IMR/PINRO
8
2024
Joint Report Series

JOINT REPORT

Fish investigations in the Barents Sea Winter 2024

Institute of Marine Research – IMR

Polar branch of the FSBSI “VINRO” (“PINRO”)

Title (English and Norwegian):

Fish investigations in the Barents Sea Winter 2024

Fish investigations in the Barents Sea Winter 2024

Report series:	Year - No.:	Date:
IMR-PINRO	2024-8	22.08.2024

Author(s):

Johanna Fall, Thomas de Lange Wenneck, Bjarte Bogstad, Elise Eidset, Edvin Fuglebakk, Jane Aanestad Godiksen, Åge Høines, Edda Johannesen, Halvard Aas Midtun, Ine Moksness, Malin Lie Skage, Georg Skaret, Arved Staby, Caroline Aas Tranang, Kristin Windsland (IMR), Alexey A. Russkikh (VNIRO) and Sergey Kharlin (VNIRO)

Approved by: Research Director(s): Geir Huse Program leader(s): Maria Fossheim

Distribution:

Open

Project No.:

15569

Program:

Barentshavet og Polhavet

Research group(s):

Bunnfisk

Pelagisk fisk

Dyphavsarter og bruskfisk

Number of pages:

156

Content

Preface

Annual catch quotas and other regulations of the Barents Sea fisheries are set through negotiations between Norway and Russia. Assessment of the state of the stocks and quota advice are given by the International Council for the Exploration of the Sea (ICES). Their work is based on survey results and international landings statistics. The results from the demersal fish winter surveys in the Barents Sea are an important source of information for the annual stock assessment.

The development of the survey started in the early 1970s and focused on acoustic measurements of cod and haddock. Since 1981 it has been designed to produce both acoustic and swept area estimates of fish abundance. Some development has taken place since then, both in area coverage and in methodology. The development is described in detail by Jakobsen et al. (1997), Johannesen et al. (2009) and in Appendix 3, and the current survey design and methods for survey index calculation are presented in Appendix 2. The survey manual is available at the internal IMR quality portal here. At present the survey provides the main data input for several ongoing projects at the Institute of Marine Research, Bergen:

- monitoring abundance of the Barents Sea demersal fish stocks
- mapping fish distribution in relation to climate and prey abundance
- monitoring food consumption and growth
- estimating predation mortality caused by cod

This report presents the main results from the surveys in January-March 2024. The surveys were performed with the Norwegian research vessels “Kronprins Haakon” and “Johan Hjort”, and the Russian research vessel “Vilnyus”. Annual survey reports since 1981 are listed in Appendix 5, and names of scientific participants in 2024 are given in Appendix 4.

1. Survey operation

Table 1.1 presents the vessels participating in the survey in 2024 and IMR trawl station series numbers, and Figure 1.1 shows survey tracks, trawl stations and ice cover.

Table 1. 1. *Vessel participation by period and trawl station series numbers by vessel for the winter survey in 2024.*

	Period	Series no.
Johan Hjort	24.01-16.03	70001-70245
Kronprins Haakon	16.01-10.02	70301-70446
Vilnyus	03.02-04.03	70501-70651

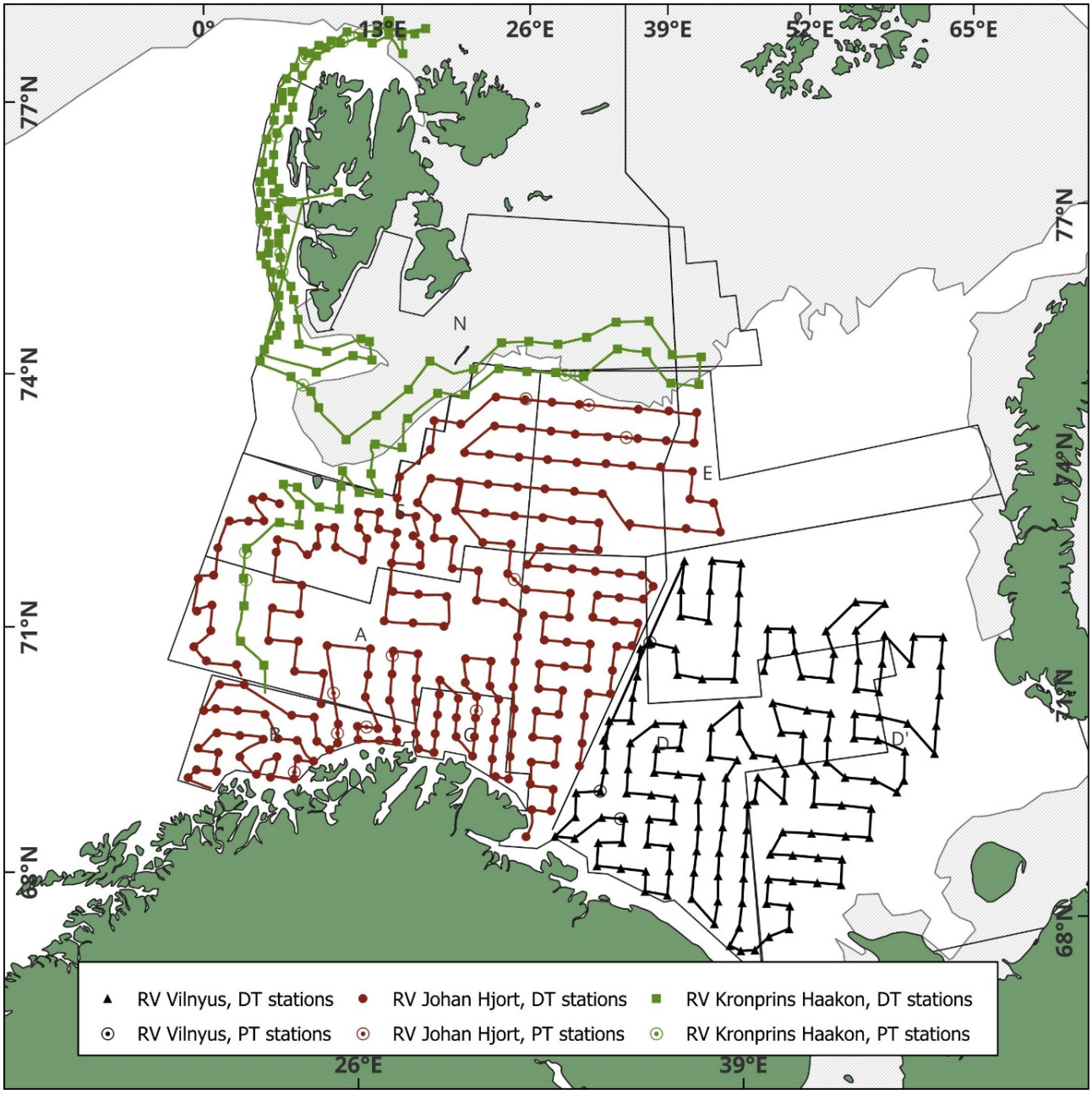

Figure 1.1.Survey tracks and all trawl stations in the winter survey 2024. Data source for the ice cover: arctic_20240116_col.png (3508×2480) (met.no) (16.01.24, the first day of the survey start on KPH) .

Table 1.2. *Number of trawl stations by main area in the Barents Sea winter 2024. B1= swept area bottom trawl (quality=1 and condition<3), B2 =other bottom trawl, P=pelagic trawl, N=trawl stations in new strata. Refer to Figure 1.1. or Appendix 1 for a map of the main areas.*

Main area	Trawl type	Number of stations
A	B_1 B_2 P	45 1 2
B	B_1 B_2 P	29 3 4
C	B_1 B_2 P	18 1 1
D	B_1 B_2 P	131 4 2

D'	B_1 B_2 P	61 2 1
E	B_1 B_2 P	32 3 4
S	B_1 B_2 P	64 4 5
Inside standard strata system	B_1 B_2 P	380 18 19
N	B_1 B_2 P	79 3 3
Outside strata system	B_1	21
	B_2 P	4 4
Total	B_1+B_2 P	505 26

The coverage of the most northern and most eastern strata differs from year to year. The areas of these strata are therefore calculated according to the coverage each year. Table A 1.3 gives the area covered by the survey every year since 1981. In that table “Extrapolated area” reflects the size of areas where some kind of extrapolations/adjustments have been made to take account of incomplete coverage (see also section 3.1). Table 1.4 summarizes the degree of coverage and main reasons for incomplete coverage in the whole period.

Table 1.4. *Barents Sea winter surveys 1981-2024. Main Areas covered, and comments on incomplete coverage.*

Year	Coverage	Comments
1981-1992	ABCD	
1993-1996	ABCDD’ES	
1997	Norwegian EEZ (NEZ), S	Not allowed access to Russian EEZ
1998	NEZ, S, minor part of Russian EEZ	Not allowed access to most of Russian EEZ
1999	ABCDD’ES	Partly limited coverage due to westerly ice extension
2000	ABCDD’ES	Russian participation starts
2001-2005	ABCDD’ES	Russian vessel covered where Norwegians had no access
2006	ABCDD’ES	No Russian vessel, not allowed access to Murman coast
2007	NEZ, S	No Russian vessel, not allowed access to Russian EEZ
2008	ABCDD’ES	Russian vessel covered where Norwegians had no access
2009	ABCDD’ES	Reduced Norwegian coverage of Russian EEZ due to catch handling
2010	ABCDD’ES	Reduced Norwegian coverage of Russian EEZ due to bad weather
2011	ABCDD’ES	Russian vessel covered where Norwegians had no access
2012	ABCDD’ES	No Norwegian coverage of Russian EEZ due to vessel problems
2013	ABCDD’ES	No Norwegian coverage of Russian EEZ due to vessel shortage
2014	ABCDD’ESN	Strata 24-26 (N) covered for the first time
2015	ABCDD’ESN	Slightly reduced/more open coverage due to bad weather
2016	ABCDD’ESN	No access to Russian EEZ, Russian vessel covered most of Russian EEZ
2017	ABCDD’ESN	No Russian vessel, not allowed access to southwestern Russian EEZ

Year	Coverage	Comments
2018	ABCDD'ESN	Russian vessel covered where Norwegians had no access
2019	ABCDD'ESN	Russian vessel covered where Norwegians had no access
2020	ABCDD'ESN	Reduced coverage of D', E, and N due to bad weather, reduced survey time (medical emergency), and ice-cover
2021	ABCDD'ESN	Reduced coverage of D' and E due to ice cover and time constraints, and of area N due to ice cover.
2022	ABCDD'ESN	Reduced coverage of D' and E due to ice cover and time constraints, and of area N due to ice cover.
2023	ABCDD'ESN	Reduced coverage of D', E, and N due to ice cover and time constraints.
2024	ABCDD'ESN	Reduced coverage of D', E due to time constraints, and area N due to ice cover.

2. Length and age material

Individual lengths are collected from all target species, while otoliths for age determination are taken from cod, haddock, and capelin. For cod and haddock, the otolith readings are key for splitting the survey indices by age.

Table A2.1 gives an account of the sampled length- and age material from bottom hauls and pelagic hauls from 1994 onwards.

Table A2.2. shows the number of age readings per age for cod from 1994 onwards, while table A2.3 shows the same for haddock. The number of age samples for fish age 10+ increased in the second half of the time series, reflecting changing age composition in the stock.

3. Survey index calculation

Details on the calculation of survey indices, including StoX settings for different species are found in Appendix 2.

In 2024, the swept area and acoustic[1] estimation in StoX was based on the following biotic and acoustic snapshot files (versioned trawl and acoustic data):

Table 3.1. *Snapshot files used in the 2024 swept area and acoustic estimation, by species.*

Cod and haddock
biotic_cruiseNumber_0159_2024_UFJN_VILN_Vilnyus_2024-04-19T22.02.05.688Z
biotic_cruiseNumber_2024002003_Johan+Hjort_2024-04-18T22.02.32.143Z
biotic_cruiseNumber_2024007002_Kronprins+Haakon_2024-04-18T22.09.20.939Z
echosounder_cruiseNumber_0159_2024_UFJN_VILN_Vilnyus_2024-04-08T22.00.00.997Z
echosounder_cruiseNumber_2024002003_Johan+Hjort_2024-03-20T23.00.00.886Z
echosounder_cruiseNumber_2024007002_Kronprins+Haakon_2024-02-13T23.00.00.703Z
Redfish (three species)
biotic_cruiseNumber_0159_2024_UFJN_VILN_Vilnyus_2024-04-19T22.02.05.688Z biotic_cruiseNumber_2024002003_Johan+Hjort_2024-04-08T22.02.20.856Z biotic_cruiseNumber_2024007002_Kronprins+Haakon_2024-04-08T22.06.52.131Z
Greenland halibut
biotic_cruiseNumber_0159_2024_UFJN_VILN_Vilnyus_2024-04-19T22.02.05.688Z.xml
biotic_cruiseNumber_2024002003_Johan+Hjort_2024-04-18T22.02.32.143Z.xml
biotic_cruiseNumber_2024007002_Kronprins+Haakon_2024-04-24T22.05.41.532Z.xml
Blue whiting
biotic_cruiseNumber_0159_2024_UFJN_VILN_Vilnyus_2024-04-19T22.02.05.688Z.xml
biotic_cruiseNumber_2024002003_Johan+Hjort_2024-04-18T22.02.32.143Z.xml
biotic_cruiseNumber_2024007002_Kronprins+Haakon_2024-05-02T22.01.22.682Z.xml

[1] Acoustic estimation is done for cod and haddock only. The biotic files are used in the acoustic StoX projects to split the acoustic backscatter by age.

3.1. Raising of indices

In 1997, 1998 and 2007, only the Norwegian EEZ (NEZ) and parts of the Svalbard area (S) was covered. The swept-area indices for cod, haddock, and Greenland halibut have therefore been raised to also represent the Russian EEZ (REZ) (Mehl *et al*. 2016).

In 2006, there was not complete coverage in the southeast due to restrictions. The observations in the partially covered strata 7 were extrapolated to the full strata, and the observations in the partially covered strata 13 were extrapolated to the same area as covered in 2005.

In 2012 the coverage was incomplete in the eastern areas, and the cod and haddock swept area estimates within the covered area were raised by the “index ratio by age” observed for the same area in 2008-2011 (ICES 2012). The scaling factor (“index ratio”) for estimating adjusted total from <Total – area D’> was the average

ratio by age for Total/(Total – area D') in the years 2008-2011 (Aglen et al. 2012).

In 2017, the Norwegian vessel was not allowed to operate south of 70º 10' N and west of 41º 00 º E, and no Russian vessel participated in the survey. Only a small part of strata 7 was covered, and strata 13, 15, 17 and 20 were not covered. The cod, haddock, and Greenland halibut swept area estimates and cod and haddock acoustic estimates within the covered area were raised following the same procedure as for 2012. The scaling factor for estimating adjusted total from <Total – strata 7 > was the average ratio by age for Total/(Total – (strata 7+13+15+17+20)) swept area indices in the years 2014-2016.

In 2020, coverage was incomplete in strata 17, 19, and 20, and the cod and haddock acoustic and swept area estimates were raised by the "index ratio by age" observed for these strata in 2018-2019. The scaling factor for estimating adjusted total from <Total –strata 17, 19 and 20> was the average ratio by age for Total/(Total – (strata 17+19+20)) in the years 2018-2019.

In 2021, coverage was incomplete in strata 16, 19, and 20. Indices in the partly covered stratum 19 were extrapolated to the entire strata. No trawling was done in stratum 20. As cod and haddock abundances generally are low there, the stratum was partly ice covered and did not have coverage in the last two years, this stratum was excluded from estimation. Only one trawl station was taken in stratum 16. Here the cod and haddock acoustic and swept area estimates were raised by the "index ratio by age" observed for these strata in 2019-2020. The scaling factor for estimating adjusted total from <Total – strata 16> was the average ratio by age for Total/(Total – strata 16) in the years 2019-2020.

The three redfish survey indices were revised in 2022, and no adjustments have been made to the new indices.

In 2023, coverage was incomplete in strata 16, 17, and 20. Coverage was also reduced in strata 9, 13-15, and 24-26, but taken as representative. The main parts of the cod and haddock distributions were, nevertheless, well covered. Given historically low abundances of cod and haddock in stratum 20, this stratum was excluded from the estimation as in previous years. Stratum 16 had only two trawl stations, but given low abundances this year and, historically, they were taken as representative and included in the estimation procedure. Only the southeastern part of stratum 17 was covered. This area has a low abundance of haddock. Therefore, no adjustment was necessary in the haddock indices. For cod, the area of stratum 17 was adjusted to match the 300 m isobath in order to avoid inflating catches in the southwest, which have historically been higher than in the rest of the stratum.

The 2024 coverage was generally good, but there was partly reduced coverage in strata 13-16 and 24-26 due to time constraints and ice cover. No adjustments to the survey indices were deemed necessary apart from the usual adjustment of strata borders in area N, reflecting ice coverage. Stratum 20 was not covered and excluded from the estimation.

4. Total echo abundance of cod and haddock

Table 4.1 presents the time series of total echo abundance (mean s_A multiplied by strata area and summed over all strata) of cod and haddock in the investigated areas.

The lowest echo abundances of cod were recorded in the late 1990s, 2004-2007, and in the last few years of the time series (2021-2023), while the highest values were seen in 1994 and 2013-2015. The very low value in 2007 likely reflects the lack of coverage of the Russian zone and is not directly comparable to the others, making 2023 the lowest observed echo abundance in the time series, reflecting the current downwards trend in the stock.

The trend for haddock is similar, but without the dip in 2004-2007 and with peak values five years earlier than cod (2008-2010). The sharp reduction in echo abundance between 2020 and 2021 were seen for both species, but while cod echo abundance dropped from 2022 to 2023, haddock echo abundance remained at similar levels.

Table 4.1. *Cod and haddock. Total echo abundance in the Barents Sea winter 1994-2024 (m2 reflecting surface Â· 103) estimated by StoX. Observations outside main areas A-S are not included.*

	StoX		
Year	**Cod**	**Haddock**	**Sum**
1994	5282	3898	9180
1995	3671	2948	6619
1996	2789	1248	4037
1997[1]	1355	832	2187
1998[1]	2254	543	2797
1999	1517	771	2288
2000	2833	1534	4367
2001	2158	1488	3646
2002	1976	2247	4223
2003	3717	3570	7287
2004	1174	2087	3261
2005	1370	2519	3889
2006	1116	2541	3657
2007[1]	675	2311	2986
2008	3510	6195	9705
2009	2452	5300	7752
2010	3526	5939	9465
2011	2967	3715	6682
2012	3478	4182	7660
2013	5026	3604	9656
2014	4847	2915	7762

	StoX		
2015	5245	2161	7406
2016	2879	1587	4466
2017[1]	2139	2588	4732
2018	3537	2851	6388
2019	3282	3039	6321
2020[1]	2676	2199	4875
2021[1]	1128	983	2111
2022	1437	1624	3061
2023	948	1635	2583
2024	1146	2151	3297

[1] not scaled for uncovered areas

5. Distribution and abundance of cod

For both the bottom trawl and acoustic estimates as well as the diet data, cod with all otolith types (coastal cod included) are included in the calculations.

5.1. Acoustic estimation

Surveys in the Barents Sea at this time of the year mainly cover the immature part of the cod stock. Most of the mature cod (age 7 and older) have started on their spawning migration southwards out of the investigated area and are therefore to a lesser extent covered. There are indications that a higher proportion than normal spawned along Finnmark in some years, e.g., 2004-2006. Thereby, a higher proportion of spawners might have been covered by the survey in those years. Figure 5.1 shows the spatial distribution of acoustic registrations assigned to cod in 2024. The registrations reflect the general distribution of cod in the central and southwestern Barents Sea. The NASC values in 2024 were low, reflecting the overall low echo abundance.

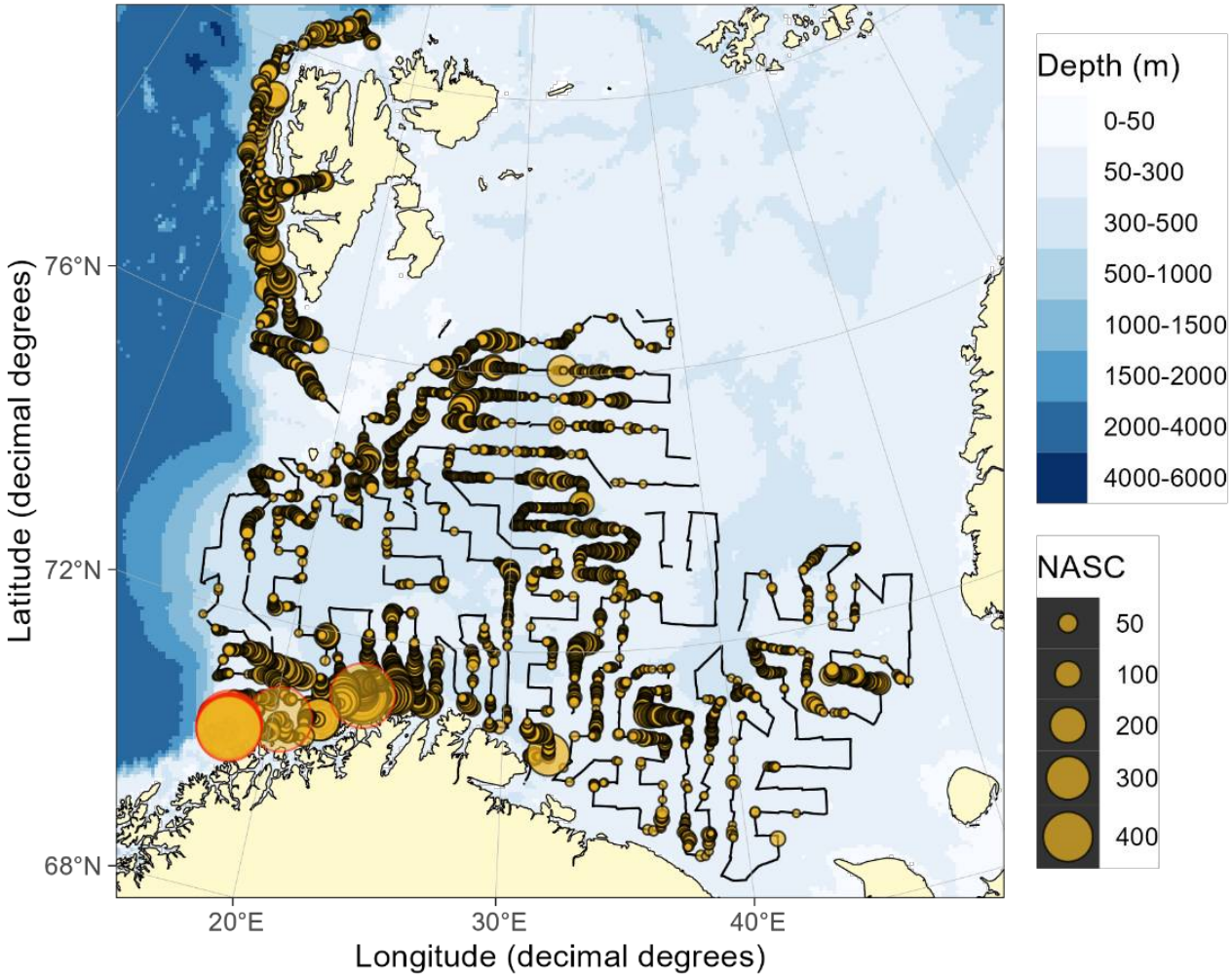

Figure 5.1. COD NASC. Distribution of acoustic backscatter (m2/nmi2) assigned to cod in 2024. The black lines without yellow circles represent parts of the cruise track where the acoustic backscatter was scrutinized, but not assigned to cod. NASC values < 5 was set to zero for this illustration.

Table A5.1 shows the acoustic indices for each age group by main areas in 2024. 56% of the 1-year-olds were found in the extended area (N) in 2024 compared to 73 % in 2023. Age 1 also had the highest percentage in area N of all age groups. The time series of total abundance at age (1994-2024) is presented in Table A5.2 and Figure 5.2.

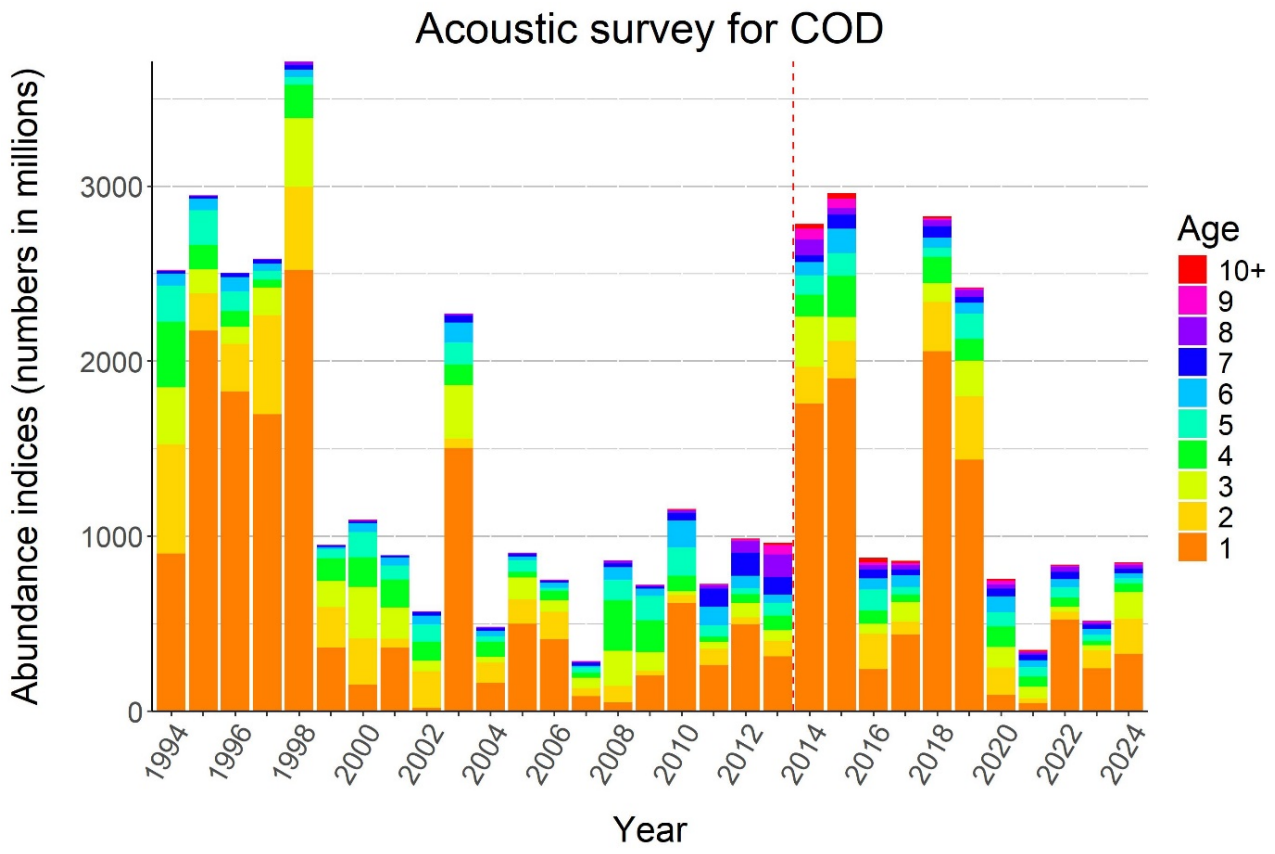

Figure 5.2. Time series of total acoustic abundance at age for cod (1994-2024). The dotted line separates the periods before and after the survey area was extended to include also area N.

The acoustic estimates have been variable and increasing in later years, with a peak in biomass in 2013, and this may partly be explained by variable and not complete coverage of the distribution area towards north and east in several years. As cod grow older it gets a more south-westerly distribution during winter, so that it “grows into” the covered area with increasing age. This is especially evident for the strong 2004 and 2005 year classes, which as 6-11-year-olds stand out as the strongest in the time series. The 2019-2020 year classes were among the lowest in the time series at age 1-3 while the 2021-2023 year classes were moderate at age 1-3. Table A5.3 shows time series for strata 24-26 (area N) in 2014-2024, which are included in the main time series.

Table A5.4 presents estimated coefficients of variation (CV) for cod age groups 1-14 in 1994-2024. These estimates were obtained by using StoX with a stratified bootstrap routine treating each transect as the primary sampling unit. In addition, a bootstrap routine for all trawl stations by strata was carried out within each run. The estimated CV (Standard Deviation · 100/mean) is estimated from 500 iterations . A CV of 20% or less could be viewed as acceptable in a traditional stock assessment approach if the indices are unbiased (conditional on a catchability model). In 2024 the age groups 1-7 fall into this category. Values above this indicate higher uncertainty of the estimated index, with reduced information regarding year class strength. In all years, CVs for age groups older than 10 years are above what could be considered as acceptable. This is to a large degree related to low catch rates resulting in fewer age samples for these age groups (Table A2.2).

5.2. Swept area estimation

Figures 5.3 - 5.6 show the geographic distribution of bottom trawl catch rates (number of fish per NM^2), for cod

size groups < 20 cm, 20-34 cm, 35-49 cm and ≥ 50 cm. Usually, a high proportion of the smallest cod (less than 35 cm) are found in the eastern part of the survey area within the Russian EEZ and in the northern part of the strata system. While this general pattern was still there in 2024, cod abundance in the southeastern Barents Sea was low for all size groups (Fig. 5.3-5.6). The highest catch rates of large cod (≥ 50 cm) were found along the Norwegian coast, around Bear Island and to the west of Svalbard (Fig. 5.6).

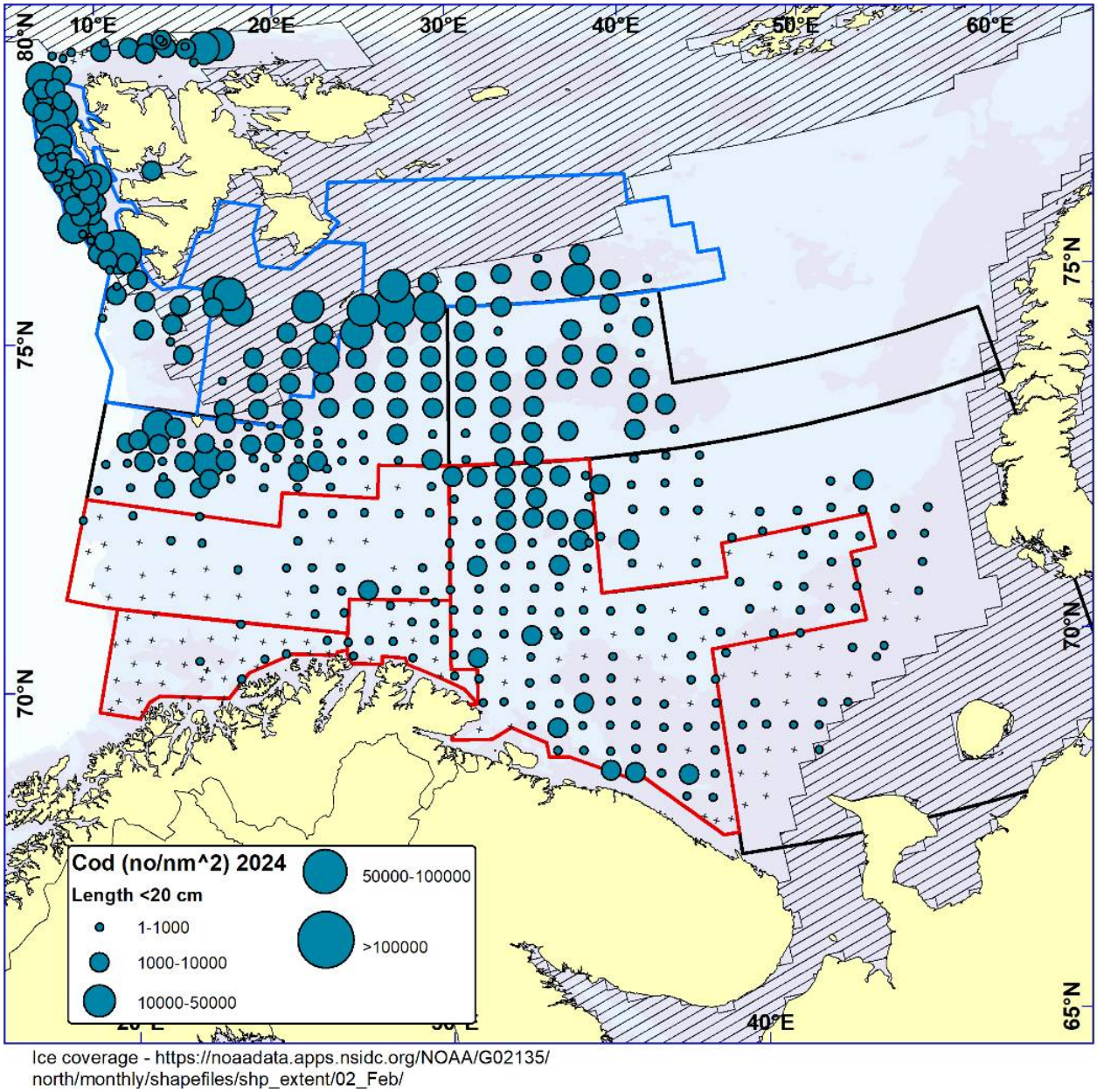

Figure 5.3. COD < 20 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

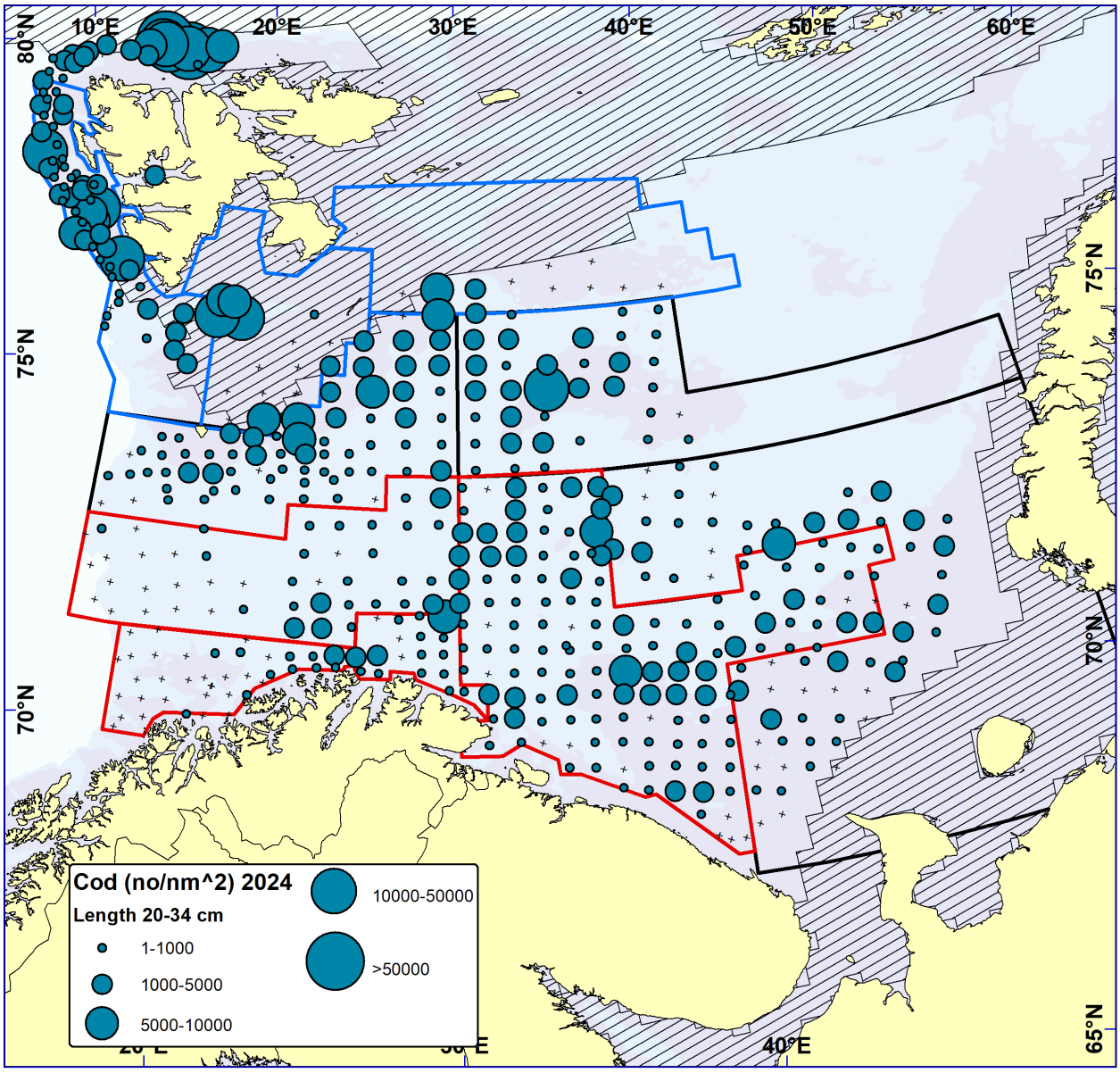

Figure 5.4. COD 20-34 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

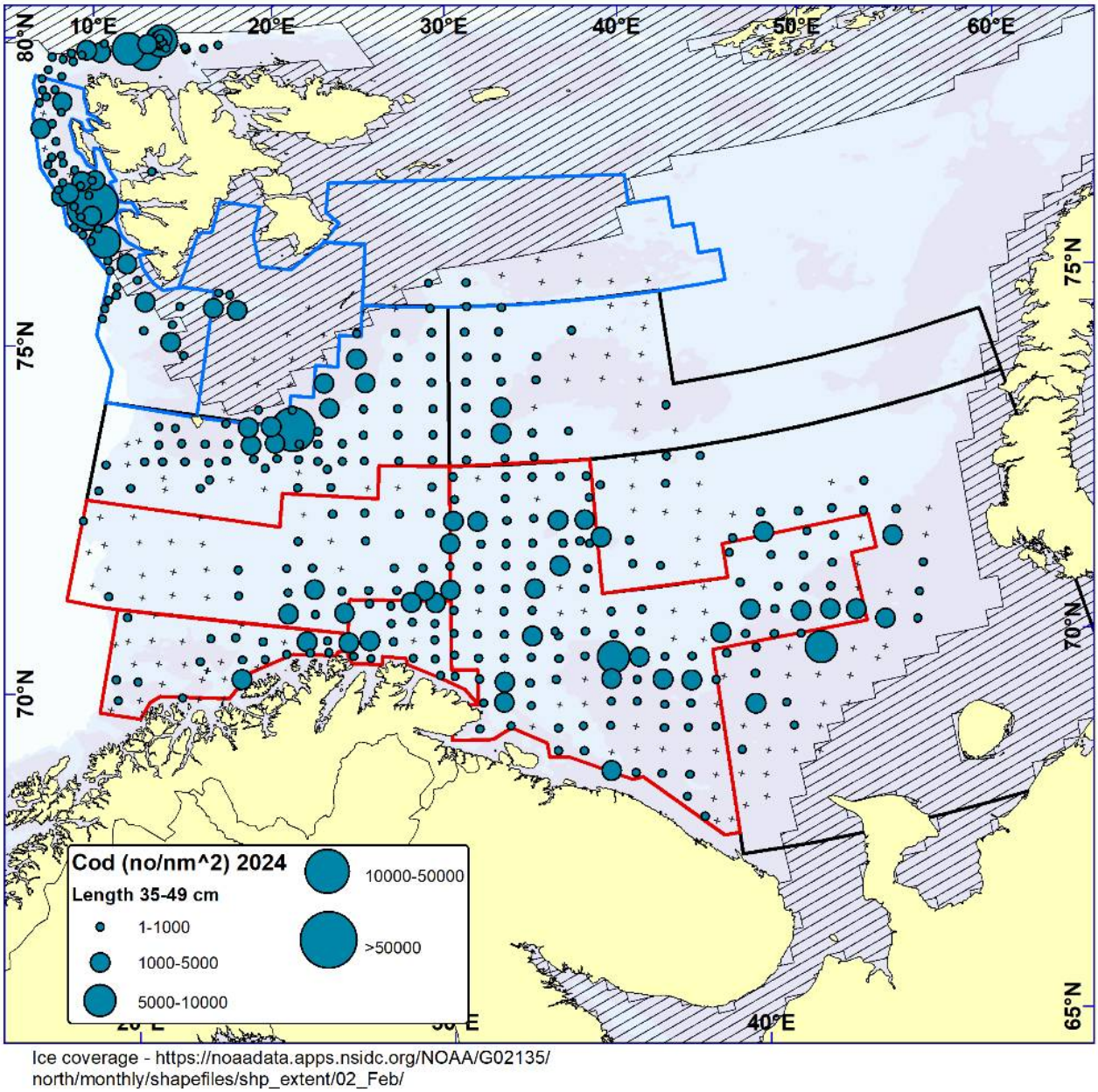

Figure 5.5. COD 35-49 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm 2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

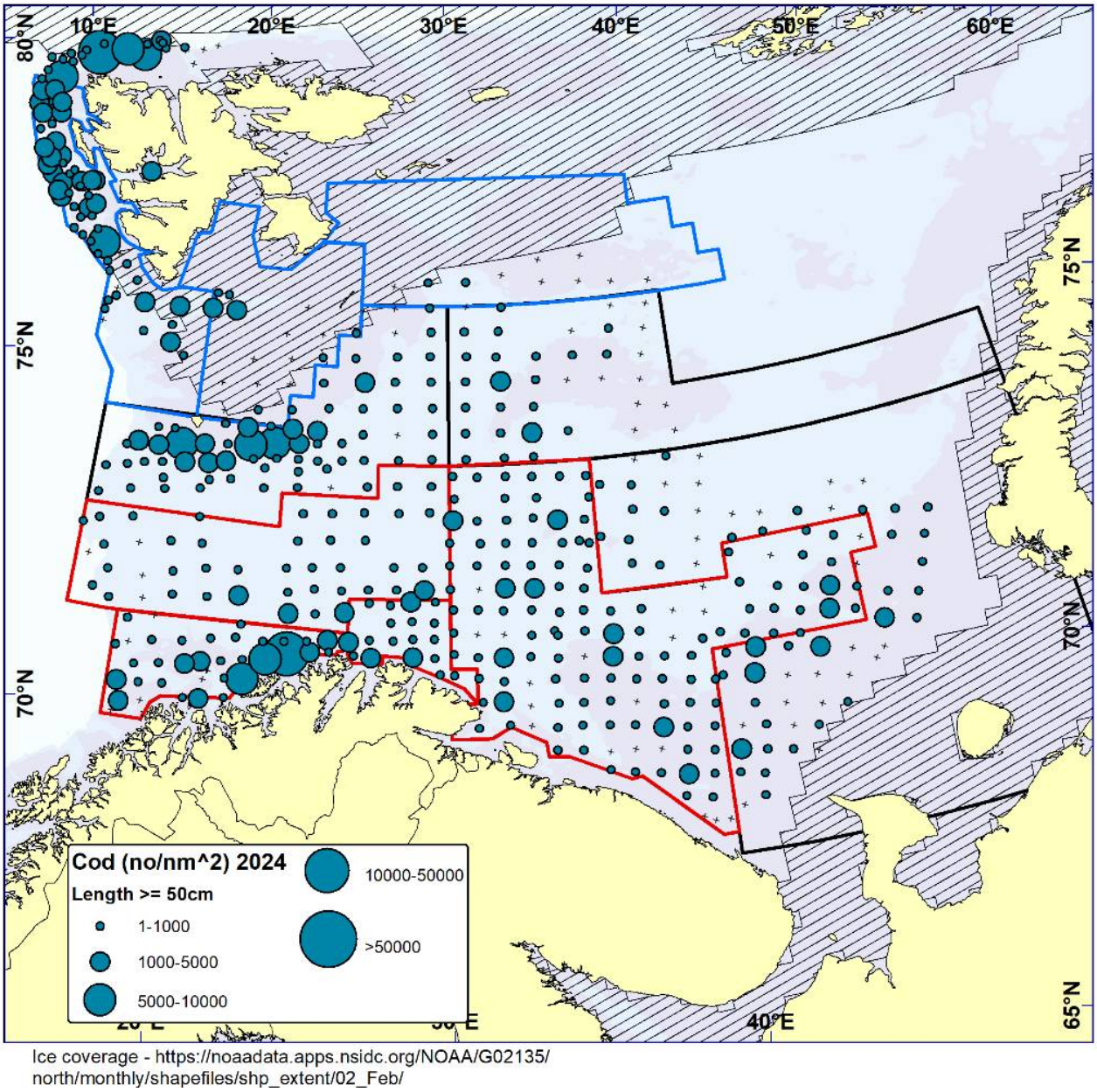

Figure 5.6. COD ≥ 50 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm 2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

Table A5.5 presents abundance indices by main areas and age, and the full time series 1994-2024 is shown in Table A5.6 and Figure 5.7. The bottom trawl indices have fluctuated somewhat for the same reasons as the acoustic indices, and the 2004 and 2005 year-classes stand out as the strongest in the time series. The 2009, 2011 and 2014 year-classes seemed to be strong as 1-year olds, but have later been reduced to average level or below. The year classes 2017 and 2018 also seemed strong at age one, but are more average as 2- and 3-year-olds. The 2019-2020 year classes were among the lowest in the time series both at age 1 and 2 while the 2021-2023 year classes were moderate at age 1-3. 63% of the 1-year olds were found in the extended area (N) in 2024 compared to 70 % in 2023. Age 1 also had the highest percentage in area N of all age groups (Table A5.5). Table A5.7 shows the time series for strata 24-26 (area N) in 2014-2024, which are included in the main time series. In 2023, there was hardly any coverage northeast of the extended area, i.e., north of Svalbard outside of the survey stratification, where fair amounts of cod have been observed prior to 2023 and also in

2024.

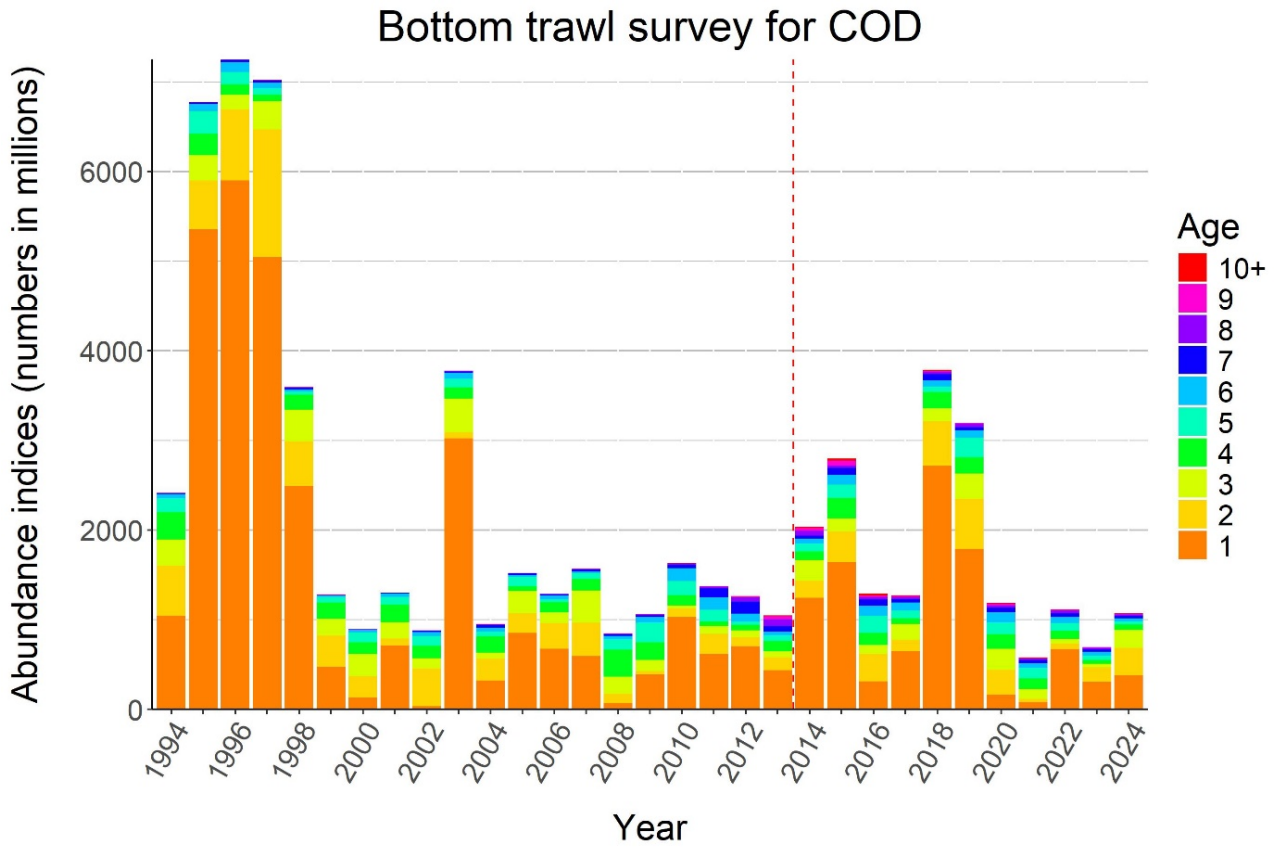

Figure 5.7. Time series of total bottom trawl abundance at age for cod (1994-2024). The dotted line separates the periods before and after the survey area was extended to include also area N.

Table A5.8 presents estimated coefficients of variation (CV) for cod age groups 1-15 in 1994-2024. In 2024, age groups 1-8 have CVs below or equal to 20 %. Values above this indicate higher uncertainty of the estimated index, with reduced information regarding year class strength. In all years, CVs for age groups older than 10 years are above what could be considered as acceptable. This is to a large degree related to low catch rates resulting in fewer age samples for these age groups (Table A2.2).

5.3. Survey mortalities

Table A5.9 and Figure 5.8a-b show the time series of survey-based mortalities (natural log ratios between survey indices of the same year class in two successive years) for the acoustic and swept area indices since 1994. These mortalities are influenced by natural and fishing mortality, age reading errors, and the catchability and availability (coverage) at age for the survey. In the period 1994-1999 there was an increasing trend in the survey mortalities. Most later surveys show lower mortalities, but there are some fluctuations for the same reasons as mentioned for the acoustic and swept area indices. Presumably the mortality of the youngest age groups (ages 1-3) is mainly caused by predation, while for the older age groups the fishery is the main cause. Although the survey mortalities are noisy, the mortalities for age 4 and older correspond well with the strong decrease in fishing mortality around 2007 in the stock assessment. The low survey mortalities in the 2010s,

even with “impossible” negative values, could partly be caused by fish gradually “growing into” the covered area at increasing age. 2019-2020 and 2020-2021 estimates suggest higher survey mortalities than in previous years, while mortality decreased for most age groups in 2021-2022, increased again in 2022-2023 and then decreased again in 2023-2024.

