

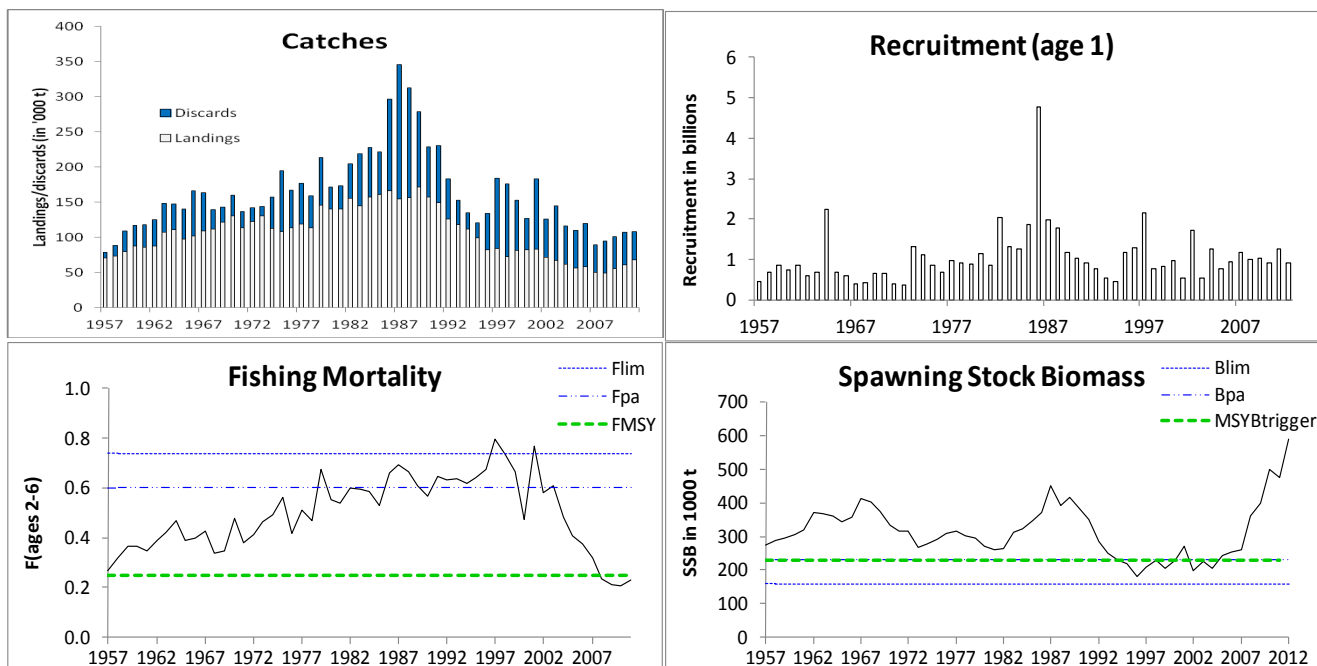
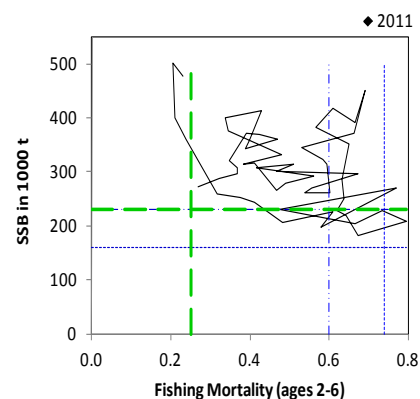
**ECOREGION** North Sea  
**STOCK** Plaice in Subarea IV (North Sea)

**Advice for 2013**

ICES advises on the basis of the EU management plan (Council Regulation No. 676/2007) that landings of plaice in Subarea IV in 2013 should be no more than 97 070 t. The implementation of stage two of the plan (as stipulated in article 5 of the EC regulation) is not yet defined.

**Stock status**

F (Fishing Mortality)			
	2009	2010	2011
MSY ( $F_{MSY}$ )	✓	✓	✓ Appropriate
Precautionary approach ( $F_{pa}, F_{lim}$ )	✓	✓	✓ Harvested sustainably
Management plan ( $F_{MP}$ )	✓	✓	✓ Below target
SSB (Spawning-Stock Biomass)			
	2010	2011	2012
MSY ( $B_{trigger}$ )	✓	✓	✓ Above trigger
Precautionary approach ( $B_{pa}, B_{lim}$ )	✓	✓	✓ Full reproductive capacity
Management plan ( $SSB_{MP}$ )	✓	✓	✓ Above target



**Figure 6.4.7.1** Plaice in Subarea IV (North Sea). Summary of stock assessment (weights in '000 tonnes). Top right: SSB and F for the time series used in the assessment.

