Sandeel (*Ammodytes* spp.) in divisions 4.b–c, Sandeel Area 1r (central and southern North Sea, Dogger Bank)

ICES advice on fishing opportunities

ICES advises that when the MSY approach and precautionary considerations are applied, there should be zero catch in 2022.

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.

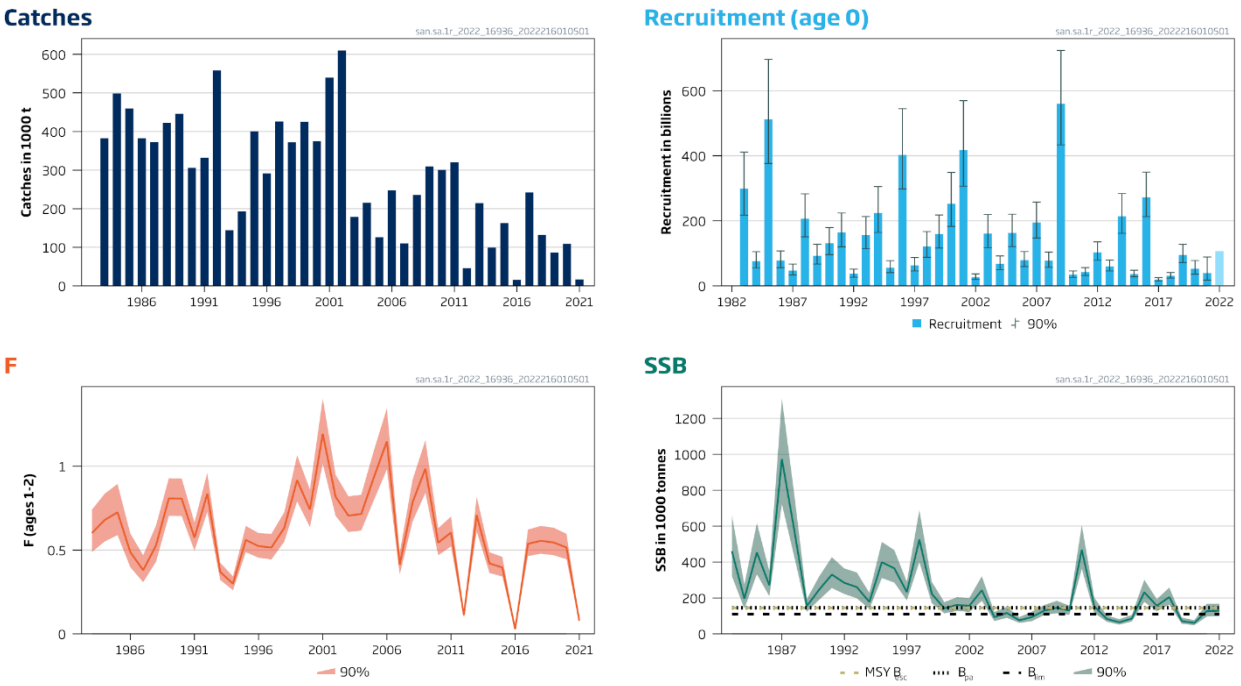

Figure 1 Sandeel in divisions 4.b–c, Sandeel Area 1r. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

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

Variable	Value	Notes
$F_{ages\ 1–2}$ (2021)	0.079	Assessment model estimate. Selection pattern in 2022 assumed to be the same as 2021.
Recruitment (2021)	39626157	Assessment model estimate; Thousands
Recruitment (2022)	106885513	Geometric mean recruitment (GM, 1983–2020); Thousands
SSB (2022)	128284	Assessment model estimate; Tonnes

Table 2 Sandeel in divisions 4.b–c, Sandeel Area 1r. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2022)	F_{total} (2022)	SSB (2023)	% SSB change *	% TAC change **	% advice change ***
ICES advice basis						
SSB(2023) ≥ MSY $B_{escapement}$	0	0	136622	6.5	−100	−100
Other scenarios						
F = 0	0	0	136622	6.5	−100	−100
SSB(2023) = MSY $B_{escapement}$ = B_{pa} ^	-	-	-			
B_{lim}	41998	0.175	110000	−14.3	685	669
F = F_{2021}	20290	0.079	123790	−3.5	279	271
5000 tonnes monitoring TAC	5000	0.0189	133376	4.0	−6.6	−8.5

* SSB_{2023} relative to SSB_{2022}.
** Catch scenario for 2022 relative to TAC in 2021 (5351 t).
*** Advice value 2022 relative to advice value 2021 (5464 t).
^ MSY $B_{escapement}$ and B_{pa} cannot be achieved by 2023 even with zero catch advice

The catch advice for 2022 is zero because there is no fishing mortality that can bring the stock above MSY $B_{escapement}$ due to the low stock size and low year class size in 2021.

