

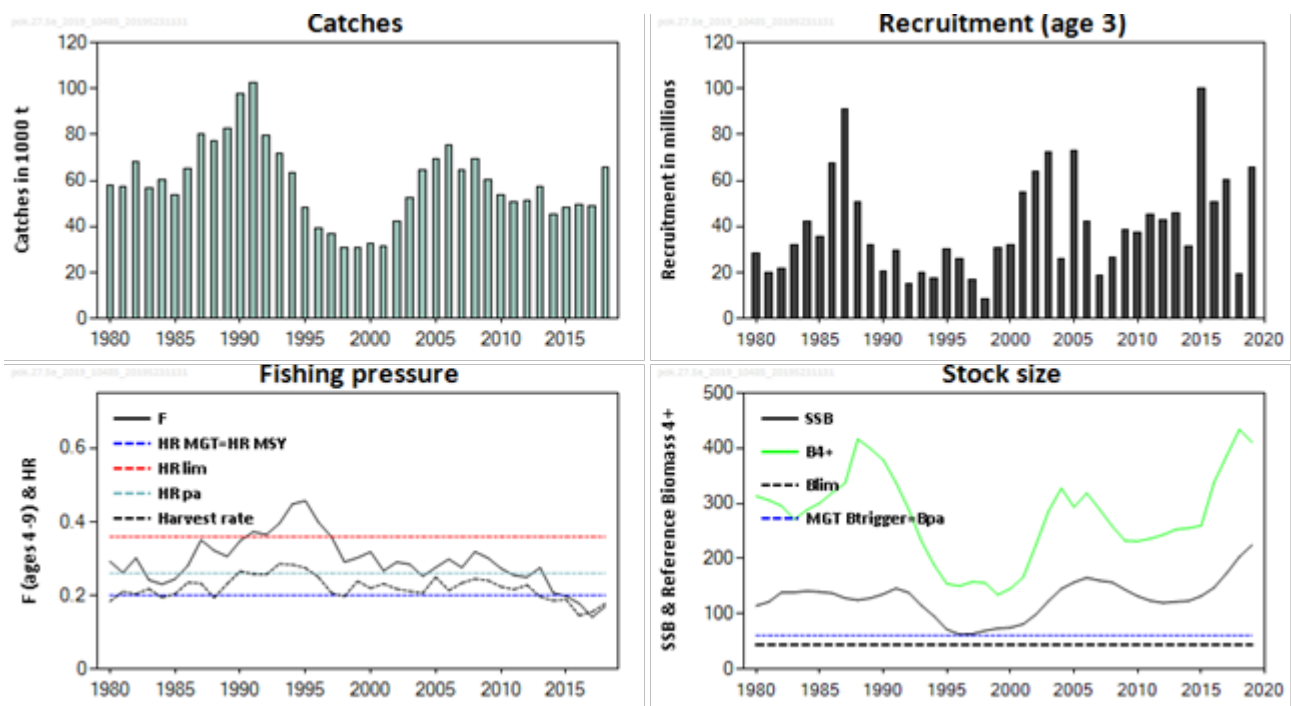
## Saithe (*Pollachius virens*) in Division 5.a (Iceland grounds)

### ICES advice on fishing opportunities

ICES advises that when the Iceland management plan is applied, catches in the fishing year 2019/2020 should be no more than 80 588 tonnes.

### Stock development over time

The spawning-stock biomass (SSB) is well above  $MSY B_{trigger}$  and is currently at the time-series maximum. The harvest rate (HR) has declined from 2009 and is presently below  $HR_{MSY}$ . Recruitment (R) has been fluctuating and is estimated to be above the average in most of the years of the last decade.



**Figure 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 (SSB is shown as a black line on the plot). For this stock,  $MGT B_{trigger} = MSY B_{trigger}$ .

### Stock and exploitation status

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

**Table 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, 2019a).

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

## Catch scenarios

**Table 2** Saithe in Division 5.a. Assumptions made for the interim year and in the forecast. All weights are in tonnes. Recruitment in thousands.

Variable	Value	Notes
F <sub>ages 4-9</sub> (2019)	0.229	TAC constraint.
SSB (2020)	232 035	Assessment model.
R <sub>age 3</sub> (2020)	35 818	Assessment model.
Total catch (2019)	82 831	Estimated catch until the end of the fishing year (31 August 2019) and estimated catch in the first four months of the next fishing year (1 September–31 December 2019).

**Table 3** Saithe in Division 5.a. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2019/2020)	F <sub>ages 4-9</sub> (2020)	HR (2020)	SSB (2021)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis							
Management plan	80 588	0.230	0.2	225 165	-3	2	2

\* SSB 2021 relative to SSB 2020.

\*\* Catch in 2019/2020 relative to TAC<sub>2018/19</sub> (79 092 tonnes).

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

The advised catch is similar to that of last year.

