

Cruise Report

Cruise no. 2016

Faroese part of International Ecosystem Survey in the Norwegian Sea (IESNS) 2020

29 April – 11 May 2020

R/V Magnus Heinason OW2252

Participants:

Regin Kristiansen

Jens Arni Thomassen

Ebba Mortensen

Sólvá Káradóttir Eliassen



HAVSTOVAN
FAROE MARINE RESEARCH INSTITUTE

INTRODUCTION

The main aim of this cruise was to investigate the distribution and abundance of Norwegian spring spawning herring and blue whiting in the Norwegian Sea north of the Faroe Islands (yellow transects in **Figure 1**). Zooplankton and hydrographic data were collected for each 60 nmi along the cruise tracks.

The cruise was part of the joint International Ecosystem Survey in the Norwegian Sea (IESNS). Five parties and research vessels (see text table below) took part in the survey, coordinated by the “Working Group of International Pelagic Surveys” (WGIPS) in ICES. The combined results from all five vessels will be used in the assessment of Norwegian spring spawning herring by the “Working Group on Widely Distributed Stocks” (WGWIDE) in September 2020.

Ship	Nation
Magnus Heinason	Faroese
G.O. Sars	Norway
Atlantniro	Russia
Árni Friðriksson	Iceland
Dana	Denmark (EU)

In general, the cruise went as planned. 775 herring were length measured and 394 herring otoliths were sampled. Only 8 blue whittings were caught in the net. Based on the limited number of blue whittings, no length and age distribution is presented. Mackerel was caught in 2 hauls. 150 mackerels were length measured and 149 mackerel otoliths were sampled.

The present survey report is based on data from R/V Magnus Heinason only. Therefore no estimate of abundance of Norwegian spring spawning herring is given due to incomplete coverage of the area.

MATERIAL AND METHODS

Cruise tracks with preplanned hydrographic stations (CTD and WP2 net), and opportunistic pelagic trawl stations in the surveyed area are shown in **Figure 2**. Acoustic data were recorded with a Simrad EK-60 echo sounder. Data from the hull mounted 38 kHz transducer were logged at sea and used in the fish abundance estimation. The area backscattering recordings (sA) per nautical mile were averaged by each nautical mile and the recordings were scrutinised on a daily basis with the LSSS 2.8.0 software and allocated to primarily herring or blue whiting, and to some extent also to other fish (e.g. myctophids) based on pelagic trawling aimed at the various acoustic recordings. The 38 kHz echo sounder was calibrated prior to this year’s surveys with a standard copper sphere.

Biological data were sampled from the trawl hauls. The catch was sorted to species – by subsampling if the catch was more than ~50 kg. Stomachs were sampled from 10 individuals of herring and blue whiting. Otoliths were sampled from ~50 individuals, for which sex and maturity stage was also registered. Length and weight were measured for up to additionally 150 individuals. For non-target species, length and weight was measured.

Zooplankton was sampled by WP2 net (0.25m² - 200µm meshsize). The samples were split in half – one part was preserved in 4% formalin for taxonomic studies and the other size-fractioned (2000µm, 1000µm and 200µm) and dried for biomass estimates. Salinity and temperature were sampled with CTD.

RESULTS

Norwegian spring spawning herring

The transects surveyed by the Faroese vessel change somewhat among years and therefore it is not possible to compare annual differences in surveyed abundance.

Generally the abundance of spring spawning herring was lowest in the southern part of the survey area and the highest abundances were found north of 63° 30' N, see **Figure 3** and **Figure 4**. The herring showed a quite consistent diurnal pattern, residing at 200-400 m depths during the day time and in the surface during night time, see **Figure 4**. The herring was found in water masses with temperatures within the range 0 °C – 8 °C, see **Figure 4**.

The spring spawning herring caught in the trawl were on average 34.6 cm, 301 g and 9.6 years, and 85% of the spring spawning herring were year classes 7+. The 2009 and 2013 year classes were relatively abundant, with the 2009 year class accounting for 23% of all caught spring spawning herring, see **Figure 5**. At the trawl station in the north-eastern corner of the survey area more than half of the caught herring was from the 2016 year class, see **Figure 3**.

The centre of the otoliths of herring caught on the two trawl stations on Transect 1 – east of the Faroes – were 95% autumn spawners (**Figure 3** and **Figure 6**). Thus, herring registrations on this transect are most likely mainly from autumn spawners.

As the survey progressed it seemed that the herring was increasingly difficult to catch, and it was only on the first two trawl stations that the catch was subsampled. On several occasions strong herring registrations prompted the start of a trawl station, but as soon as the trawl was in the water the registrations disappeared and reappeared as soon as the trawl was back on the deck. On four of the stations, where herring was caught, the catch was less than 20 individuals, and on two stations it was 33 and 42, respectively (**Figure 3**).

