

**ECOREGION** North Sea  
**STOCK** Sole in Subarea IV (North Sea) (updated)

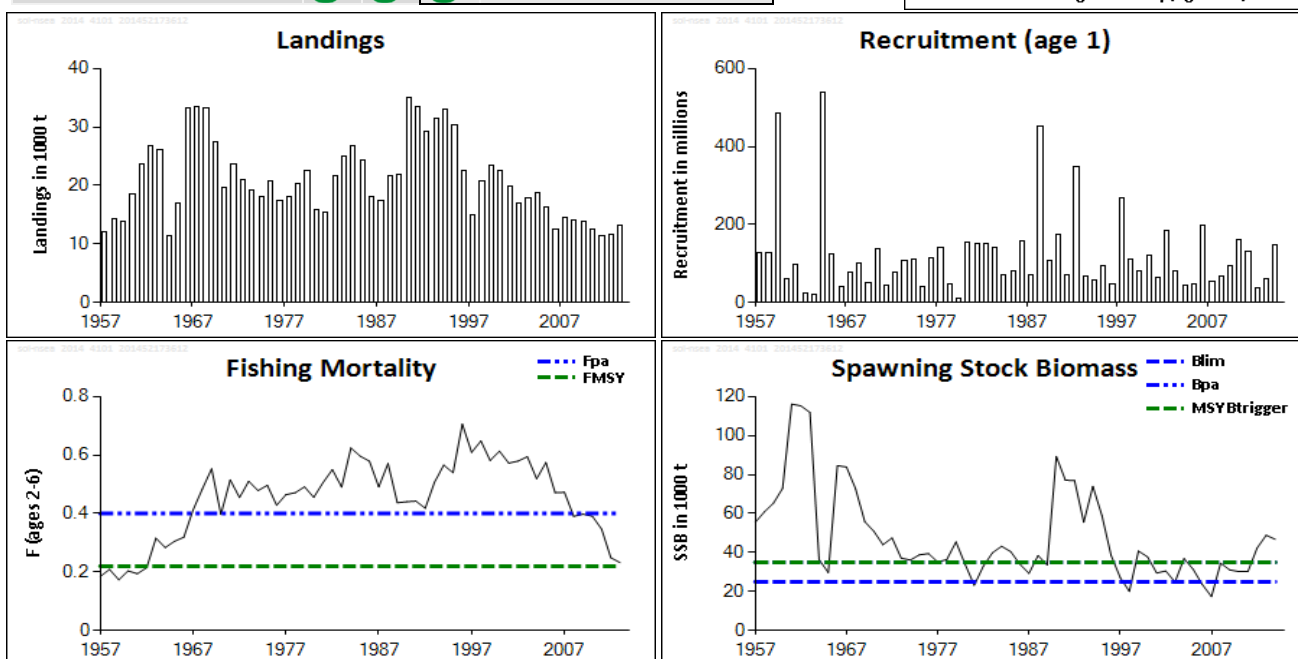
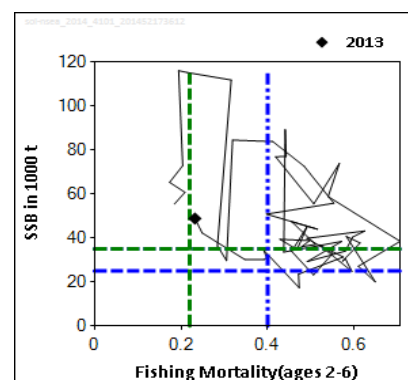
*Please note: The present advice replaces the advice given for this stock in June 2014.*

**Advice for 2015**

ICES advises on the basis of the second stage of the EU management plan (Council Regulation No. 676/2007) but cannot quantify the resulting catches. The implied landings should be no more than 11 365 t.

**Stock status**

	Fishing pressure			
	2011	2012	2013	
MSY ( $F_{MSY}$ )	✗	✗	✗	Just above target
Precautionary approach ( $F_{pa}$ , $F_{lim}$ )	✓	✓	✓	Harvested sustainably
Management plan ( $F_{MP}$ )	✓	✓	✓	Appropriate
	Stock size			
	2012	2013	2014	
MSY ( $B_{trigger}$ )	✓	✓	✓	Above trigger
Precautionary approach ( $B_{pa}$ , $B_{lim}$ )	✓	✓	✓	Full reproductive capacity
Management plan ( $SSB_{MP}$ )	✓	✓	✓	Above target



**Figure 6.3.27.1** Sole in Subarea IV (North Sea). Summary of stock assessment (weights in thousand tonnes). Top right: SSB and F for the time-series used in the assessment.

