Sandeel (*Ammodytes* spp.) in divisions 4.a–b and Subdivision 20, Sandeel Area 3r (northern and central North Sea, Skagerrak)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 30 570 tonnes.

ICES advice on conservation aspects

ICES has not identified any conservation aspects.

Stock development over time

Spawning-stock size is above MSY $B_{escapement}$, B_{pa}, and B_{lim}. No reference points for fishing pressure have been defined for this stock.
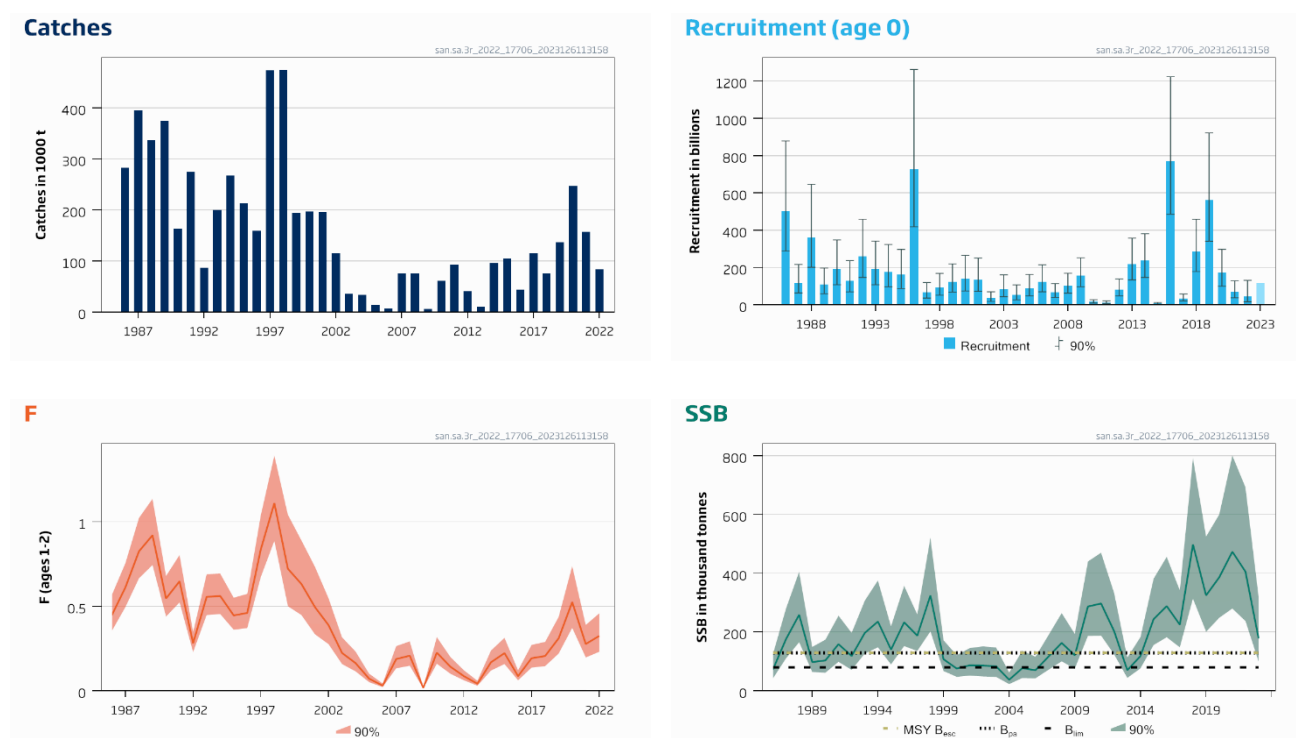
Figure 1   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Summary of the stock assessment. The assumed recruitment value for 2023 is shaded in a lighter colour.

Conservation status

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

Catch scenarios

Table 1   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Values in the forecast .

Variable	Value	Notes
F (2022)	0.33	Assessment model estimate
Recruitment (2023)	118 831 839	Geometric mean 1986–2021; thousands
SSB (2023)	178 439	Assessment model estimate; tonnes

Table 2 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. 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						
$SSB_{2024} \geq MSY\ B_{escapement} = B_{pa}$	30 570	0.133	129 000	−28	−70	−64
Other scenarios						
F = 0	0	0	146 667	−18	−100	−100
$SSB_{2024} = B_{lim}$	118 388	0.65	80 000	−55	16	38
$F = F_{2022}$	68 521	0.33	107 456	−40	−33	−20

* SSB_{2024} relative to SSB_{2023}.
** Catch scenario for 2023 relative to the TAC in 2022 (101 845 t = the sum of the Norwegian [95 000 t], EU-UK TAC [6845 t]).
*** Advice value 2023 relative to advice value 2022 (85 559 t).

