

Preliminary Cruise Report
Cruise no. 2216

Faroese part of International Ecosystem Survey in the Norwegian Sea (IESNS) 2022

28 April - 10 May 2022

R/V Jákup Sverri XPZO



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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 west and north of the Faroe Islands (yellow transects in **Figure 1**). In addition, 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 2021.

In general, the cruise went as planned. 1093 herring were length measured and 325 herring otoliths were sampled. 1595 blue whiting were length measured and 282 blue whiting otoliths were sampled. Mackerel (3 pcs) were only caught in one surface haul.

Ship	Nation
Jákup Sverri	Faroes
G.O. Sars	Norway
	Russia (did not participate in 2022)
Árni Friðriksson	Iceland
Dana	Denmark (EU)
Resolute	Scotland

The present survey report is based on data from R/V *Jákup Sverri* 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-80 echo sounder. Data from the keel 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 LSSS software and allocated to primarily herring or blue whiting based on pelagic trawling aimed at the various acoustic recordings. The 38 kHz echo sounder (as well as other frequencies) was calibrated prior to this year’s survey 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 5 individuals of herring and blue whiting. Otoliths were sampled from ~25-50 individuals, for which sex and maturity stage was also registered. Length and weight were measured for up to additionally 100 individuals. For non-target species, length and weight was measured.

Zooplankton was sampled by WP2 net (0.25m² - 200µm mesh-size). The samples were split in half – one part was preserved in 4% formalin for taxonomic studies and the other size-fractionated (2000µm, 1000µm and 200µm) and dried for biomass estimates. Salinity and temperature were sampled with SeaBird CTD 911+.

RESULTS

Norwegian spring spawning herring

The preliminary results from the Faroese investigations in May 2022 indicated lower abundances of Norwegian spring spawning herring in the southern part of Stratum 3 than last year. The abundance was approximately the same as in 2020 but the distribution was more northerly within the area covered by the Faroese vessel. The transects surveyed by the Faroese vessel change somewhat among years and this can also affect the observed biomass and distribution. Generally, herring was only found on the two northernmost transects (**Figure 3**) and on the three southernmost transects, virtually no herring was observed. 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; only very few autumn spawners were observed this year – this is linked to the fact that no herring was observed on the two southernmost transects.

The length distribution of Norwegian spring spawning herring (**Figure 4**) shows a mean length of 32.9 cm. Six year old herring constituted more than half of all age-read herring and nine year old herring approximately 15%. The proportion of old herring (older than age 10) is now relatively low as compared to around five years ago.

Blue whiting

The abundance of blue whiting in May has been increasing the last two years – but is still less than when large year classes entered the stock around 2015. The sum of the s_A values of blue whiting per nautical mile along the cruise tracks from the *Jákup Sverri* survey are shown in **Figure 5**.

The mean length of blue whiting was 22.7 cm (**Figure 6**) but was clearly tri-modal. More than 60 % of age-read blue whiting were 2 year old, around 25% were 1 year old, and the remaining fish were 3-8 year old fish. There are now clear indications that the 2020 year class is a good year class and even the 2021 year class may be a relatively good one as well.

Overlap between herring and blue whiting

Only in the easternmost part of the survey area, there was overlap between herring and blue whiting registrations in the echogram, which was also confirmed by trawl hauls. 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 (**Figure 7**). Blue whiting was observed continuously mainly at 200-400 m depth and there was also indication of vertical migrations up in the water column during the darkest hours.

Mackerel

Mackerel (3 pcs) were only caught in one surface haul on the first transect (**Figure 8**).

Pink salmon

Pink salmon was caught at one station. So far, pink salmon have mostly been observed at sea odd years, so it was not expected to catch any quantities of pink salmon.

Plankton and hydrography

Temperature and salinity casts down to 1000 m were taken along the track. All the planned 23 CTD-stations and zooplankton stations along the tracks were sampled. Dry weights of zooplankton from WP2 samples are shown in **Figure 9**; in general, the smallest quantities of zooplankton were observed in the western part of the survey area, whereas the highest abundance was seen in the eastern part of the survey area. Mostly, it was zooplankton in the size-group 1000-2000 μm that dominated the biomass.

