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Leiðangursskýrsla um sameiginlegan íslensk-grænlenskan loðnu- og vistkerfisleiðangur á svæðinu Ísland-Austur-Grænland -Jan Mayen, haustið 2025

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Teresa Silva, Lars Heilmann, Sigurður Þ Jónsson, Höskuldur Björnsson, Ayca Eleman, Teunis Jansen

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Ágrip

Hér er greint frá niðurstöðum bergmálsmælingaleiðangurs á loðnustofninum á svæðinu milli Íslands, Austur-Grænlands og Jan Mayen (IEGJM) haustið 2025 sem er samvinnuverkefni Hafrannsóknastofnunar og grænlensku náttúrufræðistofnunarinnar (GINR). Leiðangurinn fór fram dagana 23. ágúst til 22. september 2025 á tveimur rannsóknaskipum, Tarajoq og Árni Friðrikssyni. Meginmarkmiðið var að meta magn og útbreiðslu kynþroska og ókynþroska loðnu á hafsvæðunum við Ísland, Austur-Grænland og Jan Mayen með bergmálsmælingum. Jafnframt voru gerðar mælingar á ástandi sjávar, útbreiðslu svifþörunga og dýrasvifs, auk hvalatalninga. Leiðangurinn fylgdi fyrirfram ákveðnum sniðum með flotvörpusýnatökum þar sem vart var við fisk ásamt umhverfis- og vistkerfisathugunum á föstum stöðvum. Loðna mældist meðfram austur-grænlenska landgrunninu og meðfram landgrunnsbrúnunum í Grænlandssundi og norður af Íslandi, allt norður að 70°N. Ókynþroska loðna fannst í mestu magni meðfram suðausturströnd Grænlands, og blandaður hluti stofnsins fannst ásamt kynþroska loðnu nálægt landi upp við og norðan við Scoresbysund. Engin loðna fannst vestan við Jan Mayen eða við Kolbeinseyjarhrygg. Heildarfjöldi loðnu var 139 milljarðar. Heildarlífmassi var metinn 1.209 þúsund tonn, og af því voru um 419 þúsund tonn kynþroska loðna. Niðurstöður hvalatalninga sýndu skýr merki um skörun milli dreifingu hnúfubaks, þéttleika loðnu og þéttleika svifdýra (mesozooplankton) og ljósátu meðfram austur-grænlensku landgrunnsbrúninni. Niðurstöður þessa leiðangurs gefa upplýsingar um stöðu IEGJM loðnustofnsins sem eru nýttar við veiðiráðgjöf þessarar mikilvægu auðlindar hafsins.

Keywords: loðna, bergmálsmælingaleiðangurs, haust, milli Íslands- Austur-Grænlands og Jan Mayen (IEGJM), ástandi sjávar, dýrasvifs, hvalatalninga.

Abstract

This report summarises the findings from the 2025 autumn acoustic survey of the Iceland-East Greenland-Jan Mayen (IEGJM) capelin stock, conducted jointly by Icelandic and Greenlandic research institutions. The survey was conducted from August 23 to September 22, 2025, using two research vessels, Tarajoq and Árni Friðriksson. The primary objective was to estimate the acoustic stock size and distribution of mature and immature capelin in Icelandic, East Greenland, and Jan Mayen waters. The survey also focused on collecting data on hydrography, phytoplankton, zooplankton distribution, and whale sightings. The survey design included systematic acoustic transects complemented by targeted pelagic trawl stations for biological sampling. The results indicate that maturing capelin were primarily observed along the East Greenlandic continental shelf and along the shelf edges in Denmark Strait and north of Iceland, extending north to 70°N. Immature capelin were found in greatest quantity along the southeastern coast of Greenland, and a mixed portion of the stock was found with maturing capelin nearshore close to and north of the opening of Kangertittivaq/Scoresby Sund. No capelin were found west of Jan Mayen or by the Kolbeinsey Ridge. The total number of capelin was 139 billion. The total biomass estimated was 1,209 thousand tonnes, of which about 419 thousand tonnes were maturing capelin (spawning stock biomass). A clear overlap was observed between humpback whale sightings and areas of high capelin density along the East Greenland shelf edge, as well as with capelin prey, the mesozooplankton, and krill. The findings from this survey provide valuable insights into the current status of the IEGJM capelin stock and contribute to the ongoing efforts to manage this important marine resource.

***Keywords**: capelin*, *acoustic survey,* autumn, *Iceland-East Greenland-Jan Mayen (IEGJM)*, *hydrography, zooplankton, whale sightings.*

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Abstract This report summarises the findings from the 2025 autumn acoustic survey of the Iceland-East Greenland-Jan Mayen (IEGJM) capelin stock, conducted jointly by Icelandic and Greenlandic research institutions. The survey was conducted from August 23 to September 22, 2025, using two research vessels, Tarajoq and Árni Friðriksson. The primary objective was to estimate the acoustic stock size and distribution of mature and immature capelin in Icelandic, East Greenland, and Jan Mayen waters. The survey also focused on collecting data on hydrography, phytoplankton, zooplankton distribution, and whale sightings. The survey design included systematic acoustic transects complemented by targeted pelagic trawl stations for biological sampling. The results indicate that maturing capelin were primarily observed along the East Greenlandic continental shelf and along the shelf edges in Denmark Strait and north of Iceland, extending north to 70˚N. Immature capelin were found in greatest quantity along the southeastern coast of Greenland, and a mixed portion of the stock was found with maturing capelin nearshore close to and north of the opening of Kangertittivaq/Scoresby Sund. No capelin were found west of Jan Mayen or by the Kolbeinsey Ridge. The total number of capelin was 139 billion. The total biomass estimated was 1,209 thousand tonnes, of which about 419 thousand tonnes were maturing capelin (spawning stock biomass). A clear overlap was observed between humpback whale sightings and areas of high capelin density along the East Greenland shelf edge, as well as with capelin prey, the mesozooplankton, and krill. The findings from this survey provide valuable insights into the current status of the IEGJM capelin stock and contribute to the ongoing efforts to manage this important marine resource.

1 Introduction

The Iceland-East Greenland-Jan Mayen (IEGJM) capelin (*Mallotus villosus*) stock has been assessed by acoustics annually since 1978. The surveys have been conducted in autumn (August - October) and in winter (December-February). An overview is provided in the Northwestern Working Group (NWWG) report (ICES, 2023) stock annex. Since 2010, the autumn surveys have started in late August to early September, a month earlier than in preceding years. It is due to difficulties in covering the stock because of drift ice and weather during later months at the more north-westerly feeding grounds of the stock since the early 2000s (Vilhjálmsson, 2007). The primary purpose of the autumn survey is to estimate the stock size and distribution of mature and immature capelin (age groups 1 and older) in Icelandic, East Greenland, and Jan Mayen waters. After 2016, the surveys changed into an ecosystem survey conducted jointly by the Marine and Freshwater Research Institute of Iceland (MFRI) and the Greenland Institute of Natural Resources (GINR), in order to gain further information on capelin biology and the ecosystem, including zooplankton and the physical environment in the area. In 2025, the autumn survey used two research vessels: RV Árni Friðriksson on behalf of MFRI and RV Tarajoq on behalf of GINR, from August 23 to September 22. The survey area encompassed the continental shelf and shelf edges of East Greenland, Denmark Strait, and briefly covered the waters surrounding Jan Mayen, extending northward to approximately 72˚N (Figure 1). The survey design included systematic acoustic transects complemented by targeted pelagic trawl stations for biological sampling.

2 Methods

2.1 Survey design

The autumn survey design followed previously predetermined oceanographic transects (A, B, C, D and E, see Figure 2), and the survey grid accounted for observed capelin distribution in recent years (since the 2000s). For this, the survey planner function in Rstox version 1.11 (https://rdrr.io/github/Sea2Data/Rstox/man/surveyPlanner.html) was used to plan the survey tracks and strata boundaries based on the survey grid of probability of observing capelin in the region, as well as to follow the predetermined oceanographic transects. The survey planner function uses a stratified random sampling design to allocate survey effort across different strata based on their priority and the probability of finding capelin. The planned strata priorities are described in Figure 1. This year, three priority regions were set to be surveyed (Figure 1) if weather conditions allowed and a 4th stratum was allocated as low priority, as previous surveys indicated a low probability of finding capelin there. Another point was that the northern Icelandic shelf was set as a higher priority to search this year due to capelin observations in July in the International Ecosystem Summer Survey in the Nordic Seas (IESSNS) see figure 26a in the IESSNS 2025 report.

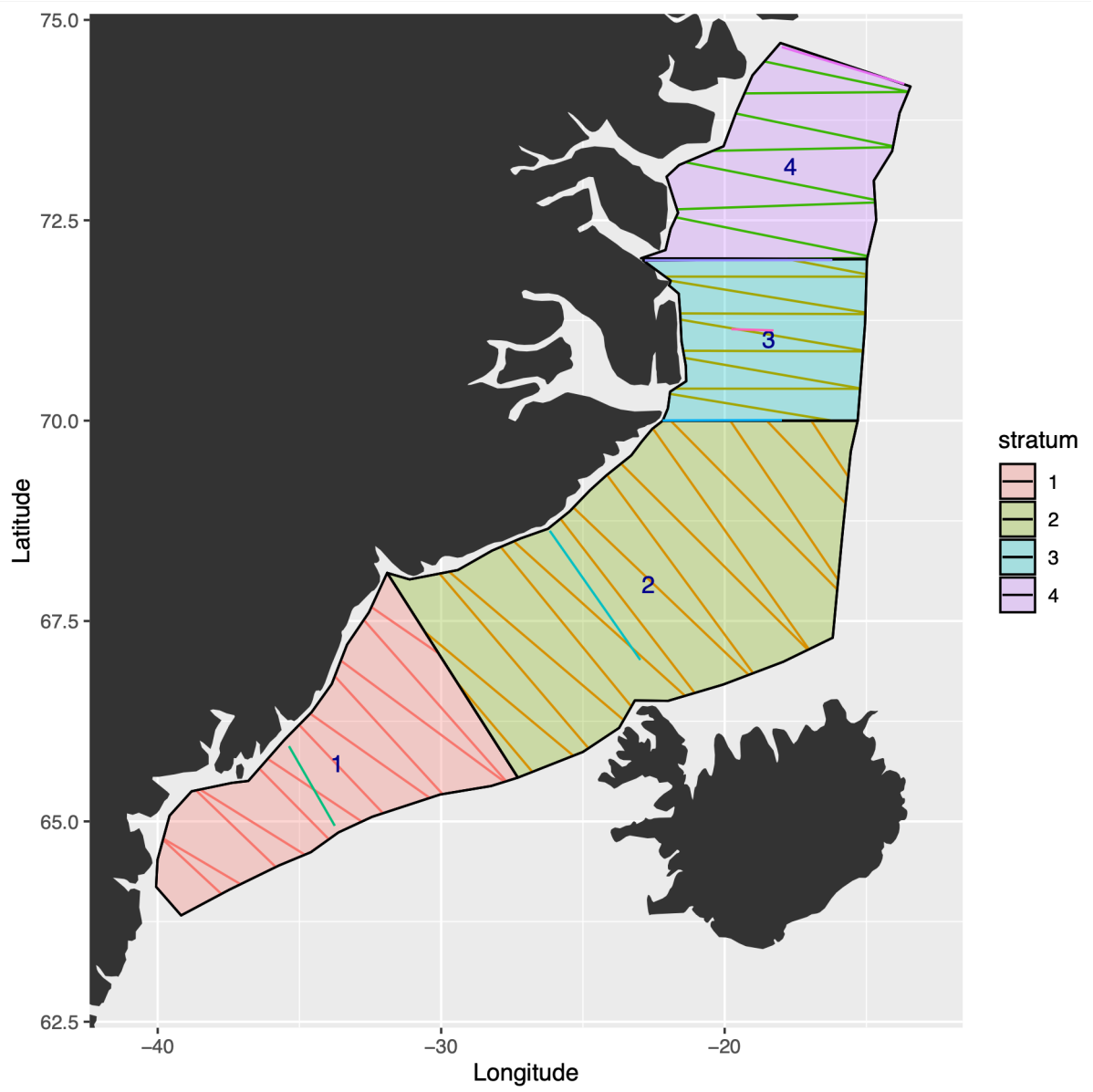


Figure 1. Planned survey stratum. Strata one, two, and three were priorities, and the fourth stratum was a low priority because previous surveys had a low probability of finding capelin. Green lines indicate the standard transects A, B, C, D and E listed later in Figure 2.

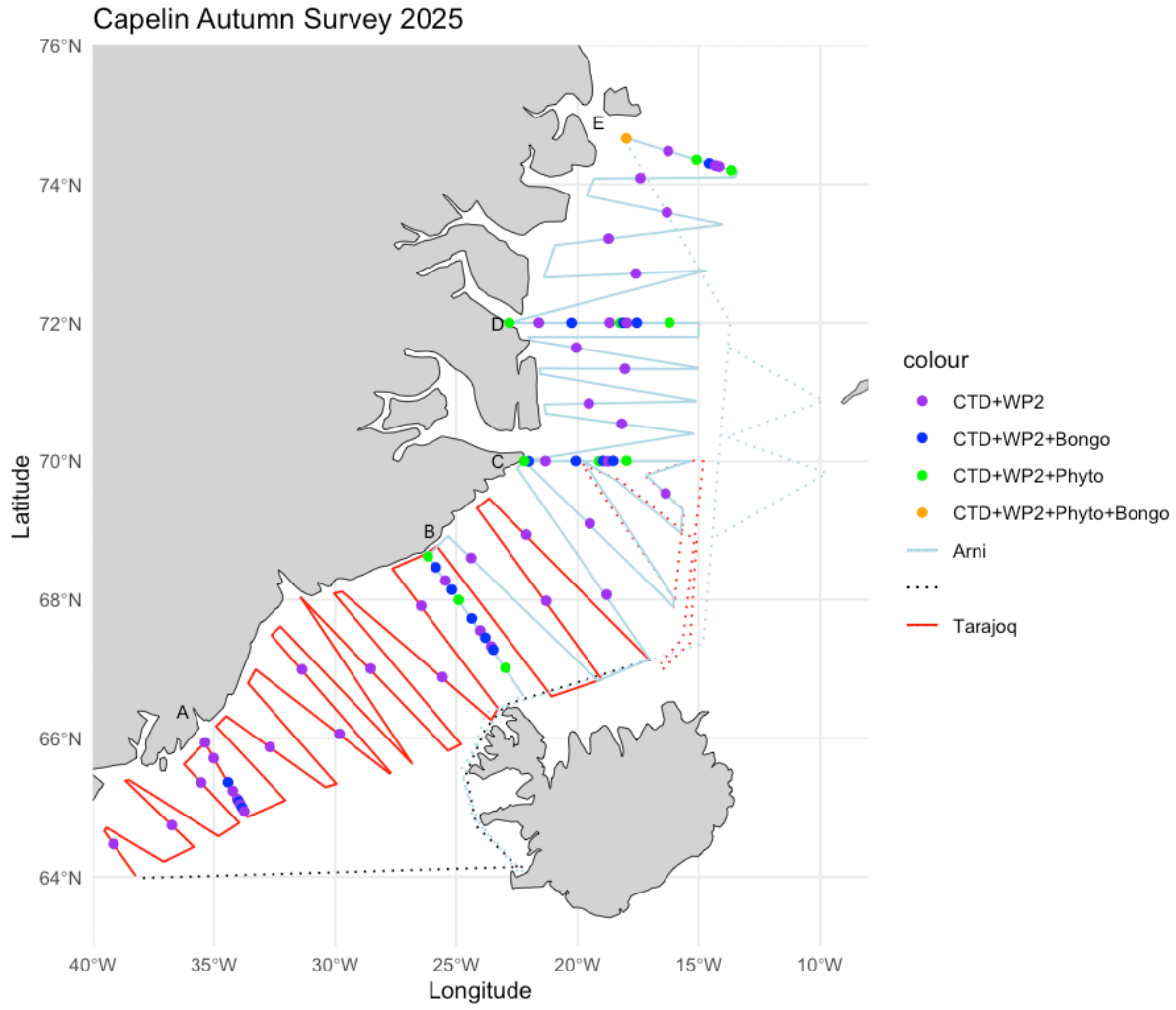


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2.2 Acoustic sampling and processing

Acoustic data were collected with Simechosounders, with operating transducers at 18, 38, 70, 120, and 200 kHz on both vessels, and 333 kHz ondition on Tarajoq. Two scientists scrutinised the acoustic data using post-processing in the Large Scale Survey System (LSSS version 3.0.0) software. Both RVs acoustic equipment was calibrated using the calibration procedure of Demer *et al.,* (2015). A first attempt at calibrating the echosounders of RV Tarajoq was made on the 23rd of August in Hvalfjorður, but due to bad weather conditions it was not successful, and it was then calibrated again on the 9th of September in Malik Fjord, an east Greenlandic fjord, for frequencies 38, 70, 120 and 200 kHz. The acoustic equipment on board the RV Árni Friðriksson was calibrated on the 4th to 5th of September in Hvalfjorður for frequencies of 18, 38, 70, 120 and 200 kHz, as well as, the ADCP. See Table 1 for details of the acoustic specifications for both research vessels for 38 kHz.

