

Cruise Report
Cruise no. 2230

Faroese part of International Ecosystem Summer Survey in the Norwegian Sea 2022

1st-17th July 2022

Jákup Sverri



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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 2022.

Vessel	Nation
Jákup Sverri	Faroes
Vendla	Norway
Eros	Norway
Árni Fríðriksson	Iceland
Ceton	Denmark
Tarajoq	Greenland

The present survey report is based on data from Jákup Sverri 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 late August 2022, and which will be part of the WGIPS report from the upcoming WGIPS meeting in January 2023.

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 60 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. For herring and blue whiting standard acoustic survey methods were used. The acoustic data were recorded with a Simrad EK-80 echosounder. Data from the 38 kHz transducer mounted on a drop keel 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 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 of the trawl and spread of the trawl doors. Light measurements were done during trawling. The 38 kHz Echo sounder was calibrated prior to survey with a standard copper sphere.

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** the reported values were all within the standards recommended for the MULTPELT trawl. The acoustic settings are shown in **Table 5**.

There were initially 34 planned surface trawl stations, however three of these (in the southernmost survey area) were skipped due to bad weather. Due to shortage in survey time the northernmost transect including three predetermined trawl stations, was covered by the Icelandic research vessel. Thus, there were 28 predetermined stations on the cruise. In addition 5 deep hauls were targeting blue whiting.

Mackerel

Mackerel was caught in all the predetermined surface trawl stations in the survey area. The catches of mackerel and herring on each surface trawl station are shown in **Figure 1**, left panel, with average weights and age of each station shown in the right panel. The average catches of mackerel in the Faroese survey area 2022 were somewhat higher than in 2021. It should however be noted that the covered areas have not been identical among years. The largest catch (per ½ hour trawl haul) was observed in Icelandic waters. The catch rates in the southern area were low in 2022.

The mean length of mackerel was 37.2 cm and mean weight 474 gr (**Figure 2**). The bulk of the stock is 8-11 years old fish however there were also high numbers of 3 years old.

Norwegian spring spawning herring

Herring was observed east and north of the Faroes (**Figure 3**). East of the Faroes and on the eastern Icelandic plateau some mixing of autumn and summer spawners was observed (**Figure 3**, right panel and **Figure 4**, middle and right panel). The autumn spawners were generally smaller and younger than the Norwegian spring spawning herring.

The length distribution of Norwegian spring spawning herring was mainly 30-37 cm (**Figure 4**). The age distribution shows that the 2016 year class was well represented, with almost 50% of the aged spring spawners being 6 years old. Relatively few specimens were older than 9 years.

The acoustic registrations of herring are shown in **Figure 5** and **Figure 6**, left panel. The vertical distribution of herring was very shallow in 2022 (**Figure 5**), and was seen as small schools in the upper 40 m throughout the survey area. This may lead to an underestimation of the herring since an unknown part may be distributed shallower than 9 meters, which is the depth of the transducer under the drop keel.

Blue whiting

Blue whiting was distributed in the whole area as rather loose scattering layers from 100 m down to about 350-400 m (**Figure 6**, left panel, **Figure 7** and **Figure 8**). The concentrations were somewhat higher on the Iceland-Faroe Ridge and in the southern part of the surveyed area. In the south schools of 0-group blue whiting were observed.

The length and age distribution of blue whiting is shown in **Figure 7**. The mean length was 25.7 cm and the mean weight was 111 gr, 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 1 to 7 year old fish. Two years old blue whiting had highest abundances.

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. One salmon was caught west of the Faroe Islands.

Hydrography and zooplankton

Temperature and salinity casts down to 500 m were taken on the 28 predetermined trawl stations as well as zooplankton, which was sampled with WP2 200 µm zooplankton net. The surface temperature was logged all along the cruise track (**Figure 9**, upper left panel).

The main zooplankton throughout the survey area was *Calanus finmarchicus*, which is the main food source for mackerel and herring during summer, mixed with krill and amphipods. The abundance was generally highest on the Faroe Plateau and in the northern areas (**Figure 9**).

Table 1. Trawl specifications for the Faroese MULTPELT 832 in July 2022.

Circumference (m)	832
Vertical opening (m)	45
Mesh size in codend (mm)	45
Typical towing speed (kn)	4.4

Table 2. Survey effort for Jákup Sverri 1.-17.July 2022.

