Working Document to

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INTERNATIONAL ECOSYSTEM SURVEY IN NORDIC SEA (IESNS) in April - May 2025

Post-cruise meeting on Teams, 17-19 June 2025

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Introduction

In April-May 2025, four research vessels and one hired commercial vessel participated in the International ecosystem survey in the Nordic Seas (IESNS); R/V Dana, Denmark (joint EU survey by Denmark, Germany, Ireland, The Netherlands and Sweden), R/V Jákup Sverri, Faroe Islands, R/V Árni Friðriksson, Iceland, R/V G.O. Sars, Norway and M/S Resolute, United Kingdom (UK). The Barents Sea was not covered by Russia in 2025. The aim of the survey was to cover the whole distribution area of the Norwegian Spring-spawning herring with the objective of estimating the total abundance of the herring stock, in addition to collect data on plankton and hydrographical conditions in the area. The survey was initiated by the Faroes, Iceland, Norway and Russia in 1995. Since 1997 the EU has also participated (except 2002 and 2003) and from 2004 onwards the survey has been more integrated into an ecosystem survey.

This report represents analyses of data from this international survey in 2025 that are stored in the PGNAPES database and the ICES acoustic database and supported by national survey reports from some survey participants (Dana: Cruise Report R/V Dana Cruise 03/2025, Árni Friðriksson: A7-2025 Cruise Report, Bjarnason, 2025, Jákup Sverri, cruise report 2522, Homrum, 2025 and IESNS-UK 2025 Survey Report).

Material and methods

Coordination of the survey was done during the WGIPS meeting in January 2025 and by correspondence. Planning of the acoustic transects, hydrographic stations and plankton stations were carried out by using the survey planner function in the r-package Rstox version 1.11 (see https://www.hi.no/en/hi/forskning/projects/stox). The survey planner function generates the survey plan (transect lines) in a cartesian coordinate system and transforms the positions to the geographical coordinate system (longitude, latitude) using the azimuthal equal distance projection, which ensures that distances, and also equal coverage, if the method used is designed with this prerequisite, are preserved in the transformation. Figure 1 shows the planned acoustic transects and hydrographic and plankton stations in each stratum. Only parallel transects were used this year, however, because the transects follow great circles they appear bended in a Mercator projection. The participating vessels together with their effective survey periods are listed in the table below:

Vessel	Institute	Survey period
Dana	DTU Aqua - National Institute of Natural Resources, Denmark	22/04-16/05
G.O. Sars	Institute of Marine Research, Bergen, Norway	28/04-27/05
Jákup Sverri	Faroe Marine Research Institute, Faroe Islands	03/05-10/05
Árni Friðriksson	Marine and Freshwater Research Institute, Iceland	05/05-24/05
Resolute	CEFAS, United Kingdom	24/04-06/05

Figure 2 shows the cruise tracks and strata, Figure 3 the hydrographic and WPII plankton stations and, Figure 4 Macroplankton trawl and Multinet stations and Figure 5 the pelagic trawl stations. Survey effort by each vessel is detailed in the table below. Daily contacts were maintained between the vessels during the course of the survey, primarily through electronic mail. The temporal progression of the survey is shown in Figure 6.

Survey effort by vessel for the International ecosystem survey in the Nordic Seas in April - May 2025.

Vessel	Effective survey period	Effective acoustic cruise track (nm)	Trawl stations	Ctd stations	Aged fish (HER)	Length fish (HER)	Plankton stations
Dana	24/4-15/5	2611	30	34	602	1763	34
Jákup Sverri	3/5-10/5	1116	11	17	292	1545	17
Árni Fridriksson	5/5-24/5	2600	15	32	409	1389	28
G.O. Sars	28/4-27/5	4421	36	51	531	1778	48
Resolute	24/4-06/5	1151	15	20	289	548	20

The weather conditions were good during the survey, and the acoustic data collection was not negatively affected by weather, however, a few pre-planned CTD and WP2 stations had to be cancelled due to rough sea. The survey was based on scientific echosounders using 38 kHz frequency. Transducers were calibrated with the standard sphere calibration (Foote *et al.*, 1987) prior to the survey. Salient acoustic settings are summarized in the text table below.

Acoustic instruments and settings for the primary frequency (boldface).

	Dana	G. O. Sars	Arni Friðriksson	Jákup Sverri	Resolute
Echo sounder	Simrad EK60	Simrad EK80	Simrad EK80	Simrad EK80	Simrad EK80
Frequency (kHz)	**38**	**38**, 18, 70, 120, 200, 333	**38**, 18, 70, 120, 200	18,**38**, 70, 120, 200, 333	**38**,200
Primary transducer	ES38BP	ES 38-7	ES38-7	ES38-7	ES38-7
Transducer installation	Towed body	Drop keel	Drop keel	Drop keel	Hull-mounted
Transducer depth (m)	2-5	6	7	6-9	6

	Dana	G. O. Sars	Arni Friðriksson	Jákup Sverri	Resolute
Upper integration limit (m)	10	15	12	15	10
Absorption coeff. (dB/km)	10.4	10.1	10.6	10.2	10.1
Pulse length (ms)	1.024	1.024	1.024	1.024	1.024
Band width (kHz)	2.425	2.43	2.425	3.06	2.425
Transmitter power (W)	2000	2000	2000	2000	2000
Angle sensitivity (dB)	21.9	21.9	18	21.9	18
2-way beam angle (dB)	-20.5	-20.7	-20.3	-20.4	-20.7
Sv Transducer gain (dB)					
Ts Transducer gain (dB)	25.41	26.13	27.05	26.84	26.41
s_A correction (dB)	-0.57	-0.057	-0.01	-0.07	-0.041
3 dB beam width (dg)					
alongship:	6.82	6.47	6.44	6.49	6.36
athw. ship:	6.84	6.47	6.61	6.53	6.49
Maximum range (m)	500	500	500	500	500
Post processing software	LSSS	LSSS	LSSS	LSSS	Echoview

All participants except UK used the same post-processing software (LSSS). The UK data were, however, scrutinized using Echoview. Scrutinization was carried out according to an agreement at the PGNAPES scrutinizing workshop in Bergen in February 2009 (ICES 2009), and “Notes from acoustic Scrutinizing workshop in relation to the IESNS”, Reykjavík 3.-5. March 2015 (Annex 4 in ICES 2015). Generally, acoustic recordings were scrutinized on daily basis and species identified and partitioned using catch information, characteristic of the recordings, and frequency between integration on 38 kHz and on other frequencies by a scientist experienced in viewing echograms. All vessels used a large or medium-sized pelagic trawl as the main tool for biological sampling. The salient properties of the trawls, plankton nets and hydrographic equipment are as follows:

	Dana	**G.O. Sars**	**Arni Friðriksson**	**Jákup Sverri**	**Resolute**
<u>Trawl dimensions</u>					
Circumference (m)		**496**	**832**	**832**	**972**
Vertical opening (m)	**20-30**	**25-30**	**20–35**	**30-40**	**30-50**
Mesh size in codend (mm)	**18**	**24**	**20**	**45**	**20**
Typical towing speed (kn)	**3.5-4.5**	**3.0–4.5**	**3.1–5.0**	**3.2–4.5**	**3.5-5**
<u>Plankton sampling</u>					
Sampling net	**WP2**	**WP2**	**WP2**	**WP2**	**WP2**
Standard sampling depth (m)	**200**	**200**	**200**	**200**	**200**

	Dana	G.O. Sars	Arni Friðriksson	Jákup Sverri	Resolute
<u>Hydrographic sampling</u>					
CTD unit	**SBE911**	**SBE911**	**SBE911**	**SBE911**	**SAIV SD208**
Standard sampling depth (m)	**1000**	**1000**	**1000**	**1000**	**500**

Catches from trawl hauls were sorted and weighed; fish were identified to species level, when possible, and other taxa to higher taxonomic levels. A subsample of herring, blue whiting and mackerel were sexed, aged, and measured for length and weight, and their maturity status was estimated using established methods. An additional sample of fish was measured for length. For the Norwegian, Icelandic and Faroese vessel, a smaller subsample of stomachs was sampled for further analyses on land. As part of ongoing stock identity research, herring genetic samples were collected. Salient biological sampling protocols for trawl catches are listed in the table below.

	Species	Dana	G.O. Sars	Arni Friðriksson	Jákup Sverri	Resolute
Length measurements	Herring	200-300	100	200	100-150	100
	Blue whiting	200-300	100	50	100-150	100
	Mackerel	100	100	50	100-150	100
	Other fish sp.	50	30	30	30-100	30
Weighed, sexed and maturity determination	Herring	50	25-100	50	100-150*	50
	Blue whiting	50	25-100	50	100-150*	50
	Mackerel	50	25-100	50	100-150*	50
	Other fish sp.	0	0	0	30-100*	0
Otoliths/scales collected	Herring	50	25-30	50	25-50	50
	Blue whiting	50	30	50	25-50	50
	Mackerel	0	25	50	25-50	50
	Other fish sp.	0	0	0	0	0
Stomach sampling	Herring	0	10	10	5	0
	Blue whiting	0	10	10	5	0
	Mackerel	0	10	10	5	0
	Other fish sp.	0	0	0	0	0
Genetic samples	Herring	50	25-30	50	30	50

* Only fish that are aged are being sexed and maturity determined.

Acoustic data were analysed using the StoX software package (version 4.1.4) which has been used for many years now for WGIPS coordinated surveys. A description of StoX can be found in Johnsen et al. (2019) and here: https://www.hi.no/en/hi/forskning/projects/stox. Estimation of abundance from acoustic surveys with StoX is carried out according to the stratified transect design model developed by Jolly and Hampton (1990). This method requires pre-defined strata, and the survey area in the Norwegian Sea was therefore split into 4 strata with pre-defined acoustic transects. Within each stratum, parallel transects with equal distances were used. The distance between transects was based on available survey time, and the starting point of the first transect in each stratum was randomized. This approach allows for robust statistical analyses of uncertainty of the acoustic estimates. The strata and transects used in StoX are shown in Figure 2. Generally, and in accordance with most WGIPS coordinated surveys, all trawl stations within a given stratum with catches of the target species (either blue whiting or herring) were assigned to all transects within the stratum, and the length distributions were weighted equally within the stratum.

The following target strength (TS)-to-fish length (L) relationships were used:

Blue whiting: TS = 20.0 log(L) – 65.2 dB (ICES 2012)
Herring: TS = 20.0 log(L) – 71.9 dB (Foote et al. 1987)

The target strength for herring is the traditionally one used while this target strength for blue whiting was first applied in 2012 (ICES 2012).

The hydrographical and plankton stations by survey are shown in Figure 3. Hydrographical were collected data using a SBE 911 CTD. Maximum sampling depth was 1000 m.

Zooplankton was sampled by WP2 nets on all vessels, according to the standard procedure for the surveys. Mesh sizes were 180 or 200 μm. The net was hauled vertically from 200 m to the surface or from the bottom whenever bottom depth was less than 200 m. Samples were split in two and one half was preserved in formalin while the other half was dried and weighed (Resolute did not collect samples in formalin, just dry weight). The samples for dry weight were size fractionated before drying by sieving the samples through 2000 μm and 1000 μm sieves, giving the size fractions 180/200 – 1000 μm, 1000 – 2000 μm, and > 2000 μm. Data are presented as total mg dry weight per m2. For the zooplankton distribution map, all stations are presented. Estimates of the statistical distribution of the zooplankton biomass indices is done by simple bootstrapping by re-sampling with replacement.

Results and Discussion

Hydrography

The temperature distributions in the ocean, averaged over selected depth intervals; 0-50 m, 50-200 m, and 200-500 m, are shown in Figures 7a-c. The temperatures in the surface layer (0-50 m) ranged from below 0°C in the Greenland Sea to 9-10°C in the southern part of the Norwegian Sea (Figure 7a). The Arctic front was encountered south of 65°N east of Iceland extending eastwards towards about 2°W where it turned north-eastwards to 65°N and then almost straight northwards. The front sharpened and had a more eastern location with depths. Further to west at about 8°W, another front runs northward to Jan Mayen, the Jan Mayen Front, that was most distinct in the upper 200 m. The warmer North Atlantic water formed a broad tongue that stretched far northwards along the Norwegian coast with temperatures about 6 °C to south of the Bear Island at 74°N in the surface layer.

Relative to the long-term mean, from 1995 to 2021, the temperature anomalies in the upper 0-50 m of the Norwegian Sea were generally slightly negative, mostly ranging from 0 to -0.5°C, in the western part and south of 72°N. In contrast, positive anomalies dominated the eastern region, with strongest warming observed in the southern area where temperature reached up to 1°C above average. The eastern Greenland Sea exhibited the highest positive values, with temperatures approximately 2°C above the long-term mean. Additionally, the western Iceland Sea was warmer than normal (Figure 7a).

At 50-200 m depth, the anomaly patterns largely mirrored those at the surface. The western Norwegian Sea remained cooler than average, with anomalies reaching up to 1°C below the long-term mean, while the eastern region was warmer than normal, exhibiting similar anomalies to the surface layer. The eastern Greenland Sea also was anomalously warm at 50-200 m depth, consistent with surface observations. However, the western Iceland Sea showed temperatures closer to the long-term mean, in contrast to the warmer surface layer (Figure 7b).

In the 200-500 m layer, the temperature anomaly patterns became more spatially variable, though still broadly consistent with shallower depths. The warming observed in the southeastern Norwegian Sea at the shallower depths was less pronounced at these greater depths (Figure 7c). Overall, the warming above 200 m in the eastern and especially the southern Norwegian Sea suggests a warmer inflowing Atlantic Water.

Two main features of the circulation in the Norwegian Sea, where the herring stock is grazing, are the Norwegian Atlantic Current (NWAC) and the East Icelandic Current (EIC). The NWAC with its offshoots forms the northern limb of the North Atlantic current system and carries relatively warm and salty water from the North Atlantic into the Nordic Seas. The EIC, on the other hand, carries Arctic waters. This water largely derives from the East Greenland Current, but to a varying extent, some of its waters may also have been formed in the Iceland and Greenland Seas. The EIC flows into the southwestern Norwegian Sea where its waters subduct under the Atlantic waters to form an intermediate Arctic layer. While such a layer has long been known in the area north of the Faroes and in the Faroe-Shetland Channel, it is in the last four decades a similar layer has been observed all over the Norwegian Sea. Also, in periods this layer has been less well-defined.

This circulation pattern creates a water mass structure with warm Atlantic Water in the eastern part of the area and more Arctic conditions in the western part. The NWAC is rather narrow in the southern Norwegian Sea, but when meeting the Vøring Plateau off Mid Norway it is deflected westward. The western branch of the NWAC reaches the area of Jan Mayen at about 71°N. Further northward in the Lofoten Basin the lateral extent of the Atlantic water gradually narrows again, apparently under topographic influence of the mid-ocean ridge. It has been shown that atmospheric forcing largely controls the distribution of the water masses in the Nordic Seas. Hence, the lateral extent of the NWAC, and consequently the position of the Arctic Front, that separates the warm North Atlantic waters from the cold Arctic waters, is correlated with the large-scale distribution of the atmospheric sea level pressure. The local air-sea heat flux in addition influences the upper layer and it is found that it can explain about half of the year-to-year variability of the ocean heat content in the Norwegian Sea.

