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

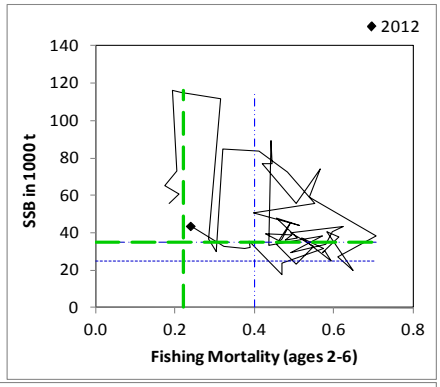
Advice for 2014

ICES advises on the basis of stage one the EU management plan (Council Regulation No. 676/2007) that landings in 2014 should be no more than 11 900 tonnes. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

Stock status

F (Fishing Mortality)	2010	2011	2012	
MSY (F_{MSY})	✗	✗	✗	Above target
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvested sustainably
Management plan (F_{MP})	✓	✓	✓	Appropriate

SSB (Spawning-Stock Biomass)	2011	2012	2013	
MSY ($B_{trigger}$)	✗	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	o	✓	✓	Full reproductive capacity
Management plan (SSB_{MP})	✗	✓	✓	Above target



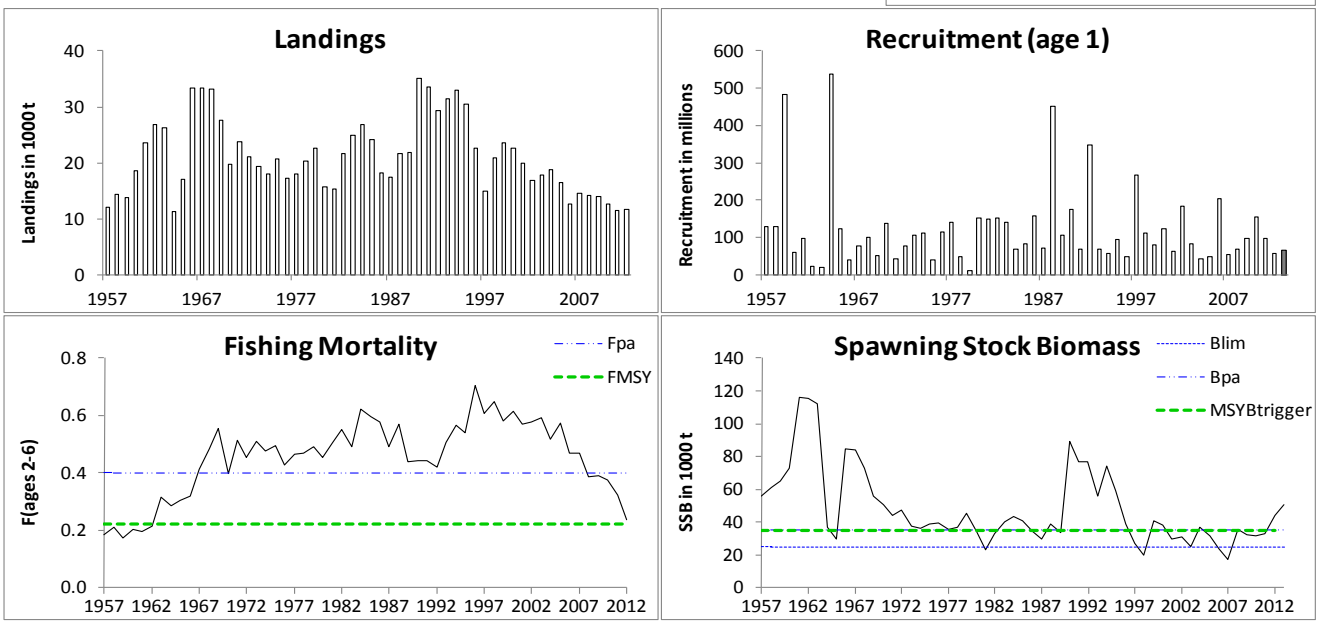


Figure 6.4.27.1 Sole in Subarea IV (North Sea). Summary of stock assessment (weights in thousand tonnes). Top right: SSB and F for the time series used in the assessment.

