ICES CIEM

Whiting (*Merlangius merlangus*) in Division 6.a (West of Scotland)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2019 and 2020.

Stock development over time

The spawning–stock biomass (SSB) has been increasing since 2010 but remains very low compared to the historical estimates and is below B_{lim}. Fishing mortality (F) has declined continuously since around 2000 and is estimated well below F_{MSY}. Recruitment is estimated to have been very low since 2002, but estimated to have increased in recent years.
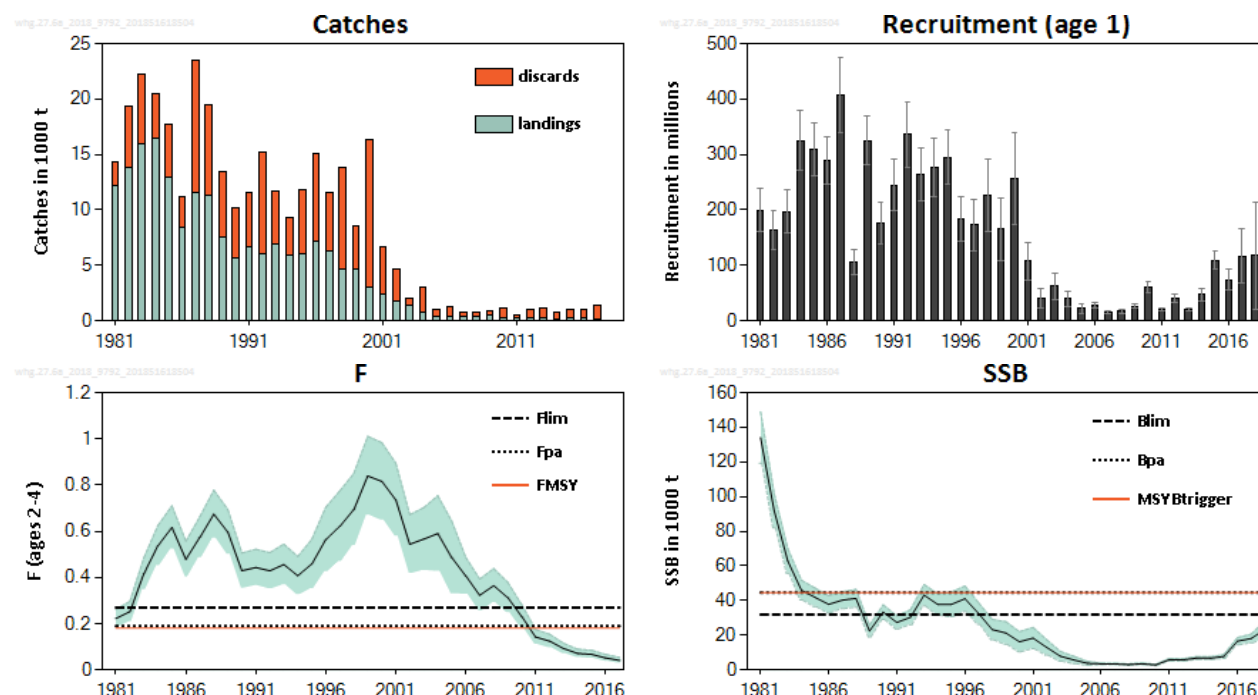

Figure 1   Whiting in Division 6.a. Observed catches and summary of stock assessment (weights in thousand tonnes). The shaded areas in the bottom panels and the error bars in the recruitment plot correspond to two standard errors.

Stock and exploitation status

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

Table 1   Whiting in Division 6.a. State of the stock and fishery relative to reference points.

		Fishing pressure					Stock size			
		2015	2016	2017			2016	2017	2018	
Maximum sustainable yield	F_{MSY}	✅	✅	✅	Below	MSY $B_{trigger}$	❌	❌	❌	Below trigger
Precautionary approach	F_{pa},F_{lim}	✅	✅	✅	Harvested sustainably	B_{pa},B_{lim}	❌	❌	❌	Reduced reproductive capacity
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	—	—	Not applicable

Catch scenarios

Table 2   Whiting in Division 6.a. The basis for the catch scenarios.

Variable	Value	Notes
$F_{ages\ 2-4}$ (2018)	0.053	Average F (2015–2017)
SSB (2019)	26646 tonnes	Fishing at F = 0.053
$R_{age\ 1}$ (2018)	117219 thousands	Assessment model estimate
$R_{age\ 1}$ (2019)	42440 thousands	GM (2008–2017)
Catch (2018)	1283 tonnes	Fishing at F = 0.053
Landings (2018)	380 tonnes	Average discard rates at age (2015–2017)
Discards (2018)	903 tonnes	Average discard rates at age (2015–2017)

Table 3   Whiting in Division 6.a. The catch scenarios. Weight in tonnes.

