

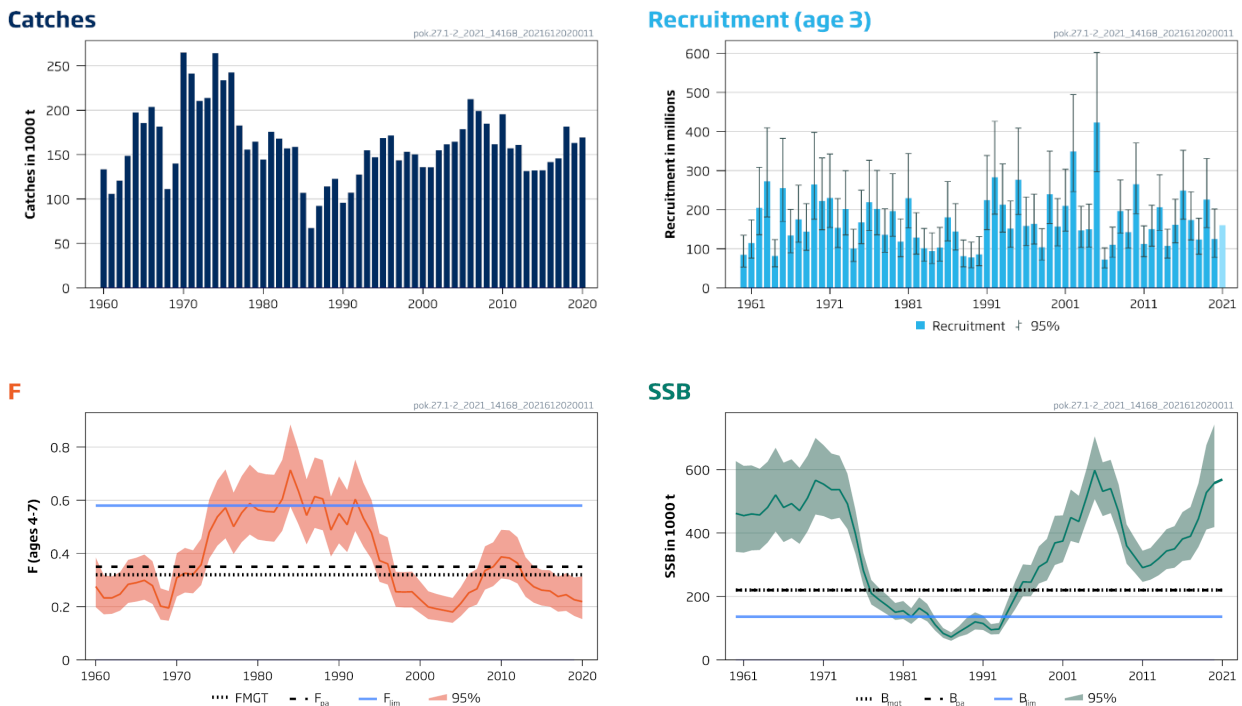
## Saithe (*Pollachius virens*) in subareas 1 and 2 (Northeast Arctic)

### ICES advice on fishing opportunities

ICES advises that when the Norwegian management plan is applied, catches in 2022 should be no more than 197 212 tonnes.

### Stock development over time

Fishing pressure on the stock is below  $F_{MGT}$  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 from the summary of stock assessment (weights in thousand tonnes). Assumed recruitment value is shaded in a lighter colour.

### Catch scenarios

**Table 1** Saithe in subareas 1 and 2. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 4-7}$ (2021)	0.27	Based on a catch of 197 779 tonnes for 2021
SSB (2022)	541 708	Short-term forecast; tonnes
$R_{age\ 3}$ (2021 onwards)	160 336	Geometric mean (1960–2020); thousands
Total catch (2021)	197 779	TAC for 2021; tonnes

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

Basis	Total catch (2022)	F total (2022)	SSB (2023)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis						
Management plan	197 212	0.28	482 900	-11	0	0
Other scenarios						
F = 0	0	0	667 929	23	-100	-100
F <sub>pa</sub>	234 658	0.35	448 436	-17	19	19
F = F <sub>sq</sub>	169 313	0.23	531 508	-2	-14	-14

\* SSB 2023 relative to SSB 2022.

\*\* Catch in 2022 relative to TAC in 2021 (197 779 tonnes).

\*\*\* Catch in 2022 relative to the advice value for 2021 (197 779 tonnes).

