Capelin (*Mallotus villosus*) in subareas 5 and 14 and Division 2.a west of 5°W (Iceland and Faroes grounds, East Greenland, Jan Mayen area)

ICES advice on fishing opportunities

ICES advises that when the harvest control rule agreed in 2015 by the Coastal States is applied, the initial TAC for the fishing season July 2020–March 2021 should be 169 520 tonnes.

Stock development over time

The spawning-stock biomass (SSB) was estimated at 127 000 tonnes at the time of spawning in March 2019, which is below B_{lim} (150 000 t). The recruitment (the immature 1- and 2-year-old capelin) estimate from the acoustic survey in autumn 2019 is above the average of the time-series.

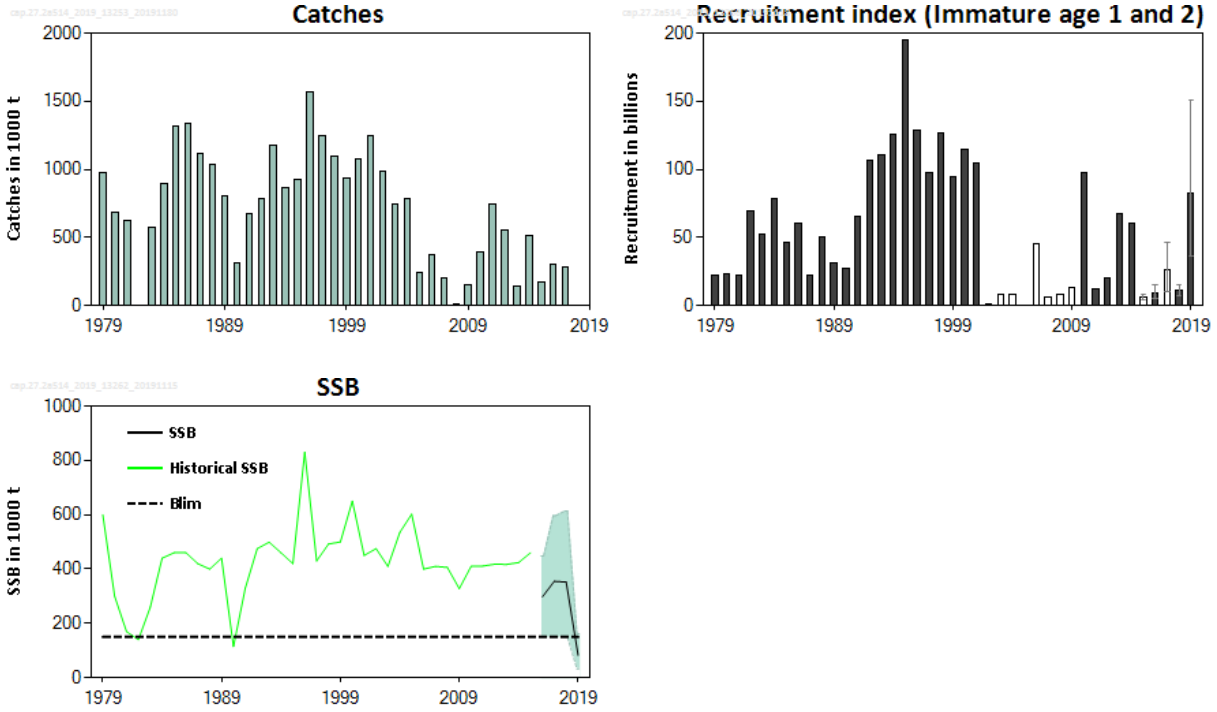

Figure 1 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Summary of the stock assessment. Catches by fishing season (July–March of the following year). Recruitment as acoustic index from autumn surveys (unshaded bars indicate incomplete spatial coverage likely resulting in notable underestimation), and SSB at spawning time (March–April). From 2016, 90% confidence intervals are shown for R and SSB. Note that the SSB values for 2016 and onwards are not directly comparable to historical values, because they are based on different assumptions about natural mortality.

Stock and exploitation status

ICES assesses that spawning stock size is below B_{lim} and B_{mgt}. No reference points for fishing pressure have been defined for this stock.

Table 1 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. State of the stock and fishery relative to reference points.

