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MRV *Scotia*

Survey 0822S

## **REPORT**

29<sup>th</sup> June – 19<sup>th</sup> July 2022

### **Ports**

**Departure:** Aberdeen, 29<sup>th</sup> June

**Half-landing:** 7<sup>th</sup> July

**Arrival and unloading:** Aberdeen, 18<sup>th</sup> July, unloading 19<sup>th</sup> July

### **Personnel**

S O'Connell (SIC)

H Holah (co-SIC)

M Rennie

L Clayton (SIT)

Alex Neeson

Eleanor MacLeod

**Estimated days by project:** 20 days – RV2109 (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 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 a

maximum of 100 fish per haul will have tissue samples collected. For herring caught east of the 4°W 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 samples (from five hauls). Fish will be measured and lengths recorded, then frozen and returned to the lab where they will be measured again to ascertain any effect of freezing on the length of the fish
- 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**

Prior to departure the SIC was informed of planned strike action to take place from noon on the 4<sup>th</sup> of July until noon on the 8<sup>th</sup> of July. Due to this plans were made to accommodate this into the cruise program.

MRV Scotia departed Aberdeen at 05:30 on Wednesday 29<sup>th</sup> June and steamed directly to the start position of the first transect east of Wick. As we made our way north we encountered high densities of herring East of Orkney with densities peaking around the 1°W mark. We saw the distribution extend further north and east than usual and connects well distribution from the Norwegian survey see (Figure 1). On the evening of the 3<sup>rd</sup> of July we made our way to Levenwick bay south of Lerwick having completed 6 transects. We ran calibrations into the early hours of the following day. Due to poor conditions caused by life in the water column just the 38kHz and 120kHz anchor were completed however these were both poor quality. At 05:00 to make our way to Scalloway to facilitate strike action being taken by some of the crew.

On the 8<sup>th</sup> of July at 14:00 we departed Scalloway and made our way to a nearby bay to attempt another calibration. Unfortunately our anchorage was subject to unexpectedly high winds which caused the boat to move making a calibration impossible despite efforts to negate the effects of the wind. At 20:00 we sailed for the start point of transect 7 heading east. Good herring marks were encountered along the proceeding transects more to the east compared to last year. Good surface marks were also encountered which had been less common in recent years.

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 200m contour line. This was punctuated by some quite large herring schools on transect 4 from which we secured a good sample of herring. 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.

Due to the time lost during the cruise as a result of the strike action taken by the crew it was necessary to considerably reduce the number of CTDs we were able to complete; only successfully completing 10 deployments out of a planned 50. We completed 22 trawls which is almost half the amount normally carried out. Our survey day was extended by two hours one hour earlier in the morning and one hour later at night. This was suboptimal but necessary to cover the entire survey area and carry out an adequate number of biological sampling tows. The end of cruise calibration was not performed in order to complete the survey on schedule

On the 19<sup>th</sup> of July we arrived in Aberdeen at approximately 15:00. 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 2184 nmi of transects in total with a completed survey track (not counting passage at start and end of trip or half landing) was approximately 2400 nmi.

The distribution of herring observed on this survey was largely in agreement with the patterns seen historically on this survey. This year the large aggregations seen NE of Shetland were much reduced in comparison to last year, likely due to our late departure as the fish may have progressed in their southern migration. In line with this, we saw greater abundance of herring East of Fair Isle than last year, again suggesting a greater southerly progression of herring compared to last year. West of Scotland herring were again scarce; we saw less this year than last. We saw a large isolated concentration of herring West of Shetland closer to the shelf edge although further south along last year's corresponding transect.

Fishing took place on an opportunistic basis with the aim of verifying species and size composition of echotraces encountered. A total of 22 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 17m depth however the fewer midwater and near surface marks seen on this year's survey meant we did not need to fish at these depths.

Herring catches were secured in most areas where significant herring schools were observed (Figure 2,3 and Table 1). 18 of the 22 trawls performed contained herring (Figure 4) (over 30 herring is considered the minimum requirement for a sample in the coordinated survey) (Table

1). In area 6a (West of 4° W), only a few herring schools were encountered. Two likely herring schools were encountered, however when we attempted fish on these marks, by the time we had turned around and had shot the net the marks had disappeared.

