Saithe (*Pollachius virens*) in subareas 1 and 2 (Northeast Arctic)

ICES advice on fishing opportunities

ICES advises that when the Norwegian management plan is applied, catches in 2023 should be no more than 226 794 tonnes.

Bycatches of coastal cod and golden redfish (*Sebastes norvegicus*) in fisheries targeting saithe in subareas 1 and 2 should be kept as low as possible.

Stock development over time

Fishing pressure on the stock is below F_{MP}, and spawning-stock size is above MSY $B_{trigger}$, B_{pa}, and B_{lim}.

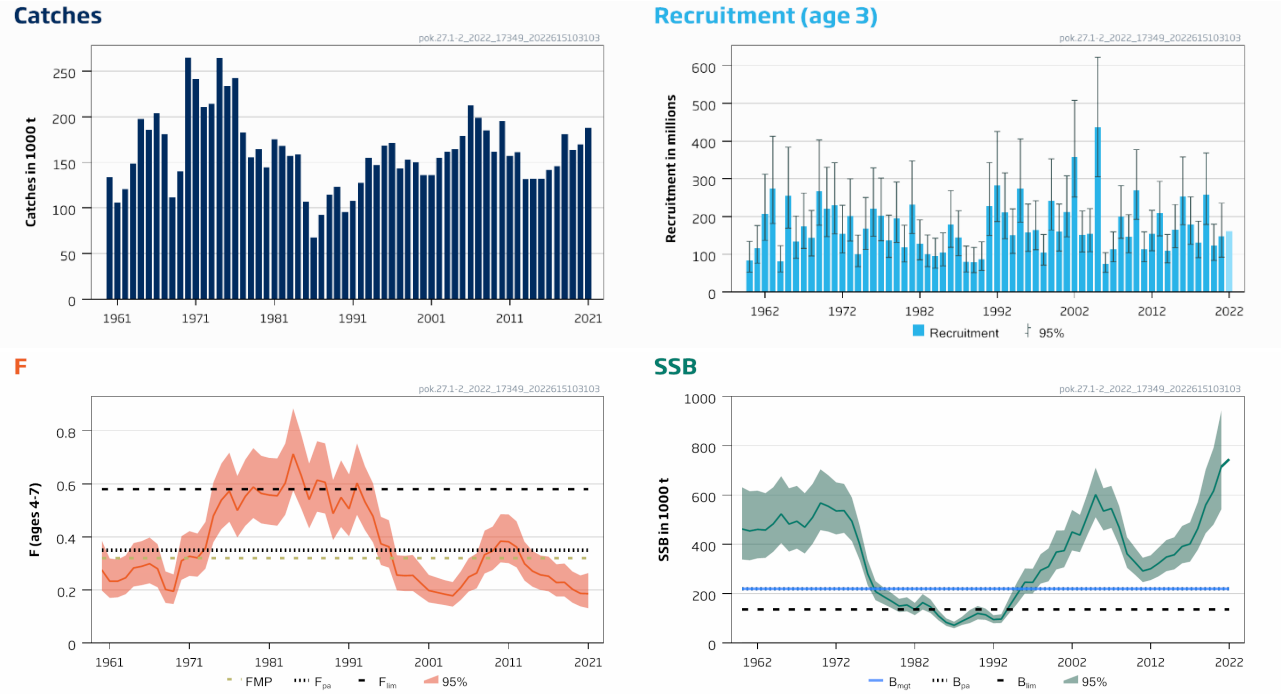

Figure 1 Saithe in subareas 1 and 2. Historical development of the stock . The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Saithe in subareas 1 and 2. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{ages\ 4–7}$ (2022)	0.207	Based on a catch of 197 212 tonnes for 2022.
SSB (2023)	686 937	Short-term forecast; tonnes.
$R_{age\ 3}$ (2022 onwards)	161 659	Geometric mean (1960–2021); thousands.
Total catch (2022)	197 212	TAC for 2022; tonnes.