	Fishing pressure					Stock size				
		2016	2017	2018			2017	2018	2019	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{trigger}$	?	?	?	Undefined
Precautionary approach	F_{pa},F_{lim}	?	?	?	Undefined	B_{pa},B_{lim}	✓	✓	✗	Reduced reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	✓	✓	✗	Below

Catch scenarios

Table 2 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
Immature age 1 (2018 year class)	81.5 billion	Index from the autumn acoustic survey 2019.
Immature age 2 (2017 year class)	1.1 billion	Index from the autumn acoustic survey 2019.

Table 3 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. The catch scenarios.

ICES advice basis	Catches in 2020/2021 (t)	% advice change*
Harvest control rule agreed by the Coastal States (precautionary approach for initial TAC).	169 520	100%

* Initial advice for 2020/2021 relative to initial advice for 2019/2020 (0 tonnes).

The initial advice for 2020/2021 is higher than the initial advice of zero tonnes for the 2019/2020 fishing season, because of a higher number of immature fish estimated by the autumn survey in 2019.

Basis of the advice

The basis of the advice is the harvest control rule agreed by the Coastal States in 2015 (Anon., 2015). This implies applying the advice rule established by ICES in 2015 (ICES, 2015) for setting an initial TAC on the basis of immature abundance (ages 1–2) in the autumn acoustic survey (Figure 2). ICES recommends that the initial TAC is revised based on acoustic survey information in autumn 2020 (intermediate TAC), with the final TAC being set based on the results of the winter survey in 2021.

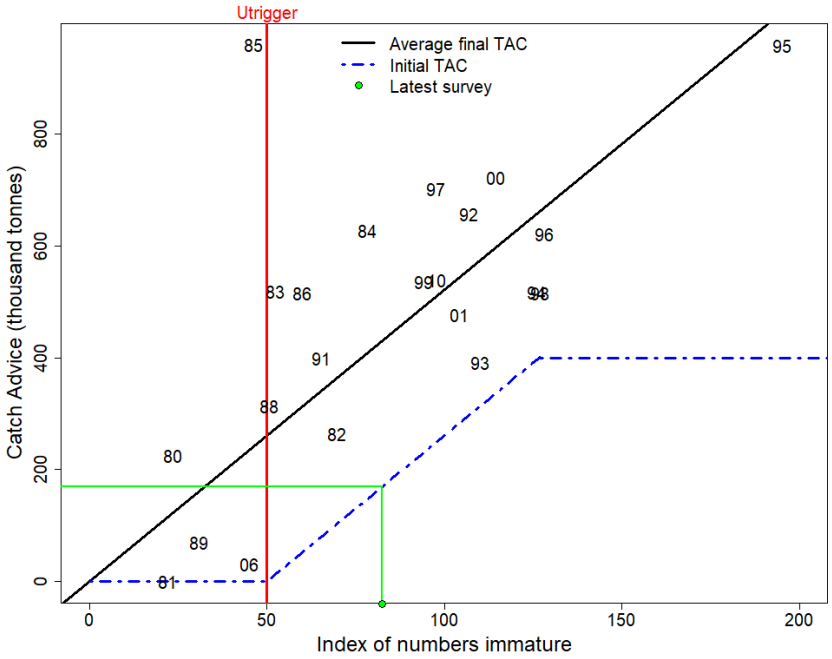

Figure 2 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Catch advice (initial TAC), according to the rule developed by ICES based on the measured number of immature capelin the previous autumn (about 16 months earlier than the winter survey used for the final TAC; ICES, 2015). The predicted final TAC is shown as a black solid line (based on immature index and the final TAC for the period 1980–2006) and the initial TAC as a blue dashed line. The latter is set using an index abundance trigger point ($U_{trigger}$; red vertical line) of 50 billion immature fish, with a cap on the initial TAC of 400 000 t. The green circle shows the index value from the autumn acoustic survey in 2019, with the corresponding initial TAC for 2020/2021 shown on the *y*-axis.

Table 4 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. The basis of the advice.

Advice basis	Harvest control rule agreed by the Coastal States (precautionary approach for initial TAC)
Management plan	The Coastal States (Iceland, Greenland, and Norway), have agreed (Anon., 2015) to use the following harvest control rule as the basis for management: an initial TAC is set for the next fishing season following the rule developed by ICES (2015), with a very low probability of the initial TAC being higher than a regression estimated final TAC. This is followed by an intermediate TAC set in the autumn and a final TAC set in winter during the fishing season, which will lead to >95% probability of SSB being greater than or equal to B_{lim} at spawning time in the following spring.

