

Witch (*Glyptocephalus cynoglossus*) in Subarea 4 and divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches should not be more than 1733 tonnes.

Management of witch and lemon sole under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species. ICES advises that management should be implemented at the species level in the entire stock distribution area (Subarea 4 and divisions 3.a and 7.d).

Note: This advice sheet is abbreviated due to the COVID-19 disruption. The previous advice issued for 2020 is attached as Annex 1.

Stock development over time

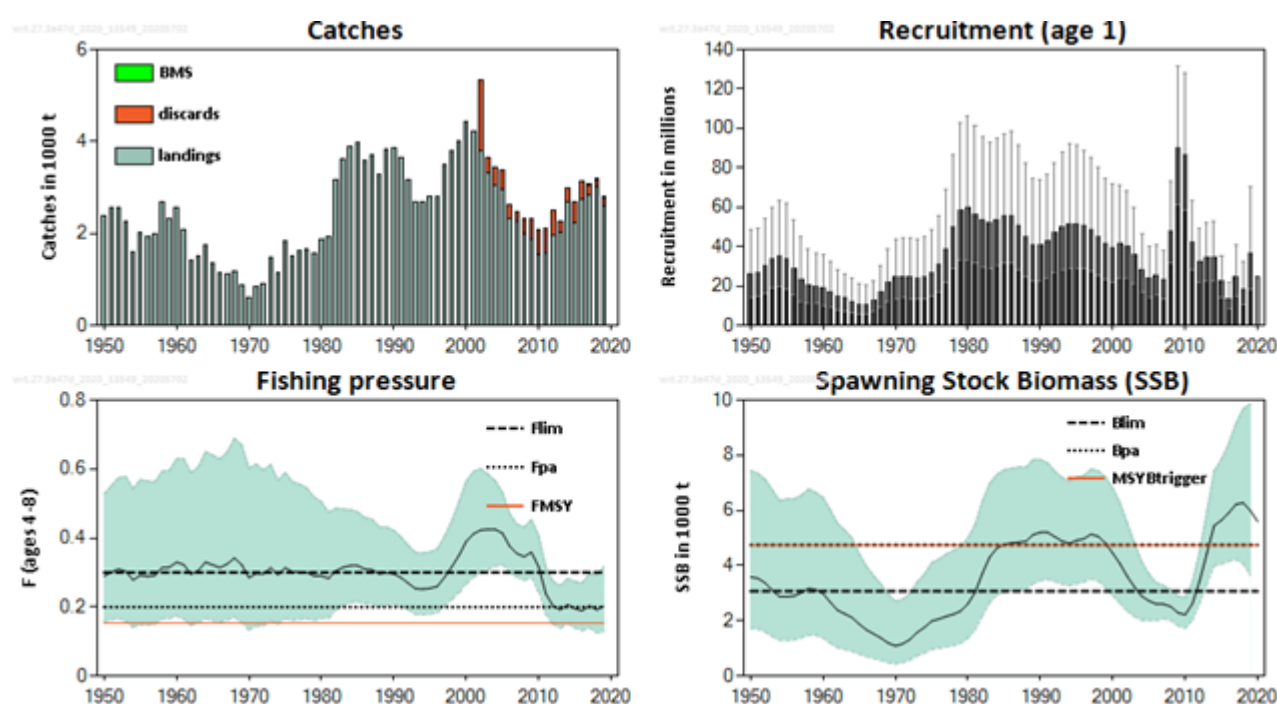


Figure 1 Witch in Subarea 4 and divisions 3.a and 7.d. Official landings and discards (in thousand tonnes); discard information is available from 2002. The shaded areas on the spawning-stock biomass (SSB) and fishing pressure (F) plots, and the error bars on the recruitment (R) plot represent 95% confidence intervals. The assumed recruitment for 2020 is unshaded. SSB is estimated at the middle of the year (i.e. spawning time). Landings below minimum conservation reference size (BMS) are those officially reported.

Stock and exploitation status

Table 1 Witch in Subarea 4 and divisions 3.a and 7.d. State of the stock and the fishery relative to reference points.

		Fishing pressure				Stock size		
		2017	2018	2019		2018	2019	2020
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	MSY	✓	✓
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	—
								✓ Above trigger
								✓ Full reproductive capacity
								— Not applicable

Catch scenarios

Table 2 Witch in Subarea 4 and divisions 3.a and 7.d. Assumptions made for the interim year and in the forecast. All weights are in tonnes, recruitment is in thousands.

Variable	Value	Notes
F_{4-8} (2020)	0.20	$F_{sq} = F_{4-8}$ (2019).
SSB (2020)	5644	SSB at the middle of the year (i.e. spawning time).
$R_{age\ 1}$ (2020, 2021, 2022)	24699	Median of the resampled recruitment estimates of 2017–2019.
Total catch (2020)	2472	Short-term forecast.
Projected landings (2020)	2375	Based on landings fraction (average 2017–2019).
Projected discards (2020)	97	Based on discard fraction (average 2017–2019).

