

9.3.34 Horse mackerel (*Trachurus trachurus*) in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k (Northeast Atlantic)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 69 186 tonnes.

Stock development over time

The stock and the fishery are very dependent on occasional high recruitments. The very high 1982 recruitment gave a peak in SSB in 1988, and the relatively high one in 2001 gave a moderate increase in SSB up to 2009. Recruitment from 2002 onwards has been low. In recent years, SSB has been declining and is currently the lowest observed in the entire time-series, below MSY $B_{trigger}$. Fishing mortality has increased since 2007 and is currently just below F_{MSY} .

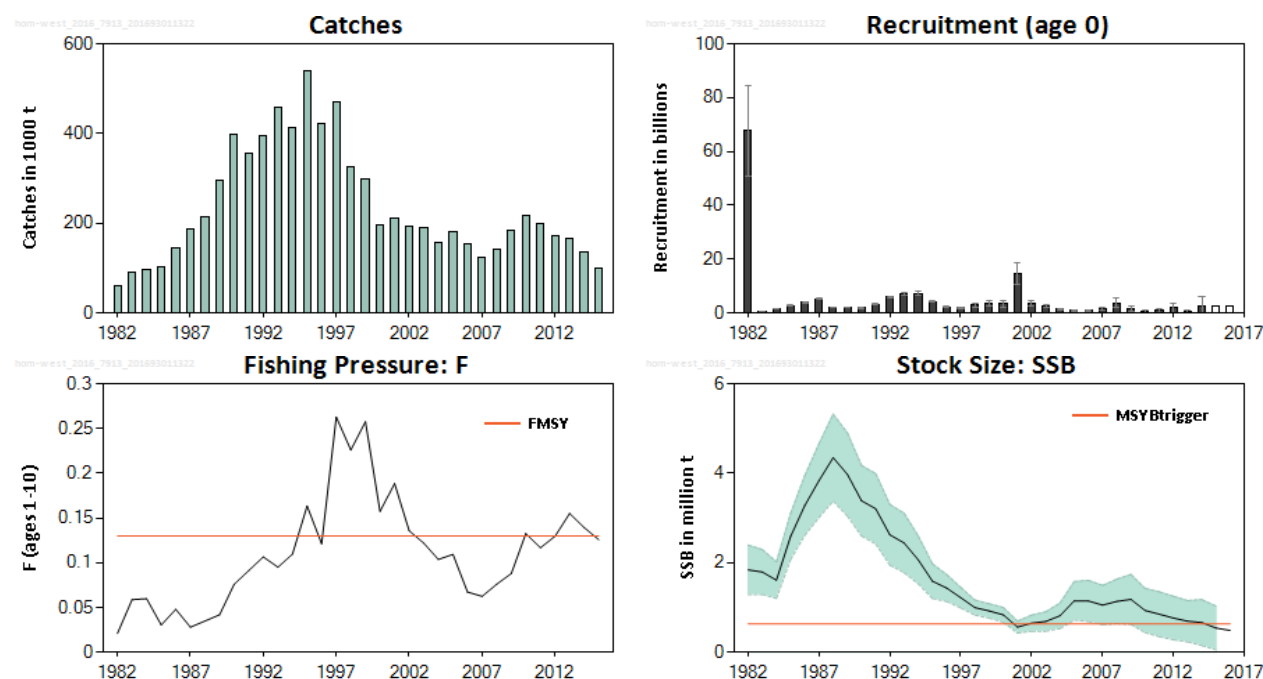


Figure 9.3.34.1 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. Summary of stock assessment. Predicted values are not shaded. Confidence intervals (95%, based on approximation using 2 * standard deviation) are included in the recruitment and spawning stock biomass plots.

Stock and exploitation status

Table 9.3.34.1 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. 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}	✗	✗	✓	Appropriate	MSY	✓	✗	Below trigger
Precautionary approach	F_{pa}, F_{lim}	?	?	✓	Below possible candidate reference points	B_{pa}, B_{lim}	✓	?	Undefined
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	Not applicable

Catch options

Table 9.3.34.2 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. The basis for the catch options.

Variable	Value	Source	Notes
F ages 1–10 (2016)	0.1606	ICES (2016a)	Catch constraint
SSB (2016) at spawning time	489 616 t	ICES (2016a)	Based on the ICES estimate of the total catch for 2016.
R _{age 0} (2016–2018)	2 342 897 thousands	ICES (2016a)	GM 1983–2014
Catch (2016)	124 403 t	ICES (2016a)	EU TAC – which is also the expected catch. The catches since 2007 have been below the total TAC (EU TAC plus national quotas of other countries) and closer to the EU TAC.

