

ECOREGION Iceland and East Greenland
STOCK Cod in Division Va (Icelandic cod)

Advice for 2012/2013

ICES advises on the basis of the Icelandic 2009 management plan that landings in the fishing year 2012/2013 should be no more than 196 000 t.

Stock status

		F (Fishing Mortality)		
		2009	2010	2011
MSY (F_{MSY})		✓	✓	✓ Below possible candidate
Precautionary approach (F_{pa}, F_{lim})		✓	✓	✓ Below possible candidate F_{pa} and F_{lim}
Management plan (HR _{MP})		✓	✓	✓ Within expected range
		SSB (Spawning-stock Biomass)		
		2010	2011	2012
MSY ($B_{trigger}$)		✓	✓	✓ Above trigger
Precautionary approach (B_{lim})		✓	✓	✓ Full reproductive capacity
Management plan (MP _{Btrigger})		✓	✓	✓ Above trigger

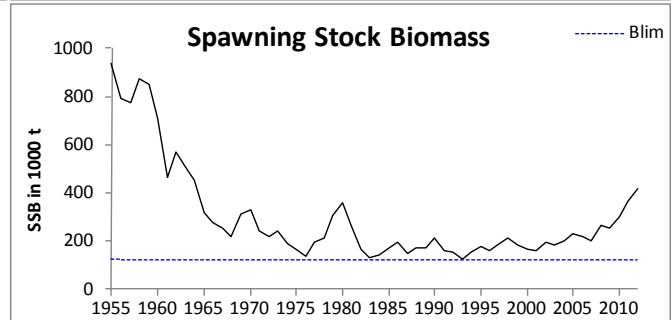
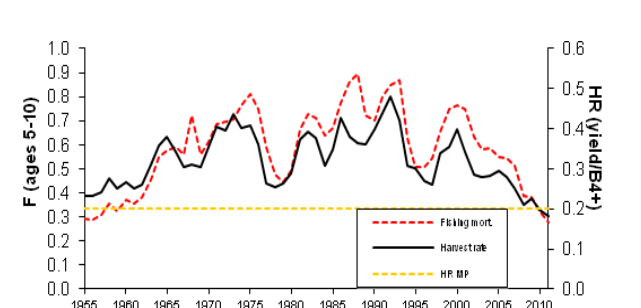
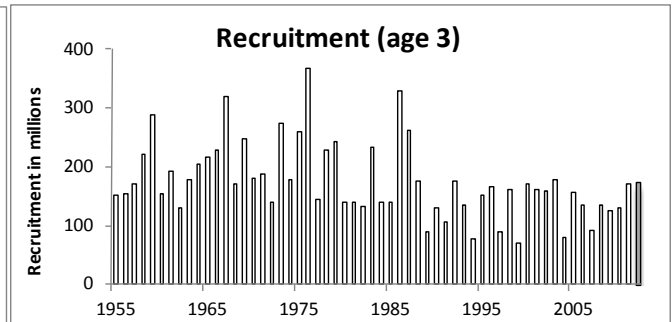
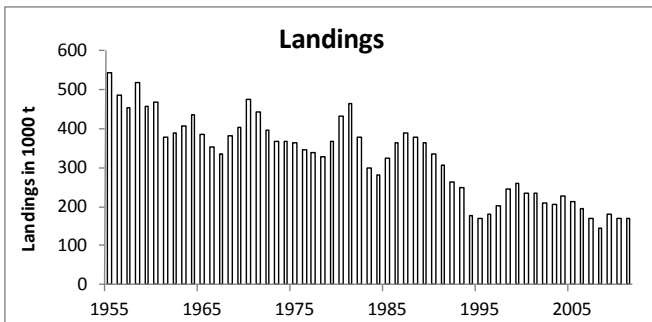
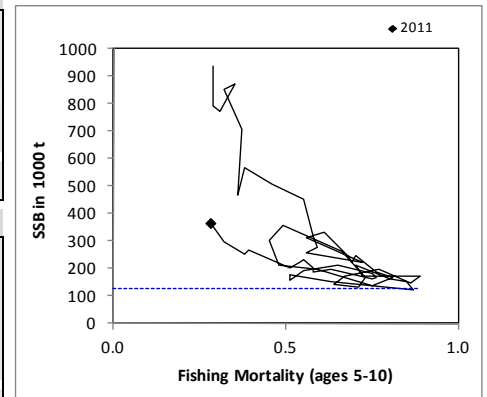


Figure 2.4.2.1 Cod in Division Va (Icelandic cod). Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment.

