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3.5.18 Answer to requests from EC on rebuilding plans for cod and hake stocks

3.5.18.a ICES is requested to investigate the performance and robustness of proposed multi-annual arrangements to set TACs (harvest control rules) as part of the stock rebuilding plans for North Sea cod.

1. The experts shall perform analyses, by means of computer simulations, which include, as appropriate:

- Alternative models (e.g. different stock-recruit relations and catchability relationships);
- Consideration of assessment error by modelling separately the underlying operating models representing the fish stocks, and the perceived populations as measured using surveys and assessment models;
- Application of defined harvest rules as detailed below;
- Alternative assumptions about past and future changes in fishing practices.

   New software shall be developed as needed in support of the above-mentioned tasks.

   The analyses shall be used to evaluate the likely development and consequent risks for the stock, with particular reference to future spawning stock biomass, fishing mortality rate, landings and discards.

2. The harvest control rules to be studied shall imply:

   a) setting a TAC allowing for an expected increase in the spawning stock biomass from one year to the next by a range of percentages including a 30% increase, and

   b) setting a TAC according to a predetermined regime of fishing mortality rates.

   In both cases, the following constraints shall be applied:

   1. Projected fishing mortality shall not exceed $\mathbf{F}_{pa}$; and

   2. Wherever possible, annual changes in landings shall be limited to particular percentage increases or decreases. Consequences of using alternative percentage limits shall be explored.

3. The simulations shall be used to evaluate the robustness of the harvest rules in assuring stock recovery, considering a range of uncertainty (variance and bias) that are plausible in the light of statistical analysis and of historical experience about assessment performance.

4. The simulations shall include consideration of:

   a) discarding, taking into account possible changes in discarding practice;

   b) the effect of possible changes in natural mortality due to multi-species effects; and

   c) possible changes in selectivity due to planned measures for fishing gears.

Answer to the request on North Sea cod

1. The European Commission has recently proposed a regulation [COM(2001) 724] which includes harvest control rules for the selection of total allowable catches (TACs) for a number of fish stocks. In order to evaluate the risks and benefits of the proposed harvest control rules, the Commission invited a number of national experts to attend an *ad hoc* sub-group of the Scientific, Technical and Economic Committee for Fisheries (STECF). This meeting took place in Brussels from 20-22 March 2002 and was immediately preceded by a two-day meeting of scientists from the EU and Norway. The report is available from EC DG Fish.

2. The meeting of EU-Norway scientists addressed harvest control scenarios for cod in the North Sea, Skagerrak, and eastern Channel. Scenarios were investigated which

   a) aim for a certain percentage increase in spawning stock biomass (SSB);

   b) aim for a pre-determined regime of fishing mortality rates (Fs);

   c) investigate robustness to assumptions (e.g. natural mortality, exploitation pattern, weight-at-age).

3. The STECF sub-group addressed harvest control scenarios for northern hake and cod stocks in the Kattegat, in the Irish Sea, and to the west of Scotland. The STECF sub-group did not address further the harvest control scenarios for cod in the North Sea, Skagerrak, and eastern Channel. The scenarios under 2a) and 2b) above were

investigated, but unlike the EU-Norway scientists' meeting, the STECF sub-group did not evaluate:

- the effects of possible selectivity changes
- the effect of possible changes in natural mortality
- the effect of variable weight-at-age.

4. In both meetings, discarding was not considered.

5. Both the STECF sub-group and the EU-Norway meeting defined *recovery* as two successive years with SSB above $\mathbf{B}_{pa}$, in line with the requirements from the European Commission.

6. The results of the STECF sub-group and the EU-Norway meeting have been evaluated by the STECF meeting in April 2002 (Report of the STECF April 2002, DG Fish, EC). ACFM in general endorses the conclusions from the STECF evaluation.

7. The probabilities referred to in the STECF sub-group report and the discussion of the likely outcomes of the different harvest control rules should not be interpreted as absolute values. They are conditional upon a number of assumptions within the forecast models that have been used, and can only be considered as relative values to be compared with one another. They can be informative about whether any particular harvest control rule has a higher probability of reaching an objective than other rules do (or, equivalently, is likely to reach the objective sooner). They may not give reliable estimates of the absolute likelihood or actual time required to reach a specified objective for any particular scenario, nor of the absolute differences in F, SSB, or yield between scenarios during the rebuilding period.

8. The results produced at the two meetings indicate that none of the stocks are likely to recover within a five-year period for any of the scenarios evaluated. Only after six years do stocks and scenarios begin to indicate a non-negligible probability of recovery, with some scenarios requiring more than a decade for even a 50% chance of recovery.

9. All recovery scenarios require a sustained reduction in fishing mortality, which in turn requires a corresponding reduction in fishing effort, that is both sustained and effective.

10. There is a trade-off between a quick response in the trajectory of the population (through a strong reduction in fishing mortality) and a more gradual response (allowing more fishing in the short term) achieved by aiming for a pre-defined increase in SSB.

11. For stocks to have no greater than 50% risk of falling below $\mathbf{B}_{pa}$ in the long term requires that F is at or below $\mathbf{F}_{pa}$ in the long term. $\mathbf{F}_{pa}$ therefore represents the maximum permitted fishing mortality consistent with sustainability. In the post-recovery period, it may be possible to allow the severely reduced F to rise to $\mathbf{F}_{pa}$ but certainly no higher.

12. The harvest control strategies were implemented only to the point where stocks recovered to $\mathbf{B}_{pa}$; beyond that a different control strategy might be required.

13. The simulations presented assume complete compliance with the management measures implemented to obtain the required reductions in fishing mortality and thereby the recovery of the stocks. Lack of compliance or any inefficiency in implementation of the measures will reduce the probability of achieving any specified objective in a given time, and increase the time required to achieve the rebuilding target. The simulations shed no light on whether all harvest control rules are equally vulnerable to incomplete compliance or ineffective implementation.

14. The simulations did not examine if the criteria of recovery; namely, two successive years with SSB above $\mathbf{B}_{pa}$, is sufficient to ensure a resilient and robust recovery. Notably, when the aim is to restore the stock in a resilient way, there needs to be an additional criterion that gives a measure of the population structure. For example, an option may be to derive a so-called age diversity index that could be compared to values of the index during the historical period of the stock development.

15. In general, it should be remembered that predictions and simulations of this kind have had a tendency to be overly optimistic. This tendency has some potential serious consequences, such as:

    - in practice, management constraints on harvesting may have to be kept in place much longer than forecast by the simulations in order to reach rebuilding targets; and
    - harvest control strategies which are based on gradual increments in SSB and which allow harvesting of substantial portions of the annual stock productivity may be ineffective. If the annual productivity is overestimated, and a substantial portion of the overestimated production is allocated to harvest, then the actual annual increment in SSB will be much lower than simulated.

3.5.18.b Answer to EC request on evaluation of the effectiveness of certain management measures in relation to rebuilding cod and hake stocks

EC DG Fish asked:

> *Evaluate the effectiveness of the management measures described in the Commissions Communication, as found in http://europa.eu.int/comm/fisheries/doc_et_publ/factsheets/legal_texts/docscom/en/com_01_326f_en.pdf, and in particular their conformity with ICES' usual interpretation of the precautionary approach.*
>
> *Take note of the agreed record recently concluded with Norway about technical measures concerning the cod stock. Information contained in these two documents will be relevant to ICES' annual considerations about the state and management of the stocks of the cod and hake.*

Specifically, this request applies to a communication from the Commission to the (European) Council and to the European Parliament (CEC COM(2001) 326). However, at the current ACFM meeting, the EU observer asked for ACFM also to comment on a proposed Council Regulation that followed this communication and establishes measures for the recovery of cod and hake stocks (CEC COM(2001) 724). In this respect, ACFM has asked its relevant assessment working groups to address this at their current or forthcoming meetings. One such working group was meeting at the same time as ACFM and another about a week after the close of the current ACFM meeting. Thereafter ACFM will consider the WG comments by e-mail and seek to provide a direct response to the EU's revised request. For the moment, it will restrict its response to consideration of the communication referred to in the original EU request.

ICES has taken note of the agreed record and has informed relevant assessment working groups on the content of EU-Norway agreement. ICES will take this arrangement into account in the assessments and advice to be presented to the Commission in October 2002. The North Sea and Skagerrak Demersal Assessment Working Group in their report from June 2001 offered an analysis of the agreement and the effects on various fisheries. This report is available from the ICES Secretariat on request.

It is not possible to make a detailed evaluation of the Communication CEC COM(2001) 326 in relation to an implementation of the precautionary approach as the communication does not provide sufficient details. However, the general principles laid down in this communication are in accordance with the precautionary approach. There are several aspects of the communication that are outside ICES competence, e.g. Market Measures and Accompanying Structural Measures. These are not commented upon. Concerning biological reference points, ICES has sent a separate letter of 31 May 2001 to Governments and to the Fisheries Commissions informing them of the plans for revisiting the Precautionary Approach reference points in 2003. Following the chapters of the Communication, ACFM offers the comments given below.

Introduction

The Communication provides an appropriate summary of the problems facing the stocks of cod and hake. In particular, it addresses the frequently stated view of ACFM that TACs alone are not sufficient to regulate fishing mortality and that regulation of fishing effort is also needed.

Objectives and Targets

The objectives and targets as stated are appropriate to the recovery phase for stock rebuilding, subject to the following caveats:

- It is true that other species may be caught in association with cod and hake and that the fishing mortality of these other species must be regulated in accordance with the cod and hake recovery plans. However, it should be noted that the degree to which this is necessary is variable depending on the species and area concerned;
- The absence of clearly defined and agreed management objectives and targets in the past has reduced the ability of ACFM to provide appropriate management advice. It is important, therefore, to note that the objectives and targets referred to here relate solely to the stock recovery phase and must be succeeded by appropriately defined objectives and targets, possibly in a framework of harvest control rules, for any post-recovery management phase;
- The specific precautionary biomass values to be used as targets for recovery have been queried in the case of northern hake. However, ACFM has proposed a procedure to be adopted in September for revision of the reference points in. As discussed above, ACFM has requested its relevant assessment WGs to comment more fully on the specific terms of the proposed recovery plans, and will report on this shortly;
- The EC communication refers specifically to stock recovery rules that are based on fishing mortality. Subsequent EC proposals have referred also to recovery rules that are based on target increases in SSB. These are discussed more fully above.

Actions Already Taken

ICES working groups have already commented on the perceived effectiveness of some of the actions already undertaken with regard to stock recovery measures.

Preparation of the Full Recovery Plans

The text referring to the setting of TACs and the need for effort limitations are straightforward statements of fact. In particular, the need for input regulation (fishing effort) to accompany output regulation (TACs) specifically reflects the frequently re-iterated view of ICES. However, options for the ways in which input regulation may be addressed require more of an economic view than can be expressed by ICES.

Technical Measures

Whereas improvements in the selection of fishing gears can certainly be attained, they can commonly be circumvented by a number of means that are well-known to fishermen, fisheries scientists, and gear technologists. For such technical measures to be effective, they require a level of compliance by fishermen that entails active support for the measures rather than an enforcement-lead imposition of them.

Regarding closed or controlled areas, comments on the likely effectiveness of the measures previously adopted are provided by WGNSSK June 2001.

Reinforcement of Control Measures

This is largely outside ICES scientific competence. However, the goals defined in the scientific advice can only be achieved with compliance of the fishing regulations by the fishing industry. Compliance with regulations is the basis for the scientific advice.

National fishery research institutes commonly depend upon the goodwill of their fishing industries to permit biological sampling of catches both onshore and at sea, and that such sampling may be undertaken remotely from enforcement agencies. If the proposed observer scheme is viewed as a reinforcement to control measures, it is possible that the national institutes will lose voluntary access to fish catches, and also the goodwill of the fishing industry when sampling catches.

Means to Take Rapid Action

There is a mismatch between the time required for management to react and the time frame within fish stocks and of the fishing industry change. Any improvement in the speed at which management measures can be enacted is to be welcomed, providing the measures are well-founded.

Accompanying Measures

Observer schemes may help improve knowledge of fish distributions, etc., as well as catch composition, but it is extremely expensive for national research institutes to mount such schemes and it is unlikely that sufficient coverage will prevail specifically to identify distributions, etc., with high precision. It is not clear whether the Commission anticipates Member States mounting such schemes independently of the research institutes and for costs to be recovered from the sampled vessels, or if national institutes are expected to organise and fund the scheme.

3.5.18.c Answer to special request from EC on recovery plans for cod and hake stocks

DG Fish has requested ICES to:

> *Evaluate the effectiveness of the management measures described in the Commissions Communication, as found in: http://europa.eu.int/comm/fisheries/doc_et_publ/factsheets/legal_texts/docscom/en/com_01_326f_en.pdf, and in particular their conformity with ICES' usual interpretation of the precautionary approach.*

> *Take note of the agreed record recently concluded with Norway about technical measures concerning the cod stock. Information contained in these two documents will be relevant to ICES' annual considerations about the state and management of the stocks of the cod and hake.*

ICES Comments:

In November 2000, ICES indicated that a number of cod stocks and the stock of northern hake were at serious risk of collapse. Following this, various emergency measures covering these stocks were enacted in 2001 by Norway and the EU. This was in addition to measures adopted by the EU to aid recovery of Irish Sea cod in the previous year. Proposals for longer-term recovery plans for these stocks were also made by the EU. These proposals include multi-annual recovery plans for northern hake and for cod in the North Sea, to the west of Scotland, in the Kattegat, and in the Irish Sea**.**

The proposed recovery plans aim to increase spawning stock biomass, SSB, to above the adopted biological reference point, $\mathbf{B}_{pa}$, of each stock. The necessary tools proposed to achieve recovery are TACs set to ensure a high probability that SSB will increase annually by 30% for the cod stocks and 15% for the hake stocks. Within the recovery period there is a proposed maximum annual variation of TACs of no more than 50% from year to year. The tolerance for year-to-year changes in TACs is symmetric, and has higher priority than ensuring the target increase in SSB if the two rules are in conflict. The rule with highest priority is that fishing mortality should not be permitted to exceed $\mathbf{F}_{pa}$ in any year. To achieve the necessary decreases in fishing mortality, fishing effort limitations are also an integral part of the proposal in addition to measures to temporarily close fishing areas and to increase monitoring and control of fishing vessels.

For North Sea cod, a joint EU-Norway Working Group was established to evaluate the likely effects of the proposed multi-annual plans as set out in the proposal by European Commission. In addition, the EU STECF has reported on the likely development of SSB, fishing mortality, and yield for northern hake and the other cod stocks for which recovery plans were advised, and commented on the robustness of the proposed rules. The results of simulation modelling within these groups incorporating uncertainty in recruitment and bias in the estimation of population numbers were available to ICES. The starting point for simulations was the most recent stock data as provided by ICES Working Groups, usually from the assessment working group meetings convened during 2001. Two categories of scenarios were conducted: simulations constrained by annual biomass increases and simulations constrained by defined fishing mortality rates. Within those two categories, a number of simulations were run with annual catch deviations ranging from zero to ±50%. The definition of recovery was considered to be two successive years with a probability greater than 50% that the SSB exceeded $\mathbf{B}_{pa}$. An overview of scenarios is given in the text table below:

Biomass or F Control	Biomass or F constraint		Catch constraint	Scenario name
	Cod	Hake		
B	+ 30%	+ 15%	± 50%	Sc01_base
B	+ 45%	+ 20%	± 50%	Sc02
B	+ 15%	+ 10%	± 50%	Sc03
F	0.8 x Fpa	0.8 x Fpa	± 50%	Sc04
F	0.6 x Fpa	0.6 x Fpa	± 50%	Sc05
F	1.0 x Fpa	1.0 x Fpa	± 50%	Sc06
B	+ 30%	+ 15%	± 20%	Sc07
B	+ 45%	+ 20%	± 20%	Sc08
B	+ 15%	+ 10%	± 20%	Sc09
F	0.8 x Fpa	0.8 x Fpa	± 20%	Sc10
F	0.6 x Fpa	0.6 x Fpa	± 20%	Sc11
F	1.0 x Fpa	1.0 x Fpa	± 20%	Sc12
B	+ 30%	+ 15%	none	Sc13
B	+ 45%	+ 20%	none	Sc14
B	+ 15%	+ 10%	none	Sc15
F	0.8 x Fpa	0.8 x Fpa	none	Sc16
F	0.6 x Fpa	0.6 x Fpa	none	Sc17
F	1.0 x Fpa	1.0 x Fpa	none	Sc18

The evaluation of the simulations by an STECF sub-group (SGRST) can be summarized as follows:

i. The simulations implied a high probability of recovery within 6-9 years for all stocks except for Irish Sea cod. These results were specific to stock-specific scenarios. However, it was emphasised that the time frames given in the sub-group report should not be taken as absolute, that the periods were relative and to be used in comparison of scenarios only, and that the simulations assume that fishing mortality is controlled effectively.

ii. All scenarios were associated with dramatic decreases in yield and F in the first year of the recovery plan.

iii. The positive slope of the relationship between yield and recovery time do not allow easy choice of ”best” scenario taking into account socio-economic considerations, i.e. the choice requires other objectives.

iv. At current stock sizes, constraining F to $\mathbf{F}_{pa}$ is not effective for rebuilding, requiring the longest recovery time.

v. During the recovery phase, sustained reduction of F<$\mathbf{F}_{pa}$ is required to ensure a high probability of stock recovery.

The SGRST evaluation was considered by STECF, which concluded that:

i. The simulation model platform was not optimal with regard to the evaluation of economic impacts, because economic analyses were impeded by the single-species modelling approach.

ii. Some consequences for harvesting that result from the harvest rules or rebuilding constraints were considered unattainable (e.g. sharp reduction in fishing mortality and in catches in 2003, and realizing very low fishing mortalities by the end of the period), and some biological assumptions (no long-term trends in recruitment, no change in mean weight-at-age between years) were considered implausible.

For each stock, STECF had the following comments:

Northern hake: Most scenarios have a high probability to achieve recovery within a 10-year period. STECF noted that the $\mathbf{B}_{pa}$ and $\mathbf{F}_{pa}$ bases for the simulations were poorly determined and the reference points should be revised. The various catch constraints had no effect on recovery time and on annual change in SSB.

North Sea cod: Fishing at 80% of $\mathbf{F}_{pa}$ or higher produced no stock recovery within an 8-year period. A biomass target of 15% annual increase in SSB is not sufficient for recovery of this stock.

Cod in Kattegat: Scenarios associated with fishing at $\mathbf{F}_{pa}$ did not result in a high probability of recovery; this was attained when fishing at the lower Fs examined. All the biomass-controlled scenarios resulted in a high probability of recovery.

Irish Sea cod: Only 7 of 18 scenarios indicated more than a 90% probability of recovery of this stock within 6-7 years. Recovery within the period could be achieved both by F and SSB constraints. To achieve recovery within 9 years annual catches would have to be limited to below 4700 t.

West of Scotland cod: None of the 18 scenarios indicate recovery within five years. Recovery within 10 years could be achieved both by SSB and F controlled management. To achieve a recovery of more than 90% probability within a 10-year period, catches would have to be limited to below 5600 t.

ICES Evaluation:

An evaluation by ACFM of the current status of all stocks for which emergency measures have been applied, i.e. cod in the Kattegat, cod in the North Sea, Skagerrak, and Eastern Channel, cod to the West of Scotland, cod in the Irish Sea and hake in the Northern area, as given in 2002 ACFM report, revealed that none of the stocks currently fulfilled the condition SSB>$\mathbf{B}_{pa}$. An examination of recent fishing mortality rates compared to those of recent previous years, did not show any sign of decrease in F-at-age.

Should any recovery plan be implemented, then the evaluation of stock status with regard to the details of the plan should be undertaken following implementation (the plans are still under consideration and the measures to be implemented are still under discussion). In June 2002, the WGNSSK analysed the effects of the starting population in the medium-term simulations, the effect of different recruitment models, the effect of bias in the assessment, and software effects. The results of this comparative analysis can be summarised as follows:

- The medium-term projections were sensitive to the terminal assessment year since the starting population in 2002 was found to be significantly reduced compared to 2001. The reduction in the starting population of North Sea cod resulted in a reduced probability of recovery from 90% in the baseline scenario to 82%.

- The main factor affecting the estimated recovery time and recovery probability was assessment bias. Assuming a consistent 20% stock size overestimation caused a prolongation of the potential recovery time of almost 4 years.

- Yield, SSB, fishing mortality, and recruitment projections were also found to differ for different simulation methods. Properties of the various programs that could be used in the simulations generated dissimilar recruitment variation.

- As fitted, Shepherd, Beverton & Holt, and Ricker functions were found almost identical over the SSB range up to $\mathbf{B}_{pa}$. No effect on the medium-term stock parameters could be detected.

ACFM notes that implementation error due to the lack of reliable information on catches (e.g. discards) and to systematic overestimation of spawning biomass (retrospective error) appear to be substantial. These sources of uncertainty alone can severely compromise achieving the objectives of recovery plans, including the rapid rebuilding of spawning biomass towards $\mathbf{B}_{lim}$ or $\mathbf{B}_{pa}$.

ICES does not accept the likely time frames to recovery indicated from the results of the stochastic simulations undertaken to evaluate harvest strategies, and also expressed doubt over the assumption of 100% implementation efficiency implied by the simulations. The success of any recovery plan will depend upon the ability of managers to monitor catches and discards, to adhere to the effort reduction schemes, and to achieve reductions in fishing mortality despite assessment uncertainties. Attention has to be paid to all stages of implementation.

Impact of new technical measures:

Two analyses of mesh changes were presented, one for cod, haddock, and whiting in the North Sea, and one for Northern hake.

North Sea demersal fisheries have been subjected to a number of EC and national regulations designed to modify the selectivity of fishing gears. No complete evaluation of their likely impacts has yet been undertaken, but an overview of their potential effects is available based upon a number of simplifying assumptions. This overview considers measures outlined in EC regulations 850/98 and 2056/2001, and UK measures SSI 227/2000, SSI 250/2001 and SI 649/2001. Results are expressed as the percentage deviation from baseline simulations, which assume that no selectivity changes occur. The results are considered to be indicative of the likely impacts. The simulations are made assuming single-species population dynamics and assuming full and effective implementation of the measures , i.e. that all fleets catching cod are subject to the full impact of the measures. For 2002 it is assumed that all UK vessels have adopted the 110 mm mesh size derogation of EU regulation 2056/2001 and that 20% of non-UK fleets have adopted it. For 2003 no such derogation is assumed to apply. The results can be summarised in the following way:

Cod

Year	Landings for human consumption	Discards	Industrial bycatch	Spawning stock biomass
2002	<-1%	-	-	
2003	<-1%	-	-	<1%
Long Term	7%	-	-	5%

The absence of information on discards in the cod assessment and forecasts mean that the effect of increased selectivity at the youngest ages is not accounted for in the above table.

Haddock

Year	Landings for human consumption	Discards	Industrial bycatch	Spawning stock biomass
2002	-11%	-64%	10%	
2003	9%	-70%	29%	28%
Long Term	120%	-77%	113%	160%

Whiting:

Year	Landings for human consumption	Discards	Industrial bycatch	Spawning stock biomass
2002	-66%	-88%	6%	
2003	-72%	-93%	16%	13%
Long Term	-42%	-91%	26%	57%

The results are based on single-species forecasts in which biological interactions, *ie.*, predation, are excluded.

Northern Hake

Very simple simulations have been carried out regarding Northern Hake, using modified selection patterns for the predicted period. A partial improvement of the selection pattern is assumed in the intermediate year (no catch at age 0-1), and further improvement is assumed from 2003 onwards (preventing any catch at age 0-2, i.e. less than 30 cm). It is recognised that this improvement remains theoretical and has not been documented in the fishery.

The main results are:

- Since hake is a late maturing fish [23% age 3 are mature, 60% age 4, 90% age 5 and 100% at age 6 and above], any improvement in the selection pattern preventing the capture of younger fish (ages 0-2, ~ less than 30 cm) will only result in SSB increases in the medium term.
- An improvement in the selection pattern alone is unlikely to be effective enough to rebuild SSB. At *status quo* F and with no catch at ages 0-1 in 2002 and no catch at ages 0-2 in 2003 onwards, the SSB is expected to be 18% higher in 2007 than with the current selection pattern.
- An improvement of the selection pattern would increase the probability that a reduction in F will allow a rebuilding in SSB.

General Conclusion

ACFM notes that the theoretical gains in spawning biomass depicted in these studies may not, in effect, be realized, as mesh size measures are not always as effective as expected in their implementation, often because adjustments in fishing practices may undermine their effect.

3.5.19 Answer to EC Request on Overestimation in the Forecasting of Haddock and Whiting by-catch in the Industrial Fisheries

ICES is requested by the EC:

> *to look into the problem of predicting industrial by-catches of whiting and haddock in the North Sea. It appears that there is a consistent tendency for the predictions to exceed the realized catch.*

ICES Comments

The amount of "overshoot" is largest for the predicted by-catch of whiting and was more than 350% for the year 1997. The forecast suggested 28 000 tonnes by-catch of whiting in the industrial fishery, while the estimated by-catch was as low as 6 000 tonnes. The forecast for haddock by-catch in 1996 was more than 200% higher than the estimated by-catch that year (16 000 tonnes compared to 5 000 tonnes). The degree of overestimation has been decreasing in later years and the forecast of whiting by-catch for 2000 was an underestimate. Table 3.5.19.1 shows predicted (as given in the ICES advice) and observed by-catches of haddock and whiting in the industrial fisheries. The forecast procedures are described in detail in the Report of the Assessments of North Sea and Skagerrak Demersal Fish Stocks, CM 2003/ACFM:02.

The nature of the problem makes it unlikely that ICES will be able to make precise forecasts of industrial catches, but ICES will continue to investigate methods to improve the precision in the forecasts.

The results of the study are summarized in the following table:

	Whiting	***Haddock***
Weight-at-age prediction	A clear source for overestimating the industrial by-catch in some years. Contributes towards an underestimate in 1995 and 2000, but towards an overestimate in the years between.	Contributes to an overestimate in 1996 and 2000. No clear picture for the years between.
Partial fishing mortality	The use of a *status quo* fishing mortality would contribute to an overestimate in the period 1991 to 1996 during the time that the fishing mortality of whiting in the industrial by-catches decreased. The small increase in F the last year contributes towards an underestimate in 2000 (which also occurred).	The use of a *status quo* fishing mortality would contribute to an overestimate in the period 1991 to 1995, but possibly to an underestimate in some of the following years. The problem with the estimation of the partial fishing mortality of the 1998 year class contributes strongly towards an overestimate of the by-catch of haddock.
Stock size	The overestimation of stock size in 1995 and 1996 could possibly have contributed to an overestimate of the industrial by-catch those years. The effect is not straightforward to assess because the estimate of stock size is closely linked to the estimate of fishing mortality, which again is linked to the perception of the *status quo* partial fishing mortality (in the by-catches).	A relatively small overestimation of fishing mortality in the period 1992-1995, followed by a (still small) underestimation of fishing mortality in the years 1996-1999. There are clear signs of autocorrelation in this pattern. Previous assessments used commercial cpue data, and the tendency to overestimate the stock was larger and could have been the major source of the prediction error in at least some years.
Conclusions	**The sources of error described above are quite likely to have produced the large discrepancies between predicted and observed by-catch of whiting in the industrial fishery.**	**The picture is not as clear as for whiting. Future studies could go more into detail to see if there are any systematic differences between small and large year classes. The use of the age range 2 to 6 in calculating mean fishing mortality should be compared with the use of other age ranges (in the prediction of partial fishing mortality in the by-catch).**

Table 3.5.19.1 Comparison of predicted and observed by-catches of whiting and haddock in the industrial fisheries.

Assessment	Year	Haddock by-catch ('000 t)		Whiting by-catch ('000 t)	
		Predicted	Observed	Predicted	Observed
October 1990	1991	7	5	70	38
October 1991[1]	1992		11		27
October 1992	1993	16	11	50	20
October 1993	1994	13	4	47	10
October 1994	1995	14	8	28	27
October 1995	1996	16	5	19	5
October 1996	1997	7	7	28	6
October 1997	1998	10	5	9	3
October 1998	1999	8	4	11	5
October 1999	2000	13	8	6	9
October 2000	2001	10	8	10	7

[1]No prediction of by-catches given in the ACFM advice.

3.6 Stocks in the Eastern Channel (Division VIId)

3.6.1 Overview

Major fleets

A large proportion of the Eastern Channel is in the coastal zones (12-mile zone), which are exploited by small-scale fisheries. The major fleets operating in this area are: a French inshore fleet, mainly comprising small vessels using various gears, an English inshore fleet using fixed gear, English and Belgian offshore beam trawlers and French offshore otter trawlers.

Both beam trawl fleets mainly target sole and take a significant amount of plaice as a by-catch. Sole is also taken in directed inshore UK fisheries using trammels and in French fisheries using trammels and otter trawl. The major part of the plaice landings originates from a seasonal fishery in winter by French offshore otter trawlers taking sole as by-catch. The major part of the cod landings originates from French offshore trawlers and inshore gill-netters. Cod is also taken as a by-catch in other fisheries. Whiting are caught by inshore and offshore French trawlers in the Channel in mixed fisheries.

A pelagic trawl fishery takes place in the winter during the herring spawning season.

Effort directed at flatfish increased consistently and considerably in all fleets from 1975 and reached a peak during 1989–1990, after which it has remained at that level.

There are no separate TACs for cod and whiting in Division VIId, but they are part of a total TAC for the whole of Subarea VII excluding Division VIIa. Sole is managed by a TAC for the Division VIId, and plaice is managed by a TAC for Divisions VIId and VIIe combined. TACs for cod, whiting, plaice, and sole in recent years have generally not been restrictive.

Cod and whiting are assessed together with the North Sea stocks; reference is made to Sections 3.5.1, 3.5.2, and 3.5.4.

The spawning stock of plaice has been fairly constant since 1992 although the estimates of fishing mortality are rather variable. The stock is harvested outside of safe biological limits. Although the spawning biomass of the sole stock is above the proposed $\mathbf{B}_{pa}$, the exploitation rate is high and unsustainable.

Pelagic species caught in Division VIId are herring (Downs herring), horse mackerel, mackerel, and sprat. These species are subject to TACs set over larger areas. There are no separate estimates of the state of the stocks in this area. Also no separate statistics on catches and landings are available.

3.6.2 Sole in Division VIId (Eastern Channel)

State of stock/exploitation: The stock is within safe biological limits. The SSB in 2002 is above $\mathbf{B}_{pa}$, and the fishing mortality in 2001 was below $\mathbf{F}_{pa}$.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
There is currently no biological basis for defining $\mathbf{B}_{lim}$.	$\mathbf{B}_{pa}$ be set at 8 000 t. This is the lowest observed biomass, at which there is no indication of impaired recruitment.
$\mathbf{F}_{lim}$ is 0.55. This is a fishing mortality at or above which the stock has shown continued decline.	$\mathbf{F}_{pa}$ be set at 0.4. This F is considered to provide approximately 95% probability of avoiding $\mathbf{F}_{lim}$.

Technical basis:

$\mathbf{B}_{lim}$: Poor biological basis for definition.	$\mathbf{B}_{pa}$: Smoothed $\mathbf{B}_{loss}$ (no sign of impairment): 8 000 t.
$\mathbf{F}_{lim}$ is set equal to $\mathbf{F}_{loss}$, but poorly defined; analogy to North Sea and setting of 1.4 $\mathbf{F}_{pa}$ = 0.55.	$\mathbf{F}_{pa}$: Between $\mathbf{F}_{med}$ and 5th % of $\mathbf{F}_{loss}$; SSB>$\mathbf{B}_{pa}$ and probability ($\mathbf{SSB}_{mt}$<$\mathbf{B}_{pa}$), 10%: 0.4.

Advice on management: ICES recommends that the fishing mortality be less than $\mathbf{F}_{pa}$ = 0.4, corresponding to landings of less than 5 400 t in 2003.

Relevant factors to be considered in management: Due to the large 1999 year class, SSB is expected to remain above $\mathbf{B}_{pa}$ in the short term, providing fishing mortality does not exceed $\mathbf{F}_{pa}$.

There is no long-term gain in yield by increasing current fishing mortality. Restricting landings to 4 700 t would maintain *status quo* fishing mortality.

Catch forecast for 2003:

Basis: F(sq) = F(99–01, scaled) = 0.34; Landings(2002) = 4.9; SSB(2003) = 15.1.

F(2003 onwards)	Basis	Landings (2003)	SSB (2004)
0.27	0.8*$\mathbf{F}_{sq}$	3.9	16.1
0.31	0.9*$\mathbf{F}_{sq}$	4.3	15.6
0.34	1.0*$\mathbf{F}_{sq}$	4.7	15.1
0.40	$\mathbf{F}_{pa}$ = 1.18*$\mathbf{F}_{sq}$	5.4	14.4
0.41	1.2*$\mathbf{F}_{sq}$	5.5	14.3

Weights in ‘000 t

Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: No medium-term and long-term predictions carried out for this stock.

Comparison with previous assessment and advice: Fishing mortality in 2001 has been revised upwards by 31% and SSB in 2001 downwards by 17%. This is considered to be an expression of the uncertainty of the assessment.

Elaboration and special comment: There are 5 main commercial fleets fishing for sole in Division VIId. Belgian and English offshore beam trawlers (> 300 HP) fish mainly for sole, but can switch to scallops or move to adjacent areas. French offshore trawlers target roundfish and take sole as by-catch. Numerous inshore (under 10 m vessels) on the English and French coasts using mainly fixed nets target sole in the spring and autumn. The inshore vessels take half the reported landings and sole forms their main source of income. The minimum mesh size in the sole fishery with towed gears is 80 mm and in the fishery with static gears 90 mm.

Multiannual TAC Arrangements and Recovery Plans: Section 3.5.17 reviewed a study on schemes for Multiannual advice on TACs for four plaice and two sole stocks. These studies indicated possible target fishing mortalities for specific TAC schemes. ICES considers that target values must be defined by management taking scientific studies into account. ICES has not received feed-back with specification of target reference points and therefore continues to provide advice based on the precautionary reference points consistent with previous practice.

Analytical assessment using catch-at-age and CPUE data from commercial fleets and surveys. Under-reporting from the inshore fleet and mis-reporting by beam trawlers, fishing in adjacent management areas is thought to be significant. The lack of information on this phenomenon contributes to the uncertainty of the stock assessment and forecasts.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 11 – 20 June 2002 (ICES CM 2003/ACFM:02).

Yield and spawning biomass per Recruit F-reference points:

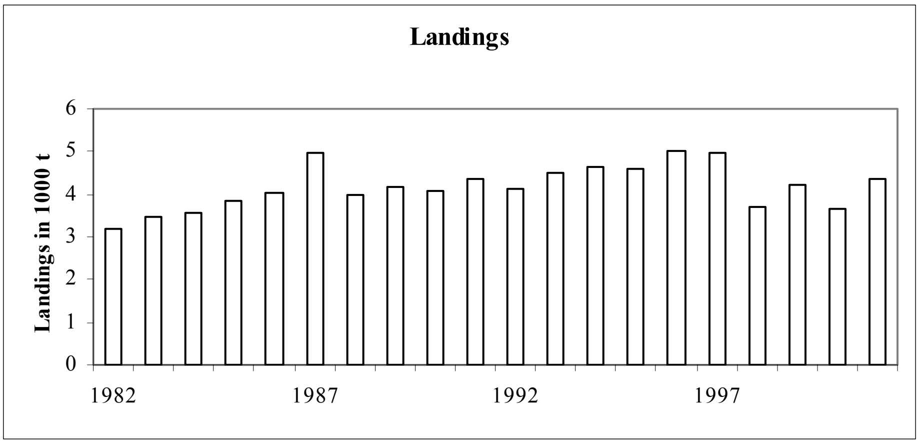
	Fish Mort Ages 3-8	Yield/R	SSB/R
Average Current	0.434	0.177	0.583
$\mathbf{F}_{max}$	0.279	0.178	0.715
$\mathbf{F}_{0.1}$	0.128	0.162	1.434
$\mathbf{F}_{med}$	0.515	0.172	0.373

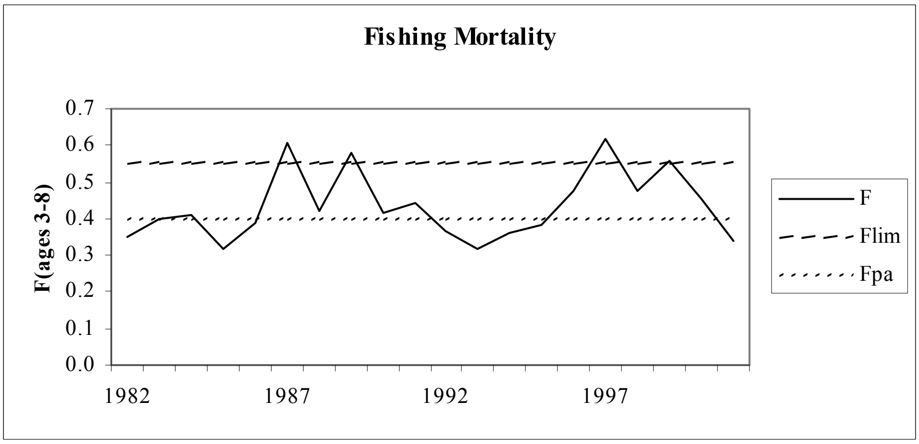
Catch data (Tables 3.6.2.1–2):

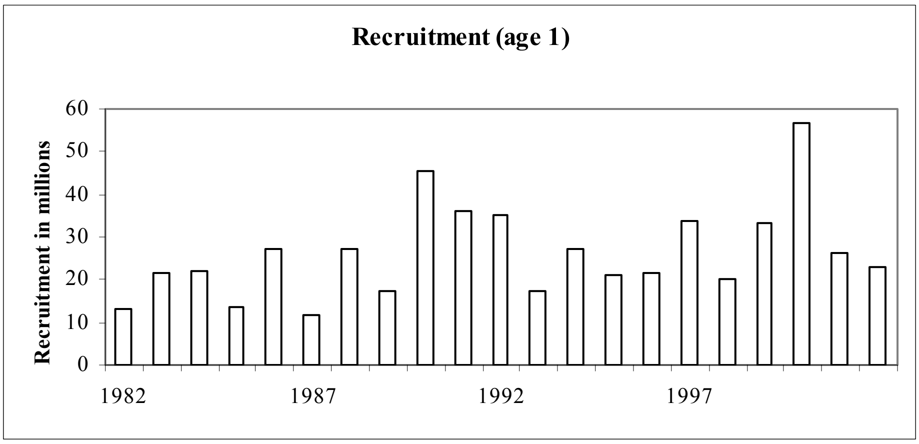
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Precautionary TAC	3.1	3.85	3.8	5.0
1988	*Status quo* (Shot) TAC	3.4	3.85	3.3	4.0
1989	*Status quo* (Shot) TAC	3.8	3.85	2.9	4.2
1990	No effort increase; TAC	3.7	3.85	3.0	4.1
1991	*Status quo* F; TAC	3.4	3.85	3.8	4.4
1992	TAC	≤2.7	3.5	3.8	4.1
1993	70% of F(91)~2 800 t	2.8	3.2	3.4	4.5
1994	Reduce F	<3.8	3.8	3.7	4.6
1995	No increase in F	3.8	3.8	3.7	4.5
1996	No long-term gain in increasing F	4.7	3.5	4.1	5.0
1997	No advice	-	5.23	3.8	5.0
1998	No increase in effort	4.5	5.23	3.0	3.7
1999	Reduce F to $\mathbf{F}_{pa}$	3.8	4.7	3.9	4.2
2000	F < $\mathbf{F}_{pa}$	<3.9	4.1	3.8	3.6
2001	F < $\mathbf{F}_{pa}$	<4.7	4.6	4.6	4.4
2002	F < $\mathbf{F}_{pa}$	<5.2	5.2		
2003	F < $\mathbf{F}_{pa}$	<5.4			

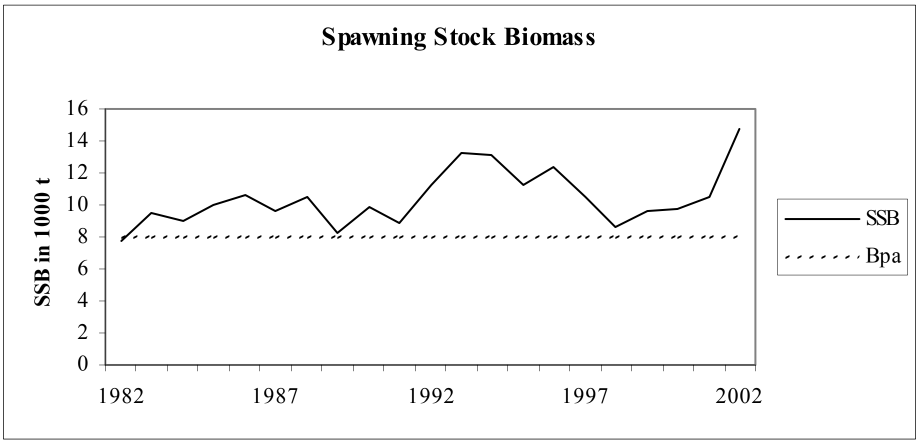
Weights in '000 t.

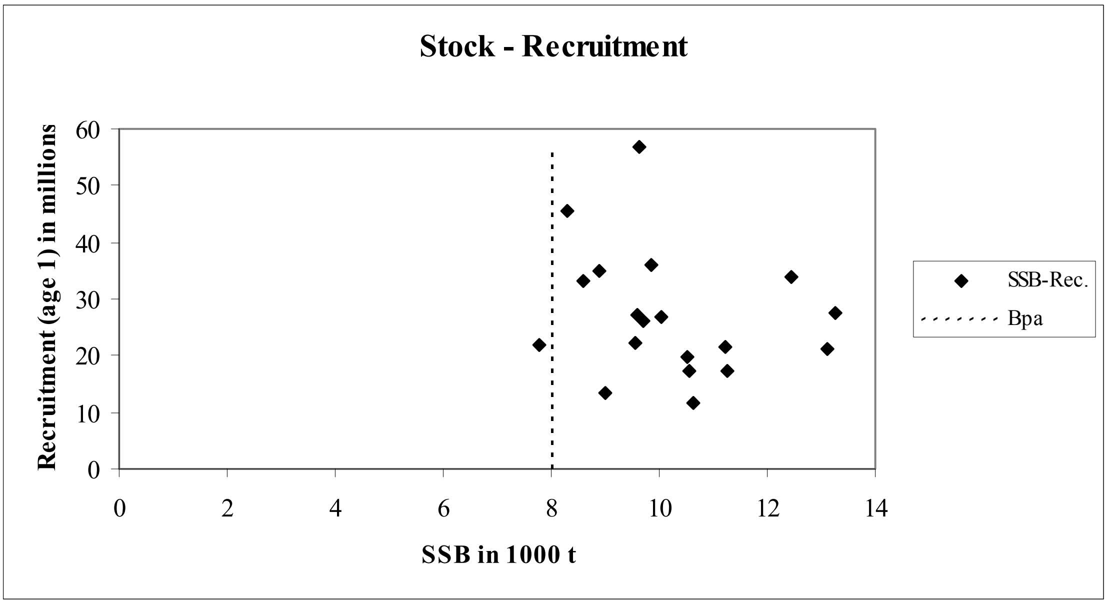
Sole in Division VIId (Eastern Channel)

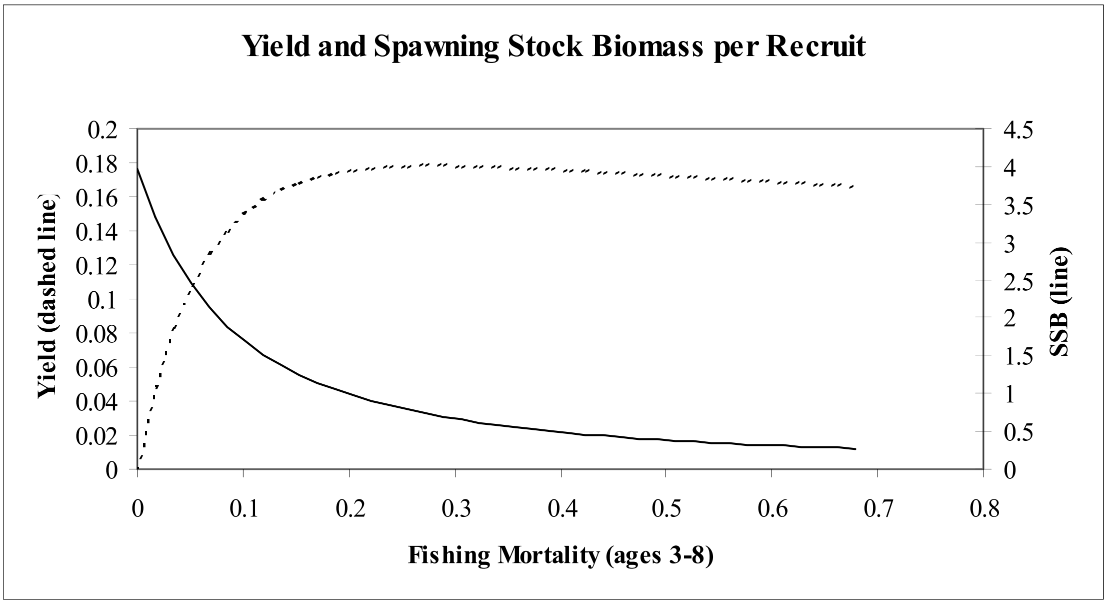









Stock - Recruitment
Recruitment (age 1) in millions
0
10
20
30
40
50
60
0
2
4
6
8
10
12
14
SSB in 1000 t
SSB-Rec.
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
SSB (line)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Fishing Mortality (ages 3-8)

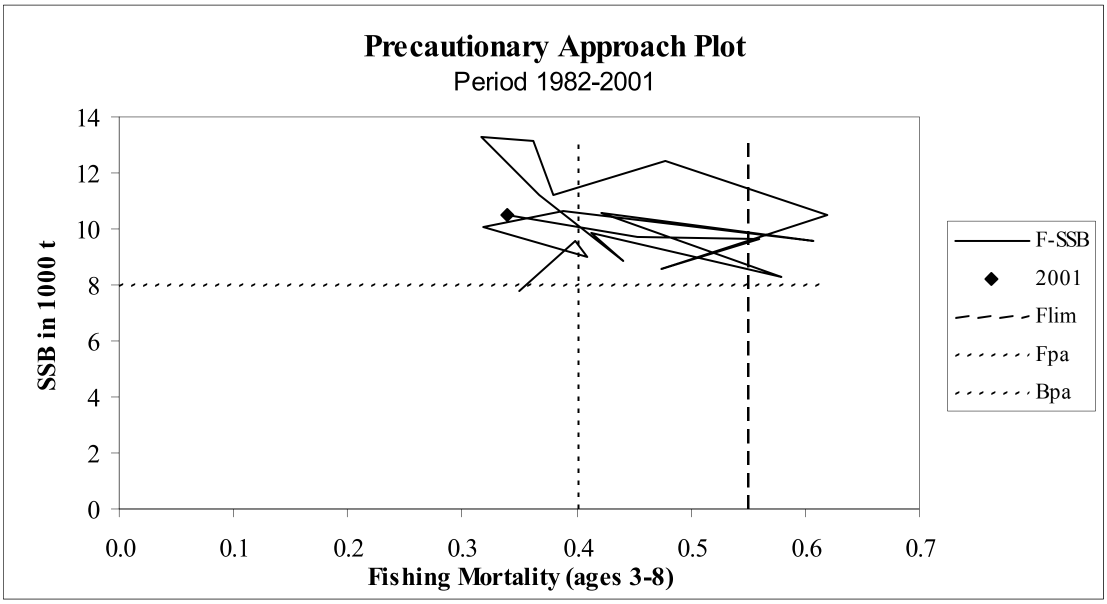

Precautionary Approach Plot
Period 1982-2001
SSB in 1000 t
0
2
4
6
8
10
12
14
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Fishing Mortality (ages 3-8)
F-SSB
2001
Flim
Fpa
Bpa

Table 3.6.2.1 Sole in Division VIId. Nominal landings (tonnes) as officially reported to ICES and used by the Working Group.

Year	Belgium	France	UK (E&W)	Others	Total reported	Unallocated*	Total used by WG	TAC
1974	159	469	309	3	940	-56	884	
1975	132	464	244	1	841	41	882	
1976	203	599	404	.	1,206	99	1,305	
1977	225	737	315	.	1,277	58	1,335	
1978	241	782	366	.	1,389	200	1,589	
1979	311	1,129	402	.	1,842	373	2,215	
1980	302	1,075	159	.	1,536	387	1,923	
1981	464	1,513	160	.	2,137	340	2,477	
1982	525	1,828	317	4	2,674	516	3,190	
1983	502	1,120	419	.	2,041	1,417	3,458	
1984	592	1,309	505	.	2,406	1,169	3,575	
1985	568	2,545	520	.	3,633	204	3,837	
1986	858	1,528	551	.	2,937	1,087	4,024	
1987	1,100	2,086	655	.	3,841	1,133	4,974	3,850
1988	667	2,057	578	.	3,302	680	3,982	3,850
1989	646	1,610	689	.	2,945	1,242	4,187	3,850
1990	996	1,255	742	.	2,993	1,067	4,060	3,850
1991	904	2,054	825	.	3,783	599	4,382	3,850
1992	891	2,187	706	10	3,794	348	4,142	3,500
1993	917	1,907	610	13	3,447	1,064	4,511	3,200
1994	940	2,001	701	15	3,657	984	4,641	3,800
1995	817	2,248	669	9	3,743	840	4,583	3,800
1996	899	2,335	877	.	4,111	914	5,025	3,500
1997	1,306	1,609	933	.	3,848	1,135	4,983	5,230
1998	541	1,703**	803	.	3,047	647	3,694	5,230
1999	880	2,239**	769	.	3,888	350	4,238	4,700
2000	1,021	2,171	621	.	3,813	-164	3,649	4,100
2001	1,313	2,436	816	.	4,565	-215	4,350	4,600

* Unallocated mainly due to misreporting.
** Preliminary.

Table 3.6.2.2 Sole in Division VIId (Eastern Channel)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-8
1982	12991	7779	3190	0.3504
1983	21786	9542	3458	0.3989
1984	22175	8991	3575	0.4101
1985	13505	10045	3837	0.3191
1986	26959	10641	4024	0.3880
1987	11572	9576	4974	0.6072
1988	27065	10552	3982	0.4212
1989	17148	8289	4187	0.5801
1990	45403	9859	4060	0.4138
1991	35909	8890	4382	0.4411
1992	35104	11241	4142	0.3672
1993	17275	13274	4511	0.3165
1994	27367	13121	4643	0.3623
1995	21096	11208	4583	0.3801
1996	21510	12435	5025	0.4777
1997	33786	10505	4983	0.6202
1998	19934	8603	3694	0.4747
1999	33349	9636	4238	0.5594
2000	56686	9707	3649	0.4530
2001	26084	10472	4350	0.3397
2002	23054	14800		
Average	26179	10436	4174	0.4340

3.6.3 Plaice in Division VIId (Eastern Channel)

State of stock/exploitation: The stock is outside safe biological limits. SSB in 2002 is estimated to be below the proposed $\mathbf{B}_{pa}$, and has fluctuated near this level since 1992. Fishing mortality in 2001 is estimated to be above $\mathbf{F}_{pa}$.

Management objectives: No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to reduce or maintain F below the proposed $\mathbf{F}_{pa}$ and to increase or maintain the spawning stock biomass above the proposed $\mathbf{B}_{pa}$.

Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 5 600 t, the lowest observed biomass.	$\mathbf{B}_{pa}$ be set at 8 000 t. This affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of the assessment.
$\mathbf{F}_{lim}$ is 0.54, the fishing mortality estimated to lead to stock collapse.	$\mathbf{F}_{pa}$ be set at 0.45. This F is considered to provide approximately 95 % probability of avoiding $\mathbf{F}_{lim}$, taking into account the uncertainty of the assessment.

Technical basis:

$\mathbf{B}_{lim}$: $\mathbf{B}_{loss}$: 5 600 t.	**$\mathbf{B}_{pa}$: 1.4 $\mathbf{B}_{lim}$: 8 000 t.**
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$: 0.54	**$\mathbf{F}_{pa}$: 5th % of $\mathbf{F}_{loss}$; B*>$\mathbf{B}_{pa}$ and P($\mathbf{SSB}_{MT}$<$\mathbf{B}_{pa}$)<10 %:0.45**

B* is equilibrium SSB at $\mathbf{F}_{pa}$.

Advice on management: ICES recommends that fishing mortality in 2003 be reduced to less than the proposed $\mathbf{F}_{pa}$ (0.45), corresponding to landings in 2003 of less than 5 300 t.

Relevant factors to be considered in management: The TAC is set for Divisions VIId and VIIe combined. Managers should consider restrictions on where catches should be taken. The plaice stock in VIId is harvested in a mixed fishery with sole in VIId, and the advice given for the two stocks is broadly consistent.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$(99-01, scaled) = 0.48; Landings(2002) = 4.8; SSB(2003) = 7.2.

F(2003 onwards)	Basis	Landings (2003)	SSB (2004)
0	0*$\mathbf{F}_{sq}$	0.7	14.0
0.05	0.1*$\mathbf{F}_{sq}$	1.3	13.4
0.1	0.2*$\mathbf{F}_{sq}$	1.9	12.8
0.14	0.3*$\mathbf{F}_{sq}$	2.4	12.2
0.19	0.4*$\mathbf{F}_{sq}$	3.0	11.7
0.24	0.5*$\mathbf{F}_{sq}$	3.5	11.2
0.29	0.6*$\mathbf{F}_{sq}$	4.0	10.7
0.34	0.7*$\mathbf{F}_{sq}$	4.5	10.3
0.39	0.8*$\mathbf{F}_{sq}$	4.9	9.8
0.43	0.9*$\mathbf{F}_{sq}$	5.0	9.4
0.45	$\mathbf{F}_{pa}$=0.93*$\mathbf{F}_{sq}$	5.3	9.3
0.48	1*$\mathbf{F}_{sq}$	5.8	9.0
0.53	1.1*$\mathbf{F}_{sq}$	6.1	8.7
0.58	1.2*$\mathbf{F}_{sq}$	0.7	8.3

Weights in ‘000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: No medium- and long-term projections have been done.

Comparison with previous assessment and advice. The current assessment deviates from the previous assessment for the most recent years. SSB is now estimated to be lower and F to be higher. The main reasons for this change are a revision of stock weights and the uncertainty in the calibration data that is used in this assessment. The revision of stock weights is also responsible for the reclassification to outside safe biological limits in 2001.

Elaboration and special comments: In the Channel, plaice are taken mainly in a mixed flatfish fishery by otter and beam trawlers. There is a directed fishery in winter by French offshore otter trawlers. Large numbers of plaice are discarded, but are not included in the assessment.

There is a tendency to underestimate F and overestimate SSB in the assessment. SSB in 2002 and 2003 is mostly driven by the apparently strong 2000 year class, which is not well defined yet.

Multiannual TAC Arrangements and Recovery Plans: Section 3.5.17 reviewed a study on schemes for Multiannual advice on TACs for four plaice and two sole stocks. These studies indicated possible target fishing mortalities for specific TAC schemes. ICES considers that target values must be defined by management taking scientific studies into account. ICES has not received feed-back with specification of target reference points and therefore continues to provide advice based on the precautionary reference points consistent with previous practice.

The analytical assessment uses CPUE data from 3 commercial fleets and 3 surveys.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 11 – 20 June 2002 (ICES CM 2003/ACFM: 02).

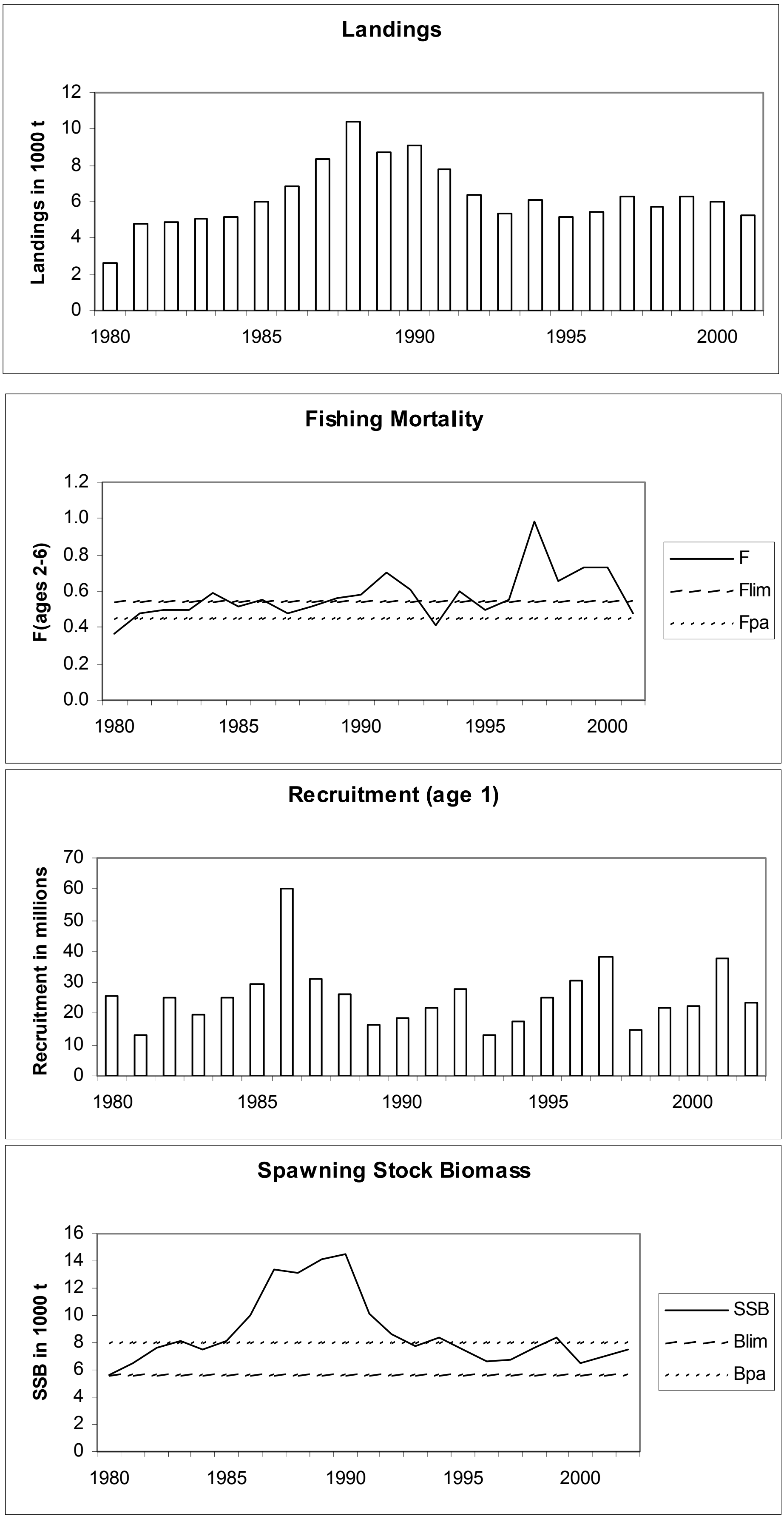
Yield and spawning biomass per Recruit F-reference points:

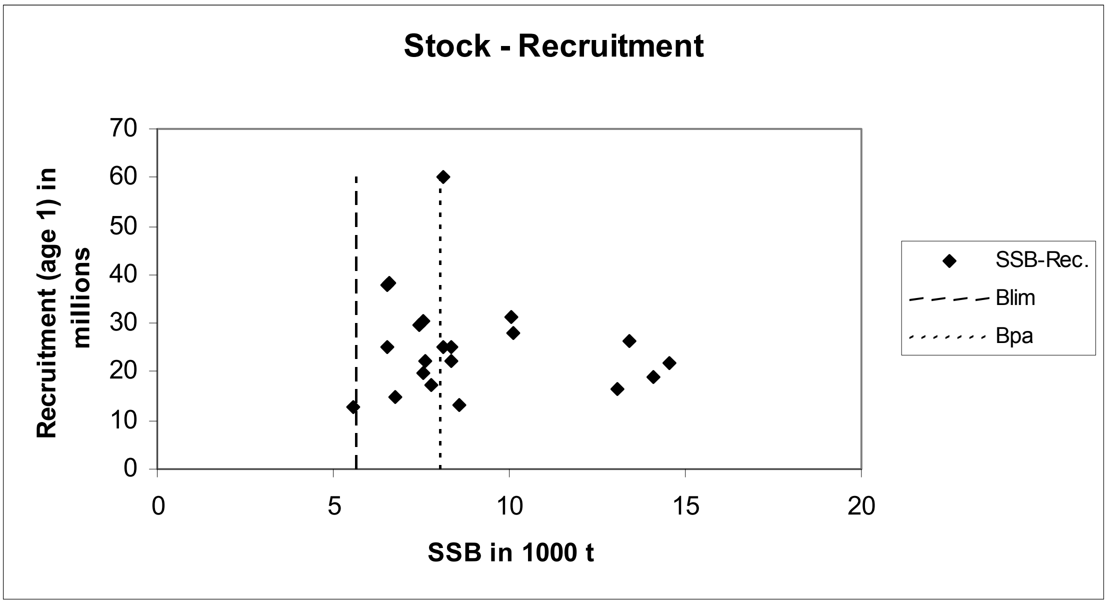
	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.572	0.260	0.443
$\mathbf{F}_{max}$	0.195	0.296	1.533
$\mathbf{F}_{0.1}$	0.113	0.276	2.670
$\mathbf{F}_{med}$	0.554	0.252	0.361

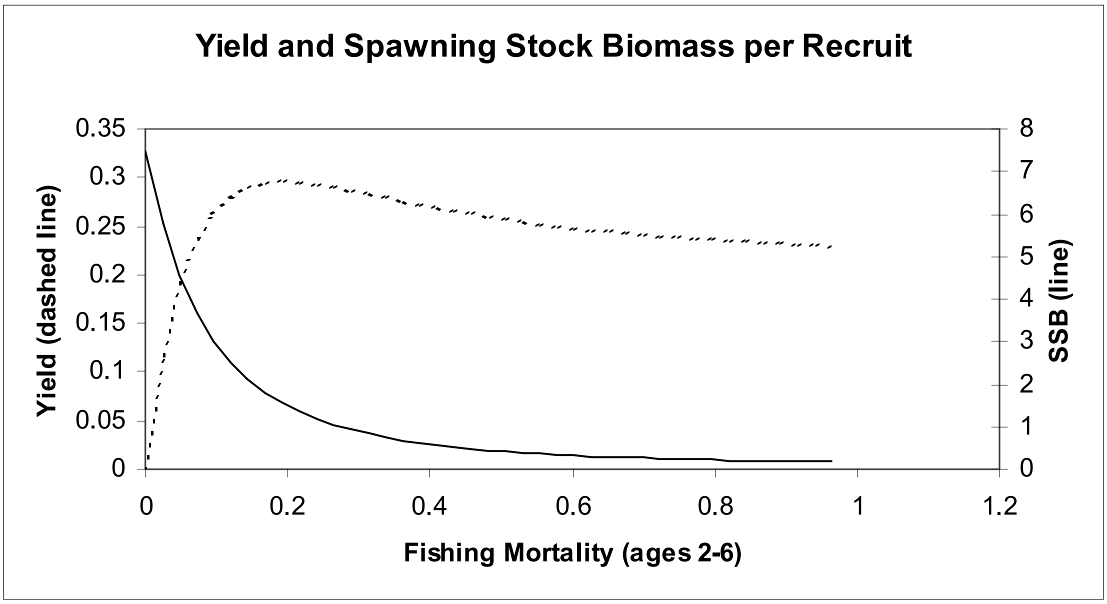
Catch data (Tables 3.6.3.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official landings	ACFM landings
1987	Precautionary TAC[1]	6.8[1]	8.3	7.9	8.4
1988	Precautionary TAC[1]	6.9[1]	9.96	9.1	10.4
1989	No increase in effort[1]	11.7[1]	11.7	6.7[2]	8.8
1990	No increase in F; TAC	10.7[1]	10.7	7.8[2]	9.0
1991	TAC	8.8[1]	10.7	7.4[2]	7.8
1992	*Status quo* F gives mean SSB	7.6[3]	9.6	6.2	6.3
1993	Within safe biological limits	6.4[3]	8.5	4.8	5.3
1994	No long-term gains in increased F	-	9.1	5.6	6.1
1995	No increase in F	5.6	8.0	4.6	5.1
1996	No long-term gains in increasing F	6.5	7.53	4.6	5.4
1997	No advice	-	7.09	5.3	6.3
1998	Reduce F in 98 by 30% from 96 value	4.3	5.7	4.8	5.8
1999	Fishing at $\mathbf{F}_{pa}$	6.3	7.4	5.4	6.3
2000	Fishing at $\mathbf{F}_{pa}$	4.9	6.5	5.6	6.0
2001	Fishing at $<\mathbf{F}_{pa}$	<4.4	6.0	5.3	5.3
2002	Fishing at $<\mathbf{F}_{pa}$	<5.8	6.7		
2003	Fishing at $<\mathbf{F}_{pa}$	<5.3			

[1]TACs for Divisions VIId,e. [2]For France Division VIId landings are estimated by ICES from combined VIId,e landings.
[3] Catch at *status quo* F. Weights in ‘000 t.


Landings
Landings in 1000 t
0
2
4
6
8
10
12
1980
1985
1990
1995
2000
Fishing Mortality
F(ages 2-6)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
F
Flim
Fpa
Recruitment (age 1)
Recruitment in millions
0
10
20
30
40
50
60
70
Spawning Stock Biomass
SSB in 1000 t
0
2
4
6
8
10
12
14
16
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-6)

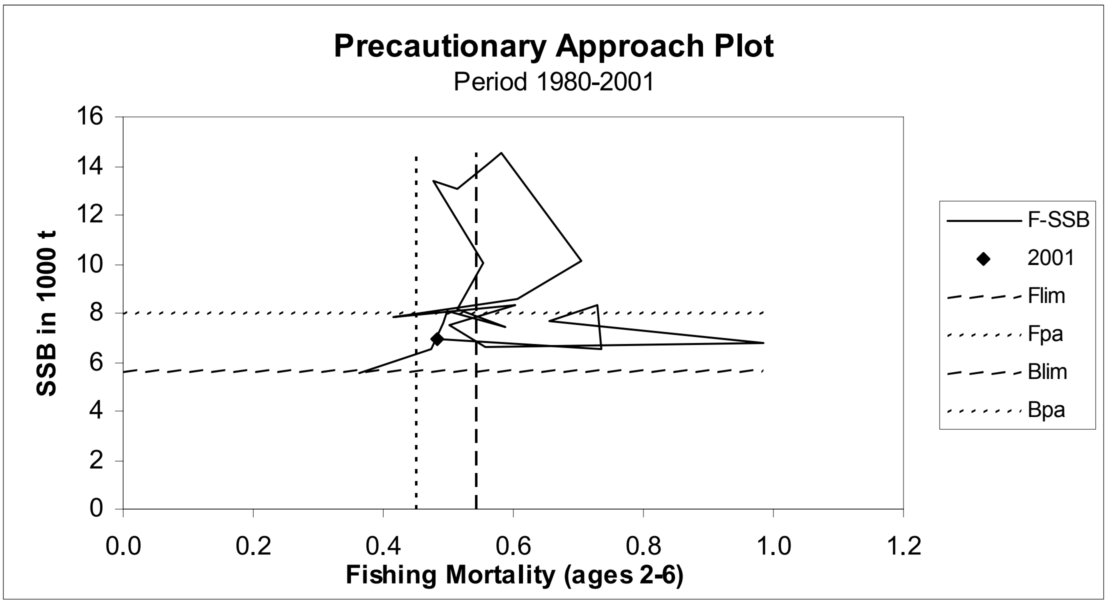

Precautionary Approach Plot
Period 1980-2001
SSB in 1000 t
Fishing Mortality (ages 2-6)
F-SSB
2001
Flim
Fpa
Blim
Bpa

Table 3.6.3.1 Plaice in Division VIId (Eastern Channel). Nominal landings (tonnes) as officially reported to ICES.

Year	Belgium	Denmark	France	UK (E&W)	Others	Total reported	Un-allocated	Total as used by WG
1976	147	1 [1]	1,439	376	-	1,963	-	1,963
1977	149	81 [2]	1,714	302	-	2,246	-	2,246
1978	161	156 [2]	1,810	349	-	2,476	-	2,476
1979	217	28 [2]	2,094	278	-	2,617	-	2,617
1980	435	112 [2]	2,905	304	-	3,756	-1,106	2,650
1981	815	-	3,431	489	-	4,735	34	4,769
1982	738	-	3,504	541	22	4,805	60	4,865
1983	1,013	-	3,119	548	-	4,680	363	5,043
1984	947	-	2,844	640	-	4,431	730	5,161
1985	1,148	-	3,943	866	-	5,957	65	6,022
1986	1,158	-	3,288	828	488 [2]	5,762	1,072	6,834
1987	1,807	-	4,768	1,292	-	7,867	499	8,366
1988	2,165	-	5,688 [2]	1,250	-	9,103	1,317	10,420
1989	2,019	-	3,265 [1]	1,383	-	6,667	2,091	8,758
1990	2,149	-	4,170 [1]	1,479	-	7,798	1,249	9,047
1991	2,265	-	3,606 [1]	1,566	-	7,437	376	7,813
1992	1,560	1	3,099	1,553	19	6,232	105	6,337
1993	877	+ [2]	2,792	1,075	27	4,771	560	5,331
1994	1,418	+	3,199	993	23	5,633	488	6,121
1995	1,157	-	2,598 [2]	796	18	4,569	561	5,130
1996	1,112	-	2,630 [2]	856	-	4,598	795	5,393
1997	1,161	-	3,077	1,078	-	5,316	991	6,307
1998	854	-	3,276 [2,3]	700	-	4,830	932	5,762
1999	1,306	-	3,388 [2,3]	743	-	5,437	889	6,326
2000	1,315	-	3,513 [2]	752	-	5,580	434	6,014
2001	1,346	-	3,265 [2]	655	+	5,266	-	5,266

[1]Estimated by the Working Group from combined Division VIId,e. [2]Includes Division VIIe.
[3]Provisional.

Table 3.6.3.2 Plaice in Division VIId (Eastern Channel)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-6
1980	25536	5584	2650	0.3632
1981	12863	6558	4769	0.4743
1982	25201	7574	4865	0.4935
1983	19917	8122	5043	0.4995
1984	25025	7453	5161	0.5869
1985	29678	8130	6022	0.5148
1986	60223	10047	6834	0.5548
1987	31260	13394	8366	0.4762
1988	26464	13077	10420	0.5150
1989	16293	14115	8758	0.5641
1990	18828	14549	9047	0.5811
1991	21713	10101	7813	0.7033
1992	27942	8564	6337	0.6048
1993	13212	7800	5331	0.4161
1994	17281	8333	6121	0.6033
1995	25073	7538	5130	0.5009
1996	30481	6577	5393	0.5561
1997	38310	6783	6307	0.9843
1998	14818	7640	5762	0.6548
1999	22044	8363	6326	0.7288
2000	22317	6512	6015	0.7359
2001	37774	6966	5266	0.4823
2002	23427	7230		
Average	25464	8751	6261	0.5725

3.7 Stocks in Sub-area VI

3.7.1 Overview

Fisheries

To a large extent, the roundfish fishery in Division VIa is an extension of the similar fishery in the North Sea. The demersal fisheries in Division VIa are predominantly conducted by otter trawlers fishing for cod, haddock, anglerfish, and whiting, with by-catches of saithe, megrim, and lemon sole. Since 2001, these trawlers have adopted mesh sizes of 100–120 mm and other gear modifications depending on the requirements of recent EU technical conservation regulations and national legislation. These measures are aimed at reducing the considerable rates of discarding of young fish, particularly haddock and whiting that have been observed on vessels using 80-100 mm mesh trawls. The majority of the vessels in the demersal fishery are locally-based Scottish trawlers using 'light-trawls', but trawlers from Ireland, Northern Ireland, England, France, and Germany also participate in this fishery. The importance of Scottish seiners essentially targeted at haddock has been declining in recent years as many of these vessels have been converted to trawlers. A part of the fleet of light trawlers has diversified into a fishery for anglerfish that has been expanding into deeper water off the northern coast of Scotland. By-catches in this fishery include megrim and cod.

The larger Scottish trawlers and Irish trawlers fish for haddock at Rockall when opportunities arise for good catches from the Division VIb stock. Vessels from the Russian federation have fished for haddock and other demersal species at Rockall since 1999 when part of the Bank was designated as being in international waters. Although young saithe are caught by coastal trawlers in Subarea VI, the fishery for saithe essentially takes place on the shelf edge to the west and northwest of Scotland. Traditionally, this fishery has largely been operated by the larger deep-sea French trawlers. However, the number of these vessels has declined in recent years. Since the late 1980s, some of these vessels diverted their activity toward deep-sea species, notably orange roughy, and some medium-sized trawlers also participate in the fishery for deep-sea species during summer in some years.

Some 200 Scottish trawlers also take part in fisheries for *Nephrops* on inshore grounds. Some use 70 mm mesh with an 80 mm square mesh panel, but others use 100 mm mesh to avoid the by-catch limitations associated with the smaller mesh size. These boats also land small quantities of haddock, cod, whiting, and small saithe, but discard large amounts of whiting and haddock.

The pelagic fishery for herring is mainly operated by UK, Dutch, and German vessels in the north, and by Irish vessels in a roe fishery in the south. Substantial misreporting of catches from the North Sea and between the northern and southern stocks occurred in the past, but UK licensing regulations are thought to have reduced misreporting since 1997. In recent years TACs for the northern stock have not been restrictive, presumably because of low effort and a weak market. The Clyde herring fishery has declined sharply in recent years as the stock has suffered from a series of low recruitments. Recent TACs have not been taken and the catches have been less than 1 000 t since 1991.

There is a directed trawl fishery for mackerel and horse mackerel in the area. The mackerel fishery mainly takes place in the fourth and first quarter of the year, when the mackerel is returning from the feeding area to the spawning area. The horse mackerel is mainly fished in the second half of the year. In addition, there are fisheries for blue whiting in the area.

The industrial fisheries in Division VIa are much smaller than in the North Sea. The Scottish sandeel fishery started in the early 1980s, peaking in 1986 and 1988. It is irregular, depending on the availability of the resource and of processing facilities at Shetland, Denmark, and the Faroes. By-catches in this fishery are very small. The Norway pout fishery is conducted mainly by Danish vessels.

State of stocks

The assessments of demersal and herring stocks in Subarea VI continued to be hampered by the poor quality of catch data due to misreporting, although this has become less of a problem for roundfish species in recent years. Quantities misreported during 1992-1995 were estimated for Division VIa cod, and estimates of area misreporting since 1987 were made for anglerfish and megrim. The distribution of reported catch data were also examined to estimate the likely extent of misreporting of herring between the North Sea and Division VIa North.

It is likely that the stocks of haddock, saithe, anglerfish, and megrim in Division VIa are closely related to those of the same species in the North Sea. The saithe stock is now assessed as part of the North Sea stock, and the pattern of haddock recruitment in the two areas is very similar. The assessment of anglerfish now treats the catches from Division VIa and the North Sea as coming from a single stock.

All roundfish stocks in Subarea VI are outside safe biological limits and ICES advice points to the need of reducing fishing mortality in the relevant fisheries.

The stock of cod is outside safe biological limits and the spawning stock sizes in 2000 and 2001 are the smallest recorded. Analysis indicates that with the current rates of exploitation it is very unlikely to achieve safe limits in the medium term. Due to the poor state of the cod in Division VIa, emergency measures were enacted by the EU for 2001 and 2002 prior to the agreement and implementation of a five-year cod recovery plan that was intended to start in 2002. The principal regulatory measure for 2001 and 2002, other than the TAC, was the establishment of three controlled areas from 6 March – 30 April 2001. The regulations sought to minimise cod catches, but also to minimise the effect of the measures on certain pelagic and shellfish fisheries. Consequently, derogations existed for: purse seine and pelagic trawls targeting pelagic fish species; dredges, pots and creels; and for the inner Clyde area, *Nephrops* trawls. The aim of the controlled areas was to allow as many cod as possible to spawn before the end of April when the spawning season finishes (Commission Regulation (EC) No. 456/2001). Consequently, the regulation targeted areas where high catch rates of cod are usually experienced during March and April. The controlled areas were not defined for the purposes of regulating fishing effort on the cod stock in this area. No measures were applied to regulate effort displaced during the period of the control.

The haddock spawning stock in Division VIa fell below $\mathbf{B}_{pa}$, in 2000, but has increased above B_{pa} from 2001 onwards because of a very strong 1999 year class, which is also expected to dominate catches in the short term. Fishing mortality remains above $\mathbf{F}_{pa}$. The spawning biomass in Division VIb has declined continuously since 1995 and has been below $\mathbf{B}_{pa}$ since 2000, whilst fishing mortality has increased above $\mathbf{F}_{pa}$ in recent years.

The whiting stock in Division VIa is outside safe biological limits. Spawning biomass declined to the lowest recorded in 2000, well below $\mathbf{B}_{pa}$, whilst fishing mortality has been above $\mathbf{F}_{pa}$ in all years since 1983.

There are indications that fishing mortality on anglerfish may not be sustainable in the long term. The fish are exploited at an early age due to their size and shape, and are subject to considerable fishing mortality prior to first maturity. The expansion of this fishery has been further accelerated by the diversion of fishing effort from other stocks subject to more restrictive quotas in recent years and by market opportunities. Trends in fishing mortality on megrim are poorly defined, and high rates of discarding have been observed in some fisheries. Megrim are taken as a by-catch in the anglerfish fishery and show similar trends in landings to anglerfish. Recent studies have shown that male megrim attain a much smaller maximum size than females which consequently make up the bulk of the landed catch.

The assessment of the stock of herring in Division VIa North is less uncertain than in previous years, reflecting the stability of the input data over the last two or three years. The fishing mortality is at present considered to be low. SSB is believed to have risen recently due to a good year class that entered the fishery in 2001 and an increase in the proportion mature. However, reference points have not been set so far. The state of the herring stock in Division VIa South is uncertain and the fishery appears to be dependent on occasional strong year classes. There are indications that this stock may have declined considerably in recent years, and that levels of fishing mortality may be comparatively high. There is evidence that the Clyde herring stock remains low.

When last assessed (in 1996) the level of exploitation on sandeel was moderate and the SSB of this stock appears to be high. The stock is, however, subject to large variations depending on recruitment. Precautionary management has been put in place on a three-year basis, including a TAC and fishery closures after 31 July each year, in order to reduce the interaction with breeding seabirds.

The fisheries for mackerel and horse mackerel exploit the southern and western components of mackerel and the western horse mackerel stock. Information on these widely distributed stocks is presented in Section 3.12. The mackerel stock is harvested outside safe biological limits: the spawning biomass is well above $\mathbf{B}_{pa}$, but fishing mortality is above $\mathbf{F}_{pa}$. Following the outstanding 1982 year class of horse mackerel, which for more than a decade contributed a significant part of the catches, recruitment of horse mackerel has been weak. SSB is bound to be low as this year class is fished out, and the sustainable yield is unlikely to be higher than about 130 000 t per year.

The *Nephrops* stocks are assessed every two years. The overall catches of *Nephrops* from Division VIa North have remained stable since the mid-1980s, and catch-rates of the different stocks have fluctuated without trend.

3.7.2 Cod

3.7.2.a Cod in Division VIa (West of Scotland)

State of stock/exploitation: The stock remains outside safe biological limits. Fishing mortality has been above $\mathbf{F}_{pa}$ in all years since 1976 and above $\mathbf{F}_{lim}$ from 1983 to 2000. SSB has been declining since the early 1980s and the estimates for 2000 and 2001 are the lowest recorded, well below $\mathbf{B}_{pa}$ and $\mathbf{B}_{lim}$. At the average rate of exploitation estimated for recent years, the chance of continued poor recruitment is high. In the last ten years, only one year class has been above average and the four poorest year classes have been recruited since 1995.

Management objectives: Due to the poor state of the cod stock in Division VIa, emergency measures were enacted by the EU for 2001 prior to the agreement and implementation of a five-year cod recovery plan to start in 2002.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 14 000 t.	$\mathbf{B}_{pa}$ be set at 22 000 t. This is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments. This also corresponds with the lowest range of SSB during the earlier, more productive, historical period.
$\mathbf{F}_{lim}$ is 0.8. Fishing mortalities above this have historically led to stock decline.	$\mathbf{F}_{pa}$ be set at 0.60. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$.

Technical basis:

$\mathbf{B}_{lim}$ = smoothed estimate of $\mathbf{B}_{loss}$ (as enumerated in 1998).	$\mathbf{B}_{pa}$ = previously set at 25 000 t at which good recruitment is probable. Reduced to 22 000 t due to an extended period of stock decline.
$\mathbf{F}_{lim}$ = F's above 0.8 have led to stock decline in the early 1980's.	$\mathbf{F}_{pa}$ consistent with $\mathbf{B}_{pa}$.

Advice on management: Given the very low stock size, the recent poor recruitments, and continued high fishing mortality despite management efforts to promote stock recovery, ICES recommends a closure of all fisheries for cod as a targeted species or by-catch. In fisheries where cod comprises solely an incidental catch there should be stringent restrictions on the catch and discard rates of cod, with effective monitoring of compliance with those restrictions.

These and other measures that may be implemented to promote stock recovery should be kept in place until there is clear evidence of the recovery of the stock to a size associated with a reasonable probability of good recruitment and there is evidence that productivity has improved. The current SSB is so far below historic stock sizes that both the biological dynamics of the stock and the operations of the fisheries are unknown, and therefore historic experience and data are not considered a reliable basis for medium-term forecasts of stock dynamics under various rebuilding scenarios.

Relevant factors to be considered in management: Although large short-term losses will be incurred in many Division VIa fisheries, the advised measures are required if the cod stock is to reach a level where it can regain historic productivity. The advice will likely result in greatly reduced harvesting of other stocks where the fisheries take cod as part of a mixed species fisheries, particularly haddock and whiting. However, the current state of the cod stock, and the failure of past measures to bring fishing mortality down to rates that allow rebuilding, mean that more stringent action is required.

Time and area closures for particular fisheries may be a tool in rebuilding this stock, and their effect can be considered in evaluating harvest opportunities for other species.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for other species down to near zero, then these programs could be considered in management of such fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their catches of cod are fully and credibly reported.

The EC regulation No. 456/2001 of the Commission targeted areas where high catch rates of cod are usually experienced during March and April. The controlled areas were not defined for the purposes of regulating fishing effort on the cod stock in this area. No measure was applied to regulate effort displaced during the period of the control. It is unlikely that the controlled areas in Division VIa will significantly have affected fishing mortality on cod in 2001. Observer trips since 1978 have given very variable estimates of discard rates, mainly at age 1 but with significant quantities at age 2 in some years. The estimate of discards for 1-year-olds in 2000 (1999 year class) was comparatively large.

Even with no directed harvest or by-catch of cod in 2003,

SSB is forecasted in the short term to remain below $\mathbf{B}_{pa}$ and $\mathbf{B}_{lim}$. All possible measures should be considered for implementation in the recovery plan. Fishing effort displaced due to the cod rebuilding plan in Division VIIa, should not be permitted to target cod in Division VIa, or any other stocks considered to be outside safe biological limits.

Cod is taken with whiting and haddock in a mixed demersal fishery. *Nephrops* trawlers take a by-catch of cod. Management needs to take this into account.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$ = F(01) = 0.61; Landings (2002) = 3.18 ; SSB(2003) = 6.73

F(2003 onwards)	Basis	Catch (2003)	Landings (2003)	SSB (2004)	Probability (%)SSB < $\mathbf{B}_{pa}$ in 2004	Probability (%)SSB < $\mathbf{B}_{pa}$ in 2011
0	0.0* $\mathbf{F}_{sq}$	0	0	13.5	> 50%	<25%
0.12	0.2*$\mathbf{F}_{sq}$	0.9	0.9	12.3	90%	<25%
0.24	0.4*$\mathbf{F}_{sq}$	1.8	1.8	11.1	>90%	<25%
0.37	0.6*$\mathbf{F}_{sq}$	2.5	2.5	10.1	>90%	<25%
0.41	0.67*$\mathbf{F}_{sq}$ 45% SSB increase	2.7	2.7	9.8	>90%	25%
0.49	0.8*$\mathbf{F}_{sq}$	3.2	3.2	9.2	>90%	40%
0.54	0.89*$\mathbf{F}_{sq}$ 30% SSB increase	3.5	3.5	8.8	>90%	50%
0.61	$\mathbf{F}_{sq}$[1)]	3.8	3.8	8.3	>90%	50 - 90%

[1] $\mathbf{F}_{pa}$ = 0.60

Weights in '000 t.

Shaded scenarios considered inconsistent with a precautionary approach.

Medium- and long-term projections: Although the short-term forecast suggests some improvement in SSB, medium-term analyses indicate that with the current rates of exploitation, there remains a high probability that it will remain below $\mathbf{B}_{pa}$.

Comparison with previous assessment and advice: The estimate of F for 2000 is 8% lower, and SSB in 2001 the same, as given in last year's assessment. Previous assessments of this stock have shown a tendency to underestimate fishing mortality in the last year. It is possible that the sharp decline in the estimate of fishing mortality from 2000 to 2001, given by the present assessment, is a further manifestation of this bias.

Elaboration and special comment: The directed fishery consists mainly of Scottish vessels using towed gears. Since 1976, effort by Scottish heavy trawl and seine effort has decreased, whilst that of light trawlers has generally increased, particularly in more offshore areas.

Immature cod in Division VIa are subject to high fishing mortality. The fish are not fully mature until age group 4, increasing the susceptibility of the stock to collapse.

Analytical assessment is based on landings-at-age and survey CPUE data. Although data on discarding are available, the estimates are extremely variable and there is a need to carefully examine the sensitivity on the assessment before these data can be included. Discard data have not been taken into account in the assessment model and the youngest age groups are therefore likely underestimated. The quantities of fish mis-reported during 1992–1995 are estimated in the assessment, but the true quantities caught in those years remain uncertain.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

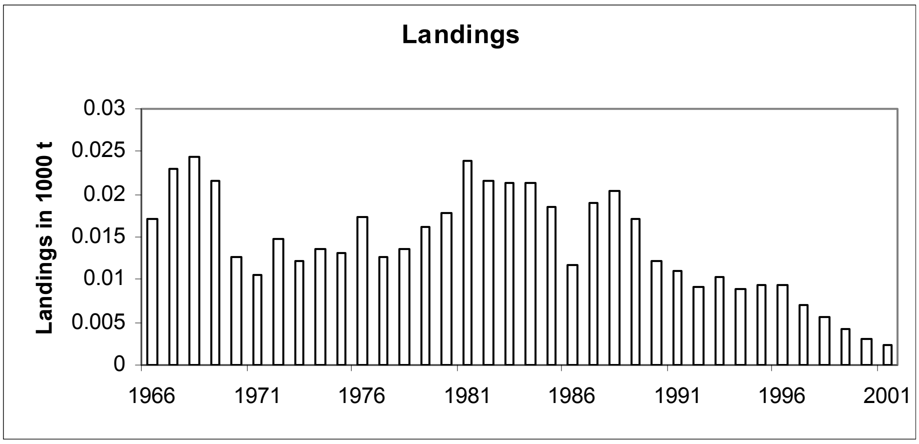
Yield and spawning biomass per Recruit
F-reference points:

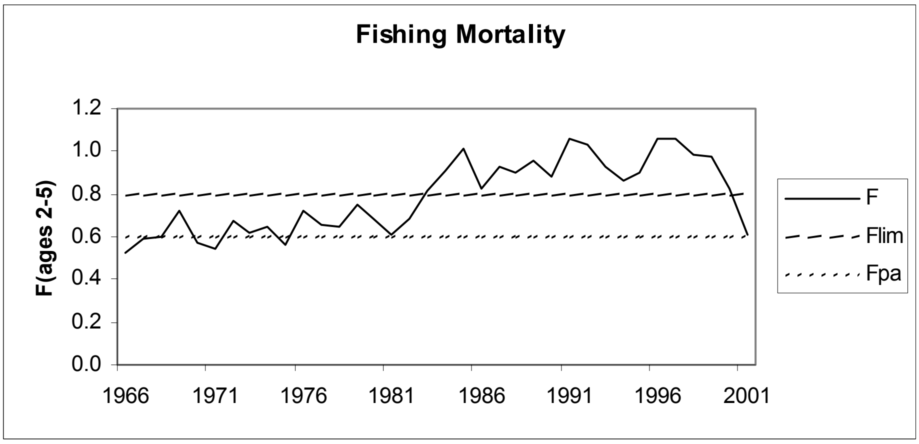
	Fish Mort Ages 2-5	Yield/R	SSB/R
1999-2001 mean	0.787	1.380	2.654
$\mathbf{F}_{max}$	0.267	1.631	6.898
$\mathbf{F}_{0.1}$	0.163	1.531	10.391
$\mathbf{F}_{med}$	0.641	1.354	2.483

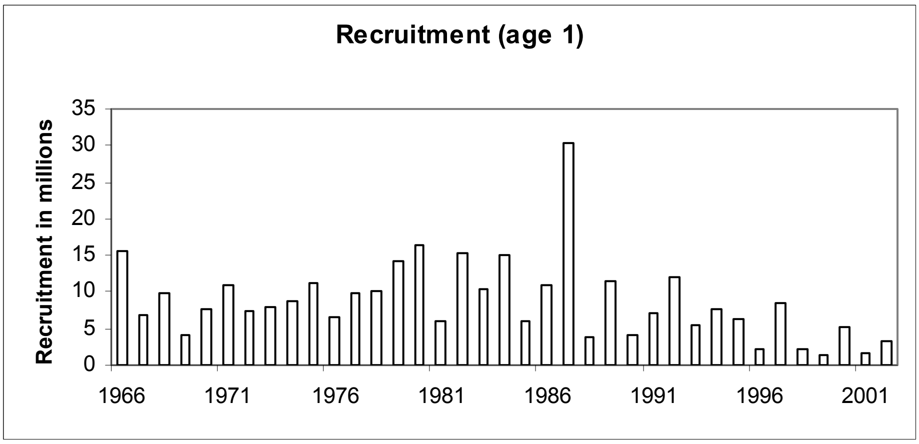
Catch data (Tables 3.7.2.a.1-2):

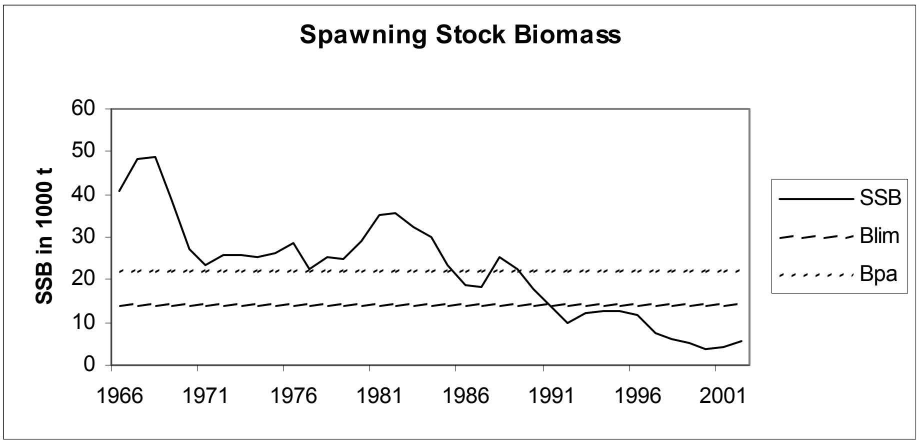
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official landings	ACFM landings
1987	Reduce F towards $\mathbf{F}_{max}$	18.0	22.0	19.2	19.0
1988	No increase in F; TAC	16.0	18.4	19.2	20.4
1989	80% of F(87); TAC	16.0	18.4	15.4	17.2
1990	80% of F(88); TAC	15.0	16.0	11.8	12.2
1991	70% of effort (89)	-	16.0	10.6	10.9[2]
1992	70% of effort (89)	-	13.5	9.0	9.3[3]
1993	70% of effort (89)	-	14.0	10.5	10.8[3]
1994	30% reduction in effort	-	13.0	9.1	10.1[3]
1995	Significant reduction in effort	-	13.0	9.6	9.6[3]
1996	Significant reduction in effort	-	13.0	9.6	9.4
1997	Significant reduction in effort	-	14.0	7.0	7.0
1998	20% reduction in F	9.5[5]	11.0	5.7	5.7
1999	F reduced to below $\mathbf{F}_{pa}$	<9.7[5]	11.8	4.3	4.2
2000	Recovery plan, 60 % reduction in F	<4.2	7.48	2.8[4]	3.1
2001	Lowest possible F, recovery plan	-	3.7	2.5	2.3
2002	Recovery plan or lowest possible F	-	4.6		
2003	Closure	-			

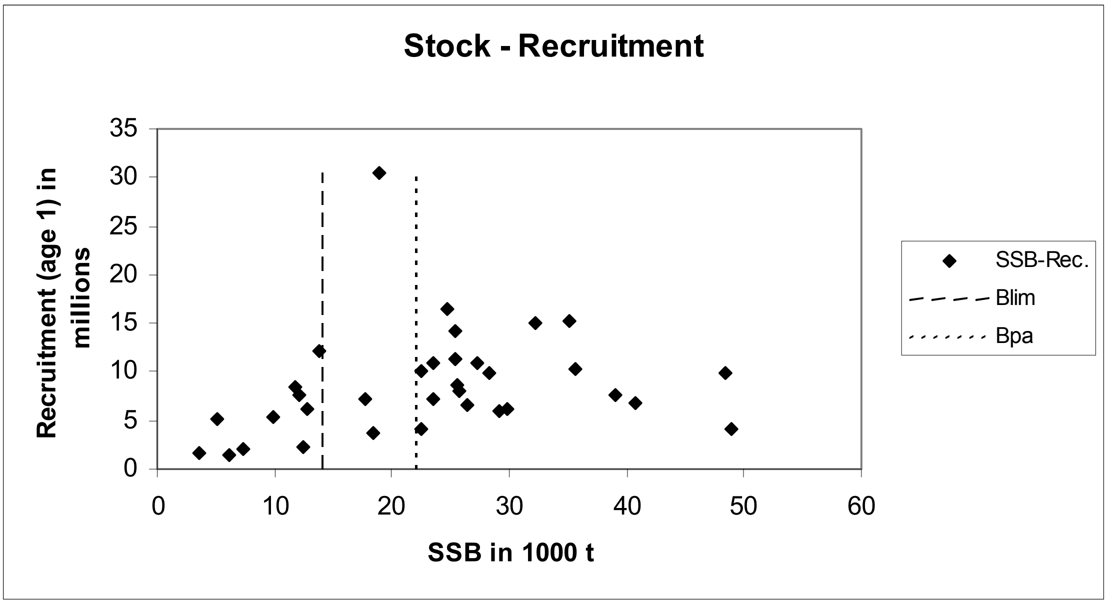
[1]TAC is for the whole of Subareas Vb1, VI, XII and XIV. [2]Not including mis-reporting. [3]Including ACFM estimates of mis-reporting. [4]Incomplete data. [5]For VIa only. Weights in '000 t.

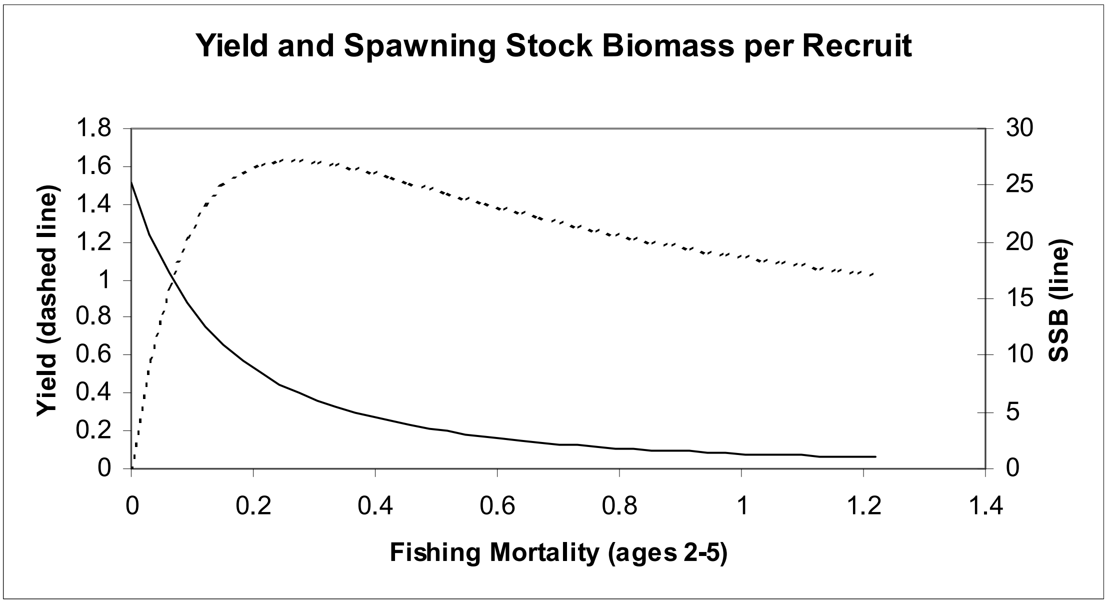

Landings
Landings in 1000 t
0.03
0.025
0.02
0.015
0.01
0.005
0
1966
1971
1976
1981
1986
1991
1996
2001


Fishing Mortality
F(ages 2-5)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1966
1971
1976
1981
1986
1991
1996
2001
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
35
30
25
20
15
10
5
0
1966
1971
1976
1981
1986
1991
1996
2001


Spawning Stock Biomass
SSB in 1000 t
60
50
40
30
20
10
0
1966
1971
1976
1981
1986
1991
1996
2001
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-5)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
5
10
15
20
25
30

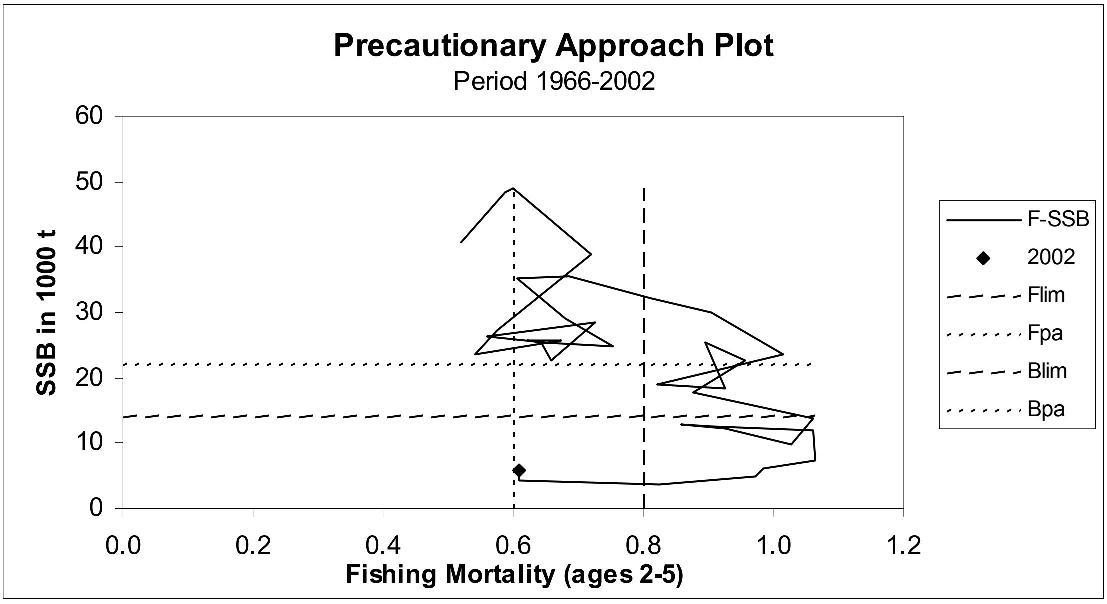

Precautionary Approach Plot
Period 1966-2002
SSB in 1000 t
Fishing Mortality (ages 2-5)
F-SSB
2002
Flim
Fpa
Blim
Bpa
0
10
20
30
40
50
60
0.0
0.2
0.4
0.6
0.8
1.0
1.2

Table 3.7.2.a.1 Nominal landings of COD in Division VIa, 1984–2001, as officially reported to ICES.

	1984	1985	1986	1987	1988	1989	1990	1991	1992
Belgium	22	48	88	33	44	28	-	6	-
Denmark	-	-	-	4	1	3	2	2	3
Faroes Islands	-	-	-	-	11	26	-	-	-
France	7,637	7,411	5,096	5,044	7,669	3,640	2,220	2,503	1,957
Germany	75	66	53	12	25	281	586	60	5
Ireland	2,316	2,564	1,704	2,442	2,551	1,642	1,200	761	761
Netherlands	-	-	-	-	-	-	-	-	-
Norway	231	204	174	77	186	207	150	40	171
Spain	64	28	-	-	-	85	-	-	-
UK (E. & W. & N.I.)	724	260	160	444	230	278	230	511	577
UK (Scotland)	9,483	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543
UK									
Total	20,552	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,017
Unallocated	720	-6	294	-228	1,231	1,743	399	293	240
As used by W.G.	21,272	18,607	11,820	18,971	20,413	17,169	12,176	10,927	9,257[1]

	1993	1994	1995	1996	1997	1998	1999	2000	2001*
Belgium	22	1	2	+	11	1	+	+	2
Denmark	2	+	4	2	-	+	+	-	-
Faroes Islands	-	-	-	-	-	-	-	n/a	-
France	3,047	2,488	2,533	2,253	956	714*	842*	310*	424
Germany	94	100	18	63	5	6	8	6	4
Ireland	645	825	1,054	1,286	708	478	223	n/a	319
Netherlands	-	-	-	-	2	1	-	-	
Norway	72	51	61	137	36	36	79	114	40
Spain	-	-	16	+	6	42	45	n/a	
UK (E. & W. & N.I.)	524	419	450	457	779	474	381	280	
UK (Scotland)	6,069	5,247	5,522	5,382	4,489	3,919	2,711	2,057	
UK									1679
Total	10,475	9,131	9,660	9,580	6,992	5,671	4,289	2,767	2,468
Unallocated	281	883	-38	-153	42	43	-88	349	-135
As used by W. G.	10,756[1]	10,014[1]	9,622[1]	9,427	7,034	5,714	4,201	3,116	2,333

* Preliminary.
[1] Estimated by TSA (2001 WG meeting).

Table 3.7.2.a.2 Cod in Division VIa (West of Scotland)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings[1)] tonnes	Mean F Ages 2-5
1966	15697	40676	17102	0.521
1967	6702	48353	22978	0.587
1968	9923	48931	24338	0.599
1969	4098	38957	21599	0.720
1970	7559	27216	12652	0.575
1971	10961	23524	10657	0.543
1972	7249	25821	14695	0.675
1973	8001	25568	12262	0.621
1974	8646	25382	13636	0.645
1975	11344	26448	13162	0.561
1976	6657	28366	17406	0.725
1977	9876	22547	12619	0.660
1978	10120	25328	13521	0.643
1979	14183	24694	16089	0.753
1980	16403	29172	17879	0.681
1981	6050	35075	23865	0.607
1982	15319	35615	21511	0.687
1983	10265	32215	21305	0.813
1984	14987	29890	21272	0.906
1985	6121	23596	18607	1.015
1986	10998	18858	11820	0.821
1987	30456	18385	18971	0.926
1988	3757	25327	20413	0.896
1989	11403	22542	17169	0.957
1990	4216	17786	12176	0.877
1991	7191	13777	10927	1.063
1992	12164	9913	9086	1.027
1993	5345	12098	10314	0.927
1994	7553	12866	8928	0.860
1995	6180	12479	9439	0.904
1996	2310	11827	9427	1.063
1997	8353	7313	7034	1.064
1998	2156	6113	5714	0.986
1999	1434	5035	4201	0.971
2000	5129	3596	2977	0.826
2001	1739	4331	2333	0.610
2002	3292	5844		0.610
Average	8752	22310	14113	0.782

[1)] Landings fitted by TSA value may differ slightly from values given in catch tables

3.7.2.b Cod in Division VIb (Rockall)

Catch data are given in Table 3.7.2.b.1.

Special comments: There is no information on the status of cod in Division VIb. Official catch data are incomplete.

Relevant factors to be considered in management: Due to the rapid decline in cod catches in Division VIa the official landings reported from this area now account for about 25 % of the catch in Subarea VI. TAC set for Division VIb cod should not jeopardise a rebuilding plan for cod in Division VIa nor management measures for haddock in this area.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2003 (ICES CM 2003/ACFM:04).

Table 3.7.2.b.1 COD in Division VIb (Rockall).

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992
Faroes Islands	18	-	1	-	31	5	-	-	-
France	9	17	5	7	2	-	-	-	-
Germany	-	3	-	-	3	-	-	126	2
Ireland	-	-	-	-	-	-	400	236	235
Norway	373	202	95	130	195	148	119	312	199
Portugal	-	-	-	-	-	-	-	-	-
Russia	-	-	-	-	-	-	-	-	-
Spain	241	1200	1219	808	1345	-	64	70	-
UK (E. & W. & N.I.)	161	114	93	69	56	131	8	23	26
UK (Scotland)	221	437	187	284	254	265	758	829	714
Total	1,023	1,973	1,600	1,298	1,886	549	1,349	1,596	1,176

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Faroes Islands	1	-	-	-	-	-	-	n/a	n/a
France	-	-	-	-	-	-	-	-	+
Germany	-	-	-	10	22	3	11	1	-
Ireland	472	280	477	436	153	227	148	119	n/a
Norway	199	120	92	91	55*	51*	85*	152*	164*
Portugal	-	-	-	-	5	-	-	-*	-
Russia	-	-	-	-	-	-	-	7*	26
Spain	-	-	2	5	1	6	4	3	
UK (E. & W. & N.I.)	103	25	90	23	20	32	22	4	
UK (Scotland)	322	236	370	210	706	341	389	286	
UK									178*
Total	1,097	661	1,031	775	962	660	659	572	358*

* Preliminary.

3.7.3 Haddock

3.7.3.a Haddock in Division VIa (West of Scotland)

State of stock/exploitation: This stock is harvested outside safe biological limits. Fishing mortality has been above $\mathbf{F}_{pa}$ in every year since 1987. SSB varied around $\mathbf{B}_{pa}$ during the 1990s, and reached a historic low at 60% of $\mathbf{B}_{pa}$ in 2000. The very strong 1999 year class, the 4th largest since 1965, has caused SSB to increase rapidly above $\mathbf{B}_{pa}$ in 2001 and 2002.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$= 22 000 t	$\mathbf{B}_{pa}$ be set at 30 000 t
$\mathbf{F}_{lim}$= not defined	$\mathbf{F}_{pa}$ be set at 0.50

Technical basis:

$\mathbf{B}_{lim}$ = lowest observed SSB	$\mathbf{B}_{pa} = \mathbf{B}_{lim}$*1.4
$\mathbf{F}_{lim}$ = not defined	$\mathbf{F}_{pa}$ = high probability of avoiding SSB<$\mathbf{B}_{pa}$ in the long term

Advice on management: Since haddock is mostly taken in demersal fisheries with cod, whiting, and in a directed *Nephrops* fishery, the advice for cod determines the advice for haddock. Unless ways to harvest haddock without by-catch or discards of cod can be demonstrated, fishing for haddock should not be permitted.

Relevant Factors: On the basis of the status of haddock alone, ICES would recommend that the fishing mortality be less than F = 0.50 (=$\mathbf{F}_{pa}$). This would correspond to landings of less than 15 800 t in 2003 and a reduction of fishing mortality of at least 20%. If any fisheries on haddock are permitted, despite the advice on cod and haddock, then total catches should not exceed these values.

The extent to which the cod-haddock-whiting fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for haddock down to near zero, then these programs could be considered in management of these fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring that their catches of cod are fully and credibly reported.

Fisheries targeting *Nephrops* may take a by-catch of haddock. In this case ICES notes that haddock may continue to be caught subject to existing EU regulations applying to *Nephrops* fisheries, and providing the catch of cod complies with the advice on cod.

Haddock, while a principal target for some fleets, are taken in a mixed roundfish fishery. This means it is important to take into account the impact of management of haddock on other stocks, notably cod and whiting. The reverse is, of course, also true. Recent measures to protect Division VIa cod, such as the closed area in 2001, and agreements to increase mesh size, will affect the haddock fishery. Improvements in selectivity related to measures to protect cod should, if effectively implemented, benefit the haddock fishery by reducing discards and increasing landings in the long term.

A high proportion (up to 50% in weight, 1991–2001) of the total haddock catch is discarded. Square mesh panels were introduced in UK fisheries in 2000 in an attempt to improve selectivity. The minimum mesh size for vessels fishing for cod in the mixed demersal fishery in EC Zones 1 and 2 (West of Scotland and North Sea excluding Skagerrak) was changed from 100 mm to 120 mm from the start of 2002 under EU regulations regarding the cod recovery plan (Commission Regulation EC 2056/2001), with a one-year derogation of 110 mm for vessels targeting other species, including haddock. If implemented effectively, these measures should help to improve gear selectivity and reduce discarding of haddock. Measures to control by-catch and discarding of cod should be implemented within any directed haddock fisheries.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$ = F(99–01) = 0.63; Catch(2002) = 28.8 ; Landings(2002) = 19.8; SSB(2003) = 48.1.

F(2003 onwards)[1]	Basis	Catch (2003)	Discards (2003)	Landings (2003)	SSB (2004)
0.25	0.4* $\mathbf{F}_{sq}$	11.5	2.6	8.9	52.8
0.38	0.6*$\mathbf{F}_{sq}$	16.4	3.8	12.6	47.6
0.50	$\mathbf{F}_{pa}$ (0.8* $\mathbf{F}_{sq}$)	20.7	4.9	15.8	42.9
0.63	$\mathbf{F}_{sq}$	24.6	5.9	18.7	38.8
0.76	1.2* $\mathbf{F}_{sq}$	28.1	6.8	21.3	35.1

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The basis for a single-stock fishery advice is the same as last year. The assessment of this stock shows a tendency for the fishing mortality estimates for the final year to be revised upwards when additional catch and survey data for the following year are included. The F for 2000 was estimated last year to be 0.63, and has been revised to 0.76 by the current assessment. The SSB estimate for 2001 has been revised downwards by 10%.

Elaboration and special comment: The fishery is dominated by Scottish light trawlers. Effort by Scottish seiners and heavy trawlers has declined since 1976. Haddock in Division VIa are fully exploited by age group 3, and also reach full maturity at that age. Immature fish are subject to comparatively high fishing mortality, and comprise a large fraction of the discarded catch. High fishing mortality on immature haddock increases the susceptibility of the stock to over-exploitation.

Analytical age-based assessment uses landings-at-age data, discard-at-age data, and indices from research vessel surveys. Some misreporting of landings has occurred in recent years.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

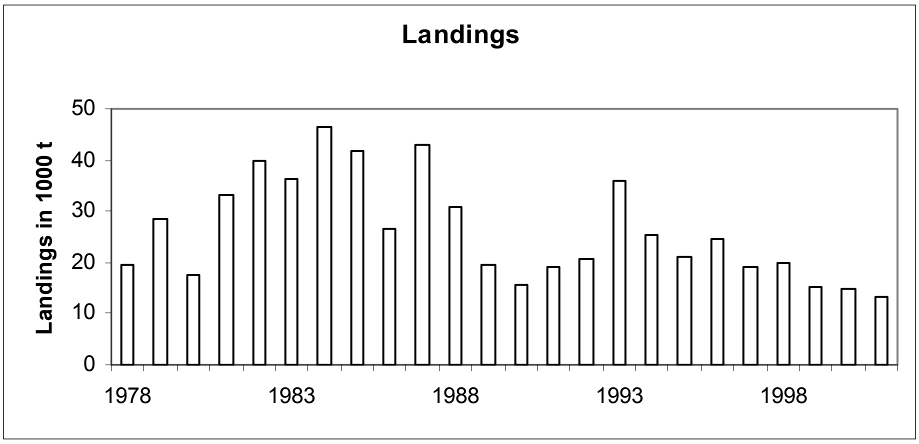
Yield and spawning biomass per Recruit
F-reference points:

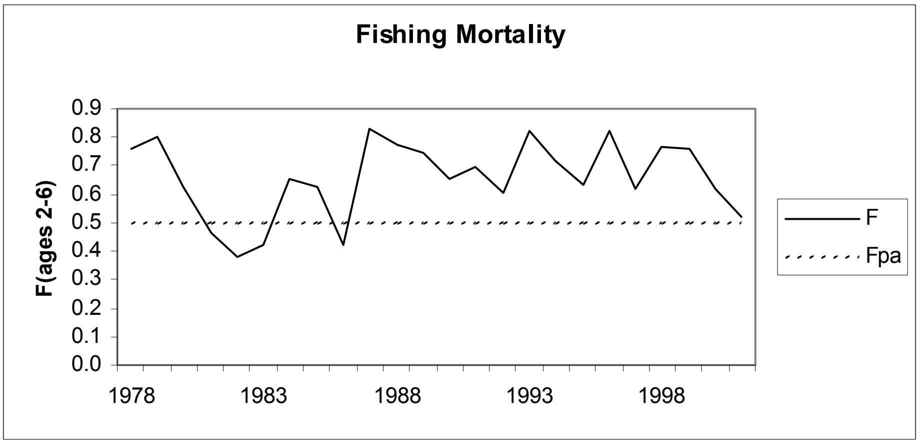
	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.634	0.130	0.363
$\mathbf{F}_{max}$	0.246	0.163	0.854
$\mathbf{F}_{0.1}$	0.148	0.152	1.218
$\mathbf{F}_{med}$	0.572	0.136	0.403

Catch data (Tables 3.7.3.a.1-2):

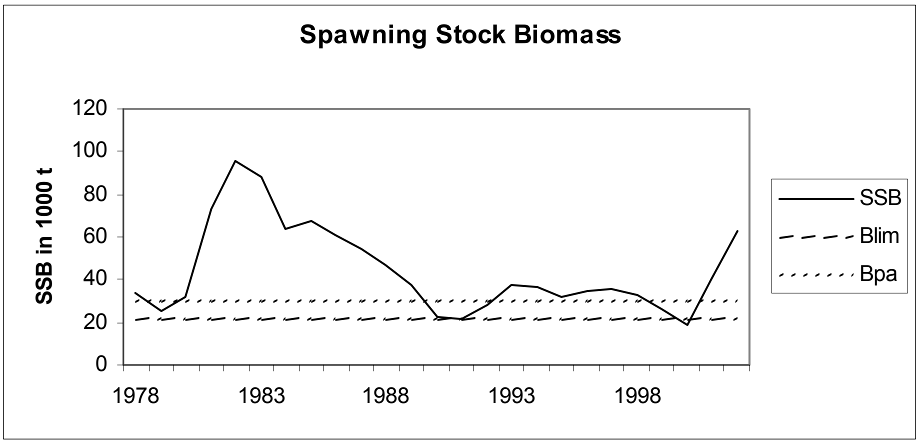
Year	ICES Advice	Predicted landings corresp. to advice	Agreed TAC[1]	Official Landings	ACFM Landings	Discard Slip.	ACFM Catch
1987	Reduce F towards $\mathbf{F}_{max}$	20.0	32.0	27	27.0	16.2	43.2
1988	No increase in F; TAC	25.0	35.0	21	21.1	10.2	31.3
1989	80% of F(87); TAC	15.0	35.0	24	16.7	3.2	19.9
1990	80% of F(88); TAC	14.0	24.0	13	10.1	5.4	15.5
1991	70% of effort (89)	-	15.2	10	10.6	9.2	19.8
1992	70% of effort (89)	-	12.5	7	11.4[2]	9.4[2]	20.8[2]
1993	70% of effort (89)	-	17.6	13	19.1[2]	16.9[2]	36.0[2]
1994	30% reduction in effort	-	16.0	9	14.2[2]	11.2[2]	25.4[2]
1995	Significant reduction in effort	-	21.0	13	12.4	8.8	21.2
1996	Significant reduction in effort	-	22.9	13	13.4	11.8	25.3
1997	Significant reduction in effort	-	20.0	13	12.9	6.6	19.5
1998	No increase in F	20.8[3]	25.7	14	14.4	5.7	20.1
1999	F reduced to $\mathbf{F}_{pa}$	14.3[3]	19.0	11	10.4	5.1	15.6
2000	Maintain F below $\mathbf{F}_{pa}$	<14.9[3]	19.0	7	6.9	8.2	15.2
2001	Reduce F below $\mathbf{F}_{pa}$	<11.2[3]	13.9	7	6.7	6.7	13.4
2002	Reduce F below $\mathbf{F}_{pa}$	<14.1[3]	14.1				
2003	No cod catches	-					

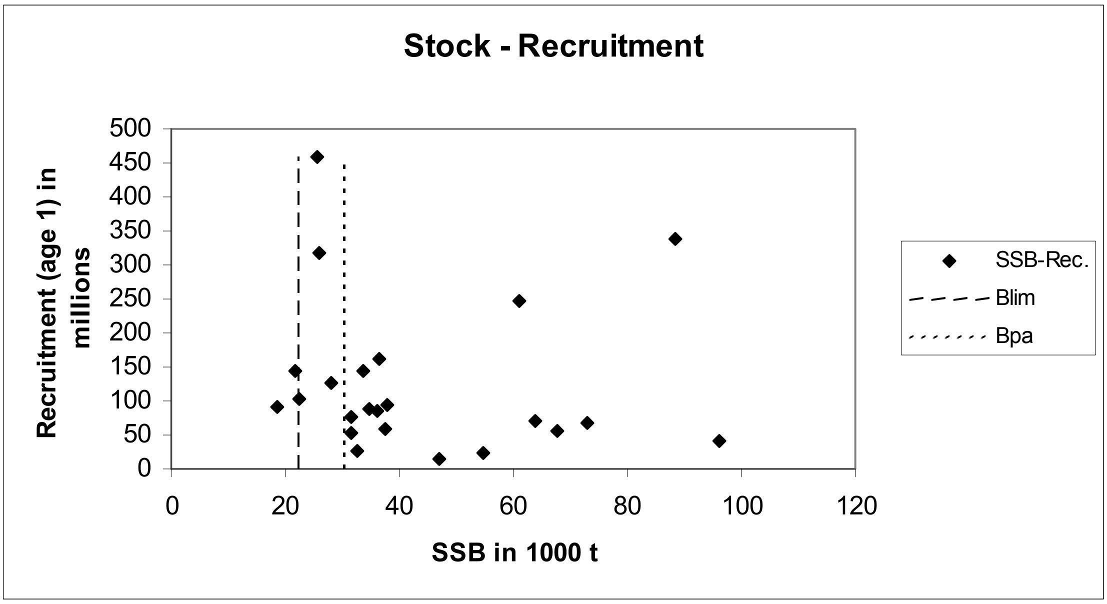
[1]TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on quantity that can be taken in VIa from 1990. [2]Adjusted for misreporting. [3] For VIa only. Weights in '000 t.


