

Megrim (*Lepidorhombus* spp.) in divisions 4.a and 6.a (northern North Sea, West of Scotland)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for Western waters and adjacent waters is applied, catches in 2020 that correspond to the F ranges in the MAP are between 6450 and 8350 tonnes.

Stock development over time

Fishing pressure (F) has declined since the mid-1990s and is below F_{MSY} . Biomass (B) has increased since the mid-2000s and been above $MSY B_{trigger}$ for the entire time-series.

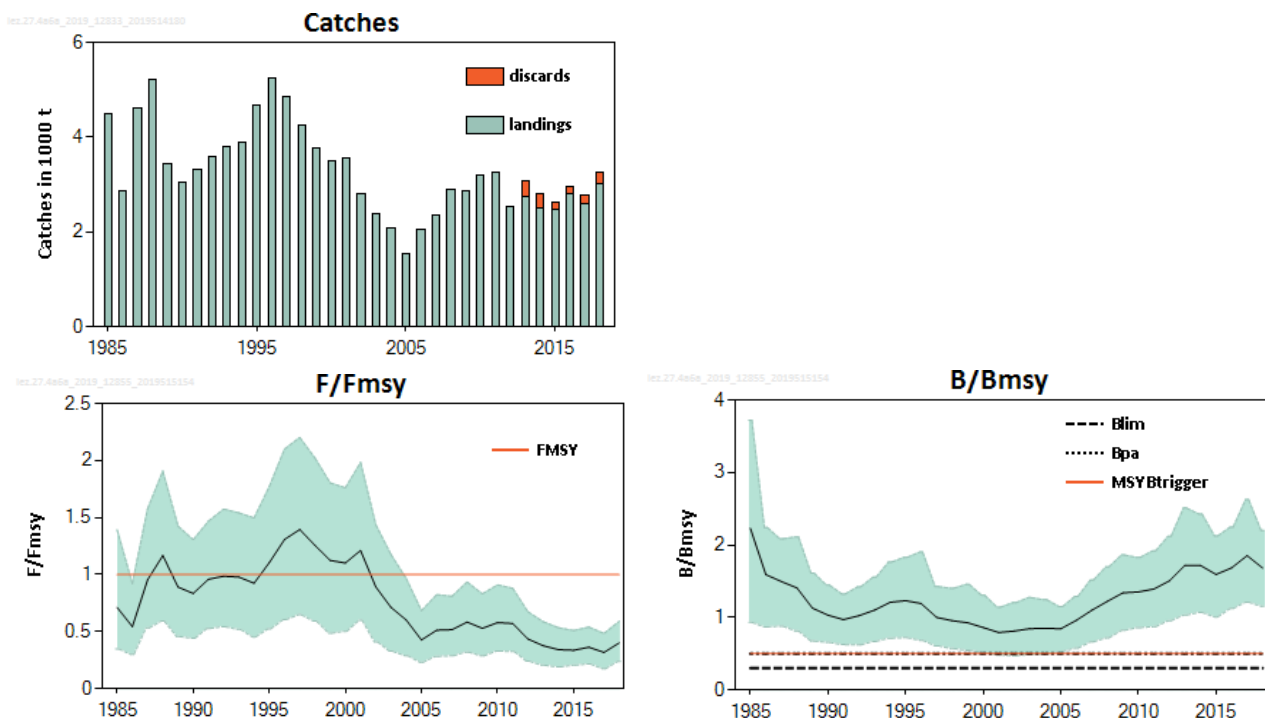


Figure 1 Megrim in divisions 4.a and 6.a. Summary of the stock assessment. Landings and discards are in thousands of tonnes. Discards estimates are available since 2013. Fishing mortality relative to F_{MSY} (bottom left panel) and biomass relative to B_{MSY} (bottom right panel). The shaded areas in the F/F_{MSY} and B/B_{MSY} plots represent 95% confidence intervals.

