

Preliminary Cruise Report
Cruise no. 2052

Faroese part of International Ecosystem Summer Survey in the Norwegian Sea 2020

02 July – 18 July 2020

M/T Tróndur í Gøtu



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INTRODUCTION

The main aim of this survey was to investigate the distribution and abundance of Northeast Atlantic mackerel (mackerel), Norwegian spring-spawning herring (herring) and blue whiting in the Northeast Atlantic. Zooplankton and hydrographic data were collected along the cruise tracks.

The cruise was part of the joint International Ecosystem Summer Survey in the Nordic Seas (IESSNS). Five parties and six research vessels (see text table below) took part in the survey, coordinated by the “Working Group of International Pelagic Surveys” (WGIPS) in ICES. The results from all vessels combined were used in the assessment of mackerel, herring and blue whiting by the “Working Group on Widely Distributed Stocks” (WGWIDE) in August-September 2020.

Vessel	Nation
Tróndur í Gøtu	Faroes
Vendla	Norway
Kings Bay	Norway
Árni Friðriksson	Iceland
Eros	Greenland
Ceton	Denmark

The present survey report is based on data from M/V *Tróndur í Gøtu* only. Therefore no biomass estimate is given due to incomplete coverage of the area. Only the results from the Faroese survey are presented. The combined results with biomass estimates are available in the survey report presented to WGWIDE in September 2020, and which will be part of the WGIPS report from the WGIPS meeting in January 2021.

MATERIAL AND METHODS

Cruise tracks with stations, i.e. predefined pelagic trawl stations and hydrographical stations (CTD and WP2 plankton), are shown in **Figure 1**. For mackerel, the surface swept-area trawl survey method was used based on 30 min trawling at regularly spaced (approximately 52 nmi apart) trawl stations on equally spaced latitudinal tracks with a randomly selected starting latitude. The specifically designed standard MULTPELT 832 survey trawl (**Table 1**) with standardised rigging was used conforming to standard operational settings (see Nøttestad et al. 2016 for further details). For herring and blue whiting standard acoustic survey methods were used. The acoustic data were recorded with a Simrad EK-60 echosounder. 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 LSSS software and allocated to herring and blue whiting based on pelagic trawling aimed at the various acoustic recordings. The trawl gear was monitored during trawling with designed trawl sensors measuring depth and spread of the trawl. Light measurements were done during trawling. The 38 kHz Echo sounder was calibrated prior to survey with a standard copper sphere. During the first part of the survey there were issues with acoustic noise – these issues (fauna on the transducers) were resolved a week into the survey, and thereafter the 38 kHz echosounder was calibrated again (two columns in Table 5). The data from this first week was usable down to 150 m.

RESULTS

The total survey effort (number of trawl stations and biological sampling) is shown in **Table 2** and **3**. The various trawl settings and operation details are given in **Table 4** and the acoustic settings in **Table 5**. The depth of the trawl doors, the door spread and vertical opening of the trawl based on

sensor data are given in **Table 6**, and the reported values were all within the standards recommended for the MULTPELT trawl.

Mackerel

Mackerel was caught in 29 of the 38 predetermined surface trawl stations in the survey area (**Figures 1 and 2**). The average catches of mackerel in the Faroese survey area 2020 were in line with the catches in 2018, but somewhat lower than in 2019. It should however be noted that the covered areas have not been identical among years. The catches of mackerel and herring on each surface trawl station are shown as pie charts in **Figure 1**. The highest concentrations of mackerel were generally observed north off the Faroe Plateau and on and north off the Faroe - Iceland ridge. Only very limited amounts of mackerel were caught south of the Faroes and over the banks west of the Faroes.

The mean length of mackerel was 37.7 cm and mean weight 504 g (**Figure 2**). The age distribution (**Figure 2**) shows that the bulk was 7-11 year old fish.

Norwegian spring spawning herring

The average abundance of herring indicated lower abundances in 2020 than in recent years. The surveyed area changes somewhat between years and this can affect the observed biomass.

