

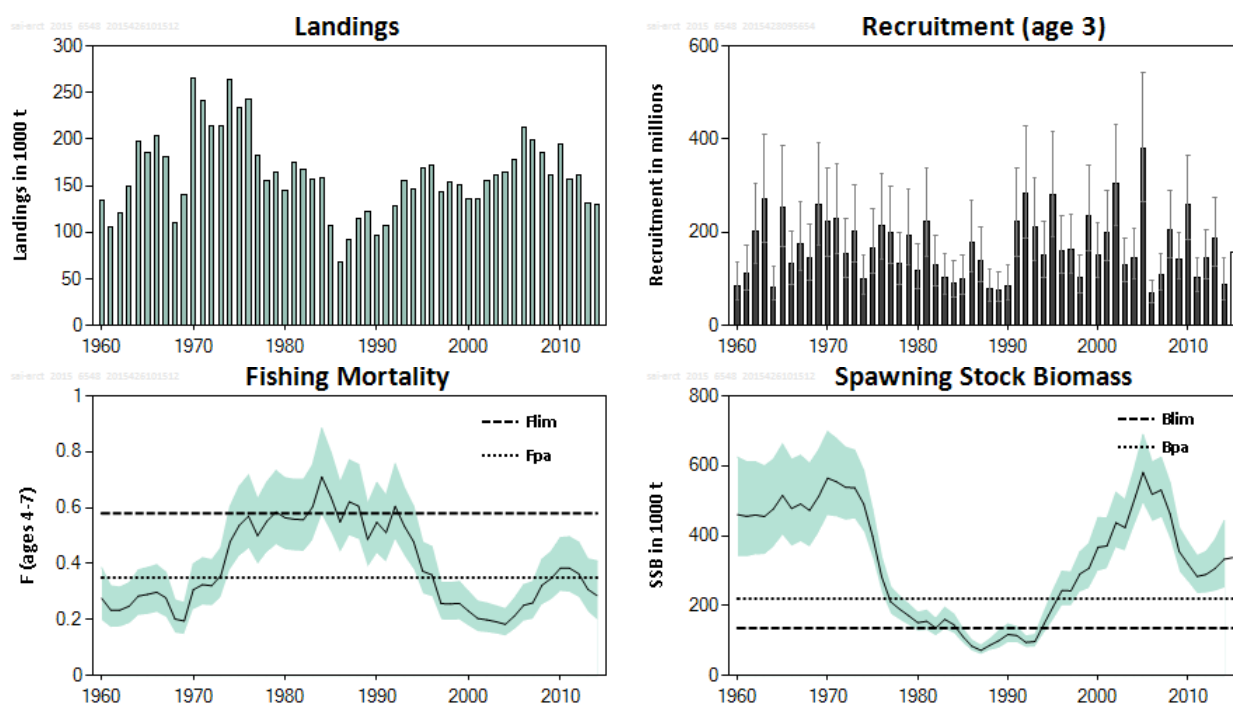
### 3.3.10 Saithe (*Pollachius virens*) in Subareas I and II (Northeast Arctic)

#### ICES stock advice

ICES advises that when the Norwegian management plan is applied, catches in 2016 should be no more than 140 000 t. All catches are assumed to be landed. Bycatches of coastal cod and *Sebastes norvegicus* in fisheries targeting saithe in Subareas I and II should be kept as low as possible.

#### Stock development over time

The spawning-stock biomass (SSB) has been above  $B_{pa}$  since 1996, declined considerably from 2007 to 2011, then increased again and is presently (2015) estimated to be well above  $B_{pa}$ . The fishing mortality (F) was below the  $F_{pa}$  from 1997 to 2008, started to increase in 2005 and was above  $F_{pa}$  from 2010 to 2012, but is now most likely to be below  $F_{pa}$ . Recruitment (R) has since 2005 been about 10 % below the long-term geometric mean level.



**Figure 3.3.10.1** Saithe in Subareas I and II. Historical development of the stock from the summary of stock assessment (weights in thousand tonnes). Recruitment (R), fishing mortality (F), and spawning-stock biomass (SSB) have uncertainty boundaries (95%) in the plots. Predicted recruitment values are not shaded.

