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ACFM REPORT 1998 – PART 1

Preface

The ICES Advisory Committee for Fishery Management met twice in 1998, 13–22 May and 20–29 October 1998. Both meetings were held at the ICES Headquarters, Palægade 2–4, Copenhagen. Attendance is listed on the following pages.

ACFM in its advice includes a proposal for how the Precautionary Approach can be interpreted. This proposal was developed between the May and October meetings and the format of the report therefore changed between these two meetings. The proposal on the Precautionary Approach is described in the introductions to the meeting reports.

The reports are in response to requests from Management Commissions (EC, IBSFC, NEAFC, and NASCO) and from member countries. These requests are summarised in Sections 1 and 2. The management advice is presented stock by stock in Section 3 where also the answers to special requests are given.

ICES Fisheries Adviser
ICES Headquarters, Copenhagen
March 1999

**MEMBERS AND ALTERNATE MEMBERS OF THE ADVISORY COMMITTEE ON FISHERY
MANAGEMENT IN 1998**

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Chair of Resource Management Committee	Dr R. L. Stephenson	
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USA	Dr W. Gabriel Dr M. Terceiro ²	Dr M. Terceiro Mr S. Cadrin ²

¹ From September 1998

² From October 1998

ADVISORY COMMITTEE ON FISHERY MANAGEMENT
PARTICIPANTS AT MEETING, SPRING 1998

PARTICIPANTS		A	B
Mr J-J. Maguire	Chair	X	X
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Mr E. Aro	Chair, Baltic Fish Committee	X	X
Dr R. L. Stephenson	Chair, Resource Management Committee	X	X
Mr W. Vanhee	Belgium	X	X
Dr J. Rice	Canada	X	X
Mr H. Lassen	Denmark	X	X
Dr T. Raid	Estonia and Chair of Baltic Fisheries Assessment WG	X	X
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Mr A. Forest	France	X	X
Dr C. Hammer	Germany	X	X
Dr O. Rechlin	Germany		X
Dr G. Stefánsson	Iceland	X	X
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Mr H. Heessen	Netherlands	X	X
Mr A. Dommasnes	Norway	X	X
Dr A. Aglen	Norway		X
Dr J. Horbowy	Poland	X	X
Dr (Ms) F. Borges	Portugal	X	X
Dr V. Shleinik	Russia	X	X
Ms. C. Porteiro	Spain	X	X
Mr B. Sjöstrand	Sweden	X	X
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Mr J. Reinert (part time)	Chair of North-Western WG and Observer Faroe Islands and Greenland	X	X
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Dr L. Marshall	Chair of WG on North Atlantic Salmon		X
Dr J. Carscadden	Chair of Northern Pelagic and Blue Whiting Fisheries WG		X
Mr J. Simmonds	Chair of Herring Assessment WG for the Area South of 62°N		X
Mr J. D. M. Gordon	Chair of SG on Deep Sea Fisheries Resources		X
Dr W. Dekker	Chair of EIFAC/ICES WG on Eels		X
Dr R. Bowering	Chair of Arctic Fisheries WG		X
Dr H. Sparholt	ICES Fisheries Assessment Scientist	X	X

A Plenary Sessions 18-22 May 1998

B Sub-Groups 13-16 May 1998

ADVISORY COMMITTEE ON FISHERY MANAGEMENT
PARTICIPANTS AT MEETING, AUTUMN 1998

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Mr E. Aro	Chair, Baltic Committee	X	X
Dr R. L. Stephenson	Chair, Resource Management Committee	X	X
Dr (Ms) A. Jarre-Teichmann	Chair, Marine Habitat Committee	X	X
Mr W. Vanhee	Belgium	X	X
Dr J. Rice	Canada	X	X
Mr E. Kirkegaard	Denmark	X	X
Dr A. Järvik	Estonia	X	X
Dr P. Suuronen	Finland	X	
Mr B. Mesnil	France	X	X
Dr C. Hammer	Germany	X	X
Dr E. Hjørleifsson	Iceland	X	X
Mr J. Molloy	Ireland	X	X
Mr M. Plikshs	Latvia	X	X
Mr F. van Beek	Netherlands and Chair of Demersal Stocks in the North Sea and Skagerrak WG	X	X
Dr A. Aglen	Norway	X	X
Dr J. Horbowy	Poland	X	X
Dr (Ms) F. Borges	Portugal	X	X
Dr V. Shleinik	Russia	X	X
Ms C. Porteiro	Spain	X	X
Mr B. Sjöstrand	Sweden	X	X
Dr K. Stokes	UK	X	X
Dr M. Terceiro	USA	X	X
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Mr P. Kannevorff	Observer Faroe Islands and Greenland	X	X
Mr H.-P. Cornus	Observer NAFO	X	
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Dr R. Bowering	Chair of Arctic Fisheries WG		X
Mr M. Pawson	Chair of Southern Shelf Demersal Stock WG		X
Dr G. Stenson	Chair of Joint ICES/NAFO WG on Harp and Hooded Seals		X
Dr R. K. Mohn	Chair of SG on the Assessment of Other Fish and Shellfish Species		X
Mr S. Munch Petersen	Chair Pandalus WG		X
Dr H. Sparholt	ICES Fisheries Assessment Scientist	X	X

A Plenary Sessions 26-29 October 1998

B Sub-Groups 20-24 October 1998

1.1.a The Form of the ICES Advice (May 1998)

ICES recognises that "changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values" (FAO 1996). Therefore ICES agrees that a precautionary approach should be applied to fishery management. Reference points, stated in terms of fishing mortality rates or biomass, or in other units, are a key concept in implementing a precautionary approach. They should be regarded as signposts giving information of the status of the stock in relation to predefined limits that should be avoided to ensure that stocks and their exploitation remain within safe biological limits.

The concept of safe biological limits was introduced in ICES advice in 1981 and further developed in 1986 (Serchuk and Grainger, 1992). At first the term was used in relation to management actions, whereas latterly it has been used in relation to the state of a stock, and also of its exploitation. In its recent implementation of the concept, ICES has equated being within safe biological limits as being above MBAL and being outside safe biological limits as being below MBAL. This is a needlessly restricted interpretation of a concept which is clearly multi-dimensional involving at least reference points related to fishing mortality and biomass, but possibly also factors such as age-distribution in the stock and in the catch, geographical range, condition factor etc. The concept of safe biological limits is explicitly referred to in the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks and ICES will continue to use it, but in an expanded way, consistent with the precautionary approach.

In order for stocks and fisheries exploiting them to be within safe biological limits, there should be a high probability that 1) the spawning stock biomass is above the threshold where recruitment is impaired, and 2) the fishing mortality is below that which will drive the spawning stock to the biomass threshold which must be avoided. The biomass threshold is defined as B_{lim} (lim stands for limit) and the fishing mortality threshold as F_{lim} . In order to have a high probability to avoid the thresholds, management action must be taken before the thresholds are approached, and the distance away from the threshold where management action should be taken is related to how precisely the thresholds and the current situations with respect to them are known. The greater the precision of the assessment, the smaller the distance between limit and precautionary reference points. If the assessment is less reliable, the distance will be greater. ICES has defined B_{pa} (pa stands for precautionary approach) as the biomass below which action should be taken and F_{pa} as the fishing mortality above which management action should be taken. The distance between the limit and the precautionary approach reference points is also related to the degree of risk that

fishery management agencies are willing to accept. Therefore, although ICES sees its responsibility to identify limit reference points, it will suggest precautionary reference points. The adoption of precautionary reference points requires discussion with fishery management agencies.

Formal definitions are provided below:

F_{lim} is the limit fishing mortality which should be avoided with high probability because it is associated with unknown population dynamics or stock collapse. There are very few stocks for which F_{lim} is accurately known. Some stocks in the ICES area have collapsed in the past when fishing mortality exceeded F_{lim} , but generally speaking, the fishing mortality rate at which the probability of stock collapse becomes unacceptably high remains unknown. Therefore, there are uncertainties in the estimate of current fishing mortality. In order to have a high probability that fishing mortality will be below F_{lim} , a precautionary reference point, F_{pa} lower than F_{lim} , is defined. Used as a constraint on fishing, F_{pa} is designed to ensure that there is a high probability that F_{lim} will be avoided and that the spawning stock biomass will remain above the threshold below which the probability of good to average recruitment is decreased. In other words, F_{pa} is a device to ensure that recruitment overfishing does not take place.

F_{pa} is the upper bound on fishing mortality rate to be used by ICES in providing advice. F_{pa} , given uncertainties, must have a high probability of being below F_{lim} , and it must have a high probability of being sustainable based on the history of the fishery; i.e., it should be set in the range, and imply a biomass, within those previously perceived to be acceptable. Fishing mortality rates in excess of F_{pa} will be regarded as "overfishing".

B_{lim} is the limit spawning stock biomass, below which recruitment is impaired. Stocks may become depleted due to reduced recruitment even if fishing mortality is successfully maintained at or below F_{pa} . Furthermore, efforts to restrain fishing below F_{pa} may not be successful and biomass may decline as a result. Clearly, therefore, in addition to a constraint on fishing mortality, it is desirable to have a biomass-based constraint to prevent stock decline to values where expected recruitment is low or unknown. Whereas F_{pa} defines an "overfishing threshold", a definition of when the stock is regarded as being in a "depleted state" is also necessary. A threshold in this respect, B_{pa} , needs to be set to ensure a high probability of avoiding reducing the stock to a point, B_{lim} , at which the probability of recruitment failure is high or the dynamics of the stock are unknown.

B_{lim} is in general equal to previously defined MBAL values for those stocks where MBAL has been based on considerations of stock-recruitment relationships. B_{pa} is the biomass below which the stock would be regarded as potentially depleted or overfished. When SSB is below B_{pa} , fishing mortality may need to be reduced below F_{pa} . B_{pa} should be set to ensure a high probability that B_{lim} is not reached.

Framework for advice

Advice from ICES will be constrained by F_{pa} and B_{pa} . If fishery management decisions lead to F_{pa} being exceeded, then this would be regarded as overfishing and management would not be regarded as consistent with a precautionary approach. The development of a management plan to reduce fishing mortality to no greater than F_{pa} would be advised. If no such plan were developed, ICES would generally advise that management was not consistent with a precautionary approach. Because F_{pa} would be set such that B_{pa} were unlikely to be reached, and because B_{pa} is chosen to provide a high probability of avoiding recruitment failure, if SSB were to fall below B_{pa} , advice to reduce fishing mortality would be likely. This would depend, however, on whether or not F_{pa} were also being exceeded and on the prognosis for SSB trends and the probability of recovering to above B_{pa} in the short term. If SSB were predicted to remain below B_{pa} in the short to medium term, the development of a recovery plan would be advised. But in general, B_{pa} is the biomass threshold triggering advice for a reduction in F to a value below F_{pa} .

F_{pa} and B_{pa} are thus the main devices in the ICES framework for providing advice. They are thresholds which constrain advice or which likely trigger advice for the implementation of management/recovery plans. If the development of plans were proposed, fishery management agencies, scientists and perhaps other parties would need to work together on their development. Such plans might involve explicit harvest control rules or sets of decision rules. If the development of plans were recommended, but not taken up, ICES would have to advise that management was not consistent with a precautionary approach. If plans were developed and not effectively implemented, again the advice would be that management was not consistent with a precautionary approach.

Note that if a stock is regarded as being in a depleted state, or even if overfishing is taking place, the development and effective implementation of a plan which is regarded as sufficient to reduce fishing mortality to no higher than F_{pa} and to rebuild SSB to above B_{pa} , within a "reasonable" period, would satisfy the condition that management were consistent with a precautionary approach.

Serchuk, F. M., and Grainger, J. R. 1992. Development of the basis and form of ICES Fisheries Management Advice; Historical background (1976-1990) and the new form of ACFM Advice (1991 - ?). ICES C.M. 1992/Assess:20.

1.1.b

The Form of the ICES Advice (October 1998)

ICES recognises that "changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values" (FAO 1996). Therefore ICES agrees that a precautionary approach should be applied to fishery management. Reference points, stated in terms of fishing mortality rates or biomass and management plans are key concepts in implementing a precautionary approach. They should be regarded as signposts giving information of the status of the stock in relation to predefined limits that should be avoided to ensure that stocks and their exploitation remain within safe biological limits.

The concept of safe biological limits was introduced in ICES advice in 1981 and further developed in 1986 (Serchuk and Grainger, 1992). At first the term was used in relation to management actions, whereas lately it has been used in relation to the state of a stock, and also of its exploitation. In its recent implementation of the concept, ICES has equated being within safe biological limits as being above MBAL and being outside safe biological limits as being below MBAL. This is a needlessly restricted interpretation of a concept which is clearly multi-dimensional involving at least reference points related to fishing mortality and biomass, but possibly also factors such as age-distribution in the stock and in the catch, geographical range, condition factor etc. The concept of safe biological limits is explicitly referred to in the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks and ICES will continue to use it, but in an expanded way, consistent with the precautionary approach.

In order for stocks and fisheries exploiting them to be within safe biological limits, there should be a high probability that 1) the spawning stock biomass is above the threshold where recruitment is impaired, and 2) the fishing mortality is below that which will drive the spawning stock to the biomass threshold which must be avoided. The biomass threshold is defined as B_{lim} (lim stands for limit) and the fishing mortality threshold as F_{lim} . In order to have a high probability to avoid the thresholds, management action must be taken before the thresholds are approached. The precision with which the thresholds and current status of the stocks are known, and the risk which is tolerable, are important factors in determining the distance away from the threshold that management action is required. The greater the precision of the assessment, the smaller the distance between limit and precautionary reference points. If the assessment is less reliable, the distance will be greater. ICES has defined B_{pa} (pa stands for precautionary approach) as the biomass below which action should be taken and F_{pa} as the fishing mortality above which management action should be taken. The distance between the limit and the precautionary approach reference points is also related to the degree of risk that fishery management agencies are willing to accept.

Therefore, although ICES sees its responsibility to identify limit reference points, it will suggest precautionary reference points. The adoption of precautionary reference points requires discussion with fishery management agencies.

Formal definitions are provided below:

F_{lim} is the limit fishing mortality which should be avoided with high probability because it is associated with unknown population dynamics or stock collapse. There are very few stocks for which F_{lim} is accurately known. Some stocks in the ICES area have collapsed in the past when fishing mortality exceeded F_{lim} , but generally speaking, the fishing mortality rate at which the probability of stock collapse becomes unacceptably high remains unknown. Therefore, there are uncertainties in the estimate of F_{lim} , and there are also uncertainties in estimates of current fishing mortality.

In order to have a high probability that fishing mortality will be below F_{lim} , a precautionary reference point, F_{pa} lower than F_{lim} , is defined. Used as a constraint on fishing, F_{pa} is designed to ensure that there is a high probability that F_{lim} will be avoided and that the spawning stock biomass will remain above the threshold below which the probability of good to average recruitment is decreased. In other words, F_{pa} is a device to ensure that recruitment overfishing does not take place. It is the upper bound on fishing mortality rate to be used by ICES in providing advice. F_{pa} , given uncertainties, must have a high probability of being below F_{lim} , and it must have a high probability of being sustainable based on the history of the fishery; i.e., it should be set in the range, and imply a biomass, within those previously perceived to be acceptable. Fishing mortality rates in excess of F_{pa} will be regarded as "overfishing".

B_{lim} is the limit spawning stock biomass, below which recruitment is impaired or the dynamics of the stock are unknown. Stocks may become depleted due to reduced recruitment even if fishing mortality is successfully maintained at or below F_{pa} . Furthermore, efforts to restrain fishing below F_{pa} may not be successful and biomass may decline as a result. Clearly, therefore, in addition to a constraint on fishing mortality, it is desirable to have a biomass-based constraint to prevent stock decline to values where expected recruitment is low or unknown.

Whereas F_{pa} defines an "overfishing threshold", a definition of when the stock is regarded as being in a "depleted state" is also necessary. A threshold in this respect, B_{pa} , needs to be set to ensure a high probability of avoiding reducing the stock to a point, B_{lim} , below which recruitment is impaired or the dynamics of the stock are unknown. B_{lim} is in general equal to previously

defined MBAL values for those stocks where MBAL has been based on considerations of stock-recruitment relationships. B_{pa} is the biomass below which the stock would be regarded as potentially depleted or overfished. When SSB is below B_{pa} , fishing mortality may need to be reduced below F_{pa} . B_{pa} should be set to ensure a high probability that B_{lim} is not reached.

Framework for advice

Advice from ICES will be constrained by F_{pa} and B_{pa} . If fishery management decisions lead to F_{pa} being exceeded, then this would be regarded as overfishing and management would not be regarded as consistent with a precautionary approach. The development of a management plan to reduce fishing mortality to no greater than F_{pa} would be advised. If no such plan were developed, ICES would generally advise that management was not consistent with a precautionary approach. Because F_{pa} would be set such that B_{pa} were unlikely to be reached, and because B_{pa} is chosen to provide a high probability of avoiding recruitment failure, if SSB were to fall below B_{pa} , advice to reduce fishing mortality would be likely. This would depend, however, on whether or not F_{pa} were also being exceeded and on the prognosis for SSB trends and the probability of recovering to above B_{pa} in the short term. If SSB were predicted to remain below B_{pa} in the short to medium term, the development of a recovery plan would be advised. But in general, B_{pa} is the biomass threshold triggering advice for a reduction in F to a value below F_{pa} .

F_{pa} and B_{pa} are thus the main devices in the ICES framework for providing advice. They are thresholds which constrain advice or which likely trigger advice for the implementation of management/recovery plans. If the development of plans were proposed, fishery management agencies, scientists and perhaps other parties would need to work together on their development. Such plans might involve explicit harvest control rules or sets of decision rules. If the development of plans were recommended, but not taken up, ICES would have to advise that management was not consistent with a precautionary approach. If plans were developed and not effectively implemented, again the advice would be that management was not consistent with a precautionary approach.

Note that if a stock is regarded as being in a depleted state, or even if overfishing is taking place, the development and effective implementation of a plan which is regarded as sufficient to reduce fishing mortality to no higher than F_{pa} and to rebuild SSB to above B_{pa} , within a "reasonable" period, would satisfy the condition that management were consistent with a precautionary approach.

The new "pa" thresholds being proposed in 1998 are a provisional step to the implementation of a

precautionary approach. Estimates of thresholds may change as the concept evolves, or with additional knowledge on stock and fishery dynamics. Attempts to integrate this approach with similar initiatives elsewhere (FAO, NAFO, etc.) can be expected to result in changes in terminology.

ICES 1997. Report of the Precautionary Approach to Fisheries Management. Copenhagen, 5–11 February 1997. ICES CM 1997/Assess:7.

ICES 1998. Report of the Precautionary Approach to Fisheries Management. Copenhagen, 3–6 February 1998. ICES CM 1998/ACFM:10.

Serchuk, F. M., and Grainger, J. R. 1992. Development of the basis and form of ICES Fisheries Management Advice; Historical background (1976–1990) and the new form of ACFM Advice (1991 - ?). ICES C.M. 1992/Assess:20.

1.2 Requests for Advice

Listed below are the requests for advice received from NEAFC, IBSFC, HELCOM, NASCO and the EC addressed in this report. Additional requests from individual member countries of ICES are also included.

1.2.1 Request for information and advice from ICES for the Seventeenth Annual Meeting of North-East Atlantic Fisheries Commission (NEAFC), November 1998

- 1) ICES is requested to provide information and advice on the management of all the fish stocks in the NEAFC Convention area for which sufficient data are available to provide such advice, taking into account the Precautionary Approach.
- 2) It is particularly requested to:
 - a) provide information on the relationship between pelagic "deep-sea" *S. mentella* and the *Sebastes mentella* fished in demersal fisheries on the continental shelf and slope;
 - b) provide advice on the medium-term consequences of an adaptive harvesting strategy, based on a constant annual catch within each 5 year period, set at a level required to obtain sustainable yields of "Oceanic" *S. mentella* and "deep-sea" *S. mentella*;
 - c) describe the depth distribution of the pelagic components of *Sebastes mentella* by season, area and year and provide information on the stock identity of the deep-sea type and oceanic type *S. mentella*;

- d) advise NEAFC on an appropriate scientific monitoring scheme for the pelagic fishery for *S. mentella* in the Irminger Sea considering the current knowledge of the stock complexity, and respond not later than 1 May 1998;
- e) indicate new developments in the seasonal and area distribution of the total Norwegian spring-spawning herring stock;
- f) collect and evaluate the available data on the area distribution of mackerel in the NEAFC area for juvenile as well as parental components, and advise NEAFC on what further research is needed in order to give a comprehensive description of the distribution and possible technical interaction;
- g) update descriptions of deep water fisheries in waters inside and beyond coastal state jurisdiction South of 63° North, for species like grenadiers, scabbard fishes, Greenland halibut, blue ling, redfish, orange roughy, fork beards, sharks, angler fish and crabs, especially catch statistics by species, fleets and gear; and if possible indicate the biological status of these stocks;
- h) ICES is requested to provide for the blue whiting stock:
 - i) appropriate limit and reference points.
 - ii) short and medium-term levels of catches and spawning stock biomass. The medium term analysis should include 1–10 years stochastic projections of yield and spawning biomass at levels of fishing mortalities from 0.1 to the fishing mortality that corresponds to Flim and subject to yearly catch ceilings up to 1,000,000 tonnes. The percentiles given of distribution of 5, 25, 50, 75 and 95 percent.
 - iii) appropriate harvest regimes including reference points at which remedial actions should be taken, which takes into account sustainable exploitation rates and appropriate biomass thresholds.

stocks, including a separate assessment of Gulf of Riga herring, taking into account when possible the biological interactions between species;

- b) advice on appropriate reference points including limit reference points and precautionary reference points, taking into account the recent environmental conditions, to be used as guidelines for medium-term management strategies of cod, herring and sprat according to harvest control rules¹;
- c) medium-term projections with probability distributions of spawning stock biomass and yield for cod, herring and sprat, taking into account known variations in input parameters and stock-recruitment relationships based where appropriate on the recent environmental conditions;
- d) advice on a mortality-based harvesting strategy for Baltic cod, taking into account hydrographic conditions in the eastern Baltic in particular, and which will:
 - i) in the medium term-maintain the spawning stock biomass above the limit reference biomass with high probability (90-95%);
 - ii) reduce year to year variation in TAC.
- e) advice on medium-term strategies for herring and sprat stocks;
- f) advice on catch options for cod, herring and sprat for 1999 that are consistent with the advice on medium-term strategies, according to IBSFC management areas². Gulf of Riga herring catch options should be shown separately;
- g) advice on the appropriateness of and requirements for effort management as an alternative or

¹ The harvest control rules require the identification of the following limits and precautionary reference points:

- i) F_{pa} = The fishing mortality which, if applied continuously, carries a very low probability of the SSB falling below B_{lim} . The subscript "pa" refers to the precautionary approach.
- ii) B_{lim} = The lower limit of SSB below which the stock should not be allowed to fall. This is a limit point to be avoided.
- iii) B_{pa} = A biomass threshold below which management action should be taken to reduce the prevailing fishing mortality rate. This is a precautionary control to reduce the risk of approaching B_{lim} .

² At present the IBSFC TAC management areas are:

Baltic herring:

The Western Baltic, the Main Basin and Gulf of Finland (Sub-divisions 22–29S including Gulf of Riga and 32)
Management Unit III (Sub-divisions 29N; 30 and 31)

Sprat

The whole Baltic (Sub-divisions 22–32)

Baltic cod:

The whole Baltic (Sub-divisions 22–32)

Baltic salmon:

The Main Basin and the Gulf of Bothnia (Sub-divisions 24–31)
The Gulf of Finland (Sub-division 32)

1.2.2 Request from the International Baltic Sea Fishery Commission, Twenty Third Session, September 1997

The International Baltic Sea Fishery Commission requests ICES to provide to its Twenty Fourth Session the following:

- a) assessments of the state of the stocks of cod, herring, sprat and salmon by appropriate areas and

supplement to TAC management for the cod stocks on the basis of material available from the IBSFC Working Group on Standardisation of Effort for Management Purposes;

h) review existing management measures for Baltic salmon in the light of IBSFC objectives:

i) to gradually increase the production of wild Baltic salmon to attain by 2010 at least 50% of the natural production capacity of each river with current or potential natural production of salmon;

ii) to maintain the commercial Baltic salmon fishery as high as possible.

i) advice on necessary management measures and catches in number for Baltic salmon in 1999 for the Main Basin and the Gulf of Bothnia and for the Gulf of Finland. The measures should meet IBSFC objectives;

j) any new information on the state of the flatfish and sea trout stocks in the Baltic.

1.2.3 Request from the North Atlantic Salmon Conservation Organization, Fourteenth Annual Meeting, June 1997

1 With respect to Atlantic salmon in the North Atlantic area:

- 1.1 provide an overview of salmon catches, including unreported catches and catch and release, and worldwide production of farmed and ranched salmon in 1997;
- 1.2 report on significant developments which might assist NASCO with the management of salmon stocks;
- 1.3 provide any new information on the causes of changes in abundance of salmon;
- 1.4 comment and advise on the Report of the NASCO Working Group on the Precautionary Approach, as it relates to the work of ICES;
- 1.5 provide a compilation of microtag, finclip and external tag releases by ICES member countries in 1997.

2 With respect to Atlantic salmon in the North-East Atlantic Commission area:

- 2.1 describe the events of the 1997 fisheries and the status of the stocks;
- 2.2 update the evaluation of the effects on stocks and homewater fisheries of the suspension of commercial fishing activity at Faroes since 1991;

- 2.3 provide age specific stock conservation limits for all stocks occurring in the Commission area based on best available information;
- 2.4 estimate the expected abundance of salmon in the North-East Atlantic for 1998/1999;
- 2.5 provide catch options with an assessment of risks relative to the objective of exceeding stock conservation limits;
- 2.6 evaluate any new information on the potential by-catch of post-smolts in pelagic fisheries;
- 2.7 identify relevant data deficiencies and research requirements.

3 With respect to Atlantic salmon in the North American Commission Area:

- 3.1 describe the events of the 1997 fisheries and the status of the stocks;
- 3.2 update the evaluation of the effects on US and Canadian stocks and fisheries of management measures implemented after 1991 in the Canadian commercial salmon fisheries;
- 3.3 update age-specific stock conservation limits based on new information as available;
- 3.4 provide catch options with an assessment of risks relative to the objective of exceeding stock conservation limits;
- 3.5 identify relevant data deficiencies and research requirements.

4 With respect to Atlantic salmon in the West Greenland Commission area:

- 4.1 describe the events of the 1997 fisheries and the status of the stocks;
- 4.2 evaluate the impact of the Reserve Quota at West Greenland on salmon stocks in relation to the goal of exceeding stock conservation limits (spawning targets);
- 4.3 provide a detailed explanation of any changes to the model used to provide catch advice and of the impacts of any changes to the model on the calculated quota;
- 4.4 provide age specific stock conservation limits (spawning targets) for all stocks occurring in the Commission area based on best available information;
- 4.5 examine critically the model used to provide catch advice, looking at all the assumptions, and comment on the confidence limits on the output from the model;
- 4.6 provide catch options with an assessment of risks relative to the objective of exceeding stock conservation limits (spawning targets);
- 4.7 identify relevant data deficiencies and research requirements.

1.2.4 Request from the European Commission, Directorate-General XIV for Fisheries, September 1997

As in former years ICES is requested to review the state of the stocks of fish and shellfish in Community waters or straddling adjacent zones, and to provide advice for their management. The European Commission has noted that ICES in 1997 provided two years advice for *Nephrops* stocks. It would be appreciated that ICES indicate for which other stocks multi-annual advice might be appropriate.

The Commission is very satisfied with the way ICES is progressing in implementation of a precautionary approach in fisheries management, including uncertainty and providing medium term management options. However, there are still many stocks for which this information is not yet provided and the European Commission wishes that ICES be successful in providing enhanced advice for sustainable management plans for as many stocks as possible. The European Commission wishes to stress that an early indication on stock status and exploitation rates, although preliminary and based on limited analytical assessment, are of great importance to fulfil the intentions in the precautionary approach. This would also apply for stocks where no specific request for advice is requested.

The Commission therefore again requests ICES to provide for each stock fishing mortality limits and spawning stock biomass thresholds that will satisfy medium term and long term sustainability of these stocks. The harvest strategy or harvest control rules and corresponding fishing mortalities should have associated high probability of maintaining the stock above the defined threshold level within defined time periods. The range of probabilities that may be used by ICES in medium to long term analyses that would satisfy the Commission are still 80%, 90% and 95%.

The European Commission is also concerned about the real fishing opportunities given by "non-extensively known" fish stocks, such as deep water fish, oceanic pelagic fish stocks other than tuna and swordfish, squids, etc. Very often these "unexploited" stocks, are thought to be able to absorb excess fishing effort from overexploited stocks, and the Commission would welcome some scientific guidelines on this issue.

There is an increasing concern about the situation for the European eel stock and its future development. ICES is therefore requested to provide information about the status of eel stock(s) and on any possible management actions, and to identify gaps in knowledge about eel in order to secure a sustainable development of the eel fisheries within the European Union.

The European Union has recently decided a multi-annual plan on the restriction of fleet capacity with the view to achieve a durable balance between the resources

and their exploitation. During these discussions it has become evident that more accurate knowledge is required on the fishing power of vessels as a function of controllable parameters. An improved knowledge about the relation between effort and fishing mortality would facilitate the management of exploitation rates by direct measures on fishing effort. ICES is requested to provide guidance on this issue.

1.2.5 Request from the Government of Estonia, June 1997

Herring in the Baltic is assessed by the ICES in 3 assessment units. Before 1990 the number of assessment units was higher, corresponding in many cases to the distribution of local stocks. In 1990 most of the local stocks of the Central and Eastern Baltic were united into one so called Central Baltic Herring (Sub-divisions 25-29+32 including the Gulf of Riga).

Since herring from different stocks show differences both in meristic and morphometric characters, but also in year-class abundance trends, it was pointed out by the Working Group on Assessment of Pelagic Stocks in the Baltic "the consequence of this... approach is that separate entities cannot be monitored, and that one or the other could get lost through over-exploitation and/or recruitment failure" (ICES CM 1990/Assess:18). The last findings of the Baltic Fisheries Assessment Working Group (ICES CM 1997/Assess:12) have shown the continuous decreasing trend in the Central Baltic herring united stock. This alarming news points at the need of investigation of trends in local stocks, having, in many cases, an important role in supporting the local coastal fisheries.

Therefore, Estonia hereby requests ICES to explore the possibilities of re-establishment, at least in the northeastern Baltic, of the management system of herring used prior to 1990.

1.2.6 Request from the Governments of Norway and Russia, December 1997

During the bilateral quota negotiations for 1998 between Norway and Russia, held 10-15 November 1997, the parties discussed the uncertainty, pointed out by ACFM, concerning the stock estimate of North-East Arctic cod. However, it proved difficult to assess the extent and the various implications of the uncertainty in the ACFM recommendation, of the ACFM report.

In the quota protocol the Parties strongly emphasised the need for increased research and surveys in the stock's entire area of distribution. In this connection the Parties discussed the serious consequences of the lack of coverage of such surveys, in the ACFM report. Based on the results of the coming winter's research surveys, the Parties agreed to request ICES to revise the stock

evaluation presented by ACFM and to evaluate the methodology used for estimating the stock size.

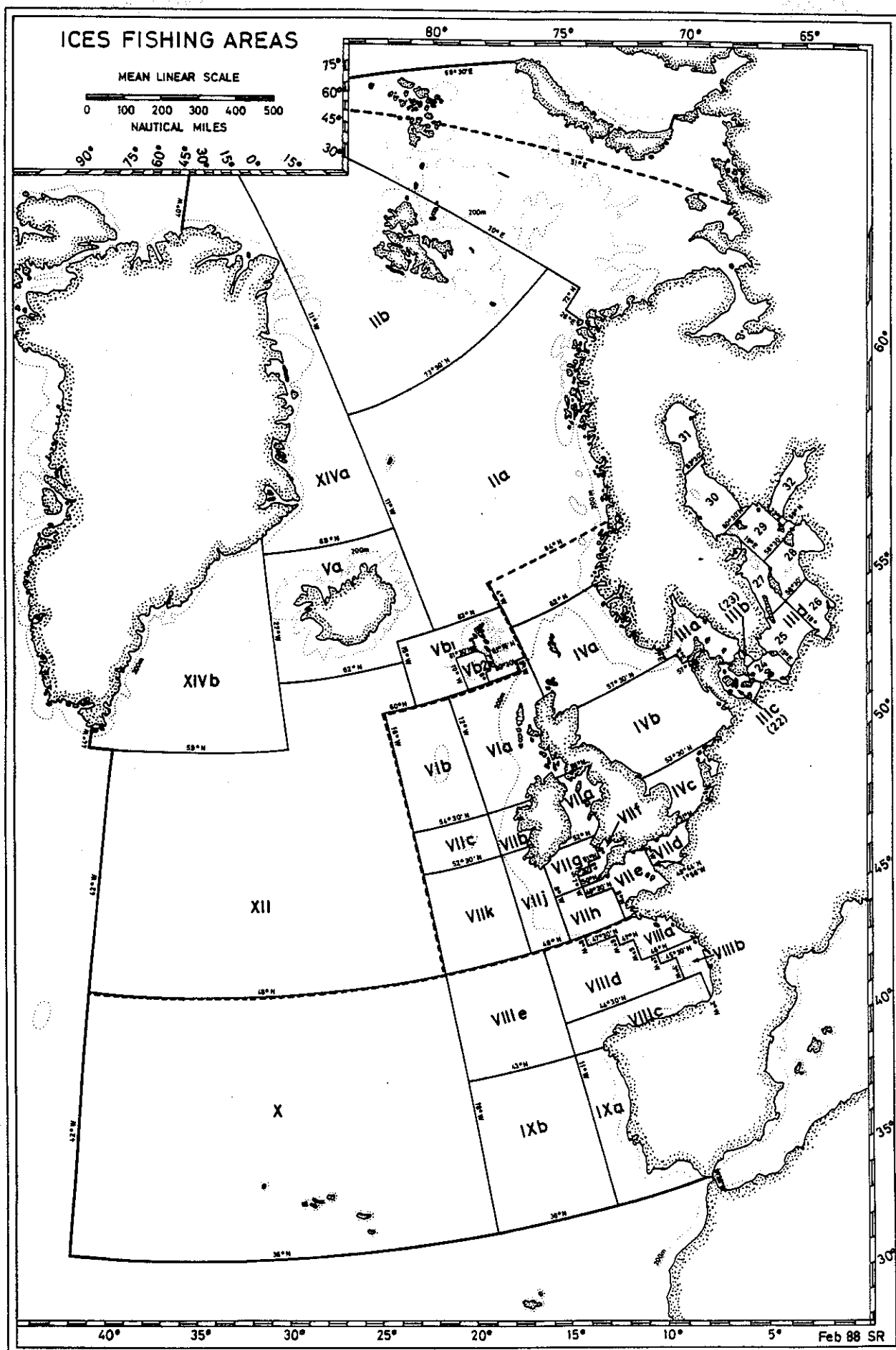
Accordingly, the Norwegian-Russian Fisheries Commission requests ICES to undertake the above mentioned revision of the stock situation and evaluation of the methodology, as stated in the quota protocol.

1.2.7 Additional Request from the European Commission, Directorate-General XIV for Fisheries, January 1998

The stock of sardine in ICES Divisions VIIIc and IX is subject to several management measures, adopted by national authorities from the concerned EU Member States, following the delicate state of the stock described in recent ACFM reports.

Given the seriousness of the situation, it has become evident that a closer follow-up of the stock status is required in order to take any further remedial action.

With this in mind, ICES is requested to review, in the course of the 1998 May meeting of ACFM, the assessment carried out in 1997 in the light of any new scientific information available. In particular, it is requested to consider the results of the acoustic surveys conducted at the end of 1997 and in spring of 1998, as well as the catch figures for 1997.



2.1

Introduction

The assessments presented in this report are carried out using the best catch data available to ICES. These data are not necessarily identical with the official statistics but, where appropriate, include estimates of unreported landings as well as corrections for misallocation of catches by area and species. Despite considerable effort exerted on this problem, there is no guarantee that all instances of misreporting were discovered. Often the catch data used by ICES are collated on a stock rather than an area basis, and so straightforward comparisons between these figures and the official statistics, which are provided on an area basis, are not appropriate.

In the assessments, ICES tries to estimate the total catch taken, including slipped catches, discards, landings which are not officially reported, and the composition of the industrial by-catches. These amounts of different species, which have to be included in the estimates of what has been taken from a given stock in order for the assessments to be correct, thus appear in the tables and figures in this report. These discards, slipped fish, unreported landings, and industrial by-catches vary considerably between different stocks and fisheries, being negligible in some cases and constituting important parts of the total removal from other stocks.

The catch data used in the assessments are given in the "table" section of this report. In cases where there might be doubt, it has been indicated if discards, by-catches, and estimates of unreported landings are included in the assessments. Estimates of catches landed as by-catches, especially from the industrial fisheries, are included in the assessments wherever data allow it and are included in the catch options.

It should be noted that, in general, catches in the industrial fisheries of protected species above the minimum landing size which are sorted and landed for human consumption, are included in the estimates of human consumption landings, both in the catch input data and in the projected catch options. Estimates of industrial by-catches cover, in most cases, that part of the by-catch which is used for reduction purposes.

In the past there have been problems associated with discrepancies between the official landing figures reported to ICES by member countries and corresponding catch data used by ICES. ICES recognises the need for a clear identification of the categories of the catch data used for assessments and whenever possible specifies the composition of the catch data used to estimate fishing mortalities. ICES also attempts to identify factors contributing to the total fishing mortality in the various stocks, e.g.:

- recorded landings,
- discards at sea,
- slipping of unwanted catches,
- losses due to burst nets etc.,
- unreported landings,
- catch reported as other species,
- catch reported as taken in other areas,
- catch taken as by-catch in other fisheries.

It is recognised that it may not always be possible to reveal the sources of the data. It is, however, indicated whether the data originate from sampling programmes, field observations, interviews, etc., in order to allow ICES and other interested parties to evaluate the quality of the data, and hence the basis for the assessment.

The overall responsibility for obtaining reliable, adequate and timely fisheries statistics for publication in *ICES Fisheries Statistics* does not rest with ICES. It is the opinion of ICES that national offices for fisheries statistics are responsible for providing the catch data needed for assessments. These offices should ensure that catch statistics are collected on a gear basis and that the species composition of landings is determined in the case where landings are made unsorted by species.

2.2 Deterioration of Quality of Fishery Statistics

ICES expressed the greatest concern in past ACFM advice over the quality of catch and effort data from most of the important fisheries in the ICES area. ICES stressed that the immediate consequences of this are that ICES will be unable to provide reliable estimates of current stock sizes and forecasts that have been used to set TACs. Trends in stock size and the overall status of the stock can sometimes be evaluated from research vessel surveys, but such information alone cannot be used to give the short-term TAC advice usually required.

2.3 Structure of the Report

In continuation of the 1997 report, information and advice are provided on an area basis. Thus, all stocks belonging to a given area are placed in a separate section, together with an overview of the state of the stocks and fisheries in that area. Where general comments applying to a particular species or group of species are required, these are included in a separate section under "Introductory Items" (see Sections 2.4–2.5). Special requests from Commissions or member countries of ICES are placed in the section dealing with the respective area and stock.

Exceptions to this structure are that the report to the North Atlantic Salmon Conservation Organization and the report on Harp and Hooded Seals are reprinted as separate sections at the end of the report.

2.4 The Precautionary Approach

In 1998 ACFM worked at developing a framework for applying the Precautionary Approach. This framework is described in details in Sections 1 and 4.4. This is a proposal made by ICES for further development with its client organisations.

2.5 Format of the ACFM Report

The format changed between the 1998 May and the 1998 October meeting as a consequence of the development of the ICES proposal on the Precautionary Approach. This slight difference in report formatting between meetings has been maintained in the publication of the 1998 ACFM report.

3 REVIEW OF THE STOCKS

3.1 Stocks in the North-East Arctic (Sub-areas I and II)

3.1.1 Overview

Major Stocks and Landings

The total landings of fish and invertebrates in this area in 1997 were in the order of 2.5 million t. These catches were taken from a variety of demersal and pelagic stocks.

The major demersal stocks in the North-East Arctic include cod, haddock, saithe and northern shrimp. In addition wolffish, redfish, Greenland halibut and flatfishes (e.g., long rough dab, plaice) occur demersally on the shelf and at the continental slope, with ling and tusk found also at the slope and in deeper waters. In 1997, landings of 1.1 million t were taken from the stocks of cod, haddock, saithe, redfish and Greenland halibut. An additional catch of about 100 000 t was taken from demersal stocks, including crustaceans, not assessed at present.

The major pelagic stocks are capelin, herring and polar cod. Blue whiting and adult mackerel extend their feeding migrations seasonally into the southern parts of this region. The international fishery for in 1997 was 1.43 million t. No landings of capelin were reported from the Barents Sea in 1997, and landings of polar cod were 11 000 t. Landings of the highly migratory pelagic species, mackerel and blue whiting, in Sub-areas I and II plus Division Vb were 62 000 t and 105 000 t, respectively.

Invertebrate species of krill, copepods and amphipods are considered to be important food resources for the

fish stocks in this area. Marine mammals play an important role as predators on fish. Several stocks of other species of fish and invertebrates are found in the area. Species with relatively small landings include salmon, halibut, hake, pollack, whiting, Norway pout, anglerfish, wolffish, lumpsucker, argentine, grenadiers, flatfishes, horse mackerel, dogfishes, skates, crustaceans and molluscs.

Fleets and Fisheries

The fleets operating in this area are:

1. Factory and freezer trawlers operating in the whole area all year round targeting mainly cod, haddock and saithe and taking other species as by-catch. The number of these vessels has been stable in recent years, at a lower level than previously.
2. Fresh fish trawlers operating in Sub-area I and Division IIa all year round targeting mainly cod and haddock, taking other species as by-catch. The number of these vessels has been reduced in recent years.
3. Freezer trawlers operating in Sub-area I and Division IIb fishing only shrimp. The number of these vessels has been stable.
4. Large purse seiners and pelagic trawlers targeting herring, mackerel, blue whiting, capelin and polar cod in seasonal fisheries in this region. These vessels fish some of the same species in other areas as well.
5. Small fresh fish trawlers targeting shrimp and capelin in near coast areas in Sub-area I. The size of this fleet has decreased in recent years.
6. A fleet of vessels using conventional gears (gillnet, longline, handline and Danish seine) mainly in near-shore fisheries targeting various demersal species all around the year. This fleet, together with fleets 7 and 8, accounts for approximately 30% of landings of demersal stocks. This share is maintained by quota allocation. When vessels in this fleet are modernised or replaced, there is a trend towards medium-sized (app. 15–20 m Loa, length over all) multi-gear vessels with crews of 3–5.
7. Small purse seiners targeting saithe in coastal waters in a seasonal fishery, being to a large extent vessels from the group using conventional gears.
8. Longliners operating offshore targeting non TAC-restricted species, mainly ling, blue ling and tusk. These vessels are generally larger and use technologically advanced auto-line systems.

Due to management restrictions and given the rather low abundance of other resources, the overall effort in the fisheries has stabilised. The only increase seen in the

fisheries outside Exclusive Economic Zones (EEZ), is for herring in Division IIa.

Management Measures

The fisheries in Sub-areas I and II are managed by TAC constraints for the main stocks and by allocation of TAC shares amongst states with established fishing interests in these Sub-areas. These sub-areas consist mainly of waters within EEZs but also contain some waters outside EEZs.

The fisheries in the EEZs for the main species are regulated by quotas at a variety of scales (vessels, fleets, species, season). Management measures also regulate minimum landing size, mesh size, and use of sorting grids. Since January 1997 use of sorting grids in the trawl fisheries has been mandatory for the entire Barents Sea and Svalbard area. Minimum landing size is also a minimum catching size implying that vessels have to avoid fishing grounds with small-sized fish. Discarding is prohibited in some EEZs. Time and area closures may be implemented to protect small fish.

Sampling programmes for landings and catches have improved in recent years. However, there are still parts of the catches and landings that are not adequately sampled. Discards are not regarded as a major problem due to regulations and enforcement.

Compilation of effort data relevant to the different species is difficult when the fisheries are regulated by vessel quotas. In some cases the effort targeted at the main species, e.g., cod, may be calculated but it is almost impossible to calculate effort for non-target species.