Effective survey period	Length of cruise track (nmi)	Trawl stations	CTD stations	Plankton sampling	Aged fish mackerel/herring/blue whiting	Length-measured fish
1-17/7	2768	33	28	28	506/413/190	1480/815/487

Table 3. Summary of biological sampling in the Faroese IESSNS survey from 1.-17.July 2022 on each station. Numbers denote the maximum number of individuals sampled for each species for the different determinations.

	Species	Number
Length and weight measurements	Mackerel	100
	Herring	100
	Blue whiting	100
	Other fish sp.	20-50
Sexed and maturity determination	Mackerel	15-25
	Herring	25-50
	Blue whiting	15-50
	Other fish sp.	0-20
Otoliths/scales collected	Mackerel	15-25
	Herring	25-50
	Blue whiting	15-50
	Other fish sp.	0
Stomach sampling	Mackerel	5
	Herring	5
	Blue whiting	5
	Other fish sp.	0

Table 4. Trawl settings and operation details during the IESSNS survey in 2022.

Properties	Jákup Sverri
Trawl producer	Vónin
Warp in front of doors	Dynex – 38 mm
Warp length during towing	350 (350-360) m
Difference in warp length (m) port/starboard	7 m
Weight at the lower wing ends	2*400 kg
Setback in metres	6
Type of trawl door	Injector Twister
Weight of trawl door (kg)	1650
Area trawl door (m ²)	4.5
Towing speed (knots)	4.4 (3.4-6)
Trawl height (m)	43 (35-50)
Door distance (m)	115 (107-125)
Turn radius	5 degrees BB turn
A fish lock in front end of cod-end	Yes
Headline depth	0 m
Float arrangements on the headline	Kite with + 1 buoy (fender) on each wingtip
Weighing of catch	Catch < 12 tonnes weighted,

Table 5. Acoustic instruments and settings for the primary frequency in the IESSNS survey in 2022.

Parameter	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)	6-9
Upper integration limit (m)	15 m
Absorption coeff. (dB/km)	9.5
Pulse length (ms)	1.024
Band width (kHz)	3.064
Transmitter power (W)	2000
Angle sensitivity (dB)	21.9
2-way beam angle (dB)	-20.6
Sv Transducer gain (dB)	27.28
TS Transducer gain (dB)	27.27
sA correction (dB)	-0.01
3 dB beam width (dg)	
alongship:	6.86
athw. ship:	6.89
Maximum range (m)	500
Post processing software	LSSS 2.12.0