Table 1. Acoustic specifications of RV Árni Friðriksson and RV Tarajoq 38 kHz used in the autumn 2025 capelin survey.

Parameter	Arni_Fridriksson	Tarajoq
Echo sounder	Simrad EK80	Simrad EK80
Frequency (kHz)	18, **38**, 70, 120, 200	18, **38**, 70, 120, 200, 333
Primary transducer	ES38-7	ES38-7
Transducer installation	Drop keel	Drop keel
Transducer depth (m)	10	2
Upper integration limit (m)	15	15
Absorption coeff. (dB/km)	10.5	10.3
Pulse length (ms)	1.024	1.024
Band width (kHz)	2.425	3.06
Transmitter power (W)	2000	2000
Angle sensitivity (dB)	18	21.9
2-way beam angle (dB)	-20.3	-20.4
Sv Transducer gain (dB)		
Ts Transducer gain (dB)	27.03	26.94
sA correction (dB)	-0.04	-0.13
3 dB beam width (dg) alongship	6.43	6.47
3 dB beam width (dg) athw. ship	6.43	6.54
Maximum range (m)	500	500
Post processing software	LSSS	LSSS
Other acoustic equipment		
ADCP	Simrad 150 kHz	Simrad 150 kHz
Horizontal sonar	SU90	SU90

2.2.1 Acoustical interpretation and estimation of capelin

During the survey, the acoustics watch monitored the acoustic instruments 24 hours a day. Trawl samples were deployed to verify the acoustic registrations, which were used to assess species composition, size distribution and capelin abundance. Acoustic interpretations were conducted in LSSS software, and capelin was assigned as capelin backscatter, the defined category “CAP”, after corroboration with ground-truth species identification. Acoustic registrations interpreted as capelin were saved with a -70 dB lower threshold, using 0.1 nmi integration intervals in the LSSS post-processing program at 38 kHz. After that, the average NASC was computed in quadrangles of dimensions 30’ latitude and 1° longitude or 1° latitude and 2° longitude.

In areas where capelin backscatter was defined, the Nautical Area Scattering Coefficient (NASC) (m^2/nmi^2) is calculated at 0.1 nmi integration intervals. Then, the average NASC within rectangles of 30 minutes latitude and 15 minutes longitude was calculated. Abundance in numbers was estimated using a length-dependent target strength (TS; in dB re $1m^2$)

$$TS = 19.1 * log(L) - 74.5$$

from (Vilhjalmsson 1994). The total length of the capelin was measured to the nearest mm. For each length interval l within the length distribution of capelin the backscattering cross-section was calculated:

$$\sigma_l = 4 * \pi * 10^{TS_l/10}$$

The survey area was then divided into strata using a post-stratification method based on the proportion of mature individuals in the trawl samples. The echo abundance, EA_s allocated to capelin in each strata s consisting of rectangles r is the sum of the products of average NASC, rectangle area and proportion of rectangle area included p_r:

$$EA = \sum \overline{NASC}_r * A_r * p_r$$

Echo abundance is converted to numbers by simple division:

$$N_s = EA_s / \overline{\sigma_s}$$

and weights, age and maturity proportions by strata are used to compile the stock in different ways.

As East-West and West-East transects are along parallels from 70˚N and northwards they coincide with rectangle boundaries in some cases. Therefore, 0.01 was added to the latitude values north of 69.99˚N to ensure a more even distribution of NASC values to rectangles.

2.2.2 Acoustical interpretation and estimation of krill

Multifrequency acoustic measurements, combined with ground-truth species identification (see below), were used to categorise krill acoustics on RV Árni Friðriksson. Because of bad weather, we collected only a few target macrozooplankton samples using a Bongo net equipped with strobe lights over dense acoustic layers indicative of krill backscatter (120 kHz and 200 kHz). However, standard Bongo samples were collected an fixed stations and can be used to inform the distribution of krill in the area, which is an important prey for capelin and other predators. The difference in acoustic backscatter at 38 and 120 kHz has proven effective in distinguishing krill from fish. In this study, we identified and automatically categorised krill acoustic backscatter using an acoustic feature library based on relative frequency response, using the KORONA post-processing tool in the Large Scale Survey System (LSSS) software (Korneliussen et al. 2016). The defined category “Krill” in LSSS was stored as nautical area scattering coefficient values (NASC, m^2/nmi^2) with a -85 dB lower threshold in 0.1 nmi resolution (or lower). Data will be processed in the Korona post-processing tool in LSSS.

2.3 Hydrography sampling

Hydrographic conditions were assessed by taking Conductivity, Temperature, and Depth (CTD) vertical profiles at fixed locations on the standard sections across the capelin distribution (Figure 2, Table 2). The CTD was lowered to 500 m or to 10 m from the bottom in shallower waters, and a seawater sample

was collected near the deepest depth to calibrate the salinity measurements on board the RV Árni Friðriksson. CTD measurements (temperature, salinity, etc.) provide information on environmental parameters linked to capelin migration and enable estimation of sound speed and absorption through the water column for correct parametrisation of the echo sounders, which is important for comparison of backscatter across different frequencies. Additionally, on board RV Árni Friðriksson, a continuous recording of surface environmental parameters (underway system) was maintained throughout the survey, including surface temperature and salinity.

2.4 Biological sampling

A total of **155** stations were sampled during the survey with different equipment (Table 2).

Table 2. Number of stations by gear type and research vessel. See locations in Figure 3.

Station type / Vessel	Tarajoq	Árni Fr.	Total
Pelagic trawl	14	16	30
CTD	16	33	49
WPII	16	34	50
Bongo	5	6	11
Phytoplankton	0	12	12
Fishcanner *	0	3	3
Total samples	51	104	155

2.4.1 Phytoplankton sampling

A total of 12 phytoplankton samples (three samples per transect) were collected along the standard transects (B, C, D and E, see Figure 2). Water samples were collected into vials for phytoplankton counts at depths of 0, 20, and 50 m, respectively. The samples were preserved in a 2% formaldehyde solution for subsequent laboratory analysis. No phytoplankton results are included in this report, but the data will be used to inform the distribution of phytoplankton and will be processed within the Phate project.

2.4.2 Zooplankton sampling

Mesozooplankton was sampled by vertical hauls with WP2 nets (mouth opening of 0.25 m^2 and a mesh size of 200 µm) at depths down to 50 and 200 m at locations where CTD casts were taken if weather permitted. The samples were preserved in a 4% formaldehyde solution for subsequent laboratory analysis. In total, 50 WP2 samples were collected during the survey (Figure 2, Table 2). WP2 net samples were grouped by total zooplankton and fractioned into <1000 µm and >1000 µm and large zooplankton groups of euphausiids, amphipods and chaetognaths were picked out from the samples

and then frozen. In the laboratory, the frozen zooplankton samples were dried for biomass estimation as dry weight (g m^2) by oven-drying at 60-70°C for a minimum of 24 hours.

Bongo samples (mouth opening of 0.5 m^2 and a mesh size of 500 µm) were used to sample large zooplankton, and nets were deployed diagonally down to 200 m at chosen standard transects (Figure 2) as well as at targeted depths based on acoustic observations indicative of krill registrations based on the 120 kHz frequency. In total, 11 bongo samples were collected, two of them were target stations. The Bongo plankton net contains two nets: one sample net was preserved in 4% formaldehyde, and the other was frozen for later laboratory analysis.

Spatial interpolation of zooplankton biomass data collected in autumn 2025 was performed using gridded bivariate linear interpolation for irregularly spaced data using the Akima package in R (Akima and Gebhardt 2022).

2.4.3 Pelagic trawl sampling

Pelagic trawl sampling was conducted at 30 stations and depth in areas of high capelin density as indicated by acoustic backscatter (38kHz). The pelagic trawls used during the survey were Multpelt 416 by RV Tarajoq and Multpelt 832 or 416 on RV Árni Friðriksson with a mesh size of 19 mm in the cod end. The hauls lasted from 30 to 60 minutes at each station, with a towing speed of approximately 3 knots. A starmon TD temperature and depth sensor was attached to the upper headline of the opening of the pelagic trawl to take measurements of the temperature preferred by capelin.

The total trawl catch was weighed and the whole catch composition was sorted and identified. A random subsample of capelin was taken for further biological analysis. The total length and weight of up to 100 individual capelin fish were measured from the catch at each pelagic trawl station. Individual length, ungutted weight (only on RV Árni Friðriksson), gonad weight, sex and maturity were recorded, with maturity visually staged into maturation stages following the scale in Bjarnason et al 2019 (stages 1: immature-a, 2: immature-b, 3: mature-ripening a, 4: mature-ripening b, 5: mature-ripening c, 6: spawning, 7: spent and 8: resting). The roe of maturing females and males capelin was weighed. Age was estimated from otoliths using standard procedures. The stomachs of 10 capelin were preserved at each station for later laboratory analysis to evaluate the diet composition and feeding behaviour of capelin (Petursdottir *et al.,* 2026). Also, 50 capelin individuals were sampled at every second station for genetic analysis, and at each station, 100 individuals across two size categories (above and below 14 cm) were sampled for fat content analysis.

When the weather allowed, the pelagic trawl was deployed, incorporating a Fishcanner system onboard RV Árni Friðriksson to collect underwater video of capelin schools. In total, three Fishcanner samples were collected during this survey, two in the East Greenlandic shelf and one in the northern Icelandic shelf. The Fishcanner system consists of a camera mounted on a pelagic trawl, which captures video footage of fish schools as the trawl is deployed. This allows for non-invasive observation of capelin behaviour and distribution in their natural habitat, providing valuable insights into their schooling patterns and interactions with the environment. The data collected with the fishcanner will be used in the project MARINE GUARDIAN which aims to use advanced tools such as artificial intelligence to enhance the transition towards sustainable and economically viable fisheries.

2.4.4 Whale watching

Whale sightings were recorded during the survey in accordance with standard protocols. Systematic data collection to estimate marine mammal abundance was conducted aboard both RVs Tarajoq and Árni Friðriksson by two trained observers, each equipped with Fujinon 7×50 FMTRC-SX binoculars. Observations took place during daylight hours along a transect, with two observers on duty at a time in 2-hour shifts followed by approximately 2 hours of rest. Observations were conducted only under suitable environmental conditions, defined as sea state < Beaufort 6 and visibility > 2000 m.

Observation effort and environmental conditions were recorded hourly or when conditions changed. Environmental variables included sea state (Beaufort scale), visibility, swell and glare. Distances to animals were estimated using binocular reticles, and angles were measured with an angleboard positioned between the observers.

On RV Tarajoq, observations were made from an indoor platform located above the bridge (15 m above sea level) and, when visibility from the top platform was reduced by rain, from the bridge itself. On RV Árni Friðriksson, observations were made from an outdoor platform above the bridge (11.5 m above sea level). The port-side observer scanned from 10° starboard to 90° port, and the starboard-side observer scanned from 10° port to 90° starboard.

All sightings were registered on iPads using Whale Tally, a custom-built application. Species were identified to the most precise taxonomic level possible. Where species-level identification was not feasible, sightings were assigned to the most representative category in the Whale Tally species list (e.g., unidentified dolphin, unidentified large baleen whale).

Each sighting record included:

- Time of sighting
- Species name or category
- Number of individuals
- Estimated distance
- Angle
- Cue type
- Number of cue observations
- Observer name

When feasible, photographs were taken to aid species identification using a Nikon Z6 with NIKKOR Z 100–400 mm lens on Tarajoq, and a Canon EOS 550D with Sigma 150–600 mm lens on Árni Friðriksson.

2.4.5 Qualitative analysis during capelin stock assessment

Qualitative analysis of data collected prior to and during the capelin stock assessment is important to ensure data quality and to ensure the stock assessment is conducted with precision. Qualitative analysis was conducted after the survey in terms of i) acoustic interpretation of the capelin backscatter,

ii) maturity staging of the capelin observed in the pelagic trawl samples, and iii) age estimation of the capelin observed in the pelagic trawl samples.

Two independent interpretations of acoustic data collected by both RV vessels were made by two scientists and compared before the final interpretation was determined. Acoustic interpretations were conducted in LSSS software as described above. Both interpretations of the acoustic data showed a similar distribution pattern of capelin backscatter. The distribution of capelin backscatter was generally consistent with the distribution of maturing capelin observed in the pelagic trawl samples, providing confidence in the acoustic interpretation and the subsequent biomass estimates. Overall, the qualitative analysis of the acoustic data provided valuable comparable insights into the spatial distribution of capelin in the surveyed area and supported the subsequent quantitative biomass estimates. Acoustic calibrations were conducted on both vessels during the survey period, and the calibration results were compared to ensure consistency in the acoustic data collected.

Maturity stage validation was performed by examining the length-maturity histogram for stations where both vessels were in close proximity. Maturity Stages 1-2 were considered immature, and stages 3-5 were considered mature fish. There was some uncertainty in the staging of immature stages in southeast Greenland by GINR, which may be due to less experienced biologists conducting the analysis. However, a clear cut between <14 cm and >14 cm capelin, as in the staging of immature and maturing capelin, was observed at station 8 on RV Tarajoq and was suggested to need readjustment. This was not observed in MFRI maturity staging, where immature capelin was observed in less quantity than mature.

A total of 400 otolith samples collected during the survey were cross-read for age validation by MFRI and GINR age readers. The results of the cross-validation were compared, and samples were corrected before final assessment.

