Baltic International Acoustic Survey

Report for R/V Aranda

CRUISE 6/2024

ICES_BIAS_2024

18TH SEPTEMBER – 1ST OCTOBER 2024

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INTRODUCTION

International hydroacoustic surveys have been conducted in the Baltic Sea since 1978 (Håkansson et al. 1979). The initial Finnish-Estonian (FIN-EST) research survey on the R/V Baltica was realised in October 2006 (Grygiel et al. 2007), in the framework of the long-term ICES Baltic International Acoustic Surveys (BIAS) programme. The FIN-EST BIAS surveys on the R/V Baltica were continued until 2012. Since 2007, Finland and Sweden joined together to additionally cover Bothnian Sea (ICES Subdivision 30). In 2012 Sweden could not support the funding of the survey in the Bothnian Sea due to economic difficulties within the DCF program and therefore the coverage of the SD30 had to be based on Finnish funding which resulted in half the normal effort (ICES 2013). In 2013, Finland installed fishing equipment and a Simrad EK60 echo sounder into the R/V Aranda and used the vessel in order to cover ICES SDs 29N, 30, and 32N. In 2017, the R/V Aranda was in dry dock for major renovation and therefore Danish R/V Dana was hired for Finnish BIAS2017 survey. Since 2018, R/V Aranda was used again.

The Baltic International Acoustic Survey (BIAS) is mandatory for the countries that have exclusive economic zone (EEZ) in the Baltic Sea, and it is a part of the Data Collection Framework. The BIAS survey in September/October are co-ordinated and managed by the ICES working group WGBIFS. The main objective of BIAS is to assess clupeoid resources in the Baltic Sea. The survey will provide data to the ICES Baltic Fisheries Assessment Working Group (WGBFAS). The aim of the cruise was to carry out Baltic International Acoustic Survey on herring and sprat covering SDs 29N, 30, and 32N during the autumn 2024, within the remit of the Natural Resources Institute Finland (Luke).

MATERIALS AND METHODS

Narrative

The cruise was completed in two legs covering most of the Bothnian Sea (SD30), the Northern Baltic Sea (SD29) and the Gulf of Finland (SD32) (Figure 1). Altogether 42 stations of 49 planned were completed during the survey. The research area, cruise track and trawl stations are shown in Figure 2. At every trawl station and calibration site a CTD (Conductivity Temperature Depth) cast was made.

The R/V Aranda departed from the harbour of Helsinki (Finland) on Tuesday 18.09.2024 at 09:00 (UTC 06:00) and EK80 echosounder was calibrated at the beginning of the survey. After calibration the research begun. Investigations were continued in the western direction and then to Bothnian Sea (SD30). All at sea research were finalised before the noon 01.10.2024 and the vessel was navigated back to the port of Helsinki.

The Finnish BIAS 2024 survey had some deviation from the original plan when the trawling could not be performed due to stormy weather. In addition, Swedish authorities didn't allow R/V Aranda to use scientific echo-sounder in the territorial water of Sweden. Therefore, any research investigations were not done in the Swedish territorial areas.

Survey design and hydrographical data

During the cruise, echo-integration was performed along the survey track from ICES Sub-Divisions 29N, 30, and 32N. A SeaBird CTD instrument (SBS 19 plus) was used with state-of-the-art sensors for salinity, temperature, oxygen, connectivity and depth.

Calibration

The SIMRAD EK80 echo sounder with 38, 120, and 200 kHz transducers were calibrated on 18.9.2024 on (N60°06.56', E25°00.28'), according to manuals (ICES 2017; Demer *et al*. 2015). The reference target strength of the 38.1 mm diameter tungsten carbide sphere under the prevailing conditions was calculated using a web page application (https://swfscdata.nmfs.noaa.gov/AST/SphereTS/). Values from the calibration were within required accuracy.

Acoustic data collection

The acoustic sampling was performed around the clock. SIMRAD EK80 echo sounder with the 38 kHz hull-mounted transducer (ES38B) was used for the acoustic data collection. The 120 and 200 kHz transducers were used only during trawling. The settings of the hydroacoustic equipment were as described in the IBAS manual (ICES 2017). The post processing of the stored raw data was done using the Echoview software (www.echoview.com). The mean volume back scattering values (Sv) were integrated over 1 nautical mile elementary distance sampling units (ESDUs) from 10 m below the surface to the bottom at 10 m intervals.

Data analysis

The pelagic target species sprat and herring are usually distributed in mixed layers in combination with other species so that it is impossible to allocate the integrator readings to a single species. Therefore, the species composition was based on the trawl catch results. For each rectangle the species composition and length distribution were determined as the unweighted mean of all trawl results in this rectangle. In the case of lack of sample hauls within an individual ICES rectangle (due to gear problems, bad weather conditions or other limitations) a mean from hauls from neighbouring rectangles was used. From these distributions the mean acoustic cross-section was calculated according to the target strength (TS) - length (L) relationships TS = m log L (cm) – a, where species specified constants m and a were found in list below.

AcoCat	SpecCat	m	a
ABZ	Ammodytes tobianus	20	-71.2
ELE	Anguilla anguilla	20	-67.5
GAR	Belone belone	20	-67.5
HER	Clupea harengus	20	-71.2
LUM	Cyclopterus lumpus	20	-67.5
ENC	Enchelyopus cimbrius	20	-67.5
ANE	Engraulis encrasicolus	20	-67.5
COD	Gadus morhua	20	-67.5
GTA	Gasterosteus aculeatus	20	-71.2
GSE	Hyperoplus lanceolatus	20	-71.2
LAR	Lampetra fluviatilis	20	-67.5
LEM	Leptoclinus maculatus	20	-67.5
LIL	Liparis liparis	20	-67.5
LUL	Lumpenus lampretaeformis	20	-67.5
WHG	Merlangius merlangus	20	-67.5
TGQ	Myoxocephalus quadricornis	20	-67.5
MYS	Myoxocephalus scorpius	20	-67.5
NEM	Neogobius melanostomus	20	-67.5
NRO	Nerophis ophidion	20	-67.5
SME	Osmerus eperlanus	20	-71.2
FLE	Platichthys flesus	20	-71.2
PLE	Pleuronectes platessa	20	-67.5
GOB	Pomatoschistus	20	-71.2
POM	Pomatoschistus microps	20	-67.5
GPT	Pungitius pungitius	20	-71.2
SAL	Salmo salar	20	-71.2
TRS	Salmo trutta	20	-71.2
MAC	Scomber scombrus	20	-84.9
TUR	Scophthalmus maximus	20	-67.5
SPR	Sprattus sprattus	20	-71.2
SYM	Symphodus	20	-67.5
ELP	Zoarces viviparus	20	-67.5

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section s_A and the rectangle area, divided by the corresponding mean cross section δ (sigma). The total number was separated into different fish species according to the mean catch composition in the rectangle.

PERSONNEL

Cruise leader during the survey was Juha Lilja from Natural Resources Institute Finland (Luke). The acoustic measurements were performed by Natural Resources Institute Finland (Luke) as well as fish sampling. The participating scientific crew can be seen in the list below.