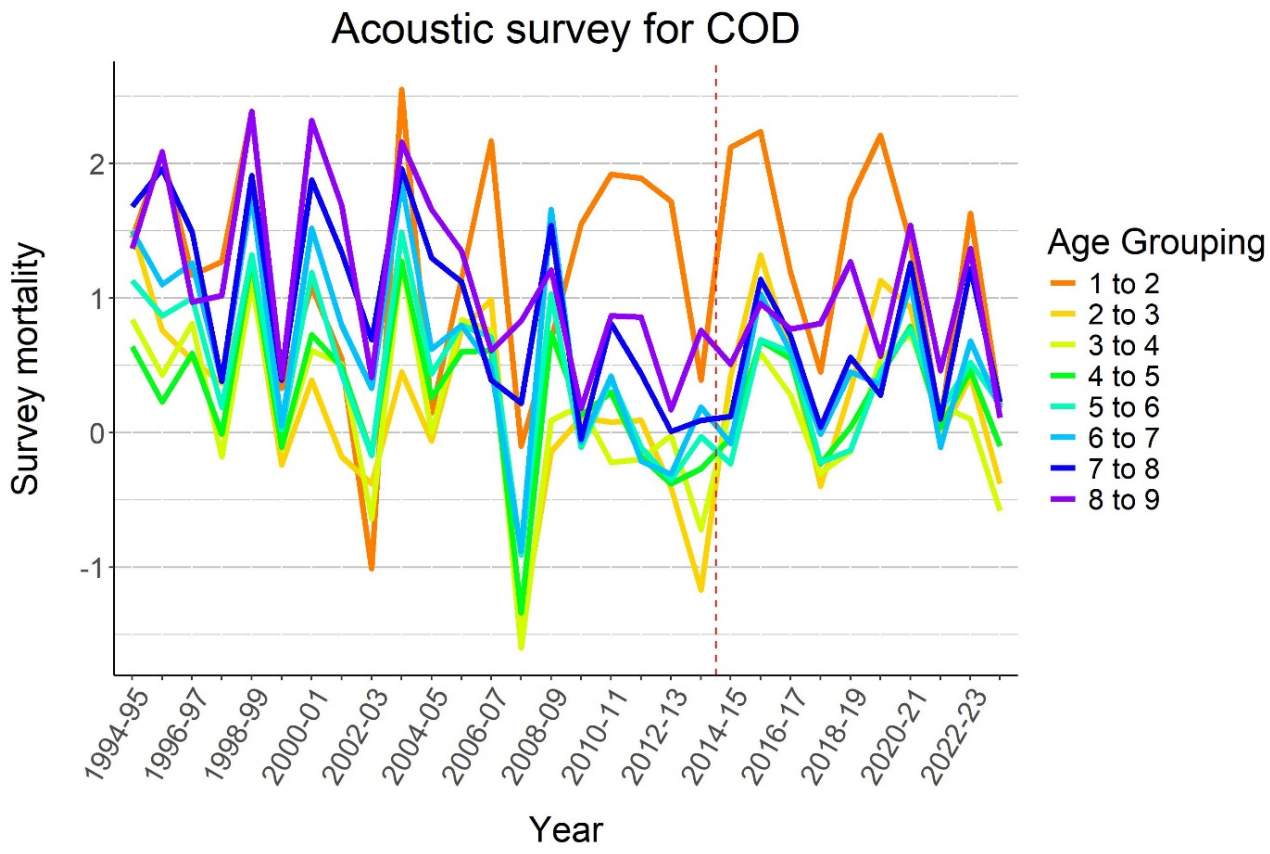

Figure 5.8a. Survey mortalities for cod calculated from acoustic abundance indices.

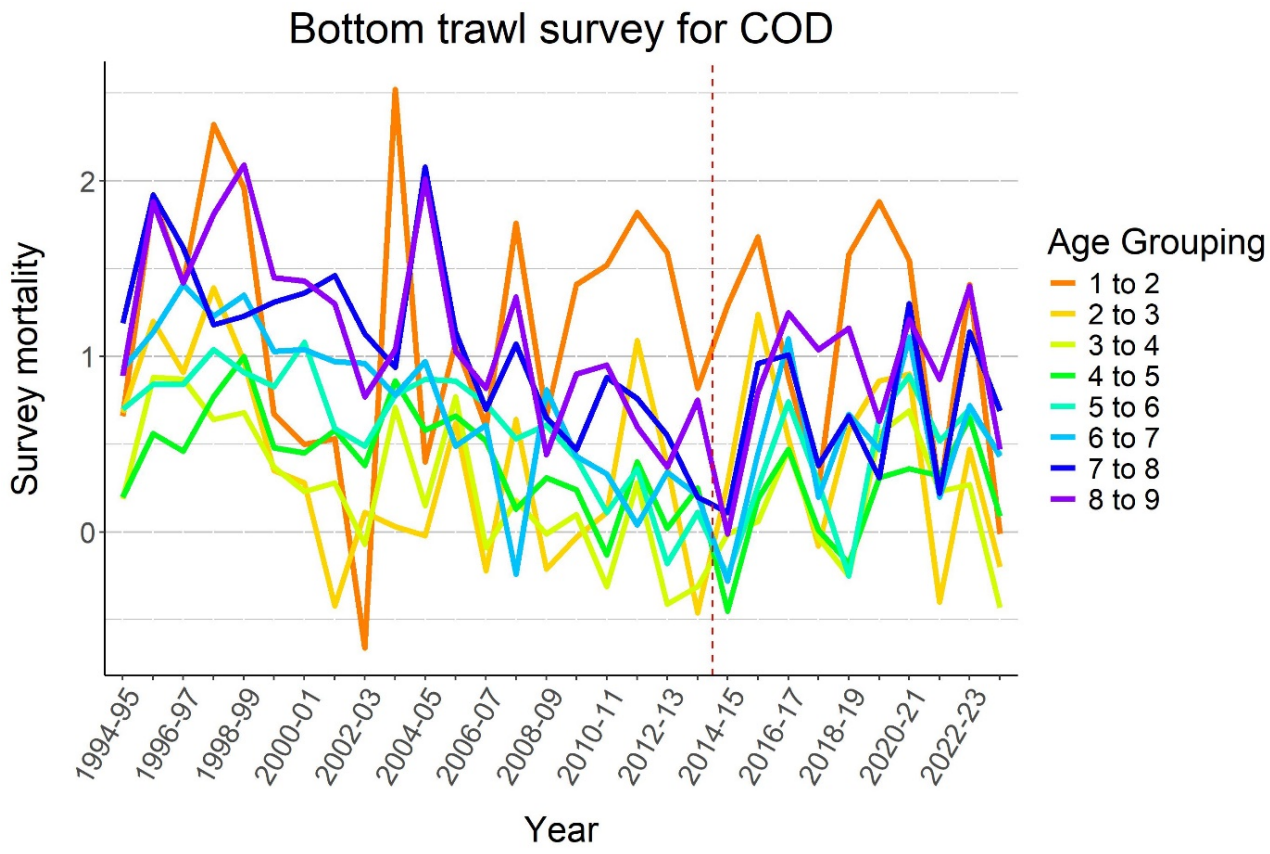

Figure 5.8b. Survey mortalities for cod calculated from bottom trawl abundance indices.

5.4. Growth and maturity

Tables A5.10-11 and figure 5.9-5.10 present the time series for mean length and mean weight at age. In 2020-2021, both length and weight at age was considerably reduced for several age groups, with length at age 4 and 5 and weight at age 4, 5, 6 and 8 in 2021 being the lowest observed in the time series. Growth improved somewhat from 2021 to 2023 and size at age is now close to average level for all age groups (Table A5.12 and Fig 5.11).

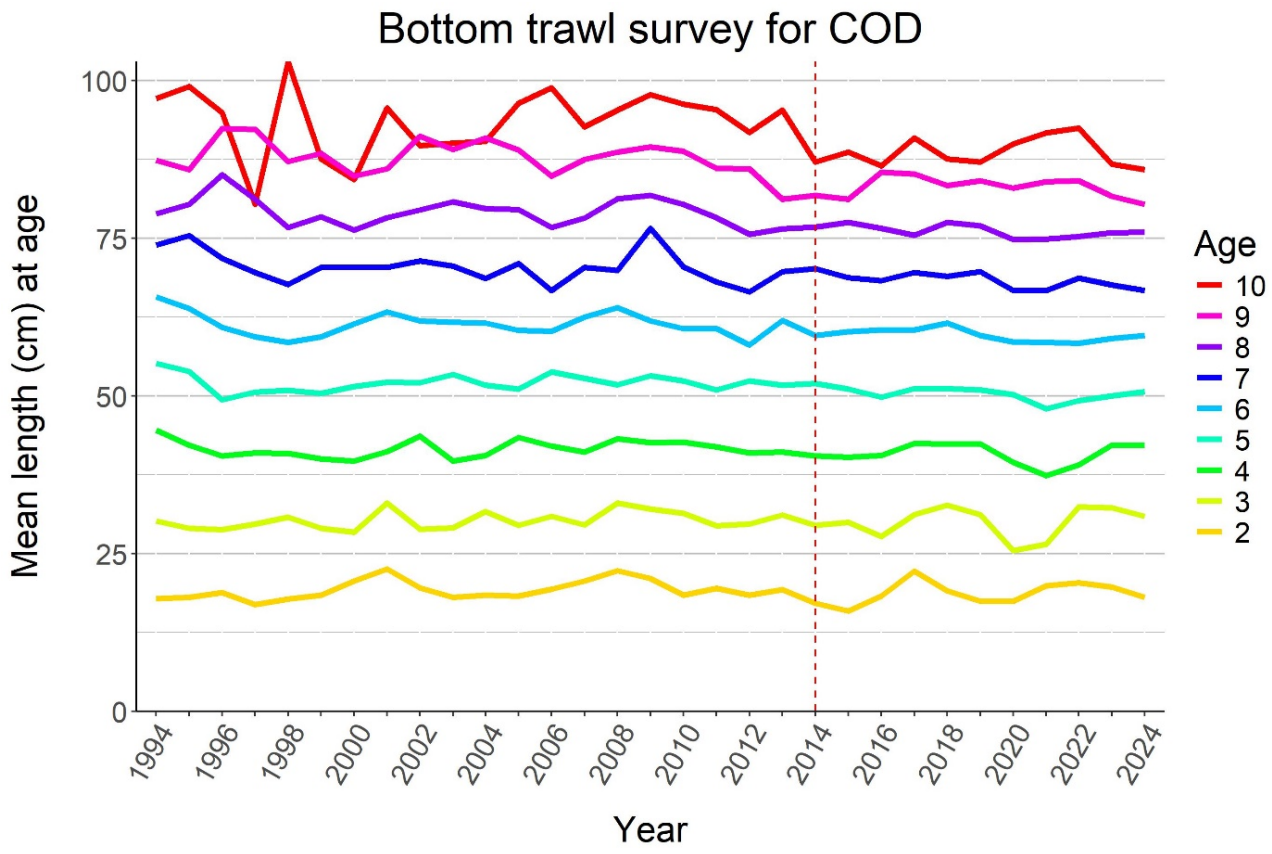

Figure 5.9. Mean length at age for cod.

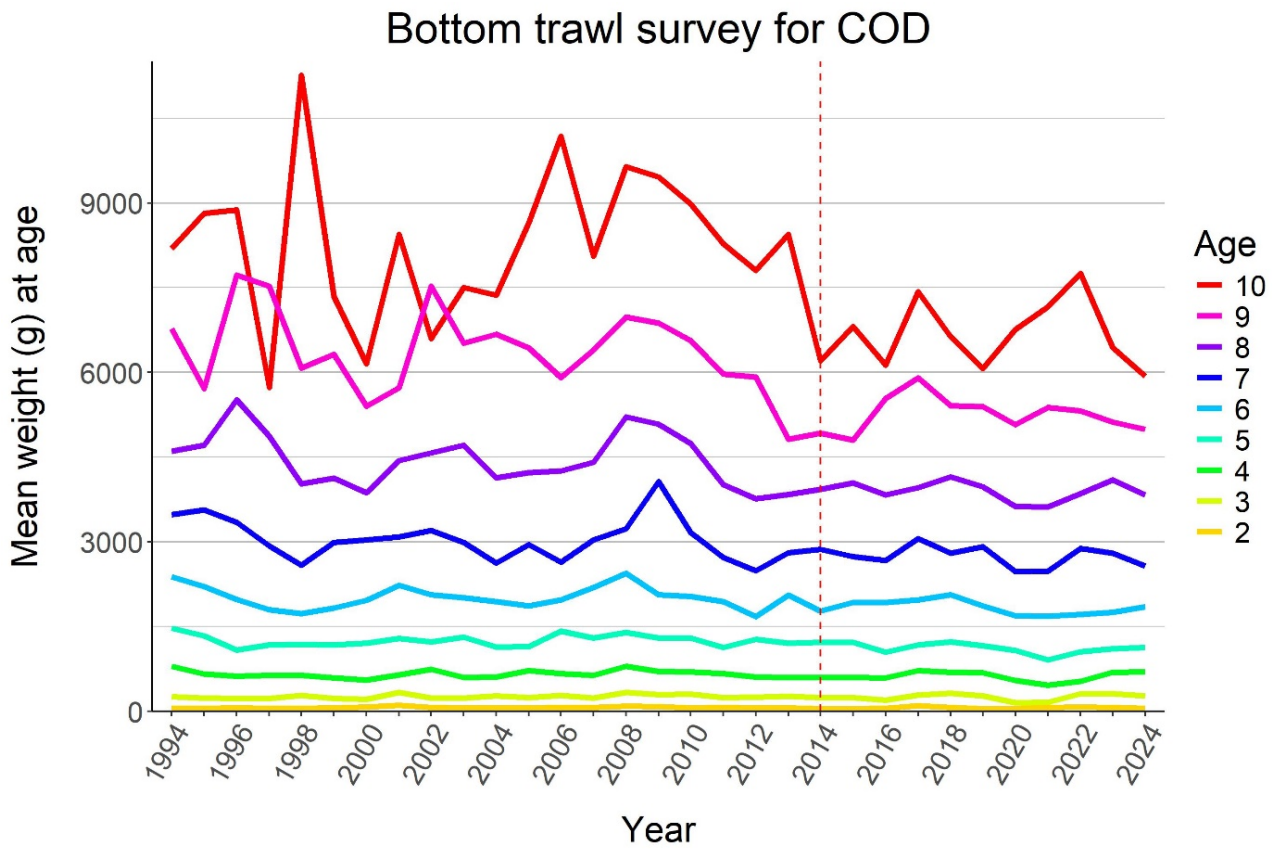

Figure 5.10. Mean weight at age for cod.

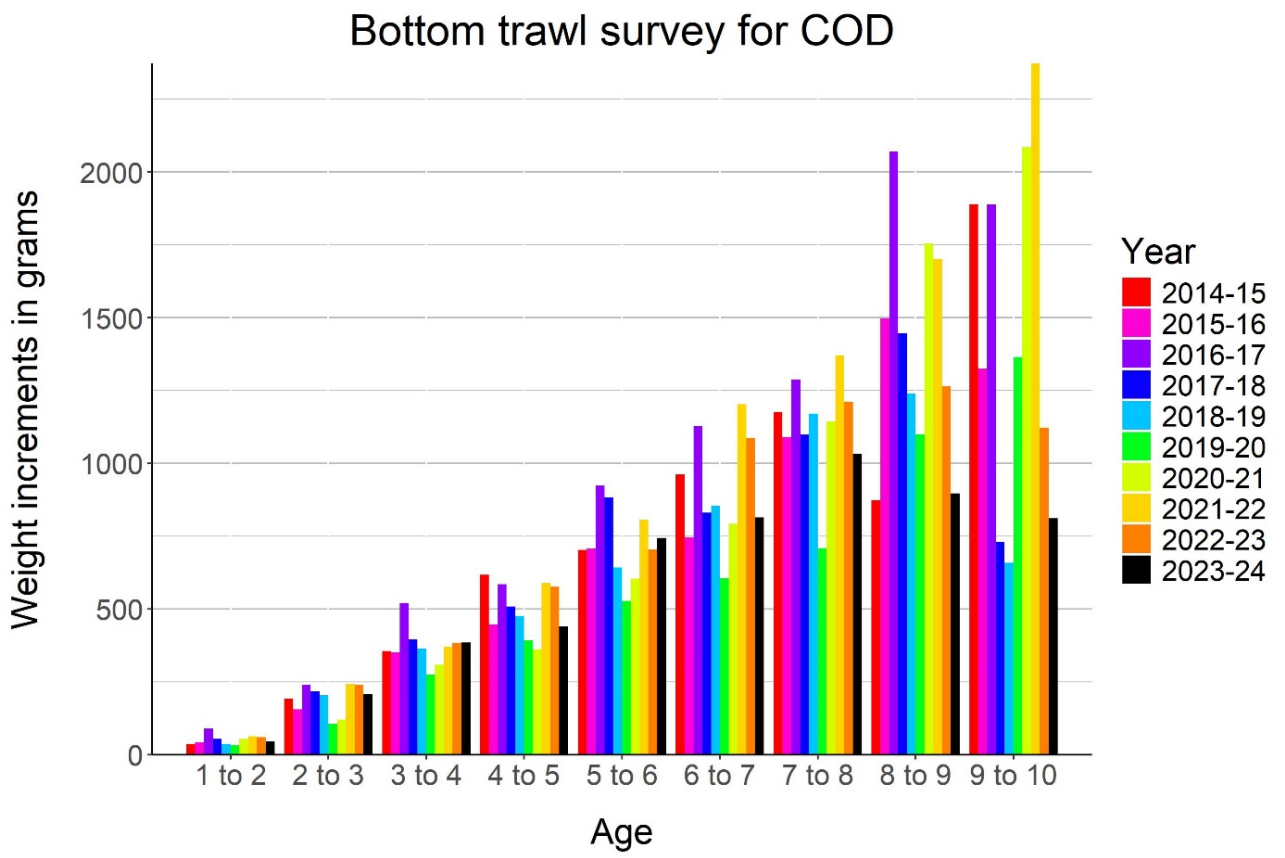

Figure 5.11. Mean growth increment at age for cod for the period 2014-2024.

The proportion mature at age is presented in Table A5.13 and Fig 5.12. The proportions showed only small changes from 2023 to 2024.

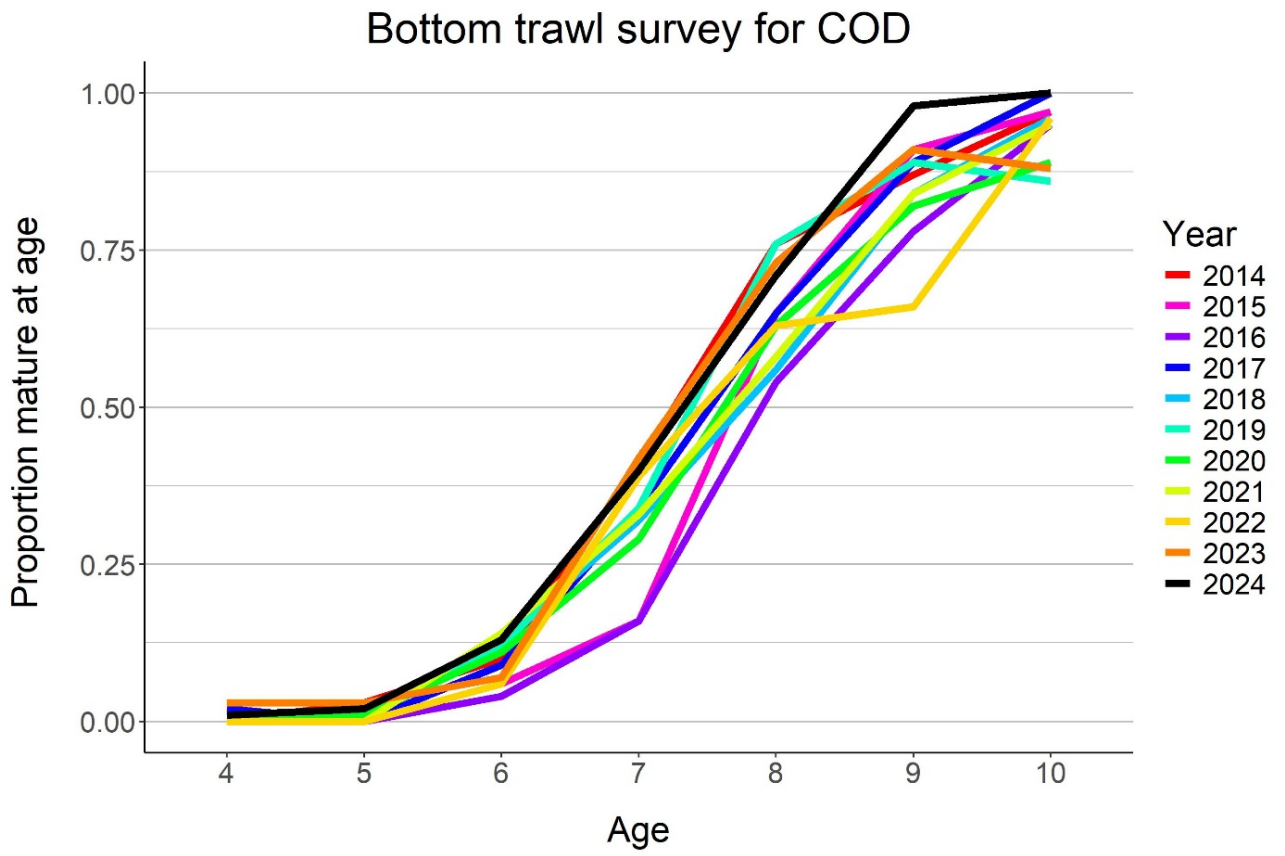

Figure 5.12. Proportion mature-at-age for cod from 2014-2024.

The degree of coverage of the Russian zone (REZ) may also influence the biological parameters, as body size tends to decrease towards the northeast in the survey area. In addition, length, weight and maturity at age of older ages has higher uncertainty due to fewer samples (c.f. table A2.2).

5.5. Stomach sampling

Since 1984, cod stomachs have been sampled regularly during the winter survey. The sampling strategy has generally been the same as that for sampling otoliths. Stomach have been frozen on board and analysed in the laboratory, except for the period 1994-2000, when some of the stomachs were analysed on board and only the main prey categories were identified. For details about the sampling methodology and the Norwegian-Russian cooperation on diet investigations in the Barents Sea, see Mehl and Yaragina (1992) and Dolgov *et al* . (2007).

The number of stations and stomachs sampled as well as the proportion of empty stomachs and the mean stomach fullness index (SFI, see below) for each of four size groups (≤ 19 cm, 20-34 cm, 35-49 cm, ≥ 50 cm) is given in Table A5.14 and Fig. 5.13. Tables A5.15 - A5.18 and Figs. 5.14-5.17 show the mean stomach content composition by prey species/groups by year for each size group. Note that in the years 1994-2000, blue whiting, long rough dab and Norway pout were included in the category ‘other fish’ when stomachs were analysed on board.

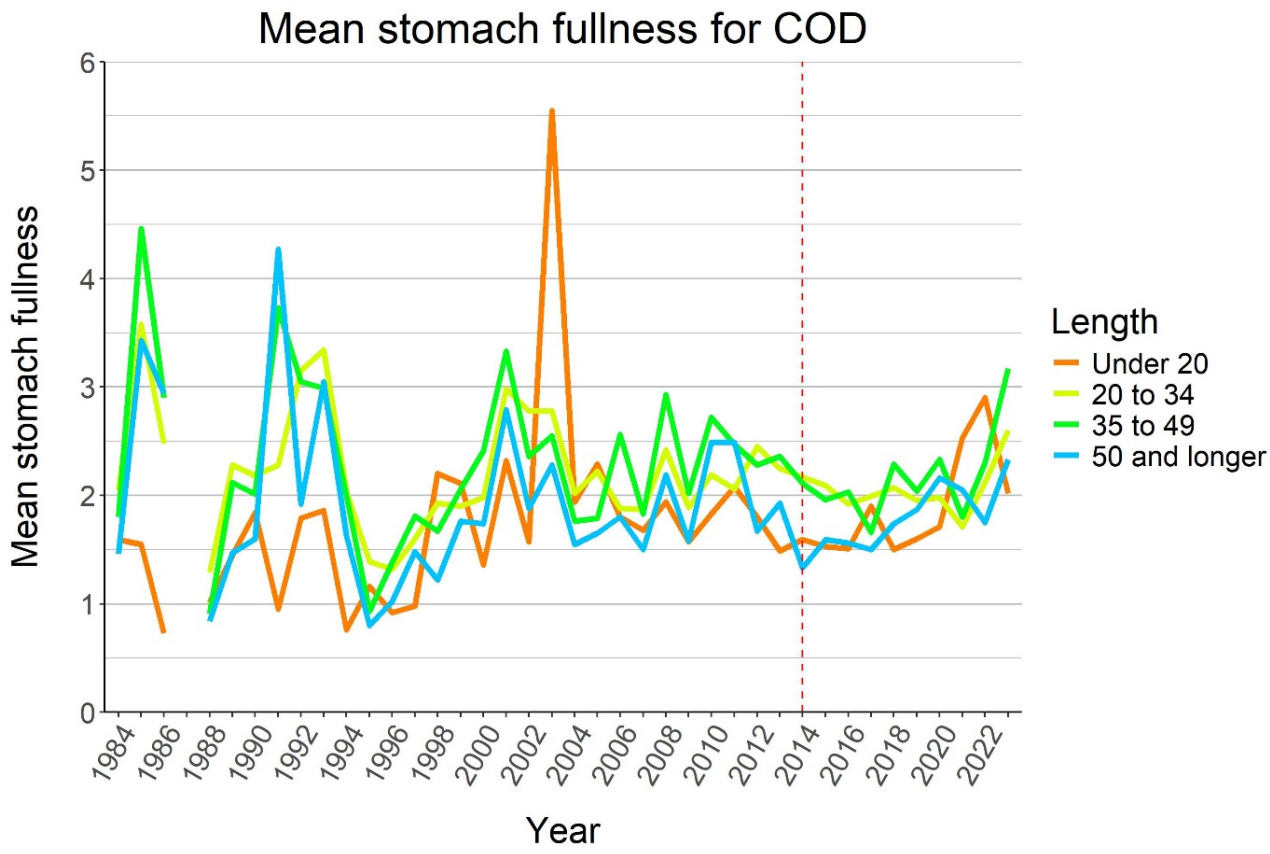

Figure 5.13. Mean stomach fullness for cod.

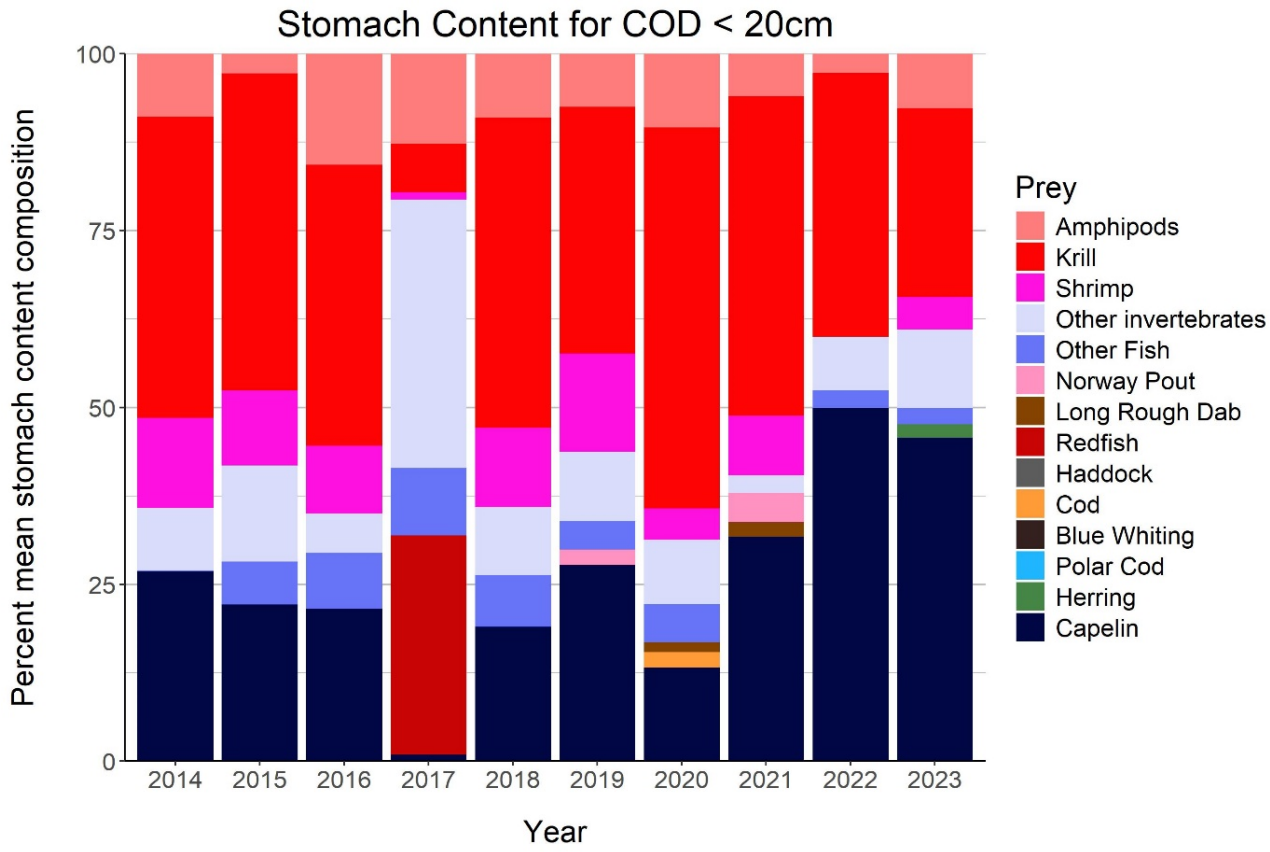

Figure 5.14. Stomach content composition for cod <20 cm.

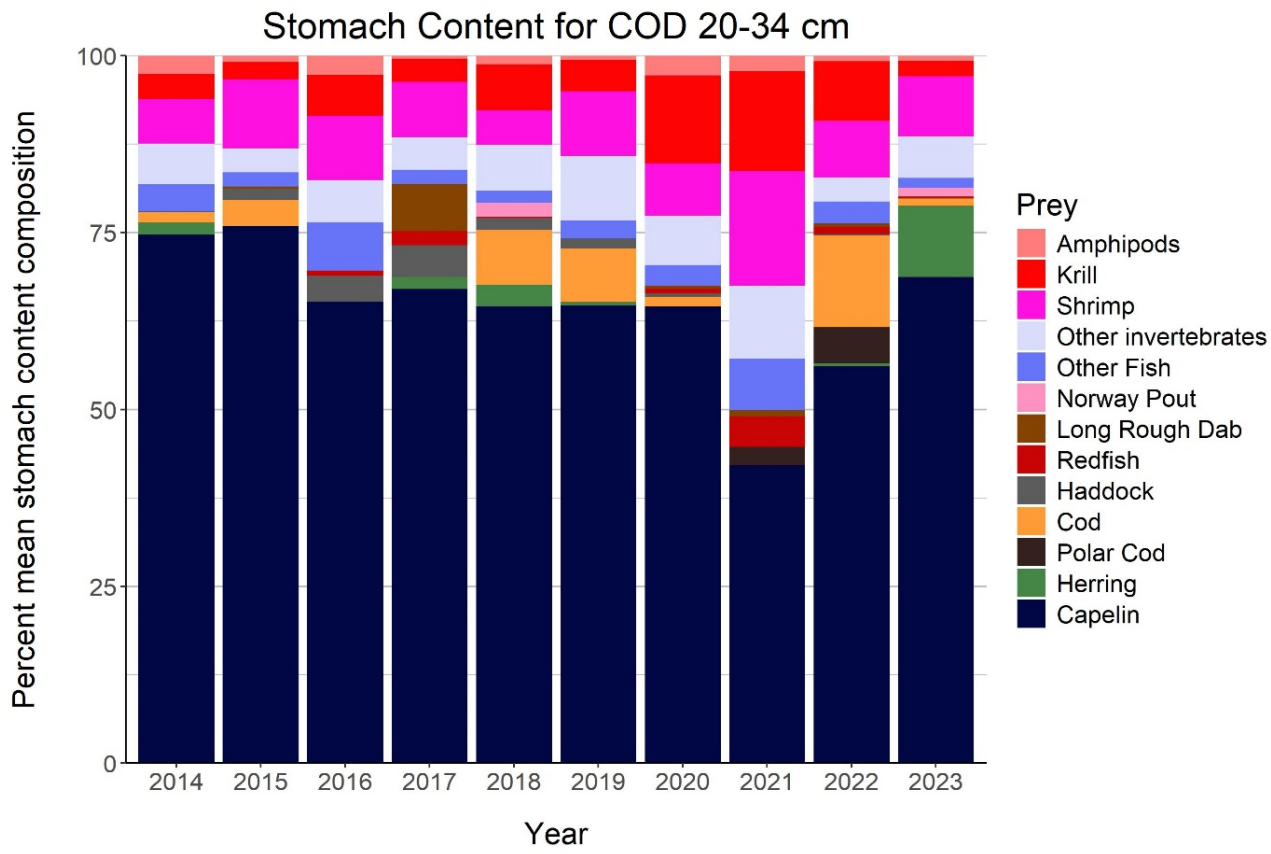

Figure 5.15. Stomach content composition for cod 20-34 cm.

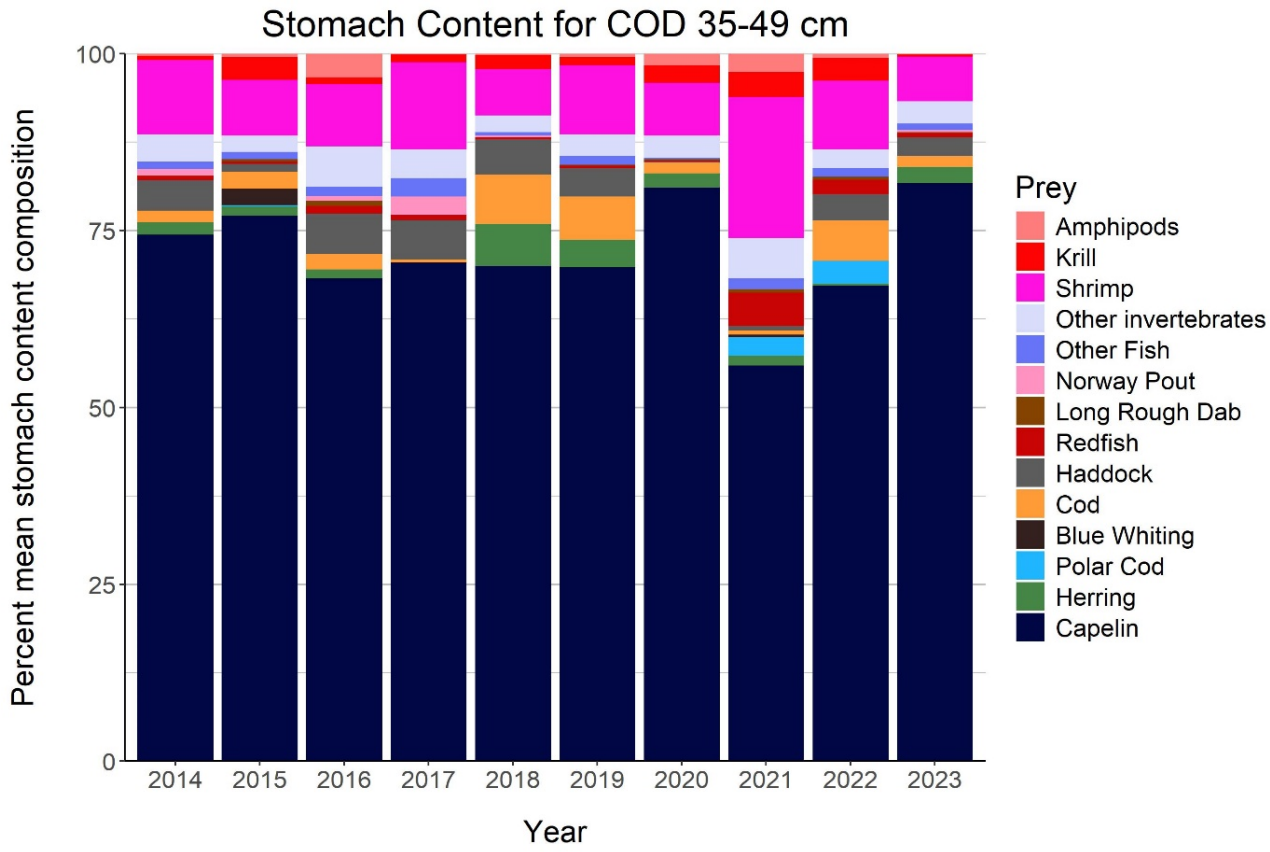

Figure 5.16. Stomach content composition for cod 35-49 cm.

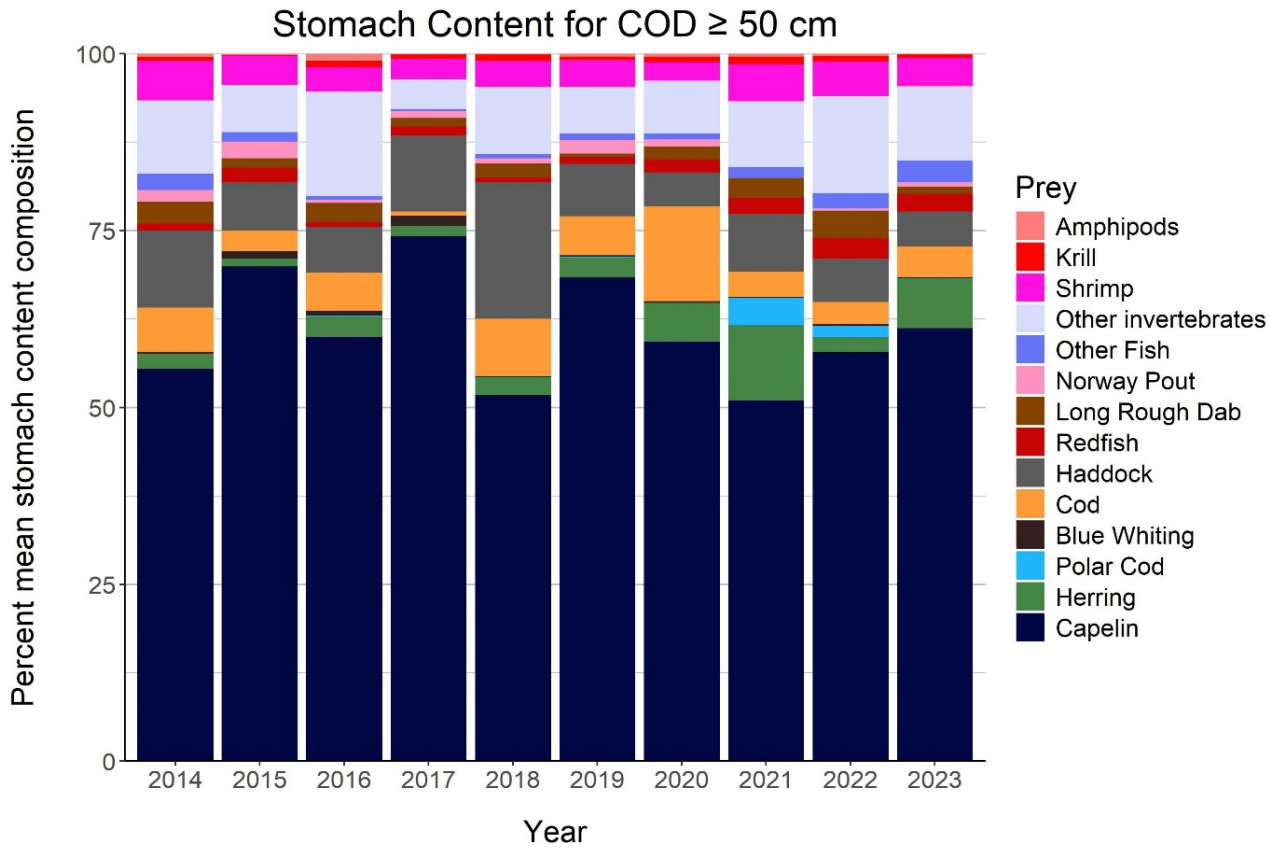

Figure 5.17. Stomach content composition for cod >=50 cm.

The stomach fullness index is calculated as $SFI_i=100*\Sigma WS_i/W_i$, where WS_i is the weight (g) of the stomach of fish *i*, and W_i is the weight (g) of fish *i* . For 1987 SFI has not been calculated, because very few fish were weighed that year due to technical problems. The distribution on prey groups has been adjusted by distributing the unidentified component of the diet proportionally among the various components, taking into account the level of identification.

The proportion of empty stomachs is largest for the smallest fish (Table A5.14), a pattern seen for all years. The stomach fullness in 2023 was higher than in 2022 for all length groups except cod < 20 cm. Capelin is the dominating prey for cod ≥ 20 cm, followed by shrimp and a variety of fish prey (Tables A5.16-A5.18), while krill dominates for the smallest cod (Table A5.15). However, in many years capelin is also an important prey for the smallest cod. The proportion of capelin in the diet increased from 2022 to 2023 for all cod size groups except cod < 20 cm.

6. Distribution and abundance of haddock

6.1. Acoustic estimation

The survey covers best the immature part of the haddock stock. At this time of the year an unknown proportion of the mature haddock (age 6 and older) is on its spawning migration south-westwards out of the investigated area. In some earlier years, e.g., 2004 and 2005, concentrations of mature haddock have been observed pelagically rather far above bottom along the shelf edge. The bottom trawl sampling poorly covers these concentrations. There are indications that the distribution of age groups 1 and 2 in some years are concentrated in coastal areas not well covered by the survey. This occurred in the late 1990s and will have strongest effect on estimates of abundance of the poor year-classes. In the later surveys, small haddock have been widely distributed, and the strong year-classes have been found unusually far to the north. Favourably hydrographic conditions and/or density dependent mechanisms might cause this. However, it is difficult to separate the two factors.

Figure 6.1 shows the spatial distribution of acoustic registrations assigned to haddock in 2024. The registrations reflect the general distribution of haddock in the southern and eastern Barents Sea. The overall echo abundance in 2024 was the highest since 2019.

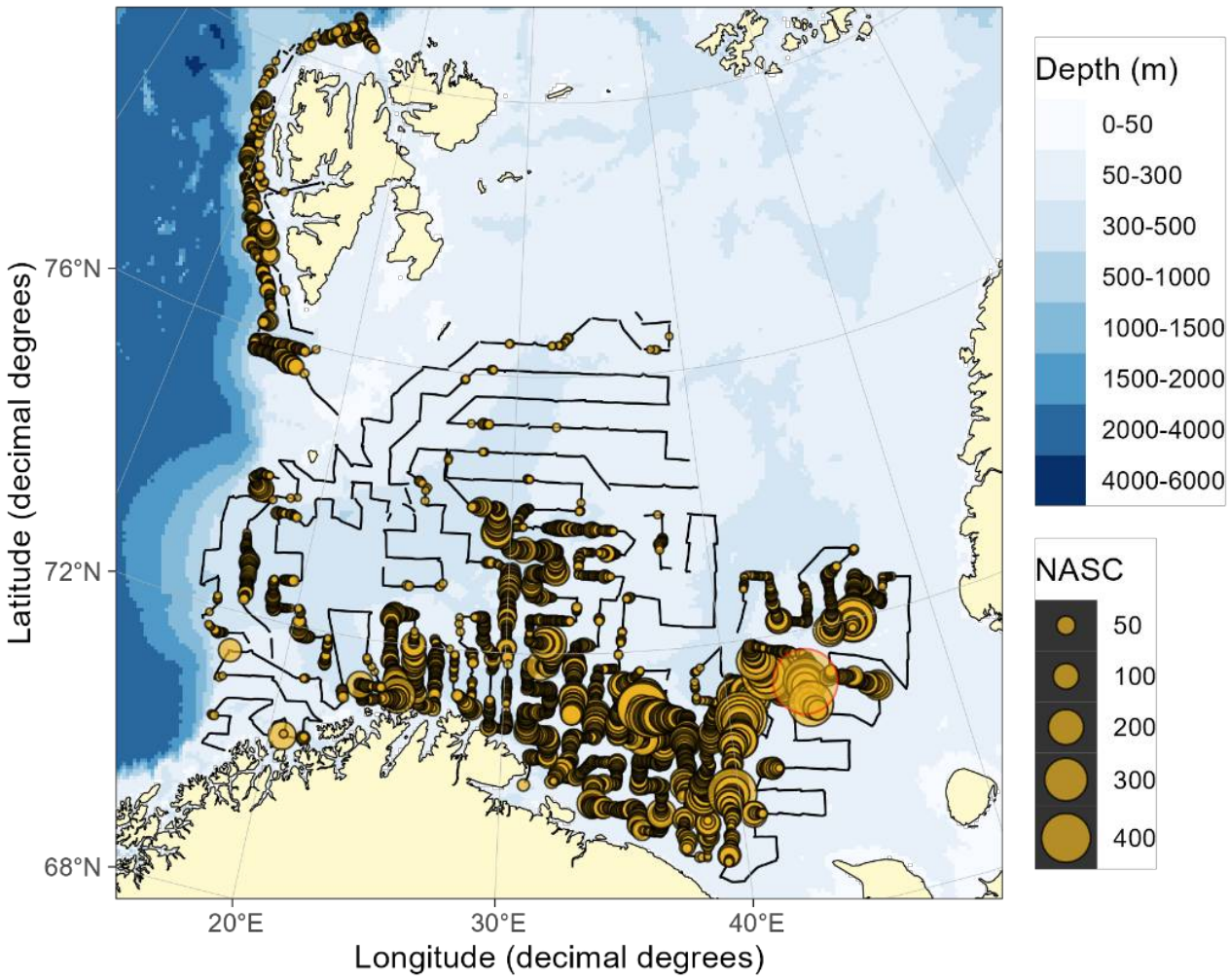

Figure 6.1. HADDOCK NASC. Distribution of acoustic backscatter (m2/nmi2) assigned to haddock in 2024. The black lines without yellow circles represent parts of the cruise track where the acoustic backscatter was scrutinized, but not assigned to haddock. NASC values < 5 was set to zero for this illustration.

The acoustic abundance indices by age and the main areas in 2024 are presented in Table A6.1. As in most of the previous years the highest abundance was observed in main area D. The full time series is presented in Table A6.2 and Figure 6.2. Abundance of age 1 in 2024 increased compared to 2023. Abundance of fish older than 3 was low, compared to preceding years.

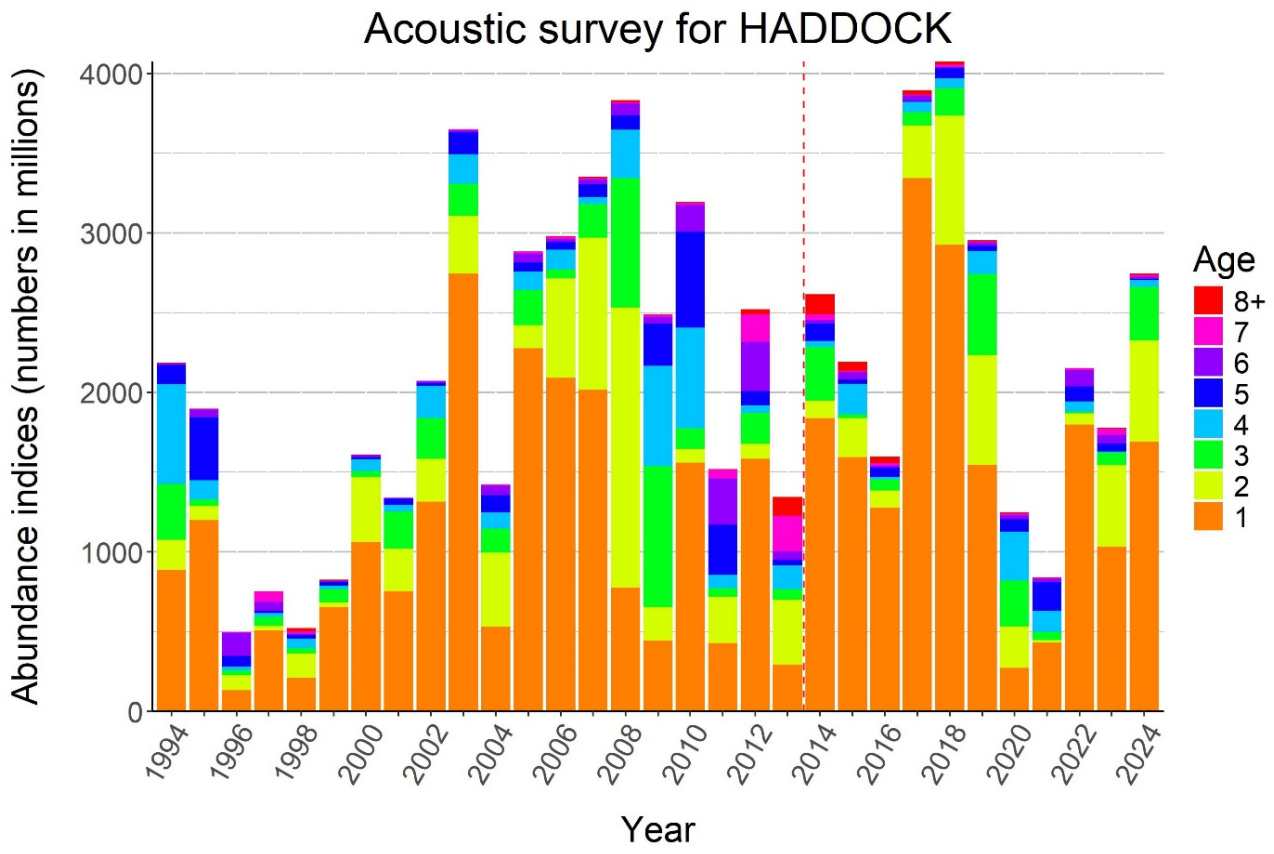

Figure 6.2. HADDOCK abundance (acoustic indices) 1994-2024. The different colours represent the ages from 1 to 8+. The dashed vertical line indicates 2014 when the survey area was extended to include main area N.

The year classes 2016 and 2017 have high indices at age 1-2. The year class 2019 appears to be much weaker as the abundance of 1-year-olds observed in 2020 is the third lowest in the time series, and the weakest in the time series at ages 2, 3, and 4. Abundance of the 2020 year-class, while still low, is still almost 7 times higher than the 2019 year-class as 3 year olds. The 2021 year-class is much stronger and above average in the time series and the 2023 year-class seems to be of similar magnitude.

Table A6.3 shows indices for strata 24-26 (main area N), which are also included in the full time series (Table A 6.2). The contribution from main area N was rather low in all years, except in 2018 when 29% of age 1 haddock (by number) was found in the extended area, constituting 13% of the biomass. The total abundance in area N in 2023 is 16% by number and 5% by biomass, abundance of age 1 in N is 18% of the total.

Table A 6.4 presents estimated coefficients of variation (CV) for haddock age groups 1-14. In most years, CVs for age groups older than 7 years are above what could be considered as acceptable (approximately 20 %). In 2024, the CVs for age 4-5 and ages 9+ were higher than 20%.

6.2. Swept area estimation

Figures 6.3 - 6.6 show the geographic distribution of bottom trawl catch rates (number of fish per NM^2) for haddock size groups < 20 cm, 20-34 cm, 35-49 cm and ≥ 50 cm. Like in previous years, the distribution extends further to the north and to the east than what was usual in the 1990s.

Table A6.5 presents the indices for each age group by main areas. In 2024, area N contributed about 20 % of

total abundance and about 7 % of total biomass, which is more than in 2023.

