

Whiting (*Merlangius merlangus*) in Subarea 4 and Division 7.d (North Sea and eastern English Channel)

ICES stock advice

Please note: The present advice replaces the advice given in June 2017 for catches in 2018.

ICES advises that when the MSY approach is applied, catches in 2018 should be no more than 26 191 tonnes.

Stock development over time

Spawning-stock biomass (SSB) has fluctuated around, and is now above MSY $B_{trigger}$. Fishing mortality (F) has been above F_{MSY} throughout the time-series. Since 2003 recruitment (R) has been generally lower than in previous years.

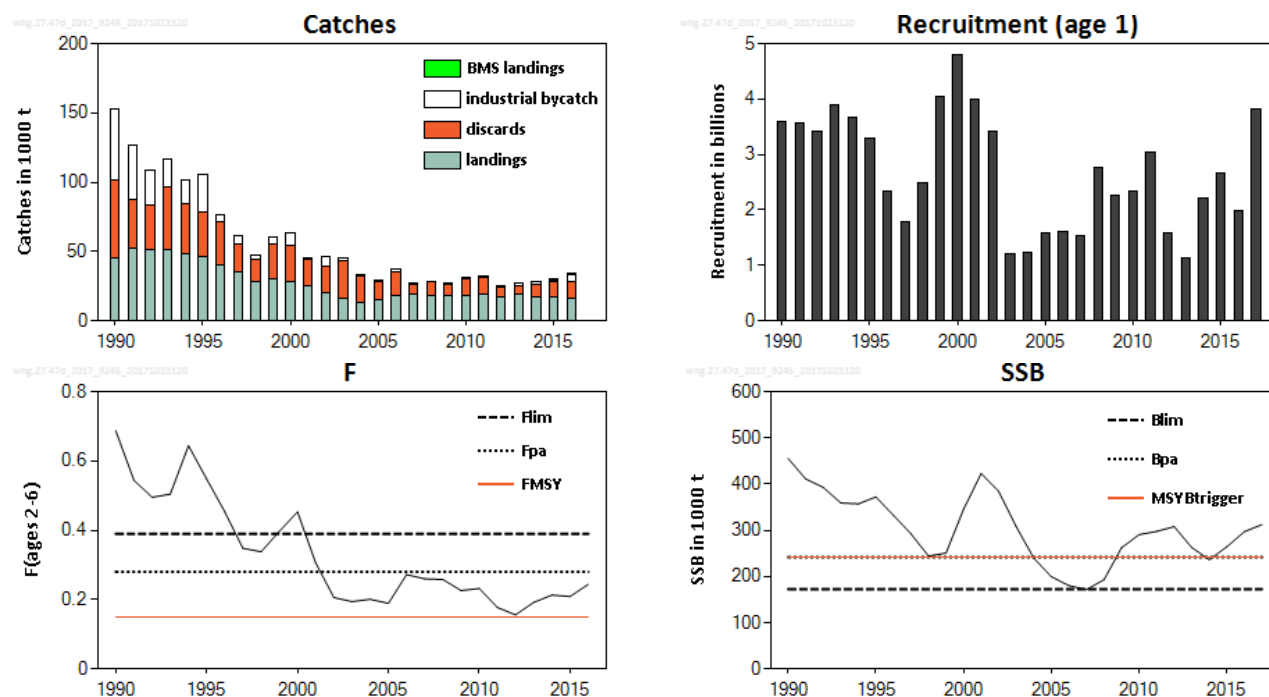


Figure 1 Whiting in Subarea 4 and Division 7.d. Summary of the stock assessment.

Stock and exploitation status

Table 1 Whiting in Subarea 4 and Division 7.d. State of the stock and fishery relative to reference points.

	Fishing pressure				Stock size			
	2014	2015	2016		2015	2016	2017	
Maximum sustainable yield	F_{MSY}	✗	✗	✗ Above	MSY	✓	✓	✓ Above trigger
Precautionary approach	F_{pa}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	-	-	- Not applicable	SSB_{MGT}	-	-	- Not applicable

Catch options

Table 2 Whiting in Subarea 4 and Division 7.d. The basis for the catch options.