Table 1. Survey effort for *Jákup Sverri* 28 April - 10 May 2022:

Effective survey period	Length of cruise track (nmi)	Trawl stations	CTD stations	Plankton sampling	Aged fish herring/blue whiting	Length-measured fish
28/4 – 8/5	1464	19	23	23	325/280	1093/1595

Table 2. Trawl and sampling specifications for *Jákup Sverri*:

	Jákup Sverri
<u>Trawl dimensions</u>	
Circumference (m)	832
Vertical opening (m)	44-55
Mesh size in codend (mm)	45
Typical towing speed (kts)	3.7 (3-4.5)
<u>Plankton sampling</u>	
Sampling net	WP2 plankton net
Standard sampling depth (m)	200
<u>Hydrographic sampling</u>	
CTD Unit	SBE911
Standard sampling depth (m)	1000

Table 3. Acoustic instruments and settings for the primary acoustic sampling frequency for *Jákup Sverri* in spring 2022.

Jákup Sverri	
Echo sounder	Simrad EK80
Frequency (kHz)	18, 38 , 70, 120, 200, 333
Primary transducer	ES38-7
Transducer installation	Drop keel
Transducer depth (m)	6
Upper integration limit (m)	15
Absorption coeff. (dB/km)	10.3
Pulse length (ms)	1.024
Band width (kHz)	3.06
Transmitter power (W)	2000
Angle sensitivity (dB)	21.9
2-way beam angle (dB)	-20.4
Sv Transducer gain (dB)	
Ts Transducer gain (dB)	26.94
s _A correction (dB)	-0.13
3 dB beam width (dg)	
alongship:	6.47
athw. ship:	6.54
Maximum range (m)	750
Post processing software	LSSS