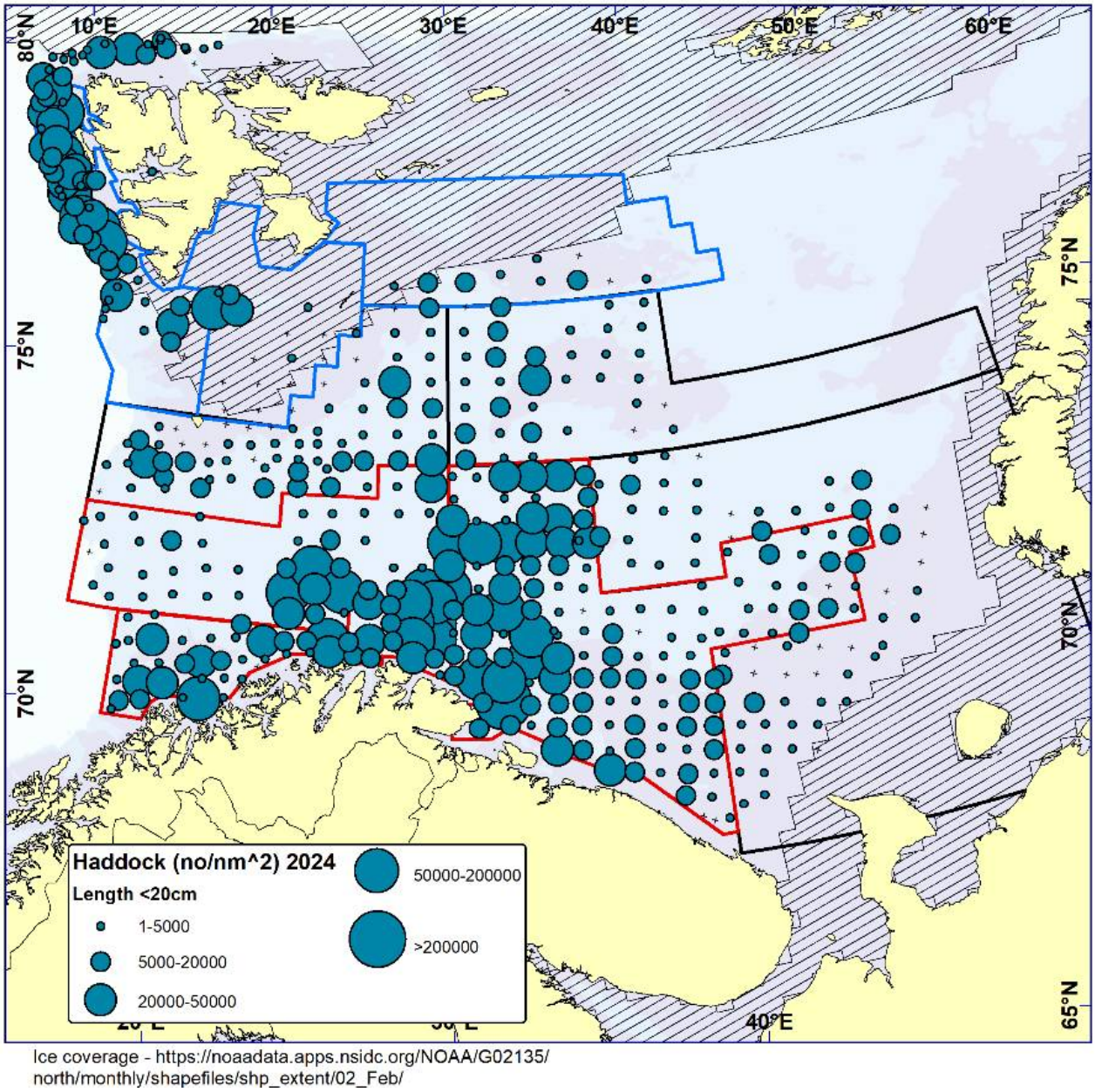

Figure 6.3. HADDOCK < 20 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

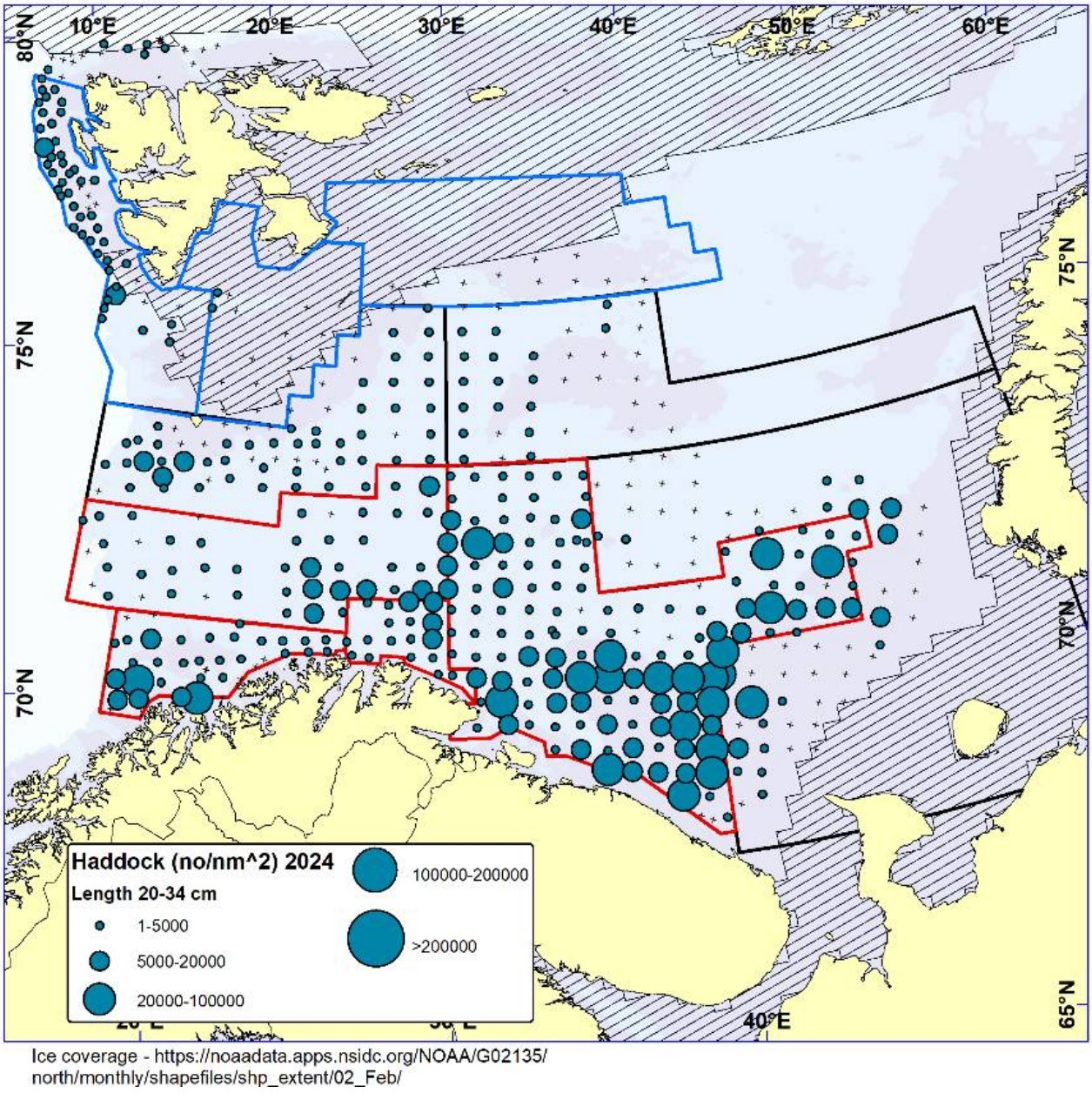

Figure 6.4. HADDOCK 20-34 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

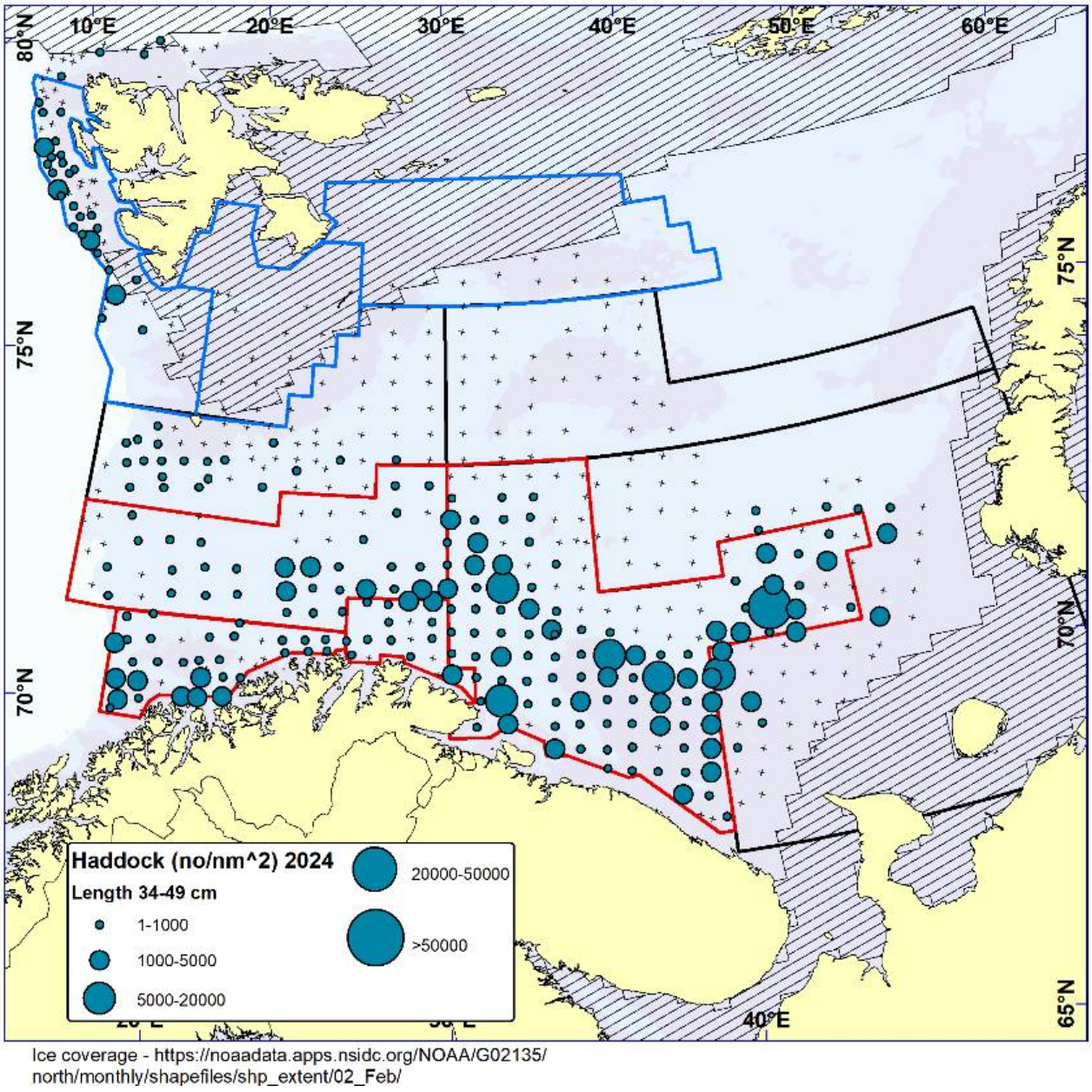

Figure 6.5. HADDOCK 35-49 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

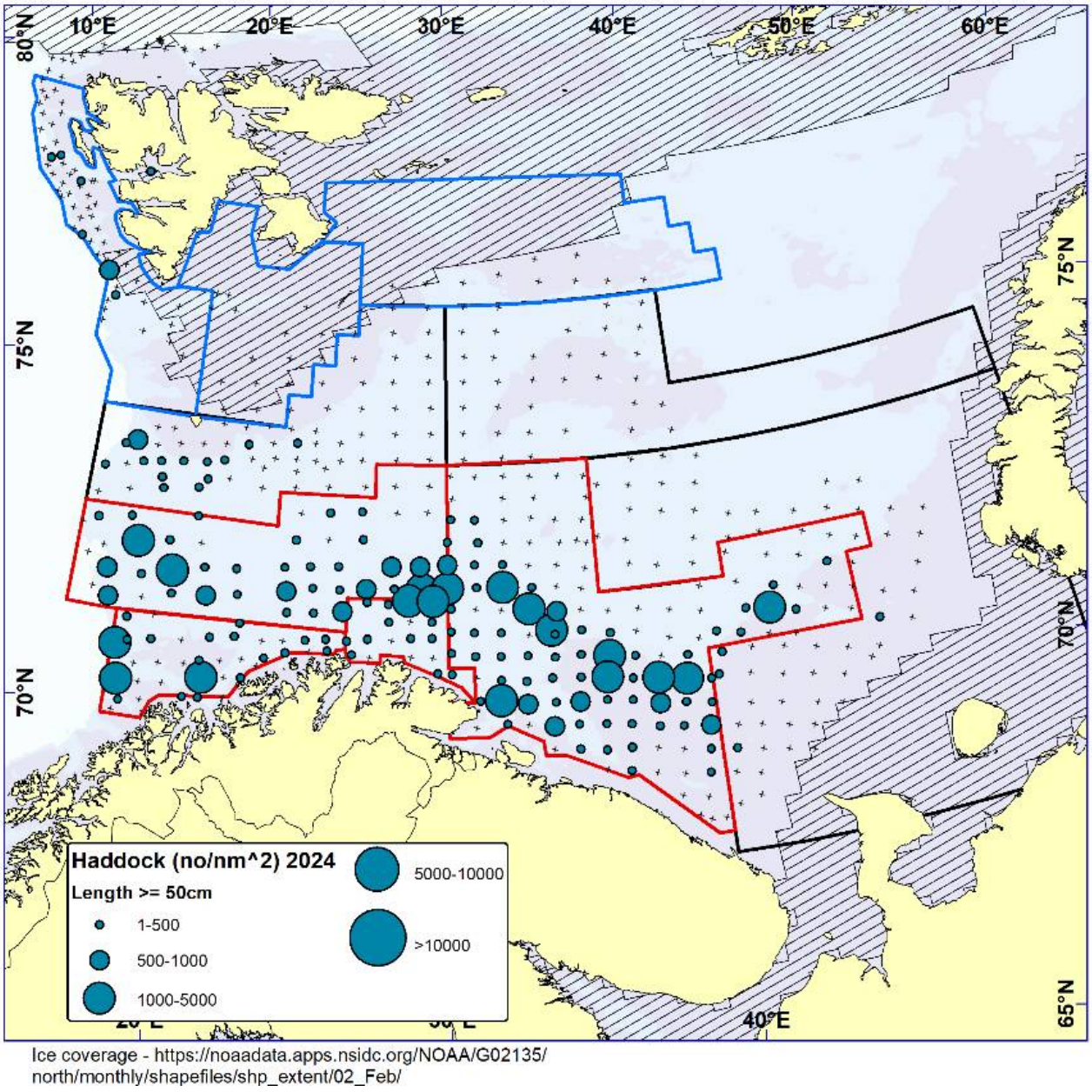

Figure 6.6. HADDOCK ≥ 50 cm. Distribution in valid bottom trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

The full time series is shown in Table A6.6 and Figure 6.7. The swept area estimates, too, are highest in the east in area D. The weak 2019 year-class noted for the acoustic index is evident also in the swept area estimates. Overall, this survey tracks both strong and poor year-classes fairly well.

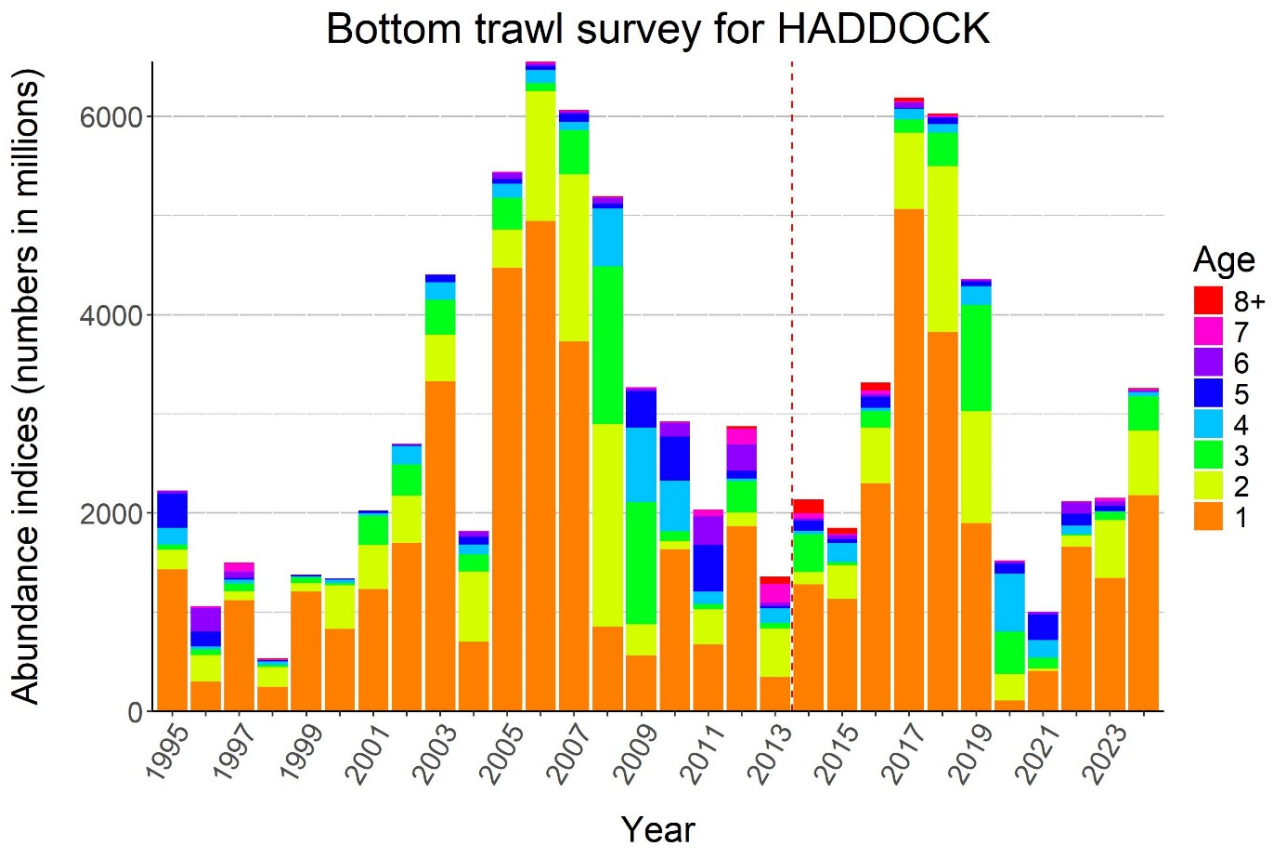

Figure 6.7. HADDOCK abundance (swept area indices) 1994-2024. The different colours represent the ages 1-9+. The dashed vertical line indicates 2014 when the survey area was extended to include main area N.

Table A6.8 presents estimated coefficients of variation (CV) for haddock age groups 1-14. Cv's tend to by higher for less abundant ages/year-classes. In most years, CVs for age groups older than 7 years are above what could be considered as acceptable (approximately 20 %) . In 2024, CVs were higher than 20% for age 4 and 9+.

6.3. Survey mortalities

Survey mortalities based on the acoustic and swept area indices (Table A 6.9, Figure 6.8) have varied between years, and for most age groups there are no obvious trends. However, there are signs of co-variability within years. In 2024, it is notable that survey mortalities increased for almost all ages, especially for acoustic survey mortalities.

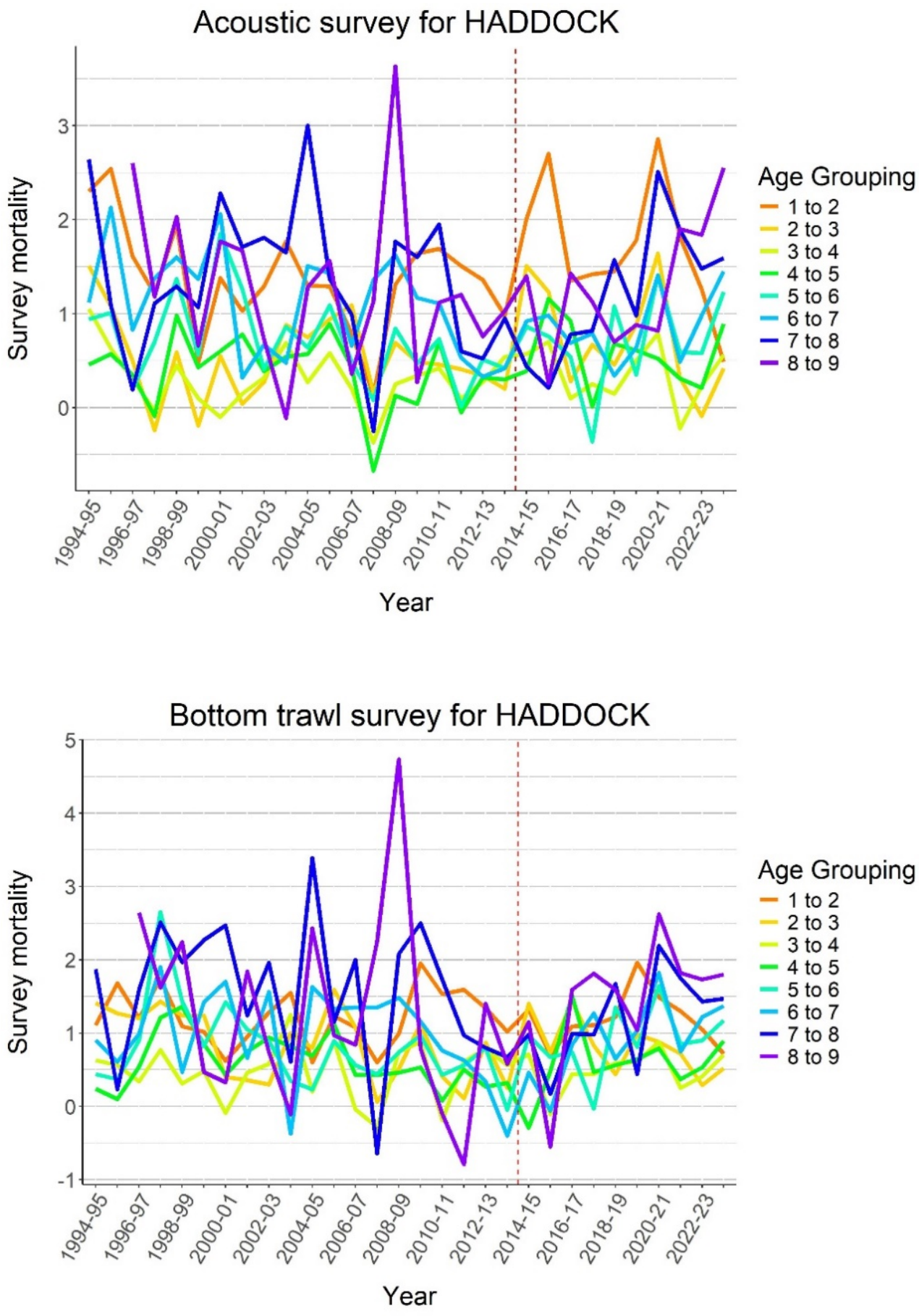

Figure 6.8 . HADDOCK, survey mortalities 1994-2024. Top: acoustic indices. Bottom: swept area indices.

6.4. Growth and maturity

Tables A 6.10 and Figure 6.9 present the time series for mean length. Table A 6.11 Figure 6.10 present mean weight at age. Length and weight estimates have been quite variable over time. In 2024, the size of the oldest fish has declined.

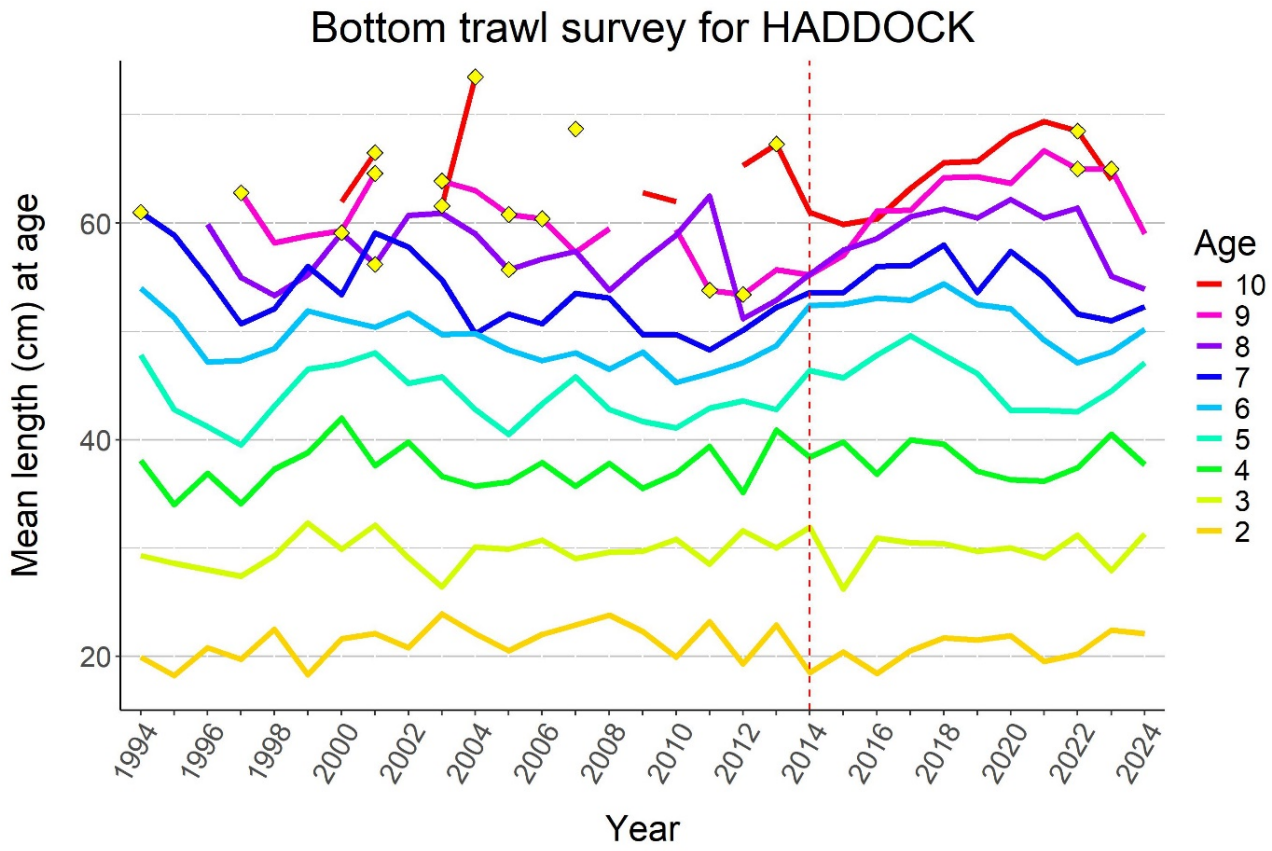

Figure 6.9 . HADDOCK, mean length (cm) by age 1994-2024. Yellow diamonds indicate ages with < 5 individuals sampled.

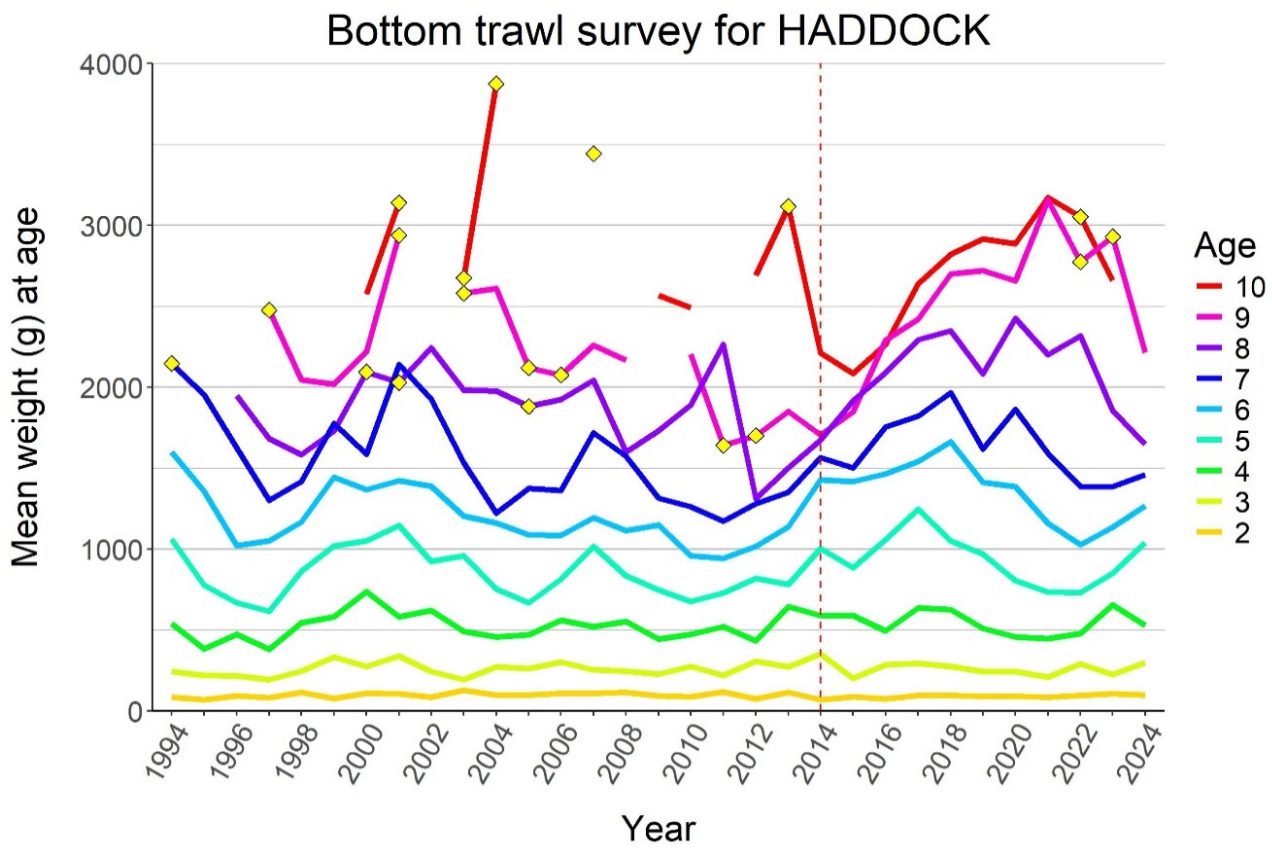

Figure 6.10 . HADDOCK, mean weight (kg) by age 1994-2024. Yellow diamonds indicate ages with < 5 individuals sampled.

Annual weight increments are shown in Table A 6.12, and Figure 6.11, these are highly variable.

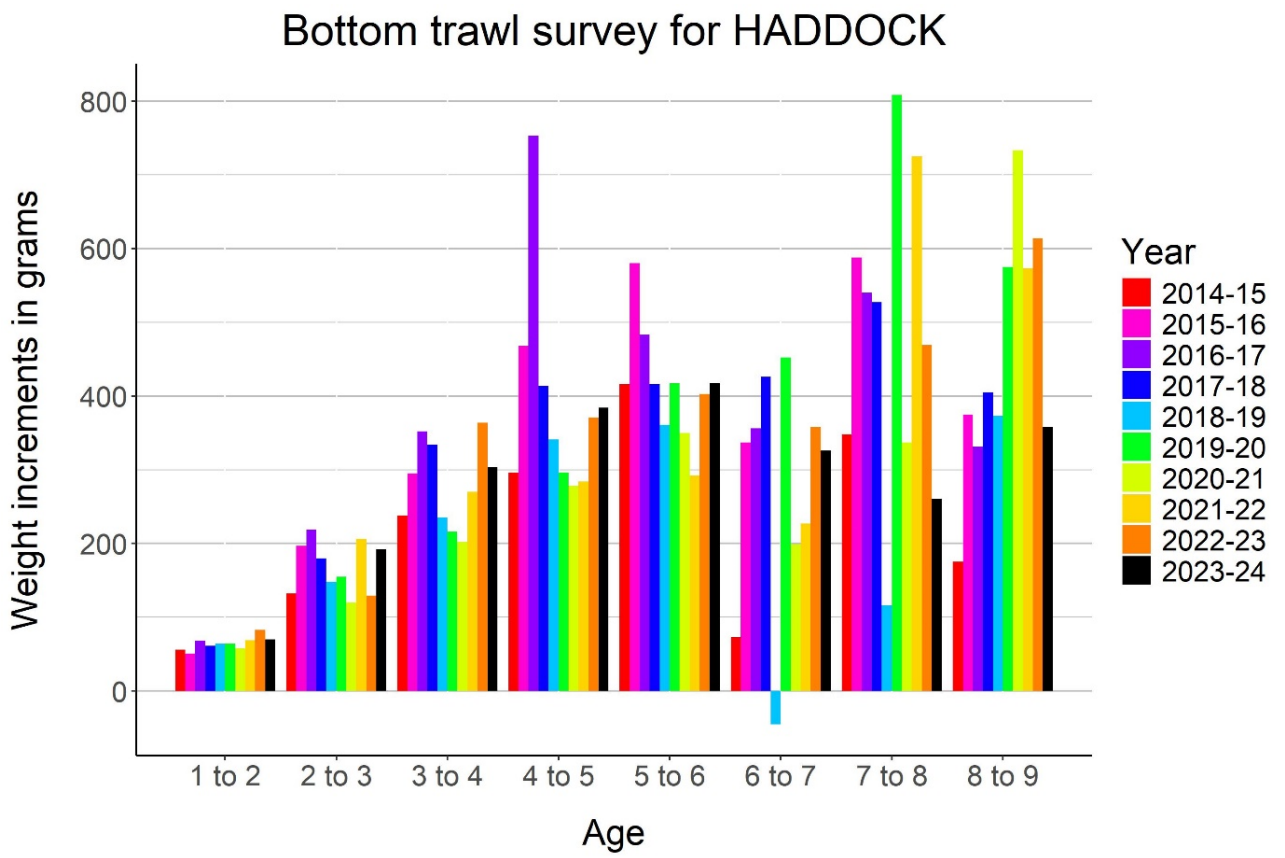

Figure 6.11 HADDOCK, annual weight increments.

The proportion mature at age also shows large variations between years (Table A 6.13, Figure 6.12).

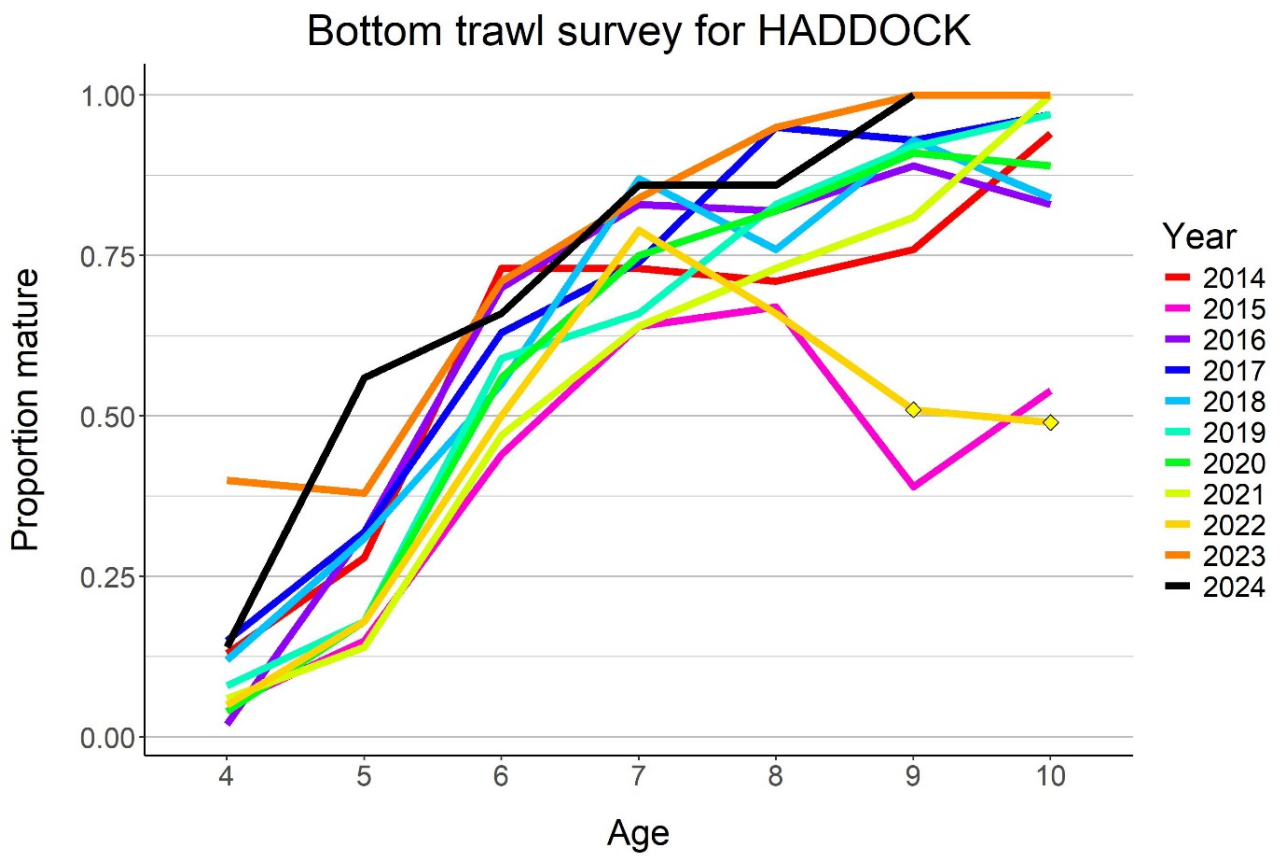

Figure 6.12 HADDOCK, proportion mature at age. Yellow diamonds indicate ages with < 5 individuals sampled.

The large variation is one of the reasons that length, weight and maturity at age are modelled from the empirical data in the haddock stock assessment to account for inconsistencies due to high sampling variance and to fill in missing age-year combinations. The assessment input data for these variables may therefore differ from what presented here. The degree of coverage of the Russian Exclusive economic zone (EEZ) may influence the biological parameters, as body size tends to decrease towards the northeast in the survey area. In addition, length, weight and maturity at age of older ages has higher uncertainty due to fewer samples.

7. Distribution and abundance of redfish

Earlier reports from this survey have presented distribution maps and abundance indices based on acoustic observations of redfish. In later years, blue whiting has dominated the acoustic records in some of the main redfish areas. Due to incomplete pelagic trawl sampling the splitting of acoustic records between blue whiting and redfish has been very uncertain. The uncertainty relates mainly to the redfish, since it only makes up a minor proportion of the total value. This has been the case since the 2003 survey, and the acoustic results for redfish are therefore not included in the reports.

7.1. Golden redfish (*Sebastes norvegicus*)

Figure 7.1 shows the geographical distribution of golden redfish based on the catch rates in bottom trawl. In most years, the distribution is completely covered except towards the northwest. Figure 7.2 and Table A7.1 presents the time series (1994-2024) of swept area indices by 5 cm length groups for the standard area (strata 1-23). The indices were low in many years since 1999 for all length groups. However, in 2016 and 2017 there was an increase in the indices of fish above 25 cm, and in 2018 the total index was at the same level as in 2017, while the total biomass was slightly lower. In 2019 the indices for fish between 35 and 50 cm increased further, and the total abundance and biomass were the highest since 1998. The index for most length groups declined in 2020 and further in 2021 when the abundance of fish < 20 cm was particularly low. However, the 2021 year class appears to have been strong as the number of <10 cm fish was the highest in the series in 2022 and the numbers in the 15-19 cm length class in 2024 was the highest since 1995. Table A7.2 present swept area abundance indices by length groups for area N in 2014-2024. Golden redfish was found in this extended survey area in 2014-2024, mainly west of Spitsbergen (strata 24). 18% of the total abundance and 11 % of total biomass was found in the extended area in 2024. Table A7.3 presents estimates of coefficients of variation (%) by length groups. In all years, CVs for most length groups are above what could be considered as acceptable in stock assessment (approximately 20 %).

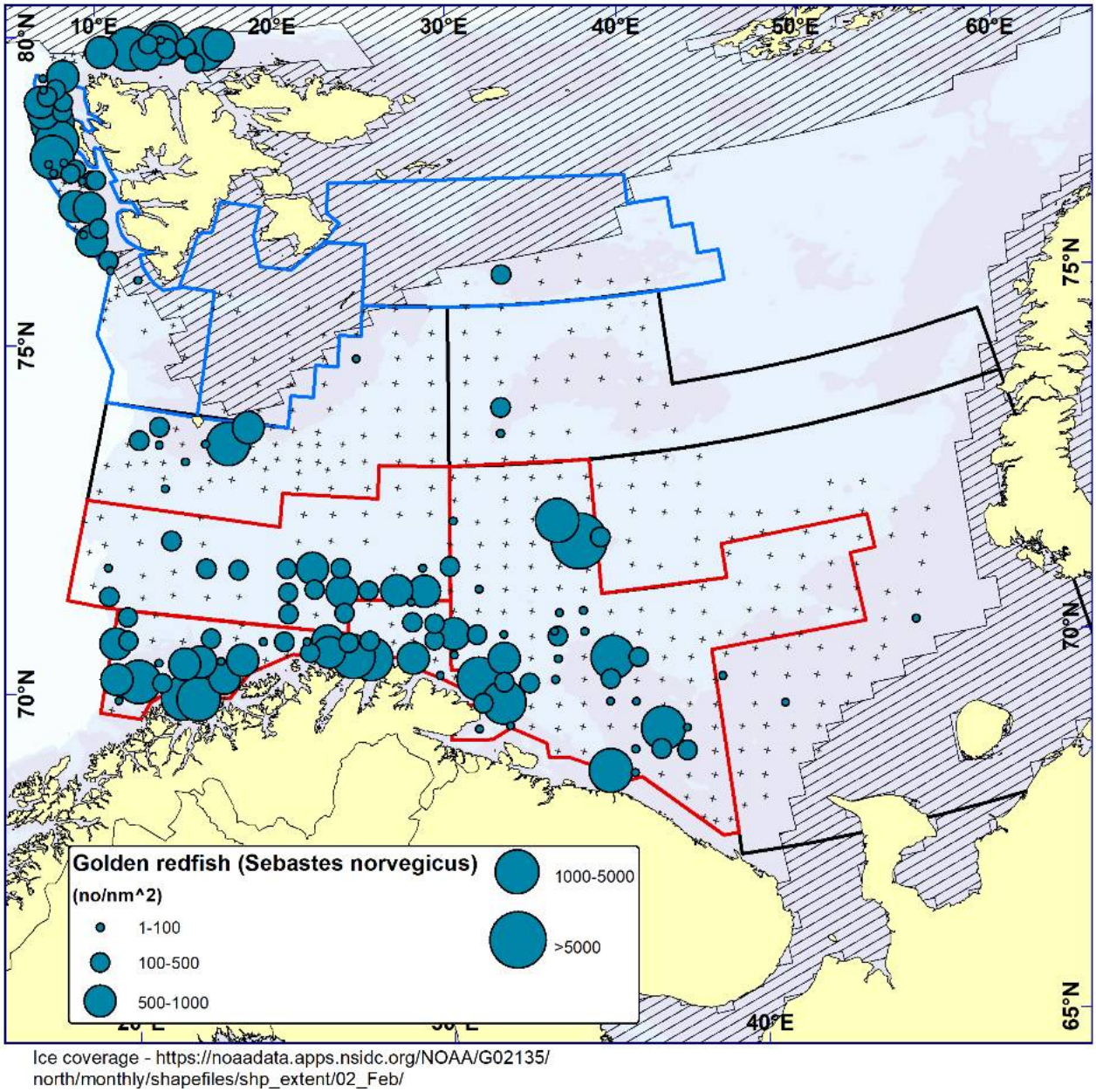

Figure 7.1. GOLDEN REDFISH (Sebastes norvegicus) . Distribution in the trawl catches winter 2024 (number per nm 2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

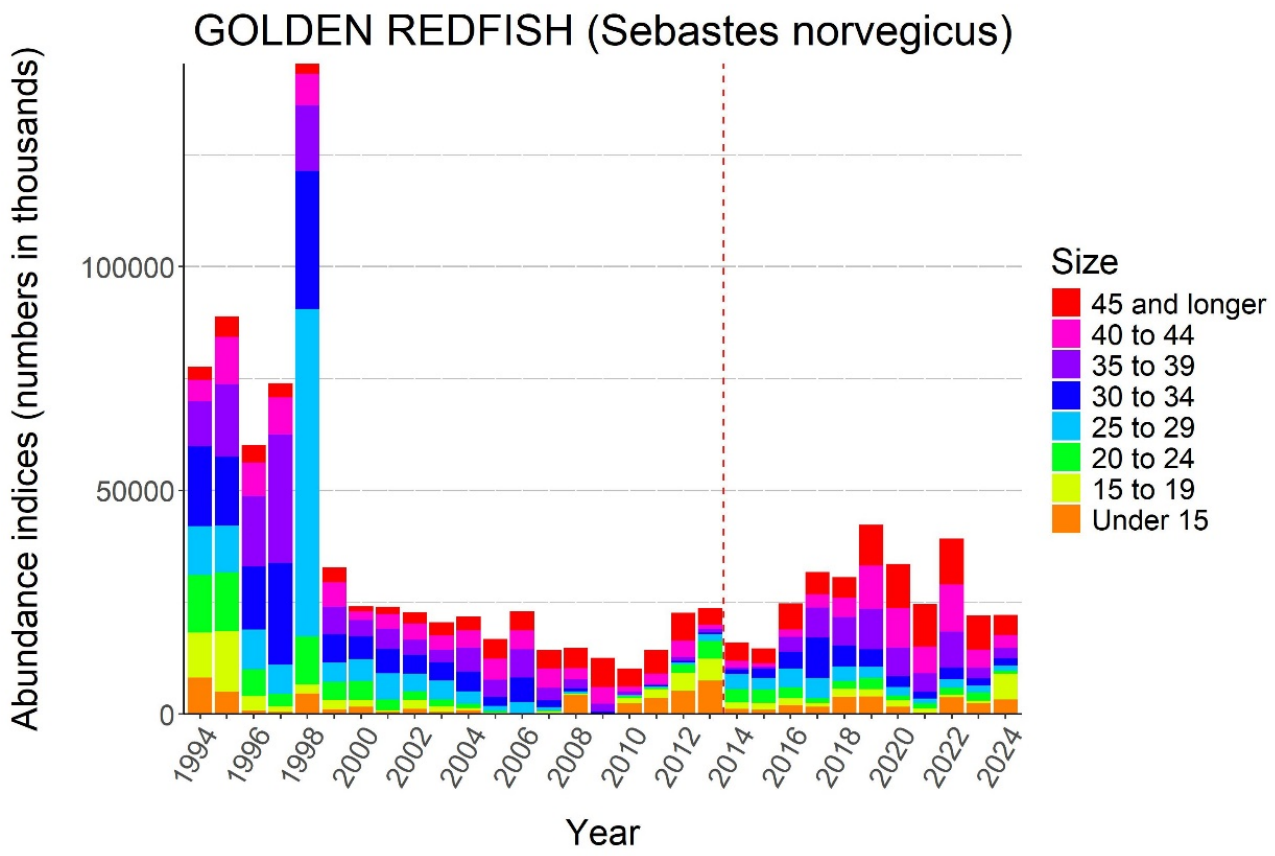

Figure 7.2. GOLDEN REDFISH (S*ebastes norvegicus)* . Abundance indices (numbers in thousands) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024 .

7.2 Beaked redfish (*Sebastes mentella*)

Figure 7.3 shows the geographical distribution of beaked redfish based on the catch rates in bottom trawl. Figure 7.4 and Table A7.4 presents the time series (1994-2024) of swept area abundance indices by 5 cm length group for beaked redfish in the standard area (strata 1-23), while Table A7.5 present indices for new strata 24-26 in 2014-2024.

In 2015 and 2016, the estimated indices for 20-39 cm beaked redfish were among the highest in the time series, and in 2017 the indices for 30-39 cm beaked redfish were the highest in the time series, as were the total index and total biomass. The indices for most length groups decreased somewhat from 2017 to 2018 and remained at about the same level in 2019 and 2020 before increasing in 2021. However, the 2020, year class, appears to have been strong as the 2021 estimate of fish < 10 cm, 2022-2023 estimate of 10-15 cm fish and the 15-19 cm in group in 2024 were the highest in the time series. The coverage of the beaked redfish distribution was not complete west and north of Spitsbergen (Fig. 7.3). The extended survey area in 2024 contributed about 6% of the total abundance index, compared to around 10 % in in 2021 to 2023.

Table A7.6 presents estimates of coefficients of variation (%) by length groups. In most years, CVs for length groups between 10 and 29 cm are at a level that could be considered as acceptable for stock assessment, and in most recent years up to 44 cm.

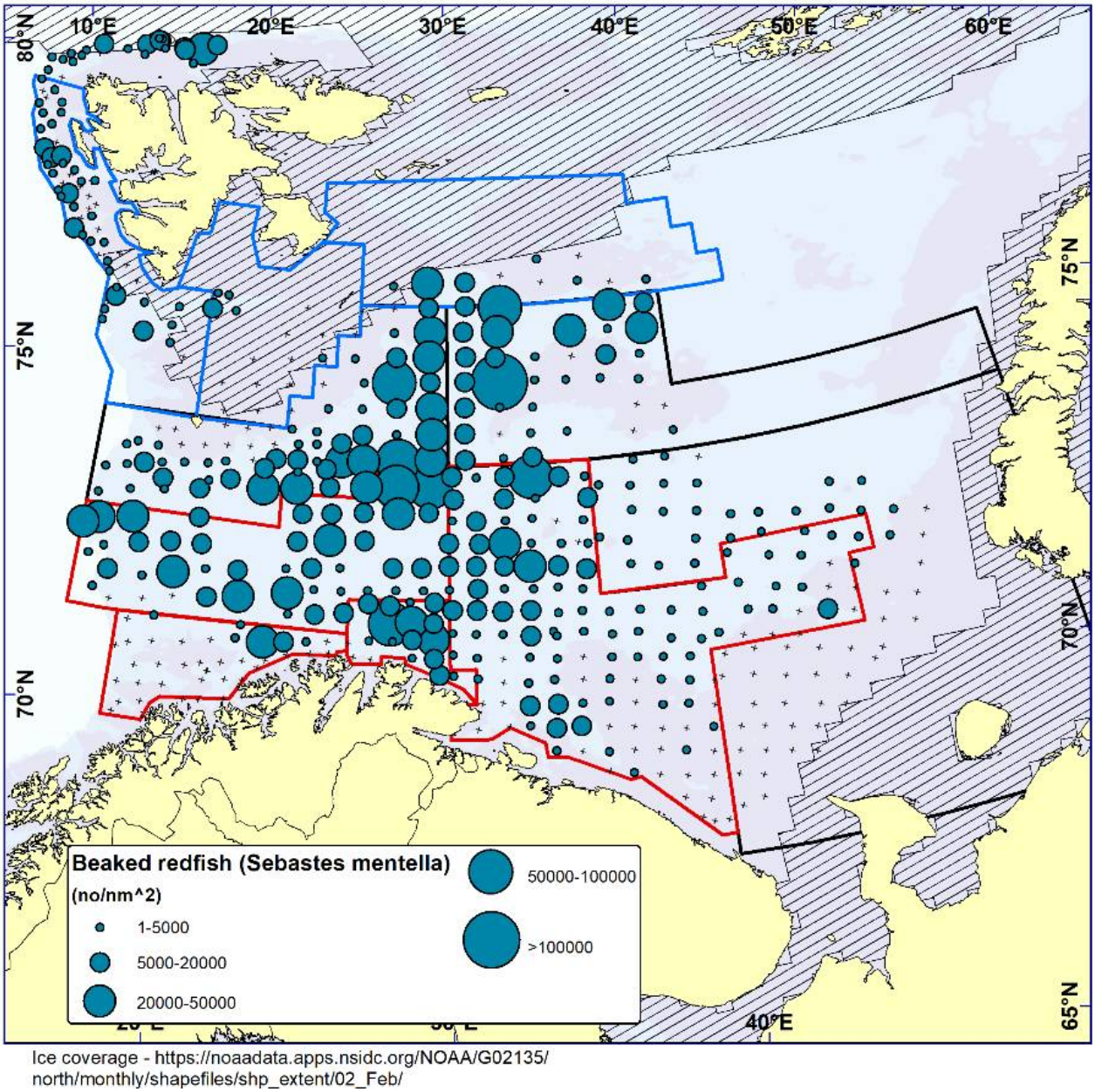

Figure 7.3. BEAKED REDFISH (Sebastes mentella). Distribution in the trawl catches winter 2024 (number per nm 2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

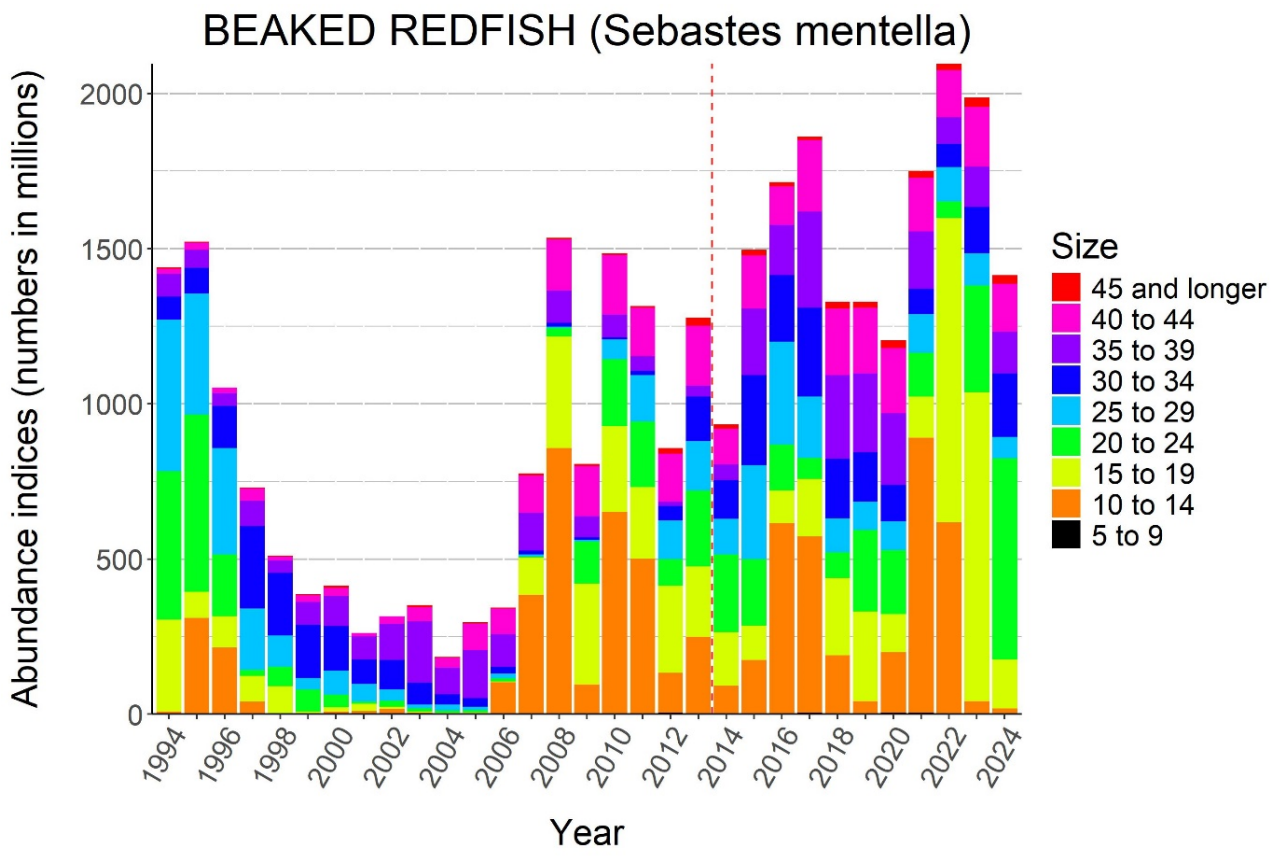

Figure 7.4. BEAKED REDFISH (Sebastes mentella). Abundance indices (numbers in millions) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.

