

7.3.23 Four-spot megrim (*Lepidorhombus boscii*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 1197 tonnes. If discard rates do not change from the average of the last five years (2011–2015), this implies landings in 2017 of no more than 861 tonnes.

Stock development over time

The spawning-stock biomass (SSB) decreased from the late 1980s to a minimum in 2001, but since then SSB has increased and is currently above $MSY_{Btrigger}$. Fishing mortality (F) has been increasing in the last three years and has always been above F_{MSY} . Record-high recruitment is estimated in 2012 and 2014.

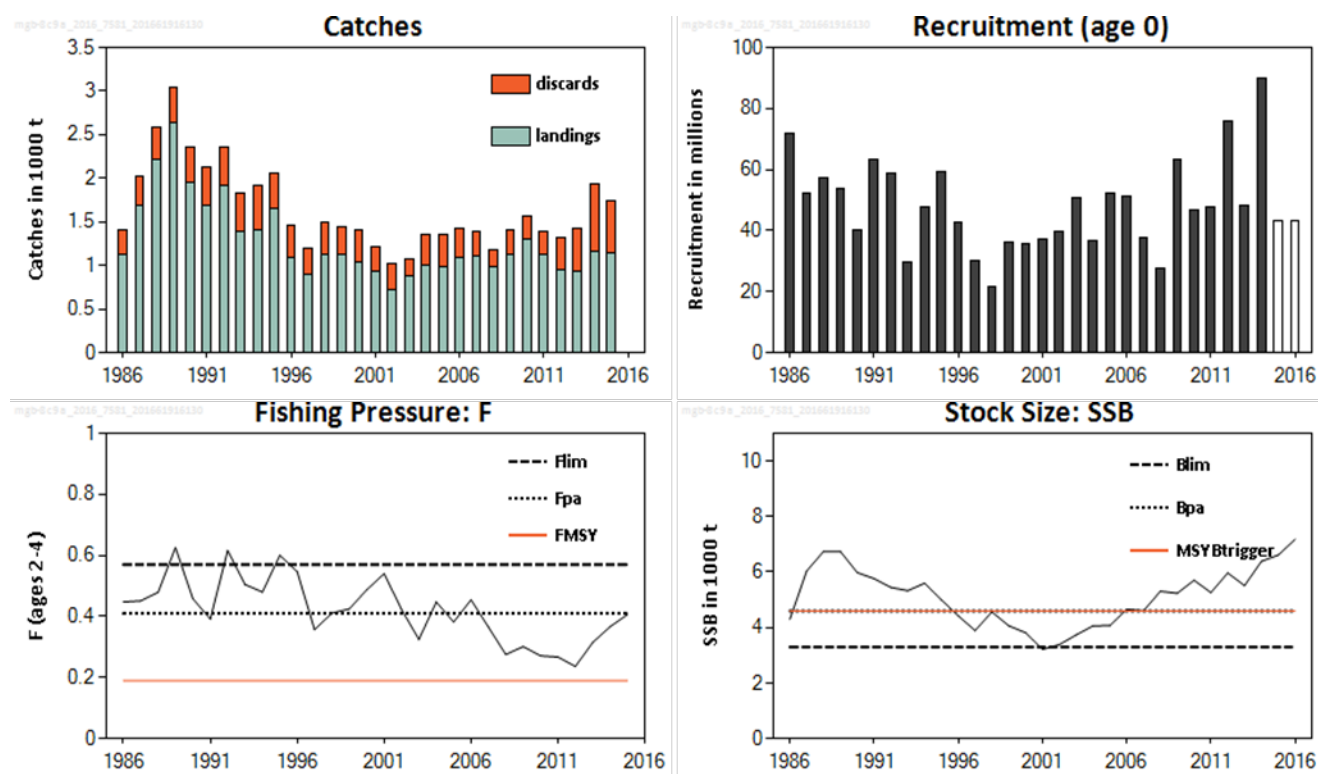


Figure 7.3.23.1 Four-spot megrim in divisions 8.c and 9.a. Summary of stock assessment (weights in thousand tonnes). Assumed recruitment values are unshaded.

Stock and exploitation status

Table 7.3.23.1 Four-spot megrim in divisions 8.c and 9.a. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2013	2014	2015			2014	2015	2016
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	SSB_{MGT}	-	-	- Not applicable

Catch options

Table 7.3.23.2 Four-spot megrim in divisions 8.c and 9.a. The basis for the catch options.