A total of 5073 herring were sampled to obtain length frequency data and 1388 of these fish were further sampled for biological parameters such as weight, age, sex, maturity. From the length frequency distributions in (Figure 5) we can see that the mode increases as we make our way North through strata 91 and 111 (Figure 7). You can see from Figure 6 that the proportion of middle aged fish as seen in this survey has declined over the last three years.

Additionally tissue samples were taken from 155 fish from 6 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 4 degree line. Each haul had a maximum of 30 samples taken. A total of 10 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.

We took samples as requested and detailed above in the survey objectives. These were placed in cold storage to be sampled at a later date

This was the second 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 two new staff in the various sampling techniques employed on HERAS. Lauren Clayton 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.

Submitted:  
S. O'Connell  
23<sup>rd</sup> November 2022

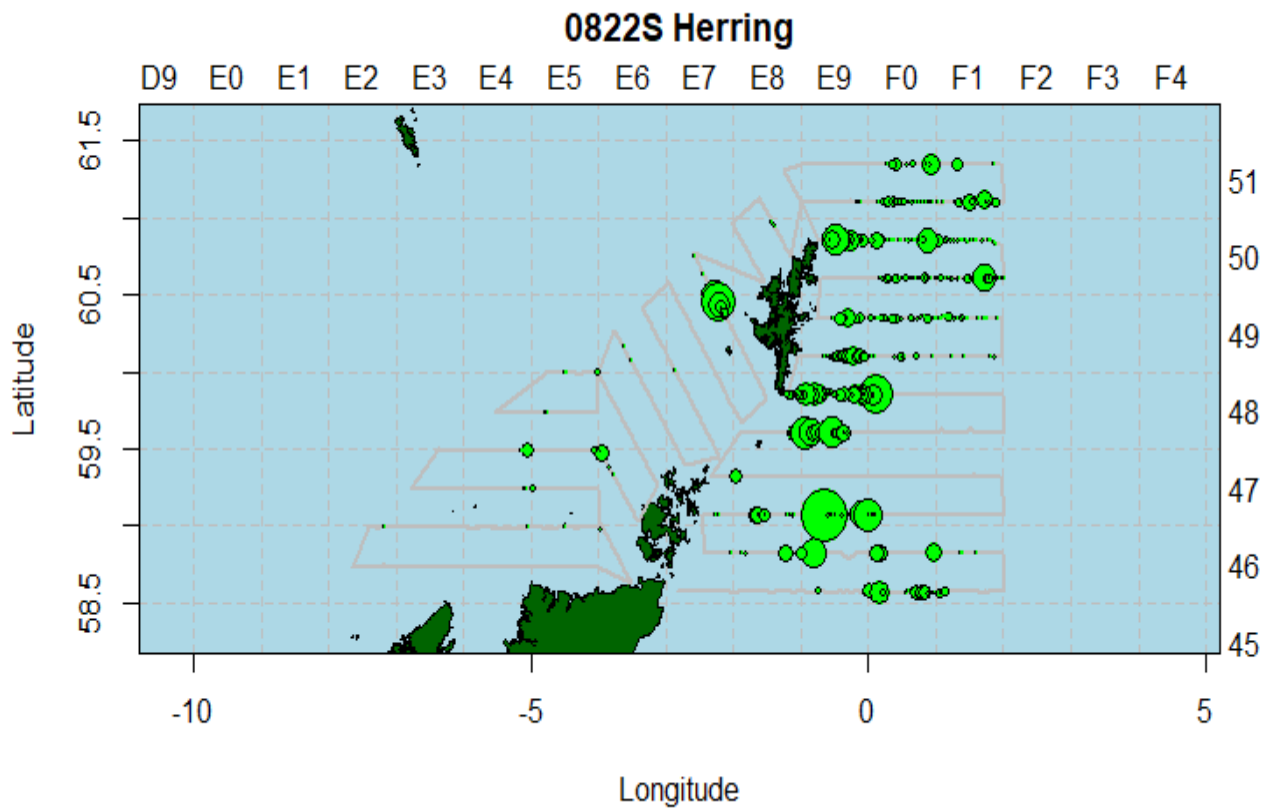


Figure 1. 0822S. Completed transects (grey lines) and distribution of herring (green circles indicate position and relative size of aggregations). Survey begins at the North-East tip of mainland Scotland and finishes West of Orkney.