The large decrease in advice from 2022 is due to a decrease in recent recruitments, with the estimated recruitment in 2021 and 2022 (1 and 2 years old in 2023) being less than half of the long-term average, a decrease in SSB and a lower target F in order to achieve MSY $B_{trigger}$ at the end of the fishing year.

Basis of the advice

Table 3 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. 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

Specific assessment model settings were introduced in the 2020 interbenchmark (ICES, 2020) to reduce the tendency of the model to overestimate both recruitment and SSB, especially in years with incoming high year classes. Despite this, SSB has been upscaled in the last couple of years.
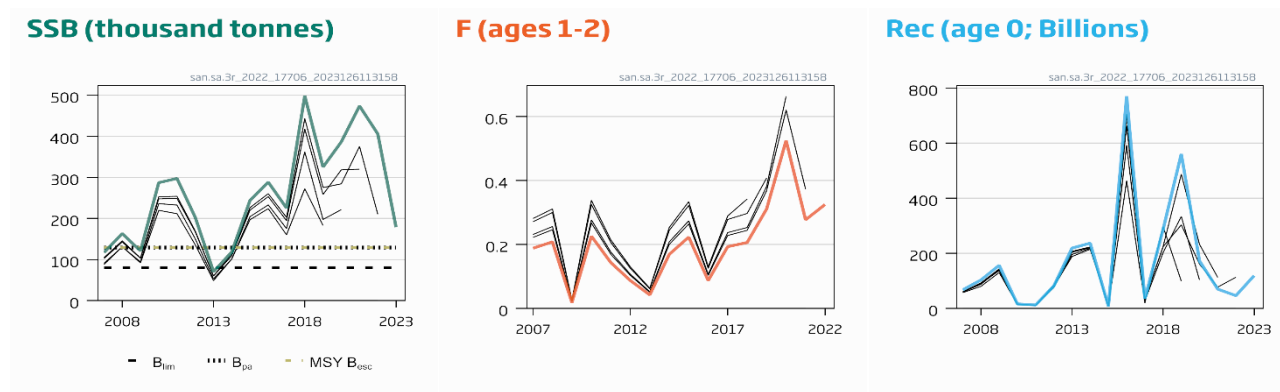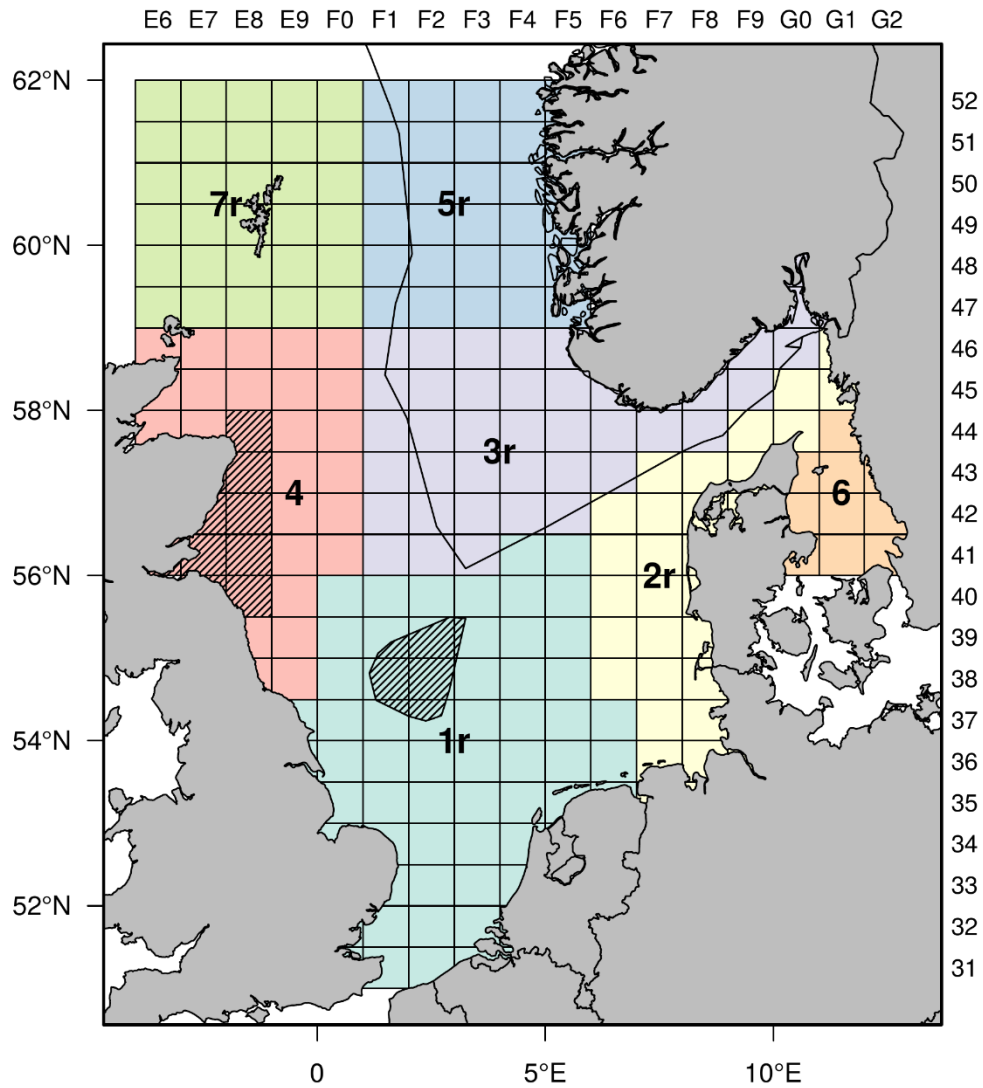