SSB has been increasing since 2007 and is estimated to be above  $B_{pa}$  in 2014. Fishing mortality has declined since 1995 and is estimated to be just above  $F_{MSY}$  in 2013.

**Management plans**

There is a two-stage management plan for North Sea sole and plaice (Council Regulation (EC) No. 676/2007, see Annex 6.3.27). An evaluation of the plan (ICES, 2010a) concluded that the management plan is precautionary. The stocks are presently in stage two of the plan (STECF, 2014); implementation of this second stage (as stipulated in Article 5 of the EC regulation) is not yet defined.

## Biology

Sole is a long-lived flatfish species and can reach an age of over 40 years. Sole is a nocturnal predator and therefore more susceptible to capture by fisheries at night than in daylight. The North Sea is the northern-most border of the distribution of this species. In cold winters it withdraws to the deeper, warmer waters of the southern North Sea. The main spawning takes place in the second quarter in coastal areas close to the nurseries. The main diet of sole consists of worms and small soft-shelled bivalves. The large fluctuations in the stock are caused by the exceptionally strong year classes that occasionally occur.

## Environmental influence on the fish

Large mortality of adult fish has been observed in extremely cold winters (1963) if the water temperature drops below 3 degrees. However, all very strong year classes have occurred after a cold winter, suggesting an environmental impact on recruitment success.

## The fisheries

Sole is mainly caught together with other species by the beam trawl fleet working with 80 mm mesh. An increasing proportion of the traditional beam trawl fleet is switching to SumWing and/or pulse trawl. Fishing effort by the total beam trawl fleet has reduced by 65% in the last 15 years. Other directed fisheries for sole are carried out with gillnets and otter trawls. Bycatches of sole in other fisheries are small.

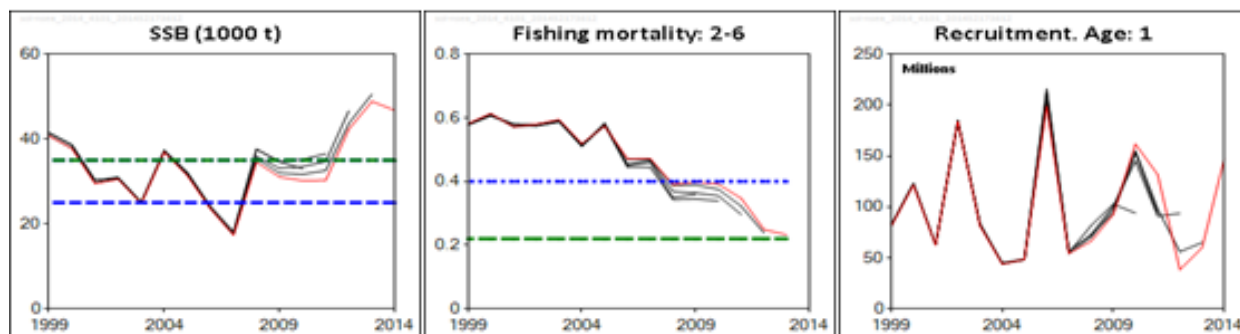
**Catch distribution** Total catches are unknown. ICES landings (2013) = 13.1 kt (84.1% beam trawl, 10.4% gill/trammelnets, 2.2% otter trawl, and 3.3% other gear). Discards (in the order of 20%) are known to take place but cannot be fully quantified.

## Effects of the fisheries on the ecosystem

The mixed plaice and sole fishery is dominated by bottom trawls, with bycatch of both commercial and non-commercial species and a physical impact on the seabed. Bottom trawling impacts biomass, production, and species richness. Trawling impact differs among benthic habitats and is likely to be more important in deeper water with silty sediments than in shallow areas characterized by sandy grounds. High discard rates of small plaice are associated with the small-meshed sole fisheries.

## Quality considerations

Age compositions of the landings are well sampled and the quality of the surveys is adequate. The commercial data used to tune the assessment may be biased due to gradual changes in the gear composition, with different catchability, used in this fishery (pulse trawl, sum wing). Better data on the type of gear used is needed in logbooks. Discards are not included in the assessment as time-series are not available yet, but discarding seems to be increasing.



**Figure 6.3.27.2** Sole in Subarea IV (North Sea). Historical assessment results (final-year recruitment estimates included).