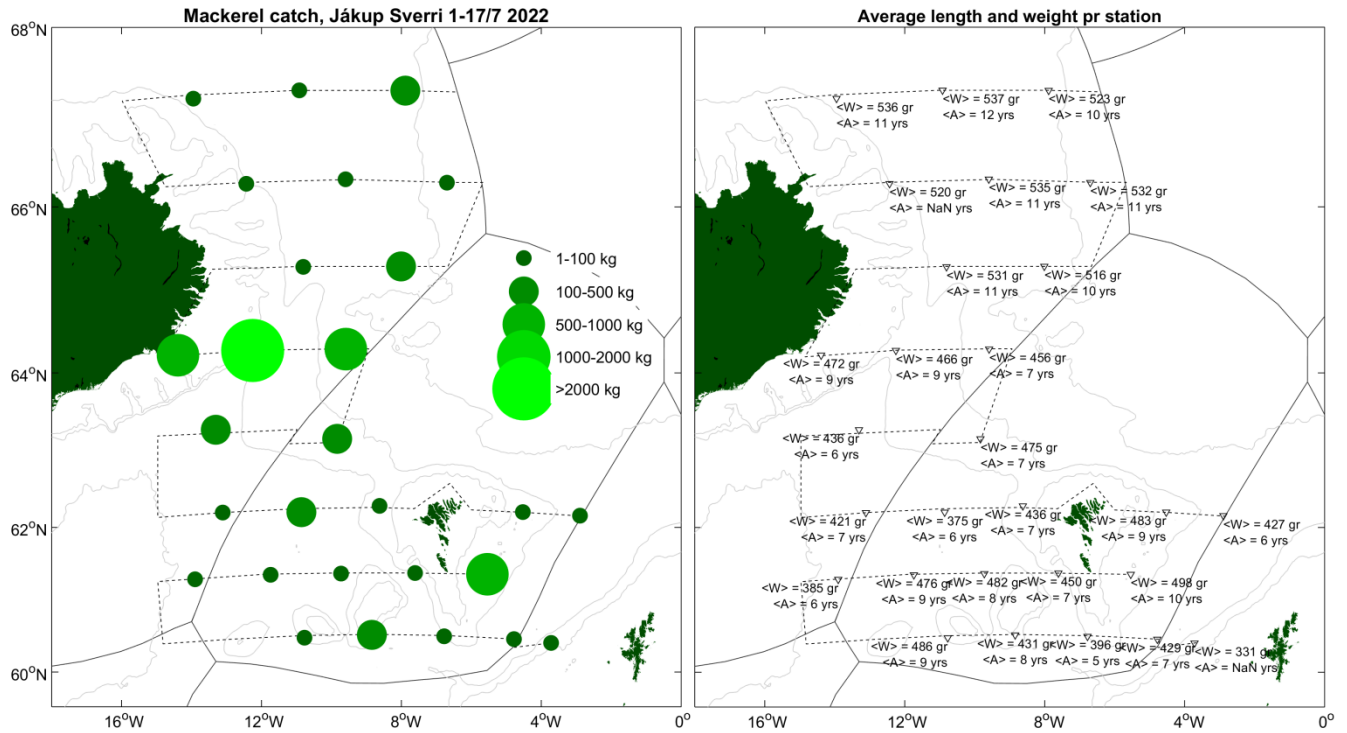


Figure 1 Cruise tracks with predetermined trawl/CTD/WP2 stations (circles) approximately 52 nmi apart during the IESSNS 2022 cruise with Jákup Sverri cruise 2230, 1.-17.July 2022 with catch of mackerel (left panel) by ½ hour trawl haul and average weights and ages pr station (right panel). The total covered distance was 2768 nautical miles. The size of the circles corresponds to total amount of fish caught (in tonnes).

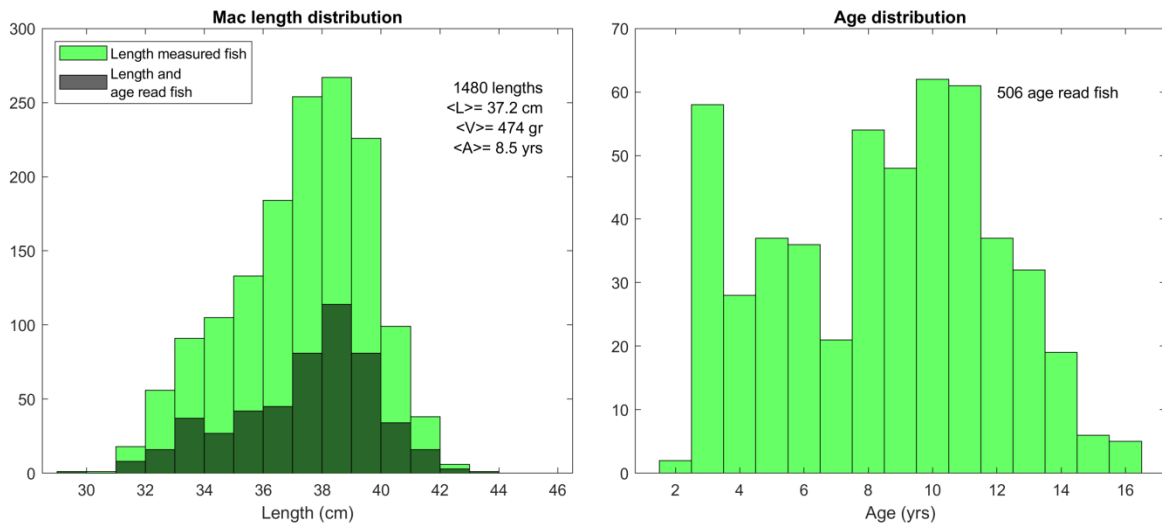


Figure 2 Length (left) and age (right) distribution of mackerel during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17.July 2022.

