Sprat (*Sprattus sprattus*) in Division 3.a and Subarea 4 (Skagerrak, Kattegat, and North Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in the period from 1 July 2020 to 30 June 2021 should be no more than 207 807 tonnes.

Note: This advice sheet is abbreviated due to the Covid 19 disruption. Last year's advice is attached as Annex 1.

Stock development over time

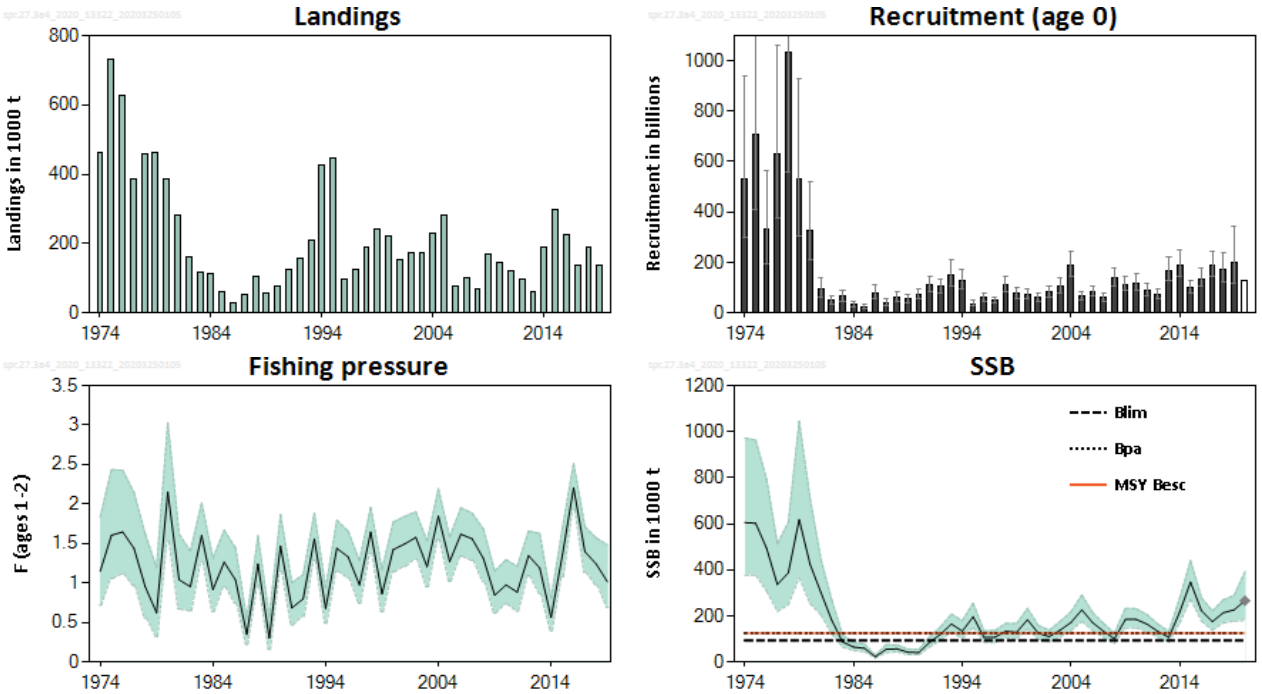

Figure 1 Sprat in Division 3.a and Subarea 4. Summary of the stock assessment. Historical development from the summary of the stock assessment with 90% confidence intervals. Years on the *x*-axes refer to the model years (i.e. "2009" corresponds to the period July 2009 to June 2010); recruitment and SSB are for July 1 of the given year; predicted values for recruitment and SSB are shown as an unshaded bar and a grey diamond.

Stock and exploitation status

Table 1 Sprat in Division 3.a and Subarea 4. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2017	2018	2019		2018	2019	2020	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{escapement}$	✓	✓	✓ Above escapement
Precautionary approach	F_{pa},F_{lim}	?	?	?	Undefined	B_{pa},B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable

Catch scenarios

Table 2 Sprat in Division 3.a and Subarea 4. Assumptions made for the forecast.

Variable	Value	Notes
$F_{ages\ 1–2}$ (2019)	1.015	Based on observed catches until 9 March 2020.
SSB (2020)	265 933	From the assessment; in tonnes.
$R_{age\ 0}$ (2019)	199 235 879	From the assessment; in thousands.
$R_{age\ 0}$ (2020)	128 110 595	Geometric mean (GM 2009–2018); in thousands.
Discards (2019)	-	Discarding is assumed to be negligible.
Total catch (2019)	136 523	Model estimated catches; in tonnes.

Note: Years in parentheses refer to the period July to the following June (e.g. 2019 corresponds to July 2019 to June 2020). Recruitment and SSB are for 1 July of the given year.

