Sandeel (*Ammodytes* spp.) in divisions 4.a–b, Sandeel Area 4 (northern and central North Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 35 020 tonnes.

ICES advice on conservation aspects

ICES has not identified any conservation aspects.

Stock development over time

Spawning-stock size is below MSY $B_{escapement}$ and between B_{pa} and B_{lim}. No reference points for fishing pressure have been defined for this stock.

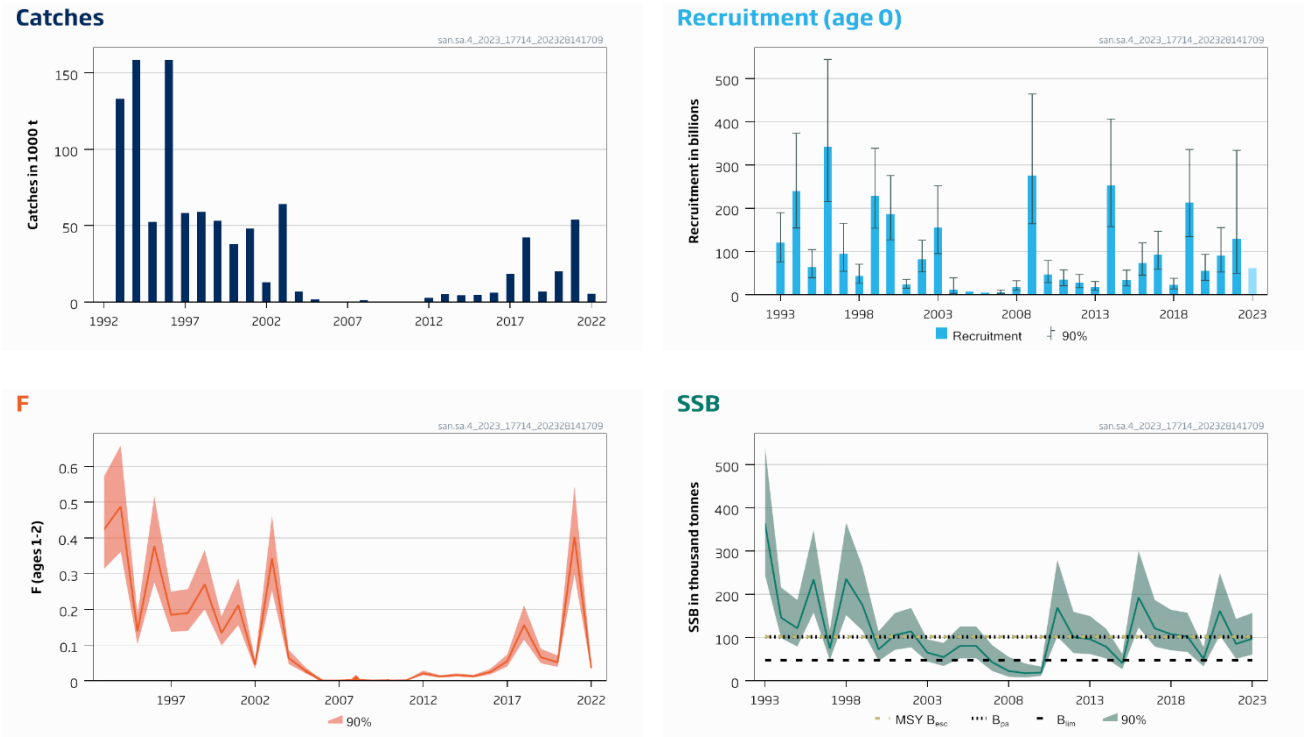

Figure 1 Sandeel in divisions 4.a–b, Sandeel Area 4. Summary of the stock assessment. The assumed recruitment value for 2023 is shaded in a lighter colour. Uncertainty bounds of recruitment in 2005 and 2006 are not shown as these could not be reliably estimated.

Conservation status

ICES is not aware of any information on stock specific conservation status.