Herring was observed in a broad band from east of the Faroes in a north-western direction towards Iceland (**Figure 1 and 3**). The herring in the south-eastern part of the Faroese survey area may originate from several herring stocks, and the herring has not been split into stocks in this report. The herring north of the Faroes and towards Iceland is, however, most likely Norwegian spring-spawning herring, while the herring on the eastern Icelandic plateau most likely is of Icelandic summer-spawning origin (**Figure 1 and 3**).

The herring was mainly observed in the upper 10-50 m throughout the survey area. The highest abundances were observed north off the Faroe Plateau and Faroe-Iceland ridge (**Figure 3**).

The length distribution of herring was mainly 30-35 cm herring (**Figure 4**). The age distribution shows that the 2016 year class has also reached this western area in 2020 (**Figure 4**). The 2013 year class was, however, the most abundant year class (25% of the aged fish) in the Faroese survey area. Relatively few specimens were older than 11 years.

Blue whiting

Blue whiting was found in a rather loose scattering layer from 50-100 m down to about 350-400 m north of the Faroe Plateau and along the Faroe – Iceland ridge and in the southern part of the surveyed area (**Figure 5**). The density of the blue whiting layer was higher in the continental slope areas and on the Iceland-Faroe Ridge as seen from the s_A values per each nautical mile. In the southernmost part of the survey area dense aggregations of 0-group blue whiting were observed.

The length and age distribution of blue whiting is shown in **Figure 6**. The mean length was 19.5 cm and the mean weight 69 g, but these numbers do not tell the true story, as the length distribution consisted of two groups. A lower group of 0-group blue whiting with a mean length of 13 cm (??) and a group of larger fish (> 21 cm) consisting of 2 to 7 year old fish. The 0-group blue whiting were observed in several stations on the two southernmost transects.

Other species

Lumpfish of all sizes were caught in small numbers in the upper 30 m of the water column in several stations throughout the surveyed area. No salmon was caught this year.

Zooplankton

Zooplankton was sampled on all trawl stations with WP2 200 µm zooplankton net. In total 38 stations. The main zooplankton throughout the survey area was most likely *Calanus finmarchicus*, which is the main food source for mackerel and herring during summer. The abundance was generally highest east of the Faroes and north of the Faroe-Iceland ridge (**Figure 7**).

Hydrography

The sea-surface temperature (SST) in the surveyed area was between 5 and 12°C (**Figure 8**). Temperature and salinity casts down to 500 m if possible were taken along the track (38 stations).

References

Nøttestad, L., Utne, K. R., Oskarsson, G. J., Jónsson, S., Jacobsen, J. A., Tangen, Ø., Anthonypillai, V., Aanes, S., Vølstad, J. H., Bernasconi, M., Debes, H. H., Smith, L., Sveinbjørnsson, S., Holst, J. C., Jansen, T., and Slotte, A. 2016. Quantifying changes in abundance, biomass, and spatial distribution of Northeast Atlantic mackerel (*Scomber scombrus*) in the Nordic seas from 2007 to 2014. *ICES Journal of Marine Science* 73, 359-373.

Table 1. Trawl specifications for the Faroese MULTPELT 832 in July 2020.

Circumference (m)	832
Vertical opening (m)	47.7
Mesh size in codend (mm)	40
Typical towing speed (kn)	4.6 (3.8–6.8)

Table 2. Survey effort for Tróndur í Gøtu 2 - 18 July 2020.

Effective survey period	Length of cruise track (nmi)	Trawl stations	CTD stations	Plankton sampling	Aged fish mackerel/herring/blue whiting	Length-measured fish
2-17/7	~2600	38	38	38	550/305/230	2183/944/1591

Table 3. Summary of biological sampling in the Faroese IESSNS survey from 2-17 July 2020. Numbers denote the maximum number of individuals sampled for each species for the different determinations.

	Species	Faroes
Length measurements	Mackerel	100
	Herring	100
	Blue whiting	100
	Other fish sp.	20-50
Weighed, sexed and maturity determination	Mackerel	15-25
	Herring	15-25
	Blue whiting	5-50
	Other fish sp.	20-50 (weighed)
Otoliths/scales collected	Mackerel	15-25
	Herring	15-25
	Blue whiting	5-50
	Other fish sp.	0
Stomach sampling	Mackerel	5
	Herring	5
	Blue whiting	5
	Other fish sp.	0
Tissue for genotyping	No genetic samples	0

Table 4. Trawl settings and operation details during the IESSNS survey in 2020.

