.5	1.56			1.6	2	918	6%	14242	94%	15160	
788	3			10.6				0.04	0.04		0.02					0.32	0.00		0.01				0.32	102.4	1.56			59.8	9	7090	22%	25656	78%	32746	
790	4			103.9			0.02				0.14					0.00	0.00		0.01				70.31	2656.1	0.73			113.3	4	10564	2%	602076	98%	612640	
792	5																						3.13	116.29	73.99			2831.2	7	10564	2%	602076	98%	612640	
801	6			6.5			0.04	1.69	0.33		0.06		0.07			0.01	0.00						15.76	20.3	1.54			195.1	4	410	9%	3972	91%	4382	
810	7			878.1			0.04	0.79	0.01		0.06					0.00	0.00						39.99	1619.9	0.32			44.6	10	63550	18%	288194	82%	351744	
812	8							0.33	0.04		0.03					0.04	0.04		0.19				1.99	3.9	0.32			2538.8	6	63550	18%	288194	82%	351744	
816	9			214.0				0.92	1.86		0.03					0.04	0.04						1.99	3.9	0.32			1.1	3	14454	97%	428	3%	14882	
827	10			62.2				1.86	0.09		0.03					0.04	0.04						1.99	3.9	0.32			66.0	5	2102	99%	30	1%	2132	
836	11			324.2				2.50	0.09		0.18		0.03			0.02	0.02						0.17	55.7	0.32			382.7	7	24014	72%	9422	28%	33436	
846	12							10.30	0.00		0.18					0.01	0.01						0.17	55.7	0.32			10.3	2	24014	72%	9422	28%	33436	
850	13							0.00	0.00		0.02					0.01	0.01						0.17	55.7	0.32			10.3	2	24014	72%	9422	28%	33436	
866	14							0.00	0.00		0.02					0.01	0.01						0.17	55.7	0.32			10.3	2	24014	72%	9422	28%	33436	
868	15			0.5			0.78	9.31	0.00		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
872	16			0.4				0.00	0.00		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
885	17			2.3				1.17	0.06		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
887	18			0.1			0.06	6.55	0.00		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
910	19			19.2				2.45	0.00		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
914	20			0.6				0.09	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
925	21			0.1				0.09	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
937	22			0.1				0.09	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
949	23			98.6				0.09	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
951	24			51.5			0.31	0.09	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
958	25			0.02				0.12	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
964	26			0.04				0.12	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
971	27			0.04				0.12	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
973	28			0.04				0.12	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
975	29			0.04				0.12	0.04		0.02					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
979	30			62.0			1.84	0.98	14.34		0.06					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
984	31			0.04				0.13	0.04		0.06					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
986	32			0.04				0.13	0.04		0.06					0.03	0.03						0.17	55.7	0.32			0.1	3	272	100%	272	0%	272	
Total		0.0	0.0	1919.5	0.5	1.9	2.5	43.2	0.0	43.2	14.3	5.6	1.5	4.2	0.4	25.5	0.1	0.6	0.0	0.0	0.0	3.4	3.1	417.4	5469.1	142.6	0.2	0.0	8056.3	26	7897	17%	37311	83%	45209

Table 4a. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: **Herring**
length frequency proportion (%) by trawl haul. Length in cm.