### Basis of the advice

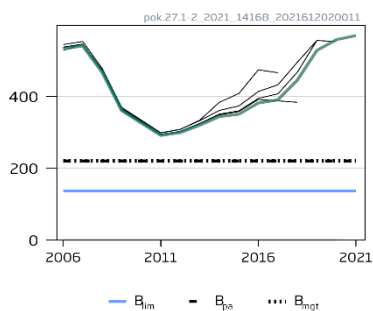
**Table 3** Saithe in subareas 1 and 2. The basis of the advice.

Advice basis	Norwegian management plan
Management plan	<p>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:</p> <ul style="list-style-type: none"> <li>Estimate the average TAC level for the coming three years based on <math>F_{MP} = 0.32</math>. The TAC for the next year will be set to this level as a starting value for the three-year period.</li> <li>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.</li> <li>If the spawning-stock biomass (SSB) at 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 the TAC should be based on a fishing mortality that is linearly reduced from <math>F_{MP}</math> at <math>SSB = B_{pa}</math> to zero at SSB equal to zero. At SSB levels below <math>B_{pa}</math> 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.</li> </ul>
	<p>The HCR was last evaluated by ICES in 2011 (ICES, 2011), with <math>F_{MP} = 0.35</math>. The evaluation concluded that the HCR is precautionary. The <math>F_{MP}</math> 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.</p>

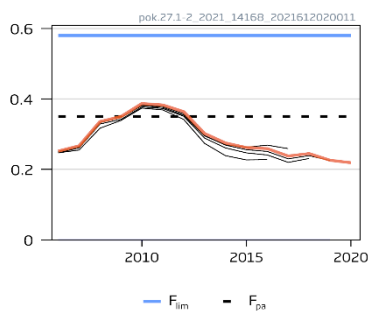
### Quality of the assessment

The assessment is fairly consistent over recent years. The variability in the assessment is taken into account by the HCR in the management plan. Predicted catches are dependent upon assumptions of average recruitment as reliable recruitment estimates are lacking.

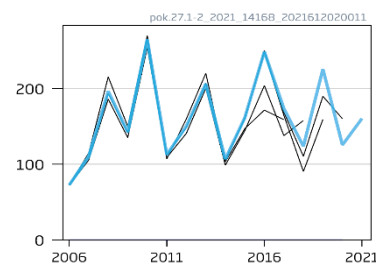
#### SSB (1000 t)



#### F (ages 4-7)



#### Rec (age 3; Millions)



**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 coastal cod should be kept as low as possible given the zero-TAC advice for northern Norwegian coastal cod.

## 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)
	$B_{pa}$	220 000 t	$B_{lim} \times e^{1.645 \times \sigma}$ , where $\sigma = 0.3$	ICES (2005)
	$F_{lim}$	0.58	F corresponding to an equilibrium stock = $B_{lim}$	ICES (2005)
	$F_{pa}$	0.35	$F_{lim} \times e^{-1.645 \times \sigma}$ , where $\sigma = 0.3$ . This value is considered to have a 95% probability of avoiding the $F_{lim}$ .	ICES (2005)
Management plan	$SSB_{MGT}$	220 000 t	$B_{pa}$ ; 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 5** Saithe in subareas 1 and 2. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2021a).
Assessment type	Age-based analytical assessment (SAM; ICES, 2021b) 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 for the period 2004–2017; 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 inter-benchmark 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 <sup>§</sup>	ICES catches
1994	No increase in F	158000 <sup>#</sup>	145000	146950
1995	No increase in F	221000 <sup>#</sup>	165000	168378
1996	No increase in F	158000 <sup>#</sup>	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 <sup>##</sup>	153327
1999	Reduce F below $F_{pa}$	87000	144000 <sup>###</sup>	150375
2000	Reduce F below $F_{pa}$	89000	125000 <sup>^</sup>	135928
2001	Reduce F below $F_{pa}$	< 115000	135000	135853
2002	Maintain F below $F_{pa}$	< 152000	162000 <sup>^^</sup>	154870
2003	Maintain F below $F_{pa}$	< 168000	164000	161592
2004	Maintain F below $F_{pa}$	< 186000	169000	164636
2005	Take account of <i>Sebastes marinus</i> bycatch; maintain F below $F_{pa}$	< 215000	215000	178568
2006	Take account of <i>Sebastes marinus</i> bycatch; maintain F below $F_{pa}$	< 202000	193500	212557

