

Sandeel (*Ammodytes* spp.) in divisions 4.b–c and Subdivision 20, Sandeel Area 2r (central and southern North Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2022 should be no more than 71 859 tonnes.

Stock development over time

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

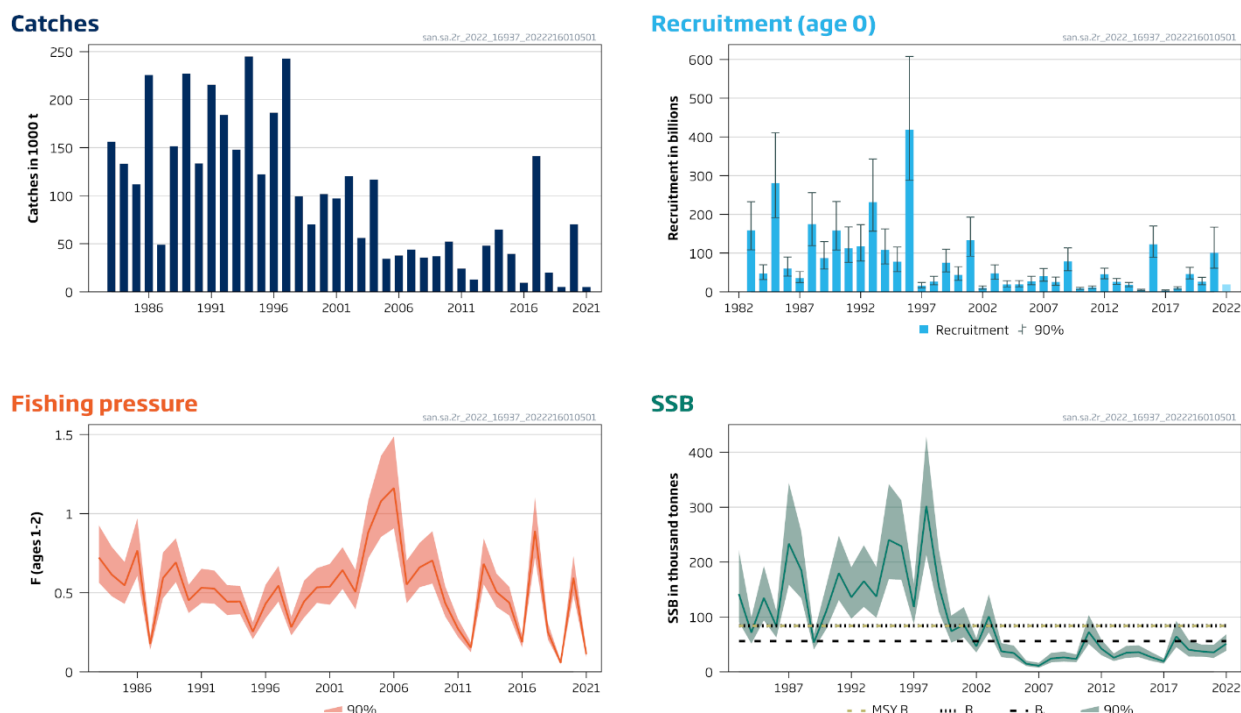


Figure 1 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Values in the forecast.

Variable	Value	Notes
F (2021)	0.112	Assessment model estimate
Recruitment (2021)	100936282	Assessment model estimate; thousands
Recruitment (2022)	19066388	Geometric mean 2011–2020; thousands
SSB (2022)	51277	Assessment model estimate; tonnes

Table 2 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. 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						
$\text{SSB}_{2023} \geq \text{MSY } B_{\text{escapement}} \text{ with } F_{\text{cap}}$	71859	0.44	93977	83	1367	-
Other scenarios						
$F = 0$	0	0	137618	168	-100	-
$\text{SSB}_{2023} = \text{MSY } B_{\text{escapement}} = B_{\text{pa}}^{\wedge}$	88771	0.57	84000	64	1713	-
B_{lim}	137759	1.00	56000	9.2	2713	-
$F_{2022} = F_{\text{sq}}$	20970	0.112	124704	143	328	-

* SSB_{2023} relative to SSB_{2022} .

** Catch scenario for 2022 relative to TAC in 2021 (4897 t).

*** Advice value 2022 relative to advice value 2021 (0 t).

The large increase in advice from a zero advice for 2021 is due to the large 2021 year class. This year class is expected to contribute to a large extent to the catches in 2022, resulting in an SSB above $\text{MSY } B_{\text{escapement}}$ by 1 January 2023.