Basis	Catch total (2019)	Wanted catch* (2019)	Unwanted catch* (2019)	F_{total} (2019)	F_{wanted} (2019)	$F_{unwanted}$ (2019)	SSB (2020)	% TAC change **	% SSB change ***	% Advice change ^^
ICES advice basis										
Precautionary approach: Zero catch	0	0	0	0	0	0	24239	−100	−9.0	
Other scenarios										
$F_{MSY\ lower}$	3152	1184	1968	0.150	0.052	0.098	20760	456	−22	
F_{MSY}	3730	1400	2330	0.180	0.063	0.117	20131	557	−24	
F_{2018}	1171	441	730	0.053	0.0185	0.035	22939	107	−13.9	
F_{lim}	5368	2010	3358	0.27	0.094	0.176	18359	844	−31	
F_{pa}	3919	1471	2448	0.190	0.066	0.124	19925	591	−25	
$F_{MSY} \times SSB_{2019}/MSY\ B_{trigger}$	2305	867	1438	0.108	0.037	0.070	21688	307	−18.6	
$F_{MSY\ lower} \times$ SSB (2019)/MSY $B_{trigger}$	1937	729	1208	0.090	0.031	0.058	22092	242	−17	
$SSB_{2020} = B_{pa} = MSY\ B_{trigger}$ ^										
$SSB_{2020} = B_{lim}$ ^										

* "Wanted catch" is used to describe fish that would be landed in the absence of the EU landing obligation. The "unwanted catch" refers to the component that was previously discarded.

** Wanted catch in 2019 compared with the TAC of Subarea 6 (213 tonnes). Note the stock area is only Division 6.a.

*** SSB 2020 relative to SSB 2019.

^ The B_{lim}, B_{pa}, and MSY $B_{trigger}$ options were left blank because $SSB_{2020} = B_{lim}$ and $SSB_{2020} = B_{pa} = MSY\ B_{trigger}$ cannot be achieved in 2020, even with zero catch advice.

^^ Advice value for 2019 relative to advice value for 2018. This is not provided because the advice in 2018 was zero.

There has been no change in the perception of stock status and, therefore, there is no change in advice.

Basis of the advice

Table 4   Whiting in Division 6.a. The basis of the advice.

Advice basis	Precautionary approach
Management plan	The EU has proposed a multiannual management plan for the Western Waters, which is not yet finalized (EU, 2018).

Quality of the assessment

The introduction of technical measures has changed fishery selectivity, leading to changes in effort for different métiers. These changes are not explicitly taken into account in the assessment model and are a source of bias in the assessment.

The majority of catches have been discarded in recent years. Despite increased sampling levels, discard information remains imprecise. Discarding at age 0 is known to occur but is not taken into account in the assessment.

The mean weights-at-age in the catch have been quite variable in recent years because of low and patchy sampling. This implies that the catch information of recent years in the assessment is less certain.
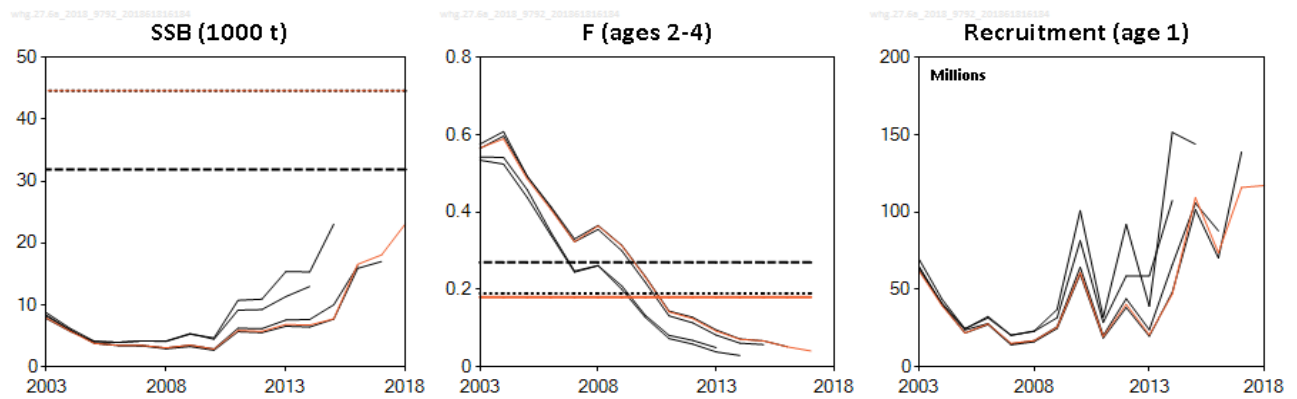
Figure 2   Whiting in Division 6.a. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

In previous years, ICES provided advice based on the MSY approach. This year, the EU has requested that the advice be based on the precautionary approach.

