

Tusk (*Brosme brosme*) in Subarea 14 and Division 5.a (East Greenland and Iceland grounds)

ICES advice on fishing opportunities

ICES advises that when the Icelandic management plan is applied, catches in the fishing year 1 September 2019 to 31 August 2020 should be no more than 3856 tonnes in Division 5.a.

At present ICES cannot provide catch advice for Subarea 14.

Stock development over time

Recruitment in 2012–2015 was very low, and has increased since then. The harvest rate (HR) has declined in recent years and is below the HR producing maximum sustainable yield (HR_{MSY}). Spawning-stock biomass (SSB) has been increasing in recent years; the reference biomass (tusk longer than 40 cm) has increased slightly and remains stable.

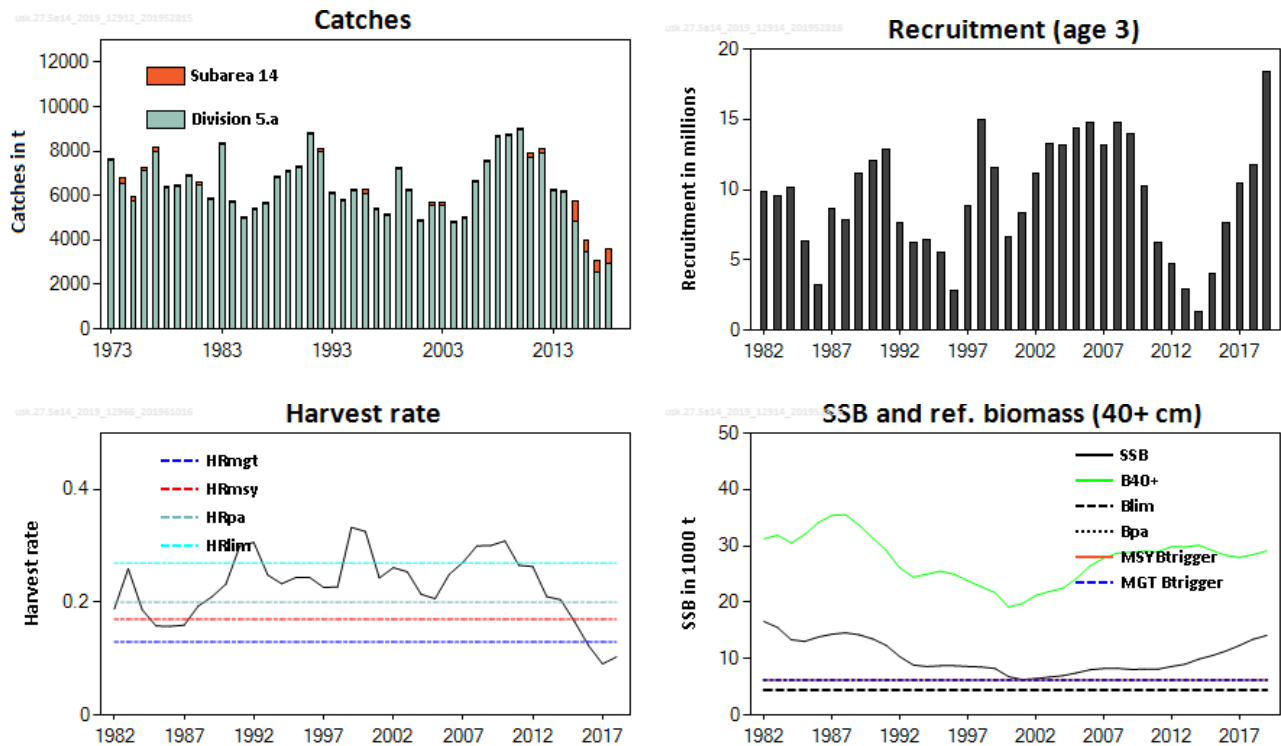


Figure 1 Tusk in Subarea 14 and Division 5.a. Summary of the stock assessment in Division 5.a. The lower right panel shows trends in spawning-stock biomass (SSB), the biomass of tusk at length 40 cm and greater (B_{40+}) that is used in the harvest control rule (HCR), and reference points (B_{lim} , B_{pa} , and B_{MGT} , with $B_{MGT} = B_{pa} = MSY B_{trigger}$). The lower left panel shows trends in harvest rate (catches in Division 5.a / B_{40+}) alongside harvest rate reference points. Final-year recruitment and biomass estimates are included.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is below HR_{MSY} , HR_{pa} , and HR_{lim} , and spawning-stock size is above $MSY B_{trigger}$, B_{pa} , and B_{lim} .

