

Megrim (*Lepidorhombus whiffiagonis*) in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 18 976 tonnes.

Management of megrim and four-spot megrim under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to overexploitation of either species.

Stock development over time

The spawning-stock biomass (SSB) has been above $MSY B_{trigger}$ since 2008. The fishing mortality (F) has decreased since 2004, although it is still above F_{MSY} . Recruitment (R) has been relatively stable throughout the time-series although the last two years are above the time-series average.

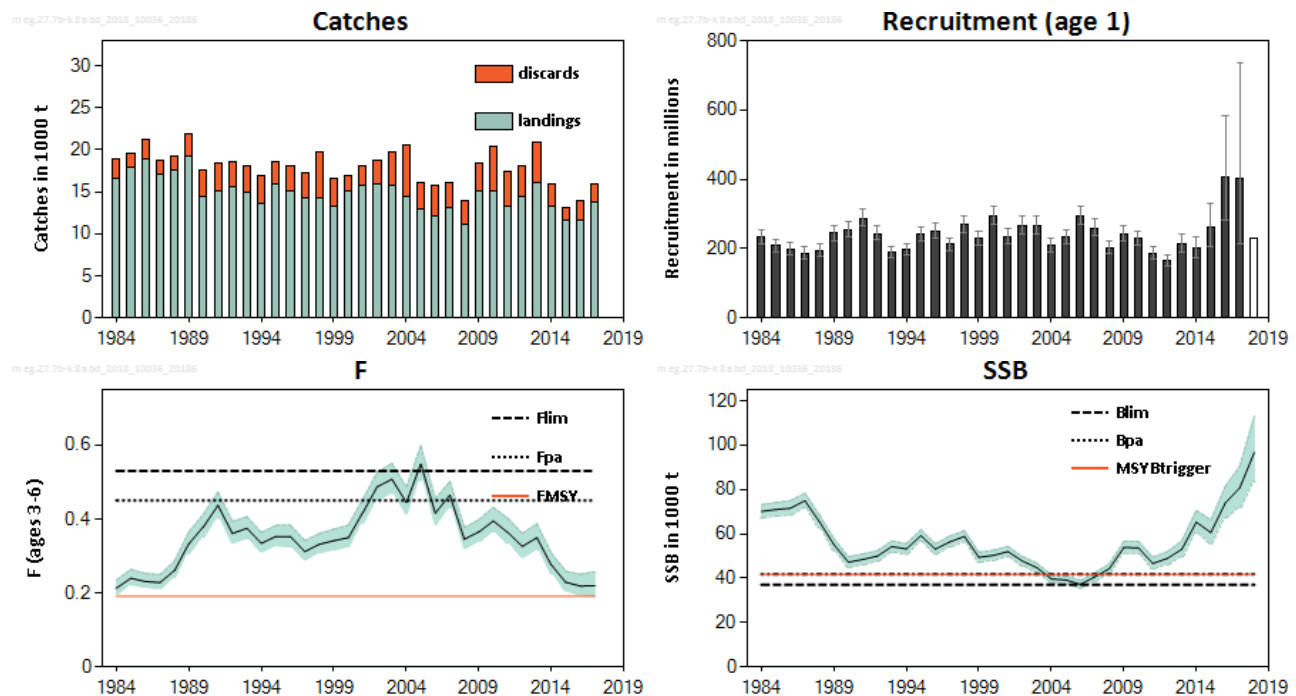


Figure 1 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Summary of the stock assessment. Recruitment, F, and SSB are displayed with confidence intervals (95%). Assumed values of recruitment are unshaded.

Stock and exploitation status

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

Table 1 Megrim in divisions 7.b–k, 8.a–b, and 8.d. 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}	✗	✗	✗	Above	$MSY B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	–	Not applicable

Catch scenarios

Table 2 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Assumptions made for the interim year and in the forecast. All weights are in tonnes, recruitment in thousands.

