

6.3.51 Sprat (*Sprattus sprattus*) in Subarea 4 (North Sea)

ICES stock advice

ICES provides catch advice for the period July to June in the following year. The TAC at present corresponds to the calendar year (January to December). ICES advises that when the MSY approach is applied, catches from July 2016 to June 2017 should be no more than 125 541 tonnes. An in-year revision of the 2016 TAC is required to ensure that exploitation is consistent with the ICES MSY approach.

Stock development over time

The spawning-stock biomass (SSB) has been at or above $MSY_{Bescapement}$ since 2013. Fishing mortality (F) has shown an increase in the last two years. Recruitment (R) in 2015 is estimated to be above the long term average.

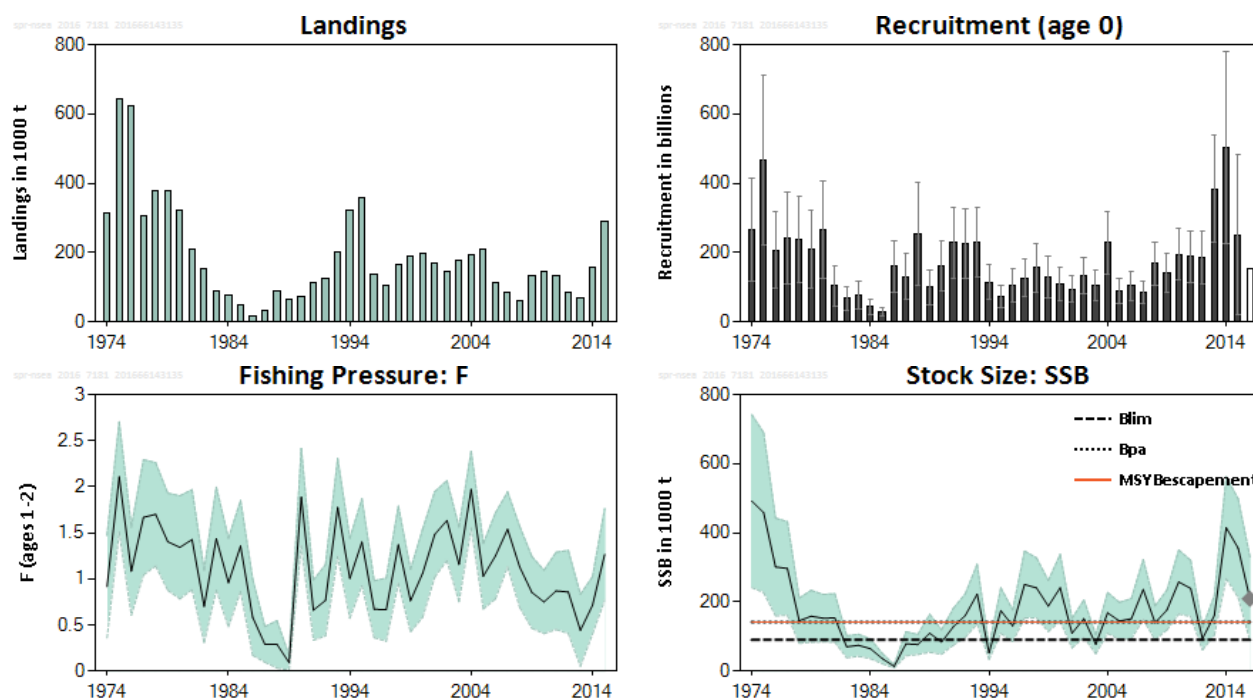


Figure 6.3.51.1 Sprat in Subarea 4. Estimated landings, recruitment, fishing mortality, and spawning-stock biomass from the stock assessment (weights in thousand tonnes). NB: Years on the x-axes refer to the model years (i.e. 2009 corresponds to: 07/2009 to 06/2010). Predicted values for recruitment and SSB are shown as unshaded bars and a diamond shape.

Stock and exploitation status

Table 6.3.51.1 Sprat in Subarea 4. 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}	?	?	?	Undefined	$MSY_{Bescapement}$	✓ Above trigger
Precautionary approach	F_{pa}, F_{lim}	?	?	?	Undefined	B_{pa}, B_{lim}	✓ Full reproductive capacity
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	- Not applicable

Catch options

Table 6.3.51.2 Sprat in Subarea 4. The basis for the catch options.