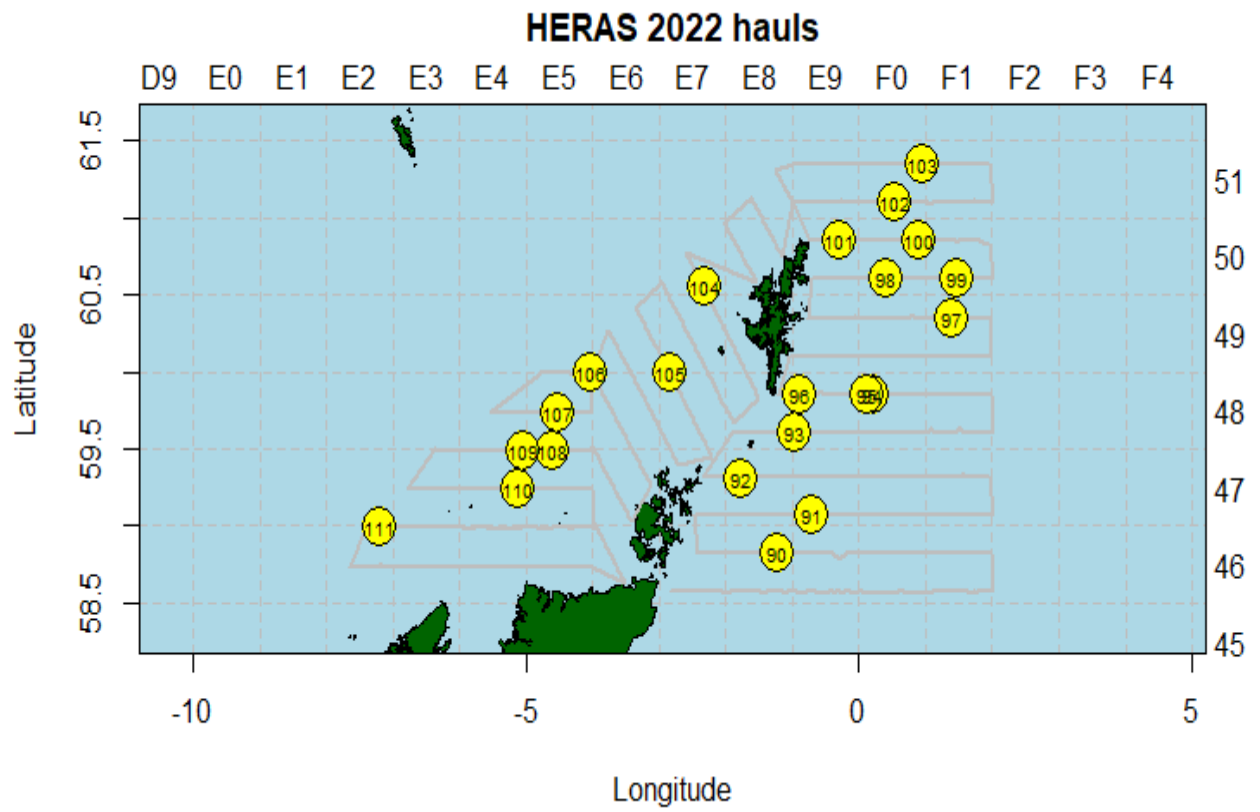


Figure 2. 0822S. Yellow circles represent haul positions and the numbers within are the associated haul number.