Landings
Landings in 1000 t
50
40
30
20
10
0
1978
1983
1988
1993
1998

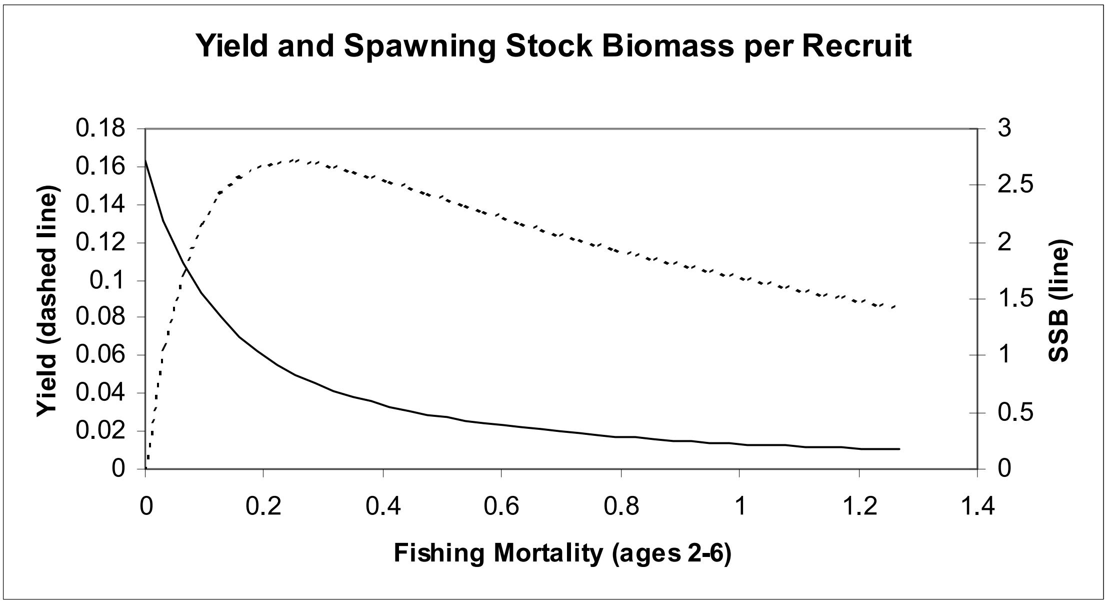

Fishing Mortality
F(ages 2-6)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1978
1983
1988
1993
1998
F
Fpa


Recruitment (age 1)
Recruitment in millions
500
400
300
200
100
0
1978
1983
1988
1993
1998

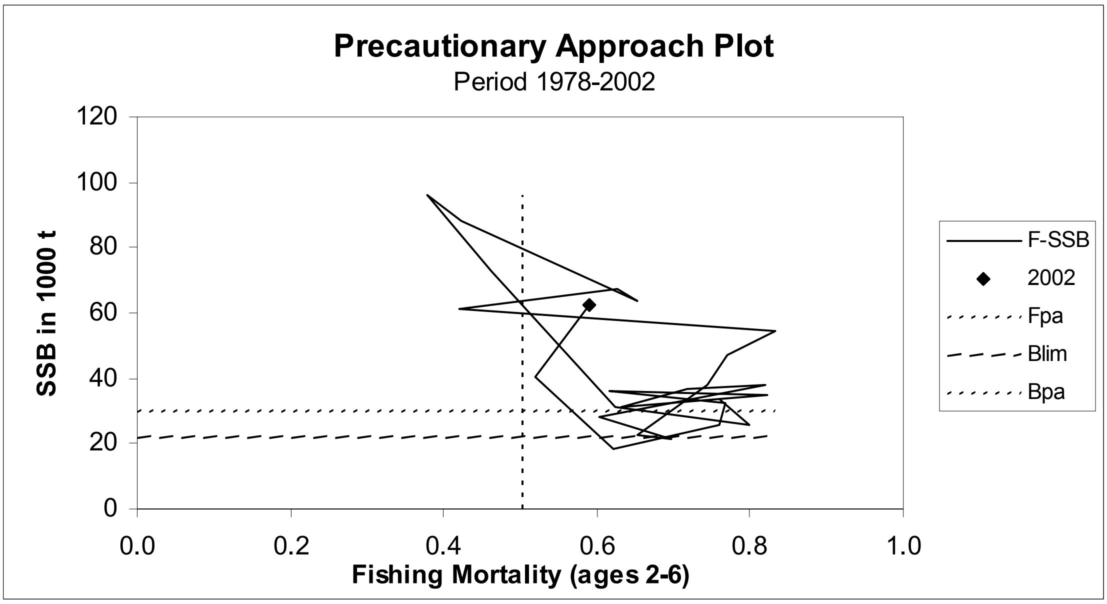

Spawning Stock Biomass
SSB in 1000 t
120
100
80
60
40
20
0
1978
1983
1988
1993
1998
SSB
Blim
Bpa



Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120



Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-6)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
3
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4



Precautionary Approach Plot
Period 1978-2002
SSB in 1000 t
Fishing Mortality (ages 2-6)
F-SSB
2002
Fpa
Blim
Bpa
120
100
80
60
40
20
0
0.0
0.2
0.4
0.6
0.8
1.0

Table 3.7.3.a.1 Haddock, Division VIa. Nominal catch (tonnes) of haddock, 1986–2001, as officially reported to ICES.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	-	29	8	9	-	9	1	7	1	+	1	3	2	2	1	2
Denmark	+	+	+	+	+	+	1	1	-	1	1	-	+	-	-	-
Faroe Islands	1	-	-	13	-	1	-	-	-	-	-	-	-	-	n/a	n/a
France	4,956	5,456	3,001	1,335[1,2]	863[1,2]	761[1,2]	761	1,132	753	671	445	270	394[1]	788	358	159[1]
Germany, Fed.Rep.	25	21	4	4	15	1	2	9	19	14	2	1	1	2	1	1
Ireland	2,026	2,628	2,731	2,171	773	710	700	911	746	1,406	1,399	1447	1,352	1054	677	1000
Norway	45	13	54	74	46	12	72	40	7	13	16[1]	21[1]	28	18	70[1]	33[1]
Spain	-	-	-	-	-	-	-	-	-	-	-	-	2	4	9	n/a
UK (E & W)[3]	222	425	114	235	164	137	132	155	254	322	448	493	458	315	199	199
UK (N. Ireland)	155	1	35								...	...	…	...	…	…
UK (Scotland)	12,955	18,503	15,151	19,940	10,964	8,434	5,263	10,423	7,421	10,367	10,790	10,352	12,125	8,630	5,933	
UK (total)																6,107
Total	20,385	27,076	21,098	23,781	12,825	10,065	6,932	12,678	9,201	12,794	13,102	12,587	14,360	10,813	7,248	7,302
Landings as used by WG	19,574	27,004	21,137	16,693	10,136	10,560	11,353	19,067	14,243	12,372	13,452	12,866	14,401	10,426	6,949	6,724
Discards	7,352	16,218	10,164	3,178	5,406	9,192	9,398	16,904	11,192	8,794	11,838	6,623	5,712	5,131	8,207	6,650
Unallocated landings	-811	-72	39	-7,088	-2,689	495	4,421	6,389	5,042	-423	350	279	41	-387	-299	-578
Total as used by WG	26,926	43,222	31,301	19,871	15,542	19,752	20,752[1]	35,971	25,435	21,166	25,290	19,489	20,114	15,557	15,156	13,374

[1]Preliminary. [2]Includes Divisions Vb(EC) and VIb. [3]1989–2001 N. Ireland included with England and Wales. n/a = Not available.

Table 3.7.3.a.2 Haddock in Division VIa (West of Scotland)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings[1)] tonnes	Mean F Ages 2-6
1978	61249	33651	19515	0.7610
1979	143064	25761	28653	0.7999
1980	459273	31516	17461	0.6238
1981	54183	73124	33246	0.4618
1982	68751	96005	39710	0.3796
1983	40381	88314	36188	0.4227
1984	336766	63815	46341	0.6527
1985	71992	67623	41868	0.6270
1986	54864	61132	26745	0.4201
1987	246556	54700	43163	0.8324
1988	22703	47054	30667	0.7702
1989	14893	37932	19662	0.7454
1990	94214	22554	15488	0.6520
1991	103971	21664	19239	0.6982
1992	144886	28174	20548	0.6042
1993	127429	37678	35862	0.8211
1994	58611	36545	25351	0.7176
1995	161066	31452	20945	0.6319
1996	75695	34759	24802	0.8232
1997	87486	36062	19334	0.6156
1998	84049	32492	19933	0.7671
1999	27442	25905	15315	0.7604
2000	316368	18433	14844	0.6215
2001	92522	40196	13381	0.5193
2002	75682	62511		0.5911
Average	120964	44362	26178	0.6528

[1)] Landings fitted by TSA value may differ slightly from values given in catch tables

3.7.3.b Haddock in Division VIb (Rockall)

State of stock/exploitation: The stock remains outside safe biological limits. Spawning stock biomass was below $\mathbf{B}_{\text{lim}}$ in 2001 and fishing mortality was above $\mathbf{F}_{\text{pa}}$ in 2001. Fishing mortality was above $\mathbf{F}_{\text{pa}}$ in most years from 1985 to 1992, then declined to 60% of $\mathbf{F}_{\text{pa}}$ in 1998 before increasing above $\mathbf{F}_{\text{pa}}$ again in 2000 and 2001. SSB increased from around $\mathbf{B}_{\text{pa}}$ in 1990 to more than double $\mathbf{B}_{\text{pa}}$ in 1995, but has since declined rapidly to below $\mathbf{B}_{\text{pa}}$ in 2000 and 2001. Recruitment has been weak since 1998.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (established in 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{\text{lim}}$ is 6 000 t, the lowest observed spawning stock.	$\mathbf{B}_{\text{pa}}$ be set at 9 000 t. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $\mathbf{B}_{\text{lim}}$, taking into account the uncertainty of assessments.
$\mathbf{F}_{\text{lim}}$ is not defined.	$\mathbf{F}_{\text{pa}}$ be set at 0.4. This F provides a small probability that SSB will fall below $\mathbf{B}_{\text{pa}}$ in the long term.

Technical basis:

$\mathbf{B}_{\text{lim}} = \mathbf{B}_{\text{loss}}$ as estimated in a previous assessment.	$\mathbf{B}_{\text{pa}} = \mathbf{B}_{\text{loss}} * 1.4$
$\mathbf{F}_{\text{lim}}$ = could not be defined, due to uninformative stock recruitment data.	$\mathbf{F}_{\text{pa}}$ = adopted by analogy with other haddock stocks.

Advice on management: ICES recommends that fishing mortality in 2003 should be reduced to the lowest possible level.

Relevant factors to be considered in management: The TAC applies to Subarea VI, with a limit on how much of the catch may be taken in Division VIa, but no such limit for Division VIb. In addition, part of Division VIb now falls within international waters where non-EU vessels are not subject to TAC. This allows for an unregulated fishery in that area. A separate TAC applicable only to Division VIb, including international waters, would ensure a sustainable fishery in Division VIb.

Following the NEAFC agreement in March 2001, an area of the NEAFC zone around Rockall was closed to fishing. It is too early to quantify the effect this closure has had on the haddock stock. It is difficult to predict actual fishing mortality as fleet behaviour will depend on fishing opportunities elsewhere.

Catch forecast for 2003:

Basis F(2002) = F(99-01) = 0.55; Landings(2002) = 1.7; SSB(2003) = 2.8.

F(2002)	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0	$0.0^* \mathbf{F}_{\text{sq}}$	0	0	4.6
0.11	$0.2^*\mathbf{F}_{\text{sq}}$	0.4	0.4	4.2
0.22	$0.4^*\mathbf{F}_{\text{sq}}$	0.8	0.8	3.8
0.33	$0.6^*\mathbf{F}_{\text{sq}}$	1.1	1.1	3.5
0.40	$\mathbf{F}_{\text{pa}}$	1.3	1.3	3.3
0.44	$0.8^*\mathbf{F}_{\text{sq}}$	1.4	1.4	3.2
0.55	$\mathbf{F}_{\text{sq}}$	1.6	1.6	2.9

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The recent three assessments of this stock have consistently shown an increase in fishing mortality from 1999 onwards, and a decline in SSB to the lowest observed value in the last year. The estimate of fishing mortality in 2000 is 26% higher, and that of SSB in 2001 34% lower, in this year's assessment compared to last year's assessment.

Elaboration and special comment: The Rockall fishery is dominated by Scottish vessels and until recently has taken place largely in the summer if fishing at Rockall is more profitable than in the North Sea or West of Scotland. A few Irish vessels exploit this stock on a more regular basis. Scottish and Irish vessels fish mainly for haddock, whilst Russian trawlers also fish for species such as gurnard.

During 1999 a substantial spring fishery developed for the first time, fishing on concentrations of haddock in a different area of the Rockall bank than previously. A fishery on part of the bank which now falls outside of the EU EEZ also started during 1999 and has led to opportunities for other nations to exploit the fishery, notably Russia. The table on official statistics has included Russian catches from the Rockall area for the last three years. Russian vessels operating in international waters catch and retain haddock below the EU minimum landing size of 30 cm. As the assessment contains no data on discards of such fish from EU fleets, the Russian catch data have been adjusted to exclude fish below 30 cm.

The analytical, age-based assessment uses landings-at-age data and research vessel survey data. The Scottish research vessel survey takes place every two years, most recently in 2001. Although no discard data are available, there is likely to be substantial discarding of younger fish. The short time-series, variable fishing effort, and mis-reporting of landings limit the precision of the assessment. Fifty percent of the SSB forecast for 2004 comprises the 2001 year class which is assumed to be at the recent average. The time-series is too short to estimate the stock-recruitment relationship for medium-term projections and estimation of fishing mortality reference points. Maturity is assumed to be attained at age 3, but information from surveys in 2001 indicates that fish may be maturing at an earlier age.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

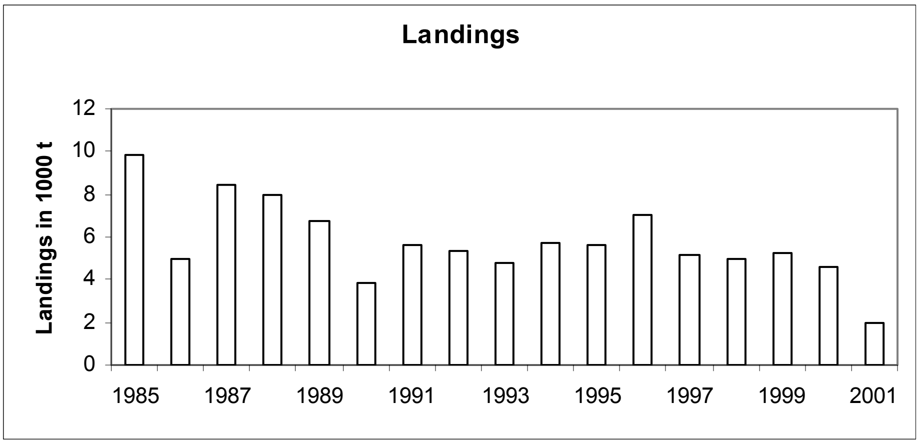
Yield and spawning biomass per Recruit F-reference points:

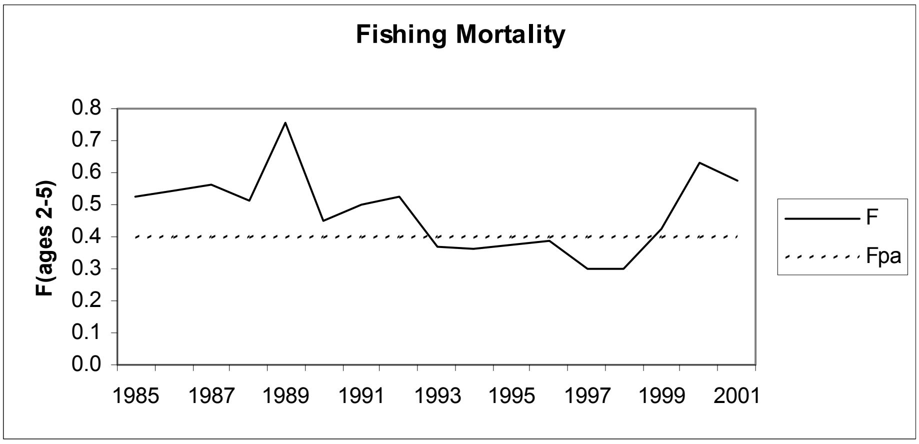
	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	0.477	0.234	0.407
$\mathbf{F}_{max}$	N/A		
$\mathbf{F}_{0.1}$	0.130	0.179	0.934
$\mathbf{F}_{med}$	0.116	0.173	0.985

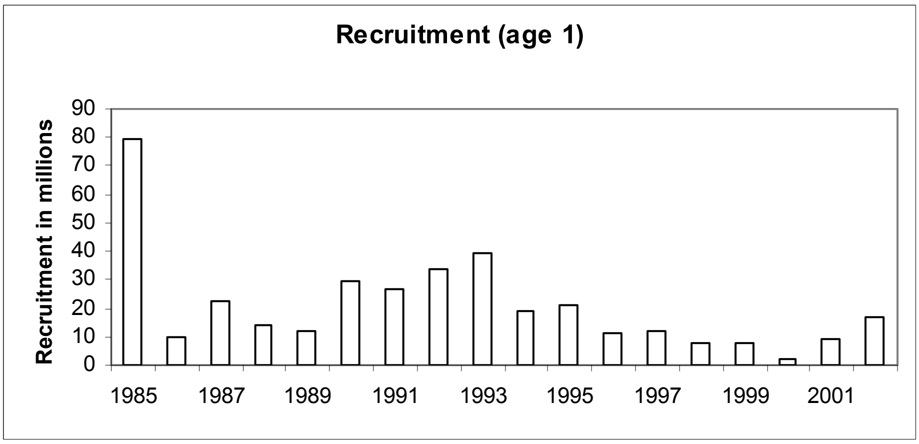
Catch data (Tables 3.7.3.b.1–2):

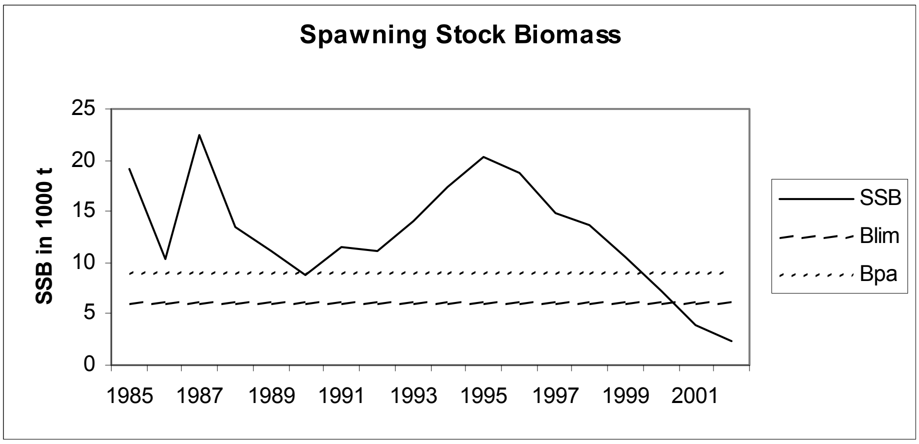
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official Landings	ACFM Landings
1987	Precautionary TAC	10.0		8.0	8.4
1988	Precautionary TAC	10.0		7.6	7.9
1989	*Status quo* F; TAC	18.0		6.6	6.7
1990	Precautionary TAC	5.5		8.2	3.9
1991	Precautionary TAC	5.5		5.9	5.7
1992	Precautionary TAC	3.8		4.5	5.3
1993	80% of F(91)	3.0		4.1	4.8
1994	If required, precautionary TAC	-		3.7	5.7[2]
1995	No long-term gain in increasing F	5.1[3]		5.5	5.6
1996	No long-term gains in increasing F	6.9[3]		6.8	7.1
1997	No advice given	4.9[3]		5.2	5.2
1998	No increase in F	4.9		5.1	5.0
1999	Reduce F below $\mathbf{F}_{pa}$	3.8		6.0	5.2[5]
2000	Reduce F below $\mathbf{F}_{pa}$	< 3.5		5.7[4]	4.6[5]
2001	Reduce F below $\mathbf{F}_{pa}$	< 2.7		1.9[4]	1.9[5]
2002	Reduce F below 0.2	<1.3			
2003	Lowest possible F	-			

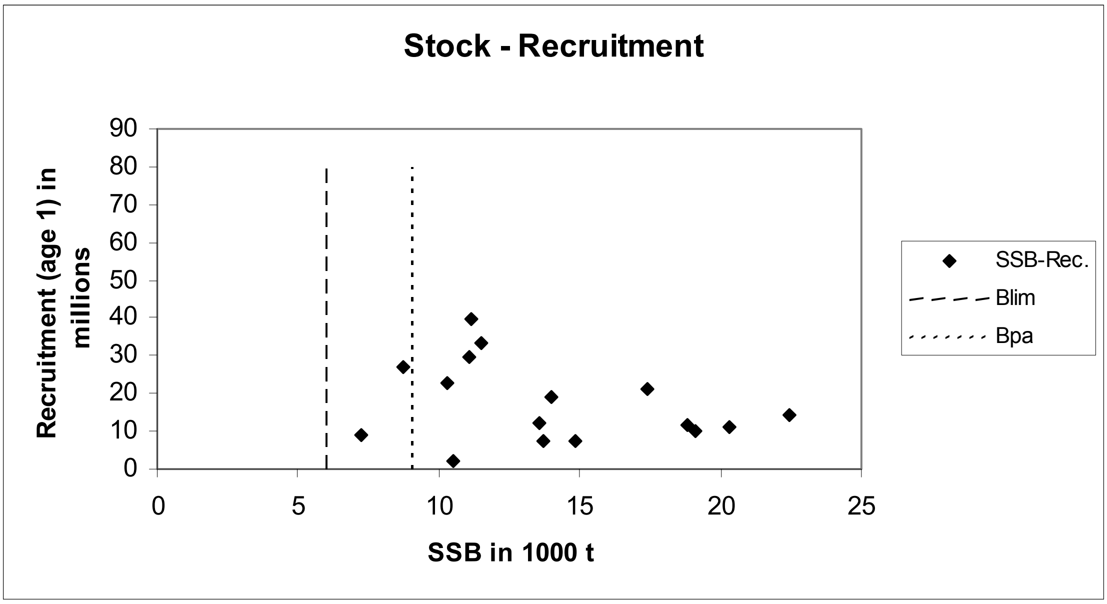
[1]TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on quantity that can be taken in VIa from 1990. [2]Including mis-reporting. [3]Landings at *status quo* F. [4]Incomplete data. [5]Russian data adjusted to exclude fish below MLS of 30 cm. Weights in '000 t.

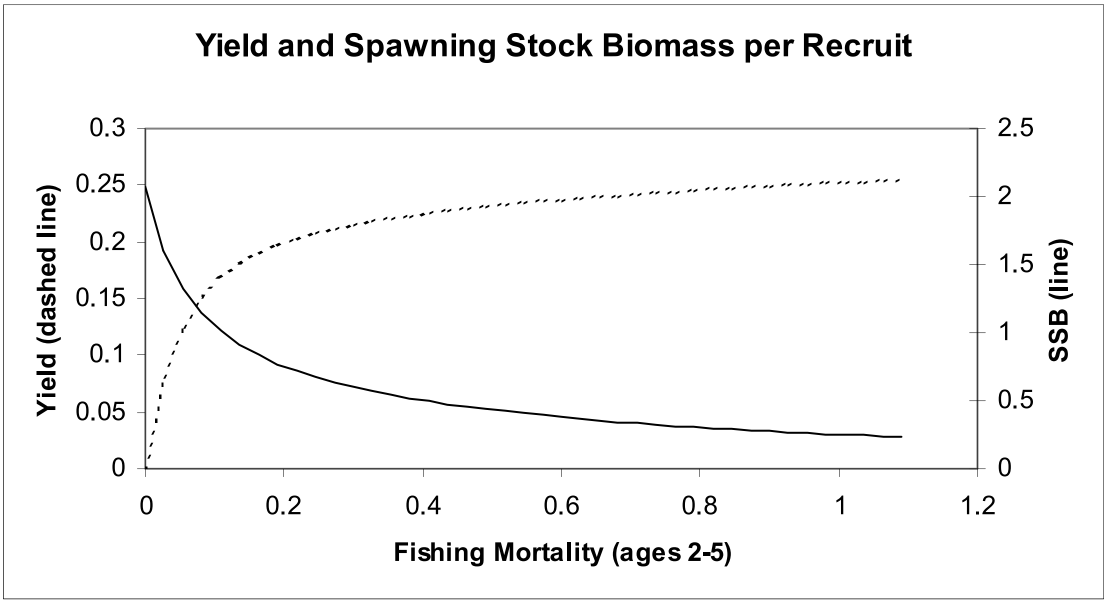

Landings
Landings in 1000 t
12
10
8
6
4
2
0
1985
1987
1989
1991
1993
1995
1997
1999
2001


Fishing Mortality
F(ages 2-5)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1985
1987
1989
1991
1993
1995
1997
1999
2001
F
Fpa


Recruitment (age 1)
Recruitment in millions
90
80
70
60
50
40
30
20
10
0
1985
1987
1989
1991
1993
1995
1997
1999
2001


Spawning Stock Biomass
SSB in 1000 t
25
20
15
10
5
0
1985
1987
1989
1991
1993
1995
1997
1999
2001
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa
0
10
20
30
40
50
60
70
80
90
0
5
10
15
20
25


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-5)
0
0.05
0.1
0.15
0.2
0.25
0.3
0
0.5
1
1.5
2
2.5
0
0.2
0.4
0.6
0.8
1
1.2

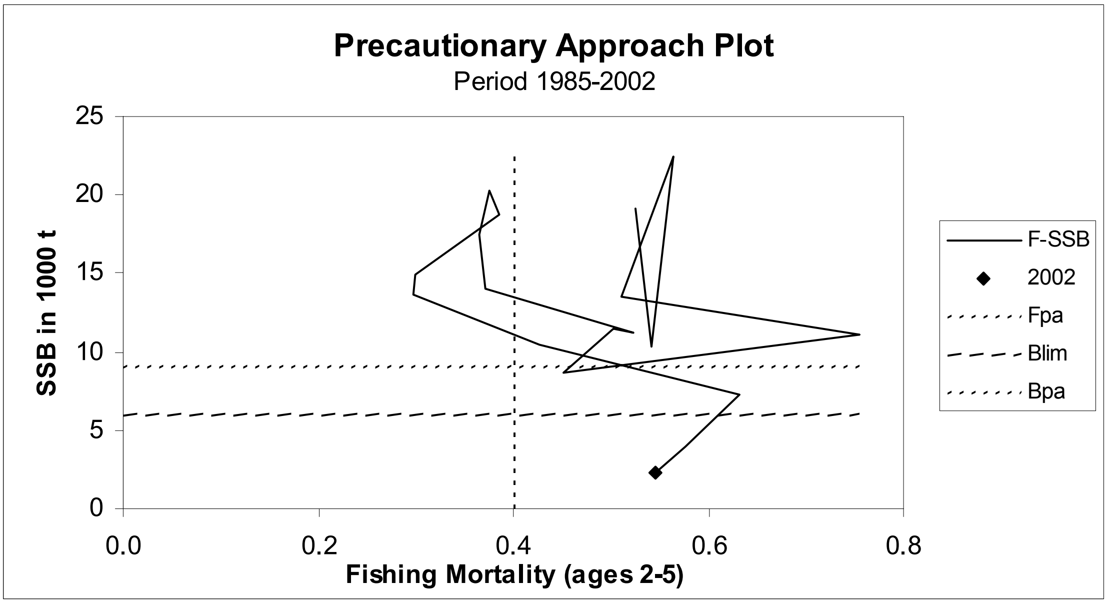

Precautionary Approach Plot
Period 1985-2002
SSB in 1000 t
Fishing Mortality (ages 2-5)
F-SSB
2002
Fpa
Blim
Bpa
0
5
10
15
20
25
0.0
0.2
0.4
0.6
0.8

Table 3.7.3.b.1 Nominal catch (tonnes) of HADDOCK in Division VIb, 1986–2001, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Faroe Islands	-	5	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
France	99	5	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	2
Germany, Fed.	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	+	-	167	3[1]	-
Ireland	-	-	-	620	640	571	692	956	677	747	895	704	1,021	824	n/a
Norway	33	20	47	38	69	47	68	75	29	24	24[1]	40[1]	61[1]	152[1]	70[1]
Portugal	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Russia	-	-	-	-	-	-	-	-	-	-	-	-	458	2,154	630
Spain	371	245	337	178	187	51	-	-	28	1	22	21	25	50	n/a
UK (E & W)[3]	1,271	753	272	238	165	74	308	169	318	293	165	561	288	36	-
UK (N. Ireland)	-	-	…	…	…	…	…	…	…	…	…	…	…	…	…
UK (Scotland)	6,221	6,542	5,986	7,139	4,792	3,777	3,045	2,535	4,439	5,753	4,114	3,768	3,970	2,470	1,205[1]
Total	7,995	7,574	6,643	8,213	5,853	4,520	4,113	3,735	5,491	6,818	5,220	5,098	5,990	5,686	1,907
Unallocated catch	437	355	85	-	-198	800	671	1,998	96	257	-54	-114	-769	-	17
WG estimate	8,432	7,929	6,728	3,884	5,655	5,320	4,784	5,733	5,587	7,075	5,166	4,984	5,221	4,559	1,924

[1]Preliminary.

[2]Included in Division VIa.

[3]1989–2001 N. Ireland included with England and Wales.

[4]includes a reduction in Russian catch data to approximate to "landings-equivalent values" (see Section 4.2.3).

n/a = Not available.

Table 3.7.3.b.2 Haddock in Division VIb (Rockall)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1985	79707	19117	9810	0.5259
1986	10190	10328	5014	0.5423
1987	22816	22476	8433	0.5648
1988	14061	13569	7929	0.5103
1989	11937	11093	6728	0.7557
1990	29585	8732	3884	0.4522
1991	26918	11501	5655	0.5021
1992	33408	11163	5320	0.5233
1993	39710	14024	4784	0.3707
1994	19126	17434	5733	0.3651
1995	20936	20322	5587	0.3759
1996	11228	18797	7075	0.3860
1997	11894	14865	5166	0.2993
1998	7447	13709	4984	0.2970
1999	7639	10492	5221	0.4271
2000	2327	7269	4559	0.6325
2001	8911	3960	1924	0.5767
2002	7350[1]	2328		
Average	20805	12843	5753	0.4807

[1] 1996-2001 GM

3.7.3.c Answer to NEAFC regarding Rockall Haddock

Regarding Rockall haddock NEAFC has requested ICES to consider:

a) to evaluate the spatial distributions of the fishery, the spawning stock and the juvenile fish of the stock of haddock around Rockall to allow NEAFC to consider the appropriateness of area and seasonal closures amongst other measures, for example the evaluation of the consequences of fishing with larger mesh sizes (within a range as considered appropriate by ICES), TACs and other measures;

b) to evaluate the effectiveness of the closure of the area implemented for 2001 in preventing by-catch of juvenile haddock and consider other possible area closures.]

ICES Comments:

Ad a) In 2001 ICES, in the ACFM report (CRR 246, pp. 361-398) presented extensive information on the spatial distribution of the fishery, spawning grounds, and the juvenile fish around Rockall. Since that time little new information has become available. The fishery in 2001 was the lowest since 1985.

ICES advises that fishing in 2003 should be at the lowest possible level and does not consider that mesh regulations are sufficient for management of the haddock on Rockall.

ICES does not have information available that allows it to propose changes in the seasonal and area closures.

Ad b) Following the NEAFC agreement in March 2001, an area of the NEAFC zone around Rockall was closed to fishing. It is too early to quantify the effect this closure has had on the haddock stock. It is difficult to predict actual fishing mortality as fleet behaviour will depend on fishing opportunities elsewhere.

3.7.4 Whiting

3.7.4.a Whiting in Division VIa (West of Scotland)

State of stock/exploitation: The stock remains outside safe biological limits. Fishing mortality has exceeded $\mathbf{F}_{pa}$ in all years since 1983, and is estimated to be close to $\mathbf{F}_{lim}$ since 1999. Spawning stock, which has been in decline since 1981, has exceeded $\mathbf{B}_{pa}$ in only one year since 1988 and has been below $\mathbf{B}_{lim}$ since 1998. There has been a general decline in recruitment since the mid-1980s, and the 1996, 1998, and 2000 year classes are the three weakest on record.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 16 000 t, the lowest observed spawning stock estimated in previous assessments.	$\mathbf{B}_{pa}$ be set at 22 000 t. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ is 1.0, above which stock decline has been observed.	$\mathbf{F}_{pa}$ be set at 0.6. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{lim}(1998) = 16\,000$ t	$\mathbf{B}_{pa} = \mathbf{B}_{lim} * 1.4$
$\mathbf{F}_{lim}$ = see above	$\mathbf{F}_{pa} = 0.6 * \mathbf{F}_{lim}$

Advice on management: Since whiting is mostly taken in demersal fisheries with cod and haddock, the advice for cod determines the advice for whiting. Unless ways to harvest whiting without by-catch or discards of cod can be demonstrated, fishing for whiting should not be permitted.

Relevant factors to be considered in management: On the basis of the status of whiting alone, ICES would recommend that to bring SSB above $\mathbf{B}_{pa}$ in 2004, fishing mortality in 2003 should be below 0.14, corresponding to a human consumption landing of less than 900 t. If any fisheries on whiting are permitted, despite the advice on cod and whiting, then total catches should not exceed these values.

The extent to which the cod-haddock-whiting fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish.

Fisheries targeting *Nephrops* may take a by-catch of whiting. In this case ICES notes that whiting may continue to be caught subject to existing EU regulations applying to *Nephrops* fisheries, and providing the catch of cod complies with the advice on cod.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for whiting down to near zero, then these programs could be considered in management of these fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring that their catches of cod are fully and credibly reported.

Whiting are taken in a mixed roundfish fishery. This means it is important to take into account the impact of management of whiting on other stocks, notably cod and haddock. The reverse is, of course, also true. Recent measures to protect Division VIa cod, such as the closed area, and agreements to increase mesh size, will affect the whiting fishery. Improvements in selectivity related to measures to protect cod should, if effectively implemented, benefit the whiting fishery by reducing discards and increasing landings in the long term.

Whiting are taken as a by-catch with cod and haddock in a mixed demersal fishery. The emergency measures introduced for cod in Division VIa have had no measurable effect on the stock and fishery for whiting in Division VIa. A reduced whiting fishery should have a positive impact on the rebuilding of the cod stock in Division VIa.

Over 50% of the SSB in 2004 is expected to be comprised of the 2002 year class for which short-term geometric mean recruitment has been assumed. Retrospective analysis indicates that the overestimation of the stock may not be fully accounted for in the current assessment and catch forecast.

Fishing effort displaced due to the cod rebuilding plan in Division VIIa, should not be permitted to target whiting in Division VIa, or any other stocks considered to be outside safe biological limits.

The proportion of fish discarded is very high and appears to have increased in recent years. Approximately half of the annual catch weight comprises undersized or low-value whiting which are discarded. Measures to improve the exploitation pattern would be beneficial to the stock and to the fishery. The more widespread use of 110 mm mesh nets in 2002, and the requirement to fit square mesh panels to certain towed gears since late 2000, may improve the selection pattern for whiting.

Catch forecast for 2003:

Basis F(2002) = $\mathbf{F}_{sq}$ = F(2001) = 0.85; Catch(2002) = 6.3; Landings(2002) = 3.7 ; SSB(2003) = 12.0.

F(2002 onwards)	Basis	Catch (2003)	Discards (2003)	Landings (2003)	SSB (2004)
0.09	0.1*$\mathbf{F}_{sq}$	1.0	0.4	0.6	22.7
0.14	0.16*$\mathbf{F}_{sq}$	1.5	0.6	0.9	22.0
0.17	0.2*$\mathbf{F}_{sq}$	1.9	0.8	1.1	21.5
0.26	0.3*$\mathbf{F}_{sq}$	2.7	1.1	1.6	20.4
0.43	0.5*$\mathbf{F}_{sq}$	4.3	1.8	2.4	18.3
0.60	$\mathbf{F}_{pa}$ =0.71*$\mathbf{F}_{sq}$	5.7	2.4	3.2	16.4
0.68[1]	0.8*$\mathbf{F}_{sq}$	6.2	2.7	3.5	15.7[1]
0.85	$\mathbf{F}_{sq}$	7.3	3.2	4.1	14.2

Weights in '000 t. [1] Option giving 30% increase in SSB.
Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The estimate of fishing mortality in 2000 is 2% lower and the estimate of SSB in 2001 30% lower in this year's assessment compared to last year's assessment. Whilst estimates of fishing mortality have been quite consistent from year to year in this stock, there has been a pronounced tendency for the estimate of SSB for the final year to be revised downwards when an additional year's catch and survey data are included in the assessment. The basis for the single-stock fishery advice is the same as last year.

Elaboration and special comment: Whiting in Division VIa are caught mainly by Scottish trawlers. Since 1976, Scottish heavy trawl and seine effort has declined, whilst that of light trawlers has generally increased. Approximately 50% of the total catch in weight is discarded, so restricted landings alone will not achieve the necessary increase in SSB. The analytical age-based assessment uses landings-at-age data, discard-at-age data, and indices from research vessel surveys.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

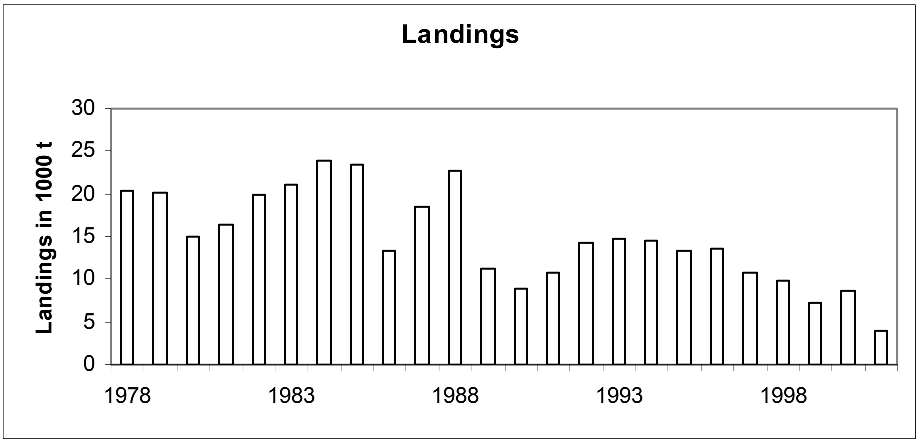
Yield and spawning biomass per Recruit
F-reference points:

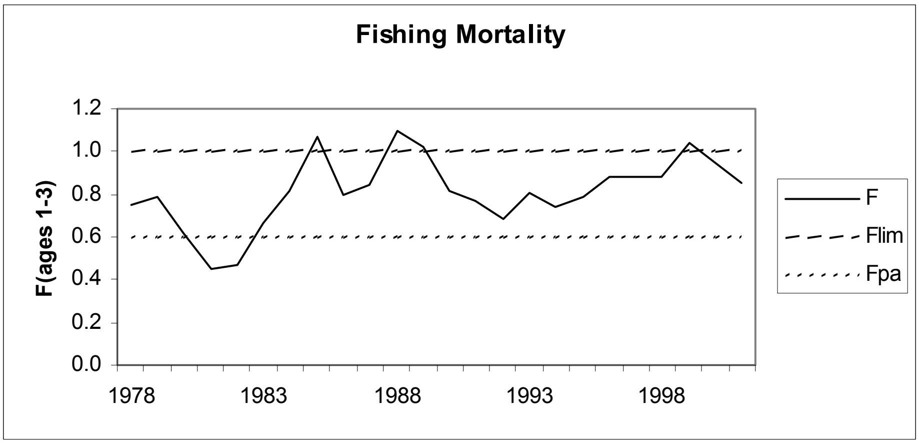
	Fish Mort Ages 1-3	Yield/R	SSB/R
Average Current	0.946	0.063	0.150
$\mathbf{F}_{max}$	0.182	0.119	0.614
$\mathbf{F}_{0.1}$	0.107	0.111	0.859
$\mathbf{F}_{med}$	0.557	0.087	0.248

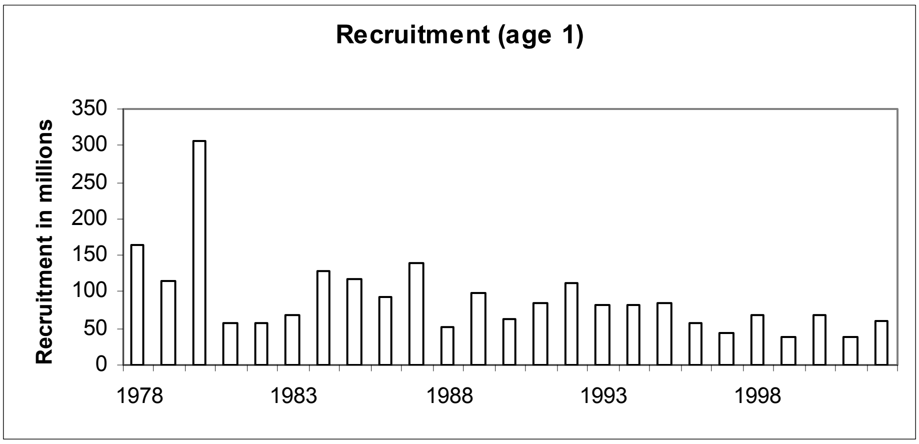
Catch data (Tables 3.7.4.a.1-2):

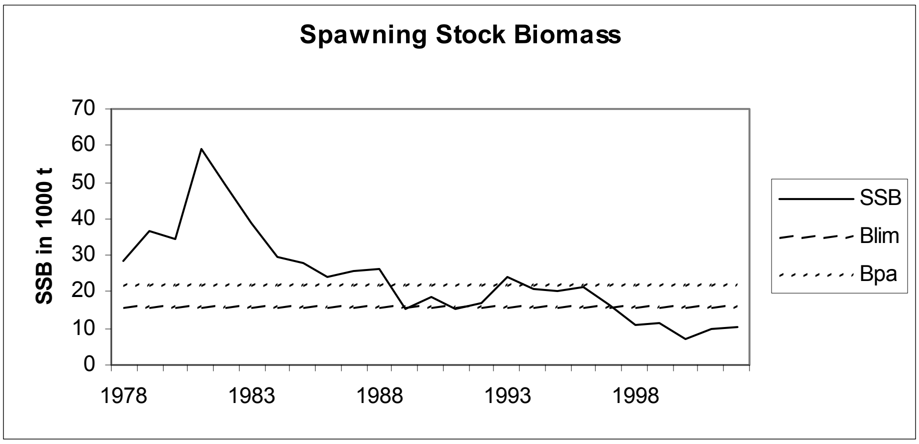
Year	ICES Advice	Predicted landing corresp. to advice	Agreed TAC[1]	Official Landings	ACFM Landings	Discards slip	ACFM catch
1987	No increase in F	15.0	16.4	12.4	11.5	6.9	18.4
1988	No increase in F; TAC	15.0	16.4	11.9	11.4	11.5	22.9
1989	No increase in F; TAC	13.0	16.4	7.7	7.5	3.7	11.3
1990	No increase in F; TAC	11.0	11.0	6.0	5.6	3.4	9.0
1991	70% of effort (89)	-	9.0	6.9	6.7	4.0	10.7
1992	70% of effort (89)	-	7.5	6.0	6.0	8.4	14.3[4]
1993	70% of effort (89)	-	8.7	6.8	6.9	8.0	14.9[4]
1994	30% reduction in effort	-	6.8	5.8	5.9	8.6	14.5[4]
1995	Significant reduction in effort	-	6.8	6.3	6.1	7.3	13.4[4]
1996	Significant reduction in effort	-	10.0	6.6	7.2	6.6	13.7
1997	Significant reduction in effort	-	13.0	6.2	6.3	4.6	10.9
1998	No increase in F	6.5	9.0	4.7	4.7	5.2	9.9
1999	Reduce F below $\mathbf{F}_{pa}$	4.3	6.3	4.7	4.6	2.6	7.2
2000	Reduce F below $\mathbf{F}_{pa}$	<4.3	4.3	3.3	3.0	5.6	8.7
2001	Reduce F below $\mathbf{F}_{pa}$	<4.2	4.0	2.4	2.4	1.6	4.0
2002	SSB>$\mathbf{B}_{pa}$ in short term	<2.0	3.5				
2003	No cod catches	-					

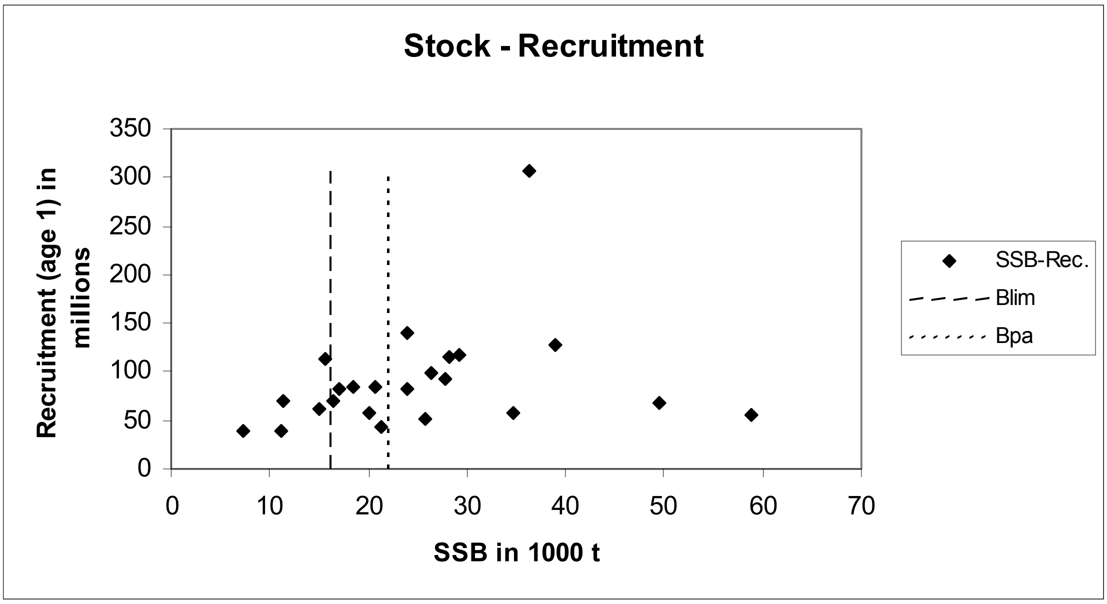
[1]TAC is set for Divisions VIa and VIb combined. [2]Incomplete. [3]Not including misreporting. [4]Including ACFM estimates of misreporting. Weights in '000 t.

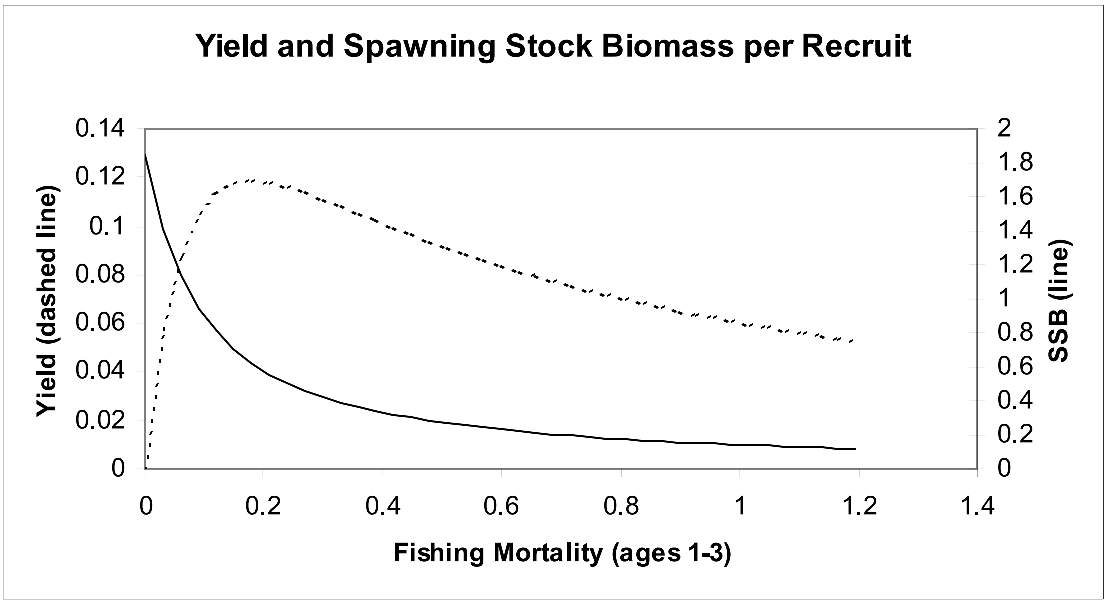

Landings
Landings in 1000 t
0
5
10
15
20
25
30
1978
1983
1988
1993
1998


Fishing Mortality
F(ages 1-3)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1978
1983
1988
1993
1998
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
0
50
100
150
200
250
300
350
1978
1983
1988
1993
1998


Spawning Stock Biomass
SSB in 1000 t
0
10
20
30
40
50
60
70
1978
1983
1988
1993
1998
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
SSB (line)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Fishing Mortality (ages 1-3)

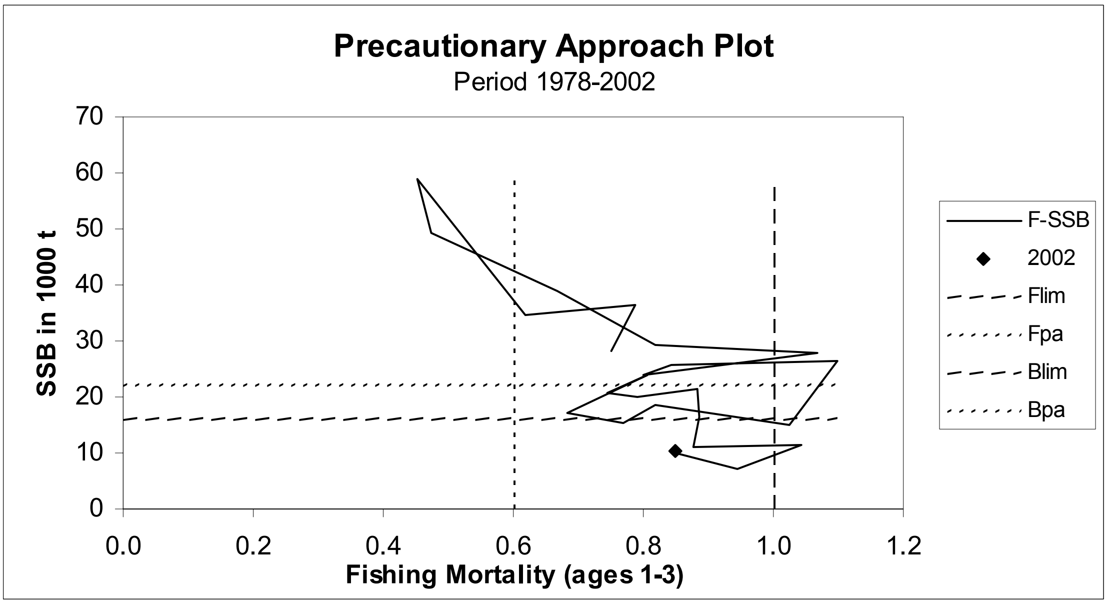

Precautionary Approach Plot
Period 1978-2002
SSB in 1000 t
70
60
50
40
30
20
10
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Fishing Mortality (ages 1-3)
F-SSB
2002
Flim
Fpa
Blim
Bpa

Table 3.7.4.a.1 Nominal catch (t) of WHITING in Division VIa, 1986–2001, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999[1]	2000[1]	2001
Belgium	4	3	1	-	+	-	+	+	+	-	1	1	+	+	-
Denmark	5	-	1	+	3	1	1	+	+	+	+	-	-	-	-
France	1,644	1,249	199[1,2]	180	352[1,2]	105	149	191	362	202	108	82[1]	300[1]	164[1]	54[1]
Germany	+	4	+	+	+	1	1	+	-	-	-	-	+	-	-
Ireland	2,868	2,640	1,315	977	1,200	1,377	1,192	1,213	1,448	1,182	977	952	1,121	793	631[1]
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	1	-	1	2	+	-	n/a
UK (E&W)[3]	62	30	44	50	218	196	184	233	204	237	453	251	210	104	…
UK (N.I.)	13	89	…	…	…	…	…	…	…	…	…	…	…	…	…
UK (Scot.)	7,803	7,864	6,109	4,819	5,135	4,330	5,224	4,149	4,263	5,021	4,638	3,369	3,046	2,258	…
UK (total)															1,724[1]
Total landings	12,399	11,879	7,669	6,026	6,908	6,010	6,751	5,786	6,278	6,642	6,178	4,657	4,677	3,319	2,409
Unallocated landings	-857	-530	-142	-382	-234	-5	122	177	-199	527	113	38	-49	-301	-5
Discards as used by W.G.	6,875	11,460	3,713	3,356	4,044	8,360	8,017	8,570	7,272	6,568	4,571	5,211	2,567	5,644	1,586
Landings as used by W.G.	11,542	11,349	7,527	5,644	6,674	6,005	6,873	5,963	6,079	7,169	6,291	4,695	4,628	3,018	2,404
Total catches as used by W.G.	18,417	22,809	11,240	9,000	10,718	14,365	14,890	14,533	13,351	13,737	10,862	9,906	7,195	8,662	3,990

[1]Preliminary.
[2]Includes Divisions Vb (EC) and VIb.
[3]1989–2001 N. Ireland included with England and Wales.
n/a = Not available.

Table 3.7.4.a.2 Whiting in Division VIa (West of Scotland)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings[1)] tonnes	Mean F Ages 1-3
1978	163886	28276	20436	0.750
1979	114988	36394	20159	0.788
1980	307610	34669	15101	0.620
1981	58071	58824	16462	0.452
1982	56310	49455	20025	0.473
1983	68546	39015	21150	0.667
1984	128059	29273	24007	0.818
1985	118169	27833	23390	1.069
1986	93328	23924	13373	0.800
1987	139818	25778	18453	0.842
1988	50932	26408	22845	1.097
1989	99722	15058	11248	1.024
1990	61904	18541	8981	0.819
1991	83530	15532	10739	0.769
1992	112919	17025	14332	0.684
1993	83291	24023	14881	0.807
1994	82908	20620	14532	0.745
1995	83634	20023	13372	0.792
1996	58427	21258	13706	0.882
1997	43880	16420	10857	0.885
1998	69198	11178	9864	0.878
1999	38330	11367	7202	1.042
2000	69371	7208	8661	0.945
2001	38475	10107	3984	0.850
2002	59371	10200		0.850
Average	91387	23936	14907	0.814

[1)] Landings fitted by TSA value may differ slightly from values given in catch tables

3.7.4.b Whiting in Division VIb (Rockall)

Elaboration and special comments: Landings of whiting from Division VIb are negligible. No assessment has been carried out on this stock.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, September 2002 (ICES CM 2003/ACFM:04).

Whiting in Division VIb (Rockall)

Table 3.7.4.b.1 Nominal catch (t) of WHITING in Division VIb, 1986–2000, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999[1]	2000[1]	2001[1]
France	-	-	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	[2]	[2]	[2]
Ireland	-	-	-	-	-	-	32	10	4	23	3	1	-	n/a	[1]
Spain	-	-	-	-	-	-	-	n/a	n/a	n/a	n/a	n/a	+	n/a	n/a
UK (E & W)[3]	4	-	16	6	1	5	10	2	5	26	49	20	+	+	
UK (N.Ireland)	-	-	…	…	…	…	…	…	…	…	…	…	…	…	
UK (Scotland)	108	23	18	482	459	283	86	68	53	36	65	23	44	58	
UK (all)															4[1]
Total	112	23	34	488	460	288	128	80	62	85	117	44	44	58	4

[1]Preliminary.
[2]Included in Division VIa.
[3]1989–2000 N. Ireland included with England and Wales.
n/a = not available.

3.7.5 Saithe in Subarea VI (West of Scotland and Rockall)

Saithe in Subarea VI has previously been assessed as a separate stock. This component has now been combined with saithe in the North Sea (Subarea IV) and saithe in Skagerrak and Kattegat (Division IIIa), see Section 3.5.5.

3.7.6 Megrim in Subarea VI (West of Scotland and Rockall)

State of stock/exploitation: The absence of a time-series of abundance indices and discards estimates means that the historical perspective of SSB, fishing mortality and recruitment is not well estimated for this stock. It is likely that fishing mortality increased in the 1990s as the fishery for anglerfish, (in which megrim is taken as a by-catch) expanded into progressively deeper water. Landings of both species peaked in 1996 and have subsequently declined. There are weak indications that fishing mortality on megrim may have declined in recent years, as has also been estimated for anglerfish.

Management objectives: No explicit management objectives are set for this stock.

Reference points: There is not sufficient information to estimate appropriate reference points.

Advice on management: ICES advises that catches in 2003 be no more than the recent TAC.

Relevant factors to be considered in management: Megrim are caught as part of a targeted anglerfish fishery, which expanded rapidly in the 1990s. Vessels targeting anglerfish in waters deeper than 450 m are likely to have reduced by-catches of megrim, particularly when using 100 mm and larger meshes. Maintenance of the existing megrim TAC should help to prevent expansion of the fishery for anglerfish that is considered to be outside safe biological limits. Megrim are also caught in a mixed-species fisheries in VIa, and discarding is a problem particularly from trawls with 80 mm meshes. The megrim in Subarea VI consists of two species,*Lepidorhombus whiffiagonis* and *L. boscii.*

The large majority of the landings are *L. whiffiagonis*. Although total landings are less than the TAC, some national quotas are restrictive and this has led to mis-reporting. Previously, the adjacent fishery in the North Sea was not subject to a TAC for megrim, and catch controls on anglerfish in Subarea VI have led to mis-reporting of landings, including the megrim component, into the North Sea. Male megrim grow to a smaller maximum size than females, and as a consequence the majority of males in the catches are discarded and the bulk of fish landed comprise females.

The landings from Division VIa showed a marked increase from 1991 to 1996 (4 400 t), but have subsequently fallen to the recent low of 2 300 t in 2001.

Elaboration and special comment: Until recently, megrim was taken mainly as a by-catch in bottom trawl groundfish fisheries. The expansion of the fishery for anglerfish has led to increased fishing pressure on megrim in the area, where they are now caught as a by-catch in the targeted anglerfish fishery. Previous analyses have indicated that megrim are more robust to exploitation than anglerfish, hence management of the fishery should primarily reflect concerns for the anglerfish stock.

Length frequency and age composition data are only available for 1992–2001. Incomplete data were available for 1990 and 1991. Preliminary assessments have previously indicated that F may be rather low, but this impression may be due to the expansion of the area fished.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

Catch data (Tables 3.7.6.1-2)

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official landings	ACFM landings[3]
1987	Not assessed	-	4.4	3.9	-
1988	Not assessed	-	4.84	4.5	-
1989	Not assessed	-	4.84	2.7	-
1990	Not assessed	-	4.84	2.7	2.9
1991	No advice	-	4.84	3.2	2.7
1992	No advice	-	4.84	3.2	3.7
1993	No long-term gain in increased F	-	4.84	3.0	3.4
1994	No long-term gain in increased F	-	4.84	3.0	3.3
1995	No advice	-	4.84	3.3	3.8
1996	No advice	-	4.84	2.9	4.4
1997	No advice	-	4.84	2.8	3.6
1998	Adequate catch controls	-	4.84	2.7	3.1
1999	Maintain current TAC	4.84	4.84	2.5	2.9
2000	Maintain current TAC	4.84	4.84	2.0	2.7
2001	Maintain current TAC	4.84	4.36	1.8[2]	2.3
2002	Maintain current TAC	4.36	4.36		
2003	Maintain current TAC	4.36			

[1]Vb(EC), VI, XII and XIV. [2] Incomplete data. [3] Landings in VIa. Landings in Vb (EC), XII, and XIV negligible. Weights in ‘000 t.

Megrim in Subarea VI (West of Scotland and Rockall)

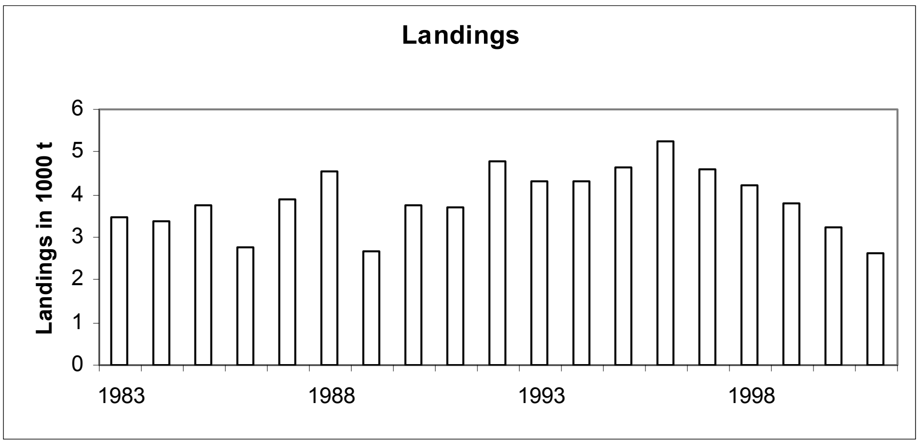


Table 3.7.6.1 Nominal catch (t) of MEGRIM in Subarea VI (West of Scotland and Rockall), as officially reported to ICES, and WG best estimates of landings for Division VIa.

Megrim in Division VIa (West of Scotland)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*	2000*	2001*
Belgium	1	1	1	-	1	-	-	1	-	-	-	-	-	+	-
Denmark	-	-	1	-	-	-	-	-	-	-	-	-		-	-
France	997	1,295	457	398	455	504	517	408	618	462	192	172	203	167	244
Germany	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	403	685	474	317	260	317	329	304	535	460	438	433	438	417	507†
Spain	102	121	43	91	48	25	7	1	24	22	87	111	83	85	n/a
UK(E&W&NI)	380	354	122	25	167	392	298	327	322	156	123	65	42	20	-
UK(Scotland)	991	1,068	1,169	1,093	1,223	887	896	866	952	944	954	841	831	754	-
UK															776
Total	2,874	3,526	2,267	1,924	2,154	2,125	2,047	1,907	2,451	2,044	1,794	1,622	1,597	1,443	1,527
Unallocated				1,000	518	1,595	1,356	1,373	1,375	2,381	1,795	1,522	1,338	1,247	821
As used by WG				2,924	2,672	3,720	3,403	3,280	3,826	4,425	3,589	3,144	2,935	2,690	2,348

Megrim in Division VIb (Rockall)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*	2000*	2001*
France	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Ireland	-	-	-	196	240	139	128	176	117	124	141	218	127	167	-
Spain	583	751	205	363	587	683	594	574	520	515	628	549	404	22	-
UK(E&W&NI)	261	77	18	19	14	53	56	38	27	92	76	116	57	57	-
UK(Scotland)	174	185	178	226	204	198	147	258	152	112	164	208	278	309	-
UK															278
Total	1,020	1,014	401	804	1,045	1,073	925	1,046	816	843	1,009	1,091	866	555	279

Total Megrim in Sub-area VI (West of Scotland and Rockall)

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*	2000*	2001*
Total	3,894	4,540	2,668	2,728	3,199	3,198	2,972	2,953	3,267	2,887	2,803	2,713	2,463	1,998	1,806
As used by WG				3,728	3,717	4,793	4,328	4,326	4,642	5,268	4,598	4,235	3,801	3,245	2,627

* Preliminary. † Includes 6b landings.

Table 3.7.6.2 Megrim in Subarea VI (West of Scotland and Rockall)

Year	Landings tonnes
1983	3469
1984	3384
1985	3753
1986	2780
1987	3894
1988	4540
1989	2668
1990	3728
1991	3717
1992	4793
1993	4328
1994	4326
1995	4642
1996	5268
1997	4598
1998	4235
1999	3801
2000	3245
2001	2627
Average	3884

3.7.7 Anglerfish in Division IIIa (Kattegat and Skagerrak), Subarea IV (North Sea), and Subarea VI (West of Scotland and Rockall) (*Lophius piscatorius* and *L. budegassa*)

Two species occur, *Lophius piscatorius* and *L. budegassa*, although catches are almost exclusively of the former.

This year, for the first time, an assessment was accepted for anglerfish in Division IIIa, Subarea IV, and in Division VIa. Therefore, the advice has a structure different from what has been previously presented.

State of stock/exploitation: The stock is harvested outside of safe biological limits. An assessment for the combined area indicates that the recent F's have been well above $\mathbf{F}_{pa}$**.** Even though the historical perspective of SSB, fishing mortality, and recruitment is not well estimated, it is likely that fishing mortality has increased since the 1980s as the fishery has expanded into deeper water with an associated increase in catches, although these have declined since 1997. The fishery has expanded into areas believed to have been refugia for adult anglerfish, increasing the vulnerability of the stock to over-exploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

Management objectives: No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to reduce or maintain F below $\mathbf{F}_{pa}$.

Precautionary Approach reference points (unchanged since 1998):

ICES considers that:	ICES proposes that:
There is currently no biological basis for defining $\mathbf{B}_{lim}$ or $\mathbf{F}_{lim}$	$F_{35\%SPR}$= 0.30 be chosen as $\mathbf{F}_{pa}$. This fishing mortality corresponds to 35% of the unfished SSB/R. It is considered to be an approximation of $\mathbf{F}_{MSY}$.

Advice on management: ICES recommends that the fishing mortality be reduced to less than $\mathbf{F}_{pa}$. This implies landings of less than 6 700 t for the combined Division IIIa, Subarea IV, and Division VIa. The corresponding catch in Division VIb will be about 400 t, applying a cut proportional to that used in the other areas.

Relevant factors to be considered in management: Catches for the combined area are believed to be adequately estimated. However, due to a long history of mis-reporting, the correct allocation of catches to Subareas IV and VI is not possible. Estimates which take into account mis-reporting indicate that the percentage of the catch taken in Division IIIa, Subarea IV, and Division VIa in the years 1992-2001 (the period used in the assessment) is 3%, 58%, and 39%, respectively. These values may be used as a basis to allocate the 2003 TAC between these areas.

The lack of TAC regulation in the adjacent Subarea IV before 1998 encouraged mis-reporting of landings into that area and undermined management for Subarea VI. The agreed TACs in 1998 and 1999 for Subarea IV were based on recent landings reported from that area. Because those landings included mis-reporting in the preceding years these TACs are unlikely to have prevented further mis-reporting or to have improved conservation in either area.

Anglerfish are subject to significant fishing mortality before attaining full maturity, and this means the stock is particularly vulnerable to depletion of the spawning component. Their body shape means that at a young age they are easily retained by the minimum mesh size currently in force. They are known to be discarded, although no routine discard sampling is undertaken. There is also a by-catch of small anglerfish associated with scallop dredging.

In past assessments the existence of a large unexploited reservoir of mature females was assumed to exist in deep waters. In recent years, surveys and fisheries have explored deep water areas widely, without locating any such aggregations of mature anglerfish.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$ = F(01 unscaled) = 0.91 ; Landings (2002) = 16.5 ; SSB(2003) = 9.6.

F(2003 onwards)	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0	0	0	0	17
0.18	0.2*$\mathbf{F}_{sq}$	4.1	4.1	15
0.30	$\mathbf{F}_{pa}$	6.7	6.7	14
0.37	0.4*$\mathbf{F}_{sq}$	7.9	7.9	13
0.55	0.6*$\mathbf{F}_{sq}$	11.3	11.3	12
0.73	0.8*$\mathbf{F}_{sq}$	14.3	14.3	11
0.92	$\mathbf{F}_{sq}$	17.1	17.1	10

Weights in '000 t.

Shaded scenarios considered inconsistent with a precautionary approach.

Comparison with previous assessment and advice: Following trials in 2000 and 2001, the length-based assessment has now been evaluated as providing sufficient information on the state of the stock for making an analytical forecast. Previous advice was based on 2/3 of the landings in the period 1973-1999.

Elaboration and special comment: The distribution of anglerfish in the North Sea, Kattegat, and Skagerrak is closely associated with the distribution to the West of Scotland (Division VIa). It is likely that catches from these areas come from the same biological stock. The link with the anglerfish in Rockall is less certain, and separate advice is therefore given for Division VIb.

Until the mid-1980s, anglerfish was taken mainly as a by-catch in bottom trawl groundfish fisheries. Restrictive TACs for other species in Division VIa have led to increased fishing pressure on anglerfish in that area, where they are now caught in a targeted anglerfish fishery. Species such as cod, haddock, and saithe form a significant by-catch in the anglerfish fishery.

The North Sea catch-at-length distribution is derived solely from Scottish market sampling. Information for catch composition is unavailable from other countries. The assessment does not contain data from Rockall, and the forecast refers to landings in Division IIIa, Subarea IV, and Division VIa.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

Catch data (Tables 3.7.7.2):

Subarea IV - North Sea

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM Landings
1989	Not assessed	-	-	10.1	9.3
1990	Not assessed	-	-	10.6	9.5
1991	Not assessed	-	-	11.8	10.6
1992	Not assessed	-	-	13.3	11.7
1993	Not assessed	-	-	15.5	13.1
1994	Not assessed	-	-	18.2	15.4
1995	Not assessed	-	-	20.9	15.8
1996	Not assessed	-	-	27.3	16.2
1997	Not assessed	-	-	25.8	18.2
1998	Not assessed	-	22.1	19.0	14.0
1999	Not assessed	-	22.1	14.9	11.7
2000	40% reduction in catches	<9.7	17.66	14.0	11.6
2001	2/3 of the catches in 1973-1990	5.7	14.13	14.6	10.1
2002	2/3 of the catches in 1973-1990	5.7	10.50		
2003	Reduce F below $\mathbf{F}_{pa}$	<6.7 [1)]			

Weights in '000 t.

[1)] Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

Catch data (Tables 3.7.7.3):

Subarea VI - West of Scotland and Rockall

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official landings	ACFM landings[2]
1987	Not assessed	-	7.8	5.2	5.6
1988	Not assessed	-	8.6	7.7	7.7
1989	Not assessed	-	8.6	6.0	7.3
1990	Not assessed	-	8.6	6.4	6.6
1991	No advice	-	8.6	6.0	6.3
1992	No advice	-	8.6	6.6	9.2
1993	No long-term gain in increased F	-	8.6	6.2	10.1
1994	No long-term gain in increased F	-	8.6	6.0	8.8
1995	A precautionary TAC not exceeding recent catch levels	-	8.6	7.2	12.3
1996	A precautionary TAC not exceeding recent catch levels	-	8.6	7.0	18.2
1997	Reduction in fishing effort	-	8.6	6.2	13.7
1998	Reduction in fishing effort	-	8.6	5.4	10.6
1999	Reduce fishing effort, effective implementation of the TAC	-	8.6	5.3	8.4
2000	40% reduction in catches	<7.4	8.0	4.9	7.3
2001	2/3 of the catches in 1973-1990	4.3	6.4	3.5	5.7
2002	2/3 of the catches in 1973-1990	4.3	4.8		
2003	Reduce F below $\mathbf{F}_{pa}$	<6.7 [4)]			

[1]Vb(EC), VI, XII, and XIV. [2]Division VIa only. [3]Incomplete data. Weights in '000t.

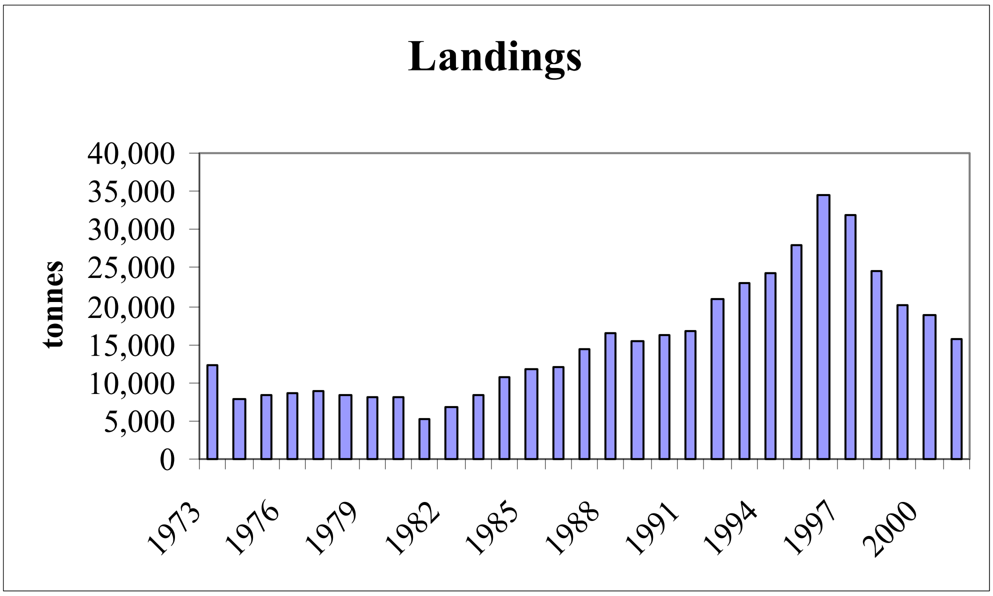
[4)] Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

Catch data (Tables 3.7.7.1-3):

Division IIIa, Subarea IV, and Subarea VI combined

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official landings	ACFM landings[2]
2003	Reduce F below $\mathbf{F}_{pa}$	<6.7			

Anglerfish in Subarea IV (North Sea) and VI (W of Scotland and Rockall)



Anglerfish in Division VIa and the North Sea: stock trends.

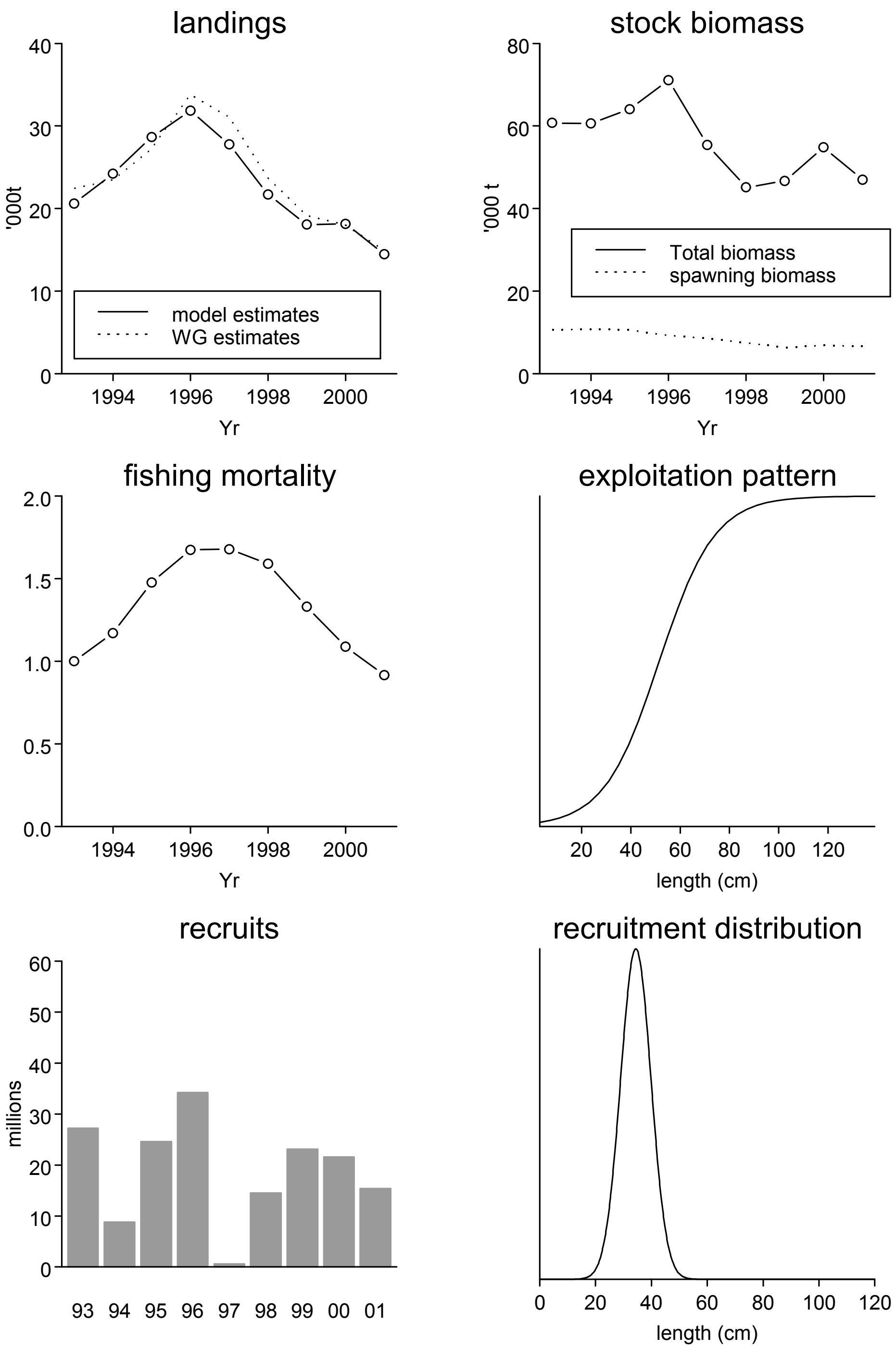


Table 3.7.7.1 Nominal catch (t) of Anglerfish in Division IIIa, 1990–2001, as officially reported to ICES.

Skagerrak and Kattegat (IIIa)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	22	15	48	34	21	35	-	-	-	-	-	-
Denmark	477	493	658	565	459	312	367	550	415	362	377	375
Germany	1	-	-	1	-	-	1	1	1	2	1	+
Norway	57	64	170	154	263	440	309	186	177	260	197*	200*
Sweden	13	23	62	89	68	36	25	39	33	36	27	46
Total	570	595	938	843	811	823	702	776	626	660	602	621

*Preliminary.

Table 3.7.7.2 Nominal catch (t) of ANGLERFISH in the North Sea, 1989–2001, as officially reported to ICES.

Northern North Sea (IVa)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	1	8	2	9	3	3	2	8	4	1	5	12	-
Denmark	835	984	1,245	1265	946	1,157	732	1,239	1,155	1,024	1,128	1,087	1,289
Faroes	1	7	1	-	10	18	20	-	15	10	6	n/a	
France	-	-	124	151	69	28	18	7	7	3*	18[1*]	19[1*]	19*
Germany	187	70	71	68	100	84	613	292	601	873	454	182	95
Netherlands	70	18	23	44	78	38	13	25	12	-	15	12	-*
Norway	309	421	587	635	1,224	1,318	657	821	672	954	1,219	1,182*	1,209*
Sweden	9	5	14	7	7	7	2	1	2	8	8	78	44
UK(E, W&NI)	99	91	129	143	160	169	176	439	2,174	668	781	218	…
UK (Scotland)	6,366	6,788	7,039	7,887	9,712	11,683	15,658	22,344	18,783	13,319	9,710	9,559	…
UK (total)													10,194
Total	7,877	8,392	9,235	10,209	12,309	14,505	17,891	25,176	23,425	16,860	13,344	12,349	12,850

* Preliminary. [1]Includes IVb,c.

Central North Sea (IVb)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	209	216	357	538	558	713	579	287	336	371	270	449	579
Denmark	211	278	345	421	347	352[1]	295	225	334	432	368	260	251
Faroes	-	-	-	-	2	-	-	-	-	-	-	n/a	
France	-	-	-	1	-	2	-	-	-	-*	…[2*]	…[2*]	-*
Germany	2	1	4	2	13	15	10	9	18	19	9	14	9
Netherlands	574	267	285	356	467	510	335	159	237	223	141	141	-*
Norway	2	27	17	4	3	11	15	29	6	13	17	9*	15*
Sweden	-	-	-	-	-	3	2	1	3	3	4	3	2
UK(E, W&NI)	628	754	669	998	1,285	1,277	919	662	664	603	364	423	…
UK (Scotland)	495	634	845	733	469	564	472	475	574	424	344	318	…
UK (total)													848*
Total	2,121	2,177	2,522	3,053	3,144	3,447	2,627	1,847	2,172	2,088	1,517	1,617	1,704

* Preliminary. [1]Includes 2 tonnes reported as Subarea IV. [2]Included in IVa.

Southern North Sea (IVc)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	54	21	13	12	34	37	26	28	17	17	11	15	15
Denmark	-	-	2	-	-	-	-	-	-	+	+	+	+
France	-	-	-	-	-	-	-	-	-	10	…[1*]	…[1*]	-*
Germany	-	-	-	-	-	-	-	-	-	-	-	+	-
Netherlands	2	7	5	10	14	20	15	17	11	15	10	15	-*
Norway							-	-	-	-	+	-*	+*
UK(E&W&NI)	30	6	6	17	18	136	361	256	131	36	3	1	…
UK (Scotland)	-	-	-	-	-	17	-	3	1	+	+	+	…
													+*
Total	86	34	26	39	66	210	402	304	160	78	24	31	15

* Preliminary. [1]Included in IVa.

Total North Sea

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001*
Total	10,084	10,603	11,783	13,301	15,519	18,162	20,920	27,327	25,757	19,026	14,885	13,997	14,569
WG estimate	9,342	9,491	10,566	11,728	13,078	15,432	15,794	16,240	18,217	14,027	11,719	11,564	10,102
Unallocated	-742	-1,112	-1,217	-1,573	-2,441	-2,730	-5,126	-	-7,540	-4,999	-3,166	-2,433	-4,467

*Preliminary.

Table 3.7.7.3 Anglerfish in Subarea VI. Nominal landings (t) as officially reported to ICES.

Anglerfish in Division VIa (West of Scotland)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	2	8	-	3	2	9	6	5	+	5	2	+	+	+
Denmark	-	34	-	1	3	4	5	10	4	1	2	1	+	+
France	2,329	1,901	2,182	1,910	2,308	2,467	2,382	2,648	2,899	2,058	1,634[*]	1,814[1*]	1,843[1*]	951[*]
Germany	9	10		1	2	60	67	77	35	72	137	50	39	11
Ireland	324	556	398	250	403	428	303	720	717	625	749	617	515	500[*]
Netherlands	-	-	-	-	-	-	-	-	-	27	1	-	-	-[*]
Norway	8	27	8	6	14	8	6	4	4	1[*]	3[*]	1[*]	3[*]	2[*]
Spain	269	15	35	7	11	8	1	37	33	63	86	53	79	
UK(E&W&NI)	433	153	71	270	351	223	370	320	201	156	119	60	44	…
UK(Scotland)	2,629	3,024	2,921	2,613	2,385	2,346	2,133	2533	2,515	2,322	1,773	1,688	1,496	…
UK (total)														1,158[*]
Total	6,003	5,728	5,615	5,061	5,479	5,553	5,273	6,354	6,408	5,330	4,506	4,284	4,019	2,622
Unallocated			184	296	2,638	3,816	2,766	5,112	11,148	7,506	5,234	3,799	2,406	2,186
As used by WG			5,799	5,357	8,117	9,369	8,039	11,466	17,556	12,836	9,654	7,413	6,425	4,808

[*]Preliminary. [1]Includes Vib.

Anglerfish in Division VIb (Rockall)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Faroe Islands	6	1	-	-	2	-	-	-	15	4	2	2		
France	4	-	-	-	-	29	-	-	-	1	1	…[1*]	…[1*]	195[*]
Germany	-	-	-	-	-	103	73	83	78	177	132	144	119	67
Ireland	-	-	400	272	417	96	135	133	90	139	130	75	81	-[*]
Norway	7	13	16	18	10	17	24	14	11	4	6	5	11[*]	5[*]
Portugal	-	-	-	-	-	-	-	-	-	-	+	-	20	19
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Spain	1340	81	138	333	263	178	214	296	196	171	252	291	14	
UK(E&W&NI)	123	17	19	99	173	76	50	105	144	247	188	111	272	…
UK(Scotland)	250	201	249	201	224	182	281	199	68	156	189	344	374	…
UK (total)														565[*]
Total	1,730	313	822	923	1,089	681	777	830	602	899	900	972	891	852

[*]Preliminary. [1]Included in VIa.

Total Anglerfish in Sub-area VI (West of Scotland and Rockall)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001[*]
Total official	7,733	6,041	6,437	5,984	6,568	6,234	6,050	7,184	7,010	6,229	5,406	5,256	4,910	3,474
Total ICES	7,733	6,041	6,621	6,280	9,206	10,050	8,816	12,296	18,158	13,735	10,554	8,385	7,316	5,660

*Preliminary.

3.7.8 Herring West of Scotland

3.7.8.a Herring in Division VIa (North)

State of stock/exploitation: The fishing mortality is at present considered to be low. SSB is believed to have risen recently due to a good year class that entered the fishery in 2001 and an increase in the proportion mature.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points: None adopted. Candidate reference points are under investigation.

Advice on management: **ICES recommends that the fishing mortality be maintained at *status quo* (=0.20), corresponding to catches in 2003 of less than 30 000 t**.

Relevant factors to be considered in management: In recent years TACs have not been restrictive, presumably because of low effort and a weak market. There has been substantial misreporting of catches into this area from the North Sea and Division VIa(S).

Catch forecast for 2003:
Basis: F(2002) =$\mathbf{F}_{sq}$=F(99-01), scaled = 0.197; Landings(2002) = 28; SSB(2002) = 139 .

F(2003 and 2004)	Basis	SSB(2003)	Landings(2003)	SSB(2004)
0.16	0.81$\mathbf{F}_{sq}$	146	25	152
0.20	$\mathbf{F}_{sq}$	143	30	145
0.24	1.22$\mathbf{F}_{sq}$	140	35	137
0.28	1.42$\mathbf{F}_{sq}$	136	40	130
0.32	1.62$\mathbf{F}_{sq}$	133	45	123

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The perception of the state of the stock and management advice has not changed.

Elaboration and special comment: There are three main fleets operating: 1) the Scottish inshore paired mid-water trawl fleet, that, together with the Northern Irish fleet, operates in the Minches and around the Isle of Barra in the southern part of the area; 2) the Scottish purse-seine fleet, which operates in the northern part of Division VIa; 3) the offshore (mainly Dutch and German freezer trawlers) fleet, which operates in the deeper waters near the edge of the continental shelf.

Misreporting of the catches has decreased in recent years. Better information of the catches has been obtained and biological sampling of catches has improved over the last 3-4 years. Satellite surveillance data has improved knowledge of vessel behaviour. The assessment in 2002 is less uncertain than in previous years reflecting the stability of the input data over the last two or three years. Estimates of F are reasonably reliable and suggest that F is well below candidate $\mathbf{F}_{pa}$. Estimates of SSB are more uncertain but suggest the stock is well above any candidate $\mathbf{B}_{pa}$. Analyses in recent years have consistently pointed towards the stock being exploited at a sustainable rate. Data from the acoustic surveys and the catch, coupled with a high proportion mature of both 2- and 3-ringers, indicate a considerable increase in spawning biomass due to a large recruitment of 2-ring herring into the population. Yield per recruit analysis with geometric mean recruitment suggests that an F of 0.28 would provide a yield of 35 000 t in the long term.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

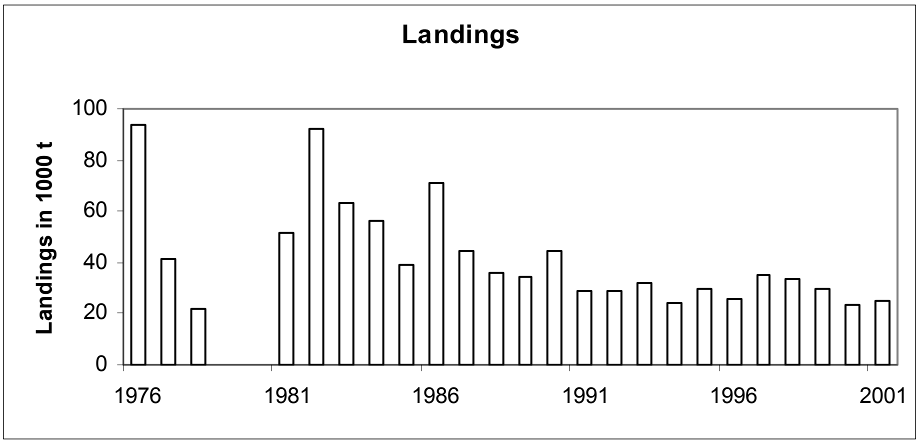
Yield and spawning biomass per Recruit F-reference points:

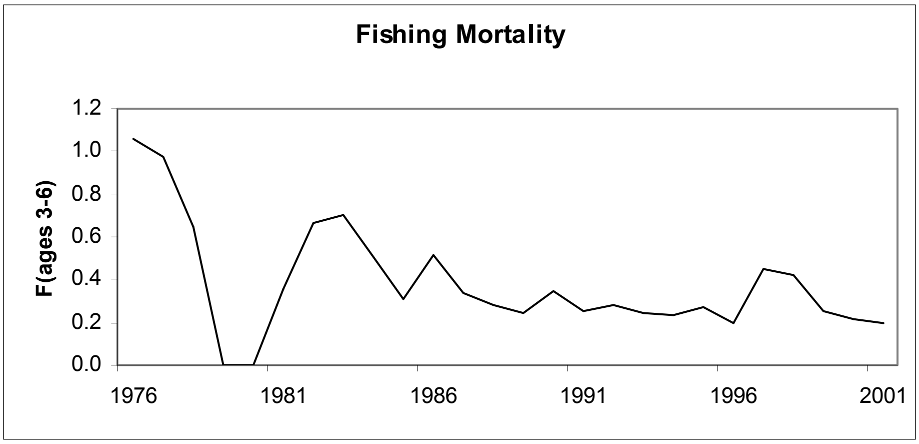
	Fish Mort Ages 3-6	Yield/R	SSB/R
Average Current	0.383	0.034	0.165
$\mathbf{F}_{max}$	N/A		
$\mathbf{F}_{0.1}$	0.167	0.033	0.186
$\mathbf{F}_{med}$	0.264	0.036	0.130

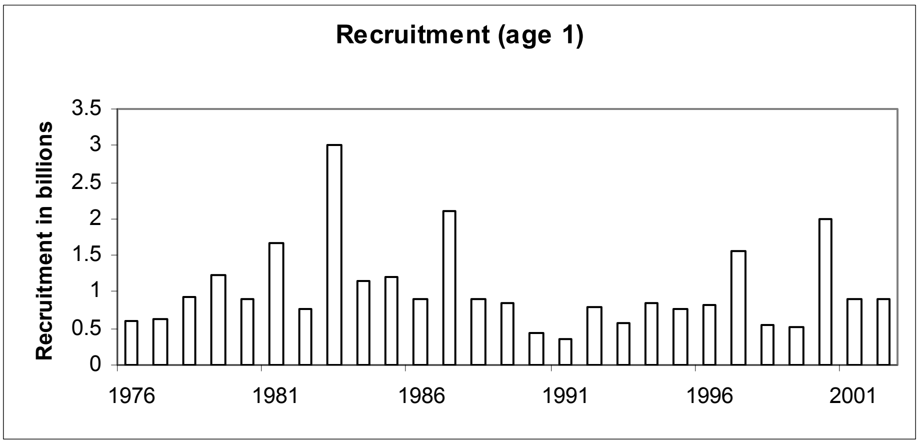
Catch data (Tables 3.7.8.a.1-2):

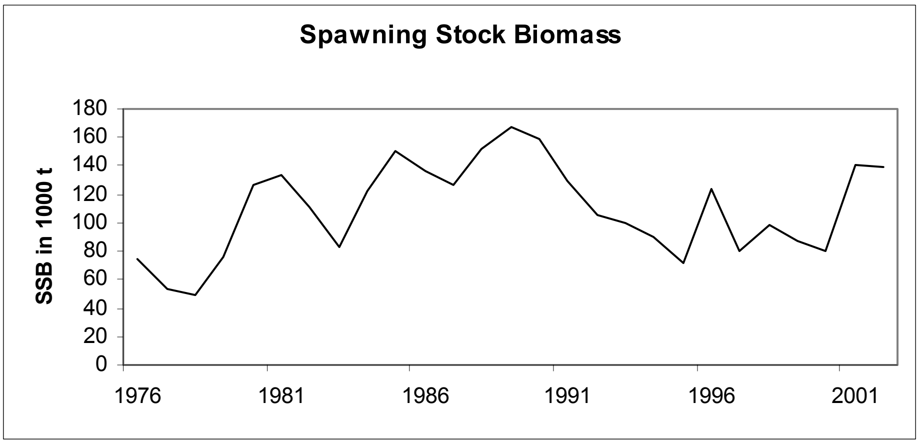
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Disc. slip.	ACFM Catch[1]
1987	Reduce F to $\mathbf{F}_{0.1}$/*status quo* F	38-55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at *status quo* F	54-58	62	0.8	32
1994	Catch at *status quo* F	50-60	62	0.7	24
1995	No specific advice	60[2]	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at *status quo* F		83.57	0.1	33[3]
1998	Catch at *status quo* F	59	80.37	0.9	33
1999	Average catches, 1991–1996	28	68		30
2000	Average catches, 1991–1996	28	42		23
2001	Average catches, 1991–1999	30	36.36		25
2002	Average catches, 1991–1999	30	33		
2003	Catch at *status quo* F	30			

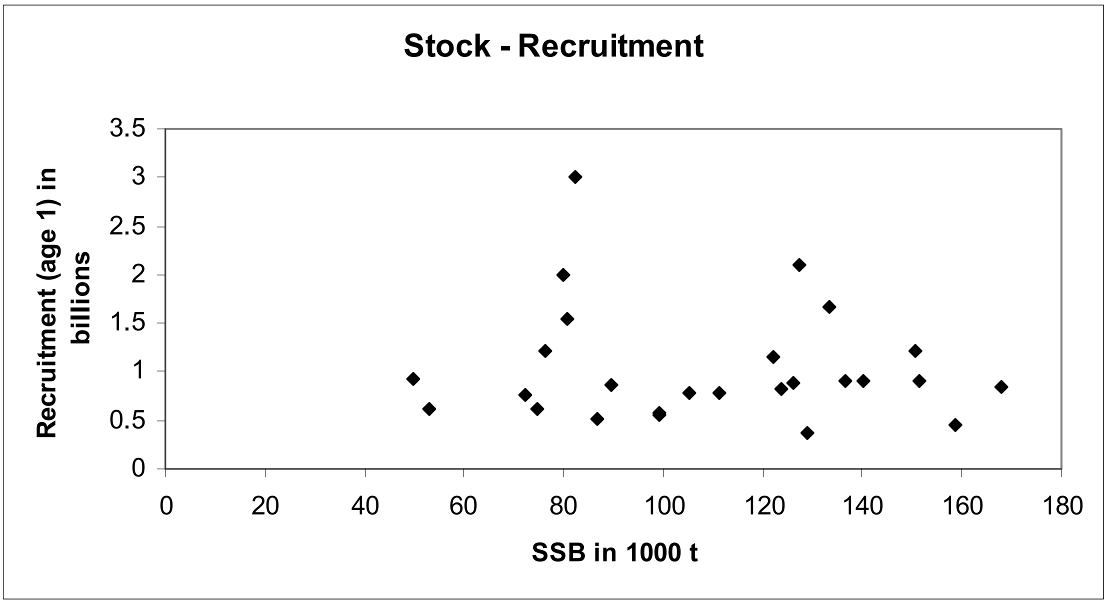
[1]Adjusted for misreporting. [2]Catch at *status quo* F. Weights in '000 t. [3]Revised down from 60 in 1999.


Landings
Landings in 1000 t
100
80
60
40
20
0
1976
1981
1986
1991
1996
2001


Fishing Mortality
F(ages 3-6)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1976
1981
1986
1991
1996
2001


Recruitment (age 1)
Recruitment in billions
3.5
3
2.5
2
1.5
1
0.5
0
1976
1981
1986
1991
1996
2001


Spawning Stock Biomass
SSB in 1000 t
180
160
140
120
100
80
60
40
20
0
1976
1981
1986
1991
1996
2001


Stock - Recruitment
Recruitment (age 1) in billions
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
SSB in 1000 t

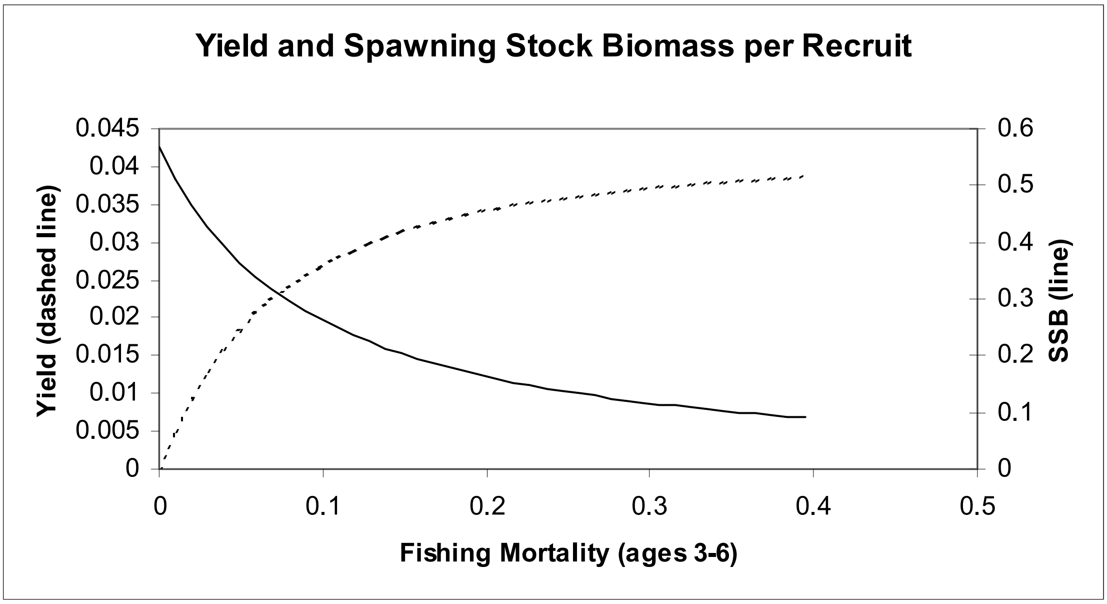

Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
SSB (line)
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
Fishing Mortality (ages 3-6)

Table 3.7.8.a.1 Nominal Landings Herring in VIa(N). Catch in tonnes by country, 1981—2001.

These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1981	1982	1983	1984	1985	1986	1987
Denmark	1580			96			
Faroes Islands		74	834	954	104	400	
France	1243	2069	1313		20	18	136
Germany	3029	8453	6283	5564	5937	2188	1711
Ireland						6000	6800
Netherlands	5602	11317	20200	7729	5500	5160	5212
Norway	3850	13018	7336	6669	4690	4799	4300
United Kingdom	31483	38471	31616	37554	28065	25294	26810
Unallocated	4633	18958	-4059	16588	-502	37840	18038
Discards							
Total	51420	92360	63523	75154	43814	81699	63007
Area-Misreported				-19142	-4672	-10935	-18647
WG Estimate	**51420**	**92360**	**63523**	**56012**	**39142**	**70764**	**44360**
Source (WG)	1983	1984	1985	1986	1987	1988	1989

Country	1988	1989	1990	1991	1992	1993	1994
Denmark							
Faroes Islands			326	482			
France	44	1342	1287	1168	119	818	274
Germany	1860	4290	7096	6450	5640	4693	5087
Ireland	6740	8000	10000	8000	7985	8236	7938
Netherlands	6131	5860	7693	7979	8000	6132	6093
Norway	456		1607	3318	2389	7447	8183
United Kingdom	26894	29874	38253	32628	32730	32602	30676
Unallocated	5229	2123	2397	-10597	-5485	-3753	-4287
Discards		1550	1300	1180	200		700
Total	47354	53039	69959	50608	51578	56175	54664
Area-Misreported	-11763	-19013	-25266	-22079	-22593	-24397	-30234
WG Estimate	**35591**	**34026**	**44693**	**28529**	**28985**	**31778**	**24430**
Source (WG)	1990	1991	1992	1993	1994	1995	1996

Country	1995	1996	1997	1998	1999	2000	2001
Denmark							
Faroes Islands							
France	3672	2297	3093	1903	463	870	760
Germany	3733	7836	8873	8253	6752	4615	3944
Ireland	3548	9721	1875	11199	7915	4841	4311
Netherlands	7808	9396	9873	8483	7244	4647	4534
Norway	4840	6223	4962	5317	2695		
United Kingdom	42661	46639	44273	42302	36446	22816	21862
Unallocated	-4541	-17753	-8015	-11748	-8155		
Discards			62	90			
Total	61271	64359	64995	65799	61514	37789	35411
Area-Misreported	-32146	-38254	-29766	-32446	-23623	-14626	-10437
WG Estimate	**29575**	**26105**	**35233***	**33353**	**29736**	**23163**	**24974**
Source (WG)	1997	1997	1998	1999	2000	2001	2002

*WG estimate for 1997 has been revised according to the Bayesian assessment (Working Group Report Section 5.1.3).

Table 3.7.8.a.2 Herring in Division VIa (North)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1976	613130	74572	93642	1.0573
1977	625870	53121	41341	0.9738
1978	918160	49875	22156	0.6493
1979	1218170	76139	60	0.0007
1980	891330	126025	306	0.0004
1981	1664130	133253	51420	0.3588
1982	772340	111116	92360	0.6683
1983	3009950	82530	63523	0.7036
1984	1150750	121989	56012	0.5096
1985	1206360	150687	39142	0.3086
1986	896180	136499	70764	0.5163
1987	2107780	127192	44360	0.3361
1988	908810	151468	35591	0.2776
1989	848170	167820	34026	0.2423
1990	444740	158549	44693	0.3423
1991	367420	129053	28529	0.2546
1992	781080	105165	28985	0.2791
1993	583740	99385	31778	0.2482
1994	860420	89704	24430	0.2307
1995	754010	72155	29575	0.2706
1996	817420	123623	26105	0.1977
1997	1546920	80829	35233	0.4478
1998	551720	99078	33353	0.4197
1999	516800	86602	29736	0.2576
2000	2004690	79944	23163	0.2157
2001	913633	140331	24974	0.1972
2002	913633	139181	0	0.1972
Average	1032865	109848	37232	0.3763

3.7.9 Norway pout in Division VIa (West of Scotland)

State of the stock/exploitation: There is no current information on which to evaluate the state of the stock.

Management objectives: There are no specific management objectives for the fisheries exploiting this stock.

Elaboration and special comment: The fishery is a small-mesh trawl fishery operated by Danish vessels. Catches are highly variable. The only data available are official landings statistics. There is no information available on which to base scientific advice. By-catches in this fishery should be quantified and made available to ICES.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 11-20 June 2002 (ICES CM 2003/ACFM:02).

Catch data (Tables 3.7.9.1-2):

Year	ICES advice	Official Landings
1987	No advice	38.3
1988	No advice	6.7
1989	No advice	28.2
1990	No advice	3.3
1991	No advice	4.3
1992	No advice	5.2
1993	No advice	7.3
1994	No advice	14.1
1995	No advice	24.4
1996	No advice	6.3
1997	No advice	9.6
1998	No advice	7.2
1999	No advice	4.6
2000	No advice	2.0
2001	No advice	3.2
2002	No advice	
2003	No advice	

Weights in '000 t.

Norway pout in Division VIa (West of Scotland)

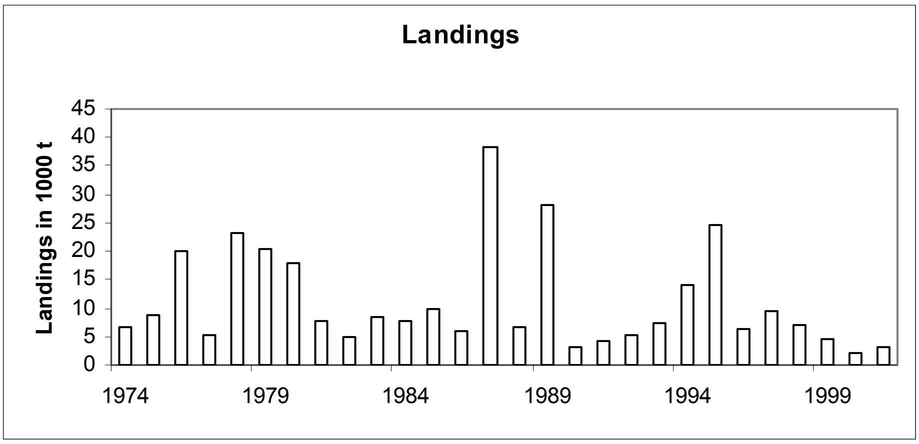


Table 3.7.9.1 Norway pout in Division VIa. Officially reported landings (tonnes).

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	5849	28180	3316	4348	5147	7338	14147	24431	6175	9549
Faroes	376	11	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	1	-	-
Netherlands	-	-	-	-	10	-	-	7	7	-
Norway	-	-	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-	-
UK (E+W)	-	-	-	-	1	-	1	-	-	-
UK (Scotland)	517	5	-	-	-	-	+	-	140	13
Total	6742	28196	3316	4348	5158	7338	14148	24439	6322	9562

Country	1998	1999	2000	2001
Denmark	7186	4624	2005	3214
Faroes	-	-	-	
Germany	-	-	-	
Netherlands	-	1	-	
Norway	-	-	-	
Poland	-	-	-	
UK (E+W)	-	-	-	
UK (Scotland)	-	-	-	
Total	7186	4625	2005	3214

Table 3.7.9.2 Norway pout in Division VIa (West of Scotland).

Year	Landings tonnes
1974	6721
1975	8655
1976	19933
1977	5206
1978	23250
1979	20502
1980	17870
1981	7757
1982	4911
1983	8325
1984	7794
1985	9697
1986	5832
1987	38267
1988	6742
1989	28196
1990	3316
1991	4348
1992	5158
1993	7338
1994	14148
1995	24439
1996	6322
1997	9562
1998	7186
1999	4625
2000	2005
2001	3214
Average	11119

3.7.10 Sandeel in Division VIa

State of the stock/exploitation: There is no current information on which to evaluate the state of the stock.

Management objectives: The current management regime uses a multi-annual TAC of 12 000 t per year with the fishery closed from 31 July. Access is limited to vessels with a track record. These arrangements took effect in 1998 for a period of three years and were renewed in 2001.

Relevant factors to be considered in management: Fishing grounds are close inshore and often adjacent to large colonies of seabirds for which the sandeel population is an important food supply, especially during the breeding season.

Elaboration and special comment: The stock was last assessed in 1996 and a new assessment has not been made. At that time it was considered to be within safe biological limits.

The justification of treating Division VIa as a management area for sandeel separately from Subarea IV and Division IIIa has been explored. The available information suggests that Division VIa should be considered as a separate stock unit for sandeel assessment.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 11-20 June 2002, Copenhagen (ICES CM 2003/ACFM: 02).

Catch data (Table 3.7.10.1):

Year	ICES Advice	Agreed TAC	Official landings	ACFM catch
1987	No advice		14.5	14.5
1988	No advice		24.5	24.5
1989	No advice		18.8	18.8
1990	No advice		16.5	16.5
1991	No advice		8.5	8.5
1992	No advice		4.9	4.9
1993	No advice		6.2	6.2
1994	No advice		10.6	10.6
1995	No advice		7.1	7.1
1996	No advice		13.3	13.3
1997	No advice		12.7	12.7
1998	No advice	12	5.3	5.3
1999	No advice	12	2.6	2.6
2000	No advice	12	5.8	5.8
2001	No advice	12	0.3	0.3
2002	No advice	12		
2003	No advice			

Weights in '000 t.

Sandeel, Division VIa. Trends in effort and landings

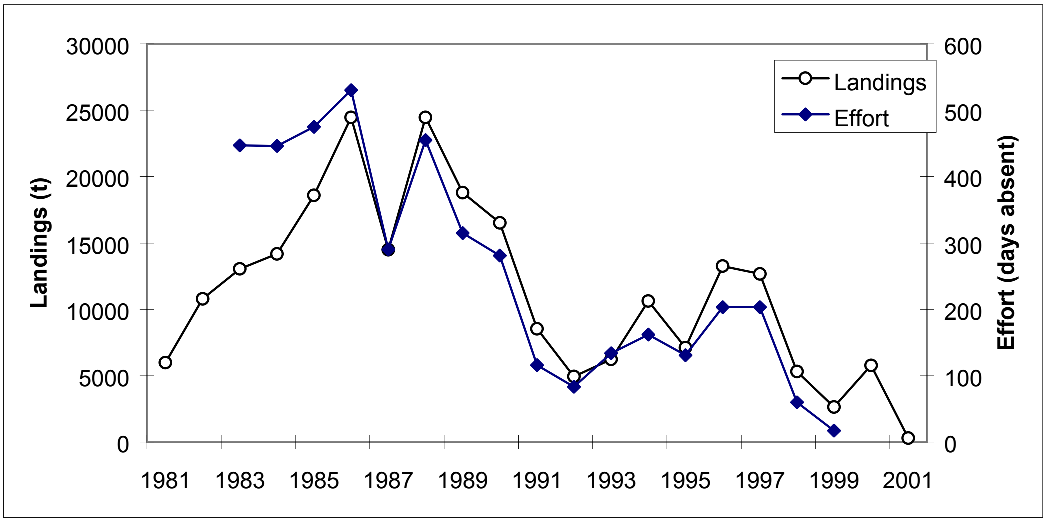


Table 3.7.10.1 Sandeel, Division VIa.
Landings (tonnes), 1981-2001, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Denmark	-	-	-	-	-	-	-	-	-	-
UK, Scotland	5972	10786	13051	14166	18586	24469	14479	24465	18785	16515
Total	5972	10786	13051	14166	18586	24469	14479	24465	18785	16515

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Denmark	-	-	80	-	-	-	-	-	-	-
UK, Scotland	8532	4935	6156	10627	7111	13257	12679	5320	2627	-
United Kingdom										5771
Total	8532	4935	6236	10627	7111	13257	12679	5320	2627	5771

Country	2001*
Denmark	
UK, Scotland	
United Kingdom	295
Total	295

*Preliminary data for 2001

3.8 Stocks in the Irish Sea (Division VIIa)

3.8.1 Overview

Fisheries

The roundfish fisheries in the Irish Sea are conducted primarily by vessels from the bordering countries (UK and Ireland). The majority of vessels are otter trawlers fishing for cod, haddock, whiting, and plaice, with by-catches of anglerfish, hake, and sole. Since 2001, these trawlers have adopted mesh sizes of 100–120 mm, and other gear modifications, depending on the requirements of recent EU technical conservation regulations and national legislation. These measures are aimed at reducing the considerable rates of discarding of young fish, particularly haddock and whiting, that have been observed on vessels using 80-100 mm mesh trawls. Square mesh panels have been mandatory for UK otter trawlers since 1993, and for Irish trawlers since 1994. The number of Irish vessels operating in this region has declined in recent years. Some Irish vessels participate in a fishery for rays in the southern Irish Sea. Fishing effort in the England and Wales fleet by vessels longer than 12.2 m declined rapidly after 1989, and over 1992–1995 was about 40% of the effort reported in the 1980s, although it has increased slightly in recent years. Since the early 1980s there has been a development of semi-pelagic trawling for cod and whiting, and more recently haddock, predominantly by vessels from Northern Ireland. Some of these vessels switch between pelagic trawling and twin-trawl fishing for *Nephrops,* depending on fishing opportunities and market demands.

Although some of the otter trawlers also take part in the fishery for sole, there have been a growing number of beam trawlers, particularly from southern England and from Belgium, exploiting this stock. The most important by-catches of this fleet are plaice, rays, brill, turbot, and anglerfish. The fishing effort of the Belgian beam-trawl fleet varies according to the catch-rates of sole in the Irish Sea compared with other areas in which the fleet operates. Fishing effort peaked in the late 1980s following a series of strong year classes of sole, but is presently only about 60% of the peak value.

A fleet of vessels, primarily from Ireland and Northern Ireland, takes part in a targeted *Nephrops* fishery using 70 mm nets and 75 mm square-mesh panels. The larger vessels, including some that normally target roundfish, may use twin trawls with 80 mm mesh. Decommissioning has reduced the size of the Northern Ireland fleet in recent years. All boats take a considerable by-catch of whiting, much of which is discarded. Discards comprise mainly juveniles because the distribution of *Nephrops* coincides with the main nursery grounds for whiting. In this fishery as well as in the roundfish fishery in the western Irish Sea, the by-catch of haddock has increased substantially in recent years because of strong year classes in the 1990s, whilst landings of whiting have declined substantially.

The other gears employed to catch demersal species are gillnets and tangle nets, notably by inshore boats targeting cod, bass, grey mullet, sole, and plaice.

The main pelagic fishery in the Irish Sea is for herring. In recent years, it has been predominantly operated by pair trawlers from Northern Ireland. The size of this fleet has declined to a very low level in recent years.

State of the Stocks

The stock of cod is outside safe biological limits. The spawning biomass is below $\mathbf{B}_{\text{lim}}$ and fishing mortality above $\mathbf{F}_{\text{lim}}$. Fishing mortality on cod increased progressively throughout the 1980s and has been close to or above F_{lim} since 1987. As with stocks of cod to the west of Scotland and in the North Sea, the high rate of fishing mortality has caused a long-term decline in spawning stock biomass, slowed or reversed only temporarily by occasional strong year classes. During the early 1990s, the spawning stock declined rapidly and recruitment has since varied around a lower average than in earlier decades. Two of the weakest year classes on record were formed in 1997 and 1998 and caused the spawning stock biomass to decline sharply in 2000 to a historic low well below F_{lim}. The EU introduced an emergency spawning closure in 2000 to try to maximise the egg production from the severely depleted spawning stock (Council Regulation (EC) No. 304/2000) and subsequently established additional technical measures to improve the selectivity of towed gears (Council Regulation (EC) No. 2549/2000). The spawning closure covered known cod spawning grounds in the Irish Sea from 14 February to 30 April 2000. Within the closure it was prohibited to use any demersal trawl, seine, or similar towed net, any gillnet, trammel net, tangle net, or similar static net or any fishing gear incorporating hooks. Derogations were permitted for *Nephrops* trawlers within defined areas, and for certain beam trawls, and some limited experimental fisheries were permitted with observers to examine by-catch of cod in fisheries for haddock and flatfish. The closure was continued in 2001 and 2002, but was restricted to the western Irish Sea west of 4°50′W on the evidence that the abundance of adult cod in the eastern Irish Sea was too low to justify the restrictions on fishing for other species. Derogations for *Nephrops* fishing were continued in 2001 and 2002, and further experimental fishing for haddock and rays was permitted in 2001. Although certain areas of the *Nephrops* grounds close to the centres of cod spawning were closed to all fishing, *Nephrops* vessels with observers were permitted provided the nets were fitted with recently developed inclined separator panels that had been shown to markedly reduce the by-catch of cod.

Landings of whiting in the main otter trawl fisheries, which now operate mostly in the western Irish Sea, have declined precipitously over time. Total international landings in 2000 and 2001 were below 1 000 t compared with to 10 000 t in the 1980s. Research surveys commencing in the early 1990s show this substantial decline to be a phenomenon mainly of the western Irish Sea, whereas average catch-rates of whiting above the commercial minimum landing size are not only higher in the eastern Irish Sea throughout this period, but show little trend over time. These different trends have prevented an analytical assessment of the state of the stock throughout the Irish Sea. The Irish Sea whiting fishery has been characterised by high levels of fishing mortality throughout the 1980s and 1990s. At such high fishing mortalities, the spawning stock contains few age classes and is vulnerable to poor recruitment. Discarding of whiting is considered a major problem in the *Nephrops* directed fishery, which continues to use 70 mm and 80 mm meshes. The increases in mesh size to 100 mm or more in the roundfish fisheries, required under recent EU and national legislation, should reduce discard rates in these fisheries.

A notable phenomenon in the Irish Sea, and also in the Celtic Sea, during the 1990s has been a growth in the stocks of haddock. Very strong 1994 and 1996 year classes caused a substantial increase in stock size in the Irish Sea leading to the development of targeted haddock fisheries using pelagic and demersal trawls. The fish are confined mainly to the western Irish Sea where established roundfish and *Nephrops* fisheries take place. This concentration of the stock may be responsible for the very high rates of fishing mortality observed in the 1990s, three times higher than the $\mathbf{F_{pa}}$. Due to the TAC arrangements for Subarea VII, some national quotas proved limiting in the 1990s, causing substantial misreporting as the stock and fishery expanded. To alleviate this problem, a separate TAC allocation for Irish Sea haddock has operated since 1999. Substantial discarding of small haddock has been observed in the otter trawl fisheries. The stock should benefit from the recent increases in mesh size in the roundfish fisheries. Due to the poor quality of landings data for this stock, and the absence of complete data on discards, the recent trends in abundance and fishing mortality are relatively poorly defined, although there is evidence that fishing mortality may have reduced in 2000 and 2001, although remaining above $\mathbf{F_{pa}}$. The biomass is expected to remain high in the short term due to relatively strong recruitment since 1999.