Table 3 Sprat in Division 3.a and Subarea 4. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch * (July 2020–June 2021)	F_{total} (July 2020–June 2021)	SSB (2021)	% SSB change *	% TAC change **	% Advice change
ICES advice basis						
$SSB_{2021} \geq$ MSY $B_{escapement}$ with F_{cap}	207 807	0.69	262 724	−1.21%	36.77	49.80
Other scenarios						
F = 0	0.00	0	393 335	47.91%	−100	−100
F = 0.4	136 387	0.4	306 093	15.10%	−10.24	−1.69
F = 0.8	230 586	0.8	249 322	−6.25%	51.76	66.22
F = 1.0	267 187	1.0	228 301	−14.15%	75.85	92.60
SSB_{2021} = MSY $B_{escapement}$ = B_{pa}	480 040	3.492	125 000	−53.00%	215.94	246.03
$F = F_{2019}$	269 710	1.015	226 878	−14.69%	77.51	94.42

* SSB in July 2021 relative to SSB in July 2020.
** The catch (July 2020–June 2021) relative to the sum of the TACs for July 2019–June 2020 in Subarea 4 and for 2019 and the first half of 2020 in Division 3.a.

The increase in advised catch is mainly due to the increased recruitment that leads to an increasing stock size.

Quality of the assessment

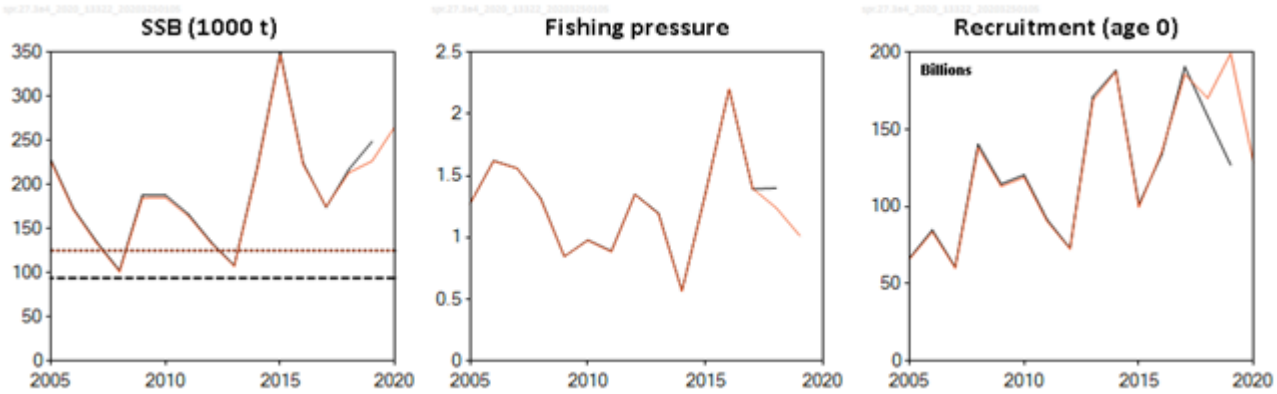

Figure 2 Sprat in Division 3.a and Subarea 4. Historical assessment results. The final point on each recruitment line is a ten-year geometric mean.

History of the advice, catch, and management

Table 4 Sprat in Division 3.a and Subarea 4. ICES advice as well as the official and ICES landings. All weights are in tonnes. During WKSPRAT (the Subarea 4 and Division 3.a stocks were merged into one stock. Hence, this table contains no historical records. To see the history of the former Subarea 4 and Division 3.a stocks, please go to http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/spr.27.4.pdf and http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/spr.27.3a.pdf

Year	ICES advice	Predicted catch corresponding to advice *	Agreed TAC *	Official landings	ICES landings *
2019	MSY approach, F_{cap} (catch)	≤ 138 726	151 940 ***	148 916 **	136 523 **
2020	MSY approach, F_{cap} (catch)	≤ 207 807			

* For 1 July to 30 June.
** Landings are preliminary.
*** The sum of the TACs for July 2019–June 2020 in Subarea 4 and for 2019 and the first half of 2020 in Division 3.a.

Summary of the assessment

Table 5 Sprat in Division 3.a and Subarea 4. Assessment summary. Weights are in tonnes. Recruitment in thousands. High and low refer to 90% confidence intervals.