Basis of the advice

Table 3 Sandeel in divisions 4.b–c, Sandeel Area 1r. The basis of the advice.

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 2019 recruitment value have been revised further downwards by this year's assessment.

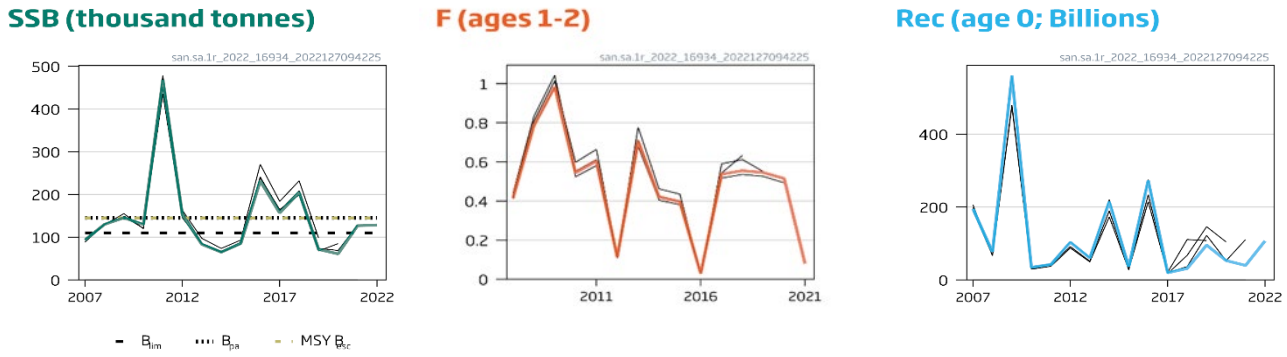

Figure 2 Sandeel in divisions 4.b–c, Sandeel Area 1r. Historical assessment results (final-year recruitment is the geometric mean).

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.

In order to obtain samples to assess the status of the stock in 2023, ICES recommends a monitoring TAC in 2022 (ICES, 2017). Catches should not exceed 5000 tonnes and should have an associated sampling protocol in the fishery.

Catches in 2021 were 16 944 tonnes which exceeded ICES advice by 11 593 tonnes predominantly due to banking/borrowing of quota in 2020. The management strategy evaluation (MSE) conducted for this stock has not accounted for the interannual quota flex practised for this fishery, and such a practice therefore may be unprecautionary (ICES, 2017).

The dredge survey does not provide reliable information on the abundance of ages 2+. Information on the age structure and mean weights of older fish are obtained from samples from the commercial fishery. The advice monitoring TAC of 5000 tonnes in 2022 is based on obtaining a minimum of 30 samples in order to provide information on abundance and the mean weight of sandeel in the assessment (ICES, 2014).