Table 3 Witch in Subarea 4 and divisions 3.a and 7.d. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2021) ^{^^}	Projected landings (2021)	Projected discards (2021) *	F_{total} ages 4–8 (2021 & 2022)	SSB [^] (2021)	SSB [^] (2022)	% SSB change **	% advice change ***
ICES advice basis								
MSY approach: F_{MSY}	1733	1681	53	0.154	5490	5476	–0.25	5.0
Other scenarios								
F_{MSY} -upper	2295	2228	67	0.21	5327	5006	–6.0	39
F_{MSY} -lower	1243	1210	33	0.108	5635	5898	4.7	–25
$F = 0$	0	0	0	0.00	5976	6992	17.0	–100
F_{pa}	2195	2131	65	0.20	5353	5082	–5.1	33
F_{lim}	3135	3033	103	0.30	5074	4341	–14.4	90
F_{sq}	2215	2150	66	0.20	5348	5063	–5.3	34
SSB (2022) = B_{lim}	4942	4793	149	0.53	4508	3069	–32	199
SSB (2022) = B_{pa}	2629	2547	82	0.24	5222	4745	–9.1	59
SSB (2022) = MSY $B_{trigger}$	2629	2547	82	0.24	5222	4745	–9.1	59
Rollover advice	1651	1603	48	0.146	5515	5561	0.85	0

* Including BMS landings, assuming recent discard rate (average of 2017–2019).

** SSB in 2022 relative to SSB in 2021.

*** Advice value for 2021 relative to the advice for 2020 (1651 tonnes).

[^] SSB is estimated at spawning time (1 July).

The basis for the advice changed, from the precautionary approach for 2020 to the MSY approach for 2021.

Quality of the assessment

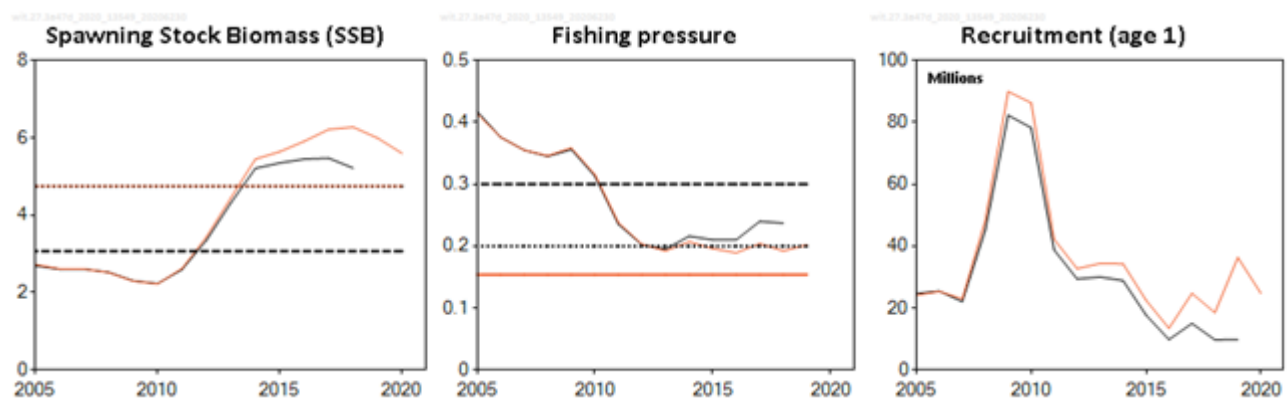


Figure 2 Witch in Subarea 4 and divisions 3.a and 7.d. Historical assessment results (final-year recruitment included for each line, corresponding to the forecast recruitment in the interim year).

History of the advice, catch, and management

Table 4 Witch in Subarea 4 and divisions 3.a and 7.d. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Witch		Witch and lemon sole		Witch			
		Predicted landings corresponding to advice	Predicted catches corresponding to advice	Agreed TAC*	Official landings	Official landings	ICES landings	ICES discards	ICES catch
				Div. 2.a and Subarea 4	Subarea 4 and divs. 3.a and 7.d	Subarea 4 and divisions 3.a and 7.d			
2006				6175	6593	2303	2335	296	2631
2007				6175	6725	2237	2271	199	2470
2008				6793	5929	1954	1999	318	2317
2009				6793	5212	1818	1863	455	2319
2010				6521	4691	1490	1531	559	2090
2011				6391	5552	1530	1567	547	2114
2012	Reduce catches			6391	5922	1896	1952	555	2507
2013	No new advice, same as for 2012			6391	5754	1993	2013	254	2267
2014	Decrease landings by 4% (average of the last 3 years)	< 1574 **		6391	6335	2646	2685	307	2992
2015	No new advice, same as for 2014	< 1574 **		6391	5752	2359	2240	449	2690
2016	Precautionary approach (increase catches by no more than 20%)		≤ 2212	6391	6463	2658	2744	390	3135
2017	Precautionary approach (same advised catch value as given for 2016)		≤ 2212	6391	6064	2811	2850	236	3085
2018	Precautionary approach (increase catches by no more than 8%)		≤ 2390	6391	5966	3001	3010	199	3209
2019	Precautionary approach (same advised catch value as given for 2018)		≤ 2390	7874	5806	2568	2580	217 ***	2797
2020	Precautionary approach		≤ 1651	6785					
2021	MSY approach		≤ 1733						

* EU combined TAC for witch and lemon sole in EU waters of Subarea 4 and Division 2.a.

** Advice based on official landings.

*** Includes BMS landings.

Summary of the assessment

Table 5 Witch in Subarea 4 and divisions 3.a and 7.d. Assessment summary. Weights are in tonnes, recruitment is in thousands.