Variable*	Value	Source	Notes
$F_{\text{ages 1-2}}$ (2015)	1.226	ICES (2016a)	Observed catch for Q3 and Q4 of 2015 plus average of the last three years (Q1 and Q2).
SSB (2016)	208.904	ICES (2016a)	In thousand tonnes.
R_{age0} (2015)	250819	ICES (2016a)	
R_{age0} (2016)	153211	ICES (2016a)	Geometric mean (GM 1996–2015)
Discards	-	ICES (2016a)	Assumed to be negligible.
Total catch (2015)	275.150	ICES (2016a)	Model-estimated catch in thousand tonnes.

* Years refer to the period July to the following June (e.g. 2015 corresponds to July 2015 to June 2016).

Table 6.3.51.3 Sprat in Subarea 4. The catch options.

Rationale	Catch* (July 2016–June 2017)	Basis	F (July 2016– June 2017)	SSB* (July 2017)	% SSB change**	% catch advice change***
MSY approach	126	Escapement strategy with F_{cap}	0.7	206	-19	-75
Zero catch	0	$F = 0$	0	286	12	-100
Other options	23	$F_{2015-2016} \times 0.08$	0.1	271	6	-95
	43	$F_{2015-2016} \times 0.16$	0.2	257	1	-92
	62	$F_{2015-2016} \times 0.24$	0.3	245	-4	-88
	80	$F_{2015-2016} \times 0.33$	0.4	234	-8	-84
	96	$F_{2015-2016} \times 0.41$	0.5	224	-12	-81
	112	$F_{2015-2016} \times 0.49$	0.6	215	-16	-78
	126	$F_{2015-2016} \times 0.57$	0.7	206	-19	-75
	139	$F_{2015-2016} \times 0.65$	0.8	199	-22	-73
	183	$F_{\text{status quo}}$ $F_{2015-2016} \times 0.98$	1.2	174	-32	-64
	309	$F_{\text{sq}} \times 2.81$	3.45	116	-55	-39
	245	Escapement strategy without F_{cap}	2.01	142	-44	-11

* Weights are in thousand tonnes.

** SSB in July 2017 relative to SSB in July 2016.

*** Relative to catch advice given in 2015.

Basis of the advice

Table 6.3.51.4 Sprat in Subarea 4. The basis of the advice.

Advice basis	MSY approach; escapement strategy with an $F_{\text{cap}} = 0.7$.
Management plan	There is no management plan for sprat in this area.

Quality of the assessment

The bycatch percentage of herring in landings monitored by the control agencies has often reached more than the 20% limit. Until 2015, catches of sprat with a bycatch higher than this limit were not allowed to be landed. Therefore, discarding occurred but was not quantified. In 2015, the landing obligation was in effect and discarding was prohibited, however, there was no information on discarding from observers. In 2015, biological samples indicate a low percentage of herring that would imply that the condition that would lead to discarding was unlikely to have occurred.

High recruitment of the 2015 year-class was not confirmed by the 2015 HERAS and IBTS Q3 survey estimates and the estimated SSB on July 1st 2015 was only 54% of that predicted in the assessment in spring 2015. Consequently, the 2016 assessment has revised the SSB downwards in the most recent year. The advice is based on the escapement strategy (with an F_{cap}), which relies heavily on a prediction of SSB after the fishery has taken place. A high proportion of the predicted SSB

consists of recruits for which the abundance and proportion mature is unknown. This contributes to the uncertainty in the advice.

Natural mortality was revised in 2015 (ICES, 2014a), which rescaled the estimates of F , SSB , and R in subsequent assessments.



Figure 6.3.51.2 Sprat in Subarea 4. Historical assessment results (final-year recruitment and SSB estimates included). The change in SSB between assessment years 2013 and 2014 is caused by an update of natural mortality in 2014.

Issues relevant for the advice

The TAC year (calendar year) and the advice year (July to June) do not correspond. New information indicates that the current TAC (355 500 t), which includes the first half of 2016, is substantially above the advice of 125 541 t, which includes the second half of 2016. Taking the remaining TAC for 2016 in the second half of the year would result in overfishing, hence ICES advises an in-year revision of the 2016 TAC. The TAC for the period 1st July–31st December 2016 should be set according to the advised catch 2016/2017 minus the assumed catch in the first half of 2017 ($125\,541 - 16\,800 = 108\,741$ t). The assumed catch in the first half of 2017 is based on the 2004–2015 average catch.

