ICES Advice on fishing opportunities, catch, and effort
Arctic Ocean, Barents Sea, and Norwegian Sea ecoregions
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Capelin (*Mallotus villosus*) in subareas 1 and 2 (Northeast Arctic), excluding Division 2.a west of 5°W (Barents Sea capelin)
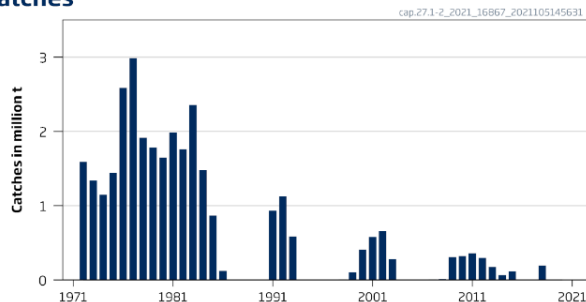
ICES advice on fishing opportunities

ICES advises that when the management plan of the Joint Norwegian–Russian Fisheries Commission (JNRFC) is applied, catches in 2022 should be no more than 70 000 tonnes.
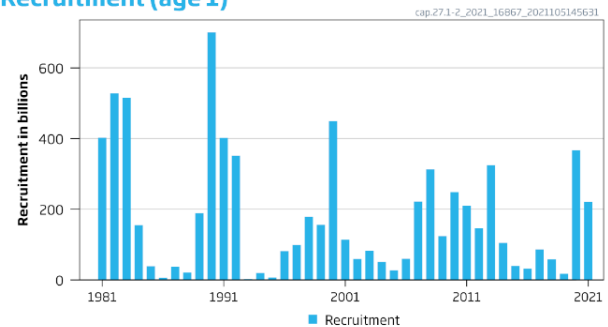
Stock development over time

Spawning-stock size is above B_{lim}. No reference points for fishing pressure have been defined for this stock.
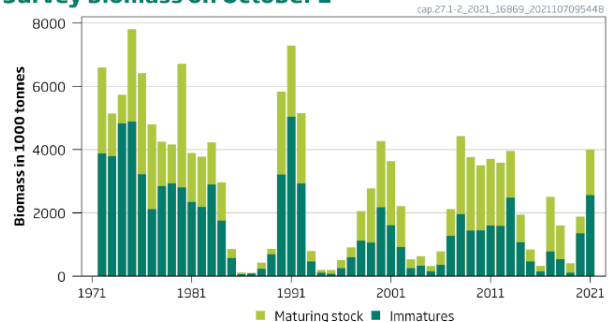

Figure 1   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Summary of the stock assessment. Recruitment values are estimates from the acoustic survey completed by the beginning of October. The recruitment plot is shown only from 1981 onwards since earlier estimates of age 1 capelin are based on incomplete survey-area coverage. Stock size estimates (SSB; vertical shading in the last five years is the 90% confidence interval) are shown only from 1989 onwards because a different model was used previously.

Catch scenarios

Calculations of catch scenarios are based on a forward projection from the autumn acoustic survey. It involves that SSB for April 2022 is calculated by taking into account predation by immature cod and other natural mortality. A catch scenario that results in SSB greater than 200 000 tonnes with 95% probability corresponds to the JNRFC Management Plan.

Table 1   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
Maturing stock biomass 2021	1 437 960	Biomass of fish above the length-at-maturity (14 cm), estimated based on the autumn acoustic survey 1 October 2021. These fish will be spawning in April 2022; tonnes.
Predation by immature cod January–March 2022; from the predation model	571 055	Based on the prediction of cod abundance in 2022 (ICES, 2021a) from the 2021 cod stock assessment; tonnes.

Table 2   Capelin in 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 (2022)	SSB (2022)	P (SSB 2022 > 200 000 t) in %	% TAC change *	% advice change *
ICES advice basis					
MP harvest control rule, P (SSB > 200 000 t) = 95%	70000	423751	95	NA	NA
Other scenarios					
F=0	0	481256	99	NA	NA

* TAC (2022) vs. TAC (2021). As TAC (2021) is zero, the percentage change cannot be calculated.
NA = not available.

