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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 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 (F_s);
- 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, 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 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 $\pm 50\%$. The definition of recovery was considered to be two successive years with a probability greater than 50% that the SSB exceeded 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 F _{pa} | 0.8 x F _{pa} | ± 50% | Sc04 |
| F | 0.6 x F _{pa} | 0.6 x F _{pa} | ± 50% | Sc05 |
| F | 1.0 x F _{pa} | 1.0 x F _{pa} | ± 50% | Sc06 |
| B | + 30% | + 15% | ± 20% | Sc07 |
| B | + 45% | + 20% | ± 20% | Sc08 |
| B | + 15% | + 10% | ± 20% | Sc09 |
| F | 0.8 x F _{pa} | 0.8 x F _{pa} | ± 20% | Sc10 |
| F | 0.6 x F _{pa} | 0.6 x F _{pa} | ± 20% | Sc11 |
| F | 1.0 x F _{pa} | 1.0 x F _{pa} | ± 20% | Sc12 |
| B | + 30% | + 15% | none | Sc13 |
| B | + 45% | + 20% | none | Sc14 |
| B | + 15% | + 10% | none | Sc15 |
| F | 0.8 x F _{pa} | 0.8 x F _{pa} | none | Sc16 |
| F | 0.6 x F _{pa} | 0.6 x F _{pa} | none | Sc17 |
| F | 1.0 x F _{pa} | 1.0 x F _{pa} | 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 F_{pa} is not effective for rebuilding, requiring the longest recovery time.
- v. During the recovery phase, sustained reduction of F < 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 B_{pa} and 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 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 F_{pa} did not result in a high probability of recovery; this was attained when fishing at the lower F_s 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 $SSB > B_{pa}$. 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 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 B_{lim} or 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:

| | <i>Whiting</i> | <i>Haddock</i> |
|----------------------------------|---|---|
| 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 <i>status quo</i> 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 <i>status quo</i> 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 <i>status quo</i> 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 |

¹No 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 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 B_{pa} , and the fishing mortality in 2001 was below 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 B_{lim} . | B_{pa} be set at 8 000 t. This is the lowest observed biomass, at which there is no indication of impaired recruitment. |
| F_{lim} is 0.55. This is a fishing mortality at or above which the stock has shown continued decline. | F_{pa} be set at 0.4. This F is considered to provide approximately 95% probability of avoiding F_{lim} . |

Technical basis:

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

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

remain above B_{pa} in the short term, providing fishing mortality does not exceed F_{pa} .

Relevant factors to be considered in management: Due to the large 1999 year class, SSB is expected to

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: $F(sq) = F(99-01, \text{scaled}) = 0.34$; Landings(2002) = 4.9; SSB(2003) = 15.1.

| F(2003 onwards) | Basis | Landings (2003) | SSB (2004) |
|-----------------|--------------------------|-----------------|------------|
| 0.27 | $0.8 * F_{sq}$ | 3.9 | 16.1 |
| 0.31 | $0.9 * F_{sq}$ | 4.3 | 15.6 |
| 0.34 | $1.0 * F_{sq}$ | 4.7 | 15.1 |
| 0.40 | $F_{pa} = 1.18 * F_{sq}$ | 5.4 | 14.4 |
| 0.41 | $1.2 * F_{sq}$ | 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.

The minimum mesh size in the sole fishery with towed gears is 80 mm and in the fishery with static gears 90 mm.

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.

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.

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.

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:

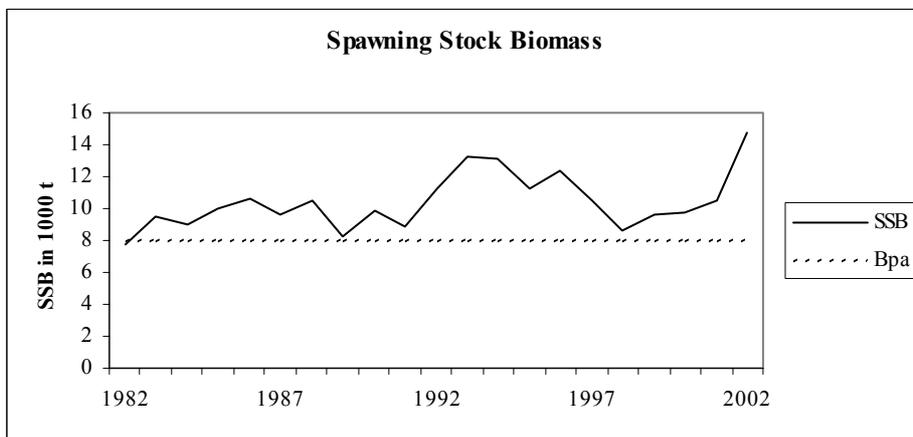
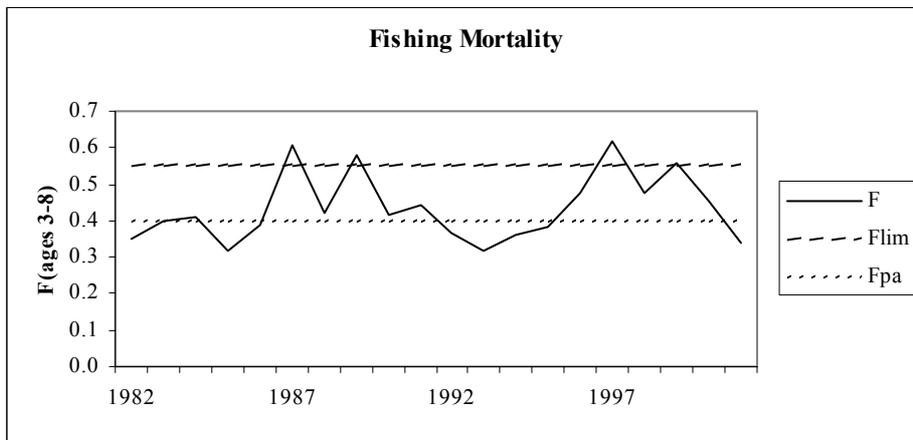
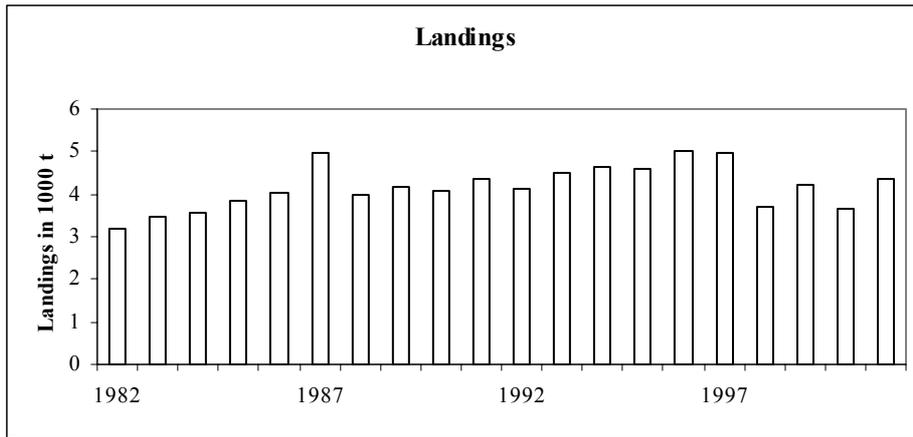
| | Fish Mort Ages 3-8 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.434 | 0.177 | 0.583 |
| F_{max} | 0.279 | 0.178 | 0.715 |
| $F_{0.1}$ | 0.128 | 0.162 | 1.434 |
| F_{med} | 0.515 | 0.172 | 0.373 |

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 | <i>Status quo</i> (Shot) TAC | 3.4 | 3.85 | 3.3 | 4.0 |
| 1989 | <i>Status quo</i> (Shot) TAC | 3.8 | 3.85 | 2.9 | 4.2 |
| 1990 | No effort increase; TAC | 3.7 | 3.85 | 3.0 | 4.1 |
| 1991 | <i>Status quo</i> 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 F_{pa} | 3.8 | 4.7 | 3.9 | 4.2 |
| 2000 | $F < F_{pa}$ | <3.9 | 4.1 | 3.8 | 3.6 |
| 2001 | $F < F_{pa}$ | <4.7 | 4.6 | 4.6 | 4.4 |
| 2002 | $F < F_{pa}$ | <5.2 | 5.2 | | |
| 2003 | $F < F_{pa}$ | <5.4 | | | |

Weights in '000 t.

Sole in Division VIIId (Eastern Channel)



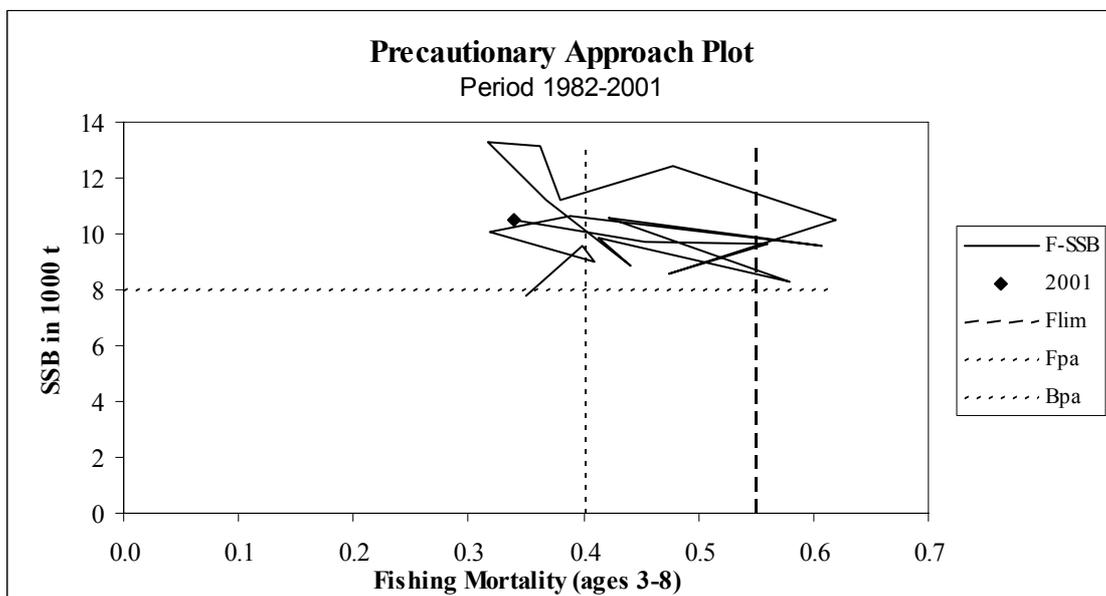
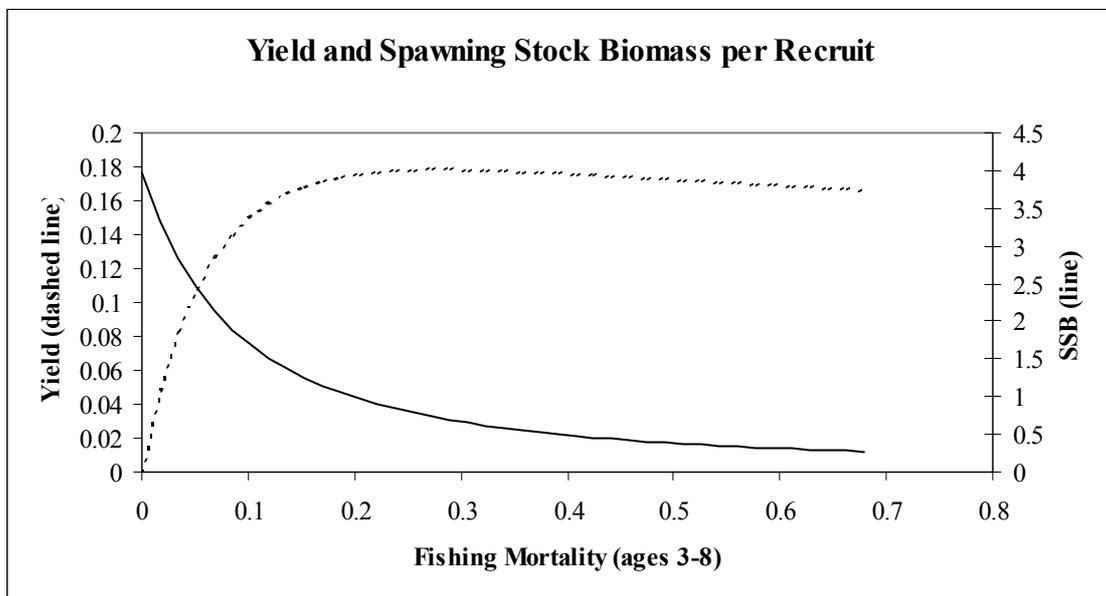
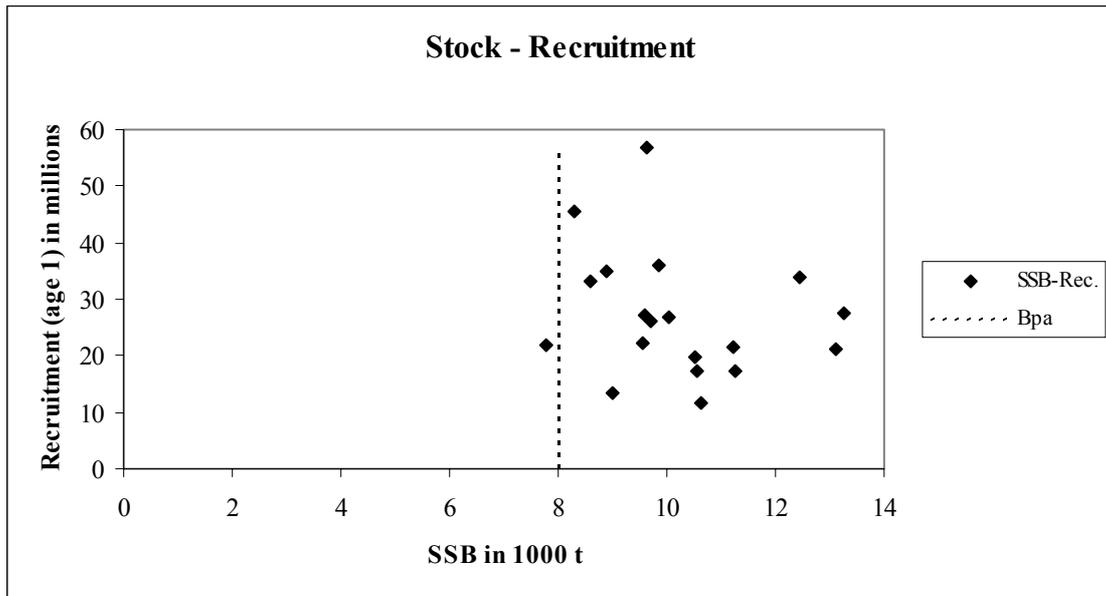


Table 3.6.2.1 Sole in Division VIIId. Nominal landings (tonnes) as officially reported to ICES and used by the Working Group.

| 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 VIIId (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 B_{pa} and has fluctuated near this level since 1992. Fishing mortality in 2001 is estimated to be above 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 F_{pa} and to increase or maintain the spawning stock biomass above the proposed B_{pa} .

Precautionary Approach reference points (unchanged since 1999):

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

Technical basis:

| | |
|-----------------------------------|---|
| B_{lim} : B_{loss} : 5 600 t. | B_{pa} : 1.4 B_{lim} : 8 000 t. |
| F_{lim} : F_{loss} : 0.54 | F_{pa} : 5 th % of F_{loss} ; $B^* > B_{pa}$ and $P(SSB_{MT} < B_{pa}) < 10\%$: 0.45 |

B^* is equilibrium SSB at F_{pa} .

Advice on management: ICES recommends that fishing mortality in 2003 be reduced to less than the proposed 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: $F(2002) = F_{sq}(99-01, scaled) = 0.48$; Landings(2002) = 4.8; SSB(2003) = 7.2.

| F(2003 onwards) | Basis | Landings (2003) | SSB (2004) |
|-----------------|--------------------------|-----------------|------------|
| 0 | $0 * F_{sq}$ | 0.7 | 14.0 |
| 0.05 | $0.1 * F_{sq}$ | 1.3 | 13.4 |
| 0.1 | $0.2 * F_{sq}$ | 1.9 | 12.8 |
| 0.14 | $0.3 * F_{sq}$ | 2.4 | 12.2 |
| 0.19 | $0.4 * F_{sq}$ | 3.0 | 11.7 |
| 0.24 | $0.5 * F_{sq}$ | 3.5 | 11.2 |
| 0.29 | $0.6 * F_{sq}$ | 4.0 | 10.7 |
| 0.34 | $0.7 * F_{sq}$ | 4.5 | 10.3 |
| 0.39 | $0.8 * F_{sq}$ | 4.9 | 9.8 |
| 0.43 | $0.9 * F_{sq}$ | 5.0 | 9.4 |
| 0.45 | $F_{pa} = 0.93 * F_{sq}$ | 5.3 | 9.3 |
| 0.48 | $1 * F_{sq}$ | 5.8 | 9.0 |
| 0.53 | $1.1 * F_{sq}$ | 6.1 | 8.7 |
| 0.58 | $1.2 * F_{sq}$ | 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 |
| F_{max} | 0.195 | 0.296 | 1.533 |
| $F_{0.1}$ | 0.113 | 0.276 | 2.670 |
| F_{med} | 0.554 | 0.252 | 0.361 |

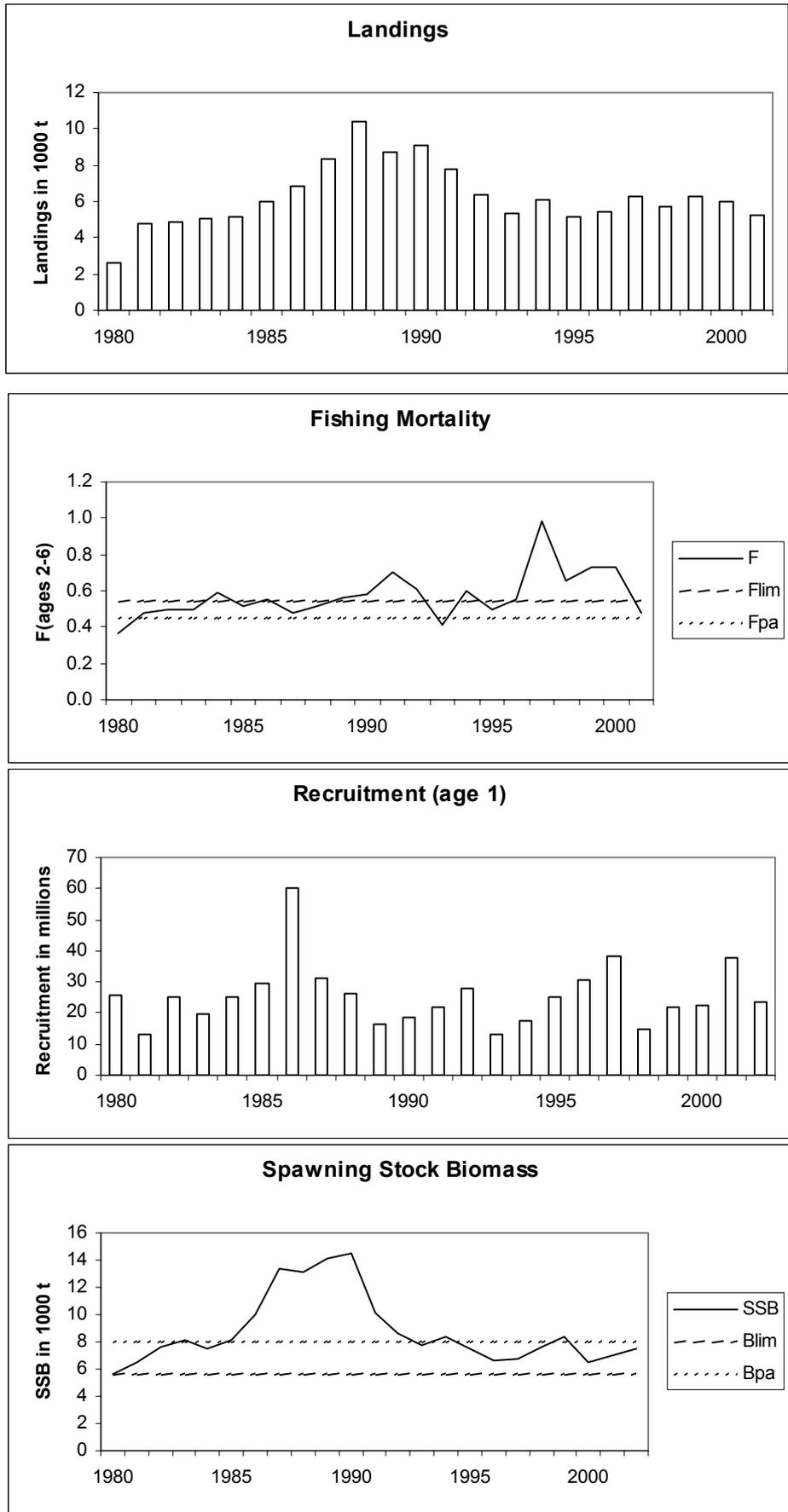
Catch data (Tables 3.6.3.1–2):

| 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 | <i>Status quo</i> 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 F_{pa} | 6.3 | 7.4 | 5.4 | 6.3 |
| 2000 | Fishing at F_{pa} | 4.9 | 6.5 | 5.6 | 6.0 |
| 2001 | Fishing at $<F_{pa}$ | <4.4 | 6.0 | 5.3 | 5.3 |
| 2002 | Fishing at $<F_{pa}$ | <5.8 | 6.7 | | |
| 2003 | Fishing at $<F_{pa}$ | <5.3 | | | |

¹TACs for Divisions VIIId,e. ²For France Division VIIId landings are estimated by ICES from combined VIIId,e landings.

³Catch at *status quo* F. Weights in '000 t.

Plaice in Division VIIId (Eastern Channel)



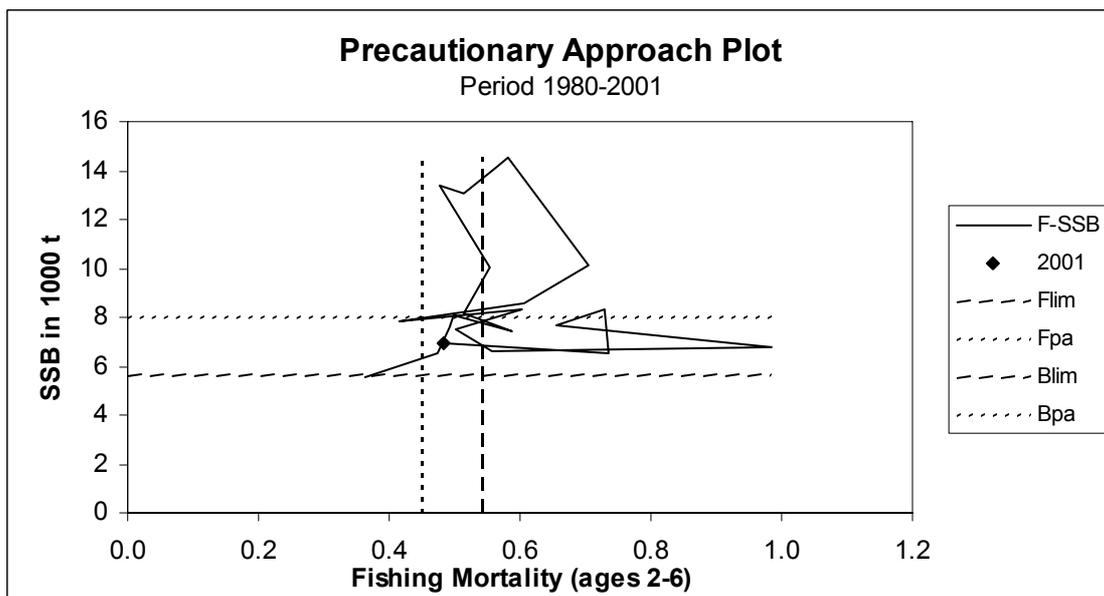
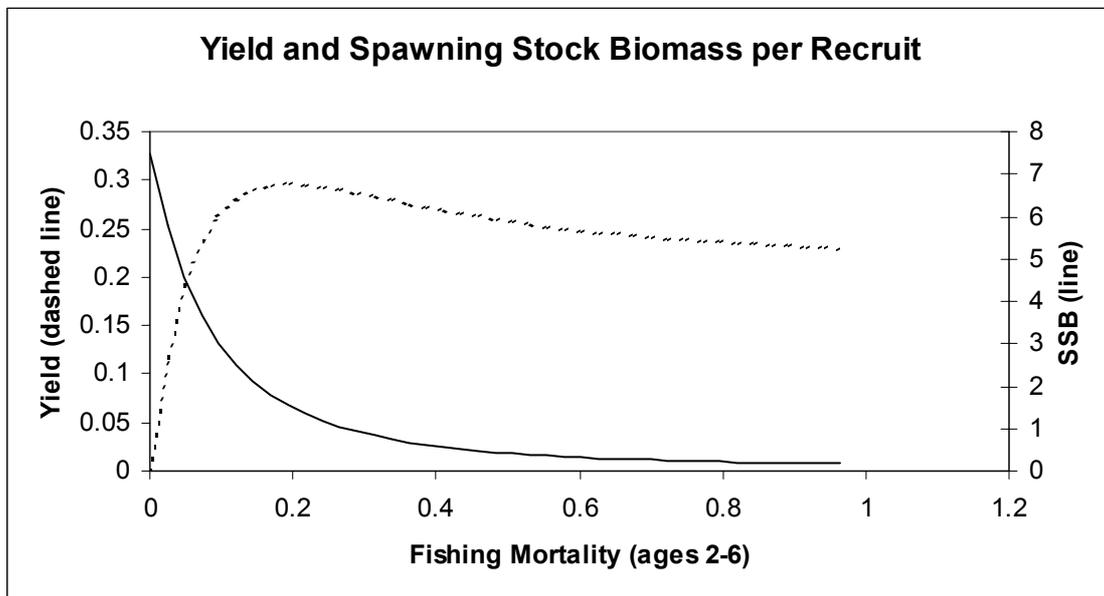


Table 3.6.3.1 Plaice in Division VIIId (Eastern Channel). Nominal landings (tonnes) as officially reported to ICES.

| 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 |

¹Estimated by the Working Group from combined Division VIIId,e. ²Includes Division VIIe.

³Provisional.

Table 3.6.3.2 Plaice in Division VIIId (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 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 F_{pa} . The spawning biomass in Division VIb has declined continuously since 1995 and has been below B_{pa} since 2000, whilst fishing mortality has increased above 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 B_{pa} , whilst fishing mortality has been above 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 B_{pa} , but fishing mortality is above 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 F_{pa} in all years since 1976 and above 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 B_{pa} and 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: |
|--|---|
| B_{lim} is 14 000 t. | 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 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. |
| F_{lim} is 0.8. Fishing mortalities above this have historically led to stock decline. | F_{pa} be set at 0.60. This F is considered to have a high probability of avoiding F_{lim} . |

Technical basis:

| | |
|--|--|
| B_{lim} = smoothed estimate of B_{loss} (as enumerated in 1998). | 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. |
| F_{lim} = F's above 0.8 have led to stock decline in the early 1980's. | F_{pa} consistent with 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 B_{pa} and 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: $F(2002) = F_{sq} = F(01) = 0.61$; Landings (2002) = 3.18 ; SSB(2003) = 6.73

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

¹ $F_{pa} = 0.60$

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 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 | Yield/R | SSB/R |
|----------------|-----------|---------|-------|
| Ages 2-5 | | | |
| 1999-2001 mean | 0.787 | 1.380 | 2.654 |

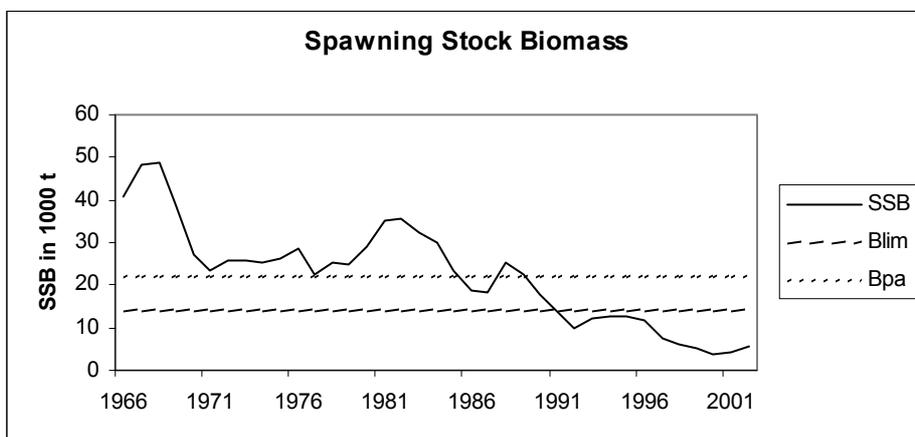
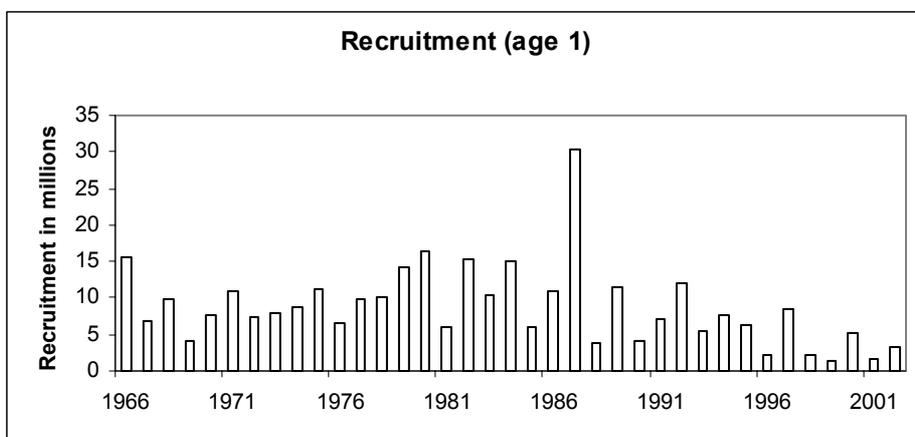
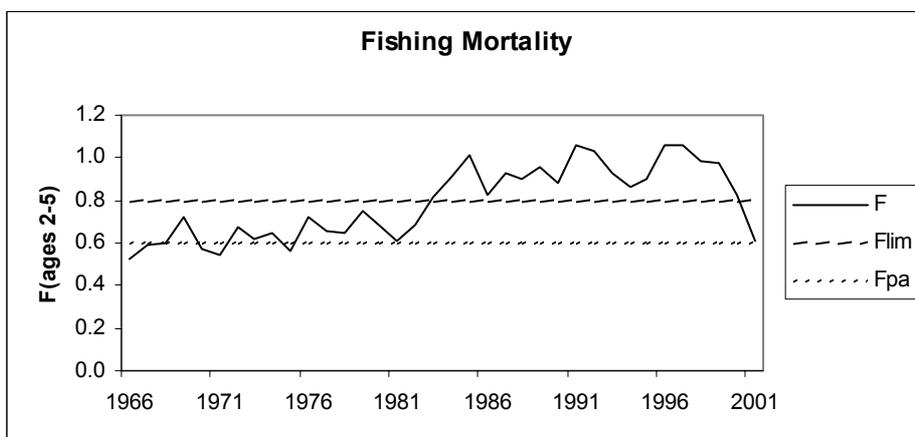
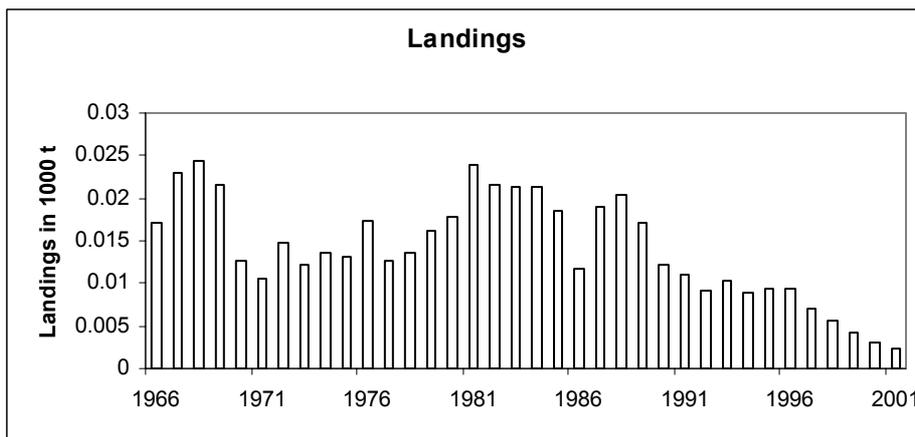
| | | | |
|-----------|-------|-------|--------|
| F_{max} | 0.267 | 1.631 | 6.898 |
| $F_{0.1}$ | 0.163 | 1.531 | 10.391 |
| F_{med} | 0.641 | 1.354 | 2.483 |

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 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 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 | - | | | |

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

Cod in Division VIa (West of Scotland)



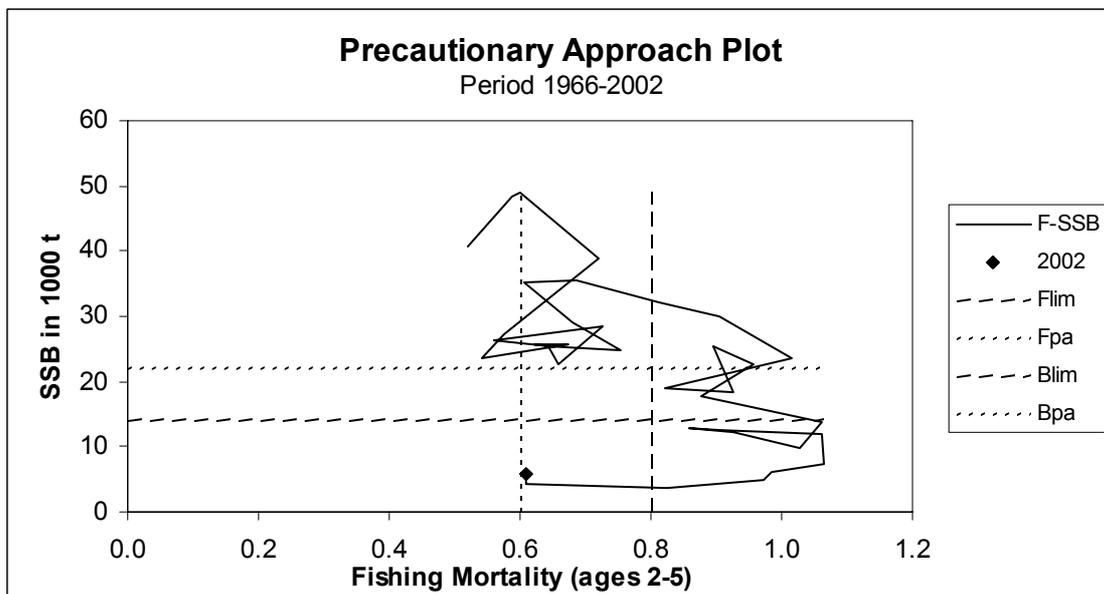
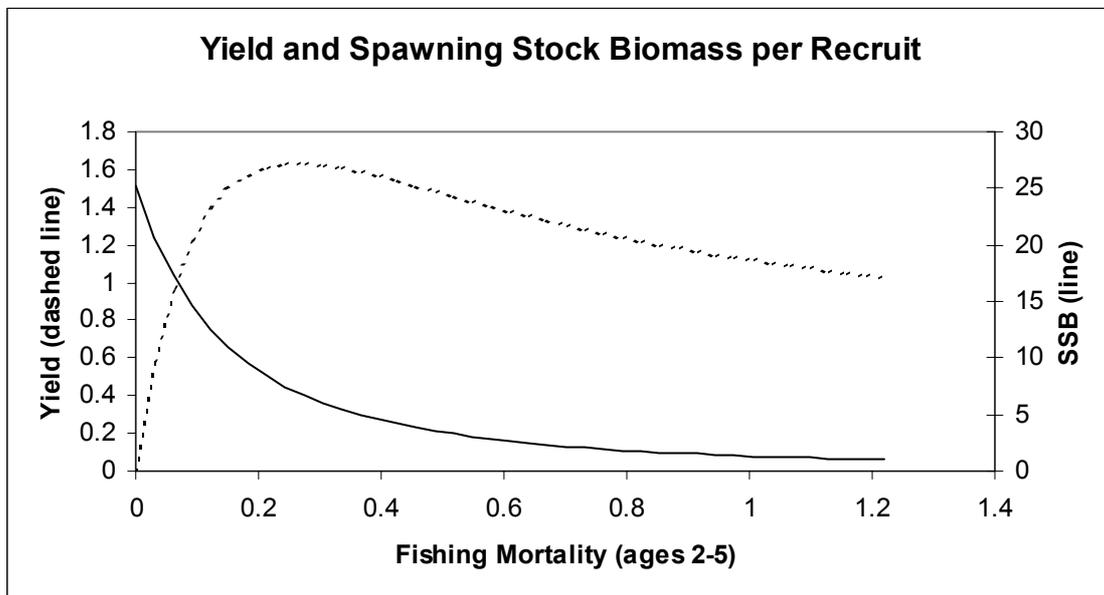
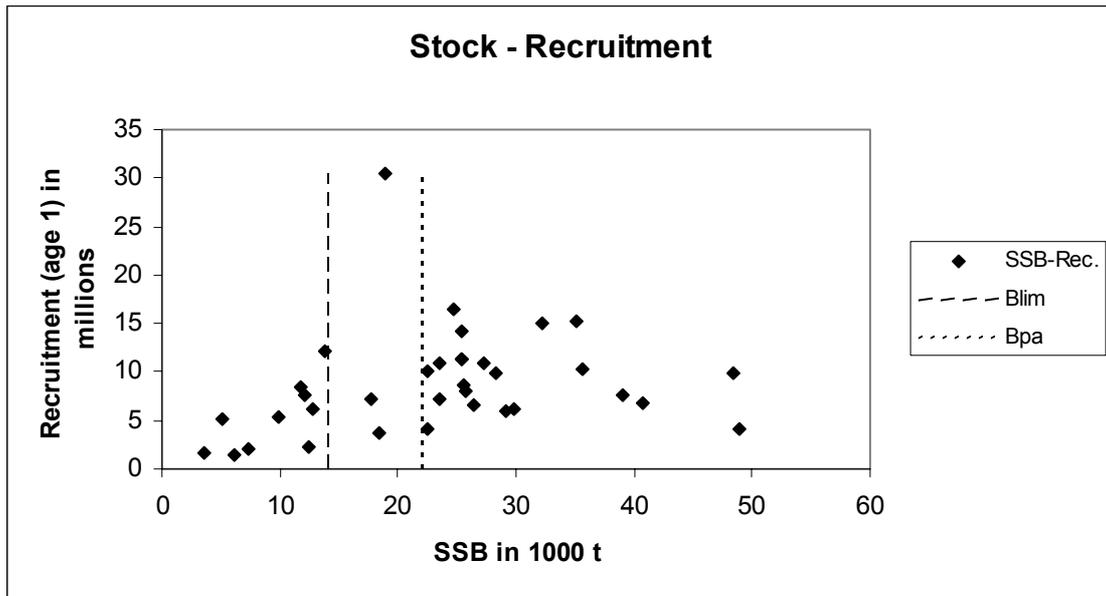


Table 3.7.2.a.1 Nominal landings of COD in Division VIa, 1984–2001, as officially reported to ICES.

| | 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 F_{pa} in every year since 1987. SSB varied around B_{pa} during the 1990s, and reached a historic low at 60% of B_{pa} in 2000. The very strong 1999 year class, the

4th largest since 1965, has caused SSB to increase rapidly above 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: |
|--------------------------------|-----------------------------|
| $B_{lim} = 22\ 000\ t$ | B_{pa} be set at 30 000 t |
| $F_{lim} = \text{not defined}$ | F_{pa} be set at 0.50 |

Technical basis:

| | |
|--|---|
| $B_{lim} = \text{lowest observed SSB}$ | $B_{pa} = B_{lim} * 1.4$ |
| $F_{lim} = \text{not defined}$ | $F_{pa} = \text{high probability of avoiding } SSB < B_{pa} \text{ in the long term}$ |

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.

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.

Relevant Factors: On the basis of the status of haddock alone, ICES would recommend that the fishing mortality be less than $F = 0.50$ ($=F_{pa}$). 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.

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.

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.

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.

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.

Catch forecast for 2003:

Basis: $F(2002) = F_{sq} = F(99-01) = 0.63$; 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 | $0.4 * F_{sq}$ | 11.5 | 2.6 | 8.9 | 52.8 |
| 0.38 | $0.6 * F_{sq}$ | 16.4 | 3.8 | 12.6 | 47.6 |
| 0.50 | $F_{pa} (0.8 * F_{sq})$ | 20.7 | 4.9 | 15.8 | 42.9 |
| 0.63 | F_{sq} | 24.6 | 5.9 | 18.7 | 38.8 |
| 0.76 | $1.2 * F_{sq}$ | 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:

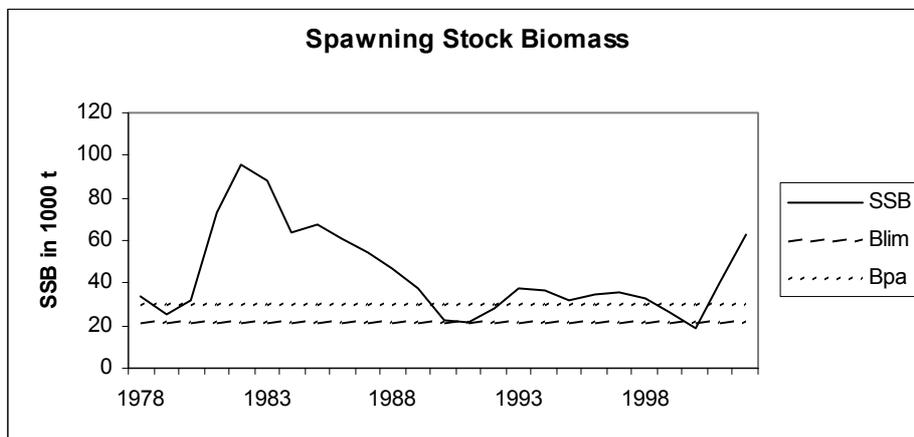
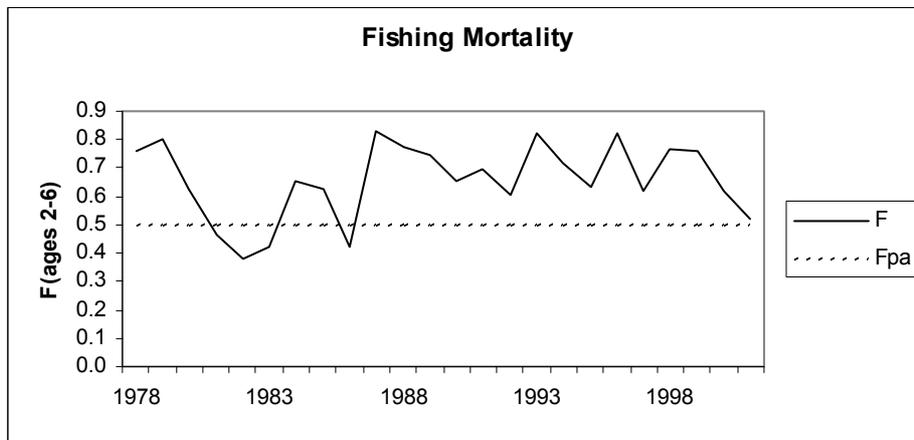
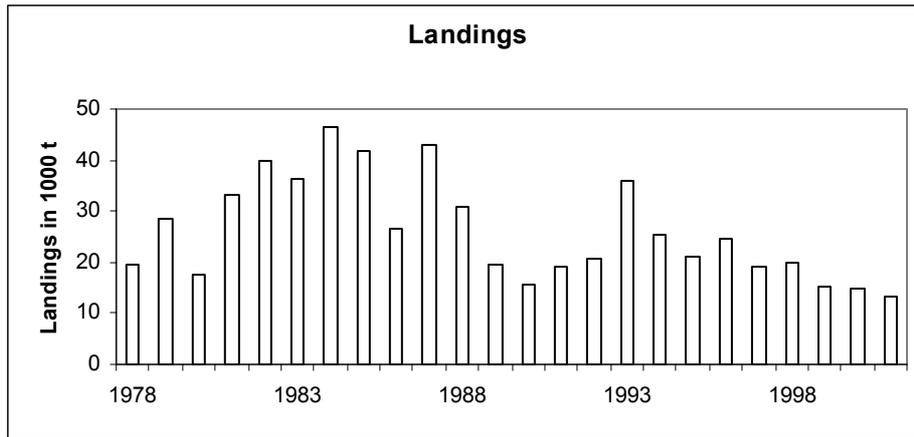
| | Fish Mort Ages 2-6 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.634 | 0.130 | 0.363 |
| F_{max} | 0.246 | 0.163 | 0.854 |
| $F_{0.1}$ | 0.148 | 0.152 | 1.218 |
| F_{med} | 0.572 | 0.136 | 0.403 |

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 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 F_{pa} | 14.3 ³ | 19.0 | 11 | 10.4 | 5.1 | 15.6 |
| 2000 | Maintain F below F_{pa} | <14.9 ³ | 19.0 | 7 | 6.9 | 8.2 | 15.2 |
| 2001 | Reduce F below F_{pa} | <11.2 ³ | 13.9 | 7 | 6.7 | 6.7 | 13.4 |
| 2002 | Reduce F below F_{pa} | <14.1 ³ | 14.1 | | | | |
| 2003 | No cod catches | - | | | | | |

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

Haddock in Division VIa (West of Scotland)



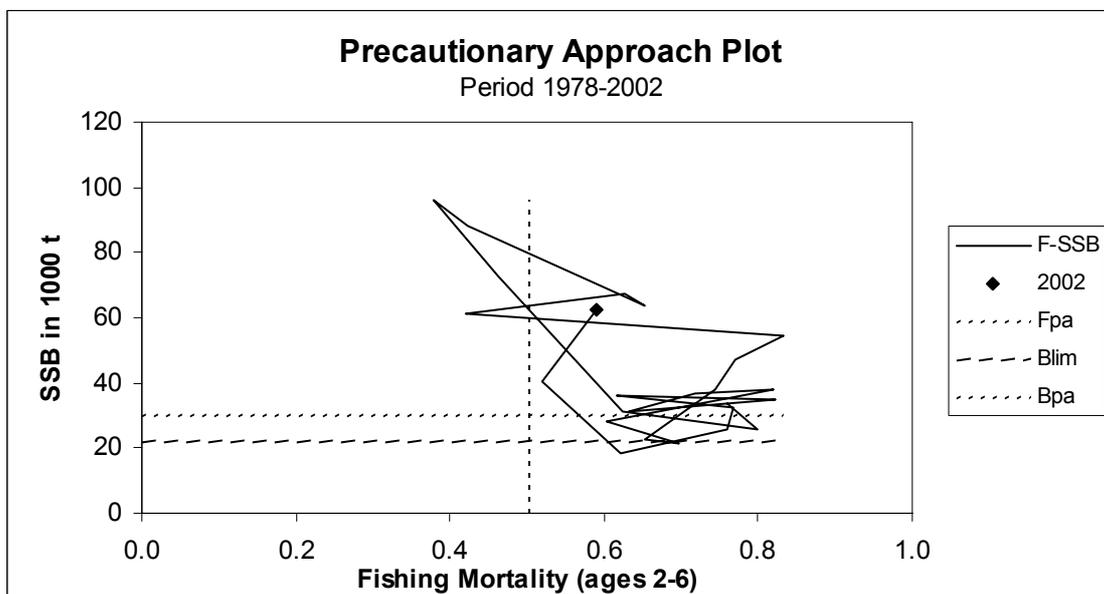
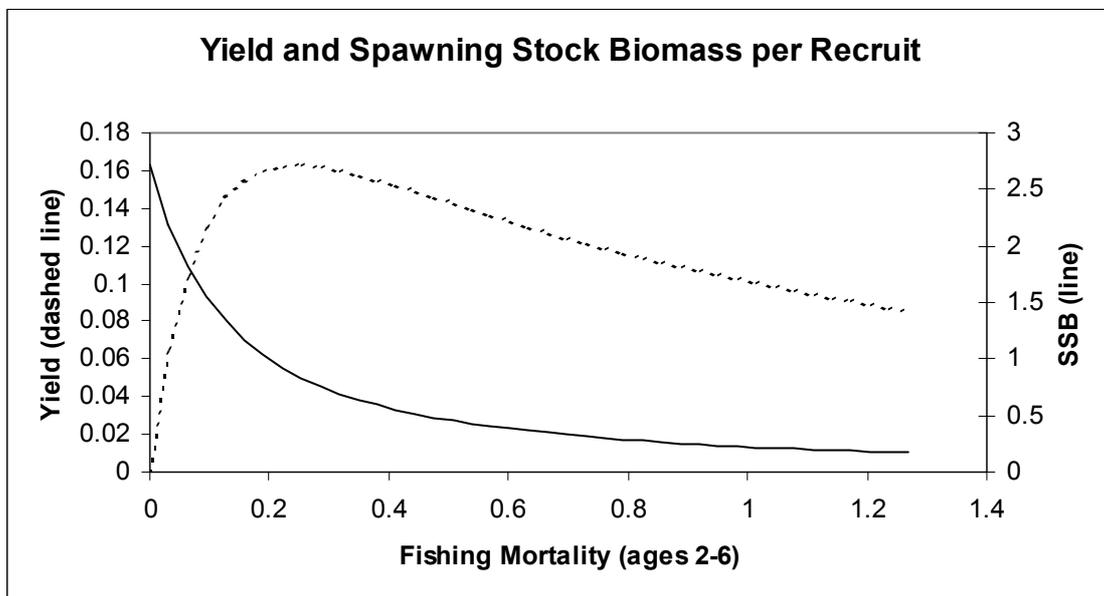
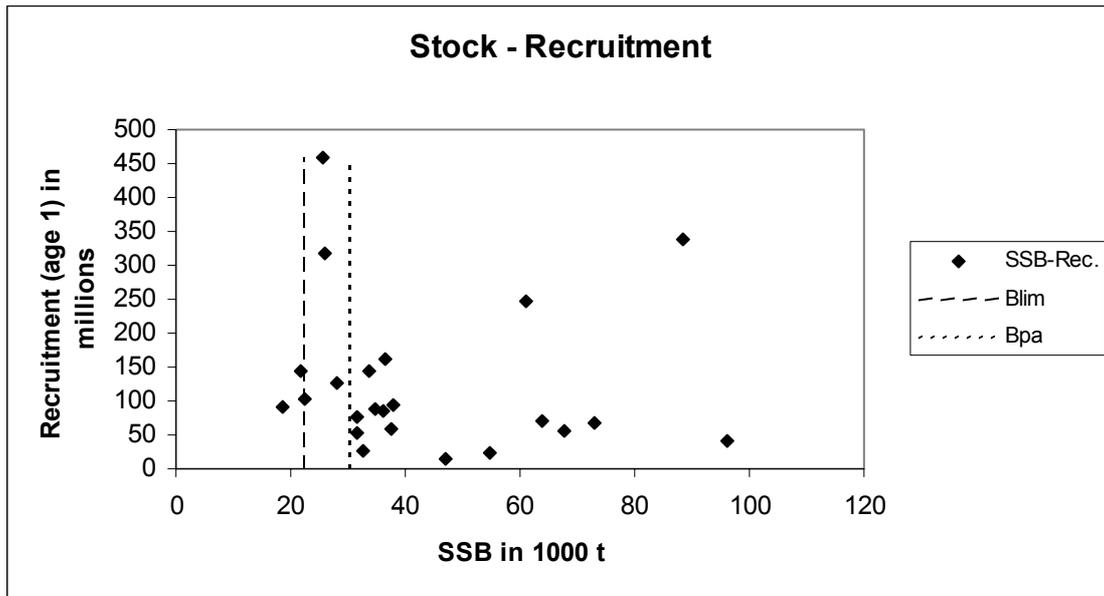


Table 3.7.3.a.1 Haddock, Division VIa. Nominal catch (tonnes) of haddock, 1986–2001, as officially reported to ICES.

| 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 |

¹Preliminary. ²Includes Divisions Vb(EC) and VIb. ³1989–2001 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 B_{lim} in 2001 and fishing mortality was above F_{pa} in 2001. Fishing mortality was above F_{pa} in most years from 1985 to 1992, then declined to 60% of F_{pa} in 1998 before increasing above F_{pa} again in 2000 and 2001. SSB increased from around B_{pa} in 1990 to more than

double B_{pa} in 1995, but has since declined rapidly to below B_{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: |
|---|---|
| B_{lim} is 6 000 t, the lowest observed spawning stock. | B_{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 B_{lim} , taking into account the uncertainty of assessments. |
| F_{lim} is not defined. | F_{pa} be set at 0.4. This F provides a small probability that SSB will fall below B_{pa} in the long term. |

Technical basis:

| | |
|--|--|
| $B_{lim} = B_{loss}$ as estimated in a previous assessment. | $B_{pa} = B_{loss} * 1.4$ |
| $F_{lim} =$ could not be defined, due to uninformative stock recruitment data. | $F_{pa} =$ 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.

fishery in that area. A separate TAC applicable only to Division VIb, including international waters, would ensure a sustainable fishery in Division VIb.