Year *	Recruitment (age 0)	Recruitment High	Recruitment Low	SSB	SSB High	SSB Low	Catches **	F (1–2)	F High	F Low
	thousands			tonnes			tonnes			
1974	531386401	938654694	300825755	605010	972332	376453	463344	1.15	1.83	0.72
1975	708740494	1228375513	408924699	602595	963176	377003	732312	1.61	2.4	1.06
1976	329471364	564662898	192241034	494350	793678	307911	628598	1.65	2.4	1.12
1977	629854879	1059053002	374596142	336381	514417	219962	385257	1.44	2.1	0.97
1978	1031211333	1911065175	556441940	387317	605126	247907	458804	0.95	1.62	0.56
1979	533516203	928612902	306521198	618468	1045016	366025	463638	0.62	1.20	0.33
1980	328484431	517412332	208541650	424641	710838	253673	387434	2.2	3.0	1.53
1981	93362470	140299087	62128350	302247	446016	204821	280582	1.04	1.62	0.67
1982	48934831	69413830	34497704	180773	269137	121422	162357	0.95	1.40	0.65
1983	65923135	91518079	47486352	87029	117180	64636	115440	1.60	2.0	1.27
1984	33131664	46362844	23676441	64861	85602	49145	113444	0.92	1.31	0.64
1985	23115178	31832125	16785289	59755	78449	45515	62514	1.26	1.67	0.96
1986	78530685	110641168	55739365	22834	29729	17538	27520	1.04	1.45	0.75
1987	40507593	55686197	29466281	55105	75175	40393	53942	0.35	0.54	0.23
1988	60249209	85176903	42616801	57125	74194	43983	103652	1.24	1.60	0.96
1989	53704105	73866448	39045209	42235	56249	31712	58420	0.30	0.57	0.160
1990	73002190	97142370	54860920	41274	54476	31272	78180	1.47	1.87	1.15
1991	111663451	146638187	85030554	85221	110307	65840	125815	0.69	1.00	0.47
1992	103388056	135574409	78842978	120331	152717	94812	156471	0.80	1.11	0.58
1993	148783085	209326240	105750748	165215	208478	130929	208848	1.56	1.89	1.28
1994	127292736	169435740	95631776	134054	179487	100122	424206	0.68	0.94	0.49
1995	35891103	47615142	27053816	196418	255498	150999	446555	1.44	1.80	1.15
1996	60249209	80264637	45224987	107152	135257	84886	95496	1.33	1.66	1.07
1997	48593484	64128367	36821874	107581	137246	84328	125174	0.98	1.28	0.74
1998	109124501	145156974	82036408	133252	167820	105805	188907	1.65	1.96	1.38
1999	77284193	102179310	58454558	129056	166823	99839	243158	0.86	1.17	0.64
2000	72783512	96368253	54970796	183506	232961	144549	222027	1.42	1.77	1.14
2001	60672433	79311146	46413957	124742	158647	98083	153321	1.49	1.84	1.21
2002	81327925	107345361	61616370	110084	138573	87452	174713	1.58	1.90	1.31
2003	105899385	139556858	80359216	138413	176304	108666	174988	1.21	1.53	0.95
2004	186697459	245428237	142020909	171785	218110	135299	231352	1.85	2.2	1.55
2005	65659969	84952934	50748472	226613	291185	176360	280275	1.27	1.58	1.02
2006	83470180	108101212	64451367	170587	214490	135670	78028	1.62	1.95	1.34
2007	60068732	77471186	46575414	133252	167343	106107	99902	1.56	1.89	1.29

Year *	Recruitment (age 0)	Recruitment High	Recruitment Low	SSB	SSB High	SSB Low	Catches **	F (1–2)	F High	F Low
	thousands			tonnes			tonnes			
2008	137894575	177855580	106912101	100912	125523	81126	69892	1.31	1.68	1.02
2009	113124552	146931009	87096416	184795	232629	146796	170934	0.85	1.15	0.62
2010	118924572	156744980	90229708	185165	231228	148278	145415	0.98	1.30	0.74
2011	90331790	118064445	69113374	164226	205756	131079	122472	0.88	1.21	0.65
2012	72420502	92987452	56402548	132853	164241	107464	96030	1.35	1.66	1.09
2013	168930847	222540743	128235534	107152	133559	85965	60207	1.19	1.63	0.87
2014	187445745	247521008	141951213	216858	277699	169347	190268	0.56	0.80	0.40
2015	99632602	130250683	76211926	346972	440243	273462	298227	1.35	1.69	1.08
2016	135570180	176565844	104093031	222571	279241	177401	227169	2.2	2.5	1.93
2017	185766302	242423044	142350819	175080	222020	138065	135824	1.40	1.71	1.14
2018	170287714	235858850	122946014	213630	269398	169406	190779	1.24	1.57	0.98
2019	199235879	340842129	116461352	226613	289361	177472	136523	1.01	1.48	0.70
2020	128110600***			265933	391423	180675				

* Years refer to the period July to the following June (e.g. 2016 corresponds to July 2016 to June 2017). Recruitment and SSB are for 1 July of the given year.
** Catches are estimates from the assessment model.
*** Geometric mean recruitment (2009–2018).

Sources and references

ICES. 2020. Sprat in the North Sea and 3.a. Section 10 *in* Herring Assessment Working Group for the Area South of 62°N (HAWG). Section 10 is available separately at the HAWG website.