2.4.6 Data spatial visualization

Spatial distributions of hydrography, zooplankton, and capelin backscatter were generated in R using the ggplot2 package for visualisation and the Akima package for spatial interpolation of zooplankton biomass data. The spatial visualisation of the raw distribution of capelin and krill backscatter presented in this report was interpolated using the R package metakriging and visualised with ggplot2. The distribution of capelin backscatter is here presented using interpolated maps of NASC values at 38 kHz, as well as the distribution of krill backscatter at 120 kHz.

3 Results and discussion

3.1 Survey progression

The autumn survey covered the shelf edge off East Greenland from about 64°30´N to 72°15´N, the Denmark Strait, outside the Kangertittivaq/Scoresby Sund areas, and the slope off northwest Iceland and scouted part of Iceland Sea and Jan Mayen area (Figure 3). The survey design had some flexibility to allow adjustments based on real-time observations and weather conditions, enabling us to maximise coverage in areas with higher probabilities of finding capelin.

RV Tarajoq departed from Hafnafjörður on August 22nd. An initial calibration attempt in Hvalfjörður was unsuccessful due to poor weather conditions. The vessel departed on August 23rd and began surveying the southwestern part of the survey area on August 24th. Weather constraints forced a one-day stop in Malik Fjord, where the echosounder calibration was successfully completed. The vessel further sailed north, covering the main transects along the southeast coast of Greenland until reaching the Denmark Strait. Due to continuing adverse weather, the survey was cut short by one day, with RV Tarajoq completing operations on September 9th.

RV Árni Friðriksson departed from Hafnafjörður on September 6th and sailed along the Denmark Strait standard transect, covering the northern part of the survey area (Figure 3). Prolonged storm conditions along the east coast of Greenland forced changes to the planned survey tracks. As a result, RV Árni Friðriksson briefly scouted the Iceland Sea and Jan Mayen area before commencing survey operations on standard transect D at 72°N.

Prior to RV ÁrniFriðriksson reaching 72°N, RV Þórunn Þórdardóttir had conducted an oceanographic survey in the region. Good communication between MFRI RVs confirmed that no capelin had been observed north of approximately 71.5°N during the RV Þórunn Þórdardóttir survey. RV Árni Friðriksson further confirmed the absence of capelin at 72°N, and a decision was made to sail southward and complete the remaining survey area with denser survey tracks adjusted to the observed distribution of capelin backscatter and weather constraints. The survey was completed on September 22nd for RV Árni Friðriksson, covering the main region along the southeast coast of Greenland and the shelf edge in Denmark Strait.

Weather conditions were generally favourable for surveying, though periods of rough weather limited sampling and acoustic operations in certain areas, particularly in the northernmost regions. For the same reason, hydrographic measurements, zooplankton sampling, and pelagic trawl deployments were also restricted. Drift ice had minimal impact on survey coverage, affecting only a few nearshore regions, although icebergs and limited bottom topography information occasionally affected routes and limited the extent of transects towards the Greenlandic coast (Figure 3).

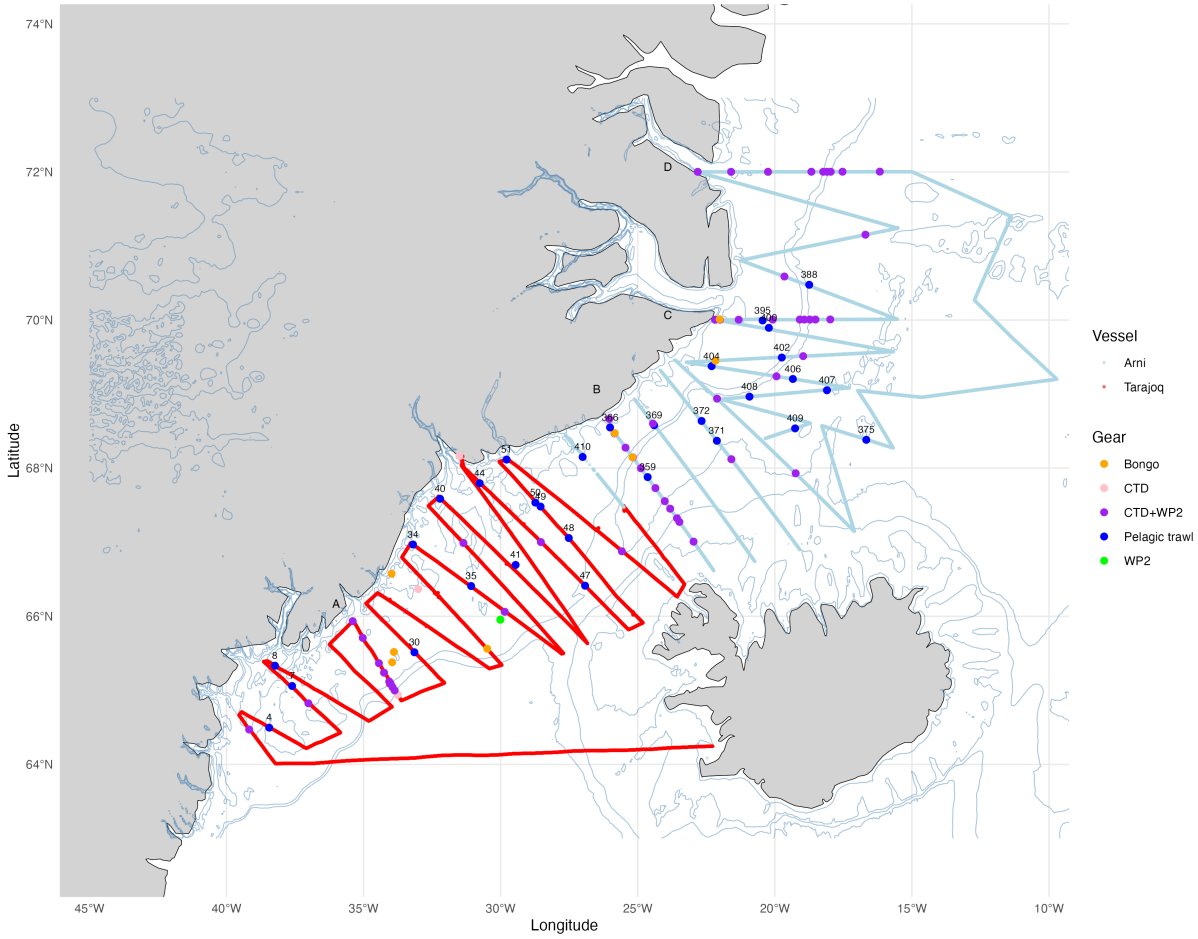


Figure 3. Survey tracks and location of stations conducted during the autumn survey in 2025. Different colours indicate the gear and survey tracks used by each research vessel. Bathymetry isolines of 50, 200, 500 and 1000 m are marked by light blue contour lines. Station numbers of pelagic trawls are also marked.

3.2 Hydrography

Spatial distribution of temperature and salinity in autumn 2025 revealed consistent gradients across the study region, with depth-related variability.

Surface layers (0-50 m) were warmer and fresher, with temperatures highest in the south and decreasing northward, while salinity was lowest in the south and higher offshore and to the north (Figure 4). With increasing depth (50-300 m), temperatures decreased, and salinity increased; both parameters showed a more homogeneous distribution across the study area. Overall, the water column was strongly stratified, with a warm, fresh surface layer overlying colder and more saline deeper waters.

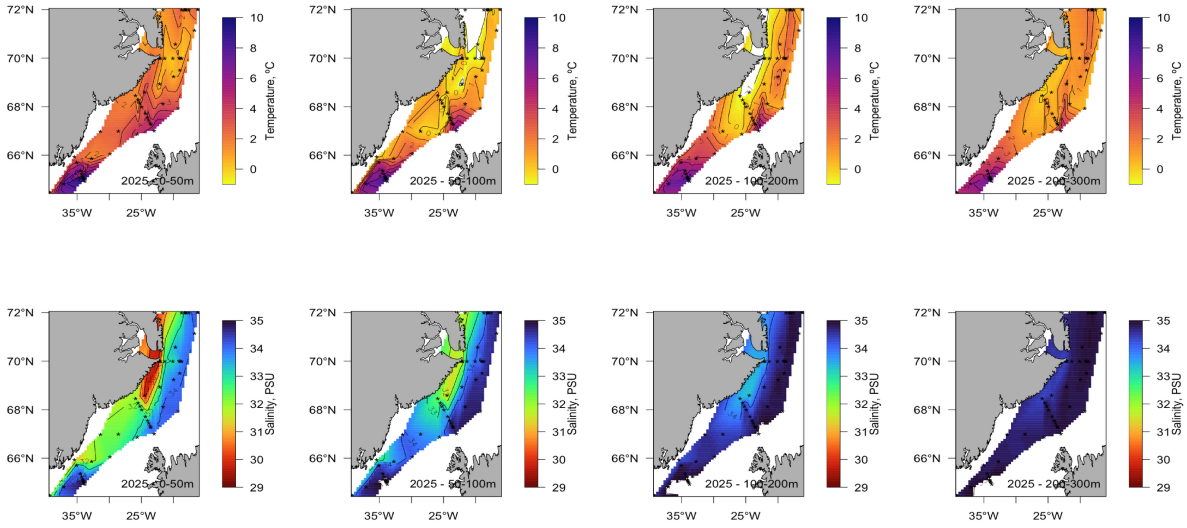


Figure 4. Temperature (upper panels) and salinity (lower panels) variability during the autumn survey in 2025 by depth intervals.

3.3 Zooplankton distribution

The biomass of total zooplankton, <1000 µm and >1000 µm, as well as the biomass for the large zooplankton groups of Euphausiids, amphipods and Chaetognaths observed during the autumn survey in 2025 is shown in Figure 5. Zooplankton biomass was variable, with some regions showing higher concentrations than others. Total zooplankton biomass was generally higher in the southern part of the survey area, particularly along the East Greenlandic shelf and shelf edge, compared to the northern regions. The biomass of zooplankton <1000 µm was generally higher than that of >1000 µm, indicating a dominance of smaller zooplankton in the surveyed area. Large zooplankton groups such as euphausiids and amphipods were observed along the southeast Greenlandic shelf and shelf edge, particularly in the Denmark Strait area. The distribution of chaetognaths was sparse, occurring mainly in the southern part of the survey area.

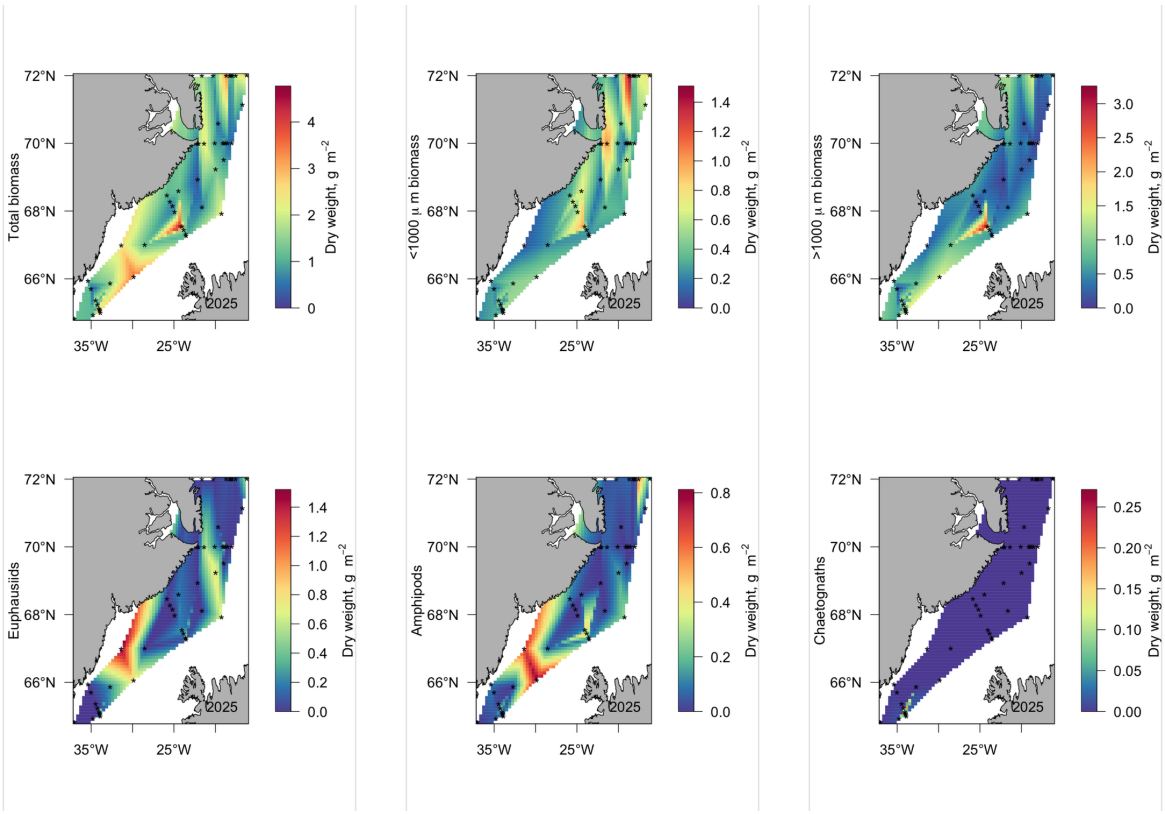


Figure 5. Distribution of total zooplankton, <1000 µm and >1000 µm biomass as well as the biomass for the large zooplankton groups of euphausiids, amphipods and chaetognaths observed during the autumn survey in 2025.

On average, the biomass of total zooplankton was estimated to be 1.4 g m^2, with a range of 0.2 to 4.7 g m^2 across the surveyed area (Table 3). The biomass of zooplankton <1000 µm was estimated to be on average 0.4 g m^2, while the biomass of zooplankton >1000 µm was estimated to be 0.6 g m^2. The biomass of euphausiids was estimated to be ~0.2 g m^2 on average, while the biomass of amphipods and chaetognaths was estimated to be 0.1 g m^2 and 0.01 g m^2, respectively.

Table 3. Summary of zooplankton biomass (gm^2) estimates for each fraction (< 1000 µm and >1000 µm) and each large zooplankton group observed during the autumn survey in 2025.

Parameter	Total Biomass	<1000µm	>1000µm	Euphausiids	Amphipods	Chaetognaths
mean	1.44	0.43	0.61	0.18	0.10	0.01
stdev	1.00	0.28	0.61	0.30	0.18	0.04
min	0.19	0.09	0.03	0.00	0.00	0.00
max	4.77	1.51	3.26	1.52	0.81	0.27

3.3.1 Krill spatial distribution from acoustic estimates

Currently, this report focuses only on describing krill density from acoustics data and biomass estimates are not presented because bongo samples are still being processed. Krill density was generally higher in the southern part of the survey area, particularly along the East Greenland shelf edge and in the Denmark Strait, compared to the northern regions north of 68˚N, offshore regions, and

the Jan Mayen area (Figure 6). However, due to differences in pulse lengths on the RV Tarajoq quantitative estimates of krill biomass were not comparable between the two RVs and the RV Tarajoq´s data were therefore not included in this report. Further analysis and validation of the acoustic data are required to provide accurate estimates of krill distribution and biomass.

