

6.4.7 Plaice in Subarea IV (North Sea)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	Fishing mortality in relation to agreed target	Comment
Full reproductive capacity	Harvested sustainably	Overfished	Below target	

Based on the most recent estimate of SSB (in 2009) and fishing mortality (in 2008), ICES classifies the stock as having full reproductive capacity and as being harvested sustainably. SSB is estimated to have increased above the B_{pa} . Fishing mortality is estimated to have decreased to below F_{pa} and F_{target} . Recruitment has been of average strength from 2005 onwards. The recruitment in 2008 is just below the long-term average.

Management objectives

EC and Norway have no agreed management plan for North Sea plaice. However, the EC has adopted a management plan for flatfish in the North Sea in June 2007 (Council Regulation (EC) No. 676/2007, see 6.4.7 Appendix). This plan has two stages. The first stage aims at an annual 10% reduction of fishing mortality in relation to the fishing mortality estimated for the preceding year until an F of 0.3 is reached, with a maximum change in TAC of 15% until the precautionary reference points are reached for both plaice and sole for two successive years. ICES interprets the F for the preceding year as the estimate of F for the year in which the assessment is carried out. The basis for this F estimate in the preceding year will be a constant application of the procedure used by ICES in 2007. In the second stage, the management plan aims for exploitation at $F = 0.3$.

ICES has evaluated the agreed long-term management plan (Council Regulation (EC) No. 676/2007) for plaice and sole. For plaice, the management plan evaluation is not yet conclusive with regards to consistency with the precautionary approach.

Reference points

	Type	Value	Technical basis
Precautionary approach	B_{lim}	160 000 t	$B_{loss} = 160\ 000$ t, the lowest observed biomass in 1997 as assessed in 2004.
	B_{pa}	230 000 t	Approximately 1.4 B_{lim} .
	F_{lim}	0.74	F_{loss} for ages 2–6.
	F_{pa}	0.60	5th percentile of F_{loss} (0.6) and implies that $B_{eq} > B_{pa}^{1)}$ and a 50% probability that $SSB_{MT} \sim B_{pa}$.
Targets	F_{mgt}	0.3	EU management plan

(unchanged since 2004, target added in 2008)

Yield and spawning biomass per Recruit F -reference points (2009):

	Fish Mort Ages 2-6	Yield/R	SSB/R
Average last 3 years	0.31	0.09	0.55
F_{max}	0.17	0.10	1.25
$F_{0.1}$	0.12	0.10	1.74
F_{med}	0.42	0.07	0.32

A candidate for the reference point consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock is F_{max} .

Single-stock exploitation boundaries

Considering the options below, ICES advises on the basis of the existing EU management plan. Although the evaluation of the plan has not been conclusive, the fishing mortality in 2010 when applying the management plan is expected to give benefits in terms of long-term yield and low risk to the stock compared to fishing at precautionary levels. ICES therefore advises to limit landings to 63 825 t for the year 2010.

Exploitation boundaries in relation to existing management plans

According to the management plan adopted by the EU in 2007, the fishing mortality in 2010 should be at the target $F (= 0.3)$ with the constraint that the change in TAC should not be more than 15%. In this case the 15% limit is the determining factor, resulting in a TAC of no more than 63 825t.

Exploitation boundaries in relation to high long term yield, low risk of depletion of production potential and considering ecosystem effects

The current total fishing mortality (including discards) is estimated to be 0.25, which is above the rate expected to lead to high long-term yields and low risk of stock depletion (F_{max}).

Exploitation boundaries in relation to precautionary limits

The exploitation boundaries in relation to precautionary limits imply human consumption landings of less than 138 000 t in 2010, which is expected to maintain SSB above B_{pa} in 2011, while maintaining F below F_{pa} .

Short-term implications

Outlook for 2010

Basis: $F(2009) = \text{mean}(F_{2006-2008})$ scaled to 2008 = 0.246; $R(2009) = GM(1957-2006) = 912\,907$; $\text{Landings}(2009) = 59.5$; $\text{Discards}(2009) = 43.8$; $\text{SSB}(2010) = 442$.