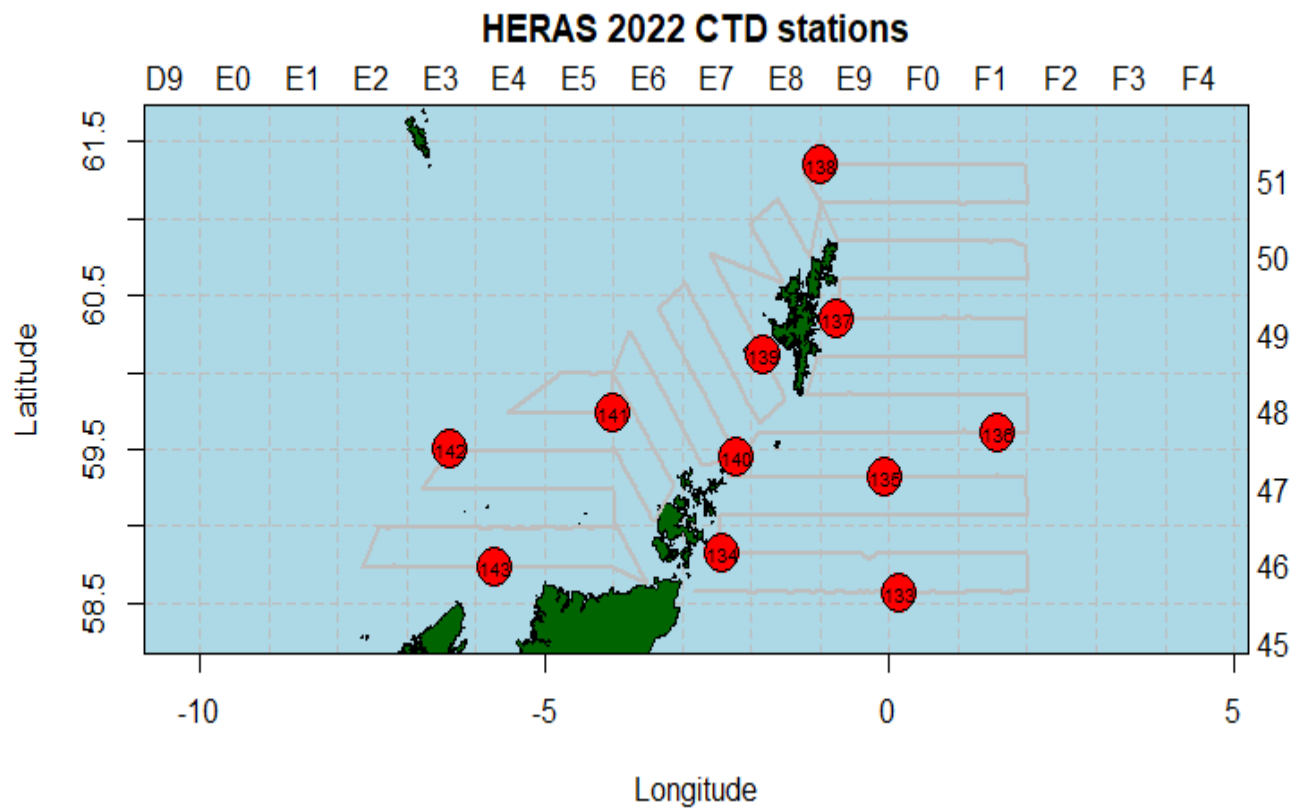


Figure 3. 0822S. Position of CTD stations. The red circles represent the positions of CTDs and the numbers within are their associated station number.

<b>Haul</b>	<b>Species</b>	<b>Catch Weight (kg)</b>
91	HER	800
93	HER	8000
95	HER	2379.72
96	HER	728.44
97	HER	110.8
98	HER	660
99	HER	300.16
100	HER	2697.41
101	HER	1640
102	HER	1501.59
103	HER	110.25
104	HER	6000
106	HER	4.7
107	HER	1.5
108	HER	0.196
109	HER	2.6
110	HER	1.6
111	HER	22.229

Table 1: Herring catch weights 0822S (Kg)