Stock and exploitation status

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

Table 1 Megrim in divisions 4.a and 6.a. 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}	✓	✓	✓	Below	$MSY B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Below possible reference points	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	✓	✓	✓	Below range	B_{MGT}	✓	✓	✓	Above trigger

Catch scenarios

Table 2 Megrim in divisions 4.a and 6.a. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F_{2019}/F_{MSY}	0.40	F_{sq} = average relative F (2016–2018)
B_{2020}/B_{MSY}	1.68	Fishing at F_{sq}
Catch (2019)	3258	Tonnes; fishing at F_{sq}
Wanted catch (2019)	2998	Tonnes; assuming discard rate of 7.98% in total weight of catch (average 2016–2018)
Unwanted catch (2019)	260	Tonnes; assuming discard rate of 7.98% in total weight of catch (average 2016–2018)

Table 3 Megrim in divisions 4.a and 6.a. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2020)	Wanted catch *(2020)	Unwanted catch *(2020)	Fishing mortality F_{2020}/F_{MSY}	Stock size B_{2021}/B_{MSY}	% B change **	% TAC change ^	% Advice change ^^
ICES advice basis								
EU MAP ^^^: F_{MSY}	8350	7684	666	1	1.42	-15	-4 [†]	1
F = MAP F_{MSY} lower	6450	5935	515	0.77	1.52	-10	-26	-22
F = MAP F_{MSY} upper	8350	7684	666	1	1.42	-15	-4 [†]	1
Other scenarios								
F = 0	0	0	0	0	1.83	9	-100	-100
$B_{2021} = B_{lim}$	31550	29033	2517	3.77	0.35	-79	264	282
$B_{2021} = B_{pa} = MSY B_{trigger}$	16700	15368	1332	1.99	1.01	-40	92.6	102.4
F = F_{2019}	3258	2998	260	0.40	1.68	0	-62	-61

* “Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded, respectively, in the absence of the EU landing obligation (for Division 6.a only), based on discard rate estimates for 2015–2018.

** Biomass 2021 relative to biomass 2020.

^ Total catch in 2020 relative to TAC in 2019 (8669 tonnes, which corresponds to the 2019 TAC for subareas 4 and 6).

^^ Advice value for 2020 relative to the advice value for 2019 (8250 tonnes).

^^^ EU multiannual plan (MAP) for the Western Waters (EU, 2019).

The advice is similar to last year, because of the similar perception of the stock size.

Basis of the advice

Table 4 Megrim in divisions 4.a and 6.a. The basis of the advice.

Advice basis	Management plan
Management plan	<p>The EU multiannual plan (MAP) for stocks in in the Western Waters and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock.</p> <p>In accordance with the MAP, catches higher than those corresponding to F_{MSY} can only be taken providing SSB is greater than $MSY B_{trigger}$, and one of the following conditions is met:</p> <ol style="list-style-type: none"> if it is necessary for the achievement of objectives of mixed fisheries; if it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; in order to limit variations in fishing opportunities between consecutive years to not more than 20%. <p>ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary.</p> <p>Full details of the plan are described in EU (2019).</p>

[†] Version 2: Value corrected

Quality of the assessment

The model estimates of relative B and relative F have large uncertainty. Despite this, there is a low probability that B is below $MSY B_{trigger}$ and a high probability that F is below F_{MSY} .

The reference points are re-estimated within the assessment, which results in small shifts in stock status between years. However, trends in relative B and F are consistent with those of previous years.

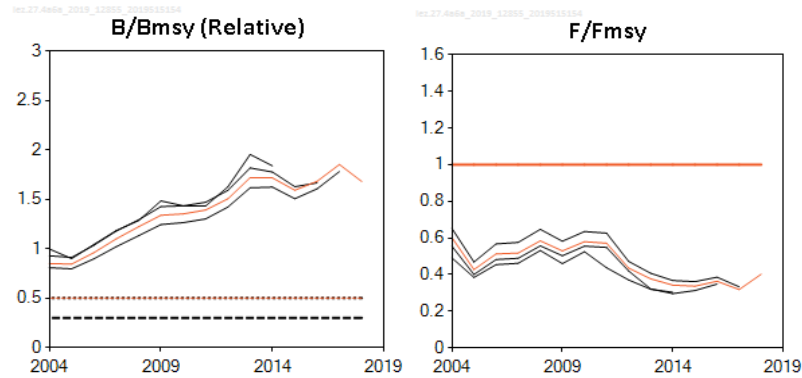


Figure 2 Megrim in divisions 4.a and 6.a. Historical assessment results.

Issues relevant for the advice

Megrim is a bycatch species in the mixed demersal trawl fishery in divisions 4.a and 6.a. Management measures for other species have constrained the fishery, and reduced effort and fishing mortality on megrim since the early 2000s may have contributed to an increase biomass.

The TAC is for subareas 4 and 6 and includes Division 6.b, for which the advice is given separately.

The advice is for the two species, *L. whiffiagonis* and *L. boscii* combined. Available information indicates that *L. boscii* are a negligible proportion, based on historical sampling of the Scottish and Irish megrim catch.