Rationale	Landings 2010	Basis	F total (2-6) (2010)	F HC (2-6) (2010)	F disc (2-3) (2010)	Disc (2010)	Catch (2010)	SSB (2011)	%SSB change	%TAC change
zero catch	0	$F=0$	0	0	0	0	0	596	+35%	-100%
High long-term yield	46.4	$F(\text{long-term yield})$	0.17	0.17	0.17	31.2	77.5	517	+17%	-16%
Eu management plan	63.8	$F_{sq} * 0.978$	0.24	0.24	0.25	42.5	106.3	488	+10%	+15%
Status quo	17.6	$F_{sq} * 0.25$	0.06	0.06	0.06	12	29.6	566	+28%	-68%
	34.3	$F_{sq} * 0.50$	0.12	0.12	0.13	23.2	57.5	538	+22%	-38%
	47	$F_{sq} * 0.70$	0.17	0.17	0.18	31.6	78.6	516	+17%	-15%
	55.6	$F_{sq} * 0.84$	0.21	0.21	0.21	37.2	92.8	502	+14%	0%
	59.2	$F_{sq} * 0.90$	0.22	0.22	0.23	39.5	98.7	496	+12%	+7%
	65.1	F_{sq}	0.25	0.25	0.25	43.3	108.4	486	+10%	+17%
	77.7	$F_{sq} * 1.22$	0.3	0.3	0.31	51.3	129	465	+5%	+40%
	79.3	$F_{sq} * 1.25$	0.31	0.31	0.32	52.3	131.7	462	+5%	+43%
	92.9	$F_{sq} * 1.50$	0.37	0.37	0.38	60.7	153.6	439	-1%	+67%
	105.8	$F_{sq} * 1.75$	0.43	0.43	0.44	68.6	174.3	418	-5%	+91%
	118	$F_{sq} * 2$	0.49	0.49	0.51	75.9	193.9	398	-10%	+113%
	138.1	$F_{sq} * 2.44 = F_{pa}$	0.6	0.6	0.62	87.6	225.7	366	-17%	+149%
	225.6	$F_{sq} * 4.98$	1.23	1.23	1.26	133.9	359.5	230	-48%	+307%

Weights in '000t.

Shaded scenarios are not considered consistent with the precautionary approach.

¹⁾ SSB 2011 relative to SSB 2010

²⁾ Landings 2010 relative to TAC 2009.

Management considerations

Plaice is taken by beam trawlers in a mixed fishery with sole in the southern and central part of the North Sea with a minimum mesh size of 80 mm. In other areas plaice is also taken with larger mesh size, and by other gears. Technical measures applicable to the mixed flatfish fishery with beam trawls will 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 which are selected from 17 cm, while the minimum landing size is 27 cm. Recent discard estimates indicate fluctuations around 50% discards in weight. Mesh enlargement would reduce the catch of undersized plaice, but would also result in loss of marketable sole.

For two successive years, the stock has been classified within safe precautionary boundaries and thus fulfilled the 1st phase of the management plan. Although the estimates of the SSB and fishing mortality are uncertain, it is evident that the stock has increased considerably and the fishing mortality has been reduced. The increase in the stock has occurred under average recruitment conditions and is not caused by a higher productivity of the stock. The main reason for the increase of the SSB is the reduction of fishing mortality under the present management plan. Also a reduction of capacity in the fleets fishing for plaice, limitation of fishing effort and high fuel prices have contributed to the decrease in fishing mortality.

Fishing effort has been substantially reduced since 1995, including the decommissioning of 25 vessels in 2008. The reduction in fishing effort is reflected in recent estimates of fishing mortality. There are indications that technical efficiency has increased in this fishery, which may have reduced the effect of the reduction in effort, but this may have been counteracted by decreases in fishing efficiency resulting from reduced fishing speed in an attempt to reduce fuel consumption.

The combination of days-at-sea regulations, high oil prices, and the decreasing TAC for plaice and the relatively stable TAC for sole, appear to have induced a more southern fishing pattern in the North Sea. This concentration of fishing effort results in increased discarding of juvenile plaice that are mainly distributed in those areas. This process could be aggravated by movement of juvenile plaice to deeper waters in recent years where they become more susceptible to the fishery. Also the lpue data 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 assessment is considered to be highly uncertain, partly because discards form a substantial part of the total catch and cannot be well estimated from the low number of annual sampling trips, but most importantly due to the large differences in abundance observed in the different regions of the North Sea. The TAC constraint in the EU management plan is designed to allow for the uncertainty in the assessment.

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 2009.

Management plan evaluations

In the 2008 evaluation of the management plan for plaice a number shortcomings were observed:

- lack of robustness to the starting values of population abundance;
- systematic over-estimation of historic landings;
- under-estimation of bias and variance in the assessment model.

Therefore ICES cannot presently conclude on the precautionary nature of the management plan for plaice. To be able to do so, the causes for the observed lack of robustness to the starting values need to be clarified. Additional evaluations should take into account various sources of assessment errors and include uncertainties associated with possible changes in discard practices. Uncertainties associated with the recent observed changes in the spatial distribution pattern of the stock and fishery, and the fact that some surveys and fishing fleets used in the assessment cover different parts of the stock distribution area need to be taken into account as well.