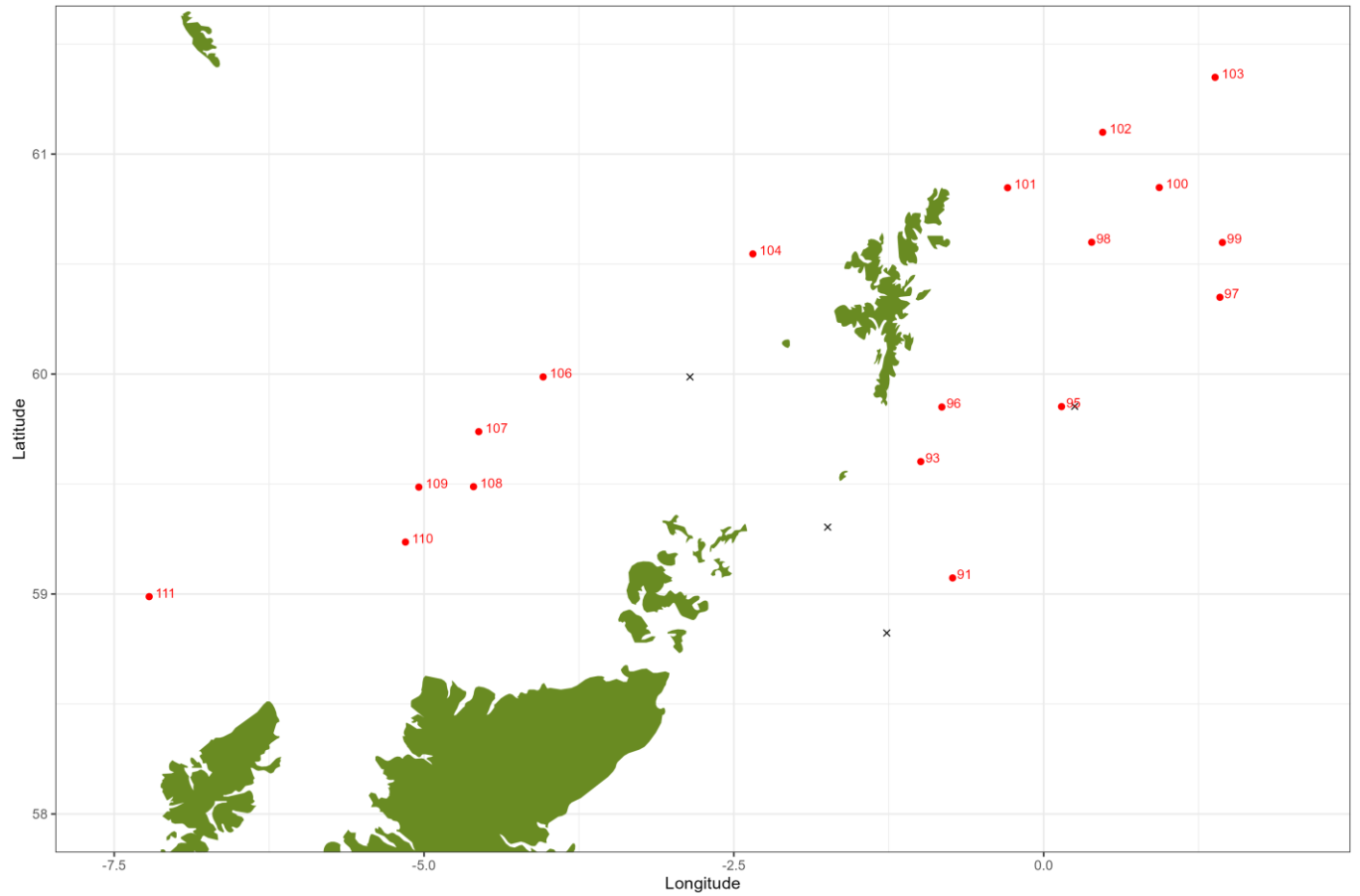


Figure 4: Location of hauls containing herring indicated by red dot and haul number. X indicates hauls with no herring. EM