Zooplankton

The zooplankton biomass (mg dry weight m^{-2}) distribution in the upper 200 m in 2025 is shown in Figure 8. Sampling stations covered Atlantic water, Arctic water, and the Arctic frontal zone. The biomass was evenly distributed between water masses and larger geographical areas, while spots with higher zooplankton biomass were found northeast of Iceland, and off the northern coast of Norway. The area north of the Faroe Islands and between the Faroe Islands and Iceland seems to have lower amounts of zooplankton.

Figure 9a) shows new sub-areas that have been developed in the ICES group WGINOR, based on bottom-topography, water-mass distribution, and geographical variations in annual primary production. The stations were evenly distributed within the sub-areas, but the two westernmost sub-areas were not fully covered, and some stations were located outside the sub-areas.

Figure 9b) shows the zooplankton time series indices for the six sub-areas. The highest average biomass in 2025 was found in the Iceland Sea, with ~ 11 g dry weight m^{-2}. The Iceland Sea had an increase in zooplankton biomass compared with 2024, while all the other sub-areas showed no change from the level in 2024. The zooplankton biomass indices for the Norwegian Sea and adjacent areas in May have been estimated since 1995. All sub-areas had a high biomass period until mid-2000, and a lower period thereafter. The long-term decrease has been most pronounced in the Iceland Sea and the western part of the Norwegian Basin. The low-biomass period after 2010 has been relatively stable, but with interannual variations. The average biomass in this lower period has also been relatively similar for the entire investigated area, varying between 8661 and 7501 mg dry weight m^{-2} for the different sub-areas.

The reasons for the changes in zooplankton biomass are not obvious. The period with lower zooplankton biomass coincides with higher-than-average heat content in the Norwegian Sea (ICES, 2020) and reduced inflow of Arctic water into the southwestern Norwegian Sea (Kristiansen et al., 2019; Skagseth et al., 2022). Timing effects, such as match/mismatch with the phytoplankton bloom, can also affect the zooplankton abundance. Changes in the timing of seasonal development can also result in zooplankton being sampled in different successional phases from year to year, which will affect the biomass. The high biomass of pelagic fish feeding on zooplankton has been suggested to be one of the main causes for the reduction in zooplankton biomass. However, carnivorous zooplankton and not pelagic fish may be the main predators of zooplankton in the Norwegian Sea (Skjoldal et al., 2004), and we do not have good data on the development of the carnivorous zooplankton stocks.

Norwegian spring-spawning herring

Survey coverage in the Norwegian Sea was considered adequate in 2025, and it is recommended that the results from IESNS 2025 can be used for assessment purpose. The zero-line was believed to be reached for adult NSS herring, but with some exceptions. In the northeastern part of the survey area, relatively high densities of herring were observed towards the entrance of the Barents Sea. This was small herring (3-4-year-olds) and since the Barents Sea is an important nursery area, the young herring (particularly 3-year-olds and younger) will be mostly distributed east of the coverage area of the IESNS, and age 3 herring are not well recruited to the IESNS. Additionally, further south, west off Lofoten and Vesterålen, high densities of herring were observed on the eastern ends of several transect. This was mostly 4-year-olds, and it is likely that the zero line was not reached here. Due to the narrow shelf in this area, however, the transect ends are close to the coast and it can be assumed that only minor quantities of herring would be distributed east of the transect ends here.

The herring distribution (Figure 10) was similar to last year except for the relatively high concentrations of young herring in the northeastern area in 2025. It is a commonly observed pattern that the older fish are distributed in the west while the younger fish are found closer to the nursery areas in the Barents Sea (Figure 11).

Four-year-old herring (2021 year class) was the most abundant year class in terms of numbers (33%), followed by three-year old (2022-year class, 22%) and nine-year-old (2016 year class, 16%) on basis of the StoX bootstrap estimates for the Norwegian Sea (Table 1). In terms of biomass, however, the 2016-year class was still the largest (25%).

The point estimate of abundance of the 2016 year class decreased by 44% compared to last year's estimate (Figure 12). Uncertainty estimates for number at age based on bootstrapping within StoX are shown in Figure 13 and Table 1. The relative standard error (CV) is 20% for the total biomass and 19% for the total numbers estimate. The relative standard error for abundance for the dominating age groups is between 24% and 34% (Figure 13) while there is a typical pattern of higher values for the youngest and oldest age classes.

The total estimate of herring in the Norwegian Sea from the 2025 survey was 20.6 billion in number and the biomass was 3.6 million tonnes. The biomass estimate is about 5% lower than the 2024 survey estimate and the estimated number of individuals is about 16% higher than in 2024. The biomass estimate decreased significantly from 2009 to 2012 and has since then been rather stable with similar confidence intervals (Figure 14), but the trend has been downwards the last few years and the lowest biomass occurred in 2025.

Since 2015 an increased awareness has been raised around the age reading of herring. It appeared that the age distributions from the different participants some years showed differences and the older specimens appear to have uncertain ages. An age-reading workshop was held in Bergen 17.-19. April 2023 (WKARNSSH2, ICES 2023). This workshop was based on otoliths and scales collected in 2021 and subsequently exchanged between the participating countries. The conclusion from the workshop was that the agreement in age reading was at an acceptable level (ICES 2023), although there were some differences between readings of scales and otoliths particularly for older individuals. No issues directly related to age reading were identified and the guidelines were therefore not updated. The workshop also concluded that stock mixing is a minor issue when it comes to age reading.

Some differences in age distributions from different vessels within same strata were noted in this year's survey, particularly in strata 1 and 2 (Figure 15). It is not thought that this is due to differences in age reading however, but rather an effect of the vessels covering different areas within the strata and the distribution of age classes is not spatially uniform within each strata (Figure 11).

Recently, concerns have been raised by the survey group (WGIPS) for the International ecosystem surveys in the Nordic Seas (IESNS and IESSNS) on mixing issues between Norwegian spring-spawning herring and other herring stocks (e.g. Icelandic summer-spawning, Faroese autumn-spawning, Norwegian summer-spawning and North Sea type autumn-spawning herring) occurring in some of the fringe regions in the Norwegian Sea. Currently, fixed cut lines are being used by the survey group to exclude herring of presumed other types than NSS herring, however this simple procedure is thought to introduce some contamination of the stock indices of the targeted NSS herring. WGIPS noted in their 2019 report that the separation of different herring stock components is an issue in several of the surveys coordinated in WGIPS and the needs for development of standardized stock splitting methods was also noted in the WKSIDAC (ICES 2017) and WGIPS ever since as well as WKSIDAC2 and WKSIDAC3. Genetic samples of herring are therefore now collected routinely in the survey (Figure 5).

Blue whiting

Boostrap estimates of abundance, biomass, mean length and mean weight of blue whiting during IESNS 2025 are shown in Table 2. The estimated biomass was 1.48 million tons (CV=0.24) which is a 91% increase from last year's estimate, and above the average from the period 2008-2024. The estimated total abundance was 17.5 billion (CV=0.18) which is a 123% increase from last year's estimate. The stock is dominated by one year old blue whiting this year, the 2024 year class appears strong in the survey. Uncertainty estimates for numbers at age based on bootstrapping with StoX are shown in Figure 18 and Table 2.

The spatial distribution of blue whiting in 2025 is shown in Figure 16. As usual, most of the fish was registered in the eastern part of the Norwegian Sea. The largest fish was found in the northern and south-eastern part of the of the survey area (Figure 17). Comparison of the size and age distributions of blue whiting by stratum and country are shown in Figure 19 and 20, and they seem to be in fairly good agreement.

Mackerel

Trawl catches of mackerel are shown in Figure 21. Mackerel was generally present in the southern part of the Norwegian Sea, however there were also two hauls with mackerel in north-east and these were small individuals (18-24 cm. No further quantitative information can be drawn from these data as this survey is not designed to monitor mackerel.

General recommendations and comments

Recommendation	Addressed to
1. Continue the methodological research in distinguishing between herring and blue whiting in the interpretation of echograms.	WGIPS
2. Implement logging of sonar data to measure the amount of herring in the surface blind zone	WGIPS
3. Conduct genetic sampling of all aged herring (even if the actual analysis will only be realised in a few years time from now at least the samples will be there to produce a retrospective split)	WGIPS

Next year's post-cruise meeting

We will aim for a physical meeting in Bergen 16-18 June 2026. The final decision will be made at the next WGIPS meeting.

Concluding remarks

- The sea temperature in 2025 was generally near the long-term mean (1995-2021) in the Norwegian Sea.
- The 2025 indices of zooplankton biomass in the Norwegian Sea and adjoining waters showed no change from the level in 2024 for any sub-areas, except for the Iceland Sea where an increase in biomass was observed.
- The total biomass estimate of NSSH in herring in the Norwegian Sea was 3.6 million tonnes, which is an 5% decrease from the 2024 survey estimate. The estimate of total number of NSSH was 20.6 billion, which is 16% higher than in the 2024 survey. The survey followed the pre-planned protocol and the survey group recommends using the abundance estimates in the analytical assessment.
- The 2021 year class of NSSH was the biggest in the survey in numbers (30%) while the 2016 year class was biggest in biomass (25%). The abundance of the 2016 year-class decreased by 44% compared to last year's estimate.

- The biomass of blue whiting measured in the 2025 survey increased by 91% from last year's survey and 123% in terms of numbers. The stock is now dominated by the 2024 year class.

References

Foote, K. G., Knudsen, H. P., Vestnes, G., MacLennan, D. N., and Simmonds, E. J. 1987. Calibration of acoustic instruments for fish density estimation: a practical guide. ICES Coop. Res. Rep. 144: 1–57.

ICES 2009. Report of the PGNAPES Scrutiny of Echogram Workshop (WKCHOSCRU) 17–19 February 2009, Bergen, Norway ICES CM 2009/RMC

ICES. 2012. Report of the Workshop on implementing a new TS relationship for blue whiting abundance estimates (WKTSBLUES), 23–26 January 2012, ICES Headquarters, Copenhagen, Denmark. ICES CM 2012/SSGESST:01. 27 pp.

ICES. 2015. Report of the Workshop on scrutinisation procedures for pelagic ecosystem surveys (WKSCRUT), 7-11 September 2015, Hamburg, Germany. ICES CM 2015/SSGIEOM:18. 107pp.

ICES. 2017. Workshop on Stock Identification and Allocation of Catches of Herring to Stocks (WKSIDAC). ICES WKSIDAC Report 2017 20-24 November 2017. Galway, Ireland. ICES CM 2017/ACOM:37. 99 pp.

Johnsen, E., Totland, A., Skålevik, Å., Holmin, A.J., Dingsør, G.E., Fuglebakk, E., Handegard, N.O. 2019. StoX: An open source software for marine survey analyses. Methods Ecol Evol. 2019, 10:1523–1528.

Jolly, G. M., and I. Hampton. 1990. A stratified random transect design for acoustic surveys of fish stocks. Can.J. Fish. Aquat. Sci. 47: 1282-1291.

Kristiansen, I., Hátun H., Petursdottir, H., Gislason, A., Broms, C., Melle, W., Jacobsen, J.A., Eliasen S.K., Gaard E. 2019. Decreased influx of Calanus spp. into the south-western Norwegian Sea since 2003. Deep Sea Research, 149, 103048

Mork, K. A., Ø. Skagseth, V. Ivshin, V. Ozhigin, S. L. Hughes, and H. Valdimarsson (2014), Advective and atmospheric forced changes in heat and fresh water content in the Norwegian Sea, 1951–2010, Geophys. Res. Lett., 41, 6221–6228, doi:10.1002/ 2014GL061038.

Skagseth Ø, Broms C, Gundersen K, Hátún H, Kristiansen I, Larsen KMH, Mork KA, Petursdottir H and Søiland H (2022). Arctic and Atlantic Waters in the Norwegian Basin, Between Year Variability and Potential Ecosystem Implications. Front. Mar. Sci. 9:831739. doi: 10.3389/fmars.2022.831739

Skjoldal, H.R., Dalpadado, P., and Dommasnes, A. 2004. Food web and trophic interactions. *In* The Norwegian Sea ecosystem. Ed. by H.R. Skjoldal. Tapir Academic Press, Trondheim, Norway: 447-506.

Tables

Table 1. IESNS 2025 in the Norwegian Sea. Estimates of abundance, mean weight and mean length of Norwegian spring-spawning herring. The estimates are mean of 1000 bootstrap replicates in Stox.

	Age in years (year class)															
Length	**1 (2024)**	**2 (2023)**	**3 (2022)**	**4 (2021)**	**5 (2020)**	**6 (2019)**	**7 (2018)**	**8 (2017)**	**9 (2016)**	**10 (2015)**	**11 (2014)**	**12 (2013)**	**Unknown**	**Number (10^6)**	**Biomass (10^6)**	**Mean weight (g)**
13	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0.05	16
14	7.4	0	0	0	0	0	0	0	0	0	0	0	0	7.4	0.1	15
18	0	59.1	0	0	0	0	0	0	0	0	0	0	0	59.1	2.3	38.4
19	0	26.7	129.5	0	0	0	0	0	0	0	0	0	2.6	158.8	7.4	46.3
20	0	31.2	463.9	19.6	0	0	0	0	0	0	0	0	0	514.7	28.0	54.4
21	0	118	918.9	0	0	0	0	0	0	0	0	0	0	1036.9	66.4	64
22	0	22.9	982.5	192	0	0	0	0	0	0	0	0	0	1197.4	89.1	74.4
23	0	0	673.2	588.2	0	0	0	0	0	0	0	0	0	1261.4	108.9	86.3
24	0	29.8	307.6	1101.3	0	0	0	0	0	0	0	0	0	1438.7	140.8	97.9
25	0	0	239.8	995.9	0	0	0	0	0	0	0	0	0	1235.7	138.3	111.9
26	0	0	368.2	755.5	19.7	10.9	0	0	0	0	0	0	0	1154.3	148.6	128.7
27	0	0	385.9	872.9	107.2	51.3	15.4	0	0	0	0	0	0	1432.7	203.3	141.9
28	0	0	102.1	994.7	229.4	80.5	50.2	5.3	16.1	0	0	0	0	1478.3	233.7	158.1
29	0	0	25.6	384.7	317.1	127.8	47.3	32.3	6.1	5.4	21.7	7.4	0	975.4	171.5	175.8
30	0	0	0	273.9	316.2	241.5	99.2	24.9	10.5	19.8	41	9.1	0	1036.1	203.1	196
31	0	0	0	41.2	247.7	184	86.4	13.1	34.9	26.4	35.6	10.6	0	679.9	147.3	216.7
32	0	0	0	18.6	132.6	106.3	179.9	142	176.7	16.7	29.3	22.4	0	824.5	197.2	239.2
33	0	0	0	1.9	18.6	90.5	297.3	361.6	1001.1	23.8	11.7	12.9	0	1819.4	462.5	254.2
34	0	0	0	0	7.1	18.8	200.9	386.4	1410.7	83.1	86.3	8.5	0	2201.8	589.4	267.7
35	0	0	0	0	0	12.4	93.5	128.2	516.3	129.9	104.8	114.6	0	1099.7	314.4	285.9
36	0	0	0	0	0	4.9	8.6	36.6	95.3	32.4	118.9	135.2	0	431.9	135.1	312.9
37	0	0	0	0	0	0	17.4	24	59.3	0	45.7	170.5	0	316.9	106.8	337.1
38	0	0	0	0	0	0	0	4.7	13.6	5.3	2.6	114.4	0	140.6	48.8	347.4
39	0	0	0	0	0	0	0	0	0	0	0	52.5	0.6	53.1	20.2	380.4
40	0	0	0	0	0	0	0	0	0	0	0	0	4.9	4.9	1.8	361
43	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0.9		
TSN(mill)	10.4	287.7	4597.1	6240.4	1395.5	928.9	1096.1	1159.1	3340.4	342.7	497.6	658.2	9	**20563.1**		
cv (TSN)	0.86	0.5	0.34	0.27	0.24	0.3	0.25	0.26	0.32	0.33	0.3	0.37		**0.36**		
TSB(1000 t)	0.2	17.4	398.8	791	264.2	192	266.1	303.8	890.3	96.1	138.6	211.5	1.8		**3571.8**	
cv (TSB)	0.85	0.48	0.29	0.25	0.24	0.3	0.27	0.27	0.32	0.34	0.31	0.38			**0.36**	
Mean length(cm)	13.5	20.7	24	26.9	30	31	32	33	33	33.1	33.5	34	35.2			
Mean weight(g)	15.5	67.3	98.3	135	191.4	209.8	242.3	258.8	264.6	283.3	282.3	320.6	347.4			

Table 2. IESNS 2025 in the Norwegian Sea. Estimates of abundance, mean weight and mean length of blue whiting. The estimates are mean of 1000 bootstrap replicates in Stox.