Table 9.3.34.3 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. The catch options.

Rationale	Catch (2017)	Basis	F (2017 and 2018)	SSB (2017)*	SSB (2018)*	%SSB change**	% TAC change***
MSY approach ^	69186	$F_{MSY} \times SSB_{2017} / MSY B_{trigger}$	0.092	455086	490225	8	–45
	96494	F_{MSY}	0.13	445576	461276	4	–23
Zero catch	0	$F = 0$	0	478383	566841	18	–100
Other options	93031	F_{2015}	0.126	446793	464906	4	–26
	116886	F_{2016}	0.161	438350	440145	0	–7
	0	$SSB_{2018} = MSY B_{trigger}^{^^}$					
	126103	ICES catch advice for 2016	0.175	435049	430740	–1	0

Weights in tonnes.

* SSB at spawning time.

** SSB_{2018} relative to SSB_{2017} at spawning time.

*** Catch in 2017 relative to the ICES advised catch for 2016 (126 103 t)

^ ICES MSY advice rule is based on SSB at spawning time (May) in 2017.

^^ Even with zero catch it is not possible to reach $MSY B_{trigger}$ by 2018.

Basis of the advice

Table 9.3.34.4 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. The basis of the advice.

Advice basis	MSY approach.
Management plan	The Pelagic AC proposed a management plan for horse mackerel in 2007 (see Annex 9.3.12.1 in ICES, 2014). ICES does not advise according to the management plan because it is not consistent, in its current configuration, with the precautionary approach (ICES, 2013).

Quality of the assessment

There is large uncertainty in the absolute estimates of SSB. The only fishery-independent information for this stock is a measure of egg production from surveys conducted every three years. The assessment assumes that fecundity is constant over time. If this assumption is incorrect, the assessment results may be biased. A change in the perception of the stock has occurred after each new egg survey estimate was included; the inclusion of the latest data point (2016) also changed the perception this year, but to a lesser extent than previously seen.

The landings fraction sampled to estimate biological parameters has increased since 2013; it is important to maintain these levels of sampling to maintain the quality of catch-at-age data.

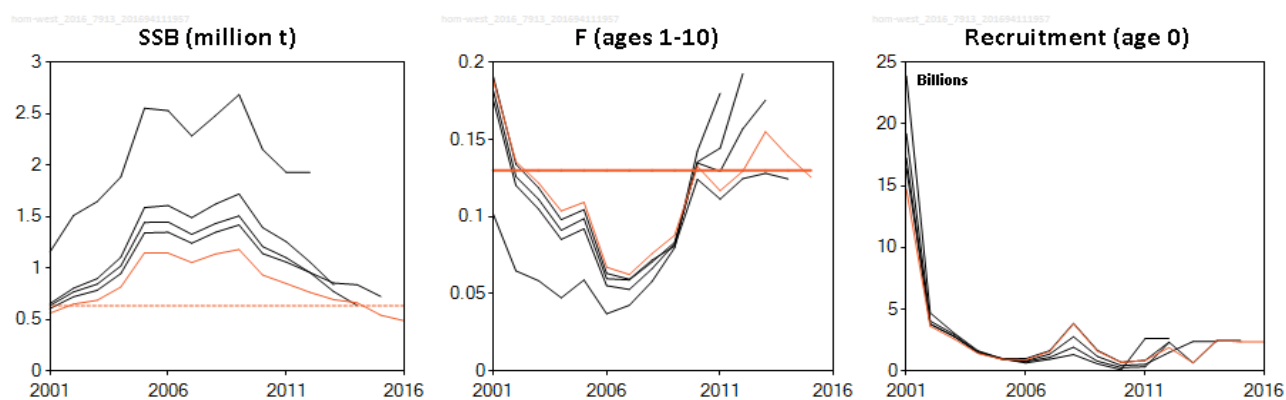


Figure 9.3.34.2 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

With the inclusion of the 2016 egg survey data point there has been a downward revision in the SSB estimates since the early 2000s. The SSB in 2016 is estimated to be at its lowest point in the entire time-series. The stock is on a downward trajectory and there is limited information on recent recruitment, which makes it difficult to predict future stock development.

The catch advice for 2017 is substantially lower than for 2016 (45% decrease). This is because SSB in 2017 is estimated to be considerably lower than last year's estimate of SSB in 2016. Additionally, a lower SSB below MSY B_{trigger} implies using a lower value of F when applying the ICES MSY approach.