7.3 Norway redfish (Sebastes viviparus)

Figure 7.5 shows the geographical distribution of Norway redfish in 2024. Figure 7.6 and Table A7.7 presents the time series (1994-2024) of swept area indices by 5 cm length groups in the standard area (strata 1-23). Almost all Norway redfish are found in areas ABCD, mainly in main area B, and almost nothing in the extended survey area (Table A7.8). In 2021, the smallest fish (< 10 cm) were found in the extended survey area for the first time and then again in 2022 as the < 15 cm fish. In 2023 and 2024, fish between 5 and 25 cm were found in the extended survey area.

A few large catches often drive the indices for Norway redfish. There was a large and unexplained increase in the indices of most length groups from 2013 to 2015 to among the highest levels in the time series. Apart from a dip in 2016, the total abundance has remained relatively high since then. The total abundance increased with nearly 50 % in 2021 to the highest observed since 1994, driven by high abundance of 15-30 cm fish. In 2022 and 2023, the abundance of <10 cm increased significantly, followed by a very high increase in fish 15-24 cm in 2024.

Table A7.9 presents estimates of coefficients of variation (%) by length groups. In most years, CVs for most length groups are far above what could be considered as acceptable for stock assessment.

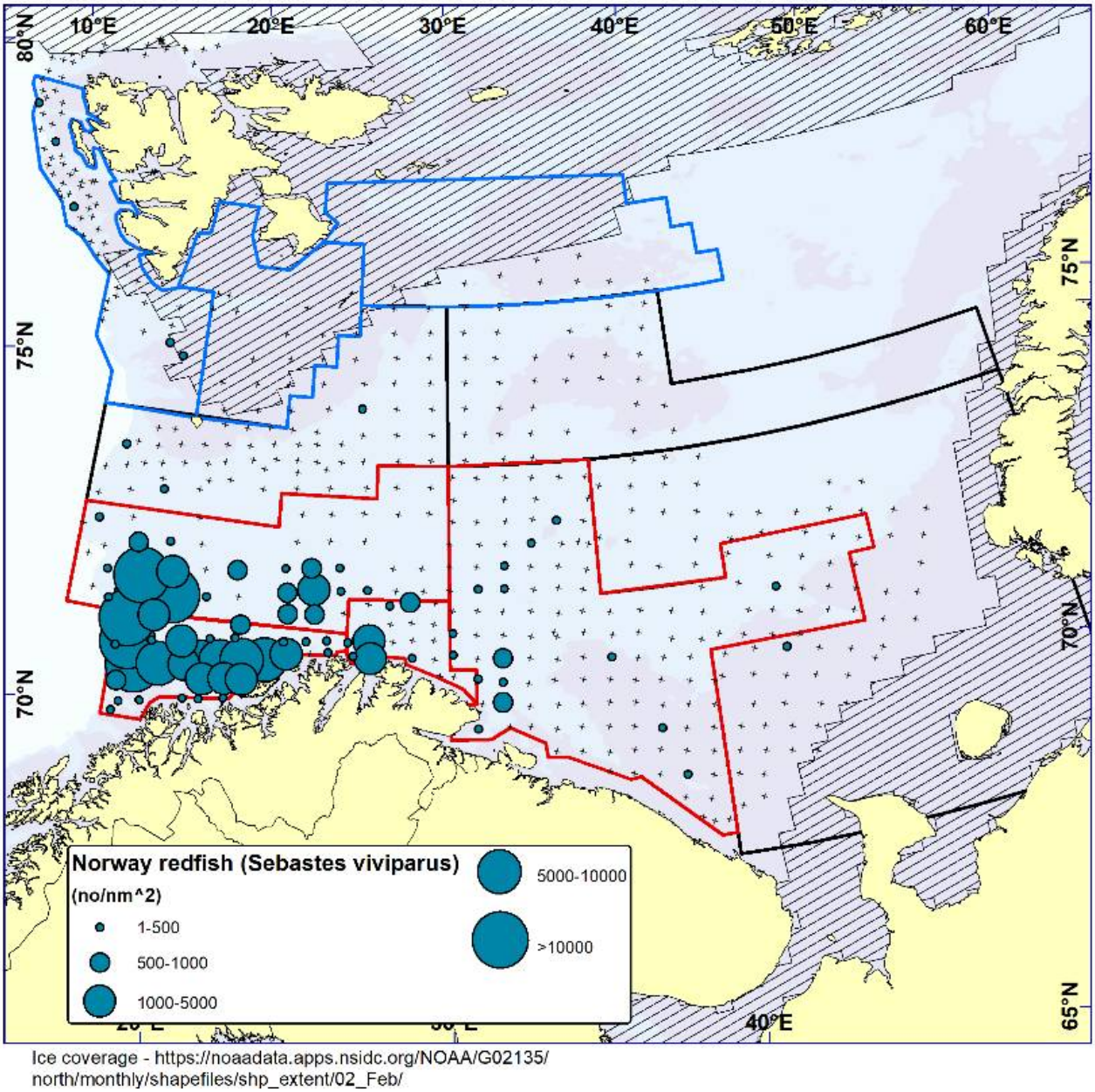

Figure 7.5. NORWAY REDFISH (Sebastes viviparus) . Distribution in the trawl catches winter 2024 (number per nm 2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

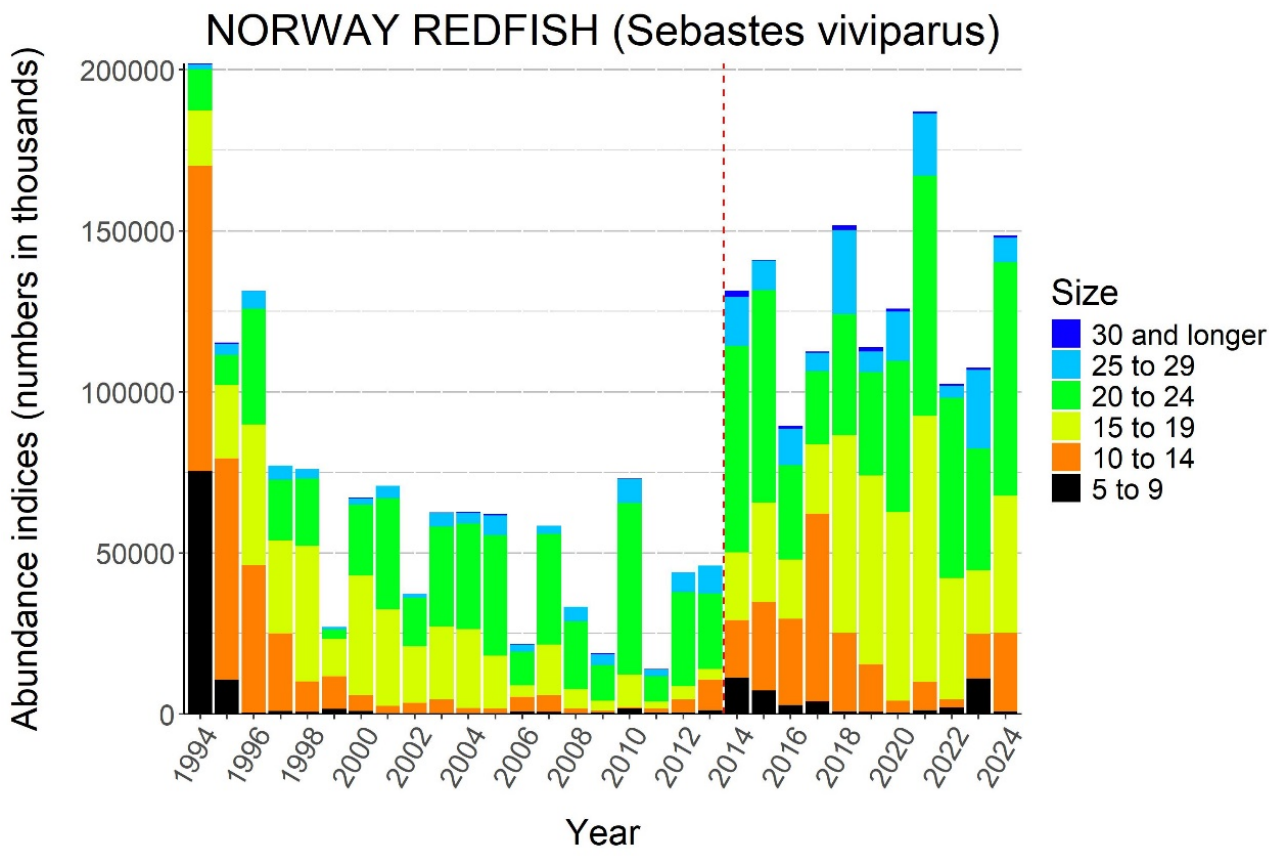

Figure 7.6. NORWAY REDFISH (Sebastes viviparus). Abundance indices (numbers in thousands) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.

8. Distribution and abundance of Greenland halibut

Figure 8.1 shows the distribution of bottom trawl catch rates of Greenland halibut. The most important distribution areas for the adult fish (depths between 500 and 1000 m along the western slope), are not covered by this survey. The observed distribution pattern in 2024 was similar to those observed in previous years' surveys, but with larger abundances south of Svalbard than last year.

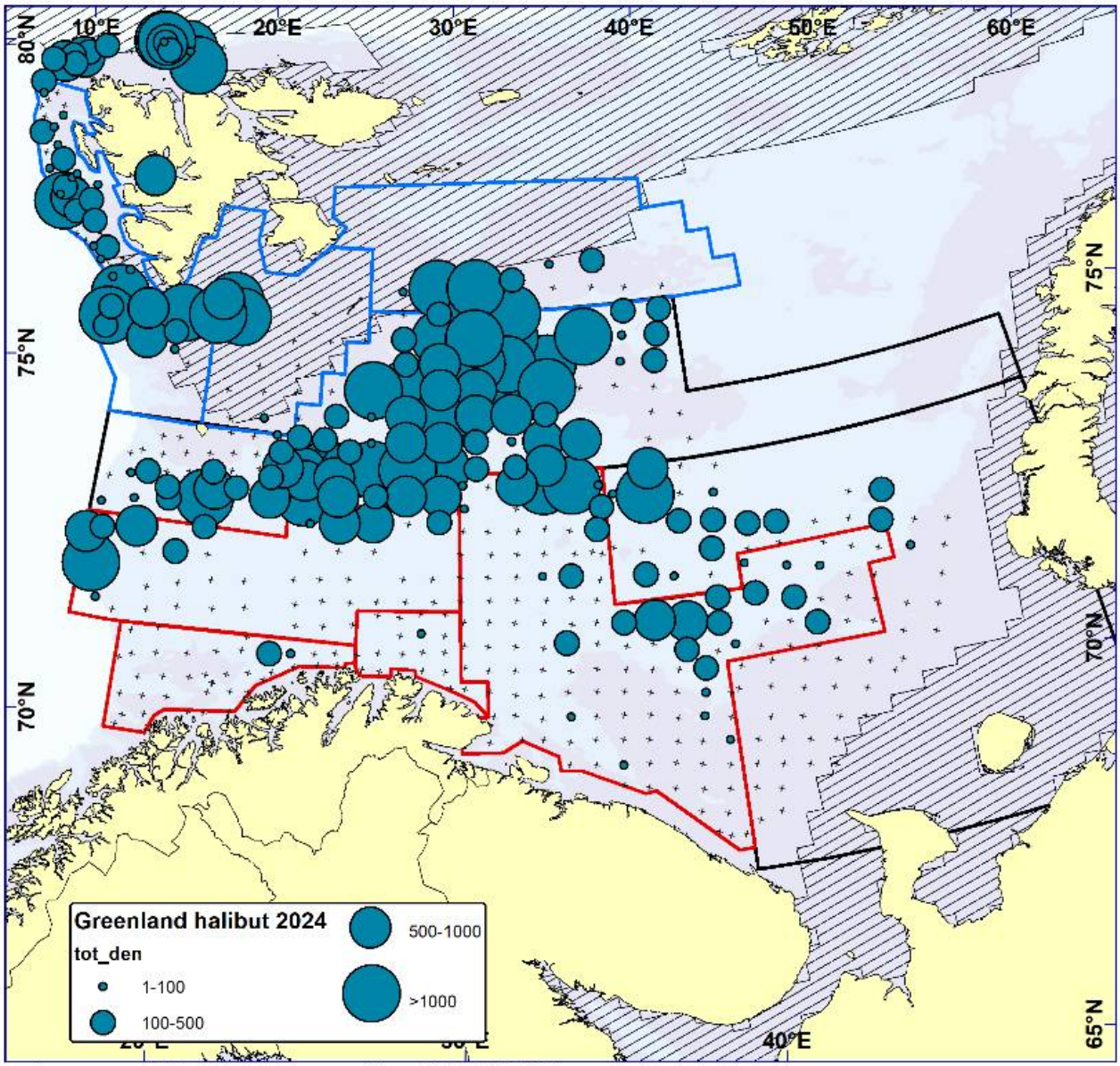

Figure 8.1 GREENLAND HALIBUT. Distribution in the trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

The time series (1994-2024) of swept area abundance indices by 5 cm length groups in the standard area is presented in Table A8.1 and Figure 8.2. The abundance indices were lower in the early 2000's, but increased

after 2005 and have remained at a higher level since then, with a peak in 2015. After decreasing indices from 2016-2018, there has been an increase in abundance indices. The abundance in 2023 and 2024 are at an all-time high, mainly due to an increase in abundance of length groups 30-34 and 35-39 cm.

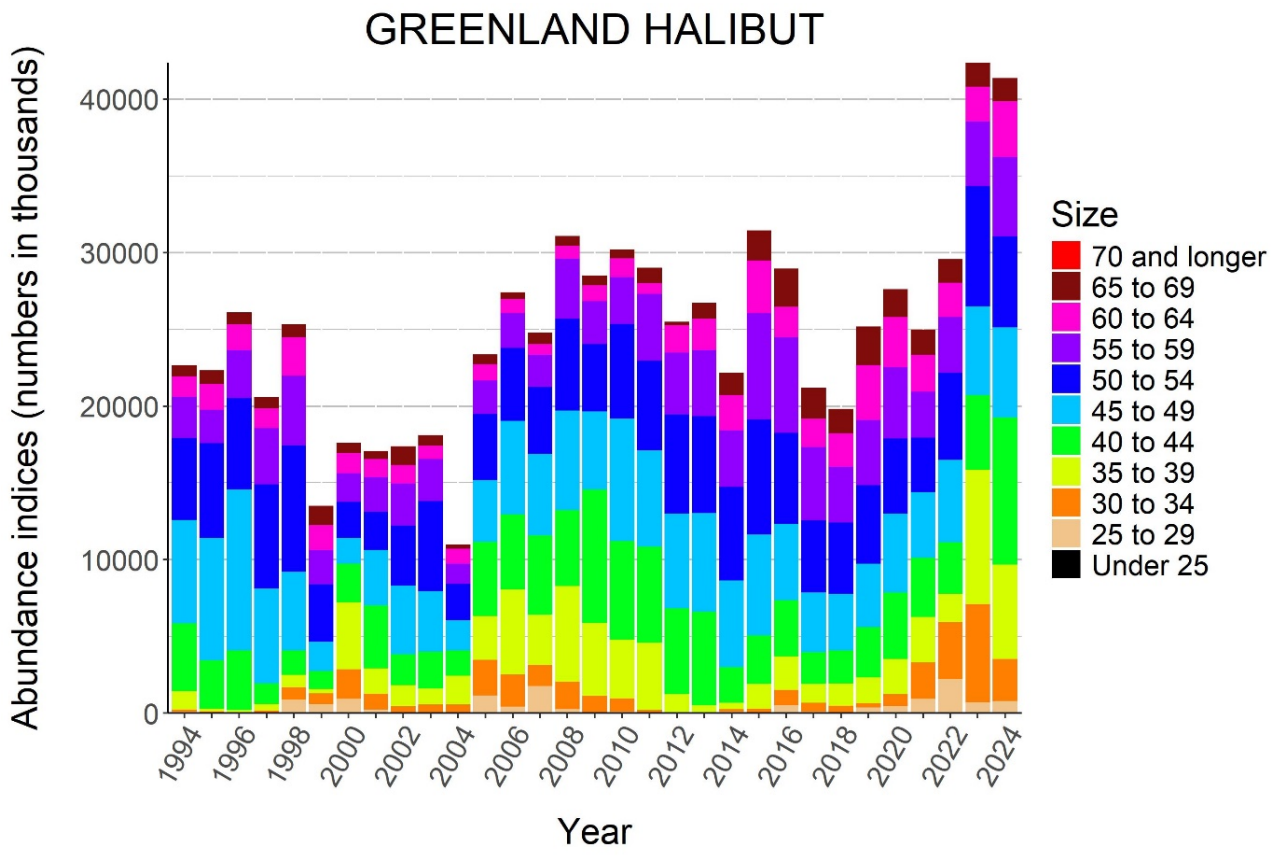

Figure 8.2 GREENLAND HALIBUT . Abundance indices (numbers in thousands) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.

Swept area abundance indices by length groups for the new strata (24-26) in 2014-2024 are found in table A8.2. The abundance index for the new strata varies greatly. The abundance index has shown an increased trend until 2022 when it peaked at an all-time high (at that time), followed by a near all-time low in 2023. The abundance index for 2024 was at a new all-time high, largely due high numbers of fish below 25 cm.

Table A8.3 presents estimates of coefficients of variation (%) for length groups. In most years, only CVs for length groups between 40 and 65 cm are at a level that could be considered as acceptable for stock assessment.

9. Distribution and abundance of capelin, polar cod and blue whiting

9.1. Capelin

Although capelin is primarily a pelagic species, small amounts of capelin are normally caught in the bottom trawl throughout most of the investigated area. In Figure 9.1 catch rates of capelin smaller and larger than 14 cm are shown for the winter survey in 2024. Capelin smaller than 14 cm during this period will mainly comprise the immature stock component, while the larger capelin constitutes the pre-spawning capelin stock. Some few trawl hauls show large capelin catches (numbers exceeding 100 000 individuals), and these can probably not be considered representative for the density in the area, because such hauls will either result from hitting a capelin school at the bottom or up in the water column. For this reason, we choose not to present swept area-based indices for capelin in this report.

At this time of the year, maturing capelin have started their approach to the spawning areas along the coast of Troms, Finnmark and the Kola peninsula, while immature capelin will normally be found further north and east, in the wintering areas. This is reflected on the maps of capelin distribution, even though some large capelin is always found north of 75°N, and smaller capelin are found sporadically in near-coastal areas. The geographical coverage of the capelin stock is incomplete, but the maturing component is probably better covered than the immature.

It has been noted during several surveys that when sampling capelin from demersal and pelagic trawls, the individuals from demersal trawls are normally larger (and older) than those sampled pelagically. This has led to formation of a hypothesis saying that larger individuals tend to stay deeper than smaller individuals and some even to take up a demersal life. This hypothesis has not been tested, and during the winter surveys there are probably too few pelagic hauls to study the vertical distribution of capelin in a systematic way.

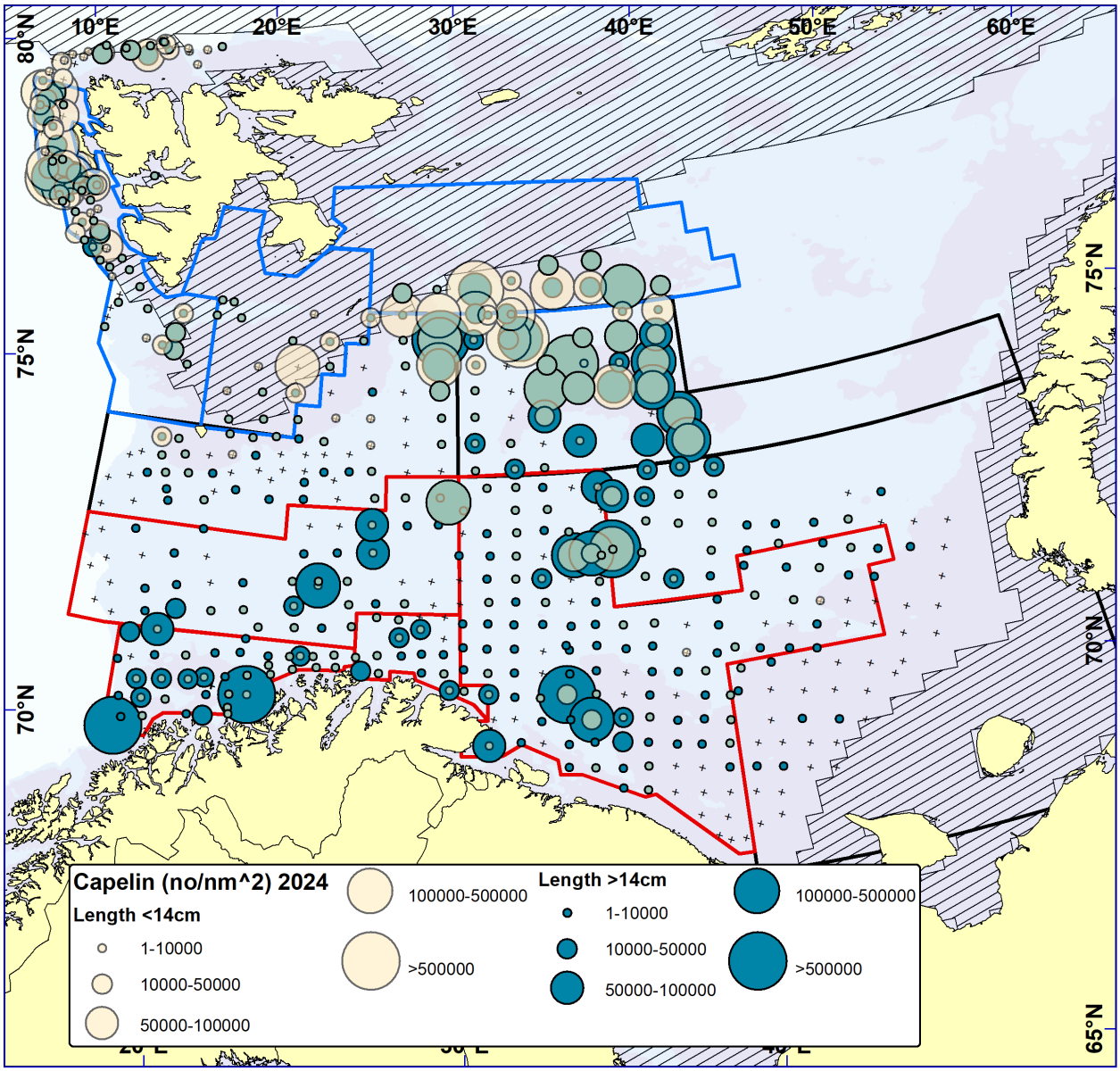

Figure 9.1. CAPELIN. Distribution in the trawl catches winter 2024 (number per nm2) for immature capelin (<14 cm; beige circles, appearing green when placed on top of blue) and maturing capelin (≥14 cm; blue circles). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

9.2. Polar cod

Polar cod are not well represented in the trawl hauls conducted during the winter surveys (Figure 9.2). This is because this endemic arctic species have a more northern and eastern distribution area in the Barents Sea. During this time of the year, polar cod are known to be spawning under the ice in the Pechora Sea and close to Novaya Zemlya. It is not clear whether the concentrations found in open water at this time of the year are maturing fish either on their way to spawning or from the spawning areas, or if this is immature fish. In 2024, the observed distribution of polar cod stretched almost along the entire ice edge and continued along the west and north coast of Svalbard. In 2023, the distribution was more concentrated with high catch rates in central areas.

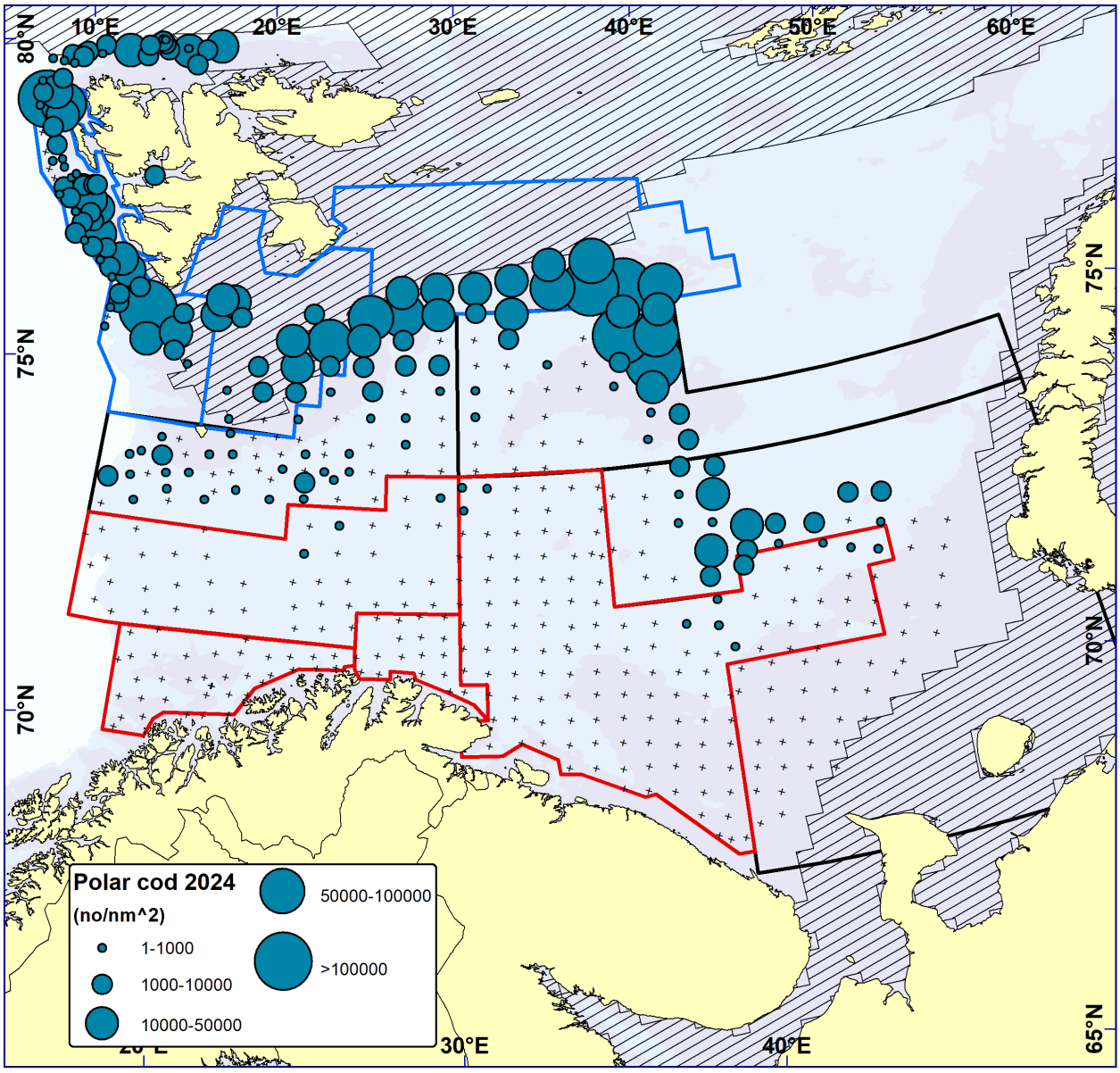

Figure 9.2 POLAR COD. Distribution in the trawl catches winter 2024 (number per nm2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

9.3. Blue whiting

Since the second part of the 1990s, blue whiting have shown a wider distribution than previously, and echo recordings have indicated higher abundance in the Barents Sea. Figure 9.3.1 shows the geographical distribution of the bottom trawl catch rates of blue whiting in 2024. Since the fish is mainly found pelagically, the bottom trawl does not reflect the real density distribution, but gives some indication of the distribution limits. Acoustic observations would better reflect the relative density distribution. The number of pelagic hauls has,

however, been too low to properly separate the pelagic recordings. During the years with high abundance of blue whiting, dense concentrations of blue whiting might have masked recordings of pelagic redfish, haddock and small cod.

Figure 9.3.2 and Table A9.1 shows the bottom trawl swept area estimates by 5 cm length groups for the years 1994-2024. High abundance of fish below 20 cm in several years, e.g., 2001, 2004, 2012, 2015, and 2021 reflects abundant recruiting year-classes (age 1). The distribution of blue whiting in the Barents Sea reflects mostly abundance of younger age groups, i.e., when there are strong year-classes coming into the stock they are seen in the winter survey in the Barents Sea as 1-group the year after. The 2014 year-class is very strong, and this is reflected in the survey in 2015 as fish smaller than 20 cm. 2020 and 2021 year-classes are also regarded as very strong.

Relatively high abundance of blue whiting was found in the extended survey area the last years, similar to the situation with abundant recruiting year-classes (Table A9.2). Table A9.3 presents estimates of coefficients of variation (%) by length groups. In most years, CVs for most length groups are above what could be considered as acceptable for stock assessment.

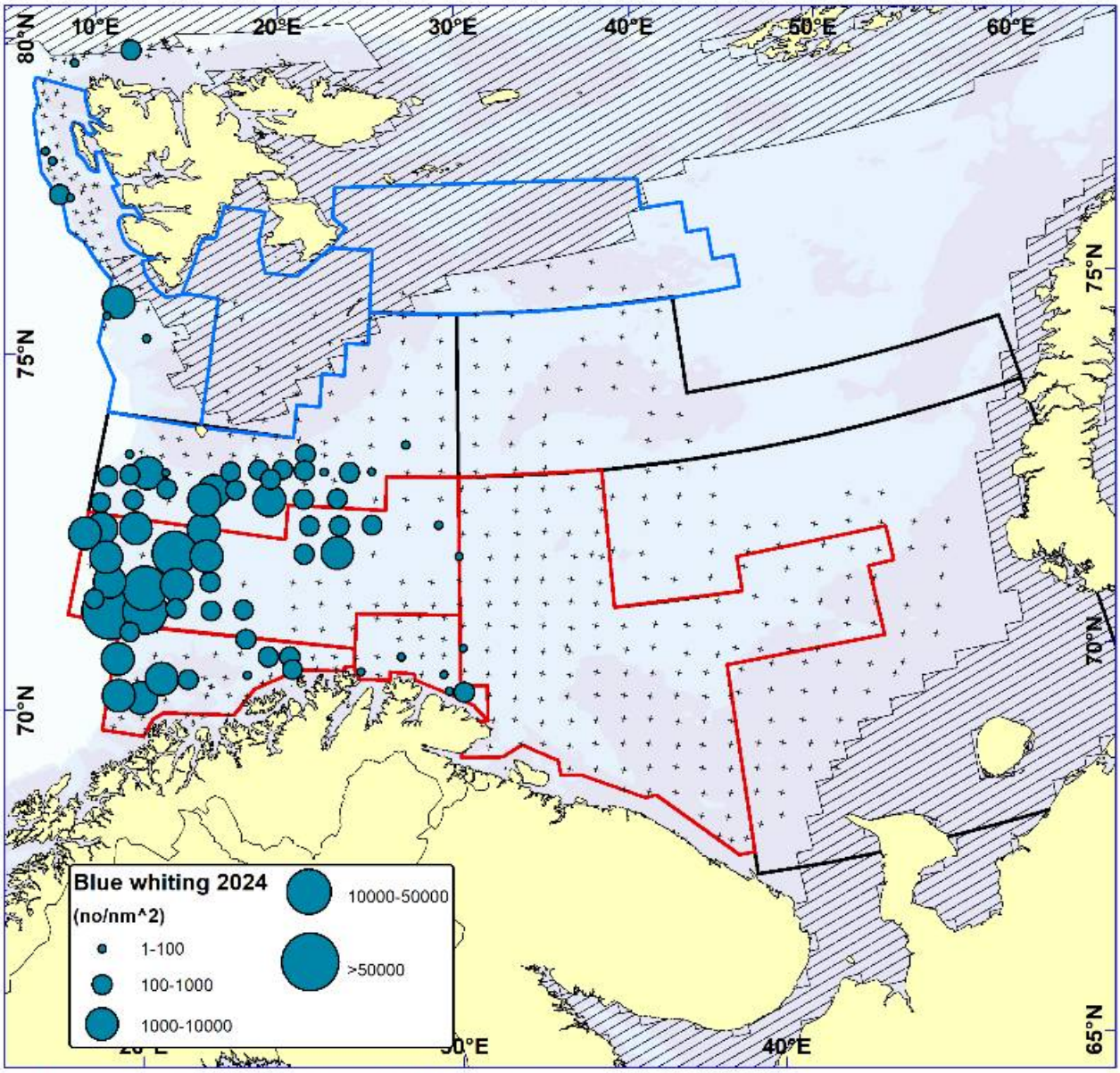

Figure 9.3.1 BLUE WHITING. Distribution in the trawl catches winter 2024 (number per nm 2). Black crosses indicate zero catches and the shaded area the ice coverage early in the survey.

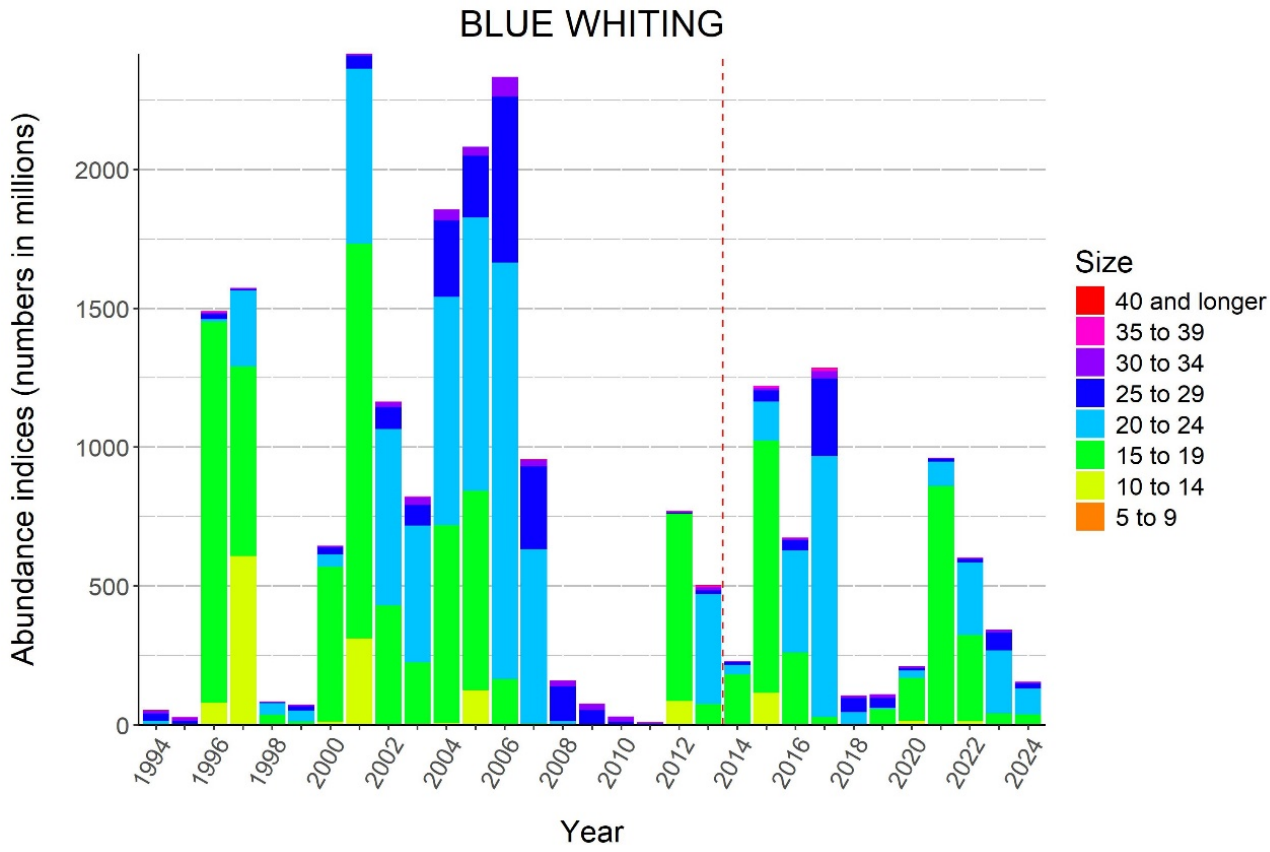

Figure 9.3.2 BLUE WHITING. Time series of total bottom trawl abundance at age for blue whiting (1994-2024). The dotted line separates the periods before and after the survey area was extended to include also area N.

10. References

Aglen, A. and Nakken, O. 1997. Improving time series of abundance indices applying new knowledge. Fisheries Research, 30: 17-26.

Aglen, A., Dingsør, G., Mehl, S., Murashko, P. and Wenneck, T. de L. 2012. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 21 January – 15 March 2012. WD #3 ICES Arctic Fisheries Working Group, Copenhagen, Denmark 20-26 April 2012.

Aschan, M. and Sunnanå, K. 1997. Evaluation of the Norwegian shrimp surveys conducted in the Barents Sea and Svalbard area 1980-1997. ICES C M 1997/Y:07. 24pp.

Bogstad, B., Fotland, Å. and Mehl, S. 1999. A revision of the abundance indices for cod and haddock from the Norwegian winter survey in the Barents Sea, 1983-1999. Working Document, ICES Arctic Fisheries Working Group, 23 August - 1 September 1999.

Dalen, J. and Nakken, O. 1983. On the application of the echo integration method. ICES CM 1983/B: 19, 30 pp.

Dalen, J. and Smedstad, O. 1979. Acoustic method for estimating absolute abundance of young cod and haddock in the Barents Sea. ICES CM 1979/G:51, 24pp.

Dalen, J. and Smedstad, O. 1983. Abundance estimation of demersal fish in the Barents Sea by an extended acoustic method. *In* Nakken, O. and S.C. Venema (eds.), Symposium on fisheries acoustics. Selected papers of the ICES/FAO Symposium on fisheries acoustics. Bergen, Norway, 21-24 June 1982. FAO Fish Rep., (300): 232-239.

Dickson, W. 1993a. Estimation of the capture efficiency of trawl gear. I: Development of a theoretical model. Fisheries Research 16: 239-253.

Dickson, W. 1993b. Estimation of the capture efficiency of trawl gear. II: Testing a theoretical model. Fisheries Research 16: 255-272.

Dolgov, A. V., Yaragina, N.A., Orlova, E.L., Bogstad, B., Johannesen, E., and Mehl, S. 2007. 20 th anniversary of the PINRO-IMR cooperation in the investigations of feeding in the Barents Sea – results and perspectives. Pp. 44-78 in ‘Long-term bilateral Russian-Norwegian scientific cooperation as a basis for sustainable management of living marine resources in the Barents Sea.’ Proceedings of the 12th Norwegian- Russian symposium, Tromsø, 21-22 August 2007. IMR/PINRO report series 5/2007, 212 pp.

Engås, A. 1995. Trålmanual Campelen 1800. Versjon 1, 17. januar 1995, Havforskningsinstituttet, Bergen. 16 s. (upubl.).

Engås, A. and Godø, O.R. 1989. Escape of fish under the fishing line of a Norwegian sampling trawl and its influence on survey results. Journal du Conseil International pour l'Exploration de la Mer, 45: 269-276

Engås, A. and Ona, E. 1993. Experiences using the constraint technique on bottom trawl doors. ICES CM 1993/B:18, 10pp.

Fall, J. 2020. NEA cod and haddock indices from the Barents Sea winter survey 2020. Working

Document # 10 Arctic Fisheries Working Group, ICES HQ (via webex), Copenhagen, Denmark, 16-22 April 2020

Foote, K.G. 1987. Fish target strengths for use in echo integrator surveys. Journal of the Acoustical Society of America, 82: 981-987.

Godø, O.R. and Sunnanå, K. 1992. Size selection during trawl sampling of cod and haddock and its effect on abundance indices at age. Fisheries Research, 13: 293-310.

ICES 2012. ICES. (Aglen, A., Bogstad, B., Dingsør, G.E., Gjøsæter, H., Hallfredsson, E.H., Mehl, S., Planque, B. et al.) 2012. Report of the Arctic Fisheries Working Group, ICES Headquarters, Copenhagen 20-26 April 2012. ICES CM 2012/ACOM: 05. 633 pp.

ICES. 2020. Benchmark Workshop for Demersal Species (WKDEM). ICES Scientific Reports. 2:31. 136 pp. http://doi.org/10.17895/ices.pub.5548

ICES. 2021. Benchmark Workshop for Barents Sea and Faroese Stocks (WKBARFAR). ICES Scientific Reports. 3:21. 2015 pp. https://doi.org/10.17895/ices.pub.7920

Jakobsen, T., Korsbrekke, K., Mehl, S. and Nakken, O. 1997. Norwegian combined acoustic and bottom trawl surveys for demersal fish in the Barents Sea during winter. ICES CM 1997/Y: 17, 26 pp.

Johannesen, E., Wenneck, T. de L., Høines, Å., Aglen, A., Mehl, S., Mjanger, H., Fotland, Å., Halland, T. I. and Jakobsen, T. 2009. Egner vintertoktet seg til overvåking av endringer i fiskesamfunnet i Barentshavet? En gjennomgang av metodikk og data fra 1981-2007. Fisken og Havet nr. 7/2009. 29s.

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 in Ecology and Evolution, 10(9), 1523-1528.

Jolly, G. M., & Hampton, I. (1990). A stratified random transect design for acoustic surveys of fish stocks. Canadian Journal of Fisheries and Aquatic Sciences, 47(7), 1282-1291.

Knudsen, H.P. 1990. The Bergen Echo Integrator: an introduction. - Journal du Conseil International pour l'Exploration de la Mer, 47: 167-174.

Korneliussen, R. J., Heggelund, Y., Macaulay, G. J., Patel, D., Johnsen, E., & Eliassen, I. K. (2016). Acoustic identification of marine species using a feature library. Methods in Oceanography, 17, 187-205.

Korsbrekke, K. 1996. Brukerveiledning for TOKT312 versjon 6.3. Intern program dokumentasjon., Havforskningsinstituttet, september 1996. 20s. (upubl.).

Korsbrekke, K., Mehl, S., Nakken, O. og Sunnanå, K. 1995. Bunnfiskundersøkelser i Barentshavet vinteren 1995. Fisken og Havet nr. 13 - 1995, Havforskningsinstituttet, 86 s.

MacLennan, D.N. and Simmonds, E.J. 1991. Fisheries Acoustics. Chapman Hall, London, England. 336pp.

Mehl, S., Aglen, A. and Johnsen, E. 2016. Re-estimation of swept area indices with CVs for main demersal fish species in the Barents Sea winter survey 1994-2016 applying the Sea2Data StoX software. Fisken og havet 10/2016. Institute of Marine Research, Bergen, Norway. 43 pp.

Mehl, S., Aglen, A., Johnsen, E. and Skålevik, Å. 2018. Estimation of acoustic indices with CVs for cod and haddock in the Barents Sea winter survey 1994 – 2017 applying the Sea2Data StoX software. Fisken og havet no. 5-2018. ISSN 0071-5638. Institute of Marine Research, Bergen, Norway. 29 pp.

Mehl, S. and Yaragina, N.A. 1992. Methods and results in the joint PINRO-IMR stomach sampling program. Pp. 5-16 in Bogstad, B. and Tjelmeland, S. (eds.): Interrelations between fish populations in the Barents Sea. Proceedings of the fifth PINRO-IMR Symposium, Murmansk, 12-16 August 1991. Institute of Marine Research, Bergen, Norway.

Mjanger, H., Svendsen, B.V., Fuglebakk, E., Skage, M.L., Diaz, J, Johansen, G.O., Vollen, T, Bruck, S. A., and Gundersen, S. 2021. Handbook for sampling fish, crustaceans and other invertebrates. Version 16.00. October 2021. Ref.id.: FOU.SPD.HB-05, Institute of Marine Research. 146 pp.

Totland, A. and Godø, OR. 2001. BEAM – an interactive GIS application for acoustic abundance estimation.

In T. Nishida, P.R. Kailola and C.E. Hollingworth (eds.): Proceedings of the First Symposium on Geographic Information System (GIS) in Fisheries Science. Fishery GIS Research Group. Saitama, Japan.

Appendix 1. Data tables

Table A1.3. *Area (NM2) covered in the bottom trawl surveys in the Barents Sea winter 1981-2024, 1994-2024 are StoX estimates.*

	Main Area									Extra- polated area
Year	**A**	**B**	**C**	**D**	**D'**	**E**	**S**	**N**	**Total excluding N**	
1981-92	23299	8372	5348	51116	-	-	-		88135	
1993	23929	8372	5348	51186	23152	8965	16690		137642	
1994	27180	9854	5165	53394	36543	11417	17557		161110	
1995	26797	9854	5165	53394	58605	13304	24783		191904	
1996	26182	9854	5165	53394	54047	5738	11809		166190	
1997[1]	27785	9854	5165	23964	2670	0	18932		88371	56200
1998[1]	27785	9854	5165	23964	5911	3829	23931		100440	51100
1999	27785	9854	5165	43230	8031	5742	18737		118545	
2000	27173	9854	5165	52314	29438	14207	25053		163204	
2001	26609	9854	5165	53394	29694	15777	24157		164652	
2002	26594	9854	5165	53394	21914	15757	24689		157369	
2003	26621	9897	5165	52072	23947	6259	23400		147361	
2004	27785	9854	5165	53394	42731	4739	20760		164428	
2005	27785	9854	5165	53394	39104	19931	24648		179883	
2006[2]	27785	9854	5165	53394	35302	13872	24691		170064	18100
2007[1]	27785	9854	5165	23911	8498	20822	27858		123894	56700
2008	27785	9854	5165	53394	23792	18873	26313		165176	
2009	27785	9854	5165	53394	31978	15739	27858		171774	
2010	27785	9854	5165	53394	17882	18562	27858		160501	
2011	27785	9854	5165	53394	33432	16835	27858		174324	
2012[2]	27785	9854	5165	53394	9917	17289	27858		151263	16700
2013	27785	9854	5165	53394	58183	21118	27858		203358	
2014[3]	27785	9854	5165	53394	54800	29897	27858	58048	208754	
2015	27785	9854	5165	53394	45449	26541	27858	47263	196047	
2016	27785	9854	5165	53526	29266	20342	27630	54387	173568	
2017[2]	27785	9854	5165	45493	12223	18524	27858	38786	146903	37460
2018	27785	9854	5165	53394	45193	23095	27630	44186	192117	
2019	27785	9854	5165	53394	56452	26788	27630	34035	207121	
2020[2]	27785	9854	5165	53394	47002	11475	26881	21614	181557	25148
2021[2]	27785	9854	5165	52848	33050	26897	27630	48777	183230	10933
2022	27785	9854	5165	53395	44972	26897	26095	27630	216297	

	Main Area									Extra- polated area
2023	27785	9854	5165	53394	60456	26897	27630	42069	220847	
2024	27785	9854	5165	53394	63546	26897	27630	39148	223937	

[1] Russian EEZ not covered. [2] Russian EEZ not completely covered (Strata 7 and 13 in 2006, Area D' in 2012, strata 7, 13, 15, 7 and 20 in 2017, strata 17, 19, and 20 in 2020, and strata 16, 19, and 20 in 2021). [3] Additional northern areas (N) covered from this year.