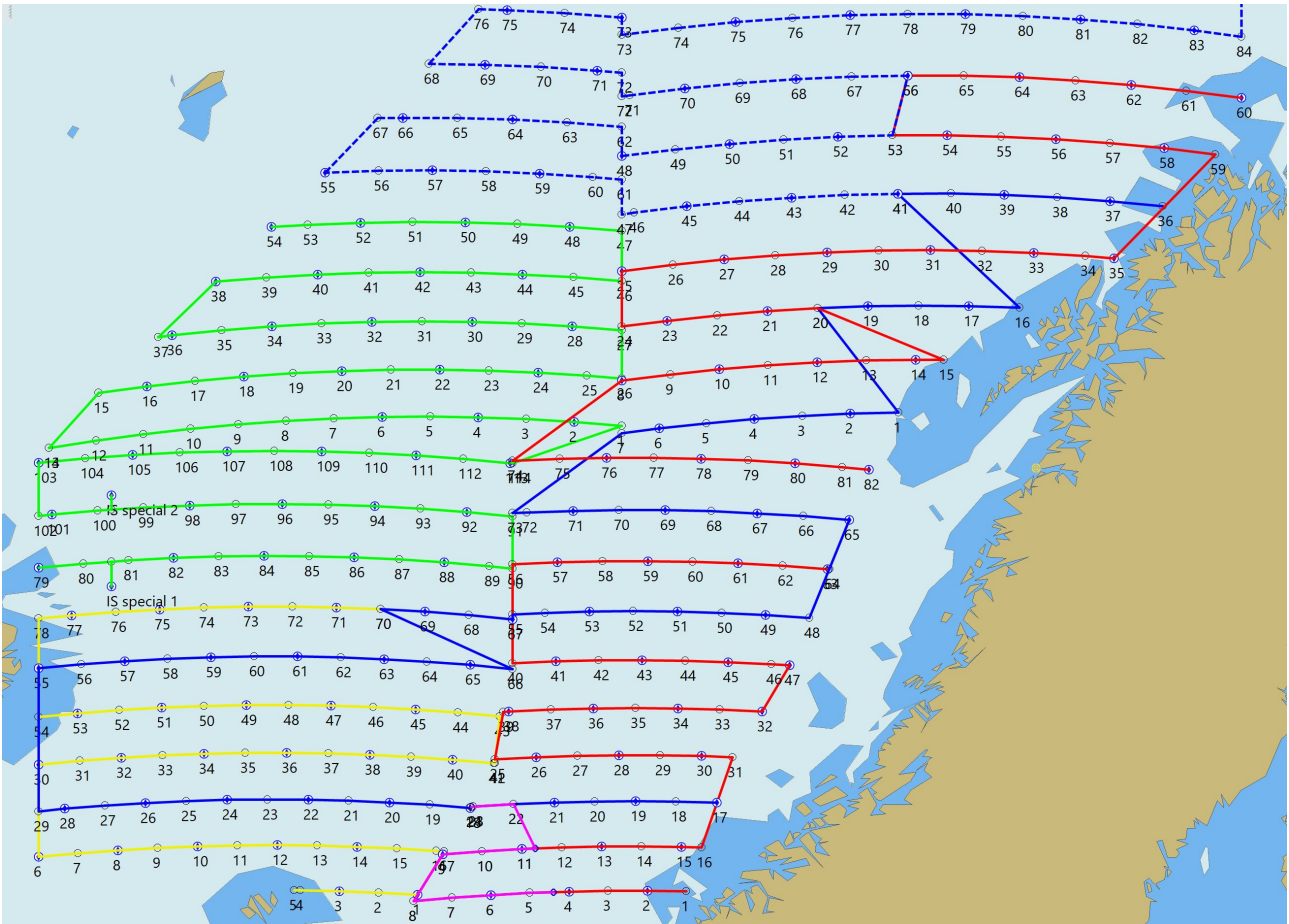


Figure 1. Cruiseplan for the International Ecosystem Survey in the Norwegian Sea in April-May 2022. The participating vessels were: *Árni Friðriksson* IS, *G. O. Sars* NO, *Dana* EU, *Jákup Sverri* FO and *Resolute* UK-Scotland. *Jákup Sverri* covered the yellow transects north of the Faroes and into Icelandic and international waters.