There was not much overlap between herring and blue whiting registrations in the echogram, neither horizontally, nor vertically, which of course is not unexpected, as the abundances of blue whiting were low in the whole survey area.

Blue whiting

The Faroese investigations in May 2020 indicate less blue whiting in the Faroese area than what was observed four-five years ago. The blue whiting was observed in the southern and western edges of the survey area: east of the Faroes, along the northern slope of the Faroe Shelf and on and around the Iceland-Faroe ridge.

The vertical distribution of the blue whiting sA values on each of the five transects is shown in **Figure 4**. The sum of the sA values of blue whiting per nautical mile along the cruise tracks from the Magnus Heinason survey are shown in **Figure 7**.

Blue whiting was only caught on two trawl stations, four individuals in each haul. These data are not considered sufficient as a basis for a length and age distribution.

Mackerel

Mackerel was caught in two surface hauls in the eastern part of the survey area, see **Figure 2**. In both hauls the mackerel was subsampled. On the southernmost station, the mackerel had a bimodal distribution, with highest abundances of 3 and 4 years old mackerel and high abundances of 7-9 years old fish as well. On the northernmost station, the mackerel were older, on average 10 years, but the 2009 year class was the most abundant. The caught mackerel had an average length, weight and age of 36.1 cm, 363 g and 7.3 years, respectively, see **Figure 8**.

Plankton and hydrography

Temperature and salinity casts down to 1000 m if possible were taken along the track. The surface temperature is shown in **Figure 2** and the isotherms down to 500 m, based on 21 CTD stations are shown in **Figure 4**.

All 22 planned CTD-stations and zooplankton stations along the tracks were sampled. Dry weights of zooplankton from WP2 samples are shown in **Figure 9**. The highest abundances of zooplankton were found in the cold watermasses in the northernmost part of the surveyed area and the lowest biomasses were found in the warmer water masses, especially on the Iceland-Farøe Ridge. Zooplankton larger than 2 mm, were often not present at all on the Iceland-Farøe Ridge.

Survey effort for Magnus Heinason 29 April – 11 May 2020:

Effective survey period	Length of cruise track (nm)	Trawl stations	CTD stations	Plankton sampling	Aged fish	
					herring	Length-measured herring
29/4 – 11/5	1319	15	22	22	394	775

Trawl specifications for Magnus Heinason:

Circumference (m)	640
Vertical opening (m)	45–55
Mesh size in cod end (mm)	40
Typical towing speed (kn)	3.0–4.5