Table 1 Tusk in Subarea 14 and Division 5.a. State of the stock and fishery relative to reference points. The determination of the symbols for fishing pressure under the management plan is based on the expected range of realized HR (0.09 to 0.18) following the management plan (HR_{MGT} ; see ICES, 2017a).

		Fishing pressure			Stock size					
		2016	2017	2018	2017	2018	2019			
Maximum sustainable yield	HR_{MSY}	✓	✓	✓	Below	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	HR_{pa} , HR_{lim}	✓	✓	✓	Harvested sustainably	B_{pa} , B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	HR_{MGT}	✓	✓	✓	Within the range	MGT $B_{trigger}$	✓	✓	✓	Above

Catch scenarios

The basis of the catch scenario for the Division 5.a component of the stock is the management plan. A catch scenario is provided for the Icelandic fishery year from September 2019 to the end of August 2020, based on the estimated reference biomass at the end of quarter 1 in 2019. A short-term forecast to the end of 2020 is provided to evaluate the impact of the catch on the SSB.

Table 2 Tusk in Subarea 14 and Division 5.a. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
HR_{MGT}	0.13	
Reference biomass 2019	29490	Biomass of fish 40 cm and larger (40+) at the end of quarter 1; in tonnes
Recruitment age 3 (2019)	18434	Estimated by the model; in thousands
Catch (2019, sum of quarters 2 & 3)	2876	Remainder of the TAC for the fishing year 2018/2019; in tonnes

Table 3 Tusk in Subarea 14 and Division 5.a. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2019/2020)	HR (2020)	SSB (2021)	% SSB change *	% TAC change **	% Advice change ***
Management plan	3856	0.13	14391	3%	2%	2%

* SSB in 2021 relative to SSB in 2020.

** Advice value for 2019/2020 relative to the TAC in 2018/2019.

*** Advice value for 2019/2020 relative to advice value for 2018/2019.

The catch advice has increased from last year due to an increase in the reference biomass level.

Basis of the advice

Table 4 Tusk in Subarea 14 and Division 5.a. The basis of the advice.

Advice basis	Management plan for the stock component in Division 5.a (ICES, 2017a).
Management plan	<p>The Icelandic Ministry of Industries and Innovation’s fisheries management plan for Icelandic tusk (ICES, 2017a) has been evaluated by ICES. It is considered to be precautionary and conforms to the ICES MSY approach. According to the management plan the TAC for the fishing year Y/Y+1 (1 September of year Y to 31 August of year Y+1) is calculated as follows:</p> <p><i>When SSB_y is equal or above $MGT B_{trigger}$:</i> $TAC_{Y/Y+1} = HR_{MGT} * B_{Ref,y}$</p> <p><i>When SSB_y is below $MGT B_{trigger}$:</i> $TAC_{Y/Y+1} = HR_{MGT} * (SSB_y / MGT B_{trigger}) * B_{Ref,y}$</p> <p><i>The spawning-stock biomass trigger ($MGT B_{trigger}$) is defined as 6.24 kt, the reference biomass (B_{Ref}) is defined as the biomass of tusk 40+ cm and the target harvest rate (HR_{MGT}) is set to 0.13.</i></p>