Scientific crew	Time	Organisation
Juha Lilja	18.09.2024 - 01.10.2024	LUKE
Perttu Rantanen	18.09.2024 - 01.10.2024	LUKE
Anna Reunamo	26.09.2024 - 01.10.2024	SYKE
Anu Lastumäki	18.09.2024 - 01.10.2024	SYKE
Nicolas Goni	18.09.2024 - 26.09.2024	LUKE
Jari Raitaniemi	18.09.2024 - 26.09.2024	LUKE
Hannu Harjunpää	18.09.2024 - 01.10.2024	LUKE
Ronja Routa	18.09.2024 - 01.10.2024	LUKE
Annie Pursiainen	18.09.2024 - 01.09.2024	LUKE
Erkki Jaala	18.09.2024 - 01.10.2024	LUKE
Riku Helisevä	18.09.2024 - 01.10.2024	LUKE
Tommi Lindroth	18.09.2024 - 01.10.2024	FISH
Toni Nikaniemi	18.09.2024 - 01.10.2024	FISH
Pasi Ala-opas	18.09.2024 - 01.10.2024	LUKE
Roope Lehmonen	26.09.2024 - 01.10.2024	LUKE
Jukka Pohtila	18.09.2024 - 01.10.2024	LUKE
Markku Gavrilov	18.09.2024 - 01.10.2024	LUKE
Maiju Lehtiniemi	18.09.2024 - 26.09.2024	SYKE
Carolina Åkerlund	18.09.2024 - 01.10.2024	SLU
Per Andersson	18.09.2024 - 01.10.2024	SLU
Laura Uusitalo	26.09.2024 - 01.10.2024	LUKE
Mikko Kytökorpi	18.09.2024 - 01.10.2024	LUKE
Juha Flinkman	18.09.2024 – 26.10.2024	SYKE

LUKE: Luonnonvarakeskus / Natural Resources Institute Finland
SYKE: Suomen ympäristökeskus / Finnish Environment Institute
SLU: Sveriges lantbruksuniversitet / Swedish University of Agricultural Sciences

RESULTS

Fish catches, biological and hydro-meteorological data

The number of planned trawling stations was 49. From these, 42 trawling stations were accomplished, and from those all were counted as "valid" (technically sound hauls and sufficient catch for a sample) (Table 1). The total number of trawling stations in Bothnian Sea (ICES SD 30) was 30 and 6 in northern Baltic proper (SD 29). In addition, 6 trawl hauls were done in the northern Gulf of Finland (SD 32).

The 7551 kg combined catches (Table 1) consisted of 22 fish species (7072 kg) and mostly unidentified organic matter categorized as "waste" (249 kg), but also small amounts of common jellyfish *Aurelia aurita* (229 kg) and the isopod *Saduria entomon*. The most common and abundant species were herring (*Clupea harengus*) (4312 kg), sprat (*Sprattus sprattus*) (1975 kg) and three-spined stickleback (*Gasterosteus aculeatus*) (760 kg). All observed species are presented in Table 2. From the sub-samples of the 42 fish catches a total of 19029 measurements for species-specific length distributions (0,5 cm interval for herring and sprat, and 1 cm interval for other species) were performed according to Table 3.

Ten individual samples per statistical rectangle for age determination and maturity definitions by length-class were collected from herring and sprat, 3646 and 1390 samples respectively (Table 4). The mean weights for each length-class were also derived from these individual fish samples.
In addition, from BIAS survey on R/V Aranda 100 specimens of herring were collected from the Sea of Bothnia for contaminant analysis of Swedish Museum of Natural History (NRM). A pilot samples targeting the mysids were taken with vertical dipnet and towing multinet in 7 and 4 sample sites, respectively.

Hydrographical data: temperature (°C), oxygen concentration (ml/l), salinity (psu), sound speed (m/s), oxygen concentration (% saturation), conductivity (mS/cm) and sound speed (m/s) were measured. Total of 43 CTD casts were done during the entire cruise.

Abundance estimates

The total area covered by the Finnish BIAS survey was 21940 square nautical miles (nmi^2), 30 rectangles, and after the scrutinizing, the distance used for acoustic estimates was 1486 nautical miles (nmi). The cruise track and positions of trawl hauls are shown in Figure 2. Abundance of Bothnian Sea herring in SD 30 from 2007 to 2024 with StoX calculations are shown in Figure 3. The survey statistics e.g., total abundance of herring and sprat are presented in Table 6. Estimated numbers of herring and sprat by age group in Subdivision 29 and 32 are given in Table 7 and Table 10, respectively. Corresponding mean weights by age group in Subdivision 29 and 32 are shown in Table 8 and Table 11, respectively. Estimates of herring and sprat biomass by age group in Subdivision 29 and 32 are summarized in Table 9 and Table 12, respectively.
Survey statistics for Bothnian Sea herring SD 30 based on StoX calculations in 2024 are given in Table 13. Estimated numbers, biomass, and mean weight of Bothnian Sea herring by age group in SD 30 were summarized in Table 14, Table 15, and Table 16, respectively.

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TABLES, MAP, AND FIGURES

Table 1.Trawl catches (kg) by species/category during the Finnish BIAS-survey in 2024.

Haul number	SD	Rectangle	Ammodytes tobianus	Aurelia aurita	Clupea harengus	Coregonus lavaretus	Cyclopterus lumpus	Gadus morhua	Gasterosteus aculeatus	Gobius niger	Gymnocephalus cernuus	Hyperoplus lanceolatus	Lampetra fluviatilis	Liparis liparis	Lumpenus lampretaeformis	Myoxocephalus scorpius	Nerophis ophidion	Osmerus eperlanus	Platichthys flesus	Pomatoschistus minutus	Pungitius pungitius	Saduria entomon	Salmo salar	Scophthalmus maximus	Sprattus sprattus	Zoarces viviparus	Waste	Fish catch
1	32	48H3		45	2.2				24								0		0.1		0.2			0.1	163	0	1.6	190
2	29	48H2		65	19				1.6	0							0	1.5	0.2		0				227		12	250
3	30	50G8	0		136				1.8							0.2	0				0	0.1			1.27	0	11	139
4	30	50G8	0		90.8				1									0.1			0	0			0.28	0.1	0.7	92
5	30	51G7	0		52.4				0.4								0				0	0			0.01		6.2	53
6	30	51G8			55.6				0.6												0				0.05		1.3	56
7	30	52G8			64.2				0.7		0						0				0				0.11		1	65
8	30	52G9			15.6				40								0	0			0	0			5.11		3.7	60
9	30	52G8			15.2				4.3						0		0								0.14		0.9	20
10	30	53G8			70.7				2.1												0	0			0.83		0.4	74
11	30	53G8	0		41.9				7.2									0			0	0	0.1		0.4		0.4	50
12	30	53G9			86.9				2.9					0.2								0					1	90
13	30	54G8	0		51.5				1.8					0.1	0		0					0						53
14	30	54G9			125				9.2					0	0		0										5.2	134
15	30	55G9	0		89.8				5									0			0	0			6.26		0.9	101
16	30	55H0	0		62.6				7.7								0.2				0.1		0.5		3.27		0.7	74
17	30	54G9	0		64.2				3.2					0.2			0					0					7.5	67
18	30	54H0	0		62.3				1.1					0.1			0	0				0			1.13		1.3	65
19	30	54H0			342	0.2			1.2				0	0.1				0.1				0			4.55		1.5	348
20	30	53H0			105				0.9					0.1							0	0			1.5		1.3	108
21	30	53G9	0		68				275				0.1		0		0	0			0							343
22	30	53H0			46.8				8.9						0		0					0					0.2	56
23	30	52H0	0		144				60												0	0			1.7		19	205
24	30	52H0			243				19					0.1			0				0	0			6.94		0.9	269
25	30	52G9			124				52						0		0				0	0			0.17		4.1	176
26	30	51G9	0		79				19					0			0				0	0	0.5		1.33		4.2	100
27	30	51G9			124				9.4												0		0.2		3.37			137
28	30	51H0			38.9				0.1					0								0			0.28	0	0.7	39
29	30	51H0			25.6				17								0				0						13	43
30	30	50H0			62.1				47								0	0		0		0			0.65		8.3	110
31	30	50G9			102				26			0.1					0						0.4		1.74		2.9	130
32	30	50G9			85.9				36								0					0			3.11		0.6	125
33	29	48G9		0	10				4								0				0	0			0.74	0	5	15
34	29	47H0		21	53.2		0.3	0	38								0				0				12.9		0.1	105
35	29	47H0		9.9	18.6		0.6		11								0				0				138		2.6	168
36	29	48H1		2.1	356				0.2								0								0.71	0	7.2	357
37	29	48H2		78	4.1		0.1		5								0				0.3		0.3	0.1	663		13	673
38	32	48H3		4.1	193				10								0				1				239		53	443
39	32	48H4		1.1	237				1.2								0	0.3	0.2		0.1				42.2	0	8.3	281
40	32	49H6			271				2.5								0	3.9			0.7	0			287		33	565
41	32	49H5			337				1				0.1					10			0.2				53		10	402
42	32	48H5		2.6	137				1.6									0.1			0.1				104		3.8	243
Total			0.1	229	4312	0.2	1	0	760	0	0	0.1	0.2	0.9	0	0.2	0.3	16	0.5	0	2.8	0.3	2	0.2	1975	0.2	249	**7072**

Table 2. English, scientific, and Finnish names of observed species in Finnish 202 4BIAS-survey.