The spawning stock of Icelandic cod is increasing and is higher than has been observed over the last four decades. Fishing mortality has declined significantly in the last decade and is presently at a historical low and below likely candidates for F_{pa} and F_{lim} . Year classes since early 1990s are estimated to be stable around lower values than previously.

Management plan

In spring 2009 the Icelandic Government adopted a management plan for the Icelandic cod. ICES has evaluated the plan and concludes that it is in accordance with the precautionary approach and the ICES MSY framework.

Biology

The Icelandic cod is distributed all around Iceland. Spawning takes place in late winter mainly off the southwestern coast, but smaller and variable regional spawning components have also been observed all around Iceland. The pelagic eggs and larvae drift clockwise around the island to the main nursery ground off the north coast. A larval drift to Greenland waters has been recorded in some years and substantial immigrations of mature cod from Greenland, which are considered to be of Icelandic origin, have been observed in some years.

Environmental influence on the stock

An increased inflow of Atlantic water has been observed in Icelandic waters since 1997, resulting in higher temperature and higher salinity. A northward shift in distribution of immature capelin may be linked to these hydrographical changes, resulting in lower availability of capelin for cod. In the past low weights-at-age of cod have been related to a low biomass of capelin. In recent years the productivity of capelin has improved to some degree and may be the reason for increased weights-at-age in the cod stock.

The fisheries

Cod has traditionally been targeted in the trawl fisheries with other species being bycatch. With the recent constraints in TAC the fleet has reduced effort in areas where cod is in relatively high abundance, manifested in a higher proportion of the annual catches being taken in tows where the species composition is more mixed in nature. For vessels that can target cod the catch rates are very high.

Estimates of annual cod discards since 2001 are in the range of 1.4–4.3% of numbers landed.

Catch distribution Total landings (2011) are 173 kt (45% bottom trawl, 35% longline, 10% gillnet, 5% Danish seine, and 5% hooks). Discards are in the range of 1.4–4.3%.

Quality considerations

This assessment is considered very consistent.

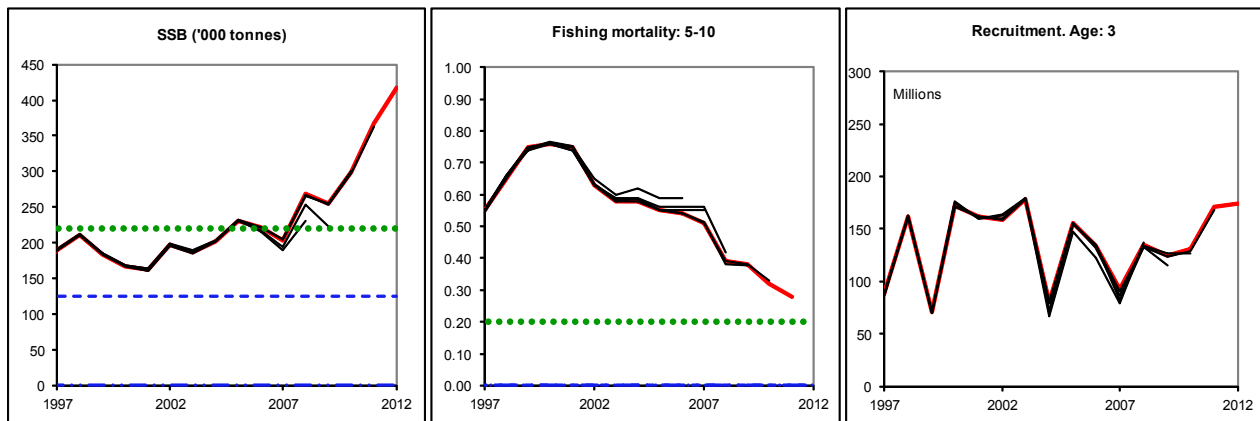


Figure 2.4.2.2 Cod in Division Va (Icelandic cod). Historical assessment results (final year recruitment estimates included).

