

Turbot (*Scophthalmus maximus*) in Subarea 4 (North Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2024 should be no more than 2 052 tonnes.

The use of a combined species TAC for brill and turbot prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species. ICES advises that management should be implemented at the species level.

ICES advice on conservation aspects

ICES has not identified any conservation aspects.

Stock development over time

Fishing pressure on the stock is below F_{MSY} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

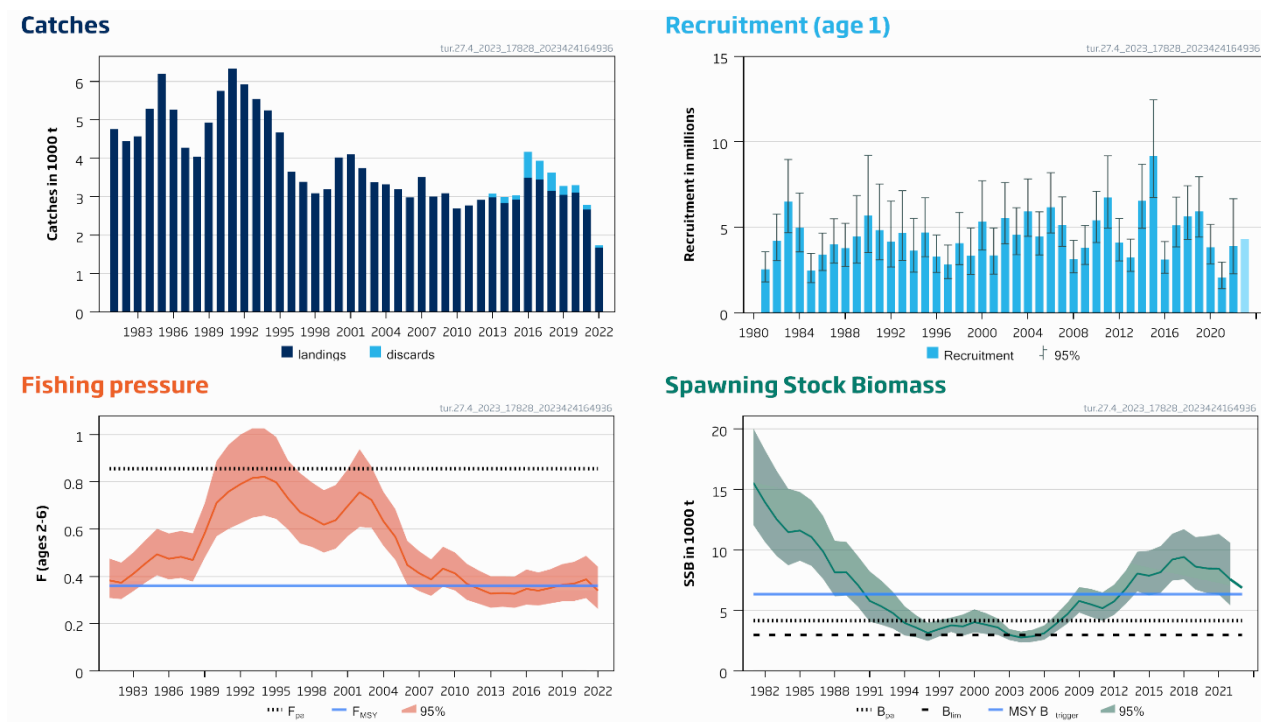


Figure 1 Turbot in Subarea 4. Summary of the stock assessment. Discards are only available since 2013 and include below minimum size (BMS) landings. The assumed recruitment value for 2023 is shaded in a lighter colour.

Conservation status

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

Catch scenarios

Table 1 Turbot in Subarea 4. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{\text{age 2-6}}$ (2023)	0.34	Average exploitation pattern (2020–2022), scaled to $F_{\text{ages 2-6}}$ 2022
SSB (2024)	6495	Short-term forecast; in tonnes
$R_{\text{age 1}}$ (2023, 2024)	4314	Geometric mean 1981–2022; in thousands
Projected landings (2023)	1762	Short-term forecast; in tonnes
Catch (2023)	1845	(Projected landings)/(1–average discard rate); average discard rate by weight 2020–2022 = 4.5%

Table 2 Turbot in Subarea 4. Annual catch scenarios. Weights are in tonnes.