Impacts of fisheries on the ecosystems

Currently 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 reduces 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). Chronic fishing has caused a shift from communities dominated by relatively sessile, emergent, 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, plaice and sole become mature at younger ages and at smaller sizes in recent years than in the past. There is a risk that this shift is a genetic fisheries-induced change (Grift *et al.*, 2004; Mollet *et al.*, 2007).

Factors affecting the fisheries and the stock

Regulations and their effects

The Dutch beam trawl fleet has reduced its number of vessels and technical management measures 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. A substantial number of the Dutch vessels have been replaced by vessels registered in other countries (England, Scotland, Germany, and Belgium). Approximately 85% of plaice landings from the UK (England and Scotland) is landed into the Netherlands by Dutch vessels fishing on the UK register. The technical efficiency has increased by about 1.6% per year in the plaice fishery since 1990, which could have counteracted part of the overall decrease in effort (Rijnsdorp *et al.*, 2006).

The overall capacity and effort of North Sea beam trawl vessels appears to have decreased since 1995. This decrease has continued in 2009 with the decommissioning of 25 Dutch trawl vessels.

The minimum landing size of North Sea plaice is 27 cm. This minimum landing size results in high discarding levels in the mixed flatfish fishery with beam and bottom trawls using 80 mm mesh size.

The Plaice Box is a closed area along the continental coast that has been introduced in 1989. The area has been closed all year round since 1995. The closed area applies to vessels using towed gears, but vessels smaller than 300 HP are exempted from the regulation. An STECF evaluation of the plaice box has indicated that: "From trends observed it was inferred that the Plaice Box has likely had a positive effect on the recruitment of plaice but that its overall effect has decreased since it was established. There are two reasons to assume that the Plaice Box has a positive effect on the recruitment of plaice: 1) At present, the Plaice Box still protects the majority of undersized plaice. Approximately 70% of the undersized plaice are found in the Plaice Box and Wadden Sea. Despite the changed distribution, densities of juvenile plaice inside the Box are still higher than outside; 2) In the 80 mm fishery, discard percentages in the Box are higher than outside. Because more than 90% of the plaice caught in the 80 mm fishery in the Box are discarded, any reduction in this fishery would reduce discard mortality." (Grift *et al.*, 2004).

Changes in fishing technology and fishing patterns

Due to a range of factors such as effort limitations, increases in fuel prices, and disproportionate changes in the TACs for the two main target species plaice and sole, the fishing effort of the major fleets has concentrated in the southern part of the North Sea. This is the area where many juvenile fish are found. In addition, juvenile plaice has shown a more offshore distribution in recent years. The combination of a change in fishing pattern and the spatial distribution of juvenile plaice has led to an increase in discarding of plaice.

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, overlapping with the distribution area of sole. The feeding grounds are located more northerly than the sole distribution areas.

Juvenile stages 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 is almost absent from the area where it was 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 for the different abundance estimates in the different tuning series used in the assessment.

Scientific basis

Data and methods

The stock assessment is based on an age-based model (XSA) using landings and discards, calibrated with three survey indices: BTS-Tridens, BTS-Isis, and SNS. A Statistical Catch at Age model (Aarts & Poos 2009) has been run in parallel to the current XSA. The SCA model estimates similar stock trends compared to the XSA.

Discards estimates are based on Dutch, UK, German, and Danish samples from observer programmes, on different fleet segments. For the years prior to 2000, discards were reconstructed based on a model-based analysis of growth, selectivity of the 80 mm beam trawl gear, and the availability of undersized plaice on the fishing grounds.

Information from the fishing industry

A self-sampling programme by the Dutch beam trawl fleet has been in place since 2004. This sampling effort indicates spatial and temporal trends in discarding; higher discards are observed in coastal regions and late summer. However, the self sampling gives overall lower estimates of discarding. This discrepancy is caused by differences in the implementations of different sampling methods (Aarts and van Helmond, 2009).

The North Sea Fishers' Survey for 2008 resulted in a total of 303 responses. The large vessel group was dominated by respondents fishing with beam trawls (70%), stating that the plaice abundance is "more" and "much more. This is consistent with the trends in the assessment. In terms of discarding, the modal response was that there was "no change" in discarding.