SSB has fluctuated around the precautionary reference points for the last decade and is estimated to be well above B_{pa} in 2013. Fishing mortality has shown a declining trend since 1995 and is estimated to be close to Fmsy in 2012.

Management plans

There is a two-stage management plan for North Sea sole and plaice (Council Regulation (EC) No. 676/2007, see Annex 6.4.27). An evaluation of the plan (ICES, 2010) concluded that the management plan is precautionary. The stocks are presently in stage two of the plan; 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 most northern 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 fluctuation in the stock are caused by exceptional strong year classes, which 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.

The fisheries

Sole is mainly caught by the beam-trawl fleet working with 80 mm mesh mixed with other species. An increasing proportion of the traditional beam trawl fleet is switching to sumwing and/or pulse trawl. Other directed fisheries for sole are carried out with gill nets and otter trawls. Bycatches of sole in other fisheries are small.

Catch distribution	Total catches are unknown. Landings (2012) = 11.6 kt, 83.8% beam trawl, 13.6% gill / trammel nets, 2.2% otter trawl, 0.4% other). Total discards estimates are not available

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. Days-at-sea regulations, high oil prices, and changes in the ratio of TACs for plaice and sole have led to a transfer of fishing effort to the southern North Sea where sole and juvenile plaice tend to be more abundant, leading to an increase in discarding of small plaice in the beginning of the 2000s.

Quality considerations

There are divergent signals between the scientific survey and the commercial data used to tune the sole assessment. A survey covering the whole area would be a more suitable index of abundance. The commercial data used to tune the assessment may be biased due to gradual changes in gear composition, with different catchability, used in this fishery (puls trawl, sum wing). Data on the type of gear used is needed in logbooks. Discard are not included in the assessment as time series are not available yet.

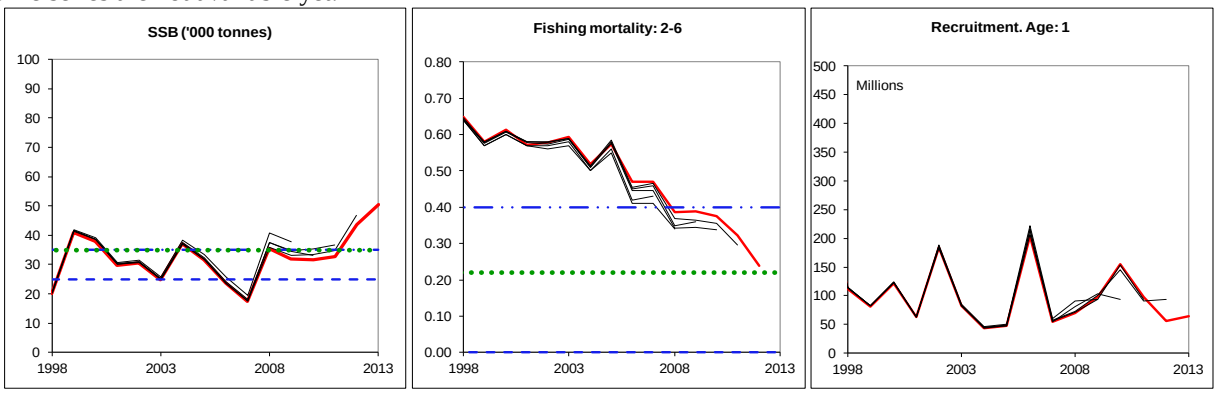


Figure 6.4.27.2 Sole in Subarea IV (North Sea). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Input data	Commercial catches (international landings, age frequencies from catch sampling), two survey indices (BTS-ISIS Q3, SNS 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)
Discards and bycatch	Discards not included in the assessment but available for monitoring (TBB, OTB)
Indicators	None.
Other information	Benchmarked February 2010 (WKFLAT). A benchmark is proposed for 2015.
Working group report	WGNSSK (ICES, 2013a)