Properties	Tróndur í Gøtu
Trawl producer	Vónin
Warp in front of doors	Dynema – 32 mm
Warp length during towing	355(330-360) m
Difference in warp length port/starboard	0-15 m
Weight at the lower wing ends	2*400 kg
Setback in metres	6 m
Type of trawl door	Injector F-15
Weight of trawl door (kg)	2000
Area trawl door (m ²)	6
Towing speed (knots)	4.5 (4.3-4.8)
Trawl height (m)	45.5 (40.5-49.5)
Door distance (m)	99.1 (94-104)
Trawl width (m)	57.2
Turn radius	5-10 degrees BB turn
A fish lock in front end of cod-end	Yes
Trawl door depth (port, starboard, m)	10.3 (4-20), 11.6 (5-19)
Headline depth	0 m
Float arrangements on the headline	Kite with fender buoy + 1 buoy on each wingtip
Weighing of catch	All weighed

Table 5. Acoustic instruments and settings for the primary frequency in the IESSNS survey in 2020. The vessel was re-calibrated mid-survey – therefore two set of parameters.

Parameter	M/V Tróndur í Gøtu 25/06/2020	M/V Tróndur í Gøtu 08/07/2020
Echo sounder	Simrad EK 60	Simrad EK 60
Frequency (kHz)	38,120, 200	38,120, 200
Primary transducer	ES38B	ES38B
Transducer installation	Hull	Hull
Transducer depth (m)	7	7
Upper integration limit (m)	Not used	Not used
Absorption coeff. (dB/km)	9.7	9.7
Pulse length (ms)	1.024	1.024
Band width (kHz)	2.43	2.43
Transmitter power (W)	2000	2000
Angle sensitivity (dB)	21.9	21.9
2-way beam angle (dB)	-20.6	-20.6
TS Transducer gain (dB)	23.44	24.09
s_A correction (dB)	-0.65	-0.65
alongship:	7.42	7.20
athw. ship:	7.09	7.03
Maximum range (m)	500	500
Post processing software	LSSS 2.8.0	LSSS 2.8.0

Table 6. Descriptive statistics for trawl door spread, vertical trawl opening and tow speed for the Faroese IESSNS survey in July 2020 with *Tróndur í Gøtu*. Two different kinds of data were analyzed, manually reported towing speed values from (one value per station from the GPS) and digitally recorded data from trawl sensors. Digitally recorded data were filtered prior to calculations; for trawl door spread all values < 70 m and > 150 m were deleted and for vertical opening all values < 25 m and > 60 were deleted. The average values per station were used to calculate overall mean, maximum (max), minimum (min) and standard deviation (st.dev.). Number of trawl stations used in calculations is also reported – stations with fewer than 10 registrations were excluded. This year, the reported parameters were based on the manually reported data, after they had been checked against the digitally recorded data.

Tróndur í Gøtu	
Trawl doors horizontal	
Number of stations	37
mean	99.1
max	104
min	94
st. dev.	2.2
Vertical trawl opening (m)	
Number of stations	37
mean	45.5
max	49.5
min	40.5
st. dev.	2.0
Horizontal trawl opening mean	57.2
Speed (over ground, nmi)	

