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FRV *Scotia*

Cruise 0823S

Report

29 June – 20 July 2023

Ports

Departure: Aberdeen, 29 June
Half-landing: Lerwick 12 July
Arrival and unloading: Aberdeen, 29 June, unloading 20 July

Estimated days by project: 22 days – HERACO (20726)

Sampling Gear

Midwater trawls PT160 x 3
BT237 x 1
SIMRAD FS70 net sonde x 2
Seabird 19+ CTD, salinity bottles surface and at depth
Scanmar trawl eye

Objectives

- To conduct an acoustic survey to estimate the abundance and distribution of herring in the north western North Sea and north of Scotland between 58º30'-62ºN, and from the shelf edge to 2ºE, excluding Faroese waters.

- To obtain biological samples by directed trawling with pelagic nets to confirm echosounder trace identification.

- To obtain samples of herring and sprat for biological analysis, including age, length, weight, organ weights, presence of Ichthyophonous, sex and maturity throughout the survey area.

- Collect samples and data for stock identity determination of herring. Otoliths will be collected for morphometric stock ID analysis. For herring caught west of 4ºW a maximum of 100 fish per haul will have tissue samples collected. For herring caught east of the 4ºW herring tissue samples will be taken, 30 individuals per haul. These samples will be analysed for stock identification in both areas.

- To obtain physical oceanography and hydrographic data for comparison to the horizontal and vertical distribution of herring and sprat.

- Collect herring otoliths collected for experiment looking at effects of water on otolith readability.

- Update and add to the HERAS Manual ensuring all procedures are up to date.

- Undertake training (with two staff members on the survey) as part of participation in the Co-SIC program, this will help to inform the roll out of the pilot scheme to the wider MSS survey program.

Narrative

FRV *Scotia* departed Aberdeen at 09:00 hours on Wednesday 29 June and steamed to Scapa flow to carry out our acoustic system calibration. On the way we carried out shakedown tows for both the PT160 pelagic trawl and BT237 bottom trawl.

On 30 June set up for calibration began at 05:30 hours. A tungsten sphere was deployed without much issue. Initially the line appeared to be caught on the port side but it came free after pulling it slightly. The bow line somehow crossed over to the side of the bow where the anchor chain was running but this didn't seem to affect the movement of the sphere very much.

Note: the 120 kHz transducer wiring is mixed up so the quadrants do not detect the target in the order they should (for example the top right quadrant displays the sphere moving left to right when it is actually moving the opposite way). Calibration started at 07:00 hours and was completed at 15:00 hours. A crew member had to be seen by the doctor for a minor eye issue so we attempted the 38 kHz one more time and tried to rectify the wiring issue of the 120 khz but were unsuccessful.

Transect 1 commenced at 17:36 hours with results from CTD at 5 m entered into the Environment of the ER60 to calculate the absorption rate. Some smaller marks were seen at around 20:00 hours but I decided not to fish as it was quite early on in the transect and late in the day and the marks were likely to disperse by the time we had turned to shoot. We finished surveying for the day at the usual time of 23:00 hours and a CTD was performed (116).

Herring marks were encountered consistently as we made our way north along our transects. The largest aggregations occurred east of Lerwick which is consistent with what we've seen for the last number of years. We did encounter more herring than usual further north particularly in the north east of the survey area. We did see confirmed herring marks on our most northerly transect in strata 91 which may suggest herring could be present beyond the survey area and perhaps an experimental transect should be undertaken next year to investigate this. Unfortunately this was not possible this year due to time constraints.

Making our way around the north coast of Shetland there was a notable drop off in herring marks as we made our way south along the west coast and out to the 200 m contour line. This was punctuated by some quite large herring schools around the four degree line and west of Fair Isle. We only secured a good sample of herring from one of the three tows attempted on these marks (Hauls 161,162,164 and 167). Unfortunately, this was the last sign of good amounts of herring west of the Northern Isles. A limited number of small herring marks were seen in strata one with only very small numbers of herring caught mainly using our BT237 bottom trawl.

On 19 July we arrived in Aberdeen at approximately 21:00 hours. The fishing gear and scientific sampling equipment were unloaded the next morning. Most gear was returned to the Marine Laboratory while the net and associated rigging was delivered to the Altens store yard.

Results

Scotia completed all planned survey tracks and acoustic data was collected from 2234 nmi of transects in total with almost 3500 miles travelled over the course of the survey.