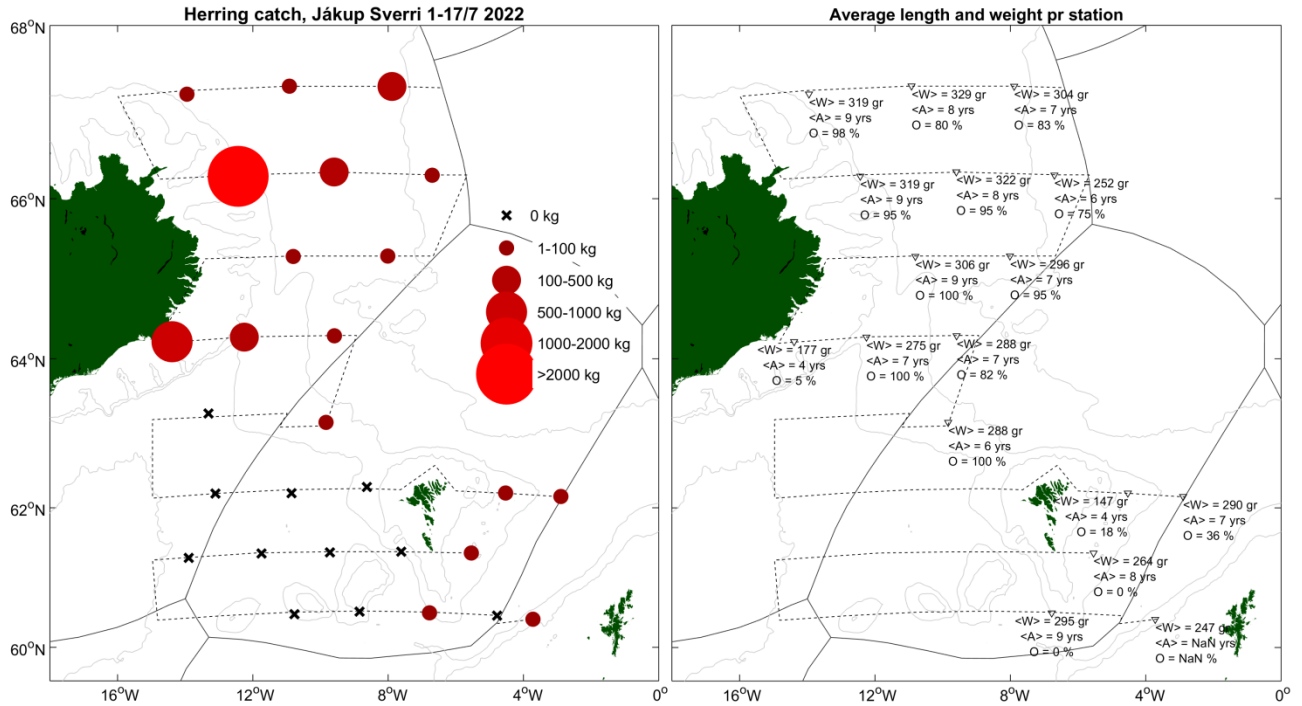


Figure 3 Herring caught in trawl during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17.July 2022. Size of catch (left panel) and average weight, age and percentage of opaque otoliths pr station (right panel).

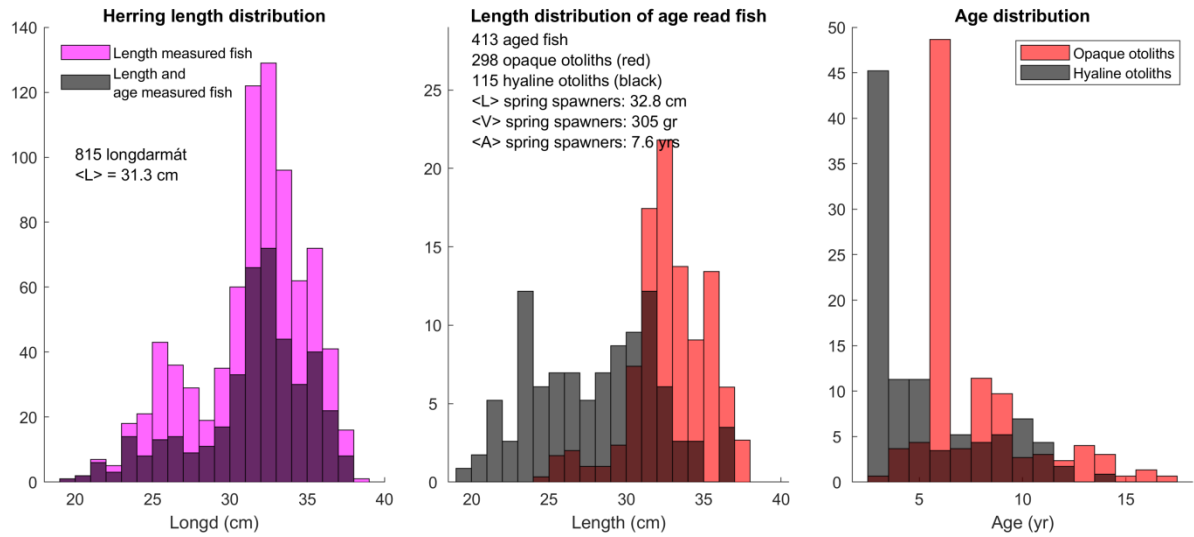


Figure 4 Herring length and age distribution during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17.July 2022. Left panel: Length distribution. Middle panel: Length distribution of spring spawners (red) and autumn spawners (black). Right panel: Age distribution of spring spawners (red) and autumn spawners (black).