Table 2 Saithe in subareas 1 and 2. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	F total (2023)	SSB (2024)	% SSB change*	% TAC change**	% advice change***
ICES advice basis						
Management plan^	226 794	0.254	597 899	-13	15	15
Other scenarios						
F = 0	0	0	815 773	19	−100	−100
F_{pa}	295 900	0.35	532 739	−22	50	50
$F = F_{sq}$	189 690	0.207	633 154	−8	−4	−4

* SSB 2024 relative to SSB 2023.
** Catch advice in 2023 relative to TAC in 2022 (197 212 tonnes).
*** Catch advice in 2023 relative to the advice value for 2022 (197 212 tonnes).
^ Catch advice is based on an average of a three-year catch forecast using F_{MP}. The relevant predicted catches are 275 058 tonnes (2023), 229 797 tonnes (2024), and 199 602 tonnes (2025) which give an average of 234 819 tonnes. The advice is constrained by the stability clause of 15% which reduces this to 226 794 tonnes.

The advice for 2023 is higher than the advice for 2022 because of an increase in stock size.

Basis of the advice

Table 3 Saithe in subareas 1 and 2. The basis of the advice.

Advice basis	Norwegian management plan
Management plan	The harvest control rule (HCR), 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 three years based on F_{MP} = 0.32. The TAC for the next year will be set to this level as a starting value for the three-year period. – The year after, the TAC calculation for the next three years is repeated based on 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) at the beginning of the year for which the quota is set (first year of prediction) is below B_{pa}, the procedure for establishing the TAC should be based on a fishing mortality that is linearly reduced from F_{MP} at SSB = B_{pa} to zero at SSB equal to zero. At SSB levels below B_{pa} in any of the operational years (current year and three years of prediction), there should be no limitations on the year-to-year variations in TAC. The HCR was last evaluated by ICES in 2011 (ICES, 2011), with F_{MP} = 0.35. The evaluation concluded that the HCR is precautionary. The F_{MP} was lowered to the current value of 0.32 by Norwegian authorities in 2013. The interbenchmark for this stock in 2014 did not result in significantly different estimates of stock dynamics, and the former HCR evaluation is still considered valid.

Quality of the assessment

The assessment is fairly consistent over recent years.

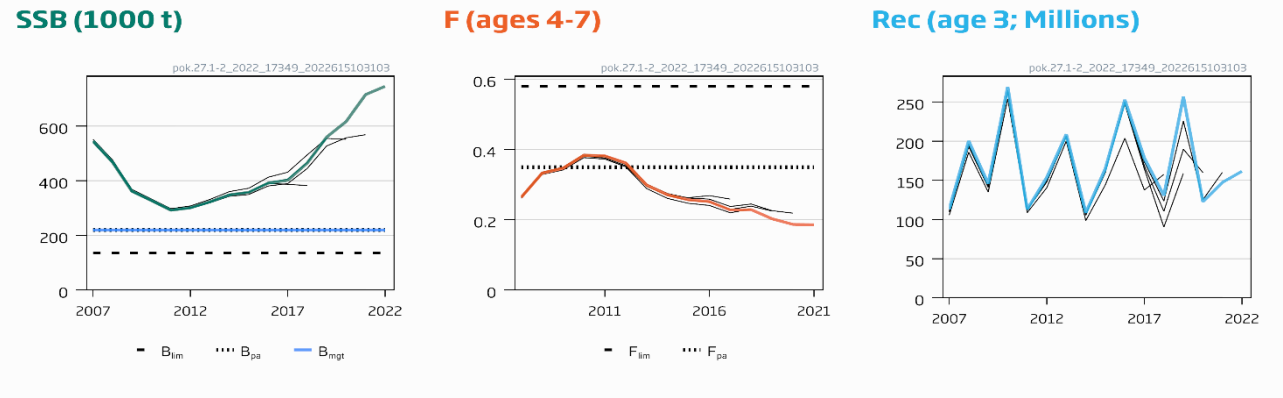

Figure 2 Saithe in subareas 1 and 2. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

The current catch of golden redfish (*Sebastes norvegicus*) taken as bycatch in fisheries targeting Northeast Arctic (NEA) saithe constitutes a considerable part of the total *Sebastes norvegicus* catch. Bycatch of *Sebastes norvegicus* should be kept as low as possible because of the poor status of this stock.