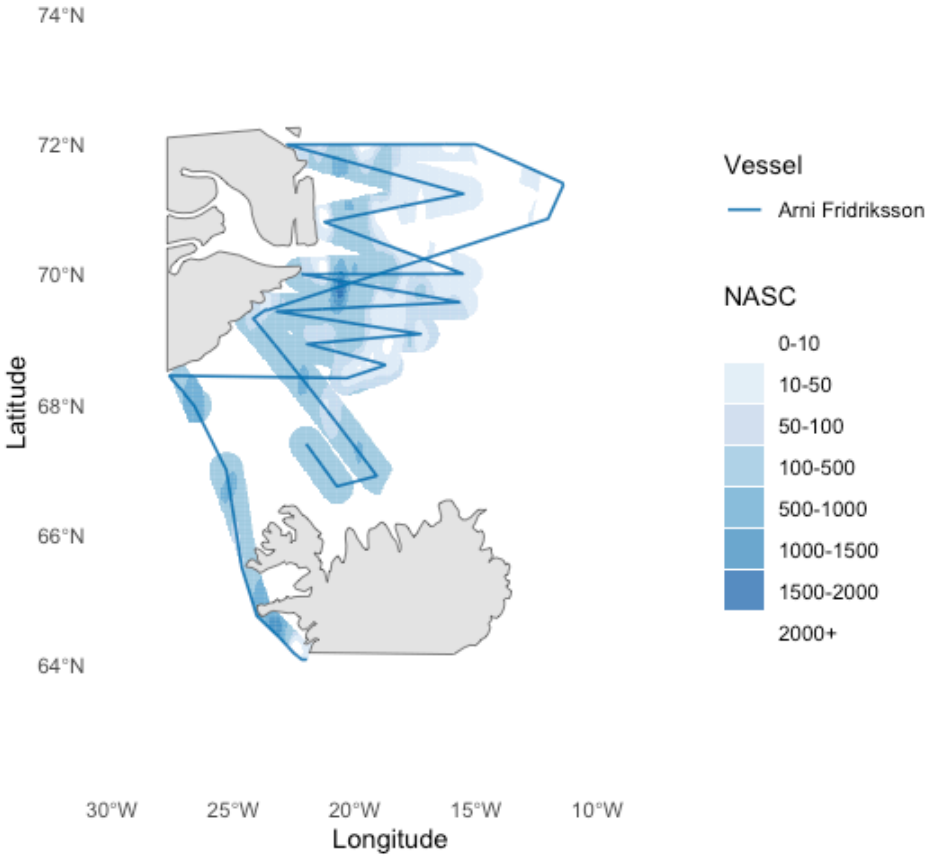


Figure 6. The relative density of acoustic backscatter of krill at 120 kHz as NASC (m2/nmi^2) during 23 August-22 September 2025. Survey tracks of RV Árni Friðriksson are shown in different colours.

3.3.1.1 Diel vertical distribution of krill

Weight mean depth distribution from acoustics of krill is shown in (Figure 7) and it shows that the depth of krill in the water column varied across the survey area during time of day, with krill generically staying at 200 to 300 m depth during the day hours (6-18h) and staying shallower around 50 to 150 m during the night hours (20-3h). The depth distribution of krill also varied across different latitudes of the survey area (Figure 8), with some regions showing shallower distributions than others, while other regions showed deeper distributions. This variability in depth distribution may be influenced by factors such as prey availability, predator avoidance, and environmental conditions.

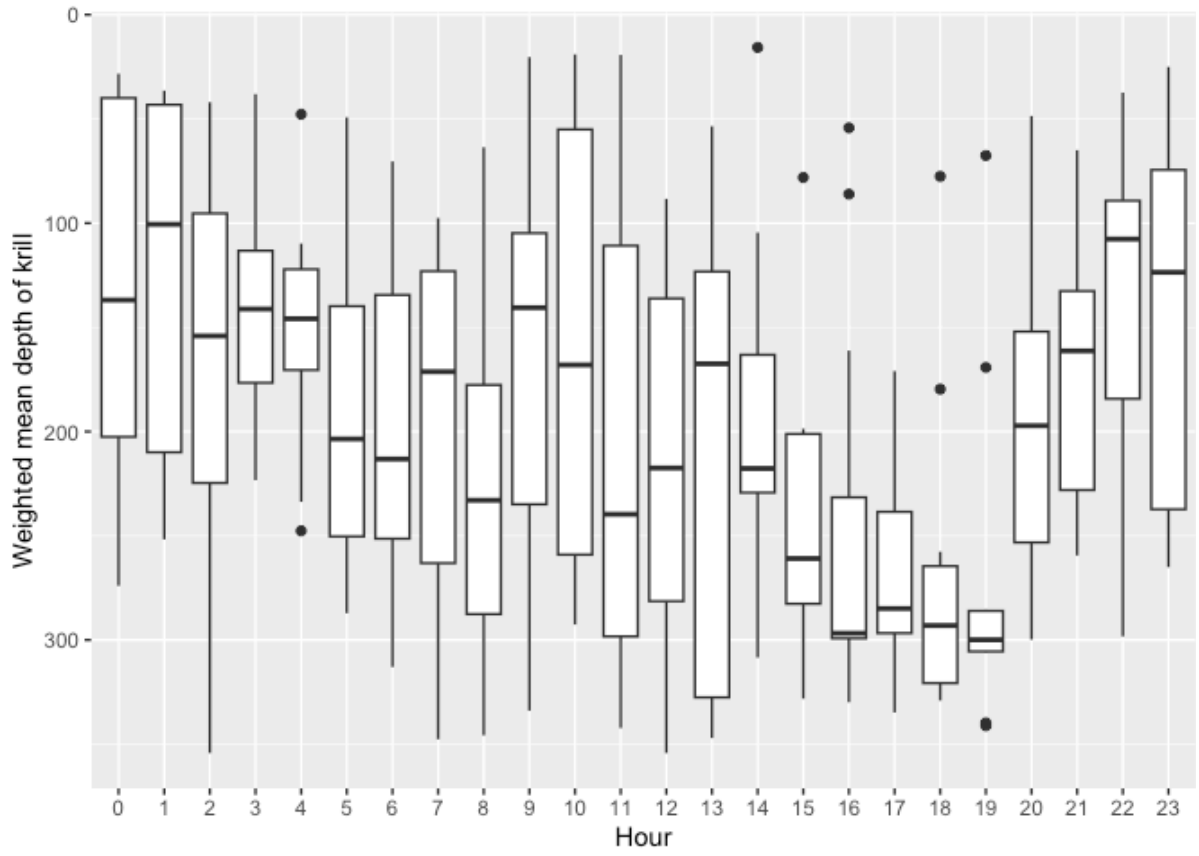


Figure 7. Boxplot showing the daily variability of the weighted mean depth (m) of krill observed during the autumn survey 2025. The y-axis is reversed to show the depth of krill in the water column.

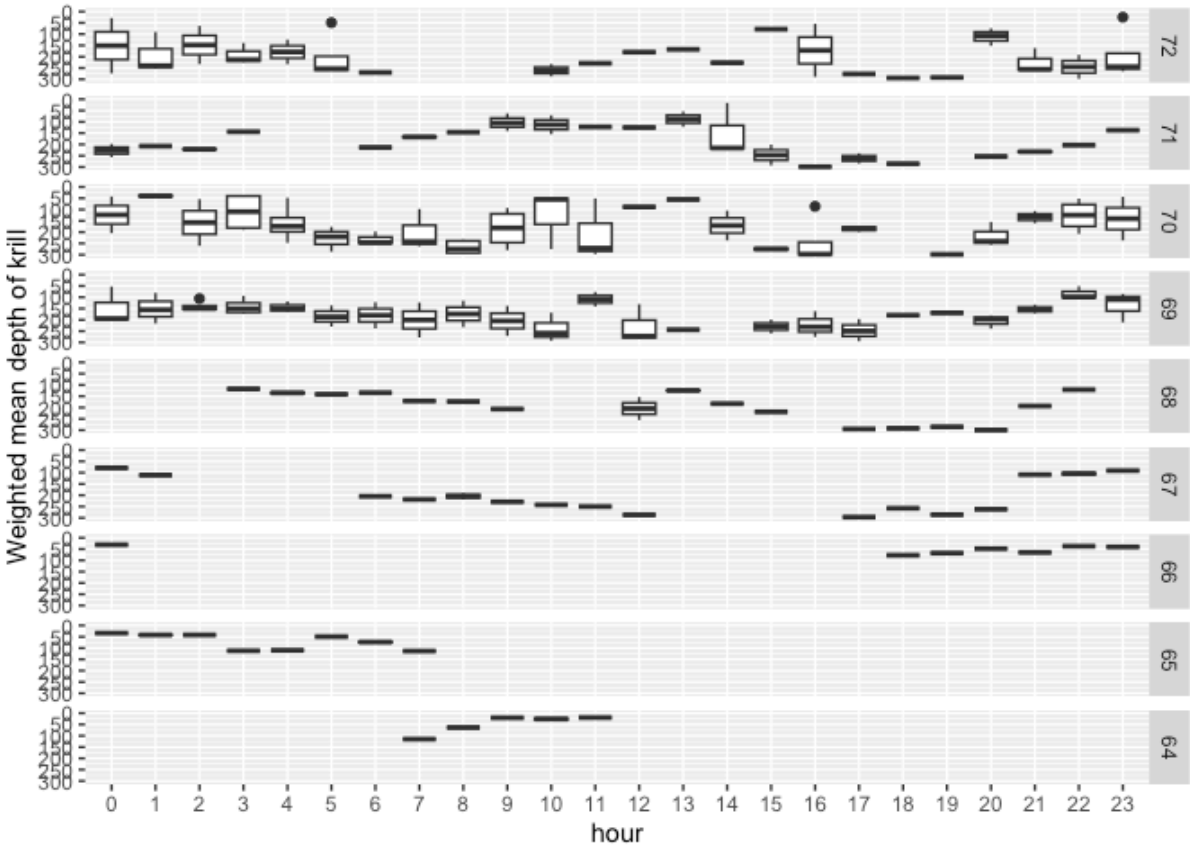


Figure 8. Boxplot showing the daily variability of the weighted mean depth (m) of krill observed during the autumn survey 2025. Each panel indicates the latitude degree where the krill were observed. The y-axis is reversed to show the depth of krill in the water column.

3.4 Spatial distribution of pelagic fish

Capelin was the target species in the pelagic trawl and, as expected, the dominant species observed. Capelin were widely distributed across the surveyed area, with higher densities along the southeast Greenlandic shelf and shelf edge, particularly in the Denmark Strait area. Maturing capelin were observed in greater quantity, with the highest catches clustered between 68-70˚N and 20-25˚ W, where most of the mature capelin were found. Other species were observed in the pelagic trawl samples, but at lower abundances than capelin.

Gadiformes displayed a moderate distribution, with cod (*Gadus morhua*) and polar cod (*Boreogadus saida*) occurring predominantly at northern latitudes, while haddock (*Melanogrammus aeglefinus*) and blue whiting (*Micromesistius poutassou*) appeared at lower abundances in southern regions of the survey area. Myctophiformes were recorded as isolated, low-abundance occurrences in the western portion of the survey area. Scorpaeniformes, particularly redfish (*Sebastes sp.*) and the sculpin (*Triglops murrayi* and *Triglops sp.*), were sparsely distributed along the southeastern Greenland coast, suggesting an association with shallower shelf-influenced waters. Lumpfish (*Cyclopterus lumpus*) were observed in low abundances, primarily along the southeastern margin of the survey area near the east Greenland coast.

Krill were found scattered across mid-latitudes at low to moderate densities; however, it should be noted that krill were not recorded in the trawls conducted by the MFRI. Cephalopods (squid *Gonatus sp.*) were observed in low abundances, primarily in the southern and western margins (64-68˚ N).

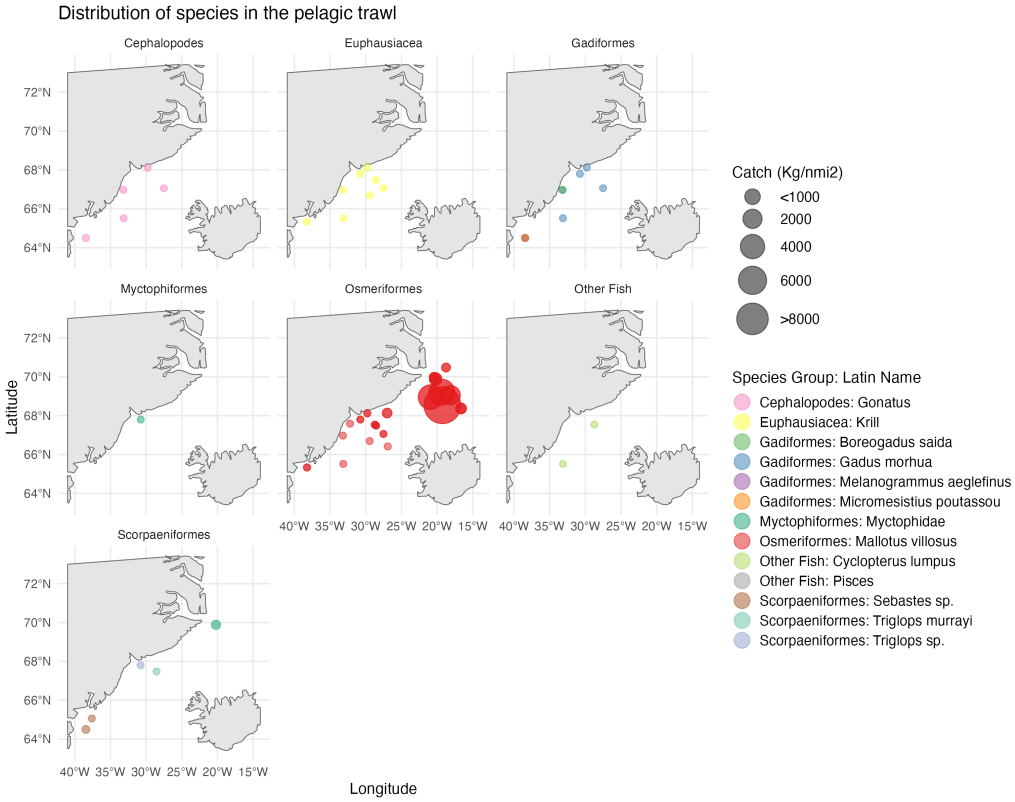


Figure 9. Distribution of species caught by the pelagic trawl during the autumn survey in 2025.

3.5 Capelin distribution and biomass estimates

A clear spatial structure in capelin maturity was evident, with more mature individuals occurring in the northeast part of the surveyed region. Maturing capelin was mainly observed outside the Icelandic continental slope, north and northwest of Iceland (between 68-70°N and 20-22°W, see Figure 10). In the western Denmark Strait, maturing capelin mixed with immature capelin, while mainly maturing capelin occurred farther northeast, outside Scoresby Sund. As last year, mature capelin were found only a relatively short distance east of the Denmark Strait. No capelin was found near the western part of the Jan Mayen ridge or north of 71°N. Juveniles (0-group) of various species, including capelin (although not quantified) were observed along the continental shelf north and northwest of Iceland and along the southwestern coverage of the Greenlandic shelf. Immatures were mixed with maturing capelin near shore, both south and north of the opening of Kangertittivaq/Scoresby Sund, and in the southwestern part of the survey area and western Denmark Strait, with less mature capelin admixture. Immature capelin was found along the Greenlandic shelf, dominating in the southwestern part of the survey area and close to the coast along the Denmark Strait (Figure 11). In general, distinguishing between mature and immature developmental stages was less challenging than in autumn 2022.