Uncertainties in assessment and forecast

The estimated increase in SSB is due to an increase in plaice observed in the survey in the north-western part of the North Sea. The surveys in the south-eastern part indicate that the stock has increased less. The different survey tuning series in different areas of the North Sea indicate different trends in the most recent development of the stock. This gives problems in the interpretation of the signals; this has resulted in a relatively strong retrospective pattern, with this year's assessment estimating much higher SSBs and lower fishing mortalities for the most recent years. Discards form a substantial part of the total catch and cannot be well estimated from the limited number of sampling trips.

The different trends in abundance in the two areas may indicate a change in distribution of older plaice, as has also been observed for juvenile plaice. However, the difference in distribution may also be explained by different exploitation rates in the two areas, with individual plaice in the more northern part susceptible to much lower fishing mortality

Comparison with previous assessment and advice

In 2008 the SSB for 2008 was estimated at 265 kt, while this assessment estimates the SSB for that same year (2008) at 345 kt. Similarly, the F in 2007 was estimated at 0.39, while this year assessment estimates F in 2007 at 0.31.

Last year ICES advised according to management plan aiming at a reduction in F of 10%. For this year, the basis of the advice in 2010 is to apply the EU management plan, corresponding to a 15% constraint on TAC increase.

Sources of information

Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 6-12 May 2009 (ICES CM 2009/ACFM:10).

Aarts, G. M., and van Helmond, A. T. M. 2007. Discard sampling of plaice (*Pleuronectes platessa*) and cod (*Gadus morhua*) in the North Sea by the Dutch demersal fleet from 2004 to 2006. IJmuiden, IMARES, Report C120/07, p. 42.

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Hiddink, J. G., Jennings, S., Kaiser, M. J., Queirós, A. M., Duplisea, D. E, and Piet, G. J. 2006. Cumulative impacts of seabed trawl disturbance on benthic biomass, production, and species richness in different habitats. Canadian Journal of Fisheries and Aquatic Sciences, 63: 721–736.

Hinz, H., Hiddink, J. G., Forde, J., and Kaiser, M. J. 2008. Large-scale responses of nematode communities to chronic otter-trawl disturbance. *Canadian Journal of Fisheries and Aquatic Sciences*, 65: 723–732.

Kaiser, M. J., Ramsay, K., Richardson, C. A., Spence, F. E., and Brand, A. R. 2000. Chronic fishing disturbance has changed shelf sea benthic community structure. *Journal of Animal Ecology*, 69: 494–503.

Mollet, F. M., Kraak, S. B. M., and Rijnsdorp, A. D. 2007. Fisheries-induced evolutionary changes in maturation reaction norms in North Sea sole *Solea solea*. *Marine Ecology Progress Series*, 351: 189–199.

Rijnsdorp, A. D., Daan, N., and Dekker, W. 2006. Partial fishing mortality per fishing trip: a useful indicator of effective fishing effort in mixed demersal fisheries. *ICES Journal of Marine Science*, 63: 556–566.

Table 6.4.7.1 Plaice in Subarea IV (North Sea). Single stock exploitation boundaries (advice), management and landings.

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresponding to advice	Predicted catch corresponding to single-stock boundaries	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		- ¹		175	123	125
1993	No long-term gains in increasing F		170 ¹		175	115	117
1994	No long-term gains in increasing F		- ¹		165	110	110
1995	Significant reduction in F		87 ²		115	96	98
1996	Reduction in F of 40%		61		81	80	82
1997	Reduction in F of 20%		80		91 ³	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 _{pa}		<77		77	70	70
2003	Fish at F=0.23		60 ⁴		73	66	67
2004		Recovery plan		-	61	61	61
2005	Rebuild the SSB above B _{pa} in 2006		35 ⁴	35	59	55	56
2006	Rebuild the SSB above B _{pa} in 2007		48 ⁴		57	56	58
2007	Rebuild the SSB above B _{pa} in 2008		<32 ⁴		50	49	50
2008	Rebuild the SSB above B _{pa} in 2009		<35 ⁴		49	48	49
2009	Limit total landings to 55 500 t		<55.5 ⁴		55.5		
2010	Limit total landings to 63 825 t		<63.8 ⁴				

Weights in '000t.

¹⁾ Catch at *status quo* F.

²⁾ Catch at 20% reduction in F.

³⁾ After revision from 77 000 t.

⁴⁾ Landings.