The increase in mesh size from 100 mm to 120 mm, established under the emergency measures since 2010, and the introduction of large square mesh panels in the *Nephrops* fishery, are likely to have contributed to the observed reductions in fishing mortality.

Landing obligations will apply to fleets fishing in Division 6.a in 2019. Given the continued high discards and low TAC this stock could become a major "choke species" for the Division 6.a *Nephrops* fishery in the context of the landing obligation.

Reference points

Table 5   Whiting in Division 6.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	44600 tonnes	B_{pa}	ICES (2016a)
	F_{MSY}	0.18	F_{MSY} capped by F_{p05} (EqSim)	ICES (2016a)
Precautionary approach	B_{lim}	31900 tonnes	B_{lim} = SSB value at the change point in the segmented regression stock–recruitMENT function.	ICES (2016a)
	B_{pa}	44600 tonnes	$B_{pa} = B_{lim} \times \exp(1.645\sigma)$, where $\sigma = 0.20$.	ICES (2016a)
	F_{lim}	0.27	The F that gives a 50% probability of falling below B_{lim} in the long term.	ICES (2016a)
	F_{pa}	0.19	$F_{pa} = F_{lim} \times \exp(-1.645\sigma)$, where $\sigma = 0.20$.	ICES (2016a)
Management plan	SSB_{MGT}	Not applicable		
	F_{MGT}	Not applicable		

Basis of the assessment

Table 6   Whiting in Division 6.a. The basis of the assessment.

ICES stock data category	1 ([ICES, 2016b](#)).
Assessment type	Age-based analytic assessment (TSA) that uses catches in the model and in the forecast (ICES, 2018).
Input data	Commercial landings, estimated discards, age composition of catches; five survey indices (ScoGFS-WIBTS-Q1, ScoGFS-WIBTS-Q4, IGFS-WIBTS-Q4, UK-SCOWCGFS-Q1 and UK-SCOWCGFS-Q4); fixed maturity data from surveys; natural mortalities estimated from mean weight-at-age (Lorenzen's model (Lorenzen, 1996), using mean weight data from market sampling and discard observations).
Discards and bycatch	Included in the assessment (ages 1+), data series from the main fleets (covering 95% of the landings).
Indicators	None.
Other information	The stock was benchmarked in 2012 (WKROUND; ICES, 2012) and in 2015 (IBPWSRound; ICES, 2015).
Working group	Working Group for the Celtic Seas Ecoregion ([WGCSE](#))

Information from stakeholders

Industry notes that the discard information is imprecise. Sampling coverage has improved since 2014, due to the Scottish industry/science observer sampling scheme in Subarea 6.

In 2015, the industry group GITAG (Gear Innovation and Technology Advisory Group) was established to stimulate innovation in the development of fishing gear technology. These assisted the Scottish fishing industry's transition to the operational requirements of the phasing in of the landing obligation whilst protecting economic viability. The first phase of the project focused on gear development in the *Nephrops* trawling sector to reduce bycatches, particularly undersized fish. Indications from the first three sets of trials conducted by GITAG provide encouragement that practical solutions will greatly improve the reduction of undersized whiting catches. Further trials of selective gear options are envisaged in 2018–2020.

History of the advice, catch and management

Table 7   Whiting in Division 6.a. History of ICES advice, the agreed TAC, ICES estimates of landings and discards. Weights in tonnes.