SSB plot: green line $MSYB_{trigger}$, blue line B_{lim} . F plot: green line $HarvestRate_{MP}$

Scientific basis

Assessment type	A forward-based statistical catch-at-age model, implemented in the AD model builder.
Input data	Landings-at-age and age-structured spring and fall survey indices.
Discards and bycatch	Not included in the assessment and considered low.
Indicators	None.
Other information	Immigration has been taken into account.
Working group report	NWWG

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
Management plan	MP _{Btrigger}	220 000 t	Set by managers, consistent with ICES MSY framework.
	Harvest Rate _{MP}	0.2	Set by managers, consistent with ICES MSY framework.
MSY	MSY B _{trigger}	220 000t	Trigger point in HCR considered consistent with ICES MSY framework.
Framework	F _{MSY}	Not relevant	
Precautionary Approach	B _{lim}	125 000 t	B _{loss}
	B _{pa}	Not defined	
	F _{lim}	Not defined	
	F _{pa}	Not defined	

(unchanged since 2011)

Outlook for 2013

Basis: F(2012) = TAC constraint: F = 0.26; landings (2012) = 177; SSB(2013) = 460; B4+(2013) = 1195; R (2012) = 174 million.

Rationale	Landings (2013)	Basis	F (2013)	SSB (2014)	%SSB change ¹⁾	% TAC change ²⁾
Management plan	196	Harvest Control Rule	0.26	523	13%	11%
Zero catch	0	F=0	0	739	43%	

Weights in thousand tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

²⁾ Landings 2013 relative to TAC 2012.

Management plan

The TAC value is given for the calendar year (i.e. 2013) while it is applied in the fishery for the fishing year (September 2012 to august 2013).

Following the agreed management plan (Annex 2.4.2) implies a TAC of 196 000 t in the fishing year 2012/2013. The management plan has been evaluated to be in conformity with the ICES MSY framework.

Additional considerations*Management considerations*

Prior to allocating the ITQ catches to the Icelandic fishing fleet, managers should ensure that all expected catches from other sources are subtracted. The amount is not known in advance, but is likely to be of a similar magnitude as in recent years and estimated to be 6 kt in the 2012/2013 fishing year.

Stock size is at present high in spite of low productivity because of a sharply decreasing harvest rate in recent years.

The immigration of adult cod from Greenland to Icelandic waters has occurred in some years, based on results from tagging returns and catch-at-age anomalies. The high abundance of larvae in East Greenland waters in years with high recruitments in Iceland indicate that some of these year classes originate from spawning in Iceland. Based on catch-at-age data anomalies attempts have been made to estimate some of these migrations in the historical part of the assessment. Tag returns, survey estimates in Greenlandic waters, as well as anomalies in the catch-at-age matrix in Iceland indicate that a portion of the moderate 2003 year class observed in Greenlandic waters in recent years may have migrated to Icelandic waters in 2009. This has been taken into account in the assessment, resulting in an additional 5% increase (40 kt) in the estimates of the reference biomass in 2009.

Regulations and their effects

The restrictions of the catches by the TAC have resulted in 60% reduction in fishing mortality since 2000.

A real-time-closure system aimed at protecting juvenile fish has been in force since 1976. Fishing is prohibited, for at least two weeks, in areas where the proportion by number of small cod (< 55 cm) in the catches is observed by inspectors to exceed 25%. This is the measure taken rather than setting a minimum landing size and allowing discarding. A preliminary evaluation of the effectiveness of the system indicates that the relatively small areas closed for a short time most likely do not contribute significantly to the protection of juveniles. On the other hand, several consecutive quick closures often lead to closures of larger areas for a longer time and force the fleet to operate in other areas. The effect of these longer closures has not been evaluated.