Table A2.1. *Number of fish measured for length (L) and age (A) in the Barents Sea winter survey 1994-2024.*

Year	Cod		Haddock		Golden redfish	Beaked redfish	Greenland halibut	Blue whiting	Capelin		Polar cod
	L	A	L	A	L	L	L	L	A	L	
1994	57290	3400	40608	1808	3157	12389	525				
1995	66264	3547	37775	1692	3785	9622	583				
1996	61559	3304	34497	1416	2510	10206	587				
1997	35381	2381	30054	1003	5429	10997	675				
1998	39044	2843	12512	859	1739	9664	649				
1999	22971	2321	12752	926	1266	6677	397				
2000	31543	2871	25881	1426	1161	8739	546		9172	1860	3702
2001	36789	2998	30921	1657	1173	7323	499		8079	2402	5955
2002	45399	3730	58464	2057	1143	6660	688		10643	2387	7283
2003	59573	2857	54838	1883	1102	4654	657		10390	1742	2510
2004	40851	3175	51705	1874	1438	5507	459		11633	1994	6080
2005	33582	3216	67921	2060	835	5166	832		12482	1892	6052
2006	19319	2683	23611	1899	728	3356	962		6851	2232	1362
2007	16556	2954	26610	2023	798	4544	973	4657	5475	1186	203
2008	26844	3809	50195	2490	897	8568	1020	1350	13772	886	3166
2009	22528	3486	40872	2433	455	9205	807	891	7636	776	617
2010	30209	4085	35881	2367	429	8564	984	626	12337	1189	551
2011	26913	3959	29180	2260	286	6885	607	105	11073	829	1492
2012	17139	3020	33524	1854	574	5721	354	2441	11047	1256	601
2013	14525	2451	19142	1671	479	6087	263	1091	15962	1591	3517
2014	22624	4501	35940	2586	563	9310	444	1846	32811	3647	6879
2015	25401	3795	18483	2038	395	8933	541	1991	15578	300	408
2016	16636	3368	25423	2067	614	8668	425	2396	11423	150	681
2017	12402	2851	15689	1955	576	8898	448	4799	5140	671	578
2018	42462	5178	43294	3307	1211	11500	548	1443	16219	788	876
2019	16217	5260	15967	3072	761	8981	413	886	13771	821	748
2020	19971	3770	11047	1641	1040	11853	711	866	16801	745	1569

Year	Cod		Haddock		Golden redfish	Beaked redfish	Greenland halibut	Blue whiting	Capelin		Polar cod
2021	13714	4020	15253	1950	810	11292	1076	1722	16179	1377	5567
2022	20294	4160	25161	2288	1176	9826	945	1520	18371	2072	4115
2023	11492	3472	27026	2960	696	9752	704	1571	12650	2483	793
2024	20846	4398	30125	2872	780	9448	1298	606	10667	800	2910

Table A2.2. *Number of age samples from cod by age in the Barents Sea winter survey 1994-2024. Year-age combinations with < 5 aged individuals are highlighted in yellow. Abundance indices are still presented for ages with < 5 age samples, but note the uncertainty level (c. f. tables A5.4 and A5.8). Biological parameters by age are presented for ages with a minimum of three age readings (c. f. tables A5.10-A5.13).*

Age/Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1994	283	354	392	652	571	363	124	54	37	16	19	3	2	-	-	-	-	-	-	-
1995	409	360	461	528	714	532	268	47	16	13	8	6	-	-	-	-	-	-	-	-
1996	304	564	359	400	462	584	384	108	23	8	6	5	3	1	-	-	-	-	-	-
1997	257	322	321	224	264	310	310	108	27	5	2	-	-	-	-	-	-	-	-	-
1998	331	311	445	425	220	242	257	193	39	6	3	-	1	-	2	-	-	-	-	-
1999	250	323	365	450	334	185	159	110	38	5	1	1	1	-	-	-	-	-	-	-
2000	256	365	470	491	578	340	119	66	50	12	4	2	1	-	-	-	-	-	-	-
2001	437	259	440	544	513	484	201	44	19	13	3	-	-	-	1	-	-	-	-	-
2002	162	650	478	661	607	506	345	90	16	7	3	-	-	-	1	-	-	-	-	-
2003	246	108	545	391	434	456	304	175	48	7	3	-	2	2	-	-	-	-	-	-
2004	311	493	260	599	368	407	387	254	87	17	6	1	1	-	-	-	-	-	-	-
2005	341	386	619	309	565	306	388	196	56	21	3	2	4	1	-	-	-	-	-	-
2006	291	364	423	521	234	430	194	162	68	18	6	3	-	-	-	-	-	-	-	-
2007	295	258	474	358	453	205	369	159	95	22	10	6	1	-	-	-	-	-	-	-
2008	169	366	676	866	471	532	246	300	72	17	2	1	1	-	-	-	-	-	-	-
2009	319	276	445	635	695	420	292	124	120	24	9	2	1	-	-	-	-	-	-	-
2010	429	369	292	489	571	745	371	247	93	64	25	2	2	3	-	-	1	-	-	-
2011	373	526	484	319	436	621	677	226	76	34	14	7	4	2	1	-	-	-	-	-
2012	275	214	319	330	198	303	504	415	100	47	25	10	9	2	1	1	-	-	-	-
2013	149	251	232	330	296	188	282	426	215	38	20	8	5	1	1	-	-	-	-	-
2014	414	301	571	387	415	341	186	368	308	89	18	12	4	1	2	1	-	-	-	-
2015	479	413	369	589	396	457	290	173	267	176	51	11	3	2	1	-	-	-	-	-
2016	235	529	405	484	678	437	418	323	164	178	86	20	15	3	3	1	1	-	-	-
2017	296	248	449	299	323	494	274	191	110	44	37	33	9	7	1	1	-	-	-	-
2018	508	762	592	901	438	491	673	338	186	91	45	51	23	4	4	3	1	-	-	-
2019	465	632	892	651	839	435	356	508	149	66	17	10	6	8	2	1	-	-	-	-

Age/Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2020	265	523	755	830	585	673	432	305	310	88	41	11	16	10	10	7	-	-	-	-
2021	270	235	537	630	683	503	445	226	145	103	32	12	6	1	6	3	-	-	-	1
2022	709	340	293	450	550	530	460	378	128	53	28	17	7	-	7	1	1	3	1	-
2023	396	602	348	301	416	475	439	253	143	41	12	5	3	-	-	2	2	-	-	-
2024	413	627	881	480	353	391	433	315	183	59	14	4	1	1				1		

Table A2.3. *Number of age samples from haddock by age in the Barents Sea winter survey 1994-2024. Year-age combinations with < 5 aged individuals are highlighted in yellow. Abundance indices are still presented for ages with < 5 age samples, but note the uncertainty level (c. f. tables A6.4 and A6.8). Biological parameters by age are presented for ages with a minimum of three age readings (c. f. tables A6.10-A6.13).*

Age/Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1994	212	192	250	432	219	40	4	5	8	5	13	1	-	-	-	-	-	-
1995	289	177	131	241	543	156	15	1	2	1	-	5	1	-	-	-	-	-
1996	225	236	155	106	228	343	52	9	-	1	-	2	1	-	-	-	-	-
1997	169	62	147	86	44	113	163	19	4	-	-	-	2	1	-	-	-	-
1998	151	178	68	147	74	38	73	112	12	1	1	-	-	-	2	1	-	-
1999	251	112	238	81	98	44	19	23	24	1	-	1	-	-	-	-	-	-
2000	327	321	138	344	64	72	16	3	20	9	2	1	1	-	-	-	-	-
2001	388	339	430	99	315	26	23	3	3	3	8	1	2	-	-	1	-	-
2002	445	354	382	450	84	123	19	7	1	2	5	3	2	-	-	-	-	-
2003	376	234	154	268	298	42	32	5	3	3	3	1	1	-	-	-	-	-
2004	303	464	254	232	277	251	50	22	7	4	3	1	2	3	-	-	-	-
2005	487	263	437	247	189	284	125	4	4	1	-	-	-	-	-	-	-	-
2006	458	516	141	356	166	108	104	45	4	2	-	2	-	-	1	1	-	-
2007	422	404	372	116	257	107	51	34	15	4	2	-	-	-	1	-	-	-
2008	317	525	584	470	168	237	46	23	8	1	2	1	-	-	-	-	-	-
2009	298	318	562	488	473	114	78	13	2	5	-	1	-	-	-	-	-	-
2010	448	190	272	519	462	294	41	19	8	7	2	2	-	-	-	-	-	-
2011	337	394	123	205	494	440	159	15	3	-	-	2	1	-	-	-	-	-
2012	355	112	338	58	116	408	291	73	4	6	1	3	-	-	-	-	-	-
2013	176	377	134	328	56	75	286	204	35	3	-	-	-	-	-	-	-	-
2014	449	116	455	98	202	57	96	202	90	11	4	-	-	1	-	-	-	-
2015	429	371	88	524	81	160	43	110	123	55	6	3	1	-	-	-	-	-
2016	430	282	430	99	452	88	126	87	175	129	39	6	-	2	2	1	-	-
2017	449	385	250	294	43	236	54	62	21	68	48	26	3	-	-	-	-	-
2018	704	696	596	372	424	62	160	45	44	35	56	48	19	3	-	-	-	-
2019	644	630	679	486	211	187	39	46	14	24	7	12	8	3	-	1	-	1
2020	219	359	498	622	339	141	80	22	16	10	8	13	15	10	1	-	-	-

Age/Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
2021	439	68	244	373	501	172	51	19	5	5	4	3	6	2	-	1	-	-
2022	618	301	68	243	305	437	99	16	4	4	6	-	-	2	-	-	-	-
2023	751	646	343	97	324	389	339	44	3	5	1	1	-	-	-	-	1	-
2024	739	553	628	266	60	207	187	124	5		2							

Table A5.1. *COD. Abundance indices (numbers in millions) for the main areas of the Barents Sea from acoustic survey winter 2024 estimated by StoX software. Bootstrap mean estimates.*

Age group																**Total**	**Biomass ('000 t)**
Area	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
A	3.09	2.08	8.74	3.03	1.38	1.68	2.48	1.23	0.67	0.15	0.00	0.00	0.00	0.00	0.00	24.52	26.7
B	0.82	0.62	5.31	7.43	3.08	5.66	9.83	9.51	7.25	2.72	0.15	0.05	0.00	0.05	0.00	52.48	157.6
C	0.71	1.07	4.36	1.21	0.51	0.45	0.61	0.58	0.22	0.05	0.09	0.02	0.00	0.00	0.00	9.89	11.6
D	15.75	16.34	37.37	14.50	5.96	5.82	4.76	2.57	1.15	0.46	0.08	0.02	0.00	0.00	0.00	104.78	71.5
D'	2.59	15.07	11.68	4.43	2.38	1.17	1.44	0.66	0.56	0.03	0.00	0.00	0.00	0.00	0.01	40.01	19.7
E	39.22	48.98	16.15	2.50	1.40	0.90	0.97	0.99	0.16	0.00	0.00	0.00	0.00	0.00	0.00	111.25	19.8
S	81.56	37.34	24.77	7.41	4.16	5.15	2.88	1.66	0.27	0.13	0.00	0.00	0.00	0.00	0.00	165.33	41.2
N	184.69	79.48	42.35	10.47	10.47	6.48	5.29	1.62	1.01	0.28	0.11	0.03	0.02	0.00	0.00	342.32	74.1
ABCD	20.37	20.11	55.77	26.17	10.94	13.60	17.68	13.89	9.30	3.38	0.32	0.09	0.00	0.05	0.00	191.67	267.4
AN	328.44	200.98	150.72	50.97	29.34	27.31	28.25	18.83	11.29	3.82	0.43	0.12	0.02	0.05	0.01	850.58	422.2

Table A5.2. *COD. Abundance indices (numbers in millions) from acoustic surveys in the Barents Sea winter 1994-2024 estimated by StoX software. Area N included from 2014 onwards. Bootstrap mean estimates.*

Age group																Total	Biomass ('000 t)[4]
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+		
1994	902.64	624.38	323.88	374.47	205.53	70.24	13.00	3.59	2.60	0.71	1.15	0.11	0.13	0.00	0.00	2522.43	1060.26
1995	2175.25	212.29	137.74	139.49	197.08	66.38	15.73	2.43	0.91	0.32	0.48	0.17	0.00	0.00	0.00	2948.27	665.14
1996	1826.33	271.71	99.40	89.62	111.34	82.96	22.17	2.22	0.30	0.10	0.07	0.05	0.10	0.01	0.00	2506.38	504.47
1997[1]	1698.49	565.31	158.57	44.22	49.91	40.91	23.48	5.02	0.84	0.27	0.09	0.00	0.00	0.01	0.00	2587.12	346.39
1998[1]	2523.56	475.15	391.16	189.79	44.87	41.22	27.85	16.06	1.81	0.50	0.04	0.00	0.00	0.00	0.06	3712.07	563.03
1999	364.84	231.51	147.62	130.29	52.03	11.93	6.94	4.13	1.47	0.24	0.01	0.03	0.01	0.00	0.00	951.05	262.81
2000	153.42	262.81	294.83	167.25	145.55	50.75	11.33	4.70	2.75	0.85	0.18	0.11	0.03	0.00	0.00	1094.56	545.52
2001	363.55	51.45	177.44	160.63	80.80	44.47	11.10	1.73	0.46	0.19	0.08	0.00	0.00	0.00	0.01	891.91	435.40
2002	19.22	209.10	61.37	106.23	98.78	52.18	20.07	2.90	0.32	0.52	0.09	0.00	0.00	0.00	0.02	570.8	428.50
2003	1505.00	52.53	306.71	116.80	124.62	116.52	37.69	10.05	1.93	0.31	0.07	0.00	0.08	0.07	0.00	2272.38	755.03
2004	161.20	117.19	33.41	85.21	32.96	28.03	18.14	5.33	1.16	0.31	0.08	0.00	0.01	0.00	0.00	483.03	244.57
2005	499.71	138.66	125.03	33.28	65.94	21.21	15.02	4.95	1.01	0.25	0.05	0.07	0.05	0.03	0.00	905.26	259.70
2006[2]	411.21	157.95	64.77	53.82	18.35	29.52	9.50	4.90	1.28	0.20	0.13	0.30	0.00	0.00	0.00	751.93	227.27
2007[1]	85.13	47.09	58.49	30.40	29.35	9.04	18.07	6.41	2.67	0.53	0.24	0.07	0.00	0.00	0.00	287.49	213.63
2008	50.87	94.20	199.85	288.71	116.17	72.91	21.82	14.43	2.80	0.81	0.04	0.01	0.01	0.00	0.00	862.63	822.87
2009	204.90	25.46	107.83	182.54	138.08	41.48	13.87	4.69	4.32	0.50	0.14	0.02	0.01	0.00	0.00	723.84	536.93
2010	620.25	43.56	22.82	87.98	160.16	154.39	44.56	14.57	3.90	2.89	0.94	0.11	0.12	0.09	0.01	1156.35	885.82
2011	266.00	91.00	40.36	28.32	65.20	106.97	101.80	19.76	6.11	1.70	0.92	0.25	0.15	0.09	0.02	728.65	787.82
2012[3]	496.49	40.23	82.79	49.38	33.77	72.53	132.31	65.59	8.37	4.39	1.21	0.66	0.47	0.04	0.10	988.33	969.09

Age group																Total	Biomass (‘000 t)
2013	313.11	89.17	60.55	84.49	72.18	47.75	98.41	130.54	55.32	5.41	4.02	1.30	0.73	0.20	0.07	963.25	1494.33
2014	1758.58	211.04	286.89	124.18	111.14	74.47	39.41	89.89	61.31	22.64	2.56	1.31	0.16	0.05	0.19	2783.82	1437.38
2015	1903.54	211.41	138.71	235.58	128.80	140.36	80.55	35.07	53.80	24.38	7.91	0.80	0.13	0.05	0.01	2961.1	1469.58
2016	240.80	201.89	56.29	76.91	119.38	64.84	50.17	25.80	13.49	17.83	7.35	2.15	0.72	0.22	0.10	877.94	873.17
2017[3]	439.40	73.30	111.54	42.35	44.25	65.30	35.75	24.31	11.97	4.00	2.88	3.15	0.67	0.19	0.11	859.17	680.62
2018	2057.60	280.29	109.03	149.94	53.40	54.93	66.09	34.35	10.78	6.27	1.73	2.25	1.50	0.15	0.23	2828.54	883.80
2019	1437.21	362.38	203.63	125.42	144.06	60.98	34.99	37.86	9.64	3.47	0.55	0.32	0.18	0.28	0.24	2421.21	842.03
2020[3]	92.68	157.92	117.32	117.32	81.36	90.60	42.35	26.57	21.41	6.23	1.75	0.67	0.66	0.51	0.89	758.24	809.18
2021[3]	45.92	28.51	64.86	59.08	55.48	38.54	30.80	12.41	6.32	4.67	2.17	0.29	0.18	0.00	0.21	349.45	400.67
2022	524.71	43.42	29.42	52.98	56.69	47.05	42.94	27.77	7.85	2.44	1.51	0.94	0.18	0.00	0.28	838.17	519.36
2023	244.43	103.24	28.66	26.54	33.54	33.83	23.81	12.62	7.08	1.58	0.33	0.11	0.04	0.00	0.08	515.90	319.74
2024	328.44	200.98	150.72	50.97	29.34	27.31	28.25	18.83	11.29	3.82	0.43	0.12	0.02	0.05	0.01	850.58	422.36

[1] Indices raised to also represent the Russian EEZ.

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

[3] Indices raised to also represent uncovered parts of the Russian EEZ.

[4] 1994-2020: bootstrap mean biomass estimated based on relationship between (unraised) numbers-at-age and biomass-at-age from StoX baseline run. From 2021: bootstrap mean biomass estimated directly in StoX; in years with adjustments for lack of coverage it is estimated based on relationship between unraised bootstrap mean numbers-at-age and unraised bootstrap mean biomass-at-age.

Table A5.3. *COD. Abundance indices (numbers in millions) for new strata 24-26 from acoustic surveys in the Barents Sea winter 2014-2024 estimated by StoX software. 2014-2020: baseline estimates, from 2021: bootstrap mean estimates.*

Age group																Total	Biomass ('000 t)
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
2014	1112.50	53.97	54.53	11.67	14.62	7.31	2.26	4.73	2.98	0.27	0.02	0.00	0.00	0.00	0.00	1264.87	103.44
2015	589.67	88.32	25.22	49.00	12.68	11.24	5.34	1.08	3.40	1.16	0.77	0.05	0.00	0.00	0.00	787.93	122.36
2016	104.90	84.60	17.95	14.58	16.83	2.47	2.94	1.86	0.30	0.67	0.17	0.02	0.01	0.00	0.00	247.30	60.15
2017	31.09	28.70	26.54	5.44	5.68	4.13	1.54	0.65	0.24	0.05	0.28	0.04	0.00	0.00	0.00	104.37	40.15
2018	514.18	50.59	16.17	16.74	6.96	4.35	8.64	0.99	0.76	0.25	0.08	0.12	0.01	0.00	0.00	619.85	76.08
2019	371.39	75.30	20.87	27.74	20.56	7.98	3.63	5.27	0.42	0.44	0.14	0.04	0.01	0.03	0.00	533.82	112.10
2020	12.66	13.01	16.05	11.60	12.75	7.53	3.10	1.87	2.67	0.44	0.25	0.09	0.06	0.00	0.08	82.15	71.84
2021	3.35	1.85	4.11	6.72	4.13	3.70	1.61	0.45	0.20	0.21	0.01	0.01	0.00	0.00	0.01	26.36	24.23
2022	135.8	14.0	10.4	12.1	9.16	4.19	2.53	1.13	0.21	0.08	0.04	0.00	0.01	0.00	0.01	189.6	40.6
2023	179.0	32.1	6.28	6.32	7.62	7.53	2.69	1.51	0.60	0.07	0.00	0.02	0.00	0.00	0.00	243.7	49.7
2024	184.69	79.48	42.35	10.47	10.47	6.48	5.29	1.62	1.01	0.28	0.11	0.03	0.02	0.00	0.00	342.32	74.1

Table A5.4 . *COD. Estimates of coefficients of variation (%) for acoustic abundance indices. Barents Sea winter 1994-2024.*

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1994	30	41	29	12	7	10	13	19	20	29	29	69	89	-
1995	14	24	15	9	7	8	12	23	26	35	54	50	-	-
1996	11	15	14	10	10	11	14	16	29	43	58	54	100	110
1997[1]	33	29	14	11	10	10	8	13	22	54	63	-	-	129
1998[1]	23	18	11	9	10	8	8	11	22	36	45	-	101	-
1999	22	23	17	15	10	11	11	13	25	58	114	121	107	-
2000	31	26	17	10	7	10	17	21	22	42	72	68	110	-
2001	13	15	11	9	10	9	13	22	32	36	78	-	-	-
2002	18	16	10	6	7	10	15	17	32	78	73	-	-	-
2003	26	31	15	13	8	8	13	17	20	40	59	-	99	94
2004	18	16	13	10	10	10	9	13	16	45	58	95	125	-
2005	26	49	19	14	14	14	12	20	26	24	62	90	49	91
2006[2]	24	14	11	8	8	10	16	18	19	37	61	66	-	-
2007[1]	27	24	14	14	11	17	21	24	27	36	42	44	92	-
2008	18	24	15	16	13	10	16	14	20	44	75	65	100	-
2009	21	20	26	22	18	17	13	14	19	32	45	71	112	-
2010	36	17	19	25	17	12	11	13	17	22	28	86	74	70
2011	13	27	12	11	11	10	9	15	28	29	35	39	66	86

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2012[2]	36	14	53	11	19	19	17	13	19	35	33	55	52	81
2013	15	21	13	9	11	11	14	11	18	35	44	55	66	108
2014	15	10	11	10	13	8	11	11	14	21	30	53	59	96
2015	27	22	15	15	10	14	18	21	19	29	48	55	63	70
2016	36	20	13	13	11	15	17	16	23	23	32	46	55	87
2017[2]	15	19	12	11	10	8	11	14	21	22	19	25	31	58
2018	11	9	9	9	9	8	8	13	15	24	24	33	53	51
2019	12	12	8	7	6	11	12	10	14	23	32	55	49	60
2020[2]	15	15	10	7	10	11	15	16	18	23	29	38	31	38
2021[2]	32	42	34	21	13	13	17	16	20	20	29	44	69	175
2022	20	25	20	17	11	11	19	21	31	36	48	52	74	-
2023	30	14	13	13	12	11	9	11	16	22	43	71	72	-
2024	20	13	10	12	11	14	17	23	31	36	37	71	99	113

[1] REZ not covered

[2] REZ partly covered

Table A5.5. *COD. Abundance indices from bottom trawl hauls for main areas of the Barents Sea winter 2024 (numbers in millions). Bootstrap mean estimates.*

Age group																Total	Biomass ('000 t)
Area	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
A	4.37	3.43	12.98	5.19	1.83	2.63	3.29	1.91	0.93	0.19	0.00	0.00	0.00	0.00	0.00	36.75	39.0
B	0.27	0.17	2.10	2.06	0.68	1.12	2.89	2.68	2.69	1.25	0.06	0.01	0.00	0.01	0.00	15.99	49.4
C	0.80	0.81	5.41	1.23	0.47	0.43	0.71	0.50	0.27	0.03	0.11	0.02	0.00	0.00	0.00	10.79	12.2
D	19.58	20.31	44.47	19.10	6.88	6.32	5.22	2.70	1.18	0.49	0.08	0.03	0.00	0.00	0.00	126.35	83.0
D'	6.44	33.18	34.92	14.44	7.08	3.49	5.23	2.24	2.02	0.20	0.00	0.00	0.00	0.00	0.06	109.32	66.5
E	35.80	74.44	19.42	2.88	1.85	1.05	0.96	1.17	0.16	0.00	0.00	0.00	0.00	0.00	0.00	137.72	23.9
S	73.78	62.82	30.10	9.92	5.29	8.37	4.31	3.32	0.48	0.18	0.00	0.00	0.00	0.00	0.00	198.59	62.9
N	236.87	111.88	49.32	8.49	12.11	6.54	5.62	1.63	1.17	0.33	0.13	0.04	0.02	0.00	0.00	434.13	82.2
ABCD	25.01	24.72	64.96	27.58	9.87	10.51	12.10	7.79	5.07	1.96	0.25	0.06	0.00	0.01	0.00	189.89	183.7
AN	377.90	307.04	198.71	63.31	36.21	29.96	28.22	16.15	8.90	2.68	0.37	0.10	0.02	0.01	0.06	1069.64	419.1

Table A5.6. *COD. Abundance indices (numbers in millions) from bottom trawl surveys in the Barents Sea winter 1994-2024. Area N included from 2014 onwards. Bootstrap mean estimates.*

Age group																Total	Biomass ('000 t)
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
1994	1043.78	556.68	293.92	307.04	153.33	45.72	7.95	2.61	1.48	0.55	0.55	0.08	0.05	0	0	2413.74	763.41
1995	5356.43	541.25	282.84	242.36	251.01	76.42	17.98	2.42	1.07	0.50	0.61	0.19	0	0	0	6773.08	937.79
1996	5899.23	791.62	163.08	117.43	138.59	108.88	24.43	2.64	0.37	0.17	0.12	0.07	0.07	0.02	0	7246.72	718.00
1997[1]	5044.09	1422.92	317.99	68.44	74.26	59.99	26.67	4.85	0.64	0.91	0.08	0	0	0	0	7020.84	558.85
1998[1]	2490.54	496.48	355.10	166.94	31.67	26.15	17.52	8.16	0.79	0.52	0.04	0	0	0	0.04	3593.95	432.77
1999	473.04	350.21	188.48	180.75	61.39	12.71	6.81	5.14	1.01	0.26	0.02	0.04	0.02	0	0	1279.88	322.68
2000	128.57	242.33	245.81	130.03	111.73	26.75	4.56	1.84	1.21	0.33	0.10	0.03	0.02	0	0	893.31	363.23
2001	712.77	78.03	182.79	195.11	82.90	37.96	9.45	1.17	0.44	0.19	0.04	0	0	0	0.01	1300.86	436.57
2002	34.11	418.73	118.36	137.56	108.95	45.79	14.40	2.20	0.32	0.18	0.05	0	0	0	0.02	880.67	447.43
2003	3022.23	65.78	376.70	126.31	93.93	66.88	17.50	4.67	1.02	0.17	0.04	0	0.02	0.02	0	3775.27	546.13
2004	322.87	242.94	63.88	184.62	53.46	43.24	30.59	6.85	1.65	0.28	0.07	0.01	0.01	0	0	950.47	415.07
2005	853.43	216.67	248.88	55.06	102.97	22.38	16.36	3.81	0.92	0.30	0.04	0.02	0.04	0.04	0	1520.92	359.76
2006[2]	674.21	289.39	116.49	115.38	28.32	43.42	13.72	5.24	1.36	0.24	0.18	0.18	0	0	0	1288.13	334.94
2007[1]	594.69	369.74	361.13	127.73	68.51	13.65	23.60	6.82	2.30	0.41	0.11	0.10	0	0	0	1568.79	444.84
2008	68.83	101.96	194.37	300.59	111.90	40.24	17.34	8.11	1.79	0.36	0.03	0.02	0.01	0	0	845.55	686.98
2009	389.48	35.59	126.28	196.70	220.23	60.69	17.90	9.02	5.24	0.51	0.17	0.03	0.04	0	0	1061.88	757.32
2010	1027.59	95.14	36.81	114.25	154.80	144.50	39.56	11.24	3.67	1.60	0.58	0.04	0.02	0.04	0.02	1629.86	827.36
2011	617.18	225.81	85.40	50.37	129.70	138.66	103.51	16.37	4.36	1.20	0.82	0.19	0.14	0.04	0.02	1373.77	891.44
2012[3]	702.97	100.30	75.72	64.59	33.71	90.69	132.58	48.61	9.02	2.26	0.88	0.55	0.44	0.07	0.05	1262.44	879.93
2013	435.72	142.96	68.84	114.09	63.18	40.43	64.54	76.38	33.52	2.22	2.87	0.40	0.35	0.06	0.03	1045.59	951.73

Age group																Total	Biomass (‘000 t)
2014	1245.71	191.48	226.85	93.79	88.59	56.39	32.74	53.05	36.19	9.81	1.01	0.95	0.15	0.02	0.08	2036.81	897.87
2015	1642.00	342.76	144.07	228.25	147.29	113.53	74.43	29.22	53.51	18.08	3.38	0.75	0.12	0.07	0.04	2797.50	1338.73
2016	312.16	305.57	99.37	135.48	188.31	113.47	72.33	28.56	13.17	16.06	6.77	0.97	0.52	0.17	0.14	1293.05	1085.06
2017[3]	644.51	128.92	179.25	62.15	84.54	90.16	37.82	26.33	8.18	3.26	2.61	3.70	0.58	0.17	0.06	1272.24	753.67
2018	2714.35	500.69	139.41	184.78	61.81	64.17	73.88	25.88	9.28	5.87	1.29	2.46	1.23	0.13	0.37	3785.60	908.45
2019	1790.57	559.44	281.57	179.15	221.90	79.65	32.96	38.31	8.15	2.62	0.54	0.24	0.16	0.18	0.12	3195.56	974.96
2020[3]	164.75	273.82	237.73	160.24	131.56	114.88	49.83	24.26	20.44	4.53	1.66	0.93	0.51	0.26	0.73	1186.13	857.96
2021[3]	80.88	34.87	111.50	119.35	112.31	54.28	37.98	13.57	7.27	3.53	1.25	0.42	0.25	0.04	0.32	577.83	528.35
2022	667.82	65.64	51.98	88.68	86.60	66.51	44.60	30.42	5.70	2.29	2.08	1.49	0.16	0.00	0.90	1114.9	634.0
2023	305.40	163.06	41.21	39.82	46.52	43.17	32.24	14.26	7.49	1.58	0.34	0.14	0.06	0.00	0.14	695.4	458.72
2024	377.9	307.04	198.71	63.31	36.21	29.96	28.22	16.15	8.9	2.68	0.37	0.1	0.02	0.01	0.06	1069.4	419.08

[1] Indices raised to also represent the Russian EEZ.

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

[3] Indices raised to also represent uncovered parts of the Russian EEZ.

[4] 1994-2020: bootstrap mean biomass estimated based on relationship between (unraised) numbers-at-age and biomass-at-age from StoX baseline run. From 2021: bootstrap mean biomass estimated directly in StoX; in years with adjustments for lack of coverage it is estimated based on relationship between unraised bootstrap mean numbers-at-age and unraised bootstrap mean biomass-at-age.

Table A5.7. *COD. Abundance indices (numbers in millions) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024. Bootstrap mean estimates.*

Age group															Total	Biomass (‘000 t)
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**	

Age group																Total	Biomass (‘000 t)
2014	713.08	77.53	42.89	18.72	15.38	9.93	2.90	5.31	3.65	0.55	0.06	0.01	0.00	0.00	0.00	890.00	117.15
2015	403.27	85.44	26.44	46.50	20.73	11.77	5.27	1.82	2.47	1.44	0.45	0.06	0.00	0.00	0.00	605.64	129.79
2016	101.28	92.79	27.21	24.25	28.17	9.40	5.58	2.52	0.61	0.96	0.35	0.05	0.02	0.00	0.00	293.19	109.39
2017	182.91	49.50	60.34	27.67	28.94	31.41	10.26	3.29	0.60	0.26	0.33	0.08	0.00	0.00	1.72	397.32	187.18
2018	1010.90	115.27	29.03	42.62	13.37	11.59	14.39	4.05	1.55	0.40	0.19	0.24	0.03	0.00	0.00	1243.61	170.48
2019	493.52	119.15	40.37	33.55	42.75	12.63	6.88	8.39	1.43	0.61	0.14	0.08	0.02	0.06	0.00	759.60	190.84
2020	25.44	30.50	36.58	33.77	22.46	21.42	8.16	4.32	3.99	0.85	0.44	0.06	0.11	0.00	0.09	188.20	162.34
2021	31.98	12.50	22.74	32.50	26.64	14.80	7.51	1.66	1.13	0.86	0.04	0.08	0.00	0.00	0.02	152.45	115.76
2022	158.91	18.08	15.83	22.22	21.53	9.86	6.33	3.96	0.58	0.26	0.15	0.00	0.02	NA	0.03	257.76	99.69
2023	215.0	41.5	7.82	9.03	9.40	9.45	2.37	1.88	0.77	0.11	0.00	0.02	0.00	0.00	0.00	297.3	60.6
2024	236.87	111.88	49.32	8.49	12.11	6.54	5.62	1.63	1.17	0.33	0.13	0.04	0.02	0.00	0.00	434.13	82.2

Table A5.8. *COD. Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea winter 1994-2024.*

Age group															
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1994	7	15	10	10	10	9	13	24	23	25	18	72	69	-	-
1995	8	14	11	12	10	10	12	23	33	27	42	39	-	-	-
1996	7	12	19	10	12	9	13	13	25	40	50	39	48	92	-
1997[1]	27	29	17	14	13	10	9	15	21	56	70	-	-	-	-
1998[1]	8	12	15	11	11	11	8	10	17	48	61	-	95	-	68
1999	18	28	17	14	9	10	14	29	22	62	106	95	91	-	-
2000	12	18	15	8	9	10	12	11	15	32	55	65	84	-	-
2001	11	15	17	14	10	11	16	23	28	36	57	-	-	-	96

Age group															
2002	13	23	24	7	9	13	9	14	26	40	63	-	-	-	93
2003	25	33	26	19	8	7	10	12	17	40	55	-	71	69	-
2004	12	13	19	14	10	12	14	12	14	36	40	106	101	-	-
2005	9	18	27	20	18	14	11	10	16	23	61	66	49	94	-
2006[2]	12	13	14	27	17	13	21	12	17	27	55	63	-	-	-
2007[1]	25	21	16	25	7	10	10	14	19	19	34	47	84	-	-
2008	9	16	16	23	31	9	37	14	25	24	70	83	99	-	-
2009	10	10	16	11	19	13	16	23	22	31	33	61	91	-	-
2010	33	10	13	19	13	10	21	11	22	21	25	71	57	60	-
2011	6	24	11	15	16	10	9	10	26	19	48	36	58	64	99
2012[2]	9	14	13	12	15	20	20	12	24	19	23	39	52	76	100
2013	10	19	14	17	12	10	12	10	17	21	55	34	43	102	94
2014	11	9	10	11	11	7	16	12	11	19	26	33	61	117	68
2015	7	19	12	13	15	16	27	21	40	16	21	28	74	71	82
2016	9	11	15	11	8	17	19	11	15	25	20	33	31	53	52
2017[2]	10	11	12	14	26	15	19	23	11	18	20	26	43	37	96
2018	6	14	7	9	8	12	8	12	12	29	20	34	48	46	48
2019	8	8	9	9	16	16	12	8	14	15	24	35	40	35	82
2020[2]	14	10	13	16	11	11	12	10	12	14	21	52	29	39	30
2021[2]	15	10	16	11	10	12	10	16	15	13	24	38	68	91	46
2022	7	12	22	21	15	10	16	18	15	27	58	72	41	-	91
2023	23	9	11	11	10	9	9	10	20	18	39	45	62	-	-
2024	10	13	8	12	11	8	8	8	21	21	28	47	99	90	-

[1] REZ not covered.

[2] REZ partly covered.

Table A5.9. *COD. Survey mortality from surveys in the Barents Sea winter 1994-2024.*

	Age							
Year	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**	**7-8**	**8-9**
	Acoustic investigations							
1994-95	1.45	1.51	0.84	0.64	1.13	1.50	1.68	1.37
1995-96	2.08	0.76	0.43	0.23	0.87	1.10	1.96	2.09
1996-97	1.17	0.54	0.81	0.59	1.00	1.26	1.49	0.97
1997-98	1.27	0.37	-0.18	-0.01	0.19	0.38	0.38	1.02
1998-99	2.39	1.17	1.10	1.29	1.32	1.78	1.91	2.39
1999-00	0.33	-0.24	-0.12	-0.11	0.02	0.05	0.39	0.41
2000-01	1.09	0.39	0.61	0.73	1.19	1.52	1.88	2.32
2001-02	0.55	-0.18	0.51	0.49	0.44	0.80	1.34	1.69
2002-03	-1.01	-0.38	-0.64	-0.16	-0.17	0.33	0.69	0.41
2003-04	2.55	0.45	1.28	1.27	1.49	1.86	1.96	2.16
2004-05	0.15	-0.06	0.00	0.26	0.44	0.62	1.30	1.66
2005-06	1.15	0.76	0.84	0.60	0.80	0.80	1.12	1.35
2006-07	2.17	0.99	0.76	0.61	0.71	0.49	0.39	0.61
2007-08	-0.10	-1.45	-1.60	-1.34	-0.91	-0.88	0.22	0.83
2008-09	0.69	-0.14	0.09	0.74	1.03	1.66	1.54	1.21
2009-10	1.55	0.11	0.20	0.13	-0.11	-0.07	-0.05	0.18
2010-11	1.92	0.08	-0.22	0.30	0.40	0.42	0.81	0.87

	Age							
2011-12	1.89	0.09	-0.20	-0.18	-0.11	-0.21	0.44	0.86
2012-13	1.72	-0.41	-0.02	-0.38	-0.35	-0.31	0.01	0.17
2013-14	0.39	-1.17	-0.72	-0.27	-0.03	0.19	0.09	0.76
2014-15	2.12	0.42	0.20	-0.04	-0.23	-0.08	0.12	0.51
2015-16	2.24	1.32	0.59	0.68	0.69	1.03	1.14	0.96
2016-17	1.19	0.59	0.28	0.55	0.60	0.60	0.72	0.77
2017-18	0.45	-0.40	-0.30	-0.23	-0.22	-0.01	0.04	0.81
2018-19	1.74	0.32	-0.14	0.04	-0.13	0.45	0.56	1.27
2019-20	2.21	1.13	0.55	0.43	0.46	0.36	0.28	0.57
2020-21	1.41	0.93	0.73	0.79	0.77	1.11	1.26	1.54
2021-22	0.06	-0.03	0.20	0.04	0.16	-0.11	0.10	0.46
2022-23	1.63	0.42	0.1	0.46	0.52	0.68	1.22	1.37
2023-24	0.20	-0.38	-0.58	-0.10	0.21	0.18	0.23	0.11
	Bottom trawl investigations							
1994-95	0.66	0.68	0.19	0.20	0.70	0.93	1.19	0.89
1995-96	1.91	1.20	0.88	0.56	0.84	1.14	1.92	1.88
1996-97	1.42	0.91	0.87	0.46	0.84	1.41	1.62	1.42
1997-98	2.32	1.39	0.64	0.77	1.04	1.23	1.18	1.81
1998-99	1.96	0.97	0.68	1.00	0.91	1.35	1.23	2.09
1999-00	0.67	0.35	0.37	0.48	0.83	1.03	1.31	1.45
2000-01	0.50	0.28	0.23	0.45	1.08	1.04	1.36	1.43
2001-02	0.53	-0.42	0.28	0.58	0.59	0.97	1.46	1.30
2002-03	-0.66	0.11	-0.07	0.38	0.49	0.96	1.13	0.77

	Age							
2003-04	2.52	0.03	0.71	0.86	0.78	0.78	0.94	1.04
2004-05	0.40	-0.02	0.15	0.58	0.87	0.97	2.08	2.01
2005-06	1.08	0.62	0.77	0.66	0.86	0.49	1.14	1.03
2006-07	0.60	-0.22	-0.09	0.52	0.73	0.61	0.70	0.82
2007-08	1.76	0.64	0.18	0.13	0.53	-0.24	1.07	1.34
2008-09	0.66	-0.21	-0.01	0.31	0.61	0.81	0.65	0.44
2009-10	1.41	-0.03	0.10	0.24	0.42	0.43	0.47	0.90
2010-11	1.52	0.11	-0.31	-0.13	0.11	0.33	0.88	0.95
2011-12	1.82	1.09	0.28	0.40	0.36	0.04	0.76	0.60
2012-13	1.59	0.38	-0.41	0.02	-0.18	0.34	0.55	0.37
2013-14	0.82	-0.46	-0.31	0.25	0.11	0.21	0.20	0.75
2014-15	1.29	0.28	-0.01	-0.45	-0.25	-0.28	0.11	-0.01
2015-16	1.68	1.24	0.06	0.19	0.26	0.45	0.96	0.80
2016-17	0.88	0.53	0.47	0.47	0.74	1.10	1.01	1.25
2017-18	0.25	-0.08	-0.03	0.01	0.28	0.20	0.38	1.04
2018-19	1.58	0.58	-0.25	-0.18	-0.25	0.67	0.66	1.16
2019-20	1.88	0.86	0.56	0.31	0.66	0.47	0.31	0.63
2020-21	1.55	0.90	0.69	0.36	0.89	1.11	1.30	1.21
2021-22	0.21	-0.40	0.23	0.32	0.52	0.20	0.22	0.87
2022-23	1.41	0.47	0.27	0.65	0.70	0.72	1.14	1.40
2023-24	-0.01	-0.20	-0.43	0.09	0.44	0.43	0.69	0.47

Table A5.10 *COD. Mean length (cm) at age from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimates. "+" indicates few samples (< 3), while "–" indicates no samples. Lengths are not adjusted for incomplete coverage.*

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1994	11.3	17.9	30.2	44.6	55.2	65.7	73.9	78.9	87.4	97.2	97.6	104.7	+	-
1995	12.2	18.1	29.0	42.2	53.9	63.9	75.4	80.4	85.9	99.1	90.1	109.0	-	-
1996	12.1	18.8	28.8	40.5	49.4	60.9	71.8	85.1	92.4	94.9	96.1	104.2	103.9	+
1997[1]	10.8	16.9	29.7	41.0	50.6	59.4	69.6	81.2	92.3	80.4	+	-	-	-
1998[1]	10.5	17.8	30.8	40.9	50.9	58.5	67.7	76.7	87.2	103.0	111.4	-	+	-
1999	12.0	18.4	29.0	40.0	50.4	59.4	70.4	78.4	88.5	87.6	+	+	+	-
2000	12.8	20.7	28.4	39.7	51.5	61.4	70.4	76.3	84.9	84.3	100.0	+	+	-
2001	11.6	22.6	33.0	41.2	52.2	63.3	70.4	78.3	86.0	95.7	104.7	-	-	-
2002	12.0	19.6	28.9	43.6	52.1	61.9	71.4	79.5	91.2	89.7	103.7	-	-	-
2003	11.4	18.1	29.1	39.7	53.4	61.7	70.6	80.8	89.1	90.1	105.4	-	+	+
2004	10.6	18.4	31.7	40.6	51.7	61.6	68.6	79.7	90.9	90.4	92.2	+	+	-
2005	11.2	18.3	29.5	43.4	51.1	60.4	71.0	79.6	89.0	96.4	109.3	+	129.6	+
2006[2]	12.0	19.4	30.9	42.1	53.8	60.3	66.7	76.7	84.9	98.9	95.4	84.9	-	-
2007[1]	13.2	20.7	29.6	41.1	52.8	62.5	70.4	78.2	87.5	92.7	101.8	121.6	+	-
2008	12.1	22.3	33.0	43.2	51.8	64.0	69.9	81.3	88.7	95.3	+	+	+	-
2009	11.2	21.1	32.1	42.6	53.2	61.9	76.6	81.8	89.5	97.8	99.5	+	+	-
2010	11.2	18.4	31.4	42.7	52.4	60.7	70.5	80.4	88.8	96.3	102.2	+	+	126.0
2011	11.9	19.5	29.4	41.9	51.0	60.7	68.1	78.3	86.1	95.4	102.2	110.4	114.3	+
2012[2]	10.6	18.4	29.7	41.0	52.4	58.1	66.5	75.6	86.0	91.8	105.9	114.0	119.0	+
2013	11.2	19.3	31.1	41.1	51.7	62.0	69.7	76.5	81.2	95.3	93.7	110.7	110.8	+
2014	9.7	17.1	29.5	40.5	52.0	59.6	70.2	76.8	81.8	87.1	97.4	98.9	107.8	+
2015	10.5	15.9	30.0	40.3	51.1	60.2	68.8	77.5	81.2	88.7	94.0	101.9	127.5	+
2016	12.2	18.3	27.7	40.6	49.8	60.5	68.3	76.6	85.5	86.5	90.5	94.1	112.0	122.5

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2017[2]	12.3	22.2	31.2	42.5	51.2	60.5	69.6	75.5	85.2	90.9	96.0	92.6	108.6	108.7
2018	11.2	19.1	32.7	42.4	51.2	61.6	69.0	77.5	83.4	87.6	97.0	99.3	101.8	106.8
2019	11.7	17.5	31.2	42.4	51.0	59.6	69.7	77.0	84.1	87.1	99.3	103.4	104.6	109.8
2020[2]	12.0	17.5	25.5	39.5	50.2	58.6	66.7	74.8	83.0	90.0	93.9	92.4	111.2	113.9
2021[2]	11.6	19.9	26.5	37.4	48.0	58.5	66.7	74.9	84.0	91.7	97.7	102.1	105.8	+
2022	10.8	20.4	32.4	39.1	49.3	58.4	68.7	75.3	84.1	92.5	98.2	102.6	113.2	-
2023	11.4	19.7	32.3	42.2	50.0	59.1	67.6	75.9	81.7	86.8	104.2	104.1	115.6	-
2024	11.3	18.1	30.9	42.2	50.7	59.6	66.7	76.0	80.4	85.9	96.6	99.5	+	+

[1] REZ not covered.

[2] REZ partly covered.

Table A5.11. *COD. Mean weight (g) at age from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimates. "+" indicates few samples (< 3), while "–" indicates no samples. Weights are not adjusted for incomplete coverage.*

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1994	13	56	262	796	1470	2386	3481	4603	6777	8195	8516	13972	+	-
1995	15	54	240	658	1336	2207	3570	4715	5712	8816	6817	12331	-	-
1996	15	62	232	627	1084	1980	3343	5514	7722	8873	9613	12865	12556	+
1997[1]	13	52	230	638	1175	1797	2931	4875	7529	5739	+	-	-	-
1998[1]	11	52	280	635	1182	1728	2588	4026	6076	11257	14391	-	+	-
1999	14	59	231	592	1178	1829	2991	4128	6321	7342	+	+	+	-
2000	16	74	210	558	1210	1963	3036	3867	5401	6154	10023	+	+	-
2001	14	106	336	646	1288	2233	3088	4439	5732	8442	11429	-	-	-
2002	14	67	238	747	1229	2063	3199	4578	7525	6598	12292	-	-	-

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2003	13	61	234	597	1316	2014	2989	4715	6517	7500	12812	-	+	+
2004	11	59	275	608	1143	1947	2623	4137	6673	7368	8109	+	+	-
2005	13	61	246	723	1146	1866	2949	4226	6436	8646	12537	+	24221	-
2006[2]	13	69	280	669	1420	1970	2641	4260	5914	10179	9439	8328	-	-
2007[1]	19	73	235	639	1302	2190	3039	4411	6394	8056	10826	20104	+	-
2008	15	90	335	798	1399	2442	3235	5210	6981	9641	+	+	+	-
2009	13	83	294	704	1302	2065	4067	5087	6874	9460	9511	+	+	-
2010	12	64	304	700	1296	2033	3162	4743	6562	8984	10315	+	+	22766
2011	15	66	246	668	1131	1940	2726	4013	5969	8275	10309	13159	14868	+
2012[2]	13	62	252	609	1276	1681	2489	3764	5920	7809	12199	15006	17582	+
2013	11	65	269	602	1208	2055	2809	3843	4822	8447	9101	15108	14743	+
2014	8	50	246	603	1226	1780	2866	3930	4927	6203	8570	9566	12239	+
2015	10	44	242	602	1221	1929	2741	4043	4804	6817	7759	11544	21652	+
2016	13	53	200	593	1049	1928	2674	3830	5540	6129	7110	8272	15256	21945
2017[2]	15	102	292	720	1178	1972	3056	3962	5901	7429	9301	8599	12958	14894
2018	12	69	320	688	1228	2062	2803	4154	5409	6632	9156	10510	11810	12443
2019	12	48	273	685	1164	1870	2916	3974	5394	6068	9637	11507	12371	13993
2020[2]	14	44	153	548	1077	1692	2476	3625	5074	6758	8040	8107	14892	15793
2021[2]	14	68	164	462	910	1682	2484	3620	5379	7160	9313	10923	12410	+
2022	11	77	311	535	1052	1716	2885	3855	5321	7751	9538	11432	14940	-
2023	12	71	316	694	1111	1757	2802	4097	5119	6443	10937	10668	14732	-
2024	12	57	278	701	1133	1855	2571	3834	4994	5931	8809	10805	+	+

[1] REZ not covered.

[2] REZ partly covered.

***Table A5.12**. COD. Yearly weight increment (g) from bottom trawl surveys in the Barents Sea winter 1994-2024.*

Year\Age	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
1994-95	41	184	396	540	737	1184	1234	1109	2039
1995-96	47	178	387	426	644	1136	1944	3007	3161
1996-97	37	168	406	548	713	951	1532	2015	-1983
1997-98	39	228	405	544	553	791	1095	1201	3728
1998-99	48	179	312	543	647	1263	1540	2295	1266
1999-00	60	151	327	618	785	1207	876	1273	-167
2000-01	90	262	436	730	1023	1125	1403	1865	3041
2001-02	53	132	411	583	775	966	1490	3086	866
2002-03	47	167	359	569	785	926	1516	1939	-25
2003-04	46	214	374	546	631	609	1148	1958	851
2004-05	50	187	448	538	723	1002	1603	2299	1973
2005-06	56	219	423	697	824	775	1311	1688	3743
2006-07	60	166	359	633	770	1069	1770	2134	2142
2007-08	71	262	563	760	1140	1045	2171	2570	3247
2008-09	68	204	369	504	666	1625	1852	1664	2479
2009-10	51	221	406	592	731	1097	676	1475	2110
2010-11	54	182	364	431	644	693	851	1226	1713
2011-12	47	186	363	608	550	549	1038	1907	1840
2012-13	52	207	350	599	779	1128	1354	1058	2527
2013-14	39	181	334	624	572	811	1121	1084	1381
2014-15	36	192	356	618	703	961	1177	874	1890

Year\Age	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
2015-16	43	156	351	447	707	745	1089	1497	1325
2016-17	89	239	520	585	923	1128	1288	2071	1889
2017-18	54	218	396	508	884	831	1098	1447	731
2018-19	36	204	365	476	642	854	1171	1240	659
2019-20	32	105	275	392	528	606	709	1100	1364
2020-21	54	120	309	362	605	792	1144	1754	2086
2021-22	63	243	371	590	806	1203	1371	1701	2372
2022-23	60	239	383	576	705	1086	1212	1264	1122
2023-24	45	207	385	439	744	814	1032	897	812

Table A5.13. *COD. Proportion mature at age from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimate. The proportion mature is the number of fish classified as maturity category 2 and 3, divided by the total number of fish assigned categories 1-3.*

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1994	0.00	0.00	0.00	0.00	0.06	0.14	0.31	0.71	0.92	1.00	0.83	1.00	+	-
1995	0.00	0.00	0.00	0.01	0.05	0.26	0.32	0.51	0.85	0.91	1.00	1.00	-	-
1996	0.00	0.00	0.00	0.00	0.01	0.16	0.33	0.51	1.00	1.00	1.00	1.00	1.00	+
1997	0.00	0.00	0.00	0.00	0.01	0.08	0.38	0.80	1.00	0.83	+	-	-	-
1998	0.00	0.00	0.00	0.01	0.04	0.18	0.33	0.64	0.84	1.00	-	+	-	-
1999	-	0.00	0.00	0.00	0.01	0.12	0.37	0.70	0.88	+	+	+	-	+
2000	0.00	0.00	0.00	0.00	0.05	0.28	0.85	0.86	1.00	1.00	+	+	-	+
2001	0.00	0.00	0.00	0.01	0.05	0.27	0.43	0.70	0.91	1.00	-	-	-	-
2002	-	0.00	0.00	0.01	0.04	0.29	0.47	0.56	0.87	1.00	-	-	-	-
2003	-	0.00	0.00	0.00	0.05	0.21	0.40	0.69	0.94	1.00	-	+	+	-
2004	-	0.00	0.00	0.01	0.05	0.25	0.53	0.72	0.87	0.88	+	+	-	+

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2005	0.00	0.00	0.00	0.00	0.04	0.18	0.49	0.80	0.92	1.00	1.00	+	1.00	-
2006	0.00	0.00	0.00	0.03	0.05	0.20	0.39	0.74	0.72	1.00	1.00	1.00	-	-
2007	0.00	0.00	0.00	0.01	0.05	0.33	0.57	0.84	0.98	1.00	1.00	1.00	+	-
2008	0.00	0.00	0.01	0.01	0.12	0.32	0.54	0.74	0.82	1.00	1.00	+	+	-
2009	0.00	0.00	0.00	0.00	0.08	0.25	0.49	0.64	0.91	0.96	0.86	+	+	-
2010	-	0.00	0.01	0.01	0.10	0.37	0.50	0.79	0.89	0.95	0.93	+	+	1.00
2011	0.00	0.00	0.00	0.00	0.03	0.22	0.43	0.54	0.84	0.88	1.00	1.00	1.00	+
2012	0.00	0.00	0.00	0.00	0.09	0.21	0.42	0.67	0.85	0.93	1.00	1.00	1.00	+
2013	0.00	0.00	0.00	0.00	0.01	0.11	0.40	0.69	0.79	0.98	0.95	1.00	1.00	+
2014	0.00	0.00	0.00	0.00	0.03	0.10	0.41	0.76	0.87	0.97	0.98	0.96	1.00	+
2015	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.65	0.91	0.97	0.95	1.00	1.00	+
2016	0.00	0.00	0.00	0.00	0.00	0.04	0.16	0.54	0.78	0.95	0.95	1.00	1.00	1.00
2017	0.00	0.00	0.00	0.02	0.00	0.09	0.34	0.65	0.89	1.00	1.00	0.97	1.00	1.00
2018	0.00	0.00	0.00	0.00	0.02	0.13	0.32	0.56	0.84	0.96	1.00	0.97	0.97	1.00
2019	0.00	0.00	0.00	0.00	0.01	0.12	0.34	0.76	0.89	0.86	0.95	1.00	1.00	1.00
2020	0.00	0.00	0.00	0.00	0.01	0.11	0.29	0.63	0.82	0.89	1.00	1.00	1.00	1.00
2021	0.00	0.01*	0.00	0.00	0.00	0.14	0.33	0.58	0.84	0.95	0.96	1.00	1.00	+
2022	0.00	0.00	0.02	0.00	0.00	0.06	0.39	0.63	0.66	0.96	1.00	0.96	1.00	-
2023	0.00	0.00	0.01	0.03	0.03	0.07	0.42	0.73	0.91	0.88	1.00	1.00	1.00	-
2024	0.00	0.00	0.00	0.01	0.02	0.13	0.40	0.71	0.98	1.00	1.00	1.00	1.00	1.00

* Based on one sample only.