	Age in years (year class)														
Length	**1 (2024)**	**2 (2023)**	**3 (2022)**	**4 (2021)**	**5 (2020)**	**6 (2019)**	**7 (2018)**	**8 (2017)**	**9 (2016)**	**10 (2015)**	**11 (2014)**	**Unknown**	**Number (10^6)**	**Biomass (10^6 kg)**	**Mean weight (g)**
15	0	0	0	0	0	0	0	0	0	0	0	3.7	3.7	0.07	19
16	61.1	0	0	0	0	0	0	0	0	0	0	0.1	61.2	1.5	24.8
17	500.9	0	0	0	0	0	0	0	0	0	0	0	500.9	15.4	30.7
18	1671.5	0	0	0	0	0	0	0	0	0	0	0	1671.5	58.8	35.2
19	2325.6	53.9	0	0	0	0	0	0	0	0	0	0	2379.5	96.8	40.7
20	2159.2	58.2	0	0	0	0	0	0	0	0	0	0	2217.4	104.2	47
21	1184.2	87.1	10.4	0	0	0	0	0	0	0	0	0	1281.7	68.6	53.5
22	307.9	95.6	0	0	0	0	0	0	0	0	0	0	403.5	24.3	60.2
23	31.3	172.7	0	101.5	40.6	0	0	0	0	0	0	0	346.1	27.0	78
24	0	342.7	24.3	249.5	177.6	18.2	0	0	0	0	0	0	812.3	74.0	91.1
25	0	198.9	35.1	481.6	432.8	141.3	0	0	0	0	0	0	1289.7	130.1	100.9
26	0	39.5	44.1	493	800.8	360.1	3.2	0	0	0	0	0	1740.7	194.6	111.8
27	7.8	5.4	94	204.8	791.7	462.1	0	7.5	0	0	0	0	1573.3	193.7	123.1
28	0	0	143.6	223.8	556.8	419	0	31.2	0	0	0	0	1374.4	185.8	135.2
29	0	2.6	91.3	45.5	468.6	255.3	5	9.8	5	0	0	0	883.1	133.1	150.7
30	0	0	62.9	0	101.2	237.6	9.7	17.1	44.1	8	12.2	0	492.8	80.8	163.9
31	0	0	51.2	0	6.9	161.1	0	26.5	4.9	0	0	0	250.6	45.8	182.8
32	0	0	40.6	0	5.1	42.5	8.3	17	0	0	0	0	113.5	21.7	190.9
33	0	0	17.5	0	2.1	12.6	3.2	39.4	0	1.3	0	0	76.1	16.9	221.9
34	0	0	7.9	0	0	0	20.5	0	5.4	0	0	0	33.8	7.3	215.3
35	0	0	2	0	0	0	0	12.7	0	0	0	0.5	15.2	3.8	249
36	0	0	0	0	0	0	0	0.9	0	0	0	0	0.9	0.3	291.1
37	0	0	0	0	0	0	0	0	0	0	0	3.5	3.5	0.8	242.4
TSN(mill)	8249.3	1056.6	624.8	1799.7	3384.2	2109.8	49.8	162.1	59.4	9.3	12.2		**17517.2**		
cv (TSN)	0.19	0.22	0.39	0.28	0.28	0.34	0.54	0.46	0.81	0.84	1.35		**0.52**		
TSB(1000 t)	356.7	84.1	89.4	195.2	418.7	287.1	9.1	29.4	10.3	1.4	2	1		**1484.4**	
cv (TSB)	0.18	0.25	0.42	0.3	0.3	0.37	0.53	0.47	0.78	0.83	1.35			**0.53**	
Mean length(cm)	20.3	23.6	28.8	26	28	28.5	30.7	31.2	31	31.5	30	27.4			
Mean weight(g)	42.8	81.7	142.2	108.2	122.8	133.6	184.2	184.1	180.1	190.6	165	134.5			

Figures

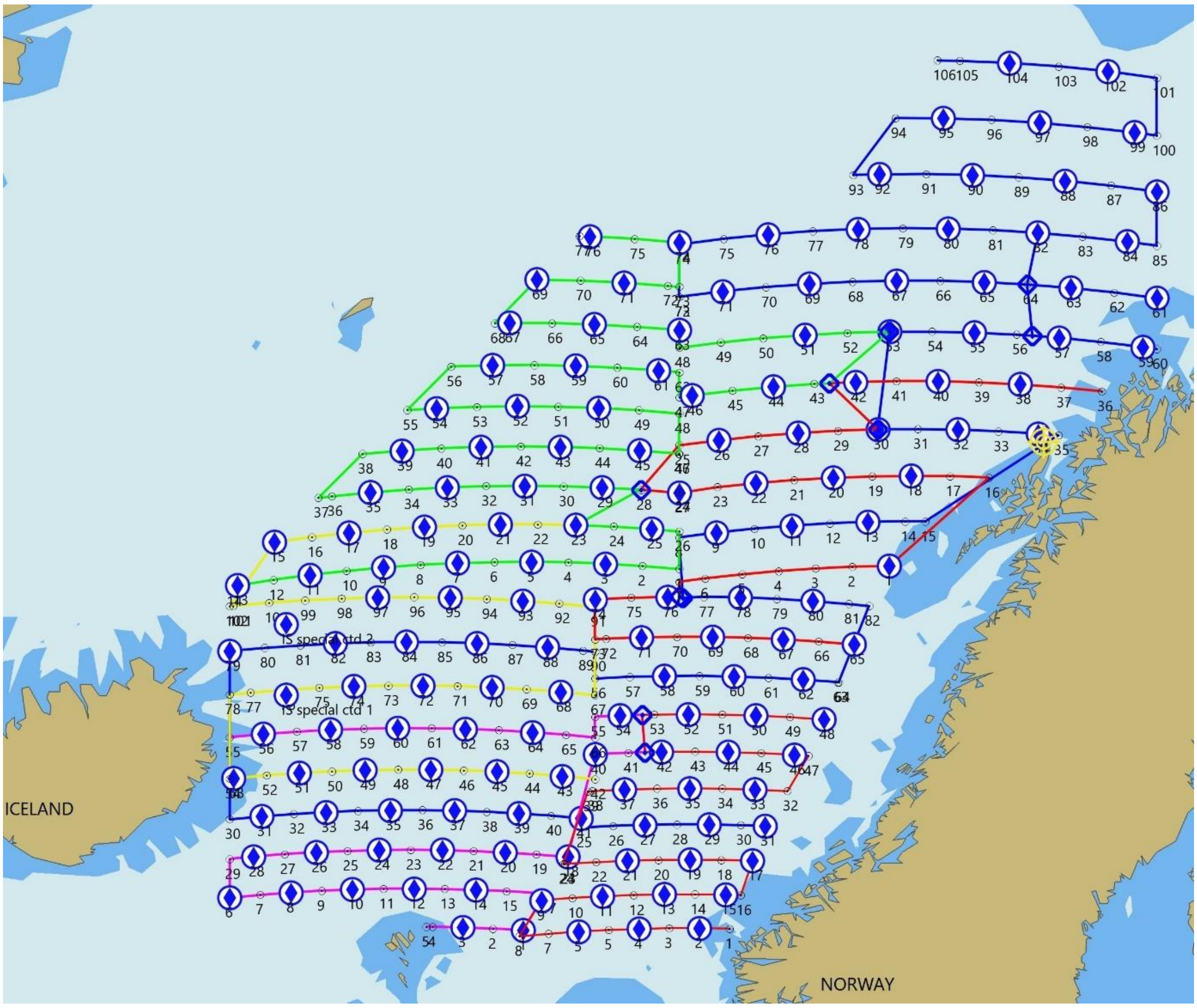


Figure 1. The pre-planned transects for the IESNS survey in 2025 (red: EU, dark blue: Norway, yellow: Faroes Islands, violet: UK, green: Iceland). Hydrographic stations and plankton stations are shown as blue circles with diamonds. All the transects have numbered waypoints for each 30 nautical mile and at the ends**.**

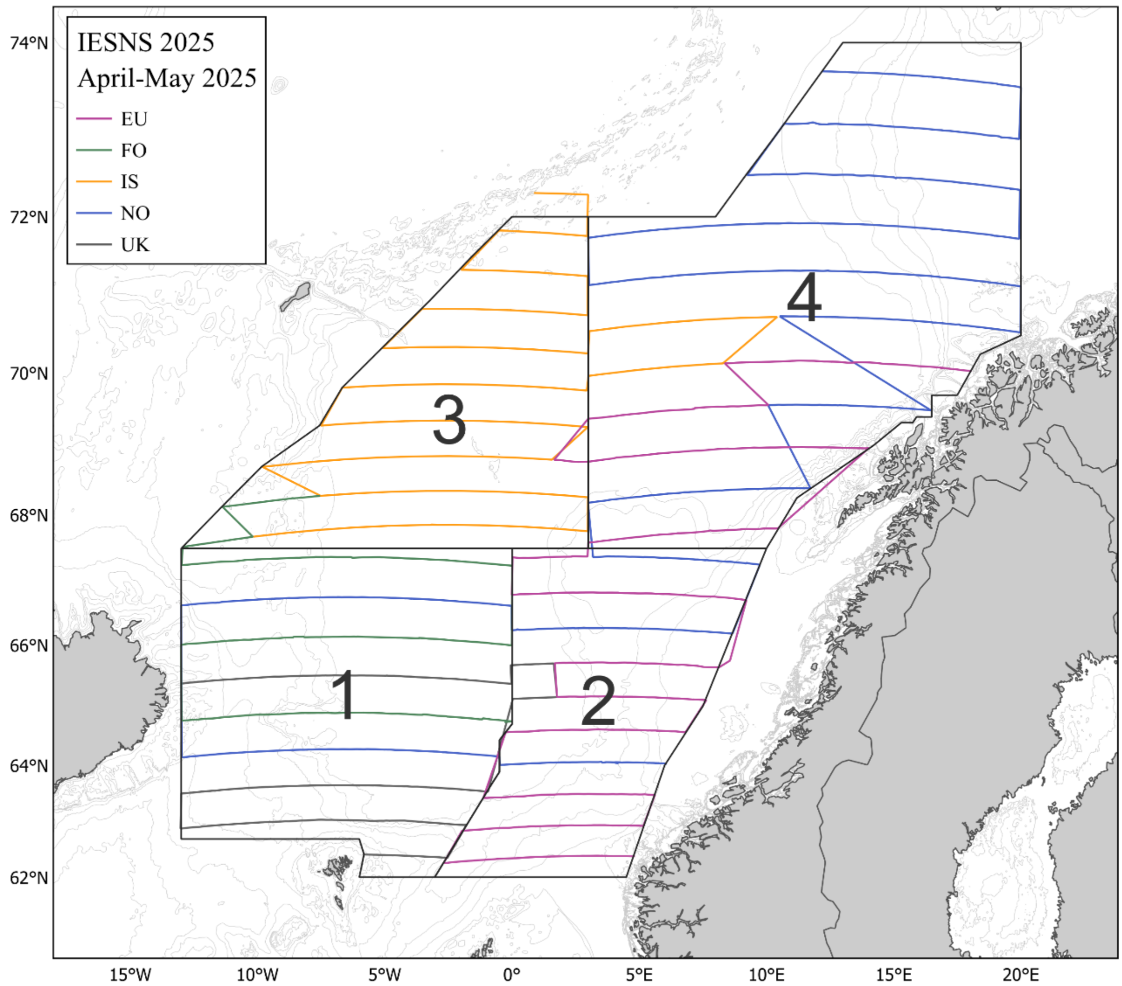


Figure 2. Cruise tracks and strata (with numbers) for the IESNS survey in May 2025.

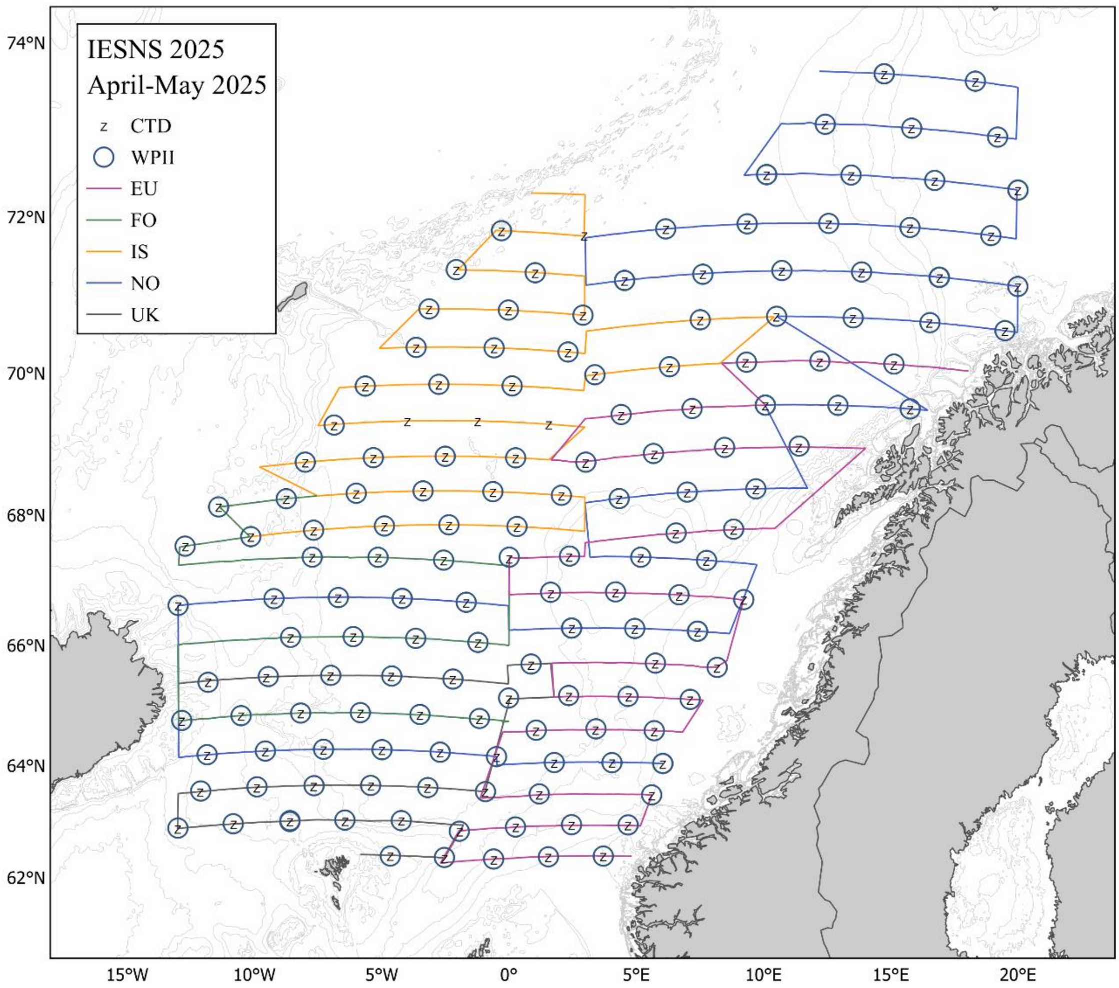


Figure 3. IESNS survey in May 2025: location of hydrographic and WPII plankton stations.