Variable	Value	Source	Notes
F (2017)	0.244	ICES (2017a)	F (2016)
SSB (2018)	358 795	ICES (2017a)	Short-term forecast (STF); in tonnes.
R _{age 1} (2017)	3 815 195	ICES (2017a)	RCT3; in thousands.
R _{age 1} (2018)	1 012 691	ICES (2017a)	RCT3; in thousands.
R _{age 1} (2019)	2 443 772	ICES (2017a)	Geometric mean (GM, 1990–2016); in thousands.
Total catch (2017)	41 065	ICES (2017a)	STF; in tonnes.
Wanted catch (2017)	21 036	ICES (2017a)	STF; in tonnes. Landings rate by age equals average 2014–2016.
Unwanted catch (2017)	16 395	ICES (2017a)	STF; in tonnes. Discard rate by age equals average 2014–2016.
Industrial bycatch (2017)	3 634	ICES (2017a)	STF; in tonnes. Bycatch rate by age equals average 2014–2016.

Table 3 Whiting in Subarea 4 and Division 7.d. Annual catch options. All weights are in tonnes.

Basis	Total catch 2018	Total wanted catch 4+7.d 2018 *	Total unwanted catch 2018 *	Total IBC 2018 **	Wanted catch 4 2018 ***	Wanted catch 7.d 2018 ***	Total F 2018	F (wanted catch) 2018	F (unwanted catch) 2018	F(IBC) 2018	SSB 2019	% SSB change ^	% TAC change (wanted catch) ^^
ICES advice basis													
MSY approach: F _{MSY}	26191	13799	8546	3846	11040	2759	0.150	0.088	0.040	0.023	293339	-18.2%	-31%
Other options													
F = 0 (IBC only)	4008	0	0	4008	0	0	0.023	0.000	0.000	0.023	311439	-13.2%	-100%
F = F ₂₀₁₇	42196	23731	14737	3728	18986	4745	0.244	0.152	0.069	0.023	280305	-21.9%	19%
Rollover TAC	36266	20002	12492	3771	16003	3999	0.213	0.131	0.060	0.023	285191	-20.5%	0%
15% TAC decrease (27.4 only)	31395	17002	10585	3807	13603	3400	0.182	0.110	0.050	0.023	289132	-19.4%	-15%
15% TAC increase (27.4 only)	41137	23003	14399	3735	18403	4599	0.243	0.151	0.069	0.023	281250	-21.6%	15%
0.75 × F ₂₀₁₇	32372	17605	10967	3800	14085	3520	0.188	0.114	0.052	0.023	288339	-19.6%	-12%
1.25 × F ₂₀₁₇	50190	28578	17944	3669	22864	5714	0.299	0.190	0.087	0.023	273928	-23.7%	43%
F _{pa}	47142	26701	16750	3691	21362	5339	0.280	0.177	0.081	0.023	276393	-23.0%	33%
F _{lim}	64869	37618	23692	3560	30096	7522	0.390	0.252	0.115	0.023	262055	-27.0%	88%
SSB (2019) = B _{pa} = MSY B _{trigger}	89780	52958	33446	3376	42369	10589	0.545	0.359	0.163	0.023	241837	-32.6%	165%
SSB (2019) = B _{lim}	175057	105472	66838	2747	84383	21089	1.074	0.722	0.329	0.023	172741	-51.8%	427%
F _{mgt} = 0.15 (EU–Norway Management Plan)	31395	17002	10585	3807	13603	3400	0.182	0.11	0.05	0.023	289132	-19.4%	-15%
Mixed-fisheries options– <i>The mixed-fisheries considerations were published as part of the advice in June 2017 and have not been updated.</i>													
A: Max.	134306						0.87				274853	-22	
B: Min.	15153						0.08				367550	4	
C: HAD	25676						0.13				363256	3	
D: POK	46139						0.26				335921	-5	
E: SQ effort	37594						0.20				349038	-1	
F: Value	33833						0.18				352637	0	

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* “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 discard rate estimates for 2014–2016.