#### Stock and exploitation status

**Table 3.3.10.1** Saithe in Subareas I and II. State of the stock and fishery, relative to reference points.

		Fishing pressure			Stock size					
		2012	2013	2014	2013	2014	2015			
Maximum Sustainable Yield	$F_{MSY}$	?	?	?	Undefined	MSY	?	?	?	Undefined
Precautionary approach	$F_{pa}$ , $F_{lim}$	0	✓	✓	Harvested sustainably	$B_{pa}$ , $B_{lim}$	✓	✓	✓	Full reproductive capacity
Management Plan	$F_{MGT}$	✗	✓	✓	Below target	$SSB_{MGT}$	✓	✓	✓	Above trigger

**Catch forecast and outlook**

**Table 3.3.10.2** Saithe in Subareas I and II. The basis for the catch options.

Variable	Value	Source	Notes
F ages 4–7 (2015)	0.26	ICES (2015a)	F status quo ( $F_{sq}$ )
SSB(2016)	338 kt	ICES (2015a)	
$R_{age3}$ (2015 onwards)	157 million	ICES (2015a)	Geometric mean (1960–2013)
Total catch (2015)	122 kt	ICES (2015a)	

**Table 3.3.10.3** Saithe in Subareas I and II. The catch options. Weights in thousand tonnes.

Rationale	Catches (2016)	Basis	F (2016)	SSB (2017)	%SSB change *	%TAC change **
Management plan ***	140	$F_{MP}$	0.30	318	-6%	+15%
Precautionary approach	158	$F_{pa}$	0.35	302	-11%	+30%
Zero catch	0	$F = 0$	0.00	446	+32%	-100%
Status quo	79	$F_{sq} \times 0.5$	0.16	373	+10%	-36%
	146	$F_{sq} \times 1.0$	0.32	312	-8%	+20%
	176	$F_{sq} \times 1.25$	0.40	286	-16%	+44%

\* SSB 2017 relative to SSB 2016.

\*\* TAC 2016 relative to TAC 2015.

\*\*\* Catch decided by limit of +15% change compared to TAC 2015.

**Basis of the advice**

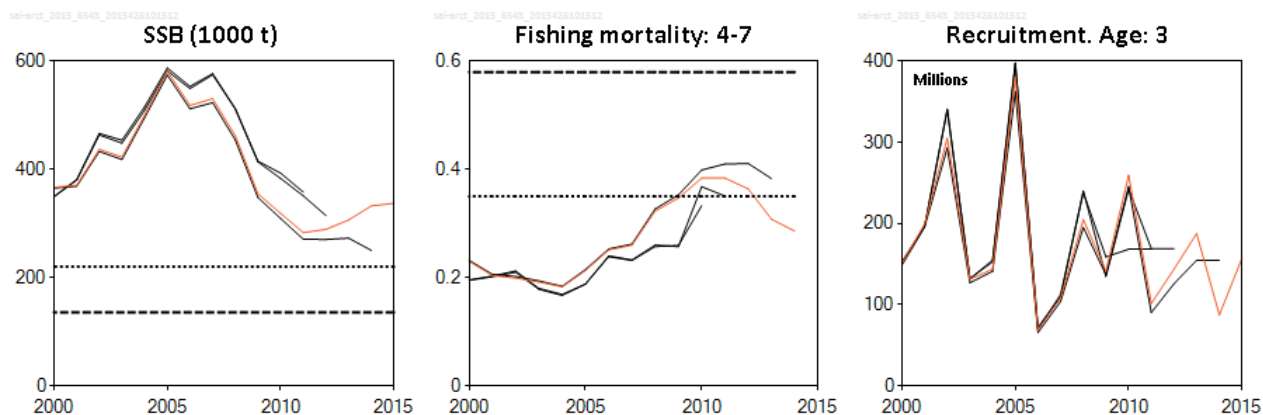
**Table 3.3.10.4** Saithe in Subareas I and II. The basis of the assessment and advice.