Basis	Total catch* (2024)	Projected landings (2024)	Projected discards (2024) **	$F_{\text{projected landings (ages 2-6)}}$ (2024)	SSB (2025)	% SSB change^	% advice change^^
ICES advice basis							
MSY approach: F_{MSY}	2052	1960	92	0.361	6478	–0.27	–15.6
Other scenarios							
$F_{\text{MSY upper}}$	2604	2487	117	0.482	5967	–8.1	7.1
$F_{\text{MSY lower}}$	1502	1435	68	0.252	6991	7.6	–38
$F = 0$	0	0	0	0	8411	29	–100
F_{pa}	3991	3811	179	0.856	4706	–28	64
$F = F_{2023}$	1952	1865	88	0.34	6571	1.16	–19.7
SSB (2025) = B_{lim}	5983	5714	269	1.71	2974	–54	146
SSB (2025) = B_{pa}	4601	4394	207	1.07	4163	–36	89
SSB (2025) = MSY B_{trigger}	2187	2088	98	0.39	6353	–2.2	–10.1
Rollover advice	2432	2323	109	0.44	6126	–5.7	0

* (Projected landings)/(1–average discard rate); average discard rate by weight 2020–2022 = 4.5%.

** Including BMS landings. Assuming average discard rate by weight 2020–2022 = 4.5%.

^ SSB 2025 relative to SSB 2024.

^^ Total catch in 2024 relative to the advice value for 2023 (2432 tonnes).

The change in advice (–15.6%) is mainly due to the decline in, and downward revision of, the stock size.

Basis of the advice

Table 3 Turbot in Subarea 4. The basis of the advice.

Advice basis	MSY approach.
Management plan	The EU Multiannual Plan for the North Sea (EU, 2018) takes bycatch of this species into account. There is no agreed shared management plan with the UK for this stock and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F_{MSY} ranges are provided.

Quality of the assessment

Only 37% of landings of turbot in Subarea 4 were sampled for age in 2022, compared to 59% sampled in the previous year. Higher percentages of landings with age samples would improve the accuracy of the assessment.

An age-aggregated LPUE index from the Dutch beam trawl fleet has been available since 1995. Between 2014 and 2018, the Dutch pulse trawl fleet largely replaced the traditional beam trawl fleet with turbot as bycatch in the North Sea (ICES, 2018). Following the EU decision in February 2019 to revise the technical measures regulations, pulse gear was prohibited from 30 June 2021 (EU, 2019). This shift may have impacted the LPUE index included in the assessment. This index has the most weight in estimating the final biomass and strongly influences the trend in the assessment.

The assessment also includes two age-structured indices from scientific surveys (BTS-ISIS and SNS). These indices show a poor internal consistency, however, especially for older ages; this leads to a poor tracking of cohorts over time. A fisheries-independent survey, targeting large flatfish and covering the entire distribution area of the stock, would greatly enhance

the accuracy of the assessment. To address this issue, a Dutch science–industry partnership initiated a new fisheries-independent beam trawl survey in 2019 to improve future assessments of turbot.

The proportion of SSB in the plus group has been generally increasing since 2000; in the current assessment, it is now above 30% in 2022. This issue requires further investigation.

Discard estimates are available, but age-length information is very limited. Discards are not included in the current assessment but are used to provide advice.

