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Barents Sea Capelin - Report of the Joint Russian-Norwegian Working Group on Arctic Fisheries (JRN-AFWG) 2024

Institute of Marine Research – IMR

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Barents Sea Capelin - Report of the Joint Russian-Norwegian Working Group on Arctic Fisheries (JRN-AFWG) 2024

Barentshavslodde - rapport frå Den bilaterale norsk-russiske arbeidsgruppa for arktiske fiskeri (JRN-AFWG) 2024

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Summary (Norwegian):

Den bilaterale norsk-russiske arbeidsgruppa for arktiske fiskeri (JRN-AFWG) hadde møte per korrespondanse 10.-11. oktober 2024 for bestandsvurdering og kvoterådgjeving på barentshavslodde.

Den geografiske dekninga av loddebestanden under toktet i Barentshavet hausten 2024 var tilnærma fullstendig. Biomassen av totalbestanden blei berekna til 887 000 tonn, og den modnande biomassen (≥14 cm) til 534 000 tonn.

Toktresultata viser at overlevinga for både 2 og 3-åringar frå i fjor til i år har vore svært låg. Det berekna talet på rekruttar (1-åringar) frå årets tokt var også langt under langtidsmiddelet. Gjennomsnittsvekt ved alder i 2024 var høgare enn i fjor for fisk eldre enn 1 år.

I bestandsrådgjevinga for lodde blir det gjennomført ei framskriving av den modnande loddebiomassen frå 1. oktober til 1. april (gytetidspunkt) året etter. Framskrivingsmodellen (bifrost) inneheld ein eigen modul for torskekonsum av lodde. I framskrivinga blei median gytebiomasse 1. april 2024 berekna til 177 000 tonn utan fangst (90% konfidensintervall: 56-332 000 tonn), og sannsynet for å ligga over referansepunktet (200 000 tonn) i haustingsregelen var 40%. I tråd med haustingsregelen om at kvoten ikkje skal settast høgare enn at det er minst 95% sannsyn for at gytebiomassen er over referansepunktet, blei det tilrådd 0 fiske etter barentshavslodde for 2025-sesongen.

Content

1 - Barents Sea Capelin

1.1 - Barents Sea Capelin

The Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG) met by correspondence 10-11 October 2024 to assess and give quota advice for the Barents Sea capelin stock.

Participants:

Bjarte Bogstad (Norway, Chair of meeting)

Anatoly Chetyrkin (Russia)

Stine Karlson (Norway)

Yury Kovalev (Russia)

Dmitry Prozorkevich (Russia)

Frøydis Rist (Norway)

Georg Skaret (Norway)

Alexey Stesko (Russia)

Sindre Vatnehol (Norway)

1.2 - Regulation of the Barents Sea Capelin Fishery

Since 1979, the Barents Sea capelin fishery has been regulated by a bilateral fishery management agreement between Russia (former USSR) and Norway. A TAC has been set separately for the winter fishery and for the autumn fishery. From 1999, no autumn fishery has taken place, except for a small Russian experimental fishery in some years and small by-catch in the northern shrimp fishery. A minimum landing size of 11 cm has been in force since 1979. Scientific advice is to carry out capelin fishery only on mature fish during the period from January to April.

1.3 - TAC and Catch Statistics (Table 10.1-10.2)

The Joint Norwegian- Russian Fishery Commission (JNRFC) set a TAC of 62 000 tonnes for 2023 and 196 000 tonnes for 2024. For both years, the quotas were in accordance with the advice. The international historical catch by country and season in the years 1965–2024 is given in Table 10.1. The Norwegian catch in 2024 was 117 555 tonnes which was 5 tonnes above the national TAC. Russian catches were 51 125 tonnes which was 27 325 tonnes below the national TAC.

The age-length distribution of Norwegian and Russian catches in 2024 are summarized in Table 10.2a-b. A summary of the capelin catch sampling and BESS capelin sampling used for abundance estimation in 2024 is summarised below:

Investigation	No. of samples	Length measurements	Aged individuals
Sampling from fishing vessels in winter-spring 2024 (Norway)	32	3200	960
Sampling from fishing vessels in winter-spring 2024 (Russia)	47	21342	550
BESS 2024(Norway) (included in estimation)	121	7987	2780
BESS 2024 (Russia) (included in estimation)	45	2438	350

1.4 - Stock assessment

1.4.1 - Acoustic stock size estimates in 2024 (Table 10.3, Figures 10.1-10.3)

The geographical survey coverage of the Barents Sea capelin stock during the BESS in 2024 was close to complete and with very good coverage of the main distribution area. The areas west of Svalbard and west of Frans Josef Land where small quantities of capelin were found last year, were not covered. The geographical distribution of capelin in 2024 is shown in Figure 10.1.

The stock estimate (made in StoX v 4.0) from the area covered by the 2024 survey was 0.887 million tonnes (Table 10.3). About 60% (0.534 million tonnes) of the estimated stock biomass consisted of maturing fish (>14.0 cm). The mean weight at age increased from the 2023 to the 2024 survey for ages 2-4 (Figure 10.2). Estimates of stock in number by age group and total biomass for the historical period are shown in Table 10.4. Survey mortality for ages 1-2 and 2-3 is shown in Figure 10.3.

A fixed sampling variance expressed as Coefficient of Variation (CV) of 0.2 for all age groups has previously been applied as input for CapTool for the forecast in the capelin assessment (Tjelmeland 2002; Gjøsæter *et al.* 2002). The survey design and estimation software now allow for estimation of a direct CV by age group. CV estimates by age group for the years 2004-2021 and 2023-2024 are given in Table 10.5. It was found that age groups with very low abundance in the survey usually have very high CVs. That is expected since there are few observations in the survey for such age groups. Vice versa an abundant age group normally has much lower CV. WKCAPELIN recommended to use the average CV for each age group from the last five years with high-quality surveys in the stock projection. However, including age groups with very low abundance and accordingly high CV in the averaging is inappropriate.