Variable	Value	Notes
F (2018)	0.22	Mean F (2015–2017)
SSB (2019)	111887	Assessment forecast
R (2018)	228120	Geometric mean of recruitment (1984–2015) (in thousands)
R (2019)	228120	Geometric mean of recruitment (1984–2015) (in thousands)
Catch (2018)	18528	Based on F_{2018}
Wanted catch (2018)	14397	Estimated using average wanted catch rate of 2015–2017
Unwanted catch (2018)	4131	Estimated using average wanted catch rate of 2015–2017

Table 3 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Annual catch scenarios. All weights are in tonnes. Note: The % change in TAC is not computed because the TAC is for the two species (*L. whiffiagonis* and *L. boschii*) combined.

Basis	Total catch (2019)	Wanted catch (2019)	Unwanted catch (2019)	F_{total} (2019)	SSB (2020)	% SSB change *	% Advice change **
ICES advice basis							
MSY approach: F_{MSY}	18976	15092	3884	0.191	122698	9.7	21
Other scenarios							
F = 0	0	0	0	0	144860	29	-100
F_{pa}	39713	31337	8376	0.45	98849	-11.7	153
F_{lim}	45273	35634	9639	0.53	86513	-23	188
SSB (2020) = B_{lim}	96467	73309	23158	1.88	37100	-67	514
SSB (2020) = B_{pa}	91767	70056	21711	1.68	41800	-63	484
SSB (2020) = $MSY B_{trigger}$	91767	70056	21711	1.68	41800	-63	484
F = F_{2018}	21879	17386	4493	0.22	119300	6.6	39
F = $F_{MSY lower}$	12528	9967	2541	0.122	130172	16.3	-20
F = $F_{MSY upper}$	27371	21704	5667	0.29	112972	0.97	74

* SSB 2020 relative to SSB 2019.

** Catches in 2019 relative to the advised catch in 2018 (15 720 tonnes).

The increase in the catch advice for 2019 is caused primarily by the strong recruitment in recent years.

Basis of the advice

Table 4 Megrim in divisions 7.b–k, 8.a–b, and 8.d. The basis of the advice.

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

Quality of the assessment

A benchmark was completed in 2016 (ICES, 2016a), bringing the assessment to a stock data category 1.

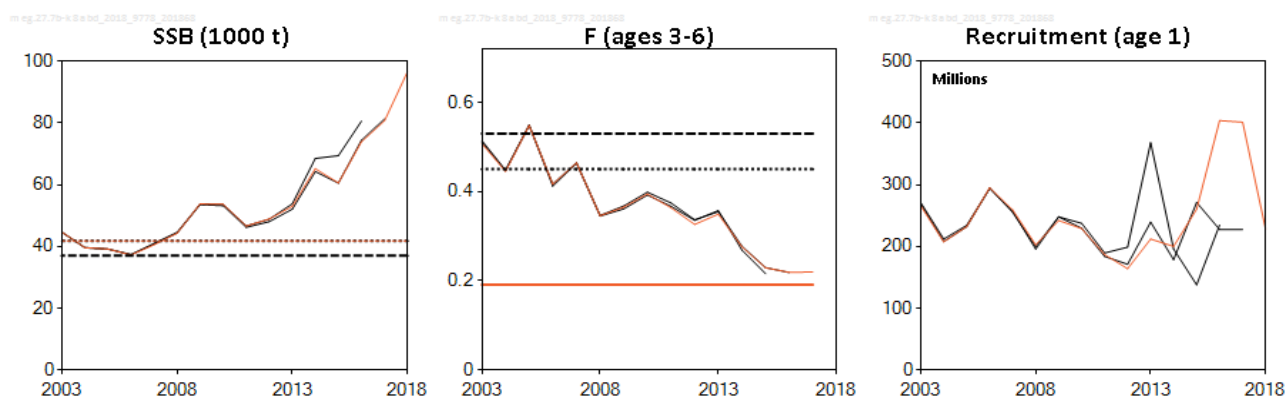


Figure 2 Megrim in divisions 7.b-k, 8.a-b, and 8.d. Historical assessment results.

Owing to a lack of French market sampling of length in Q1 and Q2 of 2017 (biological and onboard sampling was unaffected), for some sampling strata length data were supplemented using data from previous years, which is considered to have limited impact (ICES, 2018).

