

### 6.3.41 Sandeel (*Ammodytes* spp.) in Divisions 4b and 4c, SA 1 (Central and South North Sea, Dogger Bank)

#### ICES stock advice

ICES advises that catches in 2016, on the basis of the MSY approach, would correspond to zero tonnes. However, in order to obtain samples to assess the status of the stock in 2017, ICES advises a monitoring TAC in 2016 with catches that should not exceed 5000 tonnes and an associated sampling protocol in the fishery.

#### Stock development over time

The spawning-stock biomass (SSB) in sandeel area 1 (SA 1) was below the lower biomass limit ( $B_{lim}$ ) in 2014 but is estimated to be above the precautionary biomass level ( $B_{pa} = MSY_{B_{escapement}}$ ) in 2016. Recruitment ( $R$ ) in 2014 was average, but it was the second lowest in the time series in 2015.

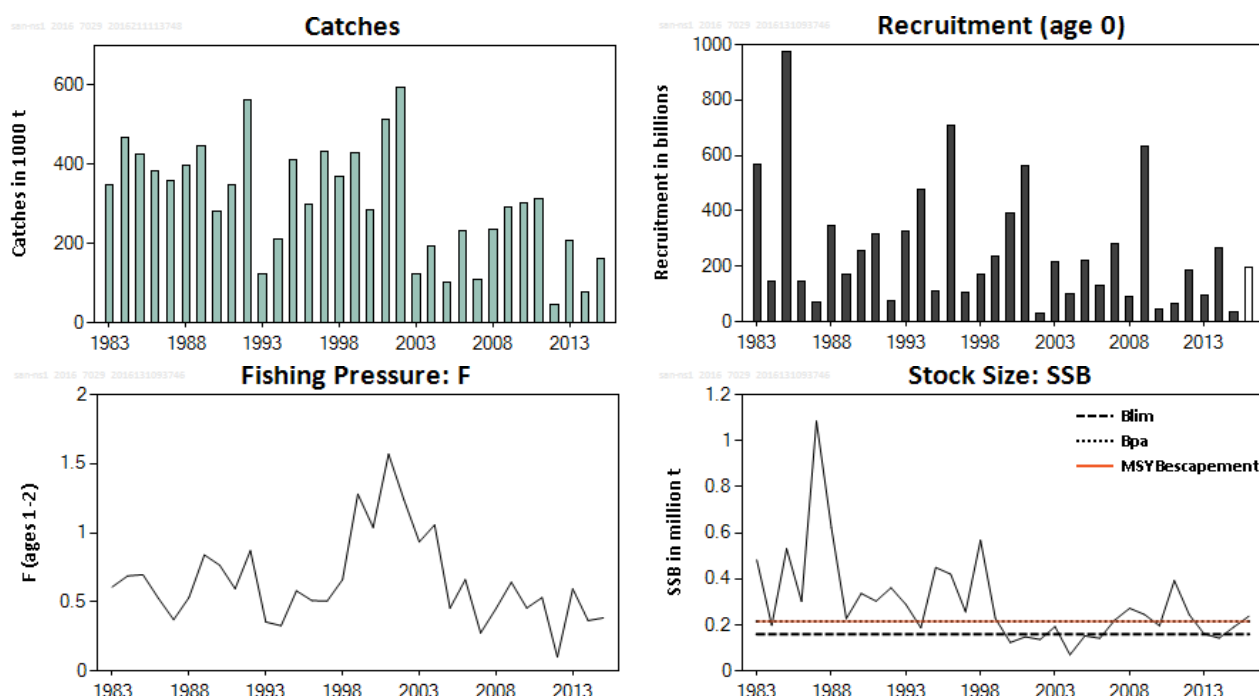


Figure 6.3.41.1 Sandeel in the Dogger Bank area (SA 1). Historical development of the stock from the summary of the stock assessment. Predicted values are not shaded.

#### Stock and exploitation status

Table 6.3.41.1 Sandeel in the Dogger Bank area (SA 1). 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	$MSY_{B_{escapement}}$	✗	✗	✓ Above escapement
Precautionary approach	$F_{pa}, F_{lim}$	?	?	?	Undefined	$B_{pa}, B_{lim}$	✗	○	✓ Low risk
Management plan	$F_{MGT}$	?	?	?	Undefined	$SSB_{MGT}$	?	?	?