Catch scenarios

Table 1 Sandeel in divisions 4.a–b, Sandeel Area 4. Values in the forecast.

Variable	Value	Notes
$F_{1–2}$ (2022)	0.036	Assessment model estimate. Selection pattern in 2023 assumed to be the same as 2022.
Recruitment (2023)	61 281 945	Geometric mean 2012–2021; thousands
SSB (2023)	97 538	Assessment model estimate; tonnes

Table 2 Sandeel in divisions 4.a–b, Sandeel Area 4. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	F_{total} (2023)	SSB (2024)	% SSB change *	% TAC change **	% advice change ***
ICES advice basis						
SSB(2024) ≥ MSY $B_{escapement}$ with F_{cap}	35 020	0.15	114 743	18	538	-
Other scenarios						
F = 0	0	0	133 616	37	−100	-
SSB(2024) = MSY $B_{escapement}$ = B_{pa}	59 252	0.27	102 000	5	979	-
SSB(2024) = B_{lim}	170 570	1.10	48 000	−51	3007	-
F = F_{2022}	8947	0.036	128 747	32	32	-

* SSB_{2024} relative to SSB_{2023}.
** Catch scenario for 2023 relative to the TAC in 2022 (5000 t).
*** Advice value 2023 relative to advice value 2022 (0 t).

The upward revision of the 2022 year class in this year's assessment that is 30% higher than the historical average, and a higher SSB at the start of the advice year (2023) make it possible to have a non-zero catch advice that ensures an SSB at the beginning of 2024 no lower than MSY $B_{escapement}$.

Basis of the advice

Table 3 Sandeel in divisions 4.a–b, Sandeel Area 4. The basis of the advice for fishing opportunities.

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

Quality of the assessment

The uncertainty of the estimated SSB and F is large in the assessment. This uncertainty results from a period of low commercial fishing effort (2004–2016), no data on catch age composition (2006–2011), and no survey indices (2004–2007).

There is a mismatch between the location of the dredge survey samples, mostly taken from the area under fishery closure, and the area where the fishery takes place. This may increase the uncertainty in the assessment.

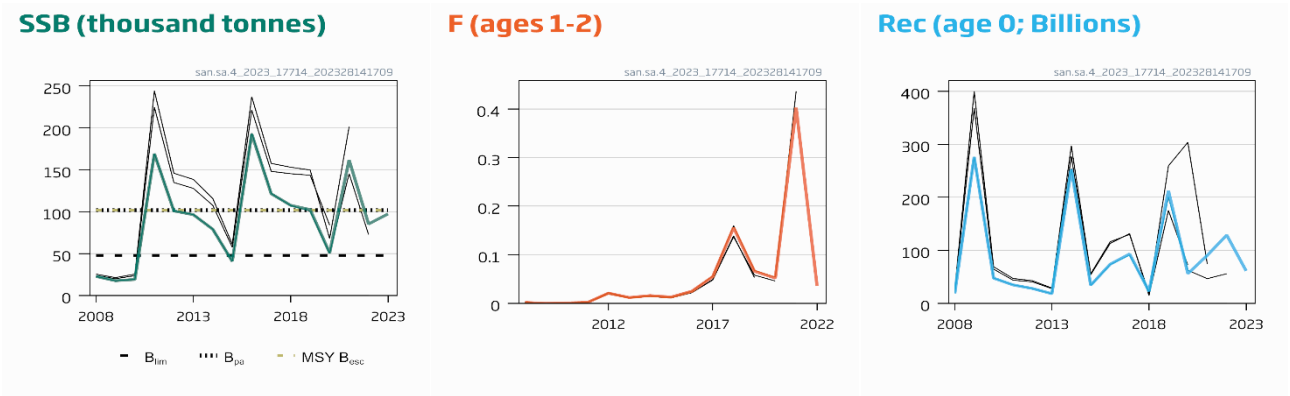

Figure 2 Sandeel in divisions 4.b–c, Sandeel Area 4. Historical assessment results (final-year recruitment includes geometric means).