The stock is well within precautionary boundaries, and has reached its highest levels in recorded history. Recruitment has been at the long-term average from 2007 onwards. Fishing mortality is estimated to be at the historic low.

**Management plans**

The EU management plan for North Sea plaice and sole (Council Regulation (EC) No. [676/2007](#), see Appendix 6.4.7). An evaluation of the plan (ICES, 2010) concluded that the management plan is precautionary.

## Biology

Plaice is a bottom dwelling species, mainly feeding on annelids and molluscs. Plaice aggregate at spawning grounds in the first quarter of the year. The condition factor for plaice is highest in summer/autumn on the more dispersed feeding grounds. These feeding grounds are generally located more northerly than the spawning grounds

## Environmental influence on the stock

Juvenile plaice have been distributed more offshore in recent years. This could be linked to environmental changes in the productivity or changes in the temperature of the southern North Sea, but these links have not been shown conclusively. The distribution shift of plaice increased the bycatch of small plaice further offshore.

## The fisheries

Plaice is predominantly caught by beam trawlers in the central part of the North Sea with a minimum mesh size of 100–120 mm depending on area. A mixed fishery with sole in the southern North Sea takes place with a minimum mesh size of 80 mm. This mesh size catches plaice under the minimum landing size of 27 cm, which causes high discard rates (in the range of 50% by weight). The discard ratio in the catch has declined in recent years.

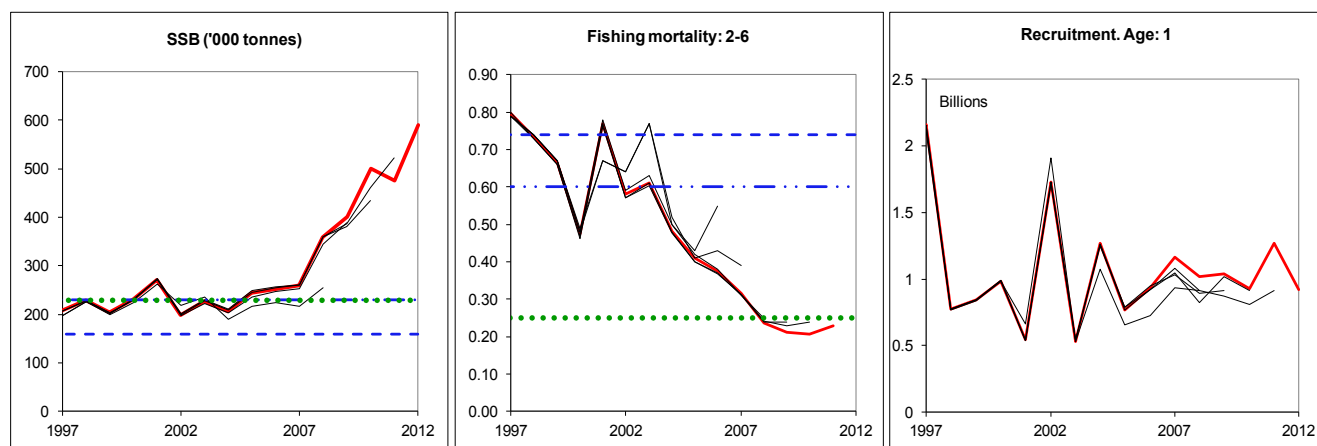
**Catch distribution** Total catch (2011) = 108.523 t, where 63% are landings (60% beam trawl, 36% otter trawl, and 5% other gears), 37% are discards and <1% industrial bycatch.

## 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. For plaice, the size selectivity may lead to a shift in the age and size at maturation, which means individuals start spawning earlier.

## Quality considerations

The assessment is considered to be imprecise, partly because discards form a substantial part of the total catch. Data on the migratory behaviour of plaice in the North Sea, English Channel and the Skagerrak would improve determining stock units for management.



**Figure 6.4.7.2** Plaice in Subarea IV (North Sea). Historical assessment results (final year recruitment estimates included).

## Scientific basis

<b>Assessment type</b>	Age-based analytical assessment (XSA).
<b>Input data</b>	Three survey indices (BTS-Tridens, BTS-Isis, SNS).
<b>Discards and bycatch</b>	Included in the assessment.
<b>Indicators</b>	None.
<b>Other information</b>	This stock was benchmarked in 2009 (WKFLAT).
<b>Working group report</b>	<a href="#">WGNSK</a>

