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Preliminary Cruise Report
Cruise no. 1918

Faroese part of International Ecosystem Survey in the Norwegian Sea (IESNS) 2019

2 – 14 May 2019

R/V Magnus Heinason OW2252

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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 in the vicinity 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 2019.

In general, the cruise went as planned. 523 herring were length measured and 349 herring otoliths were sampled. 554 blue whiting were length measured and 303 blue whiting otoliths were sampled. No mackerel was caught in the trawl hauls.

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

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 distribution area and varying survey area among years.

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 (s_A) per nautical mile were averaged by each nautical mile and the recordings were scrutinised on a daily basis with the EchoView 9 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 ~25-100 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 formalin for taxonomic studies and the other size-fractionated (2000µm, 1000µm and 200µm) and dried for biomass estimates. Salinity and temperature were sampled with CTD.

RESULTS

Norwegian spring spawning herring

The preliminary results from the Faroese investigations in May 2019 indicate higher abundances of Norwegian spring spawning herring in Stratum 3 than in the last two years. The transects surveyed by the Faroese vessel change somewhat among years and this can also affect the observed biomass – this year two transects were in the southern part of stratum 4. Generally, the abundance of herring was lowest in the middle part of the survey area (**Figure 3**). The abundance in the northern part of the survey area was significantly higher than the last two-three years. In south, most of the herring was observed in the top 50 metres (**Figure 4**). In north the herring was mostly observed in schools at 150-300 m depth during the day, while during the night it was mostly distributed in the top 50 metres. There was not much overlap between herring and blue whiting registrations in the echogram, neither horizontally, nor vertically, which was also confirmed by trawl hauls. The only exception was in the north-eastern part of the survey area, where herring and blue whiting were observed as a mixture, both in the echograms and in the trawl hauls. In earlier years, based on the centre of the otoliths, the herring in the southeastern area has been a combination of spring- and autumn spawning stocks. Unfortunately, weather conditions prevented trawling on herring registrations on the two first transects, so we do not have an estimate of the percentage of autumn spawning herring this year.

The length distribution of Norwegian spring spawning herring (**Figure 6**) shows a mean length of 34.4 cm. Six year old herring were caught in the northern part of the survey area (**Figure 6**), and constituted ~25% of all age-read herring. The length distribution shows two modes – one mode with fish larger than 34 cm and a second mode at 32 cm. The latter mode reflects the high abundance of 6 year old fish. Probably, the relatively high numbers of 11-14 year old herring as compared to 15 year old (the large 2004 yearclass) is a consequence of problems with age-reading old specimens from otoliths.

Blue whiting

Due to the two transects in stratum 4 that have not been surveyed before by the Faroese research vessel, it is not possible to compare the quantities of blue whiting with the preceding years. The sum of the s_A values of blue whiting per nautical mile along the cruise tracks from the *Magnus Heinason* survey are shown in **Figure 7**.

The length and age distribution of blue whiting is shown in **Figure 8**. The mean length was 28.2 cm and the length distribution peaked at 27-29 cm. Most of the blue whiting was 4 and 5 year old, and very few 1-3 year old fish were caught. This is in line with the results from last year's IESNS survey and the IBWSS surveys the last two years.

Mackerel

No mackerel was caught in this year's survey.