The distribution of herring observed was largely in agreement with the patterns seen historically on this survey. Schools seem to be more widespread with fewer particularly large dense aggregations.

Fishing took place on an opportunistic basis with the aim of verifying species and size composition of echotraces encountered. A total of 32 hauls were successfully completed (Figure 2) on the survey throughout the water column as shallow as ~15m and as deep as ~200m, this was almost half as many as an average year. The PT160 midwater trawl was used for the majority of fishing operations. Hauls carried out with the PT160 were monitored using the Simrad FS70 scanning netsonde connected with the steel wire armored cable. Headline depth was recorded with the EK60 RAW data and visualized in real time on the EK60 echogram. Most hauls in the west were completed using the BT237 to sample acoustic marks close to the sea bed without the risk of damaging our pelagic gear.

A load shackle with remote readout was used to weigh catches from the PT160.

The multipurpose doors that are used to quickly change between pelagic and ground gears were again used on this survey. The deck crew with our gear technician and fishing master developed a method of changing the doors which will reduce the time taken by 15 minutes. These doors provided greater stability and lift to the pelagic net than doors previously used, allowing it to be fished in a stable and reliable manner as shallow as 17 m depth.

Herring catches were secured in all areas where significant herring schools were observed (Figure 1,2 and Table 1). 24 of the 32 trawls performed contained herring (Table 1) (over 30 herring is considered the minimum requirement for a sample in the coordinated survey) (Table 1). In area 6a (West of 4º W), only a few herring schools were encountered. Two likely herring schools were encountered (164 and 167), however, when we attempted fish on these marks, by the time we had turned around for trawl the mark had moved away (haul 167). Haul 164 was on similar marks very close by to haul 167 although technically in strata 121. As it is difficult to catch herring in Strata 1 It was decided to include haul 164 in the trawls used to analyse the acoustic data in that area.

A total of 8587 herring were sampled to obtain length frequency data and 2383 of these fish were further sampled for biological parameters which are weight, age, sex, maturity.

Additionally, tissue samples were taken from 232 fish from seven hauls as part of an ongoing collaborative genetics study with the Marine Institute (Ireland) to further our understanding of herring stock structure to the west of the UK and Ireland. Genetic samples were also taken from herring in hauls containing more than thirty fish east of the four degree line, this applied to 20 hauls in this area and, therefore, a total of 600 herring were sampled for genetics in the North Sea area. Each haul had a maximum of 30 samples taken.

A total of 34 vertical hydro dips were carried out over the survey area (Figure 3). Data collection parameters were conductivity, temperature, and oxygen. Water samples were collected at the surface for all dips for calibration of salinities.

The vessel thermosalinograph (TSG) was run continuously to obtain sea surface temperature and salinity throughout the survey area. These readings are recorded on our haul sheets for each fishing attempt.

This was the third year that staff on the HERAS roster participated in the MSS Co-SIC program. Helen Holah acted as co-SIC shadowing the SIC predominantly for fishing activities undertaken on the bridge. This involved communicating with the crew regarding fishing operations and monitoring/recording fishing metrics. Helen undertook training in how to use Echoview to process our acoustic and has begun assisting in species allocations. Lauren Clayton acted as SIT and this survey has progressed from shadowing Helen Holah within the fish house to leading the samplers in the fish house and training new staff in the various sampling techniques employed on HERAS. Lauren is now responsible for deciding the appropriate sampling strategy on a haul-by-haul basis and communicating this to the deck crew as well as problem solving with deckmaster/FSS data entry and data quality checking. Lauren undertook training to process Echoview data and has commenced training to age herring using their otoliths with the SIC.