Bycatch of northern coastal cod should be kept as low as possible to ensure sustainable management of coastal cod.

Predicted catches in the forecast are influenced by recent recruitment estimates; these estimates are uncertain, but they make a relatively small contribution to catches in the forecast period.

Sampling data from the Russian Federation for catches in 2021 were not available for the assessment.

Reference points

Table 4 Saithe in subareas 1 and 2. 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}	136 000 t	Change point regression	ICES (2005, 2014)
	B_{pa}	220 000 t	$B_{lim} \times e^{1.645 \times \sigma}$, where σ= 0.3	ICES (2005, 2014)
	F_{lim}	0.58	F corresponding to an equilibrium stock at B_{lim}	ICES (2005, 2014)
	F_{pa}	0.35	$F_{lim} \times e^{-1.645 \times \sigma}$, where σ = 0.3. This value is considered to have a 95% probability of avoiding the F_{lim}.	ICES (2005, 2014)
Management plan	SSB_{MGT}	220 000 t	B_{pa}	ICES (2011)
	F_{MP}	0.32	From the agreed MP	ICES (2014)

Basis of the assessment

Table 5 Saithe in subareas 1 and 2. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a).
Assessment type	Age-based analytical assessment (SAM; ICES, 2022b) that uses landings 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 from the Norwegian coastal survey Q4 (A6335, split in 2002) recalculated using StoX from 2004 onwards; three-year running average maturity based on spawning zones from otoliths from commercial catches and surveys for 1985–2006, constant (2005–2007 average) for later years.
Discards and bycatch	Discarding is considered negligible. Bycatch is included.
Indicators	None.
Other information	An interbenchmark was undertaken in 2014 (ICES, 2014).
Working group	Arctic Fisheries Working Group (AFWG).

History of the advice, catch, and management

Table 6 Saithe in subareas 1 and 2. ICES advice, TAC, and catches. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC[§]	ICES catches
1994	No increase in F	158000[#]	145000	146950
1995	No increase in F	221000[#]	165000	168378
1996	No increase in F	158000[#]	163000	171348
1997	Reduction of F to F_{med} or below	107000	125000	143629
1998	Reduction of F to F_{med} or below	117000	145000[##]	153327
1999	Reduce F below F_{pa}	87000	144000[###]	150375
2000	Reduce F below F_{pa}	89000	125000^	135928
2001	Reduce F below F_{pa}	< 115000	135000	135853
2002	Maintain F below F_{pa}	< 152000	162000^^	154870
2003	Maintain F below F_{pa}	< 168000	164000	161592
2004	Maintain F below F_{pa}	< 186000	169000	164636
2005	Take account of *Sebastes marinus* bycatch; maintain F below F_{pa}	< 215000	215000	178568
2006	Take account of *Sebastes marinus* bycatch; maintain F below F_{pa}	< 202000	193500	212557
2007	Take account of *Sebastes marinus* bycatch; maintain F below F_{pa}	< 247000	222525	198967
2008	Take account of *Sebastes marinus* bycatch; maintain F below F_{HCR}	< 247000	< 247000	184840
2009	Take account of *Sebastes marinus* bycatch; apply management plan	< 225000	225000	161865
2010	Take account of *Sebastes marinus* bycatch; apply management plan	< 204000	204000	195554
2011	Take account of *Sebastes marinus* bycatch; apply management plan	< 173000	173000	157048
2012	Take account of coastal cod and *Sebastes marinus** bycatch; apply management plan	< 164000	164000	160960
2013	Take account of coastal cod and *Sebastes marinus** bycatch; apply management plan	< 164000	140000^^^	131629
2014	Take account of coastal cod and *Sebastes marinus** bycatch; stabilize SSB	< 140000	119000^^^	132070
2015	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	< 122000	122000	132275
2016	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	< 140000	140000	141768
2017	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 150000	150000	145819
2018	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 172500	172500	181280