Recommended citation: ICES. 2020. Sprat (*Sprattus sprattus*) in Division 3.a and Subarea 4 (Skagerrak, Kattegat, and North Sea). *In* Report of the ICES Advisory Committee, 2020. ICES Advice 2020, spr.27.3a4, https://doi.org/10.17895/ices.advice.6002.

Annex 1

ICES Advice on fishing opportunities, catch, and effort
Greater North Sea ecoregion
Published 12 April 2019
Version 2 published 17 June 2019

Sprat (*Sprattus sprattus*) in Division 3.a and Subarea 4 (Skagerrak, Kattegat, and North Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in the period from 1 July 2019 to 30 June 2020 should be no more than 138 726 tonnes.

Stock development over time

The spawning-stock biomass (SSB) at 1 July has been above MSY $B_{escapement}$ since 2013. Fishing mortality (F) has been higher than average for the last four years. Recruitment (R) at 1 July in 2018 is estimated to have been below the long-term average, but above the average of the last ten years.

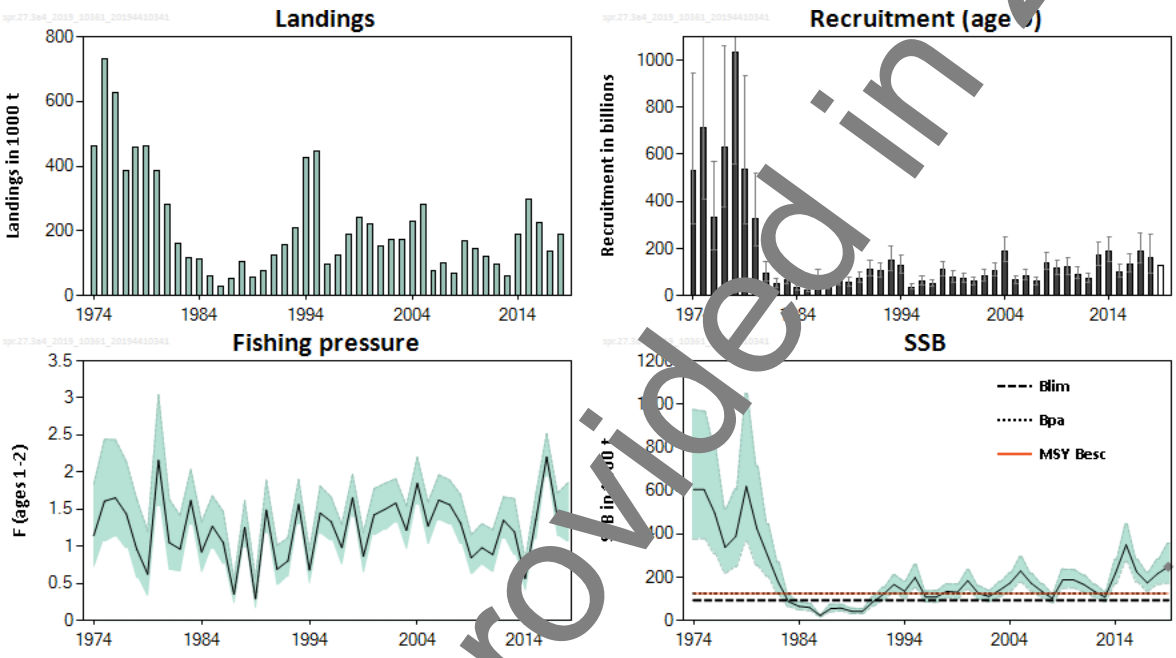

Figure 1 Sprat in Division 3.a and Subarea 4. Summary of the stock assessment. Historical development from the summary of the stock assessment with 90% confidence intervals. Years on the *x*-axes refer to the model years (i.e. "2009" corresponds to the period July 2009 to June 2010); recruitment and SSB are for July 1 of the given year; predicted values for recruitment and SSB are shown as an unshaded bar and a grey diamond.

Stock and exploitation status

ICES assesses that the size of the spawning stock is above MSY $B_{escapement}$, B_{pa}, and B_{lim}.

Table 1 Sprat in Division 3.a and Subarea 4. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2016	2017	2018		2017	2018	2019	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{escapement}$	✓	✓	✓ Above
Precautionary approach	F_{pa},F_{lim}	?	?	?	Undefined	B_{pa},B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable

Catch scenarios

Table 2 Sprat in Division 3.a and Subarea 4. Assumptions made for the forecast.

Variable	Value	Notes
$F_{ages\ 1–2}$ (2018)	1.40	Based on observed catches until 9 March 2019.
SSB (2019)	248 824	From the assessment; in tonnes.
$R_{age\ 0}$ (2018)	158 457 979	From the assessment; in thousands.
$R_{age\ 0}$ (2019)	126 949 604	Geometric mean (GM 2008–2017); in thousands.
Discards (2018)	-	Assumed to be neglible.
Total catch (2018)	190 052	Model estimated catches; in tonnes.