Advice basis	Management plan.
Management plan	<p>Norwegian management plan.</p> <p>The harvest control rule as revised in 2013 and communicated to ICES by the Norwegian Ministry of Fisheries and Coastal Affairs contains the following elements:</p> <ul style="list-style-type: none"> <li>• Estimate the average TAC level for the coming 3 years based on <math>F_{mp} = 0.32^1</math>. TAC for the next year will be set to this level as a starting value for the 3-year period.</li> <li>• The year after, the TAC calculation for the next 3 years is repeated based on the updated information about the stock development. However, the TAC should not be changed by more than +/- 15% compared with the previous year's TAC.</li> <li>• If the spawning-stock biomass (SSB) in the beginning of the year for which the quota is set (first year of prediction), is below <math>B_{pa}</math>, the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from <math>F_{mp}</math> at <math>SSB = B_{pa}</math> to 0 at SSB equal to zero. At SSB levels below <math>B_{pa}</math> in any of the operational years (current year and 3 years of prediction) there should be no limitations on the year-to-year variations in TAC.</li> </ul>

<sup>1</sup>  $F_{mp}$  was formerly 0.35.

**Quality of the assessment**

The low level of biological sampling following the termination of the original Norwegian port-sampling programme in 2009 continued to be an issue in 2014 and will affect the precision of the catch-, weight-, and maturity-at-age data. Predicted catches are dependent upon assumptions of average recruitment due to the lack of reliable recruitment estimates.



**Figure 3.3.10.2** Saithe in Subareas I and II. Historical assessment results (final-year recruitment estimates included). 2013 omitted because no assessment was accepted.

**Issues relevant for the advice**

Bycatch of *Sebastes norvegicus* should be kept as low as possible because of the low stock status of this stock. It should be noted that the *Sebastes norvegicus* currently in and those entering the fishery are from a period of poor recruitment, and that the stock would need to be stabilized before any safe catch limits can be defined. Current catches of *Sebastes norvegicus*, with bycatches in fisheries targeting Northeast Arctic (NEA) saithe constitutes a considerable part of the total *Sebastes norvegicus* catch, and is far above any sustainable catch level for this species.

Bycatch of coastal cod should be kept as low as possible in order to obtain the reductions in fishing mortality implied by the coastal cod rebuilding plan.

**Reference points**

**Table 3.3.10.5** Saithe in Subareas I and II. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Reference
MSY approach	MSY $B_{trigger}$	Not defined.		
	$F_{MSY}$	Not defined.		
Precautionary approach	$B_{lim}$	136 kt	Change point regression.	ICES (2005)
	$B_{pa}$	220 kt	$B_{lim} \times \exp(1.645 \times \sigma)$ , where $\sigma = 0.3$ .	ICES (2005)
	$F_{lim}$	0.58	F corresponding to an equilibrium stock = $B_{lim}$ .	ICES (2005)
	$F_{pa}$	0.35	$F_{lim} \times \exp(-1.645 \times \sigma)$ , where $\sigma = 0.3$ . This value is considered to have a 95% probability of avoiding the $F_{lim}$ .	ICES (2005)
Management plan	$SSB_{MGT}$	220 kt	$B_{pa}$ , F is linearly reduced from $F_{pa}$ at $SSB = B_{pa}$ to zero at $SSB = 0$ .	ICES (2011)
	$F_{MP}$	0.32	Average TAC for the coming three years based on $F_{MP}$ .	ICES (2011)

## Basis of the assessment

**Table 3.3.10.6** Saithe (*Pollachius virens*) in Subareas I and II (Northeast Arctic). The basis of the assessment.

ICES stock data category	1 (ICES, 2015b).
Assessment type	Age-based analytical assessment (SAM; ICES, 2015a) that uses catches in the model and in the forecast.
Input data	Commercial catches (international landings, ages and length frequencies from Norwegian, German, and Russian catch sampling); one survey index (NOcoast-Aco-4Q, split in 2002); three-year running average maturity from spawning zones in otoliths from commercial catches and surveys for 1985–2006, constant (2005–2007 average) for later years.
Discards and bycatch	Not included, considered negligible.
Indicators	None.
Other information	An inter-benchmark was undertaken in 2014 ( <a href="#">ICES IBP NEA SAITHE</a> ; ICES, 2014).
Working group	Arctic Fisheries Working Group ( <a href="#">AFWG</a> ).

## Information from stakeholders

The Norwegian reference fleets provide information on catch composition.