Issues relevant for the advice

Discards are included in the assessment and ICES has provided catch advice for this stock since 2016.

The ICES advice is for *L. whiffiagonis*, whereas the TAC is for *L. whiffiagonis* and *L. boscii* combined.

The two megrim species (*L. whiffiagonis* and *L. boscii*) are not totally separated in the landings. A single TAC covers both species and species-specific landings are estimated by ICES (ICES, 2018). ICES considers that management of the two megrim species under a combined TAC prevents effective control of the single-species exploitation rates and could lead to overexploitation of either species.

Reference points

Table 5 Megrim in divisions 7.b-k, 8.a-b, and 8.d. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	41800	B_{pa}	ICES (2016a)
	F_{MSY}	0.191	Stochastic simulations based on a segmented regression, with the breakpoint fixed at the lowest observed biomass.	ICES (2016a)
Precautionary approach	B_{lim}	37100	B_{loss} , which is the lowest biomass observed, corresponding to year 2006.	ICES (2016a)
	B_{pa}	41800	$B_{lim} e^{1.645 \sigma}$; $\sigma_B = 0.07$	ICES (2016a)
	F_{lim}	0.53	The F that gives 50% probability of SSB being above B_{lim} .	ICES (2016a)
	F_{pa}	0.45	$F_{lim} e^{-1.645 \sigma}$; $\sigma_F = 0.102$	ICES (2016a)

Framework	Reference point	Value	Technical basis	Source
Management plan	SSB _{mgt}	Not defined		ICES (2016a)
	F _{mgt}	Not defined		ICES (2016a)
	MAP MSY B _{trigger}	41800	MSY B _{trigger}	
	MAP B _{lim}	37100	B _{lim}	
	MAP F _{MSY}	0.191	F _{MSY}	
	MAP range F _{lower}	0.122	Consistent with ranges provided by ICES (2016b), resulting in no more than 5% reduction in long-term yield compared with MSY.	
	MAP range F _{upper}	0.29	Consistent with ranges provided by ICES (2016b) resulting in no more than 5% reduction in long-term yield compared with MSY.	

Basis of the assessment

Table 6 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016c)
Assessment type	Bayesian statistical catch at age (ICES, 2018) using catches in the model and forecast.
Input data	Commercial catches (international landings, ages, and length frequencies from catch sampling). Survey indices: FR-EVHOE-WIBTS-Q4 and SP-PORC-WIBTS-Q3. Commercial indices: SP-VIGOTR7 (VIGO84, VIGO99), and IRTBB. Maturity ogive from Anon. (1998). Natural mortality: a fixed value of 0.2 is used for all age groups and all years.
Discards and bycatch	Discards are included in the assessment.
Indicators	None
Other information	The stock was benchmarked in 2016 (ICES, 2016a).
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE)

Information from stakeholders

There is no additional information available.

History of the advice, catch, and management

Table 7 Megrim in divisions 7.b–k, 8.a–b, and 8.d. ICES advice and landings. All weights are in tonnes.