Quality of the assessment

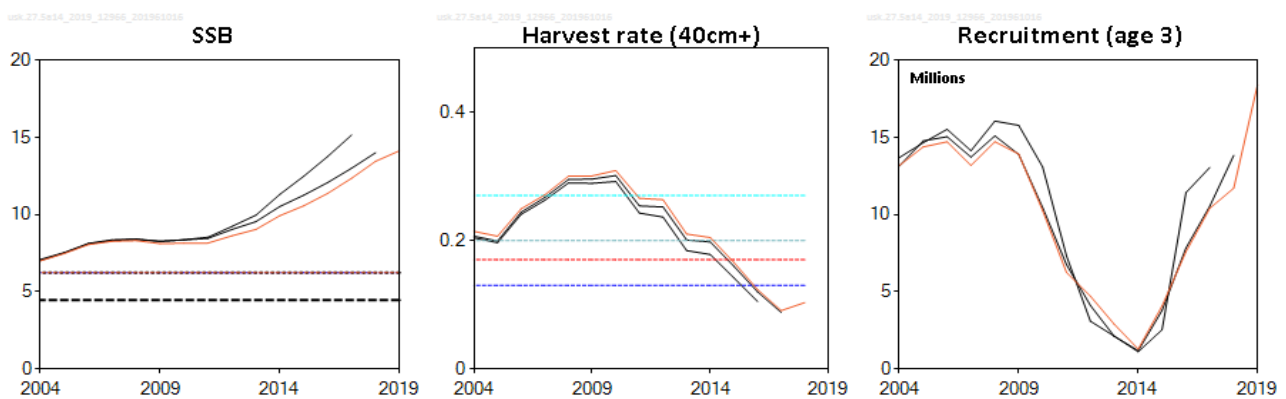


Figure 2 Tusk in Subarea 14 and Division 5.a. Historical assessment results for the stock component in Division 5.a. Final-year recruitment and biomass estimates are included.

The assessment of this stock has not included catch information from the Greenlandic part of Subarea 14. Historically the catches from this area have on average been around 1% (< 100 tonnes) of the total catches of tusk, but are currently closer to 20% (around 600 tonnes) in 2017 and 2018. However, in the 2017 benchmark, it was not considered appropriate to include catches from the Greenlandic part of Subarea 14 in the assessment before conducting additional exploration as there are doubts about whether the tusk in the area constitute a single stock.

Issues relevant for the advice †

This stock is classified as Category 4 in the [NEAFC categorization of deep-sea species/stocks](#) which implies that fisheries are primarily restricted to Coastal State exclusive economic zones (EEZs) and therefore management measures are not taken by NEAFC unless complementary to coastal state conservation and management measures.

This advice pertains only to the tusk stock component in Division 5.a. because catch data from Subarea 14 are not used in the assessment. At present ICES can not provide a catch advice for the stock component in Subarea 14. If the recent higher levels of catch in the Greenlandic area of Subarea 14 continue, the treatment of catch data may need to be reconsidered in future assessments and management.

† Version 2: NEAFC categorisation of deep-sea stocks added to section.

Reference points

Table 5 Tusk in Subarea 14 and Division 5.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	6240	B_{pa} (tonnes).	ICES (2017b)
	HR_{MSY}	0.17	Stochastic simulations.	ICES (2017b)
Precautionary approach	B_{lim}	4460	$B_{pa}/1.4$ (tonnes).	ICES (2017b)
	B_{pa}	6240	B_{loss} (tonnes).	ICES (2017b)
	HR_{lim}	0.27	The equilibrium HR that will maintain the stock above B_{lim} with a 50% probability.	ICES (2017b)
	HR_{pa}	0.20	5% probability that true HR has been above HR_{lim} .	ICES (2017b)
Management plan	MGT $B_{trigger}$	6240	B_{pa} (tonnes).	ICES (2017b)
	HR_{mgt}	0.13	Proportion of catch relative to reference biomass. Leads to long-term MSY. Realized HR can range from 0.09 to 0.18.	ICES (2017b)

Basis of the assessment

Table 6 Tusk in Subarea 14 and Division 5.a. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018).
Assessment type	Analytical length-based assessment (Gadget model) that uses catches in the model and in the forecast (ICES, 2019).
Input data	March Icelandic groundfish survey and landings in Division 5.a.
Discards and bycatch	Discarding is considered negligible.
Indicators	None.
Other information	Last benchmarked in 2017 (WKICEMSE; ICES, 2017b).
Working group	Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP).

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Tusk in Subarea 14 and Division 5.a. ICES advice and official landings. All weights are in tonnes. The EU sets a small TAC (21 tonnes since 2016) exclusively for bycatches and for subareas 1, 2, and 14 combined.

Year	ICES advice	Catch corresponding to advice	ICES catches**	TAC Icelandic Division 5.a*	ICES catches Division 5.a*
2004/2005	^		5099	3500	4901
2005/2006	^		6669	3500	5928
2006/2007	^		7581	5000	7942
2007/2008	^		8215	5500	7594
2008/2009	Constrain catches to 5 000 t	< 5000	8295	5500	8162
2009/2010	Biennial	< 5000	8988	5500	8382
2010/2011	Fishing at $F_{0.1}$	< 6000	7565	6000	7777
2011/2012	Biennial	< 6000	8014	7000	7401
2012/2013	Fishing at F_{MSY} (F_{max})	< 6700	6283	6400	6833
2013/2014	No new advice, same as 2013	< 6700	6055	5900	5881
2014/2015	Fishing at F_{MSY}	< 3950	5721	3700	4958
2015/2016	Fishing at F_{MSY}	< 3440	3965	3000	4121
2016/2017	Fishing at F_{MSY}	\leq 3780	3100	3380	2418
2017/2018	Management plan	\leq 4370*	3621	3770	3139
2018/2019	Management plan	\leq 3776*		3100	
2019/2020	Management plan	\leq 3856*			

* Icelandic national fishing year ending 31 August.