The advice for 2022 has increased from zero in 2021 because the maturing stock is estimated to be larger.
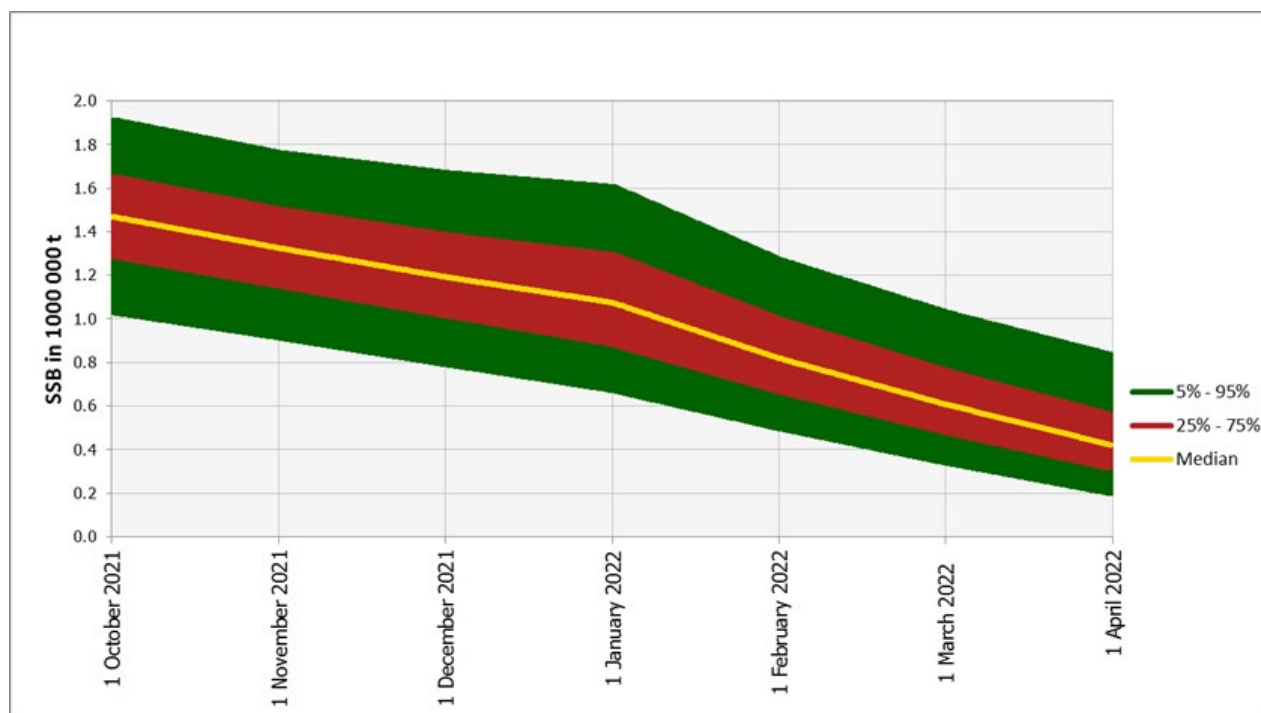

Figure 2   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Probabilistic prognosis of SSB for the Barents Sea capelin maturing stock from 1 October 2021 to 1 April 2022, based on the acoustic survey estimates from autumn 2021, assuming a catch of 70 000 tonnes. The median and the 5th, 25th, 75th, and 95th percentiles of the distribution are shown.

Basis of the advice

Table 3   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. The basis of the advice.

Advice basis	Management plan
Management plan	In 2002, the Joint Norwegian–Russian Fisheries Commission (JNRFC) adopted the following harvest control rule (HCR) for Barents Sea capelin: '*The TAC for the following year should be set so that, with 95% probability, at least 200 000 tonnes of capelin (B*$_{lim}$*) will be allowed to spawn*'. ICES evaluated this HCR as well as alternative HCRs suggested by JNRFC in 2016 (ICES, 2016), and only the existing HCR was found to be precautionary. Following ICES evaluation, the JNRFC decided to maintain the existing HCR (JNRFC, 2016) but decided that the HCR should be evaluated again in 2021.