**History of advice, catch, and management**

**Table 3.3.10.7** Saithe (*Pollachius virens*) in Subareas I and II (Northeast Arctic). History of ICES advice, the agreed TAC, and ICES estimates of landings. Weights in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC*	Official landings	ICES landings
1987	No increase in F; TAC; protect juveniles	90	-	92	92
1988	No increase in F	< 83	-	114	114
1989	Status quo F; TAC	120	120	123	123
1990	$F \leq F_{med}$ ; TAC	93	103	96	96
1991	F at $F_{low}$ ; TAC	90	100	107	107
1992	Within safe biological limits	115	115	128	128
1993	Within safe biological limits	132 <sup>#</sup>	132	155	155
1994	No increase in F	158 <sup>#</sup>	145	147	147
1995	No increase in F	221 <sup>#</sup>	165	168	168
1996	No increase in F	158 <sup>#</sup>	163	171	171
1997	Reduction of F to $F_{med}$ Or below	107	125	144	144
1998	Reduction of F to $F_{med}$ Or below	117	145 <sup>##</sup>	153	153
1999	Reduce F below $F_{pa}$	87	144 <sup>###</sup>	150	150
2000	Reduce F below $F_{pa}$	89	125 <sup>^^</sup>	136	136
2001	Reduce F below $F_{pa}$	< 115	135	136	136
2002	Maintain F below $F_{pa}$	< 152	162 <sup>^^^</sup>	155	155
2003	Maintain F below $F_{pa}$	< 168	164	162	162
2004	Maintain F below $F_{pa}$	< 186	169	165	165
2005	Take account of <i>Sebastes marinus</i> bycatch. Maintain F below $F_{pa}$	< 215	215	179	179
2006	Take account of <i>Sebastes marinus</i> bycatch. Maintain F below $F_{pa}$	< 202	193.5	213	213
2007	Take account of <i>Sebastes marinus</i> bycatch. Maintain F below $F_{pa}$	< 247	222.525	199	199
2008	Take account of <i>Sebastes marinus</i> bycatch. Maintain F below $F_{hcr}$	< 247	< 247	185	185
2009	Take account of <i>Sebastes marinus</i> bycatch. Apply management plan	< 225	225	162	162
2010	Take account of <i>Sebastes marinus</i> bycatch. Apply management plan	< 204	204	195	195
2011	Take account of <i>Sebastes marinus</i> bycatch. Apply management plan	< 173	173	157	157
2012	Take account of coastal cod and <i>Sebastes marinus</i> bycatch. Apply management plan.	< 164	164	161	161
2013	Take account of coastal cod and <i>Sebastes marinus</i> bycatch. Apply management plan.	< 164	140 <sup>^^^</sup>	132	132
2014	Take account of coastal cod and <i>Sebastes marinus</i> bycatch. Stabilize SSB.	< 140	119 <sup>^^^</sup>	130	130
2015	Take account of coastal cod and <i>Sebastes norvegicus</i> ** bycatch. Apply management plan.	< 122	122		
2016	Take account of coastal cod and <i>Sebastes norvegicus</i> ** bycatch. Apply management plan.	< 140			

# Predicted catch at status quo F.

## TAC first set at 125 000 t, then increased in May 1998 after an intersessional assessment.

### TAC set after an intersessional assessment in December 1998.

^ TAC set after an intersessional assessment in December 1999.

^^ TAC first set at 152 000 t, then increased in June 2003 after the spring 2002 assessment.

^^^Set by Norwegian authorities based on national advice where cpue was excluded from the assessment.

\* Set by Norwegian authorities. TAC for Russian EEZ is not included.

\*\* This species has up to now been named *Sebastes marinus*. It was decided to adopt the species list by WoRMS (<http://www.marinespecies.org/>). The name used for this species will hence hereafter be *Sebastes norvegicus*.