## Basis of the advice

**Table 4** Saithe in Division 5.a. The basis of the advice.

Advice basis	Management plan (Icelandic MII, 2019).
Management plan	<p>The Icelandic Ministry of Industries and Innovation's fisheries has a management plan for Icelandic saithe (Icelandic MII, 2019). The plan aims at providing long-term maximum sustainable yield and has been evaluated by ICES (ICES, 2019a). The plan is considered to be precautionary. 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>If <math>SSB_Y \geq MGT B_{trigger}</math>:  <math display="block">TAC_{Y/Y+1} = 0.5 \times 0.2 B_{4+,Y} + 0.5 \times TAC_{Y-1/Y}</math></p> <p>If <math>SSB_Y &lt; MGT B_{trigger}</math>:  <math display="block">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\}</math></p> <p>where <math>B_{4+,Y}</math> is the biomass of saithe aged 4 and older in year Y, and <math>MGT B_{trigger} = 61\ 000</math> tonnes.</p>

## Quality of the assessment

The combination of uncertain survey indices, particularly for recruitment, 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.

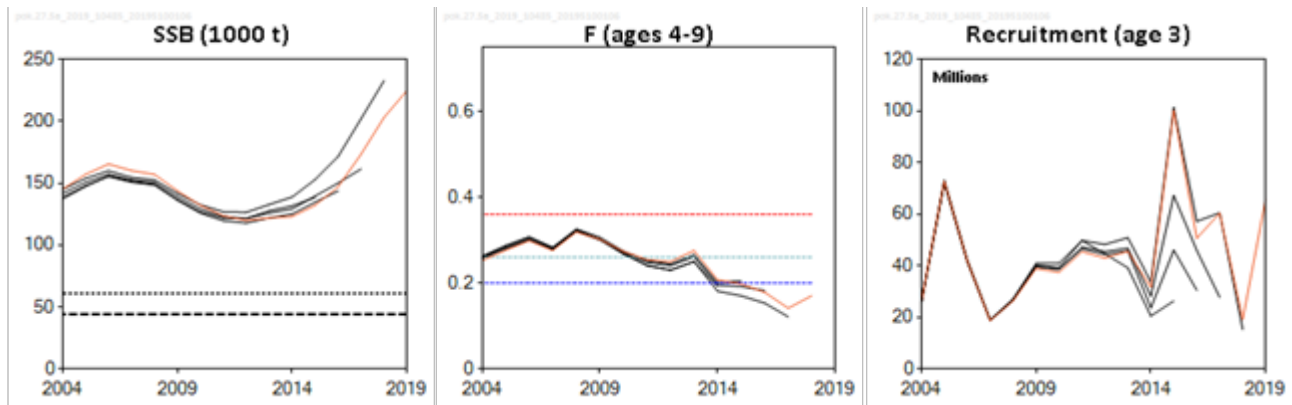


Figure 2 Saithe in Division 5.a. Historical assessment results.

### Issues relevant for the advice

The stock was benchmarked in 2019 together with a management strategy evaluation, which resulted in updated reference points. ICES concluded that the Management Plan is consistent with both the precautionary approach and ICES MSY approach (ICES, 2019a).

### Reference points

Table 5 Saithe in Division 5.a. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	61000	$B_{pa}$	ICES(2019b)
	$HR_{MSY}$	0.2	Stochastic HCR evaluation (SSB 95% of the time over $B_{lim}$ )	ICES (2019b)
Precautionary approach	$B_{lim}$	44000	$B_{pa} / 1.4$	ICES (2019b)
	$B_{pa}$	61000	$B_{loss}$	ICES (2019b)
	$HR_{lim}$	0.36	Equilibrium HR that will maintain the stock above $B_{lim}$ with a 50% probability.	ICES (2019b)
	$HR_{pa}$	0.26	$HR_{pa} = HR_{lim} / 1.4$	ICES (2019b)
Management plan	MGT $B_{trigger}$	61000	$B_{pa}$	ICES (2019b)
	$HR_{MGT}$	0.2	Stochastic HCR evaluation (SSB > 95% of the time over $B_{lim}$ ). Realized harvest rates can range from 0.14 to 0.29.	ICES (2019b)

### Basis of the assessment

Table 6 Saithe in Division 5.a. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018).
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 (ICES, 2019c).
Input data	Catch-at-age and age-disaggregated abundance indices from the spring groundfish survey.
Discards and bycatch	Discarding is considered negligible.
Indicators	None.
Other information	The stock was benchmarked and harvest control rules evaluated in 2019 (ICES, 2019a, 2019b).
Working group	North-Western Working Group (NWWG).

### Information from stakeholders

There is no additional available information for this stock.