**ECOREGION** North Sea  
**STOCK** Plaice in Subarea IV (North Sea)

**Reference points**

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
Management Plan	SSB <sub>MP</sub>	230 000 t	Stage one: Article 2.
	F <sub>MP</sub>	0.6 0.3	Stage one: Article 2; Stage two: Article 4.
MSY Approach	MSY B <sub>trigger</sub>	230 000 t	Default to value of B <sub>pa</sub> .
	F <sub>MSY</sub>	0.25	Simulation studies and equilibrium analyses taking into account a number of possible stock–recruitment relationships (range of 0.2–0.3).
Precautionary approach	B <sub>lim</sub>	160 000 t	B <sub>loss</sub> = 160 000 t, the lowest observed biomass in 1997 as assessed in 2004.
	B <sub>pa</sub>	230 000 t	Approximately 1.4 B <sub>lim</sub> .
	F <sub>lim</sub>	0.74	F <sub>loss</sub> for ages 2–6.
	F <sub>pa</sub>	0.60	5th percentile of F <sub>loss</sub> (0.6) and implies that B <sub>eq</sub> > B <sub>pa</sub> <sup>1)</sup> and a 50% probability that SSB <sub>MT</sub> ~ B <sub>pa</sub> .

(unchanged since: 2011)

**Outlook for 2013**

Basis: F(2012) = mean(F2009–2011) scaled to 2011 = 0.23; R(2012) = GM(1957–2008) = 922 million; Landings(2012) = 78 501; Discards(2012) = 51 192; SSB(2013) = 628 143.

Rationale	Landings (2013) <sup>3)</sup>	Basis	F(2–6) total (2013)	F(2–6) HC (2013)	F(2–3) Disc (2013)	Disc (2013)	Catch (2013)	SSB (2014)	% SSB change <sup>1)</sup>	%TAC change <sup>2)</sup>
Management plan	97.070	TAC + 15%	0.27	0.14	0.26	53	151	665	6	15
MSY framework	90	F <sub>MSY</sub>	0.25	0.13	0.24	50	140	677	8	7
Precautionary approach	189	F <sub>pa</sub>	0.6	0.31	0.57	100	290	523	-17	125
Zero catch	0	F=0	0	0	0	0	0	821	31	-100
Other options	26	F <sub>2012</sub> *0.3	0.069	0.04	0.07	15	42	778	24	-68
	52	F <sub>2012</sub> *0.6	0.14	0.07	0.13	29	81	738	17	-38
	72	TAC - 15% (=F <sub>2012</sub> *0.85)	0.20	0.1	0.19	40	113	705	12	-15
	83	F <sub>2012</sub>	0.23	0.12	0.22	46	129	688	10	-1
84	Stable TAC (=F <sub>2012</sub> *1.01)	0.23	0.12	0.22	47	132	689	9	0	
<i>Mixed fisheries options – minor differences with calculation above can occur due to different methodology used (ICES, 2012b)</i> □										
Maximum	121	A	0.38	NA	NA	NA	NA	575	-9	44
Minimum	49	B	0.12	NA	NA	NA	NA	785	25	-42
Cod_MP	52	C	0.14	NA	NA	NA	NA	724	15	-38
SQ effort	94	D	0.28	NA	NA	NA	NA	639	2	12
Effort_Mgt	68	E	0.18	NA	NA	NA	NA	716	15	-19

Weights in '000 t.

<sup>1)</sup> SSB 2014 relative to SSB 2013.

<sup>2)</sup> Landings 2013 relative to TAC 2012.

<sup>3)</sup> Landings of plaice in Subarea IV, calculated as the projected total stock landings less the stock landings that occur in Division VIIId. The subtracted value (620 t) is estimated based on the plaice catch advice for Division VIIId for 2013, using the recent 3-year average (2009–2011) proportion of the Subarea IV plaice stock in the annual plaice landings in Division VIIId.

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 2012 and 2013 as in 2011
- E. Effort management scenario: Effort reductions according to cod and flatfish management plans

**Management plan**

Following the EU multiannual plan would imply a TAC of 97 070 t (F=0.27) for Subarea IV in 2013, which is a 15% increase in comparison to 2012, complying to the constraint of 15% TAC change of the plan. This is expected to lead to an SSB of 665 000 t in 2014. ICES has evaluated this management plan and considers it to be precautionary. 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)

### ***MSY approach***

Following the ICES MSY framework implies an increase in fishing mortality to 0.25, resulting in landings of 90 000 t of plaice in Subarea IV in 2013. This is expected to lead to an SSB of 677 000 t in 2014.

Given that the current (2011) estimate of fishing mortality is only slightly below  $F_{MSY}$  there is no need to follow a transition scheme towards this reference value.

### ***Precautionary approach***

The fishing mortality in 2012 should be no more than  $F_{pa}$  (0.6) corresponding to landings of less than 189 000 t of plaice in Subarea IV in 2013. This is expected to keep SSB above  $B_{pa}$  in 2014.