Plankton and hydrography

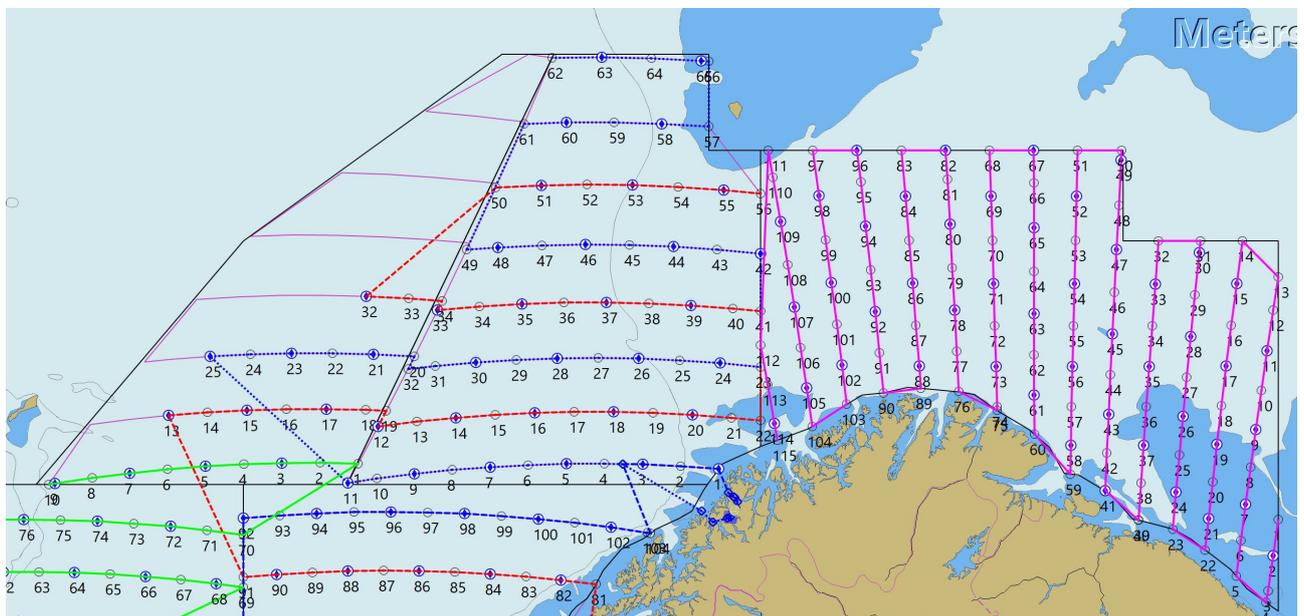
Temperature and salinity casts down to 1000 m were taken along the track; the isotherms down to 500 m based on 19 CTD stations are shown in **Figure 4**. All 19 planned CTD-stations and zooplankton stations along the tracks were sampled. Dry weights of zooplankton from WP2 samples are shown in **Figure 10**; in general, the smallest quantities of zooplankton were observed in the southwestern part of the survey area, whereas the highest abundance was seen on the two northernmost transects. Mostly it was zooplankton in the size-group 1000-2000 μm that dominated the biomass.

Survey effort for *Magnus Heinason* 2 – 14 May 2019:

Effective survey period	Length of cruise track (nm)	Trawl stations	CTD stations	Plankton sampling	Aged fish herring/blue whiting	Length-measured fish
2 – 12/5	1496	12	19	19	349/303	523/554

Trawl specifications for *Magnus Heinason*:

Circumference (m)	640
Vertical opening (m)	45–55
Mesh size in codend (mm)	40
Typical towing speed (kn)	3.0–3.5