The stock of plaice is within safe biological limits. The landings declined in the 1990s, and in 1998 were close to the lowest recorded. This resulted from a combination of declining fishing effort and a succession of below-average year classes recruited since 1987. The spawning stock is currently above $\mathbf{B}_{\mathrm{pa}}$ and the fishing mortality since 1998 has been below $\mathbf{F}_{\mathrm{pa}}$. The stock is expected to increase and will have a low probability of falling outside safe biological limits in the medium term.

The sole stock is within safe biological limits. It has benefited several times since 1970 from very strong year classes, and as a consequence has sustained fishing mortalities that are considered high for a sole stock. In 2001, fishing mortality was below $\mathbf{F}_{\mathrm{pa}}$ and SSB above $\mathbf{B_{pa}}$. The frequency of strong year classes has decreased since the mid-1980s, leading to a decline in spawning stock to a historical low in 1996.

The stocks of *Nephrops* in the Irish Sea are considered to be fully exploited. There is some concern that fishing mortality may rise from the current high level if the use of twin trawls expands. Account should also be taken of the impact of this fishery on the stocks of protected species. There has been no assessment in recent years of the effects on *Nephrops* of predation by cod, but the low abundance of the latter has probably reduced its impact.

The stock of Irish Sea herring is presently subject to low fishing mortality exerted by a small fleet of trawlers from Northern Ireland. The stock has recovered from a collapse that followed high fishing mortalities in the 1970s. However, its present state is uncertain because the series of survey estimates remains too short to establish the recent trends in biomass.

3.8.2 Cod in Division VIIa (Irish Sea)

State of stock/exploitation: The stock remains outside of safe biological limits. Fishing mortality in 2001 was estimated to be above $\mathbf{F}_{lim}$ and SSB in 2002 below $\mathbf{B}_{lim}$. Fishing mortality has increased progressively over time and has been above $\mathbf{F}_{pa}$ since 1980 and close to, or above $\mathbf{F}_{lim}$ since 1987. A general decline in SSB since the early 1980s was reversed temporarily only by the strong 1986 year class, and, following two weak year classes in 1997 and 1998, SSB reached a historic low in 2000 at less than 50% of $\mathbf{B}_{lim}$. SSB has increased slightly since 2000 due to reduced influence of the weak 1997 and 1998 year classes. The probability of good recruitment appears to have been reduced at the SSBs observed since 1990, and the five weakest year classes on record were produced since 1992.

Management objectives: To rebuild the SSB of the stock, a spawning closure was introduced in 2000 for ten weeks from mid-February to maximize the reproductive output of the stock (EU Regulations 304/2000 and 2549/2000). The measures were revised in 2001 and 2002, involving a continued, but smaller spawning ground closure, coupled with changes in net design to improve selectivity.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 6 000 t.	$\mathbf{B}_{pa}$ be set at 10 000 t. This is the previously agreed MBAL and affords a high probability of maintaining the SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments. Below this value the probability of below-average recruitment increases.
$\mathbf{F}_{lim}$ is 1.0. This is the fishing mortality above which there is a reduced probability that the stock can sustain itself.	$\mathbf{F}_{pa}$ be set at 0.72. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$. Fishing mortalities above $\mathbf{F}_{pa}$ have been associated with observed stock decline.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$	$\mathbf{B}_{pa} =$ Previous MBAL with signs of reduced recruitment
$\mathbf{F}_{lim} = \mathbf{F}_{med}$	$\mathbf{F}_{pa} = \mathbf{F}_{med} * 0.72$

Advice on management: Given the very low stock size, the recent poor recruitments, and continued high fishing mortality despite management efforts to promote stock recovery, ICES recommends a closure of all fisheries for cod as a targeted species or by-catch. In fisheries where cod comprises solely an incidental catch there should be stringent restrictions on the catch and discard rates of cod, with effective monitoring of compliance with those restrictions.

These and other measures that may be implemented to promote stock recovery should be kept in place until there is clear evidence of the recovery of the stock to a size associated with a reasonable probability of good recruitment and there is evidence that productivity has improved. The current SSB is so far below historic stock sizes that both the biological dynamics of the stock and the operations of the fisheries are unknown, and therefore historic experience and data are not considered a reliable basis for medium-term forecasts of stock dynamics under various rebuilding scenarios.

Relevant factors to be considered in management: Although large short-term losses will be incurred in many Irish Sea fisheries, the advised measures are required if the cod stock is to reach a level where it can regain historic productivity. The advice will likely result in greatly reduced harvesting of other stocks where the fisheries take cod as part of a mixed species fisheries, particularly haddock and *Nephrops*. However, the current state of the cod stock, and the failure of past measures to bring fishing mortality down to rates that allow rebuilding, mean that more stringent action is required.

Time and area closures for particular fisheries may be a tool in rebuilding this stock, and their effect can be considered in evaluating harvest opportunities for other species.

Diversion of effort from the cod spawning grounds to other vulnerable stocks should also be prevented. It is important that management action being taken to reduce fishing mortality on the adult component of the stock is not compensated for by an increase in fishing mortality on the juveniles.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for other species down to near zero, then these programs could be considered in management of such fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their catches of cod are fully and credibly reported.

Catch forecast for 2003:
Basis: F(2002) = F(2001) = 1.08; Landings (2002) = 4.4; SSB(2003) = 4.6.

F (2003) Onwards	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0	0.0* $\mathbf{F}_{sq}$	0	0	10.6
0.22	0.2*$\mathbf{F}_{sq}$	1.2	1.2	8.9
0.43	0.4*$\mathbf{F}_{sq}$	2.2	2.2	7.4
0.57	0.5*$\mathbf{F}_{sq}$ 45% SSB increase	2.7	2.7	6.6
0.65	0.6*$\mathbf{F}_{sq}$	3.0	3.0	6.2
0.72	$\mathbf{F}_{pa}$; 30% SSB increase	3.2	3.2	5.9
0.86	0.8*$\mathbf{F}_{sq}$	3.6	3.6	5.3
1.08	$\mathbf{F}_{sq}$	4.2	4.2	4.5

Weights in '000 t.
Shaded scenarios are considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The estimate of mean fishing mortality at ages 2 to 4 given by last year's assessment was influenced by a very high value at age 2 (1998 year class), and a very low value at age 4 (1996 year class). The former year class is by far the weakest recorded, making estimates of fishing mortality very unreliable. The current assessment gives a more even distribution of fishing mortality across these age groups, although the estimate for the 1998 year class remains relatively high. The estimate of fishing mortality in 2000 is 12% higher and SSB in 2001 40% lower in this year's assessment compared to last year's assessment. The basis for the advice is the same as last year.

Elaboration and special comment: The cod fishery was traditionally carried out by otter trawlers targeting spawning cod in spring and juvenile cod in autumn and winter. Activities of these vessels have decreased, whilst a fishery for cod and haddock using large pelagic trawls increased substantially during the 1990s. In recent years the pelagic fishery has also targeted cod during the summer. Cod are also taken as a by-catch in fisheries for *Nephrops*, plaice, sole, and rays. The closure of the spawning grounds during spring from 2000 onwards has mainly affected pelagic trawlers and whitefish otter trawlers, causing displacement of effort into surrounding regions and in some cases switching to *Nephrops* trawl gear to take advantage of the derogation for *Nephrops* fishing within the closure. Given the precision of the assessment and the tendency to underestimate F in the final year, it is not yet possible to determine if the emergency measures from 2000 onwards have been successful in reducing fishing mortality and improving SSB.

Analytical assessment is based on landings-at-age and recruitment indices from surveys in Division VIIa. Estimates of mis-reported landings are included from 1991 onwards. There has been a tendency for the fishing mortality estimates for adult cod in the final year of the assessment to be revised upwards, and SSB revised downwards, when new catch and survey data for the following year are added.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

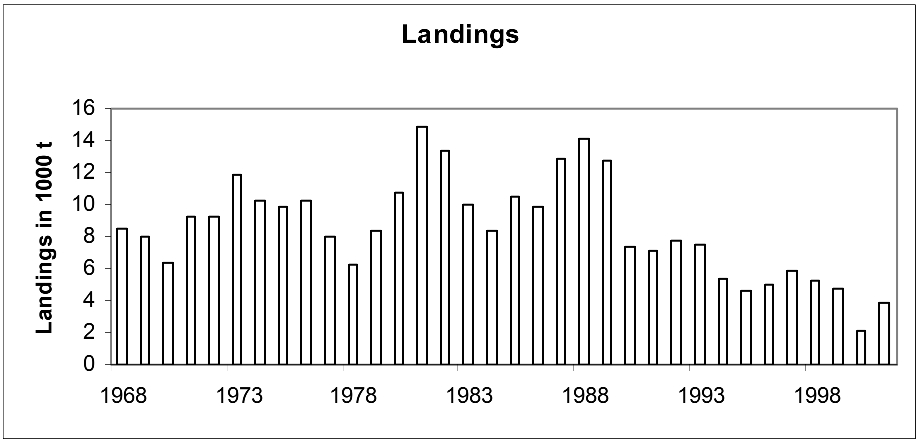
Yield and spawning biomass per Recruit F-reference points:

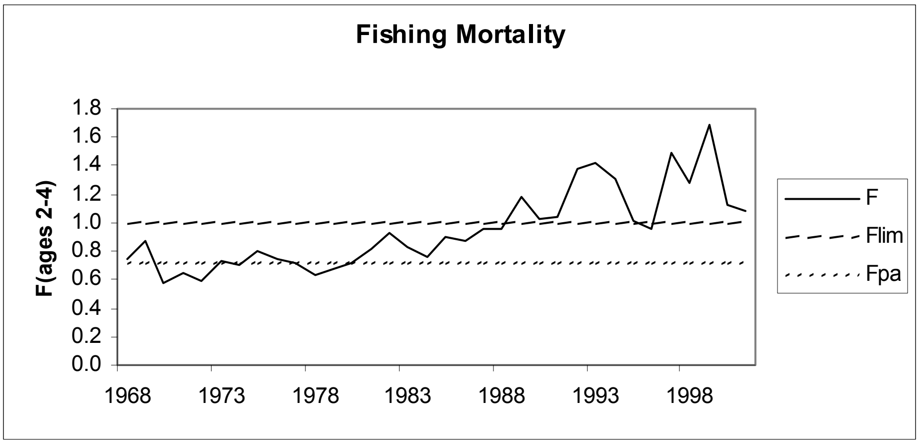
	Fish Mort Ages 2-4	Yield/R	SSB/R
Average Current	1.296	1.291	1.197
$\mathbf{F}_{max}$	0.301	1.750	5.976
$\mathbf{F}_{0.1}$	0.165	1.618	9.633
$\mathbf{F}_{med}$	1.005	1.393	1.623

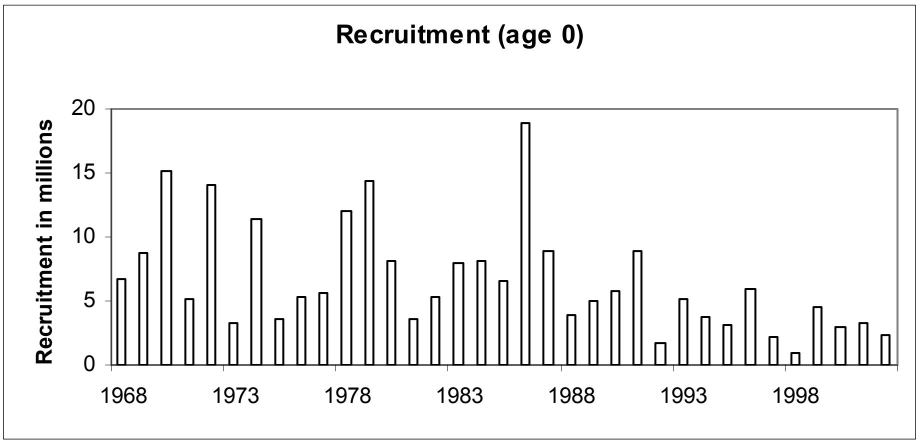
Catch data (Tables 3.8.2.1–2):

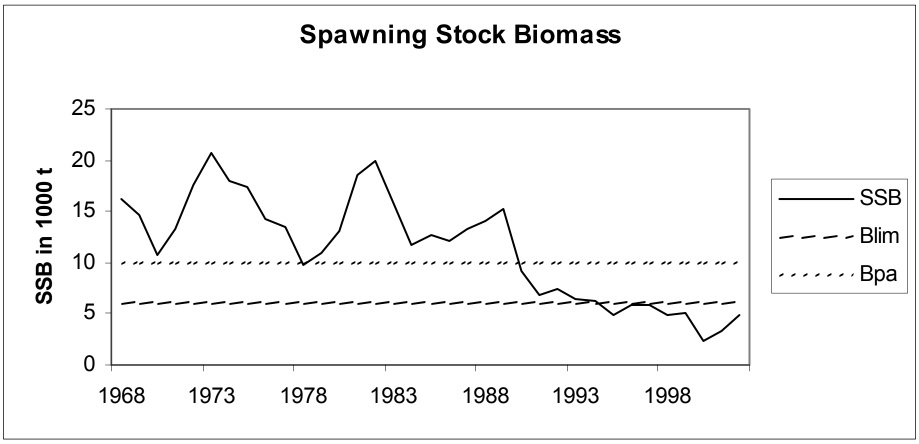
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM Landings
1987	No increase in F; interaction with *Nephrops*	10.3	15.0	13.2	12.9
1988	No increase in F; interaction with *Nephrops*	10.1	15.0	15.8	14.2
1989	No increase in F	13.4	15.0	11.3[1]	12.8
1990	F at $\mathbf{F}_{med}$; TAC	15.3	15.3	9.9[1]	7.4
1991	Stop SSB decline; TAC	6.0	10.0	7.0[1]	7.1[2]
1992	20% of F(90) ~ 10 000 t	10.0	10.0	7.4	7.7[2]
1993	$\mathbf{F}_{med}$ ~ 10 200 t	10.2	11.0	5.9	7.6[2]
1994	60% reduction in F	3.7	6.2	4.5	5.4[2]
1995	50% reduction in F	3.9	5.8	4.5	4.6[2]
1996	30% reduction in F	5.4	6.2	5.30	4.96[2]
1997	30% reduction in F	5.9	6.2	4.44	5.86[2]
1998	No increase in F	6.2	7.1	4.96	5.31[2]
1999	Reduce F below $\mathbf{F}_{pa}$	4.9	5.5	2.96	4.69[2]
2000	Lowest possible F	0	2.1	1.43[3]	2.18[2]
2001	Lowest possible F	0	2.1	1.07[3]	3.88[2]
2002	Establish rebuilding plan	-	3.2		
2003	Closure of all fisheries for cod	-			

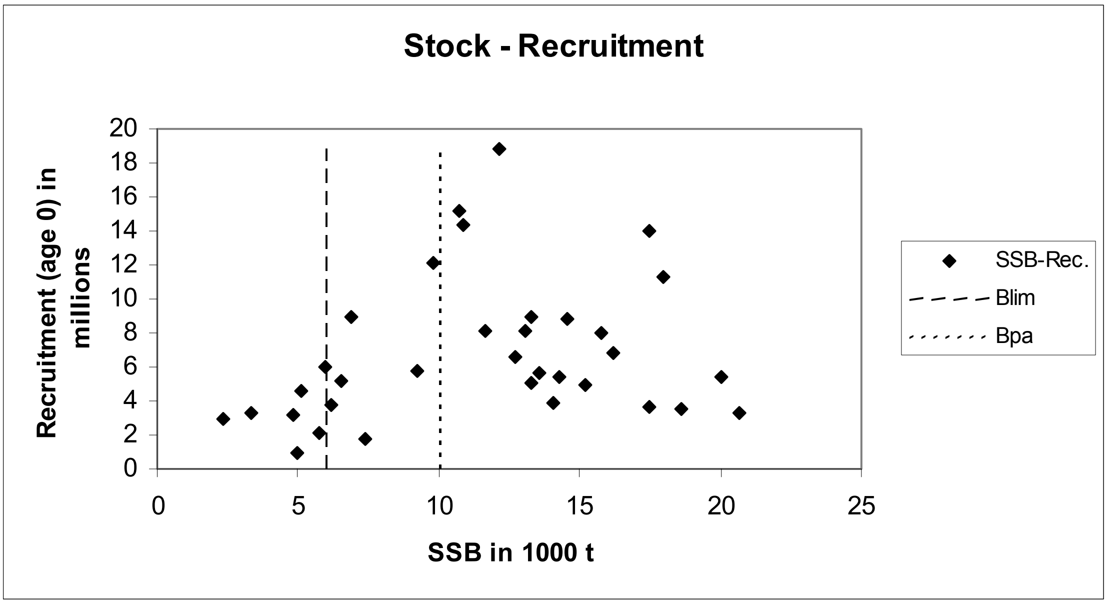
[1]Preliminary. [2]Including estimates of mis-reporting. [3]Incomplete data. Weights in '000 t.

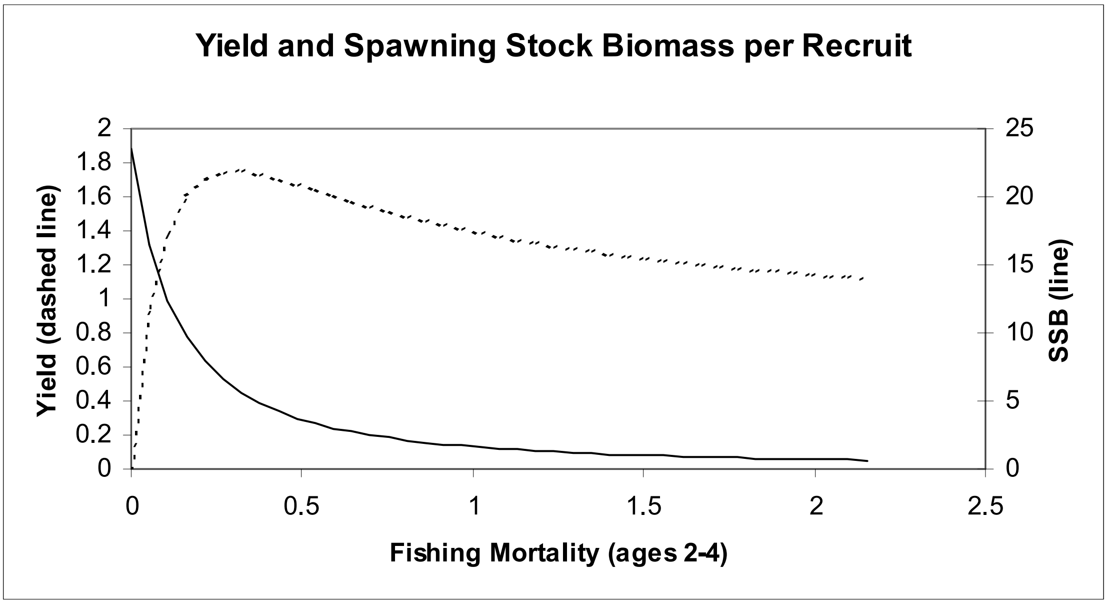

Landings
Landings in 1000 t
16
14
12
10
8
6
4
2
0
1968
1973
1978
1983
1988
1993
1998


Fishing Mortality
F(ages 2-4)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1968
1973
1978
1983
1988
1993
1998
F
Flim
Fpa


Recruitment (age 0)
Recruitment in millions
20
15
10
5
0
1968
1973
1978
1983
1988
1993
1998


Spawning Stock Biomass
SSB in 1000 t
25
20
15
10
5
0
1968
1973
1978
1983
1988
1993
1998
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 0) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa
0
2
4
6
8
10
12
14
16
18
20
0
5
10
15
20
25


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-4)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
5
10
15
20
25
0
0.5
1
1.5
2
2.5

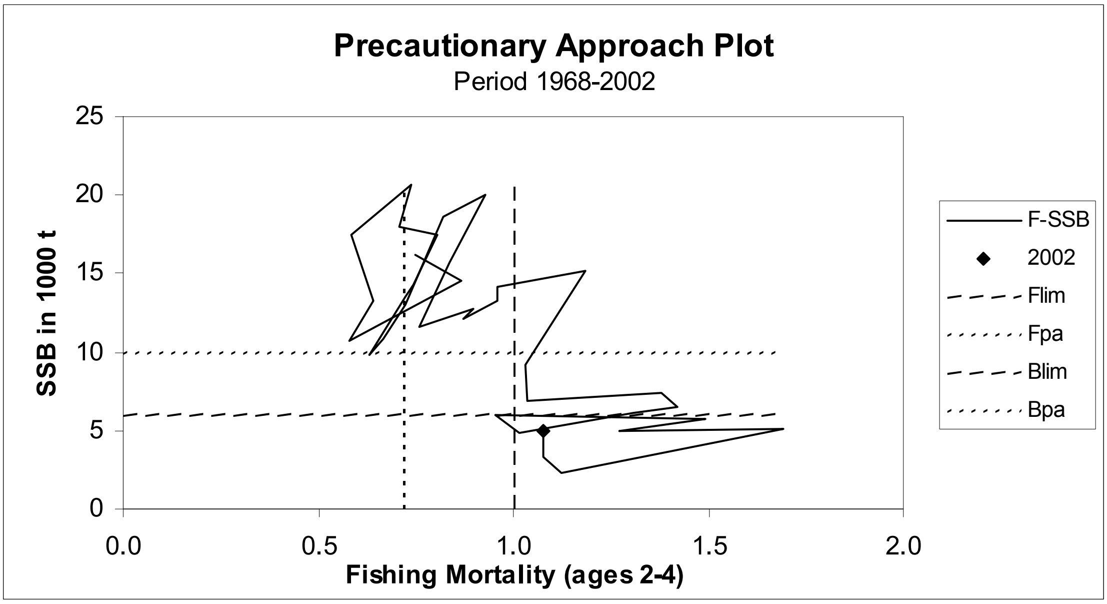

Precautionary Approach Plot
Period 1968-2002
SSB in 1000 t
Fishing Mortality (ages 2-4)
F-SSB
2002
Flim
Fpa
Blim
Bpa
0
5
10
15
20
25
0.0
0.5
1.0
1.5
2.0

Table 3.8.2.1 Nominal catch (t) of COD in Division VIIa as officially reported to ICES, and Working Group estimates of annual landings.

Country	1986	1987	1988	1989	1990	1991	1992	1993
Belgium	222	344	269	467	310	78	174	169
France	1,480	1,717	2,406	352[1]	201[1]	320[1]	916	686
Ireland	3,991	5,017	5,821	3,656	2,800	2,364	2,260	1,328
Netherlands	-	-	-	-	-	-	-	-
UK (England & Wales)[3]	847	1,922	2,667	6,320	4,752	3,562	3,529	3,244
UK (Isle of Man)	80	44	118	39	48	175	129	57
UK (N. Ireland)	2,992	3,565	4,080	…	…	…	…	…
UK (Scotland)	446	574	472	465	1,767	515	393	453
Total	10,058	13,183	15,833	11,299	9,878	7,014	7,401	5,937
Unallocated	-206	-289	-1,665	1,452	-2,499	81	334	1,618
Total figures used by Working Group for stock assessment	9,852	12,894	14,168	12,751	7,379	7,095	7,735	7,555

Country	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	129	187	142	183	316	150	60	283
France	208	166	148	268	269[1]	85[1]	66[1]	74
Ireland	1,506	1,414	2,476	1,492	1,739	966	n/a	714
Netherlands	-	-	25	29	20	5	1	-[1]
UK (England & Wales)[3]	2,274	2,330	2,359	2,370	2,517	1,665	799	n/a
UK (Isle of Man)	26	22	27	19	34	9	n/a	n/a
UK (N. Ireland)[3]	…	…	…	…	…	…	…	…
UK (Scotland)	326	414	126	80	67	80	38	n/a
Total	4,469	4,533	5,303	4,441	4,962	2,960	1,430	1,071
Unallocated	933	54	-339	1,418	348	1,734	749	2,804
Total figures used by Working Group for stock assessment	5,402	4,587	4,964	5,859	5,310[2]	4,694[2]	2,179[2]	3,875

[1]Preliminary.
[2]Revised.
[3]1989–2000 N. Ireland included with England and Wales.
n/a = not available.

Table 3.8.2.2 Cod in Division VIIa (Irish Sea)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-4
1968	6790	16226	8541	0.7487
1969	8803	14570	7991	0.8688
1970	15209	10719	6426	0.5783
1971	5085	13313	9246	0.6432
1972	14035	17507	9234	0.5858
1973	3285	20667	11819	0.7367
1974	11350	17998	10251	0.7067
1975	3615	17464	9863	0.8035
1976	5355	14270	10247	0.7433
1977	5593	13553	8054	0.7237
1978	12093	9801	6271	0.6304
1979	14374	10897	8371	0.6686
1980	8074	13056	10776	0.7238
1981	3578	18573	14907	0.8192
1982	5364	20014	13381	0.9278
1983	7951	15741	10015	0.8345
1984	8071	11652	8383	0.7593
1985	6548	12716	10483	0.8970
1986	18860	12143	9852	0.8704
1987	8901	13303	12894	0.9583
1988	3864	14096	14168	0.9593
1989	4987	15215	12751	1.1871
1990	5738	9226	7379	1.0319
1991	8928	6889	7095	1.0336
1992	1774	7383	7735	1.3815
1993	5169	6524	7555	1.4213
1994	3781	6160	5402	1.3091
1995	3181	4849	4587	1.0178
1996	5945	5945	4964	0.9521
1997	2163	5781	5859	1.4948
1998	994	4973	5310	1.2737
1999	4601	5106	4694	1.6898
2000	2932	2312	2179	1.1207
2001	3295	3364	3875	1.0762
2002	2396	4932		
Average	6648	11341	8546	0.9501

3.8.3 Haddock in Division VIIa (Irish Sea)

State of stock/exploitation: Historical perspectives of SSB, fishing mortality, and recruitment are not well known for this stock, but fishing mortality appears to be high. Occasional pulses of strong recruitment have in the past resulted in opportunistic fisheries lasting only for relatively short periods. The relatively longer productivity in the 1990s indicates that a more sustained population exists.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{\text{lim}}$ not defined	$\mathbf{B}_{\text{pa}}$ not set
$\mathbf{F}_{\text{lim}}$ not defined	$\mathbf{F}_{\text{pa}}$ be set at 0.5

Technical basis:

$\mathbf{B}_{\text{lim}}$ = not defined	$\mathbf{B}_{\text{pa}}$ = not set
$\mathbf{F}_{\text{lim}}$ = not defined	$\mathbf{F}_{\text{pa}}$ adopted by analogy with other haddock stocks

Advice on management: Since haddock is mostly taken in demersal fisheries with cod and in a *Nephrops* directed fishery, the advice for cod determines the advice for haddock. Unless ways to harvest haddock without by-catch or discards of cod can be demonstrated, fishing for haddock should not be permitted.

Relevant factors to be considered in management: On the basis of the status of the haddock stock alone, ICES would recommend that catches in 2003 be no higher than 2000 t, the average of the last two years.

The extent to which the cod-haddock fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish. Fisheries targeting *Nephrops* may take a by-catch of haddock. In this case ICES notes that haddock may continue to be caught subject to existing EU regulations applying to *Nephrops* fisheries and providing the catch of cod complies with the advice on cod.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for haddock down to near zero, then these programs could be considered in management of these fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring that their catches of cod are fully and credibly reported.

The haddock stock is mainly confined to the western Irish Sea where important mixed-species fisheries for *Nephrops* and cod take place. A directed fishery has developed for haddock during the 1990s. Large catches of haddock are taken in the *Nephrops* fishery during periods of high haddock abundance. A directed fishery for mature haddock in spring, using pelagic trawls and whitefish otter trawls, has been curtailed since 2000 by the cod spawning closure. Fishing effort of these vessels has been redirected to surrounding regions, and some vessels switched to using *Nephrops* trawls to take advantage of the derogation for *Nephrops* fishing in the closure.

A TAC is set for haddock for the whole of Subareas VII, VIII, IX, and X. The present high availability of haddock in Division VIIa has resulted in substantial mis-reporting and/or discarding due to large by-catches of haddock taken by fleets with restrictive allocations available to them. To alleviate this problem, a separate TAC allocation has been made for Division VIIa since 1999.

The haddock stock in the Irish Sea could be sustained if recent year classes indicated by surveys are allowed to realise their potential for growth, and contribute to SSB. This would only occur if fishing mortality is reduced substantially from the high values recorded in the 1990s.

A study of discards from the midwater trawl, single *Nephrops* and twin trawl fleet indicates that almost all fish younger than 2 years old and around 50% of the fish at age 2 are discarded.

The current directed fishery for haddock in the Irish Sea is likely to generate by-catches of cod in the same area. Experimental haddock fisheries with observers were permitted inside the cod closure by the European Commission in spring 2000 and 2001, and yielded by-catches of cod of approximately 15 - 20% by weight.

Comparison with previous assessment and advice: The advice last year was based on an analytical assessment and forecast. This assessment has been considered very unreliable because of sensitivity towards various model settings. The current advice is based on the average catch of the last two years.

Elaboration and special comment: Haddock production in the Irish Sea has been irregular, with one productive period in the late 1950s, two in the early 1970s, and a recent one in the latter half of the 1990s. Production in the 1990s has exceeded that in the earlier periods and also coincided with increased abundance of haddock in the Celtic Sea. Previous productive periods, other than the recent one, are believed to have coincided with strong year classes in Subarea VI. Whilst the 1994 year class was relatively strong in Divisions VIa, VIIa, and VIIb-k, patterns of recruitment in subsequent years have differed markedly between areas. Growth rates of individual haddock also differ between areas, and haddock grow fastest in the Irish Sea.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

Catch data (Tables 3.8.3.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings[2]	ACFM landings
1987	Not dealt with			1.287	1.287
1988	Not dealt with			0.747	0.747
1989	Not dealt with			0.560	0.560
1990	Not dealt with			0.582	0.582
1991	Not dealt with			0.616	0.616
1992	Not dealt with			0.656[6]	0.703
1993	Not dealt with			0.730	0.813
1994	Not dealt with			0.681	1.043
1995	Not dealt with		6[1]	0.841	1.753
1996	No advice		7[1]	1.453	3.023
1997	Means of setting catch limits required		14[1]	1.925	3.391
1998	Catch limit for VIIa	3.0	20[1]	3.015	4.902
1999	No increase in F; Catch limit for VIIa	7.0	4.99[2]	2.370	4.119
2000	Reduce F below $\mathbf{F}_{pa}$	<2.8	3.4[2]	2.398[3]	1.380
2001	Reduce F below $\mathbf{F}_{pa}$	<1.71	2.7[2]	2.102[3]	2.498
2002	Reduce F below $\mathbf{F}_{pa}$	<1.20	1.3[2]		
2003	No cod catches	-			

[1] precautionary TAC for VII, VIII, IX, X. [2] VIIa allocation of precautionary TAC. [3]Incomplete data.

Haddock in Division VIIa (Irish Sea)

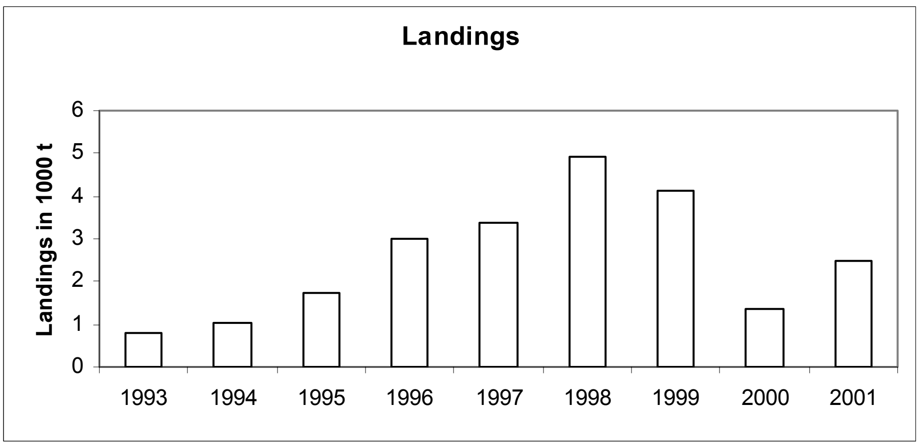


Table 3.8.3.1 Nominal landings (t) of HADDOCK in Division VIIa, 1984–2001, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	3	4	5	10	12	4	4	1
France	38	31	39	50	47	n/a	n/a	n/a
Ireland	199	341	275	797	363	215	80	254
Netherlands	-	-	-	-	-	-	-	-
UK (England & Wales)[1]	29	28	22	41	74	252	177	204
UK (Isle of Man)	2	5	4	3	3	3	5	14
UK (N. Ireland)	38	215	358	230	196	…	…	…
UK (Scotland)	78	104	23	156	52	86	316	143
Total	387	728	726	1,287	747	560	582	616
Unallocated	0	0	0	0	0	0	0	0
Total figures used by Working Group	387	728	726	1,287	747	560	582	616

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000
Belgium	8	18	22	32	34	55	104	53	22
France	26	41	22	58	105	74	86	n/a	n/a
Ireland	251	252	246	320	798	1,005	1,699	759	1,238
Netherlands	-	-	-	-	1	14	10	5	2
UK (England & Wales)[1]	244	260	301	294	463	717	1,023	1,479	1,061
UK (Isle of Man)	13	19	24	27	38	9	13	7	19
UK (N. Ireland)	…	…	…	…	…	…	…	…	…
UK (Scotland)	114	140	66	110	14	51	80	67	56
United Kingdom									
Total	656	730	681	841	1,453	1,925	3,015	2,370	2,398
Unallocated	47	83	362	912	1,570	1,466	1,887	1,749	-1,018
Total figures used by Working Group	703	813	1,043	1,753	3,023	3,391	4,902	4,119	1,380

Country	2001
Belgium	68
France	183*
Ireland	528*
Netherlands	
UK (England & Wales)[1]	
UK (Isle of Man)	
UK (N. Ireland)	
UK (Scotland)	
United Kingdom	1,323*
Total	2,102
Unallocated	396
Total figures used by Working Group	2,498

*Preliminary.
[1] 1989–2000 Northern Ireland included with England and Wales.
n/a = not available.

3.8.4 Whiting in Division VIIa (Irish Sea)

State of stock/exploitation: The current state of the stock in the Irish Sea as a whole is poorly defined. There has been a severe decline in abundance in the western Irish Sea where the bulk of the catch is taken, and fishing mortality is very high in this region. Historical estimates of fishing mortality have been above $\mathbf{F}_{pa}$. Catches have declined progressively since the early 1980s, and the proportion discarded has increased. Estimates for 2000 and 2001 indicate that 60 - 70% of the catch was discarded.

Management objectives: No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to reduce or maintain F below $\mathbf{F}_{pa}$ and to increase or maintain spawning stock biomass above $\mathbf{B}_{pa}$.

Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 5 000 t, the lowest observed spawning stock biomass as estimated in previous assessment. There is no clear evidence of reduced recruitment at the lowest observed SSB's.	$\mathbf{B}_{pa}$ be set at 7 000 t, which is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ is 0.95. This is the fishing mortality estimated to lead to a potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.65. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and is consistent with a high probability of remaining above $\mathbf{B}_{pa}$ in the long run.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$	$\mathbf{B}_{pa} = \mathbf{B}_{loss} * 1.4$
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$ as estimated in an earlier assessment	$\mathbf{F}_{pa}$ = 0.65, implies an equilibrium SSB of 10.6 kt, and a relatively low probability of SSB < $\mathbf{B}_{pa}$ (= 7 kt), and is within the range of historic Fs.

Advice on management: ICES recommends that fishing mortality on whiting should be reduced to as close to zero as possible in 2003. A rebuilding plan, including provisions to effectively reduce directed harvest, discards, and by-catch in other fisheries should be developed and implemented in order to rebuild SSB.

Relevant factors to be considered in management: A *Nephrops*-directed fishery operates on the main whiting nursery areas in the Irish Sea. Recent levels of discards in this *Nephrops*-directed fishery during the late 1990s have been at around 43% by weight of the estimated catch of whiting in this fishery, rising to over 60% in 2000 and 2001. Discard rates have increased because of the scarcity of fish above minimum landing size and the low value of the catch. This means that the fishing mortality on whiting cannot be effectively controlled by restrictions on landings alone, but would also require measures to reduce discards. Square mesh panels have been mandatory for all UK trawlers (excluding beam trawlers) in the Irish Sea since 1993, and for Irish trawlers since 1994. While the effects of this technical measure have not been formally evaluated, the *Nephrops* fishery still generates substantial quantities of whiting discards, indicating that further measures are necessary. Management measures for the *Nephrops* fishery should also take into account the effect on whiting. Increased use of 100 mm mesh size in whitefish trawlers since 2001 should also improve selectivity for whiting.

Medium- and long-term projections: No medium-term projections have been carried out because of the uncertainties in the assessment.

Comparison with previous assessment and advice: The advice last year was based on an analytical assessment and forecast. This assessment has been considered very unreliable because of conflicting signals between survey and commercial catch data, and is now considered inadequate for making an analytical forecast.

Elaboration and special comment: Whiting is taken mainly as a by-catch in mixed-species otter trawl fisheries for *Nephrops*, cod, and other demersal species, and to a lesser extent in the pelagic fishery for cod and haddock.

Uncertainties in the assessment are related to different trends in survey indices from the Eastern and Western Irish Sea. Survey catch-rates of whiting above the MLS of 27 cm have declined continuously in the western region since 1992, reflecting the rapid decline in commercial landings, whilst survey catch-rates in the eastern region are much higher and show little or no trend over time. The commercial fishery has become more concentrated in the western region in recent years as the English and Welsh fleets, which operate mainly in the east, have declined over time. Reconciling the conflicting signals in the assessment will necessitate understanding dispersal of whiting between the two areas. It is not known if the collapse of the population of adult whiting in the western Irish Sea represents a localised depletion of a more broadly distributed stock, or the depletion of a local sub-population.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

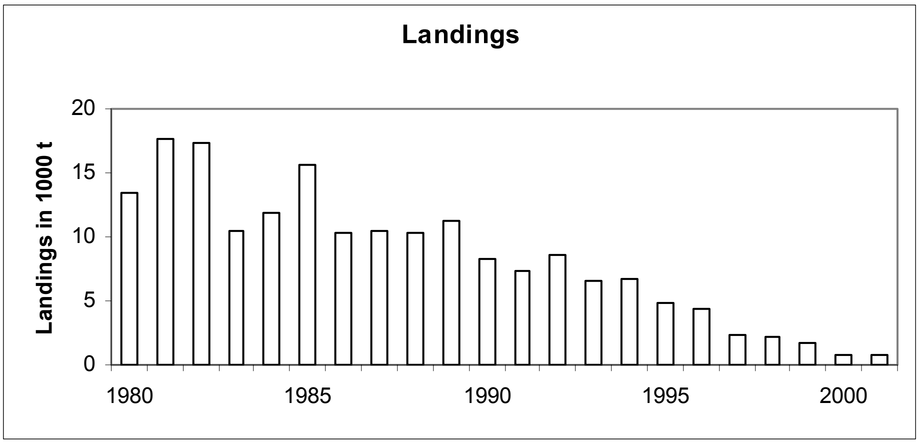
Yield and spawning biomass per Recruit F-reference points:

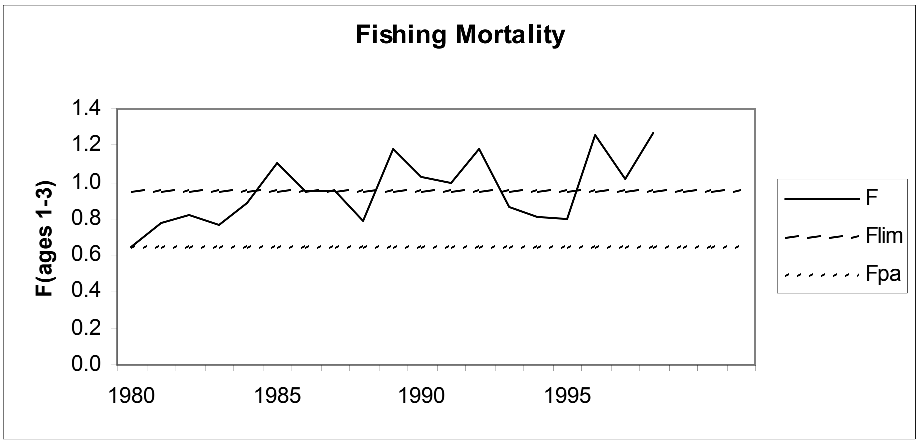
	Fish Mort Ages 1-3	Yield/R	SSB/R
Average Current	0.908	0.067	0.321
$\mathbf{F}_{max}$	0.252	0.068	0.280
$\mathbf{F}_{0.1}$	0.165	0.064	0.398
$\mathbf{F}_{med}$	0.677	0.047	0.085

Catch data (Tables 3.8.4.1-2):

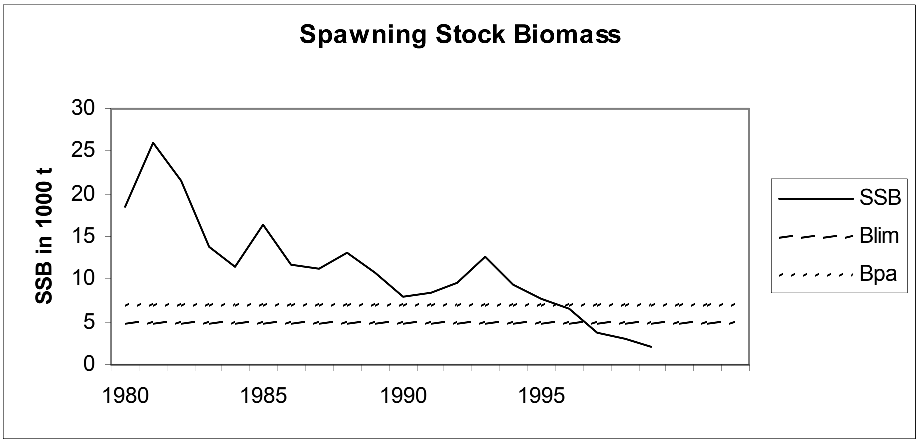
Year	ICES Advice	Predicted catches corresp. to advice	Agreed TAC	Official Landings	Disc.[2]	ACFM catch
1987	Reduce F	16.0	18.2	11.7	3.8	14.4
1988	No increase in F; enforce mesh regulations	12.0	18.2	11.5	1.9	11.9
1989	F = $\mathbf{F}_{high}$; enforce mesh regulation	11.0	18.2	11.3	2.0	13.4
1990	No increase in F; TAC	8.3[1]	15.0	8.2	2.7	10.7
1991	Increase SSB to SSB(89); TAC	6.4[1]	10.0	7.4	2.7	9.9
1992	80% of F(90)	9.7[1]	10.0	7.1	4.3	12.8[3]
1993	70% of F(91) ~ 6 500 t	6.5	8.5	6.0	2.7	9.2[3]
1994	Within safe biological limits	-	9.9	5.6	1.2	7.9[3]
1995	No increase in F	8.3[1]	8.0	5.5	2.2	7.0[3]
1996	No increase in F	9.8[1]	9.0	5.6	3.5	8.0[3]
1997	No advice given	-	7.5	4.5	1.9	4.2[3]
1998	20% reduction in F	3.8[5]	5.0	3.4	1.3	3.5[3]
1999	Reduce F below $\mathbf{F}_{pa}$	3.5[5]	4.41	2.0	1.1	2.8[3]
2000	Reduce F below $\mathbf{F}_{pa}$	<1.6[5]	2.64	1.2	2.1	2.9[3]
2001	Lowest possible F	~0	1.39	1.1	1.0	1.7[3]
2002	Lowest possible F	~0	1.00			
2003	Lowest possible F	~0				

[1]Not including discards from the *Nephrops* fishery. [2]From *Nephrops* fishery. [3]Including estimates of misreporting.
[5]Landings only, no discards included. Weights in '000 t.

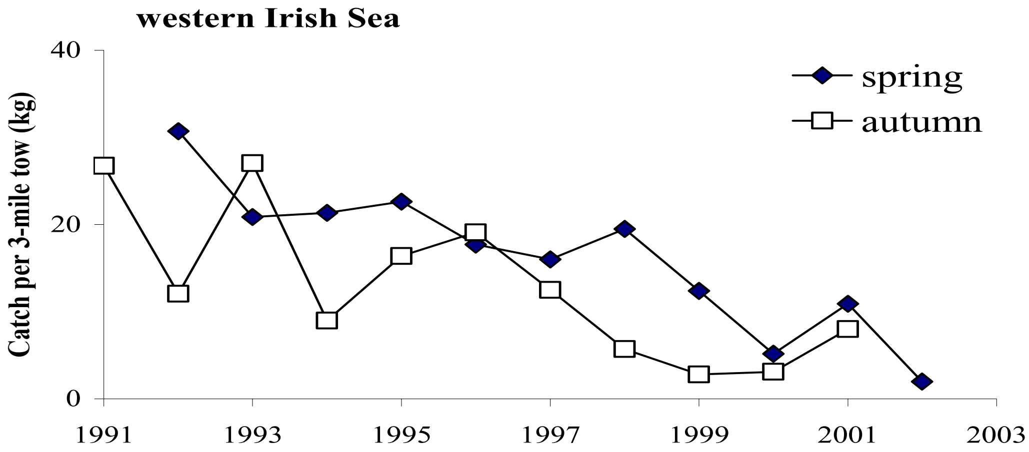

Landings
Landings in 1000 t
20
15
10
5
0
1980
1985
1990
1995
2000


Fishing Mortality
F(ages 1-3)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1980
1985
1990
1995
F
Flim
Fpa


Recruitment (age 0)
Recruitment in millions
300
250
200
150
100
50
0
1980
1985
1990
1995


Spawning Stock Biomass
SSB in 1000 t
30
25
20
15
10
5
0
1980
1985
1990
1995
SSB
Blim
Bpa

UK(NI) groundfish survey catch-rates of whiting above MLS of 27cm, by area



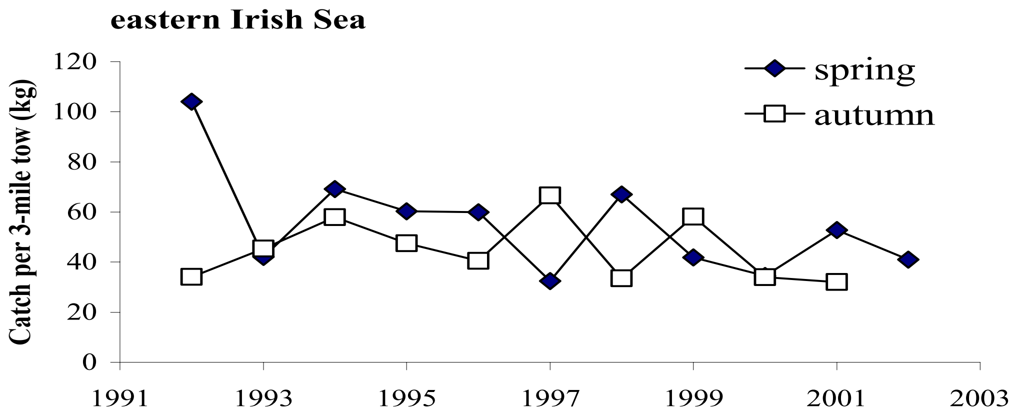


Table 10.1.3.1 **Table 3.8.4.1** Nominal catch (t) of WHITING in Division VIIa, 1987–2001, as officially reported to ICES and Working Group estimates of human consumption and discards.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	109	90	92	142	53	78	50	80	92	80	47	52	46	30	27
France	826	1,063	533	528	611	509	255	163	169	78	86	81	150	96	25
Ireland	4,067	4,394	3,871	2,000	2,200	2,100	1,440	1,418	1,840	1,773	1,119	1,260	509	353	467
Netherlands										17	14	7	6	1	
UK (Engl.& Wales) [a]	1,529	1,202	6,652	5,202	4,250	4,089	3,859	3,724	3,125	3,557	3,152	1,900	1,229	670	
UK (Isle of Man)	14	15	26	75	74	44	55	44	41	28	24	33	5	2	
UK (N. Ireland)	4,858	4,621													
UK (Scotland)	281	107	154	236	223	274	318	208	198	48	30	22	44	15	
UK															531
Total human consumption	11,684	11,492	11,328	8,183	7,411	7,094	5,977	5,637	5,465	5,581	4,472	3,355	1,989	1,167	1,050
Estimated *Nephrops* fishery discards used by the WG [b]	3,899	1,611	2,103	2,444	2,598	4,203	2,707	1,173	2,151	3,631	1,928	1,304	1,092	2,118	1,012
Estimated landings used by the WG	10,519	10,245	11,305	8,212	7,348	8,588	6,523	6,763	4,893	4,335	2,277	2,229	1,670	762	733
Unallocated human consumption	-1,165	-1,247	-23	29	-63	1,494	546	1,126	-572	-1,246	-2,195	-1,126	-319	-405	-317
Total catch figures used by the WG	14,418	11,856	13,408	10,656	9,946	12,791	9,230	7,936	7,044	7,966	4,205	3,533	2,762	2,880	1,745

Revised

Preliminary

[a] 1989–2000 Northern Ireland included with England and Wales.

[b] Based on UK (N. Ireland) and Ireland data.

Table 3.8.4.2 Whiting in Division VIIa (Irish Sea)

Year	Landings tonnes
1980	13461
1981	17646
1982	17304
1983	10525
1984	11802
1985	15582
1986	10300
1987	10519
1988	10245
1989	11305
1990	8212
1991	7348
1992	8588
1993	6523
1994	6763
1995	4893
1996	4335
1997	2277
1998	2229
1999	1670
2000	762
2001	733
Average	8319

3.8.5 Plaice in Division VIIa (Irish Sea)

State of stock/exploitation: The stock remains within safe biological limits. The SSB in 2002 was above $\mathbf{B}_{pa}$ and fishing mortality in 2001 was below $\mathbf{F}_{pa}$. Fishing mortality on this stock was above $\mathbf{F}_{pa}$ in most years between 1967 and 1997, but declined through the 1990s and is now at about 60% of $\mathbf{F}_{pa}$. SSB has been above $\mathbf{B}_{pa}$ throughout the period of assessment.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
There is no biological basis for defining $\mathbf{B}_{lim}$ or $\mathbf{F}_{lim}$.	$\mathbf{B}_{pa}$ be set at 3 100 t. There is evidence of high recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ can therefore be set equal to the lowest observed SSB.
	$\mathbf{F}_{pa}$ be set at 0.45. This is considered to provide a high probability that SSB remains above $\mathbf{B}_{pa}$ in the long term.

Technical basis:

$\mathbf{B}_{lim}$ and $\mathbf{F}_{lim}$: stock-recruitment data uninformative; $\mathbf{F}_{loss}$ poorly defined.	$\mathbf{B}_{pa} = \mathbf{B}_{loss}$.
	$\mathbf{F}_{pa} = \mathbf{F}_{med}$ in a previous assessment, and long-term considerations.

Advice on management: ICES recommends that fishing mortality on plaice in 2003 should not be allowed to increase above the current level, corresponding to landings of less than 1 900 t. This is consistent with the advice for sole, which is taken in the same fisheries. In addition there is no long-term gain in yield-per-recruit at higher fishing mortality.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$ = F(99-01) = 0.30; Landings(2002) = 1.7; SSB(2003) = 5.5.

F(2003) onwards	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0.30	1.0*$\mathbf{F}_{sq}$	1.9	1.9	5.7
0.36	1.2*$\mathbf{F}_{sq}$	2.2	2.2	5.4
0.45	$\mathbf{F}_{pa}$ (= 1.5*$\mathbf{F}_{sq}$)	2.6	2.6	5.0

Weights in '000 t.

Medium- and long-term projections: At current F, and assuming that the pattern of reduced recruitment observed since the late 1980s continues into the future, SSB is expected to increase to around 6 000 t by 2004 and to 7 000 t by 2011. The probability of SSB falling below $\mathbf{B}_{pa}$ remains very small for fishing mortality rates at $\mathbf{F}_{pa}$ and below. Current F is close to the value giving maximum yield-per-recruit.

Comparison with previous assessment and advice: The estimate of fishing mortality in 2000 is 18% higher and SSB in 2001 14% lower in this year's assessment compared to last year's assessment. The basis for the advice is the same as last year.

Elaboration and special comment: Plaice are taken mainly in long-established UK and Irish otter trawl fisheries for demersal fish. They are also taken as a by-catch in the beam trawl fishery for sole. The main fishery is concentrated in the North-east Irish Sea. Effort in the UK and Belgian beam trawl fleets increased in the late 1980s, but declined in the early 1990s.

Multiannual TAC Arrangements and Recovery Plans: Section 3.5.17 reviewed a study on schemes for Multiannual advice on TACs for four plaice and two sole stocks. These studies indicated possible target fishing mortalities for specific TAC schemes. ICES considers that target values must be defined by management taking scientific studies into account. ICES has not received feed-back with specification of target reference points and therefore continues to provide advice based on the precautionary reference points consistent with previous practice.

The analytical assessment is based on a tuned catch-at-age analysis with CPUE data from three commercial fleets and three surveys, and does not include estimates of discarded fish.

Reported landings in recent years are likely to be more accurate than in the past.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

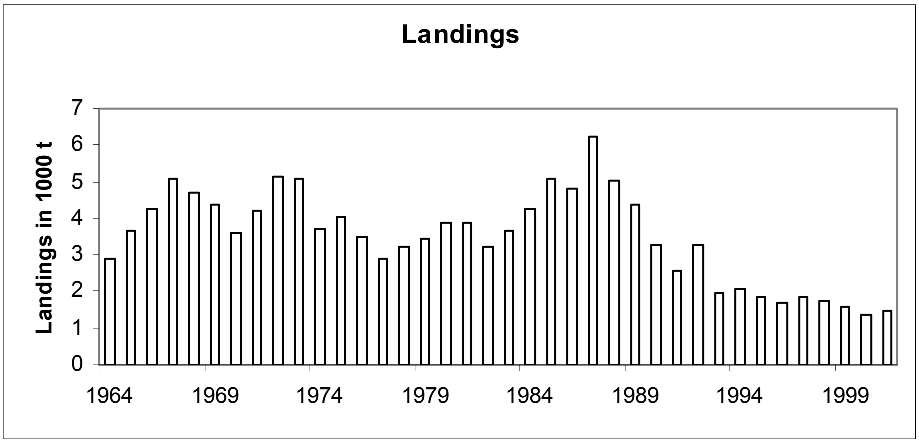
Yield and spawning biomass per Recruit F-reference points:

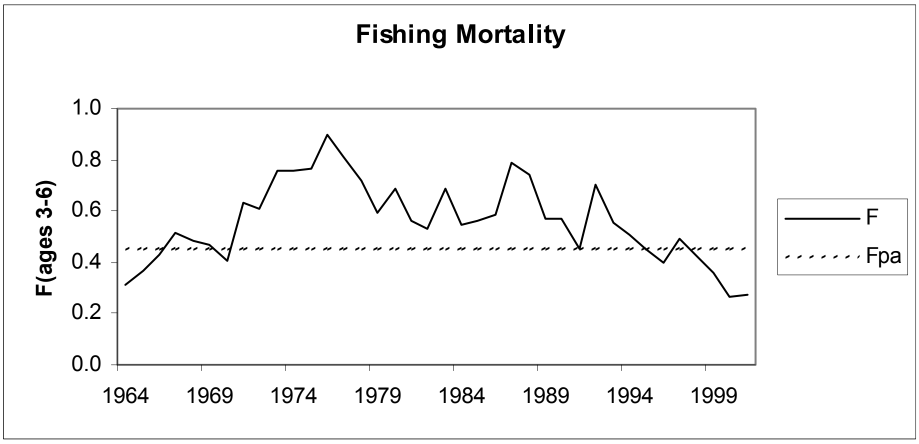
	Fish Mort Ages 3-6	Yield/R	SSB/R
Average Current	0.559	0.211	0.630
$\mathbf{F}_{max}$	0.317	0.211	0.599
$\mathbf{F}_{0.1}$	0.124	0.187	1.283
$\mathbf{F}_{med}$	0.426	0.209	0.456

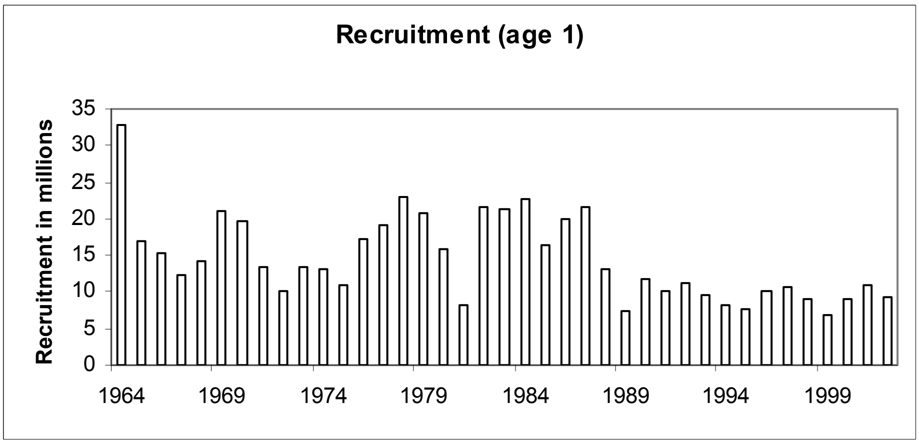
Catch data (Tables 3.8.5.1-2):

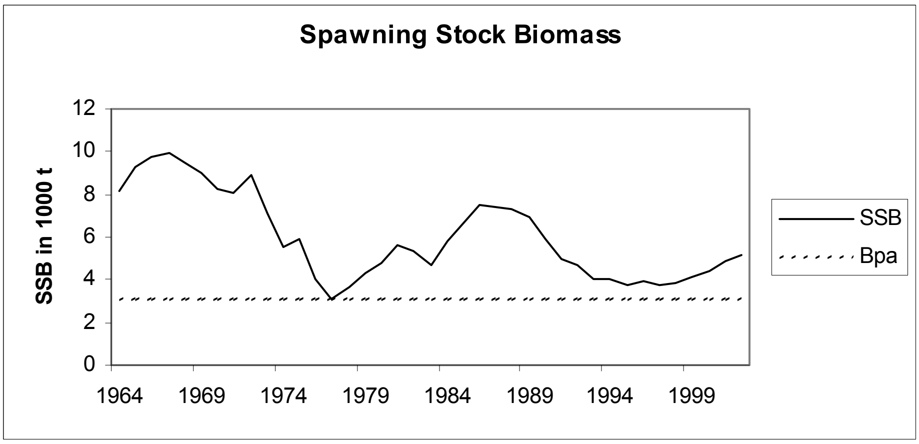
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM Landings
1987	F high; no long-term gains in increasing F	5.0	5.0	5.6	6.2
1988	No increase in F	4.8	5.0	4.4	5.0
1989	80% of F(87); TAC	5.8	5.8	4.2	4.4
1990	Halt decline in SSB; TAC	5.1	5.1	4.0	3.3
1991	Rebuild SSB to SSB(90); TAC	3.3	4.5	2.8	2.6
1992	70% of F(90)	3.0	3.8	3.2	3.3
1993	F = 0.55 ~ 2 800 t	2.8	2.8	2.0	2.0
1994	Long-term gains in decreasing F	<3.7	3.1	2.1	2.1
1995	Long-term gains in decreasing F	2.4[1]	2.8	2.0	1.9
1996	No long-term gain in increasing F	2.5	2.45	1.9	1.7
1997	No advice	-	2.1	2.0	1.9
1998	No increase in F	2.4	2.4	1.8	1.8
1999	Keep F below $\mathbf{F}_{pa}$	2.4	2.4	1.6	1.6
2000	Keep F below $\mathbf{F}_{pa}$	<2.3	2.4	1.5	1.4
2001	Keep F below $\mathbf{F}_{pa}$	<2.4	2.0	1.5	1.5
2002	Keep F below $\mathbf{F}_{pa}$	<2.8	2.4		
2003	No increase in F	1.9			

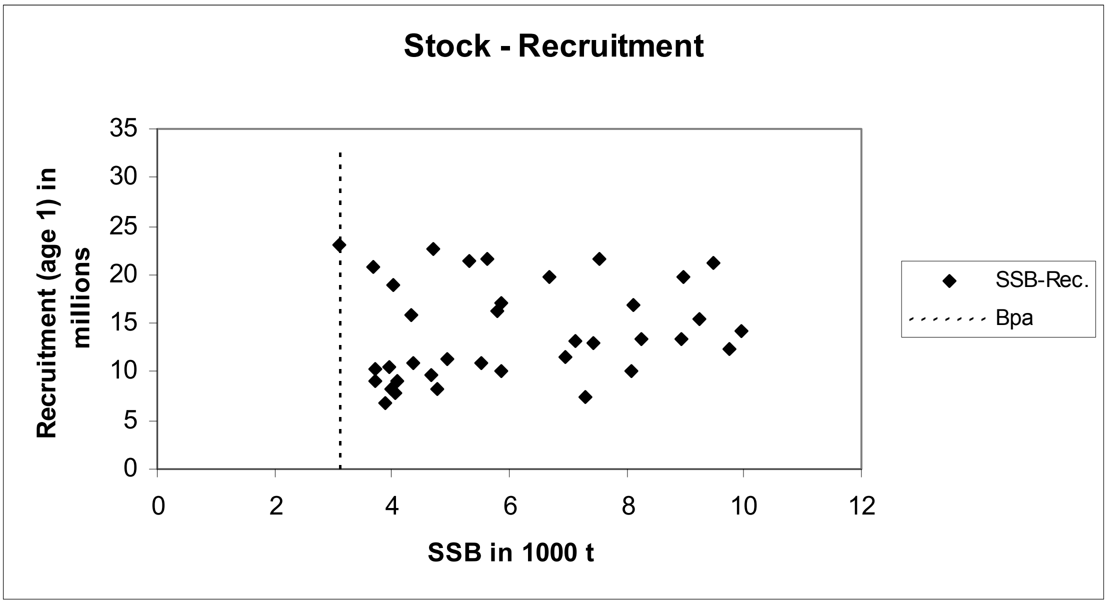
Weights in '000 t. [1]Catch at *status quo* F. [2] Incomplete statistics.

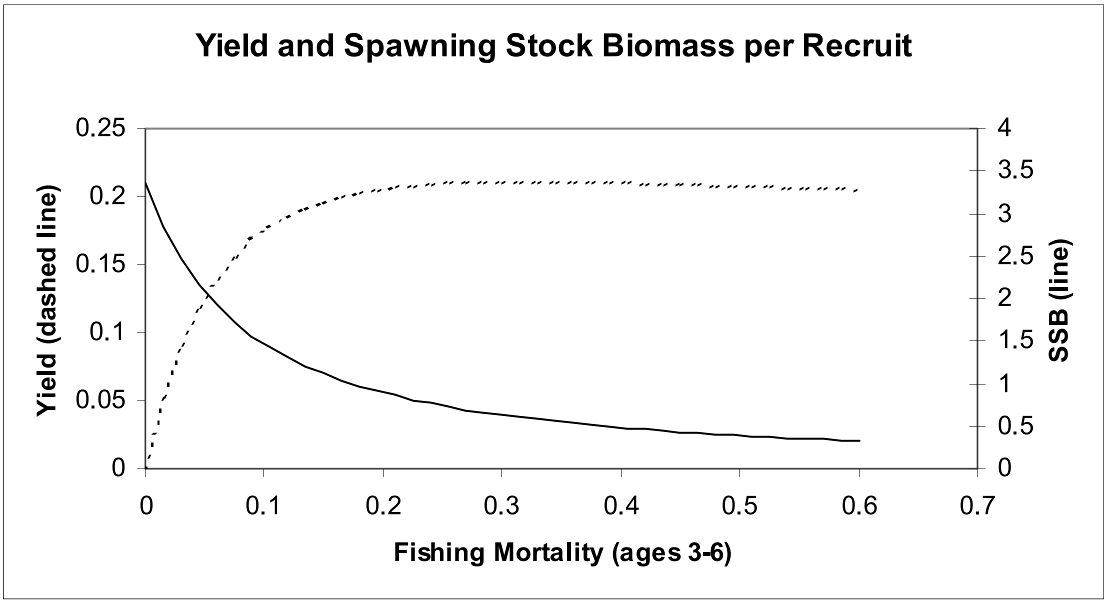

Landings
Landings in 1000 t
0
1
2
3
4
5
6
7
1964
1969
1974
1979
1984
1989
1994
1999


Fishing Mortality
F(ages 3-6)
0.0
0.2
0.4
0.6
0.8
1.0
1964
1969
1974
1979
1984
1989
1994
1999
F
Fpa


Recruitment (age 1)
Recruitment in millions
0
5
10
15
20
25
30
35
1964
1969
1974
1979
1984
1989
1994
1999


Spawning Stock Biomass
SSB in 1000 t
0
2
4
6
8
10
12
1964
1969
1974
1979
1984
1989
1994
1999
SSB
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
SSB in 1000 t
SSB-Rec.
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.25
0.2
0.15
0.1
0.05
0
SSB (line)
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Fishing Mortality (ages 3-6)

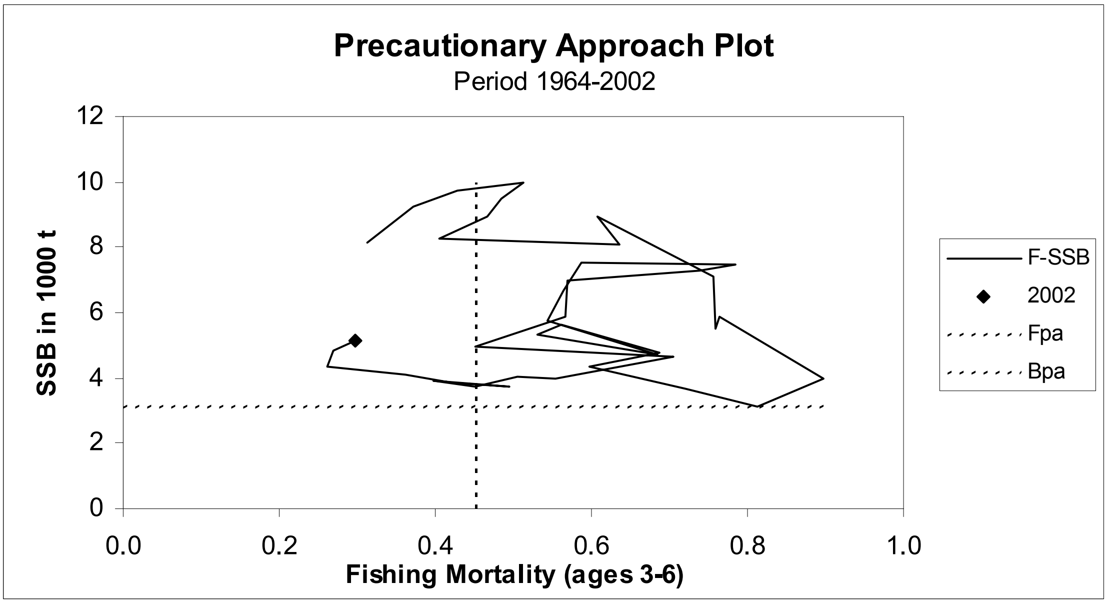

Precautionary Approach Plot
Period 1964-2002
SSB in 1000 t
12
10
8
6
4
2
0
0.0
0.2
0.4
0.6
0.8
1.0
Fishing Mortality (ages 3-6)
F-SSB
2002
Fpa
Bpa

Table 3.8.5.1 Nominal landings (t) of PLAICE in Division VIIa as officially reported to ICES.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001[1]
Belgium	243	265	301	138	321	128	332	327	344[3]	459	327	275	325	482
France	58	11	105	20	42	19	13	10	11	8	8	5	22	9[1]
Ireland	2,009	1,406	1,350	900	1,355	654	547	557	538	543	730	541	420	367[1]
Netherlands	-	-	-	-	-	-	-	-	69	110	27	30	47	-[1]
UK (Eng.&Wales)[2]	1,630	2,409	1,959	1,584	1,381	1,119	1,082	1,050	878	798	679	687	610	618[1]
UK (Isle of Man)	12	18	27	51	24	13	14	20	16	11	14	5	6	
UK (N. Ireland)	286	…	…	…	…	…	…	…	…	…	…	…	…	…
UK (Scotland)	127	76	219	104	70	72	63	60	18	25	18	23	21	…
UK (Total)														
Total	4,365	4,185	3,961	2,797	3,193	2,005	2,051	2,024	1,874	1,954	1,803	1,566	1,451	1,476
Discards	220	-	-	-	-	-	-	-	-	-	-	-	-	-
Unallocated	420	187	-686	-243	74	-9	15	-150	-167	-83	-38	34	-80	-3
Total figures used by the Working Group for stock assessment	5,005	4,372	3,275	2,554	3,267	1,996	2,066	1,874	1,707	1,871	1,765	1,600	1,371	1,473

[1]Provisional.
[2]1989–1999 Northern Ireland included with England and Wales.
[3]Final Statlant 27a data.
{UK (Total) excludes Isle of Man data}.
n/a = not available.

Table 3.8.5.2 Plaice in Division VIIa (Irish Sea)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1964	32801	8128	2879	0.3117
1965	16941	9246	3664	0.3709
1966	15435	9757	4268	0.4288
1967	12377	9950	5059	0.5122
1968	14252	9492	4695	0.4857
1969	21154	8962	4394	0.4677
1970	19664	8255	3583	0.4041
1971	13481	8064	4232	0.6362
1972	9987	8920	5119	0.6066
1973	13337	7129	5060	0.7552
1974	13141	5529	3715	0.7602
1975	11007	5862	4063	0.7639
1976	17123	4007	3473	0.8975
1977	19023	3095	2904	0.8123
1978	22957	3691	3231	0.7195
1979	20707	4332	3428	0.5976
1980	15794	4756	3903	0.6866
1981	8323	5618	3906	0.5619
1982	21516	5324	3237	0.5316
1983	21406	4721	3639	0.6838
1984	22715	5779	4241	0.5441
1985	16280	6685	5075	0.5653
1986	19852	7542	4806	0.5879
1987	21716	7443	6220	0.7857
1988	13011	7309	5005	0.7396
1989	7487	6969	4372	0.5701
1990	11628	5866	3275	0.5666
1991	10123	4938	2554	0.4511
1992	11331	4680	3267	0.7048
1993	9579	3993	1996	0.5529
1994	8208	4071	2066	0.5042
1995	7722	3711	1874	0.4504
1996	10229	3944	1707	0.3967
1997	10599	3719	1871	0.4956
1998	8993	3878	1765	0.4202
1999	6787	4089	1600	0.3623
2000	8979	4375	1371	0.2626
2001	10896	4863	1473	0.2703
2002	9184[1]	5172		
Average	14506	5997	3500	0.5519

[1] Short-term GM (1989-2000)

3.8.6 Sole in Division VIIa (Irish Sea)

State of stock/exploitation: The stock is within safe biological limits. The SSB in 2002 was above $\mathbf{B}_{pa}$ and fishing mortality in 2001 was below $\mathbf{F}_{pa}$. Fishing mortality varied around $\mathbf{F}_{lim}$ from 1970 to 1999, but has declined to 80% of $\mathbf{F}_{pa}$ in 2001. SSB has recently increased from the historic low in 1997.

Management objectives: No explicit management objectives are set for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 2 800 t. The lowest observed spawning stock in an earlier assessment.	$\mathbf{B}_{pa}$ be set at be set at 3 800 t, which is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ is 0.4. Although poorly defined, there is evidence that fishing mortality in excess of 0.4 has led to a general stock decline and is only sustainable during periods of above-average recruitment.	$\mathbf{F}_{pa}$ be set at 0.30. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$.

Technical basis:

$\mathbf{B}_{lim}$ = $\mathbf{B}_{loss}$	$\mathbf{B}_{pa}$ ~ $\mathbf{B}_{lim}$ * 1.4
$\mathbf{F}_{lim}$ = $\mathbf{F}_{loss}$ poorly defined; based on historical considerations	$\mathbf{F}_{pa}$ = see above

Advice on management: ICES recommends that fishing mortality in 2003 remains below the proposed $\mathbf{F}_{pa}$, corresponding to landings of less than 1 010 t in 2003.

Relevant factors to be considered in management: Limited observations on discarding of sole indicate that rates of discarding are relatively low. **Catch forecast for 2003:**

Basis: F(2002) = F(99-01); $\mathbf{F}_{sq}$ = 0.28; Landings (2002) = 1.05; SSB (2003) = 4.11.

F(2003) onwards	Basis	Landings (2003)	SSB (2004)
0.26	0.9*$\mathbf{F}_{sq}$	0.88	4.31
0.28	1*$\mathbf{F}_{sq}$	0.97	4.23
0.30	$\mathbf{F}_{pa}$=1.05*$\mathbf{F}_{sq}$	1.01	4.18
0.31	1.1*$\mathbf{F}_{sq}$	1.05	4.14
0.34	1.2*$\mathbf{F}_{sq}$	1.13	4.06

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The estimate of fishing mortality in 2000 is 12% higher, and SSB in 2001 the same, in this year's assessment compared to last year's assessment. The basis for a single-stock fishery advice is the same as last year.

Elaboration and special comment: Sole are taken mainly in a beam trawl fishery and are also taken as a by-catch in otter trawl fisheries. In recent years, catch rates of sole have been low in the Irish Sea, and part of the beam

trawl fleet has moved to sole fishing grounds in other areas. The analytical assessment is based on a tuned catch-at-age analysis with CPUE data from two commercial beam trawl fleets and two surveys.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

Yield and spawning biomass per Recruit F-reference points:

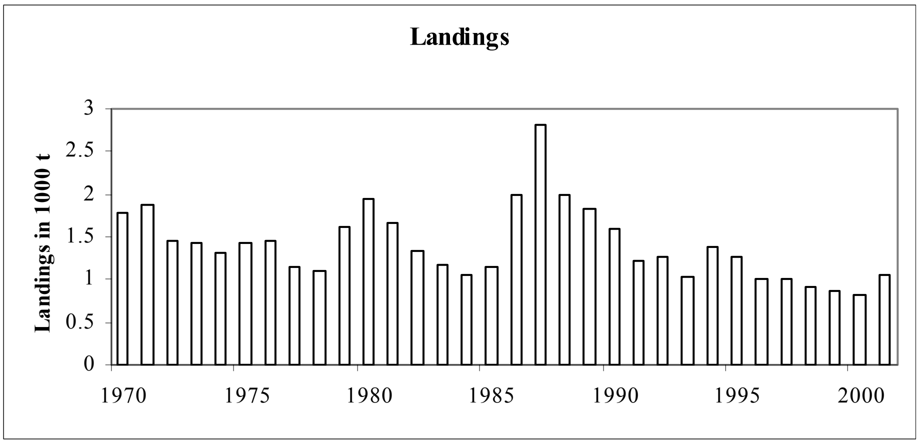
	Fish Mort Ages 4-7	Yield/R	SSB/R
Average Current	0.399	0.186	0.795
$\mathbf{F}_{max}$	0.523	0.192	0.463
$\mathbf{F}_{0.1}$	0.177	0.169	1.169
$\mathbf{F}_{med}$	0.300	0.187	0.758

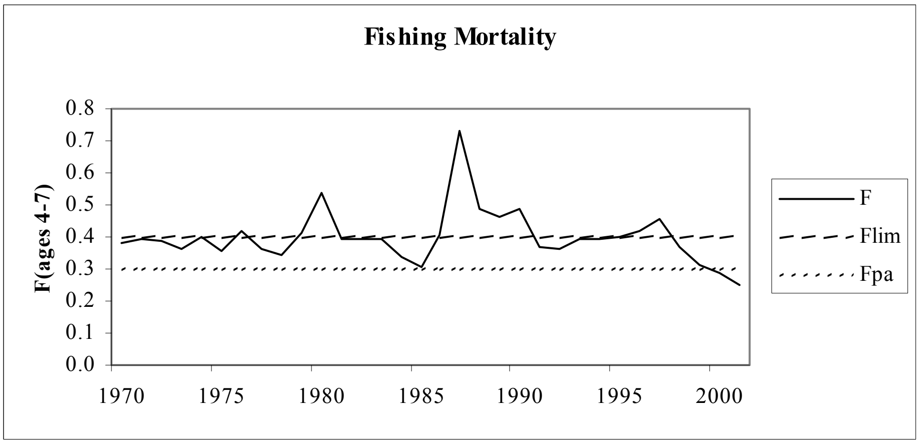
Catch data (Tables 3.8.6.1–2):

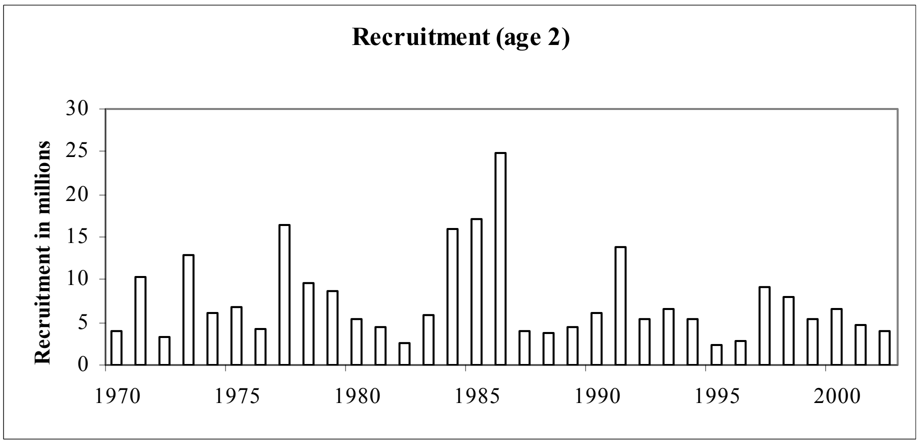
Year	ICES Advice	Predicted catch. corresp. to advice	Agreed TAC	Official landings	ACFM landings[2]
1987	No increase in F	1.9	2.1	2.0	2.8
1988	80% of F(86); TAC	1.6	1.75	1.9	2.0
1989	80% of F(87); TAC	< 1.48	1.48	1.8	1.8
1990	Interim advice	1.05[3]	1.5	1.6	1.6
1991	90% of F(89); TAC	1.3	1.5	1.2	1.2
1992	No long-term gains in increased F	1.2[1]	1.35	1.2	1.3
1993	F = F(91) ~ 920 t	0.92	1.0	1.0	1.0
1994	No long-term gains in increased F	1.51[1]	1.5	1.4	1.4
1995	20% reduction in F	0.8	1.3	1.3	1.3
1996	20% reduction in F	0.8	1.0	1.0	1.0
1997	20% reduction in F	0.8	1.0	1.0	1.0
1998	20% reduction in F	0.85	0.9	0.9	0.9
1999	Reduce F below $\mathbf{F}_{pa}$	0.83	0.9	0.8	0.9
2000	Reduce F below $\mathbf{F}_{pa}$	< 1.08	1.08	0.8	0.8
2001	Reduce F below $\mathbf{F}_{pa}$	< 0.93	1.1	1.0	1.1
2002	Keep F below $\mathbf{F}_{pa}$	<1.10	1.1		
2003	Keep F below $\mathbf{F}_{pa}$	<1.01			

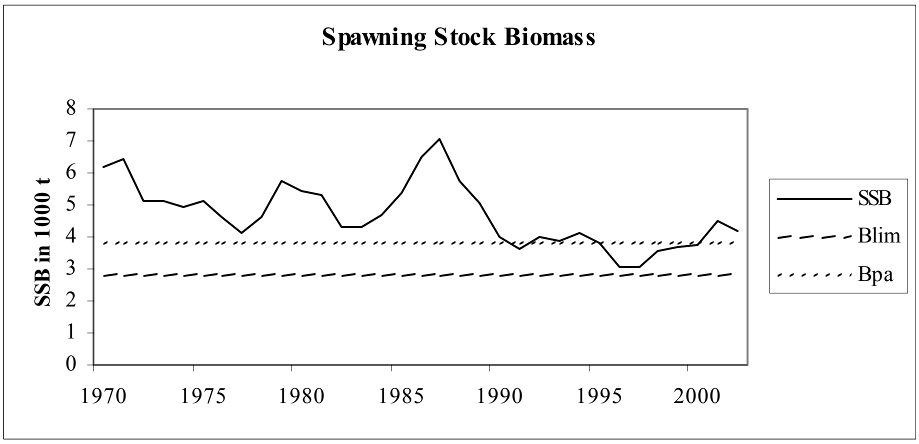
[1]Catch at *Status quo* F. [2] Not including misreporting. [3]Revised in 1990 to 1.5. Weights in '000 t.

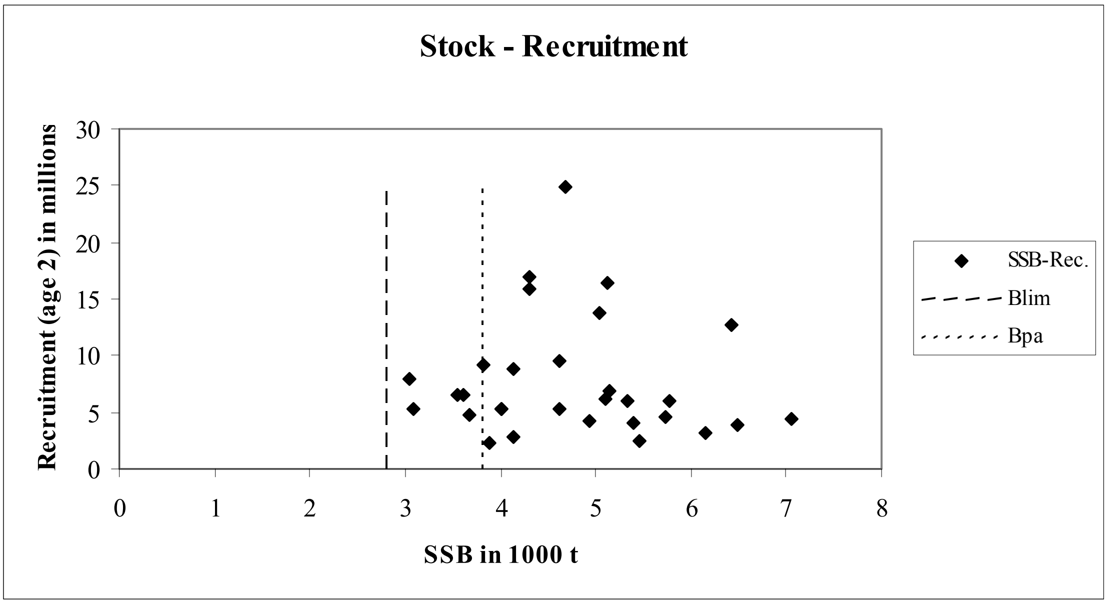
Sole in Division VIIa (Irish Sea)

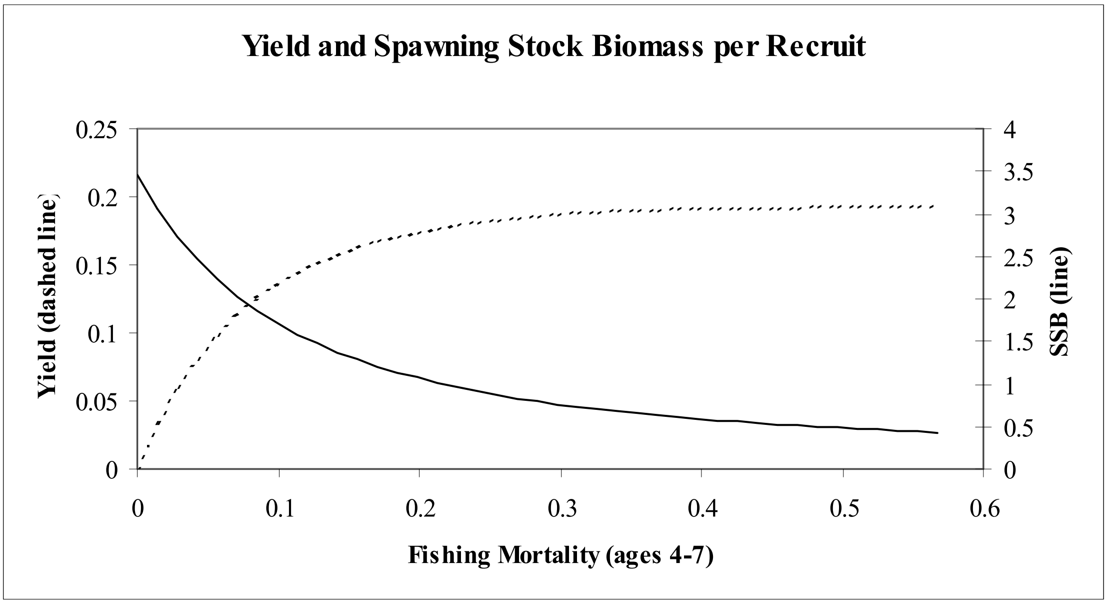









Stock - Recruitment
Recruitment (age 2) in millions
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.25
0.2
0.15
0.1
0.05
0
SSB (line)
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
Fishing Mortality (ages 4-7)

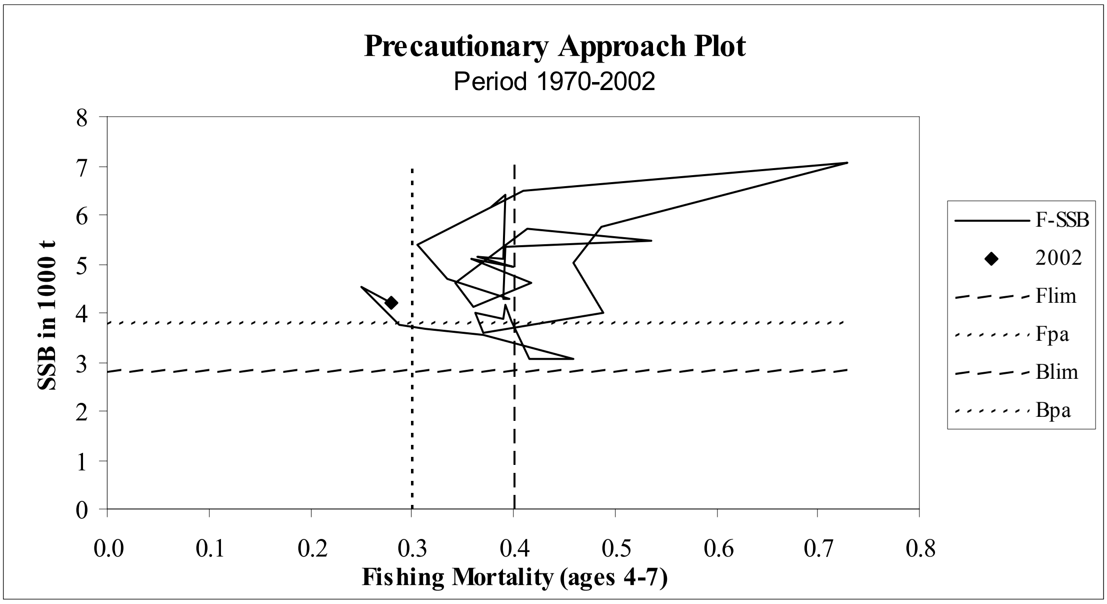

Precautionary Approach Plot
Period 1970-2002
SSB in 1000 t
8
7
6
5
4
3
2
1
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Fishing Mortality (ages 4-7)
F-SSB
2002
Flim
Fpa
Blim
Bpa

Table 3.8.6.1 Irish Sea Sole. Divisions VIIa. Nominal landings (t), as officially reported to ICES

able 12.1.1.1 Sea Sole: Nominal landings (tonnes) as officially reported by ICES

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	930	987	915	1010	786	371	531	495	706	675	533	570	525	469	493	674
France	17	5	11	5	2	3	11	8	7	5	5	3	5 *	1 *	2 *	4 *
Ireland	235	312	366	155	170	198	164	98	226	176	133	130	134	120	134	125 *
Netherlands	-	-	-	-	-	-	-	-	-	-	149	123	60	46	60	- *
UK (Engl.& Wales)[1]	637	599	507	613	569	581	477	338	409	424	194	189	161	165	133	...
UK (Isle of Man)	1	3	1	2	10	44	14	4	5	12	4	5	3	1	1	
UK (N. Ireland)[1]	50	72	47													
UK (Scotland)	46	63	38	38	39	26	37	28	14	8	5	7	9	8	8	...
United Kingdom																198 *
Total	1,916	2,041	1,885	1,823	1,576	1,223	1,234	971	1,367	1,300	1,023	1,027	897	810	831	1,001
Unallocated	79	767	114	10	7	-9	25	52	2	-34	-21	-24	14	50	-13	52
Total used by Working Group in Assessment	1,995	2,808	1,999	1,833	1,583	1,214	1,259	1,023	1,369	1,266	1,002	1,003	911	859	818	1053

* Preliminary

[1] 1989 onwards: N. Ireland included with England & Wales

Table 3.8.6.2 Sole in Division VIIa (Irish Sea)

Year	Recruitment Age 2 thousands	SSB tonnes	Landings[1)] tonnes	Mean F Ages 4-7
1970	4047	6159	1785	0.3782
1971	10297	6419	1882	0.3926
1972	3221	5106	1450	0.3902
1973	12785	5141	1428	0.3636
1974	6199	4942	1307	0.4006
1975	6804	5119	1441	0.3581
1976	4185	4626	1463	0.4171
1977	16453	4140	1147	0.3602
1978	9591	4627	1106	0.3438
1979	8762	5722	1614	0.4142
1980	5324	5450	1941	0.5359
1981	4506	5341	1667	0.3917
1982	2516	4305	1338	0.3909
1983	5940	4302	1169	0.3962
1984	15964	4674	1058	0.3354
1985	17025	5387	1146	0.3056
1986	24896	6492	1995	0.4093
1987	4082	7056	2808	0.7286
1988	3860	5769	1999	0.4864
1989	4494	5032	1833	0.4594
1990	6031	4017	1583	0.4892
1991	13744	3603	1212	0.3710
1992	5283	4007	1259	0.3618
1993	6482	3884	1023	0.3909
1994	5377	4146	1374	0.3921
1995	2288	3820	1266	0.3978
1996	2797	3052	1002	0.4165
1997	9117	3080	1003	0.4586
1998	7903	3554	911	0.3709
1999	5313	3683	863	0.3127
2000	6577	3736	818	0.2883
2001	4731	4513	1053	0.2507
2002	3869	4210		
Average	7590	4700	1405	0.3951

[1)] Landings fitted by TSA value may differ slightly from values given in catch tables

3.8.7 Irish Sea herring (Division VIIa)

State of the stock/exploitation: The state of the stock is uncertain. SSB declined in the late 1980s, and may have been stable in the 1990s, but the current stock size cannot be estimated with certainty.

Management objectives: There are no explicit management objectives for this stock. However, for any management objective to meet precautionary criteria, spawning stock biomass should be greater than the proposed $\mathbf{B}_{pa}$.

Precautionary Approach reference points (established in year 2000):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 6 000t	$\mathbf{B}_{pa}$ = 9 500t
$\mathbf{F}_{lim}$ is not defined	$\mathbf{F}_{pa}$ under review, proposed as 0.36 in 1999, not adopted

Technical basis:

$\mathbf{B}_{lim}$: lowest observed SSB	$\mathbf{B}_{pa}$: $\mathbf{B}_{lim}$ *1.58; still under consideration
$\mathbf{F}_{lim}$: not defined	$\mathbf{F}_{pa}$: $\mathbf{F}_{med}$

Advice on management: ICES advises that the catch in 2003 should not be allowed to increase above the advised 2002 TAC (4 800 t).

Relevant factors to be considered in management: Areas closed to herring fishing around the east coast of Ireland and west coast of Britain were put in place to protect juveniles when an industrial fishery operated. A closed area exists to the east of the Isle of Man to protect the spawning aggregations.

These closed areas should be maintained. The catch in 1998 to 2001 is uncertain.

Comparison with previous assessment and advice: The update of the assessment gave a similar perception of SSB as last year (2001 assessment) and the 1999 assessment, but was different from the 2000 assessment. Until this change in the perception of the stock size is explained it will not be possible to use the assessment for quantitative catch advice.

Elaboration and special comment: Fishing mortality was high during the 1970s due to a transfer of effort from other closed herring fisheries and the operation of an industrial fleet. Since 1981 the size of the exploiting fleets in this area has declined and the industrial fishery has closed.

Over the years the survey indices have been revised and the new assessments are based on the uncertain catches, with additional survey data series providing more information on recruitment and the age structure of the stock. Further exploratory analyses are required before the current assessment can be regarded as stable.

Many aspects of the biology and fisheries data changed rapidly in the mid-1980s, affecting assessment results. These changes require further investigations and depending on the causes of the changes, reference points may be affected. If the changes are a result of stock components being exploited differently by the fishery, any similar changes in the future could cause serious problems for producing reliable assessments.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

Yield and spawning biomass per Recruit
F-reference points:

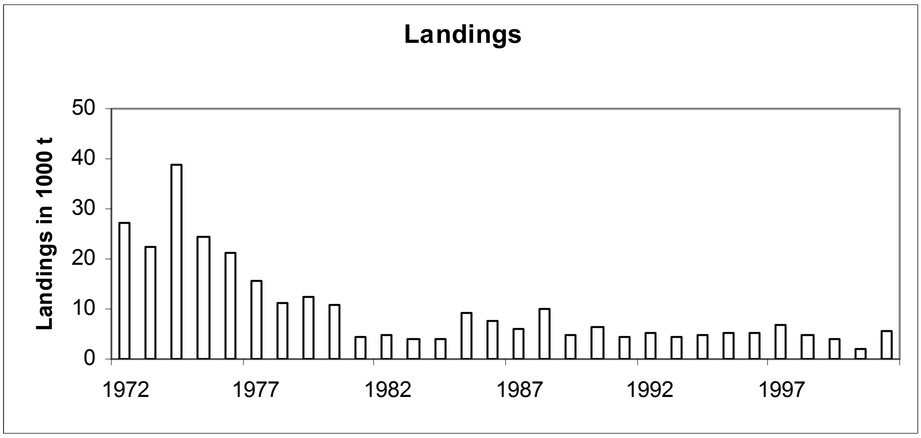
	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.277	0.033	0.098
$\mathbf{F}_{max}$	N/A		
$\mathbf{F}_{0.1}$	0.166	0.029	0.154
$\mathbf{F}_{med}$	N/A		

Catch data (Tables 3.8.7.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	TAC	4.3	4.5	5.8
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2
1989	TAC	5.5	6.0	5.0
1990	Precautionary TAC	5.7	7.0	6.3
1991	TAC	5.6	6.0	4.4
1992	TAC	6.6	7.0	5.3
1993	TAC	4.9-7.4	7.0	4.4
1994	Precautionary TAC	5.3	7.0	4.8
1995	Precautionary TAC	5.1	7.0	5.1
1996	If required, precautionary TAC	5.0	7.0	5.3
1997	No advice given	-	9.0	6.6
1998	*Status quo* F	6.5	9.0	4.9
1999	F=Proposed $\mathbf{F}_{pa}$=0.36	4.9	6.6	4.1
2000	F=90% F(98)=0.31	3.9	5.4	2
2001	*Status quo* F= 0.26	5.1	6.9	5.5
2002	Average catch of 1996-2000	4.8	4.8	
2003	2002 TAC	4.8		

Weights in ‘000 t.

Irish Sea herring (Division VIIa)



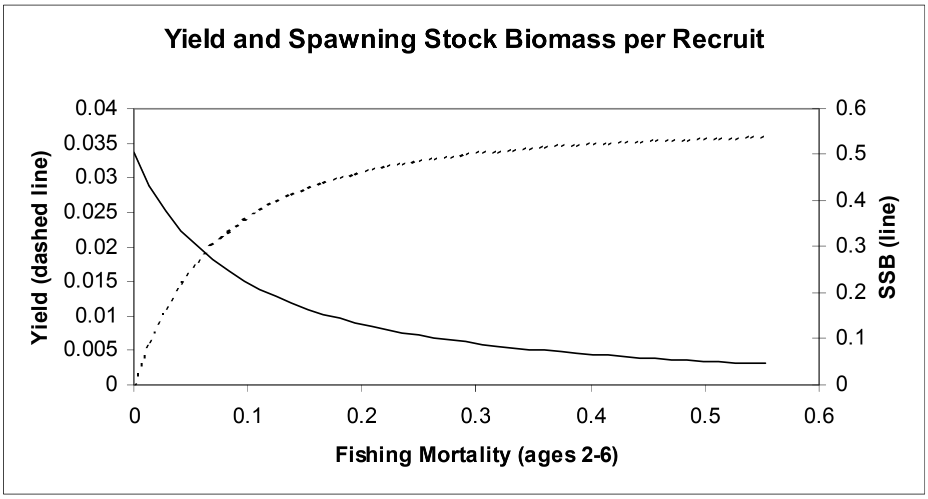


Table 3.8.7.1 Irish Sea Herring (Division VIIa). Catch in tonnes by country, 1985-2001.

The total catch does not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993
Ireland	1,000	1,640	1,200	2,579	1,430	1,699	80	406	0
UK	4,077	4,376	3,290	7,593	3,532	4,613	4,318	4,864	4,408
Unallocated	4,110	1,424	1,333	-	-	-	-	-	-
Total	9,187	7,440	5,823	10,172	4,962	6,312	4,398	5,270	4,408

Country	1994	1995	1996	1997	1998	1999	2000	2001
Ireland	0	0	100	0	0	0	0	862
UK	4,828	5,076	5,180	6,651	4,905	4,127	2,002	4,599
Unallocated	-	-	22	-	-	-	-	
Total	4,828	5,076	5,302	6,651	4,905*	4,127*	2,002*	5,461*

* Preliminary

3.9 Stocks in the Celtic Sea (Divisions VIIf-k), Western Channel (Division VIIe), and northern parts of the Bay of Biscay (Divisions VIIIa,b,d, and e)

3.9.1 Overview

Fleets and fisheries

Most of the demersal fisheries in this area have a mixed catch. Although it is possible to associate specific target species with particular fleets, various quantities of cod, whiting, hake, anglerfish, megrim, sole, plaice, and *Nephrops* are taken together, depending on gear type.

In the Celtic Sea and Western Channel, fisheries for demersal species, mainly cod, whiting, sole and plaice, are conducted by Belgium, France, Ireland, and the UK. The principal gears used are otter trawls and beam trawls. The targeting of sole and plaice using beam trawls became prevalent during the mid-1970s, leading to an increase in the landings of these two species. The gradual replacement of otter trawls by beam trawls has occurred in the Belgian and UK fleets. In the Bay of Biscay there has been a substantial replacement of inshore trawling by gillnet fisheries targeting sole.

A trawl fishery for anglerfish by Spanish and French vessels developed in the Celtic Sea and Bay of Biscay in the 1970s and expanded until 1990. In addition, a gillnet fishery has developed in the Celtic Sea in the 1990s. Selectivity is known to be poor for these species.

Nephrops are an important component of the fisheries in this area. These fisheries developed in the 1970s and 1980s. Fishing effort has decreased continuously since the early 1990s. However, gear efficiency has increased in recent years and this may have helped maintaining LPUE at relatively high levels. In the Bay of Biscay, since 1st January 2000, the mesh size used when fishing for *Nephrops* has increased and is now similar to the one used for other demersal fish (70 mm). Management of these fisheries needs to be sensitive to by-catches of stocks requiring protection such as Celtic Sea cod and Northern hake.

There are separate trawl fisheries targeting herring in the Celtic Sea and mackerel and horse mackerel in the whole area. The herring fishery is principally a "roe" fishery and discard rates have at times reached very high levels, but not in the most recent two years. There is also a small directed fishery for sprat in the Channel.

Management measures

The assessment units used for many of the demersal stocks in this area are small and catches deriving from them are generally in the region of 10 000 t or less. However, the TACs set for the stocks often cover many assessment units. In addition, for some units, there are still insufficient data for adequate assessments. This means that TACs comprise a summation across units of analytical forecasts and average catches which may offer no effective management control of the exploitation rate. Since a number of stocks affected by this problem are close to or outside safe biological limits, there is a need to reconsider the areas for which TACs are set if management is to improve.

A notable feature of the demersal fisheries in this area is their mixed nature. The effectiveness of single-species TACs is likely to be diminished unless this is taken into account. Use of measures to reduce fishing mortality directly, such as effort reductions in fleets, is likely to avoid a number of the disadvantages of catch controls in regulating the exploitation rate.

The fisheries in the Celtic Sea are very similar to the fisheries in the Bay of Biscay and some of the same fleets operate in both areas. However, the technical measures in the two areas differ. Despite the revision by the European Commission Technical Conservation Regulation of existing technical measures in 1st January 2000, the minimum mesh sizes in the Celtic Sea are still often different from those in the Bay of Biscay. These differences make enforcement more difficult.

The catch includes a large amount of juveniles of some late-maturing species (anglerfish, hake). While improving selectivity to prevent any catch of hake less than 55 cm (length of maturity for females) seems to be difficult, some selective devices such as rigid grids should be promoted to protect juveniles of the incoming strong year classes of white anglerfish.

State of the stocks

The majority of the fish stocks which are assessed in this area are harvested outside safe biological limits. They are characterised by low spawning stock biomass and recent high fishing mortality rates. Of particular concern are Celtic Sea (VIIf,g) and Western Channel (VIIe) sole and plaice, Celtic Sea (VIIe-k) cod, and Bay of Biscay (VIIIabd) sole. These stocks exhibit high F, low SSB, and low recruitments in most recent years.

The Celtic Sea whiting stock has been fluctuating within safe biological limits, following periods of low and high recruitment.

The assessment of Celtic Sea haddock was considered preliminary due to the short time-series. Recruitment seems to be highly variable, influencing the variation in the stock size. This is also reflected in the landings.

Anglerfish and megrim are close to safe biological limits. Recent recruitment for both species (*Lophius piscatorius* and *Lophius budegassa)* are well above average.

The Northern hake stock is discussed fully in Section 3.12.2. It is important to note that this species is taken by most of the demersal fleets in this area. This hake stock is outside safe biological limits, and a rebuilding plan is needed in order to rebuild the SSB.

There are no major concerns about the *Nephrops* stock in the Celtic Sea.

The *Nephrops* stock in the Bay of Biscay has declined since the early 1990s. A strong reduction in the fishing mortality and an improvement of the selection pattern is required. The recent increase in mesh size (from 55 mm to 70 mm), which occurred in 2000 is unlikely to have improved selectivity significantly.

The abundance of anchovy varies considerably according to fluctuations in recruitment, which is likely to be strongly dependent on environmental factors. In 2002, the stock is inside safe biological limits.

The mackerel caught in the area belong to the Southern and Western spawning components. The Western horse mackerel has declined rapidly since the mid-1980s and is estimated to continue to decline.

3.9.2 Cod in Divisions VIIe-k

State of stock/exploitation: The stock is outside safe biological limits. SSB has decreased since 1996 and is currently well below $\mathbf{B}_{pa}$, and just above $\mathbf{B}_{lim}$. Recruitment is highly variable. The 1997 and 1998 year classes are well below average, while the 1999 year class is estimated to be above average and the 2000 year class around average. Fishing mortality has generally increased since the early 1980s and has increased well above $\mathbf{F}_{pa}$ since 1989. Fishing mortality has been above $\mathbf{F}_{lim}$ since 1998.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach Reference Points (established in 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 5 400 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 10 000 t. Biomass above this value affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the variability in the stock dynamics and the uncertainty in assessments.
$\mathbf{F}_{lim}$ is 0.90, the fishing mortality estimated to lead to potential collapse.	$\mathbf{F}_{pa}$ be set at 0.68. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and maintaining SSB above $\mathbf{B}_{pa}$ in the medium term, taking into account the uncertainty assessments.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$	$\mathbf{B}_{pa}$ = historical development of the stock
$\mathbf{F}_{lim}$ = based on historical response of the stock	$\mathbf{F}_{pa} = 5^{th}$ percentile of $\mathbf{F}_{loss}$

Advice on management: ICES recommends that fishing mortality should be reduced to less than 0.41 which is below $\mathbf{F}_{pa}$, corresponding to landings of less than 3 800 t in 2003. This represents a reduction in F of at least 60% and this would allow SSB to reach $\mathbf{B}_{pa}$ in the short term.

Relevant factors to be considered in management: The assessment area was expanded in 1997 to cover Divisions VIIe-k and the ICES advice applies to these areas. However, the cod TAC is set for Subareas VII (excluding Division VIIa) and VIII. Within this larger area there is no control over where the catches will be taken. In order to be able to regulate the fishing mortality on the cod stock in Division VIIe-k, a TAC must be set specifically for this area.

The North Sea cod assessment area includes Division VIId and the North Sea stock will be affected by the cod catches taken in Division VIId. Considering the poor state of the North Sea cod stock, the cod TAC for Subareas VII (excl. VIIa) and VIII must be kept at present low levels.

The yield-per-recruit model suggests that a reduction in fishing mortality to $\mathbf{F}_{max}$ (=0.28) will increase the long-term yield.

Catch forecast for 2003:

Basis: F(2002) = F(99–01) =1.01 ; Landings(2002) =9.0 ; SSB(2003) = 7.0.

F(2003) onwards	Basis	Catch(2003)	Landings (2003)	SSB (2004)
0.41	0.4 $\mathbf{F}_{sq}$		3.8	10.1
0.51	0.5 $\mathbf{F}_{sq}$		4.6	9.2
0.61	0.6 $\mathbf{F}_{sq}$		5.2	8.4
0.68	$\mathbf{F}_{pa}$= 0.67 $\mathbf{F}_{sq}$		5.7	7.8
0.81	0.8 $\mathbf{F}_{sq}$		6.4	6.9
1.01	$\mathbf{F}_{sq}$		7.4	5.8

Weights in ‘000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

About 60% of the calculated SSB(2004) (year classes 2001-2002 at ages 2-3) is based on long-term geometric mean recruitment.

A 30% increase in SSB from 2003 to 2004 requires a 50% reduction in fishing mortality.

Medium- and long-term projections: Assuming the current selection pattern, fishing at $\mathbf{F}_{max}$ would require a 70% reduction in fishing mortality.

Comparison with previous assessment and advice: The estimates of fishing mortality and SSB are very similar to those obtained last year, while the estimate of the 2000 year class is now higher. The fishery took about 60% more cod and the fishing mortality in 2001 was almost twice that advised, causing a decrease in stock size from 2000 to 2001. Therefore, to achieve the same increase in SSB in the short term, this year's advice requires a greater reduction in fishing mortality than the one provided last year.

Elaboration and special comment: Cod in Divisions VIIe-k are taken in mixed trawl fisheries. Landings are made mainly by French gadoid trawlers, which prior to 1980 were mainly fishing for hake in the Celtic Sea. Landings of cod by French *Nephrops* trawlers have fluctuated between 10% and 20% of the total French cod landings from this stock in recent years. UK (England and Wales) accounts for about 10% and Ireland for 15%, while Belgian vessels take about 5%. Landings occur throughout the year, but mainly in the winter months during November to April.

Analysis of landings trip by trip for the French gadoid trawlers for the period 1996-1999 showed that on a trip basis, cod and whiting were mixed. Information from the fishery indicates that on a haul basis, these two species are rather well separated, i.e. fishermen seem to be able, for each trawl operation, to target cod and whiting separately. In Ireland in recent years, cod has increasingly been the target, using gillnet rather than trawl.

Most cod spawning in the Celtic Sea occurs off northern Cornwall in mid- to late March. There is also some spawning off southeast Ireland and a little in the Western Channel. Tagging studies have given no evidence of cod movement out of Division VIIe, where there appears to be a simple inshore-offshore migration between deep-water wrecks and reefs in the summer and inshore spawning areas in the winter. Recent tagging work in the Irish Sea suggest that only a small component of cod landings from the Celtic Sea are fish which spawn in the Irish Sea. Furthermore, no cod tagged in the Celtic Sea were recaptured in the Irish Sea.

The analytical assessment was based on landings data and CPUE data for four commercial fleets and two surveys.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

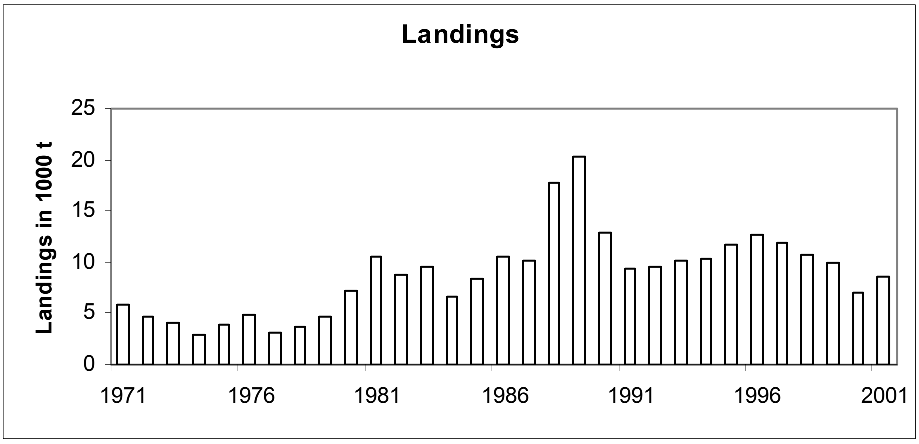
Yield and spawning biomass per Recruit
F-reference points:

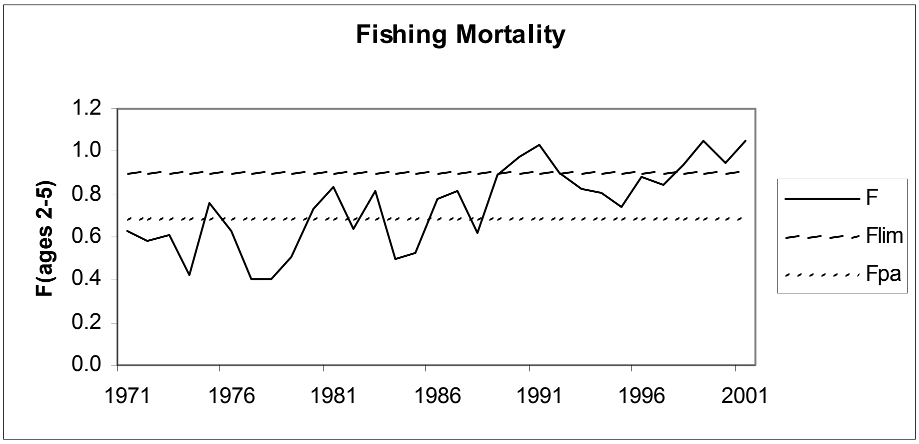
	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	1.014	1.774	1.459
$\mathbf{F}_{max}$	0.281	2.519	9.258
$\mathbf{F}_{0.1}$	0.170	2.363	14.604
$\mathbf{F}_{med}$	0.696	2.079	2.752

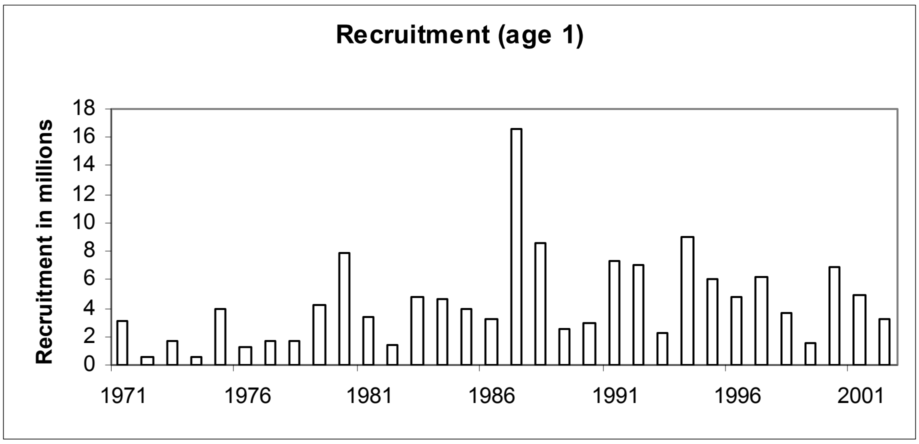
Catch data (Tables 3.9.2.1-3):

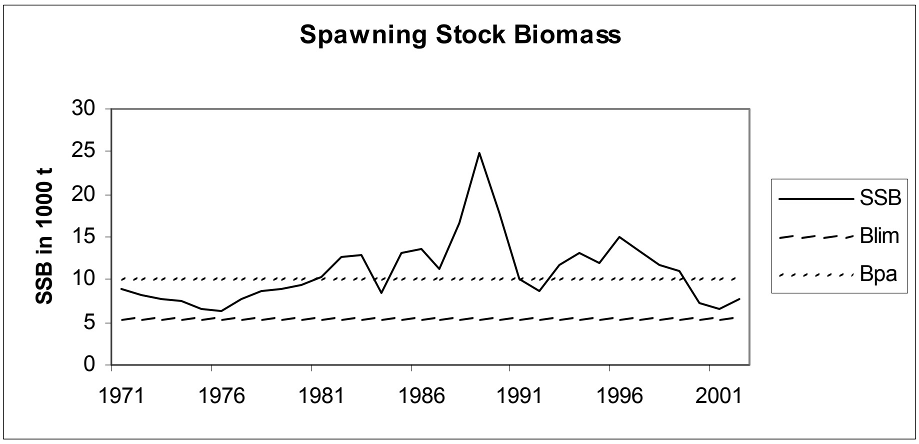
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Landings
1987	Reduce F	< 6.4[2]		-
1988	No increase in F; TAC	7.0[2]		17.7
1989	No increase in F; TAC	8.6[2]		20.3
1990	No increase in F; TAC	9.2[2]		12.9
1991	TAC; SSB = mean	4.5[2]		9.3
1992	Appropriate to reduce F	-		9.6
1993	20% reduction in F	6.5[2]	19.0	10.2
1994	20% reduction in F	5.6[2]	17.0	10.3
1995	20% reduction in F	4.7[3]	17.0	11.7
1996	20% reduction in F	4.7[3]	20.0	12.8
1997	20% reduction in F	7.4[4]	20.0	11.8
1998	10% reduction in F	8.8[4]	20.0	10.7
1999	Reduce F below $\mathbf{F}_{pa}$	9.2[4]	19.0	9.9
2000	Reduce F below $\mathbf{F}_{pa}$	< 7.6[5]	16.0	7.0
2001	40% reduction in F	< 4.3[5]	10.5	8.5
2002	45% reduction in F	< 5.3[5]	8.7	
2003	60% reduction in F	< 3.8[5]		

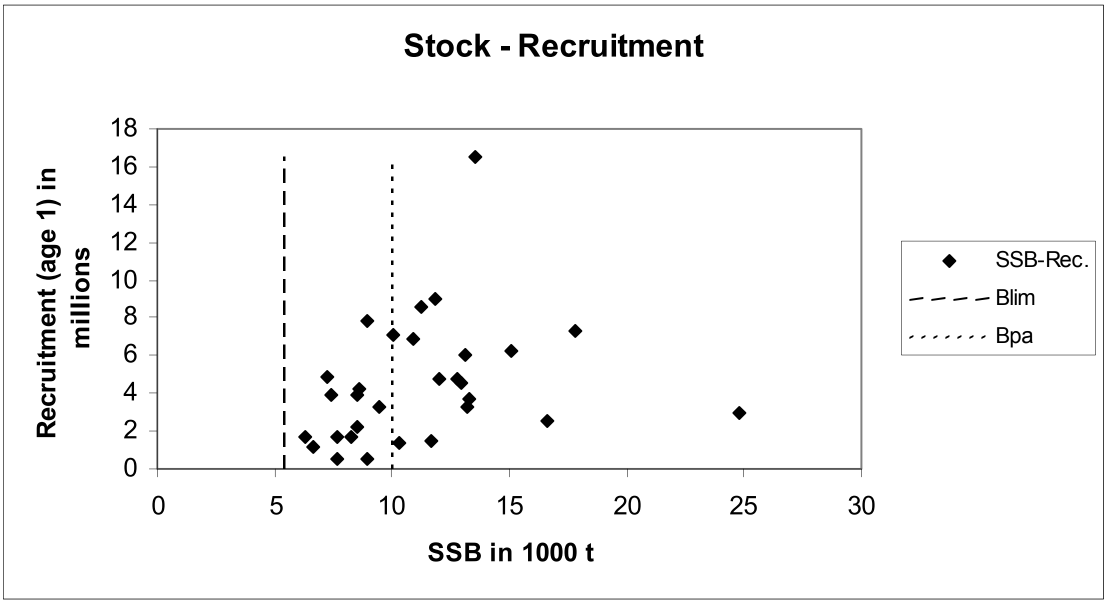
[1]TAC covers Subareas VII (except Division VIIa) and VIII. [2] For the VIIf+g stock component. [3] For the VIIf-h stock component. [4] For the VIIe-h stock component. [5] For VIIe-k stock component. Weights in '000 t.