Stat.Rect. Haul	37F7	37F5	36F5	36F5	37F6	37F5	39F7	39F6	40F5	37F1	37F1	37F0	36F4	36F4	41F7	41F7	36F3	33F2	34F2	35F2	36F1	37F0	37F1	36F4	
Length (cm)	1	3	4	5	7	8	10	11	12	14	15	16	17	18	19	21	22	23	24	25	26	29	30	31	
Total	781	788	790	792	810	812	827	836	846	866	868	872	885	887	910	925	937	949	951	958	964	975	979	984	
4.75	0												2												
5.25	0.1		3										1								1				
5.75	0.2	2	5										4	1							1				
6.25	0.3		5										38	7			2				1				
6.75	0.8		13										41	16			22				3				
7.25	1.9	4	25	17									12	37			25				3				
7.75	1.8		11	26	5				1				3	18			31			12					
8.25	2.3		15	13	8				1					13			13			1	19				
8.75	2.9	0	17	5	12	2		2	3				5	5			1			10	16			2	
9.25	5.7	7	4	1	17	2		1	1				2	2			1			13	12			1	
9.75	12.9	28	4	0	8	1			0								1			33	12			1	
10.25	12.9	34	4	0					0								1			23	10			2	
10.75	8.4	23	9			1			0							2				11	5			2	
11.25	3.1	4	7	1	8				1							15				8	3			4	
11.75	1.7	1	7	0	2											27				1	1			22	
12.25	1.7	7	1	8					1							22				19				19	
12.75	1.4	0	2	0	8									1		21				23	10			16	
13.25	0.6		2			1										6				5	2			7	
13.75	2.3	0		8		5	0		1											8	3			11	
14.25	3.9				5	13	1	1	4							0				1	1			4	
14.75	9.5				16	30	11	9	11							2	1			8	3			1	
15.25	12.8		2		35	29	40	36	30						20	3	1			20	26			30	
15.75	7.7				16	10	35	36	30						60	2	1			60	29			3	
16.25	2.4		2		5	2	8	14	13						20	0				20	958			3	
16.75	1.0					2	4	1	2							0	2				964			3	
17.25	0.3					1	1	1	1												975			3	
17.75	0.0						0														979			3	
18.25	0.3																				984				
19.25	0.0																								
20.25	0.0																								
20.75	0.0																								
21.25	0.0																								
21.75	0.3																								
22.75	0.2					1																			
23.25	0.2					1																			
25.25	0.2					1																			
Total n ('000)	252.7	69.3	0.9	7.1	10.6	0.4	63.5	14.5	2.1	24.0	0.0	0.0	0.4	1.7	0.0	4.1	0.3	0.0	29.1	16.0	0.0	0.0	0.0	0.0	8.6
mean lgth	12.2	10.2	9.8	7.5	11.8	13.8	15.0	15.5	15.3	15.0	0.0	0.0	6.6	7.5	15.8	12.4	7.8	21.8	9.9	8.9	0.0	0.0	0.0	0.0	12.6

Table 4b. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: **Sprat** length frequency proportion (%) by trawl haul. Length in cm.

Stat.Rect. Haul	37F7	37F5	36F5	36F5	37F6	37F5	39F7	39F6	40F5	37F1	37F1	37F0	36F4	36F4	41F7	41F7	36F3	33F2	34F2	35F2	36F1	37F0	37F1	36F4
Length (cm)	781	788	790	792	810	812	827	836	846	866	868	872	885	887	910	925	937	949	951	958	964	975	979	984
2.75										1														
3.25										11	4													
3.75										39	20		6										4	
4.25										45	34		32	1									14	
4.75										5	25		38	53									44	5
5.25										11	11		11	35									32	33
5.75										3	3		6	10									7	42
6.25													4	2			1						3	16
6.75																	2						4	
7.25																								
7.75																	1							
8.25																	13							
8.75																	32							
9.25																	24			1				
9.75																	15							
10.25																	8							
10.75																	3							
11.25																								
11.75																								
12.25																								
12.75																								
13.25																								
13.75																								
14.25																								
Total n ('000)	1194	42.4	14.2	25.7	602.1	4.0	288.2	0.4	0.0	0.3	0.2	0.0	0.1	4.2	0.0	0.0	0.2	0.0	83.9	51.6	0.0	0.1	2.3	64.6
mean lgth	10.5	10.3	9.5	9.9	10.4	9.8	11.0	12.8	10.3	11.3	4.0	0.0	4.8	5.0	0.0	11.5	9.1	0.0	10.1	10.3	11.6	4.9	5.7	10.9

Table 5a. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Age/maturity-length key for **herring** (absolute numbers (millions) raised to the abundance in the survey area).

Length (cm)	0 1 imm.	1 2 imm.	1 2 mat.	2 3 imm.	2 3 mat.	3 4 mat.	4 5 mat.	5+ 6+ mat.	Sum
4.75	1								1
5.25	13								13
5.75	18								18
6.25	63								63
6.75	264								264
7.25	343								343
7.75	461								461
8.25	41								401
8.75	639								639
9.25	831								831
9.75	1915								1915
10.25	1729								1729
10.75	148								1048
11.25	719								719
11.75	743								743
12.25	558	2							578
12.75	526								526
13.25	153	18							171
13.75	98	78							176
14.25	18	163							181
14.75		56							506
15.25		1138							1138
15.75		99							909
16.25		35							305
16.75		127							127
17.25		18							18
17.75		4							4
18.25		8							8
21.75					8				8
22.75						5			5
23.25						5			5
25.25							5		5
Sum	1542	3293			8	1	5		13858

Table 5b. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Age/maturity-length key for **sprat** (absolute numbers (millions) raised to the abundance in the survey area), separately for the western and the eastern part (divided at 3°E).