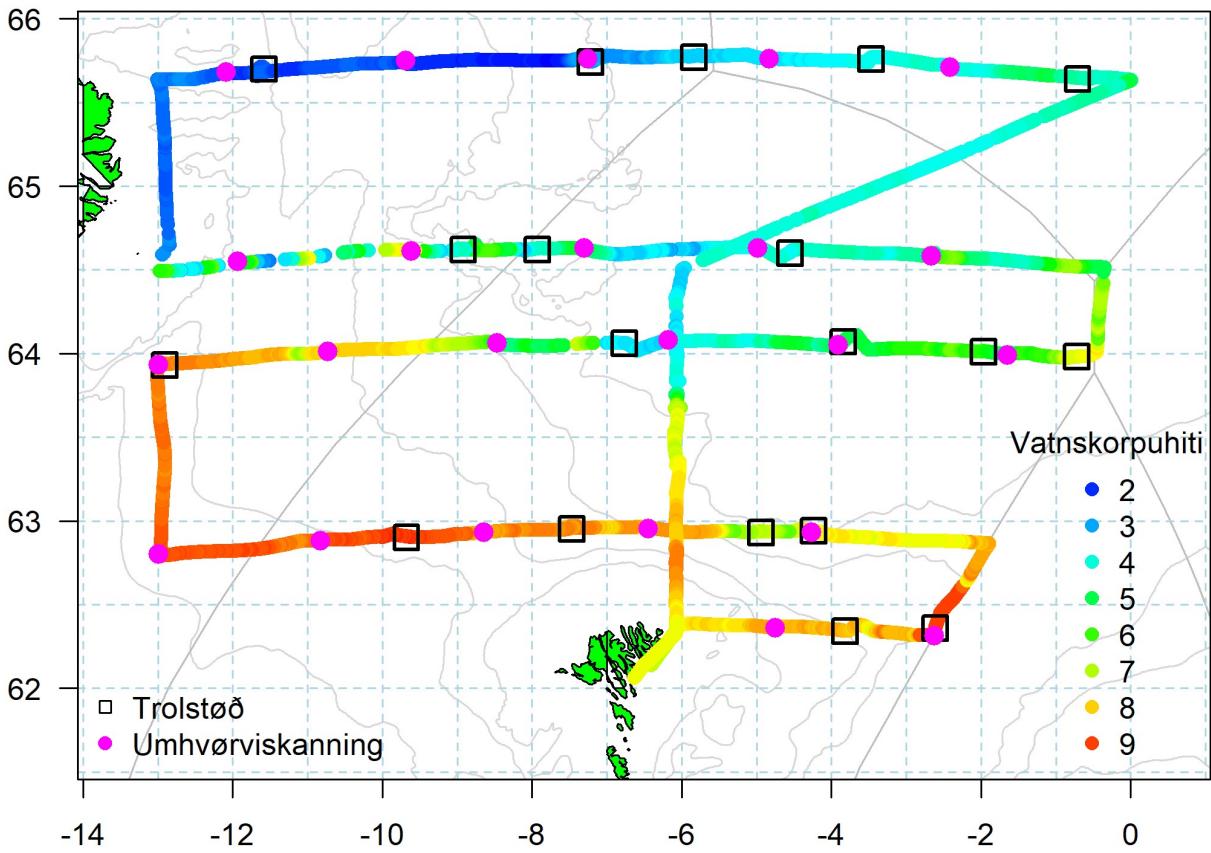


Figure 2. Cruise track, with hydrographic stations (purple circles) and trawl stations (black squares) north of the Faroes, for *Jákup Sverri* cruise 2216, 28 April - 10 May 2022. The surface temperature is indicated by colour scale along the cruise track. The total covered distance was 1464 nautical miles.

