ECOREGION Barents Sea and Norwegian Sea
STOCK Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin)

Advice summary for 2011

Following the agreed harvest control rule, ICES advises a catch of no more than 380 000 tonnes in 2011.

Stock status

Fishing mortality	2007	2008	2009
$\mathbf{F_{MSY}}$	N/A	N/A	N/A
$\mathbf{F_{PA}/F_{lim}}$	N/A	N/A	N/A
Spawning Stock Biomass (SSB)	2008	2009	2010
MSY $\mathbf{B_{trigger}}$	N/A	N/A	N/A
$\mathbf{B_{lim}}$*	Below	Above	Above

*Above/below here refers to whether probability for SSB to be above B_{lim} if no fishing takes place, was above/below 95%.

The maturing component in autumn 2010 was estimated to be 2.05 million tonnes. The spawning stock in 2011 will consist of fish from the 2007 and 2008 year classes. The survey estimate at age 1 of the 2009 year class is above the long-term mean, while 0-group observations during the joint Russian-Norwegian ecosystem survey in August-September 2010 indicated that the 2010 year class is close to the long-term mean.

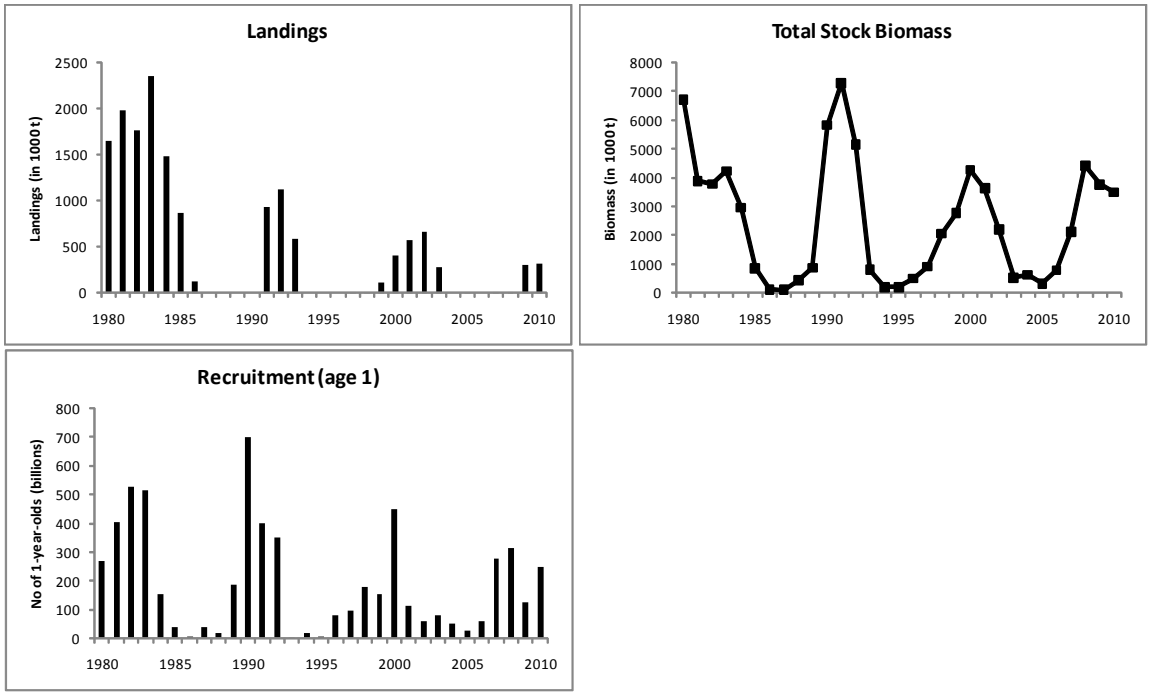

Figure 3.4.8.1 Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin). Summary of stock assessment (weights in '000 tonnes).

Management plans

The fishery is managed according to a target escapement strategy taking into account the predation by cod. The harvest control rule is designed to ensure that at the close of the fishery, the SSB remains above the proposed $\mathbf{B_{lim}}$ of 200 000 t (with 95% probability). ICES considers the management plan to be consistent with the precautionary approach.

A basis for the management plan is that all catch is taken on prespawning capelin.

Biology

Capelin has a life-span of 3–5 years, and has almost total spawning mortality.