Length (cm)	West of 3°E										East of 3°E										grand total			
	0 imm.					1 imm.					2 imm.					3 mat.								
	wr	0	1	2	total	wr	0	1	2	total	wr	0	1	2	total	wr	0	1	2	total				
2,75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	
3,25	240	0	0	0	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	
3,75	923	0	0	0	923	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	924	
4,25	1221	0	0	0	1221	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1229	
4,75	1087	0	0	0	1087	281	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	281	
5,25	4609	0	0	0	4609	184	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	184	
5,75	5760	0	0	0	5760	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	
6,25	2273	0	0	0	2273	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	
6,75	657	0	0	0	657	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	
7,25	58	0	0	0	58	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
7,75	0	17	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
8,25	10	61	0	0	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	
8,75	0	248	0	0	270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	418	
9,25	0	1442	0	0	1442	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	688	
9,75	0	2905	153	0	3058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3319	
10,25	0	1757	1757	0	391	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6986	
10,75	0	534	610	76	1601	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3928	
11,25	0	96	384	48	576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9494	
11,75	0	131	131	26	289	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	589	
12,25	0	0	40	0	241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1849	
12,75	0	0	0	0	173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1560	
13,25	0	0	0	0	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	817	
13,75	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1097	
14,25	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1849	
total	16850	7059	3075	173	2002	29	29189	556	11934	6604	364	2907	66	22430	51620									

Table 6. cont'd: herring.

36	total	0.0	113.0	14.8	0.0	5721.2	693.5	11982.3	1316.8	1561.7	111.2	4190.0	239.0	1683.7	216.9
11	0.0	0.0	113.0	14.8	0.0	5124.3	672.5	9309.2	1221.7	719.1	94.4	1702.0	140.7	1641.3	215.4
21	0.0	0.0	0.0	0.0	0.0	596.8	21.0	2673.1	94.1	319.5	11.3	2768.6	94.0	42.4	1.5
2m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	total	0.0	0.0	0.0	0.0	162.1	20.6	24.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	154.7	20.3	14.6	1.9	0.0	0.0	0.0	0.0	0.0	0.0
21	no stations and no echo-information	0.0	0.0	0.0	0.0	7.4	0.3	4.2	0.1	0.0	0.0	no stations and no echo-information	0.0	0.0	0.0
2m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	total	0.0	0.0	0.0	0.0	519.9	66.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	519.9	66.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	no stations and no echo-information	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	total	0.0	0.0	0.0	0.0	370.6	48.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	370.6	48.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	no stations and no echo-information	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	no stations and no echo-information	0.0	0.0	0.0
2m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	total	0.0	0.0	0.0	0.0	436.0	57.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	436.0	57.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	no stations and no echo-information	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

fishes (t)	Weight	173745	Totals (m3)	13738
11	807840.34	11	10503.9880	
21	807453.8421	21	3184.9240	
2m	0.002m	2m	0.0000	
31	0.0031	31	0.0000	
3m	711.923m	3m	7.6550	
4m	1031.614m	4m	10.3690	
5m	679.195m	5m	5.1840	
6+	0.006+	6+	0.0000	

Weight at age&aturity (g)	7.62
11	7.62
21	28.40
2m	0.002m
31	0.0031
3m	93.00
4m	99.49
5m	131.00
6+	0.006+

biomass from validly sampled squares
 biomass from interpolated squares

100768
73447

58%
42%

calculated with mean weigh per age&aturity-class
 = interpolated square

no haul info and too remote for interpolation. Calculated against the rules with whole survey mean LFD-data to avoid unpleasant gaps.

Table 7. FRV "Walther Herwig III", cruise 265: International hydroacoustic survey on herring in the North Sea, 28 June 2004 -19 July 2004: Mean weight, biomass (tonnes) and numbers (millions) for **sprat** by age and maturity per statistical rectangle. Note that for rectangles marked in violet LFDs for the whole survey area have been used, as no catch information from neighboring rectangles was available.

	E9	F0	F1	F2	F3	F4	F5	F6	F7	F8
	W [t]	N [10 ⁶]	W [t]	N [10 ⁶]	W [t]	N [10 ⁶]	W [t]	N [10 ⁶]	W [t]	N [10 ⁶]
42	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									
41	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									
40	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									
39	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									
38	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									
37	total									
	0i									
	1i									
	1m									
	2i									
	2m									
	3+m									
	total									

Table 7. cont'd: sprat.