Year	ICES advice	Catch corresponding to advice	Agreed TAC[§]	ICES catches
2019	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 149550	149550	163180
2020	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 171982	171982	169405
2021	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 197779	197779	188175
2022	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 197212	197212	
2023	Take account of coastal cod and *Sebastes norvegicus* bycatch; apply management plan	≤ 226794		

[#] Predicted catch at *status quo* F.
[##] TAC first set at 125 000 tonnes, 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 tonnes, 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.
[§] TAC set by Norwegian authorities.
* Until 2014 this species was named *Sebastes marinus*, thereafter *Sebastes norvegicus.*

History of the catch and landings

Table 7 Saithe in subareas 1 and 2. Catch distribution by fleet in 2021 as estimated by ICES.

Catch (2021)	Commercial landings				Discards
188 175 tonnes	15.7% gillnets	24.5% other	16.4% purse-seine	43.4% bottom trawl	Assumed to be negligible
	188 175 tonnes				

Table 8 Saithe in subareas 1 and 2. Catches inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES.

Year	Inside the NEAFC RA (tonnes)	Outside the NEAFC RA (tonnes)	Total catches (tonnes)	Proportion inside the NEAFC RA (%)
2018	2	181278	181280	< 0.01%
2019	257	162923	163180	< 0.01%
2020	0	169405	169405	0%
2021	0	188175	188175	0%

Summary of the assessment

Table 9 Saithe in subareas 1 and 2. Assessment summary. High and low refer to 95% confidence bounds.