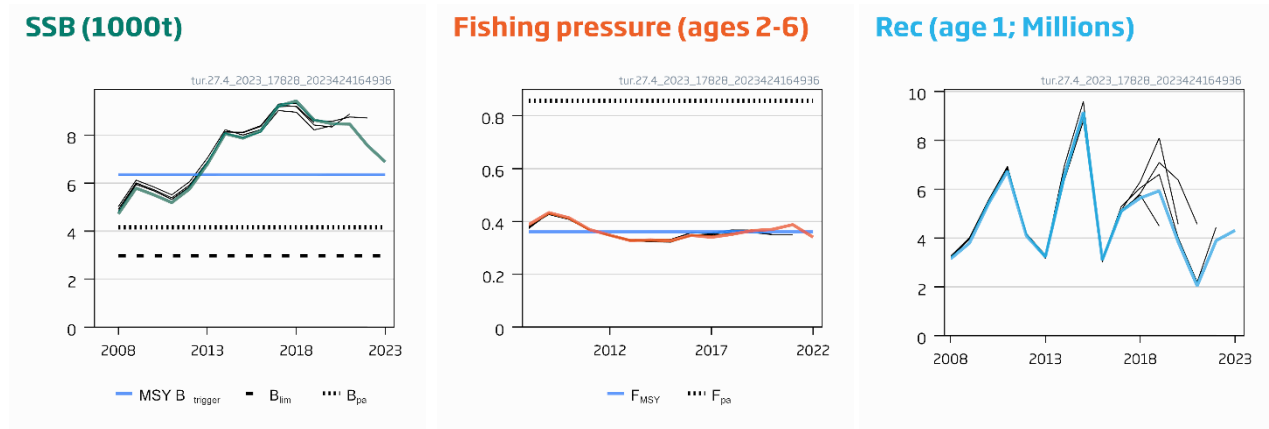


Figure 2 Turbot in Subarea 4. Historical assessment results (final-year recruitment included for each line, corresponding to the forecast recruitment in the interim year).

Issues relevant for the advice

Turbot is mainly caught as a bycatch species in mixed fisheries and is currently managed under a combined TAC with brill in Subarea 4 and Division 2.a. ICES (2022) advised that removing the TAC for turbot would generate a high risk of the stock being exploited unsustainably. The management of brill and turbot under a combined TAC, however, prevents effective control of the single-species exploitation rates and could potentially lead to the overexploitation of either species. A single-species TAC covering the entire stock (Subarea 4) is recommended for improving the management of turbot in the North Sea.

Reference points

Table 4 Turbot in Subarea 4. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	6353	Fifth percentile of the SSB at MSY; in tonnes	ICES (2018b)
	F_{MSY}	0.361	EqSim analysis based on the recruitment period 1981–2017	ICES (2018b)
Precautionary approach	B_{lim}	2974	B_{lim} was set to B_{loss} ; in tonnes	ICES (2018b)
	B_{pa}	4163	$B_{lim} \times \exp(1.645 \times \sigma) \approx 1.4 \times B_{lim}$, $\sigma = 0.20$; in tonnes	ICES (2018b)
	F_{lim}		F_{lim} (0.606) is no longer considered appropriate given the estimate of F_{pa}	ICES (2018b, 2022a)
	F_{pa}	0.856	The F that provides a 95% probability for SSB to be above B_{lim} ($F_{P,05}$ with advice rule [AR])	ICES (2018b, 2022a)
EU Management plan (MAP)*	MAP MSY $B_{trigger}$	6353	MSY $B_{trigger}$; in tonnes	ICES (2018b)
	MAP B_{lim}	2974	B_{lim} ; in tonnes	ICES (2018b)
	MAP F_{MSY}	0.361	F_{MSY}	ICES (2018b)
	MAP range F_{lower}	0.252–0.361	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY	ICES (2018b)
	MAP range F_{upper}	0.361–0.482	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY	ICES (2018b)

* EU multiannual plan (MAP) for the North Sea (EU, 2018).

Basis of the assessment

Table 5 Turbot in Subarea 4. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2023a)
Assessment type	Age-based analytical assessment (SAM; ICES, 2023b; Nielsen and Berg, 2014) that uses landings and surveys in the model and in the forecast.
Input data	Commercial landings raised to international landings, two survey indices (SNS [B3499] and BTS-Isis [B2453]), one standardized commercial biomass index (NL_BT2). Assumed constant annual maturity ogive (over years) and natural mortality (over ages and years).
Discards and bycatch	Discard data are not included in the assessment but are used to provide catch advice. The discard rate was 4.5% (average of 2020–2022). 52% of the catches include discard information in 2022, and 0% of the discards were sampled for age.
Indicators	None
Other information	An interbenchmark procedure was conducted for this stock in July 2018, changing the perception of the stock and upgrading the stock to a category 1 assessment (ICES, 2018b)
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

History of the advice, catch, and management

Table 6 Turbot in Subarea 4. ICES advice, ICES estimates of landings and discards, and official landings. Weights are in tonnes.