Because of incomplete survey coverage in 2022, the CVs of that year were not included in the averaging. Following the approach from last year, it was decided to use the unweighted average for the recent 5 years (2019-2021 and 2023-2024) for ages 1 and 2 and apply the value for age 2 for the ages 3-5 also, based on the similarity in estimated CV for ages 2-4 in 2024 and lack of information from previous years on CV at age 5. The summary results are presented below:

CV	Age 1	Age 2	Age 3	Age 4	Age 5
Average	0.205	0.216	0.275	0.528	
2024	0.196	0.218	0.211	0.230	0.336
Value to use	0.205	0.216	0.216	0.216	0.216

A methodology for handling very small or very large CV values and abundance estimates of different orders of

magnitude in the averaging should be explored, together with exploring using annual CVs. With a low CV there is a risk that sampling variance is not a good reflection of total uncertainty, since other sources of uncertainty could then dominate over sampling variance in the total uncertainty.

1.4.2 - Benchmark results

An ICES benchmark meeting joint for the Iceland East Greenland Jan Mayen capelin and Barents Sea capelin (WKCAPELIN) was held in Reykjavik 21-25 November 2022 (ICES, 2023). A summary of the changes to the assessment method following the benchmark is given in the 2023 capelin assessment report (Bogstad et al. 2023).

1.4.3 - Reference points

A B_{lim} (SSB_{lim}) management approach has been suggested for this stock (Gjøsæter *et al.,* 2002). In 2002, the JNRFC agreed to adopt a management strategy based on the rule that, with 95% probability, at least 200 000 tonnes of capelin should be allowed to spawn. Consequently, 200 000 tonnes was used as a B_{lim}. Alternative harvest control rules of 80, 85 and 90% probability of SSB > B_{lim} were suggested by JNRFC and evaluated by ICES (ICES 2016). ICES considers these rules not to be precautionary. At its 2016 meeting, JNRFC decided not to change the adopted management strategy.

The B_{lim} used up until present is based on SSB in 1989 (estimated to 96 000 tons) with an uncertainty buffer added (SSB + uncertainty buffer assumed to add up to 200 000 tonnes). The SSB in 1989 is the lowest in the time series which resulted in good recruitment.

In WKCAPELIN it was considered that B_{lim} should not be based on years which are affected by the NSS-herring collapse in the Barents Sea, as was the case for the year 1989. Among the included years, 1990 had the lowest estimated SSB (68 000 tonnes) that still produced an above average recruitment.

The procedure of including an uncertainty buffer to B_{lim} like it was done previously, was not accepted by WKCAPELIN. Separate terms for the biological reference point (B_{lim}) and the reference point used in the harvest control rule ($B_{escapement}$) were therefore introduced.

1.4.4 - Harvest control rule evaluation

Trochta et al. (2024) assessed harvest control rules for capelin in the Barents Sea using a management strategy evaluation (MSE), a modeling framework that simulates population and fishery responses to management actions. The form of the current escapement rule is retained and is defined by $B_{escapement}$, the biomass that must escape to spawn after fishing is accounted for. The MSE specifically tested four different $B_{escapement}$ values (100 000, 150 000, 200 000 and 400 000 tonnes) with and without three alternative fixed minimum quotas (25 000, 50 000 or 75 000 tonnes). When assuming historical capelin productivity, accurate survey estimates and correctly estimated survey precision, all four $B_{escapement}$ values without fixed minimum quotas maintained a low risk (<5%) of spawning biomass falling below B_{lim}. However, a $B_{escapement}$ equal to 100 000 tonnes showed notably higher risk (of SSB<B_{lim}) if either the survey estimate is biased high or estimated survey precision is biased low. High probabilities of fishery closures resulted from $B_{escapement}$ = 400 000 tonnes. All the alternative rules using fixed minimum quotas showed very high risk of SSB falling below B_{lim} and the model framework projected reduced future recruitment to the extent of stock collapse over the long term. In general, average catch decreased and the number of years with closed fishery increased with higher $B_{escapement}$. When selecting a rule, managers should also consider the trade-offs with other consequences and potential impacts on the ecosystem given the critical role played by capelin as the key forage fish for various predators in the Barents Sea.

1.4.5 - Comparison of historical capelin advice using different model configurations

As part of the 2022 capelin benchmark, the configuration of the forecast model for Barents Sea capelin, *Bifrost,* was reviewed and updated. Vatnehol and Skaret (2024) compared the quota advice for the advice years 2005-2023 based on forecasts with the updated and original model configurations, using the existing harvest control rule. The results show that the catch advice in general would have been higher with the updated configuration, but the years with no-fishery-advice were the same with the updated and original configuration. The comparison further showed that the changes in parameter settings of the cod consumption module in addition to the parameters set for natural capelin mortality in the autumn (1 October to 1 January) had the greatest impact on the advice. It must be noted that the model configuration is partly adapted to the current ecosystem state, so the comparison between configurations becomes less relevant the further back in time we go. Furthermore, some parameters including the natural capelin mortality in the autumn and the proportion of immature cod in the Svalbard area will be updated each year as part of the capelin assessment, so a direct comparison with historical advice will change each year.

1.4.6 - Stock assessment in 2024 (Tables 10.4-10.5, Figures 10.4-10.5)

All projections described below were based on a maturation and predation model as described in the 2023 WKCAPELIN Benchmark report (ICES, 2023), with parameters estimated by the model Bifrost and data on predicted cod abundance and size at age in 2025 from the 2024 JRN-AFWG assessment (Howell et al. 2024). The methodology is described in the Benchmark report (ICES 2023).