Basis of the advice

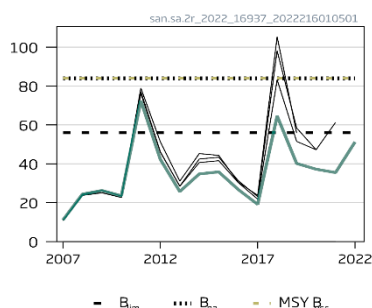
Table 3 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. The basis of the advice.

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

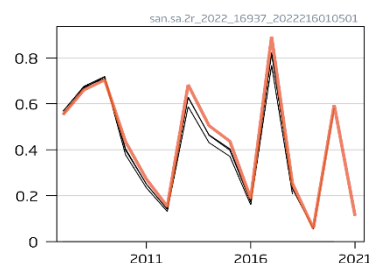
Quality of the assessment

There is a tendency of the assessment to downscale SSB.

SSB (thousand tonnes)



F (ages 1-2)



Rec (age 0; Billions)

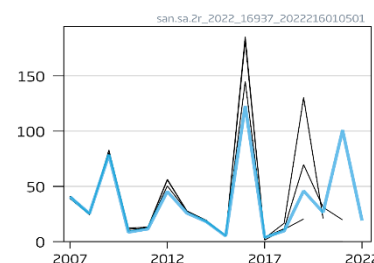


Figure 2 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Historical assessment results (final-year recruitment is the geometric mean).

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.

The assessment model has a density-dependent parameter which was 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. The strong signal of the 2021 year class from the dredge survey is suppressed by the assessment model, supporting the precautionary objectives of this advice.

