

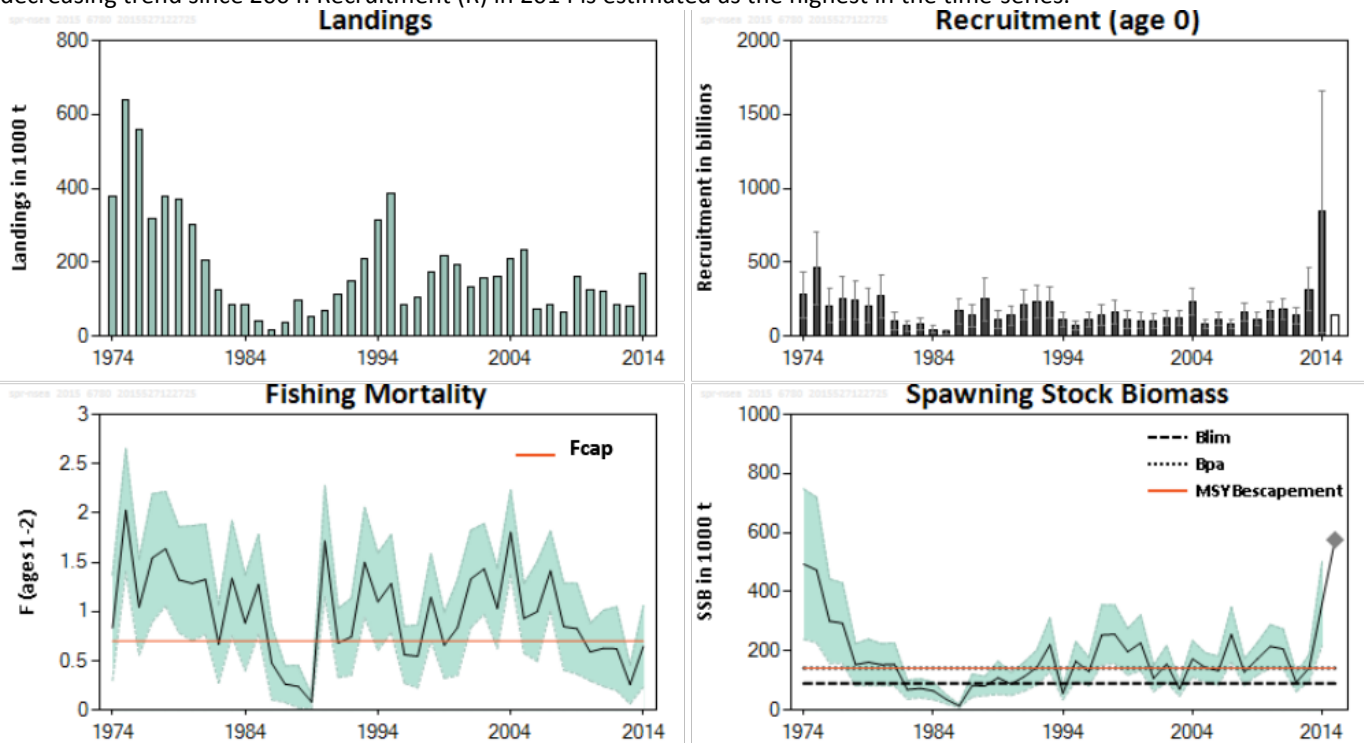
### 6.3.49 Sprat (*Sprattus sprattus*) in Subarea IV (North Sea)

#### ICES stock advice

ICES advises that when the MSY approach is applied, wanted catches<sup>1</sup> from July 2015 to June 2016 should be no more than 506 000 tonnes. ICES cannot quantify the corresponding total catches.

#### Stock development over time

The spawning-stock biomass (SSB) has been at or above  $MSY_{B_{escapement}}$  since 2013. Fishing mortality (F) has shown an overall decreasing trend since 2004. Recruitment (R) in 2014 is estimated as the highest in the time-series.



**Figure 6.3.49.1** Sprat in Subarea IV. 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 6.3.49.1** Sprat in Subarea IV. State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size				
		2012	2013	2014	2013	2014	2015		
Maximum Sustainable Yield	$F_{MSY}$	?	?	?	MSY	✓	✓	✓	Above escapement
	$F_{cap}$	✓	✓	✓	$B_{escapement}$	✓	✓	✓	Full reproductive capacity
Precautionary approach	$F_{pa}, F_{lim}$	-	-	-	$B_{pa}, B_{lim}$	✓	✓	✓	Not applicable
Management plan	$F_{MGT}$	-	-	-	$SSB_{MGT}$	-	-	-	Not applicable

<sup>1</sup> The term “Wanted catch” is used to describe fish that would be landed in the absence of the EU landing obligation.