ECOREGION North Sea
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Reference points

	Type	*Value*	*Technical basis*
Management Plan	SSB_{MP}	35 000 t	Stage one: Article 2.
	F_{MP}	0.4 0.2	Stage one: Article 2; Stage two: Article 4.
MSY Approach	MSY $B_{trigger}$	35 000 t	Default to value of B_{pa}.
	F_{MSY}	0.22	Median of stochastic MSY analysis assuming Ricker Stock-Recruit relationship (range of 0.2-0.25).
Precautionary Approach	B_{lim}	25 000 t	B_{loss}
	B_{pa}	35 000 t	$B_{pa}1.4*B_{lim}$
	F_{lim}	Not defined.	
	F_{pa}	0.4	F_{pa} = 0.4 implies $B_{eq} > B_{pa}$ and $P(SSB<B_{pa}) < 10\%$

(unchanged since: 2011)

Outlook for 2014

Basis: F (2013) = mean (F2010–2012) scaled to 2012 =0.24; SSB (2014) =48.151; R (2014)= 94.1 million =GM(1957–2010); Landings (2013) =12.757.

Rationale	**Landings (2014)**	**Basis**	**F landings (2014)**	**SSB (2015)**	**%SSB change** [1)]	**%TAC change** [2)]
Management plan	11.900	15% TAC reduction	0.24	46.070	-4%	-15%
MSY approach	11.190	F_{MSY}	0.22	46.822	-3%	-20%
Precautionary approach	18.533	F_{pa}	0.40	39.087	-19%	+32%
Zero catch	0	F = 0	0.00	58.674	22%	-100%
Other options	10.282	Management F target	0.20	47.782	-1%	-27%
	11.900	TAC-15% (F_{2013})	0.24	46.070	-4%	-15%
	14.000	Stable TAC (F_{2013}*1.2)	0.29	43.847	-9%	0
	16.100	TAC+15% (F_{2013}*1.4)	0.34	41.702	-13%	+15%
Mixed fisheries options – minor differences with calculation above can occur due to different methodology used (ICES, 2013b)						
Maximum	17.576	A	0.38	40.002	-17%	+26%
Minimum	6.420	B	0.12	51.775	+8%	-54%
Cod_MP	6.424	C	0.12	51.772	+8%	-54%
SQ effort	12.040	D	0.24	45.835	-5%	-14%
Effort_Mgt	11.869	E	0.24	46.015	-4%	-15%

Weights in thousand tonnes.

[1)] SSB 2015 relative to SSB 2014.

[2)] Human Consumption landings 2014 relative to TAC 2013.

Mixed fisheries assumptions

A. Maximum scenario: Fleets stop fishing when last quota exhausted
B. Minimum scenario: Fleets stop fishing when first quota exhausted
C. Cod management plan scenario: Fleets stop fishing when cod quota exhausted
D. SQ effort scenario: Effort in 2013 and 2014 as in 2012
E. Effort management scenario: Effort reductions according to cod and flatfish management plans

Management plan

Both the North Sea plaice and sole stocks have been within safe biological limits in the last two years. According to the management plan (Article 3.2), this signals the end of stage one. Application of the plan is on the basis of transitional arrangements until an evaluation of the plan has been conducted (as stipulated in article 5 of the EC regulation).

Following the EU multiannual plan stage 1 (as rules relating to the setting of F for stage 2 are not yet defined) would imply a 10% reduction of F to 0.21, which results in a TAC (landings) reduction of more than 15%. Therefore, the maximum TAC reduction of 15% is applied, resulting in landings of no more than 11 900 t in 2014. This is expected to

lead to an SSB of 46 070 t in 2015. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

ICES has evaluated the plan and considers it to be precautionary (ICES, 2010).

MSY approach

Following the ICES MSY approach implies fishing mortality to be reduced to 0.22 (F_{MSY}, as SSB 2012 > MSY $B_{trigger}$), resulting in landings of 11 194 t in 2014. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated. This is expected to lead to an SSB of 46 916 t in 2015.