With no catch, the estimated median spawning stock size on 1 April 2025 is 177 000 tonnes (90% confidence interval: 56-332 000 tonnes) (Fig 10.4), and the probabilities for the spawning stock to be above 150 000, 200 000 and 400 000 tonnes are 63, 40 and 1%, respectively. Summary plots for catch, stock size and recruitment are given in Figure 10.5.

This year's headline advice is thus based on a $B_{escapement}$ of 200 000 tonnes, as in previous years, but we also provide information about what the quota advice would be for $B_{escapement}$ values of 150 000 tonnes and 400 000 tonnes, as these values were also found to be precautionary during the HCR evaluation. The catch options are given in the text table below.

Annual catch scenarios. P = probability. All weights are in tonnes.

Barents Sea capelin (ICES subareas 1 and 2, excluding Division 2.a west of 5°W). Annual catch scenarios. P = probability. All weights are in tonnes.

Basis	Total catch (2025)	Median SSB (2025)	P(SSB 2025 > $B_{escapement}$) in %	% TAC change*	% advice change**
MP harvest control rule, P (SSB > $B_{escapement}$=200 000 t) = 95%	0	177 000	40	-100	-100
Harvest control rule with P (SSB > $B_{escapement}$=150 000 t) = 95%	0	177 000	63	-100	-100
Harvest control rule with P (SSB > $B_{escapement}$=400 000 t) = 95%	0	177 000	1	-100	-100

*TAC (2025) vs. TAC (2024).

**Advice (2025) vs. Advice (2024).

Recruitment

No 0-group estimate was yet available for the 2024 capelin assessment. The 1-group abundance in 2024 in the area covered by the survey was 58.6 billion which is much lower than the long-term average (Table 10.4).

High abundance of young herring (mainly age groups 1 and 2) has been suggested to be an important but not a single factor causing recruitment failure in the capelin stock (Hjermann *et al.,* 2010; Gjøsæter *et al.* 2016). In 2023, high abundance of age 1-3 herring was observed during the BESS. Also, high abundance of age 2 herring was observed during the Russian 2024 young herring survey in April/May (ICES 2024). Preliminary results from BESS 2024 shows some areas with high acoustic herring recordings in the southern Barents Sea but no abundance estimates of herring in the Barents Sea for 2024 were available at the time of the 2024 capelin assessment.

1.5 - Further work

The time series of SSB should be updated annually following annual updates of cod assessment, and plots showing historic assessment values of SSB should be included in the report and advice sheet.

1.6 - References

Bogstad, B. et al. 2023. Barents Sea Capelin - Report of the Joint Russian-Norwegian Working Group on Arctic Fisheries (JRN-AFWG) 2023. IMR-PINRO Report Series 9-2023, 23 pp.

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Trochta, J., B. Bogstad, Y. Kovalev, D. Prozorkevich, G. Skaret, S. Vatnehol, and D. Howell. 2024. Report on evaluation of harvest rules for Barents Sea capelin in subareas 1 and 2 (Northeast Arctic), excluding Division 2.a west of 5°W. In press.

Vatnehol, S. and Skaret, G. 2024. Comparison of historical capelin quota advice using original and updated

forecast model configuration. In press.

Appendix

Table A1. Barents Sea Capelin. International catch (1000 tonnes) as used by the Working Group.

Year	Winter-Spring				Summer-Autumn			Total
	Norway	**Russia**	**Others**	**Total**	**Norway**	**Russia**	**Total**	
1965	217	7	0	224	0	0	0	224
1966	380	9	0	389	0	0	0	389
1967	403	6	0	409	0	0	0	409
1968	460	15	0	475	62	0	62	537
1969	436	1	0	437	243	0	243	680
1970	955	8	0	963	346	5	351	1314
1971	1300	14	0	1314	71	7	78	1392
1972	1208	24	0	1232	347	13	360	1591
1973	1078	34	0	1112	213	12	225	1337
1974	749	63	0	812	237	99	336	1148
1975	559	301	43	903	407	131	538	1441
1976	1252	228	0	1480	739	368	1107	2587
1977	1441	317	2	1760	722	504	1226	2986
1978	784	429	25	1238	360	318	678	1916
1979	539	342	5	886	570	326	896	1782
1980	539	253	9	801	459	388	847	1648
1981	784	429	28	1241	454	292	746	1986
1982	568	260	5	833	591	336	927	1760
1983	751	373	36	1160	758	439	1197	2357
1984	330	257	42	629	481	368	849	1477
1985	340	234	17	591	113	164	277	868
1986	72	51	0	123	0	0	0	123
1987-1990	0	0	0	0	0	0	0	0
1991	528	159	20	707	31	195	226	933
1992	620	247	24	891	73	159	232	1123
1993	402	170	14	586	0	0	0	586
1994-1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	1	1	1
1998	0	2	0	2	0	1	1	3
1999	50	33	0	83	0	22	22	105
2000	279	94	8	381	0	29	29	410

2001	376	180	8	564	0	14	14	578
2002	398	228	17	643	0	16	16	659
2003	180	93	9	282	0	0	0	282
2004	0	0	0	0	0	0	0	0
2005	1	0	0	1	0	0	0	1
2006	0	0	0	0	0	0	0	0
2007	2	2	0	4	0	0	0	4
2008	5	5	0	10	0	2	0	12
2009	233	73	0	306	0	1	1	307
2010	246	77	0	323	0	0	0	323
2011	273	87	0	360	0	0	0	360
2012	228	68	0	296	0	0	0	296
2013	116	60	0	177	0	0	0	177
2014	40	26	0	66	0	0	0	66
2015	71	44	0	115	0	0	0	115
2016-2017	0	0	0	0	0	0	0	0
2018	129	66	0	195	0	0	0	195
2019-2021	0	0	0	0	0	0	0	0
2022	42	23	0	65	0	0	0	65
2023	38	23	0	61	0	0	0	61
2024	118	51	0	169				

Table A2a. Barents Sea capelin, Age-length distribution of Norwegian catch in 2024 (million individuals). Lengths in cm.