## Catch options

**Table 6.3.49.2** Sprat in Subarea IV. The basis for the catch options.

Variable*	Value	Source	Notes
$F_{ages\ 1-2}$ (2014)	0.605	ICES (2015a)	
SSB (2015)	576	ICES (2015a)	In thousand tonnes.
$R_{age0}$ (2014)	840 billion	ICES (2015a)	
$R_{age0}$ (2015)	142 billion	ICES (2015a)	Geometric mean (GM 1995–2014)
Total catch (2014)	168	ICES (2015a)	Model-estimated catch in thousand tonnes.

\* Years refer to the period July to the following June (e.g. 2009 corresponds to July 2009 to June 2010).

**Table 6.3.49.3** Sprat in Subarea IV. The catch options.

Rationale	Wanted catch* <sup>#</sup> (July 2015–June 2016)	Basis	F (July 2015–June 2016)	SSB* (July 2016)	% SSB change**
MSY approach	506	$F_{cap}$	0.7	265	-54%
Zero catch	0	$F = 0$	0	529	-8%
Other options	99	$F_{2014-2015} \times 0.16$	0.1	474	-18%
	188	$F_{2014-2015} \times 0.32$	0.2	427	-26%
	266	$F_{2014-2015} \times 0.49$	0.3	385	-33%
	336	$F_{2014-2015} \times 0.65$	0.4	349	-40%
	399	$F_{2014-2015} \times 0.81$	0.5	317	-45%
	455	$F_{2014-2015} \times 0.97$	0.6	289	-50%
	506	$F_{2014-2015} \times 1.14$	0.7	265	-58%
	551	$F_{2014-2015} \times 1.3$	0.8	243	-58%
	799	$F_{2014-2015} \times 3.64$ (MSY $B_{escapement}$ )	1.631	142	-75%

\* Weights are in thousand tonnes.

\*\* SSB in July 2016 relative to SSB in July 2015.

<sup>#</sup> The term “Wanted catch” is used to describe fish that would be landed in the absence of the EU landing obligation.

## Basis of the advice

**Table 6.3.49.4** Sprat in Subarea IV. The basis of the advice.

Advice basis	Escapement strategy with an $F_{cap} = 0.7$ .
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 often reach 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.

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

The most recent estimate of natural mortality from the North Sea Stochastic Multispecies Model (SMS; ICES, 2014) has been used. The use of new natural mortalities revised the long-term geometric mean of recruitment downwards, and in consequence,  $F_{cap}$  was reduced.



Figure 6.3.49.2 Sprat in Subarea IV. Historical assessment results (final-year recruitment and SSB estimates included).

**Issues relevant for the advice**

The latest recruitment estimate is the highest on record, thereby having a large influence on the advised TAC (amounting to a 201% increase). This high recruitment estimate is confirmed by two independent surveys (HERAS and IBTS Q1).

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). To ensure that exploitation is consistent with stock status, the TAC year and the advice year should be synchronized.

A new  $F_{cap}$  of 0.7 is used in place of the previous  $F_{cap} = 1.2$ . The new  $F_{cap}$  has been evaluated (ICES, 2015a) according to the MSE criteria (ICES, 2013), using a new natural mortality (ICES, 2014) and updated model inputs.

Future inter-species quota transfers (e.g. under Article 15 of EU, 2013) were not considered in this advice. If such transfers occur, they should be monitored closely to ensure that catches by species are reported correctly. ICES notes the risk that exploitation on some stocks might increase significantly under a transfer system. This is especially the case when a stock from which these transfers are taken (the donor stock) is much larger than the stocks that receive the transfer (the receiving stocks). When setting the TACs for fish stocks, any transfer should be accounted for to prevent that the resulting total fishing mortality for these stocks exceeds the intended one.

**Reference points**

Table 6.3.49.5 Sprat in Subarea IV. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{escapement}$	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; $F_{cap} = 0.7$ .	ICES (2013), ICES (2015a)
	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	$B_{pa} = B_{lim} \times \exp(\sigma \times 1.645)$ , with $\sigma = 0.28$ estimated from assessment uncertainty in the terminal year (ICES, 2013).	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 6.3.49.6** Sprat in Subarea IV. The basis of the assessment.

ICES stock data category	1 ( <a href="#">ICES, 2015b</a> )
Assessment type	Age-based analytical assessment (SMS; ICES, 2015a) 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, 2014).
Discards and bycatch	Discards are known to have taken place prior to 2015 but cannot be quantified.
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 ( <a href="#">HAWG</a> )

**Information from stakeholders**

There is no available information.

**History of advice, catch, and management**

**Table 6.3.49.7** Sprat in Subarea IV. 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		

\* 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 6.3.49.8** Sprat in Subarea IV. Catch distribution by fleet in 2014 as estimated by ICES.