Recent conditions in the North-East Arctic

The recent developments in the stocks of cod, haddock, saithe, Greenland halibut, redfishes, herring and capelin are summarised in the following.

F_{med} and the minimum spawning stock required to keep the probability of poor recruitment at a minimum have been used as criteria for assessing the status of the stocks in this area. New reference points in accordance with the precautionary approach are now proposed.

The stocks of cod, haddock, saithe, Greenland halibut and *Sebastes mentella* are assessed to be outside safe biological limits.

The available information on *Sebastes marinus* is insufficient to assess the stock properly, but there are signs in the surveys of reduced recruitment.

The capelin stock is assessed to be within safe biological limits and currently increasing due to increased recruitment.

The spawning stock of Norwegian spring-spawning herring is now expected to decline but this stock is still considered to be within safe biological limits. High recruitment is infrequent and the stock is now determined by two strong year classes.

Multispecies interactions are very important in this area and considerable effort has been devoted to investigate them. Some of these investigations have reached the stage where quantitative results are available for use in assessments. Growth of cod depends on availability of prey such as capelin, and variability in cod growth has had major impacts on the cod fishery. Cod are able to compensate only partially for low capelin abundance, by switching to other prey species. This may lead to periods of high cannibalism on young cod, and may result in impacts on other prey species which are greater than those estimated for periods when capelin are abundant. In a situation with low capelin abundance juvenile herring experience increased predation mortality by cod. The timing of cod spawning migrations is influenced by the presence of spawning herring in the relevant area.

The interaction between capelin and herring is illustrated by the recruitment failure of capelin coinciding with years of high abundance of young herring in the Barents Sea. Herring predation on capelin larvae is believed to be partially responsible for the recruitment failure of capelin when young herring are abundant in the Barents Sea.

The annual consumption of herring and capelin by marine mammals is estimated to be in the order of about 1.0 to 1.2 million t.

The composition and distribution of species in the Barents Sea depend considerably on the position of the polar front which separates warm and salty Atlantic waters from colder and fresher waters of arctic origin. At present this front is found further to the south and west and this is associated with a period of observed cooling. Variation in the recruitment of some species including cod and capelin has been associated with the changes in the influx of Atlantic waters to the large areas of the Barents Sea shelf.

3.1.2 Cod in Sub-areas I and II

3.1.2.a North-East Arctic cod

State of stock/fishery: The stock is considered to be outside safe biological limits. Fishing mortality is high ($F = 0.79$), well above the proposed F_{pa} (0.42) and F_{med} (0.46). SSB is probably above the proposed B_{pa} of 500 000 t (previously described as MBAL). The assessment has consistently overestimated stock size and underestimated fishing mortality in recent years (see Elaboration and special comment).

Management objectives: In recent years, the advice has been to keep fishing mortality below F_{med} , and to keep the spawning stock above 500 000 t, which is considered to be the minimum value required to have a high probability

of good recruitment (previously defined as MBAL). This approach has also been adopted as the management objective since 1997. For 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} .

Advice on management: ICES recommends that fishing mortality should be reduced to below the proposed F_{pa} (0.42), corresponding to landings in 1999 of less than 360 000 t, inclusive of catches by fisheries outside EEZs, which are currently unregulated.

Reference points:

ICES considers that:	ICES proposes that
B_{lim} is 112 000 t, which is the lowest observed spawning stock size in the 50 year time series.	B_{pa} be set at 500 000 t which is considered to be the minimum SSB required to ensure a 95% probability of maintaining SSB above B_{lim} , taking into account the uncertainty in assessments and in stock dynamics.
F_{lim} is 0.7, the fishing mortality which resulted in the lowest observed spawning stock in the past.	F_{pa} be set at 0.42. This value is considered to have a 95% probability of avoiding the F_{lim} .

Technical basis:

$B_{lim} = B_{loss}$; both high and low recruitments have occurred at low observed SSB.	B_{pa} = previously defined MBAL, above which recruitment has been good
F_{lim} = median value of F_{loss} .	F_{pa} = 5 th percentile of F_{loss} ; close to F_{med} (0.46); Fs around this value appeared to be sustainable for 20 years at the beginning of the time series.

Relevant factors to be considered in management: Recent assessments have overestimated the stock size and underestimated the fishing mortality. It is uncertain to what extent this may apply for the SSB and F in 1998 and the forecast was not adjusted for a possible overestimation. It might therefore be optimistic.

The TAC for this stock does not include the fishery which has developed in the international area of the Barents Sea. Apart from this, the catch control system is working

satisfactory for all fleets fishing in the EEZs in the area. In the past there have been unreported landings, but at present there is no evidence of catches which are not accounted for. There are no available estimates of discards.

Both unreported landings and discards will reduce the effect of management measures and it is important that management agencies ensure that all catches are controlled by the TAC regulations.

Catch forecast for 1999:

Basis: TAC, Landings (98) = 654, $F(98) = 0.71$, SSB(99) = 576.

F(99)	basis	Catch(99)	Landings(99)	SSB (2000)	Medium term effect of fishing at given level
0.16	0.2 F_{97}		150	785	n/a
0.31	0.4 F_{97}		281	669	n/a
0.42	F_{pa}		360	599	n/a
0.47	0.6 F_{97}		395	571	n/a
0.63	0.8 F_{97}		494	488	n/a
0.79	1.0 F_{97}		582	418	n/a
0.94	1.2 F_{97}		659	359	n/a

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: The present assessment is largely a repetition of the May 1998 assessment. The current estimate of the spawning stock in 1998 is 22% lower than predicted in the November 1997 ACFM report. In the time series of stock development there is a pattern of periodical discrepancies between the survey estimates and the VPA stock estimates derived from the landing statistics. There are indications that this pattern is related in part to the capelin stock in such a way that during periods with low capelin abundance the surveys tend to overestimate the cod stock compared to periods with high capelin abundance. Therefore, the overestimation of the cod stock in recent assessments might be linked to the low abundance of capelin observed over the same period. The latest survey data used in the present assessment have been collected at a somewhat higher capelin abundance. It is, therefore, regarded to be uncertain whether the present assessment has a bias similar to the bias in recent assessments.

Extended Survivor Analysis (XSA) has been used to assess Northeast Arctic cod for almost the last decade. It is a standard assessment tool applied successfully on many stocks assessed by ICES, when the data are sufficient. Recent downward revisions in stock estimates of Northeast Arctic cod have raised questions about the reliability of XSA as an assessment tool. These concerns are considered to be ill-founded and the stock size revisions are more likely related to assumptions on how stock size indices relate to the actual stock size than to using XSA as the assessment method.

Data on changes in growth, maturity and cannibalism are available for this stock. These data also show linkage with the capelin stock. Work on developing a new assessment model for this stock is in progress. In this work attempts will be made to better incorporate the likely interactions between cod and capelin for the purpose of improving the stock assessment. The new model will be tested and evaluated by international groups of experts in December 1998 and January 1999, and it is expected to be available for use at next year's Working Group meeting.

The capelin stock has increased in 1998 and is expected to increase further in 1999. Increased growth and reduced cannibalism are not expected to have large impact on the fishable stock in 1999, but might have large positive effect for the stock development in the medium term. Survey data from August 1998 do not show significant increase in individual growth.

The uncertainty in the estimate of stock size is further compounded in the present assessment because the 1997 and 1998 Norwegian surveys were restricted to the Norwegian EEZ and because the Russian surveys also had a reduced coverage. The problems with area coverage continue and such reduced survey coverage seriously jeopardises the scientific basis for providing advice on this stock.

The fishery for North-east Arctic cod is conducted both by an international trawler fleet operating in offshore waters and by vessels using gillnets, longlines, handlines and Danish seine operating both offshore and in the coastal areas. Quotas were introduced in the trawl fishery in 1978 and for the fisheries with conventional gears in 1989. In addition to quotas the fisheries are regulated by mesh size limitations including sorting grids, a minimum catching size, a maximum by-catch of undersized fish, maximum by-catch of non-target species, closure of areas with high densities of juveniles and by seasonal and area restrictions. Since January 1997 sorting grids has been mandatory for the trawl fisheries in the entire Barents Sea and Svalbard area. The control of the fisheries is done by inspections of the trawler fleet at sea, reporting to catch control points when entering and leaving the EEZs and by inspections when landing the fish for all fishing vessels. Keeping a detailed log-book of fishing on board is mandatory for most vessels, and large parts of the fleet report to the authorities on a daily basis.

Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM:3).

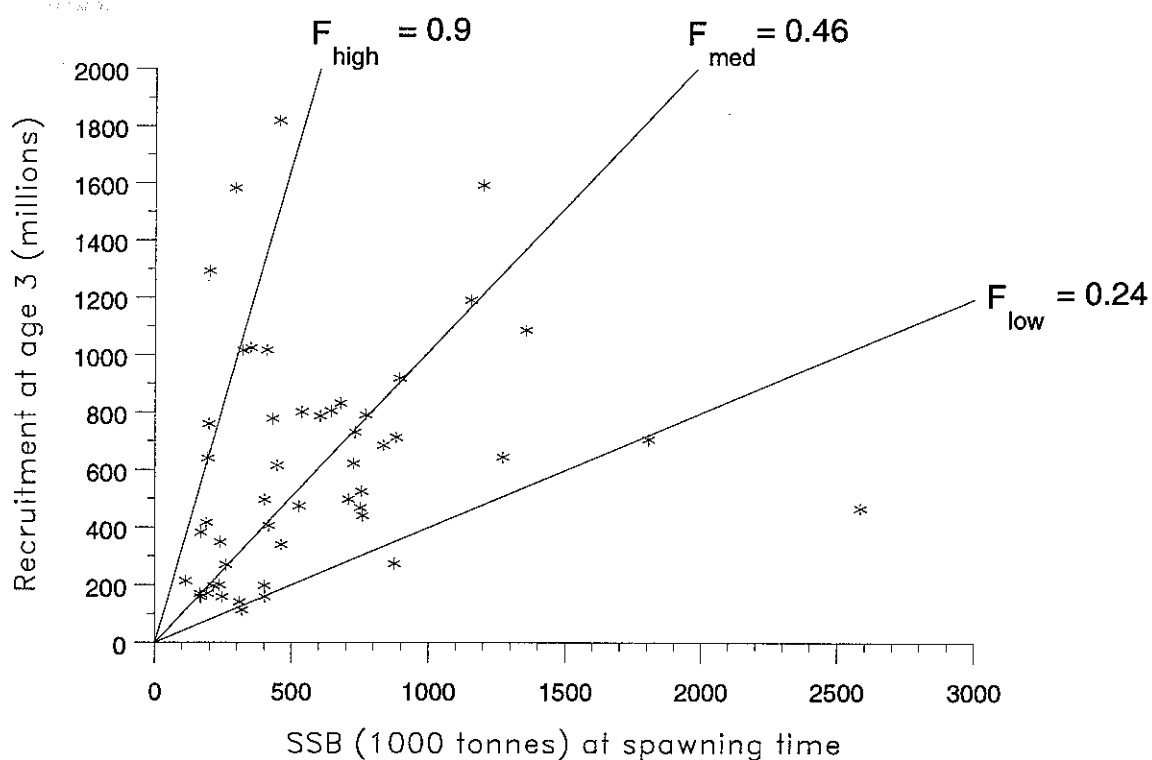
Catch data (Tables 3.1.2.a.1-3):

Year	ICES advice	Predicted catch corresp. to advice ¹	Agreed TAC ¹	Official Landings	ACFM landings ¹	Unreported landings
1987	Gradual reduction in F	595	560	552	523	
1988	F = 0.51; TAC	530	590	459	435	
1989	Large reduction in F	335	451	351	332	
1990	F at F _{low} ; TAC	172	160	211	212	25
1991	F at F _{low} ; TAC	215	215	295	319	50
1992	Within safe biological limits	250 ²	356	421	513	130
1993	Healthy stock	256 ²	500	575	582	50
1994	No long-term gains in increased F	649 ²	700	796	771	25
1995	No long-term gains in increased F	681 ²	700	766	740	
1996	No long-term gains in increased F	746 ²	700	754	727	
1997	Well below F _{med}	< 993	850	747	755	
1998	F less than F _{med}	514	654			
1999	Reduce F to below F _{pa}	360				

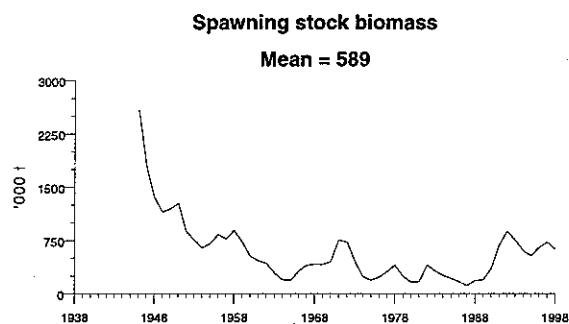
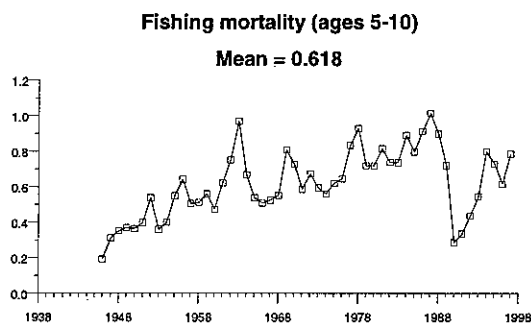
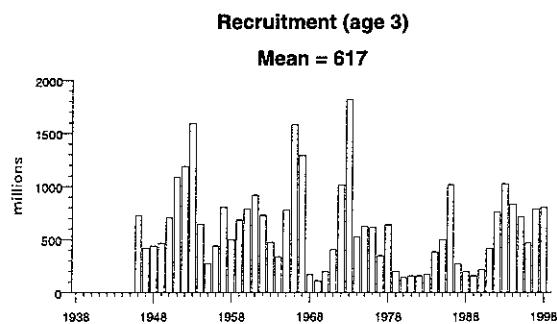
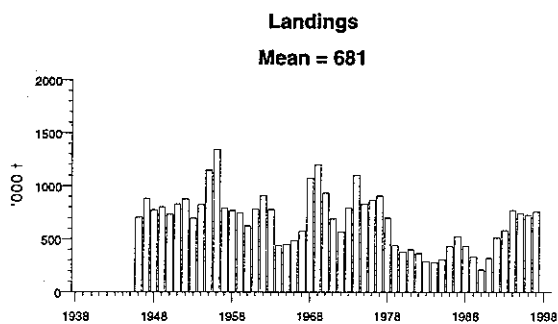
¹Norwegian coastal cod not included. ²Catch at *Status quo* F. Weights in '000 t.

North -East Arctic Cod

Stock - Recruitment

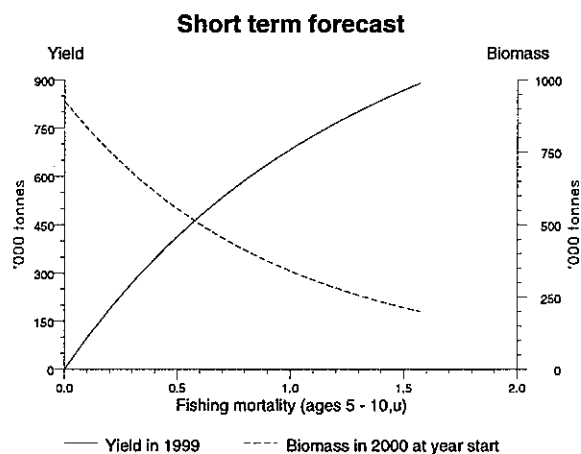
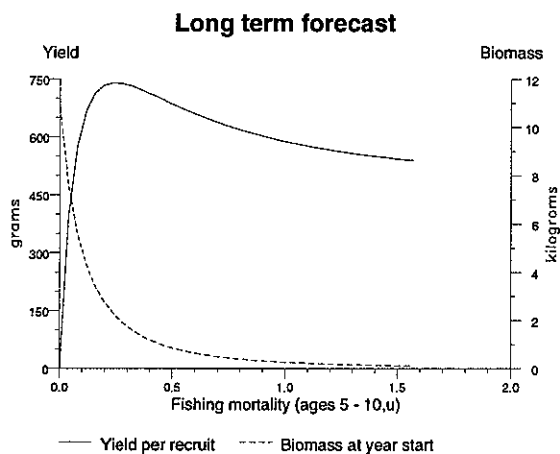


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North-East Arctic cod

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Cod, North-East Arctic (Fishing Areas I and II)

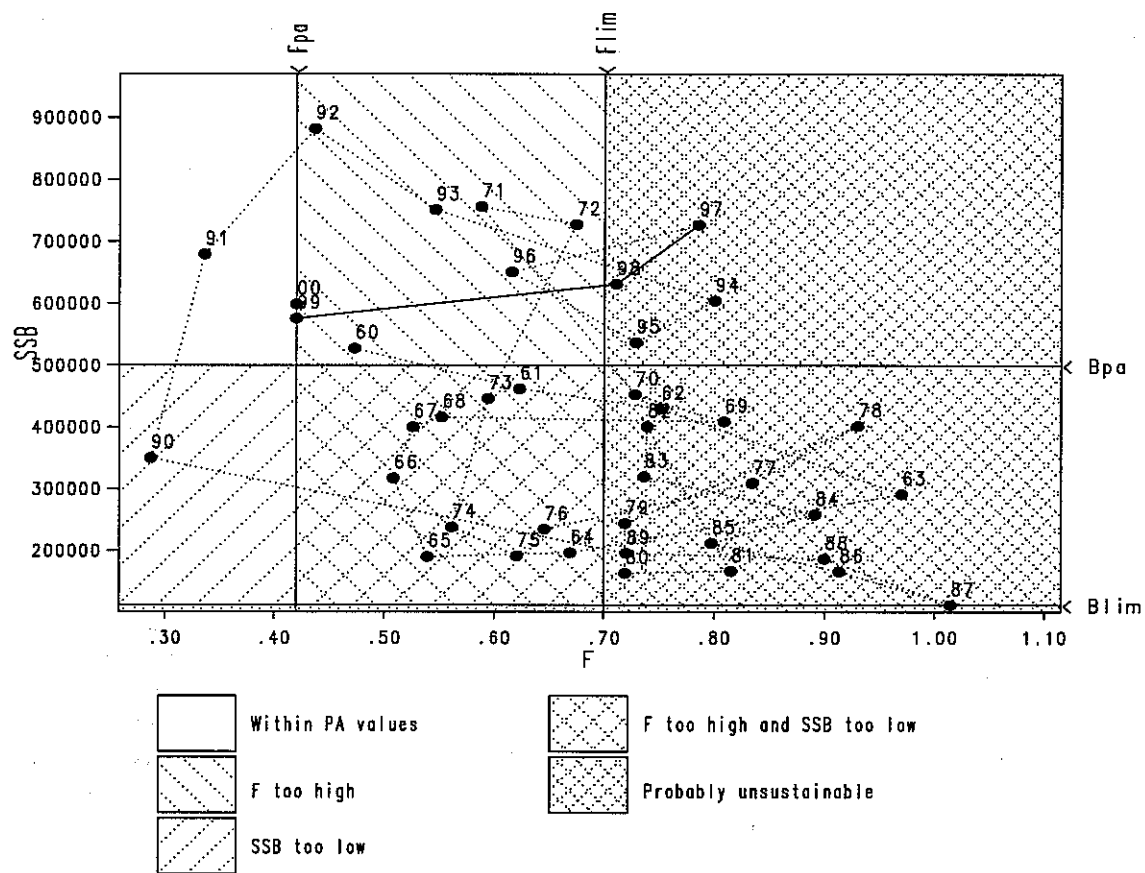


Table 3.1.2.a.1 North-East Arctic COD. Total catch (t) by fishing areas and unreported catch.
(Data provided by Working Group members.)

Year	Sub-area I	Division IIa	Division IIb	Unreported catches	Total catch
1961	409,694	153,019	220,508		783,221
1962	548,621	139,848	220,797		909,266
1963	547,469	117,100	111,768		776,337
1964	206,883	104,698	126,114		437,695
1965	241,489	100,011	103,430		444,983
1966	292,253	134,805	56,653		483,711
1967	322,798	128,747	121,060		572,605
1968	642,452	162,472	269,254		1,074,084
1969	679,373	255,599	262,254		1,197,226
1970	603,855	243,835	85,556		933,246
1971	312,505	319,623	56,920		689,048
1972	197,015	335,257	32,982		565,254
1973	492,716	211,762	88,207		792,685
1974	723,489	124,214	254,730		1,102,433
1975	561,701	120,276	147,400		829,377
1976	526,685	237,245	103,533		867,463
1977	538,231	257,073	109,997		905,301
1978	418,265	263,157	17,293		698,715
1979	195,166	235,449	9,923		440,538
1980	168,671	199,313	12,450		380,434
1981	137,033	245,167	16,837		399,037
1982	96,576	236,125	31,029		363,730
1983	64,803	200,279	24,910		289,992
1984	54,317	197,573	25,761		277,651
1985	112,605	173,559	21,756		307,920
1986	157,631	202,688	69,794		430,113
1987	146,106	245,387	131,578		523,071
1988	166,649	209,930	58,360		434,939
1989	164,512	149,360	18,609		332,481
1990	62,272	99,465	25,263	25,000	212,000
1991	70,970	156,966	41,222	50,000	319,158
1992	124,219	172,792	86,483	130,000	513,494
1993	195,771	269,383	66,457	50,000	581,611
1994	353,425	306,417	86,244	25,000	771,086
1995	251,448	317,585	170,966		739,999
1996	278,364	294,019	154,496		726,879
1997 ¹	272,394	323,674	158,764		754,832

¹Provisional figures

Table 3.1.2.a.2 North-East Arctic COD. Nominal catch (t) by countries (Sub-area I and Divisions IIa and IIb combined). (Data provided by Working Group members.)

Year	Faroe Islands	France	German Dem. Rep.	Fed. Rep. Germany	Norway	Poland	United Kingdom	Russia ²	Others	Total all countries
1961	3,934	13,755	3,921	8,129	268,377	-	158,113	325,780	1,212	783,221
1962	3,109	20,482	1,532	6,503	225,615	-	175,020	476,760	245	909,266
1963	-	18,318	129	4,223	205,056	108	129,779	417,964	-	775,577
1964	-	8,634	297	3,202	149,878	-	94,549	180,550	585	437,695
1965	-	526	91	3,670	197,085	-	89,962	152,780	816	444,930
1966	-	2,967	228	4,284	203,792	-	103,012	169,300	121	483,704
1967	-	664	45	3,632	218,910	-	87,008	262,340	6	572,605
1968	-	-	225	1,073	255,611	-	140,387	676,758	-	1,074,084
1969	29,374	-	5,907	5,543	305,241	7,856	231,066	612,215	133	1,197,226
1970	26,265	44,245	12,413	9,451	377,606	5,153	181,481	276,632	-	933,246
1971	5,877	34,772	4,998	9,726	407,044	1,512	80,102	144,802	215	689,048
1972	1,393	8,915	1,300	3,405	394,181	892	58,382	96,653	166	565,287
1973	1,916	17,028	4,684	16,751	285,184	843	78,808	387,196	276	792,686
1974	5,717	46,028	4,860	78,507	287,276	9,898	90,894	540,801	38,453	1,102,434
1975	11,309	28,734	9,981	30,037	277,099	7,435	101,843	343,580	19,368	829,377
1976	11,511	20,941	8,946	24,369	344,502	6,986	89,061	343,057	18,090	867,463
1977	9,167	15,414	3,463	12,763	388,982	1,084	86,781	369,876	17,771	905,301
1978	9,092	9,394	3,029	5,434	363,088	566	35,449	267,138	5,525	698,715
1979	6,320	3,046	547	2,513	294,821	15	17,991	105,846	9,439	440,538
1980	9,981	1,705	233	1,921	232,242	3	10,366	115,194	8,789	380,434
Spain										
1981	12,825	3,106	298	2,228	277,818	14,500	5,262	83,000	-	399,037
1982	11,998	761	302	1,717	287,525	14,515	6,601	40,311	-	363,730
1983	11,106	126	473	1,243	234,000	14,229	5,840	22,975	-	289,992
1984	10,674	11	686	1,010	230,743	8,608	3,663	22,256	-	277,651
1985	13,418	23	1,019	4,395	211,065	7,846	3,335	62,489	4,330	307,920
1986	18,667	591	1,543	10,092	232,096	5,497	7,581	150,541	3,505	430,113
1987	15,036	1	986	7,035	268,004	16,223	10,957	202,314	2,515	523,071
1988	15,329	2,551	605	2,803	223,412	10,905	8,107	169,365	1,862	434,939
1989	15,625	3,231	326	3,291	158,684	7,802	7,056	134,593	1,273	332,481
1990	9,584	592	169	1,437	88,737	7,950	3,412	74,609	510	187,000
1991	8,981	975	Greenland	2,613	126,226	3,677	3,981	119,427 ³	3,278	269,158
1992	11,663	262	3,337	3,911	168,460	6,217	6,120	182,315	Iceland 1,209	383,494
1993	17,435	3,572	5,389	5,887	221,051	8,800	11,336	244,860	9,374 3,907	531,611
1994	22,826	1,962	6,882	8,283	318,395	14,929	15,579	291,925	36,737 28,568	746,086
1995	22,262	4,912	7,462	7,428	319,987	15,505	16,329	296,158	34,214 15,742	739,999
1996	17,758	3	6,529	6,529	319,158	15,871	16,061	305,317	23,005 14,851	726,879
1997 ¹	17,758	3	6,426	6,680	357,036	17,130	18,066	313,344	5,891 12,498	754,832

¹Provisional figures

²USSR prior to 1991

³Includes Baltic countries

Table 3.1.2.a.3 Cod in the North-East Arctic (Areas I and II).

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 5-10
1946	729.76	2,585.41	706.00	0.193
1947	419.95	1,805.12	882.02	0.313
1948	440.69	1,355.19	774.30	0.352
1949	466.66	1,153.49	800.12	0.370
1950	705.51	1,197.24	731.98	0.365
1951	1,085.89	1,271.43	827.18	0.398
1952	1,190.84	876.07	876.80	0.539
1953	1,592.01	760.08	695.55	0.360
1954	644.33	643.24	826.02	0.401
1955	272.94	708.24	1,147.84	0.550
1956	440.23	835.95	1,343.07	0.643
1957	805.06	771.02	792.56	0.506
1958	497.10	894.00	769.31	0.512
1959	684.73	731.96	744.61	0.560
1960	790.43	527.35	622.04	0.473
1961	918.95	462.19	783.22	0.623
1962	729.96	430.03	909.27	0.752
1963	473.30	291.64	776.34	0.970
1964	338.96	196.78	437.70	0.669
1965	778.09	190.41	444.93	0.539
1966	1,582.38	317.62	483.71	0.508
1967	1,292.66	400.39	572.61	0.526
1968	169.75	416.15	1,074.08	0.552
1969	111.97	409.27	1,197.23	0.809
1970	197.05	453.14	933.25	0.728
1971	404.98	756.09	689.05	0.588
1972	1,015.58	727.53	565.25	0.674
1973	1,818.30	446.44	792.69	0.594
1974	524.95	238.15	1,102.43	0.561
1975	622.07	191.53	829.38	0.620
1976	614.25	234.94	867.46	0.646
1977	347.73	309.69	905.30	0.835
1978	639.60	401.98	698.72	0.930
1979	198.98	244.30	440.54	0.719
1980	140.42	163.72	380.43	0.719
1981	158.14	167.00	399.04	0.815
1982	157.70	401.14	363.73	0.739
1983	168.68	320.04	289.99	0.737
1984	382.06	258.52	277.65	0.891
1985	495.59	212.44	307.92	0.798
1986	1,015.47	166.40	430.11	0.913
1987	269.54	112.22	523.07	1.014
1988	196.12	186.92	434.94	0.900
1989	158.32	196.06	332.48	0.720
1990	213.29	350.09	212.00	0.287
1991	415.67	679.30	319.16	0.336
1992	759.46	881.81	513.49	0.437
1993	1,023.90	751.02	581.61	0.546
1994	830.93	604.38	771.09	0.800
1995	712.75	537.16	740.00	0.729
1996	467.10	650.78	726.88	0.615
1997	786.43	726.96	754.83	0.786
1998	800.98	631.23	.	.
Average	616.95	589.27	680.79	0.618
Unit	Millions	1000 tonnes	1000 tonnes	-

3.1.2.b Norwegian Coastal cod

State of stock/fishery: While the state of this stock complex is uncertain there are no signs of declines in recent years. Sampling of the fishery since 1984 indicates a broad age composition of the resource. Surveys conducted in the coastal areas during 1995–1997 indicate widespread distribution of coastal cod.

Management objectives: Coastal cod is managed as part of the Norwegian NEA cod fishery. An expected yield of 40 000 t from the coastal complex has been added annually in the past to the Norwegian quota for NEA cod. There are no explicit management objectives for this stock complex. Management objectives should be defined

taking into consideration the well-being of the coastal stock components.

Elaboration and special comment: At present, catch statistics for Norwegian coastal cod are based on separation from North-east Arctic cod by area and time of capture. A method of catch separation by otolith pattern has been used in recent years to estimate landings from this coastal cod stock complex. The fishery for Norwegian Coastal cod is part of a directed fishery on cod in Norway using a variety of traditional gears including trawl.

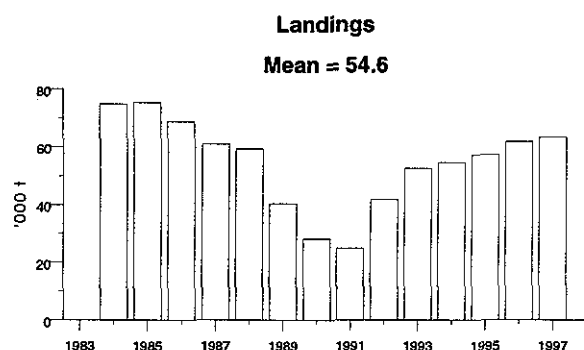
Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM:3).

Catch data (Table 3.1.2.b.1):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings ³	ACFM landings ²
1987	Not assessed				31
1988	Not assessed				22
1989	No advice				17
1990	No advice				24
1991	Included in TAC for I and II				25
1992	Shot forecast included in TAC for I and II				35
1993	Shot forecast included in TAC for I and II				44
1994	No advice				48
1995	No advice				40
1996	No advice				32
1997	No advice				36
1998	No advice				
1999	No advice				

¹40,000 tons has been added annually to the agreed TAC of North-East Arctic cod. ²Norwegian landings from Division IIa (see also Table 3.1.2.b.1). ³No official landings available for Norwegian Coastal Cod. Landings reported to ACFM = AFWG landings. Weights in '000 t.

As calculated from samples



By area and time of capture

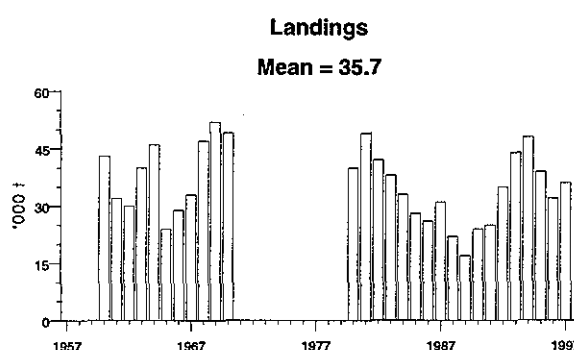


Table 3.1.2.b.1 Landings of Norwegian Coastal cod in Divisions I and II.

Year	Landings (tonnes)	
	As calculated from samples	By area and time of capture
1960	-	43
1961	-	32
1962	-	30
1963	-	40
1964	-	46
1965	-	24
1966	-	29
1967	-	33
1968	-	47
1969	-	52
1970	-	49
1971	-	*)
1972	-	*)
1973	-	*)
1974	-	*)
1975	-	*)
1976	-	*)
1977	-	*)
1978	-	*)
1979	-	*)
1980	-	40
1981	-	49
1982	-	42
1983	-	38
1984	74	33
1985	75	28
1986	69	26
1987	61	31
1988	59	22
1989	40	17
1990	28	24
1991	25	25
1992	42	35
1993	53	44
1994	55	48
1995	57	39
1996	62	32
1997	63	36**)
Average	55	

*No data

**Provisional data

Response to request from Norway and Russia for revised stock evaluation of the North-East Arctic cod

Request to ICES from the Royal Norwegian Ministry of Fisheries, 18 December 1997, and from the Ministry of Agriculture and Food of the Russian Federation, 30 December 1997:

"Based on the results of the coming winter's research surveys, the Parties agreed to request ICES to revise the

stock evaluation presented by ACFM and to evaluate the methodology used for estimating the stock size."

ICES has informed the Parties (letter of 22 January 1998) that it give updated stock advice at the May 1998 ACFM Meeting, while the evaluation of methodology will be given at the October 1998 ACFM Meeting.

3.1.2.c Update of North-East Arctic cod, May 1998

State of stock/fishery: The assessment shows that the fishing mortality in 1993–1997 has been well above historical estimates of F_{med} (0.46). The updated estimates of the stock size in 1996 and 1997 are lower than in the previous assessment, and the assessment is still considered uncertain. There are indications that the year classes now dominating the spawning stock, still could be overestimated, and a continuation of the 1997 fishing mortality lead to a considerable risk for the stock to remain outside safe biological limits in the short term. In 1997 the TAC was not reached, while the TAC had been overfished for the 7 preceding years.

Updated assessment in relation to the advice given: According to an updated assessment the F_{med} catch in 1998 would be 450 000 t, compared with 514 000 t in the former advice. The agreed TAC of 654 000 t may represent a non sustainable fishing mortality and is a threat to the spawning stock even in the short term. ICES will provide advice for 1999 after the autumn meeting of ACFM.

Catch forecast: Basis: $F(97) = 0.77$, $SSB(98) = 619$.

F(98 onward)	Basis	Landings(98)	SSB (99)
0.23	0.3 F_{97}	250	920
0.31	0.4 F_{97}	322	848
0.39	0.5 F_{97}	389	782
0.46	F_{med}	450	724
0.54	0.7 F_{97}	510	666
0.62	0.8 F_{97}	564	615
0.70	0.9 F_{97}	614	569
0.76	TAC	654	533

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: There is a considerable risk (not much below 50%) that a catch of 654 000 t in 1998 will bring the spawning stock below 500 000 t at the beginning of 1999, while the risk for this to happen in 2000 is above 50%, if the corresponding fishing mortality is continued during 1999.

The present assessment is based on the same prior assumptions as the previous assessment. Some revisions were made on catch and survey data, which had minor influence on the results. The change in results compared to previous assessment is mainly caused by adding one more year of data. The assessment still proved to be sensitive to the prior assumptions regarding the relationship between survey results and stock size. The results indicate that the assumptions made in the two latest assessment are more realistic than those made earlier. The uncertainty in the survey data has increased because the Norwegian surveys have been restricted to the Norwegian EEZ and international waters during 1997 and 1998.

Growth, maturity and cannibalism has shown large variability for this stock. This variability seems to be linked to the capelin stock. These relationships need to be incorporated into the assessment to improve the quality of the advice.

Source of information: Report to ACFM from a group of experts meeting in Bergen, Norway, 21–23 April 1998. Report of the Arctic Fisheries Working Group, August 1997 (ICES CM 1998/Assess:2).

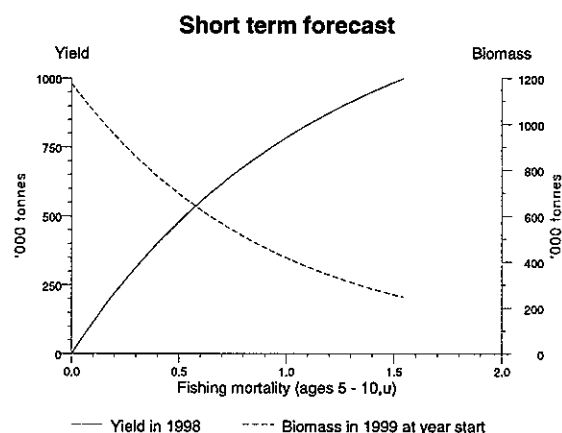
Catch data (Tables 3.1.2.c.1–3).

Year	ICES advice	Landings corresp. to advice ¹	Agreed TAC ¹	Official landings	ACFM landings ¹	Unreported landings
1987	Gradual reduction in F	595	560	552	523	
1988	F = 0.51; TAC	530	590	459	435	
1989	Large reduction in F	335	451	343	332	
1990	F at F_{low} ; TAC	172	160	187	212	25
1991	F at F_{low} ; TAC	215	215	269	319	50
1992	Within safe biological limits	250 ²	356	383	513	130
1993	Healthy stock	256 ²	500	532	582	50
1994	No long-term gains in increased F	649 ²	700	746	771	25
1995	No long-term gains in increased F	681 ²	700	740	740	
1996	No long-term gains in increased F	746 ²	700	731	731	
1997	Well below F_{med}	< 993	850	768	768	
1998	F less than F_{med}	≤ 514	654			

¹Norwegian coastal cod not included. ²Catch at *status quo* F. Weights in '000 t.

North-East Arctic cod

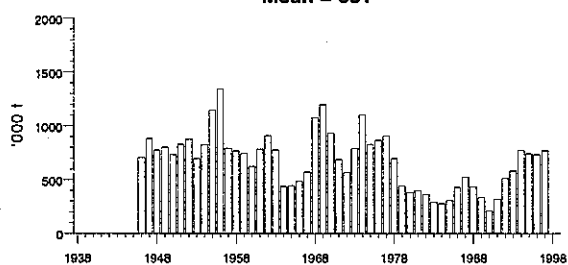
Yield and Spawning Stock Biomass



North-East Arctic cod

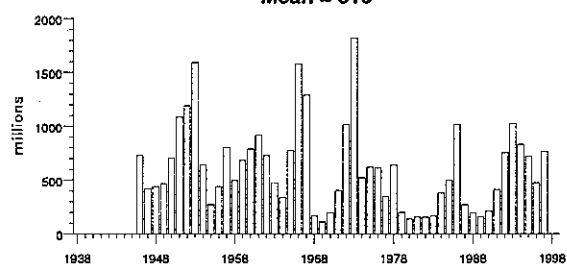
Landings

Mean = 681



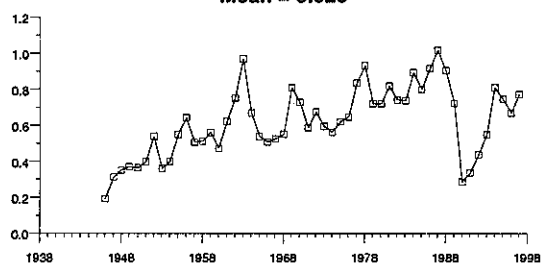
Recruitment (age 3)

Mean = 613



Fishing mortality (ages 5-10)

Mean = 0.620



Spawning stock biomass

Mean = 587

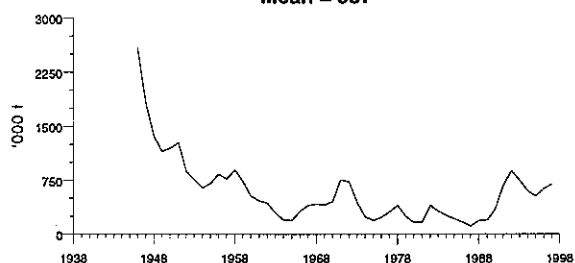


Table 3.1.2.c.1 North-East Arctic COD. Total landings (t) by fishing areas and unreported landings.
(Data provided by Working Group members)

Year	Sub-area I	Division IIa	Division IIb	Unreported catches	Total catch
1961	409,694	153,019	220,508		783,221
1962	548,621	139,848	220,797		909,266
1963	547,469	117,100	111,768		776,337
1964	206,883	104,698	126,114		437,695
1965	241,489	100,011	103,430		444,983
1966	292,253	134,805	56,653		483,711
1967	322,798	128,747	121,060		572,605
1968	642,452	162,472	269,254		1,074,084
1969	679,373	255,599	262,254		1,197,226
1970	603,855	243,835	85,556		933,246
1971	312,505	319,623	56,920		689,048
1972	197,015	335,257	32,982		565,254
1973	492,716	211,762	88,207		792,685
1974	723,489	124,214	254,730		1,102,433
1975	561,701	120,276	147,400		829,377
1976	526,685	237,245	103,533		867,463
1977	538,231	257,073	109,997		905,301
1978	418,265	263,157	17,293		698,715
1979	195,166	235,449	9,923		440,538
1980	168,671	199,313	12,450		380,434
1981	137,033	245,167	16,837		399,037
1982	96,576	236,125	31,029		363,730
1983	64,803	200,279	24,910		289,992
1984	54,317	197,573	25,761		277,651
1985	112,605	173,559	21,756		307,920
1986	157,631	202,688	69,794		430,113
1987	146,106	245,387	131,578		523,071
1988	166,649	209,930	58,360		434,939
1989	164,512	149,360	18,609		332,481
1990	62,272	99,465	25,263	25,000	212,000
1991	70,970	156,966	41,222	50,000	319,158
1992	124,219	172,792	86,483	130,000	513,494
1993	195,771	269,383	66,457	50,000	581,611
1994	353,425	306,417	86,244	25,000	771,086
1995	251,448	317,585	170,966		739,999
1996	278,285	296,610	156,266		731,161
1997 ¹	276,530	325,135	166,198		767,863

¹ Provisional figures.

Table 3.1.2.c.2 North-East Arctic COD. Nominal landings (t) by countries (Sub-area I and Divisions IIa and IIb combined). (Data provided by Working Group members).

Year	Faroe Islands	France	German Dem. Rep.	Fed. Rep. Germany	Norway	Poland	United Kingdom	Russia ²	Others	Total all countries
1961	3,934	13,755	3,921	8,129	268,377	-	158,113	325,780	1,212	783,221
1962	3,109	20,482	1,532	6,503	225,615	-	175,020	476,760	245	909,266
1963	-	18,318	129	4,223	205,056	108	129,779	417,964	-	775,577
1964	-	8,634	297	3,202	149,878	-	94,549	180,550	585	437,695
1965	-	526	91	3,670	197,085	-	89,962	152,780	816	444,930
1966	-	2,967	228	4,284	203,792	-	103,012	169,300	121	483,704
1967	-	664	45	3,632	218,910	-	87,008	262,340	6	572,605
1968	-	-	225	1,073	255,611	-	140,387	676,758	-	1,074,084
1969	29,374	-	5,907	5,543	305,241	7,856	231,066	612,215	133	1,197,226
1970	26,265	44,245	12,413	9,451	377,606	5,153	181,481	276,632	-	933,246
1971	5,877	34,772	4,998	9,726	407,044	1,512	80,102	144,802	215	689,048
1972	1,393	8,915	1,300	3,405	394,181	892	58,382	96,653	166	565,287
1973	1,916	17,028	4,684	16,751	285,184	843	78,808	387,196	276	792,686
1974	5,717	46,028	4,860	78,507	287,276	9,898	90,894	540,801	38,453	1,102,434
1975	11,309	28,734	9,981	30,037	277,099	7,435	101,843	343,580	19,368	829,377
1976	11,511	20,941	8,946	24,369	344,502	6,986	89,061	343,057	18,090	867,463
1977	9,167	15,414	3,463	12,763	388,982	1,084	86,781	369,876	17,771	905,301
1978	9,092	9,394	3,029	5,434	363,088	566	35,449	267,138	5,525	698,715
1979	6,320	3,046	547	2,513	294,821	15	17,991	105,846	9,439	440,538
1980	9,981	1,705	233	1,921	232,242	3	10,366	115,194	8,789	380,434
Spain										
1981	12,825	3,106	298	2,228	277,818	14,500	5,262	83,000	-	399,037
1982	11,998	761	302	1,717	287,525	14,515	6,601	40,311	-	363,730
1983	11,106	126	473	1,243	234,000	14,229	5,840	22,975	-	289,992
1984	10,674	11	686	1,010	230,743	8,608	3,663	22,256	-	277,651
1985	13,418	23	1,019	4,395	211,065	7,846	3,335	62,489	4,330	307,920
1986	18,667	591	1,543	10,092	232,096	5,497	7,581	150,541	3,505	430,113
1987	15,036	1	986	7,035	268,004	16,223	10,957	202,314	2,515	523,071
1988	15,329	2,551	605	2,803	223,412	10,905	8,107	169,365	1,862	434,939
1989	15,625	3,231	326	3,291	158,684	7,802	7,056	134,593	1,273	332,481
1990	9,584	592	169	1,437	88,737	7,950	3,412	74,609	510	187,000
1991	8,981	975	Greenland	2,613	126,226	3,677	3,981	119,427 ³	3,278	269,158
1992	11,663	262	3,337	3,911	168,460	6,217	6,120	182,315	Iceland 1,209	383,494
1993	17,435	3,572	5,389	5,887	221,051	8,800	11,336	244,860	9,374 3,907	531,611
1994	22,826	1,962	6,882	8,283	318,395	14,929	15,579	291,925	36,737 28,568	746,086
1995	22,262	4,912	7,462	7,428	319,987	15,505	16,329	296,158	34,214 15,742	739,999
1996	17,758	4,315	6,529	8,326	319,128	15,871	16,061	305,317	23,005 14,851	731,161
1997 ¹	24,500	6,141	6,600	6,400	357,353	17,500	16,452	313,344	6,178 12,832	767,300

¹ Provisional figures.