**History of catch and landings**

**Table 3.3.10.8** Saithe in Subareas I and II. Catch distribution by fleet in 2014 as estimated by ICES.

Total catch (2014)	Official landings				Discards
130 kt	49% trawl	26% purse-seine	15% gillnet	10% other gear types	negligible
	130 kt				

**Table 3.3.10.9** Saithe in Subareas I and II. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. Weights in tonnes.

Year	Faroes	France	Germany Dem.Rep	Fed.Rep.Germany	Iceland	Norway	Poland	Portugal	Russia***	Spain	UK	Others***	Total all countries
1960	23	1 700		25 948		96 050					9 780	14	133 515
1961	61	3 625		19 757		77 875					4 595	18	105 951
1962	2	544		12 651		101 895			912		4 699	4	120 707
1963		1 110		8 108		135 297					4 112		148 627
1964		1 525		4 420		184 700			84		6 511	186	197 426
1965		1 618		11 387		165 531			137		6 741	181	185 600
1966		2 987	813	11 269		175 037			563		13 078	41	203 788
1967		9 472	304	11 822		150 860			441		8 379	48	181 326
1968			70	4 753		96 641					8 781		110 247
1969	20	193	6 744	4 355		115 140					13 585	23	140 060
1970	1 097		29 362	23 466		151 759			43 550		15 469		264 924
1971	215	14 536	16 840	12 204		128 499	6 017		39 397	13 097	10 361		241 272
1972	109	14 519	7 474	24 595		143 775	1 111		1 278	13 125	8 223		214 334
1973	7	11 320	12 015	30 338		148 789	23		2 411	2 115	6 841		213 859
1974	46	7 119	29 466	33 155		152 699	2521		28 931	7 075	3 104	5	264 121
1975	28	3 156	28 517	41 260		122 598	3860	6430	13 389	11 397	2 763	55	233 453
1976	20	5 609	10 266	49 056		131 675	3164	7233	9 013	21 661	4 724	65	242 486
1977	270	5 658	7 164	19 985		139 705	1	783	989	1 327	6 935		182 817
1978	809	4 345	6 484	19 190		121 069	35	203	381	121	2 827		155 464
1979	1 117	2 601	2 435	15 323		141 346			3	685	1 170		164 680
1980	532	1 016		12 511		128 878			43	780	794		144 554
1981	236	218		8 431		166 139			121		395		175 540
1982	339	82		7 224		159 643			14		732		168 034
1983	539	418		4 933		149 556			206	33	1 251		156 936
1984	503	431	6	4 532		152 818			161		335		158 786
1985	490	657	11	1 873		103 899			51		202		107 183
1986	426	308		3 470		63 090			27		75		67 396
1987	712	576		4 909		85 710			426		57	1	92 391
1988	441	411		4 574		108 244			130		442		114 242
1989	388	460**		606		119 625			506	506	726		122 817
1990	1 207	340**		1 143		92 397			52		709		95 848
1991	963	77**	Greenland	2 003		103 283			504**		492	5	107 327
1992	165	1980	734	3 451		119 763			964	6	541		127 604
1993	31	566	78	3 687	3	140 604		1	9 509	4**	415	5	154 903
1994	67**	557	15	1 863	4**	141 589		1**	1 640**	655**	557	2	146 950
1995	172**	358	53	935		165 001		5	1 148		688	18	168 378
1996	248**	346	165	2 615		166 045		24	1 159	6	707	33	171 348

Year	Faroes	France	Germany Dem.Rep	Fed.Rep.Germany	Iceland	Norway	Poland	Portugal	Russia***	Spain	UK	Others""	Total all countries
1997	193**	560	363**	2 915		136 927		12	1 774	41	799	45	143 629
1998	366	932	437**	2 936		144 103		47	3 836	275	355	40	153 327
1999	181	638**	655**	2 473	146	141 941		17	3 929	24	339	32	150 375
2000	224**	1 438	651**	2 573	33	125 932		46	4 452	117	454	8**	135 928
2001	537	1 279	701**	2 690	57	124 928		75	4 951	119	514	2	135 853
2002	788	1 048	1 393	2 642	78	142 941		118	5 402	37	420	3	154 870
2003	2 056	1 022	929**	2 763	80**	150 400		147	3 894	18	265	18**	161 592
2004	3 071	255	891**	2 161	319	147 975		127	9 192	87	544	14	164 636
2005	3 152	447	817**	2 048	395	162 338		354	8 362	25	630		178 568
2006	1 795	899	786**	2 779	255	195 462	89	339**	9 823	21**	532	42	212 822
2007	2 048	966	810**	3 019	219	178 644	99	412	12 168	53**	558	12	199 008
2008	2 314	1 009	503**	2 263	113	165 998	66	348	11 577	33**	506	10	184 740
2009	1 611**	326	697	2 021	69	144 570	30	204**	11 899	2**	379	45**	161 853
2010	1 632	677	954	1 592	109**	174 544	279	93	14 664	8	283	2**	194 837
2011	112	367	445	1 371	65	143 314		46	10 007	2	972	15	156 716
2012	146	781	658	1 371	126	143 145		23**	13 607	4	1 000	4**	160 865
2013	80	1 901	972	1 326****	290**	111 962	2	17	14 796	5	433	22	131 806
2014*	315**	202**	407**	259	322	115 958	1	12	12 396	13	518	5	130 408