Quality of the assessment

The survey coverage in autumn 2021 was considered to be close to complete and no adjustments for incomplete spatial coverage were required.
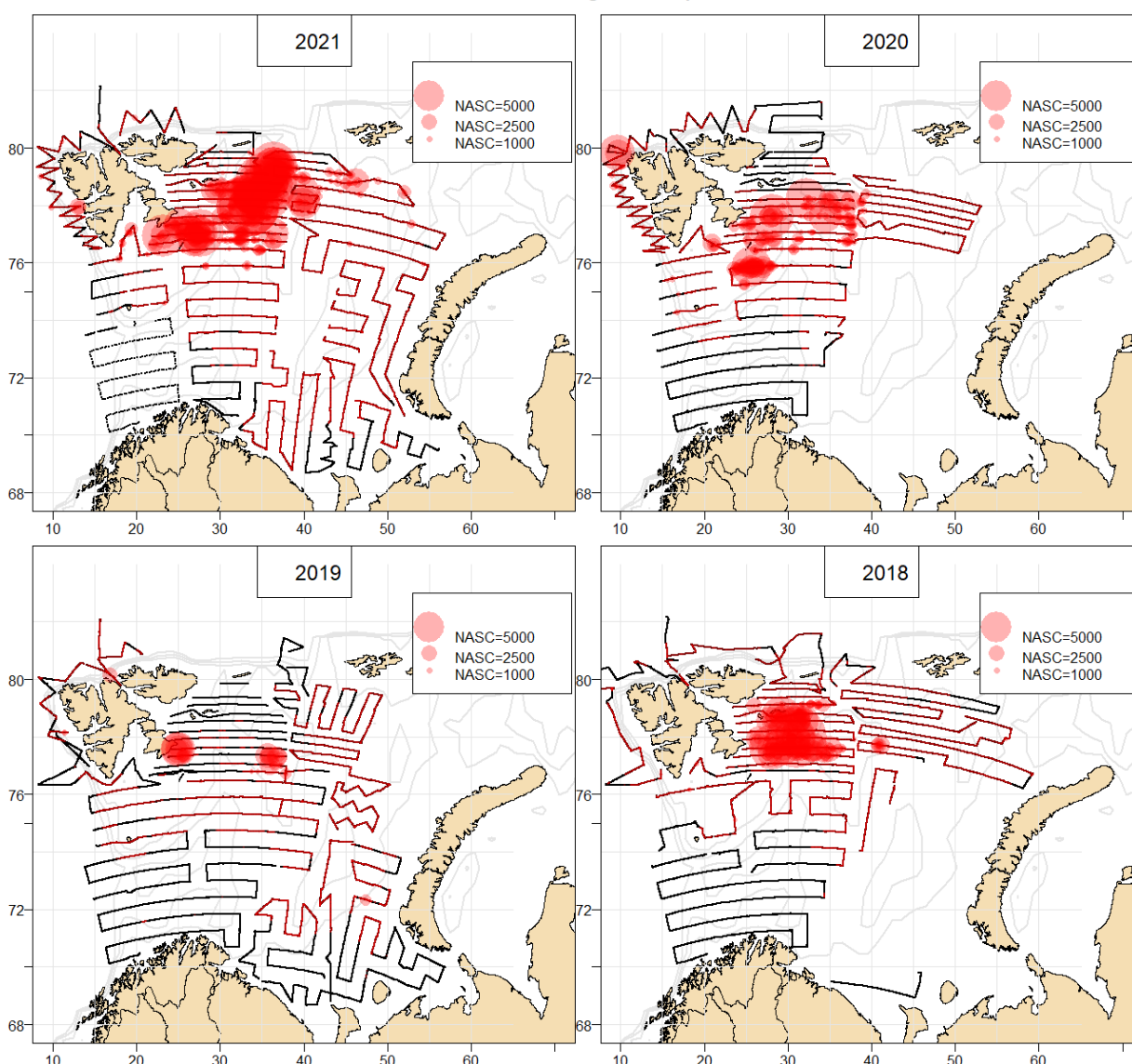

Figure 3   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Geographical distribution of capelin from autumn 2018 to 2021, as observed in the acoustic survey used to provide advice.

Issues relevant for the advice

There is no information to present for this stock.

Reference points

Table 4   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$			
	F_{MSY}			
Precautionary approach	B_{lim}	200 000	Value set above SSB_{1989}, which was the lowest SSB that has produced a good year class. SSB estimated on April 1; tonnes	ICES (2001), Gjøsæter *et al.* (2002).
	B_{pa}			
	F_{lim}			
	F_{pa}			
Management plan	B_{mgt}	No specific value	The B_{mgt} used in the HCR corresponds to 95% probability of the SSB being above B_{lim} (200 000)	JNRFC (2016)
	F_{mgt}			

Basis of the assessment

Table 5   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2021b).
Assessment type	Model based on acoustic survey and prediction six months ahead to calculate spawning biomass. Target escapement strategy used.
Input data	Norwegian–Russian acoustic survey in September (Eco-NoRu-Q3 [Aco]; A5216). Model estimates of maturation based on survey data. Natural mortalities from multispecies model (predation by immature cod on prespawning capelin based on information on cod distribution, abundance and stomach content data).
Discards and bycatch	All catches are assumed to be landed. The amount of bycaught capelin in other fisheries is very low.
Indicators	None.
Other information	Latest benchmark was in 2015 (ICES, 2015).
Working group	Arctic Fisheries Working Group (AFWG).