Variable	Value	Source	Notes
F (2016)	0.36	ICES (2016a)	Average $F_{2013-2015}$
SSB (2017)	6940 t	ICES (2016a)	
Recruitment (2016 to 2018)	43.283 million	ICES (2016a)	GM 1990–2013
Total catch (2016)	2154 t	ICES (2016a)	Based on F_{2016}
Landings (2016)	1411 t	ICES (2016a)	According to 2011–2015 average discard rates at age
Discards (2016)	743 t	ICES (2016a)	According to 2011–2015 average discard rates at age

Table 7.3.23.3 Four-spot megrim in divisions 8.c and 9.a. The catch options. All weights are in tonnes.

Rationale	Total catch (2017)	Landings (2017)	Discards (2017)	Basis	F total (2017)	F landings (2017)	F discards (2017)	SSB (2018)	%SSB change*	% Advice change **
MSY approach	1197	861	336	F_{MSY} [$F_{sq} \times 0.52$]	0.190	0.108	0.082	7507	8	12
Precautionary approach	2317	1650	667	F_{pa} [$F_{sq} \times 1.13$]	0.41	0.234	0.176	6159	-11	116
Other options	0	0	0	$F = 0$	0	0	0	8953	29	-100
	248	180	68	$F_{sq} \times 0.1$	0.036	0.021	0.016	8653	25	-77
	1148	827	322	$F_{sq} \times 0.5$	0.181	0.103	0.078	7566	9	7
	1072	772	300	Advice for 2016 [$F_{sq} \times 0.464$]	0.168	0.096	0.072	7658	10	0
	2098	1497	601	$F_{sq} \times 1$	0.363	0.207	0.156	6422	-7	96
	2970	2100	869	F_{lim} [$F_{sq} \times 1.56$]	0.57	0.322	0.243	5375	-23	177
	4699	3301	1398	$SSB_{2018} = B_{lim}$ [$F_{sq} \times 2.655$]	0.963	0.549	0.414	3300	-52	338
	3617	2541	1076	$SSB_{2018} = B_{pa}$ [$F_{sq} \times 2.044$]	0.741	0.422	0.319	4600	-34	237
	3617	2541	1076	$SSB_{2018} = MSY B_{trigger}$ [$F_{sq} \times 2.044$]	0.741	0.422	0.319	4600	-34	237

* SSB 2018 relative to SSB 2017.

** Total catch 2017 relative to advised catch for 2016 (1072 t).

Basis of the advice

Table 7.3.23.4 Four-spot megrim in divisions 8.c and 9.a. The basis of the advice.

Advice basis	MSY approach
Management plan	There is no management plan for four-spot megrim in this area.

Quality of the assessment

The inclusion of discards in the 2014 assessment led to an upwards revision of the recruitment and fishing mortality estimates, but it did not alter the overall perception of stock trends.



Figure 7.3.23.2 Four-spot megrim in divisions 8.c and 9.a. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

The two megrim species are not separated in the landings and a single TAC covers both of them. For these reasons, ICES provided advice in previous years applying a common multiplier of the current F for both megrim species; the value of the multiplier used in the advice corresponded to that required to get fishing mortality for both stocks at or below F_{MSY} in the advice year. 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. Therefore, this year's advice is based on the single-species F_{MSY} .

If the TAC continues to be set for both megrim species combined, then using the common F -multiplier approach (as has been done in the ICES advice in previous years), would result in combined megrim catches in 2017 of no more than:

$$1363 \text{ t (both megrim species)} = 1197 \text{ t (} L. \text{ boscii single-species catch advice)} + 166 \text{ t (} L. \text{ whiffiagonis catch resulting from the } L. \text{ boscii } F\text{-multiplier)}.$$

A mixed-fisheries analysis covering the Iberian waters stocks of hake, megrim, four-spot megrim, and white anglerfish is provided for the first time this year (ICES, 2016b).