Length group (cm)	Age 3	Age 4	Age 5	Total	%	
12.5-12.9	3	0	0	3	0.05	
13.0-13.4	44	0	0	44	0.71	
13.5-13.9	85	73	10	168	2.71	
14.0-14.4	85	257	89	431	6.95	
14.5-14.9	89	425	202	716	11.55	
15.0-15.4	84	633	369	1086	17.52	
15.5-15.9	15	285	227	527	8.5	
16.0-16.4	54	694	692	1440	23.23	
16.5-16.9	37	337	439	813	13.12	
17.0-17.4	22	156	284	462	7.45	
17.5-17.9	6	84	309	399	6.44	
18.0-18.4	13	32	52	97	1.56	
18.5-18.9	0	4	9	13	0.21	
Total	537	2980	2682	6199		
%	8.66	48.07	43.27		100	

Table A2b. Barents Sea capelin. Age-length distribution of Russian catch in 2024 (million individuals). Lengths in cm.

Length group (cm)	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Total**	**%**
9.0-9.9	0.0	0.0	0.0	0.0	0.0	0.0
10.0-10.9	0.0	0.0	0.0	0.0	0.0	0.0
11.0-11.9	0.0	0.0	0.0	0.0	0.0	0.0
12.0-12.9	0.0	5.3	0.0	0.0	5.3	0.2
13.0-13.9	5.3	36.8	5.3	0.0	47.3	1.6
14.0-14.9	73.6	352.1	99.8	0.0	525.5	18.2
15.0-15.9	57.8	725.2	268.0	0.0	1051.0	36.4
16.0-16.9	31.5	315.3	362.6	0.0	709.4	24.5
17.0-17.9	5.3	189.2	257.5	5.3	457.2	15.8
18.0-18.9	0.0	31.5	47.3	5.3	84.1	2.9
19.0-19.9	0.0	5.3	5.3	0.0	10.5	0.4
Total	173.4	1660.5	1045.7	10.6	2890.1	
%	6.0	57.5	36.2	0.36		100

Table A3. Barents Sea Capelin. Stock size estimation table. Estimated stock size (10^9) by age and length, and biomass (1000 tonnes) from the acoustic survey in August-October 2024. TSN: Total stock number. TSB: Total stock biomass. MSN: Maturing stock number. MSB: Maturing stock biomass.

Length (cm)	Age/year class						Sum (10^9)	Biomass (10^3 t)	Mean weight (g)
	1	2	3	4	5	6			
	2023	2022	2021	2020	2019	2018			
6.5-7.0	0.434						0.434	0.099	1.25
7.0-7.5	2.008						2.008	2.131	1.26
7.5-8.0	4.859						4.859	7.281	1.74
8.0-8.5	5.469						5.469	9.720	2.11
8.5-9.0	8.887						8.887	19.094	2.54
9.0-9.5	7.793						7.793	20.755	3.11
9.5-10.0	8.836						8.837	27.217	3.64
10.0-10.5	7.589	0.052					7.641	32.441	4.33
10.5-11.0	5.493	0.086					5.578	27.135	4.89
11.0-11.5	3.902	0.117					4.019	22.483	5.70
11.5-12.0	2.241	0.793					3.034	20.655	6.87
12.0-12.5	0.390	1.407	0.051				1.848	14.581	7.94
12.5-13.0	0.599	2.671	0.066				3.336	29.409	8.90
13.0-13.5	0.058	4.534	0.346	0.127			5.066	52.743	10.37
13.5-14.0		3.947	1.255	0.527			5.729	67.374	11.74
14.0-14.5		2.136	1.896	0.828	0.211		5.071	66.915	13.24
14.5-15.0		2.067	2.725	2.205	0.091		7.089	105.034	14.85
15.0-15.5		1.218	3.310	2.210	0.342	0.023	7.103	119.925	16.83
15.5-16.0		0.515	1.638	1.575	0.161		3.889	74.262	19.29
16.0-16.5		0.207	1.233	1.179	0.391		3.010	62.802	20.99
16.5-17.0		0.066	0.421	1.041	0.090	0.001	1.618	40.243	24.91
17.0-17.5		0.022	0.281	0.744	0.158		1.205	33.617	27.84
17.5-18.0			0.172	0.396	0.069		0.637	19.946	31.48
18.0-18.5			0.040	0.232			0.272	9.444	35.45
18.5-19.0				0.019			0.019	0.730	39.00
19.0-19.5				0.002			0.002	0.047	31.00
19.5-20.0									
20.0-20.5					0.019		0.019	0.576	31.00
TSN (10^9)	58.560	19.837	13.434	11.084	1.534	0.024	104.473		
TSB (10^3 t)	190.690	233.120	220.203	212.774	29.479	0.395		886.661	
Mean length (cm)	9.55	13.47	14.85	15.37	15.52	15.75			
Mean weight (g)	3.96	11.90	16.19	18.97	18.04	20.33			8.49

SSN (10^9)		6.230	11.716	10.430	1.534	0.024	29.933		
SSB (10^3 t)		97.708	201.022	204.937	29.479	0.395		533.541	

Table A4. Barents Sea Capelin. Stock size in numbers by age, total stock biomass and biomass of the maturing component (MSB) at 1 October. The numbers have been revised and might differ slightly from the 2023 numbers. Note that blanks denote no fish observed for a given age group and year, whereas '0.0' denotes a value >0, but <0.05.