Year	Recruitment			Spawning-stock biomass***			Catches		Fishing pressure			Official BMS landings ^
	R (age 1)	High	Low	SSB	High	Low	Landings	Discards^	F (ages 4–8)	High	Low	
	thousands			Tonnes			tonnes					tonnes
1950	26092	48585	14012	3586	7437	1730	2379		0.29	0.53	0.159	
1951	27044	49358	14818	3539	7348	1705	2568		0.30	0.55	0.164	
1952	30071	54510	16589	3378	7128	1601	2554		0.31	0.57	0.167	
1953	33611	60031	18819	3109	6753	1431	2263		0.30	0.58	0.159	
1954	35468	63367	19852	2870	6356	1296	1590		0.28	0.54	0.142	
1955	33889	61854	18567	2873	6413	1287	2027		0.29	0.57	0.149	
1956	28582	53510	15267	2899	6415	1310	1936		0.29	0.56	0.148	
1957	23517	44866	12326	3016	6545	1389	1991		0.29	0.56	0.151	
1958	20808	39058	11086	3172	6768	1487	2678		0.31	0.59	0.166	
1959	20108	36773	10995	3133	6649	1477	2333		0.32	0.60	0.167	
1960	19120	35710	10237	2990	6467	1382	2563		0.33	0.63	0.174	
1961	17021	32237	8987	2676	6025	1189	2093		0.32	0.63	0.165	
1962	15159	28351	8106	2384	5533	1028	1419		0.30	0.59	0.148	
1963	13898	25986	7433	2254	5290	960	1523		0.31	0.61	0.154	
1964	12279	23652	6374	2121	5000	900	1760		0.33	0.65	0.167	
1965	10724	20941	5492	1879	4437	796	1356		0.32	0.64	0.161	
1966	10601	20242	5552	1674	3974	705	1137		0.31	0.63	0.157	
1967	12461	22811	6807	1526	3637	640	1125		0.33	0.65	0.163	
1968	16976	30164	9554	1377	3336	568	1174		0.34	0.69	0.170	
1969	21685	38470	12224	1196	2964	482	891		0.32	0.67	0.156	
1970	24555	43981	13709	1095	2706	443	597		0.28	0.60	0.135	
1971	24667	44062	13809	1165	2783	488	843		0.30	0.61	0.144	
1972	24574	44446	13587	1325	2988	587	908		0.30	0.60	0.147	
1973	24318	43938	13459	1580	3412	732	1494		0.31	0.61	0.161	
1974	24791	45011	13654	1762	3690	841	1138		0.29	0.57	0.152	
1975	26682	48422	14703	1989	4101	965	1841		0.31	0.59	0.167	
1976	30814	55421	17132	2065	4235	1007	1496		0.30	0.56	0.162	
1977	39048	69067	22077	2159	4417	1055	1618		0.30	0.56	0.164	
1978	50079	86497	28995	2238	4546	1102	1664		0.30	0.55	0.166	
1979	58533	102911	33292	2354	4682	1183	1572		0.29	0.52	0.162	
1980	59534	106428	33302	2614	4997	1367	1883		0.29	0.51	0.167	
1981	56338	101173	31372	3033	5481	1679	1933		0.28	0.48	0.168	
1982	53336	95837	29683	3715	6330	2180	3155		0.31	0.49	0.192	
1983	51850	92936	28927	4305	6972	2659	3606		0.32	0.48	0.21	
1984	53591	94854	30278	4631	7302	2936	3903		0.32	0.48	0.21	
1985	55711	97341	31885	4774	7466	3053	3979		0.32	0.48	0.22	
1986	55875	98365	31739	4816	7515	3086	3579		0.31	0.46	0.21	
1987	50965	91206	28478	4847	7566	3105	3700		0.31	0.46	0.21	
1988	45161	81967	24882	4877	7559	3147	3290		0.30	0.43	0.20	
1989	41189	74762	22693	5120	7840	3343	3841		0.30	0.43	0.21	
1990	41001	73568	22851	5204	7842	3454	3862		0.30	0.42	0.21	
1991	43042	76389	24252	5205	7729	3506	3641		0.28	0.40	0.20	
1992	46962	82529	26723	5042	7424	3424	3164		0.27	0.38	0.191	
1993	49993	87783	28472	4891	7191	3326	2673		0.25	0.36	0.179	
1994	51693	91937	29065	4803	7054	3271	2696		0.25	0.36	0.178	
1995	51326	91185	28890	4911	7214	3343	2810		0.25	0.36	0.180	
1996	50610	88930	28802	4972	7261	3404	2790		0.26	0.37	0.184	