² USSR prior to 1991.

³ Includes Baltic countries.

Table 3.1.2.c.3 Cod in the North-East Arctic (Areas I and II).

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 5-10
1946	729.76	2,585.41	706.00	0.193
1947	419.95	1,805.12	882.02	0.313
1948	440.69	1,355.20	774.30	0.352
1949	466.66	1,153.49	800.12	0.370
1950	705.51	1,197.24	731.98	0.365
1951	1,085.89	1,271.43	827.18	0.398
1952	1,190.84	876.07	876.80	0.539
1953	1,592.01	760.08	695.55	0.360
1954	644.33	643.24	826.02	0.401
1955	272.94	708.24	1,147.84	0.550
1956	440.23	835.95	1,343.07	0.643
1957	805.06	771.02	792.56	0.506
1958	497.10	894.00	769.31	0.512
1959	684.73	731.96	744.61	0.560
1960	790.43	527.35	622.04	0.473
1961	918.95	462.19	783.22	0.623
1962	729.96	430.03	909.27	0.752
1963	473.30	291.64	776.34	0.970
1964	338.96	196.78	437.70	0.669
1965	778.09	190.41	444.93	0.539
1966	1,582.38	317.62	483.71	0.508
1967	1,292.66	400.39	572.61	0.526
1968	169.75	416.15	1,074.08	0.552
1969	111.97	409.27	1,197.23	0.809
1970	197.05	453.14	933.25	0.728
1971	404.98	756.08	689.05	0.588
1972	1,015.58	727.53	565.25	0.674
1973	1,818.30	446.44	792.69	0.594
1974	524.91	238.15	1,102.43	0.561
1975	622.07	191.53	829.38	0.620
1976	614.24	234.94	867.46	0.646
1977	347.73	309.69	905.30	0.835
1978	639.59	401.98	698.72	0.930
1979	198.96	244.23	440.54	0.719
1980	140.42	163.65	380.43	0.720
1981	158.11	166.89	399.04	0.817
1982	157.70	401.02	363.73	0.739
1983	168.68	319.92	289.99	0.737
1984	382.05	258.39	277.65	0.892
1985	495.58	212.23	307.92	0.798
1986	1,015.26	166.30	430.11	0.915
1987	269.29	112.11	523.07	1.016
1988	195.84	186.77	434.94	0.904
1989	158.40	195.89	332.48	0.721
1990	212.37	349.80	212.00	0.287
1991	411.89	678.56	319.16	0.337
1992	755.19	880.37	513.49	0.437
1993	1,022.66	748.68	581.61	0.549
1994	831.01	600.07	771.09	0.810
1995	720.55	529.43	740.00	0.746
1996	472.71	637.79	731.16	0.669
1997	763.21	694.82	767.86	0.772
Average	613.01	587.24	681.12	0.620
Unit	Millions	1000 tonnes	1000 tonnes	-

3.1.3 North-East Arctic haddock

State of stock/fishery: The stock is considered to be outside safe biological limits. Fishing mortality in 1997 is estimated to be above the proposed F_{pa} . In recent years the stock has been dominated by the 1990 year class which is one of three outstanding year classes since 1950 (in excess of 600 million recruits) and which has increased the stock considerably and SSB is now estimated to be well above proposed B_{pa} (100 000 tons). The stock is declining as the influence of the 1990 year class is reduced.

Management objectives: There have been no management objectives other than managing the stock

within safe biological limits. 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} . In recent years, advice has been to keep the fishing mortality below F_{med} .

Advice on management: ICES recommends that fishing mortality should be reduced below the proposed $F_{pa}=0.35$, corresponding to landings in 1999 of less than 74 000 t.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 60 000 t, the SSB below which only poor year classes have been observed.	B_{pa} be set at 100 000 t which is considered to be the minimum SSB required to provide a 95% probability of maintaining SSB above B_{lim} taking into account the uncertainty in assessments and stock dynamics.
F_{lim} is 0.49, the fishing mortality associated with potential stock collapse.	F_{pa} be set at 0.35. This value is considered to have a high probability of keeping SSB above B_{lim} .

Technical Basis:

B_{lim} : only poor recruitment has been observed from 5 years of SSB < 60 000 t and all moderate or large year classes have been produced at higher SSB.	$B_{pa} = B_{lim} \times 1.67$.
F_{lim} = median value of F_{loss} .	$F_{pa} = F_{med}$. The stock has sustained higher fishing mortality for most of the period after 1950 without collapsing, however low SSB has often resulted.

Relevant factors to be considered in management:
Since the haddock is a major by-catch in the cod fishery,

the possible limitations of the haddock catches also depend on the management of North-East Arctic cod.

Catch forecast for 1999:

Basis: TAC/National estimates, Landings (98) = 110, $F(98) = 0.37$, SSB(99) = 188.

F (99)	Basis	Catch (99)	Landings (99)	SSB(2000)	Medium-term effect of fishing at given level
0.08	0.2F(97)	20	20	192	n/a
0.16	0.4F(97)	38	38	174	n/a
0.25	0.6F(97)	55	55	157	n/a
0.33	0.8F(97)	70	70	142	n/a
0.35	F_{pa}	74	74	138	n/a
0.41	1.0F(97)	84	84	128	n/a

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: The 1990 year class has dominated the stock in the recent years. Subsequent recruitment has been low and SSB is expected to decline even with low fishing mortality. About 46 000 t of the 56 000 t decrease in the advised TAC compared with the 1998 TAC is due to a decrease in stock size. The other 10 000 t is due to advising a lower F .

Survey coverage has been reduced substantially in 1997 and 1998. If the limitations in survey coverage persist they will further threaten the scientific basis for management advice on North-East Arctic haddock.

The fishery is mainly a trawl fishery, in periods only as by-catch in the fishery for cod. The fishery is also restricted by quotas for the traditional gears. The fishery is regulated by a minimum catching size, a

minimum mesh size in trawls and Danish seine, a maximum by-catch of undersized fish, closure of areas with high density of juveniles and other area and seasonal restrictions.

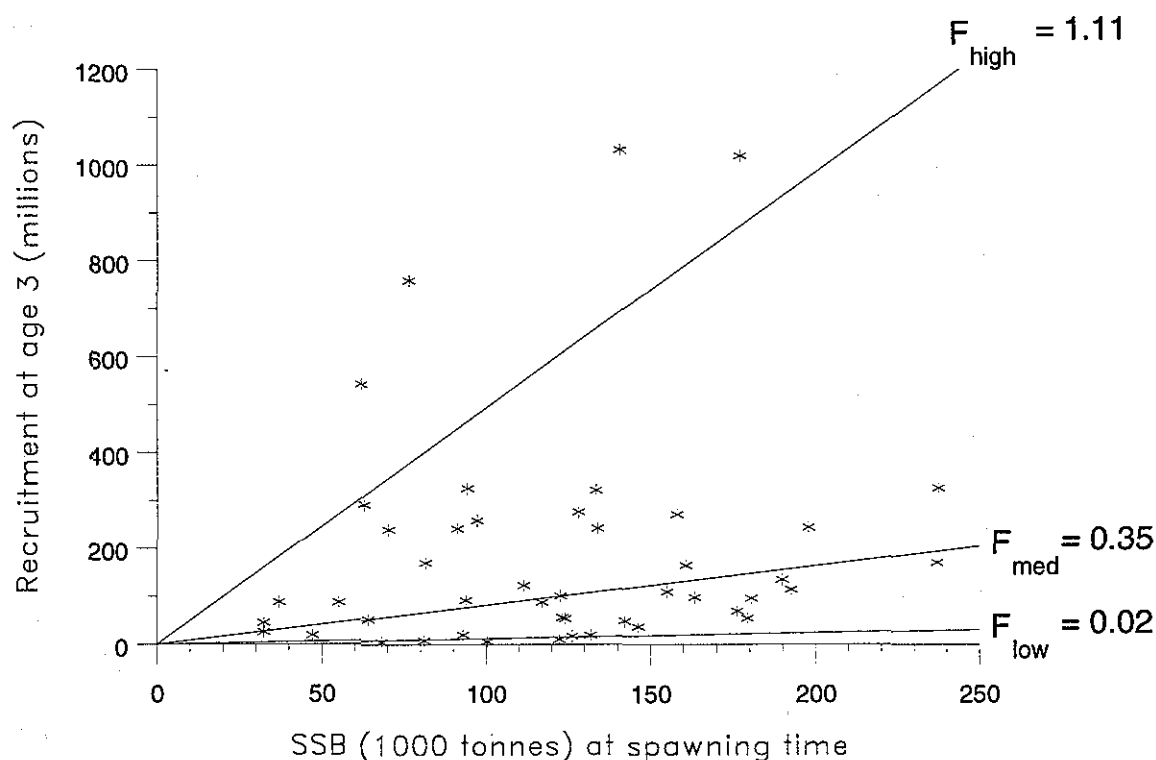
Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM:3).

Catch data (Tables 3.1.3.1-3):

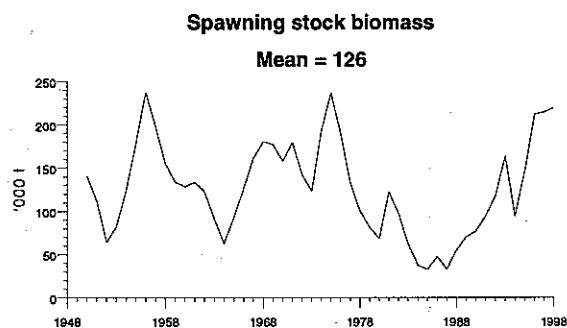
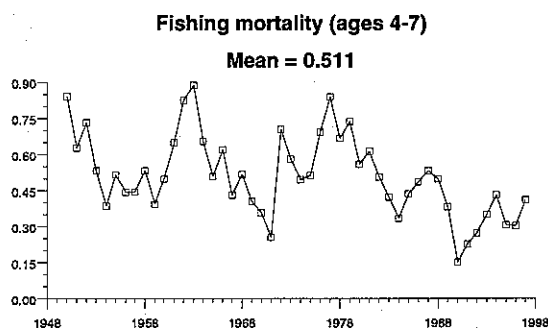
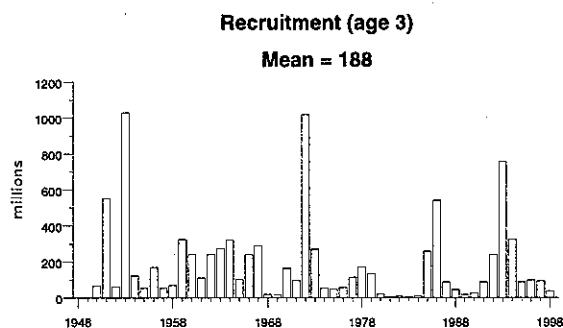
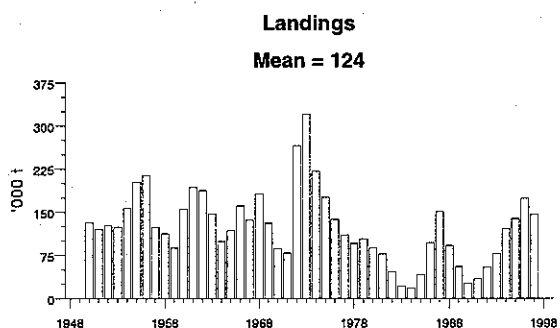
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings ¹
1987	No increase in F; TAC	160	250	155	151
1988	No increase in F	<240	240	95	92
1989	Large reduction in F	69	83	60	55
1990	No directed fishery	-	25	27	26
1991	No directed fishery	-	28	34	34
1992	Within safe biological limits	35 ²	63	58	54
1993	No long-term gains in increasing F	56 ²	72	83	78
1994	No long-term gains in $F > F_{med}$	97 ³	120	125	121
1995	No long-term gains in $F > F_{med}$	122 ³	130	139	138
1996	No long-term gains in $F > F_{med}$	169 ³	170	177	173
1997	Well below F_{med}	<242	210	152	146
1998	Below F_{med}	120	130		
1999	Reduce F below F_{pa}	74			

¹Haddock in Norwegian coastal areas not included. ²Predicted catch at *status quo* F. ³Predicted landings at F_{med} . Weights in '000 t.

Stock - Recruitment

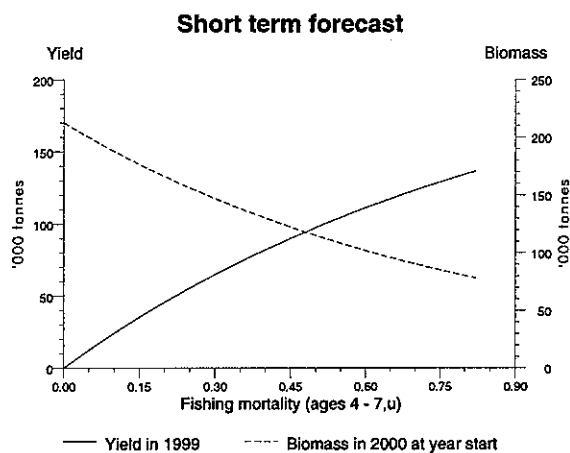
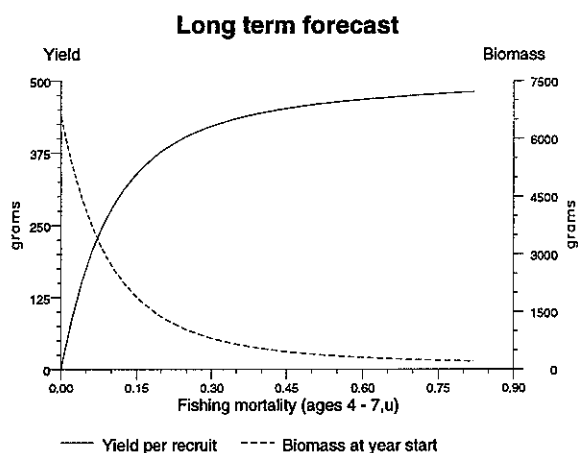


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North-East Arctic haddock

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Haddock, North-East Arctic (Fishing Areas I and II)

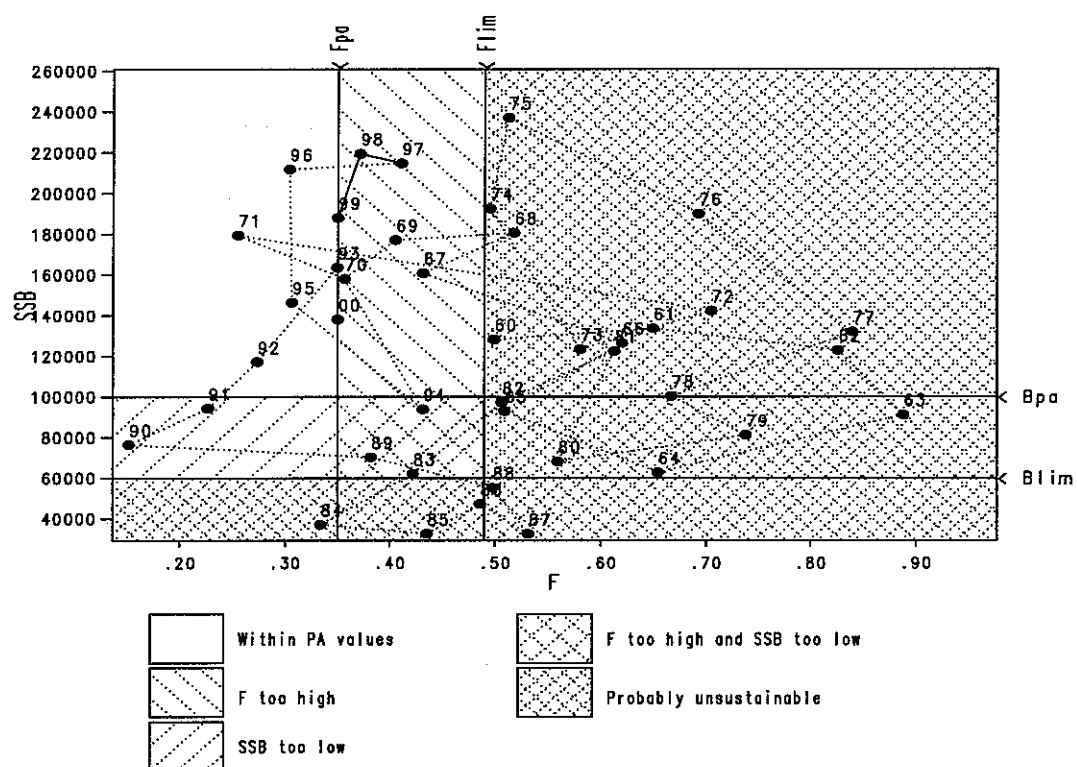


Table 3.1.3.1 North-East Arctic HADDOCK. Total nominal catch (t) by fishing areas.
(Data provided by Working Group members).

Year	Sub-area I	Division IIa	Division IIb	Total
1960	125,675	27,925	1,854	155,454
1961	165,165	25,642	2,427	193,234
1962	160,972	25,189	1,727	187,888
1963	124,774	21,031	939	146,744
1964	79,056	18,735	1,109	98,900
1965	98,505	18,640	939	118,079
1966	124,115	34,892	1,614	160,621
1967	108,066	27,980	440	136,486
1968	140,970	40,031	725	181,726
1969	89,736	40,211	565	130,512
1970	59,493	26,611	497	86,601
1971	56,991	21,454	463	78,908
1972	221,183	41,979	2,155	265,317
1973	283,728	23,348	12,989	320,065
1974	159,037	47,033	15,068	221,138
1975	121,692	44,337	9,729	175,758
1976	94,065	37,566	5,649	137,280
1977	72,159	28,452	9,547	110,158
1978	63,965	30,478	979	95,422
1979	63,841	39,167	615	103,623
1980	54,205	33,616	68	87,889
1981	36,834	39,864	455	77,153
1982	17,948	29,005	2	46,955
1983	7,550	13,872	185	21,607
1984	4,000	13,247	71	17,318
1985	30,385	10,774	111	41,270
1986	69,865	26,006	714	96,585
1987	109,429	38,182	3,048	150,659
1988	43,990	47,086	668	91,744
1989	31,265	23,502	355	55,122
1990	15,138	10,375	304	25,817
1991	18,772	14,417	416	33,605
1992	30,746	22,177	964	53,887
1993	47,573	27,010	3,037	77,619
1994	70,773	43,707	6,885	121,365
1995	70,252	54,073	14,098	138,423
1996	112,932	57,319	3,274	173,525
1997 ¹	74,380	68,480	2,714	145,574

¹Provisional figures

Table 3.1.3.2 North-East Arctic HADDOCK. Nominal catch (t) by countries, Sub-area I and Divisions IIa and IIb combined. (Data provided by Working Group members).

Year	Faroe Islands	France	German Dem.Re.	Fed. Rep. Germ.	Norway	Poland	United Kingdom	Russia ²	Others	Total
1960	172	-	-	5,597	46,263	-	45,469	57,025	125	155,651
1961	285	220	-	6,304	60,862	-	39,650	85,345	558	193,234
1962	83	409	-	2,895	54,567	-	37,486	91,910	58	187,438
1963	17	363	-	2,554	59,955	-	19,809	63,526	-	146,224
1964	-	208	-	1,482	38,695	-	14,653	43,870	250	99,158
1965	-	226	-	1,568	60,447	-	14,345	41,750	242	118,578
1966	-	1,072	11	2,098	82,090	-	27,723	48,710	74	161,778
1967	-	1,208	3	1,705	51,954	-	24,158	57,346	23	136,397
1968	-	-	-	1,867	64,076	-	40,129	75,654	-	181,726
1969	2	-	309	1,490	67,549	-	37,234	24,211	25	130,820
1970	541	-	656	2,119	37,716	-	20,423	26,802	-	87,257
1971	81	-	16	896	45,715	43	16,373	15,778	3	78,905
1972	137	-	829	1,433	46,700	1,433	17,166	196,224	2,231	266,153
1973	1,212	3,214	22	9,534	86,767	34	32,408	186,534	2,501	322,626
1974	925	3,601	454	23,409	66,164	3,045	37,663	78,548	7,348	221,157
1975	299	5,191	437	15,930	55,966	1,080	28,677	65,015	3,163	175,758
1976	536	4,459	348	16,660	49,492	986	16,940	42,485	5,358	137,265
1977	213	1,510	144	4,798	40,118	-	10,878	52,210	287	110,158
1978	466	1,411	369	1,521	39,955	1	5,766	45,895	38	95,422
1979	343	1,198	10	1,948	66,849	2	6,454	26,365	454	103,623
1980	497	226	15	1,365	61,886	-	2,948	20,706	246	87,889
1981	381	414	22	2,398	58,856	Spain	1,682	13,400	-	77,153
1982	496	53	-	1,258	41,421	-	827	2,900	-	46,955
1983	428	-	1	729	19,371	139	259	680	-	21,607
1984	297	15	4	400	15,186	37	276	1,103	-	17,318
1985	424	21	20	395	17,490	77	153	22,690	-	41,270
1986	893	33	75	1,079	48,314	22	431	45,738	-	96,585
1987	464	26	83	3,106	69,333	99	563	76,980	-	150,654
1988	1,113	116	78	1,324	57,273	72	435	31,293	41	91,745
1989	1,218	125	26	171	31,825	1	590	20,903	-	54,859
1990	875	-	5	128	17,634	-	494	6,605	-	25,741
1991	1,117	60	Greenland	219	19,285	-	514	12,388	22	33,605
1992	1,093	151	1,719	387	30,203	38	596	19,699	1	53,887
1993	546	1,215	880	1,165	36,590	76	1,802	34,700	646	77,619
1994	2,761	678	770	2,412	64,688	22	4,673	44,484	877	121,365
1995	2,833	598	1,097	2,675	72,864	14	3,108	54,516	718	138,423
1996	3,743	538	1,510	942	89,500	669	2,275	74,131	217	173,525
1997 ¹	416	547	1,790	971	97,585	364	2,340	41,286	275	145,574

¹Provisional figures

²USSR prior to 1991

Table 3.1.3.3 Haddock in the North-East Arctic (Areas I and II).

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-7
1950	66.40	140.64	132.13	0.841
1951	552.71	111.58	120.08	0.627
1952	62.33	64.15	127.66	0.732
1953	1,030.19	81.68	123.92	0.533
1954	122.54	124.22	156.79	0.386
1955	52.31	176.28	202.29	0.516
1956	169.10	237.44	213.92	0.443
1957	53.25	197.61	123.58	0.445
1958	68.97	155.12	112.67	0.533
1959	324.53	133.92	88.21	0.394
1960	242.52	128.20	155.45	0.499
1961	109.13	133.52	193.23	0.649
1962	240.73	122.88	187.89	0.826
1963	274.82	91.08	146.74	0.888
1964	320.31	62.71	98.90	0.654
1965	100.31	92.98	118.08	0.509
1966	240.27	126.36	160.62	0.620
1967	290.56	160.80	136.49	0.432
1968	19.93	180.58	181.73	0.518
1969	17.20	177.04	130.50	0.405
1970	163.91	157.98	86.60	0.357
1971	95.48	179.37	78.91	0.255
1972	1,017.76	142.25	265.32	0.705
1973	269.63	123.39	320.07	0.581
1974	53.68	192.51	221.14	0.495
1975	48.50	237.10	175.76	0.512
1976	55.69	189.87	137.22	0.692
1977	113.84	131.90	110.16	0.839
1978	170.09	100.36	95.42	0.667
1979	134.06	81.17	103.62	0.738
1980	18.87	68.18	87.89	0.559
1981	5.65	122.43	77.15	0.613
1982	7.93	97.13	46.96	0.506
1983	4.74	61.96	21.61	0.422
1984	9.66	37.03	17.66	0.334
1985	257.21	32.47	41.27	0.435
1986	541.06	47.18	96.59	0.486
1987	87.08	32.39	150.66	0.532
1988	44.59	55.24	91.74	0.498
1989	18.41	70.22	55.12	0.382
1990	25.35	76.38	25.82	0.152
1991	86.46	94.26	33.61	0.227
1992	238.34	117.13	53.89	0.273
1993	757.34	163.46	77.62	0.350
1994	324.03	93.89	121.37	0.432
1995	87.18	146.32	138.42	0.306
1996	97.31	211.74	173.53	0.304
1997	91.64	214.70	145.57	0.411
1998	36.40	219.44	.	.
Average	188.16	126.45	124.20	0.511
Unit	Millions	1000 tonnes	1000 tonnes	-

3.1.4 North-East Arctic saithe

State of stock/fishery: The stock is considered to be outside safe biological limits. Although the spawning stock biomass has increased after being low for almost 20 years and is now above the proposed B_{pa} , it will decrease below B_{pa} in the short term at current fishing mortality. Fishing mortality has declined but is still above the proposed F_{pa} . Expected landings in 1998 will result in an increase in fishing mortality.

Management objectives: Other than managing the stock within safe biological limits, there has not been any explicit management objectives for this stock. In recent

years the advice has been given to keep fishing mortality below F_{med} (0.32), and to keep the spawning stock above the MBAL of 170 000 t. 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} .

Advice on management: ICES recommends that fishing mortality should be reduced below the proposed F_{pa} (0.26) corresponding to landings in 1999 of less than 87 000 t.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 89 000 t, the lowest observed SSB in the 35 year time series.	B_{pa} be set at 150 000 t, the SSB below which the probability of poor year classes increases.
F_{lim} is 0.45, the fishing mortality associated with potential stock collapse.	F_{pa} be set at 0.26. This value is considered to have a 95% probability of avoiding the F_{lim} .

Technical Basis:

$B_{lim} = B_{loss}$.	B_{pa} = examination of stock-recruit plot.
F_{lim} = Median value of F_{loss} .	$F_{pa} = F_{lim} \times 0.6$.

Relevant factors to be considered in management: The estimation of incoming recruitment for forecasting purposes is difficult as the year classes recruit to the survey in the same year that they recruit to the purse seine fishery. Large variation in availability causes large variation in the estimation of the 2-year-olds. In the most

recent years there has been a change in the exploitation pattern with reduced mortality on the youngest ages. Unrepresentative sampling in recent years has reduced the reliability of estimated catch numbers of 2 years old, which may have affected recruitment indices.

Catch forecast for 1999:

Basis: Expected Landings(98) = 146, $F(98) = 0.43$, $SSB(99) = 171$.

F (99)	Basis	Catch (99)	Landings (99)	SSB (2000)	Medium-term effect of fishing at given level
0.08	0.2F(97)		29	237	n/a
0.15	0.4F(97)		54	211	n/a
0.23	0.6F(97)		77	188	n/a
0.26	F_{pa}		87	177	n/a
0.30	0.8F(97)		98	168	n/a
0.38	1.0F(97)		117	150	n/a
0.45	1.2F(97)		134	134	n/a

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: The change in the perception of the state of the stock since the last assessment is the result of lower estimates of stock size and a lower fishing mortality reference point. The mean weights at age of the dominant age groups are lower than in the past and the recruitment is uncertain. At present the strength of the 1993 year class is also

uncertain, and this may have considerable effect on the estimates of the current stock size and the projections.

Since the early 1960s, the fishery has been dominated by purse seine and trawl fisheries, with a traditional gill net fishery for spawning saithe as the third major component. The purse seine fishery is conducted in

coastal areas and fjords. Historically, purse seiners and trawlers have taken roughly equal shares of the catches. From 1992–1995, purse seine catches have decreased substantially and the trawl catches have increased correspondingly, accounting for more than half the catches. In 1996 and 1997, however, the purse seine catches more than doubled and the trawl catches declined correspondingly.

Based on a target level for the catches and estimates of catches for other gears, quotas are set for purse seine and trawl fisheries. In the Norwegian fishery, quotas may be transferred between purse seine and trawl based on negotiations if it becomes clear that the quota allocated to one of the fleets will not be taken.

Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM: 3).

Catch data (Tables 3.1.4.1–2):

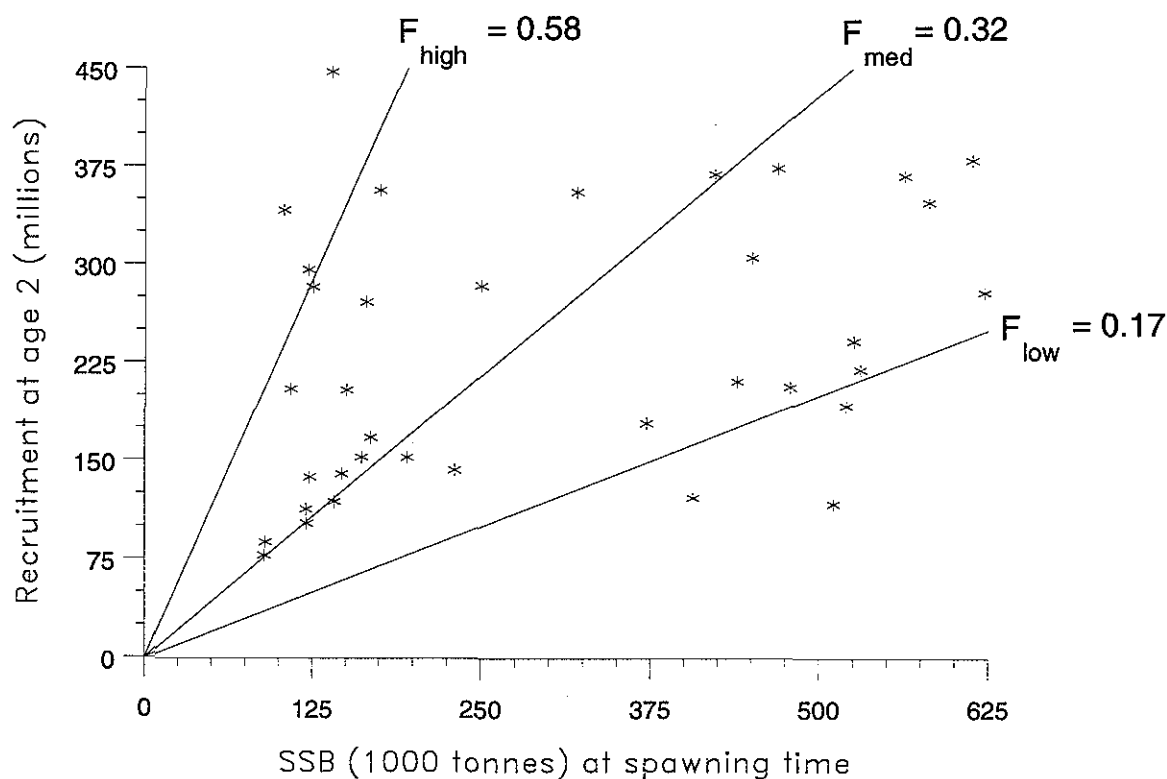
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ²	Official landings	ACFM landings
1987	No increase in F; TAC; protect juveniles	90	-	92	92
1988	No increase in F	< 83	-	114	115
1989	<i>Status quo</i> F; TAC	120	120	122	123
1990	$F \leq F_{med}$; TAC	93	103	96	95
1991	F at F_{low} ; TAC	90	100	107	107
1992	Within safe biological limits	115	115	128	128
1993	Within safe biological limits	132 ¹	132	154	154
1994	No increase in F	158 ¹	145	142	142
1995	No increase in F	221 ¹	165	169	169
1996	No increase in F	158 ¹	163	171	171
1997	Reduction of F to the F_{med} or below	107	125	143	143
1998	Reduction of F to the F_{med} or below	117	144 ³		
1999	Reduce F below F_{pa}	87			

¹ Predicted catch at *status quo* F. ² Set by Norwegian authorities. Weights in '000 t.

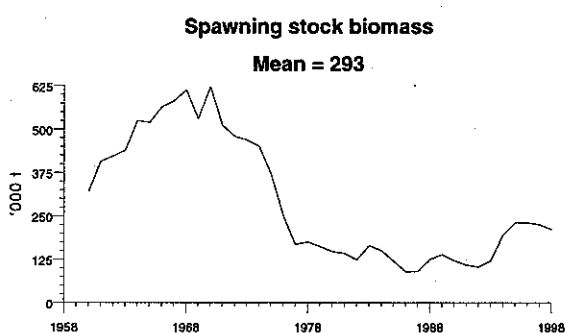
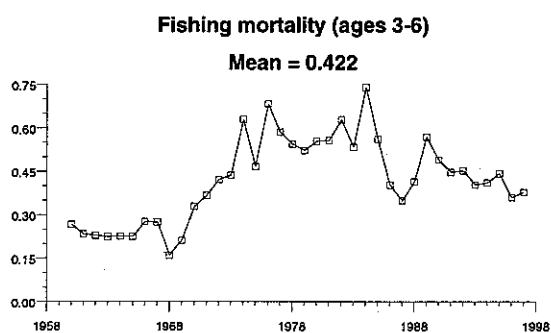
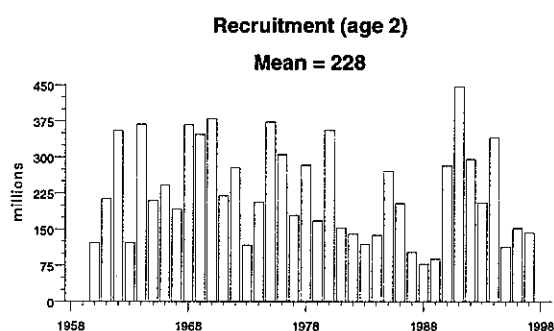
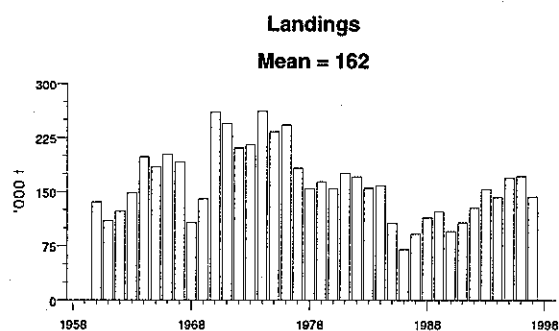
³ TAC first set at 125 000 t, increased in May 1998.

North-East Arctic saithe

Stock - Recruitment

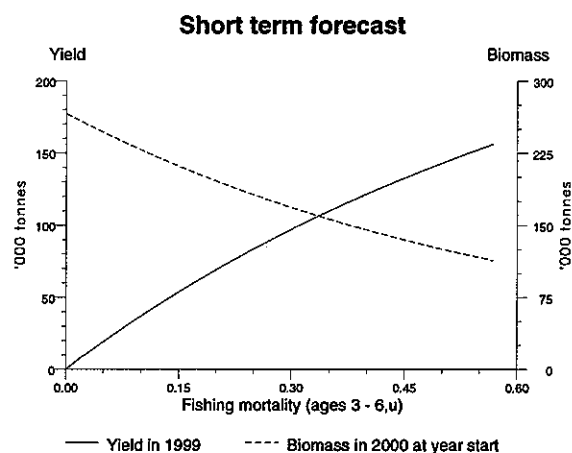
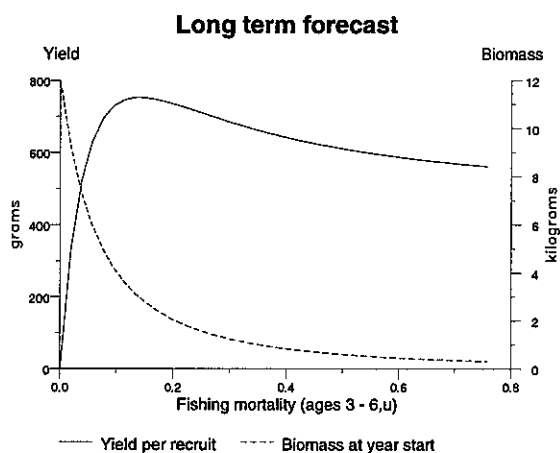


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North-East Arctic saithe

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Saithe, North-East Arctic (Fishing Areas I and II)

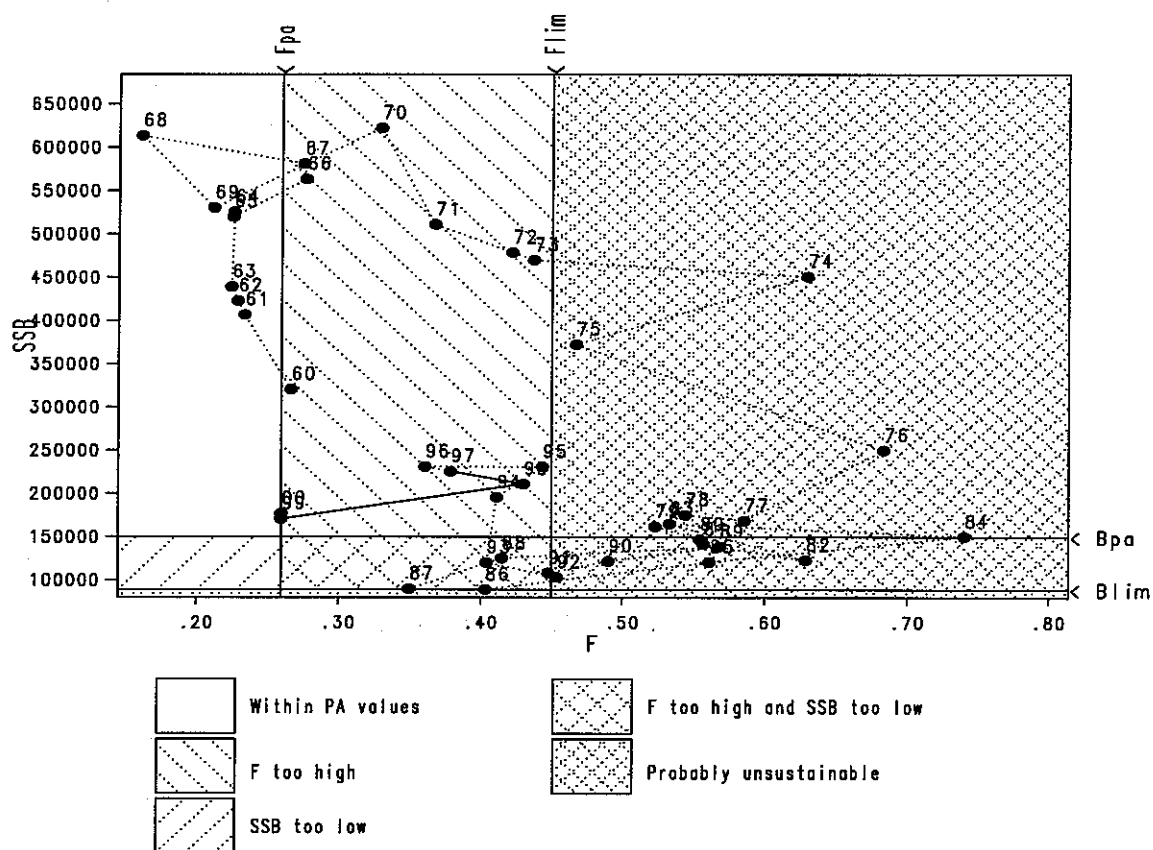


Table 3.1.4.1 North-East Arctic SAITHE. Nominal catch (t) by countries, Sub-area I and Divisions IIa and IIb combined, as officially reported to ICES.

Year	Faroe Islands	France	Germany Dem. Rep.	Fed. Rep. Germany	Norway	Poland	Portugal	Russia ³	Spain	UK (England & Wales)	UK (Scotland)	Others ⁵	Total of all countries
1960	23	1,700	-	25,948	96,050	-	-	-	-	9,780	-	14	133,515
1961	61	3,625	-	19,757	77,875	-	-	-	-	4,595	20	18	105,951
1962	2	544	-	12,651	101,895	-	-	912	-	4,699	-	4	120,707
1963	-	1,110	-	8,108	135,297	-	-	-	-	4,112	-	-	148,627
1964	-	1,525	-	4,420	184,700	-	-	84	-	6,511	-	186	197,506
1965	-	1,618	-	11,387	165,531	-	-	137	-	6,741	5	181	185,600
1966	-	2,987	813	11,269	175,037	-	-	563	-	13,078	-	41	203,788
1967	-	9,472	304	11,822	150,860	-	-	441	-	8,379	-	48	181,326
1968	-	-	70	4,753	96,641	-	-	-	-	8,781	2	-	110,246
1969	20	193	6,744	4,355	115,140	-	-	-	-	13,585	-	23	140,033
1970	1,097	-	29,362	23,466	151,759	-	-	43,550	-	15,469	221	-	264,924
1971	215	14,536	16,840	12,204	128,499	6,017	-	39,397	13,097	10,361	106	-	241,272
1972	109	14,519	7,474	24,595	143,775	1,111	-	1,278	13,125	8,223	125	-	210,456
1973	7	11,320	12,015	30,338	148,789	23	-	2,411	2,115	6,593	248	-	213,769
1974	46	7,119	29,466	33,155	152,699	2,521	-	38,931	7,075	3,001	103	5	264,121
1975	28	3,156	28,517	41,260	122,598	3,860	6,430	13,389	11,397	2,623	140	55	233,453
1976	20	5,609	10,266	49,056	131,675	3,164	7,233	9,013	21,661	4,651	73	47	242,486
1977	270	5,658	7,164	19,985	139,705	1	783	989	1,327	6,853	82	-	182,817
1978	809	4,345	6,484	18,190	121,069	35	203	381	121	2,790	37	-	154,464
1979	1,117	2,601	2,435	14,823	141,346	-	-	3	685	1,170	-	-	164,180
1980	532	1,016	-	12,511	128,878	-	-	43	780	794	-	-	144,554
1981	236	194	-	8,431	166,139	-	-	121	-	395	-	-	175,498
1982	339	82	-	7,224	159,643	-	-	14	-	731	1	-	168,034
1983	539	418	-	4,933	149,556	-	-	206	33	1,251	-	-	156,936
1984	503	431	6	4,532	152,818	-	-	161	-	335	-	-	158,786
1985	490	657	11	1,873	103,899	-	-	51	-	202	-	-	107,147
1986	426	308	-	3,470	66,152	-	-	27	-	54	21	-	67,396
1987	712	576	-	4,909	85,710	-	-	426	-	54	3	1	92,391
1988	441	411	-	4,574	108,244	-	-	130	-	436	6	-	114,242
1989	388	460 ²	-	606	119,625	-	-	23	506	-	702	-	122,310
1990	1,207	340 ²	-	1,143	92,397	-	-	52	-	681	28	-	95,848
1991	963	77 ²	Greenland	2,003	103,283	-	-	504 ⁴	-	449	42	5	107,326
1992	165	1,890 ²	734	3,451	119,765	-	-	964	6	516	25	-	127,606
1993	31	566 ²	78	3,687	139,288	-	1	9,509	4	408	7	5	153,584
1994	67	151 ²	15	1,863	137,298	-	1	1,640	655	548	9	6	142,253
1995	172 ²	222 ²	53	934	166,205	-	4	1,148	-	589	99	18	169,444
1996	248 ²	365 ²	176 ²	2,615	166,149	-	24	1,159	9 ²	690 ²	16	47 ²	171,498
1997 ¹	193 ²	559 ²	363 ²	2,915	136,655	-	12	1,774	45 ²	676	123	40 ²	143,355

¹Provisional figures

²As reported to Norwegian authorities

³USSR prior to 1991

⁴Includes Estonia

⁵Includes Denmark, Netherlands, Iceland, Ireland and Sweden

Table 3.1.4.2 Saithe in the North-East Arctic (Areas I and II).

