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

Advice for 2014

ICES advises that catches in 2014 should be no more than 140 000 t. All catches are assumed to be landed. Bycatches of coastal cod and *Sebastes marinus* in fisheries targeting saithe in subareas I and II should be kept as low as possible.

Stock status

F (Fishing Mortality)		
		2010–2012
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown
Management plan (F_{MP})	?	Unknown
SSB (Spawning-Stock Biomass)		
		2011–2013
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Management plan (SSB_{MP})	?	Unknown

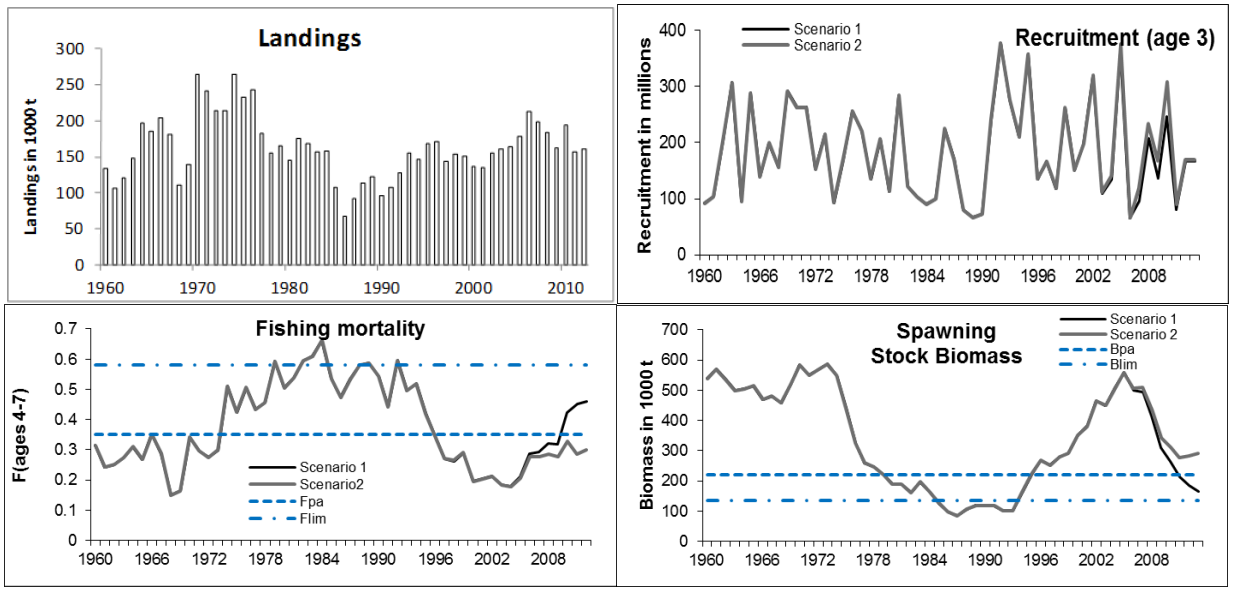

Figure 3.4.8.1 Saithe in Subareas I and II (Northeast Arctic). Summary of two exploratory stock assessments, scenarios 1 and 2. Weights in thousand tonnes.

The SSB has declined since 2005 and is likely to be close to B_{pa} in 2013. The fishing mortality was below F_{pa} from 1996 to 2009, but started to increase in 2005 and is likely to be close to F_{MP}.

Management plans

The Norwegian Ministry of Fisheries and Coastal Affairs implemented a harvest control rule (HCR) in autumn 2007 (see Annex 3.4.8). 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).

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 marinus* are caught as bycatch in some of the saithe fisheries (ICES, 2011b, 2011c).

Catch distribution	Total catch (2012) is 161 kt (46% trawl, 27% purse-seine, 18% gillnet, and 9% other gear types). Discards are considered negligible.

Quality considerations

No assessment has been accepted for this stock. Two exploratory scenarios have been evaluated and are considered to capture the main aspects of stock dynamics. Scenario 1 indicates that SSB is 28% above B_{pa}, scenario 2 indicates 16% below, Scenario 1 gives F_{2012}=0.3, scenario 2 F_{2012}=0.46. Based only on diagnostics scenario 1 gives the best assessment, though the CPUE tuning series which is used in scenario 1 is regarded as the more suspect of the two tuning series. Both assessments are poor, leading to great uncertainty in biomass at ages greater than eight. This leads to the conclusion that there is a need for more exploration to determine if a single assessment can be identified. For the provision of advice the short term forecast suggests that a rollover TAC will give almost rollover SSB in both scenarios, giving a year to develop an improved assessment.

Scientific basis

Assessment type	Exploratory analysis with XSA (XSA with a 3–15+ catch matrix, shrinkage (S.E. of the mean to which estimates are shrunk = 1.0), and no tapered time weighting.
Stock data category	Category 2.
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); one cpue index from Norwegian trawl fishery; three-year running average maturity from spawning zones in otoliths from commercial catches and surveys.
Discards and bycatch	Discards are not included and are assumed negligible.
Indicators	None.
Other information	The latest benchmark was performed in 2010 (WKROUND 2010; ICES, 2010).
Working group report	AFWG (1CES, 2013).

