

ECOREGION North Sea
STOCK Turbot in Subarea IV (North Sea)

Advice for 2015

ICES advises on the basis of the data-limited approach that catches should be no more than 2406 t. All catches are assumed to be landed.

TACs may not be appropriate as a management tool for bycatch species. A combined TAC for turbot and brill may lead to overexploitation of one of the stocks. An increase in mesh size would lead to higher yield per recruit and reduction in the proportion of immature fish in the catches.

Stock status

Fishing pressure				
	2011	2012	2013	
MSY (F_{MSY})	✘	✘	✘	Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	?	Unknown
Qualitative evaluation	↘	↘	↘	Declining
Stock size				
	2012	2013	2014	
MSY ($B_{trigger}$)	?	?	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	?	?	Unknown
Qualitative evaluation	↗	↗	↗	Increasing from low level

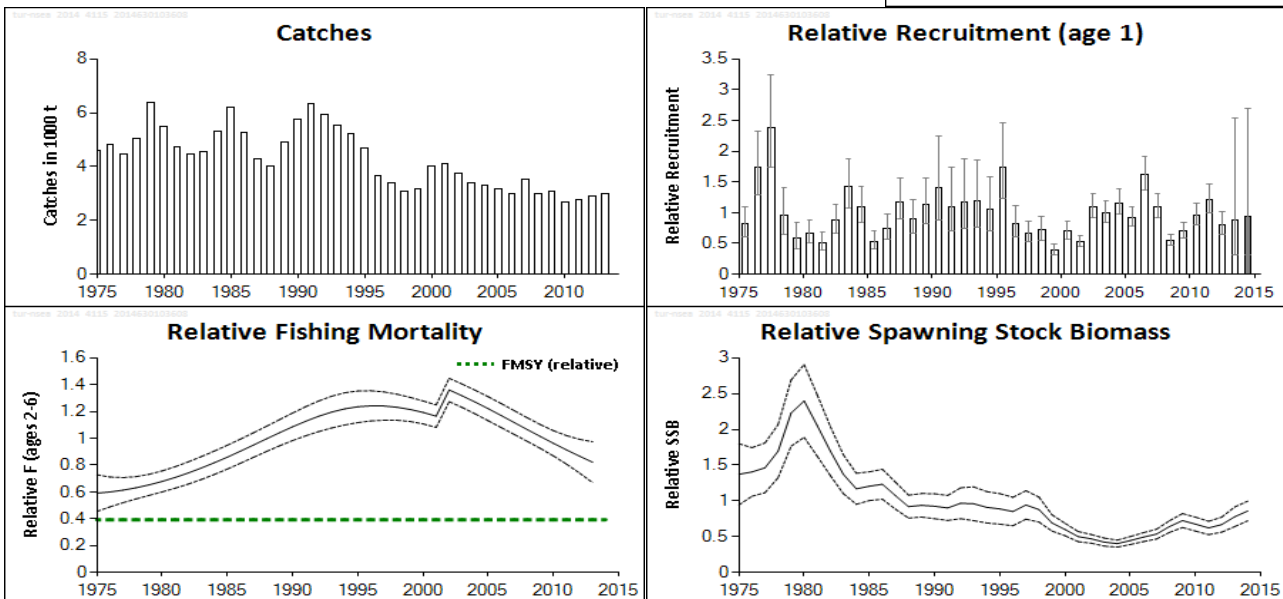
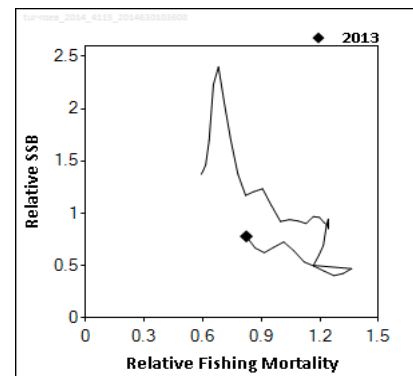


Figure 6.3.32.1 Turbot in Subarea IV. Official catches and summary of median stock trends from the assessment with 95% confidence limits. Assumed values are shaded. Top right: median SSB and F for the time-series used in the assessment

Recruitment is variable around the long-term average. The sudden increase in F in 2002 is because of a reduction of the minimum landing size in The Netherlands in 2001. Since then fishing mortality has declined. Spawning-stock biomass is at a low level, but has been gradually increasing in recent years.