Given that the current (2012) estimate of fishing mortality is close to FMSY there is no need to follow a transition scheme towards this reference value.

Precautionary approach

The F_{pa} for North Sea sole is 0.4. This would lead to landings of 18 540 t in 2014 and an SSB of 39 175 t in 2015. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

Mixed fisheries

In contrast to single-species advice there is no single recommendation for mixed fisheries (ICES, 2013b), but rather a range of example scenarios, assuming fishing patterns and catchability in 2013 and 2014 are unchanged from those in 2012. Major differences between the outcomes of the various scenarios indicate potential undershoot or overshoot of the advised landings corresponding to the single-species advice. As a result, fleet dynamics may change, but cannot be determined.

Cod is the limiting species for the North Sea and eastern channel demersal fisheries in 2014. Following the 'cod' scenario (full implementation of the cod management plan), the sole management plan catch options could not be fully utilised.

Additional considerations

Sole are mainly caught in a mixed beam-trawl fishery with plaice and other flatfish using 80 mm mesh in the southern North Sea. The minimum mesh size in the mixed beam-trawl fishery in the southern North Sea means that large numbers of undersized plaice are discarded. There are indications that in recent years sole discarding has increased. Reasons for the increase are unclear and should be investigated. Measures to reduce discarding in the mixed beam-trawl fishery would greatly benefit these stocks. An increase in the minimum landing size of sole could provide an incentive to fish with larger mesh sizes and would therefore mean a reduction in the discarding of plaice. The minimum landing size of North Sea sole is 24 cm. An increased mesh size in the fishery would reduce the catch of undersized plaice, but would also result in a loss of marketable sole.

The peaks in the historical time-series of SSB of North Sea sole correspond with the occasional occurrence of strong year classes. Due to a high fishing mortality the SSB has declined during the nineties. The SSB and landings have in recent years been dominated by the 2005 year class. The effect of the 2005 year class is now, however, starting to decline. The 2009 year class, which entered into the SSB in 2012, is above average.

The decline in the fishing mortality starting in the mid-2000s coincides with a reduction of capacity in the beam-trawl fleet. High fuel prices may have contributed to the decrease in effort and, consequently, of fishing mortality.

The assumption of status quo fishing mortality in 2013 in the forecast indicates that the TAC for 2013 will not be taken. The TAC for sole has not been fully utilized in 2010, 2011 and 2012, and in the last 3 years effort limitations have not been restrictive.

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 2013.

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 un-fished situation (Hiddink *et al.*, 2006; Hinz *et al.*, 2008). The impact of fishing since then has probably reduced by 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 (EC regulation 676/2007) which describes two stages: a recovery plan during its first stage and a management plan during its second stage. Objectives are defined for these two stages, rebuilding the stocks to within safe biological limits in the first and exploiting the stocks at MSY in the second. Stage 1 is deemed to be completed when both stocks have been within safe biological limits for two consecutive years. TAC-setting procedures are provided to accommodate stage 1 as well as a transitional period during which an impact assessment and evaluation should take place to reconsider long-term objectives. The plaice stock has been within safe biological limits as defined by the plan since 2005. The sole stock has been within safe biological limits in terms of fishing mortality since 2008. The 2012 and 2013 estimates are well above B_{pa} (43 kt and 39 kt). .Consequently, ICES concludes that the objectives of stage 1 are currently met and provides advice based on the plan's TAC-setting procedure, acknowledging the stock to be in a transitional stage at present.

The current plan prescribes effort limitations (kW-days per metier) to be adjusted in line with changes in fishing mortality. The current advice implies a reduction of 10% in effort (following a 10% reduction in F to 0.21 for sole) as well as an increase in fishing mortality for plaice.

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 to 0.25 and to cease reductions of effort. ICES concluded that the plan – subject to those amendments –is consistent with the precautionary approach and the principle of maximum sustainable yield (ICES, 2012b). However, implementation of stage two of the plan is not yet defined.