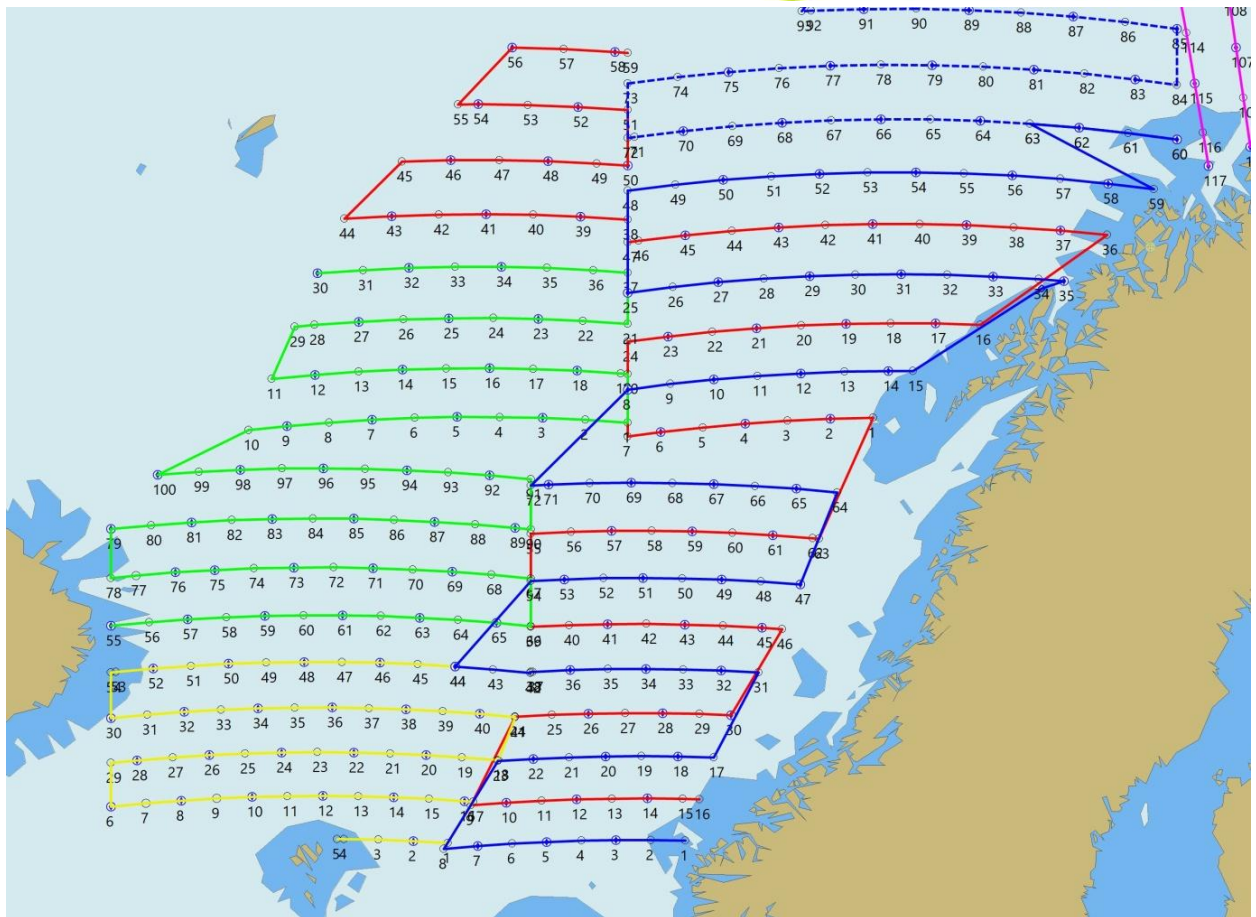


Figure 1. Cruiseplan for the International Ecosystem Survey in the Norwegian Sea in May-June 2020. The participating vessels were: Árni Friðriksson IS, G.O. Sars NO, Dana EU, Magnus Heinason FO and Atlantniro RU. Magnus Heinason covered the yellow transects in Faroese EEZ and into Icelandic and international waters. Atlantniro covered the Barents Sea, which is only briefly seen in this plot.

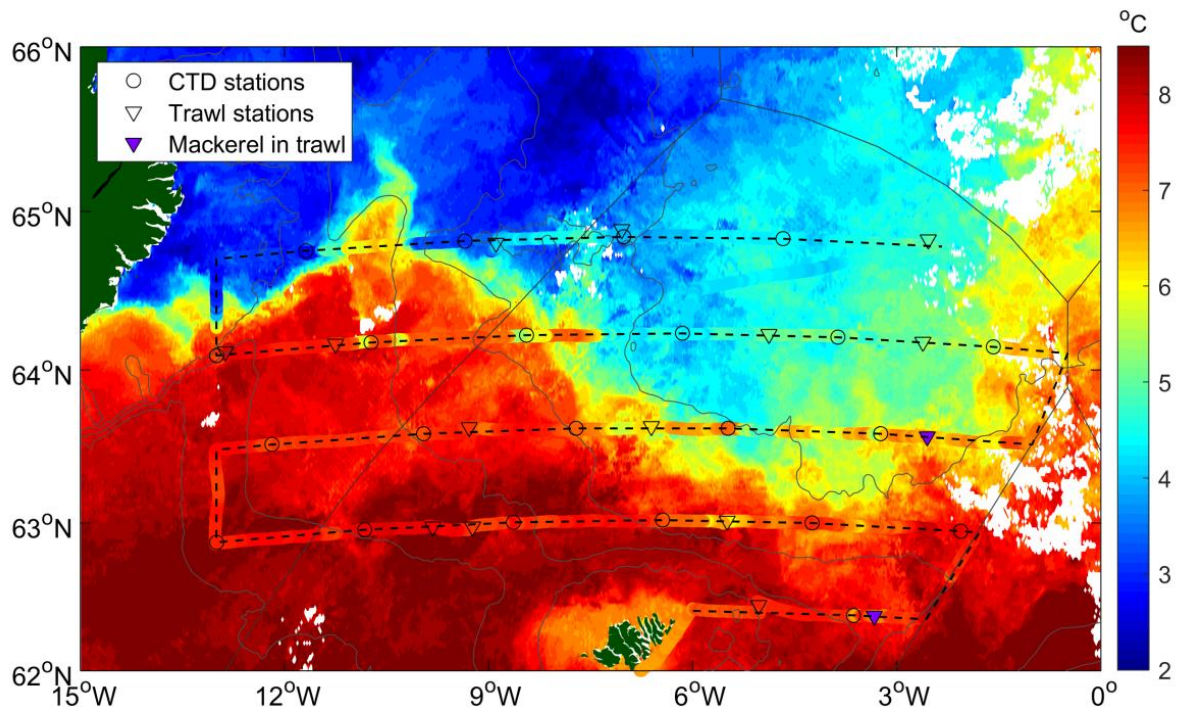


Figure 2. Cruise track, with 22 hydrographic stations (circles) and 15 trawl stations (triangles) north of the Faroes, for Magnus Heinason cruise 2016, 29 April – 11 May 2020. The temperature logged onboard MH is shown behind the cruise track and is supplemented by satellite observations of SST for the period 22 April – 29 April 2020. The total covered distance was 1770 nautical miles, of which acoustic registrations were logged and interpreted on 1320 nautical miles.