Number of stations	38
mean	4.55
max	4.8
min	4.3
st. dev.	0.1

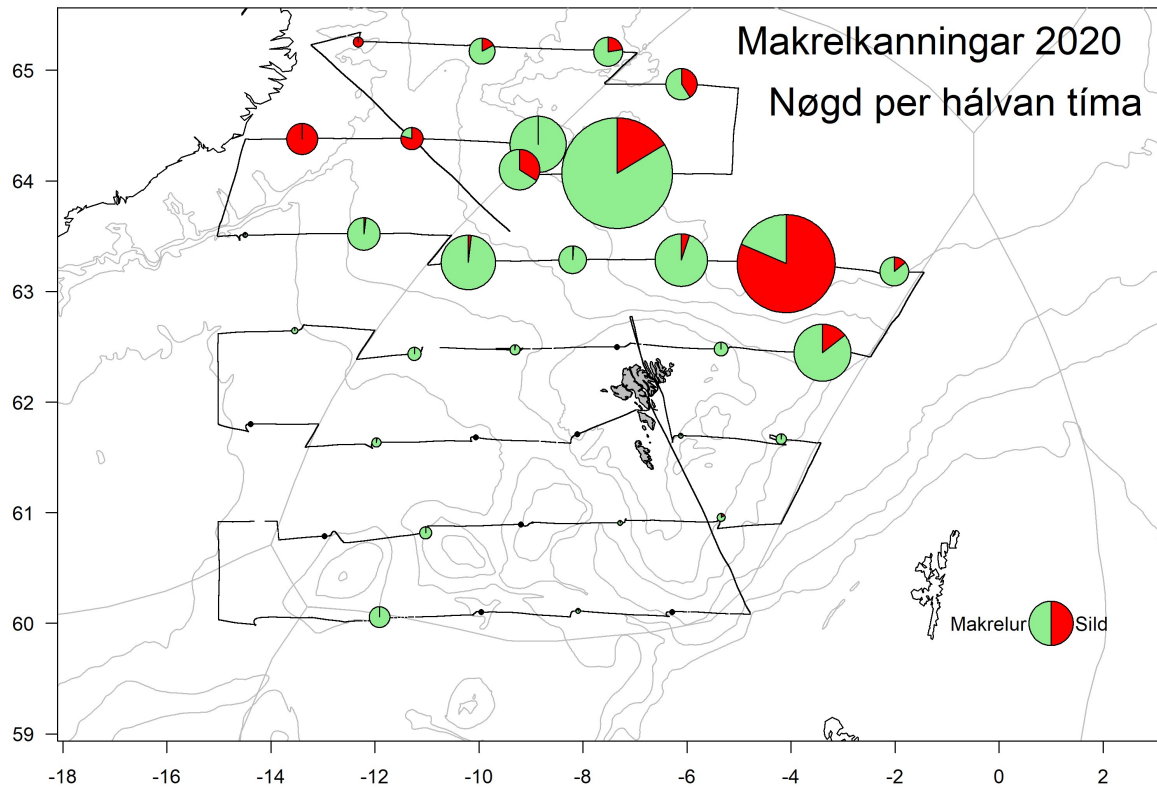


Figure 1. Cruise tracks with predetermined trawl/CTD/WP2 stations (circles) approximately 52 nmi apart during the IESSNS 2020 cruise with *Tróndur í Gøtu* cruise 2052, 2-18 July 2020. The total covered distance was 2600 nautical miles. Catch of mackerel (green) and herring (red) by ½ hour trawl haul is shown on the pie charts. The size of the circles corresponds to total amount of fish caught (in tonnes).

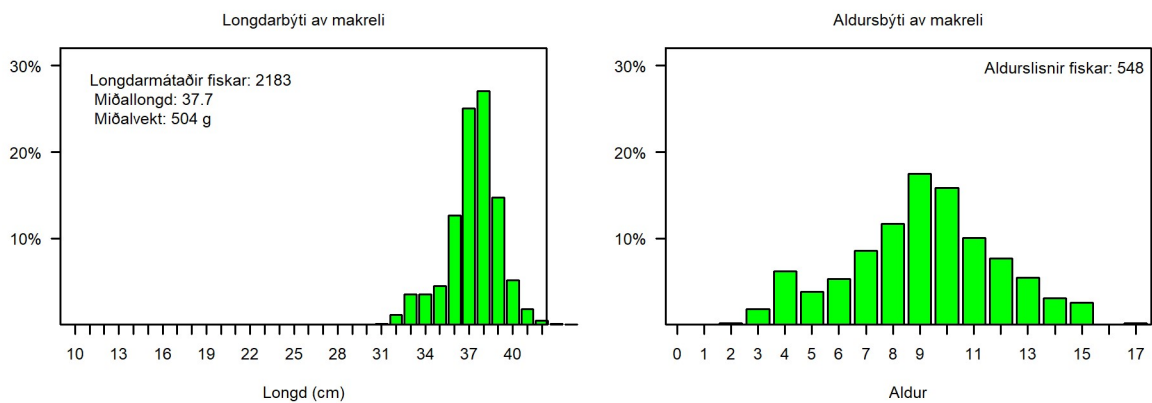


Figure 2. Length (left) and age (right) distribution of mackerel during the IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020.