Year	Stock in numbers (10^9)						Biomass (10^3 tonnes)	
	Age 1	Age 2	Age 3	Age 4	Age 5	Total	Total	MSB
1973	528.5	375.0	39.8	17.1	0.2	960.5	5146.2	1349.7
1974	304.8	547.4	173.1	3.4	0.1	1028.8	5738.1	907.1
1975	190.4	348.1	295.7	86.4	0.3	920.8	7815.8	2915.7
1976	210.8	233.1	163.0	76.6	12.4	695.8	6420.4	3200.3
1977	359.8	174.8	98.5	40.3	7.3	680.8	4802.8	2676.2
1978	83.5	391.7	75.8	8.9	0.7	560.6	4247.5	1402.0
1979	12.0	333.4	113.8	4.9	0.1	464.1	4160.9	1226.6
1980	269.9	195.8	155.3	33.0	0.3	654.3	6723.5	3913.4
1981	402.6	195.3	48.0	13.8	0.3	659.9	3892.1	1551.5
1982	528.3	147.6	56.8	2.2		734.9	3778.2	1591.0
1983	514.9	200.2	38.1	0.4		753.5	4225.4	1328.7
1984	154.8	186.7	48.2	3.1		392.7	2964.3	1207.9
1985	38.7	48.3	20.7	0.9		108.6	857.4	285.1
1986	6.0	4.7	3.3	0.3		14.3	120.2	65.1
1987	37.6	1.7	0.1	0.0		39.4	100.1	16.9
1988	21.0	28.7	0.2			49.9	427.3	200.3
1989	189.2	17.7	2.5	0.0		209.5	868.9	173.6
1990	700.4	177.6	16.2	0.1		894.3	5837.8	2617.0
1991	402.1	580.2	32.9	1.2		1016.4	7281.8	2248.0
1992	351.3	196.3	128.8	1.3		677.7	5155.0	2228.3
1993	2.2	53.4	17.3	2.4		75.3	796.8	330.1
1994	19.8	3.4	4.3	0.2		27.7	199.1	94.4
1995	7.1	8.1	1.5	0.3		17.2	193.6	118.4
1996	81.9	11.5	2.1	0.1		95.6	502.1	248.4
1997	98.9	39.1	1.9	0.1		140.0	910.0	312.1
1998	179.0	72.6	10.5	0.6	0.1	262.9	2054.7	931.7
1999	155.9	101.5	26.5	0.9		284.8	2774.1	1717.8
2000	449.2	110.6	34.1	0.8	0.1	594.7	4273.8	2096.7
2001	113.6	218.7	30.5	1.1	0.1	363.9	3629.1	2018.8
2002	59.7	90.8	50.2	0.6		201.3	2208.7	1289.6
2003	82.4	9.6	11.0	1.4		104.4	533.6	279.6
2004	62.1	17.0	4.4	0.7	0.1	84.2	513.8	225.1
2005	22.7	21.3	3.6	0.3	0.0	47.9	497.9	354.7

2006	57.3	16.8	5.1	0.1	0.0	79.3	637.2	347.7
2007	195.1	50.1	5.8	0.3		251.3	1816.3	845.9
2008	292.4	198.1	24.1	0.5		515.1	3951.3	2185.6
2009	172.8	148.6	48.1	0.0		369.4	3247.1	1891.8
2010	243.6	137.1	67.1	1.6		449.5	3823.6	2247.7
2011	194.3	173.3	57.7	7.8		433.0	3603.6	2059.2
2012	176.1	117.0	88.3	3.0		384.4	3456.8	1996.3
2013	323.8	197.5	67.6	11.9	0.0	600.8	3972.8	1725.0
2014	103.1	81.0	37.4	1.9		223.4	1688.8	784.5
2015	37.8	42.4	12.9	1.0		94.0	878.5	434.0
2016	32.6	7.9	2.3	0.1		42.9	316.7	153.3
2017	115.4	119.0	14.0	0.3		248.7	2428.5	1546.8
2018	58.8	60.9	22.5	0.4	0.0	142.6	1641.0	1100.2
2019	18.0	9.6	6.8	1.2	0.0	35.7	413.3	302.4
2020	370.0	31.3	4.1	0.8	0.0	406.2	1890.4	542.4
2021	222.7	326.4	7.4	0.0		556.6	3987.1	1459.5
2022	75.5*	135.8*	57.7*	1.2*	0.0*	270.2*	2173.7*	817.5*
2023	108.5	80.3	107.4	23.9	0.2	320.3	2951.7	1285.9
2024	58.6	19.8	13.4	11.1	1.5	104.5	886.7	533.5

***Not adjusted for incomplete area coverage**

Table A5. Barents Sea Capelin. CV by age group of the acoustic estimates shown in Table 10.4, for the period 2004-2024.

Year	CV age 1	CV age 2	CV age 3	CV age 4	CV age 5
2004	0.253	0.235	0.225	0.513	
2005	0.319	0.332	0.375	0.508	
2006	0.301	0.240	0.344	0.705	
2007	0.197	0.232	0.331	0.665	
2008	0.228	0.198	0.302	0.634	
2009	0.455	0.370	0.453	1.680	
2010	0.163	0.224	0.199	0.288	
2011	0.231	0.205	0.276	0.463	
2012	0.210	0.314	0.335	0.605	
2013	0.132	0.127	0.138	0.267	
2014	0.237	0.213	0.237	0.331	
2015	0.235	0.252	0.234	0.364	
2016	0.167	0.237	0.305	0.491	
2017	0.182	0.099	0.123	0.407	
2018	0.288	0.255	0.276	0.441	
2019	0.138	0.322	0.355	0.405	
2020	0.241	0.269	0.338	0.501	
2021	0.168	0.102	0.299	1.301	
2022					
2023	0.280	0.170	0.170	0.200	
2024	0.196	0.218	0.211	0.230	0.336

