3.3.3 Capelin (*Mallotus villosus*) in subareas 1 and 2 (Northeast Arctic), excluding Division 2.a west of 5°W (Barents Sea capelin)

ICES stock advice

ICES advises that when the management plan of the Joint Norwegian–Russian Fisheries Commission (JNRFC) is applied, there should be zero catch in 2017.

Stock development over time

The maturing component of the stock in autumn 2016 in the acoustic survey was estimated to be 181 000 tonnes. The estimate of the 2015 year class at age 1, during the survey in August–September 2016, was found to be well below the long-term average.

Figure 3.3.3.1 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). Summary of stock assessment results for catch and stock biomass in millions of tonnes and recruitment abundance in billions of fish. Both the total and the maturing stock are estimated in October so the maturing biomass does not compare directly to the reference point (B_{lim}), which relates to SSB in April. The recruitment plot is shown only from 1980 onwards, as earlier survey estimates of age 1 capelin are unreliable.

Stock and exploitation status

Table 3.3.3.1 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). State of the stock and fishery relative to reference points.

		Fishing pressure					Stock size				
		2014	2015	2016			2015	2016	2017	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	$B_{trigger}$	?	?	?	Undefined
Precautionary approach	F_{pa}, F_{lim}	?	?	?	Undefined	B_{lim}	✓	✗	✗	Reduced reproductive capacity
Management plan	F_{MGT}	?	?	?	Undefined	SSB_{MGT}	?	?	✗	Below

Catch options

Table 3.3.3.2 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). The basis for the catch options.

Variable	Value	Source	Notes
Maturing stock biomass 2016	181	ICES (2016a)	Estimated stock by autumn acoustic survey (10^3 t) 1 October

Table 3.3.3.3 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). The catch options.

Rationale	Catch 2017 (kt)	SSB 2017 (kt)	P (SSB< 200 kt)
MP Harvest Control Rule, P (SSB > 200 kt) = 95 %	0	37	100%

Catch options are calculated based on a forward projection from the autumn acoustic survey, taking natural mortality and fishery options into account to calculate an SSB in April 2017. This year a zero catch option results in an SSB far below B_{lim} (Figure 3.3.3.2.). Therefore, the advice is for zero catch.

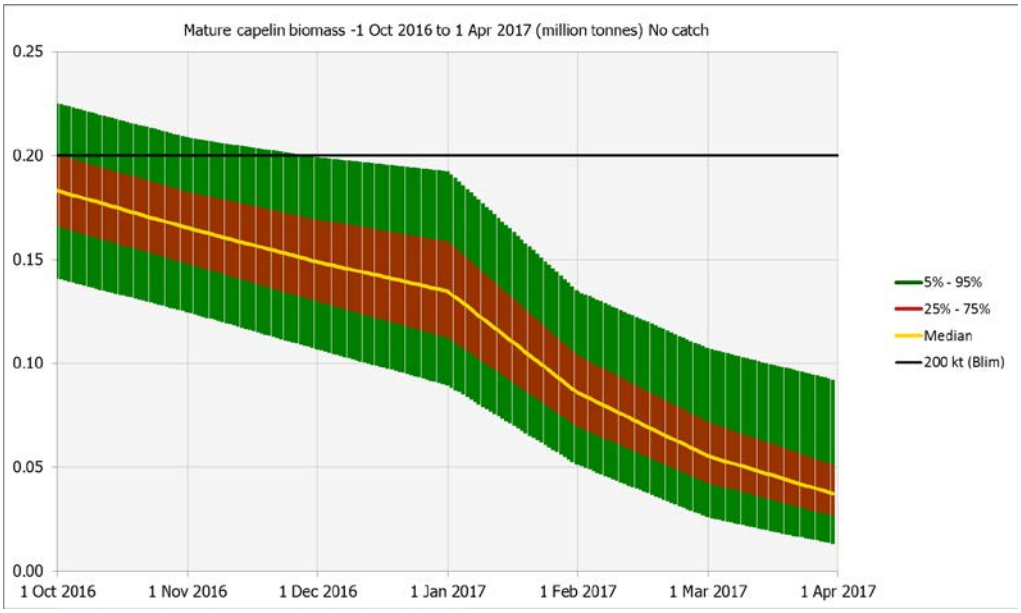

Figure 3.3.3.2 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). Probabilistic prognosis 1 October 2016–1 April 2017 for Barents Sea capelin (maturing stock, no catch). Biomass in million tonnes. The mean and 5th, 25th, 75th, and 95th percentiles of the distribution are shown.