** The split of catch between wanted catch, unwanted catch, and industrial bycatch (IBC) in 2018 was done using partial age-dependent fishing mortalities as forecasting input. Partial F_s were calculated based on total F -at-age and the numbers-at-age per catch category as estimated in the assessment (average exploitation pattern of the three most recent years).

*** The wanted catch split between Subarea 4 and Division 7.d in 2018 is the same as the proportion of landings between the areas in 2016: 80% from Subarea 4 and 20% from Division 7.d. This assumes that management for Division 7.d is separate from Subarea 7. Total catches are based on a combined discard rate for Subarea 4 and Division 7.d.

^ SSB 2019 relative to SSB 2018.

^^ Human consumption (HC; wanted catch) for Subarea 4 in 2018 relative to TAC for Subarea 4 and Division 2.a in 2017 (16 003 t).

Mixed-fisheries assumptions (note: “fleet’s stock share” is used to describe the share of the fishing opportunities for each particular fleet, which has been calculated based on the single-stock advice for 2018 and the historical proportion of the stock landings taken by the fleet):

A. Maximum scenario: Each fleet stops fishing when its last stock share is exhausted.

B. Minimum scenario: Each fleet stops fishing when its first stock share is exhausted.

C. HAD: Each fleet stops fishing when its individual haddock share is exhausted.

D. POK: Each fleet stops fishing when its individual saithe share is exhausted.

E. SQ (*status quo*) effort scenario: The effort of each fleet in 2017 and 2018 is as in 2016.

F. Value scenario: The effort of each fleet is equal to the weighted average of the efforts required to catch the fleet’s quota share of each of the stocks, where the weights are the relative catch values of each stock in the fleet’s portfolio.

Basis of the advice

Table 4 Whiting in Subarea 4 and Division 7.d. The basis of the advice.

Advice basis	MSY approach
Management plan	<p>The MSY approach with F_{MSY} (estimated in 2016) replaces the EU–Norway management strategy for whiting in the North Sea that was used as the basis for advice in previous years.</p> <p>At an interbenchmark process in 2016, revised natural mortality values (ICES, 2016a) were applied. The risk of falling below B_{lim} was higher than 5% when using the harvest control rule F_{MGT}, as proposed in the EU–Norway management strategy (0.15 without a $B_{trigger}$ value). Therefore, the MSY approach is used, with an F_{MSY} of 0.15 and an additional check whether $SSB(2018) > B_{lim}$ (ICES, 2016a).</p>

Quality of the assessment

Catch data have been provided to ICES since 2012 through sampling programmes such as Fully Documented Fisheries (FDF), and there has been increased coverage by the Scottish industry/science observer sampling scheme.

In 2014, natural mortality estimates were revised substantially, which resulted in a rescaling of the recruitment. After the interbenchmark meeting in early 2016, it was decided to use these revised natural mortality values.

Stock identity remains an unresolved issue with this assessment, both within the North Sea and between the North Sea and neighbouring areas.

There have been issues with regard to the age readings of North Sea whiting compared to other gadoids; in particular, age readings used for the IBTS indices. Age-reading techniques were reviewed and coordinated between countries in late 2016 (ICES, 2016b), and continue to be investigated. Until these investigations have been concluded, reported age readings continue to be used as in previous years.

