

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

ICES stock advice

ICES advises that when the precautionary approach is applied, catches should be no more than 2390 tonnes in each of the years 2018 and 2019. If discard rates do not change from the average of the last three years (2014–2016), this implies annual landings of no more than 2079 tonnes.

Stock development over time

Landings declined from a peak in the 1990s to a low at the end of the 2000s, and have recently increased. The spawning biomass index (IBTS Q1) declined from a high value in the mid-1990s to a low at the end of the 2000s, and has shown a recent increase. The spawning biomass index (IBTS Q3) has fluctuated without trend.

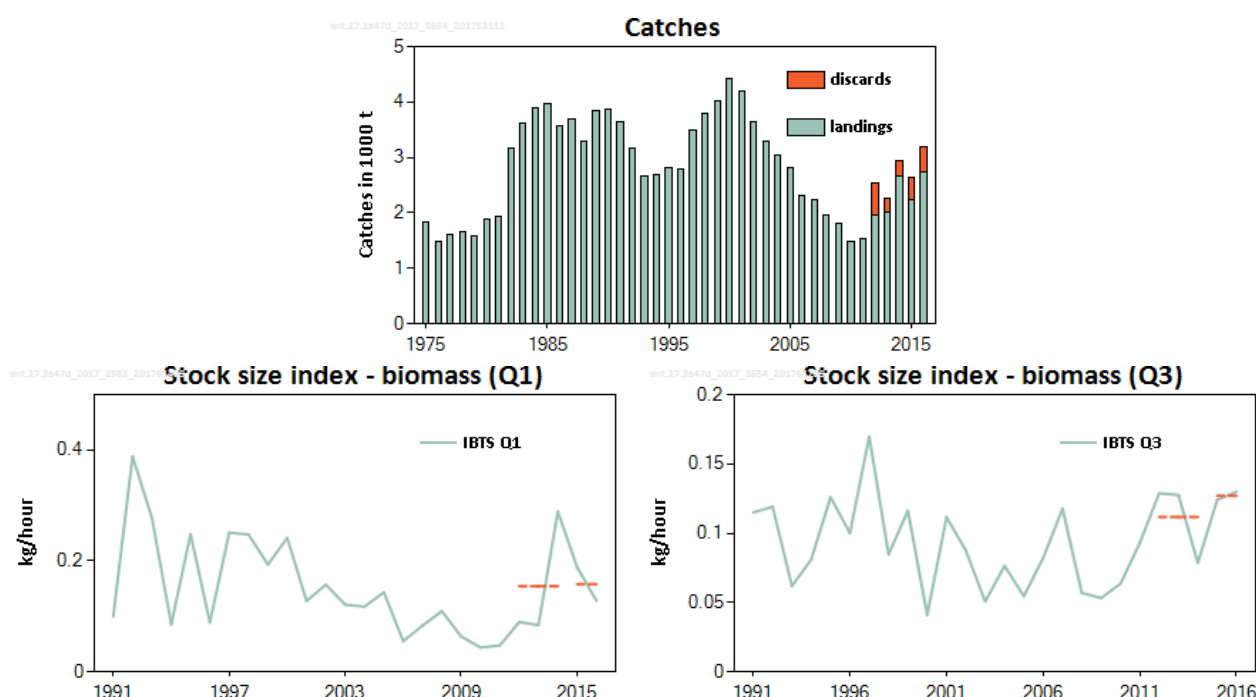


Figure 1 Witch in Subarea 4 and divisions 3.a and 7.d. Official landings and discards (in thousand tonnes). Discards data have only been included since 2012. Spawning biomass indices (kg h^{-1}) from the IBTS survey in Q1 and Q3 were estimated for the mature portion of the stock (i.e. all individuals larger than 34 cm).

Stock and exploitation status

Table 1 Witch in Subarea 4 and divisions 3.a and 7.d. State of the stock and fishery relative to reference points. The fishing pressure and stock size status indicators are based on the SPiCT analyses shown in Figure 2.

