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MRV *Scotia*

Survey 0920S

## **Report**

3<sup>rd</sup> July – 25<sup>th</sup> July 2020

## **Ports**

**Departure:** Aberdeen, 3<sup>rd</sup> July

**Half-landing:** None (Covid-19 restrictions)

**Arrival and unloading:** Aberdeen, 25<sup>th</sup> July, unloading 26<sup>th</sup> July

## **Personnel**

S O'Connell (SIC)

H Holah

M Rennie

R Kynoch

L Clayton

C Pert

A Gallego

**Estimated days by project:** 23 days – RV1912 (20583)

## **Sampling Gear**

Midwater trawls PT160 x 3

SIMRAD FS70 net sonde x 2

1 SBE19+ CTD & laptop and salinity bottles surface only

Hydrographic mooring recovery equipment.

## **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 58°30'-62°N, and from the shelf edge to 2°E, 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, 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 4 °W. Herring will

be collected throughout the survey area and tissue samples will be taken and stored for genetic analysis after returning from the survey.

- To obtain physical oceanography and hydrographic data for comparison to the horizontal and vertical distribution of herring and sprat.
- Recover ADCP (Acoustic Doppler Current Profiler) from the Faroe Shetland Channel and the Fair Isle Channel.
- Recover and freeze sponge settlement plates attached to ADCP moorings in the Faroe Shetland Channel.

## **Narrative**

Scotia departed Aberdeen at 09:00 on 3<sup>rd</sup> July 2020 and made passage for Scapa Flow, Orkney Islands, to commence calibration of acoustic systems. Due to the time taken to perform gear shake downs and the tide running against us in the Pentland Firth, we did not reach anchorage until 2 am the following morning. The calibration took place between 07:30 and 20:00 on 4<sup>th</sup> July. The calibration went well and measures were better than they had been the previous year, owing in most part to the fine weather we were lucky enough to experience. The survey commenced at 02:00 on the 5<sup>th</sup> of July on the first eastwards transect as shown on the cruise track map (Figure 1).

On the morning of the 6<sup>th</sup> July poor weather was experienced and the drop keel was lowered to reduce data loss due to cavitation bubbles forming on the transducer faces. The drop keel was restored to the regular position at midnight.

A number of difficulties were experienced with the aft FS70 computer. This was resolved by switching to the forward computer on the 7<sup>th</sup> July and this worked perfectly for the remainder of the cruise.

On the 9<sup>th</sup> July we attempted to retrieve the two ADCP moorings in the Fair Isle gap. The southernmost mooring was successfully retrieved however the second mooring failed to release. Another unsuccessful attempt was made to retrieve this mooring on the morning of the 11<sup>th</sup> July prior to sailing to Lerwick for water. Note there was no haul landing scheduled due to Covid-19 restrictions and we were back on transect at 15:00 that day.

On the 14<sup>th</sup> July we lost a codend due to a large haul of herring. A large mark was fished close to the bottom and unfortunately a second mark could not be avoided as we hauled the net. Despite a weak point being added; not enough herring escaped to prevent the bag separating from the rest of the net. A new net was rigged and a weak point which extended further down into the codend was inserted.

On the 16<sup>th</sup> July a power cut was thought to be responsible for EK60 and TSG data not being displayed on the Davis system. This was quickly addressed using the CTD laptop to connect to and reboot the Davis system.

Early on the 17<sup>th</sup> we successfully recovered the two Faroe Shetland Channel moorings.

Surveying west of Shetland there were noticeably less marks visible on the echograms. Some midwater marks that resembled herring were determined to be other species, for example blue whiting and mackerel. Fishing was much more difficult on the west side of the survey area due to the lack of marks and the rough ground encountered. However a sample of herring from 6aN was collected; which was not possible last year.

The final calibration was completed on the 24<sup>th</sup> of July in Scapa flow. All four frequencies were successfully calibrated and the following day we made passage for Aberdeen.