Management plans

No specific management objectives are known to ICES. An EU TAC is set for EU waters of Division IIa and Subarea IV together with brill (ICES, 2013a).

Biology

Turbot is one of the fastest growing flatfish. Turbot is a typical visual feeder and feeds mainly on other bottom-living fish and small pelagic fish and could be regarded as a top predator. In general, turbot is a rather sedentary species, but there are some indications of migratory patterns. For example in the North Sea, migrations from the nursery grounds in the southeastern part to more northerly areas have been recorded. Adult turbot are more tolerant of the colder conditions in the northern areas of the North Sea where temperatures are too low for juveniles to survive.

The fisheries

Turbot is an economically valuable bycatch in the fishery for flatfish and demersal species using beam trawl, otter trawl, and static gear. There is a targeted gillnet fishery that takes less than 10% of the total catch. Discarding in the trawl fisheries for turbot is low. Currently the catches are comprised predominantly of immature fish. No official minimum landing size has been set, but Belgian and Dutch producer organizations have adopted voluntary minimum landing sizes between 25 and 30 cm. A reduction in fishing effort on target flatfish species such as plaice and sole may have influenced the turbot catches.

Catch distribution	ICES estimated catch (2013) = 3.008 kt, where 100% were estimated landings (~90% beam and otter trawls, ~10% gill- and trammelnets).
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Effects of the fisheries on the ecosystem

Currently the mixed flatfish fishery (targeting sole and plaice, but also contributing to the majority of turbot catches) is dominated by beam and otter trawls, with bycatch of both commercial and non-commercial species and a physical impact on the seabed. Bottom trawling can impact biomass, production, and species richness.

Quality considerations

Age data only exist for several short periods. The collection of data needs to be continued for the whole area in order to get a better understanding of the state of turbot stocks in the Northeast Atlantic area. A fisheries independent index covering the entire distribution area of the stock would improve the assessment. The assessment model estimates of the most recent recruitment are very uncertain. Age structure estimates are derived entirely from the Dutch beam trawl fishery, possibly creating bias in the assessment since a large proportion of the catch comes from other gears.

Scientific basis

Stock Data Category	2.1.1. (ICES, 2014a)
Assessment type	Trends-based statistical age-structured assessment
Input data	Commercial catches (episodic age frequencies from catch sampling raised to international catches), two survey indices (SNS, BTS-Isis), one commercial index (NL_BT2). Assumed constant annual maturity ogive and natural mortality (over ages and years).
Discards and bycatch	Not included and are considered negligible.
Indicators	None
Other information	Last benchmarked in 2012 (IBPNEW, ICES, 2012). An interbenchmark is proposed for autumn 2014.
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), Working Group on Mixed Fisheries Advice (WGMIXFISH-NS).

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Reference points

	<i>Type</i>	<i>Relative Value</i>	<i>Technical basis</i>
MSY Approach	MSY B _{trigger}	Undefined.	
	F _{MSY}	0.39	Precautionary proxy based on F _{0.1} , relative to the average of the time series in the 2014 assessment.
Precautionary approach	Not defined.		

(Last changed in: 2014)

Outlook for 2015

Basis: trends-based forecast relative to the average of the time series: Relative F (2014) = F(2013) = 0.82 ; Relative SSB (2015) = 0.86; Relative R (2014) = Geometric Mean (1957–2012) = 0.93; Catch (2014) = 3414.