Year	Recruitment			Spawning-stock biomass***			Catches		Fishing pressure			Official BMS landings ^
	R (age 1)	High	Low	SSB	High	Low	Landings	Discards^	F (ages 4–8)	High	Low	
	thousands			Tonnes			tonnes					tonnes
1997	48402	85053	27545	5137	7497	3521	3494		0.29	0.41	0.20	
1998	45209	80304	25452	5060	7440	3441	3786		0.32	0.45	0.22	
1999	41633	74789	23176	4812	7211	3211	4024		0.35	0.51	0.24	
2000	39745	71509	22091	4454	6822	2908	4422		0.39	0.56	0.27	
2001	41347	71374	23952	4068	6275	2638	4206		0.41	0.59	0.29	
2002	40283	68533	23678	3613	5551	2352	3813	1529	0.42	0.60	0.30	
2003	35667	59963	21215	3223	4820	2155	3308	349	0.43	0.59	0.31	
2004	27864	46689	16630	2895	4147	2021	3059	369	0.43	0.57	0.32	
2005	24109	40178	14467	2724	3699	2006	2960	419	0.41	0.53	0.32	
2006	25322	40946	15659	2609	3381	2013	2335	296	0.38	0.47	0.30	
2007	22939	38203	13774	2608	3283	2071	2271	199	0.36	0.44	0.29	
2008	48202	72974	31839	2516	3132	2021	1999	318	0.35	0.43	0.28	
2009	89970	131692	61467	2294	2893	1819	1863	455	0.36	0.45	0.28	
2010	86319	127772	58315	2220	2847	1731	1531	559	0.32	0.41	0.25	
2011	42216	63101	28243	2621	3403	2020	1567	547	0.24	0.32	0.179	
2012	32683	48954	21820	3441	4519	2620	1952	555	0.20	0.27	0.150	
2013	34382	51884	22784	4451	5950	3329	2013	254	0.192	0.26	0.140	
2014	34253	52493	22351	5448	7430	3995	2685	307	0.21	0.28	0.152	
2015	22471	34928	14457	5642	7848	4056	2240	449	0.196	0.27	0.140	
2016	13406	21750	8263	5910	8409	4154	2744	390	0.189	0.27	0.132	
2017	24699	41163	14820	6217	9154	4223	2850	236**	0.20	0.30	0.140	0.085
2018	18469	32457	10509	6276	9684	4067	3010	199**	0.192	0.29	0.126	0.38
2019	36285	70587	18652	5993	9860	3642	2580	216**	0.20	0.32	0.128	1.09
2020	24699*			5644								

* Median of the resampled recruitment estimates of 2017–2019.

** Since 2017, discards minus BMS landings from EU fleets officially reported in logbooks.

*** SSB is estimated at spawning time.

^ Discards from 2009 (including BMS landings since 2017) are used in the model.

Sources and references

ICES. 2020. Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Scientific Reports, 2:61. <http://doi.org/10.17895/ices.pub.6092>.

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Annex 1

ICES Advice on fishing opportunities, catch, and effort
Greater North Sea ecoregion
Published 28 June 2019
Version 2: 1 July 2019

Witch (*Glyptocephalus cynoglossus*) in Subarea 4 and divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)

ICES advice on fishing opportunities

In the context of the EU multiannual plan for demersal fisheries in the North Sea, in which this stock is considered bycatch, the EC has requested that ICES provide advice based on the precautionary approach. ICES advises that catches of up to 1651 tonnes are considered to be precautionary.

ICES advises that witch should be managed using a single-species TAC covering the entire stock distribution area (i.e. ICES Division 3.a, Subarea 4, and Division 7.d).

Stock development over time

Fishing mortality (F) has been above F_{MSY} since the beginning of the time-series. Spawning-stock biomass (SSB) that was below B_{lim} around 2010, has increased since then and is now above $MSY B_{trigger}$. Recruitment (R) has declined since 2010 and is currently at a low level.

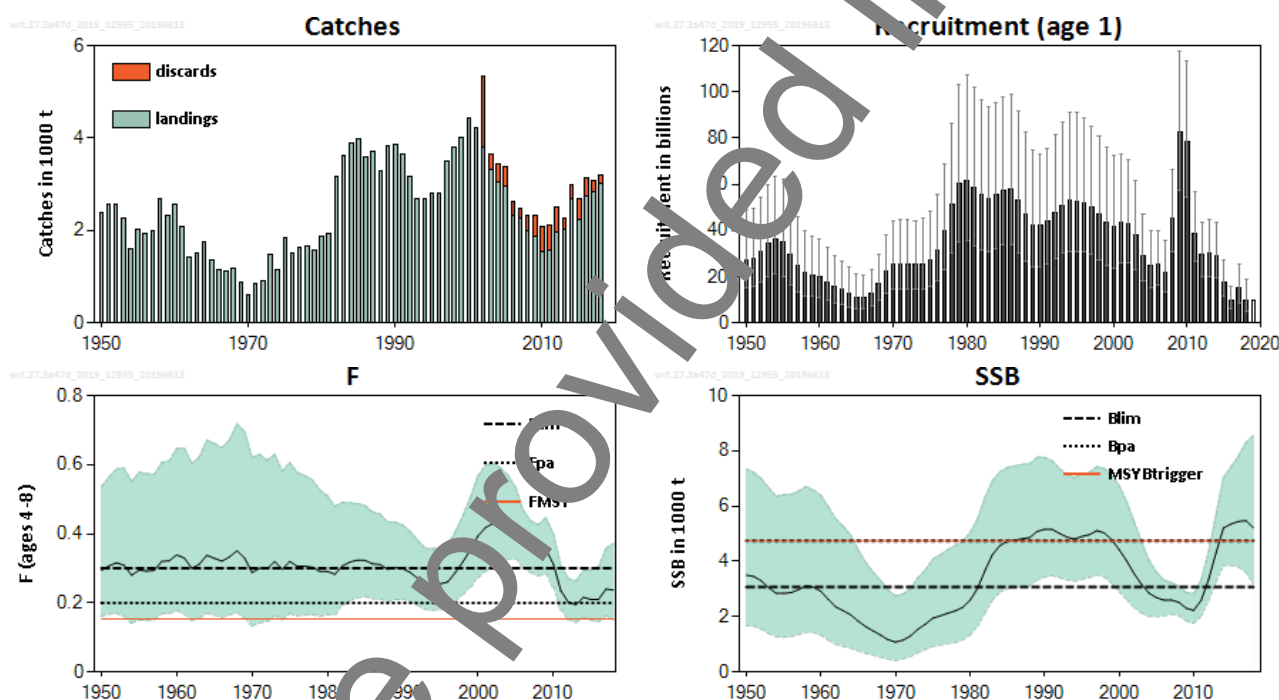


Figure 1 Witch in Subarea 4 and divisions 3.a and 7.d. Official landings and discards (in thousand tonnes); discard information is available since 2002. SSB, F, and R are shown with 95% confidence intervals. Assumed recruitment is unshaded. SSB is estimated at the middle of the year (i.e. spawning time).