Fishnames		
English	**Scientific**	**Finnish**
Atlantic Salmon	Salmo salar	Lohi
Brown Trout	Salmo trutta	Meritaimen
Cod	Gadus morhua	Turska
Common Goby	Pomatoschistus microps	Liejutokko
Common Seasnail	Liparis liparis	Imukala
European Whitefish	Coregonus lavaretus	Siika
Flounder	Platichthys flesus	Kampela
Fourhorn Sculpin	Triglopsis quadricornis	Härkäsimppu
Great Sandeel	Hyperoplus lanceolatus	Isotuulenkala
Herring	Clupea harengus	Silakka
Lamprey	Lampetra fluviatilis	Nahkiainen
Lesser Sandeel	Ammodytes tobianus	Pikkutuulenkala
Lumpsucker	Cyclopterus lumpus	Rasvakala
Nine-spined Stickleback	Pungitius pungitius	Kymmenpiikki
Perch	Perca fluviatilis	Ahven
Pipefish	Syngnathus typhle	Särmäneula
Rock Gunnel	Pholis gunnellus	Teisti
Round Goby	Neogobius melanostomus	Mustatäplätokko
Ruffe	Gymnocephalus cernuus	Kiiski
Sand Goby	Pomatoschistus minutus	Hietatokko
Shorthorn Sculpin	Myoxocephalus scorpius	Isosimppu
Smelt	Osmerus eperlanus	Kuore
Snake Blenny	Lumpenus lampretaeformis	Elaska
Snake blenny	Zoarces viviparus	Kivinilkka
Sprat	Sprattus sprattus	Kilohaili
Straightnose Pipefish	Nerophis ophidion	Siloneula
Three-spined Stickleback	Gasterosteus aculeatus	Kolmipiikki
Turbot	Scophthalmus maximus	Piikkikampela
Vendace	Coregonus albula	Muikku

Table 3. Number of length measurements /species and Sub-Division in Finnish 2024 BIAS-survey.

Species	ICES SD			Total
	29	30	32	
Ammodytes tobianus		20		20
Clupea harengus	1477	9515	1599	12591
Coregonus lavaretus		1		1
Cyclopterus lumpus	5			5
Gadus morhua	1			1
Gasterosteus aculeatus	317	1823	431	2571
Gobius niger	1			1
Hyperoplus lanceolatus		1		1
Lampetra fluviatilis		2	1	3
Liparis liparis		52		52
Lumpenus lampretaeformis		10		10
Myoxocephalus scorpius		1		1
Nerophis ophidion	27	69	27	123
Osmerus eperlanus	12	13	87	112
Platichthys flesus	2		2	4
Pomatoschistus minutus		1		1
Pungitius pungitius	21	68	206	295
Salmo salar	1	6		7
Scophthalmus maximus	1		1	2
Sprattus sprattus	954	1171	1094	3219
Zoarces viviparus	2	5	2	9
Total	**2821**	**12758**	**3450**	**19029**

Table 4. Individual samples of herring and sprat (for age determination) per SD in 2024.

	Species							
	Sprat				Herring			
Length class	29	30	32	Sprat total	29	30	32	Herring total
40						6		6
45						10		10
50						20		20
55	3			3	2	37		39
60	15		8	23	4	37		41
65	46		30	76	4	34	3	41
70	51		60	111	9	21	3	33
75	51	2	60	113	13	26	17	56
80	46		54	100	14	28	37	79
85	34	2	23	59	19	34	38	91
90	7			7	7	23	16	46
95		1		1	7	31	16	54
100			2	2	7	25	9	41
105		4	5	9	7	30	7	44
110	15	11	22	48	3	30	6	39
115	26	29	33	88		13	8	21
120	32	74	37	143	3	5	22	30
125	35	119	34	188	2	11	35	48
130	23	120	28	171	11	33	43	87
135	19	102	4	125	14	75	50	139
140	4	80		84	24	125	50	199
145		35		35	34	162	49	245
150		3		3	39	171	50	260
155		1		1	38	184	50	272
160					40	180	43	263
165					35	183	46	264
170					31	181	17	229
175					31	181	4	216
180					29	169	1	199
185					23	162	1	186
190					13	119		132
195					9	87		96
200					5	58		63
205					1	29		30
210						8		8
215					2	4		6
220						1		1
225						3		3
230					1	1		2
235						3		3
240						2		2
250						1		1
280						1		1
Total	**407**	**583**	**400**	**1390**	**481**	**2544**	**621**	**3646**

Table 5. Numbers and locations of fishing stations (WGS-84) during Finnish BIAS-survey in 2024.

HaulNumber	HaulStationName	ICES SD	HaulStartTime	HaulDuration	HaulStartLatitude	HaulStartLongitude	HaulStopLatitude	HaulStopLongitude	HaulMinTrawlDepth	HaulBottomDepth	HaulDistance	HaulNetopening
1	48H3-1	32	2024-09-18T21:55	30	59.59850	23.28583	59.61650	23.26817	20	72	2871	15.6
2	48H2-1	29	2024-09-18T23:17	20	59.66167	22.55300	59.68217	22.53283	20	62	1914	14.3
3	50G8-1	30	2024-09-19T18:32	45	60.88450	18.64917	60.85200	18.62117	19.9	70	3473	18.1
4	50G8-2	30	2024-09-19T23:21	45	60.82200	18.10700	60.79783	18.05417	19	57	3889	17.9
5	51G7-1	30	2024-09-20T18:13	60	61.28867	17.94733	61.23950	17.94383	15.8	75	5371	16.8
6	51G8-1	30	2024-09-20T21:06	60	61.24217	18.09167	61.28917	18.10150	7.9	85	5371	19.2
7	52G8-1	30	2024-09-21T01:32	90	61.64134	18.08750	61.71133	18.06183	7.9	75	8056	18
8	52G9-1	30	2024-09-21T12:35	120	61.89933	19.17983	61.99150	19.16733	7.9	75	10001	18.6
9	52G8-2	30	2024-09-21T18:13	60	61.88633	18.18483	61.91700	18.25867	19	80	5186	18.6
10	53G8-1	30	2024-09-21T22:27	60	62.11050	18.23033	62.15717	18.24600	9.5	89	5371	20.1
11	53G8-2	30	2024-09-22T02:02	60	62.15233	18.68367	62.17967	18.60333	7.9	95	5186	19.3
12	53G9-1	30	2024-09-22T07:09	70	62.32884	19.21817	62.37850	19.23217	74.4	115	5618	16.1
13	54G8-1	30	2024-09-22T14:31	75	62.57033	18.88317	62.51733	18.86200	79.2	140	6019	15.5
14	54G9-1	30	2024-09-22T19:30	60	62.71883	19.32933	62.67367	19.33167	9.5	170	5186	20.5
15	55G9-1	30	2024-09-23T01:27	90	63.04267	19.62817	63.02267	19.47733	9.5	140	7778	20.2
16	55H0-1	30	2024-09-23T07:21	90	63.17900	20.33733	63.13450	20.22500	7.9	88	7501	20.2
17	54G9-2	30	2024-09-23T14:33	90	62.70000	19.86300	62.63550	19.83600	71.3	120	7501	15.9
18	54H0-1	30	2024-09-23T19:03	45	62.72067	20.11933	62.68984	20.11283	26.9	95	3611	20.4
19	54H0-2	30	2024-09-23T22:12	50	62.59083	20.26317	62.55283	20.27233	18.7	83	4321	18.7
20	53H0-1	30	2024-09-24T01:03	60	62.43650	20.29383	62.39200	20.30050	19	85	5371	17.8
21	53G9-2	30	2024-09-24T09:11	116	62.32784	19.62250	62.24117	19.59650	72.9	118	10384	18
22	53H0-2	30	2024-09-24T14:32	75	62.10467	20.04317	62.05633	20.09967	71.3	140	6251	15.8
23	52H0-1	30	2024-09-24T18:34	45	61.82100	20.13850	61.78684	20.16417	17.4	125	4167	17.4
24	52H0-2	30	2024-09-24T23:24	50	61.59767	20.69667	61.55450	20.71817	20.6	85	4476	15
25	52G9-2	30	2024-09-26T19:24	30	61.91217	19.85683	61.89550	19.84583	15.8	95	2778	17
26	51G9-1	30	2024-09-26T23:48	35	61.43917	19.65633	61.45667	19.70550	15.8	90	2917	13.6
27	51G9-2	30	2024-09-27T02:24	50	61.34733	19.68733	61.38133	19.73483	20.6	95	3858	18
28	51H0-1	30	2024-09-27T06:37	75	61.31800	20.21233	61.36467	20.28333	76	125	6482	14.9
29	51H0-2	30	2024-09-27T12:57	72	61.12433	20.05000	61.17067	20.00750	69	120	6223	14.1
30	50H0-1	30	2024-09-27T19:23	30	60.87700	20.41700	60.89517	20.39900	11.1	80	2685	18.6
31	50G9-1	30	2024-09-27T23:50	45	60.87017	19.80250	60.89167	19.74383	12.7	95	4167	17.6
32	50G9-2	30	2024-09-28T02:34	45	60.90350	19.46717	60.92300	19.40517	9.5	106	4028	19.1
33	48G9-1	29	2024-09-28T15:49	60	59.79517	19.98283	59.80017	19.89633	79.2	150	5186	13.3
34	47H0-1	29	2024-09-28T22:12	20	59.26433	20.23833	59.27334	20.21283	15	72	1729	18.6
35	47H0-2	29	2024-09-29T02:15	20	59.17133	20.74117	59.17733	20.71000	15.8	103	1852	16.5
36	48H1-1	29	2024-09-29T07:50	60	59.54284	21.26983	59.53133	21.18767	5	90	4815	17.1
37	48H2-2	29	2024-09-29T15:43	45	59.54733	22.93400	59.56200	22.87083	11.1	85	4028	17.5
38	48H3-2	32	2024-09-29T19:56	25	59.56434	23.49683	59.57317	23.46400	22.2	85	2238	17.4
39	48H4-1	32	2024-09-29T23:42	20	59.71517	24.02267	59.72233	24.00000	19	70	1790	18.6
40	49H6-1	32	2024-09-30T18:25	15	60.04617	26.39267	60.04600	26.37050	19	70	1250	17.6
41	49H5-1	32	2024-09-30T21:17	7	60.01933	25.88117	60.01617	25.87050	20	60	583	17.8
42	48H5-1	32	2024-10-01T00:05	5	59.91717	25.53017	59.91717	25.52217	22.2	69	417	18.6