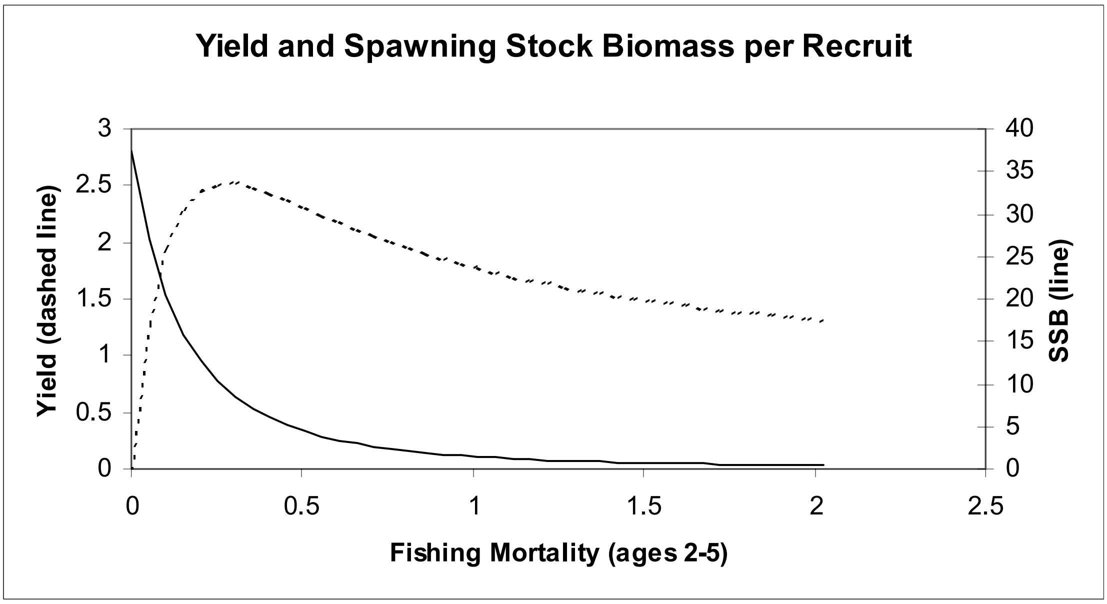

Landings
Landings in 1000 t
25
20
15
10
5
0
1971
1976
1981
1986
1991
1996
2001


Fishing Mortality
F(ages 2-5)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1971
1976
1981
1986
1991
1996
2001
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
18
16
14
12
10
8
6
4
2
0
1971
1976
1981
1986
1991
1996
2001


Spawning Stock Biomass
SSB in 1000 t
30
25
20
15
10
5
0
1971
1976
1981
1986
1991
1996
2001
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa
0
2
4
6
8
10
12
14
16
18
0
5
10
15
20
25
30


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-5)
0
0.5
1
1.5
2
2.5
3
0
5
10
15
20
25
30
35
40

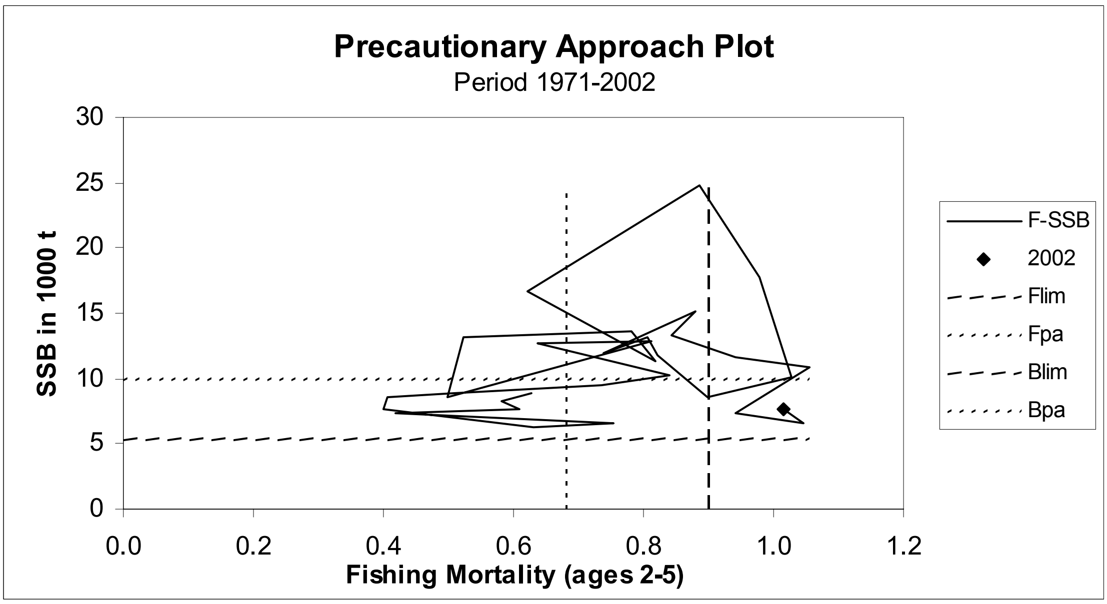

Precautionary Approach Plot
Period 1971-2002
SSB in 1000 t
Fishing Mortality (ages 2-5)
F-SSB
2002
Flim
Fpa
Blim
Bpa
0
5
10
15
20
25
30
0.0
0.2
0.4
0.6
0.8
1.0
1.2

Table 3.9.2.1 Nominal landings of Cod in Divisions VIIf–h, VIIe, VIIe–h, VIIj–k, VIIe–k as used by the Working Group in 2002.

Divisions VIIf,g,h

Year	Belgium	France	Ireland	UK (E + W)	Others	Total
1971						4647
1972						3807
1973	524	2413	64	196	30	3227
1974	197	1954	24	154		2329
1975	377	2657	15	130	30	3209
1976	226	3535	13	97	1	3872
1977	107	2272	17	62		2458
1978	88	2744	30	69		2931
1979	110	3469	72	86		3737
1980	172	5187	246	209	7	5821
1981	285	7806	108	317		8516
1982	174	6391	142	338		7045
1983	262	7013	274	199		7748
1984	240	4569	204	316		5329
1985	456	5632	198	398		6684
1986	374	7473	226	345		8418
1987	216	7187	380	437		8220
1988	542	12065	612	400		13619
1989	891	14298	1003	482		16674
1990	615	8612	177	689		10093
1991	297	5750	246	590		6883
1992	193	6417	340	655		7605
1993	386	7650	331	604		8971
1994	397	6947	966	480		8790
1995	388	7571	820	539		9317
1996	550	8324	949	597		10420
1997	687	7665	397	556		9305
1998	519	6326	659	515		8019
1999	326	5879	1220	444		7869
2000	207	4048	961	407		5623
2001*	345	5489**	818	490		7142

Division VIIe

Year	Belgium	France	Ireland	UK	Others	Total
1988	12	1899		839		2750
1989	19	1453		727	2	2201
1990	6	654		610	9	1279
1991	6	341		408		755
1992	2	331		365		698
1993	5	307		274	2	587
1994	1	308		309	2	620
1995	12	554		348		914
1996	2	497		415		914
1997	1	627		441		1069
1998	5	955		456		1416
1999	0	831		431		1262
2000	0	620		318		938
2001*	2	602**		348		952

Continued …

Table 3.9.2.1 Continued

Divisions VIIe, f,g,h

Year	Belgium	France	Ireland	UK	Others	Total
1988	554	13964	612	1239	0	16369
1989	910	15751	1003	1209	2	18875
1990	621	9266	177	1299	9	11372
1991	303	6091	246	998	0	7638
1992	195	6748	340	1020	0	8303
1993	391	7957	331	878	2	9558
1994	398	7255	966	789	2	9410
1995	399	8124	820	888	0	10231
1996	552	8821	949	1012	0	11334
1997	688	8292	397	997	0	10374
1998	525	7280	659	970	0	9434
1999	326	6710	1220	875	0	9131
2000	208	4668	961	725	0	6561
2001*	347	6091**	818	838	0	8094

Divisions VIIj,k

Year	Belgium	France	Ireland	UK	Others	Total
1988		407	868	53	2	1330
1989		508	857	14	13	1392
1990		276	1064	47	149	1536
1991		115	1413	96	20	1644
1992		202	872	187	13	1274
1993		143	435	67	4	649
1994		117	650	117	6	890
1995		193	1126	147	8	1474
1996		233	1033	154	0	1420
1997	6	153	1116	169	0	1444
1998	4	102	1059	118	0	1283
1999	0	110	663	22	0	795
2000	0	80	341	20	0	441
2001*	0	179**	273	0	0	452

Continued …

Table 3.9.2.1 Continued

Divisions VIIe,f,g,h,j,k

Year	Belgium	France	Ireland	UK	Others	Total
1971	-	-	-	-	-	5782
1972	-	-	-	-	-	4737
1973	-	-	-	-	-	4015
1974	-	-	-	-	-	2898
1975	-	-	-	-	-	3993
1976	-	-	-	-	-	4818
1977	-	-	-	-	-	3058
1978	-	-	-	-	-	3647
1979	-	-	-	-	-	4650
1980	-	-	-	-	-	7243
1981	-	-	-	-	-	10596
1982	-	-	-	-	-	8766
1983	-	-	-	-	-	9641
1984	-	-	-	-	-	6631
1985	-	-	-	-	-	8317
1986	-	-	-	-	-	10475
1987	-	-	-	-	-	10228
1988	554	14371	1480	1292	2	17699
1989	910	16259	1860	1223	15	20267
1990	621	9542	1241	1346	158	12908
1991	303	6206	1659	1094	20	9282
1992	195	6950	1212	1207	13	9577
1993	391	8100	766	945	6	10207
1994	398	7372	1616	906	8	10300
1995	399	8317	1946	1035	8	11705
1996	552	9055	1982	1166	0	12754
1997	693	8445	1513	1166	0	11818
1998	528	7383	1718	1089	0	10718
1999	326	6820	1883	897	0	9926
2000	208	4748	1302	745	0	7002
2001*	347	6270**	1091	838	0	8546

* Provisional.
** Estimated landings derived from official landings in TAC area and computed log-books.

Table 3.9.2.2 Nominal landings (t) of Cod in Divisions VIIb,c, VIId, and, VIIe–k as used by the Working Group in 2002.

Year	VIIb,c	VIId	VIIe-k
1971			5782
1972			4737
1973			4015
1974			2898
1975			3993
1976			4818
1977			3058
1978			3647
1979			4650
1980		5020	7243
1981		5336	10596
1982		3981	8766
1983		3841	9641
1984		3524	6631
1985		3331	8317
1986		12814	10475
1987		14219	10228
1988		10729	17699
1989		5538	20267
1990		2763	12908
1991		1886	9282
1992		2669	9577
1993		2432	10207
1994		2850	10300
1995	473	3964	11705
1996	519	3503	12754
1997	301	7043	11818
1998	318	8580	10718
1999	172	6858	9926
2000	148	2325	7002
2001*	99	1573	8546

* Provisional.

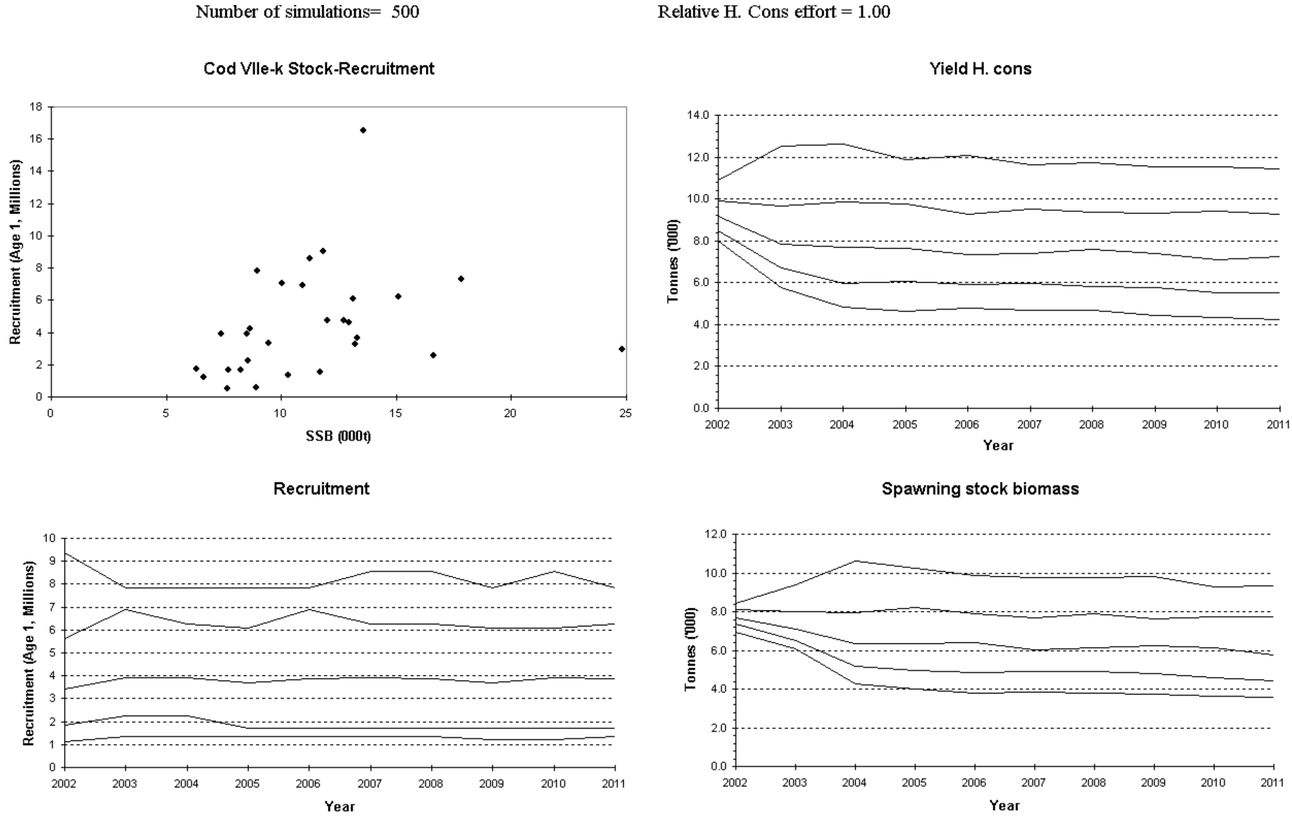
.

Table 3.9.2.3 Cod in Divisions VIIe-k

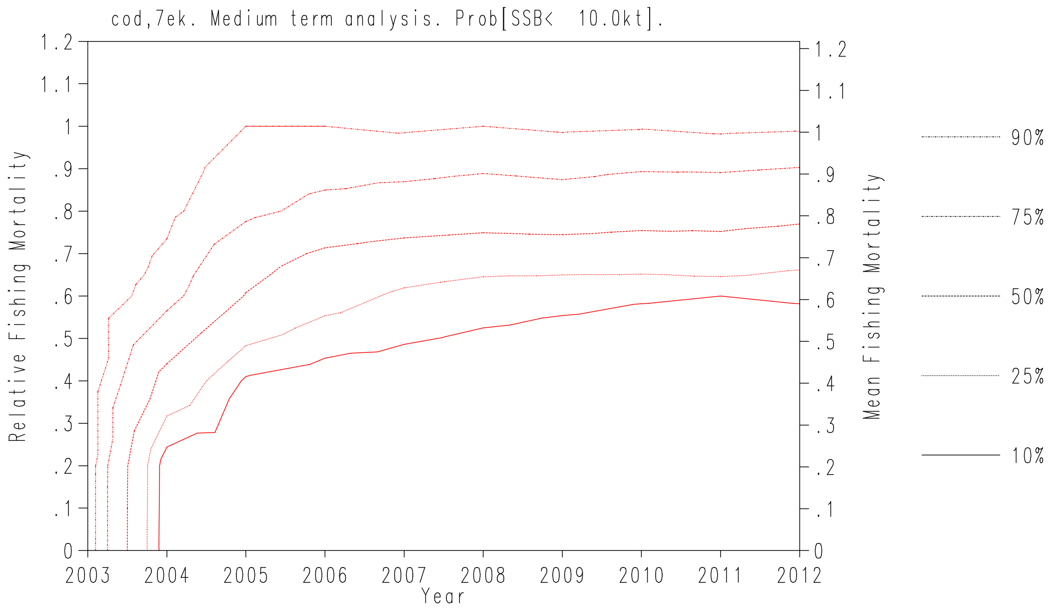
Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1971	3075	8928	5782	0.6284
1972	565	8225	4737	0.5822
1973	1665	7669	4015	0.6096
1974	500	7412	2898	0.4194
1975	3889	6630	3993	0.7549
1976	1202	6304	4818	0.6317
1977	1716	7692	3059	0.3994
1978	1690	8626	3647	0.4050
1979	4221	8951	4650	0.5068
1980	7822	9453	7243	0.7340
1981	3318	10287	10597	0.8387
1982	1350	12745	8766	0.6377
1983	4730	12931	9641	0.8128
1984	4604	8515	6631	0.4999
1985	3919	13204	8317	0.5235
1986	3289	13553	10475	0.7805
1987	16557	11260	10228	0.8182
1988	8574	16644	17699	0.6227
1989	2570	24830	20267	0.8867
1990	2941	17831	12908	0.9789
1991	7325	10041	9282	1.0284
1992	7075	8560	9577	0.8992
1993	2227	11815	10207	0.8222
1994	9015	13115	10300	0.8064
1995	6062	11994	11705	0.7380
1996	4749	15097	12754	0.8809
1997	6244	13305	11818	0.8426
1998	3679	11675	10717	0.9404
1999	1516	10925	9926	1.0541
2000	6891	7277	7002	0.9422
2001	4886	6580	8546	1.0464
2002	3280	7659		1.0142
Average	4411	10929	8781	0.7527

Cod in VIIe-k (Celtic Sea). Medium-term projections. Solid lines show 10, 25, 50, 75 and 90th percentiles. Stock-recruitment relationship estimated by random bootstrap.

Number of simulations = 500 Relative H. Cons effort = 1.00



Medium-term projection starting in 2003 with population numbers from the *status quo* F catch forecast.



3.9.3 Whiting in Divisions VIIe–k

State of stock/exploitation: The stock is within safe biological limits. SSB reached high levels in 1995 and 1996, and has decreased until 1999 though remaining well above $\mathbf{B}_{pa}$. SSB increased sharply in 2001 as the outstanding 1999 year class matured. The 2000 and 2001 year classes are estimated to have been very weak. Fishing mortality was very high during the 1980s, decreased in the early 1990s and is currently estimated to be around 0.6.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 15 000 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 21 000 t. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of the assessment.
$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ not proposed.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$	$\mathbf{B}_{pa} = \mathbf{B}_{lim} * 1.4$
$\mathbf{F}_{lim}$ not proposed.	$\mathbf{F}_{pa}$ not proposed.

Advice on management: There is no $\mathbf{F}_{pa}$ defined for this stock, but there is no long-term gain in increasing fishing mortality. Therefore, ICES recommends that fishing mortality should not increase, corresponding to landings of at most 20 200 t in 2003.

Relevant factors to be considered in management: The assessment area was expanded in 1997 to cover Divisions VIIe-k. The TAC for whiting is set for all of Subarea VII (excluding Division VIIa). In order to protect whiting in Divisions VIIe-k, the TAC should be allocated to Divisions, with catches in the other parts of Subarea VII being accounted against such TACs. The state of whiting in Division VIId should be considered, if setting an overall TAC for Subarea VII.

Catch forecast for 2003:

Basis: F(2002) = F(99–01) = $\mathbf{F}_{sq}$ = 0.63 ; Landings(2002) = 25.8 ; SSB(2003) = 40.6.

F (2003 onwards)	Basis	Landings (2003)	SSB (2004)
0.38	$0.6*\mathbf{F}_{sq}$	13.8	41.8
0.50	$0.8*\mathbf{F}_{sq}$	17.2	38.4
0.63	$1*\mathbf{F}_{sq}$	20.2	35.5
0.75	$1.2*\mathbf{F}_{sq}$	22.7	33.0
0.88	$1.4*\mathbf{F}_{sq}$	25.0	30.8

Weights in ‘000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: $\mathbf{F}_{max}$ is not well estimated due to a flat-topped Y/R curve.

Comparison with previous assessment and advice: The outstanding 1999 year class is now estimated by three surveys and verified by two commercial fleets and found to be 25% lower than previously estimated. There was an upward revision of fishing mortality and a downward revision of SSB in the current assessment.

Elaboration and special comment: Geometric mean recruitment assumptions account for 42% of the forecast SSB (2004).

Celtic Sea whiting are taken in mixed species (cod, whiting, hake, *Nephrops*) fisheries. French trawlers account for about 60% of the total landings, Ireland 30%, and the UK (England and Wales) 7%, while Belgian vessels take less than 1%. The French *Nephrops* trawlers have for several years adopted a larger mesh, following by-catch restrictions and market demand for larger *Nephrops*.

Analysis of landings trip by trip by the French gadoid trawlers for the period 1996-1998 showed that on a trip basis, cod and whiting were mixed. Information from the fishery indicates that on a haul basis, these two species are rather well separated, i.e. that fishermen seem to be able, for each trawl operation, to target cod and whiting separately.

The main Irish fleets in Divisions VIIf,g,h are inshore and offshore otter trawlers and seiners based in Dunmore East and Kilmore Quay. However, in recent years there has been an increase in the number of Irish beamers (+6 vessels) targeting anglerfish and megrim with whiting as by-catch, offshore in Division VIIg. Division VIIj–k whiting are taken in mixed species fisheries (cod/whiting/anglerfish/megrim and *Nephrops*). The main gears used are otter trawl and seiners, and landings are taken by Ireland (90%) and France (7%).

The main Irish fleet in Divisions VIIj,k are otter trawlers that target mixed gadoids and account for 10% of landings of whiting in Divisions VIIe-k. The main UK fisheries in Divisions VIIe,f,g,h are inshore between Newlyn and Salcombe and off the north Cornish coast, the bulk of the landings (> 60%) being made in the winter months between November and March. UK landings in the 1950s were 4–5 times higher than at present, though landings overall have generally increased during the period since 1982, with peaks in 1989 (16 540 t) and in 1995 (22 680 t). The main gears used in the Western Channel are otter trawls targeting a wide range of species, and beam trawls targeting sole, anglerfish, and plaice.

The main spawning areas of whiting in the Western Channel and Celtic Sea are off Start Point (VIIe), off Trevose Head (VIIf), and southeast of Ireland (VIIg). Returns of adult whiting tagged in the Western Channel indicated more movement into the Celtic Sea than between the Western and Eastern Channel. Whiting released in the Bristol Channel moved south and west towards the two spawning grounds off Trevose Head and southeast of Ireland. There was no evidence of emigration out of the Celtic Sea area. The results of returns of whiting tagged and released in the County Down spawning area show that a greater proportion of Irish Sea whiting move south into the Celtic Sea than north towards the west of Scotland.

Analytical assessment is based on landings, commercial CPUE, and surveys data. Some information on discards indicates that they may be substantial.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

Yield and spawning biomass per Recruit F-reference points:

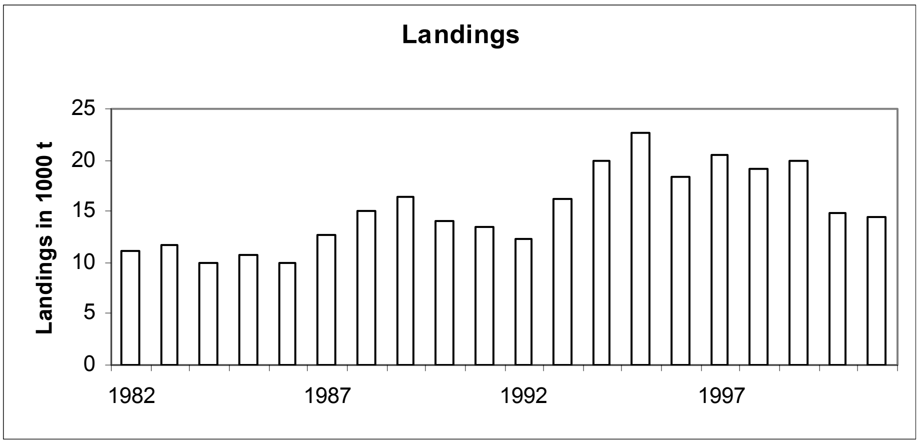
	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	0.625	0.191	0.484
$\mathbf{F}_{max}$	1.363	0.195	0.325
$\mathbf{F}_{0.1}$	0.257	0.165	0.790
$\mathbf{F}_{med}$	1.559	0.195	0.304

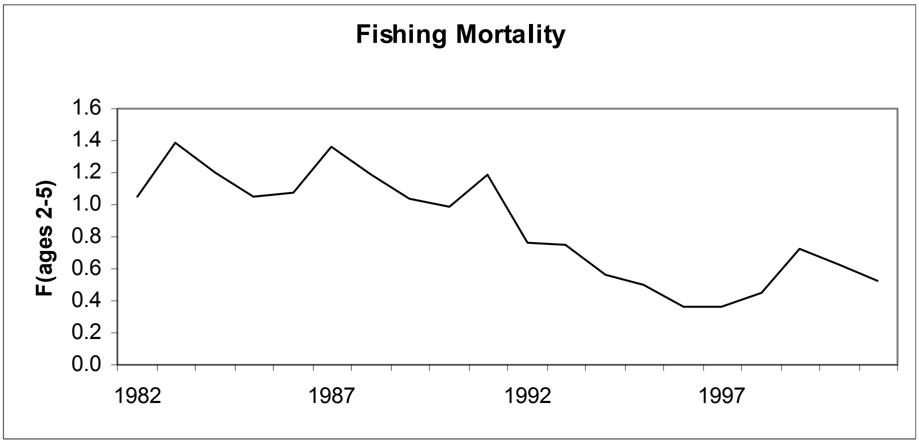
$\mathbf{F}_{max}$ is not well-defined.

Catch data (Tables 3.9.3.1–2):

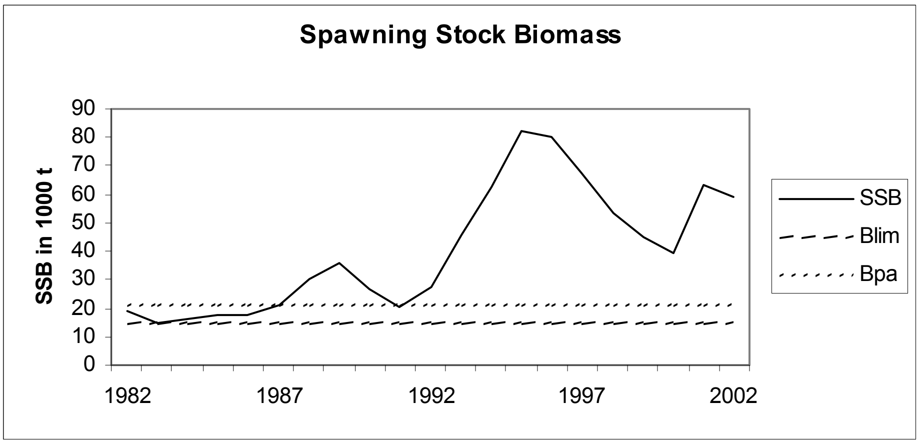
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Landings
1987	*Status quo* F; TAC	7.1[2]		12.7
1988	Precautionary TAC	7.0[2]		13.6
1989	Precautionary TAC	7.9[2]		16.5
1990	No increase in F; TAC	8.4[2]		14.1
1991	Precautionary TAC	8.0[2]		13.5
1992	If required, precautionary TAC	8.0[2]		12.4
1993	Within safe biological limits	6.6[2]	22.0	16.3
1994	Within safe biological limits	< 9.4[2]	22.0	20.0
1995	20% reduction in F	8.2[3]	25.0	22.7
1996	20% reduction in F	8.6[3]	26.0	18.3
1997	At least 20% reduction in F	< 7.3[4]	27.0	20.5
1998	At least 20% reduction in F	< 8.2[4]	27.0	19.2
1999	No increase in F	12.4[4]	25.0	19.9
2000	17% reduction in F	< 13.1[4]	22.2	14.9
2001	No increase in F	13.5[4]	21.0	14.5
2002	No increase in F	27.7[4]	31.7	
2003	No increase in F	20.2[4]		

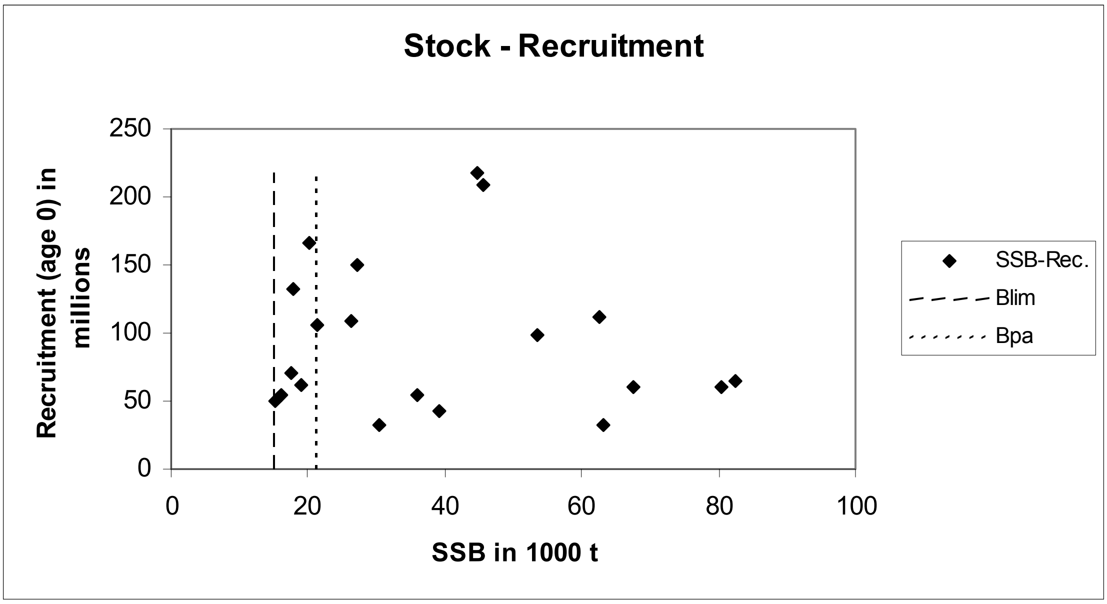
[1] TAC covers Subarea VII (except Division VIIa). [2] For the VIIf+g stock component, [3] For the VIIf-h stock component, [4]For the VII e-k stock component. Weights in '000 t.

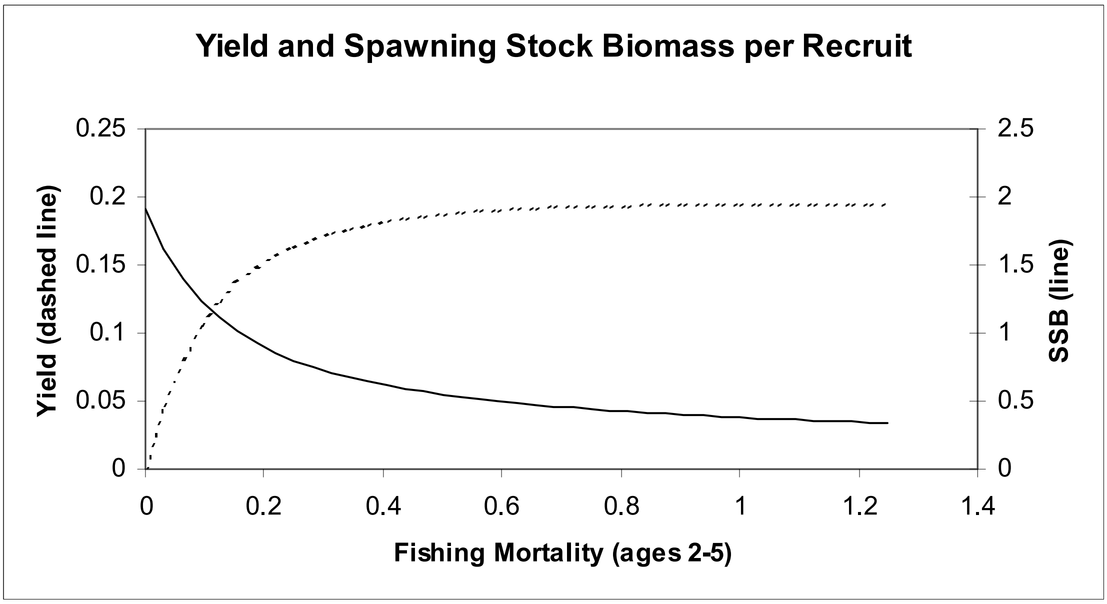

Landings
Landings in 1000 t
25
20
15
10
5
0
1982
1987
1992
1997


Fishing Mortality
F(ages 2-5)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1982
1987
1992
1997


Recruitment (age 0)
Recruitment in millions
250
200
150
100
50
0
1982
1987
1992
1997


Spawning Stock Biomass
SSB in 1000 t
90
80
70
60
50
40
30
20
10
0
1982
1987
1992
1997
2002
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 0) in millions
SSB in 1000 t
250
200
150
100
50
0
0
20
40
60
80
100
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-5)
0.25
0.2
0.15
0.1
0.05
0
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4

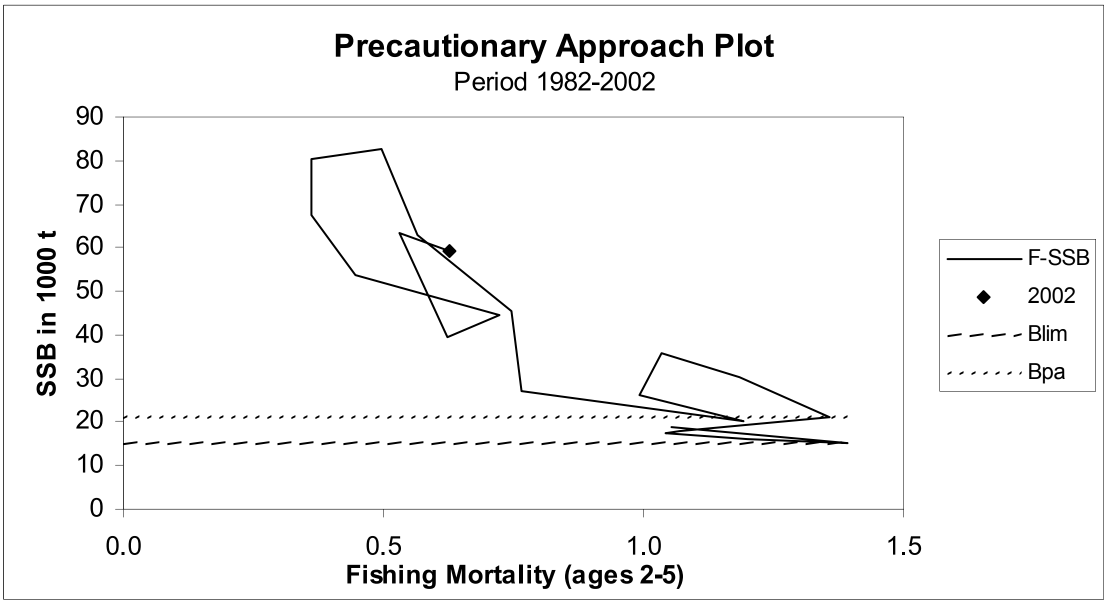

Precautionary Approach Plot
Period 1982-2002
SSB in 1000 t
Fishing Mortality (ages 2-5)
90
80
70
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
F-SSB
2002
Blim
Bpa

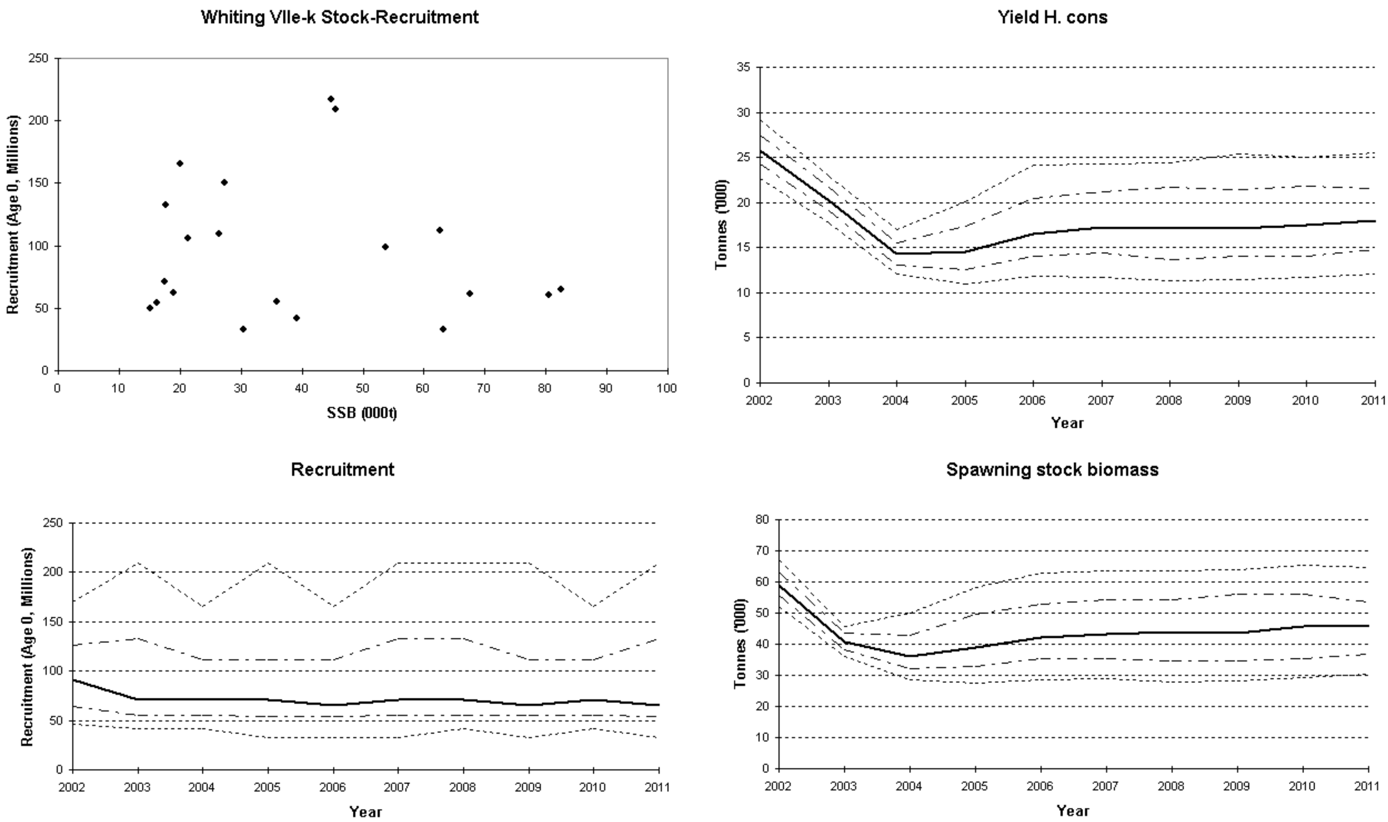
Table 3.9.3.1 WHITING in Divisions VIIe-k.
Nominal Landings (t) as reported to ICES, and total landings as used by the Working Group.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	135	161	167	107	111	159	296	308	292	107	145	228	205	268	449	479	448	194	171
Denmark																			
France	8,982	7,171	7,820	7,647	10,054	11,410	12,171	10,464	9,956	9,165	10,771	12,634	13,400	9,936	11,370	11,711[1]	12,346[2]	8,954[2]	8867[2]
Germany										14									
Ireland	1,487	1,301	2,241	1,309	1,452	398	2,817	1,478	1,258	1,691	3,631	5,618	6,077	6,115	6,893	5,226	5,807	4,795	4942
Netherlands		398		124										8		1			5
Spain													4	31	24	53	21	10	
UK (E/W/NI)	1,177	954	610	765	1,035	1,598	1,252	1,782	1,969	1,379	1,756	1,548	1,804	1,728	1,742	1,709	1,346	1,252	
UK(Scotland)						1	5	74	33	8	17	6	23	34	42	68	3	2	
United Kingdom																			822
Total	11,781	9,985	10,838	9,952	12,652	13,566	16,541	14,106	13,508	12,364	16,320	20,034	21,513	18,120	20,520	19,247	19,971	15,207	14,807
Unallocated	0	0	0	0	0	1,562	0	0	0	0	0	0	1,165	140	12	-2	-56	-288	-352
Total as used by the Working Group	11781	9985	10838	9952	12652	15128	16541	14106	13508	12364	16320	20034	22678	18260	20532	19245	19915	14919	14455

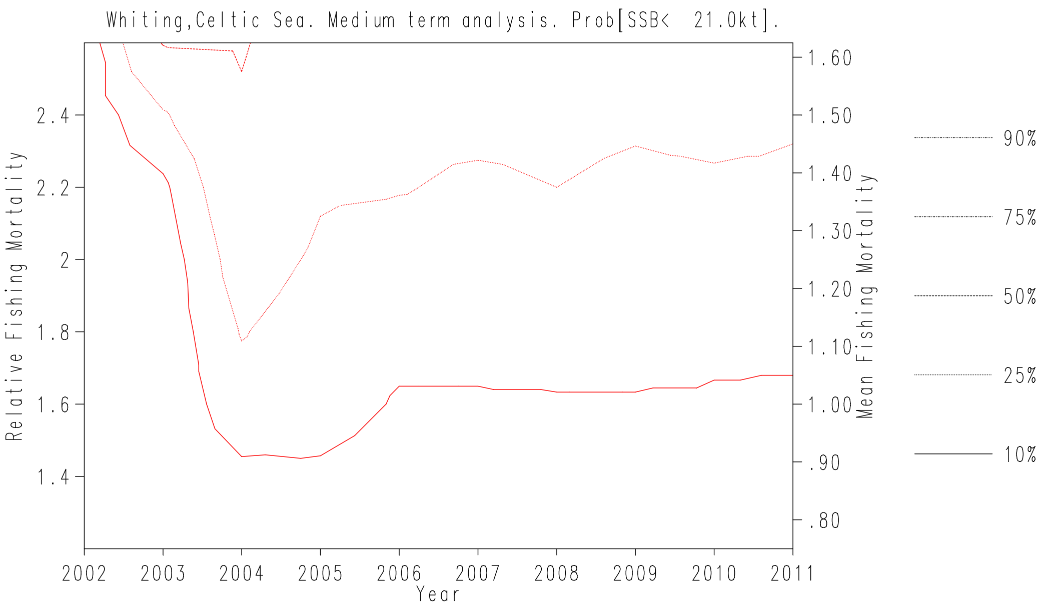
[1] Preliminary
[2] Estimated from logbooks

Table 3.9.3.2 Whiting in Divisions VIIe-k

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1982	62000	19000	11200	1.052
1983	50000	15100	11800	1.391
1984	54000	16100	10000	1.199
1985	71000	17500	10800	1.044
1986	133000	17700	10000	1.071
1987	106000	21300	12700	1.359
1988	33000	30400	15100	1.186
1989	55000	35900	16500	1.036
1990	109000	26400	14100	0.992
1991	166000	20100	13500	1.193
1992	150000	27300	12400	0.766
1993	209000	45600	16300	0.745
1994	112000	62700	20000	0.566
1995	65000	82500	22700	0.495
1996	61000	80500	18300	0.362
1997	61000	67600	20500	0.362
1998	98000	53600	19200	0.447
1999	218000	44700	19900	0.722
2000	42000	39300	14900	0.622
2001	33000	63200	14500	0.531
2002	88000	59300		0.625
Average	94095	40276	15220	0.846



Whiting in VIIe-k (Celtic Sea)
Medium-term analysis. Lines show 10th, 25th and 50th percentiles.



3.9.4 Celtic Sea plaice (Divisions VIIf and g)

State of stock/exploitation: The stock is outside safe biological limits. SSB decreased from 1988 to 2000 and has been below $\mathbf{B}_{pa}$ since 1998. Fishing mortality has fluctuated around the average. Most recent year classes have been below average.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998, modified in 2001):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 1 100 t, the lowest observed spawning stock biomass $\mathbf{B}_{loss}$.	$\mathbf{B}_{pa}$ be set at 1 800 t. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty assessments.
$\mathbf{F}_{lim}$ not defined.	$\mathbf{F}_{pa}$ not defined

Technical basis:

$\mathbf{B}_{lim}$=$\mathbf{B}_{loss}$	$\mathbf{B}_{pa}$= $\mathbf{B}_{lim}$ * 1.64
$\mathbf{F}_{lim}$=Not defined	$\mathbf{F}_{pa}$ not defined

Advice on management: ICES recommends a reduction in fishing mortality of at least 40% relative to $\mathbf{F}_{sq}$, corresponding to landings of less than 660 t in 2003. This is consistent with the reduction in fishing mortality recommended for sole, which is the target species for the flatfish fishery in this area. This is expected to result in an increase in SSB above $\mathbf{B}_{pa}$ in the short term.

Relevant factors to be considered in management: At *status quo* F, SSB is likely to remain below $\mathbf{B}_{pa}$.

Plaice is taken mainly in a directed beam-trawl fishery for sole, and to a lesser extent in otter trawl fisheries. Management should take account of the mix of Celtic Sea sole and plaice.

Catch forecast for 2003:
Basis: TAC constraint; $\mathbf{F}_{sq}$ = F(99-01) =0.55; Landings (2002) = 0.68; SSB(2003) = 1.78.

F(2003) Onwards	Basis	Landings (2003)	SSB(2004)
0.27	0.5 * $\mathbf{F}_{sq}$	0.57	2.12
0.33	0.6 * $\mathbf{F}_{sq}$	0.66	2.03
0.38	0.7 * $\mathbf{F}_{sq}$	0.76	1.94
0.44	0.8 * $\mathbf{F}_{sq}$	0.84	1.86
0.55	$\mathbf{F}_{sq}$	1.01	1.71
0.66	1.2 * $\mathbf{F}_{sq}$	1.16	1.57

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

In order to achieve a 30% increase in SSB from 2003 to 2004 a 70% reduction in F would be required.

Medium- and long-term projections: Assuming the current selection pattern, $\mathbf{F}_{max}$ is estimated to be 0.44 $\mathbf{F}_{sq}$. Results of the medium-term analysis indicate a low probability of SSB falling below $\mathbf{B}_{pa}$ in the medium term when fishing mortality is reduced by 40% from 2003 onwards.

Comparison with previous assessment and advice: Results of this assessment are close to the previous one. As previously, advice has been based on sole.

Elaboration and special comment: The fisheries that catch plaice in the Celtic Sea mainly involve vessels from France, Belgium, England and Wales, and to a lesser extent Ireland.

In the 1970s, the Divisions VIIf,g plaice fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. Effort in the UK and Belgian beam-trawl fleets increased in the late 1980s, but has since declined. Recently, many otter trawlers have been replaced by beam trawlers, which target sole. Landings gradually increased until 1989, then declined rapidly in 1991. The main fishery occurs in the spawning area off the north Cornish coast, at depths greater than 40 m, about 20 to 25 miles offshore. Although plaice are taken throughout the year, the larger landings occur during March after the peak of spawning, and again in September.

There is some evidence from tagging that plaice from the south and west coasts of Wales move southwards to join the adult population off the north Cornish coast during spawning.

Analytical age-based assessment using landings, survey, and commercial CPUE data.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

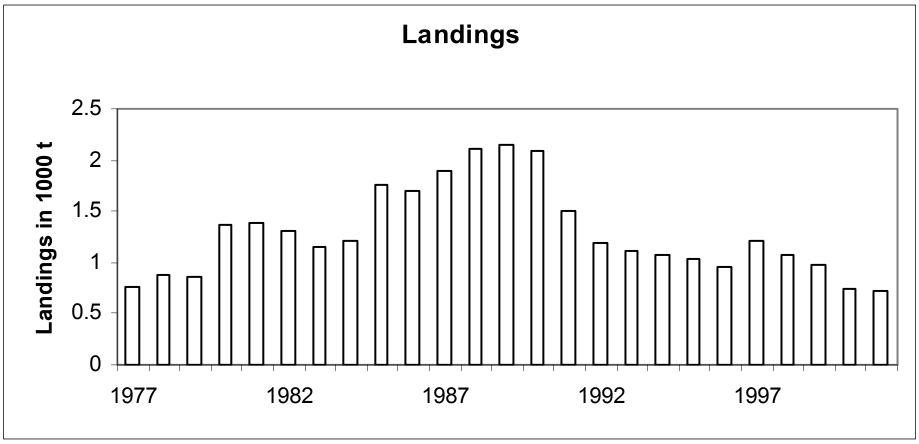
Yield and spawning biomass per Recruit F-reference points:

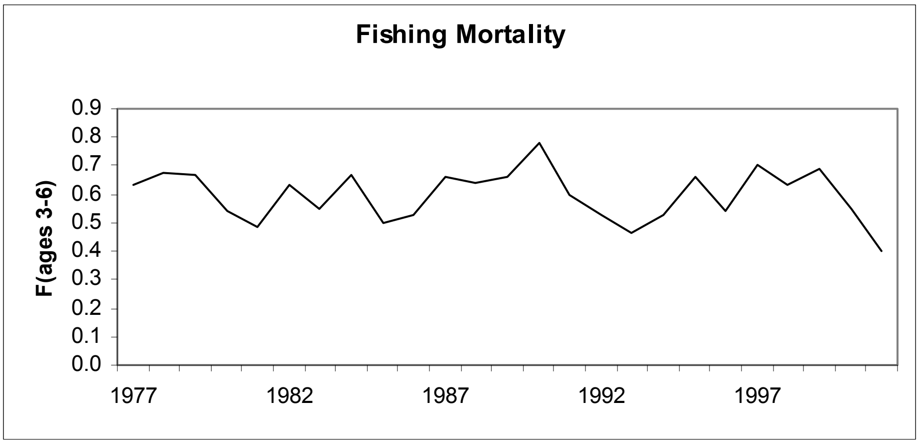
	Fish Mort Ages 3-6	Yield/R	SSB/R
Average Current	0.545	0.249	0.439
$\mathbf{F}_{max}$	0.240	0.264	0.972
$\mathbf{F}_{0.1}$	0.105	0.237	1.871
$\mathbf{F}_{med}$	0.514	0.251	0.466

Catch data (Tables 3.9.4.1-2):

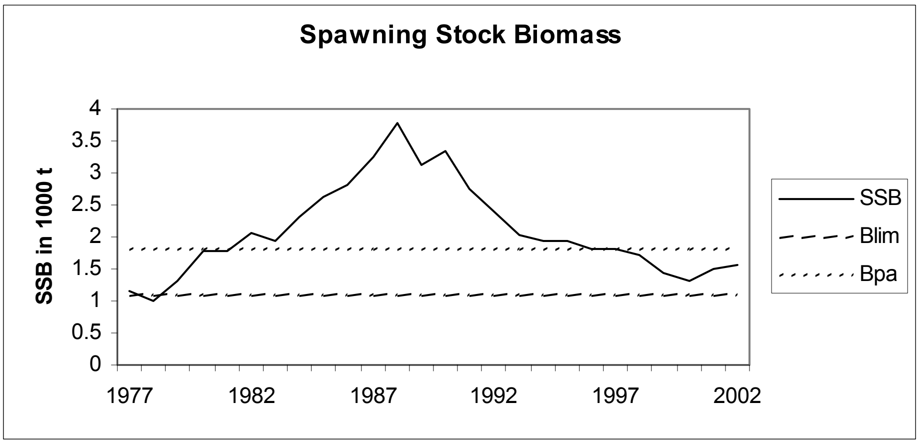
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM Landings
1987	TAC not to be restrictive on other species	-	1.8	1.90	1.90
1988	TAC not to be restrictive on other species	-	2.5	2.12	2.12
1989	TAC not to be restrictive on other species	-	2.5	2.15	2.15
1990	F likely to be F(88)	~1.9	1.9	2.08	2.08
1991	F likely to be F(89)	~1.7	1.9	1.50	1.50
1992	No long-term gains in increasing F	-	1.5	1.19	1.19
1993	No long-term gains in increasing F	-	1.4	1.11	1.11
1994	No long-term gains in increasing F	-	1.4	1.07	1.07
1995	No increase in F	1.29	1.4	1.03	1.03
1996	20% reduction in F	0.93	1.1	0.95	0.95
1997	20% reduction in F	1.10	1.1	1.22	1.22
1998	20% reduction in F	1.00	1.1	1.07	1.07
1999	35% reduction in F	0.67	0.9	0.97	0.97
2000	30% reduction in F	0.70	0.80	0.74	0.74
2001	40% reduction in F	0.60	0.76	0.72	0.72
2002	At least 35% reduction in F	0.68	0.68		
2003	At least 40% reduction in F	<0.66			

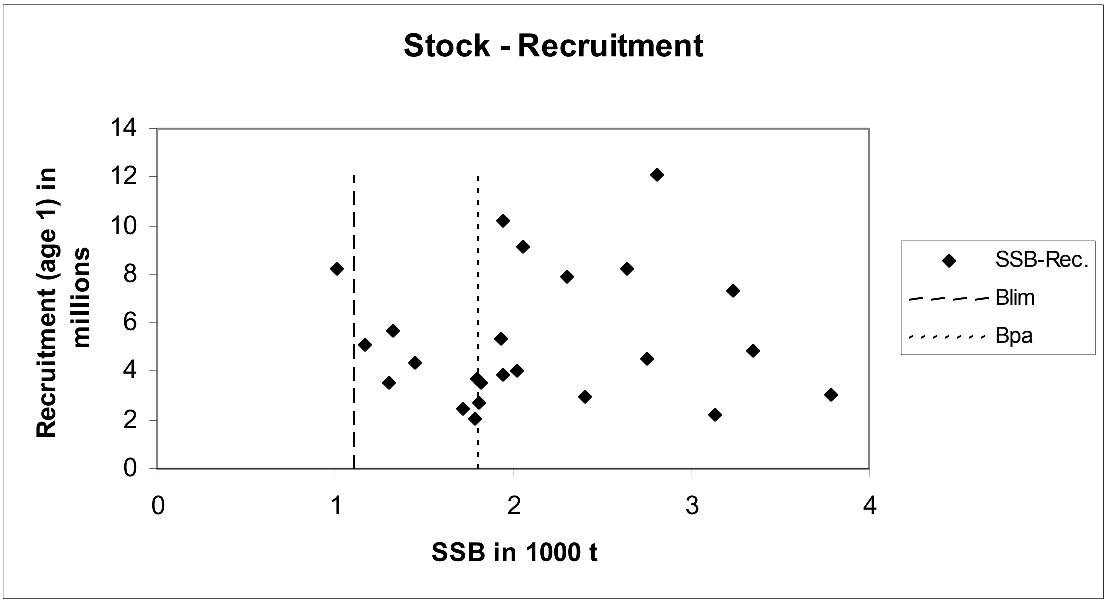
Weights in ‘000 t.

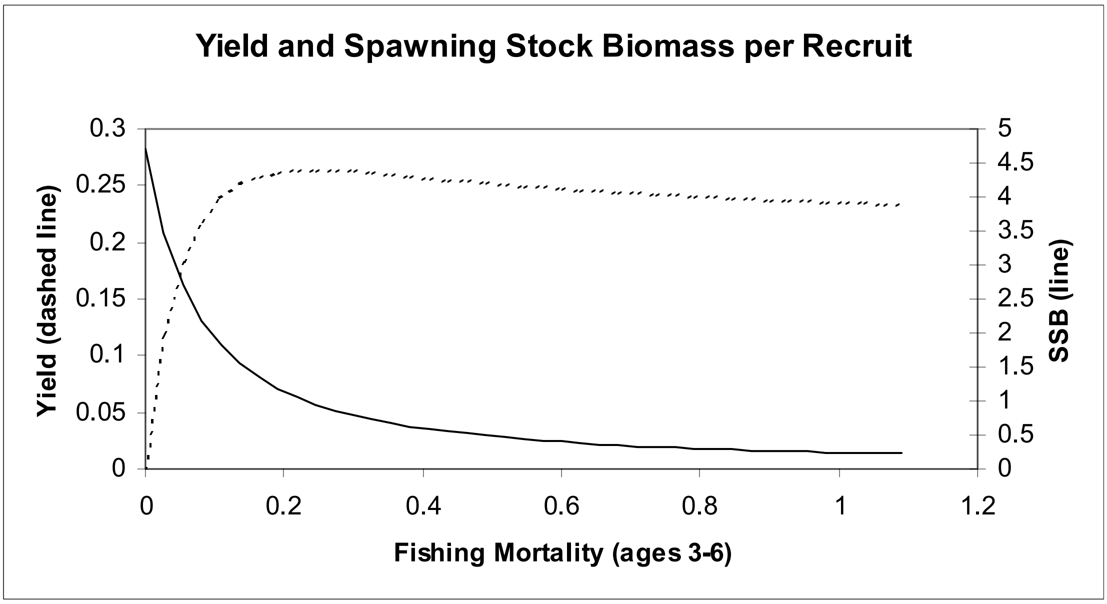

Landings
Landings in 1000 t
2.5
2
1.5
1
0.5
0
1977
1982
1987
1992
1997


Fishing Mortality
F(ages 3-6)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1977
1982
1987
1992
1997


Recruitment (age 1)
Recruitment in millions
14
12
10
8
6
4
2
0
1977
1982
1987
1992
1997


Spawning Stock Biomass
SSB in 1000 t
4
3.5
3
2.5
2
1.5
1
0.5
0
1977
1982
1987
1992
1997
2002
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa
0
2
4
6
8
10
12
14
0
1
2
3
4


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 3-6)
0
0.05
0.1
0.15
0.2
0.25
0.3
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
0.2
0.4
0.6
0.8
1
1.2

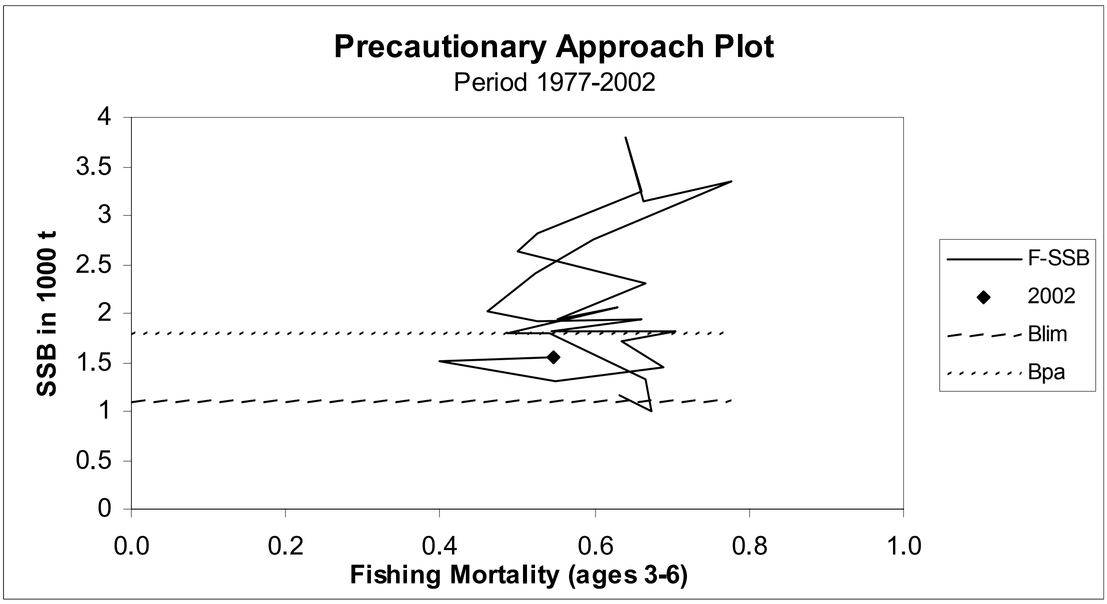

Precautionary Approach Plot
Period 1977-2002
SSB in 1000 t
Fishing Mortality (ages 3-6)
F-SSB
2002
Blim
Bpa
0
0.5
1
1.5
2
2.5
3
3.5
4
0.0
0.2
0.4
0.6
0.8
1.0

Table 3.9.4.1 Celtic Sea Plaice. Nominal landings (t) in Divisions VIIf+g, as used by Working Group.

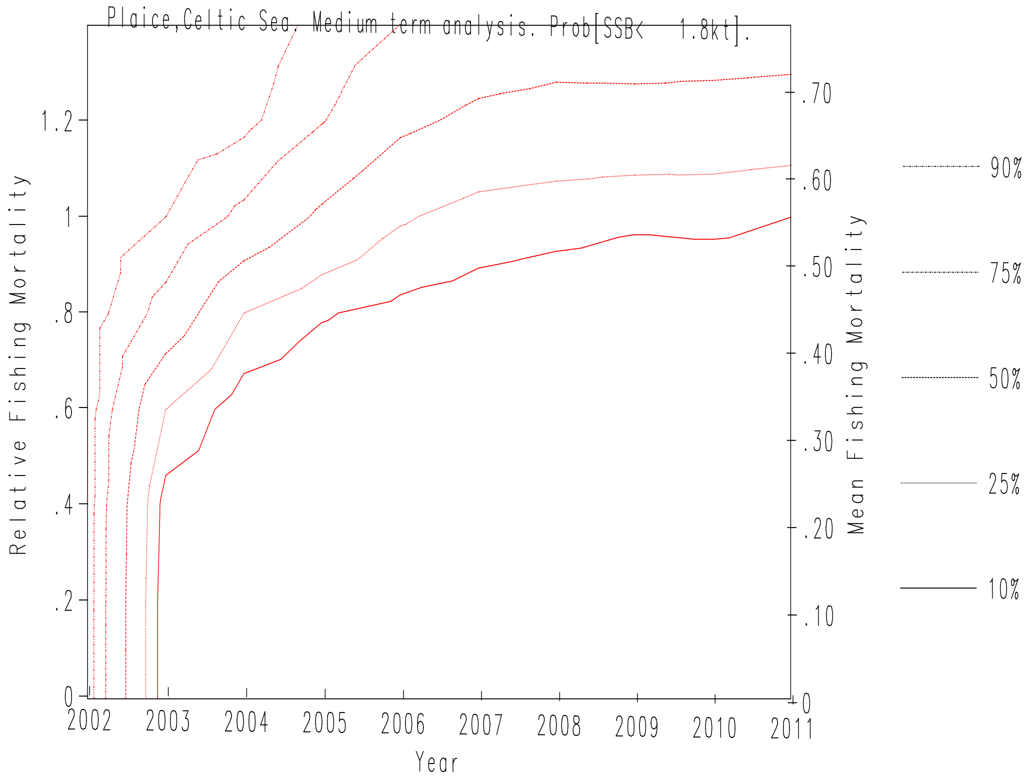
Year	Belgium	France	Ireland	UK (Engl. & Wales)	Others	Total reported	Unallocated	Total as used by WG
1977	214	365	28	150	0	757	0	757
1978	196	527	0	152	0	875	0	875
1979	171	467	49	176	0	863	0	863
1980	372	706	61	227	7	1,373	0	1,373
1981	365	697	64	251	0	1,377	0	1,377
1982	341	568	198	196	0	1,303	0	1,303
1983	314	532	48	279	0	1,173	-27	1,146
1984	283	558	72	366	0	1,279	-69	1,210
1985	357	493	91	466	0	1,407	345	1,752
1986	544	598	59	324	21	1,546	145	1,691
1987	576	708	122	495	0	1,901	0	1,901
1988	635	687	164	630	0	2,116	0	2,116
1989	835	649	195	472	0	2,151	0	2,151
1990	777	642	167	496	0	2,082	0	2,082
1991	479	533	94	395	0	1,501	0	1,501
1992	326	455	106	301	0	1,188	0	1,188
1993	396	342	87	290	0	1,114	0	1,114
1994	357	281	182	250	0	1,070	0	1,070
1995	337	254	153	284	0	1,028	0	1,028
1996	359	239	116	238	0	952	0	952
1997	494	321	143	259	0	1,217	0	1,217
1998	458	298	135	176	0	1,067	0	1,067
1999	415	262	122	169	0	968	0	968
2000	233	302	70	134	0	739	0	739
2001	277	256	46	136	0	715	0	715

N.B.: ICES receives statistics from some countries only for Divisions VIIg-k combined and not for each Division separately. The figures up to 1982 and from 1987 and onwards are provided by members of the Working Group; from 1983–1986, they are figures submitted to the EC by member states.

Table 3.9.4.2 Celtic Sea plaice (Divisions VIIf and g)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1977	3633	1170	757	0.632
1978	5091	1010	875	0.673
1979	8264	1323	863	0.666
1980	5709	1789	1373	0.541
1981	2080	1793	1377	0.488
1982	3679	2055	1303	0.630
1983	9161	1942	1146	0.551
1984	10212	2298	1210	0.666
1985	7947	2635	1752	0.500
1986	8229	2809	1691	0.527
1987	12086	3238	1901	0.661
1988	7291	3792	2116	0.641
1989	3063	3134	2151	0.664
1990	2197	3347	2082	0.777
1991	4884	2751	1501	0.598
1992	4533	2400	1188	0.524
1993	2942	2025	1114	0.462
1994	4074	1927	1070	0.527
1995	5324	1942	1028	0.660
1996	3898	1815	952	0.544
1997	3555	1808	1217	0.704
1998	2692	1717	1067	0.634
1999	2473	1450	968	0.689
2000	4365	1305	739	0.549
2001	3537*	1513	715	0.398
2002	3537*	1553		0.546
Average	5171	2098	1286	0.594

* GM $_{89-00}$



Plaice,Celtic Sea. Medium term analysis. Prob[SSB< 1.8kt].
Relative Fishing Mortality
Mean Fishing Mortality
Year
0
.2
.4
.6
.8
1
1.2
.10
.20
.30
.40
.50
.60
.70
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
90%
75%
50%
25%
10%

3.9.5 Sole in Divisions VIIf and g (Celtic Sea)

State of stock/exploitation: The stock is harvested outside safe biological limits. Fishing mortality has increased since the late 1970s, exceeding $\mathbf{F}_{pa}$ since the early 1980s, and is at present above $\mathbf{F}_{lim}$. SSB has declined steadily since the early 1970s. SSB fell below $\mathbf{B}_{pa}$ in 1995 and has remained low until 2001, when the outstanding 1998 year class began to contribute and SSB increased above $\mathbf{B}_{pa}$. SSB is forecast to increase further in 2002-2003. Recruitment has fluctuated with some peaks: the 1970 and 1989 year classes were strong, and the 1998 year class the strongest in the series.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is not defined	$\mathbf{B}_{pa}$ be set at 2 200 t. There is no evidence of reduced recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ can therefore be set equal to the lowest observed SSB.
$\mathbf{F}_{lim}$ is 0.52, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.37. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and maintaining SSB above $\mathbf{B}_{pa}$ in 10 years, taking into account the uncertainty of assessments.

Technical basis:

$\mathbf{B}_{lim}$: Not defined	$\mathbf{B}_{pa}$: $\mathbf{B}_{loss}$
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$	$\mathbf{F}_{pa}$: $\mathbf{F}_{lim}$ x 0.72; implies a less than 5% probability that (SSB_{MT}< $\mathbf{B}_{pa}$)

Advice on management: ICES recommends that the fishing mortality should be reduced to below $\mathbf{F}_{pa}$, corresponding to landings of less than 1 240 t in 2003. This corresponds to a reduction of 40% from *status quo* F, and will maintain SSB above $\mathbf{B}_{pa}$ in the short term.

Relevant factors to be considered in management: The assessment indicates a large 1998 year class, and SSB is expected to increase in the short term. However, outstanding year classes have only been produced at long intervals and the stock increase is therefore likely to be temporary.

Sole is taken mainly in a directed beam-trawl fishery with plaice as a by-catch, and to a lesser extent in otter trawl fisheries. Management should take account of the mix of Celtic Sea sole and plaice.

Catch forecast for 2003:
Basis: F(2002)=TAC constraint, $\mathbf{F}_{sq}$ = F(99–01,scaled)=0.63; Landings(2002) = 1.07; SSB(2003) = 3.37.

F(2003)	Basis	Landings (2003)	SSB (2004)
0.25	0.4*$\mathbf{F}_{sq}$	0.89	3.77
0.31	0.5 * $\mathbf{F}_{sq}$	1.08	3.56
0.37	$\mathbf{F}_{pa}$ = 0.59 * $\mathbf{F}_{sq}$	1.24	3.37
0.44	0.7 * $\mathbf{F}_{sq}$	1.43	3.16
0.50	0.8 * $\mathbf{F}_{sq}$	1.59	2.99
0.57	0.9 * $\mathbf{F}_{sq}$	1.74	2.82
0.63	1.0 * $\mathbf{F}_{sq}$	1.88	2.66

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: Results of the medium-term analysis indicate a low probability of SSB falling below $\mathbf{B}_{pa}$ after 5-10 years when the fishing mortality is reduced below $\mathbf{F}_{pa}$ from 2003 onwards. Assuming the current selection pattern, $\mathbf{F}_{max}$ is 0.39* $\mathbf{F}_{sq}$.

Comparison with previous assessment and advice: Results are very close to those of the previous assessment. The size of the 1998 year class was re-estimated to be around 30% larger than the previous estimate.

Elaboration and special comment: The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium, taking 2/3, the UK 1/4, and France and Ireland taking minimal amounts of the total landings. The sole fishery is concentrated on the north Cornish coast off Trevose Head and around Lands End.

The catch options for 2003 are based on the assumption that the TAC in 2002 represents the catch in 2002. This is based on information that the Belgian fleet has stopped fishing for sole in June 2002 when this fleet reached its TAC limit. Hence the fishing mortality in 2002 would be below $\mathbf{F}_{sq}$.

Sole are taken mainly in a beam trawl fishery that started in the early 1960s and, to a lesser extent, in the longer established otter-trawl fisheries. In the 1970s, the fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam trawls (to target sole and plaice) increased during the mid-1970s, and the Belgian otter trawlers have now been almost entirely replaced by beam trawlers. Effort in the Belgium beam-trawl fleet increased in the late 1980s as vessels normally operating in the North Sea were attracted to the west by improved fishing opportunities. Beam trawling by UK vessels increased substantially from 1986, reaching a peak in 1990 and decreasing thereafter. In the Celtic Sea, the beam and otter trawl fleets also take plaice, rays, brill, turbot, and anglerfish.

The main spawning areas for sole in the Celtic Sea are in waters 40–75 m deep, off Trevose Head, and spawning usually takes place between February and April. Juvenile sole are found in relatively high abundance in depths up to 40 m, and adult sole (fish aged 3 plus) are generally found in deeper water. Spawning and nursery grounds are well defined.

The results of recent tagging experiments suggest that there is only limited movement of sole between the Bristol Channel and adjacent areas.

Age-based analytical assessment using catch-per-unit effort data from two commercial fleets and one survey.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

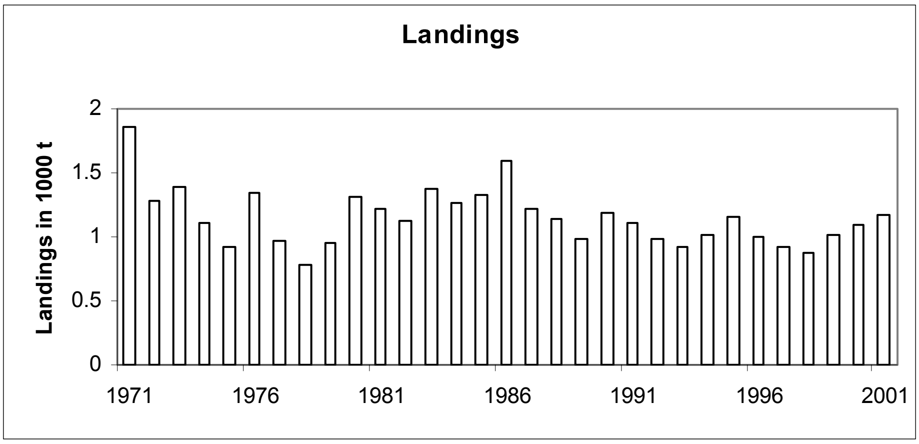
Yield and spawning biomass per Recruit
F-reference points:

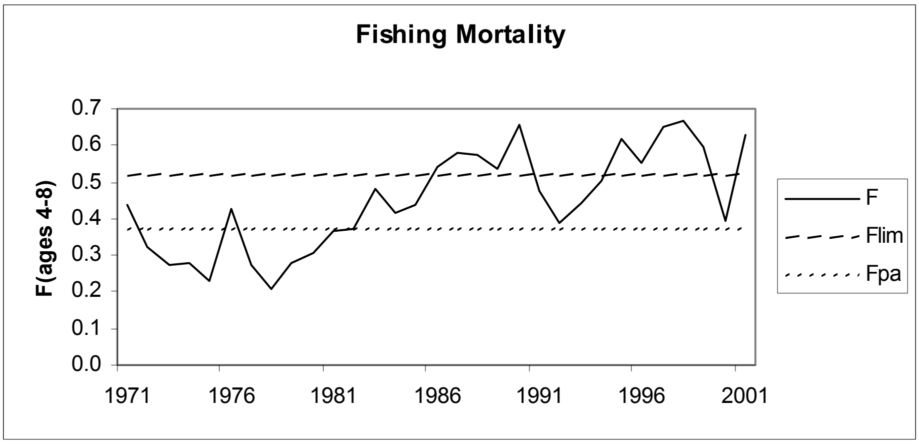
	Fish Mort Ages 4-8	Yield/R	SSB/R
Average Current	0.538	0.210	0.384
$\mathbf{F}_{max}$	0.248	0.226	0.959
$\mathbf{F}_{0.1}$	0.117	0.205	1.885
$\mathbf{F}_{med}$	0.345	0.222	0.664

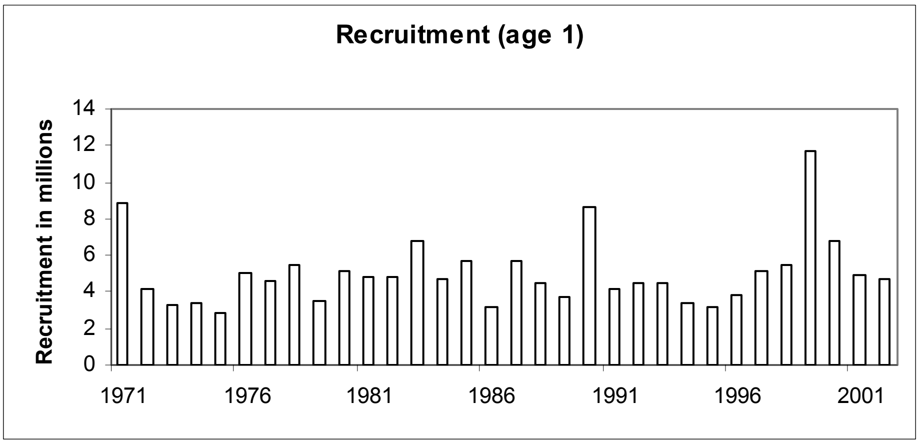
Catch data (Tables 3.9.5.1-2):

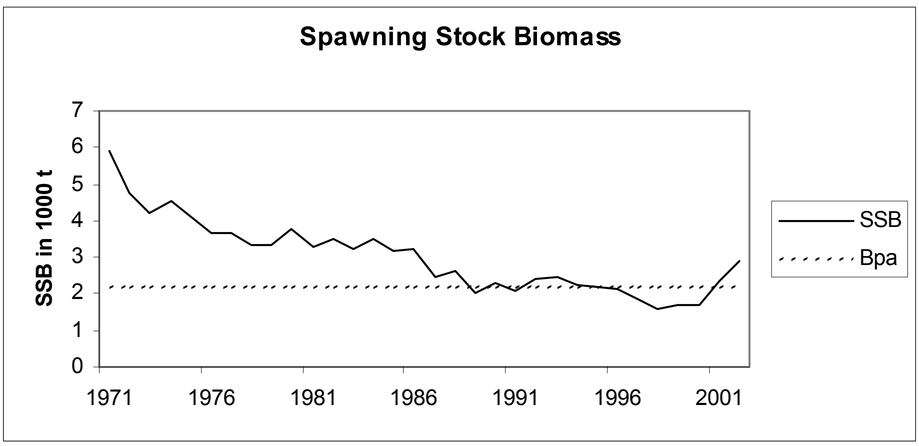
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Landings
1987	*Status quo* F; TAC	1.6	1.6	1.22
1988	F = F(pre-86); TAC	0.9	1.1	1.15
1989	F at F(81–85); TAC	1.0	1.0	0.99
1990	No increase in F	1.2	1.2	1.19
1991	No increase in F	1.1	1.2	1.11
1992	No long-term gains in increasing F	1.1	1.2	0.98
1993	No long-term gains in increasing F	-	1.1	0.93
1994	No long-term gains in increasing F	-	1.1	1.01
1995	No increase in F	1.0	1.1	1.16
1996	20% reduction in F	0.8	1.0	1.00
1997	20% reduction in F	0.8	0.9	0.93
1998	20% reduction in F	0.7	0.85	0.88
1999	Reduce F below $\mathbf{F}_{pa}$	0.81	0.96	1.01
2000	Reduce F below $\mathbf{F}_{pa}$	<1.16	1.16	1.09
2001	Reduce F below $\mathbf{F}_{pa}$	< 0.81	1.02	1.17
2002	Reduce F below $\mathbf{F}_{pa}$	< 1.00	1.07	
2003	Reduce F below $\mathbf{F}_{pa}$	< 1.24		

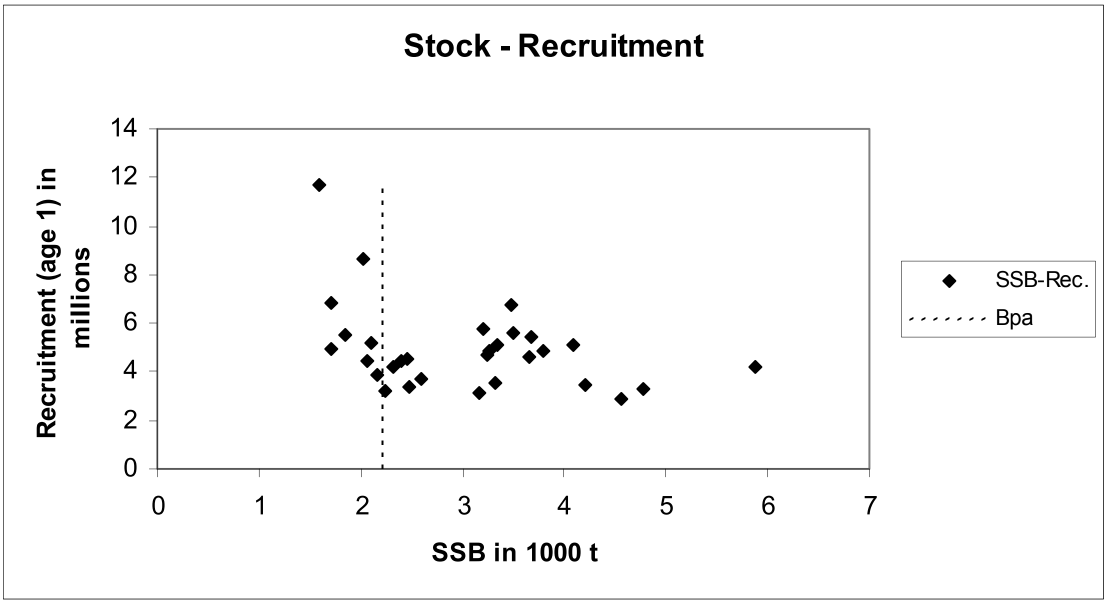
Weights in '000 t.

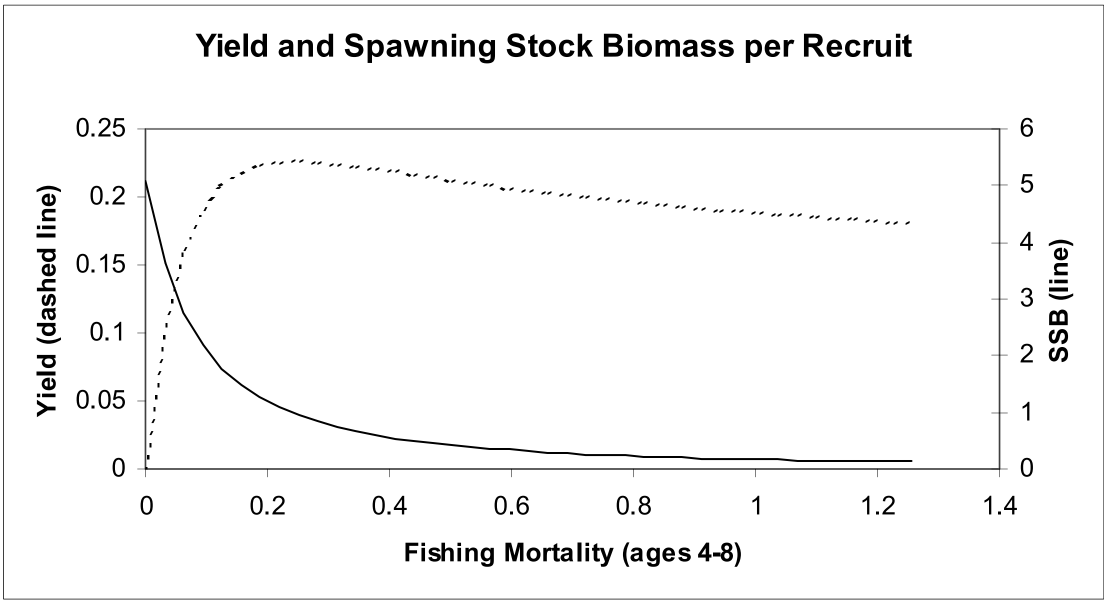

Landings
Landings in 1000 t
2
1.5
1
0.5
0
1971
1976
1981
1986
1991
1996
2001


Fishing Mortality
F(ages 4-8)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1971
1976
1981
1986
1991
1996
2001
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
14
12
10
8
6
4
2
0
1971
1976
1981
1986
1991
1996
2001


Spawning Stock Biomass
SSB in 1000 t
7
6
5
4
3
2
1
0
1971
1976
1981
1986
1991
1996
2001
SSB
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Bpa
0
2
4
6
8
10
12
14
0
1
2
3
4
5
6
7


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 4-8)
0
0.05
0.1
0.15
0.2
0.25
0
1
2
3
4
5
6
0
0.2
0.4
0.6
0.8
1
1.2
1.4

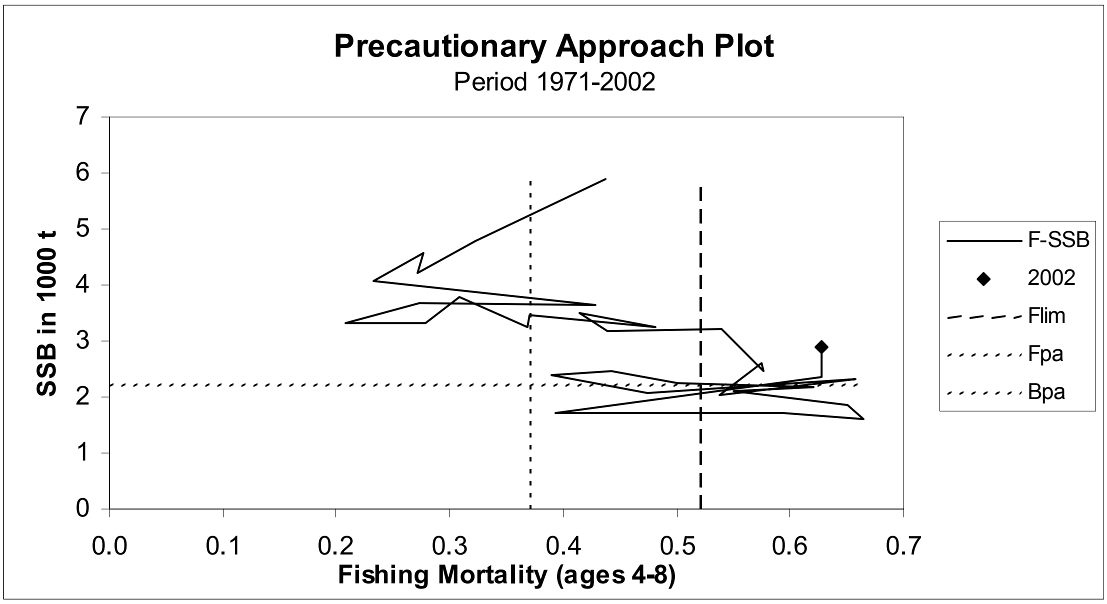

Precautionary Approach Plot
Period 1971-2002
SSB in 1000 t
Fishing Mortality (ages 4-8)
F-SSB
2002
Flim
Fpa
Bpa
0
1
2
3
4
5
6
7
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

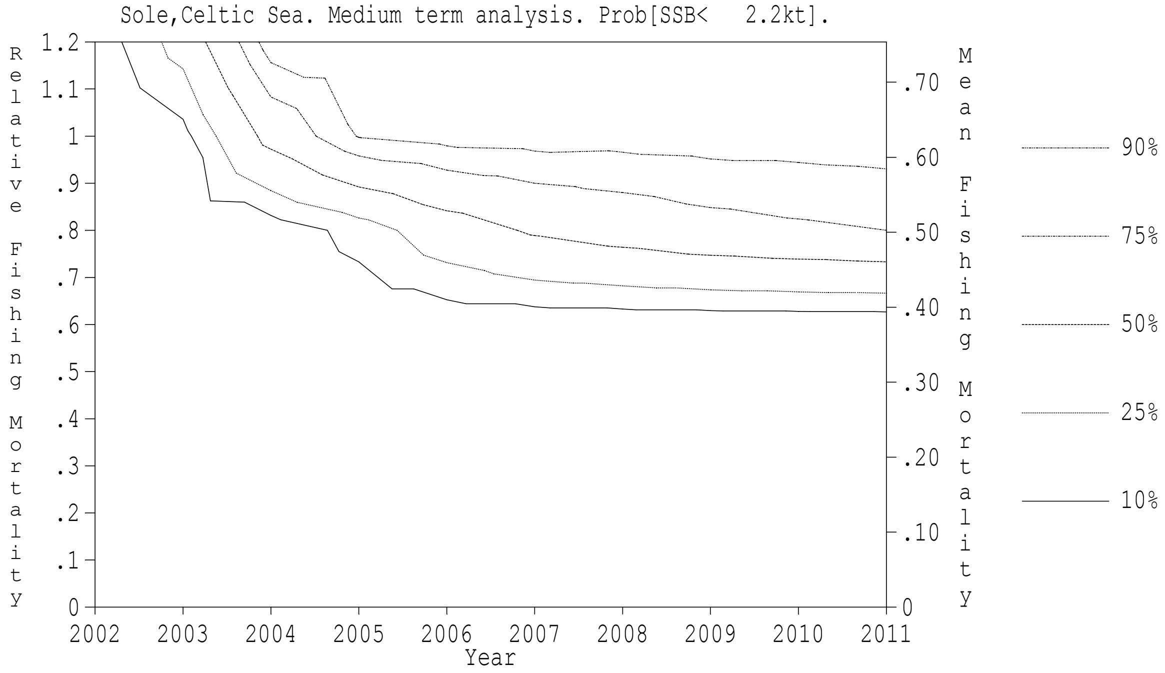
Table 3.9.5.1 Celtic Sea SOLE. Divisions VIIf and VIIg. Nominal landings (t), 1986–2001. Data used by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001[1]
Belgium	1,092	704	725	660	689	839	516	512	612	728	610	562	568	669	694	748
France	92	72	89	97	100	80	136	103	86	89	97	79	72	98	117	78
Ireland	12	9	15	32	41	n/a	4	28	47	45	23	36	37	50	74	36
UK(E. & W.)	404	437	317	203	359	395	325	285	264	294	265	251	198	231	243	288
Others	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
Total	1,600	1,222	1,146	992	1,189	1,324	981	928	1,009	1,156	995	928	875	1,047	1,128	1149
Unallocated	-	-	-	-	-	-217	-	-	-	1	-	-1	-	-36	-37	19
Total used in assessment	1,600	1,222	1,146	992	1,189	1,107	981	928	1,009	1,157	995	927	875	1,012	1,091	1168

[1]Preliminary.

Table 3.9.5.2 Sole in Divisions VIIf and g (Celtic Sea)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1971	8900	5883	1861	0.438
1972	4176	4775	1278	0.322
1973	3335	4203	1391	0.271
1974	3423	4555	1105	0.277
1975	2844	4087	919	0.232
1976	5072	3650	1350	0.429
1977	4578	3668	961	0.273
1978	5419	3316	780	0.208
1979	3524	3337	954	0.279
1980	5096	3791	1314	0.308
1981	4827	3265	1212	0.369
1982	4853	3474	1128	0.370
1983	6752	3251	1373	0.481
1984	4675	3500	1266	0.414
1985	5636	3166	1328	0.439
1986	3141	3209	1600	0.539
1987	5738	2460	1222	0.577
1988	4502	2600	1146	0.574
1989	3743	2024	992	0.537
1990	8625	2320	1189	0.657
1991	4201	2059	1107	0.475
1992	4463	2397	981	0.390
1993	4434	2472	928	0.442
1994	3396	2246	1009	0.501
1995	3195	2171	1157	0.620
1996	3851	2110	995	0.550
1997	5164	1850	927	0.651
1998	5491	1599	875	0.665
1999	11663	1712	1012	0.594
2000	6802	1711	1091	0.393
2001	4928	2360	1168	0.628
2002	4716	2904		0.628
Average	5036	3004	1149	0.454



Sole,Celtic Sea. Medium term analysis. Prob[SSB< 2.2kt].
Relative Fishing Mortality
1.2
1.1
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
Mean Fishing Mortality
.70
.60
.50
.40
.30
.20
.10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
90%
75%
50%
25%
10%

3.9.6 Plaice in Division VIIe (Western Channel)

State of stock/exploitation: The stock is outside safe biological limits. SSB peaked in 1988–1990, following a series of good year classes in the mid-1980s, but has declined rapidly to well below $\mathbf{B}_{pa}$ until 1995 and is currently close to $\mathbf{B}_{lim}$. Fishing mortality increased in the 1980s and has fluctuated well above $\mathbf{F}_{pa}$ in the 1990s. In recent years recruitment has been below average.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 1 300 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 2 500 t. This is the previously proposed MBAL. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty in assessments.
$\mathbf{F}_{lim}$ not defined	$\mathbf{F}_{pa}$ be set at 0.45. This F is considered to have a high probability of maintaining SSB above $\mathbf{B}_{pa}$ in the medium term, taking into account the uncertainty in assessments.

Technical basis:

$\mathbf{B}_{lim}$=$\mathbf{B}_{loss}$	$\mathbf{B}_{pa}$ = MBAL
$\mathbf{F}_{lim}$=Not defined	$\mathbf{F}_{pa}$ = low probability that (SSB_{MT}< $\mathbf{B}_{pa}$)

Advice on management: ICES recommends that fishing mortality should be reduced to below 0.31, corresponding to catches of less than 530 t in 2003. This represents a reduction in F of 50% and will allow SSB to reach $\mathbf{B}_{pa}$ in five years with around 50% probability. This advice is consistent with the advice for sole in Division VIIe.

Relevant factors to be considered in management: Only a complete closure of the fishery would be required to bring SSB above $\mathbf{B}_{pa}$ in the short-term. If the advice for sole is followed, it would also imply an approximate 50% reduction in fishing mortality for plaice.

The TAC for plaice in the Channel is set for Divisions VIId,e combined, so the results from this assessment need to be considered along with those for the much larger Division VIId stock. Given that the Division VIId component dominates the TAC, a catch control does not guarantee that fishing mortality in Division VIIe is constrained. To achieve a decrease in fishing mortality, a direct reduction in fishing effort in Division VIIe, or a separate catch control, is necessary.

Plaice are taken in a mixed demersal species otter trawl fishery, and as a by-catch in the sole beam trawl fishery. Management measures should therefore be considered in conjunction with those for Division VIIe sole.

Catch forecast for 2003:
Basis: F(2002) = $\mathbf{F}_{sq}$ = F(99–01) = 0.63 ; Landings (2002) = 0.90 ; SSB(2003) = 1.49.

F(2003)	Basis	Landings (2003)	SSB(2004)
0	0*$\mathbf{F}_{sq}$	0	2.45
0.31	0.5*$\mathbf{F}_{sq}$	0.53	1.96
0.38	0.6*$\mathbf{F}_{sq}$	0.62	1.88
0.44	0.7*$\mathbf{F}_{sq}$	0.70	1.80
0.45	$\mathbf{F}_{pa}$ = 0.72*$\mathbf{F}_{sq}$	0.72	1.78
0.50	0.8*$\mathbf{F}_{sq}$	0.78	1.72
0.56	0.9*$\mathbf{F}_{sq}$	0.86	1.65
0.63	1.0*$\mathbf{F}_{sq}$	0.93	1.59

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: Under the current selection pattern, $\mathbf{F}_{max}$ is 40% of $\mathbf{F}_{sq}$.

Comparison with previous assessment and advice: The current estimates of SSB and F are very similar to those obtained last year. However, the strength of the 1998 and 1999 year classes has been revised downwards

(40% and 10%, respectively) and the strength of the 2000 year class is estimated to be 30% lower than the geometrical mean assumed last year. This results in a 20% lower estimate of SSB for 2002 than that projected last year.

Elaboration and special comment: The fisheries taking plaice in the Western Channel mainly involve vessels from the bordering countries: The total landings are split among UK vessels (75%), France (22%), and Belgium (the remaining 3%). Landings of plaice in the Western Channel were low and stable between 1950 and the mid-1970s, and increased rapidly during 1976 to 1988 as beam-trawls began to replace otter-trawls, although plaice are taken mainly as a by-catch in beam-trawling directed at sole and anglerfish. Reported landings have been declining throughout the 1990s. The main fishery is south and west of Start Point. Although plaice are taken throughout the year, the larger landings are made during February, March, October and November.

Most plaice tagged whilst spawning during December to March around Start Point in the western Channel migrated into the eastern Channel and the North Sea after spawning, whilst few plaice tagged there during April and May were recaptured outside the Channel. This suggests there is both a resident stock and one, which migrates to the North Sea after spawning in the Channel.

Analytical age-based assessment based on landings, survey, and commercial CPUE data. Mis-reporting of landings is thought to have occurred in the past, but industry comments indicate that in recent years this has not been a problem.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

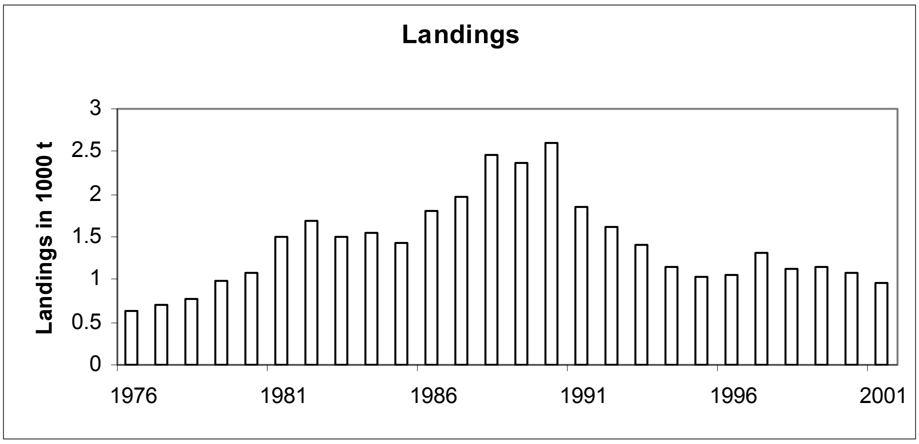
Yield and spawning biomass per Recruit
F-reference points:

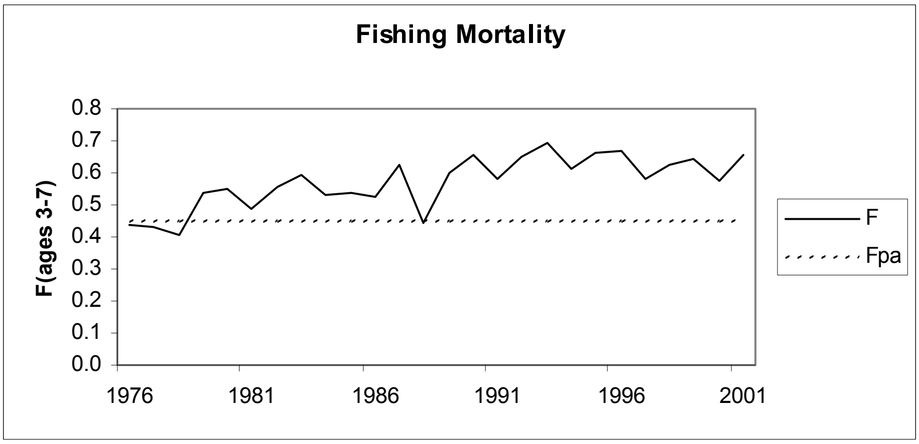
	Fish Mort Ages 3-7	Yield/R	SSB/R
Average Current	0.628	0.257	0.409
$\mathbf{F}_{max}$	0.248	0.277	1.066
$\mathbf{F}_{0.1}$	0.114	0.251	2.054
$\mathbf{F}_{med}$	0.567	0.260	0.455

Catch data (Tables 3.9.6.1-2):

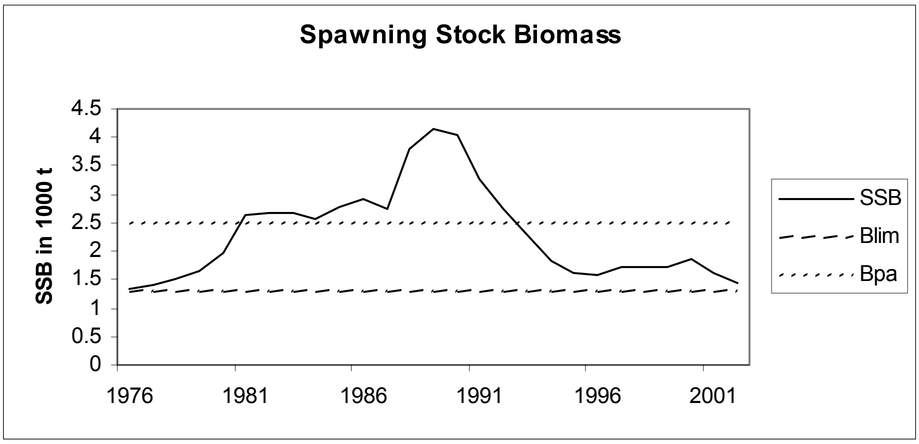
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official Landings	ACFM Landings
1987	Precautionary TAC	6.8	8.3	1.92	1.96
1988	Precautionary TAC	6.9	9.96	2.33	2.46
1989	No increase in effort; TAC	11.7	11.7	2.25	2.36
1990	No increase in F; TAC	10.7	10.7	1.99	2.59
1991	50% reduction in F in VIIe	8.8	10.7	1.65	1.85
1992	Sq. F gives over mean SSB	2.0[2]	9.6	1.56	1.62
1993	Not outside safe biological limits	-	8.5	1.44	1.42
1994	Within safe biological limits	-	9.1	1.29	1.16
1995	No increase in F	1.4[2]	8.0	1.16	1.03
1996	60% reduction in F	0.6[2]	7.5	1.14	1.04
1997	60% reduction in F	0.51[2]	7.09	1.37	1.32
1998	60% reduction in F	0.5[2]	5.7	1.24	1.13
1999	Reduce F below $\mathbf{F}_{pa}$	1.1[2]	7.4	1.15	1.15
2000	Reduce F below $\mathbf{F}_{pa}$	< 1.08[2]	6.5	1.10	1.08
2001	Reduce F below $\mathbf{F}_{pa}$	< 0.93	6.0	0.96	0.97
2002	Reduce F below $\mathbf{F}_{pa}$	< 0.89	6.7		
2003	At least 50% reduction in F	< 0.53			

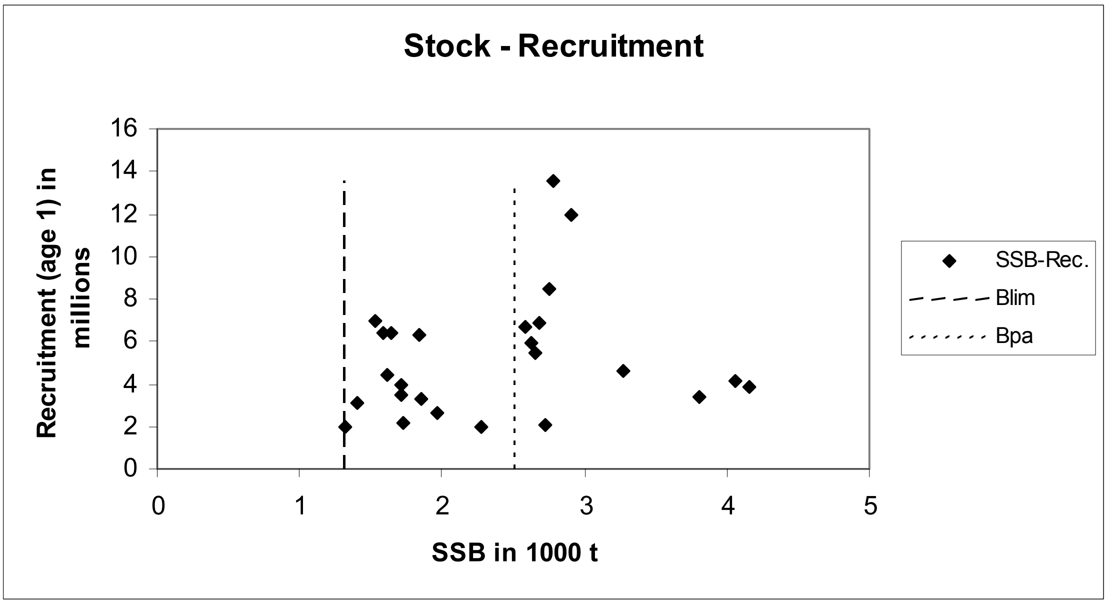
[1]TACs for Divisions VIId,e. [2]For Division VIIe only. Weights in '000 t.

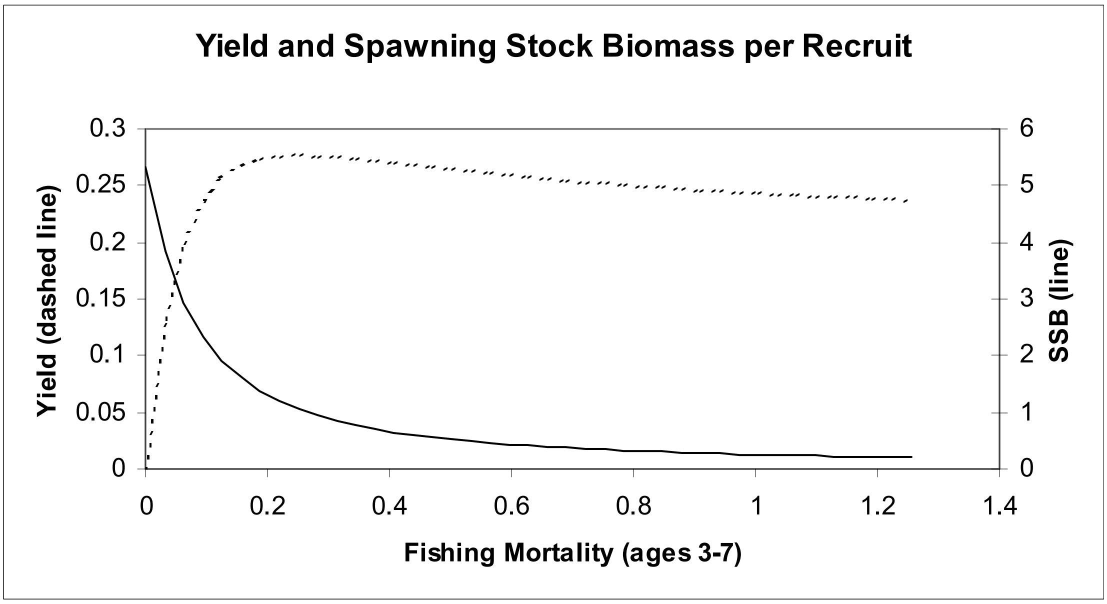

Landings
Landings in 1000 t
3
2.5
2
1.5
1
0.5
0
1976
1981
1986
1991
1996
2001


Fishing Mortality
F(ages 3-7)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1976
1981
1986
1991
1996
2001
F
Fpa


Recruitment (age 1)
Recruitment in millions
16
14
12
10
8
6
4
2
0
1976
1981
1986
1991
1996
2001


Spawning Stock Biomass
SSB in 1000 t
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1976
1981
1986
1991
1996
2001
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 3-7)

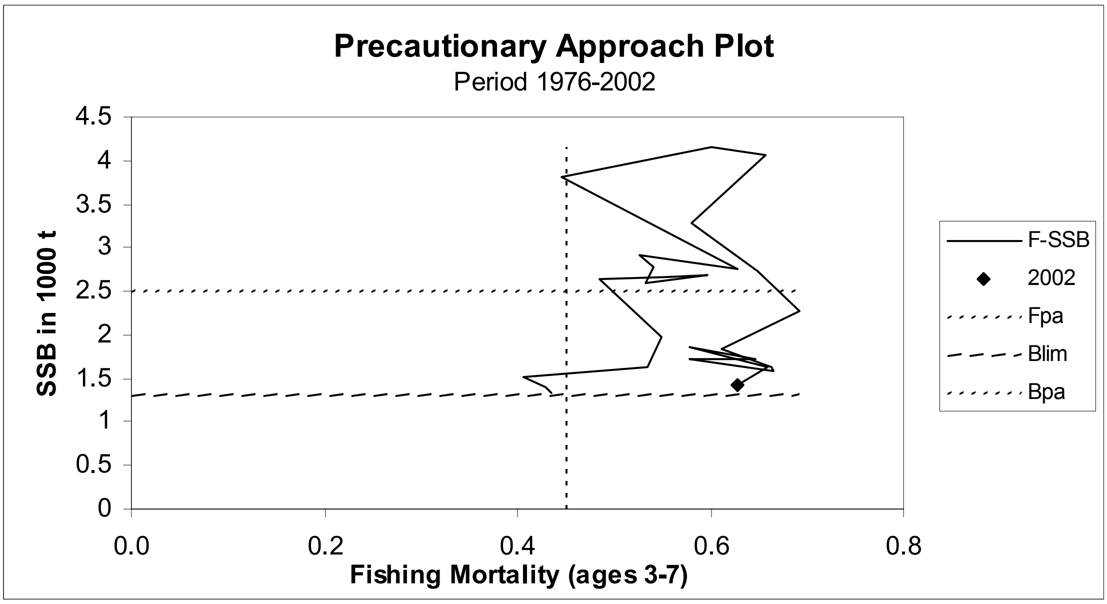

Precautionary Approach Plot
Period 1976-2002
SSB in 1000 t
Fishing Mortality (ages 3-7)
F-SSB
2002
Fpa
Blim
Bpa

Table 3.9.6.1 Western Channel Plaice. Nominal landings (t) in Division VIIe, as used by Working Group.

Year	Belgium	Denmark	France	UK (Engl. & Wales)	Others	Total reported	Unallocated[2]	Total
1976	5	-[3]	323	312	-	640	-	640
1977	3	-[3]	336	363	-	702	-	702
1978	3	-[3]	314	467	-	784	-	784
1979	2	-[3]	458	515	-	975	2	977
1980	23	-[3]	325	609	9	966	113	1,079
1981	27	-	537	953	-	1,517	-16	1,501
1982	81	-	363	1,109	-	1,553	135	1,688
1983	20	-	371	1,195	-	1,586	-91	1,495
1984	24	-	278	1,144	-	1,446	101	1,547
1985	39	-	197	1,122	-	1,358	83	1,441
1986	26	-	276	1,389	-[1]	1,691	119	1,810
1987	68	-	435	1,419	-	1,922	36	1,958
1988	90	-	584	1,654	-	2,328	130	2,458
1989	89	-	448[1]	1,708	2	2,247	111	2,358
1990	82	2	N/A[2]	1,885	18	1,987	606	2,593
1991	57	-	251[1]	1,323	16	1,647	201	1,848
1992	25	-	419	1,102	14	1,560	64	1,624
1993	56	-	284	1,080	24	1,444	-27	1,417
1994	10	-	277	998	3	1,288	-132	1,156
1995	13	-	288	857	-	1,158	-127	1,031
1996	4	-	279	855	-	1,138	-94	1,044
1997	6	-	329	1,032	1	1,368	-45	1,323
1998	22	-	327	892	1	1,242	-111	1,131
1999	12	-	194[1]	947	-	1,153	1	1,154
2000	4	-	166[1]	926	-	1,096	-12	1,084
2001	12		164[1]	784	-	960	7	967

[1]Estimated by the Working Group.
[2]Divisions VIId,e = 4,739 t.
[3]Included in Division VIId.

Table 3.9.6.2 Plaice in Division VIIe (Western Channel)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1976	3764	1321	640	0.436
1977	2001	1410	702	0.430
1978	3101	1524	784	0.406
1979	6963	1640	977	0.535
1980	6417	1973	1079	0.550
1981	2629	2630	1501	0.486
1982	5908	2660	1688	0.555
1983	5415	2684	1495	0.596
1984	6839	2583	1547	0.532
1985	6643	2775	1441	0.540
1986	13525	2909	1810	0.527
1987	11927	2747	1958	0.627
1988	8502	3801	2458	0.445
1989	3405	4157	2358	0.602
1990	3812	4060	2593	0.656
1991	4144	3279	1848	0.580
1992	4604	2727	1624	0.648
1993	2071	2280	1417	0.692
1994	1950	1838	1156	0.612
1995	6259	1622	1031	0.664
1996	4446	1581	1044	0.666
1997	6401	1718	1323	0.579
1998	3522	1730	1131	0.625
1999	2132	1718	1154	0.646
2000	3910	1849	1084	0.578
2001	3331	1630	967	0.659
2002	4582	1434		0.627
Average	5119	2307	1416	0.574

3.9.7 Sole in Division VIIe (Western Channel)

State of stock/exploitation: The stock is outside safe biological limits. SSB has declined since 1980 and has been estimated to be at its historic lowest level in 2002, well below $\mathbf{B}_{pa}$ and below $\mathbf{B}_{lim}$ since 2001. Fishing mortality has been above $\mathbf{F}_{lim}$ since 1982. Since 1990 most year classes have been below average.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (revised in 2001):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 2 000 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 2 800 t.
$\mathbf{F}_{lim}$ is 0.28, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.2.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$	$\mathbf{B}_{pa}$: historical development: Biomass below this has increased risk of reduced recruitment.
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$	$\mathbf{F}_{pa}$:$\mathbf{F}_{lim}$*0.72

Advice on management: In the light of SSB being below $\mathbf{B}_{lim}$, ICES recommends a recovery plan until the safe and rapid recovery of SSB to a level in excess of $\mathbf{B}_{pa}$. If a recovery plan is not implemented, ICES recommends that fishing mortality should be reduced to the lowest possible level.

Rebuilding plan: To rebuild SSB to $\mathbf{B}_{pa}$ in 2006 with 50% probability requires an immediate and sustained reduction of fishing mortality by 50%. These results assume $\mathbf{F}_{sq}$ in 2002. Given the state of the stock, the most rapid possible rebuilding to $\mathbf{B}_{pa}$ is strongly advised.

Relevant factors to be considered in management: Even a complete closure of the fishery is not expected to rebuild SSB above $\mathbf{B}_{pa}$ in the short-term.

Fisheries for sole also take plaice as a by-catch. This needs to be taken into account in management.

The advised recovery plan with a 50 % reduction in fishing mortality is consistent with the advice for plaice in Division VIIe

Catch forecast in 2003:
Basis: F(2002) = F(99–01) = 0.41 ; Landings(2002) = 0.75 ; SSB(2003) = 1.81 .

F(2003) Onwards	Basis	Landings (2003)	SSB (2004)
0.0	0.0	0.0	2.50
0.08	0.2*F_{sq}	0.16	2.35
0.2	$\mathbf{F}_{pa}$ (0.5* F_{sq})	0.41	2.12
0.25	0.6* F_{sq}	0.49	2.04
0.29	0.7* F_{sq}	0.56	1.98
0.33	0.8* F_{sq}	0.63	1.91
0.37	0.9* F_{sq}	0.70	1.85
0.41	F_{sq}	0.76	1.79

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: $\mathbf{F}_{max}$ is poorly determined as the yield-per-recruit curve is flat-topped. There is a high probability that SSB will remain below $\mathbf{B}_{pa}$ in the medium term at $\mathbf{F}_{sq}$.

Comparison with previous assessment and advice: Addition of misallocated landings from 1986 onwards has resulted in a slight change in the trend in F in the 1980s. SSB, although now estimated at a slightly higher level in the 1980s, is nevertheless at a similar level to that in previous assessments in the most recent period.

Elaboration and special comment: Due to TAC constraints, strategic misallocation and under-reporting of landings from this stock may have affected the assessment in the past. The database has been revised since 1986 to reduce the errors from misallocation. In recent years, UK vessels have accounted for around 60% of the total landings, with France taking approximately a third and Belgian vessels the remainder. UK landings were low and stable between 1950 and the mid-1970s, but increased rapidly after 1978 due to the replacement of otter trawlers by beam trawlers. The principal gears used are otter trawls and beam trawls, and sole tends to be the target species of an offshore beam-trawl fleet, which is concentrated off the south Cornish coast, and also takes plaice and anglerfish and at times cuttlefish.

In the Western Channel the peak spawning period of sole is April and May. The main spawning areas are to the west of the Isle of Wight and in the vicinity of Hurd Deep. The nurseries are in estuaries, tidal inlets and shallow, sandy bays. Adult sole in the Western Channel may recruit from local nurseries and from those in the Eastern Channel, but there is no evidence of subsequent emigration from the Western Channel. Coupled with the localised spawning areas in the western Channel, this suggests that adult sole are largely isolated from those found in northern Biscay, the eastern Celtic Sea, and the Eastern Channel.

