

2.3.15 Saithe (*Pollachius virens*) in Division 5.a (Iceland grounds)

ICES stock advice

ICES advises that when the Icelandic management plan is applied, catches in the fishing year 2016/2017 should be no more than 55 000 t.

Stock development over time

The spawning-stock biomass (SSB) has been above $MSY B_{trigger}$ since 1998 and is currently close to the time-series maximum (from 1980 to present). The harvest rate (HR) has declined from 2009 and is presently below HR_{MSY} . Recruitment (R) has been relatively stable and the average of the year classes 2006–2012 is estimated to be above the average seen since 1980. The biomass of ages 4+ has, on the other hand, been slightly below average in recent years, partly due to the lower mean weight-at-age of young saithe in this period.

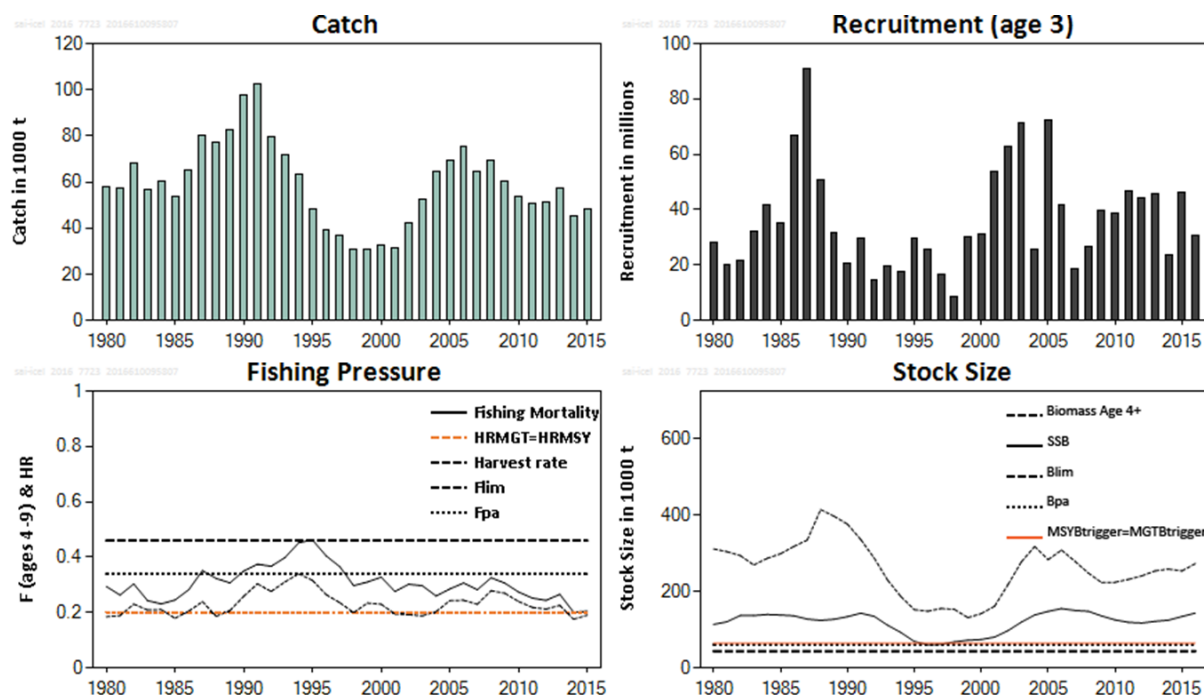


Figure 2.3.15.1 Saithe in Division 5.a. Summary of the stock assessment. Harvest rates are calculated based on biomass age 4+. All biomass reference points refer to SSB levels. For this stock, $HR_{MGT} = HR_{MSY}$ and $MGT B_{trigger} = MSY B_{trigger}$; therefore, the horizontal lines displaying these points in the graph overlap.

Stock and exploitation status

Table 2.3.15.1 Saithe in Division 5.a. State of the stock and fishery relative to reference points. The expected range of realized HR following the management plan (HR_{MGT}) can be found in the management plan evaluation advice (ICES, 2013).