Environmental influence on the stock

Capelin is an important part of the diet for many predators, including cod, harp seals, minke whales, humpback whales and haddock. Capelin is the main prey item for cod. Growth, maturation, and cannibalism of cod are all affected by the capelin abundance. The estimated annual consumption of capelin by cod has varied between 0.2 and 3.0 million t over the period 1984–2009. Young herring consume capelin larvae, and this predation pressure is thought to be among the main reasons for the poor year classes of capelin in the periods 1984–1986, in 1992–1994 and in 2001-2005. The abundance of young herring in the Barents Sea is expected to be at a low level in 2011.

Low capelin abundance has also in some periods had a negative impact on harp seal and seabird populations. However, these effects were much stronger during the first capelin collapse (caused by the 1983 year class of herring) than during the two later collapses. After spawning, dead capelin may also be of importance as food for haddock and other benthic feeders.

The fisheries

Since 1979, the fishery has been regulated by a bilateral agreement between Norway and Russia (formerly USSR). The catches have been very close to the advice in all years since 1987.

Catch by fleet	Total catch (2010) 315 kt where 315 kt landings, 0 kt discards, 0 kt industrial bycatch, 0 kt unaccounted removals

Quality considerations

The assessment takes account of uncertainties both in the survey estimate and in other input data.

Scientific basis

Assessment type	Model estimating maturity, growth, and mortality (including predation by cod)
Input data	Russian-Norwegian acoustic surveys in September
Discards and by-catch	Not included in the assessment
Indicators	
Other information	Benchmark meeting in 2009. Updated stock annex will be available in spring 2011.
Working group report	AFWG

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Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Undefined	
	F_{MSY}	Undefined	
Precautionary Approach	B_{lim}	200 000 t	Above SSB_{1989}, the lowest SSB that has produced a good year class.
	B_{pa}	Undefined	
	F_{lim}	Undefined	
	F_{pa}	Undefined	

(unchanged since: 2010)

Outlook for 2011

An update assessment was carried out. Following the agreed management plan would imply catches of 380 000 tonnes in spring 2011. Only catches of mature fish have been considered.

Additional considerations

Management considerations

For this stock, a $\mathbf{B}_{lim}$ equal to the value of the 1989 spawning stock biomass, which is the lowest SSB having produced an outstanding year class, is considered a good basis for such a reference point when abundance of young herring is low. The mean value of the 1989 spawning-stock biomass is less than 100 000 t. However, the assessment method is unlikely to account for all sources of uncertainty. Thus, ICES considers it appropriate to use a somewhat higher $\mathbf{B}_{lim}$ and a value of 200 000 t has been used in recent years.

The $\mathbf{B}_{lim}$ rule is intended to be a safeguard against recruitment failure. However, it is likely that the recruitment would be larger at a larger spawning stock, especially for moderate to good recruitment conditions. In such a situation a target-based control rule in addition to the $\mathbf{B}_{lim}$-based rule could be appropriate. The negative influence of herring on capelin recruitment should be included in the $\mathbf{B}_{lim}$-based rule if such a relationship can be described quantitatively. Adjustments to the harvest control rule should be investigated further and should take into account the uncertainty associated with the impacts of the environment and the predicted amount of spawners and the role of capelin as a prey item into account.

Data and methods

The assessment and stock history is based on joint Russian-Norwegian acoustic surveys during September each year. The spawning stock in 2011 is predicted from the acoustic survey in September 2010, by a model estimating maturity, growth, and mortality (including predation by cod).

Uncertainties in assessment and forecast

The assessment model takes account of uncertainties both in the survey estimate and in other input data.

Sources

Report from the joint Russian-Norwegian meeting to assess the Barents Sea capelin stock, Kirkenes, 27–29 September 2010.