Total catch (2014)	Industrial landings	Discards
Unknown	All gear types	Known to take place but cannot be quantified
	157 kt	

**Table 6.3.49.9** Sprat in Subarea IV. 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 IVb catches for 2000–2007 divided by Divisions IVbW and IVE can be found in ICES (2008).

Year	Quarter	Area				Total
		IVaW	IVaE	IVb	IVc	
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

\* < 0.5 tonnes.

Summary of the assessment

Table 6.3.49.10 Sprat in Subarea IV. Assessment summary (weights in tonnes).

Year	Recruitment	High	Low	SSB	High	Low	Landings	Mean F	High	Low
	Age 0			(tonnes)			(tonnes)	Ages 1–2		
	(thousands)									
1974	277672445	437840000	117500000	493675	747870	239470	379747	0.834	1.368	0.3
1975	462120881	708940000	215300000	473609	719610	227610	637282	2.027	2.649	1.404
1976	206205903	318466000	93954000	300856	443270	158450	557359	1.045	1.531	0.558
1977	255410574	397908000	112912000	293821	430076	157564	318769	1.544	2.193	0.894
1978	239833976	368120000	111540000	153745	224914	82586	378632	1.636	2.217	1.055
1979	206574424	320742000	92398000	161617	239738	83502	368667	1.322	1.859	0.785
1980	269769696	416762000	122778000	153510	224314	82706	300239	1.285	1.869	0.701
1981	98744648	157265000	40225000	154754	227674	81826	203897	1.326	1.886	0.767
1982	67206618	102403000	32011000	69179	101055	37303	123379	0.67	1.066	0.273
1983	78052760	119263000	36843000	73648	105942	41354	85168	1.337	1.922	0.753
1984	43967749	66842000	21094000	64943	94591	35295	85617	0.884	1.37	0.399
1985	28772108	42789400	14754600	36475	52087	20863	40921	1.275	1.781	0.77
1986	167353390	249550000	85150000	13955	19210	8700	15687	0.478	0.851	0.105
1987	138380685	212554000	64206000	83078	121804	44352	37551	0.264	0.449	0.078
1988	247341118	396428000	98252000	81594	114232	48956	95972	0.239	0.453	0.024
1989	112009664	172790000	51230000	109308	165400	53220	51943	0.083	0.156	0.01
1990	136816942	201824000	71816000	88114	126496	49732	67386	1.714	2.276	1.152
1991	209840407	308790000	110890000	112610	161206	64014	114872	0.681	1.032	0.331
1992	231656834	340582000	122738000	144104	203672	84528	148236	0.743	1.135	0.351
1993	228421502	334918000	121922000	220851	311520	130180	209193	1.499	2.056	0.943
1994	112257970	165236000	59284000	56683	78307	35059	313687	1.098	1.593	0.603
1995	71099238	104111000	38087000	165482	231716	99244	387626	1.283	1.78	0.786
1996	108093921	159016000	57164000	129996	177892	82108	84573	0.561	0.849	0.273
1997	142097896	211578000	72622000	253825	355396	152244	104797	0.545	0.865	0.225
1998	161009925	237382000	84638000	256582	355456	157704	172063	1.143	1.584	0.701
1999	115649288	175868000	55432000	197045	275764	118336	215412	0.658	0.992	0.323
2000	105839120	157990000	53690000	227366	321638	133102	195170	0.836	1.323	0.35
2001	102773498	149188000	56352000	107056	151516	62604	131538	1.33	1.825	0.836
2002	122100506	168128000	76072000	155833	218054	93606	157248	1.432	1.891	0.972
2003	119246199	169342000	69158000	71115	94973	47257	159515	1.032	1.439	0.624
2004	231829115	318176000	145484000	173429	234730	112130	207779	1.803	2.232	1.374
2005	78553214	110133000	46973000	143612	193470	93750	232048	0.929	1.281	0.577
2006	114414266	161174000	67646000	133207	182082	84338	74648	0.998	1.503	0.494
2007	79439198	110213000	48665000	255703	348446	162954	85080	1.412	1.816	1.007
2008	164387025	223176000	105604000	128603	173342	83858	63623	0.847	1.289	0.405
2009	115020971	156898000	73142000	173037	227462	118618	162714	0.826	1.286	0.366
2010	169134425	230824000	107436000	215236	288802	141678	126077	0.59	0.883	0.297
2011	179800351	248016000	111584000	206881	273908	139852	119083	0.627	1.013	0.241
2012	136756995	189528000	83992000	93658	124878	62438	86196	0.623	1.049	0.197
2013	313421720	459118000	167722000	142489	187894	97086	81268	0.259	0.454	0.063
2014	839738525	1662360000	17120000	360294	502192	218388	167812	0.646	1.059	0.234
2015	142000000*			576000*						
Average	176924183	274200766	81350746	178728	239820	98258	184109	0.984	1.418	0.551

\* Average mean weight and maturity (2012–2014).

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