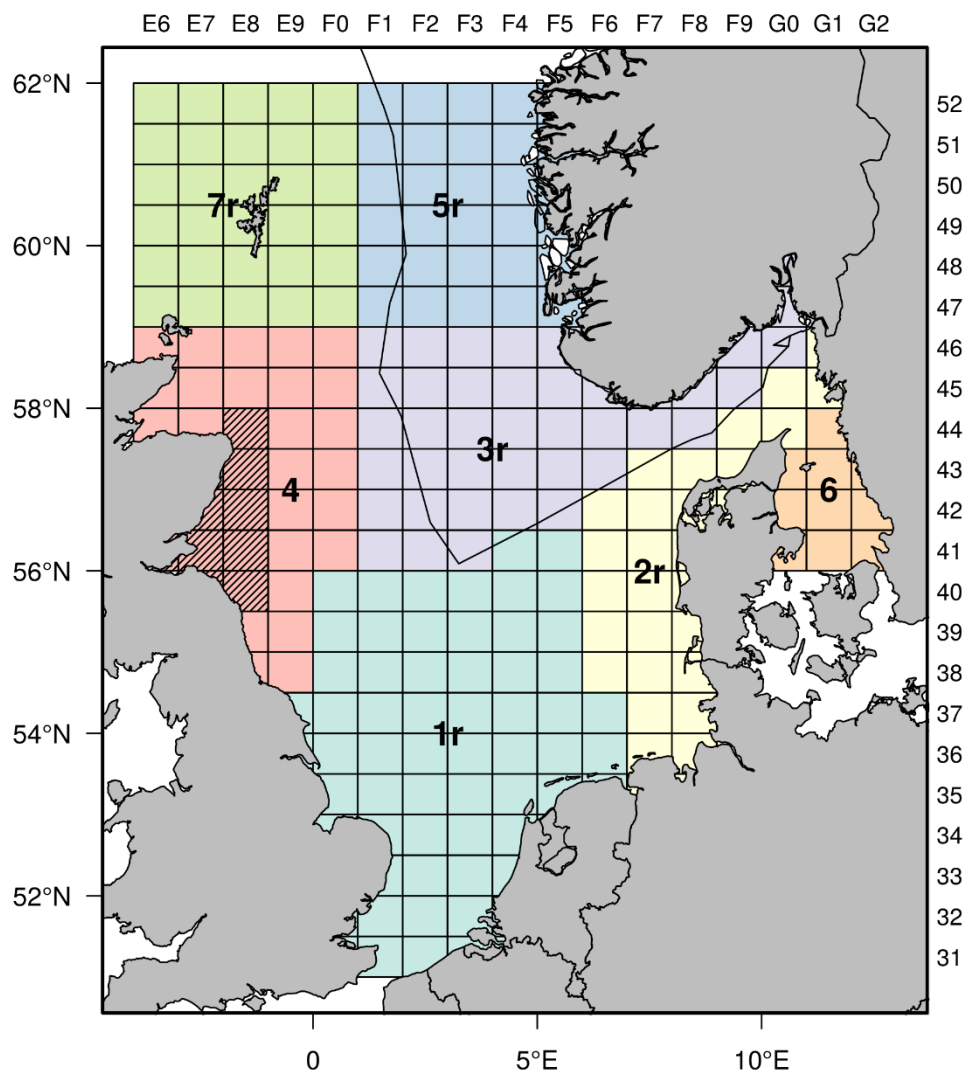


Figure 3 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Stock areas for the seven sandeel stocks. The border of the Norwegian Exclusive Economic Zone (EEZ) is shown as a black line. The closed part of Sandeel Area 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY B _{escapement}	84 000	B _{pa} ; tonnes	ICES (2017)
	F _{MSY}	Not defined		
	F _{cap} *	0.44	Maximum F, estimated from a management strategy evaluation (MSE), resulting in < 5% probability of SSB < B _{lim}	ICES (2017)
Precautionary approach	B _{lim}	56 000	Average SSB of the two lowest SSB estimates (in 2001 and 2009) that provide high recruitment; tonnes	ICES (2017)
	B _{pa}	84 000	B _{pa} = B _{lim} × exp(σ × 1.645), with σ = 0.25 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 and Subdivision 20, Sandeel Area 2r. The basis of the assessment and advice.

ICES stock data category	1 (see ICES, 2021)
Assessment type	Analytical age-based (SMS-effort), half-yearly time-steps (ICES, 2022)
Input data	One survey index (D9376; dredge survey since 2010). Total international catch and fishing effort. Constant maturity-at-age from surveys. 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). Interbenchmark in 2020 (ICES, 2020).
Working group	Herring Assessment Working Group (HAWG)

History of advice, catch, and management

Table 6 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. 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 2	ICES catch SA 2r	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**	41000		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**	35000		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**	6000		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**	13000		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**	10000		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**	32000		414000
2011	MSY approach: allow for sufficient stock ($MSY B_{escapement}$) to remain for successful recruitment	< 34000	34000	30000		438000
2012	Catches for monitoring purposes should not exceed 5000 t	< 5000	5000	8000		102000
2013	MSY approach: allow for sufficient stock ($MSY B_{escapement}$) to remain for successful recruitment	< 17544	18000	23000		278000
2014	Catches for monitoring purposes should not exceed 5000 t	< 5000	5000	8900		264000
2015	MSY approach: allow for sufficient stock ($MSY B_{escapement}$) to remain for successful recruitment	< 29000	29000	21000		312000
2016	Catches for monitoring purposes should not exceed 5000 t	≤ 5000	5000	4037	9569	75405
2017^	MSY approach: allow for sufficient stock ($MSY B_{escapement}$) to remain for successful recruitment	≤ 175941	175941		141314	517499
2018^	Catches for monitoring purposes should not exceed 5000 t	≤ 5000	5000		20240	269579

Year	ICES advice	Catch corresponding to advice	TAC	ICES catch SA 2	ICES catch SA 2r	Total ICES catch (SAs 1r–7r)
2019 [^]	Catches for monitoring purposes should not exceed 5000 t	≤ 5000	5000		5151	235537
2020 [^]	MSY approach: allow for sufficient stock (MSY B _{escapement}) to remain for successful recruitment	≤ 62658	62658		70198	446765
2021 [^]	MSY approach: zero catch. Monitoring TAC should not exceed 5000 t.	≤ 5000	4897		4980***	233178***
2022 [^]	MSY approach: allow for sufficient stock (MSY B _{escapement}) to remain for successful recruitment	≤ 71859				

* 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 and Subdivision 20, Sandeel Area 2r. Catch distribution by fleet in 2021 data as estimated by ICES (in tonnes).

Total catch (2021)	Landings	Discards
4980	100% industrial trawl fisheries	Discarding is considered negligible
	4980	

Summary of the assessment

Table 8 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Assessment summary. Weights are in tonnes, recruitment is in thousands. The SSB is estimated for 1 January. High and Low represent 90% confidence intervals.