In relation to the EU multiannual plan, the F_{MSY} range for this stock is capped at F_{MSY} .

Reference points

Table 5 Megrim in divisions 4.a and 6.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	$0.5 \times B_{MSY}^*$	$0.25 \times K$. Relative value. B_{MSY} is estimated directly from the assessment surplus production model and changes when the assessment is updated.	ICES (2015a)
	F_{MSY}	$1 \times F_{MSY}^*$	$r / 2$. Relative value. F_{MSY} is estimated directly from the assessment surplus production model and changes when the assessment is updated.	ICES (2015a)
Precautionary approach	B_{lim}	$0.30 \times B_{MSY}^*$	$0.15 \times K$. Relative value.	ICES (2015a)
	B_{pa}	$0.5 \times B_{MSY}^*$	MSY $B_{trigger}$	ICES (2017)
	F_{lim}		Not relevant.	
	F_{pa}		Not relevant.	
Management plan	MAP MSY $B_{trigger}$	$0.5 \times B_{MSY}^*$	MSY $B_{trigger}$	
	MAP B_{lim}	$0.30 \times B_{MSY}^*$	B_{lim}	
	MAP F_{MSY}	$1 \times F_{MSY}^*$	F_{MSY}	
	MAP range F_{lower}	$0.78 \times F_{MSY}^*$	The lower bound is set at 0.39 of the intrinsic biomass growth rate.	ICES (2015b)
	MAP range F_{upper}	$1 \times F_{MSY}^*$	The upper bound is set to the same level as F_{MSY} .	ICES (2015b)

* Fishing mortality is presented only in relation to F_{MSY} and total stock biomass is presented only in relation to B_{MSY} . K is the carrying capacity and r is the intrinsic biomass growth rate. These values are directly estimated from the stock assessment and change when the assessment is updated.

Basis of the assessment

Table 6 Megrim in divisions 4.a and 6.a. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018).
Assessment type	Bayesian state–space biomass dynamic model that uses catches in the model and in the forecast.
Input data	Commercial sampling of landings and discards; six survey indices (SAMISS-Q2, IAMISS-Q2, Sco-IBTS-Q1, Sco-IBTS-Q3, Sco-WIBTS-Q1 until 2010, and Sco-WIBTS-Q4 until 2010).
Discards and bycatch	Discards have been included in the assessment, from bottom otter trawl fleets. Discard estimates since 2013 are based on observed discards. Discard estimates prior to 2013 are assumed based on limited sampling information.
Indicators	None.
Other information	This stock was benchmarked at WKFLAT (ICES, 2011) and at IBPMEG (ICES, 2012).
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE)

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Megrim in divisions 4.a and 6.a. History of ICES advice, the agreed TAC, official landings, and ICES estimates of landings and discards. All weights are in tonnes.

Year	ICES advice	Catches corresponding to advice *	Landings corresponding to advice *	Agreed TAC in Div. 2.a and Subarea 4	Agreed TAC in Div. 5.b (EC) and subareas 6, 12, and 14 ^	Official landings in subareas 4 and 6	ICES landings ** in divisions 4.a and 6.a	ICES discards in divisions 4.a and 6.a
1991	No advice	-	-	-	4840	4415	3310	
1992	No advice	-	-	-	4840	4689	3574	
1993	No long-term gain in increased F	-	-	-	4840	4788	3802	
1994	No long-term gain in increased F	-	-	-	4840	5031	3900	
1995	No advice	-	-	-	4840	5565	4670	
1996	No advice	-	-	-	4840	6148	5253	
1997	No advice	-	-	-	4840	5944	4856	
1998	Adequate catch controls	-	-	3000	4840	5417	4253	
1999	Maintain current TAC	-	4840	3000	4840	4437	3759	
2000	Maintain current TAC	-	4840	2700	4840	4503	3494	
2001	Maintain current TAC	-	4840	2700	4360	4381	3571	
2002	Maintain current TAC	-	4360	2700	4360	3266	2803	
2003	Maintain current TAC	-	4360	1890	4360	3008	2369	
2004	Reduce TAC to recent landings	-	3600	1740	3600	2547	2067	
2005	Reduce TAC to recent landings	-	2300	1740	2880	1920	1527	
2006	Reduce TAC to recent landings	-	2300	1479	2880	2373	2054	
2007	Reduce TAC to recent landings	-	2100	1597	2880	2733	2348	
2008	Reduce TAC to recent landings	-	1400	1597	2592	3162	2894	
2009	Same advice as last year	-	1400	1757	2799	3229	2871	
2010	No increase in effort	-	-	3000	3079	3346	3197	
2011	No increase in catches	-	-	1845	3387	2912	3257	
2012	No increase in catches	-	-	1845	3387	2798	2545	
2013	MSY framework	-	4700	1937	3387	2996	2737	327
2014	MSY approach	7000	5950	2083	4074	2823	2500	309
2015	Same advice as for 2014	7000	5950	2083	4129	2781	2471	152
2016	MSY approach	≤ 8567	≤ 7539	2639	5214	3209	2792	167
2017	Same advised values as for 2016	≤ 8567	≤ 7539	2639	5682	2788 ***	2594	193
2018	MSY approach	≤ 7800	≤ 7217	2526	5432	3258 ***	3003	255
2019	MSY approach	≤ 8250		2887	5782			
2020	Management plan	8350 (range 6450–8350)						