Year	ICES advice	Catch corresponding to advice	Agreed TAC <sup>§</sup>	ICES catches
2007	Take account of <i>Sebastes marinus</i> bycatch; maintain F below $F_{pa}$	< 247000	222525	198967
2008	Take account of <i>Sebastes marinus</i> bycatch; maintain F below $F_{HCR}$	< 247000	< 247000	184840
2009	Take account of <i>Sebastes marinus</i> bycatch; apply management plan	< 225000	225000	161865
2010	Take account of <i>Sebastes marinus</i> bycatch; apply management plan	< 204000	204000	195554
2011	Take account of <i>Sebastes marinus</i> bycatch. Apply management plan	< 173000	173000	157048
2012	Take account of coastal cod and <i>Sebastes marinus</i> * bycatch; apply management plan	< 164000	164000	160960
2013	Take account of coastal cod and <i>Sebastes marinus</i> * bycatch; apply management plan	< 164000	140000 <sup>^^^</sup>	131629
2014	Take account of coastal cod and <i>Sebastes marinus</i> * bycatch; stabilize SSB	< 140000	119000 <sup>^^^</sup>	132070
2015	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	< 122000	122000	132275
2016	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	< 140000	140000	141768
2017	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	≤ 150000	150000	145819
2018	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	≤ 172500	172500	181280
2019	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	≤ 149550	149550	163180
2020	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	≤ 171982	171982	169405
2021	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	≤ 197779	197779	
2022	Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan	≤ 197212		

# 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** Cod in subareas 1 and 2 (Norwegian coastal waters cod). Catch distribution by fleet in 2020 as estimated by ICES.

Catch (2020)	Commercial landings				Discards
	18% gillnets	23% Other	16% Purse seine	44% bottom trawl	
169 405 tonnes	169 405 tonnes				Discarding is assumed to be negligible

**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%

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 catch	Fishing mortality		
	(age 3)	High	Low	SSB	High	Low		F (ages 4–7)	High	Low
	thousands			tonnes			tonnes			
1960	84699	134657	53275	461954	626997	340356	133515	0.28	0.39	0.198
1961	114852	173696	75943	454922	612090	338110	105951	0.23	0.32	0.171
1962	204858	308196	136169	460151	613317	345236	120707	0.23	0.31	0.173
1963	272636	409624	181460	456977	602773	346445	148627	0.25	0.33	0.185
1964	81455	123447	53746	480943	625107	370027	197426	0.28	0.38	0.21
1965	254946	382703	169838	520226	668972	404553	185600	0.29	0.38	0.22
1966	134092	200765	89560	480651	622065	371385	203788	0.30	0.40	0.23
1967	175037	262669	116641	492806	632610	383899	181326	0.28	0.37	0.21
1968	143735	215371	95926	470649	605670	365728	111424	0.20	0.27	0.151
1969	264196	397412	175635	510533	643625	404962	140060	0.195	0.26	0.147
1970	221990	332241	148325	566421	699977	458348	264924	0.31	0.40	0.24
1971	230022	342578	154447	554255	677481	453442	241272	0.33	0.42	0.25
1972	153427	228234	103139	536782	650930	442652	210456	0.32	0.41	0.25
1973	201535	299799	135478	537080	643914	447971	213859	0.36	0.46	0.28
1974	100491	150087	67284	492447	587580	412716	264121	0.48	0.60	0.38
1975	167910	249960	112793	398335	473754	334922	233453	0.54	0.68	0.43
1976	218787	326615	146558	281638	337125	235285	242486	0.57	0.72	0.46
1977	201807	300399	135574	209586	251765	174474	182817	0.50	0.63	0.40
1978	135845	202439	91157	189206	225733	158590	155464	0.55	0.69	0.44
1979	196239	292004	131882	170572	203581	142916	164680	0.59	0.73	0.47
1980	118551	176384	79680	150371	179617	125886	144554	0.56	0.71	0.45
1981	229591	343722	153357	154603	185661	128741	175540	0.56	0.70	0.45
1982	128751	192158	86267	135850	163053	113185	168034	0.56	0.70	0.44
1983	101648	152165	67903	163039	197295	134731	156936	0.60	0.75	0.49
1984	93620	140769	62263	146429	176635	121389	158786	0.71	0.89	0.58
1985	102877	154717	68406	110786	133174	92162	107183	0.63	0.79	0.51
1986	180678	271854	120081	83490	100480	69372	67396	0.54	0.68	0.43
1987	144255	215216	96691	72108	86615	60032	92391	0.61	0.76	0.50
1988	81170	122403	53826	88284	106815	72968	114242	0.61	0.75	0.49
1989	77533	117162	51308	103598	133471	80411	122817	0.49	0.61	0.39
1990	86025	131017	56483	119821	149924	95763	95848	0.55	0.69	0.44
1991	224378	338544	148711	114696	139745	94137	107327	0.51	0.64	0.41
1992	283158	426021	188204	95078	112980	80013	127604	0.60	0.75	0.48
1993	212838	317156	142833	97184	116594	81005	154903	0.53	0.67	0.43
1994	151833	222233	103735	147920	181893	120292	146950	0.48	0.60	0.38
1995	276797	408509	187552	196912	244932	158307	168378	0.37	0.48	0.29
1996	158509	232352	108133	245964	301256	200820	171348	0.36	0.46	0.28
1997	163726	239520	111916	245018	299115	200706	143629	0.26	0.33	0.199
1998	103855	151361	71259	293347	357725	240555	153327	0.26	0.33	0.197
1999	239763	349603	164433	308959	381372	250296	150375	0.26	0.33	0.197
2000	156637	228352	107445	368739	454586	299103	135928	0.23	0.30	0.175
2001	209826	303263	145177	374648	455588	308088	135853	0.199	0.26	0.153
2002	348923	494582	246162	448824	537304	374915	154870	0.192	0.25	0.149
2003	146813	208523	103365	436241	517600	367672	161592	0.186	0.24	0.144
2004	149455	214106	104326	514712	604488	438268	164636	0.180	0.23	0.139
2005	422980	602123	297136	597772	705257	506669	178568	0.21	0.27	0.164
2006	72425	102426	51211	531606	623241	453445	212557	0.25	0.32	0.196
2007	110219	155246	78251	540217	630925	462550	198967	0.27	0.34	0.21
2008	196489	276007	139880	466129	553038	392878	184840	0.34	0.43	0.26
2009	142496	199769	101643	359824	427029	303195	161865	0.35	0.44	0.28
2010	265036	370498	189593	325466	384802	275279	195554	0.39	0.49	0.31
2011	112547	158802	79765	290802	344333	245593	157048	0.38	0.49	0.30