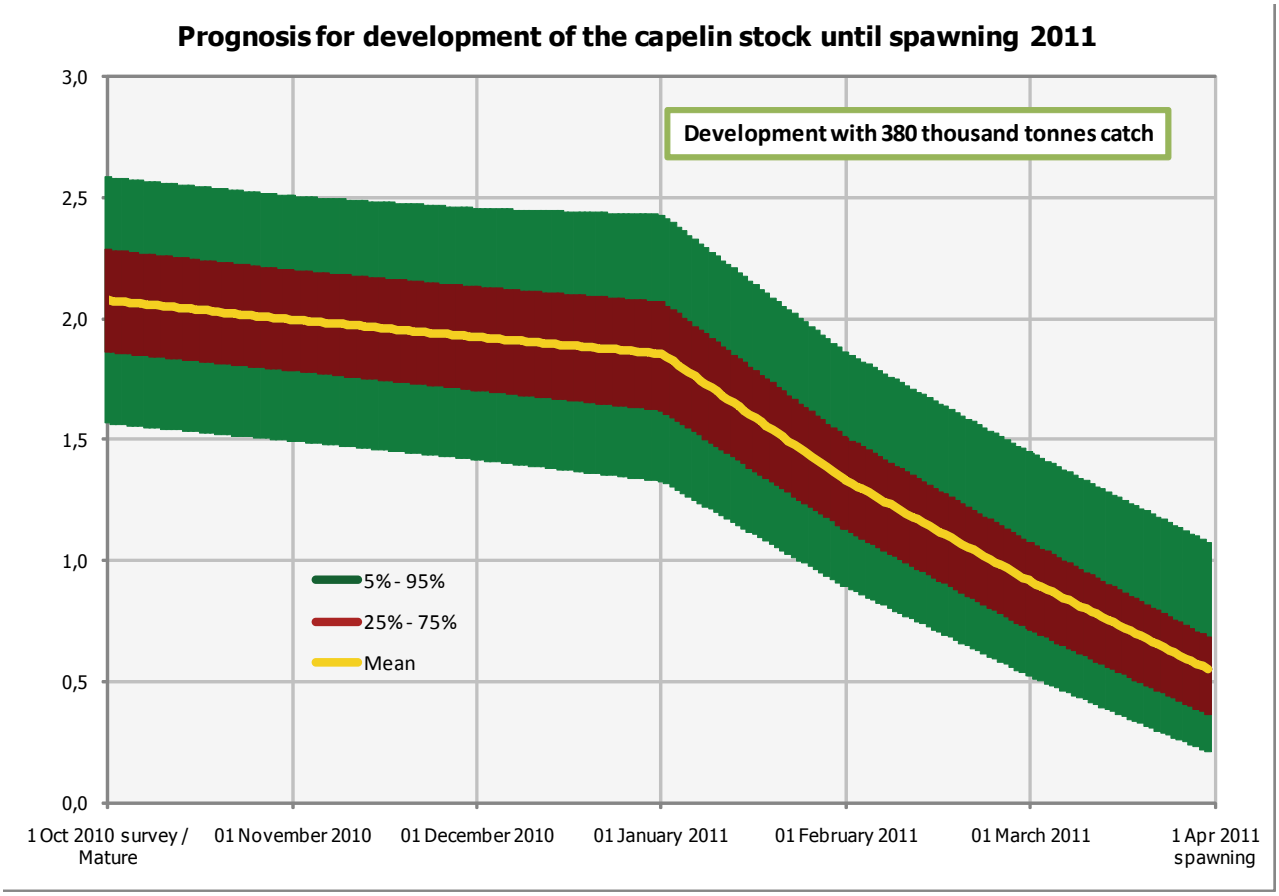

Figure 3.4.8.2 Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin). Probabilistic prognosis 1 October 2010 -1 April 2011 (maturing stock, catch of 380 000 tonnes).

Table 3.4.8.1 Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin). ICES advice, management and catches

Year	ICES Advice	Recommended TAC	Agreed TAC	ICES catch
1987	Catches at 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	1000[1]	900	933
1992	SSB > 4–500,000 t	834	1100	1123
1993	A cautious approach, SSB > 4–500,000 t	600	630	586
1994	No fishing	0	0	0
1995	No fishing	0	0	0
1996	No fishing	0	0	0
1997	No fishing	0	0	1
1998	No fishing	0	0	1
1999	SSB> 500,000 t	79[1]	80	101
2000	5% probability of SSB< 200,000 t	435[1]	435	414
2001	5% probability of SSB< 200,000 t	630[1]	630	568
2002	5% probability of SSB< 200,000 t	650[1]	650	651
2003	5% probability of SSB< 200,000 t	310[1]	310	282
2004	No fishing	0	0	0
2005	No fishing	0	0	1[2]
2006	No fishing	0	0	0
2007	No fishing	0	0	4[2]
2008	No fishing	0	0	12[2]
2009	5% probability of SSB< 200,000 t	390[1]	390	307
2010	5% probability of SSB< 200,000 t	360[1]	360	315
2011	5% probability of SSB< 200,000 t	380[1]		

[1]Winter-spring fishery.
[2]Research catch.

Table 3.4.8.2 Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin). International catch (‘000 t) as used by the Working Group.