Year	ICES advice / Single-stock exploitation boundaries since 2004	Catch corresponding to advice	Agreed TAC*	Official landings	ICES landings	Discards^	ICES catch
1987	No increase in F	15000	16400	12399	11544	11918	23462
1988	No increase in F; TAC	15000	16400	11879	11352	8132	19458
1989	No increase in F; TAC	13000	16400	7669	7531	5876	13407
1990	No increase in F; TAC	11000	11000	6026	5643	4530	10173
1991	70% of effort (89)	-	9000	6908	6660	4883	11543
1992	70% of effort (89)	-	7500	6010	6004	9249	15253
1993	70% of effort (89)	-	8700	6751	6872	4759	11631
1994	30% reduction in effort	-	6800	5786	5901	3455	9356
1995	Significant reduction in effort	-	6800	6277	6076	5771	11847
1996	Significant reduction in effort	-	10000	6642	7156	7940	15096
1997	Significant reduction in effort	-	13000	6178	6285	5251	11536
1998	No increase in F	6500	9000	4657	4631	216	13847
1999	Reduce F below F_{pa}	4300	6300	4677	4613	3975	8588
2000	Reduce F below F_{pa}	< 4300	4300	3203	3010	13285	16295
2001	Reduce F below F_{pa}	< 4200	4000	2543	2438	4263	6701
2002	SSB >B_{pa} in the short term	< 2000	3500	1735	1709	2851	4560
2003	No cod catches	-	2000	1365	1356	709	2075
2004	SSB >B_{pa} in the short term	< 2100**	1600	819	811	2626	3437
2005	Exploitation not allowed to increase	< 1600	1600	289	341	898	1239
2006	Lowest possible level	0	1360	383	380	946	1326
2007	Lowest possible level	0	1020	488	484	365	849
2008	Lowest possible level	0	765	440	443	174	617
2009	Same advice as last year	0	574	482	488	417	905
2010	Same advice as last year	0	431	349	307	886	1193
2011	See scenarios	-	323	230	230	339	569
2012	Reduce catches	-	307	301	313	729	1041
2013	Lowest possible catch, improve selectivity	0	292	214	222	953	1175
2014	Lowest possible catch, improve selectivity	0	292	181	184	586	770
2015	Lowest possible catch	0	263	221	227	833	1060
2016	Precautionary approach (minimize all catches)	0	213	232^^	233	796	1029
2017	MSY approach	0	213	169^^	176	1209	1386
2018	MSY approach	0	213				
2019	Precautionary approach	0					
2020	Precautionary approach	0					

* TAC is set for Division 5.b and subareas 6, 12, and 14.

** Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries, protecting stocks outside safe biological limits.

^ Discards estimated for ages 1+.

^^ Preliminary.

History of the catch and landings

Table 8   Whiting in Division 6.a. Catch distribution by fleet in 2017 as estimated by ICES

Catch (2017)	Landings			Discards*		
	Finfish directed otter trawl	*Nephrops* directed otter trawl	Other gear	Finfish directed otter trawl	*Nephrops* directed otter trawl	Other gear
1723 tonnes	78%	3%	19%	12%	69%	19%
	176 tonnes			1547 tonnes		

* All discards, including the 0-group (note that discard estimates in Tables 7 and 10 are for 1+ discards).

Table 9   Whiting in Division 6.a. History of official landings by country. All weights are in tonnes.

Year	Belgium	Denmark	Faroe Islands	France	Germany	Ireland	Netherlands	Norway	Spain	UK (E W & NI)	UK (Scot.)	UK (total)	Total official landings
1989	1	1	-	199	< 0.5	1315	-	-	-	44	6109		7669
1990	-	< 0.5	-	180	-	977	-	-	-	50	4819		6026
1991	-	3	-	352	< 0.5	1200	-	-	-	218	5135		6908
1992	-	1	-	105	1	1377	-	-	-	196	4330		6010
1993	-	1	-	149	1	1192	-	-	-	184	5224		6751
1994	-	< 0.5	-	191	< 0.5	1213	-	-	-	233	4149		5786
1995	-	< 0.5	-	362	-	1448	-	-	1	204	4263		6277
1996	-	< 0.5	-	202	-	1182	-	-	-	237	5021		6642
1997	1	< 0.5	-	108	-	977	-	-	1	453	4638		6178
1998	1	-	-	82	-	952	-	-	2	251	3369		4657
1999	< 0.5	-	-	300	-	1121	-	-	< 0.5	210	3046		4677
2000	-	-	-	48	-	793	-	-	-	104	2258		3203
2001	-	-	-	52	-	764	-	-	2	71	1654		2543
2002	-	-	-	21	-	577	-	-	-	73	1064		1735
2003	-	< 0.5	-	11	-	568	-	-	-	35	751		1365
2004	< 0.5	< 0.5	-	6	-	356	-	-	-	13	444		819
2005	-	-	-	9	-	172	-	-	-	5	103		289
2006	-	-	-	7	-	196	-	-	-	2	178		383
2007	-	-	-	6	1	56	-	-	-	20	405		488
2008	-	-	-	1	-	69	-	-	-	2	368		440
2009	-	-	< 0.5	1	-	125	-	2	-	-	354		482
2010	-	-	-	3	-	99	-	-	-	2	245		349
2011	-	-	1	+	-	149	-	-	-	-	-	80	230
2012	-	-	1	+	-	96	-	-	-	-	-	204	301
2013	-	-	-	1	-	97	-	-	-	-	-	116	214
2014	-	-	-	1	-	97	-	-	-	-	-	83	181
2015	-	-	-	< 0.5	-	88	11	-	-	-	-	122	221
2016*	-	-	-	-	-	77	52	-	-	-	-	98	232
2017*	-	-	-	3	-	53	19	-	-	-	-	94	169

*Preliminary.