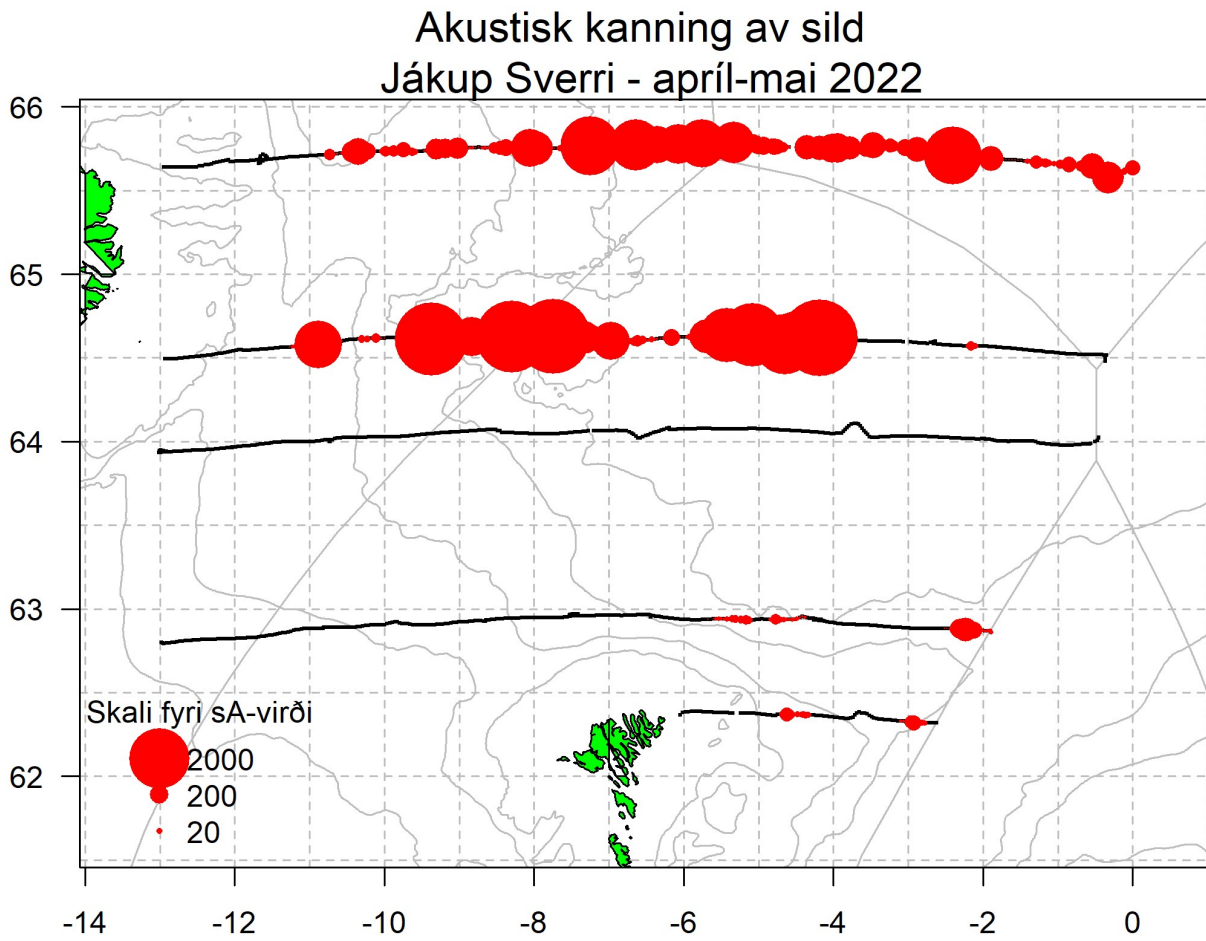


Figure 3. Integration values (s_A , m^2/nm^2) of herring per each nmi along the cruise tracks, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022. The size of the circles corresponds to biomass of fish.

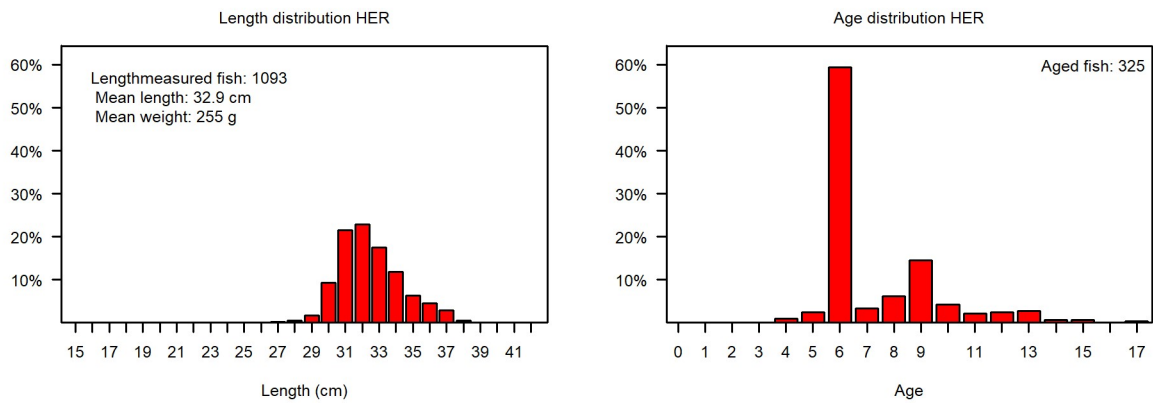


Figure 4. Length and age distribution of Norwegian spring spawning herring north of the Faroes, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022. The age distribution is based on fish classified as spring spawners.