Stock and exploitation status

ICES assesses that fishing pressure on the stock is above F_{MSY} and between F_{pa} and F_{lim} , and that spawning stock size is above $MSY B_{trigger}$, B_{pa} , and B_{lim} .

Table 1 Witch in Subarea 4 and divisions 3.a and 7.d. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size		
		2016	2017	2018		2016	2017	2018
Maximum sustainable yield	F_{MSY}	✗	✗	✗ Above		✓ $MSY B_{trigger}$	✓	✓ Above trigger
Precautionary approach	F_{pa}, F_{lim}	○	○	○ Increased risk		✓ B_{pa}, B_{lim}	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	—	—	—		— B_{MGT}	—	—

Catch scenarios

Table 2 Witch in Subarea 4 and divisions 3.a and 7.d. Assumptions made for the interim year and in the forecast.

Variable	Value	Note
F_{4-8} (2019)	0.237	$F_{sq} = F_{4-8}$ (2018).
SSB (2019)	4748	Tonnes; SSB at the middle of the year (i.e. spawning time) before the TAC year.
$R_{age 1}$ (2019, 2020, 2021)	9761	Thousands; Median of the resampled recruitment estimates of 2016–2018.
Total catch (2019)	2368	Tonnes; Short-term forecast.
Wanted catch (2019)	2346	Tonnes; Based on wanted catch fraction (average 2016–2018).
Unwanted catch (2019)	22	Tonnes; Based on unwanted catch fraction (average 2016–2018).

Table 3 Witch in Subarea 4 and divisions 3.a and 7.d. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2020)	Wanted catch (2020) *	Unwanted catch (2020) *	total catch ages 4–8 (2020 & 2021)	SSB (2020)	SSB (2021)	% SSB change **	% Advice change ***
ICES advice basis								
Precautionary approach: F_{pa}	1651	1608	43	0.20	4101	3622	–11.7	–31
Other scenarios								
MSY approach: F_{MSY}	1301	1266	35	0.154	4206	3915	–6.9	–46
$F_{MSY-upper}^{\dagger}$	1726	1680	47	0.21	4078	3559	–12.7	–28
$F_{MSY-lower}$	938	913	25	0.108	4315	4229	–2	–61
$F = 0$	0	0	0	0	4578	5027	9.8	–100
F_{pa}	1651	1608	43	0.2	4101	3622	–11.7	–31
F_{lim}	2350	2286	64	0.3	3880	3061	–21	–1.66
F_{sq}	1925	1866	59	0.24	4011	3393	–15.4	–19.5
SSB (2021) = B_{lim}	2339	2275	64	0.3	3883	3069	–21	–2.1
SSB (2021) = B_{pa}	312	304	7	0.035	4492	4745	5.6	–87
SSB (2021) = $MSY B_{trigger}$	117	304	7	0.035	4492	4745	5.6	–87
Roll-over advice	2390	2326	64	0.31	3866	2846	–26	0

* “Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on average discard rate estimates for 2016–2018.

** SSB in 2021 relative to SSB in 2020.

*** Total catch in 2020 relative to advice value 2019 (2390 tonnes).

The change in advice (–31 %) is due to a changed perception of the stock following a benchmark in 2018 (ICES, 2018a), during which the advice basis for witch changed from a category 3 to a category 1 stock.

[†] Version 2. FMSY upper scenario updated.

Basis of the advice

Table 4 Witch in Subarea 4 and divisions 3.a and 7.d. The basis of the advice.

Advice basis	Precautionary approach.
Management plan	The EU multiannual plan (MAP) for stocks in the North Sea (EU, 2018) and adjacent waters applies to by-catches of this stock. The EC has requested that ICES provide advice based on the precautionary approach.

Quality of the assessment

Witch was benchmarked in 2018 (ICES, 2018a), changing the perception of stock status and trends compared with previous advice.

Witch are generally distributed in deeper areas, and the IBTS survey does not cover some of that habitat. A fisheries-independent survey that has both adequate catchability of large flatfish and covers the entire distribution area of the stock, would improve the assessment.

Age information is only available from 2009 onwards, increasing the uncertainty prior to 2009 in the assessment.

Issues relevant for the advice

This is the first time ICES provides advice for witch as a category 1 stock.

The basis for the advice this year is the precautionary approach, as requested by the European Commission.

The precautionary advice for this stock is based on a constant fishing mortality that has a low probability of bringing SSB below B_{lim} in the long term ($F_{P.05} = 0.20$; see ICES, 2018b). This would imply a decrease in F compared to current levels (0.24), but still above F_{MSY} (0.154).

Witch is mainly a bycatch species in mixed fisheries. Witch and lemon sole are largely caught by different fisheries in different areas. Management of lemon sole and witch under a combined species TAC may hinder effective management of the single-species exploitation rates and could potentially lead to the overexploitation of witch. A single-species TAC for witch, covering the entire stock, would be more appropriate.