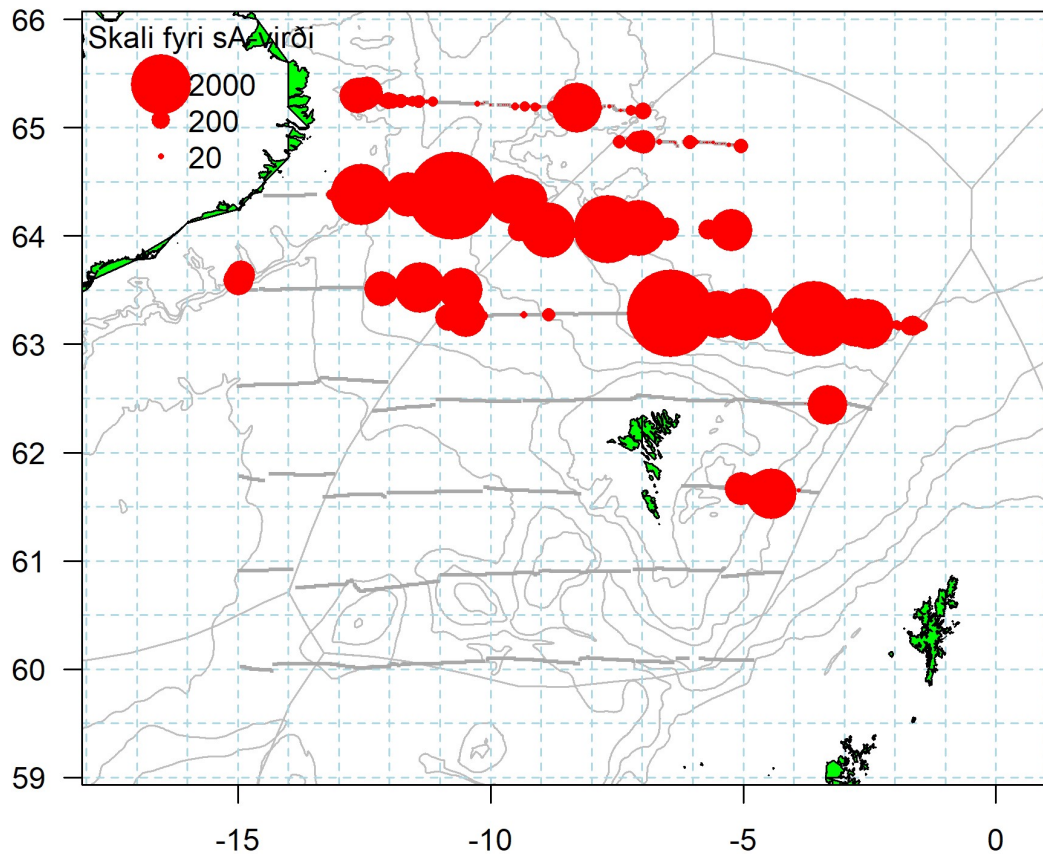


Figure 3. Mean integration values (s_A m²/nm²) per nautical miles of herring along the cruise track. The size of the circles corresponds to amount of fish detected. IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020.