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1960	121.65	320.64	136.01	0.267
1961	213.27	406.91	109.82	0.234
1962	355.49	423.04	122.84	0.229
1963	121.81	439.25	148.04	0.224
1964	368.89	525.38	198.11	0.226
1965	210.34	519.89	184.55	0.225
1966	241.19	563.34	201.86	0.277
1967	191.85	581.11	191.19	0.275
1968	367.81	613.38	107.18	0.161
1969	347.40	530.38	140.38	0.212
1970	379.78	622.14	260.40	0.329
1971	219.50	510.98	244.73	0.367
1972	278.36	478.65	210.51	0.422
1973	117.25	469.86	215.66	0.437
1974	206.17	450.80	262.30	0.630
1975	373.51	372.44	233.45	0.467
1976	305.11	250.23	242.49	0.684
1977	178.75	168.84	182.81	0.586
1978	283.51	175.43	154.47	0.545
1979	167.66	162.03	164.23	0.523
1980	356.38	147.16	154.38	0.555
1981	152.67	141.58	175.52	0.557
1982	140.12	123.15	170.90	0.629
1983	118.85	165.07	155.41	0.534
1984	137.59	150.39	158.80	0.740
1985	271.02	120.94	107.15	0.562
1986	203.78	89.10	70.46	0.403
1987	102.33	89.96	91.68	0.350
1988	78.10	125.25	114.51	0.415
1989	88.22	138.83	122.66	0.569
1990	282.50	121.98	95.39	0.490
1991	447.21	108.40	107.33	0.448
1992	295.70	103.38	127.61	0.453
1993	204.68	120.44	153.58	0.404
1994	341.29	195.86	142.25	0.411
1995	113.09	230.91	169.44	0.444
1996	152.51	231.15	171.50	0.361
1997	143.00	225.67	143.36	0.379
1998	.	211.26	.	.
Average	228.38	292.95	161.66	0.422
Unit	Millions	1000 tonnes	1000 tonnes	-

3.1.5 Redfish in Sub-areas I and II

(Table 3.1.5.1)

3.1.5.a *Sebastes mentella* in Sub-areas I and II

State of stock/fishery: The stock is considered to be outside safe biological limits. Although the assessment is only indicative of the relative trends in stock size, it shows that the spawning stock is close to its historical low. The 1991–1997 year classes are indicated to be the lowest on record.

Management objectives: No explicit management objectives have been established 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} .

Advice on management: ICES recommends that there be no directed fishing on this stock until a significant increase in spawning stock biomass has been detected in surveys. In addition the by-catch of redfish in other fisheries should be reduced.

Reference points:

ICES considers that:	ICES proposes that:
No limit or precautionary reference points for the fishing mortality or the biomass are proposed.	

Relevant factors to be considered in management:

Low recruitment has been observed in the recent surveys and this gives cause for concern about the SSB and future recruitment. In this connection it is of vital importance that the recruiting year classes be given the strongest protection from being caught as by-catch in any fishery, i.e., the shrimp fisheries in the Barents Sea and Svalbard area. This will ensure that the recruiting year classes can contribute as much as possible to the stock rebuilding.

Elaboration and special comment: The most recent analytical assessment in 1997, indicated that the spawning biomass was close to its historic low, and recruitment indices had been poor through the 1990s. Subsequent young fish surveys have indicated no improvement in recruitment. Because of the slow growth of this species, the surveys should detect improvements to incoming year classes several years before they contribute to the fisheries or the spawning population.

The only directed fishery for *S. mentella* is a trawl fishery. In addition, by-catches are taken in cod and shrimp-trawl fisheries. After the introduction of sorting grids in 1993 discarding in the shrimp fishery was reduced. Traditionally, the directed fishery was conducted by Russia and other East-European countries on grounds from south of Bear Island towards Spitzbergen. From the mid-1970s to the mid-1980s large catches were taken annually. From the mid-1980s Norwegian trawlers started fishing along the continental slope (around 500 m depth) further south, on grounds never harvested before, and inhabited primarily by mature fish. After a sharp decrease in the landings from the traditional area until 1987, this fishery on new grounds resulted in a temporary increase in the landings until 1991, after which the landings declined. Since 1991 the fishery has been dominated by Norway and Russia.

Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM:3).

Catch data (Tables 3.1.5.a.1-5):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings ¹	ACFM landings of <i>S. mentella</i>
1987	Precautionary TAC	70 ¹	85	35	11
1988	$F \leq F_{0.1}$; TAC	11	-	41	16
1989	Status quo F; TAC	12	-	47	23
1990	Status quo F; TAC	18	-	63	35
1991	F at F_{med} ; TAC	12	-	68	49
1992	If required, precautionary TAC	22	-	32	16
1993	If required, precautionary TAC	18	18	30	13
1994	If required, precautionary TAC	-	-	29	12
1995	Lowest possible F	-	-	25	10
1996	Catch at lowest possible level	-	-	25	8
1997	Catch at lowest possible level	-	-	24	8
1998	No directed fishery, reduce by-catch	-	-		
1999	No directed fishery, reduce by-catch	-	-		

¹ Includes both *S. mentella* and *S. marinus*. Weights in '000 t.

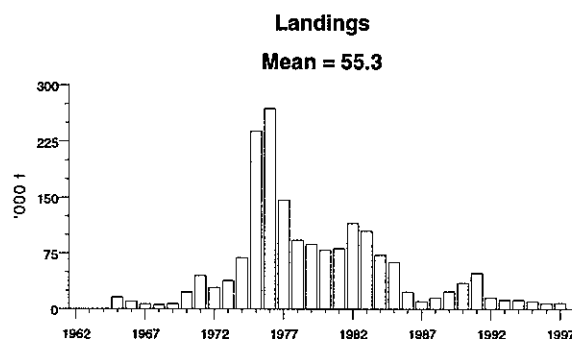
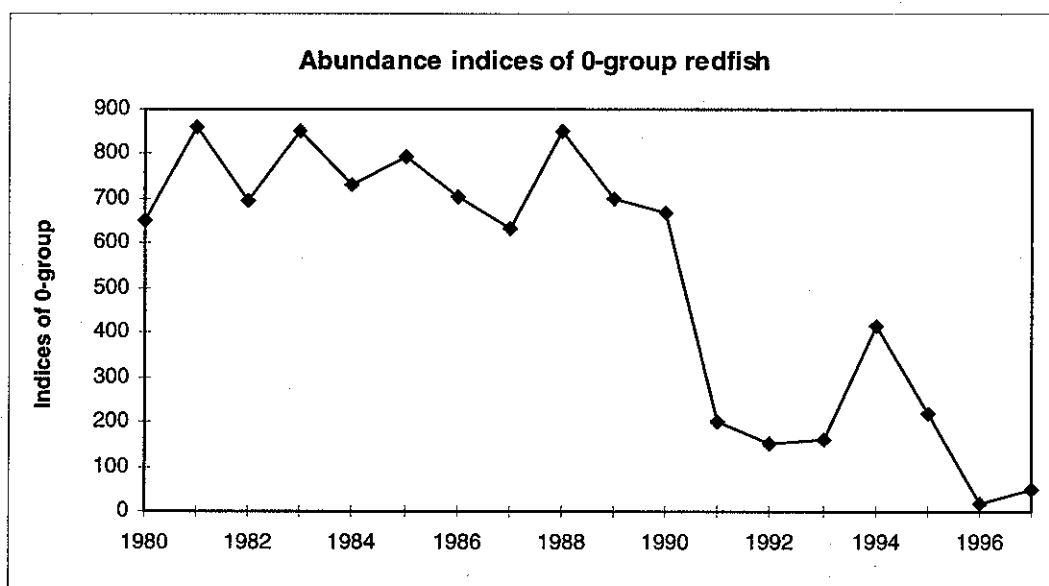


Table 3.1.5.1 REDFISH in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I, Divisions IIa and IIb combined as officially reported to ICES.

Year	Canada	Denmark	Faroe Islands	France	Germany ⁴	Green-land	Iceland	Ireland	Netherlands	Norway	Poland	Portugal	Russia ⁵	Spain	UK (E & W)	UK (Scotl)	Total
1984	-	-	-	2,970	7,457	-	-	-	-	18,650	-	1,806	69,689	25	716	-	101,313
1985	-	-	-	3,326	6,566	-	-	-	-	20,456	-	2,056	59,943	38	167	-	92,552
1986	-	-	29	2,719	4,884	-	-	-	-	23,255	-	1,591	20,694	-	129	14	53,315
1987	-	+	450 ³	1,611	5,829	-	-	-	-	18,051	-	1,175	7,215	25	230	9	34,595
1988	-	-	973	3,349	2,355	-	-	-	-	24,662	-	500	9,139	26	468	2	41,494
1989	-	-	338	1,849 ¹	4,245	-	-	-	-	25,295	-	340	14,344	5 ²	271	1	46,688
1990	-	37 ³	386	1,821 ¹	6,741	-	-	-	-	34,090	-	830	18,918	-	333	-	63,156
1991	-	23	639	791 ¹	981	-	-	-	-	49,463	-	166	15,354	1	336	13	67,754
1992	-	9	58	1,301 ^{1,6}	530	614	-	-	-	23,451	-	977	4,335	16	479	3	31,773
1993	8 ³	4	152	921 ^{1,6}	685	15	-	-	-	18,226	-	1,040	7,573	65	734	1	29,389
1994	-	28	26	771 ^{1,6}	1026	6	4	3	-	19,783	-	985	6,220	34	259	13	29,158
1995	-	-	30	748	692	7	1	5	1	15,620	-	936	6,985	67	252	13	25,357
1996	-	-	42 ³	746	618	37	-	2	-	20,533 ²	-	523	1,641	408	305	121	24,976
1997 ¹	-	-	25 ³	616 ³	538 ²	39 ²	-	12 ³	-	18,213 ²	1	535	4,556	228 ²	235	29	25,027

¹ Provisional figures.

² Working Group figure.

³ As reported to Norwegian authorities.

⁴ Includes former GDR prior to 1991.

⁵ USSR prior to 1991.

⁶ Possibly excluding landings abroad.

Table 3.1.5.a.1 *Sebastes mentella* in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I and Divisions IIa and IIb combined.

Year	Canada	Denmark	Faroe Islands	France	Germany ³	Greenland	Ireland
1986	-	-	-	-	1,252	-	-
1987	-	-	200	63	1,321	-	-
1988	No species specific data available by country.						-
1989	-	-	335	1,093	3,833	-	-
1990	-	-	108	142	6,354	36	-
1991	-	-	487	85	-	23	-
1992	-	-	23	12	-	-	-
1993	8	4	13	50	35	1	-
1994	-	28	4	74	18	1	3
1995	-	-	3	16	176	2	4
1996	-	-	4	75	119	3	2
1997 ¹	-	-	17	35	80	16	7

Year	Norway	Poland	Portugal	Russia ⁴	Spain	UK England and Wales	UK Scotland	Total
1986	1,274	-	1,273	17,815	-	84	-	23,112 ²
1987	1,488	-	1,175	6,196	25	49	1	10,518
1988	No species specific data available by country.							15,586
1989	4,633	-	340	13,080	5	174	1	23,494
1990	10,173	-	830	17,355	-	72	-	35,070
1991	33,592	-	166	14,302	1	68	3	48,727
1992	10,751	-	972	3,577	14	238	3	15,590
1993	4,939	-	963	6,260	57	293	-	12,623
1994	6,029	-	895	5,021	30	124	12	12,239
1995	2,534	-	927	6,346	67	93	4	10,172
1996	5,727	-	467	925	328	76	23	7,749
1997 ¹	4,371	1	474	2,972	210	71	7	8,261

¹ Provisional figures.

² Including 1,414 tonnes in Division IIb not split on countries.

³ Includes former GDR prior to 1991.

⁴ USSR prior to 1991.

Table 3.1.5.a.2 *Sebastes mentella* in Sub-areas I and II. Nominal catch (t) by countries in Sub-area 1.

Year	Faroe Islands	Germany ⁴	Greenland	Norway	Russia ⁵	UK England & Wales	Total
1986 ³	-	-	-	1,274	911	-	2,185
1987 ³	-	2	-	1,166	234	3	1,405
1988	No species specific data presently available						
1989	13	-	-	60	484	9 ²	566
1990	2	-	-	-	100	-	102
1991	-	-	-	8	420	-	428
1992	-	-	-	561	408	-	969
1993	2 ²	-	-	24	588	-	614
1994	2 ²	2	-	37	308	-	349
1995	2 ²	-	-	23	203	-	228
1996 ¹	-	-	-	5	101	-	106
1997 ¹	-	-	3	12	174	1	190

¹ Provisional figures.

² Split on species according to reports to Norwegian authorities.

³ Based on preliminary estimates of species breakdown by area.

⁴ Includes former GDR prior to 1991.

⁵ USSR prior to 1991.

Table 3.1.5.a.3 *Sebastes mentella* in Sub-areas I and II. Nominal catch (t) by countries in Division IIa.

Year	Faroe Islands	France	Germany ⁴	Greenland	Ireland	Norway
1986 ³	-	-	1,252	-	-	-
1987 ³	200	63	970	-	-	149
1988	No species specific data presently available					
1989	312 ²	1,065 ²	3,200	-	-	4,573
1990	98 ²	137 ²	1,673	-	-	8,842
1991	487 ²	72 ²	-	-	-	32,810
1992	23 ²	7 ²	-	-	-	9,816
1993	11 ²	15 ²	35	1 ²	-	4,870
1994	2 ²	33 ²	16 ²	1 ²	2 ²	5,629
1995	1 ²	16 ²	176 ²	2 ²	2 ²	2,092
1996 ¹	- ²	75 ²	119 ²	3 ²	-	5,541
1997 ¹	13 ²	22 ²	77	12 ²	2 ²	4,173

Year	Portugal	Russia ⁵	Spain	UK England & Wales	UK Scotland	Total
1986 ³	1,273	16,904	-	84	-	19,513
1987 ³	1,156	4,469	-	34	1	7,042
1988	No species specific data presently available					
1989	251	9,749	-	158 ²	1 ²	19,309
1990	824	6,492	-	9	-	18,075
1991	159 ²	7,596	-	23 ²	-	41,147
1992	824 ²	1,096	-	27 ²	-	11,793
1993	648 ²	5,328	-	2 ²	-	10,910
1994	687 ²	4,692	8 ²	4 ²	-	11,074
1995	715 ²	5,916	65 ²	41 ²	2 ²	9,028
1996 ¹	429 ²	677	5 ²	42 ²	19 ²	6,910
1997 ¹	410	2,341	4 ²	48 ²	7 ²	7,109

¹ Provisional figures.

² Split on species according to reports to Norwegian authorities.

³ Based on preliminary estimates of species breakdown by area.

⁴ Includes former GDR prior to 1991.

⁵ USSR prior to 1991.

Table 3.1.5.a.4 *Sebastes mentella* in Sub-areas I and II. Nominal catch (t) by countries in Division IIb.

Year	Canada	Den- mark	Faroe Islands	France	Germany ⁵	Green- land	Ireland
1986 ⁴	Data not available on countries						
1987 ⁴	-	-	-	-	349	-	-
1988	No species specific data presently available						
1989	-	-	10	28	633	-	-
1990	-	-	8 ²	5 ²	4,681	36 ²	-
1991	-	-	-	13 ²	-	23	-
1992	-	-	-	5 ²	-	-	-
1993	8 ²	4 ²	-	35 ²	-	-	-
1994	-	28 ²	-	41 ²	-	-	1 ²
1995	-	-	-	-	-	-	2 ²
1996 ¹	-	-	4 ²	-	-	-	2 ²
1997 ¹	-	-	4 ²	13 ²	3	1 ²	5 ²

Year	Norway	Poland	Portugal	Russia ⁶	Spain	UK England and Wales	UK Scotland	Total
1986 ⁴	Data not available on countries							1,414
1987 ⁴	173	-	19	1,493	25	12	-	2,071
1988	No species specific data presently available							
1989	-	-	89	2,847	5	7 ²	-	3,619
1990	1,331	-	6	10,763	-	63 ²	-	16,893
1991	774	-	7	6,286	1	45 ²	3 ²	7,152
1992	374	-	148 ²	2,073	14	211 ²	3 ²	2,826
1993	45	-	315 ²	344	57 ³	291 ²	-	1,099
1994	363	-	208 ²	21	22 ³	120 ²	12 ²	816
1995	419	-	212 ²	227	2 ³	52 ²	2 ²	916
1996 ¹	181	-	38 ²	147	323 ²	34 ²	4 ²	733
1997 ¹	186	1 ²	64 ²	457	206 ²	22 ²	- ²	962

¹ Provisional figures.

² Split on species according to reports to Norwegian authorities.

³ Split on species according to the 1992 catches.

⁴ Based on preliminary estimates of species breakdown by area.

⁵ Includes former GDR prior to 1991.

⁶ USSR prior to 1991.

Table 3.1.5.a.5 *Sebastes mentella* in the North-East Arctic (Areas I and II).

Year	Landings
1965	16
1966	10
1967	6
1968	5
1969	7
1970	23
1971	45
1972	29
1973	38
1974	69
1975	239
1976	269
1977	146
1978	93
1979	87
1980	79
1981	82
1982	115
1983	105
1984	73
1985	63
1986	23
1987	11
1988	16
1989	23
1990	35
1991	49
1992	16
1993	13
1994	12
1995	10
1996	8
1997	8
Average	55
Unit	1000 tonnes

3.1.5.b *Sebastes marinus* in Sub-areas I and II

State of stock/fishery: It has not been possible to assess the status of this stock with respect to safe biological limits. Indices from surveys in young fish areas in the Barents Sea and Svalbard waters show a decrease of the recruitment to the stock. Available data from both surveys and commercial CPUE on larger fish do not indicate any large recent changes in the adult stock but the data are too variable from year to year to detect moderate changes.

Management objectives: No explicit management objectives have been established 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} .

Advice on management: Consistent with a precautionary approach, ICES recommends that a management plan including monitoring of the development of the stock and of the fishery, with corresponding intervention rules, should be developed and implemented as a prerequisite to continued fishing.

Reference points:

ICES considers that:	ICES proposes that:
No limit or precautionary reference points for the fishing mortality or the biomass are proposed.	

Relevant factors to be considered in management:

Uncertainty about the state of the stock and the signs in the survey of weak recruitment cause concern that parts of the stock may be overfished. In view of the poor knowledge of the structure and distribution of this stock complex, further scientific investigations should be undertaken to improve knowledge.

If the concerns expressed about the apparent lack of pre-recruit size groups in the recent surveys are substantiated, then a decline in the stock can be anticipated over the next few years.

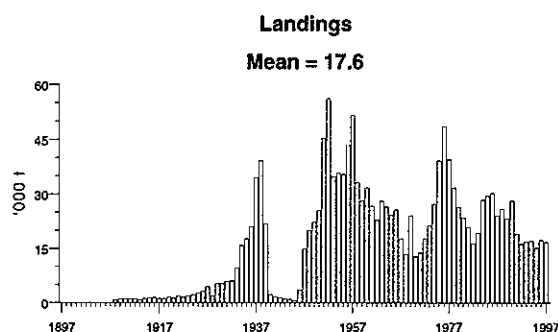
Elaboration and special comment: The fishery is mainly conducted by Norway accounting for 80–90% of the total catch. Germany also has a long tradition of a trawl fishery for this species. The fish are mainly caught by trawl and gillnet, and to a lesser extent by longline and handline. Some of the catches are taken in mixed fisheries together with saithe and cod. Important fishing grounds are the Møre area (Svinøy), Halten Bank, outside Lofoten and Vesterålen, and at Sleppen outside Finnmark.

Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM:3).

Catch data (Tables 3.1.5.b.1-5):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official landings ¹	ACFM Landings of <i>S. marinus</i>
1987	Precautionary TAC	-	-	35	24
1988	Reduction in F; TAC	15	-	41	26
1989	Status quo F; TAC	24	-	47	23
1990	Status quo F; TAC	23	-	63	28
1991	Precautionary TAC	24	-	68	19
1992	If required, precautionary TAC	25	-	32	16
1993	Precautionary TAC	12	12	30	17
1994	If required, precautionary TAC	-	-	29	17
1995	If required, precautionary TAC	-	-	25	15
1996	If required, precautionary TAC	-	-	25	17
1997	If required, precautionary TAC	-	-	24	17
1998	Management plan required as pre-requisite to continued fishing	-	-		
1999	Management plan required as pre-requisite to continued fishing	-	-		

¹Includes both *S. mentella* and *S. marinus*. Weights in '000 t.



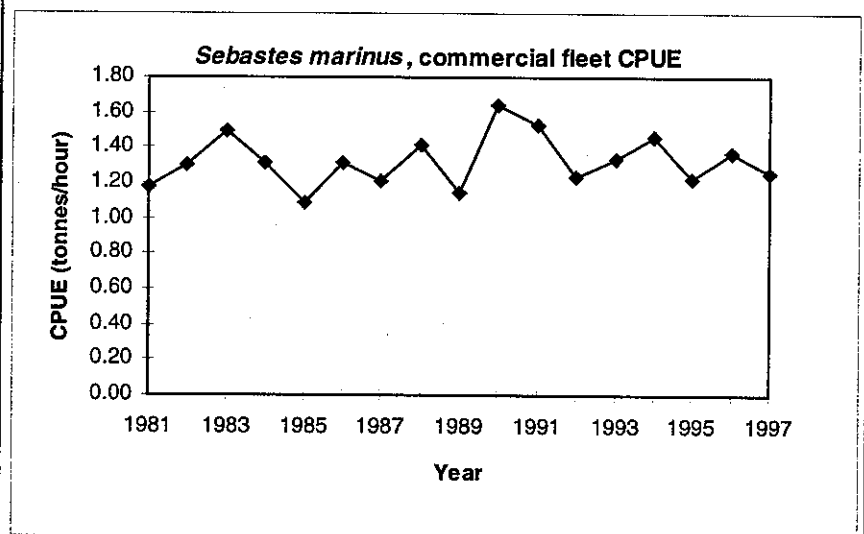
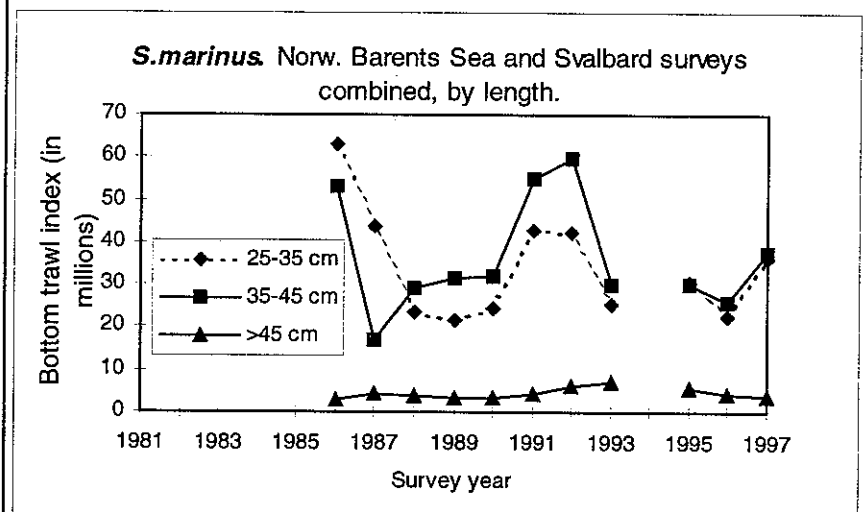
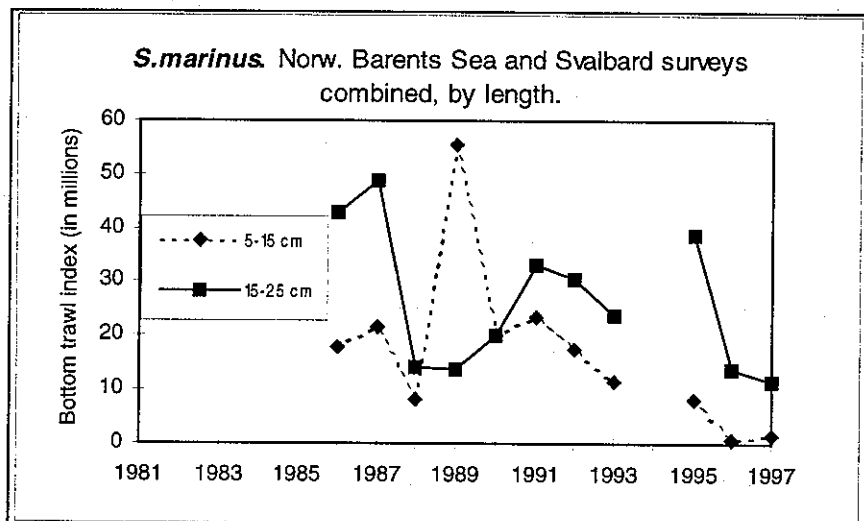


Table 3.1.5.b.1 *Sebastes marinus* in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I and Divisions IIa and IIb combined.

Year	Faroe Islands	France	Germany ²	Greenland	Iceland	Ireland	Netherlands
1986	29	2,719	3,369	-	-	-	-
1987	250	1,553	4,508	-	-	-	-
1988	No species specific data presently available on countries						25,908
1989	3	784	412	-	-	-	-
1990	278	1,684	387	1	-	-	-
1991	152	706 ¹	981	-	-	-	-
1992	35	1,289 ¹	530	623	-	-	-
1993	139	871 ¹	650	14	-	-	-
1994	22	697 ¹	1,008	5	4	-	-
1995	27	732 ¹	517	5	1	1	1
1996	38	671 ¹	499	34	-	-	-
1997 ¹	8	581	457	23	-	5	-

Year	Norway	Portugal	Russia ³	Spain	UK England & Wales	UK Scotland	Total
1986	21,680	-	2,350	-	42	14	30,203
1987	16,728	-	850	-	181	7	24,077
1988	No species specific data presently available on countries						
1989	20,662	-	1,264	-	97	-	23,222
1990	23,917	-	1,549	-	261	-	28,077
1991	15,872	-	1,052	-	268	10	19,041
1992	12,700	5	758	2	241	2	16,185
1993	13,380	77	1,313	8	441	1	16,894
1994	13,935	90	1,199	4	135	1	17,100
1995	13,023	9	639	-	159	9	15,123
1996	14,806	55	716	81	229	98	17,227
1997 ¹	13,842	61	1,584	18	164	22	16,765

¹ Provisional figures.

² Includes former GDR prior to 1991.

³ USSR prior to 1991.

Table 3.1.5.b.2 *Sebastes marinus* in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I.

Year	Faroe Islands	Germany ⁴	Greenland	Iceland	Norway	Russia ⁵	UK England & Wales	UK Scotland	Total
1986 ³	-	50	-	-	2,972	155	32	3	3,212
1987 ³	-	8	-	-	2,013	50	11	-	2,082
1988	No species specific data presently available								
1989	-	-	-	-	1,763	110	4 ²	-	1,877
1990	5	-	-	-	1,263	14	-	-	1,282
1991	-	-	-	-	1,993	92	-	-	2,085
1992	-	-	-	-	2,162	174	-	-	2,336
1993	24 ²	-	-	-	1,800	330	-	-	2,154
1994	12 ²	72	-	4	1,652	109	-	-	1,849
1995	19 ²	1 ²	-	1 ²	2,250	201	1 ²	-	2,473
1996	7 ²	-	-	-	2,245	131	3 ²	-	2,386
1997 ¹	-	-	5 ²	-	2,528	160	2 ²	-	2,695

¹ Provisional figures.

² Split on species according to reports to Norwegian authorities.

³ Based on preliminary estimates of species breakdown by area.

⁴ Includes former GDR prior to 1991.

⁵ USSR prior to 1991.

Table 3.1.5.b.3 *Sebastes marinus* in Sub-areas I and II. Nominal catch (t) by countries in Division IIa.

Year	Faroe Islands	France	Germany ⁴	Greenland	Ireland	Netherlands	Norway	Portugal	Russia ⁵	Spain	UK England & Wales	UK Scotland	Total
1986 ³	29	2,719	3,319	-	-	-	18,708	-	2,195	-	10	11	26,991
1987 ³	250	1,553	2,967	-	-	-	14,715	-	800	-	170	7	20,462
1988	No species specific data presently available												
1989	3 ²	784 ²	412	-	-	-	18,833	-	912	-	93 ²	-	21,037
1990	273	1,684	387	-	-	-	22,444	-	392	-	261	-	25,441
1991	152 ²	706 ²	678	-	-	-	13,835	-	534	-	268 ²	10 ²	16,183
1992	35 ²	1,294 ²	211	614	-	-	10,536	-	404	-	206 ²	2 ²	13,302
1993	115 ²	871 ²	473	14 ²	-	-	11,580	77 ²	940	-	431 ²	1 ²	14,502
1994	10 ²	697 ²	654 ²	5 ²	-	-	12,265	90 ²	1,030	-	129 ²	-	14,880
1995	8 ²	732 ²	328 ²	5 ²	1 ²	1	10,658	2 ²	405	-	158 ²	9 ²	12,307
1996	27 ²	671 ²	448 ²	34 ²	-	-	12,529	51 ²	449	5 ²	223 ²	98 ²	14,535
1997 ¹	8 ²	581 ²	438	18 ²	5 ²	-	11,280	61 ²	1,199	18 ²	162 ²	22 ²	13,792

¹ Provisional figures.

² Split on species according to reports to Norwegian authorities.

³ Based on preliminary estimates of species breakdown by area.

⁴ Includes former GDR prior to 1991.

⁵ USSR prior to 1991.

Table 3.1.5.b.4 *Sebastes marinus* in Sub-areas I and II. Nominal catch (t) by countries in Division IIb.

Year	Faroe Islands	Germany ⁵	Greenland	Norway	Portugal	Russia ⁶	Spain	UK E & W	UK Scotland	Total
1986	-									+
1987 ⁴	-	1,533	-	-	-	-	-	-	-	1,533
1988				No species specific data presently available						
1989	-	-	-	66	-	242	-	-	-	308
1990	-	-	1 ²	210	-	1,157	-	-	-	1,368
1991	-	303	-	44	-	426	-	-	-	773
1992	-	319	9 ²	2	5 ²	180	2	35 ²	-	552
1993	-	177	-	-	-	43	8 ³	10 ²	-	238
1994	-	282	-	18	-	60	4 ³	6 ²	1 ²	371
1995	-	187	-	115	7	33	-	-	-	342
1996	4	51 ²	-	32	5	136	76 ²	3 ²	-	307
1997 ¹	-	20	-	34	-	225	-	-	-	279

¹ Provisional figures.

² Split on species according to reports to Norwegian authorities.

³ Split on species according to the 1992 catches.

⁴ Based on preliminary estimates of species breakdown by area.

⁵ Includes former GDR prior to 1991.

⁶ USSR prior to 1991.

Table 3.1.5.b.5 *Sebastes marinus*. Total international catches 1908-1997

Year	Catch '000 t	Year	Catch '000 t
1908	0.65	1957	51.61
1909	1.00	1958	33.12
1910	1.03	1959	28.07
1911	1.01	1960	31.77
1912	1.01	1961	26.73
1913	0.81	1962	22.82
1914	1.14	1963	28.10
1915	1.31	1964	26.55
1916	1.46	1965	24.31
1917	1.16	1966	25.63
1918	1.11	1967	17.73
1919	1.51	1968	13.35
1920	1.17	1969	24.07
1921	1.83	1970	12.82
1922	1.47	1971	13.82
1923	1.94	1972	17.73
1924	2.21	1973	21.44
1925	2.72	1974	27.27
1926	3.19	1975	39.13
1927	4.47	1976	48.58
1928	1.95	1977	39.51
1929	5.28	1978	31.74
1930	5.29	1979	26.48
1931	5.88	1980	23.41
1932	6.10	1981	20.83
1933	9.59	1982	16.37
1934	15.86	1983	19.26
1935	17.69	1984	28.38
1936	21.03	1985	29.48
1937	34.59	1986	30.20
1938	39.17	1987	24.08
1939	21.87	1988	25.91
1940	2.29	1989	23.22
1941	1.68	1990	28.08
1942	1.43	1991	19.04
1943	1.02	1992	16.19
1944	0.92	1993	16.89
1945	0.56	1994	17.10
1946	3.57	1995	15.12
1947	14.88	1996	17.23
1948	20.00	1997	16.77
1949	22.36		
1950	25.56	average	17.57
1951	45.30		
1952	56.17		
1953	34.83		
1954	35.78		
1955	35.47		
1956	43.38		

3.1.6 Greenland halibut in Sub-areas I and II

State of stock/fishery: The stock is considered to be outside safe biological limits. The stock has declined more or less steadily since 1970, and recent SSBs are among the lowest observed. For the older part of the spawning stock (age 10+) which constitutes the major part of the female spawners, the present estimate is only 13% of the ones during the 1970–75 period and 34% of estimates during the 1976–86 period. The 1995 year class may be stronger than previous ones in the 1990s.

Management objectives: No explicit management objectives have been established 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} .

Advice on management: ICES reiterates for 1999 its recommendation from recent years that no fishing on Greenland halibut should take place.

Reference points:

ICES considers that:	ICES proposes that:
No limit or precautionary reference points for the fishing mortality or the biomass are proposed. SSB has decreased fourfold, to approximately 35 000 t, while recruitment has shown low annual variation over the period, but signs of a slowly decreasing trend. An MBAL of 65 000 t was considered the value at which the probability of poor recruitment increased. Further review has not supported MBAL as a B_{lim} . SSB showed periods of stability and decline over a range of F (0.18–0.42), but recently may be increasing slightly with F in the same range. Hence present data are inadequate to determine F reference points.	

Relevant factors to be considered in management: Protection of juvenile Greenland halibut has been improved by area closure and the use of sorting grids in the shrimp trawl fishery. Continued protection should enhance the survival of the promising 1995 year class.

However, the landings decreased in the 1970s. The fishery has been regulated since 1992 by allowing a directed fishery only by small coastal long line and gill net vessels. By-catches in the trawl fisheries for other species have been limited by allowable by-catch per haul and at any time on board.

Elaboration and special comment: Following the introduction of trawlers in the fishery in the late 1960s, the landings increased to about 90 000 t in the early 1970s.

Source of information: Report of the Arctic Fisheries Working Group, August 1998 (ICES CM 1999/ACFM:3).

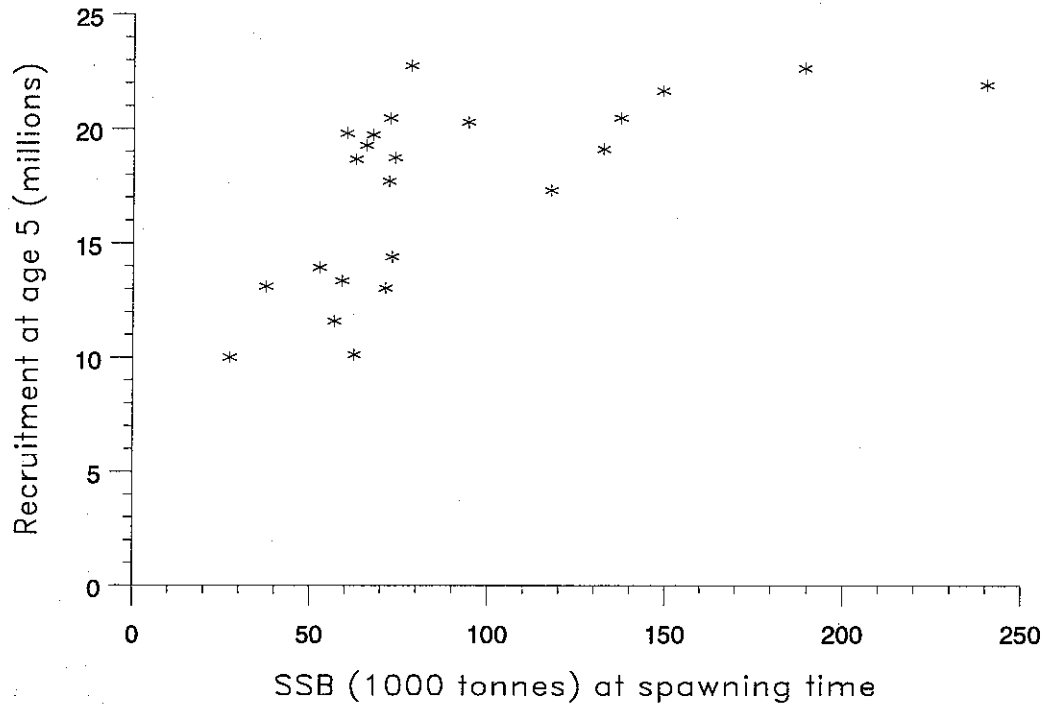
Catch data (Tables 3.1.6.1–6):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Precautionary TAC	-	-	19	19
1988	No decrease in SSB	19	-	20	20
1989	$F = F(87)$; TAC	21	-	20	20
1990	$F = F(89)$; TAC	15	-	23	23
1991	F at F_{med} ; TAC; improved expl. pattern	9	-	33	33
1992	Rebuild SSB(1991)	6	7 ¹	9	9
1993	TAC	7	7 ¹	12	12
1994	$F < 0.1$	< 12	11 ¹	9	9
1995	No fishing	0	2.5 ²	11	11
1996	No fishing	0	2.5 ²	14	14
1997	No fishing	0	2.5 ²	9	9
1998	No fishing	0	2.5 ²		
1999	No fishing	0			

¹Set by Norwegian authorities. ²Set by Norwegian authorities for the non-trawl fishery; unavoidable by-catch in the trawl fishery is additional to this. Weights in 000 t.

Greenland halibut in Sub-areas I and II

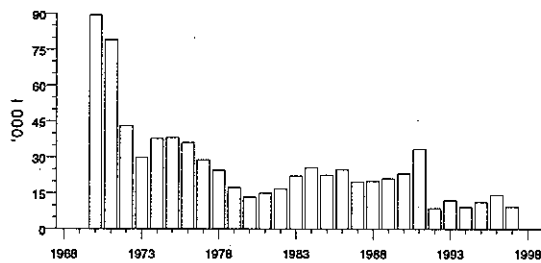
Stock - Recruitment



(run: XSAOLE03)

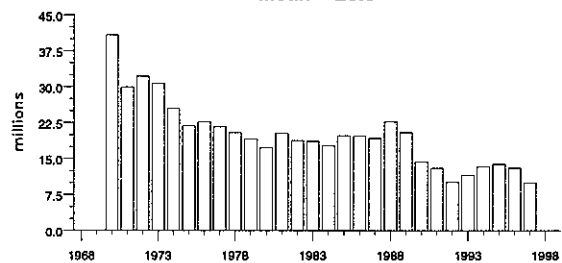
Landings

Mean = 26.7



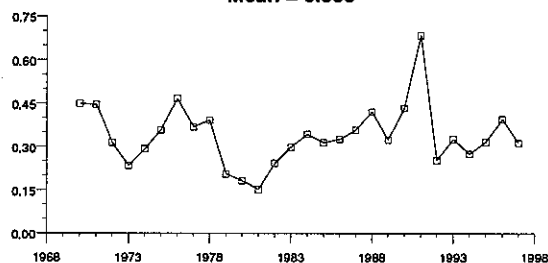
Recruitment (age 5)

Mean = 20.0



Fishing mortality (ages 6-10)

Mean = 0.339



Spawning stock biomass

Mean = 79.2

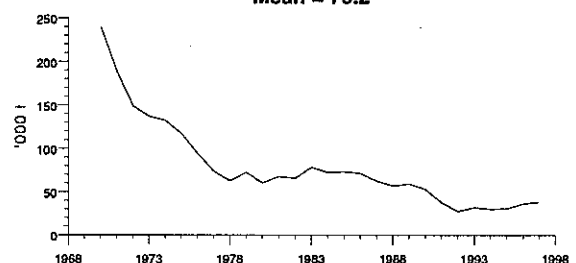


Table 3.1.6.1 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries (Sub-area I, Divisions IIa and IIb combined) as officially reported to ICES.

Year	Den- mark	Estonia	Faroe Isl.	France	Fed.Rep. Germany	Green- land	Iceland	Ireland	Lithu- ania	Norway	Poland	Portugal	Russia ²	Spain	UK (E & W)	UK Scotland	Total
1984	0	0	0	138	2,165	0	0	0	0	4,376	0	0	15,181	0	23	0	25,629
1985	0	0	0	239	4,000	0	0	0	0	5,464	0	0	10,237	0	5	0	22,565
1986	0	0	42	13	2,718	0	0	0	0	7,890	0	0	12,200	0	10	2	24,822
1987	0	0	0	13	2,024	0	0	0	0	7,261	0	0	9,733	0	61	20	19,702
1988	0	0	186	67	744	0	0	0	0	9,076	0	0	9,430	0	82	2	20,083
1989	0	0	67	31	600	0	0	0	0	10,622	0	0	8,812	0	6	0	21,080
1990	0	0	163	49	954	0	0	0	0	17,243	0	0	4,764	0	10	0	23,263
1991	11	2564	314	119	101	0	0	0	0	27,587	0	0	2,490	132	0	2	33,332
1992	0	0	16	111	13	13	0	0	0	7,667	0	31	718	23	7	0	8,594
1993	2	0	61	80	22	8	56	0	30	10,380	0	43	1,235	0	16	0	11,971
1994	4	0	86	55	296	3	15	5	4	8,322	0	36	283	2	76	2	9,191
1995	0	0	12	174	35	12	25	2	0	9,200	0	84	794	757	115	7	11,252
1996	0	0	0	219	81	153	70	0	0	11,606	0	79	1,576	137	317	57	14,205
1997 ¹	0	0	0	0	56	5	62	0	0	7,894	12	50	1,038	54	67	25	9,259

¹Provisional figures

²USSR prior to 1991

Table 3.1.6.2 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I as officially reported to ICES.

Year	Estonia	Faroe Islands	Fed. Rep. Germany	Greenland	Iceland	Norway	Russia ³	Spain	UK (England & Wales)	UK (Scotland)	Total
1984	-	-	-	-	-	593	81	-	17	-	691
1985	-	-	-	-	-	602	122	-	1	-	725
1986	-	-	1	-	-	557	615	-	5	1	1179
1987	-	-	2	-	-	984	259	-	10	+	1255
1988	-	9	4	-	-	978	420	-	7	-	1418
1989	-	-	-	-	-	2039	482	-	+	-	2521
1990	-	7	-	-	-	1304	321 ²	-	-	-	1632
1991	164	-	-	-	-	2,029	522 ²	-	-	-	2715
1992	-	-	+	-	-	2,349	467	-	-	-	2816
1993	-	32	-	-	56	1,754	867	-	-	-	2709
1994	-	17	217	-	15	1,157 ²	175	-	+	-	1581
1995	-	12	-	-	25	1,321 ²	270	57	-	-	1685
1996	-	-	+	30	70	792 ²	198	-	+	-	1090
1997 ¹	-	-	-	1	62	573 ²	170	-	+	-	806

¹Provisional figures

²Working Group figures

³USSR prior to 1991

Table 3.1.6.3 GREENLAND HALIBUT in Sub areas I and II. Nominal catch (t) by countries in Division IIa as officially reported to ICES.

Year	Estonia	Faroe Islands	France	Fed. Rep. Germany	Greenland	Ireland	Norway	Portugal	Russia ⁵	Spain	UK (England & Wales)	UK (Scotland)	Total
1984		-	138	265	-	-	3,703	-	5,459	-	1	-	9,566
1985		-	239	254	-	-	4,791	-	6,894	-	2	-	12,180
1986		6	13	97	-	-	6,389	-	5,553	-	5	1	12,064
1987		-	13	75	-	-	5,705	-	4,739	-	44	10	10,586
1988		177	67	150	-	-	7,859	-	4,002	-	56	2	12,313
1989		67	31 ¹	104	-	-	8,050	-	4,964	-	6	-	13,222
1990		133	49 ¹	12	-	-	8,233	-	1,246 ²	-	1	-	9,674
1991	1,400	314	119 ¹	21	-	-	11,189	-	305 ²	-	+	1	13,349
1992	-	16	108 ¹	1	13 ⁴	-	3,586	15 ³	58	-	1	-	3,798
1993	-	29	78 ¹	14	8 ⁴	-	7,977	17	210	-	2	-	8,335
1994	-	68 ²	47 ¹	33	3 ⁴	4	6,390 ²	26	67	+	14	-	6,652
1995	-	-	174	30	12 ⁴	2	6,061 ²	60	227	-	83	2	6,651
1996	-	-	219	34	123 ⁴	-	9,565 ²	55	466	3	278	57	10,800
1997 ¹	-	-	-	23 ²	4 ⁴	-	6,078 ²	41	334	-	22	25	6,527

¹Provisional figures

²Working Group figure

³As reported to Norwegian authorities

⁴Includes ~Division IIb

⁵USSR prior to 1991

Table 3.1.6.4 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Division IIb as officially reported to ICES.