Reference points

Table 5 Witch in Subarea 4 and divisions 3.a and 7.d. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	4 745	Set equal to B_{pa} .	ICES (2018a)
	F_{MSY}	0.154	EQsim simulation of long-term yield.	ICES (2018a)
Precautionary approach	B_{lim}	3 069	Breakpoint in a segmented regression, based on recruitment 1940–2016.	ICES (2018a)
	B_{pa}	4 745	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.265$ is the standard deviation of the $\ln(SSB(2017))$.	ICES (2018a)
	F_{lim}	0.30	Simulation using B_{lim} and B_{pa} with no assessment and advice noise.	ICES (2018a)
	F_{pa}	0.20	$F_{P.05}$ without ICES advice rule.	ICES (2019)

Basis of the assessment

Table 6 Witch in Subarea 4 and divisions 3.a and 7.d. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018b).
Assessment type	Age-based analytical assessment (SAM; ICES, 2018a).
Input data	In order to obtain convergence, artificial catch-at-age data were added to the beginning of the time-series (1940–1944), leaving a period of five years without data before the total landings series started in 1950. Commercial catches (international landings and ages from catch sampling by métier raised in Intercatch). Three survey indices (IBTS Q1 from 1983, IBTS Q3 from 1991, BTS Q1 from 1991); age-based from 2009–2018, total biomass until 2008. Assumed constant natural mortality (over ages and years) and maturity ogive (over years).
Discards and bycatch	Discards were quantified for the years 2002–2018. Discards ranged between 9.5% and 23.3% of the total catches. The discard coverage in 2018 was 91%.
Additional indicators	None.
Other information	Benchmarked in 2018 (ICES, 2018a).
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

Information from stakeholders

There is no additional available information for this stock.

History of the advice, catch, and management

Table 7 Witch in Subarea 4 and divisions 3.a and 7.d. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted landings corresp. to advice	Predicted catches corresp. to advice	Agreed TAC* 2.a and 4	Official landings 4, 3.a, 7.d	Official landings 4, 3.a, 7.d	ICES landings 4, 3.a, 7.d	ICES discards 4, 3.a, 7.d	ICES catch 4, 3.a, 7.d
		witch	witch	witch and lemon sole	witch				
2006				6175	6593	2303	2335	296	2631
2007				6175	6725	2237	2271	199	2470
2008				6793	5929	1954	1999	318	2317
2009				6793	5212	1818	1863	455	2319
2010				521	4691	1490	1531	559	2090
2011				6391	5552	1530	1567	547	2114
2012	Reduce catches			6391	5922	1896	1952	555	2507
2013	No new advice, same as for 2012			6391	5754	1993	2013	254	2267
2014	Decrease landings by 4% (last 3 years' average)	< 1574 **		6391	6335	2646	2685	307	2992
2015	No new advice, same as for 2014	< 1574 *		6391	5752	2359	2240	449	2690
2016	Precautionary approach (increase catches by no more than 20%)		≤ 2212	6391	6463	2658	2744	390	3135

Year	ICES advice	Predicted landings corresp. to advice	Predicted catches corresp. to advice	Agreed TAC* 2.a and 4	Official landings 4, 3.a, 7.d	Official landings 4, 3.a, 7.d	ICES landings 4, 3.a, 7.d	ICES discards 4, 3.a, 7.d	ICES catch 4, 3.a, 7.d
		witch	witch	witch and lemon sole			witch		
2017	Precautionary approach (same advised catch value as given for 2016)		≤ 2212	6391	6064	2811	2850	236	3085
2018	Precautionary approach (increase catches by no more than 8%)		≤ 2390	6391	5966	3001	3011	199	3209
2019	Precautionary approach (same advised catch value as given for 2018)		≤ 2390	7874					
2020	Precautionary approach		≤ 1651						

* EU combined TAC for witch and lemon sole in EU waters of Subarea 4 and Division 3.a.

** Advice based on official landings.

History of the catch and landings

Table 8 Witch in Subarea 4 and divisions 3.a and 7.d. Catch distribution by fleet in 2018 as estimated by ICES.

Catch (2018)	Landings		Discards
	Bottom otter trawl 90.5%	Others 9.5%	
3209 tonnes	3210 tonnes		199 tonnes

Table 9 Witch in Subarea 4 and divisions 3.a and 7.d. History of official landings (3.a and 4), and ICES estimates of landings, catches, and discards (Division 3.a, Subarea 4, and Division 7.d). All weights are in tonnes.