Summary of the assessment

Table 10 Whiting in Division 6.a. Assessment summary with weights in tonnes and recruitment in thousands. 'High' and 'Low' refer to 2 × standard errors.

Year	Recruitment age 1	High	Low	SSB	High	Low	Landings*	Discards*	F ages 2–4	High	Low
1981	198943	238124	159762	134120	148975	119265	12194	2132	0.22	0.26	0.184
1982	162367	197453	127281	91818	101625	82012	13880	5485	0.25	0.30	0.21
1983	197243	235777	158709	62839	69909	55768	15962	6294	0.42	0.48	0.35
1984	324806	378073	271539	46008	51737	40280	16459	4017	0.54	0.62	0.45
1985	308253	355774	260732	41855	47203	36507	12879	4840	0.62	0.71	0.52
1986	288271	331238	245304	37841	42766	32916	8458	2669	0.48	0.56	0.40
1987	407271	475945	338598	40232	45115	35349	11542	11918	0.57	0.66	0.48
1988	105863	128389	83337	41273	46395	36150	11349	8132	0.67	0.78	0.57
1989	325196	369207	281186	22472	25840	19104	7523	5876	0.60	0.69	0.50
1990	175921	213335	138507	33353	37529	29177	5642	4530	0.43	0.51	0.35
1991	244411	291217	197604	27389	31128	23650	6658	4883	0.44	0.52	0.36
1992	335918	394246	277591	30363	34691	26035	6005	9249	0.43	0.51	0.35
1993	262760	310565	214955	43129	49265	36992	6872	4759	0.46	0.54	0.37
1994	276377	328972	223781	37746	43887	31605	5901	3455	0.41	0.49	0.32
1995	294174	343105	245242	37784	44916	30652	6078	5771	0.46	0.56	0.35
1996	184362	224470	144255	41069	48420	33719	7158	7940	0.56	0.70	0.42
1997	172260	218361	126158	32526	38701	26351	6290	5251	0.62	0.77	0.47
1998	225850	291069	160631	23280	29109	17451	4627	9216	0.69	0.85	0.54
1999	164874	220887	108861	21309	27840	14778	4613	3975	0.84	1.01	0.67
2000	256888	339078	174699	16253	22025	10482	3011	13285	0.82	0.98	0.65
2001	107098	141522	72673	18362	24503	12221	2439	4263	0.74	0.90	0.58
2002	39585	57437	21732	12986	17375	8597	1767	2851	0.54	0.67	0.42
2003	62145	85369	38921	7890	10677	5103	1355	719	0.57	0.70	0.43
2004	39584	54047	25120	5744	7812	3676	811	2159	0.59	0.75	0.43
2005	21882	30110	13655	3787	4898	2675	341	629	0.49	0.64	0.33
2006	27671	32654	22688	3472	3949	2994	380	946	0.41	0.49	0.33
2007	15201	18803	11598	3438	3841	3035	427	317	0.32	0.39	0.25
2008	16916	20124	13708	3065	3492	2637	445	314	0.36	0.44	0.29
2009	25630	29517	21744	3513	4034	2992	488	419	0.31	0.38	0.25
2010	60969	70861	51077	2865	3256	2474	307	893	0.23	0.28	0.181
2011	19544	22421	16667	5881	6658	5105	230	339	0.142	0.175	0.110
2012	40426	47638	33213	5724	6451	4997	313	727	0.125	0.154	0.095
2013	20659	24031	17286	6839	7698	5981	222	951	0.092	0.115	0.069
2014	47026	57536	36515	6739	7550	5929	184	583	0.071	0.089	0.053
2015	109349	126581	92117	7768	8860	6676	227	835	0.067	0.085	0.049
2016	73666	91972	55360	16563	18663	14463	233	797	0.052	0.067	0.037
2017	115989	164920	67058	18098	20622	15574	176	1207	0.041	0.054	0.028
2018	117219	214757	19681	23143	28245	18041					

*Calculated using Sum of Products from the catch-at-age.

Sources and references

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