Since 1995, spawning areas have been closed for 2–3 weeks during the spawning season for all fisheries. The intent of this measure was to protect spawning fish. In 2005, the maximum mesh size allowed in gillnets was decreased to 20.3 cm (8 inches) in order to protect the largest spawners. The effect of these measures has not been evaluated.

The mesh size in the codend in the trawling fishery was increased from 120 mm to 155 mm in 1977. Since 1998 the minimum codend mesh size allowed is 135 mm, provided that a so-called “Polish cover” is not used. Numerous areas are closed temporarily or permanently for all fisheries or specific gears to protect juveniles and habitat, or for socio-political reasons. The effects of these measures have not been evaluated.

Data and methods

The data used in the assessment are landings-at-age and two age-structured survey indices. The analytical assessment is based on landings and survey data using a forward-based statistical catch-at-age model, implemented in the AD model builder. Landings-at-age data as well as survey indices are considered reliable. The modelling setup is the same as last year, using both the spring and the fall survey indices in the final assessment.

Comparison with previous assessment and advice

The SSB, F, and recruitment estimates are consistent with last year’s estimates (Figure 2.4.2.2).

The basis of the advice this year is the same as last year.

Sources

ICES. 2010. Icelandic request on evaluation of Icelandic cod management plan. Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 2, Section 2.3.3.1, pp. 4–8.

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

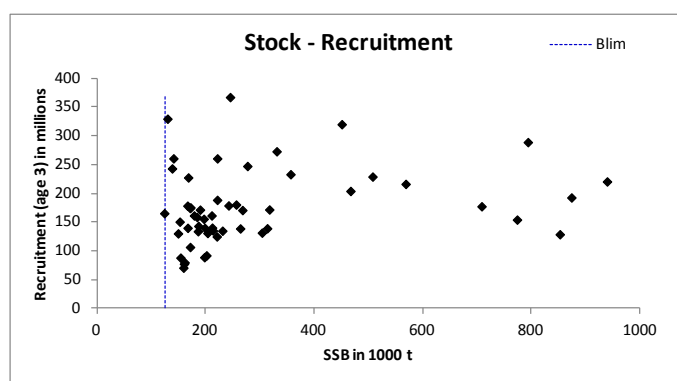


Figure 2.4.2.3 Cod in Division Va (Icelandic cod). Stock–recruitment plot.

Table 2.4.2.1 Cod in Division Va (Icelandic cod). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings for the fishing year	ICES landings for the calendar year
1988 ¹	National advice	300	350		378
1989 ¹	National advice	300	325		356
1990 ¹	National advice	250	300		335
1991 ¹	National advice	240	245		309
1991/1992 ²	National advice	250	265	274	274
1992/1993 ²	Reduce F by 40%	154	205	241	241
1993/1994 ²	Reduce F by 40%	150	165	197	197
1994/1995 ²	Reduce F by 50%	130	155	165	169
1995/1996 ²	Apply catch rule	155	155	170	182
1996/1997 ²	Apply catch rule	186	186	202	203
1997/1998 ²	Apply catch rule	218	218	227	243
1998/1999 ²	Apply catch rule	250	250	254	260
1999/2000 ²	Apply catch rule	247	250	257	236
2000/2001 ²	Apply catch rule	203	220 ³	221	235
2001/2002 ²	Apply catch rule	164	190 ³	217	209
2002/2003 ²	Apply catch rule	183	179 ³	198	206
2003/2004 ²	Apply catch rule	210	209	225	226
2004/2005 ²	Apply catch rule	205	205	214	214
2005/2006	Apply catch rule	198	198	209	196
2006/2007	Apply catch rule	187	193 ⁴	187	170
2007/2008	Apply catch rule	152	130	140	147
2008/2009	Apply F_{max}	< 124	160 ⁵	168	181
2009/2010	Apply F_{max}	< 135	150 ⁶	168	169
2010/2011	Apply catch rule	160	160	165	165
2011/2012	Apply catch rule	177	177		
2012/2013	Apply catch rule	196			

Weights in thousand tonnes.

¹ Calendar year.

² National fishing year ending 31 August.

³ Amended catch rule.