History of the advice, catch, and management

Table 6   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. ICES advice, agreed TAC, and catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	ICES catch
1987	Catches at the lowest practical level	0	0	0
1988	No catch	0	0	0
1989	No catch	0	0	0
1990	No catch	0	0	0
1991	TAC	1000000	900000	933000
1992	SSB > 400 000–500000 t	834000	1100000	1123000
1993	A cautious approach, SSB > 400 000–500 000 t	600000	630000	586000
1994	No fishing	0	0	0
1995	No fishing	0	0	0
1996	No fishing	0	0	0
1997	No fishing	0	0	1000
1998	No fishing	0	0	3000
1999	SSB > 500 000 t	79000	80000	101000
2000	5% probability of SSB < 200 000 t	435000	435000	414000
2001	5% probability of SSB < 200 000 t	630000	630000	568000
2002	5% probability of SSB < 200 000 t	650000	650000	651000
2003	5% probability of SSB < 200 000 t	310000	310000	282000
2004	No fishing	0	0	0
2005	No fishing	0	0	1000*
2006	No fishing	0	0	0
2007	No fishing	0	0	4000*
2008	No fishing	0	0	12000*
2009	5% probability of SSB < 200 000 t	390000	390000	307000
2010	5% probability of SSB < 200 000 t	360000	360000	323000
2011	5% probability of SSB < 200 000 t	380000	380000	360000
2012	5% probability of SSB < 200 000 t	320000	320000	296000
2013	5% probability of SSB < 200 000 t	200000	200000	177000
2014	5% probability of SSB < 200 000 t	65000	65000	66000
2015	5% probability of SSB < 200 000 t	6000	120000	115000
2016	Zero catch	0	0	0
2017	Zero catch	0	0	0
2018	5% probability of SSB < 200 000 t	205000	205000	194520
2019	Zero catch	0	0†	53*
2020	Management plan	0	0†	31*
2021	Management plan	0	0†	10*
2022	Management plan	≤ 70000		

* Research catch and bycatches in other fisheries; values are preliminary.
† Up to 500 tonnes was allowed for research survey catches.

History of the catch and landings

Table 7 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Catch distribution by fleet in 2021 as estimated by ICES. Discards are research catches.

Catch (2021)	Landings	Discards
10 tonnes	0 tonnes	10 tonnes

Table 8 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. The history of official catches is presented for each country participating in the fishery. All weights are in tonnes.

Year	Winter				Summer–Autumn			Year total
	Norway	Russia	Others	Total	Norway	Russia	Total	
1965	217000	7000	0	224000	0	0	0	224000
1966	380000	9000	0	389000	0	0	0	389000
1967	403000	6000	0	409000	0	0	0	409000
1968	460000	15000	0	475000	62000	0	62000	537000
1969	436000	1000	0	437000	243000	0	243000	680000
1970	955000	8000	0	963000	346000	5000	351000	1314000
1971	1300000	14000	0	1314000	71000	7000	78000	1392000
1972	1208000	24000	0	1232000	347000	13000	360000	1591000
1973	1078000	34000	0	1112000	213000	12000	225000	1337000
1974	749000	63000	0	812000	237000	99000	336000	1148000
1975	559000	301000	43000	903000	407000	131000	538000	1441000
1976	1252000	228000	0	1480000	739000	368000	1107000	2587000
1977	1441000	317000	2000	1760000	722000	504000	1226000	2986000
1978	784000	429000	25000	1238000	360000	318000	678000	1916000
1979	539000	342000	5000	886000	570000	326000	896000	1782000
1980	539000	253000	9000	801000	459000	388000	847000	1648000
1981	784000	429000	28000	1241000	454000	292000	746000	1986000
1982	568000	260000	5000	833000	591000	336000	927000	1760000
1983	751000	373000	36000	1160000	758000	439000	1197000	2357000
1984	330000	257000	42000	629000	481000	368000	849000	1477000
1985	340000	234000	17000	591000	113000	164000	277000	868000
1986	72000	51000	0	123000	0	0	0	123000
1987	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0
1991	528000	159000	20000	707000	31000	195000	226000	933000
1992	620000	247000	24000	891000	73000	159000	232000	1123000
1993	402000	170000	14000	586000	0	0	0	586000
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	1000	1000	1000
1998	0	2000	0	2000	0	1000	1000	3000
1999	50000	33000	0	83000	0	22000	22000	105000
2000	279000	94000	8000	381000	0	29000	29000	410000
2001	376000	180000	8000	564000	0	14000	14000	578000
2002	398000	228000	17000	643000	0	16000	16000	659000
2003	180000	93000	9000	282000	0	0	0	282000
2004	0	0	0	0	0	0	0	0
2005	1000	0	0	1000	0	0	0	1000
2006	0	0	0	0	0	0	0	0
2007	2000	2000	0	4000	0	0	0	4000
2008	5000	5000	0	10000	0	2000	2000	12000
2009	233000	73000	0	306000	0	1000	1000	307000