* Before 2011, advice was given for megrim in divisions 4.a, 6.a, and 6.b combined.

** Landings in divisions 4.a and 6.a and unallocated landings from Subarea 4.

*** Preliminary.

^ Landings in Division 5.b (EC) and subareas 12 and 14 are negligible.

History of the catch and landings

Table 8 Megrim in divisions 4.a and 6.a. Catch distribution by fleet in 2018 as estimated by ICES.

Catch	Landings			Discards		
	Fin fish trawls	<i>Nephrops</i> trawls	Other gears	Fin fish trawls	<i>Nephrops</i> trawls	Other gears
3258 tonnes	97%	< 1%	3%	97%	3%	< 1%
	3003 tonnes			255 tonnes		

Table 9 Megrim in divisions 6.a. History of commercial landings. All weights are in tonnes.

Year	Belgium	France	Ireland	Netherlands	Spain	UK (E&W and NI)	UK (Scotland)	UK	Official total	ICES landings
1990	0	398	317	0	91	25	1093	-	1924	2210
1991	1	455	260	0	48	167	1223	-	2154	2432
1992	0	504	317	0	25	392	887	-	2125	2549
1993	0	517	329	0	7	298	896	-	2047	2721
1994	1	408	304	0	1	327	866	-	1907	2693
1995	0	618	535	0	24	322	952	-	2451	3498
1996	0	462	460	0	22	156	944	-	2044	4054
1997	0	192	438	1	87	123	954	-	1795	3272
1998	0	172	433	0	111	65	841	-	1622	2705
1999	0	0	438	0	83	42	831	-	1394	2648
2000	0	135	417	0	98	20	754	-	1424	2247
2001	0	252	509	0	92	7	770	-	1630	2473
2002	0	79	280	0	89	14	643	-	1105	1828
2003	0	92	344	0	98	13	558	-	1105	1642
2004	0	50	278	0	45	17	469	-	859	1328
2005	0	48	156	0	69	10	269	-	552	561
2006	0	53	221	0	52			346	672	875
2007	0	104	191	0	5			667	967	1301
2008	0	92	172	0	149			874	1287	1545
2009	0	174	188	0	112			953	1427	1387
2010	0	271	318	0	288			822	1699	1698
2011	0	153	227	0	217			715	1312	1297
2012	0	140	214	0	142			590	1086	1132
2013	0	105	203	0	213			470	991	949
2014	0	126	246	0	57			465	894	948
2015	0	140	311	0	140			520	1110	1110
2016	0	189	408	0	146			694	1437	1437
2017 *	0	132	336	0	313			579	1359	1359
2018 *	0	119	301	0	289			683	1392	1392

* Preliminary.

Table 10 Megrim in divisions 4.a. History of commercial landings; both the official and ICES estimated values are presented for each country. All weights are in tonnes.