		Fishing pressure				Stock size		
		2014	2015	2016		2015	2016	2017
Maximum sustainable yield	F_{MSY} proxy	✓	✓	✓ Below		$MSY B_{trigger}$ proxy	✓	✓ Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓ Below possible reference points		B_{pa}, B_{lim}	✓	✓ Above possible reference points
Management plan	F_{MGT}	—	—	— Not applicable		B_{MGT}	—	— Not applicable
Qualitative evaluation	-	—	—	— -		-	—	— -

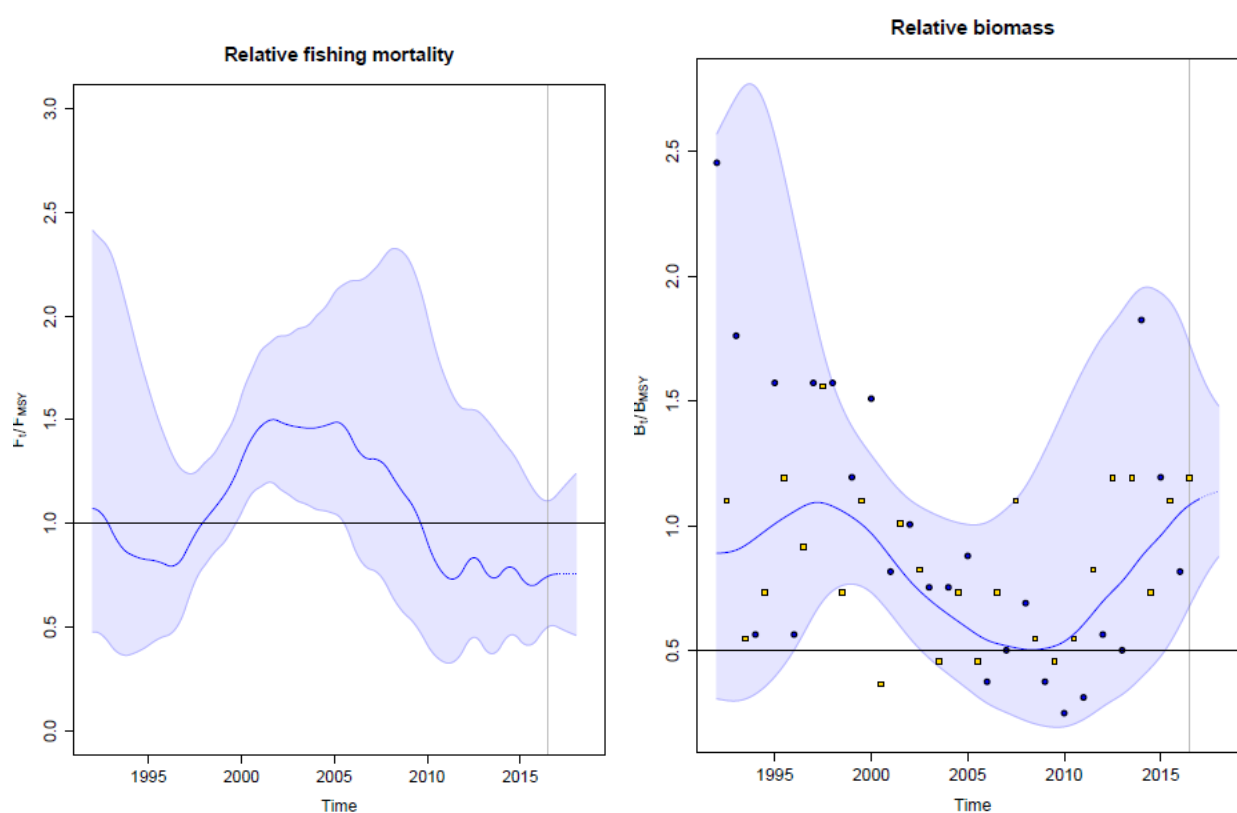


Figure 2 Witch in Subarea 4 and divisions 3.a and 7.d. SPiCT analysis showing exploitable biomass relative to B_{MSY} and fishing mortality relative to F_{MSY} . The symbols in the relative biomass plot indicate observed biomass indices (blue circles = IBTS Q1, yellow squares = IBTS Q3), while the shaded areas in both plots indicate 95% confidence intervals. The horizontal lines indicate levels relative to the F_{MSY} and $MSY B_{trigger}$ proxies.