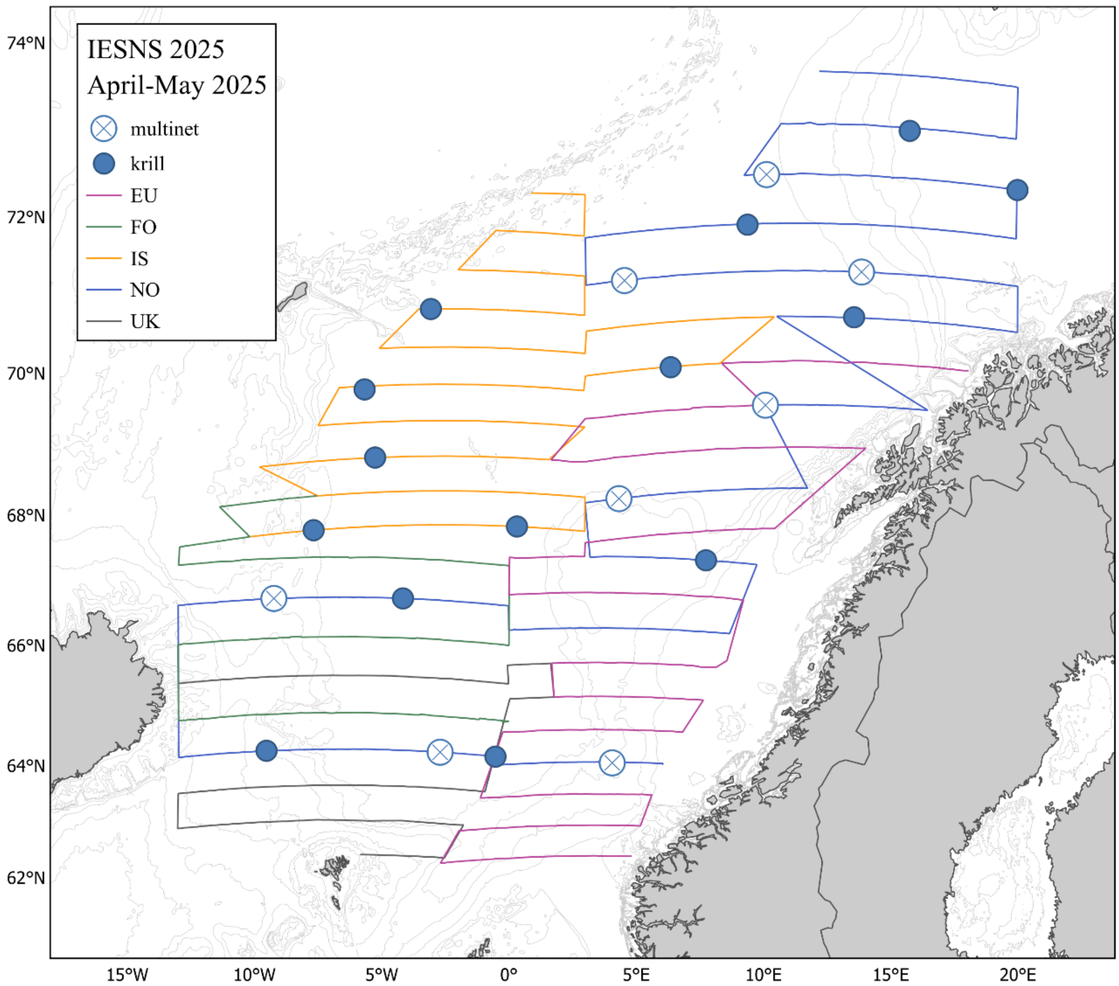


Figure 4. IESNS survey in May 2025: location of Macroplankton/Krill trawl and Multinet stations.

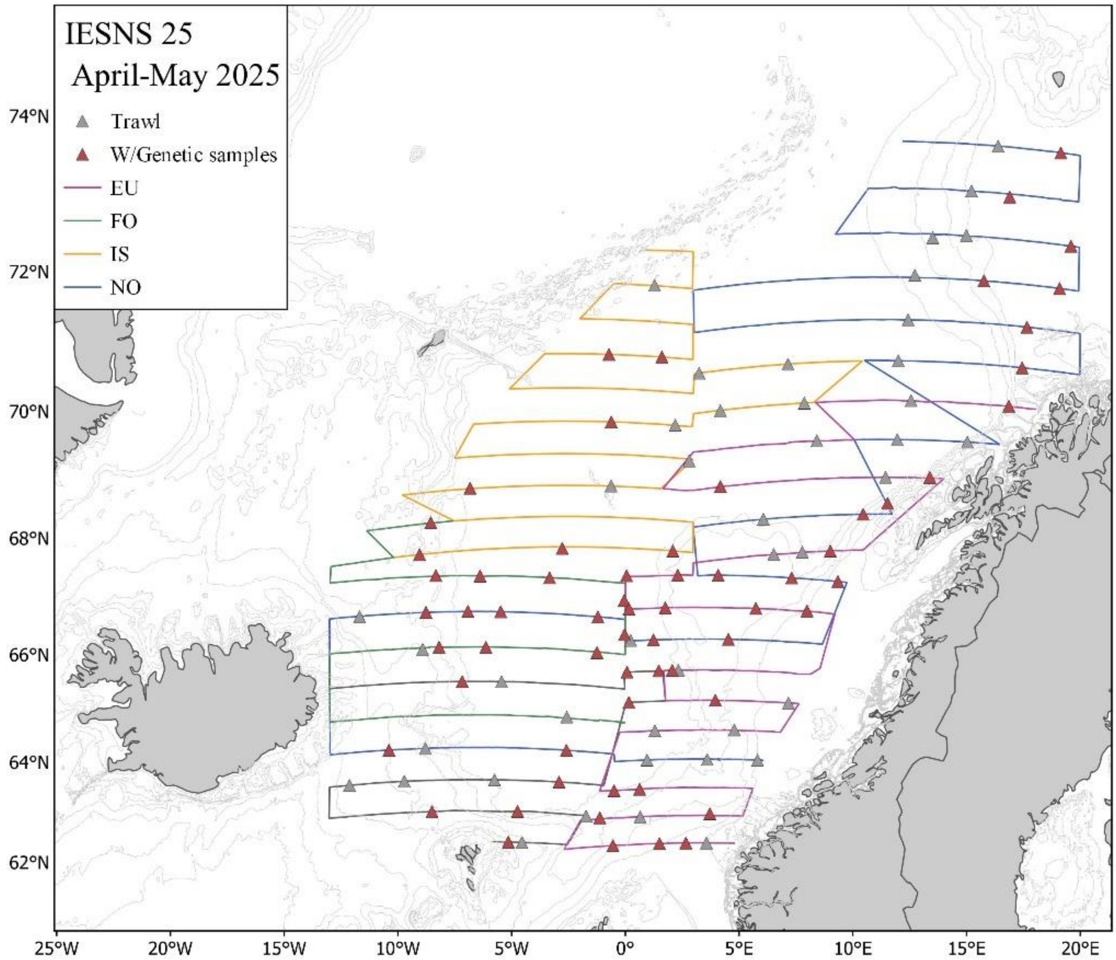


Figure 5. IESNS survey in May 2025: cruise tracks and location of pelagic trawl stations. Stations where genetic herring samples were taken are red.

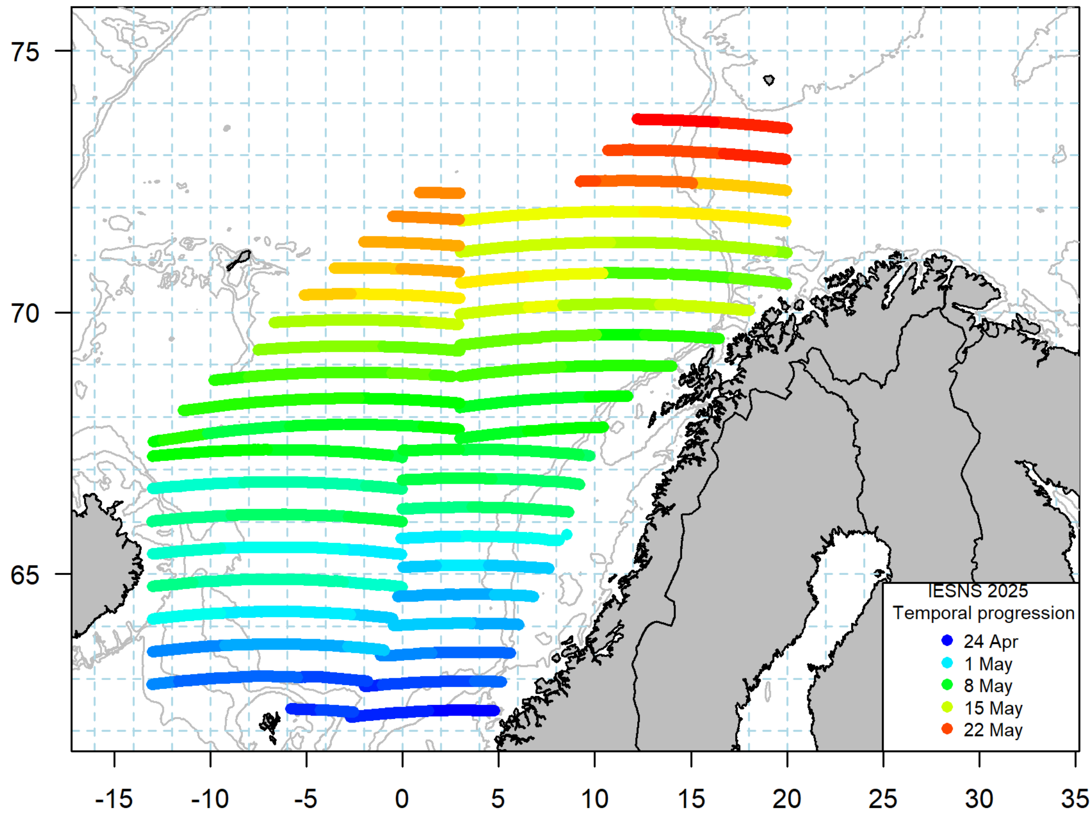


Figure 6. Temporal progression IESNS in April-May 2025.

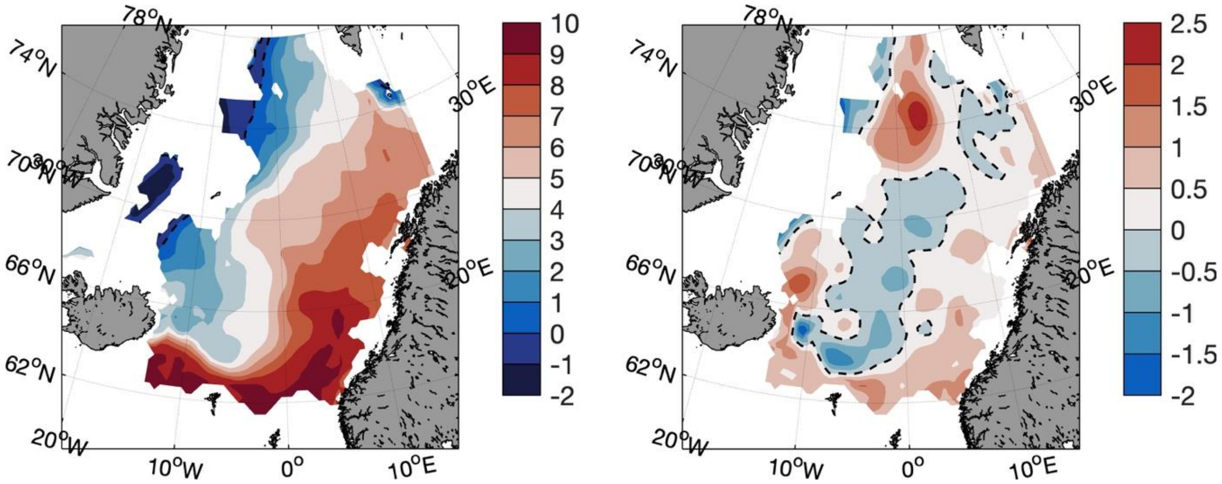


Figure 7a. Temperature (left) and temperature anomaly (right) averaged over 0-50 m depth in May 2025. Anomaly is relative to the 1995-2021 mean.

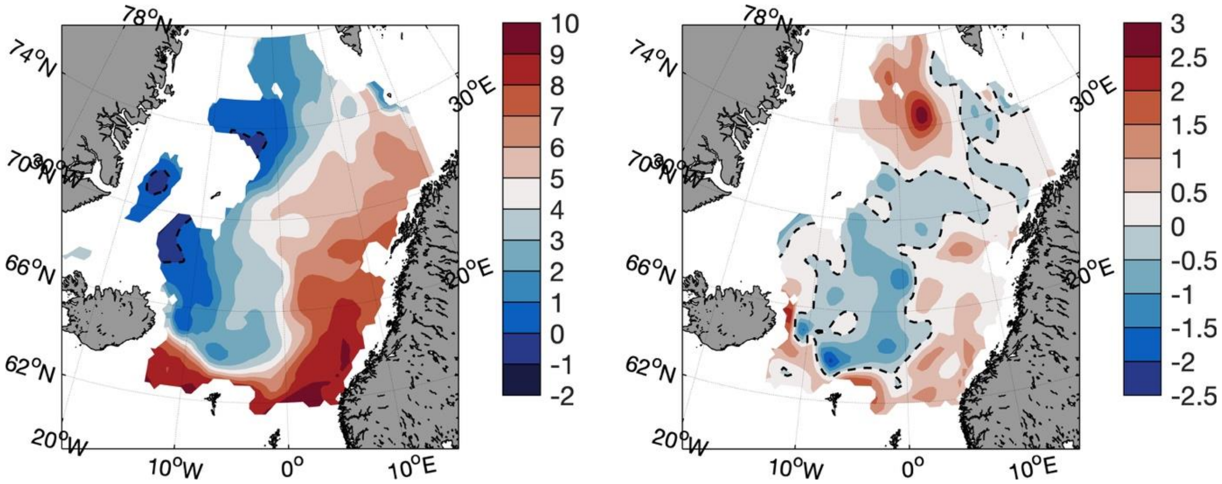


Figure 7b. Same as above but averaged over 50-200 m depth.