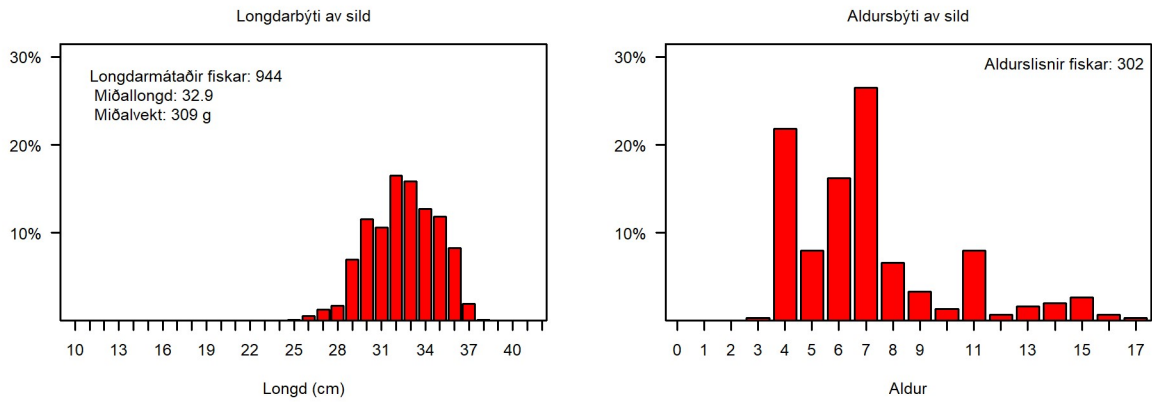


Figure 4. Length (left) and age (right) distribution of herring during the IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020.

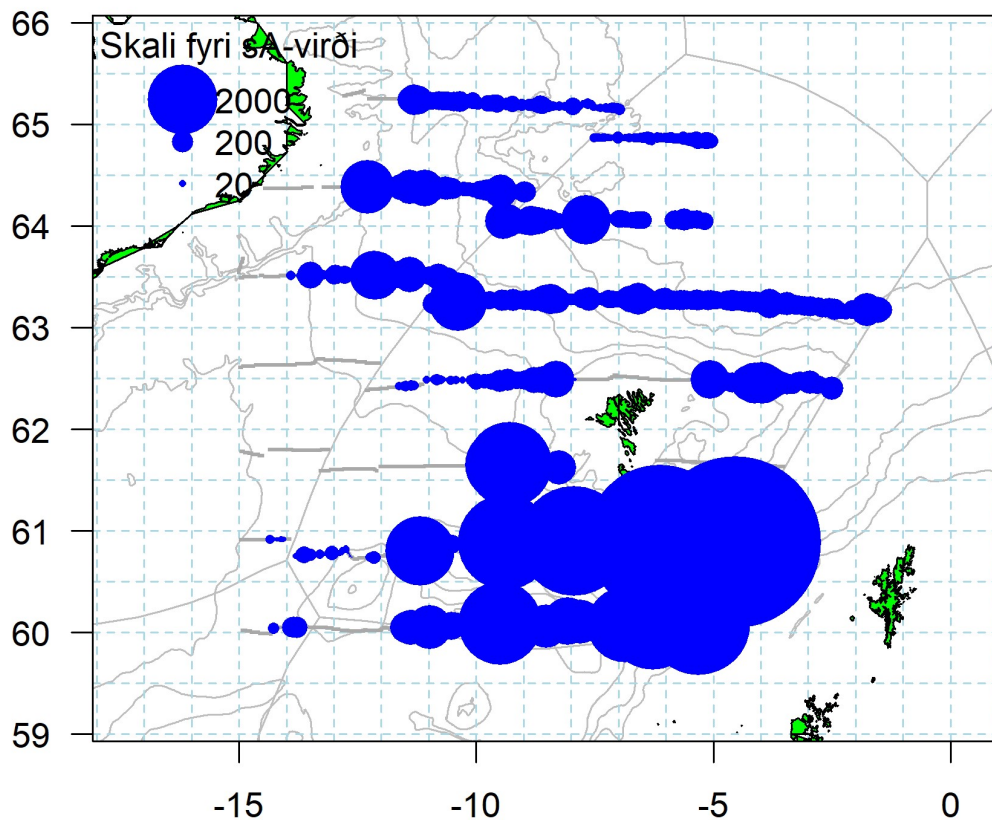


Figure 5. Integration values (s_A , m^2/nm^2) of blue whiting per each nm along the cruise tracks. The size of the circles corresponds to amount of fish. IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020.