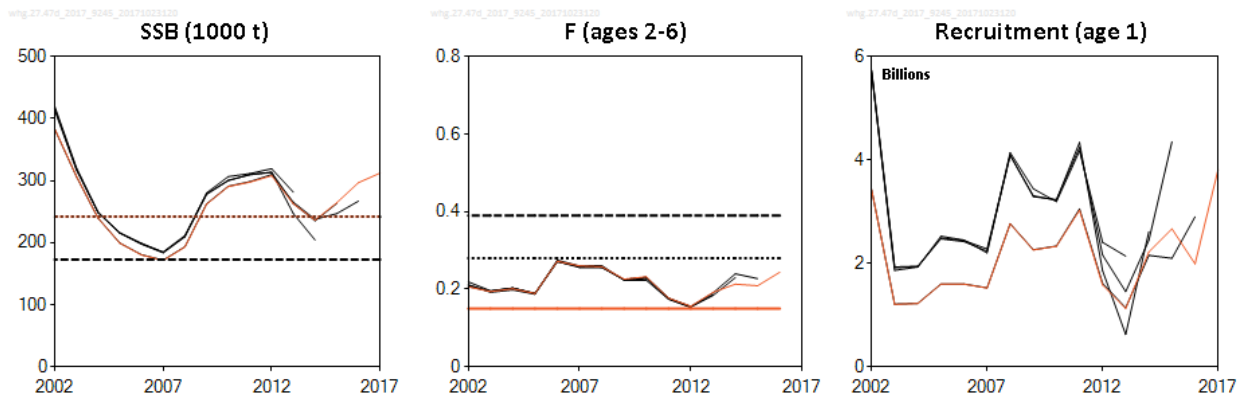


Figure 2 Whiting in Subarea 4 and Division 7.d. Historical assessment results.

Issues relevant for the advice

There is a concentration of whiting biomass in the western part of the North Sea; therefore, catch rates from some local fleets do not represent trends in the overall stock.

Because of updated natural mortality estimates (ICES, 2015, 2016a), the EU–Norway management strategy (fixed F without B_{trigger} and with TAC constraints; ICES, 2013a) used in previous years' advice is no longer considered precautionary. Currently, ICES provides advice on the MSY approach (with B_{trigger}).

The stock dynamics of North Sea whiting are largely driven by recruitment and natural mortality. To maximize the benefit for the fishery of this stock, the most significant measure would be to improve selectivity in those fisheries with high rates of discarding.

Based on the survey information (IBTS Q3) that has become available in summer 2017, the advice has been updated from that released in June 2017 (ICES, 2017b).

Results from a North Sea mixed-fisheries analysis are presented in ICES (2017c); this analysis has not been updated. The analysis for 2018, assuming a strictly implemented discard ban (corresponding to the “Minimum” scenario), indicated that whiting would be the most limiting stock, being estimated to constrain 24 out of 42 fleet segments. Haddock is the second most limiting stock, constraining eight fleet segments. Additionally, if Norway lobster was managed by separate TACs for the individual functional units (FUs), Norway lobster in FU 6 would be considered the most limiting stock for ten fleet segments. Conversely, in the “Maximum” scenario, saithe and eastern English Channel plaice would be the least limiting for 20 and 11 fleet segments, respectively. Finally, if Norway lobster was managed by separate TACs, Norway lobster in FUs 7, 5, 33, and outside the FUs in Subarea 4 would be the least limiting for nine, two, one, and two fleet segments, respectively. For those demersal fish stocks for which the F_{MSY} range is available, a “Range” scenario is presented that minimizes the potential for TAC mismatches in 2018 within the F_{MSY} range. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities for 2018, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for quota over- and undershoot. This “Range” scenario suggests that the potential for mixed-fisheries mismatch would be lowered with a 2018 TAC in the lower part of the F_{MSY} range for eastern English Channel plaice and saithe, and in the upper part of the range for cod and North Sea plaice. At the time of the mixed-fisheries analysis (ICES, 2017c), the F_{MSY} range for this stock had not yet been determined and the “Range” scenario was consequently not available.

Reference points

Table 5 Whiting in Subarea 4 and Division 7.d. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY B_{trigger}	241 837 t	B_{pa}	ICES (2016a)
	F_{MSY}	0.15	EQsim analysis based on the recruitment period 2004–2014*	ICES (2016a)
Precautionary approach	B_{lim}	172 741 t	B_{loss} (SSB in 2007, as estimated in the 2016 assessment)	ICES (2016a)
	B_{pa}	241 837 t	$B_{\text{lim}} \times \exp(1.645 \times 0.2) \approx 1.4 \times B_{\text{lim}}$	ICES (2016a)
	F_{lim}	0.39	EQsim analysis based on the recruitment period 2003–2014	ICES (2016a)
	F_{pa}	0.28	$F_{\text{lim}} \times \exp(-1.645 \times 0.2) \approx F_{\text{lim}} / 1.4$	ICES (2016a)
Management plan	SSB _{MGT}	Not defined		
	F_{MGT}	0.15	F_{MSY}	ICES (2013a)

*Version 2: recruitment year range corrected.