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

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 | $0.0 * F_{sq}$ | 0 | 0 | 4.6 |
| 0.11 | $0.2 * F_{sq}$ | 0.4 | 0.4 | 4.2 |
| 0.22 | $0.4 * F_{sq}$ | 0.8 | 0.8 | 3.8 |
| 0.33 | $0.6 * F_{sq}$ | 1.1 | 1.1 | 3.5 |
| 0.40 | F_{pa} | 1.3 | 1.3 | 3.3 |
| 0.44 | $0.8 * F_{sq}$ | 1.4 | 1.4 | 3.2 |
| 0.55 | F_{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:

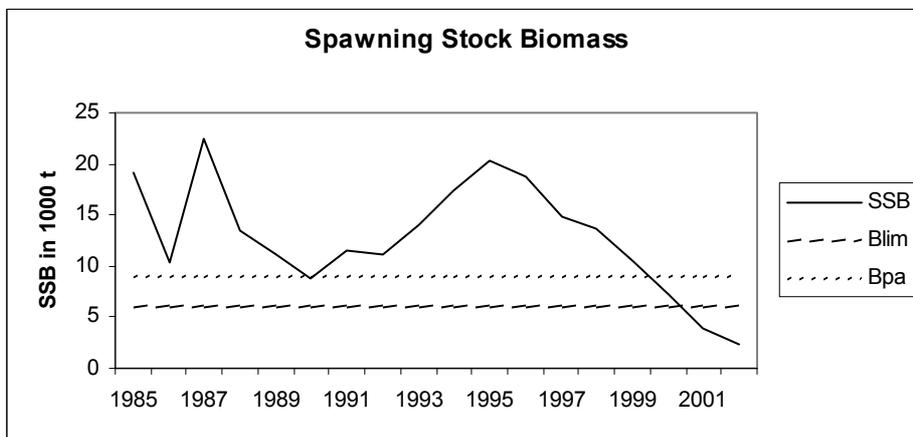
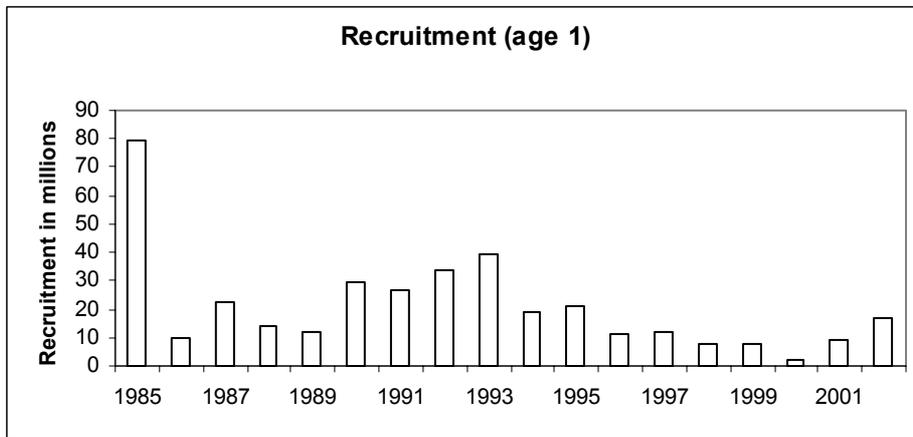
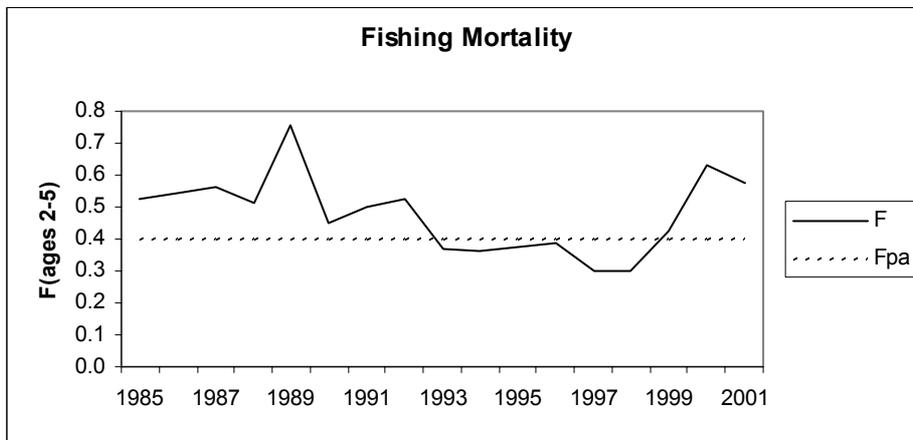
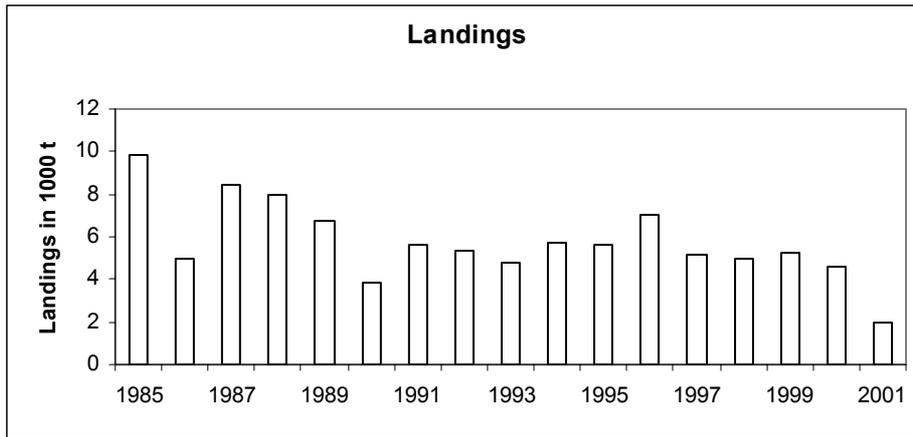
| | Fish Mort Ages 2-5 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.477 | 0.234 | 0.407 |
| F_{max} | N/A | | |
| $F_{0.1}$ | 0.130 | 0.179 | 0.934 |
| F_{med} | 0.116 | 0.173 | 0.985 |

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 | <i>Status quo</i> 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 F_{pa} | 3.8 | | 6.0 | 5.2 ⁵ |
| 2000 | Reduce F below F_{pa} | < 3.5 | | 5.7 ⁴ | 4.6 ⁵ |
| 2001 | Reduce F below F_{pa} | < 2.7 | | 1.9 ⁴ | 1.9 ⁵ |
| 2002 | Reduce F below 0.2 | <1.3 | | | |
| 2003 | Lowest possible F | - | | | |

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

Haddock in Division VIb (Rockall)



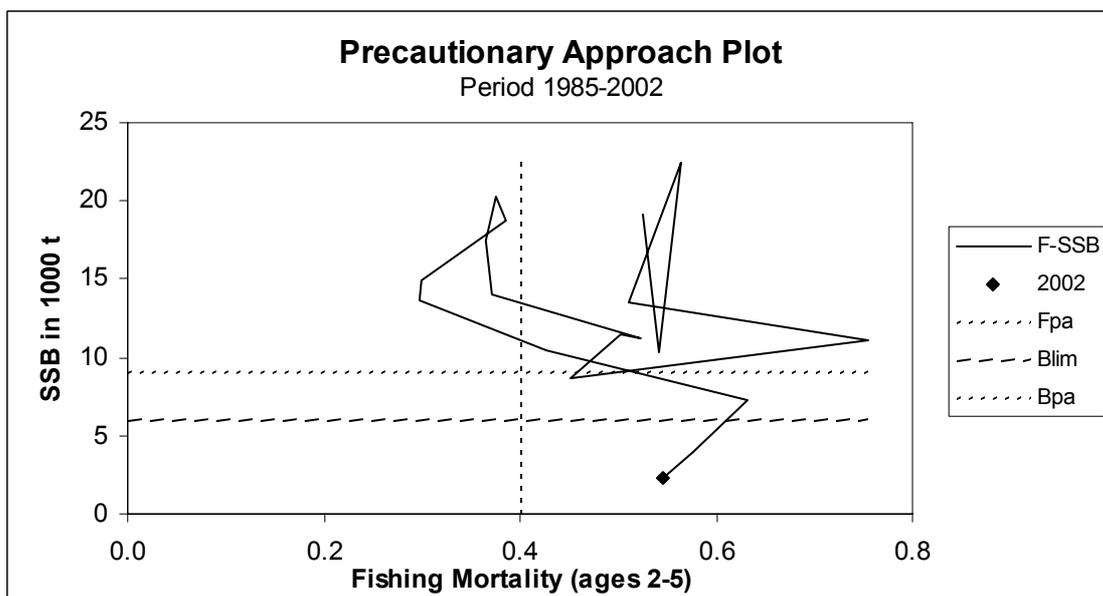
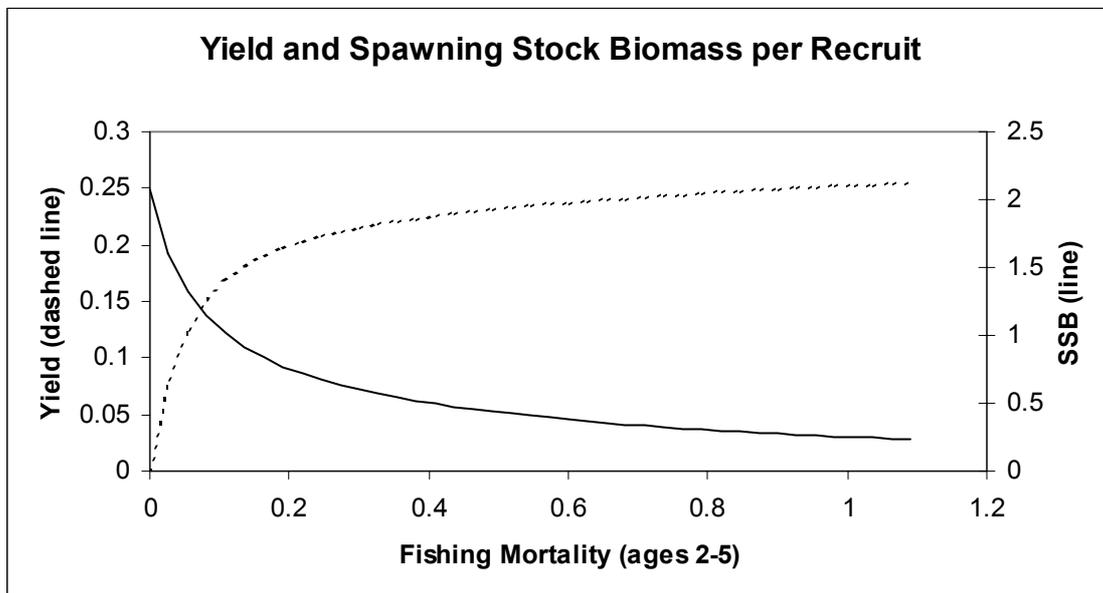
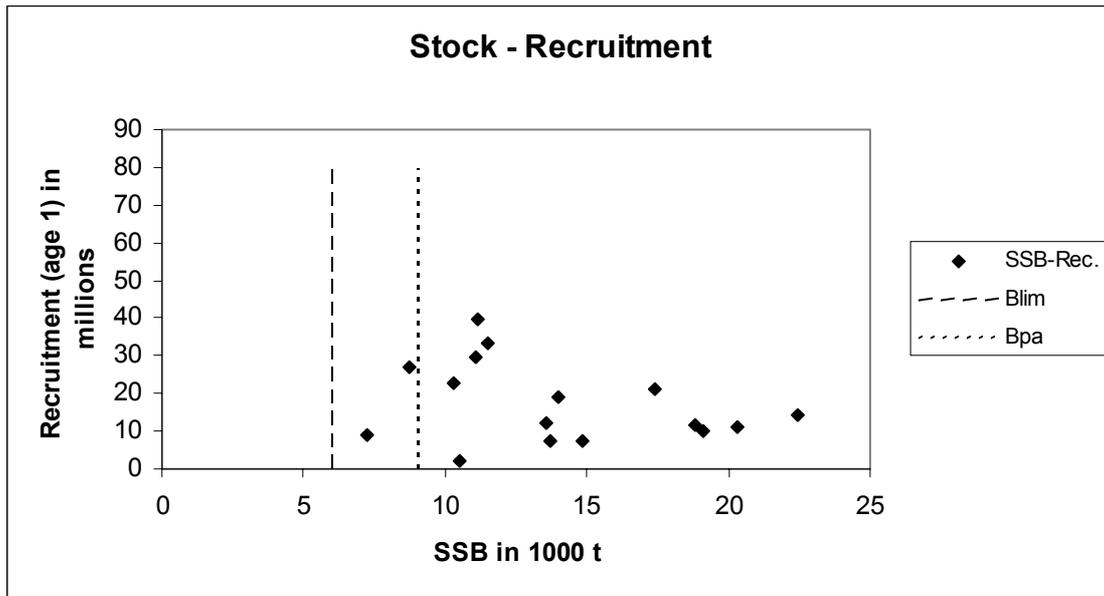


Table 3.7.3.b.1 Nominal catch (tonnes) of HADDOCK in Division VIb, 1986–2001, as officially reported to ICES.

| 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 |
| 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 |

¹Preliminary.²Included in Division VIa.³1989–2001 N. Ireland included with England and Wales.⁴includes 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 |

¹1996-2001 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 F_{pa} in all years since 1983, and is estimated to be close to F_{lim} since 1999. Spawning stock, which has been in decline since 1981, has exceeded B_{pa} in only one year since 1988 and has been below 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: |
|--|--|
| B_{lim} is 16 000 t, the lowest observed spawning stock estimated in previous assessments. | 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 B_{lim} , taking into account the uncertainty of assessments. |
| F_{lim} is 1.0, above which stock decline has been observed. | F_{pa} be set at 0.6. This F is considered to have a high probability of avoiding F_{lim} . |

Technical basis:

| | |
|--|--------------------------|
| $B_{lim} = B_{lim}(1998) = 16\ 000\ t$ | $B_{pa} = B_{lim} * 1.4$ |
| $F_{lim} = \text{see above}$ | $F_{pa} = 0.6 * F_{lim}$ |

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.

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.

Relevant factors to be considered in management: On the basis of the status of whiting alone, ICES would recommend that to bring SSB above 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.

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.

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.

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.

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.

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.

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

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 $F(2002) = F_{sq} = F(2001) = 0.85$; 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 | $0.1 * F_{sq}$ | 1.0 | 0.4 | 0.6 | 22.7 |
| 0.14 | $0.16 * F_{sq}$ | 1.5 | 0.6 | 0.9 | 22.0 |
| 0.17 | $0.2 * F_{sq}$ | 1.9 | 0.8 | 1.1 | 21.5 |
| 0.26 | $0.3 * F_{sq}$ | 2.7 | 1.1 | 1.6 | 20.4 |
| 0.43 | $0.5 * F_{sq}$ | 4.3 | 1.8 | 2.4 | 18.3 |
| 0.60 | $F_{pa} = 0.71 * F_{sq}$ | 5.7 | 2.4 | 3.2 | 16.4 |
| 0.68 ¹ | $0.8 * F_{sq}$ | 6.2 | 2.7 | 3.5 | 15.7 ¹ |
| 0.85 | 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:

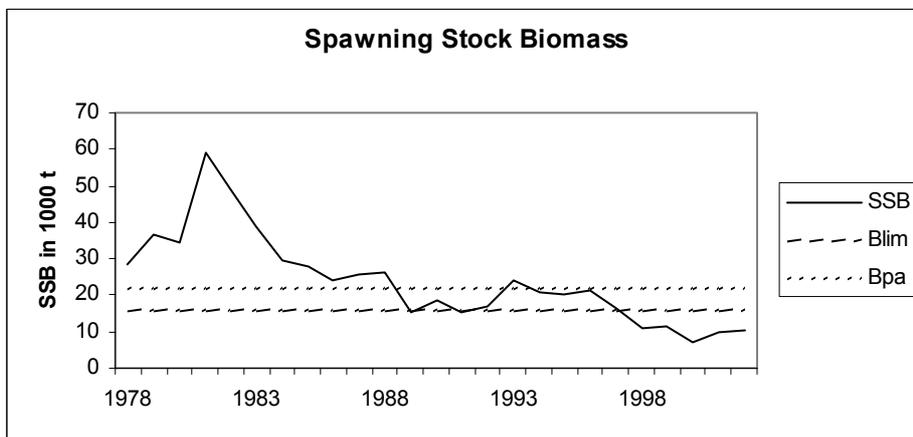
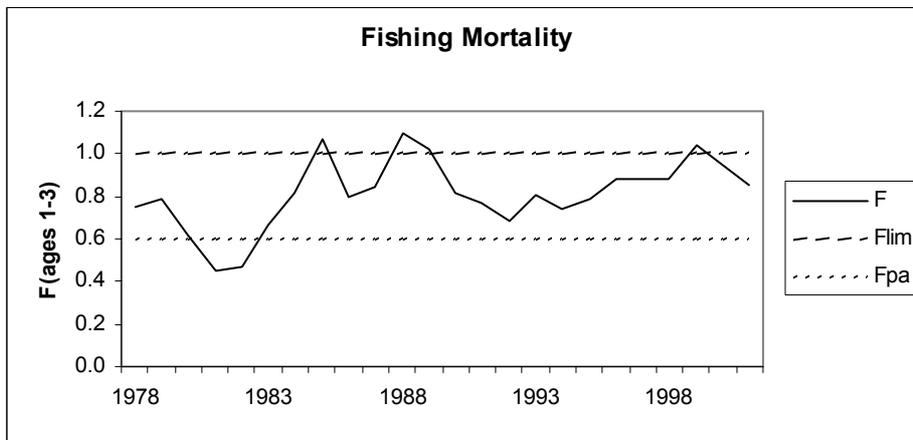
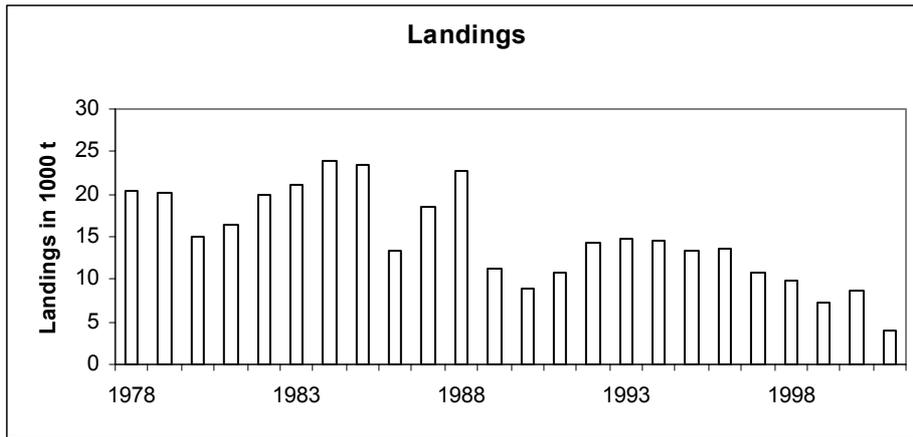
| | Fish Mort Ages 1-3 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.946 | 0.063 | 0.150 |
| F_{max} | 0.182 | 0.119 | 0.614 |
| $F_{0.1}$ | 0.107 | 0.111 | 0.859 |
| F_{med} | 0.557 | 0.087 | 0.248 |

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 F_{pa} | 4.3 | 6.3 | 4.7 | 4.6 | 2.6 | 7.2 |
| 2000 | Reduce F below F_{pa} | <4.3 | 4.3 | 3.3 | 3.0 | 5.6 | 8.7 |
| 2001 | Reduce F below F_{pa} | <4.2 | 4.0 | 2.4 | 2.4 | 1.6 | 4.0 |
| 2002 | SSB > B_{pa} in short term | <2.0 | 3.5 | | | | |
| 2003 | No cod catches | - | | | | | |

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

Whiting in Division VIa (West of Scotland)



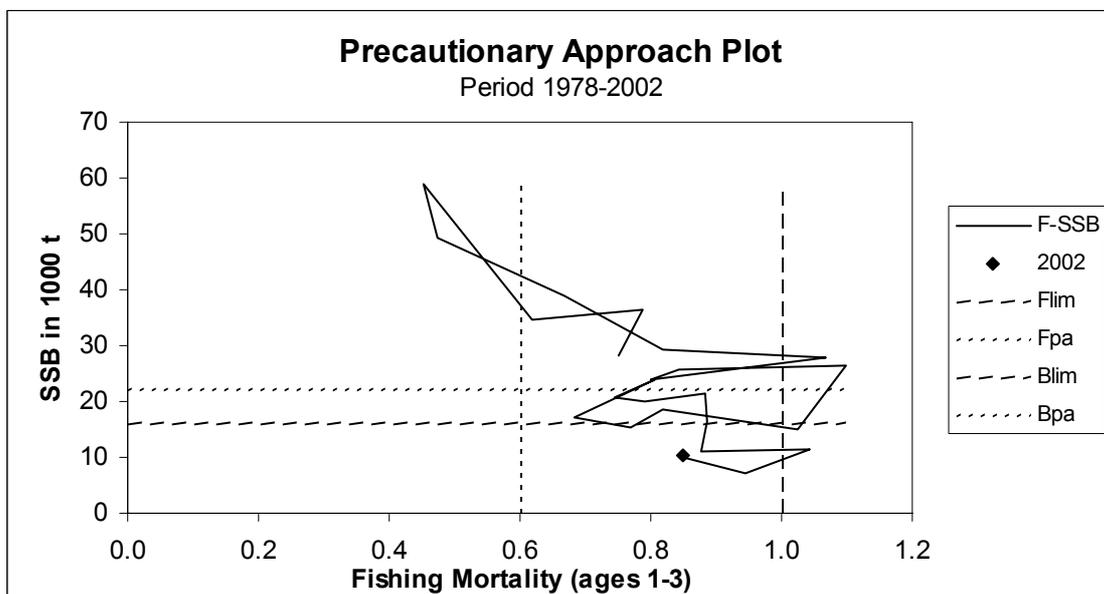
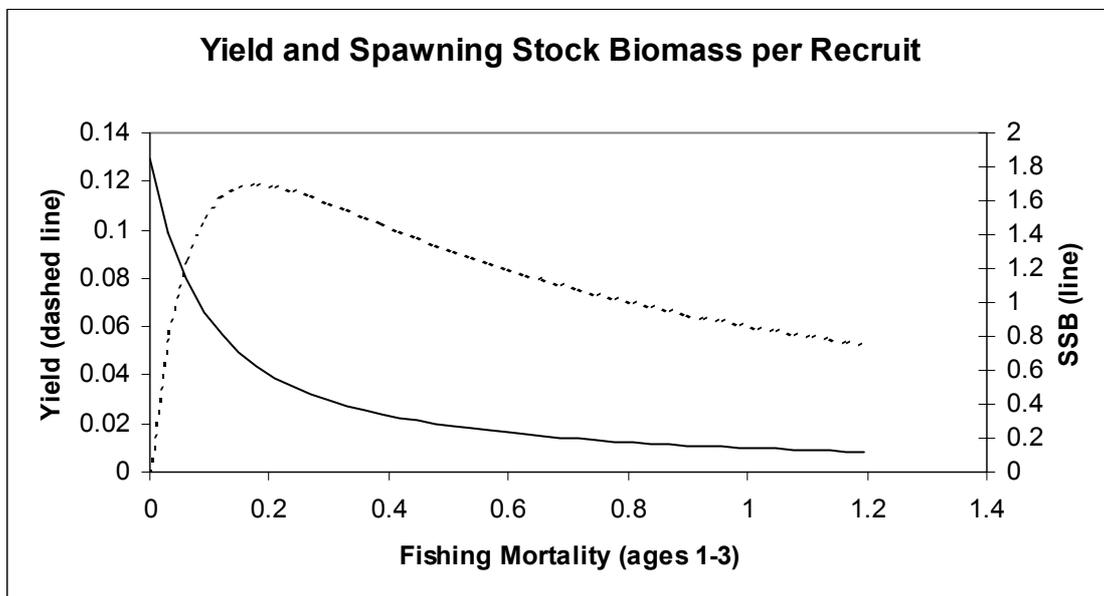
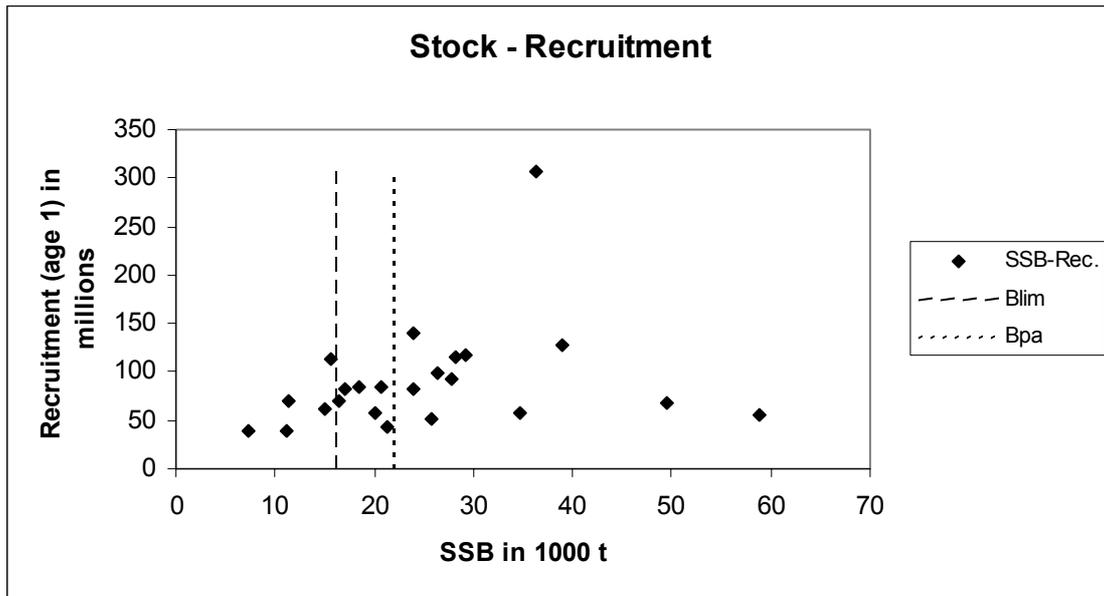


Table 3.7.4.a.1 Nominal catch (t) of WHITING in Division VIa, 1986–2001, as officially reported to ICES.

| 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 |

¹Preliminary.²Includes Divisions Vb (EC) and VIb.³1989–2001 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 |
| 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 |

¹Preliminary.

²Included in Division VIa.

³1989–2000 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 | | | |

¹Vb(EC), VI, XII and XIV. ²Incomplete data. ³Landings in VIa. Landings in Vb (EC), XII, and XIV negligible. Weights in '000 t.

Megrim in Subarea VI (West of Scotland and Rockall)

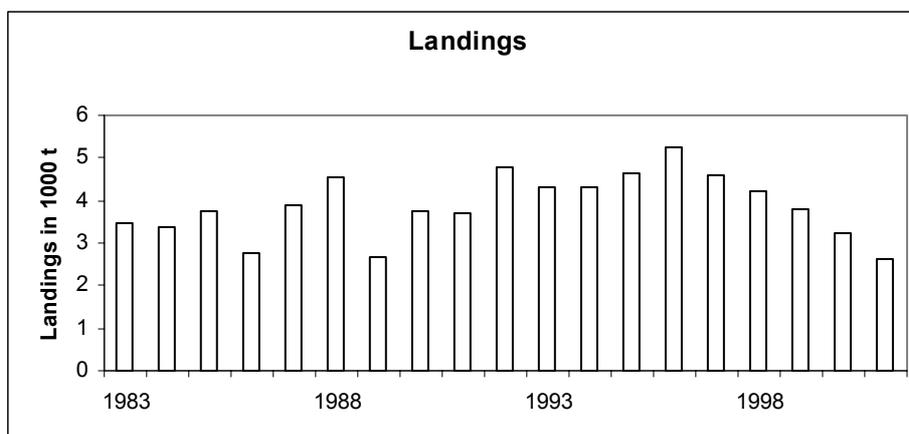


Table 3.7.6.1 Nominal catch (t) of MEGRIM in Subarea VI (West of Scotland and Rockall), as officially reported to ICES, and WG best estimates of landings for Division VIa.

| 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 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 F_{pa} .

Precautionary Approach reference points (unchanged since 1998):

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

Advice on management: ICES recommends that the fishing mortality be reduced to less than 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: $F(2002) = F_{sq} = F(01 \text{ unscaled}) = 0.91$; 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 | $0.2 * F_{sq}$ | 4.1 | 4.1 | 15 |
| 0.30 | F_{pa} | 6.7 | 6.7 | 14 |
| 0.37 | $0.4 * F_{sq}$ | 7.9 | 7.9 | 13 |
| 0.55 | $0.6 * F_{sq}$ | 11.3 | 11.3 | 12 |
| 0.73 | $0.8 * F_{sq}$ | 14.3 | 14.3 | 11 |
| 0.92 | 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 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 F_{pa} | <6.7 ⁴⁾ | | | |

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

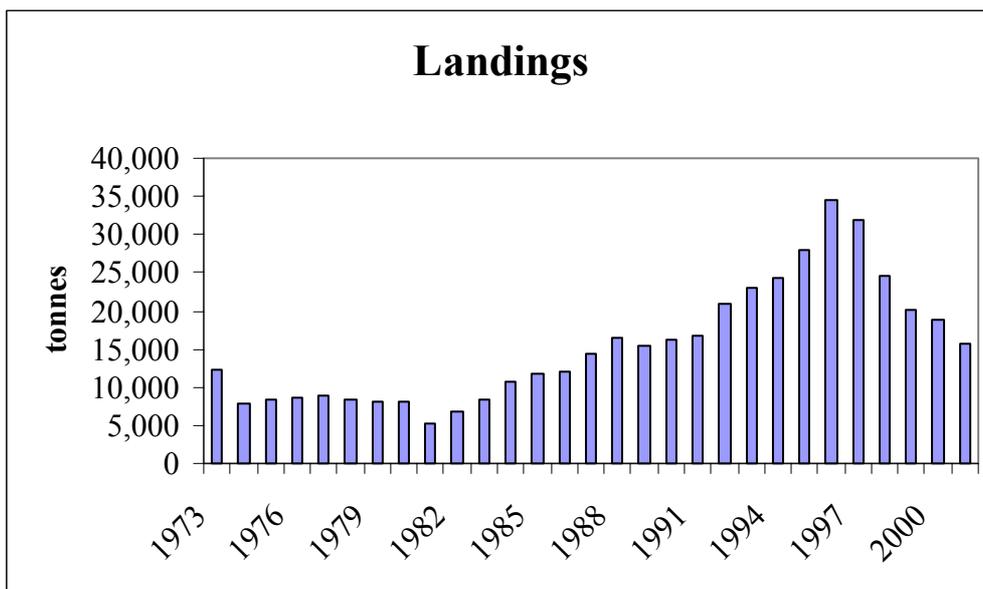
⁴⁾ Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

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 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.

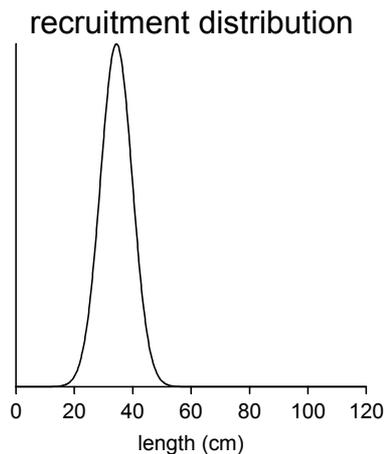
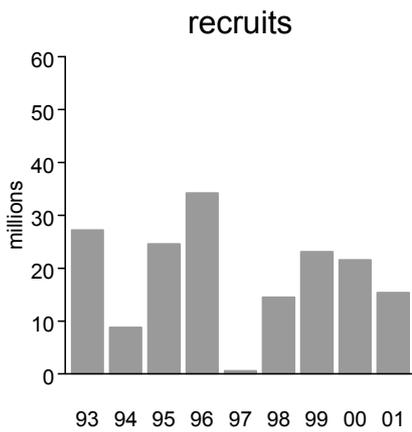
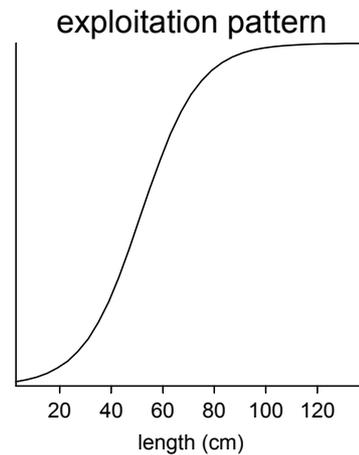
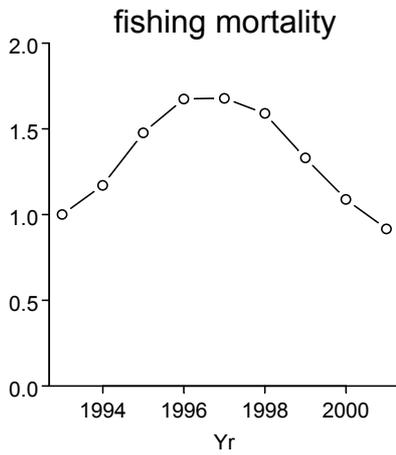
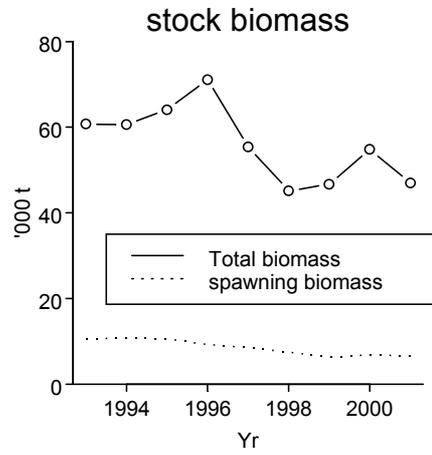
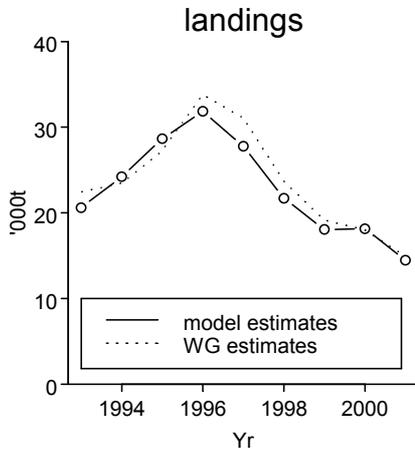


Table 3.7.7.1 Nominal catch (t) of Anglerfish in Division IIIa, 1990–2001, as officially reported to ICES.**Skagerrak and Kattegat (IIIa)**

| | 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. ¹Includes 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. ¹Includes 2 tonnes reported as Subarea IV. ²Included 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. ¹Included 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 | 2,533 | 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. ¹Includes 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. ¹Included 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: $F(2002) = F_{sq} = F(99-01)$, scaled = 0.197;
Landings(2002) = 28; SSB(2002) = 139 .

| F(2003 and 2004) | Basis | SSB(2003) | Landings(2003) | SSB(2004) |
|------------------|---------------|-----------|----------------|-----------|
| 0.16 | 0.81 F_{sq} | 146 | 25 | 152 |
| 0.20 | F_{sq} | 143 | 30 | 145 |
| 0.24 | 1.22 F_{sq} | 140 | 35 | 137 |
| 0.28 | 1.42 F_{sq} | 136 | 40 | 130 |
| 0.32 | 1.62 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 F_{pa} . Estimates of SSB are more uncertain but suggest the stock is well above any candidate 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:

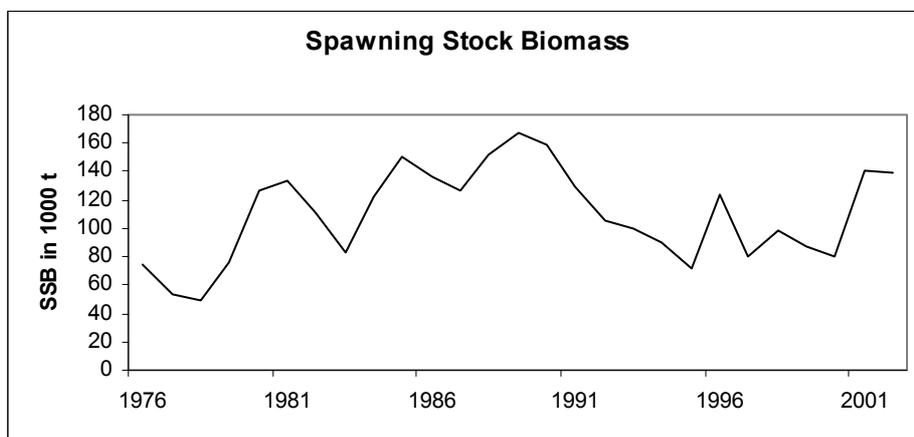
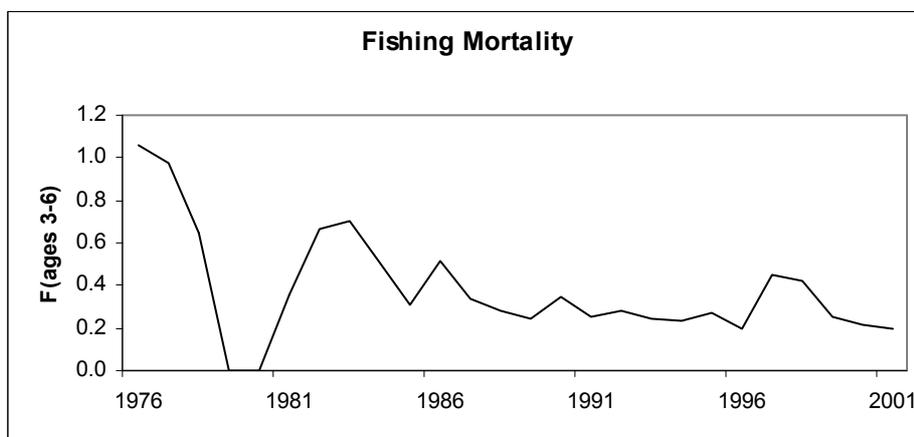
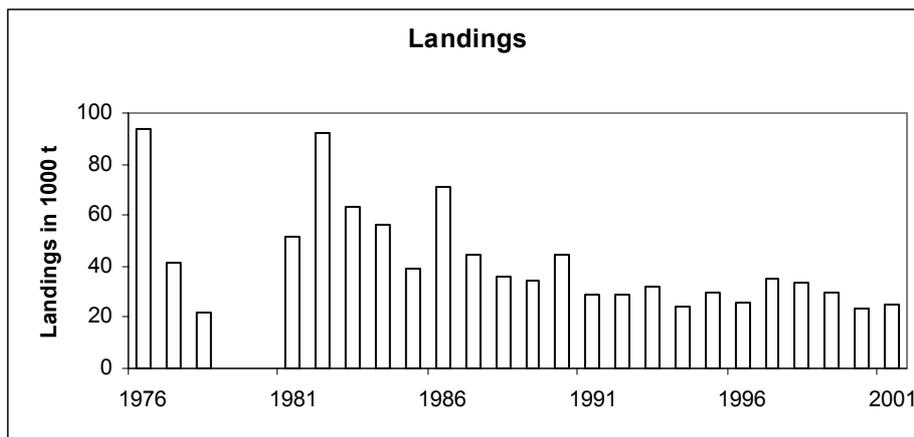
| | Fish Mort Ages 3-6 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.383 | 0.034 | 0.165 |
| F_{max} | N/A | | |
| $F_{0.1}$ | 0.167 | 0.033 | 0.186 |
| F_{med} | 0.264 | 0.036 | 0.130 |

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 $F_{0.1}$ / <i>status quo</i> 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 <i>status quo</i> F | 54-58 | 62 | 0.8 | 32 |
| 1994 | Catch at <i>status quo</i> 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 <i>status quo</i> F | | 83.57 | 0.1 | 33 ³ |
| 1998 | Catch at <i>status quo</i> 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 <i>status quo</i> F | 30 | | | |

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

Herring in Division VIa (North)



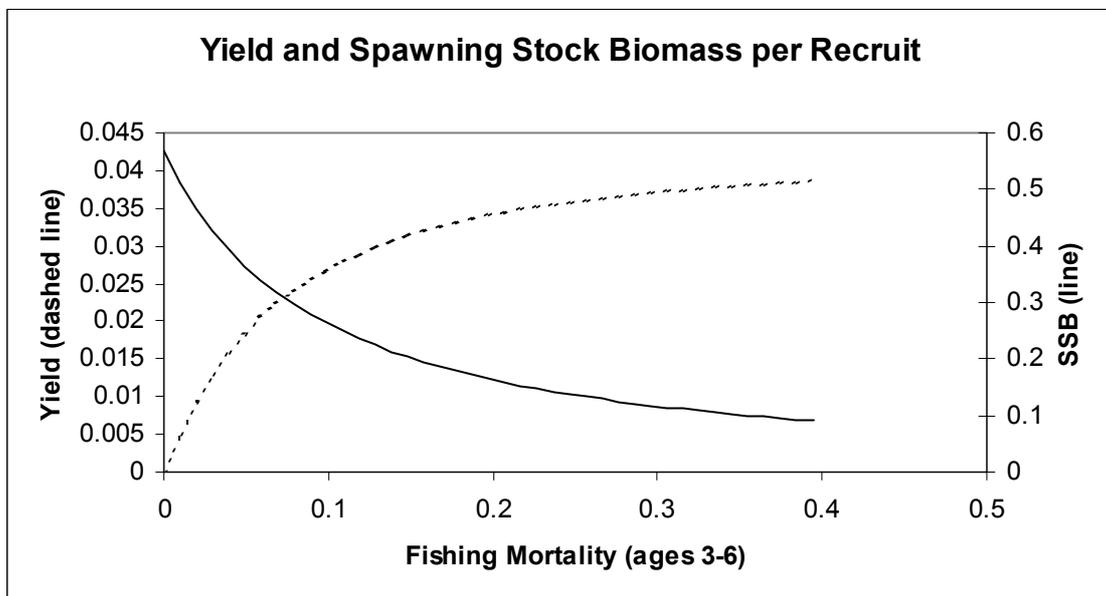
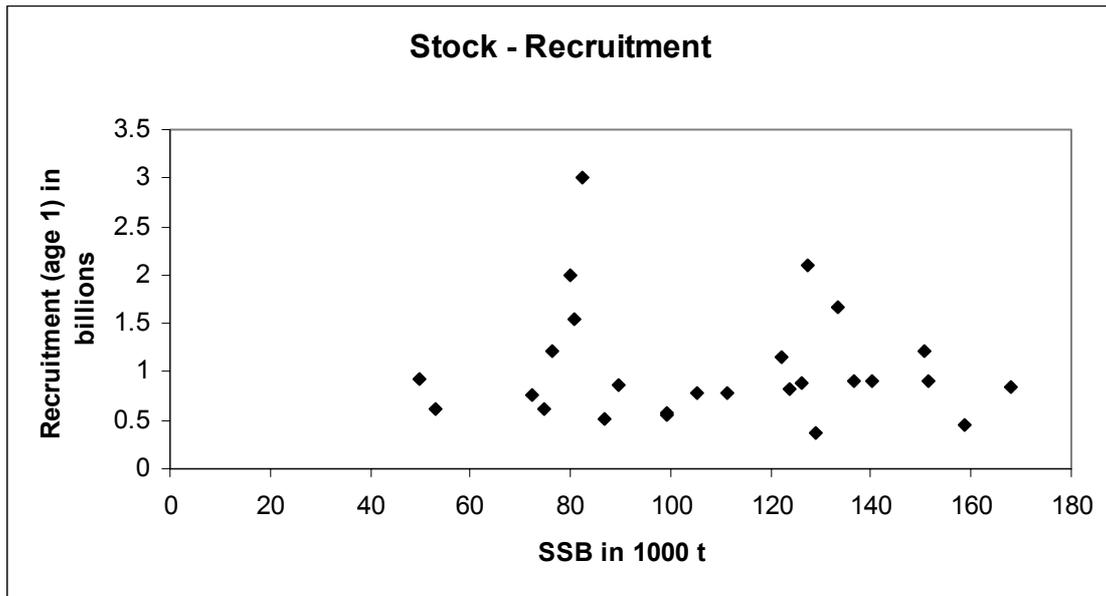


Table 3.7.8.a.1 Nominal Landings Herring in VIa(N). Catch in tonnes by country, 1981—2001.

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)

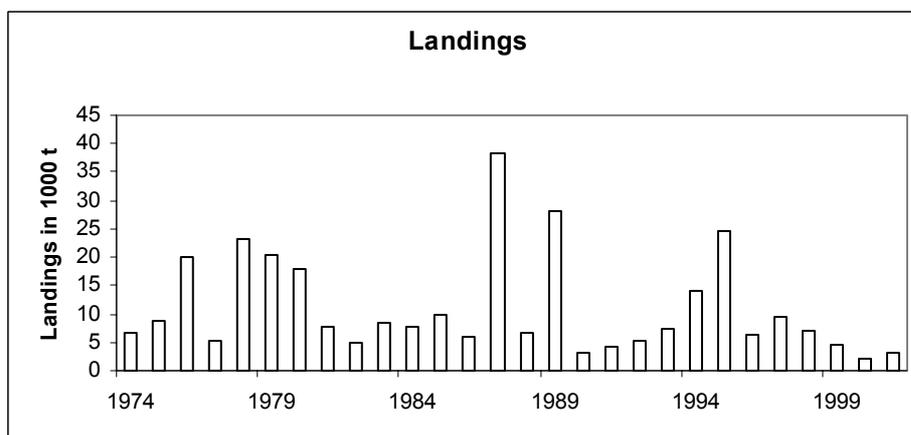


Table 3.7.9.1 Norway pout in Division VIa. Officially reported landings (tonnes).

| 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

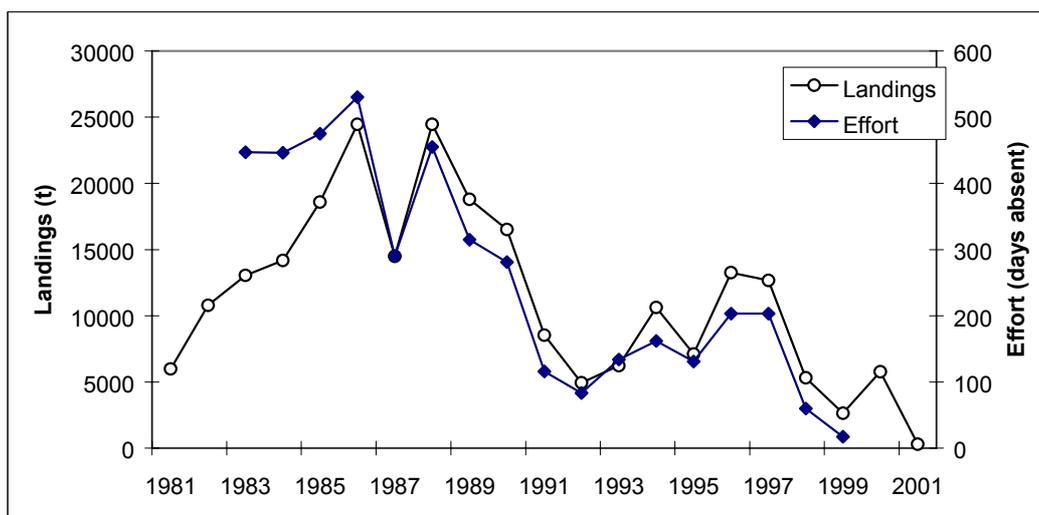


Table 3.7.10.1 Sandeel, Division VIa.
Landings (tonnes), 1981-2001, as officially reported to ICES.

| 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 B_{lim} and fishing mortality above F_{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 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 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 B_{pa} and the fishing mortality since 1998 has been below F_{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 F_{pa} and SSB above 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 F_{lim} and SSB in 2002 below B_{lim} . Fishing mortality has increased progressively over time and has been above F_{pa} since 1980 and close to, or above 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 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: |
|---|--|
| B_{lim} is 6 000 t. | B_{pa} be set at 10 000 t. This is the previously agreed MBAL and affords a high probability of maintaining the SSB above B_{lim} , taking into account the uncertainty of assessments. Below this value the probability of below-average recruitment increases. |
| F_{lim} is 1.0. This is the fishing mortality above which there is a reduced probability that the stock can sustain itself. | F_{pa} be set at 0.72. This F is considered to have a high probability of avoiding F_{lim} . Fishing mortalities above F_{pa} have been associated with observed stock decline. |

Technical basis:

| | |
|----------------------|--|
| $B_{lim} = B_{loss}$ | $B_{pa} =$ Previous MBAL with signs of reduced recruitment |
| $F_{lim} = F_{med}$ | $F_{pa} = F_{med} * 0.72$ |

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 | $0.0 * F_{sq}$ | 0 | 0 | 10.6 |
| 0.22 | $0.2 * F_{sq}$ | 1.2 | 1.2 | 8.9 |
| 0.43 | $0.4 * F_{sq}$ | 2.2 | 2.2 | 7.4 |
| 0.57 | $0.5 * F_{sq}$ 45% SSB increase | 2.7 | 2.7 | 6.6 |
| 0.65 | $0.6 * F_{sq}$ | 3.0 | 3.0 | 6.2 |
| 0.72 | F_{pa} ; 30% SSB increase | 3.2 | 3.2 | 5.9 |
| 0.86 | $0.8 * F_{sq}$ | 3.6 | 3.6 | 5.3 |
| 1.08 | 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:

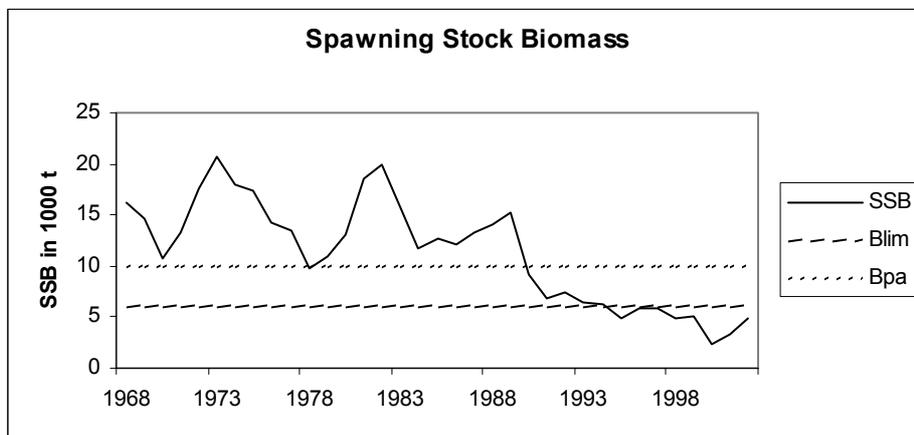
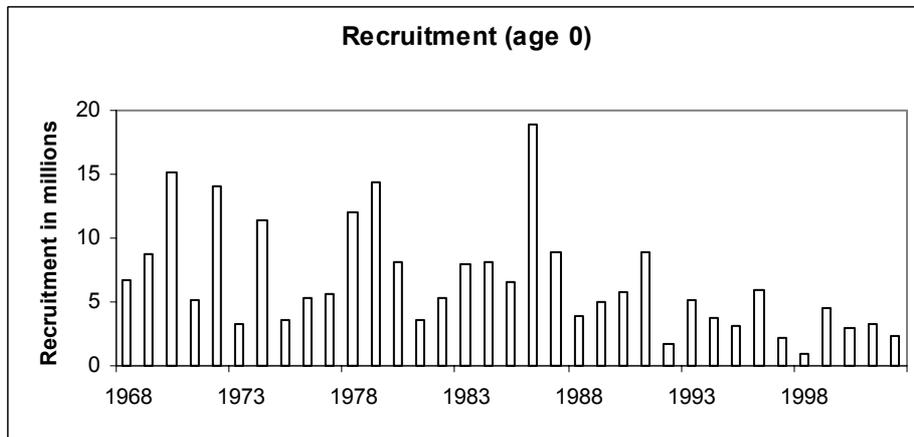
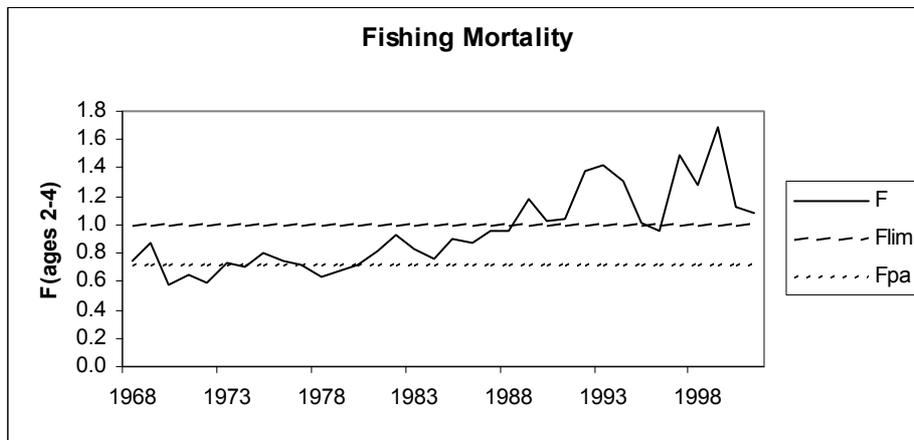
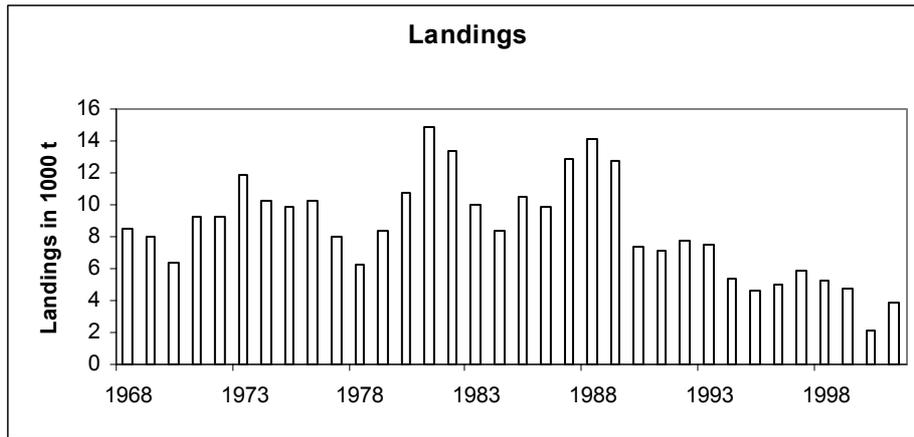
| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 2-4 | | |
| Average Current | 1.296 | 1.291 | 1.197 |
| F_{max} | 0.301 | 1.750 | 5.976 |
| $F_{0.1}$ | 0.165 | 1.618 | 9.633 |
| F_{med} | 1.005 | 1.393 | 1.623 |

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 <i>Nephrops</i> | 10.3 | 15.0 | 13.2 | 12.9 |
| 1988 | No increase in F; interaction with <i>Nephrops</i> | 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 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 | 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 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 | - | | | |

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

Cod in Division VIIa (Irish Sea)



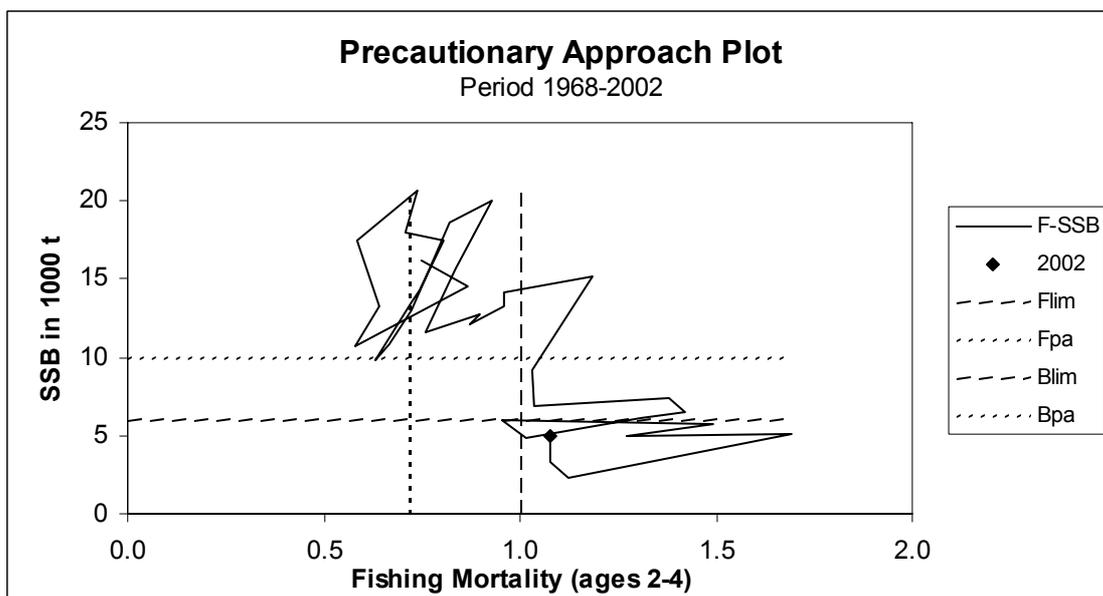
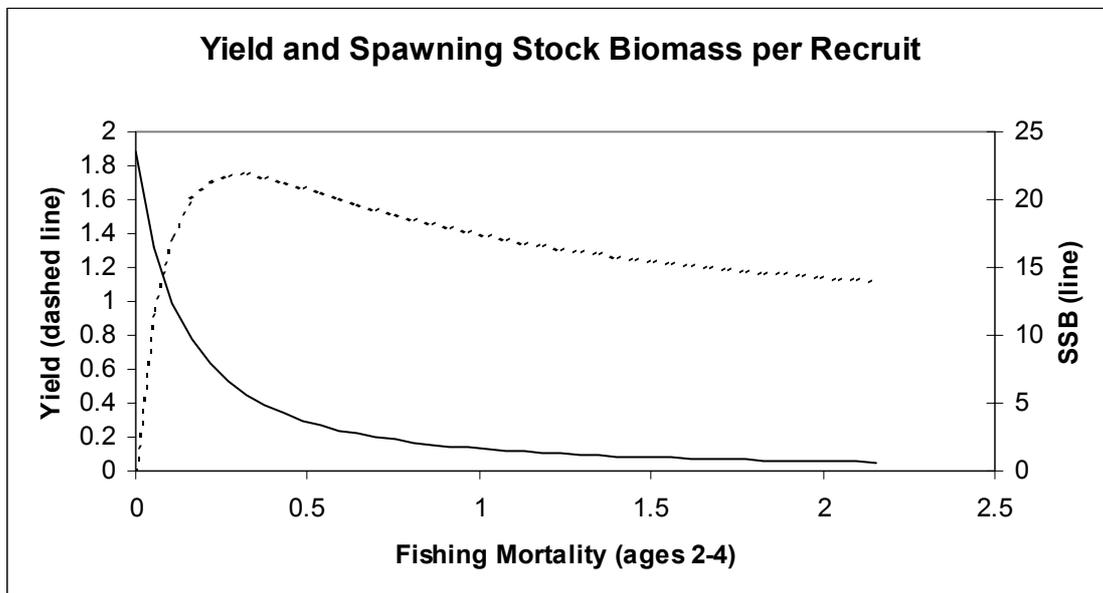
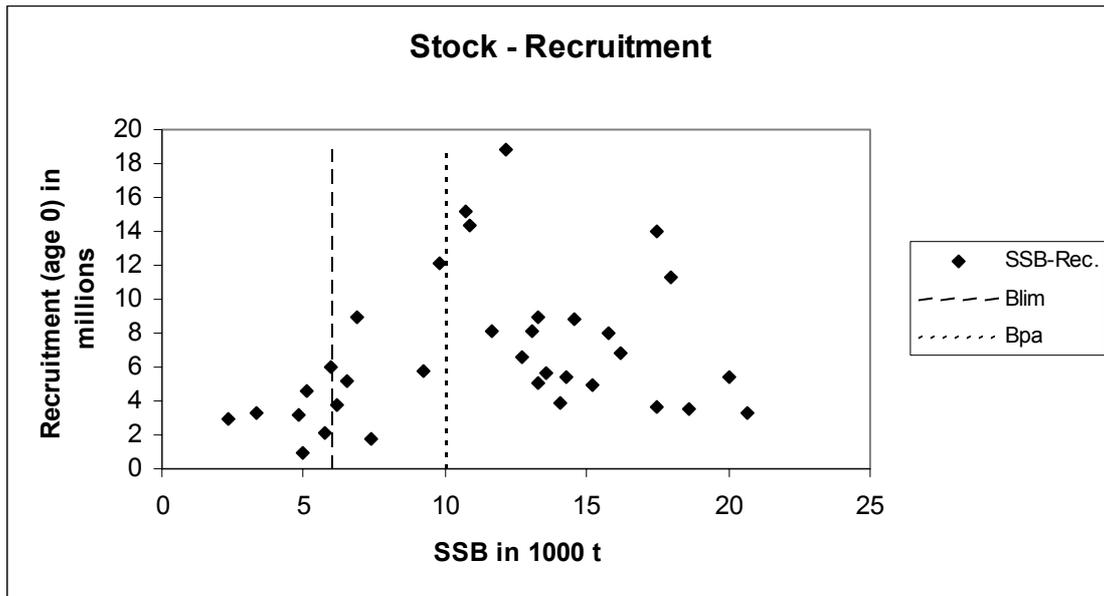


Table 3.8.2.1 Nominal catch (t) of COD in Division VIIa as officially reported to ICES, and Working Group estimates of annual landings.

| 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 |

¹Preliminary.

²Revised.

³1989–2000 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: |
|-----------------------|------------------------|
| B_{lim} not defined | B_{pa} not set |
| F_{lim} not defined | F_{pa} be set at 0.5 |

Technical basis:

| | |
|-------------------------|---|
| B_{lim} = not defined | B_{pa} = not set |
| F_{lim} = not defined | F_{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 F _{pa} | <2.8 | 3.4 ² | 2.398 ³ | 1.380 |
| 2001 | Reduce F below F _{pa} | <1.71 | 2.7 ² | 2.102 ³ | 2.498 |
| 2002 | Reduce F below 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)

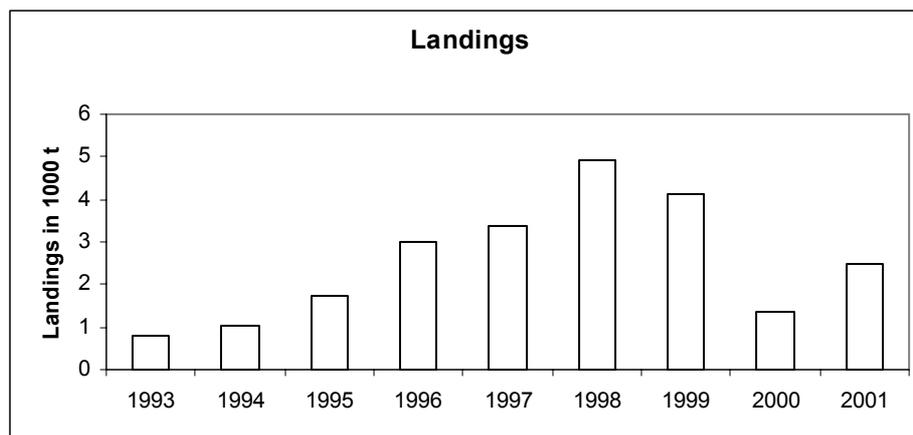


Table 3.8.3.1 Nominal landings (t) of HADDOCK in Division VIIa, 1984–2001, as officially reported to ICES.

| 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.

¹1989–2000 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 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 F_{pa} and to increase or maintain spawning stock biomass above B_{pa} .