Rationale	Catches (2015)	Basis	Relative F (2015)	%SSB change₁₎	% Catch change₂₎
DLS approach	2406	Maximum change (2013 catch * 0.8)	0.54	+23%	-20%
MSY proxy	1817	F _{MSY} proxy	0.39	+34%	-40%
<i>Mixed fisheries options – minor differences with calculation above can occur due to different methodology used (ICES, 2014c)</i>					
<i>Maximum</i>	5469	A	1.59	-32%	+77%
<i>Minimum</i>	1803	B	0.39	+34%	-42%
<i>Cod_MP</i>	1972	C	0.43	+31%	-36%
<i>SQ effort</i>	3351	D	0.80	+6%	+9%
<i>Effort_Mgt</i>	3026	E	0.70	+12%	-2%

Weights in tonnes.

¹⁾ SSB 2016 relative to SSB 2015.

²⁾ Catches 2015 relative to ICES estimates of catches in 2013

Mixed Fisheries assumptions:

- Maximum scenario: Fleets stop fishing when the last quota is exhausted.
- Minimum scenario: Fleets stop fishing when the first quota is exhausted.
- Cod management plan scenario: Fleets stop fishing when the cod quota is exhausted.
- SQ effort scenario: Effort in 2014 and 2015 as in 2013.
- Effort management scenario: Effort reductions according to cod and flatfish management plans.

ICES approach to data-limited stocks

For data-limited stocks with analytical assessment and forecast that are only treated qualitatively, ICES uses a short-term forecast applying the F_{MSY} proxy (or lower, if the stock biomass is estimated to be below MSY B_{trigger}). A change limit of ±20% is applied to the advice.

Since MSY B_{trigger} has not been identified for this stock, the ICES MSY approach has been applied without consideration of SSB in relation to MSY B_{trigger}, and the method has been applied based directly on the F_{MSY} proxy. This implies fishing mortality should be reduced to 0.39, resulting in catches of no more than 1817t in 2015, which is a decrease of more than 20% in relation to the 2013 catches. A change limit of ±20% (uncertainty cap) is applied in the data-limited stock advice, and therefore ICES advises catches of no more than 2406 t in 2015. This is expected to lead to an increase in SSB of 23% from 2015 to 2016. All catches are assumed to be landed.

Mixed fisheries

Mixed fisheries advice informs managers of the consequences of setting TACs for single species which are exploited in a mixed fishery (ICES, 2014c). In contrast to single-species advice there is no single recommendation because no management objectives have been defined for mixed fisheries. Mixed fisheries forecasts explore a range of scenarios which provide insight on the overall balance between the various single species TACs. Major differences between the

outcomes of the various scenarios indicate a potential for undershoot or overshoot of the advised landings corresponding to the single-species advice. The results provide indication of which species are globally limiting for the North Sea fisheries as a whole, but may not necessarily reflect the actual constraints on individual fishers.

Assuming fishing patterns and catchability in 2014 and 2015 are unchanged from those in 2013, Cod and *Nephrops* in FU6 are the limiting species for 73% and 27% respectively for the fleets in the North Sea demersal fisheries in 2015.

Following the ‘minimum’ or the ‘cod’ scenario, the turbot catch option could not be fully utilized. Under the ‘max’, ‘status quo effort’ and ‘effort management’ scenarios the implied F would exceed these catches which is not considered precautionary.

Additional considerations

Advice considerations

Turbot is mainly a bycatch species in fisheries for plaice and sole. TACs may not be appropriate as a management tool for bycatch species.

Turbot and brill have different advice areas. Management of these stocks under a combined species TAC prevents effective control of the single species exploitation rates and could potentially lead to the overexploitation of either species.

ICES considers that the current exploitation pattern of turbot in the North Sea is having a negative impact on the potential yield from the stock. Currently the catches are comprised predominantly of immature fish. Since turbot is a fast growing species, reducing the exploitation on younger ages could lead to an increase in maximum sustainable yield. An increase in mesh size would lead to higher yield per recruit and reduction in the proportion of immature fish in the catches.