Table 6. Survey statistics by area in SDs 29, 30 and 32 (r/v Aranda in 2024).

ICES SD	ICES Rect.	NM	N (million/nm²)	Area (nm²)	Sa (m²/nm²)	σ (cm²)	N total (million)	Herring (%)	Sprat (%)	Cod (%)	3-spinn. (%)
29	47H0	63	22.447212	920.3	1486.60	0.662263	20658.17	6.10	46.12	0.01	47.69
29	48G9	65	10.772818	772.8	808.28	0.750292	8325.233	16.13	6.14	0.00	77.24
29	48H0	41	6.172383	730.3	1025.92	1.662107	4507.691	57.21	3.37	0.00	38.98
29	48H1	64	11.121608	544	2862.61	2.573921	6050.155	98.30	0.61	0.00	0.72
29	48H2	66	64.136943	597	4995.23	0.778838	38289.75	2.10	95.72	0.00	1.81
32	48H3	67	41.142653	615.7	2312.27	0.562013	25331.53	3.59	78.45	0.00	17.29
32	48H4	64	14.672097	835.1	1843.52	1.256483	12252.67	46.32	50.03	0.00	3.35
32	48H5	61	10.255506	767.2	1380.62	1.34622	7868.024	40.27	55.22	0.00	4.11
29	49G9	56	3.060816	564.2	229.65	0.750292	1726.912	16.13	6.14	0.00	77.24
32	49H5	4	17.203083	306.9	2635.61	1.532058	5279.626	69.25	25.88	0.00	2.25
32	49H6	34	16.592768	586.5	2239.08	1.349428	9731.658	69.25	25.88	0.00	2.25
30	50G7	21	3.271379	403.1	798.39	2.440539	1318.693	86.76	0.95	0.00	12.05
30	50G8	53	1.824250	833.4	445.22	2.440539	1520.33	86.76	0.95	0.00	12.05
30	50G9	63	2.341894	879.5	203.00	0.866808	2059.696	16.17	3.61	0.00	79.97
30	50H0	33	7.588638	795.1	460.66	0.607042	6033.726	11.67	0.23	0.00	88.08
30	51G7	17	1.466505	614.5	391.79	2.671593	901.1675	94.67	0.05	0.00	4.91
30	51G8	72	1.734905	863.7	435.26	2.508817	1498.437	88.29	0.15	0.00	11.40
30	51G9	58	2.028269	865.8	248.93	1.227284	1756.076	42.19	1.61	0.00	56.14
30	51H0	39	0.911033	865.7	147.49	1.618964	788.6808	52.86	0.63	0.00	46.36
30	52G8	67	1.001565	852	172.07	1.718035	853.3337	55.46	0.35	0.00	44.10
30	52G9	55	6.952954	852	420.44	0.604688	5923.917	11.35	0.88	0.00	87.68
30	52H0	60	5.256557	852	600.10	1.14162	4478.587	34.36	1.40	0.00	64.14
30	53G8	58	1.437690	838.1	232.31	1.615842	1204.928	51.55	1.13	0.00	47.25
30	53G9	49	1.212961	838.1	192.06	1.583395	1016.583	48.84	0.00	0.00	51.13
30	53H0	86	2.393431	838.1	411.53	1.719434	2005.934	60.96	0.98	0.00	37.96
30	54G8	18	0.551224	642.2	112.79	2.046184	353.9958	68.82	0.00	0.00	30.44
30	54G9	56	1.485755	824.2	246.64	1.660023	1224.559	55.65	0.00	0.00	43.97
30	54H0	49	1.779114	727.9	413.41	2.323693	1295.017	93.91	2.33	0.00	3.50
30	55G9	23	1.933329	625.6	283.25	1.46511	1209.49	60.72	5.84	0.00	33.24
30	55H0	24	3.770929	688.6	330.80	0.877238	2596.661	65.38	2.00	0.00	31.78

Table 7. Numbers (millions) of herring by age in SDs 29 and 32 (r/v Aranda 2024).

SD	Rect	0	1	2	3	4	5	6	7	8+	Total
29	47H0	372.53	17.39	283.23	53.61	59.77	101.11	97.49	77.07	197.09	1259.31
29	48G9	29.84	114.81	467.19	71.90	129.28	155.52	86.60	71.12	216.53	1342.78
29	48H0	28.66	148.57	948.35	150.13	247.70	318.19	188.07	158.22	391.17	2579.06
29	48H1	0.00	176.70	2304.58	373.95	569.81	778.69	483.83	414.73	845.03	5947.32
29	48H2	565.34	117.21	73.70	9.79	12.43	14.16	4.39	2.84	6.13	805.98
32	48H3	304.83	50.38	164.16	27.10	101.62	78.02	58.25	40.11	86.11	910.58
32	48H4	526.98	722.39	2004.73	171.22	878.88	672.10	278.31	136.97	283.80	5675.38
32	48H5	705.66	805.32	862.05	55.22	286.63	222.43	91.94	45.61	93.95	3168.83
29	49G9	6.19	23.81	96.91	14.91	26.82	32.26	17.96	14.75	44.91	278.53
32	49H5	809.81	1072.99	1026.13	48.41	267.74	218.90	92.25	38.64	81.50	3656.37
32	49H6	2986.69	1329.99	1425.58	64.91	355.82	283.73	122.25	54.36	116.27	6739.60

Table 8. Mean weight (g) of herring by age in SDs 29 and 32 (r/v Aranda 2024).