Reference points

Table 9.3.34.5 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY B_{trigger}	634 577 t	B_{loss} 2014 assessment; SSB in 2001 at spawning time.	ICES (2014)
	F_{MSY}	0.13	$F_{0.1}$ from the yield-per-recruit.	ICES (2010)
Precautionary approach	B_{lim}	Not defined.		
	B_{pa}	Not defined.		
	F_{lim}	Not defined.		
	F_{pa}	Not defined.		

Basis of the assessment

Table 9.3.34.6 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. The basis of the assessment.

ICES stock data category	Category 1 (ICES, 2016b)
Assessment type	Age-based analytical assessment (Linked Separable Adapt VPA; ICES, 2015a) that uses catches in the model and in the forecast.
Input data	Commercial catches: international catches and ages from catch sampling. One survey index: Triennial egg survey index. One tuning index: potential fecundity vs. fish weight 1987, 1992, 1995, 1998, 2000, and 2001. Annual maturity data: constant since 1998. Natural mortalities: constant = 0.15.
Discards and bycatch	Discards are known to take place but are only quantified for part of the fisheries (discards in 2015 were below 4.3% in weight, 69% of the landings covered). Partial discard estimates are included in the assessment and overall discarding is considered negligible.
Indicators	None
Other information	The next benchmark is planned for 2017.
Working group	Working Group on Widely Distributed Stocks (WGWIDE).

Information from stakeholders

The Pelagic AC (PELAC) has been working actively with a number of scientists not only to resolve the scientific issues with the potential management strategies for horse mackerel, but also to identify additional data sources, particularly from the groundfish surveys. The Irish fishing industry reported large shoals of horse mackerel west of Scotland (Division 6.a) during January 2016. The pelagic freezer trawlers self-sampling programme reported larger proportions of small horse mackerel in Division 7.j in 2016 compared to 2015, and the Irish demersal fleet encountered increased numbers of juvenile horse mackerel to south and west of Ireland.

History of advice, catch, and management

Table 9.3.34.7 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. History of ICES advice, the agreed TAC, and ICES estimates of landings and catch.

Year	ICES advice	Predicted catch corresp. to advice**	Agreed TAC*	ICES estimated landings***	Discards ***	ICES estimated catch***
1987	Not assessed	-	155	157	-	157
1988	No increase in catches	102	169	184	4	188
1989	If sustained catches required; TAC	100	153	267	1	269
1990	TAC	~200	203	363	10	373
1991	Within safe biological limits	-	230	328	5	334
1992	Within safe biological limits	-	250	369	2	371
1993	Within safe biological limits	-	250	424	9	433
1994	Prudent not to increase F	-	300	385	4	389
1995	Reduction in catch	-	300	509	2	511
1996	Reduction in catch	-	300	379	17	397
1997	Reduction in F	173	300	440	3	443
1998	Reduction in F to 0.15	150	320	296	1	304
1999	Effectively limit catches to 200 000 t	< 200	265	274	-	274
2000	Effectively limit catches to 200 000 t	< 200	240	175	-	175
2001	Effectively limit catches to 224 000 t	< 224	233	191	-	191
2002	Effectively limit catches to 98 000 t	< 98	150	172	-	172
2003	Effectively limit catches to 113 000 t	< 113	137	190	-	190
2004	Limit catches to less than 130 000 t	< 130	137	157	1	158
2005	Limit catches to less than 150 000 t	< 150	137	182	1	182
2006	Limit catches to less than 150 000 t	< 150	137	155	0	155
2007	Limit catches to less than 150 000 t	< 150	137	123	0	123
2008	Follow proposed management plan	180	170	143^	0	143^
2009	Follow proposed management plan	180	170	183^	0	183^
2010	Follow proposed management plan	180	185	203^	15	218
2011	See scenarios	181–229	184	193	7	200
2012	MSY framework	≤ 211	183	170	3	173
2013	MSY framework	≤ 126	183	161	4	165
2014	MSY approach	≤ 110.546	135	134	2	136.36
2015	MSY approach	≤ 99.304	99.304	94	4	98.419
2016	MSY approach	≤ 126.103	126.103			
2017	MSY approach	≤ 69.186				

Weights in thousand tonnes.

* Applies to EU waters only. For 2014 and 2015 this is the EU TAC.

** Division 8.c is not included prior to 2005.

*** Division 8.c is not included prior to 2003.

^ Revised in 2015.

History of catch and landings

Table 9.3.34.8 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings				Discards
98.419 kt	Otter trawl	Pelagic trawl	Purse seine	Undefined and other gears	Discarding is known to take place and is estimated at 4.3%; considered negligible
	29%	7%	23%	40%	
	94.191 kt				4.228 kt

Table 9.3.34.9 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. History of catch and landings; both the official and ICES estimated values are presented by area. Unallocated catch not included.

