

ECOREGION Barents Sea and Norwegian Sea
STOCK Saithe in Subareas I and II (Northeast Arctic)

Advice for 2015

ICES advises on the basis of the Norwegian management plan that catches in 2015 should be no more than 122 000 t. All catches are assumed to be landed. Bycatches of coastal cod and *Sebastes norvegicus*¹ in fisheries targeting saithe in Subareas I and II should be kept as low as possible.

Stock status

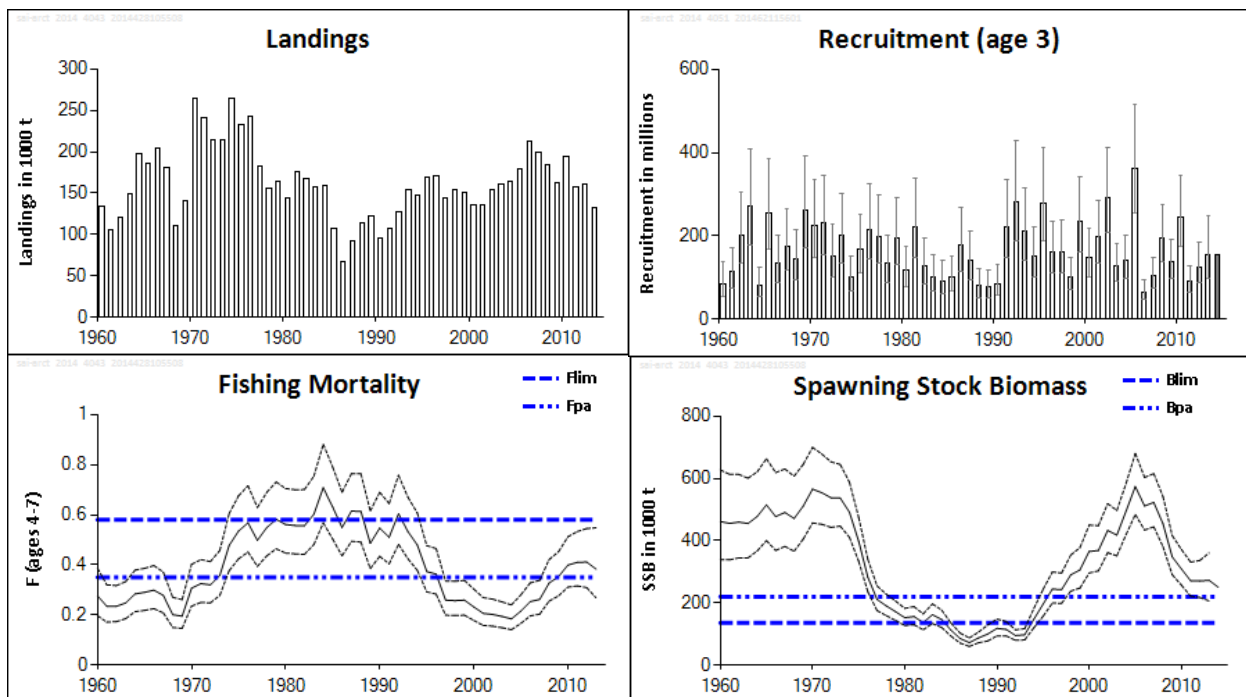
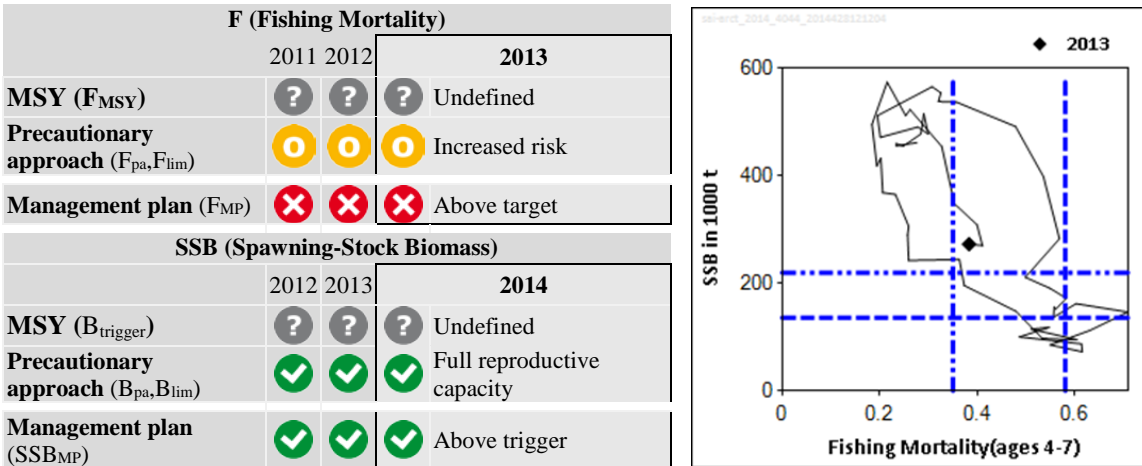