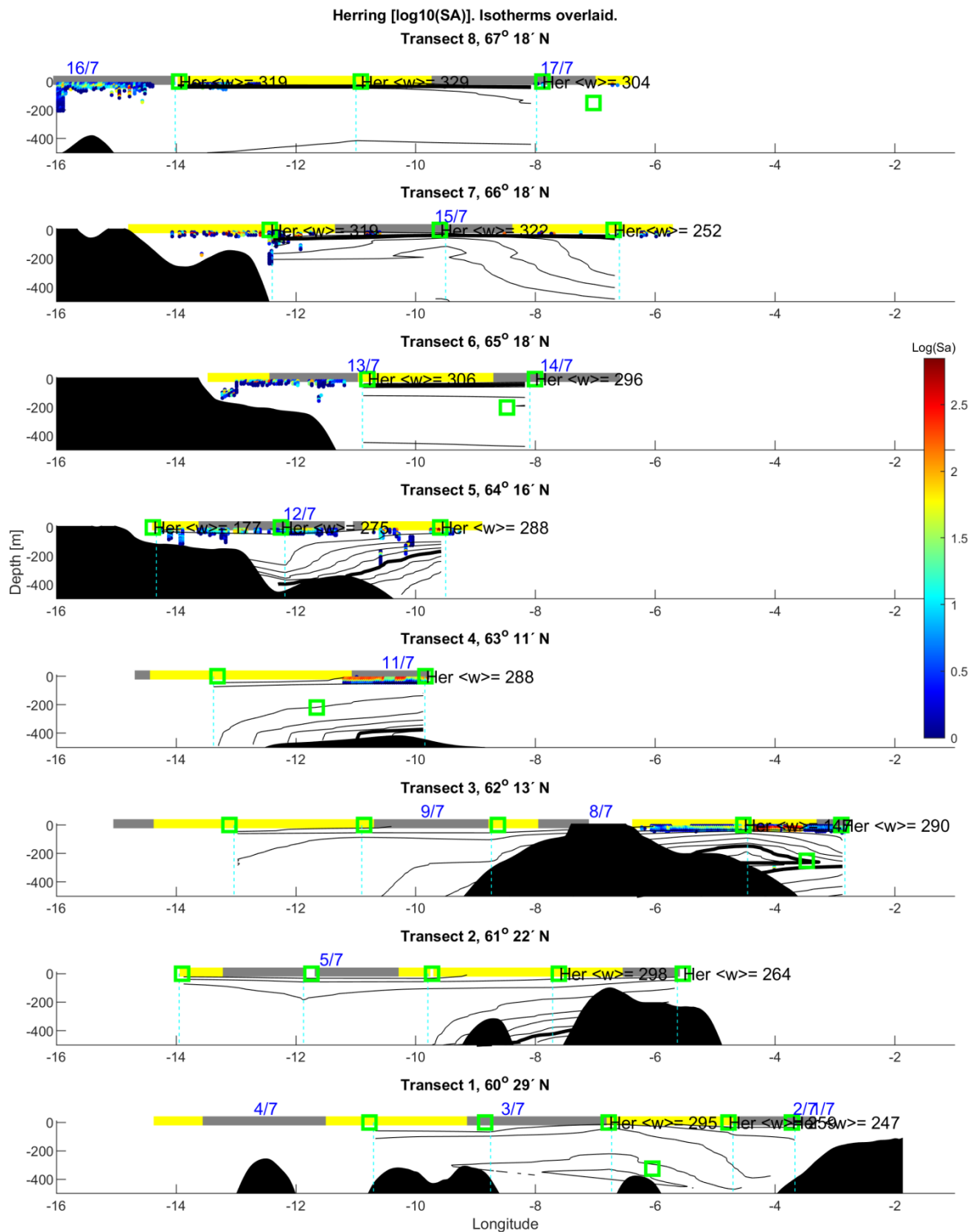


Figure 5 Vertical distribution of acoustic registrations of herring ($\log(Sa)$) during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17.July 2022. Yellow/grey colors on the top of each panel indicates day/night time, green squares indicates trawl stations, with text indicating if herring was caught and what the average weight was. Black lines indicate isotherms as observed with the CTD. 1 degree is between each isotherm, with the 4°C shown in bold.