Year	ICES advice	Catch / landings corresponding to advice	Agreed TAC*	ICES landings	Discards	ICES catch
1987	Not assessed	-	16460	17114	1705	18819
1988	Not assessed	-	18100	17577	1725	19302
1989	Not assessed	-	18100	19233	2582	21815
1990	Not assessed	-	18100	14370	3284	17654
1991	No advice	-	18100	15094	3282	18376
1992	No advice	-	18100	15600	2988	18588
1993	Within safe biological limits	-	21460	14929	3108	18037
1994	Within safe biological limits	-	20330	13684	2700	16384
1995	No particular concern	-	22590	15862	3206	19068
1996	No long-term gain in increased F	16600	21200	15109	3026	18135
1997	No advice	14300	25000	14230	3066	17296
1998	No increase in F	15200	25000	14345	5371	19716
1999	Reduce F below F_{pa}	14600	20000	13305	3297	16601
2000	Reduce F below F_{pa}	< 14200	20000	15031	1870	16750
2001	Reduce F below F_{pa}	< 14100	16800	15778	2262	18040
2002	Reduce F below F_{pa}	< 13000	14900	15987	2813	18800
2003	Reduce F below F_{pa}	< 16100	16000	15711	4008	19719
2004	Reduce F below F_{pa}	< 20200	20200	14358	6243	20602
2005	Reduce F below F_{pa}	< 22600	21500	12888	3275	16163
2006	Reduce F below F_{pa}	<13600	20425	12037	3751	15788
2007	Less than average landings 2003–2005	< 14200	20425	13060	3033	16092
2008	Less than average landings 2004–2006	< 13000	20425	11048	2860	13908
2009	Same advice as last year	< 13000	20425	15064	3278	18342
2010	No increase in effort	< 13000	20425	15101	5343	20444
2011	See scenarios	-	20106	13226	4187	17413
2012	Catch and effort reduction	-	19101	14433	3704	18137
2013	Decrease landings by 4% (20% increase, followed by 20% PA reduction)	< 12000	19101	16025	4885	20910
2014	Same advice as 2013	< 12000	19101	13277	2569	15846
2015	Increase landings by no more than 13%	< 15180	19101	11569	1507	13076
2016	Precautionary approach (increase recent advised landings by no more than 20%)	≤ 18216	20056	11548	2445	13992
2017	MSY approach (catch advice)	≤ 16021	15043	13784	2173	15957
2018	MSY approach (catch advice)	≤ 15720	13528			
2019	MSY approach (catch advice)	≤ 18976				

* Includes *L. boschii* and divisions 7.a and 8.e.

History of the catch and landings

Table 8 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Catch distribution by fleet in 2017 as estimated by ICES. All weights are in tonnes.

Catch (2017)	Landings		Discards
	Trawl 98%	Other gears 2%	
15957	13784		2173

Table 9 Megrim in divisions 7.b–k, 8.a–b, and 8.d. History of commercial catch and landings; ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

Year	France	Spain	U.K. (England & Wales)	U.K. (Scotland)	Ireland	Belgium	Unallocated	ICES estimated landings	ICES estimated discards	ICES estimated catch
1984								16659	2169	18828
1985								17865	1732	19597
1986	4896	10242	2048		1563	178		18927	2321	21248
1987	5056	8772	1600		1561	125		17114	1705	18819
1988	5206	9247	1956		995	173		17577	1725	19302
1989	5452	9482	1451		2548	300		19233	2582	21815
1990	4336	7127	1380		1381	147		14370	3284	17654
1991	3709	7780	1617		1956	32		15094	3282	18376
1992	4104	7349	1982		2113	52		15600	2988	18588
1993	3640	6526	2131		2592	40		14929	3108	18037
1994	3214	5624	2309		2420	117		13684	2700	16384
1995	3945	6129	2658		2927	203		15862	3206	19068
1996	4146	5572	2493		2699	199		15109	3026	18135
1997	4333	5472	2875		1420	130		14230	3066	17296
1998	4232	4870	2492		2621	129		14345	5371	19716
1999	3751	4615	2193		2597	149		13305	3297	16601
2000	4173	6047	2185		2512	115		15031	1870	16750
2001	3645	7575	1710		2767	80		15778	2262	18040
2002	2929	8797	1787		2413	62		15987	2813	18800
2003	3227	8340	1732		2249	163		15711	4008	19719
2004	2817	7526	1622		2288	106		14358	6243	20602
2005	2972	5841	1764		2155	156		12888	3275	16163
2006	2763	5916	1509		1751	99		12037	3751	15788
2007	2745	6895	1462		1763	195		13060	3033	16092
2008	2578	5402	1387		1514	167		11048	2860	13908
2009	3032	8062	1840		1918	209		15064	3278	18342
2010	3651	7095	1805		2283	261		15101	5343	20444
2011	3235	3500	1845		2227	330	2089	13226	4187	17413
2012	4012	4055	1744		3047	609	966	14433	3704	18137
2013	4549	4982	2918		3038	538		16025	4885	20910
2014	4311	3318	2753	176	2391	179	150	13277	2569	15846
2015	3073	2864	2804	147	2436	246	1	11569	1507	13076
2016	3141	2672	2694	145	2593	302	1	11548	2445	13992
2017	5101	3178	2512	176	2458	360		13784	2173	15957

Summary of the assessment

Table 10 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Assessment summary. Weights are in tonnes. Highs and lows are confidence intervals (95%). All weights are in tonnes.