Basis of the assessment

Table 6 Whiting in Subarea 4 and Division 7.d. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016c)
Assessment type	Age-based analytical assessment XSA (ICES, 2017a) that uses catches in the model and in the forecast
Input data	Commercial catches (international landings, ages from catch sampling by métier), two survey indices (IBTS Q1 & Q3 ages 1 to 5); maturity data assumed fixed through time; time-varying natural mortalities from the SMS multispecies model (ICES, 2015).
Discards, BMS landings, and bycatch	Included in the assessment, using samples (in 2016) to estimate discards from France, UK (England), and UK (Scotland), covering 61% of landings. No biological samples were available from the industrial bycatch in 2016. Below minimum size (BMS) landings, where reported, are included with discards as unwanted catch in the assessment from 2015.
Indicators	None
Other information	This assessment was benchmarked in 2013 (WKROUND; ICES, 2013b). New natural mortality values were tested at an interbenchmark in early 2016 (ICES, 2016a).
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 7 Whiting in Subarea 4 and Division 7.d. ICES advice for the stock and by area (if any) and official landings by area. Predicted values are presented according to the catch option table. All weights are in tonnes. Values of landings, discards, and catches for the period 1994 to 2011 are presented to the nearest thousand tonnes.

Year	ICES advice	Predicted landings corresp. to advice	Predicted total catch corresp. to advice	Predicted wanted catch in Subarea 4 corresp. to advice	Agreed TAC	Off. landings	ICES estimates				
							Wanted catch	Indust. bycatch	Unwanted catch*	Total catch	BMS reported to ICES
							Subarea 4 (North Sea)				
1994	Significant reduction in effort; mixed fishery	-		-	100000	42000	42000	17000	32000	91000	-
1995	Significant reduction in effort; mixed fishery	-		-	81000	41000	41000	27000	29000	97000	-
1996	Mixed fishery; take into account cod advice	-		-	67000	35000	36000	5000	27000	68000	-
1997	Mixed fishery; take into account cod advice	-		-	74000	32000	31000	6000	17000	54000	-
1998	No increase from 1996 level	50700		44900	60000	24000	24000	3000	12000	40000	-
1999	At least 20% reduction of F(95–97)	33800		29900	44000	25000	26000	5000	22000	52000	-
2000	Lowest possible catch		0	0	30000	24000	24000	9000	22000	55000	-
2001	60% reduction of F(97–99)	21900		19400	30000	19000	19000	1000	16000	36000	-
2002	F not larger than 0.37	≤ 37000		≤ 33000	32000	16000	15000	7000	17000	39000	-
2003	No cod catches	-	-	-	16000	11000	10000	3000	26000	39000	-
2004	No cod catches. Fishing mortality in 2004 should be < F_{pa}		Catch should not increase compared to recent years	-	16000	9000	9000	1000	18000	28000	-
2005	No cod catches. Less than recent average	25000	52000		28500	8000	11000	1000	10000	22000	-
2006	No cod catches. Less than recent average	< 17300			23800	16000	15000	2000	14000	31000	-
2007	No cod catches. Less than recent average	< 15100			23800	16000	16000	1000	5000	22000	-
2008	No cod catches. Less than recent average	< 5000			17900	14000	13000	0	8000	22000	-
2009	No cod catches. $F < F_{max}$	< 5900	< 11000		15200	12000	12000	1000	5000	18000	-
2010	No cod catches. Stable SSB	< 6800	< 12500		12900	12000	12000	1000	8000	21000	-
2011	No cod catches. Stable SSB	< 12700	< 21900	< 9500	14832	13000	13000	2000	8000	23000	-
2012	Management plan	< 21300	< 31500	< 17100	17056	12588	12929	78	5929	18936	-