Precautionary Approach reference points (unchanged since 1999):

| ICES considers that: | ICES proposes that: |
|---|---|
| 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. | 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. |
| F_{lim} is 0.95. This is the fishing mortality estimated to lead to a potential stock collapse. | F_{pa} be set at 0.65. This F is considered to have a high probability of avoiding F_{lim} and is consistent with a high probability of remaining above B_{pa} in the long run. |

Technical basis:

| | |
|--|---|
| $B_{lim} = B_{loss}$ | $B_{pa} = B_{loss} * 1.4$ |
| $F_{lim} = F_{loss}$ as estimated in an earlier assessment | $F_{pa} = 0.65$, implies an equilibrium SSB of 10.6 kt, and a relatively low probability of $SSB < B_{pa}$ (= 7 kt), and is within the range of historic F_s . |

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.

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

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.

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 | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 1-3 | | |
| Average Current | 0.908 | 0.067 | 0.321 |
| F_{max} | 0.252 | 0.068 | 0.280 |
| $F_{0.1}$ | 0.165 | 0.064 | 0.398 |
| F_{med} | 0.677 | 0.047 | 0.085 |

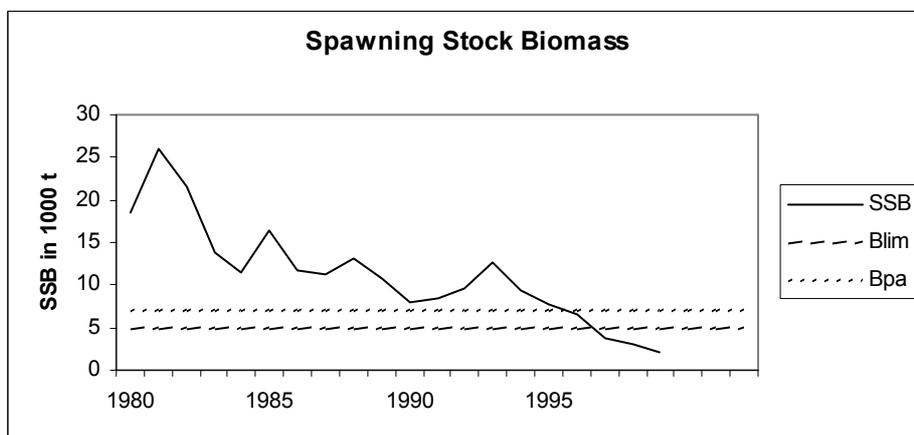
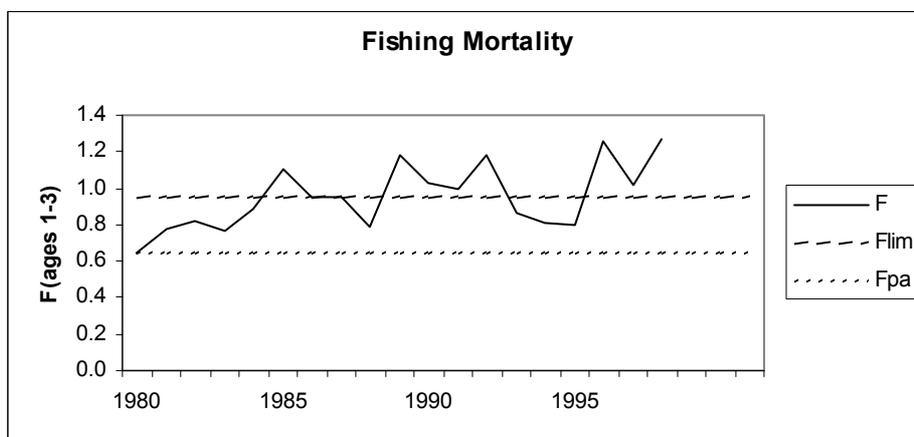
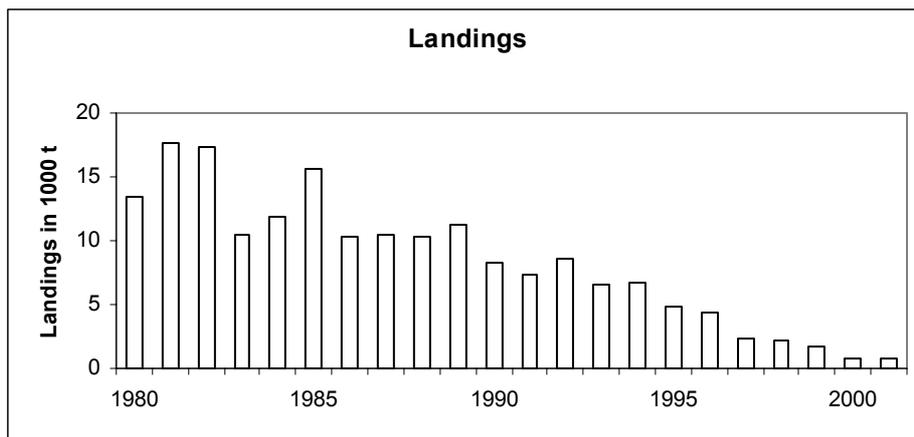
Catch data (Tables 3.8.4.1-2):

| 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 = 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 F_{pa} | 3.5 ⁵ | 4.41 | 2.0 | 1.1 | 2.8 ³ |
| 2000 | Reduce F below 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 | | | | |

¹Not including discards from the *Nephrops* fishery. ²From *Nephrops* fishery. ³Including estimates of misreporting.

⁵Landings only, no discards included. Weights in '000 t.

Whiting in Division VIIa (Irish Sea)



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

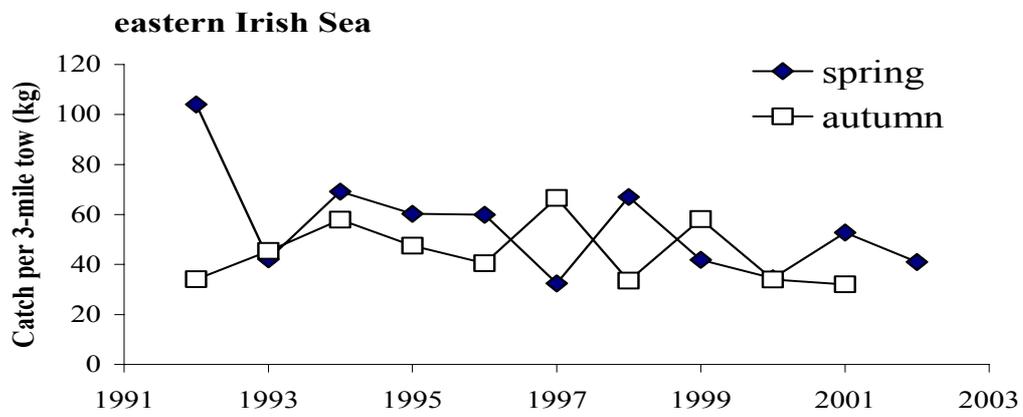
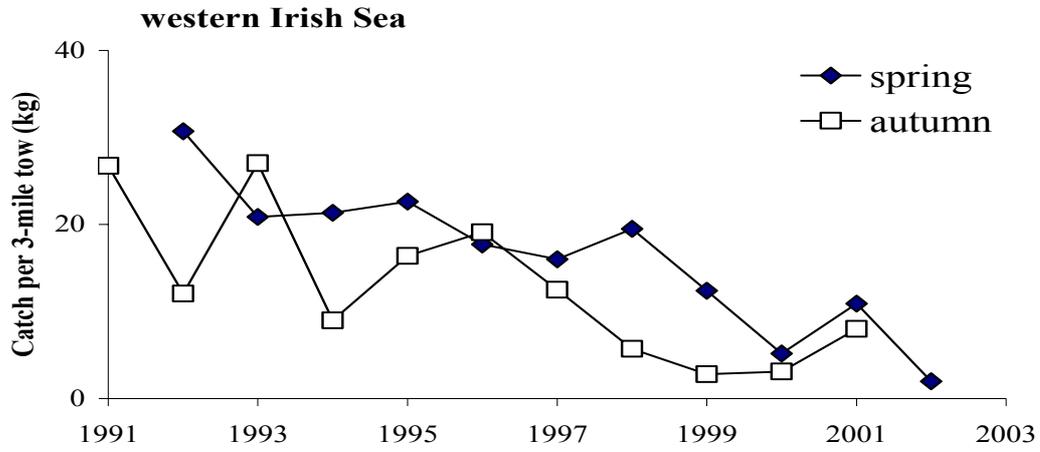


Table 3.8.4.1 Nominal catch (t) of WHITING in Division VIIa, 1987–2001, as officially reported to ICES and Working Group estimates of human consumption and discards.

| 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 <i>Nephrops</i> 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 B_{pa} and fishing mortality in 2001 was below F_{pa} . Fishing mortality on this stock was above F_{pa} in most years between 1967 and 1997, but declined through the 1990s

and is now at about 60% of F_{pa} . SSB has been above 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 B_{lim} or F_{lim} . | B_{pa} be set at 3 100 t. There is evidence of high recruitment at the lowest biomass observed and B_{pa} can therefore be set equal to the lowest observed SSB. |
| | F_{pa} be set at 0.45. This is considered to provide a high probability that SSB remains above B_{pa} in the long term. |

Technical basis:

| | |
|--|--|
| B_{lim} and F_{lim} : stock-recruitment data uninformative; F_{loss} poorly defined. | $B_{pa} = B_{loss}$. |
| | $F_{pa} = F_{med}$ 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: $F(2002) = F_{sq} = F(99-01) = 0.30$; Landings(2002) = 1.7; SSB(2003) = 5.5.

| F(2003) onwards | Basis | Catch (2003) | Landings (2003) | SSB (2004) |
|-----------------|---------------------------|--------------|-----------------|------------|
| 0.30 | $1.0 * F_{sq}$ | 1.9 | 1.9 | 5.7 |
| 0.36 | $1.2 * F_{sq}$ | 2.2 | 2.2 | 5.4 |
| 0.45 | $F_{pa} (= 1.5 * F_{sq})$ | 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 B_{pa} remains very small for fishing mortality rates at 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:

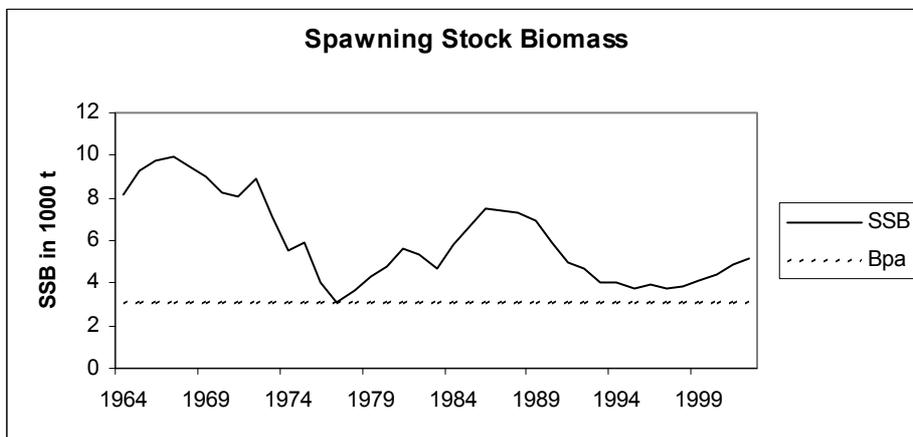
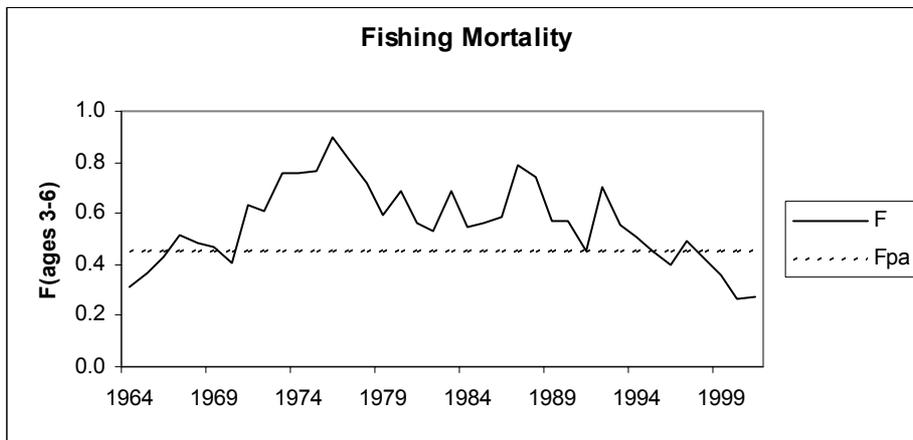
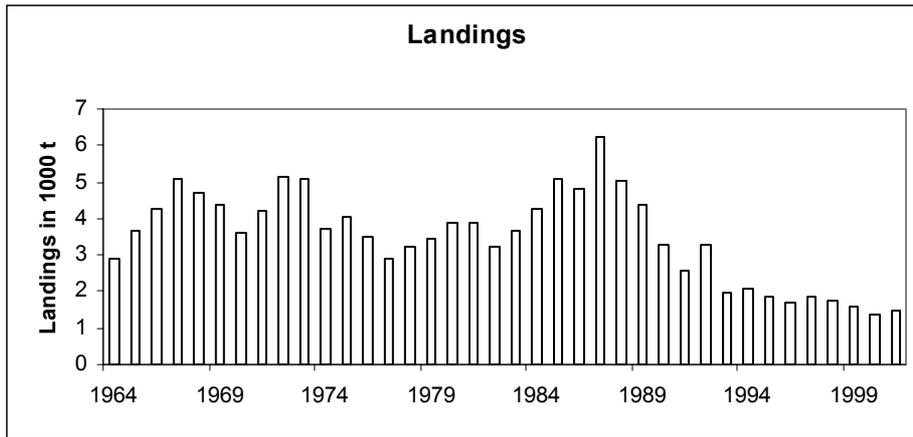
| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 3-6 | | |
| Average Current | 0.559 | 0.211 | 0.630 |
| F_{max} | 0.317 | 0.211 | 0.599 |
| $F_{0.1}$ | 0.124 | 0.187 | 1.283 |
| F_{med} | 0.426 | 0.209 | 0.456 |

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 F_{pa} | 2.4 | 2.4 | 1.6 | 1.6 |
| 2000 | Keep F below F_{pa} | <2.3 | 2.4 | 1.5 | 1.4 |
| 2001 | Keep F below F_{pa} | <2.4 | 2.0 | 1.5 | 1.5 |
| 2002 | Keep F below F_{pa} | <2.8 | 2.4 | | |
| 2003 | No increase in F | 1.9 | | | |

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

Plaice in Division VIIa (Irish Sea)



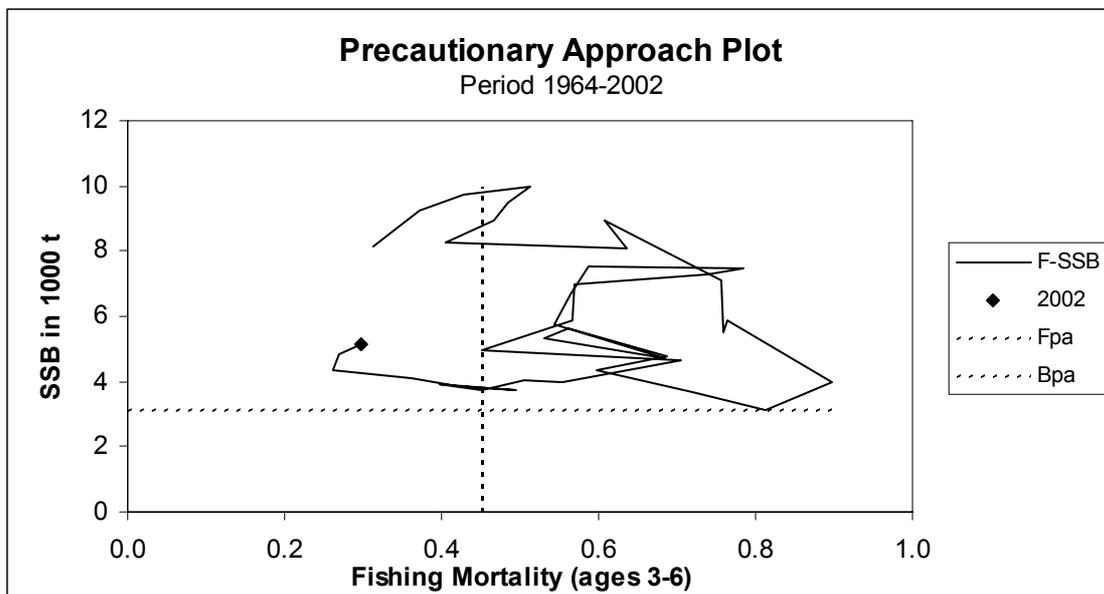
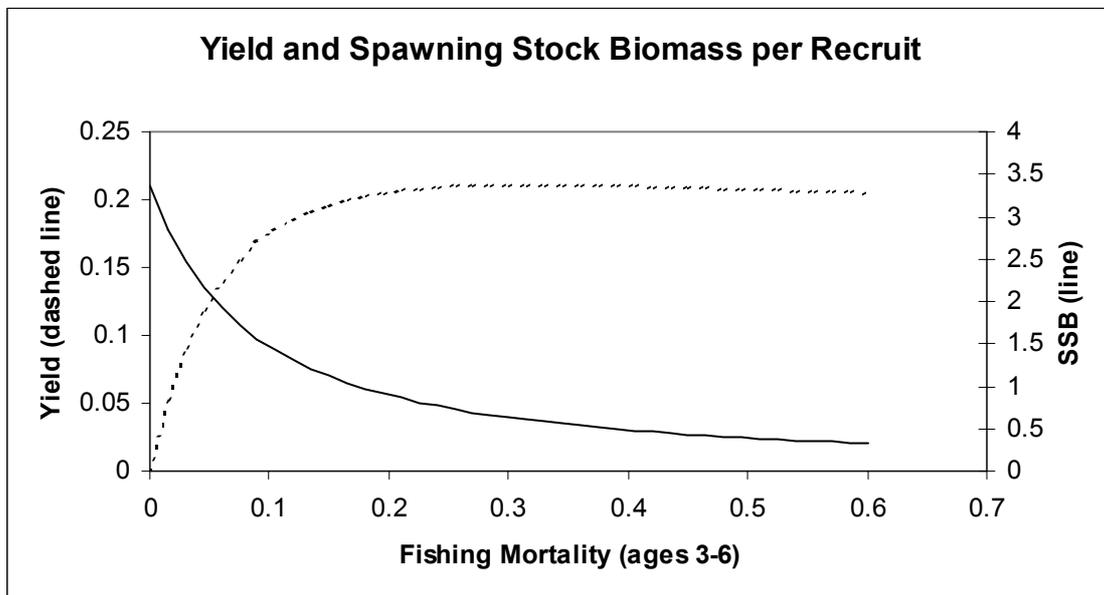
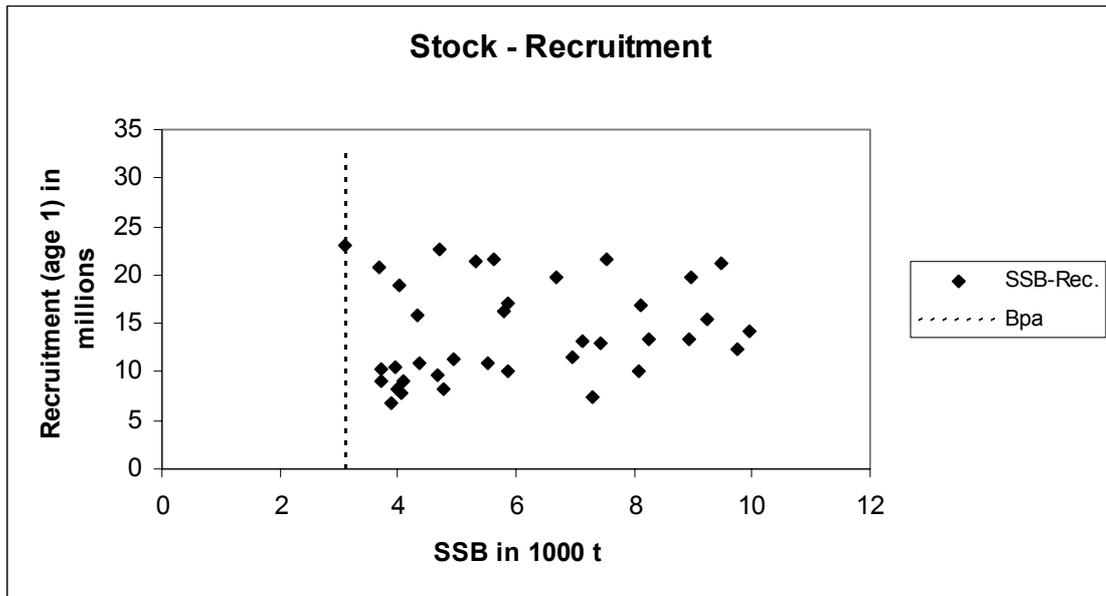


Table 3.8.5.1 Nominal landings (t) of PLAICE in Division VIIa as officially reported to ICES.

| 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 |

¹Provisional.²1989–1999 Northern Ireland included with England and Wales.³Final 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 B_{pa} and fishing mortality in 2001 was below F_{pa} . Fishing mortality varied around F_{lim} from 1970 to 1999, but has

declined to 80% of 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: |
|--|---|
| B_{lim} is 2 800 t. The lowest observed spawning stock in an earlier assessment. | 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. |
| 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. | F_{pa} be set at 0.30. This F is considered to have a high probability of avoiding F_{lim} . |

Technical basis:

| | |
|---|-----------------------------|
| $B_{lim} = B_{loss}$ | $B_{pa} \sim B_{lim} * 1.4$ |
| $F_{lim} = F_{loss}$ poorly defined; based on historical considerations | $F_{pa} =$ see above |

Advice on management: ICES recommends that fishing mortality in 2003 remains below the proposed 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: $F(2002) = F(99-01)$; $F_{sq} = 0.28$; Landings (2002) = 1.05; SSB (2003) = 4.11.

| F(2003) onwards | Basis | Landings (2003) | SSB (2004) |
|-----------------|--------------------------|-----------------|------------|
| 0.26 | $0.9 * F_{sq}$ | 0.88 | 4.31 |
| 0.28 | $1 * F_{sq}$ | 0.97 | 4.23 |
| 0.30 | $F_{pa} = 1.05 * F_{sq}$ | 1.01 | 4.18 |
| 0.31 | $1.1 * F_{sq}$ | 1.05 | 4.14 |
| 0.34 | $1.2 * F_{sq}$ | 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:

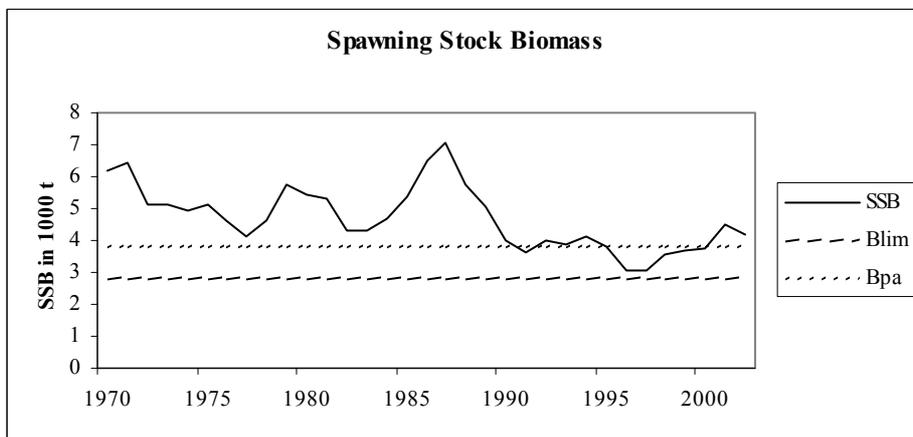
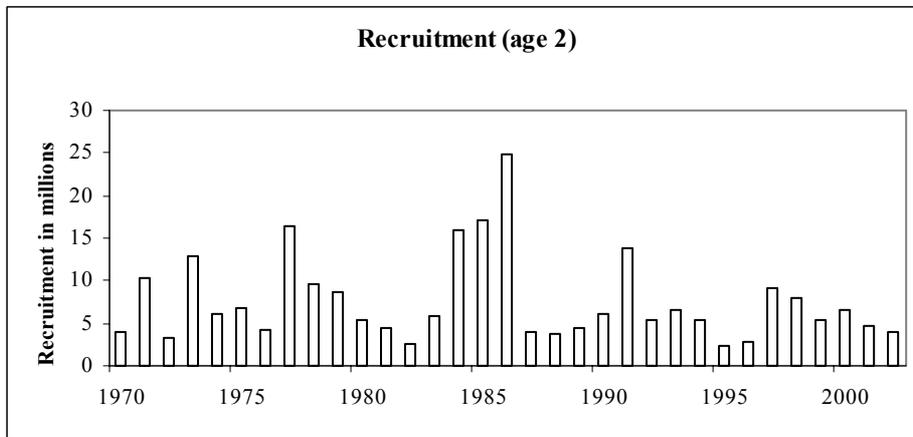
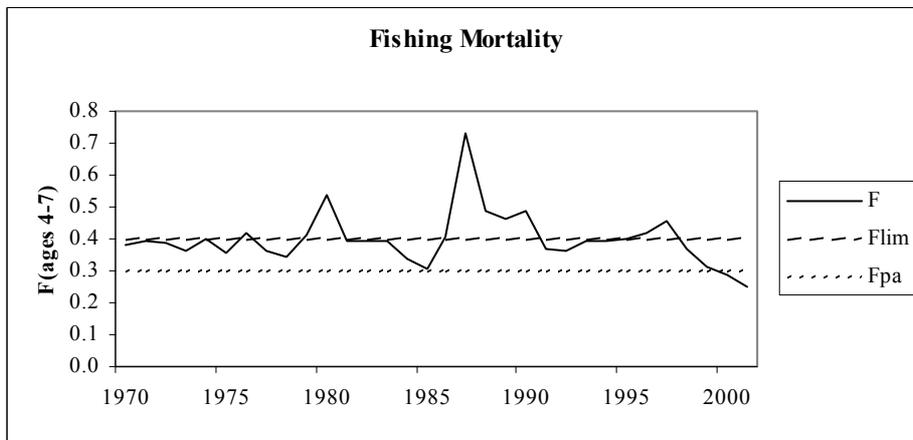
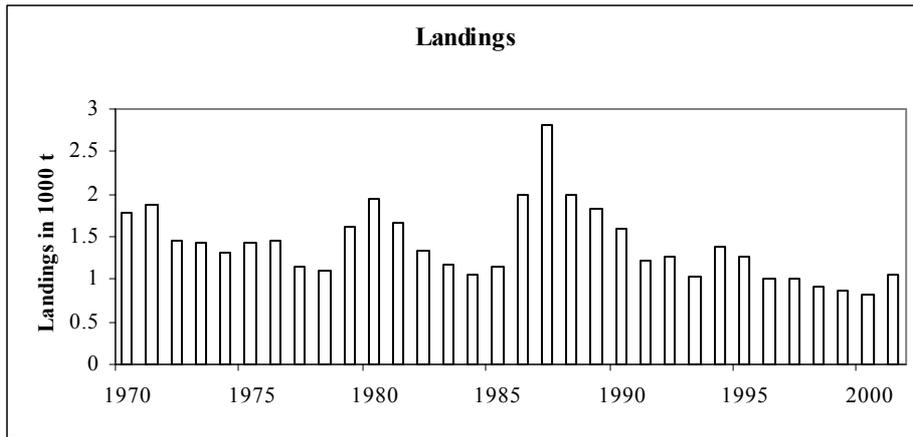
| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 4-7 | | |
| Average Current | 0.399 | 0.186 | 0.795 |
| F_{max} | 0.523 | 0.192 | 0.463 |
| $F_{0.1}$ | 0.177 | 0.169 | 1.169 |
| F_{med} | 0.300 | 0.187 | 0.758 |

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 F_{pa} | 0.83 | 0.9 | 0.8 | 0.9 |
| 2000 | Reduce F below F_{pa} | < 1.08 | 1.08 | 0.8 | 0.8 |
| 2001 | Reduce F below F_{pa} | < 0.93 | 1.1 | 1.0 | 1.1 |
| 2002 | Keep F below F_{pa} | <1.10 | 1.1 | | |
| 2003 | Keep F below F_{pa} | <1.01 | | | |

¹Catch 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)



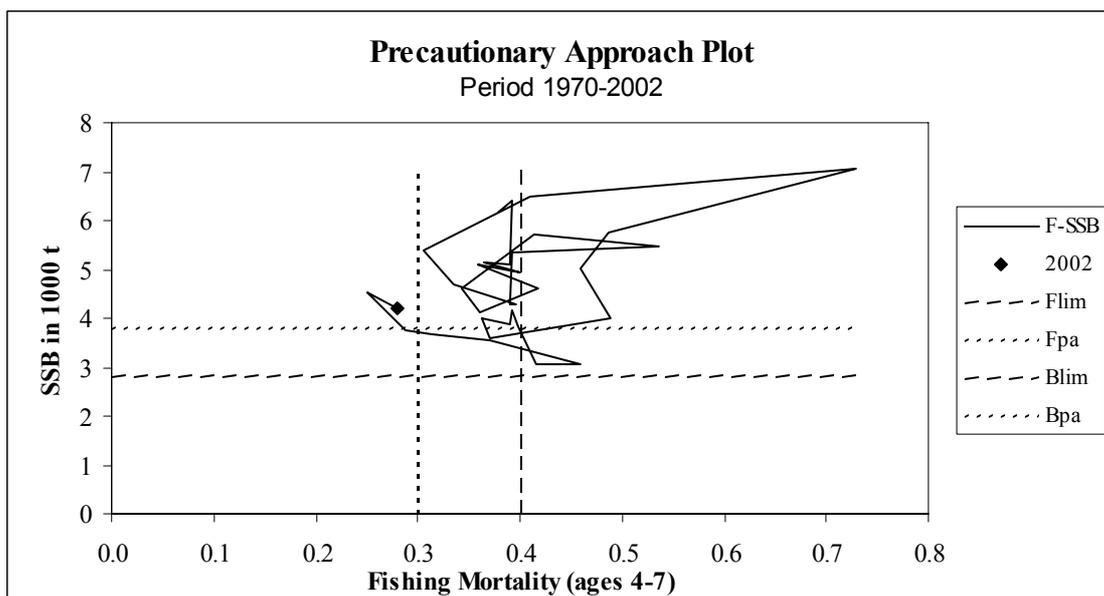
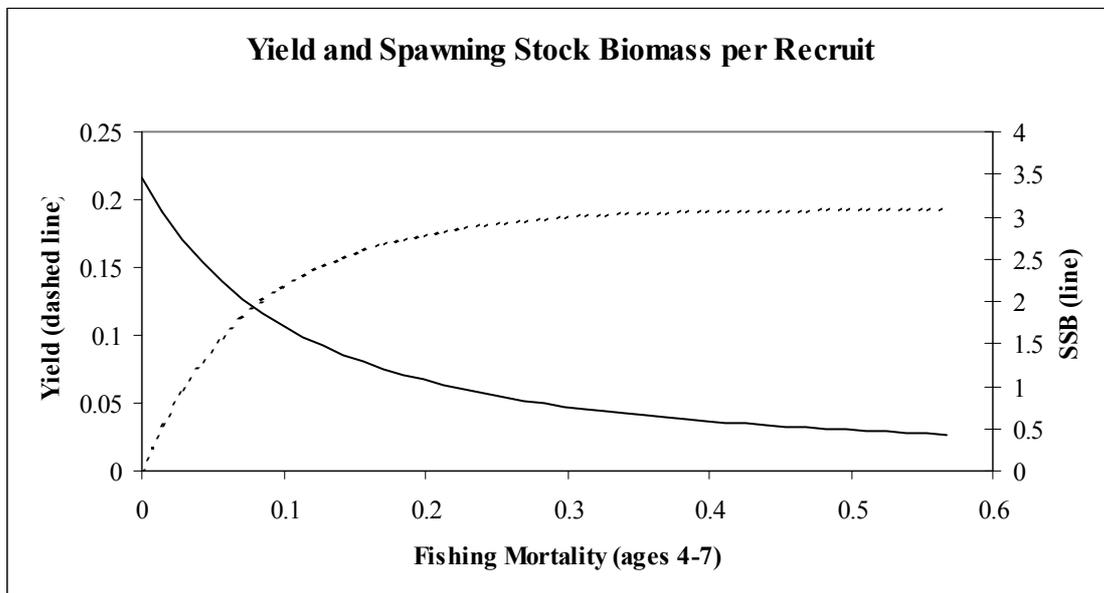
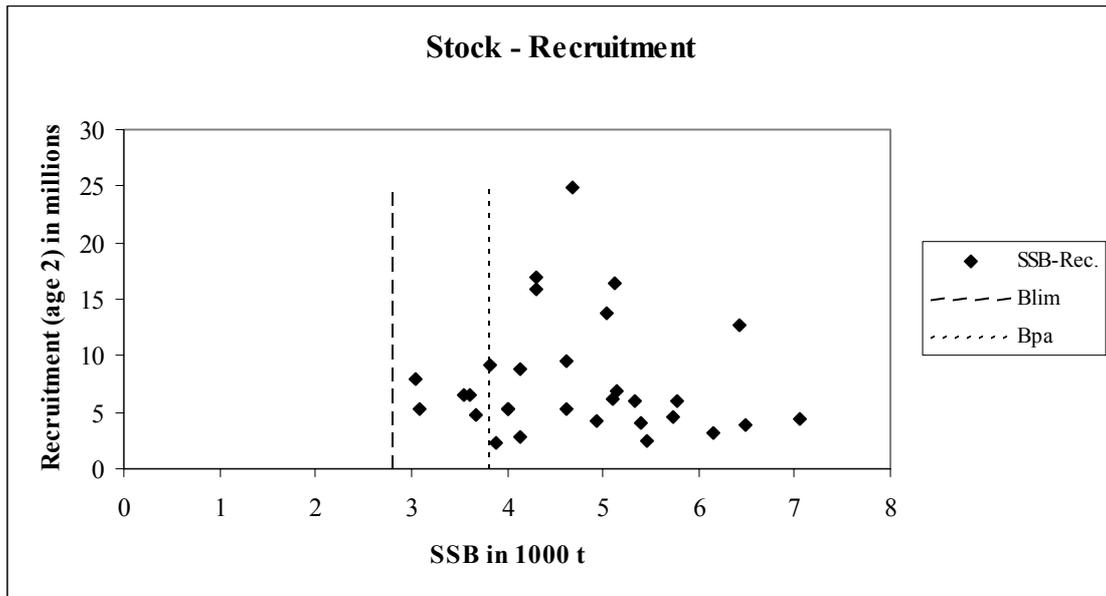


Table 12.1.1.1
Table 3.8.6.1

Sea Sole, Nominal landings (tonnes) as officially reported by ICES
Irish Sea Sole, DIVISIONS VIIa, Nominal landings (t), as Officially reported to 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 B_{pa} .

Precautionary Approach reference points (established in year 2000):

| ICES considers that: | ICES proposes that: |
|--------------------------|--|
| B_{lim} is 6 000t | $B_{pa} = 9\ 500t$ |
| F_{lim} is not defined | F_{pa} under review, proposed as 0.36 in 1999, not adopted |

Technical basis:

| | |
|---------------------------------|---|
| B_{lim} : lowest observed SSB | B_{pa} : $B_{lim} * 1.58$; still under consideration |
| F_{lim} : not defined | F_{pa} : 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 |
| F_{max} | N/A | | |
| $F_{0.1}$ | 0.166 | 0.029 | 0.154 |
| 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 | <i>Status quo</i> F | 6.5 | 9.0 | 4.9 |
| 1999 | F=Proposed $F_{pa}=0.36$ | 4.9 | 6.6 | 4.1 |
| 2000 | F=90% $F(98)=0.31$ | 3.9 | 5.4 | 2 |
| 2001 | <i>Status quo</i> 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)

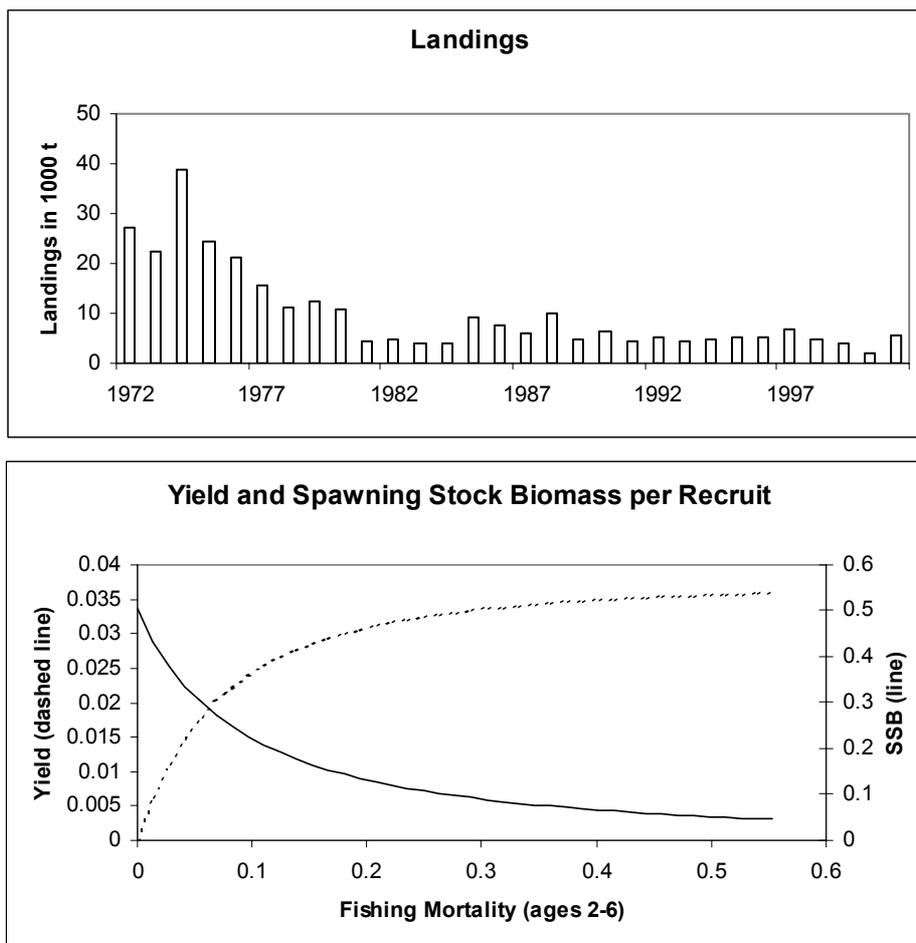


Table 3.8.7.1 Irish Sea Herring (Division VIIa). Catch in tonnes by country, 1985-2001.

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 VIII-f-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 (VIII-f,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 B_{pa} , and just above 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 F_{pa} since 1989. Fishing mortality has been above 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: |
|---|---|
| B_{lim} is 5 400 t, the lowest observed spawning stock biomass. | B_{pa} be set at 10 000 t. Biomass above this value affords a high probability of maintaining SSB above B_{lim} , taking into account the variability in the stock dynamics and the uncertainty in assessments. |
| F_{lim} is 0.90, the fishing mortality estimated to lead to potential collapse. | F_{pa} be set at 0.68. This F is considered to have a high probability of avoiding F_{lim} and maintaining SSB above B_{pa} in the medium term, taking into account the uncertainty assessments. |

Technical basis:

| | |
|---|---|
| $B_{lim} = B_{loss}$ | B_{pa} = historical development of the stock |
| F_{lim} = based on historical response of the stock | F_{pa} = 5 th percentile of F_{loss} |

Advice on management: ICES recommends that fishing mortality should be reduced to less than 0.41 which is below 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 B_{pa} in the short term.

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.

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

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 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 F_{sq} | | 3.8 | 10.1 |
| 0.51 | 0.5 F_{sq} | | 4.6 | 9.2 |
| 0.61 | 0.6 F_{sq} | | 5.2 | 8.4 |
| 0.68 | $F_{pa} = 0.67 F_{sq}$ | | 5.7 | 7.8 |
| 0.81 | 0.8 F_{sq} | | 6.4 | 6.9 |
| 1.01 | 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 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:

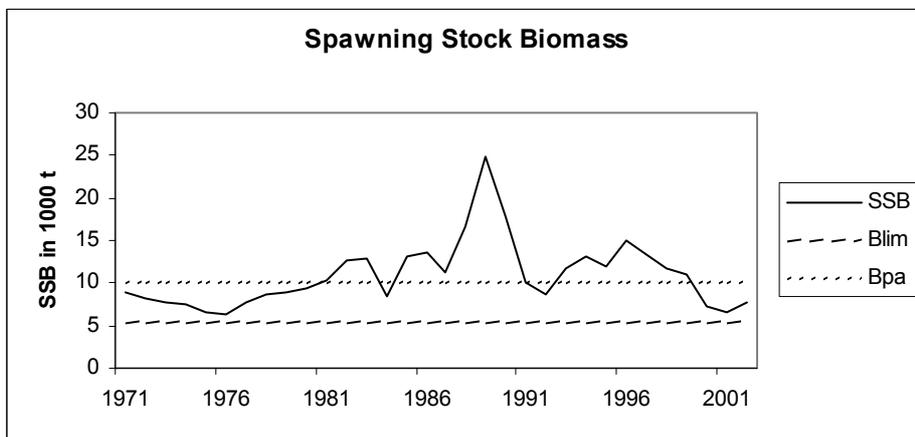
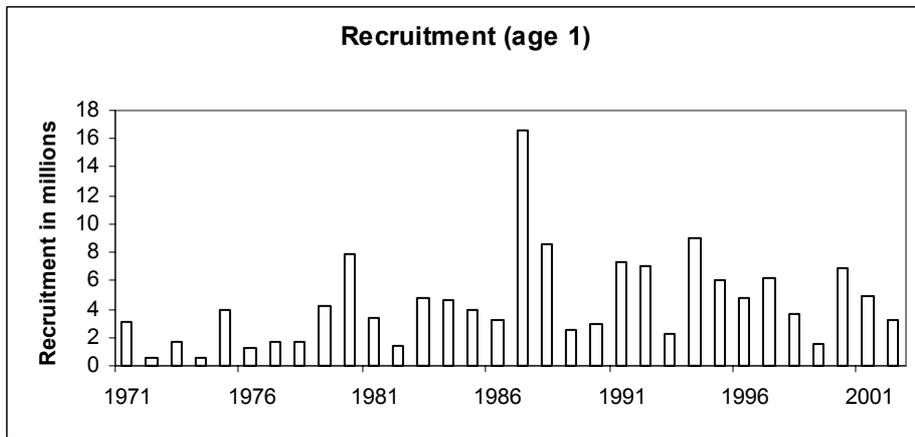
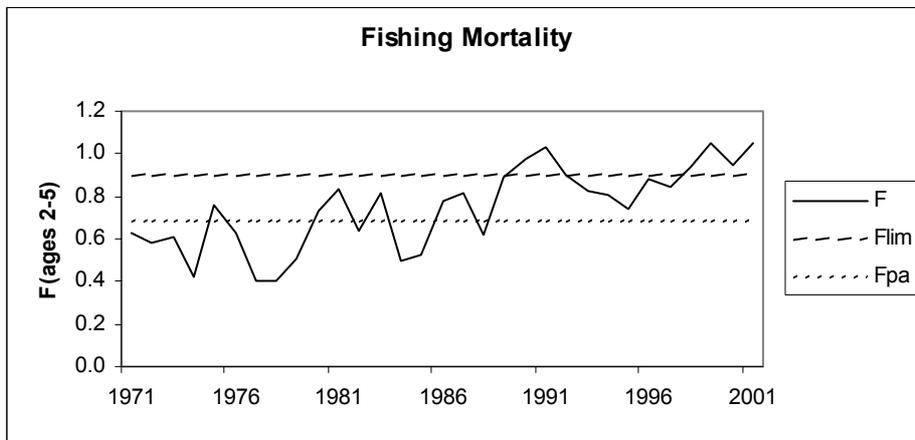
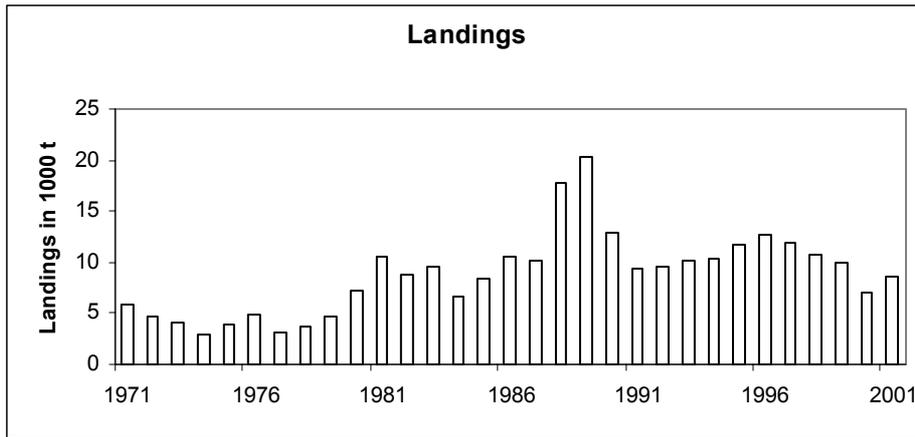
| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|--------|
| | Ages 2-5 | | |
| Average Current | 1.014 | 1.774 | 1.459 |
| F_{max} | 0.281 | 2.519 | 9.258 |
| $F_{0.1}$ | 0.170 | 2.363 | 14.604 |
| F_{med} | 0.696 | 2.079 | 2.752 |

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 F_{pa} | 9.2 ⁴ | 19.0 | 9.9 |
| 2000 | Reduce F below 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 | | |

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

Cod in Divisions VIIe-k



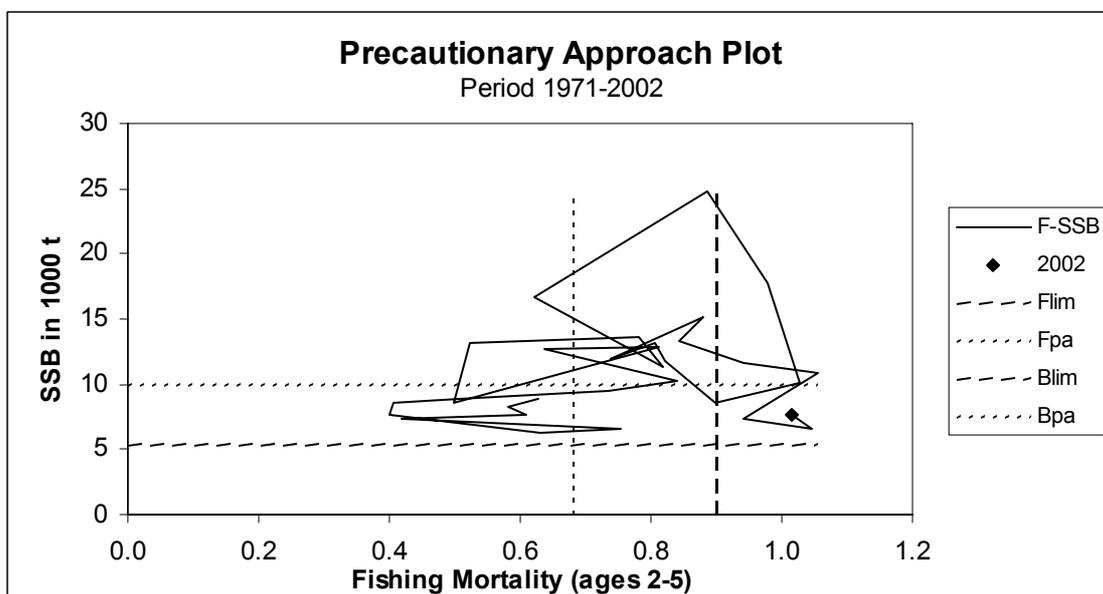
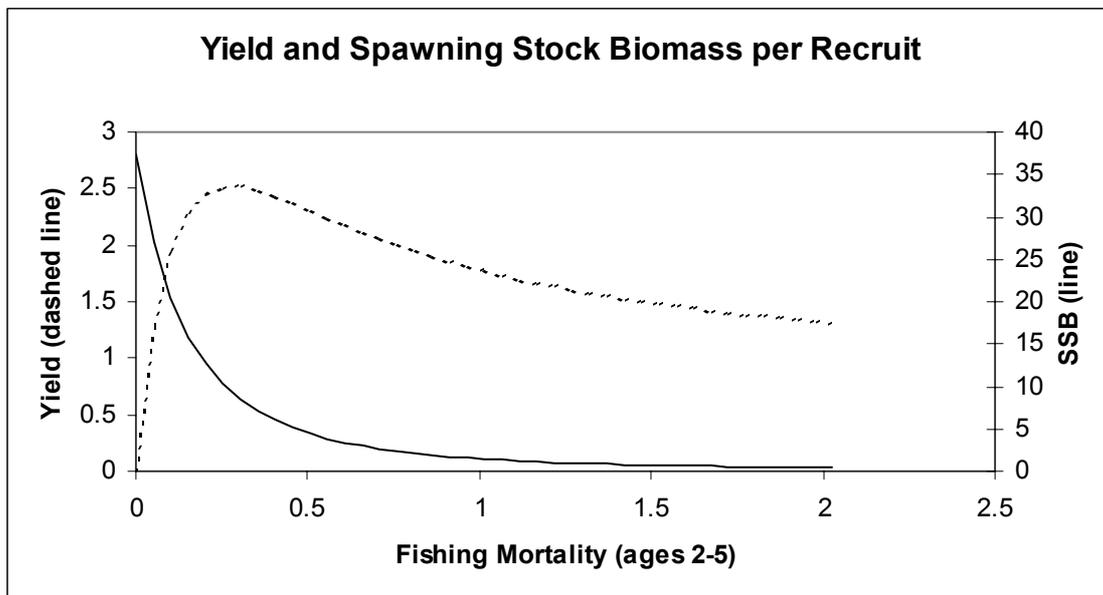


Table 3.9.2.1 Nominal landings of Cod in Divisions VIIf–h, VIIe, VIIe–h, VIIj–k, VIIe–k as used by the Working Group in 2002.

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

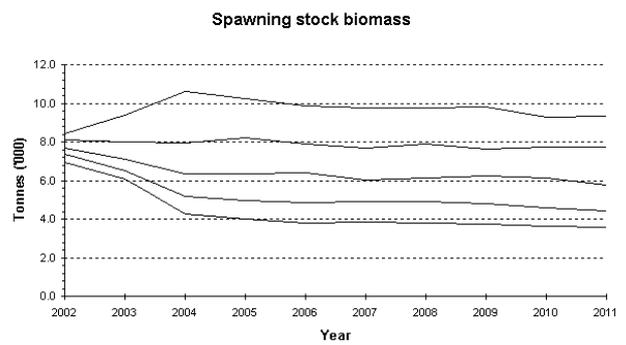
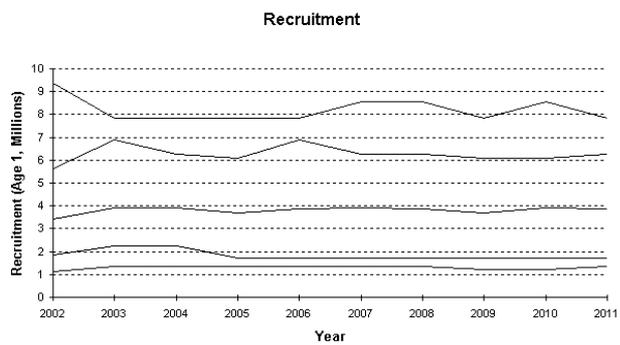
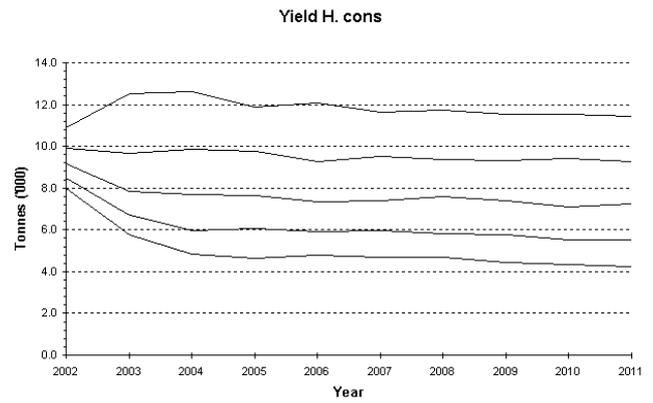
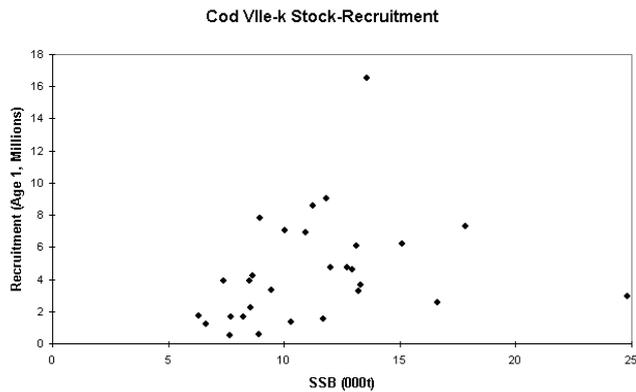
Cod in Divisions VIIe-k

| 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 |

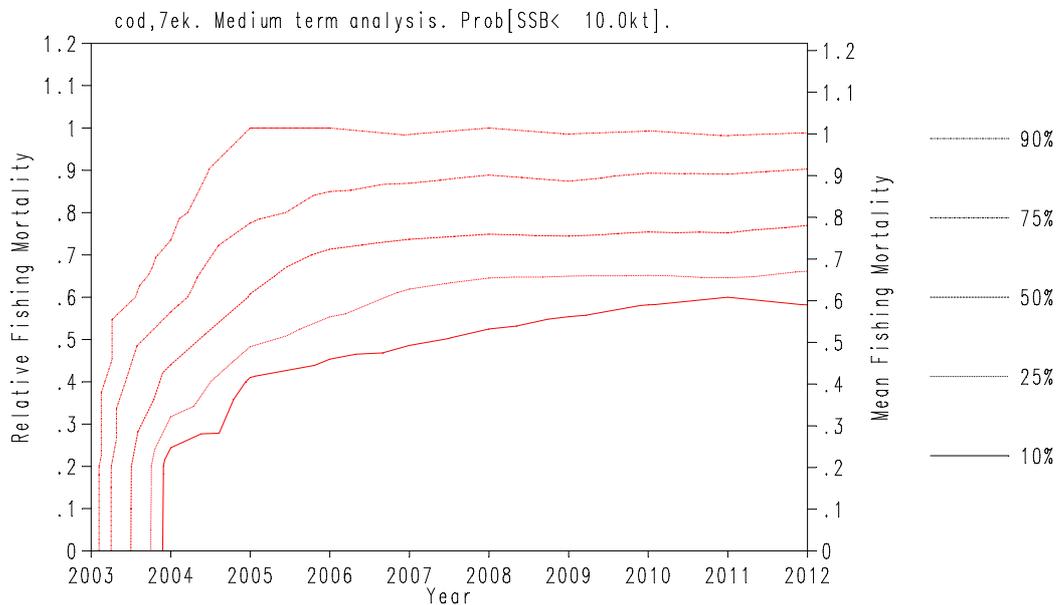
Cod in VIIe-k (Celtic Sea). Medium-term projections. Solid lines show 10, 25, 50, 75 and 90th percentiles. Stock-recruitment relationship estimated by random bootstrap.

Number of simulations = 500
Number of simulations = 500

Relative H. Cons effort = 1.00
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 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: |
|--|--|
| B_{lim} is 15 000 t, the lowest observed spawning stock biomass. | B_{pa} be set at 21 000 t. Biomass above this affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of the assessment. |
| F_{lim} is not defined. | F_{pa} not proposed. |

Technical basis:

| | |
|-------------------------|--------------------------|
| $B_{lim} = B_{loss}$ | $B_{pa} = B_{lim} * 1.4$ |
| F_{lim} not proposed. | F_{pa} not proposed. |

Advice on management: There is no 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.

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 VIIId should be considered, if setting an overall TAC for Subarea VII.

Relevant factors to be considered in management: The assessment area was expanded in 1997 to cover Divisions

Catch forecast for 2003:

Basis: $F(2002) = F(99-01) = F_{sq} = 0.63$; Landings(2002) = 25.8 ; SSB(2003) = 40.6.

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

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

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

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*.

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.

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.

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

The main Irish fleets in Divisions VII_{f,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 VII_g. Division VII_{j-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 VII_{j,k} are otter trawlers that target mixed gadoids and account for 10% of landings of whiting in Divisions VII_{e-k}. The main UK fisheries in Divisions VII_{e,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 (VII_e), off Trevose Head (VII_f), and southeast of Ireland (VII_g). 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 | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 2-5 | | |
| Average Current | 0.625 | 0.191 | 0.484 |
| F_{max} | 1.363 | 0.195 | 0.325 |
| $F_{0.1}$ | 0.257 | 0.165 | 0.790 |
| F_{med} | 1.559 | 0.195 | 0.304 |

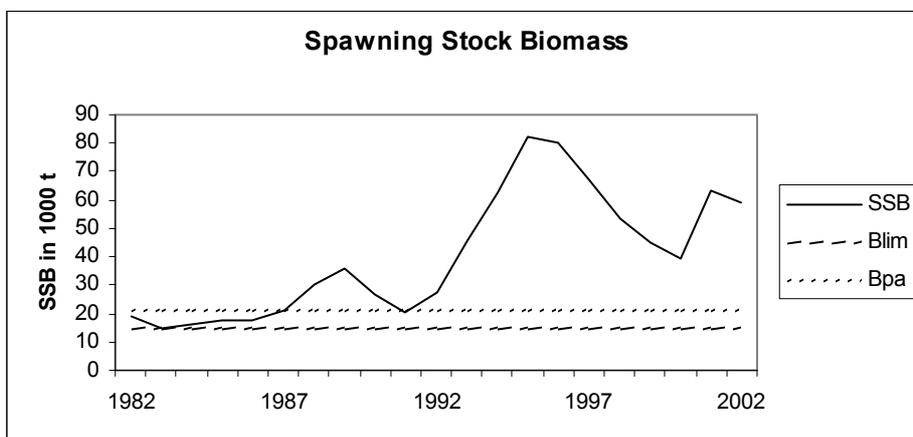
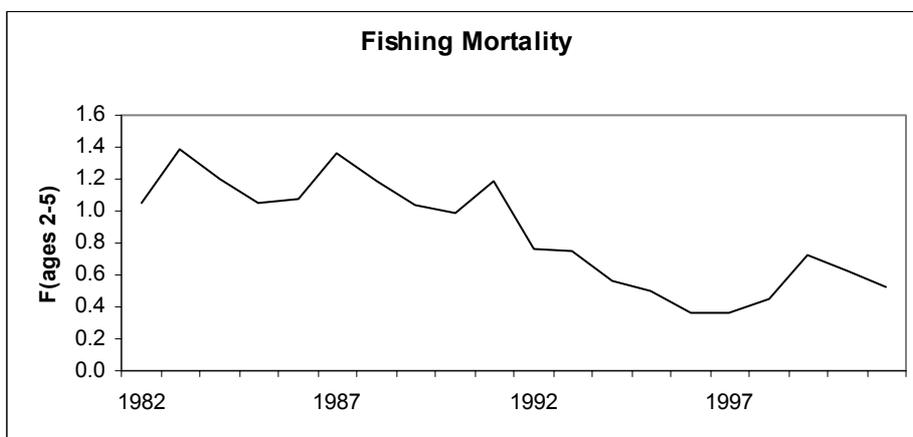
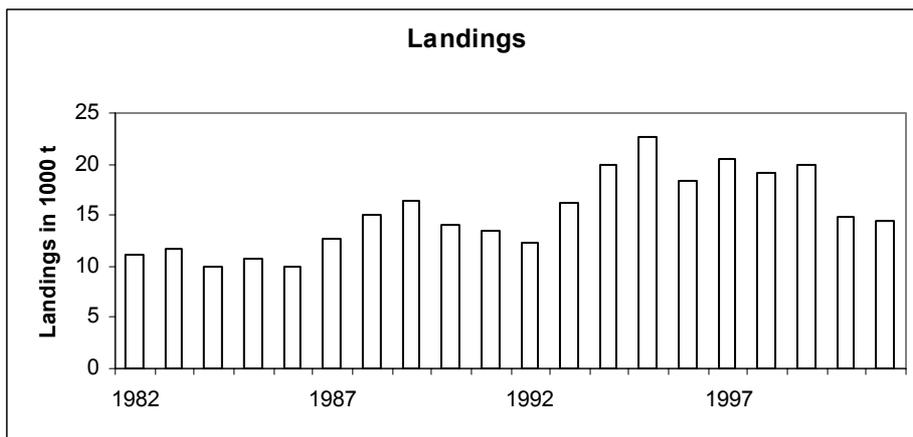
F_{max} is not well-defined.