SD	Rect.	SUM	0	1	2	3	4	5	6	7	8+
29	**47H0**	23.29	4.96	21.14	29.06	30.34	29.49	30.52	32.80	32.90	33.88
29	**48G9**	28.14	1.58	20.15	25.70	27.10	26.22	28.03	30.15	33.33	40.39
29	**48H0**	28.21	1.58	20.83	26.57	27.60	26.43	27.92	30.24	31.56	36.19
29	**48H1**	28.27		22.81	27.35	28.02	26.64	27.82	30.31	30.22	31.43
29	**48H2**	9.79	5.36	17.05	21.95	20.66	24.02	24.95	25.25	28.42	31.92
32	**48H3**	17.50	4.97	15.64	22.28	25.33	23.93	24.18	26.55	26.98	27.22
32	**48H4**	20.03	5.36	16.87	20.39	23.94	23.02	23.35	24.34	25.91	26.27
32	**48H5**	16.04	4.45	14.87	19.52	23.96	22.95	22.74	24.43	26.09	26.38
29	**49G9**	28.14	1.58	20.15	25.70	27.10	26.22	28.03	30.15	33.33	40.39
32	**49H5**	15.61	4.70	14.88	19.21	23.67	22.23	22.22	24.84	27.51	27.98
32	**49H6**	12.43	4.39	15.23	19.08	23.59	22.14	22.11	24.13	26.54	26.90

Table 9. Total biomass (ton) of herring by age in SDs 29 and 32 (r/v Aranda 2024).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	**47H0**	1848	368	8232	1626	1762	3086	3198	2536	6678	29334
29	**48G9**	47	2313	12007	1949	3390	4360	2611	2371	8745	37792
29	**48H0**	45	3095	25197	4144	6547	8884	5687	4994	14157	72750
29	**48H1**	0	4030	63028	10479	15181	21663	14665	12532	26560	168136
29	**48H2**	3030	1998	1618	202	299	353	111	81	196	7887
32	**48H3**	1516	788	3657	686	2432	1887	1546	1082	2344	15938
32	**48H4**	2823	12187	40882	4098	20228	15694	6774	3549	7456	113692
32	**48H5**	3141	11977	16831	1323	6578	5058	2246	1190	2479	50823
29	**49G9**	10	480	2491	404	703	904	542	492	1814	7839
32	**49H5**	3804	15962	19709	1146	5951	4863	2292	1063	2280	57071
32	**49H6**	13123	20251	27203	1531	7876	6274	2950	1443	3128	83779

Table 10. Numbers (millions) of sprat by age and area (r/v Aranda 2024).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	47H0	6810.1	154.3	494.3	270.2	937.7	441.6	75.8	61.4	281.9	9527.3
29	48G9	369.3	7.0	23.9	13.7	48.0	26.1	4.0	3.3	15.7	511.0
29	48H0	82.6	4.0	15.3	9.5	23.5	10.1	1.8	0.5	4.7	152.0
29	48H1	13.3	1.4	5.7	3.6	7.9	3.0	0.6	0.0	1.1	36.7
29	48H2	27904.7	1379.9	2280.1	1184.9	2279.1	998.2	184.6	72.0	366.2	36649.6
32	48H3	19342.7	29.0	130.8	32.8	154.6	93.9	10.7	4.4	74.4	19873.3
32	48H4	5896.2	24.8	81.3	15.0	42.6	37.5	7.9	4.3	20.9	6130.5
32	48H5	1448.2	211.1	775.8	164.2	732.3	526.5	78.2	50.9	357.4	4344.5
29	49G9	76.6	1.5	5.0	2.8	10.0	5.4	0.8	0.7	3.3	106.0
32	49H5	477.5	66.6	228.9	61.2	225.3	156.3	23.1	11.1	116.5	1366.5
32	49H6	324.2	186.9	578.2	138.9	532.9	391.2	62.5	37.6	266.4	2518.8
30	50G7	0.0	1.0	1.7	1.0	4.8	2.0	0.3	0.6	1.3	12.6
30	50G8	0.0	1.1	1.9	1.1	5.6	2.3	0.3	0.7	1.5	14.5
30	50G9	0.0	1.1	8.4	4.6	28.6	13.3	2.0	4.0	12.3	74.3
30	50H0	0.0	0.2	0.7	0.6	4.7	2.6	0.4	0.8	3.7	13.6
30	51G7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
30	51G8	0.0	0.2	0.4	0.2	0.6	0.2	0.0	0.1	0.7	2.3
30	51G9	0.0	0.8	2.9	1.8	10.5	4.9	0.7	1.6	5.0	28.2
30	51H0	0.0	0.0	0.4	0.2	2.0	1.0	0.2	0.3	0.8	4.9
30	52G8	0.0	0.0	0.2	0.1	0.9	0.5	0.1	0.1	1.1	3.0
30	52G9	26.2	0.4	2.8	1.7	7.9	3.4	0.3	1.2	8.5	52.4
30	52H0	0.0	0.6	3.7	2.8	20.8	12.0	2.2	4.3	16.4	62.9
30	53G8	0.0	0.3	1.4	0.8	5.0	2.5	0.4	0.8	2.4	13.6
30	53G9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	53H0	0.0	0.1	1.2	0.8	6.2	3.7	0.7	1.3	5.5	19.7
30	54G8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	54G9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	54H0	0.0	0.1	1.5	1.2	9.7	6.0	1.2	2.1	8.5	30.2
30	55G9	0.0	1.4	5.9	3.8	26.4	13.9	2.1	4.3	12.8	70.6
30	55H0	0.0	1.6	4.8	3.1	19.4	9.5	1.5	3.1	8.5	51.5

Table 11. Mean weight (g) of sprat by age and area (r/v Aranda 2024).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Average (g)
29	**47H0**	3.01	11.71	13.16	13.21	14.27	15.15	15.67	16.09	15.52	6.19
29	**48G9**	2.59	11.73	13.19	13.20	14.40	15.37	15.74	16.11	15.76	5.86
29	**48H0**	2.77	12.23	12.98	12.95	13.70	13.98	14.05	16.11	14.83	7.67
29	**48H1**	3.13	12.41	12.92	12.88	13.40	13.12	13.25		13.91	9.49
29	**48H2**	2.93	11.50	12.48	12.70	13.39	14.08	14.58	16.42	15.56	5.32
32	**48H3**	2.91	10.72	11.59	12.01	12.05	12.01	12.35	11.84	11.99	3.15
32	**48H4**	3.10	9.55	11.14	10.21	11.65	11.41	10.81	11.84	11.45	3.40
32	**48H5**	3.29	9.91	11.42	11.80	11.96	12.01	12.29	11.50	11.91	8.87
29	**49G9**	2.59	11.73	13.19	13.20	14.40	15.37	15.74	16.11	15.76	5.86
32	**49H5**	3.18	10.19	11.27	12.22	12.04	11.99	12.35	12.20	12.10	8.74
32	**49H6**	3.08	10.03	11.36	11.68	11.96	11.97	12.13	11.46	11.91	10.51
30	**50G7**		9.39	12.83	13.13	14.22	14.84	15.00	14.87	16.13	13.92
30	**50G8**		9.39	12.83	13.13	14.22	14.84	15.00	14.87	16.13	13.92
30	**50G9**		11.36	13.09	13.56	14.38	15.07	15.65	15.31	16.81	14.74
30	**50H0**		11.20	13.50	14.19	15.13	15.66	15.99	15.78	17.28	15.69
30	**51G7**	3.25									3.25
30	**51G8**		11.20	11.98	11.81	13.72	15.47	14.04	15.93	18.51	14.66
30	**51G9**		10.90	13.05	13.42	14.46	15.10	15.80	15.40	17.22	14.83
30	**51H0**		12.48	13.89	14.32	14.62	15.14	16.02	15.54	16.52	15.07
30	**52G8**		12.48	13.75	14.12	14.75	15.63	15.84	15.96	18.04	16.05
30	**52G9**	3.25	12.48	12.76	13.22	14.23	15.43	14.27	15.41	18.23	9.37
30	**52H0**		11.48	13.44	14.14	15.00	15.73	16.46	16.03	17.11	15.65
30	**53G8**		10.49	12.99	13.61	14.54	15.11	15.99	15.55	16.76	14.82
30	**53G9**										
30	**53H0**		11.52	13.49	14.06	14.88	15.76	16.61	16.20	17.32	15.73
30	**54G8**										
30	**54G9**										
30	**54H0**		11.75	13.59	14.43	15.18	15.89	16.54	16.15	17.10	15.85
30	**55G9**		10.59	13.01	13.90	14.87	15.36	15.92	15.54	16.48	15.04
30	**55H0**		10.38	13.10	13.64	14.65	15.29	15.89	15.49	16.45	14.81