Note: Years refer to the period July to the following June (e.g. 2016 corresponds to July 2016 to June 2017). Recruitment and SSB are for 1 July of the given year.

Table 3 Sprat in Division 3.a and Subarea 4. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch* (July 2019–June 2020)	F_{total} (July 2019–June 2020)	SSB (2020)	% SSB change *	% TAC change	% Advice change
ICES advice basis						
$SSB_{2020} \geq$ MSY $B_{escapement}$ with F_{cap}	138 726	0.69	270 784	8.83%		
Other scenarios						
F = 0	0	0	368 650	44.94%		
F = 0.4	88 565	0.4	302 599	21.60%		
F = 0.8	155 361	0.8	266 466	4.68%		
F = 1.0	182 794	1.0	243 731	−2.05%		
SSB_{2020} = MSY $B_{escapement}$ = B_{pa}	417 854	2.19	125 000	−49.76%		
$F = F_{2018}$	228 739	1.4	216 613	−12.95%		

* SSB in July 2020 relative to SSB in July 2019.

At the Benchmark Workshop on Sprat (WKSPRAT) in 2018, sprat in Division 3.a and Subarea 4 were combined into a single stock unit (ICES, 2018a). Calculating % TAC change and % advice change is, therefore, not possible this year. The former TAC and ICES advice for Division 3.a follows the calendar year, while the TAC for Subarea 4 is from 31 July to 30 June.

Basis of the advice

Table 4 Sprat in Division 3.a and Subarea 4. The basis of the advice.

Advice basis	MSY approach (escapement strategy with F_{cap} = 0.69).
Management plan	ICES is not aware of any agreed precautionary management plan for sprat in this area.

Quality of the assessment

Sprat in Division 3.a and Subarea 4 were combined during the WKSPRAT benchmark (ICES, 2018a). Various changes were made to the assessment model, which improved the quality (i.e. better fit and reduced retrospective bias).

The new assessment, combining Subarea 4 and Division 3.a, is compared in Figure 2 with the previous assessment that covered Subarea 4 only. The levels and trends are similar.

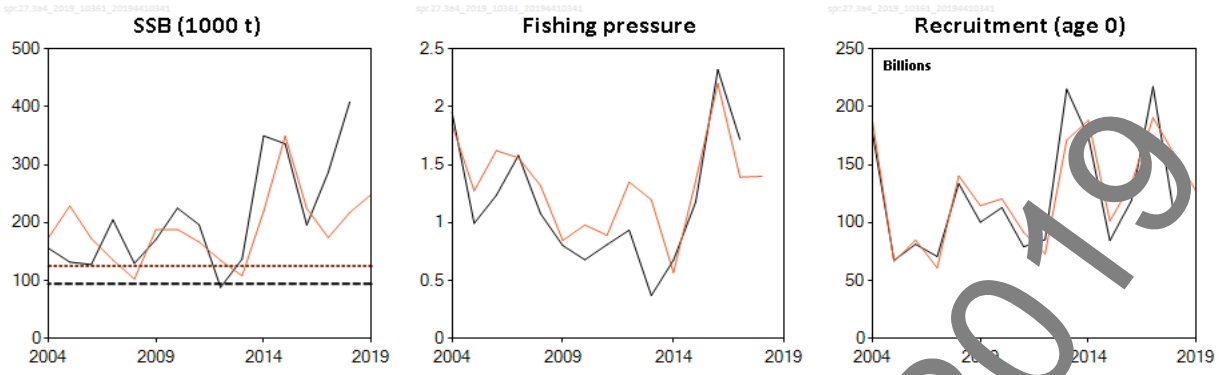

Figure 2 Sprat in Division 3.a and Subarea 4. Historical assessment results. Red lines: the new merged stock (Subarea 4 and Division 3.a combined). Black lines: last year of the former stock (Subarea 4).

Issues relevant for the advice

The advice is based on the MSY escapement strategy (with an F_{cap}), which relies on a prediction of SSB after the fishery has taken place. A high proportion of the predicted SSB consists of recruits from the previous year for which the abundance and proportion of mature fish at spawning time is unknown. This contributes to the uncertainty in the forecast, which is accounted for by the F_{cap}.

Recruitments slightly higher than average in recent years have contributed to an increase in SSB well above MSY $B_{escapement}$ in recent years. The F_{cap} of 0.69 is used to ensure that after the fishery has been conducted, escapement biomass is preserved above B_{lim} with high probability. This will result in a median SSB above MSY $B_{escapement}$ in the long term (ICES, 2018b).

The mean weight-at-age is decreasing over time, and this is taken into account by using a recent average in the forecast.