Catch data (Tables 3.9.3.1–2):

| Year | ICES Advice | Predicted catch corresp. to advice | Agreed TAC ¹ | ACFM Landings |
|------|--------------------------------|------------------------------------|-------------------------|---------------|
| 1987 | <i>Status quo</i> 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 VII_a). ² For the VII_{f+g} stock component, ³ For the VII_{f-h} stock component, ⁴ For the VII_{e-k} stock component. Weights in '000 t.

Whiting in Divisions VIIe-k



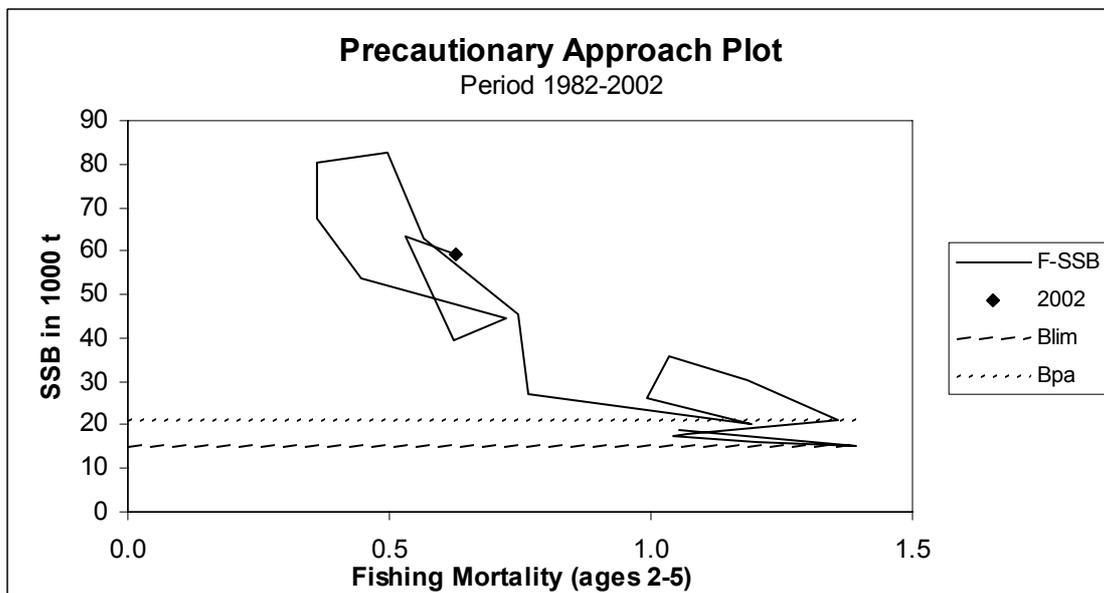
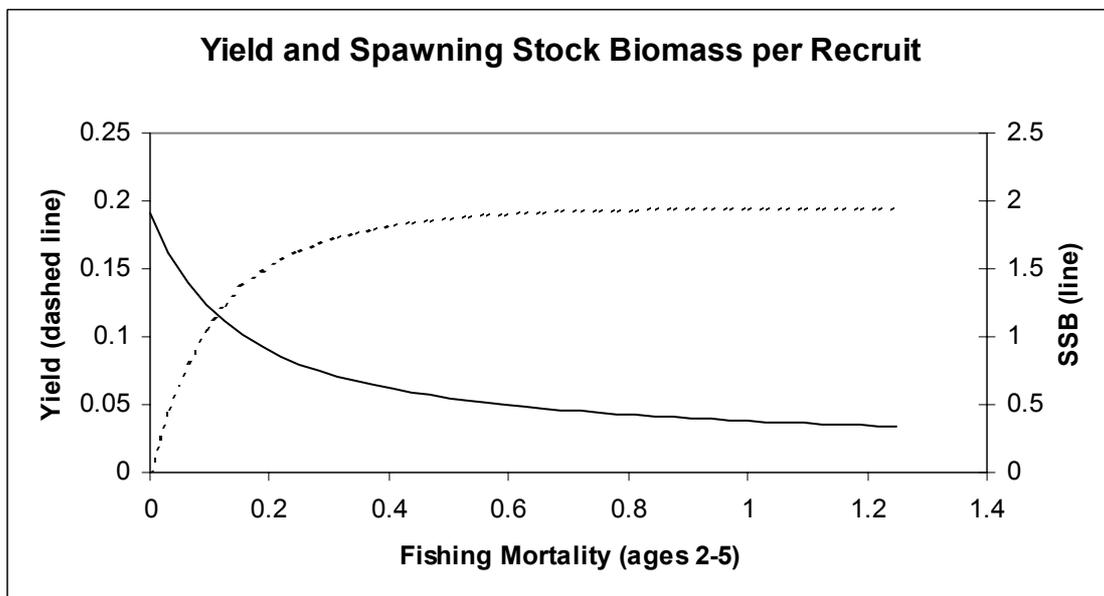
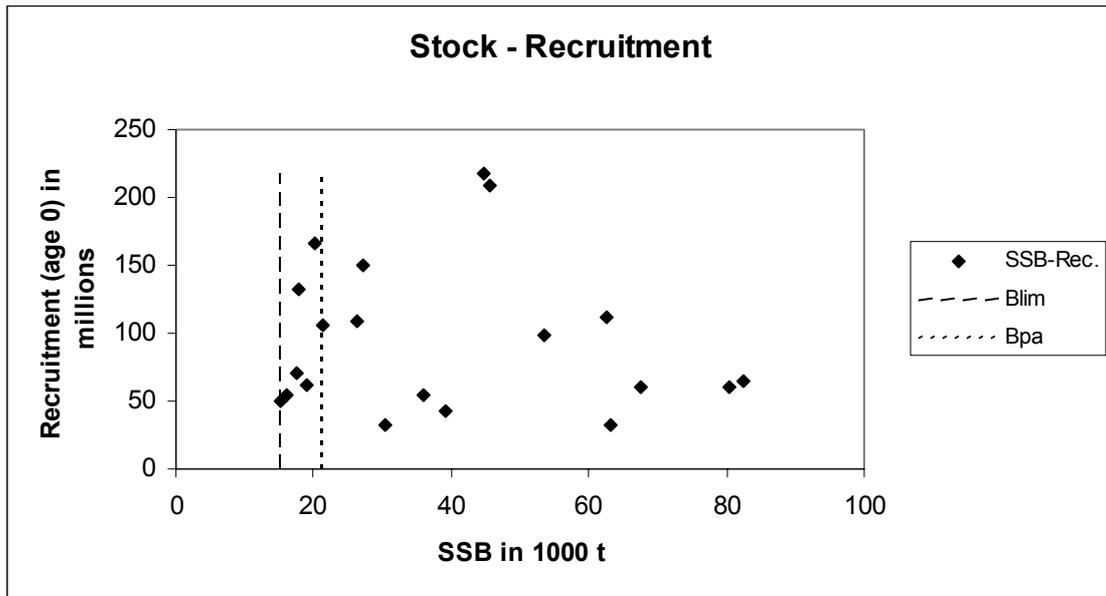


Table 3.9.3.1

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 |

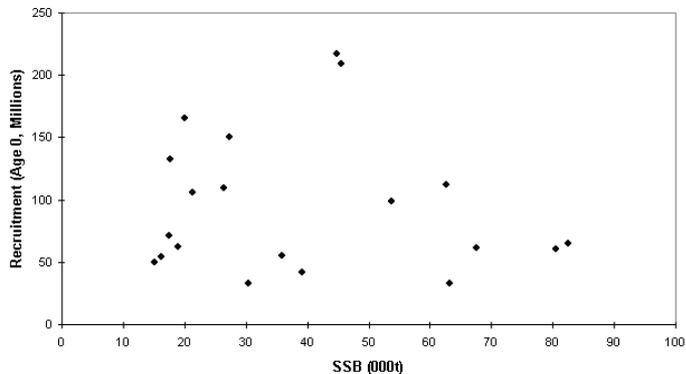
¹ Preliminary² Estimated from logbooks

Table 3.9.3.2

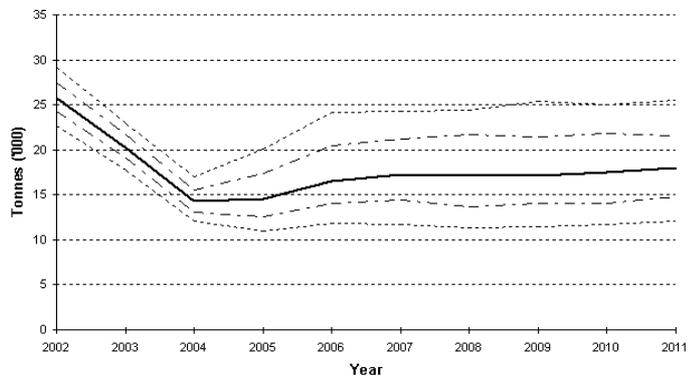
Whiting in Divisions VIIe-k

| 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 |

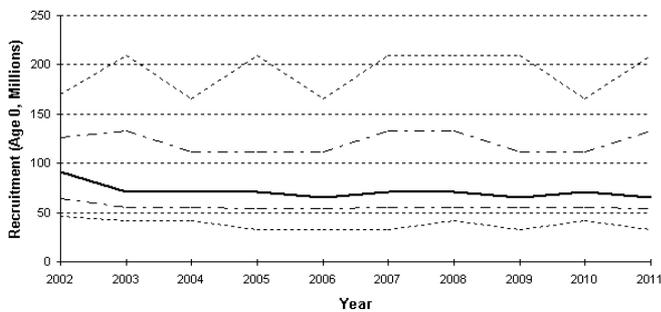
Whiting VIIe-k Stock-Recruitment



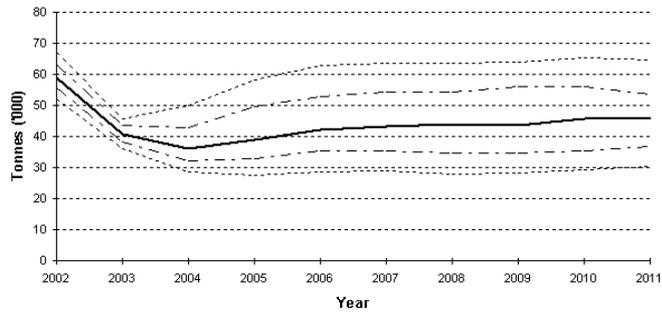
Yield H. cons



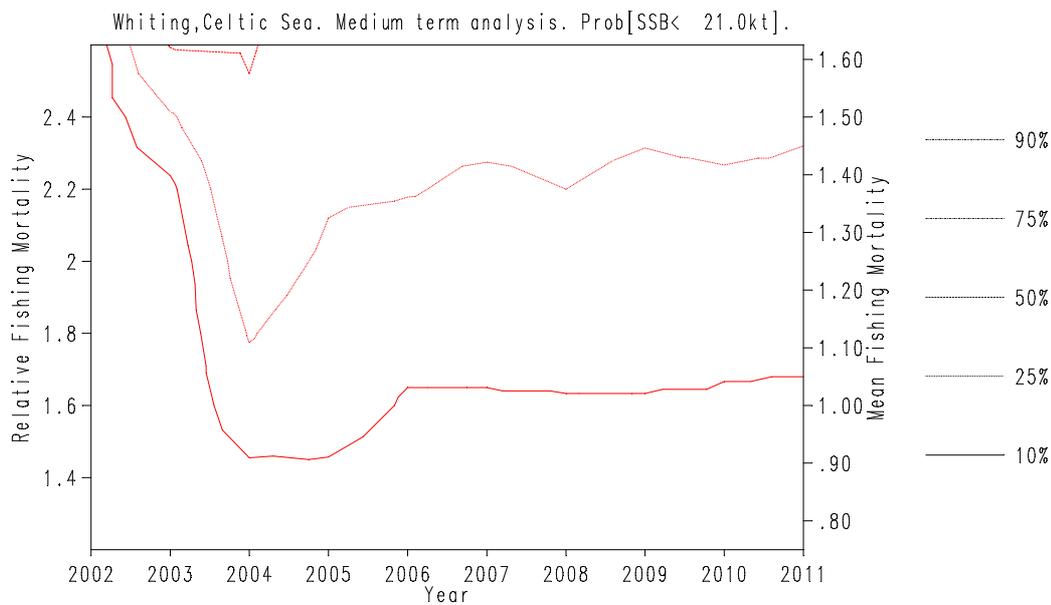
Recruitment



Spawning stock biomass



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



3.9.4 Celtic Sea plaice (Divisions VIIIf and g)

State of stock/exploitation: The stock is outside safe biological limits. SSB decreased from 1988 to 2000 and has been below 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: |
|---|---|
| B_{lim} is 1 100 t, the lowest observed spawning stock biomass B_{loss} . | B_{pa} be set at 1 800 t. Biomass above this affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty assessments. |
| F_{lim} not defined. | F_{pa} not defined |

Technical basis:

| | |
|------------------------|--------------------------|
| $B_{lim}=B_{loss}$ | $B_{pa}= B_{lim} * 1.64$ |
| F_{lim} =Not defined | F_{pa} not defined |

Advice on management: ICES recommends a reduction in fishing mortality of at least 40% relative to 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 B_{pa} in the short term.

Relevant factors to be considered in management: At *status quo* F, SSB is likely to remain below 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; $F_{sq} = F(99-01) = 0.55$; Landings (2002) = 0.68; SSB(2003) = 1.78.

| F(2003) Onwards | Basis | Landings (2003) | SSB(2004) |
|--------------------|----------------|--------------------|-----------|
| 0.27 | $0.5 * F_{sq}$ | 0.57 | 2.12 |
| 0.33 | $0.6 * F_{sq}$ | 0.66 | 2.03 |
| 0.38 | $0.7 * F_{sq}$ | 0.76 | 1.94 |
| 0.44 | $0.8 * F_{sq}$ | 0.84 | 1.86 |
| 0.55 | F_{sq} | 1.01 | 1.71 |
| 0.66 | $1.2 * F_{sq}$ | 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, F_{max} is estimated to be $0.44 F_{sq}$. Results of the medium-term analysis indicate a low probability of SSB falling below 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 VIIIf,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:

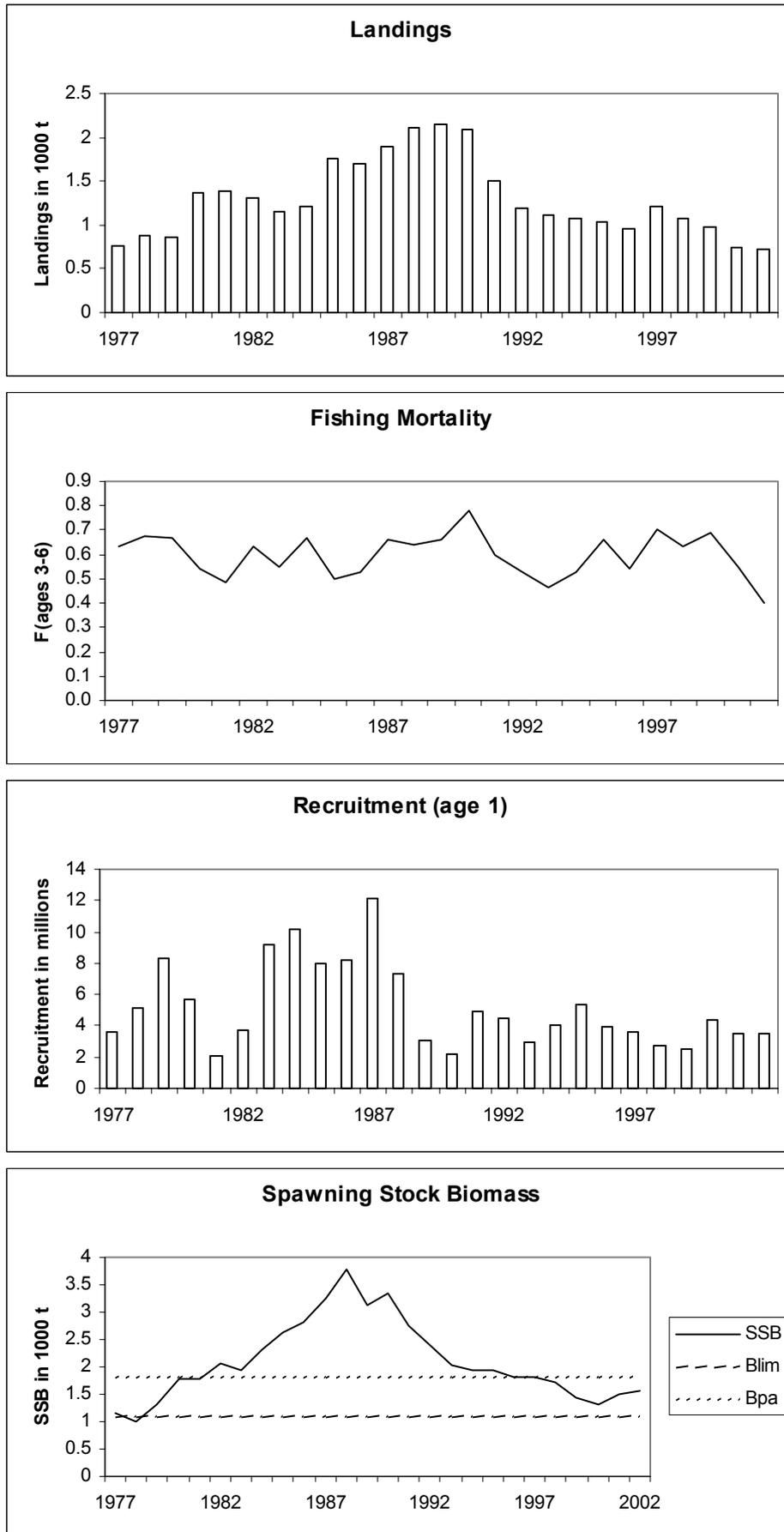
| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 3-6 | | |
| Average Current | 0.545 | 0.249 | 0.439 |
| F_{max} | 0.240 | 0.264 | 0.972 |
| $F_{0.1}$ | 0.105 | 0.237 | 1.871 |
| F_{med} | 0.514 | 0.251 | 0.466 |

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.

Celtic Sea plaice (Divisions VII f and g)



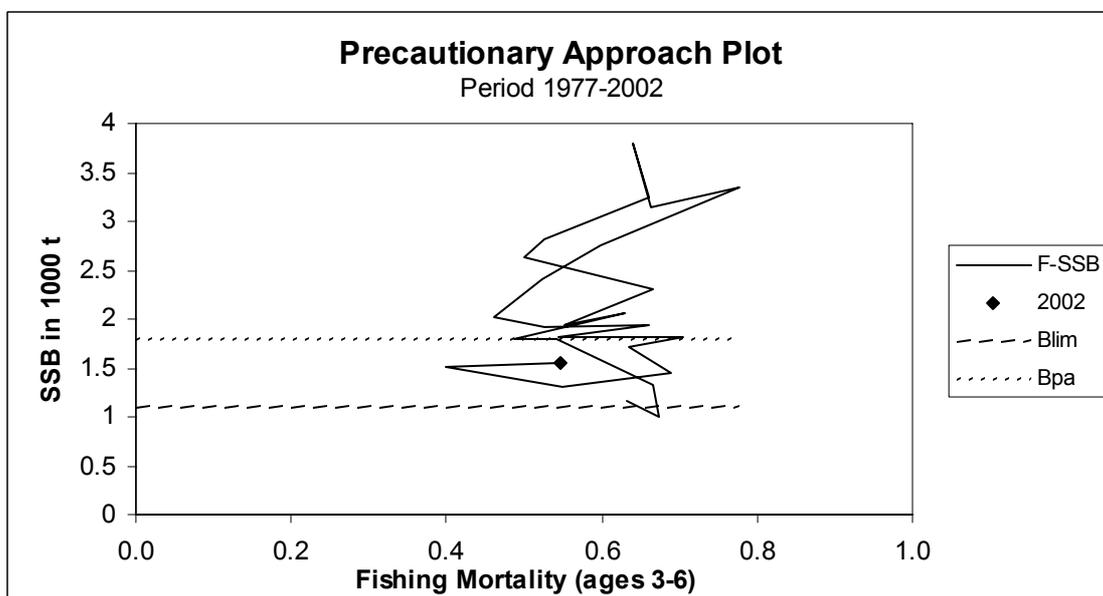
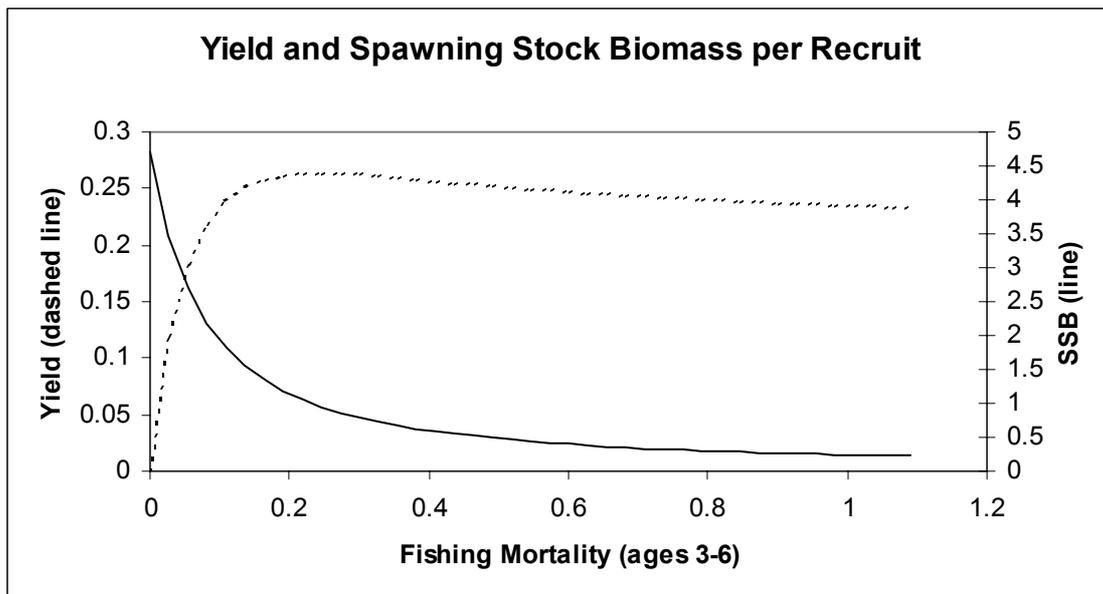
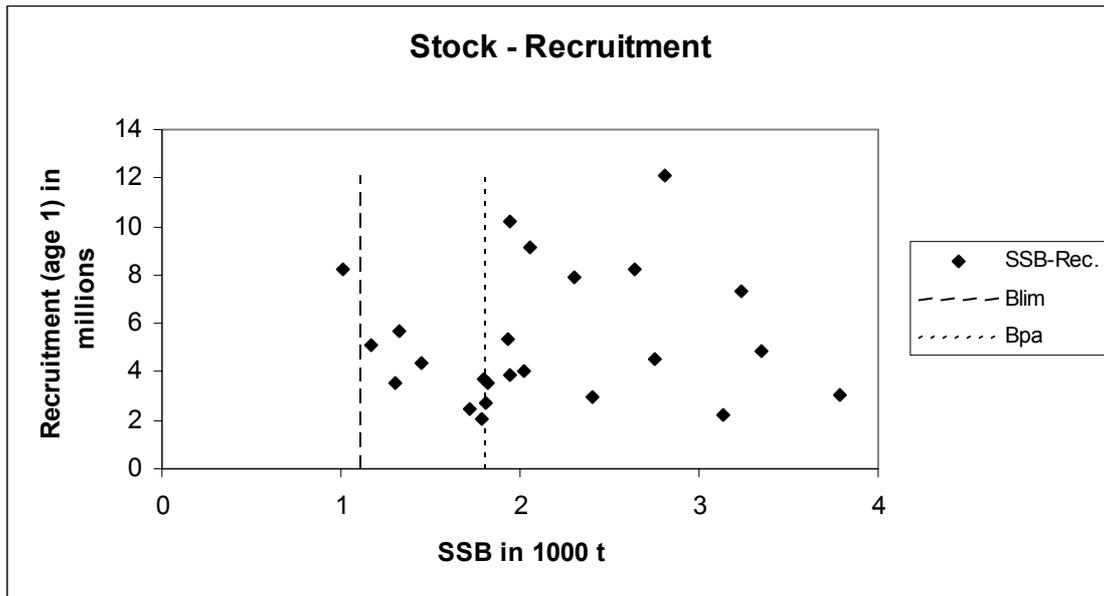


Table 3.9.4.1 Celtic Sea Plaice. Nominal landings (t) in Divisions VIIf+g, as used by Working Group.

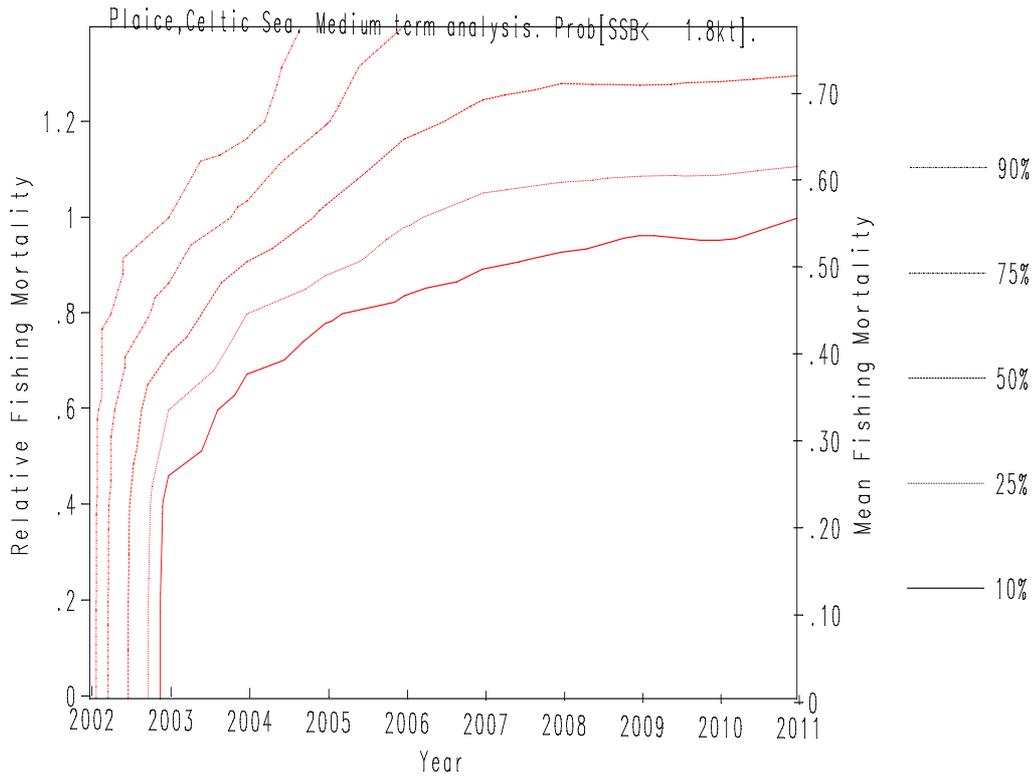
| Year | Belgium | France | Ireland | UK (Engl. & Wales) | Others | Total reported | Unallocated | Total as used by WG |
|------|---------|--------|---------|--------------------|--------|----------------|-------------|---------------------|
| 1977 | 214 | 365 | 28 | 150 | 0 | 757 | 0 | 757 |
| 1978 | 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 VII f 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 |

* GM₈₉₋₀₀



3.9.5 Sole in Divisions VIIIf 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 F_{pa} since the early 1980s, and is at present above F_{lim} . SSB has declined steadily since the early 1970s. SSB fell below B_{pa} in 1995 and has remained low until 2001, when the outstanding 1998 year class began to contribute and SSB

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

Technical basis:

| | |
|-------------------------|--|
| B_{lim} : Not defined | $B_{pa} : B_{loss}$ |
| $F_{lim} : F_{loss}$ | $F_{pa} : F_{lim} \times 0.72$; implies a less than 5% probability that ($SSB_{MT} < B_{pa}$) |

Advice on management: ICES recommends that the fishing mortality should be reduced to below 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 B_{pa} in the short term.

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.

Relevant factors to be considered in management: The assessment indicates a large 1998 year class, and SSB is

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, $F_{sq} = F(99-01, scaled)=0.63$; Landings(2002) = 1.07; SSB(2003) = 3.37.

| F(2003) | Basis | Landings (2003) | SSB (2004) |
|---------|--------------------------|-----------------|------------|
| 0.25 | $0.4 * F_{sq}$ | 0.89 | 3.77 |
| 0.31 | $0.5 * F_{sq}$ | 1.08 | 3.56 |
| 0.37 | $F_{pa} = 0.59 * F_{sq}$ | 1.24 | 3.37 |
| 0.44 | $0.7 * F_{sq}$ | 1.43 | 3.16 |
| 0.50 | $0.8 * F_{sq}$ | 1.59 | 2.99 |
| 0.57 | $0.9 * F_{sq}$ | 1.74 | 2.82 |
| 0.63 | $1.0 * F_{sq}$ | 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 B_{pa} after 5-10 years when the fishing mortality is reduced below F_{pa} from 2003 onwards. Assuming the current selection pattern, F_{max} is $0.39 * F_{sq}$.

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 Trevoze 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 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 Trevoze 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:

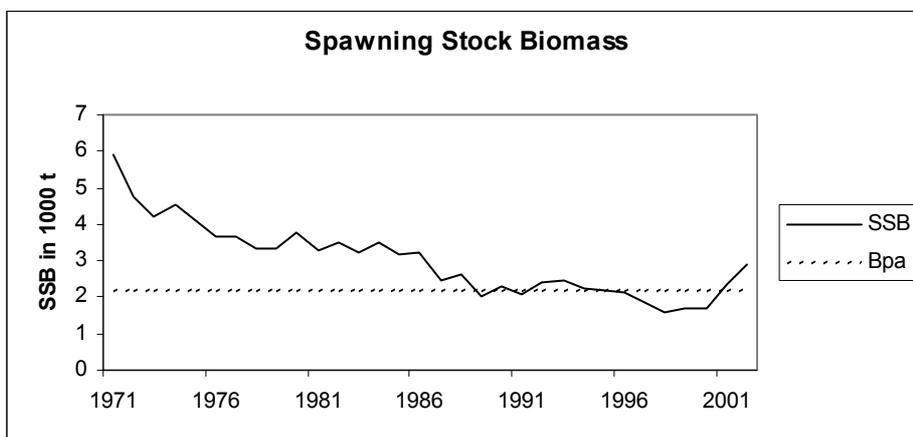
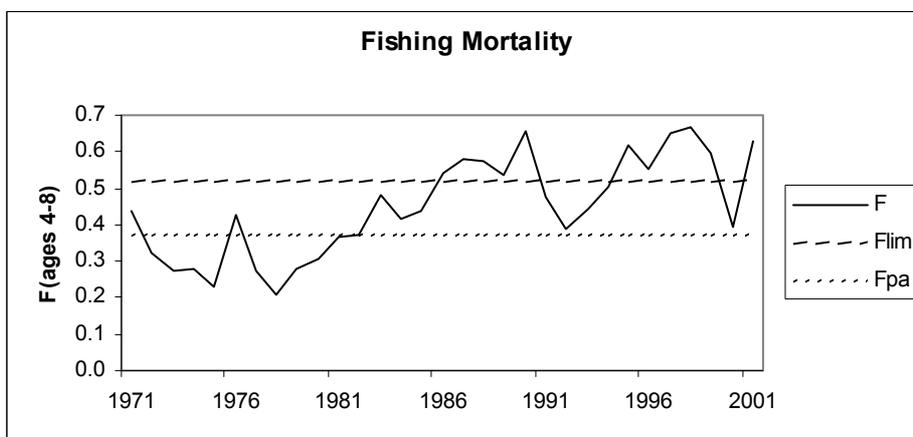
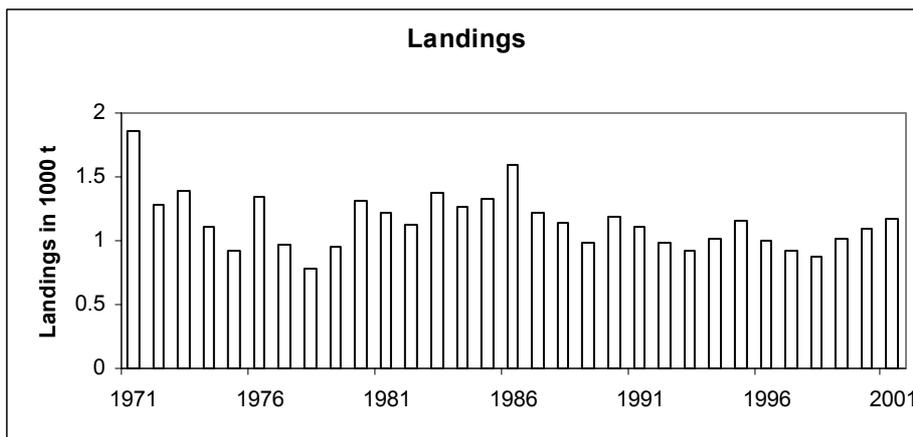
| | Fish Mort Ages 4-8 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.538 | 0.210 | 0.384 |
| F_{max} | 0.248 | 0.226 | 0.959 |
| $F_{0.1}$ | 0.117 | 0.205 | 1.885 |
| F_{med} | 0.345 | 0.222 | 0.664 |

Catch data (Tables 3.9.5.1-2):

| Year | ICES advice | Predicted catch corresp. to advice | Agreed TAC | ACFM Landings |
|------|------------------------------------|---------------------------------------|---------------|------------------|
| 1987 | <i>Status quo</i> 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 F_{pa} | 0.81 | 0.96 | 1.01 |
| 2000 | Reduce F below F_{pa} | <1.16 | 1.16 | 1.09 |
| 2001 | Reduce F below F_{pa} | <0.81 | 1.02 | 1.17 |
| 2002 | Reduce F below F_{pa} | <1.00 | 1.07 | |
| 2003 | Reduce F below F_{pa} | <1.24 | | |

Weights in '000 t.

Sole in Divisions VIIIf and g (Celtic Sea)



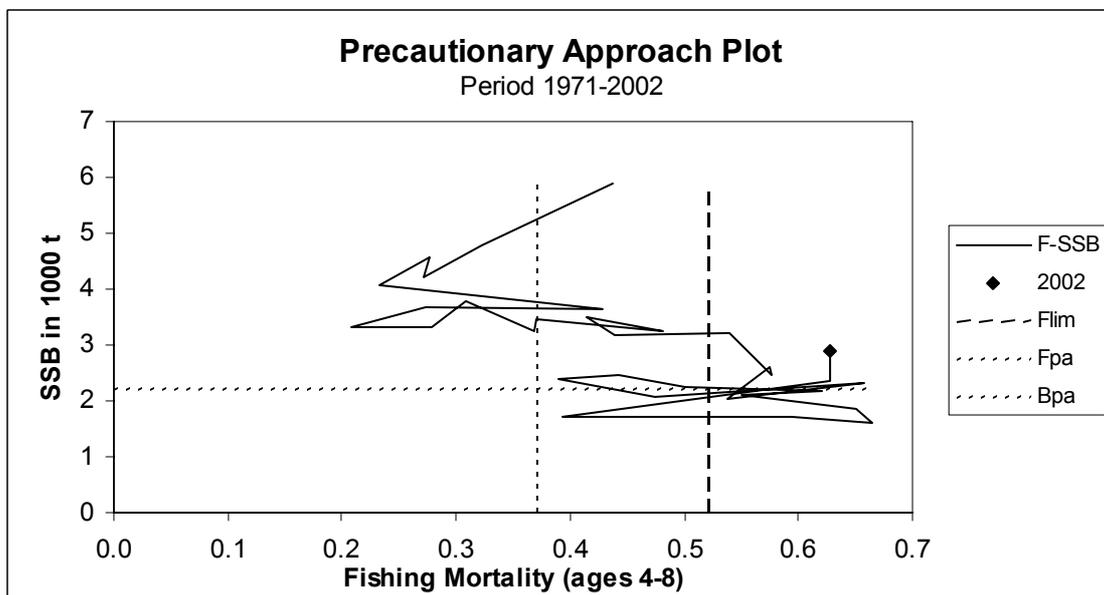
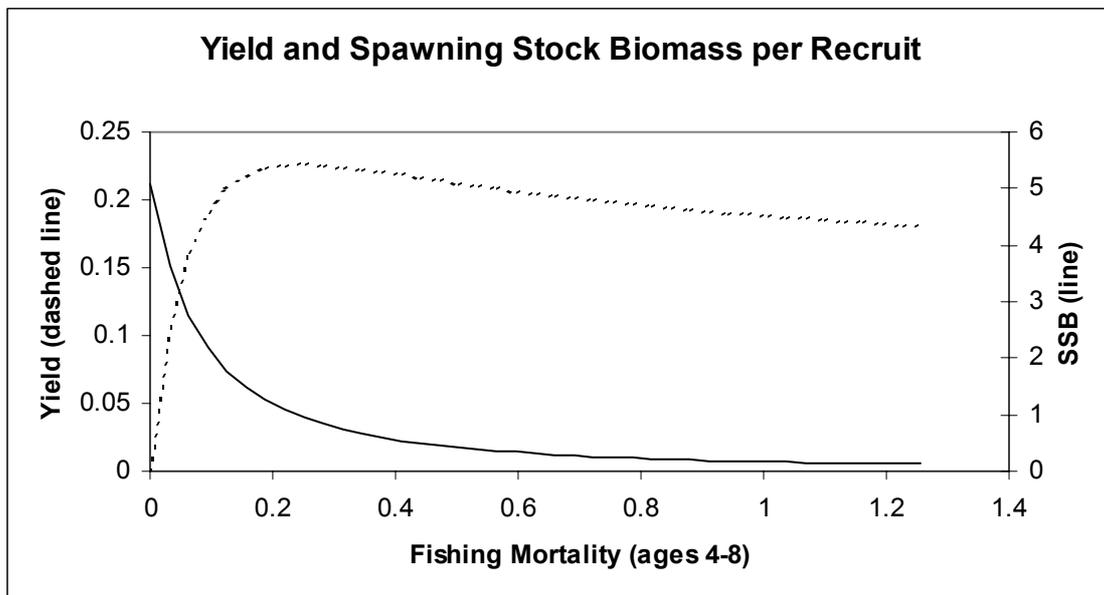
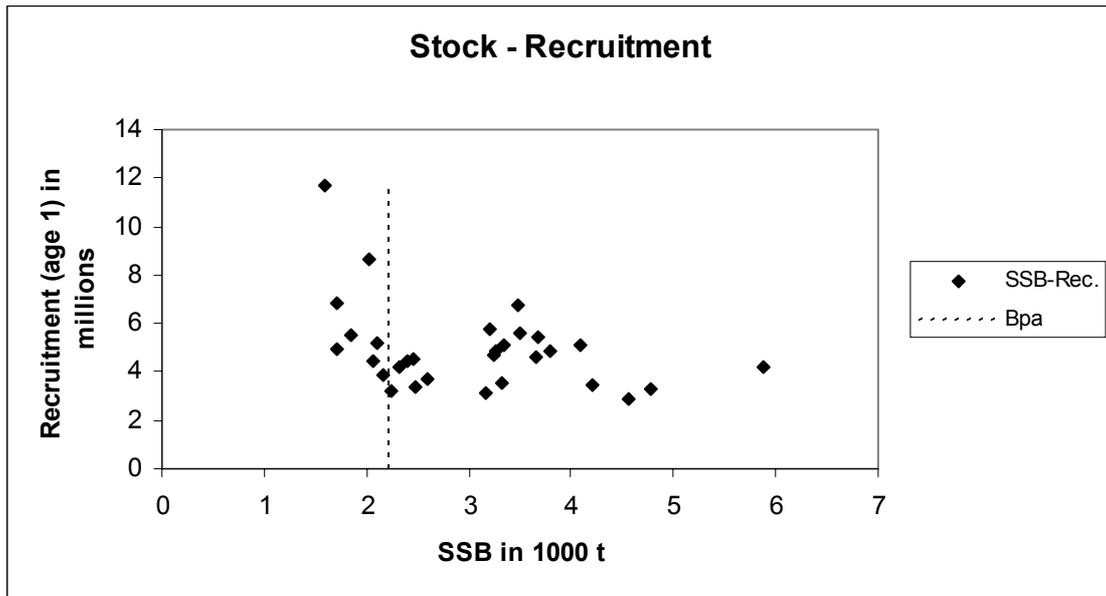


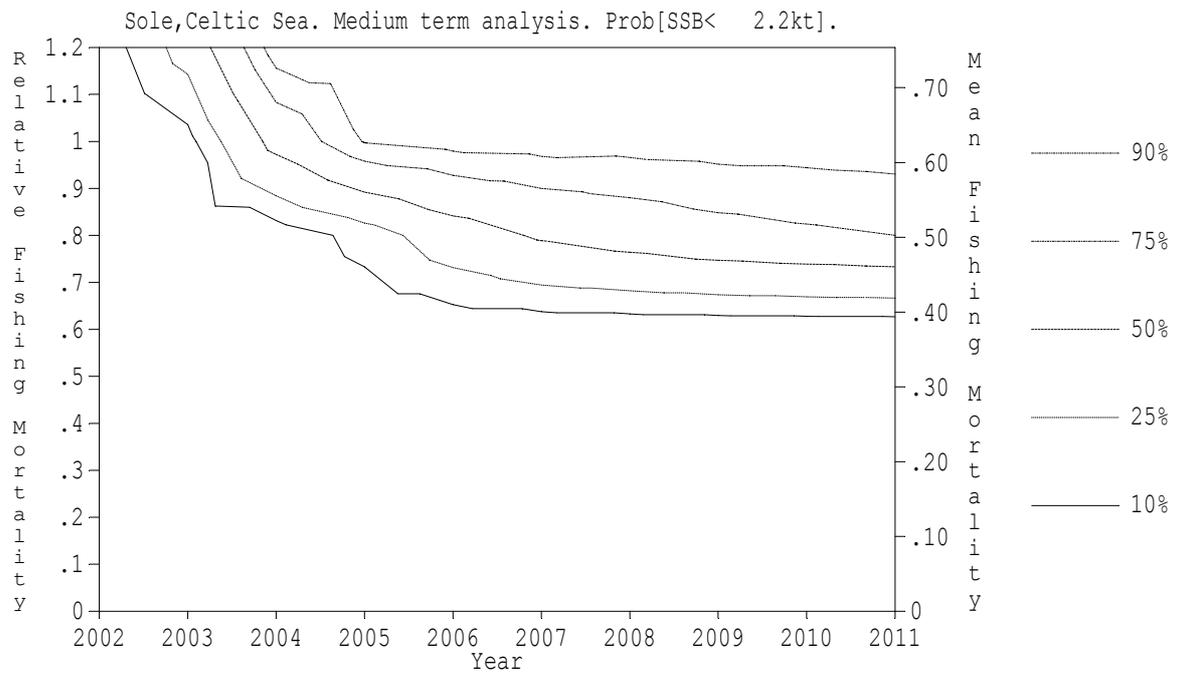
Table 3.9.5.1 Celtic Sea SOLE. Divisions VIIIf and VIIg. Nominal landings (t), 1986–2001.
Data used by the Working Group.

| 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 |

¹Preliminary.

Table 3.9.5.2 Sole in Divisions VIIIf 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 |



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 B_{pa} until 1995 and is currently close to B_{lim} . Fishing mortality increased in the

1980s and has fluctuated well above 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: |
|---|--|
| B_{lim} is 1 300 t, the lowest observed spawning stock biomass. | 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 B_{lim} , taking into account the uncertainty in assessments. |
| F_{lim} not defined | F_{pa} be set at 0.45. This F is considered to have a high probability of maintaining SSB above B_{pa} in the medium term, taking into account the uncertainty in assessments. |

Technical basis:

| | |
|------------------------|--|
| $B_{lim}=B_{loss}$ | $B_{pa} = MBAL$ |
| $F_{lim}=Not\ defined$ | $F_{pa} = low\ probability\ that\ (SSB_{MT} < B_{pa})$ |

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 B_{pa} in five years with around 50% probability. This advice is consistent with the advice for sole in Division VIIe.

The TAC for plaice in the Channel is set for Divisions VIIe combined, so the results from this assessment need to be considered along with those for the much larger Division VIIe stock. Given that the Division VIIe 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.

Relevant factors to be considered in management:

Only a complete closure of the fishery would be required to bring SSB above 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.

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: $F(2002) = F_{sq} = F(99-01) = 0.63$; Landings (2002) = 0.90 ; SSB(2003) = 1.49.

| F(2003) | Basis | Landings (2003) | SSB(2004) |
|---------|--------------------------|-----------------|-----------|
| 0 | $0 * F_{sq}$ | 0 | 2.45 |
| 0.31 | $0.5 * F_{sq}$ | 0.53 | 1.96 |
| 0.38 | $0.6 * F_{sq}$ | 0.62 | 1.88 |
| 0.44 | $0.7 * F_{sq}$ | 0.70 | 1.80 |
| 0.45 | $F_{pa} = 0.72 * F_{sq}$ | 0.72 | 1.78 |
| 0.50 | $0.8 * F_{sq}$ | 0.78 | 1.72 |
| 0.56 | $0.9 * F_{sq}$ | 0.86 | 1.65 |
| 0.63 | $1.0 * F_{sq}$ | 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, F_{max} is 40% of 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:

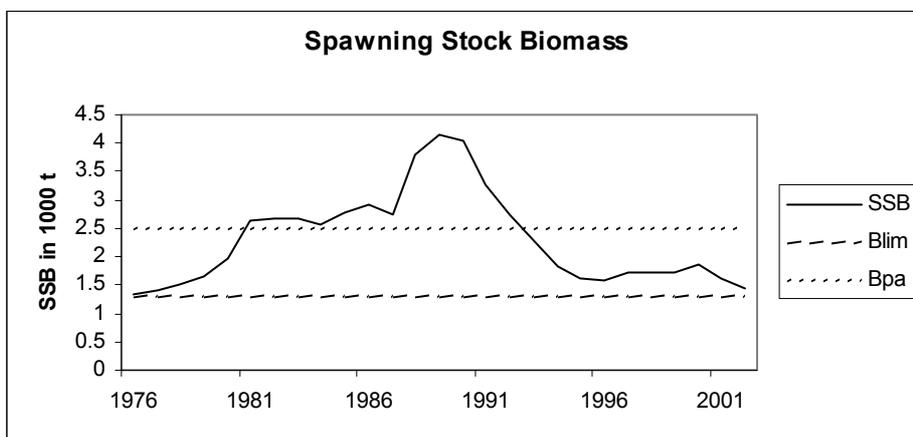
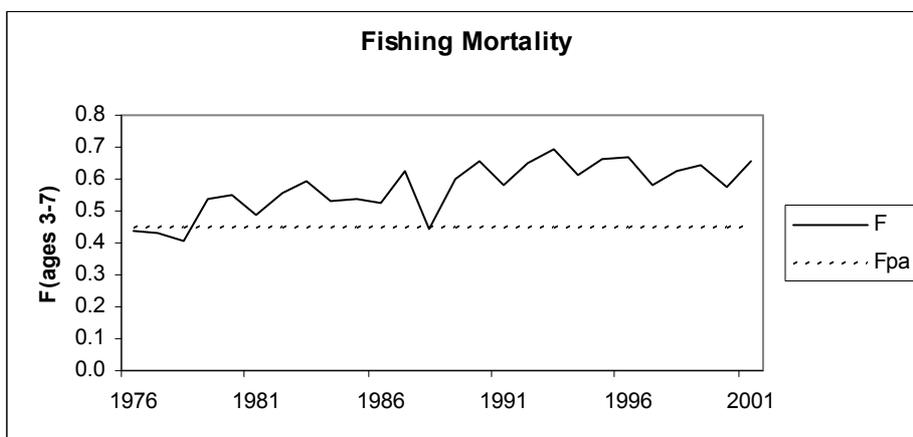
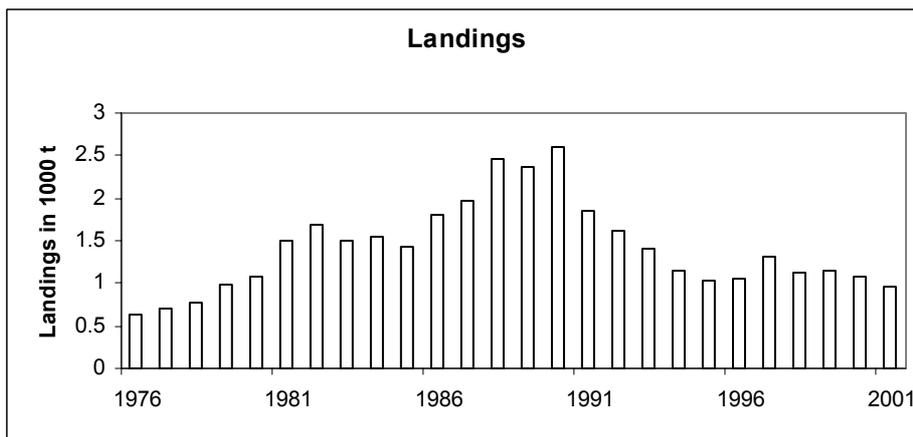
| | Fish Mort Ages 3-7 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.628 | 0.257 | 0.409 |
| F_{max} | 0.248 | 0.277 | 1.066 |
| $F_{0.1}$ | 0.114 | 0.251 | 2.054 |
| F_{med} | 0.567 | 0.260 | 0.455 |

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 F_{pa} | 1.1 ² | 7.4 | 1.15 | 1.15 |
| 2000 | Reduce F below F_{pa} | < 1.08 ² | 6.5 | 1.10 | 1.08 |
| 2001 | Reduce F below F_{pa} | < 0.93 | 6.0 | 0.96 | 0.97 |
| 2002 | Reduce F below F_{pa} | < 0.89 | 6.7 | | |
| 2003 | At least 50% reduction in F | < 0.53 | | | |

¹TACs for Divisions VII d,e. ²For Division VII e only. Weights in '000 t.

Plaice in Division VIIe (Western Channel)



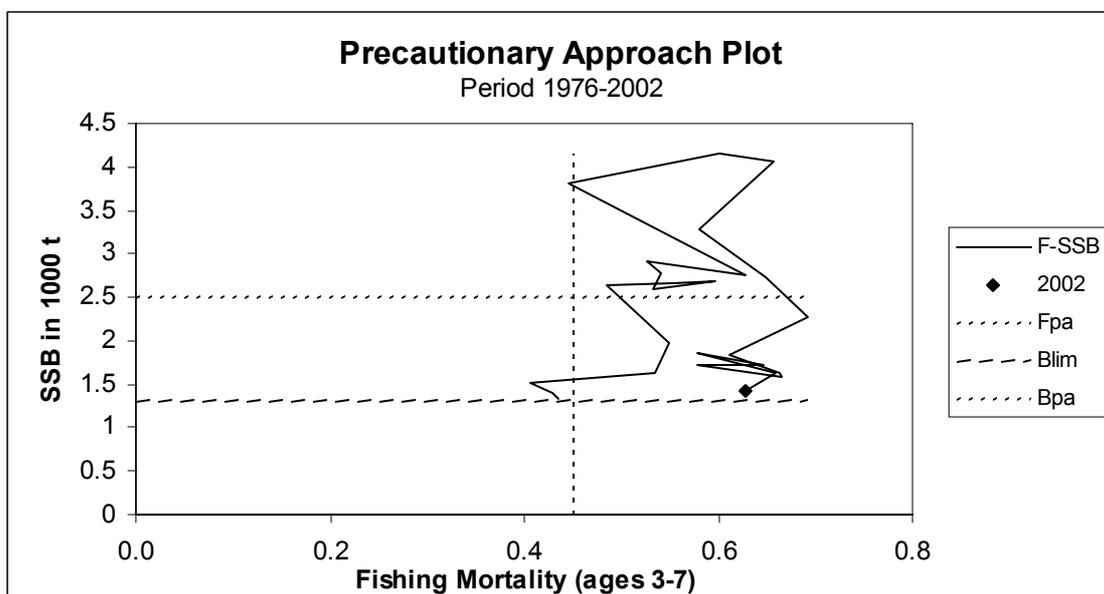
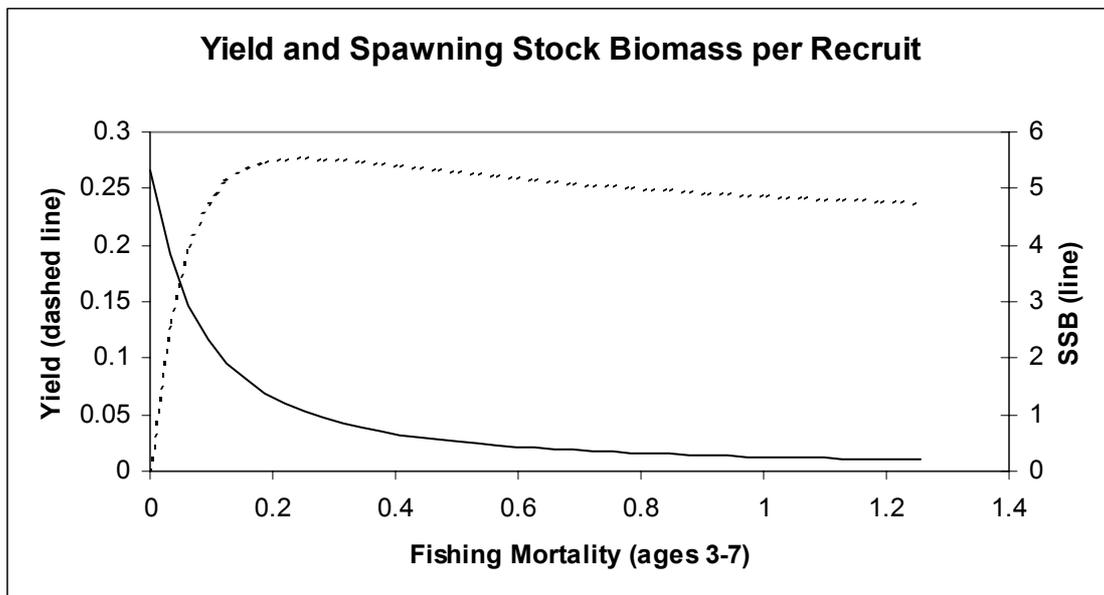
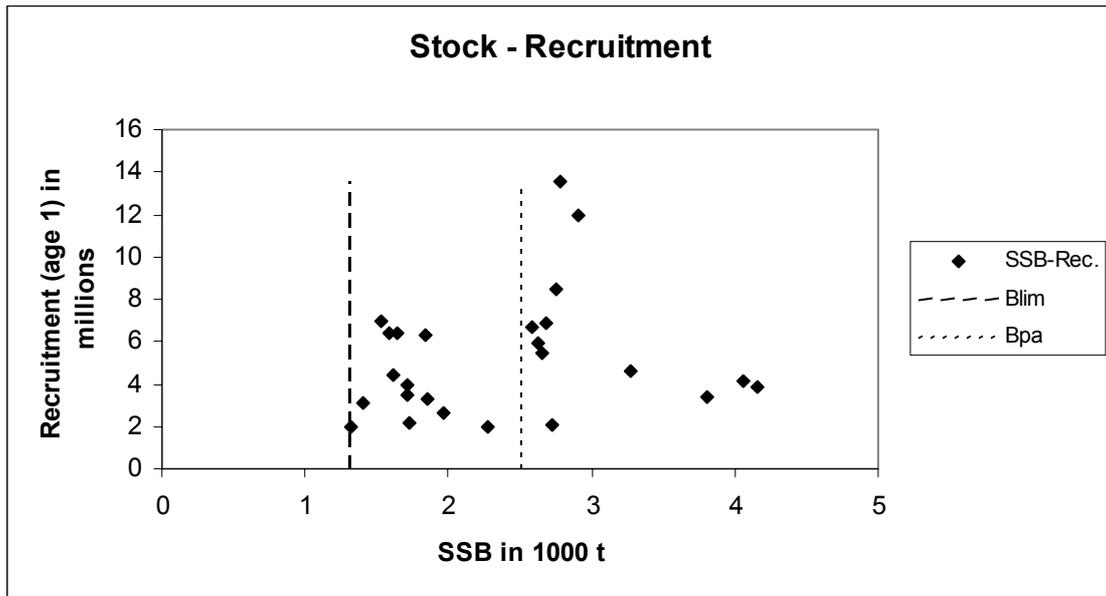


Table 3.9.6.1 Western Channel Plaice. Nominal landings (t) in Division VIIe, as used by Working Group.

| 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 |

¹Estimated by the Working Group.²Divisions VIIId,e = 4,739 t.³Included in Division VIIId.