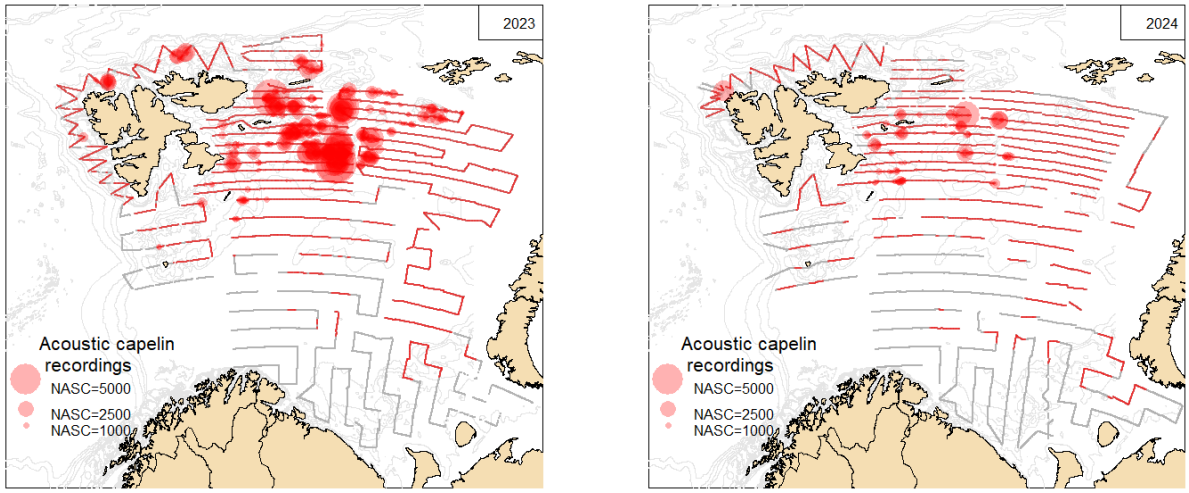

Figure A1. Survey coverage and geographical distribution of acoustic recordings of capelin in autumn 2023 and 2024. The size of the circles corresponds to nautical acoustic scattering coefficient (NASC; m^2/nm^2) per 1 nautical mile. Grey lines mark transect sections with no acoustic recordings of capelin. The south western strata were also covered in both years, but there were no capelin recordings there so it was excluded from the estimate and the map.

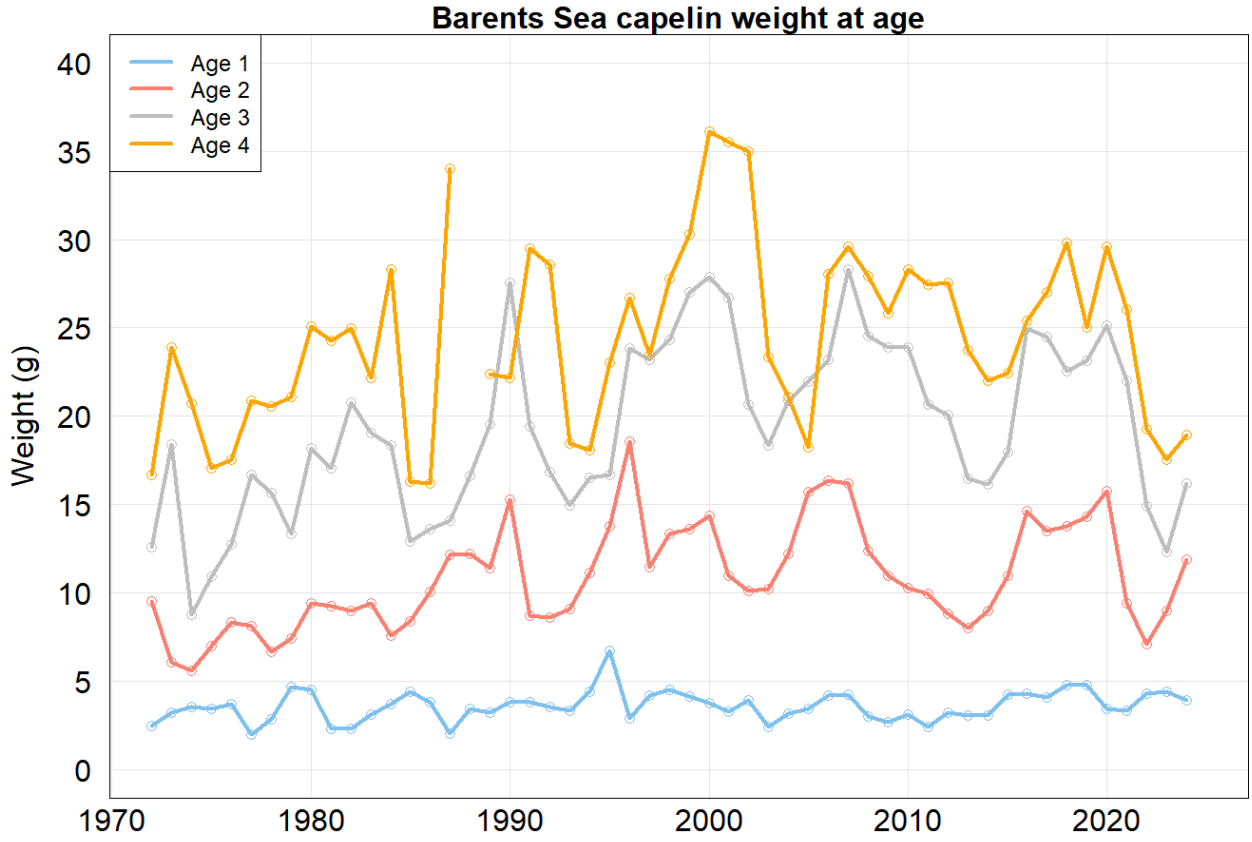

Figure A2. Weight-at-age (grams) for capelin from the autumn survey.