Last year's mean weight was particularly low, leading to a higher catch in numbers. Therefore, fishing mortality in 2018 was higher than expected.

This advice applies to the stock unit (i.e. recognized from genetics, growth, etc.) which is distributed within Division 3.a and Subarea 4. Local, genetically identifiable populations also exist in the periphery of Division 3.a, along the Norwegian coast and likely the Swedish coast. Norwegian populations are better characterized and are not part of this assessment or advice. The effort distribution within Division 3.a is important to consider. If a significant amount of fishing effort is re-allocated to coastal areas in Division 3.a this could cause depletion of local populations.

Although the advice now applies to the combined area, there are different TAC-setting procedures for each area. For consideration regarding the splitting of advice between areas, please see ICES (2018a).

Reference points

Table 5 Sprat in Division 3.a and Subarea 4. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{escapement}$	125 000	= B_{pa}.	ICES (2018a)
	F_{cap}	0.69	F_{cap} is the upper limit on exploitation rates when biomass is greater than MSY $B_{escapment}$ that has a less than 5% risk of causing the stock to decline below B_{Lim} in the long term.	ICES (2018b)
	MSY $B_{trigger}$	Not defined		
	F_{MSY}	Not defined		
Precautionary approach	B_{lim}	94 000	The breakpoint of the hockey-stick relationship.	ICES (2018a)
	B_{pa}	125 000	$B_{pa} = B_{lim} * e^{(\sigma * 1.645)}$, where σ = 0.173 is estimated from assessment uncertainty in the terminal year.	ICES (2018a)
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	SSB_{mgt}			
	F_{mgt}			

Basis of the assessment

Table 6 Sprat in Division 3.a and Subarea 4. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018c).
Assessment type	Age-based analytical assessment (SMS; ICES, 2019) that uses landings in the model.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling), three survey indices (IBTS Q1&Q3, HERAS), constant maturity based on long-term average from IBTS Q1 survey (ICES, 2018a), and natural mortalities from the multispecies model (ICES, 2017).
Discards and bycatch	Discards are not included. Discarding is known to have taken place prior to 2015, but the amount has not been quantified. Discarding has been assumed negligible since 2016.
Indicators	None.
Other information	To match the sprat life cycle, the assessment and advice year is July to June. The latest benchmark was performed in 2018 (ICES, 2018a).
Working group	Herring Assessment Working Group for the Area South of 62°N (HAWG)

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Sprat in Division 3.a and Subarea 4. ICES advice as well as the official and ICES landings. All weights are in tonnes. During WKSPRAT (ICES, 2018a) the Subarea 4 and Division 3.a stocks were merged into one stock. Hence, this table contains no historical records. To see the history of the former Subarea 4 and Division 3.a stocks, please go to http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/spr.27.4.pdf and http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/spr.27.3a.pdf

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC*	Official landings	ICES landings
2019**	MSY approach: F_{cap} (catch)	≤ 138726			

* TACs are set for January–December, whereas the advice since 2013 has been given for July (of the TAC year) to June of the following year.
** Advice for 1 July to 30 June.

History of the catch and landings

Table 8 Sprat in Division 3.a and Subarea 4. Catch distribution by fleet in 2018 as estimated by ICES (in tonnes).

Catch (2018)	Landings		Discards
191 184	Industrial trawl 99%	Purse-seine 1%	negligible
	191 184		

Table 9[†] Sprat in Division 3.a and Subarea 4. History of commercial catch and landings; ICES estimate values are presented by area for each country participating in the fishery. See ICES (2006) for earlier landings data. Catches in coastal areas of Norway are excluded. The Division 4.b catches for 2000–2007 divided by division 4.b West and 4.b East can be found in ICES (2008). All weights are in tonnes.

Year	Quarter	Area				Total
		Division 3a	Division 4.a	Division 4.b	Division 4.c	
2008	1	2890	0	2872	43	5805
	2	1017	0	52	*	1069
	3	636	0	21787		22423
	4	3672	0	27394	8334	40001
	Total	8215	0	52706	8377	69298
2009	1	2600	0	36	1268	3904
	2	300	0	2526	1	2827
	3	3300	22	41513		44835
	4	2400	0	78373	9336	90109
	Total	8600	22	122448	10604	141675
2010	1	1462	0	10976	17072	29510
	2	648	0	3235	3	3886
	3	3405	0	14220		17625
	4	4278	0	62006	35973	102257
	Total	9793	0	90437	53048	153278
2011	1	3216	0	3747	21039	28002
	2	617	0	2067	3	2687
	3	2311	0	22309	451	25072
	4	3887	8	70256	13759	87910
	Total	10031	8	98380	35252	143671
2012	1	4668	0	81	1649	6399
	2	909	0	2924	0	3832
	3	1631	0	26779	307	28717
	4	2728	0	47765	6060	56553
	Total	9936	0	77549	8016	95501
2013	1	1296	0	1281	3158	5734
	2	443	0	32	0	474
	3	211	0	25577	720	26509
	4	943	0	18892	16276	36110
	Total	2893	0	45781	20154	68827
2014	1	384	0	59	125	568

[†] Version 2: totals corrected.