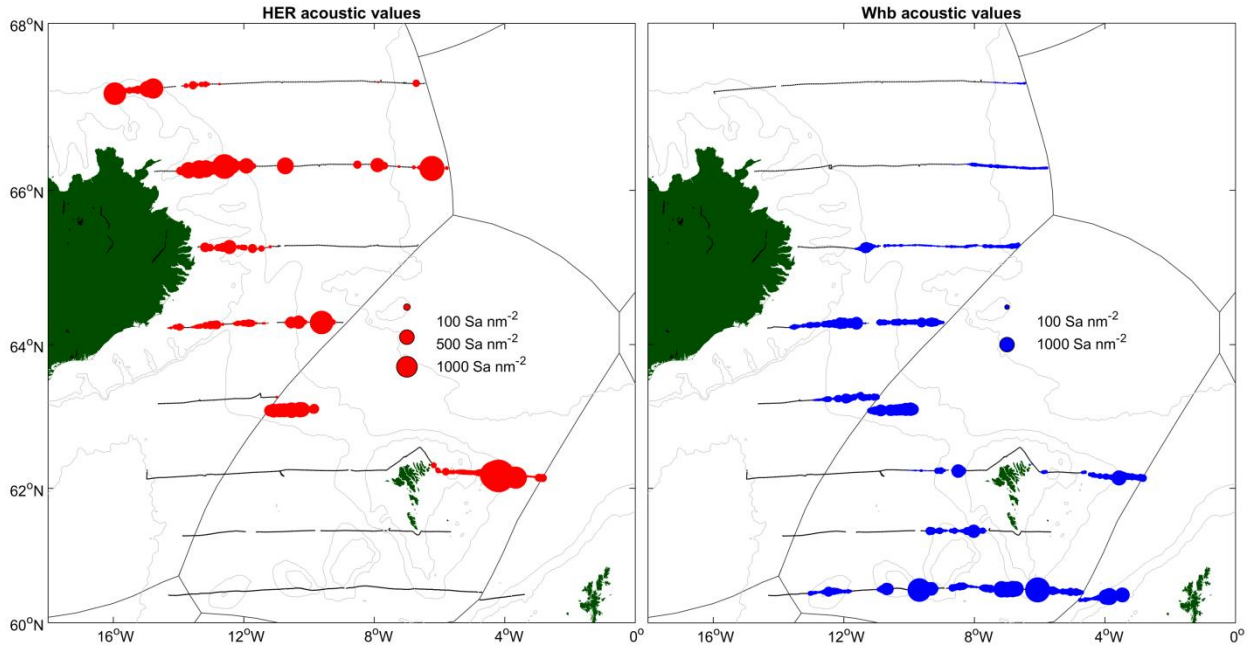


Figure 6 Sa-values (Sa-sum pr log) for herring (left panel) and blue whiting (right panel) during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17.July 2022.

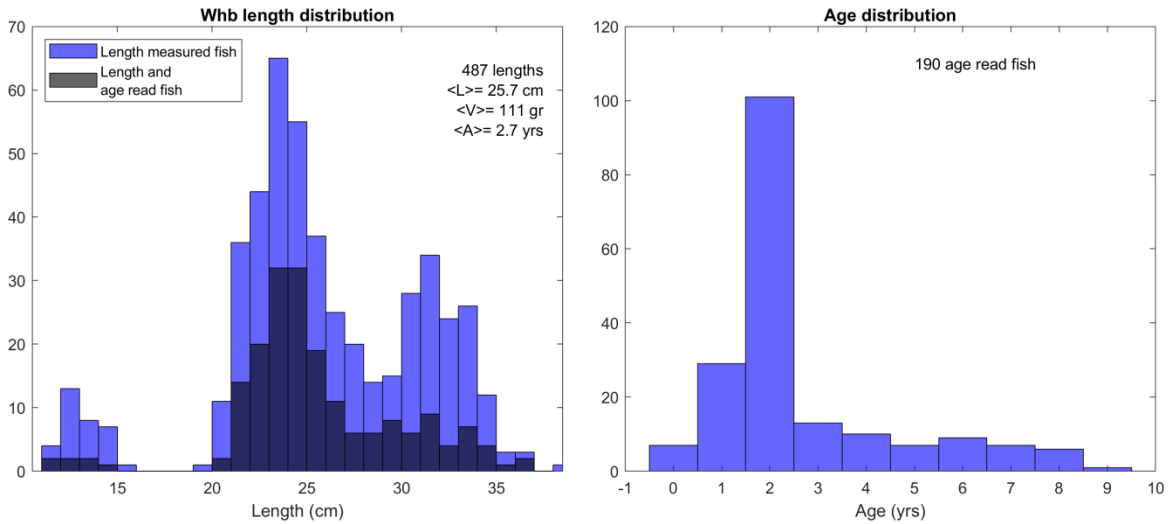


Figure 7 Blue whiting length distribution (left panel) and age distribution (right panel).