**Scientific basis**

<b>Stock data category</b>	1 ( <a href="#">ICES, 2014a</a> ).
<b>Assessment type</b>	Age-based analytical assessment (XSA).
<b>Input data</b>	Commercial catches (international landings, age frequencies from catch sampling), three survey indices (BTS-ISIS Q3, SNS Q3, DFS Q3), one commercial index (NL TBB, all year). Natural mortality is assumed constant. Maturity-at-age is assumed to be knife-edged (at age 3).
<b>Discards and bycatch</b>	Discards are known to take place but are only quantified for part of the fisheries (discards are approximately 20% in weight in recent years, 80% of the landings covered in 2013).
<b>Indicators</b>	None.
<b>Other information</b>	Benchmarked by WKFLAT in February 2010 ( <a href="#">ICES, 2010b</a> ). A new benchmark is proposed for 2015. The advice was reopened in November 2014, based on new recruitment information (ages 1 and 2 in 2014) from the Q3 BTS-ISIS survey.
<b>Working group report</b>	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak ( <a href="#">WGNSSK</a> ), Working Group on Mixed-Fisheries Advice ( <a href="#">WGMIXFISH-NS</a> ).

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**Reference points**

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
Management plan	SSB <sub>MP</sub>	35 000 t	Stage one: Article 2.
	F <sub>MP</sub>	0.4 0.22	Stage one: Article 2; Stage two: Article 4.3 – F <sub>MSY</sub> .
MSY approach	MSY B <sub>trigger</sub>	35 000 t	Default to value of B <sub>pa</sub> .
	F <sub>MSY</sub>	0.22	Median of stochastic MSY analysis assuming a Ricker stock–recruit relationship (range of 0.2–0.25).
Precautionary approach	B <sub>lim</sub>	25 000 t	B <sub>loss</sub>
	B <sub>pa</sub>	35 000 t	B <sub>pa</sub> 1.4 × B <sub>lim</sub>
	F <sub>lim</sub>	Not defined.	
	F <sub>pa</sub>	0.4	F <sub>pa</sub> = 0.4 implies B <sub>eq</sub> > B <sub>pa</sub> and P(SSB < B <sub>pa</sub> ) < 10%.

(last changed in: 2011)

**Outlook for 2015**

Basis: F (2014) = mean F (2011–2013) scaled to 2013 = 0.232; SSB (2015) = 46 764; R (2015) = GM(1957–2011) = 94 million; Catch (2014) = unknown; Landings (2014) = 11 769.

<b>Rationale</b>	<b>Landings (2015)</b>	<b>Basis</b>	<b>F landings (2015)</b>	<b>SSB (2016)</b>	<b>%SSB change<sup>1)</sup></b>	<b>%TAC change<sup>2)</sup></b>
Management plan / MSY approach	11.365	Stage two: –F <sub>MSY</sub>	0.22	55.257	+22	–5
Precautionary approach	18.804	F <sub>pa</sub>	0.40	47.496	+4	+58
Zero catch	0	F = 0	0	67.179	+48	–100
Other options	10.125	TAC –15% (F <sub>2014</sub> × 0.9)	0.20	56.552	+25	–15
	11.912	F <sub>2014</sub>	0.23	54.648	+20	0
	11.935	Stable TAC (F <sub>2014</sub> × 1.2)	0.23	54.663	+20	0
	13.706	TAC+15% (F <sub>2014</sub> × 1.4)	0.27	52.811	+16	+15
<i>Mixed-fisheries options – not updated in November.</i> □						
<i>Maximum</i>	18.156	A	0.40	46.333	+6	+53
<i>Minimum</i>	6.211	B	0.12	58.793	+34	–48
<i>Cod_MP</i>	6.469	C	0.12	58.524	+34	–46
<i>SQ effort</i>	11.460	D	0.23	53.306	+22	–4
<i>Effort_Mgt</i>	11.328	E	0.23	53.444	+22	–5

Weights in thousand tonnes.

<sup>1)</sup> SSB 2016 relative to SSB 2015.<sup>2)</sup> Human consumption landings 2015 relative to TAC 2014.**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.

**Management plan**

The North Sea plaice and sole stocks have both been within safe biological limits in the last three years, which means that the stocks are presently in stage two of the EU multiannual plan (STECF, 2014). Application of stage two of the plan is based on transitional arrangements until an evaluation of the plan has been conducted (as stipulated in Article 5 of the EC regulation).