The assessment is analytical based on landings, survey, and commercial CPUE data. Revised commercial tuning fleets were used in 2002. Biological sampling data are good. Variations in effort and fleet catchability may occur as vessels move in and out of the fishery dependent on prevailing catch rates of sole.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

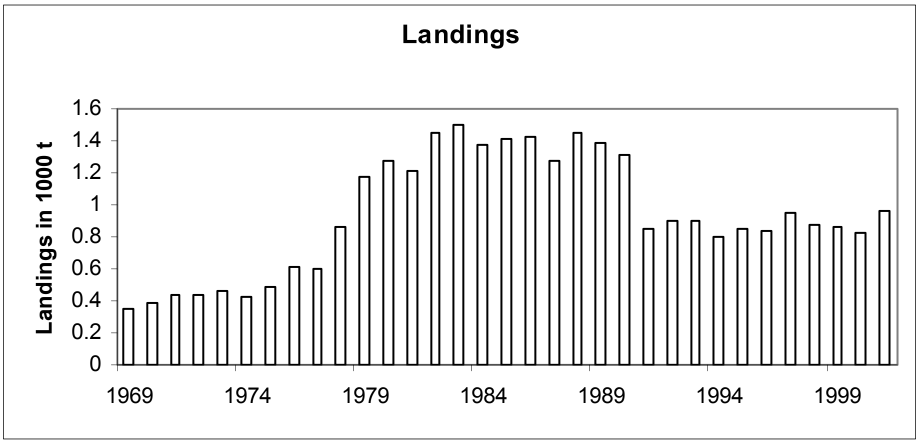
Yield and spawning biomass per Recruit
F-reference points:

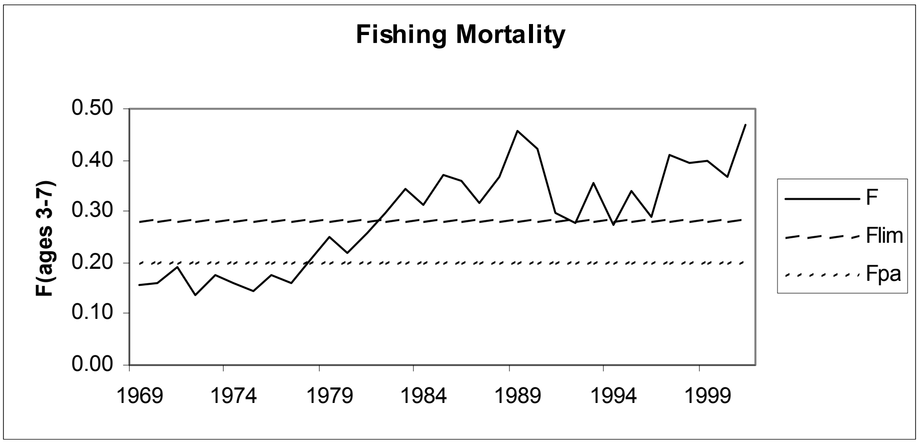
	Fish Mort Ages 3-7	Yield/R	SSB/R
Average Current	0.411	0.208	0.484
$\mathbf{F}_{max}$	0.379	0.208	0.523
$\mathbf{F}_{0.1}$	0.109	0.179	1.485
$\mathbf{F}_{med}$	0.246	0.205	0.782

Catch data (Tables 3.9.7.1-2):

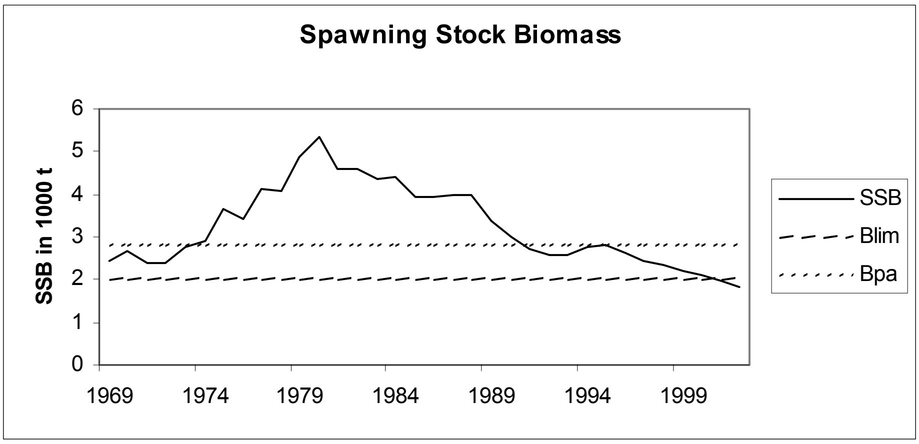
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	ACFM Landings (a)	ACFM Landings (b)
1987	No increase in F	1.15	1.15	1.11	1.16	1.28
1988	No decrease in SSB;	1.3	1.3	0.95	1.35	1.44
1989	No decrease in SSB;	1.0	1.0	0.8	1.16	1,39
1990	SSB = 3,000 t; TAC	0.9	0.9	0.75	1.08	1.31
1991	TAC	0.54	0.8	0.84	0.73	0.85
1992	70% of F(90)	0.77	0.8	0.77	0.77	0.89
1993	35% reduction in F	0.7	0.9	0.79	0.76	0.90
1994	No increase in F	1.0	1.0	0.84	0.68	0.80
1995	No increase in F	0.86	0.95	0.88	0.76	0.85
1996	$F_{96} < F_{94}$	0.68	0.70	0.74	0.65	0.83
1997	No increase in F	0.69	0.75	0.86	0.75	0.95
1998	No increase in F	0.67	0.67	0.77	0.65	0.88
1999	Reduce F below $\mathbf{F}_{pa}$	0.67	0.70	0.66	0.66	0.87
2000	Reduce F below $\mathbf{F}_{pa}$	< 0.64	0.64	0.65	0.65	0.82
2001	Reduce F below $\mathbf{F}_{pa}$	<0.58	0.60	0.62	0.64	0.96
2002	Reduce F below $\mathbf{F}_{pa}$	<0.45	0.53			
2003	Rebuilding plan or F=0	-				

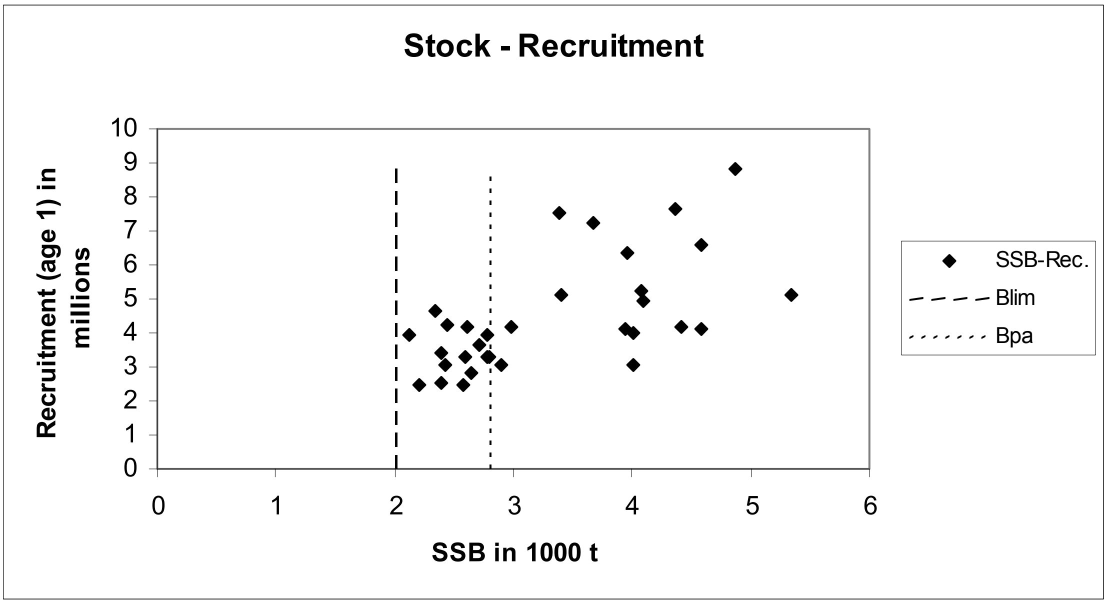
Weights in '000 t.
a) Original
b) Includes misallocated landings

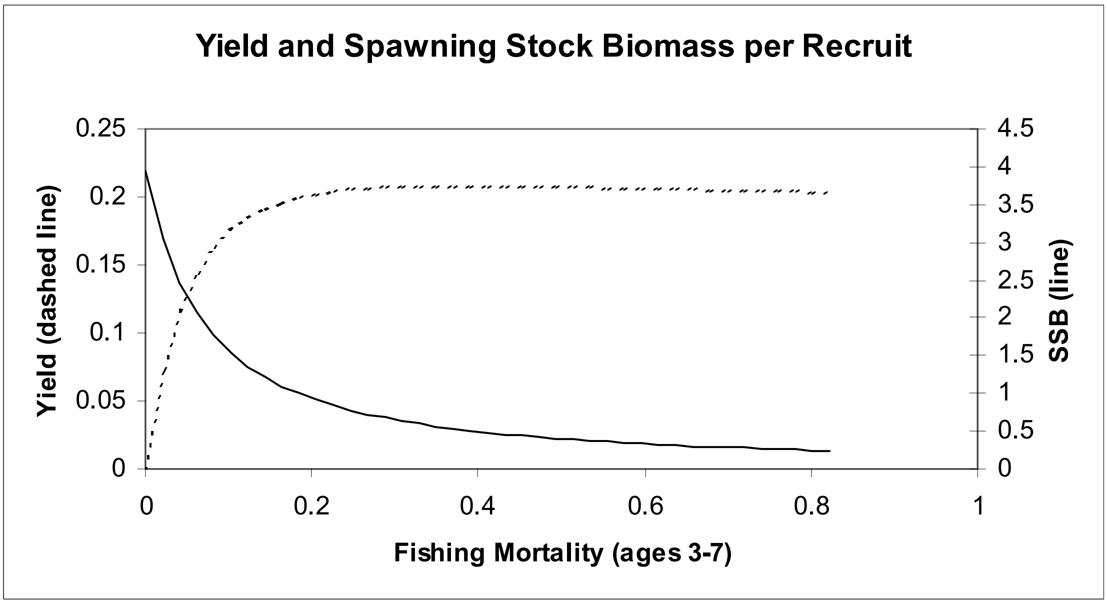

Landings
Landings in 1000 t
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1969
1974
1979
1984
1989
1994
1999


Fishing Mortality
F(ages 3-7)
0.50
0.40
0.30
0.20
0.10
0.00
1969
1974
1979
1984
1989
1994
1999
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
10
8
6
4
2
0
1969
1974
1979
1984
1989
1994
1999


Spawning Stock Biomass
SSB in 1000 t
6
5
4
3
2
1
0
1969
1974
1979
1984
1989
1994
1999
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
10
9
8
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.25
0.2
0.15
0.1
0.05
0
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SSB (line)
0
0.2
0.4
0.6
0.8
1
Fishing Mortality (ages 3-7)

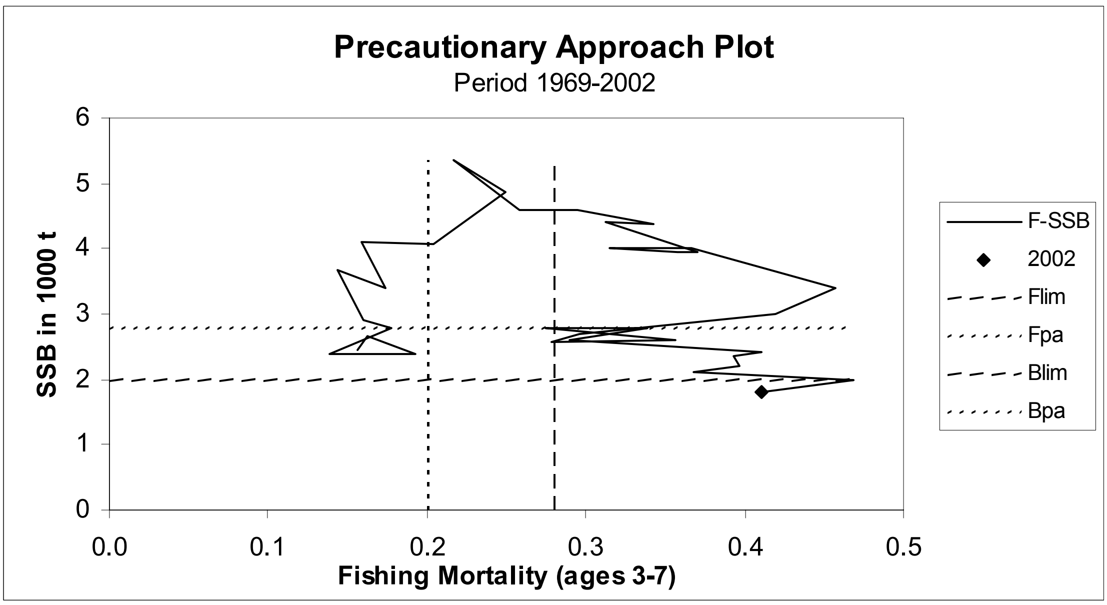

Precautionary Approach Plot
Period 1969-2002
SSB in 1000 t
6
5
4
3
2
1
0
0.0
0.1
0.2
0.3
0.4
0.5
Fishing Mortality (ages 3-7)
F-SSB
2002
Flim
Fpa
Blim
Bpa

Table 3.9.7.1 Division VIIe Sole. Nominal landings (t), 1972–2001 used by Working Group.

Year	Belgium	France	UK (Engl. & Wales)	Other	Total Reported	Unallocated [2]	Total*
1972	6	230[1]	201	-	437	-	437
1973	2	263[1]	194	-	459	-	459
1974	6	237	181	-	424	3	427
1975	3	271	217	-	491	-	491
1976	4	352	260-	-	616	-	616
1977	3	331	271	-	606	-	606
1978	4	384	453	20	861	-	861
1979	1	515	665	-	1,181	-	1,181
1980	45	447	764	13	1,269	-	1,269
1981	16	415	788	1	1,220	-5	1,215
1982	98	321	1,028	-	1,447	-1	1,446
1983	47	405	1,043	3	1,498	-	1,498
1984	48	421	901	-	1,370	-	1,370
1985	58	130	911	-	1,099	310	1,409
1986	62	467	840	127	1,496	-77	1,419
1987	48	432	632	-	1,112	168	1,280
1988	67	98	784	-	949	495	1,444
1989	69	112[3]	610	6	797	593	1,390
1990	41	81[3]	632	-	754	561	1,315
1991	35	325[3]	477	-	837	15	852
1992	41	267[3]	457	9	774	121	895
1993	59	236[3]	480	18	793	111	904
1994	33	257[3]	548	-	838	-38	800
1995	21	294	565	-	880	-24	856
1996	8	297	437	-	742	91	833
1997	13	348	496	1	858	91	949
1998	40	343[3]	389	-	772	108	880
1999	13	254[3]	396	-	663	205	868
2000	4	237[3]	413	-	654	170	824
2001[3]	19	218[3]	384[4]		621	344	965

[1]Estimated from Division VIId,e total by the Working Group.
[2]Estimated by the Working Group.
[3]Provisional.
[4]United Kingdom.
*Total revised to include additional unallocated landings from 1986 onwards.

Table 3.9.7.2 Sole in Division VIIe (Western Channel)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1969	1484	2438	353	0.156
1970	4233	2653	391	0.162
1971	2839	2390	432	0.193
1972	2503	2397	437	0.138
1973	3436	2780	459	0.177
1974	3284	2898	427	0.160
1975	3087	3673	491	0.143
1976	7240	3406	616	0.174
1977	5129	4102	606	0.159
1978	4929	4077	861	0.204
1979	5263	4869	1181	0.249
1980	8818	5348	1269	0.217
1981	5096	4586	1215	0.258
1982	4111	4588	1446	0.295
1983	6573	4370	1498	0.342
1984	7638	4410	1370	0.312
1985	4158	3956	1409	0.370
1986	6340	3938	1419	0.358
1987	4117	4003	1280	0.315
1988	4026	4007	1444	0.367
1989	3034	3386	1390	0.457
1990	7530	2988	1315	0.420
1991	4158	2706	852	0.296
1992	3658	2579	895	0.278
1993	2456	2601	904	0.357
1994	3272	2776	800	0.274
1995	3963	2801	856	0.339
1996	3282	2607	833	0.290
1997	4148	2432	949	0.411
1998	3080	2351	880	0.393
1999	4659	2203	868	0.397
2000	2449	2127	824	0.368
2001	3933	1977	965	0.468
2002	4137	1814		0.411
Average	4355	3242	937	0.291

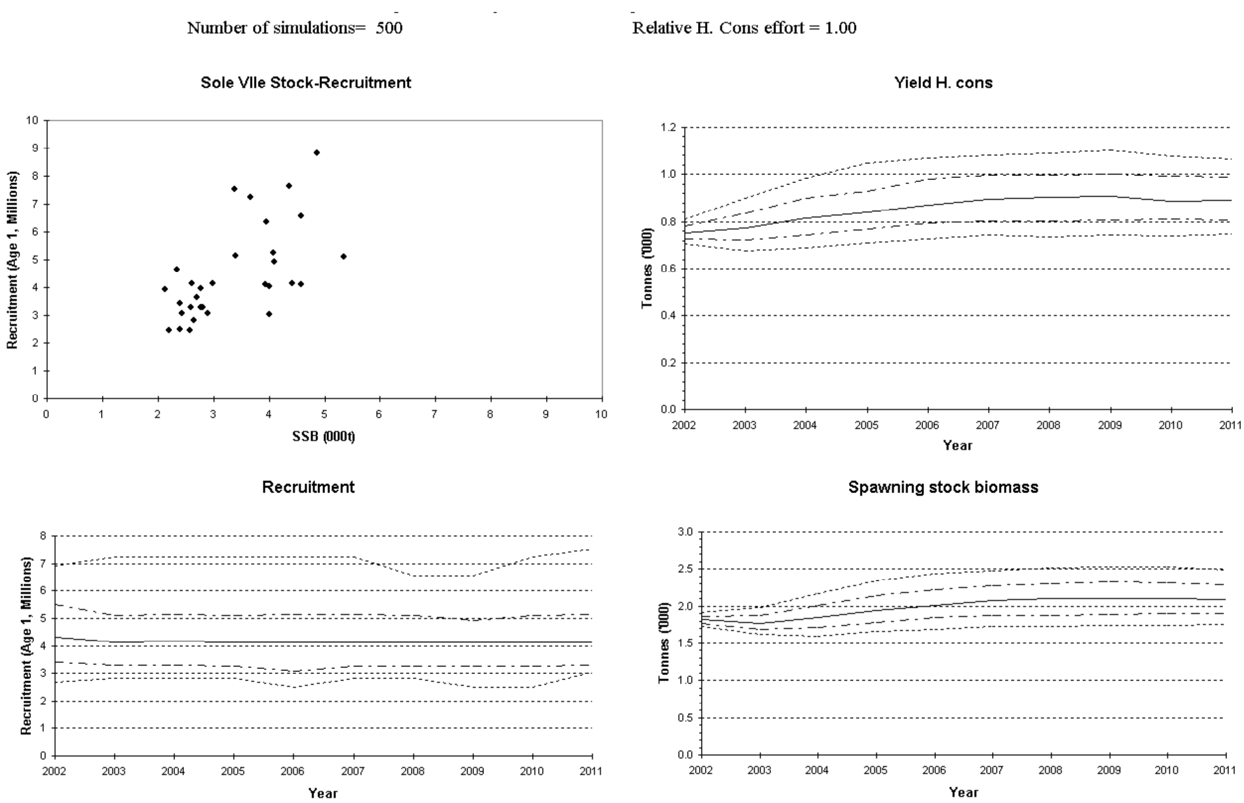


Figure 3.9.7.1 Sole in VIIe Western Channel. Medium term projections. Solid lines show 10, 25, 50, 75 and 90th percentiles. Stock recruitment relationship estimated by random bootstrap.

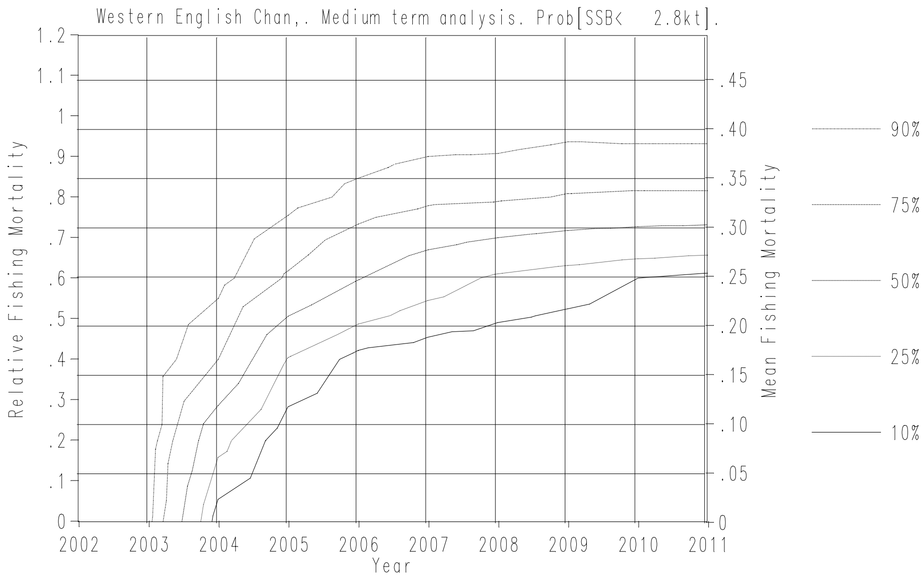
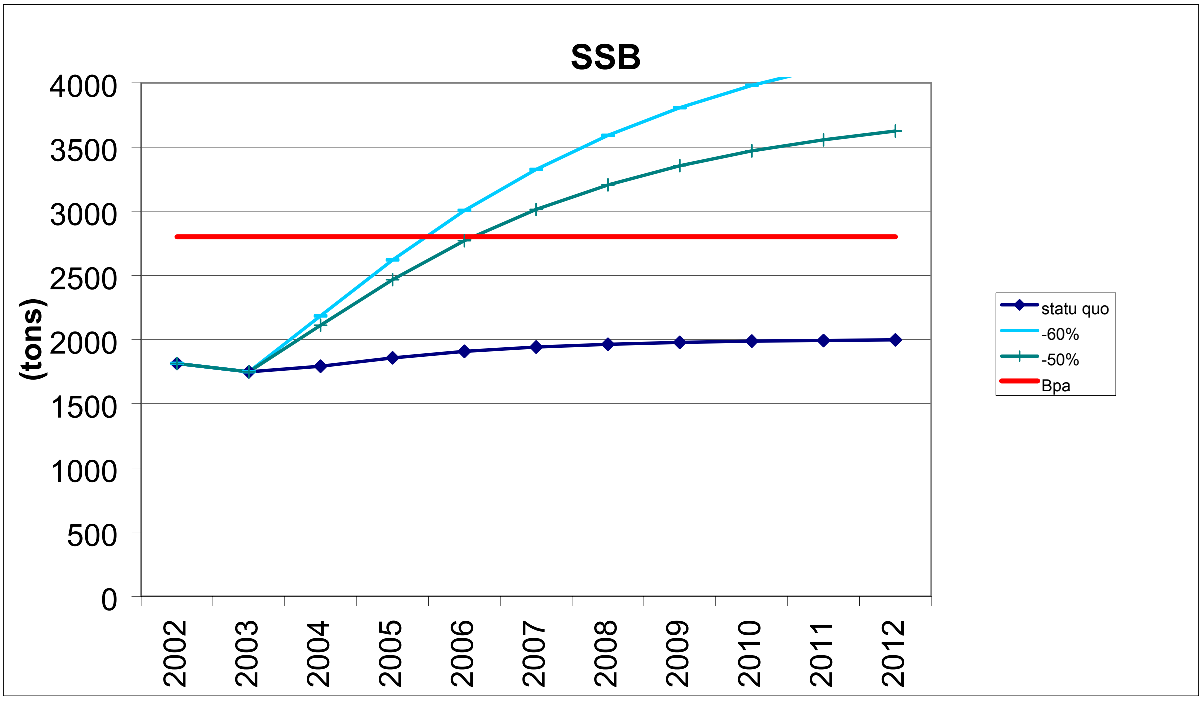


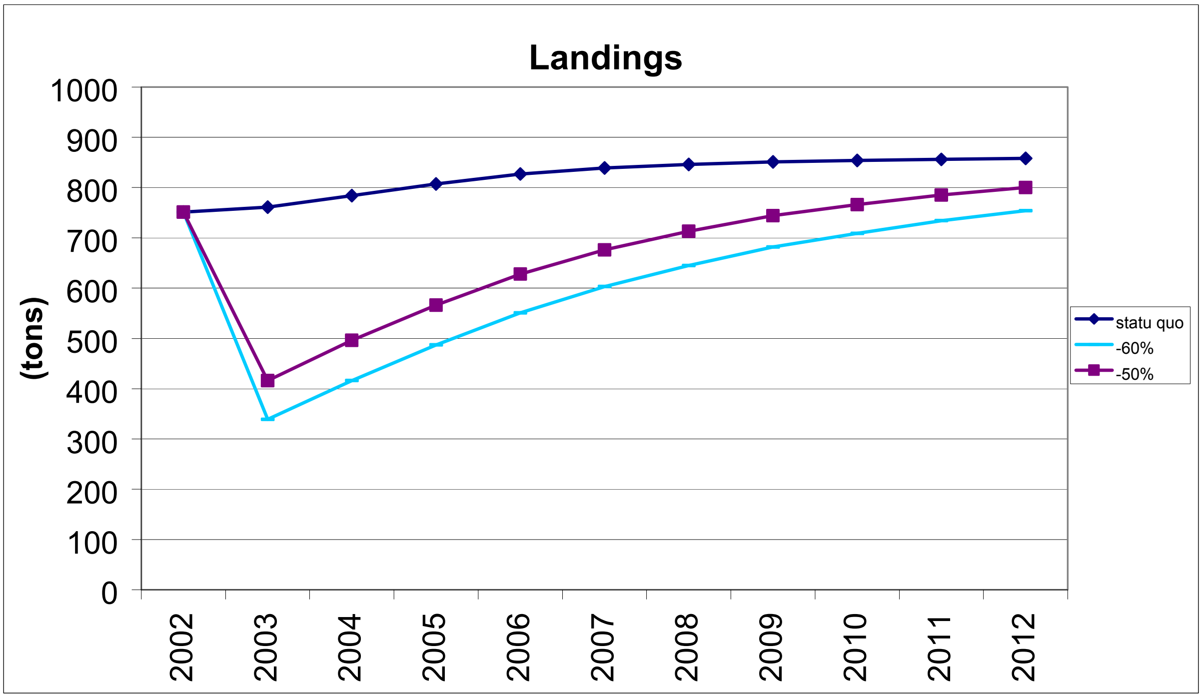
Figure 3.9.7.2 Medium-term projections contour plot (bootstrapped recruitment). Medium-term projection starting in 2002 based on constant fishing mortality from 2002 and onwards; Fishing mortality is expressed as the fishing mortality relative to F_{sq}.

Sole in Division VIIe

Constant F multipliers in 2003 and onwards

Deterministic projection using a constant R = 4.137 millions over the simulated period





3.9.8 Sole in Divisions VIIIa,b (Bay of Biscay)

State of stock/exploitation: The stock is outside safe biological limits. Fishing mortality has generally increased since 1984 and has been above $\mathbf{F}_{lim}$ since 1997. SSB has remained relatively stable up to 1995, but has decreased sharply since then, and has been below $\mathbf{B}_{pa}$ since 1997. Since 1992 recruitment has been at a lower level.

Management objectives: There is no explicit management objective for this stock.

Precautionary Approach reference points (changed in 2001):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ not defined.	$\mathbf{B}_{pa}$ be set at 13 000 t. The probability of reduced recruitment increases when SSB is below 13 000 t.
$\mathbf{F}_{lim}$ = 0.5, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ = 0.36

Technical basis:

$\mathbf{B}_{lim}$: Not defined.	$\mathbf{B}_{pa}$ ~ historical development of the stock [lowest observed for the converged part of the VPA, i.e. the most recent years are not included]
$\mathbf{F}_{lim}$: based on historical response of the stock	$\mathbf{F}_{pa}$ = $\mathbf{F}_{lim}$ * 0.72

Advice on management: In the light of the sharp decrease in SSB, ICES recommends a recovery plan that will ensure a safe and rapid recovery of SSB to a level in excess of $\mathbf{B}_{pa}$. If a recovery plan is not implemented, ICES recommends that the fishing mortality should be reduced to the lowest possible level in 2003.

Rebuilding plan: Rebuilding of the sole stock can be obtained by reducing the fishing mortality, by improving the exploitation pattern, or by a combination of the two.

Even a fishing mortality of zero in 2003 would not allow SSB to reach $\mathbf{B}_{pa}$ by 2004. However, a rebuilding plan could achieve this goal in 3 years. Fishing mortality of around 0.3 ($\mathbf{F}_{sq}$ reduced by 60%) in 2003, 2004, and 2005 is expected to rebuild it by 2006 with close to 50% probability (see Table 3.8.9.3).

An immediate reduction in F of 50% would require one year more to rebuild SSB above $\mathbf{B}_{pa}$. Given the state of the stock, and the risk of impaired recruitment, this is not in accordance with the precautionary approach.

Setting the TAC at a low level may reduce fishing mortality, but past experience has shown that it is very difficult to control fishing mortality by TACs alone. ICES, therefore, recommends that in addition to a TAC, restrictions in effort of fleets exploiting sole should be implemented. Large closed areas and seasons may contribute to stock recovery, but only if accompanied by major reductions in effort.

The selection pattern improved in the late 1980s when the gillnet fishery expanded. More than two thirds of the sole is caught by gillnet, and strong regulation of this fishery (limitation of number and length of nets) should be implemented, since no or small further improvement of selectivity of these nets is expected. However, improvement of selection pattern for the trawl fishery would contribute to stock recovery in the medium term. It has to be noted that the stock of sole may benefit from the effort measures taken for the rebuilding of the hake stock.

Relevant factors to be considered in management: Even though the selection pattern of this stock has improved in the past due to the development of the gillnet fishery (in the mid-1980s), fishing mortality is too high to allow a sustainable exploitation of this stock.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$ = F(99–01, scaled) = 0.74 ; Landings(2002) = 4.0; SSB(2003) = 6.7.

F(2003)	Basis	Landings (2003)	SSB (2004)
0	0	0	11.5
0.30	0.4 F_{sq}	1.9	9.3
0.36	$\mathbf{F}_{pa}$ = 0.5 F_{sq}	2.3	8.9
0.42	F= 0.57 F_{sq} (+ 30% SSB)	2.6	8.6
0.52	0.7 F_{sq}	3.0	8.0
0.59	0.8 F_{sq}	3.4	7.7
0.74	1.0 F_{sq}	4.0	7.0

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

About 80% of the projected SSB in 2004 is based on recruitment of yearclasses for which the strength has not been verified, neither by commercial fisheries nor by abundance surveys. The calculations are done assuming that these yearclasses have a strength equal to the geometric mean (1992-2000) of past recruitment, which may still be optimistic.

Medium-term projections: There is a low probability of SSB >$\mathbf{B}_{pa}$ in the medium term.

Comparison with previous assessment and advice: The present assessment is in line with last year's. It confirms the decline of the stock in recent years.

Elaboration and special comment: Catches have increased continuously until a maximum was reached in 1994 (7 400 t). They have decreased afterwards to stay between 5400 t and 6400 t until 2000, but fell to 4800 t in 2001. Since 1984, catches of sole by French small-mesh shrimp trawlers decreased markedly. The gill-net and trammel-net fisheries have expanded and account for three quarters of the French landings in 2001.

Landings by Belgium beam trawlers increased rapidly in the late 1980s and have, since 1991, contributed from 6 to 13% to the total landings. Since 1996, an increase in effort of this fleet is associated with a decrease of its CPUE.

The assessment is analytical and based on landings, available discards information, and CPUE data series from 1984 to 2000. No recruitment indices are available for this stock. Data prior to 1984 are not considered reliable. An observed maturity ogive based on females has been used since 2001.

Unallocated landings may account for more than 25% of estimated landings.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

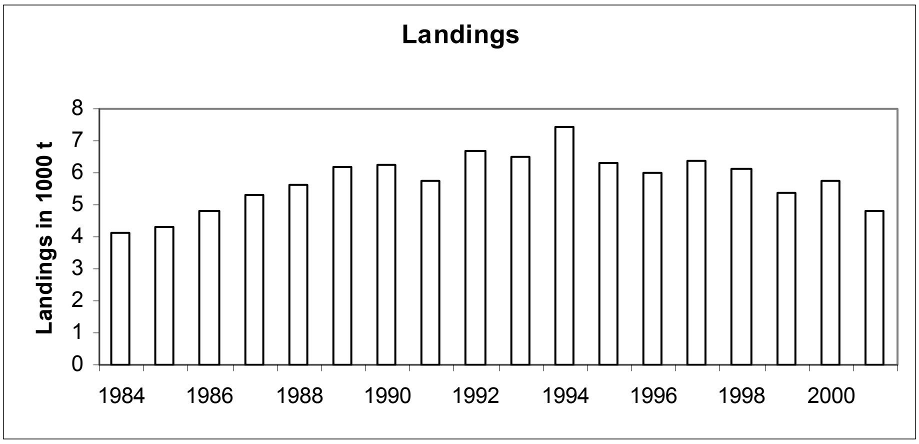
Yield and spawning biomass per Recruit
F-reference points:

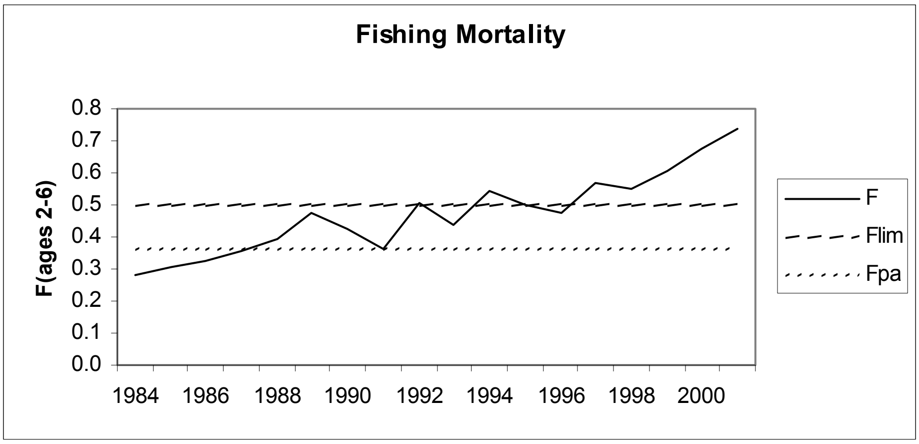
	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.673	0.176	0.310
$\mathbf{F}_{max}$	0.190	0.209	1.021
$\mathbf{F}_{0.1}$	0.092	0.190	1.781
$\mathbf{F}_{med}$	0.405	0.193	0.503

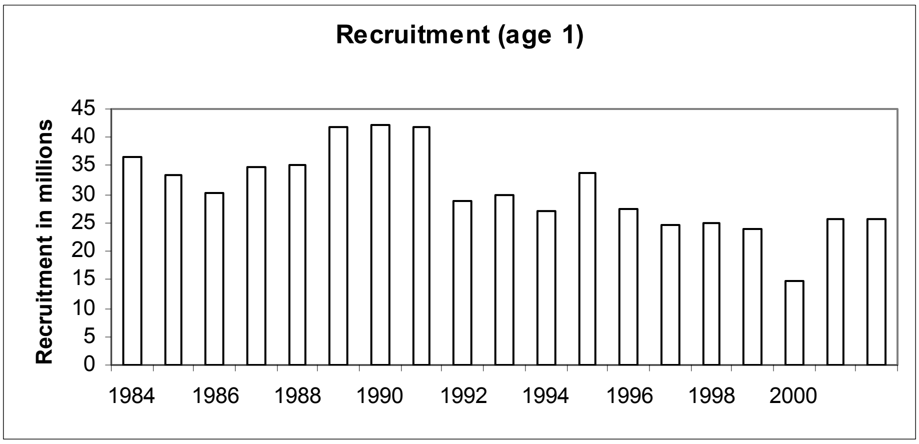
Catch data (Tables 3.9.8.1-2):

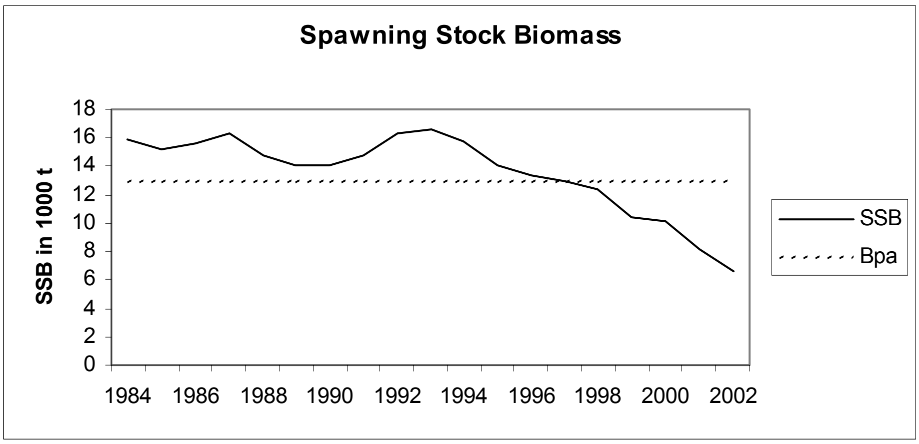
Year	ICES Advice	Catch corresp. to advice	Agreed TAC	Official Landings	ACFM Landings	Disc. slip.	ACFM Catch
1987	Not assessed	-	4.4	4.4	5.1	0.2[3]	5.3
1988	Precautionary TAC	3.7	4.0	4.4	5.4	0.3[3]	5.6
1989	No increase in effort; TAC	4.5	4.8	5.8[1]	5.8	0.4[3]	6.2
1990	No increase in F; TAC	5.1	5.2	5.5[1]	5.9	0.3[3]	6.2
1991	Precautionary TAC	4.7	5.3	4.7[1]	5.6	0.2[3]	5.8
1992	F = F(90)	5.0	5.3	6.4[1]	6.6	0.1[3]	6.7
1993	No long-term gain in increasing F	-	5.7	6.5	6.4	0.1[3]	6.5
1994	No long-term gain in increasing F	-	6.6	7.1	7.2	0.2[3]	7.4
1995	No long-term gain in increasing F	5.4[2]	6.6	5.9	6.2	0.1[3]	6.3
1996	No increase in F	5.0	6.6	4.3	5.9	0.1[3]	6.0
1997	40% reduction in F	3.1	5.4	5.0	6.3	0.1	6.4
1998	No increase in F	7.6	6.0	4.4[4]	6.0	0.1	6.1
1999	Reduce F below $\mathbf{F}_{pa}$	< 5.0	5.4	3.8[4]	5.2	0.2	5.4
2000	F at $\mathbf{F}_{pa}$	< 5.8	5.8	5.9[4]	5.7	0.1	5.8
2001	TAC 2001 at most TAC 2000	< 5.8	6.3	5.2[4]	4.8	0.0	4.8
2002	Establish rebuilding plan or no fishing	-	4.0				
2003	Establish rebuilding plan or no fishing	-					

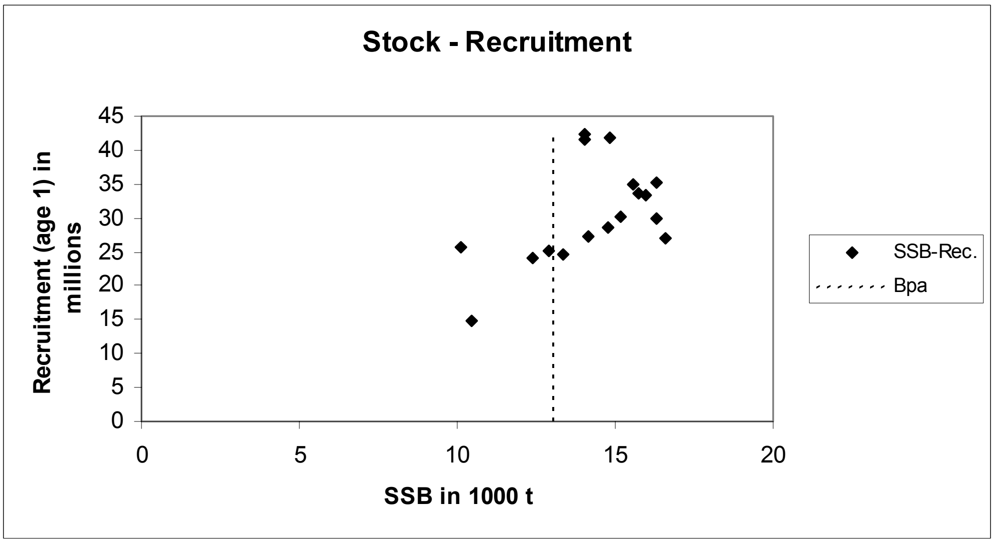
[1]Not reported for all countries. [2]Landings assuming current discarding practise. [3] Discards revised in 1998. [4] Preliminary. TAC in 2001 increased from 5.8 to 6.3 in Nov. Weights in ‘000 t.

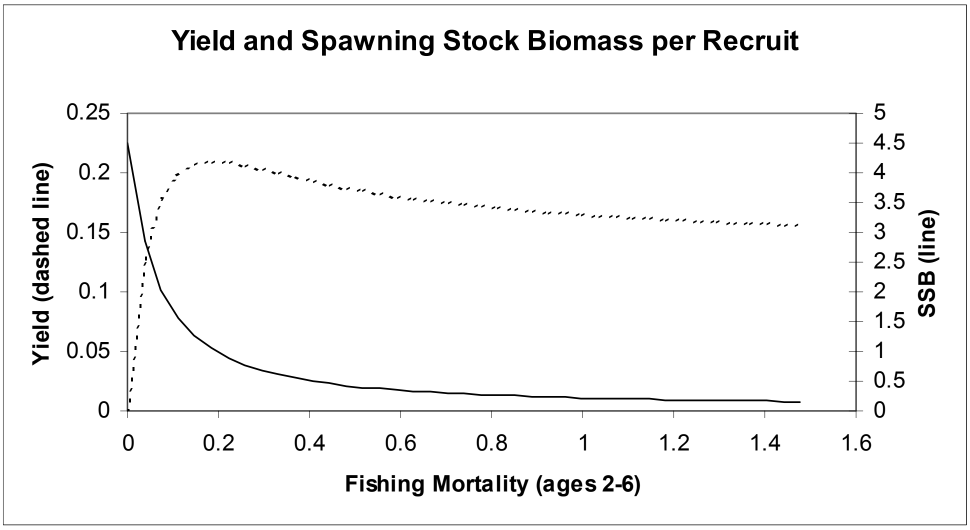

Landings
Landings in 1000 t
0
1
2
3
4
5
6
7
8
1984
1986
1988
1990
1992
1994
1996
1998
2000


Fishing Mortality
F(ages 2-6)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1984
1986
1988
1990
1992
1994
1996
1998
2000
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
0
5
10
15
20
25
30
35
40
45
1984
1986
1988
1990
1992
1994
1996
1998
2000


Spawning Stock Biomass
SSB in 1000 t
0
2
4
6
8
10
12
14
16
18
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
SSB
Bpa


Stock - Recruitment
Recruitment (age 1) in millions
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
SSB in 1000 t
SSB-Rec.
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.25
0.2
0.15
0.1
0.05
0
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SSB (line)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Fishing Mortality (ages 2-6)

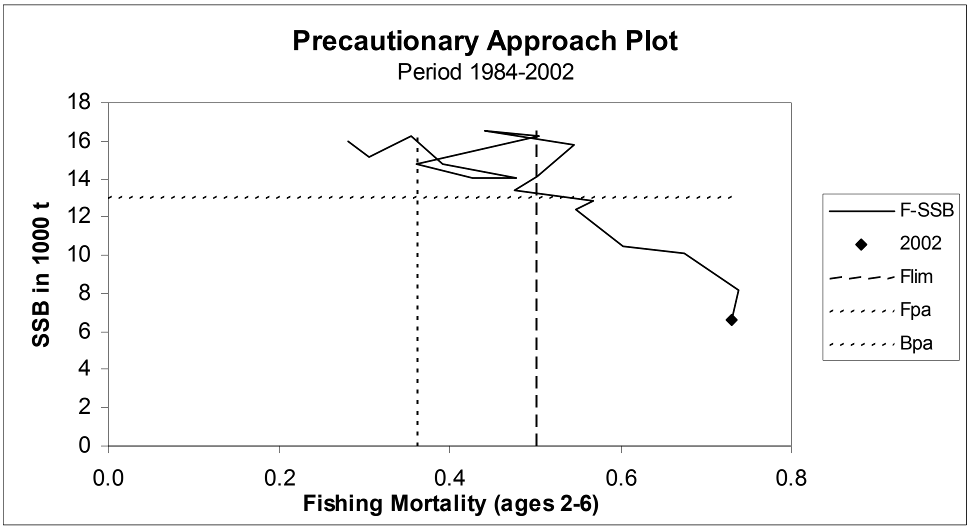

Precautionary Approach Plot
Period 1984-2002
SSB in 1000 t
18
16
14
12
10
8
6
4
2
0
0.0
0.2
0.4
0.6
0.8
Fishing Mortality (ages 2-6)
F-SSB
2002
Flim
Fpa
Bpa

Table 3.9.8.1 Sole in Divisions VIIIa,b (Bay of Biscay). International landings and catches used by Working Group (in tonnes).

Year	Official Landings					Unallocated Landings	WG Landings	Discards[1]	WG Catches
	Belgium	France	Nether.	Spain	Total				
1979	5*	2376		62*	2443	176	2619	-	-
1980	33*	2549		107*	2689	297	2986	-	-
1981	4*	2581*	13*	96*	2694	242	2936	-	-
1982	19*	1618*	52*	57*	1746	2067	3813	-	-
1983	9*	2590	32*	38*	2669	959	3628	-	-
1984		2968	175*	40*	3183	855	4038	99	4137
1985	25*	3423	169*	308*	3925	326	4251	64	4315
1986	52*	4227	213*	75*	4567	238	4805	27	4832
1987	124*	4009	145*	101*	4379	707	5086	198	5284
1988	135*	4308			4443	939	5382	254	5636
1989	311*	5471*			5782	63	5845	356	6201
1990	301*	5231			5532	384	5916	303	6219
1991	389*	4315		3	4707	862	5569	198	5767
1992	440*	5919			6359	191	6550	123	6673
1993	400*	6083		13	6496	-76	6420	104	6524
1994	466*	6620		17***	7103	123	7226	184	7410
1995	546*	5325		6***	5877	328	6205	130	6335
1996	460*	3843		13***	4316	1537	5853	142	5995
1997	435*	4526		23***	4984	1275	6259	118	6377
1998	469*	3821**	44	40***	4374	1608	5982	127	6109
1999	504*	3280**		41***	3825	1424	5249	109	5358
2000	451*	5303**		148***	5902	-195	5707	58	5765
2001	361*	4588**	201		5150	-395	4755	28	4783
Mean					4485	606	5090	146	5762

*Reported in VIII.
**Preliminary.
*** Reported as *Solea* spp (*Solea lascaris* and *Solea solea*) in VIII.
[1]Discards = Partial estimates for the French offshore trawlers fleet

Table 3.9.8.2 Sole in Divisions VIIIa,b (Bay of Biscay)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-6
1984	36461	15938	4137	0.280
1985	33281	15191	4315	0.305
1986	30225	15589	4832	0.327
1987	34846	16284	5284	0.354
1988	35148	14806	5636	0.391
1989	41857	14046	6201	0.478
1990	42325	14038	6219	0.427
1991	41685	14753	5767	0.361
1992	28671	16299	6673	0.504
1993	29940	16564	6524	0.440
1994	27046	15764	7410	0.546
1995	33732	14130	6335	0.503
1996	27342	13378	5995	0.476
1997	24656	12873	6377	0.569
1998	25072	12409	6109	0.548
1999	24053	10463	5358	0.604
2000	14841	10110	5765	0.675
2001	25602*	8136	4783	0.739
2002	25602*	6594		0.731
Average	30652	13546	5762	0.487

*GM(1992-2000)

Table 3.8.9.3 Medium-term projections for 2003 onwards for a range of F reductions are presented below. The simulations are based on bootstrapped random recruitment and on F(2002) = $\mathbf{F}_{sq}$ = 0.74.

F(2003) onwards = 1.0 * $\mathbf{F}_{sq}$: Catches 2003 = 4.1

		SSB	
	25%	Median	75%
2003	6.3	6.7	7.1
2004	6.6	7.1	7.5
2005	6.8	7.2	7.7
2006	6.9	7.3	7.7
2007	6.9	7.4	7.8

F(2003) onwards = 0.3 * $\mathbf{F}_{sq}$: Catches 2003 = 1.5

		SSB	
	25%	Median	75%
2003	6.3	6.7	7.1
2004	9.3	9.9	10.5
2005	12.1	**12.8**	**13.6**
2006	**14.6**	15.3	16.3
2007	16.6	17.5	18.3

F(2003) onwards = 0.4 * $\mathbf{F}_{sq}$: Catches 2003 = 2.0

		SSB	
	25%	Median	75%
2003	6.3	6.7	7.1
2004	8.8	9.4	10.0
2005	11.0	11.6	12.4
2006	**12.8**	**13.4**	**14.3**
2007	14.1	14.9	15.6

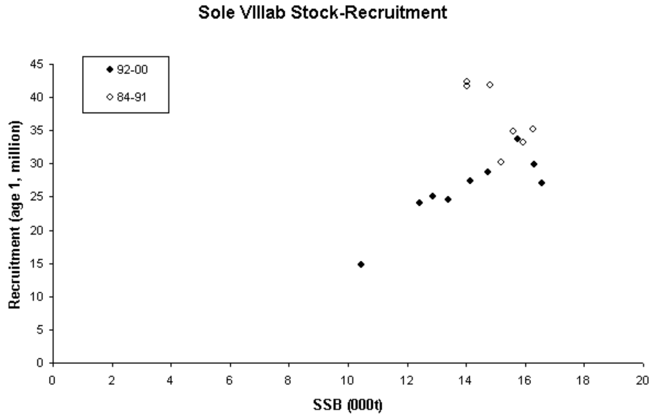
F(2003) onwards = 0.5 * $\mathbf{F}_{sq}$: Catches 2003 = 2.3

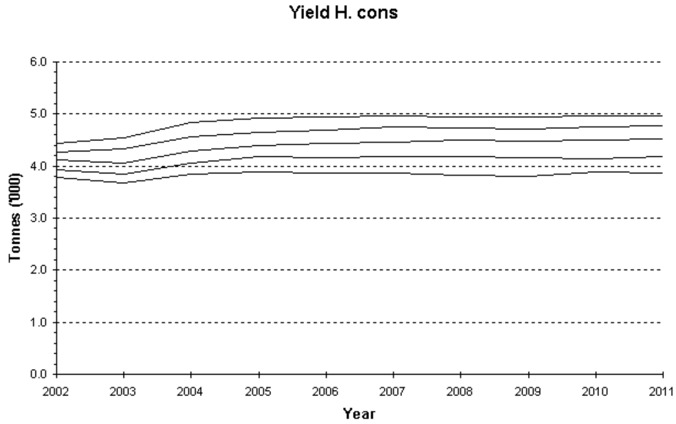
		SSB	
	25%	Median	75%
2003	6.3	6.7	7.1
2004	8.5	9.0	9.6
2005	10.2	10.8	11.5
2006	11.5	12.1	**12.8**
2007	12.4	**13.1**	13.9

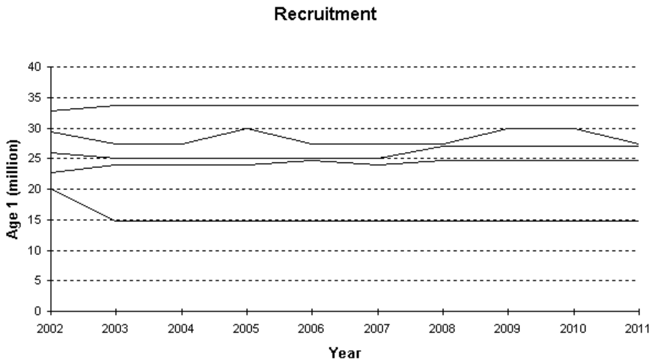
Sole in VIIab (Bay of Biscay). Medium term projections. Solid lines show 10, 25, 50, 75 and 90th percentiles. Stock-recruitment relationship estimated by random bootstrap (1992-2000 series).

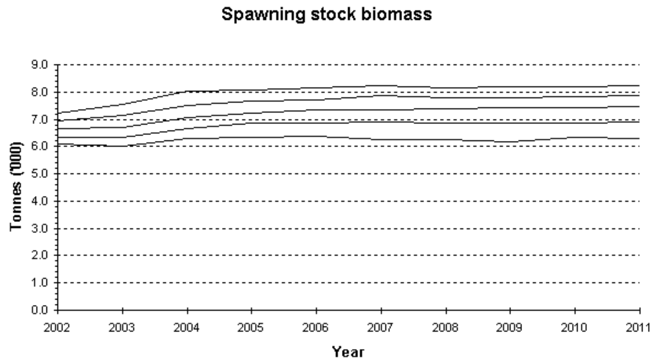
Number of simulations = 500

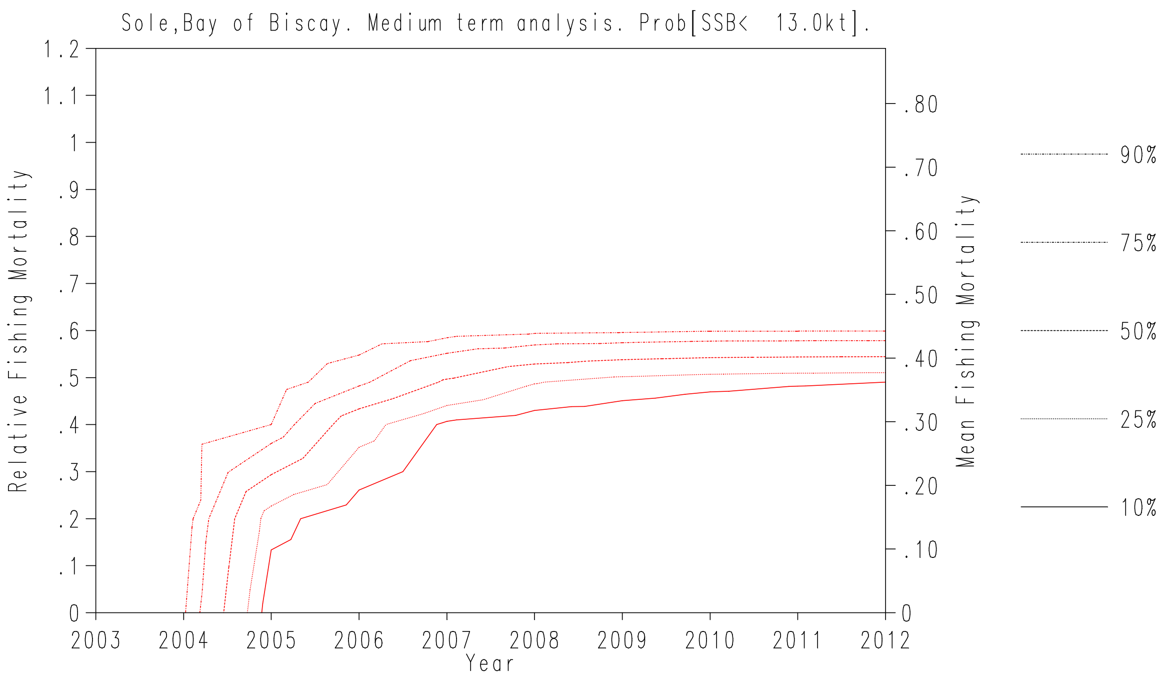
Relative H. Cons effort = 1.00









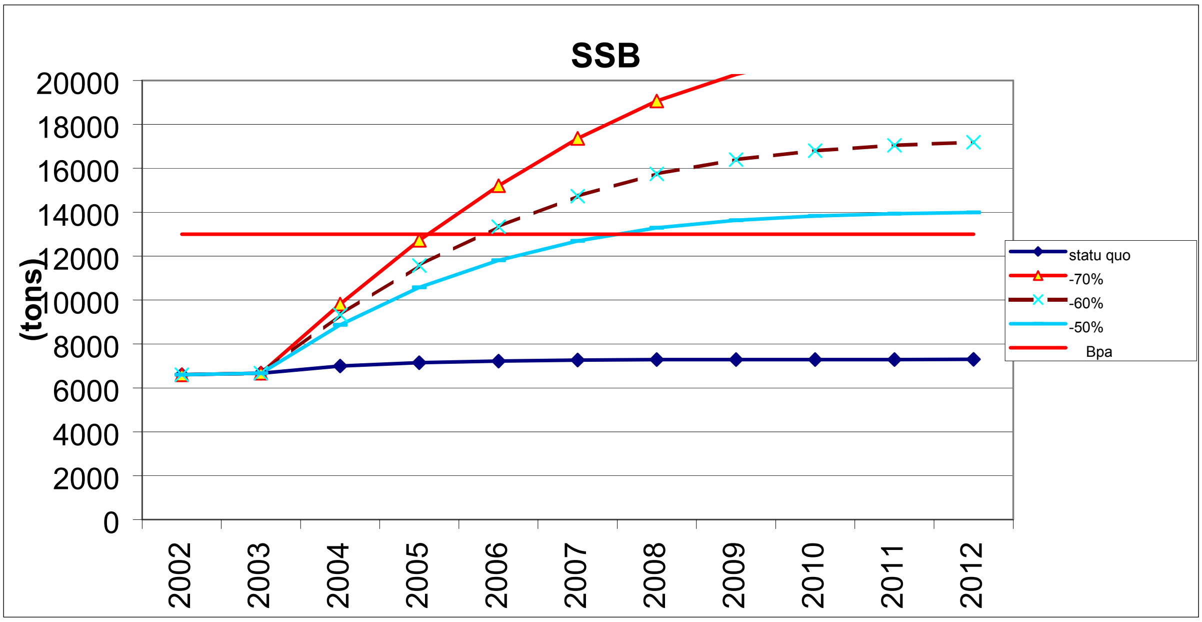


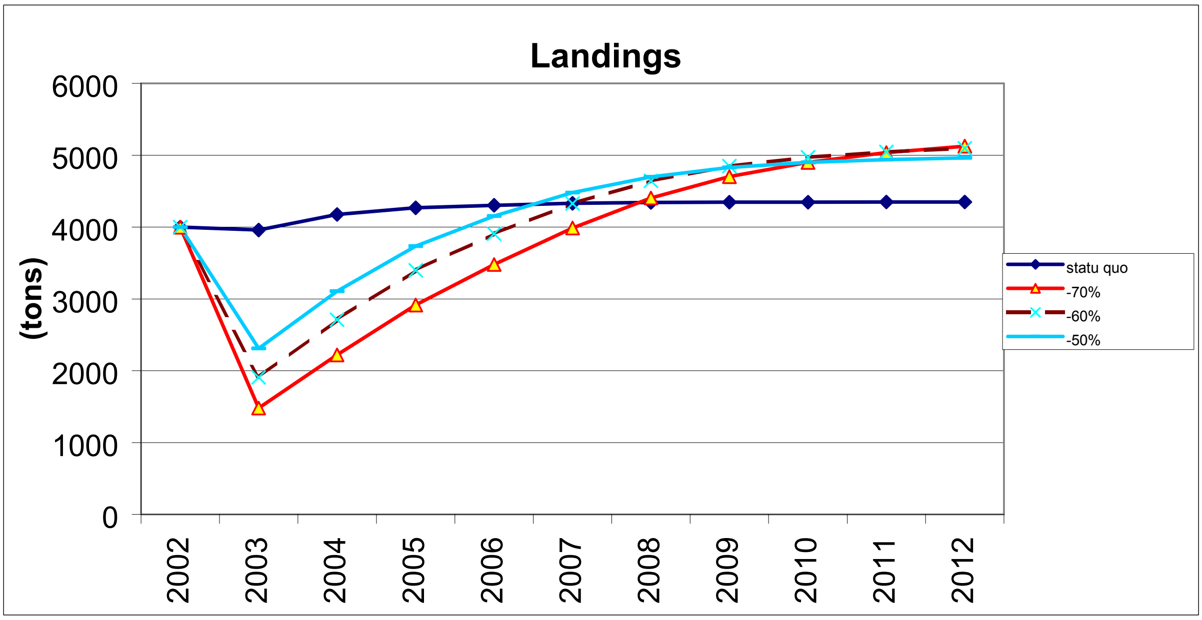
Medium-term projection starting in 2003 with population numbers from the status quo F catch forecast.

Bay of Biscay Sole

Constant F multipliers in 2003 and onwards

Deterministic projection using a constant R = 25.6 millions over the simulated period





3.9.9 Celtic Sea and Division VIIj herring

State of the stock/exploitation: The state of the stock is uncertain. Information from the catch and surveys suggests relatively low abundance of older herring for the past two years, and some years of poor recruitment in the mid- to late- 1990s.

Management objectives: A local Irish management committee has been established for this stock. One of its objectives is the protection of small fish, which is to be enforced by the closure (by Irish statute) of any area in the Celtic Sea and Division VIIj where the landings of herring from the Irish fleet contain more than 50% of individual fish below 23 cm. An Irish management plan is currently in place to protect small first-time spawning fish.

Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 26 000 t	$\mathbf{B}_{pa}$ be set at 44 000 t
$\mathbf{F}_{lim}$: not defined	$\mathbf{F}_{pa}$: not defined

Technical basis:

$\mathbf{B}_{lim}$: The lowest stock observed	$\mathbf{B}_{pa}$: Low probability of low recruitment
$\mathbf{F}_{lim}$: not defined	$\mathbf{F}_{pa}$: not defined

Advice on management: ICES recommends that catches in 2003 should be substantially less than recent catches. Catches in subsequent years should remain low until there is evidence of increased abundance of older fish in the population.

Relevant factors to be considered in management: The catches largely consist of incoming year classes about which little is know. Therefore, it is difficult to give appropriate management advice for 2002 because of the uncertainty about the current recruitment.

There was a general lack of older fish in the population, indicated by relatively low catches of adults in the fishery and the acoustic survey during 2000. In 2001, there were proportionally more 3+ ringers in the catch, but not nearly as many as observed prior to 1998. There were also proportionally more 3-5 ringers in the 2001 acoustic survey.

Comparison with previous assessment and advice: In 2000 the status of this stock was also considered to be unknown. Due to continued problems with the assessment, precise advice and catch options for 2003 are not possible. The interim advice on the 2002 catch from ICES in May 2002 was based on an assessment that was subsequently rejected by ACFM as a basis for advice for 2003. As stressed in the advice in 2001 and again in the interim advice for 2002, the assessment is highly uncertain, largely caused by the inability to precisely predict recruitment.

Elaboration and special comment: The point estimate of SSB from a provisional assessment is very imprecise and is greatly influenced by the number of recruits in 2001. The stock is so dependent on recruitment that ICES stresses the importance of obtaining and evaluating all recruitment information that is available from surveys in the area.

Due to the variability of the acoustic survey indices, any analytical assessment will likely result in stock size estimates that have low precision. Such estimates cannot be useful in the context of providing point estimates in short-term projections. However, such estimates, together with their uncertainties, can be used in the context of risk assessment if risk levels (e.g., of avoiding $\mathbf{B}_{pa}$ with a high probability) are pre-specified.

Following the 2000-2001 fishery it was decided by the Irish fishing industry (who account for the majority of the catches) to form a Pelagic Management Committee. This committee has stated the following management objective "*to maintain the stock at a level whereby it can sustain annual catches of around 20,000 t. In the event of the stock falling below the level at which these catches can be sustained the Committee will take appropriate rebuilding measures. The Committee will also introduce such measures as are necessary to prevent landings of small first time spawning herring including closed areas, and/or appropriate time closures*". It is also an objective of the Committee that all landings of herring from the fleet should contain at least 50% of individual fish above 23 cm. Spawning Box closures. Like the ones presently in operation should be retained and may, if necessary, be expanded both in time and area. This management measure was brought into effect by statute in the last season and resulted in an area closure, and the season was closed before the Irish quota was taken.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

Yield and spawning biomass per Recruit
F-reference points:

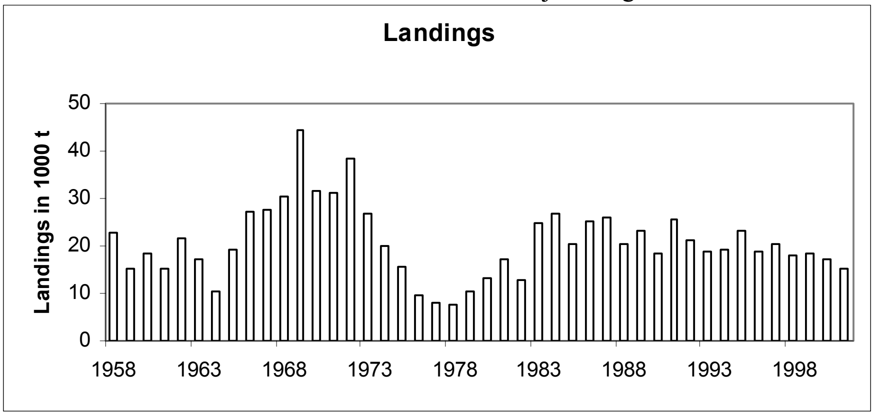
	Fish Mort Ages 2-7	Yield/R	SSB/R
Average Current	0.330	0.035	0.125
$\mathbf{F}_{max}$	N/A		
$\mathbf{F}_{0.1}$	0.128	0.030	0.218
$\mathbf{F}_{med}$	N/A		

Catch data (Tables 3.9.9.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Discards	ACFM Catch[1]
1987	Precautionary TAC	18	18	18	4.2	27.3
1988	TAC	13	18	17	2.4	19.2
1989	TAC	20	20	18	3.5	22.7
1990	TAC	15	17.5	17	2.5	20.2
1991	TAC (TAC excluding discards)	15 (12.5)	21	21	1.9	23.6
1992	TAC	27	21	19	2.1	23.0
1993	Precautionary TAC (including discards)	20–24	21	20	1.9	21.1
1994	Precautionary TAC (including discards)	20–24	21	19	1.7	19.1
1995	No specific advice	-	21	18	0.7	19.0
1996	TAC	9.8	16.5 – 21[2]	21	3.0	21.8
1997	If required, precautionary TAC	< 25	22	20.7	0.7	18.8
1998	Catches below 25	< 25	22	20.5	0.0	20.3
1999	F = 0.4	19	21	19.4	0.0	18.1
2000	F < 0.3	20	21	18.8	0.0	17.1
2001	F < 0.34	17.9	20	17.8	0.0	17.2
2002	Precautionary TAC for 1st half of 2002	6.0	8 for Jan.-			
2003	Substantially less than recent catches	-				

[1]By calendar year. [2]Revised during 1996 after ACFM May meeting. Weights in '000 t.

Celtic Sea and Division VIIj herring



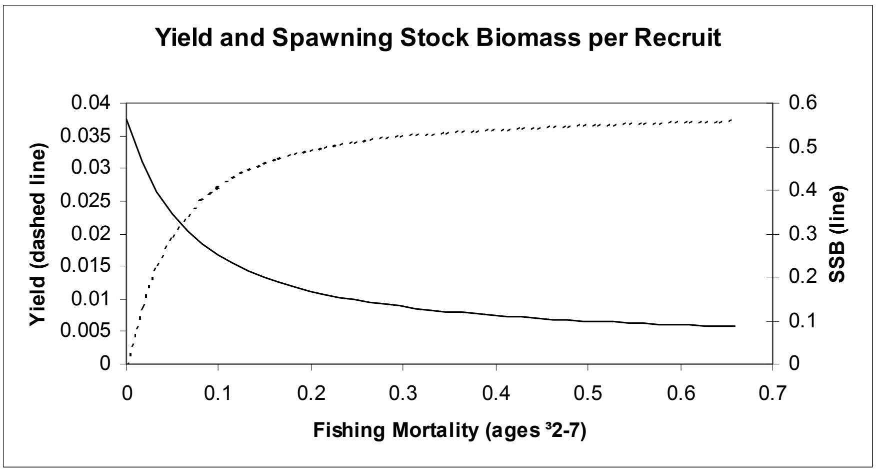


Table 3.9.9.1 Celtic Sea and Division VIIj Herring landings by calendar year (t), 1988-2001. (Data provided by Working Group members.)

These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988	-	-	16,800	-	-	-	2,400	19,200
1989	+	-	16,000	1,900	-	1,300	3,500	22,700
1990	+	-	15,800	1,000	200	700	2,500	20,200
1991	+	100	19,400	1,600	-	600	1,900	23,600
1992	500	-	18,000	100	+	2,300	2,100	23,000
1993	-	--	19,000	1,300	+	-1,100	1,900	21,100
1994	+	200	17,400	1,300	+	-1,500	1,700	19,100
1995	200	200	18,000	100	+	-200	700	19,000
1996	1,000	0	18,600	1,000	-	-1,800	3,000	21,800
1997	1,300	0	18,000	1,400	-	-2,600	700	18,800
1998	+	-	19,300	1,200	-	-200	0	20,300
1999	-	200	17,900	1,300	+	-1300	0	18,100
2000	573	228	18,038	44	1	-617	0	18,267
2001[1]	1,359	219	17,729	-	-	-1578	0	17,729

[1]Preliminary.

Table 3.9.9.2 Celtic Sea and Division VIIj Herring landings (t) by season (1 April-31 March) 1988/1989-2001/2002. (Data provided by Working Group members.)

These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988/1989	-	-	17,000	-	-	-	3,400	20,400
1989/1990	+	-	15,000	1,900	-	2,600	3,600	23,100
1990/1991	+	-	15,000	1,000	200	700	1,700	18,600
1991/1992	500	100	21,400	1,600	-	-100	2,100	25,600
1992/1993	-	-	18,000	1,300	-	-100	2,000	21,200
1993/1994	-	-	16,600	1,300	+	-1,100	1,800	18,600
1994/1995	+	200	17,400	1,300	+	-1,500	1,900	19,300
1995/1996	200	200	20,000	100	+	-200	3,000	23,300
1996/1997	1,000	-	17,900	1,000	-	-1,800	750	18,800
1997/1998	1,300	-	19,900	1,400	-	-2100	0	20,500
1998/1999	+	-	17,700	1,200	-	-700	0	18,200
1999/2000	-	200	18,300	1,300	+	-1300	0	18,500
2000/2001	573	228	16,962	44	1	-617	0	17,191
2001/2002[1]	-	-	15,236	-	-	-	0	15,236

[1] Preliminary.

3.9.9.a Response to the request from DG Fish concerning TACs for 2002 for Celtic Sea and Division VIIj herring

EC has requested ICES to reconsider its advice for **Celtic Sea and Division VIIj herring** for 2002 taking into account any additional data that may have become available since the assessment was done in 2001.

Based on its assessment in June 2001, ICES advised as follows:

Advice on management: ICES recommends that catches be restricted to 6 000 t for the first half of 2002, which is about 2/3 of current landings during the 1st half year. Advice for the second half of 2002 will be given in June 2002.

ICES Comments: The Celtic Sea and Division VIIj herring was assessed by the ICES Herring Assessment Working Group for the Area South of 62°N (HAWG), in March 2002. A complete 2001 dataset was available. The ICES Advisory Committee on Fishery Management (ACFM) will review the assessment made by HAWG in May 2002. ACFM will at that time formulate the ICES advice for 2003.

Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 26 000 t	$\mathbf{B}_{pa}$ be set at 44 000 t
$\mathbf{F}_{lim}$: not defined	$\mathbf{F}_{pa}$: not defined

Technical basis:

$\mathbf{B}_{lim}$: The lowest stock observed	$\mathbf{B}_{pa}$: Low probability of low recruitment

In 2001 the status of this stock was considered to be unknown. The current SSB estimate is still highly uncertain, but the SSB figures in the recent period are higher than those estimated last year.

The most recent assessment shows that fishing mortality has decreased significantly in the past year and that fishing mortality in 2000 was overestimated by last year's assessment. However, the point estimate of SSB in 2001 is very imprecise and is greatly influenced by the number of recruits in 2001. Projections based on this perception of the stock are naturally sensitive to recruitment. Recruitment in the most recent years appears to be above average (although these data points are relatively poorly estimated). Following the 2000-2001 fishery, it was decided by the Irish fishing industry (who account for the majority of the catches) to form a Pelagic Management Committee. This committee has stated the following management objective "*to maintain the stock at a level whereby it can sustain annual catches of around 20,000 t. In the event of the stock falling below the level at which these catches can be sustained the Committee will take appropriate rebuilding measures. The Committee will also introduce such measures as are necessary to prevent landings of small first time spawning herring including closed areas, and/or appropriate time closures*". It is also an objective of the Committee that all landings of herring from the fleet should contain at least 50% of individual fish above 23 cm. Spawning Box closures, as are at present in operation, should be retained and may, if necessary, be expanded both in time and area. This management measure was brought into effect by statute in the last season and resulted in an area closure, and the season was closed before the Irish quota was taken.

The catches largely consist of incoming year classes about which little is known. Therefore, it is difficult to give appropriate management advice for 2002. Nonetheless using a conservative estimate based on the geometric mean (1958-1999) would suggest that only catches in excess of 27,000t would reduce the SSB below $\mathbf{B}_{pa}$ in 2002. Fishing in 2002 at $\mathbf{F}_{sq} = 0.44$, which is fairly high for a herring stock, will maintain SSB above $\mathbf{B}_{pa}$. As stated in the ICES advice for 2001 F ~ 0.35 is close to likely candidate values for $\mathbf{F}_{pa}$, and this will keep the stock above $\mathbf{B}_{pa}$ with a high probability.

Catch options for 2002:

Basis	F(2002)	SSB(2002)	Landings (2002)	SSB(2003) with fishing at given level
F(2002)= 0.57*F_{2001}	0.25	50	8	60
F(2002)= 0.68*F_{2001}	0.30	50	9	56
F(2002)=likely candidate for $\mathbf{F}_{pa}$	0.35	49	11	53
F(2002)=$\mathbf{F}_{sq}$	0.44	49	13	50
F(2002)=1.43*F_{2001}	0.50	48	15	49
F(2002)=1.57*F_{2001}	0.55	48	16	48
F(2002)=1.71*F_{2001}	0.60	48	17	47

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Advice on management: ICES recommends that fishing mortality in 2002 should be at or below 0.35, corresponding to catches in 2002 of no more than 11 000 t.

3.9.10 Sprat in Divisions VIId,e

State of stock/exploitation: The state of the stock is not known.

Management objectives: There are no specific management objectives for this stock.

Elaboration and special comment: Insufficient data are available to carry out an assessment. Sprat catches are very low and are mainly taken in the second half of the year by the Lyme Bay sprat fishery. The 2001 catch has decreased to 1 349 t; the catch has thus been lower than average since 1984.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

Catch data (Tables 3.9.10.1-2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	No advice	-	5	2.7
1988	No advice	-	5	5.5
1989	No advice	-	12	3.4
1990	No advice	-	12	2.1
1991	No advice	-	12	2.6
1992	No advice	-	12	1.8
1993	No advice	-	12	1.8
1994	No advice	-	12	3.2
1995	No advice	-	12	1.5
1996	No advice	-	12	1.8
1997	No advice	-	12	1.6
1998	No advice	-	12	2.0
1999	No advice	-	6.3	3.6
2000	No advice	-	12	1.7
2001	No advice	-	12	1.3
2002	No advice	-	12	
2003	No advice	-		

[1]Weights in '000 t.

Sprat in Divisions VIId,e

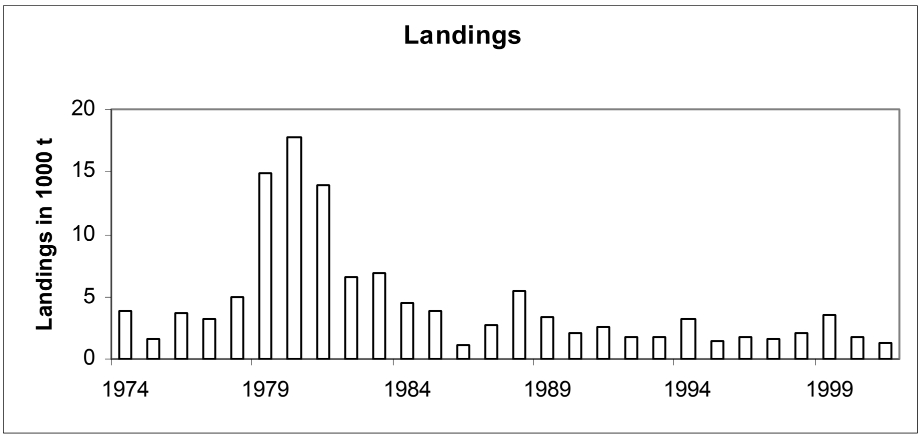


Table 3.9.10.1 Nominal catch of Sprat (t) in Divisions VIId,e 1985–2001.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993
Denmark	-	15	250	2,529	2,092	608	-	-	-
France	14	-	23	2	10	-	-	35	2
Netherlands	-	-	-	-	-	-	-	-	-
UK (Engl.&Wales)	3,771	1,163	2,441	2,944	1,319	1,508	2,567	1,790	1,798
Total	3,785	1,178	2,714	5,475	3,421	2,116	2,567	1,825	1,800

Country	1994	1995	1996	1997	1998*	1999*	2000*	2001*
Denmark	-	-	-	-	-	-	-	-
France	1	0	-	-	-	-	18	-
Netherlands	-	-	-	-	-	1	1	-
UK (Engl.&Wales)	3,177	1,515	1,789	1,621	2,024	3,559	1,692	1,349
Total	3,178	1,515	1,789	1,621	2,024	3,560	1,711	1,349

* Preliminary.

Table 3.9.10.2 Sprat in Divisions VIId,e

Year	Landings tonnes
1974	3793
1975	1571
1976	3724
1977	3237
1978	4999
1979	14833
1980	17732
1981	13890
1982	6612
1983	6911
1984	4455
1985	3785
1986	1178
1987	2714
1988	5475
1989	3421
1990	2116
1991	2567
1992	1825
1993	1800
1994	3178
1995	1515
1996	1789
1997	1621
1998	2024
1999	3560
2000	1711
2001	1349
Average	4407

3.9.11 Megrim in Divisions VIIb,c,e-k and VIIIa,b,d (*L. whiffiagonis and L. boscii*)

State of stock/exploitation: The stock of *Lepidorhombus whiffiagonis* is harvested outside safe biological limits. SSB was high from 1984 to 1988, then declined until 1990 but has remained above $\mathbf{B}_{pa}$. The fishing mortality has declined from the 1991 peak until 1997 and has increased since then to above $\mathbf{F}_{pa}$. Recruitment at age 1 has been relatively stable with peaks for the 1997 and the 1999 year classes.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is not defined	$\mathbf{B}_{pa}$ be set at 55 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ was therefore set equal to the lowest observed SSB.
$\mathbf{F}_{lim}$ is 0.44, the fishing mortality above which stock dynamics are unknown	$\mathbf{F}_{pa}$ be set at 0.30, the estimated $\mathbf{F}_{med}$. This F is consistent with the proposed $\mathbf{B}_{pa}$ and it approximates $\mathbf{F}_{MSY}$.

Technical basis:

$\mathbf{B}_{lim}$ = Not defined	$\mathbf{B}_{pa} = \mathbf{B}_{loss}$
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$	$\mathbf{F}_{pa} = \mathbf{F}_{med}$; implies a less than 5% probability that ($SSB_{MT} < \mathbf{B}_{pa}$)

Advice on management: ICES recommends that fishing mortality should be reduced to below $\mathbf{F}_{pa}$, corresponding to landings of less than 15 300 t in 2003. Including a 5% contribution of *L. boscii* in the landings, the equivalent TAC for the two species combined would be 16 100 t.

Relevant factors to be considered in management: For most fleets, megrim is taken in mixed fisheries for hake, anglerfish, *Nephrops*, cod, and whiting. The selection pattern is poor, i.e. that the fishery takes a disproportionate amount of small fish. Technical measures such as increases in mesh size to reduce the catches of small fish should be investigated for this stock.

Catch forecast for 2003:

Basis: F(2002) = F(99–01) = 0.35; Landings(2002) = 16.3 t ; Catch(2002) = 19.4 t; SSB(2003) = 70.6.

F(2003)	Basis	Catch(2003)	Landings (2003)	SSB(2004)
0.17	0.5 $\mathbf{F}_{sq}$	11.1	9.5	79.0
0.21	0.6 $\mathbf{F}_{sq}$	13.1	11.2	76.7
0.24	0.7 $\mathbf{F}_{sq}$	15.0	12.8	74.4
0.28	0.8 $\mathbf{F}_{sq}$	16.9	14.4	72.2
0.30	$\mathbf{F}_{pa}$	18.0	15.3	70.9
0.31	0.9 $\mathbf{F}_{sq}$	18.7	15.9	70.1
0.35	1 $\mathbf{F}_{sq}$	20.4	17.3	68.0
0.38	1.1 $\mathbf{F}_{sq}$	22.0	18.7	66.1
0.42	1.2 $\mathbf{F}_{sq}$	23.6	20.1	64.2

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: Medium-term projections suggest that fishing at status quo leads to a more than 95% probability of SSB exceeding $\mathbf{B}_{pa}$ in 2007, at $\mathbf{F}_{pa}$ there is a 5% probability of SSB falling below $\mathbf{B}_{pa}$ in 2009.

There would be no loss in the long term (yield-per-recruit) if the current fishing mortality rate was reduced to $\mathbf{F}_{max}$. Such a reduction in fishing mortality would increase the expected spawning stock biomass per recruit to the order of 50%.

Comparison with previous assessment and advice: The title for this assessment has been changed to better reflect the areas covered. However, the actual assessment area is unchanged compared to previous years. Historical trends in F and SSB are similar to those in the previous assessment, with a slight downward revision in F and upward revision in SSB in the very recent years (by less than 5% for SSB and less than 10% for F). The present advice is similar to last year's advice.

Elaboration and special comment: Megrim in the Celtic sea, west of Ireland and in the Bay of Biscay are caught predominantly by Spanish and French vessels, which together have reported more than 60% of the total landings, and by Irish and UK demersal trawlers. Most UK landings of megrim are made by beam trawlers fishing in Divisions VIIe,f,g,h. Otter trawlers account for the majority of Spanish landings from Subarea VII, prosecuting a mixed fishery for anglerfish, hake, and megrim on the shelf edge around the 200-m contour to the south and west of Ireland. Irish megrim landings are largely made by multi-purpose vessels fishing in Divisions VIIb,c,g for gadoids as well as plaice, sole, and anglerfish. Megrim landings have remained fairly stable over the period 1986–2001. Discards are estimated to be less than 10% by weight of the total catches in recent years and comprise fish over a large range of sizes.

Megrim are widely distributed over the whole of Subareas VII and VIII and are most abundant in the deeper waters of the continental shelf. Spawning takes place between January and April along the edge of the continental shelf to the southwest and west of the British Isles, and research vessel trawling surveys indicate that 0-group megrim do not move far from the spawning grounds on the shelf edge during their first year.

An age-based analytical assessment using catch-per-unit effort from three commercial fleets and three surveys was performed. Discard estimates were used but were considered incomplete as only Spain provided data. Estimates of recruitment are considered to be very dependent on discard information.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

Yield and spawning biomass per Recruit
F-reference points:

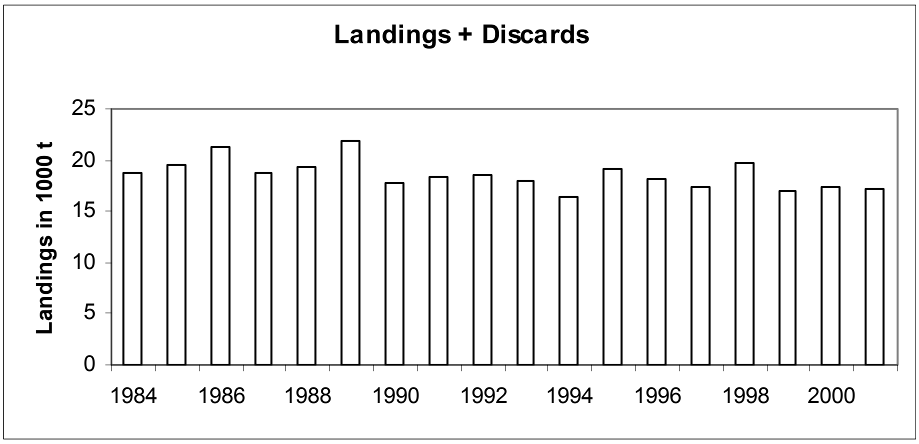
	Fish Mort Ages 3-6	Landings/R	SSB/R
Average Current	0.349	0.066	0.227
$\mathbf{F}_{max}$	0.229	0.068	0.337
$\mathbf{F}_{0.1}$	0.134	0.064	0.522
$\mathbf{F}_{med}$	0.290	0.067	0.271

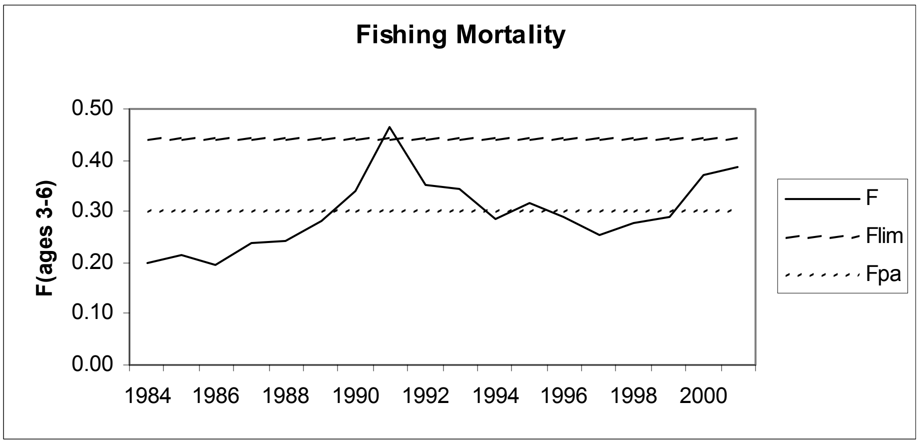
Catch data (Tables 3.9.11.1-2):

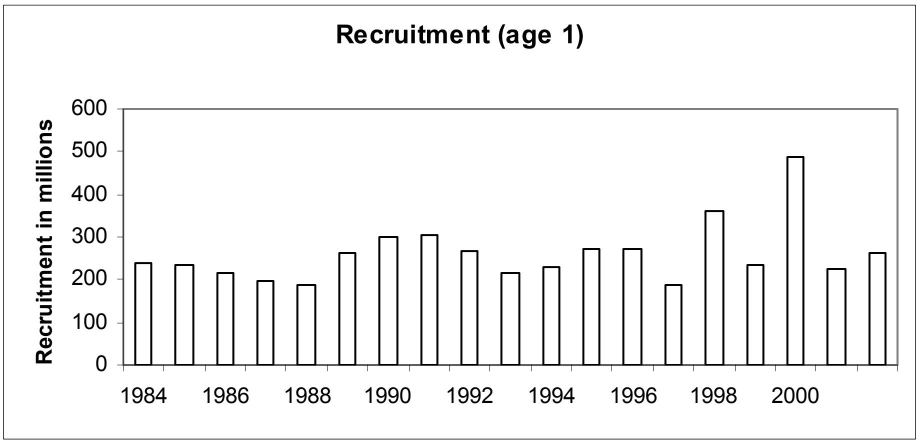
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Landings	Disc. slip.	ACFM catch
1987	Not assessed	-	16.46	17.1	1.7	18.8
1988	Not assessed	-	18.1	17.6	1.7	19.3
1989	Not assessed	-	18.1	19.2	2.6	21.8
1990	Not assessed	-	18.1	14.4	3.3	17.7
1991	No advice	-	18.1	15.1	3.3	18.4
1992	No advice	-	18.1	15.6	3.0	18.6
1993	Within safe biological limits	-	21.46	14.9	3.1	18.0
1994	Within safe biological limits	-	20.33	13.7	2.7	16.4
1995	No particular concern	-	22.59	15.9	3.2	19.1
1996	No long-term gain in increased F	16.6[2]	21.20	15.1	3.0	18.1
1997	No advice	14.3[2]	25.0	14.3	3.1	17.3
1998	No increase in F	15.2[2]	25.0	14.3	5.4	19.7
1999	Reduce F below $\mathbf{F}_{pa}$	14.6[2,1]	25.0	13.7	3.1	16.9
2000	Reduce F below $\mathbf{F}_{pa}$	<14.2[2,1]	20.0	15.0	2.3	17.3
2001	Reduce F below $\mathbf{F}_{pa}$	< 14.1[2,1]	16.8	15.8	1.3	17.1
2002	Reduce F below $\mathbf{F}_{pa}$	< 13.0[2,1]	14.9			
2003	Reduce F below $\mathbf{F}_{pa}$	< 16.1[2,1]				

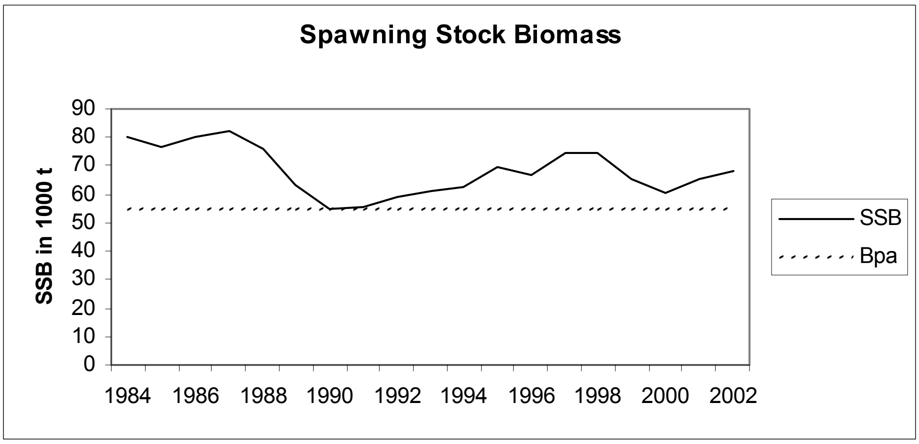
[1]Includes *L. boscii*. [2] Landings assuming current discarding practise. Weights in '000 t.

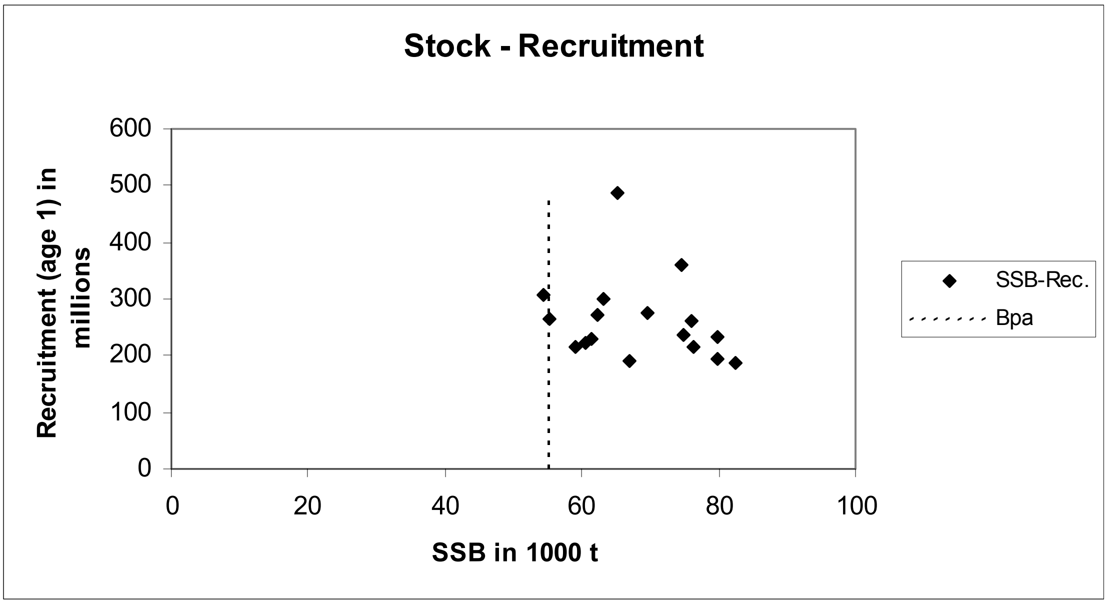
Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k & VIIIa,b,d

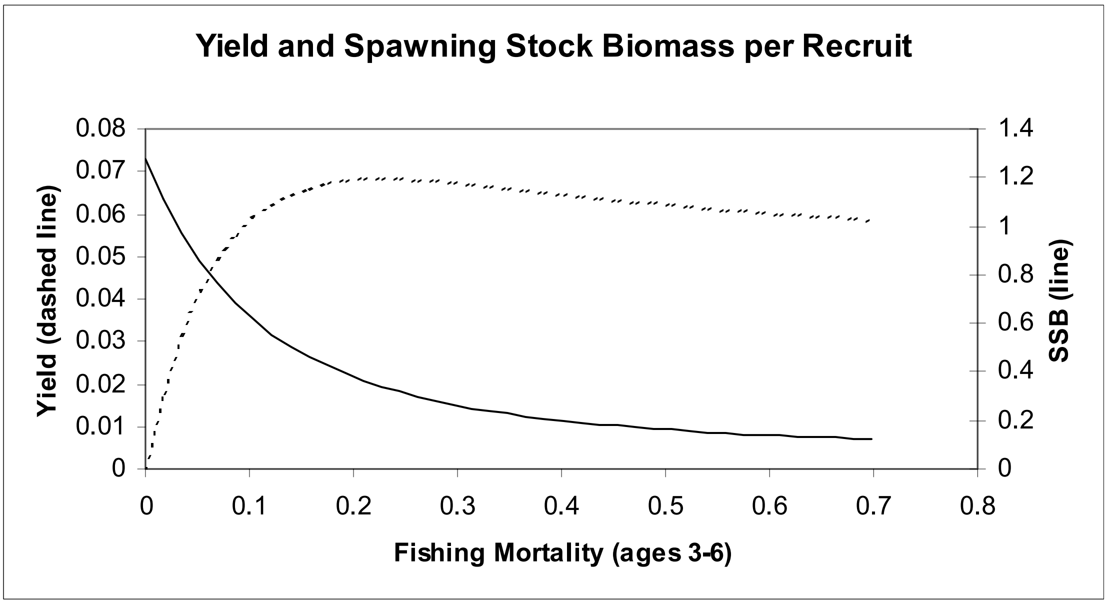









Stock - Recruitment
Recruitment (age 1) in millions
600
500
400
300
200
100
0
0
20
40
60
80
100
SSB in 1000 t
SSB-Rec.
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1.4
1.2
1
0.8
0.6
0.4
0.2
0
SSB (line)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Fishing Mortality (ages 3-6)

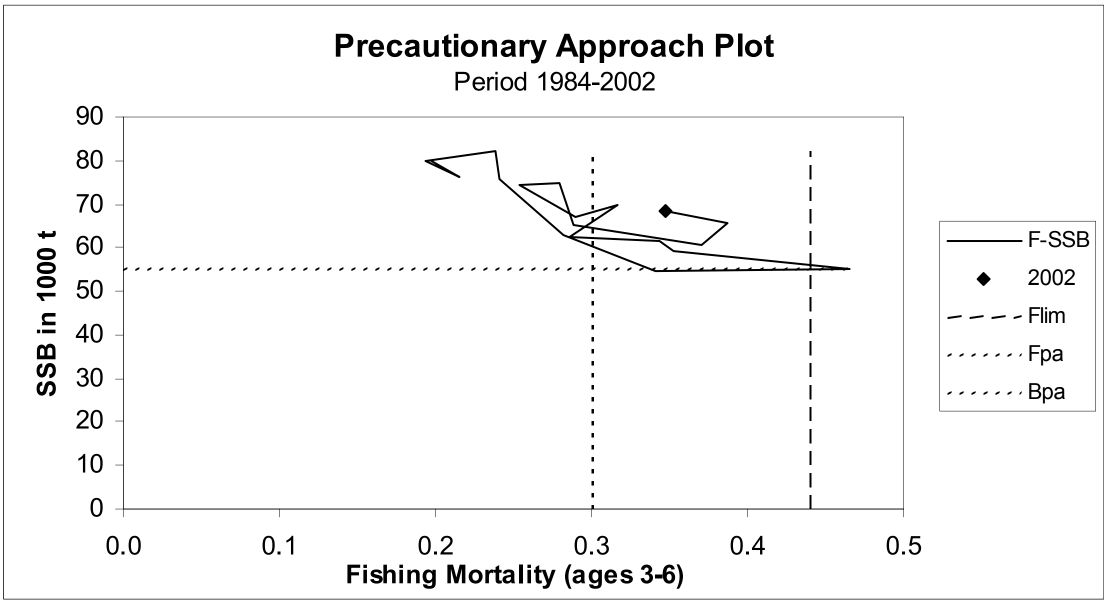

Precautionary Approach Plot
Period 1984-2002
SSB in 1000 t
90
80
70
60
50
40
30
20
10
0
0.0
0.1
0.2
0.3
0.4
0.5
Fishing Mortality (ages 3-6)
F-SSB
2002
Flim
Fpa
Bpa

Table 3.9.11.1 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIIa,b,d. Nominal landings and catches (t) provided by the Working Group.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total landings	17865	18927	17114	17577	19233	14371	15094	15600	14929	13685
Total discards	1732	2321	1705	1725	2582	3284	3282	2988	3108	2700
Total catches	19597	21248	18819	19302	21815	17655	18376	18588	18037	16385
Agreed TAC [1]			16460	18100	18100	18100	18100	18100	21460	20330

	1995	1996	1997	1998	1999	2000	2001
Total landings	15862	15109	14254	14345	13714	15031	15778
Total discards	3206	3026	3066	5371	3135	2265	1275
Total catches	19068	18135	17320	19716	16850	17297	17053
Agreed TAC [1]	22590	21200	25000	25000	25000	20000	16800

[1] For both Megrim species and VIIa included.

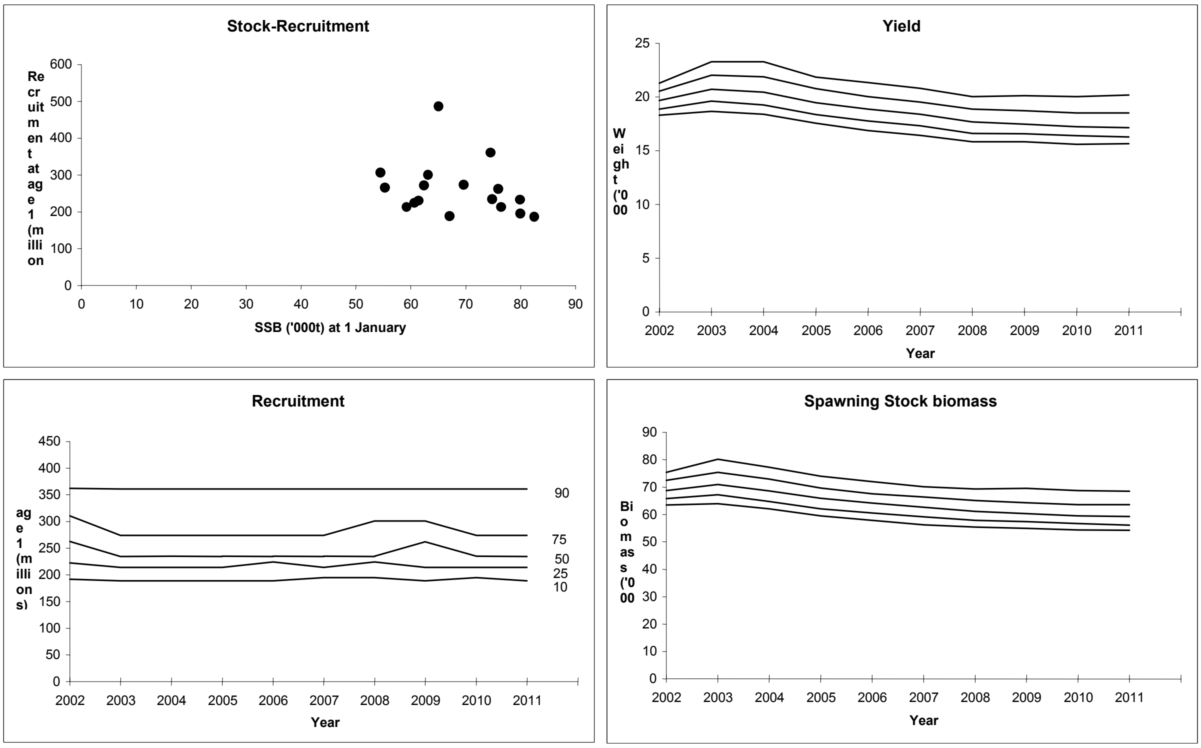
Table 3.9.11.2 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k & VIIIa,b,d

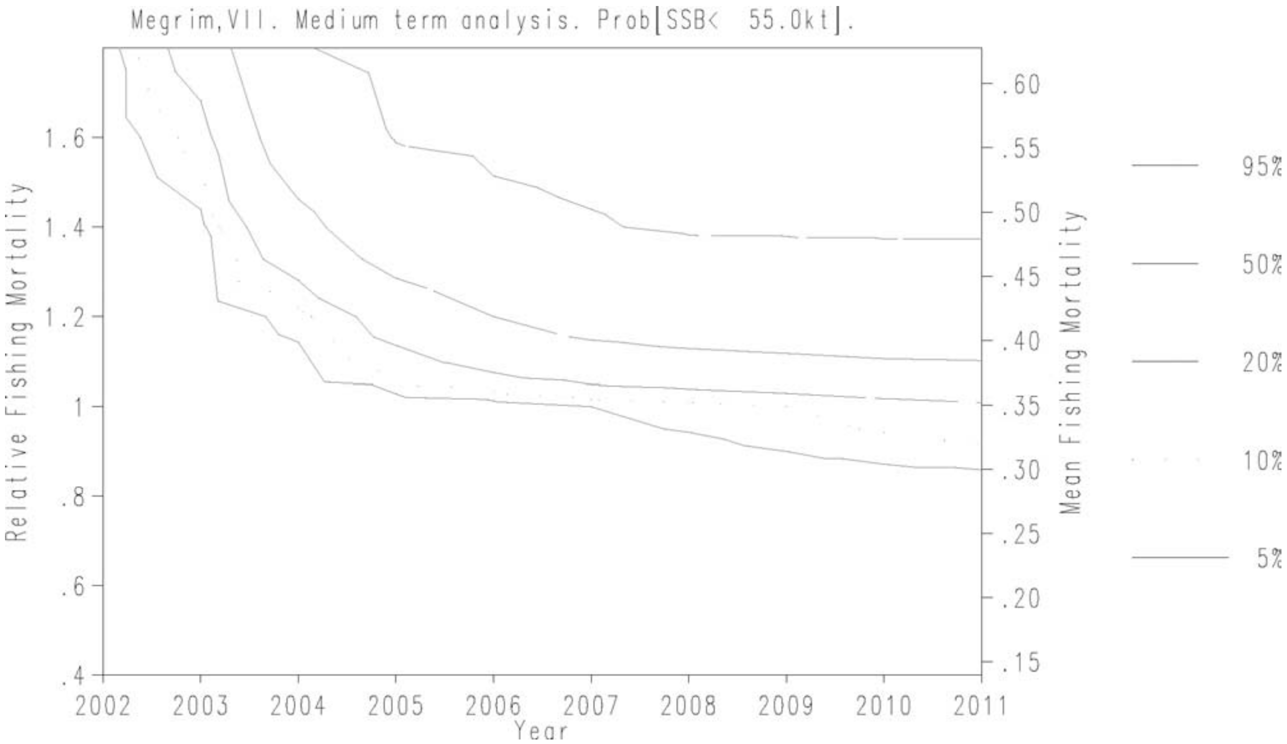
Year	Recruitment Age 1 thousands	SSB tonnes	Landings + Discards tonnes	Mean F Ages 3-6
1984	239000	79900	18800	0.198
1985	234000	76400	19600	0.216
1986	214000	79900	21200	0.194
1987	195000	82400	18800	0.238
1988	187000	75900	19300	0.241
1989	262000	63100	21800	0.282
1990	301000	54500	17700	0.341
1991	307000	55300	18400	0.465
1992	266000	59200	18600	0.353
1993	214000	61400	18000	0.343
1994	231000	62400	16400	0.286
1995	272000	69600	19100	0.317
1996	274000	67100	18100	0.290
1997	189000	74500	17300	0.254
1998	361000	74800	19700	0.279
1999	235000	65100	16900	0.289
2000	487000	60600	17300	0.370
2001	224000	65700	17100	0.387
2002	261000*	68500		0.348
Average	260684	68226	18561	0.300

*GM 87-00

Megrim in Div. VII + VIIIabd. Medium term projections. Lines show 10, 25, 50, 75 and 90 percentiles. Random stock-recruitr

Megrim in Divisions VII and VIIIabd. Medium term analysis, 1.00 * Fsq.





3.9.12 Anglerfish in Divisions VIIb–k and VIIIa,b,d (*L. piscatorius* and *L. budegassa)*

State of stocks/exploitation: The stock of *Lophius piscatorius* is outside safe biological limits, and the stock of *Lophius budegassa* is inside safe biological limits. The SSB of both stocks decreased from 1986 until 1993, then increased up to 1995-1996 and are presently decreasing. For both stocks, fishing mortality in most years has been above $\mathbf{F}_{pa}$, and even above $\mathbf{F}_{lim}$ for *L. piscatorius*. In 2001 fishing mortality is estimated to be below $\mathbf{F}_{pa}$ for *L. budegassa,* while for *L. piscatorius* F_{2001} is above $\mathbf{F}_{lim}$. Recent recruitments of *L. piscatorius* (1998 and 1999 year classes) and of *L. budegassa* (1997 and 1998 year classes) are above average, and there is evidence of strong year classes (2000 and 1999, respectively) recruiting to the fishery.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to reduce or maintain F below $\mathbf{F}_{pa}$, and to increase or maintain spawning stock biomass above $\mathbf{B}_{pa}$.

Precautionary Approach reference points:
***L. piscatorius* (changed in 2000)**

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is not defined	$\mathbf{B}_{pa}$ be set at 31 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ can therefore be set equal to the lowest observed SSB.
$\mathbf{F}_{lim}$ is 0.33, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.24. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$, taking into account the uncertainty in assessments.

Technical basis:

$\mathbf{B}_{lim}$: Not defined	$\mathbf{B}_{pa}$: $\mathbf{B}_{loss}$
$\mathbf{F}_{lim}$:$\mathbf{F}_{loss}$	$\mathbf{F}_{pa}$: $\mathbf{F}_{lim}$ x 0.72

***L. budegassa*: ($\mathbf{B}_{pa}$ changed in 2002 due to a correction of the maturity ogive values):**

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is not defined.	$\mathbf{B}_{pa}$ be set at 22 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ can therefore be set equal to the lowest observed SSB.
$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ be set at $\mathbf{F}_{med}$ = 0.23. This F is consistent with the proposed $\mathbf{B}_{pa}$.

Technical basis:

$\mathbf{B}_{lim}$= Not defined	$\mathbf{B}_{pa}$= $\mathbf{B}_{loss}$
$\mathbf{F}_{lim}$= Not defined	$\mathbf{F}_{pa}$= see above.

Advice on management: ICES recommends that F should be reduced by 30% for both species in order to rebuild SSB of *L. piscatorius* above $\mathbf{B}_{pa}$ in the short term. This corresponds to landings of less than 16 400 t in 2003 for both species combined (11 400 t *L. piscatorius*, and 5 000 t *L. budegassa*).

Relevant factors to be considered in management: The fishery may become heavily dependent on the strong year classes entering in the fishery. The increase in small individuals in the catches causes some concern as the potential contribution to the future landings and SSB of the recent strong year classes could be impaired by growth overfishing. There is no minimal landing size for anglerfish, but in order to protect juveniles of these year classes, the use of selective devices, such as rigid grids, should be promoted.

L. piscatorius and *L. budegassa* are both caught on the same grounds by the same fleets, and are usually not separated by species in landings; therefore, management measures for both species must be considered together and in conjunction with other species caught in these fisheries (sole, cod, rays, megrim, and hake). The management area for anglerfish also includes Division VIIa, where catches in recent years have been between 500 and 1 300 t.

Catch forecast for 2003:

Basis: *L. piscatorius*: F_{2002} = F(99-01) = 0.30 ; Landings(2002) = 15.6; SSB(2003) = 26.4.
Basis*:* *L. budegassa*: F_{2002} = F(99-01) = 0.27 ; Landings(2002) = 6.8 ; SSB(2003) = 22.6.

L. piscatorius				***L. budegassa***			
F(2003)	Basis	Landings(2003)	SSB(2004)	F(2003)	Basis	Landings(2003)	SSB(2004)
0.18	0.6$\mathbf{F}_{sq}$	9.9	32.0	0.16	0.6$\mathbf{F}_{sq}$	4.4	25.1
0.21	0.7$\mathbf{F}_{sq}$	11.4	30.7	0.19	0.7$\mathbf{F}_{sq}$	5.0	24.5
0.24	$\mathbf{F}_{pa}$=0.8$\mathbf{F}_{sq}$	12.7	29.4	0.21	0.8$\mathbf{F}_{sq}$	5.7	23.9
0.27	0.87$\mathbf{F}_{sq}$	13.7	28.6	0.23	$\mathbf{F}_{pa}$=0.87$\mathbf{F}_{sq}$	6.1	23.5
0.27	0.9$\mathbf{F}_{sq}$	14.1	28.3	0.24	0.9$\mathbf{F}_{sq}$	6.3	23.3
0.30	1.0$\mathbf{F}_{sq}$	15.4	27.1	0.27	1.0$\mathbf{F}_{sq}$	6.9	22.8
0.33	1.1$\mathbf{F}_{sq}$	16.6	26.1	0.29	1.1$\mathbf{F}_{sq}$	7.5	22.2
0.36	1.2$\mathbf{F}_{sq}$	17.8	25.0	0.32	1.2$\mathbf{F}_{sq}$	8.1	21.7

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Medium- and long-term projections: Assuming the current selection pattern, $\mathbf{F}_{max}$ is 0.29$\mathbf{F}_{sq}$ and 0.59$\mathbf{F}_{sq}$ for *L. piscatorius* and *L. budegassa,* respectively.

Medium-term projections suggest that a 20% reduction in F (i.e. $\mathbf{F}_{pa}$ for *L. piscatorius*) leads to a more than 95% probability of both stocks exceeding $\mathbf{B}_{pa}$ in 2005.

Comparison with previous assessment and advice: The title for this assessment has been changed to better reflect the areas covered. However, the actual assessment area is unchanged compared to previous years. For *L. piscatorius* the present estimates of F and SSB are very similar to those obtained from last year's assessment. For *L. budegassa* correction of an error in the values of the maturity ogive did not alter the historic trend in SSB but has scaled it upwards. Fishing mortality for this stock has been revised upwards since 1996. Changes in strategy and fishing grounds of the fishery have caused changes in the selection pattern of some fleets towards smaller fish. Recent recruitments for both stocks have been strongly revised. However, these revisions do not strongly affect the estimate of SSB in the short term.

The present advice is stronger than last year because the stocks have remained low and fishing mortality has increased on small fish.

Elaboration and special comment: Anglerfish landings from the west of the British Isles and down to the northern Bay of Biscay comprise two species - *L. piscatorius* and *L. budegassa*. *L. piscatorius* has a wide distribution in waters from the south-western Barents Sea to the Atlantic coast of Spain, whereas *L. budegassa* has a more southerly distribution, ranging from the British Isles in the north to Senegal in the south. Large specimens of both species are found in deep waters. Juvenile anglerfish have been caught both in deep water and along the shoreline, and discrete nursery areas have not been identified.

Anglerfish are an important component of mixed fisheries taking hake, megrim, sole, cod, plaice, and *Nephrops*. A trawl fishery by Spanish and French vessels developed in the Celtic Sea and Bay of Biscay in the 1970s, and overall annual landings may have attained 35–40 000 t by the early 1980s. Even though fishing effort increased until 1990, landings decreased between 1986 and 1993, but returned to the original level 10 years ago, when France and Spain together reported more than 75% of the total landings of both species combined. The remainder is taken by the UK and Ireland (around 10% each) and Belgium (less than 5%). Otter trawls (the main gear used by French, Spanish and Irish vessels) currently take about 80% of the total landings of *L. piscatorius*, while around 60% of UK landings are by beam trawlers and gill netters. Over 95% of total international landings of *L. budegassa* are taken by otter trawlers. There has been an expansion of the French gillnet fishery in the late 1980s in the Celtic Sea and in the north of the Bay of Biscay, mainly by vessels based in Spain and fishing in medium to deep waters. Otter trawling in medium and deep water in ICES Subarea VII appears to have declined, even though the increasing use of twin trawls by French vessels may have increased significantly the overall efficiency of the French fleet. Fishing activity by UK gillnetters and beam trawlers has remained relatively stable over the period 1986–1995. Belgium landings of anglerfish are exclusively by beam trawlers.

The analytical age-based assessment is based on landings, survey and commercial CPUE data. The catch-at-age matrix covers ages to 13+ for *L. piscatorius* and to 14+ for *L. budegassa*. Short-term predictions of landings and SSB are not sensitive to recent assumed recruitment.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

Anglerfish (*L. piscatorius*)
Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3-8	Yield/R	SSB/R
Average Current	0.302	0.952	1.794
$\mathbf{F}_{max}$	0.088	1.313	8.165
$\mathbf{F}_{0.1}$	0.052	1.226	12.237
$\mathbf{F}_{med}$	0.272	0.998	2.128

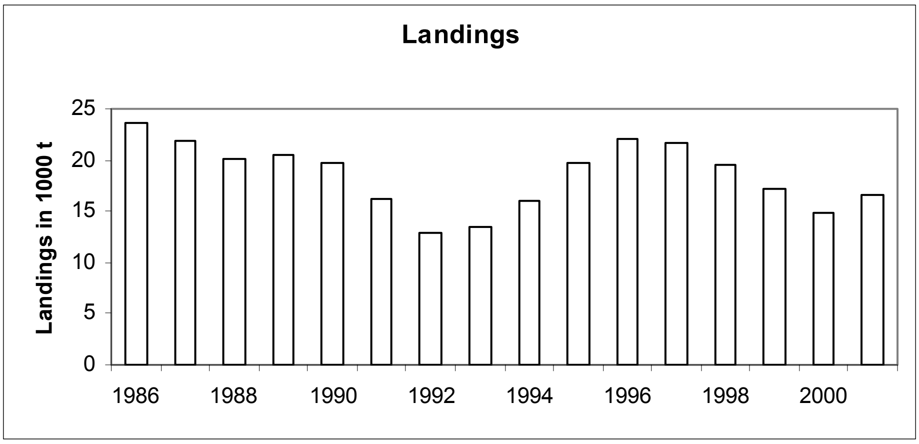
Anglerfish (*L. budegassa*)
Yield and spawning biomass per Recruit
F-reference points:

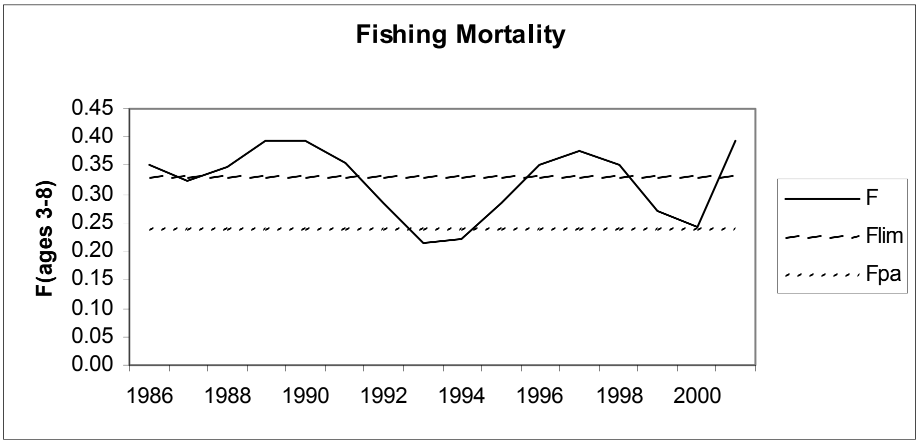
	Fish Mort Ages 6-10	Yield/R	SSB/R
Average Current	0.267	0.464	1.529
$\mathbf{F}_{max}$	0.159	0.497	2.915
$\mathbf{F}_{0.1}$	0.100	0.469	4.494
$\mathbf{F}_{med}$	0.232	0.479	1.853

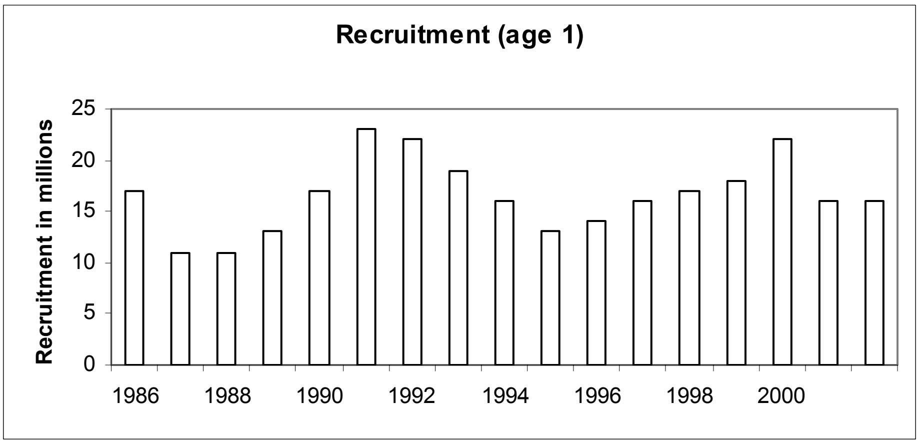
Catch data (Tables 3.9.12.1-5):

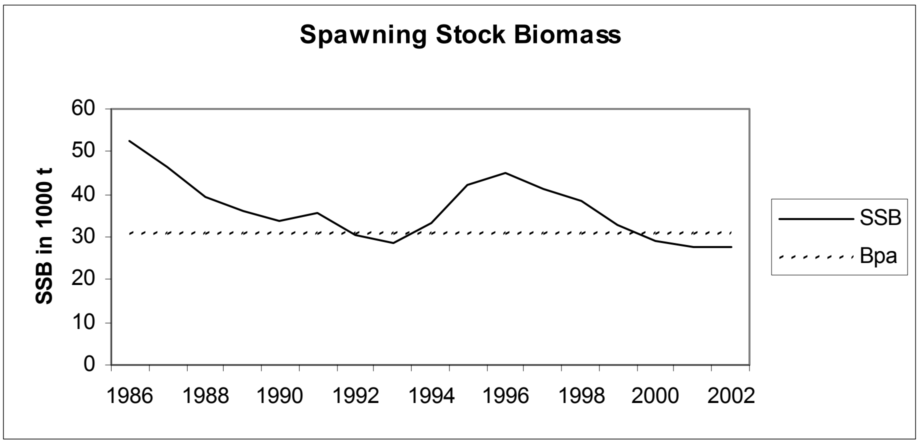
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Landings	Landings of *L. piscat.*	Landings of *L. budeg.*
1987	Not assessed	-	39.08	29.5	21.9	7.6
1988	Not assessed	-	42.99	28.5	20.1	8.4
1989	Not assessed	-	42.99	30.0	20.5	9.5
1990	Not assessed	-	42.99	29.4	19.8	9.6
1991	No advice	-	42.99	25.1	16.2	8.8
1992	No advice	-	42.99	21.1	12.8	8.3
1993	Concern about *L. pisc.* SSB decrease	-	25.1	20.1	13.5	6.7
1994	SSB decreasing, still inside safe biological limits	-	23.9	21.9	16.1	5.8
1995	No increase in F	20.0	23.2	26.8	19.7	7.1
1996	No increase in F	30.3	30.4	30.2	22.1	8.1
1997	No increase in F	34.3	34.3	29.8	21.7	8.1
1998	No increase in F	33.0	34.3	28.2	19.6	8.6
1999	No increase in F	32.9	34.3	24.5[3]	17.2[3]	7.3[3]
2000	At least 20% decrease in F	< 22.3	29.6	22.0[3]	14.9[3]	7.1[3]
2001	Reduce F below $\mathbf{F}_{pa}$	< 27.6	27.6	22.2	16.6	5.6
2002	Reduce F below $\mathbf{F}_{pa}$	< 19.9	23.7			
2003	At least 30% decrease in F	< 16.4				

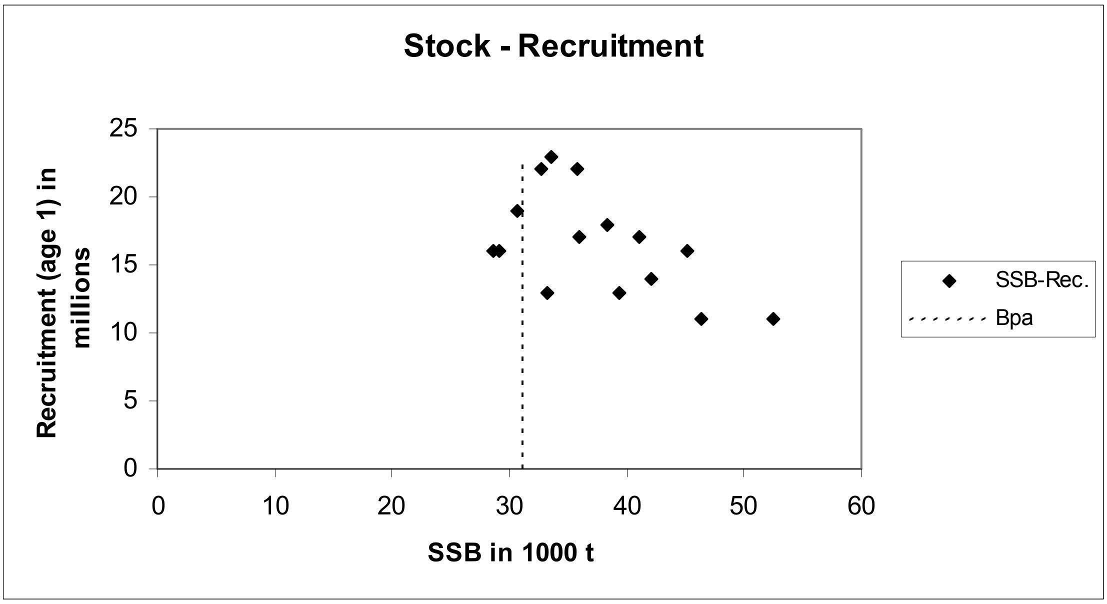
[1]Includes Division VIIa and Divisions VIIId,e; applies to both species. [3]Revised. Weights in '000 t.