On the 25<sup>th</sup> of July we arrived in Aberdeen at approximately 15:00. The gear was unloaded the next morning including the four hydrographic moorings. Most gear was returned to the Marine Laboratory while the net and associated rigging was delivered to the Altens store yard.

The Covid-19 measures adopted by the ship worked well and were adhered to by all staff on board.

## **Results**

Scotia completed all planned survey tracks and acoustic data was collected from 2363 nmi of transects in total with a completed survey track (not counting passage at start and end of trip or half landing) was approximately 2600 nmi.

The distribution of herring observed on this survey was largely in agreement with the patterns seen historically on this survey. However, it was notable that this year the range appears to extend further into the North east in comparison to recent years where herring would be more consolidated East of Shetland around the 0 degree line. Most schools were found aggregated high in the water column at depths of approximately 20m-50m.

Fishing took place on an opportunistic basis with the aim of verifying species and size composition of echotraces encountered. A total of 42 hauls were successfully completed on the survey throughout the water column as shallow as ~15m to a depth of ~200m (Table 2). The PT160 midwater trawl was used for all 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.

A load shackle with remote readout was used to weigh catches from the PT160. This worked well this year and was utilised for all but one haul when some of the catch was lost due to a broken cod end. In this case the fishing master provided a catch estimate by eye. This is in line with methodology employed by previous surveys prior to the use of the load shackle.

The new multipurpose doors that are used to change to quickly change between pelagic and ground gears were again used on this survey. However we did not utilize this feature as the ground gear was not used during this cruise. 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 17m depth.

Herring catches were secured in most areas where significant herring schools were observed (Figure 2, Table 2). A total of 43 hauls were carried out during the cruise, 24 which contained herring (over 30 herring is considered minimum requirement for a sample in the coordinated

survey) (Table 1). In the 6a area (West of 4° W), only a few herring schools were encountered and despite several attempts only one herring sample was successfully obtained. This was due to a combination of schools being close to hard ground prohibiting fishing on some observed possible herring traces and schools being isolated and very flighty.

A total of 5588 herring were sampled to obtain length frequency data and 1825 of these fish were further sampled for biological parameters such as weight, age, sex, maturity (Table 1).

Additionally tissue samples will be taken from 100 herring (eight separate hauls) and were frozen. These will be further processed back at the laboratory as part of an ongoing collaborative genetics study with the Marine Institute (Ireland), Scottish Pelagic Fishermans Association (SPFA), University College Dublin, Killybegs Fishermans Organization, Wageningen Institute, Pelagic Fishermans Association, Pelagic AC to further our understanding of herring stock structure in the North Sea and to the west of the UK and Ireland.

Only one herring catch (111.6kg) was obtained from 6a (West of 4° W). No herring morphology sampling or genetic sampling was carried out for stock discrimination analysis. Due to Covid-19 restrictions limiting staff numbers it was deemed impractical to carry out this work.

The net mounted camera work which had previously been conducted on this survey has been discontinued. It has become apparent that the current technology is not capable of providing the resolution required for reliable species identification at this present time. However this work may be continued in the future depending on technological advances and the availability of suitable camera systems.

A total of 51 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.