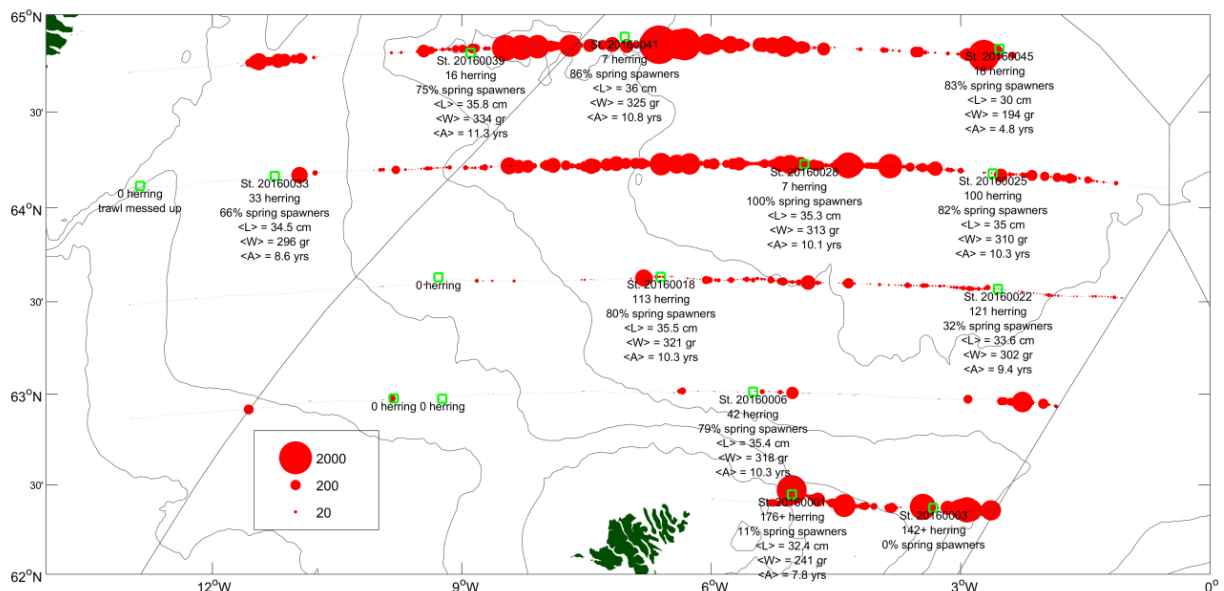


Figure 3. Integration values ($sA, m^2/nm^2$ – red circles) of Norwegian spring spawning herring per each nm along the cruise tracks, Magnus Heinason cruise 2016, 29 April – 11 May 2020. The size of the circles corresponds to amount of fish. Trawl stations are shown as green squares with catch details listed below each trawl station (size of catch, proportion of spring spawning herring based on the centre of the otolith, average length, weight and age of these). On the southernmost two stations the catch was subsampled, which is indicated by the “+” behind the number of measured herring. At all other stations, the complete herring catch was sampled.