## Catch options

**Table 6.3.41.2** Sandeel in the Dogger Bank area (SA 1). The basis for the catch options.

Variable	Value	Source	Notes
F (2015)	0.313	ICES (2016a)	Sum of half-yearly Fs
R (2015)	37 billion	ICES (2016a)	
R (2016)	195 billion	ICES (2016a)	Geometric mean (1983–2014)
SSB (2016)	238 kt	ICES (2016a)	

**Table 6.3.41.3** Sandeel in the Dogger Bank area (SA 1). Annual catch options. All weights are in thousand tonnes.

Rationale	Catches (2016)	Basis	F (2016)	SSB (2017)	%SSB change*	%TAC change**
MSY approach	0	$SSB_{2017} = MSY B_{\text{escapement}}$	0	190	-20%	-100%
Zero catch	0	$F = 0$	0	190	-20%	-100%
Other options	5.0	Monitoring TAC	0.018	187	-22%	-96%
	21.323	$F_{2015} \times 0.25$	0.078	176	-26%	-84%
	41.072	$F_{2015} \times 0.5$	0.156	162	-32%	-69%
	59.37	$F_{2015} \times 0.75$	0.235	150	-37%	-55%
	76.33	$F_{2015} \times 1$	0.313	139	-42%	-43%

\* SSB 2017 relative to SSB 2016.

\*\* Catch option for 2016 relative to TAC in 2015 (133 kt).

## Basis of the advice

**Table 6.3.41.4** Sandeel in the Dogger Bank area (SA 1). The basis of the advice.

Advice basis	MSY approach (Escapement strategy)
Management plan	There is no management plan for sandeel in this area.

## Quality of the assessment

The assessment relies on the assumption that the age selectivity of the fishery has remained the same since 1999 and that the commercial fishery supplies sufficient sampling information on older age groups which are not caught representatively in the survey. Observed changes in fleet structure during the last decade may have changed the fishing selection pattern to some extent. The assessment is considered to be robust to moderate changes in the selection pattern.

An examination of the spatial distribution of reported catches, fishing days, and vessel monitoring system (VMS) data indicated that a substantial amount of catches taken in SA 1 were likely to have been misreported to SA 3. The catches used in the assessment were corrected and are considered to be the best estimates of catches. ICES has reallocated from SA 3 to SA 1 a total of 44 000 t in 2014 and 15 000 t in 2015 associated with misreporting, and this correction is considered to be reliable.

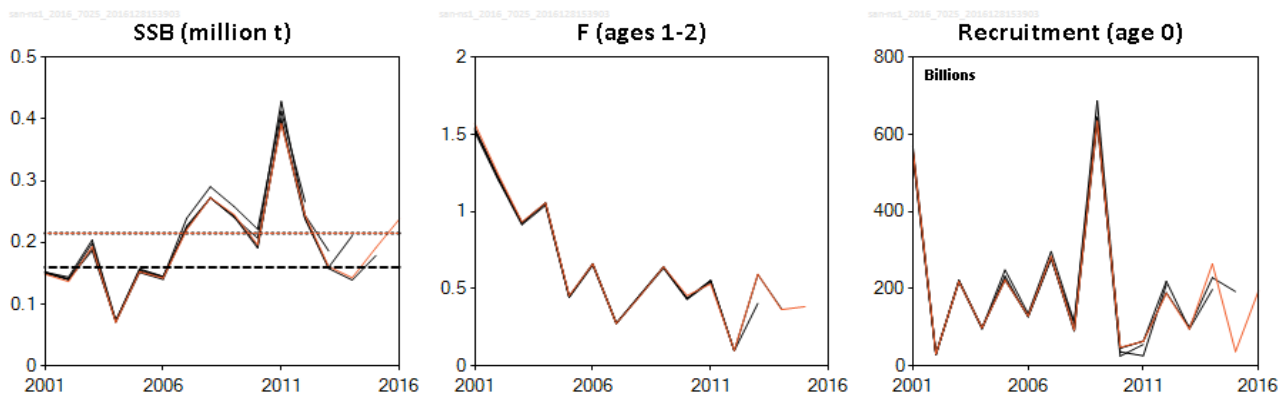


Figure 6.3.41.2 Sandeel in the Dogger Bank area (SA 1). Historical assessment results (final-year recruitment estimates included).

**Issues relevant for the advice**

The reported catches from SA 1 in 2014 and 2015 were revised based on information from VMS and previous catch distributions to account for substantial area misreporting of catches taken in SA 1, but reported to SA 3. Based on the misreporting of catches as observed in 2014, management measures to avoid area misreporting (only one fishing area per trip) have been mandatory for the Danish fishery since 2015. This eliminated the misreporting issue for Danish catches; however, there are strong indications of area misreporting for other nations in 2015. Management measures for all nations, similar to those in the Danish fishery, should reduce area misreporting.