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 B_{pa} and below B_{lim} since 2001. Fishing mortality has been above 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: |
|---|-----------------------------|
| B_{lim} is 2 000 t, the lowest observed spawning stock biomass. | B_{pa} be set at 2 800 t. |
| F_{lim} is 0.28, the fishing mortality estimated to lead to potential stock collapse. | F_{pa} be set at 0.2. |

Technical basis:

| | |
|----------------------|--|
| $B_{lim} = B_{loss}$ | B_{pa} : historical development: Biomass below this has increased risk of reduced recruitment. |
| $F_{lim} = F_{loss}$ | $F_{pa}: F_{lim} * 0.72$ |

Advice on management: In the light of SSB being below B_{lim} , ICES recommends a recovery plan until the safe and rapid recovery of SSB to a level in excess of B_{pa} . If a recovery plan is not implemented, ICES recommends that fishing mortality should be reduced to the lowest possible level.

Relevant factors to be considered in management: Even a complete closure of the fishery is not expected to rebuild SSB above 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.

Rebuilding plan: To rebuild SSB to B_{pa} in 2006 with 50% probability requires an immediate and sustained reduction of fishing mortality by 50%. These results assume F_{sq} in 2002. Given the state of the stock, the most rapid possible rebuilding to B_{pa} is strongly advised.

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 | $F_{pa} (0.5 * F_{sq})$ | 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: F_{max} is poorly determined as the yield-per-recruit curve is flat-topped. There is a high probability that SSB will remain below B_{pa} in the medium term at 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 |
| F_{max} | 0.379 | 0.208 | 0.523 |
| $F_{0.1}$ | 0.109 | 0.179 | 1.485 |
| F_{med} | 0.246 | 0.205 | 0.782 |

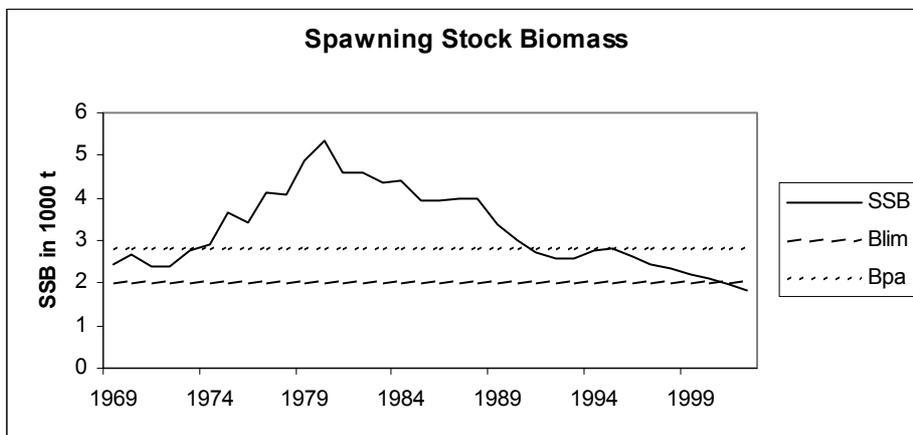
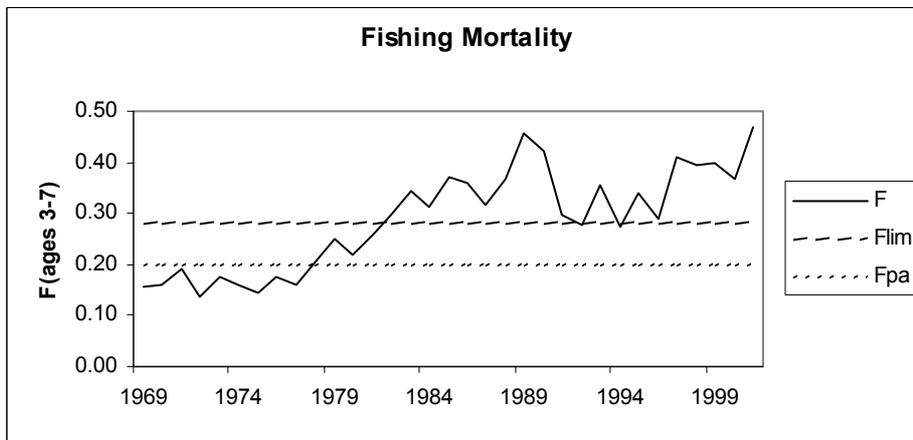
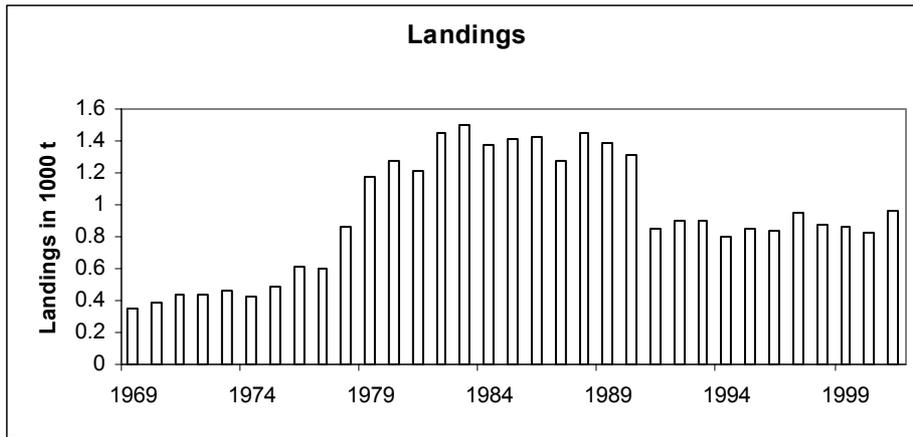
Catch data (Tables 3.9.7.1-2):

| 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 F_{pa} | 0.67 | 0.70 | 0.66 | 0.66 | 0.87 |
| 2000 | Reduce F below F_{pa} | < 0.64 | 0.64 | 0.65 | 0.65 | 0.82 |
| 2001 | Reduce F below F_{pa} | < 0.58 | 0.60 | 0.62 | 0.64 | 0.96 |
| 2002 | Reduce F below F_{pa} | < 0.45 | 0.53 | | | |
| 2003 | Rebuilding plan or F=0 | - | | | | |

Weights in '000 t.

- a) Original
- b) Includes misallocated landings

Sole in Division VIIe (Western Channel)



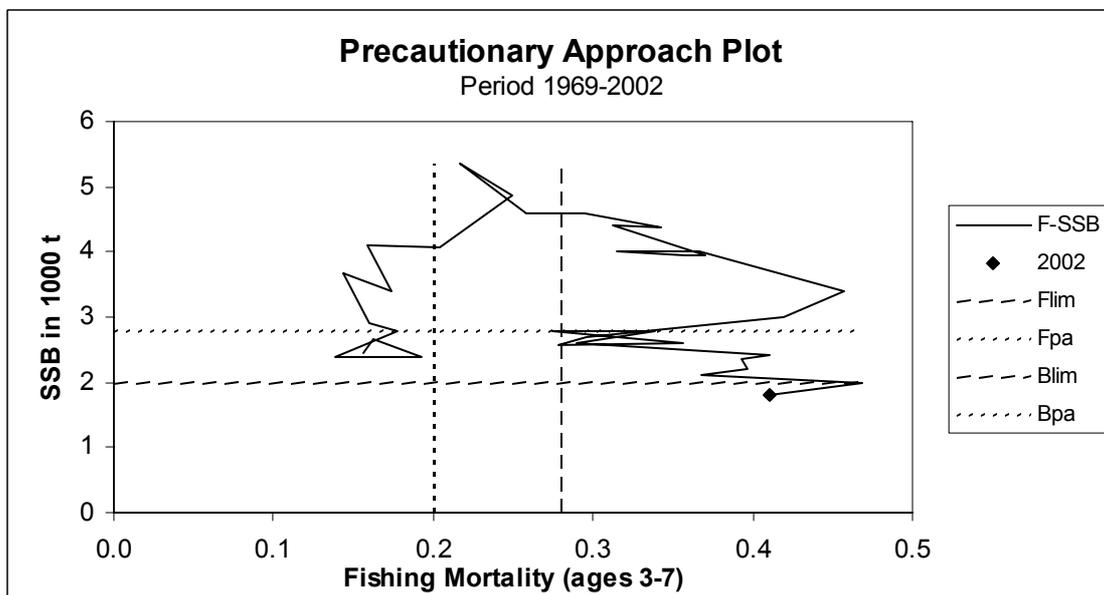
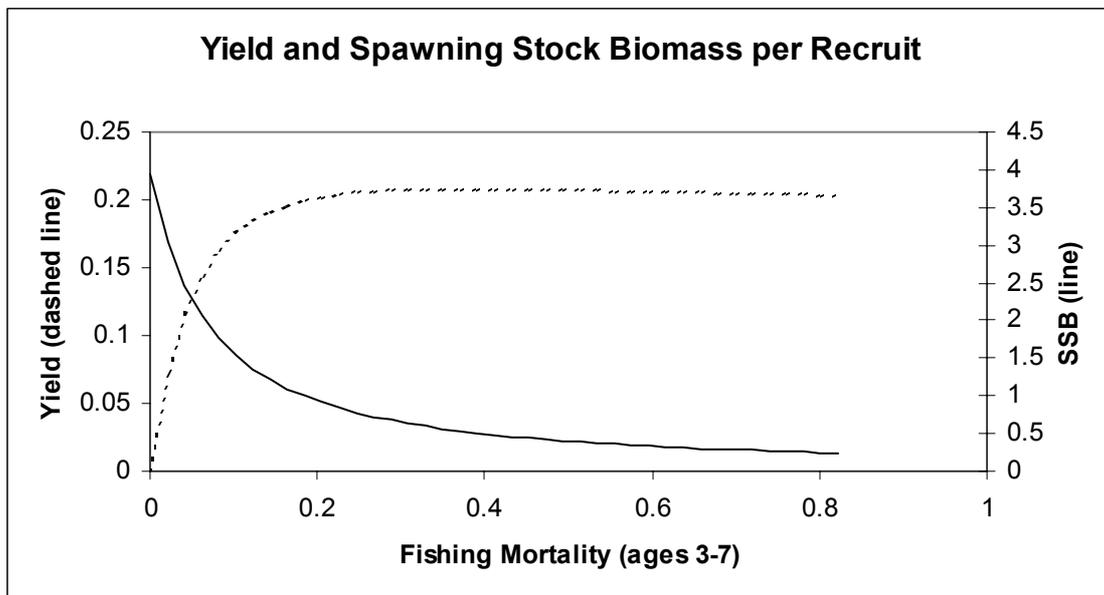
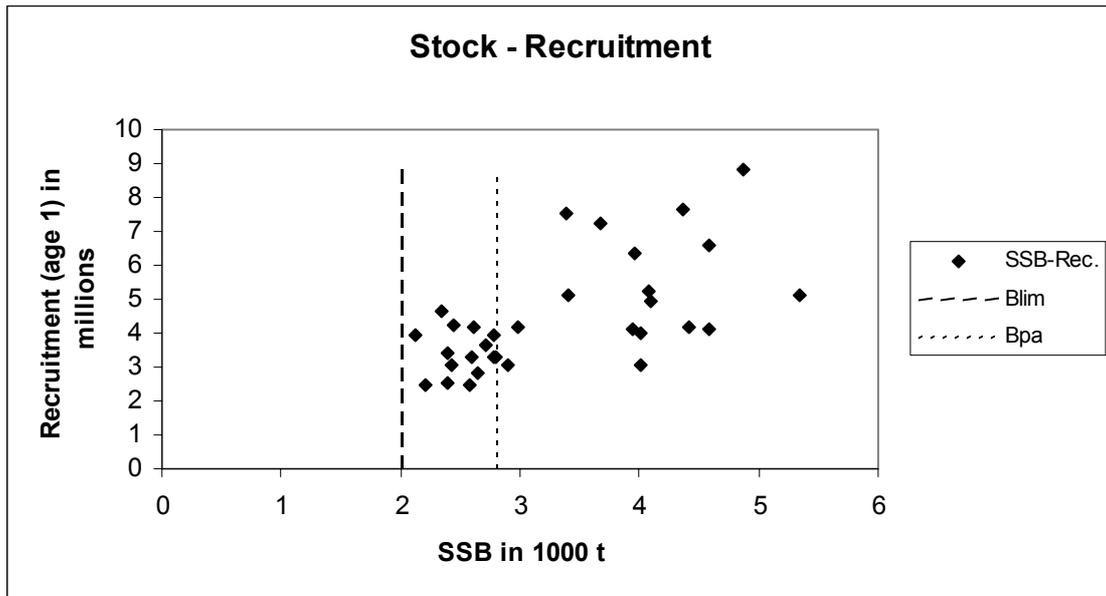


Table 3.9.7.1 Division VIIe Sole. Nominal landings (t), 1972–2001 used by Working Group.

| 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 |

¹Estimated from Division VIIId,e total by the Working Group.²Estimated by the Working Group.³Provisional.⁴United 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 |

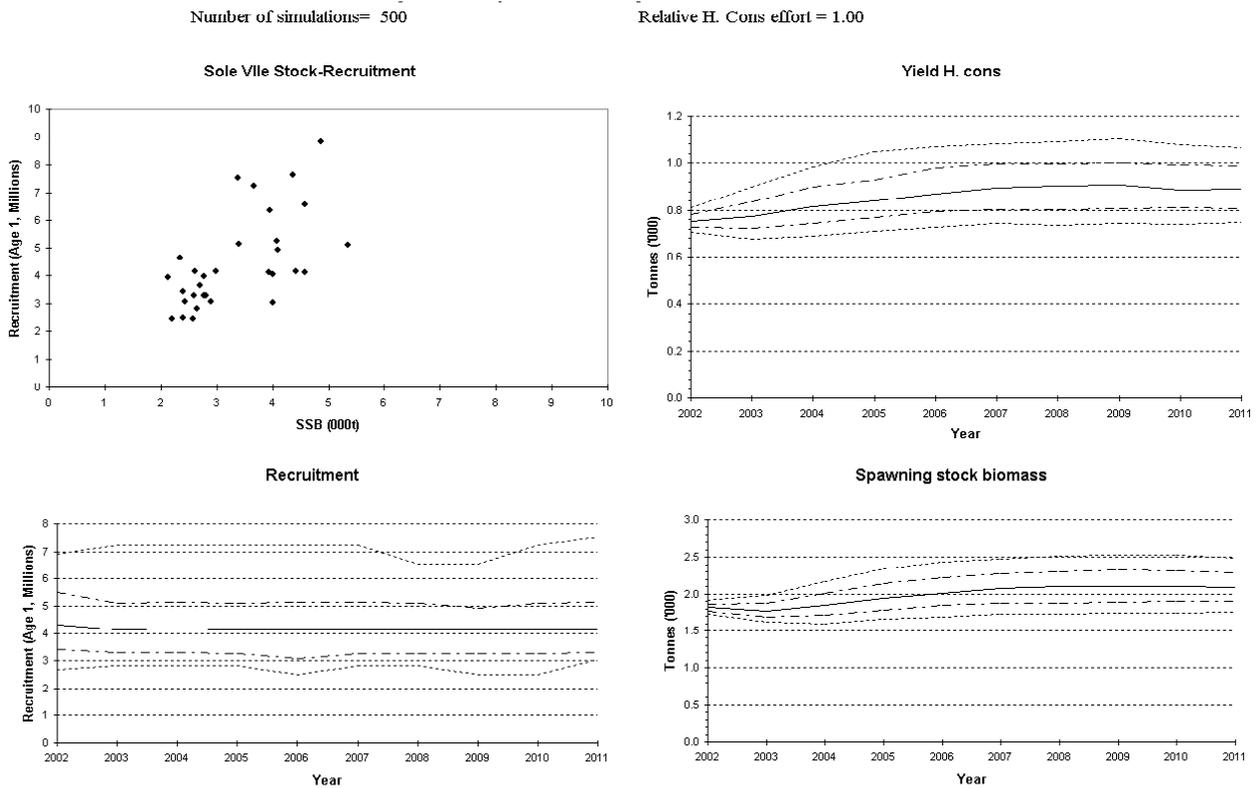


Figure 3.9.7.1 Sole in Vlle Western Channel. Medium term projections. Solid lines show 10, 25, 50, 75 and 90th percentiles. Stock recruitment relationship estimated by random bootstrap.

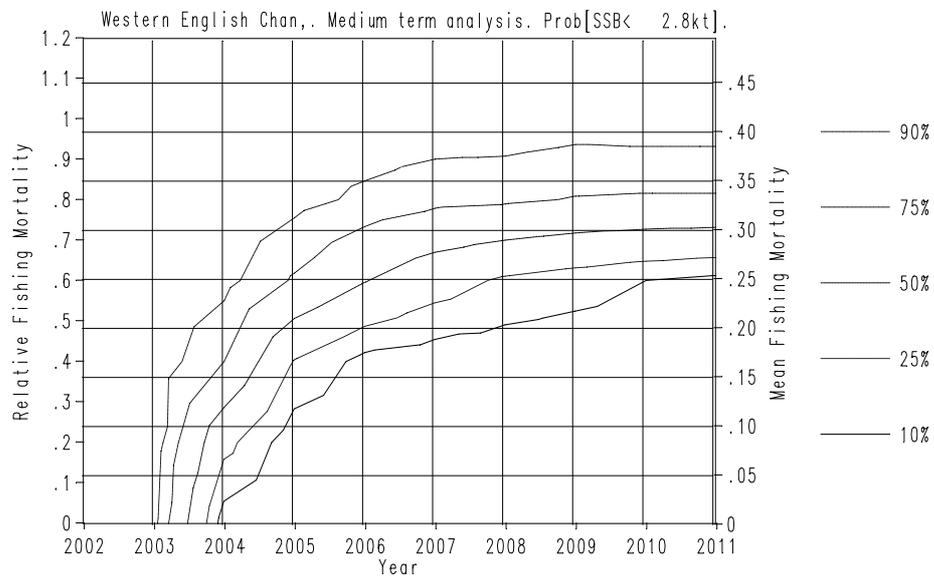
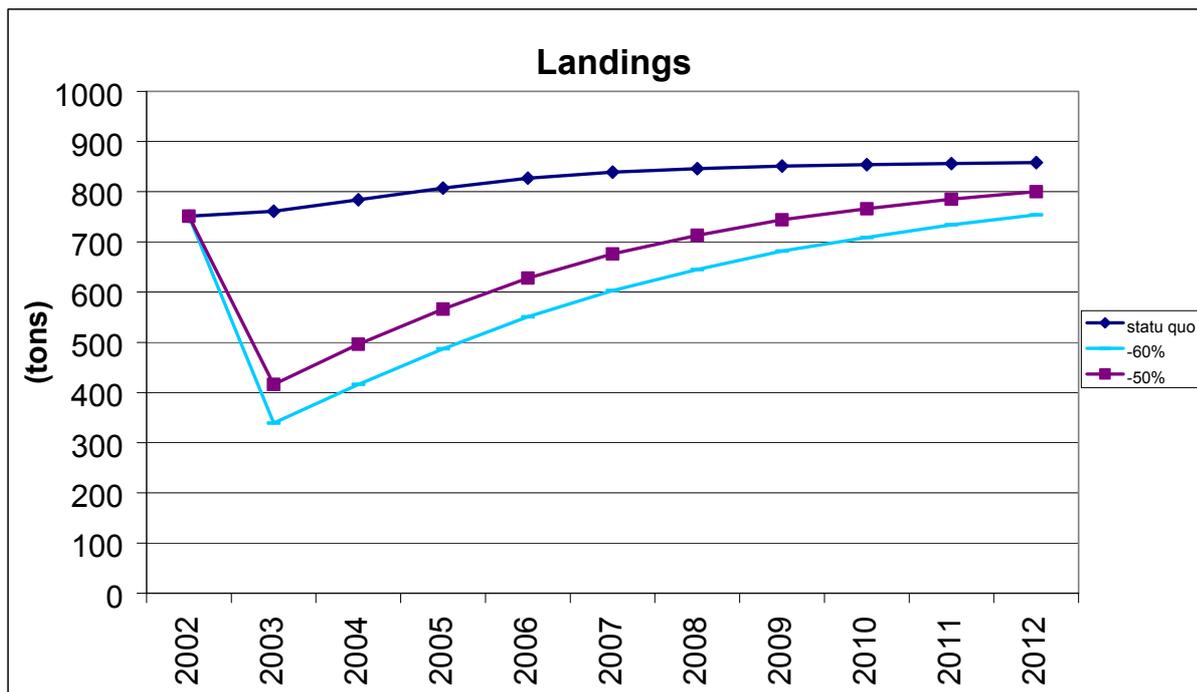
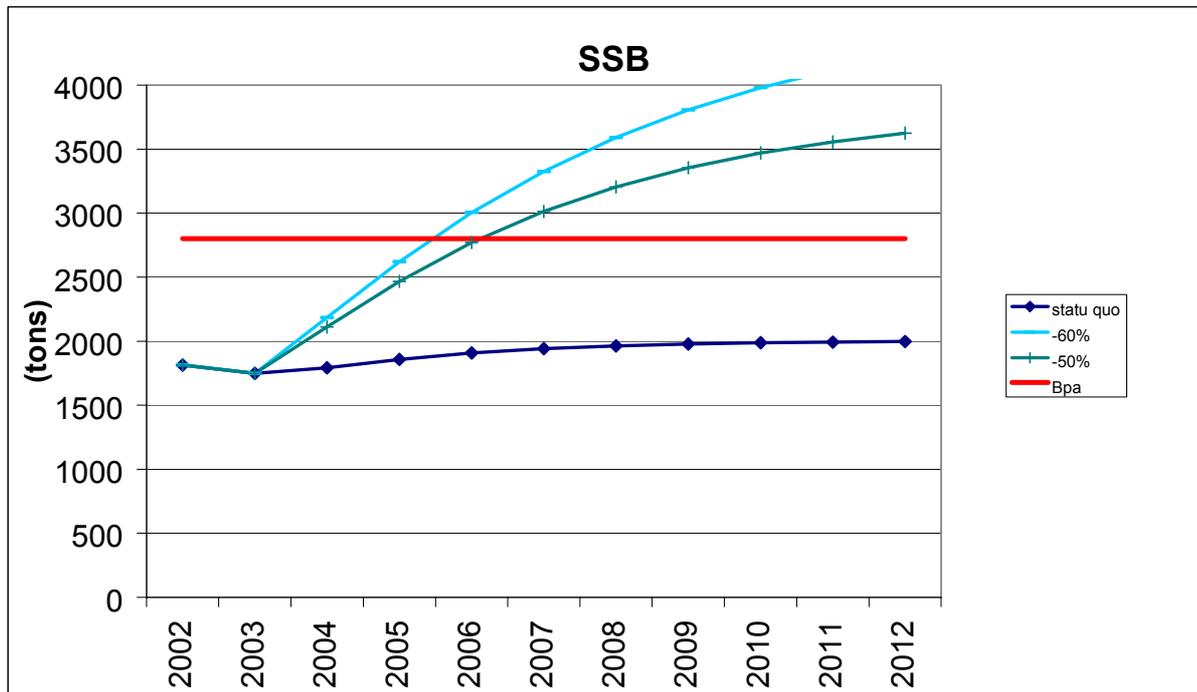


Figure 3.9.7.2 Medium-term projections contour plot (bootstrapped recruitment). Medium-term projection starting in 2002 based on constant fishing mortality from 2002 and onwards; Fishing mortality is expressed as the fishing mortality relative to F_{sq} .

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 F_{lim} since 1997. SSB has remained relatively stable up to 1995, but has decreased sharply since then, and has been below 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: |
|--|---|
| B_{lim} not defined. | B_{pa} be set at 13 000 t. The probability of reduced recruitment increases when SSB is below 13 000 t. |
| $F_{lim} = 0.5$, the fishing mortality estimated to lead to potential stock collapse. | $F_{pa} = 0.36$ |

Technical basis:

| | |
|---|--|
| B_{lim} : Not defined. | $B_{pa} \sim$ historical development of the stock [lowest observed for the converged part of the VPA, i.e. the most recent years are not included] |
| F_{lim} : based on historical response of the stock | $F_{pa} = F_{lim} * 0.72$ |

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 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.

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.

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.

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.

Even a fishing mortality of zero in 2003 would not allow SSB to reach B_{pa} by 2004. However, a rebuilding plan could achieve this goal in 3 years. Fishing mortality of around 0.3 (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).

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.

An immediate reduction in F of 50% would require one year more to rebuild SSB above B_{pa} . Given the state of the stock, and the risk of impaired recruitment, this is not in accordance with the precautionary approach.

Catch forecast for 2003:

Basis: $F(2002) = F_{sq} = F(99-01, \text{scaled}) = 0.74$; 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 | $F_{pa} = 0.5 F_{sq}$ | 2.3 | 8.9 |
| 0.42 | $F = 0.57 F_{sq} (+ 30\% \text{ SSB})$ | 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 $SSB > B_{pa}$ 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:

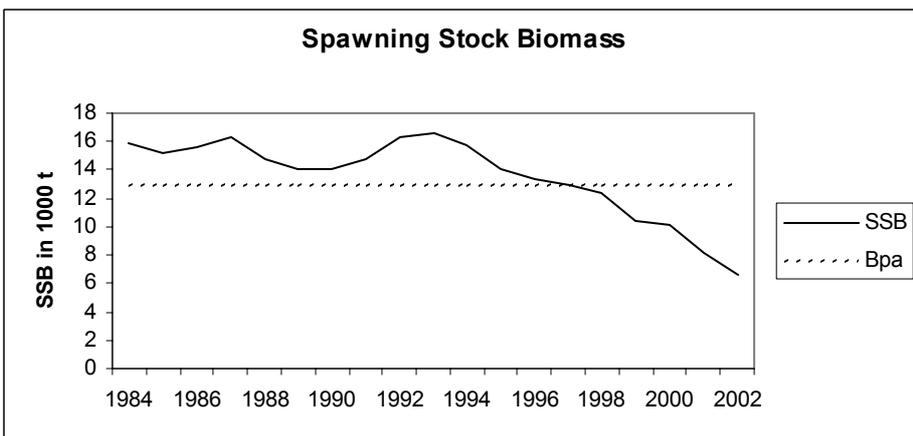
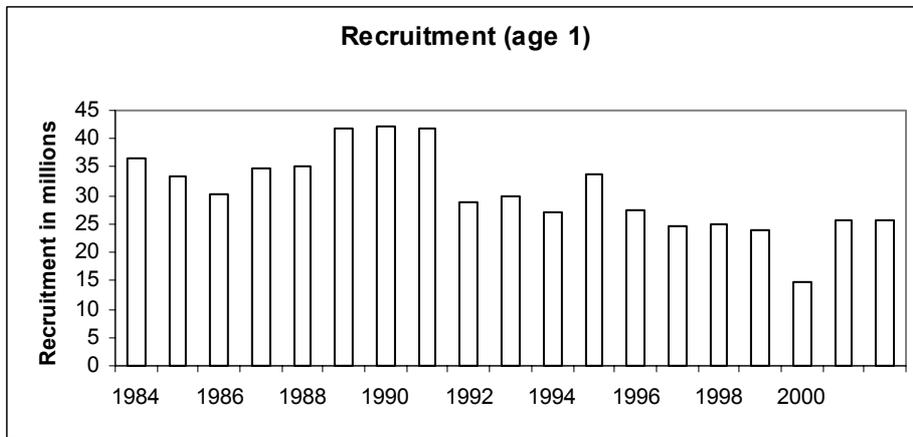
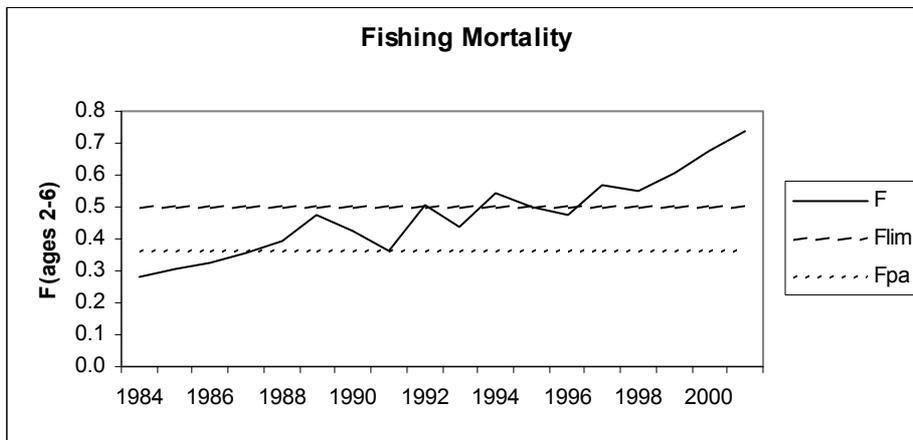
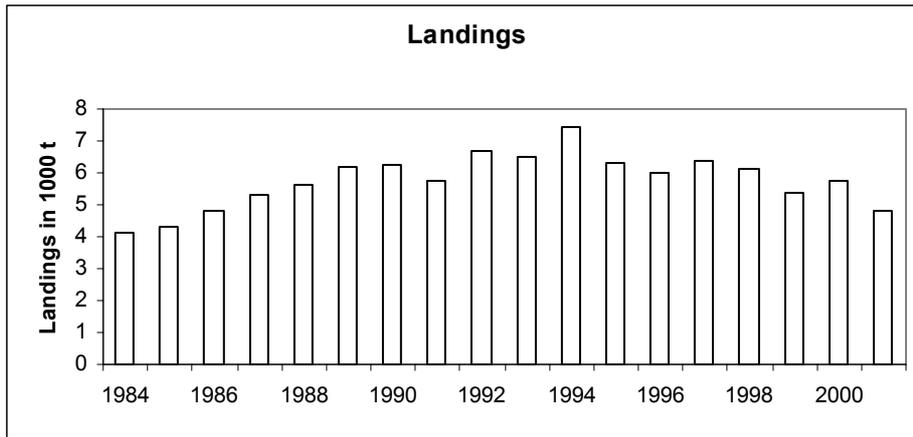
| | Fish Mort Ages 2-6 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.673 | 0.176 | 0.310 |
| F_{max} | 0.190 | 0.209 | 1.021 |
| $F_{0.1}$ | 0.092 | 0.190 | 1.781 |
| F_{med} | 0.405 | 0.193 | 0.503 |

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 F _{pa} | < 5.0 | 5.4 | 3.8 ⁴ | 5.2 | 0.2 | 5.4 |
| 2000 | F at 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 | - | | | | | |

¹Not reported for all countries. ²Landings 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.

Sole in Divisions VIIIa,b (Bay of Biscay)



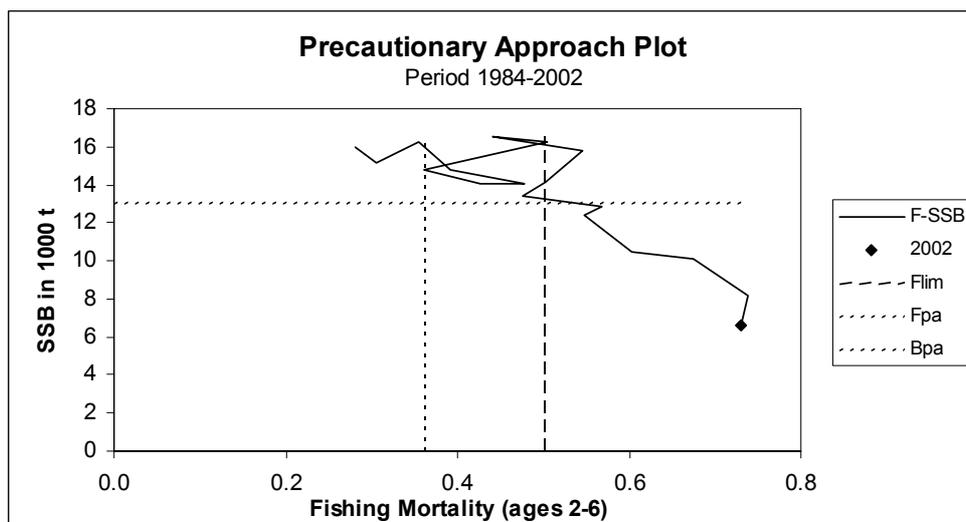
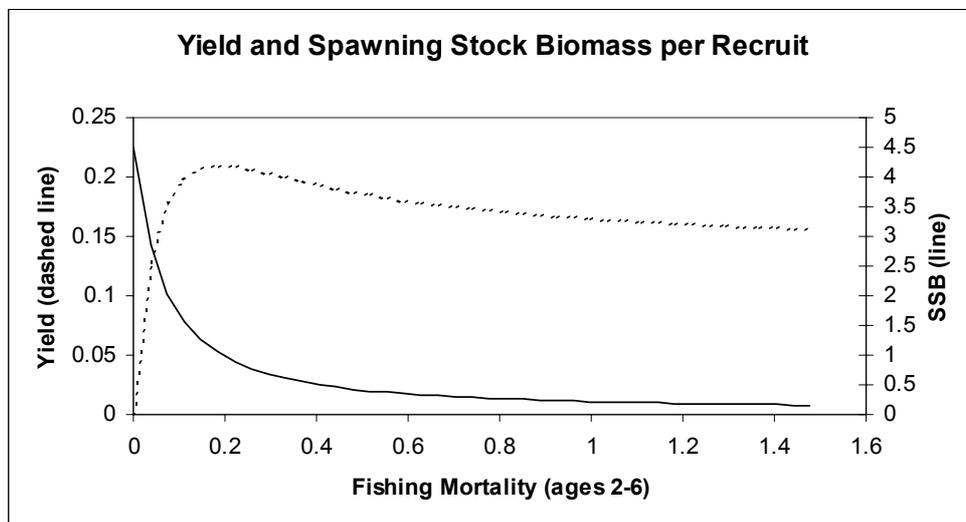
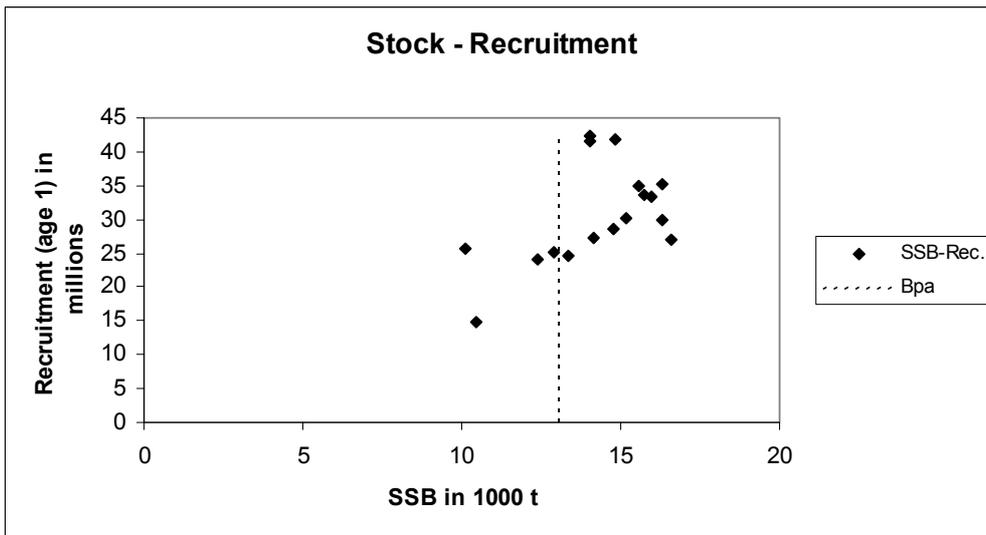


Table 3.9.8.1 Sole in Divisions VIIIa,b (Bay of Biscay). International landings and catches used by Working Group (in tonnes).

| 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.

¹Discards = 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 $F(2002) = F_{sq} = 0.74$.

F(2003) onwards = 1.0 * F_{sq} : Catches 2003 = 4.1

| | 25% | SSB | |
|------|-----|--------|-----|
| | | 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 * F_{sq} : Catches 2003 = 1.5

| | 25% | SSB | |
|------|-------------|-------------|-------------|
| | | 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 * F_{sq} : Catches 2003 = 2.0

| | 25% | SSB | |
|------|-------------|-------------|-------------|
| | | 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 * F_{sq} : Catches 2003 = 2.3

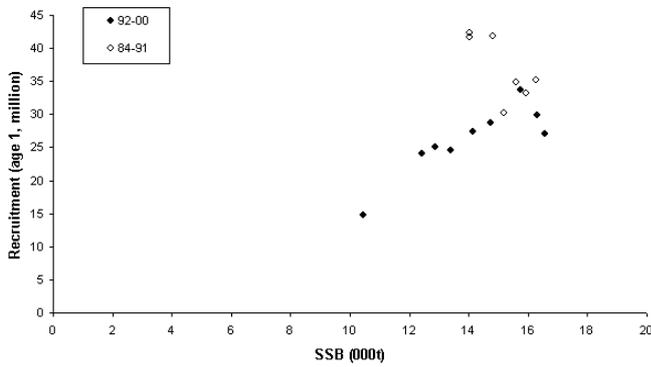
| | 25% | SSB | |
|------|------|-------------|-------------|
| | | Median | 75% |
| 2003 | 6.3 | 6.7 | 7.1 |
| 2004 | 8.5 | 9.0 | 9.6 |
| 2005 | 10.2 | 10.8 | 11.5 |
| 2006 | 11.5 | 12.1 | 12.8 |
| 2007 | 12.4 | 13.1 | 13.9 |

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).

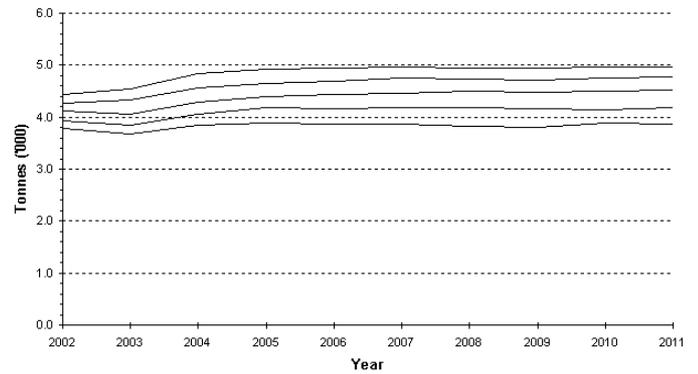
Number of simulations = 500

Relative H. Cons effort = 1.00

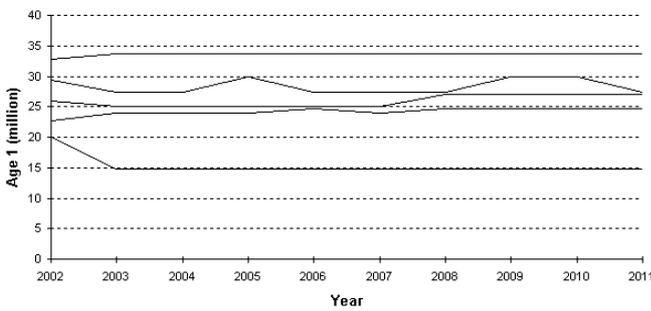
Sole VIIIab Stock-Recruitment



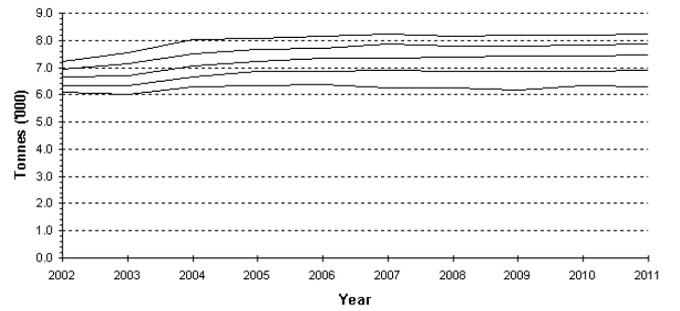
Yield H. cons



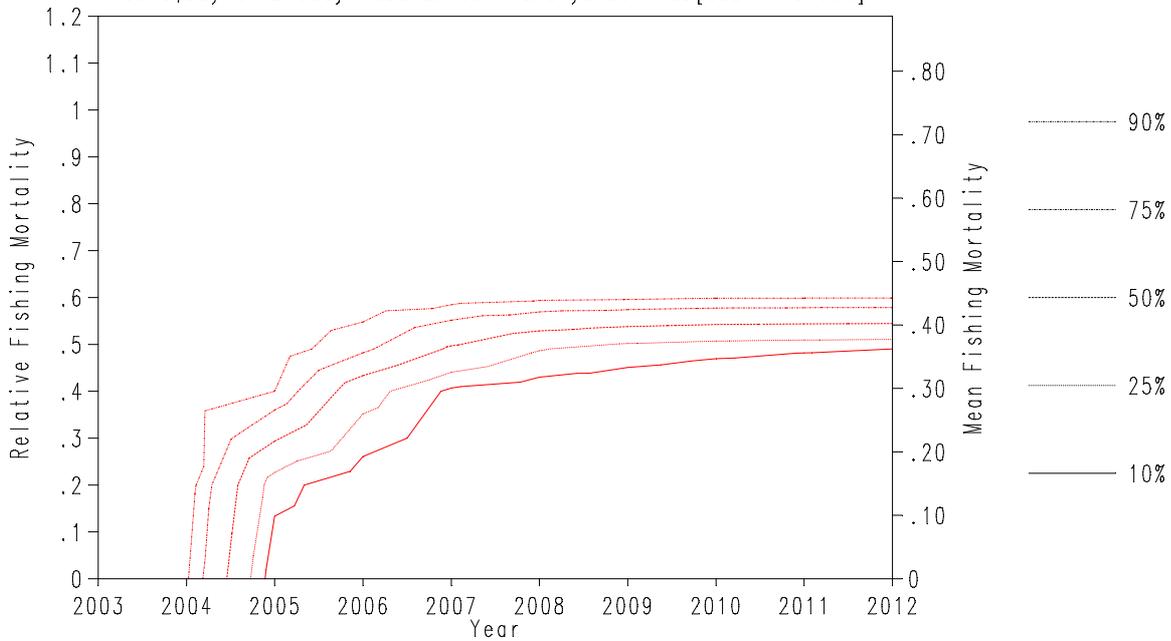
Recruitment



Spawning stock biomass



Sole, Bay of Biscay. Medium term analysis. Prob[SSB < 13.0kt].

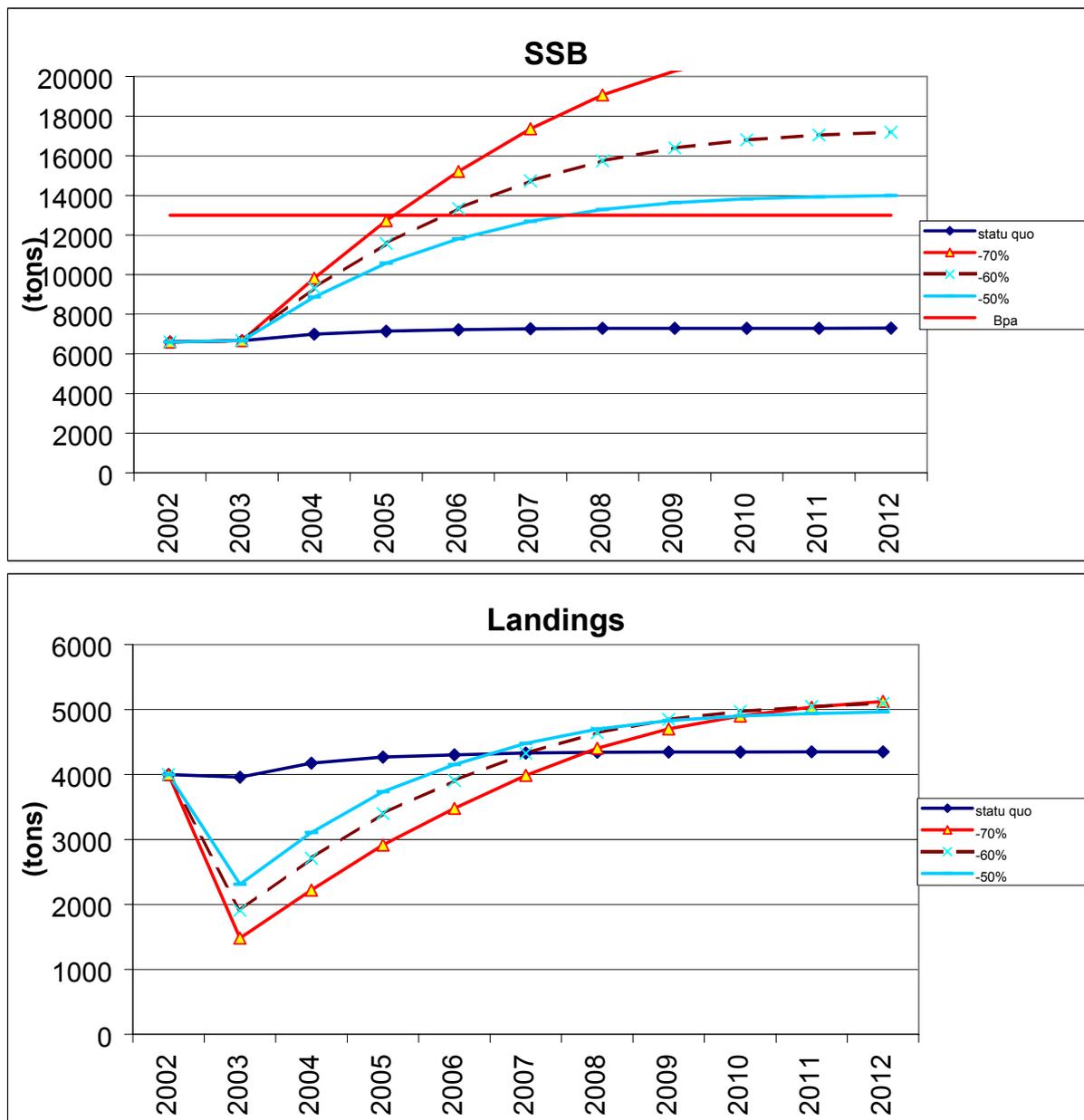


Medium-term projection starting in 2003 with population numbers from the status quo F catch forecast.

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: |
|-------------------------|-----------------------------|
| B_{lim} is 26 000 t | B_{pa} be set at 44 000 t |
| F_{lim} : not defined | F_{pa} : not defined |

Technical basis:

| | |
|---------------------------------------|---|
| B_{lim} : The lowest stock observed | B_{pa} : Low probability of low recruitment |
| F_{lim} : not defined | 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 known. 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 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 |
| F_{max} | N/A | | |
| $F_{0.1}$ | 0.128 | 0.030 | 0.218 |
| 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 1 st half of 2002 | 6.0 | 8 for Jan.- | | | |
| 2003 | Substantially less than recent catches | - | | | | |

¹By calendar year. ²Revised during 1996 after ACFM May meeting. Weights in '000 t.

Celtic Sea and Division VIIj herring

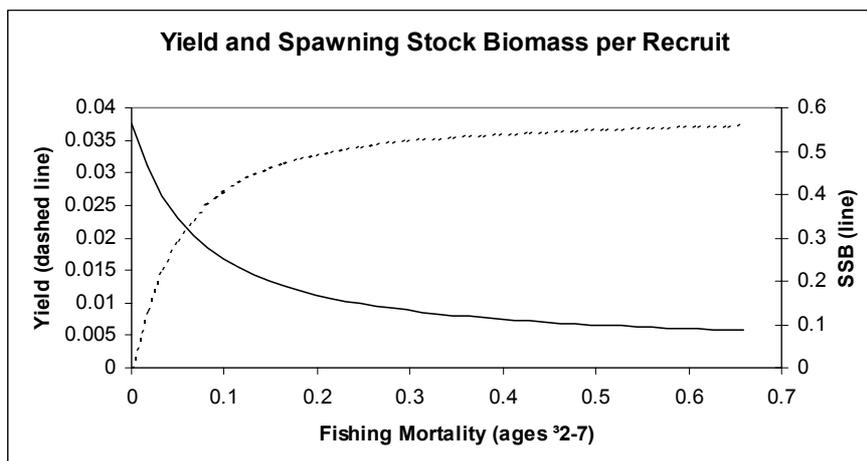
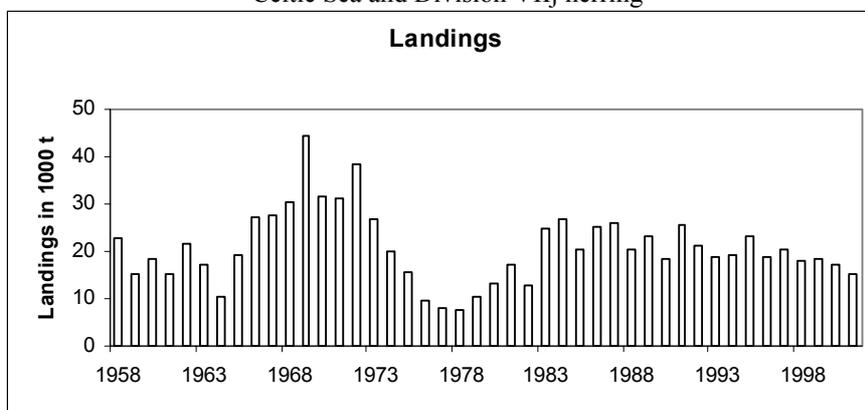


Table 3.9.9.1 Celtic Sea and Division VIIj Herring landings by calendar year (t), 1988-2001. (Data provided by Working Group members.)

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 |

¹Preliminary.

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 |

¹Preliminary.

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: |
|-------------------------|-----------------------------|
| B_{lim} is 26 000 t | B_{pa} be set at 44 000 t |
| F_{lim} : not defined | F_{pa} : not defined |

Technical basis:

| | |
|---------------------------------------|---|
| B_{lim} : The lowest stock observed | 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 B_{pa} in 2002. Fishing in 2002 at $F_{sq} = 0.44$, which is fairly high for a herring stock, will maintain SSB above B_{pa} . As stated in the ICES advice for 2001 $F \sim 0.35$ is close to likely candidate values for F_{pa} , and this will keep the stock above B_{pa} with a high probability.

Catch options for 2002:

| Basis | F(2002) | SSB(2002) | Landings (2002) | SSB(2003) with fishing at given level |
|--|---------|-----------|-----------------|---------------------------------------|
| $F(2002)=0.57 \cdot F_{2001}$ | 0.25 | 50 | 8 | 60 |
| $F(2002)=0.68 \cdot F_{2001}$ | 0.30 | 50 | 9 | 56 |
| $F(2002)=$ likely candidate for F_{pa} | 0.35 | 49 | 11 | 53 |
| $F(2002)=F_{sq}$ | 0.44 | 49 | 13 | 50 |
| $F(2002)=1.43 \cdot F_{2001}$ | 0.50 | 48 | 15 | 49 |
| $F(2002)=1.57 \cdot F_{2001}$ | 0.55 | 48 | 16 | 48 |
| $F(2002)=1.71 \cdot F_{2001}$ | 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 VIIId,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 | - | | |

¹Weights in '000 t.

Sprat in Divisions VIIId,e

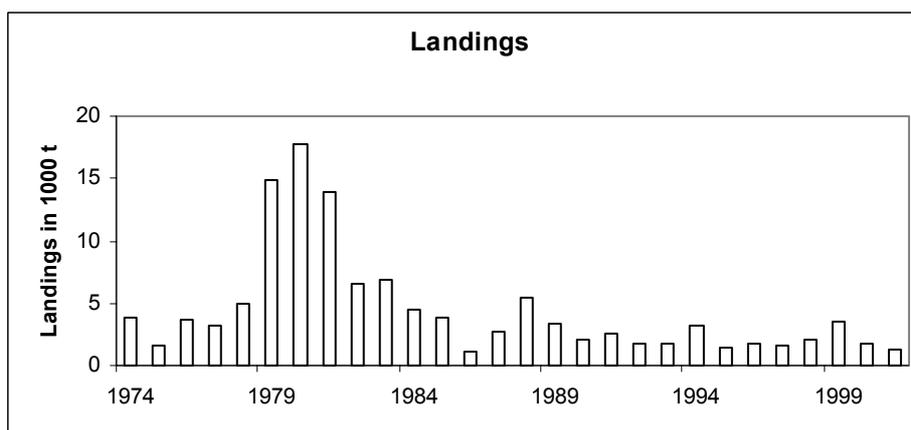


Table 3.9.10.1 Nominal catch of Sprat (t) in Divisions VIIId,e 1985–2001.

| 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 VIIId,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 B_{pa} . The fishing mortality has declined from the 1991 peak until 1997 and has increased since then to above 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: |
|---|--|
| B_{lim} is not defined | B_{pa} be set at 55 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and B_{pa} was therefore set equal to the lowest observed SSB. |
| F_{lim} is 0.44, the fishing mortality above which stock dynamics are unknown | F_{pa} be set at 0.30, the estimated F_{med} . This F is consistent with the proposed B_{pa} and it approximates F_{MSY} . |

Technical basis:

| | |
|--------------------------------|--|
| $B_{lim} = \text{Not defined}$ | $B_{pa} = B_{loss}$ |
| $F_{lim} = F_{loss}$ | $F_{pa} = F_{med}$; implies a less than 5% probability that $(SSB_{MT} < B_{pa})$ |

Advice on management: ICES recommends that fishing mortality should be reduced to below 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 F_{sq} | 11.1 | 9.5 | 79.0 |
| 0.21 | 0.6 F_{sq} | 13.1 | 11.2 | 76.7 |
| 0.24 | 0.7 F_{sq} | 15.0 | 12.8 | 74.4 |
| 0.28 | 0.8 F_{sq} | 16.9 | 14.4 | 72.2 |
| 0.30 | F_{pa} | 18.0 | 15.3 | 70.9 |
| 0.31 | 0.9 F_{sq} | 18.7 | 15.9 | 70.1 |
| 0.35 | 1 F_{sq} | 20.4 | 17.3 | 68.0 |
| 0.38 | 1.1 F_{sq} | 22.0 | 18.7 | 66.1 |
| 0.42 | 1.2 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 B_{pa} in 2007, at F_{pa} there is a 5% probability of SSB falling below 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 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:

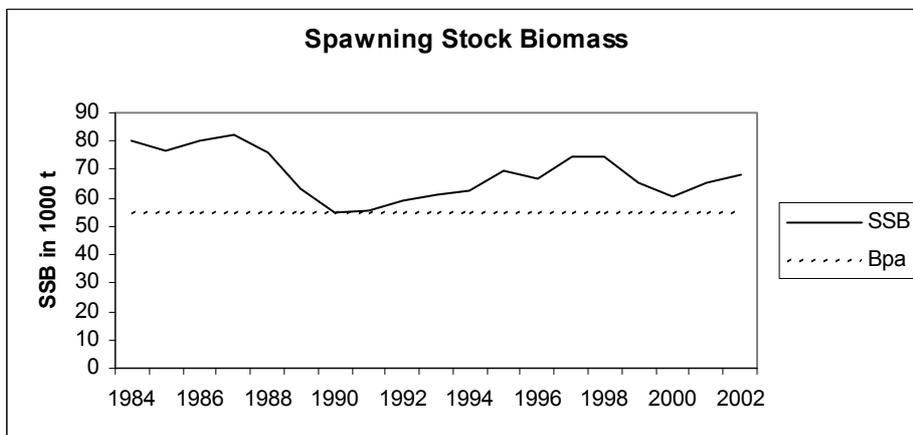
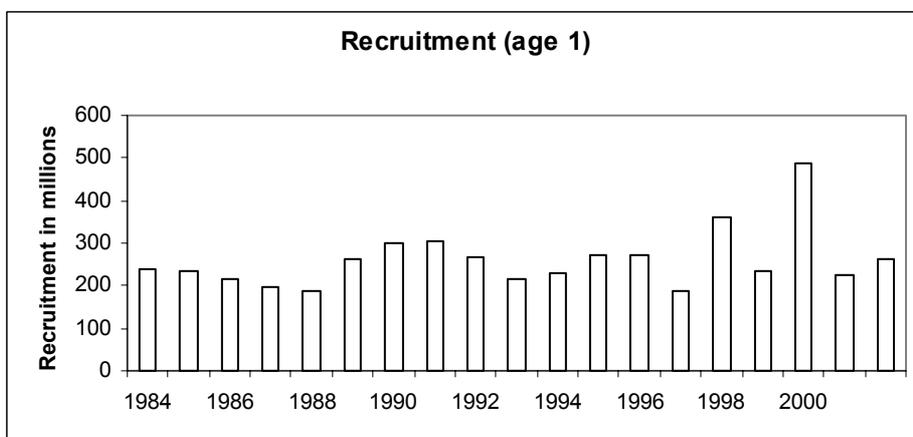
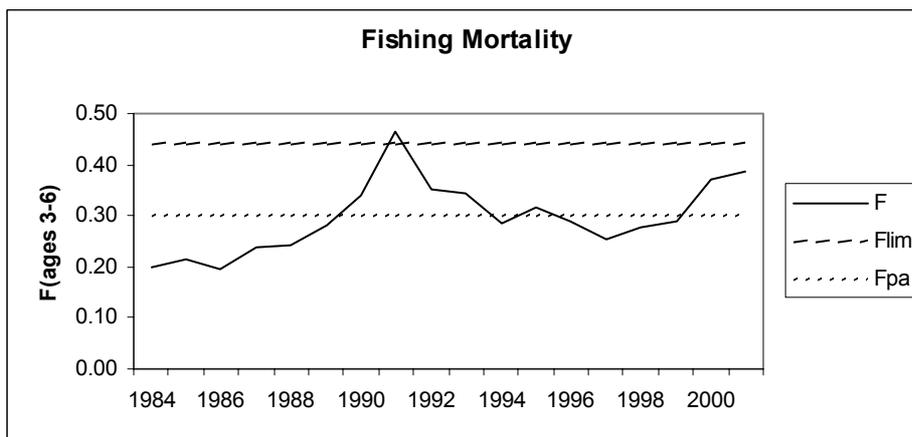
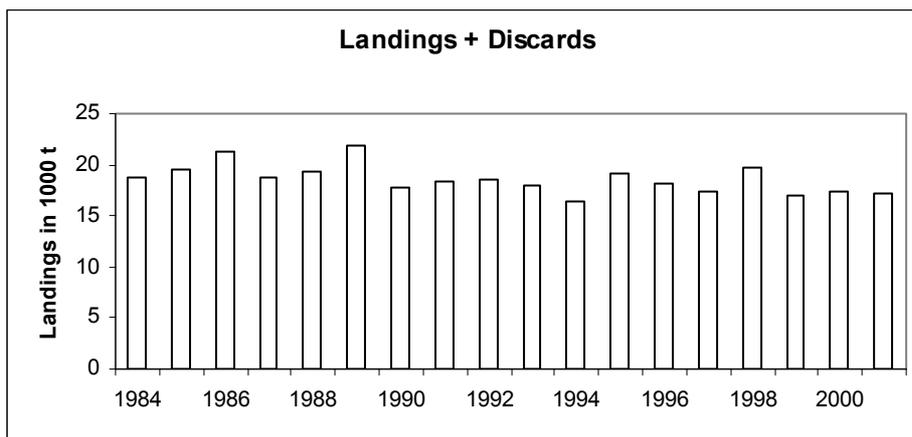
| | Fish Mort | Landings/R | SSB/R |
|-----------------|-----------|------------|-------|
| | Ages 3-6 | | |
| Average Current | 0.349 | 0.066 | 0.227 |
| F_{max} | 0.229 | 0.068 | 0.337 |
| $F_{0.1}$ | 0.134 | 0.064 | 0.522 |
| F_{med} | 0.290 | 0.067 | 0.271 |

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 F_{pa} | 14.6 ^{2,1} | 25.0 | 13.7 | 3.1 | 16.9 |
| 2000 | Reduce F below F_{pa} | <14.2 ^{2,1} | 20.0 | 15.0 | 2.3 | 17.3 |
| 2001 | Reduce F below F_{pa} | <14.1 ^{2,1} | 16.8 | 15.8 | 1.3 | 17.1 |
| 2002 | Reduce F below F_{pa} | <13.0 ^{2,1} | 14.9 | | | |
| 2003 | Reduce F below F_{pa} | <16.1 ^{2,1} | | | | |

¹Includes *L. boschii*. ²Landings assuming current discarding practise. Weights in '000 t.

Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k & VIIIa,b,d



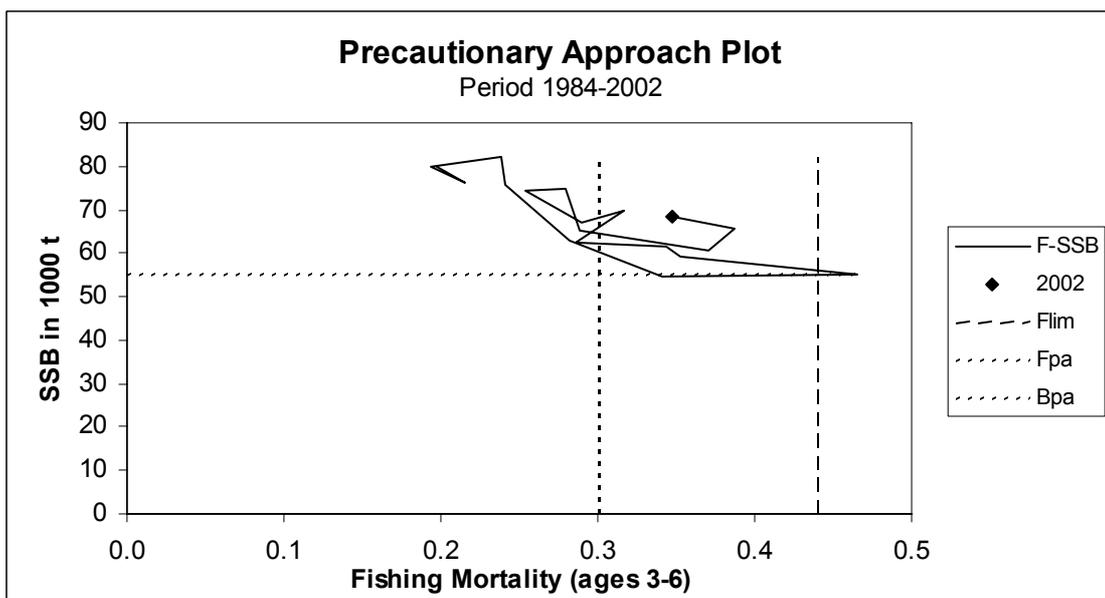
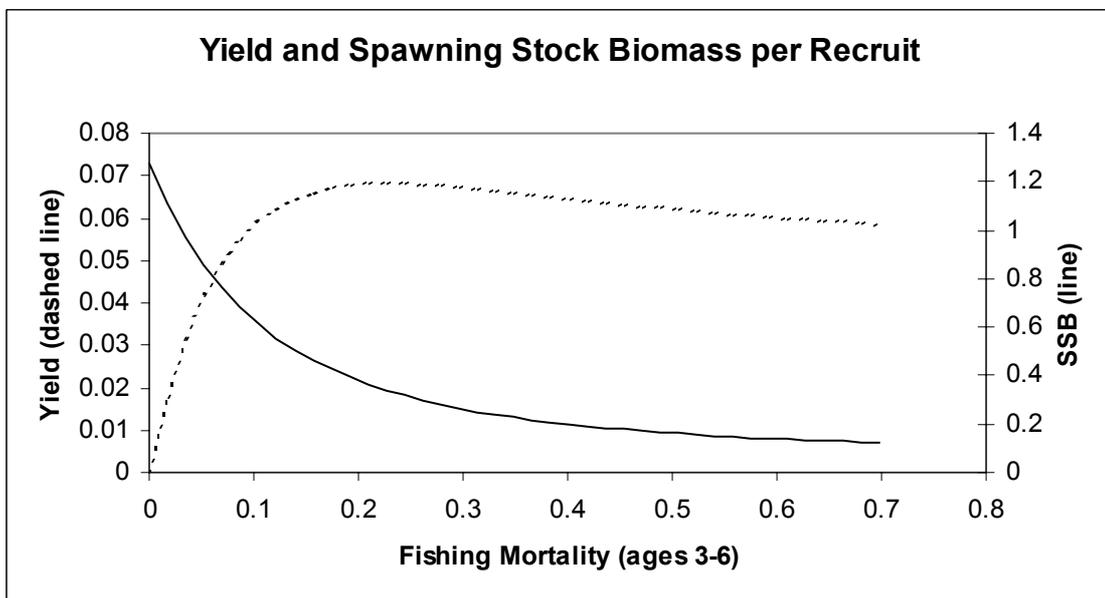


Table 3.9.11.1 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIIa,b,d. Nominal landings and catches (t) provided by the Working Group.

| | 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.

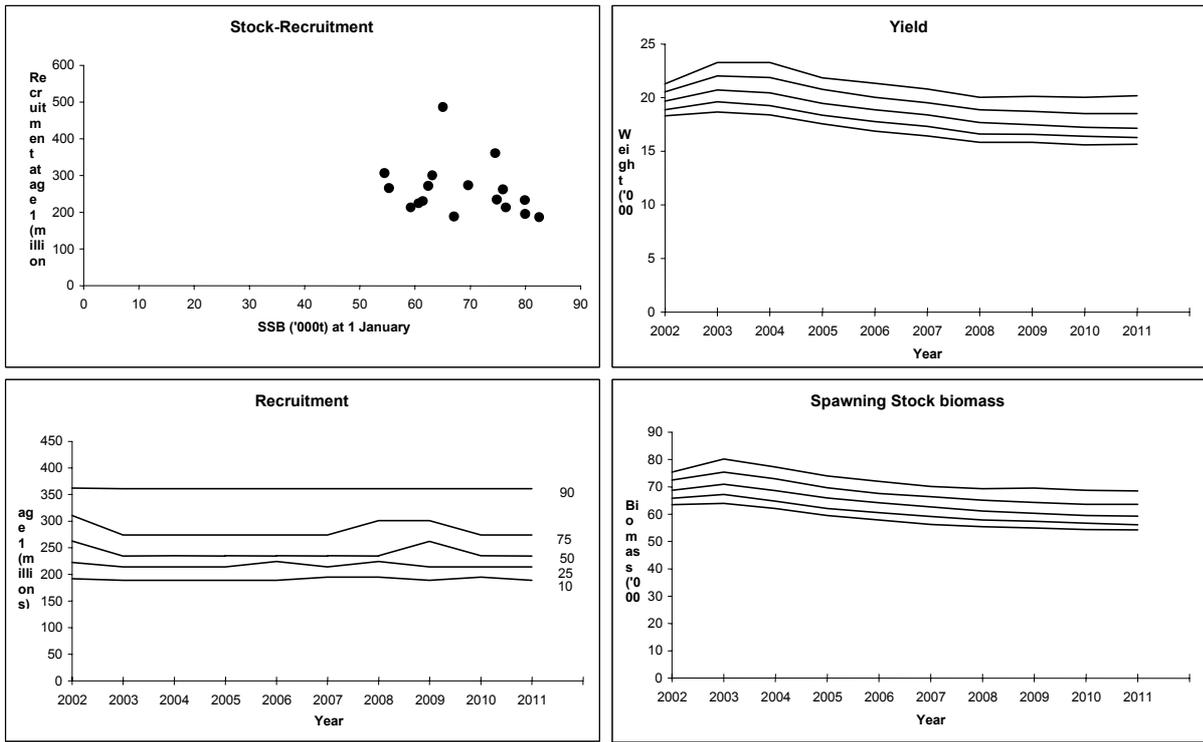
Table 3.9.11.2 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k & VIIIa,b,d

| 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 |

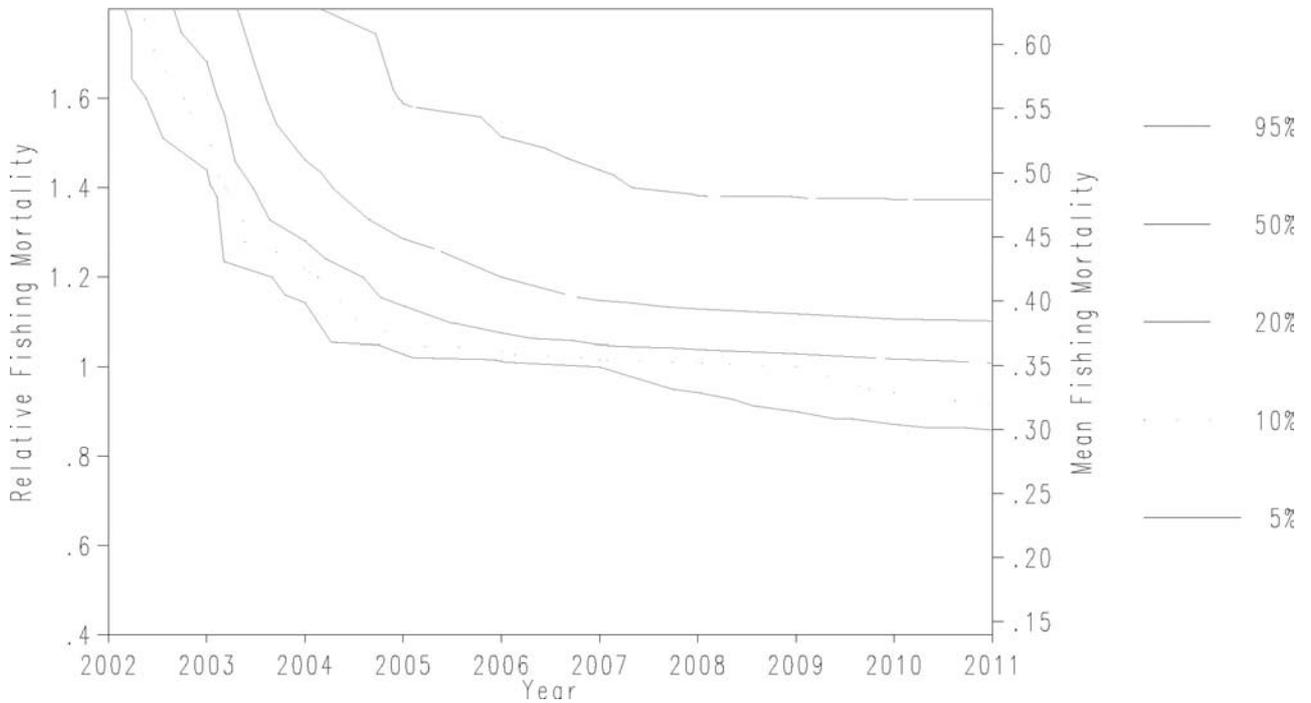
*GM 87-00

Megrim in Div. VII + VIIIabd. Medium term projections. Lines show 10, 25, 50, 75 and 90 percentiles. Random stock-recruit

Megrim in Divisions VII and VIIIabd. Medium term analysis, $1.00 * F_{sq}$.



Megrim, VII. Medium term analysis. Prob[SSB < 55.0kt].



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 F_{pa} , and even above F_{lim} for *L. piscatorius*. In 2001 fishing mortality is estimated to be below F_{pa} for *L. budegassa*, while for *L. piscatorius* F_{2001} is above 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 F_{pa} , and to increase or maintain spawning stock biomass above B_{pa} .

Precautionary Approach reference points:

L. piscatorius (changed in 2000)

| ICES considers that: | ICES proposes that: |
|---|---|
| B_{lim} is not defined | B_{pa} be set at 31 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and B_{pa} can therefore be set equal to the lowest observed SSB. |
| F_{lim} is 0.33, the fishing mortality estimated to lead to potential stock collapse. | F_{pa} be set at 0.24. This F is considered to have a high probability of avoiding F_{lim} , taking into account the uncertainty in assessments. |

Technical basis:

| | |
|-------------------------|----------------------------------|
| B_{lim} : Not defined | $B_{pa} : B_{loss}$ |
| F_{lim} : F_{loss} | F_{pa} : $F_{lim} \times 0.72$ |

L. budegassa: (B_{pa} changed in 2002 due to a correction of the maturity ogive values):

| ICES considers that: | ICES proposes that: |
|---------------------------|---|
| B_{lim} is not defined. | B_{pa} be set at 22 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and B_{pa} can therefore be set equal to the lowest observed SSB. |
| F_{lim} is not defined. | F_{pa} be set at $F_{med} = 0.23$. This F is consistent with the proposed B_{pa} . |

Technical basis:

| | |
|-------------------------|-----------------------|
| B_{lim} = Not defined | B_{pa} = B_{loss} |
| F_{lim} = Not defined | 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 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.

| <i>L. piscatorius</i> | | | | <i>L. budegassa</i> | | | |
|-----------------------|--------------------|----------------|-----------|---------------------|---------------------|----------------|-----------|
| F(2003) | Basis | Landings(2003) | SSB(2004) | F(2003) | Basis | Landings(2003) | SSB(2004) |
| 0.18 | 0.6 F_{sq} | 9.9 | 32.0 | 0.16 | 0.6 F_{sq} | 4.4 | 25.1 |
| 0.21 | 0.7 F_{sq} | 11.4 | 30.7 | 0.19 | 0.7 F_{sq} | 5.0 | 24.5 |
| 0.24 | $F_{pa}=0.8F_{sq}$ | 12.7 | 29.4 | 0.21 | 0.8 F_{sq} | 5.7 | 23.9 |
| 0.27 | 0.87 F_{sq} | 13.7 | 28.6 | 0.23 | $F_{pa}=0.87F_{sq}$ | 6.1 | 23.5 |
| 0.27 | 0.9 F_{sq} | 14.1 | 28.3 | 0.24 | 0.9 F_{sq} | 6.3 | 23.3 |
| 0.30 | 1.0 F_{sq} | 15.4 | 27.1 | 0.27 | 1.0 F_{sq} | 6.9 | 22.8 |
| 0.33 | 1.1 F_{sq} | 16.6 | 26.1 | 0.29 | 1.1 F_{sq} | 7.5 | 22.2 |
| 0.36 | 1.2 F_{sq} | 17.8 | 25.0 | 0.32 | 1.2 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, F_{max} is 0.29 F_{sq} and 0.59 F_{sq} for *L. piscatorius* and *L. budegassa*, respectively.

Medium-term projections suggest that a 20% reduction in F (i.e. F_{pa} for *L. piscatorius*) leads to a more than 95% probability of both stocks exceeding 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 |
| F_{max} | 0.088 | 1.313 | 8.165 |
| $F_{0.1}$ | 0.052 | 1.226 | 12.237 |
| F_{med} | 0.272 | 0.998 | 2.128 |

Anglerfish (*L. budegassa*)
Yield and spawning biomass per Recruit
F-reference points:

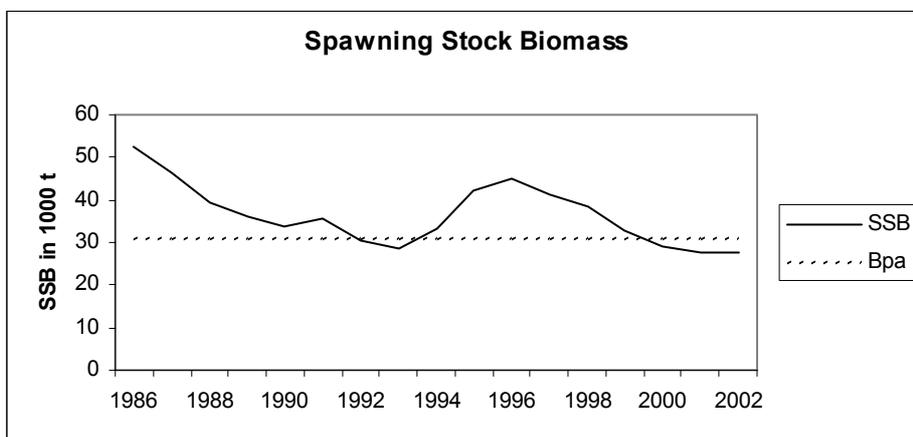
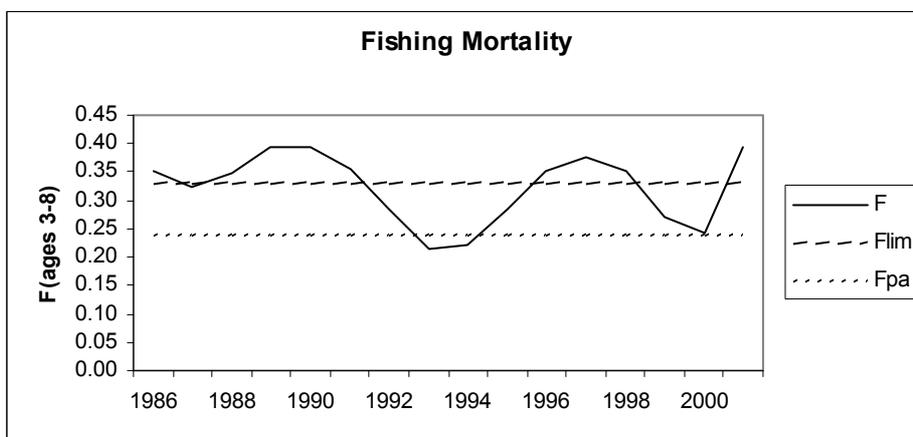
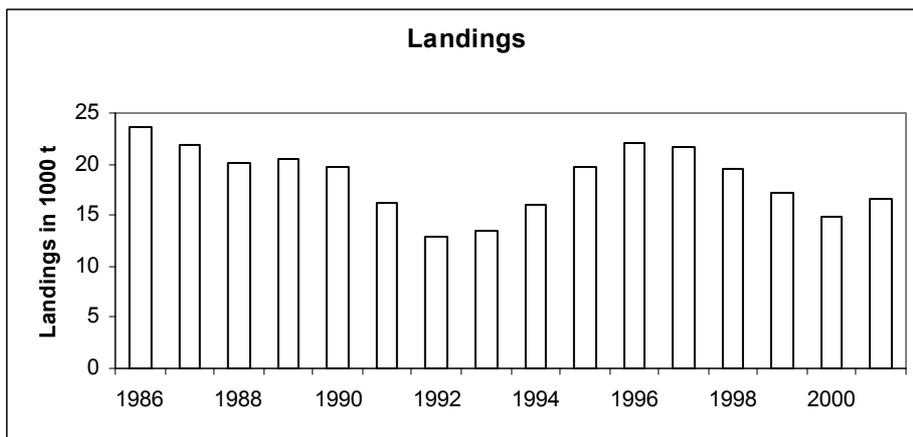
| | Fish Mort Ages 6-10 | Yield/R | SSB/R |
|-----------------|------------------------|---------|-------|
| Average Current | 0.267 | 0.464 | 1.529 |
| F_{max} | 0.159 | 0.497 | 2.915 |
| $F_{0.1}$ | 0.100 | 0.469 | 4.494 |
| F_{med} | 0.232 | 0.479 | 1.853 |

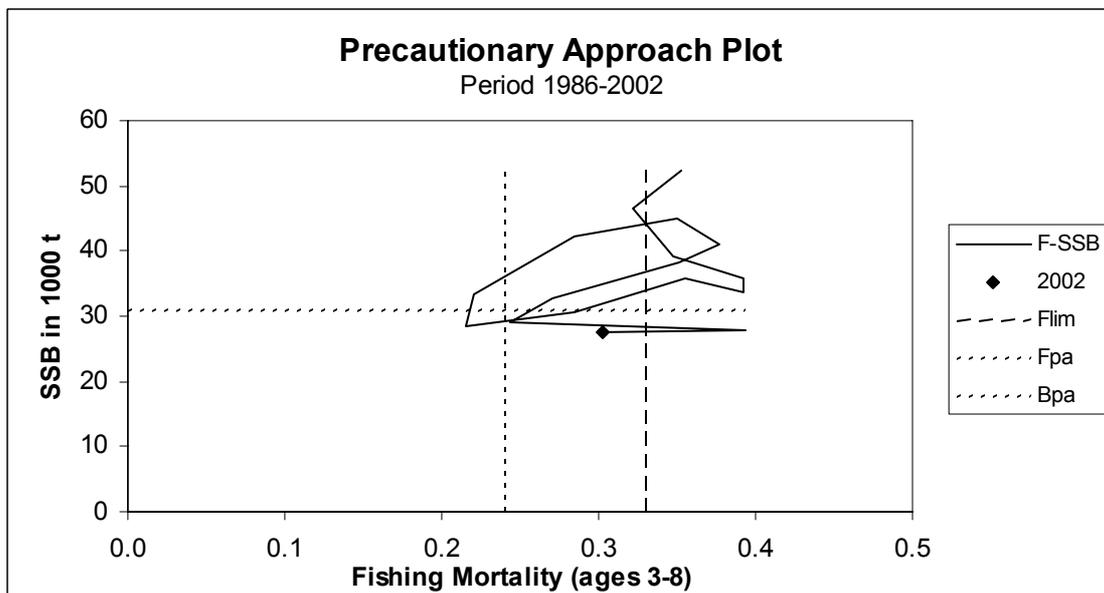
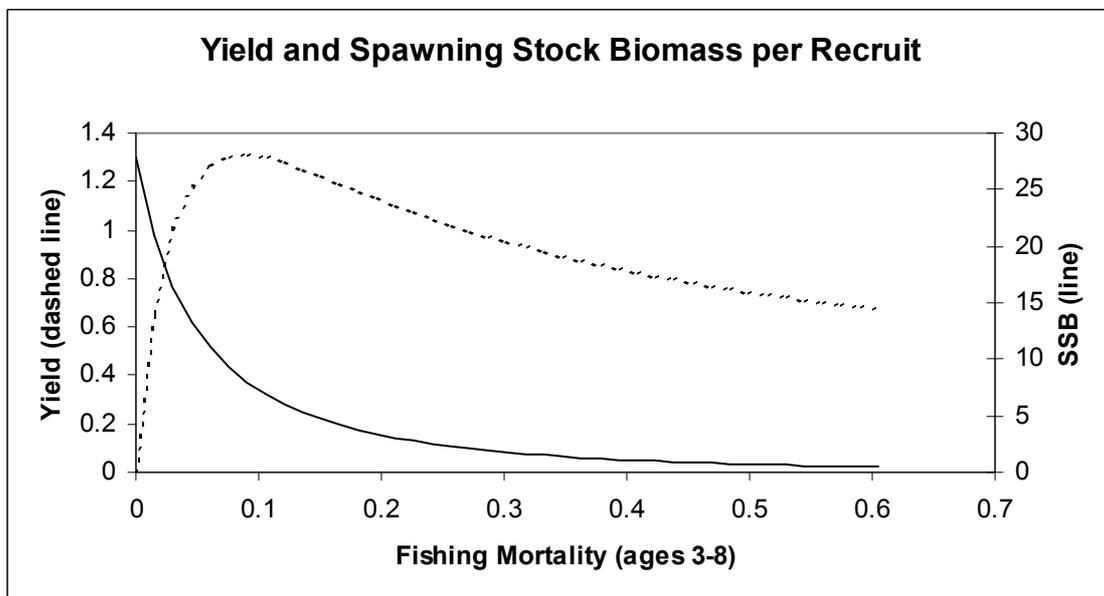
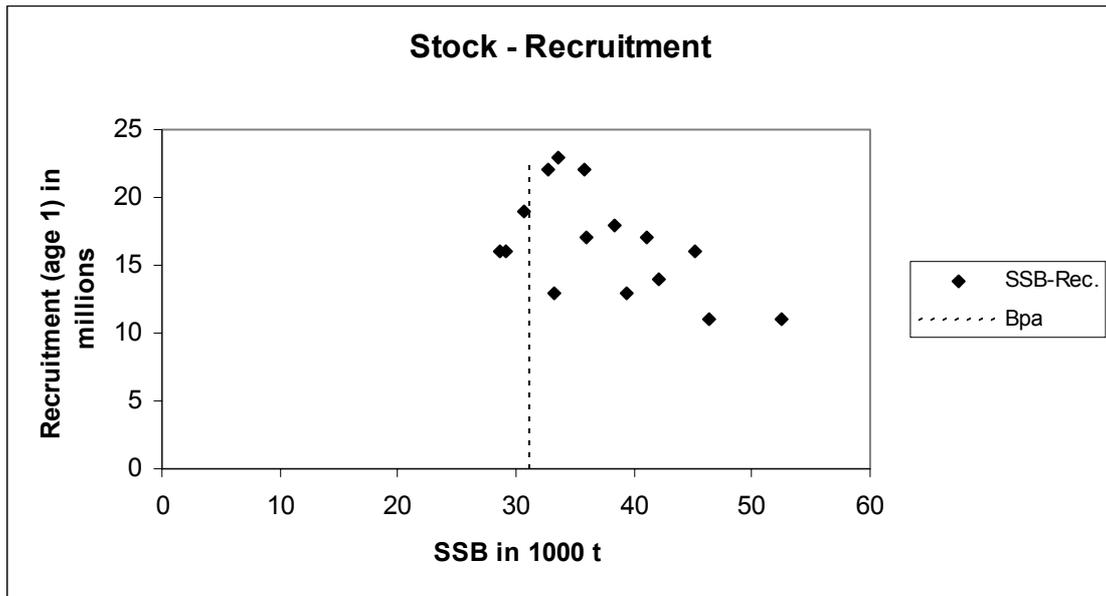
Catch data (Tables 3.9.12.1-5):

| Year | ICES Advice | Predicted catch corresp. to advice | Agreed TAC ¹ | ACFM Landings | Landings of <i>L. piscat.</i> | Landings of <i>L. budeg.</i> |
|------|---|------------------------------------|-------------------------|-------------------|-------------------------------|------------------------------|
| 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 <i>L. pisc.</i> 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 F_{pa} | < 27.6 | 27.6 | 22.2 | 16.6 | 5.6 |
| 2002 | Reduce F below F_{pa} | < 19.9 | 23.7 | | | |
| 2003 | At least 30% decrease in F | < 16.4 | | | | |

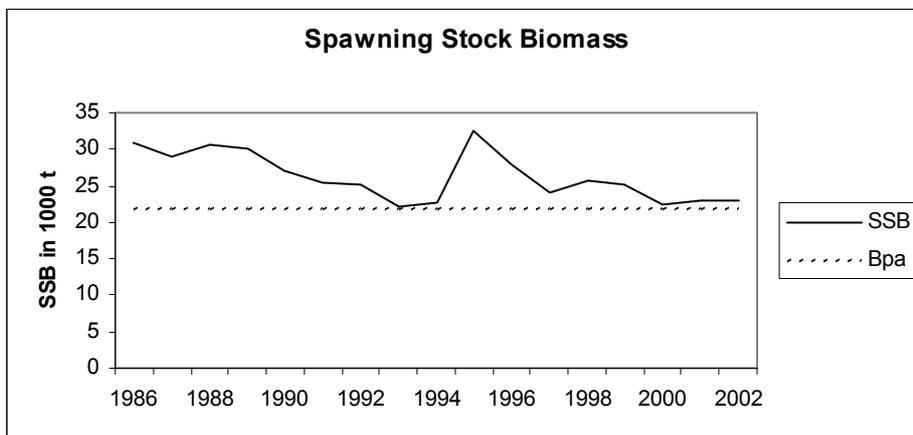
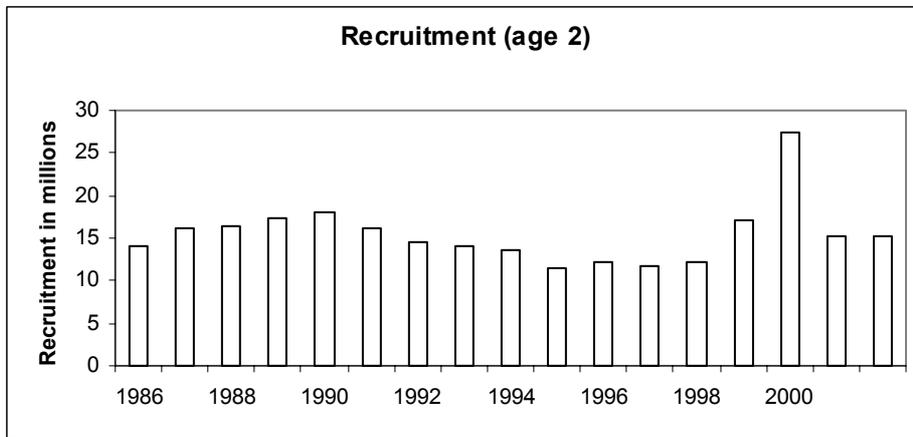
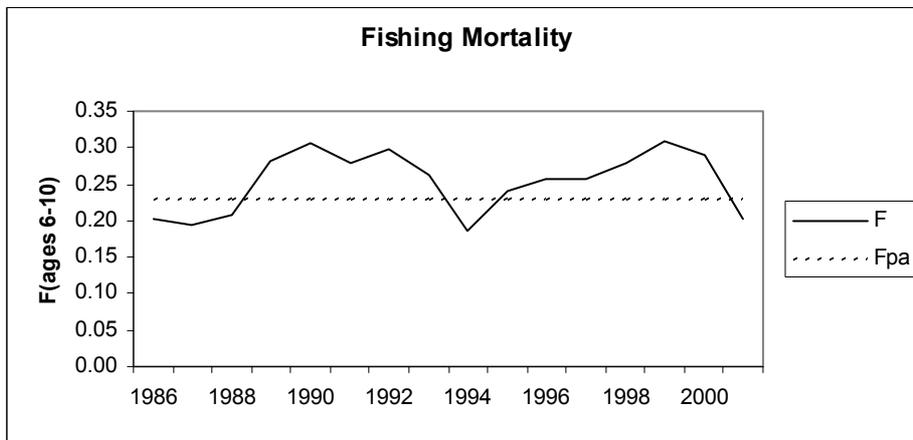
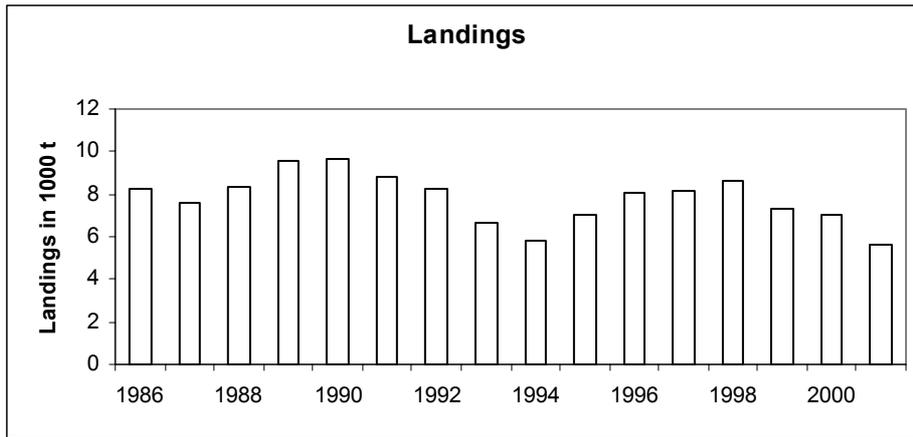
¹Includes Division VIIa and Divisions VIII d,e; applies to both species. ³Revised. Weights in '000 t.

Anglerfish (*L. piscatorius*) in Divisions VIIb-k and VIIIa,b,d





Anglerfish (*L. budegassa*) in Divisions VIIb-k and VIIIa,b,d



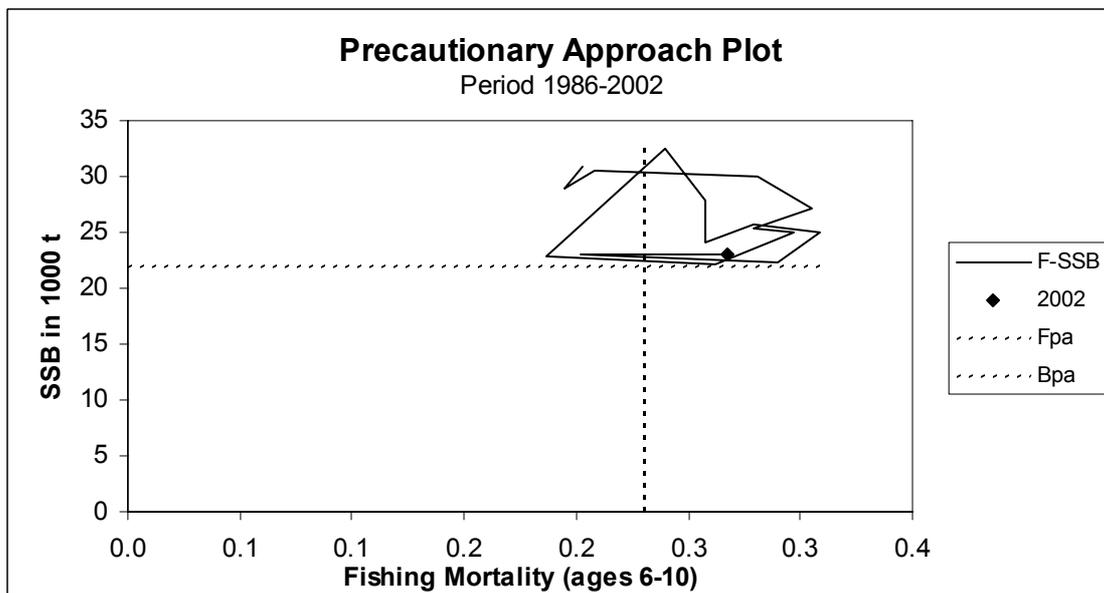
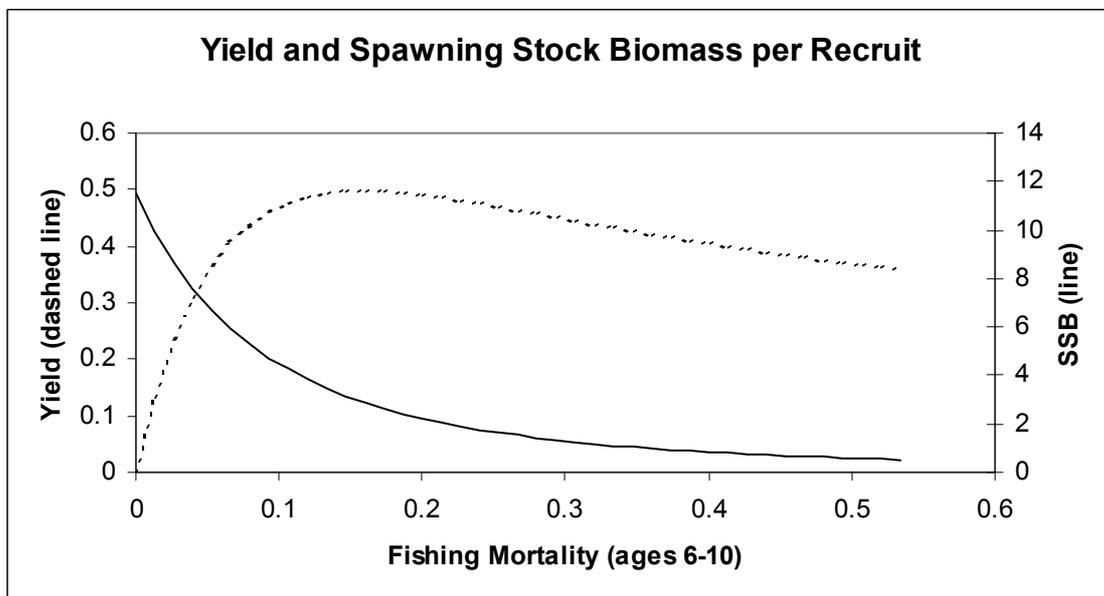
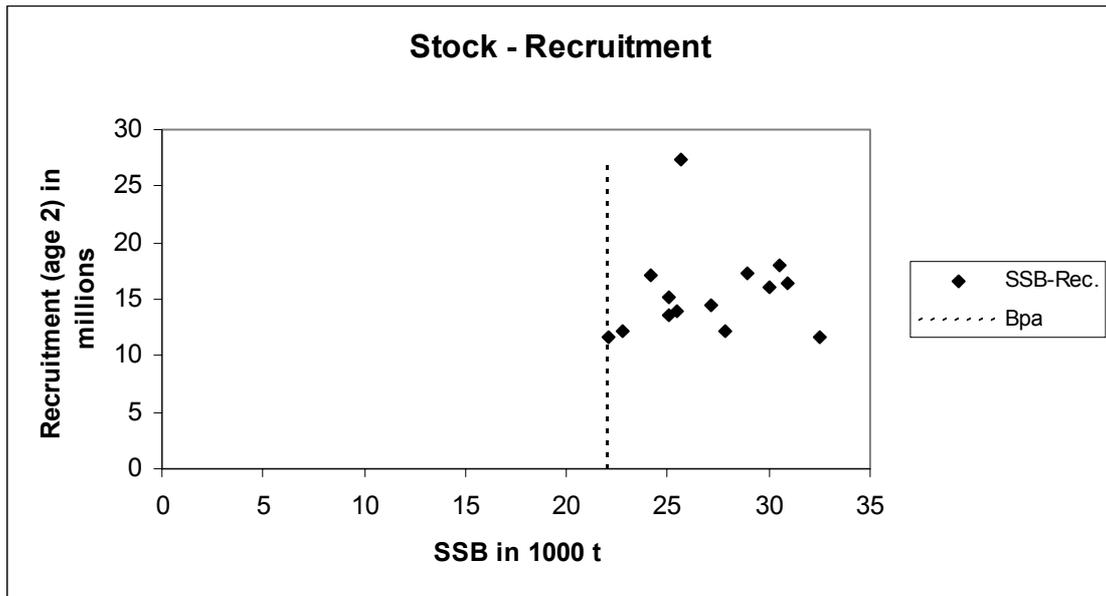


Table 3.9.12.1

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 |

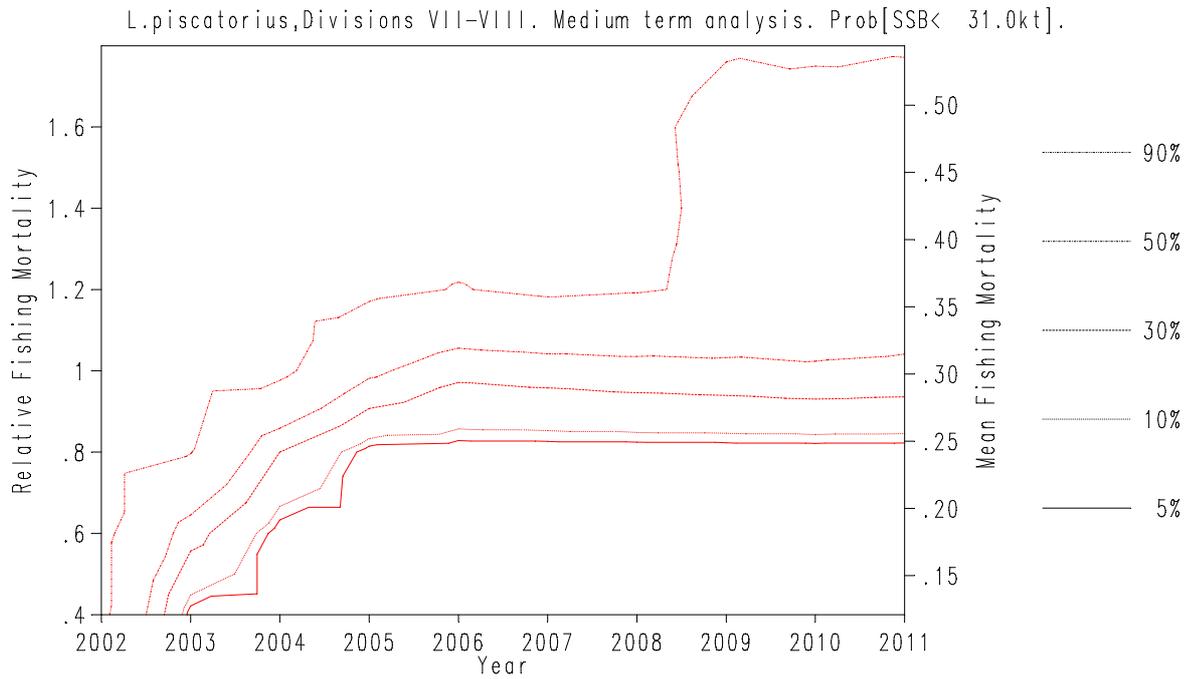
* GM87-00

Table 3.9.12.5 Anglerfish (*L. budegassa*) in Divisions VIIb-k and VIIIa,b,d

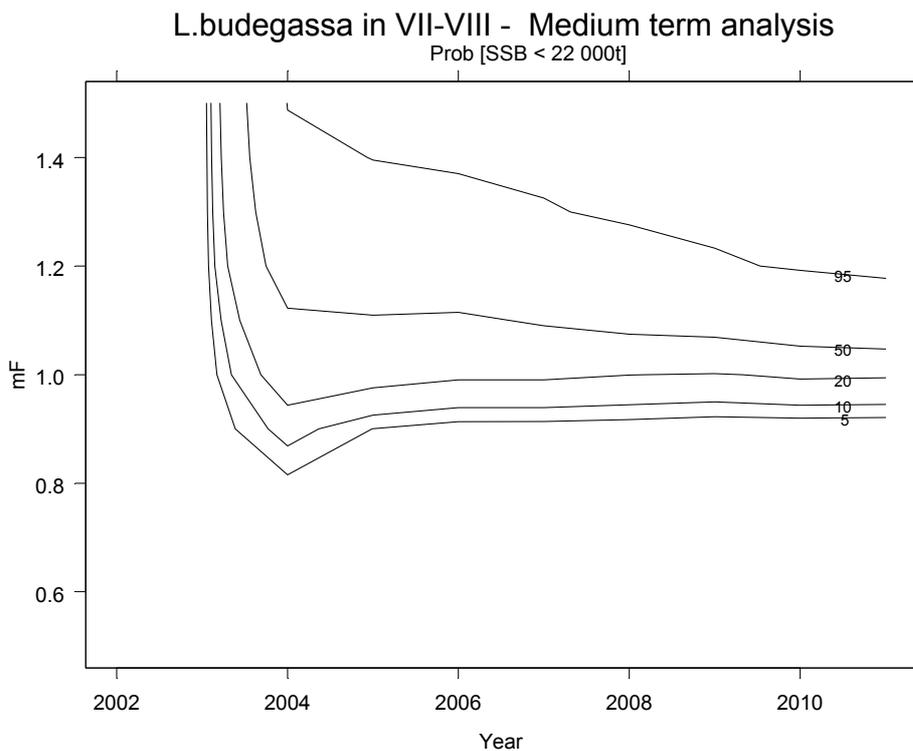
| Year | Recruitment Age 2 thousands | SSB tonnes | Landings tonnes | Mean F Ages 6-10 |
|---------|-----------------------------------|---------------|--------------------|---------------------|
| 1986 | 14024 | 30969 | 8217 | 0.203 |
| 1987 | 16228 | 28923 | 7619 | 0.195 |
| 1988 | 16462 | 30497 | 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 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 VIIIh-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 VIIIh-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 | | | |

¹Applies to Subareas VII, VIII, IX and X. ²Possible underestimates due to misreporting. ³Increased in-year to 14 000 t. ⁴Incomplete official statistics. ⁵Includes separate Division VIIa allocation of 4 990 t. ⁶Includes separate Division VIIa allocation of 3 400 t. Weights in 000' tonnes.

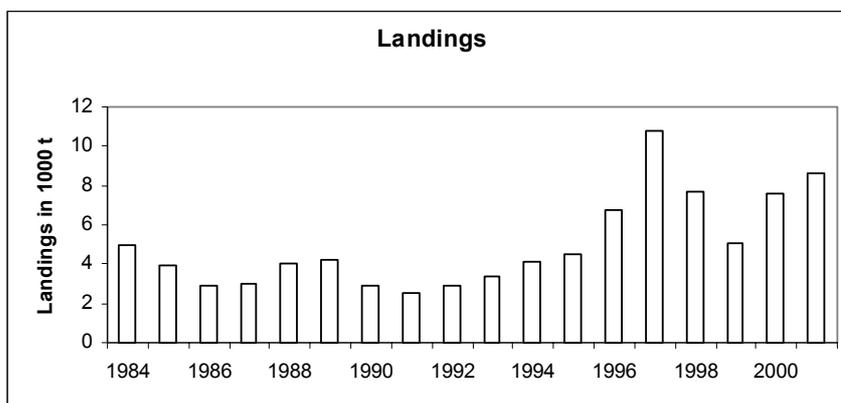


Table 3.10.2.a.1 Nominal landings (t) of Haddock in Divisions VIIb,c,e-k, 1984-2000, as officially reported to ICES.

| 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 B_{pa} over a three-year period.

Precautionary Approach reference points (changed in 1999):

| ICES considers that: | ICES proposes that: |
|-----------------------|------------------------------|
| B_{lim} is 81 000 t | B_{pa} be set at 110 000 t |
| F_{lim} is 0.33 | F_{pa} be set at 0.22 |

Technical basis:

| | |
|---|--|
| B_{lim} : Lowest reliable estimated SSB | B_{pa} : Approximately 1.4 B_{lim} |
| F_{lim} : F_{loss} | F_{pa} : = $F_{med}(98)$ |

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 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 stock¹.

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 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 | | | | |

¹Weights in '000 t.

Herring in Divisions VIa (South) and VIIb,c

Herring in Divisions VIa (South) and VIIb,c

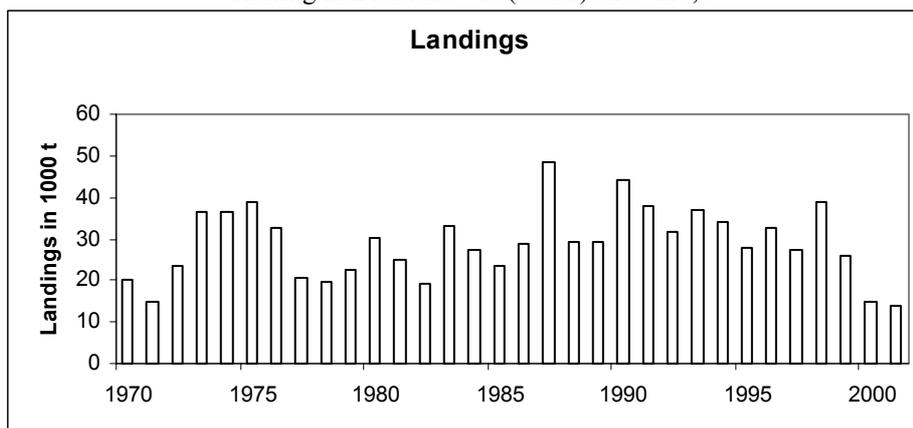


Table 3.10.3.1 Estimated herring catches in tonnes in Divisions VIa (South) and VIIb,c, 1988-2001.

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 |

¹Provisional 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/Nl) | + | + | + | + | 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 B_{pa} , and the fishing mortality has remained well below 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 B_{lim} since 1994. Fishing mortality has been variable at, or about

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: |
|-----------------------|-----------------------------|
| B_{lim} is 20 500 t | B_{pa} be set at 33 600 t |
| F_{lim} is 0.45 | F_{pa} be set at 0.27 |

Technical basis:

| | |
|---|-----------------------------------|
| $B_{lim} = B_{loss}$ the lowest observed spawning stock biomass | $B_{pa} \sim B_{lim} \times 1.64$ |
| $F_{lim} = F_{loss}$ the fishing mortality above which the stock dynamics are unknown | $F_{pa} \sim F_{lim} \times 0.61$ |

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 B_{pa} in the short term.

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.

Relevant factors to be considered in management:

The assessment remains uncertain, and the quality of commercial data suggests that 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

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: $F(2002) = F_{sq} = F(99-01) = 0.44$; Landings(2002) = 8.1 ; SSB(2003) = 17.3 .

| F(2003) onwards | Basis | Landings (2003) | SSB (2004) |
|-----------------|----------------|-----------------|------------|
| 0 | $0 * F_{sq}$ | 0 | 26.3 |
| 0.17 | $0.4 * F_{sq}$ | 3.7 | 22.3 |
| 0.22 | $0.5 * F_{sq}$ | 4.6 | 21.4 |
| 0.26 | $0.6 * F_{sq}$ | 5.4 | 20.6 |
| 0.27 | F_{pa} | 5.5 | 20.4 |
| 0.35 | $0.8 * F_{sq}$ | 6.9 | 19.0 |
| 0.44 | F_{sq} | 8.3 | 17.6 |
| 0.52 | $1.2 * F_{sq}$ | 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:

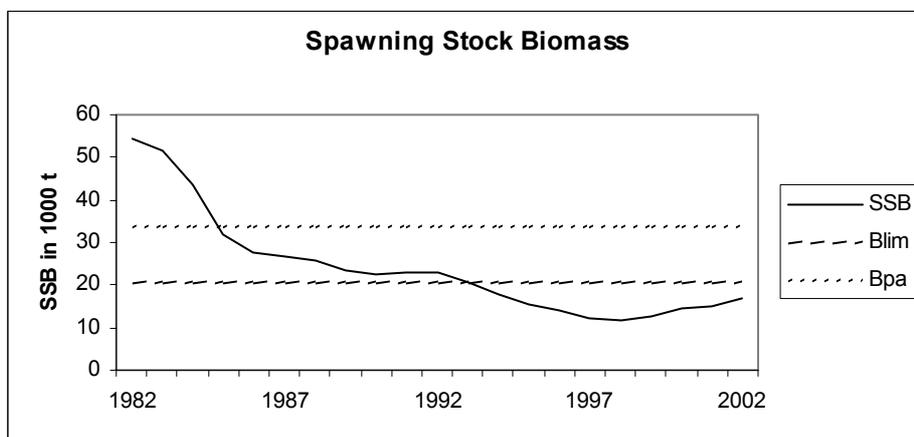
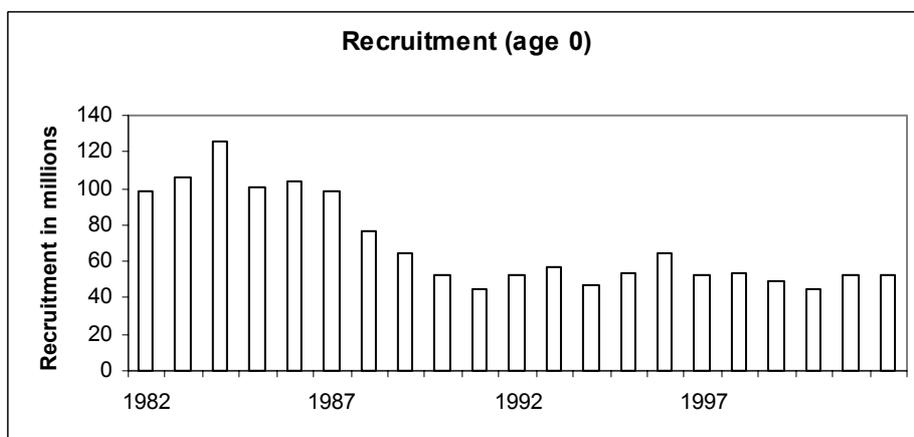
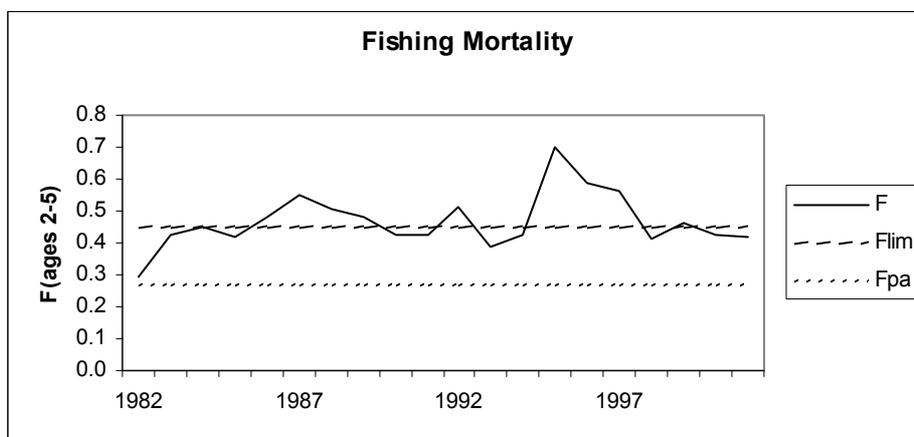
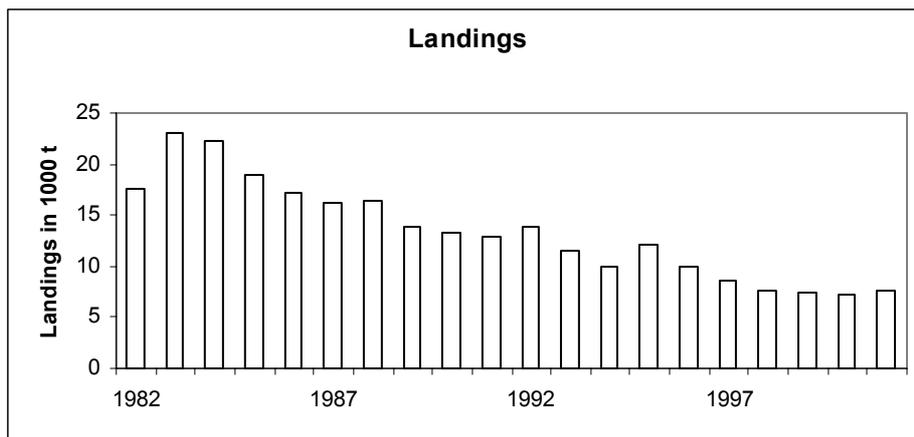
| | Fish Mort Ages 2-5 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.435 | 0.170 | 0.355 |
| F_{max} | 0.248 | 0.184 | 0.752 |
| $F_{0.1}$ | 0.154 | 0.173 | 1.191 |
| F_{med} | 0.460 | 0.168 | 0.326 |

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 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 F_{pa} ; no increase in landings | 8.5 | 8.9 | 7.6 |
| 2002 | F below F_{pa} | < 8.0 | 8.0 | |
| 2003 | Lowest possible catch / rebuilding plan | 0 | | |

Weights in '000 t.

Hake - Southern stock (Divisions VIIIc and IXa)



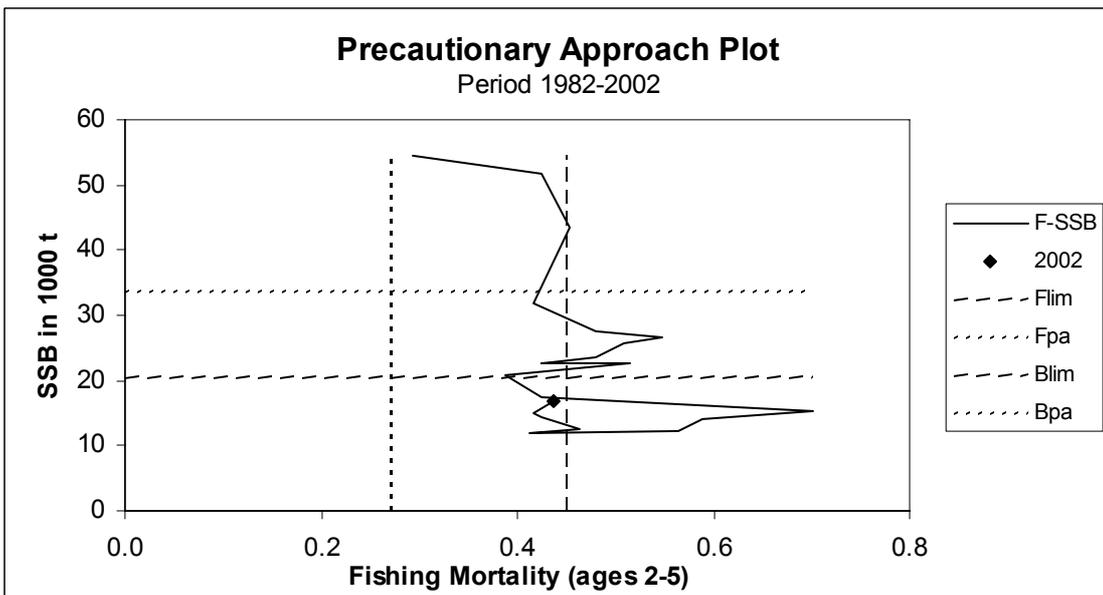
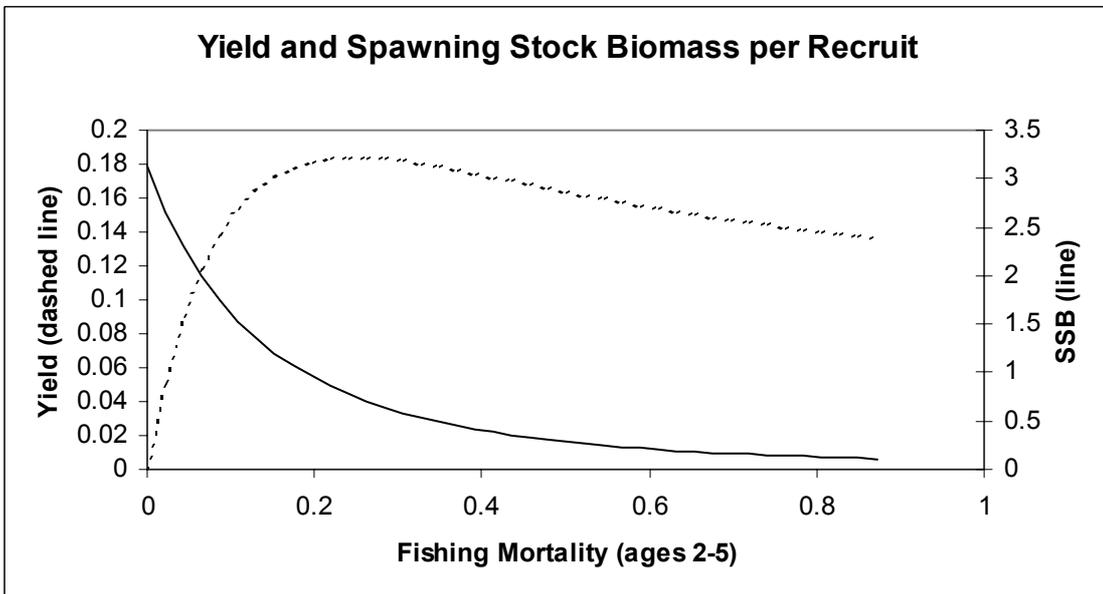


Table 3.11.2.1 Landing estimates ('000 t) for the Southern Hake stock (Divisions VIIIc and IXa) by country and gear as determined by the Working Group, 1972–2001.

| Year | Spain | | | | | | | Portugal | | | France | Total Stock |
|------|----------------------|---------------|----------|------------------------|-----------------|--------------------|-------|-----------|-------|-------|--------|-------------|
| | Gillnet ¹ | Small Gillnet | Longline | Artisanal Unal-located | Total Artisanal | Trawl ² | Total | Artisanal | Trawl | Total | | |
| 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.