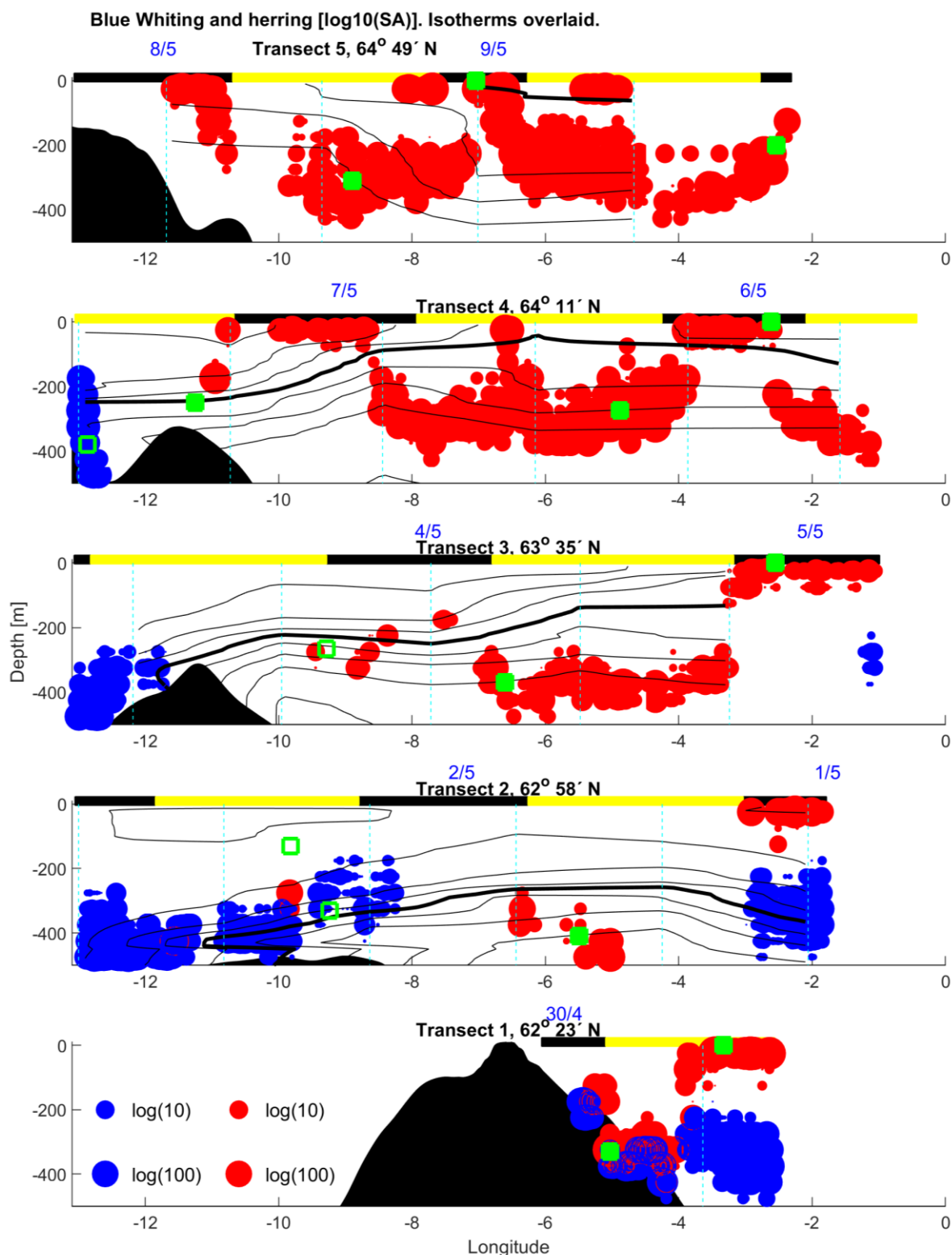


Figure 4. Vertical distribution of herring (red) and blue whiting (blue) per each nm along the cruise tracks, Magnus Heinson cruise 2016, 29 April – 11 May 2020. The black contour lines are isotherms based on temperature casts with the 4° C isotherm marked with a bold line. Time of day is indicated at the top of each transect, showing the darkest hours in black. Trawl hauls are indicated by green squares, where those with no fill color indicate “zero herring” catch.