Subarea 4 (North Sea)											
Year	ICES advice	Predicted landings corresp. to advice	Predicted total catch corresp. to advice	Predicted wanted catch in Subarea 4 corresp. to advice	Agreed TAC	Off. landings	ICES estimates				
							Wanted catch	Indust. bycatch	Unwanted catch*	Total catch	BMS reported to ICES
2013	Precautionary considerations (F = 0.225) and separate management for Division 7.d	< 26000		< 19000	18932	13361	15384	1530	4198	21112	-
2014	November update: Precautionary considerations (15% TAC reduction) and separate management for Division 7.d	< 21199	< 31553	< 16092	16092	13791	15616	1479	8326	25421	-
2015	November update: Management plan and separate management for Division 7.d	< 17190	< 30579	< 13678	13678	13098	13608	2053	10468	26130	128
2016	EU–Norway management strategy		≤ 30510	≤ 12373	13678	12717	12684	4701	10474	27859	632
2017	MSY approach		≤ 23527	≤ 9744	16003						
2018	MSY approach		≤ 26191	≤ 11040							

* Unwanted catch includes discards and BMS landings.

Table 7 Con't.

Division 7.d (Eastern English Channel)											
Year	ICES advice	Predicted landings corresp. to advice	Predicted total catch corresp. to advice	Predicted wanted catch in Division 7.d corresp. to advice	Agreed TAC *	Official landings	ICES estimates				
							Wanted catch	Unwanted catch^	Total catch	BMS reported to ICES	
1994	No long-term gains in increasing F	-		-	-	7100	6600	3900	10500	-	
1995	Significant reduction in effort; link to North Sea	-		-	-	5600	5400	3200	8600	-	
1996	Reference made to North Sea advice	-		-	-	5100	5000	3400	8300	-	
1997	Reference made to North Sea advice	-		-	-	4800	4600	3000	7600	-	
1998	Reference made to North Sea advice	50700		5800	27000	4800	4600	3200	7800	-	
1999	Reference made to North Sea advice	33800		3900	25000	200	4400	3600	8000	-	
2000	Lowest possible catch		0	0	22000	6100	4300	4100	8400	-	
2001	60% reduction of F_{sq}	21900		2500	21000	6600	5800	3100	8900	-	
2002	F not larger than 0.37	≤ 37000		≤ 4000	31700	5400	5800	1300	7200	-	
2003	No cod catches	-	-	-	27000	7000	5700	600	6300	-	

Division 7.d (Eastern English Channel)										
Year	ICES advice	Predicted landings corresp. to advice	Predicted total catch corresp. to advice	Predicted wanted catch in Division 7.d corresp. to advice	Agreed TAC *	Official landings	ICES estimates			
							Wanted catch	Unwanted catch [^]	Total catch	BMS reported to ICES
2004	No cod catches. Fishing mortality should be $< F_{pa}$	-	Catch should not increase compared to recent years	-	21600	5300	4400	900	5300	-
2005	No cod catches	25000	52000		19900	4900	4800	2200	7000	-
2006	No cod catches. Less than recent average	< 17300			19900	3700	3400	2200	5700	-
2007	No cod catches. Less than recent average	< 15100			19900	3400	3300	1800	5000	-
2008	No cod catches. Less than recent average	< 5000			19900	200	4500	1900	6400	-
2009	No cod catches. $F < F_{max}$	< 5900	< 11000		16900	6600	6600	2500	9100	-
2010	No cod catches. Stable SSB	< 6800	< 12500		14400	6100	6000	3700	9700	-
2011	No cod catches. Stable SSB	< 12700	< 21900	< 3200	16600	5500	5100	3500	8600	-
2012	Management plan	< 21300	< 31500	< 4200	19053	857	4103	2446	6549	-
2013	Precautionary considerations ($F = 0.225$) and separate management for Division 7.d	< 26000		< 7000	24500	4293	3950	1778	5728	-
2014	November update: Precautionary considerations (15% TAC reduction) and separate management for Division 7.d	< 21199	< 31553	< 5106	20668	3212	3130	2125	5255	-
2015	November update: management plan and separate management for Division 7.d	< 17190	< 30579	< 3512	17742	4109	4098	2961	7059	0
2016	EU–Norway management strategy for Division 7.d		≤ 30510	< 2480	22778	3730	3170	2730	5900	0
2017	MSY approach		≤ 23527	≤ 2935	27500					
2018	MSY approach		≤ 26191	≤ 2759						