		Fishing pressure			Stock size		
		2013	2014	2015	2014	2015	2016
Maximum sustainable yield	HR_{MSY}	✗	✓	✓ Appropriate	$MSY B_{trigger}$	✓	✓ Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓ Full reproductive capacity
Management plan	HR_{MGT}	✓	✓	✓ Within expected range	$MGT B_{trigger}$	✓	✓ Above

Catch options

Table 2.3.15.2 Saithe in Division 5.a. The basis for the catch options.

Variable	Value	Source	Notes
F ages 4–9 (2016)	0.26	ICES (2016a)	Catch constraint
SSB (2017)	141 kt	ICES (2016a)	
R _{age3} (2017)	30 million	ICES (2016a)	Assessment model
Total catch (2016)	60 kt	ICES (2016a)	Estimated catch until the end of the fishing season (31.08.2016) and estimated catch in the first four months of the next fishing season (01.09–31.12.2016).
Landings (2016)	60 kt		
Discards (2016)	-		Considered negligible

Table 2.3.15.3 Saithe in Division 5.a. The catch options. All weights are in thousand tonnes.

Rationale	Landings (2016/2017)	Basis	F (2017)	SSB (2018)	% SSB change *	% TAC change
Management plan	55	Harvest control rule in the management plan**	0.24	138	-3	0

* SSB 2018 relative to SSB 2017.

** Because SSB₂₀₁₆ is bigger than MGT B_{trigger}, the TAC for 2016/17 is calculated as $(0.2 B_{4+,2016} + TAC_{2015/16})/2$.

Basis of the advice

Table 2.3.15.4 Saithe in Division 5.a. The basis of the advice.

Advice basis	Management plan.
Management plan	<p>The Icelandic Ministry of Industries and Innovation's fisheries management plan for Icelandic saithe (Icelandic Fisheries, 2013). The plan, aimed at providing maximum sustainable yield, has been evaluated by ICES (ICES, 2013) and is considered to be precautionary. According to the management plan, the TAC for the fishing year Y/Y+1 (September 1 of year Y to August 31 of year Y+1) is calculated as follows:</p> <p>If $SSB_Y \geq MGT B_{trigger}$:</p> $TAC_{Y/Y+1} = 0.5 \times 0.2 B_{4+,Y} + 0.5 \times TAC_{Y-1/Y}$ <p>If $SSB_Y < MGT B_{trigger}$:</p> $TAC_{Y/Y+1} = \frac{SSB_Y}{MGT B_{trigger}} \left\{ \left(1 - 0.5 \frac{SSB_Y}{MGT B_{trigger}} \right) 0.2 B_{4+,Y} + 0.5 TAC_{Y-1/Y} \right\}$ <p>where $B_{4+,Y}$ is the biomass of saithe aged 4 and older in year Y, and $MGT B_{trigger} = 65\,000$ tonnes.</p>

Quality of the assessment

The combination of an unreliable index of recruitment, uncertain survey indices, and time-varying fleet selectivity leads to high uncertainty in the estimates of current SSB and fishing mortality. The management plan has been designed to take these uncertainties into account.

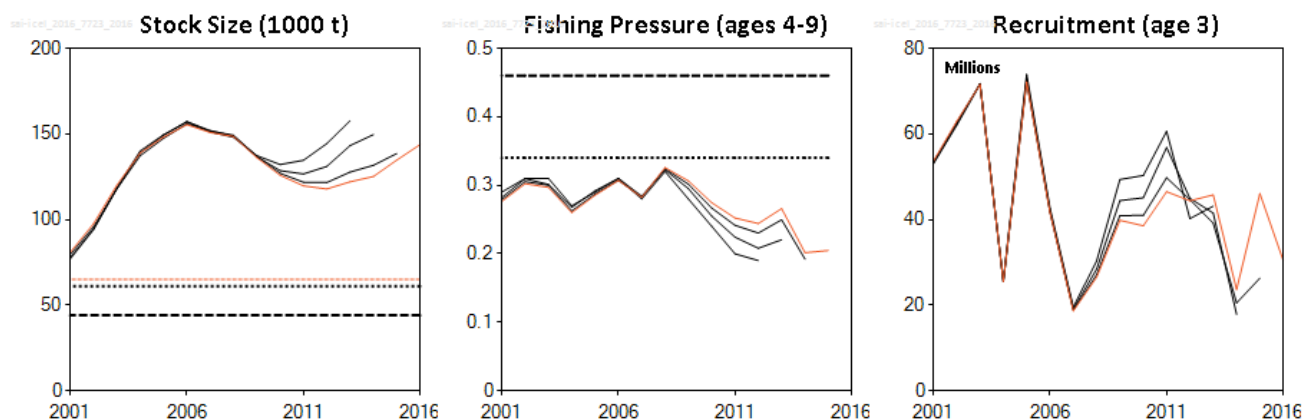


Figure 2.3.15.2 Saithe in Division 5.a. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

There is no information to present for this stock.