Table A5.14. *Number of stations and stomachs sampled, % empty stomachs, and mean stomach fullness by length group in the Barents Sea winter 1984-2023.*

		no. stomachs sampled				% empty stomachs				mean stomach fullness			
Year	**Stations**	**<20 cm**	**20-34 cm**	**35-49 cm**	**>=50 cm**	**<20 cm**	**20-34 cm**	**35-49 cm**	**>=50 cm**	**<20 cm**	**20-34 cm**	**35-49 cm**	**>=50 cm**
1984	31	176	288	242	381	18.8	14.9	5.0	4.5	1.59	2.05	1.80	1.46
1985	49	106	494	582	612	44.3	34.0	19.8	20.6	1.55	3.58	4.46	3.43
1986	73	231	309	398	427	43.3	32.4	26.9	19.0	0.73	2.48	2.90	2.94
1987	52	133	415	501	409	32.3	48.9	45.3	48.9				
1988	79	29	418	844	704	34.5	40.2	31.6	29.7	1.01	1.29	0.91	0.84
1989	82	82	378	890	1132	40.2	21.2	16.3	20.6	1.45	2.28	2.12	1.47
1990	60	177	300	450	870	39.0	22.7	18.4	16.4	1.84	2.18	2.01	1.60
1991	70	271	463	450	1107	40.6	25.5	11.3	9.5	0.95	2.28	3.73	4.27
1992	100	229	382	471	922	65.9	45.8	31.4	38.2	1.79	3.15	3.05	1.92
1993	117	139	393	570	1073	76.3	38.4	21.2	26.7	1.86	3.34	2.99	3.05
1994	138	296	370	580	1163	64.9	34.9	25.0	24.3	0.76	2.04	2.00	1.63
1995	161	452	517	638	1482	52.2	36.4	32.0	30.8	1.16	1.39	0.93	0.80
1996	254	483	507	540	1338	55.7	39.1	28.0	27.4	0.92	1.32	1.38	1.02
1997	149	305	337	358	1105	57.0	34.1	20.7	29.5	0.98	1.60	1.81	1.48
1998	197	496	492	564	1042	64.7	48.2	29.3	28.6	2.20	1.93	1.67	1.22
1999	211	310	471	554	849	61.3	38.6	27.4	25.9	2.11	1.90	2.06	1.76
2000	243	413	645	669	1069	53.8	28.7	21.2	21.1	1.36	1.98	2.41	1.74
2001	361	644	728	884	1485	72.4	42.3	29.3	32.2	2.32	2.98	3.33	2.79
2002	345	393	704	799	1423	69.2	42.8	30.9	30.9	1.57	2.78	2.36	1.88
2003	285	325	499	637	1468	61.5	39.5	22.6	24.4	5.55	2.78	2.55	2.28
2004	329	508	525	663	1522	51.8	37.9	24.1	27.6	1.94	2.02	1.76	1.55
2005	335	509	651	648	1423	43.6	34.7	26.5	25.4	2.29	2.22	1.79	1.65

		no. stomachs sampled				% empty stomachs				mean stomach fullness			
2006	259	402	464	534	1059	59.2	42.5	21.9	24.5	1.80	1.88	2.56	1.80
2007	273	386	483	592	1341	60.6	45.3	30.7	30.1	1.68	1.87	1.83	1.50
2008	326	260	733	933	1655	61.9	38.5	26.0	23.0	1.94	2.42	2.93	2.19
2009	319	385	547	798	1657	56.1	35.1	22.3	23.9	1.57	1.89	2.02	1.58
2010	360	594	552	748	2079	51.5	38.6	23.0	25.5	1.83	2.19	2.72	2.49
2011	359	515	628	506	1821	56.7	37.7	17.2	23.9	2.08	2.06	2.47	2.49
2012	297	373	408	431	1626	42.6	27.5	13.9	21.0	1.80	2.45	2.28	1.67
2013	279	209	352	425	1435	44.0	28.4	12.7	17.2	1.49	2.25	2.36	1.93
2014	434	570	686	686	2004	42.8	26.7	18.4	19.8	1.59	2.17	2.11	1.33
2015	356	664	562	670	1735	45.8	29.9	20.1	23.1	1.53	2.09	1.96	1.59
2016	387	427	616	728	1971	52.5	32.0	25.4	24.2	1.51	1.92	2.03	1.56
2017	293	339	465	529	1416	46.0	35.5	28.5	28.2	1.90	1.99	1.66	1.50
2018	432	638	850	935	2086	44.8	28.1	19.4	17.5	1.50	2.07	2.29	1.74
2019	506	787	974	1095	2302	46.1	29.6	19.1	17.2	1.60	1.95	2.04	1.87
2020	458	633	952	992	2369	38.1	28.2	18.2	18.0	1.71	1.98	2.33	2.16
2021	447	385	824	899	1842	49.1	23.1	12.7	16.5	2.53	1.71	1.80	2.05
2022	467	824	543	787	1953	52.5	31.1	17.7	14.3	2.90	2.12	2.30	1.75
2023	417	625	572	602	1634	44.3	20.5	12.0	13.8	2.02	2.60	3.17	2.33

Table A5.15. *Mean stomach content composition (% of total SFI) of cod ≤ 19 cm from the survey in the Barents Sea winter 1984-2023.*

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1984	1.2	7.7	37.5	4.5	13.3						35.8			
1985	15.5	7.9	27.9	44.4										4.3

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1986	14.3	3.8	34.0	14.4	15.2									18.3
1987	24.8	17.7	10.9	0.2	25.4		21.0							
1988	3.5	19.2		64.3							13.0			
1989	41.1	27.9		31.0										
1990	5.5	14.2	38.4	3.7	3.8						3.2			31.2
1991	12.2	18.7	6.9	8.4	53.8									
1992	3.7	3.8	6.9	54.3	17.7									13.6
1993	35.3	59.0		5.7										
1994	19.1	40.8	10.9	11.6										17.6
1995	12.9	6.7	33.9	3.5	7.4		27.8		6.2					1.6
1996	16.3	25.4	15.0	27.4	9.4									6.5
1997	23.3	35.9	26.5	0.3										14.0
1998	20.9	30.3	17.2	12.4	16.9							2.3		
1999	9.9	18.4	34.0	6.5		18.0	13.2							
2000	3.3	57.1	17.8	0.0	17.3									4.5
2001	7.0	31.2	10.1	10.7	26.8	8.6								5.6
2002	15.0	32.1	21.1	13.9	17.9									
2003	1.6	80.0	10.4	1.4	6.6									
2004	11.0	44.7	5.9	9.1	14.3	4.2	10.8							
2005	17.2	22.8	16.2	0.3	35.8									7.7
2006	9.7	49.9	7.8	20.5	12.1									
2007	6.0	74.6	6.1	0.5	11.6							1.2		
2008	7.3	47.6	31.3	8.7	0.7							0.3		4.1

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
2009	4.7	61.4	1.9	8.8	18.1									5.1
2010	3.5	41.7	1.4	1.6	48.2						0.7			2.9
2011	1.5	24.8	14.6	4.0	29.6						8.2			17.3
2012	4.7	20.2	8.5	4.0	53.0									9.6
2013	2.2	66.2		17.8										13.8
2014	8.9	42.6	12.7	8.9	26.8									0.1
2015	2.8	44.8	10.6	13.6	22.1									6.1
2016	15.7	39.7	9.6	5.6	21.5									7.9
2017	12.7	6.9	1.0	38.0	0.9						31.0			9.5
2018	9.0	43.9	11.2	9.6	19.0									7.3
2019	7.5	34.9	13.9	9.8	27.7								2.2	4.0
2020	10.4	53.9	4.4	9.1	13.2				2.2			1.4		5.4
2021	6.0	45.2	8.4	2.5	31.7							2.1	4.1	
2022	2.7	37.3		7.6	49.9									2.5
2023	7.7	26.7	4.6	11.1	45.7	1.9								2.3

Table A5.16. *Mean stomach content composition (% of total SFI) of cod 20-34 cm from the survey in the Barents Sea winter 1984-2023.*

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1984	0.1	0.1	21.0	2.7	40.2		8.1				26.3	0.2		1.3
1985	0.2	0.1	17.0	2.0	69.2	9.3				1.1	0.2			0.9
1986	2.0	1.1	5.9	2.8	56.2	7.0				0.8	23.3			0.9
1987	0.5	1.9	25.2	0.3	53.7				6.6		11.4			0.4
1988	0.9	0.2	20.7	7.0	52.9						18.3			

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1989	11.9	7.1	9.0	5.6	33.2		5.4		1.6		25.4	0.5		0.3
1990	0.6	0.5	18.5	0.7	66.7						8.4			4.6
1991	0.1	0.2	4.3	0.2	92.5						2.0			0.7
1992	0.4	0.8	6.4	1.2	88.1				0.4		2.5			0.2
1993	0.1	0.6	8.1	0.3	78.4	5.9	3.8		0.9	1.1	0.1			0.7
1994	1.2	10.2	8.3	1.7	54.9	14.2	4.8		1.7		1.2			1.8
1995	1.4	1.5	9.4	1.8	45.8		10.8	0.6	13.3	3.4	9.3			2.7
1996	1.9	0.5	13.6	1.3	48.9		5.3		24.9		1.8	0.3	0.8	0.7
1997	1.1	3.4	17.6	1.6	42.6		1.2	5.4	10.0					17.1
1998	2.2	2.6	23.5	1.6	47.8	3.4			10.3			5.6		3.0
1999	2.3	4.0	24.5	3.4	45.6	13.5	0.8		3.2	2.7				
2000	0.7	8.0	14.2	0.3	59.4	4.2	5.3		3.6	2.1		0.1		2.1
2001	0.9	2.8	8.5	2.8	69.4	4.7	5.6		4.0					1.3
2002	0.5	1.6	12.2	2.9	71.2	0.7	7.0			1.9				2.0
2003	0.5	2.4	7.3	0.7	71.9	14.4			2.1			0.1	0.5	0.1
2004	2.1	5.2	9.7	1.9	60.6	5.9	6.4		1.9	4.2				2.1
2005	0.6	2.3	12.0	0.9	61.2	3.6	7.7		5.7				4.9	1.1
2006	1.4	1.5	11.8	3.2	66.6	1.6	2.8	2.1		3.4			4.9	0.7
2007	2.3	4.8	15.0	7.3	58.8	0.1				7.7	3.7			0.3
2008	0.5	3.8	11.1	4.7	63.3		3.5			2.4	4.2	1.0		5.5
2009	0.5	6.6	8.8	5.6	71.2		2.4		1.5		0.2			3.2
2010	0.7	5.2	7.4	1.8	74.2	1.0			6.4		2.2			1.1
2011	0.9	3.3	8.3	3.7	74.3				1.1		6.0	0.1	1.1	1.2

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
2012	0.4	2.6	7.2	2.3	77.1	0.4			7.7					2.3
2013	0.3	7.2	10.4	3.4	68.0		2.1		4.3		0.3	0.1		3.9
2014	2.6	3.5	6.3	5.8	74.7	1.7			1.5	0.1				3.8
2015	0.9	2.4	9.8	3.4	75.9				3.7	1.6		0.3		2.0
2016	2.7	5.8	9.1	6.0	65.2					3.7	0.7			6.8
2017	0.4	3.3	7.8	4.6	67.0	1.7				4.5	2.0	6.7		2.0
2018	1.2	6.5	4.9	6.5	64.6	3.0			7.8	1.7	0.1		2.0	1.7
2019	0.6	4.4	9.2	9.1	64.7	0.5			7.6	1.4				2.5
2020	2.8	12.4	7.4	7.0	64.5				1.4	0.5	0.7	0.4		2.9
2021	2.2	14.1	16.2	10.3	42.1		2.6				4.3	0.9		7.3
2022	0.8	8.4	8.0	3.4	56.1	0.4	5.1		13	0.2	1	0.5		3.1
2023	0.7	2.2	8.5	5.9	68.7	10.1			1.0		0.2	0.1	1.2	1.4

Table A5.17. *Mean stomach content composition (% of total SFI) of cod 35-49 cm from the survey in the Barents Sea winter 1984-2023.*

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1984	0.5		18.2	1.3	41.5				0.7	2.6	34.5	0.1	0.6	
1985	0.5		4.7	0.2	88.7	4.2			0.5	0.2	0.9			0.1
1986	0.8	2.5	6.8	3.6	58.4	12.4					15.3			0.2
1987	0.5	0.2	22.9	1.7	47.9	9.2	1.8		4.4	2.0	5.5		3.8	0.1
1988	1.0	1.9	29.1	6.3	51.2			1.5			8.8			0.2
1989	4.1	1.8	11.3	3.3	50.2		7.9		0.2		18.6	0.8	0.2	1.6
1990	0.1	0.1	7.4	1.6	84.8	2.0				1.3	2.5		0.2	
1991	0.1	0.1	1.8	0.6	94.0					1.5	1.2	0.1		0.6

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1992		0.1	3.3	3.7	79.7	9.1			0.3	0.3	1.2		1.7	0.6
1993	0.1	0.2	6.0	0.6	85.4	5.6	0.5		0.2	0.4		0.2	0.8	
1994	0.9	14.2	6.9	1.2	48.9	13.5	9.1		2.2	0.4	0.3			2.4
1995	0.9	0.6	12.8	2.2	44.7	6.2	1.2		17.9	8.6	4.7			0.2
1996	1.8	0.7	10.0	2.2	21.6	1.5	2.1	5.5	37.4	6.7	2.5		6.9	1.1
1997	0.9	0.3	14.8	4.3	40.3		5.2	3.6	17.1	3.7	0.5	0.1	1.2	8.0
1998	1.1	0.4	23.2	6.8	50.3	8.5	1.2	1.8	4.1	1.5	0.8			0.3
1999	0.3	0.4	28.0	1.8	44.9	12.0	2.4		1.9	5.7	0.5	0.1	0.4	1.6
2000	0.9	0.3	8.2	0.6	83.5	4.1	0.4		0.7	0.3				1.0
2001	0.4	0.2	6.3	3.3	73.6	5.2	7.3	1.4	1.1	0.5		0.3		0.4
2002	0.2	0.6	10.4	4.2	68.3	2.3	4.8	0.8	3.2	3.9		0.5	0.4	0.4
2003	0.3	1.1	8.2	1.6	68.4	11.1	1.2	0.2	2.7	4.9				0.3
2004	0.9	1.6	14.5	4.5	61.7	6.5	2.3	1.0	4.1	1.5			1.0	0.4
2005	0.7	0.7	13.7	2.1	58.3	3.1	3.6	1.9	0.2	13.2		0.3	1.4	0.8
2006	0.1	0.2	13.1	1.5	64.8	2.0	1.3	1.6	1.1	12.7		0.2	0.3	1.1
2007	3.5	0.8	18.7	2.4	47.6	7.8		0.2	1.1	13.1	0.4	0.4	3.3	0.7
2008	0.3	0.9	11.7	1.3	71.9	2.7	7.4			0.9	1.1	0.3	0.4	1.1
2009	0.8	1.7	6.9	6.9	75.9	1.8	2.4		1.7	0.4	0.6	0.1	0.8	
2010	1.0	1.2	6.3	1.3	81.2	0.4	0.3		2.2	3.6	1.4	0.1	0.6	0.4
2011	0.1	0.7	7.5	3.2	76.0	1.5		1.4	4.2	0.9	2.3	0.1	1.4	0.7
2012	0.5	0.9	7.7	4.3	71.2	0.5	0.8	0.3	4.2	4.4	0.8	0.3	2.6	1.5
2013	0.4	1.5	7.9	4.6	77.9		1.1		3.3	1.6	0.3	0.1	0.3	1.0
2014	0.3	0.6	10.5	3.9	74.4	1.8			1.6	4.3	0.6	0.1	0.9	1.0

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
2015	0.5	3.2	7.9	2.3	77.1	1.3	0.2	2.3	2.4	1.1	0.3	0.4		1.0
2016	3.3	1.0	8.8	5.7	68.2	1.3			2.2	5.7	1.1	0.7	0.7	1.3
2017	0.1	1.1	12.3	4.1	70.5				0.4	5.6	0.7		2.6	2.6
2018	0.2	2.0	6.5	2.4	70.0	5.9			7.0	5.0	0.3		0.2	0.5
2019	0.5	1.1	9.8	3.0	69.8	3.9			6.1	4.0	0.4	0.1		1.3
2020	1.6	2.5	7.5	3.1	81.1	2.0			1.5	0.1	0.2	0.2		0.2
2021	2.6	3.5	20.0	5.7	55.9	1.4	2.6	0.4	0.6	0.6	4.7	0.5		1.5
2022	0.6	3.2	9.7	2.7	67.2	0.3	3.2		5.7	3.7	2.1	0.4		1.2
2023	0.1	0.3	6.3	3.2	81.7	2.3			1.5	2.7	0.6	0.1	0.3	0.9

***Table A5.18**. Mean stomach content composition (% of total SFI) of cod ≥ 50 cm from the survey in the Barents Sea winter 1984-2023.*

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1984	0.4		16.3	1.3	48.1		0.6		3.5	2.4	26.4	0.3		0.7
1985	0.2		5.2	0.4	85.8	3.0		0.3	2.1	0.6	1.2	1.1	0.1	
1986	0.6	0.2	4.4	3.9	53.9	3.2		2.5	9.5	7.9	7.7	0.1	4.1	2.0
1987	1.9	0.1	7.4	6.5	2.2	3.6	3.1	3.3	15.6		35.3	0.3	18.9	1.8
1988	0.9	0.7	11.7	7.0	11.9			4.8	0.0		16.3	4.7		42.0
1989	0.8	1.0	10.1	7.2	50.9		1.1		0.0	0.5	25.1	1.2	0.8	1.3
1990	0.1	0.3	5.2	1.8	74.4	1.1		5.2	0.1	4.8	4.0	0.9	1.8	0.3
1991			1.2	0.5	94.1	0.4			0.6	0.9	1.0	0.1	0.4	0.8
1992	0.2	0.1	5.6	3.8	56.7	17.6	0.1		2.3	4.1	3.7	2.3	2.6	0.9
1993		0.3	2.2	11.4	54.9	16.0	0.3	0.6	5.2	4.3	0.9	0.0	3.8	0.1
1994	0.5	12.9	5.9	2.8	35.4	7.1	4.4	0.2	12.0	4.3	5.8	1.1		7.6

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
1995	0.5	0.3	5.0	2.2	8.4	8.0	0.7		18.3	20.4	18.8	2.2	0.2	15.0
1996	0.5	0.2	4.1	2.7	9.3	14.6	2.5	0.4	27.2	27.8	6.2	1.8	2.6	0.1
1997	0.2	0.2	10.1	0.8	45.8	5.0	1.1	3.4	5.3	8.2	4.3	0.8	0.6	14.2
1998	1.2	0.2	22.7	3.8	34.5	7.3	1.0	1.2	6.2	6.6	4.1	3.7	2.6	4.9
1999	0.2	0.1	25.8	6.3	26.5	9.8	2.5	0.7	10.3	5.0	0.4	1.4	0.5	10.5
2000	0.9	0.4	7.9	1.6	68.9	6.5	0.8	2.3	2.8	3.4	0.7	1.5		2.3
2001	0.7	0.2	4.4	4.6	71.7	4.4	1.6	2.5	3.3	2.6	0.3	1.9	0.4	1.4
2002	0.2	0.7	5.9	6.5	50.9	3.0	4.2	2.0	9.0	13.0	1.0	1.7	0.7	1.2
2003	0.1	0.2	5.5	4.9	59.1	10.6	1.5	1.1	4.3	9.1	0.5	1.4	0.4	1.3
2004	0.2	0.2	6.5	3.2	48.2	4.9	0.5	2.6	7.6	17.0	1.6	2.7	1.6	3.2
2005	0.3	0.3	5.8	4.2	33.2	2.9	0.8	5.6	7.9	31.2		1.5	2.5	3.8
2006	0.1	0.1	4.6	4.8	45.8	1.8	0.6	6.1	1.8	28.3	1.6	1.8	1.5	1.1
2007	0.5	0.2	8.3	5.0	29.2	18.4		1.9	7.8	20.8	2.0	2.3	2.7	0.9
2008	0.1	0.4	4.9	2.7	60.7	7.5	0.3	0.4	0.9	17.4	0.8	1.8	0.9	1.2
2009	0.2	0.3	5.5	4.2	53.0	8.6	0.8	0.4	4.1	12.9	1.5	2.9	3.9	1.7
2010	0.6	0.3	2.5	2.3	72.7	1.7	0.2	0.1	3.5	10.6	0.9	2.0	2.5	0.1
2011	0.1	0.3	3.1	2.9	82.0	0.4	0.6		2.6	5.2	0.9	0.5	1.1	0.3
2012	0.1	0.2	4.0	7.1	60.9		0.1	0.1	2.6	16.7	0.5	1.1	3.8	2.8
2013	0.3	0.7	4.1	7.6	67.9	0.2	0.4	0.6	5.1	8.3	0.9	1.4	1.8	0.7
2014	0.5	0.5	5.6	10.4	55.4	2.2		0.2	6.3	10.9	1.0	3.1	1.6	2.3
2015	0.2	0.1	4.1	6.7	69.9	1.1		1.1	2.9	6.8	2.1	1.3	2.4	1.3
2016	1.0	0.9	3.4	14.8	60.0	2.9	0.1	0.7	5.3	6.5	0.7	2.7	0.4	0.6
2017	0.1	0.6	2.9	4.2	74.2	1.4		1.5	0.6	10.7	1.3	1.2	1.0	0.3

Year	Amphipods	Krill	Shrimp	Other invertebrates	Capelin	Herring	Polar cod	Blue whiting	Cod	Haddock	Redfish	Long rough dab	Norway pout	Other fish
2018	0.1	0.9	3.7	9.5	51.7	2.5	0.1	0.1	8.1	19.3	0.7	2.0	0.7	0.6
2019	0.4	0.5	3.8	6.6	68.4	2.8	0.1	0.2	5.5	7.4	1.0	0.5	1.9	0.9
2020	0.4	0.8	2.6	7.5	59.3	5.5	0.0	0.2	13.4	4.8	1.8	1.9	1.0	0.8
2021	0.4	1.1	5.2	9.3	51.0	10.6	3.9	0.1	3.6	8.1	2.3	2.8		1.6
2022	0.3	0.8	4.9	13.7	57.8	2.1	1.6	0.3	3.1	6.1	2.9	3.9	0.3	2.2
2023	0.1	0.5	4.0	10.5	61.2	7.0	0.1	0.1	4.4	4.9	2.5	1.0	0.6	3.1

Table A 6.1. *HADDOCK. Abundance indices (numbers in millions) for the main areas of the Barents Sea from acoustic survey winter 2024 estimated by StoX software.*

Age group																**Total**	**Biomass (‘000 t)**
Area	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
A	190.73	40.12	17.50	2.18	0.55	4.16	4.57	1.60	0.08	0.00	0.10	0.00	0.00	0.00	0.00	261.58	31.7
B	24.02	8.32	4.42	0.42	0.19	0.23	0.21	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.95	4.6
C	91.29	6.44	1.70	0.44	0.07	0.33	0.34	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.76	4.8
D	792.63	411.65	246.92	30.43	2.72	9.50	6.55	5.40	0.06	0.00	0.02	0.00	0.00	0.00	0.00	1505.88	179.5
D'	165.74	139.75	55.79	9.74	0.13	0.33	0.56	0.33	0.04	0.00	0.00	0.00	0.00	0.00	0.00	372.42	40.8
E	48.80	3.59	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.77	1.3
S	81.25	10.32	2.31	0.18	0.02	0.36	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94.57	4.5
N	295.73	13.84	8.39	0.66	0.02	0.04	0.18	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	319.01	13.0
ABCD	1098.67	466.53	270.53	33.46	3.54	14.21	11.68	7.29	0.15	0.00	0.12	0.00	0.00	0.00	0.00	1906.17	220.6
Sum	1690.20	634.03	337.40	44.03	3.70	14.95	12.49	7.80	0.21	0.00	0.12	0.00	0.00	0.00	0.00	2744.93	280.3

Table A 6.2. *HADDOCK. Abundance indices (numbers in millions) from acoustic surveys in the Barents Sea winter 1994-2024 estimated by StoX software.*

ge group																Total	Biomass (‘000 t)
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
1994	887.82	187.96	348.73	626.65	121.38	8.55	0.70	0.33	0.61	0.48	1.46	0.16	0.00	0.00	0.00	2184.83	643.51
1995	1198.18	88.59	41.47	121.49	395.37	47.61	2.80	0.05	0.12	0.03	0.00	0.54	0.14	0.00	0.00	1896.39	508.78
1996	132.60	94.52	29.97	22.09	68.65	143.69	5.67	0.93	0.00	0.01	0.00	0.02	0.04	0.00	0.00	498.19	248.35
1997[1]	508.87	26.51	57.27	22.22	15.47	56.13	62.77	4.68	0.07	0.00	0.00	0.01	0.05	0.06	0.00	754.11	201.67
1998[1]	210.96	150.99	33.78	58.79	24.20	7.70	14.06	20.69	1.44	0.02	0.04	0.00	0.00	0.00	0.12	522.78	150.98
1999	653.40	30.11	83.67	21.64	22.10	6.17	1.55	3.88	2.72	0.03	0.00	0.02	0.00	0.00	0.00	825.29	107.86
2000	1063.01	404.77	36.39	75.53	14.01	12.61	1.57	0.53	2.01	0.69	0.17	0.13	0.02	0.00	0.00	1611.44	189.81
2001	753.01	266.12	233.45	40.20	41.38	2.20	1.61	0.15	0.09	0.14	0.28	0.09	0.09	0.00	0.02	1338.83	206.40
2002	1315.15	267.90	255.20	201.84	18.47	11.70	1.59	0.29	0.03	0.13	0.26	0.09	0.05	0.00	0.00	2072.70	298.25
2003	2743.74	362.35	203.68	184.57	136.04	12.26	6.01	0.26	0.14	0.26	0.34	0.09	0.07	0.00	0.00	3649.81	444.48
2004	528.97	466.54	151.01	101.85	107.82	57.68	7.61	1.15	0.29	0.04	0.05	0.05	0.04	0.08	0.00	1423.18	322.95
2005	2276.46	143.98	221.33	115.67	57.43	56.71	12.69	0.38	0.32	0.01	0.00	0.00	0.00	0.00	0.00	2884.98	305.99
2006[2]	2091.11	624.78	56.32	123.84	47.37	19.26	13.64	3.23	0.08	0.15	0.00	0.03	0.00	0.00	0.09	2979.90	297.84
2007[1]	2015.71	953.50	209.28	46.14	80.57	28.92	10.00	5.05	2.26	0.30	0.18	0.00	0.00	0.00	0.05	3351.97	401.72
2008	778.39	1753.54	812.41	303.04	90.02	74.12	7.41	12.77	1.63	0.14	0.16	0.18	0.00	0.00	0.00	3833.81	920.38
2009	443.93	209.05	883.68	629.98	266.65	38.87	14.57	1.26	0.34	0.66	0.00	0.05	0.00	0.00	0.00	2489.04	865.44
2010	1559.42	86.03	128.07	631.03	603.99	166.96	12.07	2.94	0.96	0.99	0.10	0.06	0.00	0.00	0.00	3192.62	1035.93
2011	428.46	288.27	54.16	84.23	313.02	292.21	54.91	1.71	0.96	0.23	0.00	0.20	0.07	0.00	0.00	1518.43	712.08
2012[3]	1583.44	94.54	191.63	48.84	88.12	310.60	172.52	30.09	0.52	0.34	0.02	0.13	0.00	0.00	0.00	2520.79	814.60
2013	292.71	407.16	67.29	146.77	35.41	53.03	223.77	102.68	14.12	0.25	0.00	0.00	0.00	0.00	0.00	1343.19	759.62
2014	1838.71	109.92	334.82	39.12	108.72	23.18	34.77	86.36	36.63	1.66	0.52	0.00	0.00	0.01	0.00	2614.42	583.94

ge group																Total	Biomass (‘000 t)
2015	1593.12	246.59	24.35	189.40	26.63	46.13	9.22	22.45	21.33	9.86	0.56	0.15	0.09	0.00	0.00	2189.88	387.71
2016	1276.00	107.18	71.81	12.08	59.62	12.52	17.28	7.48	17.21	12.74	2.76	0.48	0.00	0.03	0.02	1597.21	274.45
2017[3]	3343.93	331.42	81.15	65.05	4.81	34.81	6.24	7.93	1.78	7.06	6.10	2.34	0.44	0.00	0.00	3893.06	338.87
2018	2925.90	810.16	171.03	62.74	64.40	6.77	15.57	2.75	2.57	1.56	5.56	2.99	1.87	0.14	0.00	4074.01	410.39
2019	1544.96	687.80	507.61	146.22	31.73	21.88	4.72	3.46	1.37	1.57	0.38	0.39	0.33	0.06	0.09	2952.57	396.54
2020[3]	272.94	260.72	286.32	306.38	79.18	22.38	11.59	1.84	1.36	0.83	0.85	1.22	0.99	0.96	0.12	1247.68	381.58
2021[3]	431.68	15.69	50.76	130.37	181.80	19.35	5.44	0.94	0.81	0.48	0.07	0.21	0.07	0.05	0.08	837.80	258.47
2022	1797.1	70.2	11.4	63.4	95.3	101.2	11.8	0.82	0.14	0.20	0.70	0.00	0.00	0.07	0.00	2152.2	282.60
2023	1032.7	511.1	77.0	9.02	51.3	53.3	38.1	2.69	0.13	0.28	0.01	0.02	0.00	0.00	0.05	1775.5	275.0
2024	1690.20	634.03	337.40	44.03	3.70	14.95	12.49	7.80	0.21	0.00	0.12	0.00	0.00	0.00	0.00	2744.93	280.3

[1] Indices raised to also represent the Russian EEZ.

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

[3] Indices raised to also represent uncovered parts of the Russian EEZ.

Table A6.3. *HADDOCK. Abundance indices (numbers in millions) for new strata 24-26 from acoustic surveys in the Barents Sea winter 2014-2024 estimated by StoX software. In 2020, the main index was revised to include these strata.*

Age group																Total	Biomass (‘000 t)
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
2014	135.0	0.88	10.3	0.92	0.81	0.80	0.96	1.84	1.31	0.20	0.02	0	0	0	0	153.0	17.9
2015	71.2	22.2	0.71	17.9	1.10	6.77	0.90	1.31	4.01	3.03	0.14	0	0.09	0	0	129.4	48.2
2016	15.7	1.77	3.32	0.26	3.67	0.70	0.71	0.62	1.75	0.83	0.33	0	0	0	0	29.7	16.1
2017	80.1	8.20	1.23	2.28	0.40	2.60	0.40	0.92	0.29	0.64	0.61	0.33	0	0	0	98.0	18.1

Age group																Total	Biomass (‘000 t)
2018	855.7	46.4	11.7	2.57	3.48	1.15	2.97	0.45	0.33	0.25	0.54	0.39	0.38	0	0	926.4	54.6
2019	67.68	25.50	16.12	5.59	1.07	1.01	0.13	0.11	0.05	0.03	0.03	0.09	0.03	0.05	0.00	118.11	17.84
2020	1.54	1.18	12.6	12.4	3.09	2.40	0.55	0.49	0.16	0.09	0.04	0.08	0.08	0.05	0	34.8	22.7
2021	5.47	0.44	0.23	4.87	7.44	0.73	0.28	0.14	0.08	0.01	0.05	0.02	0.05	0.00	0.00	19.8	13.4
2022	102.5	3.81	0.05	0.61	3.72	1.70	0.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	112.7	51.8
2023	129.6	9.22	0.52	0.00	0.13	0.71	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140.4	6.43
2024	295.73	13.84	8.39	0.66	0.02	0.04	0.18	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	319.01	13.0

Table A6.4. *HADDOCK. Estimates of coefficients of variation (%) for acoustic abundance indices. Barents Sea winter 1994-2024.*

Age group														
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1994	11	12	10	9	12	21	44	53	39	55	31	103	-	-
1995	16	22	24	15	10	15	34	128	85	114	-	55	90	-
1996	20	27	31	23	16	15	22	44	-	120	-	98	108	-
1997[1]	12	17	14	16	16	12	14	33	53	-	-	121	63	74
1998[1]	14	15	15	13	14	21	17	15	50	107	109	-	-	-
1999	19	24	21	28	22	23	32	34	26	118	-	123	-	-
2000	9	9	21	12	18	17	28	45	30	39	72	102	104	-
2001	17	16	16	25	16	30	35	65	66	96	62	94	86	-
2002	8	10	12	10	16	16	29	51	111	69	60	53	71	-
2003	11	11	11	9	15	25	38	80	106	90	76	102	107	-
2004	37	23	23	30	33	17	21	26	45	65	65	86	64	66
2005	10	16	11	15	12	16	19	59	76	104	-	-	-	-

Age group														
2006[2]	12	10	27	20	12	15	20	33	66	67	-	78	-	-
2007[1]	9	7	9	12	12	15	21	29	40	52	88	-	-	-
2008	13	10	10	10	21	24	29	62	94	263	84	137	-	-
2009	14	13	9	11	14	19	19	43	79	48	-	107	-	-
2010	15	17	10	10	9	13	27	34	49	49	108	92	-	-
2011	15	13	16	12	11	10	15	40	58	94	-	84	115	-
2012[2]	16	28	16	35	24	20	20	27	86	50	105	68	-	-
2013	14	13	22	11	22	16	13	15	26	59	-	-	-	-
2014	13	19	12	20	18	17	16	15	15	44	79	-	-	109
2015	14	17	24	13	23	21	27	23	20	55	64	65	-	-
2016	11	15	15	19	12	14	15	19	17	15	30	43	-	70
2017[2]	6	9	15	13	22	16	22	23	34	29	24	36	67	-
2018	8	8	9	13	17	29	22	29	34	30	27	28	54	81
2019	9	8	8	8	13	14	29	26	48	35	64	35	72	115
2020[2]	15	14	11	12	12	14	19	26	30	48	54	49	43	50
2021[2]	15	25	19	34	45	21	37	48	78	94	61	121	57	87
2022	14	17	26	15	13	13	20	41	71	77	57	-	-	86
2023	11	12	15	19	16	15	17	30	77	113	116	117	-	-
2024	9	13	14	22	27	16	18	19	71	-	92	-	-	-

[1] Russian EEZ not covered. [2] Russian EEZ partly covered.

Table A6.5. *HADDOCK. Abundance indices from bottom trawl hauls for main areas of the Barents Sea winter 2024 (numbers in millions). Bootstrap mean estimates.*

Age group																Total	Biomass ('000 t)
Area	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
A	230.84	55.57	20.65	2.14	0.50	4.46	3.86	1.95	0.08	0.00	0.09	0.00	0.00	0.00	0.00	320.2	35.2
B	134.68	54.76	23.10	1.28	0.48	0.62	1.02	0.54	0.02	0.00	0.00	0.00	0.00	0.00	0.00	216.5	23.6
C	182.39	16.60	3.57	0.87	0.17	0.70	0.83	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	205.4	10.1
D	885.49	321.06	181.87	23.26	2.11	8.94	5.28	4.45	0.18	0.00	0.03	0.00	0.00	0.00	0.00	1432.7	143.4
D'	134.88	157.94	104.24	12.55	0.00	0.57	1.30	0.29	0.06	0.00	0.00	0.00	0.00	0.00	0.00	411.8	55.7
E	84.44	9.50	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94.9	2.8
S	112.82	20.96	4.80	0.32	0.09	0.44	0.14	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.7	7.9
N	413.96	14.58	7.52	0.44	0.00	0.03	0.16	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	436.9	15.6
ABCD	1433.40	448.00	229.20	27.55	3.26	14.72	10.99	7.19	0.28	0.00	0.12	0.00	0.00	0.00	0.00	2174.7	212.3
Sum	2179.51	650.98	346.71	40.85	3.34	15.76	12.59	7.72	0.36	0.00	0.12	0.00	0.00	0.00	0.00	3258.0	294.4

Table A6.6. *HADDOCK. Abundance indices (numbers in millions) from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimates.*

Age group																Total	Biomass ('000 t)[4]
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**		
1994	604.20	224.79	314.53	436.25	46.18	3.54	0.16	0.13	0.20	0.15	0.47	0.03	0.00	0.00	0.00	1026.43	403.7
1995	1429.04	199.52	54.86	167.10	343.38	29.62	1.44	0.03	0.04	0.02	0.00	0.29	0.09	0.00	0.00	2225.43	443.9
1996	300.78	265.08	55.84	31.33	150.77	238.11	16.13	1.15	0.00	0.01	0.00	0.03	0.03	0.00	0.00	1059.26	431.9
1997[1]	1117.83	90.81	79.63	39.86	18.25	61.57	88.41	3.28	0.08	0.00	0.00	0.00	0.03	0.02	0.00	1499.77	273.3
1998[1]	248.27	196.70	21.68	36.75	11.84	1.29	9.20	7.21	0.65	0.02	0.02	0.00	0.00	0.00	0.03	533.66	91.7
1999	1207.98	83.20	56.92	15.87	9.42	2.83	0.81	1.28	0.77	0.02	0.00	0.02	0.00	0.00	0.00	1379.12	86.7
2000	832.30	437.22	24.08	35.24	6.79	4.13	0.68	0.08	0.80	0.22	0.03	0.03	0.01	0.00	0.00	1341.61	124.1
2001	1230.98	446.84	294.00	26.25	23.00	1.63	0.75	0.06	0.06	0.05	0.16	0.09	0.02	0.00	0.00	2023.89	227.7
2002	1700.19	475.31	312.87	185.45	12.42	8.04	0.85	0.22	0.01	0.09	0.16	0.04	0.04	0.00	0.00	2695.69	308.4
2003	3327.32	471.68	352.24	174.45	72.71	5.10	1.68	0.12	0.10	0.10	0.10	0.01	0.01	0.00	0.00	4405.62	411.5
2004	700.86	706.61	173.13	100.52	77.02	51.28	7.41	0.91	0.13	0.04	0.05	0.04	0.04	0.07	0.00	1818.11	307.6
2005	4473.16	386.39	317.89	141.06	50.66	61.19	10.08	0.25	0.08	0.01	0.00	0.00	0.00	0.00	0.00	5440.77	431.0
2006[2]	4944.60	1310.22	78.80	130.76	46.05	20.87	16.21	3.18	0.09	0.15	0.00	0.05	0.00	0.00	0.04	6551.02	454.2
2007[1]	3731.19	1684.83	443.27	81.78	84.67	26.28	5.41	2.20	1.38	0.80	0.07	0.00	0.00	0.00	0.03	6061.91	594.8
2008	853.09	2042.01	1591.03	583.61	53.08	54.73	6.79	10.25	0.23	0.05	0.08	0.05	0.00	0.00	0.00	5195.00	1100.5
2009	562.61	317.05	1230.43	751.01	368.33	25.41	12.44	0.85	0.09	0.35	0.00	0.01	0.00	0.00	0.00	3268.58	976.7
2010	1634.82	79.89	102.45	510.45	443.76	139.32	7.99	1.02	0.39	0.47	0.05	0.05	0.00	0.00	0.00	2920.66	759.4
2011	676.31	353.87	52.88	123.63	469.48	290.04	65.24	1.42	1.12	0.00	0.00	0.15	0.03	0.00	0.00	2034.17	827.5
2012[3]	1866.96	137.38	316.08	28.79	74.71	267.94	154.60	24.77	3.11	0.28	0.04	0.08	0.00	0.00	0.00	2874.74	740.3

Age group																Total	Biomass (‘000 t)
2013	344.58	490.28	57.44	143.98	22.02	33.62	191.14	69.38	6.11	0.08	0.00	0.00	0.00	0.00	0.00	1358.63	600.9
2014	1281.40	123.95	381.17	32.73	104.40	23.26	50.04	97.54	38.69	1.82	0.59	0.00	0.00	0.02	0.00	2135.61	656.0
2015	1133.97	342.02	30.61	187.04	43.60	39.44	14.67	18.73	30.74	9.70	0.33	0.14	0.02	0.00	0.00	1851.01	404.4
2016	2299.37	561.96	163.38	34.34	115.60	22.41	41.95	12.44	32.40	27.64	4.34	0.98	0.00	0.14	0.05	3317.00	569.4
2017[3]	5065.43	770.04	134.94	105.48	7.55	55.34	9.69	15.60	2.53	10.33	8.74	4.06	0.73	0.00	0.00	6190.46	566.0
2018	3823.29	1675.64	336.31	86.66	65.76	7.77	15.59	3.62	2.56	1.70	4.72	4.00	1.38	0.13	0.00	6029.13	574.8
2019	1898.20	1125.27	1075.55	187.22	49.40	17.00	4.04	2.95	0.74	1.08	0.19	0.35	0.20	0.05	0.00	4362.24	600.0
2020[3]	110.62	267.79	424.22	586.99	99.12	22.08	6.06	2.61	1.04	0.67	0.23	0.71	0.70	0.49	0.02	1523.35	537.8
2021 [3]	405.82	24.99	111.35	176.57	265.49	19.32	3.57	0.68	0.19	0.11	0.08	0.29	0.17	0.04	0.03	1009	342.0
2022	1662.1	110.3	12.2	86.5	121.7	113.6	9.10	0.62	0.11	0.16	0.24	0.00	0.00	0.04	0.00	2116.7	316.7
2023	1343.8	583.9	82.5	8.10	50.8	49.3	33.5	2.17	0.11	0.24	0.02	0.02	0.00	0.00	0.05	2154.6	275.0
2024	2179.51	650.98	346.71	40.85	3.34	15.76	12.59	7.72	0.36	0.00	0.12	0.00	0.00	0.00	0.00	3257.94	294.40

[1] Indices raised to also represent the Russian EEZ.

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

[3] Indices raised to also represent uncovered parts of the Russian EEZ.

[4] 1994-2020: for years with raising, estimated based on relationship between unraised numbers-at-age and biomass-at-age from StoX baseline run. From 2021: estimated based on relationship between unraised numbers-at-age and biomass-at-age bootstrap mean estimates from StoX.

Table A6.7. *HADDOCK. Abundance indices (numbers in millions) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024. 2014-2020: baseline estimates, from 2021: bootstrap mean estimates.*

Age group															Total	Biomass (‘000 t)
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15+**	

Age group																Total	Biomass (‘000 t)
2014	128.7	1.26	12.3	0.65	2.22	0.12	3.38	1.16	0.74	0.07	0.0	0.0	0.0	0.0	0	150.6	20.9
2015	49.0	17.4	0.33	13.2	0.46	4.30	0.88	0.56	3.51	2.16	0.0	0.0	0.0	0.0	0	91.8	34.5
2016	42.6	4.50	10.2	0.51	9.69	2.45	1.43	2.41	4.80	3.13	0.36	0.0	0.0	0.0	0	82.0	45.7
2017	199.6	15.7	3.76	5.83	2.18	7.56	0.80	2.07	1.06	1.82	2.39	0.72	0.0	0.0	0	243.5	51.6
2018	1141.9	65.3	17.9	3.20	5.03	2.27	3.66	0.90	0.54	0.35	0.72	0.48	0.56	0.0	0	1242.8	77.9
2019	115.3	45.6	30.1	7.74	3.03	1.13	0.15	0.14	0.0	0.07	0.0	0.06	0.0	0.0	0.02	203.4	29.9
2020	3.61	3.93	35.1	33.1	8.11	7.89	1.93	1.05	0.54	0.28	0.13	0.25	0.27	0.11	0	96.3	63.2
2021	12.6	1.08	0.40	7.74	13.4	1.29	0.61	0.14	0.09	0.02	0.06	0.09	0.11	0.00	0.00	37.6	22.8
2022	79.3	2.86	0.04	0.32	3.00	0.59	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.2	6.81
2023	129.6	9.22	0.52	0.00	0.13	0.71	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140.4	6.43
2024	413.96	14.58	7.52	0.44	0.00	0.03	0.16	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	436.9	15.6

Table A6.8. *HADDOCK. Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea winter 1994-2024.*

Age group														
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1994	11	13	15	13	15	29	52	45	33	52	38	97	-	-
1995	12	19	28	29	16	21	38	180	75	97	-	58	97	-
1996	14	13	12	25	30	24	61	64	-	98	-	95	96	-
1997[1]	13	35	13	15	17	21	18	57	54	-	-	-	64	92
1998[1]	15	13	13	14	16	25	18	16	34	107	106	-	-	-
1999	15	37	14	24	21	24	25	31	22	89	-	97	-	-
2000	9	9	18	9	16	14	34	51	31	34	63	91	105	-
2001	12	17	12	20	11	36	33	47	59	51	47	86	62	-

Age group														
2002	9	11	10	10	22	17	27	39	81	60	48	51	75	-
2003	16	24	28	13	11	19	31	59	60	71	56	92	93	-
2004	9	12	15	16	10	13	28	24	43	56	58	93	60	54
2005	9	17	12	22	14	22	14	70	48	93	-	-	-	-
2006[2]	14	14	18	12	13	16	21	30	44	70	-	63	-	-
2007[1]	10	8	9	19	12	17	24	26	44	50	61	-	-	-
2008	12	17	15	13	19	30	27	81	42	81	68	88	-	-
2009	13	20	15	21	24	18	32	27	91	68	-	94	-	-
2010	10	17	18	22	18	18	25	29	42	55	144	167	-	-
2011	10	10	14	25	18	13	20	38	73	-	-	81	84	-
2012[2]	19	28	17	16	15	13	15	33	73	48	83	61	-	-
2013	12	12	13	14	27	24	27	14	26	50	-	-	-	-
2014	7	26	12	22	16	22	20	14	24	40	55	-	-	99
2015	7	13	26	14	44	11	25	18	21	28	40	51	97	-
2016	22	25	13	42	11	15	20	15	15	19	27	51	-	62
2017[2]	5	13	15	12	20	14	21	27	25	18	21	36	77	-
2018	7	16	13	12	10	17	15	23	18	18	18	20	32	52
2019	9	11	15	12	27	12	40	20	30	30	35	29	35	46
2020[2]	16	9	11	14	14	19	22	29	27	40	39	29	24	37
2021[2]	12	22	17	16	22	13	21	25	47	46	47	66	42	69
2022	10	12	27	17	23	18	19	25	52	66	49	-	-	65
2023	8	11	16	15	19	14	14	18	58	50	94	134	-	-
2024	9	11	17	24	19	16	12	15	51	-	81	-	-	-

[1] Russian EEZ not covered.

[2] Russian EEZ partly covered.