Submitted:  
S. O'Connell  
25th November 2020

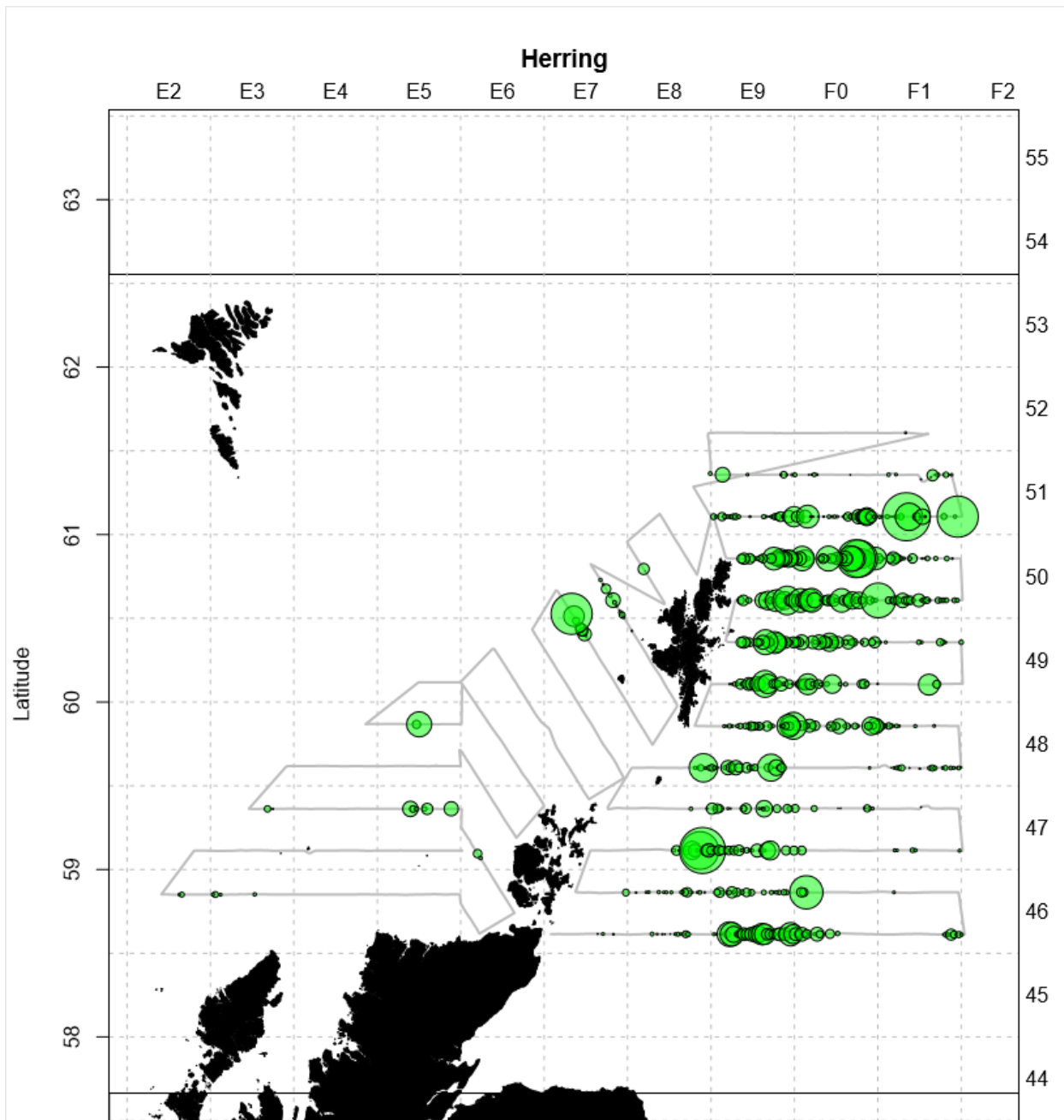


Figure 1. Cruise 0920S. Completed transects (grey lines) and distribution of herring (green circles indicate position and size of aggregations). Survey begins at the North-East tip of mainland Scotland.