Year	Quarter	Area				Total
		Division 3a	Division 4.a	Division 4.b	Division 4.c	
	2	1415	0	11631	3	13050
	3	9622	1	88457	1 28	99507
	4	6905	7	37851	82	45586
	Total	18327	8	137999	378	158711
2015	1	1442	0	14816	16972	33230
	2	619	0	16843	107	17568
	3	6528	0	124512	335	131375
	4	4389	25	88395	28375	121184
	Total	12978	25	244566	45789	303358
2016	1	746	68	18487	5969	25250
	2	669	0	8 27	51	9647
	3	4664	0	1 22	111	163297
	4	1764	2	1070	14466	50301
	Total	7843	70	220007	20596	248516
2017	1	92	1	3432	1220	4745
	2	33	0	1327	*	1360
	3	227	0	92885	217	93329
	4	849	94	29310	174	30426
	Total	1200	95	126954	1611	129860
2018	1	168	0	8994	1628	10790
	2	224	0	11898	*	12122
	3	1328	0	112361	*	113690
	4	2249	0	46411	5922	54582
	Total	3969	0	179664	7551	191184

* < 0.5 tonnes.

Summary of the assessment

Table 10 Sprat in Division 3.a and Subarea 4. Assessment summary. Weights are in tonnes. Recruitment in thousands. High and Low refer to 90% confidence intervals.

Year*	Recruitment (age 0)	Recruitment High	Recruitment Low	SSB	SSB High	SSB Low	Catches**	F (1–2)	F High	F Low
	thousands			tonnes			tonnes			
1974	533516203	9427 7956	301922182	605615	973689	376680	463344	1.15	1.84	0.72
1975	713005719	1230133887	411263829	605010	967561	378309	732312	1.61	2.4	1.06
1976	33046126	56694929	192704469	497325	798730	309657	628598	1.65	2.4	1.12
1977	6317 7281	1062689348	375560955	337729	516734	220735	385257	1.44	2.1	0.97
1978	10 75820	1917223555	556877635	388481	607163	248562	458804	0.96	1.63	0.56
1979	34584 3	931513398	306791484	619706	1048246	366360	463638	0.63	1.20	0.33
1980	32 184431	519040578	207887448	425491	713234	253834	387434	2.2	3.0	1.53
198	00778	142215874	62529143	302549	447374	204608	280582	1.05	1.63	0.67
1982	49278577	69933635	34724037	180954	270001	121275	162357	0.96	1.42	0.65
1983	66986389	93188628	48151543	87378	117857	64781	115440	1.62	2.0	1.28
1984	33531639	47094220	23874922	65578	86703	49601	113444	0.93	1.33	0.64
1985	23324153	32267663	16859483	60355	79421	45866	62514	1.27	1.68	0.96