Year	Recruitment			Spawning-stock biomass			Total	Fishing mortality		
	Recruitment (age 3)	High	Low	SSB	High	Low	Catch	F (ages 4–7)	High	Low
	thousands			tonnes			tonnes			
1960	84026	134326	52561	462688	632112	338674	133515	0.28	0.39	0.198
1961	116162	176295	76540	454708	616028	335633	105951	0.23	0.32	0.170
1962	206835	312245	137011	460869	618305	343520	120707	0.23	0.32	0.172
1963	273837	412927	181598	458340	608234	345386	148627	0.25	0.33	0.184
1964	80835	122880	53177	483760	632184	370183	197426	0.28	0.38	0.21
1965	254979	384110	169260	523809	676974	405297	185600	0.29	0.38	0.22
1966	134273	201748	89365	482581	627985	370844	203788	0.30	0.40	0.23
1967	174211	262323	115695	494141	637762	382863	181326	0.28	0.37	0.21
1968	143787	216229	95615	469782	608057	362951	111424	0.20	0.27	0.151
1969	267366	403313	177243	509859	646012	402401	140060	0.195	0.26	0.147
1970	220408	330662	146917	568159	705038	457854	264924	0.31	0.40	0.24
1971	229850	343220	153927	554682	680661	452021	241272	0.33	0.42	0.25
1972	154265	230043	103449	535848	652069	440342	210456	0.32	0.41	0.25
1973	201294	300013	135058	537224	645881	446847	213859	0.36	0.46	0.28
1974	100846	150854	67415	493712	590337	412902	264121	0.48	0.61	0.38
1975	168309	250872	112918	398963	475420	334802	233453	0.54	0.68	0.43
1976	220420	329412	147490	281331	337436	234555	242486	0.57	0.72	0.46
1977	202624	302023	135938	208941	251498	173586	182817	0.50	0.63	0.40
1978	136704	203960	91625	189086	225968	158224	155464	0.55	0.69	0.44
1979	195867	291824	131462	170439	203739	142582	164680	0.59	0.74	0.47
1980	118880	177178	79764	150189	179728	125504	144554	0.56	0.71	0.45
1981	232133	347614	155017	154449	185819	128375	175540	0.56	0.70	0.45
1982	127952	191143	85652	135715	163162	112885	168034	0.56	0.70	0.44
1983	100879	151234	67291	164048	198741	135411	156936	0.60	0.75	0.48
1984	94848	142751	63020	146889	177361	121652	158786	0.71	0.89	0.57
1985	104305	157235	69193	110715	133162	92052	107183	0.63	0.79	0.51
1986	178608	269107	118543	83490	100536	69335	67396	0.54	0.68	0.43
1987	144151	215734	96320	72061	86591	59969	92391	0.61	0.76	0.50
1988	80501	121721	53240	88318	106963	72923	114242	0.61	0.75	0.49
1989	78046	118292	51493	104092	134415	80609	122817	0.49	0.62	0.39
1990	87261	133215	57160	120178	150620	95890	95848	0.55	0.69	0.44
1991	226767	343375	149759	114661	139901	93974	107327	0.51	0.64	0.40
1992	281942	425764	186702	95211	113212	80072	127604	0.60	0.75	0.48
1993	211259	315927	141268	97293	116900	80974	154903	0.53	0.67	0.43
1994	150273	220647	102344	148467	182887	120525	146950	0.48	0.60	0.38
1995	274143	405903	185154	197554	246391	158396	168378	0.37	0.48	0.29
1996	158412	233241	107589	246590	302864	200772	171348	0.36	0.46	0.28
1997	164614	241966	111990	246211	301643	200966	143629	0.26	0.33	0.198
1998	104290	152695	71230	294713	360634	240842	153327	0.25	0.33	0.196
1999	241011	353040	164532	309916	383956	250154	150375	0.26	0.33	0.196
2000	159210	233216	108688	368993	456652	298161	135928	0.23	0.30	0.174
2001	212316	308116	146303	374833	457293	307242	135853	0.198	0.26	0.153
2002	357911	508475	251930	450424	540388	375437	154870	0.191	0.25	0.148
2003	150915	214855	106003	437861	520334	368459	161592	0.184	0.24	0.143
2004	153670	221003	106851	518880	610410	441074	164636	0.178	0.23	0.137
2005	436325	622375	305892	602367	711569	509925	178568	0.21	0.27	0.162
2006	73821	104591	52104	535304	628049	456254	212557	0.25	0.32	0.194
2007	113108	159694	80112	545628	637846	466743	198967	0.26	0.34	0.21
2008	200409	281971	142439	468492	556028	394737	184840	0.33	0.42	0.26
2009	145999	204967	103996	361785	429342	304858	161865	0.35	0.44	0.28
2010	269620	377489	192575	327806	387730	277143	195554	0.38	0.49	0.30
2011	113082	159583	80132	292358	346200	246890	157048	0.38	0.49	0.30

Year	Recruitment			Spawning-stock biomass			Total	Fishing mortality		
	Recruitment (age 3)	High	Low	SSB	High	Low	Catch	F (ages 4–7)	High	Low
	thousands			tonnes			tonnes			
2012	153896	216571	109359	301256	355904	254999	160960	0.36	0.46	0.28
2013	209004	293333	148918	323389	386947	270270	131629	0.30	0.38	0.24
2014	108650	152865	77223	348814	417817	291208	132070	0.27	0.35	0.21
2015	165109	232047	117480	357938	429363	298395	132275	0.26	0.33	0.20
2016	252926	358158	178613	391741	474963	323101	141768	0.25	0.33	0.195
2017	178636	252660	126300	401931	489720	329879	145819	0.23	0.30	0.175
2018	130677	187881	90890	464929	571597	378166	181280	0.23	0.30	0.175
2019	257000	368558	179210	560109	704413	445368	163180	0.20	0.27	0.152
2020	122722	179818	83756	616956	792107	480534	169405	0.187	0.26	0.138
2021	147428	235474	92304	715674	943818	542678	188175	0.186	0.26	0.131
2022	161659*			745913**						

* Geometric mean 1960–2021
**Predicted

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Download the stock assessment data and figures.

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