Year	ICES advice	Catch corresp. to advice	Agreed TAC* in Subarea 4 and Division 2.a (turbot and brill)	Official landings in Subarea 4 and Division 2.a (turbot and brill)	Official landings in Subarea 4 (turbot)	ICES landings in Subarea 4 (turbot)	ICES discards in Subarea 4 (turbot) ^	ICES catch in Subarea 4 (turbot) ^
2000		-	9000	5534	4025			
2001		-	9000	5674	4100			
2002		-	6750	5052	3749			
2003		-	5738	4721	3374			
2004		-	4877	4568	3317			
2005		-	4550	4355	3195			
2006		-	4323	4157	2976			
2007		-	4323	4754	3508			
2008		-	5263	4015	3005			
2009		-	5263	4258	3090			
2010		-	5263	4201	2695			
2011		-	4642	4312	2811			
2012	No increase in catches	-	4642	4529	2991			
2013	No new advice, same as for 2012	-	4642	4480	3085	2982	97	3079
2014	Apply F_{MSY} proxy for data-limited stocks (DLS)	≤ 2978	4642	4132	2872	2834	158	2992
2015	ICES DLS approach (max. –20%)	≤ 2406	4642	4677	2978	2922	112	3034
2016	Precautionary approach (decrease catches by 20%)	≤ 1995	4488	4953	3421	3493	666	4159
2017	Precautionary approach	≤ 4952	5924	5106	3641	3441	496	3937
2018	Precautionary approach	≤ 4952	7102	4422	3228	3140	486	3626
2019	Precautionary approach	≤ 4952	8122	4514	3119	3045	230	3275
2020	Precautionary approach	≤ 4538	6498	4389	3192	3104	199	3303
2021	MSY approach	≤ 3948	5848	3584**	2696**	2659	129	2788
2022	MSY approach	≤ 3609	5487	2194**	1697**	1680	49	1729
2023	MSY approach	≤ 2432	3747					
2024	MSY approach	≤ 2052						

* A combined TAC for turbot and brill in EU waters of Subarea 4 and Division 2.a. up to 2020 and in United Kingdom and European Union waters of Subarea 4; United Kingdom waters of Division 2.a thereafter.

** Preliminary.

^ Includes estimated BMS landings since 2019.

History of the catch and landings

Table 7 Turbot in Subarea 4. Catch distribution by fleet in 2022 as estimated by ICES.

Catch	Landings			Discards*
1729 tonnes	Beam trawls 53%	Bottom trawls 33%	Other gears 14%	49 tonnes
	1680 tonnes			

* Discards include BMS landings from EU and UK fleets.

Table 8 Turbot in Subarea 4. History of commercial landings; the official landings and BMS for each country participating in the fishery. Weights are in tonnes.

Year	Netherlands	UK	Denmark	Belgium	France	Germany	Norway	Other**	BMS landings	Total
1975	3349	503	387	158	21	169	0	1		4588
1976	3253	631	588	146	38	156	0	2		4814
1977	2973	683	474	145	37	172	0	0		4484
1978	3196	752	693	170	50	173	0	< 1		5034
1979	3999	838	1164	187	22	151	0	3		6364
1980	3241	559	1360	162	17	146	0	0		5485
1981	3073	404	1044	142	6	86	0	0		4755
1982	3029	335	880	153	14	42	0	< 1		4453
1983	3163	277	893	174	24	44	0	< 1		4575
1984	3800*	282	886	242	40	46	0	1		5297
1985	4600*	312	983	222	37	34	0	0		6188
1986	3810*	287	997	133	5	31	0	0		5263
1987	2760*	345	988	130	21	27	0	0		4271
1988	2660	328	858	129	24	41	0	1		4041
1989	3666	333	637	176	30	85	0	0		4927
1990	3732	437	1046	292	52	184	0	7		5750
1991	3780	688	1233	350	64	186	30	9		6340
1992	3495	902	907	317	81	163	65	3		5933
1993	2939	1013	817	355	123	252	47	0		5546
1994	2724	882	862	330	141	263	42	0		5244
1995	2476	703	761	315	108	275	33	0		4671
1996	1776	687	618	210	160	157	36	0		3644
1997	1854	619	479	169	1	215	45	0		3382
1998	1695	582	392	198	22	164	33	< 1		3086
1999	1808	488	411	224	0	224	32	0		3187
2000	2280	549	469	302	21	349	55	0		4025
2001	2226	642	506	333	17	297	79	0		4100
2002	1898	551	677	243	15	280	85	0		3749
2003	1893	431	486	192	18	289	65	0		3374
2004	1762	463	518	207	15	278	74	0		3317
2005	1903	347	429	159	18	274	65	0		3195
2006	1828	381	338	147	22	221	40	< 1		2976
2007	2263	485	310	173	32	203	43	0		3508
2008	1744	370	457	182	21	199	32	< 1		3005
2009	1698	421	548	172	24	198	29	< 1		3090
2010	1469	386	467	118	37	191	26	< 1		2695
2011	1540	396	548	122	33	144	28	< 1		2811
2012	1740	366	481	150	30	187	37	< 1		2991
2013	1763	374	498	161	40	219	29	< 1		3085
2014	1594	391	433	176	42	197	38	< 1		2872