In stage two, the EU multiannual plan calls for management in line with the principles of MSY. ICES considers  $F_{MSY}$  to be 0.22. Following the EU multiannual plan stage two therefore implies fishing mortality to be reduced to 0.22, which results in a TAC (landings) reduction of less than 15%. ICES cannot quantify the resulting catches. The implied landings should be no more than 11 365 t. Discards are known to take place in the order of an additional 20% of the landings in the last three years (2011–2013).

### ***MSY approach***

Following the ICES MSY approach implies fishing mortality to be reduced to 0.22 ( $F_{MSY}$ , as  $SSB_{2012} > MSY B_{trigger}$ ). ICES cannot quantify the resulting catches. The implied landings should be no more than 11 365 t. Discards are known to take place in the order of 20% of the landings of plaice in the last three years (2011–2013). This is expected to lead to an SSB of 55 257 t in 2016.

### ***Precautionary approach***

The fishing mortality in 2015 should be no more than  $F_{pa} = 0.4$ . ICES cannot quantify the resulting catches. The implied landings should be no more than 18 804 t. Discards are known to take place in the order of an additional 20% of the landings in the last three years (2011–2013). This is expected to keep SSB above  $B_{pa}$  in 2016.

### ***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 FU 6 are the limiting species (73% and 27%, respectively) for the effort of fleets in the North Sea demersal fisheries in 2015.

The “Maximum” scenario leads to an overestimate of the North Sea sole TAC in 2015, while the “Minimum” and “Cod MP” scenarios lead to an underestimate. The mixed-fisheries projections have not been updated in November. The revised advice for haddock, whiting, *Nephrops* in FU6, plaice, and sole, based on the new survey information, does not change the general perception of which stocks are more likely to limit the North Sea fisheries in 2015.

## **Additional considerations**

### ***Management considerations***

The sole and plaice stocks in the North Sea have both been within safe biological limits for a number of consecutive years. Therefore ICES considers that the management plan is now in its second stage, which implies that the stocks should be managed on the basis of MSY (Article 4.1). Considering that the management plan specifies that fishing mortality for plaice in the second stage should not be set below the target of 0.3 (Article 4.2), the current advice for plaice is based on this objective. Taking into account the procedures for setting the TAC for plaice (Article 7) the TAC advice for 2015 is based on a maximum change of 15%.

The majority of the sole catches are taken by beam trawlers in a mixed fishery with other flatfish and roundfish species. In general, bycatches and discards of other species in small-meshed beam trawls are rather high. Also, beam trawls are considered to have a undesirable impact on the bottom fauna. Effort in the small-meshed beam trawl fishery has reduced by 50% in the period 2003–2013. The significant reduction of effort in the fleet must have contributed to reduce the impact of this fishery on the marine ecosystem.

ICES has developed a generic approach to evaluate whether new survey information that becomes available in September forms a basis to update the advice. If this is the case, ICES will publish new advice in November 2014.

### ***Impacts of fisheries on the ecosystems***

Currently the mixed sole and plaice fishery is dominated by bottom 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. For the North Sea, an ecosystem model showed that the bottom-trawl fleet reduced benthic biomass and

production by 56% and 21%, respectively, compared with an unfished situation (Hiddink *et al.*, 2006; Hinz *et al.*, 2008). The impact of fishing since then has probably been reduced by the considerable reduction in effort and a change to different gears. Continuous fishing has caused a shift from communities dominated by relatively sessile, emergent, and high biomass species to communities dominated by infaunal, smaller-bodied fauna (Kaiser *et al.*, 2000). Within species, the size selectivity may lead to a shift in the age and size at maturation. For example, in recent years plaice and sole have become mature at younger ages and at smaller sizes than in the past.

### *Management plan*

A multiannual plan for plaice and sole in the North Sea was adopted by the EU Council in 2007 (Council Regulation (EC) No. 676/2007) which describes two stages: a recovery plan during its first stage and a management plan during its second stage. The long-term management plan for plaice and sole in the North Sea specifies two distinct phases. The objective of stage one of the flatfish management plan was to bring both sole and plaice stocks within safe biological limits. This objective has been achieved for both stocks. The management plan foresees a re-evaluation of the biological objectives and introduction of economic and social objectives after stage one is completed. The management plan states that when stage one is completed, the Council shall decide on the basis of a proposal from the Commission on the amendment of Articles 4(2) and 4(3) and the amendment of Articles 7, 8, and 9 that will, in the light of the latest scientific advice from the STECF, permit the exploitation of the stocks at a fishing mortality rate compatible with maximum sustainable yield.