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. 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, the European Council decided upon a roll-over of effort level of 2012 into 2013 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 (−40% between 2003 and 2012, −16% between 2008 and 2012). Effort by the beam trawl fleet in small mesh size (80–120 mm, BT2) has shown a sharp decline (−45% between 2003 and 2012), while effort in large mesh size (≥120 mm, BT1) has increased significantly in 2012 after a decade of continuous decline.

Changes in fishing technology and fishing patterns

The combination of days-at-sea regulations, high oil prices, and the constrained TAC for plaice (due to the 15% limitation in the multiannual plan) and the relatively stable TAC for sole have lead to a more southern fishing pattern in the North Sea, where sole has become relatively more abundant. This concentration of fishing effort in the South has resulted in increased discarding of juvenile plaice that are mainly distributed in those areas. This process could be aggravated by the movement of juvenile plaice to deeper waters in recent years 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. In 2011, approximately 30 derogation licenses for Pulse trawls were taken into operation, which increased to 42 in 2012. Debate is ongoing in the EU about extensions of an additional 42 derogation licenses as well as possible amendments to EU regulations which would permanently legalize the use of pulse gears. ICES concluded that pulse trawls experienced reduced catch rates (kg/hr) of undersized sole, compared to standard beam trawls (ICES, 2006). Catch rates of sole above the minimum landings 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 the 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 the electric pulse trawl in fisheries.

The introduction of a new mesh meter (the Omega meter) in 2010 has lead to a slight increase in the effective mesh size in the fishery.

Information from the fishing industry

The Fishers' North Sea stock survey again took place in 2012 (Napier, 2012; Figure 6.4.27.4). Overall, about one-third of respondents (35%) reported that sole were 'more' abundant in 2012, a higher proportion than 2011 (24%). Most fishermen had the perception that the recruitment was "Moderate" (53%). The overall perceptions of the fishing industry reflect a more positive impression of the trends in the sole stock than estimated by ICES.

Preliminary observations by the industry using "Pulse trawls" in 2011 show higher catch rates of sole than traditional beam trawls.

Uncertainties in the assessment and forecast

Estimations of sole stock status appear to have a slight retrospective under-estimation of fishing mortality and over-estimation of SSB, which have resulted in forecast bias.

Changes in commercial fleets (e.g. from beam to pulse trawls) used for tuning the assessment may have introduced bias.

The SNS survey in 2012 was conducted two weeks later and with a different vessel (Tridens) than usual (ISIS), because the ISIS was unavailable due to technical problems. The 2012 SNS datapoint was also the lowest in the timeseries and was not consistent with the BTS survey for all ages. An exploratory analysis was done with additional data from a German survey in the German bight. This survey also showed different trends than the BTS, and was more consistent with the SNS. Therefore it was concluded that the SNS datapoint should be kept in the analysis.

Comparison of previous assessment and advice

The 2013 assessment is in very close agreement with that of 2012. As last year, the advice is based on the EU management plan.

Sources

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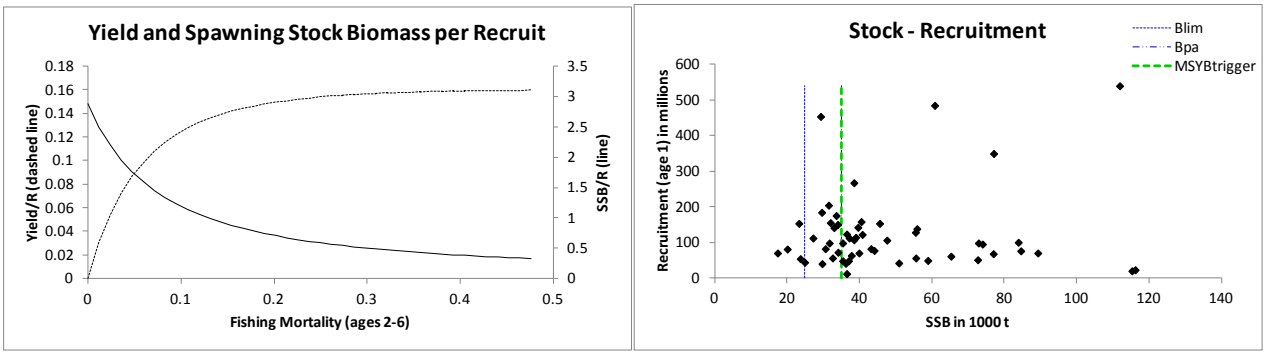

Figure 6.4.27.3 Sole in Subarea IV (North Sea). Stock–recruitment and yield-per-recruit analysis plot.

