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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 stock advice

ICES advises that when the harvest control rule agreed by the Coastal States is applied, the initial TAC for the fishing season 2018/2019 should be zero tonnes. The initial TAC should be revised based on acoustic survey information in autumn 2018. The final TAC should be set on the basis of survey information in autumn 2018 and winter 2018/2019.

Stock development over time

The spawning-stock biomass (SSB) is estimated at 355 000 tonnes (median value) at the time of spawning in March 2017, which corresponds to 95% probability of the SSB being above B_{lim} (150 000 t). The estimates of SSB from 2016 onwards are based on a new method with different assumptions about natural mortality. Therefore, they are not comparable with the historic SSB estimates. The estimates of the immature 1- and 2-year-old capelin from the acoustic survey in autumn 2017 are low.

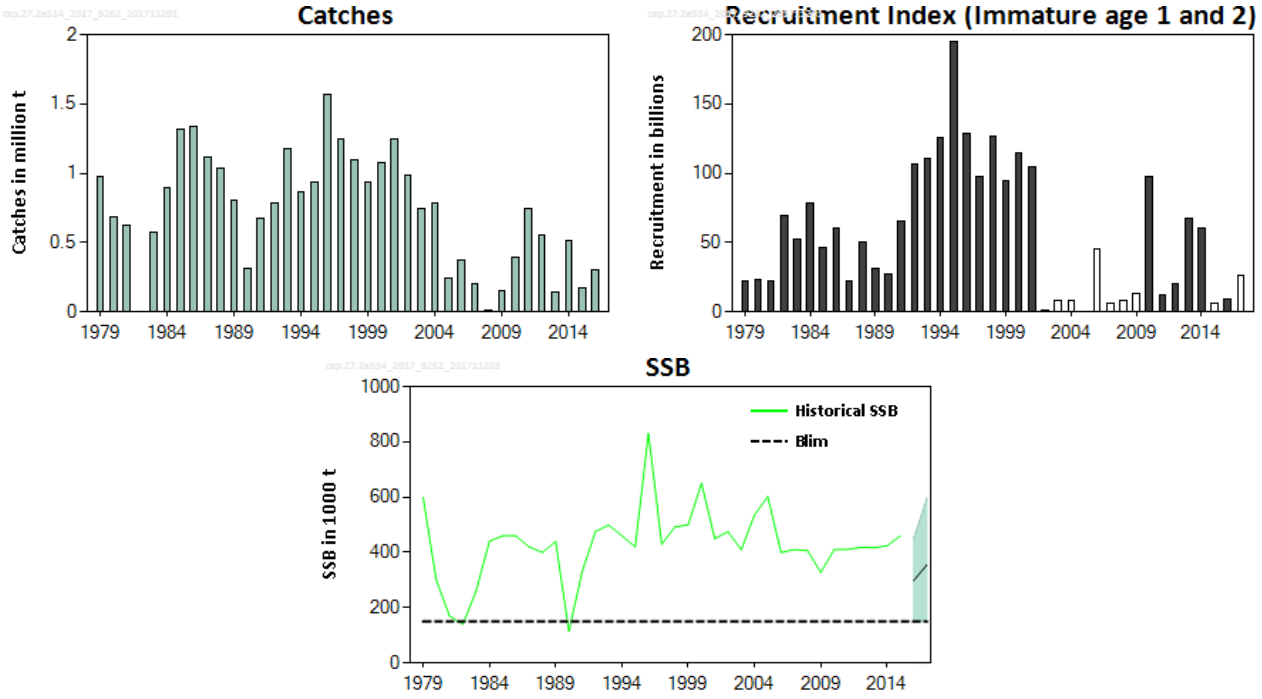

Figure 1 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Summary of the stock assessment. Catches (million t) by fishing season (July–March of the following year). Recruitment (immature-at-age 1 and 2; numbers in billions) as acoustic index from autumn surveys (unshaded bars indicate incomplete spatial coverage likely resulting in notable underestimation), and SSB (thousand t, with 90% confidence intervals for the last two years) at spawning time (March–April). 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

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				
		2014	2015	2016			2015	2016	2017	
Maximum Sustainable Yield	F_{MSY}	?	?	?	Undefined	MSY $B_{Trigger}$	?	?	?	Undefined
Precautionary Approach	F_{pa}, F_{lim}	?	?	?	Undefined	B_{pa}, B_{lim}	?	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	?	?	?	Undefined	B_{MGT}	?	✓	✓	Above

Catch options

Table 2 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. The basis for the catch options.

Variable	Value	Source	Notes
Immature age 1 (2017)	24.6 billion	ICES (2017a)	Index from the autumn acoustic survey 2017
Immature age 2 (2017)	1.5 billion	ICES (2017a)	Index from the autumn acoustic survey 2017

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

Basis	Catches in 2018/2019 (t)
ICES advice basis	
Harvest control rule agreed by the Coastal States (precautionary approach for initial TAC).	0

Basis of the advice

The basis of the advice is the harvest control rule agreed by the Coastal States in 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 2018 (intermediate TAC), with the final TAC being set on the results of the autumn and/or winter surveys in 2018/2019.