Submitted:
S O'Connell
21 August 2023

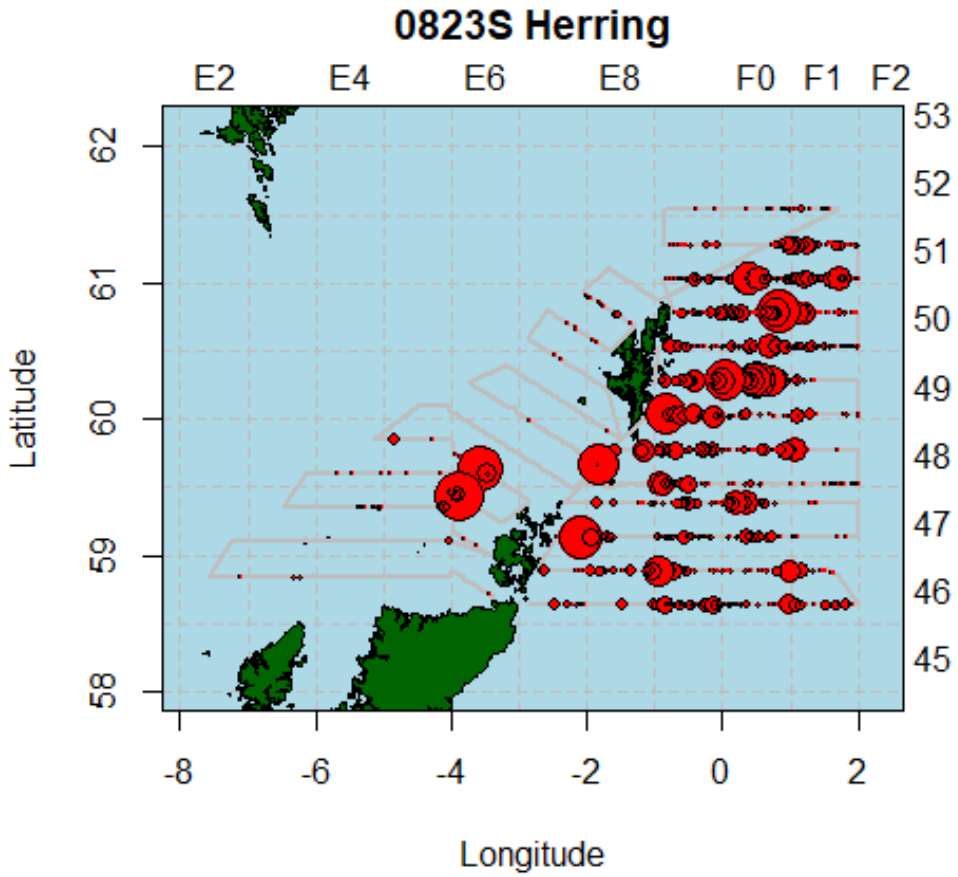

Figure 1: Cruise 0823S. Completed transects (grey lines) and distribution of herring (red circles indicate position and relative size of aggregations). Survey begins at the North-East tip of mainland Scotland and finishes West of Orkney.

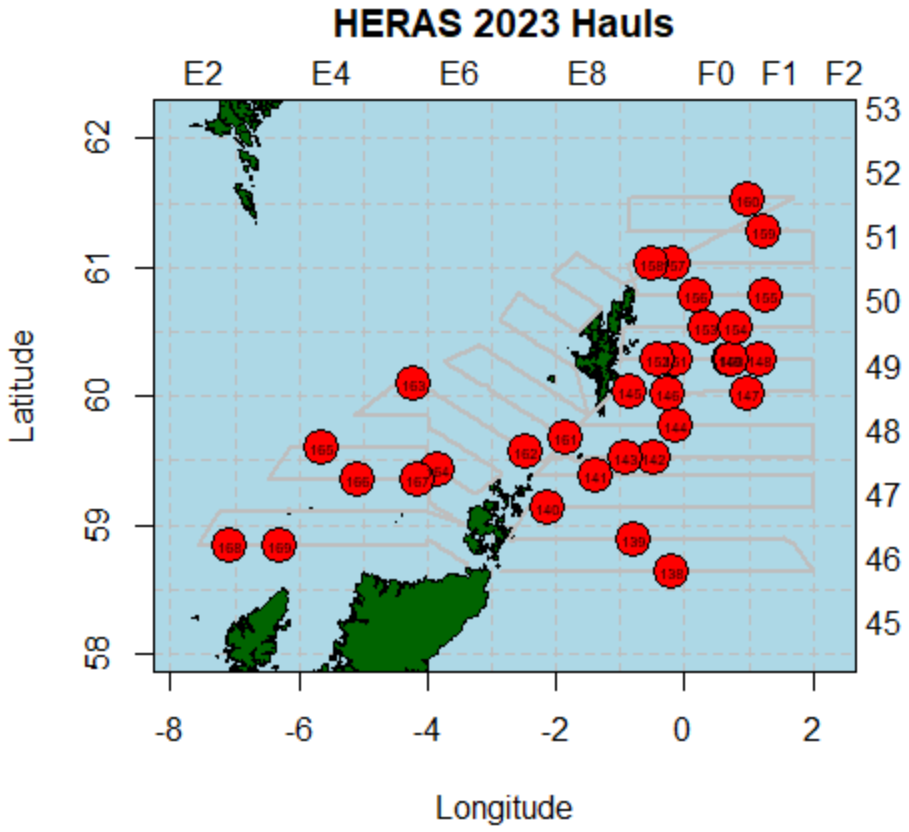

Figure 2: Cruise 0823S. Red circles represent haul positions and the numbers within are the associated haul number.