Quality of the assessment

The autumn survey in 2019 had sufficient spatial coverage. The uncertainty around the abundance estimate of immatures is high, due to a patchy distribution of the stock.

Issues relevant for the advice

This initial catch advice (TAC advice) is for the period between July 2020 and March 2021. ICES is only requested to provide initial catch advice using a rule based on having a low probability that the catch advised by ICES for the initial TAC will be higher than the final TAC (ICES, 2015). The Marine and Freshwater Research Institute in Iceland is expected to provide updated catch advice which will lead to > 95% probability of SSB being greater than or equal to B_{lim} based on acoustic survey information in autumn 2020 and winter 2021; this will form the basis for the final TAC for 2020/2021.

Reference points

Table 5 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Reference points, values, and their technical basis.

Framework	Reference points	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$			
	F_{MSY}			
Precautionary approach	B_{lim}	150000 t	B_{loss}	ICES (2015)
	B_{pa}			
	F_{lim}			
	F_{pa}			
Management plan	B_{mgt}	150000 t	B_{lim}	Anon. (2015)
	F_{mgt}			

Basis of the assessment

Table 6 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018).
Assessment type	The initial TAC advice is set by applying an advice rule designed to ensure a low risk of advised catch being higher than the final TAC (see WKICE; ICES, 2015). The final TAC advice is produced by Iceland, based on a model which takes into account uncertainty in surveys and predation from cod, haddock, and saithe on capelin to ensure that the advised catch will result in a less than 5% chance of SSB going below B_{lim} (ICES, 2019a).
Input data	The abundance estimate of immature capelin of ages 1 and 2 from acoustic surveys in autumn; preliminary cruise report (ICES, 2019b).
Discards and bycatch	Not included, considered negligible.
Indicators	None.
Other information	Last benchmarked in 2015 (ICES, 2015).
Working group	North-Western Working Group (NWWG)

Information from stakeholders

No additional information is available.

History of the advice, catch, and management

Table 7 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. ICES advice and catch. All weights are in tonnes.

Season	ICES advice	Initial TAC advice ^	Agreed final TAC ^^	ICES catch ^^^
1986/1987	TAC	1100000	1290000	1333400
1987/1988	TAC	500000	1115000	1115800
1988/1989	TAC	900000	1065000	1036500
1989/1990	TAC	900000	900000	807800
1990/1991	TAC	600000	250000	313600
1991/1992	No fishery pending survey results	0	740000	677100
1992/1993	Precautionary TAC^	500000	900000	787700
1993/1994	TAC	900000	1250000	1178700
1994/1995	Apply the harvest control rule	950000	850000	863900
1995/1996	Apply the harvest control rule	800000	1390000	929300
1996/1997	Apply the harvest control rule	1100000	1600000	1570900
1997/1998	Apply the harvest control rule	850000	1265000	1244900
1998/1999	Apply the harvest control rule	950000	1200000	1099400
1999/2000	Apply the harvest control rule	866000	1000000	932700
2000/2001	Apply the harvest control rule	650000	1090000	1071300
2001/2002	Apply the harvest control rule	700000	1300000	1249000
2002/2003	Apply the harvest control rule	690000	1000000	987700
2003/2004	Apply the harvest control rule	555000	900000	741400
2004/2005	Apply the harvest control rule	335000	985000	784000
2005/2006	Apply the harvest control rule	No fishery	235000	247000
2006/2007	Apply the harvest control rule	No fishery	385000	376800
2007/2008	Apply the harvest control rule	207000	207000	203400
2008/2009	Apply the harvest control rule	No fishery	0	15100*
2009/2010	Apply the harvest control rule	No fishery	150000	150700
2010/2011	Apply the harvest control rule	No fishery	390000	390600
2011/2012	Set the TAC at 50% of the initial quota in the HCR	366000	765000	746500
2012/2013	Precautionary approach	No fishery	570000	551000
2013/2014	Precautionary approach	No fishery	160000	141700
2014/2015	Set the initial quota at 50% of the predicted quota in the harvest control rule	225000	580000	517400
2015/2016	Precautionary approach**	53600	173000	173600
2016/2017	Precautionary approach**	0	299000	299800
2017/2018	Harvest control rule agreed by Coastal States**	0	285000	286500
2018/2019	Harvest control rule agreed by Coastal States**	0	0	0
2019/2020	Harvest control rule agreed by Coastal States**	0		
2020/2021	Harvest control rule agreed by Coastal States**	169520		