The advised monitoring TAC in 2016 of 5000 t is based on obtaining a minimum of 30 samples to provide biological information on older fish for the assessment. This is calculated based on past average sandeel tonnes per haul (commercially around 55 t) and the fact that it would be preferable to sample no more than one in every three hauls in order to reduce correlation (ICES 2014). Catches equal to the monitoring TAC would result in an F of 0.018 in 2016, a value much lower than any previous estimated values in the time series (1983–2015).

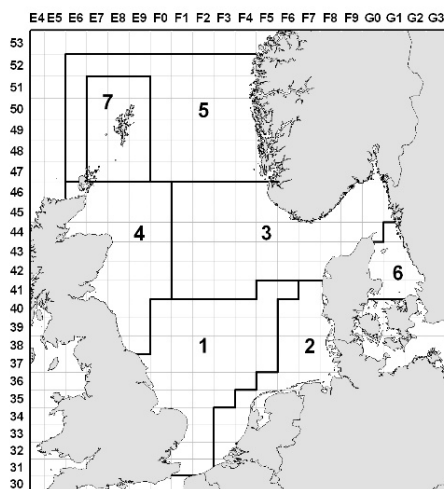


Figure 6.3.41.3 Sandeel in the Dogger Bank area (SA 1). Sandeel are largely sedentary after settlement and form a complex of local (sub-) stocks in the North Sea. To avoid local depletion, ICES advice for sandeel is provided separately for seven areas in Division 3a and Subarea 4. Advice for sandeel in the Dogger Bank area (SA 1) specifically applies to sandeel in rectangles 31–34 E9–F2; 35 E9–F3; 36 E9–F4; 37 E9–F5; 38–40 F0–F5; and 41 F5–F6.

## Reference points

**Table 6.3.41.5** Sandeel in the Dogger Bank area (SA 1). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{\text{escapement}}$	215 000 t	$= B_{\text{pa}}$	ICES (2010)
	$F_{\text{MSY}}$	Not defined		
Precautionary approach	$B_{\text{lim}}$	160 000 t	Median SSB in the years 2000–2006 of lowest SSB and no impaired recruitment.	ICES (2010)
	$B_{\text{pa}}$	215 000 t	$B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$ , with $\sigma = 0.18$ estimated from assessment uncertainty in the terminal year.	ICES (2010)
	$F_{\text{lim}}$	Not defined		
	$F_{\text{pa}}$	Not defined		
Management plan	$SSB_{\text{MGT}}$	Not defined		
	$F_{\text{MGT}}$	Not defined		

## Basis of the assessment

**Table 6.3.41.6** Sandeel in the Dogger Bank area (SA 1). The basis of the assessment and advice.

ICES stock data category	1 (see <a href="#">ICES, 2016b</a> )
Assessment type	Seasonal age-based analytical (SMS-effort) (ICES, 2016a)
Input data	One survey index in December (dredge survey since 2004). Total international catch and fishing effort. Annual maturity data from the dredge survey. Natural mortality estimated from multispecies assessment (assumed constant over time). Age and length frequencies from catch sampling.
Discards and bycatch	Discarding is considered to be negligible.
Indicators	None
Other information	Last benchmark in 2010 ( <a href="#">ICES, 2010</a> ). The stock will be benchmarked in 2016.
Working group	Herring Assessment Working Group ( <a href="#">HAWG</a> )

## Information from stakeholders

Industry considers that any real-time monitoring fishery should be designed to reflect normal fishing behavior to allow comparison with data from previous years.

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

**Table 6.3.41.7** Sandeel in the Dogger Bank area (SA 1). History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in thousand tonnes.