## History of the advice, catch, and management

**Table 7** Saithe in Division 5.a. ICES advice, TACs, and catches (for fishing year after 1991). All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	ICES catch
1987 *	TAC	64000	70000	80531
1988 *	TAC	64000	80000	77247
1989 *	TAC	80000	80000	82411
1990 *	TAC	80000	90000	98127
1991 *	TAC	87000	65000	102737
1991/1992	TAC	70000	75000	88000
1992/1993	Marginal gains from increase in F	75000	95000	78000
1993/1994	No measurable gains from increase in F	84000	85000	69000
1994/1995	No measurable gains from increase in F	72000	75000	61000
1995/1996	No measurable gains from increase in F	65000	70000	41000
1996/1997	No measurable gains from increase in F	52000	50000	38000
1997/1998	F below $F_{med} = 0.23$	30000	30000	33000
1998/1999	F below 60% of F(97)	28000	30000	30816
1999/2000	F below 60% of F(98)	24000	30000	29646
2000/2001	F = 70% of F(99)	25000	30000	31337
2001/2002	No directed fishing	-	37000	36230
2002/2003	2/3 $F_{pa}$ to rebuild stock	24000	45000	47471
2003/2004	No advice	-	50000	55953
2004/2005	$F_{pa}$	69000	70000	70609
2005/2006	$F_{pa}$	78000	80000	77882
2006/2007	$F_{pa}$	81000	80000	66467
2007/2008	No advice	-	75000	66719
2008/2009	Maintain SSB > $B_{pa}$	< 22000	65000	61981
2009/2010	F reduced below 0.22	< 34000	50000	57404
2010/2011	$F_{MSY}$	< 40000	50000	51592
2011/2012	$F_{MSY}$	≤ 45000	52000	49664
2012/2013	MSY framework [B-rule]	≤ 49000	50000	51275
2013/2014	Management plan [20% HCR]	57000	57000	54335
2014/2015	Management plan [20% HCR]	58000	58000	52033
2015/2016	Management plan [20% HCR]	55000	55000	49253
2016/2017	Management plan [20% HCR]	< 55000	55000	44980
2017/2018	Management plan [20% HCR]	60237	60237	59018
2018/2019	Management plan	79092	79092	
2019/2020	Management plan	≤ 80588		

\* Calendar year.

## History of the catch and landings

**Table 8** Saithe in Division 5.a. Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

Catch (2018)	Landings			Discards
	Bottom trawl 92%	Gillnets 3%	Other 5%	
65 360	65 360			Discarding is negligible

**Summary of the assessment**

**Table 9** Saithe in Division 5.a. Assessment summary. Weights are in tonnes.

Year	Recruitment	Stock size		Fishing pressure		Total catch
	Age 3 thousands	SSB	Reference biomass ages 4+	F ages 4–9	Harvest rate	
1980	28210	114574	313263	0.29	0.184	58347
1981	20215	121587	305881	0.26	0.211	59001
1982	21622	138852	295653	0.30	0.204	68931
1983	32174	138753	271130	0.24	0.218	58266
1984	41940	141438	288318	0.23	0.194	62719
1985	35338	139662	300524	0.24	0.204	57101
1986	67264	137368	319527	0.28	0.236	66376
1987	91330	128380	336509	0.35	0.233	80531
1988	50688	124868	416394	0.32	0.194	77247
1989	32076	128338	399025	0.31	0.232	82411
1990	20839	135750	378560	0.35	0.266	98127
1991	29486	146130	337469	0.37	0.258	102737
1992	14856	138416	289030	0.37	0.257	79597
1993	19906	115082	231581	0.40	0.286	71648
1994	17760	95670	188323	0.45	0.284	64339
1995	30027	71668	154144	0.46	0.275	48629
1996	25850	62809	150511	0.40	0.25	40101
1997	17052	63579	157996	0.36	0.207	37264
1998	8785	69407	156077	0.29	0.198	31531
1999	30864	73483	134468	0.30	0.239	31293
2000	31727	75022	145679	0.32	0.219	33146
2001	54789	81383	166197	0.27	0.232	32063
2002	64134	98699	224644	0.29	0.218	42071
2003	72479	123285	286223	0.28	0.212	52255
2004	25767	145222	327475	0.25	0.206	63091
2005	72717	157128	293192	0.28	0.25	68143
2006	41955	165478	318755	0.30	0.213	75663
2007	18677	160215	289520	0.28	0.234	64433
2008	26428	157105	258675	0.32	0.245	70190
2009	38860	143853	232621	0.30	0.241	61663
2010	37386	132068	231651	0.27	0.224	54272
2011	45428	123631	236153	0.25	0.216	51123
2012	42982	119976	243010	0.25	0.228	51783
2013	45569	121852	252581	0.28	0.196	58002
2014	31669	123148	255314	0.21	0.186	46483
2015	100205	132147	259558	0.198	0.189	48473
2016	50685	147152	337685	0.178	0.145	49212
2017	60378	173493	386219	0.141	0.156	49057
2018	19149	203216	434032	0.170	0.178	65360
2019	65713	224932	410428			

## Sources and references

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