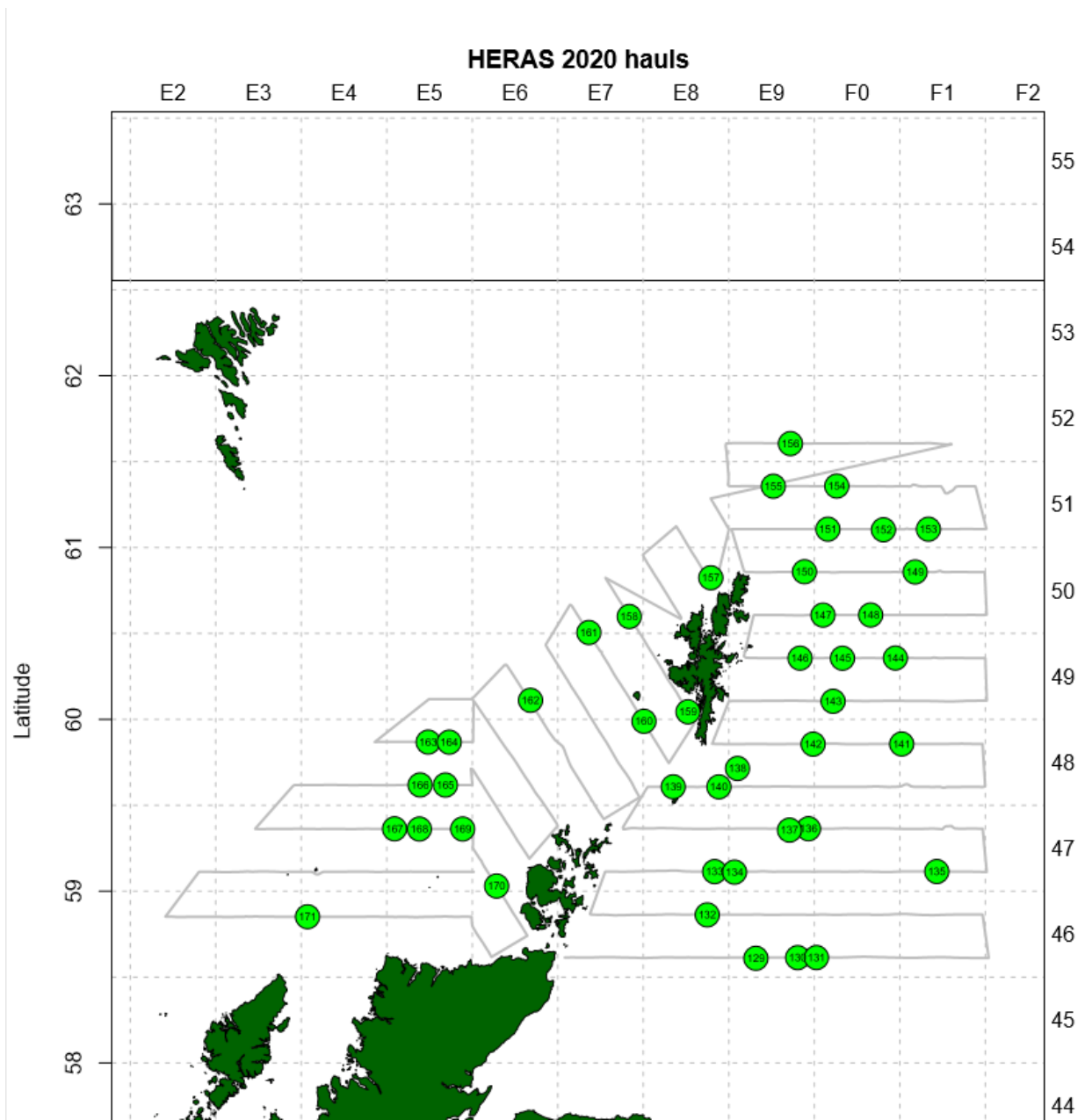


Figure 2. Cruise 0920S. Green circles represent haul positions and the numbers within are the associated haul number.