Year	Winter				Summer–Autumn			Year total
	Norway	Russia	Others	Total	Norway	Russia	Total	
2010	246000	77000	0	323000	0	0	0	323000
2011	273000	87000	0	360000	0	0	0	360000
2012	228000	68000	0	296000	0	0	0	296000
2013	116000	60000	0	177000	0	0	0	177000
2014	40000	26000	0	66000	0	0	0	66000
2015	71000	44000	0	115000	0	0	0	115000
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	128520	66000	0	194520	0	0	0	194520
2019	5	0	0	0	0	0	0	53
2020	9					21		31
2021	2					8		10

Summary of the assessment

Table 9   Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Assessment summary. Weights are in tonnes, recruitment in thousands. Recruitment and stock biomass in 1985 and earlier are survey estimates, back-calculated to 1 August (before the autumn fishing season); from 1986 and later, these values are based on the survey estimates with no back-calculation. Maturing biomass is the survey estimate of fish above the length-at-maturity (14 cm). Predicted SSB is the modelled stochastic spawning-stock biomass (after the winter fishery).

Year	Predicted SSB assuming catch = ICES advised catch, 1 April			Recruitment from autumn acoustic survey, 1 October	Stock biomass from autumn acoustic survey, 1 October		Catch
	Median	5th percentile	95th percentile		Immature	Maturing biomass	
	tonnes			Age 1, thousands	tonnes		
1972					3873000	2727000	1591000
1973					3794000	1350000	1337000
1974					4826000	907000	1148000
1975					4890000	2916000	1441000
1976					3217000	3200000	2587000
1977					2120000	2676000	2986000
1978					2845000	1402000	1916000
1979					2935000	1227000	1782000
1980					2802000	3913000	1648000
1981				402600000	2344000	1551000	1986000
1982				528300000	2188000	1591000	1760000
1983				514900000	2901000	1329000	2357000
1984				154800000	1756000	1208000	1477000
1985				38700000	575000	285000	868000
1986				6000000	55000	65000	123000
1987				37600000	84000	17000	0
1988				21000000	228000	200000	0
1989	84000			189200000	689000	175000	0
1990	92000			700400000	3214000	2617000	0
1991	643000			402100000	5039000	2248000	933000
1992	302000			351300000	2922000	2228000	1123000
1993	293000			2200000	466000	330000	586000
1994	139000			19800000	106000	94000	0
1995	60000			7100000	75000	118000	0
1996	60000			81900000	255000	248000	0
1997	85000			98900000	597000	312000	1000

Year	Predicted SSB assuming catch = ICES advised catch, 1 April			Recruitment from autumn acoustic survey, 1 October	Stock biomass from autumn acoustic survey, 1 October		Catch
	Median	5th percentile	95th percentile		Immature	Maturing biomass	
	tonnes			Age 1, thousands	tonnes		
1998	94000			179000000	1124000	932000	3000
1999	382000			156000000	1057000	1718000	105000
2000	599000			449200000	2175000	2098000	410000
2001	626000			113600000	1611000	2019000	578000
2002	496000			59700000	919000	1291000	659000
2003	427000			82400000	253000	280000	282000
2004	94000			51200000	334000	294000	0
2005	122000			26900000	150000	174000	1000
2006	72000			60100000	350000	437000	0
2007	189000			221700000	1275000	844000	4000
2008	330000			313000000	1960000	2468000	12000
2009	517000			124000000	1442000	2323000	307000
2010	504000			248200000	1449000	2051000	323000
2011	487000			209600000	1592000	2115000	360000
2012	504000			145900000	1589000	1997000	296000
2013	479000			324500000	2485000	1471000	177000
2014	399000			105100000	1076000	873000	66000
2015	504000			39500000	467000	375000	115000
2016	82000			31600000	147000	181000	0
2017	37000			86400000	783000	1723000	0
2018	462000	200000	930000	58600000	541000	1056000	194520
2019	317000	168282	613733	17455060	109533	301615	53
2020	85110	38830	171850	366430000*	1351470*	532820*	31
2021	156376	75197	314559	220850000	2559660	1437960	10
2022	423751	201897	838670				

*Revised at AFWG 2021

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Download the stock assessment data and figures.

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