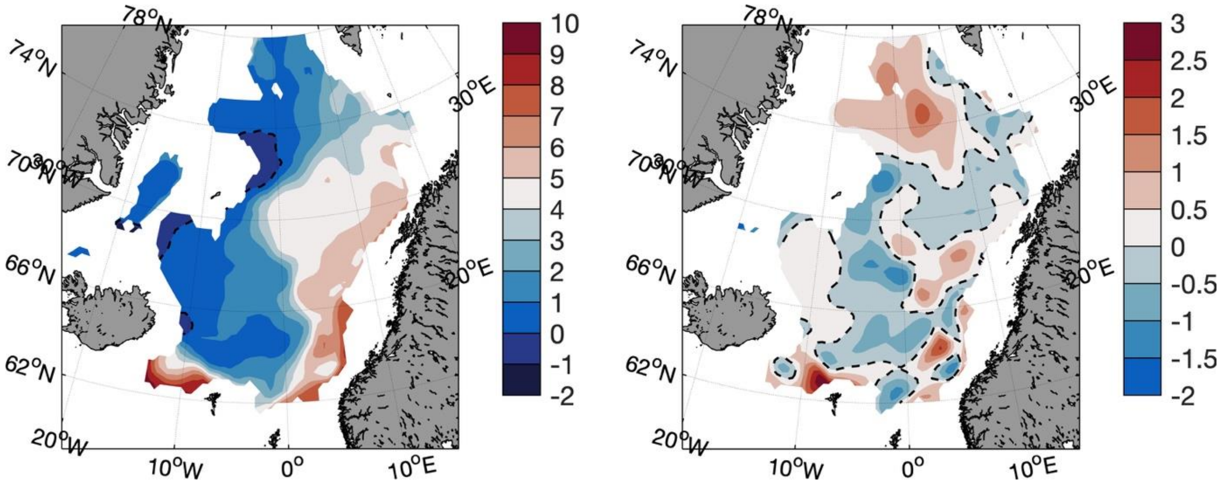


Figure 7c. Same as above but averaged over 200-500 m depth.

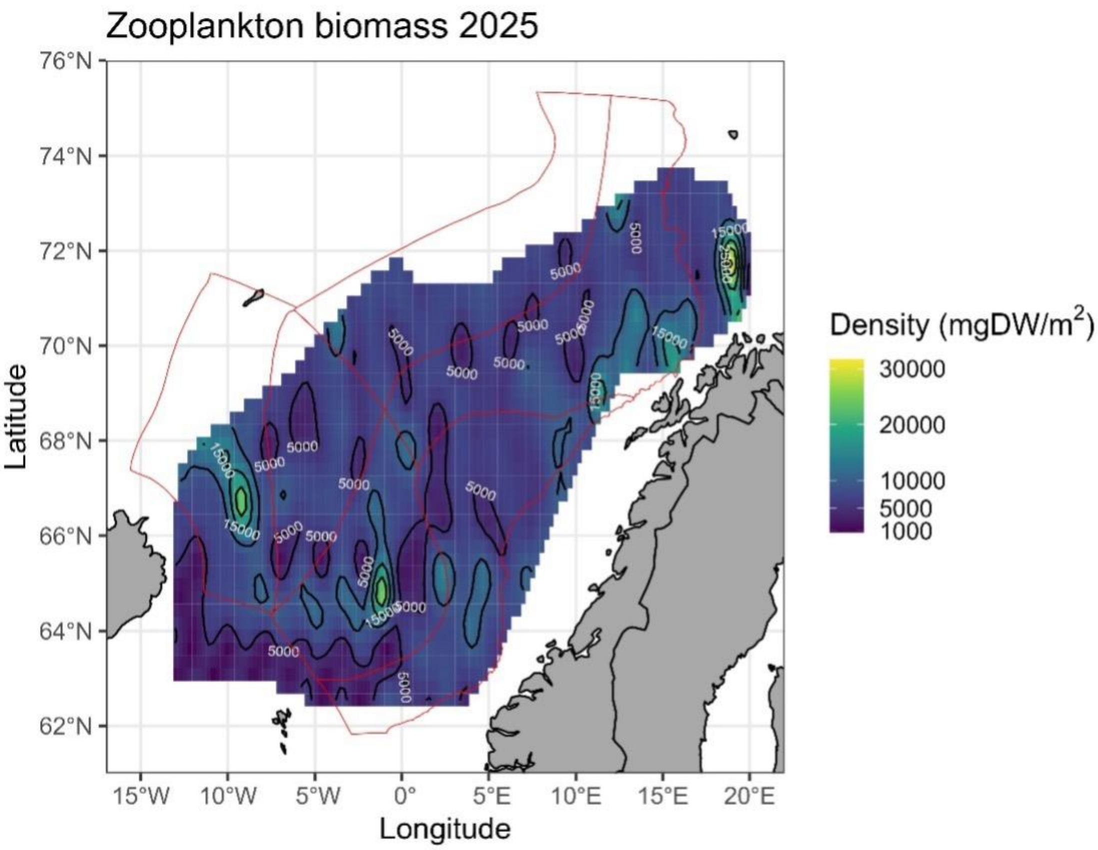
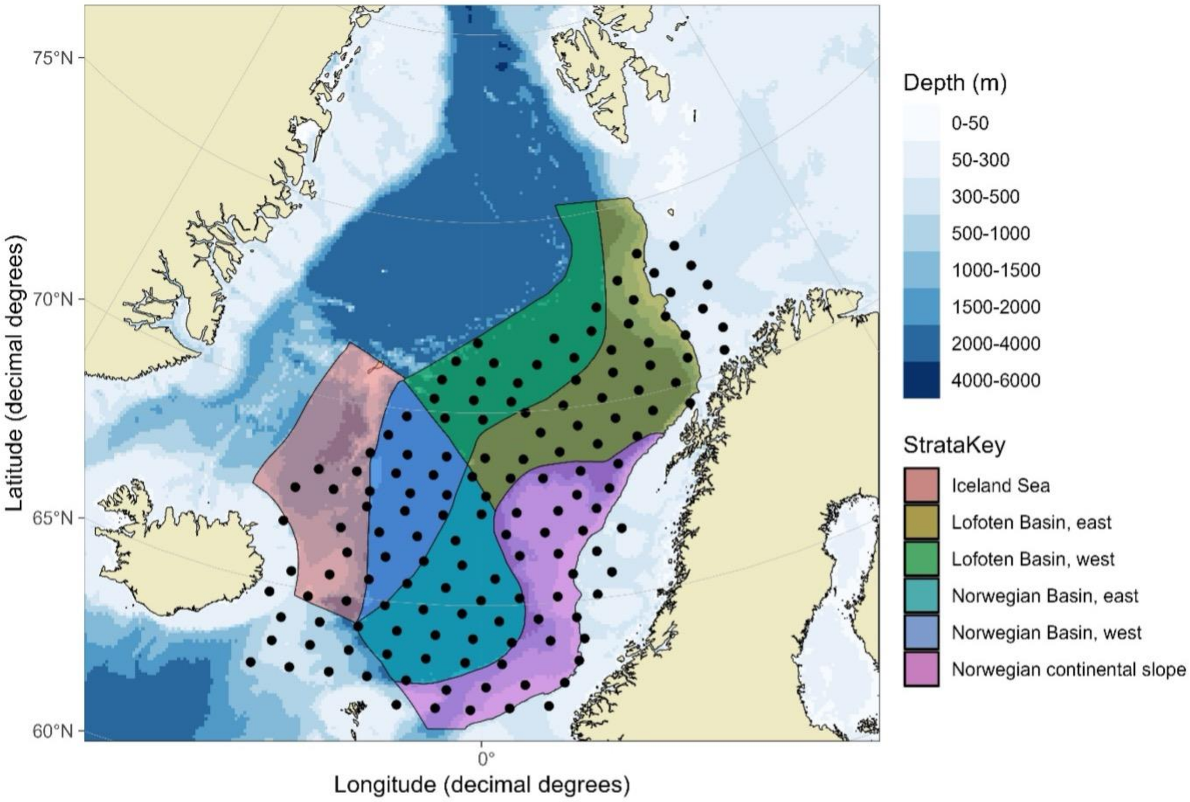


Figure 8. Distribution of zooplankton biomass (mg dry weight m^{-2}) in the upper 200 m in May, IESNS survey 2025.

a)


75°N
70°N
65°N
60°N
0°
Latitude (decimal degrees)
Longitude (decimal degrees)
Depth (m)
0-50
50-300
300-500
500-1000
1000-1500
1500-2000
2000-4000
4000-6000
StrataKey
Iceland Sea
Lofoten Basin, east
Lofoten Basin, west
Norwegian Basin, east
Norwegian Basin, west
Norwegian continental slope

b)

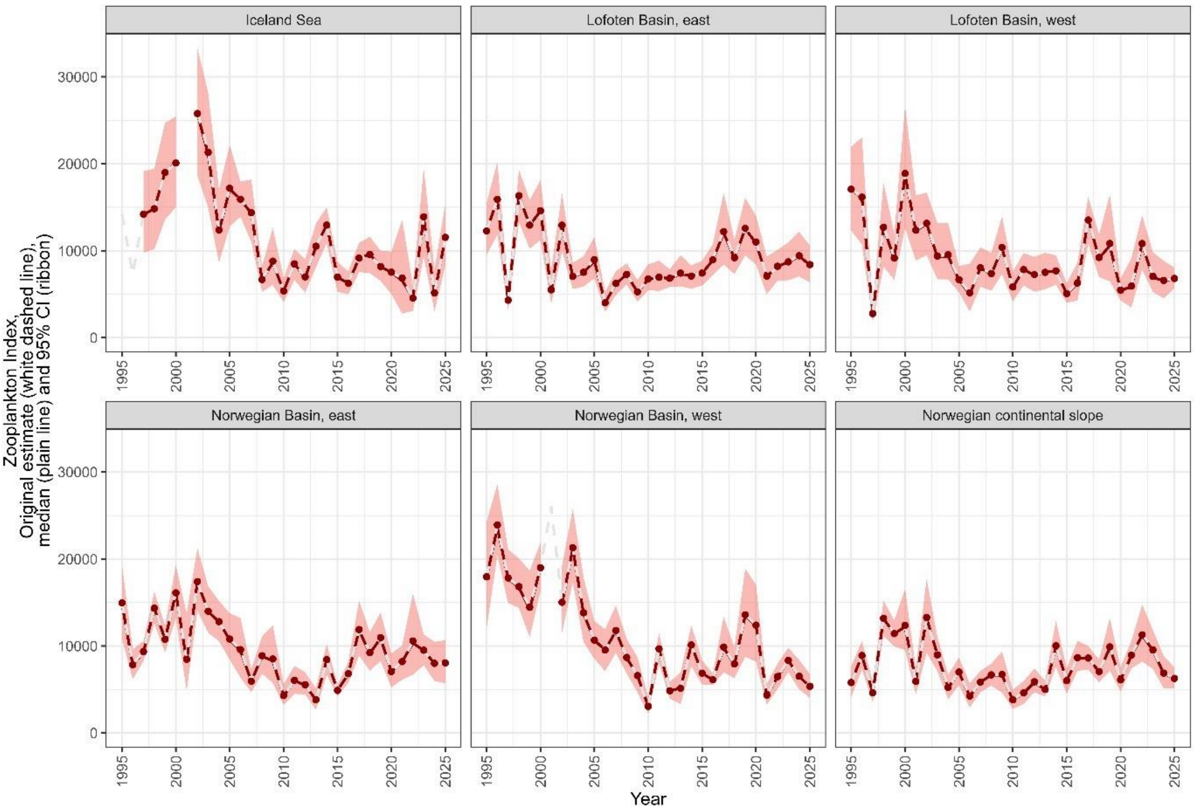
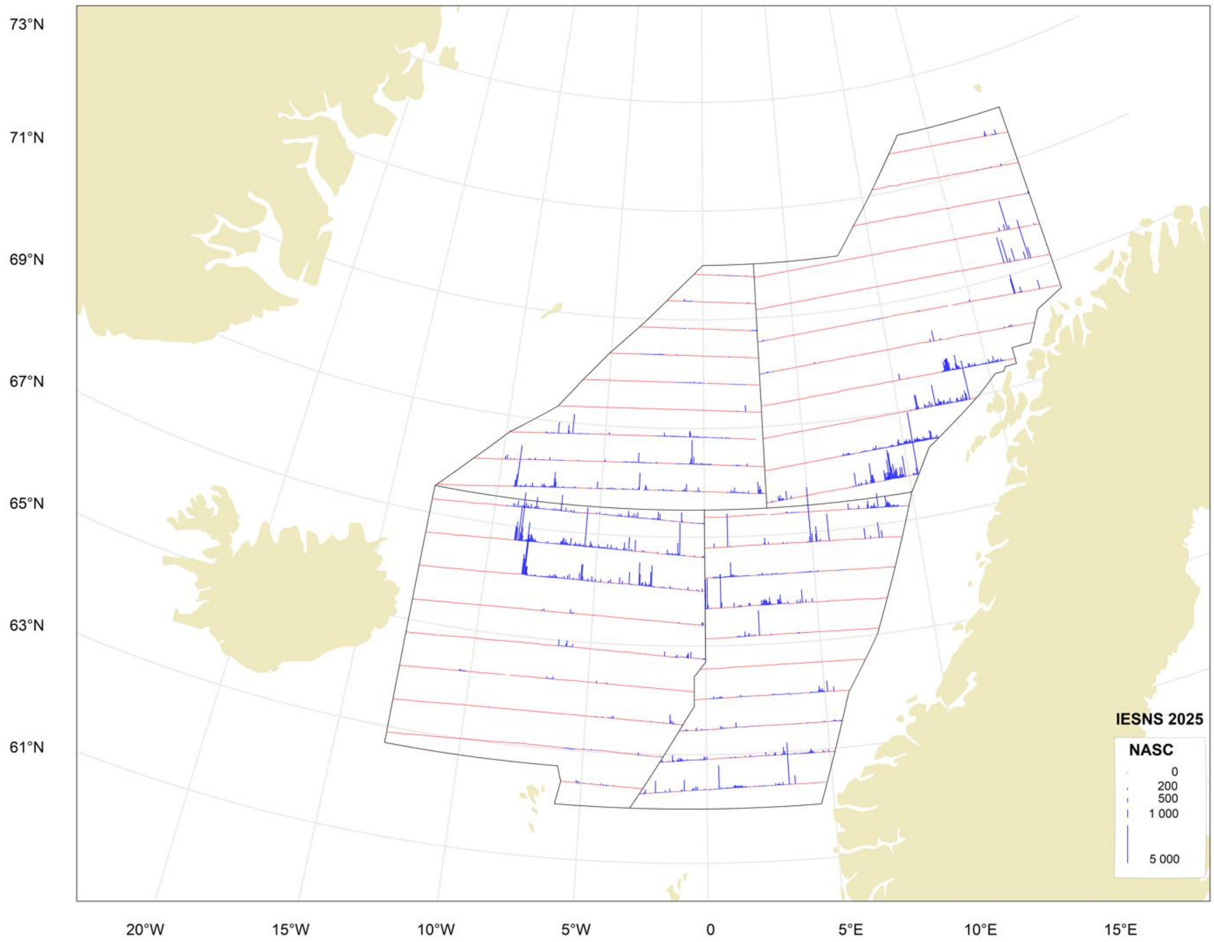


Figure 9 a) shows the sub-areas, and b) the indices of zooplankton biomass (mg dry weight m^{-2}) sampled by WP2 in May from 1995-2025.