### ***Mixed fisheries***

In 2012, ICES puts forward mixed fisheries advice for the first time (ICES 2012c). In contrast to single species advice there is no single recommendation but a range of plausible options, assuming fishing patterns and catchability in 2012 and 2013 similar to those in 2011. Major differences between the outcomes of the various scenarios indicate potential unbalance between single-species fishing opportunities. The consequences of this unbalance in terms of changes in fleet dynamics cannot be ascertained.

Cod is the limiting species for the North Sea demersal fisheries in 2013. Following the 'cod' scenario (full implementation of the cod management plan), the plaice management plan catch options could not be fully utilised.

## **Additional considerations**

### ***Management considerations***

Plaice is predominantly caught by beam trawlers in the central part of the North Sea and in a mixed fishery with sole in the southern North Sea where sole has become relatively more abundant. Technical measures applicable to the mixed flatfish beam-trawl fishery affect both sole and plaice. The minimum mesh size of 80 mm selects sole at the minimum landing size. However, this mesh size generates high discards of plaice with a larger minimum landing size than sole. Discard estimates increased until the early 2000's to above 50% in catch by weight, followed by a slight decreasing trend. Mesh enlargement would reduce the catch of undersized plaice, but would also result in loss of marketable sole.

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 2012.

### ***MSY reference points***

$F_{MSY}$  has been set to 0.25 based on simulation studies and equilibrium analyses, taking into account a number of stock-recruitment relationships that generated a range of values between 0.2 and 0.3 (ICES, 2011).

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

Currently the mixed plaice and sole fishery is dominated by beam 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 beam-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). Chronic 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 (Grift *et al.*, 2003).

### *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. Effort ceilings are updated annually. 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.

Overall nominal effort (kW-days) by European demersal trawls, seines, beam trawls, and gillnets in the North Sea, Skagerrak, and Eastern Channel had been substantially reduced (–20% between 2003 and 2011). Following the introduction of days at sea regulations in 2003, there was a substantial switch from the larger mesh (>100 mm, TR1) gear to the smaller mesh (70–99 mm, TR2) gear. Subsequently, effort by TR1 has been relatively stable, whereas effort in TR2, beam trawl 80–120 mm, (BT2), has shown a continuous decline (–12%, –39%, and –35%, respectively, between 2004 and 2011). Effort by large mesh size beam trawl (> 120 mm, BT1) has dropped to very low levels (–70%) (ICES, 2012b). Nominal effort reported by Norway has increased in 2011 due to the generalisation of electronic log-books. The overall capacity and effort of North Sea beam-trawl vessels has been substantially reduced since 1995, including the decommissioning of 25 vessels in 2008.

The current combined sole and plaice long-term management plan specifically reduces effort as a management measure. The reduction in fishing effort is reflected in reductions in estimated fishing mortality.

### *Stock identity*

The flatfish benchmark (ICES, 2010) recommended to explore the potential to perform an integrated assessment of the continuum of plaice stocks from the Baltic to the English Channel. ICES evaluated the stock identity of plaice in the Skagerrak and Kattegat (ICES 2012a,b) for which until now combined advice was given. Adjacent waters, such as the North Sea in the West and the Belts and Sound in the East are taken into account due to known migration of local components between their spawning and feeding grounds. Although work on stock identity is still under development the collected information on biology and fishery of plaice in IIIa and adjacent waters is considered to imply changes in assessment units as well as in management areas.

Plaice in Skagerrak is considered to be closely associated with plaice in the North Sea and is presented in 2012 for the first time as separate advice. In principle, it is proposed to include Skagerrak data in the North Sea plaice stock assessment in future, although it is recognised that local components (East and West Skagerrak) need to be protected. This year, information from the VIId plaice stock is included in this assessment, but the connection between North Sea and Skagerrak is only explored in the Skagerrak advice.

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

The combination of days-at-sea regulations 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. In addition high oil prices may have contributed to this change in fishing pattern as well. This concentration of fishing effort in the South has resulted in high discarding of juvenile plaice that are mainly distributed in those areas. This process could be aggravated by movement of juvenile plaice from coastal nurseries 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.

Technical management measures have caused a shift towards two categories of vessels: 2000 HP (the maximum engine power allowed) and 300 HP. The 300 HP vessels are allowed to fish within the 12-nautical mile coastal zone and in the Plaice Box.

The Plaice Box is a partially closed area along the continental coast that was implemented in phases, starting in 1989. The area has been closed to most categories of vessels >300 HP all year round since 1995. The most recent EU-funded evaluation by Beare *et al.* (2010) reported the Plaice Box as having very little impact on the plaice stock.

The increased use of “SumWing” and electric “Pulse trawls” will increasingly affect catchability and selectivity of North Sea sole. In 2011, approximately 30 licenses for Pulse trawls were taken into operation. Potential future impact either on the sole stock itself or the stock assessment is unknown. Furthermore, 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.