ICES considers that the management plan is presently in stage two but the implementation at this stage has not yet been fully defined.

The current plan prescribes effort limitations (kW-days per métier) to be adjusted in line with changes in fishing mortality. In 2012, ICES evaluated a proposal by the Netherlands for an amended management plan, which could serve as the “stage 2” plan (Coers *et al.*, 2012). The amendments included changing the target  $F$  for sole and ceasing reductions in effort when the stocks are within safe biological limits. ICES concluded that the plan – subject to these amendments – is consistent with the precautionary approach and the principle of maximum sustainable yield (ICES, 2012a).

In 2013, the effects of interannual quota flexibility in the management plan for plaice and sole were evaluated (ICES, 2013b). ICES concluded that the multiannual management plan is robust to inclusion of an interannual quota flexibility of 10% in terms of the probability of the stock biomass falling below  $B_{lim}$ , and average yield. This conclusion is conditional on the interannual quota flexibility being suspended when the stock is estimated to be outside safe biological limits.

### *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 (Council Regulation (EC) No. 1342/2008). In 2009, the effort management programme switched from a days-at-sea to a kW-day system (Council Regulation (EC) No. 43/2009), in which different amounts of kW-days are allocated within each area by Member Country to different groups of vessels, depending on gear and mesh size. A minor part of the fleets exploiting sole, i.e. otter trawls (OTB) with a mesh size equal to or larger than 100 mm 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, for 2013 and 2014, the European Council decided upon a roll-over of the effort level in 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 ( $\geq 120$  mm, BT1) has increased significantly in 2012 and 2013 after a decade of continuous decline.

Technical measures applicable to the mixed flatfish beam trawl fishery in the southern North Sea, affect both sole and plaice. The minimum mesh size of 80 mm generates high discards of plaice which have a larger minimum landing size than sole. Preliminary discard estimates for sole in 2013 are in the order of 20% in weight (mostly ages 1). The use of

larger mesh sizes would reduce the catch of undersized plaice and sole, but would also result in loss of marketable sole in the short term (Cardinale and Hjelm, 2012). The introduction of the Omega (mesh size) meter in 2010 has led to a slight increase in the effective mesh size in the fishery.

#### *Changes in fishing technology and fishing patterns*

The combination of days-at-sea regulations, high oil prices, the constrained TAC for plaice (due to the 15% limitation in the multiannual plan), and the relatively stable TAC for sole have led to a fishing pattern in the more southern part of the North Sea, where sole has become relatively more abundant. This concentration of fishing effort in the southern North Sea has resulted in increased discarding of juvenile plaice that are mainly distributed in those areas. This process could be aggravated by the movement in recent years of juvenile plaice to deeper waters where they become more susceptible to the fishery. Lpue data also show a slower recovery of stock size in the southern regions that may be caused by higher fishing effort in the more coastal regions.

The increased use of “SumWing” and electric “pulse trawls” will increasingly affect catchability and selectivity of North Sea sole. Dutch fishers started using pulse trawls in 2009. At the end of 2013, there were 42 derogation licenses available, of which 39 were in use by flatfish vessels. Catch rates of sole above the minimum landing size from research vessel trials were higher, but the commercial feasibility study suggested lower catch rates. The introduction of innovative gears may lead to changes in how the ecosystem is impacted by the plaice and sole targeting fleet. Because of the lighter gear and lower towing speed, pulse vessels generate a lower swept-area per hour and reduced bycatch of benthic organisms. The new gears may change fishing patterns as well.

ICES responded to a request by France on the use of pulse trawl (ICES, 2012a) and concluded that the introduction of electric pulse systems could significantly reduce fishing mortality of target and non-target species, including benthic organisms, assuming there is no corresponding increase in unaccounted (avoidance) mortality. However, not all relevant issues (such as delayed mortality and long-term population effects) have been fully studied and ICES therefore considers that the available data are insufficient to recommend the large-scale use of electric pulse trawl in fisheries.

#### *Information from the fishing industry*

Results of the 2013 North Sea Fishers’ stock survey were not available.

#### *Uncertainties in the assessment and forecast*

Estimations of sole stock status appear to have a slight retrospective underestimation of fishing mortality and overestimation of SSB. Changes in commercial fleets (e.g. from beam to pulse trawls) used for tuning the assessment may have introduced bias.