Year	Netherlands	UK	Denmark	Belgium	France	Germany	Norway	Other**	BMS landings	Total
2015	1739	336	392	215	46	236	10	4		2978
2016	1854	404	505	339	38	273	8	1		3421
2017	2118	397	486	336	40	252	13	1	0	3641
2018	1914	368	331	267	27	306	15	1	2.10	3228
2019	1901	362	273	228	14	326	13	1	3.00	3119
2020	2099	354	257	161	5	297	17	1	0.64	3192
2021^	1676	324	326	132	3	221	13	1	0.94	2696
2022^	922	210	332	90	1	125	15	1	0.002	1697

* No official landings are available for the Netherlands between 1984 and 1987. Values are inserted from the IBPNew report (ICES, 2012).

** "Other" includes Sweden and, in early years, Ireland and the Faroe Islands.

^ Preliminary.

Summary of the assessment

Table 9 Turbot in Subarea 4. Assessment summary. Weights are in tonnes, recruitment in thousands. High and Low values refer to 95% confidence intervals.

Year	Recruitment (Age 1)			Spawning Stock Biomass			Landings	Discards^	Fishing pressure (landings, ages 2–6)		
	Low	R	High	Low	SSB	High			Low	F	High
1981	1806	2538	3568	12 072	15 564	20 065	4755		0.31	0.38	0.48
1982	3053	4195	5766	10 657	13 952	18 266	4453		0.30	0.37	0.46
1983	4686	6481	8963	9504	12 546	16 561	4575		0.34	0.41	0.50
1984	3554	4986	6994	8733	11 472	15 070	5297		0.37	0.45	0.55
1985	1763	2471	3463	9112	11 613	14 802	6188		0.41	0.49	0.60
1986	2474	3394	4656	8688	11 073	14 113	5263		0.39	0.47	0.58
1987	2912	4001	5499	7603	9874	12 822	4271		0.39	0.48	0.59
1988	2711	3764	5228	6174	8153	10 767	4041		0.38	0.47	0.58
1989	2904	4460	6851	6233	8158	10 677	4927		0.48	0.58	0.71
1990	3513	5688	9210	5296	7090	9491	5750		0.57	0.71	0.89
1991	3096	4828	7527	4078	5799	8245	6340		0.60	0.76	0.96
1992	2676	4181	6531	3821	5345	7477	5933		0.62	0.79	1.00
1993	3063	4676	7137	3503	4789	6547	5546		0.65	0.82	1.03
1994	2374	3619	5517	2941	3972	5365	5244		0.66	0.82	1.03
1995	3280	4699	6732	2785	3584	4611	4671		0.64	0.80	0.99
1996	2356	3273	4548	2486	3152	3997	3644		0.60	0.73	0.89
1997	2004	2817	3961	2868	3479	4221	3382		0.54	0.67	0.84
1998	2820	4067	5865	3229	3780	4426	3086		0.52	0.65	0.80
1999	2247	3339	4961	2910	3690	4679	3187		0.50	0.62	0.77
2000	3675	5326	7717	3198	4040	5104	4025		0.52	0.64	0.79
2001	2258	3346	4958	3058	3828	4792	4100		0.57	0.70	0.85
2002	4030	5539	7614	2985	3602	4346	3749		0.61	0.76	0.94
2003	3396	4568	6143	2559	2984	3480	3374		0.61	0.72	0.86
2004	4467	5916	7835	2354	2775	3271	3317		0.53	0.63	0.76
2005	3386	4469	5898	2409	2870	3418	3195		0.47	0.57	0.69
2006	4668	6183	8191	2585	3126	3781	2976		0.37	0.45	0.55
2007	3881	5128	6775	3250	3898	4674	3509		0.34	0.41	0.51
2008	2335	3143	4231	3922	4717	5674	3005		0.32	0.39	0.47
2009	2824	3796	5104	4830	5791	6943	3089		0.36	0.43	0.53
2010	4108	5403	7107	4474	5512	6790	2692		0.34	0.41	0.50
2011	4940	6735	9183	4142	5191	6506	2771		0.30	0.37	0.45
2012	3029	4086	5513	4640	5758	7145	2914		0.28	0.35	0.43
2013	2419	3228	4308	5546	6786	8304	2982	97	0.27	0.33	0.40