⁴ Catch rule 2006.

⁵ Initial TAC set to 130 according to the catch rule, raised to 160 in January 2009.

⁶ Set according to the catch rule.

Table 2.4.2.2 Cod in Division Va (Icelandic cod). Summary of the assessment.

Year	Landings	F5-10	SSB	N3	B4+	Harvest rate
1955	545	0.29	940	152	2359	0.23
1956	487	0.29	794	153	2083	0.23
1957	455	0.31	774	171	1880	0.24
1958	517	0.35	874	221	1866	0.28
1959	459	0.32	853	289	1828	0.25
1960	470	0.37	709	154	1754	0.27
1961	377	0.36	467	193	1496	0.25
1962	389	0.38	569	129	1492	0.26
1963	409	0.46	508	178	1316	0.31
1964	437	0.55	451	204	1219	0.36
1965	387	0.58	318	216	1023	0.38
1966	353	0.59	277	229	1032	0.34
1967	336	0.56	256	320	1103	0.30
1968	382	0.72	222	172	1223	0.31
1969	403	0.56	314	248	1326	0.30
1970	475	0.61	331	181	1337	0.36
1971	444	0.68	242	189	1098	0.40
1972	395	0.69	222	139	997	0.40
1973	369	0.70	245	273	844	0.44
1974	368	0.76	187	179	918	0.40
1975	365	0.81	168	261	895	0.41
1976	346	0.75	138	367	955	0.36
1977	340	0.59	199	143	1289	0.26
1978	330	0.48	212	228	1297	0.25
1979	366	0.45	304	243	1397	0.26
1980	432	0.49	357	140	1490	0.29
1981	465	0.66	264	140	1242	0.37
1982	380	0.73	167	132	970	0.39
1983	298	0.71	130	233	791	0.38
1984	282	0.64	141	139	914	0.31
1985	323	0.67	172	140	928	0.35
1986	365	0.77	198	330	854	0.43
1987	390	0.86	150	261	1030	0.38
1988	378	0.89	172	176	1033	0.37
1989	363	0.72	171	89	1003	0.36
1990	335	0.70	214	130	841	0.40
1991	308	0.80	161	107	698	0.44
1992	265	0.85	153	175	550	0.48
1993	251	0.87	124	135	595	0.42
1994	178	0.63	154	78	576	0.31
1995	169	0.51	179	151	557	0.30
1996	181	0.51	159	165	670	0.27
1997	203	0.55	190	88	782	0.26
1998	244	0.65	211	162	720	0.34
1999	260	0.75	184	71	731	0.36
2000	235	0.76	167	172	590	0.40
2001	234	0.75	162	162	687	0.34
2002	208	0.63	197	159	728	0.29
2003	208	0.58	186	179	739	0.28
2004	227	0.58	202	80	799	0.28
2005	213	0.55	231	156	722	0.30
2006	196	0.54	221	134	700	0.28
2007	170	0.51	204	92	680	0.25
2008	146	0.39	268	135	697	0.21
2009	181	0.38	254	125	798	0.23
2010	169	0.32	299	131	849	0.20
2011	172	0.28	367	171	944	0.18
2012			419	174	1070	
2013				108		
2014				182		

Annex 2.4.2 Icelandic management plan

The Icelandic Government has adopted a management plan for the Icelandic cod stock for the next five fishing years, starting with the 2009/2010 fishing season. The main objective of the management plan is to ensure that the spawning-stock biomass (SSB) will, with high probability (>95%), be above the present size of 220 thousand tonnes by the year 2015. This will be achieved by applying the following harvest control rule (HCR) to calculate the total allowable catch (TAC):

$TAC_{y+1} = (\alpha B_{4^+,y} + TAC_y)/2$, where y refers to the assessment year, B_{4^+} to the biomass of 4-year and older cod, and α to the harvest rate. α is set to 0.2 when SSB_y is higher than 220 thousand tonnes (SSB_{MP}^*) but set to $\alpha = 0.2 SSB_y / SSB_{MP}$ when SSB_y is lower.

*ICES interprets SSB_{MP} as $B_{trigger}$.