Regulations and their effects

Regulated effort restrictions in the EU were introduced in 2003 (annexes to the annual TAC regulations) for the protection of the North Sea cod stock. In addition, a long-term plan for the recovery of cod stocks was adopted in 2008 (EC regulation 1342/2008). In 2009, the effort management programme switched from a days-at-sea to a kW-day system (EC regulation 43/2009), in which different amounts of kW-days are allocated within each area by Member State to different groups of vessels depending on gear and mesh size. Bottom otter trawls (OTB) with a mesh size equal to or larger than 100 mm, and included in TR1, have since 2009 been affected by the regulation. The beam-trawl fleet (BT2) was affected by this regulation only once in 2009, but not afterwards.

The current sole and plaice long-term management plan (Council Regulation (EC) No. 676/2007) also specifically reduces effort as a management measure, affecting BT2 and occasionally trammelnet (GT1) gears since the implementation of the plan. Effort ceilings are updated annually. However, the European Council decided upon a roll-over of effort level of 2012 into 2013 and 2014 for both the cod and the sole/plaice management plans.

Overall nominal effort (kW-days) by EU demersal trawls, seines, beam trawls, gill- and trammelnets, and longlines (all mesh sizes included) in the North Sea, Skagerrak, and Eastern Channel has been substantially reduced since the implementation of the two successive effort management plans in 2003 and 2008 (–38% between 2003 and 2013, –17% between 2008 and 2013). Effort by the beam trawl fleet in small mesh size (80–120 mm, BT2) has shown a sharp decline (–52% between 2004 and 2013), while effort in large mesh size (≥ 120 mm, BT1) has increased significantly in 2012 and 2013 after a decade of continuous decline.

Changes in fishing technology and fishing patterns

The increased use of “SumWing” and electric “pulse trawls” will likely affect catchability and selectivity of North Sea turbot, though this effect has not yet been quantified. Since 2009, pulse trawls have started to be used by Dutch fishermen. At the end of 2013, there were 42 derogation licenses available, of which 39 were in use by flatfish vessels. Potential future impact either on the turbot stock itself or the stock assessment is unknown.

Uncertainties in the assessment and forecast

An analytic assessment is available but because of uncertainties in some of the inputs and model settings, it is treated as indicative of trends in fishing mortality, recruitment, biomass, and future catches, rather than as a full analytical assessment. The assessment estimates, their forecasts, and status relative to reference points are considered to be consistent with each other and can therefore be used to provide management advice. Work is ongoing to make the

necessary improvements to the assessment to elevate North Sea turbot to a Category 1 stock under the ICES data-limited stocks classification.

In 2001 the Dutch national minimum landings size for turbot was reduced from 30 to 25 cm. From 2002 onwards all age structure data for landings of this stock are from Dutch samples. This resulted in an increase in landings of age 2 fish, leading to a sudden increase in mean fishing mortality over ages 2 to 6. Prior to 2001, it is unclear if fish at age 2 were discarded or not reported.

Data requirements

The collection of data needs to be continued in order to get a better understanding of the state of turbot stocks in the Northeast Atlantic. Priority should be given to improvement of catch-at-age information available from different countries and fleets. A fisheries independent index of abundance covering the whole stock area would improve the assessment of this stock.

Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from last year. The trends in both F and SSB the current assessment are the same as those in the previous year's assessment. The basis for the advice this year is the same as last year: the Data limited stock approach. However, the basis for the F_{MSY} proxy has changed from F_{max} to $F_{0.1}$ (corrected to follow the guidelines for category 2, ICES, 2012).

Assessment and management area

The latest benchmark (IBPNEW, ICES, 2012) recommended assessing and managing the North Sea (Subarea IV) turbot stock as a distinct unit. Turbot is managed in Subarea IV and Division IIa in a TAC combined with brill.

Sources

- 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.
- ICES. 2013a. Brill in Subarea IV and Divisions IIIa and VIIId,e. *In* Report of the ICES Advisory Committee, 2013. ICES Advice, 2013. Book 6, Section 6.4.1.
- ICES. 2013b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 24–30 April 2013. ICES CM 2013/ACOM:13.
- ICES. 2014a. Advice basis. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.
- ICES. 2014b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 30 April-7 May 2014. ICES CM 2014/ACOM:13
- ICES. 2014c. Report of the Working Group on Mixed-Fisheries Advice for the North Sea (WGMIXFISH), 26–30 May 2014. ICES CM 2014/ACOM:22.