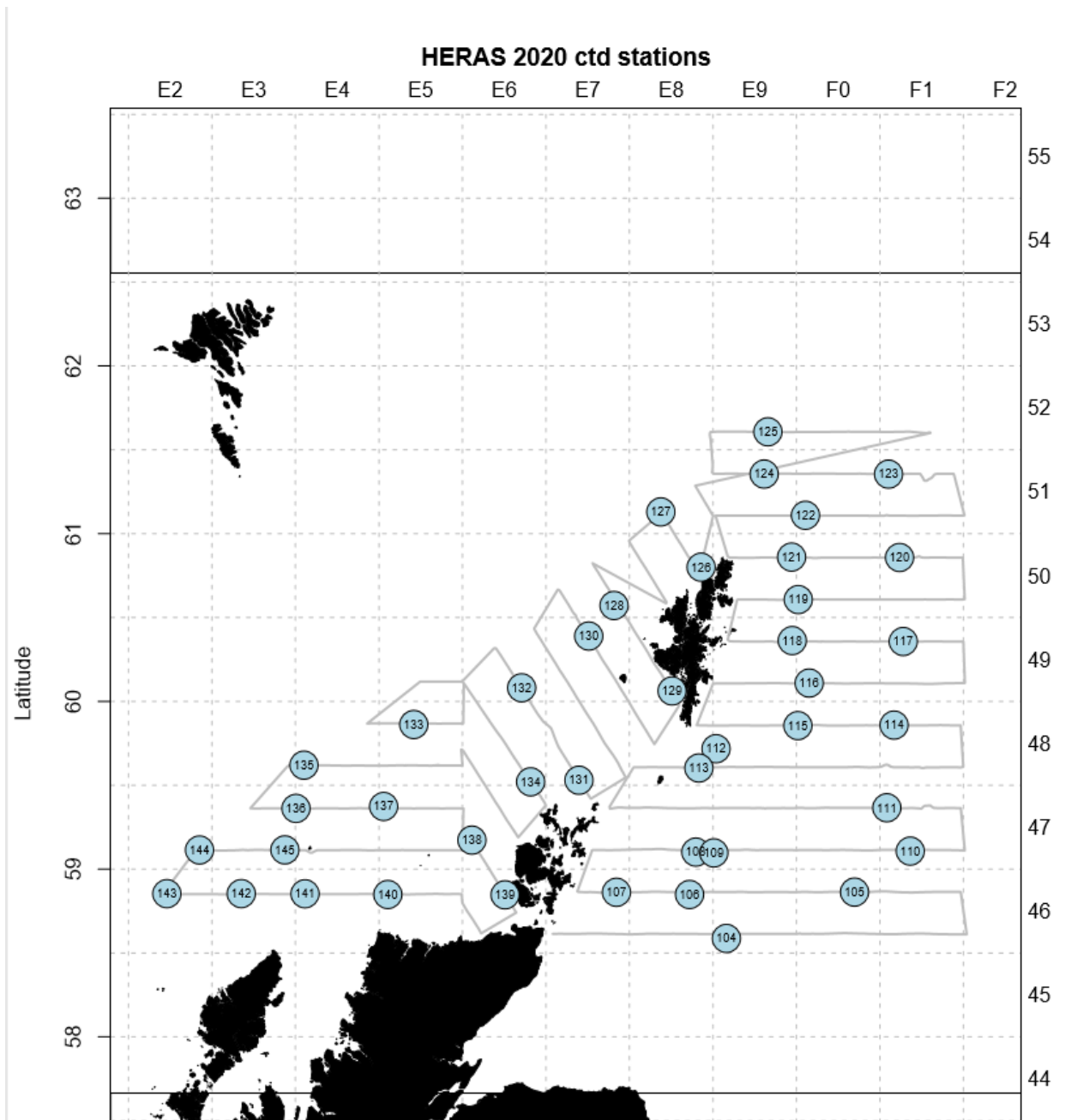


Figure 3. Cruise 0920S. Position of CTD stations. The blue circles represent the positions of CTDs and the numbers within are their associated station number.

Haul No.	Herring (kg)	Sampled (kg)	Raised No.	min (cm)	mode (cm)	max (cm)
129	1055.12	43.3	8456	18.5	25	27.5
131	337.35	47.316	2061	22.5	25.5	20.5
132	57.561	31.786	418	22	24.5	28
134	413.228	55.028	2500	23	26.5	31
136	1.872	1.872	13	22.5	NA	27
138	4.5	4.5	33	23	NA	29
140	5.9	5.9	40	20.5	26	29.5
141	953	52.6	5544	24	26	30.5
142	1410	63	6647	24	28.5	32.5
143	890.6	51.5	4756	24.5	27	31.5
144	864.385	82.3	4264	24.5	28	32.5
145	1800	112.4	7959	24.5	NA	33
146	1513	77.3	7673	23	27.5	32.5
147	1860.8	79.7	8569	23	27.5/28	32.5
148	912.154	93.7	4040	24.5	28	33.5
149	523.802	68.5	1935	26	30.5	33.5
150	1751.716	60.7	7965	25.5	28	32.5
151	14.6	14.6	64	26.5	NA	33
152*	177.2	55.5	667	26.5	30.5	33.5
153	25000	51.1	93444	27	30	33
154	25.7	25.7	110	26.5	30	33
158	1.2	1.2	8	26.5	NA	30
159	0.041	0.041	1	17.5	17.5	17.5
169	111.6	37	706	23	25.5/26	30.5