Reference points

Table 2.3.15.5 Saithe in Division 5.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Sources
MSY approach	MSY B_{trigger}	65000 t	Stochastic evaluations. Lower 5th percentile of SSB when fishing at HR_{MSY} .	Hjörleifsson and Björnsson (2013), MII (2013)
	HR_{MSY}	20%	Stochastic HCR evaluation (SSB 95% of the time over B_{lim}).	Hjörleifsson and Björnsson (2013), MII (2013)
Precautionary approach	B_{pa}	61000 t	B_{loss} is used as B_{pa} as fishing pressure has never been high for this stock, the spawning stock is not depleted much, and no relationship is seen between spawning stock and recruitment.	ICES (2016a)
	B_{lim}	44000 t	$B_{\text{pa}} / 1.4$	ICES (2016a)
	F_{lim}	0.46	Equilibrium F which will maintain the stock above B_{lim} with a 50% probability.	ICES (2016a)
	F_{pa}	0.34	$F_{\text{pa}} = F_{\text{lim}} \cdot \exp(-1.645\sigma_F)$, with $\sigma_F = 0.19$.	ICES (2016a)
Management plan	MGT B_{trigger}	65000 t	Stochastic HCR evaluation.	Hjörleifsson and Björnsson (2013)
	HR_{MGT}	20%	Stochastic HCR evaluation (SSB 95% of the time over B_{pa}).	Hjörleifsson and Björnsson (2013)

Basis of the assessment

Table 2.3.15.6 Saithe in Division 5.a. The basis of the assessment.

ICES stock data category	1 (ICES, 2016b)
Assessment type	Separable statistical catch-at-age model, with changes in selectivity for three different time periods, using catches in the model and in the forecast.
Input data	Catch-at-age and age-disaggregated abundance indices from the spring groundfish survey.
Discards and bycatch	Bycatch is included and discarding is considered negligible.
Indicators	None
Other information	Benchmark performed in 2010 (ICES, 2010); management plan adopted in 2013 (MII, 2013).
Working group	North-Western Working Group (NWWG)

Information from stakeholders

There is no available information.

History of the advice, catch, and management

Table 2.3.15.7 Saithe in Division 5.a. History of ICES advice, the agreed TAC, and ICES estimates of landings by national fishing year. All weights are in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Landings
1987*	TAC	64	70	81
1988*	TAC	64	80	77
1989*	TAC	80	80	82
1990*	TAC	80	90	98
1991*	TAC	87	65	71
1991/92	TAC	70	75	88
1992/93	Marginal gains from increase in F	75	95	78
1993/94	No measurable gains from increase in F	84	85	69
1994/95	No measurable gains from increase in F	72	75	61
1995/96	No measurable gains from increase in F	65	70	41
1996/97	No measurable gains from increase in F	52	50	38
1997/98	F below $F_{med} = 0.23$	30	30	33
1998/99	F below 60% of F(97)	28	30	32
1999/00	F below 60% of F(98)	24	30	30
2000/01	F = 70% of F(99)	25	30	32
2001/02	No directed fishing	-	37	36
2002/03	2/3 F_{pa} to rebuild stock	24	45	47
2003/04	No advice	-	50	56
2004/05	F_{pa}	69	70	71
2005/06	F_{pa}	78	80	78
2006/07	F_{pa}	81	80	66
2007/08	No advice	-	75	68
2008/09	Maintain SSB $> B_{pa}$	< 22	65	62
2009/10	F reduced below 0.22	< 34	50	54
2010/11	F_{MSY}	< 40	50	51
2011/12	F_{MSY}	≤ 45	52	51
2012/13	MSY framework [B-rule]	≤ 49	50	52
2013/14	Management plan [20% HCR]	57	57	55
2014/15	Management plan [20% HCR]	58	58	53
2015/16	Management plan [20% HCR]	55	55	
2016/17	Management plan [20% HCR]	≤ 55		

* Calendar year.