Year	Belgium	Germany		Denmark		Faroe Islands	France	Netherlands		Norway		Sweden		UK	Total landings	ICES estimates (3.a, 4, 7.d)		
	4	3.a	4	3.a	4	4	4	3.a	4	3.a	4	3.a	4	4	3.a and 4	landings	discards	catches
1968	15	0	21	173	108	0	0	0	0	12	5	0	0	840	1174			
1969	3	0	9	150	153	0	0	0	0	6	7	0	0	563	891			
1970	5	0	5	108	112	0	0	0	0	10	9	0	0	348	597			
1971	6	0	6	142	191	0	0	0	0	20	16	0	0	462	843			
1972	0	0	12	219	221	0	0	0	0	16	16	0	0	424	908			
1973	0	0	25	253	215	0	0	0	0	24	51	0	0	461	1494			
1974	0	0	18	291	221	0	0	0	0	13	3	0	0	592	1138			
1975	0	0	20	484	242	0	0	0	0	14	2	474	20	585	1841			
1976	0	0	24	441	175	0	0	0	0	18	3	319	5	511	1496			
1977	0	0	73	444	92	0	0	0	0	13	2	281	0	713	1618			
1978	0	0	37	473	87	0	1	0	0	1	1	232	0	819	1664			
1979	0	0	7	456	91	0	3	0	0	1	1	201	0	792	1572			
1980	0	0	23	569	111	0	2	0	0	4	2	256	0	871	1883			
1981	0	0	17	643	123	0	0	0	0	14	2	307	0	747	1933			
1982	0	0	16	953	495	0	0	0	0	79	2	421	4	1185	3155			
1983	0	0	19	1108	685	0	5	0	0	99	2	391	1	1296	3606			
1984	0	0	11	1158	687	0	4	0	0	158	3	480	3	1399	3903			
1985	0	0	21	1374	460	0	1	0	0	98	2	449	3	1571	3979			
1986	0	0	18	992	436	0	12	0	0	82	2	352	3	1682	3579			
1987	0	0	7	894	571	0	35	0	0	86	5	272	3	1827	3700			
1988	0	0	6	810	447	0	13	0	9	74	9	326	3	1593	3290			
1989	0	0	5	963	452	0	14	0	10	164	15	393	4	1821	3841			
1990	0	0	3	994	532	0	20	0	4	157	40	347	6	1759	3862			
1991	0	0	3	789	512	0	9	0	2	160	75	352	12	1727	3641			
1992	0	0	5	609	460	0	13	0	7	134	46	494	5	1391	3164			
1993	0	0	3	453	383	0	14	0	13	100	52	397	3	1255	2673			
1994	0	0	5	400	458	1	2	0	14	61	57	310	3	1385	2696			
1995	0	0	9	513	384	1	0	0	7	86	14	340	2	1451	2810			
1996	0	0	7	563	434	0	0	0	0	66	14	273	2	1431	2790			
1997	0	0	9	1074	488	1	0	0	1	76	10	352	3	1480	3494			
1998	0	0	13	1430	471	1	0	0	4	112	27	444	4	1275	3786			
1999	0	1	8	1629	486	1	0	0	9	111	23	499	2	1256	4025			
2000	0	0	13	1821	577	0	0	0	7	85	12	571	8	1388	4422			
2001	0	0	8	1304	744	0	0	0	1	72	16	563	12	1486	4206			
2002	0	0	5	1364	543	0	0	0	0	66	16	576	8	1062	3640	3813	1529	5341

Year	Belgium	Germany		Denmark		Faroe Islands	France	Netherlands		Norway		Sweden		UK	Total landings	ICES estimates (3.a, 4, 7.d)		
	4	3.a	4	3.a	4	4	4	3.a	4	3.a	4	3.a	4	4	3.a and 4	landings	discards	catches
2003	0	0	2	1036	771	0	0	0	0	64	23	546	3	836	3281	3308	349	3657
2004	0	1	3	1188	623	0	0	0	1	51	36	540	3	575	3030	3059	369	3428
2005	0	3	4	1006	715	0	0	0	4	42	40	557	2	443	2816	2960	419	3379
2006	0	2	6	635	654	0	0	0	3	37	31	36	2	564	2303	2335	296	2631
2007	0	2	10	618	531	0	0	0	7	45	28	284	6	706	2237	2271	199	2470
2008	0	1	6	476	351	0	0	0	19	46	58	260	19	717	1953	1999	318	2317
2009	0	0	5	593	350	0	0	0	12	28	57	152	6	615	1816	1863	455	2319
2010	0	1	7	537	251	0	0	0	9	25	40	112	1	507	1489	1531	559	2090
2011	0	1	25	565	245	0	0	0	18	23	2	104	1	523	1530	1567	547	2114
2012	0	0	4	921	246	0	0	0	19	31	20	153	2	499	1895	1952	555	2507
2013	5	1	6	803	252	0	0	0	21	28	89	169	1	618	1993	2013	254	2267
2014	15	1	7	1275	237	0	0	2	24	24	119	260	1	681	2646	2685	307	2992
2015	12	0	7	943	291	0	0	2	12	2	92	282	0	532	2196	2240	449	2690
2016	12	0	10	989	534	0	0	10	20	39	164	210	2	694	2684	2744	390	3135
2017	9	0	8	945	542	0	0	3	70	27	107	214	1	939	2865	2850	236	3086
2018	16	1	15	795	499	0	0	2	108	20	255	160	1	1129	3001	3010	199	3209

Summary of the assessment

Table 10 Witch in Subarea 4 and divisions 3.a and 7.d. Assessment summary. Weights are in tonnes.