Discard are not included in the assessment as time-series are not available yet, but discarding seems to be increasing.

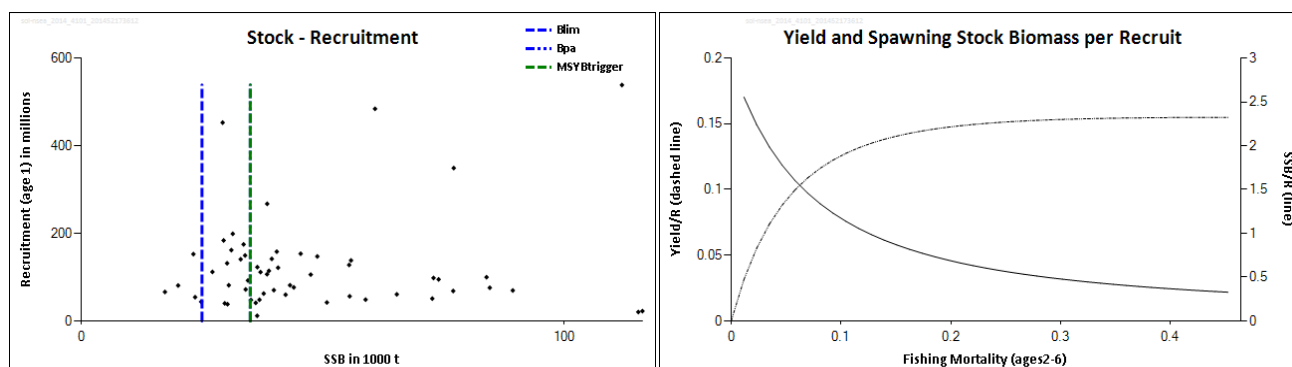
#### *Comparison of the basis of previous assessment and advice*

The basis for the assessment has not changed from last year. The 2014 assessment is in very close agreement with that of 2013. ICES advice last year was based on stage one of the management plan. This year’s advice is based on stage two of the management plan.

The advice for 2015 was updated in November, based on new recruitment information from the Q3 BTS-ISIS survey. The November advice is also based on stage two of the management plan.

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**Figure 6.3.27.3** Sole in Subarea IV (North Sea). Stock–recruitment and yield-per-recruit analysis plot.



**Table 6.3.27.1** Sole in Subarea IV (North Sea). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresponding to advice	Agreed TAC	Official landings	ICES landings
1987	Rebuild SSB to 40 000 t; TAC	11.0	14.0	13.8	17.4
1988	Increase SSB towards 50 000 t; TAC	11.0	14.0	13.4	21.6
1989	Increase SSB towards 50 000 t; TAC	14.0	14.0	14.5	21.8
1990	80% of F(88); TAC	25.0	25.0	26.5	35.1
1991	SSB >50 000 t ; TAC	27.0	27.0	27.6	33.5
1992	TAC	21.0	25.0	26.0	29.3
1993	no long-term gains in increased F	29.0*	32.0	29.8	31.5
1994	no long-term gains in increased F	31.0*	32.0	31.3	33.0
1995	no long-term gains in increased F	28.0*	28.0	28.8	30.5
1996	Mixed fishery, link plaice advice	23.0*	23.0	20.4	22.7
1997	< 80% of F(95)	14.6	18.0	13.7	15.0
1998	75% of F(96)	18.1	19.1	19.7	20.9
1999	F < F <sub>pa</sub> (80% of F(97))	20.3	22.0	22.0	23.5
2000	F < F <sub>pa</sub>	< 19.8	22.0	20.7	22.5
2001	F < F <sub>pa</sub>	< 17.7	19.0	16.4	19.9
2002	F < 0.37	< 14.3	16.0	16.0	16.9
2003	F < F <sub>pa</sub>	< 14.6	15.9	17.1	17.9
2004	F < F <sub>pa</sub>	< 17.9	17.0	17.8	17.1
2005	F < F <sub>pa</sub>	< 17.3	18.6	15.6	16.4
2006	Keep SSB above B <sub>pa</sub>	< 11.9	17.7	11.9	12.6
2007	SSB above B <sub>pa</sub>	< 10.8	15.0	13.8	14.6
2008	SSB above B <sub>pa</sub>	< 9.8	12.8	13.4	14.1
2009	Apply management plan	< 14.0	14.0	NA	14.0
2010	Apply management plan	< 14.1	14.1	12.1	12.6
2011	See scenarios	-	14.1	11.0	11.5
2012	Apply first stage of the management plan	< 15.7	16.2	11.8	11.6
2013	Apply first stage of the management plan	< 14	14.0	13.3	13.1
2014	Apply first stage of the management plan.	< 11.900	11.9		
2015	November update: Apply second stage of the management plan (MSY)	< 11.365			

Weights in thousand tonnes.