Year	Recruitment (Age 1)			Spawning Stock Biomass			Landings	Discards [^]	Fishing pressure (landings, ages 2–6)		
	Low	R	High	Low	SSB	High			Low	F	High
2014	4935	6544	8677	6580	8059	9872	2834	159	0.27	0.33	0.40
2015	6741	9163	12455	6239	7878	9948	2922	112	0.27	0.33	0.40
2016	2307	3099	4163	6464	8173	10334	3493	666	0.28	0.35	0.43
2017	3848	5101	6762	7477	9212	11350	3441	496	0.28	0.34	0.42
2018	4279	5638	7429	7574	9426	11730	3140	486	0.29	0.35	0.43
2019	4427	5933	7952	6724	8629	11074	3046	230	0.29	0.37	0.45
2020	2845	3835	5169	6439	8480	11168	3104	199	0.30	0.37	0.46
2021	1405	2039	2960	6316	8462	11338	2659	129	0.31	0.39	0.49
2022	2277	3896	6667	5411	7570	10591	1680	49	0.26	0.34	0.44
2023		4314*			6883						

* In 2023, recruitment is the geometric mean 1981–2022.

[^] Discards are not used in the model. Since 2019, discards include BMS landings from EU and UK fleets.

Sources and references

EU. 2018. Regulation (EU) 2018/973 of the European Parliament and of the Council of 4 July 2018 establishing a multiannual plan for demersal stocks in the North Sea and the fisheries exploiting those stocks, specifying details of the implementation of the landing obligation in the North Sea and repealing Council Regulations (EC) No 676/2007 and (EC) No 1342/2008. Official Journal of the European Union, L. 179. 13 pp. <http://data.europa.eu/eli/reg/2018/973/oj>

ICES. 2012. Report of the Inter-Benchmark Protocol on New Species (Turbot and Sea bass; IBPNew 2012), 1–5 October 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:45. 239 pp. <https://doi.org/10.17895/ices.pub.5346>

ICES. 2018a. EU request for ICES to provide advice on a revision of the contribution of TACs to fisheries management and stock conservation. In Report of the ICES Advisory Committee, 2018. ICES Advice 2018, sr.2018.15. 35 pp. <https://doi.org/10.17895/ices.pub.4531>

ICES. 2018b. Report of the InterBenchmark Protocol for turbot in the North Sea 2018 (IBPTurbot), 30–31 July 2018, IJmuiden, the Netherlands. ICES CM 2018/ACOM:50. 74 pp. <https://doi.org/10.17895/ices.pub.19290554>

ICES. 2022. EU/UK request to ICES on lemon sole, witch, turbot, and brill: review of ICES advice provided in 2018 on the contribution of TACs to fisheries management and stock conservation. In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sr.2022.19. <https://doi.org/10.17895/ices.advice.21739322>

ICES. 2023a. Advice on fishing opportunities. In Report of the ICES Advisory Committee, 2023. ICES Advice 2023, Section 1.1.1. <https://doi.org/10.17895/ices.advice.22240624>

ICES. 2023b. Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Scientific Reports. 5:39. 1072 pp. <http://doi.org/10.17895/ices.pub.22643143>

Nielsen, A. and Berg, C. W. 2014. Estimation of time-varying selectivity in stock assessments using state-space models. Fisheries Research, 158: 96–101. <https://doi.org/10.1016/j.fishres.2014.01.014>

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

Recommended citation: ICES. 2023. Turbot (*Scophthalmus maximus*) in Subarea 4 (North Sea). In Report of the ICES Advisory Committee, 2023. ICES Advice 2023, tur.27.4. <https://doi.org/10.17895/ices.advice.21864321>