Figure 2 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Historical assessment results (final-year recruitment is the geometric mean).

Issues relevant for the advice

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

Most of Sandeel Area 3r is within the Norwegian Exclusive Economic Zone (EEZ), where fisheries are managed by areas that are alternately open and closed based on an acoustic measurement of the stock each May and the setting of minimum biomass limits. ICES has not been requested to evaluate this management approach.

Figure 3   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. 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 1 (Dogger Bank) and 4 is shown with hatched markings.

Reference points

Table 4   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{escapement}$	129 000	B_{pa}; Tonnes	ICES (2017)
	F_{MSY}	Not defined		
	F_{cap}*	0.29	The maximum F, as estimated from the management strategy evaluation (MSE), that results in < 5% probability of SSB < B_{lim}	ICES (2017)
Precautionary approach	B_{lim}	80 000	The lowest SSB at which a high recruitment is observed; tonnes	ICES (2017)
	B_{pa}	129 000	$B_{pa} = B_{lim} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.29$ 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–b and Subdivision 20, Sandeel Area 3r**.** The basis of the assessment and advice.

ICES stock data category	1 (see ICES, 2022)
Assessment type	Age-structured model (SMS-effort), half-yearly time-step (ICES, 2023)
Input data	Acoustic survey index (A6823; 2010–2022) and dredge survey index (D9376; 2005–2022). Total international catch and fishing effort. Constant maturity-at-age estimated from the dredge survey. Natural mortality estimated from multispecies assessment (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). Interbenchmarked in 2020 (ICES, 2020)
Working group	Herring Assessment Working Group (HAWG)

History of advice, catch, and management

Table 6   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. 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	EU zone & UK TAC	Norwegian zone TAC	ICES catch SA 3	ICES catch SA 3r	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**	10000***	30000		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**	0	19000		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**	51000	114000		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**	128000	95000		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	34000		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**	50000	81000		414000
2011	No fishery	0	10000	90000	95000		438000
2012	Catches for monitoring purposes should not exceed 5 000 t	< 5000	5000	42000	46000		102000
2013	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 78331	40000	20000	39000		278000
2014	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	< 270000	140000	90000	143000		264000
2015	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment, with additional F_{cap}	< 370000	190000	100000	122000		312000
2016	MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment	≤ 123135	63000	40000	50737	44074	75405

Year	ICES advice	Catch corresponding to advice	EU zone & UK TAC	Norwegian zone TAC	ICES catch SA 3	ICES catch SA 3r	Total ICES catch (SAs 1r–7r)
2017^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 74176	0	120000		115642	517499
2018^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 108365	8669	70000		75143	269579
2019^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 133610	10689	125000		136901	235537
2020^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 155072	12406	250000		247411	446765
2021^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 161335	12907	145000		157524	232610
2022^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 85559	6845	95000		83964^^	166238^^
2023^	MSY approach: allow for sufficient stock (MSY B$_{escapement}$) to remain for successful recruitment	≤ 30570					

* Advice for Subarea 4, excluding the Shetland area.
** Set for EU waters of divisions 2.a and 3.a, and Subarea 4.
*** TAC for EU fisheries set at 10 000 t; seasonal effort limitations set for Norwegian fisheries.
^ ICES statistical rectangles included in this sandeel area have changed with the 2017 assessment and advice.
^^ Preliminary.