### *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: to be deemed a recovery plan during its first stage and a management plan during its second stage. ICES considers this plan to be precautionary (ICES, 2010). Objectives are defined for these two stages; to rebuild the stocks to within safe biological limits and to exploit the stocks at MSY respectively. 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 and Impact Assessment an 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, while SSB has been slightly fluctuating around the biomass limit ( $B_{pa}=35$  kt) since 2008. Consequently, ICES concludes that the objectives of stage 1 are currently met and provides advice based on the plan's TAC setting procedure acknowledging to be in a transitional stage at present.

The management 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 for sole).

### *Impacts of the environment on the fish stock*

Adult North Sea plaice have an annual migration cycle between spawning and feeding grounds. The spawning grounds are located in the central and southern North Sea and the eastern English Channel, overlapping with the distribution area of sole. The feeding grounds are located more northerly than the sole distribution areas. Juveniles are concentrated in shallow inshore waters and move gradually offshore as they become larger. The nursery areas on the eastern side of the North Sea contribute most of the total recruitment. Sub-populations have strong homing behavior to specified spawning grounds and rather low mixing rate with other sub-populations during the feeding season.

Juvenile plaice have been distributed more offshore in recent years. Surveys in the Wadden Sea have shown that 1-group plaice are almost absent in areas where they were very abundant in earlier years. This could be linked to environmental changes in the productivity or changes in the temperature of the southern North Sea, but these links have not been shown conclusively. The distribution shift of plaice may be the cause of the different abundance estimates in the different tuning series used in the assessment.

### *Information from the fishing industry*

A self-sampling programme by the Dutch beam-trawl fleet has been in place since 2004. This sampling programme indicates spatial and temporal trends in discarding (higher discards are observed in coastal regions and late summer), but it was considered inappropriate for overall estimates of discarding because of differences in the implementations of sampling methods. In 2009, a new self-sampling programme was launched to address this. For the 2009 and 2010 assessments, discarded numbers-at-age for the Netherlands have been estimated using data from both the self-sampling and the observer programmes. It is noted that estimates of discard numbers in 2010 differed considerably between the two programmes. From 2011 onwards, Dutch discard estimates will be derived solely from the self-sampling program. Preliminary analyses suggest that these estimates are as reliable as those from the observer program. Further analyses will be conducted in 2012 as more data from 'matched trips' (self-sampling and observer estimates from the same vessel trip) become available.

The Fishers' North Sea stock survey again took place in 2011 (Napier, 2011; Figure 6.4.7.4). Slightly less than half of the respondents (44%) reported that plaice were 'more' or 'much more' abundant in 2011 than in 2010. This is down from two thirds last year. There was also a slight increase in the proportion of respondents reporting a decrease in the abundance of plaice (from 9% to 19%). However, the overall perceptions of the fishing industry reflect the high abundances of plaice estimated by ICES.

### *Uncertainties in assessment and forecast*

The different survey tuning series in different areas of the North Sea indicate opposite trends for the 1–3 year old plaice in the most recent development of the stock, which adds to the uncertainty both in terms of recruitment and SSB. The change in distribution of juvenile plaice further offshore has resulted in conflicting estimates of abundance between the SNS survey (mainly inshore) and the Tridens and BTS-Isis surveys (offshore). This resulted in a persistent underestimation of recruits, which were then revised upwards in subsequent years as signs of abundance in old age classes became apparent.

Discards form a substantial part of the total catch. The improvement of retrospective patterns observed in the recent years might have benefited from increased coverage of discards estimates from the main fishing nations, through self-sampling and observers programs.

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

*Comparison with previous assessment and advice*

It has been estimated that 50% of first quarter landings taken in the Eastern Channel (VIId) are actually plaice from the North Sea stock migrating in and out of the area. These landings are usually removed from the assessment of the Eastern Channel stock. From 2012 these landings, which represent less than 1% of the total North Sea catches, are included in the assessment of the North Sea plaice stock.

The 2012 assessment is in very close agreement with that of 2011. As last year, advice is based on the EU management plan.