Catch forecast for 2003:

L. boscii: Basis: $F(2002) = F_{sq} = F(99-01) = F_{sq} = 0.17$; Landings (2002) = 1.15; SSB(2003) = 7.01

| F(2003) onwards | Basis | Landings (2003) | SSB (2004) |
|-----------------|----------------|-----------------|------------|
| 0.14 | $0.8 * F_{sq}$ | 1.01 | 7.32 |
| 0.17 | $1.0 * F_{sq}$ | 1.23 | 7.08 |
| 0.21 | $1.2 * F_{sq}$ | 1.44 | 6.86 |

Weights in '000 t.

L. whiffiagonis: Basis: $F(2002) = F(99-01) F_{sq} = 0.21$; 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.

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.

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 Megrin, May 2002 (ICES CM 2003/ACFM:01).

Four-spot megrim (*L. Boscii*)

Yield and spawning biomass per Recruit

F-reference points:

| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 2-4 | | |
| Average Current | 0.316 | 0.052 | 0.289 |
| F_{max} | 0.331 | 0.054 | 0.210 |
| $F_{0.1}$ | 0.114 | 0.048 | 0.353 |
| F_{med} | 0.312 | 0.054 | 0.216 |

Megrin (*L. Whiffiagonis*)

Yield and spawning biomass per Recruit

F-reference points:

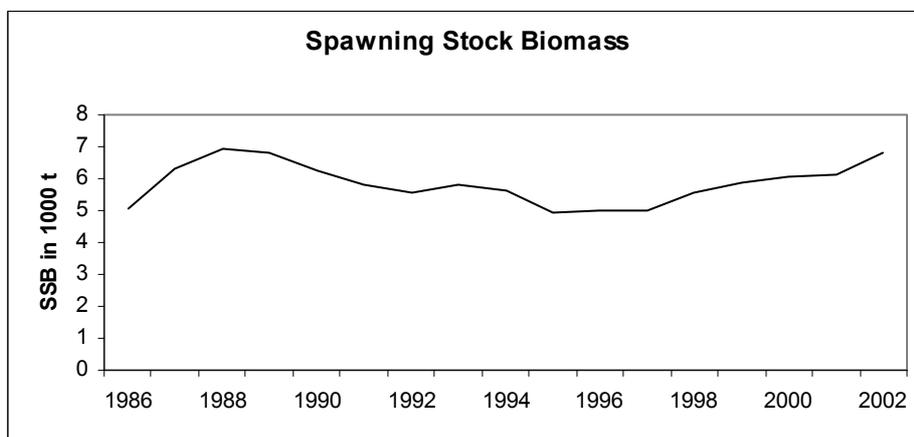
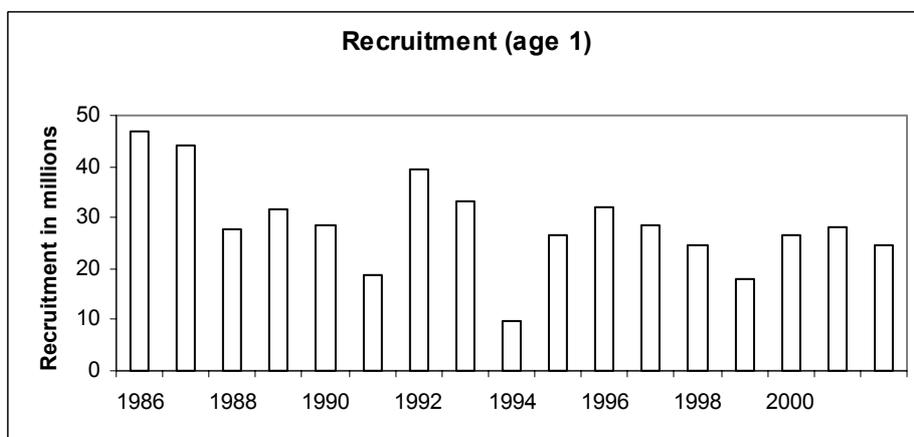
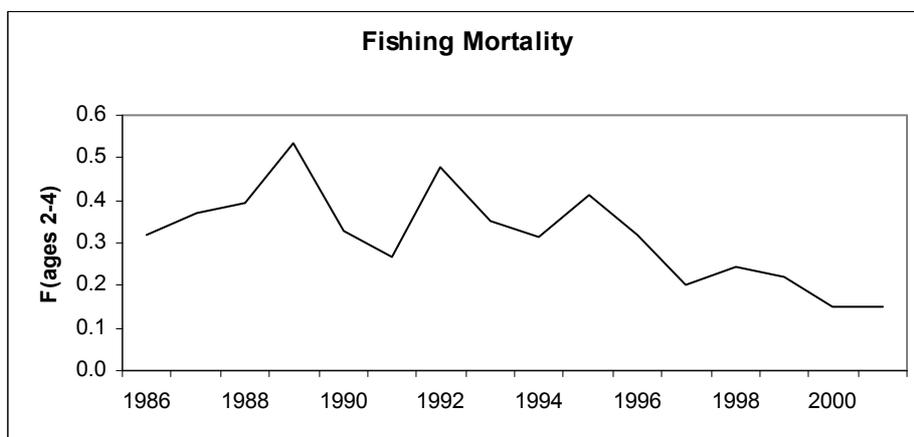
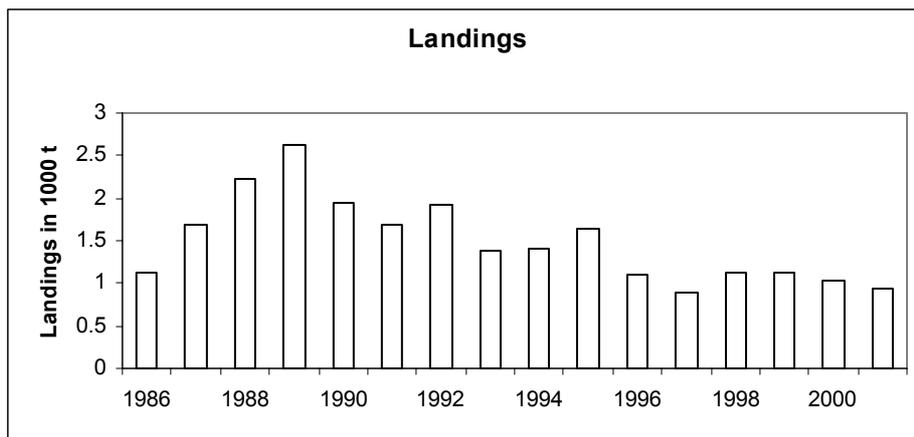
| | Fish Mort | Yield/R | SSB/R |
|-----------------|-----------|---------|-------|
| | Ages 2-4 | | |
| Average Current | 0.327 | 0.061 | 0.285 |
| F_{max} | 0.267 | 0.061 | 0.250 |
| $F_{0.1}$ | 0.113 | 0.055 | 0.397 |
| F_{med} | 0.372 | 0.060 | 0.209 |

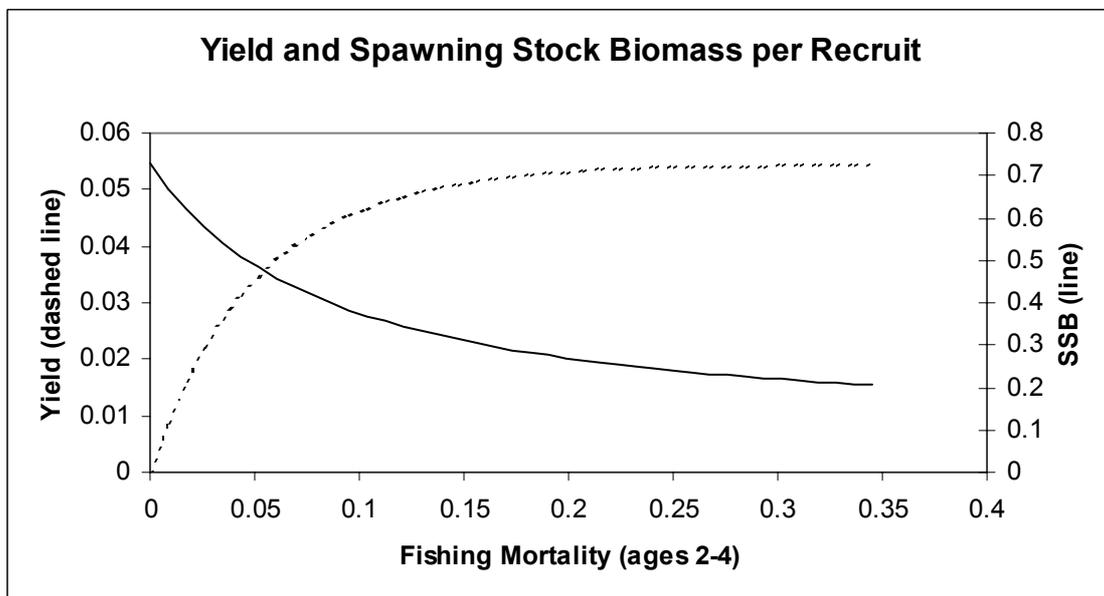
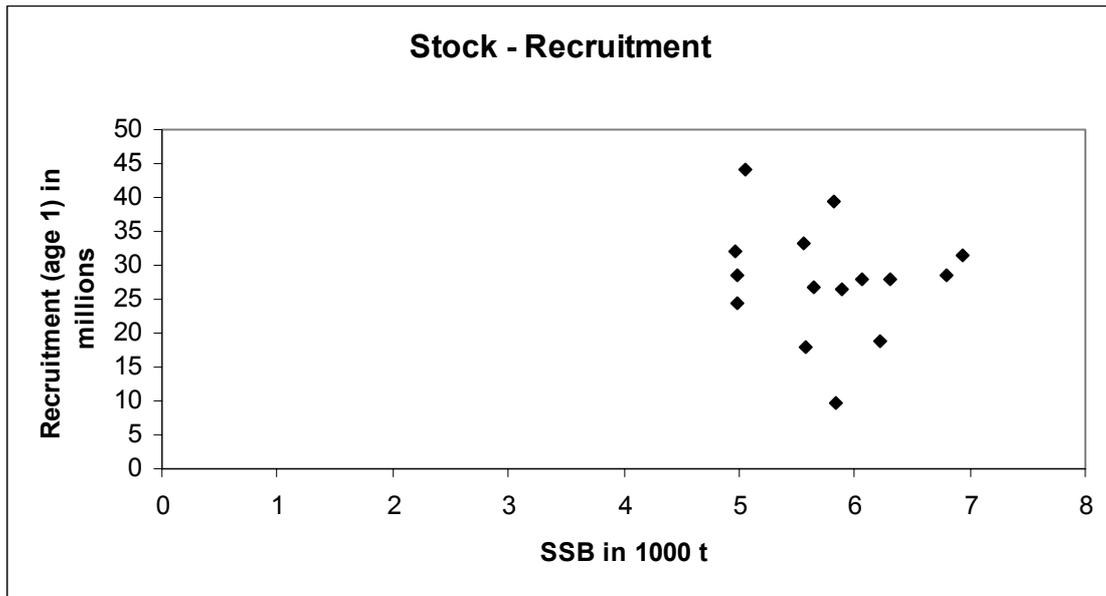
Catch data (Tables 3.11.3.1-4):

| Year | ICES Advice | Predicted catch corresp. to advice ¹ | Agreed TAC ¹ | ACFM landings ¹ | Landings <i>L. boscii</i> | Landings <i>L. whiff.</i> |
|------|---|---|-------------------------|----------------------------|------------------------------|------------------------------|
| 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 | <i>L. boscii</i> no long-term gain in increasing F, <i>L. whiff</i> 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 | | | | |

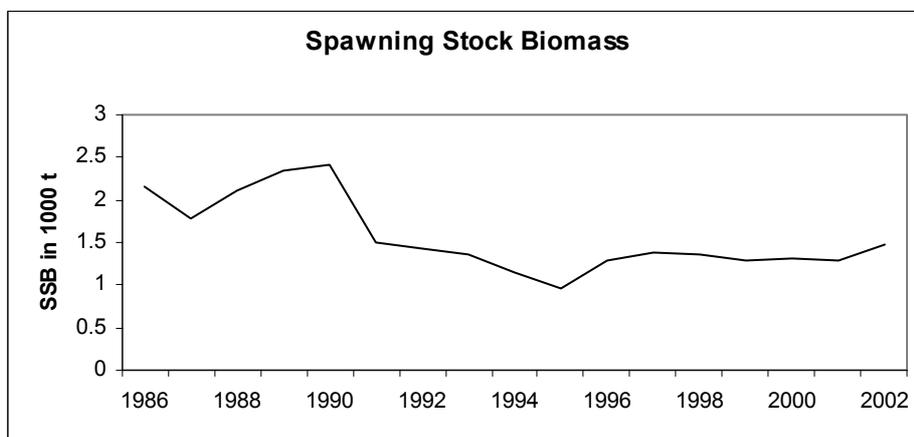
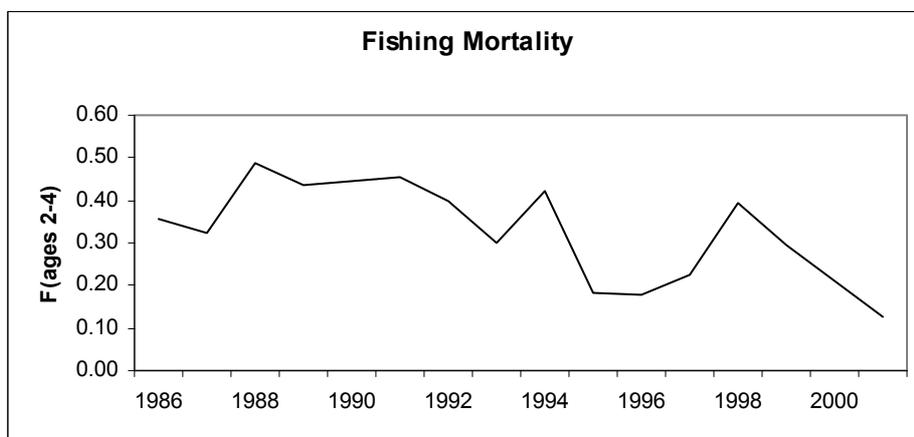
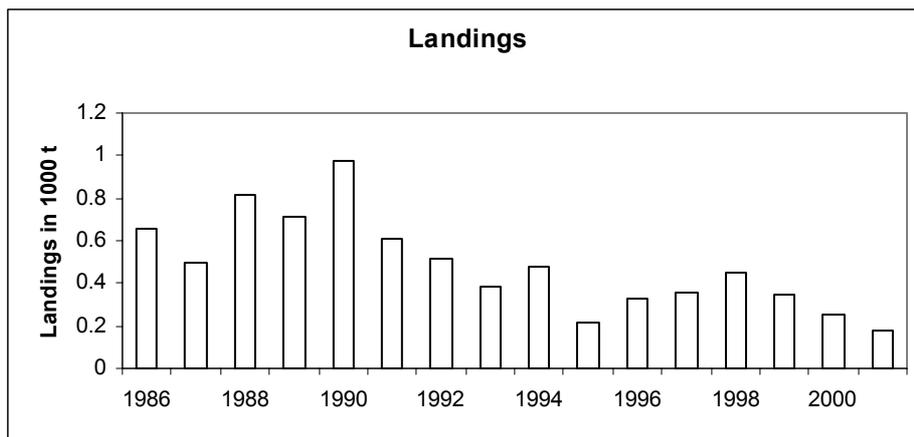
¹ *L. whiffiagonis*+ *L. boscii*. Weights in '000 t.

Megrim (*L. boscii*) in Divisions VIIIc and IXa





Megrim (*L. whiffiagonis*) in Divisions VIIIc and IXa



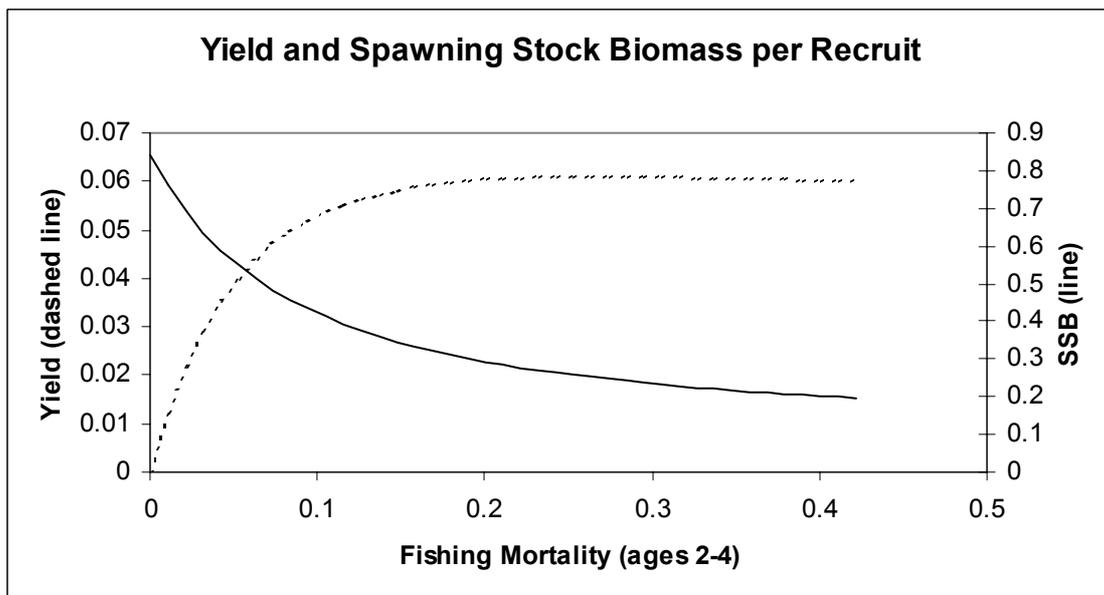
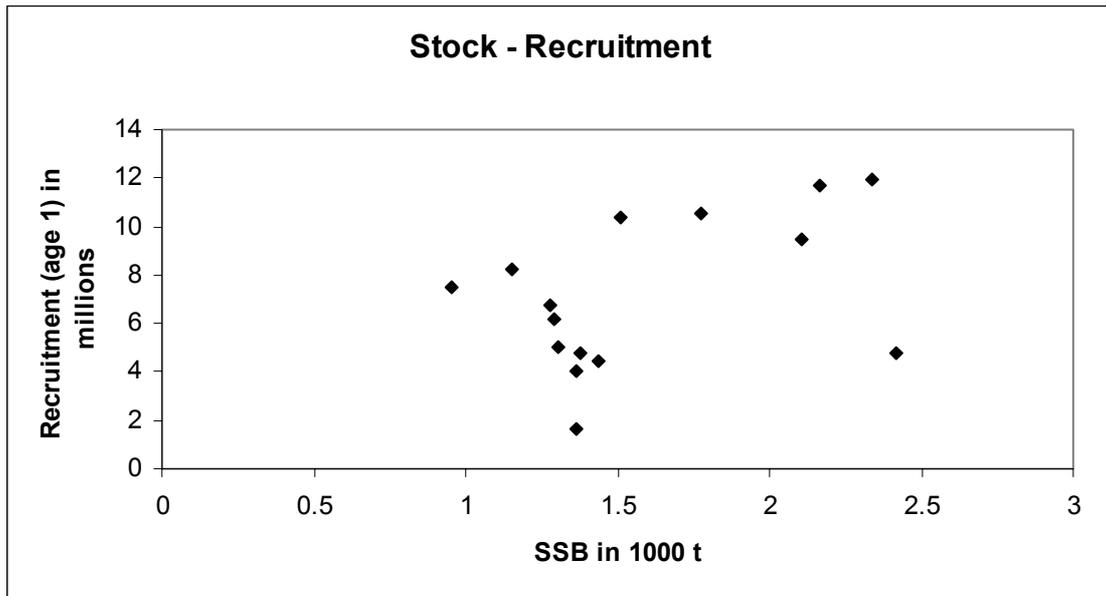


Table 3.11.3.1 Four-spot megrim (*L. boscii*) in Divisions VIIIc and IXa. Total landings (t).

| Year | Spain | | | Portugal | Total VIIIc, IXa |
|------|-------|------|-------|----------|---------------------|
| | VIIIc | IXa | Total | 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).

| Year | Spain | | | Portugal | Total VIIIc, IXa |
|------|-------|-----|-------|----------|---------------------|
| | VIIIc | IXa | Total | 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 |

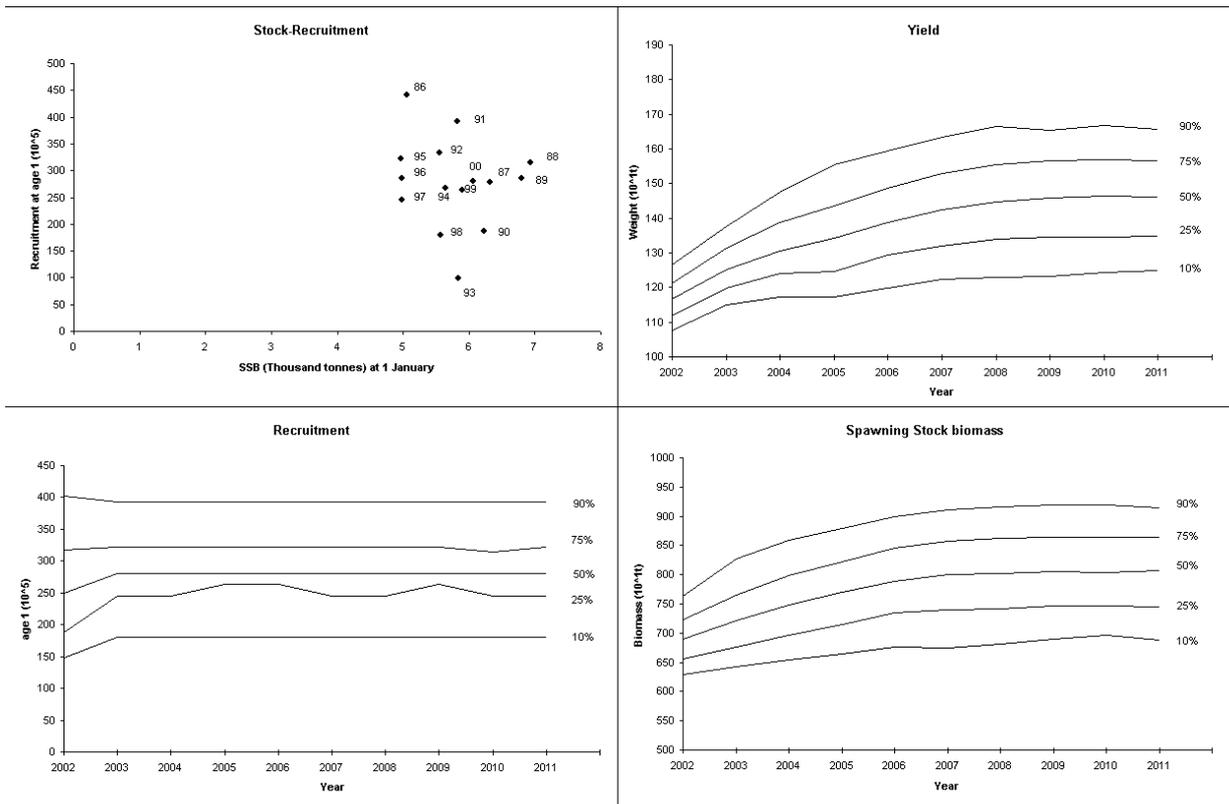
* GM 90-00

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 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 B_{MSY} in 2002, and the fishing mortality has been above F_{MSY} until 2001. In 2001, fishing mortality is around 63% of F_{MSY} . Current F ($F_{sq}=F_{99-01}$) is 5% above 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 B_{MSY} , and of F relative to F_{MSY} . The B_{MSY} and F_{MSY} points are used in the advice as a lower boundary for the biomass and an upper boundary for F .

Catch forecast for 2003:

Both species combined (*L. piscatorius* and *L. budegassa*)

Basis: $F(2002) = F_{sq} = F(1999-2001)$; $F/F_{MSY} = 1.05$; Landings(2002) = 3.2; $B/B_{MSY}(2003) = 0.79$

| $F/F_{MSY}(2003)$ | Basis | Landings(2003) | $B/B_{MSY}(2004)$ |
|-------------------|-----------------|----------------|-------------------|
| 0.95 | $0.95 * F_{sq}$ | 3.2 | 0.82 |
| 1.0 | $1.0 * F_{sq}$ | 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

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 F_{MSY} and for the biomass to increase to 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.

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.

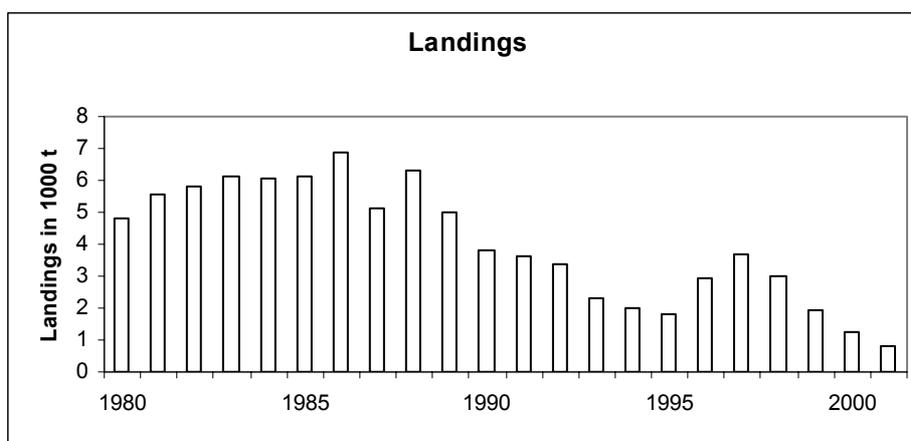
Source of information: Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

Catch data (Tables 3.11.4.1–2):

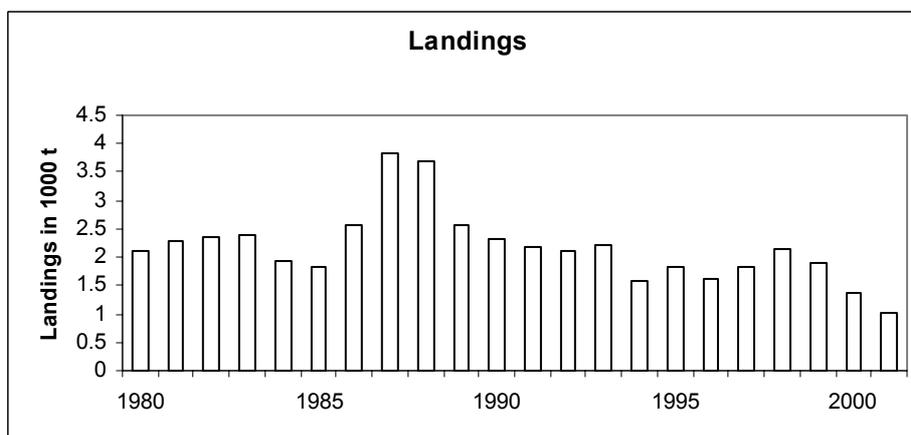
| Year | ICES Advice | Predicted catch ¹ corresp.to advice | Agreed TAC ¹ | ACFM Landings ¹ | Landings of <i>L. piscat.</i> | Landings of <i>L. budeg.</i> |
|------|---------------------------------------|--|-------------------------|----------------------------|-------------------------------|------------------------------|
| 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 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 | | | | |

¹For 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 and VIIIa
 Development of relative Fishing mortality (a) and Biomass (b)
 during 1986-2001 and the projected value of B/B_{MSY} for 2002.

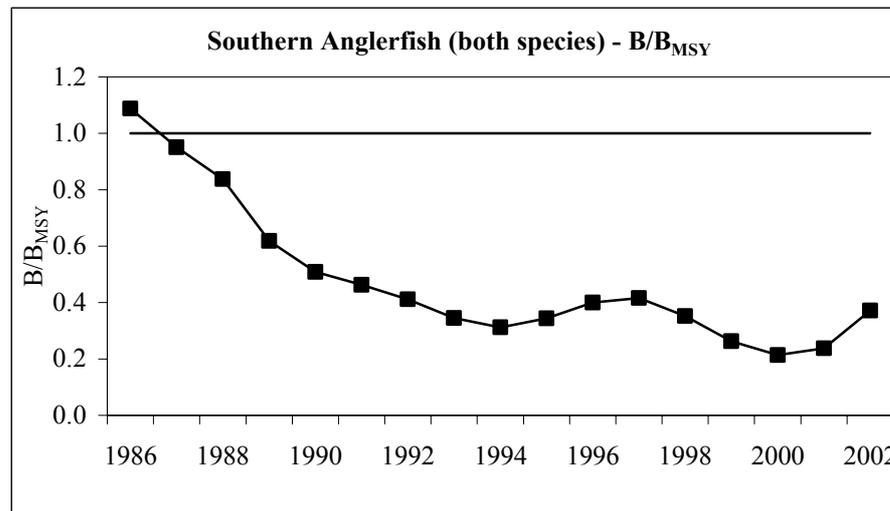
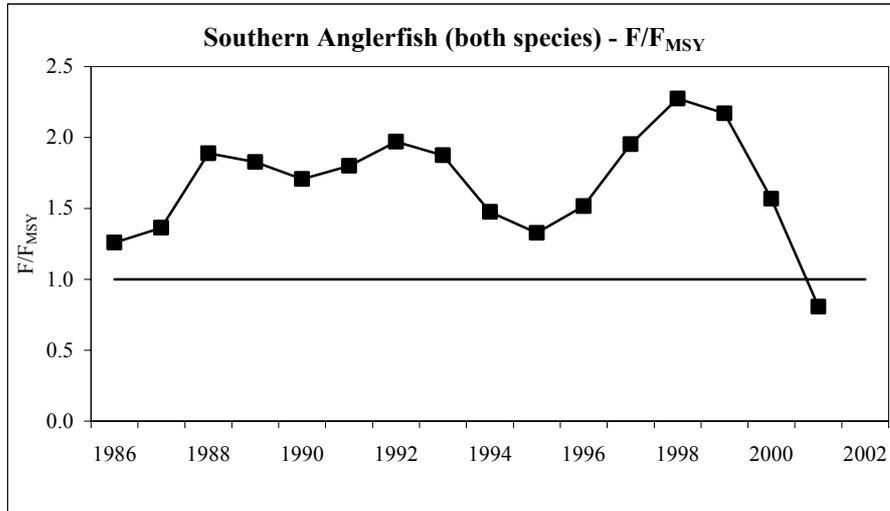


Table 3.11.4.1 Anglerfish (*L. piscatorius*) - Divisions VIIIc and IXa. Landings (t) by the main fishing fleets for 1978–2001 as determined by the Working Group.

| Year | VIIIc | | | IXa | | | | VIIIc & IXa |
|------|----------------|------------------|-------|----------------|-------------------|-----------------------|-------|-------------|
| | 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.

| Year | VIIIc | | | IXa | | | | VIIIc & IXa Total |
|------|----------------|------------------|-------|----------------|-------------------|-----------------------|-------|----------------------|
| | Spain Trawl | Spain Gillnet | Total | Spain Trawl | Portugal Trawl | Portugal Artisanal | 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.

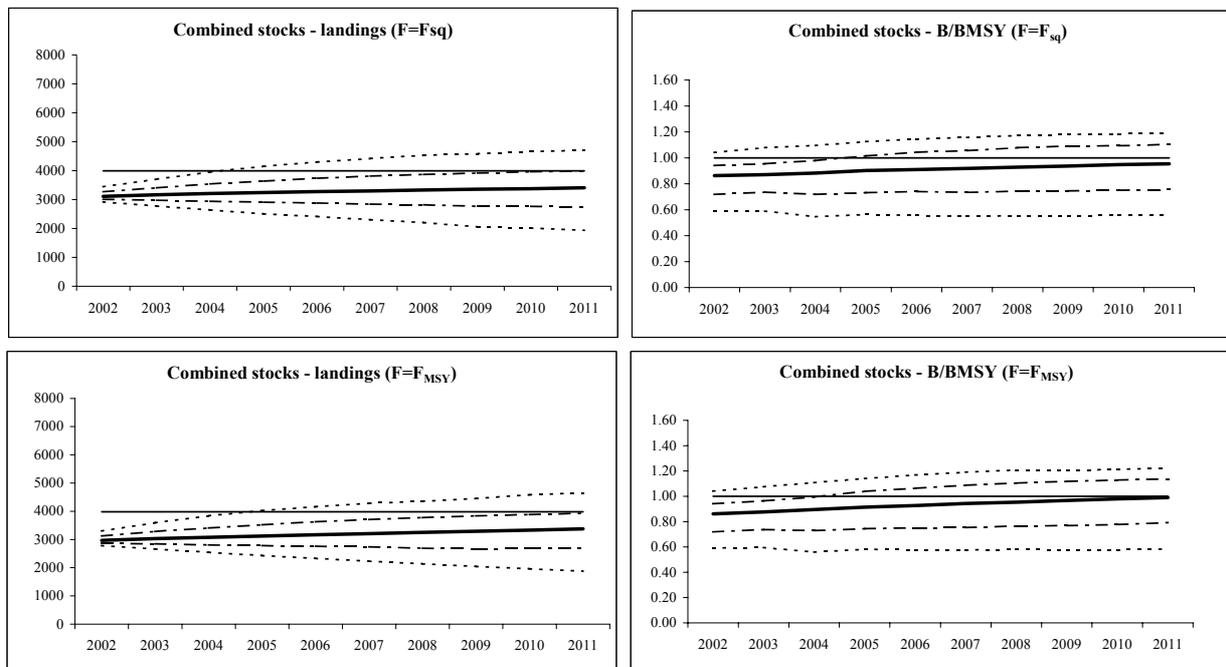
Anglerfish in VIIIc and IXa (*L.piscatorius* and *L.budegassa* combined)

Summary of the Aspic results :

$r=0.37$

| | F/F_{MSY} | B/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 F_{sq} and at $F=F_{MSY} = 0.95 F_{sq}$.



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: |
|---|--|
| B_{lim} is 136 000 t, the lowest observed biomass. | B_{pa} be set at 205 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of the assessment. |
| F_{lim} is 0.27, the fishing mortality rate above which recruitment and stock dynamics are unknown. | F_{pa} be established at 0.17. This F is considered to provide approximately 95% probability of avoiding F_{lim} , taking into account the uncertainty of assessments. |

Technical basis:

| | |
|----------------------|---------------------------|
| $B_{lim} = B_{loss}$ | $B_{pa} = B_{loss} * 1.5$ |
| $F_{lim} = F_{loss}$ | $F_{pa} = F_{lim} * 0.63$ |

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*.

statistical problems in the assessment diagnostics and concerns about the appropriateness of demersal tuning fleets for a pelagic species the assessment was considered unreliable.

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.

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 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.

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.

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

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 $F_{0.1}$; 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 | <i>Status quo</i> 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 | $F < F_{pa}$ | <59 | 68.0 ⁴ | 49 |
| 2001 | $F < F_{pa}$ | <54 | 68.0 ⁴ | 46 |
| 2002 | $F < 0.113$ | <34 | 68.0 ⁴ | |
| 2003 | Average of last 3 years | <49 | | |

¹Includes all *Trachurus* spp. ²Includes only *Trachurus trachurus* L. ³Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EC waters only). ⁴Division VIIIc and Subarea IX. ⁵Catch at *status quo* F. Weights in '000 t.

Southern horse mackerel (Divisions VIIIc and IXa)

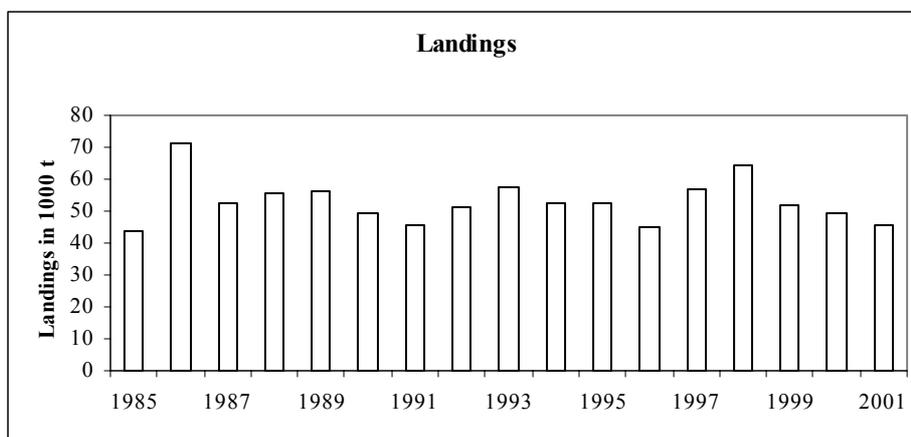


Table 3.11.6.1 Annual catches (tonnes) of SOUTHERN HORSE MACKEREL (*Trachurus trachurus*) by countries and by gear in Divisions VIIIc and IXa. Data from 1984–2001 are Working Group estimates.

| 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 |

¹Estimated value. ²Not 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 | <i>T. mediterraneus</i> | <i>T. picturatus</i> |
|-------------|--------------------------------|-----------------------------|
| 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 | Yield/R | SSB/R |
|------------------|-----------|---------|-------|
| | Ages 2–5 | | |
| Average Current | 0.267 | 0.016 | 0.050 |
| F _{max} | 1.941 | 0.024 | 0.007 |
| F _{0.1} | 0.427 | 0.019 | 0.036 |
| 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 | | | |

¹Estimated catch at *status quo* F. ²Catch 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

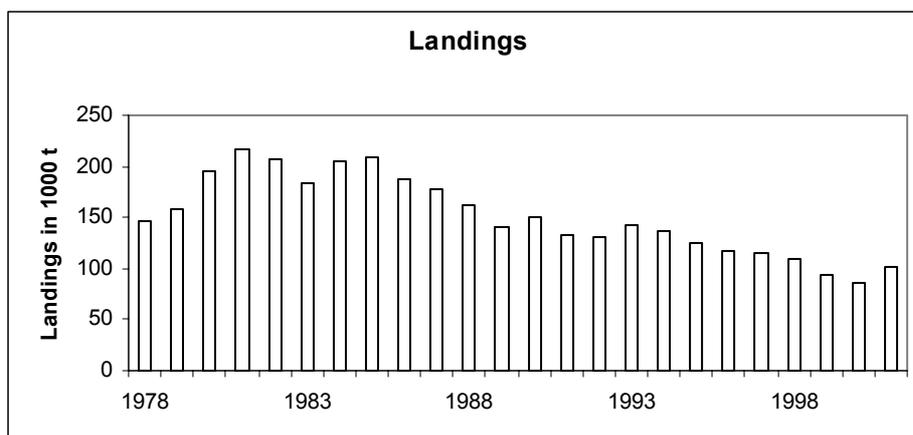


Table 3.11.7.a.1 Iberian Sardine Landings (tonnes) by sub-area and total for the period 1940-2001.

| Year | Sub-area | | | | | | All sub-areas | Div. IXa | Portugal | Spain (excl.Cadiz) | Spain (incl.Cadiz) |
|------|----------|-----------|-------------------|-------------------|-------------------|-----------------|---------------|----------|----------|--------------------|--------------------|
| | VIIIc | IXa North | IXa Central North | IXa Central South | IXa South Algarve | IXa South 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 B_{pa} , and the fishing mortality has remained well below 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 B_{pa} and reduce or maintain F below F_{pa} .

Precautionary Approach reference points (established in 1998):

| ICES considers that: | ICES proposes that: |
|---|--|
| B_{lim} is 18 000 t, the lowest observed biomass. | B_{pa} = 36 000 t. |
| There is no biological basis for defining F_{lim} . | F_{pa} be established between 1.0–1.2. |

Technical basis:

| | |
|-----------------------------------|---|
| $B_{lim} = B_{loss} = 18\ 000$ t. | B_{pa} = SSB that can withstand two successive years of poor recruitment. |
| | 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 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; $F(2002) = 0.40 = 0.69 * F_{sq}$ ($F_{sq} = F_{95-01} = 0.58$); SSB (2002) = 56.3.

| F(2003) | Basis | SSB (2003) | Catch (2003) |
|---------|----------------|------------|--------------|
| 0.41 | $0.7 * F_{sq}$ | 36.2 | 12.5 |
| 0.58 | $1 * F_{sq}$ | 34.2 | 16.9 |
| 0.70 | $1.2 * F_{sq}$ | 33.0 | 19.6 |
| 0.82 | $1.4 * F_{sq}$ | 31.8 | 22.1 |
| 0.93 | $1.6 * F_{sq}$ | 30.7 | 24.4 |
| 1.05 | $1.8 * F_{sq}$ | 29.6 | 26.5 |
| 1.17 | $2 * F_{sq}$ | 28.5 | 28.6 |
| 1.46 | $2.5 * F_{sq}$ | 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:

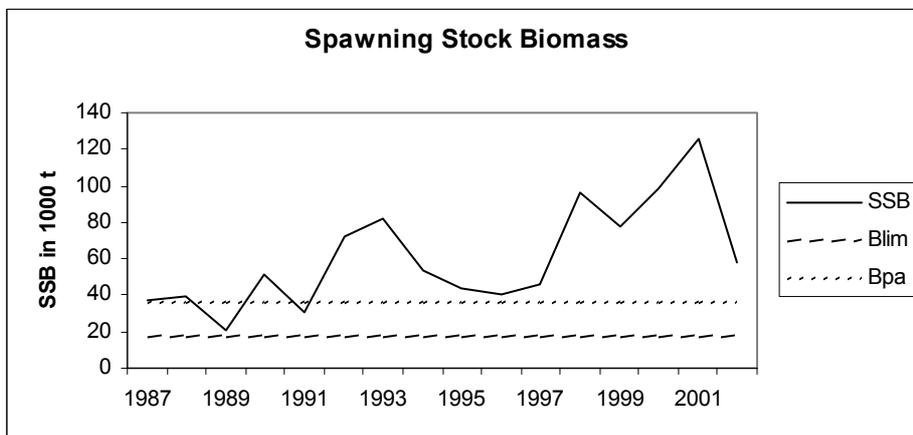
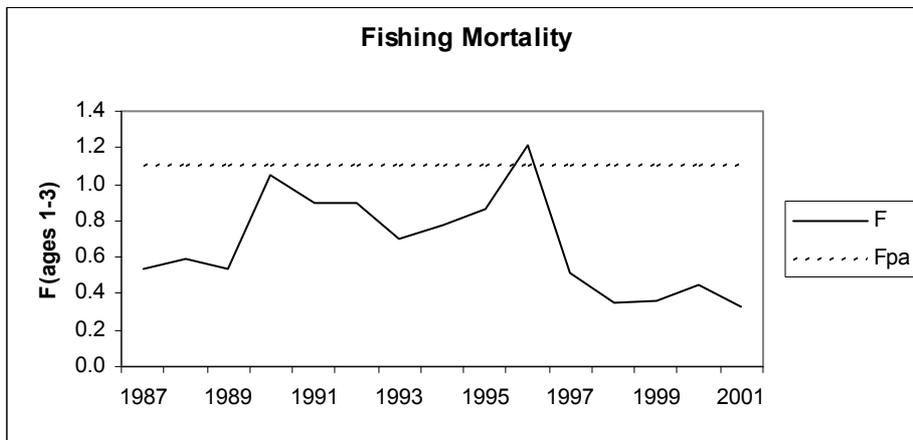
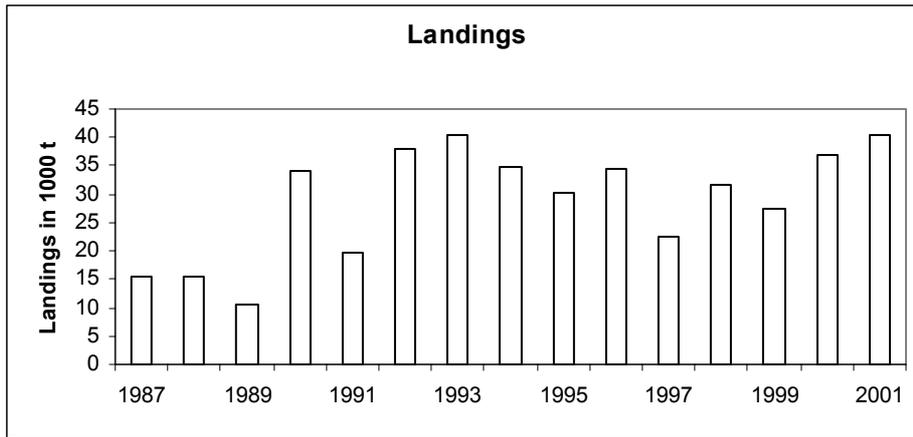
| | Fish Mort Ages 1–3 | Yield/R | SSB/R |
|-----------------|-----------------------|---------|-------|
| Average Current | 0.379 | 0.001 | 0.005 |
| F_{max} | N/A | | |
| $F_{0.1}$ | 2.376 | 0.003 | 0.002 |
| F_{med} | 1.550 | 0.003 | 0.003 |

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. ¹Mean catch of 1985–1987. ²Preliminary estimate based on catches in the first half of the year. n/a: not available.

Anchovy in Subarea VIII (Bay of Biscay)



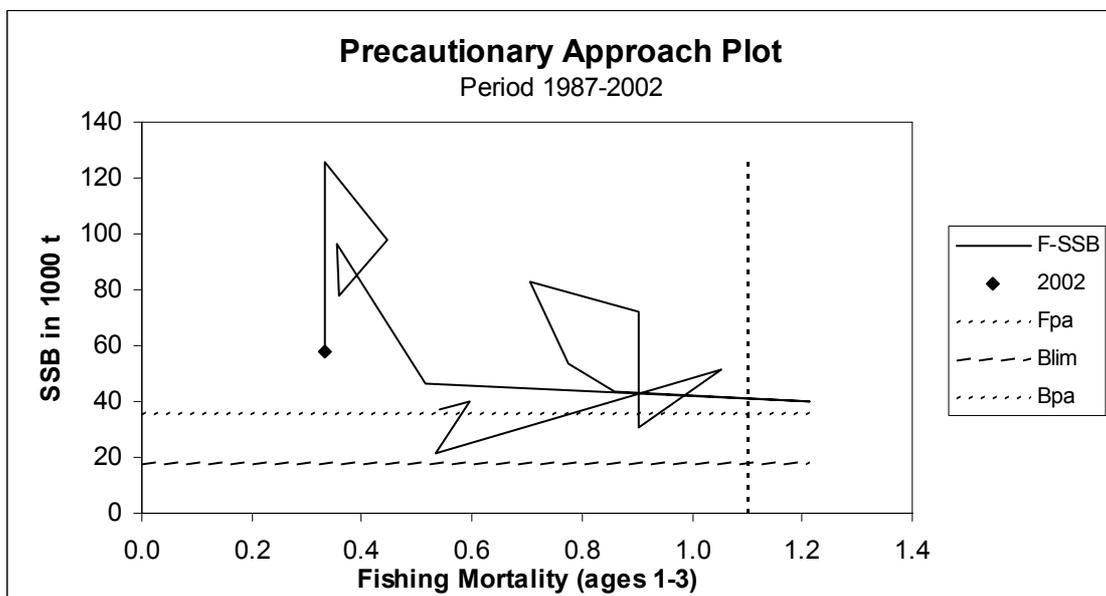
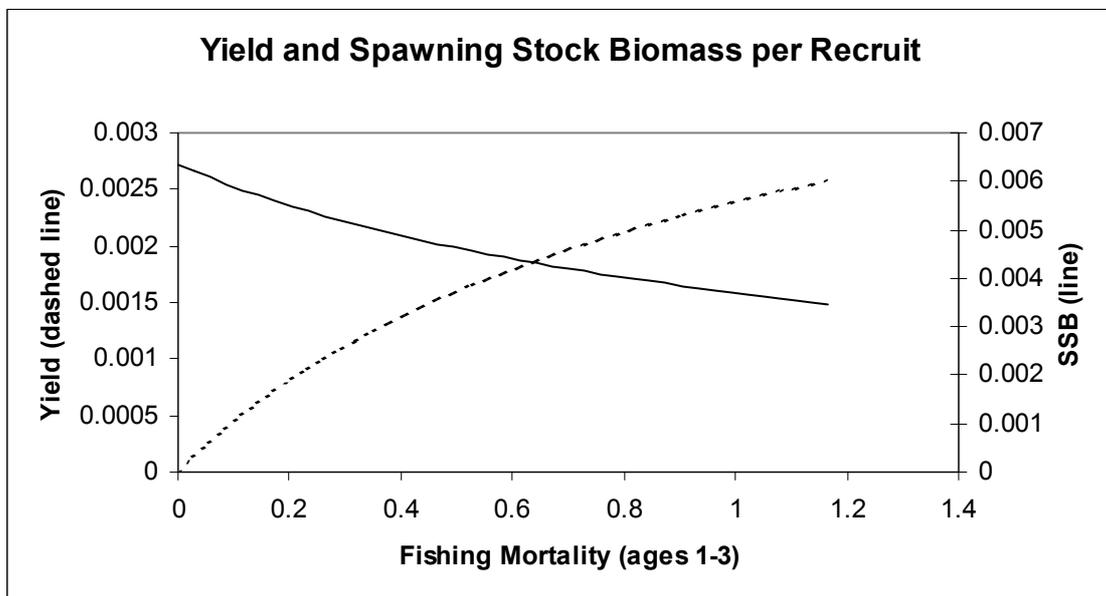
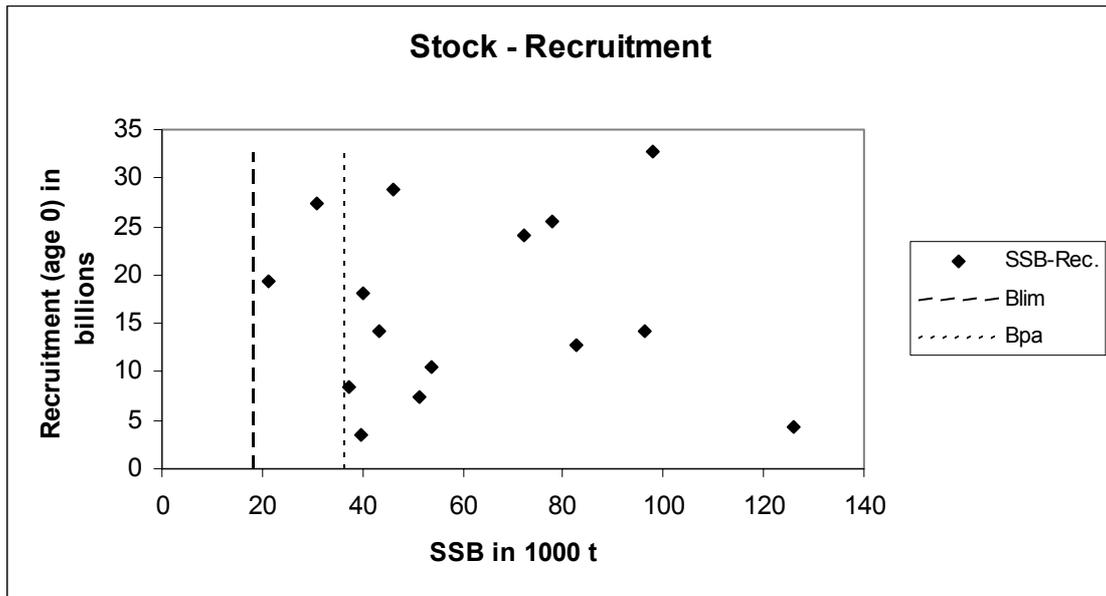


Table 3.11.8.a.1: Annual catches (in tonnes) of Bay of Biscay anchovy (Subarea VIII)
As estimated by the Working Group members.

| Country | France | Spain | Spain | International |
|---------|--------|------------------|-------------------|---------------|
| Year | VIIIab | VIIIbc, Landings | Live Bait Catches | 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 | | |

¹TAC for Subareas IX and X and CECAF 34.1.1. n/a=not available. Weights in '000 t.

Anchovy in Division IXa

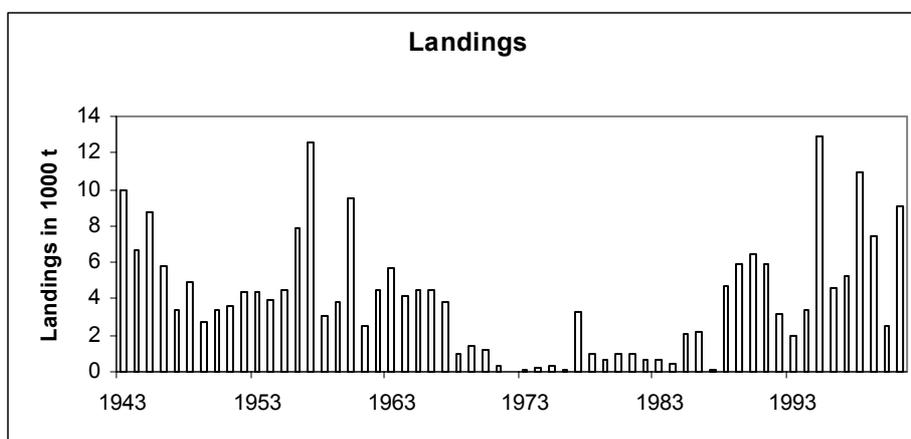


Table 3.11.8.b.1

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.

| Year | Portugal | | | | Spain | | | TOTAL |
|------|----------|---------|-----------|-------|-----------|-----------|-------|-------|
| | IXa C-N | IXa C-S | IXa South | Total | IXa North | IXa South | 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. This 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 (STCECF2000) 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 B_{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 management 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 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 F_{pa} for the entire period of the assessment, which is since 1978, and has even been above F_{lim} in most years since 1988. Current F is below F_{lim} . SSB has generally declined till the early 1990s and has stabilised at a low level since. SSB has been below B_{pa} since 1988, and

even below 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: |
|--|--|
| B_{lim} is 120 000 t, the lowest observed biomass in the 1998 assessment. | B_{pa} be set at 165 000 t. Biomass above this affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty in assessments. |
| F_{lim} is 0.28, the fishing mortality above which stock dynamics are unknown. | F_{pa} be set at 0.20. This F is considered to have a high probability of avoiding F_{lim} and a 50% probability of maintaining SSB above B_{pa} in the next 10 years, taking into account the uncertainty in assessments. |

Technical basis:

| | |
|----------------------|--|
| $B_{lim} = B_{loss}$ | $B_{pa} \sim B_{lim} \times 1.4$ |
| $F_{lim} = F_{loss}$ | $F_{pa} \sim F_{lim} * 0.72$, implies a less than 10% probability that ($SSB_{MT} < B_{pa}$). |

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 (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 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 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. $0.8 \times 27\,000$ 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 overshoot 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 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 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 F_{sq} for 2002 are presented below.