History of catch and landings

Table 7   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Catch distribution by fleet in 2022 as estimated by ICES (in tonnes).

Total catch (2022)	Landings	Discards
83 964	100% industrial trawl fisheries	Discarding is considered negligible
	83 964	

Summary of the assessment

Table 8   Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Assessment summary with weights (in tonnes) and recruitment (at age 0, in thousands). The SSB is estimated for 1 January. High and Low refer to 90% confidence intervals.

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			
1986	287835245	502949336	878829259	41654	72042	124599	282334	0.35	0.45	0.57
1987	63633019	117506005	216988940	110343	175958	280592	395298	0.50	0.61	0.76
1988	201441559	360859773	646439475	165295	258849	405352	336919	0.67	0.83	1.02
1989	59774704	108580240	197235082	63934	97831	149701	374252	0.74	0.92	1.14
1990	107546810	193541013	348296000	61528	103570	174339	163224	0.44	0.55	0.68
1991	69784757	128700686	237356512	98607	158895	256043	274839	0.52	0.65	0.80
1992	146725084	259430655	458710011	71218	118658	197698	87022	0.23	0.28	0.35
1993	108051259	192190956	341850378	126375	197008	307118	200123	0.45	0.56	0.69
1994	96426569	176706372	323823012	148015	235861	375845	267281	0.45	0.56	0.69
1995	87762681	161497464	297181339	89647	140365	219776	213168	0.36	0.45	0.55
1996	418381009	726682345	1262168259	152271	233281	357390	159304	0.37	0.46	0.57
1997	36395963	65989091	119644042	135436	187775	260341	474093	0.67	0.84	1.04

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			
1998	51538040	93175931	168453325	201960	324487	521348	474843	0.89	1.11	1.39
1999	67957350	122179276	219663886	67193	107689	172590	193621	0.50	0.72	1.04
2000	74549831	140680230	265472462	47620	76039	121417	196525	0.45	0.63	0.89
2001	72874361	135299311	251198134	51957	87029	145776	196209	0.33	0.50	0.73
2002	18071258	35569532	70011266	48964	86077	151320	115207	0.28	0.39	0.55
2003	43438789	83553692	160713951	47386	83700	147843	35365	0.158	0.22	0.32
2004	26962023	53704105	106970122	22871	37835	62591	33658	0.115	0.164	0.23
2005	47676477	88189635	163128909	43607	77265	136902	13994	0.051	0.072	0.102
2006	70316740	122914555	214856204	42404	70193	116194	7094	0.022	0.031	0.044
2007	39639671	67322159	114336800	71683	116774	190230	75376	0.133	0.188	0.27
2008	62584223	102975330	169434372	100400	163081	264893	74943	0.148	0.21	0.29
2009	96979541	156411357	252264677	75163	120813	194188	6161	0.0130	0.0180	0.025
2010	9211168	15886814	27400525	186915	286932	440467	60542	0.160	0.23	0.32
2011	7182472	12397433	21398811	187755	297152	470290	92450	0.101	0.143	0.20
2012	47520048	81246638	138910134	123391	202602	332664	40141	0.062	0.087	0.122
2013	133888986	218872516	357797753	43708	70404	113405	9838	0.030	0.042	0.060
2014	147196754	236864783	381155997	76365	118302	183271	95426	0.120	0.169	0.24
2015	4071159	7253539	12923548	155623	243775	381859	104607	0.158	0.22	0.31
2016	485730529	770846639	1223321380	182263	288370	456248	44074	0.062	0.087	0.122
2017	20674379	34622004	57979162	147898	225032	342396	115642	0.137	0.193	0.27
2018	178687044	286428643	459134396	313288	498321	792638	75143	0.146	0.21	0.29
2019	341126533	560870164	922166148	200810	324811	525384	136901	0.22	0.31	0.44
2020	99808040	172343477	297594000	248436	386157	600224	247411	0.37	0.53	0.74
2021	37666091	69789910	129310779	279961	473544	800984	157524	0.197	0.28	0.39
2022	16125467	46085089	131706905	237353	405550	692938	83964^	0.23	0.33	0.46
2023		118831839*		99426**	178439**	320242**				

* Geometric mean (1986–2021).

** Using mean weight-at-age from 2018 to 2022.

^ Preliminary.

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Download the stock assessment data and figures.

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