Issues relevant for the advice

The large change in the advice from year to year is caused by the marked interannual variability of recruitment and biomass as well as early maturation, both of which are typical for a short-lived species.

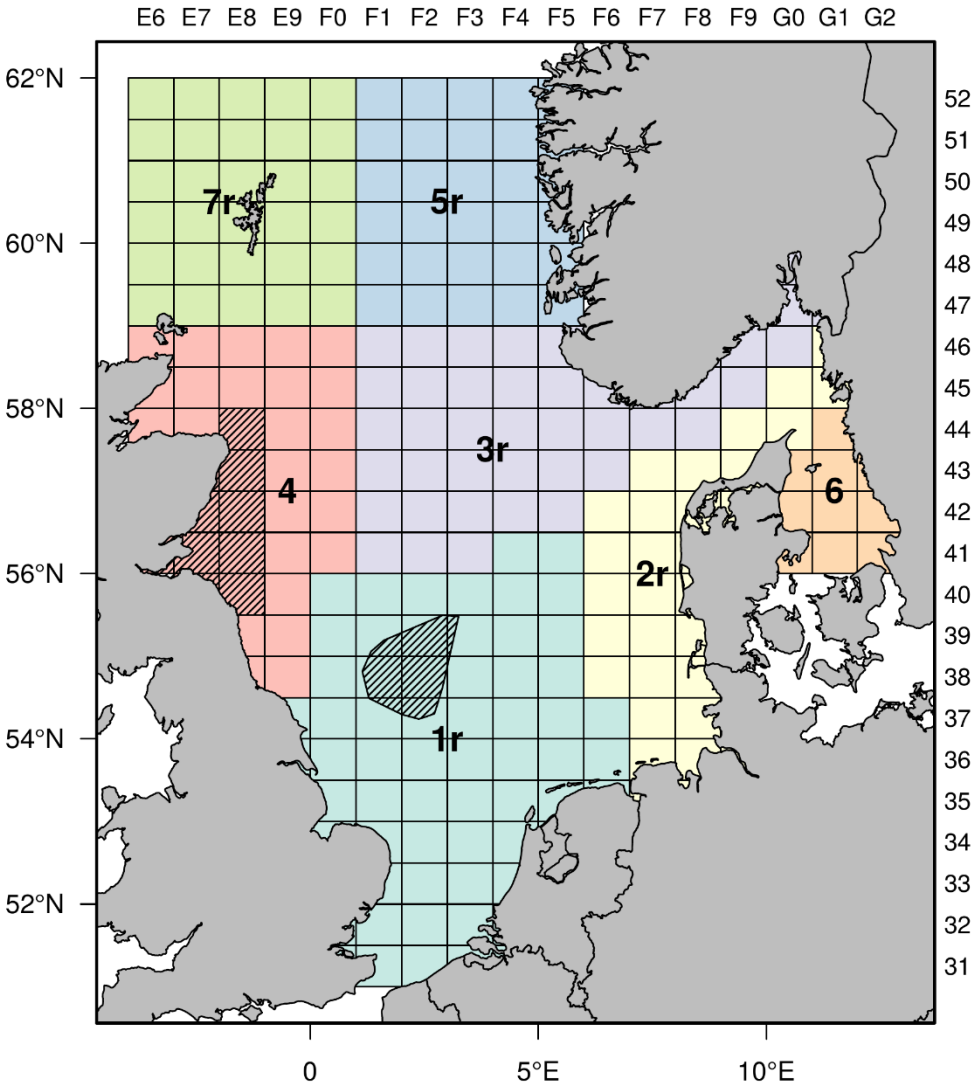

Figure 3 Sandeel in divisions 4.a–b, Sandeel Area 4. Stock areas for the seven sandeel stocks. The closed area in Sandeel Area 1 (Dogger Bank) and 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.a and 4.b, Sandeel Area 4. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{escapement}$	102 000	B_{pa}; tonnes	ICES (2017)
	F_{MSY}	Not defined		
	F_{cap}*	0.15	The maximum F estimated from the management strategy evaluation (MSE) that results in < 5% probability of SSB < B_{lim}	ICES (2017)
Precautionary approach	B_{lim}	48 000	The average SSB of the two lowest SSB estimates that provide high recruitment (2003, 2009); tonnes.	ICES (2017)
	B_{pa}	102 000	$B_{pa} = B_{lim} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.46$ estimated from the assessment uncertainty in the terminal year; tonnes	ICES (2017)
	F_{lim}	Not defined		
Management plan	SSB_{MGT}	Not defined		
	F_{MGT}	Not defined		

* Not used as a biological reference point, but used in ICES MSY approach for stocks of short-lived species.

Basis of the assessment

Table 5 Sandeel in divisions 4.a and 4.b, Sandeel Area 4. The basis of the assessment.

ICES stock data category	1 (see ICES, 2022)
Assessment type	Age-structured model (SMS-effort), half-yearly time-step (ICES, 2023)
Input data	One survey index available in January (dredge survey since 1999; D9376). Total international catch and fishing effort. Fixed maturity data. Natural mortality estimated from multispecies assessment (assumed constant over time; ICES, 2018). Age frequencies from catch sampling.
Discards and bycatch	Discarding is considered to be negligible
Indicators	None
Other information	Last benchmarked in 2016 (ICES, 2017)
Working group	Herring Assessment Working Group (HAWG)

History of advice, catch, and management

Table 6 Sandeel in divisions 4.a–b, Sandeel Area 4. History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes. Values of catch for the period 2005 to 2015 are presented to the nearest thousand tonnes.