***Table A6.9**. HADDOCK. Survey mortality from surveys in the Barents Sea winter 1994-2024.*

Year	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
				Acoustic investigations				
1994-95	2.30	1.51	1.05	0.46	0.94	1.12	2.64	1.01
1995-96	2.54	1.08	0.63	0.57	1.01	2.13	1.09	-
1996-97	1.61	0.50	0.30	0.35	0.20	0.83	0.19	2.60
1997-98	1.21	-0.24	-0.03	-0.09	0.70	1.38	1.11	1.18
1998-99	1.95	0.59	0.45	0.98	1.37	1.60	1.29	2.03
1999-00	0.48	-0.19	0.10	0.43	0.56	1.37	1.07	0.66
2000-01	1.38	0.55	-0.10	0.60	1.85	2.06	2.28	1.77
2001-02	1.03	0.04	0.15	0.78	1.26	0.32	1.71	1.67
2002-03	1.29	0.27	0.32	0.39	0.41	0.67	1.81	0.73
2003-04	1.77	0.88	0.69	0.54	0.86	0.48	1.65	-0.11
2004-05	1.30	0.75	0.27	0.57	0.64	1.51	3.00	1.28
2005-06	1.29	0.94	0.58	0.89	1.09	1.43	1.37	1.56
2006-07	0.79	1.09	0.20	0.43	0.49	0.66	0.99	0.36
2007-08	0.14	0.16	-0.37	-0.67	0.08	1.36	-0.25	1.13
2008-09	1.31	0.69	0.25	0.13	0.84	1.62	1.77	3.63
2009-10	1.64	0.49	0.34	0.04	0.47	1.17	1.60	0.27
2010-11	1.69	0.46	0.42	0.70	0.73	1.11	1.95	1.12
2011-12	1.51	0.41	0.10	-0.05	0.01	0.53	0.60	1.20

Year	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
2012-13	1.36	0.34	0.27	0.32	0.51	0.33	0.52	0.76
2013-14	0.98	0.20	0.54	0.30	0.42	0.42	0.95	1.03
2014-15	2.01	1.51	0.57	0.39	0.86	0.92	0.44	1.40
2015-16	2.70	1.23	0.70	1.16	0.76	0.98	0.21	0.26
2016-17	1.35	0.28	0.10	0.92	0.54	0.69	0.78	1.43
2017-18	1.42	0.67	0.25	0.01	-0.36	0.79	0.82	1.13
2018-19	1.45	0.46	0.15	0.68	1.08	0.34	1.57	0.70
2019-20	1.78	0.88	0.50	0.61	0.35	0.64	0.98	0.88
2020-21	2.86	1.64	0.79	0.52	1.41	1.41	2.51	0.82
2021-22	1.82	0.32	-0.22	0.31	0.59	0.49	1.89	1.90
2022-23	1.26	-0.09	0.23	0.21	0.58	0.98	1.48	1.84
2023-24	0.49	0.42	0.56	0.89	1.23	1.45	1.59	2.55
		Bottom trawl investigations						
1994-95	1.11	1.41	0.63	0.24	0.44	0.90	1.87	1.10
1995-96	1.68	1.27	0.56	0.10	0.37	0.61	0.23	-
1996-97	1.20	1.20	0.34	0.54	0.90	0.99	1.59	2.64
1997-98	1.74	1.43	0.77	1.21	2.65	1.90	2.51	1.62
1998-99	1.09	1.24	0.31	1.36	1.43	0.47	1.97	2.24
1999-00	1.02	1.24	0.48	0.85	0.82	1.42	2.27	0.47
2000-01	0.62	0.40	-0.09	0.43	1.42	1.70	2.47	0.33
2001-02	0.95	0.36	0.46	0.75	1.05	0.66	1.24	1.84
2002-03	1.28	0.30	0.58	0.94	0.89	1.56	1.96	0.74
2003-04	1.55	1.00	1.25	0.82	0.35	-0.37	0.61	-0.11

Year	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
2004-05	0.60	0.80	0.20	0.69	0.23	1.63	3.39	2.43
2005-06	1.23	1.59	0.89	1.12	0.89	1.33	1.15	0.97
2006-07	1.08	1.08	-0.04	0.43	0.56	1.35	2.00	0.84
2007-08	0.60	0.06	-0.28	0.43	0.44	1.35	-0.64	2.25
2008-09	0.99	0.51	0.75	0.46	0.74	1.48	2.08	4.73
2009-10	1.95	1.13	0.88	0.53	0.97	1.16	2.50	0.79
2010-11	1.53	0.41	-0.19	0.08	0.43	0.76	1.73	-0.10
2011-12	1.59	0.11	0.61	0.50	0.56	0.63	0.97	-0.79
2012-13	1.34	0.87	0.79	0.27	0.80	0.34	0.80	1.40
2013-14	1.02	0.25	0.56	0.32	-0.05	-0.40	0.67	0.58
2014-15	1.32	1.40	0.71	-0.29	0.97	0.46	0.98	1.15
2015-16	0.70	0.74	-0.11	0.48	0.67	-0.06	0.17	-0.55
2016-17	1.09	1.43	0.44	1.51	0.74	0.84	0.99	1.59
2017-18	1.11	0.83	0.44	0.47	-0.03	1.27	0.98	1.81
2018-19	1.22	0.44	0.59	0.56	1.35	0.65	1.67	1.59
2019-20	1.96	0.98	0.61	0.64	0.81	1.03	0.44	1.04
2020-21	1.49	0.88	0.88	0.79	1.64	1.82	2.19	2.62
2021-22	1.30	0.72	0.25	0.37	0.85	0.75	1.75	1.82
2022-23	1.05	0.29	0.41	0.53	0.90	1.22	1.43	1.73
2023-24	0.72	0.52	0.70	0.89	1.17	1.37	1.47	1.80

Table A6.10. *HADDOCK. Mean length (cm) at age from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimates. "+" indicates few samples (< 3), while "–" indicates no samples. Lengths are not adjusted for incomplete coverage.*

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1994	14.5	19.9	29.3	38.1	47.8	54.0	61.0	64.3	70.4	64.8	64.1	+	-	-
1995	15.1	18.2	28.6	34.0	42.8	51.3	58.9	+	+	+	-	+	+	-
1996	15.3	20.8	28.0	36.9	41.2	47.2	55.0	59.9	-	+	-	+	+	-
1997	15.7	19.7	27.4	34.1	39.5	47.3	50.7	55.0	62.8	-	-	-	+	+
1998	14.5	22.5	29.3	37.3	43.1	48.4	52.1	53.3	58.2	+	+	-	-	-
1999	14.4	18.3	32.3	38.8	46.5	51.9	56.0	55.2	58.8	+	-	+	-	-
2000	15.5	21.6	29.9	42.0	47.0	51.1	53.4	59.1	59.3	62.0	+	+	+	-
2001	14.6	22.1	32.1	37.6	48.0	50.4	59.1	56.2	64.6	66.5	68.2	+	+	-
2002	15.1	20.8	29.1	39.8	45.2	51.7	57.8	60.7	+	+	64.6	68.0	+	-
2003	15.8	23.9	26.4	36.6	45.8	49.7	54.8	60.9	63.9	61.6	67.3	+	+	-
2004	14.2	22.1	30.1	35.7	42.8	49.8	49.8	59.0	63.0	73.5	75.9	+	+	74.1
2005	14.8	20.5	29.9	36.1	40.5	48.3	51.6	55.7	60.8	+	-	-	-	-
2006	14.5	22.0	30.7	37.9	43.3	47.3	50.7	56.7	60.4	+	-	+	-	-
2007	15.5	22.9	29.0	35.7	45.8	48.0	53.5	57.4	57.3	68.7	+	-	-	-
2008	15.7	23.8	29.6	37.8	42.8	46.5	53.1	53.8	59.5	+	+	+	-	-
2009	14.3	22.3	29.7	35.5	41.7	48.1	49.7	56.5	+	62.8	-	+	-	-
2010	14.4	19.9	30.8	36.9	41.1	45.3	49.7	58.9	59.4	62.0	+	+	-	-
2011	13.6	23.2	28.5	39.4	42.9	46.1	48.3	62.5	53.8	-	-	+	+	-
2012	14.7	19.3	31.6	35.1	43.6	47.1	50.1	51.2	53.4	65.3	+	71.7	-	-
2013	14.5	22.9	30.0	40.9	42.8	48.7	52.2	52.9	55.7	67.3	-	-	-	-
2014	15.4	18.5	31.9	38.4	46.4	52.4	53.6	55.3	55.2	61.0	58.9	-	-	+
2015	14.5	20.4	26.2	39.8	45.7	52.5	53.6	57.5	57.0	59.9	59.9	67.3	+	-
2016	14.9	18.4	30.9	36.8	47.8	53.1	56.0	58.6	61.1	60.4	60.1	63.6	-	+

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2017	15.8	20.5	30.5	40.0	49.6	52.9	56.1	60.6	61.2	63.2	62.5	64.7	67.3	-
2018	14.5	21.7	30.4	39.6	47.8	54.4	58.0	61.3	64.2	65.6	64.6	63.9	66.5	68.9
2019	14.8	21.5	29.7	37.1	46.1	52.5	53.6	60.5	64.3	65.7	67.5	67.3	69.5	69.3
2020	15.4	21.9	30.0	36.3	42.7	52.1	57.4	62.2	63.7	68.1	69.7	67.4	69.0	70.3
2021	14.4	19.5	29.1	36.2	42.7	49.2	55.0	60.5	66.7	69.4	73.0	71.6	71.7	+
2022	14.1	20.2	31.2	37.4	42.6	47.1	51.6	61.4	65.0	68.5	69.0	-	-	+
2023	15.0	22.4	27.9	40.5	44.5	48.1	51.0	55.1	65.0	64.0	+	+	-	-
2024	13.9	22.1	31.3	37.7	47.1	50.2	52.3	53.9	59	-	73.2	-	-	-

Table A6.11. *HADDOCK. Mean weight (g) at age from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimates. "+" indicates few samples (< 3), while "–" indicates no samples. Weights are not adjusted for incomplete coverage.*

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1994	25	85	244	539	1060	1599	2146	2719	3349	2722	2662	+	-	-
1995	30	69	219	382	775	1357	1954	+	+	+	-	2537	+	-
1996	32	92	218	473	669	1022	1627	1948	-	+	-	+	3626	-
1997	35	82	193	381	616	1051	1300	1680	2476	-	-	-	+	+
1998	27	113	247	543	863	1166	1417	1583	2046	+	+	-	-	-
1999	28	77	334	580	1020	1445	1775	1730	2020	+	-	+	-	-
2000	33	109	275	736	1050	1367	1586	2093	2219	2575	+	+	+	-
2001	28	106	337	582	1146	1422	2140	2029	2939	3139	3105	+	+	-
2002	30	85	244	621	923	1388	1927	2242	+	+	2692	3280	+	-
2003	36	128	192	492	959	1204	1534	1982	2580	2675	3179	+	+	-
2004	23	98	271	458	752	1162	1222	1978	2611	3875	4186	+	+	4036
2005	29	97	263	471	669	1087	1376	1881	2120	+	-	-	-	-

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2006	26	109	301	559	812	1086	1362	1925	2075	+	-	+	-	-
2007	32	109	253	519	1016	1193	1718	2043	2258	3443	+	-	-	-
2008	32	114	247	551	835	1115	1573	1599	2167	+	+	+	-	-
2009	26	94	227	444	746	1147	1315	1732	+	2567	-	+	-	-
2010	28	87	275	473	677	957	1261	1889	2204	2492	+	+	-	-
2011	21	117	220	520	729	943	1171	2264	1641	-	-	+	+	-
2012	29	75	306	432	819	1015	1280	1313	1700	2693	+	3287	-	-
2013	25	114	272	645	782	1138	1351	1502	1850	3117	-	-	-	-
2014	32	68	352	589	1002	1428	1566	1674	1704	2212	2156	-	-	+
2015	23	88	200	590	885	1418	1501	1915	1848	2085	2298	3148	+	-
2016	27	74	285	495	1058	1466	1754	2089	2290	2263	2402	2716	-	+
2017	33	95	293	637	1247	1542	1822	2294	2420	2640	2633	2890	3241	-
2018	26	95	275	627	1051	1663	1967	2349	2699	2820	2681	2648	3011	3415
2019	25	90	242	510	968	1411	1618	2083	2722	2916	3072	3220	3475	3229
2020	27	89	244	458	806	1385	1863	2426	2658	2887	3334	3013	3366	3600
2021	27	86	208	447	735	1159	1591	2201	3156	3172	3835	3533	3771	+
2022	24	96	292	478	731	1027	1386	2316	2774	3052	3357	-	-	+
2023	28	107	225	656	849	1134	1385	1855	2930	2660	+	+	-	-
2024	23	98	299	529	1040	1266	1460	1646	2213	-	3856	-	-	-

Table A6.12. *HADDOCK. Yearly weight increment (g) from bottom trawl surveys in the Barents Sea winter 1994-2024.*

Year\Age	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
1994-95	44	134	137	235	297	355	-	-	-

Year\Age	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
1995-96	61	148	253	287	247	270	-5	-	-
1996-97	50	101	164	143	382	278	53	528	-
1997-98	78	165	349	481	550	366	283	366	-
1998-99	50	221	333	478	582	609	313	437	-
1999-00	81	198	403	470	347	141	318	489	554
2000-01	74	227	308	409	372	773	444	846	920
2001-02	57	138	285	341	242	505	102	-	-
2002-03	98	106	248	338	281	146	54	338	-
2003-04	62	143	267	261	203	18	444	629	1295
2004-05	74	165	200	210	335	214	660	142	-
2005-06	80	204	296	341	417	275	550	194	-
2006-07	84	144	218	457	381	632	681	333	1368
2007-08	82	138	298	316	99	380	-119	124	-
2008-09	62	113	197	196	311	199	160	-	400
2009-10	61	181	246	233	211	115	574	472	-
2010-11	89	133	245	256	266	214	1003	-248	-
2011-12	53	189	212	299	285	337	142	-565	1052
2012-13	85	197	339	349	319	336	221	537	1418
2013-14	43	238	317	357	646	428	323	202	362
2014-15	56	132	238	296	416	73	348	175	381
2015-16	51	197	295	468	580	337	588	375	414
2016-17	68	219	352	753	483	356	540	331	350
2017-18	61	180	334	414	416	426	527	405	400

Year\Age	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
2018-19	64	148	235	341	361	-45	116	373	217
2019-20	64	155	216	296	417	452	808	575	165
2020-21	58	120	202	278	350	199	337	733	519
2021-22	69	206	270	284	292	227	725	573	-104
2022-23	83	129	364	371	403	358	469	614	-114
2023-24	70	192	304	384	417	326	261	358	-

Table A6.13. *HADDOCK. Proportion mature at age from bottom trawl surveys in the Barents Sea winter 1994-2024. Bootstrap mean estimates. The proportion mature is the number of fish classified as maturity category 2 and 3, divided by the total number of fish assigned categories 1-5. "+" indicates few samples (< 3), while "–" indicates no samples.*

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1994	0.00	0.00	0.00	0.02	0.16	0.41	0.44	1.00	0.88	0.74	0.74	+	-	-
1995	0.00	0.00	0.01	0.04	0.18	0.38	0.41	+	+	+	-	0.63	+	-
1996	0.00	0.00	0.00	0.04	0.08	0.27	0.40	0.78	-	+	-	+	0.00	-
1997	0.00	0.00	0.00	0.00	0.15	0.33	0.64	0.31	0.70	-	-	-	+	+
1998	0.02	0.00	0.00	0.04	0.15	0.54	0.50	0.79	0.95	+	+	-	-	-
1999	0.00	0.00	0.00	0.06	0.24	0.38	0.77	0.81	0.98	+	-	+	-	-
2000	0.00	0.00	0.00	0.24	0.54	0.66	0.82	1.00	0.90	0.86	+	+	+	-
2001	0.00	0.00	0.00	0.22	0.54	0.49	0.89	1.00	1.00	0.70	1.00	+	+	-
2002	0.00	0.00	0.01	0.12	0.45	0.60	0.95	0.90	+	+	0.79	1.00	+	-
2003	0.00	0.00	0.00	0.04	0.40	0.59	0.73	0.60	0.64	0.68	1.00	+	+	-
2004	0.00	0.00	0.02	0.03	0.14	0.61	0.56	0.46	0.87	1.00	1.00	+	+	1.00
2005	0.00	0.00	0.01	0.06	0.19	0.43	0.76	0.34	1.00	+	-	-	-	-
2006	0.00	0.00	0.00	0.12	0.41	0.59	0.84	0.86	0.50	+	-	+	-	-
2007	0.00	0.00	0.01	0.19	0.46	0.67	0.82	0.95	0.84	1.00	+	-	-	-

Age/ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2008	0.13	0.02	0.02	0.09	0.47	0.66	0.83	0.84	0.99	+	+	+	-	-
2009	0.00	0.00	0.00	0.04	0.16	0.29	0.64	0.65	+	0.41	-	+	-	-
2010	0.00	0.00	0.05	0.08	0.20	0.41	0.60	0.75	0.91	0.89	+	+	-	-
2011	-	0.00	0.00	0.07	0.14	0.41	0.38	0.38	0.79	-	-	+	+	-
2012	0.00	0.00	0.01	0.06	0.38	0.51	0.61	0.71	0.26	1.00	+	0.68	-	-
2013	0.00	0.00	0.01	0.04	0.17	0.49	0.61	0.62	0.63	1.00	-	-	-	-
2014	0.00	0.01	0.02	0.13	0.28	0.73	0.73	0.71	0.76	0.94	0.95	-	-	+
2015	0.00	0.00	0.03	0.05	0.15	0.44	0.64	0.67	0.39	0.54	1.00	0.68	+	-
2016	0.00	0.00	0.00	0.02	0.32	0.70	0.83	0.82	0.89	0.83	0.94	1.00	-	+
2017	0.00	0.00	0.01	0.15	0.32	0.63	0.74	0.95	0.93	0.97	0.98	1.00	1.00	-
2018	0.00	0.00	0.01	0.12	0.31	0.55	0.87	0.76	0.93	0.84	0.86	0.93	0.94	1.00
2019	0.00	0.00	0.02	0.08	0.18	0.59	0.66	0.83	0.92	0.97	1.00	1.00	1.00	1.00
2020	0.00	0.00	0.01	0.04	0.18	0.56	0.75	0.82	0.91	0.89	0.98	1.00	0.89	0.93
2021	0.00	0.00	0.00	0.06	0.14	0.47	0.64	0.73	0.81	1.00	1.00	0.79	0.88	+
2022	0.00	0.00	0.08	0.05	0.18	0.50	0.79	0.66	0.51	0.49	0.84	-	-	+
2023	0.00	0.00	0.02	0.40	0.38	0.71	0.84	0.95	1.00	1.00	+	+	-	-
2024	0.00	0.01	0.04	0.14	0.56	0.66	0.86	0.86	1.00	-	1.00	-	-	0.00

Table A7.1. *GOLDEN REDFISH (Sebastes norvegicus) . Abundance indices (numbers in thousands) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.*

	Length group (cm)												**Total**	**Biomass (tons)**
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**>60**		
1994	675	7493	10100	12840	10914	17834	10065	4799	1645	937	202	121	77623	31841
1995	387	4658	13515	13118	10398	15429	16223	10587	3112	852	455	148	88883	42042

	Length group (cm)												Total	Biomass (tons)
1996	40	715	3285	5950	8701	13991	15681	7479	2689	893	162	165	59750	35171
1997[1]	0	316	967	2248	5084	20332	28015	8496	1845	1118	255	97	68773	43539
1998[1]	63	2375	1307	2610	4505	7402	7485	5075	1556	469	147	0	32994	19345
1999	181	928	2070	4002	4351	6273	6143	5474	2643	738	75	0	32877	20699
2000	533	1097	1495	4185	4875	5108	3564	1869	612	464	89	0	23890	10541
2001	55	411	397	2451	5835	5442	4550	3232	1211	342	96	37	24058	14060
2002	130	1042	2021	1833	3946	4229	3237	3468	1627	598	192	27	22349	13053
2003	0	477	1300	1534	4180	4070	2764	3203	1996	548	123	327	20523	13357
2004	700	193	417	962	2853	4356	5415	3854	2279	562	140	45	21777	15779
2005	0	119	203	360	1106	2088	3846	4663	2730	1276	299	128	16818	16458
2006[2]	0	0	0	178	2495	5534	6307	4155	3179	950	124	12	22934	18757
2007[1]	0	58	295	96	529	1281	2739	4408	2848	1203	210	58	13724	14801
2008	1741	2527	201	171	436	706	1966	2546	3049	1231	157	19	14748	12666
2009	0	0	86	0	38	435	1737	3767	4184	1954	267	217	12685	17220
2010	367	1992	1146	522	136	82	855	1083	2072	1595	204	127	10181	9803
2011	341	3200	2103	285	398	125	274	2329	3030	1911	131	243	14370	13255
2012[3]	805	4375	3995	1835	550	316	881	3645	4083	1775	320	85	22664	15887
2013	74	7428	4946	3961	1559	377	876	819	1280	1592	383	450	23744	11457
2014	123	1028	1454	3019	3317	1010	501	1427	2135	1172	629	191	16006	12004
2015	139	881	1467	3019	2602	2005	458	700	1216	1211	873	82	14653	10102
2016	698	1251	1454	2296	4159	3609	3362	1653	2147	2302	1114	250	24295	19696
2017[3]	341	1304	898	1065	4462	9060	6661	2980	2087	1776	604	498	31735	25264
2018	1129	2750	1799	1678	3282	4693	6335	4261	2012	1630	715	299	30582	22806

	Length group (cm)												Total	Biomass (tons)
2019	671	3248	1700	1818	2515	3910	9024	9693	6709	1544	477	415	41724	36612
2020[3]	971	650	1498	1041	1891	2424	6450	8786	6426	2773	503	151	33564	33062
2021[3]	43	303	872	1172	1093	1523	4090	5938	5323	2753	1190	239	24539	29383
2022	1806	1948	616	1472	1986	2590	7969	10624	6853	2498	720	187	39268	39084
2023	486	1927	591	1785	1561	1591	2399	4045	4944	2567	108	89	22093	21571
2024	399	2909	5750	666	1130	1618	2348	2867	2607	1379	488	0	22161	15134

[1] Indices raised to also represent the Russian EEZ

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

[3] Indices not raised to also represent uncovered parts of the Russian EEZ.

Table A7.2. *GOLDEN REDFISH (Sebastes norvegicus). Abundance indices (numbers in thousands) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024.*

	Length group (cm)									Total	Biomass (tons)
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**≥45**		
2014	35	333	358	1440	2594	1315	211	501	379	7166	2913
2015	0	202	197	127	804	804	363	0	154	2651	1261
2016	0	0	103	300	597	1186	828	107	32	3151	1405
2017	0	66	93	587	519	679	547	96	66	2654	1053
2018	58	824	750	647	639	964	1855	546	50	6331	2598
2019	76	974	1445	567	666	1445	1043	519	102	6838	2525
2020	37	277	1239	934	1315	2498	2027	993	375	9695	4850
2021	25	305	1051	1173	437	893	857	389	126	5256	2004
2022	25	167	322	1127	1233	357	366	50	47	3694	1109
2023	0	193	193	869	1283	943	156	62	0	3700	1092

	Length group (cm)									Total	Biomass (tons)
2024	0	194	301	741	1232	1275	179	70	73	4065	1615

Table A7.3. *GOLDEN REDFISH (Sebastes norvegicus). Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea standard area winter 1994-2024.*

	Length group (cm)										
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**
1994	49	38	23	29	21	37	20	34	15	18	35
1995	46	41	34	29	19	34	31	33	24	25	42
1996	73	51	48	27	18	29	27	22	17	24	46
1997[1]	-	39	26	24	19	60	66	34	16	20	35
1998[1]	53	30	27	27	24	38	44	42	24	27	44
1999	63	41	37	38	35	27	36	58	56	26	58
2000	35	28	19	24	22	28	30	29	20	23	58
2001	56	32	25	26	33	31	40	52	28	27	43
2002	56	61	52	24	27	22	25	33	37	25	41
2003	-	28	34	34	24	23	14	19	26	38	76
2004	72	38	30	28	33	55	53	26	23	26	50
2005	-	73	48	36	20	26	29	17	19	26	65
2006[2]	-	-	-	53	48	42	32	29	22	20	43
2007[1]	-	70	61	57	29	22	24	24	22	20	34
2008	33	27	39	63	38	23	21	25	19	25	49
2009	-	-	69	-	67	31	31	25	25	22	37
2010	57	27	46	48	41	54	32	29	18	20	35
2011	43	40	24	45	31	49	39	67	43	38	50

	Length group (cm)										
2012[3]	35	42	23	22	37	39	24	42	46	31	39
2013	57	43	23	17	23	46	42	39	32	23	42
2014	53	32	28	17	20	38	37	37	27	24	24
2015	66	39	32	30	19	19	23	38	26	22	33
2016	49	31	19	18	24	18	18	28	22	21	31
2017[3]	98	42	41	27	29	61	33	32	27	35	29
2018	33	21	17	20	19	17	22	17	21	21	25
2019	39	26	18	-	18	18	20	31	32	19	34
2020[3]	84	26	24	22	22	32	31	45	33	29	43
2021[3]	70	28	18	17	21	30	37	40	42	35	37
2022	43	62	28	18	25	44	49	61	47	56	41
2023	53	29	30	24	23	20	22	43	33	18	44
2024	99	43	73	24	25	22	20	18	16	18	46

[1] Russian EEZ not covered.

[2] Russian EEZ partly covered.

[3] Indices not raised to represent uncovered parts of the Russian EEZ.

Table A7.4. *BEAKED REDFISH (Sebastes mentella)1. Abundance indices (numbers in millions) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.*

	Length group (cm)										
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**≥45**	**Total**	**Biomass (‘000 t)**
1994	8	296	479	488	74	74	17	3	0	1440	161
1995	310	84	571	390	83	58	24	3	0	1522	152
1996	215	101	198	343	136	42	17	1	0	1053	128

	Length group (cm)										
1997[2]	38	83	19	198	266	82	39	3	0	728	166
1998[2]	1	87	62	101	202	40	13	2	0	507	96
1999	2	7	70	37	172	73	22	3	0	386	102
2000	9	13	40	78	143	97	27	7	1	415	113
2001	10	23	7	57	79	75	10	1	0	260	65
2002	17	7	19	36	96	116	24	1	0	317	90
2003	4	4	10	13	70	198	46	6	0	351	138
2004	2	3	7	19	33	86	32	2	0	183	68
2005	0	6	7	11	28	154	86	4	0	296	131
2006[3]	100	2	10	15	23	104	83	3	1	339	108
2007[2]	382	121	3	7	12	121	121	7	0	773	136
2008	858	359	27	5	12	104	165	5	0	1533	169
2009	95	325	136	5	9	67	163	6	0	806	156
2010	652	276	215	64	7	74	191	6	0	1485	190
2011	501	230	212	149	14	47	157	5	0	1315	177
2012[4]	129	280	86	125	47	14	154	18	0	855	173
2013	249	227	245	159	143	35	193	27	0	1279	247
2014	91	174	250	114	125	51	115	14	0	933	171
2015	175	110	215	302	290	215	171	18	0	1495	343
2016	615	105	149	332	213	163	124	14	0	1714	264
2017[5]	568	185	68	197	286	310	231	11	0	1855	412
2018	189	250	83	109	192	270	214	22	1	1329	350
2019	42	288	263	92	158	255	211	20	0	1330	339

	Length group (cm)										
2020[4]	196	122	207	92	118	231	209	25	1	1200	313
2021[4]	887	132	142	124	81	186	172	23	1	1749	277
2022	616	981	54	112	76	87	152	20	0	2098	224
2023	47	1091	335	94	149	131	194	31	1	2072	307
2024	18	158	648	70	204	134	155	27	0	1414	301

[1] Includes unidentified *Sebastes* specimens, mostly less than 10cm .

[2] Indices raised to also represent the Russian EEZ.

[3] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

[4] Indices not raised to represent uncovered parts of the Russian EEZ.

[5] Indices raised to also represent uncovered parts of the Russian EEZ.

Table A7.5. *BEAKED REDFISH (Sebastes mentella)1. Abundance indices (numbers in millions) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024.*

	Length group (cm)										Biomass
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**>45**	**Total**	**('000 t)**
2014	19.6	9.2	11.5	6.8	5.4	1.7	2.3	0.4	0	56.9	5.5
2015	13.5	5.5	8.3	11.3	11.4	5.2	3.4	0.1	0.03	58.9	9.4
2016	54.6	3.1	2.2	4.5	4.8	4.2	1.4	0.3	0	75.0	4.5
2017	81.9	13.1	1.3	4.5	6.0	6.4	3.6	0.6	0.03	117.4	7.8
2018	47.9	74.0	2.3	1.8	4.6	5.9	5.8	0.6	0	143.0	8.6
2019	10.9	10.1	7.0	0.7	1.4	1.3	2.1	0.2	0.03	33.7	3.0
2020	12.8	3.1	4.5	1.7	2.0	7.3	4.9	0.6	0.04	36.8	7.9
2021	136.1	1.0	4.3	6.0	3.2	15.2	9.4	0.5	0.05	175.7	14.5

	Length group (cm)										Biomass
2022	110.2	53.2	1.3	4.3	2.0	5.6	6.8	0.4	0	183.7	9.7
2023	6.6	157.0	30.4	2.3	2.6	1.7	3.0	0.5	0	203	9.7
2024	15	17	46	1	1	1	1	0	0	82	NA

[1] Includes unidentified *Sebastes* specimens, mostly less than 10cm.

Table A7.6. *BEAKED REDFISH (Sebastes mentella)1. Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea standard area winter 1994-2024.*

	Length group (cm)								
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**≥45**
1994	36	14	29	34	27	24	28	49	59
1995	17	26	23	22	16	17	23	33	37
1996	17	22	28	19	16	33	24	38	63
1997[2]	20	19	18	15	16	18	24	60	95
1998[2]	33	16	20	14	19	18	23	32	71
1999	20	17	15	13	20	23	27	53	71
2000	15	12	15	14	16	22	31	69	85
2001	15	14	15	13	14	18	16	25	69
2002	53	13	13	19	17	20	17	25	67
2003	54	15	17	17	17	28	29	46	90
2004	19	16	15	19	14	14	18	19	56
2005	-	25	18	16	17	19	22	38	42
2006[3]	13	50	26	30	19	19	17	21	79
2007[2]	15	24	18	15	15	23	18	40	60
2008	12	15	25	17	16	21	20	25	45

	Length group (cm)								
2009	12	10	16	21	36	31	25	22	51
2010	14	11	10	14	20	33	32	20	88
2011	12	11	11	15	19	34	26	23	58
2012[4]	15	12	14	15	19	29	37	56	45
2013	20	18	34	20	26	29	28	29	51
2014	10	11	11	12	17	19	28	24	51
2015	13	12	12	16	24	22	19	32	43
2016	10	10	14	22	18	16	19	18	60
2017[5]	9	13	15	14	14	15	16	17	81
2018	10	11	12	14	11	13	17	23	33
2019	11	12	15	12	16	18	19	21	59
2020[4]	11	14	11	11	15	13	12	17	49
2021[4]	13	32	11	15	18	24	19	19	49
2022	15	23	14	13	13	12	14	18	61
2023	12	19	22	17	15	16	14	14	54
2024	14	16	25	15	19	16	13	19	42

[1] Includes unidentified *Sebastes* specimens, mostly less than 10cm.

[2] REZ not covered.

[3] REZ partly covered.

Table A7.7. *NORWAY REDFISH (Sebastes viviparus) . Abundance indices (numbers in thousands) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.*

	Length group (cm)						Total
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**≥30**	

	Length group (cm)						Total
1994	75355	94809	17218	12818	1377	279	201857
1995	10716	68713	22737	9349	3306	503	115325
1996	439	45796	43673	35921	5498	87	131415
1997[1]	898	24202	28857	18768	4397	0	77122
1998[1]	703	9385	42183	20801	2939	91	76102
1999	1577	10134	11675	2921	707	35	27049
2000	953	4904	37128	21976	2086	133	67179
2001	249	2243	30082	34425	3802	120	70921
2002	311	3223	17485	15028	1265	84	37395
2003	234	4306	22603	31019	4277	167	62605
2004	102	1793	24461	32768	3294	291	62709
2005	172	1582	16443	37359	6153	356	62066
2006[2]	819	4480	3653	10381	2244	205	21782
2007[1]	704	5238	15652	34395	2448	80	58517
2008	0	1820	5906	21010	4557	29	33322
2009	506	528	3096	11032	3405	419	18987
2010	1704	454	10134	53180	7571	22	73065
2011	533	1250	2168	7757	2197	106	14011
2012[1]	586	3950	4080	29157	6212	74	44059
2013	1210	9521	3300	23464	8544	100	46139
2014	11388	17753	21079	64094	15135	1991	131439
2015	7353	27428	30881	65883	9178	115	140839
2016	2795	26824	18396	29229	11286	934	89464

	Length group (cm)						Total
2017[1]	3848	58422	21556	22580	5685	426	112518
2018	787	24370	61427	37470	26220	1344	151617
2019	730	14679	58705	31991	6469	1250	113824
2020[1]	603	3485	58704	46850	15290	907	125840
2021[1]	1205	8858	82510	74590	19302	677	187141
2022	2001	2502	37674	56035	3636	647	102495
2023	11066	13870	19703	37752	24461	683	107535
2024	774	24356	42671	72465	7599	588	148453

[1] Indices not raised to represent the REZ or uncovered parts, *Sebastes viviparus* is mainly found in NEZ.

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

Table A7.8. *NORWAY REDFISH (Sebastes viviparus). Abundance indices (numbers in thousands) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024.*

	Length group (cm)						Total
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**≥30**	
2014	0	87	44	0	0	0	131
2015	0	0	35	0	0	0	35
2016	0	0	111	0	0	0	111
2017	0	0	0	0	0	0	0
2018	0	0	160	126	32	0	318
2019	0	0	51	0	0	0	51
2020	0	0	54	54	0	0	108
2021	51	0	0	74	0	0	125
2022	0	74	29	26	0	0	131

	Length group (cm)						Total
2023	0	31	27	0	27	0	85
2024	40	157	19	19	0	0	235

Table A7.9. *NORWAY REDFISH (Sebastes viviparous). Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea standard area winter 1994-2024.*

	Length group (cm)					
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**
1994	41	55	28	40	43	67
1995	49	36	48	39	78	98
1996	67	23	31	36	47	65
1997[1]	83	37	32	53	59	-
1998[1]	41	25	46	73	78	78
1999	80	59	33	24	36	65
2000	54	32	45	44	38	55
2001	39	26	31	29	34	90
2002	62	38	20	24	40	85
2003	71	35	36	32	28	75
2004	53	38	36	33	25	69
2005	63	33	38	31	34	67
2006[2]	73	72	21	27	25	59
2007[1]	71	76	34	36	31	87
2008	-	53	30	30	41	74
2009	67	48	26	27	30	63
2010	47	37	48	53	57	98

	Length group (cm)					
2011	51	51	45	39	42	74
2012[2]	44	28	41	41	39	99
2013	57	31	24	41	48	101
2014	40	34	39	39	43	78
2015	35	27	30	42	43	71
2016	41	32	31	27	24	55
2017[2]	53	63	27	31	29	53
2018	46	47	35	47	35	64
2019	60	60	47	33	27	73
2020[2]	64	30	40	41	59	48
2021[2]	50	32	44	43	45	74
2022	64	37	43	-	-	-
2023	73	60	43	32	66	34
2024	41	45	53	38	39	50

[1] REZ not covered.

[2] REZ partly covered.

Table A8.1 . *GREENLAND HALIBUT. Abundance indices (numbers in thousands) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.*

	Length group (cm)																Biomass (tons)
Year	**≤14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**≥ 80**	**Total**	
1994	0	0	21	79	161	1199	4409	6745	5323	2702	1314	754	19	0	0	22724	27095
1995	320	0	0	0	130	157	3169	7962	6169	2181	1667	893	484	76	0	23207	29540
1996	9040	0	0	0	69	139	3869	10497	5956	3114	1678	782	426	81	0	35652	34772

	Length group (cm)																Biomass (tons)
1997[1]	146	215	0	0	177	404	1365	6168	6777	3669	1289	728	810	81	24	21852	31168
1998[1]	242	348	2064	882	791	805	1598	5133	8236	4513	2525	851	382	97	21	28490	37228
1999[2]	187	116	526	580	713	265	1180	1904	3740	2231	1624	1261	108	78	0	14513	21096
2000	158	203	380	931	1921	4355	2518	1696	2322	1896	1293	672	275	79	0	18697	18877
2001	75	56	159	241	1028	1643	4109	3604	2498	2245	1171	553	168	52	0	17601	19996
2002	300	0	64	31	416	1378	2022	4460	3915	2733	1196	1231	254	162	112	18275	24737
2003[2]	136	0	121	22	552	1018	2406	3937	5876	2739	878	690	282	142	0	18798	24464
2004[2]	103	103	15	0	552	1896	1626	1967	2385	1292	987	296	144	94	27	11485	13385
2005	260	72	159	1157	2317	2845	4849	4013	4309	2178	1066	649	362	136	0	24372	24606
2006[2]	0	84	99	413	2101	5531	4893	6091	4749	2265	928	464	285	40	0	27942	27374
2007[1]	0	19	144	1765	1368	3270	5171	5310	4370	2084	699	744	421	78	19	25462	26624
2008	0	0	0	261	1778	6253	4920	6505	5963	3921	839	640	175	81	49	31385	32564
2009	53	0	0	23	1102	4749	8702	5078	4386	2798	1040	623	431	297	119	29400	31526
2010[2]	0	0	0	103	840	3833	6427	7974	6166	3047	1248	547	225	270	20	30700	33463[3]
2011	50	0	0	0	214	4385	6261	6243	5850	4352	703	1013	338	254	100	29763	35222
2012[2]	130	0	0	0	53	1189	5571	6195	6456	4012	1784	243	77	0	0	25709	30718
2013	0	0	0	0	0	516	6088	6421	6331	4288	2047	1027	347	308	0	27374	36590
2014	0	0	46	89	155	417	2323	5663	6088	3683	2290	1451	154	251	77	22690	31678
2015	347	0	59	0	277	1620	3180	6550	7508	6920	3423	1982	590	336	0	32791	47913
2016	201	0	120	515	987	2182	3663	4982	5929	6232	1991	2486	644	100	52	30085	39334
2017[2]	54	0	0	80	591	1245	2061	3879	4700	4776	1857	1987	308	193	23	21756	32201
2018	0	0	64	0	481	1460	2145	3698	4644	3616	2179	1598	793	264	20	20961	31570
2019	0	0	0	369	282	1674	3264	4141	5128	4233	3580	2518	1317	531	97	27131	45581

	Length group (cm)																Biomass (tons)
2020[2]	77	85	259	465	783	2275	4345	5128	4901	4631	3276	1809	878	376	176	29461	43305
2021	0	157	935	922	2375	2971	3857	4262	3548	3011	2398	1655	662	685	155	27594	37352
2022	0	0	827	2200	3725	1845	3371	5360	5657	3639	2227	1546	807	415	139	31758	39681
2023	0	0	59	711	6385	8743	4865	5800	7834	4215	2256	1560	1048	126	276	43879	48147
2024	479	0	1299	795	2729	6156	9572	5891	5925	5145	3658	1498	985	523	0	44656	52552

[1] Indices raised to also represent REZ.

[2] Indices raised to also represent uncovered parts of the REZ.

[3]Bootstrapped biomass for 2010 not available for unknown reason, will be solved next year.

Note that in 2024, the entire time-series were recalculated in the new StoX, using complete strata areas. The abundance and biomass levels will differ from previous reports, but the trends remain the same.

***Table A8.2** . GREENLAND HALIBUT. Abundance indices (numbers in thousands) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024.*

	Length group (cm)																Biomass (tons)
Year	**≤14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**≥ 80**	**Total**	
2014	0	142	146	0	152	460	1382	1479	1383	310	822	42	118	0	0	6434	7462
2015	0	0	0	400	28	323	638	1043	668	675	654	64	103	37	0	4632	5913
2016	747	1055	706	497	365	452	340	733	343	250	68	33	144	0	33	5768	3119
2017	33	0	0	468	1389	1460	1247	1016	585	31	347	32	0	36	0	6646	5151
2018	136	28	0	926	1590	3343	1304	1123	1193	818	478	863	0	0	0	11803	11126
2019	295	325	285	284	375	1870	1813	2938	2140	1155	1365	567	25	37	0	13472	16607
2020[1]	33	325	285	284	284	1015	722	2119	1564	599	934	347	0	0	0	8510	10726
2021	1843	4062	3900	2175	1212	875	1518	1634	1148	891	495	193	23	0	0	19969	10348

	Length group (cm)																Biomass (tons)
2022	260	0	1175	691	3072	3200	5412	5945	2041	890	329	275	78	0	0	23368	18423
2023	874	0	0	262	1503	1099	763	139	331	297	69	35	35	0	0	5408	3034
2024	4100	2562	6559	801	887	3378	3131	3081	516	117	354	0	25	0	0	25512	9630

1 Indices raised to also represent uncovered parts of the REZ

Note that in 2024, the entire time-series were recalculated in the new version of Stox, using complete strata areas. The abundance and biomass levels will differ from previous reports, but the trends remain the same.

Table A8.3. *GREENLAND HALIBUT. Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea standard area winter, 1994-2024.*

	Length group (cm)														
Year	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**
1994	-	-	94	54	40	25	21	20	17	18	22	24	104	-	-
1995	-	99	-	-	69	43	19	23	23	23	30	39	64	100	-
1996	-	19	-	-	70	43	7	9	17	12	23	26	37	55	-
1997[1]	-	-	-	-	83	50	26	22	20	20	33	41	39	69	98
1998[1]	-	76	33	47	47	26	30	25	29	33	37	31	42	50	94
1999[2]	-	98	48	29	29	29	25	23	18	14	12	19	49	53	-
2000	-	73	72	84	55	58	38	16	23	22	21	31	43	57	-
2001	-	72	79	46	42	48	42	45	35	18	21	34	34	57	-
2002	-	68	70	101	32	30	17	16	20	20	15	26	30	35	57
2003[2]	-	70	63	92	35	26	21	48	41	36	47	32	40	42	-
2004[2]	94	63	101	-	28	20	18	16	17	16	22	30	35	46	94
2005	-	65	41	45	33	15	18	17	17	18	25	28	31	69	-
2006[2]	-	-	73	63	30	16	19	13	15	16	20	25	29	70	-

	Length group (cm)														
2007[1]	-	-	27	21	30	41	38	31	26	16	29	42	44	44	94
2008	-	-	-	39	23	18	12	12	14	14	19	21	43	49	72
2009	-	99	-	97	24	15	13	14	16	16	21	23	27	49	49
2010[2]	-	-	89	63	66	20	24	23	23	21	20	25	45	61	100
2011	-	71	-	-	48	16	15	14	17	16	26	29	33	41	70
2012[2]	-	-	-	-	43	27	16	20	22	29	39	63	76	-	-
2013	-	-	-	-	-	41	36	19	19	25	21	34	53	51	-
2014	-	-	77	69	60	33	24	16	19	18	25	24	49	56	74
2015	-	87	97	61	48	22	18	15	14	18	29	38	30	41	-
2016	56	69	53	45	33	26	18	26	23	30	20	22	25	68	72
2017[2]	-	97	-	71	41	27	21	20	14	16	23	24	44	55	100
2018	-	-	93	73	36	25	16	15	15	15	19	31	33	63	101
2019	-	41	94	51	45	26	18	20	16	15	16	17	24	26	69
2020[2]	99	99	93	57	38	18	15	14	15	15	14	17	30	37	54
2021	99	56	34	39	34	22	14	17	22	16	18	18	27	29	52
2022	-	56	42	46	41	27	30	22	14	15	16	16	23	40	56
2023	-	37	99	49	34	25	27	26	19	17	18	21	30	67	41
2024	91	34	53	39	17	16	15	22	14	17	17	21	22	37	-

[1] Russian EEZ not covered. [2] Russian EEZ partly covered.

Table A9.1. *BLUE WHITING. Abundance indices (numbers in millions) from bottom trawl surveys in the Barents Sea standard area winter 1994-2024.*

	Length group (cm)									Biomass
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**≥40**	**Total**	**('000 t)**

	Length group (cm)									Biomass
1994	0	0	1.2	13.6	25.7	10.9	1.1	0.1	52.6	NA
1995	0	0.5	0.8	2.4	10.3	10.8	3.9	0.2	29.0	NA
1996	0	80.0	1371.8	8.4	18.6	7.1	3.8	0.1	1489.9	38.2
1997[1]	0	608.7	681.5	273.8	3.1	5.3	1.8	0.1	1574.3	NA
1998[1]	0	1.2	34.5	42.2	3.6	1.5	1.4	0.1	84.5	NA
1999	0	0.02	11.0	40.0	16.1	5.0	1.7	0.1	74.0	NA
2000	0	12.3	557.5	44.1	25.7	4.4	0.7	0.1	644.9	NA
2001	0.04	311.6	1420.8	631.5	46.0	5.4	1.6	0.1	2417.0	NA
2002	0	0.9	428.9	636.3	77.6	17.5	3.2	0.1	1164.4	56.6
2003	0	3.9	220.5	493.4	73.4	28.0	4.0	0.3	823.4	48.1
2004	0	7.1	712.0	821.6	276.2	37.8	1.1	0.2	1856.0	95.8
2005	0	125.1	717.2	984.7	223.3	31.8	0.1	0.1	2082.4	105.0
2006[2]	0	0	164.4	1500.5	598.0	69.0	2.0	0.1	2333.9	172.9
2007[1]	0	0	4.0	628.0	299.3	23.5	1.6	0.4	956.8	79.8
2008	0	0	0.3	12.1	126.1	19.8	1.3	0.1	159.7	20.6
2009	0	0	0.02	2.7	50.6	21.2	1.5	0.02	76.1	11.4
2010	0	0	0.5	1.6	9.4	16.9	1.0	0	29.4	5.2
2011	0	0	0.1	0.3	2.8	5.1	2.5	0	10.6	2.2
2012[1]	0	85.6	674.6	1.1	1.8	5.3	2.0	0.3	770.7	18.2
2013	0	0	75.3	395.9	12.6	11.5	6.8	0.1	502.2	28.6
2014	0	0	182.1	34.2	9.7	1.6	1.5	0.04	229.2	8.5
2015	0	115.6	907.4	141.2	40.8	8.8	7.4	0	1221.3	34.2
2016	0	0.1	260.0	367.6	38.0	6.3	3.0	0.1	674.9	39.1

	Length group (cm)									Biomass
2017[1]	0	0	29.1	939.6	279.2	26.1	11.5	0.05	1285.6	99.7
2018	0	0.02	0.8	45.4	50.2	8.3	1.7	0	106.5	10.5
2019	0.1	1.7	54.4	4.5	35.9	13.0	1.0	0.09	110.7	9.2
2020[1]	0.2	14.3	154.9	25.4	7.9	8.1	0.6	0	212.8	11.5
2021[1]	0	1.5	857.8	88.9	11.1	2.1	0.2	0	961.9	37.5
2022[1]	0	13.3	311.0	260.6	11.6	3.5	1.3	0	601.4	25.9
2023	0	0	41.0	226.7	66.0	8.1	1.1	0.1	343.0	23.3
2024	0	0	38.0	92.9	18.5	4.9	0.5	0	154.7	10.0

[1] Indices not raised to represent the Russian EEZ or uncovered parts , blue whiting is mainly found in areas A, B, C and S.

[2] Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005.

Table A9.2. *BLUE WHITING. Abundance indices (numbers in millions) for new strata 24-26 from bottom trawl surveys in the Barents Sea winter 2014-2024.*

	Length group (cm)								Total	Biomass
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**≥40**	**('000 t)**	
2014	0	0	0.29	0.28	0.10	0.19	0.13	0	1.0	0.12
2015	0	0	0.16	0.10	0.25	0.78	0.42	0	1.7	0.27
2016	0	0	2.12	5.35	1.54	0.46	0.35	0	9.8	0.84
2017	0	0	0.08	20.91	4.10	1.34	0.39	0	26.8	1.98
2018	0	0	0	0.16	0.37	0.23	0.16	0	0.9	0.13
2019	0	0	0.03	0.21	0.71	0.70	0.24	0	1.9	0.34
2020	0	0	0.11	0.27	0	0.13	0	0	0.5	0.05
2021	0	0	9.60	3.53	0.48	0.41	0.07	0	14.1	0.63
2022	0	0	1.77	4.15	0.17	0.10	0	0	6.2	0.32

	Length group (cm)								Total	Biomass
2023	0	0	0.08	0.98	1.1	1.41	0.33	0	3.9	0.56
2024	0	0	0	0.08	0.06	0.24	0.02	0	0.39	0.06

Table A9.3. *BLUE WHITING. Estimates of coefficients of variation (%) for swept area abundance indices. Barents Sea standard area winter 1994-2024.*

	Length group (cm)							
Year	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**
1994	-	-	94	68	51	28	31	49
1995	-	59	55	51	66	32	28	48
1996	-	49	79	56	49	30	33	59
1997[1]	-	30	29	33	36	29	37	70
1998[1]	-	91	60	33	35	33	28	70
1999	-	98	26	27	28	31	43	71
2000	-	37	21	20	25	29	31	95
2001	69	21	18	25	26	35	39	90
2002	-	56	25	17	20	33	52	69
2003	-	87	47	23	17	27	58	83
2004	-	86	23	19	15	14	30	61
2005	-	28	25	16	24	24	71	90
2006[2]	-	-	17	12	13	26	46	61
2007[1]	-	-	50	16	12	17	42	84
2008	-	-	51	59	27	22	47	82
2009	-	-	97	60	21	20	61	95
2010	-	-	91	80	29	25	33	-

	Length group (cm)							
2011	-	-	100	88	45	48	62	-
2012[2]	-	32	30	39	45	38	29	98
2013	-	-	70	31	57	44	44	99
2014	-	-	23	23	24	27	18	137
2015	-	50	21	21	31	31	37	-
2016	-	96	33	24	17	27	29	97
2017[2]	-	-	24	16	16	16	42	101
2018	-	102	49	25	17	19	32	-
2019	68	37	38	29	35	31	50	101
2020[2]	94	90	39	27	28	29	46	-
2021[2]	-	48	23	30	32	24	45	-
2022[2]	-	73	25	18	29	34	72	-
2023	-	-	32	24	21	33	47	100
2024	-	100	69	72	30	36	71	97

[1] Russian EEZ not covered.

[2] Russian EEZ partly covered.

Appendix 2. Survey design and methods for target species index calculation

Introduction

The Institute of Marine Research (IMR), Bergen, has performed acoustic measurements of demersal fish in the Barents Sea since 1976. Since 1981 a bottom trawl survey has been combined with the acoustic survey. Typical effort of the combined survey has been 10-14 vessel-weeks, and about 350 bottom trawl hauls have been made each year. After 2018, the Russian zone has been relatively well-covered and around 500 bottom trawl hauls have been made each year. Most years three vessels have participated from about February 1 to March 15.

The purpose of the investigations is presently:

- Obtain acoustic abundance indices by length and age for cod and haddock
- Obtain swept area abundance indices by length and age for cod and haddock
- Obtain swept area abundance indices by length for redfish, Greenland halibut and blue whiting
- Map the geographical distribution of those fish stocks
- Estimate length, weight and maturity at age for cod and haddock
- Collect stomach samples from cod, for estimating predation by cod

- Map the distribution of capelin (pre-spawning) and polar cod

Data and results from the survey are used both for stock assessments in the ICES Arctic Fisheries Working Group (AFWG) and by several research projects at IMR and PINRO, the Polar branch of the Russian Federal Research Institute of Fisheries and Oceanography (VNIRO).

From 1981 to 1992 the survey area was fixed (strata 1-12, main areas ABCD in Fig. 2.1). Due to warmer climate and increasing stock size in the early 1990s, the cod distribution area increased. Consequently, in 1993 and further in 1994 the survey area was extended to the north and east (strata 13-23, main areas D'ES in Fig. 2.1) to obtain a more complete coverage of the younger age groups of cod, and since then the survey has aimed at covering the whole cod distribution area in open water. For the same reason, the survey area was extended further northwards in the western part in 2014 (strata 24-26 in Fig. 2.1). In many years since 1997 Norwegian research vessels have had limited access to the Russian EEZ, and in 1997, 1998, 2007 and 2016 the vessels were not allowed to work in the Russian EEZ. In 1999 a rather unusually wide ice-extension partly limited the coverage. Since 2000, except in 2006, 2007 and 2017, Russian research vessels have participated in the survey and the coverage has been better, but for various reasons incomplete in most years. Table 1.4 in the main report summarizes degree of coverage and main reasons for incomplete coverage in the survey.

According to the joint IMR-PINRO long-term monitoring plan for the Barents Sea, developed during a series of meeting between the institutes, and agreed to be implemented at the annual meeting between Russian and Norwegian scientists in Tromsø, 13-15 March 2018, the winter survey is from 2019 a joint IMR-PINRO survey with commitments from both institutes to obtain a total coverage of the main demersal fish resources in the area.

Methods

Swept area measurements

All vessels were equipped with the standard research bottom trawl Campelen 1800 shrimp trawl with 80 mm (stretched) mesh size in the front. Prior to 1994 a cod-end with 35-40 mm (stretched) mesh size and a cover net with 70 mm mesh size were mostly used. Since this mesh size may lead to considerable escapement of 1-year-old cod, the cod-ends were in 1994 replaced by cod-ends with 22 mm mesh size. At present a cover net with 116 mm meshes is mostly used.

The trawl is now equipped with a rockhopper ground gear (Engås and Godø 1989). Until and including 1988 a bobbins gear was used, and the cod and haddock indices from the period 1981-1988 have since been recalculated to 'rockhopper indices' and adjusted for length dependent catch efficiency and/or sweep width (Godø and Sunnanå 1992, Aglen and Nakken 1997). The sweep wire length is 40 m, plus 12 m wire for connection to the doors.

In the Norwegian Barents Sea shrimp survey (Aschan and Sunnanå 1997) the Campelen trawl has been rigged with some extra floats (45 along the ground rope and 18 along the under belly and trunk, all with 20mm diameter) to reduce problems on very soft bottom. This rigging has been referred to as "Tromsø rigging". When the shrimp survey was terminated 2004 and later merged with the Barents Sea Ecosystem survey in 2005, improved shrimp data were also requested from the winter survey, and the "Tromsø rigging" was used in parts of the shrimp areas in 2004 (11 stations) and 2005 (9 stations). In 2006-2014 "Tromsø rigging" was used for nearly all bottom trawl stations taken by Norwegian vessels in the winter survey, while since 2015 this rigging has not been applied.

Vaco doors (6 m^2, 1500kg), were previously standard trawl doors on board the Norwegian research vessels. On the Russian vessels and hired vessels V-type doors (ca 7 m^2) have been used. In 2019 the Russian vessel used 5 m^2 “Sparrow” trawl doors weighing 2000 kg. In 2004, R/V “Johan Hjort” and R/V “G.O. Sars” started using a V-type door for bottom trawling (Steinshamn W-9, 7.1m^2 , 2050 kg), the same type as used on the Russian research vessels. In 2010 the V-doors were replaced by 125” Thyborøn trawl doors. R/V “Helmer Hanssen” has used Thyborøn trawl doors since the 2008 survey. To achieve constant sampling width of a trawl haul independent of e.g. depth and wire length, a 10-15 m rope “locks” the distance between the trawl wires 80-150 m in front of the trawl doors on the Norwegian vessels. This is called “strapping”. The distance between the trawl doors is then in most hauls restricted to the range 48-52 m regardless of depth (Engås and Ona 1993, Engås 1995). Strapping was first attempted in the 1993 survey on board one vessel, in 1994 it was used on every third haul and in 1995-1997 on every second haul on all vessels. Since 1998 it has been used on all hauls when weather conditions permitted. Strapping is not applied on the Russians vessels, but the normal distance between the doors is about 50 m (D. Prozorkevich, pers. comm.).

Standard tow duration is now 15 minutes (until 1985 the tow duration was 60 min. and from 1986 to 2010 30 min.). Trawl performance is constantly monitored by Scanmar trawl sensors, i.e., distance between the doors, vertical opening of the trawl and bottom contact control. In 2005-2008 sensors monitoring the roll and pitch angle of the doors were used due to problems with the Steinshamn W-9 doors. The data is logged on files but have so far not been used for further evaluation of the quality of the trawl hauls.

At the start of the survey at least two of the trawls on the Norwegian vessels undergo a “sea test”. The purpose of the test is to check that the geometry of the trawl is within the specified limits and that the trawl performance is satisfactory, especially that the bottom contact is stable. It is further checked that the trawl sensors operate as they should.

The positions of the trawl stations are pre-defined. When the swept area investigations started in 1981 the survey area was divided into four main areas (A, B, C and D, Fig 2.1) and 35 strata.

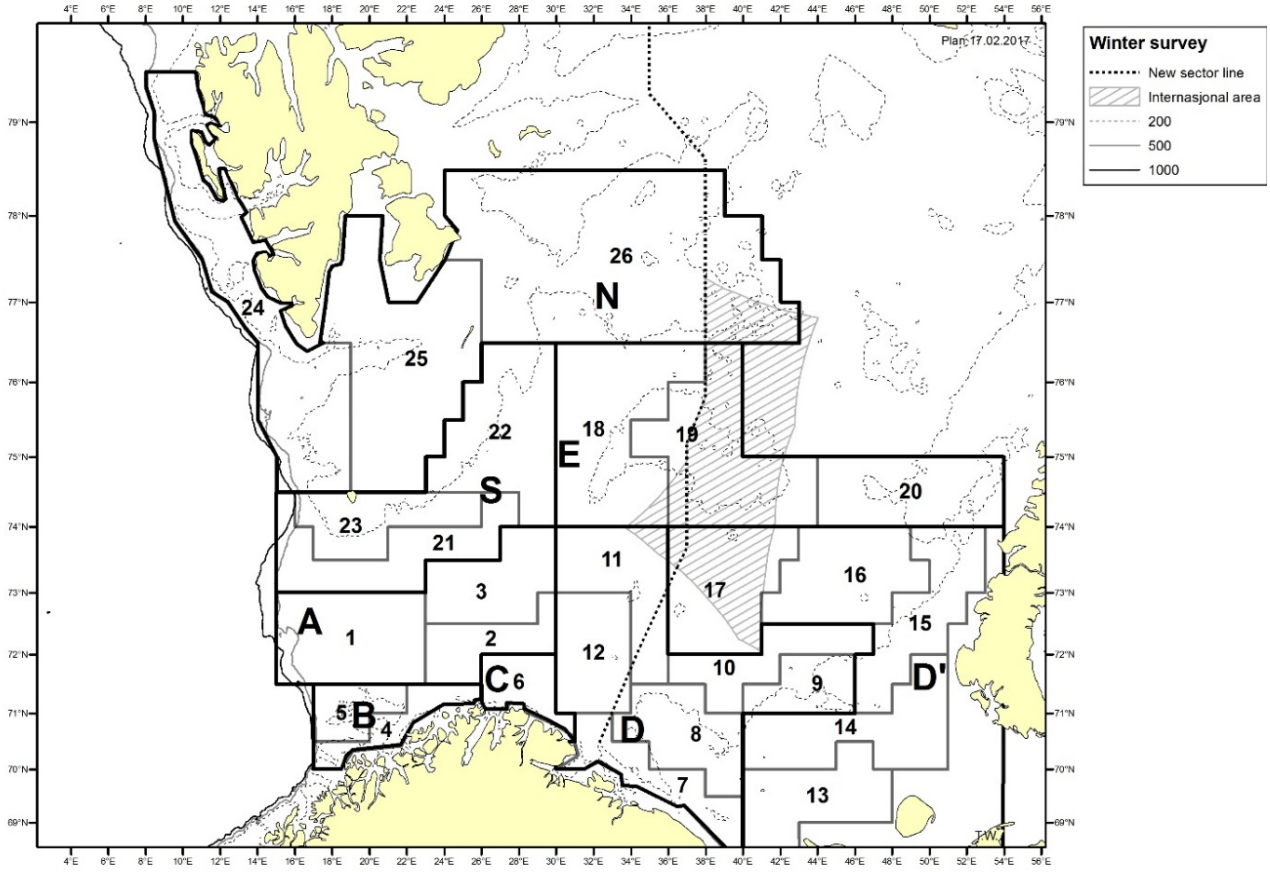

Figure 2.1. Strata (1-23) and main areas (A,B,C,D,D',E and S) used for swept area estimations and acoustic estimations with StoX. Additional strata (24-26, main area N) are covered since 2014, and are from 2020 included in the standard time series for haddock and from 2021 in the time series for cod.