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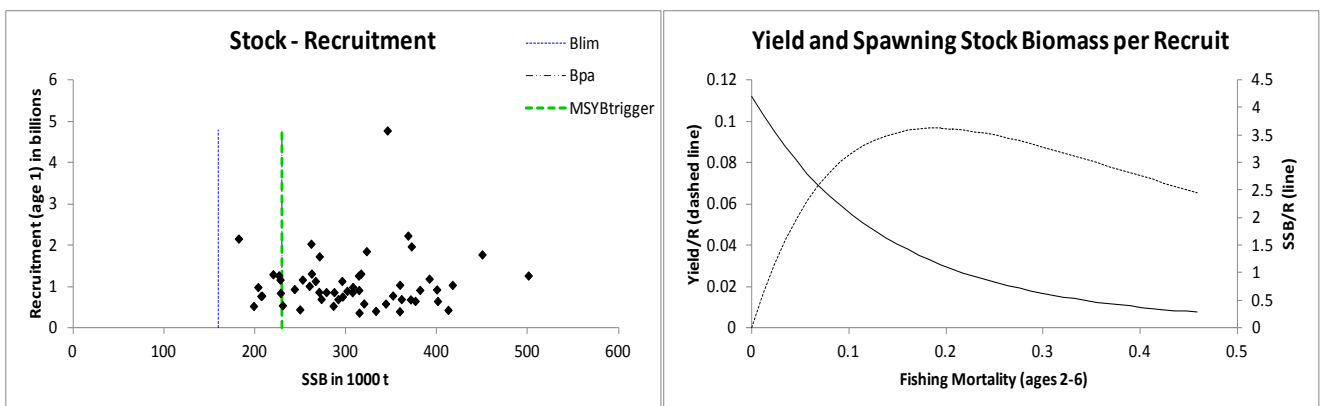
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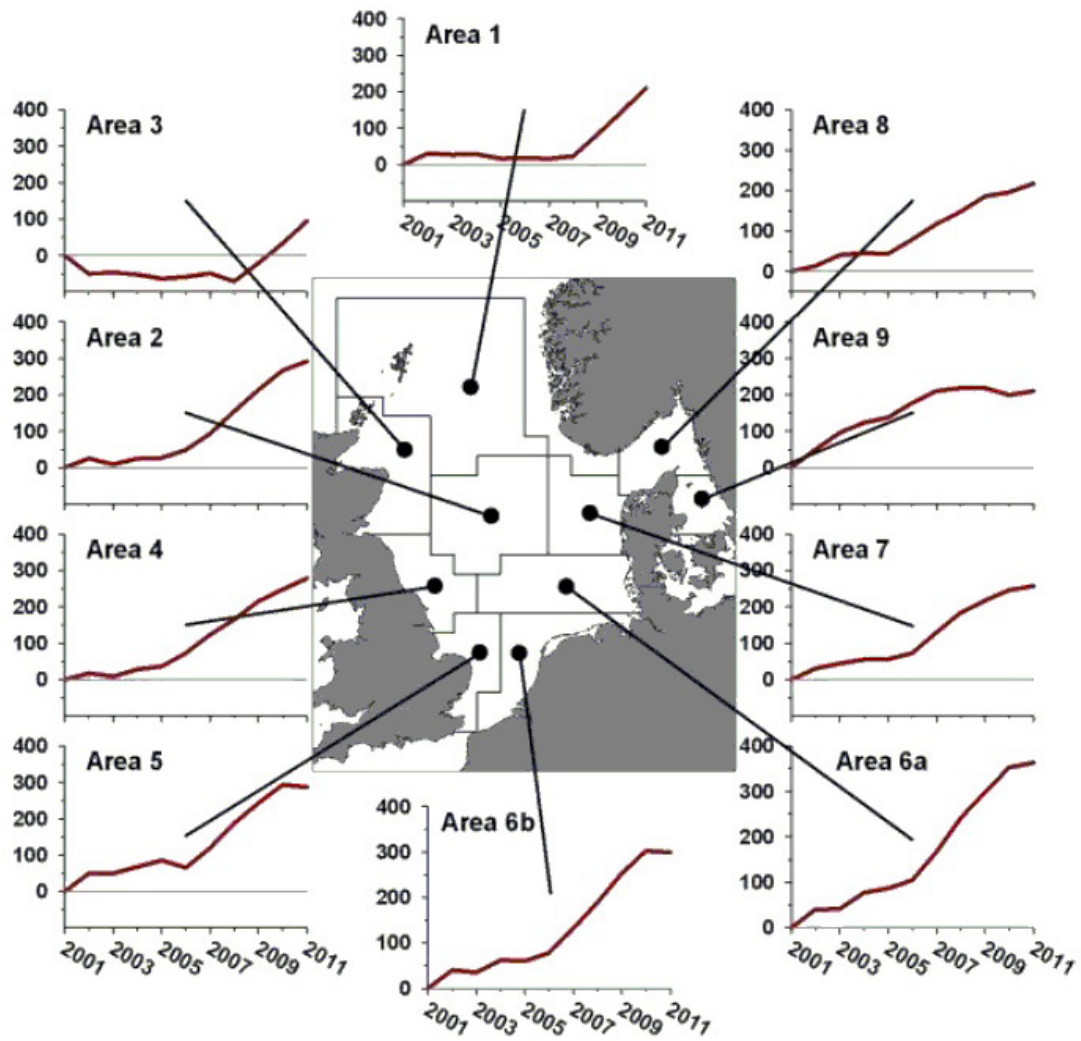
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**Figure 6.4.7.3** Plaice in Subarea IV (North Sea). Stock–recruitment plot and yield-per-recruit analysis.