Year	ICES advice	Catch corresponding to advice	TAC	ICES catch SA 4	Total ICES catch (SAs 1r–7r)
2005*	Exploitation to be kept below level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class	-	661000**	1557	177000
2006*	The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2007	-	300000**	55	293000
2007*	The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2008	-	173000**	11	230000
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	-	375000**	1168	348000
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	-	377000**	0	353000
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	-	377000**	275	414000
2011	A TAC at 5000–10 000 tonnes will impose a low risk of overfishing sandeel in this area	5000–10000	10000	272	438000
2012	Catches for monitoring purposes should not exceed 5000 tonnes	< 5000	5000	2585	102000
2013	Catch in 2012 reduced by 20% as a precautionary buffer	< 2041	4000	5225	278000
2014	Catches for monitoring purposes should not exceed 5000 tonnes (with associated sampling protocol)	< 5000	5000	4414	264000
2015	Catches for monitoring purposes should not exceed 5000 tonnes (with associated sampling protocol)	< 5000	5000	4392	312000
2016	Precautionary approach	≤ 6000	6000	6232	75405
2017	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 54043	54043	18474	517499
2018	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 59345	59345	42298	269579
2019	Catches for monitoring purposes should not exceed 5000 tonnes	≤ 5000	5000	6666	235537

Year	ICES advice	Catch corresponding to advice	TAC	ICES catch SA 4	Total ICES catch (SAs 1r–7r)
2020	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 39611	39611	20116	446765
2021	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 77512	68989	51448	232610
2022	MSY approach: zero catch	0	5000	5507***	166238***
2023	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 35020			

* Advice for Subarea 4, excluding the Shetland area.
** Set for EU waters of divisions 2.a and 3.a, and Subarea 4.
*** Preliminary.

History of catch and landings

Table 7 Sandeel in divisions 4.a–b, Sandeel Area 4. Catch distribution by fleet in 2022 as estimated by ICES (in tonnes).