\* Provisional figures.

\*\* As reported to Norwegian authorities.

\*\*\* USSR prior to 1991.

" Includes Estonia.

"" Includes Denmark, Netherlands, Ireland, and Sweden.

\*\*\*\* As reported by Working Group members.



**Summary of the assessment**

**Table 3.3.10.10** Saithe in Subareas I and II. Assessment summary (weights in tonnes).

Year	Recruitment Age 3	SSB	Landings	Mean F Ages 4–7
	thousands		tonnes	
1960	85 648	460 469	133 515	0.276
1961	113 097	455 431	105 951	0.234
1962	201 995	459 089	120 707	0.234
1963	270 763	454 976	148 627	0.248
1964	82 372	476 870	197 426	0.284
1965	254 740	515 040	185 600	0.29
1966	134 188	477 825	203 788	0.298
1967	176 134	490 902	181 326	0.278
1968	143 774	472 125	110 247	0.202
1969	259 627	511 959	140 060	0.195
1970	223 910	564 672	264 924	0.307
1971	230 499	554 044	241 272	0.325
1972	152 512	538 208	214 334	0.321
1973	201 793	537 132	213 859	0.358
1974	100 007	490 902	264 121	0.478
1975	167 042	397 918	233 453	0.537
1976	215 561	282 377	242 486	0.57
1977	198 988	210 871	182 817	0.5
1978	132 853	189 662	155 464	0.551
1979	194 269	171 099	164 680	0.585
1980	116 891	151 297	144 554	0.564
1981	222 348	155 127	175 540	0.559
1982	129 185	135 808	168 034	0.557
1983	102 232	160 813	156 936	0.603
1984	91 858	145 510	158 786	0.71
1985	100 208	111 636	107 183	0.637
1986	176 840	83 952	67 396	0.549
1987	139 246	71 898	92 391	0.621
1988	79 539	86 336	114 242	0.606
1989	76 267	99 708	122 817	0.486
1990	85 050	117 595	95 848	0.548
1991	222 571	114 348	107 327	0.511
1992	283 793	94 750	127 604	0.605
1993	210 449	97 246	154 903	0.534
1994	151 146	147 561	146 950	0.479
1995	281 532	195 634	168 378	0.373
1996	161 458	243 288	171 348	0.36
1997	162 105	242 316	143 629	0.257
1998	102 437	290 686	153 327	0.256
1999	235 155	306 815	150 375	0.258
2000	150 091	366 957	135 928	0.23
2001	199 586	370 645	135 853	0.204
2002	304 980	437 136	154 870	0.199
2003	131 268	422 946	161 592	0.192
2004	143 774	500 318	164 636	0.183
2005	380 408	581 287	178 568	0.213
2006	68 528	518 140	212 822	0.251
2007	107 904	530 725	199 008	0.26

Year	Recruitment Age 3	SSB	Landings	Mean F Ages 4–7
	thousands	tonnes	tonnes	
2008	204 843	462 314	184 740	0.323
2009	141 492	355 045	161 853	0.347
2010	259 627	318 698	194 837	0.384
2011	101 519	283 226	156 716	0.384
2012	143 774	289 237	160 865	0.364
2013	187 587	306 508	131 806	0.308
2014	87 378	332 701	130 408	0.286
2015	157 244	337 357		
Average	168 573	324 592	161 759	0.387

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