Year	Denmark	Estonia	Faroe Islands	France	Fed. Rep. Germany	Ireland	Lithuania	Norway	Poland	Portugal	Russia ⁴	Spain	UK (England & Wales)	UK (Scot.)	Total
1984	-	-	-	-	1,900	-	-	80	-	-	9,641	-	5	-	11,626
1985	-	-	-	-	3,746	-	-	71	-	-	3,221	-	2	-	7,040
1986	-	-	36	-	2,620	-	-	944	-	-	6,032	-	+	-	9,632
1987	+	-	-	-	1,947	-	-	572	-	-	4,735	-	7	10	7,271
1988	-	-	-	-	590	-	-	239	-	-	5,008	-	19	+	5,856
1989	-	-	-	-	496	-	-	533	-	-	3,366	-	-	-	4,395
1990	-	-	23 ²	-	942	-	-	7,706	-	-	3,197 ²	-	9	-	11,877
1991	11	1,000	-	-	80	-	-	14,369	-	-	1,663 ²	132	+	1	17,256
1992	-	-	-	3 ²	12	-	-	1,732	-	16 ²	193	23	6	-	1,985
1993	2 ³	-	-	2 ³	8	-	30 ³	649	-	26	158	-	14	-	889
1994	4	-	1 ³	8 ³	46	1	4 ³	775 ²	-	10	41	2 ²	62	2	956
1995	-	-	-	-	5	-	-	1,818 ²	-	24	297	700	32	5	2,881
1996	-	-	-	-	47	-	-	1,249 ²	-	24	912	134	39	+	2,405
1997 ¹	-	-	-	-	33 ²	-	-	1,243 ²	12	9	534	54	45	+	1,932

¹Provisional figures

²Working group figure

³As reported to Norwegian authorities

⁴USSR prior to 1991

Table 3.1.6.5 Greenland halibut in the North-East Arctic (Areas I and II).

Year	Recruitment Age 5	Spawning Stock Biomass	Landings	Fishing Mortality Age 6-10
1970	40.86	240.21	89.48	0.449
1971	29.94	189.20	79.03	0.446
1972	32.23	149.12	43.06	0.315
1973	30.68	137.18	29.94	0.235
1974	25.46	132.35	37.76	0.293
1975	21.89	117.62	38.17	0.358
1976	22.62	94.42	36.07	0.467
1977	21.65	73.81	28.83	0.369
1978	20.46	62.78	24.62	0.392
1979	19.10	72.13	17.31	0.205
1980	17.30	60.19	13.28	0.182
1981	20.28	67.56	15.02	0.151
1982	18.74	65.76	16.79	0.244
1983	18.66	78.39	22.15	0.300
1984	17.69	72.42	25.63	0.344
1985	19.79	73.02	22.57	0.315
1986	19.72	71.22	24.82	0.326
1987	19.27	62.48	19.70	0.359
1988	22.73	56.87	20.08	0.421
1989	20.46	58.98	21.08	0.325
1990	14.39	52.60	23.26	0.434
1991	13.02	37.58	33.33	0.684
1992	10.11	27.37	8.59	0.253
1993	11.58	31.61	11.97	0.327
1994	13.35	29.80	9.19	0.276
1995	13.92	30.50	11.25	0.317
1996	13.11	35.84	14.21	0.396
1997	10.00	37.69	9.26	0.313
Average	19.96	79.24	26.66	0.339
Unit	Millions	1000 tonnes	1000 tonnes	-

Table 3.1.6.6 Greenland halibut in the North-East Arctic (Areas I and II).
Landings 1935–1969

Year	Landings '000 tonnes
1935	1.53
1936	0.83
1937	0.62
1938	0.33
1939	0.46
1940	0.85
1941	1.66
1942	0.96
1943	0.82
1944	0.68
1945	1.15
1946	1.34
1947	1.41
1948	1.88
1949	0.20
1950	1.85
1951	2.44
1952	2.58
1953	2.21
1954	3.67
1955	3.01
1956	3.49
1957	4.13
1958	2.93
1959	4.31
1960	6.66
1961	7.98
1962	11.60
1963	11.30
1964	20.00
1965	22.30
1966	26.25
1967	24.27
1968	26.17
1969	43.79

3.1.7.a Norwegian spring-spawning herring

State of stock/fishery: The stock is at present considered to be harvested within safe biological limits as defined by the proposed reference points. The assessment of this stock is not considered to be precise but is adequate to determine stock trends. The fishing mortality has increased in recent years, but is thought to be about equal to the estimated natural mortality. The recruitment of the very strong 1992 year class led to an increase in the SSB in 1997, but subsequent year classes are weak, with the possible exception of the 1997 year class, the strength of which cannot be reliably estimated yet. The SSB is probably at its maximum and is expected to decline considerably in the next few years. Under the present management approach, the stock is likely to fall to B_{lim} (2.5 million t) in the medium term.

Management objectives: Management agencies have since 1997 adopted a strategy (harvest central rule) based on $F = 0.15$, with a catch ceiling of 1.5 million t and a minimum SSB of 2.5 million t. This is considered to comply with the precautionary approach. Due to a succession of weak recruiting year classes and a lower spawning stock, the adopted management strategy will lead to decreasing catches in coming years.

Advice on management: ICES advises that the harvest control rule outlined above should not be exceeded and this corresponds to catches of 1 263 thousand t in 1999. In order to comply with the precautionary approach it is important that the management agencies consider possible modifications to the catch control rule as soon as possible to incorporate a reduction in F towards very low levels when SSB is below 5 million t, to slow the reduction in SSB towards B_{lim} . The latest ICES advice on TACs (1.5 million t for 1997, 1.2 million t for 1998, in accordance with the adopted harvest control rule) has reflected the view of a decreasing spawning stock due to a succession of weak recruiting year classes.

Proposed reference points: Examination of the stock recruitment data suggests that the probability of poor recruitment increases at SSBs below 2.5 million t, which defines B_{lim} . In order to take into account uncertainty in estimating biomass, a $B_{pa} = 5.0$ million t is proposed. Simulations indicate that $F_{pa} = 0.15$ is adequate when used in conjunction with a catch ceiling.

Medium-term simulations indicate that the probability of SSB falling below B_{lim} can be almost halved when a reduction in F at SSB levels below $B_{pa} = 5.0$ million t is applied. An example of such a reduction would be to reduce F linearly to 0.05 as the SSB falls from 5.0 million t to 2.5 million t. Medium-term simulations based on this modified harvest control rule indicate that

the mean catch in the medium-term period (10 years) is below 1.0 million t.

Relevant factors to be considered in management: A report based on a mapping of the summer feeding areas in 1998 by an international survey, will be made available in August 1998.

Catch forecast for 1999: Basis: TAC, Landings(98) = 1 302, $F(98) = 0.17$, $F_{pa} = 0.15$, $SSB(98) = 9 836$.

F (99)	Basis	Lndgs (99)	SSB (99)	SSB (2000)
0.075	$0.5 F_{pa}$	655	8843	8087
0.11	$0.75 F_{pa}$	971	8811	7776
0.15	F_{pa}	1263	8781	7490

Weights in '000 t. Unweighted fishing mortalities.

Elaboration and special comment: A large increase in fishing effort, new technology and environmental changes contributed to the collapse of this stock around 1970. Recruitment failed when the SSB was reduced below 2.5 million t. In the years following the collapse the aim has been to rebuild the spawning stock above this minimum limit. In order to reach this goal, after a period of almost no fishing, the management between 1985 and 1993 aimed at restricting the fishing mortality to 0.05. Up to 1994, the fishery was almost entirely confined to Norwegian coastal waters. Since 1992 the coastal fishery has increased sharply. During the summer of 1994 there were also catches in the offshore areas of the Norwegian Sea for the first time in 26 years. The geographical extent of this fishery increased in 1995, with nine nations participating and a total catch exceeding 900 thousand t. The fishery expanded further in 1996 and 1997, the catches in 1997 exceeding 1.4 million t.

Multispecies Dimension: The juveniles and adults of this stock form an important part of the ecosystem in the Barents Sea and Norwegian Sea. The herring has an important role as transformer of the plankton production to higher trophic levels (cod, seabirds and marine mammals). It is therefore important to facilitate a high production of the herring stock by allowing the stock to be kept above B_{lim} . In the late 1950s the spawning stock was in the order of 5–10 million t.

Capelin and juvenile herring are important prey for the cod in the Barents Sea.

Data and assessment: Analytical assessment based on catch and survey data (acoustic estimates of adults and recruits, tagging estimates).

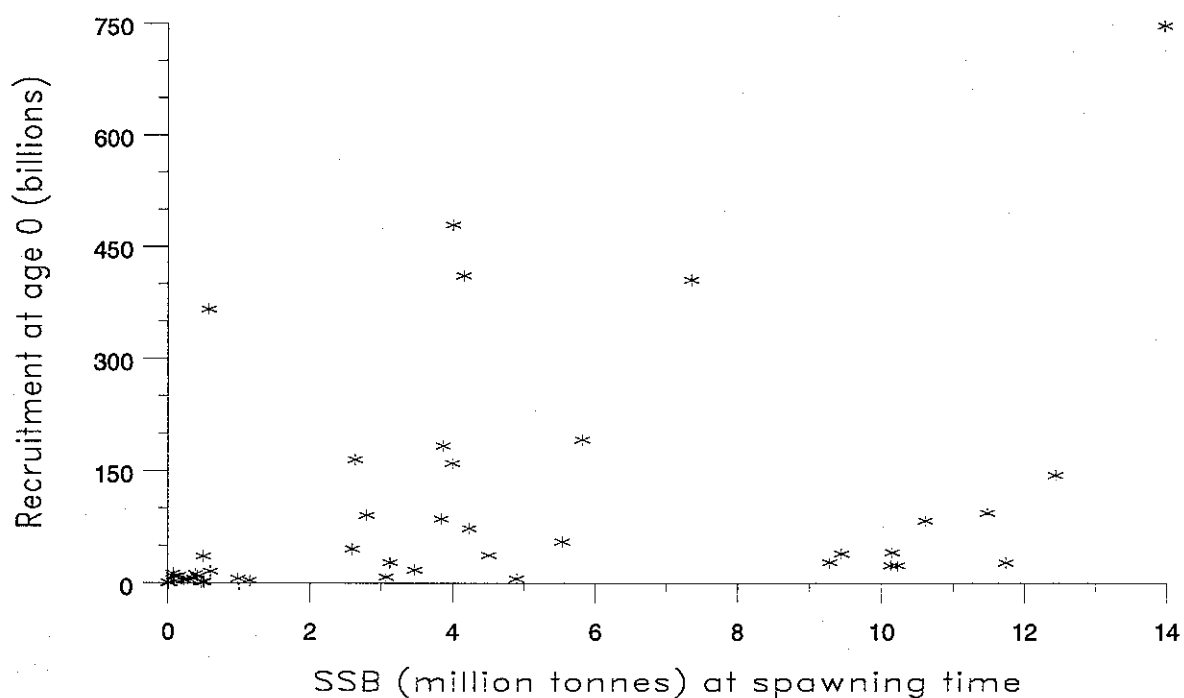
Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, April/May 1998 (ICES CM 1998/ACFM:18).

Catch data (Tables 3.1.7.a.1-3).

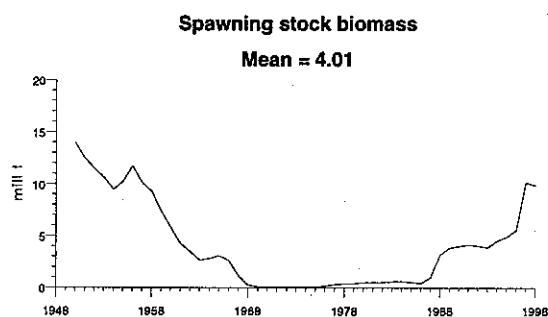
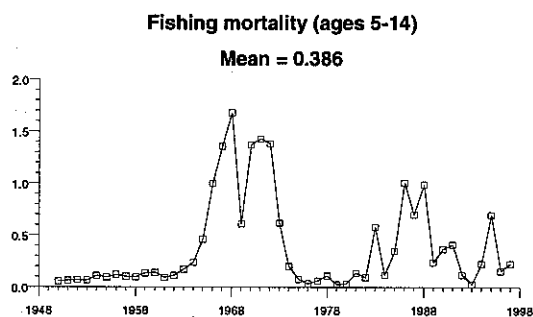
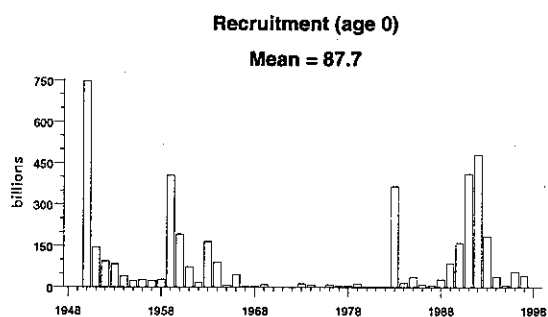
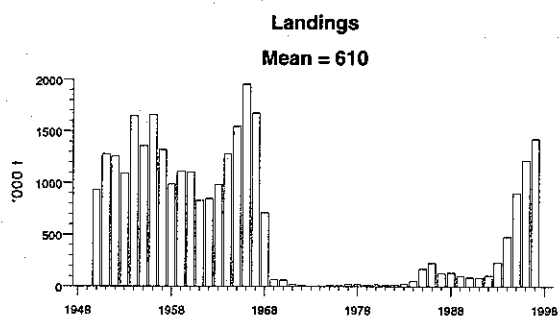
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	TAC	150	115	127
1988	TAC	120-150	120	135
1989	TAC	100	100	104
1990	TAC	80	80	86
1991	No fishing from a biological point of view	0	76	85
1992	No fishing from a biological point of view	0	98	104
1993	No increase in F	119	200	232
1994	Gradual increase in F towards $F_{0.1}$; TAC suggested	334	450	479
1995	No increase in F	513	None ¹	906
1996	Keep SSB above 2.5 million t	-	None ²	1 217
1997	Keep SSB above 2.5 million t	-	1 500	1 420
1998	Do not exceed the harvest control rule	-	1 300	
1999	Do not exceed the harvest control rule	1 263		

¹Autonomous TACs totalling 900 000 t; ²Autonomous TACs totalling 1 425 000 t were set by April 1996. Weights in '000 t.

Stock - Recruitment



(run: SEPBJA06)



Norwegian spring-spawning herring

Yield and Spawning Stock Biomass

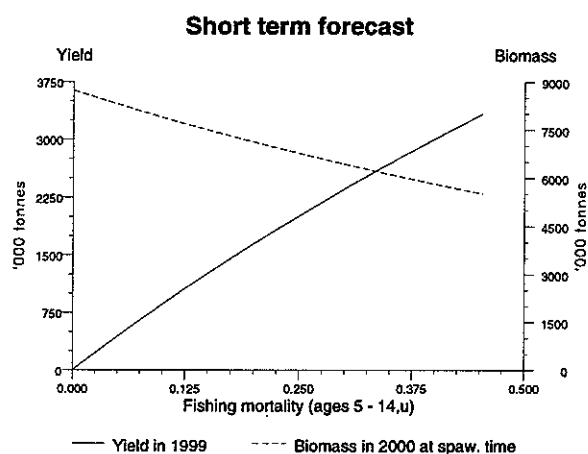
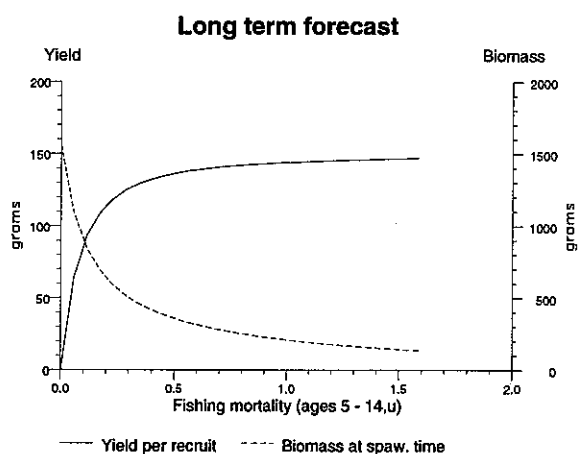


Table 3.1.7.a.1 Catches of Norwegian spring spawning herring (tonnes) since 1972.

Year	A	B ¹	C	D	Total	Total catch as used by the Working Group
1972	-	9,895	3,266 ²	-	13,161	13,161
1973	139	6,602	276	-	7,017	7,017
1974	906	6,093	620	-	7,619	7,619
1975	53	3,372	288	-	3,713	13,713
1976	-	247	189	-	436	10,436
1977	374	11,834	498	-	12,706	22,706
1978	484	9,151	189	-	9,824	19,824
1979	691	1,866	307	-	2,864	12,864
1980	878	7,634	65	-	8,577	18,577
1981	844	7,814	78	-	8,736	13,736
1982	983	10,447	225	-	11,655	16,655
1983	3,857	13,290	907	-	18,054	23,054
1984	18,730	29,463	339	-	48,532	53,532
1985	29,363	37,187	197	4,300	71,047	169,872
1986	71,122 ³	55,507	156	-	126,785	225,256
1987	62,910	49,798	181	-	112,899	127,306
1988	78,592	46,582	127	-	125,301	135,301
1989	52,003	41,770	57	-	93,830	103,830
1990	48,633	29,770	8	-	78,411	86,411
1991	48,353	31,280	50	-	79,683	84,683
1992	43,688	55,737	23	-	99,448	104,448
1993	117,195	110,212	50	-	227,457	232,457
1994	288,581	190,643	4	-	479,228	479,228
1995	320,731	581,495	0	-	902,226	902,226
1996	462,248	758,035	0	-	1,220,283	1,220,283
1997	423,275 ⁴	1,003,232 ⁴	0	-	1,426,507	1,426,507

A = catches of adult herring in winter

B = mixed herring fishery in remaining part of the year

C = by-catches of 0- and 1-group herring in the sprat fishery

D = USSR-Norway by-catch in the capelin fishery (2-group)

¹ Includes also by-catches of adult herring in other fisheries

² In 1972, there was also a directed herring 0-group fishery

³ Includes 26,000 t of immature herring (1983 year-class) fished by USSR in the Barents Sea

⁴ Preliminary

Table 3.1.7.a.2 Total catch of Norwegian spring-spawning herring (tonnes) since 1972. Data provided by Working Group members.

Year	Norway	USSR/ Russia	Denmark	Faroes	Iceland	Ireland	Nether- lands	Greenland	UK	Germany	France	Sweden	Total
1972	13,161	-	-	-	-	-	-	-	-	-	-	-	13,161
1973	7,017	-	-	-	-	-	-	-	-	-	-	-	7,017
1974	7,619	-	-	-	-	-	-	-	-	-	-	-	7,619
1975	13,713	-	-	-	-	-	-	-	-	-	-	-	13,713
1976	10,436	-	-	-	-	-	-	-	-	-	-	-	10,436
1977	22,706	-	-	-	-	-	-	-	-	-	-	-	22,706
1978	19,824	-	-	-	-	-	-	-	-	-	-	-	19,824
1979	12,864	-	-	-	-	-	-	-	-	-	-	-	12,864
1980	18,577	-	-	-	-	-	-	-	-	-	-	-	18,577
1981	13,736	-	-	-	-	-	-	-	-	-	-	-	13,736
1982	16,655	-	-	-	-	-	-	-	-	-	-	-	16,655
1983	23,054	-	-	-	-	-	-	-	-	-	-	-	23,054
1984	53,532	-	-	-	-	-	-	-	-	-	-	-	53,532
1985	167,272	2,600	-	-	-	-	-	-	-	-	-	-	169,872
1986	199,256	26,000	-	-	-	-	-	-	-	-	-	-	225,256
1987	108,417	18,889	-	-	-	-	-	-	-	-	-	-	127,306
1988	115,076	20,225	-	-	-	-	-	-	-	-	-	-	135,301
1989	88,707	15,123	-	-	-	-	-	-	-	-	-	-	103,830
1990	74,604	11,807	-	-	-	-	-	-	-	-	-	-	86,411
1991	73,683	11,000	-	-	-	-	-	-	-	-	-	-	84,683
1992	91,111	13,337	-	-	-	-	-	-	-	-	-	-	104,448
1993	199,771	32,645	-	-	-	-	-	-	-	-	-	-	232,417
1994	380,771	74,400	-	2,911	21,146	-	-	-	-	-	-	-	479,228
1995	529,838	101,987	30,577	57,084	174,109	-	7,969	2,500	881	556	-	-	905,501
1996	699,161	119,290	60,681	52,788	164,957	19,541	19,664	-	46,131	11,978	-	22,424	1,220,283
1997 ¹	860,963	168,900	44,292	59,987	220,154	11,179	8,694	-	25,149	6,190	1,500	19,499	1,426,507

¹ Preliminary, as provided by Working Group members.

Table 3.1.7.a.3 Herring Norwegian Spring-spawners.

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 5-14
1950	747,378.00	13,984.00	933.00	0.054
1951	143,908.00	12,437.60	1,278.40	0.062
1952	93,898.80	11,479.30	1,254.80	0.067
1953	83,577.00	10,612.00	1,090.60	0.065
1954	39,702.90	9,444.19	1,644.50	0.108
1955	23,753.80	10,223.00	1,359.80	0.093
1956	27,474.80	11,739.40	1,659.40	0.120
1957	23,650.60	10,128.70	1,319.50	0.101
1958	27,810.50	9,280.81	986.60	0.096
1959	405,343.00	7,349.57	1,111.10	0.133
1960	191,339.00	5,816.97	1,101.80	0.139
1961	73,282.70	4,229.84	830.10	0.090
1962	17,712.50	3,464.70	848.60	0.112
1963	164,640.00	2,635.49	984.50	0.170
1964	90,556.00	2,795.16	1,281.80	0.237
1965	7,932.62	3,067.48	1,547.70	0.459
1966	45,349.30	2,595.28	1,955.00	0.997
1967	3,582.23	1,145.47	1,677.20	1.357
1968	4,638.56	219.01	712.20	1.679
1969	9,607.28	77.54	67.80	0.610
1970	620.67	30.72	62.30	1.372
1971	209.80	8.23	21.10	1.428
1972	907.34	1.85	13.16	1.381
1973	12,701.70	74.40	7.02	0.618
1974	8,500.67	85.34	7.62	0.202
1975	2,942.58	91.38	13.71	0.074
1976	10,021.80	145.98	10.44	0.033
1977	5,039.35	283.51	22.71	0.058
1978	6,133.17	354.75	19.82	0.109
1979	12,168.10	385.58	12.86	0.024
1980	1,492.29	468.64	18.58	0.033
1981	1,091.88	502.74	13.74	0.133
1982	2,329.76	501.31	16.66	0.092
1983	365,890.00	570.82	23.05	0.579
1984	15,582.90	593.69	53.53	0.115
1985	35,833.10	491.17	169.87	0.346
1986	9,094.62	409.33	225.26	1.006
1987	6,109.82	981.83	127.31	0.701
1988	27,540.40	3,124.11	135.30	0.988
1989	85,872.10	3,839.00	103.83	0.238
1990	160,044.00	3,994.15	86.41	0.367
1991	410,945.00	4,157.94	84.68	0.409
1992	479,138.00	4,004.18	104.45	0.117
1993	183,191.00	3,864.21	232.46	0.028
1994	37,343.30	4,507.06	479.23	0.224
1995	6,151.08	4,899.19	905.50	0.698
1996	55,412.00	5,538.26	1,220.28	0.155
1997	41,232.00	10,149.10	1,426.51	0.227
1998	.	9,836.03	.	.
Average	87,680.75	4,012.65	609.62	0.386
Unit	Millions	1000 tonnes	1000 tonnes	-

3.1.7.b Norwegian spring-spawning herring distribution

Request from NEAFC

- *Indicate new developments in the seasonal and area distribution of the total Norwegian spring-spawning herring stock.*

Wintering areas 1997/1998: The adult stock wintered in the Vestfjord region, (northern Norway) as it has done since 1987/1988. It occupied a larger area compared to earlier years.

Spawning season 1998: The spawning season occurred in a wide area along the Norwegian coast from Lindesnes (58°N) to Vesteraalen (70°N).

Feeding areas: The 1998 surveys in the herring feeding areas are reported by Holst *et al.* (1998). Figure 3.1.7.b.1 show the observed stock distribution during April-May and the anticipated migration routes for the period March-June. Figure 3.1.7.b.2 show a partial

coverage of the stock distribution in late June and 3.1.7.b.3 show a partial coverage of the stock distribution in July with the anticipated migration routes for the period June-September. The conclusion from the 1998 surveys in the feeding areas is that is that the 1991 and 1992 year classes, now dominating the stock, appear to have taken up the same migration pattern like the older herring.

Summarising all the observations from the period January-July 1998 leads to the conclusion that no substantial changes in the spatial and seasonal distribution has taken place.

Source of information: Report of the Northern Pelagic Blue Whiting Fisheries Working Group (ICES CM 1998/ACFM:18 and Report of Planning Group on Surveys on Pelagic Fish in the Norwegian Sea D:3.

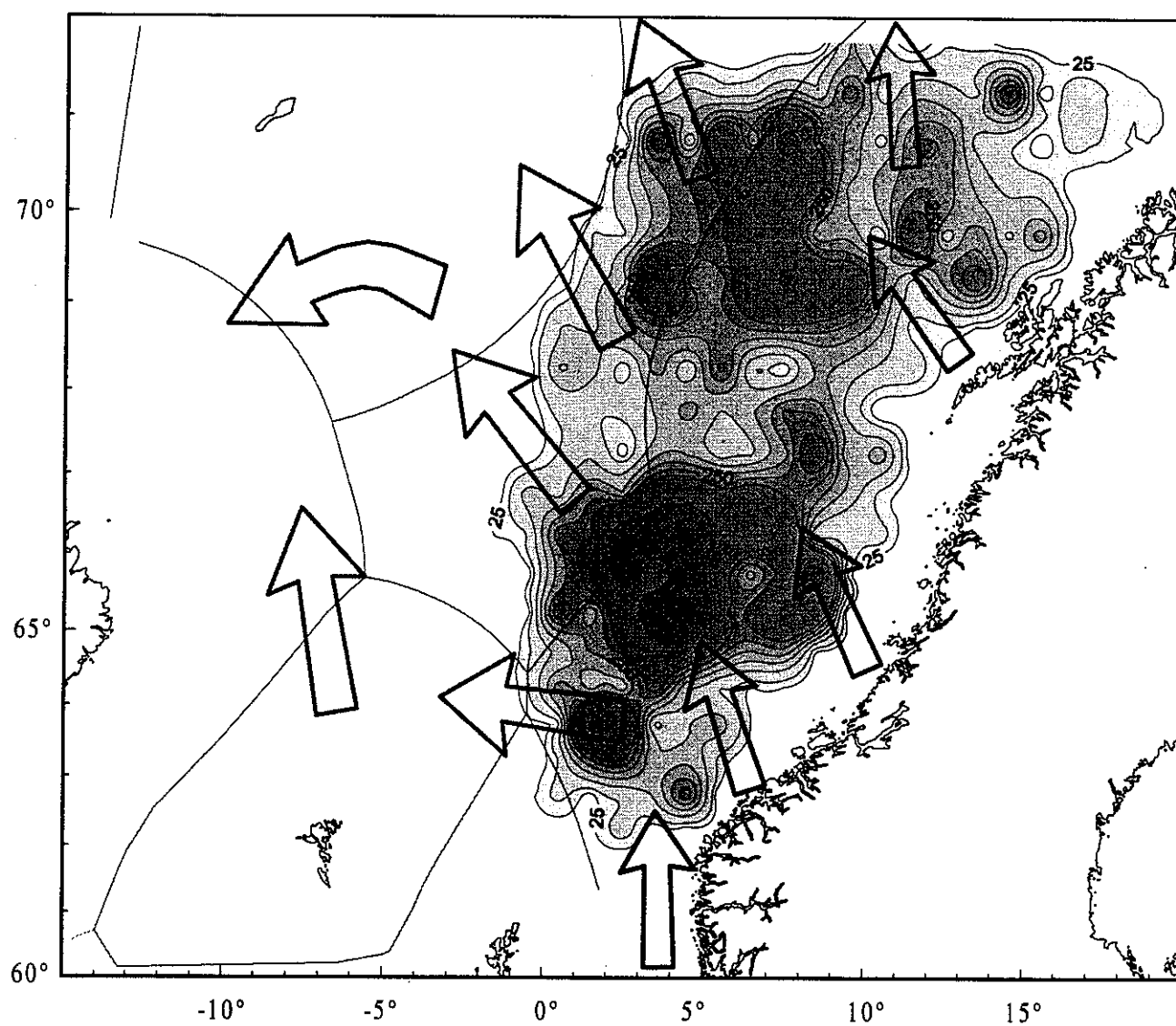


Figure 3.1.7.b.1 Distribution of Norwegian spring spawning herring as measured by R/V G.O. Sars and R/V Argos in April–May 1998. Complete coverage of the adult stock. Small arrows: anticipated migrations from March to May. Large arrows: anticipated migrations from May to June. Arrow size not proportional to biomass movement.

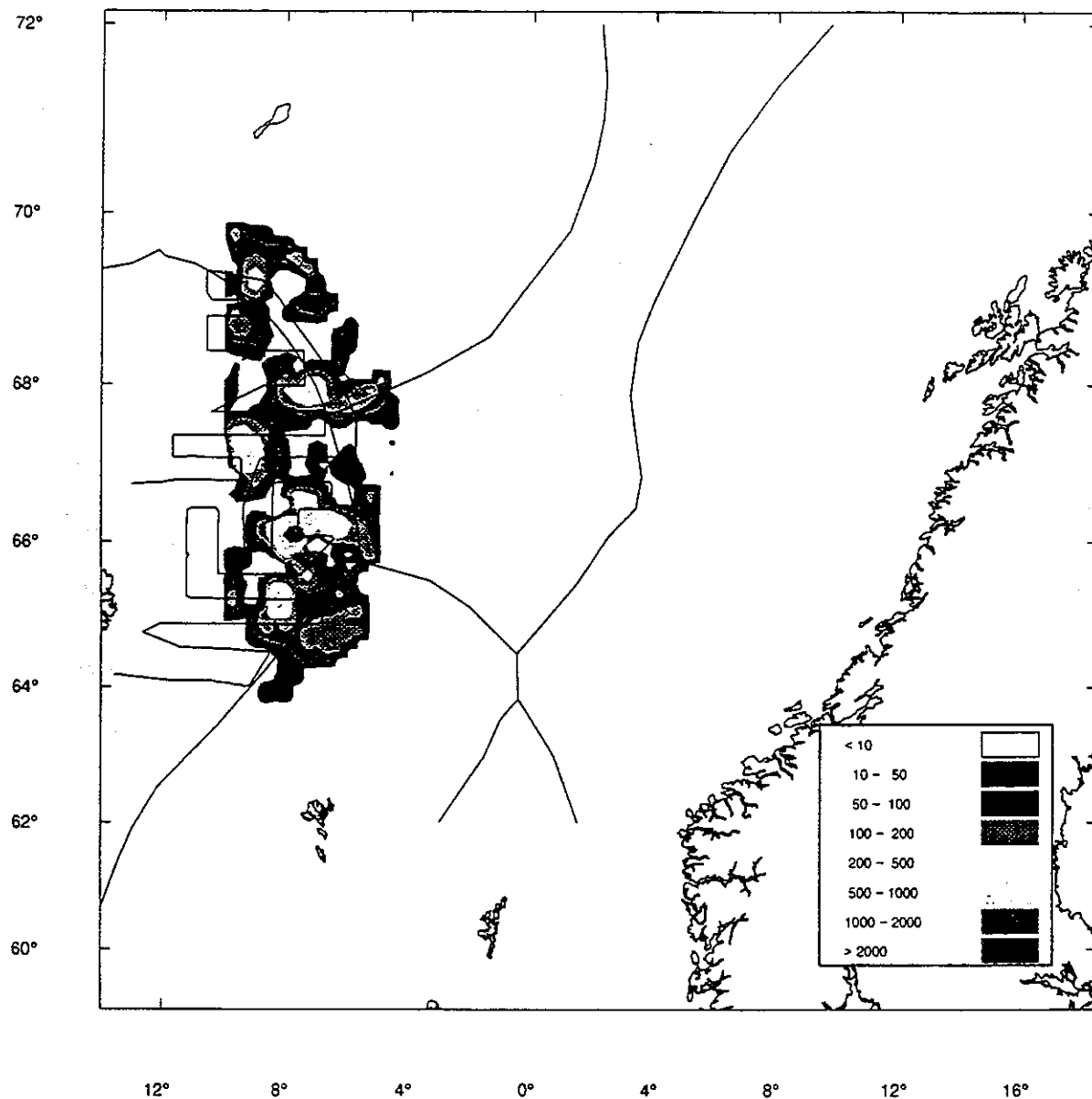


Figure 3.1.7.b.2 Herring distribution as observed by *Árni Fridriksson* during 19/6–3/7 1998.

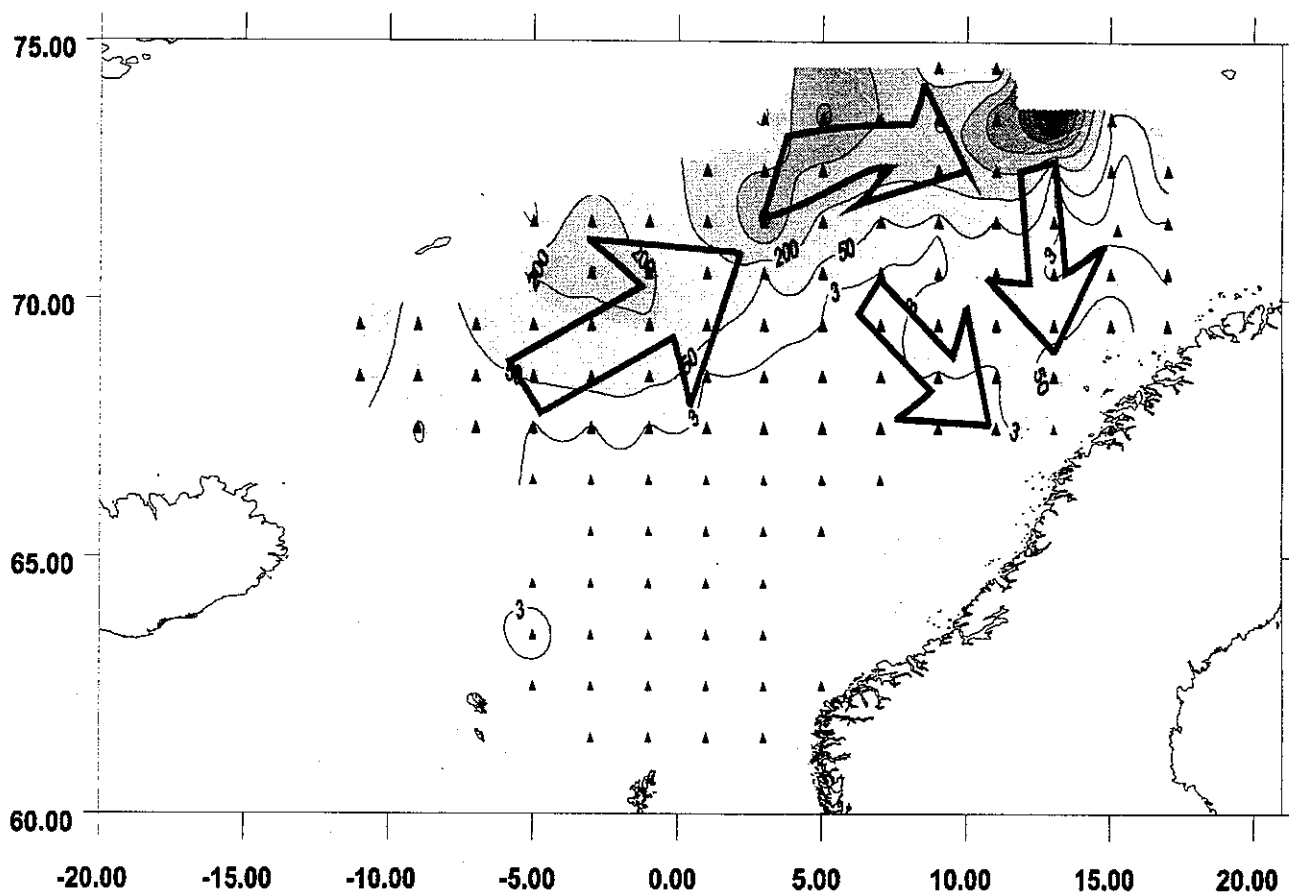


Figure 3.1.7.b.3 Distribution of Norwegian spring spawning herring as measured by R/V Johan Hjort in July 1998. Not complete coverage. Upper, large arrows: anticipated migrations from June to July. Lower, small arrows: expected migrations into wintering area in the Vestfjord in August/September. Arrow size not proportional to biomass movement. Triangles: midpoint of squares used for estimating mean S_a value.

3.1.8 Barents Sea capelin (Sub-areas I and II, excluding Division IIa west of 5°W)

State of stock/fishery: The stock is considered to be within safe biological limits. The maturing component in autumn 1998 was estimated to be 931 000 t, and is predicted to be 579 000 t at the time of spawning in 1999 (without fishing). This is above the proposed B_{pa} for 1999. Since 1993 the spawning stock has been well below the management threshold of 500 000 t, and the fishery has been closed since then.

Management objectives: The fishery is managed according to a harvest control rule allowing for 500 000 t to spawn, taking due account of predation by

cod. For management to meet precautionary criteria, the SSB should be above B_{pa} and SSB should be above B_{lim} with high probability (> 95%).

Advice on management: According to the harvest control rule the catch in 1999 should be less than 79 000 t. ICES considers this to be consistent with the precautionary approach and recommends that the harvest control rule be applied in 1999. ICES further recommends that if there is a fishery, it should be directed on the spawning stock in the first quarter of the year.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 200 000 t, for years with low abundance of herring in the Barent Sea. This is slightly above the lowest SSBs that have produced good year classes. Poor year classes are associated with high abundance of juvenile herring in the Barents Sea, and values for B_{lim} and B_{pa} for the capelin stock has not been defined for years with high abundance of herring.	B_{pa} is 500 000 t.
F_{lim} not defined.	F_{pa} not defined.

A B_{pa} serving the function as a threshold for managing the fishery, needs to vary with the uncertainty of the estimated stock size. In absolute terms this uncertainty increases with stock size. According to estimated uncertainties of the present prediction, a B_{pa} for use as biomass threshold in 1999 is proposed to be set at 500 000 t. The existing management threshold (500 000 t) is considered to meet precautionary criteria for the conditions in 1999. At some higher prediction uncertainty, associated with higher SSB, 500 000 t will be too low to ensure a high probability of having SSB above B_{lim} after the fishery.

Additional considerations on reference points

Capelin is an important food source in the Barents Sea ecosystem, and most capelin die after spawning. The strategy adopted for 1993 of directing the fishery at the spawning stock just prior to spawning allows the fish to be available for predators as long as possible. Because of the high predation and post-spawning mortality of capelin, a target escapement management strategy is regarded as the most useful way of ensuring a minimum amount of spawners. In such managements fishing mortality reference points are not relevant. Moreover, because of the large influence of environmental conditions and predator biomasses on total mortality rates the consequences of any specific fishing mortality rate are highly variable. It is not yet possible to identify appropriate F_{pa} and F_{lim} values for such circumstances, and mortality reference points based on total mortality may be more biologically sound.

Adjustments of the harvest control rule should be further investigated for the purpose to better take account of the uncertainty in the predicted amount of spawners, likely interaction with herring, and the role of capelin as a prey item.

Basis: B_{lim} : above lowest biomass giving good recruitment.

$B_{pa} = B_{lim} + (\text{median-5}^{\text{th}} \text{ percentile of predicted SSB}).$

Relevant factors to be considered in management:

The estimated annual consumption of capelin by cod has varied between 0.2 and 3.1 mill t over the period 1984–1997. Young herring has been found to consume capelin larvae, and this predation pressure is thought to be the major cause for the poor year classes of capelin in the periods 1984–1986 and in 1992–1994. The quantity of young herring in the Barents Sea is at present small and the conditions for larval survival and recruitment have improved.

Catch forecast for 1999: The spawning stock in 1999 is predicted from the acoustic survey in September 1998, by a model where maturity, growth and mortality, including predation by cod, is estimated. The model takes account of uncertainties both in the survey estimate and in other input data. For catches in 1999 below 79 000 t, the probability of having an SSB below B_{lim} (200 000 t) is acceptably low (less than 5%), and the expected amount left for spawning is above B_{pa} (500 000 t). Only catches of mature fish in the first quarter of the year have been considered.

Elaboration and special comments: The spawning stock in 1999 will be dominated by the 1996 year class. The latest survey estimate of the 1997 year class is about 80% above the estimate of the 1996 year class at the same age. Observations during an international 0-group survey in August 1998 indicated that the 1998 year class is of similar strength as the 1997 year class.

Since 1979 the fishery has been regulated by a bilateral agreement between Norway and Russia (formerly USSR). TACs have been set separately for the winter fishery and the autumn fishery. In managing this stock the main goal has been to allow 500 000 t to spawn. Since 1987 the management has been efficient in having the fishery closed in all years when the spawning stock has been predicted to fall below 500 000 t. From the

autumn of 1986 to the winter of 1991, no fishery took place. The fishery was re-opened in the winter season in 1991, on a recovered stock, but from the autumn of 1993 the fishery was again closed. There has been no fishing for Barents Sea capelin since 1993.

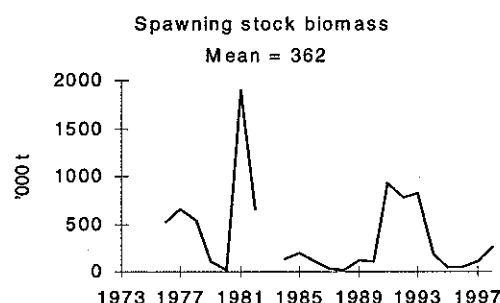
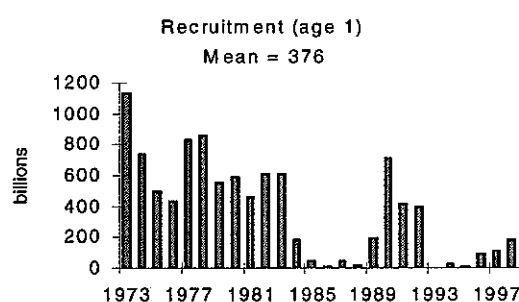
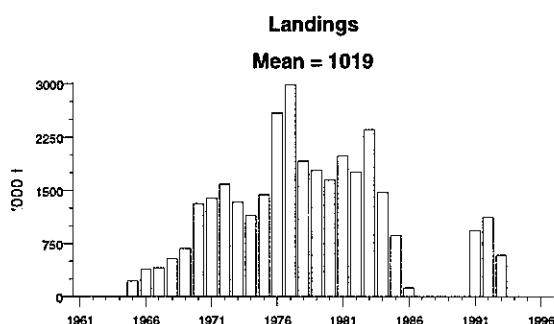
The assessment and stock history is based on joint Russian-Norwegian acoustic surveys during September each year. A new model has been used for predicting SSB in 1999, and for estimating the historical time series of SSB.