Year*	Recruitment (age 0)	Recruitment High	Recruitment Low	SSB	SSB High	SSB Low	Catches**	F (1–2)	F High	F Low
1986	79161450	111720817	56091026	23040	30134	17616	27520	1.05	1.47	0.76
1987	40832954	56310120	29609777	55492	75823	40613	53942	0.3[illegible]	[illegible]55	0.23
1988	60915609	86469649	42913455	57412	74656	44150	103652	1.2[illegible]	1.62	0.97
1989	54624879	75311099	39620686	42531	56884	31800	58420	0.30	0.56	0.156
1990	73809647	98393101	55368353	41940	55471	31710	78180	1.[illegible]9	1.89	1.17
1991	112560341	148139752	85526202	86163	111723	66451	125815	0.69	1.01	0.47
1992	104218478	136976201	79294732	121297	154246	95387	1564[illegible]1	0.80	1.11	0.58
1993	150428734	212401872	106537686	166542	210581	131712	2088[illegible]2	1.[illegible]6	1.90	1.29
1994	128700686	171750003	96441725	135402	181822	100832	[illegible]424[illegible]06	[illegible]68	0.94	0.49
1995	36324391	48312201	27311142	198590	259052	152240	[illegible]4465[illegible]5	1.45	1.81	1.16
1996	60854724	81330447	45533960	108120	136837	85430	9545[illegible]6	1.34	1.67	1.07
1997	49081856	64891248	37124091	108662	139011	84939	125174[illegible]	0.98	1.29	0.75
1998	109891052	146477523	82442979	134457	169733	10651[illegible]	188907	1.65	1.97	1.39
1999	77593949	102838914	58546134	130092	168489	1004[illegible]	243158	0.87	1.18	0.64
2000	73294784	97297756	55213250	184241	234488	14[illegible]761	222027	1.43	1.78	1.14
2001	61404888	80431189	46879330	125492	159993	98431	153321	1.50	1.85	1.21
2002	82227471	108747134	62175036	111302	140396	88236	174713	1.58	1.91	1.31
2003	106856781	141034136	80961759	139944	1786[illegible]1	1[illegible]642	174988	1.22	1.54	0.96
2004	188385320	248311983	142921129	173338	22041[illegible]	1[illegible]6314	231352	1.85	2.2	1.55
2005	66452635	86209359	51223589	228891	294[illegible]05	177714	280275	1.27	1.59	1.02
2006	84901303	110351475	65320661	1724[illegible]1	[illegible]7398	136833	78028	1.62	1.96	1.34
2007	60915609	78701816	47148993	13540[illegible]	170642	107439	99902	1.56	1.89	1.29
2008	140399151	181572175	108562457	1025[illegible]9	1[illegible]7806	82268	69892	1.32	1.70	1.02
2009	114604772	149331835	87953474	1[illegible]8263	237206	148942	170934	0.85	1.16	0.62
2010	120601225	159436698	91225268	1[illegible]8151	235569	150278	145415	0.98	1.31	0.74
2011	91696980	120061874	70033357	166[illegible]42	209307	132514	122472	0.89	1.22	0.65
2012	73002190	93964365	5671623[illegible]	134592	166716	108657	96030	1.35	1.67	1.09
2013	171312512	226600786	12951[illegible]011	[illegible]08228	135210	86631	60207	1.20	1.64	0.87
2014	188385320	249803292	14[illegible]067[illegible]9	219476	282163	170716	190268	0.57	0.81	0.40
2015	101442227	133020624	77[illegible]60375	349759	445505	274590	298227	1.36	1.71	1.09
2016	133819174	176295145	10[illegible]577224	224583	282443	178576	227169	2.2	2.5	1.93
2017	190659562	264092477	1376[illegible]5226	174207	222605	136332	135824	1.39	1.72	1.13
2018	158457979	259616385	[illegible]5715510	217510	284316	166402	190052	1.40	1.86	1.05
2019	126949604			248824	356868	173458				

* Years refer to the period July to the following June (e.g. 2016 corresponds to July 2016 to June 2017). Recruitment and SSB are for 1 July of the given year.
** Catches are estimates from the assessment model.

Sources and references

ICES. 2006. Report of the Herring Assessment Working Group South of 62°N (HAWG), 14–23 March 2006, ICES Headquarters, Denmark. ICES CM 2006/ACFM:20. 647 pp.

ICES. 2008. Report of the Herring Assessment Working Group South of 62°N (HAWG), 11–19 March 2008, ICES Headquarters, Copenhagen, Denmark. ICES CM 2008/ACOM:02. 601 pp.

ICES. 2017. Interim Report of the Working Group on Multispecies Assessment Methods (WGSAM), 16–20 October 2017, San Sebastian, Spain. ICES CM 2017/SSGEPI:20. 395 pp.

ICES. 2018. Report of the Benchmark Workshop on Sprat (WKSPRAT 2018), 5–9 November 2018, ICES HQ, Copenhagen, Denmark. ICES CM 2018/ACOM:35. 60 pp.

ICES. 2018b. Report of the Workshop on the management strategy evaluation of the reference point, F_{cap}, for sprat (*Sprattus sprattus*) in Division 3.a and Subarea 4 (Skagerrak, Kattegat and North Sea) (WKspratMSE), 11–12 December 2018, ICES HQ, Copenhagen, Denmark. ICES CM 2018/ACOM:69. 35 pp.

ICES. 2018c. Advice basis. *In* Report of the ICES Advisory Committee, 2018. ICES Advice 2018, Book 1, Section 1.2. https://doi.org/10.17895/ices.pub.4503

ICES. 2018d. Sprat (*Sprattus sprattus*) in Subarea 4 (North Sea). *In* Report of the ICES Advisory Committee, 2018. ICES Advice 2018, spr.27.4, http://doi.org/10.17895/ices.pub.4257. 9 pp.

ICES. 2018e. Sprat (*Sprattus sprattus*) in Division 3.a (Skagerrak and Kattegat). *In* Report of the ICES Advisory Committee, 2018. ICES Advice 2018, spr.27.3a, https://doi.org/10.17895/ices.pub.4258. 7 pp.

ICES. 2019. Sprat (*Sprattus sprattus*) in Division 3.a and Subarea 4 (Skagerrak, Kattegat and North Sea). Section 10 *In* Herring Assessment Working Group for the Area South of 62°N (HAWG). ICES Scientific Reports. 1:2. Section 10 is available separately at the HAWG website.

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