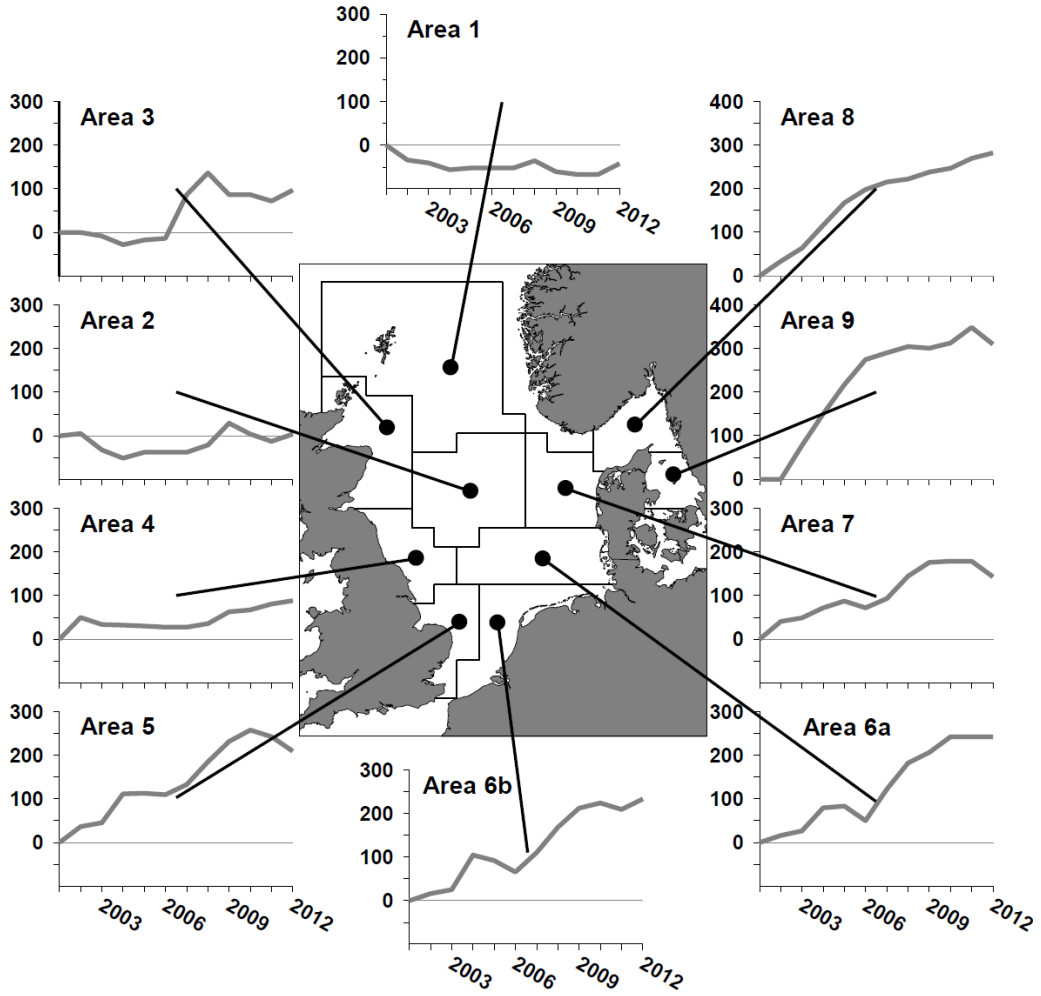

Figure 6.4.27.4 Sole in Subarea IV (North Sea). Results of North Sea Commission fisher's survey 2012 (Napier, 2012).