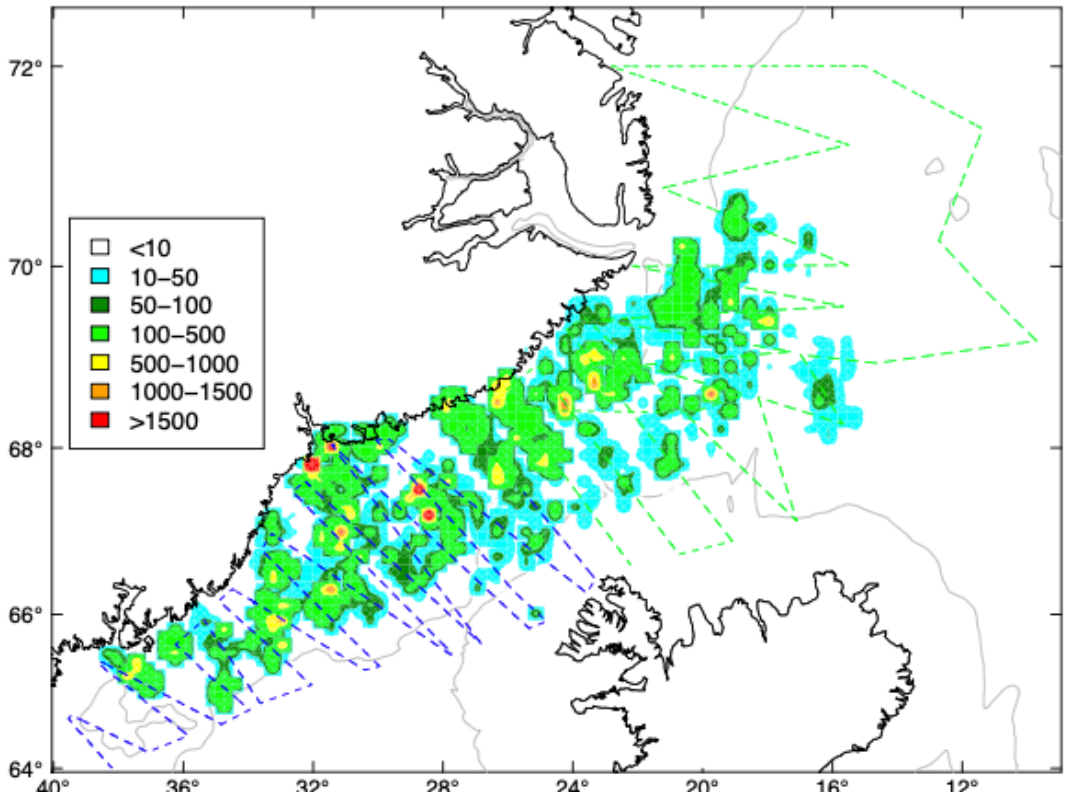


Figure 10. The relative density of acoustic backscatter of capelin as NASC (m^2/nmi^2) during 23 August-22 September 2025. Survey tracks by RV Árni Friðriksson(green), and RV Tarajoq(blue) are shown by dash lines.

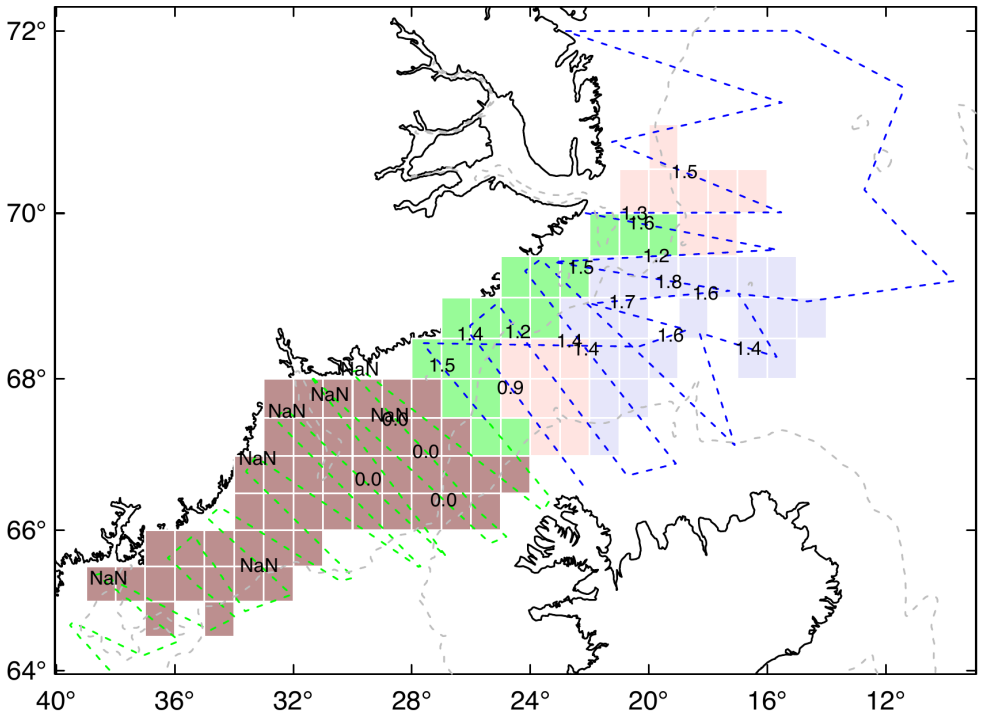


Figure 11. Average roe content of the maturing female capelin at each trawl station within each rectangle during the autumn survey from 23 August to 22 September 2025. Different colour squares (brown, green, pink, and blue) indicate the square assigned to acoustic ecoregions based on the proportion of samples. Dashed lines indicate the survey transects.

3.5.1 Diel vertical migration

Capelin were observed at a wide range of depths during the survey, from 20 m down to 250 m, with the majority of observations occurring in the upper 100 m of the water column (Figure 12). The depth distribution of capelin varied throughout the daytime (8-18 h), with a clear diel vertical migration pattern observed. During the day, capelin were primarily found at deeper depths, while at night they were observed closer to the surface. This diel pattern of capelin was consistent with previous studies showing that capelin undertake diel vertical migrations, likely as a strategy to avoid predators and optimise feeding opportunities.

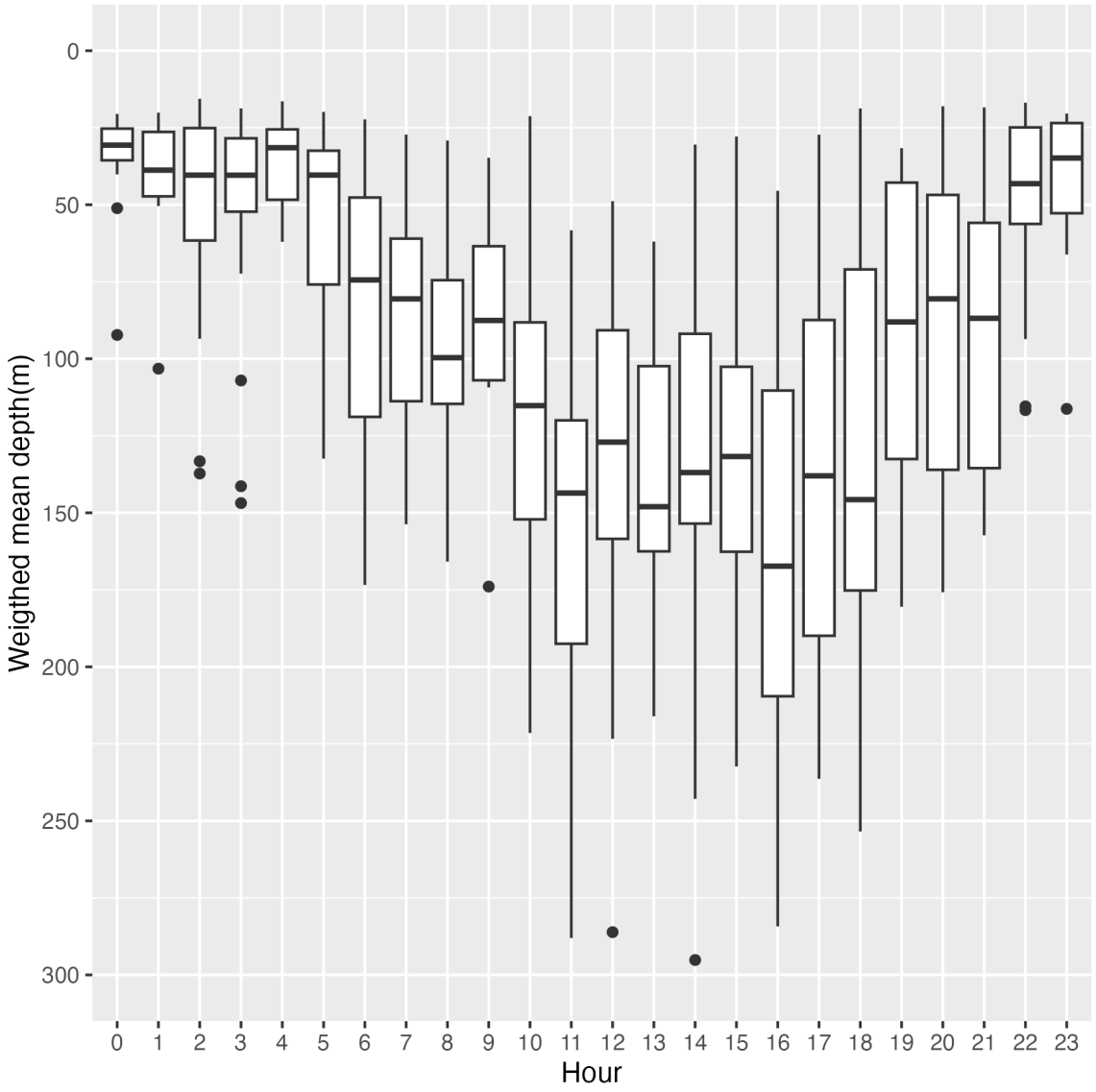


Figure 12. Boxplot showing the diurnal variability of the weighted mean depth (m) of capelin were observed during the autumn survey 2025. The y-axis is reversed to show the depth of capelin in the water column.

However, in Figure 13 it is evident that the depth distribution of capelin varied across different latitudes of the survey area, with some regions showing shallower distributions (67°N to 69°N) than others, while other regions showed deeper distributions (70°N). This variability in depth distribution may reflect prey availability, predator avoidance, and environmental conditions.

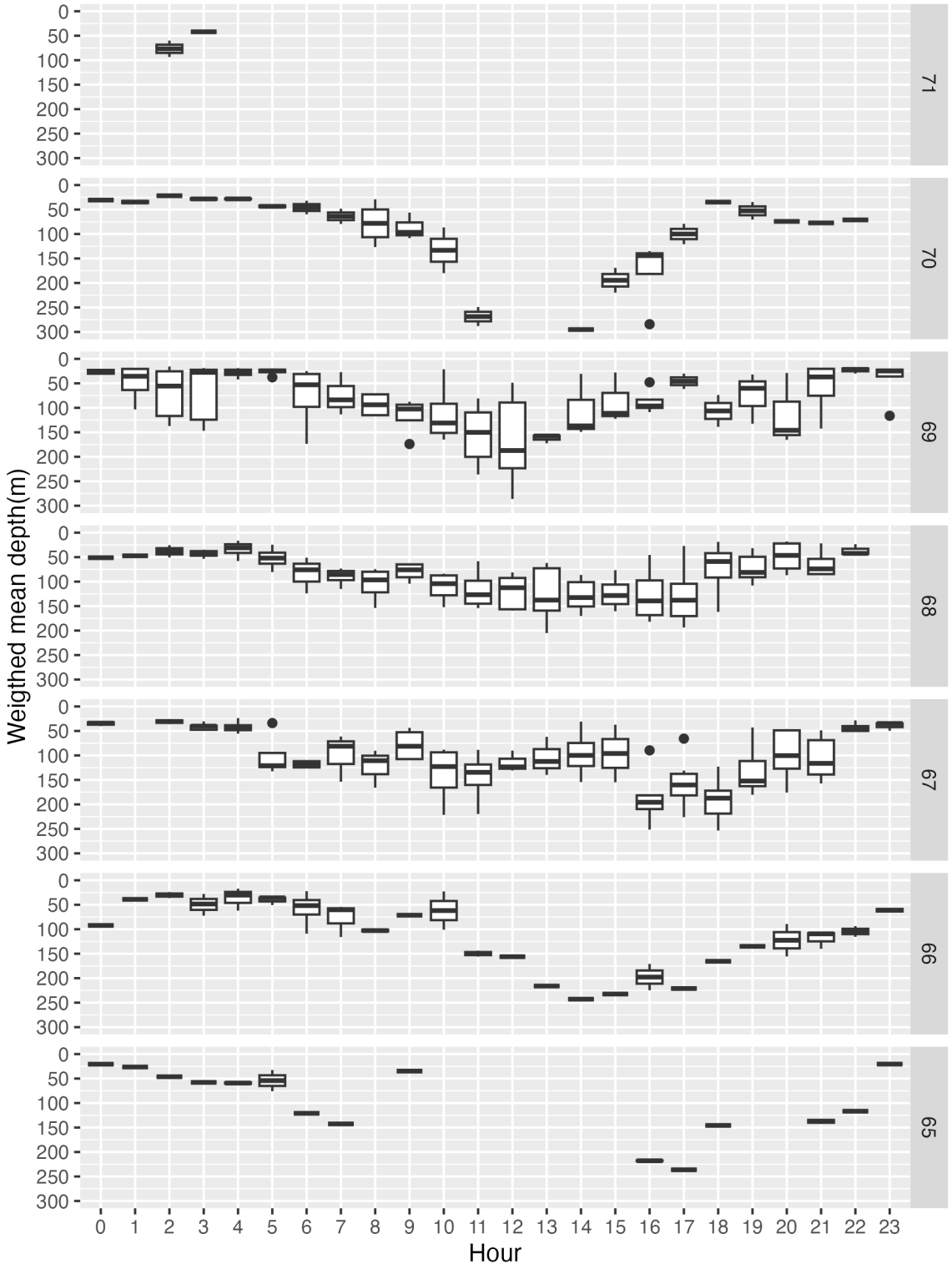


Figure 13. Boxplot showing the diurnal variability of the weighted mean depth (m) of capelin were observed during the autumn survey 2025. Each panel indicated the latitude degree where the capelin were observed. The y-axis is reversed to show the weigthed mean depth of capelin in the water column.

3.5.2 Temperature ranges of capelin observations

Capelin was observed across a wide temperature range, from -0.9 to 5.6 °C (Figure 14), with most observations occurring around 1.5 °C, though variation depended on location and depth. The

temperature range of capelin observations is consistent with previous studies that have shown that capelin prefer cooler waters.