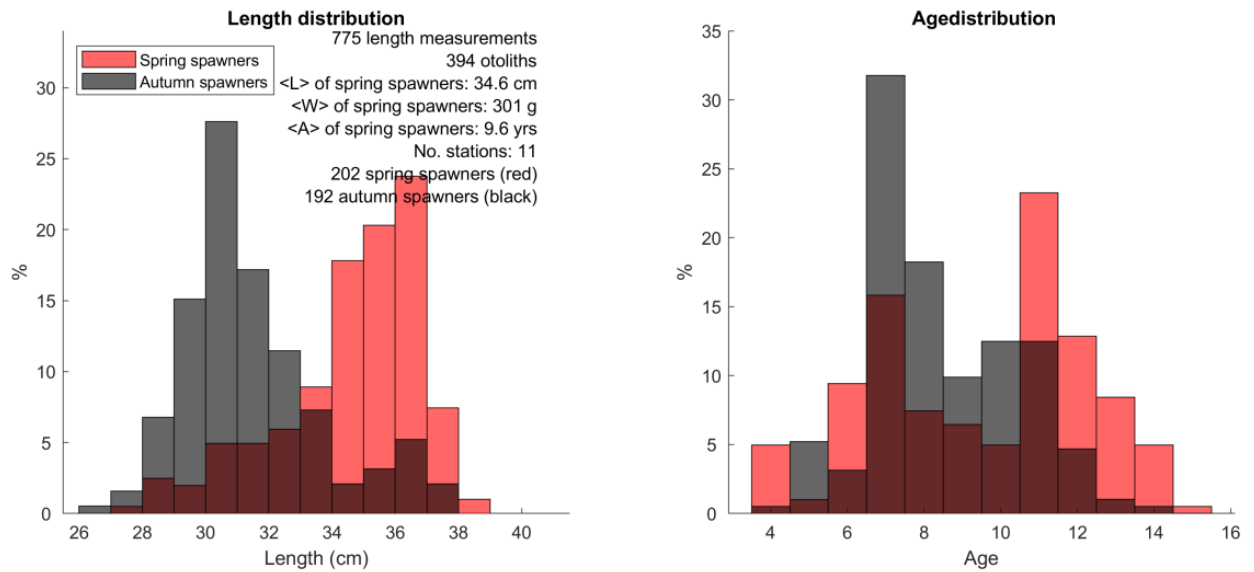


Figure 5. Length and age distribution of spring and autumn spawning herring north of the Faroes, Magnus Heinason cruise 2016, 29 April – 11 May 2020. The autumn spawners were mainly seen on Transect 1, see **Figures 3, 6** and text.

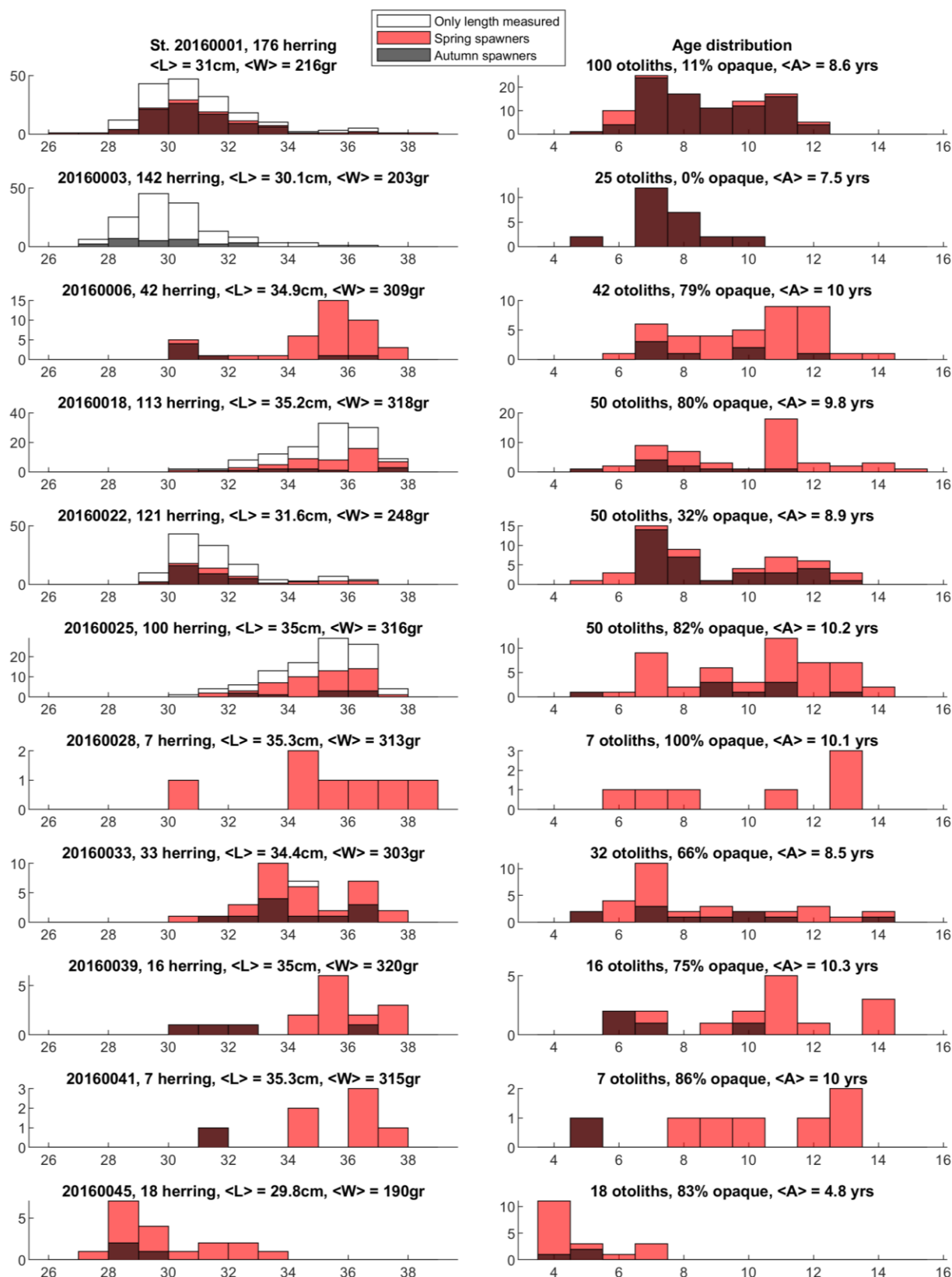


Figure 6. Herring length and age distribution by trawl station. Spring spawners are red, autumn spawners are black while only length measured herring are white. Average lengths, weights and age are based on all herrings in each sample.