Landings
Landings in 1000 t
25
20
15
10
5
0
1986
1988
1990
1992
1994
1996
1998
2000

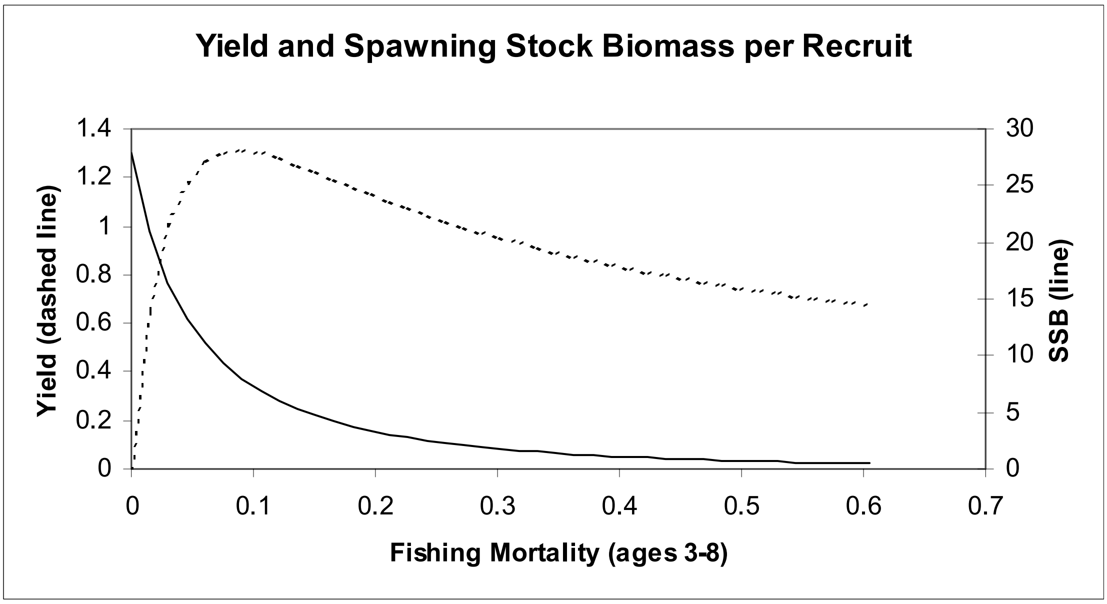

Fishing Mortality
F(ages 3-8)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1986
1988
1990
1992
1994
1996
1998
2000
F
Flim
Fpa


Recruitment (age 1)
Recruitment in millions
25
20
15
10
5
0
1986
1988
1990
1992
1994
1996
1998
2000

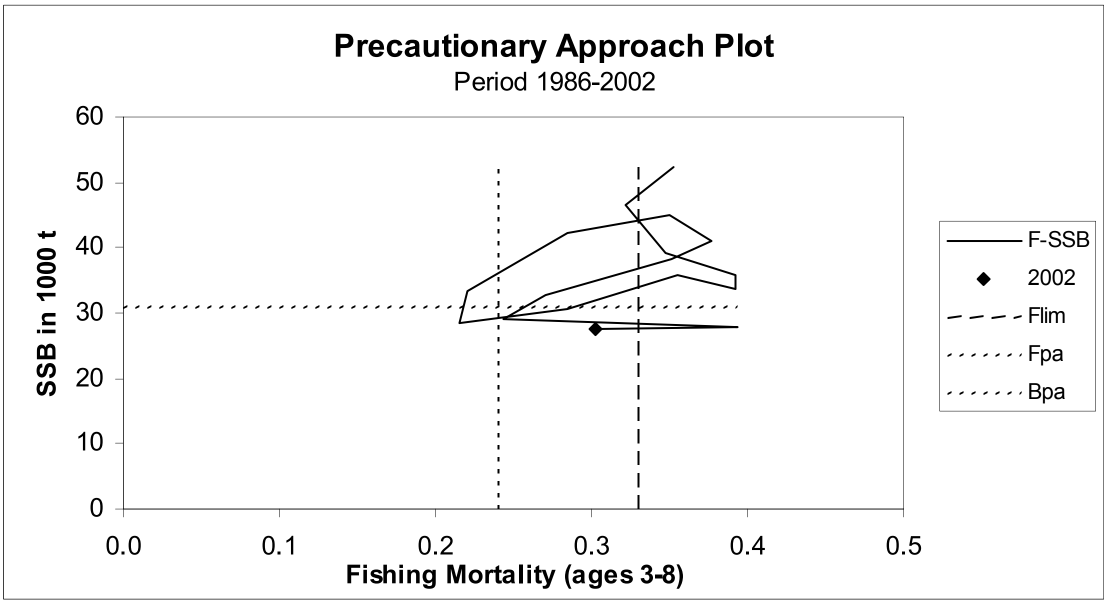

Spawning Stock Biomass
SSB in 1000 t
60
50
40
30
20
10
0
1986
1988
1990
1992
1994
1996
1998
2000
2002
SSB
Bpa



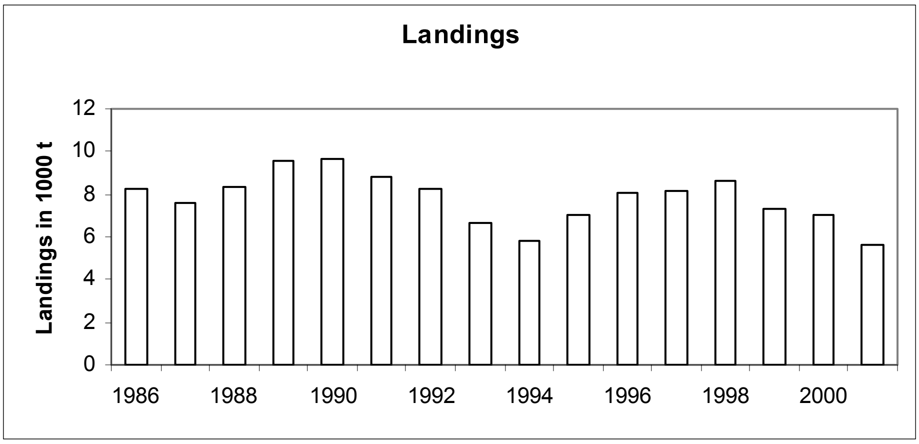
Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
SSB-Rec.
Bpa

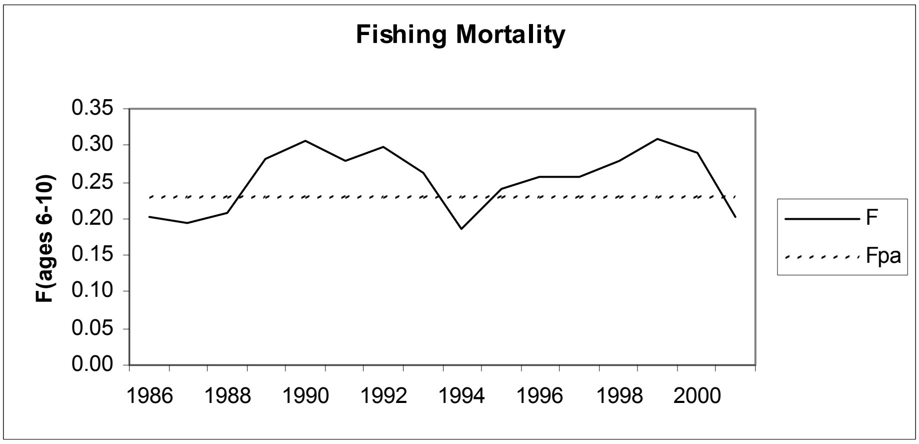


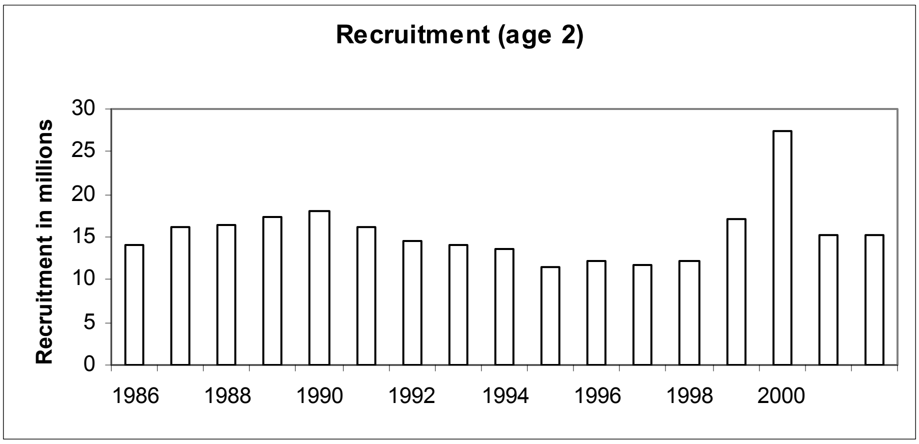
Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 3-8)

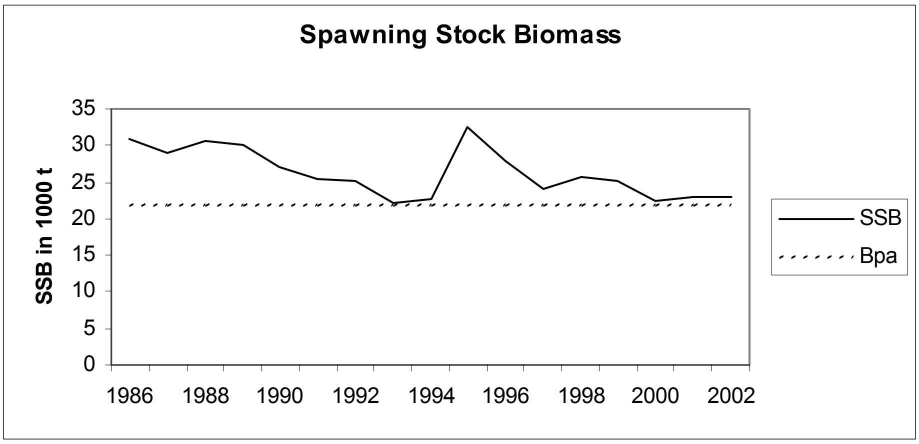


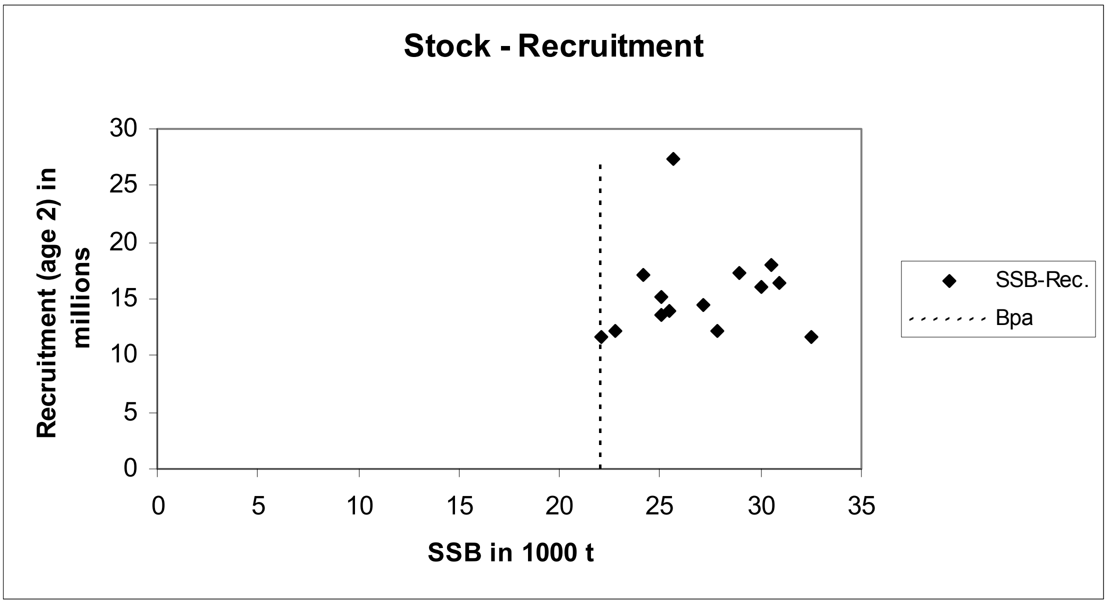
Precautionary Approach Plot
Period 1986-2002
SSB in 1000 t
Fishing Mortality (ages 3-8)
F-SSB
2002
Flim
Fpa
Bpa

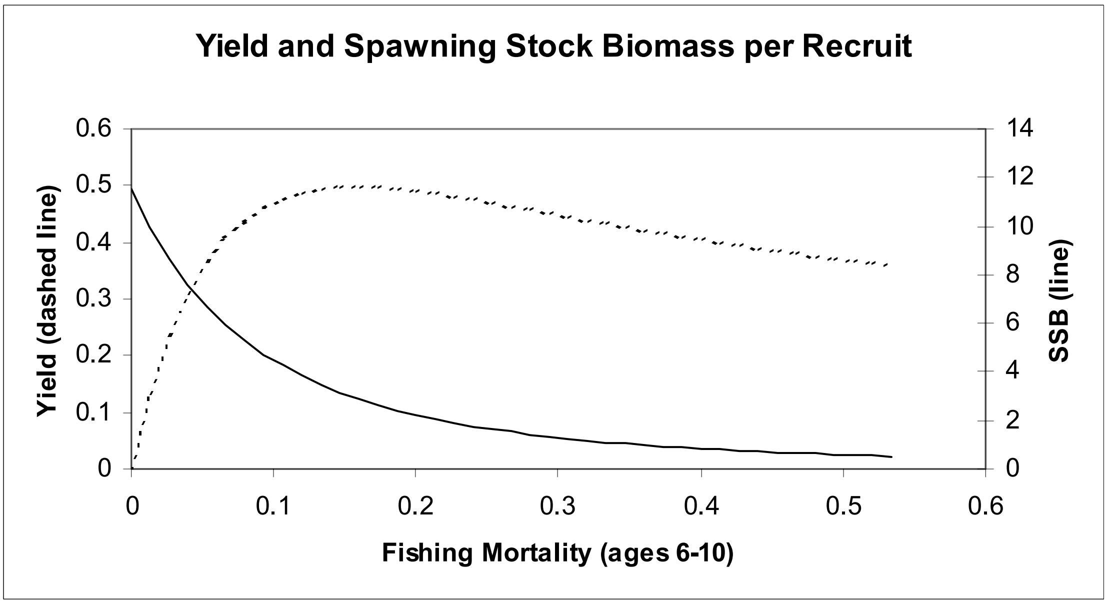

Landings
Landings in 1000 t
12
10
8
6
4
2
0
1986
1988
1990
1992
1994
1996
1998
2000


Fishing Mortality
F(ages 6-10)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1986
1988
1990
1992
1994
1996
1998
2000
F
Fpa


Recruitment (age 2)
Recruitment in millions
30
25
20
15
10
5
0
1986
1988
1990
1992
1994
1996
1998
2000


Spawning Stock Biomass
SSB in 1000 t
35
30
25
20
15
10
5
0
1986
1988
1990
1992
1994
1996
1998
2000
2002
SSB
Bpa


Stock - Recruitment
Recruitment (age 2) in millions
SSB in 1000 t
0
5
10
15
20
25
30
35
SSB-Rec.
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 6-10)
0
0.1
0.2
0.3
0.4
0.5
0.6
2
4
6
8
10
12
14

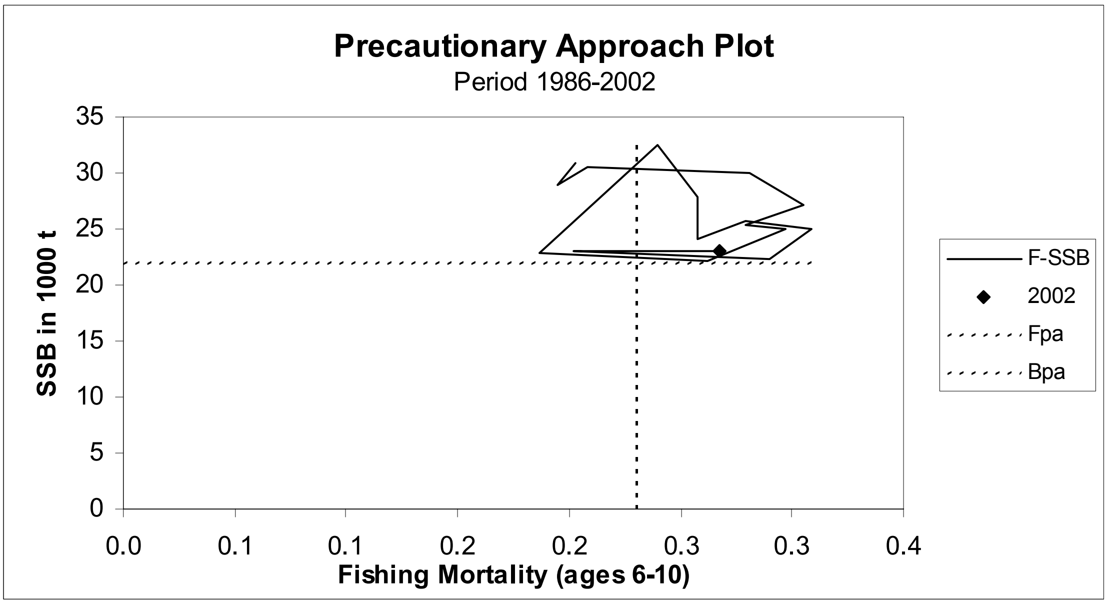

Precautionary Approach Plot
Period 1986-2002
SSB in 1000 t
Fishing Mortality (ages 6-10)
0.0
0.1
0.1
0.2
0.2
0.3
0.3
0.4
0
5
10
15
20
25
30
35
F-SSB
2002
Fpa
Bpa

Table 3.9.12.1 Landings (t) of both species of Anglerfish in Divisions VIIb-k and VIIIa,b,d. Working Group estimates.

Year	VIIb-k	VIIIa,b,d	Total
1977[1]			19895
1978[1]			23445
1979[1]			29738
1980[1]			38880
1981[1]			39450
1982[1]			35285
1983[1]			38280
1984[1]	28847	7909	36756
1985[1]	28491	7161	35652
1986	25987	5897	31883
1987	22295	7233	29528
1988	22494	5983	28477
1989	24731	5276	30007
1990	23434	5950	29384
1991	20385	4684	25069
1992	17554	3530	21084
1993	16633	3507	20140
1994	18093	3841	21934
1995	21922	4862	26784
1996	24132	6102	30233
1997	23928	5846	29774
1998	23295	4876	28171
1999[1]	21288	3224	24512
2000[1]	19250	2711	21961
2001*	19476	2728	22205

*Preliminary.
[1] Revised.

Table 3.9.12.2 Landings (t) of *L. piscatorius* in Divisions VIIb-k and VIIIa,b,d. Working Group estimates.

Year	VIIb-k	VIIIa,b,d	Total
1984[1]	23056	5416	28472
1985[1]	23193	4568	27761
1986	19544	4122	23666
1987	17180	4729	21909
1988	16147	3948	20095
1989	17584	2889	20474
1990	16374	3379	19753
1991	14071	2158	16229
1992	11456	1362	12818
1993	11894	1587	13481
1994	14075	2045	16120
1995	16618	3113	19730
1996	18153	3988	22141
1997	17743	3917	21660
1998	16786	2787	19572
1999[1]	15690	1506	17186
2000[1]	13765	1133	14898
2001*	15026	1544	16571

*Preliminary.
[1] Revised

Table 3.9.12.3 Landings (t) of *L. budegassa* in Divisions VIIb-k and VIIIa,b,d. Working group estimates.

Year	VIIb-k	VIIIa,b,d	Total
1984[1]	5791	2493	8284
1985[1]	5298	2593	7891
1986	6443	1775	8217
1987	5115	2504	7619
1988	6347	2035	8382
1989	7146	2387	9533
1990	7061	2571	9632
1991	6314	2526	8840
1992	6098	2168	8266
1993	4739	1919	6659
1994	4018	1796	5814
1995	5304	1749	7053
1996	5978	2114	8092
1997	6185	1929	8114
1998	6510	2089	8599
1999[1]	5607	1718	7325
2000[1]	5485	1578	7064
2001*	4450	1184	5634

*Preliminary.
[1] Revised.

Table 3.9.12.4 Anglerfish (*L. piscatorius*) in Divisions VIIb-k and VIIIa,b,d.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-8
1986	17000	52500	23700	0.352
1987	11000	46400	21900	0.322
1988	11000	39300	20100	0.348
1989	13000	35900	20500	0.392
1990	17000	33600	19800	0.392
1991	23000	35800	16200	0.355
1992	22000	30600	12800	0.285
1993	19000	28600	13500	0.215
1994	16000	33300	16100	0.220
1995	13000	42100	19700	0.285
1996	14000	45100	22100	0.350
1997	16000	41100	21700	0.377
1998	17000	38300	19600	0.351
1999	18000	32700	17200	0.270
2000	22000	29100	14900	0.244
2001	16000*	27800	16600	0.393
2002	16000*	27600		0.302
Average	16529	36459	18525	0.321

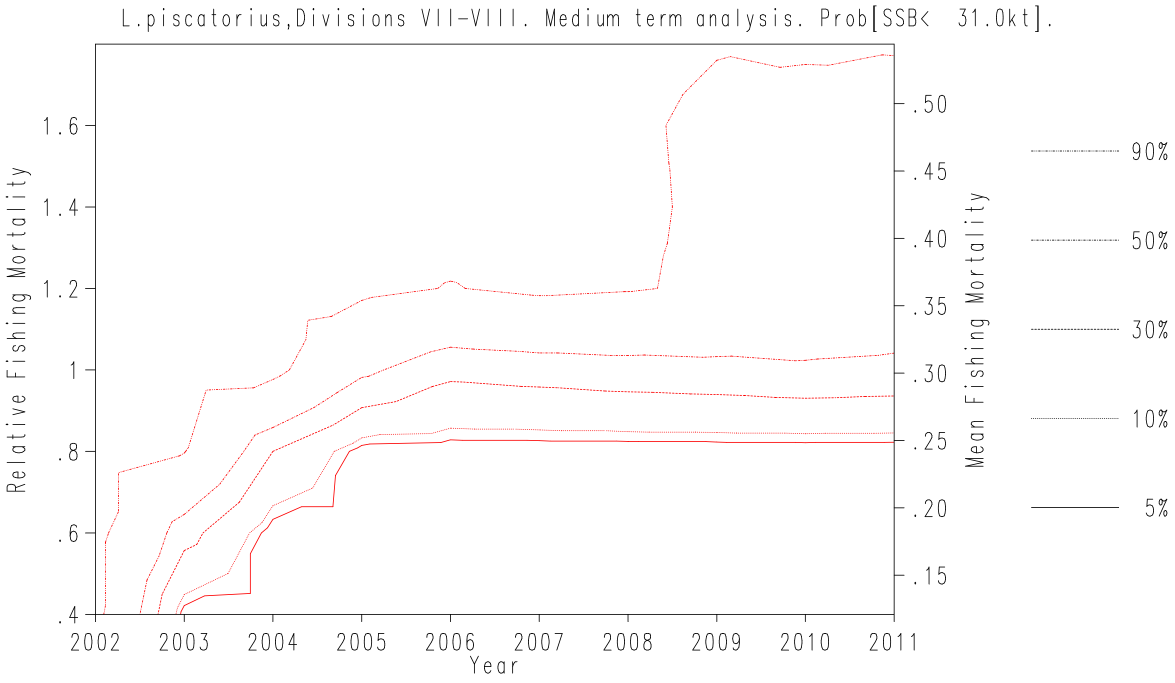
* GM87-00

Table 3.9.12.5 Anglerfish (*L. budegassa*) in Divisions VIIb-k and VIIIa,b,d

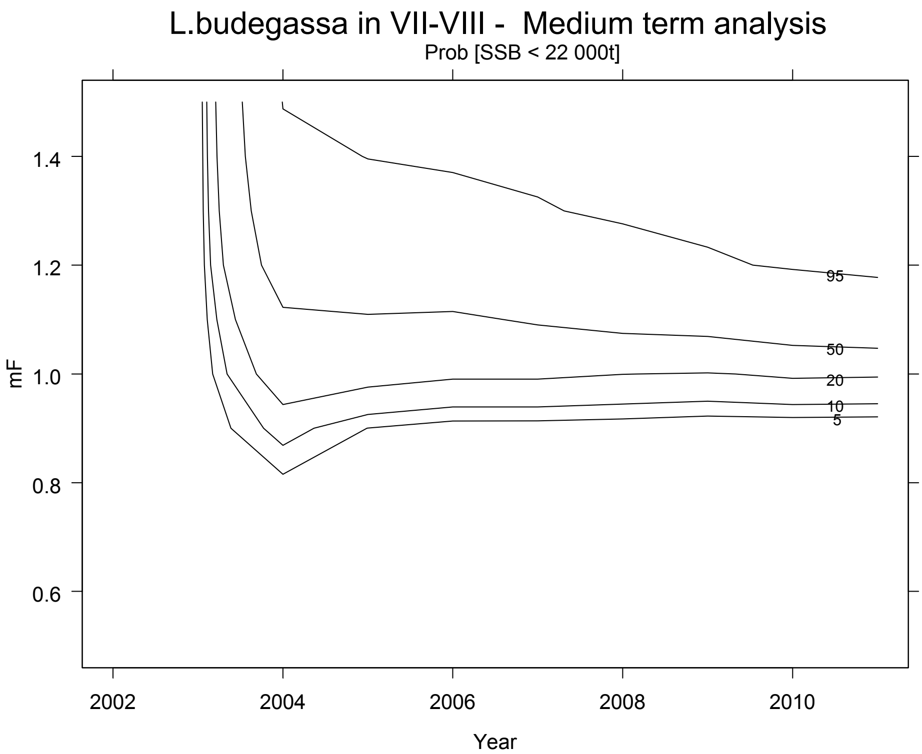
Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 6-10
1986	14024	30969	8217	0.203
1987	16228	28923	7619	0.195
1988	16462	30497	8382	0.208
1989	17255	30051	9533	0.281
1990	18006	27114	9632	0.305
1991	16068	25440	8840	0.279
1992	14460	25021	8266	0.297
1993	13995	22072	6659	0.262
1994	13631	22791	5814	0.187
1995	11561	32527	7053	0.240
1996	12095	27868	8092	0.258
1997	11656	24182	8114	0.258
1998	12183	25673	8599	0.279
1999	17031	25051	7325	0.309
2000	27379	22405	7065	0.290
2001	15166*	23066	5634	0.202
2002	15166*	23092		0.267
Average	15433	26279	7803	0.254

* GM87-00

L. piscatorius **in Div. VII-VIIIab: Medium-term contour plot.**



L. budegassa **in VII & VIII. Medium-term analysis**



3.9.13 Response to the request from DG Fish concerning TACs for 2002 for Sole in Divisions VIIIa,b (Bay of Biscay)

EC has requested ICES to reconsider its advice for sole in Division VIIIa,b (Bay of Biscay) for 2002 taking into account any additional data that may have become available since the assessment was done in 2001.

ICES advised based on its assessment in June 2001 as follows:

Advice on management: In the light of the sharp decrease in SSB and recruitment since 1995, ICES recommends a recovery plan that will ensure a safe and rapid recovery of SSB to a level in excess of 13 000 t. If a recovery plan is not implemented, ICES recommends that the fishing mortality should be reduced to the lowest possible level in 2002.

ICES comments:

1. The sole in Divisions VIIIab (Bay of Biscay)) is assessed by the ICES Working Group on the Assessment of Southern Shelf Demersal Stocks (WGSSDS). This group will meet again in July 2002 and at that time have the complete 2001 dataset available. The assessment made by WGSSDS will be reviewed by the ICES Advisory Committee on Fishery Management (ACFM) in October 2002. Also, ACFM will at that time formulate ICES advice for 2003.

2. The fishery on sole in Division VIIIab is almost entirely French although some Belgian beam trawlers are involved in the fishery. IFREMER (Institut Français de Recherche pour l'Exploration de la Mer) provides almost all data for the assessment (tuning series and age composition of catches). Therefore, ICES asked IFREMER to conduct a study to allow ICES to respond to this request.

3. The new available information is as follows:

   - French landings figures have been revised for 1999 and 2000, and the text table below compares the new estimates with those used by the WGSSDS in 2001.

Years	WGSSDS value	Revised value	Difference
1999	5 164 t	4 933 t	- 4 %
2000	5 006 t	5 179 t	+ 3.5 %

These revisions are of minor importance, and do not change the general declining trend of the international landings observed since 1994. Such revisions will not make a significant impact on the perception of the state of this stock. In 1999 and 2000 TACs were not reached (landings below TAC by 9 % and 11 % respectively).

   - The two CPUE series derived from artisanal trawler fleets from La Rochelle and Les Sables d'Olonne have been also revised for 1999 and 2000; these revisions indicate that for the two fleets, CPUE have been overestimated in the last assessment made by WGSSDS in September 2001. Compared to values used by WGSSDS, new values for 1999 and 2000 are respectively 12 % and 13 % lower for Les Sables d'Olonne fleet, 20 % and 27 % for La Rochelle fleet. These two series are used for the assessment of this stock, and a new assessment using the revised CPUE series would produce a lower SSB estimate compared to the results obtained by WGSSDS.

In conclusion, new available information indicates that SSB is lower than the estimate produced by ICES in September 2001, and well below $\mathbf{B}_{pa}$. Therefore, there is no basis to revise the previous ICES advice on the stock of sole in Division VIIIab.

3.9.14 Plaice Southwest of Ireland (Division VIIh-k)

State of stock/exploitation: The state of the stock in relation to biological reference points is not known. Catches have been declining and the 2001 landings are the lowest in the time-series.

Management objectives: No explicit management objectives have been established for this stock.

Precautionary Approach Reference points: No precautionary reference points have been proposed for this stock.

Advice on management: ICES recommends that catches in 2003 be no more than the recent average (1998-2000) of around 450 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Relevant factors to be considered in management: Recent landings have been about 30% of the TAC. Plaice are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for plaice should also take into consideration other demersal fish species taken in the fishery.

Catch forecast for 2003 and medium- and long-term projections are not available.

Comparison with previous assessment and advice: The assessment for this stock is preliminary. ICES gave no advice for this stock in 2001.

Elaboration and special comment: ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time-series of the data and tuning fleets were too short to make conclusions about the current stock status.

Plaice are predominantly caught within mixed species otter trawl fisheries in Division VIIj. These vessels target mainly hake, anglerfish, and megrim. Beam trawlers and seiners generally take a lesser catch of plaice. Ireland is the major participant in this fishery with around 60% of the international landings between 1993-2001.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

Catch data (Table 3.9.14.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM landings
1993	-	-	-	652
1994	-	-	-	578
1995	-	-	-	541
1996	-	-	-	431
1997	-	-	-	639
1998	-	-	-	439
1999	-	-	-	538
2000	-	-	-	367
2001	-	-	1215	276
2002	-	-	1080	
2003	Reduce TAC to recent average (1998-2000)	450		

Table 3.9.14.1 Plaice in Divisions VII h-k (Southwest Ireland).
Nominal landings (t) of PLAICE in Divisions VIIh-k, 1993-2001, as officially reported to ICES.

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium									6
France	44	42	47	50	58	74	77	125	98
Ireland	237	184	243	183	203	221	177	107	110
Netherlands				70		7			
UK (England & Wales)	209	172	192	148	113	111	95	95	111
UK (Scotland)	5	2							
Total	495	400	482	451	374	413	349	327	325
Unallocated		-2	-79	-8	190	10	-22		
Total figures used by Working Group	495	398	403	443	564	423	327	327	325

3.9.15 Sole Southwest of Ireland (Division VIIh-k)

State of stock/exploitation: The state of the stock is not known in relation to biological reference points. Catches in the last three years are the lowest in the short time-series.

Management objectives: No explicit management objectives have been established for this stock.

Precautionary Approach Reference points: No precautionary reference points have been proposed for this stock.

Advice on management: ICES recommends that catches in 2003 be no more than the recent average (1999-2001) of around 330 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Relevant factors to be considered in management: Recent landings have been about 50% of the TAC. Sole are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for sole should also take into consideration other demersal fish species taken in the fishery.

Catch forecast for 2003: not available.

Medium- and long-term projections: not available.

Comparison with previous assessment and advice: The assessment is preliminary. ICES gave no advice for this stock in 2001.

Elaboration and special comment: ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time-series of the data and tuning fleets were too short to make conclusions about the current stock status.

Sole are predominantly caught within mixed species otter trawl fisheries in Division VIIj. These vessels target mainly hake, anglerfish, and megrim. Beam trawlers and seiners generally take a lesser catch of sole. Ireland is the major participant in this fishery with around 50% of the international landings between 1993-2001.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

Catch data (Tables 3.9.15.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM landings
1993	No advice	-	-	495
1994	No advice	-	-	398
1995	No advice	-	-	403
1996	No advice	-	-	443
1997	No advice	-	-	564
1998	No advice	-	-	423
1999	No advice	-	-	327
2000	No advice	-	-	327
2001	No advice	-	650	325
2002	No advice	-	650	
2003	Reduce TAC to recent landings	330		

Table 3.9.15.1 Plaice in Divisions VII h-k (Southwest Ireland).
Nominal landings (t) of PLAICE in Divisions VIIh-k, 1993-2001, as officially reported to ICES.

	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium									6
France	44	42	47	50	58	74	77	125	98
Ireland	237	184	243	183	203	221	177	107	110
Netherlands				70		7			
UK (England & Wales)	209	172	192	148	113	111	95	95	111
UK (Scotland)	5	2							
Total	495	400	482	451	374	413	349	327	325
Unallocated		-2	-79	-8	190	10	-22		
Total figures used by Working Group	495	398	403	443	564	423	327	327	325

na = not available

3.10 Stocks in Divisions VIIb,c,h–k (West of Ireland)

3.10.1 Overview

Fleet and Fisheries

The fishery in Divisions VIIb,c is mainly a trawl fishery although some gillnetting is carried out. The fishery in Divisions VIIh–k is also a trawl fishery, but gillnetting is increasing in importance in the area. These are mixed fisheries for cod, haddock, whiting, hake, monk, megrim, sole, and plaice; and cod and whiting are taken as by-catch in the *Nephrops* fishery. In recent years, there has been an increase in the number of seiners operating in the Irish fleet in Divisions VIIg,j, targeting whiting and haddock.

Landing figures for these ICES Divisions are difficult to interpret as several countries differ in the manner in which they report their landings data for the various ICES Divisions.

Other species taken in the area are herring, mackerel, and blue whiting (See Sections 3.9.9, 3.10.3, 3.12.3, and 3.12.5).

Management Measures

There are single cod and whiting TACs covering the whole of Divisions VIIb–k so that assessment areas do not correspond to management areas. In 1997, the assessment areas for Celtic Sea cod and whiting were extended to include Divisions VIIj,k. The assessment areas now cover Divisions VIIe-k. There are separate plaice and sole TAC's for Divisions VIIbc and for Divisions VIIh-k.

State of the Stocks

Although stock monitoring programmes and annual groundfish and young fish surveys have been in place since 1993, assessments for the stocks of sole and plaice in Divisions VIIbc and for Divisions VIIh-k are considered tentative due to the lack of reliable series of catch and effort data. The state of these stocks is therefore not known at present.

Fish in this area may only be components of larger stock complexes. It is still not clear if the Divisions VIIbc stocks should be assessed with the stocks in the Celtic Sea or with the stocks off the West of Scotland.

There is a directed fishery for hake mainly in Divisions VIIh–k and an overview of hake is provided in Section 3.12.2.

Anglerfish and megrim are important species in this area, but are assessed for Subareas VII and VIII combined. An overview is provided in Sections 3.9.11 and 3.9.12.

Nephrops fisheries take place in Functional units 16–19 (see Section 3.14.2.k in the 2001 ACFM report). Catch per unit of effort is fluctuating without trend. There is a TAC for all of Subarea VII. An overview of *Nephrops* stocks is provided in Section 3.14.1 in the 2001 ACFM report.

3.10.2 Demersal Stocks

3.10.2.a Haddock in Divisions VIIb-k

State of stock/exploitation: The state of the stock is unknown. A preliminary assessment of the state of this stock is considered only indicative of recent stock development. Recruitment seems to be highly variable. This is also reflected in the landings.

Management objectives: none.

Precautionary Approach reference points: not defined.

Advice on management: ICES recommends not to increase landings above the average of the last four years of 7 200 t. ICES recommends that a management plan, including monitoring of the development of the stock and of the fishery should be constructed and implemented.

Relevant factors to be considered in management: This stock is presently managed by a TAC set for the whole of Subareas VII, VIII, IX and X. The TAC currently includes an additional allocation for Division VIIa. The current TAC is not restrictive on catches from Divisions VIIb-k and creates a possibility for mis-reporting from other areas.

Elaboration and special comment: Assessment of the state of this stock is difficult due to a short time-series of assessment data. Catches of haddock are recorded along the entire western seaboard of the British Isles, with concentrations off the west coast of Scotland, off the NW coast of Ireland, in the Celtic Sea, and in the western Irish Sea. The extent of mixing between these areas is not presently known. However, recent patterns of recruitment and growth differ between areas.

Some information on discards indicates that they may be substantial.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

Catch data (Tables 3.10.2.a.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Official Landings[2]	ACFM landings
1987	Not dealt with			3.0	2.6
1988	Not dealt with			4.0	3.6
1989	Not dealt with			4.2	3.2
1990	Not dealt with			2.9	2.0
1991	Not dealt with			2.6	2.3
1992	Not dealt with			2.9	2.7
1993	Not dealt with			3.4	3.3
1994	Not dealt with			4.1	4.1
1995	Not dealt with		6	4.5	4.5
1996	Not dealt with		7[3]	6.7	6.8
1997	Not dealt with		14	10.3	10.8
1998	Not dealt with		20	7.4	7.7
1999	Not dealt with		22[5]	5.9	5.0
2000	No expansion of catches		16.6[6]	3.7	7.6
2001	No expansion of catches		12[1]	9.2	8.6
2002	No expansion of catches	8.0	9.3[1]		
2003	No expansion of catches	7.2			

[1]Applies to Subareas VII, VIII, IX and X. [2]Possible underestimates due to misreporting. [3]Increased in-year to 14 000 t. [4]Incomplete official statistics. [5]Includes separate Division VIIa allocation of 4 990 t. [6]Includes separate Division VIIa allocation of 3 400 t. Weights in 000' tonnes.

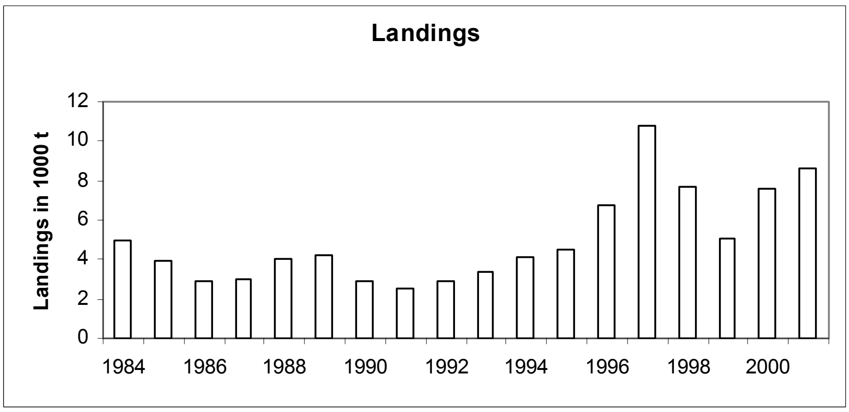


Table 3.10.2.a.1 Nominal landings (t) of Haddock in Divisions VIIb,c,e-k, 1984-2000, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	-	4	6	12	64	117	22	18
France	3,328	2,438	2,279	2,380	3,275	3,412[a]	2,110[a]	1,247
Ireland	646	794	317	314	275	323	461	1,020
Norway	17	4	86	-	-	27	31	38
Spain	532	561	-	-	-	-	-	-
UK (Channel Islands)	-	-	-	-	-	-	-	-
UK (England & Wales)	340	168	188	194	405	278	123	137
UK (Scotland)	63	7	57	79	4	17	195	113
Total	4,926	3,976	2,933	2,979	4,023	4,174	2,942	2,573
Unallocated	-2,768	-1,383	-654	-405	-375	-940	-948	-231
Total figures used by Working Group	2,158	2,593	2,279	2,574	3,648	3,234	1,994	2,342

Country	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	21	51	123	189	133	246	142	51
France	1,461	1,839	2,788	2,964	4,527	6,581	3,674*	2,725[1]*
Ireland	1,073	1,262	908	966	1,468	2,789	2,788	2,034
Norway	26	-	17	64	38	31	49	71*
Netherlands	-	-	-	-	-	-	3	-
Spain	-	-	-	19	48	54	260	88
UK (Channel Islands)	-	-	1	-	-	-	-	-
UK (England & Wales)	220	189	193	228	432	554	410	273
UK (Scotland)	86	67	47	38	7	15	35	5
Total	2,887	3,408	4,077	4,468	6,653	10,270	7,361	5,247
Unallocated	-183	-60	54	2	103	557	307	-197
Total figures used by Working Group	2,704	3,348	4,131	4,470	6,756	10,827	7,668	5,050

Country	2000	2001*
Belgium	90	165
France	3,357[1]*	5050
Ireland	n/a	3578
Norway	13*	2
Netherlands	-	
Spain	n/a	
UK (Channel Islands)	-	
UK (England & Wales)	287	
UK (Scotland)	2	
United Kingdom		422
Total	3,749	9,217
Unallocated	4,005	-602
Total figures used by Working Group	7,754	8,615

[*] Preliminary.
[a] Reported as total landings for Subareas VII & VIII.
[1] Includes the whole of area VII.
n/a = not available.

3.10.3 Herring in Divisions VIa (South) and VIIb,c

State of the stock/exploitation: The state of the stock is uncertain. A provisional assessment indicates that SSB decreased from high levels in the late 1980s, to less than 30% of those levels in the mid-1990s, but the current level is unknown. Catches in the last two years have been the lowest observed due to restrictive TACs, and there is a greater proportion of older herring in the 2001 catch.

Management objectives: A local Irish management committee has been established for this stock. One of its aims is to rebuild the stock to above $\mathbf{B}_{pa}$ over a three-year period.

Precautionary Approach reference points (changed in 1999):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 81 000 t	$\mathbf{B}_{pa}$ be set at 110 000 t
$\mathbf{F}_{lim}$ is 0.33	$\mathbf{F}_{pa}$ be set at 0.22

Technical basis:

$\mathbf{B}_{lim}$: Lowest reliable estimated SSB	$\mathbf{B}_{pa}$: Approximately 1.4 $\mathbf{B}_{lim}$
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$	$\mathbf{F}_{pa}$: = $\mathbf{F}_{med}$(98)

Advice on management: ICES recommends that the current TACs (14 000 t) should be continued in 2003.

Rebuilding plan: A management and rebuilding plan for this stock is currently in place. A continuation of this should ensure that catches do not exceed the TAC and that the stock is rebuilt.

Relevant factors to be considered in management: Recent changes to the management of the fisheries on this stock are likely to have greatly reduced the impact of misreporting and under-reporting of catches in this area. These changes add to the reliability of the catch data and should improve the assessment, which is solely based on catch-at-age data. However, a few more years of consistent data under the current management regime will be necessary before it will be possible to produce reliable estimates of SSB and review the appropriateness of the reference points.

The management plan currently in place has led to a closure of this fishery in mid-February 2002, and it will not be re-opened until October 2002.

The high stock levels observed from 1984 to 1992 were the result of two abundant year classes in 1982 and 1986. Apart from these year classes recruitment has been relatively consistent over the time-series from 1970 to 2001.

Catch forecast for 2003: Given the uncertainty of the assessment no short-term forecasts were produced this year.

Comparison with previous assessment and advice: The provisional assessment gives a substantial change in perception from last year, suggesting a much greater SSB and lower F. This inconsistency reflects the instability and imprecision of stock size estimates from the assessments.

Elaboration and special comment: In the absence of tuning data the assessments have been carried out by assuming various terminal F values on the catch-at-age data. These assessments appear to have poorly estimated F. Tuning indices are necessary to gain precision in estimates.

Total catches have decreased since 1998 and have been in line with the TAC since 2000. An acoustic survey has been resumed on the stock, and commercial vessels have been equipped with data loggers to obtain information on the distribution of the stocks.

The Irish fishery, which constitutes 85% of the catch is operated on a closed season basis, and individual boat quota are applied. The Irish fishery was closed early in February 2002 by the Irish Northwest Pelagic Management Committee (NWPMC), based on scientific advice. The Irish NWPMC has stated the following management objectives: "*As regards the herring stock in this area the management policy of the Northwest Pelagic Management Committee is to rebuild the stock to above the* $\boldsymbol{B}_{pa}$ *level of 110 000 t. The time period over which this rebuilding process can be achieved will depend on annual catches and recruitment. In the longer term it is the policy of the committee to further rebuild the stock to the level at which it can sustain annual catches of around 25,000 t. This rebuilding process will be based on scientific advice. In the event of the stock remaining below the required level additional conservation measures will be implemented. It is the policy of the committee to* *ensure that adequate research is carried out, including sampling and surveys, to enable an accurate assessment of the stock*".

The fishery exploits a mixture of autumn- and winter/spring-spawning fish, which spawn from October to March. The winter/spring-spawning component is distributed in the northern part of the area. The main decline in the overall stock appears to have taken place on the autumn-spawning component, and this is particularly evident on the traditional spawning.

Source of information: ACFM Working Document and Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

Catch data (Tables 3.10.3.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Disc. slip.	ACFM Catch
1987	TAC	18	17	17	-	49
1988	TAC depending on whether 1987 TAC is taken	11–18	14	15	-	29
1989	TAC	15	20	21	1.0	29
1990	TAC depending on whether 1989 TAC is taken	25–27	27.5	28	2.5	44
1991	TAC	< 26	27.5	23	3.4	38
1992	TAC (including discards)	29	28	27	0.1	32
1993	Precautionary TAC (including discards)	29	28	30	0.3	37
1994	Precautionary TAC	28	28	27	0.7	34
1995	Precautionary TAC (including discards)	36	28	27	-	28
1996	If required, precautionary TAC	34	28	25	-	33
1997	Catches below 25	< 25	28	28	0.1	27
1998	Catches below 25	< 25	28	28	-	39
1999	F 70% of F(97)	19	21	18	-	26
2000	F 40% of F(98) =Proposed $\mathbf{F}_{pa}$	14	14	10	-	15
2001	F 40% of F(99) F = 0.2	14	14	13		14
2002	No increase in catches	14	14			
2003	No increase in catches	14				

[1]Weights in '000 t.

Herring in Divisions VIa (South) and VIIb,c

Herring in Divisions VIa (South) and VIIb,c

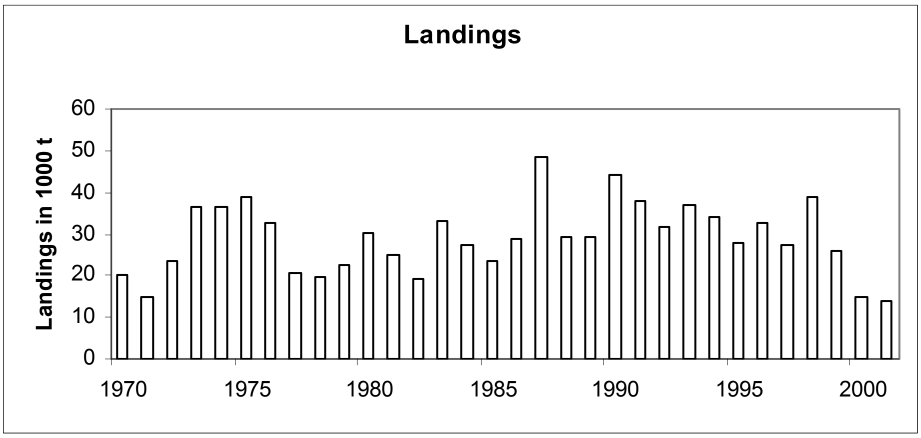


Table 3.10.3.1 Estimated herring catches in tonnes in Divisions VIa (South) and VIIb,c, 1988-2001.

These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1988	1989	1990	1991	1992	1993
France	-	-	+	-	-	-
Germany	-	-	-	-	250	-
Ireland	15,000	18,200	25,000	22,500	26,000	27,600
Netherlands	300	2,900	2,533	600	900	2,500
UK (N.Ireland)	-	-	80	-	-	-
UK (Eng.&Wales)	-	-	-	-	-	-
UK Scotland	-	+	-	+	-	200
Unallocated	13,800	7,100	13,826	11,200	4,600	6,250
Total landings	29,100	28,200	41,439	34,300	31,750	36,550
Discards	-	1,000	2,530	3,400	100	250
Total catch	29,100	29,200	43,969	37,700	31,850	36,800

Country	1994	1995	1996	1997	1998	1999
France	-	-	-	-	-	-
Germany	-	11	-		-	-
Ireland	24,400	25,450	23,800	24,400	25,200	16,325
Netherlands	2,500	1,207	1,800	3,400	2,500	1,868
UK (N.Ireland)	-	-	-		-	-
UK (Eng.&Wales)	50	24	-		-	-
UK (Scotland)	-	-	-		-	-
Unallocated	6,250	1,100	6,900	-700	11,200	7,916
Total landings	33,200	27,792	32,500	27,100	38,900	26,109
Discards	700	-	-	50	-	-
Total catch	33,900	27,792	32,500	27,150	38,900	26,109

Country	2000	2001[1]
France		
Germany		
Ireland	10,164	11,278
Netherlands	1,234	2,088
United Kingdom		
Unallocated	3,607	695
Total landings	15,005	14,061
Discards	-	-
Total catch	15,005	14,061

[1]Provisional according to text.

3.10.4 Plaice West of Ireland (Division VIIb,c)

State of stock/exploitation: The state of the stock in relation to biological reference points is not known. Catches have declined since 1995 to a historic low in 2001.

Management objectives: No explicit management objectives have been established for this stock.

Precautionary Approach Reference points: No precautionary reference points have been proposed for this stock.

Advice on management: ICES recommends that catches in 2003 be no more than the recent average (1998-2000) of around 160 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Relevant factors to be considered in management: Plaice are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for plaice should also take into consideration other demersal fish species and *Nephrops* taken in the VIIb,c fishery.

Comparison with previous assessment and advice: The assessment for this stock is preliminary. ICES gave no advice for this stock in 2001.

Elaboration and special comment: ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time-series of the data and tuning fleets were too short to make conclusions about the current stock status. Catch forecast for 2003 and medium- and long-term projections are not available.

Ireland is the major participant in this fishery with around 90% of the international landings between 1993-2001. Plaice are normally caught in mixed species otter trawl fisheries in Division VIIb. These vessels mainly target other demersal fish species and *Nephrops*.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

Catch data (Tables 3.10.4.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM landings
1993	-	-	-	197
1994	-	-	-	215
1995	-	-	-	315
1996	-	-	-	240
1997	-	-	-	213
1998	-	-	-	183
1999	-	-	-	172
2000	-	-	-	116
2001	-	-	240	87
2002	No advice	-	240	
2003	Reduce TAC to recent landings	200		

Table 3.10.4.1 Nominal Landings (t) of Plaice in Divisions VIIb,c 1993-2001, as officially reported to ICES.

	1993	1994	1995	1996	1997	1998	1999	2000	2001*
France	2	1	5	1	3		8*	22*	22*
Ireland	191	200	239	248	206	160	157	3	63
UK(Eng & Wales)	1	2	1	2		1			
UK(Scotland)	2	3	1				2		
Total	196	206	246	251	209	161	167	25	85
Unallocated	1	9	69	-11	4	22	5	91	2
Total figures as used by the Working Group	197	215	315	240	213	183	172	116	87

*Preliminary

3.10.5 Sole West of Ireland (Division VIIb,c)

State of stock/exploitation: The state of the stock in relation to biological reference points is not known. Catches have been relatively stable in recent years.

Management objectives: No explicit management objectives have been established for this stock.

Precautionary Approach Reference points: No precautionary reference points have been proposed for this stock.

Advice on management: ICES recommends that catches in 2003 be no more than the recent average (1993-2000) of around 65 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Relevant factors to be considered in management: Sole are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for sole should also take into consideration other demersal fish species and *Nephrops* taken in the VIIb, c fishery.

Catch forecast for 2003 and medium- and long-term projections are not available.

Comparison with previous assessment and advice: The assessment for this stock is preliminary. ICES gave no advice for this stock in 2001.

Elaboration and special comment: ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time-series of the data and tuning fleets were too short to make conclusions about the current stock status.

Ireland is the major participant in this fishery with 96% of the international landings between 1993-2001. Sole are normally caught in mixed species otter trawl fisheries in Division VIIb. These vessels mainly target other demersal fish species and *Nephrops*.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

Catch data (Table 3.10.5.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM landings
1993	-	-	-	60
1994	-	-	-	70
1995	-	-	-	59
1996	-	-	-	57
1997	-	-	-	55
1998	-	-	-	66
1999	-	-	-	72
2000	-	-	-	68
2001	-	-	80	60
2002	No advice	-	80	
2003	Reduce TAC to recent landings	65		

Table 3.10.5.1 Nominal Landings (t) of Sole in Divisions VIIb,c 1993-2001, as officially reported to ICES.

	1993	1994	1995	1996	1997	1998	1999	2000	2001
France	1	1	2	2	3		2*	2*	9*
Ireland	59	60	59	52	51	49	68	73	36
UK(E/W/NI)	+	+	+	+	1	+		+	
Unallocated									
Total	60	61	61	54	55	49	70	75	45
Unallocated		9	-2	3		17	2	-7	15
Total figures as used by the working group	60	70	59	57	55	66	72	68	60

*Preliminary

3.11 Stocks in the Iberian Region (Division VIIIc and Subareas IX and X)

3.11.1 Overview

The fisheries

The Iberian Region along the eastern Atlantic shelf is considered an upwelling area with high productivity; this phenomenon takes place during late spring and summer. The region is characterized by a large number of commercial and non-commercial fish species.

The fisheries are of a typical mixed nature. Different kinds of Spanish and Portuguese fleets operate: one is the mixed trawl fleet (single, pair, and crustacean trawlers) fishing for hake, blue whiting, horse mackerel, megrim, anglerfish, mackerel, *Nephrops*, bib, and cephalopods as the main species. Other fisheries are longliners fishing for hake and hand-line fishing for mackerel, fixed nets used for hake, anglerfish, and mackerel, and purse seiners, which mainly target sardine and anchovy, but also horse mackerel and mackerel.

Many bottom trawlers fish in the southern part of Division IXa (Gulf of Cadiz); these trawlers are smaller than those operating in the northern parts of the Iberian Region. The composition of their catches is also different. They are fishing for hake as well as crustaceans, mollusks, and cephalopods (*Octopus* etc.).

The number of trawlers has decreased since the early 1980s, resulting in a decreasing trend in the overall effort in the Portuguese and Spanish fleets. The number of boats in fleets operating gillnets and longlines has also declined in recent years. Spanish boats using trawl, longline, or fixed nets are currently subjected to a restricted entry system.

Two stocks of anchovy are considered in the Iberian Region, one in Subarea VIII and one in Division IXa. The Spanish and French fleets fishing for anchovy in Subarea VIII are well separated geographically and in time (the Spanish fleet operates mainly in Division VIIIc and VIIIb in spring and the French fleets in Division VIIIa in summer and autumn and in Division VIIIb in winter and summer). Changes in the catch-at-age composition between the 1984–1996 period and the earlier years could be related to a higher dependence of catches on recruitment in recent years and a change in the seasonality in this fishery. The number of Spanish purse seiners for anchovy has remained stable since 1990 and a slight increase in the number of French purse seiners has been observed in the last five years. A sharp increase in fishing effort for anchovy in the Bay of Biscay has occurred since 1987 mainly due to the increased effort in the French pelagic trawl fleet.

Traditionally the anchovy fishery in Division IXa is located in the Gulf of Cadiz (Subdivision IXa South). However, in 1995 the bulk of the fishery was located to the North of Portugal and to the West of Galicia (Subdivision IXa North) and was very reduced in the Gulf of Cadiz, owing to exceptional availability of anchovy in the northern part of Division IXa. In recent years the bulk of the anchovy fishery in IXa has again been located in the Gulf of Cadiz.

In Divisions VIIIc (East) and VIIIb the target species for the purse seine fleet change with the season – anchovy in spring and tuna in the summer. This fleet changes gear and uses trolling and bait boats to catch tuna.

The catches of horse mackerel in Divisions VIIIc and IXa have been relatively stable over the last ten years. The proportion of landings by different gears has changed, i.e., trawl catches are decreasing while the purse seine catches are increasing.

During the 1990s the purse seine fleets in Divisions VIIIc West, normally directed at sardine redirected their effort to horse mackerel because of lower availability of sardine in VIIIc West than during the 1980s.

Mackerel is a target species for the hand line fleet during the spawning season in Division VIIIc, during which about one third of the total catches are taken. It is also taken as a by-catch by the trawl fleets in Division VIIIc and IXa. The highest catches (80%) from the southern component are taken mainly from Division VIIIc in the first half of the year and consist of adult fish. In the second half of the year, catches consist of juveniles and are mainly taken in Division IXa, as by-catches of the trawl fisheries. Catches from the southern component have been increasing in recent years and in 1998 and 1999 reached a maximum of 44 000 t each year.

Management measures

The fisheries in the Iberian Region are managed by a TAC system and technical measures. In 2000 a new EU regulation was established. Common mesh sizes for trawlers are 40 mm (blue whiting or horse mackerel), 55 mm (shrimp), and 70 mm (hake and *Nephrops*). Other technical conservation measures are minimum landing sizes and seasonal area closures to protect juvenile hake.

At national level there are management measures to limit the number of crustacean vessels. Management measures are also enforced in the sardine fishery for restriction of days of absence from the ports, number of purse seiners in activity, annual catch restrictions, and seasonal closures. A minimum landing size is enforced at the international level and the minimum landing size for rose shrimp is more restrictive.

A TAC for southern mackerel is in place, as a part of the Northeast Atlantic mackerel TAC.

In recent years data quality has improved, including landing statistics and length composition, notably in the Gulf of Cadiz. Routine estimates of discards are only available for Northern Spanish waters in 1994 and in 1999. For most of the stocks the sampling level of the landings is considered adequate for assessment purposes. The low level of samples of discards, particularly of undersized hake, is considered a problem.

The Iberian Region is an important nursery ground for hake, sardine, horse mackerel, and blue whiting. Catches of fleets operating gears with low selectivity therefore contain significant quantities of juvenile fish.

State of stocks

The stock of hake is outside safe biological limits. SSB decreased very sharply between 1982 and 1986 and gradually decreased until 1998 and has slightly increased since then.

The combined anglerfish stocks (*Lophius piscatorius* and *Lophius budegassa*) are outside safe biological limits. Recently, fishing mortality has been decreasing.

The state of both megrim stocks (*Lepidorhombus boscii* and *Lepidorhombus whiffiagonis*) are unknown. Fishing mortality for both species has generally declined during the 1990s.

All *Nephrops* stocks in Divisions VIIIc and IXa are seriously over-exploited. Age-based assessments give evidence of a sharp decline in recruitment and biomass. Further depletion of the stocks in these areas can only be halted by substantial reductions in the fishing mortality.

The status of the southern horse mackerel (*Trachurus trachurus*) stock is unknown. There are, however, indications that SSB and F have been stable over a long period and that the stock can sustain the present catch level.

The state of the sardine stock in relation to precautionary reference points is unknown. Different assessment methods lead to different perceptions as to the absolute levels of stock abundance and fishing mortality, but all indicate that the stock biomass has increased from a historical low. There are large variations in recruitment and stock size is strongly dependant on the incoming year class. There is incomplete knowledge of the environmental factors affecting recruitment. The 2000 year class appears to be strong, and there are indications that the 2001 year class is of average strength.

The Bay of Biscay (VIII) anchovy stock is inside safe biological limits in 2002. The Spawning Stock Biomass is above $\mathbf{B}_{pa}$, and the fishing mortality has remained well below $\mathbf{F}_{pa}$ in recent years. In the absence of PA reference points, the state of anchovy in Division IXa is unknown.

The southern mackerel component is about 12-21% of the Northeast Atlantic mackerel. Egg surveys indicate large fluctuations of the relative share on the SSB of the Northeast Atlantic mackerel stock. Further elaboration on this widely distributed stock is given in Section 3.12.

3.11.2 Hake - Southern stock (Divisions VIIIc and IXa)

State of stock/exploitation: The stock is outside safe biological limits. SSB decreased sharply between 1982 and 1986, then gradually until 1998 and has slightly increased since then, but has remained below $\mathbf{B}_{lim}$ since 1994. Fishing mortality has been variable at, or about $\mathbf{F}_{lim}$ since 1983. Mean recruitment in the 1990s has been well below the average prior to this period.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 2000):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 20 500 t	$\mathbf{B}_{pa}$ be set at 33 600 t
$\mathbf{F}_{lim}$ is 0.45	$\mathbf{F}_{pa}$ be set at 0.27

Technical basis:

$\mathbf{B}_{lim}$ = $\mathbf{B}_{loss}$ the lowest observed spawning stock biomass	$\mathbf{B}_{pa}$ ~ $\mathbf{B}_{lim}$ x 1.64
$\mathbf{F}_{lim}$ = $\mathbf{F}_{loss}$ the fishing mortality above which the stock dynamics are unknown	$\mathbf{F}_{pa}$~ $\mathbf{F}_{lim}$ x 0.61

Advice on management: In order to rebuild the stock, ICES recommends that fishing mortality should be as close to zero as practicable. Stocks managed in conjunction with the major fisheries for this species should be managed accordingly to limit the catch of hake to the greatest possible extent. A rebuilding plan with such measures probably will have to be in place for several years, because even a reduction in F of 50% will not allow SSB to reach $\mathbf{B}_{pa}$ in the short term.

Relevant factors to be considered in management: The assessment remains uncertain, and the quality of commercial data suggests than it is unlikely that estimates of biomass and fishing mortality will become accurate and precise in the near future. Nonetheless, all indicators suggest that for the past decade the stock has been at a biomass where only poor recruitment is produced, is incapable of rebuilding strongly at current exploitation rates, and the major sources of uncertainty in the assessment are all more likely to produce an assessment with an optimistic bias than one with a pessimistic bias.

The catches in most of the years of the series did not reach the TACs.

In order to protect juveniles, fishing is prohibited in some areas during part of the year.

Hake is taken in a mixed species trawl fishery, and the management of other stocks such as horse mackerel, megrim, anglerfish, and *Nephrops* needs to be taken into account when considering the requirements of the hake stock.

Catch forecast for 2003:

Basis: F(2002) = $\mathbf{F}_{sq}$ = F(99-01) = 0.44 ; Landings(2002) = 8.1 ; SSB(2003) = 17.3 .

F(2003) onwards	Basis	Landings (2003)	SSB (2004)
0	0 * $\mathbf{F}_{sq}$	0	26.3
0.17	0.4 * $\mathbf{F}_{sq}$	3.7	22.3
0.22	0.5 * $\mathbf{F}_{sq}$	4.6	21.4
0.26	0.6 * $\mathbf{F}_{sq}$	5.4	20.6
0.27	$\mathbf{F}_{pa}$	5.5	20.4
0.35	0.8 * $\mathbf{F}_{sq}$	6.9	19.0
0.44	$\mathbf{F}_{sq}$	8.3	17.6
0.52	1.2 * $\mathbf{F}_{sq}$	9.6	16.3

Weights in ‘000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: Last year it was stated that the assessment might be optimistic. This year’s assessment is considered more realistic than last year’s since more information is included in the model (more commercial fleets), fleets data are more in agreement with model assumptions and the contribution of commercial fleets to estimate the survivors in older ages is higher which is in agreement with information from the fisheries. Resulting changes as compared to last year’s assessment are considerable:

SSB and R were revised downward and F upward for the last decade.

Elaboration and special comment: This assessment is still considered uncertain. There are serious concerns about the data quality and a number of issues need to be addressed such as the stock identity, especially in the Gulf of Cadiz area, and discard information which has never been used in the assessment. Consequently, fishing mortalities on the recruiting year classes could not be estimated.

Spanish and Portuguese fleets exploit this stock in a mixed fishery using trawls, gillnets, and long lines.

Analytical assessment using commercial CPUE and survey data. Information from surveys at age 0 is included. The stock-recruitment relationship is driven by the high values of earlier years, since the recent values are clustered and do not show a clear relationship. Combined age-length keys are used prior to 1993.

Hake landings from the Gulf of Cadiz represent about 10 % of the total hake landings. Length distributions for landings by trawlers operating in the Gulf of Cadiz have been available since 1994 and show large amounts of very small fish. Since this time-series is shorter than the data series available for the total stock, these length distributions have not been incorporated in the assessment since this would create an artificial increase in recruitment around that time. The origin of this population is questioned since these small fish cannot be found elsewhere when becoming older.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

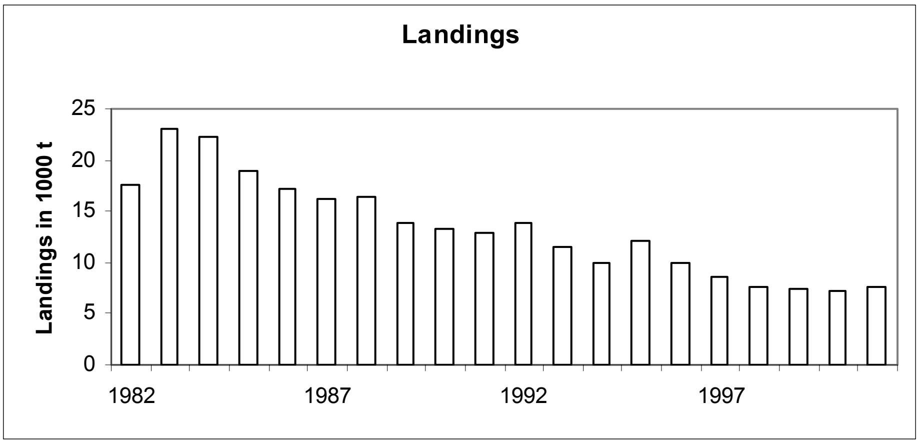
Yield and spawning biomass per Recruit
F-reference points:

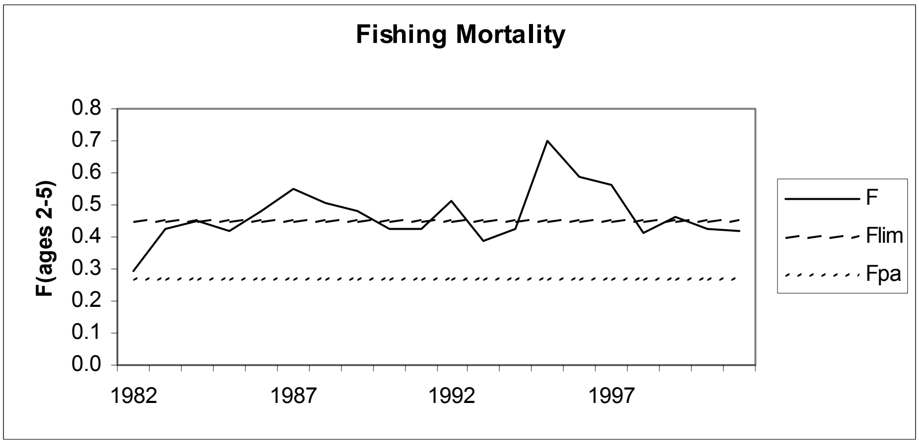
	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	0.435	0.170	0.355
$\mathbf{F}_{max}$	0.248	0.184	0.752
$\mathbf{F}_{0.1}$	0.154	0.173	1.191
$\mathbf{F}_{med}$	0.460	0.168	0.326

Catch data (Tables 3.11.2.1-2):

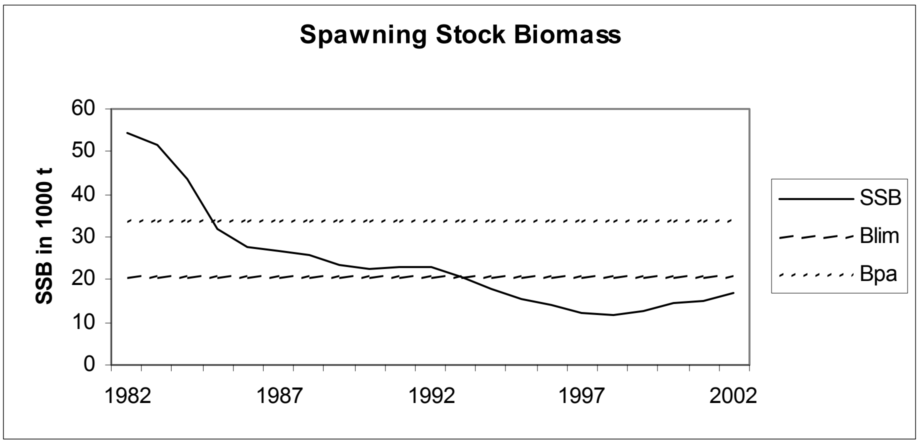
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Landings
1987	Precautionary TAC; juvenile protection	15.0	25.0	16.2
1988	TAC; juvenile protection	15.0	25.0	16.4
1989	TAC; juvenile protection	15.0	20.0	13.8
1990	TAC; juvenile protection	15.0	20.0	13.2
1991	Precautionary TAC	10.0	18.0	12.8
1992	Precautionary TAC	10.3	16.0	13.8
1993	F = 10% of F 91	1.0	12.0	11.5
1994	F lowest possible at least reduced by 80%	2.0	11.5	9.9
1995	F lowest possible	-	8.5	12.2
1996	F lowest possible	-	9.0	9.9
1997	F lowest possible	-	9.0	8.5
1998	60% reduction in F	4.0	8.2	7.7
1999	Reduce F below $\mathbf{F}_{pa}$	9.5	9.0	7.5
2000	20% reduction from 1994-98 average landings	< 7.7	8.5	7.3
2001	Reduce F below $\mathbf{F}_{pa}$; no increase in landings	8.5	8.9	7.6
2002	F below $\mathbf{F}_{pa}$	< 8.0	8.0	
2003	Lowest possible catch / rebuilding plan	0		

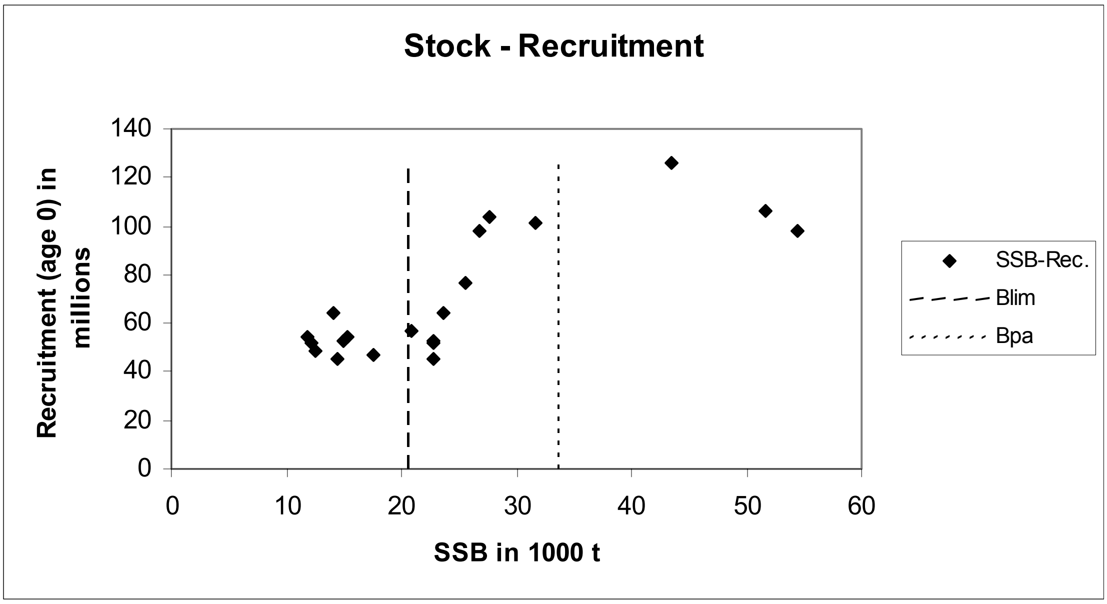
Weights in '000 t.

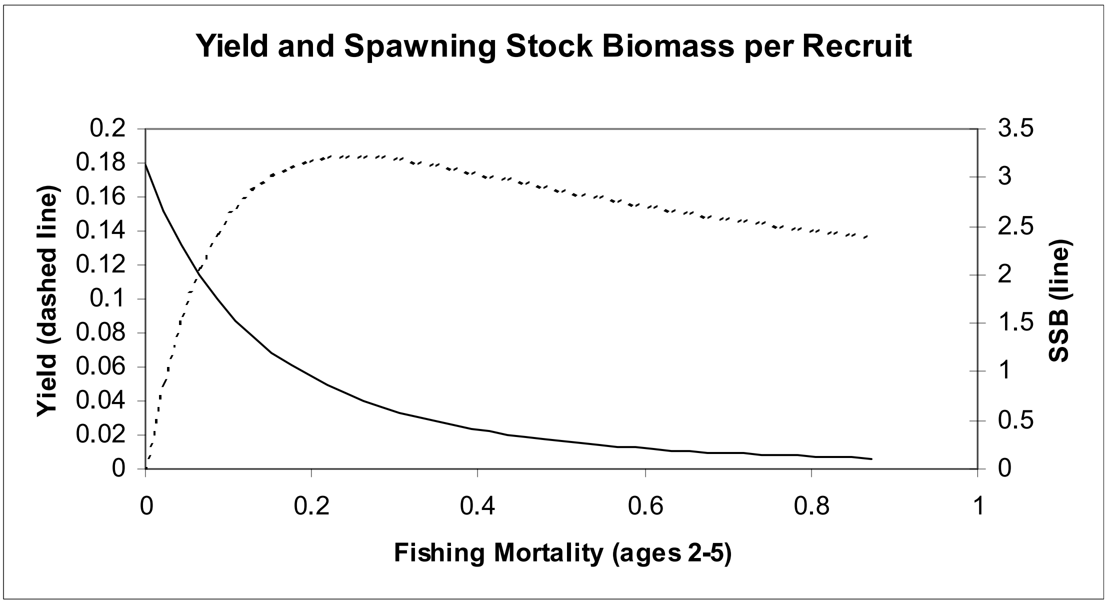

Landings
Landings in 1000 t
0
5
10
15
20
25
1982
1987
1992
1997


Fishing Mortality
F(ages 2-5)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1982
1987
1992
1997
F
Flim
Fpa


Recruitment (age 0)
Recruitment in millions
0
20
40
60
80
100
120
140
1982
1987
1992
1997


Spawning Stock Biomass
SSB in 1000 t
0
10
20
30
40
50
60
1982
1987
1992
1997
2002
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 0) in millions
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-5)

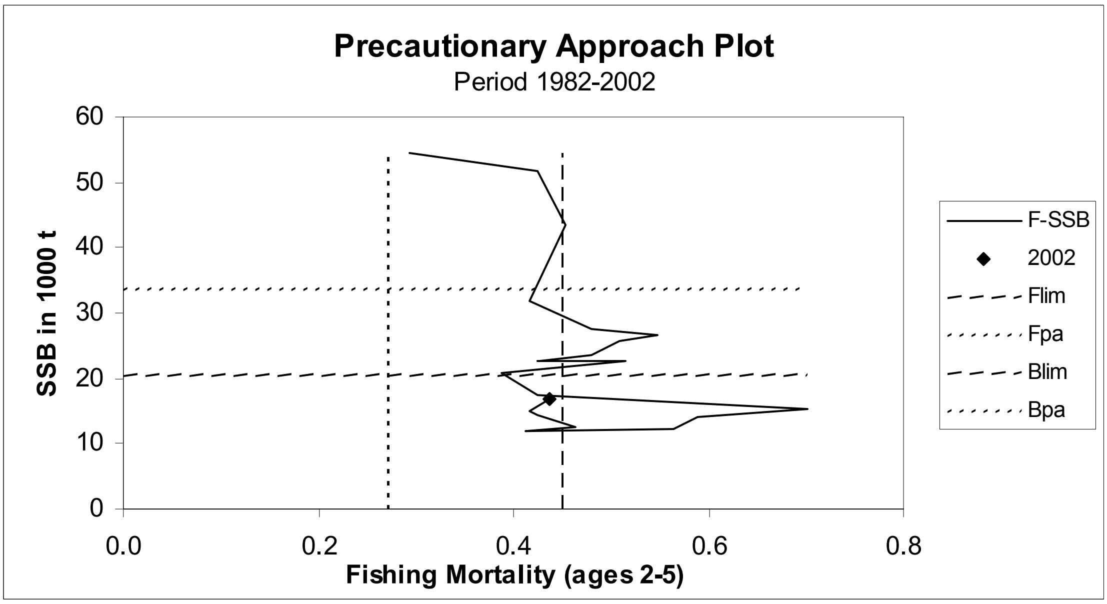

Precautionary Approach Plot
Period 1982-2002
SSB in 1000 t
Fishing Mortality (ages 2-5)
F-SSB
2002
Flim
Fpa
Blim
Bpa

Table 3.11.2.1 Landing estimates (´000 t) for the Southern Hake stock (Divisions VIIIc and IXa) by country and gear as determined by the Working Group, 1972–2001.

Year	Spain							Portugal			France	Total
	Gillnet[1]	Small Gillnet	Longline	Artisanal Unal-located	Total Artisanal	Trawl[2]	Total	Artisanal	Trawl	Total		Stock
1972	-	-	-	-	7.1	10.2	17.3	4.7	4.1	8.8	-	26.1
1973	-	-	-	-	8.5	12.3	20.8	6.5	7.3	13.8	0.2	34.8
1974	2.6	1.0	2.2	-	5.8	8.3	14.1	5.1	3.5	8.6	0.1	22.8
1975	3.5	1.3	3.0	-	7.8	11.2	19.0	6.1	4.3	10.4	0.1	29.5
1976	3.1	1.2	2.6	-	6.9	10.0	16.9	6.0	3.1	9.1	0.1	26.1
1977	1.5	0.6	1.3	-	3.4	5.8	9.2	4.5	1.6	6.1	0.2	15.5
1978	1.4	0.1	2.1	-	3.6	4.9	8.5	3.4	1.4	4.8	0.1	13.4
1979	1.7	0.2	2.1	-	4.0	7.2	11.2	3.9	1.9	5.8	-	17.0
1980	2.2	0.2	5.0	-	7.4	5.3	12.7	4.5	2.3	6.8	-	19.5
1981	1.5	0.3	4.6	-	6.4	4.1	10.5	4.1	1.9	6.0	-	16.5
1982	1.2	0.3	4.2	-	5.7	4.4	10.1	5.0	2.5	7.5	-	17.6
1983	2.1	0.4	6.6	-	9.0	5.9	14.9	5.2	2.9	8.0	-	23.0
1984	2.3	0.3	7.5	-	10.1	6.5	16.7	4.3	1.2	5.5	-	22.2
1985	1.8	0.8	4.4	-	7.0	6.1	13.1	3.8	2.1	5.8	-	18.9
1986	2.1	0.8	3.5	-	6.4	5.8	12.2	3.2	1.8	4.9	0.0	17.2
1987	2.0	0.5	4.4	-	6.9	4.5	11.4	3.5	1.3	4.8	0.0	16.2
1988	2.0	0.7	3.0	-	5.6	4.7	10.4	4.3	1.7	6.0	0.0	16.4
1989	1.9	0.6	2.0	-	4.4	4.8	9.2	2.7	1.8	4.6	0.0	13.8
1990	1.7	0.6	2.1	-	4.4	5.3	9.8	2.3	1.1	3.4	0.0	13.2
1991	1.4	0.4	2.2	-	4.0	4.8	8.9	2.7	1.2	4.0	0.0	12.8
1992	1.5	0.4	2.1	-	3.9	4.8	8.7	3.8	1.3	5.1	-	13.8
1993	1.3	0.4	2.8	-	4.4	3.2	7.6	3.0	0.9	3.9	-	11.5
1994	1.9	0.4	1.5	-	3.7	3.0	6.8	2.3	0.8	3.1	-	9.9
1995	1.6	0.4	1.0	-	2.9	5.7	8.7	2.6	1.0	3.6	-	12.2
1996	1.2	0.2	1.0	-	2.4	4.6	7.0	2.0	0.9	2.9	-	9.9
1997	1.1	0.3	0.8	-	2.2	4.0	6.1	1.5	0.9	2.4	-	8.5
1998	0.8	0.3	0.6	-	1.7	3.4	5.1	1.7	0.9	2.6	-	7.7
1999	0.6	0.2	0.3	0.2	1.3	3.0	4.3	2.1	1.1	3.2	-	7.5
2000	0.9	0.1	0.1	0.1	1.3	2.8	4.1	2.1	1.2	3.3	-	7.3
2001	0.6	0.2	0.1	0.1	1.0	3.4	4.4	1.2	2.0	3.2	-	7.6

[1] Gulf of Cadiz landings included since 1993.

[2] Gulf of Cadiz landings included since 1982.

Table 3.11.2.2 Hake - Southern stock (Divisions VIIIc and IXa)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1982	98000	54400	17600	0.294
1983	106000	51700	23000	0.424
1984	126000	43400	22200	0.453
1985	101000	31700	18900	0.417
1986	104000	27600	17200	0.479
1987	98000	26700	16200	0.548
1988	77000	25600	16400	0.509
1989	64000	23600	13800	0.480
1990	53000	22700	13200	0.427
1991	45000	22800	12800	0.425
1992	52000	22800	13800	0.514
1993	57000	20800	11500	0.388
1994	47000	17600	9900	0.424
1995	54000	15300	12200	0.701
1996	64000	14000	9900	0.588
1997	52000	12100	8500	0.564
1998	54000	11800	7700	0.413
1999	49000	12600	7500	0.464
2000	45000	14400	7300	0.425
2001	53000*	14900	7600	0.417
2002	53000*	16800		0.436
Average	69143	23967	13360	0.466

* GM 89-00

3.11.3 Megrim in Divisions VIIIc and IXa (*L. boscii* and *L. whiffiagonis*)

State of stocks/exploitation: The state of these stocks in relation to precautionary reference points is not known. SSB of both species has decreased from the late 1980s until 1995, then has increased slightly for *Lepidorhombus boscii* and has remained stable at a low level for *Lepidorhombus whiffiagonis*. Fishing mortality for both species has generally declined during the 1990s. Recruitment has been below average since 1997 for *L. whiffiagonis*, while for *L. boscii* recruitment is currently close to average.

Management objectives: There are no explicit management objectives for these stocks.

Precautionary Approach Reference Points: No reference points have been proposed.

Advice on management: ICES recommends that F should not be increased above recent levels (0.17 and 0.21, respectively) for both species; at these levels SSB has been stable or possibly slightly increasing. This corresponds to landings in 2003 of less than 1 230 t for *L. boscii* and less than 320 t for *L. whiffiagonis*.

Relevant factors to be considered in management: The TAC covers both megrim species (*L. boscii* and *L. whiffiagonis*) and has been set well above actual catches in recent years. Both megrim species are caught together in fisheries, which also take a large number of other commercial species, including southern hake.

Catch forecast for 2003:

L. boscii: Basis: F(2002) = $\mathbf{F}_{sq}$ = F(99–01) = $\mathbf{F}_{sq}$ = 0.17; Landings (2002) = 1.15; SSB(2003) = 7.01

F(2003) onwards	Basis	Landings (2003)	SSB (2004)
0.14	0.8 * $\mathbf{F}_{sq}$	1.01	7.32
0.17	1.0 * $\mathbf{F}_{sq}$	1.23	7.08
0.21	1.2 * $\mathbf{F}_{sq}$	1.44	6.86

Weights in '000 t.

L. whiffiagonis: Basis: F (2002) = F (99–01) $\mathbf{F}_{sq}$ = 0.21; Landings (2002) = 0.31; SSB(2003) = 1.52

F(2003) onwards	Basis	Landings (2003)	SSB (2004)
0.17	0.8 F_{99-01}	0.26	1.62
0.21	1.0 F_{99-01}	0.32	1.56
0.25	1.2 F_{99-01}	0.37	1.50

Weights in '000 t. There are no Precautionary Reference points, and hence no shading was applied.

Medium- and long-term projections: Medium-term projections were carried out for *L. boscii*, and the results suggest that fishing at *status quo* leads to an increase in SSB for the whole projection period.

Comparison with previous assessment and advice: For *L. boscii*, the values of F estimated are closed to those estimated last year (slight upwards revision in the early period, and downwards revision in recent years). SSB has been revised slightly downwards before 1993 (by less than 5%), and slightly upwards since then (+7% for 2000). For *L. whiffiagonis* the trends in SSB, F, and R are similar to last year's assessment. The advice is similar to last year's advice.

Elaboration and special comment: Megrim species are generally taken as a by-catch in mixed fisheries by Portuguese and Spanish trawlers, and also in small quantities by the Portuguese artisanal fleet. *L. boscii* accounts for about 70–90% of combined megrim landings. *L. boscii* is distributed equally in Divisions VIIIc and IXa. *L whiffiagonis* is also distributed in both Divisions, but with its highest abundance in Division VIIIc.

Total landings data for these stocks are not available prior to 1986. However, some Spanish ports have longer landing series for both species, and the Spanish survey provides abundance indices since 1983. These data sources indicate stable, but low, abundance up to 1986, increasing sharply to 1990, and decreasing again to the low level observed in the initial years. The majority of the catches are taken by Spanish trawlers. As megrims are always a by-catch for the fleets targeting "white fish", operating in these areas, the decreasing catch on hake has modified the target species of the fleets. The fleets now focus on other species such as blue whiting, horse mackerel, or mackerel and do not catch megrim. This has reduced the effort on megrim species. A shifting of the exploitation to pair trawlers and VHVO that do not catch megrims, has also reduced the effort on these species. In Divisions VIIIc and IXa the peak spawning period of both megrim species is in March.

Age-based analytical assessment tuned with survey data only for *L. boscii*, and including commercial CPUE for *L. whiffiagonis*.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

Four-spot megrim (*L. Boscii*)
Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 2-4	Yield/R	SSB/R
Average Current	0.316	0.052	0.289
$\mathbf{F}_{max}$	0.331	0.054	0.210
$\mathbf{F}_{0.1}$	0.114	0.048	0.353
$\mathbf{F}_{med}$	0.312	0.054	0.216

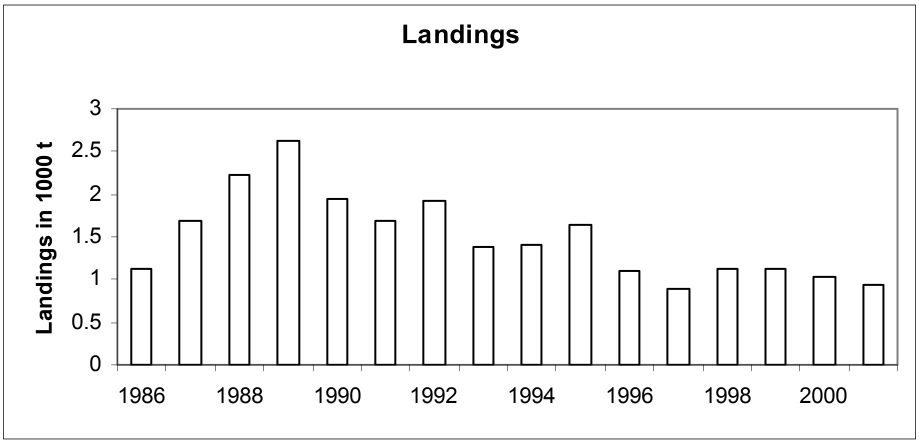
Megrim (*L. Whiffiagonis*)
Yield and spawning biomass per Recruit
F-reference points:

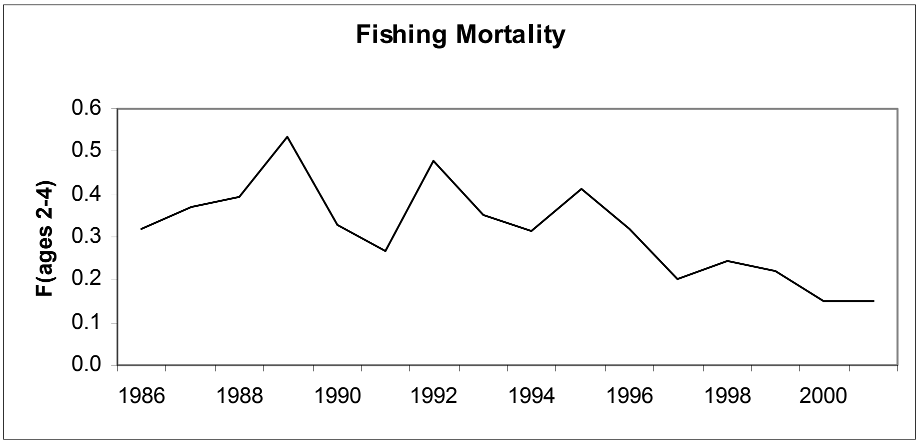
	Fish Mort Ages 2-4	Yield/R	SSB/R
Average Current	0.327	0.061	0.285
$\mathbf{F}_{max}$	0.267	0.061	0.250
$\mathbf{F}_{0.1}$	0.113	0.055	0.397
$\mathbf{F}_{med}$	0.372	0.060	0.209

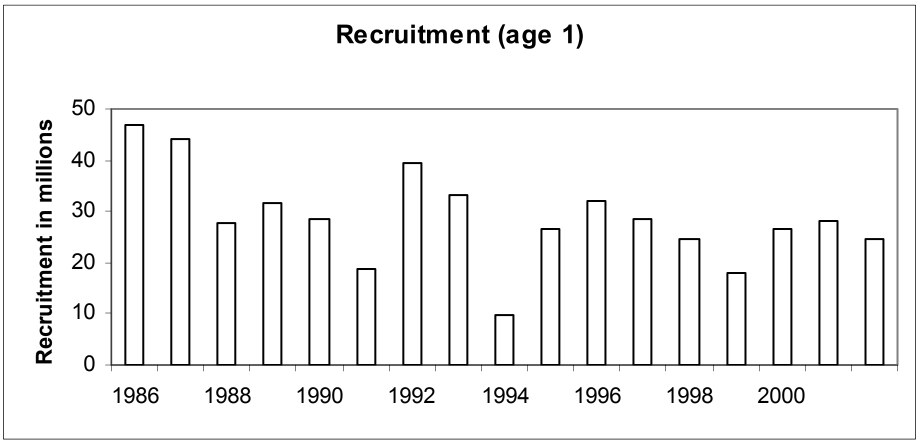
Catch data (Tables 3.11.3.1-4):

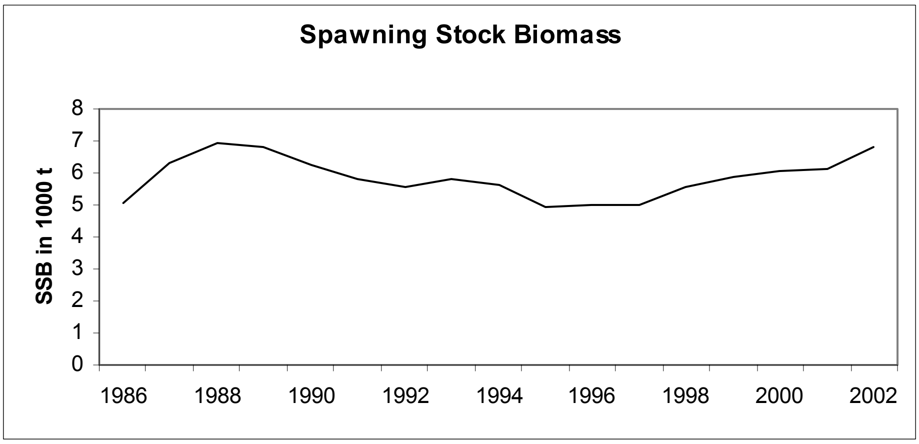
Year	ICES Advice	Predicted catch corresp. to advice[1]	Agreed TAC[1]	ACFM landings[1]	Landings *L. boscii*	Landings *L. whiff.*
1987	Not dealt with	-	13.0	2.19	1.69	0.50
1988	Not dealt with	-	13.0	3.04	2.22	0.82
1989	Not dealt with	-	13.0	3.34	2.63	0.71
1990	Not dealt with	-	13.0	2.93	1.95	0.98
1991	No advice	-	14.3	2.29	1.68	0.61
1992	No advice	-	14.3	2.44	1.92	0.52
1993	*L. boscii* no long-term gain in increasing F, *L. whiff* within safe biological limits	-	8.0	1.76	1.38	0.38
1994	No long-term gains in increasing F	-	6.0	1.88	1.40	0.48
1995	Concern about low SSB	-	6.0	1.87	1.65	0.22
1996	Mixed fishing aspects	-	6.0	1.43	1.10	0.33
1997	Reduce F by at least 50%	-	6.0	1.25	0.90	0.36
1998	Reduce F by at least 50%	0.9	6.0	1.57	1.12	0.45
1999	Reduce F by at least 50%	1.0	6.0	1.46	1.12	0.35
2000	Reduce F by at least 20%	< 1.5	5.0	1.29	1.04	0.25
2001	No increase in F	1.61	5.0	1.11	0.93	0.18
2002	No increase in F	1.55	4.0			
2003	No increase in F	1.55				

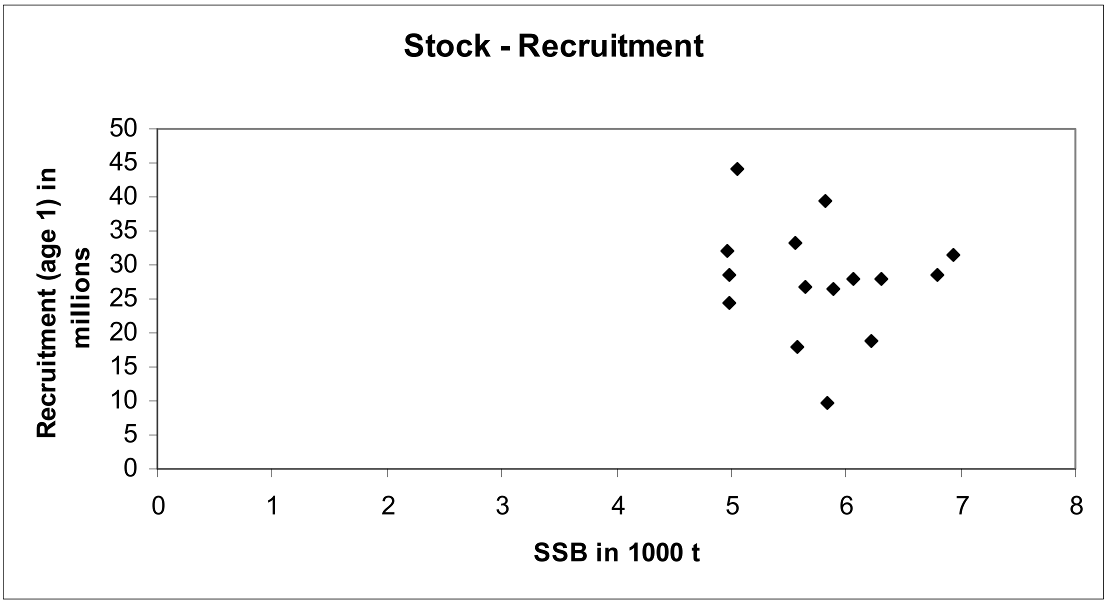
[1] *L. whiffiagonis*+ *L. boscii*. Weights in '000 t.

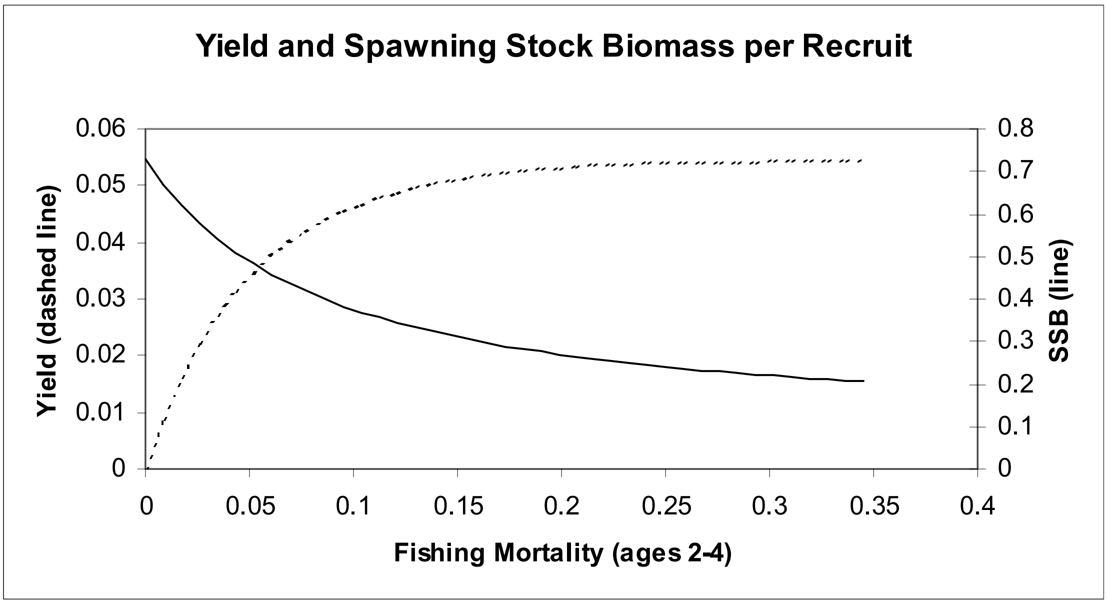

Landings
Landings in 1000 t
3
2.5
2
1.5
1
0.5
0
1986
1988
1990
1992
1994
1996
1998
2000

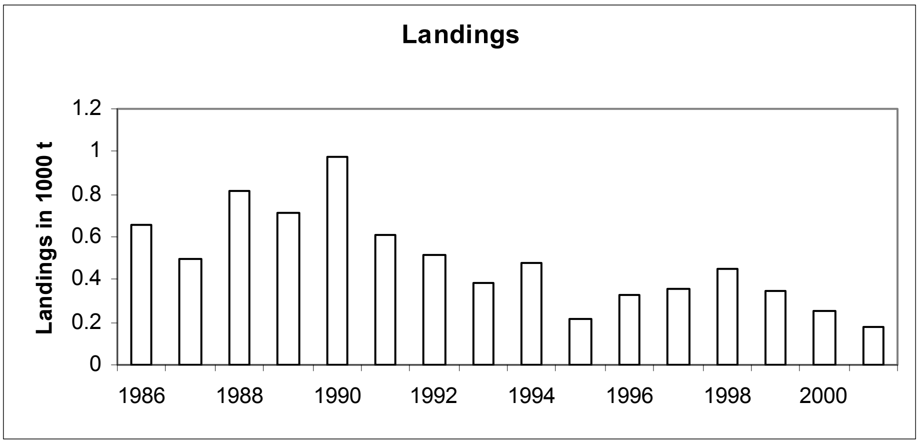

Fishing Mortality
F(ages 2-4)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1986
1988
1990
1992
1994
1996
1998
2000

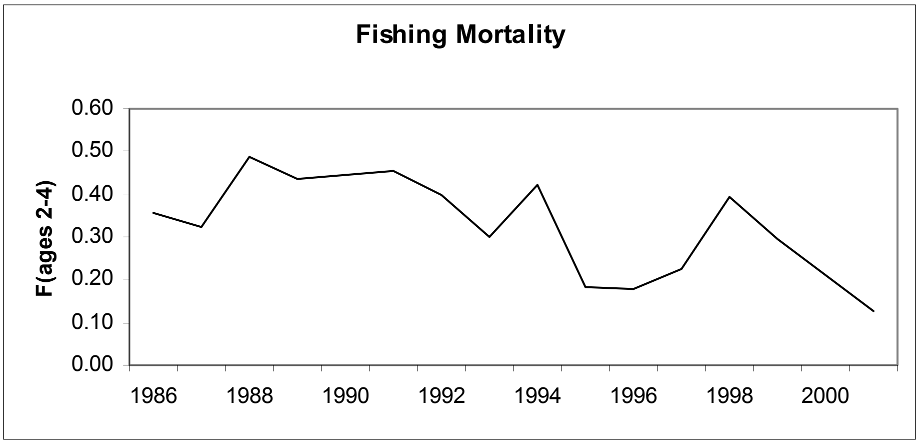

Recruitment (age 1)
Recruitment in millions
50
40
30
20
10
0
1986
1988
1990
1992
1994
1996
1998
2000

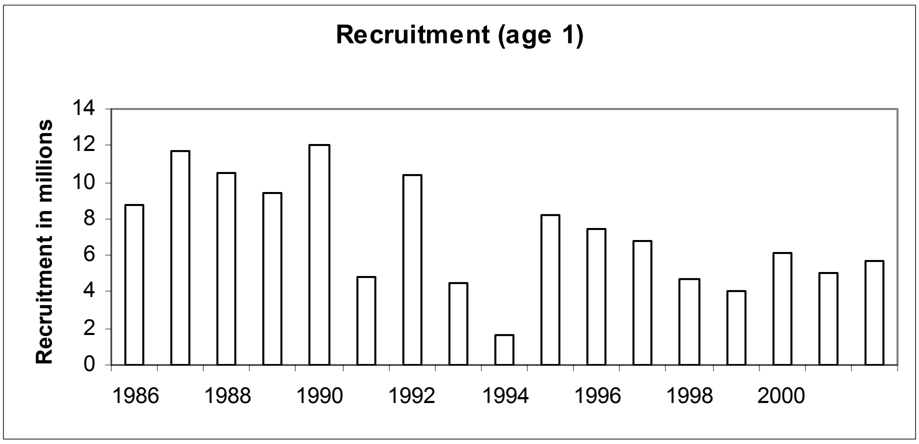

Spawning Stock Biomass
SSB in 1000 t
8
7
6
5
4
3
2
1
0
1986
1988
1990
1992
1994
1996
1998
2000
2002

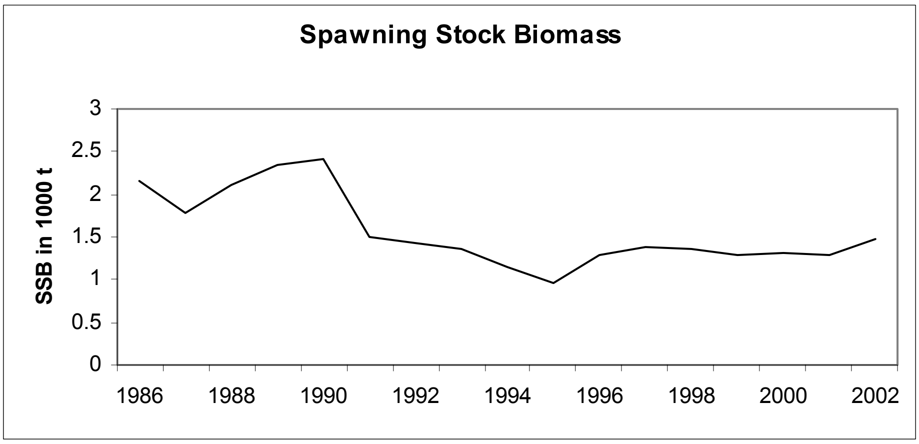

Stock - Recruitment
Recruitment (age 1) in millions
50
45
40
35
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
SSB in 1000 t

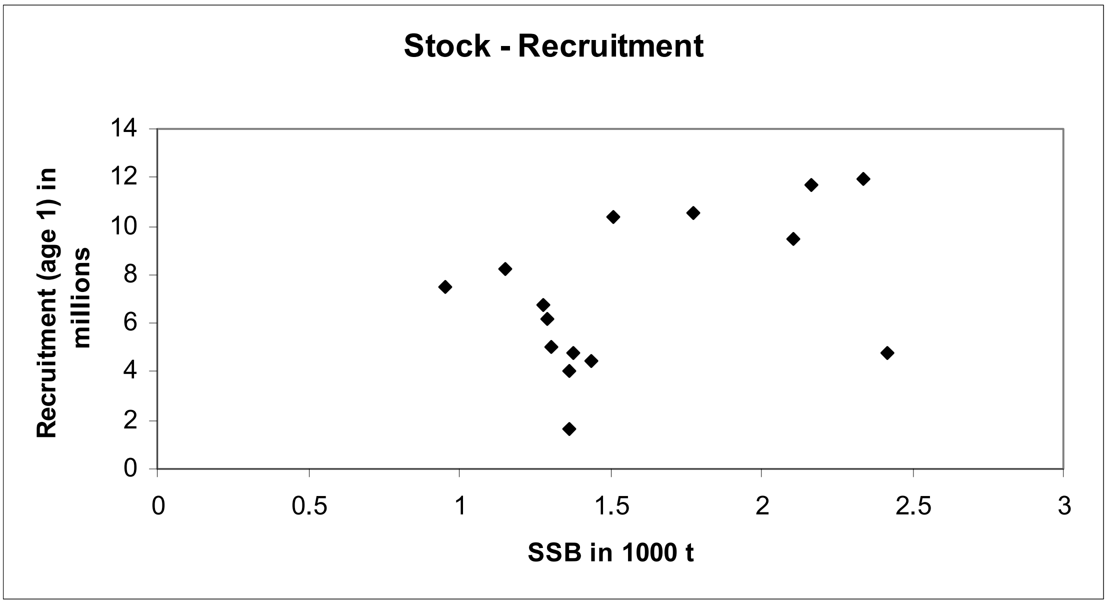

Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.06
0.05
0.04
0.03
0.02
0.01
0
SSB (line)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Fishing Mortality (ages 2-4)


Landings
Landings in 1000 t
1.2
1
0.8
0.6
0.4
0.2
0
1986
1988
1990
1992
1994
1996
1998
2000

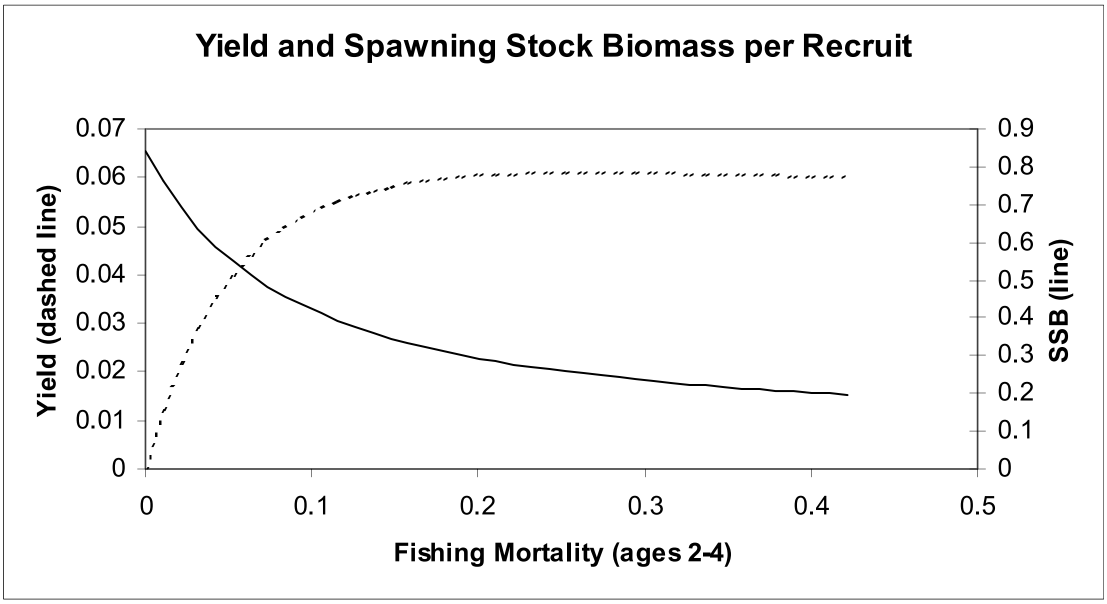

Fishing Mortality
F(ages 2-4)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1986
1988
1990
1992
1994
1996
1998
2000


Recruitment (age 1)
Recruitment in millions
14
12
10
8
6
4
2
0
1986
1988
1990
1992
1994
1996
1998
2000


Spawning Stock Biomass
SSB in 1000 t
3
2.5
2
1.5
1
0.5
0
1986
1988
1990
1992
1994
1996
1998
2000
2002



Stock - Recruitment
Recruitment (age 1) in millions
SSB in 1000 t
0
2
4
6
8
10
12
14
0
0.5
1
1.5
2
2.5
3



Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
SSB (line)
Fishing Mortality (ages 2-4)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
0.1
0.2
0.3
0.4
0.5

Table 3.11.3.1 Four-spot megrim (*L. boscii*) in Divisions VIIIc and IXa. Total landings (t).

	Spain			Portugal	Total
Year	VIIIc	IXa	Total	IXa	VIIIc, IXa
1986	799	197	996	128	1124
1987	995	586	1581	107	1688
1988	917	1099	2016	207	2223
1989	805	1548	2353	276	2629
1990	927	798	1725	220	1945
1991	841	634	1475	207	1682
1992	654	938	1592	324	1916
1993	744	419	1163	221	1384
1994	665	561	1227	176	1403
1995	685	826	1512	141	1652
1996	480	448	928	170	1098
1997	505	289	794	101	896
1998	725	284	1010	113	1123
1999	713	298	1011	104	1115
2000	674	225	899	141	1040
2001	629	177	807	121	927

Table 3.11.3.2 Megrim (*L. whiffiagonis*) in Divisions VIIIc and IXa. Total landings (t).

	Spain			Portugal	Total
Year	VIIIc	IXa	Total	IXa	VIIIc, IXa
1986	508	98	606	53	659
1987	404	46	450	47	497
1988	657	59	716	101	817
1989	533	45	578	136	714
1990	841	25	866	111	977
1991	494	16	510	104	614
1992	474	5	479	37	516
1993	338	7	345	38	383
1994	440	8	448	31	479
1995	173	20	193	25	218
1996	283	21	305	24	329
1997	298	12	310	46	356
1998	372	8	380	66	446
1999	332	4	336	12	348
2000	238	5	243	11	254
2001	167	2	169	9	178

Table 3.11.3.3 Megrim (*L. boscii*) in Divisions VIIIc and IXa.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-4
1986	46976	5058	1124	0.319
1987	44142	6313	1688	0.369
1988	27877	6929	2223	0.395
1989	31487	6803	2629	0.536
1990	28597	6223	1945	0.328
1991	18731	5825	1682	0.268
1992	39270	5555	1916	0.479
1993	33257	5838	1384	0.352
1994	9833	5650	1403	0.315
1995	26715	4967	1652	0.413
1996	32202	4977	1098	0.317
1997	28607	4984	896	0.201
1998	24491	5574	1123	0.242
1999	18031	5897	1115	0.219
2000	26411	6065	1040	0.152
2001	28088	6117	927	0.148
2002	24575*	6785		0.173
Average	28782	5856	1490	0.307

* GM 90-00

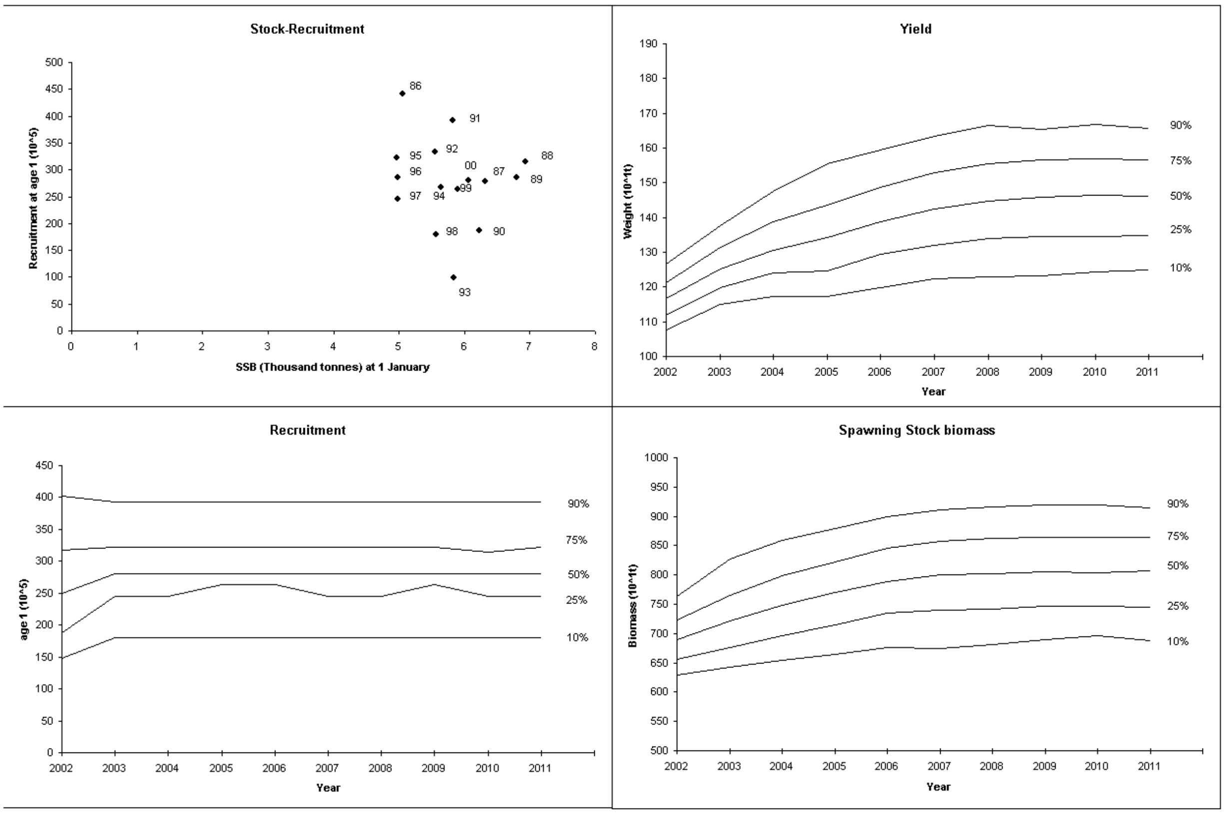
Table 3.11.3.4 Megrim (*L. whiffiagonis*) in Divisions VIIIc and IXa.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-4
1986	8713	2163	659	0.355
1987	11709	1775	497	0.325
1988	10526	2103	817	0.486
1989	9435	2339	714	0.435
1990	11978	2415	977	0.445
1991	4794	1510	614	0.454
1992	10412	1434	516	0.397
1993	4443	1361	383	0.299
1994	1622	1150	479	0.420
1995	8227	953	218	0.181
1996	7487	1281	329	0.177
1997	6764	1376	356	0.225
1998	4756	1366	446	0.396
1999	4024	1291	348	0.296
2000	6166	1307	254	0.211
2001	5046	1290	178	0.126
2002	5714*	1472		0.211
Average	7166	1564	487	0.320

* GM 90-00

Four spot megrim (*L. boscii*) Div. VIIIc, IXa. Medium term projections. Lines show 10, 25, 50, 75 and 90 percentiles. Random stock-recruitment

Four spot megrim in Divisions VIIIc and IXa. Medium term analysis, 1.00 * Fsq.



3.11.4 Anglerfish in Divisions VIIIc and IXa (*L. piscatorius* and *L. budegassa*)

State of stocks/exploitation: The combined stocks (*Lophius piscatorius* and *Lophius budegassa*) are outside safe biological limits. The biomass of both species combined is estimated to be around 76% of the $\mathbf{B}_{MSY}$ in 2002, and the fishing mortality has been above $\mathbf{F}_{MSY}$ until 2001. In 2001, fishing mortality is around 63% of $\mathbf{F}_{MSY}$. Current F ($\mathbf{F}_{sq}$=$F_{99\text{-}01}$) is 5% above $\mathbf{F}_{MSY}$.

Management objectives: There are no explicit management objectives for these stocks.

Precautionary Approach reference points: The ASPIC model provides estimates of the biomass relative to $\mathbf{B}_{MSY}$, and of F relative to $\mathbf{F}_{MSY}$. The $\mathbf{B}_{MSY}$ and $\mathbf{F}_{MSY}$ points are used in the advice as a lower boundary for the biomass and an upper boundary for F.

Advice on management: ICES advises that F should be reduced by 5%, corresponding to landings in 2003 of 3 200 t for both species combined. This will allow F to be at $\mathbf{F}_{MSY}$ and for the biomass to increase to $\mathbf{B}_{MSY}$ in the medium term.

Relevant factors to be considered in management: Given that these two species are not usually sorted in the landings and that the proportion of landings by species is based on samples taken from the various ports, an assessment with both species combined was carried out. Previous TACs have been well above the landings. A portion of the catch of *L. piscatorius* and *L. budegassa* is taken together with other species in mixed trawl fisheries.

The length-frequency distributions of *L. piscatorius* show no evidence of strong recruiting year classes.

Catch forecast for 2003:
Both species combined (*L. piscatorius* and *L. budegassa*)
Basis: F(2002) = $\mathbf{F}_{sq}$ = F(1999-2001); F/$\mathbf{F}_{MSY}$ = 1.05; Landings(2002) = 3.2; B/$\mathbf{B}_{MSY}$(2003) =0.79

F/$\mathbf{F}_{MSY}$(2003)	Basis	Landings(2003)	B/$\mathbf{B}_{MSY}$ (2004)
0.95	0.95*$\mathbf{F}_{sq}$	3.2	0.82
1.0	1.0* $\mathbf{F}_{sq}$	3.3	0.81

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: Trends in both F and B ratios are similar to those in last year's assessments. However, the addition of another CPUE series has resulted in a shift upwards for the B-ratio and downwards for the F-ratio.