Table 12.Total biomass (ton) of sprat by age and area (r/v Aranda 2024).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	**47H0**	20483	1807	6506	3568	13384	6688	1188	987	4375	58986
29	**48G9**	958	83	316	181	692	400	63	53	247	2992
29	**48H0**	229	49	199	122	322	142	26	8	70	1166
29	**48H1**	42	18	73	46	106	40	8	0	16	348
29	**48H2**	81629	15871	28452	15051	30510	14050	2692	1182	5698	195137
32	**48H3**	56306	311	1516	393	1863	1128	132	52	892	62594
32	**48H4**	18274	237	905	153	496	427	85	51	239	20869
32	**48H5**	4761	2092	8857	1938	8757	6326	961	585	4255	38530
29	**49G9**	199	17	65	38	143	83	13	11	51	621
32	**49H5**	1520	678	2580	748	2712	1874	285	135	1410	11944
32	**49H6**	997	1874	6568	1622	6373	4683	758	431	3174	26482
30	**50G7**	0	9	21	13	69	30	4	9	21	175
30	**50G8**	0	11	25	15	79	34	4	10	24	202
30	**50G9**	0	13	110	63	411	200	31	61	206	1095
30	**50H0**	0	2	10	9	70	40	6	13	63	213
30	**51G7**	2	0	0	0	0	0	0	0	0	2
30	**51G8**	0	2	4	2	8	3	0	1	12	33
30	**51G9**	0	9	38	24	152	73	11	25	86	419
30	**51H0**	0	0	5	4	29	15	2	5	14	74
30	**52G8**	0	0	3	2	13	8	1	2	19	47
30	**52G9**	85	5	36	22	112	52	5	19	155	491
30	**52H0**	0	6	50	40	313	189	36	69	281	985
30	**53G8**	0	4	18	10	73	38	6	12	40	201
30	**53G9**	0	0	0	0	0	0	0	0	0	0
30	**53H0**	0	2	17	11	92	58	12	21	96	309
30	**54G8**	0	0	0	0	0	0	0	0	0	0
30	**54G9**	0	0	0	0	0	0	0	0	0	0
30	**54H0**	0	2	20	17	147	95	19	33	145	479
30	**55G9**	0	15	76	53	393	213	33	67	211	1062
30	**55H0**	0	17	63	43	284	145	23	48	139	763

Table 13. Survey statistics for Bothnian Sea herring SD 30 calculations (StoX) in 2024.

ICES SD	ICES Rect.	NM	Area (nm^2)	Sa (m^2/nm^2)	Herring (%)	Sprat (%)	Cod (%)	3-spinn. (%)
30	50G7	21	450.1	798.4	86.76	0.95	0.00	12.05
30	50G8	53	859.6	445.2	86.76	0.95	0.00	12.05
30	50G9	63	885.7	203.0	16.17	3.61	0.00	79.97
30	50H0	33	839.2	460.7	11.67	0.23	0.00	88.08
30	51G7	17	671.0	391.8	94.67	0.05	0.00	4.91
30	51G8	72	871.7	435.3	88.29	0.15	0.00	11.40
30	51G9	58	872.0	248.9	42.19	1.61	0.00	56.14
30	51H0	39	872.0	147.5	52.86	0.63	0.00	46.36
30	52G8	67	858.2	172.1	55.46	0.35	0.00	44.10
30	52G9	55	858.2	420.4	11.35	0.88	0.00	87.68
30	52H0	60	858.2	600.1	34.36	1.40	0.00	64.14
30	53G8	58	844.2	232.3	51.55	1.13	0.00	47.25
30	53G9	49	844.3	192.1	48.84	0.00	0.00	51.13
30	53H0	86	844.3	411.5	60.96	0.98	0.00	37.96
30	54G8	18	659.2	112.8	68.82	0.00	0.00	30.44
30	54G9	56	830.3	246.6	55.65	0.00	0.00	43.97
30	54H0	49	734.1	413.4	93.91	2.33	0.00	3.50
30	55G9	23	658.4	283.3	60.72	5.84	0.00	33.24
30	55H0	24	744.5	330.8	65.38	2.00	0.00	31.78

Table 14.Numbers (millions) of herring by age in SD 30 (r/v Aranda 2024).

Rect/Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Total
50G7	0.0	32.7	92.2	34.0	470.4	340.1	162.6	86.1	28.4	15.2	2.2	2.2	0.0	8.8	2.2	0.0	1277.1
50G8	0.0	34.9	132.3	31.7	471.4	380.3	150.4	94.0	32.5	16.1	2.4	2.4	0.0	9.4	2.4	0.0	1360.1
50G9	7.7	5.7	106.8	76.4	114.7	72.2	24.3	5.0	27.8	2.9	1.4	0.0	0.0	0.0	0.0	0.0	444.8
50H0	96.9	32.3	284.4	118.5	112.0	53.9	15.1	10.8	6.5	6.5	2.2	2.2	0.0	0.0	0.0	2.2	743.2
51G7	0.0	0.0	24.7	120.3	200.5	308.4	172.7	40.1	52.4	6.2	0.0	0.0	0.0	3.1	0.0	3.1	931.3
51G8	0.0	8.4	59.0	248.4	227.4	412.7	336.9	37.9	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	1334.9
51G9	198.9	22.9	114.1	167.7	118.5	60.4	45.1	28.4	11.6	11.6	0.0	0.0	1.3	0.0	0.0	0.0	780.7
51H0	9.0	5.9	53.9	115.0	91.7	44.3	39.0	35.8	15.0	7.2	5.9	0.7	1.3	1.3	0.7	2.0	428.5
52G8	0.7	11.0	43.1	59.1	54.4	92.4	143.8	46.4	4.9	8.4	4.4	0.0	0.0	0.0	0.0	0.0	468.5
52G9	236.9	157.1	47.7	77.2	85.4	76.8	48.3	16.1	8.7	6.2	0.0	3.7	1.2	1.2	0.0	2.5	769.1
52H0	57.8	129.1	454.9	112.5	375.1	135.5	66.4	104.6	66.5	12.8	10.2	2.6	7.6	2.6	2.5	2.5	1543.1
53G8	3.1	37.6	101.0	34.6	22.4	136.6	172.2	67.2	38.7	8.2	3.1	0.0	0.0	1.0	0.0	1.0	626.6
53G9	43.9	13.0	29.8	90.2	94.6	46.4	75.2	37.6	62.2	8.7	16.5	6.1	10.5	1.7	0.0	2.6	539.0
53H0	2.0	82.4	174.8	143.0	547.2	165.6	50.6	13.4	18.8	12.6	2.0	1.8	0.0	0.0	0.0	0.0	1214.3
54G8	6.8	3.0	22.8	26.6	34.2	30.4	64.6	27.4	22.1	4.6	2.3	3.0	0.8	0.0	0.8	0.8	250.2
54G9	29.5	20.3	76.2	93.5	156.5	86.4	143.3	28.4	34.5	6.1	2.0	2.0	2.0	2.0	0.0	3.0	685.9
54H0	63.6	233.7	242.2	133.3	125.4	186.5	100.1	115.8	7.9	2.0	2.0	0.0	5.9	3.9	0.0	3.8	1226.2
55G9	171.0	193.2	88.8	57.7	84.4	55.5	60.0	33.3	20.0	0.0	2.2	0.0	0.0	2.2	2.2	2.2	772.9
55H0	1434.6	318.2	46.3	5.8	5.8	17.4	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1833.8

Table 15.Total biomass (ton) of herring by age in SD 30 (r/v Aranda 2024).