Table 6.3.32.1 Turbot in Subarea IV. ICES advice, management, official and ICES catches.

Year	ICES Advice	Predicted catch corresp. to advice turbot	Agreed TAC ¹⁾ in IV and IIa turbot & brill	Official catches in IV and IIa turbot & brill	Official catches turbot	ICES estimated catches turbot
2000		-	9	5.534	4.026	
2001		-	9	5.674	4.101	
2002		-	6.750	5.052	3.750	
2003		-	5.738	4.721	3.375	
2004		-	4.877	4.568	3.319	
2005		-	4.550	4.355	3.195	
2006		-	4.323	4.152	2.977	
2007		-	4.323	4.750	3.510	
2008		-	5.263	4.011	3.007	
2009		-	5.263	4.253	3.091	
2010		-	5.263	4.192	2.692	
2011		-	4.642	4.304	2.807	
2012	No increase in catches	-	4.642	4.426	2.914	
2013	No new advice, same as for 2012	-	4.642	4.474 ²⁾	3.084 ²⁾	3.008
2014	Apply F _{MSY} proxy for data limited stocks	< 2.978	4.642			
2015	ICES DLS approach (max.- 20%)	< 2.406				

Weights in thousand tonnes.

¹⁾ EU combined TAC for turbot and brill in EU waters of Division IIa and Subarea IV.²⁾ Preliminary.

Table 6.3.32.2 Turbot in Subarea IV. Official catches per country (in thousand tonnes).

Year	Netherlands	UK	Denmark	Belgium	France	Germany	Norway	Other ²⁾	IV totals
1975	3.349	0.503	0.387	0.159	0.021	0.169	0.000	0.001	4.589
1976	3.253	0.632	0.588	0.147	0.038	0.157	0.000	0.002	4.816
1977	2.973	0.683	0.474	0.146	0.038	0.173	0.000	0.000	4.486
1978	3.196	0.752	0.693	0.170	0.051	0.174	0.000	0.000	5.036
1979	3.999	0.838	1.164	0.187	0.022	0.152	0.000	0.003	6.365
1980	3.241	0.559	1.360	0.163	0.017	0.146	0.000	0.000	5.486
1981	3.073	0.404	1.044	0.142	0.006	0.087	0.000	0.000	4.756
1982	3.029	0.335	0.880	0.153	0.014	0.043	0.000	0.000	4.454
1983	3.163	0.277	0.893	0.174	0.024	0.044	0.000	0.000	4.576
1984	3.800 ¹⁾	0.282	0.886	0.242	0.040	0.046	0.000	0.001	5.297
1985	4.600 ¹⁾	0.312	0.983	0.222	0.037	0.034	0.000	0.000	6.188
1986	3.810 ¹⁾	0.287	0.997	0.134	0.005	0.032	0.000	0.000	5.264
1987	2.760 ¹⁾	0.345	0.988	0.130	0.021	0.028	0.000	0.000	4.272
1988	2.660	0.328	0.858	0.129	0.024	0.042	0.000	0.001	4.042
1989	3.666	0.333	0.637	0.176	0.030	0.085	0.000	0.000	4.927
1990	3.732	0.437	1.046	0.292	0.052	0.185	0.000	0.007	5.751
1991	3.780	0.688	1.233	0.350	0.064	0.186	0.030	0.009	6.340
1992	3.495	0.902	0.907	0.317	0.081	0.163	0.066	0.003	5.934
1993	2.939	1.013	0.818	0.355	0.123	0.252	0.047	0.000	5.547
1994	2.724	0.882	0.862	0.330	0.141	0.263	0.042	0.000	5.244
1995	2.476	0.703	0.761	0.315	0.108	0.276	0.033	0.000	4.672
1996	1.776	0.687	0.618	0.210	0.160	0.157	0.036	0.000	3.644
1997	1.854	0.619	0.479	0.169	0.001	0.215	0.045	0.000	3.382
1998	1.695	0.582	0.392	0.198	0.022	0.164	0.033	0.001	3.087
1999	1.808	0.488	0.411	0.224	0.000	0.224	0.032	0.000	3.187
2000	2.280	0.549	0.469	0.302	0.021	0.349	0.055	0.001	4.026
2001	2.226	0.642	0.506	0.333	0.017	0.297	0.079	0.001	4.101
2002	1.898	0.551	0.677	0.244	0.015	0.280	0.085	0.000	3.750
2003	1.893	0.431	0.486	0.193	0.018	0.289	0.065	0.001	3.375
2004	1.762	0.463	0.518	0.207	0.015	0.278	0.075	0.001	3.319
2005	1.903	0.347	0.429	0.159	0.018	0.274	0.065	0.000	3.195
2006	1.828	0.381	0.338	0.146	0.022	0.221	0.040	0.001	2.977
2007	2.263	0.485	0.310	0.173	0.033	0.203	0.043	0.000	3.510
2008	1.744	0.371	0.457	0.182	0.022	0.199	0.033	0.000	3.007
2009	1.698	0.422	0.548	0.172	0.024	0.197	0.030	0.000	3.091
2010	1.469	0.385	0.466	0.118	0.037	0.191	0.026	0.000	2.692
2011	1.540	0.396	0.548	0.122	0.029	0.144	0.028	0.000	2.807
2012	1.739	0.362	0.482	0.145	0.030	0.120	0.036	0.000	2.914
2013	1.765	0.374	0.498	0.159	0.040	0.219	0.029	0.000	3.084