Reference points

Table 7.3.23.5 Four-spot megrim in divisions 8.c and 9.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY B_{trigger}	4600 t	B_{pa}	ICES (2016c)
	F_{MSY}	0.19	Stochastic simulations based on segmented regression	ICES (2016c)
Precautionary approach	B_{lim}	3300 t	B_{loss} estimated in 2015	ICES (2016d)
	B_{pa}	4600 t	$B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$; $\sigma = 0.2$	ICES (2016d)
	F_{lim}	0.57	Based on segmented regression simulation of recruitment with B_{lim} as the breakpoint and no error	ICES (2016d)
	F_{pa}	0.41	$F_{\text{pa}} = F_{\text{lim}} \times \exp(-\sigma \times 1.645)$; $\sigma = 0.2$	ICES (2016d)
Management plan	SSB_{MGT}	Not applicable		
	F_{MGT}	Not applicable		

Basis of the assessment

Table 7.3.23.6 Four-spot megrim in divisions 8.c and 9.a. The basis of the assessment.

ICES stock data category	1 (ICES, 2016e)
Assessment type	Age-based assessment (XSA; ICES, 2016a) that uses catches in the model and in the forecast.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling); one survey index (SpGFS-WIBTS-Q4) (1988–2015 excluding 2003 and 2013); two commercial indices (SP-LCGOTBDEF-1 (1986–1999) and SP-LCGOTBDEF-2 (2000–2015)); constant maturity ogive (BIOSDEF, 1998); assumed natural mortality (0.2).
Discards and bycatch	Included in the assessment for all data series from the majority of the fleet.
Indicators	None
Other information	This stock was benchmarked in 2014 (WKSOUTH; ICES, 2014).
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE)

Information from stakeholders

There is no available information.

History of the advice, catch, and management

Table 7.3.23.7 Four-spot megrim in divisions 8.c and 9.a. History of ICES advice, the agreed TAC, and ICES estimates of landings. All weights are in thousand tonnes.¹

Year	ICES advice*	Predicted total landings corresp. to advice*	Predicted catches corresp. to advice <i>L. boscii</i>	Agreed TAC * **	ICES landings *	Landings <i>L. boscii</i>	Discards
1987	Not dealt with			13.0	2.19	1.69	0.33
1988	Not dealt with			13.0	3.04	2.22	0.36
1989	Not dealt with			13.0	3.34	2.63	0.41
1990	Not dealt with			13.0	2.93	1.95	0.41
1991	No advice			14.3	2.29	1.68	0.45
1992	No advice			14.3	2.44	1.92	0.44
1993	<i>L. boscii</i> no gain in increasing F, <i>L. whiff.</i> safe biological limits			8.0	1.76	1.38	0.44
1994	No gains in increasing F			6.0	1.88	1.40	0.52
1995	Concern about low SSB			6.0	1.87	1.65	0.41
1996	Mixed fishing aspects			6.0	1.43	1.10	0.37
1997	Reduce F by at least 50%			6.0	1.25	0.90	0.31
1998	Reduce F by at least 50%	0.9		6.0	1.57	1.12	0.38
1999	Reduce F by at least 50%	1.0		6.0	1.46	1.12	0.32
2000	Reduce F by at least 20%	< 1.5		5.0	1.29	1.04	0.37
2001	No increase in F	1.61		5.0	1.11	0.93	0.29
2002	No increase in F	1.55		4.0	0.84	0.72	0.31
2003	No increase in F	1.55		2.4	1.01	0.88	0.19
2004	No increase in F	1.38		1.336	1.14	1.01	0.35
2005	No increase in F***	1.09		1.336	1.13	0.98	0.38
2006	No increase in F	1.2		1.269	1.30	1.09	0.34
2007	No increase in F	1.4		1.440	1.26	1.10	0.29
2008	No increase in F	1.4		1.430	1.11	0.98	0.20
2009	Same advice as last year	1.4		1.430	1.22	1.13	0.28
2010	Reduce F to $F_{0.1}$	0.9		1.287	1.38	1.30	0.27
2011	MSY framework [^]	< 0.89	< 0.78 [^]	1094	1.43	1.13	0.27
2012	MSY framework [^]	< 0.86	< 0.76 [^]	1.214	1.21	0.95	0.37
2013	MSY framework [^]	< 0.89	< 0.78 [^]	1.214	1.16	0.93	0.50
2014	MSY approach [^]	< 2.26	< 1.96 [^]	2.257	1.53	1.15	0.79
2015	MSY approach [^]	< 1.01	< 0.82 [^]	1.377	1.42	1.15	0.60
2016	MSY approach	≤ 1.259	≤ 1.072	1.363			
2017	MSY approach ^{^^}	–	≤ 1.197				

*For both species combined.