** Calendar year (last year in the Icelandic national fishing year), including catches from Subarea 14 and Division 5.a.

^ Prior to 2008/2009 the advice for tusk was for the entire Northeast Atlantic, not split in several assessment units.

History of the catch and landings

This stock is distributed primarily in Icelandic waters and there are no reported catches from the NEAFC regulatory area.

Table 8 Tusk in Subarea 14 and Division 5.a. Catch distribution by fleet in the calendar year 2018 as estimated by ICES.

Catch (2018)	Landings		Discards
	Longlines 97%	Trawls 3%	
3621 tonnes	3621 tonnes		Discarding is negligible

Table 9 Tusk in Subarea 14 and Division 5.a. History of official catches by country and calendar year in Division 5.a. All weights are in tonnes.

Year	Faroes	Denmark	Germany	Iceland	Norway	UK	Total
1973	3363	0	576	2366	911	391	7607
1974	3172	0	375	1857	893	230	6527
1975	2445	0	384	1673	975	254	5731
1976	2397	0	334	2935	1352	94	7112
1977	2818	0	212	3122	1796	0	7948
1978	2168	0	0	3352	812	0	6332
1979	2050	0	0	3558	845	0	6453
1980	2873	0	0	3089	928	0	6890
1981	2624	0	0	2827	1025	0	6476
1982	2410	0	0	2801	666	0	5877
1983	4046	0	0	3468	772	0	8286
1984	2008	0	0	3430	254	0	5692
1985	1885	0	0	3064	111	0	5060
1986	2811	0	0	2549	21	0	5381
1987	2638	0	0	2987	19	0	5644
1988	3757	0	0	3087	20	0	6864
1989	3908	0	0	3158	10	0	7076
1990	2475	0	0	4821	0	0	7296
1991	2286	0	0	6476	0	0	8762
1992	1567	0	0	6432	0	0	7999
1993	1329	0	0	4745	0	0	6074
1994	1212	0	0	4616	0	0	5828
1995	979	0	1	5247	0	0	6227
1996	872	0	1	5227	3	0	6103
1997	575	0	0	4824	0	0	5399
1998	1052	0	1	4120	0	0	5173
1999	1035	0	2	5797	391	2	7227
2000	1154	0	0	4711	374	2	6241
2001	1125	0	1	3390	285	5	4806
2002	1269	0	0	3906	372	2	5549
2003	1163	0	1	4032	373	2	5571
2004	1478	0	1	3127	214	2	4822
2005	1157	0	3	3502	303	41	5006
2006	1239	0	2	5058	299	2	6600
2007	1250	0	0	5988	300	1	7539
2008	1398	0	0	6934	294	0	8626
2009	1516	0	0	6954	210	0	8680
2010	1794	0	0	6921	263	0	8978

Year	Faroes	Denmark	Germany	Iceland	Norway	UK	Total
2011	1655	0	0	5848	198	0	7701
2012	1310	0	0	6346	217	0	7873
2013	1094	0.12	0	4978	192	0	6264
2014	742	0	0	4996	425	0	6163
2015	637	0	0	4001	198	0	4836
2016	543	0	0	2650	301	0	3494
2017	492	0	0	1833	216	0	2541
2018	517	0	0	2097	326	0	2940

Table 10 Tusk in Subarea 14 and Division 5.a. History of official catches by country and calendar year in Subarea 14. All weights are in tonnes. There have been no catches in the NEAFC regulatory area since 2010.