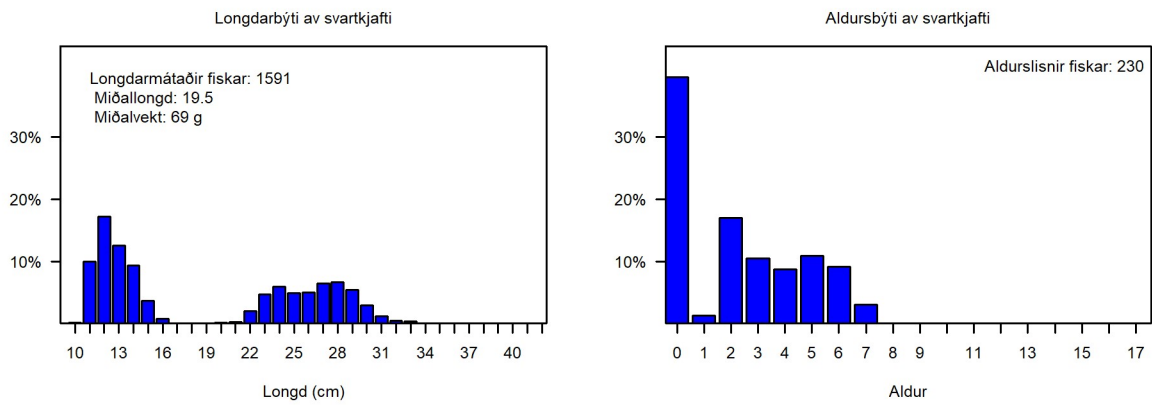


Figure 6. Length (left) and age (right) distribution of blue whiting during the IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020.