\* Catch *status quo* F.

**Table 6.3.27.2** Sole in Subarea IV (North Sea). Official landings and ICES landings (tonnes).

Year	BE	DK	FR	GE	NL.	UK (E/W/NL)	Other	Total reported	Unallocated landings	ICES Total	TAC
1982	1900	524	686	266	17686	403	2	21467	112	21579	21000
1983	1740	730	332	619	16101	435		19957	4970	24927	20000
1984	1771	818	400	1034	14330	586	1	18940	7899	26839	20000
1985	2390	692	875	303	14897	774	3	19934	4314	24248	22000
1986	1833	443	296	155	9558	647	2	12934	5266	18200	20000
1987	1644	342	318	210	10635	676	4	13829	3539	17368	14000
1988	1199	616	487	452	9841	740	28	13363	8227	21590	14000
1989	1596	1020	312	864	9620	1033	50	14495	7311	21806	14000
1990	2389	1427	352	2296	18202	1614	263	26543	8577	35120	25000
1991	2977	1307	465	2107	18758	1723	271	27608	5905	33513	27000
1992	2058	1359	548	1880	18601	1281	277	26004	3337	29341	25000
1993	2783	1661	490	1379	22015	1149	298	29775	1716	31491	32000
1994	2935	1804	499	1744	22874	1137	298	31291	1711	33002	32000
1995	2624	1673	640	1564	20927	1040	312	28780	1687	30467	28000
1996	2555	1018	535	670	15344	848	229	21199	1452	22651	23000
1997	1519	689	99	510	10241	479	204	13741	1160	14901	18000
1998	1844	520	510	782	15198	549	339	19742	1126	20868	19100
1999	1919	828		1458	16283	645	501	21634	1841	23475	22000
2000	1806	1069	362	1280	15273	600	539	20929	1603	22532	22000
2001	1874	772	411	958	13345	597	394	18351	1593	19944	19000
2002	1437	644	266	759	12120	451	292	15969	976	16945	16000
2003	1605	703	728	749	12469	521	363	17138	782	17920	15850
2004	1477	808	655	949	12860	535	544	17828	-681	17147	17000
2005	1374	831	676	756	10917	667	357	15579	776	16355	18600
2006	980	585	648	475	8299	910		11933	667	12600	17670
2007	955	413	401	458	10365	1203	5	13800	835	14635	15000
2008	1379	507	714	513	9456	851	15	13435	710	14145	12800
2009	1353	NA	NA	555	12038	951	1	NA	NA	13952	14000
2010	1268	406	621	537	8770	526	1.38	12129	474	12603	14100
2011	857	346	539	327	8133	786	2	10990	495	11485	14100
2012	593	418	633	416	9089	599	3	11752	142	11610	16200
2013	697	497	680	561	9987	867	0	13291	-153	13138	14000

NA = not available.

Table 6.3.27.3

Sole in Subarea IV (North Sea). Summary of stock assessment.