Basis of the advice

Table 3.3.3.4 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). The basis of the advice.

Advice basis	Management plan
Management plan	At the 31st meeting of the Joint Norwegian–Russian Fisheries Commission (JNRFC) in November 2002, the following management plan was adopted: "For capelin, the following harvest rule should be used: 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." [1] At the 39th Session of the Joint Norwegian–Russian Fisheries Commission in October 2010 it was agreed that the current management plan should be used "for five more years" before it is evaluated. In 2015 JNRFC suggested three alternative HCRs for this stock; setting P(SSB< 200 kt) to 90%, 85%, and 80%, respectively. They were evaluated by ICES in 2016 (ICES, 2016b), and only the existing HCR was found to be precautionary. [1] This quotation is taken from Annex 12 in the Protocol of the 42nd Session of the Joint Norwegian–Russian Fisheries Commission and translated from Norwegian to English. For an accurate interpretation, please consult the text in the official languages of the Commission (Norwegian and Russian) at www.jointfish.com.

Quality of the assessment

The assessment is based on an acoustic survey. The coverage in 2016 was good and is considered to include the whole distribution of the stock.

Issues relevant for the advice

There is no information to present for this stock.

Reference points

Table 3.3.3.5 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	Undefined		
	F_{MSY}	Undefined		
Precautionary approach	B_{lim}	200 kt	Above SSB_{1989}, the lowest SSB that has produced a good year class (estimated at spawning time).	ICES (2001)
	B_{pa}	Undefined		
	F_{lim}	Undefined		
	F_{pa}	Undefined		
Management plan	SSB_{MGT}	200 kt	B_{lim}	JNRFC (2002)
	F_{MGT}	Undefined		

Basis of the assessment

Table 3.3.3.6 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). The basis of the assessment.

ICES stock data category	1 (ICES, 2016c)
Assessment type	Model based on acoustic survey and prediction six months ahead to calculate spawning biomass. The model estimates maturity, growth, and mortality (including predation by immature cod on pre-spawning capelin). Target escapement strategy used.
Input data	Norwegian–Russian acoustic survey in September (Eco-NoRu-Q3 (Aco)). • Model estimates of maturation based on survey data. • Natural mortalities from multispecies model (predation by immature cod on pre-spawning capelin) and based on historical survey estimates.
Discards and bycatch	All catches are assumed to be landed. The amount of bycatch in other fisheries is very low.
Indicators	None
Other information	Latest benchmark in 2015 (ICES, 2015)
Working group	Arctic Fisheries Working Group (AFWG)

Information from stakeholders

There is no available information.

History of the advice, catch, and management

Table 3.3.3.7 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). History of ICES advice, the agreed TAC, and ICES estimates of catches. Weights in thousand tonnes.

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	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*	80	101
2000	5% probability of SSB< 200 000 t	435*	435	414
2001	5% probability of SSB< 200 000 t	630*	630	568
2002	5% probability of SSB< 200 000 t	650*	650	651
2003	5% probability of SSB< 200 000 t	310*	310	282
2004	No fishing	0	0	0
2005	No fishing	0	0	1**
2006	No fishing	0	0	0
2007	No fishing	0	0	4**
2008	No fishing	0	0	12**
2009	5% probability of SSB< 200 000 t	390*	390	307
2010	5% probability of SSB< 200 000 t	360*	360	323
2011	5% probability of SSB< 200 000 t	380*	380	360
2012	5% probability of SSB< 200 000 t	320*	320	296
2013	5% probability of SSB< 200 000 t	200*	200	177
2014	5% probability of SSB< 200 000 t	65*	65	66
2015	5% probability of SSB< 200 000 t	6*	120	115
2016	Zero catch	0	0	0
2017	Zero catch	0		

* Winter–spring fishery.
** Research catch.

History of catch and landings

Table 3.3.3.8 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). Catch distribution by fleet in 2016 as estimated by ICES.