In order to be in accordance with the MSY principles, a TAC in year revision will be required for July 2016 to June 2017. There is no management plan for sprat in this area, however, the within year TAC setting rule ($B_{\text{escapement}}$ with an F_{cap}) has been evaluated by ICES to be precautionary (ICES, 2014b).

Under the EU landing obligation, which entered into force in 2015, up to 9% inter-species quota transfers are allowed for stocks that are considered to be within safe biological limits (see Article 15 of EU, 2013). In 2015, no inter-species quota transfer was made (ICES, 2016a). Potential quota transfers in 2016 were not considered in this catch advice. The catch of sprat under the other species' quotas (e.g. herring) under this regulation may result in a risk of overexploitation of North Sea sprat. To achieve F_{MSY} exploitation, any transfer under this regulation should be accounted for in setting the TAC.

Reference points

Table 6.3.51.5 Sprat in Subarea 4. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{\text{escapement}}$	142 000 t	Equal to B_{pa} , used in conjunction with F_{cap} .	ICES (2013)
	F_{cap}	0.7	MSY criteria based on B escapement strategy with an additional constraint on fishing mortality; $F_{\text{cap}} = 0.7$.	ICES (2013), ICES (2014b)
	MSY B_{trigger}	Not defined		
	F_{MSY}	Not defined		
Precautionary approach	B_{lim}	90 000 t	B_{lim} was set to ensure that years of very good recruitment mainly occurred when the stock was above B_{lim} and years of very low recruitment only occurred when the stock was below B_{lim} (ICES = 2013).	ICES (2013)
	B_{pa}	142 000 t	$B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.28$ estimated from assessment uncertainty in the terminal year.	ICES (2013)
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	SSB_{MGT}	Not applicable		
	F_{MGT}	Not applicable		

Basis of the assessment

Table 6.3.51.6 Sprat in Subarea 4. The basis of the assessment.

ICES stock data category	1 (ICES, 2016b)
Assessment type	Age-based analytical assessment (SMS; ICES, 2016a) that uses landings in the model and in the forecast.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling), three survey indices (IBTS Q1&3, HERAS), annual maturity data from IBTS Q1 survey, natural mortalities from multispecies model (ICES, 2014a).
Discards and bycatch	Discards are not included. Discarding was known to have taken place prior to 2015, but the amount was not quantified. In 2015 discarding is assumed to be negligible.
Indicators	None
Other information	To match the sprat life-cycle, the assessment and advice year is July to June. Latest benchmark was in 2013 (WKSPRAT; ICES, 2013).
Working group	Herring Assessment Working Group for the Area South of 62°N (HAWG)

Information from stakeholders

There is no available information.

History of advice, catch, and management

Table 6.3.51.7 Sprat in Subarea 4. History of ICES advice, the agreed TAC, official catches, and ICES estimates of landings. All weights are in thousand tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC*	Official catches	ICES landings
1987	Catch at lowest practical level	0	57	78	32
1988	TAC < recent catches, preferably zero	0	57	93	87
1989	No advice	-	59	50	63
1990	No advice	-	59	49	73
1991	No advice	-	55	92	112
1992	No advice	-	55	72	124
1993	No advice	-	114	127	200
1994	No advice for sprat; maintain bycatch regulations	-	114	184	320
1995	No advice	-	175	190	357
1996	No advice	-	200	141	136
1997	Enforce bycatch regulations	-	150	123	103
1998	Limited by restrictions on juvenile herring	-	150	175	163
1999	Limited by restrictions on juvenile herring	-	225	167	188
2000	Limited by restrictions on juvenile herring	-	225	208	196
2001	Catch prediction	225	225	180	170
2002	Catch prediction	160	232	167	144
2003	Catch prediction	175	257	201	177
2004	Catch prediction	171	257	208	194
2005	Catch prediction	244	257	242	206
2006	Catch predictions	< 250	175	135	114
2007	Catch prediction	< 195	175	99	84
2008	Catch prediction	< 170	170	75	61
2009	No advice	-	170	140	133
2010	No advice	-	170	155	143
2011	Reduce catches	-	170	143	134
2012	Reduce catches		162	95	86
In year	No increase in catches (2011)	< 134			
2013**	MSY approach, F_{cap} (catches)	< 144	162	70.6	66
2014**	MSY approach, F_{cap} (wanted catch#)	< 227	144	157	140
2015**	MSY approach, F_{cap} (wanted catch#)	≤ 506	227	299	290.380
2016**	MSY approach, F_{cap} (catch)	≤ 125.541	356		

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

** Advice for 1 July to 30 June.

The term “wanted catch” is used to describe fish that would be landed in the absence of the EU landing obligation.