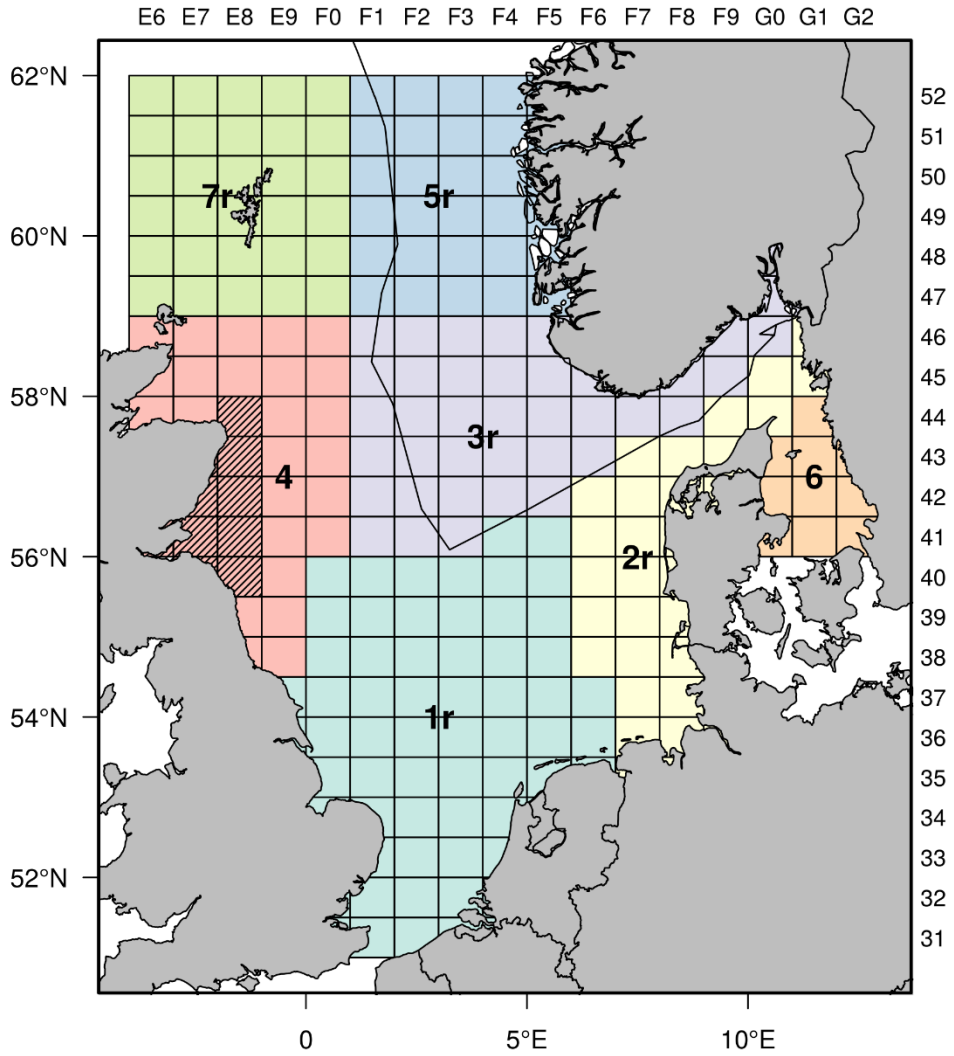

Figure 3 Sandeel in divisions 4.b–c, Sandeel Area 1r. Stock areas for the seven sandeel stocks. The border of the Norwegian Exclusive Economic Zone (EEZ) is shown as a black line. The closed part of Sandeel Area 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.b–c, Sandeel Area 1r. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{escapement}$	145 000	B_{pa}; tonnes	ICES (2017)
	F_{MSY}	Not defined		
	F_{cap}*	0.49	Maximum F, estimated from the management strategy evaluation (MSE), resulting in < 5% probability of SSB < B_{lim}	ICES (2017)
Precautionary approach	B_{lim}	110 000	The lowest SSB at which a high recruitment is observed; tonnes	ICES (2017)
	B_{pa}	145 000	$B_{pa} = B_{lim} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.17$ 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.b–c, Sandeel Area 1r. The basis of the assessment and advice.

ICES stock data category	1 (see ICES, 2021a)
Assessment type	Age-structured model (SMS-effort), half-yearly time-steps (ICES, 2022)
Input data	One survey index (D9376) in December (dredge survey since 2004) and commercial catch rates in April. Total international catch and fishing effort. Annual natural mortality estimated from multispecies assessment (ICES, 2021b). Constant maturity-at-age from surveys. 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 the advice, catch, and management

Table 6 Sandeel in divisions 4.b–c, Sandeel Area (SA) 1r. History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes. Values of catches for the period 2005 to 2015 are presented to the nearest thousand tonnes.

Year	ICES advice	Catch corresponding to advice	TAC	ICES catch SA 1	ICES catch SA 1r	Total ICES catch (SAs 1r–7r)
2005*	Exploitation to be kept below the level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class	-	661000**	104000		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**	238000		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**	109000		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**	239000		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**	309000		353000

Year	ICES advice	Catch corresponding to advice	TAC	ICES catch SA 1	ICES catch SA 1r	Total ICES catch (SAs 1r–7r)
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**	301000		414000
2011	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 320000	320000	312000		438000
2012	MSY approach: allowfor sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 23000	23000	46000		102000
2013	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 224544	225000	210000		278000
2014	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 57000	57000	99000		264000
2015	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 133000	133000	163000		312000
2016	Catches for monitoring purposes should not exceed 5000 t	≤ 5000	13000	12751	15407	75405
2017^	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 255956	255956		242069	517499
2018^	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 134461	134461		131898	269579
2019^	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 91916	91916		86723	235537
2020^	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 113987	113987		108944	446765
2021^	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 5464	5351		16944***	233178***
2022	MSY approach: zero catch	0				

* Advice for Subarea 4, excluding the Shetland area.
** Set for EU waters of divisions 2.a and 3.a and Subarea 4.
*** Preliminary.
^ ICES statistical rectangles included in this sandeel area changed with the 2017 assessment and advice.

History of catch and landings

Table 7 Sandeel in divisions 4.b–c, Sandeel Area 1r. Catch distribution by fleet in 2021 as estimated by ICES (in tonnes).