Year	ICES advice	Catch corresponding to advice	TAC	ICES catch SA 1	Total ICES catch (SAs 1–7)
2005 *	Exploitation to be kept below the level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class.	-	661**	104	177
2006 *	The fishery should remain closed until information is available which assures that the stock can be rebuilt to $B_{pa}$ by 2007.	-	300**	238	293
2007 *	The fishery should remain closed until information is available which assures that the stock can be rebuilt to $B_{pa}$ by 2008.	-	173**	109	230
2008 *	The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to $B_{pa}$ by 2009.	-	375**	239	348
2009 *	The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to $B_{pa}$ by 2010.	-	377**	309	353
2010 *	The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to $B_{pa}$ by 2011.	-	377**	301	414
2011	MSY approach: allow for sufficient stock ( $MSY B_{escapement}$ ) to remain for successful recruitment.	< 320	320	312	438
2012	MSY approach: allow for sufficient stock ( $MSY B_{escapement}$ ) to remain for successful recruitment.	< 23	23	46	102
2013	MSY approach: allow for sufficient stock ( $MSY B_{escapement}$ ) to remain for successful recruitment.	< 224.544	225	210	278
2014	MSY approach: allow for sufficient stock ( $MSY B_{escapement}$ ) to remain for successful recruitment.	< 57	57	99	255
2015	MSY approach: allow for sufficient stock ( $MSY B_{escapement}$ ) to remain for successful recruitment.	< 133	133	163***	307***
2016	Catches for monitoring purposes should not exceed 5 000 t.	≤ 5			

\* Advice for Subarea 4, excluding the Shetland area.

\*\* Set for EU waters of Divisions 2a and 3a and Subarea 4.

\*\*\* Preliminary.

**History of catch and landings**

**Table 6.3.41.8** Sandeel in the Dogger Bank area (SA 1). Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings	Discards
163 kt	100% industrial trawl fisheries	Negligible
	163 kt	

**Table 6.3.41.9** Sandeel in the Dogger Bank area (SA 1). History of total ICES estimated catch (tonnes).

Year	Catch (tonnes)
1982	429675
1983	377558
1984	491950
1985	436214
1986	389081
1987	360867
1988	401551
1989	445586
1990	283259
1991	346621
1992	564285
1993	136538
1994	205853
1995	408676
1996	279863
1997	424701
1998	373369
1999	423993
2000	363606
2001	522337
2002	611064
2003	150708
2004	206752
2005	105337
2006	238293
2007	109067
2008	235031
2009	309709
2010	298514
2011	311811
2012	45998
2013	210056
2014	99234
2015	163429

**Summary of the assessment**

**Table 6.3.41.10** Sandeel in the Dogger Bank area (SA 1). Assessment summary with weights (in tonnes), recruits (at age 0, in thousands). The SSB is estimated for 1st of January. Yield values used for the assessment do not include catches of age 0 in the first half of the year and, hence, may differ slightly from the ICES catch estimates presented in other tables.

Year	Recruitment Age 0	Stock size: SSB	Catches	Mean F Ages 1–2
	thousands	tonnes	tonnes	
1983	566232000	482224	349232	0.608
1984	148192000	198091	467609	0.688
1985	973215000	530629	424114	0.697
1986	145440000	302138	382735	0.527
1987	72777000	1084670	357671	0.371
1988	348962000	622311	398271	0.532
1989	171706000	227360	445695	0.84
1990	257018000	336684	283040	0.765
1991	315373000	303095	347096	0.595
1992	78354000	361327	564298	0.871
1993	327187000	288575	124082	0.355
1994	475475000	187669	209538	0.328
1995	110344000	449237	410513	0.58
1996	710362000	420394	298702	0.51
1997	104625000	256788	431808	0.506
1998	173604000	567415	371117	0.661
1999	238583000	227864	427691	1.28
2000	394019000	123585	284521	1.038
2001	562278000	148659	513068	1.569
2002	30824000	136644	596049	1.24
2003	218706000	192780	121863	0.934
2004	98746000	70699	195274	1.057
2005	222859000	152661	100835	0.455
2006	129499000	142255	231448	0.661
2007	284099000	220795	108600	0.275
2008	92839000	272458	237447	0.452
2009	634468000	245407	291247	0.642
2010	47929000	196346	300954	0.456
2011	63840000	392437	311542	0.531
2012	188200000	244261	45642	0.101
2013	95347000	160734	209416	0.594
2014	264706000	142851	79237	0.365
2015	37025000	191471	162054	0.384
2016	194636000**	238250*		
Average	258160853	297611	305528	0.651

\* Using mean weight-at-age from 2013 to 2015 and proportion mature from December 2015.

\*\* Geometric mean (1983–2014).

## Sources and references

ICES. 2010. Report of the Benchmark Workshop on Sandeel (WKSAN), 6–10 September 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:57. 201 pp.

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ICES. 2016a. Sandeel in Division 3a and Subarea 4. Available online as Section 11 of the coming Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG), 29 March–7 April 2016, ICES HQ, Denmark. ICES CM 2016/ACOM:07.

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