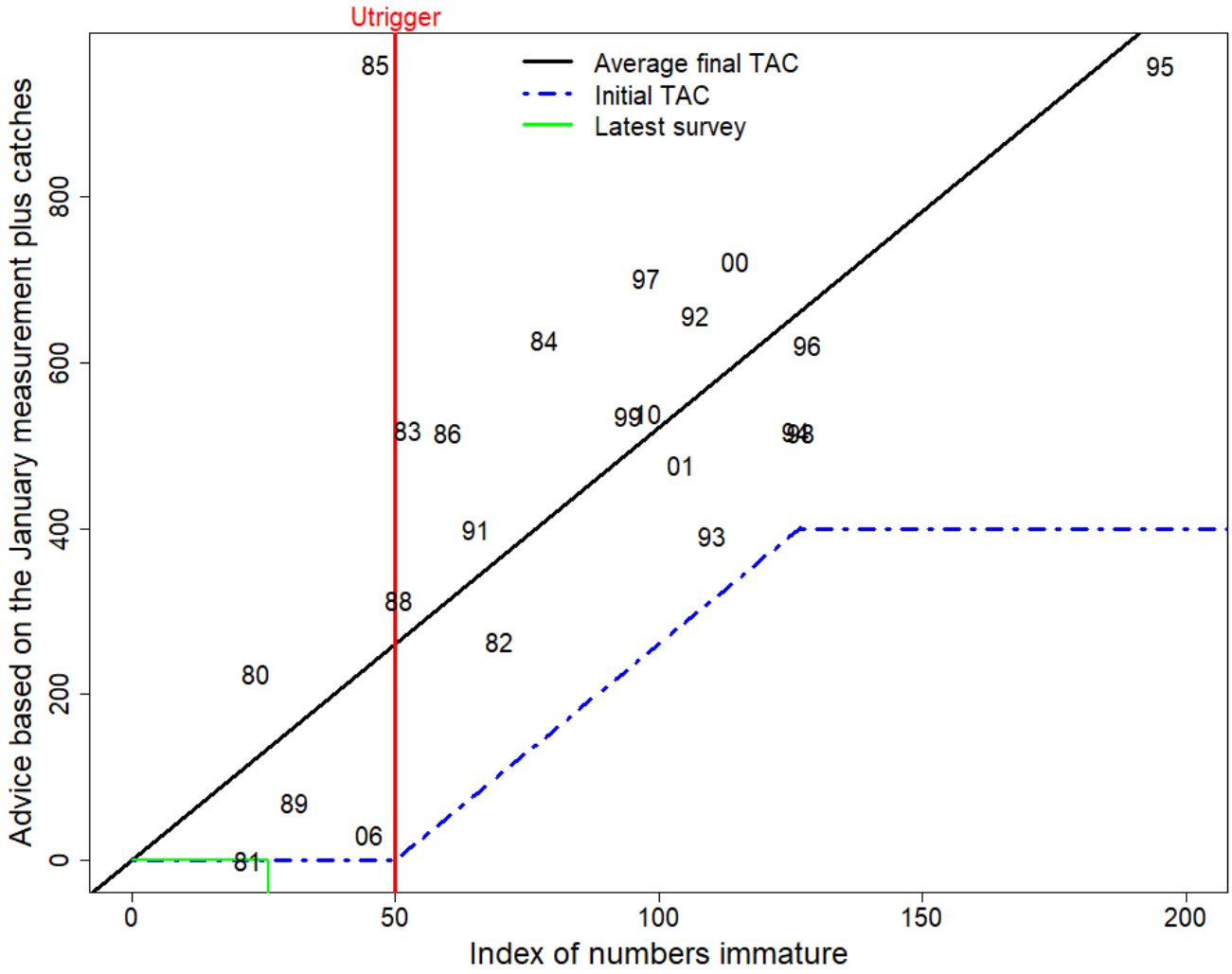

Figure 2 Capelin in subareas 5 and 14 and Division 2.a west of 5°W. Catch advice (initial TAC) according to the ICES advice rule, based on the measured number of immature capelin the previous autumn (about 16 months earlier than the winter survey used for the final TAC). The predicted final TAC is shown as the black solid line and the initial TAC as the 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 kt. The green lines show the index value from the autumn acoustic survey in 2017, with the corresponding initial TAC for 2018/2019 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 (Coastal State consultations, 2015) to use the following harvest control rule as the basis for management: an initial TAC is set following the rule developed by ICES (2015), with a very low probability of 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, that will have a >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 2016 severely underestimated the mature stock component. Hence, the coverage was increased considerably in the autumn of 2017, extending further east into the Iceland Sea, covering regions around Jan Mayen and further north along the Greenlandic shelf, while covering areas much closer to the Greenlandic coast. No capelin were observed in the eastern part of the Iceland Sea and around Jan Mayen, only small amounts north along the Greenland shelf break, but considerable quantities were observed close to the Greenland coast. Technical issues caused delays and affected the survey schedule and coverage. As a consequence there is a gap in coverage north of Iceland and the survey did not reach as far to the southwest as originally planned. This might lead to an underestimation of juveniles.