Year	Recruitment			Spawning-stock biomass			Total catch	Fishing mortality		
	(age 3)	High	Low	SSB	High	Low		F (ages 4–7)	High	Low
	thousands			tonnes			tonnes			
2012	150196	211148	106838	298842	353243	252820	160960	0.36	0.46	0.29
2013	206304	289173	147183	319164	382216	266514	131629	0.30	0.39	0.24
2014	106803	150080	76006	343361	412207	286013	132070	0.28	0.35	0.22
2015	161572	226779	115114	350008	421850	290402	132275	0.26	0.34	0.20
2016	248745	351959	175800	381242	466220	311753	141768	0.26	0.34	0.20
2017	173609	245698	122671	389843	481911	315364	145819	0.24	0.31	0.181
2018	123627	177619	86047	445032	556605	355825	181280	0.25	0.33	0.184
2019	225697	330952	153917	527748	677809	410910	163180	0.23	0.31	0.165
2020	125341	201573	77939	557582	742403	418771	169405	0.22	0.31	0.153
2021	160336*			568972						

\* Geometric mean 1960–2020.

### Sources and references

ICES. 2005. Report of the Arctic Fisheries Working Group (AFWG), 19–28 April 2005, Murmansk, Russia. ICES CM 2005/ACFM:20. 564 pp

ICES. 2011. Report of the Arctic Fisheries Working Group (AFWG), 28 April–4 May 2011, Hamburg, Germany. ICES CM 2011/ACOM:05. 659 pp.

ICES. 2014. 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

ICES. 2021a. Advice on fishing opportunities. In Report of the ICES Advisory Committee, 2021. ICES Advice 2021, section 1.1.1. <https://doi.org/10.17895/ices.advice.7720>.

ICES. 2021b. Arctic Fisheries Working Group (AFWG). ICES Scientific Reports. 3:58. <https://doi.org/10.17895/ices.pub.8196>.

[Download the stock assessment data and figures.](#)

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