Catch options

The ICES framework for category 3 stocks was applied (ICES, 2012). Spawning biomass indices, based on the IBTS Q1 and Q3, were applied as indicators of stock development. The advice is based on a comparison of, for each index, the two latest values (index A) with the three preceding values (index B), then averaged across the two indices and multiplied by the recent advised catch. The averaged index indicates an increase of 8% between 2012–2014 and 2015–2016; therefore, the uncertainty cap was not applied.

The Surplus Production in Continuous Time (SPiCT; Pedersen and Berg, 2017) analysis suggests the fishing mortality is below, and the stock size above proxies of the MSY reference points (Figure 2); therefore, no additional precautionary buffer was applied.

Table 2 Witch in Subarea 4 and divisions 3.a and 7.d. The basis for the catch options.*

Index A (2015–2016)	Q1: 0.158 kg h ⁻¹ ; Q3: 0.127 kg h ⁻¹	
Index B (2012–2014)	Q1: 0.154 kg h ⁻¹ ; Q3: 0.112 kg h ⁻¹	
Index ratio (A/B)	Q1: 1.026 and Q3: 1.137; average: 1.08	
Uncertainty cap	Not applied	-
Advised catch for 2016–2017	2212 tonnes	
Discard rate (average 2014–2016)	0.130	
Precautionary buffer	Not applied	-
Catch advice**	2390 tonnes	
Landings corresponding to the catch advice***	2079 tonnes	

* The figures in the table are rounded. Calculations were done with unrounded inputs and computed values may not match exactly when calculated using the rounded figures in the table.

** [Advised catch for 2016–2017] × [average index ratio].

*** [Advised catch for 2016–2017] × [average index ratio] × [1 – discard rate].

Basis of the advice

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

Advice basis	Precautionary approach.
Management plan	ICES is not aware of any agreed precautionary management plan for witch in this area.

Quality of the assessment

Witch are generally distributed in deeper areas and the IBTS survey does not cover some of that habitat. A fishery-independent index covering the entire distribution area of the stock and targeting witch could improve the assessment.

Issues relevant for the advice

Witch is mainly a bycatch species in mixed fisheries. Management of lemon sole and witch under a combined species TAC prevents effective control of the single-species exploitation rates and could potentially lead to the overexploitation of either species. A single-species TAC could be more appropriate.

In 2017, for the first time, the fishing pressure and stock size status indicators are based on the SPiCT analyses.

Reference points

Table 4 Witch in Subarea 4 and divisions 3.a and 7.d. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{\text{trigger proxy}}$	$\frac{B}{B_{\text{MSY}}} = 0.5$	$0.5 \times B_{\text{MSY}}$ (estimated by SPiCT from model parameters, using data from 1992–2016)	ICES (2017)
	$F_{\text{MSY proxy}}$	$\frac{F}{F_{\text{MSY}}} = 1^*$	F_{MSY} (estimated by SPiCT from model parameters, using data from 1992–2016)	ICES (2017)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	SSB_{mgt}	Not defined		
	F_{mgt}	Not defined		

* No reference points are defined for this stock in terms of absolute values. The SPiCT-estimated values of the ratios F/F_{MSY} and B/B_{MSY} are used to estimate stock status relative to the proxy MSY reference points.

Basis of the assessment

Table 5 Witch in Subarea 4 and divisions 3.a and 7.d. Basis of the assessment and advice.

ICES stock data category	3 (ICES, 2016).
Assessment type	Survey trends-based assessment (ICES, 2017).
Input data	Catch statistics, two survey indices (IBTS Q1 and Q3).
Discards and bycatch	Discards were quantified for the years 2012–2016. Discards ranged between 9.5% and 23.3% of the total
Additional indicators	SPiCT assessment.
Other information	None.
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.