Year	Belgium	Denmark	France	Germany	Germany, Fed. Rep. of	Ireland	Netherlands	Norway	Spain	Sweden	UK (E&W and NI)	UK (E&W)	UK (NI)	UK (Scotland)	UK	Official total	ICES landings
1990	4	2			3		24				17			1126		1176	837
1991	3	1		6			28				9			1169		1216	878
1992	2	4	36	3			27				47			1372		1491	1025
1993	7	6	25	4			30				8			1736		1816	1081
1994	2	1	27	1			28				19			2000		2078	1207
1995	7	2	24	2			26				44			2193		2298	1172
1996	5	7	14	1			9				4			3221		3261	1199
1997	3	5	16	2			20				3			3091		3140	1584
1998	5	18	14	4			30				5			2628		2704	1548
1999	4	21		1			26				4			2121		2177	1111
2000	10	29	7	3			20				2			2044		2115	1247
2001	2	52	5	1			11				2			1854		1927	1098
2002	5	8	6				9				3			1675		1706	975
2003	3	11	11	2		1	7	< 0.5			1			1235		1271	727
2004		7	9	2			11	< 0.5			1			1130		1160	739
2005		1	3	4			19	< 0.5			1			958		986	n/a
2006	0	3	4	1		0	6	1	0	0					1342	1357	1179
2007	0	11	18	4		0	1	1	0	0					1437	1472	1047
2008	0	31	20	1		0	1	4	0	0					1524	1581	1349
2009	0	54	9	0		0	0	6	0	0					1474	1543	1484
2010	0	22	1	0		0	1	2	0	0					1440	1466	1499
2011	0	23	10	3		0	0	1	0	0					1394	1431	1421
2012	0	35	5	3		0	0	1	0	0					1397	1441	1458
2013	0	48	8	3		0	0	17	0	0					1690	1765	1788
2014	0	35	6	1		0	0	12	0	0					1475	1530	1551
2015	0	26	7	0		0	0	8	0	0					1175	1217	1230
2016	0	46	13	2		0	2	21	0	0					1278	1362	1361
2017 *	0	0	36	0		0	0	29	0	0					1171	1235	1235
2018 *	0	0	66	0		0	0	0	0	0					1545	1611	1611

* Preliminary.

Summary of the assessment

Table 11 Megrim in divisions 4.a and 6.a. Assessment summary. High and low refers to 95% confidence intervals. All weights are in tonnes.

Year	B/B _{MSY}			Landings	Discards	F/F _{MSY}		
	Low	Value	High			Low	Value	High
1985	0.93	2.23	3.72	4499		0.35	0.71	1.39
1986	0.87	1.59	2.24	2858		0.30	0.54	0.92
1987	0.88	1.5	2.08	4614		0.53	0.95	1.58
1988	0.81	1.41	2.11	5212		0.59	1.17	1.91
1989	0.68	1.13	1.61	3451		0.46	0.89	1.42
1990	0.66	1.03	1.45	3047		0.44	0.83	1.31
1991	0.63	0.97	1.32	3310		0.53	0.96	1.47
1992	0.62	1.02	1.42	3574		0.54	0.99	1.57
1993	0.67	1.1	1.55	3802		0.52	0.98	1.54
1994	0.72	1.21	1.76	3900		0.45	0.92	1.5
1995	0.72	1.23	1.83	4670		0.52	1.10	1.77
1996	0.69	1.19	1.9	5253		0.60	1.31	2.1
1997	0.61	1	1.43	4856		0.65	1.39	2.2
1998	0.57	0.96	1.4	4253		0.59	1.26	2
1999	0.55	0.93	1.46	3759		0.49	1.12	1.8
2000	0.52	0.86	1.31	3494		0.50	1.10	1.76
2001	0.48	0.79	1.14	3571		0.60	1.21	1.98
2002	0.47	0.81	1.2	2803		0.41	0.89	1.44
2003	0.49	0.85	1.27	2369		0.33	0.71	1.18
2004	0.5	0.85	1.24	2067		0.29	0.60	0.97
2005	0.53	0.84	1.15	1527		0.23	0.43	0.68
2006	0.58	0.96	1.29	2054		0.28	0.51	0.82
2007	0.66	1.1	1.52	2348		0.29	0.52	0.81
2008	0.72	1.22	1.7	2894		0.32	0.58	0.94
2009	0.82	1.34	1.86	2871		0.29	0.53	0.83
2010	0.86	1.35	1.83	3197		0.33	0.58	0.91
2011	0.87	1.39	1.92	3257		0.33	0.57	0.88
2012	0.95	1.51	2.12	2545		0.24	0.44	0.67
2013	1.03	1.72	2.51	2737	327	0.21	0.38	0.59
2014	1.07	1.72	2.43	2500	309	0.19	0.34	0.53
2015	1.01	1.59	2.12	2471	152	0.21	0.34	0.51
2016	1.12	1.68	2.25	2792	167	0.22	0.36	0.54
2017	1.21	1.85	2.62	2594	193	0.18	0.32	0.48
2018	1.15	1.68	2.2	3003	255	0.24	0.40	0.59

Sources and references

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