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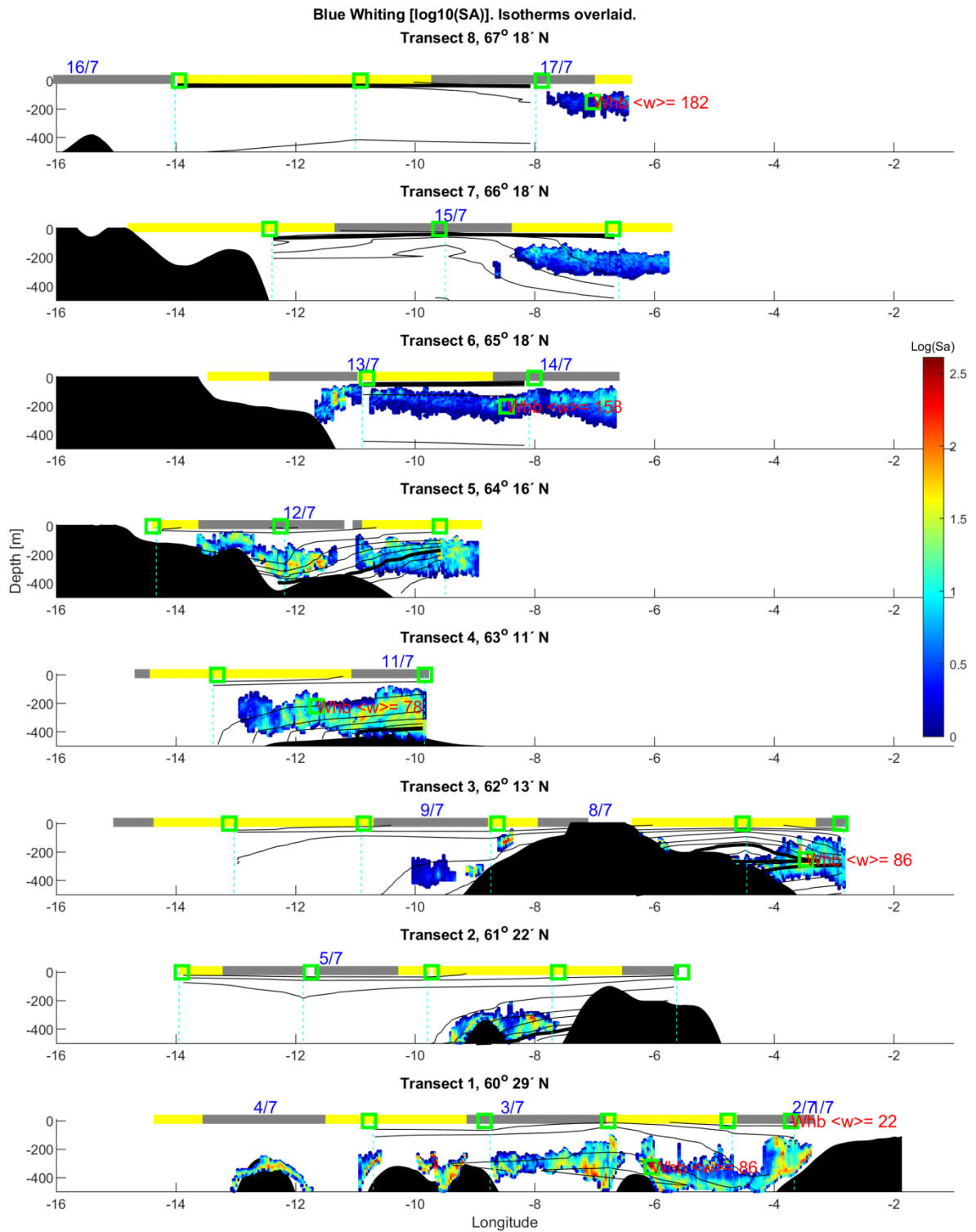


Figure 8 Vertical distribution of acoustic registrations of blue whiting during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17. July 2022. Yellow/grey colors on the top of each panel indicates day/night time, green squares indicates trawl stations, with text indicating if blue whiting was caught and what the average weight was. Black lines indicate isotherms as observed with the CTD. 1 degree is between each isotherm, with the 4°C shown in bold.