Figure 3.3.8.1 Saithe in Subareas I and II (Northeast Arctic). Summary of stock assessment (weights in thousand tonnes).

¹ 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*.

The SSB has declined since 2006 and is slightly above B_{pa} in 2014. The fishing mortality was below F_{pa} from 1997 to 2008, but started to increase in 2005; having been above F_{pa} in the last five years it is expected to be close to F_{MP} in 2014.

Management plans

The Norwegian Ministry of Fisheries and Coastal Affairs implemented a harvest control rule (HCR) in autumn 2007 (see Annex 3.3.8). ICES evaluated the HCR in 2007 and concluded that it is consistent with the precautionary approach, providing the assessment uncertainty and error are not greater than those calculated from historical data. This also holds true for implementation error (difference between TAC and catch). In 2007 the target fishing mortality used in the harvest control rule (F_{MP}) was set to $F_{pa} = 0.35$. In June 2013, after release of ICES advice for 2014 for this stock, F_{MP} was reduced to 0.32 by the Norwegian Ministry of Trade, Industry and Fisheries.

Biology

Saithe in Subareas I and II is an important predator on other species in the ecosystem, notably young herring, haddock, and Norway pout. Saithe is a typical migrating fish and makes both feeding and spawning migrations. There are examples of extensive migration of young saithe from the western part of the Norwegian coast to the North Sea and of older saithe migrating from more northern areas to Iceland and the Faroe Islands, and a few examples of migration to the Norwegian coast.

Environmental influence on the stock

There have been variations in distribution and migration patterns over the years, but the link with environmental parameters remains unclear.

The fisheries

Norway accounts for more than 90% of the landings. The gillnet fishery is most intense during winter, the purse-seine fisheries occurs mainly in the summer months, while the trawl fishery takes place more evenly year-round. Coastal cod and *Sebastes norvegicus* are caught as bycatch in some of the saithe fisheries (ICES, 2011a, 2011b).

Catch distribution Total catch (2013) was 132 kt (49% trawl, 26% purse-seine, 15% gillnet, and 10% other gear types). Discarding is considered negligible.

Quality considerations

The low level of biological sampling following the termination of the original Norwegian port-sampling programme in 2009 continued to be an issue in 2013 and will affect the precision of the catch-, weight-, and maturity-at-age data. It was decided to omit the cpue time-series due to large changes in fishing patterns (selectivity, spatial distribution of the fleet, change between targeted and bycatch fishery).

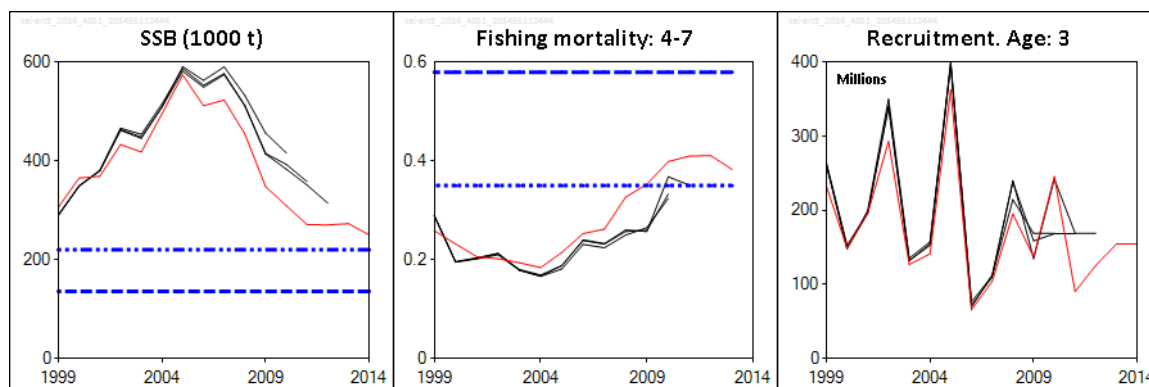


Figure 3.3.8.2 Saithe in Subareas I and II (Northeast Arctic). Historical assessment results (final-year recruitment estimates included). 2013 omitted because no assessment was accepted.