Since the TAC in 2001 was overshoot 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: $F(2002) = F_{sq} = \text{mean } F_{(99-01)} = 0.28$; 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 | $0.2 * F_{sq}$ | 9.2 | 9.0 | 139.2 |
| 0.11 | +20% SSB ~ $0.4 * F_{sq}$ | 17.9 | 17.5 | 130.1 |
| 0.14 ¹ | -20% TAC ~ $0.50 * F_{sq}$ | 22.1 | 21.6 | 125.7 |
| 0.17 | $0.6 * F_{sq}$ | 25.9 | 25.4 | 121.6 |
| 0.20 | F_{pa} | 29.8 | 29.2 | 117.5 |
| 0.23 | $0.8 * F_{sq}$ | 33.5 | 32.7 | 113.7 |
| 0.28 | 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 F_{pa} leads to a 50% probability of the stock exceeding 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:

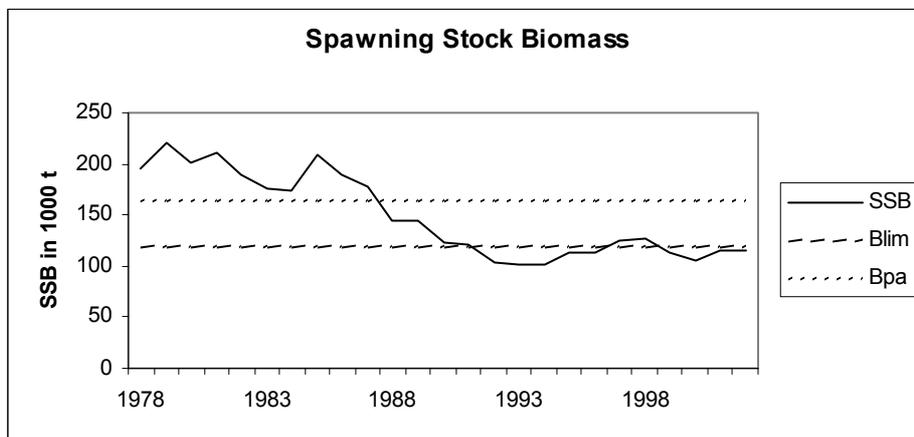
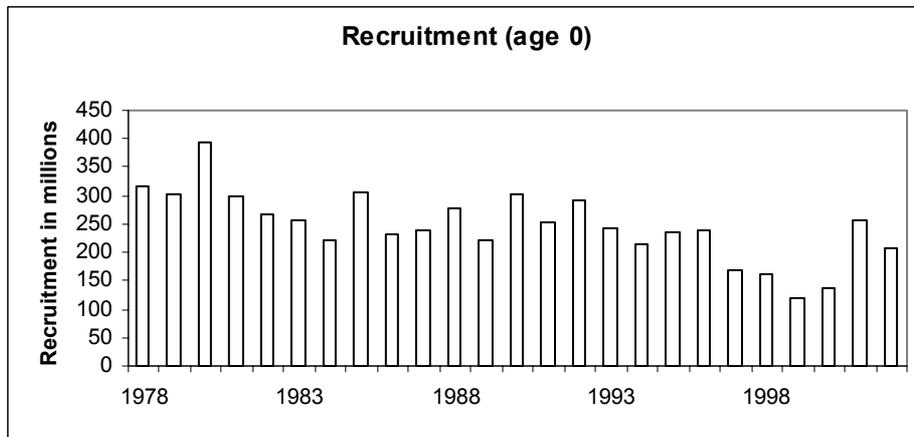
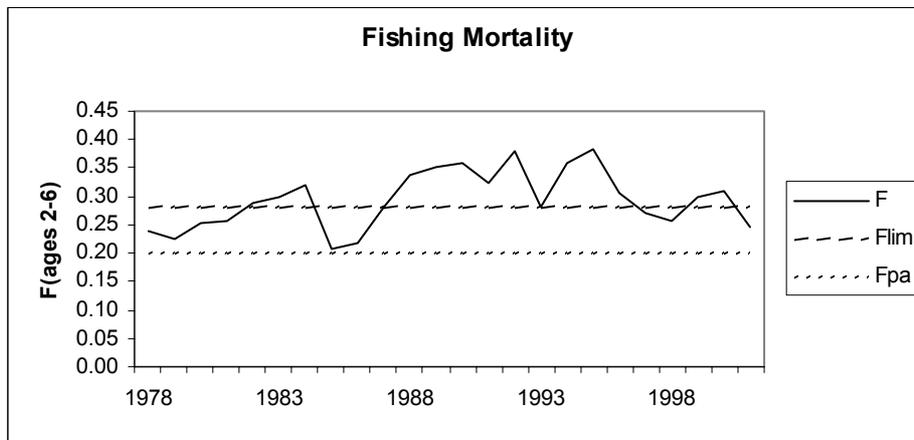
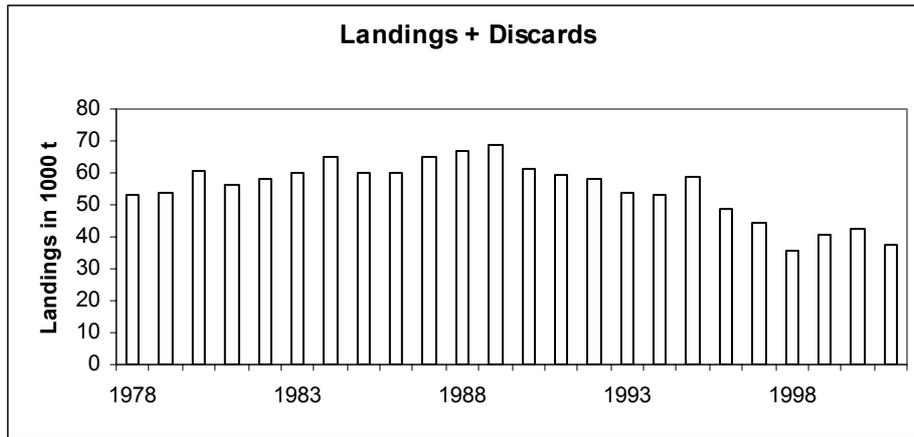
| | Fish Mort | Landings/R | SSB/R |
|-----------------|-----------|------------|-------|
| | Ages 2-6 | | |
| Average Current | 0.285 | 0.240 | 0.653 |
| F_{max} | 0.174 | 0.256 | 1.137 |
| $F_{0.1}$ | 0.107 | 0.241 | 1.705 |
| F_{med} | 0.280 | 0.241 | 0.667 |

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 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 | - | | | | |

¹Sum of area TACs corresponding to Northern stock plus Division Ila (EC zone only). ²Landings. Weights in '000 t.

Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b)



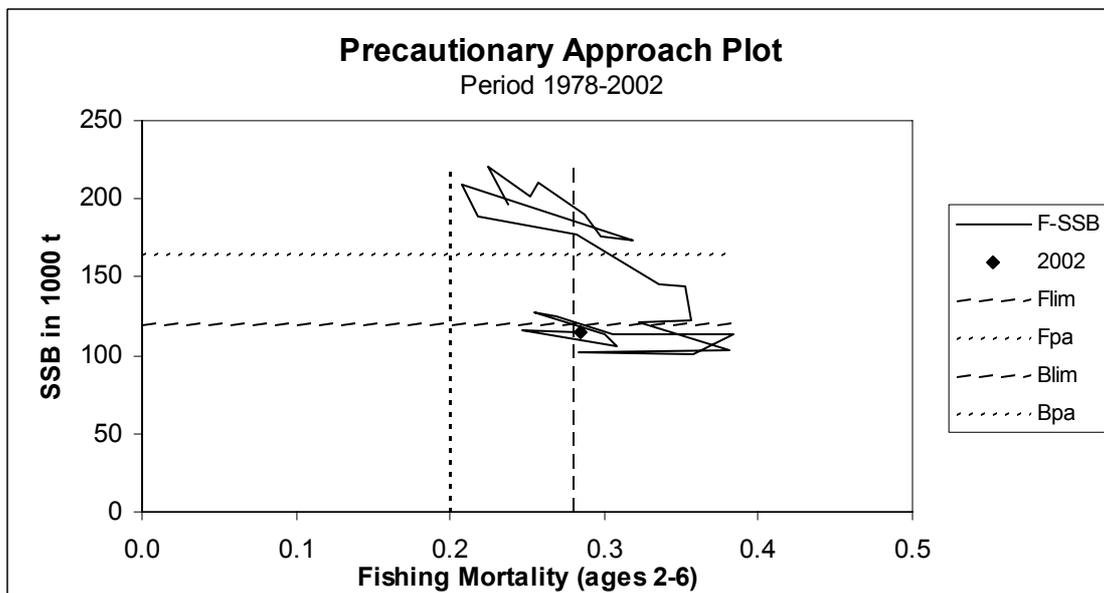
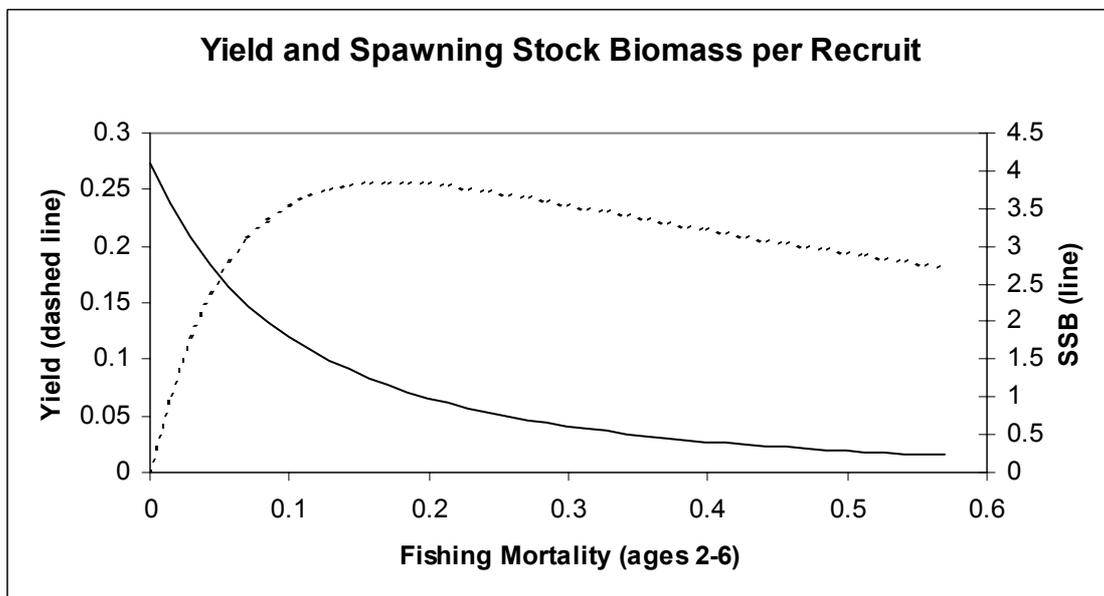


Table 3.12.2.1 Estimates of catches ('000 t) for the Northern Hake by area for 1961–2001.

| Year | Landings ⁽¹⁾ | | | | Total | Discards ⁽²⁾ | Catches ⁽³⁾ |
|------|-------------------------|------|---------|-------------|-------|-------------------------|------------------------|
| | IIIa+IVa+VI | VII | VIIIa,b | Unallocated | | 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 VIIIa,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 | Mean F |
|---------|-----------------------------------|---------------|----------------------|----------|
| | | | + Discards tonnes | 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 |

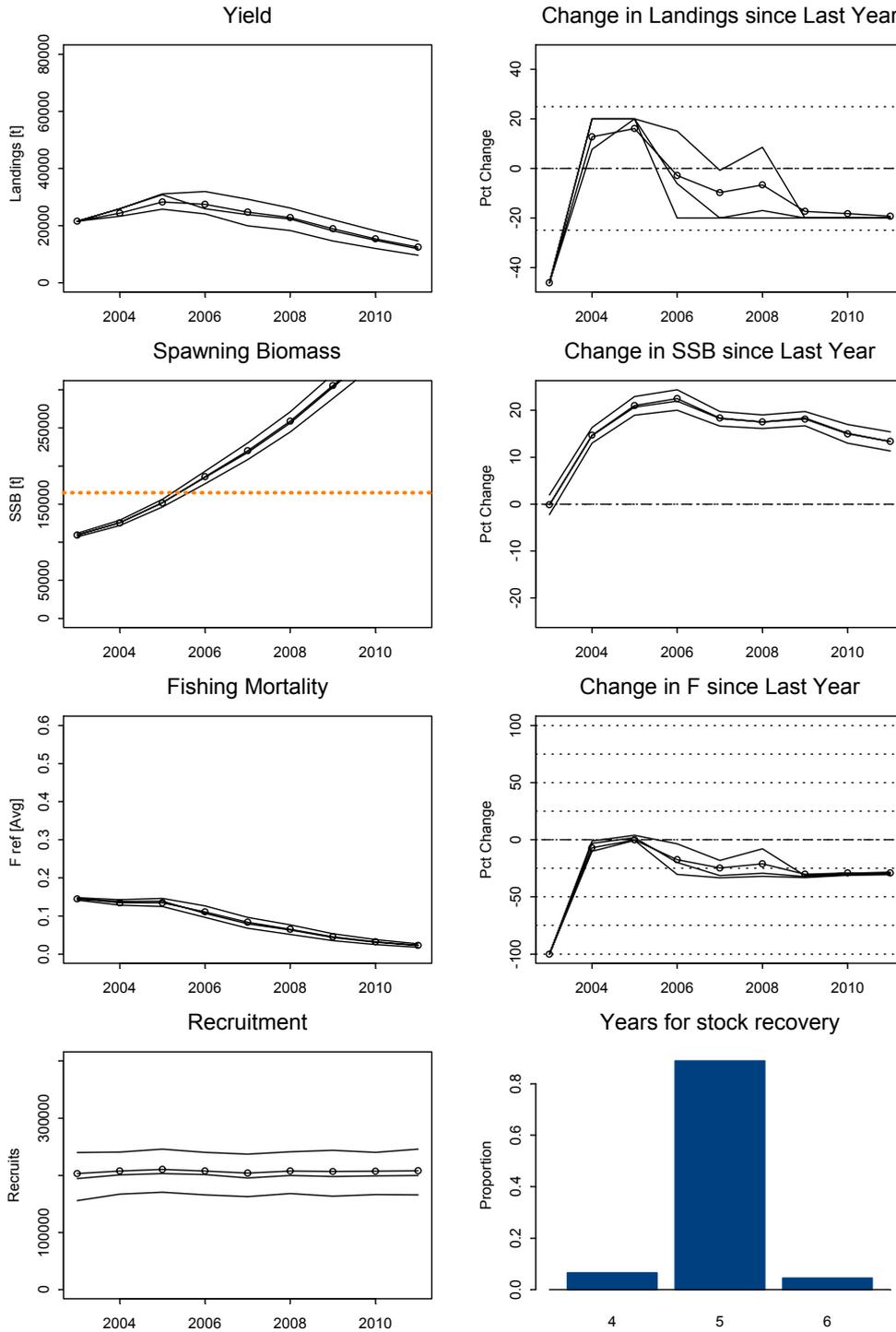
* GM 89-00

Northern Hake: CS simulation (update of STECF scenario 8):

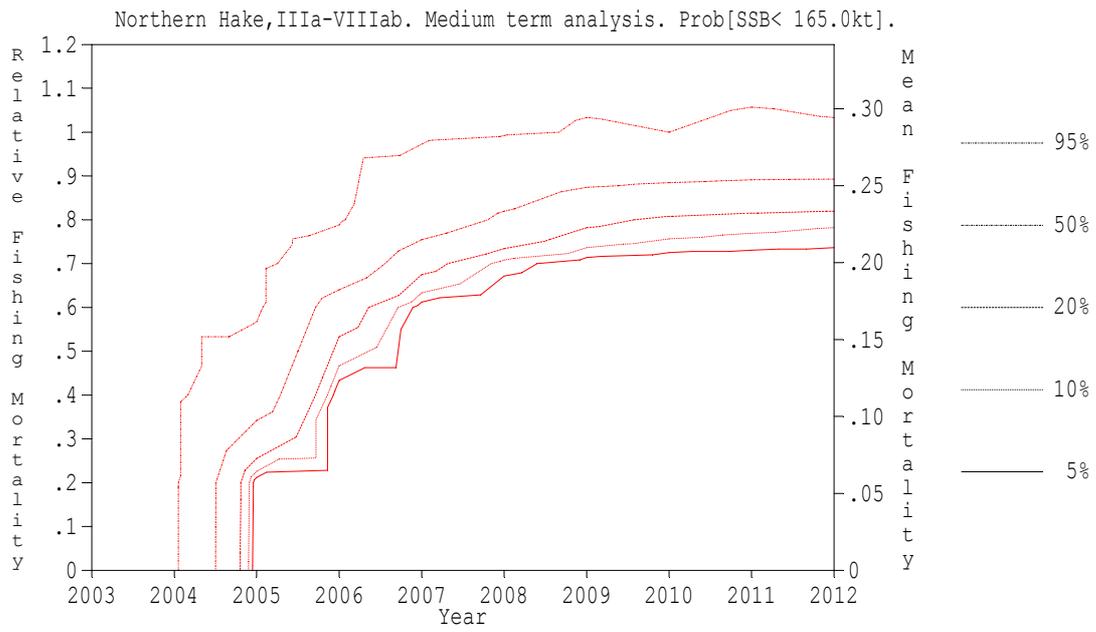
$F < F_{pa}$
 20% limit on Landings changes,
 +20% in SSB

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)



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 B_{pa} , but the fishing mortality in 2001 is above 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 (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 $F_{pa} = 0.17$ is to have a high probability of avoiding exploiting the stock above 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 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 B_{lim} | B_{pa} be set at 2.3 million t |
| F_{lim} is 0.26, the fishing mortality estimated to lead to potential stock collapse. | F_{pa} be set at 0.17. This F is considered to provide approximately 95% probability of avoiding F_{lim} , taking into account the uncertainty in the assessments. |

Technical basis:

| | |
|-----------------------------|--|
| | $B_{pa} = B_{loss}$ in Western stock raised by 15%: = 2.3 million t. |
| $F_{lim} = F_{loss} = 0.26$ | $F_{pa} = F_{lim} \times 0.65$. $F_{0.1} = 0.17$ |

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.

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 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.

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.

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

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 underestimate 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 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: $F(2002) = F(99-01, \text{unscaled}) = F_{sq} = 0.20$; 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 | $F = F_{pa}$ | 2986 | 542 | 508 | 34 | 2971 |
| 0.18 | | 2975 | 568 | 533 | 35 | 2941 |
| 0.19 | | 2964 | 597 | 560 | 37 | 2909 |
| 0.20 | 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 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:

| North-East Atlantic Mackerel | | | |
|--|-----------------------|-------------|-----------|
| Distributed and fished in ICES Subareas and Divisions IIa, IIIa, IV, Vb, VI, VII, VIII and IXa | | | |
| Spawning component | Western | Southern | North Sea |
| Spawning Areas | VI, VII, VIIIa,b,d,e. | VIIIc, IXa. | IV, IIIa. |

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 |
| F_{max} | 0.656 | 0.171 | 0.298 |
| $F_{0.1}$ | 0.188 | 0.146 | 0.749 |
| 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: F _{pa} | 642 | 612 | 579 | 2 | 667 |
| 2001 | F=0.17: F _{pa} | 665 | 670 | 620 | 1 | 676 |
| 2002 | F=0.17: F _{pa} | 694 | 683 | | | |
| 2003 | F=0.17: F _{pa} | 542 | | | | |

¹Data on discards and slipping from only two fleets. ²Landings and discards from IIa, IIIa, IV, Vb, VI, VII, VIII, and IXa. ⁴All 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 = 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 = F _{0.1} | 480 | 525 ¹ | 16 | 606 |
| 1991 | TAC; F = 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 | - | | | |

¹TAC for mackerel taken in all areas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, IVa. ²Landings and discards of Western component; includes catches of North Sea component. ³Catch 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 | | |

¹Subarea IV and Division IIIa. ²TAC for Subarea IV, Divisions IIIa, IIIb,c,d (EU zone), and Division IIa (EU zone).

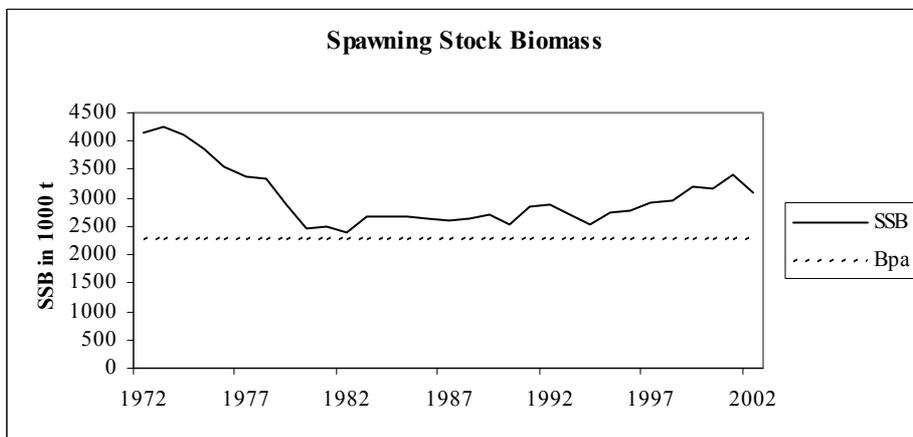
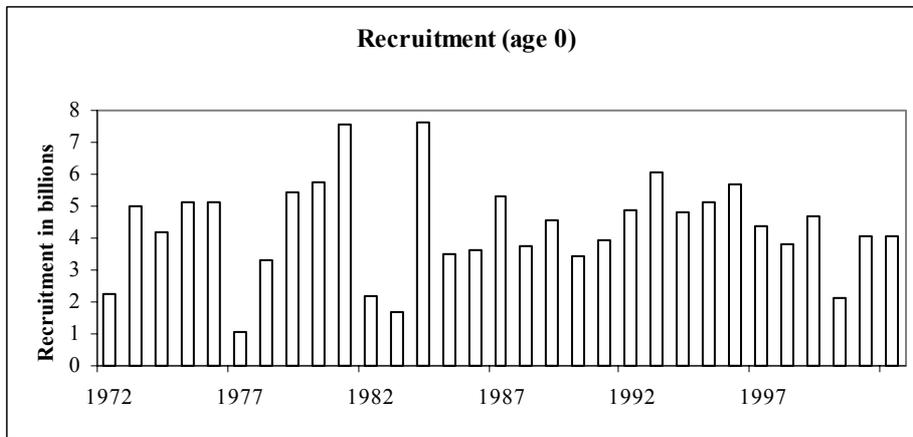
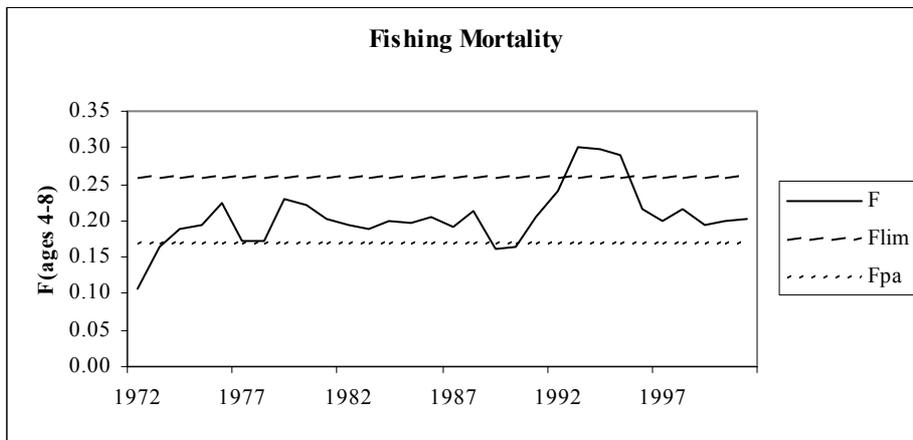
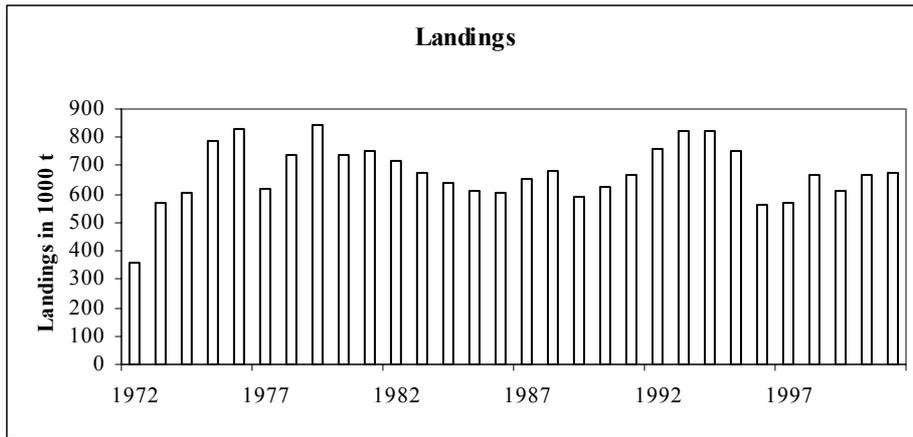
³Estimated landings of North Sea component. ⁴No information. Weights in '000 t.

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 | - | | |

¹Division 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.)



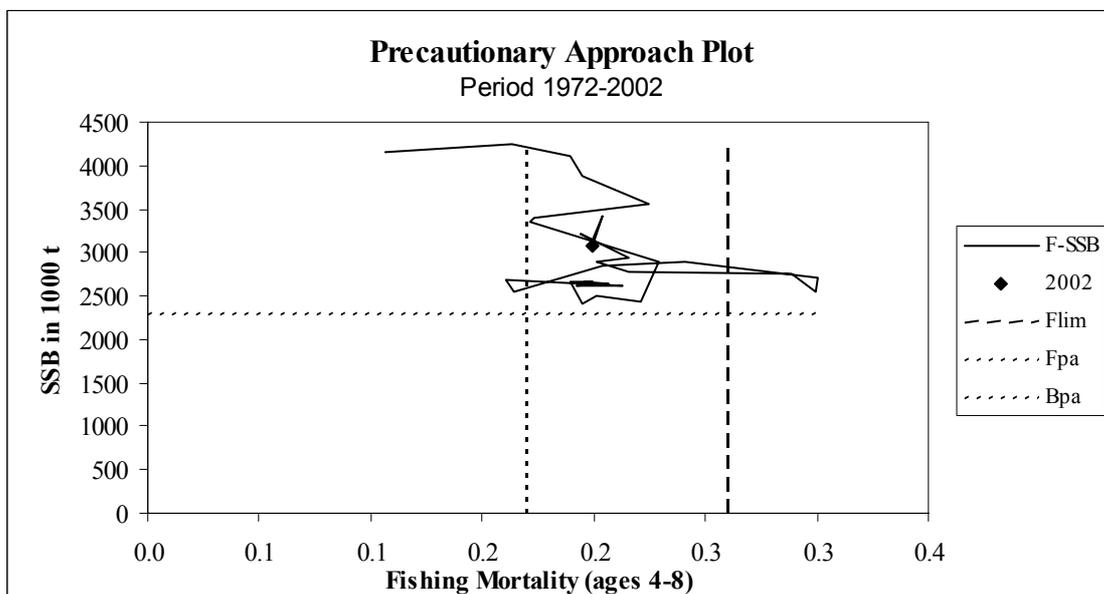
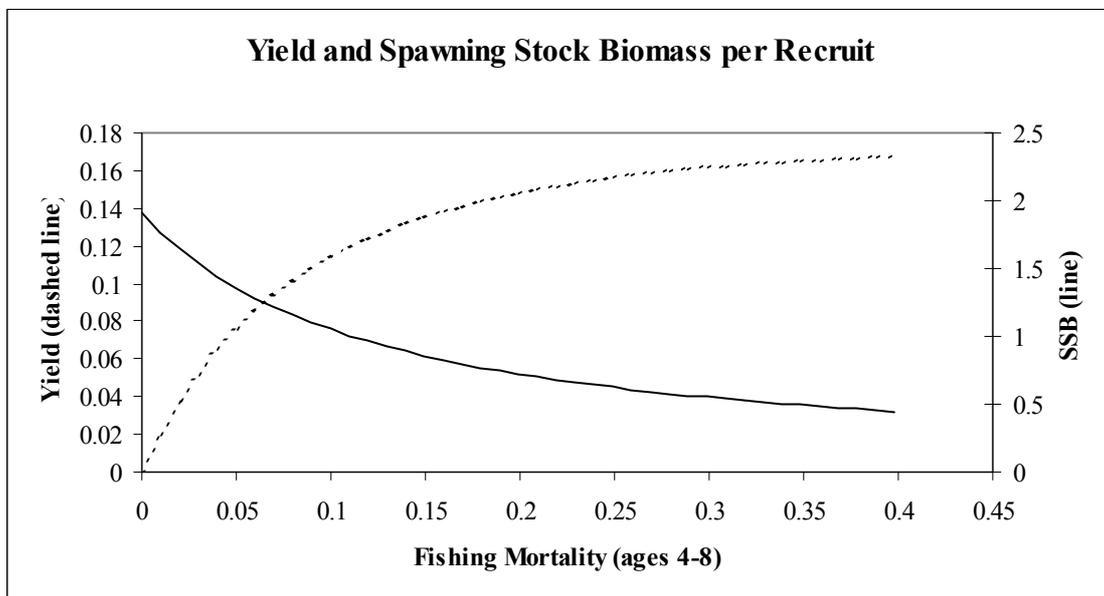
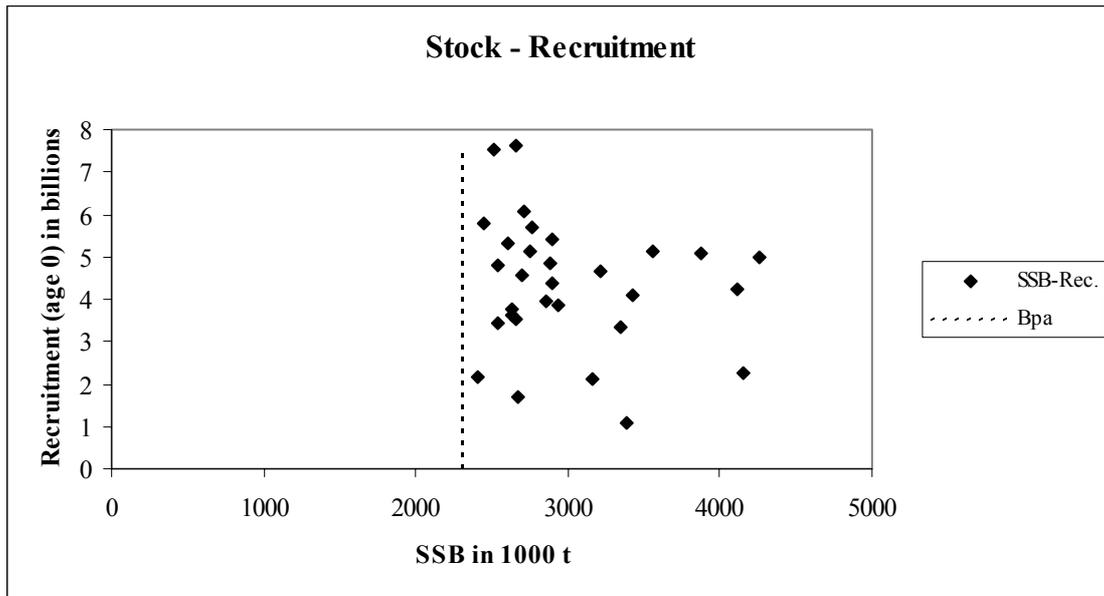


Table 3.12.3.a.1 Catches of MACKEREL by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

| 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.

¹For 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) | | | | - | -18,647 | | | -177 | -40,011 | | |
| Misreported (VIa) | | | | 109,625 | | | | | -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 |

²Russia.

*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 |

¹Includes small catches in IIIb & IIIc.

²Faroese 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 |

¹Faroese 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 |

¹Division VIIIc.

²Division 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 |

¹Division VIIIc.

²Division 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 02°00' W
- latitude 49°30' N longitude 02°00' W
- latitude 49°30' N longitude 07°00' W
- latitude 52°00' N longitude 07°00' W
- a point on the West coast of the UK at latitude 52°00' 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 VIIefgh 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).

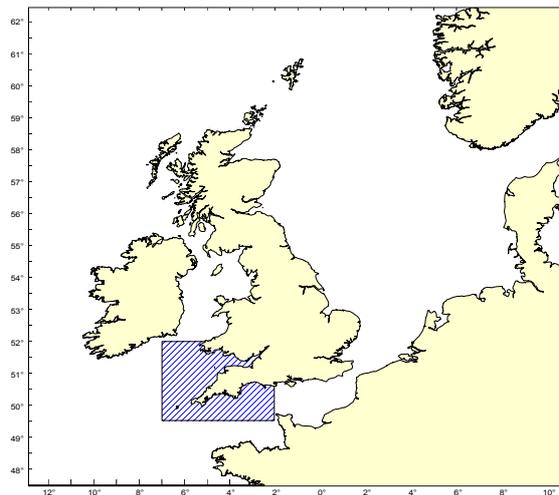


Figure 3.12.3.b.1. The Mackerel Box.

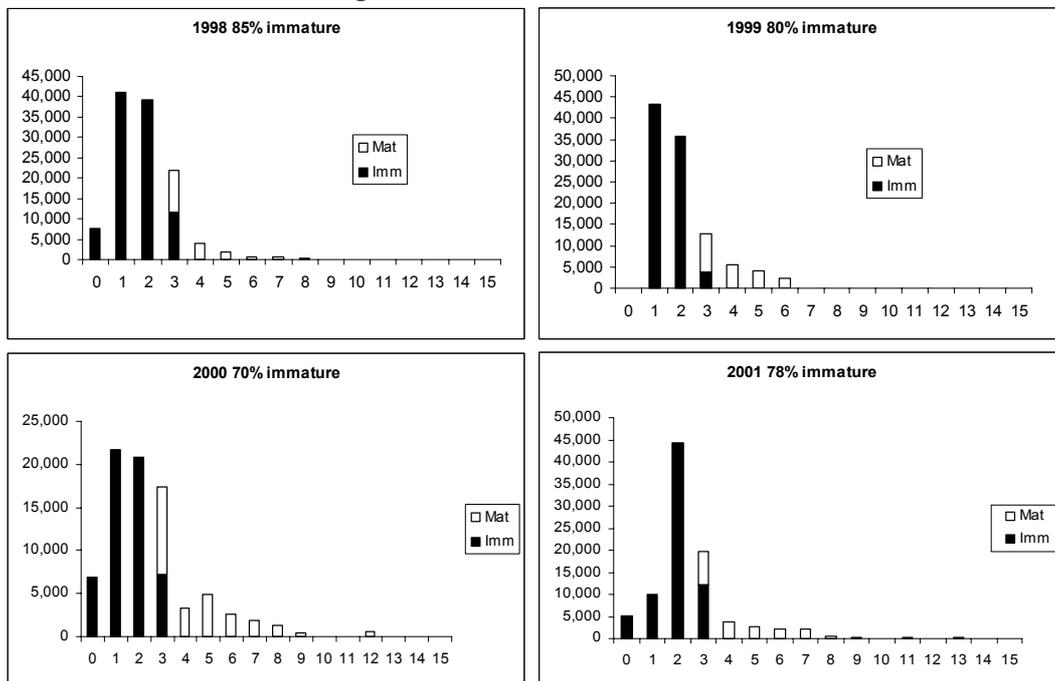


Figure 3.12.3.b.2. The percentage of mature and immature fish recorded in commercial landings from ICES Divisions VIIefgh for the years 1998–2001. Ages 0–2 are assumed to be immature, while age 3 is assumed to be immature in quarters 1 and 2 and mature in quarters 3 and 4.

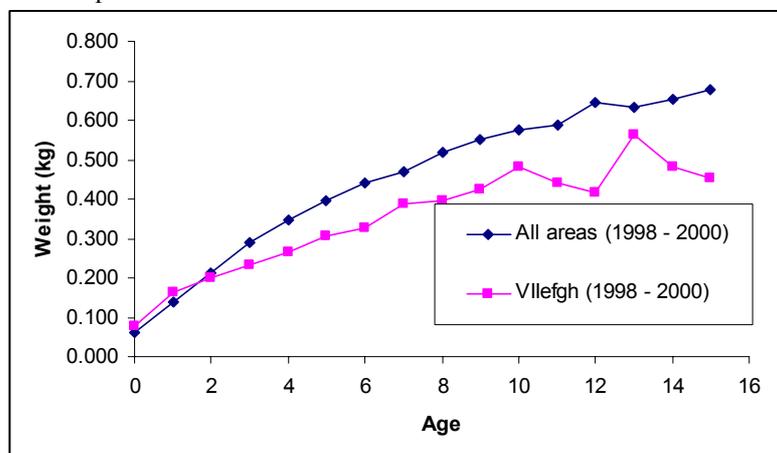


Figure 3.12.3.b.3 The average weight-at-age of mackerel caught in ICES Divisions VIIefgh and in all ICES Divisions, illustrating the relatively low weight-at-age of fish taken from Divisions VIIefgh.

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 $F_{0.1}$. 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 $F_{0.1}$. 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: $F(2002) = F(2001) = F_{sq(4-10)} = 0.22$; Landings (2002) = 181; SSB (2002) = 668.

| F(2003) | Basis | SSB (2003) | Catch (2003) | Landings (2003) | SSB (2004) |
|---------|----------------|------------|--------------|-----------------|------------|
| 0.15 | $F_{0.1}$ | 571 | 113 | 113 | 524 |
| 0.18 | $0.8 * F_{sq}$ | 565 | 131 | 131 | 506 |
| 0.22 | 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:

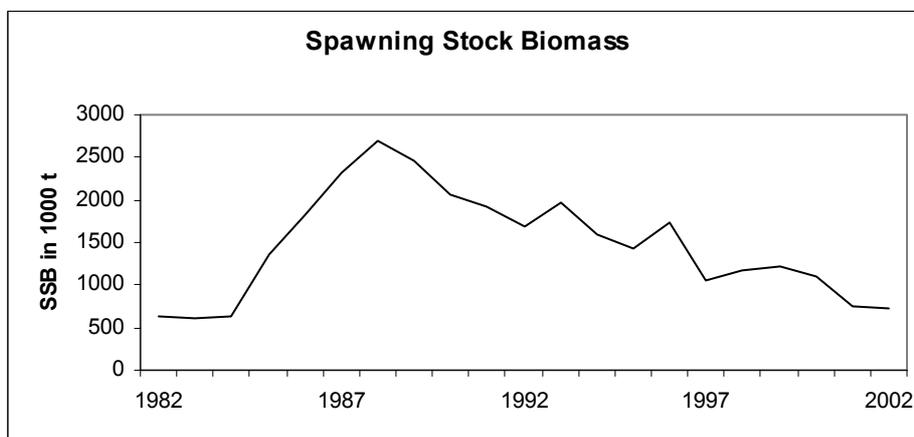
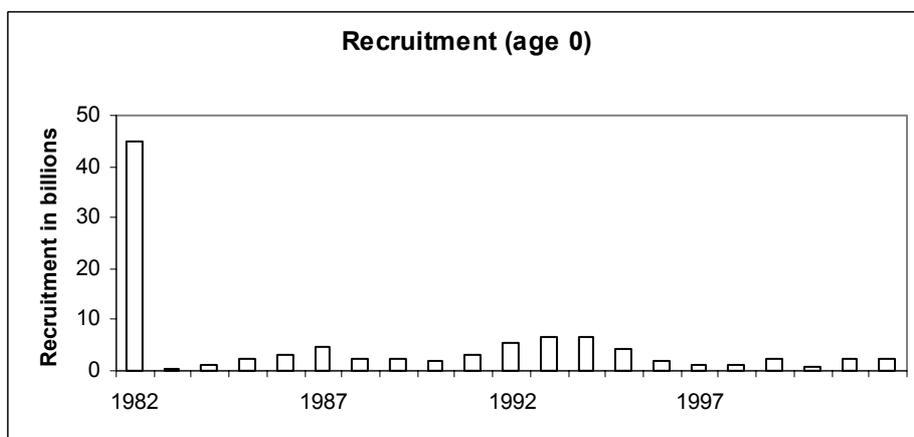
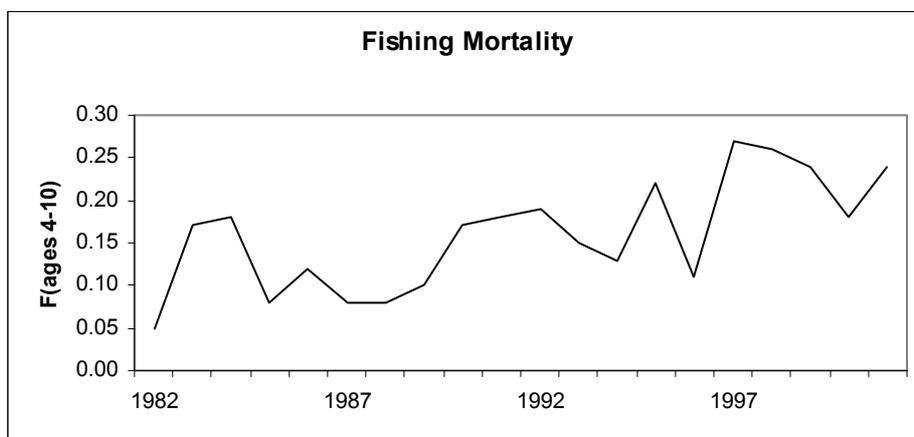
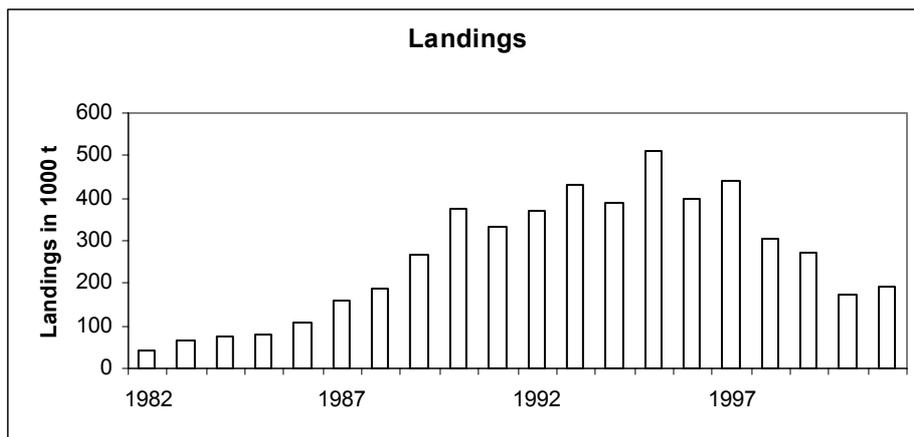
| | Fish Mort Ages 4–10 | Yield/R | SSB/R |
|-----------------|------------------------|---------|-------|
| Average Current | 0.220 | 0.053 | 0.162 |
| F_{max} | 0.557 | 0.057 | 0.047 |
| $F_{0.1}$ | 0.179 | 0.050 | 0.199 |
| F_{med} | N/A | | |

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 | | | | |

¹Division 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)



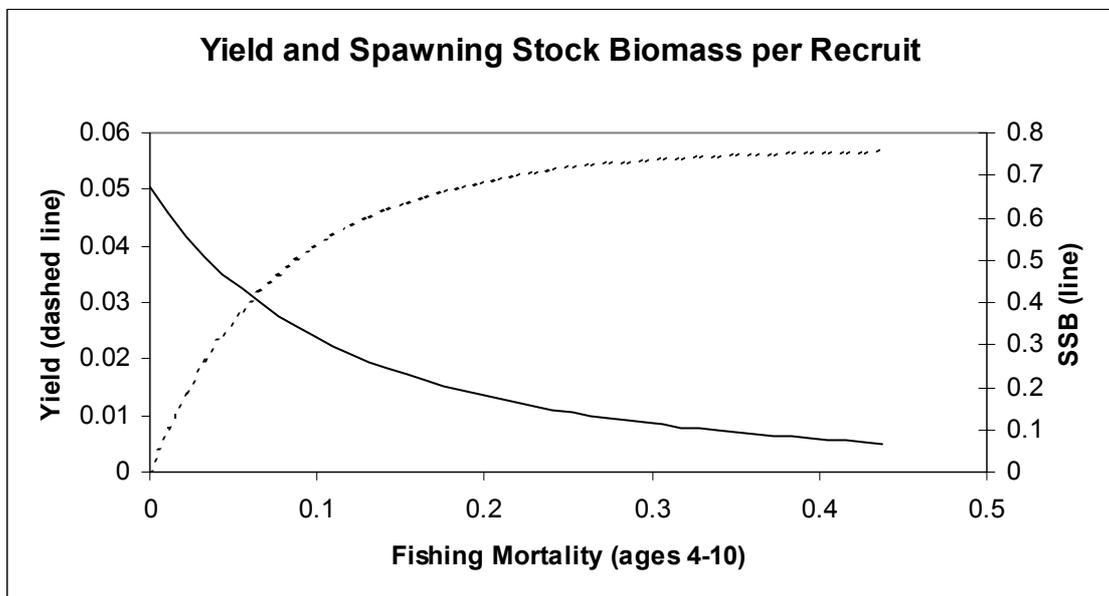
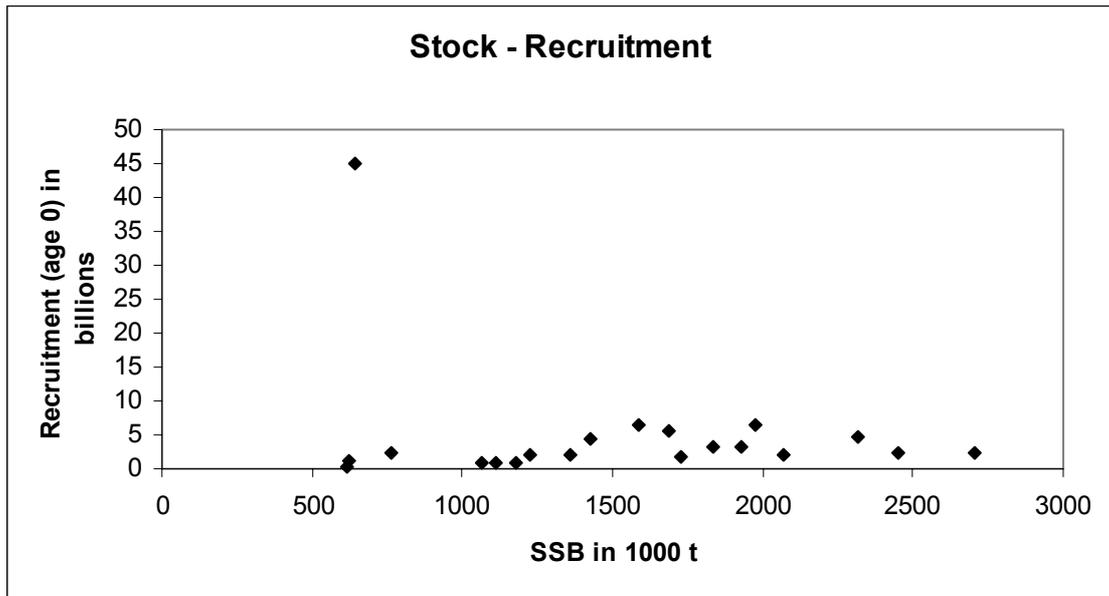


Table 3.12.4.1 Landings (t) of HORSE MACKEREL in Subarea II. (Data as submitted by Working Group members.)

| 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 |

¹Preliminary.

²Included in Subarea IV.

³Includes 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 | | | | | |

¹Preliminary.

²Included in Subarea VII.

³Includes Divisions IIIa, IVa,b and VIb.

⁴Includes 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 |

¹Provisional.

²Includes 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 |

¹Preliminary.

²Included 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 |

¹Recruitment in 2001 and 2002: geometric mean 1983–2000; SSB₂₀₀₂: projected;F₂₀₀₂ = 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 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 (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: |
|-------------------------|-----------------------------------|
| B_{lim} is 1.5 mill t | B_{pa} be set at 2.25 million t |
| F_{lim} is 0.51 | F_{pa} be set at 0.32 |

Technical basis

| | |
|----------------------------|---|
| $B_{lim}: B_{loss}$ | $B_{pa} = B_{lim} \exp(1.645 * \sigma) \sigma = 0.25$ |
| $F_{lim}: F_{loss} (0.51)$ | $F_{pa}: F_{med} (1998)$ |

Advice on management: ICES recommends that the fishing mortality be less than $F_{pa} = 0.32$, 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 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 B_{pa} . The reduction of fishing mortality to 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 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 | $F_{pa} = 0.39 * F(2001)$ | 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 F_{pa} has a high probability of reducing the stock to below B_{pa} . A revised estimate of F_{pa} that is more consistent with maintaining stock sizes above 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 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 F_{pa} (=0.32) will result in a declining SSB to a level below 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 VIIId,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.

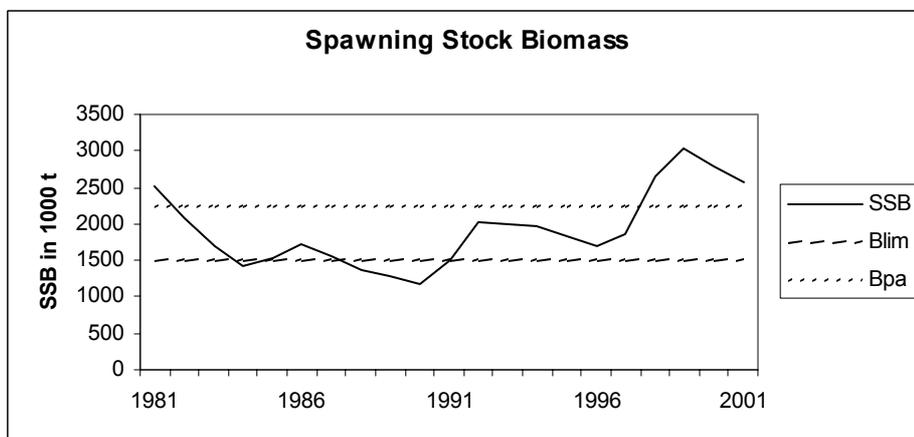
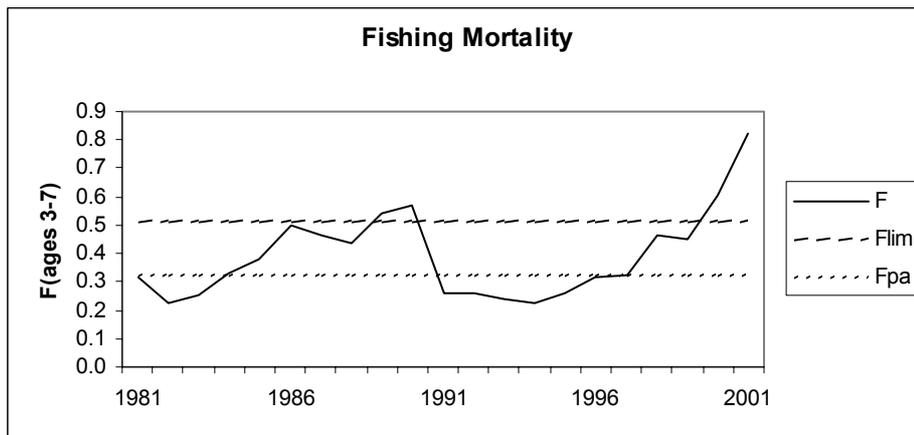
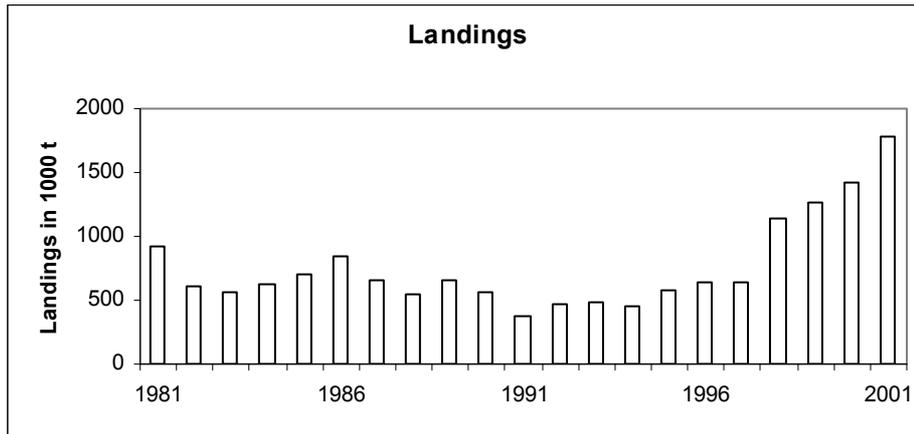
Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 29 April – 8 May 2002 (ICES CM 2002/ACFM:19).

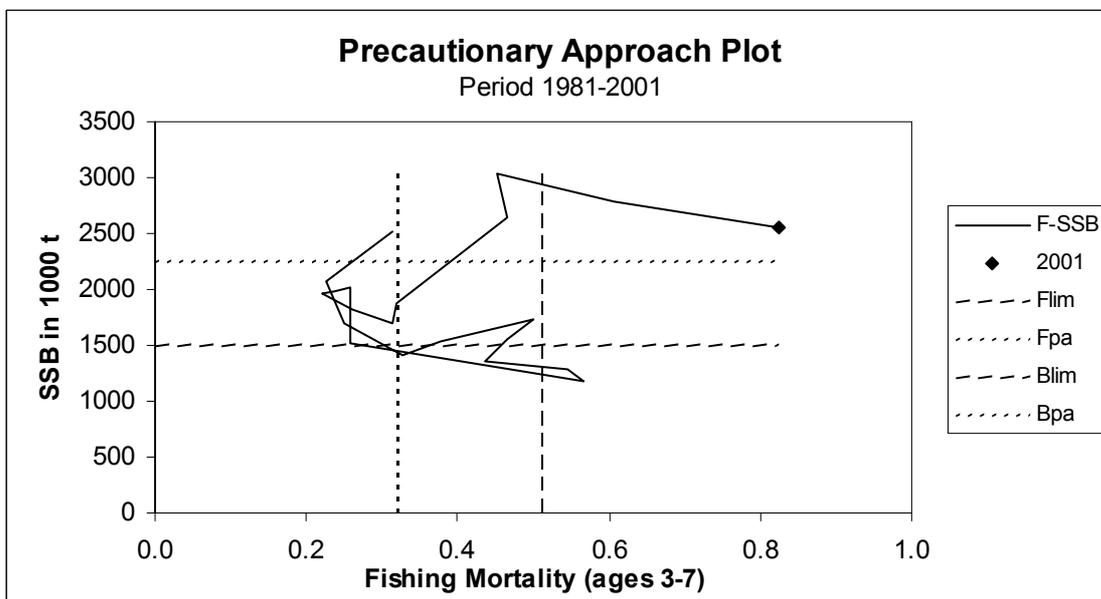
Catch data (Tables 3.12.5.1–7):

| 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 <i>status quo</i> 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 F_{pa} | 800 | | 1412 |
| 2001 | F should not exceed the proposed F_{pa} | 628 | | 1780 |
| 2002 | Rebuilding plan | 0 | | |
| 2003 | F should be less than the proposed F_{pa} | 600 | | |

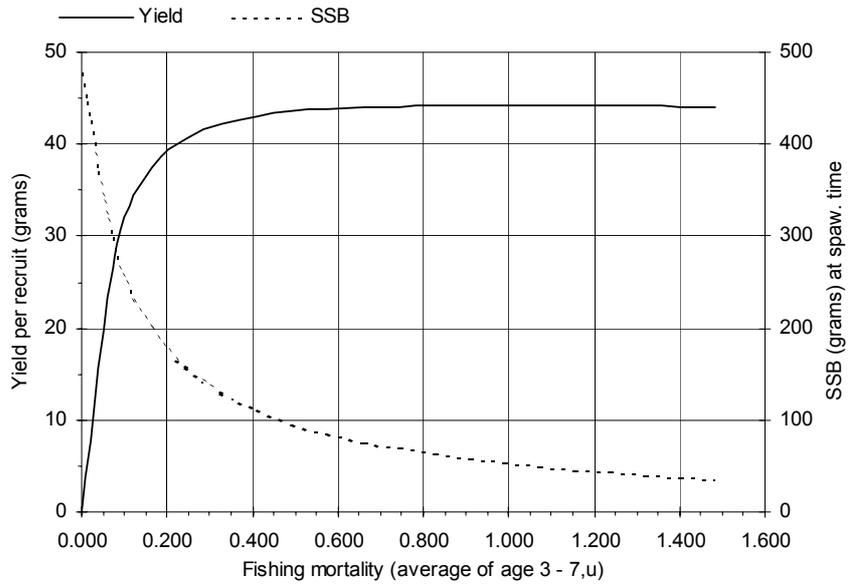
¹NEAFC proposal for NEAFC regions 1 and 2. Weights in '000 t.

Blue whiting combined stock (Subareas I-IX, XII & XIV)

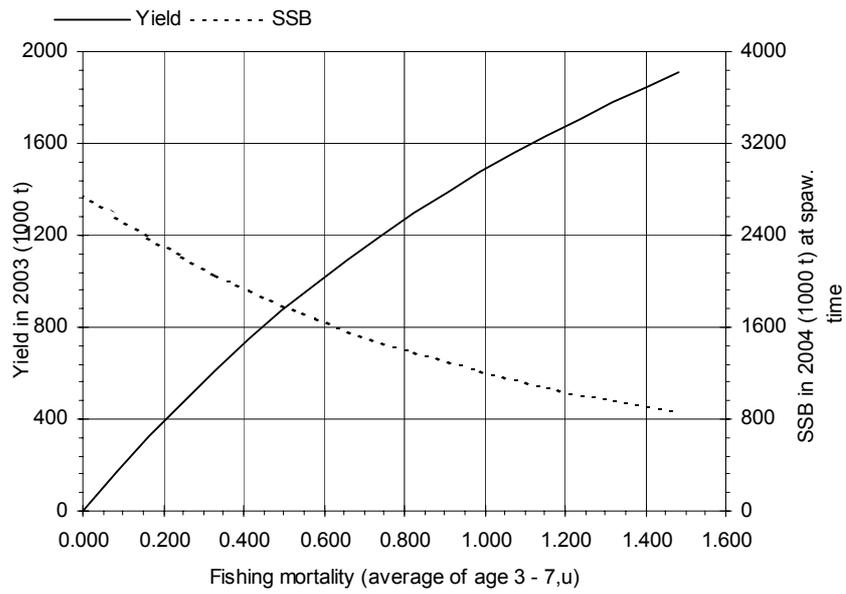




Long term yield and spawning stock biomass



Short-term yield and spawning stock biomass



| 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 | - | - | - |
| Faroese | 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 | - | - | - |
| Faroese | 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 | 45,635 | 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⁾ | | | 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⁾ | 28.541 | 18.144 | 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⁾ | | | 3.325 | 5.281 | 355 | 705 | 1.522 | 1.794 | - | 6.068 | 6.066 | - | - | - | 60 |
| Faroes ⁵⁾⁶⁾ | 7.051 | 492 | | | | | | | | | | 296 | 265 | 42 | 6.741 |
| Germany ¹⁾ | 115 | 280 | 3 | - | - | 25 | 9 | - | - | - | - | - | - | - | 81 |
| Netherlands | - | - | - | 20 | - | 2 | 46 | - | - | - | 793 | - | - | - | - |
| Norway ⁴⁾ | | | | | | | | | | | | | | | 21.804 |
| Norway ⁵⁾ | 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 | 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 |
| VIIb | | | 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) | | | | | | | | | | | | |
|---------------------------------------|-------------------|------|-------|-------|---|--|----------------------------|------|------|----------------------------|-----|-----|
| F in 2003 and after | Probabilities (%) | | | | Year when risk B<Blim is below 5% | Year when prob. B>Bpa is above 95% | Fractiles of catch in 2002 | | | Fractiles of catch in 2003 | | |
| | B<Blim | | B>Bpa | | | | 25% | 50% | 75% | 25% | 50% | 75% |
| | 2003 | 2012 | 2003 | 2012 | | | | | | | | |
| 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

| 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% |

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 ($F_{sq} = F_{98-00} = 0.29$ corresponding to an expected landing of 37·400 t) and the other option was based on the assumption that the catch in 2001 will be 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.

- 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 $F(2001) = F_{sq} = 0.29$ 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 F_{sq} (to $F_{pa}=0.20$), 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 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

B_{lim} is currently based on 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 B_{loss} about 15 % lower than estimated in the 1998 assessment. However, preliminary results from a

statistical method applied to the revised series set 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 B_{lim} and B_{pa} at 102–105 kt and 140–150 kt respectively,
- or that these changes in SSB and in B_{loss} from year to year reflect instability 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 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 Reykjavik 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 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 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 F_{pa} will lead to a substantial probability of $SSB < B_{pa}$ 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 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 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 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 B_{lim} is 5% or less. However, at any higher fishing mortality the risk falling below B_{lim} is greater than 5%. In order to bring B above 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 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 B_{pa} of 2 250 000 t (B_{pa} used until now) in 2003, and a 95% probability to be above 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)

| F in 2003 and after | Probabilities (%) | | | | Year when risk B<Blim is below 5% | Year when prob. B>Bpa is above 95% | Fractiles of catch in 2002 | | | Fractiles of catch in 2003 | | |
|------------------------|-------------------|----------------|---------------|---------------|---|--|----------------------------|------|------|----------------------------|-----|-----|
| | B<Blim 2003 | B<Blim 2012 | B>Bpa 2003 | B>Bpa 2012 | | | 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 |