Rect/Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Total
50G7	0	594	1931	810	12812	11051	5206	3584	1140	676	103	103	0	397	107	0	38515
50G8	0	633	2934	764	12840	12007	4682	3919	1289	669	110	110	0	413	114	0	40482
50G9	48	109	2403	2163	2949	2154	887	136	1133	87	62	0	0	0	0	0	12131
50H0	730	517	5883	2948	2490	1601	526	428	242	241	90	76	0	0	0	96	15870
51G7	0	0	605	3213	6053	10177	6874	1483	2115	209	0	0	0	154	0	230	31112
51G8	0	138	1561	6829	7138	13916	12428	1623	0	0	0	218	0	0	0	0	43850
51G9	1070	463	2857	4790	3685	2160	2173	1496	715	542	0	0	46	0	0	0	19996
51H0	49	118	1217	2860	3037	1299	1175	1070	573	270	205	32	50	51	32	94	12130
52G8	11	219	1043	1624	1934	3231	5854	1920	193	364	217	0	0	0	0	0	16611
52G9	985	2912	1141	2141	2683	2525	1659	633	318	289	0	172	44	45	0	181	15729
52H0	441	2063	10213	3146	11166	3920	2303	4190	2351	504	444	122	402	125	88	129	41609
53G8	9	745	2282	900	597	3907	6442	2849	1623	372	139	0	0	60	0	59	19983
53G9	87	257	683	2433	2592	1526	2633	1418	2775	370	758	302	732	84	0	169	16818
53H0	13	1619	4507	4212	17826	6684	2443	778	944	467	50	72	0	0	0	0	39615
54G8	20	60	517	653	932	974	2072	1098	804	237	107	118	38	0	36	45	7713
54G9	50	559	1623	2775	4254	2527	5077	1253	1603	271	83	97	94	152	0	180	20598
54H0	354	4200	5192	3174	3748	5946	3333	4585	288	120	78	0	290	181	0	212	31703
55G9	663	2839	2044	1464	2323	1597	1952	1078	730	0	70	0	0	140	137	137	15172
55H0	5523	5579	895	159	121	450	226	0	0	0	0	0	0	0	0	0	12954

Table 16. Mean weight (g) of herring by age in SD 30 (r/v Aranda 2024).

Rect./Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Average
50G7		18.2	20.9	23.8	27.2	32.5	32.0	41.6	40.2	44.6	46.2	46.2		45.1	48.2		30.2
50G8		18.2	22.2	24.1	27.2	31.6	31.1	41.7	39.6	41.5	46.2	46.2		44.1	48.2		29.8
50G9	6.2	19.2	22.5	28.3	25.7	29.8	36.6	27.2	40.7	30.5	43.1						27.3
50H0	7.5	16.0	20.7	24.9	22.2	29.7	34.9	39.8	37.5	37.3	42.0	35.2				44.4	21.4
51G7			24.5	26.7	30.2	33.0	39.8	37.0	40.3	33.9				50.0		74.5	33.4
51G8		16.4	26.5	27.5	31.4	33.7	36.9	42.8				51.8					32.8
51G9	5.4	20.2	25.0	28.6	31.1	35.7	48.1	52.7	61.7	46.5			36.0				25.6
51H0	5.4	20.2	22.6	24.9	33.1	29.4	30.1	29.9	38.2	37.7	34.9	48.0	38.0	38.9	48.0	47.6	28.3
52G8	16.0	19.9	24.2	27.5	35.6	35.0	40.7	41.4	39.3	43.2	49.8						35.5
52G9	4.2	18.5	23.9	27.7	31.4	32.9	34.4	39.3	36.7	46.7		46.3	35.7	36.6		71.8	20.5
52H0	7.6	16.0	22.5	28.0	29.8	28.9	34.7	40.1	35.4	39.5	43.4	46.5	52.9	49.0	34.6	52.0	27.0
53G8	2.8	19.8	22.6	26.0	26.6	28.6	37.4	42.4	42.0	45.6	45.6			58.8		58.5	31.9
53G9	2.0	19.7	22.9	27.0	27.4	32.9	35.0	37.7	44.6	42.6	45.8	49.8	69.4	48.0		64.9	31.2
53H0	6.2	19.7	25.8	29.5	32.6	40.4	48.3	58.2	50.1	36.9	24.8	40.7					32.6
54G8	3.0	19.8	22.7	24.5	27.2	32.0	32.1	40.1	36.5	52.0	46.8	38.9	50.2		47.0	59.1	30.8
54G9	1.7	27.6	21.3	29.7	27.2	29.2	35.4	44.1	46.4	44.5	41.0	47.8	46.3	75.2		59.2	30.1
54H0	5.6	18.0	21.4	23.8	29.9	31.9	33.3	39.6	36.5	59.8	39.1		49.4	46.3		55.6	25.9
55G9	3.9	14.7	23.0	25.4	27.5	28.8	32.6	32.4	36.5		31.4			63.0	61.5	61.5	19.6
55H0	3.9	17.5	19.4	27.5	21.0	25.9	39.0										7.1

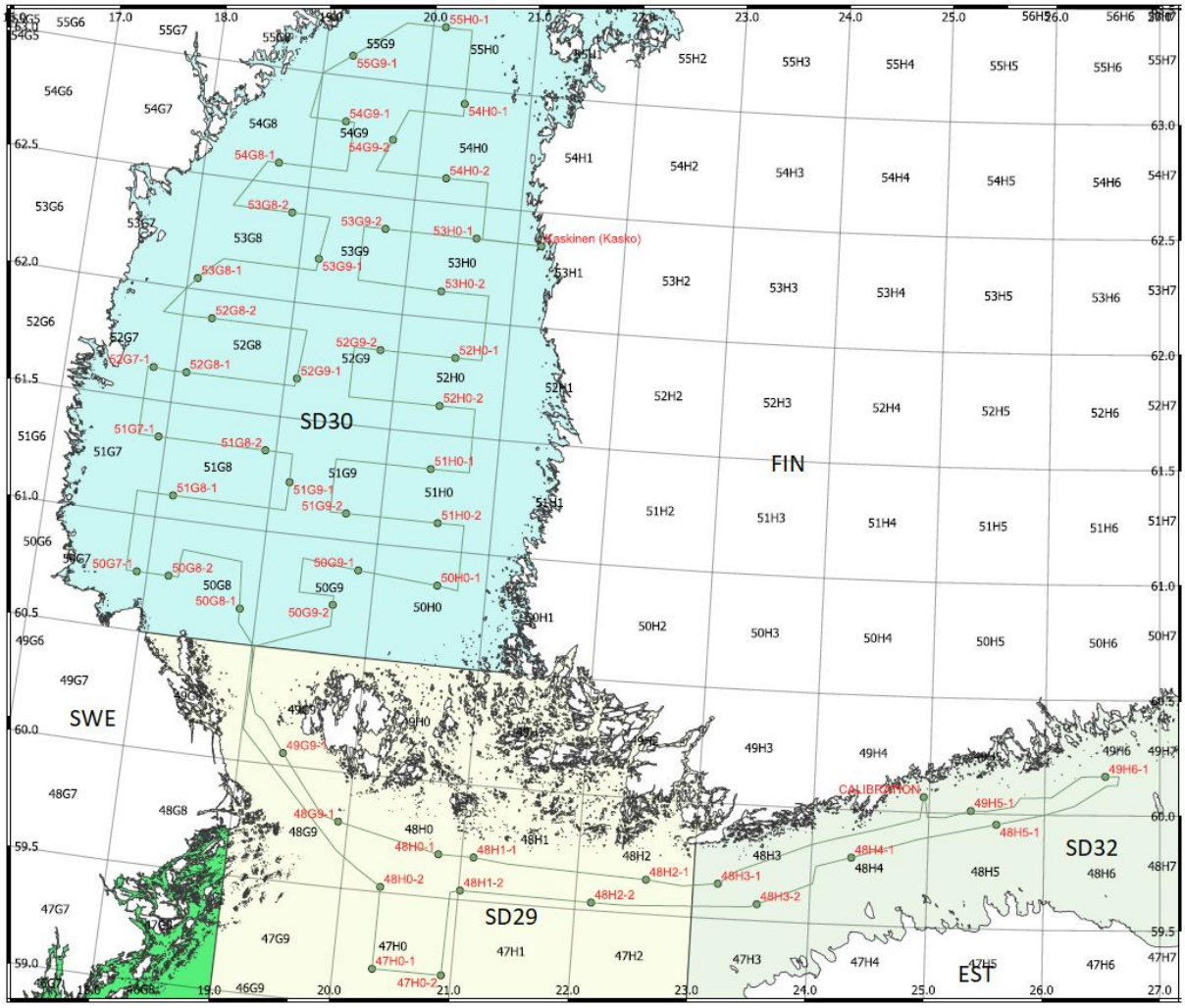

Figure 1. Planned cruise track and trawl stations of r/v Aranda during the Finnish BIAS-survey in 2024.