Year	Divisions 2.a, 5.b	Division 3.a	Division 4.a	Divisions 6.a–b	Divisions 7.a–c, e–k	Divisions 8.a–b, d–e	Division 8.c	Discards	Total Western stock
1982	-		-	6283	32231	3073	19610	-	61197
1983	412		-	24881	36926	2643	25580	-	90442
1984	23		94	31716	38782	2510	23119	500	96744
1985	79		203	33025	35296	4448	23292	7500	103843
1986	214		776	20343	72761	3071	40334	8500	145999
1987	3311		11185	35197	99942	7605	30098	-	187338
1988	6818		42174	45842	81978	7548	26629	3740	214729
1989	4809		85304*	34870	131218	11516	27170	1150	296037
1990	11414	14878	112753*	20794	182580	21120	25182	9930	398645
1991	4487	2725	63869*	34415	196926	25693	23733	5440	357288
1992	13457	2374	101752	40881	180937	29329	24243	1820	394793
1993	3168	850	134908	53782	204318	27519	25483	8600	458628
1994	759	2492	106911	69546	194188	11044	24147	3935	413022
1995	13133	128	90527	83486	320102	1175	27534	2046	538131
1996	3366		18356	81259	252823	23978	24290	16870	420942
1997	2617	2037	65073*	40145	318101	11677	29129	2921	471700
1998	2540**		17011	35043	232451	15662	22906	830	326443
1999	2557^	2095	47316	40381	158715	22824	24188		298076
2000	1169^^	1105	4524	20657	115245	32227	21984		196911
2001	60	72	11456	24636	100676	54293	20828		212090
2002	1324	179	36855	14190	86878	32450	22110	305	194292
2003	24	1974	21272	23254	101948	21732	19979		190183
2004	47		11841	21929	98984	8353	15772	701	157627
2005	176		26315	22054	91431	26483	14775	760	181994
2006	30		27152	15722	77970	20651	13470	99	155094
2007	366	110	4940	26279	63223	14428	13960	102	123408
2008	572^^^	3	12014	25902	7570	14657	19345	43	142534
2009	1847	-	58738	17775	71379	12676	20903	81	183400
2010	1627	88	11516	23104	126622	2154	37505	15366	217982
2011	648	1	14724	39298	103156	2303	32943	6522	199593
2012	66	9	3312	44975	104098	5051	12351	3280	173142
2013	30	19	6703	43264	83683	9212	17773	4401	165085
2014	424	4096	10573	32444	48747	4118	26727	1896	129025
2015	10	65	9078	24153	41063	2677	17145	4228	98419

Weights in tonnes.

* Norwegian catches from 4b included.

** Includes 1937 t from Division 5.b.

^ Includes 132 t from Division 5.b.

^^ Includes 250 t from Division 5.b.

^^^ All from Division 5.b.

Table 9.3.34.10 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. History of catch and landings; both the official and ICES estimated values are presented by country.

Year	Denmark	France	Germany, Fed.Rep.	Ireland	Netherlands	Norway	Spain	UK (Engl. + Wales)	Other countries	Unallocated + discards	Total
1997	62.897	39.188	28.533	74.250	82.885	45.058	31.087	19.778	36.371	51.653	471.700
1998	29.542	24.267	27.872	70.811	92.535	13.363	14.882	12.162	20.034	20.975	326.443
1999	22.663	25.141	17.629	57.956	75.333	46.410	25.123	9.257	14.175	4.389	298.076
2000	13.084	20.457	13.348	55.300	57.971	2.087	22.669	1.555	9.235	1.205	196.911
2001	6.108	15.145	11.493	51.874	73.439	7.956	23.053	7.096	8.132	7.794	212.090
2002	10.152	18.951	12.614	36.483	42.019	36.689	23.214	5.971	4.184	4.015	194.292
2003	11.739	10.383	15.826	35.855	47.327	20.315	24.588	4.440	1.805	17.905	190.183
2004	11.480	8.060	17.830	26.431	40.987	10.751	16.272	4.617	5.962	15.957	158.347
2005	1.021	10.690	16.734	35.361	43.445	25.113	16.636	3.560	4.430	25.023	182.013
2006	8.353	11.034	10.863	26.779	37.130	27.114	13.878	3.583	8.727	7.633	155.094
2007	7.617	12.748	5.784	30.091	29.083	4.182	14.257	5.482	6.799	7.365	123.408
2008	5.261	12.626	11.708	35.612	43.648	1.223	19.851	3.365	7.475	2.337	143.106
2009	6.009	-	15.121	40.754	39.451	59.764	21.077	6.482	1.671	-6.929	183.400
2010	5.941	0.260	17.688	44.488	61.504	11.978	38.744	12.714	2.743	22.083	218.143
2011	6.109	8.271	21.114	38.464	55.692	13.755	34.581	11.716	3.369	6.522	199.593
2012	4.002	1.795	17.063	45.242	66.396	3.251	13.560	12.122	1.335	8.375	173.141
2013	6.829	3.593	24.835	35.791	53.697	6.596	22.541	3.959	2.843	4.401	165.085
2014	5.945	3.428	9.826	32.667	25.053	14.353	19.442	4.832	3.036	10.441	129.023
2015	4.556	3.247	9.417	21.654	24.958	8.897	13.071	2.063	1.951	8.605	98.419