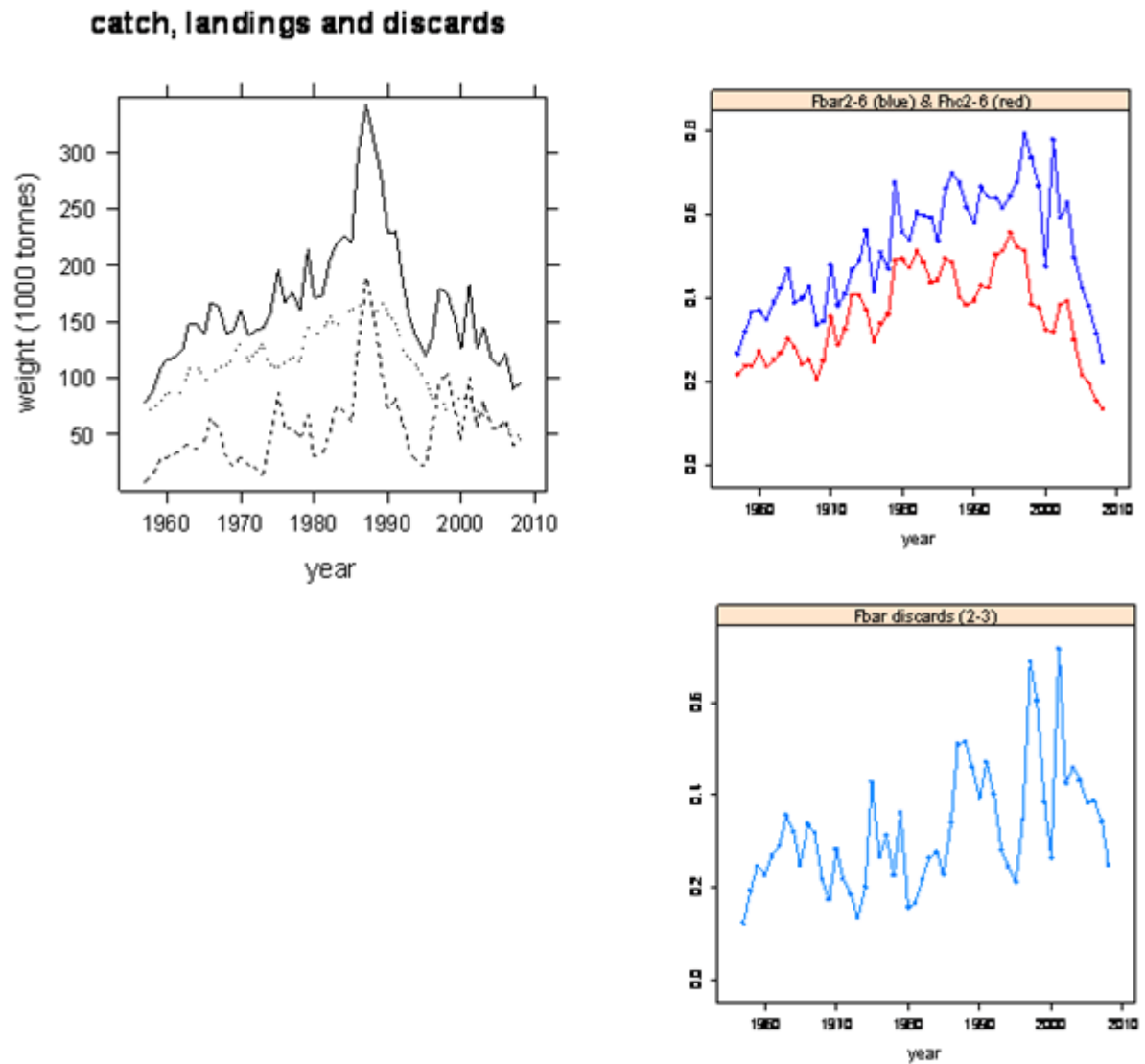


Figure 6.4.7.1 Plaice in Subarea IV (North Sea). Summary of stock assessment.
 Top left: Total catches (solid black line) landings (dotted line) and discards (dashed line);
 Top right: total fishing mortality (blue line), and fishing mortality of landings (red line);
 Bottom right: fishing mortality of discards.