(a)


73°N
71°N
69°N
67°N
65°N
63°N
61°N
20°W
15°W
10°W
5°W
0
5°E
10°E
15°E
IESNS 2025
NASC
0
200
500
1 000
5 000

(b)

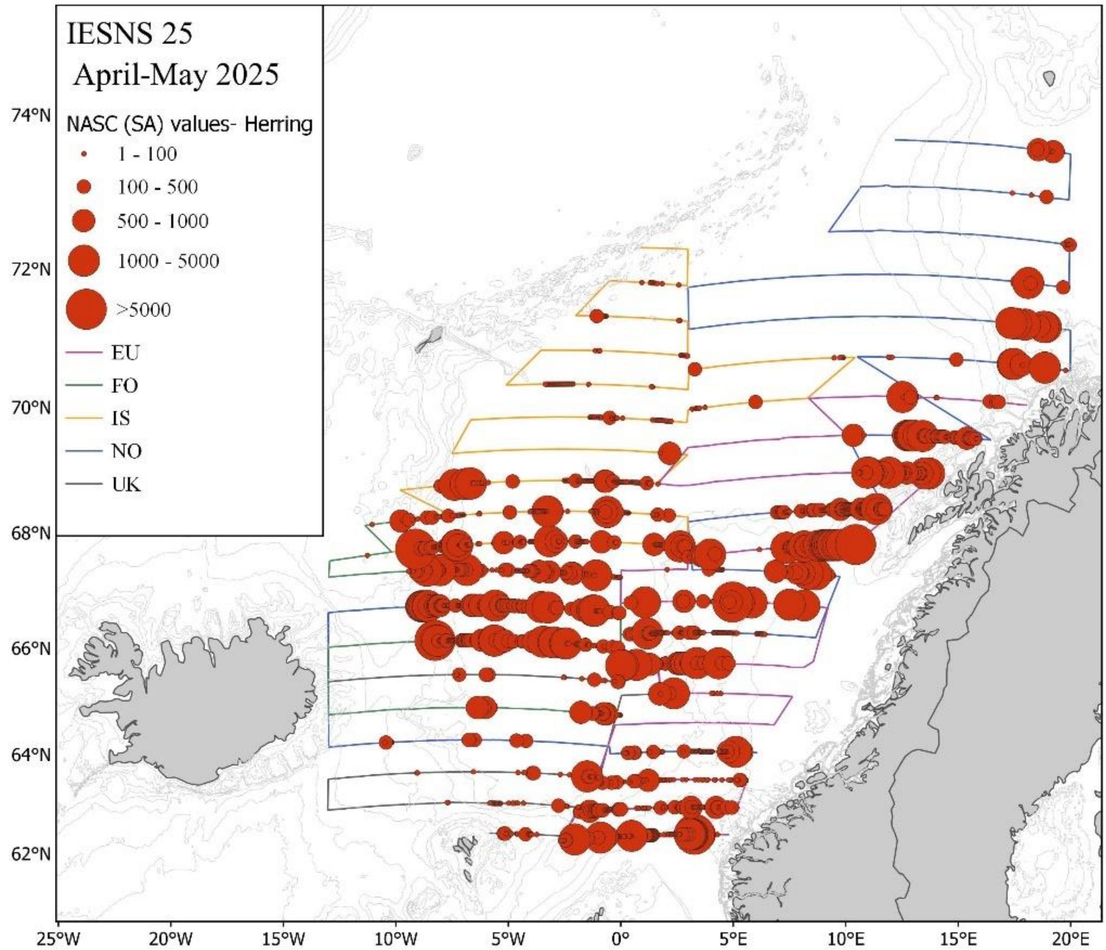


Figure 10. Distribution of Norwegian spring-spawning herring as measured during the IESNS survey in May 2025 in terms of NASC values (m^2/nm^2) averaged for every 1 nautical mile. The NASC values are represented as both bars (a) and bubbles (b).

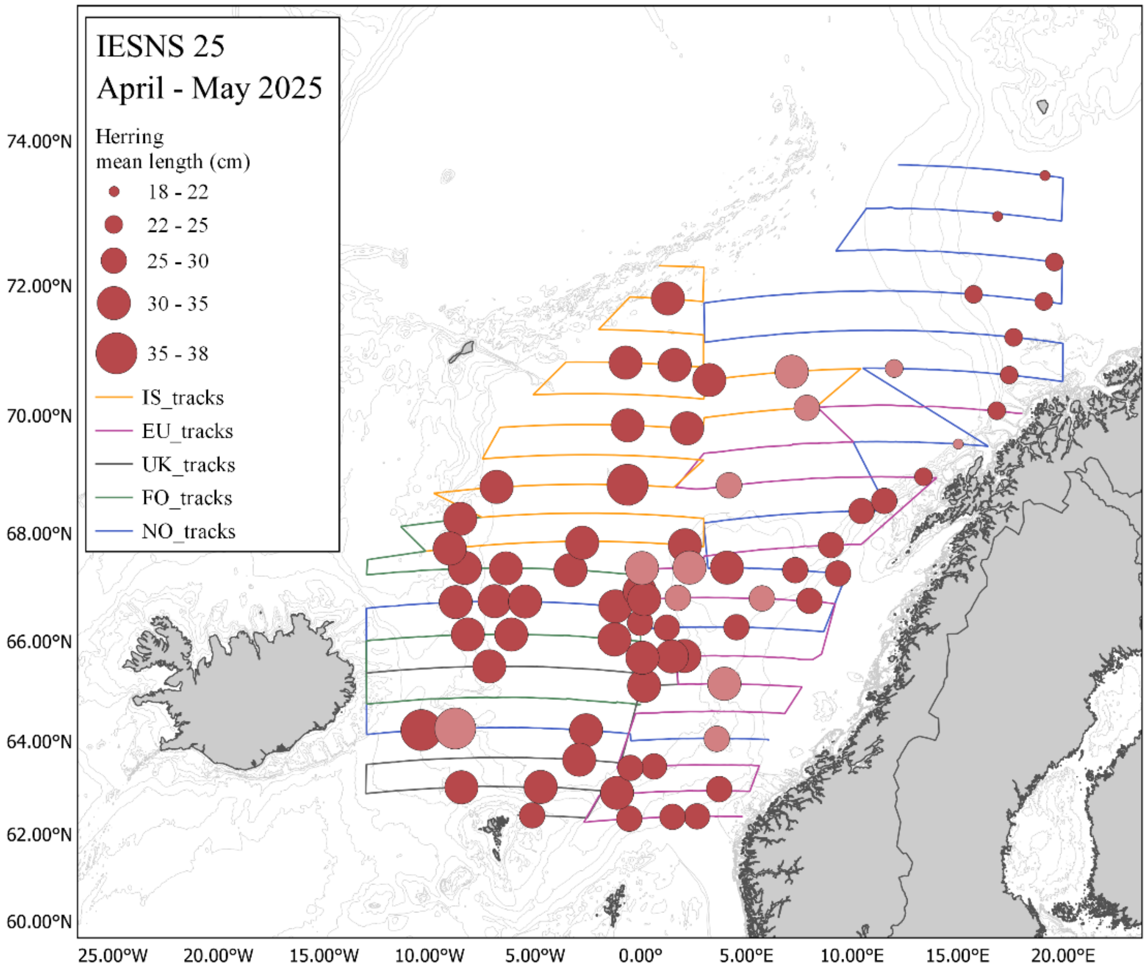


Figure 11. Mean length of Norwegian spring-spawning herring in all hauls in IESNS 2025. Hauls with less than 10 individuals caught are in lighter colour (not used in Stox).

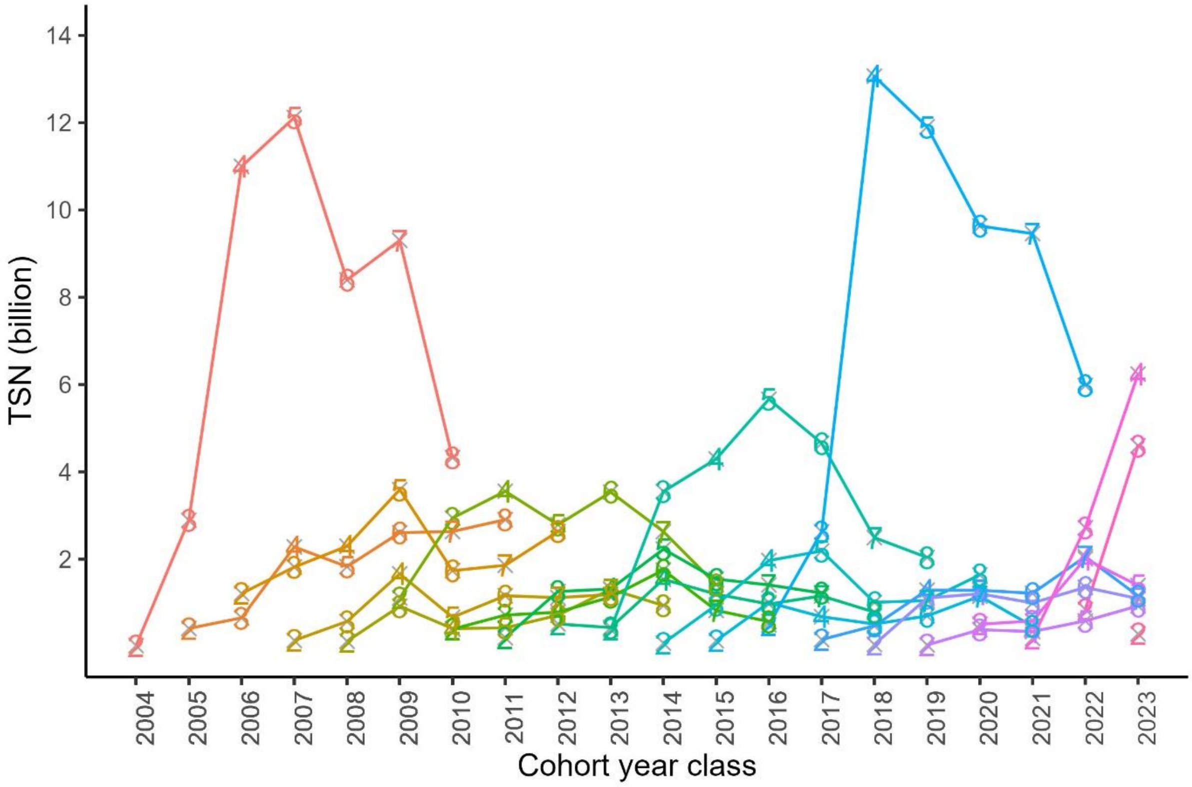


Figure 12. Tracking of the Total Stock Number at age (TSN, in billions) of Norwegian spring-spawning herring for each cohort since 2004 from age 2 to age 8. From 2008, stock is estimated using the StoX software. Prior to 2008, stock was estimated using BEAM.

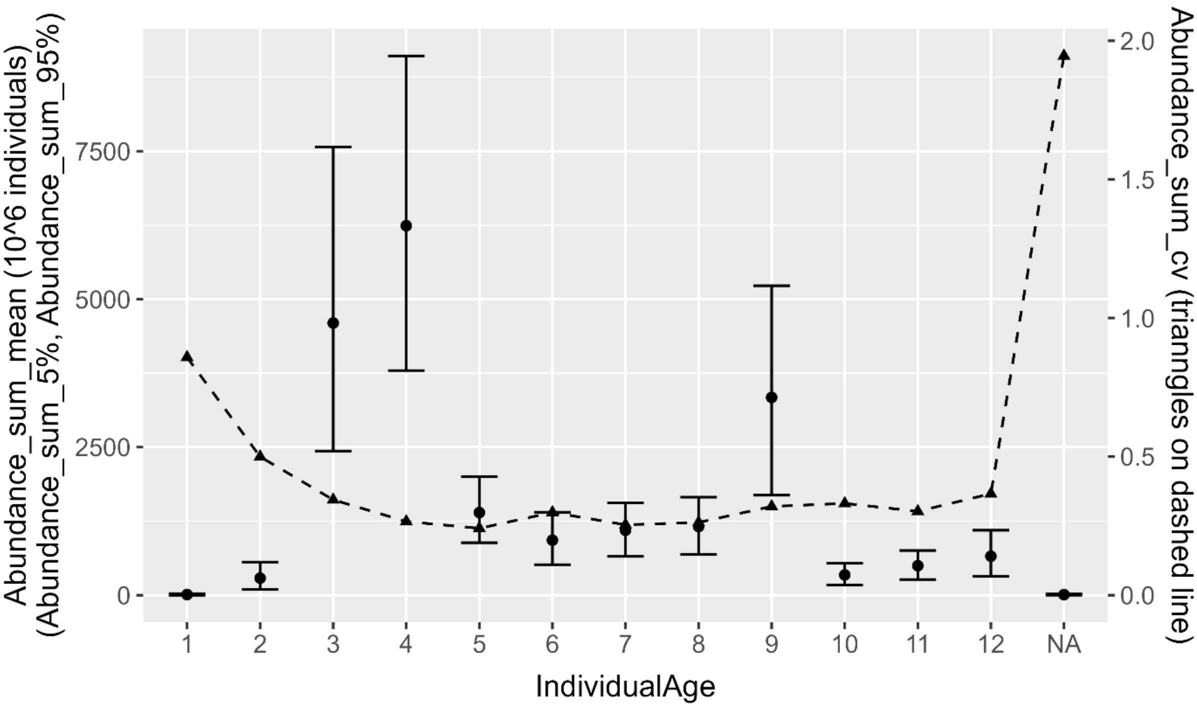


Figure 13. IESNS 2025. Norwegian spring-spawning herring in the Norwegian Sea: R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 1000 replicates using the StoX software.