* Included in TAC for Subarea 7 (except Division 7.a).

[^] Unwanted catch includes BMS landings in 2015 and 2016.

History of the catch and wanted catch

Table 8 Whiting in Subarea 4 and Division 7.d. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Wanted catch				Unwanted catch		IBC
	demersal trawls and seine mesh size ≥120 mm (North Sea) 47%	demersal trawls mesh size 70–99 mm (North Sea) 11%	demersal trawls mesh size 70–99 mm (Eastern English Channel) 16%	Other 26%	Discards	BMS landings	
33 759 tonnes					12 572 tonnes	632 tonnes	4 701 tonnes
	15 854 tonnes				13 204 tonnes		

Table 9a Whiting in Subarea 4. History of human consumption landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes. NA = not available.

Year	Belgium	Denmark	France	Germany	Netherlands	Norway	Sweden	England (Wales)	Scotland	UK	Total landings	Unallocated landings	ICES landings
1990	1040	1206	4951	692	3273	55	16	2338	23486	NA	41057	-1123	42180
1991	913	1528	5188	865	4028	103	48	2676	31257	NA	46606	396	46210
1992	1030	1377	5115	511	5390	232	22	2528	30821	NA	47026	1816	45210
1993	944	1418	5502	441	4799	130	18	2774	31268	NA	47295	685	46610
1994	1042	549	4735	239	3864	79	10	2722	28974	NA	42214	344	41870
1995	880	368	5963	124	3640	115	1	2477	27811	NA	41379	829	40550
1996	843	189	4704	187	3388	66	1	2329	23409	NA	35116	-434	35550
1997	391	103	3526	196	2539	75	1	2638	22098	NA	31567	627	30940
1998	268	46	1908	103	1941	65	0	2909	16696	NA	23936	246	23690
1999	529	58	NA	176	1795	68	9	2268	17206	NA	NA	NA	25700
2000	536	105	2527	424	1884	33	4	1782	17158	NA	24453	173	24280
2001	454	105	3455	402	2478	44	6	1301	10589	NA	18834	-426	19260
2002	270	96	3314	354	2425	47	7	1322	7756	NA	15591	721	14870
2003	248	89	2675	334	1442	39	10	680	5734	NA	11251	801	10450
2004	144	62	1721	296	977	23	2	1209	5057	NA	9491	541	8950
2005	105	57	1261	149	805	16	0	2560	3441	NA	8394	-2286	10680
2006	93	251	2711	252	702	17	2	NA	NA	11632	15660	563	15097
2007	45	78	3336	76	618	11	1	NA	NA	12110	16275	609	15666
2008	115	42	3076	76	656	92	2	NA	NA	10391	14451	972	13479
2009	162	79	2305	124	718	73	4	NA	NA	8853	12318	544	11774
2010	147	156	2644	156	614	118	8	NA	NA	7845	11690	-591	12281
2011	74	135	2794	111	514	28	6	NA	NA	8892	12554	-751	13305
2012	45	131	1925	25	471	94	4	NA	NA	9893	12588	-341	12929
2013	33	124	942	44	495	560	1	NA	NA	11162	13361	-2023	15384
2014	46	160	1884	31	464	916	2	NA	NA	10248	13751	-1865	15616
2015	69	215	1130	73	548	1088	5	NA	NA	9970	13098	-510	13608
2016*	65	208	1232	0	644	1148	6	NA	NA	9406	12709	25	12684

* Preliminary.