Total catch (2016)	Catches		Discards
0 kt	% purse seine	% trawl	0 kt
	not relevant		

Table 3.3.3.9 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). History of official catches is presented for each country participating in the fishery.

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	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	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	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	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	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	0
2016	0	0	0					

Summary of the assessment

Table 3.3.3.10 Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W (Barents Sea capelin). Assessment summary with weights (in thousand tonnes). Recruitment (age 1) and total stock biomass (TSB; age 1+) are survey estimates back-calculated to 1 August (before the autumn fishing season) for 1985 and earlier; from 1986 onwards recruitment and TSB are the actual survey estimates. Maturing stock biomass (MSB) is the survey estimate of fish above length of maturity (14.0 cm). SSB is the median value of the modelled stochastic spawning-stock biomass (after the winter/spring fishery). * indicates a very small spawning stock.

Year	Estimated stock by autumn acoustic survey (10^3 t) 1 October		SSB, assessment model, April 1 in year+1 (10^3 t)	Recruitment (Age 1), survey assessment 1 October 10^9 sp.	Capelin Catch (10^3 t)
	TSB	MSB			
1972	6600	2727			1591
1973	5144	1350	33		1337
1974	5733	907	*		1148
1975	7806	2916	*		1441
1976	6417	3200	253		2587
1977	4796	2676	22		2986
1978	4247	1402	*		1916
1979	4162	1227	*		1782
1980	6715	3913	*	270	1648
1981	3895	1551	316	403	1986
1982	3779	1591	106	528	1760
1983	4230	1329	100	515	2357
1984	2964	1208	109	155	1477
1985	860	285	*	39	868
1986	120	65	*	6	123
1987	101	17	34	38	0
1988	428	200	*	21	0
1989	864	175	84	189	0
1990	5831	2617	92	700	0
1991	7287	2248	643	402	933
1992	5150	2228	302	351	1123
1993	796	330	293	2	586
1994	200	94	139	20	0
1995	193	118	60	7	0
1996	503	248	60	82	0
1997	909	312	85	99	1
1998	2056	932	94	179	3
1999	2775	1718	382	156	105
2000	4273	2098	599	449	410
2001	3630	2019	626	114	578
2002	2210	1291	496	60	659
2003	533	280	427	82	282
2004	628	294	94	51	0

Year	Estimated stock by autumn acoustic survey (10^3 t) 1 October		SSB, assessment model, April 1 in year+1 (10^3 t)	Recruitment (Age 1), survey assessment 1 October 10^9 sp.	Capelin Catch (10^3 t)
	TSB	MSB			
2005	324	174	122	27	1
2006	787	437	72	60	0
2007	2119	844	189	222	4
2008	4428	2468	330	313	12
2009	3765	2323	517	124	307
2010	3500	2051	504	248	323
2011	3707	2115	487	209	360
2012	3586	1997	504	146	296
2013	3956	1471	479	324	177
2014	1949	873	504	105	66
2015	842	375	82	40	115
2016	328	181	37	32	0

Sources and references

ICES. 2001. Barents Sea capelin (Sub-areas I and II, excluding Division IIa west of 5°W). *In* Report of the Advisory Committee on Fishery Management, 2001, Part 1, Section 3.1.8, pp. 65–70. ICES Cooperative Research Report, 246. 921 pp. In three parts.

ICES. 2015. Report of the Benchmark Workshop on Arctic Stocks (WKARCT), 26–30 January 2015, Copenhagen, Denmark. ICES CM 2015/ACOM:31. 126 pp.

ICES. 2016a. Report of the Arctic Fisheries Working Group (AFWG), 19–25 April 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM:06.

ICES. 2016b. Report of the second Workshop on Management Plan Evaluation on Northeast Arctic cod and haddock and Barents Sea capelin, 25–28 January 2016, Kirkenes, Norway. ICES CM 2016/ACOM:47, 76 pp.

ICES. 2016c. General context of ICES advice. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.

JNRFC. 2002. Protocol of the 42nd Session of the Joint Norwegian–Russian Fisheries Commission, Annex 12. Translated from Norwegian to English. For an accurate interpretation, please consult the text in the official languages of the Commission (Norwegian and Russian) at www.jointfish.com.