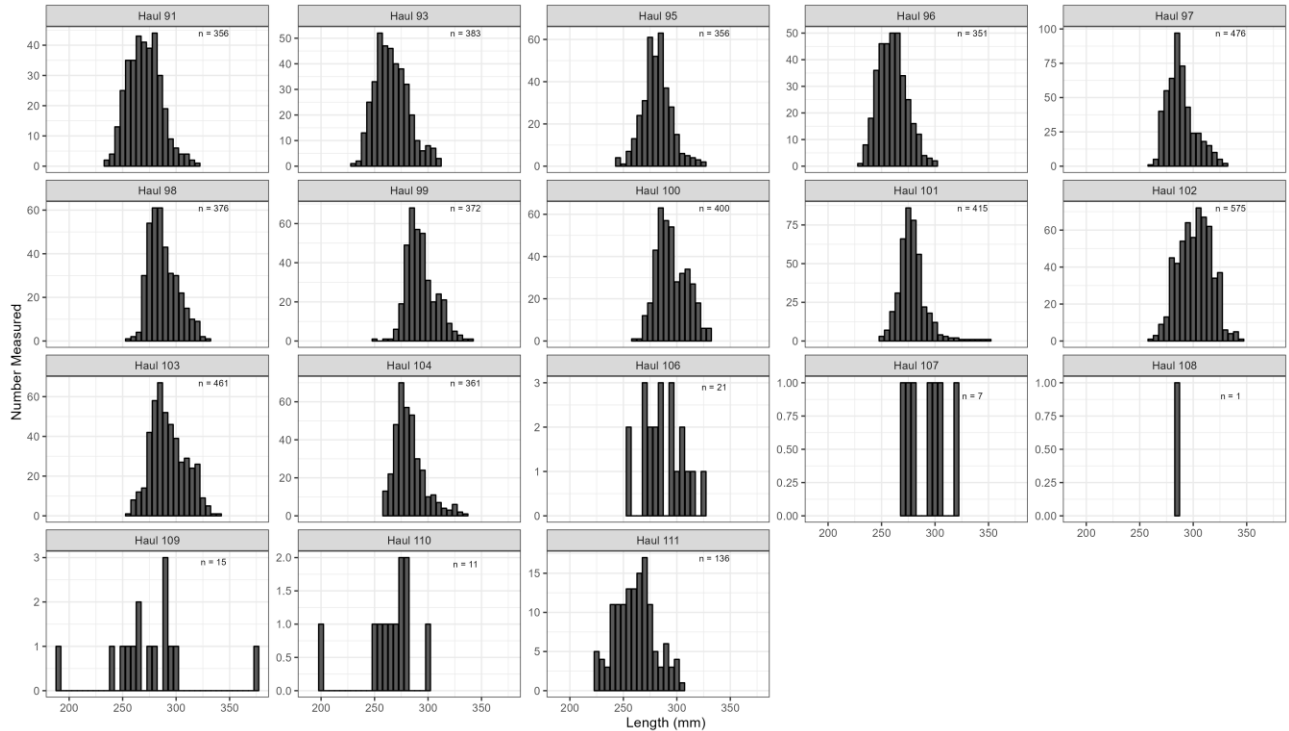


Figure 5: Length distribution of herring measured in each haul for HERAS 0822SEM

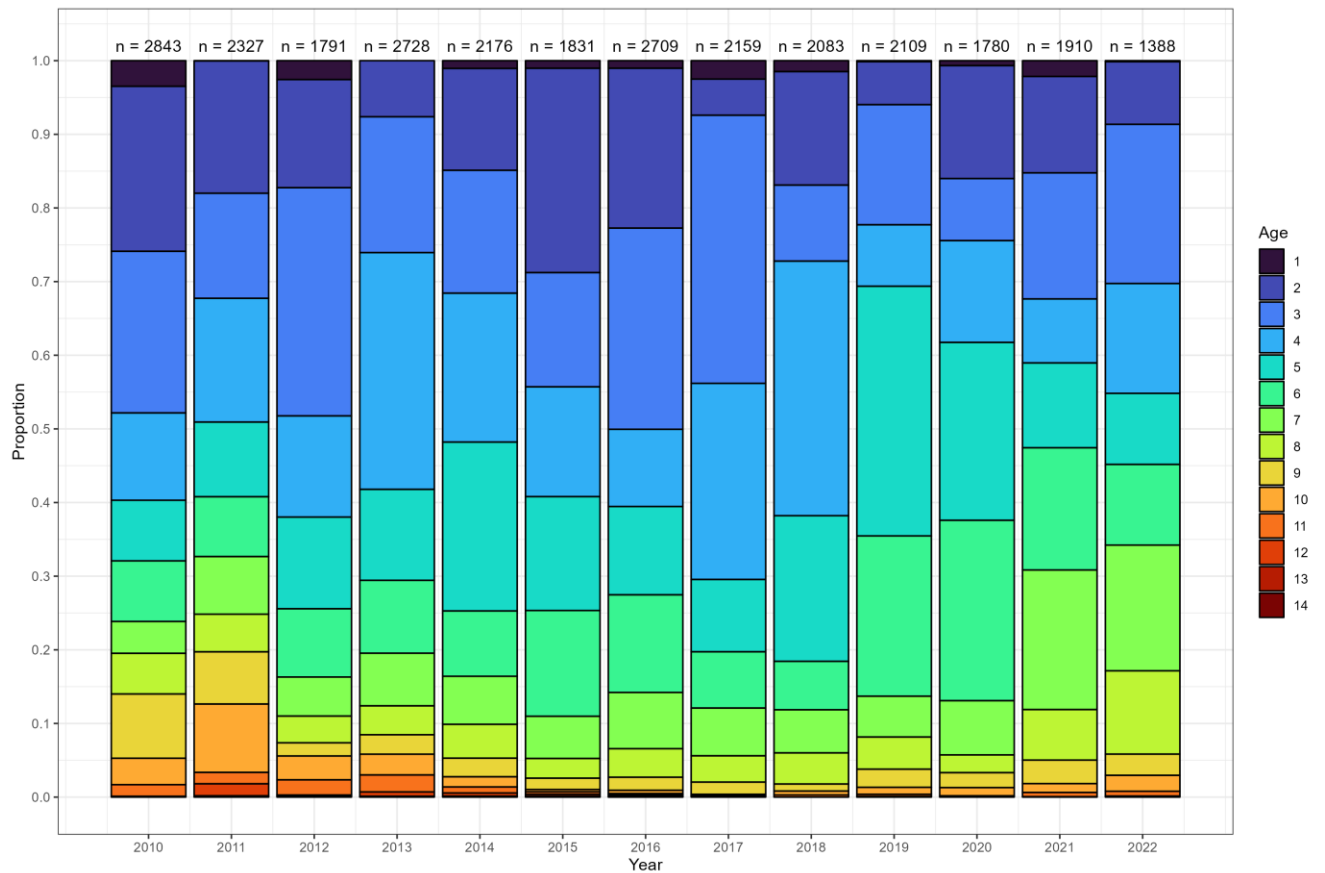