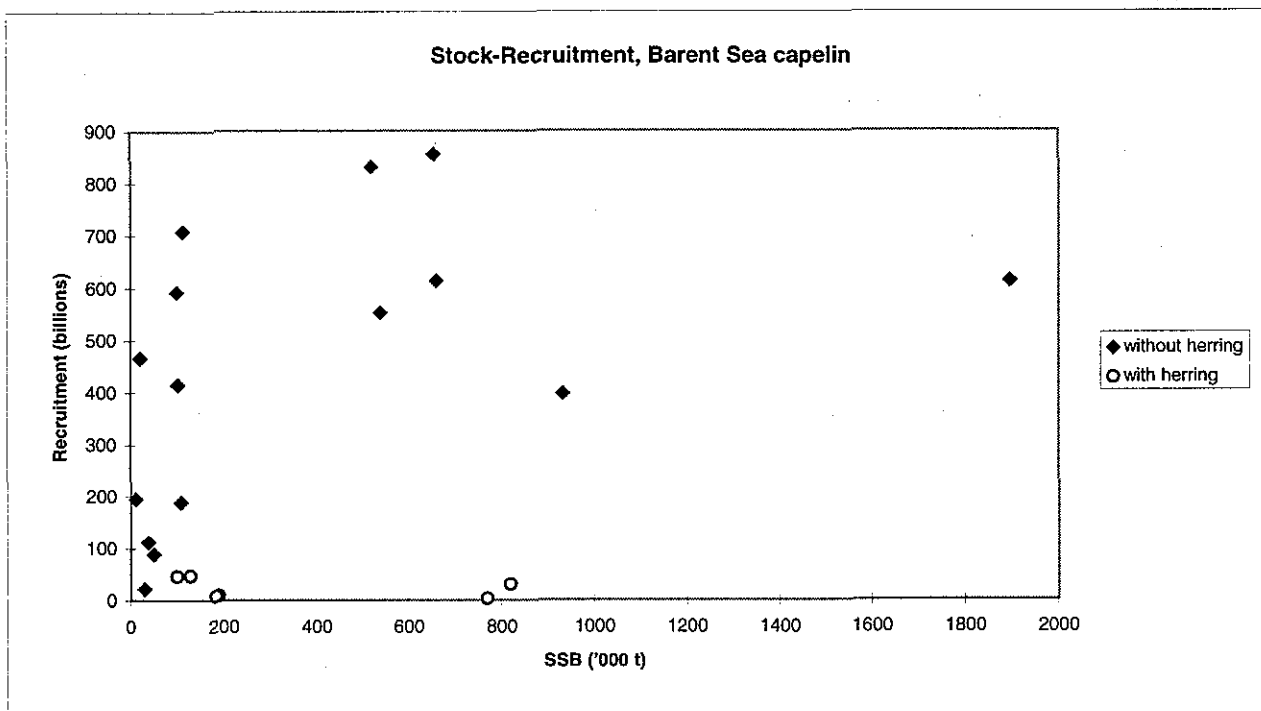
Source of information: Report from the 1998 joint Russian-Norwegian meeting to assess the Barents Sea capelin stock, Hammerfest, October 6–8, 1998.

Catch data (Tables 3.1.8.1–3):

Year	ICES advice	Recommended TAC	Agreed TAC	ACFM catch
1987	Catches at lowest practical level	0	0	0
1988	No catch	0	0	0
1989	No catch	0	0	0
1990	No catch	0	0	0
1991	TAC	1000 ¹	900	933
1992	SSB > 4–500,000 t	834	1100	1123
1993	A cautious approach, SSB > 4–500,000	600	630	586
1994	No fishing	0	0	0
1995	No fishing	0	0	0
1996	No fishing	0	0	0
1997	No fishing	0	0	0
1998	No fishing	0	0	0
1999	SSB > 500,000 t	79 ¹		

¹Winter-spring fishery. Weights in '000 t.





Open circles indicate years in which herring abundance was high.

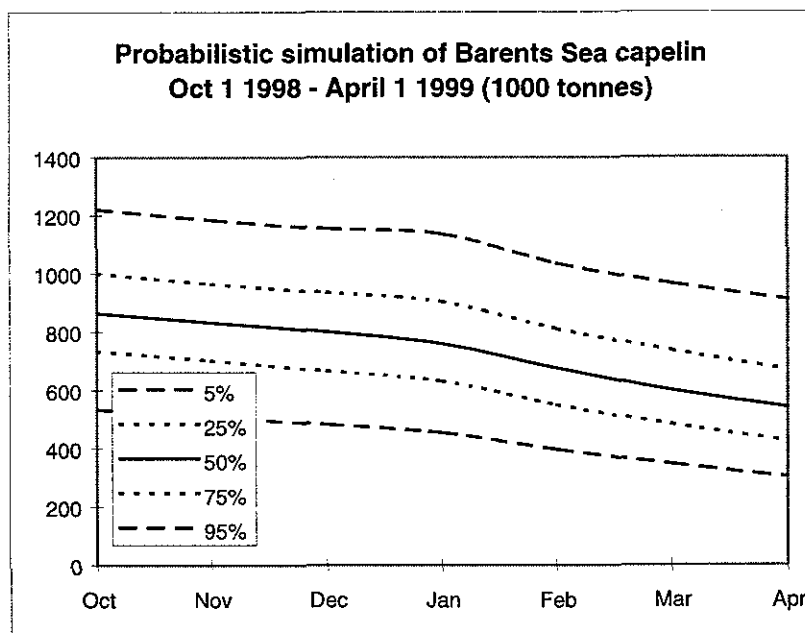


Table 3.1.8.1 Barents Sea CAPELIN. International catch ('000 t) as used by the Working Group.

Year	Winter				Summer-Autumn			Total
	Norway	Russia	Others	Total	Norway	Russia	Total	
1965	217	7	0	224	0	0	0	224
1966	380	9	0	389	0	0	0	389
1967	403	6	0	409	0	0	0	409
1968	460	15	0	475	62	0	62	537
1969	436	1	0	437	243	0	243	680
1970	955	8	0	963	346	5	351	1314
1971	1300	14	0	1314	71	7	78	1392
1972	1208	24	0	1232	347	13	360	1592
1973	1078	34	0	1111	213	12	225	1336
1974	749	63	0	812	237	99	336	1149
1975	559	301	43	903	407	131	538	1440
1976	1252	228	0	1480	739	368	1107	2587
1977	1441	317	2	1760	722	504	1227	2987
1978	784	429	25	1237	360	318	678	1915
1979	539	342	5	886	570	326	896	1783
1980	539	253	9	801	459	388	847	1648
1981	784	429	28	1240	454	292	746	1986
1982	568	260	5	833	591	336	927	1760
1983	751	373	36	1161	758	439	1197	2358
1984	330	257	42	629	481	368	849	1478
1985	340	234	17	590	113	164	278	868
1986	72	51	0	123	0	0	0	123
1987	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0
1991	528	159	20	707	31	195	226	933
1992	620	247	24	891	73	159	232	1123
1993	402	170	14	586	0	0	0	586
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0

Table 3.1.8.2 Stock summary table. Numbers: unit 10^9 , Biomass: unit '000 t.

Year	Recruitment Age 1 at 1 August	Spawning stock biomass at 1 April	Total stock (1+) at 1. October	Landings
1965				224
1966				389
1967				409
1968				537
1969				680
1970				1314
1971				1392
1972				1592
1973	1140	112	5144	1336
1974	737	*	5733	1149
1975	494	*	7806	1440
1976	434	518	6417	2587
1977	830	655	4796	2987
1978	855	538	4247	1915
1979	551	100	4162	1783
1980	592	22	6715	1648
1981	466	1896	3895	1986
1982	611	660	3779	1760
1983	612	*	4230	2358
1984	183	129	2964	1478
1985	47	189	860	868
1986	9	100	120	123
1987	46	31	101	0
1988	22	11	428	0
1989	195	113	864	0
1990	708	102	5831	0
1991	415	932	7287	933
1992	396	770	5150	1123
1993	3	819	796	586
1994	30	184	200	0
1995	8	50	193	0
1996	89	38	503	0
1997	112	108	911	0
1998	188	254 ¹	2054	0
Average since 1973	376	362	3276	1254
Units	billions	'000 t	'000 t	'000 t

*regarded to be too uncertain to be shown

¹Preliminary

Table 3.1.8.3 Barents Sea CAPELIN. Larval abundance estimate (10^{12}) in June, and 0-group index in August.

Year	Larval abundance	0-group index
1981	9.7	570
1982	9.9	393
1983	9.9	589
1984	8.2	320
1985	8.6	110
1986	-	125
1987	0.3	55
1988	0.3	187
1989	7.3	1300
1990	13.0	324
1991	3.0	241
1992	7.3	26
1993	3.3	43
1994	0.1	58
1995	0.0	43
1996	2.4	291
1997	6.9 ¹	522
1998	14.1 ¹	428

¹Is probably an underestimate, since the vessel was not allowed to work in Russian EEZ

3.2 Stocks in North-Western Areas (Division Va and Sub-areas XII and XIV)

3.2.1 Overview

The fisheries

Stocks in the north-western areas have been exploited mainly by Icelandic vessels since the mid-seventies. However, vessels of other nationalities have also been operating in Sub-areas XII and XIV during this period. In the most recent years freezer and factory trawlers of various nationalities have been increasing in number in the pelagic deep-water fishery on redfish in Sub-areas XII and XIV. Norwegian vessels have also taken part in the capelin fishery, mainly in the Jan Mayen area.

The fisheries for the main pelagic species, Icelandic summer-spawning herring and capelin in the Iceland-East Greenland-Jan Mayen area, are almost exclusively carried out by purse seiners. The demersal species are mainly exploited by stern trawlers but considerable fisheries for cod are also carried out by gill nets, longline and handline. In general, effort is considered to be increasing or to have stabilised at medium or high levels (corresponding to F_{med} or higher) in recent years. Notable exceptions to this include the cod in Division Va, herring and capelin. These stocks have been managed using harvesting strategies and, in particular, there has been a marked decrease in fishing mortality on cod since 1994.

Fisheries in these areas are characterised by the most sophisticated technological equipment available in this field. This goes for navigational techniques and fish-detection instruments as well as for the development of more effective fishing gears, not least pelagic trawls, and the ability to fish deeper with pelagic trawls. There have also been substantial improvements with respect to technological aspects of other gears such as bottom trawl, longline and handline.

Management measures

The demersal fisheries (excluding oceanic redfish) have been managed by TACs since 1984 and the pelagic fisheries since the seventies. Fisheries in these areas are managed on a transferable quota system basis which is considered to lead to economic benefits in the long term. In such a system each vessel (or factory) is allocated a proportion of the TAC of a fish stock. The holder of this proportion of a TAC has the right to sell or buy quota to or from other holders in a free-market system. All fisheries are subject to a range of other management measures such as fishing gear regulations, closed areas and closed seasons. Efforts have been made to prohibit discards through the introduction of a minimum catching size instead of a minimum landing size. These measures, however, are partly counterbalanced by other constraints on the fisheries such as limited quotas.

The state of stocks

The fish stocks considered in this report include the largest stocks in these areas. The stocks of capelin, cod and redfish are most outstanding in this respect. These and other species spawn in the warmer regions of Atlantic water but they differ substantially in their distribution patterns during other periods of their life cycle. Greenland halibut and deep-sea *Sebastes mentella* are the only demersal deep-water species among the stocks considered. The saithe is characterised by highly migratory behaviour and migrations between Norway and Iceland have been observed. Pelagic redfish (both deep-sea and oceanic *Sebastes mentella*) constitute a vast resource although rapidly increasing effort is directed towards it. A number of other demersal commercial stocks inhabit both the continental shelf, e.g. flatfish species, and deeper waters, e.g. ling, blue ling and tusk. Most of these stocks are not regulated by TACs.

Some of the largest stocks have been subject to unfavourable trends during the last decades. The stocks of cod and redfish (traditional stocks) have been declining and are considered to be at low levels of spawning stock size. However, the capelin stock is considered to be at a relatively high level of stock biomass. The Greenland halibut has been declining during recent years and is considered to be at a low level. The saithe is considered to be at a low level. The Icelandic summer-spawning herring has been increasing steadily during the last two decades and is at a higher level of stock size than observed in previous periods. Further information on the demersal stocks at Greenland and Iceland are given in a later section of this overview.

In a boreal marine system, as in these areas, most life-history features of fishes tend to fluctuate substantially. During the last 10 years, however, the recruitment of cod has been at very low levels and only occasionally has it come close to average values. During this period environmental conditions have been variable. On the other hand, the spawning stocks have been at a historically low level. Thus, it might be concluded that the spawning stocks of cod are at or outside biologically acceptable limits.

Other issues

The resources in the area have generally been managed on the basis of fairly extensive time series of data. Well known difficulties, for example age readings of slow growing species such as redfish and Greenland halibut, are the same in these areas as elsewhere. The most apparent need for improvements in data analysis and in the gathering of auxiliary information, such as trawling or acoustic stock indices, is probably for Greenland

halibut and for the deep-water and pelagic redfish stocks in the Irminger Sea (Sub-areas XII and XIV). The comprehensive assessment of these large and widely distributed stocks is a challenging task, which requires full scale international cooperation.

Interaction between commercially valuable species is frequently observed but appears to be most pronounced for few species. The most important predator-prey relationships are the cod-capelin and cod-*Pandalus* interactions through the growth dependence of cod on capelin and the effect of cod predation on the recruitment of *Pandalus*. The high catches of deep-water *Pandalus* in Icelandic waters in recent years are considered to be a derivative of this interaction through the decline of the cod stock. Baleen whales have not been harvested commercially for some time and a continued increase in the abundance of cetaceans is likely to result in increased natural mortality on stocks such as cod in Division Va.

Demersal stocks at Greenland and Iceland

The cod at Greenland and Iceland can be considered as being composed of four components spawning in different areas: A West Greenland offshore component spawning off South-west Greenland, inshore components found in various fjords, a component spawning off East Greenland and a component spawning off Iceland. Eggs and larvae from the East Greenland-Iceland components are carried by the Irminger current to West Greenland. The inflow of larvae varies from year to year but for some year classes, such as those of 1973 and 1984, it was very important.

Tagging studies off West Greenland showed that inshore cod remained mainly within the area where they were tagged whereas recaptures of Greenland offshore cod were taken at Iceland. The emigration from West Greenland was most evident for year classes which were earlier observed as 0-group drifting from Iceland to Greenland.

The fishery off West Greenland has traditionally consisted of an offshore trawl fishery and an inshore fishery mostly using poundnets. Over the last decade, the fisheries have fluctuated substantially, but after 1989 the catches declined dramatically.

Cod catches off East Greenland have also fluctuated widely, but they decreased sharply in 1993 when the directed cod fishery failed totally due to very low catch rates.

All available information confirms the severely depleted state of the cod stock off Greenland. The offshore stock may be considered to be almost non-existent at the present time, and no substantial recruitment is expected in the foreseeable future.

The inshore stock component has historically been small and available information indicates that recruitment will be at a low level during the next few years.

For cod stocks off Greenland **ICES recommends that no fishery should take place until a substantial increase in biomass and recruitment is evident.**

With the extension of fisheries jurisdiction to 200 miles in 1975, Iceland introduced new measures to protect juvenile fish. In the trawl fisheries for cod, saithe and haddock the mesh size was increased from 120 mm to 135 mm in 1976 and to 155 mm the following year. A mesh size of 135 mm was allowed only in the fishery for redfish. In addition, fishing can be prohibited immediately in areas where the number of small fish exceeds a certain percentage. A limitation of the number of fishing days was set from 1977 to 1983 and in 1984 a quota system was introduced.

In the years 1974–1976 TACs were introduced for cod and Greenland halibut off East Greenland. In 1977 Greenland extended its fisheries jurisdiction to 200 miles and in order to protect juvenile redfish area closures were established off East Greenland in 1980. Mesh size regulations for demersal trawl fisheries on fish off Greenland have been in force since 1954. In 1985 the minimum mesh size was changed from 130 mm to 140 mm. A minimum landing size for cod was 42 cm since 1970 and this was revised to 40 cm in 1973. In addition the present regulation scheme implies that fishing has to move when exceeding a level of 10% by-catch or discards and further that no discarding is allowed.

In Icelandic waters, although the cod stock has shown some sign of recovery, it is still at a low level. The present situation can be explained by poor recruitment since the mid-1980s and by high fishing pressure. In such conditions the prospect of recovery is uncertain, but the management regime adopted of harvesting 25% of the available biomass is likely to ensure the rebuilding of the stock.

The Icelandic saithe stock is considered to be at or outside safe biological limits. **ICES recommends an immediate reduction in fishing mortality.**

The fishery for Greenland halibut in Sub-areas V and XIV is conducted by various nations but dominated by Icelandic trawlers in Division Va. The fishery in Division XIVb is developing rapidly and constitutes now about a quarter of the total fishery for Greenland halibut within Sub-areas V and XIV. As surveys have only recently been initiated for Greenland halibut, there are a number of uncertainties concerning the state of the stock of this species in Greenland and Icelandic waters. The low catch rates experienced by Icelandic trawlers and the results of the assessment of the stock, however, are in agreement and indicate that the stock has been declining since the mid-1980s. Fishing mortality has reached a record level in recent years and might not be sustainable in the medium term. To reverse the decline in the SSB, **ICES recommends a reduction in fishing mortality to below F_{pa} .**

3.2.2 Cod

3.2.2.a Greenland cod (ICES Sub-area XIV and NAFO Sub-area 1)

State of stock/fishery: The stock remains outside safe biological limits. The offshore component is severely depleted without any signs of recovery since 1990 (see figure on following page and Table 3.2.2.a.3). The dramatic decrease in stock abundance was associated with changes in environmental conditions, emigration and high fishing mortalities. The inshore component has never been assessed separately, but inshore catches are presently low. Recruitment to the inshore component appears to have been poor since the 1991 year class and indicates that the inshore stock is still declining. Only the offshore catches in Greenland are subject to a TAC of 83 250 t. The inshore fishery is unregulated. This may give cause for concern about the exploitation rate of the inshore component, especially as recruitment seems to be poor for this component at present.

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

Advice on management: ICES recommends that no fishery should take place until a substantial increase in biomass and recruitment is evident. Measures should be taken to protect the inshore spawning component. A recovery plan for both the inshore and offshore components should be developed in order to take advantage of strong year classes when they materialise. The recovery plan should include measures to reduce the by-catch in the shrimp fishery.

Proposed reference points: No limit or precautionary reference points for the fishing mortality or the biomass are proposed.

Relevant factors to be considered in management: Greenland and EU established an agreement on fisheries valid from 1993 to 1999. In accordance with this a potential TAC of 83 250 t has been fixed until 1999, which is not taken due to stock conditions.

Elaboration and special comment: The fishery was mainly targeted at cod with some redfish as a by-catch. The fishery was international until the declaration of EEZs in the 1970s. During the 1980s the offshore fishery was dominated by EU vessels, mainly freezer trawlers. Catches in the 1970s remained stable off West and East Greenland. During the 1980s the offshore fishery was based almost exclusively on the 1984 and 1985 year classes. Thereafter, a total failure of the directed cod fishery indicated a stock collapse. Recently, cod are occasionally taken as by-catch in the redfish fishery off East Greenland and in the shrimp fishery off West and East Greenland.

In Greenland waters there are inshore fjord stocks and offshore stocks. Given suitable climatic conditions (water temperature) and prudent management, sustained production of offshore cod in this area is possible. However, interaction between the East Greenland and Irminger currents during the early 1970s and 1980s has apparently rendered climatic conditions unsuitable for offshore cod in some years. Combined with high fishing mortality, this has caused the offshore cod stock to be severely depleted. In order to take advantage of suitable climatic conditions, when they occur, it is necessary to protect the remaining biomass of offshore cod.

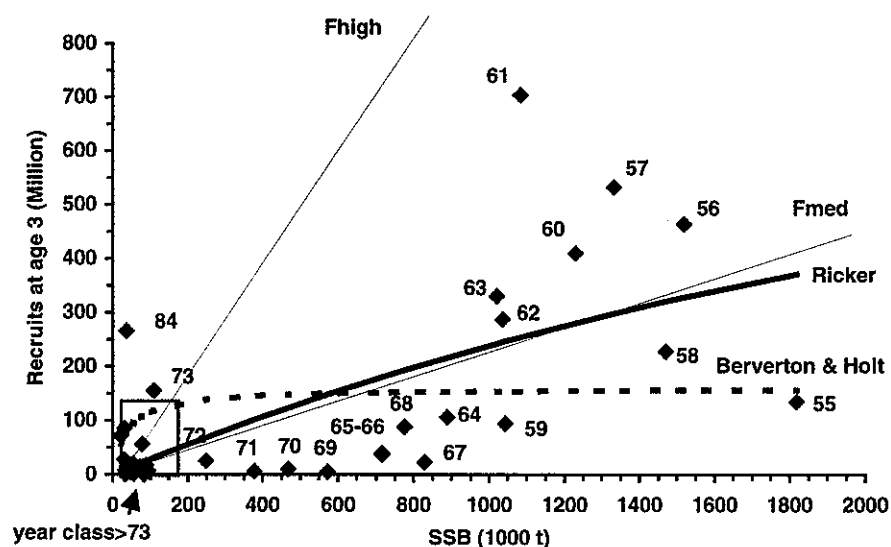
For the first time, an analytical assessment was performed in 1996 covering only the offshore component for the period 1955–1992. Most recent information available is based on a German groundfish survey, a Greenland trawl survey directed towards shrimp and a Greenland inshore gillnet survey.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

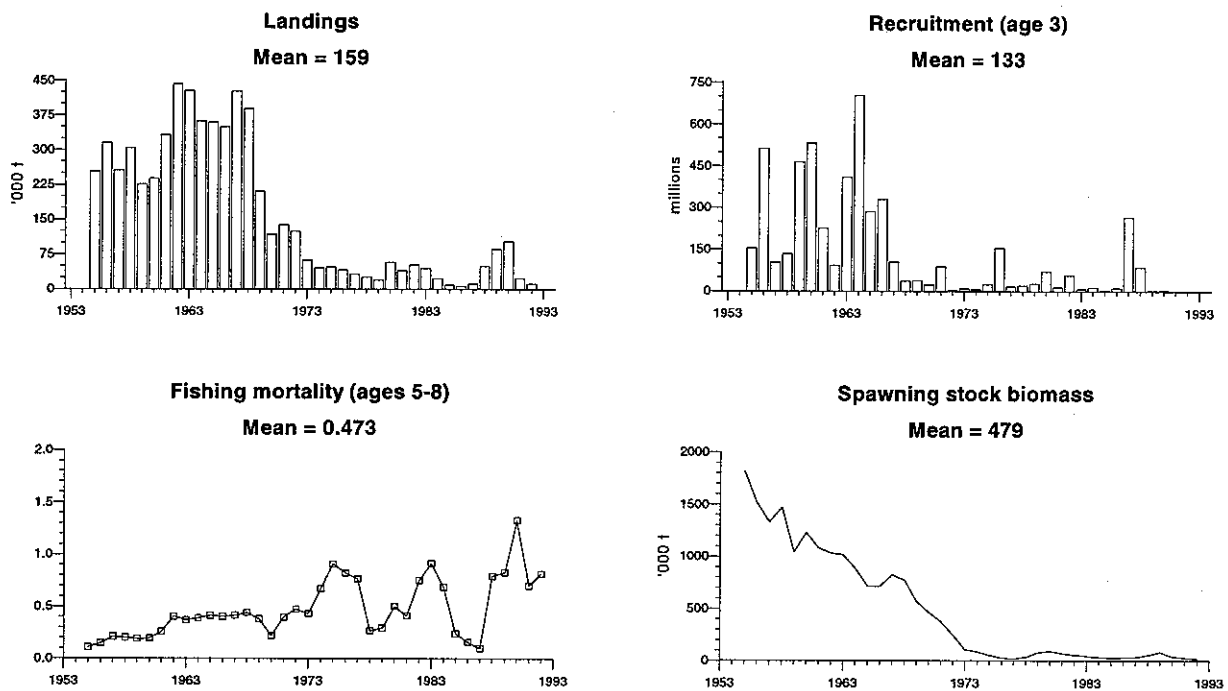
Catch data (Tables 3.2.2.a.1-4):

Year	ICES advice for Sub-area XIV ¹	Pred. catch corresp. to advice	Agreed TAC			ACFM inshore catch	ACFM total catch inshore + offshore		
			East	West	Total		East	West	Total
1987	TAC	5	11.5	12.5		8	7	12	19
1988	No increase in F	10 ²	11.5	53		23	9	63	72
1989	TAC	5	15	90		39	15	112	126
1990	No specific Recommendation	-	15	110	125	30	34	98	132
1991	No advice	-	25	90	115	19	22	20	42
1992	No advice	-	17.25	66	99.25	6	11	6	17
1993	No fishing	0	17.25	66	83.25	2	1	2	3
1994	No fishing on offshore stock complex	0	17.25	66	83.25	2	<1	2	3
1995	No fishing on offshore stock complex	0	17.25	66	83.25	2	<1	2	2
1996	No fishing on offshore stock complex	0	17.25	66	83.25	1	<1	1	1
1997	No fishing on offshore stock complex	0	17.25	66	83.25	1	<1	1	1
1998	No fishing on offshore stock complex	0	17.25	66	83.25				
1999	No fishing on offshore stock complex	0							

¹Advice for NAFO Sub-area 1 provided by NAFO Scientific Council; ²Preliminary catch corresponding to advice. Weights in '000 t.



Cod in ICES Sub-area XIV



Greenland cod Inshore and Offshore

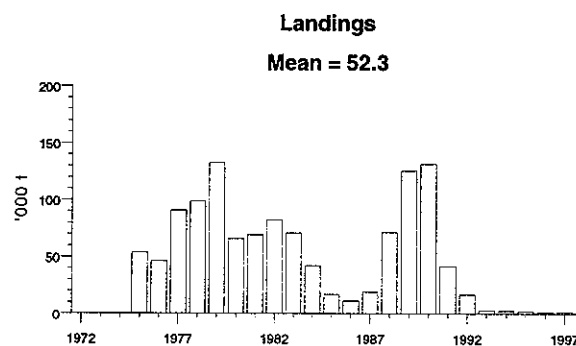


Table 3.2.2.a.1 Nominal catch (tonnes) of Cod in NAFO Sub-area 1, 1984-1997 as officially reported to NAFO.

Country	1984	1985	1986	1987	1988	1989	1990
Faroe Islands	-	-	-	-	-	-	51
Germany	8.941	2.170	41	55	6.574	12.892	7.515
Greenland	24.457	12.651	6.549	12.284	52.135	92.152	58.816
Japan	13	54	11	33	10	-	-
Norway	5	1	2	1	7	2	948
UK	-	-	-	-	927	3780	1.631
Total	33.416	14.876	6.603	12.373	59.653	108.826	68.961
WG estimate	-	-	-	-	62.653 ²	111.567 ³	98.474 ⁴

Country	1991	1992	1993	1994	1995	1996	1997 ¹
Faroe Islands	1	-	-	-	-	-	-
Germany	96	-	-	-	-	-	-
Greenland	20.238	5.723	1.924	2.115	1.710	948	1.186
Japan	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-
Total	20.335	5.723	1.924	2.115	1.710	948	1.186
WG estimate	-	-	-	-	-	-	-

¹ Provisional data reported by Greenland authorities² Includes 3,000 t reported to be caught in ICES Sub-area XIV³ Includes 2,741 t reported to be caught in ICES Sub-area XIV⁴ Includes 29,513 t caught inshore**Table 3.2.2.a.2** Nominal catch (tonnes) of cod in ICES Sub-area XIV, 1984-1997 as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990
Faroe Islands	-	-	86	-	12	40	-
Germany	7.035	2.006	4.063	5.358	12.049	10.613	26.419
Greenland	1.051	106	606	1.550	345	3.715	4.442
Iceland	-	-	-	1	9	-	-
Norway	794	-	-	-	-	-	17
Russia	-	-	-	-	-	-	-
UK (Engl. and Wales)	-	-	-	-	-	1.158	2.365
UK (Scotland)	-	-	-	-	-	135	93
United Kingdom	-	-	-	-	-	-	-
Total	8.880	2.112	4.755	6.909	12.415	15.661	33.336
WG estimate	8.914 ¹	-	-	-	9.457 ²	14.669 ³	33.513 ⁴

Country	1991	1992	1993	1994	1995	1996	1997 ⁶
Faroe Islands	-	-	-	1	-	-	-
Germany	8.434	5.893	164	24	22	5	39
Greenland	6.677	1.283	241	73	29	5	-
Iceland	-	22	-	-	1	-	-
Norway	828	1.032	122	43	+	1	15
Russia	-	126	-	-	-	-	-
UK (Engl. and Wales)	5.333	2.532	163	-	-	-	-
UK (Scotland)	528	463	46	-	-	-	-
United Kingdom	-	-	-	296	232	181	284
Total	21.800	11.351	736	437	284	192	338
WG estimate	21.818 ⁵	-	-	-	-	-	-

¹ Includes estimates of discards and catches reported in Sub-area XII² Excluding 3,000 t assumed to be from NAFO Division 1F and including 42 t taken by Japan³ Excluding 2,741 t assumed to be from NAFO Division 1F and including 1,500 t reported from other areas assumed to be from Sub-area XIV and including 94 t by Japan and 155 t by Greenland (Horsted, 1994)⁴ Includes 129 t by Japan and 48 t additional catches by Greenland (Horsted, 1994)⁵ Includes 18 t by Japan⁶ Provisional data

Table 3.2.2.a.3 Cod of Greenland (offshore component). Summary table of the 1996 assessment.

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 5-8
1955	153.80	1,817.48	253.27	0.109
1956	511.98	1,519.50	315.47	0.149
1957	104.90	1,331.26	256.30	0.210
1958	134.53	1,469.29	304.15	0.202
1959	463.65	1,042.38	226.23	0.189
1960	531.66	1,228.83	238.13	0.194
1961	226.87	1,083.45	332.12	0.257
1962	93.57	1,035.91	441.69	0.404
1963	409.56	1,020.36	427.59	0.369
1964	703.36	887.22	362.21	0.387
1965	286.69	716.21	359.01	0.411
1966	329.96	715.52	349.32	0.402
1967	105.57	828.65	425.93	0.414
1968	37.49	775.88	388.09	0.440
1969	39.07	572.01	210.31	0.379
1970	22.75	466.97	118.30	0.219
1971	87.98	378.34	138.66	0.398
1972	4.19	248.14	124.50	0.473
1973	9.18	109.53	62.88	0.431
1974	6.20	88.94	45.78	0.670
1975	24.60	54.79	47.06	0.906
1976	154.62	30.13	40.87	0.821
1977	16.62	20.60	31.81	0.764
1978	20.08	37.79	26.06	0.267
1979	26.79	78.82	20.09	0.294
1980	71.10	94.12	57.58	0.502
1981	14.25	71.08	40.27	0.414
1982	56.54	57.23	51.85	0.751
1983	7.71	46.59	44.33	0.913
1984	13.77	35.64	22.36	0.686
1985	1.99	29.87	8.50	0.241
1986	10.88	32.91	6.04	0.159
1987	265.71	36.17	10.84	0.099
1988	85.13	56.41	49.10	0.792
1989	1.41	83.62	85.95	0.828
1990	1.62	41.00	102.47	1.328
1991	0.63	30.23	22.97	0.699
1992	0.25	20.73	11.38	0.815
Average	132.54	478.78	159.46	0.473
Unit	Millions	1000 tonnes	1000 tonnes	-

Table 3.2.2.a.4 Cod off East and West Greenland (Fishing area XIV and NAFO Area I).

Year	Landings
1975	54
1976	46
1977	91
1978	99
1979	133
1980	66
1981	69
1982	83
1983	71
1984	42
1985	17
1986	11
1987	19
1988	72
1989	126
1990	132
1991	42
1992	17
1993	3
1994	3
1995	2
1996	1
1997	2
Average	52
Unit	1000 tonnes

3.2.2.b Icelandic cod (Division Va)

State of stock/fishery: The stock is considered within safe biological limits. SSB declined irregularly from 1955 to a record low in the late 1980s. It has increased since, but it is still only about 30% of the historic maximum recorded in 1955. Recruitment has been poor since the 1984 year class. Even though the 1993 year class appears to be around the average level, the 1994 year class is again far below average. Fishing mortality averaged 0.46 for 1995–1997.

Management objectives: A formal harvest control rule was implemented for this stock in 1995. The TAC for a fishing year is set as a fraction (25%) of the available biomass which is computed as the biomass of age 4 and older fish, averaged over the two adjacent calendar years. In the long term, this corresponds to a fishing mortality of about 0.4.

Advice on management: The harvest control rule which takes 25% of the biomass is considered sustainable and in accordance with the precautionary approach. Continued application of this rule is expected to result in increasing biomass. This rule corresponds to a catch of 250 000 t in 1999.

Proposed reference points: The harvest control rule currently applied appears to be in accordance with the precautionary approach since simulations have shown that there is only very low probability that the stock will decline to very low levels when the rule is applied.

Catch forecast for 1999: Assuming a catch in 1998 of 230 000 t (TAC-based), the following catch options were derived for 1999 (assuming catch=landings in all years): $F(98) = 0.42$, Basis: $Catch(98) = 230$, $B(4+,98) = 975$, $B(4+,99) = 1029$.

F (99)	Basis	Catch (99)	SSB (99)	B(4+) (2000)	SSB (2000)
0.19	0.4F(97)	121	599	1106	712
0.29	0.6F(97)	175	582	1043	645
0.39	0.8F(97)	225	566	985	586
0.44	25% rule	250	557	956	550
0.48	1.0F(97)	272	550	931	553
0.58	1.2F(97)	315	535	882	487

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

A 10% restriction in fishing mortality corresponds to the 25% catch rule; The current or increased fishing mortality is predicted to result in slight increase in SSB in 1999 compared to the 1998 level.

Elaboration and special comment: Iceland extended its fisheries jurisdiction to 200 miles in 1975 resulting in a temporary reduction in fishing mortality. In the demersal fisheries, the mesh size in trawls was increased from 120 mm to 135 mm in 1976 and to 155 mm the following year.

In order to protect juvenile fish, fishing is prohibited in areas where the number of small cod in the catches exceeds a certain percentage.

From 1977–1983, demersal fishing was limited to a certain number of days each year, but this system, as implemented, failed to meet the objective of limiting fishing mortality and a transferable boat quota system was introduced in 1984. TACs are set for each fishing year which runs from 1 September through to 31 August in the following year.

Catches have exceeded national advice and national TACs considerably for the past decade. ICES catch advice on this stock, first given for 1993, has also been exceeded.

The catch rule was evaluated in the 1995 ACFM report with the conclusion that its use was likely to reverse the trend in the continued decline in catches and biomass. The present estimates of stock size and fishing mortalities seem to confirm this.

Modelling studies of multispecies interactions indicate that medium-term forecasts should include a higher natural mortality of cod, given the present trends in predator abundance.

In years of high recruitment a larval drift to Greenland is often observed, resulting in a large year class at Greenland also.

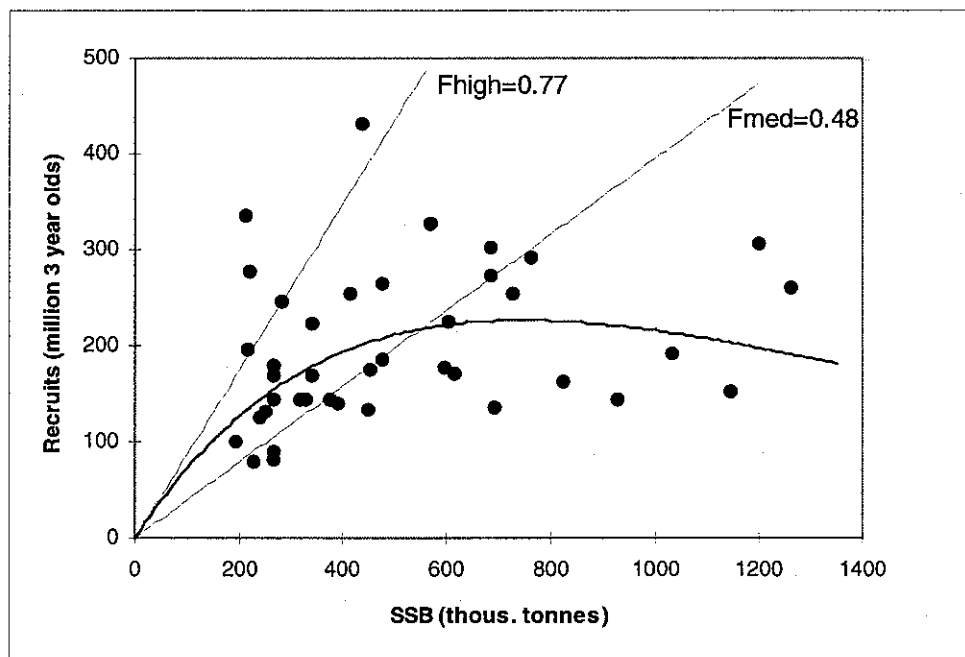
Data and assessment: Analytical assessment based on catch, survey and CPUE data. Catch-at-age data considered reliable.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

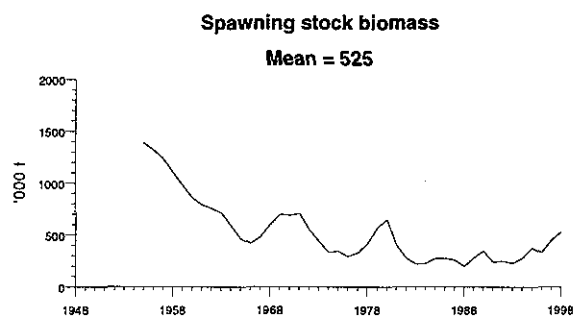
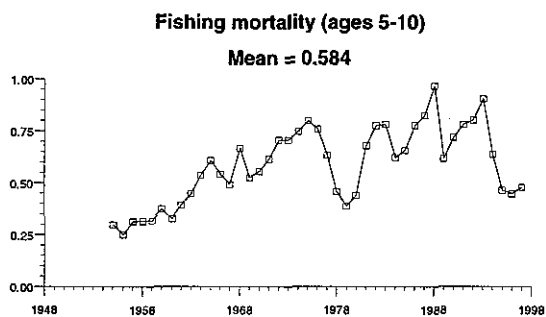
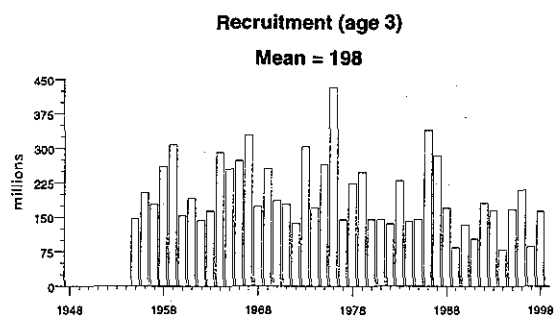
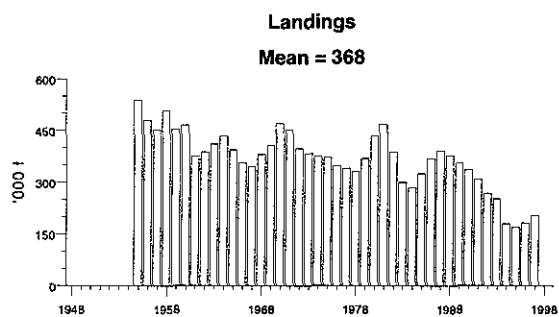
Catch data (Tables 3.2.2.b.1-2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed ¹ TAC	ACFM ² catch
1987	National advice	300	330	392
1988	National advice	300	350	378
1989	National advice	300	325	356
1990	National advice	250	300	335
1991	National advice	240	245	309
1992	National advice	250	265	268
1993	TAC	154	205	252
1994	TAC	150	165	179
1995	TAC	130	155	169
1996	TAC	162	155	182
1997	$F \leq 0.4$	186	186	204
1998	$F \leq 0.4$	218	218	
1999	$F \leq 0.44$	250		

¹National TAC for year ending 31 August; ²Calendar year. (Weights in '000 t).



Cod at Iceland. Division Va. SSB and recruitment. Historic data along with fitted stock-recruitment curve Ricker curve, accounting for cannibalism by immatures, and replacement lines corresponding to F_{med} and F_{high} .



Iceland cod (Division Va)

Yield and Spawning Stock Biomass

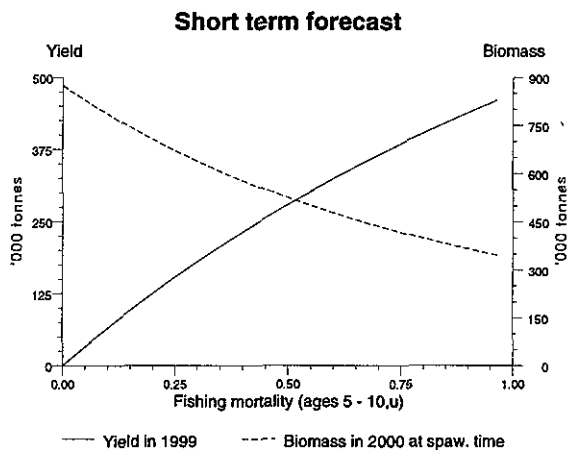
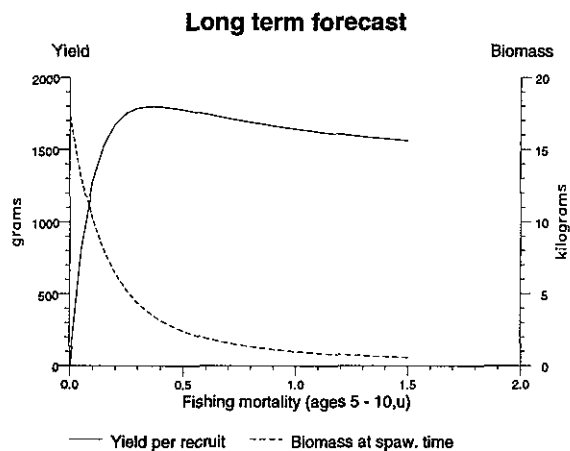


Table 3.2.2.b.1 Nominal catch (tonnes) of Cod in Division Va, by countries, 1984–1997 as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990
Belgium	254	207	226	597	365	309	260
Faroe Islands	2,041	2,203	2,554	1,848	1,966	2,012	1,782
Iceland	281,481	322,810	365,852	389,808	375,741	353,985	333,348
Norway	90	46	1	4	4	3	-
UK (Engl. and Wales)	2	1	-	-	-	-	-
Total	283,868	325,267	368,633	392,257	378,076	356,309	335,390
WG estimate	-	-	-	-	-	-	-

Country	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	548	222	145	136	-	-	-
Faroe Islands	1,323	883	664	754	739	599	-
Iceland	306,697	266,662	251,170	177,919	168,685	181,052	200,600
Norway	-	-	-	-	4	7	-
UK (Engl. and Wales)	-	-	+	-	-	-	-
Total	308,568	267,767	251,979	178,809	169,428	181,656	200,600
WG estimate	-	-	-	-	-	-	203,546 ²

¹Provisional.

²Additional landings by Iceland of 2311 t, Faroes of 628 t and Norway of 7 t are included.

Table 3.2.2.b.2 Cod in the Iceland Grounds (Fishing Area Va).

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 5-10
1955	147.23	1,385.11	538.13	0.298
1956	203.26	1,316.15	480.71	0.249
1957	178.41	1,236.92	451.91	0.314
1958	260.63	1,104.93	508.68	0.315
1959	307.53	985.60	452.50	0.317
1960	152.96	862.46	465.33	0.373
1961	191.09	792.41	374.92	0.325
1962	143.25	759.47	386.88	0.392
1963	163.64	709.06	410.05	0.447
1964	291.87	587.46	433.61	0.535
1965	255.47	462.76	393.64	0.607
1966	273.25	417.05	356.76	0.541
1967	328.47	480.47	345.02	0.492
1968	173.56	598.13	381.07	0.666
1969	255.16	697.03	406.41	0.525
1970	186.41	688.91	470.76	0.555
1971	178.61	706.10	453.05	0.614
1972	136.52	545.32	398.53	0.706
1973	303.38	438.32	383.45	0.706
1974	170.68	331.49	374.77	0.746
1975	265.50	342.14	370.99	0.797
1976	432.35	292.03	347.85	0.759
1977	144.74	329.04	340.05	0.632
1978	223.77	414.78	330.39	0.457
1979	248.03	571.29	368.06	0.388
1980	145.48	648.11	434.34	0.439
1981	144.76	396.02	468.66	0.679
1982	135.08	270.85	388.39	0.776
1983	229.01	217.36	300.06	0.781
1984	140.58	223.21	283.82	0.622
1985	145.62	272.36	325.27	0.656
1986	339.17	272.71	368.63	0.776
1987	283.16	257.51	392.26	0.825
1988	170.28	195.71	378.08	0.966
1989	83.93	278.61	355.95	0.617
1990	133.58	347.74	335.39	0.718
1991	103.47	234.04	308.56	0.780
1992	181.43	247.72	267.71	0.801
1993	165.64	225.91	251.98	0.904
1994	80.06	275.58	178.81	0.637
1995	167.01	374.97	169.43	0.464
1996	209.75	329.88	181.77	0.447
1997	86.15	448.38	203.55	0.478
1998	163.00	528.55	.	.
Average	198.25	524.99	367.82	0.584
Unit	Millions	1000 tonnes	1000 tonnes	-

3.2.3 Icelandic saithe (Division Va)

State of stock/fishery: The stock is at present considered to be harvested outside safe biological limits as defined by the proposed reference points. SSB is below B_{pa} and the fishing mortality has been substantially above F_{pa} (0.30) in recent years. SSB was at a historical low in 1996 and 1997, about 43% of the 1962–1997 average and at about 22% of historical maximum. Recruitment has been below the long-term average since 1989.