36	total	533.8	479.6	464.2	51.7	0.0	0.0	3080.8	369.8	85346.8	8461.5	39511.5	4002.0	18124.0	1798.4	1326.5	140.3	
0i		533.8	479.6	9.0	8.1	0.0	0.0	15.3	13.8	586.7	527.1	0.3	0.3	0.1	0.1	0.0	0.0	
1m	no stations and no echo-information	0.0	0.0	182.1	21.9	0.0	0.0	2888.3	322.8	28975.0	3227.2	19472.6	2338.3	8019.3	963.0	740.0	88.9	
2i		0.0	0.0	124.5	11.3	0.0	0.0	250.4	22.7	30455.3	2766.3	11750.8	1067.4	5785.2	525.5	459.5	41.7	no stations and no echo-information
2m		0.0	0.0	5.3	0.6	0.0	0.0	34.8	4.0	1300.0	150.9	519.4	60.3	251.4	29.2	18.6	2.2	no echo-information
3+m		0.0	0.0	137.2	9.5	0.0	0.0	90.3	6.3	25014.8	1736.0	7588.9	527.3	3978.7	276.4	108.3	7.5	
total		34609.4	37699.9	741.6	74.0	0.0	0.0	452.1	45.7	1114.9	92.0	178.4	8.3	89.2	4.2	0.0	0.0	
35	total	0.0	0.0	0.0	0.0	34609.4	37699.9	741.6	74.0	452.1	45.7	178.4	8.3	89.2	4.2	0.0	0.0	
0i		0.0	0.0	0.0	0.0	353.8	317.9	3.9	3.5	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	
1m	no stations and no echo-information	0.0	0.0	0.0	0.0	13707.3	1646.0	320.8	39.5	211.0	25.3	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2i		0.0	0.0	0.0	0.0	9369.1	851.0	218.7	19.9	138.4	12.6	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2m		0.0	0.0	0.0	0.0	400.5	46.5	9.3	1.1	6.1	0.7	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
3+m		0.0	0.0	0.0	0.0	10324.2	717.3	155.0	10.8	93.6	6.5	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
total		80818.9	8674.8	1914.8	203.5	0.0	0.0	203.5	0.0	2.6	0.1	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
34	total	0.0	0.0	0.0	0.0	0.0	6.3	6.3	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0i		0.0	0.0	0.0	0.0	49566.7	5952.2	1040.2	124.9	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
1m	no stations and no echo-information	0.0	0.0	0.0	0.0	23854.3	2148.6	546.9	49.7	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2i		0.0	0.0	0.0	0.0	800.3	115.0	23.0	2.7	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2m		0.0	0.0	0.0	0.0	6807.6	459.1	260.3	20.2	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
3+m		0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
total		21272.5	243.9	1313.0	140.9	0.0	0.0	140.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
33	total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0i		0.0	0.0	0.0	0.0	1393.7	167.4	805.3	96.7	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
1m	no stations and no echo-information	0.0	0.0	0.0	0.0	665.1	60.4	384.3	34.9	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2i		0.0	0.0	0.0	0.0	27.8	3.2	16.1	1.9	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2m		0.0	0.0	0.0	0.0	165.8	12.9	107.3	7.5	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
3+m		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
total		597.1	64.1	1544.9	165.8	0.0	0.0	165.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
32	total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0i		0.0	0.0	0.0	0.0	366.2	44.0	947.5	113.8	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
1m	no stations and no echo-information	0.0	0.0	0.0	0.0	174.8	15.9	452.2	41.1	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2i		0.0	0.0	0.0	0.0	7.3	0.8	18.9	2.2	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
2m		0.0	0.0	0.0	0.0	48.8	3.4	126.3	8.8	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	
3+m		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	no stations and no echo-information	

Weight at age&maturity (a)		Totals (m):	
Weight	Numbers	Weight	Numbers
0i	359594.64	51819.63	17400.49
1i	19368.48	19397.50	19397.50
1m	161533.16	9542.63	9542.63
2i	105056.92	526.43	526.43
2m	4534.88	4853.89	4853.89
3+m	66984.46	98.71	98.71

biomass from validly sampled squares
biomass from interpolated squares

80%

20%

289413

70181

calculated with mean weight per age&maturity-class

= interpolated square

no haul info and too remote for interpolation. Calculated against the rules* with whole survey mean LFD-data to avoid unpleasant gaps.