History of catch and landings

Table 2.3.15.8 Saithe in Division 5.a. Catch distribution by fleet in 2015 as estimated by ICES.

Table 1: Commercial catch and discards of sole, 2015 to 2020, by gear type				
Total catch (2015)	Commercial landings			Commercial discards
48.5kt	84% bottom trawl	5% gillnet	11% other gears	Negligible
	48.5 kt			

Summary of the assessment

Table 2.3.15.9 Saithe in Division 5.a. Assessment summary (weights in thousand tonnes, recruitment in millions).

Year	Recruitment	Stock size: SSB (tonnes)	Landings (tonnes)	Fishing pressure: F	Harvest rate (ages 4+)	Biomass age 4+ (tonnes)
	Age 3			Ages 4–9		
	(thousands)			Year–1		
1980	28241	113939	57659	0.294	0.185	311720
1981	20151	120775	57548	0.263	0.189	304443
1982	21605	137571	67865	0.304	0.231	294154
1983	32102	137260	56504	0.243	0.21	269675
1984	41853	140079	60405	0.231	0.211	286878
1985	35327	138567	53728	0.246	0.18	299095
1986	66950	136520	65230	0.283	0.205	318191
1987	91107	127846	80237	0.352	0.24	334923
1988	50572	124410	77244	0.323	0.186	414570
1989	31859	127421	82339	0.307	0.207	397252
1990	20793	134237	97537	0.35	0.259	376714
1991	29433	143454	102201	0.375	0.304	336208
1992	14831	135211	79568	0.367	0.276	287793
1993	19815	112067	71539	0.398	0.311	230257
1994	17652	92966	63559	0.452	0.34	186844
1995	29778	69364	48296	0.462	0.316	152630
1996	25536	60746	39352	0.405	0.265	148596
1997	16833	61961	36671	0.365	0.236	155610
1998	8656	68220	30657	0.297	0.2	153348
1999	30244	72701	30898	0.311	0.234	131814
2000	31103	74514	32751	0.328	0.23	142242
2001	53598	80822	31570	0.276	0.195	161726
2002	62920	97577	41969	0.302	0.192	218219
2003	71546	120062	52306	0.297	0.188	277793
2004	25557	138841	64668	0.26	0.203	318115
2005	72118	148106	69054	0.285	0.243	283622
2006	41598	155376	75462	0.307	0.244	308672
2007	18657	150785	64261	0.282	0.23	279436
2008	26499	148461	69426	0.326	0.279	248715
2009	39799	136161	60266	0.306	0.27	223375
2010	38537	125784	53853	0.274	0.24	224404
2011	46505	119612	50769	0.252	0.219	231846
2012	44370	117794	51252	0.244	0.213	241137
2013	45741	122001	57522	0.266	0.226	254253
2014	23659	125146	45538	0.202	0.176	258785
2015	46068	134705	48476	0.205	0.191	254074
2016	30449	143716				273145
Average	36542	118778	59116	0.307	0.231	258809.139

Sources and references

Hjörleifsson, E., and Björnsson, H. 2013. Report of the evaluation of the Icelandic saithe management plan. ICES CM 2013/ACOM:60. 70 pp.

ICES. 2010. Report of the Benchmark Workshop on Roundfish (WKROUND), 9–16 February 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:36. 183 pp.

ICES. 2013. Request from Iceland to ICES to evaluate the long-term management plan and harvest control rule for Icelandic saithe. *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 2, Section 2.3.3.2.

ICES. 2016a. Report of the North-Western Working Group (NWWG), 27 April–4 May, 2016, ICES Headquarters, Copenhagen. ICES CM 2016/ACOM:08.

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

MII. 2013. Adoption of management plan for Icelandic saithe. Letter from Icelandic Ministry of Industries and Innovation to ICES, dated 22 April 2013.

<https://community.ices.dk/ExpertGroups/NWWG/2013%20Meeting%20Docs/Background%20Documents/20130422%20Adoption%20of%20management%20plan%20for%20Iceland%20saithe%28B.4.g%29.pdf>.