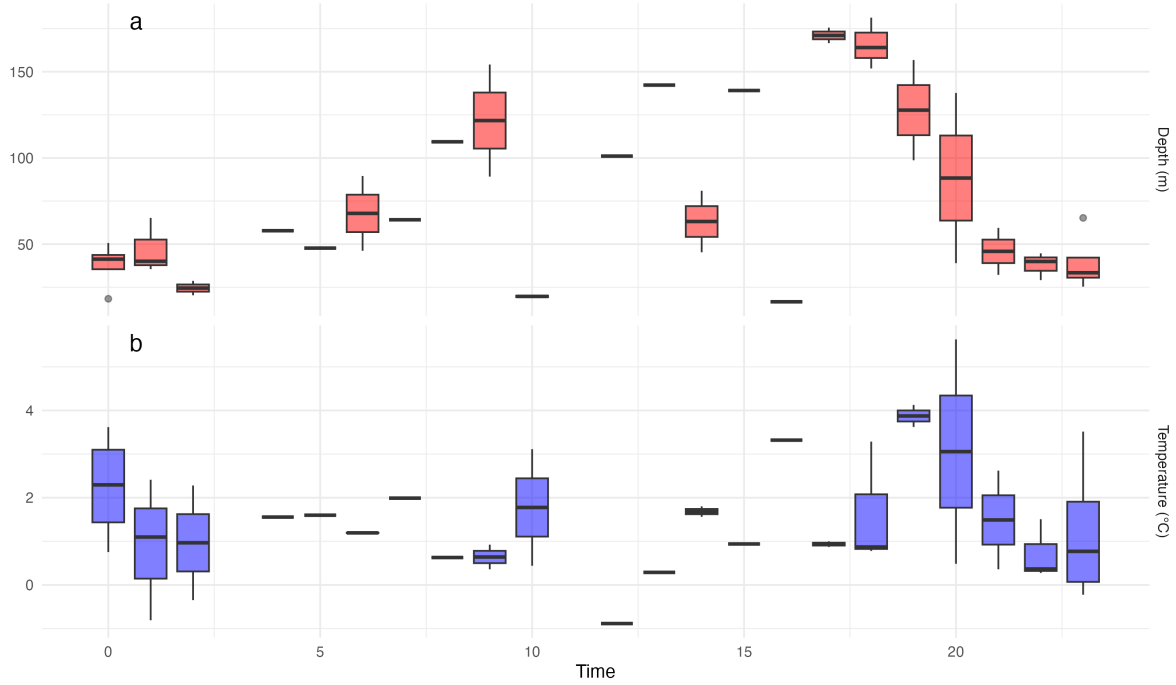


Figure 14. Boxplot showing the (a) variability of depth of the trawl (m) and (b) temperature (C) ranges by hour sampled by the pelagic trawl where capelin were observed during the autumn survey in 23 August-22 September 2025.

3.5.3 Biomass and age composition of capelin

The total number of capelin amounted to 139 billion, of which the 1-year-olds were about 117 billion (Figure 15, Table 4, Table 7). Mature capelin amounted to a total of 20.65 billion and 418 thousand tonnes (Table 6), while immature capelin amounted to 188.86 billion and 792 thousand tonnes.

Table 4. Summary of capelin stock assessment from the autumn 2025 survey. SSN: Spawning Stock Numbers (billions), SSB: Spawning Stock Biomass (thousand tonnes), Total N: Total abundance (billions), Total B: Total biomass (thousand tonnes).

Component	Abundance (billions)	Biomass (1000 tonnes)	Mean weight (g)	Mean length (cm)
Total stock	139.5	1,209,378	8.67	12.30
Spawning stock	20.6	417,550	20.23	15.75
Immature stock	118.9	791,828	6.66	11.70

Table 5. Age composition of the total capelin stock from the autumn 2025 survey.

Age (years)	Abundance (billions)	Biomass (1000 tonnes)	Percentage (%)
1	116.64	760,139	83.6
2	20.45	390,413	14.7
3	2.26	55,302	1.6
4	0.14	2,976	0.1
5+	0.02	547	0.0
Total	139.51	1,209,377	100.0

Table 6. Age composition of the spawning stock (SSN/SSB) from the autumn 2025 survey.

Age (years)	SSN (billions)	SSB (1000 tonnes)	Percentage (%)
1	3.29	36,959	15.9
2	15.52	330,396	75.2
3	1.68	46,672	8.1
4	0.14	2,976	0.7
5+	0.02	547	0.1
Total	20.65	417,550	100.0

Table 7. Age composition of the immature stock from the autumn 2025 survey.

Age (years)	Imm N (billions)	Imm B (1000 tonnes)	Percentage (%)
1	113.35	723,180	95.4
2	4.93	60,017	4.1
3	0.58	8,630	0.5
Total	118.86	791,827	100.0

About 16% of 1-year-old, 75.2% of 2-year-old, 8% of 3-year-old, and all 4-year-old capelin appeared to be maturing. This gives about 417.550 tonnes of maturing 1–5-year-old capelin (Table 6).

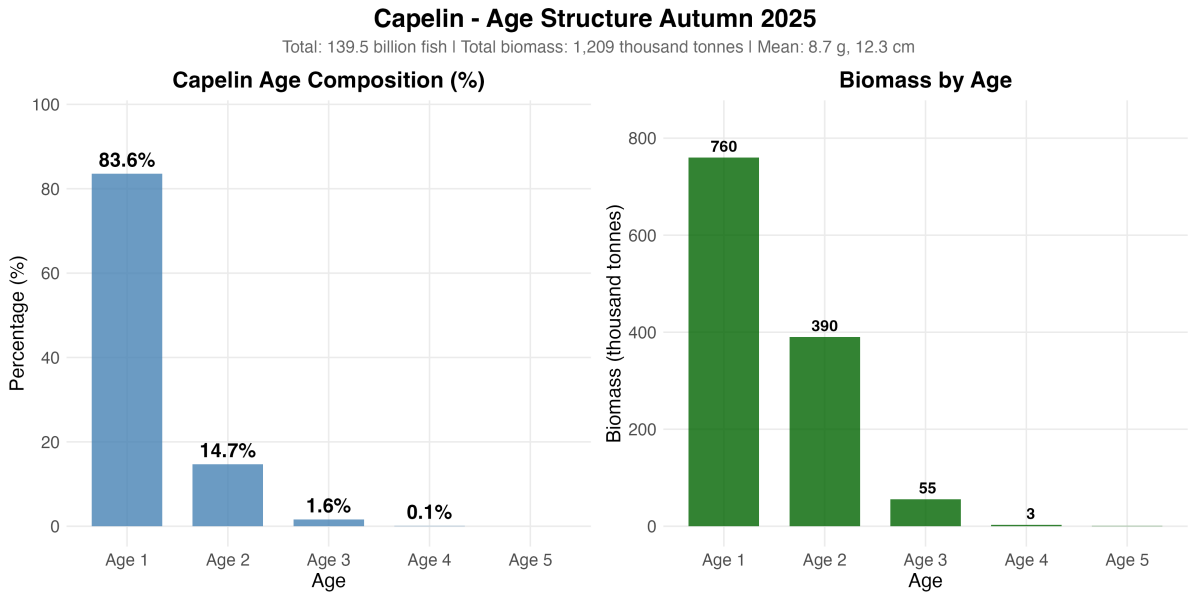


Figure 15. Age composition and disaggregated biomass (thousand tonnes) of capelin by age group (1-5 year old) in assessment during the autumn survey in 23 August-22 September 2025.

The capelin length distribution was dominated by 10-12 cm individuals. The length distribution of capelin varied across different age groups, with younger age groups (1-2 year old) being dominated by smaller individuals (10-12 cm and 15 to 16 cm, respectively), while older age groups (3-4 year old) had a wider range of lengths, including individuals up to 21 cm (Figure 17).



Figure 16. Length age structure of capelin by age group (1-5 year old) in the autumn survey in 23 August-22 September 2025.

Age and length disaggregated biomass is shown in tables B1, B2 and B3 in the Appendix, which provide a breakdown of total, maturing and immature stock by length and age.

3.5.4 Survey bootstrap uncertainty estimation

Uncertainty of estimates of stock parameters was assessed using the bootstrap method, following ICES (2015). Table 8 gives the bootstrap mean, CV and standard quantiles of selected stock parameters. The uncertainty of the assessment and forecast depends largely on the quality of the acoustic surveys, including coverage, measurement conditions and the aggregation of capelin (i.e., high patchiness leads to high variance).

The CV of immature abundance was estimated at 0.11 in the 2025 autumn survey. The survey had a relatively high coefficient of variation (CV=0.2) for the mature stock estimate. The 2025 autumn survey's spatial coverage was considered to encompass the stock‘s distribution area. Some uncertainty remains in the distribution of immature capelin in the autumn survey because the 18kHz was not calibrated on the RV Tarajoq, making it difficult to separate immature capelin from the 0-group. However, this uncertainty does not affect the assessment results for the mature stock estimate. Although time constraints and technical challenges affected the autumn survey, the survey team collected data on the distribution and abundance of immature and mature capelin components, which seemed to cover the required information.

Table 8. Bootstrap estimates mean and quantiles of stock assessment. Units for echo abundance (NASC*Area, millions m^2), N: number of individuals (billions), B: biomass (thousand tonnes), SSB: Spawning stock biomass, CV: Coefficient of variation.

Estimates	Mean	CV	5%	25%	50%	75%	95%
Echo abundance	7.66	0.10	6.43	7.13	7.64	8.17	8.97
Number of individuals	139.60	0.10	116.60	129.71	139.21	149.12	163.80
Biomass	1,207.49	0.11	1,005.03	1,118.09	1,203.13	1,291.16	1,428.16
Spawning stock numbers	20.59	0.20	14.48	17.65	20.25	23.16	27.88
SSB	415.56	0.20	291.70	355.74	408.31	467.21	564.39
Immature numbers	119.01	0.11	97.97	110.01	118.63	127.77	141.14
Immature numbers age 1	113.53	0.11	93.05	104.73	113.13	122.04	135.10
Immature numbers age 2	4.91	0.32	2.66	3.81	4.76	5.84	7.69
Immature numbers biomass	791.93	0.11	654.24	732.78	789.73	848.97	936.94
Proportion numbers age 3 in SSN	0.08	0.23	0.05	0.07	0.08	0.09	0.11
Proportion biomass age 3 in SSB	0.11	0.21	0.08	0.10	0.11	0.13	0.15

3.5.5 Predation model results

After the survey and upon completion estimation of stock parameters and their uncertainty, 100 thousand bootstrap replicates were used as starting values for predation model runs (ICES 2023, ICES

2024). Results from the autumn 2025 predation runs are given in Table 9 and shown in Figure 17 and Figure 18

Figure 17 shows four distributions from the predation model runs, comparing current and predicted stock size after predation of cod, haddock and saithe (ICES 2023, ICES 2024). The measured spawning stock biomass (SSB) during the autumn survey 2025 (median: 410 thousand tonnes) was projected to decline to 220 thousand tonnes (median). Predation averages 124 thousand tonnes (Table 9) with a predation mortality rate of approximately 40% (Figure 18).

Table 9. Quantiles and mean of SSB of capelin at time of spawning (15 of March) and total predator consumption in tonnes based on the predation model.

Parameters	Mean	Q5%	Q25%	Q50%	Q75%	Q95%
SSB	228,930	114,130	171,520	220,030	277,420	373,140
Predation	124,340	81,930	103,850	121,730	141,980	175,660

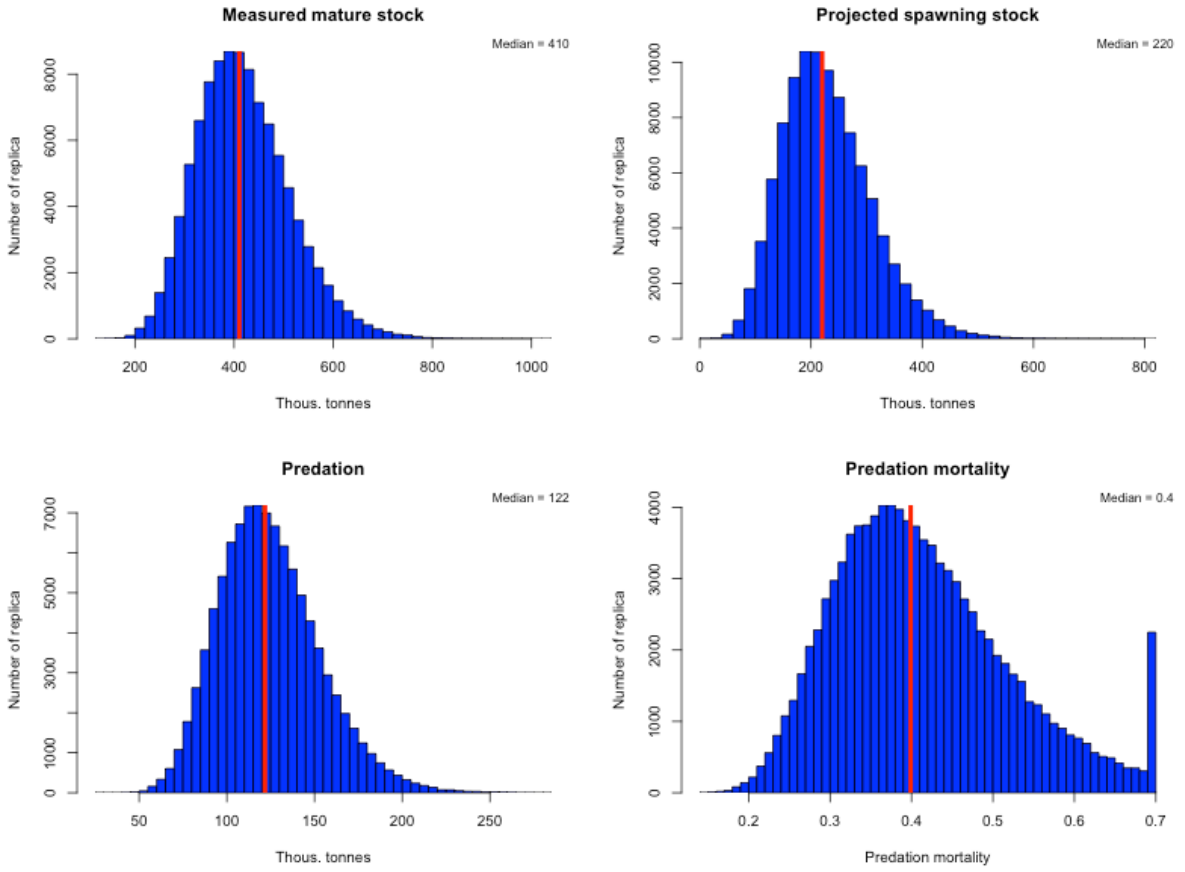


Figure 17. Summary of results from the 2025 autumn acoustic survey and predation model predictions. Biomass survey estimates of mature capelin (top-left), the projected spawning stock biomass left for spawning based on the predation model (top-right), predicted predation 15 January – 15 March (bottom-left) and the applied predation mortality (bottom-right).

The results of the acoustic measurements in autumn 2025 (see section 4.2) on biomass of the mature part of the stock and accounting for the results of the predation model indicate that the goal of the harvest control rule of leaving at least 114 000 t for spawning with a 95% probability would be met with a catch of 65 650 tonnes (Figure 18). With the added precaution of the amended HCR (setting TAC

at 2/3 of the original rule), 43 766 tonnes was advised as the intermediate TAC for the fishing season from 15 October 2025 to 15 April 2026.