Table 6.4.27.1 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[1]	32.0	29.8	31.5
1994	no long-term gains in increased F	31.0[1]	32.0	31.3	33.0
1995	no long-term gains in increased F	28.0[1]	28.0	28.8	30.5
1996	Mixed fishery, link plaice advice	23.0[1]	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	$F<F_{pa}$ (80% of F(97))	20.3	22.0	22.0	23.5
2000	$F< F_{pa}$	<19.8	22.0	20.7	22.5
2001	$F< F_{pa}$	<17.7	19.0	16.4	19.9
2002	F<0.37	<14.3	16.0	16.0	16.9
2003	$F< F_{pa}$	<14.6	15.9	17.1	17.9
2004	$F< F_{pa}$	<17.9	17.0	17.8	17.1
2005	$F< F_{pa}$	<17.3	18.6	15.6	16.4
2006	Keep SSB above B_{pa}	<11.9	17.7	11.9	12.6
2007	SSB above B_{pa}	<10.8	15.0	13.8	14.6
2008	SSB above B_{pa}	<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		
2014	Apply first stage of the management plan	<11.900			

Weights in thousand tonnes.
[1] Catch *status quo* F.

Table 6.4.27.2 Sole in Subarea IV (North Sea). Official landings and ICES landings (tonnes).

Year	Belgium	Denmark	France	Germany	Netherlands	UK (E/W/NI)	Other countries	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

Table 6.4.27.3 Sole in Subarea IV (North Sea). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-6
1957	128371	55489	12067	0.185
1958	127931	60836	14287	0.209
1959	484247	65349	13832	0.173
1960	60767	72927	18620	0.204
1961	98206	116183	23566	0.194
1962	22509	115319	26877	0.215
1963	20440	111935	26164	0.316
1964	538666	36463	11342	0.284
1965	122937	29722	17043	0.305
1966	40156	84590	33340	0.319
1967	75765	83922	33439	0.412
1968	100019	72685	33179	0.484
1969	51165	55893	27559	0.553
1970	138343	50910	19685	0.397
1971	42367	44054	23652	0.514
1972	76712	47575	21086	0.454
1973	105971	37205	19309	0.509
1974	111571	36236	17989	0.477
1975	41341	38981	20773	0.495
1976	114354	39570	17326	0.427
1977	141807	35367	18003	0.464
1978	47993	36546	20280	0.470
1979	11840	45617	22598	0.491
1980	153486	34000	15807	0.455
1981	149544	23311	15403	0.506
1982	152556	33029	21579	0.550
1983	140856	39890	24927	0.490
1984	70394	43218	26839	0.624
1985	81523	40499	24248	0.596
1986	158271	34059	18201	0.579
1987	71930	29313	17368	0.491
1988	452837	38474	21590	0.571
1989	106703	33614	21805	0.437
1990	174849	89327	35120	0.441
1991	69567	77127	33513	0.443
1992	349071	76985	29341	0.419
1993	68424	55574	31491	0.506
1994	56389	73988	33002	0.566
1995	94962	58877	30467	0.539
1996	48824	38528	22651	0.705
1997	267465	27203	14901	0.609
1998	112053	20091	20868	0.648
1999	80949	40811	23475	0.581
2000	121643	37840	22641	0.613
2001	62656	29550	19944	0.571
2002	183935	30599	16945	0.578
2003	81546	24896	17920	0.593
2004	43974	36999	18757	0.518
2005	48353	31466	16355	0.573
2006	203831	23675	12594	0.470
2007	54421	17398	14635	0.470
2008	69705	35354	14071	0.387
2009	98360	31968	13952	0.389
2010	154732	31729	12603	0.375
2011	97535	32567	11485	0.322
2012	56069	43748	11610	0.238
2013	64976*	50546		
Average	123208	48331	21211	0.455

* RCT3 estimate

Annex 6.4.27

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.*