**Figure 6.4.7.4** Plaice in Subarea IV (North Sea). Abundance estimates by the North Sea Commission fisher's survey 2010.



**Table 6.4.7.1** Plaice in Subarea IV (North Sea). ICES advice, management, and landings. ICES landings have been updated and now include 50% of the Q1 landings of plaice in area VIIId (for all years, introduced in 2012).

Year	ICES Advice	Predicted catch corresponding to advice	Agreed TAC	Official landings	ICES landings
1987	F<F(84); TAC	120	150	131	154
1988	70% of F(85); TAC	150	175	138	154
1989	Reduce F; Buffer SSB	<175	185	152	170
1990	<i>status quo</i> F; TAC	171	180	156	156
1991	No increase in F; TAC	169	175	144	148
1992	No long-term gains in increasing F	- <sup>1</sup>	175	123	125
1993	No long-term gains in increasing F	170 <sup>1</sup>	175	115	117
1994	No long-term gains in increasing F	- <sup>1</sup>	165	110	110
1995	Significant reduction in F	87 <sup>2</sup>	115	96	98
1996	Reduction in F of 40%	61	81	80	82
1997	Reduction in F of 20%	80	91 <sup>3</sup>	82	83
1998	Fish at F=0.3	82	87	70	72
1999	Fish at F=0.3	106	102	79	81
2000	Fish at F=0.3	95	97	84	81
2001	Fish at F=0.26	78	78	80	82
2002	F<F <sub>pa</sub>	<77	77	70	70
2003	Fish at F=0.23	60 <sup>4</sup>	73	66	67
2004	Recovery plan		61	61	61
2005	Rebuild the SSB above B <sub>pa</sub> in 2006	35 <sup>4</sup>	59	55	56
2006	Rebuild the SSB above B <sub>pa</sub> in 2007	48 <sup>4</sup>	57	56	58
2007	Rebuild the SSB above B <sub>pa</sub> in 2008	<32 <sup>4</sup>	50	49	50
2008	Rebuild the SSB above B <sub>pa</sub> in 2009	<35 <sup>4</sup>	49	48	49
2009	Limit total landings to 55 500 t	< 55.5 <sup>4</sup>	55.5	NA	55
2010	Limit total landings to 63 825 t	< 63.8 <sup>4</sup>	63.8	51	61
2011	See scenarios	< 64.2	73.4	66	67
2012	Apply first stage of the management plan	< 84.410	84.4		
2013	Apply first stage of the management plan	<97.07			

Weights in '000t.

<sup>1)</sup> Catch at *status quo* F.

<sup>2)</sup> Catch at 20% reduction in F.

<sup>3)</sup> After revision from 77 000 t.

<sup>4)</sup> Landings.

NA = not available.

**Table 6.4.7.2** Plaice in Subarea IV (North Sea). Official landings by country and ICES estimates of landings (tonnes).

YEAR	Belgium	Denmark	France	Germany	Nether-lands	Norway	Sweden	UK	Others	Total	Un-allocated	ICES estimate	TAC
1980	7005	27057	711	4319	39782	15	7	23032		101928	38023	139951	
1981	6346	22026	586	3449	40049	18	3	21519		93996	45701	139697	105000
1982	6755	24532	1046	3626	41208	17	6	20740		97930	56616	154546	140000
1983	9716	18749	1185	2397	51328	15	22	17400		100812	43218	144030	164000
1984	11393	22154	604	2485	61478	16	13	16853		114996	41153	156149	182000
1985	9965	28236	1010	2197	90950	23	18	15912		148311	11527	159838	200000
1986	7232	26332	751	1809	74447	21	16	17294		127902	37445	165347	180000
1987	8554	21597	1580	1794	76612	12	7	20638		130794	22876	153670	150000
1988	11527	20259	1773	2566	77724	21	2	24497	43	138412	16063	154475	175000
1989	10939	23481	2037	5341	84173	321	12	26104		152408	17410	169818	185000
1990	13940	26474	1339	8747	78204	1756	169	25632		156261	-21	156240	180000
1991	14328	24356	508	7926	67945	560	103	27839		143565	4438	148003	175000
1992	12006	20891	537	6818	51064	836	53	31277		123482	1708	125190	175000
1993	10814	16452	603	6895	48552	827	7	31128		115278	1835	117113	175000
1994	7951	17056	407	5697	50289	524	6	27749		109679	713	110392	165000
1995	7093	13358	442	6329	44263	527	3	24395		96410	1946	98356	115000
1996	5765	11776	379	4780	35419	917	5	20992		80033	1640	81673	81000
1997	5223	13940	254	4159	34143	1620	10	22134		81483	1565	83048	91000
1998	5592	10087	489	2773	30541	965	2	19915	1	70365	1169	71534	87000
1999	6160	13468	624	3144	37513	643	4	17061		78617	2045	80662	102000
2000	7260	13408	547	4310	35030	883	3	20710		82151	-1001	81150	97000
2001	6369	13797	429	4739	33290	1926	3	19147		79700	2147	81847	78000
2002	4859	12552	548	3927	29081	1996	2	16740		69705	512	70217	77000
2003	4570	13742	343	3800	27353	1967	2	13892		65669	820	66489	73250
2004	4314	12123	231	3649	23662	1744	1	15284		61008	428	61436	61000
2005	3396	11385	112	3379	22271	1660	0	12705		54908	792	55700	59000
2006	3487	11907	132	3599	22764	1614	0	12429		55933	2010	57943	57441
2007	3866	8128	144	2643	21465	1224	4	11557		49031	713	49744	50261
2008	3396	8229	125	3138	20312	1051	20	11411		47682	1193	48875	49000
2009	3474	N/A*	N/A*	2931	29142	1116	1	13143		N/A*	-	54973	55500
2010	3699	435	383	3601	26689	1089	5	14765		50666	10008	60674	63825
2011	4466	11634	344	3812	29272	1223	3	15169		65923	1463	67386	73400
2012													84410