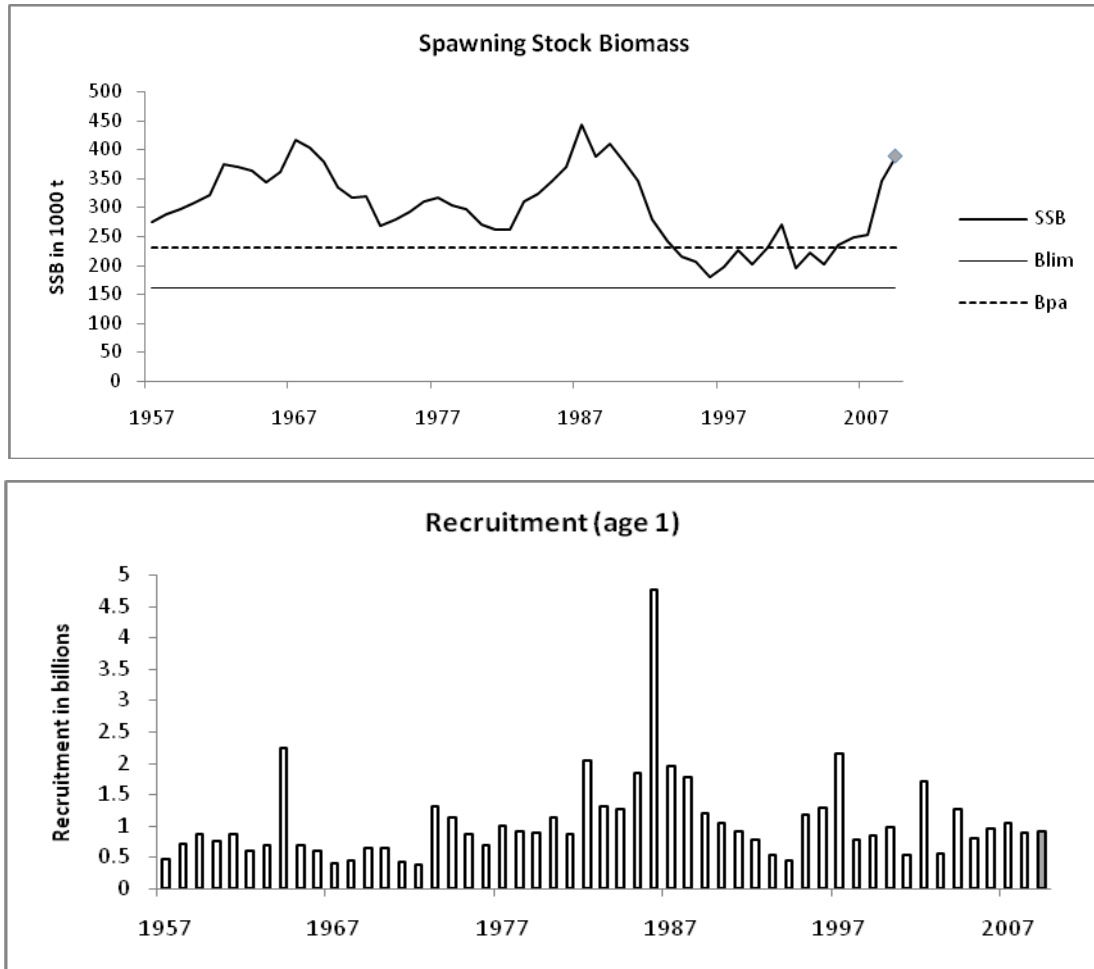


Figure 6.4.7.2 Plaiice in Subarea IV (North Sea). SSB and recruitment, predicted values are shaded.