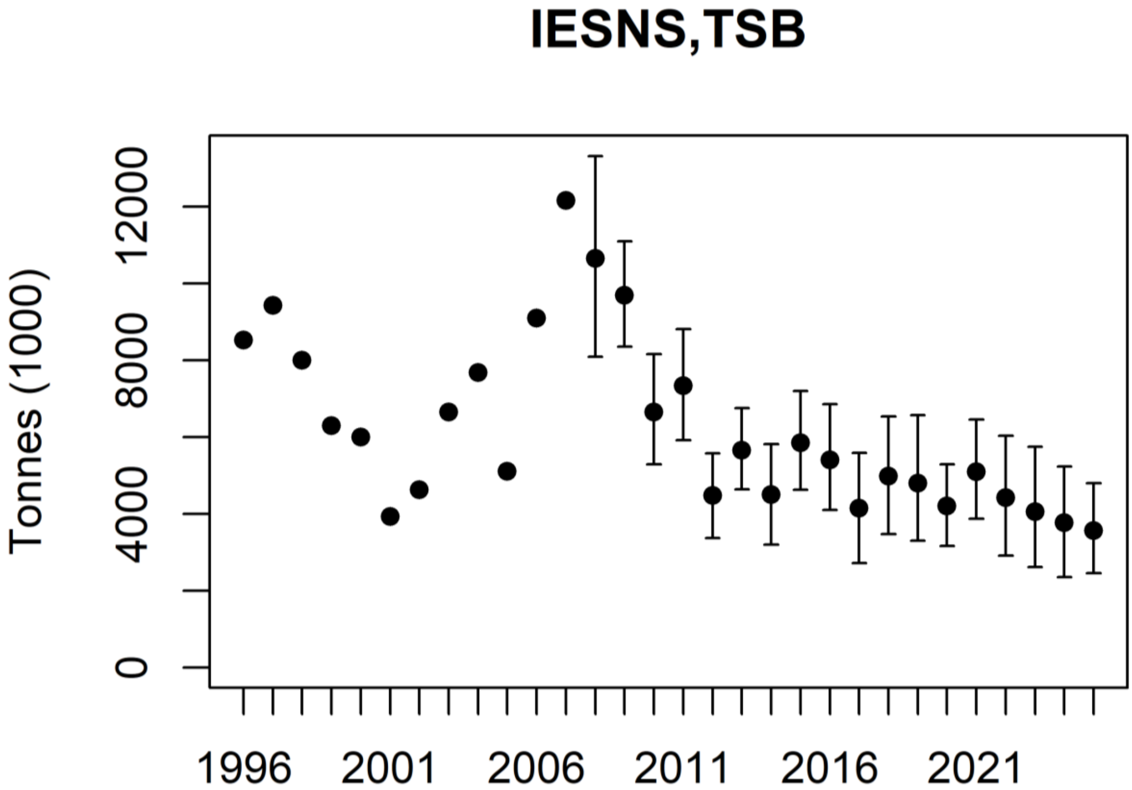


Figure 14. Biomass estimates of Norwegian-spring spawning herring in the IESNS survey (Barents Sea, east of 20°E, is excluded) from 1996 to 2025 as estimated using BEAM (1996-2007; calculated on basis of rectangles) and as estimated with the software StoX (2008-2025; bootstrap means with 90% confidence interval; calculated on basis of standard stratified transect design).

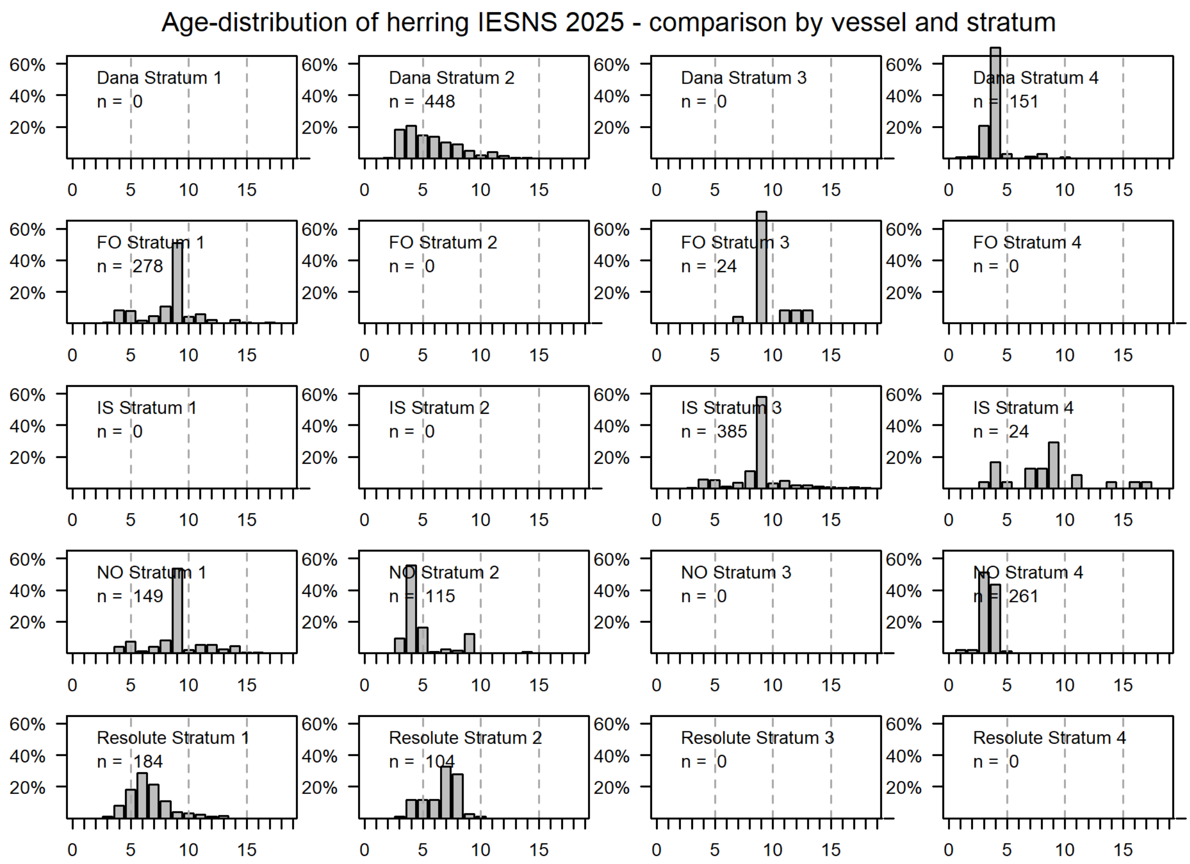
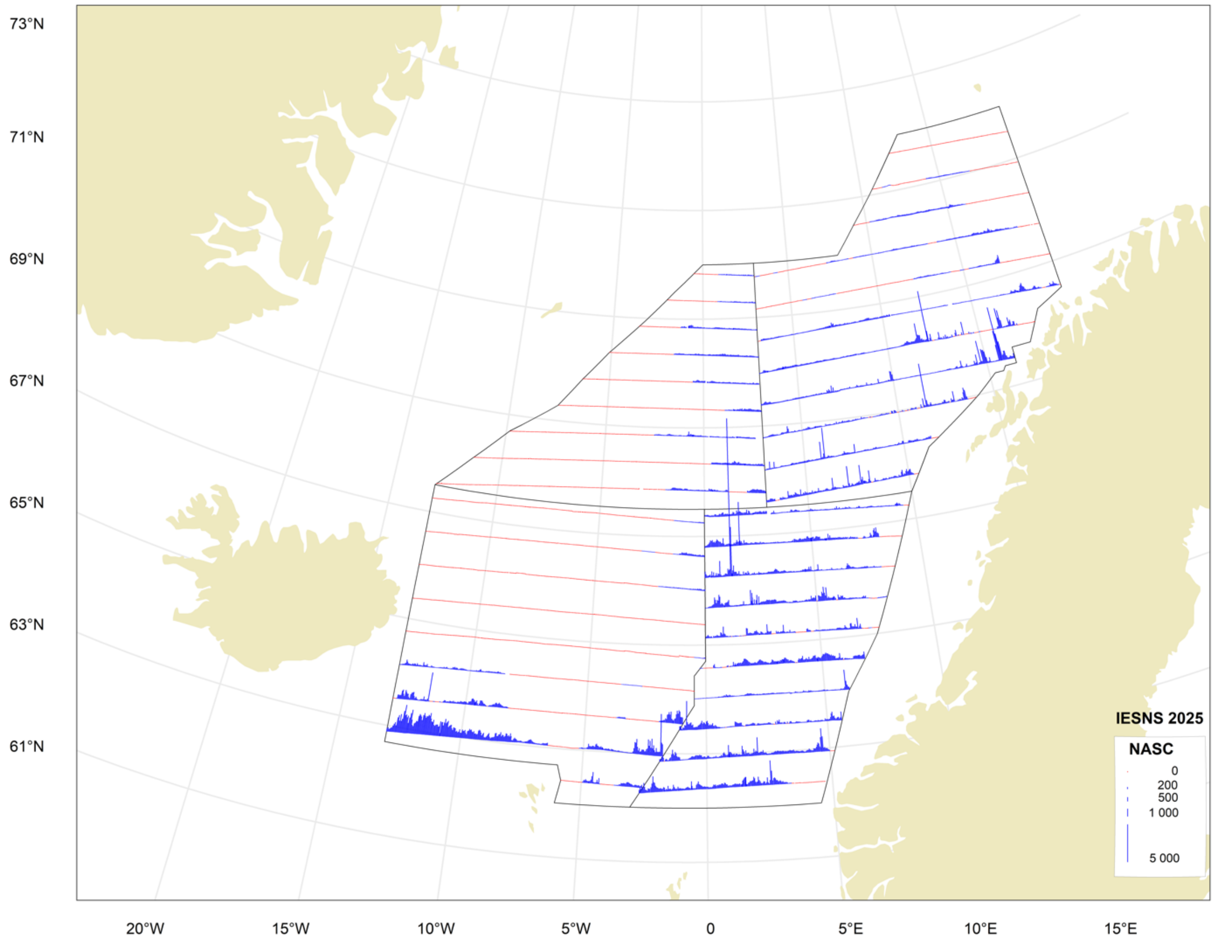


Figure 15. Comparison of the age distributions of herring by stratum and country in IESNS 2025. The strata are shown in Figure 2.

(a)


73°N
71°N
69°N
67°N
65°N
63°N
61°N
20°W
15°W
10°W
5°W
0
5°E
10°E
15°E
IESNS 2025
NASC
0
200
500
1 000
5 000

b)

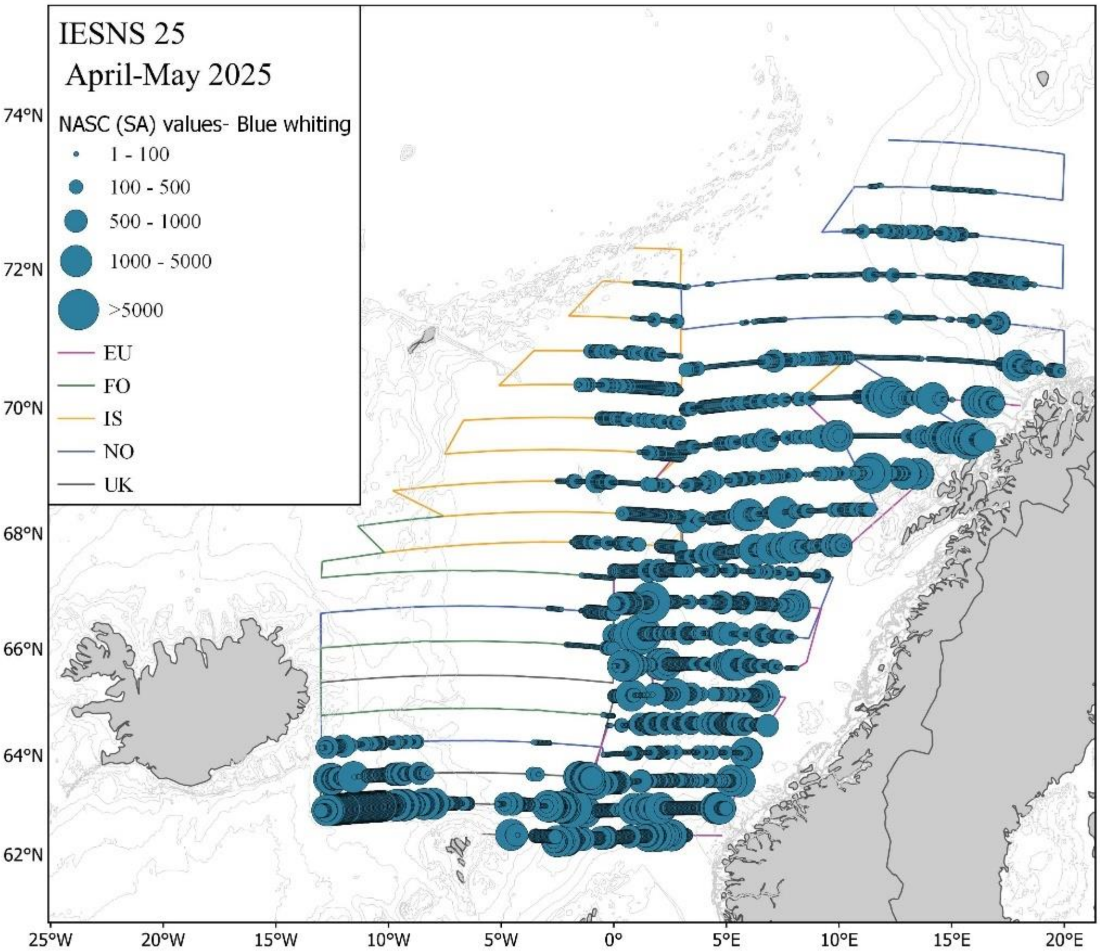


Figure 16. Distribution of blue whiting as measured during the IESNS survey in May 2025 in terms of NASC values (m²/nm²) (a) averaged for every 1 nautical mile. The NASC values are represented as both bars (a) and bubbles (b).

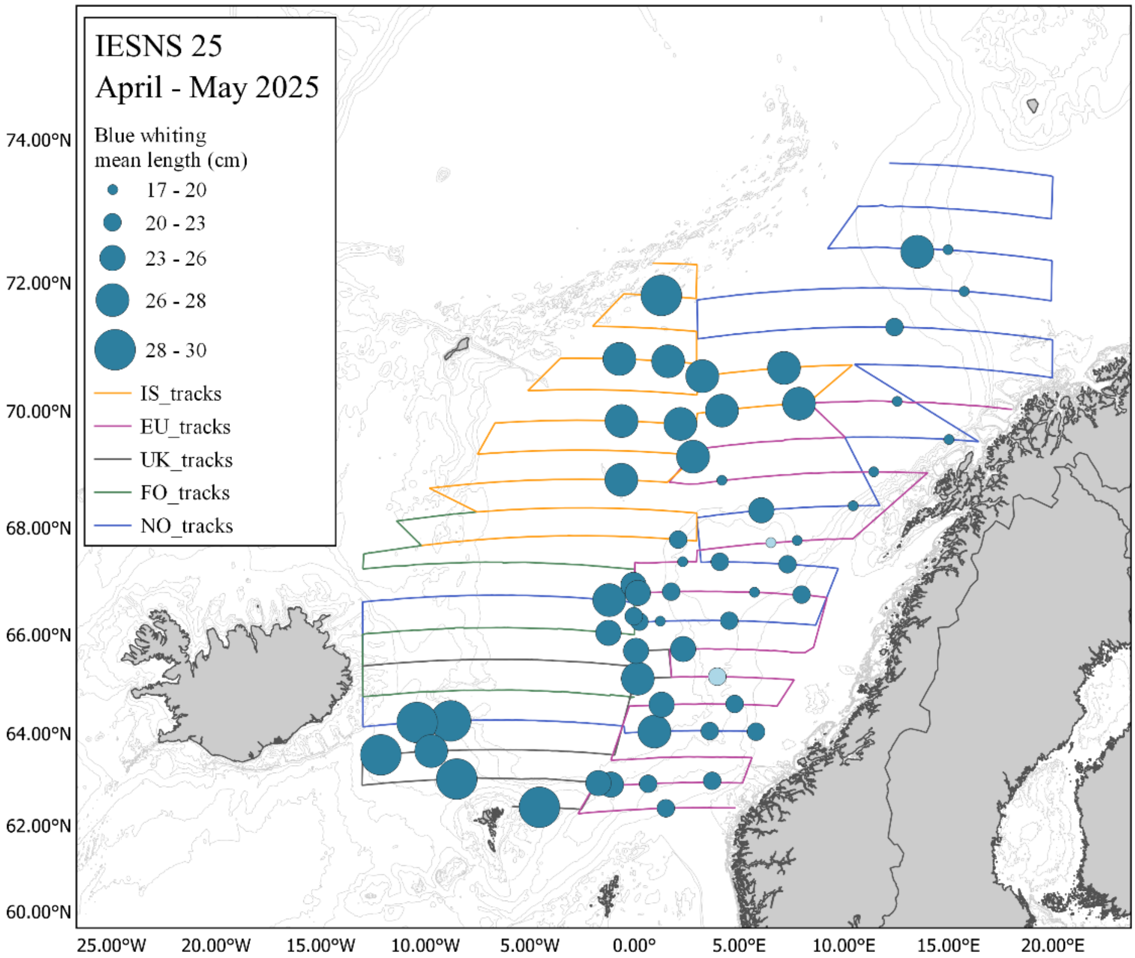


Figure 17. Mean length of blue whiting in all hauls in IESNS 2025. Hauls with less than 10 individuals caught are in lighter colour (not used in Stox).