Scientific basis**Stock data category**1 ([ICES, 2014a](#)).**Assessment type**

Accepted assessment following the inter-benchmark process in 2014 with SAM (SAM with a 3–12+ catch matrix, flat exploitation pattern for age groups 8+, correlated F_s between age groups and time, and a Beverton–Holt stock–recruitment relationship used to estimate recent recruitment).

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

The latest benchmark was performed in 2010 ([WKROUND 2010](#); ICES, 2010) and an inter-benchmark was undertaken in 2014 (ICES IBP NEA SAITHE; ICES, 2014c).

Working groupArctic Fisheries Working Group ([AFWG](#)).

ECOREGION **Barents Sea and Norwegian Sea**
STOCK **Saithe in Subareas I and II (Northeast Arctic)**

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
Management plan	Trigger SSB _{MP}	220 000 t.	B _{pa} , F is linearly reduced from F _{pa} at SSB = B _{pa} to zero at SSB = 0.
	F _{MP}	0.32	Average TAC for the coming three years based on F _{MPp} .
MSY approach	MSY B _{trigger}	Not defined.	
	F _{MSY}	Not defined.	
Precautionary approach	B _{lim}	136 000 t.	Change point regression.
	B _{pa}	220 000 t.	B _{lim} × exp(1.645 × σ), where σ = 0.3.
	F _{lim}	0.58	F corresponding to an equilibrium stock = B _{lim} .
	F _{pa}	0.35	F _{lim} × exp(-1.645 × σ), where σ = 0.3. This value is considered to have a 95% probability of avoiding the F _{lim} .

(Last changed in: 2005, F_{MP} changed in 2013)

Outlook for 2015

Basis: F₂₀₁₄ = TAC constraint = 0.33, SSB (2015) = 240, R (2014 onwards) = geometric mean (1960–2012) = 155 million.

Rationale	Catches (2015)	Basis	F (2015)	SSB (2016)	%SSB change ¹⁾	%TAC change ²⁾
Management plan ³⁾	122	F _{MP}	0.33	247	+3	+3
Precautionary approach	128	F _{pa}	0.35	240	0	+8
Zero catch	0	F = 0	0	354	+48	-100
<i>Status quo</i>	67	F _{sq} × 0.5	0.17	295	+23	-44
	143	F _{sq} × 1.0	0.40	229	-5	+20
	148	F _{sq} × 1.25	0.42	225	-6	+24

Weights in thousand tonnes.

¹⁾ SSB 2016 relative to SSB 2015.

²⁾ TAC 2015 relative to TAC 2014.

³⁾ Average TAC for the coming 3 years based on F_{mp}.

Management plan

Following the revised management plan implies a TAC of 122 000 t in 2015. The SSB is expected to remain above B_{pa} at the beginning of 2016.

Additional considerations*Advice considerations*

Since the saithe HCR is a three-year rule, the estimation of average F_{MP} catch in the HCR will affect stock numbers up to age seven, and thereby heavily affect the total prognosis of the fishable stock and the quotas derived from it. The recruitment-at-age 3 estimated by the SAM has on average been almost 10% below the long-term geometric mean since 2005.

The stock is exploited by fleets from a number of nations that acquire fishing rights by quota swaps with Norway. In addition, Russia sets a small quota for the Russian zone. ICES advice applies to all catches of Northeast Arctic saithe.

Regulations and their effects

TAC regulations are in place for this stock. Norway and Russia have each set national measures applicable to their EEZ. Since 2007 the catch has been less than the TAC. However, in 2010–2013 this difference was less than in previous years.

On 1 March 1999, the minimum fish size was increased to 45 cm for trawl and conventional gears, and to 42 cm (north of Lofoten) and 40 cm (between 62°N and Lofoten) for purse-seine, with an exception for the first 3000 t purse-seine catch between 62°N and 66°33'N, where the minimum fish size remains at 35 cm.