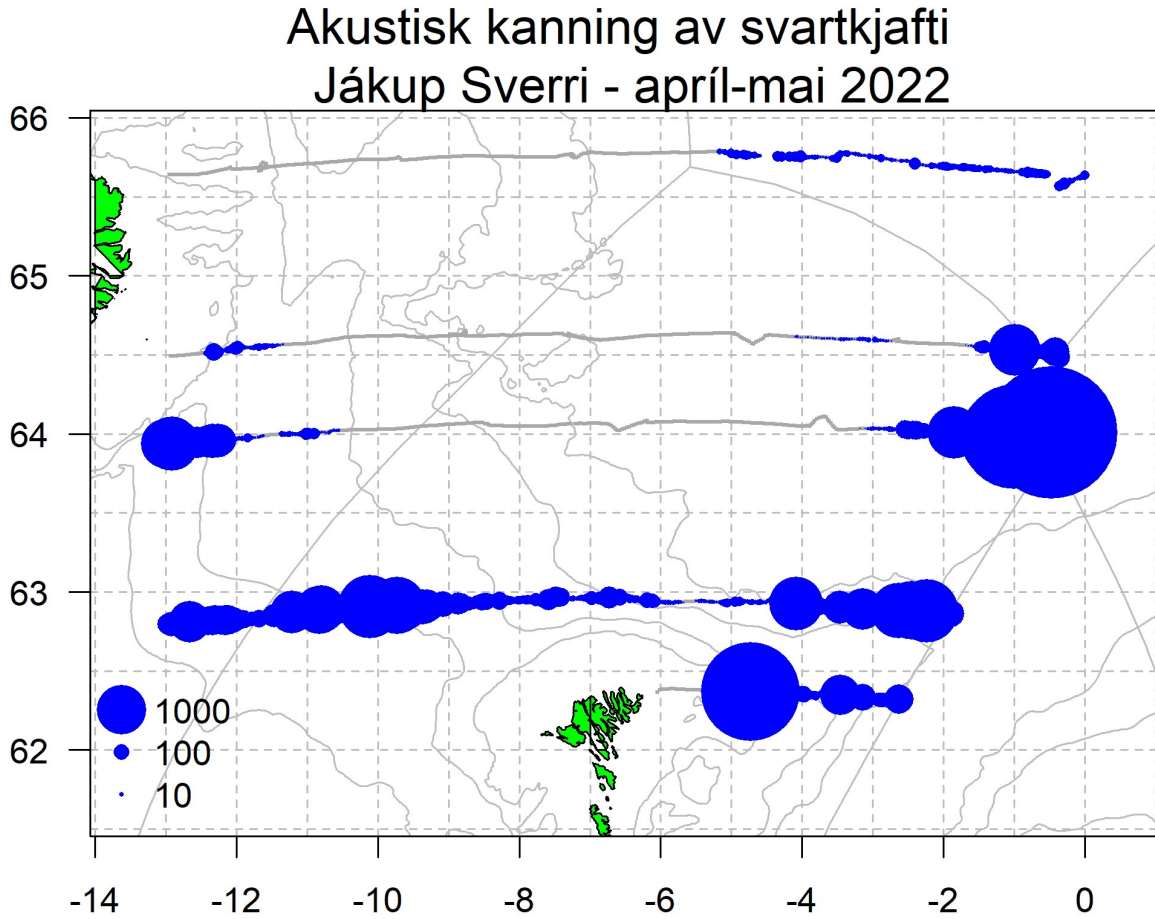


Figure 5. Integration values ($s_A, m^2/nm^2$) of blue whiting per each nmi along the cruise tracks, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022. The size of the circles corresponds to biomass of fish.

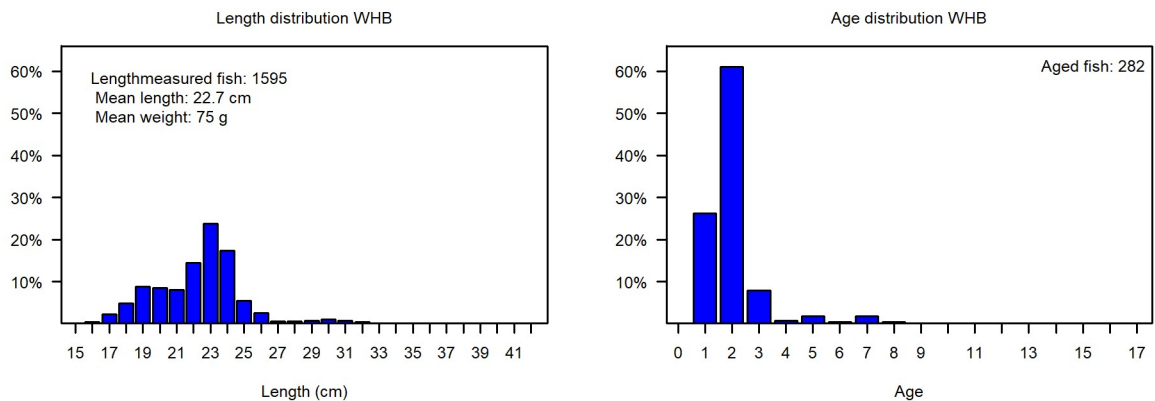


Figure 6. Length and age distribution of blue whiting north of the Faroes, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022.