** For Division 8.c and subareas 9 and 10; EU waters of CECAF 34.1.1.

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

[^] Advice is for landings.

^{^^} Advice is for single species.

History of catch and landings

Table 7.3.23.8 Four-spot megrim in divisions 8.c and 9.a. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings		Discards
1745 t	94% bottom otter trawl	6% other gear types	597 t

¹ Version 2; the header of column “Predicted catches corresp. to advice *L. boscii*” and respective footnotes was updated to be more clear that the advice for 2016 and 2017 corresponds to catches while previously was landings.

	1148 t	
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Table 7.3.23.9 Four-spot megrim in divisions 8.c and 9.a. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

Year	Official landings				ICES landings ***	Discards ***	ICES catch ***
	Spain			Portugal			
	Div. 8.c	Div. 9.a**	Total	Div. 9.a			
1986	799	197	996	128	1124	284	1408
1987	995	586	1581	107	1688	333	2021
1988	917	1099	2016	207	2223	363	2586
1989	805	1548	2353	276	2629	408	3037
1990	927	798	1725	220	1945	409	2354
1991	841	634	1475	207	1682	447	2129
1992	654	938	1592	324	1916	437	2353
1993	744	419	1163	221	1384	438	1822
1994	665	561	1227	176	1403	517	1920
1995	685	826	1512	141	1652	406	2058
1996	480	448	928	170	1098	368	1466
1997	505	289	794	101	896	308	1204
1998	725	284	1010	113	1123	378	1501
1999	713	298	1011	114	1125	317	1442
2000	674	225	899	142	1041	373	1414
2001	629	177	807	124	931	290	1221
2002	343	247	590	130	720	308	1028
2003	393	314	707	169	876	191	1067
2004	534	295	829	177	1006	348	1354
2005	473	321	794	189	983	375	1358
2006	542	348	891	201	1092	335	1427
2007	591	295	886	218	1104	292	1396
2008*	546	262	808	172	980	202	1182
2009	577	342	919	215	1134	279	1413
2010	616	484	1100	197	1297	265	1562
2011^	390	384	774	181	1128	269	1397
2012^	240	239	479	98	952	369	1321
2013^	338	283	621	80	931	496	1427
2014	427	313	739	142	1154	788	1942
2015	460	255	715	137	1148	597	1745

* Data revised in 2010.

** Division 9.a excluding Gulf of Cadiz.

*** Unallocated landings included.

^ Spanish data revised in 2015.

Summary of the assessment

Table 7.3.23.10 Four-spot megrim in divisions 8.c and 9.a. Assessment summary. Weights are in tonnes.

Year	Recruitment Age 0 (thousands)	SSB (tonnes)	Landings (tonnes)	Discards (tonnes)	Mean F Ages 2–4
1986	71931	4299	1124	284	0.448
1987	52338	6037	1688	333	0.451
1988	57185	6746	2223	363	0.479
1989	53613	6742	2629	408	0.626
1990	40371	5981	1945	409	0.459
1991	63379	5766	1682	447	0.391
1992	58918	5448	1916	437	0.616
1993	29523	5330	1384	438	0.505
1994	47963	5601	1403	517	0.48
1995	59500	5000	1652	406	0.601

Year	Recruitment Age 0 (thousands)	SSB (tonnes)	Landings (tonnes)	Discards (tonnes)	Mean F Ages 2–4
1996	42792	4422	1098	368	0.547
1997	30264	3895	896	308	0.357
1998	21406	4563	1123	378	0.411
1999	36281	4064	1125	317	0.425
2000	35916	3816	1041	373	0.487
2001	37099	3216	931	290	0.54
2002	39793	3388	720	308	0.423
2003	50899	3737	876	191	0.325
2004	36780	4063	1006	348	0.448
2005	52507	4069	983	375	0.382
2006	51472	4660	1092	335	0.455
2007	37528	4602	1104	292	0.365
2008	27845	5308	980	202	0.276
2009	63439	5236	1134	279	0.301
2010	46987	5705	1297	265	0.271
2011	47921	5262	1128	269	0.267
2012	75809	5967	952	369	0.236
2013	48207	5514	931	496	0.315
2014	90047	6389	1154	788	0.367
2015	43283*	6615	1148	597	0.406
2016	43283*	7180			

* Recruitment in 2015 and 2016 is the GM (1990–2013).

Sources and references

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