\* Official estimates not available.

Table 6.4.7.3

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

Year	Recruitment Age 1 thousands	SSB tonnes	Catches tonnes	discards tonnes	Mean F Ages 2-6
1957	458000	273000	78400	7880	0.269
1958	698000	287100	88200	14837	0.321
1959	863000	296300	109200	29864	0.367
1960	757000	307200	117300	29793	0.368
1961	861000	319900	118500	32490	0.348
1962	589000	371300	125400	37903	0.390
1963	688000	368400	148400	41258	0.423
1964	2232000	361200	147600	37031	0.469
1965	695000	343900	140200	43080	0.388
1966	587000	359200	166600	64718	0.399
1967	401000	412600	163400	54546	0.429
1968	434000	401000	139500	27987	0.336
1969	649000	376400	142800	21169	0.345
1970	651000	332900	160000	29640	0.480
1971	410000	314700	136900	22995	0.382
1972	367000	316600	142500	19632	0.412
1973	1312000	266600	143800	13354	0.466
1974	1133000	278500	157500	44945	0.491
1975	865000	291500	195200	86699	0.561
1976	693000	307700	166900	53247	0.416
1977	989000	314400	176700	57501	0.510
1978	914000	301400	159600	45655	0.468
1979	895000	295800	213300	67935	0.673
1980	1134000	270500	171500	31080	0.555
1981	869000	261800	173600	33031	0.538
1982	2035000	262300	204500	49127	0.602
1983	1312000	314100	219400	74483	0.594
1984	1264000	322800	227800	70816	0.585
1985	1854000	345700	221400	60549	0.531
1986	4775000	372200	296500	129953	0.662
1987	1970000	450000	345600	190524	0.692
1988	1776000	391800	312700	156423	0.666
1989	1189000	417300	279100	107793	0.610
1990	1039000	381500	229000	71225	0.567
1991	918000	351700	230300	80935	0.649
1992	782000	286200	183300	57049	0.631
1993	533000	249500	153000	35016	0.637
1994	446000	227800	135200	23785	0.619
1995	1167000	220000	121100	21828	0.643
1996	1296000	182000	134600	52049	0.673
1997	2160000	207600	184300	100145	0.796
1998	778000	228200	176300	103751	0.735
1999	845000	203400	152700	70976	0.666
2000	987000	230400	126800	44311	0.475
2001	544000	270900	183200	100309	0.770
2002	1730000	198600	125800	54390	0.580
2003	529000	226300	145000	77792	0.610
2004	1270000	206700	116500	54466	0.481
2005	771000	243500	110100	53876	0.410
2006	937000	252300	120300	61846	0.375
2007	1168000	259900	89800	39435	0.317
2008	1015000	359400	95300	45875	0.237
2009	1041000	400100	100700	45225	0.211
2010	929000	500800	107000	45817	0.206
2011	1266000	476100	108500	40560	0.229
2012	922294*	589341			
Average	1060577	315328	162160		0.496

\* = Long term  
geometric mean

## 6.4.7 Appendix

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 7 Procedure for setting the TAC for plaice:

- 1) *The Council shall adopt the TAC for plaice 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 a 10 % reduction in the fishing mortality rate in its year of application compared to the fishing mortality rate estimated for the preceding year;*
  - b) *that TAC the application of which will result in the level of fishing mortality rate of 0.3 on ages two to six years in its year of application.*
- 2) *Where 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 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.*