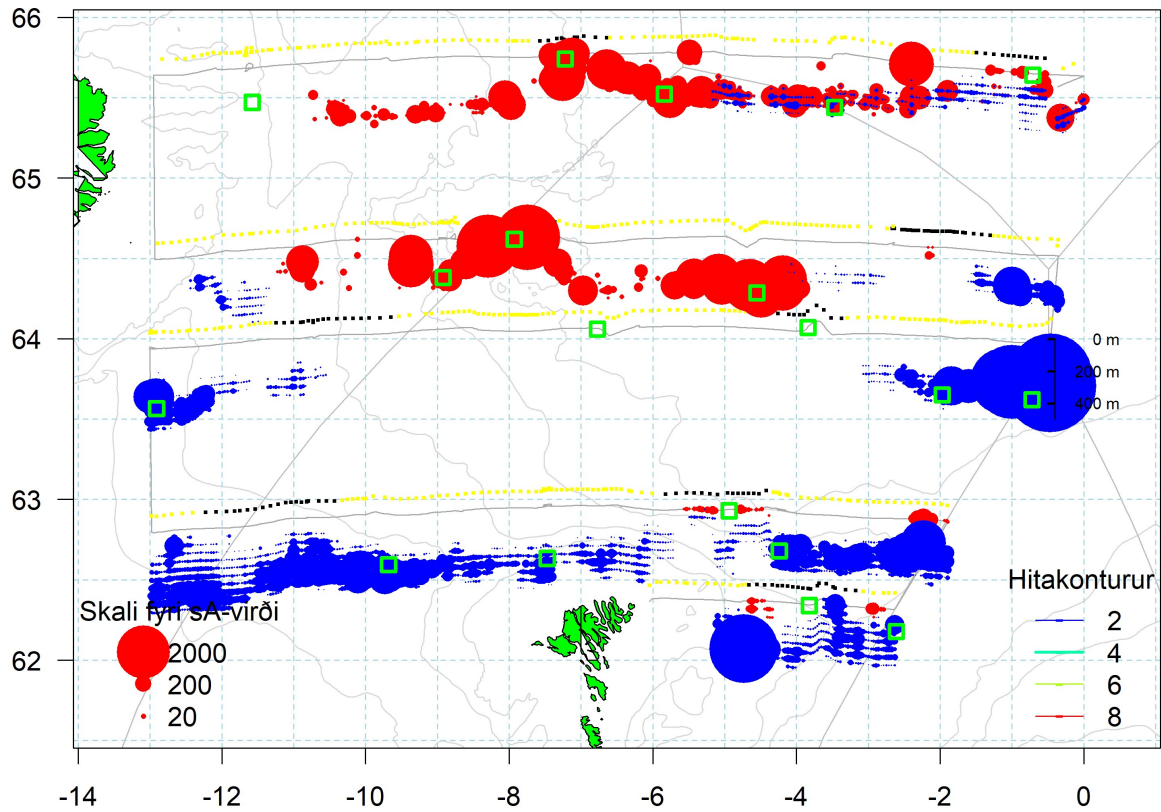


Figure 7. Vertical distribution of herring (red) and blue whiting (blue) per each nmi along the cruise tracks, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022. Time of day is indicated at the top of each transect, showing the darkest hours in black and daytime in yellow. Trawl hauls are indicated by green squares.