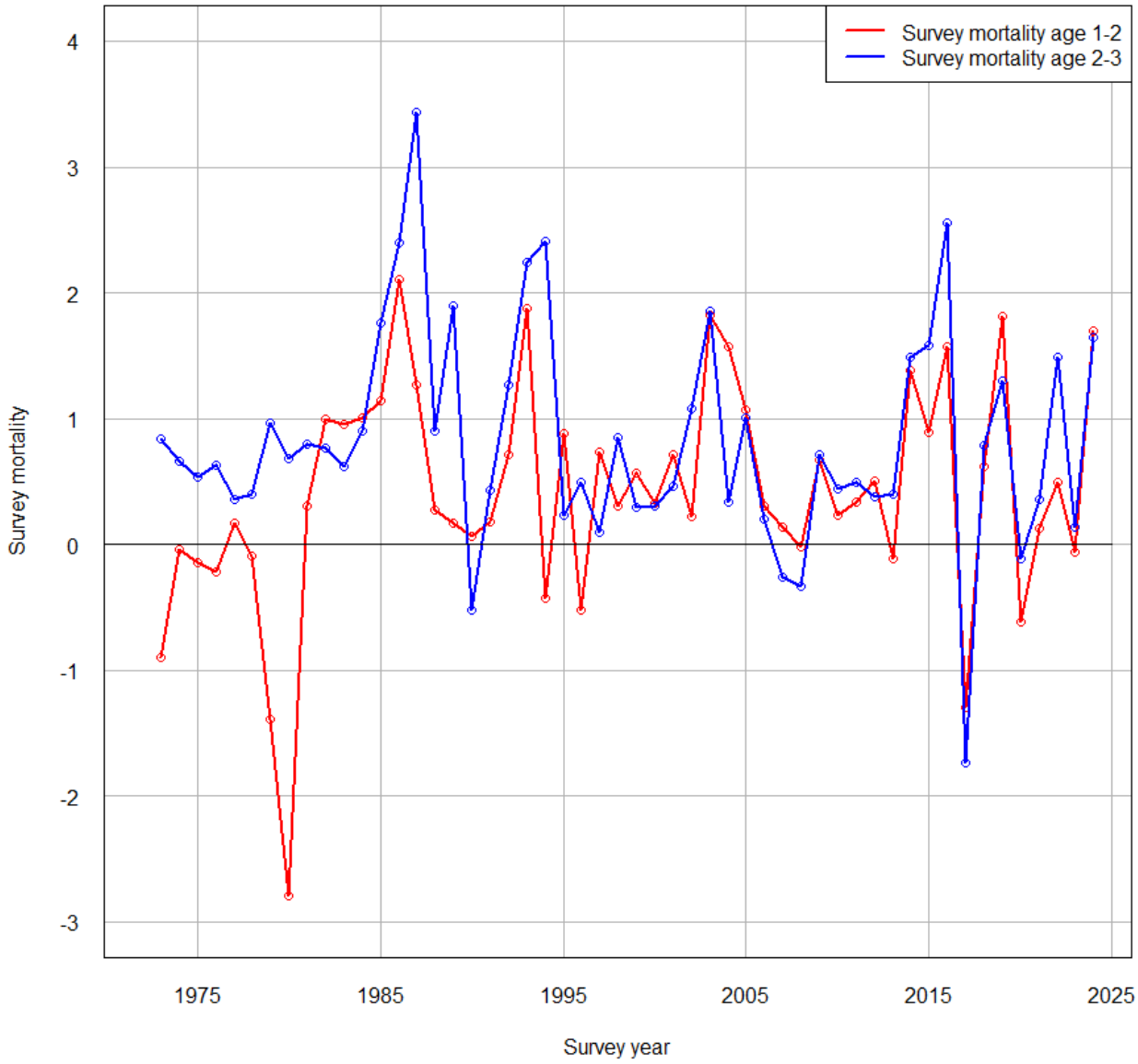

Figure A3. Survey mortality by survey year. Survey mortality is calculated as -log((N age (a+1) in year (y+1) + catch immatures of age a in year y and year (y+1))/N immatures age a in year y). Capelin >14.0 cm are assumed to be maturing.