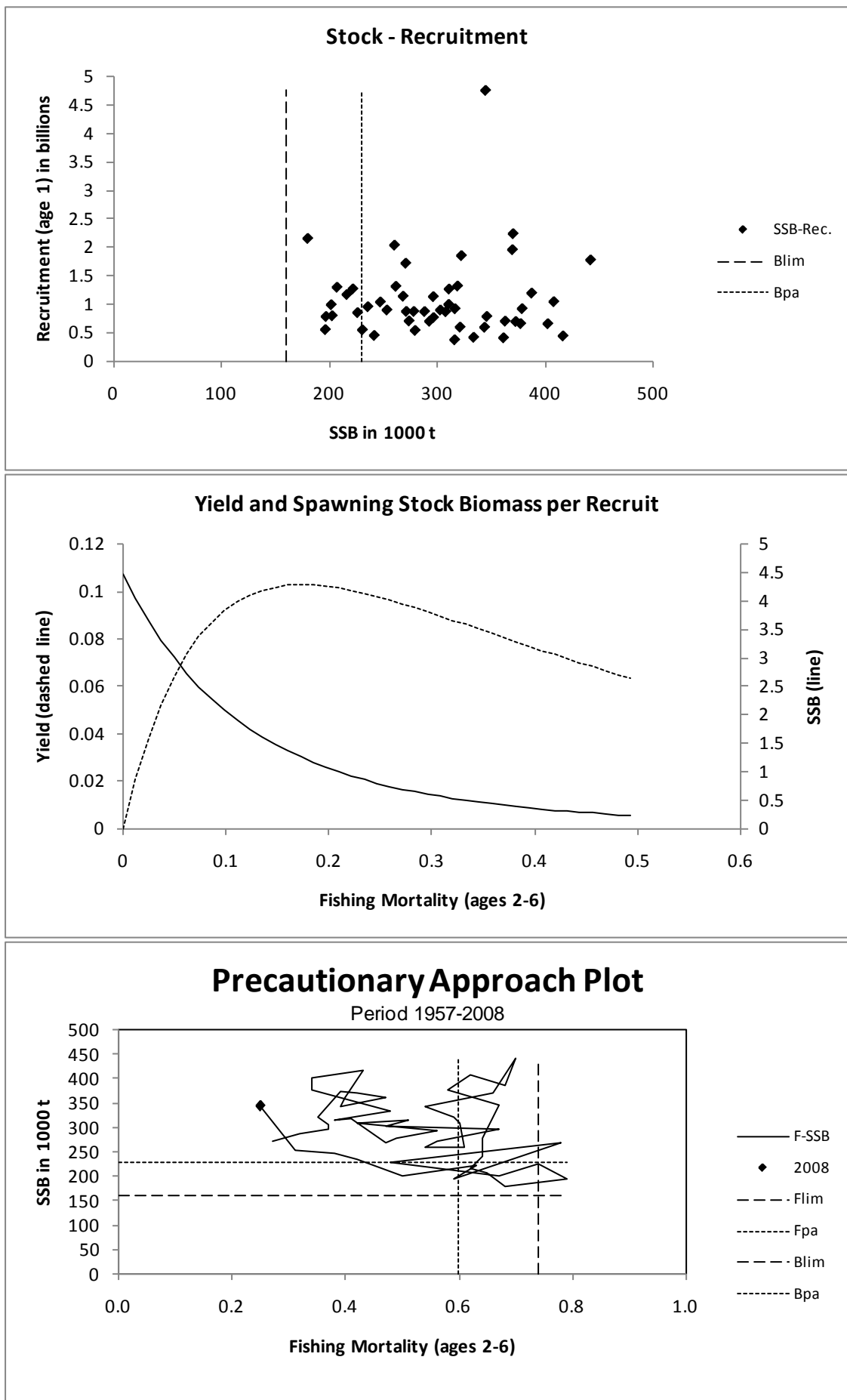


Figure 6.4.7.3 Plaiice in Subarea IV (North Sea). Yield per recruit analysis and stock–recruitment plot.



Figure 6.4.7.4 Plaice in Subarea IV (North Sea). Results of the North Sea Commission fishers' survey 2008.

Plaice Sub-area IV (North Sea)

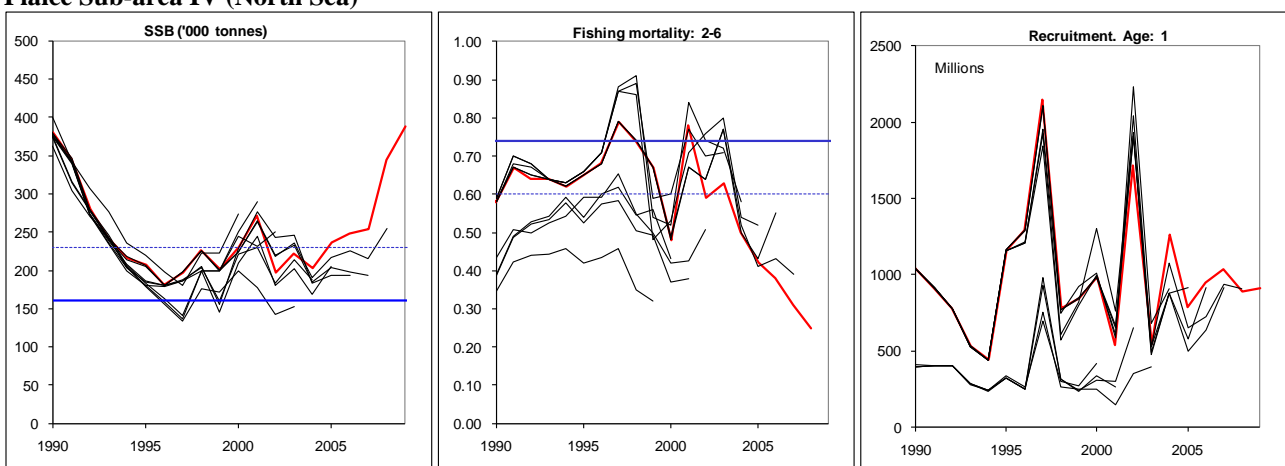


Figure 6.4.7.5 Plaice in Subarea IV (North Sea). Comparison of current assessment with previous assessments. Note the change in assessment methodology from 2004 onwards.

Table 6.4.7.2 Plaice in Subarea IV (North Sea). Nominal landings by country and area (tonnes).