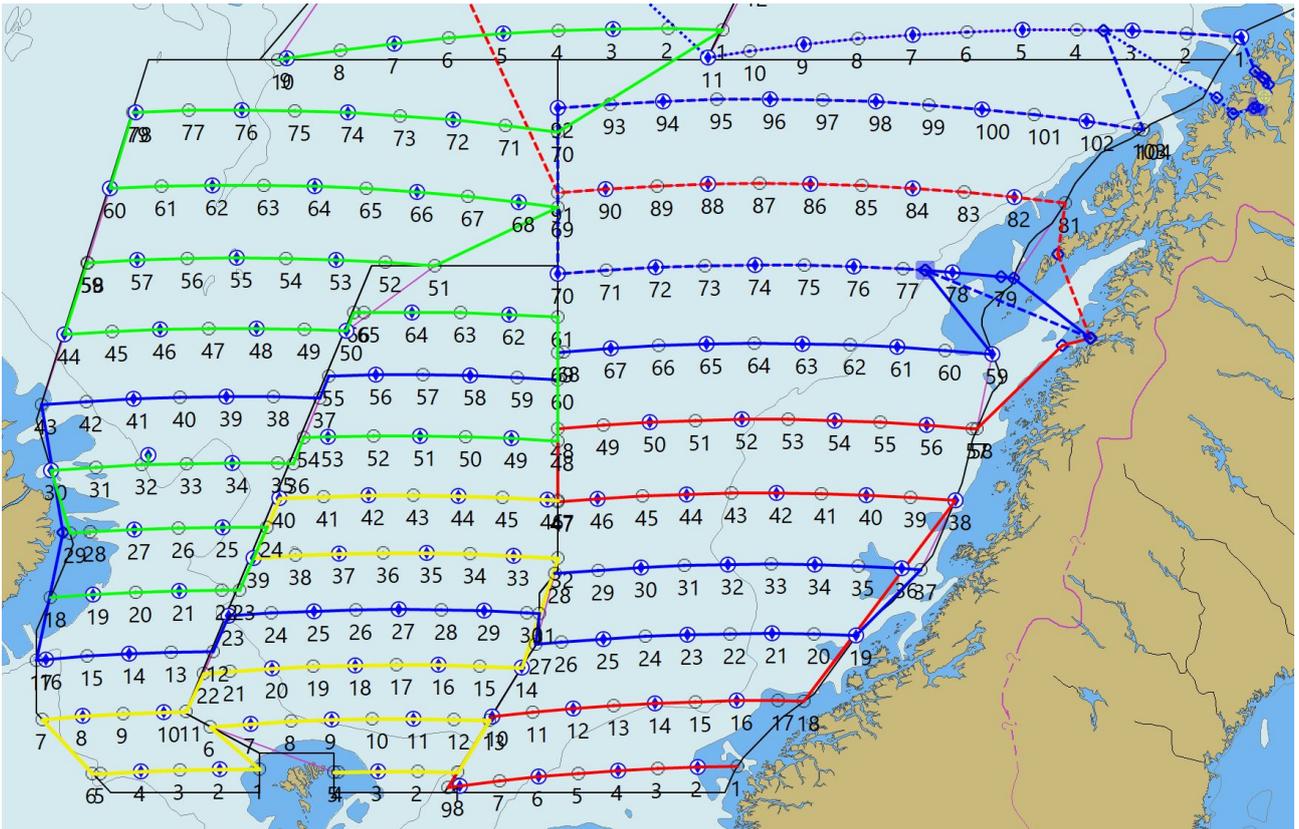


Figure 1. Cruiseplan for the International Ecosystem Survey in the Norwegian Sea in May-June 2019. The participating vessels were: *Árni Friðriksson* IS, *G.O. Sars* NO, *Dana* EU, *Magnus Heinason* FO and *Vilnyus* RU. *Magnus Heinason* covered the yellow transects north of the Faroes and into Icelandic and international waters.