In the Norwegian fishery, quotas may be transferred between fleets operating with the same minimum fish size or larger if it becomes clear that the quota allocated to one of the fleets will not be taken. In addition to quotas, the fisheries are managed by minimum mesh size, minimum fish size, bycatch regulations, area closures, and other area and seasonal restrictions. Furthermore, sorting grids are used in the trawl fishery.

Since the early 1960s, purse-seiners and trawlers have dominated the fishery, with a traditional gillnet fishery for spawning saithe as the third major component. The purse-seine fishery is conducted in coastal areas and fjords. Historically, purse-seiners and trawlers have taken, approximately, equal shares of the catches. Regulation changes led to a reduction in the amounts taken by purse-seiners after 1990.

Discarding is illegal, but may occur when trawlers targeting cod catch saithe without having a quota for saithe. In the purse-seine fishery, slipping has been reported, mainly related to minimum size of fish in the catch. There is no quantitative information on discards, but they are considered minor.

A real-time closure system has been in force along the Norwegian coast and in the Barents Sea since 1984, aimed at protecting juvenile fish. Based on scientific research data and mapping of areas by hired fishing vessels, fishing is prohibited in areas where the proportion by number of undersized cod, haddock, and saithe combined has been observed by inspectors to exceed 15% (the size limits vary by species). In the purse-seine fishery the limit is 30%. The time of notice before a closure of an area comes into force is 2–4 hours for national vessels and 7 days for foreign vessels. Before or parallel to a closure, the Coast Guard requests vessels not to fish in an area where too many small fish have been observed during their inspections. A closed area is not opened until a low percentage of juvenile fish is documented by trial fishing within the area by the Surveillance Service.

Uncertainties in assessment and forecast

Lack of reliable recruitment estimates is still a major problem leading to predicted catches being dependent upon assumptions of average recruitment.

Since 2008 a rather large reduction in maturity has been estimated for age groups 5–8. In the same period weight-at-age increased for most of these age groups, and both TSB and SSB have decreased considerably over the same period. There has been no reduction in the level of recruitment. Therefore, the apparent strong decrease in maturity-at-age cannot be justified (given that at least main trends in recruitment are captured by the assessment) and it was found reasonable to use a constant maturity ogive for the years 2007 to 2013, based on the average of 2005–2007.

Comparison of the basis of previous assessment and advice

Last year no analytical assessment was accepted. Issues were considered and were dealt with in a benchmark process.

The Inter-Benchmark Protocol (IBP) on Northeast Arctic Saithe (ICES CM 2014/ACOM:53) decided to change assessment model from XSA to the state–space assessment model SAM and to leave out the cpue time-series. The shift from XSA to SAM resulted in only minor changes in estimated fishing mortality, spawning-stock biomass, and recruitment. In the whole time-series the XSA estimates are within the confidence limits of the SAM estimates both for F_{4-7} and SSB.

This year's advice is based on the revised Norwegian management plan.

Sources

- ICES. 2010. Report of the Benchmark Workshop on Roundfish (WKROUND), 9–16 February 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:36. 183 pp.
- ICES. 2011a. Cod in Subareas I and II (Norwegian coastal waters cod). *In* Report of the ICES Advisory Committee, 2011. ICES Advice 2011, Book 3, Section 3.4.2.

- ICES. 2011b. Golden redfish (*Sebastes marinus*) in Subareas I and II. *In* Report of the ICES Advisory Committee, 2011. ICES Advice 2011, Book 3, Section 3.4.6.
- ICES. 2014a. Advice basis. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.
- ICES 2014b. Report of the Arctic Fisheries Working Group (AFWG), 23–29 April 2014, Lisbon, Portugal. ICES CM 2014/ACOM:05.
- ICES 2014c. Report of the Inter-Benchmark Protocol on Northeast Arctic Saithe in Subareas I and II (IBP NEAsaithe), March/April 2014, by correspondence. ICES CM 2014/ACOM:53. 94 pp.