Total catch (2022)	Landings	Discards
5507	100% industrial trawl fisheries	Discarding is considered negligible
	5507	

Summary of the assessment

Table 8 Sandeel in divisions 4.a–b, Sandeel Area 4. Assessment summary. All weights are in tonnes, recruitment age 0 is in thousands. The SSB is estimated for 1 January. Zero catch denotes years with very low catches in which there was no biological sampling of the fishery.

Year	Recruitment (age 0)			SSB			Total Catch	Fishing Pressure Ages 1–2		
	Low	Mid-point	High	Low	Mid-point	High		Low	Mid-point	High
	Thousands			Tonnes			Tonnes			
1993	76181254	120239964	189779612	245315	365492	544542	133136	0.31	0.42	0.57
1994	154462813	240204211	373540154	98887	146239	216266	158690	0.36	0.49	0.66
1995	39678317	64424207	104603187	79129	121662	187057	52591	0.102	0.139	0.188
1996	215726726	342574599	544009350	157750	234685	349143	158490	0.28	0.38	0.52
1997	54428541	94868284	165354264	47794	74757	116931	58446	0.137	0.185	0.25
1998	26422645	43228044	70722056	151835	235861	366389	58911	0.140	0.190	0.26
1999	154083406	228489314	338825367	116502	175782	265225	53338	0.20	0.27	0.37
2000	127133609	187258393	275817746	45851	72620	115018	37792	0.099	0.134	0.181
2001	15573792	23558565	35637178	71535	105979	157009	47918	0.156	0.21	0.29
2002	53082428	81981158	126612714	77512	114348	168689	12762	0.033	0.045	0.060
2003	95143541	154855038	252041101	44685	65513	96049	64049	0.25	0.34	0.46
2004	3427606	11617231	39374437	34313	54940	87967	6882	0.047	0.064	0.087
2005	***	7039164	***	51823	80741	125795	1557	0.021	0.028	0.038
2006	***	4308068	***	52043	80983	126018	86	0.00	0.00	0.00100
2007	3244463	6052609	11291260	22503	43088	82504	11	0.00	0.00	0.00
2008	10710139	18718071	32713506	9392	22880	55738	1168	0.0020	0.0020	0.0030
2009	164506592	276300611	464066675	7764	17732	40493	0	0.00	0.00	0.00
2010	28324037	47488589	79620220	11229	19235	32951	275	0.00100	0.00100	0.0020
2011	20937284	34760770	57710977	102365	169397	280324	270	0.0020	0.0020	0.0030
2012	16670240	27979985	46962705	63929	101013	159608	2618	0.0160	0.021	0.029
2013	10748240	18201235	30822250	62076	96568	150224	5119	0.0090	0.0120	0.0160
2014	157656499	253025289	406084097	51809	79142	120896	4505	0.0120	0.0160	0.021
2015	20577855	34209023	56869741	26775	40864	62365	4736	0.0090	0.0130	0.0170
2016	45337001	73809647	120163747	123570	192914	301171	6232	0.0180	0.025	0.034
2017	59046736	93175931	147031906	78879	121540	187273	18474	0.040	0.055	0.074
2018	13624530	22862304	38363521	70648	107796	164479	42298	0.115	0.156	0.21

Year	Recruitment (age 0)			SSB			Total Catch	Fishing Pressure Ages 1–2		
	Low	Mid-point	High	Low	Mid-point	High		Low	Mid-point	High
	Thousands			Tonnes			Tonnes			
2019	134489599	212616366	336127993	66769	102642	157788	6666	0.049	0.066	0.090
2020	33472833	56007715	93713731	33386	51021	77973	20116	0.039	0.052	0.071
2021	52778556	90603192	155535487	105013	161943	249737	53765	0.30	0.40	0.55
2022	49702929	128829451	333924536	50983	85477	143310	5507^	0.027	0.036	0.049
2023		61281945*		60540**	97538**	157147**				

* Geometric mean (2012–2021).
** Using mean weight-at-age (2018–2022).
*** Uncertainty bounds not reliably estimated.
^ Preliminary.

Sources and references

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Download the stock assessment data and figures.

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