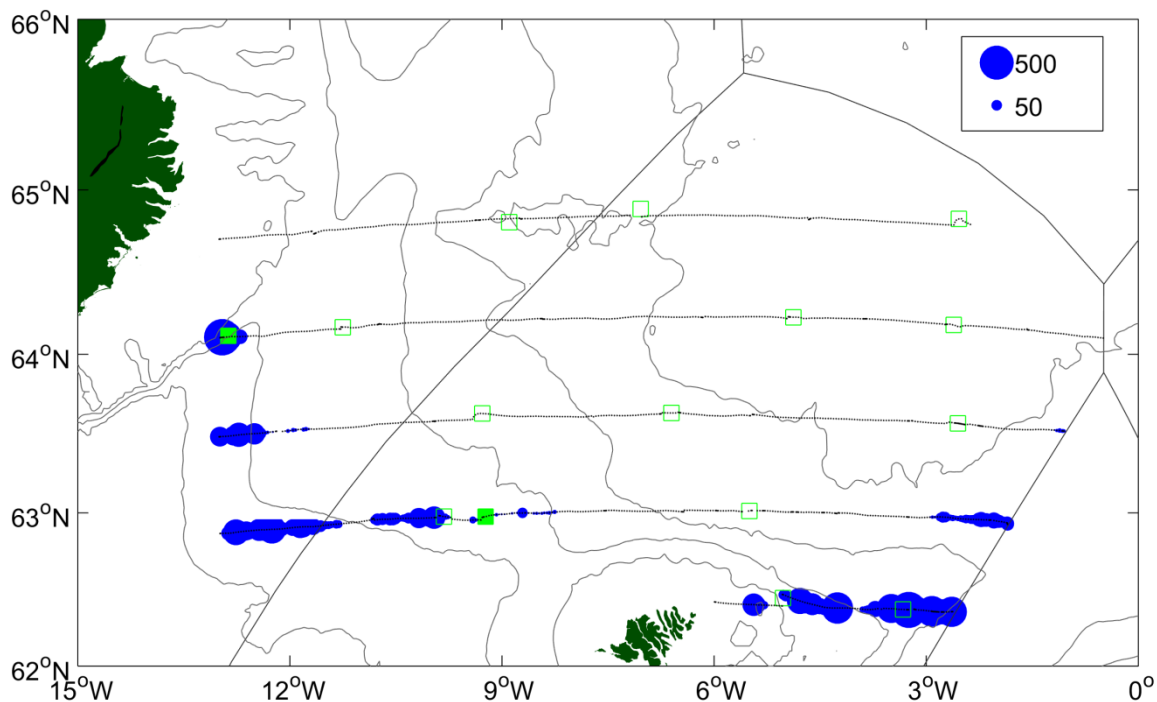


Figure 7. Integration values ($sA, m^2/nm^2$ – blue circles) of blue whiting per each nm along the cruise tracks, Magnus Heinason cruise 2016, 29 April – 11 May 2020. The size of the circles corresponds to amount of fish. Trawl stations are indicated by green squares. Blue whiting was only caught at two trawl stations – four individuals at each. These are indicated as solid squares.