Year	Winter				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	11	358	1591
1973	1078	35	0	1112	213	10	223	1336
1974	749	80	0	829	237	82	319	1149
1975	559	301	43	903	407	129	536	1439
1976	1252	231	0	1482	739	366	1105	2587
1977	1441	345	2	1788	722	477	1199	2987
1978	784	436	25	1245	360	311	671	1916
1979	539	343	5	887	570	326	896	1783
1980	539	253	9	801	459	388	847	1648
1981	784	428	28	1240	454	292	746	1986
1982	568	260	5	833	591	336	927	1760
1983	751	374	36	1161	758	439	1197	2358
1984	330	257	42	628	481	367	849	1477
1985	340	234	17	590	113	164	278	868
1986	72	51	0	123	0	0	0	123
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	528	156	20	704	31	195	226	929
1992	620	247	24	891	73	159	232	1123
1993	402	170	14	586	0	0	0	586
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	1	1	1
1998	0	0	0	0	0	1	1	1
1999	46	32	0	78	0	23	23	101
2000	283	95	8	386	0	28	28	414
2001	368	180	8	557	0	11	11	568
2002	391	228	17	635	0	16	16	651
2003	190	93	0	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	2	12
2009	233	73	0	306	0	1	1	307
2010	238	77	0	315				

Table 3.4.8.3 Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin). Stock summary table. Recruitment and total biomass are survey estimates back-calculated to 1 August (before the autumn fishing season) for 1985 and earlier, for 1986 and later it is the survey estimate. Maturing biomass is the survey estimate of fish above maturity length (14.0 cm). SSB is the median value of the modelled stochastic spawning stock biomass (after the winter/spring fishery).

Year	Stock biomass August 1/Oct. 1	Maturing biomass survey Oct. 1	Recruitment Age 1, August 1/Oct. 1	Spawning stock biomass, assessment model, April 1	Landings
	(10^3 t)	(10^3 t)	(10^9 ind.)	(10^3 t)	(10^3 t)
1965					224
1966					389
1967					409
1968					537
1969					680
1970					1314
1971					1392
1972	5831	2182			1592
1973	6630	1350	1140	33	1336
1974	7121	907	737	*	1149
1975	8841	2916	494	*	1439
1976	7584	3200	433	253	2587
1977	6254	2676	830	22	2987
1978	6119	1402	855	*	1916
1979	6576	1227	551	*	1783
1980	8219	3913	592	*	1648
1981	4489	1551	466	316	1986
1982	4205	1591	611	106	1760
1983	4772	1329	612	100	2358
1984	3303	1208	183	109	1477
1985	1087	285	47	*	868
1986	120	65	6	*	123
1987	100	17	38	34	0
1988	427	200	21	*	0
1989	869	174	189	84	0
1990	5838	2617	700	92	0
1991	7282	2248	402	643	929
1992	5155	2228	351	302	1123
1993	797	330	2	293	586
1994	199	94	20	139	0
1995	189	118	8	60	0
1996	502	248	82	60	0
1997	910	312	99	85	1
1998	2055	932	179	94	1
1999	2774	1718	156	382	106
2000	3629	2019	449	599	414
2001	3480	2019	114	626	568
2002	2209	1290	60	496	651
2003	534	280	82	427	282
2004	628	293	51	94	0
2005	324	174	27	122	1
2006	787	437	60	72	0
2007	1882	844	222	189	4
2008	4427	2468	313	330	10
2009	3757	2326	124	517	306
2010	3500	2051	248	504	315
Average 1973-2010	3357	1291	305	239	756

* Vanishing spawning stocks

Table 3.4.8.4 Capelin in Subareas I and II, excluding Division IIa west of 5°W (Barents Sea capelin). Larval abundance estimate (10^{12}) in June, and 0-group indices (10^{9}) in August-September.

		0-group Index (10^{9} ind.)	
Year	Larval Abundance (10^{12} ind.)	Not adjusted for trawl catchability of 0-group	Adjusted for trawl catchability of 0-group
1980	-	197.3	740
1981	9.7	123.9	477
1982	9.9	168.1	600
1983	9.9	100.0	340
1984	8.2	68.1	275
1985	8.6	21.3	64
1986	0.0	11.4	42
1987	0.3	1.2	4
1988	0.3	19.6	65
1989	7.3	251.5	862
1990	13.0	36.5	116
1991	3.0	57.4	169
1992	7.3	1.0	2
1993	3.3	0.3	1
1994	0.1	5.4	14
1995	0.0	0.9	3
1996	2.4	44.3	137
1997	6.9	54.8	189
1998	14.1	33.8	113
1999	36.5	85.3	288
2000	19.1	39.8	141
2001	10.7	33.6	90
2002	22.4	19.4	67
2003	11.9	94.9	341
2004	2.5	16.7	54
2005	8.8	41.8	148
2006	17.1	166.4	516
2007	-	157.9	480
2008	-	288.8	995
2009	-	189.8	673
2010	-	91.7	319
Average	9.0	78.2	269