Table 9b Whiting in Division 7.d. History of human consumption landings. Both the official and ICES estimated values are presented by area for each country participating in the fishery. Weights are in tonnes. NA = not available.

Year	Belgium 7.d	France 7.d	Netherlands 7	England (Wales) 7.d	Scotland 7.d	UK 7.d	Total landings	Unallocated landings 7.d	ICES landings 7.d
1990	83	NA	0	239	0	NA	NA	NA	3480
1991	83	NA	0	292	0	NA	NA	NA	5720
1992	66	5414	0	419	24	NA	5923	183	5740
1993	74	5032	0	321	2	NA	5429	219	5210
1994	61	6734	0	293	0	NA	7088	468	6620
1995	68	5202	0	280	1	NA	5551	161	5390
1996	84	4771	1	199	1	NA	5056	106	4950
1997	98	4532	1	147	1	NA	4779	159	4620
1998	53	4495	32	185	0	NA	4765	165	4600
1999	48	NA	6	135	0	NA	NA	NA	4430
2000	65	5875	14	118	0	NA	6072	1772	4300
2001	75	6338	67	134	0	NA	6614	814	5800
2002	58	5172	19	112	0	NA	5361	-439	5800
2003	67	6654	175	109	0	NA	7005	1295	5710
2004	46	5006	132	99	0	NA	5283	933	4350
2005	45	4638	128	NA	NA	90	4901	111	4790
2006	73	3487	117	NA	NA	72	3749	306	3443
2007	75	3135	118	NA	NA	63	3391	137	3254
2008	69	2875	162	NA	NA	87	3193	-1278	4471
2009	71	6248	112	NA	NA	138	6569	-77	6646
2010	88	5512	275	NA	NA	258	6133	194	5939
2011	78	4833	282	NA	NA	271	5464	400	5064
2012	66	3093	437	NA	NA	261	3857	-246	4103
2013	95	3076	650	NA	NA	472	4293	343	3950
2014	89	2115	663	NA	NA	345	3212	82	3130
2015	121	3065	558	NA	NA	365	4109	11	4098
2016*	144	2771	557	NA	NA	259	3730	560	3170

* Preliminary.

Summary of the assessment

Table 10 Whiting in Subarea 4 and Division 7.d. Assessment summary. Weights are in tonnes.

Year	Recruitment Age 1	SSB	Landings	Discards	Industrial bycatch	BMS landings	F Ages 2–6
	thousands						
1990	3602224	455279	45662	55603	51337		0.69
1991	3559519	411050	51929	35058	39755		0.54
1992	3426549	392805	50946	32564	25045		0.50
1993	3906041	359044	51818	44370	20723		0.50
1994	3661737	357259	48486	35692	17473		0.64
1995	3282168	372021	45938	32176	27379		0.55
1996	2335674	332282	40503	30505	5116		0.45
1997	1782753	292302	35563	19660	6213		0.35
1998	2478930	244159	28288	15693	3494		0.34
1999	4042873	250651	30130	25677	5038		0.40
2000	4799029	345801	28583	26063	9160		0.45
2001	3992721	422950	25061	19237	944		0.31
2002	3428809	384093	20675	18501	7275		0.21
2003	1208118	307423	16161	26745	2734		0.194
2004	1223023	239795	13295	19048	1214		0.20
2005	1596036	199359	15471	12525	888		0.189
2006	1598134	180314	18535	16310	1924		0.27
2007	1523410	171511	18915	6971	1088		0.26
2008	2764813	192996	17951	10296	0		0.26
2009	2259351	262076	18418	7705	892		0.23
2010	2330274	290502	18224	11577	1181		0.23
2011	3028641	297582	18899	11977	1112		0.177
2012	1579943	307953	17032	7968	77		0.156
2013	1125900	262743	19335	5976	1530		0.192
2014	2220038	236283	16755	9543	1692		0.21
2015	2668688	264295	17598	10166	2123	128	0.21
2016	1991084	296870	15854	12572	4701	632	0.24
2017	3815195*	312257**					

* RCT3 estimate.

** Estimated survivors from 2016.

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