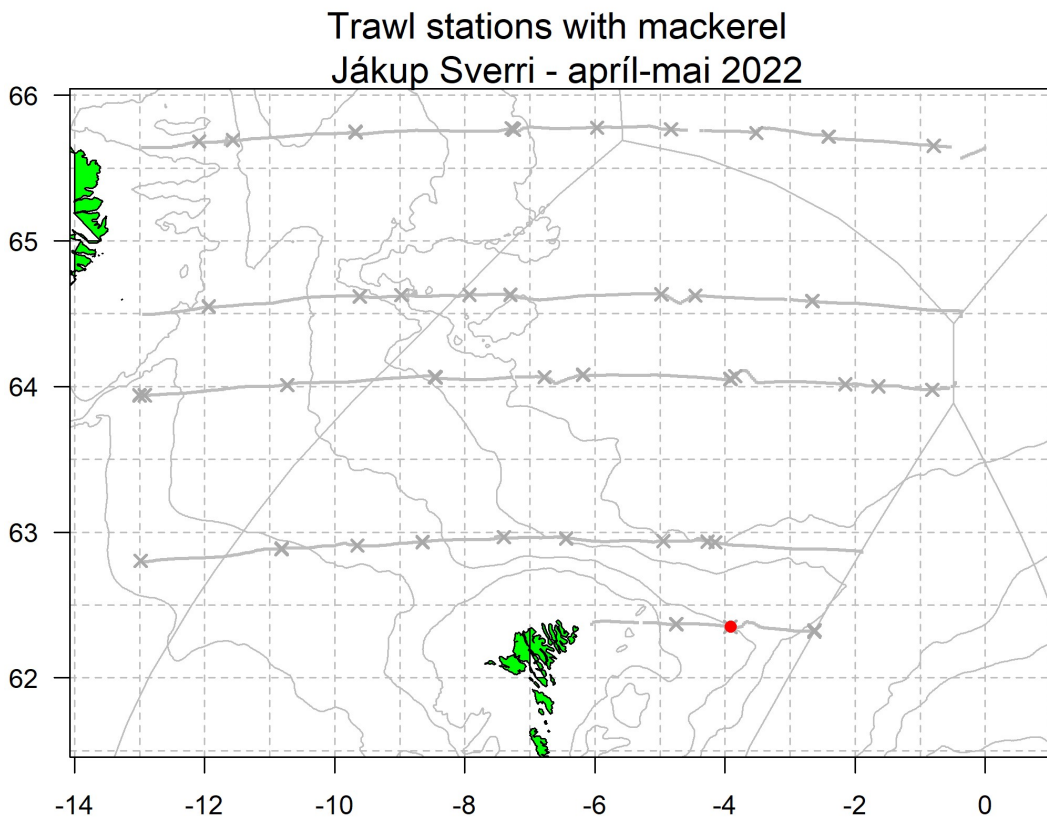


Figure 8. Trawl station with mackerel (red dot) along the cruise tracks, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022.

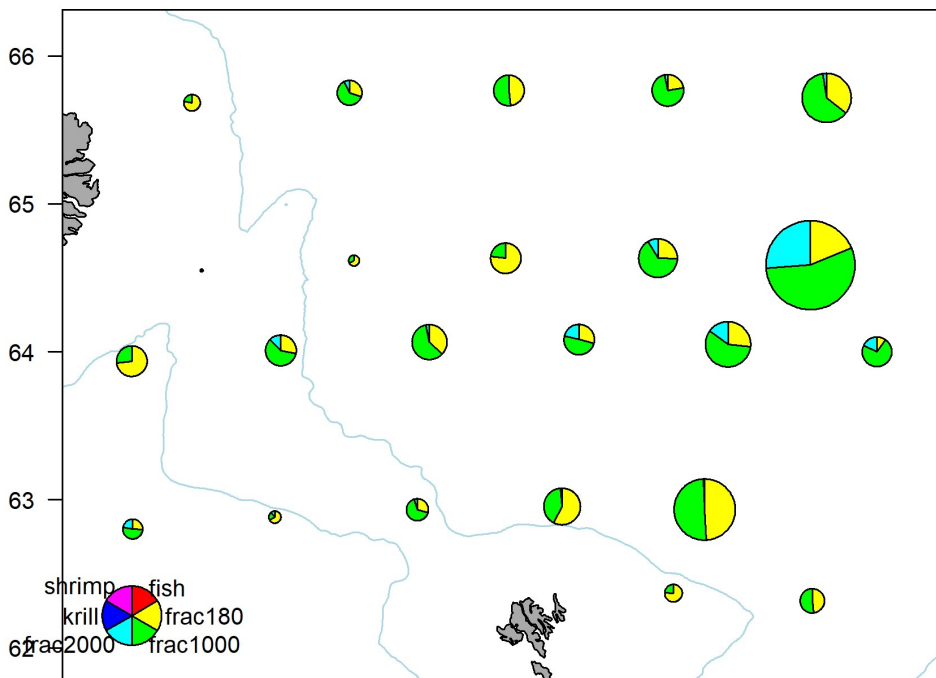


Figure 9. Distribution of zooplankton – size-fractionated WP2 samples, *Jákup Sverri* cruise 2216, 28 April - 10 May 2022.