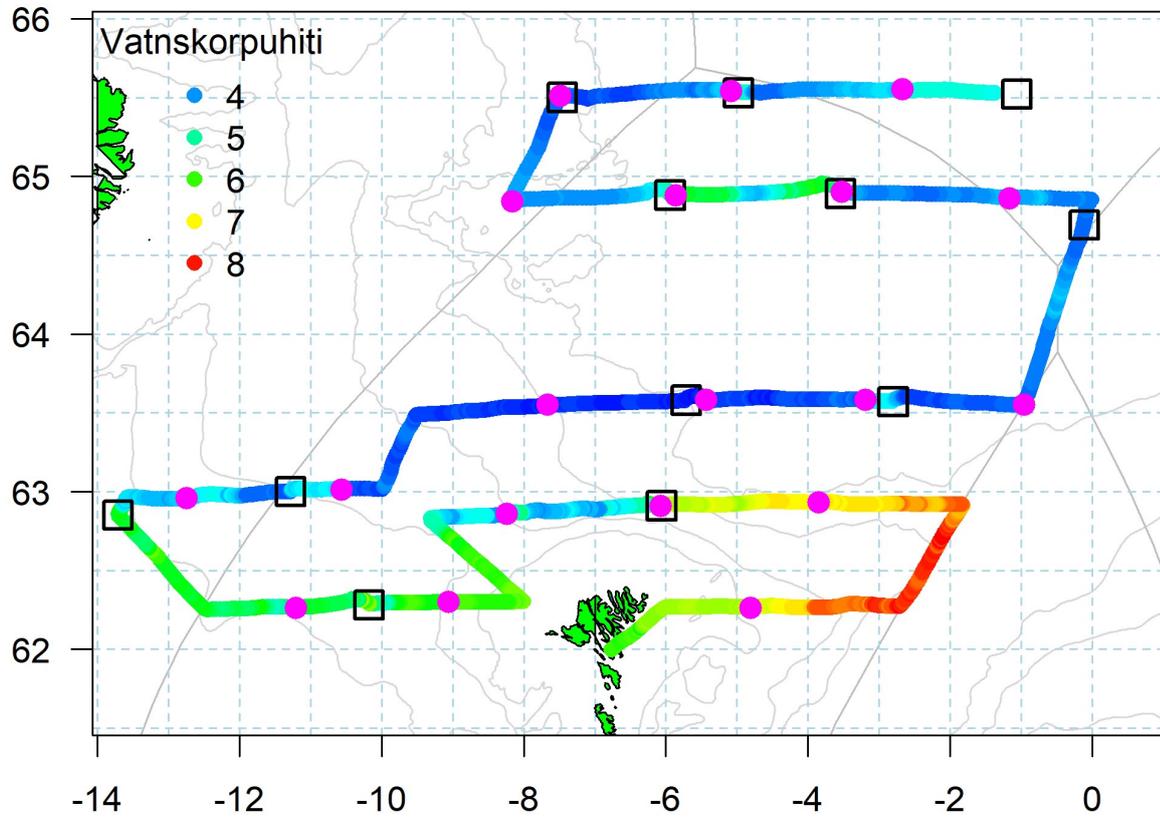


Figure 2. Cruise track, with hydrographic stations (purple circles) and trawl stations (black squares) north of the Faroes, for *Magnus Heinason* cruise 1918, 2 – 14 May 2019. The surface temperature logged onboard MH is shown on the cruise track. The total covered distance was 1496 nautical miles.