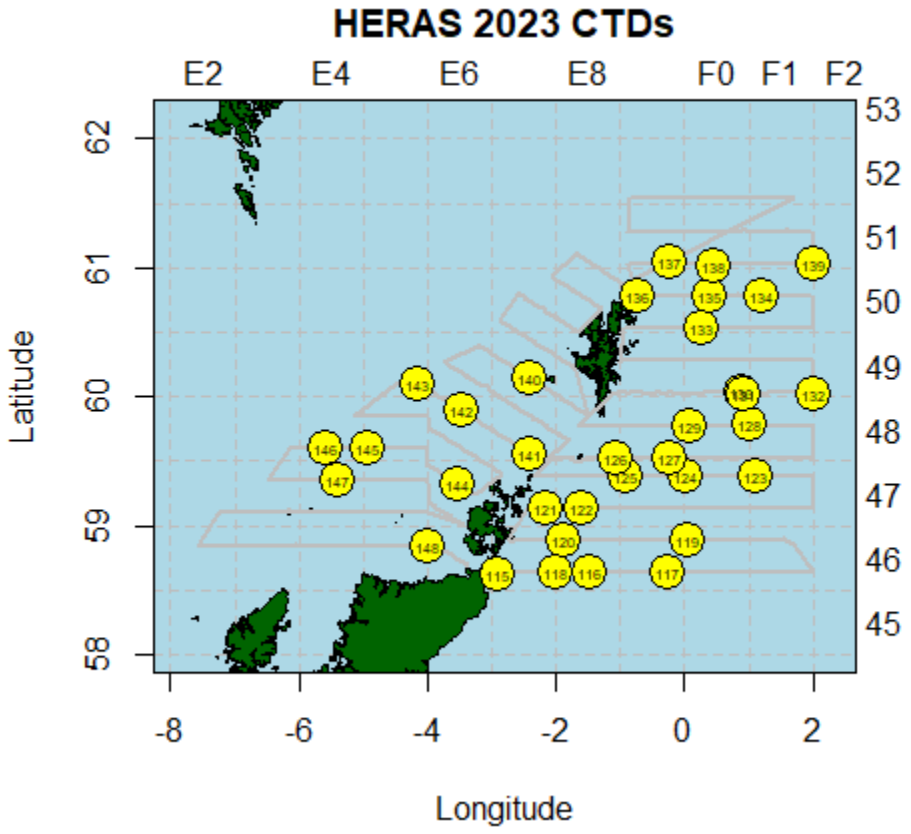

Figure 3: Cruise 0823S. Position of CTD stations. The yellow circles represent the positions of CTDs and the numbers within are their associated station number.

Haul	HER_KG	WT_Sample	No. Bios	Length	Raised No.	Min cm	Mode cm	Max cm	No. Gen	Gen_ID
138	1500	89.9	113	560	9344	19	26.5	31	30	H1-30
139	84.04	58.4	91	380	516	21.5	25	31.5	30	H31-60
140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
141	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
142	8.9	8.9	38	51	51	23.5	26.5	29.5	30	H61-90
143	7.9	7.9	45	60	60	20	21.5	31	30	H91 - G20
144	700	70.9	115	302	2994	23.5	29.5	32.5	30	G21-G50
145	677.57	61.615	104	380	4179	20.5	27	30.5	30	G51-80
146	496.9	82	132	472	2860	18.5	27	32	30	G81 - F10
147	78.7	78.7	104	544	544	20	25	30.5	30	F11-F40
148	475.99	73.864	93	692	4459	18.5	21	31	30	F41-70
149	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
150	6000	81.8	116	412	30220	23.5	28	32	30	F71-100
151	402.3	74.7	136	425	2298	20.5	26.5	33.5	30	T1-30
152	177.4	177.4	129	1107	1107	20	27	32	30	T31-60
153	520	61.6	122	354	2988	21	26.5	33	30	T61-T90
154	489.76	72.8	113	301	2025	24	28	32	30	T91-U20
155	292.3	61.3	119	283	1349	24.5	28.5	35	30	U21-50
156	2356.9	59.65	106	291	11498	21	27.5	32	30	U51-U80
157	818.6	53.2	91	274	4216	24.5	28	33	30	U81-V10
158	326.71	72.3	118	397	1794	22.5	26.5	31.5	30	V11-40
159	700	53.4	111	225	2950	25.5	28.5	33.5	30	V41-70
160	168.6	65.7	127	267	685	24	29.5	34	30	V71-100
161	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
162	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
163	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
164	620	76.2	109	402	3271	23	27.5	31	100	R1-100
165	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
166	139.39	35.7	119	376	798	23	27	30	100	S1-100
167	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
168	4.7	4.7	29	29	29	23	28	30	29	X1-29
169	0.945	0.945	3	3	3	25	27.5	27.5	3	X30-X32
Tot./Avg	17048	1483.574	2383	8587	90238	22.08	26.812	31.64		