^ Advised for the early part of the season.
^^ Final TAC recommended by national scientists for the fishing season (July–March).
^^^ July–March of the following year.
* Scientific fishing was allowed in the latter half of February 2009.
** Initial TAC advice based on low probability of advised catch being higher than the final TAC.

History of the catch and landings

Table 8 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Catch distribution by fleet in 2018/2019 as estimated by ICES.

Catch	Landings	Discards
0	0	Negligible

Table 9 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. History of commercial catch and landings; official values are presented by season and country. All weights are in tonnes.

Year	Winter season					Summer and autumn season						Total (calendar year)
	Iceland	Norway	Faroes	Greenland	Season total	Iceland	Norway	Faroes	Greenland	EU	Season total	
1964	8600	-	-	-	8600	-	-	-	-	-	-	8600
1965	49700	-	-	-	49700	-	-	-	-	-	-	49700
1966	124500	-	-	-	124500	-	-	-	-	-	-	124500
1967	97200	-	-	-	97200	-	-	-	-	-	-	97200
1968	78100	-	-	-	78100	-	-	-	-	-	-	78100
1969	170600	-	-	-	170600	-	-	-	-	-	-	170600
1970	190800	-	-	-	190800	-	-	-	-	-	-	190800
1971	182900	-	-	-	182900	-	-	-	-	-	-	182900
1972	276500	-	-	-	276500	0	-	-	-	-	-	276500
1973	440900	-	-	-	440900	-	-	-	-	-	-	440900
1974	461900	-	-	-	461900	-	-	-	-	-	-	461900
1975	457100	-	-	-	457100	3100	-	-	-	-	3100	460200
1976	338700	-	-	-	338700	114400	-	-	-	-	114400	453100
1977	549200	-	24300	-	573500	259700	-	-	-	-	259700	833200
1978	468400	-	36200	-	504600	497500	154100	3400	-	-	655000	1159600
1979	521700	-	18200	-	539900	442000	124000	22000	-	-	588000	1127900
1980	392100	-	-	-	392100	367400	118700	24200	-	17300	527600	919700
1981	156000	-	-	-	156000	484600	91400	16200	-	20800	613000	769000
1982	13200	-	-	-	13200	-	-	-	-	-	-	13200
1983	-	-	-	-	-	133400	-	-	-	-	133400	133400
1984	439600	-	-	-	439600	425200	104600	10200	-	8500	548500	988100
1985	348500	-	-	-	348500	644800	193000	65900	-	16000	919700	1268200
1986	341800	50000	-	-	391800	552500	149700	65400	-	5300	772900	1164700
1987	500600	59900	-	-	560500	311300	82100	65200	-	-	458600	1019100
1988	600600	56600	-	-	657200	311400	11500	48500	-	-	371400	1028600
1989	609100	56000	-	-	665100	53900	52700	14400	-	-	121000	786100
1990	612000	62500	12300	-	686800	83700	21900	5600	-	-	111200	798000
1991	202400	-	-	-	202400	56000	-	-	-	-	56000	258400
1992	573500	47600	-	-	621100	213400	65300	18900	500	-	298100	919200
1993	489100	-	-	500	489600	450000	127500	23900	10200	-	611600	1101200
1994	550300	15000	-	1800	567100	210700	99000	12300	2100	-	324100	891200
1995	539400	-	-	400	539800	175500	28000	-	2200	-	205700	745500
1996	707900	-	10000	5700	723600	474300	206000	17600	15000	60900	773800	1497400
1997	774900	-	16100	6100	797100	536000	153600	20500	6500	47100	763600	1561500
1998	457000	-	14700	9600	481300	290800	72900	26900	8000	41900	440500	921800
1999	607800	14800	13800	22500	658900	83000	11400	6000	2000	-	102400	761300
2000	761400	14900	32000	22000	830300	126500	80100	30000	7500	21000	265100	1095400
2001	767200	-	10000	29000	806200	150000	106000	12000	9000	17000	294000	1061200
2002	901000	-	28000	26000	955000	180000	118700	-	13000	28000	339700	1294700
2003	585000	-	40000	23000	648000	96500	78000	3500	2500	18000	198500	846500
2004	478800	15800	30800	17500	542900	46000	34000	-	12000	0	92000	634900
2005	594100	69000	19000	10000	692000	9000	-	-	-	-	9000	701100
2006	193000	8000	30000	7000	238000	-	-	-	-	0	-	238000
2007	307000	38000	19000	12800	376800	-	-	-	-	-	-	376800
2008	149000	37600	10100	6700	203400	-	-	-	-	-	-	203400
2009	15100	-	-	-	15100	-	-	-	-	-	-	15100
2010	110600	28300	7700	4700	150700	5400	-	-	-	-	5400	156100
2011	321800	30800	19500	13100	385200	8400	58500	-	5200	-	72100	457300
2012	576200	46200	29700	22300	674400	9000	-	-	1000	-	10000	684400
2013	454000	40000	30000	17000	541000	-	-	-	-	-	-	541000
2014	111400	6200	8000	16100	141700	-	30500	-	5300	9700	45500	187200