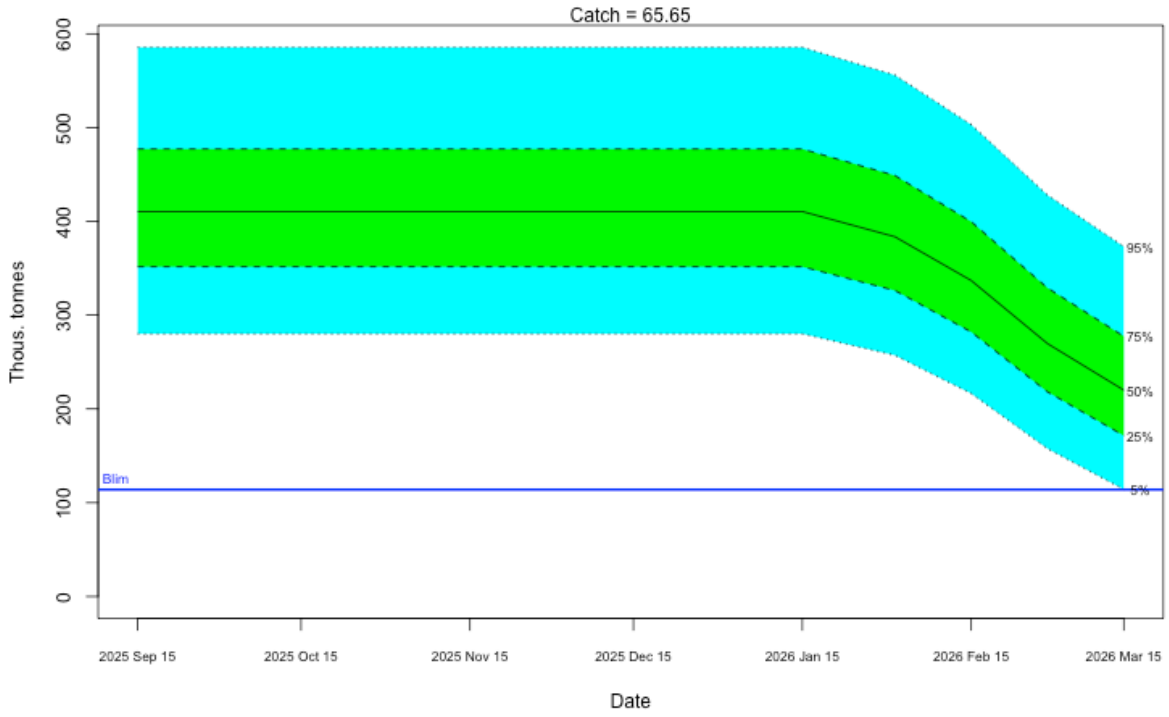


Figure 18. Predicted development of the SSB with 65 650 t catch based on the predation model.

3.6 Distribution of marine mammals

The survey spanned 33 days (17 aboard RV Tarajoq and 16 aboard RV Árni Friðriksson) and resulted in 180 marine mammal sightings comprising 676 individuals. Nine species were confirmed during the survey: blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), humpback whale (*Megaptera novaeangliae*), minke whale (*B. acutorostrata*), sei whale (*B. borealis*), northern bottlenose whale (*Hyperoodon ampullatus*), sperm whale (*Physeter macrocephalus*), long-finned pilot whale (*Globicephala melas*) and white-beaked dolphin (*Lagenorhynchus albirostris*) (Figure 19, Figure 20, Figure 21).

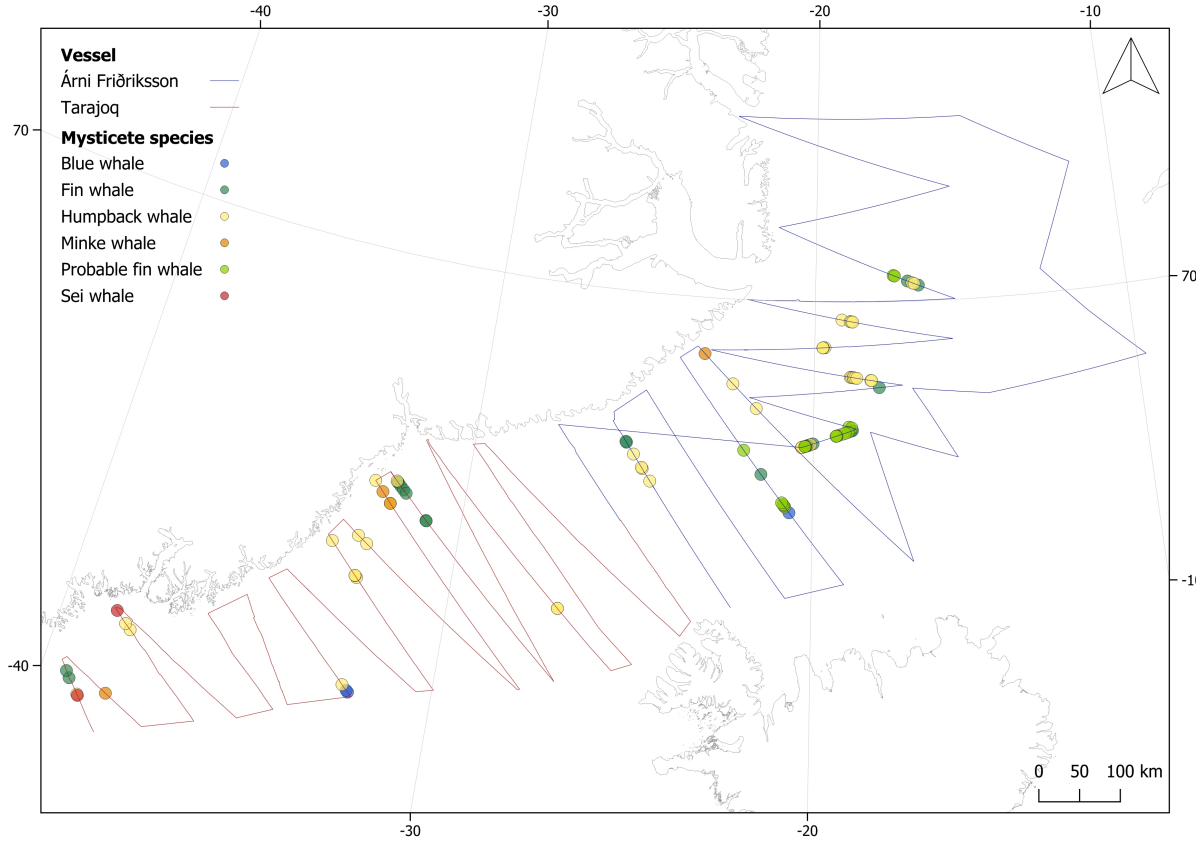


Figure 19. Map of the survey area with locations of sightings of Mysticetes species and survey tracks of RV Tarajoq (red) and RV Árni Friðriksson (blue) in August and September 2025.

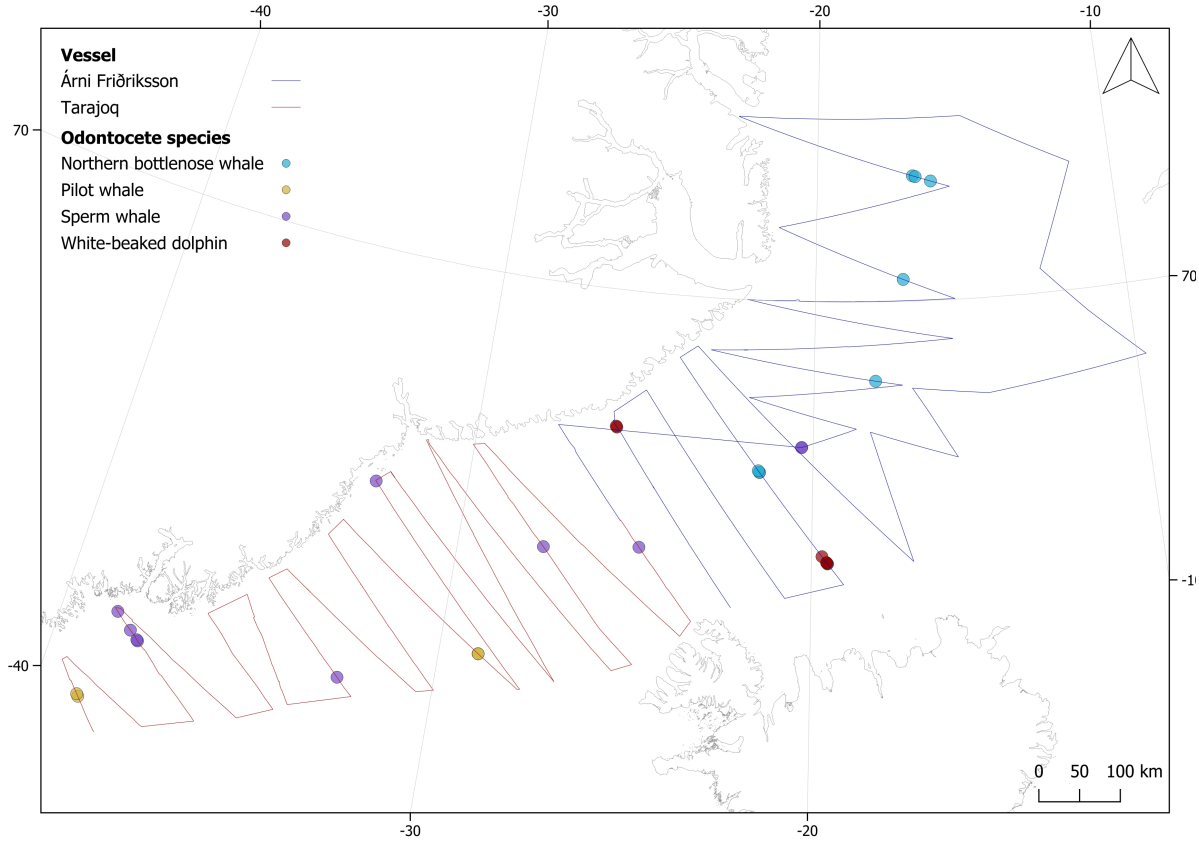


Figure 20. Map of the survey area with locations of sightings of Odontoceti species and survey tracks of RV Tarajoq (red) and RV Árni Friðriksson (blue) in August and September 2025.

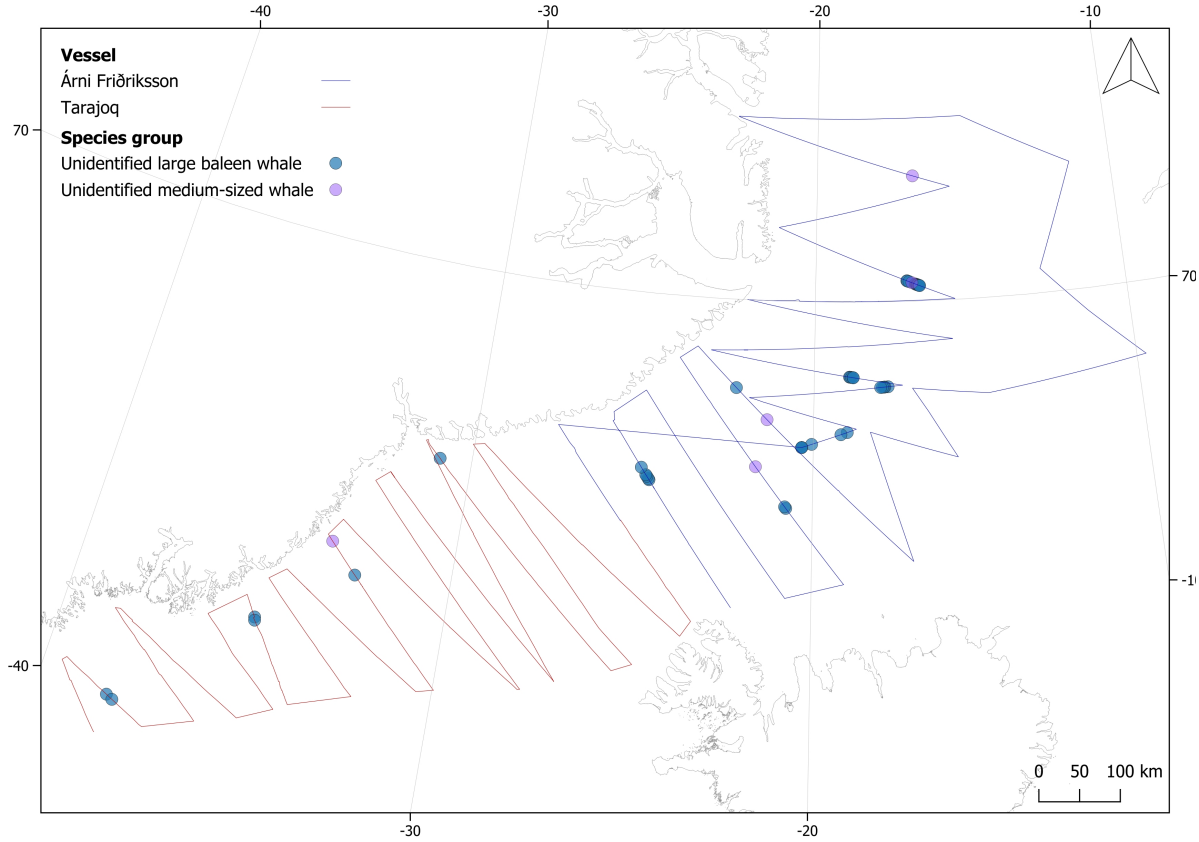


Figure 21. Map of the survey area with locations of sightings of unidentified species and survey tracks of RV Tarajoq (red) and RV Árni Friðriksson (blue) in August and September 2025.

The distribution of species varied across the survey area (Figure 19). Blue, sei, pilot, sperm whales and white-beaked dolphins (Figure 19) were recorded primarily in the southern part of the survey area, while northern bottlenose whales occurred mainly in northern offshore waters (Figure 20). Fin and humpback whales were widely distributed throughout the survey area (Figure 19). Unidentified medium-sized and large baleen whales were recorded across the entire survey area (Figure 21).

Humpback whale was the most frequently sighted species (54 sightings), followed by fin whale (25), with an additional 16 sightings recorded as probable fin whale (Figure 22). Among odontocetes, sperm whale (10), northern bottlenose whale (8), and white-beaked dolphin (7) were recorded (Figure 22). White-beaked dolphins occurred in the largest groups (two sightings of 150 individuals each) and accounted for the highest total number of individuals (385) (Figure 22 and Figure 23). Large whales were typically sighted singly or in small groups (1 to 3 individuals).

For 47 sightings (~26 %), species-level identification was not possible due to distance or time constraints. Of these, 42 were unidentified large baleen whales (likely blue or fin), and 5 were unidentified medium-sized whales (Figure 22). Notably, unidentified large baleen whales accounted for ~23% of all sightings, consistent with detection bias at greater ranges and during higher sea states. Sea state was often Beaufort 3 or higher, which likely under-represents smaller species in the dataset.