Management objectives: There are no explicit management objectives for this stock. However, for any management objective to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends an immediate reduction in fishing mortality to 60% of the 1997 fishing mortality ($F=0.22$) or less in order to ensure a stock increase in the short term. This corresponds to a catch of no more than 28 000 t in 1999.

Proposed reference points: Data on stock and recruitment do not show indications of impaired recruitment at values of SSB down to some 150 000 t. Given the poor recruitment in the past 9 years and the decrease in SSB to 90 000 t, there is concern that current SSB is outside safe biological limits. For this reason it is proposed that B_{pa} be set at 150 000 t, which corresponds to the observed low SSB values in 1978–1993, but not as low as the most recent values and B_{lim} be tentatively set at the lowest observed SSB, i.e. 90 000 t. Given that the stock appears to have sustained fishing mortality rates averaging 0.3 for 3 decades, it is proposed that $F=0.3$ be used for F_{pa} until better information has become available on the current state of stock and the recent impaired recruitment. Given the uncertainty in fishing mortality and biomass there is a need to reduce F to below F_{pa} when B is reduced to below B_{pa} .

Catch forecast for 1999: Basis: Catch(98)=30, $F(98)=0.76$, $F(97)=0.28$; SSB(98)=91; SSB(99)=104.

F(99)	Basis	Catch (99)	SSB (2000)
0.15	0.4F(97)	19	127
0.22	0.6F(97)	28	120
0.30	0.8F(97)	33	113
0.37	1.0F(97)	43	107
0.44	1.2F(97)	50	101

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: Saithe form part of a mixed demersal fishery although they may be targeted at certain times. Iceland extended its fisheries jurisdiction to 200 miles in 1975 and the mesh size in trawls was increased from 120 mm to 135 mm in 1976 and to 155 mm the following year. In order to protect juvenile fish, fishing is prohibited in areas where the number of small saithe in the catches exceeds a given percentage. From 1977 to 1983, demersal fishing was limited to a certain number of days each year, but this system, as implemented, failed to meet the objective of limiting fishing mortality and a transferable boat quota system was introduced in 1984. In recent years cod has been managed by a fixed harvesting strategy which may have resulted in increased fishing mortality on saithe.

Retrospective analysis has demonstrated a consistent underestimation of F . Taking this into account has led to a downward revision of the stock size. The allocated TAC has not been caught in recent years. This might partly be due to restrictions in the cod fishery which imply limitations on the saithe catches, and partly due to the fishery not being able to find saithe.

Time series analysis using catch at age data was used to estimate fishing mortalities. Present fishing mortalities have been underestimated in recent years and to correct for that the estimated fishing mortalities in 1997 were raised by a factor of 1.19.

The advice corresponds closely to the advice given in 1997, which recommended a reduction in F in stages towards F_{med} , with an initial reduction of 25% taken in 1998.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

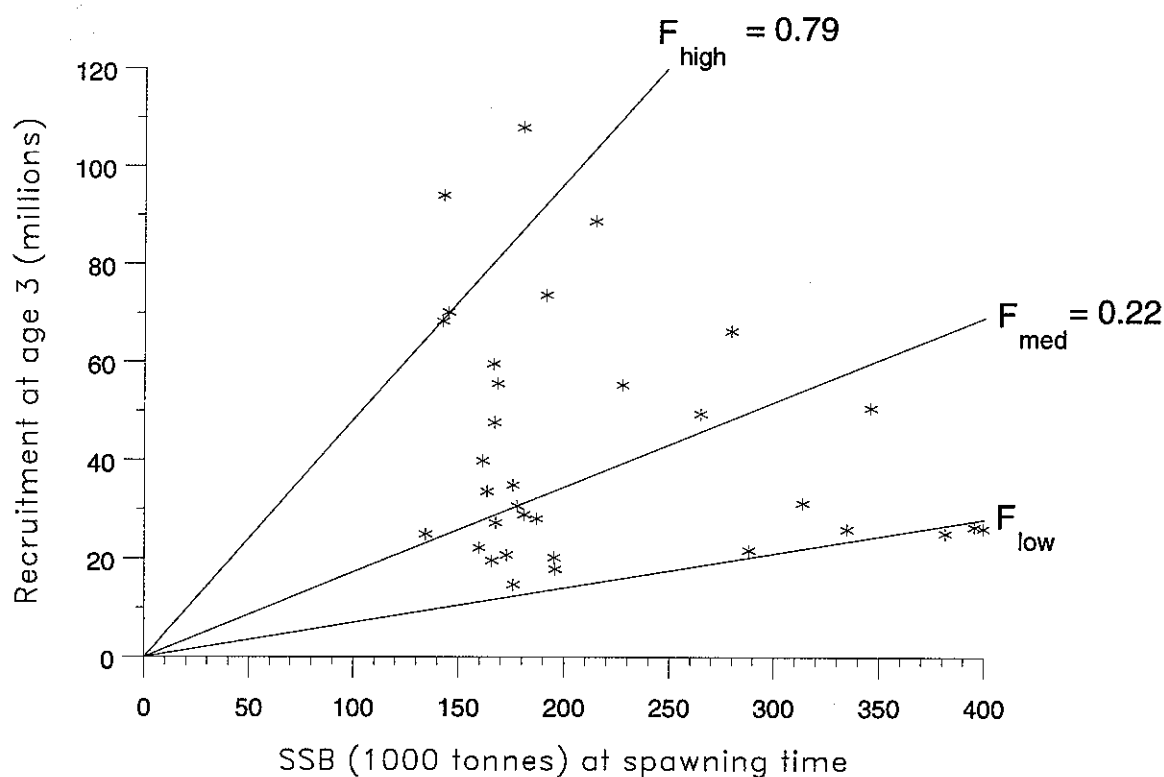
Catch data (Tables 3.2.3.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	TAC	64	70	81
1988	TAC	64	80	77
1989	TAC	80	80	82
1990	TAC	80	90	98
1991	TAC	87	65	103
1992	TAC	70	75 ²	80
1993	Marginal gains from increase in F	75 ¹	95 ²	72
1994	No measurable gains from increase in F	84 ¹	85 ²	64
1995	No measurable gains from increase in F	72 ¹	75 ²	49
1996	No measurable gains from increase in F	65 ¹	70 ²	40
1997	No measurable gains from increase in F	52 ¹	50 ²	37
1998	F less than $F_{med} = 0.23$	30 ³	30 ²	
1999	F less than 60% of 1997 F(0.37)	28		

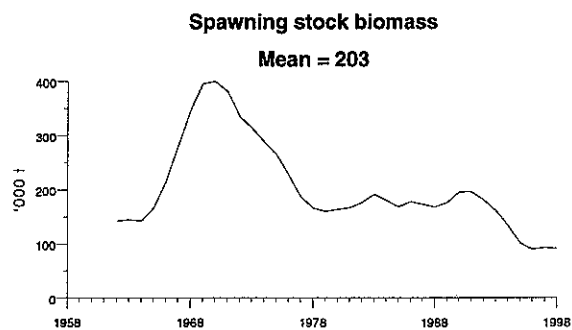
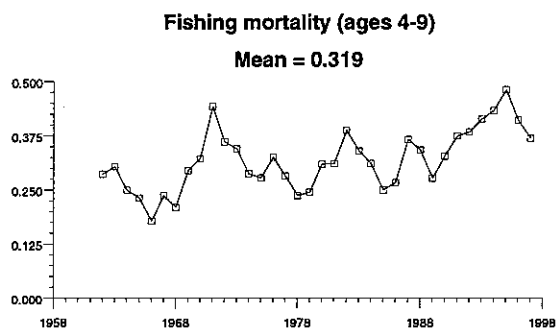
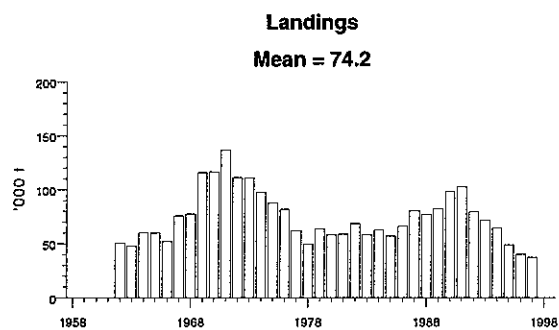
¹Catch at *status quo* F. ²For year ending 31 August; Weights in '000 t, ³Catch at 0.75F(97)

Icelandic saithe (Division Va)

Stock - Recruitment



(run: SVPSTJ02)



Icelandic saithe (Division Va)

Yield and Spawning Stock Biomass

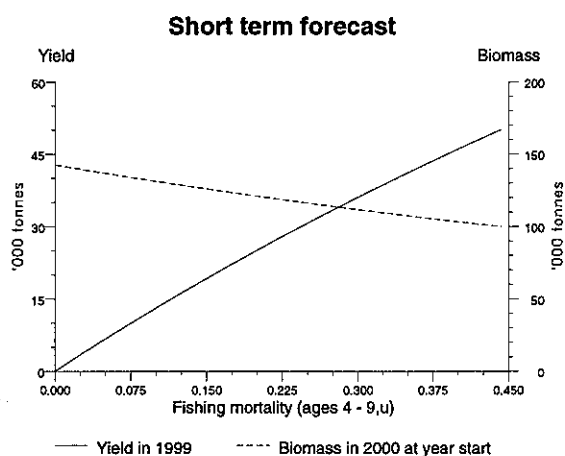
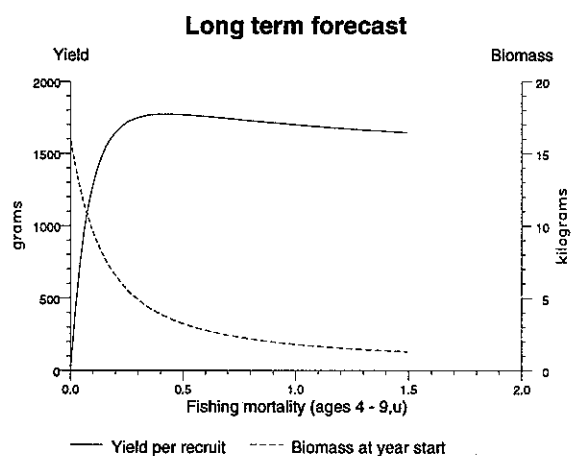


Table 3.2.3.1 Nominal catch (tonnes) of SAITHE in Division Va by countries, 1982–1997, as officially reported to ICES.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Belgium	201	224	269	158	218	217	268	369
Faroe Islands	3,582	2,138	2,044	1,778	783	2,139	2,596	2,246
France	23	-	-	-	-	-	-	-
Iceland	65,124	55,904	60,406	55,135	63,867	78,175	74,383	79,810
Norway	1	+	-	1	-	-	-	-
UK (Engl. and Wales)	-	-	-	29	-	-	-	-
Total	68,931	58,266	62,719	57,101	64,868	80,531	77,247	82,425
WG estimate	-	-	-	-	66,376 ²⁾	-	-	82,425

Country	1990	1991	1992	1993	1994	1995	1996	1997 ¹⁾
Belgium	190	236	195	104	30	-	-	-
Faroe Islands	2,905	2,690	1,570	1,562	975	1,161	801	716
France	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	1	-
Iceland	95,032	99,390	77,832	69,982	63,333	47,466	39,297	36,360
Norway	-	-	-	-	-	1	-	-
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
Total	98,127	102,316	79,597	71,648	64,338	48,628	40,099	37,076
WG estimate		102,737 ³⁾	-	-	-	-	-	37,158 ⁴⁾

1) Provisional

2) Additional catch of 1 508 t by Faroe Islands included

3) Additional catch of 451 t by Iceland included

4) Additional catch of 82 t by Faroe Islands included

Table 3.2.3.2 Saithe in the Iceland Grounds (Fishing Area Va).

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-9
1962	31.00	142.18	50.51	0.287
1963	84.11	144.61	48.01	0.304
1964	55.20	141.95	60.26	0.250
1965	94.06	166.00	60.18	0.231
1966	70.22	214.14	52.00	0.178
1967	68.33	279.29	75.71	0.237
1968	59.67	345.78	77.55	0.210
1969	88.75	395.28	115.85	0.295
1970	66.33	399.45	116.60	0.323
1971	50.64	381.38	136.76	0.443
1972	26.46	334.68	111.30	0.361
1973	26.11	313.69	110.89	0.345
1974	25.13	288.07	97.57	0.287
1975	25.93	264.70	87.95	0.278
1976	31.24	227.25	82.00	0.326
1977	21.67	186.68	62.03	0.282
1978	49.45	165.58	49.67	0.237
1979	55.31	159.55	63.50	0.245
1980	28.07	163.19	58.35	0.310
1981	19.56	166.51	58.99	0.311
1982	22.18	175.46	68.62	0.387
1983	33.64	190.88	58.27	0.340
1984	47.68	179.73	62.72	0.311
1985	34.96	168.06	57.10	0.250
1986	73.70	177.37	66.38	0.267
1987	107.94	172.51	80.56	0.367
1988	55.61	167.29	77.25	0.342
1989	30.68	175.81	82.43	0.277
1990	20.70	195.07	98.13	0.328
1991	27.25	195.55	102.74	0.374
1992	14.66	180.75	79.60	0.384
1993	20.17	161.12	71.65	0.414
1994	17.81	134.12	64.34	0.433
1995	28.90	101.02	48.65	0.481
1996	39.91	89.85	40.10	0.411
1997	24.96	92.69	37.16	0.369
1998	25.00	90.71	.	.
Average	43.32	203.46	74.20	0.319
Unit	Millions	1000 tonnes	1000 tonnes	-

3.2.4 Greenland halibut in Sub-areas V and XIV

State of stock/fishery: The stock is at present considered to be harvested outside safe biological limits as defined by the proposed reference points. Fishing mortality is at a record high of 0.47 and is above $F_{pa} = 0.37$ and may not be sustainable. Year classes currently supporting or entering the fishery (1986–1990) are weak. The SSB has been decreasing since 1988 and is close to a record low.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and the spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES last year recommended a significant reduction in fishing mortality. In light of the continuing high F above $F_{pa}=0.37$ (F 4-8, 1997 = 0.47), low recruitment in recent years and SSB being below B_{pa} of 80 000 t, this advice still stands. Considering that SSB is below B_{pa} the fishing mortality should be decreased below F_{pa} to 0.16 in accordance to the status of the SSB with respect to B_{pa} and B_{lim} . This corresponds to limiting the total catch in all areas to no more than 11 000 t in 1999.

Proposed reference points: B_{pa} is suggested to be set at 80 000 t, based on the lowest estimated biomass in recent years. F_{pa} should be set at $F_{med} = 0.37$.

Relevant factors to be considered in management: If the stock situation is to improve, total catches need to be limited. There is no consistent management in the three areas (Divisions Va, Vb and XIVb). At present the fishery in Division Vb is subject to effort limitation and the fisheries in Divisions XIVb and Va are catch limited. The agreed TAC in Division Va has been close to the recommended TAC for the entire area. In effect there is no control over total fishing mortality for this stock.

Catch forecast for 1999: Basis: Catch (98)=23, $F(98)=0.79$, $F(97)=0.37$, $B(98) = 131$.

F(99)	Basis	Catch(99)	SSB(2000)
0.00	0.0F(97)	0	76
0.09	0.2F(97)	6	72
0.14	0.3F(97)	9	69
0.16	0.35F(97)	11	68
0.19	0.4F(97)	12	67
0.28	0.6F(97)	18	64
0.37	0.8F(97)	23	60
0.47	1.0F(97)	27	57

(Weights in '000 t).

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: Traditionally, Greenland halibut were caught by demersal trawl with most of the fishery taking place in Division Va. In recent years longline fisheries have developed in Divisions Va and XIVb, in addition to an increasing trawl fishery in Division XIVb. A new fishery using longlines has developed at the Reykjanes Ridge in Divisions Va and XIVb and Sub-area XII.

There is a strong need for survey data, for monitoring both the adult stock and recruitment. In recent years recruitment to the fishery seems to have been poor and the stock is at a low level. If recruitment failure occurs then this will only be detected in the fishery some 5–10 years after it occurs. There is considerable uncertainty in the estimates of SSB due to difficulty in maturity determination, but there is no doubt that the stock is at a low level.

Analytical assessment based on catch at age data and one tuning fleet. Data on biological parameters (age, length, weight etc.) are recently available for Sub-areas V and XIV. This is an improvement from former assessments. Better information on maturity at age and recruitment is required.

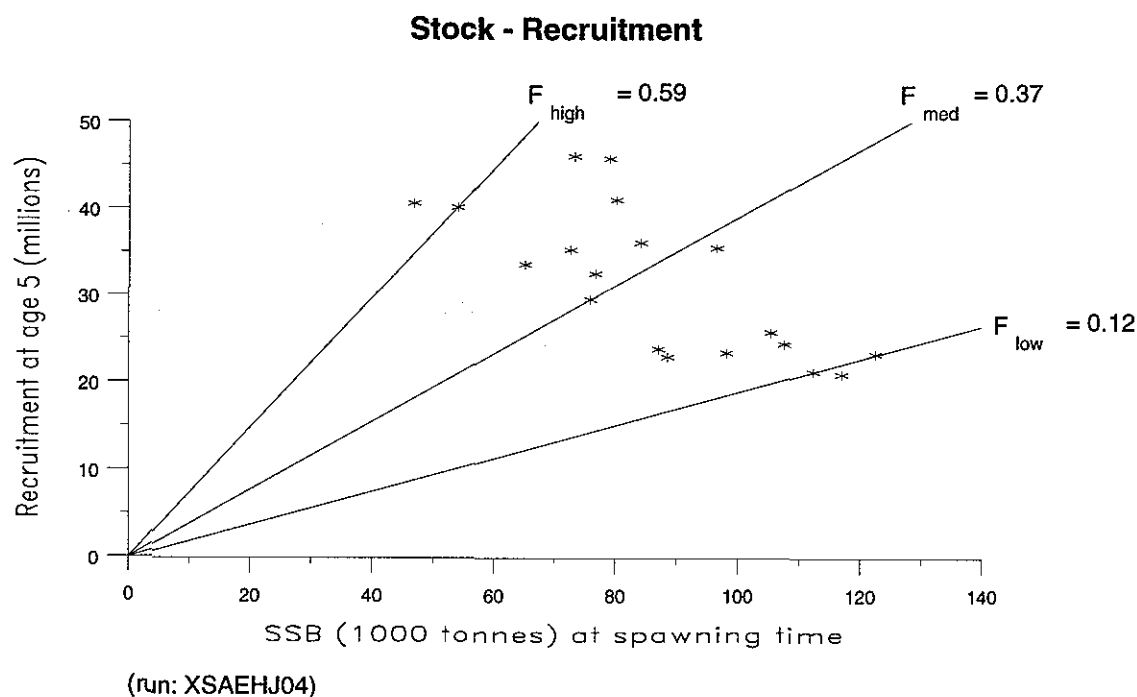
Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

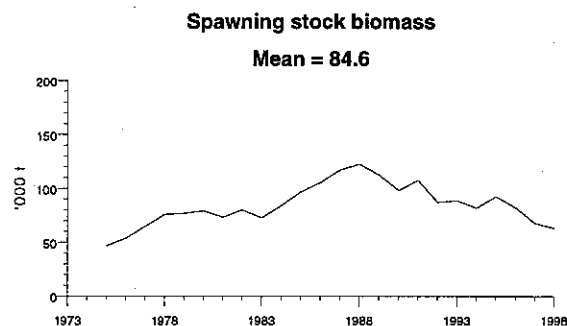
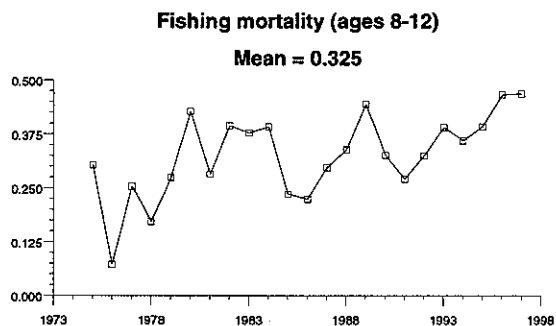
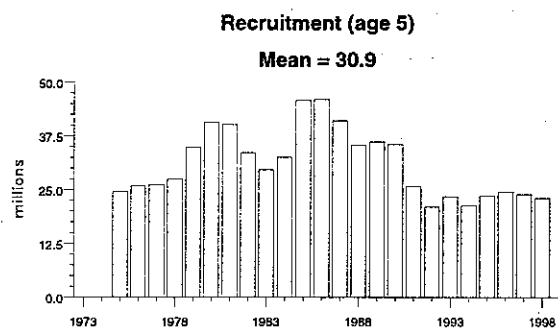
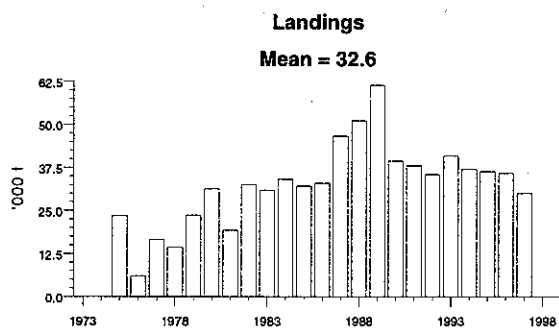
Catch data (Tables 3.2.4.1-5):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC Va	Catch in Va	ACFM catch V,XIV
1987	No increase in F	28	30	45	47
1988	No increase in F	28	30	49	51
1989	TAC	33	30	59	61
1990	No advice	-	45	37	39
1991	TAC	40	30	35	38
1992	TAC	30	25	32	35
1993	No increase in effort	28 ¹	30 ²	34	41
1994	No increase in effort	34 ¹	30 ²	29	37
1995	TAC	32	30 ²	27	36
1996	TAC	21	20 ²	22	36
1997	60% reduction in F from 1995	13	15 ²	17	30
1998	70% reduction in F from 1996	11			
1999	65% reduction in F from 1997	11			

¹Catch at *status quo* F. ²Year ending 31 August. Weights in '000 t

Greenland halibut in Sub-areas V and XIV





Greenland halibut in Sub-areas V and XIV

Yield and Spawning Stock Biomass

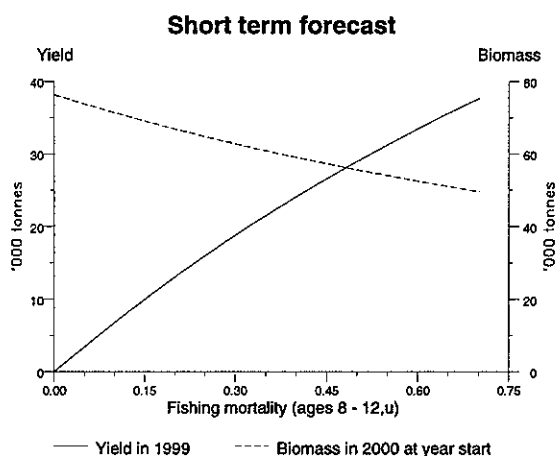
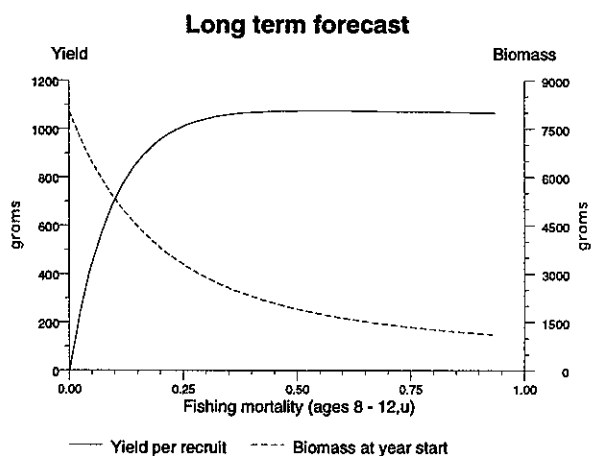


Table 3.2.4.1 GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Sub-areas V, XII and XIV
1981-1996, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-	-	6	+
Faroe Islands	767	1,532	1,146	2,502	1,052	853	1,096	1,378
France	8	27	236	489	845	52	19	25
Germany	3,007	2,581	1,142	936	863	858	565	637
Greenland	+	1	5	15	81	177	154	37
Iceland	15,457	28,300	28,360	30,080	29,231	31,044	44,780	49,040
Norway	-	-	2	2	3	+	2	1
Russia	-	-	-	-	-	-	-	-
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-
Total	19,239	32,441	30,891	34,024	32,075	32,984	46,622	51,118
Working Group estimate	-	-	-	-	-	-	-	-

Country	1989	1990	1991	1992	1993	1994	1995	1996 ¹	1997 ¹
Denmark	-	-	-	-	-	-	-	1	-
Faroe Islands	2,319	1,803	1,566	2,128	4,405	6,241	3,763	6,148	4,971
France	-	-	-	3	2	-	-	29	-
Germany	493	336	303	382	415	648	811	3,368	3,365
Greenland	11	40	66	437	288	867	533	1,162	991
Iceland	58,330	36,557	34,883	31,955	33,987	27,778	27,383	22,055	18,462
Norway	3	50	34	221	846	1,171 ¹	1,810	2,157	1,862
Russia	-	-	-	5	-	-	10	424	70
UK (Engl. and Wales)	-	27	38	109	811	513	1,436	386	-
UK (Scotland)	-	-	-	19	26	84	232	25	-
United Kingdom	-	-	-	-	-	-	-	-	243
Total	61,156	38,813	36,890	35,259	40,780	37,302	35,978	35,755	29,964
Working Group estimate	61,396	39,326	37,950	35,423	40,817	36,957	36,288	35,826 ²	-

Table 3.2.4.2 GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Division Va 1981–1997, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988
Faroe Islands	325	669	33	46	-	-	15	379
Germany	-	-	-	-	-	-	-	-
Greenland	-	-	-	-	-	-	-	-
Iceland	15,455	28,300	28,359	30,078	29,195	31,027	44,644	49,000
Norway	-	-	+	+	2	-	-	-
Total	15,780	28,969	28,392	30,124	29,197	31,027	44,659	49,379
Working Group estimate	-	-	-	-	-	-	-	-

Country	1989	1990	1991	1992	1993	1994	1995	1996 ¹	1997 ¹
Faroe Islands	719	739	273	23	166	910	13	14	26
Germany	-	-	-	-	-	1	2	4	-
Greenland	-	-	-	-	-	1	-	-	-
Iceland	58,330	36,557	34,883	31,955	33,968	27,696	27,376	22,055	16,603
Norway	-	-	-	-	-	-	-	-	-
Total	59,049	37,296	35,156	31,978	34,134	28,608	27,391	22,073	16,629
Working Group estimate	59,272 ²	37,308 ³	35,413 ⁴	-	-	-	-	22,072	-

1) Provisional data

2) Includes 223 t catch by Norway.

3) Includes 12 t catch by Norway.

4) Includes additional catch of 257 t by Iceland.

Table 3.2.4.3 GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Division Vb 1981–1997, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-	-	6	+
Faroe Islands	442	863	1,112	2,456	1,052	775	907	901
France	8	27	236	489	845	52	19	25
Germany	114	142	86	118	227	113	109	42
Greenland	-	-	-	-	-	-	-	-
Norway	2	+	2	2	2	+	2	1
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-
Total	566	1,032	1,436	3,065	2,126	940	1,043	969
Working Group estimate	-	-	-	-	-	-	-	-

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	-	-	-	-	-	-	-	-	-
Faroe Islands	1,513	1,064	1,293	2,105	4,058	5,163	3,603	6,004	4,750
France ⁶	...	...	...	3	2	...	...	29 ¹	-
Germany	73	43	24	71	24	8	1	21	41
Greenland	-	-	-	-	-	-	-	-	-
Norway	3	42	16	25	335	53	142	281 ¹	42
UK (Engl. and Wales)	-	-	-	1	15	-	31	122	-
UK (Scotland)	-	-	-	1	-	-	27	12	-
United Kingdom	-	-	-	-	-	-	-	-	26
Total	1,589	1,149	1,333	2,206	4,434	5,224	3,804	6,469 ¹	4,859
Working Group estimate	1,606 ²	1,282 ³	1,662 ⁴	2,269 ⁵	-	-	3,820 ⁷	-	-

1) Provisional data

2) Includes 17 t taken by France

3) Includes 133 t taken in Division IIa (Faroe waters).

4) Includes 317 t taken in Division IIa (Faroe waters) + France 12 t.

5) Includes 63 t taken in Division IIa (Faroe waters).

6) Quantity unknown 1989-1991 and 1993-1994.

Table 3.2.4.4 GREENLAND HALIBUT. Nominal catches (tonnes) by countries, in Sub-area XIV 1981–1997, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988
Faroe Islands	-	-	-	-	-	78	74	98
Germany	2,893	2,439	1,054	818	636	745	456	595
Greenland	+	1	5	15	81	177	154	37
Iceland	-	-	1	2	36	17	136	40
Norway	-	-	-	+	-	-	-	-
Russia	-	-	-	-	-	-	-	-
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-
Total	2,893	2,440	1,060	835	753	1,017	820	770
Working Group estimate	-	-	-	-	-	-	-	-

Country	1989	1990	1991	1992	1993	1994	1,995	1,996	1,997 ¹
Denmark	-	-	-	-	-	-	-	1	+
Faroe Islands	87	-	-	-	181	168	147	130	148
Germany	420	293	279	311	391	639	808	3,343	3,324
Greenland	11	40	66	437	288	866	533	1,162	991
Iceland	+	-	-	-	19	82	7	-	1,859
Norway	-	8	18	196	511	1,118 ¹	1,668 ¹	1,874 ⁹	1,820 ¹⁰
Russia	+	-	-	5	-	-	10	424	70
UK (Engl. and Wales)	-	27	38	108	796	513	1405	264	-
UK (Scotland)	-	-	-	18	26	84	205	13	-
United Kingdom	-	-	-	-	-	-	-	-	217
Total	518	368	401	1,075	2,212	3,470	4,783	7,211	8,429
Working Group estimate	-	736 ²	875 ³	1,176 ⁴	2,249 ⁵	3,125 ⁶	5,077 ⁷	7,283 ⁸	-

1) Provisional data

2) Includes 370 t catches taken by Japan

3) Includes 315 t catch taken by Japan and 159 t by other countries as reported to Greenland.

4) Indicates additional catches taken by Germany (96 t) and UK (17 t) as reported to Greenland.

5) Indicates additional catches taken by Germany (37 t), Norway (238 t), UK (182 t) and Japan (62 t) as reported to Greenland.

6) Total reported to Greenlandic authorities are used in assessment: 159 t trawl (Norwegian charter), 205 t gillnets (Norwegian charter).
405t from Norway not included in working group estimate.

7) Includes 273 t offshore gillnets (Greenland charter)

8) Working group estimates as in Table 6.1.5. Includes 72 t by Germany

9) Inside 200 EEZ: 1505 t. Outside 200 EEZ: 369t.

10) Inside 200 EEZ: 1756t, Outside 200 EEZ: 64t.

Table 3.2.4.5 Greenland halibut (Fishing Areas V and XIV).

Year	Recruitment Age 5	Spawning Stock Biomass	Landings	Fishing Mortality Age 8-12
1975	24.54	46.78	23.49	0.303
1976	25.83	53.96	6.05	0.072
1977	26.13	65.05	16.58	0.254
1978	27.51	75.99	14.35	0.172
1979	34.85	76.65	23.62	0.274
1980	40.62	79.10	31.25	0.428
1981	40.14	73.25	19.24	0.282
1982	33.60	80.14	32.44	0.394
1983	29.60	72.54	30.89	0.378
1984	32.53	84.12	34.02	0.391
1985	45.75	96.57	32.08	0.235
1986	46.03	105.44	32.98	0.224
1987	41.01	117.02	46.62	0.297
1988	35.29	122.52	51.12	0.338
1989	36.12	112.39	61.40	0.444
1990	35.50	98.25	39.33	0.326
1991	25.79	107.67	37.95	0.271
1992	21.01	87.18	35.42	0.324
1993	23.35	88.66	40.82	0.390
1994	21.28	81.90	36.96	0.360
1995	23.49	92.42	36.29	0.392
1996	24.46	82.27	35.83	0.466
1997	23.94	67.50	29.96	0.468
1998	23.00	62.98	.	.
Average	30.89	84.60	32.55	0.325
Unit	Millions	1000 tonnes	1000 tonnes	-

3.2.5 Redfish in Sub-areas V, VI, XII and XIV

3.2.5.a Overview

Stocks: There are two main commercial species of redfish in Sub-areas V, XII and XIV, *Sebastes marinus* and *Sebastes mentella*. There are indications that *S. marinus* includes a genetically distinct component, "giant" *S. marinus*. The species *S. mentella* is considered to consist of at least two stocks, deep-sea *S. mentella* and oceanic *S. mentella*. In Division Va a small fishery has recently developed on the third redfish species, *S. viviparus*. Thus, the fisheries in Sub-areas V, XII and XIV operate on several stocks of redfish.

Of these stocks, *S. marinus* is mainly distributed in the shallower shelf areas down to about 500 m depth, although the component of "giants" also occurs at greater depths on the Reykjanes Ridge.

The oceanic *S. mentella* occur pelagically in the open Irminger Sea from the surface down to 1 000 m depth.

The deep-sea *S. mentella* tends to occur in deeper waters than the other two stocks. Thus the deep-sea *S. mentella* is found in the open Irminger Sea at depths below 500 m, i.e. overlapping the distribution of the oceanic *S. mentella*. The distribution of the deep-sea *S. mentella* also includes the deeper parts of the slopes up to the distribution area of *S. marinus*.

The figure following this section gives an overview of the stock structure in the North-Western area.

Historical development of the fishery: Redfish in **Division Va** are mainly caught by trawlers using demersal and pelagic trawl. *S. marinus* is the predominant species down to depths of about 500 m whereas deep-sea *S. mentella* contributes most to the catches at greater depths. The Icelandic fleet takes more than 90% of the total catches but vessels from Belgium and the Faroes also fish in Division Va. In recent years the Icelandic fleet has also caught oceanic *S. mentella* in the deeper parts of Division Va using pelagic trawl.

Faroeese trawlers using otter trawl in **Division Vb** target *S. marinus* and deep-sea *S. mentella*. These catches constitute more than 90% of the redfish catches in this division. Small trawlers from Germany occasionally target these stocks. The remainder of the total catches is mainly by-catch in other demersal fisheries by other countries.

Redfish catches taken by several countries in **Sub-area VI** are considered to be mainly by-catch in demersal fisheries. These catches are negligible in comparison with redfish catches in Sub-areas V, XII and XIV.

Catches in **Sub-area XII** are mainly oceanic *S. mentella* and are taken by trawlers using pelagic trawls. At least 13

fleets have joined this fishery mainly from Russia, Germany, Iceland and Norway.

In **Sub-area XIV**, as in Division Va, all three redfish stocks are exploited. On the Greenland shelf and slopes, *S. marinus* dominates the trawl catches above 500 m whereas deep-sea *S. mentella* dominates below 500 m. Most of the catches are taken by German freezer trawlers. In 1982 a pelagic trawl fishery started exploiting the oceanic *S. mentella* in the deeper parts of Sub-area XIV. Since 1990 the main fleets are from Russia, Norway, Iceland and Germany. In recent years, vessels from several other countries have joined this fishery, mainly outside the EEZs of Iceland and Greenland.

In **Sub-areas XII and XIV**, a fishery has developed at depths greater than 500 m to target *S. mentella* which is less infested by parasites.

A new directed longline and gillnet fishery for "Giant" *S. marinus* started in 1996 on the Reykjanes Ridge.

Landings: The total landings from the redfish stock complex (i.e. redfish in all sub-areas) are given in Tables 3.2.5.a.1–11.

Conversion factors: In the landing statistics, conversion factors are used to convert the product weights into fresh round weights. However, in many cases the different countries do not use the same conversion factors for the same product, and there are doubts about the conversion factors used. **ICES recommends that each country should investigate and conduct scientific work to find the best factors for a particular product and fishery, and that the results are published and made available for assessment purposes.**

Stock distribution with respect to national fisheries zones: The distribution of the *S. marinus* and deep-sea *S. mentella* catches in the national fisheries zones is reflected in the catch statistics. Likewise, catches reported in Divisions Va and Vb are taken within the national fisheries zones of Iceland and the Faroes, respectively. In Sub-area VI the catches could be taken within the fisheries zone of the EU or in international waters.

The distribution of deep-sea *S. mentella* extends into international waters in the Irminger Sea.

Catches from the oceanic *S. mentella* stock have so far all been taken in Sub-areas XII and XIV, and recently also in Division Va. In Sub-areas XII and XIV they are taken almost exclusively in international waters, i.e. outside the national fisheries zones of the neighbouring countries with

the exception of some catches within the national fisheries zone of Greenland.

From distribution information available it is obvious that a substantial part of the adult oceanic *S. mentella* stock is, at least at times, to be found within the national fisheries zones of Iceland and Greenland. In the present state of knowledge, ICES has difficulties in quantifying the proportion of the adult stock occurring in the respective national zones.

Relationship between deep-sea *S. mentella* in the Irminger Sea and along the coasts:

Ongoing research on the stock structure of deep-sea *S. mentella* has not yet provided quantitative or even qualitative information on the inter-relationships between the components in the Irminger Sea and along the coasts.

Monitoring of the pelagic fishery for *S. mentella* in the Irminger Sea: NEAFC requests ICES for advice on an appropriate monitoring scheme for the pelagic fishery for *S. mentella* in the Irminger Sea considering current knowledge of the stock complexity.

The different countries currently participating in the pelagic *S. mentella* fishery in the Irminger Sea have their own national programs for biological sampling and collection of fishery data but with varying degree of completeness.

The following gives an overview of the different nations current sampling programs:

In addition to the national sampling program of commercial catches, data from the **German** fishery have been collected within the frame of an EU-financed project since 1995 applying an effort of one man-month per quarter. Data recordings are performed on board fishing vessels and have provided information on effort, catch, CPUE, fish size, sexual composition, maturity and infestation rates by area, year, quarter and depth.

Spanish national sampling program of commercial catches in Irminger Sea started in 1995 when Spanish trawlers began to fish in the area. The effort of the sampling was high in 1995 and reduced to a man-month to cover the four vessels operating in Irminger Sea in 1996. The observer move every month and a half to a different vessel, thus samples from two vessels are taken every quarter. Data have provided information on effort, catch, CPUE, fish size, sexual composition, maturity and infestation rates by area, year, quarter and depth. Difficulties came from the fact that usually in the beginning of the year the Spanish commercial vessels move from NAFO areas to Irminger Sea directly and therefore it is not possible to place an observer onboard.

Icelandic national biological sampling program from catches in the Irminger Sea, conducted both by

fishermen and observers onboard, have been ongoing since 1995. Samples are collected by depth and analysed by the Marine Research institute (length, weight, sex, maturity, infestation rate etc.). In addition, all Icelandic vessels participating in the fishery provides information about the vessels, their gear, effort, catch, depth, and environmental observations. Those data are all available on a computer system on haul basis and the reported catches in the logbooks counts for 80-90% of the landings. In 1997 and also in 1998, program is ongoing to measure discards by depth and the results from 1997 are presented in Section 7.4 in the Working Group report.

At present there is no national **Russian** project to monitor the pelagic fishery for the redfish in the Irminger Sea. Nevertheless 1-2 scientific observers from the Research Institutes in Murmansk and Kaliningrad collect the biological data onboard of commercial trawlers every year.

Norway and the Faroes have at present no sampling program for their fishery in the Irminger Sea. In addition to catch statistics (based on both landings and log-books) information about e.g., catch, effort and geographical position based on log-books are the only data provided. In the Faroes logbooks start and stop depth are recorded for every trawl haul, while in the Norwegian log-books a code for the depth-interval (less than 500 m, 500-600 m or deeper than 600 m) is recorded.

For **other countries** only total landings statistics for the total area are available.

ICES sees an urgent need for a stronger scientific monitoring of this fishery and makes the following proposal:

- A scientific observer program to be coordinated by NEAFC should be developed to adequately sample the effort exerted in the area. As a first guideline ICES suggests a coverage of at least 25% appropriately stratified by nation, fleet and season. An observer program is necessary to provide required quality information about catch rates (CPUE), improved biological sampling by depth, improvement and documentation of the conversion factors used to convert fillets or gutted weight to round weight, and to report the amount and size of the fish discarded.
- For each vessel sampled the observer should collect data for estimation of the conversion factor for the different fish products.
- Length measurements of the catch should be made regularly, especially if there is a shift in the fishery behaviour of the vessel (shift in common tow depth, change of area etc.)

- Biological data should be collected, especially otoliths, maturation, sex composition and recording of parasite infestation.

- Minimum and maximum fishing depth together with the dominating trawling depth should be recorded for each haul. It is most important that this depth information is recorded in the official log-books.

Redfish in the area East Greenland-Iceland -Faroe Island

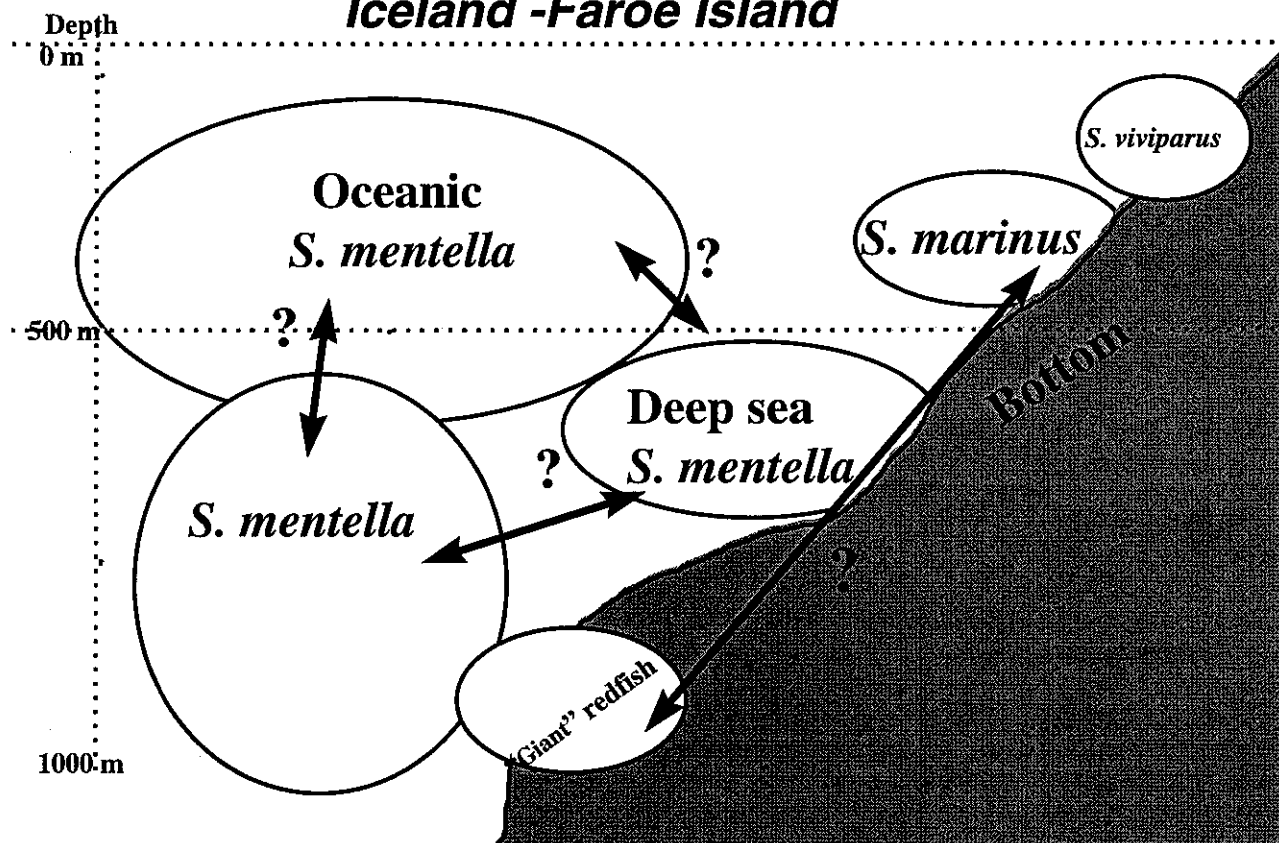


Table 3.2.5.a.1 REDFISH. Nominal catches (tonnes) by countries, in Division Va 1984-1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990
Belgium	291	400	423	398	372	190	70
Faroe Islands	686	291	144	332	372	394	624
Germany, Fed. Rep.	-	-	-	-	-	-	-
Iceland	108,270	91,381	85,992	87,768	93,995	91,536	90,891
Norway	12	8	2	7	7	1	-
Total	109,259	92,080	86,561	88,505	94,746	92,121	91,585

Country	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	146	107	96	50	-	-	-
Faroe Islands	412	389	438	202	521	309	242
Germany, Fed. Rep.	-	-	-	46	229	233	-
Iceland ²	96,770	94,382	96,577	95,091	89,474	67,757	71,200
Norway	-	-	-	-	-	134 ¹	-
Total	97,328	94,878	97,111	95,389	90,224	68,433	71,442

¹ Provisional

² Oceanic *S. mentella* not included

Table 3.2.5.a.2 Landings of REDFISH (in tonnes) by countries in Division Va as used by the Working Group.