It should be noted that the historical estimates of SSB have not been updated to take into account the revised process for estimating natural mortality. This has no implications for the advice.

Issues relevant for the advice

This initial TAC advice will be followed up with revisions by a national institute leading to a final TAC within the fishing season.

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	SSB_{mgt}	150000 t	B_{lim}	Coastal States consultations (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 assessment and advice.

ICES stock data category	1 (ICES, 2016)
Assessment type	The final TAC is 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}. 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).
Input data	The abundance estimate of immature capelin of ages 1 and 2 from acoustic surveys in autumn; Preliminary cruise report (Bardarson and Jonsson, 2017).
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

There is no information 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	1333000
1987/1988	TAC	500000	1115000	1116000
1988/1989	TAC	900000	1065000	1036000
1989/1990	TAC	900000	900000	808000
1990/1991	TAC	600000	250000	314000
1991/1992	No fishery pending survey results	0	740000	677000
1992/1993	Precautionary TAC^	500000	900000	788000
1993/1994	TAC	900000	1250000	1179000
1994/1995	Apply the harvest control rule	950000	850000	864000
1995/1996	Apply the harvest control rule	800000	1390000	930000
1996/1997	Apply the harvest control rule	1100000	1600000	1571000
1997/1998	Apply the harvest control rule	850000	1265000	1245000
1998/1999	Apply the harvest control rule	950000	1200000	1100000
1999/2000	Apply the harvest control rule	866000	1000000	934000
2000/2001	Apply the harvest control rule	650000	1090000	1071000
2001/2002	Apply the harvest control rule	700000	1300000	1250000
2002/2003	Apply the harvest control rule	690000	1000000	988000
2003/2004	Apply the harvest control rule	555000	900000	741000
2004/2005	Apply the harvest control rule	335000	985000	784000
2005/2006	Apply the harvest control rule	No fishery	235000	238000
2006/2007	Apply the harvest control rule	No fishery	385000	377000
2007/2008	Apply the harvest control rule	207000	207000	202000
2008/2009	Apply the harvest control rule	No fishery	0*	15000
2009/2010	Apply the harvest control rule	No fishery	150000	151000
2010/2011	Apply the harvest control rule	No fishery	390000	391000
2011/2012	Set the TAC at 50% of the initial quota in the HCR	366000	765000	747000
2012/2013	Precautionary approach	No fishery	570000	551000
2013/2014	Precautionary approach	No fishery	160000	142000
2014/2015	Set the initial quota at 50% of the predicted quota in the harvest control rule	225000	580000	517000
2015/2016	Precautionary approach**	53600	173000	174000
2016/2017	Precautionary approach**	0	299000	300000
2017/2018	Harvest control rule agreed by Coastal States**	0		
2018/2019	Harvest control rule agreed by Coastal States**	0		

^ 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.
* Only scouting TAC was allocated 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 2016/2017 as estimated by ICES.

Catch	Landings		Discards
300 000 tonnes	Purse seine 97%	Pelagic trawl 3%	Negligible
	300 000 tonnes		

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

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

* Preliminary.

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 column refers to the autumn of year Y and SSB columns refer to the spring of Y+1.

Fishing season	Recruitment Index (Immature age 1 and 2)	SSB* (median value)	SSB* 95th percentile	SSB* 5th percentile	Historical SSB estimates	Catch
	thousands	tonnes			tonnes	tonnes
1978/1979					600000	
1979/1980	22000000				300000	980000
1980/1981	23500000				170000	684000
1981/1982	22100000				140000	626000
1982/1983	69700000				260000	0
1983/1984	52300000				440000	573000
1984/1985	78400000				460000	896000
1985/1986	46400000				460000	1312000
1986/1987	60000000				420000	1334000
1987/1988	22000000				400000	1116000
1988/1989	50600000				440000	1036000
1989/1990	31000000				115000	807000
1990/1991	27200000				330000	313000
1991/1992	65300000				475000	677000
1992/1993	106900000				499000	788000
1993/1994	110200000				460000	1178000
1994/1995	125900000				420000	864000
1995/1996	195100000				830000	930000
1996/1997	128300000				430000	1570000
1997/1998	97600000				492000	1246000
1998/1999	126900000				500000	1100000
1999/2000	94200000				650000	932000
2000/2001	114600000				450000	1071000
2001/2002	104200000				475000	1249000
2002/2003	1500000				410000	988000
2003/2004	8000000				535000	742000
2004/2005	8000000				602000	784000
2005/2006	0				400000	247000
2006/2007	45000000				410000	377000
2007/2008	5800000				406000	203000
2008/2009	7900000				328000	15000
2009/2010	13000000				410000	151000
2010/2011	97900000				411000	391000
2011/2012	12600000				418000	747000
2012/2013	20500000				417000	551000
2013/2014	67000000				424000	142000
2014/2015	60300000				460000	518000
2015/2016	6200000	298000	447828	150338		174000
2016/2017	9400000	355000	596320	150190		300000**
2017/2018	26100000					

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

Sources and references

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