Figure 6: Proportion of fish ages present in each years survey from 2010-2022. EM

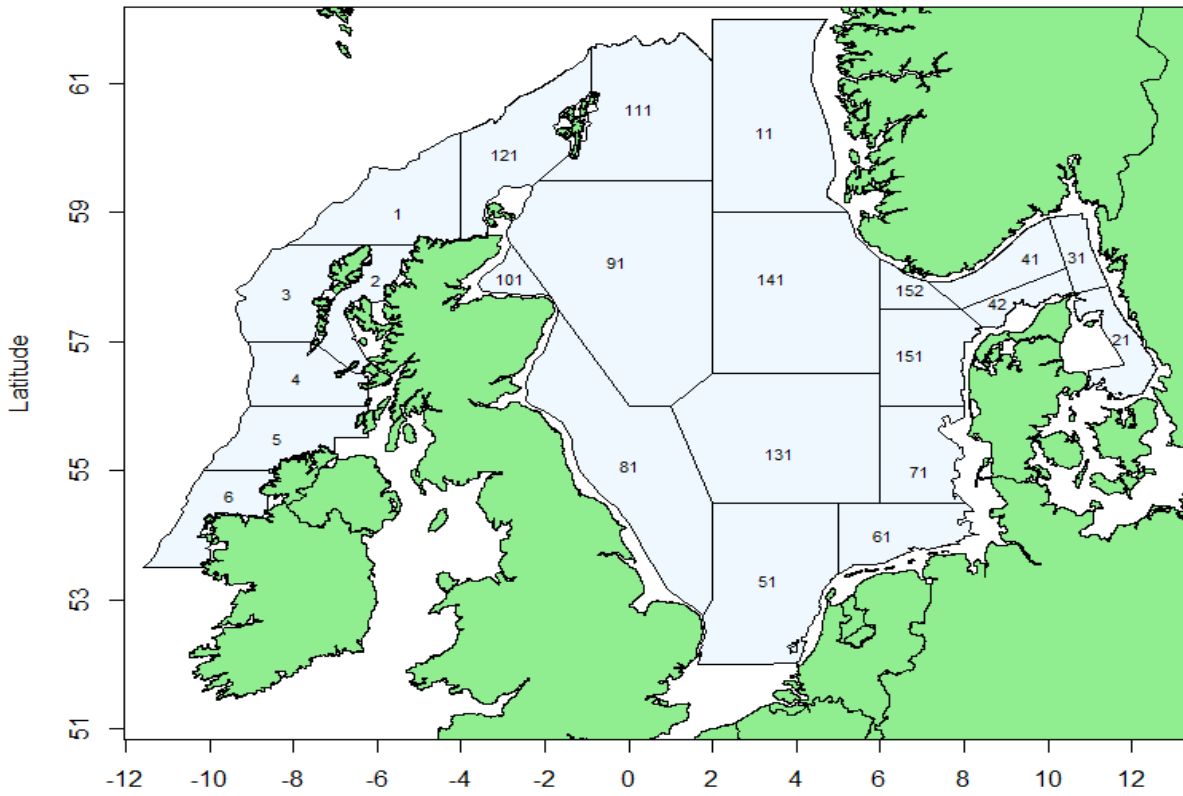


Figure 7: HERAS strata covering Malin Shelf, North sea, Skaggerak and Kattegat seas.