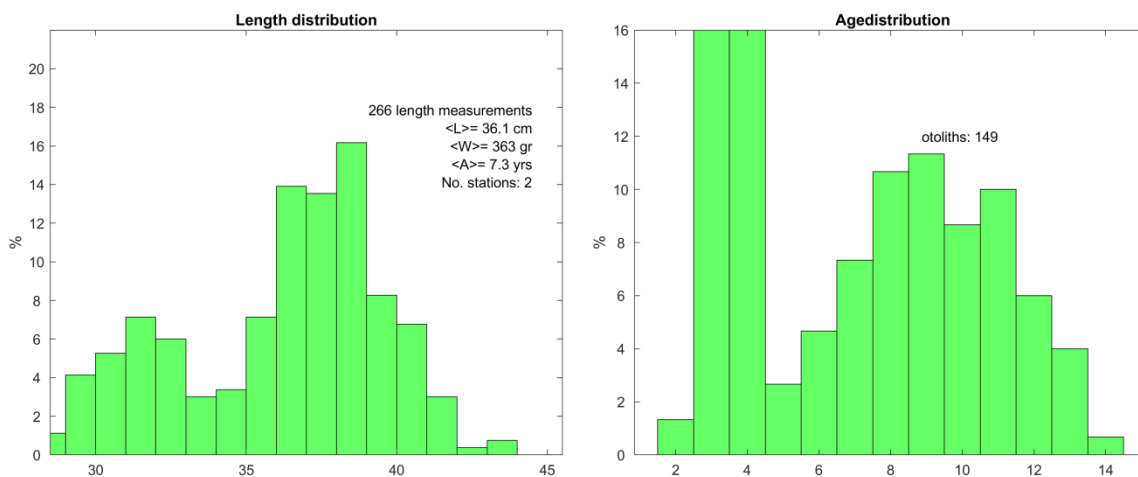


Figure 8. Length and age distribution of mackerel north of the Faroes, Magnus Heinason cruise 2016, 29 April – 11 May 2020. The mackerel was caught at two trawl stations, see **Figure 2**.

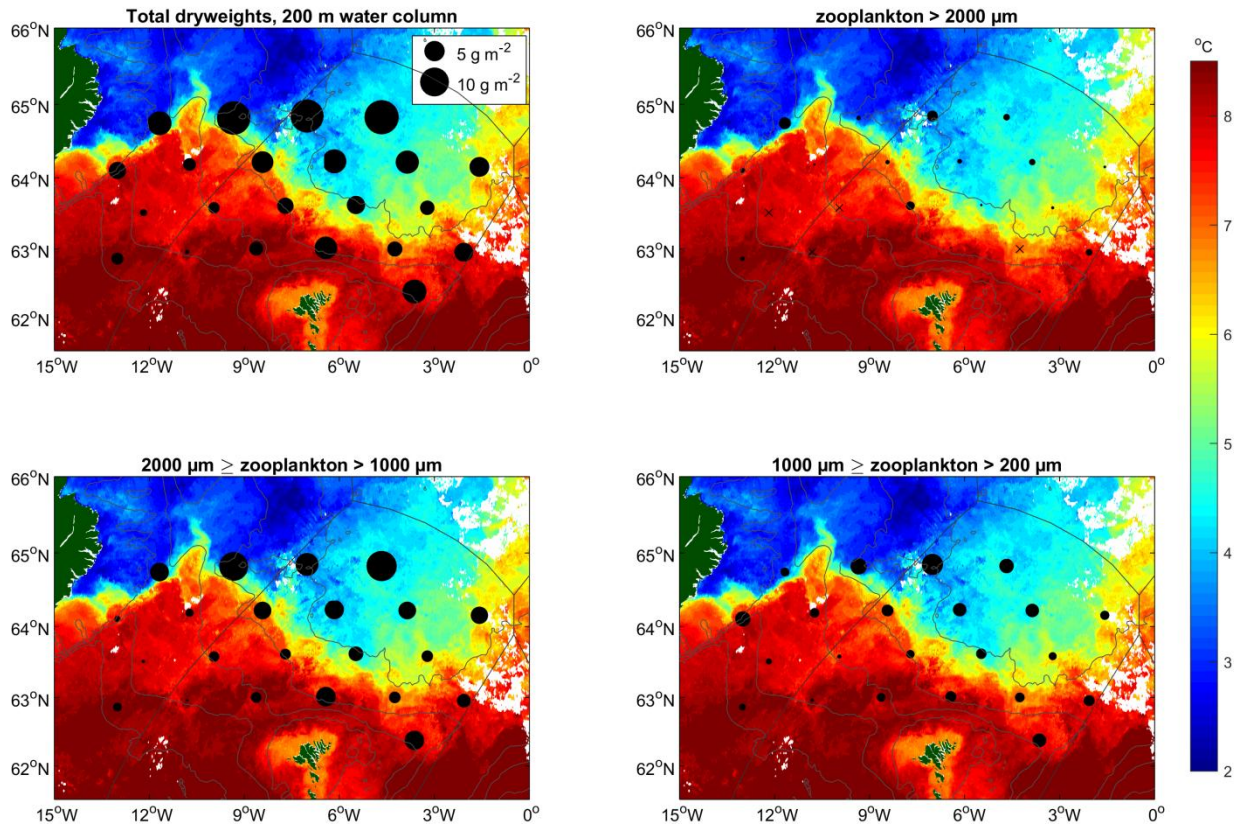


Figure 9. Distribution of zooplankton – WP2 samples, Magnus Heinason cruise 2016, 29 April – 11 May 2020, black circles. SST for the period 22 April – 29 April 2020, based on satellite observations, is shown as well.