Weights in thousand tonnes.

¹⁾ No official landings for the Netherlands between 1984 and 1987. Values are inserted from the IBPNEW report (ICES, 2012).²⁾ "Other" includes Sweden and, in early years, Ireland and Faroe Islands.

Table 6.3.32.2

Turbot in Subarea IV. Summary of the assessment. Relative values are relative to the mean of the time series.

Year	Relative Recruitment Age 1	Relative SSB	Catches Tonnes	Relative Mean F Ages 2-6
1975	0.814	1.372	4588	0.592
1976	1.733	1.406	4814	0.6
1977	2.377	1.464	4484	0.614
1978	0.95	1.696	5034	0.631
1979	0.593	2.229	6364	0.653
1980	0.666	2.399	5485	0.679
1981	0.514	2.056	4755	0.709
1982	0.875	1.7	4453	0.742
1983	1.423	1.375	4575	0.779
1984	1.099	1.17	5297	0.818
1985	0.536	1.206	6188	0.86
1986	0.751	1.233	5263	0.905
1987	1.182	1.073	4271	0.95
1988	0.899	0.921	4041	0.997
1989	1.131	0.939	4927	1.043
1990	1.409	0.926	5750	1.087
1991	1.104	0.902	6340	1.128
1992	1.175	0.968	5933	1.165
1993	1.191	0.96	5546	1.196
1994	1.055	0.911	5244	1.22
1995	1.741	0.888	4671	1.236
1996	0.817	0.852	3644	1.243
1997	0.667	0.944	3382	1.242
1998	0.723	0.878	3086	1.232
1999	0.391	0.692	3187	1.216
2000	0.7	0.6	4025	1.194
2001	0.525	0.501	4100	1.166
2002	1.094	0.469	3749	1.362
2003	1.006	0.424	3374	1.318
2004	1.163	0.403	3317	1.271
2005	0.924	0.446	3195	1.221
2006	1.624	0.493	2976	1.17
2007	1.1	0.535	3509	1.117
2008	0.549	0.641	3005	1.065
2009	0.697	0.725	3089	1.013
2010	0.965	0.675	2692	0.963
2011	1.214	0.622	2771	0.914
2012	0.809	0.668	2914	0.867
2013	0.882	0.778	3008 ^{\$}	0.822
2014	0.931*	0.86		

* Based on the geometric mean

^{\$} ICES estimate