Table 1: Herring catch weights 0823S (Kg).

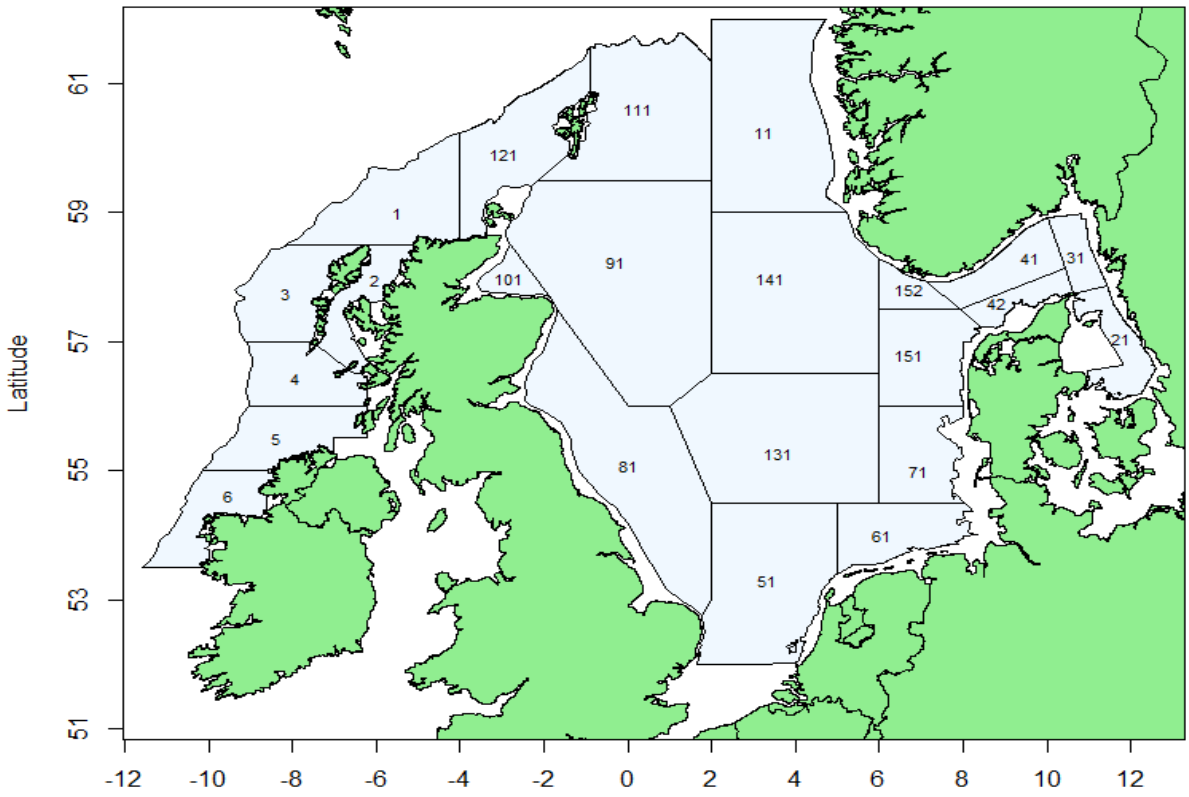

Figure 4: HERAS strata covering Malin Shelf, North sea, Skaggerak and Kattegat seas.