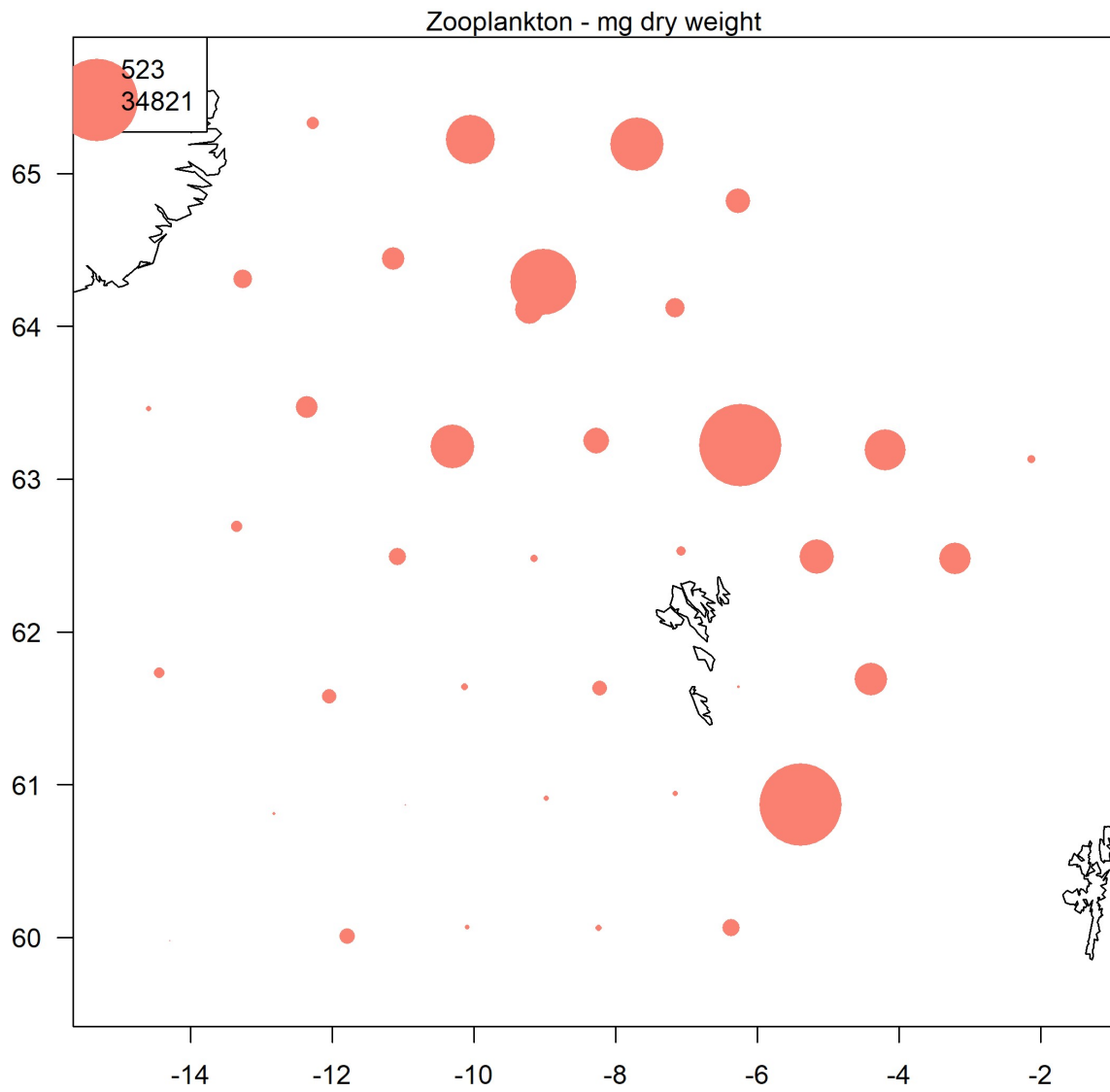


Figure 7. Zooplankton abundance (mg/m²) during the IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020.

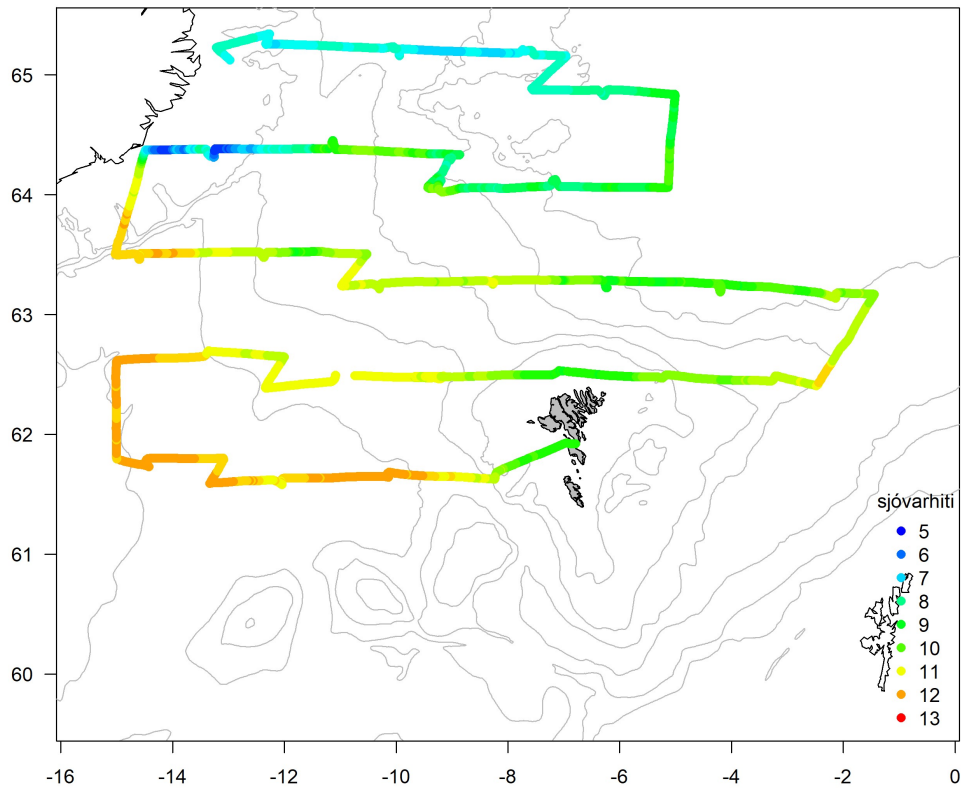


Figure 8. The sea-surface temperature (°C) along the cruise track during the IESSNS 2020 cruise, *Tróndur í Gøtu* cruise 2052, 2-18 July 2020. Note that temperatures were not correctly calibrated on the first part south of the Faroes and have therefore been excluded in this report.