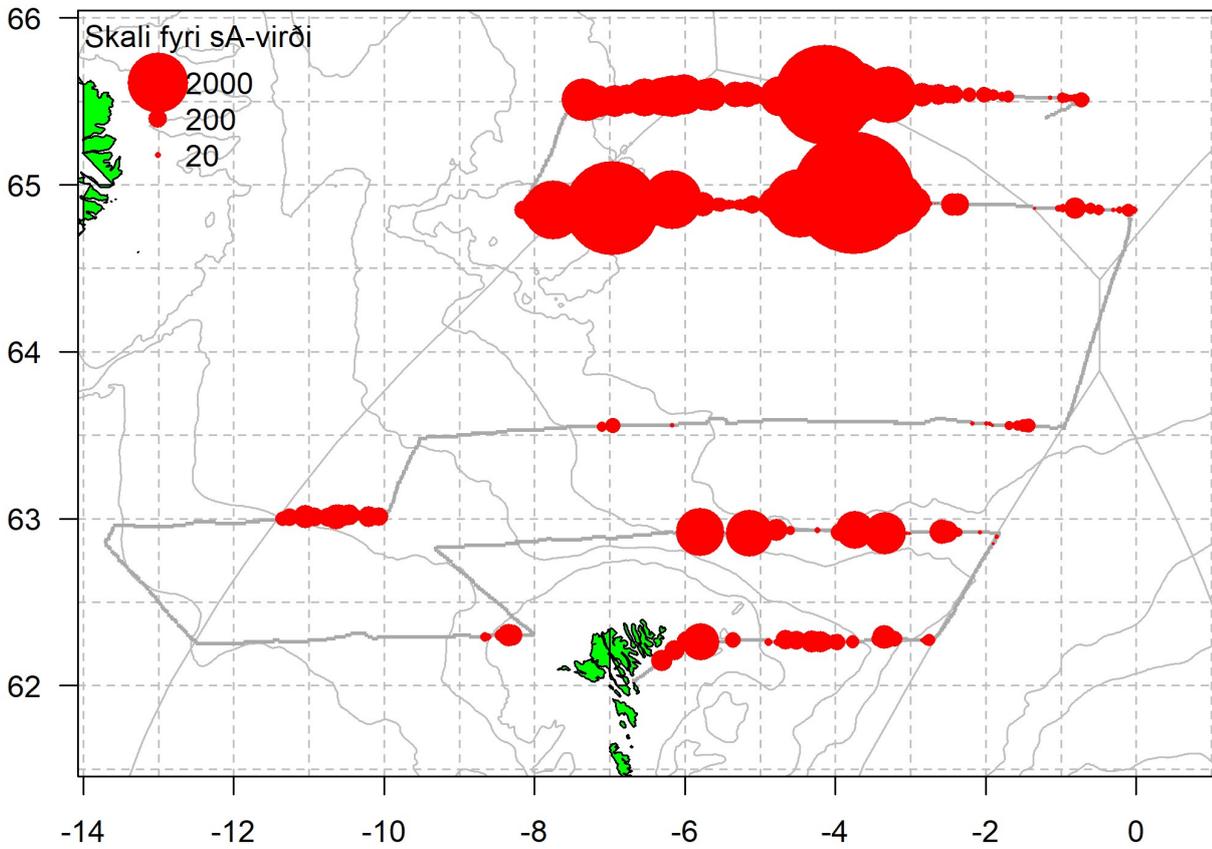


Figure 3. Integration values (s_A , m^2/nm^2) of herring per each nm along the cruise tracks, *Magnus Heinason* cruise 1918, 2 - 14 May 2019. The size of the circles corresponds to amount of fish.

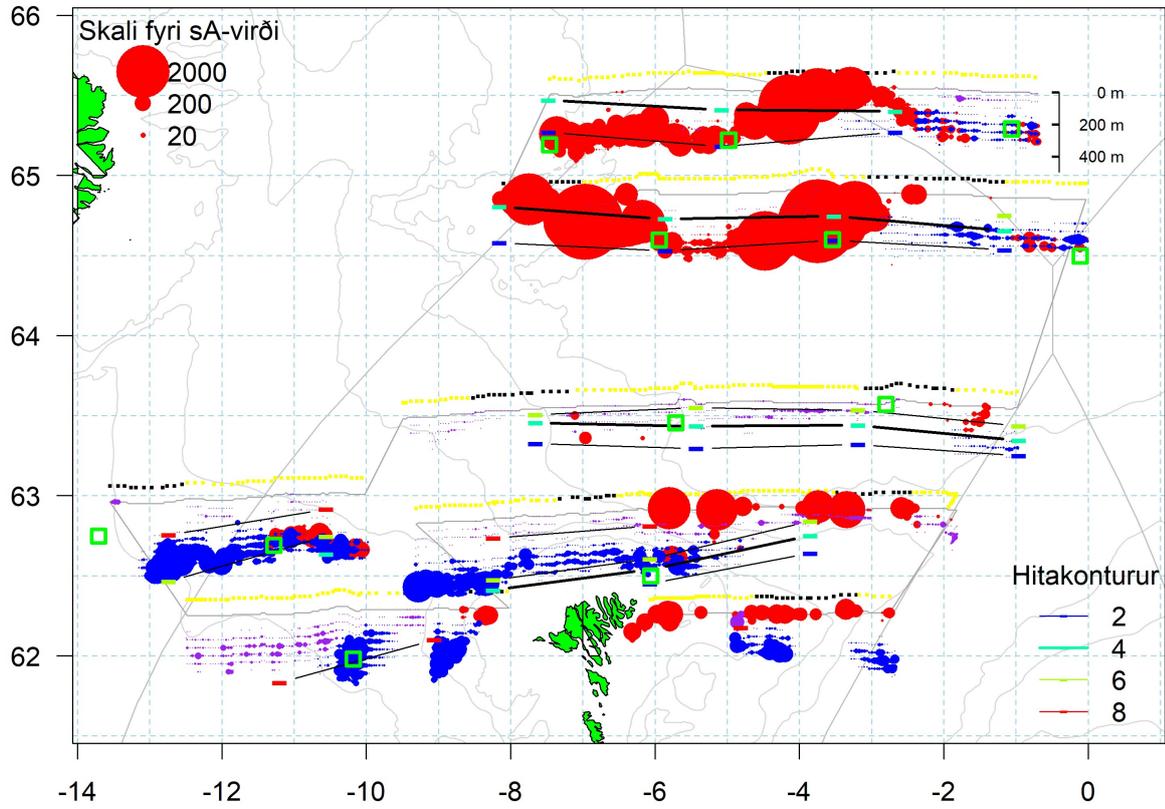


Figure 4. Vertical distribution of herring (red) and blue whiting (blue) per each nm along the cruise tracks, *Magnus Heinason* cruise 1918, 2 - 14 May 2019. The black contour lines are isotherms based on temperature casts, the 4°C isotherm is marked with a heavier line. Time of day is indicated at the top of each transect, showing the darkest hours in black, and trawl hauls are indicated by green squares.