Year	Recruitment (age 0)	High	Low	SSB	High	Low	Total Catch	Fishing pressure	High	Low
	thousands			tonnes			tonnes	ages 1–2		
1983	158934067	232803940	108503480	141775	221674	90675	156208	0.72	0.93	0.56
1984	47204510	69944022	31857845	71396	99382	51291	133398	0.62	0.79	0.48
1985	280476360	410803249	191495536	134592	193065	93828	111889	0.55	0.70	0.43
1986	60430228	89840385	40647783	83200	110863	62439	225581	0.77	0.97	0.61
1987	35462984	52416830	23992737	233748	344368	158663	49067	0.176	0.23	0.138
1988	174773254	256051242	119295224	184795	255103	133864	151543	0.59	0.76	0.47
1989	87312134	129589678	58827283	53316	69542	40877	227292	0.69	0.84	0.57
1990	158775212	233095979	108151020	111190	158079	78210	133796	0.45	0.55	0.37
1991	113011484	167628133	76190048	180052	248012	130714	215565	0.53	0.65	0.44
1992	117388558	173511551	79418768	135944	190682	96920	184241	0.53	0.64	0.43
1993	231710661	342958527	156549047	165215	230661	118337	147964	0.44	0.55	0.36
1994	108254988	162534157	72102643	137173	191015	98508	244944	0.45	0.54	0.37
1995	77827080	115747714	52329797	240386	342127	168900	122155	0.25	0.31	0.21
1996	418421560	607756439	288070337	228891	312353	167730	186460	0.43	0.55	0.34
1997	16078604	24281821	10646710	117948	160367	86749	242680	0.55	0.67	0.44
1998	26963644	40150314	18107906	302247	428814	213037	99305	0.28	0.35	0.23
1999	75225438	110029557	51430421	155749	222662	108944	70085	0.45	0.58	0.34
2000	43969202	64847598	29812835	74013	102624	53379	101952	0.53	0.66	0.44
2001	133284967	192925334	92081646	85905	117837	62627	97210	0.54	0.68	0.42
2002	10282973	15289750	6915714	46444	61254	35214	120520	0.64	0.79	0.52
2003	47583661	69592050	32535394	100912	141546	71942	56248	0.51	0.65	0.40
2004	19115307	28733283	12716785	37459	52406	26775	116837	0.88	1.08	0.72
2005	19288122	29144634	12765013	34269	47887	24524	34569	1.08	1.37	0.85
2006	27044656	40323314	18138724	14644	20325	10551	37952	1.16	1.49	0.91
2007	40588689	60330465	27306962	11142	16524	7513	44069	0.55	0.70	0.43

Year	Recruitment (age 0)	High	Low	SSB	High	Low	Total Catch	Fishing pressure ages 1–2	High	Low
	thousands			tonnes			tonnes			
2008	25418810	38241126	16895838	24441	34790	17170	35655	0.66	0.82	0.54
2009	78609255	113402953	54490777	26265	36799	18747	37049	0.70	0.89	0.56
2010	8418986	11480184	6174059	23576	31770	17496	52470	0.44	0.54	0.35
2011	11330401	15375160	8349701	72475	103490	50755	24310	0.27	0.34	0.22
2012	45353595	61039926	33698412	42319	58879	30417	12672	0.153	0.188	0.124
2013	25699960	34407708	19195930	25745	33599	19727	48172	0.68	0.84	0.55
2014	17948193	24196056	13313642	34787	47333	25567	64707	0.51	0.62	0.41
2015	4965378	6843382	3602748	35846	48198	26660	39492	0.44	0.54	0.36
2016	122914555	170023044	88858472	26796	36046	19920	9569	0.188	0.23	0.153
2017	3782894	5465529	2618281	19141	24494	14958	141314	0.89	1.10	0.72
2018	9559060	13313701	6863278	64602	92803	44971	20240	0.25	0.31	0.21
2019	45901117	63280560	33294783	40175	57807	27921	5151	0.058	0.071	0.048
2020	26403312	37878638	18404433	37235	49893	27788	70198	0.60	0.73	0.48
2021	100936282	167049301	60988779	35490	49517	25436	4980^	0.112	0.138	0.092
2022	19066388*			51277**	68422**	38428**				

* Geometric mean (2011–2020).

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

^ Preliminary.

Sources and references

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[Download the stock assessment data and figures.](#)

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