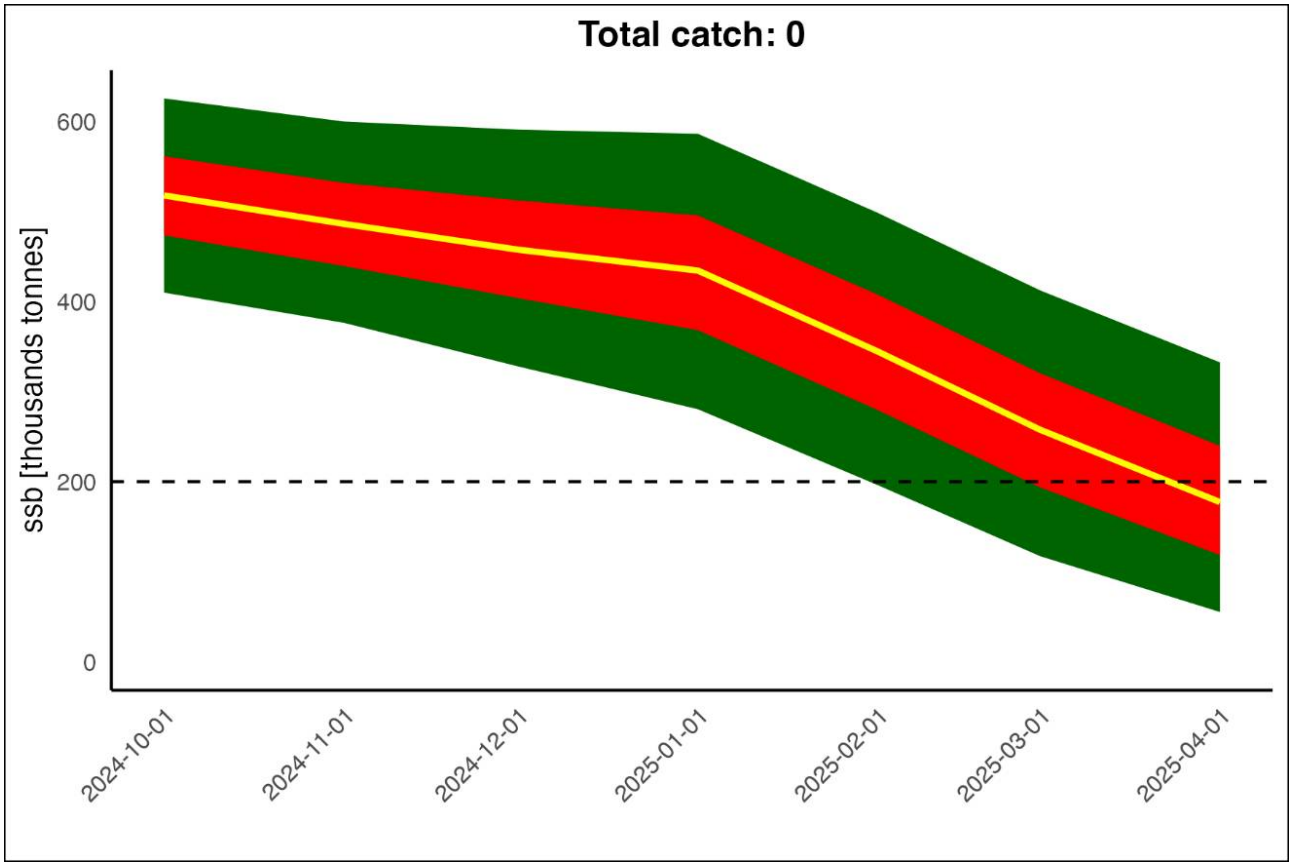

Figure A4. Barents Sea capelin (ICES subareas 1 and 2, excluding Division 2.a west of 5°W). Probabilistic prognosis of SSB for the maturing stock from 1 October 2024 to 1 April 2025, based on the acoustic survey estimate from autumn 2024 assuming zero catch. The yellow line marks the median while red band marks the 25th-75th percentiles and green band 5th-95th percentiles of the distribution. Dotted black line marks the $B_{escapement}$. The values are based on 5000 simulation replicates.

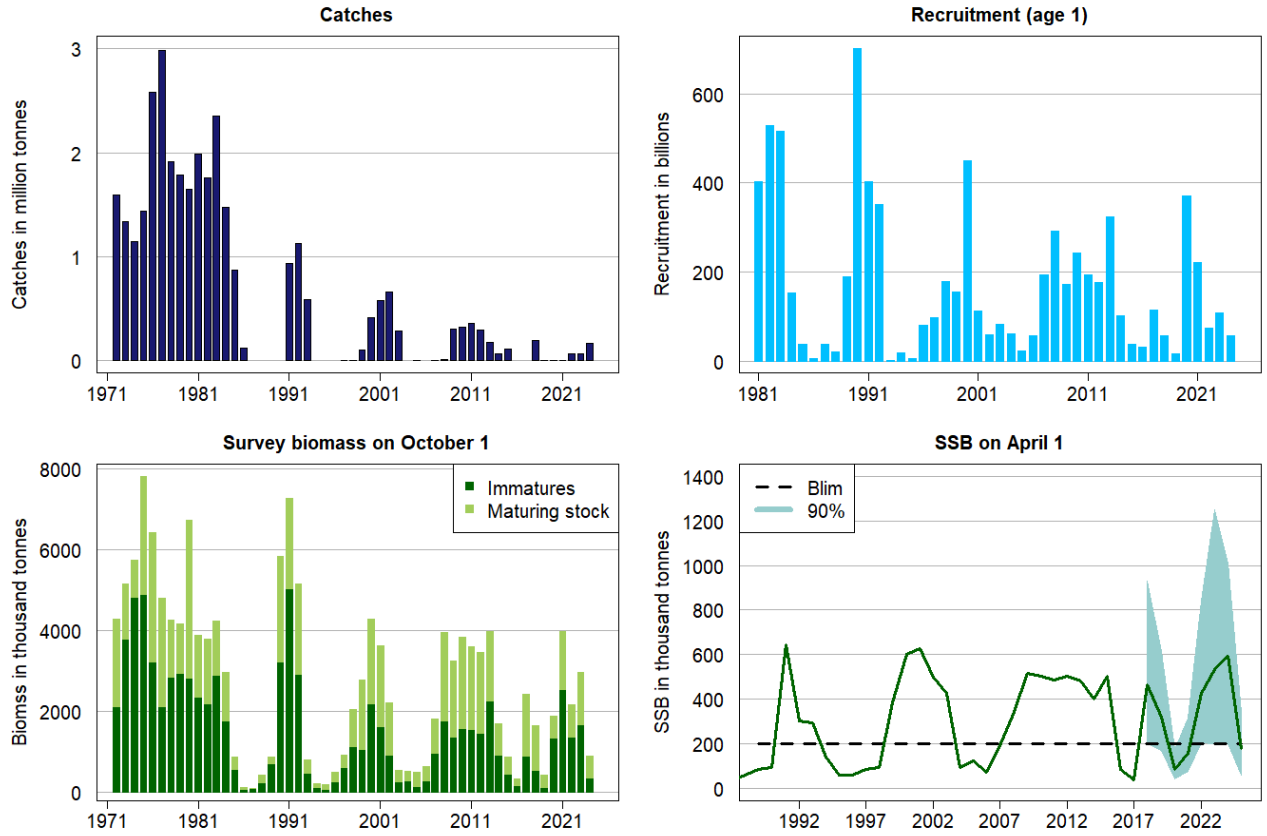

Figure A5. Capelin in subareas 1 and 2, excluding Division 2a west of 5°W (Barents Sea capelin). Catch, recruitment and summary of stock assessment (maturing and immature stock biomass October 1 and SSB April 1 in 1000 tonnes). The 2022 estimate of maturing and immature stock biomass is not corrected for incomplete survey coverage.

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