Year	Faroes	Denmark	Greenland	Germany	Iceland	Norway	USSR/Russia*	Spain	UK	Total
1973	16	0	0	9	0	0	0	0	2	27
1974	259	0	0	2	15	0	0	0	1	277
1975	29	0	0	17	13	138	0	0	0	197
1976	0	0	0	5	89	47	0	0	1	142
1977	167	0	0	16	0	40	0	0	1	224
1978	0	0	0	47	0	38	0	0	0	85
1979	0	0	0	27	0	0	0	0	0	27
1980	0	0	0	13	0	0	0	0	0	13
1981	110	0	0	10	0	0	0	0	0	120
1982	0	0	0	10	0	0	0	0	0	10
1983	74	0	0	11	0	0	0	0	0	85
1984	0	0	0	5	0	58	0	0	0	63
1985	0	0	0	4	0	0	0	0	0	4
1986	33	0	0	2	0	0	0	0	0	35
1987	13	0	0	2	0	0	0	0	0	15
1988	19	0	0	2	0	0	0	0	0	21
1989	13	0	0	1	0	0	0	0	0	14
1990	0	0	0	2	0	7	0	0	0	9
1991	0	0	0	2	0	68	0	0	1	71
1992	0	0	0	0	3	120	0	0	0	123
1993	0	0	0	0	1	39	0	0	0	40
1994	0	0	0	0	0	16	0	0	0	16
1995	0	0	0	0	0	30	0	0	0	30
1996	0	0	0	0	0	157	0	0	0	157
1997	0	0	0	0	10	9	0	0	0	19
1998	0	0	0	0	0	12	0	0	0	12
1999	0	0	0	0	0	8	0	0	0	8
2000	0	0	0	0	11	11	0	3	0	25
2001	3	0	0	0	20	69	0	0	0	92
2002	4	0	0	0	86	30	0	0	0	120
2003	0	0	0	0	2	88	0	0	0	90
2004	0	0	0	0	0	40	0	0	0	40
2005	7	0	0	0	0	41	8	0	0	56
2006	3	0	0	0	0	19	51	0	0	73
2007	0	0	0	0	0	40	6	0	0	46
2008	0	0	33	0	0	7	0	0	0	40
2009	12	0	15	0	0	5	11	0	0	43

Year	Faroes	Denmark	Greenland	Germany	Iceland	Norway	USSR/Russia*	Spain	UK	Total
2010	7	0	0	0	0	5	0	0	0	12
2011	20	0	0	0	131	24	0	0	0	175
2012	33	0	0	0	174	46	0	0	0	253
2013	1.9	0.3	0	0	0	23.8	0	0	0	26
2014	2	0	0	0	0	26	0	0	0	28
2015	670	0.1	166	0	0	62	0	0	0	898
2016	111	0	182	0	0	178	0	0	0	471
2017	83	0.4	335	0	0	141	0	0	0	559
2018**	345	0	108	0	0	228	0	0	0	681

*Russian catches were taken in Subdivision 14.b.1 (Mid-Atlantic Ridge).

**Preliminary.

Summary of the assessment

Table 11 Tusk in Subarea 14 and Division 5.a. Assessment summary by calendar year in Division 5.a and Subarea 14.

Year	Recruitment (age 3)	SSB	Catches	Harvest rate	B40+
	thousands	tonnes	tonnes		tonnes
1982	9839	16612	5877	0.188	31264
1983	9520	15542	8286	0.26	31916
1984	10133	13374	5692	0.187	30512
1985	6368	13072	5060	0.158	32021
1986	3271	13860	5381	0.158	34146
1987	8609	14351	5644	0.159	35407
1988	7833	14590	6864	0.193	35547
1989	11128	14252	7076	0.21	33703
1990	12108	13518	7296	0.23	31413
1991	12853	12374	8762	0.30	29190
1992	7676	10364	7999	0.31	26111
1993	6236	8879	6074	0.25	24456
1994	6445	8618	5828	0.23	25008
1995	5544	8753	6227	0.24	25531
1996	2781	8755	6103	0.24	24987
1997	8807	8633	5399	0.23	23833
1998	14980	8547	5173	0.23	22768
1999	11565	8281	7227	0.33	21713
2000	6609	6825	6241	0.33	19167
2001	8352	6315	4806	0.24	19765
2002	11182	6488	5549	0.26	21230
2003	13228	6748	5571	0.25	21917
2004	13183	7004	4822	0.21	22510
2005	14392	7483	5006	0.21	24233
2006	14721	8056	6600	0.25	26478
2007	13188	8274	7539	0.27	27816
2008	14728	8313	8626	0.30	28735
2009	13925	8118	8680	0.30	28879
2010	10265	8148	8978	0.31	29073
2011	6252	8156	7701	0.27	28981
2012	4715	8631	7873	0.26	29884
2013	2892	9039	6264	0.21	29821
2014	1287	9935	6163	0.20	30129
2015	4076	10576	4836	0.166	29188
2016	7598	11382	3494	0.123	28329
2017	10413	12363	2541	0.091	27972
2018	11715	13460	2940	0.103	28457
2019	18434	14143			29130

Sources and references

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