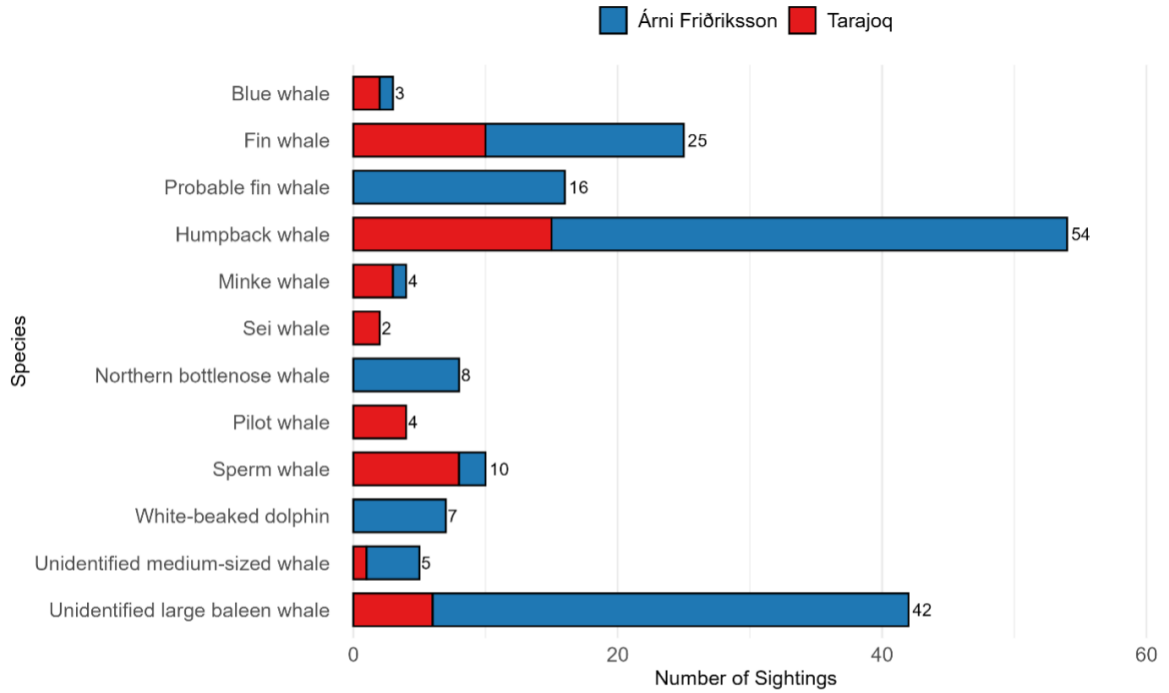


Figure 22. Number of sightings for all nine species sighted during the survey for both vessels: RV Árni Friðriksson (blue) and RV Tarajoq (red).

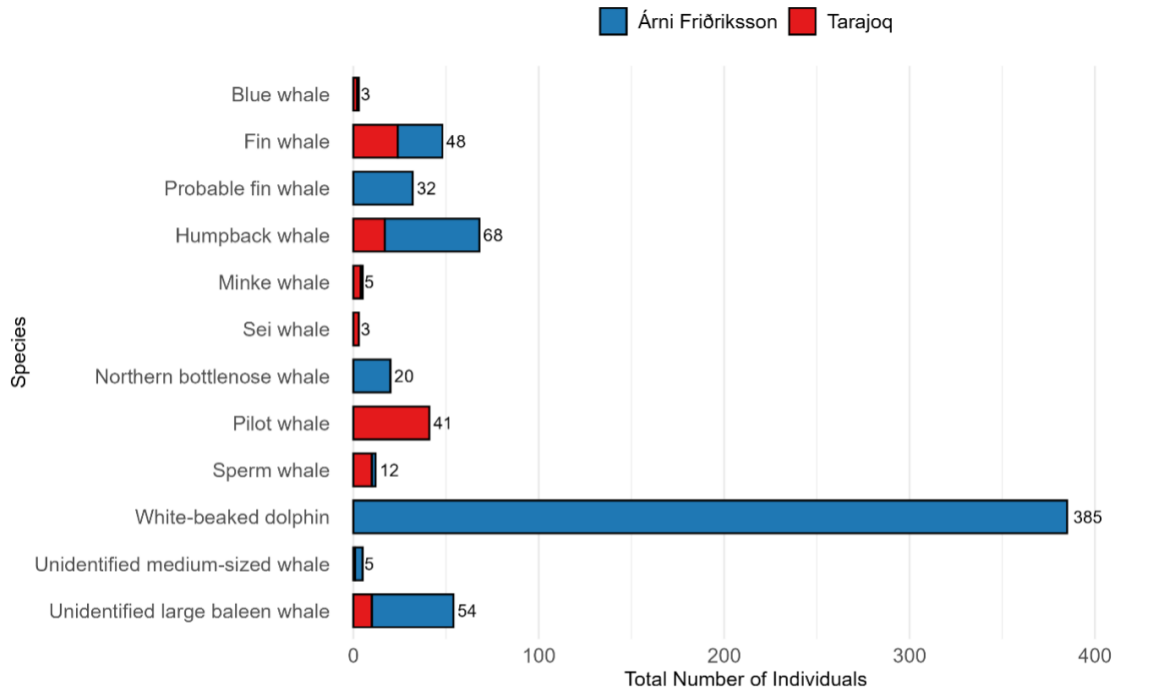


Figure 23. Number of individuals sighted for all nine species sighted during the survey for both vessels: RV Árni Friðriksson (blue) and RV Tarajoq (red).

One of the humpback whales sighted was photo-identified as NA-4776. This individual has only been sighted once before – off the northeast coast of Iceland on June 1st, 1993 .

4 Concluding remarks

Capelin distribution and biomass estimates from the 2025 autumn survey revealed a clear pattern of capelin distribution along the East Greenlandic shelf and shelf edge and north Icelandic shelf areas. Most maturing capelin were found in the Denmark Strait and the north Icelandic shelf, with some immature capelin mixed in near the shelf and north and east of Greenland. The survey also found capelin temperatures ranged from -0.9 to 5.6 °C, averaging 1.5 °C, consistent with their preference for cooler waters. Capelin were found at deeper depths during the day and closer to the surface at night, which aligns with previous studies on capelin behaviour.

Capelin biomass estimates indicated a total stock size of approximately 1 209 thousand tonnes, with about 417.5 thousand tonnes being maturing capelin and 791 thousand tonnes being immature. The juvenile capelin abundance index was 118.7 billion, the 5th-largest in the time series, indicating a large 2024 year class (spawned in spring 2024). Bootstrap uncertainty estimates revealed a relatively high coefficient of variation for the mature-stock estimate, highlighting the challenges of accurately estimating biomass in such surveys.

Compared with the 2024 autumn survey, the 2025 survey showed a similar spatial distribution of capelin, with the majority of the stock found along the East Greenlandic shelf and shelf edge, particularly in the Denmark Strait and the Kangertittivaq/Scoresby Sund areas. However, immature capelin abundance increased noticeably in the southwestern part of the survey area and along the Denmark Strait coast compared to the previous year. The distribution of maturing capelin also varied, with more mature individuals observed in the northeastern part of the surveyed region than in 2024.

Environmental conditions during the 2025 survey showed warmer water (> 6 °C between 50 and 300m depth) along the shelf edge in southeastern Greenland, more pronounced and extensive than in 2018-2021 (Petursdottir *et al.,* 2026). A sharp front between low-salinity nearshore polar water and high-salinity offshore Atlantic water was also observed in the upper layers, consistent with patterns seen in 2021 (Petursdottir *et al.,* 2026) and continuing warming and salinification trends (Lauvset *et al.,* 2018) but potentially more compressed in 2025. These environmental conditions may have influenced the distribution and abundance of capelin observed during the survey, as capelin distributions are sensitive to changes in temperature and salinity (Singh *et al.,* 2025; Singh *et al.,* 2026).

Zooplankton distribution during the 2025 survey varied across the region, with smaller species such as *Calanus finmarchicus* recorded primarily in the south, while other species were more widely distributed throughout the survey area. The zooplankton biomass in the 2025 autumn survey was generally low (Petursdottir *et al.,* 2026); the data appear to continue a declining trend from the 2018 peak (Petursdottir *et al.,* 2026), with a more restricted spatial distribution. This could reflect ongoing changes in the Iceland-East Greenland-Jan Mayen ecosystem, potentially driven by temperature and salinity changes observed in the 2025 survey. The presence of zooplankton in areas where capelin were observed suggests these areas may be important feeding grounds for capelin, with implications for their distribution and abundance. Similarly, acoustic data indicated that most krill were found along the east Greenland and Icelandic shelves, with none found in the Iceland Sea or the Jan Mayen area. Krill distribution was generally patchy, with some areas showing higher densities than others.

Marine mammal distribution varied across the area, with certain species, such as blue, sei, pilot, sperm whales, and white-beaked dolphins, primarily recorded in the southern part of the survey area, while northern bottlenose whales were mainly found in northern offshore waters. Fin and humpback whales were widely distributed throughout the survey area, in locations similar to those where mature capelin were observed. The high number of sightings of unidentified large baleen whales, likely blue or fin whales, underscores the challenges of species identification during surveys, especially under certain sea conditions that may limit visibility. These unidentified large baleen whales highlight the importance of accounting for detection bias in survey data and the need for improved species-identification methods in future surveys.

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Appendix

A. Personnel on board and roles

Table A1. A12-2025 - RV Árni Friðriksson 5-22 September

Role	Name
Chief scientist/Acoustics/CTDs	Teresa Sofia Giesta da Silva
Acoustics/CTDs	Sigurður Þór Jónsson
Acoustics/technician/CTDs	Arnþór Bragi Kristjánsson
Biological sampling	Ragnhildur Ólafsdóttir
Biological sampling	Svandís Eva Aradóttir
Whale observers	Sverrir Daniel Halldórsson
Whale observers	Melanie Stock
Captain	Kristján H. Kristinsson



Figure A 1. Group photo of the scientific crew on board RV Árni Friðriksson.

Table A2. Togt7-Tarajoq-2025 - RV Tarajoq 23 August-11 September

Role	Name
Chief scientist	Lars Heilmann
Acoustics / technician	Rune Garmund
Acoustics / Biological sampling	Kjetil Gjeitsund Thorvaldsen
Acoustics / Biological sampling	Anna H. Andreassen
Biological sampling	Paul Mackeprang
Biological sampling	Sofie Ruth Jeremiassen
Biological sampling	Else Ostermann
Whale observers	Ayca Eleman
Whale observers	Birna Daníelsdóttir
Captain	Jákup Mikkelsen



Figure A2.Group photo of the scientific crew on board RV Tarajoq.

B. Tables of stock size and age composition of capelin

Table B1. Estimated total stock size in numbers (millions) and biomass (thousand tonnes) by age (years), length (cm) and weigth (g) of capelin from the autumn acoustic survey 2025.

Length	age1	age2	age3	age4	age5	Total Number	Total (tonnes)	Biomass	Mean Weight
8.5	1,907	0	0	0	0	1,907	5,527		14
9	5,877	0	0	0	0	5,877	20,271		17
9.5	11,481	0	0	0	0	11,481	47,389		20
10	17,854	0	0	0	0	17,854	86,157		24
10.5	19,004	0	0	0	0	19,004	107,696		28
11	19,393	79	0	0	0	19,473	128,578		33
11.5	18,132	184	0	0	0	18,316	139,444		38
12	10,995	450	0	0	0	11,445	99,659		44
12.5	7,372	816	159	0	0	8,347	83,804		50
13	2,653	1,320	79	0	0	4,053	46,225		57
13.5	1,223	2,036	79	79	0	3,419	44,004		65
14	550	1,768	79	0	0	2,397	35,539		74
14.5	173	2,934	289	0	0	3,396	57,549		85
15	25	3,215	172	0	0	3,412	66,042		97
15.5	0	2,627	130	0	0	2,757	61,146		111
16	0	2,302	279	0	0	2,580	64,069		124
16.5	0	1,453	294	0	0	1,746	49,333		140
17	0	937	245	41	0	1,223	37,333		153
17.5	0	290	170	16	16	492	16,651		171
18	0	41	179	0	0	220	8,421		193
18.5	0	0	64	0	0	64	2,441		80
19	0	0	25	0	0	25	1,257		50
20	0	0	16	0	0	16	842		52

Table B2 Estimated mature stock size in numbers (millions) and biomass (thousand tonnes) by age (years), length (cm) and weight (g) of capelin from the autumn acoustic survey 2025 (see Figure 10).

Length	age1	age2	age3	age4	age5	Total Number	Total Biomass (tonnes)	Mean Weight
8.5	25	0	0	0	0	25	141	6
9	78	0	0	0	0	78	508	13
9.5	231	0	0	0	0	231	1,740	23
10	379	0	0	0	0	379	3,145	33
10.5	377	0	0	0	0	377	3,553	38
11	644	100	0	0	0	745	8,012	43
11.5	443	228	0	0	0	672	7,629	45
12	591	773	79	0	0	1,443	18,715	65
12.5	185	916	0	79	0	1,180	17,242	58
13	258	1,633	79	0	0	1,970	32,344	65
13.5	78	2,062	108	0	0	2,247	40,273	71
14	0	2,290	89	0	0	2,379	46,934	78
14.5	0	1,810	50	0	0	1,860	40,520	88
15	0	2,058	119	0	0	2,177	52,370	96
15.5	0	1,479	192	0	0	1,672	43,984	106
16	0	1,405	360	0	0	1,765	51,040	144
16.5	0	503	195	41	0	739	23,393	126
17	0	225	122	16	16	379	13,045	139
17.5	0	41	122	0	0	163	5,995	150
18	0	0	122	0	0	122	4,867	122
18.5	0	0	25	0	0	25	1,257	50
20	0	0	16	0	0	16	842	52

Table B3. Estimated immature stock size in numbers (millions) and biomass (thousand tonnes) by age (years), length (cm) and weight (g) of capelin from the autumn acoustic survey 2025 (see Figure 10).

Length	age1	age2	age3	Total Number	Total Biomass (tonnes)	Mean Weight
8.5	1,165	0	0	1,165	3,337	11
9	3,680	0	0	3,680	11,877	10
9.5	2,939	0	0	2,939	10,583	11
10	5,293	0	0	5,293	21,200	12
10.5	10,316	0	0	10,316	44,837	13
11	8,386	0	0	8,386	40,235	14
11.5	12,052	0	0	12,052	63,357	16
12	12,267	0	0	12,267	71,473	17
12.5	11,810	79	0	11,890	76,413	19
13	10,220	79	0	10,300	71,446	21
13.5	10,512	79	0	10,591	80,606	23
14	11,482	316	0	11,798	97,963	33
14.5	5,111	238	79	5,429	49,484	27
15	3,791	477	79	4,347	43,612	30
15.5	2,648	711	0	3,359	36,974	33
16	676	412	0	1,087	12,572	35
16.5	446	1,027	0	1,474	17,682	36
17	446	250	79	776	10,291	40
17.5	96	397	79	573	8,589	45
18	16	430	25	471	6,807	44
18.5	0	128	159	287	5,059	35
19	0	159	0	159	2,941	37
19.5	0	96	0	96	1,791	38
20	0	48	79	128	2,701	62



HAFRANNSÓKNASTOFNUN

Rannsókna- og ráðgjafarstofnun hafs og vatna