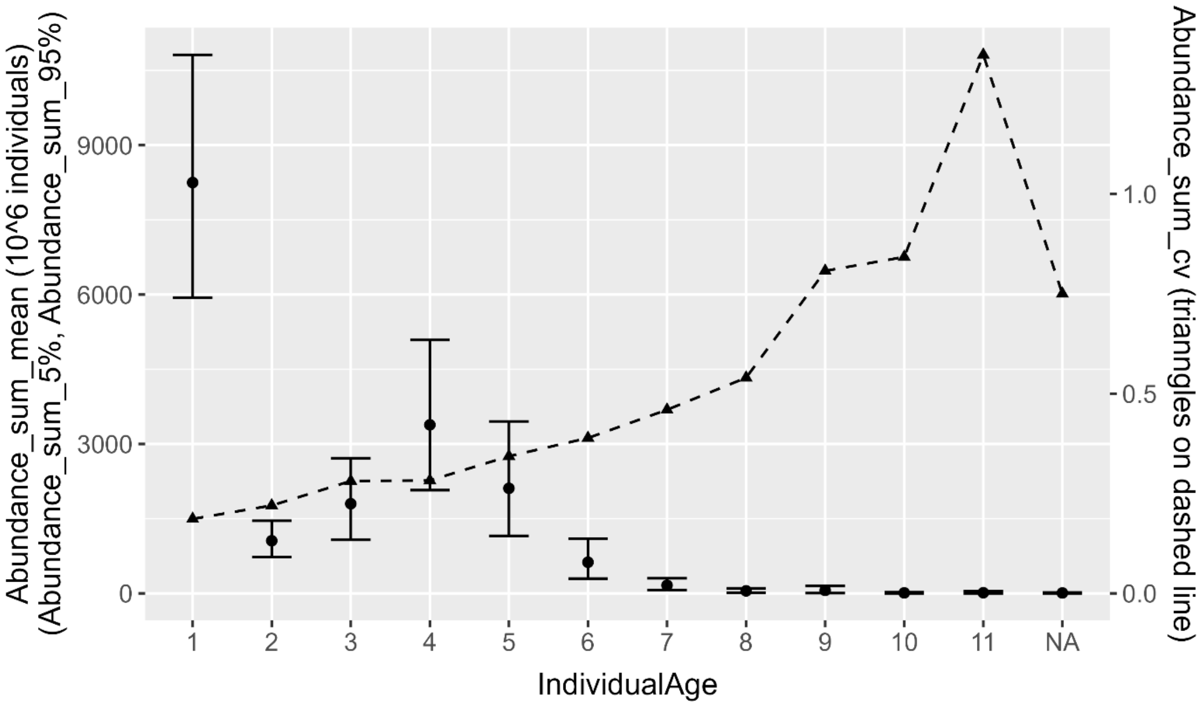


Figure 18. IESNS 2025. Blue whiting in the Norwegian Sea: R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 1000 replicates using the StoX software.

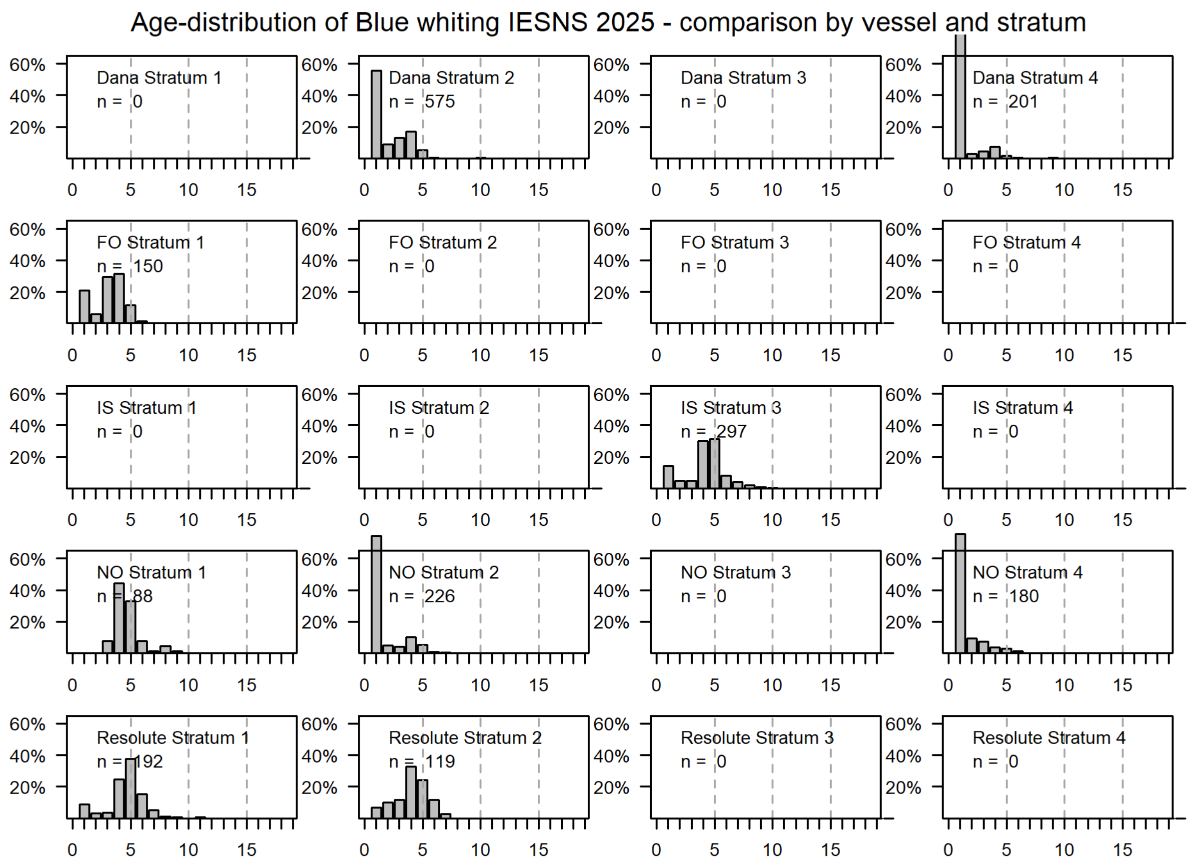


Figure 19. Comparison of the age distributions of blue whiting by stratum and country in IESNS 2025. The strata are shown in Figure 2.

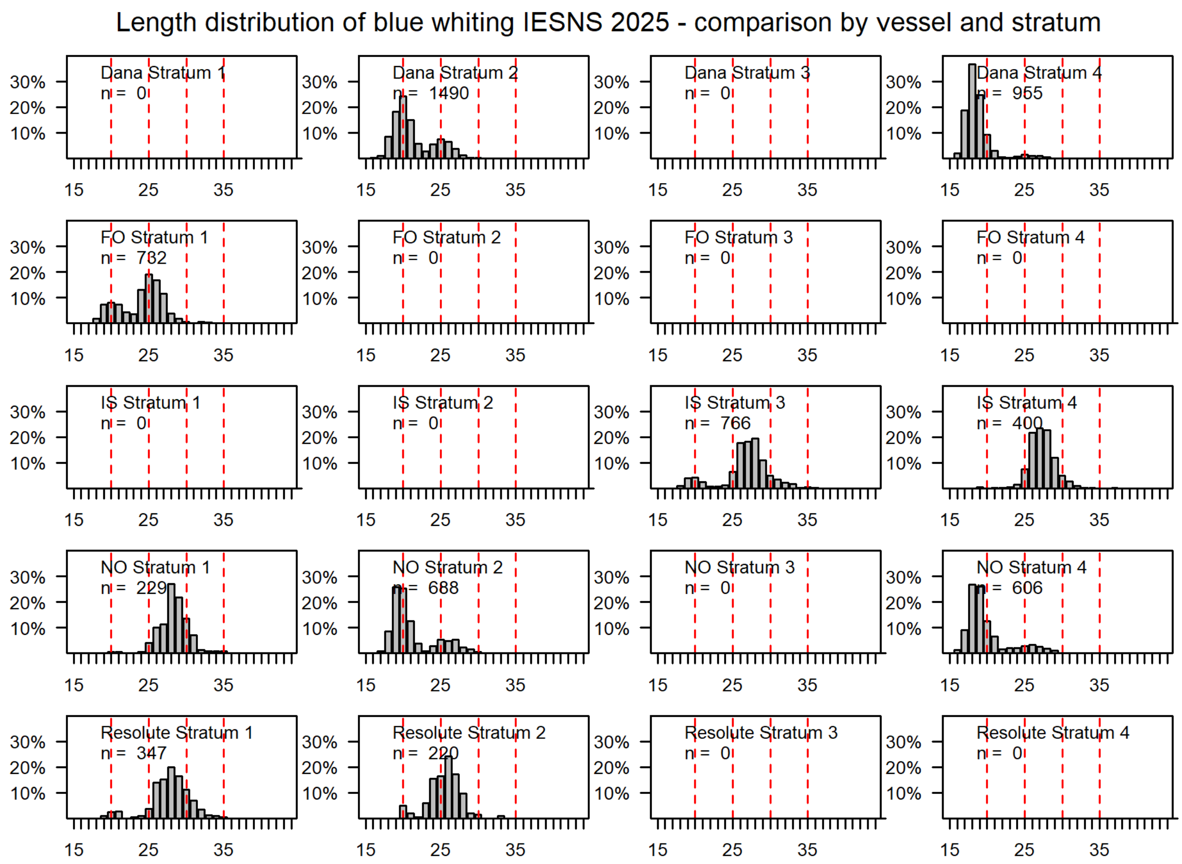


Figure 20. Comparison of the length distributions of blue whiting by stratum and country in IESNS 2025. The strata are shown in Figure 2.

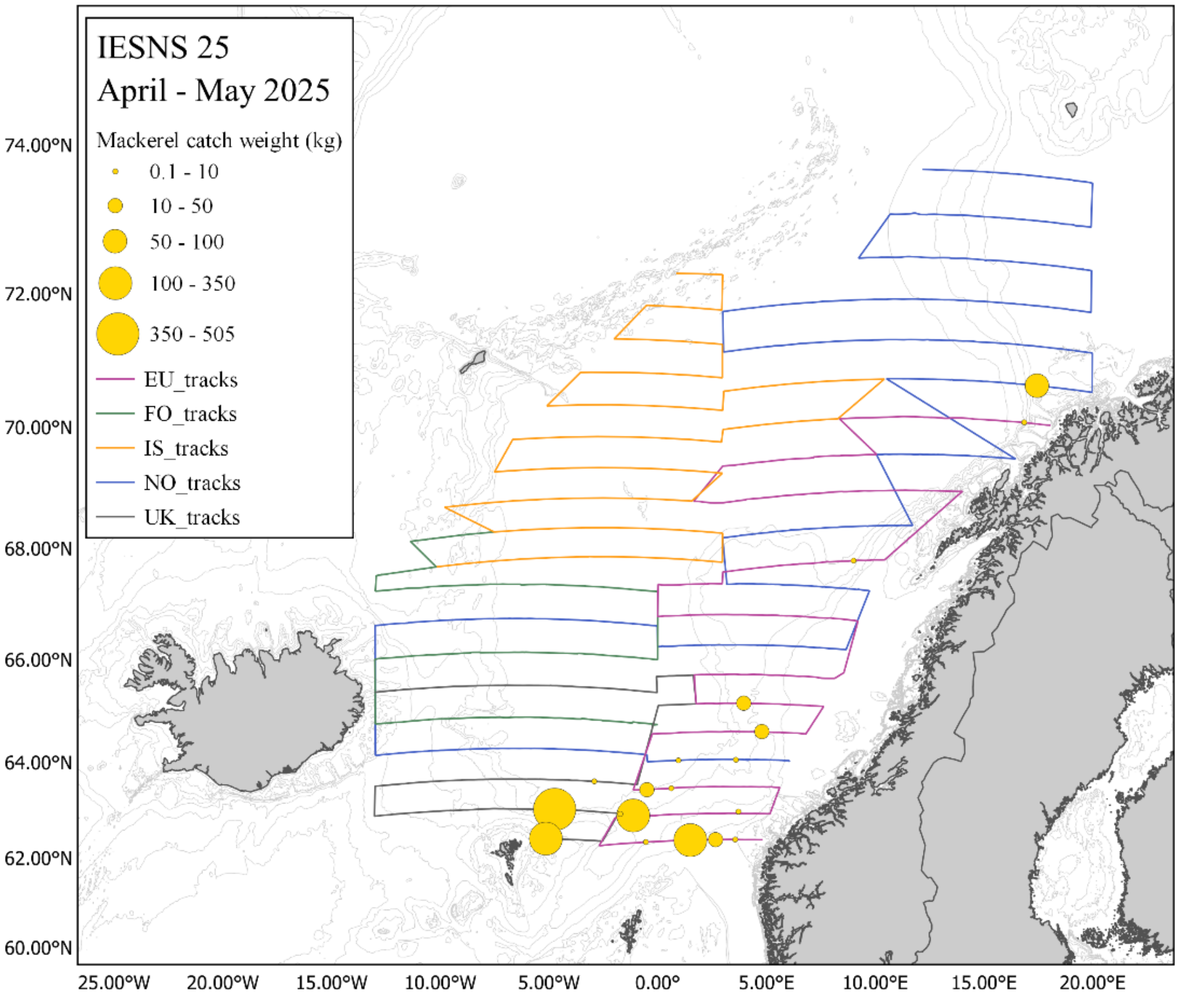


Figure 21. Pelagic trawl catches of mackerel in IESNS 2025.