Year	Recruitment			SSB			Landings	Discards	F		
	Age 1	High	Low	SSB	High	Low			Ages 4–8	High	Low
1950	26944	48817	14871	3504	7335	1674	2379		0.29	0.5	0.161
1951	27793	49372	15646	3456	7217	1655	2568		0.31	0.5	0.168
1952	30773	54222	17465	3297	6994	1555	2554		0.3	0.5	0.170
1953	34413	59817	19798	3049	6665	1395	2263		0.3	0.59	0.161
1954	36464	63404	20971	2843	6352	1272	1590		0.28	0.55	0.142
1955	35019	62309	19682	2842	6411	1260	2027		0.3	0.58	0.150
1956	29793	54317	16341	2871	6426	1283	1936		0.29	0.57	0.149
1957	24563	45612	13227	2981	6541	1359	1991		0.29	0.57	0.152
1958	21609	39582	11797	3114	6709	1445	2678		0.32	0.61	0.169
1959	20731	37121	11578	3070	6581	1432	2333		0.32	0.61	0.170
1960	19743	36066	10808	2919	6382	1335	2563		0.34	0.65	0.177
1961	17640	32696	9517	2622	5969	1151	2093		0.33	0.65	0.168
1962	15696	28765	8564	2352	5526	1001	1419		0.30	0.60	0.150
1963	14369	26347	7836	2216	5272	931	1522		0.31	0.62	0.156
1964	12766	24044	6778	2070	4955	865	1760		0.34	0.67	0.170
1965	11182	21291	5873	1839	4415	766	1356		0.33	0.66	0.164
1966	10978	20428	5899	1641	3963	679	1137		0.32	0.65	0.159
1967	12773	22782	7162	1490	3619	613	1123		0.33	0.67	0.165
1968	17221	29773	9961	1338	3312	541	1174		0.35	0.72	0.172
1969	22223	38188	12933	1170	2971	461	891		0.33	0.70	0.156
1970	25286	43970	14541	1083	2750	421	597		0.29	0.62	0.134
1971	25586	44361	14757	1150	2819	469	843		0.30	0.63	0.143
1972	25417	44670	14462	1303	3013	501	908		0.30	0.61	0.146
1973	25125	44196	14283	1544	3404	700	1494		0.32	0.63	0.162
1974	25542	45131	14456	1732	3695	747	1138		0.30	0.58	0.152
1975	27424	48446	15524	1947	4081	929	1841		0.32	0.61	0.169
1976	31600	55277	18065	2032	4235	975	1496		0.31	0.58	0.163
1977	39875	68590	23181	2127	4426	1023	1618		0.31	0.57	0.165
1978	51233	86114	30481	2212	4565	1071	1664		0.30	0.56	0.166
1979	60194	102830	35236	2337	4713	1156	1572		0.29	0.53	0.161
1980	61641	107193	35446	2600	5045	1340	1883		0.29	0.51	0.166
1981	58389	101975	33433	3022	5527	1652	1933		0.28	0.48	0.167
1982	55230	96509	31607	3071	6312	2135	3155		0.31	0.49	0.193
1983	53634	93401	30798	4241	6915	2602	3606		0.32	0.49	0.21
1984	55235	95055	32096	4574	7239	2891	3903		0.32	0.49	0.22
1985	57446	97559	33826	4721	7397	3016	3979		0.32	0.48	0.22
1986	57725	98674	33729	4774	7452	3058	3579		0.31	0.46	0.21
1987	52809	91660	30426	4814	7510	3086	3700		0.31	0.46	0.21
1988	46776	82338	25577	4864	7527	3143	3290		0.30	0.43	0.20
1989	42465	74791	21111	5083	7766	3327	3841		0.30	0.43	0.21
1990	41986	73164	24094	5163	7759	3436	3862		0.30	0.43	0.21
1991	43865	75541	25472	5160	7640	3485	3641		0.29	0.41	0.21
1992	47786	80480	28025	5013	7355	3416	3164		0.27	0.38	0.193
1993	50574	86704	29958	4879	7141	3333	2673		0.26	0.36	0.181
1994	52920	91137	30729	4807	7025	3289	2696		0.25	0.36	0.179
1995	52117	90767	30618	4901	7163	3354	2810		0.26	0.36	0.181
1996	52091	88844	30550	4969	7222	3418	2790		0.26	0.37	0.185
1997	48996	85312	29299	5111	7423	3519	3494		0.29	0.41	0.21
1998	45864	80980	27120	5032	7361	3440	3786		0.32	0.45	0.23
1999	43244	75677	24711	4788	7130	3215	4024		0.35	0.51	0.25
2000	44436	72639	23637	4424	6730	2908	4422		0.39	0.57	0.27
2001	43501	72932	25947	4021	6169	2621	4206		0.42	0.60	0.29
2002	42636	70324	25849	3562	5441	2332	3813	1529	0.43	0.61	0.31
2003	37802	61543	23219	3171	4712	2134	3308	349	0.43	0.59	0.32

Year	Recruitment			SSB			Landings	Discards	F		
	Age 1	High	Low	SSB	High	Low			Ages 4–8	High	Low
2004	29129	47057	18031	2853	4048	2010	3059	369	0.43	0.57	0.33
2005	24642	39611	15330	2691	3612	2005	2960	419	0.42	0.53	0.33
2006	25433	39658	16310	2600	3328	2031	2335	296	0.38	0.47	0.30
2007	22011	35702	13570	2605	3240	2094	2271	199	0.36	0.45	0.29
2008	45048	66212	30649	2522	3105	2048	1999	318	0.35	0.43	0.28
2009	82315	117821	57509	2303	2874	1846	1863	455	0.33	0.45	0.28
2010	78253	113109	54138	2229	2830	1756	1531	559	0.31	0.40	0.25
2011	38770	56948	26395	2592	3327	2020	1567	547	0.24	0.31	0.180
2012	29349	43249	19916	3350	4344	2584	1952	555	0.22	0.27	0.152
2013	30023	44556	20230	4320	5702	3273	2013	254	0.195	0.26	0.144
2014	28852	43596	19094	5210	7033	3859	2685	307	0.22	0.29	0.159
2015	17677	27426	11393	5350	7418	3858	2240	441	0.21	0.29	0.150
2016	9761	16029	5944	5449	7816	3799	2744	390	0.21	0.30	0.146
2017	14992	25658	8760	5472	8291	3612	2850	236	0.24	0.36	0.162
2018	9679	18848	4970	5217	8566	3177	3010	199	0.24	0.37	0.152
2019	9761*										

* Resampled from 2016–2018 recruitment.

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