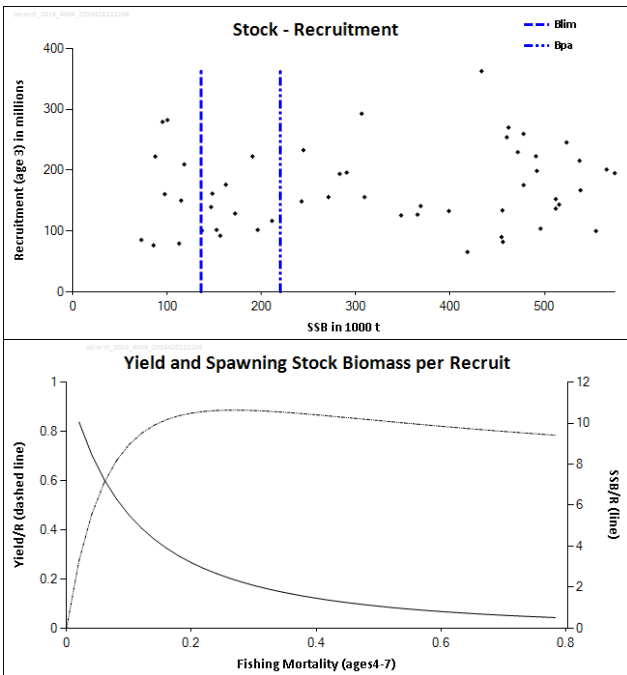


Figure 3.3.8.3 Saithe in Subareas I and II (Northeast Arctic). Stock–recruitment plot and yield-per-recruit analysis.

Table 3.3.8.1

Saithe in Subareas I and II (Northeast Arctic). ICES advice, management, and landings.

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	<i>Status quo</i> 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 ^a	132	155	155
1994	No increase in F	158 ^a	145	147	147
1995	No increase in F	221 ^a	165	168	168
1996	No increase in F	158 ^a	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 ^b	153	153
1999	Reduce F below F_{pa}	87	144 ^c	150	150
2000	Reduce F below F_{pa}	89	125 ^d	136	136
2001	Reduce F below F_{pa}	< 115	135	136	136
2002	Maintain F below F_{pa}	< 152	162 ^e	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 ^f	132	132
2014	Take account of coastal cod and <i>Sebastes marinus</i> bycatch. Stabilize SSB.	< 140	119 ^f		
2015	Take account of coastal cod and <i>Sebastes norvegicus</i> ** bycatch. Apply management plan.	< 122			

Weights in thousand tonnes.

^a Predicted catch at *status quo* F.^b TAC first set at 125 000 t, then increased in May 1998 after an intersessional assessment.^c TAC set after an intersessional assessment in December 1998.^d TAC set after an intersessional assessment in December 1999.^e TAC first set at 152 000 t, then increased in June 2003 after the spring 2002 assessment.^f 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.

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Table 3.3.8.2

Saithe in Subareas I and II (Northeast Arctic). Nominal catch (t) by country as officially reported to ICES.

Nominal catch (t) by countries as officially reported to ICES.													
Year	Faroe Islands	France	Germany Dem.Rep	Fed.Rep. Germany	Iceland	Norway	Poland	Portugal	Russia ³	Spain	UK	Others ⁵	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	2 521	28 931	7 075		3 104	5	264 121
1975	28	3 156	28 517	41 260		122 598	3 860	6 430	13 389	11 397	2 763	55	233 453
1976	20	5 609	10 266	49 056		131 675	3 164	7 233	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 ²		606		119 625		506	506		726		122 817
1990	1 207	340 ²		1 143		92 397		52			709		95 848
1991	963	77 ²	Greenland	2 003		103 283		504 ⁴			492	5	107 327
1992	165	1 980	734	3 451		119 763		964	6	541			127 604
1993	31	566	78	3 687	3	140 604		1	9 509	4 ²	415	5 ²	154 903
1994	67 ²	557	15	1 863	4 ²	141 589		1 ²	1 640 ²	655 ²	557	2	146 950
1995	172 ²	358	53	935		165 001		5	1 148		688	18	168 378
1996	248 ²	346	165	2 615		166 045		24	1 159	6	707	33	171 348
1997	193 ²	560	363 ²	2 915		136 927		12	1 774	41	799	45	143 629
1998	366	932	437 ²	2 936		144 103		47	3 836	275	355	40	153 327
1999	181	638 ²	655 ²	2 473	146	141 941		17	3 929	24	339	32	150 375
2000	224 ²	1 438	651 ²	2 573	33	125 932		46	4 452	117	454	8 ²	135 928
2001	537	1 279	701 ²	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	2 763	80 ²	150 400		147	3 894	18	265	18 ²	161 592
2004	3 071	255	891 ²	2 161	319	147 975		127	9 192	87	544	14	164 636
2005	3 152	447	817 ²	2 048	395	162 338		354	8 362	25	630		178 568
2006	1 795	899	786 ²	2 779	255	195 462	89	339 ²	9 823	21 ²	532	42	212 822
2007	2 048	966	810 ²	3 019	219	178 644	99	412	12 168	53 ²	558	12	199 008
2008	2 314	1 009	503 ²	2 263	113	165 998	66	348	11 577	33	506	10	184 740
2009	1 611 ²	326	697	2 021	69	144 570	30	204 ²	11 899	2 ²	379	45 ²	161 853
2010	1 632	677	954	1 592	109 ²	174 544	279	93	14 664	8	283	2 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 ²	13 607	4	1 000	4 ²	160 865
2013 ¹	75	1 901	977	1 326 ⁶	304	111 981	2	17	14 796	5 ²	421	22	131 827