YEAR	Belgium	Denmark	France	Germany	Nether-lands	Norway	Sweden	UK	Others	Total	Un-allocated	WG 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													55500

Table 6.4.7.3 Plaice in Subarea IV (North Sea). Summary of stock assessment.

	Recruitment Age 1 (thousands)	SSB (tonnes)	Catch (tonnes)	Landings (tonnes)	Discards (tonnes)	Mean F Total ages 2-6	Mean F Landings ages 2-6	Mean F Discards ages 2-3
1957	457973	274205	78423	70563	7860	0.27	0.22	0.12
1958	698110	288540	88240	73354	14886	0.32	0.24	0.19
1959	863386	296825	109238	79300	29938	0.37	0.24	0.24
1960	757298	308164	117138	87541	29597	0.37	0.27	0.23
1961	860575	321353	118331	85984	32347	0.35	0.24	0.27
1962	589153	372863	125272	87472	37800	0.39	0.25	0.29
1963	688365	370372	148170	107118	41052	0.42	0.27	0.36
1964	2231496	363076	147357	110540	36817	0.47	0.3	0.32
1965	694571	344012	139820	97143	42677	0.39	0.28	0.25
1966	586775	361547	166784	101834	64950	0.4	0.24	0.34
1967	401292	416560	163178	108819	54359	0.43	0.25	0.32
1968	434274	402516	139503	111534	27969	0.34	0.21	0.22
1969	648862	377425	142896	121651	21245	0.34	0.25	0.17
1970	650568	333925	160026	130342	29684	0.48	0.35	0.28
1971	410258	316330	136932	113944	22988	0.38	0.29	0.22
1972	366600	319043	142495	122843	19652	0.41	0.33	0.19
1973	1311938	268690	143883	130429	13454	0.47	0.41	0.13
1974	1132612	278608	157804	112540	45264	0.49	0.41	0.2
1975	864628	293068	195154	108536	86618	0.56	0.37	0.43
1976	692495	310834	167089	113670	53419	0.42	0.3	0.27
1977	988392	316735	176691	119188	57503	0.51	0.34	0.31
1978	911977	303134	159727	113984	45743	0.47	0.36	0.22
1979	890115	296622	213422	145347	68075	0.67	0.49	0.36
1980	1125334	271634	171235	139951	31284	0.56	0.49	0.16
1981	866020	260703	172671	139747	32924	0.54	0.47	0.16
1982	2030236	262013	204286	154547	49739	0.61	0.51	0.22
1983	1306336	311165	218424	144038	74386	0.6	0.49	0.26
1984	1258598	322582	226930	156147	70783	0.59	0.44	0.28
1985	1846346	344928	220928	159838	61090	0.54	0.44	0.23
1986	4750659	369768	296876	165347	131529	0.66	0.5	0.34
1987	1950224	442035	342985	153670	189315	0.7	0.49	0.51
1988	1769839	387569	311635	154475	157160	0.68	0.4	0.52
1989	1187325	408029	277738	169818	107920	0.62	0.38	0.46
1990	1036310	378736	228734	156240	72494	0.58	0.39	0.39
1991	913820	346093	229607	148004	81603	0.67	0.43	0.47
1992	776857	279778	183284	125190	58094	0.64	0.43	0.4
1993	531067	241954	152242	117113	35129	0.64	0.5	0.28
1994	442720	216682	134392	110392	24000	0.62	0.51	0.24
1995	1162817	207539	120316	98356	21960	0.65	0.56	0.21
1996	1290188	180465	133797	81673	52124	0.68	0.52	0.35
1997	2148532	197379	179957	83048	96909	0.79	0.51	0.69
1998	776201	226574	175002	71534	103468	0.74	0.39	0.6
1999	844549	202179	151708	80662	71046	0.67	0.38	0.38
2000	983135	231029	126142	81148	44994	0.48	0.32	0.26
2001	540793	271129	182578	81963	100615	0.78	0.32	0.72
2002	1712546	196790	125884	70217	55667	0.59	0.38	0.43
2003	546025	222231	145390	66502	78888	0.63	0.39	0.46
2004	1261256	203118	117702	61436	56266	0.5	0.3	0.43
2005	789082	236119	111060	55700	55360	0.42	0.21	0.38
2006	947769	247639	121205	57943	63262	0.38	0.2	0.39
2007	1031601	253712	90283	49744	40539	0.31	0.15	0.34
2008	890569	344871	96040	48874	47166	0.25	0.13	0.25
2009	912907*	388131						

* Recruitment GM (1957–2006).

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 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.*