Weights in thousand tonnes.

Summary of the assessment

Table 9.3.34.11 Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k. Assessment summary with weights in tonnes and recruitment in thousands. ‘High’ and ‘Low’ indicate +/- two standard deviations (indicating roughly 95% confidence bounds).

Year	Recruitment at age 0 thousands	High	Low	Stock size: SSB** tonnes	High	Low	Total catch tonnes	F Ages 1–10
1982	67605800	84516200	50695400	1840760	2394680	1286840	61197	0.021
1983	527098	561244	492952	1793680	2295040	1292320	90442	0.059
1984	1552230	1747002	1357458	1610620	2019000	1202240	96744	0.06
1985	2787330	3088630	2486030	2585680	3099780	2071580	103843	0.03
1986	3906220	4176000	3636440	3278880	3946260	2611500	145999	0.048
1987	5201980	5366788	5037172	3834240	4658620	3009860	187338	0.028
1988	1990470	2091852	1889088	4347470	5319750	3375190	214729	0.035
1989	2101790	2166642	2036938	3973870	4901930	3045810	296037	0.042
1990	1823730	1889004	1758456	3384290	4171490	2597090	398645	0.076
1991	3311120	3441440	3180800	3206070	3993090	2419050	357288	0.091
1992	6042870	6320410	5765330	2623350	3301030	1945670	394793	0.106
1993	7081060	7505780	6656340	2442960	3107120	1778800	458628	0.095
1994	7317730	7865130	6770330	2064420	2598500	1530340	413022	0.11
1995	4235980	4565820	3906140	1587950	1974830	1201070	538131	0.163
1996	2243280	2512880	1973680	1435380	1736300	1134460	420942	0.121
1997	1858050	2177530	1538570	1218440	1447180	989700	471700	0.263
1998	2940310	3562810	2317810	996561	1164941	828181	326443	0.226
1999	3545280	4396760	2693800	922966	1082702	763230	298076	0.257
2000	3518460	4825540	2211380	835344	1000116	670572	196911	0.157
2001	14735100	18802900	10667300	560950	696150	425750	212090	0.188
2002	3620230	4446630	2793830	650038	829806	470270	194292	0.136
2003	2589330	3189150	1989510	686955	903615	470295	190183	0.122
2004	1418170	1745130	1091210	815258	1101838	528678	157627	0.104
2005	941648	1163548	719748	1147900	1578380	717420	181994	0.109
2006	896333	1165133	627533	1145920	1605600	686240	155094	0.067
2007	1575080	2156400	993760	1053760	1492760	614760	123408	0.062
2008	3811010	5570950	2051070	1135830	1632890	638770	143106	0.076
2009	1598920	2478880	718960	1180460	1738980	621940	183400	0.088
2010	681324	1148384	214264	931758	1425898	437618	218143	0.133
2011	849263	1550043	148483	848863	1350023	347703	199593	0.117
2012	1888080	3732040	44120	763466	1249606	277326	173141	0.13
2013	660867	1306907	14827	692806	1153526	232086	165269	0.155
2014	2497990	5853790	0	662540	1175660	149420	136360	0.139
2015	2342897*			540923	1029423	52423	98419	0.126
2016	2342897*			489 616				

* R(age 0) is the geometric mean of the time-series 1983 to 2014.

** SSB at spawning time.

Sources and references

ICES. 2010. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 28 August–3 September 2010, Vigo, Spain. ICES CM 2010/ACOM:15. 612 pp.

ICES. 2013. EC request to ICES to evaluate possible modifications of the long-term management arrangement for the Western horse mackerel stock. *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 9, Section 9.3.3.4.

ICES. 2014. Horse mackerel (*Trachurus trachurus*) in Divisions IIa, IVa, Vb, VIa, VIIa–c, e–k, and VIIIa–e (Western stock). *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 9, Section 9.3.12.

ICES. 2016a. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 31 August–6 September 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM:16.

ICES. 2016b. General context of ICES advice. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.