History of catch and landings

Table 6.3.51.8 Sprat in Subarea 4. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Industrial landings	Discards
290.380 kt	All gear types	Assumed negligible
	290.380 kt	

Table 6.3.51.9 Sprat in Subarea 4. History of commercial catch and landings. See ICES (2006) for earlier landings data. Catches in fjords of western Norway are excluded. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes. The Division 4.b catches for 2000–2007 divided by divisions 4.bWest and 4.East can be found in ICES (2008).

Year	Quarter	Area				Total
		4aW	4aE	4b	4c	
2008	1			2872	43	2915
	2			52	*	52
	3			21787		21787
	4			27994	8334	36329
	Total			52706	8377	61083
2009	1			36	1268	1304
	2			2526	1	2527
	3		22	41513		41535
	4			78373	9336	87709
	Total		22	122448	10604	133075
2010	1			10976	17072	28048
	2			3235	3	3238
	3			14220		14220
	4			62006	35973	97979
	Total			90437	53048	143485
2011	1			3747	21039	24786
	2			2067	3	2070
	3			22309	451	22761
	4	8		70256	13759	84023
	Total	8		98380	35252	133640
2012	1			81	1649	1730
	2			2924	0	2924
	3			26779	307	27086
	4			47765	6060	53825
	Total	0	0	77549	8016	85565
2013	1			1281	3158	4438
	2			32	0	32
	3			25577	720	26297
	4			18892	16276	35167
	Total	0	0	45781	20154	65934
2014	1			59	125	184
	2			11631	3	11635
	3	1		88457	1428	89885
	4	7		37851	822	38681
	Total	8		137999	2378	140384
2015	1		*	14816	16972	31788
	2			16843	107	16949
	3			124512	335	124847
	4	25		88395	28375	116795
	Total	25	*	244566	45789	290380

* < 0.5 tonnes.

Summary of the assessment

Table 6.3.51.10 Sprat in Subarea 4. Assessment summary (weights in tonnes).

Year	Recruitment: Age (0) thousands	Stock Size: SSB (tonnes)	Landings (tonnes)	Fishing Pressure: F Ages 1–2 Year-1
1974	267080000	491616	313600	0.915
1975	465477000	458498	641200	2.107
1976	206181000	301061	621500	1.083
1977	241335000	296770	304000	1.667
1978	236288000	145487	378300	1.7
1979	208493000	158368	379600	1.403
1980	266783000	153030	323400	1.342
1981	103166000	153479	209100	1.426
1982	67455000	70013	153800	0.702
1983	78080000	74405	88400	1.436
1984	44203000	64502	76700	0.959
1985	27783000	36047	49600	1.356
1986	159582000	13410	16400	0.583
1987	130034000	78776	32400	0.289
1988	253745000	76741	87400	0.289
1989	99208000	109191	63100	0.091
1990	161587000	83854	72700	1.887
1991	229066000	128268	112000	0.66
1992	225625000	160372	124300	0.767
1993	229763000	222413	200100	1.775
1994	114425000	52434	320100	1.005
1995	72664000	174733	357100	1.399
1996	106483000	130722	136600	0.671
1997	125901000	250311	103400	0.665
1998	155195000	240588	164300	1.369
1999	128168000	187936	188400	0.763
2000	109246000	240842	195900	1.06
2001	94091000	109349	170200	1.483
2002	134243000	151555	143600	1.633
2003	103554000	77245	176500	1.157
2004	227768000	168198	194300	1.97
2005	88093000	144771	207700	1.028
2006	103130000	151237	113700	1.249
2007	85079000	235763	83800	1.537
2008	167515000	139589	61100	1.129
2009	139533000	176313	133100	0.853
2010	194144000	257542	143500	0.75
2011	187892000	238991	133600	0.869
2012	183675000	93414	85564	0.858
2013	383420000	160972	70653	0.442
2014	502730000	414827	158332	0.713
2015	250819000	355782	290380	1.265
2016	153211000*	208904*		
Average	174695651	177635	187605	1.102

* Average mean weight (2013–2015) and maturity (2006–2015).

Sources and references

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