1 Provisional figures.

2 As reported to Norwegian authorities.

3 USSR prior to 1991.

4 Includes Estonia.

5 Includes Denmark, Netherlands, Ireland and Sweden

6 As reported by Working Group members

Table 3.3.8.3

Saithe in Subareas I and II (Northeast Arctic). Assessment summary.

Year	Recruitment age 3 thousands	SSB tonnes	Landings	Mean F ages 4-7
1960	85391	461852	133515	0.276
1961	113323	455887	105951	0.234
1962	201995	460008	120707	0.234
1963	270222	455431	148627	0.248
1964	82207	477825	197426	0.284
1965	254231	515555	185600	0.29
1966	134054	477825	203788	0.299
1967	175606	490902	181326	0.278
1968	143487	471654	110247	0.201
1969	259886	511959	140060	0.195
1970	223016	565802	264924	0.307
1971	229808	554599	241272	0.325
1972	152512	538208	214334	0.32
1973	201189	537132	213859	0.357
1974	100108	491885	264121	0.478
1975	167042	398714	233453	0.535
1976	215777	282943	242486	0.568
1977	198988	211293	182817	0.498
1978	132986	190613	155464	0.549
1979	194075	172129	164680	0.582
1980	116774	152512	144554	0.561
1981	222793	156373	175540	0.557
1982	128798	137036	168034	0.556
1983	101926	162267	156936	0.602
1984	92319	146679	158786	0.708
1985	100710	112758	107183	0.631
1986	176310	85648	67396	0.549
1987	139525	72693	92391	0.615
1988	79459	87553	114242	0.613
1989	76496	100308	122817	0.486
1990	85477	118184	95848	0.547
1991	222571	114921	107327	0.51
1992	282660	95225	127604	0.604
1993	209609	97538	154903	0.533
1994	150242	148005	146950	0.479
1995	279568	196025	168378	0.373
1996	160653	244507	171348	0.363
1997	161619	242559	143629	0.259
1998	101926	290396	153327	0.257
1999	233048	306202	150375	0.259
2000	148747	365492	135928	0.232
2001	196222	368796	135853	0.206
2002	293021	433220	154870	0.202
2003	127007	418319	161592	0.194
2004	141210	495836	164636	0.184
2005	362943	574353	178568	0.215
2006	65578	511959	212822	0.253
2007	103985	523347	199008	0.262
2008	195243	454521	184740	0.327
2009	136899	348015	161853	0.353
2010	245733	309279	194837	0.399
2011	90219	271034	156716	0.41
2012	125744	270493	160865	0.411
2013	154709	272938	131827	0.383
2014	154709	250325		
Average	167279	321046	162340	0.392

Annex 3.3.8 **Implemented management strategy for saithe in Subareas I and II**

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:

- *Estimate the average TAC level for the coming 3 years based on $F_{mp}= 0.32^2$. TAC for the next year will be set to this level as a starting value for the 3-year period.*
- *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.*
- *If the spawning-stock biomass (SSB) in the beginning of the year for which the quota is set (first year of prediction), is below B_{pa} , the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from F_{mp} at $SSB = B_{pa}$ to 0 at SSB equal to zero. At SSB levels below B_{pa} 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.*

² F_{mp} was formerly 0.35.