Table 1. Herring catch weights, weight of herring sampled, raised no. of fish to catch weight, and breakdown of fish lengths. \*indicates haul where a portion of catch was lost due to codend failure.

Haul	TimeShot	TimeHaul	ShotLat	ShotLon	HaulDepth	HER catch wt
129	09:02:40	09:35:40	58.609	-0.758	130	1055.12
130	13:09:40	13:50:40	58.612	-0.153	133	NA
131	15:41:40	16:07:40	58.613	0.026	146	337.35
132	16:08:40	16:53:40	58.86	-1.215	111	57.561
133	06:28:40	06:57:40	59.114	-1.142	119	NA
134	09:05:40	09:56:40	59.113	-0.892	131	413.228
135	18:17:40	19:05:40	59.117	1.478	116	NA
136	09:17:40	09:55:40	59.364	-0.03	138	1.872
137	11:25:40	12:13:40	59.359	-0.358	140	NA
138	07:00:40	07:48:40	59.714	-0.858	128	4.5



139	14:32:40	15:10:40	59.606	-1.619	101	NA
140	17:31:40	17:51:40	59.607	-1.094	119	5.9
141	12:54:40	13:45:40	59.857	0.969	126	953
142	17:44:40	18:05:40	59.855	-0.034	149	1410
143	17:54:40	19:00:40	60.105	0.3	180	890.57
144	10:25:40	11:00:40	60.357	0.978	161	864.385
145	13:22:40	13:43:40	60.355	0.308	148	1800
146	16:04:40	17:00:40	60.356	-0.257	124	1513
147	04:47:40	05:12:40	60.605	0.137	118	1860.8
148	08:15:40	09:03:40	60.606	0.705	142	912.154
149	17:19:40	17:52:40	60.858	1.145	153	523.802
150	03:44:40	03:59:40	60.86	-0.138	159	1751.716
151	11:44:40	12:03:40	61.106	0.177	153	14.6
152	15:05:40	15:25:40	61.105	0.851	156	177.153
153	17:50:40	18:23:40	61.106	1.356	145	25000
154	07:57:40	08:27:40	61.358	0.236	172	25.7
155	11:18:40	12:07:40	61.357	-0.539	179	NA
156	18:14:40	18:36:40	61.604	-0.253	203	NA
157	17:11:40	17:55:40	60.842	-1.242	99	NA
158	14:14:40	14:41:40	60.607	-2.145	152	1.2
159	19:20:40	19:57:40	60.038	-1.471	126	0.041
160	04:00:40	04:25:40	59.997	-2.005	85	NA
161	09:52:40	10:05:40	60.51	-2.626	142	NA
162	06:33:40	06:56:40	60.114	-3.331	143	NA
163	17:04:40	17:47:40	59.868	-4.472	132	NA
164	19:49:40	20:15:40	59.868	-4.249	111	NA
165	14:39:40	15:10:40	59.618	-4.341	96.3	NA
166	16:55:40	17:39:40	59.617	-4.682	103	NA
167	10:07:40	10:28:40	59.362	-4.887	121	NA
168	13:10:40	13:41:40	59.361	-4.649	99.5	NA
169	15:52:40	16:10:40	59.361	-4.092	106	111.2
170	19:55:40	20:19:40	59.019	-3.702	120	NA
171	13:00:40	13:30:40	58.851	-5.952	97.8	NA

Table 2. Haul details and Herring catch weight