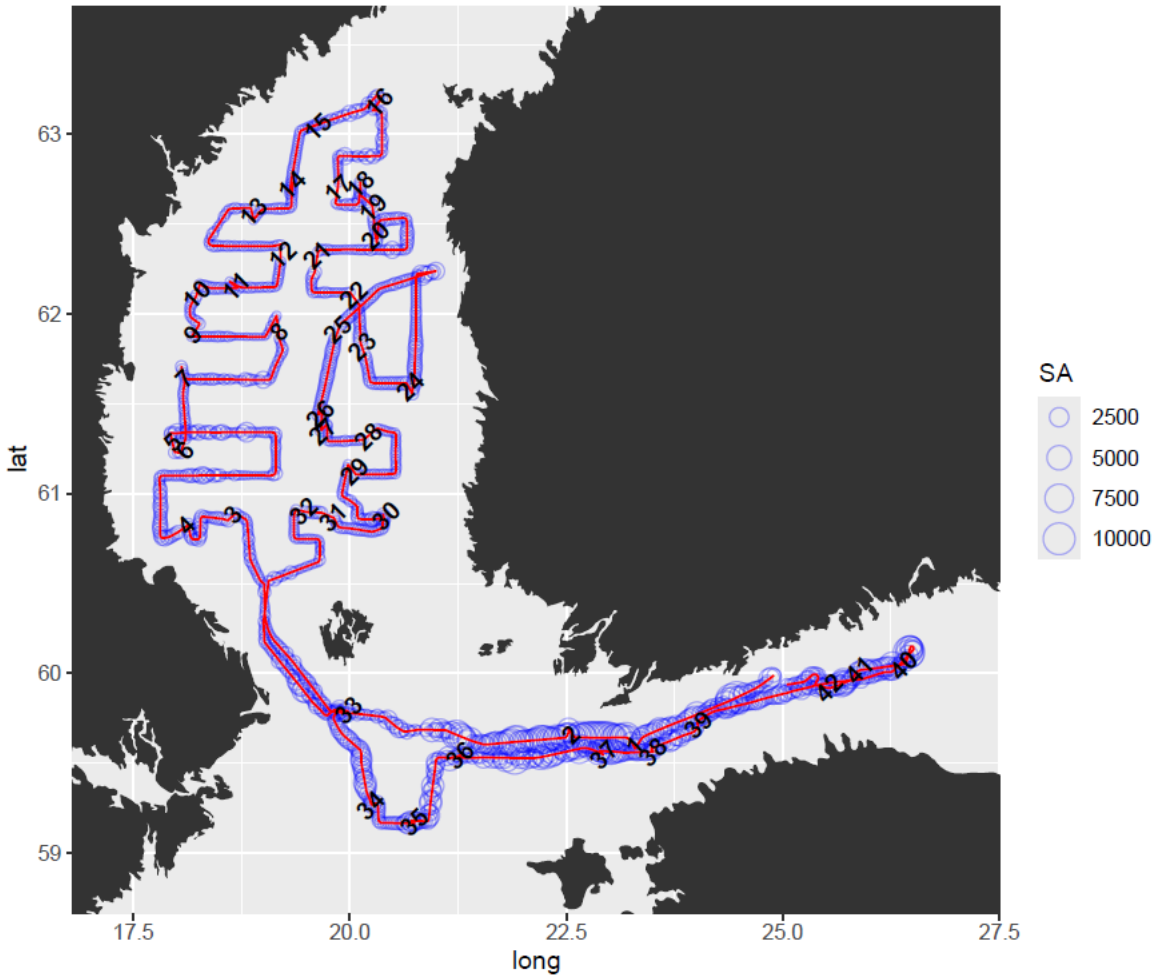

Figure 2. Realized cruise track and trawl stations of r/v Aranda during the Finnish BIAS-survey in 2024.

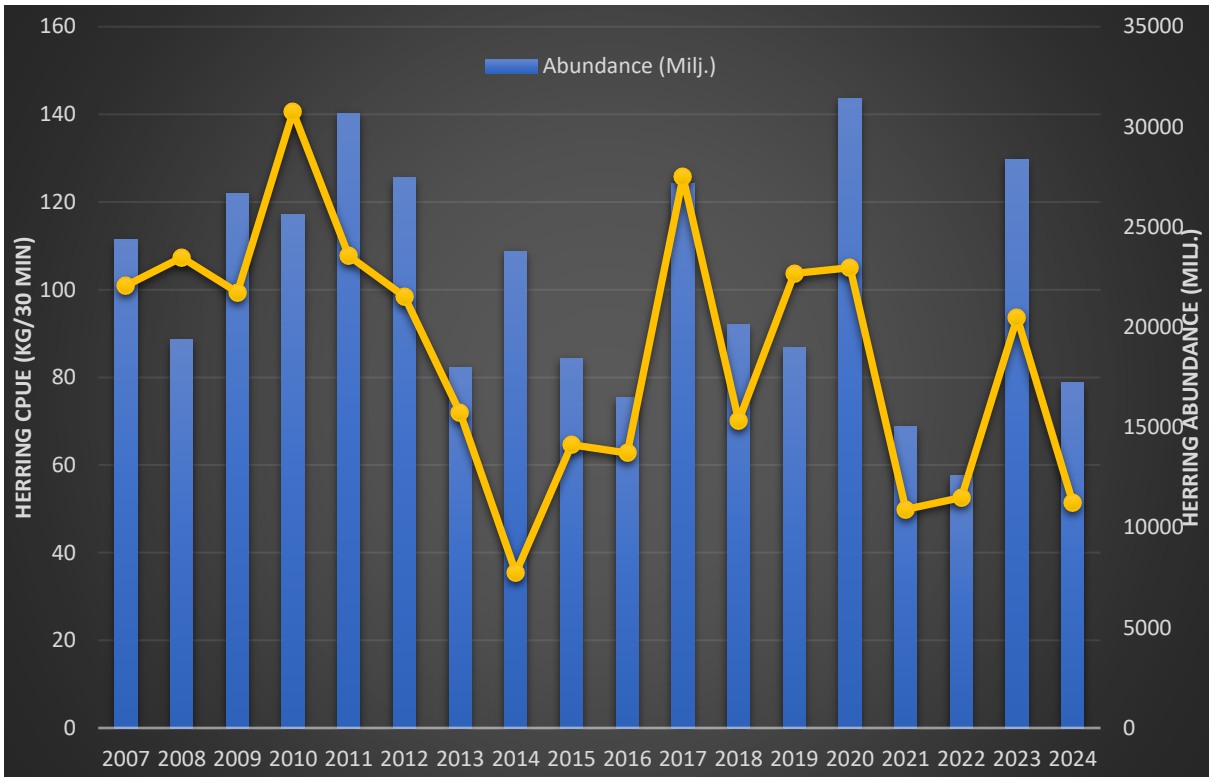

Figure 3. Abundance of herring in SD 30 from 2007 to 2024 with StoX calculations and CPUE (kg/30 min) of herring caught by Fotö-trawl.