The landings predicted last year for 2001 at *status quo* F were 3 800 t, while the reported landings for 2001 were 1 800 t. Since it is unlikely that the fishery has been reduced more than what was advised, the predictions made last year should be considered overly optimistic. This is probably caused by the high value of the growth population parameter (1.0) estimated last year. In this year's assessment, this parameter has been estimated much lower (0.37), more in line with what is expected for a slow-growing and late-maturing species.

Elaboration and special comment: Both species are caught in mixed fisheries by Portuguese and Spanish species increased and a directed artisanal fishery developed in Spain, originally targeting large fish.

A surplus production model incorporating covariates (ASPIC) was used as in previous assessments. The model provides estimates of stock biomass and fishing mortality relative to their respective MSY values.

ASPIC is used to provide guidance reference points, as well as a perspective of the evolution of total biomass and prediction of landings under different fishing mortalities.

CPUE information from Spain (A Coruña) and Portuguese trawl fleet.

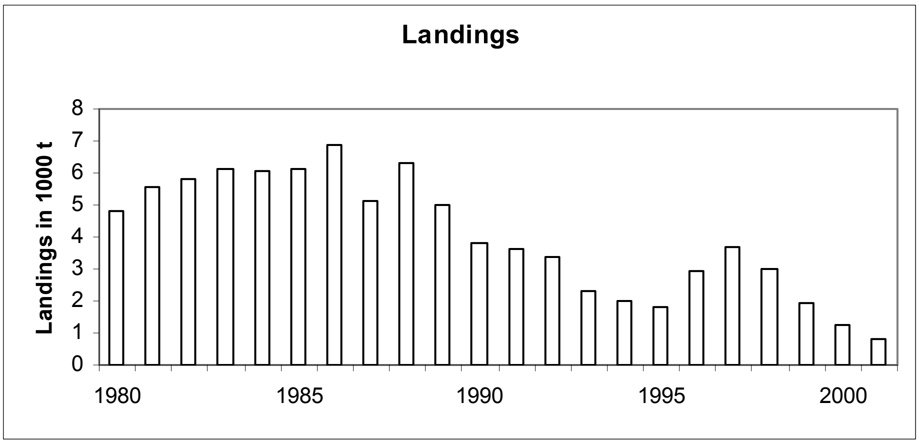
Source of information: Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

Catch data (Tables 3.11.4.1–2):

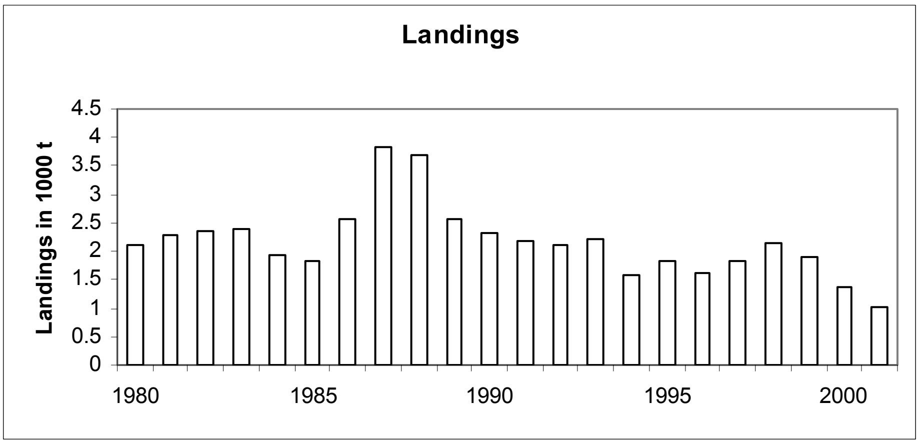
Year	ICES Advice	Predicted catch[1] corresp.to advice	Agreed TAC[1]	ACFM Landings[1]	Landings of *L. piscat.*	Landings of *L. budeg.*
1987	Not dealt with	-	12.0	8.9	5.1	3.8
1988	Not dealt with	-	12.0	10.0	6.3	3.7
1989	Not dealt with	-	12.0	7.6	5.0	2.6
1990	Not dealt with	-	12.0	6.1	3.8	2.3
1991	No advice	-	12.0	5.8	3.6	2.2
1992	No advice	-	12.0	4.2	3.4	2.1
1993	No long-term gain in increasing F	-	13.0	4.5	2.3	2.2
1994	No advice	-	13.0	3.6	2.0	1.6
1995	If required a precautionary TAC	-	13.0	3.6	1.8	1.8
1996	If required a precautionary TAC	-	13.0	4.6	3.0	1.6
1997	If required a precautionary TAC	-	13.0	5.5	3.7	1.8
1998	Restrict catch to < 80% recent levels		10.0	5.1	3.0	2.1
1999	Reduce F to $\mathbf{F}_{pa}$	4.2	8.5	3.8	1.9	1.9
2000	60% reduction in F	1.6	6.8	2.6	1.3	1.4
2001	50% reduction in F	2.8	6.0	1.8	0.8	1.0
2002	30% reduction in F	3.5	4.75			
2003	5% reduction in F	3.2				

[1]For both species combined. Weights in ‘000 t.

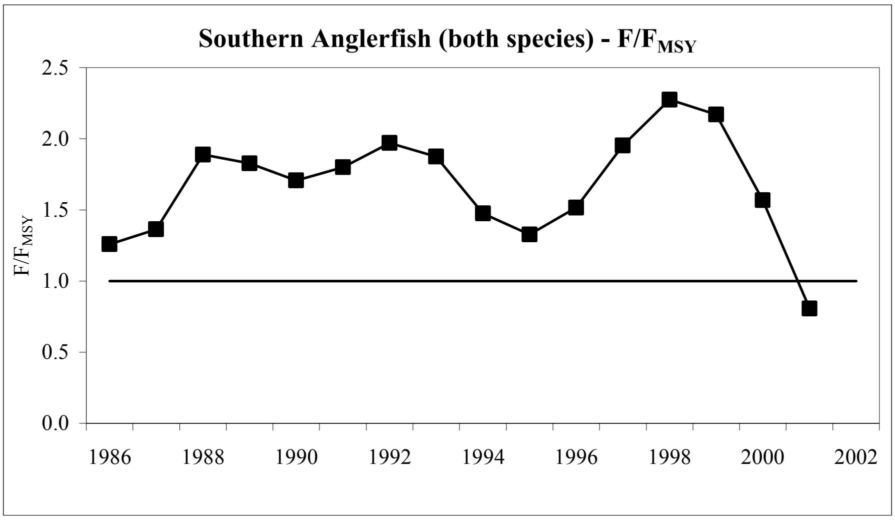
Anglerfish (*L. piscatorius*) in Divisions VIIIc and IXa



Anglerfish (*L. budegassa*) in Divisions VIIIc and IXa



ANGLERFISH (*L.piscatorius* and *L.budegassa*) Divisions VIIIc a
Development of relative Fishing mortality (a) and Biomass (b)
during 1986-2001 and the projected value of B/B_{MSY} for 2002.



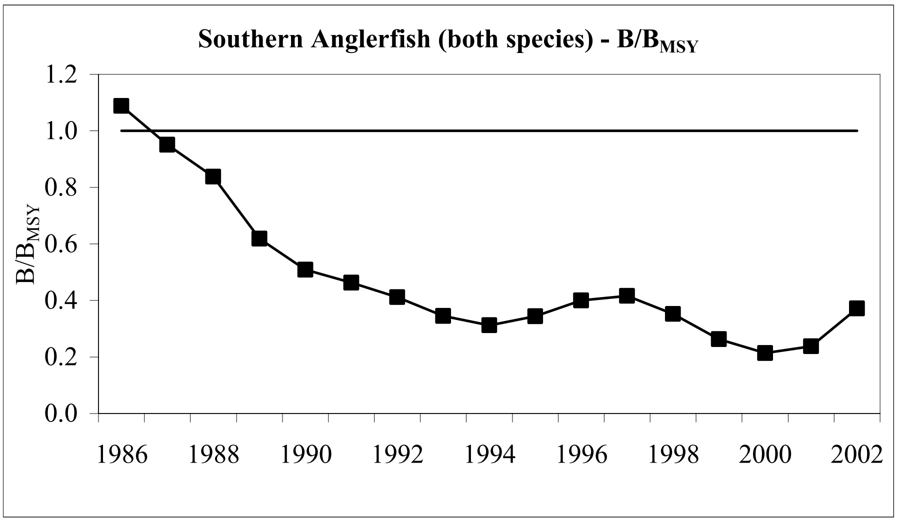


Table 3.11.4.1 Anglerfish (*L. piscatorius*) - Divisions VIIIc and IXa. Landings (t) by the main fishing fleets for 1978–2001 as determined by the Working Group.

	VIIIc			IXa				VIIIc & IXa
Year	Spain Trawl	Spain Gillnet	Total	Spain Trawl	Portugal Trawl	Portugal Artisanal	Total	Total
1978	n/a	n/a	n/a	258	0	115	373	
1979	n/a	n/a	n/a	319	0	225	544	
1980	2806	1270	4076	401	0	339	740	4816
1981	2750	1931	4681	535	0	352	887	5568
1982	1915	2682	4597	875	0	310	1185	5782
1983	3205	1723	4928	726	0	460	1186	6114
1984	3086	1690	4776	578	186	492	1256	6032
1985	2313	2372	4685	540	212	702	1454	6139
1986	2499	2624	5123	670	167	910	1747	6870
1987	2080	1683	3763	320	194	864	1378	5141
1988	2525	2253	4778	570	157	817	1543	6321
1989	1643	2147	3790	347	259	600	1206	4996
1990	1439	985	2424	435	326	606	1366	3790
1991	1490	778	2268	319	224	829	1372	3640
1992	1217	1011	2228	301	76	778	1154	3382
1993	844	666	1510	72	111	636	819	2329
1994	690	827	1517	154	70	266	490	2007
1995	830	572	1403	199	66	166	431	1834
1996	1306	745	2050	407	133	365	905	2955
1997	1449	1191	2640	315	110	650	1075	3714
1998	912	1359	2271	184	28	497	710	2981
1999	545	1013	1558	79	9	285	374	1932
2000	269	538	808	107	4	340	451	1259
2001	231	294	525	57	16	190	263	788

n/a : not available.

Table 3.11.4.2 Anglerfish (*L. budegassa*) - Divisions VIIIc and IXa. Landings (t) by the main fishing fleets for 1978–2000 as determined by the Working Group.

	VIIIc			IXa				VIIIc & IXa
Year	Spain Trawl	Spain Gillnet	Total	Spain Trawl	Portugal Trawl	Portugal Artisanal	Total	Total
1978	n/a	n/a	n/a	248	0	107	355	
1979	n/a	n/a	n/a	306	0	210	516	
1980	1203	207	1409	385	0	315	700	2110
1981	1159	309	1468	505	0	327	832	2300
1982	827	413	1240	841	0	288	1129	2369
1983	1064	188	1252	699	0	428	1127	2379
1984	514	176	690	558	223	458	1239	1929
1985	366	123	489	437	254	653	1344	1833
1986	553	585	1138	379	200	847	1425	2563
1987	1094	888	1982	813	232	804	1849	3832
1988	1058	1010	2068	684	188	760	1632	3700
1989	648	351	999	764	272	542	1579	2578
1990	491	142	633	689	387	625	1701	2334
1991	503	76	579	559	309	716	1584	2163
1992	451	57	508	485	287	832	1603	2111
1993	516	292	809	627	196	596	1418	2227
1994	542	201	743	475	79	283	837	1580
1995	913	104	1017	615	68	131	814	1831
1996	840	105	945	342	133	210	684	1629
1997	800	198	998	524	81	210	815	1813
1998	774	153	926	704	181	332	1217	2144
1999	571	127	698	671	110	406	1187	1885
2000	434	63	497	392	142	336	870	1367
2001	383	69	452	190	101	269	560	1013

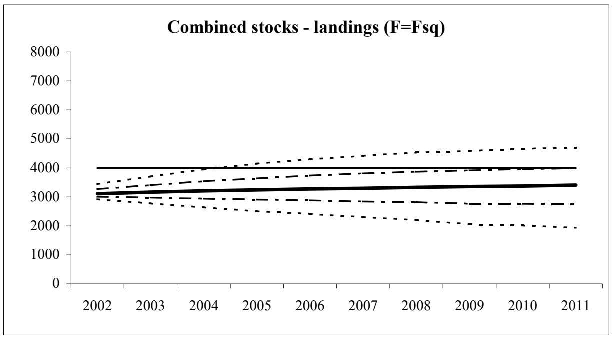
n/a : not available.

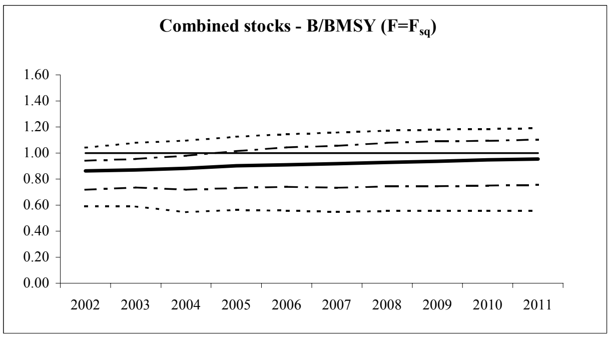
Anglerfish in VIIIc and IXa (*L.piscatorius* and *L.budegassa* combined)

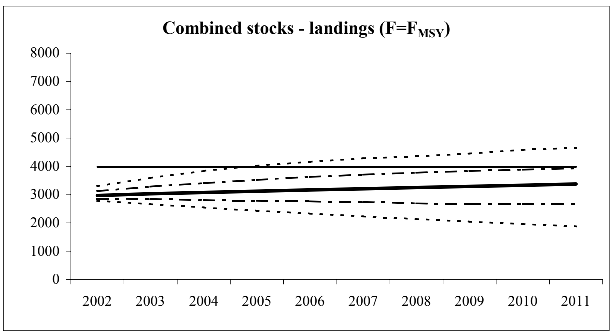
Summary of the Aspic results :
r=0.37

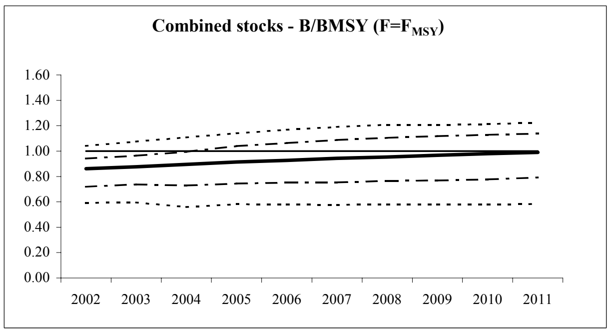
	$F/\mathbf{F}_{MSY}$	$B/\mathbf{B}_{MSY}$
1986	1.00	2.12
1987	1.16	1.78
1988	1.52	1.53
1989	1.59	1.29
1990	1.46	1.11
1991	1.51	1.01
1992	1.56	0.92
1993	1.38	0.85
1994	1.10	0.81
1995	1.10	0.83
1996	1.40	0.84
1997	1.82	0.80
1998	1.89	0.72
1999	1.50	0.65
2000	1.01	0.63
2001	0.63	0.67
2002		0.76

Medium-term projections : at $\mathbf{F}_{sq}$ and at $F=\mathbf{F}_{MSY} = 0.95\ \mathbf{F}_{sq}$.









3.11.5 Mackerel in Divisions VIIIc and IXa (Southern component)

For information on this mackerel component see mackerel (combined Southern, Western and North Sea spawning components) section 3.12.3.

3.11.6 Southern horse mackerel (*Trachurus trachurus*) (Divisions VIIIc and IXa)

State of stock/exploitation: The state of the stock is unknown, but seems to have been stable over the last 20 years.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	**ICES proposes that:**
$\mathbf{B}_{lim}$ is 136 000 t, the lowest observed biomass.	$\mathbf{B}_{pa}$ be set at 205 000 t. This affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of the assessment.
$\mathbf{F}_{lim}$ is 0.27, the fishing mortality rate above which recruitment and stock dynamics are unknown.	$\mathbf{F}_{pa}$ be established at 0.17. This F is considered to provide approximately 95% probability of avoiding $\mathbf{F}_{lim}$, taking into account the uncertainty of assessments.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$	$\mathbf{B}_{pa} = \mathbf{B}_{loss} * 1.5$
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$	$\mathbf{F}_{pa} = \mathbf{F}_{lim} * 0.63$

Advice on management: ICES recommends that the catches in 2003 should not exceed the recent average of 49 000 tonnes (1999–2001). The TAC for this stock should only apply to *Trachurus trachurus*.

Relevant factors to be considered in management: The available information, including SSB estimates from egg surveys, indicates that the stock has been relatively stable over a long period, and can sustain the present catch level.

The current TAC set by management agencies for horse mackerel in Division VIIIc and Subarea IX also includes other *Trachurus* species. Catches of these species are presented in Table 3.11.6.2. Recent catches of these species have been around 1 600 t.

Medium- and long-term projections: Not available.

Comparison with previous assessment and advice: An assessment was attempted this year using partly revised data. This assessment gave a perception of the state of the stock that was different from last year's assessment. As last year survey and commercial tuning were available for demersal fleets. However, because of the statistical problems in the assessment diagnostics and concerns about the appropriateness of demersal tuning fleets for a pelagic species the assessment was considered unreliable.

Elaboration and special comment: Southern horse mackerel are mainly exploited by Spanish and Portuguese purse seiners and by Portuguese trawlers. While the purse seiners mainly catch juvenile fish, the catches taken by trawlers comprise also older fish. There is a significant by-catch of *Trachurus mediterraneus* and *Trachurus picturatus*, mainly in the trawl fishery.

The exploratory assessment was based on catch-at-age data from Spain and Portugal. Abundance indices were available from three bottom trawl surveys and catch per unit of effort data from two commercial bottom trawl fleets. The divergent trends in these tuning fleet data are a source of uncertainty about the state of the stock.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10–19 September 2002 (ICES CM 2003/ACFM:07).

Catch data (Tables 3.11.5.1 and 3.11.6.1–2):

Year	ICES Advice	Predicted catch corresp. to advice[2]	Agreed TAC[1]	ACFM Landings[2]
1987	Not assessed	-	72.5[3]	55
1988	Mesh size increase	-	82.0[3]	56
1989	No increase in F; TAC	72.5	73.0[3]	56
1990	F at $\mathbf{F}_{0.1}$; TAC	38	55.0[4]	49
1991	Precautionary TAC	61	73.0[4]	46
1992	If required, precautionary TAC	61	73.0[4]	51
1993	No advice	-	73.0[4]	57
1994	*Status quo* prediction	55[5]	73.0[4]	53
1995	No long-term gains in increasing F	63[5]	73.0[4]	53
1996	No long-term gains in increasing F	60[5]	73.0[4]	45
1997	No advice	-	73.0[4]	57
1998	F should not exceed the F(94–96)	59	73.0[4]	64
1999	No increase in F	58	73.0[4]	52
2000	F $<\mathbf{F}_{pa}$	<59	68.0[4]	49
2001	F $<\mathbf{F}_{pa}$	<54	68.0[4]	46
2002	F <0.113	<34	68.0[4]	
2003	Average of last 3 years	<49		

[1]Includes all *Trachurus* spp. [2]Includes only *Trachurus trachurus* L. [3]Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EC waters only). [4] Division VIIIc and Subarea IX. [5]Catch at *status quo* F. Weights in '000 t.

Southern horse mackerel (Divisions VIIIc and IXa)

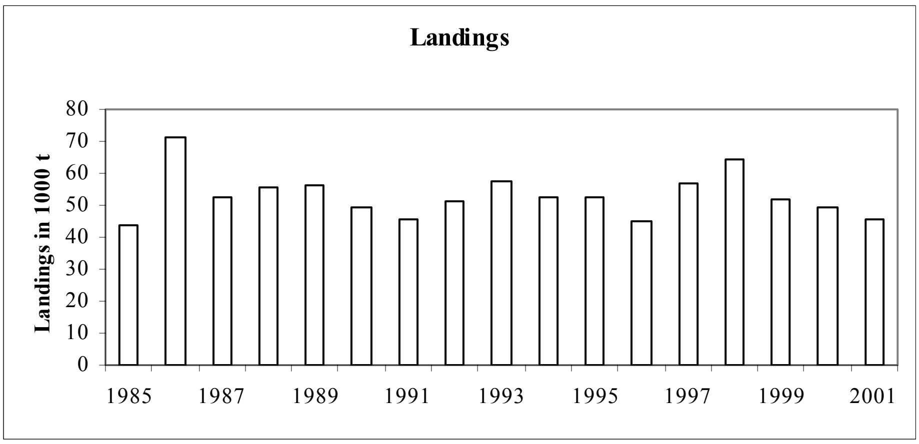


Table 3.11.6.1 Annual catches (tonnes) of SOUTHERN HORSE MACKEREL (*Trachurus trachurus*) by countries and by gear in Divisions VIIIc and IXa. Data from 1984–2001 are Working Group estimates.

Year	Portugal (Division IXa)				Spain (Divisions IXa + VIIIc)					Total VIIIc+IXa
	Trawl	Seine	Artisanal	Total	Trawl	Seine	Hook	Gillnet	Total	
1963	6,593	54,267	3,900	64,760	-	-	-	-	53,420	118,180
1964	8,983	55,693	4,100	68,776	-	-	-	-	57,365	126,141
1965	4,033	54,327	4,745	63,105	-	-	-	-	52,282	115,387
1966	5,582	44,725	7,118	57,425	-	-	-	-	47,000	104,425
1967	6,726	52,643	7,279	66,648	-	-	-	-	53,351	119,999
1968	11,427	61,985	7,252	80,664	-	-	-	-	62,326	142,990
1969	19,839	36,373	6,275	62,487	-	-	-	-	85,781	148,268
1970	32,475	29,392	7,079	59,946	-	-	-	-	98,418	158,364
1971	32,309	19,050	6,108	57,467	-	-	-	-	75,349	132,816
1972	45,452	28,515	7,066	81,033	-	-	-	-	82,247	163,280
1973	28,354	10,737	6,406	45,497	-	-	-	-	114,878	160,375
1974	29,916	14,962	3,227	48,105	-	-	-	-	78,105	126,210
1975	26,786	10,149	9,486	46,421	-	-	-	-	85,688	132,109
1976	26,850	16,833	7,805	51,488	89,197	26,291	376[1]	-	115,864	167,352
1977	26,441	16,847	7,790	51,078	74,469	31,431	376[1]	-	106,276	157,354
1978	23,411	4,561	4,071	32,043	80,121	14,945	376[1]	-	95,442	127,485
1979	19,331	2,906	4,680	26,917	48,518	7,428	376[1]	-	56,322	83,239
1980	14,646	4,575	6,003	25,224	36,489	8,948	376[1]	-	45,813	71,037
1981	11,917	5,194	6,642	23,733	28,776	19,330	376[1]	-	48,482	72,235
1982	12,676	9,906	8,304	30,886	-[2]	-[2]	-[2]	-	28,450	59,336
1983	16,768	6,442	7,741	30,951	8,511	34,054	797	-	43,362	74,313
1984	8,603	3,732	4,972	17,307	12,772	15,334	884	-	28,990	46,297
1985	3,579	2,143	3,698	9,420	16,612	16,555	949	-	34,109	43,529
1986	-[2]	-[2]	-[2]	28,526	9,464	32,878	481	143	42,967	71,493
1987	11,457	6,744	3,244	21,445	-[2]	-[2]	-[2]	-[2]	33,193	54,648
1988	11,621	9,067	4,941	25,629	-[2]	-[2]	-[2]	-[2]	30,763	56,392
1989	12,517	8,203	4,511	25,231	-[2]	-[2]	-[2]	-[2]	31,170	56,401
1990	10,060	5,985	3,913	19,958	10,876	17,951	262	158	29,247	49,205
1991	9,437	5,003	3,056	17,497	9,681	18,019	187	127	28,014	45,511
1992	12,189	7,027	3,438	22,654	11,146	16,972	81	103	28,302	50,956
1993	14,706	4,679	6,363	25,747	14,506	16,897	124	154	31,681	57,428
1994	10,494	5,366	3,201	19,061	10,864	22,382	145	136	33,527	52,588
1995	12,620	2,945	2,133	17,698	11,589	23,125	162	107	34,983	52,681
1996	7,583	2,085	4,385	14,053	10,360	19,917	214	146	30,637	44,690
1997	9,446	5,332	1,958	16,736	8,140	31,582	169	143	40,034	56,770
1998	13,221	5,906	2,217	21,334	13,150	29,805	63	118	43,136	64,480
1999	6,866	5,705	1,849	14,420	10,015	27,332	29	126	37,502	51,922
2000	7,971	4,209	2,168	15,348	10,144	23,373	59	214	33,790	49,138
2001	7,692	4,787	831	13,760	11,222	20,122	45	590	31,979	45,739

[1]Estimated value. [2]Not available by gear.

Table 3.11.6.2 Annual catches (tonnes) of other Horse mackerel species (*T. mediterraneus* & *T. picturatus*) in Divisions VIIIc and IXa. Data from 1989–2001 are Working Group estimates.

Year	*T. mediterraneus*	*T. picturatus*
1989	3903	2394
1990	2943	2012
1991	5020	1700
1992	4804	1035
1993	5576	1028
1994	3344	1045
1995	4585	728
1996	3443	1009
1997	3264	834
1998	3755	526
1999	1592	320
2000	808	464
2001	1293	420

3.11.7 Sardine

3.11.7.a Sardine in Divisions VIIIc and IXa

State of stock/exploitation: The state of the stock is unknown in relation to precautionary reference points. Different assessment methods lead to very different perceptions as to the absolute levels of stock abundance and fishing mortality, but all indicate that the stock biomass has increased from a historical low. The 2000 year class appears to be strong, and there are indications that the 2001 year class is of average strength.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points: No precautionary approach reference points have been proposed for this stock.

Advice on management: ICES recommends a catch of no more than 100 000 tonnes in 2003. This is expected to prevent a decline in stock size in the short term.

Relevant factors to be considered in management: Although the present SSB is unknown, the available assessments all indicated that a catch of 100 000 t in 2003 would maintain the presently estimated biomass in 2004. All exploratory assessments indicated that the spawning stock in the most recent year has increased from a historical low.

There are large variations in recruitment, and the stock size is strongly dependant on the incoming year class. There is incomplete knowledge of the environmental factors affecting recruitment. The 2000 year class has been confirmed as strong by both the surveys and in the fishery, but the actual size of this year class remains uncertain.

Uncertainty regarding stock units and area distribution and how the changes in fish distribution affect the overall stock dynamics make it difficult to make a meaningful comparison between the stock size and the fishing mortality in the mid-1980s and the late 1990s, and to provide accurate estimates of the state of the stock.

The possibility that the stock in recent years may be at a lower level than previously assumed, as well as the dependence of incoming recruitment indicate that a close monitoring of this stock is still needed, in spite of the recent signs of increase.

Spain and Portugal undertook management measures to reduce fishing effort (i.e., closed periods, limitation of fishing days) and the overall catches (daily and/or annual allowable catches per boat and/or per fisherman organisation), and this may have led to a reduction in the fishing mortality in the last two years.

Medium- and long-term projections: Not available.

Comparison with previous assessment and advice: Several assessment methods were used to interpret the catch and survey data. These gave quite different perceptions of the historical trends in fishing mortality and spawning stock. These differences can be attributed to differences in structural assumptions between the models, and conflicting interpretation of signals and noise in the data, but the detailed effect of these assumptions is complex and still not fully understood. None of the assessments were accepted by ICES as a basis to define the state of the stock and fishery. However, the presence of a strong 2000 year class giving rise to an increased SSB in 2002, is indicated by all methods. ICES considers that the absolute levels of stock biomass and fishing mortality are unknown.

Elaboration and special comment: Almost all catches are taken by Spanish and Portuguese purse seiners in a directed human consumption fishery.

Initial information from an acoustic survey in November 2000 indicated that the strong 2000 year class was not as wide-spread in its geographical distribution, found only in the North of Portugal. Subsequent observations from acoustic surveys in 2001 and 2002 indicated that this year class has spread out over a wider geographical area.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10–19 September 2002 (ICES CM 2003/ACFM:07).

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average Current	0.267	0.016	0.050
$\mathbf{F}_{max}$	1.941	0.024	0.007
$\mathbf{F}_{0.1}$	0.427	0.019	0.036
$\mathbf{F}_{med}$	0.296	0.017	0.047

Catch data (Table 3.11.7.a.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings VIII & IX	ACFM Landings[3]
1987	No increase in F; TAC	140	-		178
1988	No increase in F; TAC	150	-	167	162
1989	No increase in F; TAC	212	-	146	141
1990	Room for increased F	227[2]	-	150	149
1991	Precautionary TAC	176	-	135	133
1992	No advice	-	-	139	130
1993	Precautionary TAC	135	-	153	142
1994	No advice	118[1]	-	147	137
1995	No advice; apparently stable stock	-	-	137	125
1996	Lowest possible level	-	-	134	117
1997	Lowest possible level	-	-	n/a	116
1998	Significant reduction	-	-	n/a	109
1999	Reduce F to 0.2	38	-	n/a	94
2000	F below 0.2	<81	-	n/a	86
2001	F below 0.2	<88	-	n/a	102
2002	F below 0.25	<95	-		
2003	Prevent decline in SSB	<100			

[1]Estimated catch at *status quo* F. [2]Catch corresponding to 20% increase in F. [3] Includes only VIIIc and IXa. N/a=not available. Weights in '000 t.

Sardine in Divisions VIIIc and IXa

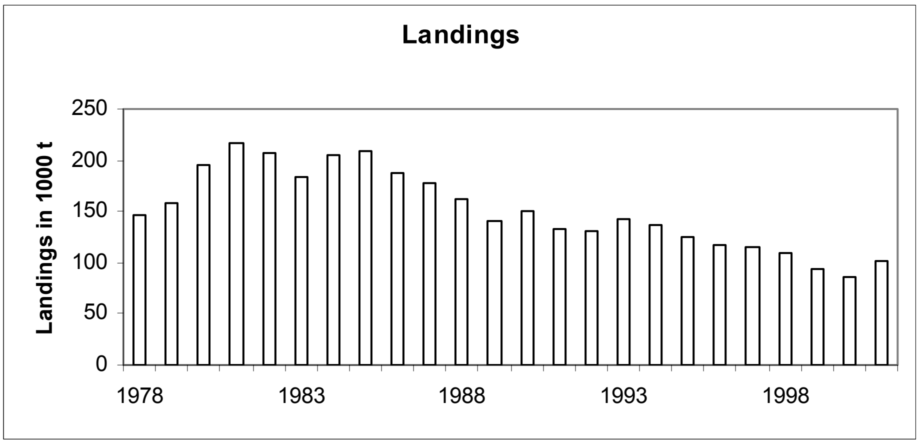


Table 3.11.7.a.1 : Iberian Sardine Landings (tonnes) by sub-area and total for the period 1940-2001.

	Sub-area										
Year	VIIIc	IXa North	IXa Central North	IXa Central South	IXa South Algarve	IXa South Cadiz	All sub-areas	Div. IXa	Portugal	Spain (excl.Cadiz)	Spain (incl.Cadiz)
1940	66816		42132	33275	23724		**165947**	**99131**	**99131**	**66816**	**66816**
1941	27801		26599	34423	9391		**98214**	**70413**	**70413**	**27801**	**27801**
1942	47208		40969	31957	8739		**128873**	**81665**	**81665**	**47208**	**47208**
1943	46348		85692	31362	15871		**179273**	**132925**	**132925**	**46348**	**46348**
1944	76147		88643	31135	8450		**204375**	**128228**	**128228**	**76147**	**76147**
1945	67998		64313	37289	7426		**177026**	**109028**	**109028**	**67998**	**67998**
1946	32280		68787	26430	12237		**139734**	**107454**	**107454**	**32280**	**32280**
1947	43459	21855	55407	25003	15667		**161391**	**117932**	**96077**	**65314**	**65314**
1948	10945	17320	50288	17060	10674		**106287**	**95342**	**78022**	**28265**	**28265**
1949	11519	19504	37868	12077	8952		**89920**	**78401**	**58897**	**31023**	**31023**
1950	13201	27121	47388	17025	17963		**122698**	**109497**	**82376**	**40322**	**40322**
1951	12713	27959	43906	15056	19269		**118903**	**106190**	**78231**	**40672**	**40672**
1952	7765	30485	40938	22687	25331		**127206**	**119441**	**88956**	**38250**	**38250**
1953	4969	27569	68145	16969	12051		**129703**	**124734**	**97165**	**32538**	**32538**
1954	8836	28816	62467	25736	24084		**149939**	**141103**	**112287**	**37652**	**37652**
1955	6851	30804	55618	15191	21150		**129614**	**122763**	**91959**	**37655**	**37655**
1956	12074	29614	58128	24069	14475		**138360**	**126286**	**96672**	**41688**	**41688**
1957	15624	37170	75896	20231	15010		**163931**	**148307**	**111137**	**52794**	**52794**
1958	29743	41143	92790	33937	12554		**210167**	**180424**	**139281**	**70886**	**70886**
1959	42005	36055	87845	23754	11680		**201339**	**159334**	**123279**	**78060**	**78060**
1960	38244	60713	83331	24384	24062		**230734**	**192490**	**131777**	**98957**	**98957**
1961	51212	59570	96105	22872	16528		**246287**	**195075**	**135505**	**110782**	**110782**
1962	28891	46381	77701	29643	23528		**206144**	**177253**	**130872**	**75272**	**75272**
1963	33796	51979	86859	17595	12397		**202626**	**168830**	**116851**	**85775**	**85775**
1964	36390	40897	108065	27636	22035		**235023**	**198633**	**157736**	**77287**	**77287**
1965	31732	47036	82354	35003	18797		**214922**	**183190**	**136154**	**78768**	**78768**
1966	32196	44154	66929	34153	20855		**198287**	**166091**	**121937**	**76350**	**76350**
1967	23480	45595	64210	31576	16635		**181496**	**158016**	**112421**	**69075**	**69075**
1968	24690	51828	46215	16671	14993		**154397**	**129707**	**77879**	**76518**	**76518**
1969	38254	40732	37782	13852	9350		**139970**	**101716**	**60984**	**78986**	**78986**
1970	28934	32306	37608	12989	14257		**126094**	**97160**	**64854**	**61240**	**61240**
1971	41691	48637	36728	16917	16534		**160507**	**118816**	**70179**	**90328**	**90328**
1972	33800	45275	34889	18007	19200		**151171**	**117371**	**72096**	**79075**	**79075**
1973	44768	18523	46984	27688	19570		**157533**	**112765**	**94242**	**63291**	**63291**
1974	34536	13894	36339	18717	14244		**117730**	**83194**	**69300**	**48430**	**48430**
1975	50260	12236	54819	19295	16714		**153324**	**103064**	**90828**	**62496**	**62496**
1976	51901	10140	43435	16548	12538		**134562**	**82661**	**72521**	**62041**	**62041**
1977	36149	9782	37064	17496	20745		**121236**	**85087**	**75305**	**45931**	**45931**
1978	43522	12915	34246	25974	23333	5619	**145609**	**102087**	**83553**	**56437**	**62056**
1979	18271	43876	39651	27532	24111	3800	**157241**	**138970**	**91294**	**62147**	**65947**
1980	35787	49593	59290	29433	17579	3120	**194802**	**159015**	**106302**	**85380**	**88500**
1981	35550	65330	61150	37054	15048	2384	**216517**	**180967**	**113253**	**100880**	**103264**
1982	31756	71889	45865	38082	16912	2442	**206946**	**175190**	**100859**	**103645**	**106087**
1983	32374	62843	33163	31163	21607	2688	**183837**	**151463**	**85932**	**95217**	**97905**
1984	27970	79606	42798	35032	17280	3319	**206005**	**178035**	**95110**	**107576**	**110895**
1985	25907	66491	61755	31535	18418	4333	**208439**	**182532**	**111709**	**92398**	**96731**
1986	39195	37960	57360	31737	14354	6757	**187363**	**148168**	**103451**	**77155**	**83912**
1987	36377	42234	44806	27795	17613	8870	**177696**	**141319**	**90214**	**78611**	**87481**
1988	40944	24005	52779	27420	13393	2990	**161531**	**120587**	**93591**	**64949**	**67939**
1989	29856	16179	52585	26783	11723	3835	**140961**	**111105**	**91091**	**46035**	**49870**
1990	27500	19253	52212	24723	19238	6503	**149429**	**121929**	**96173**	**46753**	**53256**
1991	20735	14383	44379	26150	22106	4834	**132587**	**111852**	**92635**	**35118**	**39952**
1992	26160	16579	41681	29968	11666	4196	**130250**	**104090**	**83315**	**42739**	**46935**
1993	24486	23905	47284	29995	13160	3664	**142495**	**118009**	**90440**	**48391**	**52055**
1994	22181	16151	49136	30390	14942	3782	**136582**	**114401**	**94468**	**38332**	**42114**
1995	19538	13928	41444	27270	19104	3996	**125280**	**105742**	**87818**	**33466**	**37462**
1996	14423	11251	34761	31117	19880	5304	**116736**	**102313**	**85758**	**25674**	**30978**
1997	15587	12291	34156	25863	21137	6780	**115814**	**100227**	**81156**	**27878**	**34658**
1998	16177	3263	32584	29564	20743	6594	**108924**	**92747**	**82890**	**19440**	**26034**
1999	11862	2563	31574	21747	18499	7846	**94091**	**82229**	**71820**	**14425**	**22271**
2000	11697	2866	23311	23701	19129	5081	**85786**	**74089**	**66141**	**14563**	**19644**
2001	16798	8398	32726	25619	13350	5066	**101957**	**85159**	**71695**	**25196**	**30262**

Div. IXa = IXa North + IXa Central-North + IXa Central-South + IXa South-Algarve + IXa South-Cadiz

3.11.8 Anchovy

3.11.8.a Anchovy in Subarea VIII (Bay of Biscay)

State of stock/exploitation: The stock is inside safe biological limits. The SSB in 2002 is above $\mathbf{B}_{pa}$, and the fishing mortality has remained well below $\mathbf{F}_{pa}$ in recent years.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to keep SSB above $\mathbf{B}_{pa}$ and reduce or maintain F below $\mathbf{F}_{pa}$.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 18 000 t, the lowest observed biomass.	$\mathbf{B}_{pa}$ = 36 000 t.
There is no biological basis for defining $\mathbf{F}_{lim}$.	$\mathbf{F}_{pa}$ be established between 1.0–1.2.

Technical basis:

$\mathbf{B}_{lim}$ = $\mathbf{B}_{loss}$ = 18 000 t.	$\mathbf{B}_{pa}$= SSB that can withstand two successive years of poor recruitment.
	$\mathbf{F}_{pa}$= F for 50% spawning potential ratio, i.e., the F at which the SSB/R is half of what it would have been in the absence of fishing.

Advice on management: ICES recommends that a preliminary TAC for 2003 is set to 12 500 t, in order to keep SSB above $\mathbf{B}_{pa}$ in 2003. This is based on the conservative assumption that recruitment in 2002 and beyond is 7.8 billion (mean of the below mean year classes in the historical series. This TAC should be re-evaluated in the middle of the year 2003, based on the development of the fishery and on the results from acoustic and egg surveys in May-June.

Relevant factors to be considered in management: ICES has so far not been able to find sufficient resources to make a full evaluation of the two-stage advisory procedure, see also Section 3.11.8.c. Such an evaluation is urgently needed.

There are large inter-annual fluctuations in the spawning stock due to the short life span of anchovy. The fishery depends largely on the incoming year class, the abundance of which cannot be estimated before it has entered the fishery the next spring as one-year-olds. Ideally, in-season management with a spawner escapement threshold would be appropriate for this stock.

Catch forecast for 2003:
Basis:Landings(2002) =25.0; F(2002) = 0.40=0.69*$\mathbf{F}_{sq}$ ($\mathbf{F}_{sq}$=$\mathbf{F}_{95-01}$=0.58); SSB (2002) = 56.3.

F(2003)	Basis	SSB (2003)	Catch (2003)
0.41	0.7* $\mathbf{F}_{sq}$	36.2	12.5
0.58	1* $\mathbf{F}_{sq}$	34.2	16.9
0.70	1.2* $\mathbf{F}_{sq}$	33.0	19.6
0.82	1.4* $\mathbf{F}_{sq}$	31.8	22.1
0.93	1.6* $\mathbf{F}_{sq}$	30.7	24.4
1.05	1.8* $\mathbf{F}_{sq}$	29.6	26.5
1.17	2* $\mathbf{F}_{sq}$	28.5	28.6
1.46	2.5* $\mathbf{F}_{sq}$	26.1	33.1

Weights in '000 t.
Shaded scenarios considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The current assessment is consistent with the previous ones and it is based on the same assessment model and makes use of all new available information from the catches and the new survey indices.

Elaboration and special comments: The abundance of this short-lived species will vary considerably according to fluctuations in recruitment. The recruitment is likely to be strongly dependent on environmental factors. The low accuracy of the environmental indexes as recruitment predictors makes it impossible at present to estimate the population abundance one year in advance. ICES considers that a fully operative model to evaluate alternative management regimes, including the one considered by STECF, needs to be developed.

The stock is exploited by Spanish purse seiners, mostly in the first half of the year, and French trawlers mostly in the second half of the year. Most of the fish (around 85%) have spawned at least once before being caught. The French fishery takes place outside the spawning season and the Spanish fishery is outside the spawning area.

Analytical assessment (ICA) is based on catch-at-age data from French and Spanish fisheries and stock biomass estimates from egg (1987–2001) and acoustic surveys (1989–2001). Results from biomass production models are in accordance with the ICA assessment.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, September 2002 (ICES CM 2003/ACFM:07).

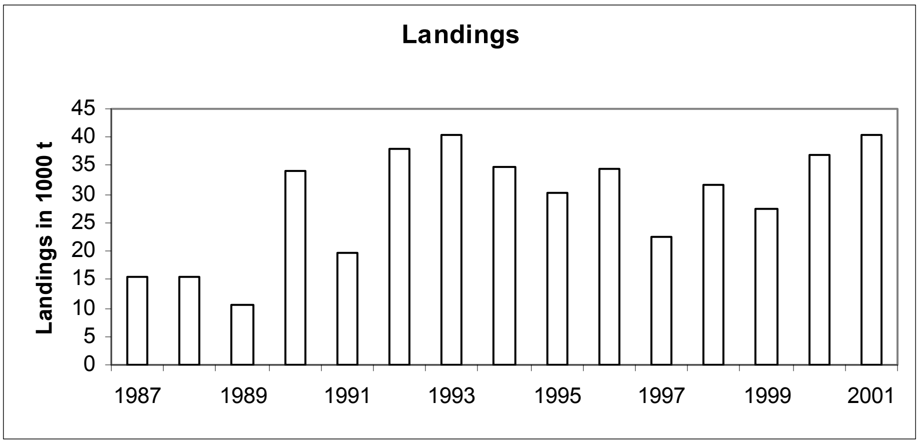
Yield and spawning biomass per Recruit
F-reference points:

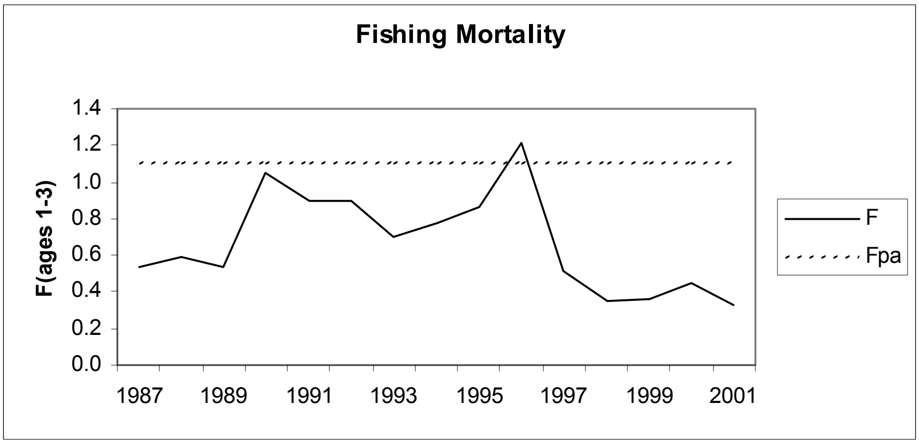
	Fish Mort Ages 1–3	Yield/R	SSB/R
Average Current	0.379	0.001	0.005
$\mathbf{F}_{max}$	N/A		
$\mathbf{F}_{0.1}$	2.376	0.003	0.002
$\mathbf{F}_{med}$	1.550	0.003	0.003

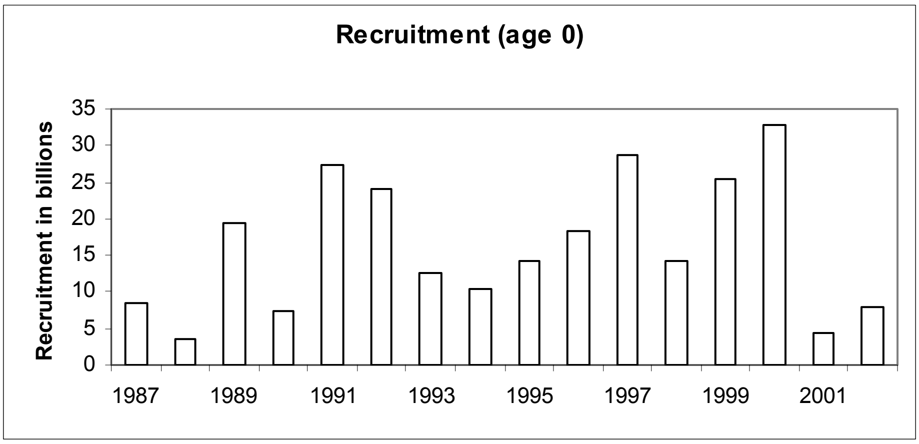
Catch data (Tables 3.11.8.a.1–2):

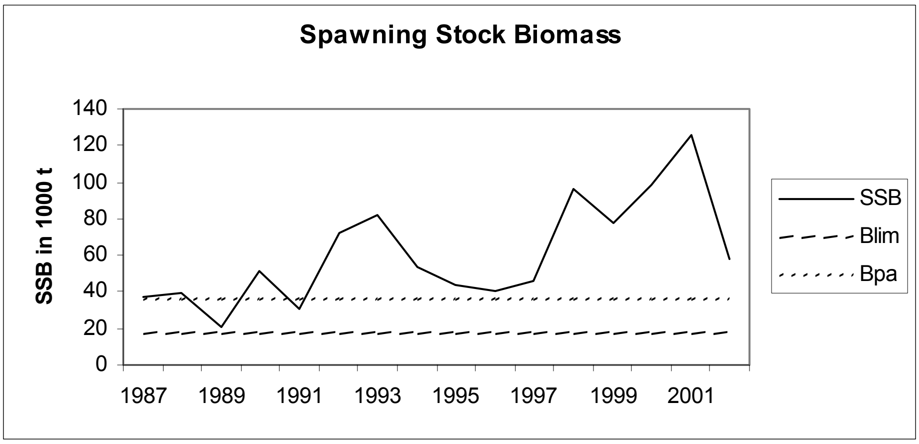
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Not assessed	-	32	14	15
1988	Not assessed	-	32	14	16
1989	Increase SSB; TAC	10.0[1]	32	n/a	11
1990	Precautionary TAC	12.3	30	n/a	34
1991	Precautionary TAC	14.0	30	n/a	20
1992	No advice	-	30	n/a	38
1993	Reduced F on juveniles; closed area	-	30	n/a	40
1994	Reduced F on juveniles; closed area	-	30	n/a	35
1995	Reduced F on juveniles; closed area	-	33	n/a	30
1996	Reduced F on juveniles; closed area	-	33	n/a	34
1997	Reduced F on juveniles; closed area	-	33	n/a	22
1998	Reduced F on juveniles; closed area		33	n/a	32
1999	Reduced F on juveniles, closed area		33	n/a	27
2000	Closure of the Fishery	0.0	33	n/a	37
2001	Preliminary TAC corresponding to recent exploitation	18	33	n/a	40
2002	Preliminary TAC corresponding to recent exploitation	33	33	n/a	25[2]
2003	Preliminary TAC corresponding to recent exploitation	12.5			

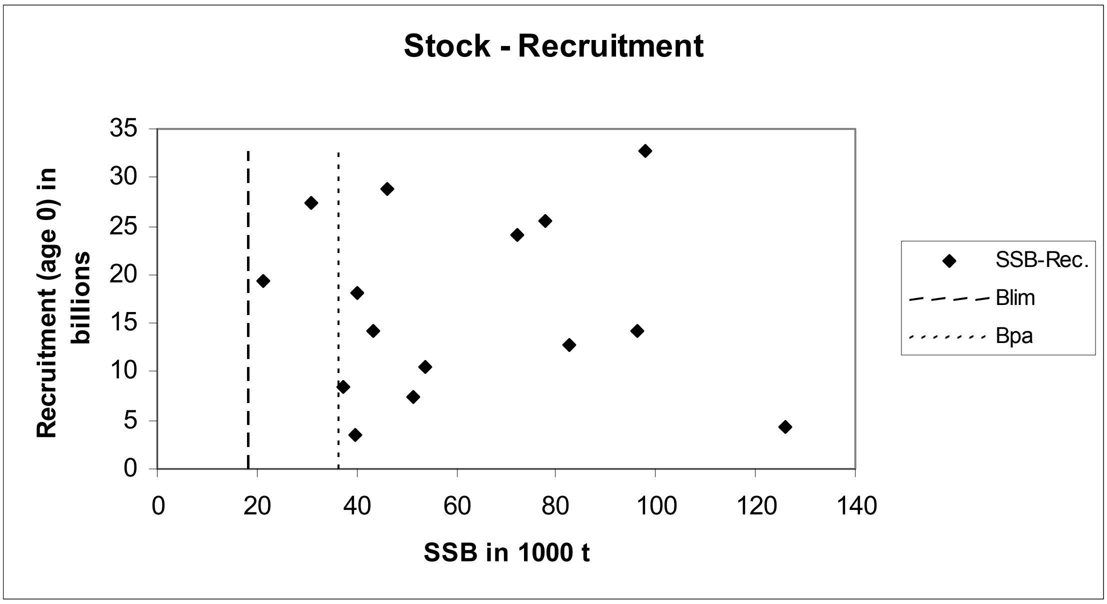
Weights in '000 t. [1]Mean catch of 1985–1987. [2]Preliminary estimate based on catches in the first half of the year. n/a: not available.


Landings
Landings in 1000 t
45
40
35
30
25
20
15
10
5
0
1987
1989
1991
1993
1995
1997
1999
2001

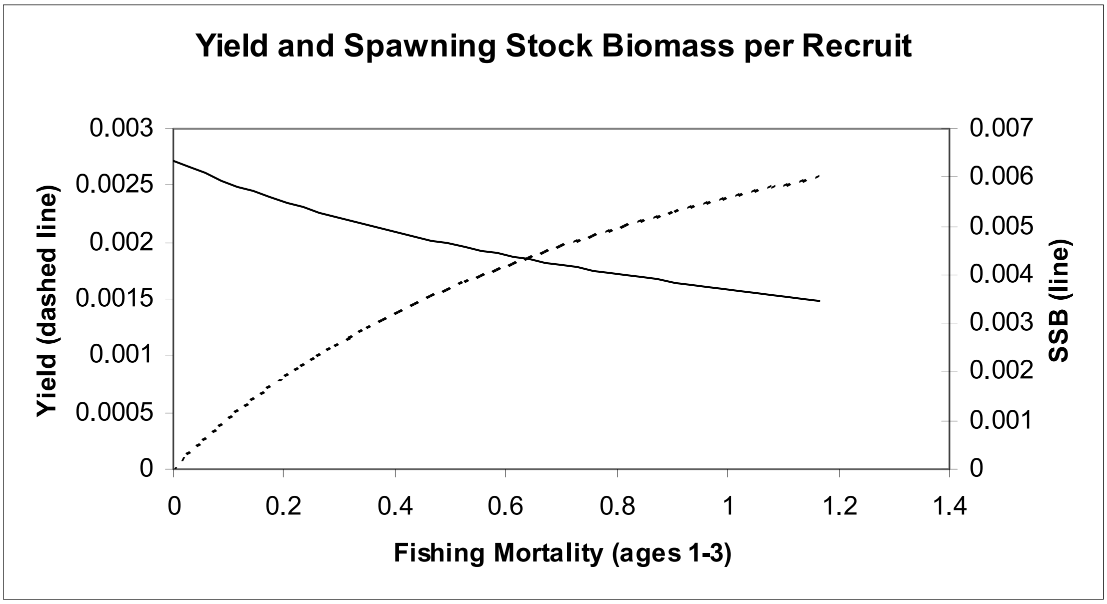

Fishing Mortality
F(ages 1-3)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1987
1989
1991
1993
1995
1997
1999
2001
F
Fpa


Recruitment (age 0)
Recruitment in billions
35
30
25
20
15
10
5
0
1987
1989
1991
1993
1995
1997
1999
2001

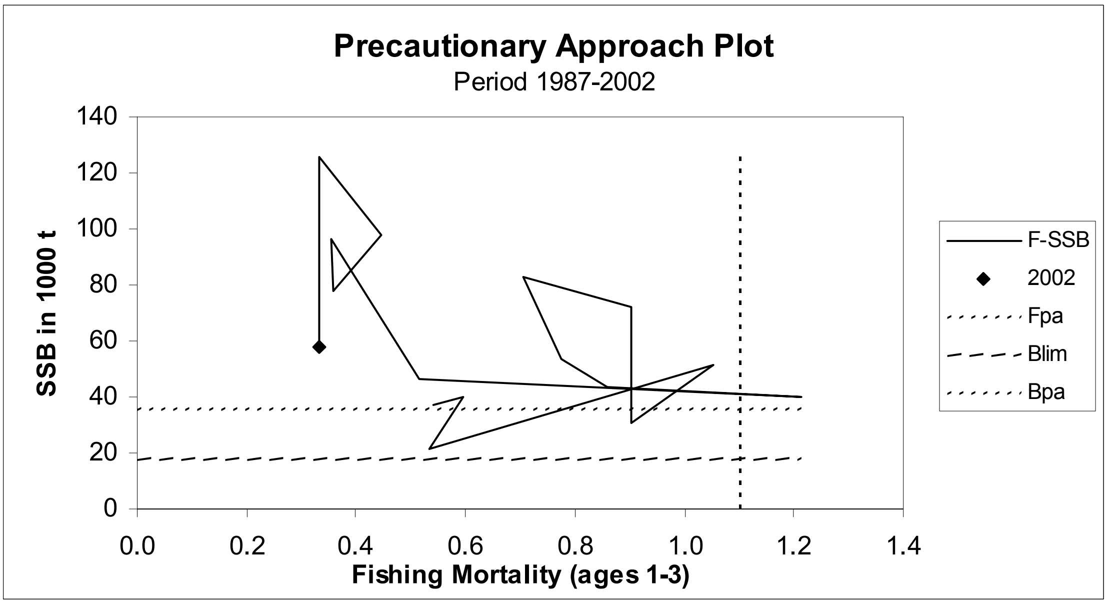

Spawning Stock Biomass
SSB in 1000 t
140
120
100
80
60
40
20
0
1987
1989
1991
1993
1995
1997
1999
2001
SSB
Blim
Bpa



Stock - Recruitment
Recruitment (age 0) in billions
0
5
10
15
20
25
30
35
0
20
40
60
80
100
120
140
SSB in 1000 t
SSB-Rec.
Blim
Bpa



Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0
0.0005
0.001
0.0015
0.002
0.0025
0.003
SSB (line)
0
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Fishing Mortality (ages 1-3)



Precautionary Approach Plot
Period 1987-2002
SSB in 1000 t
0
20
40
60
80
100
120
140
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Fishing Mortality (ages 1-3)
F-SSB
2002
Fpa
Blim
Bpa

Table 3.11.8.a.1: Annual catches (in tonnes) of Bay of Biscay anchovy (Subarea VIII) As estimated by the Working Group members.

Country Year	France VIIIab	Spain VIIIbc, Landings	Spain Live Bait Catches	International VIII
1960	1,085	57,000	n/a	58,085
1961	1,494	74,000	n/a	75,494
1962	1,123	58,000	n/a	59,123
1963	652	48,000	n/a	48,652
1964	1,973	75,000	n/a	76,973
1965	2,615	81,000	n/a	83,615
1966	839	47,519	n/a	48,358
1967	1,812	39,363	n/a	41,175
1968	1,190	38,429	n/a	39,619
1969	2,991	33,092	n/a	36,083
1970	3,665	19,820	n/a	23,485
1971	4,825	23,787	n/a	28,612
1972	6,150	26,917	n/a	33,067
1973	4,395	23,614	n/a	28,009
1974	3,835	27,282	n/a	31,117
1975	2,913	23,389	n/a	26,302
1976	1,095	36,166	n/a	37,261
1977	3,807	44,384	n/a	48,191
1978	3,683	41,536	n/a	45,219
1979	1,349	25,000	n/a	26,349
1980	1,564	20,538	n/a	22,102
1981	1,021	9,794	n/a	10,815
1982	381	4,610	n/a	4,991
1983	1,911	12,242	n/a	14,153
1984	1,711	33,468	n/a	35,179
1985	3,005	8,481	n/a	11,486
1986	2,311	5,612	n/a	7,923
1987	4,899	9,863	546	15,308
1988	6,822	8,266	493	15,581
1989	2,255	8,174	185	10,614
1990	10,598	23,258	416	34,272
1991	9,708	9,573	353	19,634
1992	15,217	22,468	200	37,885
1993	20,914	19,173	306	40,393
1994	16,934	17,554	143	34,631
1995	10,892	18,950	273	30,115
1996	15,238	18,937	198	34,373
1997	12,020	9,939	378	22,337
1998	22,987	8,455	176	31,617
1999	13,649	13,145	465	27,259
2000	17,765	19,230	n/a	36,994
2001	17,097	23,052	n/a	40,149
2002	*6,419*	*4,500*	n/a	*10,919*
Average (1960–01)	6,200	27,811	318	33,962

Provisional estimate for the first half of the year

Table 3.11.8.a.2 Anchovy in Subarea VIII (Bay of Biscay)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 1–3
1987	8497490	37164	15308	0.5401
1988	3466470	39877	15581	0.5948
1989	19308810	21306	10614	0.5336
1990	7467920	51291	34272	1.0520
1991	27378880	30791	19634	0.9013
1992	23985640	72368	37885	0.9021
1993	12681140	82507	40293	0.7053
1994	10411890	53563	34631	0.7742
1995	14232120	43363	30115	0.8607
1996	18220110	40128	34373	1.2126
1997	28780120	46182	22337	0.5170
1998	14268800	96087	31617	0.3538
1999	25530960	77885	27259	0.3573
2000	32708580	97971	36994	0.4475
2001	4356450	126033	40564	0.3331
2002[1]	7827774	58129		0.3331
Average	16195197	60915	28765	0.6512

[1] Assumed

3.11.8.b Anchovy in Division IXa

State of stock/exploitation: No precautionary approach reference points have been proposed for this stock and the state of the stock in relation to safe biological limits is unknown.

Management objectives: There are no explicit management objectives for this stock.

Precautionary reference points: At present, there is not sufficient information to estimate appropriate reference points

Advice on management: ICES recommends that catches in 2003 be restricted to 4 700 t (mean catches from the period 1988–2001 (excluding 1995, 1998, and 2001). This level should be kept until the response of the stock to the fishery is known.

Relevant factors to be considered in management: There are large inter-annual fluctuations in the spawning stock due to the short life span of anchovy. The fishery depends largely on the incoming year class, the abundance of which cannot be estimated before it has entered the fishery. Therefore in-year monitoring and management should be considered.

Elaboration and special comments: There is a regular fishery for anchovy in Division IXa South (Gulf of Cadiz). The fleets in the northern part of Division IXa occasionally target anchovy when abundant, as occurred in 1995. The anchovy in Division IXa South has different biological characteristics and dynamics from the anchovy in other parts of Division IXa. The anchovy population in Division IXa South appears to be well established and relatively independent from populations in other parts of Division IXa. These other populations seem to be abundant only when suitable environmental conditions occur. Catch statistics for Division IXa South are available from Portugal since 1943 and from Spain since 1988. Spanish data from before 1988 include catches from other areas.

In 2000 catches in Division IXa South decreased, probably as a result of a large reduction in the fishing effort by the Barbate single-purpose purse-seine fleet. Most of these vessels accepted a tie-up scheme in 2000 and 2001 because the EU-Morocco Fishery Agreement was not renewed. ICES notes that there is a potential for a rapid increase in the effort directed towards this stock which is undesirable.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10–19 September 2002 (ICES CM 2003/ACFM:07).

Catch data (Table 3.11.8.b.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM landings
1987	Not assessed	-	4.6	n/a
1988	Not assessed	-	6	4.7
1989	Not assessed	-	6	6.0
1990	Not assessed	-	9	6.5
1991	Not assessed	-	9	5.9
1992	Not assessed	-	12	3.2
1993	If required, precautionary TAC	-	12	2.0
1994	If required, precautionary TAC	-	12	3.4
1995	If required, precautionary TAC	-	12	13.0
1996	If required, precautionary TAC	-	12	4.6
1997	If required, TAC at pre-95 catch level	-	12	5.3
1998	No advice		12	11.0
1999	If required, TAC at pre-95 catch level	4.6	13	7.4
2000	Fishery less than pre-95 level and develop and implement management plan	4.6	10	2.5
2001	Average catch excl. 95 and 98	4.9	10	9.1
2002	Average catch excl. 95 and 98	4.9	8	
2003	Average catch excl. 95, 98, and 01	4.7		

[1]TAC for Subareas IX and X and CECAF 34.1.1. n/a=not available. Weights in ‘000 t.

Anchovy in Division IXa

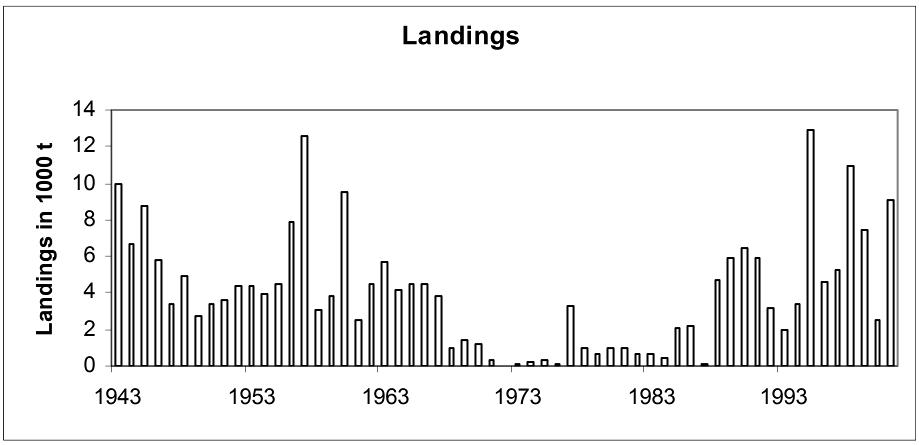


Table 3.11.8.b.1 Portuguese and Spanish annual landings (t) of Anchovy in Division IXa (From Pestana, 1989 and 1996 and Working Group members). (-) Not available. (0) Less than 1 t.

	Portugal				Spain			
Year	IXa C-N	IXa C-S	IXa South	Total	IXa North	IXa South	Total	TOTAL
1943	7121	355	2499	9975	-	-	-	-
1944	1220	55	5376	6651	-	-	-	-
1945	781	15	7983	8779	-	-	-	-
1946	0	335	5515	5850	-	-	-	-
1947	0	79	3313	3392	-	-	-	-
1948	0	75	4863	4938	-	-	-	-
1949	0	34	2684	2718	-	-	-	-
1950	31	30	3316	3377	-	-	-	-
1951	21	6	3567	3594	-	-	-	-
1952	1537	1	2877	4415	-	-	-	-
1953	1627	15	2710	4352	-	-	-	-
1954	328	18	3573	3919	-	-	-	-
1955	83	53	4387	4523	-	-	-	-
1956	12	164	7722	7898	-	-	-	-
1957	96	13	12501	12610	-	-	-	-
1958	1858	63	1109	3030	-	-	-	-
1959	12	1	3775	3788	-	-	-	-
1960	990	129	8384	9503	-	-	-	-
1961	1351	81	1060	2492	-	-	-	-
1962	542	137	3767	4446	-	-	-	-
1963	140	9	5565	5714	-	-	-	-
1964	0	0	4118	4118	-	-	-	-
1965	7	0	4452	4460	-	-	-	-
1966	23	35	4402	4460	-	-	-	-
1967	153	34	3631	3818	-	-	-	-
1968	518	5	447	970	-	-	-	-
1969	782	10	582	1375	-	-	-	-
1970	323	0	839	1162	-	-	-	-
1971	257	2	67	326	-	-	-	-
1972	-	-	-	-	-	-	-	-
1973	6	0	120	126	-	-	-	-
1974	113	1	124	238	-	-	-	-
1975	8	24	340	372	-	-	-	-
1976	32	38	18	88	-	-	-	-
1977	3027	1	233	3261	-	-	-	-
1978	640	17	354	1011	-	-	-	-
1979	194	8	453	655	-	-	-	-
1980	21	24	935	980	-	-	-	-
1981	426	117	435	978	-	-	-	-
1982	48	96	512	656	-	-	-	-
1983	283	58	332	673	-	-	-	-
1984	214	94	84	392	-	-	-	-
1985	1893	146	83	2122	-	-	-	-
1986	1892	194	95	2181	-	-	-	-
1987	84	17	11	112	-	-	-	-
1988	338	77	43	458	-	4263	4263	4721
1989	389	85	22	496	118	5336	5454	5950
1990	424	93	24	541	220	5726	5946	6487
1991	187	3	20	210	15	5697	5712	5922
1992	92	46	0	138	33	2995	3028	3166
1993	20	3	0	23	1	1960	1961	1984
1994	231	5	0	236	117	3036	3153	3389
1995	6724	332	0	7056	5329	571	5900	12956
1996	2707	13	51	2771	44	1780	1824	4595
1997	610	8	13	632	63	4600	4664	5295
1998	894	153	566	1613	371	8977	9349	10962
1999	957	96	355	1408	413	5587	6000	7408
2000	71	61	178	310	10	2182	2191	2502
2001	397	19	439	855	27	8216	8244	9098

3.11.8.c Answer to EC request on harvest strategies for anchovy

DG Fish has requested ICES to consider:

In relation to short lived species such as anchovy there is need to develop case specific harvest strategies, these should:

- *Take into account the specific life history of such species while at the same time allowing harvest close to long term maximum yield*

- *The form of advice contains some but not all of the requested information and the advice could be developed further by clear statements of the nature of the risk incurred crossing the reference points, time horizon over which the risk is assessed and the consequences for the long-term yield of various Fs. It is therefore important that the advice is accompanied by statements in relation to:*

- *The nature of the risk of immediate collapse as opposed to risks in medium or long term;*

- *The risk created by not taking appropriate remedial actions, including the risk created by not taking action at all.*

ICES Comments:

ICES has so far not been able to address this topic in full. Partial answers have been provided by STECF, 1999 and by Uriarte and Rueda in a working paper to the ICES Mackerel Assessment Working Group in 2001. There has also been done work on improving the predictability of anchovy recruitment through monitoring of environmental variables. A simulation framework to evaluate the benefits of using environmentally-linked recruitment predictors in the management of anchovy-like stocks is being devised for 2002 (Barange, 2001).

Harvest Control Rules for Anchovy

Scientific advice for the management of the fishery through TACs rely in assumptions about future recruitment, either derived through direct surveys or by indirect forecasts of the recruitment.

The population dynamics of anchovy, with a very short lifespan and with the spawning stock and catch consisting mainly of ages 1 and 2, makes this stock difficult to manage by annual TACs because most of the stock (in some years over 90%) in the TAC year consists of year classes that are unknown at the time of the advice. The would require a mid-term stock evaluation based on fishery and survey results, which causes additional work; therefore, ICES in 2000 and again STECF in November 2000 (STCEF2000) suggested that a two-stage regime might be implemented only if the spawning biomass was below some threshold value.

To avoid the possibility of advising a TAC that could turn out to be too high resulting in excessive fishing mortality and stock depletion, the incoming recruitment will have to be assumed at a low level. This results in a cautious primary advice, but would allow an increase in the TAC in the second half of the year if a mid-year revision showed that the stock could sustain a higher TAC. This would be in accordance with the precautionary approach.

ICES continues to provide advice in accordance with its previous proposal: a two-stage regime, where a preliminary TAC is set at the beginning of the year based on an analytic assessment in the autumn, and revised according to the fishery in the first half of the year, and survey results obtained in May-June from acoustic and Daily Egg Production Method (DEPM). In order to be precautionary, the preliminary TAC set at the beginning of the year aims at keeping the stock safely above $\mathbf{B}_{\mathrm{lim}}$ even if the incoming year class is poor.

References:

Barange, M. (Ed.) 2001: Report of the 1st meeting of the SPACC/IOC Study Group on “Use of environmental indices in the management of pelagic fish populations” (3–5 Sept. 2001, Cape Town, South Africa). GLOBEC Special Contribution No 5, 122 pp.

STECF-SGRST 1999. Report of the Meeting to provide the Commission with scientific background in order to define a managment strategy for the stock of anchovy in the Bay of Biscay (ICES Subarea VIII), Brussels 21–25 February 1999.

3.12 Widely Distributed and Migratory Stocks

3.12.1 Overview

A number of stocks assessed by ICES are not confined to the individual areas considered in other sections of this report. They include species with stock units that are distributed over much wider areas such as hake and a number of deepwater species, and migratory species such as mackerel, horse mackerel, and blue whiting.

The Northern hake is fished throughout Subareas IV, VI, VII, and VIII. The spawning stock biomass, which is estimated to be about 115 400 t in 2002, has been at a low level for a number of years and is considered to be outside safe biological limits. The landings, which are mainly taken by Spain and France, have decreased in recent years and the 2001 landings of 37 200 t were the second lowest recorded for over twenty years. Recruitment has been very poor in 1997–2000 and the stock is not expected to increase unless there is a substantial reduction in fishing mortality.

The Northeast Atlantic mackerel stock, which is considered to consist of three spawning components (North Sea, Western, and Southern), is fished over a very wide area extending throughout Subareas II, IV, VI, VII, and VIII. Considerable mixing of the components occurs at various times throughout the year. The fishery is conducted by a number of countries, but Norway, United Kingdom, Russia, Ireland, the Netherlands, and Spain take the main catches. The total catch in 2001 was estimated to be almost 678 000 t. The spawning stock has increased in recent years and in 2002 was estimated to be over 3.1 million t. This high SSB is expected to be maintained in the future if fishing mortality is reduced to below $\mathbf{F}_{pa}$.

The Western horse mackerel fishery extends throughout Subareas IV, VI, VII, and VIII. The stock is exploited by a number of countries; Netherlands and Ireland take the main catches. The catch in 2001 was estimated to be about 191 000 t, which is slightly more than in 2000. The stock is inside safe biological limits. Following the outstanding 1982 year class, which for more than a decade contributed a significant part of the catches, recruitment of horse mackerel has been weak. SSB is bound to be low as this year class is fished out and the sustainable yield is unlikely to be higher than about 130 000 t per year.

The Northern blue whiting stock is fished in Subareas II, V, VI, and VII and by a number of countries, mainly by Norway, Russia, Iceland, Denmark, Faroe Islands, United Kingdom, and Ireland. The 2001 catches were almost 1.8 million t and were the highest ever recorded from the fishery. Most of these catches were landed for industrial purposes. The spawning stock that in 2001 was estimated to be 2.7 million t, has been boosted by an excellent recruitment in recent years. However, it is expected that the stock will rapidly decline in the near future as it is unlikely that recruitment will be able to maintain the present high catches.

3.12.2 Hake – Northern stock (Division IIIa, Subareas IV, VI and VII, and Divisions VIIIa, b, d)

State of stock/exploitation: The stock is outside safe biological limits. Fishing mortality has been above $\mathbf{F}_{pa}$ for the entire period of the assessment, which is since 1978, and has even been above $\mathbf{F}_{lim}$ in most years since 1988. Current F is below $\mathbf{F}_{lim}$. SSB has generally declined till the early 1990s and has stabilised at a low level since. SSB has been below $\mathbf{B}_{pa}$ since 1988, and even below $\mathbf{B}_{lim}$ for most years since 1990. Recruitment estimates for 1997-2000 are the lowest recorded. Recruitment in 2001 is average.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 120 000 t, the lowest observed biomass in the 1998 assessment.	$\mathbf{B}_{pa}$ be set at 165 000 t. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty in assessments.
$\mathbf{F}_{lim}$ is 0.28, the fishing mortality above which stock dynamics are unknown.	$\mathbf{F}_{pa}$ be set at 0.20. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and a 50% probability of maintaining SSB above $\mathbf{B}_{pa}$ in the next 10 years, taking into account the uncertainty in assessments.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$.	$\mathbf{B}_{pa} \sim \mathbf{B}_{lim}$ x 1.4.
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$.	$\mathbf{F}_{pa} \sim \mathbf{F}_{lim}$ * 0.72, implies a less than 10% probability that ($\mathbf{SSB}_{MT} < \mathbf{B}_{pa}$).

Advice on management: In light of the general reduction in SSB and the generally poor recruitment since 1997, ICES recommends that a recovery plan be implemented to ensure safe and rapid recovery of SSB above 165 000 t. ICES considers the recovery plan identified as STECF scenario 8 ($\mathbf{F}_{pa}$ limit on annual fishing mortality, 20% annual limit on TAC change, and 20% annual biomass increase, given in the order of priority) to be consistent with the Precautionary Approach. This recovery plan requires an increase in SSB that is likely to be detectable on an annual basis given current assessment uncertainty, allows for a relative rapid recovery of the SSB to $\mathbf{B}_{pa}$ in about 7 years, and incorporates a modest degree of change in annual TAC to moderate disruption of the fisheries.

Such a recovery plan can only be implemented if there is full compliance by all fisheries harvesting Northern hake. This in turn requires strong support from the fisheries for the provision of the plan, and effective monitoring of the fisheries and enforcement of the fishery regulations. This will also require effective control of effort in these mixed species fisheries at levels reduced substantially from recent levels.

If the above recovery plan is adopted this corresponds to a catch of less than 21 600 t, and this implies an effort reduction of around 50% in 2003.

If such a recovery plan is not implemented, ICES recommends that fishing mortality on hake should be as close to zero as possible.

Rebuilding plan: Rebuilding of the hake stock can be obtained by reducing the fishing mortality, or by a reduction in F combined with an improvement of the selection pattern.

The minimum legal mesh-size was increased from 55/65 mm to 70 mm in the Bay of Biscay since 1 January 2000. An emergency plan for Northern Hake was implemented on 1 September 2001. This plan combines a low TAC for 2001 and 2002, and requires the use of mesh size of 100 mm for trawlers targeting hake in the Bay of Biscay and for trawlers operating in two non-*Nephrops* areas (one in the Bay of Biscay, one in the Celtic Sea). ICES has not been able to quantify the likely impact of these changes in mesh size, but, since hake is a late maturing fish, any improvement in the selection pattern that reduces the catch of younger fish (ages 0-2, ~ less than 30 cm) will have little short term effect on SSB and only increase SSB in the medium term. At *status quo* F and with no catch of hake of ages 0-1 in 2002 and no catch at ages 0-2 in 2003 onwards, SSB in 2007 is expected to be 18% higher above what is expected if the the current selection pattern is maintained. Even this 18 % higher SSB is still below $\mathbf{B}_{pa}$. But, such an improvement of the selection pattern would increase the probability that a reduction in fishing mortality will allow the rebuilding of SSB.

However, an improvement in the selection pattern alone is unlikely to be sufficient to reduce exploitation to the level needed to rebuild the hake stock. To reach this goal additional reductions in mortality are needed.

An update of the STECF Harvest Control Rule scenario 8 is summarised below. For 2002 it is assumed that fishing mortality will be at *status quo*; for 2003 a TAC constraint is applied, with a TAC 20% lower than that actually set for 2002, i.e. 0.8*27 000 tons =21 600 t. In 2001 landings were well above the TAC:

- In 2003, the decrease in landings between 2002 and 2003 is around 45%, and SSB is expected to increase by around 15%.

- For 2004 onwards, following the specified HCR would lead to the stock recovery in about 6 years, in more than 80% of the simulations.

ICES reiterates the statement made by STECF, "the values of the outcomes of the harvest control rules should NOT be interpreted as absolute. They are presented as values which are conditional on a number of assumptions made within the forecast model, and are better considered to be relative values to be compared one to another."

Reducing fishing mortality by setting the TAC at a low level has been shown to be ineffective due to TAC overshot and/or misreporting. ICES, therefore, recommends that in addition to TAC constraints, restrictions in effort of fleets exploiting/targeting hake should be implemented. Closed areas and seasons may contribute to stock recovery, but only if accompanied by major reductions in effort.

Relevant factors to be considered in management: A fishing mortality of zero in 2003 is not expected to rebuild SSB to $\mathbf{B}_{pa}$ by 2004.

Given the state of the stock, and the risk of impaired recruitment, any further delay in the definition/implementation of a recovery plan will be prejudicial to the stock and the fastest possible rebuilding to $\mathbf{B}_{pa}$ is strongly advised.

The 20% constraint on annual change in TAC means that fishing mortality will not be sufficiently reduced in 2003 to produce a 20% increase in SSB in the short term. Adoption of the rebuilding plan requires a long-term commitment not to increase TAC by more than the 20% constraint once SSB begins to rebuild.

The advised recovery plan is based on a model scenario that includes a number of assumptions. These assumptions are considered reasonable given the current knowledge, but monitoring of the stock, ecosystem, and fisheries during the rebuilding period may reveal that some of the assumptions are not met. Major deviations from the assumptions may require changes to the rebuilding plan and/or expectations about the timeframe necessary for recovery.

The advised rebuilding plan is build on forecasts suggesting rebuilding in about 7 years. This is about as fast as recovery is possible without essentially implementing a total closure of the fisheries harvesting Northern hake.

Information from the fishery indicates a decrease in the amount of small hake caught in recent years. This might be explained by an improvement in the selection pattern, changes in fishing strategy, small fish becoming inaccessible to sampling, or simply a consequence of weak year classes in recent years and the enforcement of a minimum landing size.

The Spanish fleets operating in Subareas VI, VII, and VIII stopped fishing for one and a half months during the summer of 2002. Likewise in 2001, an important part of the Spanish (Basque) fleet fishing in Subarea VIII stopped its activity for one month in August.

Hake is caught in nearly all fisheries in Subareas VII and VIII. The LPUE series show different trends in different areas and between different fleets. Compared to 2000, LPUE in 2001 shows a 30% decrease for the two most important trawler fleets operating in Subarea VII (A Coruña and Vigo fleets), whilst remaining at a high level for the A Coruña fleet. In Subarea VII long-liners show an increase (+5%) in LPUE (kg/day), and gillnetters in Subarea VII+VIII (+8%). In Subarea VIII, there is no clear trend in the LPUE. However, even though there are some conflicting signals in LPUE between areas in recent years, the main concern is the overall declining trend in the stock size since the beginning of the assessment period (1978).

Catch forecast for 2003: Forecasts with an $\mathbf{F}_{sq}$ for 2002 are presented below.

Since the TAC in 2001 was overshot by more than 60%, and even though an emergency plan has been implemented since September 2001, there is no evidence that forecasts with a TAC constraint would be realistic.

Basis: F(2002) = $\mathbf{F}_{sq}$ = mean $F_{(99-01)}$ = 0.28; Landings(2002) = 40.1; Catch(2002) = 41.0; SSB(2003) = 109.4.

F(2003) Onwards	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0	0	0	0	148.9
0.06	0.2*$\mathbf{F}_{sq}$	9.2	9.0	139.2
0.11	+20% SSB ~ 0.4*$\mathbf{F}_{sq}$	17.9	17.5	130.1
0.14[1]	-20%TAC~0.50*$\mathbf{F}_{sq}$	22.1	21.6	125.7
0.17	0.6*$\mathbf{F}_{sq}$	25.9	25.4	121.6
0.20	$\mathbf{F}_{pa}$	29.8	29.2	117.5
0.23	0.8*$\mathbf{F}_{sq}$	33.5	32.7	113.7
0.28	$\mathbf{F}_{sq}$	40.6	39.6	106.4

[1] Acceptable only if there is a long-term commitment to the specified recovery plan. Weights in '000 t.
Shaded scenarios are considered inconsistent with the precautionary approach.

Medium-term projections: Medium-term projections suggest that fishing at $\mathbf{F}_{pa}$ leads to a 50% probability of the stock exceeding $\mathbf{B}_{pa}$ in 2007, while fishing at the level required to allow a 15% increase in SSB per year leads to the same target in 2005-2006.

Comparison with previous assessment and advice: Estimates of fishing mortality and SSB in the current and last year's assessments are similar. This year's assessment did not consider catches of age 0 while these data were included in 2001. However, recruitment estimates remain very similar with the exception of the 1985 yearclass. This year's advice is similar to that of last year.

In this year's assessment, it was decided to remove the age 0 from the international catch-at-age matrix and from the commercial fleet data due to the enforcement of the minimum landing size and partial information on discards in recent years. Abundance indices for age 0 are available from surveys and are used in the assessment.

Elaboration and special comment: Since the 1930s, hake has been the main demersal species supporting trawl fleets on the Atlantic coasts of France and Spain. In 2001, Spain took 60% of the landings, France 25%, UK about 6%, Denmark 3%, and Ireland 2%. Hake are caught throughout the year, the peak landings being made in spring-summer months. The three main gear types used by vessels fishing for hake as a target species are lines (E & W, Spain), fixed-nets and trawls (all countries), mostly bottom trawls, a few pelagic ones (France), and recently also Very High Opening trawls (Spain).

Hake spawn from February through July along the shelf edge, the main areas extending from north of the Bay of Biscay to the south and west of Ireland. 0-groups descend to the seabed (at depths in excess of 200 m), moving to shallower water with a muddy seabed (75–120 m) by September. There are two major nursery areas: in the Bay of Biscay and off southern Ireland. Three-year-old hake begin to move into the shallower regions of the Bay of Biscay and Celtic Sea, but as they approach maturity they disperse to offshore regions.

Hake movements are indicated by the seasonal distribution of catches. From the beginning of the year until March/April hake are present in the North of the Bay of Biscay. They appear on the shelf edge in the Celtic Sea in June and July. Between August and December the hake fishery is centred to the west and southwest of Ireland, with a decline in catch rates in shallower waters.

Length composition data by fishery unit are available annually for 1978–1989 and quarterly for 1990–2001. Prior to 1992, these were converted to age compositions by numerical methods. For 1992–2001, age readings were used.

Investigations of some structural uncertainties in the assessment model have been carried out. The effects of increasing the current 8+ group to a 10+ group has been tested, even though the ageing of older fish using otoliths appears to be difficult. However, using a 10+ group reduces the sensitivity of SSB perception to model assumptions. In addition, differences in mean F trajectories between the 8+ and 10+ analyses are small, but become more pronounced as older ages are incorporated into the mean F calculation.

ACFM reiterates its May 2002 statement that: 'Revision of Biological Reference Points for northern hake would benefit from further investigations into the source of the instability in the assessment. Therefore, no revisions of the biological reference points are currently suggested even though the actual ones are considered to be possibly inappropriate'.

Source of information: Report of the Working Group on the Assessment of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01) and STECF Report.

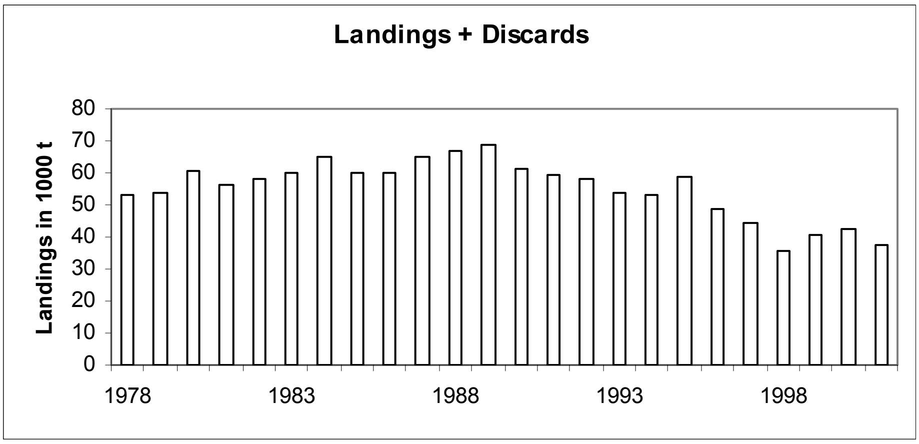
Yield and spawning biomass per Recruit
F-reference points:

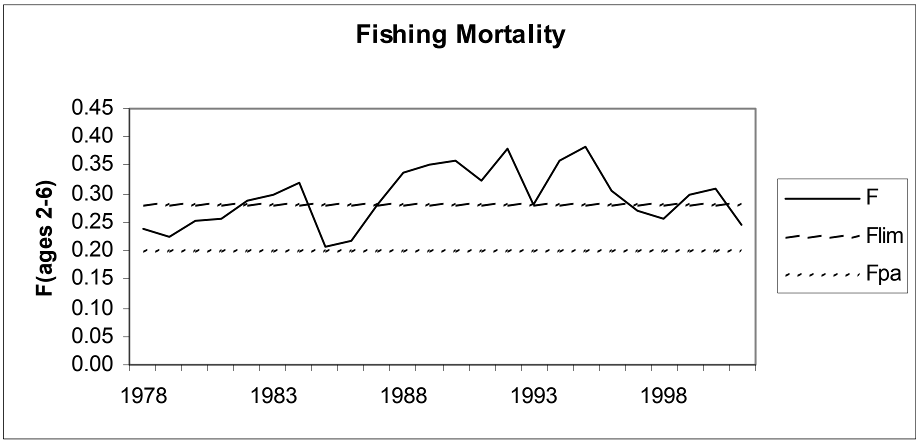
	Fish Mort Ages 2-6	Landings/R	SSB/R
Average Current	0.285	0.240	0.653
$\mathbf{F}_{max}$	0.174	0.256	1.137
$\mathbf{F}_{0.1}$	0.107	0.241	1.705
$\mathbf{F}_{med}$	0.280	0.241	0.667

Catch data (Tables 3.12.2.1–2):

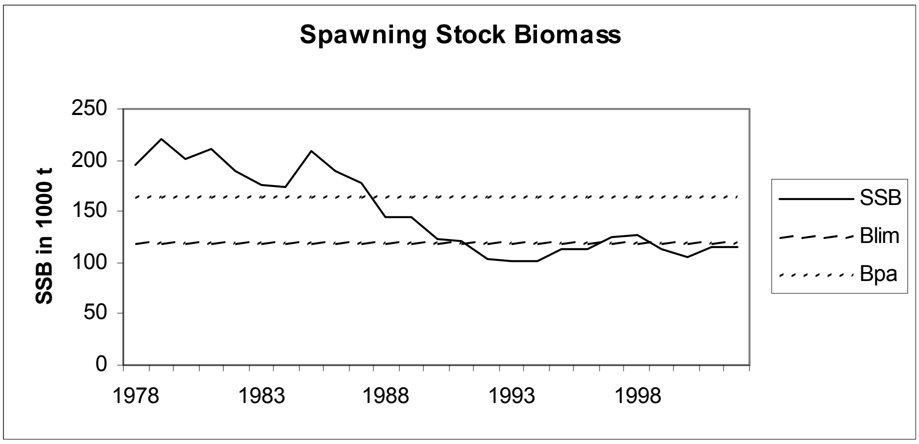
Year	ICES Advice	Predicted catch corresp to advice	Agreed TAC[1]	ACFM landings	Disc. slip.	ACFM catch
1987	Precautionary TAC; juvenile protection	-	63.5	63.4	2.0	65.3
1988	Precautionary TAC; juvenile protection	54	66.2	64.8	2.0	66.8
1989	Precautionary TAC; juvenile protection	54	59.7	66.5	2.3	68.8
1990	Precautionary TAC; juvenile protection	59	65.1	59.9	1.5	61.4
1991	Precautionary TAC; juvenile protection	59	67.0	57.6	1.7	59.3
1992	If required, precautionary TAC	61.5	69.0	56.6	1.7	58.3
1993	Enforce juvenile protection legislation	-	71.5	52.1	1.5	53.6
1994	F significantly reduced	<46	60.0	51.3	1.9	53.1
1995	30% reduction in F	31	55.1	57.6	1.2	58.9
1996	30% reduction in F	39	51.1	47.2	1.5	48.8
1997	20% reduction in F	54	60.1	42.6	1.8	44.4
1998	20% reduction in F	45[2]	59.1	35.0	0.8	35.8
1999	Reduce F below $\mathbf{F}_{pa}$	<36[2]	55.1	39.8	0.8	40.6
2000	50% reduction in F	<20[2]	42.1	42.0	0.6	42.6
2001	Lowest possible catch, rebuilding plan	-	22.6	36.7	0.5	37.2
2002	Lowest possible catch / rebuilding plan	-	27.0			
2003	Lowest possible catch / rebuilding plan	-				

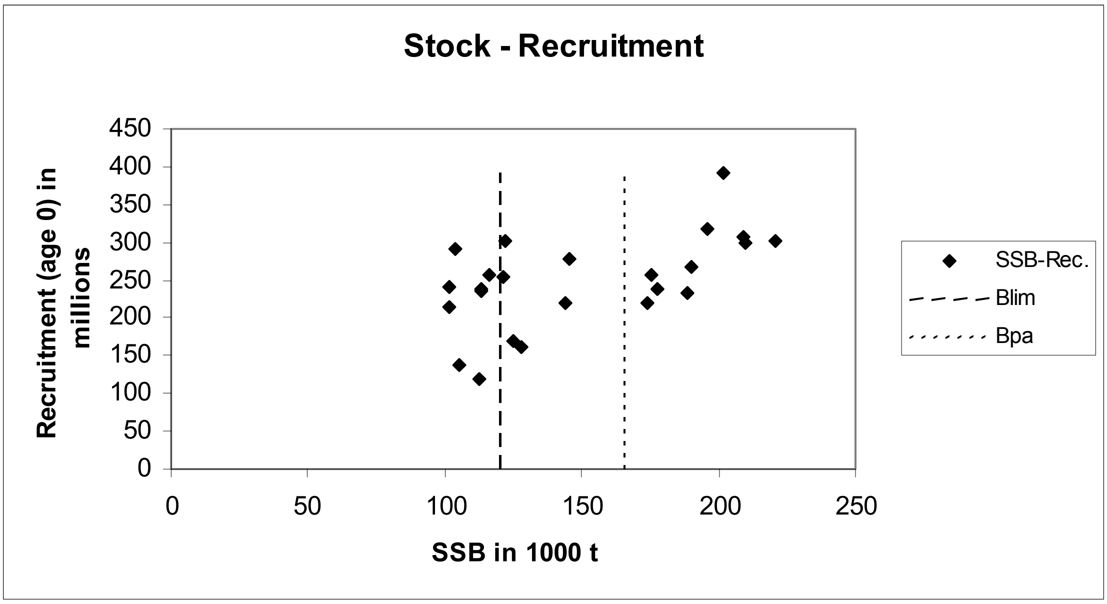
[1]Sum of area TACs corresponding to Northern stock plus Division IIa (EC zone only). [2]Landings. Weights in '000 t.

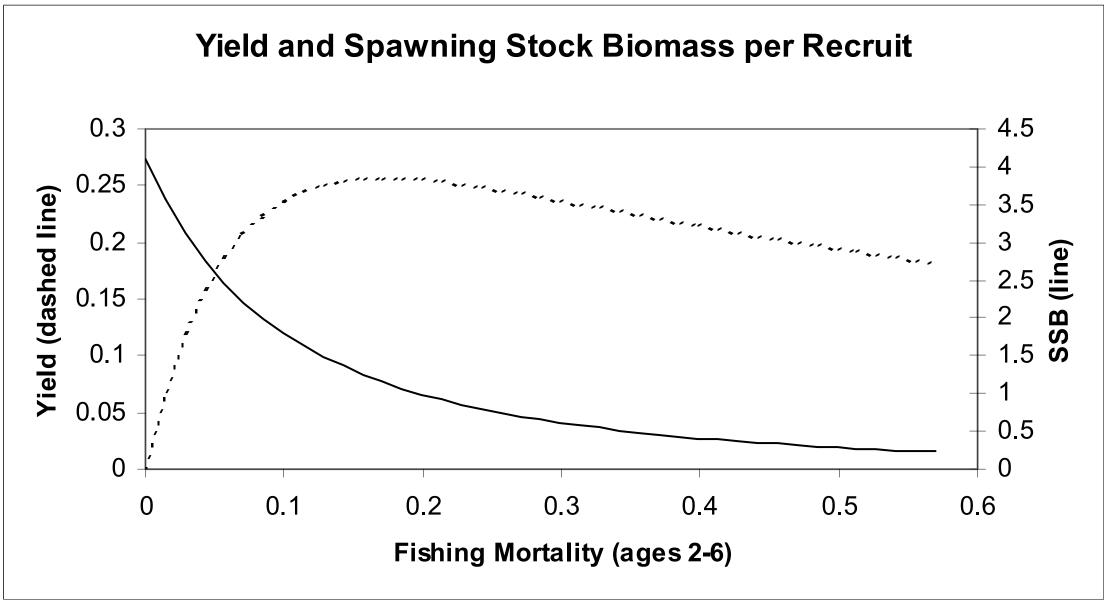

Landings + Discards
Landings in 1000 t
0
10
20
30
40
50
60
70
80
1978
1983
1988
1993
1998


Fishing Mortality
F(ages 2-6)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
1978
1983
1988
1993
1998
F
Flim
Fpa


Recruitment (age 0)
Recruitment in millions
0
50
100
150
200
250
300
350
400
450
1978
1983
1988
1993
1998


Spawning Stock Biomass
SSB in 1000 t
0
50
100
150
200
250
1978
1983
1988
1993
1998
SSB
Blim
Bpa


Stock - Recruitment
450
400
350
300
250
200
150
100
50
0
Recruitment (age 0) in millions
0
50
100
150
200
250
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
0.3
0.25
0.2
0.15
0.1
0.05
0
Yield (dashed line)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SSB (line)
0
0.1
0.2
0.3
0.4
0.5
0.6
Fishing Mortality (ages 2-6)

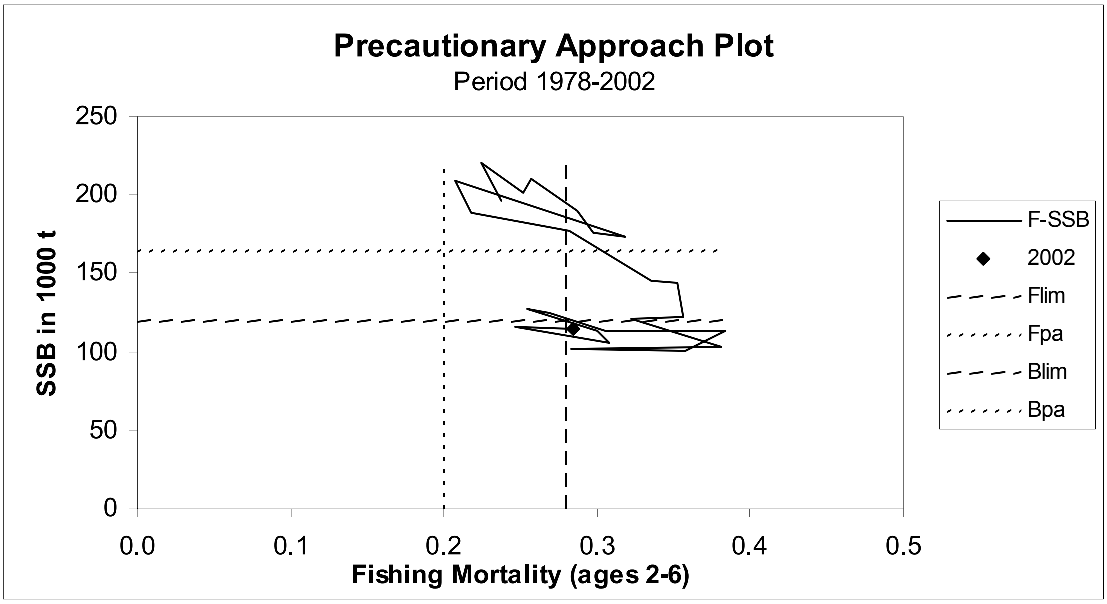

Precautionary Approach Plot
Period 1978-2002
250
200
150
100
50
0
SSB in 1000 t
0.0
0.1
0.2
0.3
0.4
0.5
Fishing Mortality (ages 2-6)
F-SSB
2002
Flim
Fpa
Blim
Bpa

Table 3.12.2.1 Estimates of catches ('000 t) for the Northern Hake by area for 1961–2001.

	Landings [1]					Discards [2]	Catches [3]
Year	IIIa+IVa+VI	VII	VIIIa,b	Unallocated	Total	VIIIa,b	Total
1961	-	-	-	95.6	95.6	-	95.6
1962	-	-	-	86.3	86.3	-	86.3
1963	-	-	-	86.2	86.2	-	86.2
1964	-	-	-	76.8	76.8	-	76.8
1965	-	-	-	64.7	64.7	-	64.7
1966	-	-	-	60.9	60.9	-	60.9
1967	-	-	-	62.1	62.1	-	62.1
1968	-	-	-	62.0	62.0	-	62.0
1969	-	-	-	54.9	54.9	-	54.9
1970	-	-	-	64.9	64.9	-	64.9
1971	8.5	19.4	23.4	0	51.3	-	51.3
1972	9.4	14.9	41.2	0	65.5	-	65.5
1973	9.5	31.2	37.6	0	78.3	-	78.3
1974	9.7	28.9	34.5	0	73.1	-	73.1
1975	11.0	29.2	32.5	0	72.7	-	72.7
1976	12.9	26.7	28.5	0	68.1	-	68.1
1977	8.5	21.0	24.7	0	54.2	-	54.2
1978	8.0	20.3	24.5	-2.2	50.6	2.4	52.9
1979	8.7	17.6	27.2	-2.4	51.1	2.7	53.8
1980	9.7	22.0	28.4	-2.8	57.3	3.2	60.5
1981	8.8	25.6	22.3	-2.8	53.9	2.3	56.3
1982	5.9	25.2	26.2	-2.3	55.0	3.1	58.1
1983	6.2	26.3	27.1	-2.1	57.5	2.6	60.1
1984	9.5	33.0	22.9	-2.1	63.3	1.9	65.1
1985	9.2	27.5	21.0	-1.6	56.1	3.8	59.9
1986	7.3	27.4	23.9	-1.5	57.1	3.0	60.1
1987	7.8	32.9	24.7	-2.0	63.4	2.0	65.3
1988	8.8	30.9	26.6	-1.5	64.8	2.0	66.8
1989	7.4	26.9	32.0	0.2	66.5	2.3	68.8
1990	6.7	23.0	34.4	-4.2	59.9	1.5	61.4
1991	8.3	21.5	31.6	-3.9	57.6	1.7	59.3
1992	8.6	22.5	23.5	2.1	56.6	1.7	58.3
1993	8.5	20.5	19.8	3.3	52.1	1.5	53.6
1994	5.4	21.1	24.7	0	51.3	1.9	53.1
1995	5.4	24.1	28.1	0	57.6	1.2	58.9
1996	4.4	24.7	18.1	0	47.2	1.5	48.8
1997	3.3	18.9	20.3	0	42.6	1.8	44.4
1998	3.2	18.7	13.1	0	35.0	0.8	35.8
1999	4.3	24.0	11.6	0	39.8	0.8	40.6
2000	4.0	26.0	12.0	0	42.0	0.6	42.6
2001	4.4	23.1	9.2	0	36.7	0.5	37.2

(1) Spanish data for 1961-1972 not revised, data for Subarea VIII for 1973-1978 include data for Divisions VIIIa,b only. Data for 1979-1981 are revised based on French surveillance data. Includes Divisions IIIa, IVb,c from 1976. There are some unallocated landings (moreover for the period 1961-1970).

(2) Discards have been estimated from 1978 and only for Divisions VIIIIa,b.

(3) From 1978 total catches used for the Working Group.

Table 3.12.2.2 Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b).

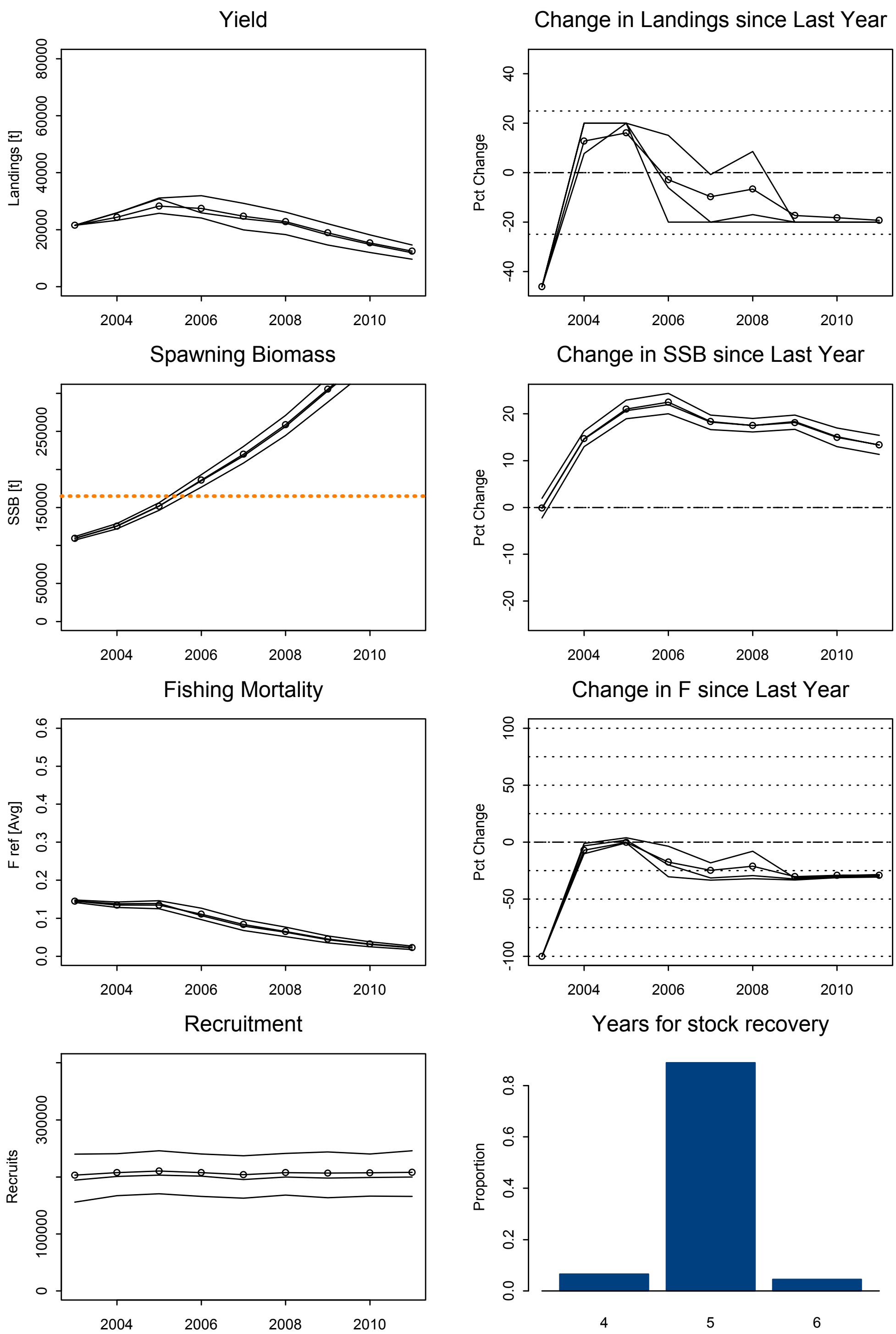
Year	Recruitment Age 0 thousands	SSB tonnes	Landings + Discards tonnes	Mean F Ages 2-6
1978	318000	196000	52900	0.238
1979	303000	221100	53800	0.224
1980	392000	202000	60500	0.252
1981	300000	210100	56300	0.257
1982	267000	190400	58100	0.287
1983	257000	175700	60100	0.298
1984	221000	173900	65100	0.319
1985	306000	209000	59900	0.207
1986	233000	188500	60100	0.218
1987	239000	177500	65300	0.282
1988	279000	145200	66800	0.336
1989	221000	143800	68800	0.353
1990	301000	122300	61400	0.357
1991	254000	121100	59300	0.323
1992	292000	103700	58300	0.381
1993	242000	101500	53600	0.283
1994	214000	101300	53100	0.358
1995	236000	113200	58900	0.384
1996	239000	113200	48800	0.306
1997	170000	125300	44400	0.269
1998	162000	127800	35900	0.255
1999	118000	112900	40600	0.300
2000	138000	105600	42600	0.308
2001	256000	116100	37200	0.247
2002	207000*	115400		0.285
Average	246600	148504	55075	0.293

* GM 89-00

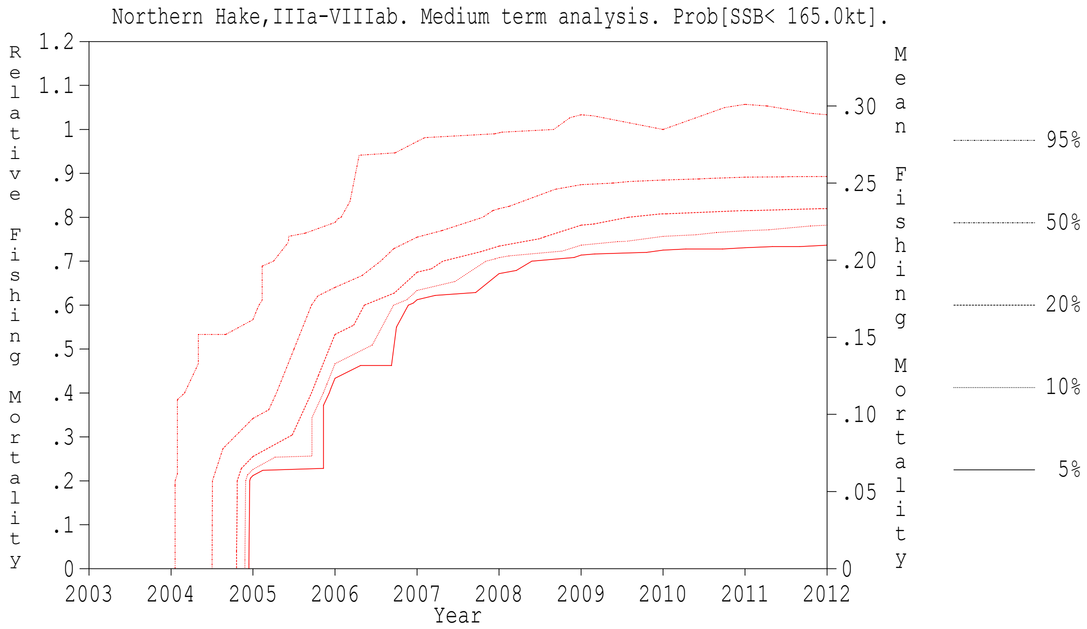
Northern Hake: CS simulation (update of STECF scenario 8):

Ockham-razor S-R assumed. 10% bias.
Assuming *status quo* F in 2002
Starting simulations in 2003 with a TAC constraint of 0.8* TAC2002 (ie 21 584 t)

$F<\mathbf{F}_{pa}$
20% limit on Landings changes,
+20% in SSB



Note: Since the starting year is 2003, it is needed to add one year to the given 'years for stock recovery'



Medium-term projection starting in 2003 with population numbers from the status quo F catch forecast.

3.12.3 Mackerel

3.12.3.a Mackerel (combined Southern, Western and North Sea spawning components)

State of stock/exploitation: The combined stock is currently harvested outside safe biological limits. The spawning stock biomass in 2002 is estimated to be well above $\mathbf{B}_{pa}$, but the fishing mortality in 2001 is above $\mathbf{F}_{pa}$. The North Sea component remains severely depleted.

Management objectives: The agreed record of negotiations between Norway, Faroe Islands, and EU in 1999, states:

"For 2000 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality in the range of 0.15 - 0.20 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of the fishing mortality rate."

"Should the SSB fall below a reference point of 2 300 000 tonnes ($\mathbf{B}_{pa}$), the fishing mortality rate, referred to under paragraph 1, shall be adapted in the light of scientific estimates of the conditions prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2 300 000 tonnes."

"The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES."

The rationale for ICES proposing $\mathbf{F}_{pa} = 0.17$ is to have a high probability of avoiding exploiting the stock above $\mathbf{F}_{lim}$. In addition, projections indicate that F =0.17 will optimise long-term yield and at the same time result in a low risk for the stock to decrease below $\mathbf{B}_{pa}$. If F on average is kept below 0.17, ICES regards the management plan as meeting precautionary criteria.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
There is no biological basis for defining $\mathbf{B}_{lim}$	$\mathbf{B}_{pa}$ be set at 2.3 million t
$\mathbf{F}_{lim}$ is 0.26, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.17. This F is considered to provide approximately 95% probability of avoiding $\mathbf{F}_{lim}$, taking into account the uncertainty in the assessments.

Technical basis:

	$\mathbf{B}_{pa} = \mathbf{B}_{loss}$ in Western stock raised by 15%: = 2.3 million t.
$\mathbf{F}_{lim} = \mathbf{F}_{loss} = 0.26$	$\mathbf{F}_{pa} = \mathbf{F}_{lim} \times 0.65$. $\mathbf{F}_{0.1} = 0.17$

Advice on management: ICES advises a fishing mortality in 2003 of no more than F_{pa} (0.17), corresponding to landings in 2003 of less than 542 000 t. ICES advises that any agreed TAC should cover all areas where North-East Atlantic mackerel are fished.

The North Sea spawning component still needs the maximum possible protection.

- **There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year.**
- **There should be no fishing for mackerel in Division IVa during the period 1 February–31 July.**
- **The 30 cm minimum landing size at present in force in Subarea IV should be maintained.**

Relevant factors to be considered in management: Egg surveys were carried out in the western and southern spawning areas during February-July 2001 and in the North Sea spawning area in June 2002. The egg survey SSB estimates in 2001 of both the Western and the Southern area are lower than in 1998. The 2002 egg survey in the North Sea with limited spatial and temporal coverage indicates a higher egg production in the North Sea area than in 1999, due to a relatively strong 1999 year class.

The advised TAC for 2003 is lower than the advice for 2002. Last year ICES indicated that the catch projections for 2002 could be too optimistic. This comment was based on the observation that preliminary information from the egg surveys, carried out in 2001, showed a decline in both the Western and Southern area, indicating that the spawning stock could have been overestimated. This preliminary information has subsequently been confirmed. In the present assessment where this new egg survey information was used the estimate of the stock size is lower and the estimate of fishing mortality is higher compared to previous assessments.

The closure of the mackerel fishery in Divisions IVb,c and IIIa throughout the whole year is designed to protect the North Sea component in this area and also the juvenile Western mackerel which are numerous, particularly in Division IVb,c during the second half of the year. This closure has unfortunately resulted in increased discards of mackerel in the non-directed fisheries (especially horse mackerel fisheries) in these areas as vessels at present are permitted to take only 10% of their catch as mackerel by-catch. No data on the actual size of mackerel by-catch are available, but the reported landings of mackerel in Divisions IIIa and IVb,c from 1997 onwards might seriously under-estimate catches due to discarded by-catch.

Closure of Division IVa for fishing during the first half of the year was recommended for several years. This was based on the perception that the western mackerel entered the North Sea in July/August, and stayed there until December before migrating back to their spawning areas. Updated observations taken in the late 1990s suggested that this return migration actually started in mid- to late February. This was believed to result in large-scale misreporting from the Northern part of the North Sea (Division IVa) to Division VIa. It was recommended that the closure date for IVa be extended to the 1st February. This was adopted for the 1999/2000 and the 2000/2001 fishing season. Misreporting from IVa to VIa occurred again in 2001. The reasons this misreporting in 2001 are unclear but are not thought to be linked to a change in the timing of the migration to spawning areas.

For mackerel, fishery independent data of the stock size becomes available only once every 3 year from egg-surveys. In the 2 years following the most recent egg-survey, the assessment is an extrapolation based on catch at age and landing data only. Inclusion of a new independent data point may result in quite large revisions of the stock size, fishing mortality and consequently catch predictions and TAC advice. In order to avoid large changes in TAC advice, ICES is investigating whether NE Atlantic mackerel is a suitable candidate to be managed by a multi-annual TAC. The spawning stock has been stable and well above $\mathbf{B}_{pa}$ over a long period. Also many age groups are well represented in the stock and annual fluctuations in recruitment are moderate. ICES has deferred from providing multi-annual advice this year because, it did not complete its work to evaluate the risks associated with specific annual TACs, but intends to consider the provision of multi-annual advice in future.

The Mackerel Box

A review of the utility of the mackerel box was undertaken. The review concluded that the loss of potential yield and the increased risk to the spawning stock of the NEA mackerel resulting from an opening of the box should be avoided. Consequently, the mackerel box should remain closed to targeted mackerel fishing. This is consistent with previous advice. For further comments see answer to special request from UK on the utility of the Western Mackerel Box.

ICES is aware that juvenile fish are sometimes taken in large quantities in other areas of the NEA mackerel stock distribution and is continually monitoring the situation. ICES will recommend management measures for those areas if appropriate.

Catch forecast for 2003:

Basis: F(2002) = F(99-01, unscaled)=$\mathbf{F}_{sq}$ = 0.20; Landings (2002) = 649;SSB(2002) = 3080.

F (2003)	Basis	SSB (2003)	Landings (2003)	Landings (2003) **N**	Landings (2003) **S**	SSB (2004)
0.15	Lower level of agreement by EU, Norway and Faroe	3007	482	452	30	3037
0.17	F=$\mathbf{F}_{pa}$	2986	542	508	34	2971
0.18		2975	568	533	35	2941
0.19		2964	597	560	37	2909
0.20	$\mathbf{F}_{sq}$=upper level of agreement by EU, Norway and Faroe	2954	629	590	39	2875

Weights in ‘000 t.

N: Northern area comprising the Western areas, North Sea, Skagerrak and Norwegian Sea (I, IIa, IIIa, IVa, Vb, VI, VII, VIIIa,b,d,e); catches in the international zone in IIa are included.

S: Southern area (VIIIc, IXa).

Shaded scenarios considered inconsistent with the precautionary approach.

The catches are allocated to areas according to the proportion of catch-at-age by area in recent years (1998-2000). This forecast is based on the assumption of no change in the spatial distribution of the population and stable fishing mortality levels.

Medium- and long-term projections: No medium- or long-term projections were carried out.

Comparison with previous assessment and advice: This year's assessment indicates that the recent level of the stock is significantly lower than predicted in the previous years. However, the spawning stock remains well above $\mathbf{B}_{pa}$, and is the largest in the time-series since 1977. The change in perception of recent SSB level is mainly caused by the inclusion of the 2001 egg survey biomass estimate, which required a change of a number of model parameter settings. However, comparative assessments performed with different models resulted in similar SSB levels. This has also led to higher estimates of fishing mortalities and lower estimates of recruitments in recent years. These differences in the stock perception may reflect the uncertainty in the assessment, which was remarked by ICES in last year's advice.

Elaboration and special comment: No independent information is available on the most recent year classes before they are fully recruited to the fishery. In addition, the assessment model is sensitive to the most recent SSB estimate from the egg surveys leading to changes in the perception of the stock. Therefore a management regime, which is capable of incorporating this uncertainty in the advice is required. Specifically the management regime should consider the possibility that poor year classes are not recognised until several years later, and that the recent perception of the stock is subject to variability.

Little is known about discards in the mackerel fishery; however, sampling for discards has improved. ICES continues to recommend that observers should be placed on vessels in order to estimate discards in those fisheries where discarding of mackerel is perceived to be a problem.

The assessment data set on commercial landings was extended in 2002, including now the data series from 1972 onwards (previously it started in 1984).

Stock components: ICES currently uses the term "North East Atlantic Mackerel" to define the mackerel present in the area extending from ICES Division IXa in the south to Division IIa in the north, including mackerel in the North Sea and Division IIIa. The spawning areas of mackerel are widely spread, and only the area in the North Sea is sufficiently distinct to be clearly identified as a separate spawning component. Tagging experiments have demonstrated that after spawning, fish from Southern and Western areas migrate to feed in the Norwegian Sea and the North Sea during the second half of the year. In the North Sea they mix with the North Sea component. Since it is at present impossible to allocate catches to the stocks previously considered by ICES, they are at present, for practical reasons, considered as one stock: the North East Atlantic Mackerel Stock. Catches cannot be allocated specifically to spawning area components on biological grounds, but by convention the catches from the Southern and Western components are separated according to the area where they are taken.

In order to be able to keep track of the development of the spawning biomasses in the different spawning areas, the North East Atlantic mackerel stock is divided into three area components: the Western Spawning Component, the North Sea Spawning Component, and the Southern Spawning Component:

<table>
<tr><th colspan="4">North-East Atlantic Mackerel</th></tr>
<tr><td colspan="4">Distributed and fished in ICES Subareas and Divisions IIa, IIIa, IV, Vb, VI, VII, VIII and IXa</td></tr>
<tr><th>Spawning component</th><th>Western</th><th>Southern</th><th>North Sea</th></tr>
<tr><td>Spawning Areas</td><td>VI, VII, VIIIa,b,d,e.</td><td>VIIIc, IXa.</td><td>IV, IIIa.</td></tr>
</table>

The Western Component is defined as mackerel spawning in the western area (ICES Divisions and Subareas VI, VII, VIII a,b,d,e). This component currently comprises 85% of the entire North East Atlantic Stock (historically 61-85% (1972-2002)). Similarly, the Southern Component is defined as mackerel spawning in the southern area (ICES Divisions VIIIc and IXa). Although the North Sea component has been at an extremely low level since the early 1970s, ACFM regards the North Sea Component as still existing. This component spawns in the North Sea and Skagerrak (ICES Subarea IV and Division IIIa). Current knowledge of the state of the spawning components is summarised below:

Western Component: The catches of this component were low in the 1960s, but increased to more than 800 000 t in 1993. The main catches are taken in directed fisheries by purse seiners and mid-water trawlers. Large catches of the western component are taken in the northern North Sea and in the Norwegian Sea. The 1996 catch was reduced by about 200 000 t, compared with 1995, because of a reduction in the TAC. The catches since 1998 have been stable. The SSB of the Western Component declined in the 1970s from above 3.0 million t to 2.2 million t in 1994, but was estimated to have increased to 2.7 million t in 1999. A separate assessment for this stock component is no longer required, as a recent extension of the time-series of NEA mackerel data now allows the estimation of the mean recruitment from 1972 onwards. Estimates of the spawning stock biomass, derived from egg surveys, indicate a decrease of 14% between 1998 and 2001.