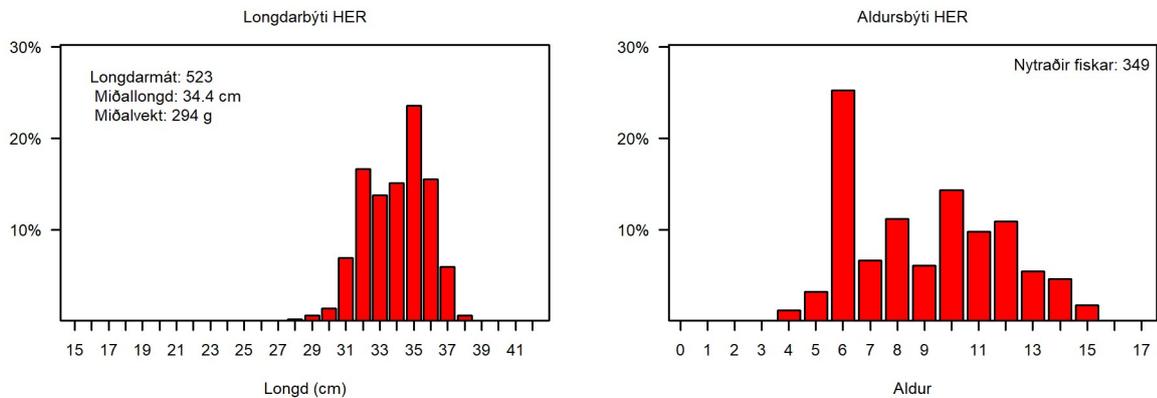


Figure 5. Length and age distribution of Norwegian spring spawning herring north of the Faroes, *Magnus Heinason* cruise 1918, 2 - 14 May 2019. The age distribution is based on fish classified as spring spawners.