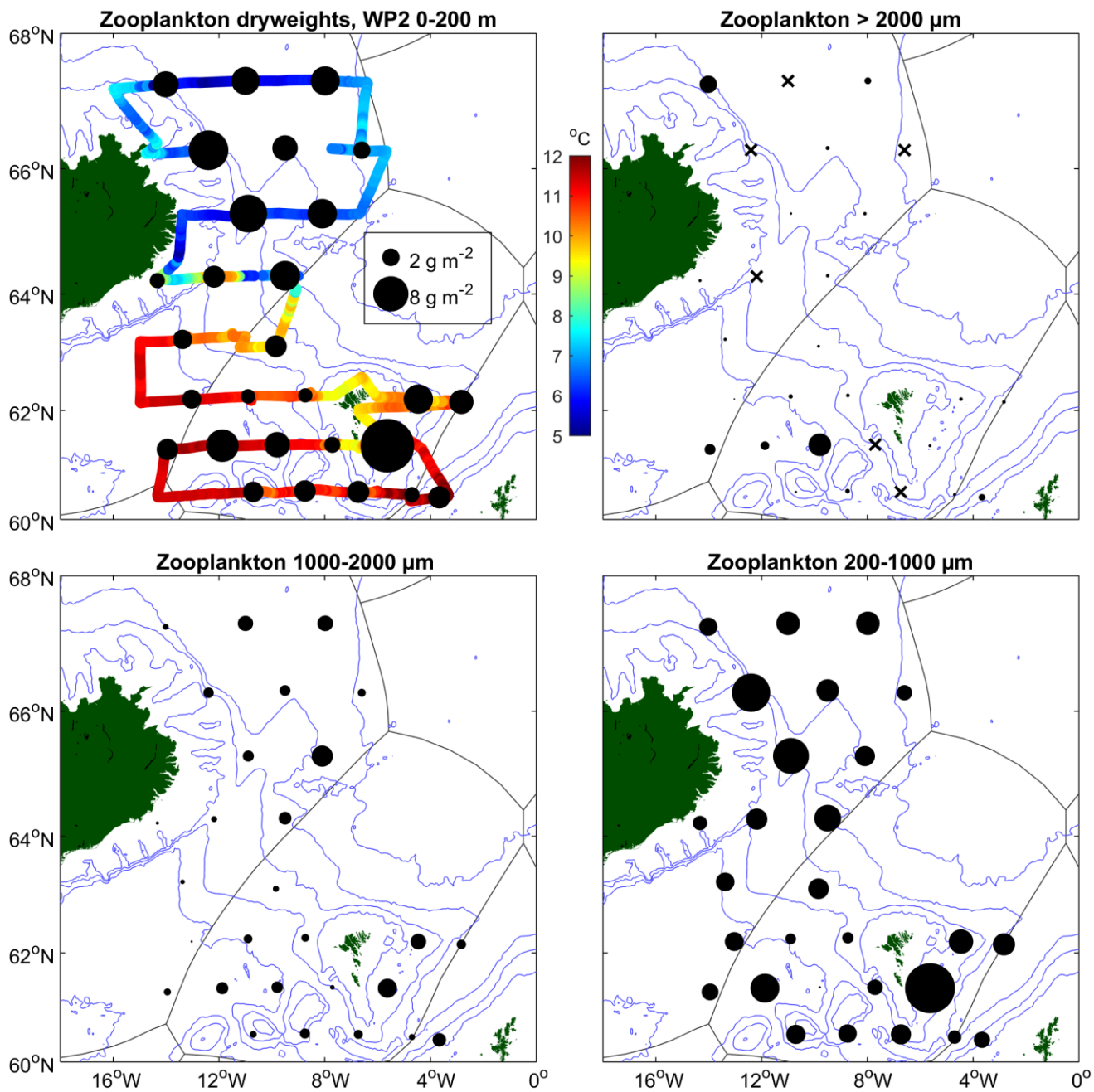


Figure 9 Zooplankton sampling during the IESSNS 2022 cruise, Jákup Sverri cruise 2230, 1.-17.July 2022. In the upper left panel sea surface temperature is shown as well.