Total catch (2021)	Landings	Discards
16944	100% industrial trawl fisheries	Discarding is considered negligible.
	16944	

Summary of the assessment

Table 8 Sandeel in divisions 4.b–c, Sandeel Area 1r. Assessment summary. Weights are in tonnes, recruitment is in thousands. The SSB is estimated for 1 January. High and Low refer to 90% confidence intervals.

Year	Recruitment (age 0)	High	Low	SSB	High	Low	Total catch	F ages 1–2	High	Low
	thousands			tonnes			tonnes			
1983	299013715	411469855	217292229	460929	660290	321762	382629	0.60	0.74	0.49
1984	75981466	105247612	54853341	196025	273966	140258	498671	0.68	0.84	0.55
1985	512084393	696698200	376390273	453160	618287	332133	460057	0.73	0.89	0.59
1986	77593949	107672304	55918009	270493	349955	209074	382844	0.49	0.60	0.40
1987	47393706	66941932	33553908	973838	1311153	723303	373021	0.38	0.47	0.31
1988	206539038	283161681	150650237	574928	773879	427124	422805	0.53	0.65	0.43
1989	92618550	127802093	67120933	154662	194566	122943	446129	0.81	0.93	0.70
1990	131169377	179290552	95963816	247707	322071	190513	306302	0.81	0.93	0.70
1991	163938186	224243270	119850771	330050	426826	255217	332204	0.57	0.67	0.50
1992	37021153	51367729	26681455	284361	364332	221944	558602	0.84	0.96	0.73
1993	155942826	213236630	114043094	260407	342229	198147	144389	0.37	0.43	0.32
1994	223964922	305480402	164201323	177726	228440	138271	193241	0.30	0.34	0.26
1995	56119842	77608020	40581330	399113	512290	310940	400759	0.56	0.64	0.49
1996	403222872	545163007	298238660	364762	466453	285241	291709	0.52	0.60	0.45
1997	63148522	87172958	45745101	232815	290293	186718	426414	0.52	0.60	0.44
1998	121084596	167026740	87779235	524919	689627	399550	372604	0.63	0.73	0.55
1999	159252253	218274806	116189681	222348	289456	170798	425478	0.92	1.06	0.79
2000	252772391	349202113	182971062	142059	177052	113982	374724	0.74	0.86	0.64
2001	418003348	569607755	306749333	161297	203782	127669	540248	1.19	1.40	1.01
2002	26722060	37165427	19213246	156217	200225	121881	610161	0.82	0.95	0.70
2003	160691992	219535551	117620660	243045	321134	183944	178642	0.71	0.82	0.61
2004	67998758	91921669	50301862	93246	121926	71313	215352	0.72	0.83	0.62
2005	163120541	220417956	120717528	116425	151646	89384	126261	0.94	1.10	0.80
2006	79319932	105651738	59550857	75508	93327	61092	247510	1.15	1.35	0.98
2007	194900553	257767551	147366204	93620	123830	70780	110395	0.41	0.48	0.35
2008	77129779	103893583	57260541	129832	160591	104965	236069	0.78	0.92	0.67
2009	560309574	724195244	433511296	145365	184107	114775	309712	0.99	1.16	0.84
2010	34552829	45925002	25996689	129573	157611	106523	300896	0.54	0.63	0.47
2011	42287412	56278312	31774677	467895	605667	361463	320241	0.60	0.70	0.52
2012	103284720	135216288	78893848	152970	201741	115990	45954	0.112	0.130	0.097
2013	60128831	79158502	45673885	83200	102667	67424	214787	0.71	0.82	0.61
2014	214109902	283751264	161560690	64861	82390	51061	99059	0.42	0.49	0.36
2015	36579554	48392958	27649968	85221	105341	68943	162861	0.40	0.46	0.34
2016	273004818	349942971	212982219	231422	301235	177789	15407	0.028	0.032	0.024
2017	19481970	25344842	14975322	156530	193514	126613	242069	0.54	0.62	0.46
2018	31171039	40992247	23702865	204843	257982	162650	131898	0.56	0.64	0.48
2019	95439204	127732107	71310510	71254	90837	55892	86723	0.55	0.63	0.47
2020	52904555	77823291	35964708	60901	76356	48574	108944	0.52	0.60	0.45
2021	39626157	88716305	17699479	126880	167765	95959	16944^	0.079	0.092	0.068
2022	106885513**			128284*	167159*	98450*				

* Using mean weight-at-age from 2017 to 2021.

** Geometric mean (1983–2020).

^ Preliminary.

Sources and references

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Download the stock assessment data and figures.

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