During the first years, the number of trawl stations in each stratum was set based on expected fish distribution to reduce the variance, i.e., more hauls in strata where high and variable fish densities were expected to occur. During the 1990s trawl stations were spread out more evenly, yet the distance between stations in the most important cod strata is shorter (16 or 20 NM) compared to the less important strata (24, 30 or 32 NM). Considerable amounts of young cod were now distributed outside the initial four main areas, and in 1993 the investigated area was therefore enlarged by areas D', E, and the ice-free part of Svalbard (S) (Fig. 2.1 and Table 1.4 in main report), 28 strata altogether. In the 1993-1995 survey reports, the Svalbard area was included in area A' and the western part of area E (west of 30 ° E). Since 1996 a revised strata system with 23 strata has been used (Figure 2.1). The main reason for reducing the number of strata was the need for enough trawl stations in each stratum to get reliable estimates of density and variance. In 2014 the investigated area was enlarged by three new strata in northwest, 24-26 (main area N, Fig. 2.1). From 2020, these strata were included in the swept area and acoustic indices for haddock and from 2021, they were included for cod (see next section). They are not yet included in the standard time series for the other species, but presented separately.

Sampling of catch and age-length keys

Sorting, (sub)sampling, weighing, and measuring of the catch are done according to instructions given in Mjanger *et al* . (2021). Since 1999 all data except age are recorded electronically by Scantrol Fishmeter

measuring board, connected to stabilized scales. The whole catch or a representative sub sample of most species is length measured at each station.

At each trawl station, one cod and haddock per 5 cm length-group is sampled for age (otoliths), individual weights, sex, and maturity. For cod, stomach samples are also taken from the same individuals. For the largest cod, other sampling schemes have been used in some years; in 2007-2009, all cod above 80 cm were sampled, and in 2010 all above 90 cm were sampled, limited to 10 per station. The stomach samples from cod are frozen and analysed after the survey. Greenland halibut otoliths are also sampled from one specimen per 5 cm length-group, while otoliths from the redfish species *Sebastes norvegicus* and *S. mentella* are sampled from two fish in every 5-cm length-group at every station. Table A2.1 in the annual report gives an account of the sampled material, and further details on the sampling protocol can be found in the sampling manual for the Winter survey (updated annually).

Swept area fish density estimation

Swept area fish density estimates ($r_{k,l,s}$) for each station *s* in stratum *k* are first estimated by length (*l*) for each bottom trawl haul by the equation:

$$\rho_{k,l,s} = \frac{f_{k,l,s}}{a_{k,l,s}}$$

$\rho_{k,l,s}$ number of fish of length *l* per n.m.^{2} observed on trawl station *s* in stratum *k*

$f_{k,l,s}$ estimated frequency of length *l*

$a_{k,l,s}$ swept area:

$$a_{k,l,s} = \frac{d_{k,s} \cdot EW_l}{1852}$$

d_s towed distance (nm)

EW_l length dependent effective fishing width. The fishing width was previously fixed to 25 m = 0.0135 nm.

Based on Dickson (1993a,b, Table 1), length dependent effective fishing width was included in the calculations for cod and haddock from 1995 (Korsbrekke *et al* ., 1995) as such:

$EW_l = \alpha \cdot l^{\beta}$ for $l_{min} l < l_{max}$

$EW_l = EW_{l_{min}} = \alpha \cdot l_{min}^{\beta}$ for $l \leq l_{min}$

$EW_l = EW_{l_{max}} = \alpha \cdot l_{max}^{\beta}$ for $l \geq l_{max}$

Table 1 : Species-specific parameters from Dickson (1993a, b) used to calculate length-dependent effective fishing width for cod and haddock.

Species	***a***	***b***	l_{min}	l_{max}
Cod	5.91	0.43	15 cm	62 cm
Haddock	2.08	0.75	15 cm	48 cm

For redfish, Greenland halibut and other species, a fishing width of 25 m is applied, independent of fish length.

After applying the length-dependent effective fishing width, the station-specific length distributions (swept area density by length) are aggregated into 5 cm length groups.

Next, the abundance (N individuals) by 5 cm length group *l* and stratum *k* are calculated as:

$$N_{k,l}=\rho_{k,l}A_k$$

Where A is the area (nmi^2) of stratum *k* and $\rho_{k,l}$ is the average swept area density by *l* in the stratum, given by:

$$\rho_{k,l}=\{1/n\}\sum_{s=1}^{n}\rho_{k,l,s}$$

Where n is the number of stations in the stratum.

A two-stage conversion process is used to convert the abundance of fish by length group to abundance of fish by age group. First, the abundance ($N_{k,l}$) by length group and stratum is distributed on the length-measured individuals (j) to generate so-called “Super-individuals” (super-individuals represent fractions of a total; our use corresponds to a probability-based design where $w_{k,l,s,j}$ is the inverse of the inclusion probability for a single fish sample), each representing an abundance estimated as:

$$N_{k,l,s,j}=N_{k,l}w_{k,l,s,j}$$

Where,

$$w_{k,l,s,j}=\rho_{k,l,s}/\left(\sum_{s=1}^{n}\rho_{k,l,s}\right)\times 1/m_{k,l,s}$$

and *m* is the number of length-measured individuals.

Second, in instances where a super-individual is not aged, the missing age is filled in by a random data imputation. The imputation of missing age is first carried out at the station level, randomly selecting the value from aged super-individuals within the same length group. If no aged super-individual is available at the station level, the imputation is attempted at strata level, or lastly at survey level. In instances where no age information is available at any level for a specific length group, the abundance estimate is presented with unknown age (Johnsen et al., 2019).

Acoustic measurements

The method is explained by Dalen and Smedstad (1979, 1983), Dalen and Nakken (1983), MacLennan and Simmonds (1991) and Jakobsen et al. (1997). The acoustic equipment has been continuously improved. Since the early 1990s Simrad EK500 echo sounder and Bergen Echo Integrator (BEI, Knudsen 1990) were used. The Simrad EK60 echo sounder replaced the EK500 on R/V “Johan Hjort” in 2005 and on R/V “Helmer Hanssen” since 2008. The latest R/V “G.O. Sars” has used EK60 since it replaced R/V “Sarsen” (former R/V “G.O. Sars”) in 2004. The Large Scale Survey System (LSSS, Korneliussen *et al*. 2016) replaced BEI on R/V “G.O. Sars” and R/V “Johan Hjort” in 2007 and on R/V “Helmer Hanssen” since 2008. On the Russian vessels EK 500 was used from 2000 to 2004 and ER60 since 2005. The new Simrad EK80 echo sounder has been used on R/V “G.O. Sars” since 2017 and on R/V “Johan Hjort” since 2018. In 2023 LSSS v. 2.13.0 was used on the Norwegian vessels and LSSS v. 1.9.0 on the Russian vessel.

In the mid-1990s the echo sounder transducers were moved from the hull to a retractable centreboard, on R/V “Johan Hjort” since the 1994 survey, on R/V “Sarsen” (former R/V “G.O. Sars”) since 1997, on the latest R/V “G.O. Sars in 2004 and on R/V “Helmer Hanssen” since the 2008 survey. This latter change has largely reduced the signal loss due to air bubbles in the close to surface layer. None of the Russian vessels have retractable centreboards.

On both Norwegian and Russian vessels, acoustic backscattering values (s_A = nautical area scattering coefficient NASC) are stored at high resolution in LSSS. After scrutinizing and allocating the values to species or species groups, the values are stored with 10 m vertical resolution and 1 nautical mile (NM) horizontal resolution. The procedure for allocation by species is based on:

- composition in trawl catches (pelagic and demersal hauls)
- the appearance of the echo recordings
- inspection of target strength distributions
- inspection of target frequency responses

For each trawl catch the relative s_A-contribution from each species is calculated (Korsbrekke 1996) and used as a guideline for the allocation. In these calculations, the fish length dependent catching efficiency of cod and haddock in the bottom trawl (Aglen and Nakken 1997) is taken into account. There is no reason to believe that trawl catches give an accurate representation of species composition in the sea, so the calculated s_A -contribution from the trawl hauls are used as a guidance only.

Acoustic fish density estimation

Within each stratum, the acoustic course tracks are divided into transects that are separated by changes in heading. A distance of about 2 nautical miles around each turn is not included in the transects. When the time series 1994-2017 was converted to StoX, the specification of transects was done by first running a R-script tagging all the transects and then the transects were inspected and edited manually in StoX if necessary. Minimum length of a transect was set to 4 nautical miles and the location of trawl stations were used to cut the tracks into transects, i.e., they were limited by trawl location as well as the heading of the ship. In this process miles with obvious errors in the s_A -values, e.g., bottom contribution, were removed from the transects. From 2018, all transects have been defined manually using the built-in functionality in the StoX software with the approach of stopping the transect for changes in heading only.

For each transect and stratum, an arithmetic mean s_A is calculated for the water column. The conversion of mean NASC (m^2 nmi^{-2}) to density of fish follows a standard procedure where all trawl stations within a stratum with a catch of more than 5 individuals are assigned to each PSU. If less than 3 trawl stations had been carried out in a stratum, stations in neighbouring strata are manually assigned to the PSUs such that at least 3 stations are assigned to each PSU. From 2021, the criterion of having minimum 5 individuals in the catch was excluded as this type of filtration is not implemented in the new StoX version.

The combined length distribution (d) is calculated for each transect (PSU (j)) as:

$$d_{l,j} = \sum_{s=1}^{S} d_{l,s,j}$$

where $d_{l,s,j}$ is density (number by 1 NM tow distance) by 1 cm length group (l) for the stations (s) assigned to PSU (j).

The trawl catches are normalised to 1 NM towing distance and adjusted for length dependent catch efficiency as describe for swept area estimation above.

The areal density of fish (ρ) (n per nmi^2) by length group l by transect j is calculated as

$$\rho_{j,l}=\frac{NASC_{j,l}}{\sigma_l}$$

where $NASC_{j,l}$ is the mean nautical area scattering coefficient by transect (j) and length group (l) and σ_l is the acoustic backscattering cross-section for a fish of length l.

$NASC_{j,l}$ is calculated as:

$$NASC_{j,l}=NASC_j\frac{\sigma_{l,p}}{\sum_l \sigma_{l,p}}$$

where $\sigma_{l,p}$ is the acoustic backscattering cross-section for a fish of length l multiplied with the proportion (p) of a fish of length l in the total length distribution and $NASC_j$ is the mean nautical area scattering coefficient in transect j.

The acoustic backscattering cross-section (m^2) for a fish of length l is calculated as

$$\sigma_l=4\pi 10^{\left(\frac{TS_l}{10}\right)}$$

where the target strength, TS, for a fish of length l (cm) is calculated as

$$TS_l=m\log_{10}(l)+a$$

Where m and a are constants. For cod and haddock, we apply:

$TS=20\log(l)-68$ (Foote, 1987)

The fish abundance (N) by length group (l) for stratum k is then:

$$N_{k,l}=\rho_{k,l}A_k,$$

where A is stratum area and the mean density of fish of length group l and stratum k is:

$$\rho_{k,l}=\frac{1}{n_k}\cdot\sum_{k=1}^{n_k} w_{kj}\rho_{kj,l}$$

where $w_{kj}=L_{kj}/L_k$ (j= 1,2, n_k) are the lengths of the n_k sample transects.

Estimates by length are converted to estimates by age using the same imputation method described for the swept area index estimation. The abundance by stratum is then summed for defined main areas (Figure 2.1).

Software for index estimation

The new Sea2Data software StoX has been applied to estimate acoustic indices with CVs for cod and haddock and swept area indices with CVs for cod, haddock, golden redfish, beaked redfish, Norway redfish, Greenland

halibut and blue whiting (Mehl *et al*. 2016, 2018). The main difference between StoX and the SAS-based BEAM software previously used (years 1981-1993 of the time-series, see earlier survey reports for results and method details) is in the use of the age-length data. StoX does not use age-length keys (ALK) in the traditional sense with ALKs estimated for large areas. Missing age information is instead imputed from known age-length data within station, strata, or the entire survey (see below). In addition, in the acoustic abundance estimation, StoX transects are defined within each stratum (Figure 2.1) as primary sampling units (PSUs) and used to calculate acoustic density (Jolly and Hampton 1990), as opposed to the BEAM method that divided the survey area into rectangles, calculating average acoustic densities (s_A) in each. StoX also allows for uncertainty estimation by bootstrapping primary sampling units (PSUs). Another main feature is storing of all user input and software versions in a version controlled file.

The entire haddock time series was revised in 2020 using StoX, in connection with the ICES Benchmark Workshop for Demersal Species (ICES 2020). This involved including strata 24-26 in the official time series from 2014, the use of bootstrap mean instead of baseline estimates for abundance at age and standardising the length groups used in the length-dependent sweep width function (Fall 2020). The additional strata were also included in the acoustic index for haddock, while the other changes were made to the swept area index only. In 2021, the same changes were made to the cod time series (ICES 2021). The revised swept area index for haddock was produced with R version 3.5.3 (years 1994-2013) and R version 3.6.2 (years 2014-2019). From 2022, the haddock acoustic index is also presented as bootstrap mean abundances.

In the update of R to 3.6.X, the random seed generator was changed, which means that the same seed will give slightly different results compared to 3.5.X. This results in minor differences to the bootstrapped estimates if old StoX projects are run with the new R version.

StoX input, filters and settings for cod and haddock

Input data for survey index estimation were downloaded from DatasetExplorer: https://datasetexplorer.hi.no/apps/datasetexplorer/v2/navigation . See section 3 in main report for information on what snapshot files were used in the current year.

The different functions and settings used in swept area estimation for cod and haddock in StoX are detailed in Table 2. The functions are divided into the three parts of the StoX estimation process: baseline, analysis, and report.

Table 2 : StoX functions and settings used in the cod and haddock swept area estimations, split on the three parts of the StoX estimation process; baseline, analysis, and report. Updated for StoX v. 3.6.1.

Function	Settings	Purpose
Baseline		
ReadBiotic	FileNames: paths to xml-files in biotic folder	Reads in versioned biotic files.
StoxBiotic	-	Converts and trims data (only keeps key variables, standardises variable names etc.) to a common format used in StoX.
AddToStoxBiotic	StoxBioticData: StoxBiotic BioticData: ReadBiotic VariableNames: gearcondition, samplequality, stationtype, length, maturationstage, otolithtype	Add variables required for filtering or that are needed in output data.

FilterStoxBiotic (1)	StoxBioticData: AddToStoxBiotic FilterExpression: {"Haul": "Gear %in% c(\"3270\", \"3271\") & gearcondition %in% c(\"1\") & samplequality %in% c(\"1\", \"3\")", "Station": "stationtype %notin% \"2\""} FilterUpwards: true	Data filtering; removes extra hauls taken on acoustic registrations and unsuccessful hauls, selecting data from bottom trawl only. See https://kvalitet.hi.no/docs/pub/DOK06839.pdf for explanation of the different codes used in the data.
FilterStoxBiotic (2)	StoxBioticData: FilterStoxBiotic (1) FilterExpression: {"SpeciesCategory": "SpeciesCategory %in% \"torsk/164712/126436/Gadus morhua\""} FilterUpwards: false	Data filtering; selecting data for the target species. For haddock, the SpeciesCategory is: "hyse/164744/126437/Melanogrammus aeglefinus\" Filter upwards set to FALSE in order to keep stations with zero catch of haddock to get representative average swept area densities.
DefineStratumPolygon	DefinitionMethod: ResourceFile FileName: input/ vintertokt_barentshavny.txt StratumLabelName: “StratumName” SimplifyStratumPolygon: false	The resource file contains polygon definitions for the strata used in the Winter survey.
StratumArea	StratumPolygon: DefineStratumPolygon AreaMethod: Accurate	Calculates the area of each stratum.
LengthDistribution	StoxBioticData: FilterStoxBiotic (2) LengthDistributionType: Normalized RaisingFactorPriority: Weight	Calculates length frequency distributions for each station and haul. ‘Normalized’ refers to a length distribution that is standardised to one nautical mile towing distance (i.e., weighted by CPUE). The RaisingFactorPriority relates to how weighting is handled when the haul contains different subsamples for the same species. See StoX documentation for more details on length distributions.
RegroupLengthDistribution (1)	LengthDistributionData: LengthDistribution LengthInterval: 1	Sets the length distribution resolution to 1 cm, i.e., 1 cm length groups. There may be length distributions with finer resolution, this will standardise it.
LengthDependentCatch-Compensation	LengthDistributionData: RegroupLengthDistribution (1) CompensationMethod: LengthDependentSweepWidth LengthDependentSweepWidth-Parameters: [{"SpeciesCategory": "torsk/164712/126436/Gadus morhua","Alpha":5.91, "Beta":0.43, "LMin":15,"LMax":62}]	Adjusts the length distributions for increasing catchability with length (based on the Dixon experiments). For haddock, the parameters are: [{"SpeciesCategory": "hyse/164744/126437/Melanogrammus aeglefinus","Alpha": 2.08, "Beta": 0.75, "LMin": 15, "LMax": 48}
RegroupLengthDistribution (2)	LengthDistributionData: LengthDependentCatch-Compensation LengthInterval: 5	Regroups the length distribution to the same resolution as the age sample stratification: 5 cm length groups.
MeanLengthDistribution	LengthDistributionData: RegroupLengthDistribution (2) StratumPolygon: DefineStratumPolygon BioticPSU: DefineBioticPSU LayerDefinition: FunctionParameter LayerDefinitionMethod: WaterColumn SurveyDefinition: FunctionParameter SurveyDefinitionMethod: AllStrata PSUDefinition: FunctionParameter PSUDefinitionMethod: StationToPSU	Calculates the mean length distribution for each PSU by summing vertically and averaging horizontally. This allows mean length distributions to be calculated across e.g., hauls taken at the same PSU (station) but different depths. For the cod and haddock projects there is only one haul per PSU, which means that the purpose of this function is to define PSUs and convert the LengthDistribution object to a MeanLengthDistribution object for use in further calculations.

SweptAreaDensity	MeanLengthDistributionData: MeanLengthDistribution SweptAreaDensityMethod: LengthDistributed SweepWidthMethod: PreDefined DensityType: "AreaNumberDensity"	Calculates the area density of fish (number of individuals per square nautical mile). The sweep width method is set to pre-defined since this is already taken care of by the LengthDependentCatchCompensation process.
MeanDensity	DensityData: SweptAreaDensity	Calculates the average swept area density in each stratum. The average is weighted by the number of hauls per PSU, meaning that for a standard swept area project with one haul per PSU, this will be an unweighted average. For acoustic projects, the mean acoustic density is weighted by the effective log distance.
Quantity	MeanDensityData: MeanDensity StratumAreaData: StratumArea	Calculates the total abundance of each length group (also species category and layer when relevant) in each stratum based on the mean swept area density and stratum area.
Individuals	StoxBioticData: FilterStoXBiotic (2) MeanLengthDistributionData: MeanLengthDistribution QuantityType: SweptArea	Defines the individual data that will be used to distribute the abundance on super individuals.
SuperIndividuals	IndividualsData: Individuals QuantityData: Quantity LengthDistributionData: RegroupLengthDistribution (2) DistributionMethod: HaulDensity	Distributes abundance on the individuals, turning them into “Superindividuals”, each representing a part of the total abundance. Abundance can be divided equally on all individuals, or it can be divided proportionally to the density of the individual’s length group in the haul in which it was caught. Needed to get indices by age and to weigh biological parameters by abundance.
ImputeSuperIndividuals	SuperIndividualsData: SuperIndividuals ImputationMethod: RandomSampling ImputeAtMissing: [“IndividualAge”] ImputeByEqual: ["SpeciesCategory", "IndividualTotalLength"] ToImpute: ["IndividualAge", "maturationstage", "IndividualRoundWeight", "otolithtype"] Seed: 1	Identifies individuals that have missing data for a specified variable (here: age, as specified in “ImputeAtMissing”), and assigns the missing variables (and possibly others specified in “ToImpute”) by random sampling from other individuals in the same length group. First, the function looks for suitable individuals from the same haul. If there are none, the random draw extends to other hauls in the stratum, and lastly to the entire survey. Will return NA if no other individuals in the same length group have been aged in the survey. This has the advantage over a traditional age-length key in that it allows imputation of other variables than age.
Analysis		
Bootstrap	BootstrapMethodTable: [{"ResampleFunction": "ResampleMeanLength-DistributionData", "ProcessName": "MeanLengthDistribution", "Seed":1}] NumberOfBootstraps: 500 OutputProcesses: ["ImputeSuperIndividuals", "SuperIndividuals"] UseOutputData: FALSE (not ticked) NumberOfCores: 8 BaselineSeedTable: [{"ProcessName": "ImputeSuperIndividuals", "Seed":1}]	This function runs a subset of the baseline model several times (as specified in “NumberOfBootstraps”) after resampling trawl hauls in each stratum (with replacement). Here, the baseline model is rerun from MeanLengthDistribution to ImputeSuperIndividuals, calculating new length distributions based on the resampled trawl hauls and redoing the age imputation. The “UseOutputData” option can be used if, e.g., new reports are to be generated from a bootstrap object that has already been run – this option reads in the bootstrap object rather than running it again. The number of cores can be set higher if relevant (will use max number of cores if less than 8).
Report		

ReportBootstrap	BootstrapData: Bootstrap BaselineProcess: ImputeSuperIndividuals TargetVariable: Abundance AggregationFunction: sum BootstrapReportFunction: summaryStox "Percentages": [5, 50, 95] GroupingVariables: ["Survey", "SpeciesCategory", "IndividualAge"] RemoveMissingValues: FALSE	Report bootstrap abundance. This function gives specified quantiles and mean, sd and CV of abundance by age. The bootstrap mean abundance is used as the official estimate of swept area abundance for cod and haddock. The “Percentages” parameter defines the quantities to report, here it is set to 5 %, 50 % and 95 %. This is the same for the other reports defined below.
ReportBootstrap	BootstrapData: Bootstrap BaselineProcess: ImputeSuperIndividuals TargetVariable: Biomass AggregationFunction: sum BootstrapReportFunction: summaryStox GroupingVariables: ["Survey", "SpeciesCategory", "IndividualAge"] RemoveMissingValues: FALSE	Report bootstrap biomass.
ReportBootstrap	BootstrapData: Bootstrap BaselineProcess: ImputeSuperIndividuals TargetVariable: Abundance AggregationFunction: sum BootstrapReportFunction: summaryStox GroupingVariables: ["Survey","SpeciesCategory, "Stratum", "IndividualAge"] RemoveMissingValues: FALSE	Report bootstrap abundance by stratum and age.
ReportBootstrap	BootstrapData: Bootstrap BaselineProcess: ImputeSuperIndividuals TargetVariable: Biomass AggregationFunction: sum BootstrapReportFunction: summaryStox GroupingVariables: ["Survey","SpeciesCategory", "Stratum", "IndividualAge"] RemoveMissingValues: FALSE	Report bootstrap biomass by stratum and age.
ReportBootstrap	BootstrapData: Bootstrap BaselineProcess: ImputeSuperIndividuals TargetVariable: length AggregationFunction: weighted.mean BootstrapReportFunction: summaryStox GroupingVariables: ["Survey","SpeciesCategory", "IndividualAge"] RemoveMissingValues: TRUE AggregationWeightingVariable: Abundance	Report bootstrap mean length at age. The mean lengths are weighted by superindividual abundance at age (i.e., individuals from abundant length groups get higher weight).

	BootstrapData: Bootstrap BaselineProcess: ImputeSuperIndividuals TargetVariable: IndividualRoundWeight AggregationFunction: weighted.mean BootstrapReportFunction: summaryStox GroupingVariables: ["Survey","SpeciesCategory", "IndividualAge"] RemoveMissingValues: TRUE AggregationWeightingVariable: Abundance	Report bootstrap mean weight at age. The mean weights are weighted by superindividual abundance at age (i.e., individuals from abundant length groups get higher weight).

*Note that this is the function name, not the process name – the latter can be freely decided by the user. If a function is used more than once, unique processes names must be given and care must be taken to refer to the right process in subsequent steps of the estimation process (as indicated by numbers after the function name).

Table 3 details the functions and settings used for cod and haddock acoustic estimation in StoX.

Table 3 : StoX functions and settings used in the cod and haddock acoustic estimations, split on the baseline and analysis part of the StoX estimation procedure. For details on functions used also in the swept area index (including report generation), refer to table 2. Updated for StoX v. 3.6.1.

Function	Settings	Details
Baseline		
ReadAcoustic	FileNames: paths to xml-files in acoustic folder	Reads in versioned acoustic files.
StoxAcoustic	-	Converts and trims data (only keeps key variables, standardises variable names etc.) to a common format used in StoX.
FilterStoxAcoustic (1)	StoxAcousticData: StoxAcoustic FilterExpression: {"Beam":"Frequency %in% 38000","ChannelReference": "ChannelReferenceType %in% \"P\""} FilterUpwards: FALSE	Select data from 38 kHz only (in case data is stored on multiple frequencies) and select only pelagic channel data (which contains data from entire water column; the bottom channel “B” is just stored at a higher resolution).
FilterStoxAcoustic (2)	StoxAcousticData: FilterStoxAcoustic(1) FilterExpression: {"AcousticCategory": "AcousticCategory %in% \"31\""} FilterUpwards: FALSE	For haddock: "AcousticCategory %in% \"30\""
DefineTranslationBeam	DefinitionMethod: TranslationTable TranslationTable: [{ "Beam": "38000/1", "NewValue": "38000/2" }] "ValueColumn": "Value", "NewValueColumn":"NewValue", "ConditionalValueColumns": "ConditionalValue"	In some cases, the beam names are different on Norwegian and Russian vessels. This defines a key that connects the two names and is used to make sure all data from 38 kHz are included.
TranslateStox-AcousticBeam	StoxAcousticData: FilterStoxAcoustic(2) Translation: DefineTranslationBeam	Apply the translation to the acoustic data.
ReadBiotic	FileNames: paths to xml-files in biotic folder	As above.
StoxBiotic	-	As above.
AddToStoxBiotic	StoxBioticData: StoxBiotic BioticData: ReadBiotic VariableNames: ["stationtype", “gearcondition”, “samplequality”]	As above.

FilterStoxBiotic	StoxBioticData: AddToStoxBiotic FilterExpression: {"Station":"stationtype %notin% \"2\"", "SpeciesCategory": "SpeciesCategory %in% \"torsk/164712/126436/Gadus morhua\"", "Haul": "gearcondition %in% c(\"1\", \"2\") & samplequality %in% c(\"1\", \"2\", \"3\")"} FilterUpwards: true	Here we do not keep trawl stations without the target species (FilterUpwards: true), since it is the length samples that are of interest.
LengthDistribution	StoxBioticData: FilterStoxBiotic LengthDistributionType: Normalized RaisingFactorPriority: Weight	As above.
RegroupLength-Distribution	LengthDistributionData: LengthDistribution LengthInterval: 1	As above.
LengthDependentCatch-Compensation	LengthDistributionData: RegroupLengthDistribution CompensationMethod: LengthDependentSweepWidth LengthDependentSweep-WidthParameters: [{"SpeciesCategory": "torsk/164712/126436/Gadus morhua","Alpha":5.91, "Beta":0.43, "LMin":15,"LMax":62}]	For haddock, the parameters are: [{"SpeciesCategory": "hyse/164744/126437/-Melanogrammus aeglefinus", "Alpha": 2.08, "Beta": 0.75, "LMin": 15, "LMax": 48}
RelativeLength-Distribution	LengthDistributionData: LengthDependentCatch-Compensation	Converts the length distribution to a relative one (in %).
DefineStratumPolygon		As above
StratumArea		As above
DefineAcousticPSU	StoxAcousticData: TranslateStoxAcousticBeam DefinitionMethod: “Manual”	Set to manual to define the transects by clicking in the GUI. After doing this once, the transect definitions are stored in the process data.
NASC	StoxAcousticData: TranslateStoxAcousticBeam	Converts the acoustic data to NASC data format.
MeanNASC	NASCData: NASC AcousticPSU: DefineAcousticPSU LayerDefinition: FunctionParameter LayerDefinitionMethod: WaterColumn SurveyDefinition: FunctionParameter SurveyDefinitionMethod: AllStrata PSUDefinition: “ FunctionInput”	Sums the NASC data vertically. Here: throughout the entire water column.
DefineBioticAssignment	StoxBioticData: FilterStoxBiotic StratumPolygon: DefineStratumPolygon AcousticPSU: DefineAcousticPSU StoxACousticData: TranslateStoxAcousticBeam DefinitionMethod: Stratum LayerDefinition: FunctionParameter LayerDefinitionMethod: WaterColumn	Assigns trawl stations to each acoustic PSU; all trawl stations within the same strata as the acoustic PSU will be assigned to that PSU. In the case of few trawl stations in a strata, additional trawls from neighbouring strata can be added manually in the map window.
BioticAssignmentWeighting	BioticAssignment: DefineBioticAssignment LengthDistributionData: RegroupLengthDistribution WeightingMethod: SumWeightedNumber	How to weight the trawl stations when calculating length distributions for each PSU. The “SumWeightedCount” option gives weighting values that are proportional to the normalized length distribution count (i.e., cpue) in the haul.
AssignmentLength-Distribution	LengthDistributionData: RelativeLengthDistribution BioticAssignment: DefineBioticAssignment	Calculates weighted average length distributions for each PSU (and layer).
DefineAcousticTarget-Strength	DefinitionMethod: Table AcousticTargetStrengthModel: LengthDependent AcousticTargetStrengthTable: [{"AcousticCategory":"31", "Frequency": 38000, "TargetStrength0": -68, "LengthExponent": 20}]	Specifies the target strength-length relation for the target species. The same settings are used for cod and haddock, except that the AcousticCategory is set to “30”.

AcousticDensity	MeanNASCData: MeanNASC AssignmentLength-DistributionData: AssignmentLength-Distribution AcousticTargetStrength: DefineAcousticTarget- Strength SpeciesLink: [{"AcousticCategory":"31", "SpeciesCategory": "torsk/164712/126436/Gadus morhua"}]	Calculate number density based on the acoustic target strength-length relationship. For haddock: SpeciesLink: [{"AcousticCategory": "30","SpeciesCategory": "hyse/164744/126437/-Melanogrammus aeglefinus"}]
MeanDensity	DensityData: AcousticDensity	Calculates the weighted average density in each stratum. The weights are the effective log distance of each acoustic PSU.
Quantity	MeanDensityData: MeanDensity StratumAreaData: StratumArea	As above.
Individuals	StoxBioticData: FilterStoxBiotic(2) BioticAssignment: BioStationWeighting AbundanceType: Acoustic	As above.
SuperIndividuals	IndividualsData: Individuals Quantity Data: Quantity LengthDistributionData: LengthDependentCatch-Compensation DistributionMethod: HaulDensity	As above. Currently, the length distribution data is not regrouped to 5 cm length bins in the acoustic projects. This should be considered in the next revision.
ImputeSuperIndividuals	SuperIndividualsData: SuperIndividuals ImputationMethod: RandomSampling ImputeAtMissing: ["IndividualAge"] ImputeByEqual: ["SpeciesCategory", "IndividualTotalLength"] ToImpute: ["IndividualRoundWeight", "LengthResolution", "WeightMeasurement", "IndividualSex", "IndividualAge"] Seed: 1	As above.
Analysis		
Bootstrap	BootstrapMethodTable: [{"ResampleFunction": "ResampleMeanNASCData", "ProcessName": "MeanNASC", "Seed":4}, {"ResampleFunction": "ResampleBioticAssignment", "ProcessName": "BioticAssignmentWeighting", "Seed":7}] NumberOfBootstraps: 500 OutputProcesses: ["ImputeSuperIndividuals"] UseOutputData: false NumberOfCores: 8 BaselineSeedTable: [{"ProcessName": "ImputeSuperIndividuals", "Seed":2}]	As above.

Estimation of variance

The acoustic and swept area survey indices are presented together with an estimate of uncertainty (coefficient of variation; CV). These estimates are obtained from the bootstrap routine presented under the analysis section of Table 2. In the bootstrap of acoustic indices, each transect is treated as the primary sampling unit. In addition, a bootstrap routine for all trawl stations by strata is carried out within each run. The estimated CV (Standard Deviation · 100/mean) is estimated from 500 iterations.

References

See section 10 in main report.

Appendix 3. Changes in survey design, methods, gear etc.

Changes to survey design and equipment

Year	Change from	To
1984	Representative age sample, 100 per station	Stratified age sample, 5 per 5-cm length group
1986	1 research vessel, 2 commercial trawlers	2 research vessels, 1 commercial trawler
1987	60 min. tow duration	30 min. tow duration
1989	Bobbins gear	Rock-hopper gear
1990	Random stratified bottom trawl stations	Fixed station grid, 20 nm distance
	Simrad EK400 echo sounder	Simrad EK500 echo sounder and BEI post processing
1993	Fixed survey area (ABCD), 1 strata system, 35 strata	Extended, variable survey area (ABCDD'ES), 2 strata systems, 53 + 10 strata
	Fixed station grid, 20 nm distance	Fixed station grid, 20/30/40 nm distance
	No constraint technique (strapping) on bottom trawl doors	Constraint technique on some bottom trawl hauls
	5 age samples per 5-cm group, 2 per stratum	2 age samples per 5-cm group, 4 per stratum (cod and haddock)
1994	35-40 mm mesh size in cod-end	22 mm mesh size in cod-end
	Strapping on some hauls	Strapping on every 3. haul
	Hull mounted transducers	Keel mounted transducers Johan Hjort
1995	Variable use of trawl sensors	Trawl manual specifying use of sensors
	Strapping on every 3. haul	Strapping on every 2. haul
	2 research vessels, 1 commercial trawler	3 research vessels
1996	2 strata systems and 63 strata, 20/30/40 nm distance	1 strata system and 23 strata, 16/24/32 nm distance
	2 age samples per 5-cm group, 4 per stratum	1 age sample per 5-cm group, all stations with > 10 specimens (cod and haddock)
1997	16/24/32 nm distance	20 nm distance
	Hull mounted transducers	Keel mounted transducers G.O. Sars
1998	Strapping on every 2. haul	Strapping on every haul
	20 nm distance	20/30 nm distance
2000	3 Norwegian research vessels	2 Norwegian and 1 Russian research vessel
2002	20/30 nm distance station grid	16/20/24/32 nm distance station grid
2003	Height trawl sensor for opening and bottom contact	Trawl eye for opening and bottom contact
2004	Vaco trawl doors	V- doors G.O. Sars and Johan Hjort
	EK 500	ER60 G.O. Sars
2005	EK 500	ER60 Johan Hjort and Russian vessels
2006	Standard Campelen rigging	"Tromsø rigging" on Norwegian vessels

2007	BEI	LSSS Norwegian vessels
2008	V trawl doors	Thyborøn doors Jan Mayen/Helmer Hanssen
2010	V trawl doors	Thyborøn doors G.O. Sars and Johan Hjort
2011	30 min. tow duration	15 min. tow duration
2014	1 strata system and 23 strata	1 strata system and 26 strata (extended area N)
2015	“Tromsø rigging” on Norwegian vessels	Standard Campelen rigging
2017	EK 60 on G.O. Sars	EK80 in EK 60 mode on G.O. Sars
2018	EK 60 on Johan Hjort	EK80 in EK 60 modus on Johan Hjort

Changes to estimation methods

Year	Change from	To	Time series revised
1989	Uniform gear handling	Correction for change from Bobbins gear to Rock-hopper gear for cod and haddock	x
1993	TS = 21.8 log L – 74.9 for cod and haddock	TS = 20 log L – 68 for all demersal species	x
	Weighting of age-length keys by total catch	Weighting of ALK by swept area estimate	
1995	Constant effective fishing width of the trawl	Fish size dependent effective fishing width (time series corrected)	x
2017	Swept area estimates by the Survey Program	Swept area and CV estimates by StoX software	x
2018	Acoustic estimates by the BEAM Program	Acoustic and CV estimates by StoX software	x
2020	Area N not included in standard time series	Area N included in haddock survey indices	x (haddock, area N presented separately for the other species)
2021	Area N not included in standard time series	Area N included in cod survey indices	x (cod, area N presented separately for b)

Appendix 4. Scientific participants 2024

Research vessel	Participants
“ Johan Hjort” (24.01-16.03)	Part 1 (24.01-31.01) **E. Johannesen (cruise leader)** , E. Holm, C. E. Bjånes, Å. Husebø, I. Huse, B. Marum, W. Skjold, B. F. Andersen Part 2 (31.01-24.02) **E. Fuglebakk (cruise leader)** , E. Holm, M. Mjanger, S. W. Heum, V. Fauskanger, H. Mjanger, L. Solbakken Part 3 (24.02-28.02) **H. Arnesen (cruise leader)** , F. Gelin, G. E. Aguirre, M. Mjanger, S. W. Heum Part 4 (28.02-16.03) **K. Korsbrekke (cruise leader)** , F. Gelin, V. Fauskanger, E. L. Langhelle, M. L. Skage, G. B. Thorsheim, C. E. Bjånes, E. Hermansen, S. Seim, R. Strømme, S. N. Larsen
“ Kronprins Haakon” (16.01-10.02)	Part 1 (16.01-31.01) **T. Wenneck (cruise leader)** , S. Seim, F. Midtøy, E. L. Langhelle, S. Grønnevik, H. Børsheim, R. H. Robertsen, A. Stensland Part 2 (31.01-10.02) **T. Wenneck (cruise leader)** , S. Seim, A. Stensland, L. D. Sivle, H. Savolainen S. Gundersen, I. Huse, L. J. Ohnstad
“ Vilnyus” (03.02-04.03)	**A. Pronjuk (cruise leader)** , M. Rybakov, P. Krivosheya, D. Marshalkovsky, Y. Kalashnikov, D. Draganov, S. Harlin, D. Okatov, M. Gubanishchev, A. Kanishchev, M. Kalashnikova, A. Kudryashova, T. Mishin

Appendix 5. Annual survey reports 1981-2023

Dalen, J., Hylen, A. og Smedstad, O. M. 1981. Intern toktrapport unummerert. Havforskningsinstituttet.

Dalen, J., Hylen, A., Jakobsen, T., Nakken, O., Randa, K. and Smedstad, O. 1982. Norwegian investigations on young cod and haddock in the Barents Sea during the winter 1982. ICES CM 1982/G: 41, 20 pp.

Dalen, J., Hylen, A., Jakobsen, T., Nakken, O., Randa, K., and Smedstad, O. 1983. Preliminary report of the Norwegian investigations on young cod and haddock in the Barents Sea during the winter 1983. ICES CM 1983/G:15, 23 pp

Dalen, J., Hylen, A., Jakobsen, T., Nakken, O. and Randa, K. 1984. Preliminary report of the Norwegian Investigations on young cod and haddock in the Barents Sea during the winter 1984. ICES CM 1984/G:44, 26 pp.

Hylen, A., Jakobsen, T., Nakken, O. and Sunnanå, K. 1985. Preliminary report of the Norwegian Investigations on young cod and haddock in the Barents Sea during the winter 1985. ICES CM 1985/G:68, 28 pp.

Hylen, A., Jakobsen, T., Nakken, O., Nedreaas, K. and Sunnanå, K. 1986. Preliminary report of the Norwegian Investigations on young cod and haddock in the Barents Sea. ICES CM 1986/G:76, 25 pp.

Godø, O. R., Hylen, A., Jacobsen, J. A., Jakobsen, T., Mehl, S., Nedreaas, K. and Sunnanå, K. 1987. Estimates of stock size of Northeast Arctic cod and haddock from survey data 1986/1987. ICES CM 1987/G: 37.

Hylen, A., Jacobsen, J.A., Jakobsen, T., Mehl, S., Nedreaas, K. and Sunnanå, K. 1988. Estimates of stock size of Northeast Arctic cod and haddock, *Sebastes mentella* and *Sebastes marinus* from survey data, winter 1988. ICES CM 1988/G: 43.

Jakobsen, T., Mehl, S., Nakken, O., Nedreaas, K. and Sunnanå, S. 1989. Estimates of stock size of Northeast Arctic cod and haddock, *Sebastes mentella* and *Sebastes marinus* from survey data, winter 1989. ICES CM 1989/G: 42.

Jakobsen, T., Mehl, S. og Nedreaas, K. 1990. Kartlegging av mengde og utbredelse av torsk, hyse og uer i Barentshavet januar mars 1990. Intern toktrapport, Senter for marine ressurser, Havforskningsinstituttet, Bergen. Engelsk abstrakt, tabell og figurtekster. 29 s. (upubl.).

Hylen, A., Jakobsen, T., Mehl, S., og Nedreaas, K. 1991. Undersøkelser av torsk, hyse og uer i Barentshavet vinteren 1991. Intern toktrapport nr. 1 -1992, Senter for marine ressurser, Havforskningsinstituttet, Bergen. Engelsk abstrakt, tabell og figurtekster. 30 s. (upubl.).

Godø, O.R., Jakobsen, T., Mehl, S., Nedreaas, K. og Raknes, A. 1992. Undersøkelser av torsk, hyse og uer i Barentshavet vinteren 1992. Intern toktrapport 39/92, Senter for marine ressurser, Havforskningsinstituttet, Bergen. Engelsk abstrakt, tabell og figurtekster. 33 s. (upubl.).

Korsbrekke, K., Mehl, S., Nakken, O. and Nedreaas, K. 1993. Bunnfiskundersøkelser i Barentshavet vinteren 1993. Rapp. Senter Marine Ressurser nr. 14-1993. Engelsk abstrakt, tabell- og figurtekster. 47s. Havforskningsinstituttet, Bergen.

Mehl, S. og Nakken, O. 1994. Bunnfiskundersøkelser i Barentshavet vinteren 1994. Fisken Hav (6) 1994. 72 s. Havforskningsinstituttet, Bergen.

Korsbrekke, K., Mehl, S., Nakken, O. og Sunnanå, K. 1995. Bunnfiskundersøkelser i Barentshavet vinteren 1995. Fisken Hav (13) 1995. 86 s. Havforskningsinstituttet, Bergen.

Mehl, S. og Nakken, O. 1996. Botnfiskundersøkingar i Barentshavet vinteren 1996. Fisken Hav (11) 1996. 68 s. Havforskingsinstituttet, Bergen.

Mehl, S. 1997. Botnfiskundersøkingar i Barentshavet (norsk sone) vinteren 1997. Fisken Hav (11) 1997. 72 s. Havforskingsinstituttet, Bergen.

Mehl, S. 1998. Botnfiskundersøkingar i Barentshavet (redusert område) vinteren 1998. Fisken Hav (7) 1998. 69 s. Havforskingsinstituttet, Bergen.

Mehl, S. 1999. Botnfiskundersøkingar i Barentshavet vinteren 1999. Fisken Hav (13) 1999. 70 s. Havforskingsinstituttet, Bergen.

Aglen, A., Drevetnyak, K., Jakobsen, T., Korsbrekke, K., Lepesevich, Y., Mehl, S., Nakken, O. and Nedreaas, K. 2001. Investigations on demersal fish in the Barents Sea winter 2000. Detailed report. IMR-PINRO Joint Report Series no. 5, 2001. 74 pp.

Aglen, A., Alvsvåg, J, Korsbrekke, K., Lepesevich, Y., Mehl, S., Nedreaas, K., Sokolov, K. and Ågotnes, P. 2002. Investigations on demersal fish in the Barents Sea winter 2001. Detailed report. IMR-PINRO Joint Report Series no. 2 2002, 66 pp.

Aglen, A., Alvsvåg, J., Drevetnyak, K, Høines, Å., Korsbrekke, K., Mehl, S., and Sokolov, K. 2002. Investigations on demersal fish in the Barents Sea winter 2002. Detailed report. IMR/PINRO Joint report series no 6, 2002. 63 pp.

Aglen, A., Alvsvåg, J., Halland, T.I., Høines, Å., Nakken, O., Russkikh, A., and., Smirnov, O. 2003. Investigations on demersal fish in the Barents Sea winter 2003. Detailed report. IMR/PINRO Joint report series no 1, 2003. 56pp.

Aglen, A., Alvsvåg, J., Høines, Å., Korsbrekke, K., Smirnov, O., and Zhukova, N., 2004. Investigations on demersal fish in the Barents Sea winter 2004. Detailed report. IMR/PINRO Joint report series no 5/2004, ISSN 1502-8828. 58pp.

Aglen, A., Alvsvåg, J., Grekov, A., Høines, Å., Mehl, S., and Zhukova, N. 2005. Investigations of demersal fish in the Barents Sea winter 2005. IMR/PINRO Joint Report Series, No 4/2005. ISSN 1502-8828, 58 pp.

Aglen, A., Alvsvåg, J., Høines, Å., Johannesen, E. and Mehl, S. 2008. Investigations on demersal fish in the Barents Sea winter 2006. Detailed report. Fisken Hav13 (2008). 49 pp.

Aglen, A. 2007. Report from demersal fish survey in the Barents Sea February-March 2007. WD #8 ICES Arctic Fisheries Working Group, Vigo, Spain 19-28 April 2007.

Aglen, A., Høines, Å., Mehl, S., Prozorkevich, D., Smirnov, O. and Wenneck, T. de L. 2008. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 25 January – 14 March 2008. WD #16 ICES Arctic Fisheries Working Group, ICES Headquarters 21-29 April 2008.

Aglen, A., Alexandrov, D., Høines, Å., Mehl, S., Prozorkevich, D. and Wenneck, T. de L. 2009. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 1 February – 15 March 2009. WD #11 ICES Arctic Fisheries Working Group, San-Sebastian, Spain 21-27 April 2007.

Aglen, A., Alexandrov, D., Gjøsæter, H., Johannesen, E., Mehl, S. and Wenneck, T. de L. 2010. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 1 February – 17 March 2010. WD #15 ICES Arctic Fisheries Working Group, Lisbon, Portugal/Bergen, Norway 22-28 April 2010.

Aglen, A., Alexandrov, D., Gjøsæter, H., Johannesen, E. and Mehl, S. 2011. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 1 February – 14 March 2011. WD #3 ICES Arctic Fisheries Working Group, Hamburg, Germany 28 April - 4 May 2011.

Aglen, A., Dingsør, G., Mehl, S., Murashko, P. and Wenneck, T. de L. 2012. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 21 January – 15 March 2012. WD #3 ICES Arctic Fisheries Working Group, Copenhagen, Denmark 20-26 April 2012.

Mehl, S., Aglen, A., Alexandrov, D.I., Bogstad, B., Dingsør, G.E., Gjøsæter, H., Johannesen, E., Korsbrekke, K., Murashko, P.A., Prozorkevich, D.V., Smirnov, O.V., Staby, A., and Wenneck, T. de Lange, 2013. Fish investigations in the Barents Sea winter 2007-2012. IMR/PINRO Joint Report Series 1-2013, 97 pp.

Aglen, A., Dingsør, G., Godiksen, J., Gjøsæter, H., Johannesen, E. and Murashko, P. 2013. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 1 February – 13 March 2013. WD #3 ICES Arctic Fisheries Working Group, Copenhagen, Denmark 18-24 April 2013.

Aglen, A., Godiksen, J., Gjøsæter, H., Mehl, S., Russkikh, A. and Wenneck, T. de L. 2014. Results from the Joint IMR-PINRO Barents Sea demersal fish survey 22 January – 8 March 2014. WD #3 ICES Arctic Fisheries Working Group, Lisbon, Portugal 23-29 April 2014.

Mehl, S., Aglen, A., Bogstad, B., Dingsør, G.E., Gjøsæter, H., Godiksen, J., Johannesen, E., Korsbrekke, K., Murashko, P.A., Russkikh, A.A, Staby, A., Wenneck, T. de Lange, Wienerroither, R. 2014. Fish investigations in the Barents Sea winter 2013-2014. IMR/PINRO Joint Report Series 2014(2), 73 pp. ISSN 1502-8828.

Mehl, S. Aglen, A., Amelkin, A., Dingsør, G.E., Gjøsæter, H., Godiksen, Staby, A., Wenneck, T. de Lange, Wienerroither. 2015. Fish investigations in the Barents Sea, winter 2015. IMR-PINRO report series 2-2015. 61 pp.

Mehl, S., Aglen, A., Amelkin, A.V., Bogstad, B., Dingsør, G., Korsbrekke, K., Olsen, E., Russkikh, A.A., Staby, A., Wenneck, T. de Lange and Wienerroither, R. 2016. Fish investigations in the Barents Sea winter 2016. IMR/PINRO Joint Report Series 2016-4, 76pp.

Mehl, S., Aglen, A., Bogstad, B., Russkikh, A.A., Staby, A., Wenneck, T. de Lange and Wienerroither, R. 2017. Fish investigations in the Barents Sea winter 2017. IMR/PINRO Joint Report Series 2017-3, 87pp.

Mehl, S., Aglen, A., Gjøsæter, H., Godiksen, J. A., Russkikh, A.A., Staby, A., Tretyakov, I., Wenneck, T. de Lange and Wienerroither, R. 2018. Fish investigations in the Barents Sea winter 2018. IMR/PINRO Joint Report Series 2018-1, 82pp.

Mehl, S., Wenneck, T. de Lange, Aglen, A., Fuglebakk, E., Gjøsæter, H., Godiksen, J. A., Seim, S.,

Staby, A., Bogstad, B., Russkikh, A. and Fomin, K. 2019. Fish investigations in the Barents Sea winter 2019. IMR/PINRO Joint Report Series: 4-2019, 84pp.

Fall, J., de Lange Wenneck, T., Bogstad, B., Fuglebakk, E., Gjøsæter, H., Seim, S. E., Skage, M. L., Staby, A., Tranang, C. A., Windsland, K., Russkikh, A. A., Fomin, K. 2020. Fish investigations in the Barents Sea winter 2020. IMR/PINRO Joint Report Series: 2-2020, 98 pp.

Fall, J., de Lange Wenneck, T., Bogstad, B., Fuglebakk, E., Godiksen, J. A., Korsbrekke, K., Seim, S. E., Skage, M. L., Staby, A., Tranang, C. A., Windsland, K., Russkikh, A. A., Fomin, K. 2021. Fish investigations in the Barents Sea winter 2021. IMR/PINRO Joint Report Series: 1-2022, 100 pp.

Fall, J., de Lange Wenneck, T., Bogstad, B., Fuglebakk, E., Godiksen, J. A., Høines, Å., Korsbrekke, K., Skage, M. L., Staby, A., Tranang, C. A., Windsland, K., Russkikh, A. A., Kharlin, S. 2022. Fish investigations in the Barents Sea winter 2022. IMR/PINRO Joint Report Series: 1-2023, 93 pp.

Fall, J., de Lange Wenneck, T., Bogstad, B., Eidset, E., Fuglebakk, E., Godiksen, J. A., Høines, Å., Korsbrekke, K., Midtun, H. A., Skage, M. L., Skaret, G., Staby, A., Tranang, C. A., Windsland, K., Russkikh, A. A., Kharlin, S. 2024. Fish investigations in the Barents Sea winter 2023. IMR/PINRO Joint Report Series: 1-2024, 144 pp.

Institute of Marine Research – IMR

Polar branch of the FSBSI “VINRO” (“PINRO”)