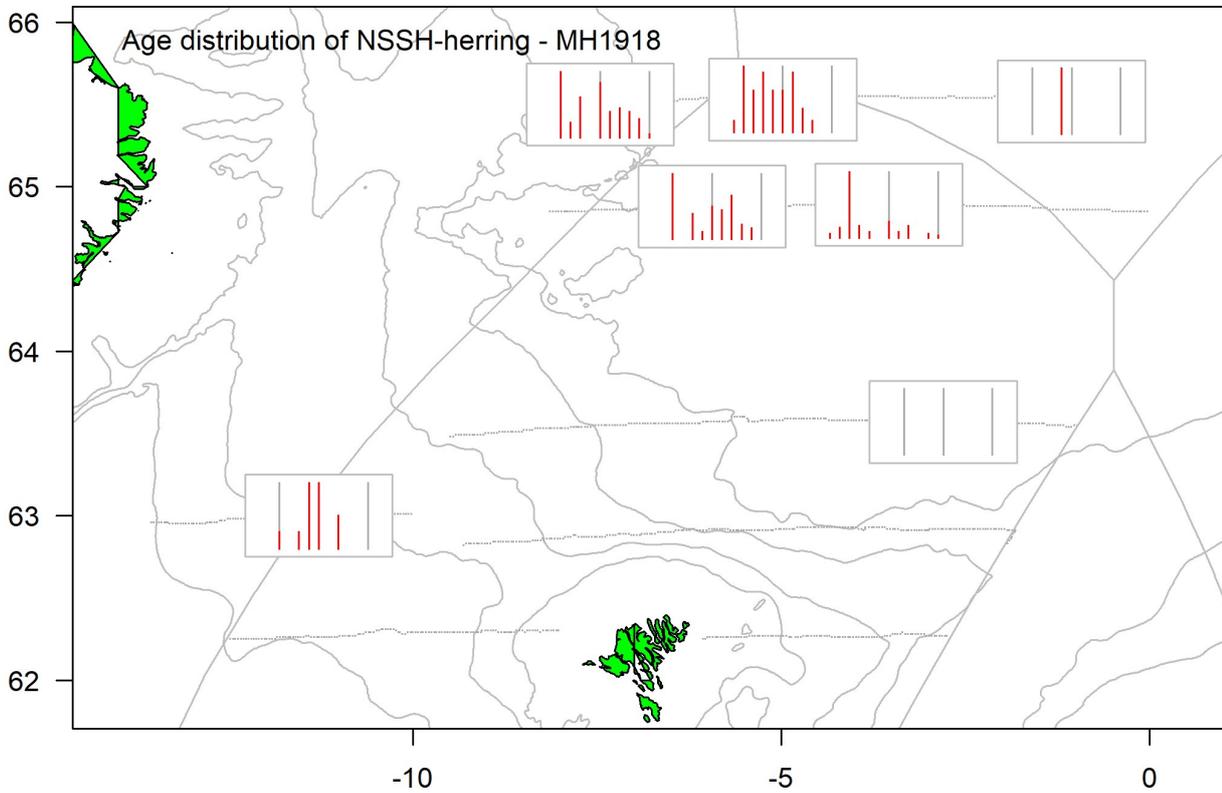


Figure 6. Age distribution by trawl station. Grey bars indicate the 2013, 2009 and 2004 year classes.