Year	Winter season					Summer and autumn season						Total (calendar year)
	Iceland	Norway	Faroes	Greenland	Season total	Iceland	Norway	Faroes	Greenland	EU	Season total	
2015	353600	50600	29900	37900	471900	-	-	-	2500	-	2500	474400
2016	101100	58200	8500	3300	171100	-	-	-	-	-	-	171100
2017	196800	60400	15000	27400	299800	-	-	-	-	-	-	299800
2018	186300	74500	14300	11400	286500	-	-	-	-	-	-	286500
2019	-	-	-	-	-	-	-	-	-	-	-	-

Summary of the assessment

Table 10 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Assessment summary. Weights are in tonnes. For a fishing season Y/Y + 1 the recruitment (in thousands) refers to the autumn of year Y, and SSB columns refer to the spring of Y + 1.

Fishing season	Recruitment index (immature ages 1 and 2)	Recruitment 95th percentile	Recruitment 5th percentile	SSB* (median value)	SSB* 95th percentile	SSB* 5th percentile	Historical SSB estimates	Catch
1979/1980	22000000						300000	980100
1980/1981	23500000						170000	683600
1981/1982	22100000						140000	626200
1982/1983	69700000						260000	0
1983/1984	52300000						440000	573000
1984/1985	78400000						460000	897000
1985/1986	46400000						460000	1311500
1986/1987	60000000						420000	1333400
1987/1988	22000000						400000	1115800
1988/1989	50600000						440000	1036500
1989/1990	31000000						115000	807800
1990/1991	27200000						330000	313600
1991/1992	65300000						475000	677100
1992/1993	106900000						499000	787700
1993/1994	110200000						460000	1178700
1994/1995	125900000						420000	863900
1995/1996	195100000						830000	929300
1996/1997	128300000						430000	1570900
1997/1998	97600000						492000	1244900
1998/1999	126900000						500000	1099400
1999/2000	94200000						650000	932700
2000/2001	114600000						450000	1071300
2001/2002	104200000						475000	1249000
2002/2003	1500000						410000	987700
2003/2004	8000000						535000	741400
2004/2005	8000000						602000	784000
2005/2006	0						400000	247000
2006/2007	45000000						410000	376800
2007/2008	5800000						406000	203400
2008/2009	7900000						328000	15100
2009/2010	13000000						410000	150700
2010/2011	97900000						411000	390600
2011/2012	12600000						418000	746500
2012/2013	20500000						417000	551000
2013/2014	67000000						424000	141700
2014/2015	60300000						460000	517400
2015/2016	6200000	8250000	4120000	298000	447828	150338		173600
2016/2017	9400000	14750000	4930000	355000	596320	150190		299800
2017/2018	26100000	46310000	10420000	352000	614000	150000		286500
2018/2019	10800000	15360000	7240000	82790	161480	33200		0
2019/2020	82600000	150650000	36620000					

* Based on predation model in current advice rule; not directly comparable to historical SSB values because it is based on different natural mortality assumptions.

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