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

Reference points

	Type	*Value*	*Technical basis*
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}	0.35	Average TAC for the coming three years based on F_{pa}.
MSY Approach	MSY $B_{trigger}$	Not defined.	
	F_{MSY}	Not defined.	
Precautionary	B_{lim}	136 000 t.	Change point regression.
	B_{pa}	220 000 t.	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.3$.
	F_{lim}	0.58	F corresponding to an equilibrium stock = B_{lim}.
	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}.

(unchanged since: 2005)

Outlook for 2014

Basis (both scenarios): Landings (2013) = 140; R (2013 onwards) = geometric mean (1960–2010) = 167 millions.
Scenario 1: F2013 = 0.25, SSB2014 = 299; scenario 2: F2013 = 0.41, SSB2014 = 150.

Rationale	Catches (2014)	Basis	F (2014)	SSB (2015)	%SSB change [1)]	%TAC change [2)]
Stable SSB	140	Scenario1 [3)]	0.25	303	+1	0
Stable SSB	140	Scenario 2 [4)]	0.44	144	−4	0

Weights in thousand tonnes.
[1)] SSB 2015 relative to SSB 2014.
[2)] TAC 2014 relative to TAC 2013.
[3)] With commercial cpue included.
[4)] With commercial cpue excluded.

Management plan

It is not possible to provide advice according to the management plan. However, the scenarios provided above, based on stable SSB and giving catches of 140 kt in 2014, are considered coherent with the objectives in the management plan.

Additional considerations

Norwegian trawl fisheries for saithe have changed in recent years, with fewer and shorter fishing periods and a smaller proportion of directed saithe fishery. This is related to the increase in cod and haddock quotas. The use of a trawl cpue series in the tuning can thus be questioned. This series shows a stable stock situation, while the acoustic survey shows a decreasing trend. Including (scenario 1) or excluding (scenario 2) the cpue series gave divergent views on stock status and fishing levels, as including the cpue series indicates $F < F_{pa}$ and $SSB > B_{pa}$, while the opposite is true when the cpue series is excluded. This led to a considerable difference in 2014 catch advice based on the target Fs of the management plan (161 kt when including the cpue series (scenario 1) and 98 kt when excluding it (scenario 2)).

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 2010–2012 this difference was less than in previous years.

In the Norwegian fishery, quotas may be transferred between fleets 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.

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.

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

There is no accepted assessment for this stock. A number of issues have been identified and need to be considered in a benchmark.

Since 2008 a rather large reduction in proportion of mature fish has been observed for age groups 5–8. In the same period there has been an increase in weight-at-age for most of these age groups, and both TSB and SSB have decreased considerably over the same period. It is therefore hard to find a good explanation for this reduction in maturity, but it is partly supported by results of gonad analyses of saithe performed during the Norwegian coastal survey.

Comparison with previous assessment and advice

This year no analytical assessment has been accepted. The advice is based on two exploratory scenarios.

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. Report of the Arctic Fisheries Working Group (AFWG), 28 April–4 May 2011. ICES CM 2011/ACOM:05.

ICES. 2011b. Cod in Subareas I and II (Norwegian coastal waters cod). *In* Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 3, Section 3.4.2.

ICES. 2011c. Golden redfish (*Sebastes marinus*) in Subareas I and II. *In* Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 3, Section 3.4.6.

ICES. 2012. Report of the Arctic Fisheries Working Group (AFWG), 20–26 April 2012. ICES CM 2012/ACOM:05.

ICES. 2013. Report of the Arctic Fisheries Working Group (AFWG), 18–24 April 2013. ICES CM 2013/ACOM:05.

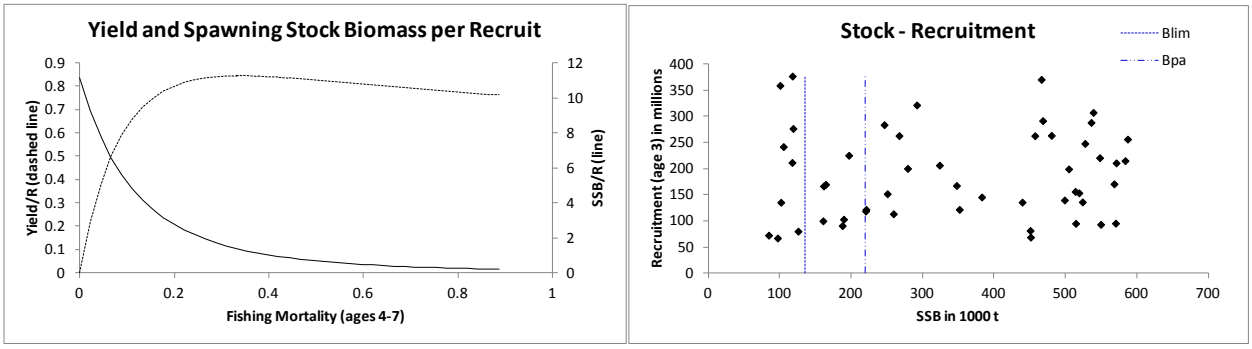

Figure 3.4.8.2 Saithe in Subareas I and II (Northeast Arctic). Stock–recruitment plot and yield-per-recruit analysis.