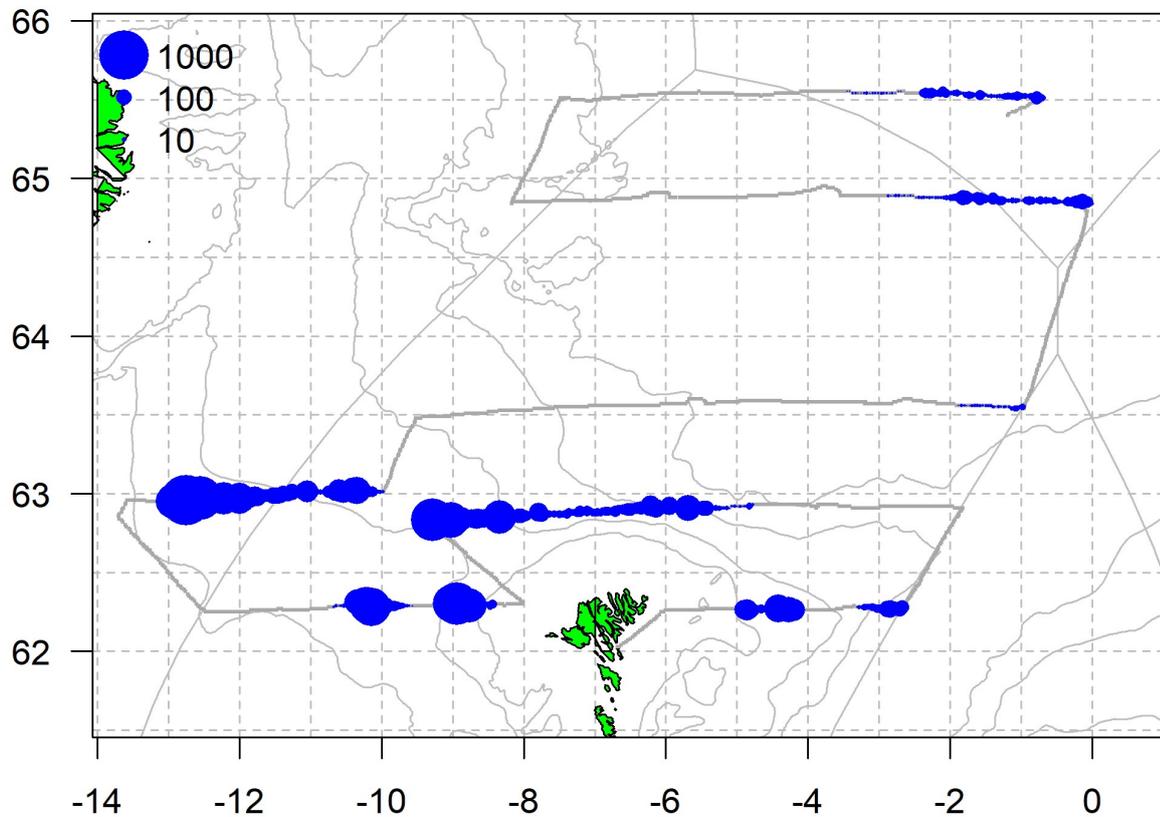


Figure 8. Integration values (s_A , m^2/nm^2) of blue whiting per each nm along the cruise tracks, *Magnus Heinason* cruise 1918, 2 - 14 May 2019. The size of the circles corresponds to amount of fish.

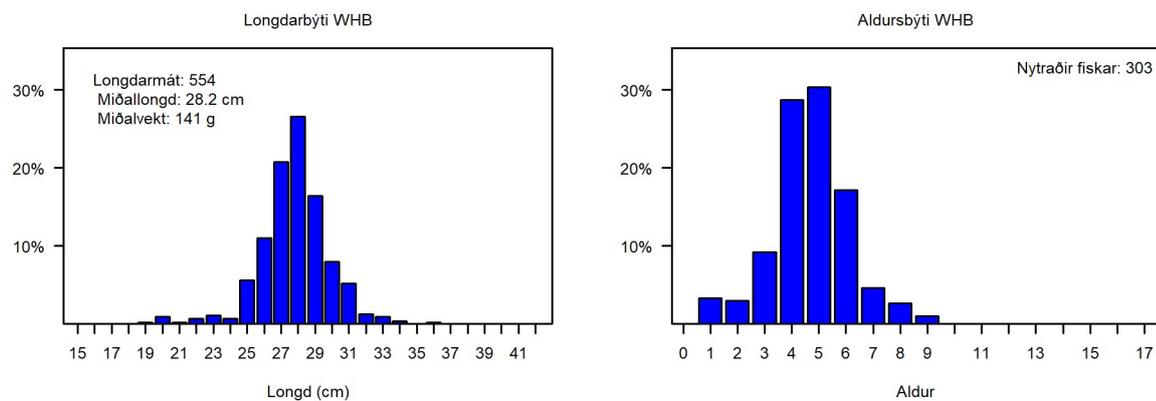


Figure 9. Length and age distribution of blue whiting north of the Faroes and in international waters, *Magnus Heinason* cruise 1918, 2 - 14 May 2019.

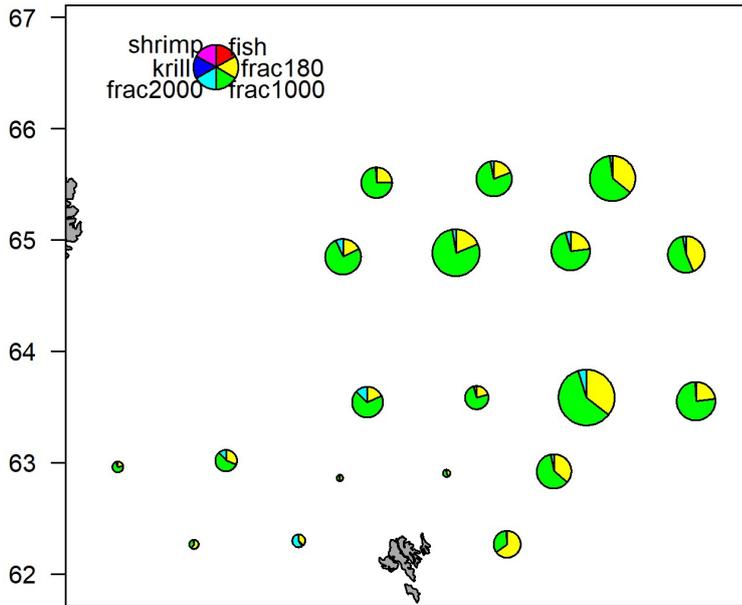


Figure 10. Distribution of zooplankton – size-fractionated WP2 samples, *Magnus Heinason* cruise 1918, 2 - 14 May 2019.