History of the advice, catch, and management

Table 6 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* 3.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 and lemon sole			witch		
2006				6175	6593	2303			
2007				6175	6725	2237			
2008				6793	5929	1954			
2009				6793	5212	1818			
2010				6521	4691	1490			
2011				6391	5552	1530			
2012	Reduce catches			6391	5922	1896	1953	592	2544
2013	No new advice, same as for 2012			6391	5754	1993	2020	252	2272
2014	Decrease landings by 4% (last 3 years' average)	< 1574**		6391	6335	2646	2669	281	2950
2015	No new advice, same as for 2014	< 1574 **		6391	5752	2359	2238	410	2649
2016	Precautionary approach (increase catches by no more than 20%)		≤ 2212	6391	6463	2658	2739	448	3187
2017	Precautionary approach (same advised catch value as given for 2016)		≤ 2212	6391					
2018	Precautionary approach (increase catches by no more than 8%)		≤ 2390						
2019	Precautionary approach (same advised catch value as given for 2018)		≤ 2390						

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

** Advice based on official landings.

History of the catch and landings

Table 7 Witch in Subarea 4 and divisions 3.a and 7.d. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings		Discards
3187 tonnes	Bottom otter trawl 89%	Others 11%	448 tonnes
	2739 tonnes		

Table 8 Witch in Subarea 4 and divisions 3.a and 7.d. History of official landings, ICES landings, ICES catches, and ICES discards. All weights are in tonnes.

Year	Official landings	ICES landings	ICES catches	ICES discards
1968	1174			
1969	891			
1970	597			
1971	843			
1972	908			
1973	1494			
1974	1138			
1975	1841			
1976	1496			
1977	1618			
1978	1664			
1979	1572			
1980	1883			
1981	1933			
1982	3155			
1983	3606			
1984	3903			
1985	3979			
1986	3579			
1987	3700			
1988	3290			
1989	3841			
1990	3862			
1991	3641			
1992	3164			
1993	2673			
1994	2696			
1995	2810			
1996	2790			
1997	3494			
1998	3786			
1999	4024			
2000	4422			
2001	4206			
2002	3640			
2003	3281			
2004	3029			
2005	2813			
2006	2303			
2007	2236			
2008	1953			
2009	1818			
2010	1490			
2011	1530			
2012	1895	1953	2544	592
2013	1993	2020	2272	252
2014	2646	2669	2950	281
2015	2359	2238	2649	410
2016	2658	2739	3187	448

Summary of the assessment

Table 9 Witch in Subarea 4 and divisions 3.a and 7.d. Assessment summary. Weights are in tonnes.

Year	Biomass index	Biomass index	ICES landings	ICES discards
1975			1841	
1976			1496	
1977			1618	
1978			1664	
1979			1572	
1980			1883	
1981			1933	
1982			3155	
1983			3606	
1984			3903	
1985			3979	
1986			3579	
1987			3700	
1988			3290	
1989			3841	
1990			3862	
1991	0.100	0.115	3641	
1992	0.39	0.119	3164	
1993	0.28	0.062	2673	
1994	0.086	0.081	2696	
1995	0.25	0.126	2810	
1996	0.089	0.100	2790	
1997	0.25	0.170	3494	
1998	0.25	0.085	3786	
1999	0.194	0.116	4024	
2000	0.24	0.041	4422	
2001	0.128	0.112	4206	
2002	0.157	0.088	3640	
2003	0.121	0.051	3281	
2004	0.118	0.076	3029	
2005	0.144	0.055	2813	
2006	0.055	0.082	2303	
2007	0.084	0.118	2236	
2008	0.109	0.057	1953	
2009	0.064	0.053	1818	
2010	0.044	0.064	1490	
2011	0.048	0.093	1530	
2012	0.090	0.129	1953	592
2013	0.084	0.128	2020	252
2014	0.29	0.079	2669	281
2015	0.188	0.124	2238	410
2016	0.128	0.130	2739	448

Sources and references

- ICES. 2012. ICES Implementation of Advice for Data-limited Stocks in 2012 in its 2012 Advice. ICES CM 2012/ACOM:68. 42 pp.
- ICES. 2016. Advice basis. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.
- ICES. 2017. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 26 April–5 May 2017, ICES Headquarters, Copenhagen, Denmark. ICES CM 2017/ACOM:21. In preparation.
- Pedersen, M. W., and Berg, C. W. 2017. A stochastic surplus production model in continuous time. *Fish and Fisheries*, 18: 226–243. doi: 10.1111/faf.12174.