North Sea Component: Very large catches were taken in the 1960s in the purse seine fishery, reaching a maximum of about 1 million t in 1967. The component subsequently collapsed and catches declined to less than 100 000 t in the late 1970s. Catches during the last five years have been assumed to be about 10 000 t. The 2002 egg survey in the North Sea with limited spatial and temporal coverage indicates a higher egg production in the North Sea area than in 1999, due to a relatively strong 1999 year class. However, this component is still considered to be severely depleted and outside safe biological limits.

Southern Component: Mackerel is a target species for the hand line fleet during the spawning season in Division VIIIc, during which about one third of the total catches are taken. It is taken as a by-catch in other fleets. The highest catches (87%) from the Southern Component are taken in the first half of the year, mainly from Division VIIIc, and consist of adult fish. In the second half of the year catches consist of juveniles and are mainly taken in Division IXa. Catches from the Southern Component increased from about 20 000 t in the early 1990s to 44 000 t in 1998, and are currently at the same level. Estimates of the spawning stock biomass, derived from egg surveys, indicate a decrease of about 50% between 1998 and 2001. However, the SSB estimated in 2001 is similar to the survey estimates in 1995.

Combined Assessment: Analytic ICA assessment is based on catch numbers-at-age for the period 1972–2001 and egg survey estimates of SSB from 1992, 1995, 1998, and 2001. Exploratory assessment using different assessment models gave comparable results.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10-19 September 2002 (ICES CM 2003/ACFM:07).

Mackerel Combined
Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average Current	0.199	0.148	0.723
$\mathbf{F}_{max}$	0.656	0.171	0.298
$\mathbf{F}_{0.1}$	0.188	0.146	0.749
$\mathbf{F}_{med}$	0.204	0.149	0.712

Catch data for combined area (Tables 3.12.3.a.1-6):

Year	ICES Advice	Predicted catch corresp. to advice	Total Agreed TAC[4]	Official landings	Disc.[1] slip	ACFM landings[2]
1987	Given by stock component		442	589	11	655
1988	Given by stock component		610	621	36	676
1989	Given by stock component		532	507	7	586
1990	Given by stock component		562	574	16	626
1991	Given by stock component		612	599	31	668
1992	Given by stock component		707	723	25	760
1993	Given by stock component		767	778	18	825
1994	Given by stock component		837	792	5	823
1995	Given by stock component		645	660	8	756
1996	Significant reduction in F	-	452	493	11	564
1997	Significant reduction in F	-	470	434	19	570
1998	F between 0.15 and 0.2	498	549	647	8	667
1999	F of 0.15 consistent with PA	437	562	595	n/a	609
2000	F=0.17: $\mathbf{F}_{pa}$	642	612	579	2	667
2001	F=0.17: $\mathbf{F}_{pa}$	665	670	620	1	676
2002	F=0.17: $\mathbf{F}_{pa}$	694	683			
2003	F=0.17: $\mathbf{F}_{pa}$	542				

[1]Data on discards and slipping from only two fleets. [2]Landings and discards from IIa, IIIa, IV, Vb, VI, VII, VIII, and IXa. [4]All areas except some catches in international waters in II. n/a=not available. Weights in '000 t.

Catch data for western component (Tables 3.12.3.a.4 and 7):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	Disc. slip	ACFM landings[2]
1987	SSB = 1.5 mill. t; TAC	380	405	11	615
1988	F = $\mathbf{F}_{0.1}$; TAC; closed area; landing size	430	573[1]	36	628
1989	Halt SSB decline; TAC	355	495[1]	7	567
1990	TAC; F = $\mathbf{F}_{0.1}$	480	525[1]	16	606
1991	TAC; F = $\mathbf{F}_{0.1}$	500	575[1]	31	646
1992	TAC for both 1992 and 1993	670	670[1]	25	742
1993	TAC for both 1992 and 1993	670	730[1]	18	805
1994	No long-term gains in increased F	831[3]	800[1]	5	798
1995	20% reduction in F	530	608[1]	8	729
1996	No separate advice	-	422[1]	11	529
1997	No separate advice	-	416[1]	19	529
1998	No separate advice	-	514[1]	8	623
1999	No separate advice	-	520[1]	0	565
2000	No separate advice	-	573[1]	2	631
2001	No separate advice	-	630[1]	1	634
2002	No separate advice	-	642[1]		
2003	No separate advice	-			

[1]TAC for mackerel taken in all areas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, IVa. [2]Landings and discards of Western component; includes catches of North Sea component. [3]Catch at *status quo* F. Weights in '000 t.

Catch data for North Sea component (Tables 3.12.3.a.3 and 8):

Year	ICES Advice	Predicted catch corresp. to advice[1]	Agreed TAC[2]	ACFM landings[3]
1987	Lowest practical level	LPL	55	3
1988	Closed areas and seasons; min. landing size; by-catch regulations	LPL	55	6
1989	Closed areas and seasons; min. landing size; by-catch regulations	LPL	49.2	7
1990	Closed areas and seasons; min. landing size; by-catch regulations	LPL	45.2	10
1991	Closed areas and seasons; min. landing size; by-catch regulations	LPL	65.5	-[4]
1992	Closed areas and seasons; min. landing size; by-catch regulations	LPL	76.3	[4]
1993	Maximum protection; closed areas and seasons; min landing size	LPL	83.1	-[4]
1994	Maximum protection; closed areas and seasons; min landing size	LPL	95.7	-[4]
1995	Maximum protection; closed areas and seasons; min landing size	LPL	76.3	-[4]
1996	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	-[4]
1997	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	-[4]
1998	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	-[4]
1999	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	-[4]
2000	Maximum protection; closed areas and seasons; min landing size	LPL	69.7	-[4]
2001	Maximum protection; closed areas and seasons; min landing size	LPL	71.4	-[4]
2002	Maximum protection; closed areas and seasons; min landing size	LPL	72.9	-[4]
2003	Maximum protection; closed areas and seasons; min landing size	LPL		

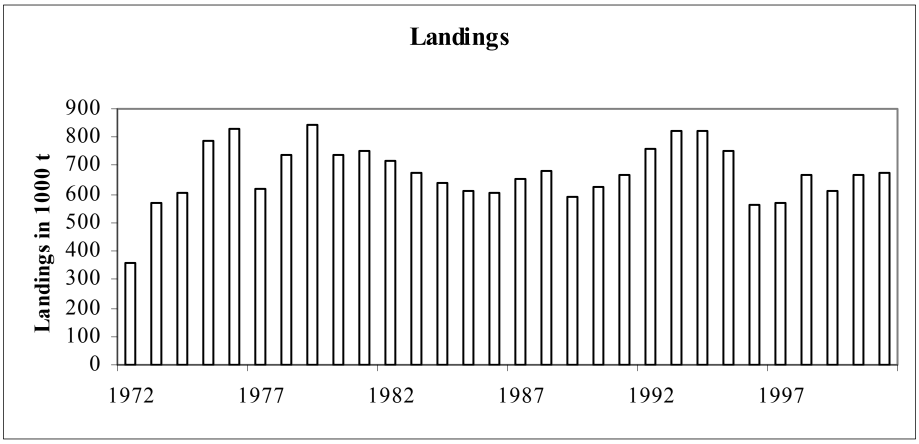
[1]Subarea IV and Division IIIa. [2]TAC for Subarea IV, Divisions IIIa, IIIb,c,d (EU zone), and Division IIa (EU zone). [3]Estimated landings of North Sea component. [4]No information. Weights in '000 t.

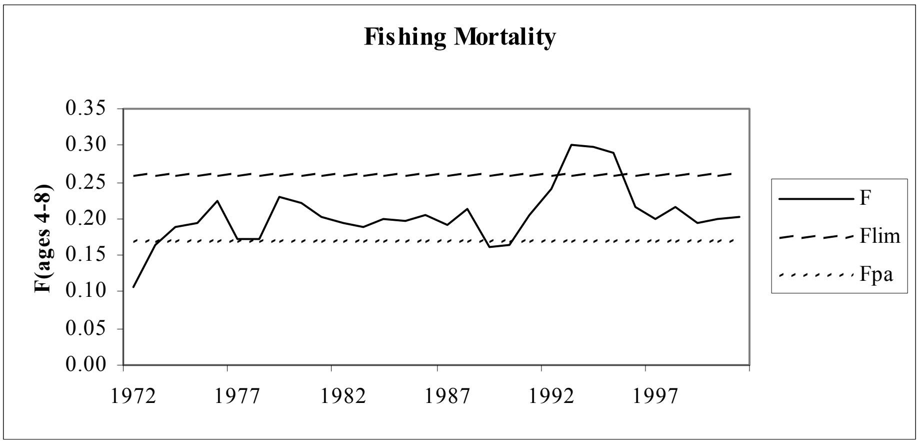
Catch data for southern component (Table 3.12.3.a.5):

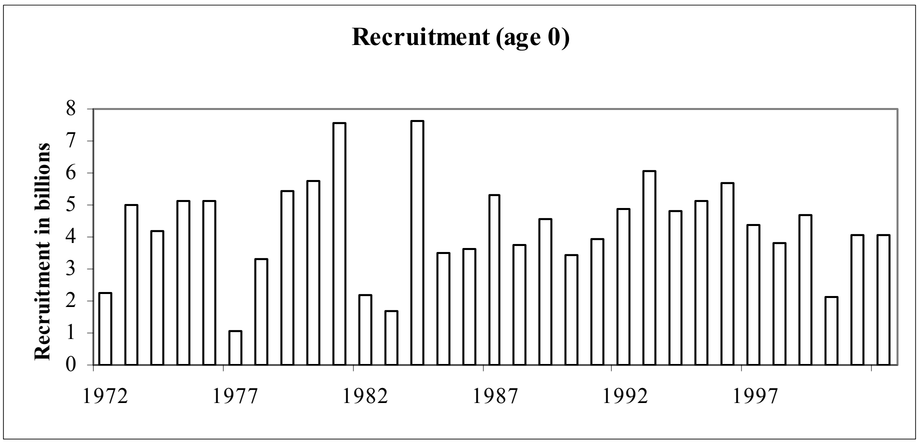
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM landings
1987	Reduce juvenile exploitation	-	36.57	22
1988	Reduce juvenile exploitation	-	36.57	25
1989	No advice	-	36.57	18
1990	Reduce juvenile exploitation	-	36.57	21
1991	Reduce juvenile exploitation	-	36.57	21
1992	No advice	-	36.57	18
1993	No advice	-	36.57	20
1994	No advice	-	36.57	25
1995	No advice	-	36.57	28
1996	No separate advice	-	30.00	34
1997	No separate advice	-	30.00	41
1998	No separate advice	-	35.00	44
1999	No separate advice	-	35.00	44
2000	No separate advice	-	39.20	36
2001	No separate advice	-	40.18	43
2002	No separate advice	-	41.1	
2003	No separate advice	-		

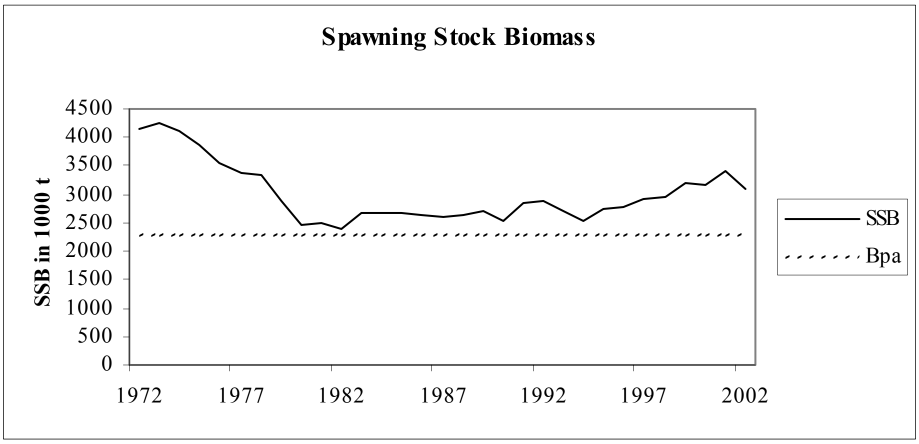
[1]Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EU waters only). Weights in '000 t.

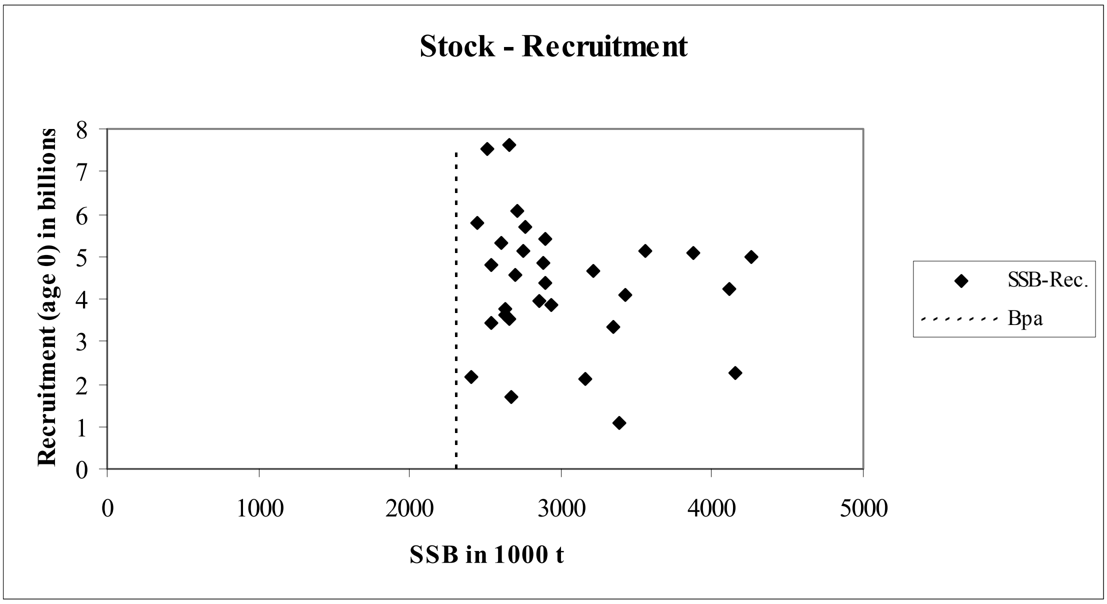
Mackerel (combined Southern, Western & N.Sea spawn.comp.)

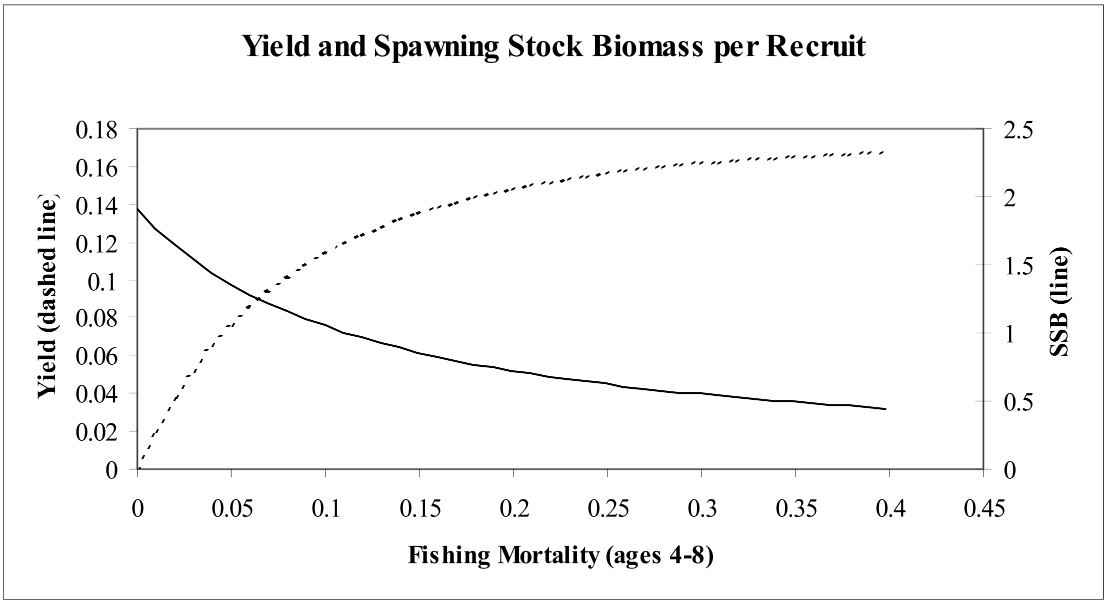









Stock - Recruitment
Recruitment (age 0) in billions
0
1
2
3
4
5
6
7
8
0
1000
2000
3000
4000
5000
SSB in 1000 t
SSB-Rec.
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
SSB (line)
0
0.5
1
1.5
2
2.5
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Fishing Mortality (ages 4-8)

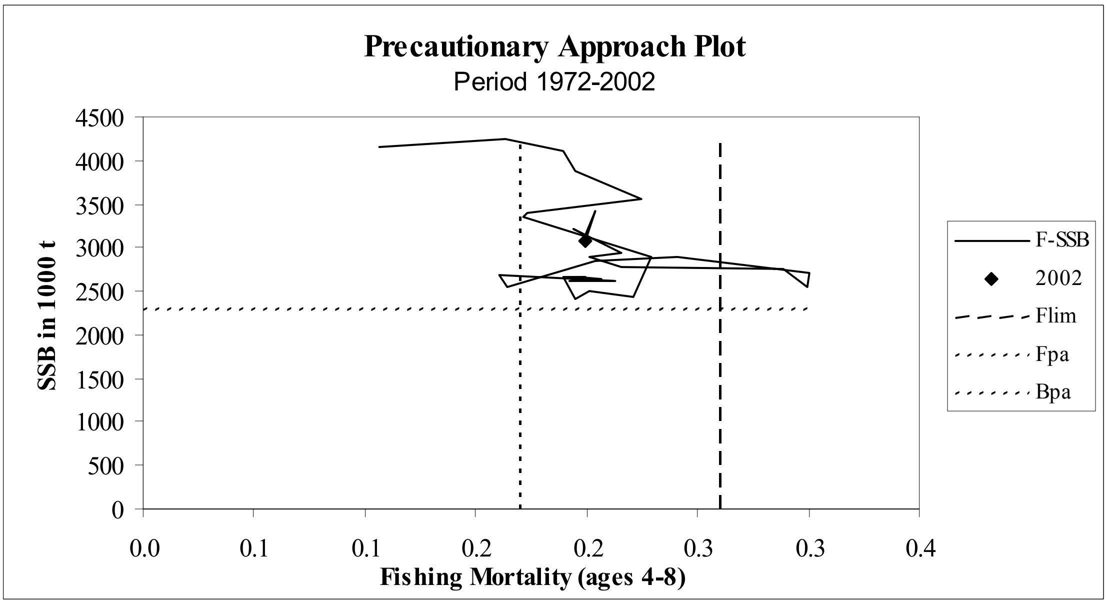

Precautionary Approach Plot
Period 1972-2002
SSB in 1000 t
0
500
1000
1500
2000
2500
3000
3500
4000
4500
0.0
0.1
0.1
0.2
0.2
0.3
0.3
0.4
Fishing Mortality (ages 4-8)
F-SSB
2002
Flim
Fpa
Bpa

Table 3.12.3.a.1 Catches of MACKEREL by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

Year	Subarea VI			Subarea VII and Divisions VIIIa,b,d,e			Subarea IV and III			Subarea I,II & Divs.Vb[1]	Divs. VIIIc, IXa	Total		
	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Landings	Landings	Discards	Catch
1969	4,800		4,800	47,404		47,404	739,175		739,175	7	42,526	833,912	0	833,912
1970	3,900		3,900	72,822		72,822	322,451		322,451	163	70,172	469,508	0	469,508
1971	10,200		10,200	89,745		89,745	243,673		243,673	358	32,942	376,918	0	376,918
1972	13,000		13,000	130,280		130,280	188,599		188,599	88	29,262	361,229	0	361,229
1973	52,200		52,200	144,807		144,807	326,519		326,519	21,600	25,967	571,093	0	571,093
1974	64,100		64,100	207,665		207,665	298,391		298,391	6,800	30,630	607,586	0	607,586
1975	64,800		64,800	395,995		395,995	263,062		263,062	34,700	25,457	784,014	0	784,014
1976	67,800		67,800	420,920		420,920	305,709		305,709	10,500	23,306	828,235	0	828,235
1977	74,800		74,800	259,100		259,100	259,531		259,531	1,400	25,416	620,247	0	620,247
1978	151,700	15,100	166,800	355,500	35,500	391,000	148,817		148,817	4,200	25,909	686,126	50600	736,726
1979	203,300	20,300	223,600	398,000	39,800	437,800	152,323	500	152,823	7,000	21,932	782,555	60600	843,155
1980	218,700	6,000	224,700	386,100	15,600	401,700	87,931		87,931	8,300	12,280	713,311	21600	734,911
1981	335,100	2,500	337,600	274,300	39,800	314,100	64,172	3,216	67,388	18,700	16,688	708,960	45516	754,476
1982	340,400	4,100	344,500	257,800	20,800	278,600	35,033	450	35,483	37,600	21,076	691,909	25350	717,259
1983	320,500	2,300	322,800	235,000	9,000	244,000	40,889	96	40,985	49,000	14,853	660,242	11396	671,638
1984	306,100	1,600	307,700	161,400	10,500	171,900	43,696	202	43,898	98,222	20,208	629,626	12302	641,928
1985	388,140	2,735	390,875	75,043	1,800	76,843	46,790	3,656	50,446	78,000	18,111	606,084	8191	614,275
1986	104,100		104,100	128,499		128,499	236,309	7,431	243,740	101,000	24,789	594,697	7431	602,128
1987	183,700		183,700	100,300		100,300	290,829	10,789	301,618	47,000	22,187	644,016	10789	654,805
1988	115,600	3,100	118,700	75,600	2,700	78,300	308,550	29,766	338,316	120,404	24,772	644,926	35566	680,492
1989	121,300	2,600	123,900	72,900	2,300	75,200	279,410	2,190	281,600	90,488	18,321	582,419	7090	589,509
1990	114,800	5,800	120,600	56,300	5,500	61,800	300,800	4,300	305,100	118,700	21,311	611,911	15600	627,511
1991	109,500	10,700	120,200	50,500	12,800	63,300	358,700	7,200	365,900	97,800	20,683	637,183	30700	667,883
1992	141,906	9,620	151,526	72,153	12,400	84,553	364,184	2,980	367,164	139,062	18,046	735,351	25000	760,351
1993	133,497	2,670	136,167	99,828	12,790	112,618	387,838	2,720	390,558	165,973	19,720	806,856	18180	825,036
1994	134,338	1,390	135,728	113,088	2,830	115,918	471,247	1,150	472,397	72,309	25,043	816,025	5370	821,395
1995	145,626	74	145,700	117,883	6,917	124,800	321,474	730	322,204	135,496	27,600	748,079	7721	755,800
1996	129,895	255	130,150	73,351	9,773	83,124	211,451	1,387	212,838	103,376	34,123	552,196	11415	563,611
1997	65,044	2,240	67,284	114,719	13,817	128,536	226,680	2,807	229,487	103,598	40,708	550,749	18864	569,613
1998	110141	71	110,212	105,181	3,206	108,387	264,947	4,735	269,682	134,219	44,164	658,652	8012	666,664
1999§	98,666		98,666	93,821		93,821	299,798		299,798	72,848	43,796	608,929	0	608,929
2000*	150,927	1	150,928	113,520	1,918	115,438	271,997	165	272,162	92,557	36,074	665,075	2084	667,159
2001*	113,234	83	113,317	141,012	1,081	142,093	311,979	24	312,003	67,097	43,198	676,520	1,188	677,708

*Preliminary.

[1]For 1976–1985 only Division IIa. Subarea I and Division IIb included in 2000 only.

§ Discards reported as part of unallocated catches.

NB: Figures in gray are revised, the revisions are documented in the SGDRAMA annex to this report.

Table 3.12.3.a.2 Catches (t) of MACKEREL in the Norwegian Sea (Division IIa) and off the Faroes (Division Vb). (Data submitted by Working Group members.)

Country	1984	1985	1986	1987	1988	1989	1990
Denmark	11,787	7,610	1,653	3,133	4,265	6,433	6,800
Faroe Islands	137				22	1,247	3,100
France		16				11	
Germany, Fed. Rep.			99		380		
German Dem. Rep.			16	292		2,409	
Norway	82,005	61,065	85,400	25,000	86,400	68,300	77,200
Poland							
United Kingdom			2,131	157	1,413		400
USSR	4,293	9,405	11,813	18,604	27,924	12,088	28,900
Discards							2,300
Total	98,222	78,096	101,112	47,186	120,404	90,488	118,700

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Denmark	1,098	251			4,746	3,198	37	2,090	106	1,375	7
Estonia		216		3,302	1,925	3,741	4,422	7,356	3,595	2,673	219
Faroe Islands	5,793	3,347	1,167	6,258	9,032	2,965	5,777**	2,716	3,011	5,546	3,272
France	23	6	6	5	5	0	270				
Germany						1					
Iceland						92	925	357			
Ireland									100		
Latvia		100	4,700	1,508	389	233					
Lithuania										2,085	
Netherlands						561			661		
Norway	76,760	91,900	110,500	141,114	93,315	47,992	41,000	54,477	53,821	31,778	21,971
Russia		42,440	49,600	28,041	44,537	44,545	50,207	67,201	51,003	49,100*	41,566
United Kingdom	514	802		1,706	194	48	938	199	662		54
USSR[2]	13,631[2]										
Poland							22				
Sweden											8
Misreported (IVa)				- 109,625	-18,647			-177	-40,011		
Misreported (VIa)									-100		
Discards											
Total	97,819	139,062	165,973	72,309	135,496	103,376	103,598	134,219	72,848	92,557	67,097

[2]Russia.

*Includes small by-catches in Subarea I & Iib.

** Faroese catch revised from previously reported 7,628.

Table 3.12.3.a.3 Catch (t) of MACKEREL in the North Sea, Skagerrak, and Kattegat (Subarea IV and III). (Data submitted by Working Group members).

Country	1986	1987	1988	1989	1990	1991	1992	1993
Belgium	49	14	20	37		125	102	191
Denmark	23,368	28,217	32,588	26,831	29,000	38,834	41,719	42,502
Estonia							400	
Faroe Islands				2,685	5,900	5,338		11,408
France	1,200	2,146	1,806	2,200	1,600	2,362	956	1,480
Germany, Fed. Rep.	1,853	474	177	6,312	3,500	4,173	4,610	4,940
Iceland								
Ireland				8,880	12,800	13,000	13,136	13,206
Latvia							211	
Netherlands	1,949	2,761	2,564	7,343	13,700	4,591	6,547	7,770
Norway	50,600	108,250	59,750	81,400	74,500	102,350	115,700	112,700
Sweden	1,300	3,162	1,003	6,601	6,400	4,227	5,100	5,934
United Kingdom	559	19857	1,002	38,660	30,800	36,917	35,137	41,010
USSR (Russia from 1990)								
Romania								
Misreported (IIa)								
Misreported (VIa)	148,000	117,000	180,000	92,000	126,000	130,000	127,000	146,697
Unallocated	7,391	8,948	29,630	6,461	-3,400	16,758	13,566	-
Discards	7,431	10,789	29,776	2,190	4,300	7,200	2,980	2,720
Total	243,700	301,618	338,316	281,600	305,100	365,875	367,164	390,558

Country	1994	1995	1996	1997	1998	1999	2000[1]	2001
Belgium	351	106	62	114	125	177	146	97
Denmark	47,852	30,891	24,057	21,934	25,326	29,353	27,720	21,680
Estonia				-	-			
Faroe Islands	11,027	17,883	13,886	3,288[2]	4,832	4,370	10,614	18,571
France	1,570	1,599	1,316	1,532	1,908	2,056	1,588	1,981
Germany, Fed. Rep.	1,479	712	542	213	423	473	78	4,514
Iceland						357		
Ireland	9,032	5,607	5,280	280	145	11,293	9,956	10,284
Latvia				-	-			
Netherlands	3,637	1,275	1,996	951	1,373	2,819	2,262	2,441
Norway	114,428	108,890	88,444	96,300	103,700	106,917	142,320	158,401
Sweden	7,099	6,285	5,307	4,714	5,146	5,233	4,994	5,090
United Kingdom	27,479	21,609	18,545	19,204	19,755	31,578	57,110	50,165
Russia				3,525	635	345	1,672	2
Romania	2,903			-	-			
Misreported (IIa)	109,625	18,647	-	-	-	40,000		
Misreported (VIa)	134,765	106,987	51,781	73,523	98,432	59,882	8,591	39,024
Unallocated	-	983	236	1,102	3,147	4,946	3,197	-272
Discards	1,150	730	1,387	2,807	4,753		1,912	24
Total	472,397	322,204	212,839	229,487	269,700	299,799	272,160	312,004

[1]Includes small catches in IIIb & IIId.

[2]Faroese catches revised from previously reported 1,367.

Table 3.12.3.a.4 Catch (t) of MACKEREL in the Western area (Subareas VI and VII and Divisions VIIIa,b,d,e). (Data submitted by Working Group members).

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992
Denmark	200	400	300	100		1,000		1,573	194
Faroe Islands	9,200	9,900	1,400	7,100	2,600	1,100	1,000		
France	12,500	7,400	11,200	11,100	8,900	12,700	17,400	4,095	
Germany	11,200	11,800	7,700	13,300	15,900	16,200	18,100	10,364	9,109
Ireland	84,100	91,400	74,500	89,500	85,800	61,100	61,500	17,138	21,952
Netherlands	99,000	37,000	58,900	31,700	26,100	24,000	24,500	64,827	76,313
Norway	34,700	24,300	21,000	21,600	17,300	700		29,156	32,365
Poland									
Spain	100				1,500	1,400	400	4,020	2,764
United Kingdom	198,300	205,900	156,300	200,700	208,400	149,100	162,700	162,588	196,890
USSR	200								
Unallocated	18000	75100	49299	26000	4700	18900	11,500	-3,802	1,472
Misreported (Iva)			-148,000	-117,000	-180,000	-92,000	-126,000	-130,000	-127,000
Discards	12,100	4,500			5,800	4,900	11,300	23,550	22,020
Grand Total	479,600	467,700	232,599	284,100	197,000	199,100	182,400	183,509	236,079

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Denmark		2,239	1,443	1,271	-	-	552	82	835
Estonia			361		-	-			
Faroe Islands	2,350	4,283	4,248	-	2,448[1]	3,681	4,239	4,863	2,161
France	8,296	9,998	10,178	14,347	19,114	15,927	14,311	17,857	18,975
Germany	23,776	25,011	23,703	15,685	15,161	20,989	19,476	22,901	20,793
Ireland	81,773	79,996	72,927	49,033	52,849	66,505	48,282	61,277	60,168
Netherlands	44,600	40,698	34,514	34,203	22,749	28,790	25,141	30,123	33,654
Norway	600	2,552			-	-			223
Spain	3,162	4,126	4,509	2,271	7,842	3,340	4,120	4,500	4,063
United Kingdom	215,265	208,656	190,344	127,612	128,836	165,994	127,094	126,620	139,589
USSR									
Unallocated	0	4,632	28,245	10,603	4,577	8,351	9,254	0	12,807
Misreported (IVa)	-146,697	-134,765	-106,987	-51,781	-73,523	-98,255	-59,982	-3,775	-39,024
Discards	15,660	4,220	6,991	10,028	16,057	3,277		1,920	1,164
Grand Total	248,785	251,646	270,476	213,272	196,110	218,599	192,486	266,367	255,408

[1]Faroese catches revised from 2,158.

Table 3.12.3.a.5 Landings (tonnes) of mackerel in Divisions VIIIc and IXa, 1977–2001. Data submitted by Working Group members.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Spain[1]	19,852	18,543	15,013	11,316	12,834	15,621	10,390	13,852	11,810	16,533	15,982	16,844
Portugal[2]	1,743	1,555	1,071	1,929	3,108	3,018	2,239	2,250	4,178	6,419	5,714	4,388
Spain[2]	2,935	6,221	6,280	2,719	2,111	2,437	2,224	4,206	2,123	1,837	491	3,540
Poland[2]	8	-	-	-	-	-	-	-	-	-	-	-
USSR[2]	2,879	189	111	-	-	-	-	-	-	-	-	-
Total[2]	7,565	7,965	7,462	4,648	5,219	5,455	4,463	6,456	6,301	8,256	6,205	7,928
TOTAL	27,417	26,508	22,475	15,964	18,053	21,076	14,853	20,308	18,111	24,789	22,187	24,772

[1]Division VIIIc.
[2]Division IXa.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Spain[1]	13,446	16,086	16,940	12,043	16,675	21,146	23,631	28,386	35,015	36,174	37,631	30,061	38,205
Portugal[2]	3,112	3,819	2,789	3,576	2,015	2,158	2,893	3,023	2,080	2,897	2,002	2,253	3,119
Spain[2]	1,763	1,406	1,051	2,427	1,027	1,741	1,025	2,714	3,613	5,093	4,164	3,760	1,874
Total[2]	4,875	5,225	3,840	6,003	3,042	3,899	3,918	6,737	5,693	7,990	6,165	6,013	4,993
TOTAL	18,321	21,311	20,780	18,046	19,719	25,045	27,549	34,123	40,708	44,164	43,796	36,074	43,198

[1]Division VIIIc.
[2]Division IXa.

Table 3.12.3.a.6 Mackerel (combined Southern, Western & N.Sea spawn.comp.)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1972	2248990	4148849	361204	0.1060
1973	4976080	4255845	571011	0.1633
1974	4216500	4118121	607632	0.1898
1975	5102370	3875290	784070	0.1944
1976	5125150	3554524	828239	0.2250
1977	1060540	3388656	620276	0.1734
1978	3341640	3352920	736832	0.1718
1979	5429540	2899829	843227	0.2288
1980	5778680	2444369	734951	0.2206
1981	7538030	2508240	754438	0.2016
1982	2180520	2407086	717267	0.1946
1983	1694210	2671034	671588	0.1897
1984	7607650	2664191	637606	0.1994
1985	3515670	2654424	614371	0.1958
1986	3620300	2637758	602200	0.2064
1987	5297020	2607755	654991	0.1925
1988	3751860	2627656	680492	0.2126
1989	4552690	2694023	589509	0.1610
1990	3446630	2542161	627511	0.1639
1991	3940490	2851443	667886	0.2039
1992	4858890	2881514	760351	0.2408
1993	6084460	2717108	825036	0.3008
1994	4805880	2537184	821395	0.2992
1995	5139740	2757892	755776	0.2890
1996	5697260	2768540	563612	0.2159
1997	4353140	2902304	569613	0.2008
1998	3839570	2937605	666682	0.2154
1999	4679650	3215136	608930	0.1937
2000	2105760	3156635	667159	0.1996
2001	4084200	3423557	677708	0.2037
2002	4084200	3080000		0.1990
Average	4327655	3009085	674052	0.2049

3.12.3.b Response to the Government of the United Kingdom on the utility of the Western Mackerel Box

UK has requested ICES to evaluate:

The utility of the western mackerel box

ICES Comments:

The restrictions on fishing for mackerel inside the regulated area known as the 'Mackerel Box' are described in Council Regulation (EC) No 894/97 Article 9.

The Mackerel Box (Figure 3.12.3.b.1) is defined by the area bounded by the following co-ordinates:

- a point on the south coast of the UK at longitude 02º00' W
- latitude 49º30' N longitude 02º00' W
- latitude 49º30' N longitude 07º00' W
- latitude 52º00' N longitude 07º00' W
- a point on the West coast of the UK at latitude 52º00' W

The restrictions were introduced in order to reduce the fishing effort on juvenile mackerel (defined as ages 1, 2, and 3 in quarters 1 and 2 and ages 0, 1, and 2 in quarters 3 and 4), which are considered to be concentrated in the area and vulnerable to targeted exploitation. A seasonal closure was imposed from 1980 and the area was permanently closed in 1985 to all methods of mackerel fishing, except quota-regulated vessels using gillnets or handlines. Mackerel may also be taken legally inside the Box as a by-catch in the Danish industrial fishery for horse mackerel and sardines and the Dutch human consumption fisheries targeted at horse mackerel.

The Mackerel Box is not the only area in which there are restrictions on the fishing of mackerel. The North Sea Divisions IVb and c, in which large numbers of juvenile mackerel from the western area occur in the south during the third quarter of the year, are closed to a targeted mackerel fishery throughout the year.

The fishery in the area of the Mackerel Box

ICES Divisions VIIefgh include parts of the Mackerel Box. The average yearly total landing for the last 10 years from Divisions VIIefgh is 25 000 tonnes, with a range of 18 – 40 000 tonnes. The majority of the catches are reported from Divisions VIIe and f.

The age compositions of the commercial catch in number-at-age recorded within Divisions VIIefgh in the years 1988 – 2001 is dominated by juvenile mackerel. Juvenile fish constitute 70–85% in numbers, see Figure 3.12.3.b.2. In recent years, catches in Division VIIefgh have generated 38% of the total 1 year old and 26% of the 2 year old mackerel catches, and accordingly the same proportions of the fishing mortality at those ages,

Research surveys inside the Mackerel Box

The commercial catch proportions are in agreement with survey information collected by CEFAS, UK from within the Mackerel Box. The proportional number of immature fish within samples taken from the Mackerel Box was 91% in 1990, 60% in 1991, 76% in the winter of 1995/6, and 69% in 1998.

The potential yield and biomass contribution from mackerel taken in the area of the Mackerel Box

Figure 3.12.3.b.3 illustrates that the average weight of a fish caught in the Divisions VIIefgh is lower than in other areas.

The calculated percentage loss of yield when taking a fish in Divisions VIIefgh compared to the remainder of the areas in which mackerel are distributed, is at the current fishing mortality rate of 0.2, 15% in yield. The loss is due to the low weight of fish taken in Divisions VIIegfh and the low modal age of capture. At the current fishing mortality rate of 0.2 the loss of SSB per recruit from fish taken in the Box area is 20%.

Both the yield- and SSB-per-recruit analyses assume that the fish taken within the Mackerel Box are of similar age composition and weight as the commercial samples from Divisions VIIefgh. The Mackerel Box is known to have large schools of 1- and 2-year-old fish. Directed fishing at these schools may result in higher local fishing mortality and result in even greater losses than those calculated at the *status quo* levels.

Conclusions

ICES considers that the loss of potential yield and the increased risk to the spawning stock of the NEA mackerel from an opening of the box should be avoided. The Mackerel Box should remain closed to targeted mackerel fishing. This advice is consistent with previous studies by this Working Group and the recommendations from the EU Scientific Technical Committee for Fisheries.

Details and further results are presented in the assessment group report.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10–19 September 2002 (ICES CM 2003/ACFM:07).

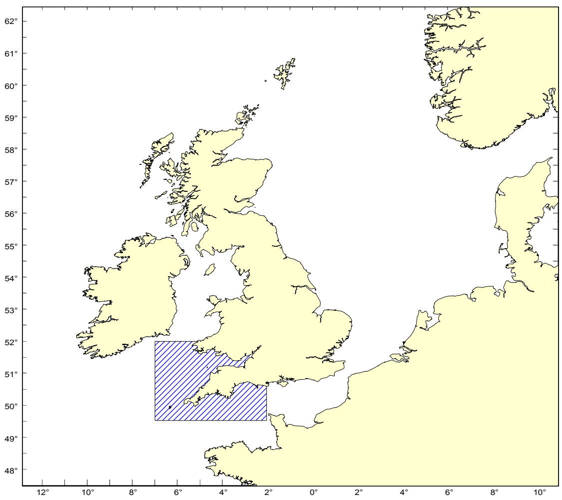


Figure 3.12.3.b.1. The Mackerel Box.

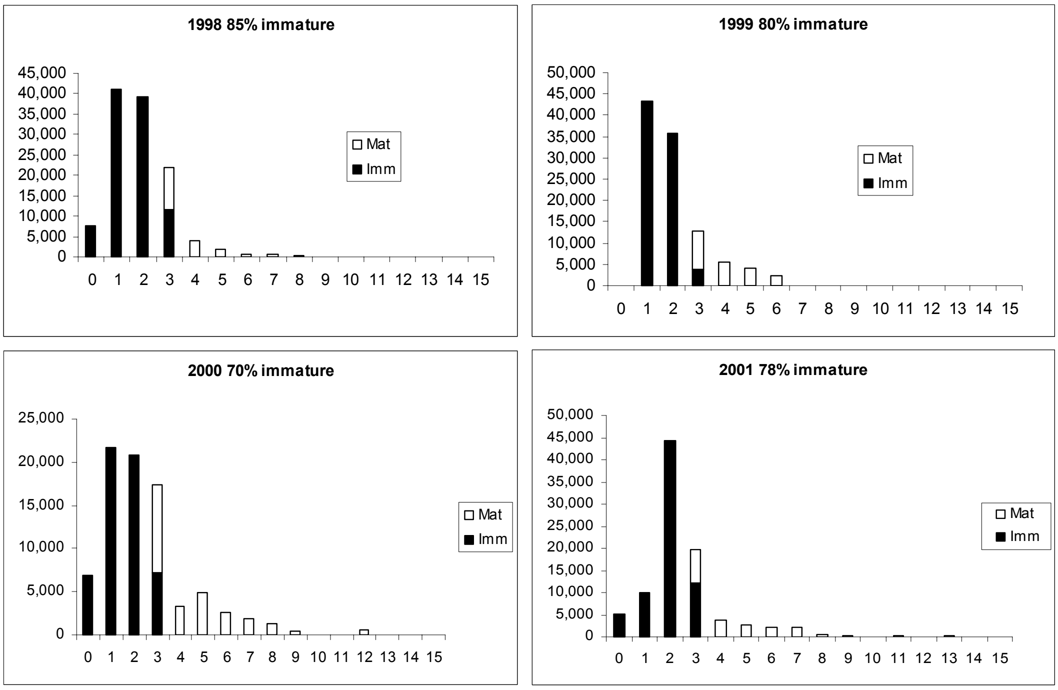


Figure 3.12.3.b.2. The percentage of mature and immature fish recorded in commercial landings from ICES Divisions VIIefgh for the years 1998–2001. Ages 0–2 are assumed to be immature, while age 3 is assumed to be immature in quarters 1 and 2 and mature in quarters 3 and 4.

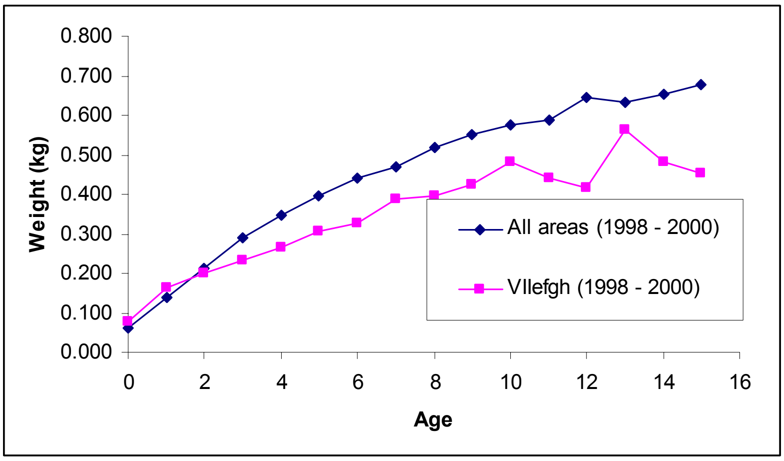


Figure 3.12.3.b.3 The average weight-at-age of mackerel caught in ICES Divisions VIIefgh and in all ICES Divisions, illustrating the relatively low weight-at-age of fish taken from Divisions VIIefgh.

3.12.4 Western horse mackerel (*Trachurus trachurus*) (Divisions IIa, IVa, Vb, VIa, VIIa–c,e–k, VIIIa,b,d,e)

State of stock/exploitation: The state of the stock relative to precautionary reference points is undefined. The current fishing mortality is above $\mathbf{F}_{0.1}$. Spawning stock biomass has decreased compared with the mid-1980s and is estimated to continue to decline at all levels of fishing mortality. Fishing mortality on the youngest ages is increasing.

Management objectives: There are no explicit management objectives for this stock.

Precautionary Approach reference points: No precautionary reference points are proposed for this stock.

Advice on management: ICES advises that catches in 2003 be effectively limited to less than 113 000 t, corresponding to F = 0.15 which in 2000 was estimated to be $\mathbf{F}_{0.1}$. ICES also recommends that the TAC for this stock should apply to all areas in which Western horse mackerel are fished, i.e., Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa–c, VIIe–k, and VIIIa,b,d,e. ICES also advises that directed horse mackerel fisheries in which juveniles are abundant, and industrial fisheries in which horse mackerel is taken as a by-catch, should be restricted.

Relevant factors to be considered in management: The spawning stock has been dominated by an outstanding 1982 year class and reached a maximum of 2.7 million tonnes in 1988. This year class has been gradually fished out and since then no other outstanding year classes have appeared, while the spawning biomass has declined continuously to 0.7 million tonnes in 2002.

In the absence of outstanding year classes, sustainable yield is unlikely to be higher than about 130 000 t, dependent on the exploitation pattern. It is therefore clear that catches will have to be reduced unless another outstanding year class is produced. The assessment indicates that the more recent year classes are well below average since 1996.

Recently fisheries have taken large catches of mainly juvenile horse mackerel from the western stock, and the fishing mortality in the juveniles has increased. ICES expresses concern about this high exploitation of juvenile fish at a time when the recruitment is low, and the spawning stock is declining.

The current fishery targeting juveniles will result in reduced fishing opportunities for adult fish as well as reduced overall TACs. ICES suggests that a management strategy similar to that for North Sea herring, in which both adult and juvenile mortality are independently restricted, be explored for this stock. If the fishing mortality in 2002 is the same as in 2001 the catch in 2002 will be below the 191 000 t recorded for 2001. Continued fishing at the level estimated for 2001 is expected to result in a further reduction of catches in 2003 and the SSB will be below 500 000 tonnes in 2004.

The TAC is set for parts of the western distribution area by EU and was overshot considerably during the period 1988–1999. The two last years the catches were less than the TAC. However, the TAC has only been given for parts of the distribution and fishing areas (EU waters). ICES advises that if a TAC is set for this stock, it should apply to all areas where western horse mackerel are caught, i.e., Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa–c, VIIe–k, and VIIIa,b,d,e.

Catch forecast for 2003:
Basis: F(2002) = F(2001) = $\mathbf{F}_{sq(4–10)}$ = 0.22; Landings (2002) = 181; SSB (2002) = 668.

F(2003)	Basis	SSB (2003)	Catch (2003)	Landings (2003)	SSB (2004)
0.15	$\mathbf{F}_{0.1}$	571	113	113	524
0.18	0.8*$\mathbf{F}_{sq}$	565	131	131	506
0.22	$\mathbf{F}_{sq}$	556	157	157	481

Weights in ‘000 t.
Shaded scenario considered inconsistent with the precautionary approach.

Comparison with previous assessment and advice: The TAC for 2003, corresponding to a fishing mortality of 0.15 is higher than the advice of last year. This is the result of a revised assessment method and the inclusion of new information on the stock size available from egg surveys in 2001, which led to higher estimates of the poor year classes 1996 - 1999. The perception of stock trend is consistent with previous years' estimates.

Elaboration and special comment: The distributional range of this stock increased when the exceptional 1982 year class entered the fishery. This resulted in the development of unregulated fisheries outside the TAC area in the Northeast North Sea. Catches outside the TAC area have been low in recent years.

The recent history of this stock reflects the development of a single large year class within the period of 17 years for which data are available. The frequency of the occurrence of such large year classes cannot be evaluated on the basis of the short time-series.

As in previous years some countries with major catches did not carry out biological sampling programmes. Although this has improved since 1998, the lack of biological data severely hampers the assessment.

The assessment was carried out using S.A.D model, which is a combination of a Separable VPA and an ADAPT VPA-based model. Recent studies have established that horse mackerel may be an indeterminate spawner and therefore the current estimate of fecundity, used to convert survey egg production estimates to SSB, is considered to be poorly determined. The S.A.D model objective function was modified in order to estimate fecundity during fitting of the model. The assessment results are consistent with previous years' estimates derived from the model and with those of a model fitted using the ISVPA structure. The present assessment uses the results of the international horse mackerel egg surveys. Due to uncertainties about whether horse mackerel is a determinate or indeterminate spawner, only the estimated egg productions have been used in the assessment. The estimated egg production in 2001 was 35% lower than the estimate in 1998.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10–19 September 2002 (ICES CM 2003/ACFM:07).

Yield and spawning biomass per Recruit F-reference points:

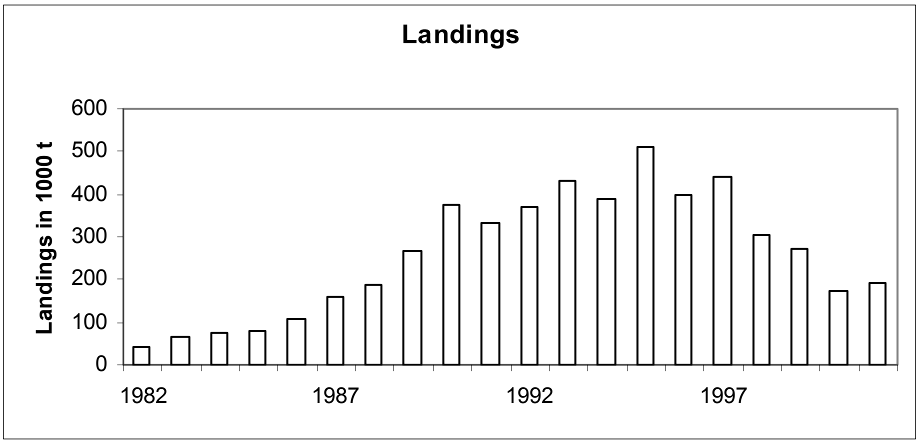
	Fish Mort Ages 4–10	Yield/R	SSB/R
Average Current	0.220	0.053	0.162
$\mathbf{F}_{max}$	0.557	0.057	0.047
$\mathbf{F}_{0.1}$	0.179	0.050	0.199
$\mathbf{F}_{med}$	N/A		

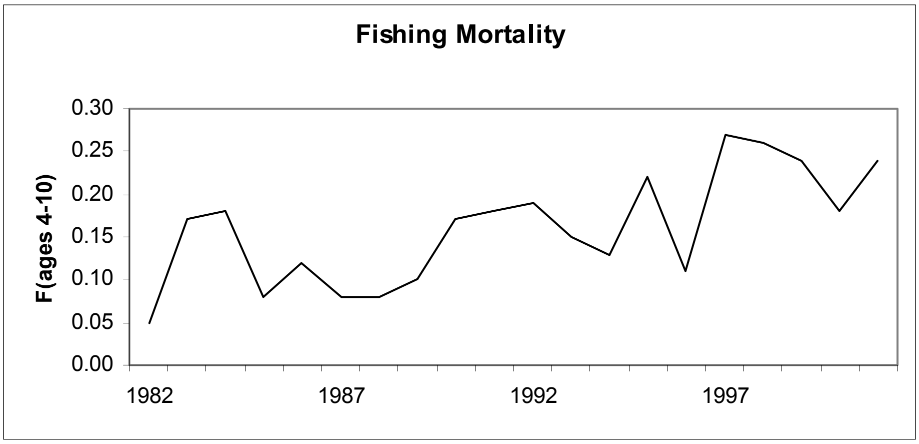
Catch data (Tables 3.5.11.1 and 3.12.4.1–6):

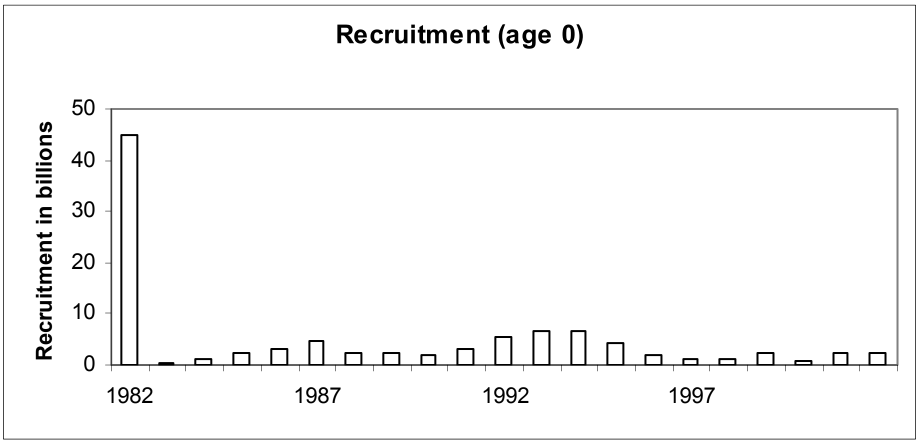
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM landings	Disc. slip	ACFM catch
1987	Not assessed	-	155	157	-	157
1988	No increase in catches	102	169	184	4	188
1989	If sustained catches required; TAC	100	153	267	1	269
1990	TAC	~200	203	363	10	373
1991	Within safe biological limits	-	230	328	5	334
1992	Within safe biological limits	-	250	369	2	371
1993	Within safe biological limits	-	250	424	9	433
1994	Prudent not to increase F	-	300	385	4	389
1995	Reduction in catch	-	300	509	2	511
1996	Reduction in catch	-	300	379	17	397
1997	Reduction in F	173	300	440	3	443
1998	Reduction in F to 0.15	150	320	296	1	304
1999	Effectively limit catches to 200 000t	<200	265	274	-	274
2000	Effectively limit catches to 200 000t	<200	240	175	-	175
2001	Effectively limit catches to 224 000t	<224	233	191	-	191
2002	Effectively limit catches to 98 000t	<98	150			
2003	Effectively limit catches to 113 000t	<113				

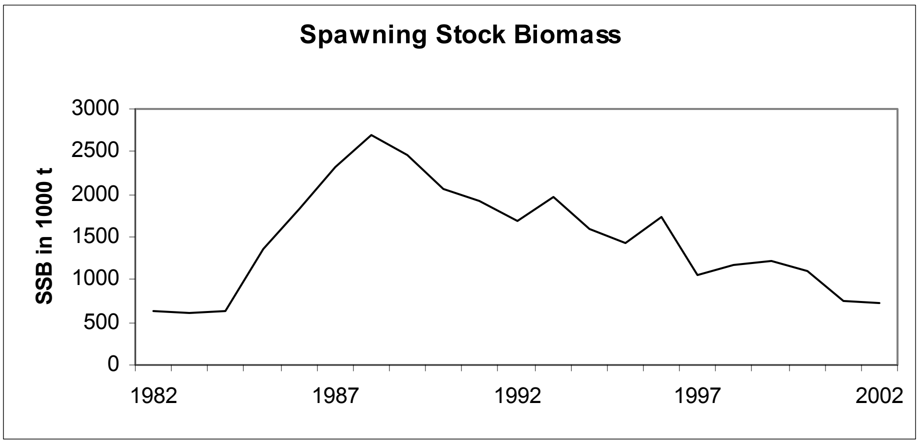
[1]Division Vb (EU waters only), Subareas VI and VII, Divisions VIIIa,b,d,e. Weights in ‘000 t.

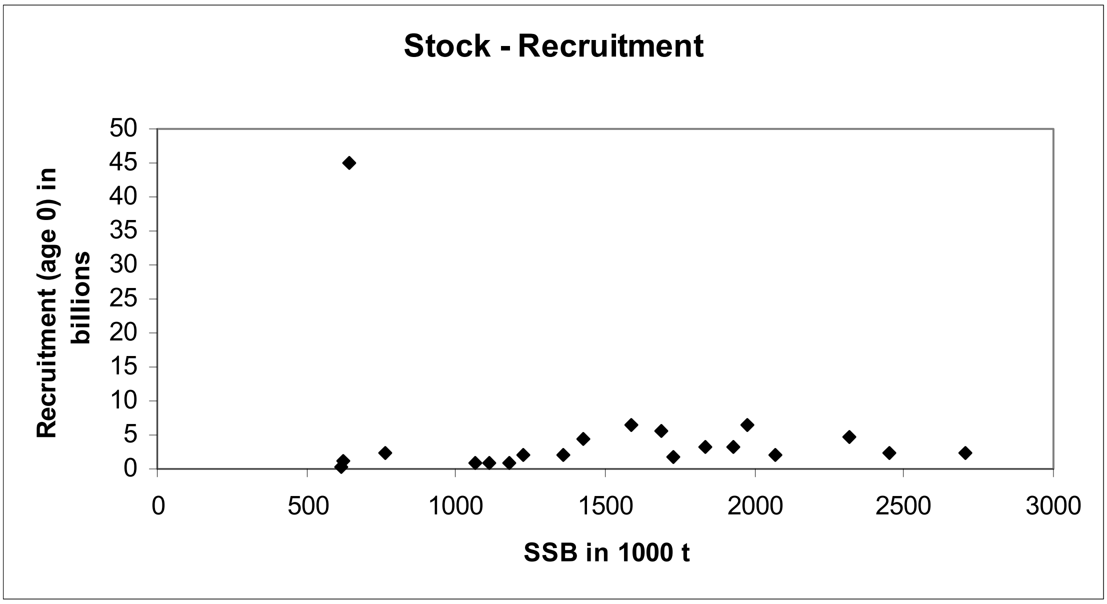
Western horse mackerel (IIa,IVa,Vb,VIa,VIIa-c,e-k,VIIIabde)



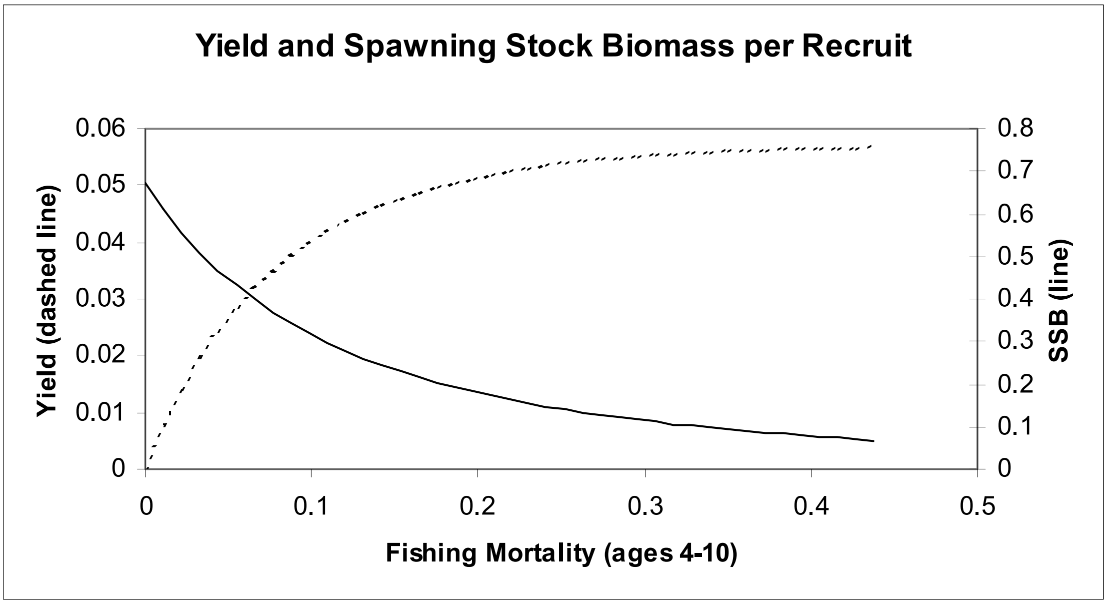








Stock - Recruitment
Recruitment (age 0) in billions
50
45
40
35
30
25
20
15
10
5
0
0
500
1000
1500
2000
2500
3000
SSB in 1000 t



Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.06
0.05
0.04
0.03
0.02
0.01
0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
SSB (line)
0
0.1
0.2
0.3
0.4
0.5
Fishing Mortality (ages 4-10)

Table 3.12.4.1 Landings (t) of HORSE MACKEREL in Subarea II. (Data as submitted by Working Group members.)

Country	1980	1981	1982	1983	1984	1985	1986	1987
Denmark	-	-	-	-	-	-	-	39
France	-	-	-	-	1	1	-[2]	-[2]
Germany, Fed.Rep	-	+	-	-	-	-	-	-
Norway	-	-	-	412	22	78	214	3,272
USSR	-	-	-	-	-	-	-	-
Total	-	+	-	412	23	79	214	3,311

	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	-	-	964[3]	1,115	9,157[3]	1,068	-	950
Denmark	-	-	-	-	-	-	-	200
France	-[2]	-	-	-	-	-	55	-
Germany, Fed. Rep.	64	12	+	-	-	-	-	-
Norway	6,285	4,770	9,135	3,200	4,300	2,100	4	11,300
USSR / Russia (1992 -)	469	27	1,298	172	-	-	700	1,633
UK (England + Wales)	-	-	17		-	-	-	-
Total	6,818	4,809	11,414	4,487	13,457	3,168	759	14,083

	1996	1997	1998	1999	2000	2001[1]
Faroe Islands	1,598	799[3]	188[3]	132[3]	250[3]	-
Denmark	-	-	1,755[3]			-
France	-	-	-			-
Germany	-	-	-			-
Norway	887	1,170	234	2304	841	44
Russia	881	648	345	121	84[3]	16
UK (England + Wales)	-	-	-			-
Estonia	-	-	22			
Total	3,366	2,617	2,544	2557	1175	60

[1]Preliminary.
[2]Included in Subarea IV.
[3]Includes catches in Division Vb.

Table 3.12.4.2 Landings (t) of HORSE MACKEREL in Subarea IV and Division IIIa by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	8	34	7	55	20	13	13	9	10
Denmark	199	3,576	1,612	1,590	23,730	22,495	18,652	7,290	20,323
Faroe Islands	260	-	-	-	-	-	-	-	-
France	292	421	567	366	827	298	231[2]	189[2]	784[2]
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	2,029[3]	824	160[3]	600[3]	850[4]	1,060[3]
Norway[2]	119	2,292	7	322	[3]	203	776	11,728[4]	34,425[4]
Poland	-	-	-	2	94	-	-	-	-
Sweden	-	-	-	-	-	-	2	-	-
UK (Engl. + Wales)	11	15	6	4	-	71	3	339	373
UK (Scotland)	-	-	-	-	3	998	531	487	5,749
USSR	-	-	-	-	489	-	-	-	-
Total	2,151	7,253	2,788	4,420	25,987	24,238	20,808	20,895	62,877

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	10	13	-	+	74	57	51	28	-
Denmark	23,329	20,605	6,982	7,755	6,120	3,921	2,432	1,433	648
Estonia	-	-	-	293	-		17	-	-
Faroe Islands	-	942	340	-	360	275	-	-	296
France	248	220	174	162	302		-	-	-
Germany, Fed.Rep.	506	2,469[5]	5,995	2,801	1,570	1,014	1,600	7	7,603
Ireland	-	687	2,657	2,600	4,086	415	220	1,100	8,152
Netherlands	14,172	1,970	3,852	3,000	2,470	1,329	5,285	6,205	37,778
Norway	84,161	117,903	50,000	96,000	126,800	94,000	84,747	14,639	45,314
Poland	-	-	-	-	-	-	-	-	-
Sweden	-	102	953	800	697	2,087	-	95	232
UK (Engl. + Wales)	10	10	132	4	115	389	478	40	242
UK (N. Ireland)	-	-	350	-	-		-	-	-
UK (Scotland)	2,093	458	7,309	996	1,059	7,582	3,650	2,442	10,511
USSR / Russia (1992 -)	-	-	-						
Unallocated + discards	12,482[4]	-317[4]	-750[4]	-278[6]	-3,270	1,511	-28	136	-31,615
Total	112,047	145,062	77,904	114,133	140,383	112,580	98,452	26,125	79,161

Country	1998	1999	2000	2001[1]
Belgium	19	21	19	19
Denmark	2,048	8,006	4,409	2,288
Estonia	22	-	-	
Faroe Islands	28	908	24	-
France	379	60	49	48
Germany	4,620	4,071	3,115	230
Ireland	-	404	103	375
Netherlands	3,811	3,610	3,382	4,685
Norway	13,129	44,344	1,246	7,948
Russia	-	-	2	-
Sweden	3,411	1,957	1,141	119
UK (Engl. + Wales)	2	11	15	317
UK (Scotland)	3,041	1,658	3,465	3,161
Unallocated + discards	737	-325	14613	649
Total	31,247	64,725	31583	19,839

[1] Preliminary. [2] Includes Division IIa. [3] Estimated from biological sampling. [4] Assumed to be misreported. [5] Includes 13 t from the German Democratic Republic. [6] Includes a negative unallocated catch of -4,000 t.

Table 3.12.4.3 Landings (t) of HORSE MACKEREL in Subarea VI by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	734	341	2,785	7	-	-	-	769	1,655
Faroe Islands	-	-	1,248	-	-	4,014	1,992	4,450[3]	4,000[3]
France	45	454	4	10	14	13	12	20	10
Germany, Fed. Rep.	5,550	10,212	2,113	4,146	130	191	354	174	615
Ireland	-	-	-	15,086	13,858	27,102	28,125	29,743	27,872
Netherlands	2,385	100	50	94	17,500	18,450	3,450	5,750	3,340
Norway	-	5	-	-	-		83	75	41
Spain	-	-	-	-	-		-[2]	-[2]	-[2]
UK (Engl. + Wales)	9	5	+	38	+	996	198	404	475
UK (N. Ireland)						-	-	-	-
UK (Scotland)	1	17	83	-	214	1,427	138	1,027	7,834
USSR	-	-	-		-	-	-	-	-
Unallocated + disc.						-19,168	-13,897	-7,255	-
Total	8,724	11,134	6,283	19,381	31,716	33,025	20,455	35,157	45,842

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	973	615	-	42	-	294	106	114	780
Faroe Islands	3,059	628	255	-	820	80	-	-	-
France	2	17	4	3	+	-	-	-	52
Germany, Fed. Rep.	1,162	2,474	2,500	6,281	10,023	1,430	1,368	943	229
Ireland	19,493	15,911	24,766	32,994	44,802	65,564	120,124	87,872	22,474
Netherlands	1,907	660	3,369	2,150	590	341	2,326	572	498
Norway	-	-	-	-	-	-	-	-	-
Spain	-[2]	-[2]	1	3	-	-	-	-	-
UK (Engl. + Wales)	44	145	1,229	577	144	109	208	612	56
UK (N.Ireland)	-	-	1,970	273	-	-	-	-	767
UK (Scotland)	1,737	267	1,640	86	4,523	1,760	789	2,669	14,452
USSR / Russia (1992 -)	-	44	-	-	-	-	-	-	-
Unallocated + disc.	6,493	143	-1,278	-1,940	-6,960[4]	-51	-41,326	-11,523	837
Total	34,870	20,904	34,456	40,469	53,942	69,527	83,595	81,259	40,145

Country	1998	1999	2000	2001[1]
Denmark	-	-	-	-
Faroe Islands	-	-	-	-
France	221	25,007	-	428
Germany	414	1,031	209	265
Ireland	21,608	31,736	15,843	20,162
Netherlands	885	1,139	687	600
Spain	-	-	-	-
UK (Engl. + Wales)	10	344	41	91
UK (N.Ireland)	1,132	-	-	
UK (Scotland)	10,447	4,544	1,839	3,111
Unallocated +disc.	98	1,507	2,038	-21
Total	34,815	65,308	20,657	24,636

[1]Preliminary.
[2]Included in Subarea VII.
[3]Includes Divisions IIIa, IVa,b and VIb.
[4]Includes a negative unallocated catch of -7,000 t.

Table 3.12.4.4 Landings (t) of HORSE MACKEREL in Subarea VII by country. Data submitted by the Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	-	1	1	-	-	+	+	2	-
Denmark	5,045	3,099	877	993	732	1,477[2]	30,408[2]	27,368	33,202
France	1,983	2,800	2,314	1,834	2,387	1,881	3,801	2,197	1,523
Germany, Fed.Rep.	2,289	1,079	12	1,977	228	-	5	374	4,705
Ireland	-	16	-	-	65	100	703	15	481
Netherlands	23,002	25,000	27,500[2]	34,350	38,700	33,550	40,750	69,400	43,560
Norway	394	-	-	-	-	-	-	-	-
Spain	50	234	104	142	560	275	137	148	150
UK (Engl. + Wales)	12,933	2,520	2,670	1,230	279	1,630	1,824	1,228	3,759
UK (Scotland)	1	-	-	-	1	1	+	2	2,873
USSR	-	-	-	-	-	120	-	-	-
Total	45,697	34,749	33,478	40,526	42,952	39,034	77,628	100,734	90,253

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Faroe Islands	-	28	-	-	-	-	-	-	-
Belgium	-	+	-	-	-	1	-	-	18
Denmark	34,474	30,594	28,888	18,984	16,978	41,605	28,300	43,330	60,412
France	4,576	2,538	1,230	1,198	1,001	-	-	-	27,201
Germany, Fed.Rep.	7,743	8,109	12,919	12,951	15,684	14,828	17,436	15,949	28,549
Ireland	12,645	17,887	19,074	15,568	16,363	15,281	58,011	38,455	43,624
Netherlands	43,582	111,900	104,107	109,197	157,110	92,903	116,126	114,692	81,464
Norway	-	-	-	-	-	-	-	-	-
Spain	14	16	113	106	54	29	25	33	-
UK (Engl. + Wales)	4,488	13,371	6,436	7,870	6,090	12,418	31,641	28,605	17,464
UK (N.Ireland)	-	-	2,026	1,690	587	119	-	-	1,093
UK (Scotland)	+	139	1,992	5,008	3,123	9,015	10,522	11,241	7,931
USSR / Russia (1992-)	-	-	-	-	-	-	-	-	-
Unallocated + discards	28,368	7,614	24,541	15,563	4,0103	14,057	68,644	26,795	58,718
Total	135,890	192,196	201,326	188,135	221,000	200,256	330,705	279,100	326,474

Country	1998	1999	2000	2001[1]
Faroe Islands	-	-	550	-
Belgium	18	-	-	-
Denmark	25,492	19,223	13,946	20,574
France	24,223	-	20,401	11,049
Germany	25,414	15,247	9,692	8,320
Ireland	51,720	25,843	32,999	30,192
Netherlands	91,946	56,223	50,120	46,196
Spain	-	-	50	7
UK (Engl. + Wales)	12,832	8,885	2,972	8,901
UK (N.Ireland)	-	-	-	-
UK (Scotland)	5,095	4,994	5,152	1,757
Unallocated + discards	12,706	31,239	1,884	11,046
Total	249,446	161,654	137,766	138,042

[1]Provisional.
[2]Includes Subarea VI.

Table 3.12.4.5 Landings (t) of HORSE MACKEREL in Subarea VIII by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-	-	446	3,283	2,793
France	3,361	3,711	3.073	2,643	2,489	4,305	3,534	3,983	4,502
Netherlands	-	-	-	-	-[2]	-[2]	-[2]	-[2]	-
Spain	34,134	36,362	19,610	25,580	23,119	23,292	40,334	30,098	26,629
UK (Engl. + Wales)	-	+	1	-	1	143	392	339	253
USSR	-	-	-	-	20	-	656	-	-
Total	37,495	40,073	22,684	28,223	25,629	27,740	45,362	37,703	34,177

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	6,729	5,726	1,349	5,778	1,955	-	340	140	729
France	4,719	5,082	6,164	6,220	4,010	28	-	7	8,690
Germany, Fed. Rep.	-	-	80	62	-		-	-	-
Netherlands	-	6,000	12,437	9,339	19,000	7,272	-	14,187	2,944
Spain	27,170	25,182	23,733	27,688	27,921	25,409	28,349	29,428	31,081
UK (Engl. + Wales)	68	6	70	88	123	753	20	924	430
USSR/Russia (1992 -)	-	-	-	-	-	-	-	-	-
Unallocated + discards	-	1,500	2,563	5,011	700	2,038	-	3,583	-2,944
Total	38,686	43,496	46,396	54,186	53,709	35,500	28,709	48,269	40,930

Country	1998	1999	2000	2001[1]
Denmark	1,728	4,818	2,584	582
France	1,844	74	7	5,316
Germany	3,268	3,197	3,760	3,645
Ireland	-	-	6,485	1,483
Netherlands	6,604	22,479	11,768	36,106
Russia	-	-	-	-
Spain	23,599	24,190	24,154	23,531
UK (Engl. + Wales)	9	29	112	1,092
UK (Scotland)	-	-	249	-
Unallocated + discards	1,884	-8658	5,093	4,365
Total	38,936	46,129	54,212	76,120

[1]Preliminary.
[2]Included in Subarea VII.

Table 3.12.4.6 Western horse mackerel (IIa,IVa,Vb,VIa,VIIa-c,e-k,VIIIabde).

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4–10
1982	44985281	640531	41587	0.05
1983	372425	615757	64862	0.17
1984	1079073	621662	73625	0.18
1985	2167673	1358069	80551	0.08
1986	3302153	1833334	105665	0.12
1987	4820702	2318144	157240	0.08
1988	2369846	2704530	188100	0.08
1989	2255342	2449473	268867	0.10
1990	1961674	2071798	373463	0.17
1991	3163768	1929564	333555	0.18
1992	5628871	1687143	370550	0.19
1993	6594782	1974281	433145	0.15
1994	6569173	1585283	388875	0.13
1995	4421001	1428589	510597	0.22
1996	1779823	1726865	396652	0.11
1997	1022526	1062891	442571	0.27
1998	1010870	1176572	303543	0.26
1999	2176244	1226129	273888	0.24
2000	924030	1109617	174927	0.18
2001	2346726	761520	191193	0.24
2002[1]	2346726	667731		0.22
Average	4823748	1476921	258673	0.16

[1]Recruitment in 2001 and 2002: geometric mean 1983–2000; SSB_{2002}: projected;
$F_{2002} = F_{status\ quo}$ ($F_{1999–2001}$)

3.12.5 Blue whiting combined stock (Subareas I–IX, XII, and XIV)

State of stock/exploitation: The stock is harvested outside safe biological limits. The spawning stock biomass for 2001 at the spawning time (April) is inside safe biological limits while the SSB for 2002 is expected to be below $\mathbf{B}_{pa}$. Fishing mortality has increased rapidly in recent years, and is estimated at 0.82 in 2001. Total landings in 2001 were almost 1.8 million t. The incoming year classes seem to be strong.

Management objectives: EU, Faroe Islands, Iceland, and Norway agreed to implement a long-term management plan for the fisheries of the blue whiting stock, which is consistent with a precautionary approach, aimed at constraining the harvest within safe biological limits and designed to provide for sustainable fisheries and a greater potential yield. The plan shall consist of the following:

1. *Every effort shall be made to prevent the stock from falling below the minimum level of Spawning Stock Biomass (SSB) of 1 500 000 tonnes.*

2. *For 2003 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality less than 0.32 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of the fishing mortality rate.*

3. *Should the SSB fall below a reference point of 2 250 000 tonnes ($\mathbf{B}_{pa}$) the fishing mortality rate, referred to under paragraph 1, shall be adapted in the light of scientific estimates of the conditions then prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2 250 000 tonnes.*

4. *In order to enhance the potential yield, the Parties shall implement appropriate measures, which will reduce catches of juvenile blue whiting.*

5. *The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.*

ICES has not yet evaluated the management plan with respect to its conformity to the precautionary approach.

Precautionary Approach reference points (proposed in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 1.5 mill t	$\mathbf{B}_{pa}$ be set at 2.25 million t
$\mathbf{F}_{lim}$ is 0.51	$\mathbf{F}_{pa}$ be set at 0.32

Technical basis

$\mathbf{B}_{lim}$: $\mathbf{B}_{loss}$	$\mathbf{B}_{pa}$= $\mathbf{B}_{lim}$ exp(1.645*σ) σ=0.25
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$ (0.51)	$\mathbf{F}_{pa}$: $\mathbf{F}_{med}$ (1998)

Advice on management: ICES recommends that the fishing mortality be less than $\mathbf{F}_{pa}$=0.32, corresponding to landings of less than 600 000 t in 2003.

Rebuilding plan: Implementation of a rebuilding plan is not necessary since according to the current assessment the state of the stock is better than previously estimated.

Relevant factors to be considered in management: The current exploitation rate is not sustainable. The advice implies a reduction in fishing mortality by 60 % to $\mathbf{F}_{pa}$. However, it is recognised that fishing mortality will have to be reduced further in the following years in order to bring SSB back above $\mathbf{B}_{pa}$. The reduction of fishing mortality to $\mathbf{F}_{pa}$ is a first necessary step.

The spawning stock biomass reached a peak in 1999 due to the strong year classes 1995, 1996, and 1997. Even though the 1999 and 2000 year classes seem to be very strong, the SSB is expected to decline rapidly at the present level of fishing mortality.

The current exploitation rate and pattern means that few year classes support the fishery. The year classes dominating in the fishery are harvested heavily before they can reproduce or reach full growth potential. The estimate of year class strength for such young age groups is uncertain. The shift in dominance of younger ages in the stock in recent years is considered to be caused by an overall increase in fishing mortality and increased recruitment.

The proposed biological reference points for this stock may not be appropriate because even at moderate exploitation the probability that the stock drops below $\mathbf{B}_{pa}$ may be substantial. Revision of the biological reference points should be carried out based on a reliable analytical assessment of the stock.

Blue whiting is widely distributed in the eastern North Atlantic. Its distribution extends from the Strait of Gibraltar to the Barents Sea. It consists of several populations with genetic "leakage" between them, but it is treated as one stock since it has so far not been possible to define an unambiguous border between populations.

Catch forecast for 2003:
Basis: F(2002) = F(2001) = 0.82; Landings(2002) = 1505; SSB in 2002 = 2238.

F(2003) onwards	Basis	Catch (2003)	Landings (2003)	SSB in year 2003	SSB in year 2004
0.00	No fishing	0	0	2238	2756
0.08	0.1 * F(2001)	169	169	2202	2559
0.16	0.2 * F(2001)	327	327	2167	2378
0.25	0.3 * F(2001)	476	476	2132	2214
0.32	$\mathbf{F}_{pa}$ = 0.39 * F(2001)	598	598	2102	2082
0.33	0.4 * F(2001)	615	615	2098	2063
0.41	0.5 * F(2001)	747	747	2065	1924
0.82	F(2001)	1296	1296	1908	1383

Weights in '000 t, Mean F, ages 3–7.

Medium- and long-term projections: Medium-term projections were made using an F status quo assumption for the current year. The projections indicate that fishing at the current $\mathbf{F}_{pa}$ has a high probability of reducing the stock to below $\mathbf{B}_{pa}$. A revised estimate of $\mathbf{F}_{pa}$ that is more consistent with maintaining stock sizes above $\mathbf{B}_{pa}$ will have to be substantially below the current value.

Comparison with previous assessment and advice: The present assessment gives far higher estimates of the stock abundance in the most recent years compared to the assessments made in 1999 to 2001. Recruitment estimates from the 2001 surveys indicated that the 1999 and 2000 year classes were very abundant. The 2002 survey on the spawning grounds suggested that most age classes are more abundant than was indicated by earlier surveys. However, the increase is also seen in all the oldest year classes where a decrease due to mortality would be expected. This suggests that the 2002 survey values may be overestimates.

The 1999 and 2000 year classes were very abundant in the fishery in 2001 (notably in the third quarter). However, the ages 8 and 9 were also more present in the catch than could be expected from the catches of the earlier years. This has caused the selection pattern that is estimated in the model to be changed compared to the assessment from last year. Notably, the selection on the oldest ages has increased and this is carried through in the historical reconstruction of the stock by giving higher fishing mortality to the oldest age and a lower SSB over the historical period.

Both the higher abundance of most year classes in the 2002 survey and the high estimates of fishing mortality for the oldest age could be year-specific effects, and not reliable indicators of true changes in stock status relative to recent assessments.

The catch information from 2001 and the surveys from 2001 and spring 2002 indicate that the 1999 and 2000 year classes are very strong, but their actual size is still very uncertain. The survey and catch information that was available for the 2001 assessment (catch data for 2000 and survey information for 2000 and spring 2001) estimated the 1999 year class to be 50 % above average. The estimated strength of the 2000 year class was based on catches of age group 0 only and these were not abnormally high. The value used in the projections was very close to the geometric mean recruitment. The surveys do not provide precise estimates of 0 group strength and the strength of the 1 group is estimated in summer after the assessment was done. The summer survey in 2000 found the 0 group abundance to be less than that of the 1999 year class.

The change in perception of recent recruitment has led to a very different outlook for the development of the stock in the near future. Spawning biomass is estimated to be above $\mathbf{B}_{pa}$, although its exact size is highly uncertain. The trend in fishing mortality is considered to be reliably reflected in the assessment, and there is little doubt that F is very high and has increased rapidly in the recent years.

Because the stock appears to have improved due to the strong 1999 and 2000 year classes, a rebuilding plan is no longer considered imperative. Nevertheless, a substantial reduction in fishing mortality is still required. Fishing at $\mathbf{F}_{pa}$ (=0.32) will result in a declining SSB to a level below $\mathbf{B}_{pa}$ (=2.25 million tonnes) in 2003 unless another strong year class appears.

Elaboration and special comment: Most of the catches are taken in the directed pelagic trawl fishery in the spawning and post-spawning areas (Divisions Vb, VIa,b, and VIIb,c). Catches are also taken in a directed and a mixed fishery in Subarea IV and Division IIIa and in the pelagic trawl fishery in the northern areas (Subarea I and II, Divisions Va, XIVa,b). These fisheries in the northern areas have taken 340 000 –

1 390 000 t per year in the last decade, while catches in the southern areas (Subarea VIII, IX, Divisions VIId,e and g-k) have been stable in the range of 25 000–34 000 t. In Division IXa blue whiting is mainly taken as by-catch in mixed trawl fisheries.

Estimates of spawning biomass by acoustic surveys are well above the level indicated by the assessment. However, it has generally been difficult to reconcile catch data and absolute survey abundance estimates for blue whiting and although the acoustic surveys may be indicative of trends in biomass, the absolute values are not considered - representative.

The analytical assessment is based on catch data, acoustic surveys, and commercial CPUE series data.

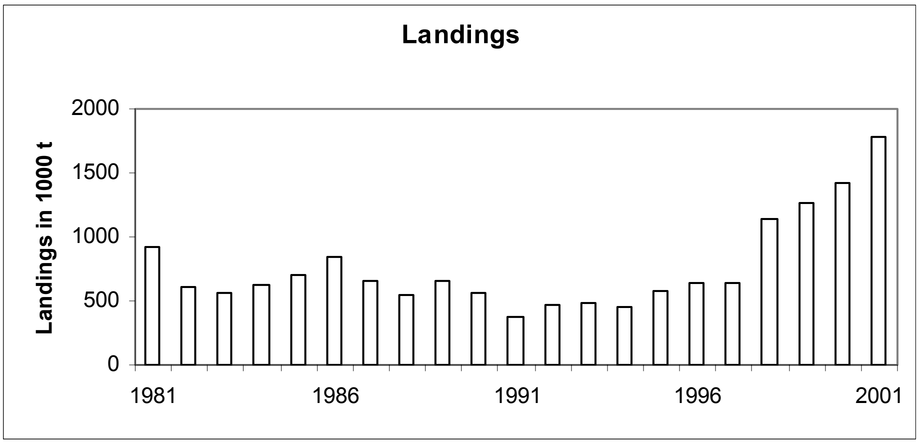
Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 29 April – 8 May 2002 (ICES CM 2002/ACFM:19).

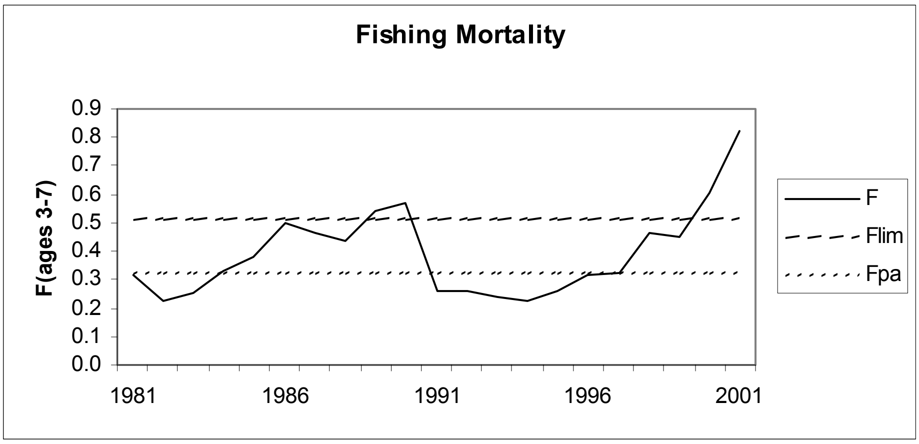
Catch data (Tables 3.12.5.1–7):

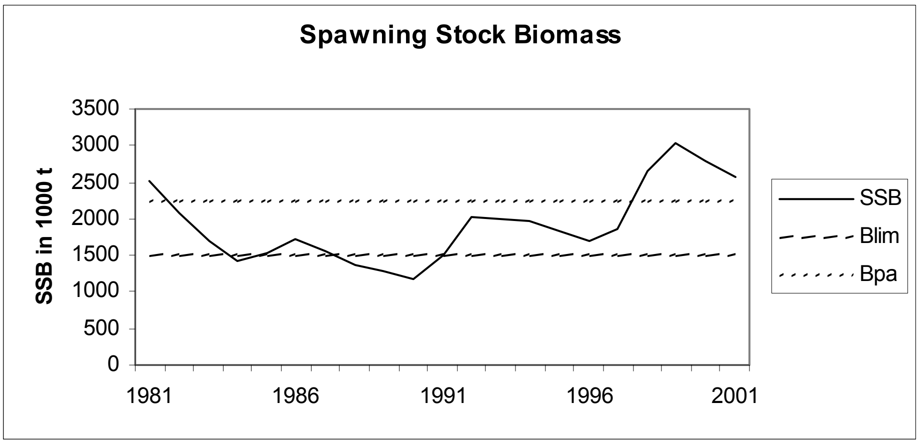
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	TAC for northern areas; no advice for southern areas	950	-	665
1988	TAC for northern areas; no advice for southern areas	832	-	558
1989	TAC for northern areas; no advice for southern areas	630	-	627
1990	TAC for northern areas; no advice for southern areas	600	-	562
1991	TAC for northern areas; no advice for southern areas	670	-	370
1992	No advice	-	-	475
1993	Catch at *status quo* F (northern areas); no assessment for southern areas	490	-	481
1994	Precautionary TAC (northern areas); no assessment for southern areas	485	650[1]	459
1995	Precautionary TAC for combined stock	518	650[1]	579
1996	Precautionary TAC for combined stock	500	650[1]	646
1997	Precautionary TAC for combined stock	540		672
1998	Precautionary TAC for combined stock	650		1125
1999	Catches above 650 000 t may not be sustainable in the long run	650		1256
2000	F should not exceed the proposed $\mathbf{F}_{pa}$	800		1412
2001	F should not exceed the proposed $\mathbf{F}_{pa}$	628		1780
2002	Rebuilding plan	0		
2003	F should be less than the proposed $\mathbf{F}_{pa}$	600		

[1]NEAFC proposal for NEAFC regions 1 and 2. Weights in ‘000 t.

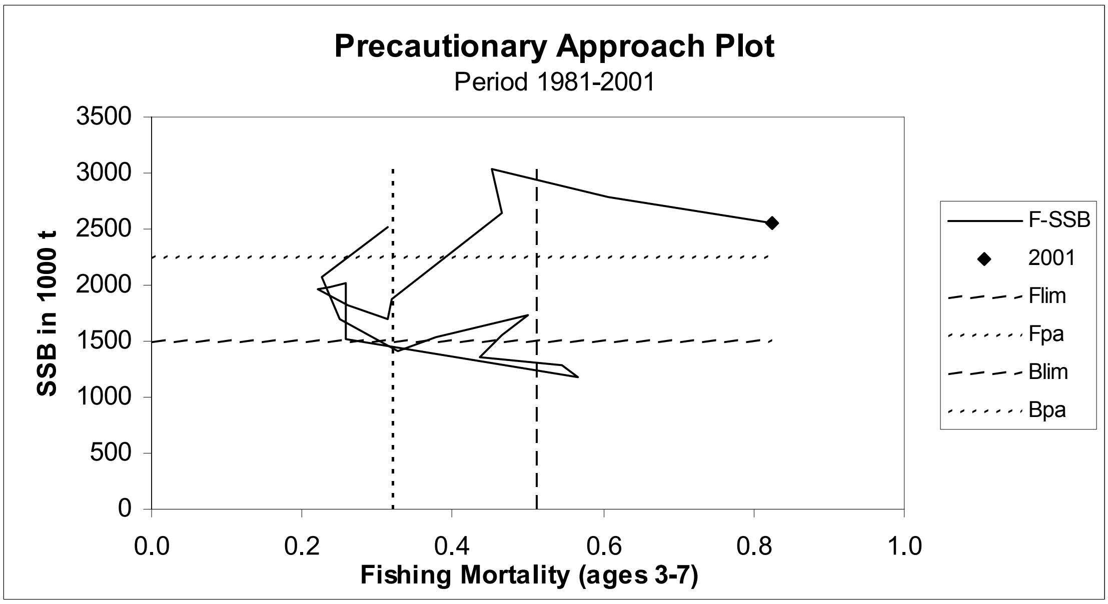
Blue whiting combined stock (Subareas I-IX, XII & XIV)

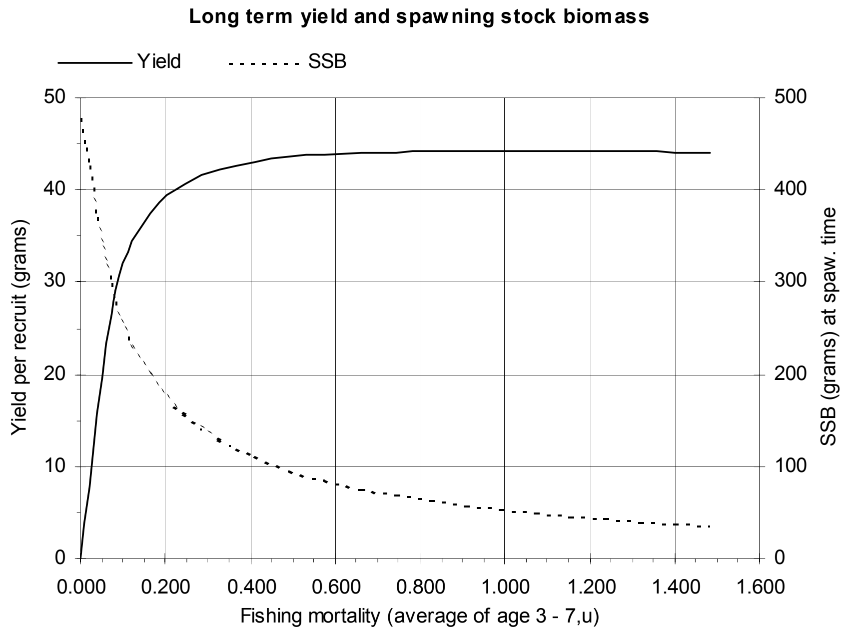




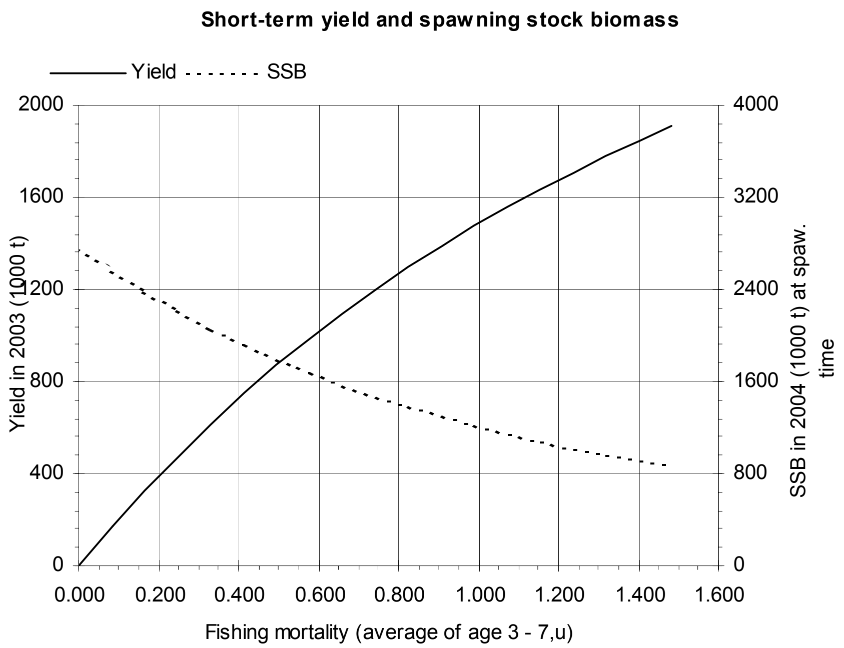



Stock - Recruitment
Recruitment (age 0) in billions
SSB in 1000 t
60
50
40
30
20
10
0
0
500
1000
1500
2000
2500
3000
3500
SSB-Rec.
Blim
Bpa


Precautionary Approach Plot
Period 1981-2001
SSB in 1000 t
Fishing Mortality (ages 3-7)
3500
3000
2500
2000
1500
1000
500
0
0.0
0.2
0.4
0.6
0.8
1.0
F-SSB
2001
Flim
Fpa
Blim
Bpa



Long term yield and spawning stock biomass
Yield
SSB
Yield per recruit (grams)
SSB (grams) at spaw. time
Fishing mortality (average of age 3 - 7,u)
0
10
20
30
40
50
0
100
200
300
400
500
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600



Short-term yield and spawning stock biomass
Yield
SSB
Yield in 2003 (1000 t)
SSB in 2004 (1000 t) at spaw. time
Fishing mortality (average of age 3 - 7,u)
0
400
800
1200
1600
2000
0
800
1600
2400
3200
4000
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600

Country	1987	1988	1989 [3)]	1990	1991	1992	1993	1994 [2)]	1995 [3)]	1996	1997	1998	1999	2000	2001
Denmark													15	7,721	5,723
Estonia	-	-	-	-	-	-	-	-	-	377	161	904	-	-	-
Faroes	9,290	-	1,047	-	-	-	-	-	-	345	-	44,594	11,507	17,980	64,496
Germany	1,010	3	1,341	-	-	-	-	2	3	32	-	78	-	-	3117
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Iceland	-	-	4,977	-	-	-	-	-	369	302	10,464	64,863 [4)]	99,092	146,903	245,814
Latvia	-	-	-	-	-	-	-	422	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	-	72	25	-	63	435	-	5180
Norway [5)]															64,581
Norway [6)]	-	-	-	566	100	912	240	-	-	58	1,386	12,132	5,455	-	28,812
Poland	56	10	-	-	-	-	-	-	-	-	-	-	-	-	-
USSR/Russia [1)]	112,686	55,816	35,250	1,540	78,603	61,400	43,000	22,250	23,289	22,308	50,559	51,042	65,932	103,941	173,860
Total	123,042	55,829	42,615	2,106	78,703	62,312	43,240	22,674	23,733	23,447	62,570	173,676	182,436	276,545	591,583

[1]) From 1992 only Russia

[2]) Includes Vb for Russia.

[3]) Icelandic mixed fishery in Va.

[4]) include mixed in Va and directed in Vb.

[5)] Directed fishery

[6)] By-catches of blue whiting in other fisheries.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 [1)]	1999	2000	2001
Denmark	2,655	797	25	-	-	3,167	-	770	-	269	-	5051	19,625	11,856	18,110
Estonia	-	-	-	-	-	6,156	1,033	4,342	7754	10,605	5,517	5,416	-	-	-
Faroes	70,625	79,339	70,711	43,405	10,208	12,731	14,984	22,548	26,009	18,258	22,480	26,328	93,234	129,969	188,464
France	-	-	2,190	-	-	-	1,195	-	720	6,442	12,446	7,984	6,662	13,481	13,480
Germany	3,850	5,263	4,073	1,699	349	1,307	91	-	6,310	6,844	4,724	17,891	3,170	12,655	15,862
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	61,438	113,280	119,287
Ireland	3,706	4,646	2,014	-	-	781	-	3	222	1,709	25,785	45635	35,240	25,200	29,854
Japan	-	-	-	-	-	918	1,742	2,574	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	10,742	10,626	2,160	-	-	-	-	-	-	-
Lithauen	-	-	-	-	-	-	2,046	-	-	-	-	-	-	-	-
Netherlands[2])	5,627	800	2,078	7,280	17,359	11,034	18,436	21,076	26,703	17,644	23,676	27,884	35,408	46,128	68,415
Norway	191,012	208,416	258,386	281,036	114,866	148,733	198,916	226,235	261,272	337,434	318,531	519,622	475,004	460,274	399,932
UK (Scotland)	3,315	5,071	8,020	6,006	3,541	6,849	2,032	4,465	10,583	14,325	33,398	92,383	98,853	42,478	50,147
USSR/Russia [3])	165,497	121,705	127,682	124,069	72,623	115,600	96,000	94,531	83,931	64,547	68,097	79,000	112,247	141,257	141,549
Total	446,287	426,037	475,179	463,495	218,946	318,018	347,101	378,704	423,504	478,077	514,654	827,194	940,881	996,578	1,045,100

[1]) Including some directed fishery also in Division IVa.

[2]) Revised for the years 1987, 1988, 1989, 1992, 1995,1996,1997

[3]) From 1992 only Russia

Country	1987	1988	1989	1990	1991	1992	1993 3)	1994	1995	1996	1997	1998 2)	1999	2000	2001
Denmark 4)	28.541	18.144	3.632	10.972	5.961	4.438	25.003	5.108	4.848	29.137	9.552	40.143	36.492	30.360	21.995
Denmark 5)			22.973	16.080	9.577	26.751	16.050	14.578	7.591	22.695	16.718	16.329	8.521	7.749	7.505
Faroes 4) 6)	7.051	492	3.325	5.281	355	705	1.522	1.794	-	6.068	6.066	-	-	-	60
Faroes 5) 6)												296	265	42	6.741
Germany 1)	115	280	3	-	-	25	9	-	-	-	-			-	81
Netherlands	-	-	-	20	-	2	46	-	-	-	793			-	-
Norway 4)	24.969	24.898	42.956	29.336	22.644	31.977	12.333	3.408	78.565	57.458	27.394	28.814	48.338	73.006	21.804
Norway 5)															58.182
Russia															69
Sweden	2.013	1.229	3.062	1.503	1.000	2.058	2.867	3.675	13.000	4.000	4.568	9.299	12.993	3.319	2.086
UK	-	100	7	-	335	18	252	-	-	1	-			-	-
Total	62.689	45.143	75.958	63.192	39.872	65.974	58.082	28.563	104.004	119.359	65.091	94.881	106.609	114.476	118.523

1) Including directed fishery also in Division IVa.

2) Including mixed industrial fishery in the Norwegian Sea

3) Imprecise estimates for Sweden: reported catch of 34265 t in 1993 is replaced by the mean of 1992 and 1994, i.e. 2,867 t, and used in the assessment.

4) Directed fishery

5) By-catches of blue whiting in other fisheries.

6) For the periode 1987-2000 landings figures also include landings from mixed fisheries in Division Vb.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Netherlands	-	-	-	450	10	-	-	-	-	-	-	10 1)	-	-	-
Norway	4	-	-	-	-	-	-	-	-	-	-			-	-
Portugal	9.148	5.979	3.557	2.864	2.813	4.928	1.236	1.350	2.285	3.561	2.439	1.900	2.625	2.032	1.746
Spain	23.644	24.847	30.108	29.490	29.180	23.794	31.020	28.118	25.379	21.538	27.683	27.490	23.777	22.622	23.218
UK	23	12	29	13	-	-	-	5	-	-	-	-	-	-	-
France	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Total	32.819	30.838	33.695	32.817	32.003	28.722	32.256	29.473	27.664	25.099	30.122	29.390	26.402	24.654	24.964

1) Directed fisheries in VIIIa

Area	Denmark	Faroes	France	Germany	Iceland	Netherlands	Ireland	Norway	Portugal	Russia	Scotland	Spain	Sweden	Grand Total
I										33				33
IIa	5,723	39,694		3,117	74,700	5,180		93,393		148,015				369,821
IIb										25,812				25,812
IIIa	2,954							22					2,040	5,016
IVa	26,546	6,801		81				79,964		69			46	113,507
IXa									1,746					1,746
Va		24,801			171,114									195,915
Vb	13,632	114,591			119,287			63,282		94,776				405,568
Vb VI VII			13,480											13,480
VIa	1,023	28,753		11,619		25,572	18,357	148,789			36,264			270,376
VIb		6,480		650		4,447	567	35,820		37,193	2,963			88,120
VIIb				51		10,595	1,563				6,816			19,025
VIIbc								75,756						75,756
VIIc	3,455	36,816		3,488		25,820	8,438				4,044			82,061
VIIgk+XII		1,824						76,285		9,580				87,689
VIIh				2										2
VIIIc+IXa												23,218		23,218
VIIj				52		1,982	929				60			3,023
Grand Total	53,333	259,761	13,480	19,060	365,101	73,595	29,854	573,310	1,746	315,478	50,147	23,218	2,086	1,780,170

Table 3.12.5.6 Blue whiting combined stock (Subareas I-IX, XII & XIV)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–7
1981	4055289	2524227	924804	0.3143
1982	16639719	2076892	613859	0.2262
1983	22220166	1701049	562084	0.2497
1984	14847654	1415142	630753	0.3275
1985	12544761	1543316	696998	0.3771
1986	11151699	1728281	849665	0.4990
1987	9213750	1546722	662561	0.4652
1988	9810064	1365409	553690	0.4368
1989	25384230	1293635	657602	0.5439
1990	10114204	1175685	560950	0.5676
1991	6792609	1514241	369806	0.2572
1992	5701122	2026704	475048	0.2593
1993	6554003	1987685	480733	0.2363
1994	8169103	1959444	459082	0.2217
1995	29012229	1819742	577921	0.2617
1996	49460845	1694646	636090	0.3135
1997	24158783	1870973	646242	0.3202
1998	13545724	2648888	1133373	0.4664
1999	29937139	3043905	1265898	0.4531
2000	38754471	2784253	1416451	0.6071
2001	11760000	2561316	1777957	0.8245
2002	13983000	2238000		0.8245
Average	16991389	1932734	759598	0.4115

Table 3.12.5.7 Blue whiting. Results of medium term analysis.

F in 2002 equals F in 2001 (F=0.8245)											
	Probabilities (%)				Year when	Year when	Fractiles of catch in 2002			Fractiles of catch in 2003		
F in 2003	B<Blim		B>Bpa		risk B<Blim is	prob. B>Bpa						
and after	2003	2012	2003	2012	below 5%	is above 95%	25%	50%	75%	25%	50%	75%
0.05	4.1	0.0	38.8	100.0	2003	2005	1216	1374	1558	89	102	117
0.10	4.6	0.0	36.9	100.0	2003	2005				174	200	230
0.15	5.5	0.0	35.8	99.8	2004	2006				255	294	336
0.20	5.8	0.0	34.4	97.7	2004	2008				334	384	440
0.25	6.6	0.0	32.2	89.7	2004	>2012				409	470	540
0.30	7.4	0.6	30.7	74.6	2004	>2012				481	554	635
0.32=Fpa	7.4	1.3	30.4	68.2	2004	>2012				509	586	672
0.35	7.8	2.6	29.9	58.1	2004	>2012				551	634	726
0.40	8.7	6.9	28.2	38.8	>2012	>2012				618	711	815

3.12.6 Response to Special Request from EC concerning the state of the Northern Hake stock and catch advice for 2002

EC DG Fish requested ICES for the Northern Hake stock to:

- *Evaluate any new relevant information concerning the state of the stock*

- *Review the catch advice provided for the year 2002*

ICES should take into account relevant comments by STECF, and in particular comments concerning the precautionary reference points for hake.

ICES advice October 2001:

In the light of the continued decrease in SSB and very poor recruitment since 1997, ICES recommends a recovery plan that will ensure a safe and rapid recovery of SSB to a level in excess of 165 000 t. If a recovery plan is not implemented ICES recommends that fishing mortality on hake should be reduced to the lowest possible level in 2002.

This advice was based on an assessment made in September 2001.

The ICES October 2001 advisory report presented short-term forecasts and medium term simulations based on two options of fishing mortality for 2001:The first option was based on status quo F ($\mathbf{F}_{sq}$ =$F_{98–00}$ =0.29 corresponding to an expected landing of 37·400 t) and the other option was based on the assumption that the catch in 2001 will constrained by the TAC (TAC_{2001}=22 600 t corresponding to F=0.16).

ICES Comments:

A. Evaluate new Information

1. At the time of writing (late May 2002) a new reviewed assessment based on the complete 2001 dataset is not available. ICES Advisory Committee on Fishery Management (ACFM) will review the assessment of the Northern Hake stock in October 2002. ACFM will at that time formulate ICES advice for 2003.

2. Compared to the data used for formulating the October 2001 advice, ICES can offer the following new information:

   - Landings statistics for 1999 and 2000 have been revised. The text table below compares the new estimates with those used in 2001.

Years	Preliminary statistics used in the 2001 assessment	Revised value	Difference
1999	38 518 t	39 815 t	+ 3.4%
2000	40 905 t	42 024 t	+ 2.7%

   - Preliminary landings statistics for 2001 are 36 675 t. This is very close to the value predicted for *status quo* F in 2001 (37 400 t). No information on the landings in the first months of 2002 was available.

   - The trend to increase the mean length in the landings was continued in 2001. Since 1997 the mean length in the landings has increased from 34 to 46 cm. This means that the proportion of small fish in the landings has decreased. There is reduced recruitment in recent years (leading to a general lack of small fish in the population). The fisheries have also changed: there is better enforcement of the legal minimum landing size and there are changes in the fishing strategies. The assessment includes discard data and shows that fishing generated mortality on 0–2 year old hake has decreased.

   - Compared to 2000, LPUE in 2001 show a 30% decrease for the two most important trawler fleets operating in Subarea VII (A Coruna and Vigo fleets) whilst remaining at a high level for the A Coruna fleet. In Subarea VII long-liners show an increase (+5%) in LPUE (kg/day), and gill-netters in Sub-Area VII+VIII (+8). In Sub-Area VIII, there is no clear trend in the LPUE.

   - Survey indices indicate an increase in recruitment (age 0) in 2001 both in the Bay of Biscay (French surveys EVHOE and RESSGASC) and in the Celtic Sea from the French EVHOE survey. The UK-Ground fish survey, which took place in March 2002, shows a consistent increase in the abundance at age 1 from the lowest in the time series.

3. The landings reported for 2001 suggests that the option using F(2001) = $\mathbf{F}_{sq}$ =0.29 is the more relevant among those presented in the 2001 report. Thus,

   - To achieve recovery of SSB in excess of 165 000 t in 2005 would require, in 2002, a 60% reduction in F (corresponding to landings less than 16 200 t in 2002).

- The 2002 TAC (26 960 t) corresponds to a F in 2002 that is 30% below $\mathbf{F}_{sq}$ (to $\mathbf{F}_{pa}$=0.20), and the simulations suggests that will only allow SSB to reach 165 000 t in 2008 with 50 % probability.

- To increase SSB by 15% each year as specified in the recovery plan, i.e., aiming at SSB = 113 000 t in 2003 requires that F (= 0.14) would be only 50% of $\mathbf{F}_{sq}$ (corresponding to landings less than 19 900 t in 2002).

4. Recruitment to future Spawning Stock Biomass is possibly larger than predicted because the improved selection pattern and changes in fishing strategy may reduce fishing mortality on immature hake more than assumed in the projections.

5. Recent information on abundance indices from the Northern part of the stock distribution area have not yet been taken into account in the assessment because of the short time series of these surveys.

Biological PA Reference Points

$\mathbf{B}_{lim}$ is currently based on $\mathbf{B}_{loss}$ as estimated in 1998. Since then there has been substantial revisions of both data and assessment model leading to a downwards re-evaluation of the whole series of SSB, with a new $\mathbf{B}_{loss}$ about 15 % lower than estimated in the 1998 assessment. However, preliminary results from a statistical method applied to the revised series set $\mathbf{B}_{lim}$ higher than the current value for this reference point.

At this stage, it can be considered

- either that Biomass Reference Points should be considered as relative. Thus, the absolute values should be consequently revised downwards, leading to new values of $\mathbf{B}_{lim}$ and $\mathbf{B}_{pa}$ at 102–105 kt and 140–150 kt respectively,

- or that these changes in SSB and in $\mathbf{B}_{loss}$ from year to year reflect unstability in the assessment and thus lead to a need to be more cautious.

Revision of Biological Reference Points for northern hake would benefit from further investigations into the source of the instability in the assessment. Therefore, no revisions of the biological reference points are currently suggested even though the actual ones are considered to be possibly inappropriate.

ICES advise, in line with the advice given in 2001, that:

In the light of the continued decrease in SSB and poor recruitment since 1997, ICES recommends a recovery plan that will ensure rebuilding of SSB to a level in excess of $\mathbf{B}_{pa}$ (currently under revision). If a recovery plan is not implemented, ICES recommends that the fishing mortality on hake should be reduced to the lowest possible level in 2002.

3.12.7 Answer to Icelandic Request on Behalf of EU, Norway, Iceland, Greenland, and, Faroe Islands, and Russia on Blue Whiting

Request to the International Council for the Exploration of the Sea

The European Community, the Faroe Islands, Greenland, Iceland, Norway, and the Russian Federation at the Meeting on the Management Measures for the Blue Whiting Stock held in Reykjavík on the 11 to 12 February 2002 agreed on the need to develop a multi-annual recovery plan that ensures a safe recovery of the blue whiting stock.

The parties agreed that the plan should include:

- *A harvest rule specifying the upper limits of the catches to be taken during the recovery period*
- *Measures to enhance the exploitation pattern with the aim of securing a low fishing mortality on juveniles.*

Within the above context, ICES is requested to provide advice on possible harvest rules and technical measures to be included in a recovery plan.

Harvest rules

1. *ICES is requested to identify candidate harvest rules and to evaluate them, in particular with respect to risks associated with a range of TAC's in the rebuilding phase and a range of targets for the rebuilding. In addition to the uncertainty about initial numbers and future exploitation pattern and weights and maturity rates, ICES should at least take into account:*

    - *The uncertainty in the estimates of those year classes that will enter the spawning stock in the rebuilding period, given the present lack of information about the stock at these ages,*
    - *A range of levels of exploitation on juveniles,*
    - *A range of scenarios for how the recruitment will respond to SSB being below* $\boldsymbol{B}_{lim}$*,*
    - *The robustness to bias in the assessment,*
    - *The robustness to a sequence of poor year classes.*

    The performance criteria to be evaluated should include:

    - *The probability that the SSB will be below* $\boldsymbol{B}_{lim}$*,*
    - *The probability that the stock will reach a target level within various time frames,*
    - *The year-to-year variation in the catches in the recovery period.*

2. *In order to establish realistic targets for the rebuilding and as a guideline for future harvest rules, ICES is requested to revisit the reference point. In particular, the fact that fishing at the current* $\boldsymbol{F}_{pa}$ *will lead to a substantial probability of SSB<*$\boldsymbol{B}_{pa}$ *should be considered.*

3. *As a guideline for evaluating harvest rules for the situation where the state of the stock is satisfactory, ICES is requested to provide the likely range of yearly catches in stochastic long-term simulations, for a range of combinations of fishing mortality on adult and juvenile fish.*

Exploitation pattern

ICES is requested to provide as detailed information as possible on the age/size composition in different segments of the blue whiting fishery and to evaluate the effect on the stock and the fisheries of possible measures to reduce exploitation of juveniles.

The evaluation should include but not be restricted to the effects of introducing a minimum size and closed areas/seasons."

Answer to the request on Harvest Control Rule

Due to exceptionally strong incoming year classes, ICES perception of the stock in 2002 is more optimistic than in 2001. The need for a *rebuilding plan* is, accordingly, not as urgent as it appeared in 2001. However, even if the SSB is currently above the 2001 $\mathbf{B}_{pa}$, and also above a suggested action level of SSB, as introduced below, the current high fishing mortality will, in the medium term, reduce the stock size heavily. Unless the recruitment continues to be above the long-term average also in the coming years, the current F will bring the SSB below the $\mathbf{B}_{lim}$ in 2004–2005. In this situation more effort is invested into suggesting a harvest control rule than to concentrate on a rebuilding plan.

Medium and long-term simulations based on the 2001 assessment were presented to the SGPA in March 2002 (Lisbon) and can be found in the report of that meeting. The group suggested to extend the reference point framework to a harvest control rule of the same general design as already agreed by the coastal states (May 2002).

Due to the unstable situation with regard to the perception of the state of the stock and recent recruitment, the WGNPBW did not reproduce or extend these simulations. This should be done to further refine a harvest control rule within the agreed framework.

However, this should be postponed until a more clear view of the stock dynamics has evolved.

Answer to the request on exploitation pattern

Evaluations of the risk associated with a harvest control rule will be very sensitive to the exploitation of juvenile fish. At present there is not enough information available to examine this in the required detail.

To be able to provide age/size compositions in different segments of the blue whiting fishery and to evaluate the effect on the stock, the following information is required:

- Homogeneous definition of "Fisheries", where the parameters gear, mesh size, area, and time are taken into account.
- Implementation of biological sampling schemes, which follow the above definitions.

In order to provide catch-at-age from the different fisheries, the following fisheries are defined:

In the North Sea and Skagerrak area blue whiting is taken in:

- a directed fishery for blue whiting using trawls with a mesh size of >=40 mm.
- a fishery where blue whiting is taken as by-catch. In this fishery trawls with mesh sizes less than 40 mm are used.

In the Northern areas outside the North Sea and Skagerrak blue whiting is taken in:

- a directed blue whiting fishery where trawls with mesh sizes of at least 40 mm are used.
- fisheries for Norwegian spring spawning herring where blue whiting is taken as by-catch. This fishery is carried out by purse seiners and trawlers using gears with mesh sizes of at least 36 mm.
- fisheries for other species where blue whiting is taken as by-catch, using gears with mesh sizes less than 36 mm.

Landings of blue whiting caught in the Southern area are taken in:

- a directed offshore fishery for blue whiting using trawls with a mesh size of >=55 mm.
- a more coastal fishery where blue whiting is taken as by-catch. In this fishery trawl with mesh sizes less than 65 mm is used.

In order to evaluate the effect which different fisheries have on the blue whiting stock, landing figures for at least five years should be available. These need to be disaggregated by fisheries. With the very short time notice such data could not be obtained. The respective ICES Working Group is requested to start compiling data on the basis of fishery, quarter, and area for the next Working Group meeting in 2003.

3.12.8 Answer to request from NEAFC concerning blue whiting

NEAFC request dated 16 November 2001:

"Regarding blue whiting stocks: provide medium-term projections using scenarios as considered appropriate"

The medium-term projections were carried out with a fishing mortality for 2002 assumed to be equal to the fishing mortality of 2001*, i.e.,* $F_{2002} = F_{2001}$. Based on this a median catch in 2002 of 1 374 000 t is predicted.

The risk of the SSB being below $\mathbf{B}_{lim}$ was found to be 4% - 9% in 2003 for F's between 0.05 and 0.4 in 2003. At a fishing mortality of 0.25 from 2004 onwards, the probability of SSB being below $\mathbf{B}_{lim}$ is 5% or less. However, at any higher fishing mortality the risk falling below $\mathbf{B}_{lim}$ is greater than 5%. In order to bring B above $\mathbf{B}_{lim}$ in 2003 a fishing mortality of less than 0.15 is required, based on a 5% risk level (Table 3.12.8.5). In other words, to obtain a B above $\mathbf{B}_{lim}$ in 2004 with a 95% probability, F must be less than 0.15.

At a fishing mortality of 0.25 there is a 30% probability that SSB will be above $\mathbf{B}_{pa}$ of 2 250 000 t ($\mathbf{B}_{pa}$ used until now) in 2003, and a 95% probability to be above $\mathbf{B}_{pa}$ in 2012.

Table 3.12.8.1

Blue whiting. Medium term projections

F in 2002 equals F in 2001 (F=0.8245, corresponding to a catch of 1 374 000 t)

	Probabilities (%)				Year when	Year when	Fractiles of catch in 2002			Fractiles of catch in 2003		
F in 2003	B<Blim		B>Bpa		risk B<Blim is	prob. B>Bpa						
and after	2003	2012	2003	2012	below 5%	is above 95%	25%	50%	75%	25%	50%	75%
0.05	4.1	0.0	38.8	100.0	2003	2005	1216	1374	1558	89	102	117
0.10	4.6	0.0	36.9	100.0	2003	2005				174	200	230
0.15	5.5	0.0	35.8	99.8	2004	2006				255	294	336
0.20	5.8	0.0	34.4	97.7	2004	2008				334	384	440
0.25	6.6	0.0	32.2	89.7	2004	>2012				409	470	540
0.30	7.4	0.6	30.7	74.6	2004	>2012				481	554	635
0.32	7.4	1.3	30.4	68.2	2004	>2012				509	586	672
0.35	7.8	2.6	29.9	58.1	2004	>2012				551	634	726
0.40	8.7	6.9	28.2	38.8	>2012	>2012				618	711	815