Table 3.4.8.1 Saithe in Subareas I and II (Northeast Arctic). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[2]	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[1]	132	155	155
1994	No increase in F	158[1]	145	147	147
1995	No increase in F	221[1]	165	168	168
1996	No increase in F	158[1]	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[3]	153	153
1999	Reduce F below F_{pa}	87	144[4]	150	150
2000	Reduce F below F_{pa}	89	125[5]	136	136
2001	Reduce F below F_{pa}	< 115	135	136	136
2002	Maintain F below F_{pa}	< 152	162[6]	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 *Sebastes marinus* bycatch. Maintain F below F_{pa}	< 215	215	179	179
2006	Take account of *Sebastes marinus* bycatch. Maintain F below F_{pa}	< 202	193.5	213	213
2007	Take account of *Sebastes marinus* bycatch. Maintain F below F_{pa}	< 247	222.525	199	199
2008	Take account of *Sebastes marinus* bycatch. Maintain F below F_{hcr}	< 247	< 247	185	185
2009	Take account of *Sebastes marinus* bycatch. Apply management plan	< 225	225	162	162
2010	Take account of *Sebastes marinus* bycatch. Apply management plan	< 204	204	195	195
2011	Take account of *Sebastes marinus* bycatch. Apply management plan	< 173	173	157	157
2012	Take account of coastal cod and *Sebastes marinus* bycatch. Apply management plan.	< 164	164	161	161
2013	Take account of coastal cod and *Sebastes marinus* bycatch. Apply management plan.	< 164	140[7]		
2014	Take account of coastal cod and *Sebastes marinus* bycatch. Stabilize SSB.	< 140			

Weights in thousand tonnes.

[1] Predicted catch at *status quo* F.

[2] Set by Norwegian authorities. TAC for Russian EEZ is not included.

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

[4] TAC set after an intersessional assessment in December 1998.

[5] TAC set after an intersessional assessment in December 1999.

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

[7] Set by Norwegian authorities based on national advice after ICES advice 2012 to exclude the cpue in the assessment.

Table 3.4.8.2 Saithe in Subareas I and II (Northeast Arctic). Nominal catch (t) by country 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	11320	12 015	30 338		148 789	23		2 411	2 115	6 841		213 859
1974	46	7119	29 466	33 155		152 699	2521		28 931	7 075	3 104	5	264 121
1975	28	3156	28 517	41 260		122 598	3860	6430	13 389	11 397	2 763	55	233 453
1976	20	5609	10 266	49 056		131 675	3164	7233	9 013	21 661	4 724	65	242 486
1977	270	5658	7 164	19 985		139 705	1	783	989	1 327	6 935		182 817
1978	809	4345	6 484	19 190		121 069	35	203	381	121	2 827		155 464
1979	1117	2601	2 435	15 323		141 346			3	685	1 170		164 680
1980	532	1016		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	1207	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	1980	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]	1438	651 [2]	2 573	33	125 932		46	4 452	117	454	8 [2]	135 928
2001	537	1279	701 [2]	2 690	57	124 928		75	4 951	119	514	2	135 853
2002	788	1048	1393	2 642	78	142 941		118	5 402	37	420	3	154 870
2003	2056	1022	929 [2]	2 763	80 [2]	150 400		147	3 894	18	265	18 [2]	161 592
2004	3071	255	891 [2]	2 161	319	147 975		127	9 192	87	544	14	164 636
2005	3152	447	817 [2]	2 048	395	162 338		354	8 362	25	630		178 568
2006	1795	899	786 [2]	2 779	255	195 462	89	339 [2]	9 823	21 [2]	532	42	212 822
2007	2048	966	810 [2]	3 019	219	178 644	99	412	12 168	53 [2]	558	12	199 008
2008	2314	1009	503 [2]	2 263	113	165 998	66	348	11 577	33	506	10	184 740
2009	1611 [2]	326	697	2 021	69	144 570	30	204 [2]	11 899	2 [2]	379	45 [2]	161 853
2010	1632	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 [1]	146	780	679	1 370	127	143 104		23 [2]	13 607	4 [2]	1 087	4 [2]	160 931

1 Provisional figures.

2 As reported to Norwegian authorities.

3 USSR prior to 1991.

4 Includes Estonia.

5 Includes Denmark,Netherlands, Ireland and Sweden

Annex 3.4.8 Implemented management strategy for saithe in Subareas I and II

The harvest control rule as 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_{pa}. 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_{pa} 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.*