Year	Recruitment age 1	High	Low	SSB	High	Low	Landings	Discards	F ages 3–6	High	Low
	thousands			tonnes			tonnes				
1984	232069	253383	212639	70101	73116	67194	16659	2169	0.21	0.24	0.193
1985	207337	226169	191214	70921	74112	68000	17865	1732	0.24	0.26	0.22
1986	198030	216930	181168	71497	74941	68454	18927	2321	0.23	0.25	0.21
1987	184016	203489	167722	74920	78333	71789	17114	1705	0.23	0.25	0.21
1988	194970	214571	178005	65467	68511	62700	17577	1725	0.26	0.29	0.24
1989	244217	267064	222974	55135	57905	52616	19233	2582	0.33	0.37	0.30
1990	255153	278921	233480	47178	49671	44840	14370	3284	0.38	0.41	0.35
1991	286555	312372	263584	48437	50929	46060	15094	3282	0.44	0.47	0.40
1992	242545	264070	223579	49947	52393	47614	15600	2988	0.36	0.39	0.33
1993	187857	203926	172827	54239	56819	51786	14929	3108	0.37	0.41	0.34
1994	197119	213232	181415	53161	55515	50807	13684	3284	0.33	0.36	0.31
1995	239447	259594	219871	59158	61833	56626	15862	2652	0.35	0.38	0.32
1996	249909	272181	229742	53070	55518	50804	15109	3026	0.35	0.38	0.32
1997	211414	230567	194006	56387	59002	54049	14230	3066	0.31	0.34	0.29
1998	267881	291902	245396	58814	61415	56303	14345	5371	0.33	0.36	0.31
1999	228943	250626	210904	49391	51699	47105	13305	3297	0.34	0.37	0.31
2000	293123	320721	268694	50267	52566	48056	15031	1870	0.35	0.38	0.32
2001	234089	256231	212652	51983	54320	49659	15778	2262	0.42	0.45	0.38
2002	266594	293388	243046	47687	49799	45447	15987	2813	0.49	0.53	0.45
2003	266029	293157	242529	44706	46714	42752	15711	4008	0.51	0.55	0.47
2004	207646	228139	190574	39624	41586	37858	14358	6243	0.45	0.49	0.41
2005	232073	252794	213951	39198	41098	37367	12888	3275	0.55	0.60	0.50
2006	295275	323028	270796	37253	39036	35526	12037	3751	0.42	0.45	0.38
2007	259305	285022	237842	40570	42414	38639	13060	3033	0.46	0.50	0.43
2008	202653	222206	185061	44302	46485	42248	11048	2860	0.35	0.38	0.32
2009	242126	266271	220752	53807	56552	51233	15064	3278	0.37	0.40	0.33
2010	228955	250780	208365	53686	56632	51069	15101	5343	0.39	0.43	0.36
2011	186827	205986	169171	46639	49460	44208	13226	4187	0.36	0.40	0.33
2012	163943	182573	147412	48902	51953	46141	14433	3704	0.33	0.36	0.29
2013	212132	241072	188366	53037	56868	49642	16025	4885	0.35	0.39	0.31
2014	200195	235274	172655	65255	70574	60526	13277	2569	0.28	0.31	0.25
2015	260439	328484	206018	60588	66224	55549	11569	1507	0.23	0.26	0.20
2016	404140	582267	281171	73937	81367	67180	11548	2445	0.22	0.25	0.191
2017	401451	737405	212450	80739	90542	71946	13784	2173	0.22	0.26	0.187
2018	228120*			96660	113016	83417					

* Geometric mean of recruitment (1984–2015).

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