Year	Recruitment Age 1	SSB	Landings	Mean F Ages 2-6
	thousands	tonnes	tonnes	
1957	128368	55481	12067	0.185
1958	127924	60829	14287	0.209
1959	484222	65342	13832	0.173
1960	60767	72919	18620	0.204
1961	98194	116174	23566	0.194
1962	22504	115311	26877	0.215
1963	20438	111925	26164	0.316
1964	538603	36457	11342	0.284
1965	122919	29715	17043	0.305
1966	40147	84578	33340	0.319
1967	75742	83904	33439	0.412
1968	99998	72660	33179	0.484
1969	51108	55862	27559	0.553
1970	138266	50871	19685	0.397
1971	42308	44004	23652	0.515
1972	76695	47507	21086	0.455
1973	105839	37126	19309	0.51
1974	111553	36138	17989	0.479
1975	41330	38850	20773	0.497
1976	114364	39439	17326	0.429
1977	141786	35140	18003	0.465
1978	47985	36419	20280	0.472
1979	11833	45426	22598	0.491
1980	153477	33939	15807	0.455
1981	149566	23222	15403	0.506
1982	152546	33005	21579	0.55
1983	140839	39873	24927	0.491
1984	70397	43215	26839	0.625
1985	81515	40476	24248	0.596
1986	158274	34044	18201	0.579
1987	71959	29289	17368	0.491
1988	452843	38470	21590	0.571
1989	106700	33618	21805	0.437
1990	174827	89322	35120	0.441
1991	69558	77118	33513	0.443
1992	348984	76988	29341	0.418
1993	68415	55569	31491	0.506
1994	56380	73978	33002	0.566
1995	94955	58878	30467	0.54
1996	48806	38505	22651	0.706
1997	267338	27174	14901	0.61
1998	111996	20061	20868	0.649
1999	80927	40763	23475	0.582
2000	121605	37777	22641	0.614
2001	62639	29496	19944	0.573
2002	183743	30546	16945	0.58
2003	81527	24839	17920	0.595
2004	43913	36909	18757	0.519
2005	48417	31373	16355	0.575
2006	199019	23585	12594	0.471
2007	54267	17351	14635	0.473
2008	66228	34528	14071	0.391
2009	92485	31072	13952	0.398
2010	161747	30201	12603	0.391
2011	131733	30285	11485	0.347
2012	38304	42309	11610	0.249
2013	59975	48871	13138	0.232
2014	147276*	46765		
<b>Average</b>	<b>121656</b>	<b>47853</b>	<b>20899</b>	<b>0.451</b>

\* RCT3 estimate.

## **Annex 6.3.27 EU multiannual plan for North Sea plaice and sole**

Extract from Council Regulation (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea:

### Article 2. Safe biological limits

1. *For the purposes of this Regulation, the stocks of plaice and sole shall be deemed to be within safe biological limits in those years in which, according to the opinion of the Scientific, Technical, and Economic Committee for Fisheries (STECF), all of the following conditions are fulfilled:*
  - (a) *the spawning biomass of the stock of plaice exceeds 230 000 tonnes;*
  - (b) *the average fishing mortality rate on ages two to six years experienced by the stock of plaice is less than 0,6 per year;*
  - (c) *the spawning biomass of the stock of sole exceeds 35 000 tonnes;*
  - (d) *the average fishing mortality rate on ages two to six years experienced by the stock of sole is less than 0,4 per year.*
2. *If the STECF advises that other levels of biomass and fishing mortality should be used to define safe biological limits, the Commission shall propose to amend paragraph 1*

### Article 3. Objectives of the multiannual plan in the first stage

1. *The multiannual plan shall, in its first stage, ensure the return of the stocks of plaice and of sole to within safe biological limits.*
2. *The objective specified in paragraph 1 shall be attained by reducing the fishing mortality rate on plaice and sole by 10 % each year, with a maximum TAC variation of 15 % per year until safe biological limits are reached for both stocks.*

### Article 4. Objectives of the multiannual plan in the second stage

1. *The multiannual plan shall, in its second stage, ensure the exploitation of the stocks of plaice and sole on the basis of maximum sustainable yield.*
2. *The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on plaice at a rate equal to or no lower than 0,3 on ages two to six years.*
3. *The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on sole at a rate equal to or no lower than 0,2 on ages two to six years.*

### Article 5. Transitional arrangements

1. *When the stocks of plaice and sole have been found for two years in succession to have returned to within safe biological limits the Council shall decide on the basis of a proposal from the Commission on the amendment of Articles 4(2) and 4(3) and the amendment of Articles 7, 8 and 9 that will, in the light of the latest scientific advice from the STECF, permit the exploitation of the stocks at a fishing mortality rate compatible with maximum sustainable yield.*

### Article 8. Procedure for setting the TAC for sole

- 1) *The Council shall adopt a TAC for sole at that level of catches which, according to a scientific evaluation carried out by STECF is the higher of:*
  - a) *that TAC the application of which will result in the level of fishing mortality rate of 0,2 on ages two to six years in its year of application;*
  - b) *that TAC the application of which will result in a 10 % reduction in the fishing mortality rate in its year of application compared to the fishing mortality rate estimated for the preceding year.*
- 2) *Where the application of paragraph 1 would result in a TAC which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which is 15 % greater than the TAC of that year.*
- 3) *Where the application of paragraph 1 would result in a TAC which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is 15 % less than the TAC of that year.*