Year	Belgium	Faroes	FRG	Iceland	Norway	Total
1978	1,549	242		33,318	93	35,202
1979	1,385	629		62,253	43	64,310
1980	1,381	1,055		69,780	33	72,249
1981	924	1,212		93,349	32	95,517
1982	283	1,046		115,051	11	116,391
1983	389	1,357		122,749	32	124,527
1984	291	686		108,270	12	109,259
1985	400	291		91,381	8	92,080
1986	423	253		85,992	2	86,670
1987	398	332		87,768	7	88,505
1988	372	372		94,011	7	94,762
1989	190	394		91,536	1	92,121
1990	70	624		90,891	0	91,585
1991	146	412		96,770	0	97,328
1992	107	389		96,350 ²	0	96,846
1993	96	438		99,180 ³	0	99,714
1994	50	202	46	110,563 ⁴	0	110,861
1995	0	521	229	91,017 ⁵	0	91,767
1996	0	309	233	72,367 ⁶	0	72,909
1997 ¹		242	0	87,599 ⁷	0	87,841

¹ Provisional data

² Including 1968 tonnes oceanic *S. mentella*.

³ Including 2603 tonnes oceanic *S. mentella*.

⁴ Including 15472 tonnes oceanic *S. mentella*.

⁵ Including 1543 tonnes oceanic *S. mentella*.

⁶ Including 4610 tonnes oceanic *S. mentella*.

⁷ Including 15253 tonnes oceanic *S. mentella*.

Table 3.2.5.a.3 REDFISH. Nominal catches (tonnes) by countries, in Division Vb 1982-1997, as officially reported to ICES.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	-	-	-	-	36	176	8	-
Faroe Islands	3,999	4,642	8,770	12,634	15,224	13,477	12,966	12,636
France	204	439	559	1,157	752	819	582	996
Germany, Fed. Rep. ²	4,660	4,300	4,460	5,091	5,142	3,060	1,595	1,191
Iceland	1	-	-	-	-	-	-	21
Norway	7	3	1	4	2	5	5	-
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
USSR	-	-	142	-	-	-	-	-
Total	8,871	9,384	13,932	18,886	21,156	17,537	15,156	14,844
Country	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Denmark	+	-	-	-	-	-	-	-
Faroe Islands	10,017	14,090	15,279	9,687	8,872	7,978	7,286	7,216
France ¹	909	473	114	32	90	111	62	30
Germany, Fed. Rep. ²	441	447	450	239	155	91	189	36
Norway	21	20	34	16	31 ¹	34	35 ¹	25
UK (E/W/NI)	-	2	21	28	1	2	40	.....
UK (Scotland)	+	1	8	1	18	24	43	....
United Kingdom								36
USSR/Russia ³	-	-	15	44	3			3 ⁴
Total	11,388	15,033	15,921	10,047	9,170	8,240	7,655	7,346

¹ Provisional

² Includes former GDR

³ As from 1991.

⁴ Reported to the Faroese Coastal Guard Service

Table 3.2.5.a.4 Landings of REDFISH (in tonnes) by countries in Division Vb as used by the Working Group.

Year	Denmar	Faroese	France	FRG	Iceland	Lithuania	Norway	Nederl	UK	Russia ²	Total
1978	0	1,525	448	7,767	0		9	0	57	0	9,806
1979	0	5,693	862	6,108	0		11	0	0	0	12,674
1980	0	5,509	627	3,891	0		12	0	0	0	10,039
1981	0	3,232	59	3,841	0		13	0	0	0	7,145
1982	0	3,999	204	5,230	1		7	0	0	0	9,441
1983	0	4,642	439	4,300	0		3	0	0	0	9,384
1984	0	8,770	559	4,460	0		1	0	0	142	13,932
1985	0	12,634	1,157	5,091	0		4	0	0	868	19,754
1986	36	15,224	752	5,142	0		2	0	0	320	21,476
1987	176	13,478	819	3,060	0		5	0	0	0	17,538
1988	8	13,318	582	1,595	0		5	0	0	0	15,508
1989	0	12,860	996	1,191	0		21	0	0	0	15,068
1990	0	10,364	909	441	0		21	0	0	2	11,737
1991	0	14,090	473	447	0		20	0	3	4	15,037
1992	0	15,279	114	450	0	4	35	35	39	47	16,003
1993	0	10,040	32	239	0	0	16	22	29	44	10,422
1994	0	7,978	90 ³	155	0	0	31	0	19	3	8,276
1995	0	7,286	111 ³	91	0	0	34	0	26	9 ³	7,557
1996	0	7,286	62 ³	189	0		35		83	0	7,655
1997 ¹	0	7,216	30 ³	36	0		25		36	3 ³	7,346

¹ Provisional data.

² USSR 1978-1991, Russia since 1992.

³ Reported to Faroese coastal guard service.

Table 3.2.5.a.5 REDFISH. Nominal catches (tonnes) by countries, in Sub-area VI 1982-1997, as officially reported to ICES.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	-	-	19	18	-	-	1	61
France	44	93	102	397	480	1,032	1,024	726
Germany, Fed. Rep.	604	359	563	76	24	-	16	1
Ireland	-	-	-	-	-	-	-	-
Norway	4	2	9	-	14	2	1	2
Spain	-	2	-	-	-	-	-	-
UK (Engl. and Wales)	2	-	1	1	2	3	75	1
UK (Scotland)	-	-	1	-	10	17	6	6
Total	654	456	695	492	530	1,054	1,123	797

Country	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Faroe Islands	-	22	6	-	-	2	-	-
France ¹	684	483	127	268	555	596	558	-
Germany, Fed. Rep.	6	8	-	77	87	5	9	1
Ireland	-	-	1	1	-	4	-	-
Norway	5	+	4	3	2 ¹	8 ¹	6 ¹	5
Spain	-	-	-	-	-	-	-	-
UK (E/W/NI)	29	12	4	4	9	105	54	...
UK (Scotland)	6	40	32	94	118	500	603	...
United Kingdom	-	-	-	-	-	-	-	533
Total	730	565	174	447	771	1,220	1,230	539

¹ Provisional

Table 3.2.5.a.6 Landings of REDFISH (in tonnes) by countries in Sub-area VI as used by the Working Group.

Year	Faroes	France	FRG	Ireland	Norway	Spain	UK	Total
1978	0	307	18	0	4	0	2	331
1979	1	215	604	0	4	0	1	825
1980	0	202	907	0	2	0	0	1,111
1981	0	24	983	0	3	1	0	1,011
1982	0	44	604	0	4	0	2	654
1983	0	93	359	0	2	2	0	456
1984	19	102	563	0	9	0	2	695
1985	18	397	76	0	0	0	1	492
1986	0	480	24	0	14	0	12	530
1987	0	1,032	0	0	2	0	20	1,054
1988	1	1,024	16	0	1	0	81	1,123
1989	61	726	1	0	2	0	7	797
1990	0	684	6	0	5	0	35	730
1991	22	483	8	0	+	0	52	565
1992	6	127	0	1	4	0	36	174
1993	0	268	77	1	3	0	98	447
1994	0	555	87	0	2	0	127	771
1995	2	596	5	4	8	0	605	1,220
1996	550	558	9	-	6	-	657	1,780
1997 ¹	0	-	1	-	5	-	533	539

¹Provisional

Table 3.2.5.a.7 REDFISH. Nominal catches (tonnes) by countries, in Sub-area XII 1983-1997, as officially reported to ICES and/or FAO.

Country	1983	1984	1985	1986	1987	1988	1989
Bulgaria	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-
Faroe Islands	-	-	-	-	-	-	-
Germany, Fed. Rep.	2,209	-	-	-	-	-	353
Germany, Dem. Rep.	-	-	-	-	-	-	-
Greenland	-	-	-	-	-	-	567
Iceland	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	112
UK (Scotland)	-	-	-	-	-	-	-
Ukraine	-	-	-	-	-	-	-
USSR	60,079	60,643	17,300	24,131	2,948	9,772	15,543
Total	62,288	60,643	17,300	24,131	2,948	9,772	16,575

Country	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Bulgaria	1,617	-	628	3,216	3,600	3,800	3,500	
Estonia	-	-	1,810	6,365	17,875	421	4,697	1,985
Faroe Islands	-	-	-	4,026	2,896	3,467	3,127	1,400
Germany Fed. Rep. ³	7	62	1,084	6,459	6,354	9,673	4,391	8,866
Greenland	-	-	9	710	-	1,856	3,537	
Iceland	185	95	361	8,098	17,892	19,577	3,613	1,130
Latvia	-	-	780	6,803	13,205	5,003	1,084	
Lithuania	-	-	6,656	7,899	7,404	22,893	10,649	
Netherlands	-	-	-	-	-	13		
Norway	249	726	380	5,911	4,275	4,593 ¹	1,010	2,699
Poland	-	-	-	-	-			662
Spain						20	410	
UK(E/WNI)							33	
UK(Scotland)							13	
UK	-	-	-	+	-			+
Ukraine	-	-	-	2,782	5,561	3,185	518	
USSR/Russia ²	4,274	6,624	2,485	4,106	10,489	34,730	606	
Total	6,332	7,507	14,193	56,375	89,551	109,231	37,188	16,742

¹Provisional

²As from 1991.

³Includes former GDR

Table 3.2.5.a.8 Landings of REDFISH (in tonnes) by countries in Sub-area XII as used by the Working Group. All catch figures taken from FAO are set to this Division.

Year	Bulgaria ⁸	Canada	Estonia ⁸	Faroes	France FRG ⁴	Greenland	Iceland	Japan	Larvia	Lithuania ⁸	Nederland	Norway	Poland	Ukraine ⁸	Russia ³	Spain	UK	Total
1981	0		0		0 0	0	0						0	0	0			0
1982	0		0		0 0	0	0						0	0	39,783			39,783
1983	0		0		0 0	0	0						0	0	60,079			60,079
1984	0		0		0 0	0	0						0	0	60,643			60,643
1985	0		0		0 0	0	0						0	0	17,300			17,300
1986	0		0		0 0	0	0						0	0	24,131			24,131
1987	0		0		0 0	0	0						0	0	2,948			2,948
1988	0		0		0 0	0	0						0	0	9,772			9,772
1989	0		0		0 353	0	658 ⁵						0	112	15,543			16,666
1990	1,617		0		0 7	0	215 ⁵						926 ²	0	4,274			7,039
1991	0		2,195		0 370	0	110 ⁵						762 ²	0	6,624			10,061
1992	628		1,810		2 1,280	9	419 ⁵		780	6,656			399 ²	0	11,266			23,249
1993	3,216		6,365	4,026	0 6,144	8	9,394 ⁵		6,803	7,899			6207 ²	0	2,782	18,669		71,512
1994	3,600		17,875	2,896	606 ⁶ 7,058	0	20,755 ⁵		13,205	7,404			4292 ²	0	5,561	10,489		93,741
1995	3,800	602 ⁷	16,854 ⁸	5,239	226 ⁶ 9,673	156	22,709 ⁵	1,148	5,003	22,893		13	4731 ²	0	3,185	32,730	20	128,982
1996	3,500	650 ⁷	7,092	4,198	4,419	0	3,974 ⁵	415	1,084	10,649			1039 ²		518	606	500 260	38,904
1997 ¹		111	1,985	3,420	0 8,866	0	1,243 ⁶	31					57 ²	662	0	0		16,375

¹ Provisional data.

² Area and/or quantum adjusted according to official log-books and raised (by 5% prior to 1994 and 3% in 1994-1996) to account for discarding.

³ USSR 1981-1991, Russia since 1992.

⁴ Includes former GDR.

⁵ Raised by 16% to account for discarding from 1989- 1995 and by 10 % in 1996-1997.

⁶ As reported to Greenland

⁷ Taken in NAFO area 1F

⁸ As reported to FAO for the North East Atlantic.

Table 3.2.5.a.9 REDFISH. Nominal catches (tonnes) by countries, in Sub-area XIV 1983-1997, as officially reported to ICES and/or FAO.

Country	1983	1984	1985	1986	1987	1988	1989
Bulgaria	-	2,961	5,825	11,385	12,270	8,455	4,546
Denmark	-	-	-	-	-	-	-
Faroe Islands	27	-	-	5	382	1,634	226
Germany, Dem. Rep.	155	989	5,438	8,574	7,023	22,582 ⁴	8,816 ⁴
Germany, Fed. Rep.	28,878	14,141	5,974	5,584	4,691		
Greenland	1	10	5,519 ²	9,542 ²	670	42	3
Iceland	-	-	+	-	-	-	814
Norway	-	17	-	-	-	-	-
Poland	-	239	135	149	25	-	-
UK (Engl. and Wales)	-	-	-	-	-	-	5
UK (Scotland)	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-
USSR/Russia	-	-	42,973	60,863	68,521	55,254	7,177
Total	29,061	18,357	65,864	96,102	93,582	87,967	21,587

Country	1990	1991	1992	1993	1994	1995	1996 ¹	1997 ¹
Bulgaria	1,073	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	-	-	-
Faroe Islands	-	115	3,765	3,095	164	8	298	40
Germany, Fed. Rep. ⁴	11,218	9,122	7,959	26,969	22,406	9,702	16,996	11,610
Greenland	24	42	962	264	422	2,936	2,699	
Iceland	3,726	7,477	12,982	11,650	29,114	8,947	49,381	36,390
Norway	6,070	4,954	14,000	8,351	2,609 ¹	2,003 ¹	6,286 ¹	433
Poland	-	-	-	-	-	-	-	114
Portugal	-	-	-	-	1,887	5,125	2,379	3,644
Spain	-	-	-	-	-	4,534	3,897	
UK (E/W/Ni)	39	219	178	241	138	48	247	
UK (Scotland)	3	+	28	8	4	10	6	
United Kingdom	-	-	-	-	-	-	-	28
USSR/Russia ³	3,040	2,665	1,844	6,560	13,917	9,439	45,142	36,930
Total	25,193	24,594	41,718	57,138	70,661	42,752	127,331	89,189

¹ Provisional data

² Fished mainly by Japan

³ As from 1991

⁴ Includes former GDR

Table 3.2.5.a.10 Landings on REDFISH (in tonnes) by country in Sub-area XIV, as used by the working group.

Year	Bulgaria	Danmark	Faroes	FRG ⁵	Greenland	Iceland	Japan	Norway	Poland	Portugal	UK	Russia ³	Spain	Total
1978	0		0	20,711	3	151	0	2	0		13	0		20,880
1979	0		0	20,428	0	0	0	0	0		0	0		20,918
1980	0		0	32,520	0	89	0	0	0		0	0		32,609
1981	0		18	42,980	1	0	0	0	0		0	0		42,999
1982	0		0	42,815	0	17	0	0	581		0	20,217		63,630
1983	0		27	30,970	1	0	0	0	0		0	0		30,998
1984	2,961		0	15,130	10	0	0	15	239		0	0		18,355
1985	5,825		0	11,412	5,519	0	0	0	135		0	42,973		65,864
1986	11,385		5	14,158	9,542	0	0	0	149		0	60,683		95,922
1987	12,270		382	11,714	2,912	0	0	0	25		0	68,521		95,824
1988	8,455		1,634	22,582	3,751	0	0	0	0		0	55,254		91,676
1989	4,546		226	8,816	285	3,158 ⁴	307	0	0		5	7,177		24,520
1990	1,073		0	11,218	24	4,322 ⁴	3,450	6,159 ²	0		42	4,973		31,261
1991	0		115	10,028	42	8,673 ⁴	1,224	5,434 ²	0		219	2,665		28,400
1992	0		3,765	8,893	3,769	13,091 ⁴	0	14,322 ²	0		206	4,467		48,513
1993	0		3,095	26,404	264	10,911 ⁴	938	8,848 ²	0		249	5,496		56,205
1994			164	23,474	422	17,105 ⁴		2,665 ²		1,887	142	13,917		59,776
1995		14	10	9,702	400 ⁶	10,379 ⁴	89 ⁶	3,378 ²		5,125	58	9,452	4,535	43,142
1996		0	2,153	16,996	350 ⁶	54,319 ⁴		6,461 ²		2,379	253	45,142	6,729	134,782
1997 ¹				11,581	192 ⁶	24,776 ⁴		3,161 ²	114	3,644	28	36,930	7,500	87,926

¹ Provisional data.

² Area and/or quantum adjusted according to official log-books catches and oceanic *S. mentella* raised by 5% prior to 1994 and 3% in 1994-1997 to account for discarding.

³ USSR 1978-1991; Russia since 1992.

⁴ Area and/or quantum adjusted according to official landings (by 16% prior to 1996 and 10% in 1996-1997) to account for discarding.

⁵ Includes former GDR

⁶ Estimated by-catch in the shrimp fishery

Table 3.2.5.a.11 Proportions used for splitting the 1996 REDFISH landings between *S. marinus* and *S. mentella* stocks.

Area	Va			Vb		VI		XII		XIV	
	<i>S.mar.</i>	<i>S.ment.</i>	<i>S.ment.</i>	<i>S.mar.</i>	<i>S.ment.</i>	<i>S.mar.</i>	<i>S.ment.</i>	<i>S.ment.</i>	<i>S.mar.</i>	<i>S.ment.</i>	<i>S.ment.</i>
Species/stock	deep-sea			deep-sea		deep-sea		oceanic		deep-sea	oceanic
Belgium	1.00										
Estonia								1.00			
Faroes	1.00	0.00	0.00	0.25	0.75			1.00	0.00	1.00	0.00
France					1.00			1.00			
Germany	0.00	1.00	0.00		1.00	0.00	1.00	1.00	0.06	0.51	0.43
Greenland								1.00	0.10	0.90	
Iceland	0.35	0.51	0.14					1.00			1.00
Latvia								1.00			
Lithuania								1.00			
Norway				1.00	0.00	1.00	0.00	1.00	0.02		0.98
Portugal											1.00
Russia				1.00	0.00			1.00	0.00	0.47	0.53
UK				1.00	0.00	1.00			0.11	0.90	

In Sub-area XIV the landings for Germany, Greenland and UK have been splitted between *S. marinus* and deep-sea *S. mentella* according to the German surveys.

For Faroe Islands, Germany, Iceland, Norway and Russia the splitting in most areas has been based on biological information presented to the Working Group and/or from log-books.

3.2.5.b *Sebastes marinus* in Sub-areas V, VI, XII and XIV

State of stock/fishery: The stock is at present considered to be harvested close to or outside safe biological limits as defined by the proposed reference points. In Division Va, the Icelandic groundfish survey has shown an increasing trend from the low level of 1995 and does also indicate incoming recruitment to the fishable stock. The survey suggests current stock sizes about 50% of the maximum for the period 1985–1998, while the inferred stock trajectory from a stock production model suggests that current stock size would be 35% of the maximum for the period 1977–1998 (Figure 3.2.5.b.1). The CPUE data from the Icelandic fishery are still at a low level but have shown similar increasing trend as the survey index. There is no indication of recruitment failure in recent years. The assessment suggests that the fishable biomass in Division Va is at a low level, indicating a decrease in 1995 to about 30% of the 1985 level, with a noticeable increase since then.

In Sub-area XIV the German groundfish survey has shown an almost continuous decrease in biomass indices by more than 90% since 1986 and *S. marinus* at East-Greenland has nearly been depleted in the most recent six years (Figure 3.2.5.b.2). Although little is known about the state of that part of the stock living in Division Vb CPUE from the Faroes groundfish survey show an increase in 1997, but the catches still remain at a very low level (Figure 3.2.5.b.3).

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

Advice on management: In order to protect the new incoming year classes, fishing effort should be kept low to allow the stock to rebuild. ICES therefore recommends that effort should not be increased from the 1997 level. Moreover, ICES recommends appropriate measures to reduce the by-catches of juveniles in the shrimp fishery.

Proposed reference points: The relative state of the stock can be assessed through survey and cpue index series (U), which imply a maximum, U_{\max} , as well as the present state. Given these data, it is proposed that reference points be defined in terms of the current state with respect to $U_{\lim} = U_{\max}/5$ and $U_{pa} = U_{\max}/2$.

Relevant factors to be considered in management: The effort in Division Va seems to have been reduced considerably in 1996 and 1997 (achieving the target of reduction from the 1995 level) and a catch of 35 000 t corresponds to continued exploitation at no more than the 1997 level.

An effort projection cannot be given for Division Vb and ICES therefore recommends that the effort should not be increased from the 1997 level. In Sub-area XIV a drastic effort reduction has already taken place and in 1997 there was no direct fishery for *S. marinus*.

The effort as well as catches of “giant” *S. marinus* decreased drastically in 1997 and only 43 t were reported. Genetic results indicate that catches of “giant” *S. marinus* are from a distinct stock. The fishable part of this component consists of very old individuals and great care must therefore be taken in harvesting this component. Although it may be difficult practically and economically to split the *S. marinus* catches within the national EEZs, *S. marinus* caught in international waters should be managed separately since nearly 100% of these fish are “giants”.

Elaboration and special comment: *S. marinus* are mainly taken by trawlers in depths down to 500 m. In Division Va the catch is mainly taken by Icelandic trawlers while in Division Vb Faroese trawlers predominate. In Sub-area XIV the catches are made mainly as a by-catch in shrimp fisheries. Total catches have decreased almost continuously. This decline has occurred in all sub-areas. In order to reduce the catches of *S. marinus* in Division Va an area closure was imposed in 1994 and the quotas have been reduced in the last years. There has in recent years been a reduction of effort in Sub-area XIV, and in Division Va in 1996.

An age-based production model is still under development for Division Va. Survey data from an Icelandic survey and CPUE from the fishery in Division Va were used as indicators of stock development. CPUE data are available from a German groundfish survey in Sub-area XIV, and from the Faroes fishery in Division Vb.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

Catch data (Table 3.2.5.b.1):

Year	ICES advice	Predicted catch corresp. to advice	<i>S. marinus</i> ACFM catch	Combined ACFM catch ¹
1987	No increase in F	83	77	115
1988	No increase in F	84	90	121
1989	TAC ¹	117 ¹	57	111
1990	TAC ¹	116 ¹	67	111
1991	Precautionary TAC	77(117 ¹)	56	123
1992	Precautionary TAC	76(116 ¹)	56	119
1993	Precautionary TAC ¹	120 ¹	50	125
1994	Precautionary TAC, if required	100 ¹	42	126
1995	TAC	90 ¹	45	100
1996	TAC for Va (28); precautionary TAC for Vb and XIV (4)	32 ²	36	79
1997	Effort 75% of 1995 value	32 ²	38	81
1998	Effort reduced in steps of 25% from the 1995 level	37 ^{2,3}		
1999	Effort not increased from 1997 level	35		

¹ Deep-sea *S. mentella* and *S. marinus* combined. ² *S. marinus* only. ³ Preliminary. Weights in '000 t.

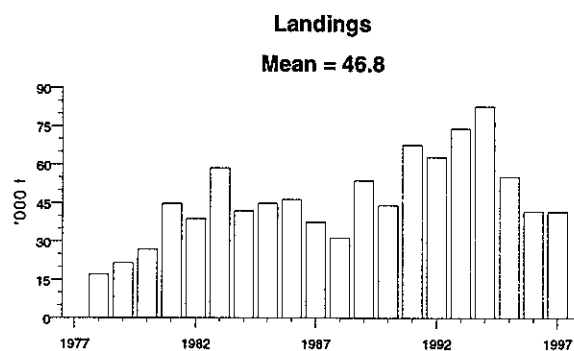


Table 3.2.5.b.1

S. marinus. Landings (in tonnes) by area used by the Working Group.

Year	Va	Vb	VI	XII	XIV	Total
1978	31,300	2,039	313	0	15,477	49,129
1979	56,616	4,805	6	0	15,787	77,214
1980	62,052	4,920	2	0	22,203	89,177
1981	75,828	2,538	3	0	23,608	101,977
1982	97,899	1,810	28	0	30,692	130,429
1983	87,412	3,394	60	0	15,636	106,502
1984	84,766	6,228	86	0	5,040	96,120
1985	67,312	9,194	245	0	2,117	78,868
1986	67,772	6,300	288	0	2,988	77,348
1987	69,212	6,143	576	0	1,196	77,127
1988	80,472	5,020	533	0	3,964	89,989
1989	51,825	4,140	373	0	685	57,023
1990	63,156	2,407	382	0	687	66,632
1991	49,677	2,140	292	0	4,255	56,364
1992	51,464	3,470	40	0	746	55,721
1993	45,890	2,621	101	0	1,738	50,350
1994	38,669	2,048	129	0	1,443	42,288
1995	41,516	2,361	613	0	61	44,551
1996	33,558	2,318	663	0	59	36,598
1997 ¹	35,514	2,846	538	0	29	38,927

¹ Provisional data

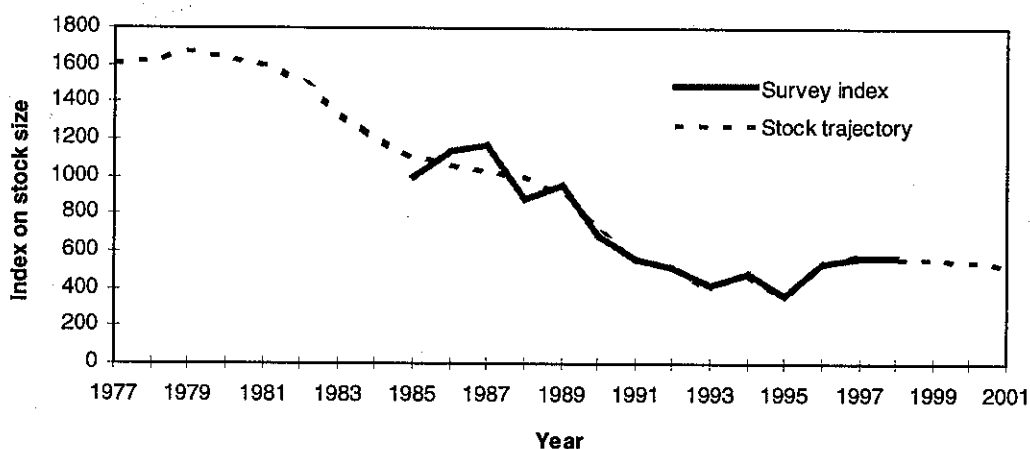


Figure 3.2.5.b.1 Survey index from Icelandic groundfish survey and stock trajectory based on age based production model.

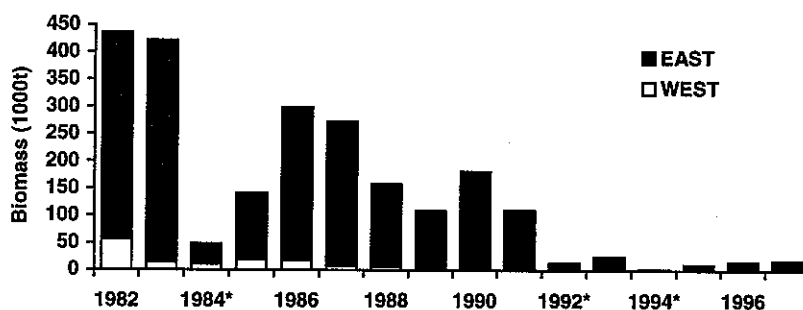


Figure 3.2.5.b.2 *S. marinus* (≥ 17 cm). Survey biomass indices for East and West Greenland as derived from the German groundfish survey, 1982–1997. *) incomplete survey coverage.

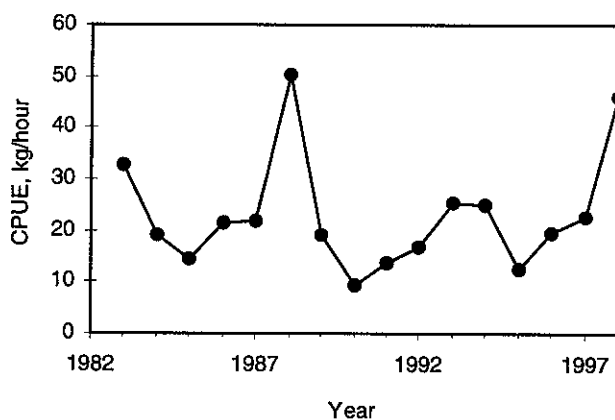


Figure 3.2.5.b.3 CPUE of *S. marinus* in the Faroese groundfish survey 1983–1998.

3.2.5.c

Deep-sea *Sebastes mentella* in Sub-areas V, VI and XIV

State of stock/fishery: There is considerable uncertainty about the original size of the stock which was subject to a larger scale fishery already in the middle of the 1940s. No CPUE data exist for this fishery however. For this reason the basis for the calculation of U_{pa} is a CPUE data series from Va starting in 1986 (Figure 3.2.5.c.1). The U_{pa} is uncertain and is considered to be an underestimate. It is clear however, that the catches have halved since 1994 for the entire area, so have the CPUE from Va from 1986 onwards. The decline of catches, however, is partly due to catch restrictions. Based on the limited information available the stock is estimated to be at or around U_{pa} .

In Sub-area XIV, 20-30 cm *S. mentella* are found to be very abundant in the German groundfish survey with record high values in the time series in 1997. However, the origin of the very abundant recruits and hence whether they will recruit to the stock of deep-sea *S. mentella* is still uncertain. Comparing the proportions between West and East Greenland, deep-sea *S. mentella* was almost exclusively distributed off East Greenland. Mature deep-sea *S. mentella* were almost absent at East-Greenland (Figure 3.2.5.c.2).

Regarding Division Vb the CPUE of deep-sea *S. mentella* have decreased from 1991, but seems to have stabilized at a very low level since 1995 (Figure 3.2.5.c.3).

It can not be excluded that there may be a relationship between the demersal deep-sea *S. mentella* on the continental shelves of the Faroe Islands, Iceland, Greenland and the pelagic redfish resembling deep-sea *S. mentella* in the Irminger Sea and this should be kept in mind in the management of this stock.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES reiterates previous advice that the fishing mortality be further reduced towards the 1986–1990 levels in all areas. The very abundant juvenile year class(es) at East-Greenland should be protected.

Proposed reference points: The relative state of the stock can be assessed through survey and CPUE index series (U), which imply a maximum, U_{max} , as well as the present state. Given these data, it is proposed that reference points be defined in terms of the current state with respect to $U_{lim} = U_{max}/5$ and $U_{pa} = U_{max}/2$.

Relevant factors to be considered in management: Using the CPUE data in the same way as the Icelandic groundfish survey used for *S. marinus* indicates that a 25% effort reduction from the present level would lead to catches of 28 000 t whereas a 40% reduction in effort would lead to catches of 22 000 t in 1999.

Elaboration and special comment: In Division Va deep-sea *S. mentella* are taken mainly by Icelandic trawlers in depths greater than 500 m. In Division Vb the fishery is carried out mainly by Faroese trawlers though some by-catch is taken by other countries fishing demersal species. In Sub-area XIV the catch is taken largely by German freezer trawlers. The annual catches did almost double in the early 1990s but has since then decreased to the level of the 1980s. This was mainly caused by an increase in Division Va, both in the demersal and in a recent developed pelagic fishery, and also by an increase in Sub-area XIV in 1993–1994.

There were substantial catches of small redfish in Sub-area XIV in 1993–1994, and the number of small redfish discarded in the shrimp fishery is still expected to be very high.

No data were available to make an analytical assessment. CPUE data are available from Icelandic trawlers in Division Va, the Faroese fishery in Division Vb, and from the German groundfish survey in Sub-area XIV.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19)

Catch data (Table 3.2.5.c.1):

Year	ICES advice	Predicted catch corresponding to advice	Deep-sea <i>S. mentella</i> ACFM catch	Combined ACFM catch ¹
1987	Precautionary TAC	41-58	38	115
1988	Precautionary TAC	41-58	31	121
1989	TAC ¹	117 ¹	54	111
1990	TAC ¹	116 ¹	44	111
1991	Precautionary TAC	(40) 117 ¹	68	123
1992	Precautionary TAC	(40) 116 ¹	63	118
1993	Precautionary TAC ¹	120 ¹	74	124
1994	Precautionary TAC, if required	100 ¹	83	125
1995	TAC	90 ¹	55	99
1996	Precautionary TAC (45 in Va; 23 in VI and XIV)	68 ²	42	79
1997	Effort 75% of 95-value	39 ²	42	81
1998	Fishing mortality be further reduced towards the 86-90 levels			
1999	Fishing mortality be further reduced towards the 86-90 levels			

Weights in '000 t. ¹ Deep-sea *S. mentella* and *S. marinus* combined. ² Deep-sea *S. mentella* only.

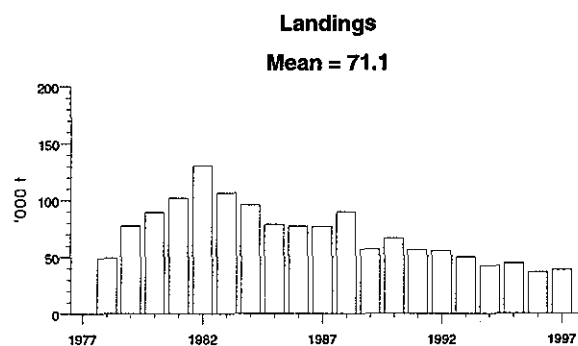


Table 3.2.5.c.1 Deep-sea *S. mentella*. Landings (in tonnes) by area used by the Working Group.

Year	Va	Vb	VI	XII	XIV	Total
1978	3,902	7,767	18	0	5,403	17,090
1979	7,694	7,869	819	0	5,131	21,513
1980	10,197	5,119	1,109	0	10,406	26,831
1981	19,689	4,607	1,008	0	19,391	44,695
1982	18,492	7,631	626	0	12,140	38,889
1983	37,115	5,990	396	0	15,207	58,708
1984	24,493	7,704	609	0	9,126	41,932
1985	24,768	10,560	247	0	9,376	44,951
1986	18,898	15,176	242	0	12,138	46,454
1987	19,293	11,395	478	0	6,407	37,573
1988	14,290	10,488	590	0	6,065	31,433
1989	40,248	10,928	424	0	2,284	53,884
1990	28,429	9,330	348	0	6,097	44,204
1991	47,651	12,897	273	0	7,057	67,878
1992	43,414	12,533	134	0	7,022	63,102
1993	51,221	7,801	346	0	14,828	74,195
1994	56,720	6,229	642	0	19,305	82,896
1995	48,708	5,196	607	0	908	55,419
1996	34,741	5,337	1,117	0	730	41,925
1997	37,074	4,500	1	0	169	41,744

¹Provisional data.

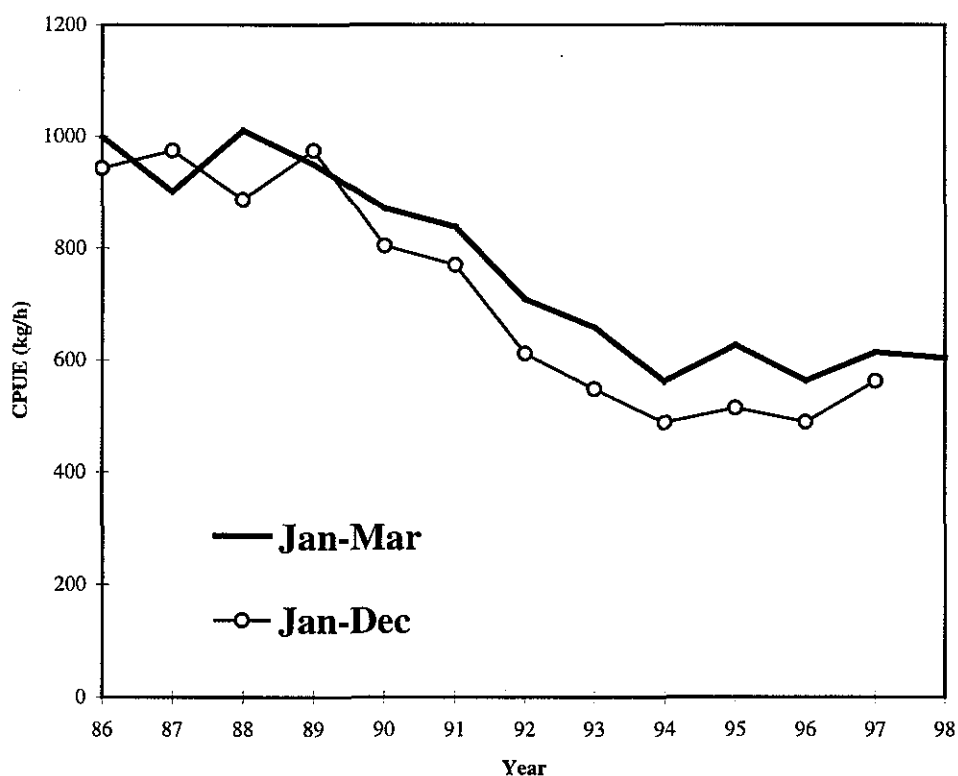


Figure 3.2.5.c.1 CPUE of *S. mentella* from Icelandic trawlers 1986–1998.

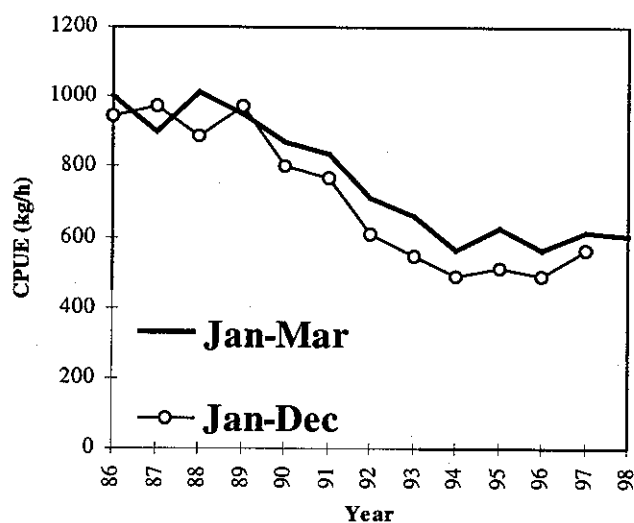


Figure 3.2.5.c.1 CPUE of *S. mentella* from Icelandic trawlers 1986–1998.

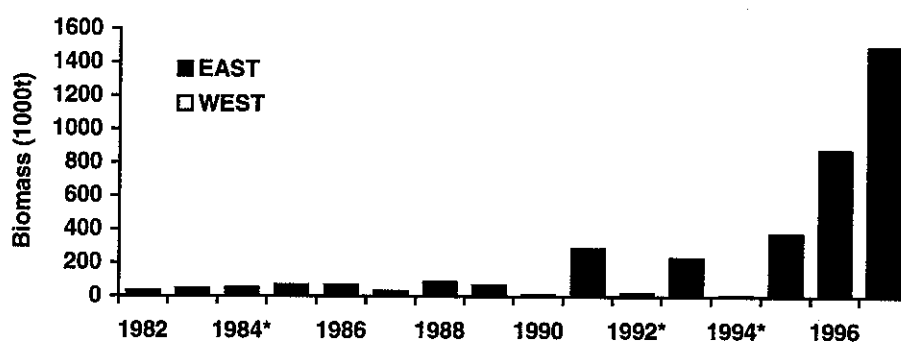


Figure 3.2.5.c.2 Deep sea *S. mentella* (≥ 17 cm). Survey biomass indices for East and West Greenland as derived from the German groundfish survey, 1982–97. *) incomplete survey coverage. Indices for West Greenland not visible due to very low values.

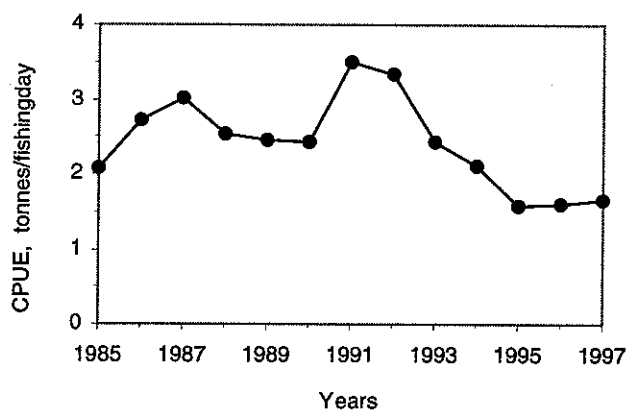


Figure 3.2.5.c.3 CPUE 1985–1997 (catch (t) per fishing day) of redfish by the otterboard trawlers larger than 1,000 HP.

3.2.5.d Pelagic fishery for *Sebastes mentella* in the Irminger Sea

This section includes information on the pelagic fishery for oceanic redfish *S. mentella* and pelagic deep-sea *S. mentella* in Sub-area XII, parts of Division Va and Sub-area XIV.

State of stock/fishery: For the oceanic redfish there have been some discussion in the past about MBAL (previous North-Western Working Group reports), and it has been measured as 50% of the virgin biomass of around 3 million tonnes. In 1994 acoustic survey, the biomass was estimated to be around 2.2 million tonnes in the uppermost 500 m but in most recent years the survey results and CPUE series have indicated lower stock size. Both survey estimates and CPUE of four fleets have decreased in a similar manner during the last 3 years. The Working Group considers the period up to 1993-1994 as a learning period including gear technology development. However, since 1994, the overall CPUE has decreased by approximately 45%. During 1995-97, the survey estimates decreased by 50% from 2.5 million tonnes to 1.2 million tonnes. This decrease is, however, not consistent with the record high catch level in the same years. The observed changes in the hydrographical environment may have caused a change in the behaviour of oceanic redfish and in the depth of the scattering layer. Some uncertainties arise regarding the indices used in the assessment (both in the CPUE and survey estimate) in relation to the environmental changes and the 1997 survey design.

The safe biological limits for this stock are unknown. The productivity of the stock is uncertain. No information is available on recruitment.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: In light of the precautionary approach the TAC will need to be reduced from 1993-1996 levels of 150 000 t and adequate monitoring programmes of the catches and stock should be implemented.

Proposed reference points: Establishing a basis for precautionary limits is marred by the lack of stock size and mortality estimates. Precautionary reference points cannot be set based on CPUE data because of the mixture of stock components harvested in this area.

Relevant factors to be considered in management: Since this is a relatively new fishery on a long-lived, slow growing species, ICES notes that monitoring of the stock is essential in order to keep track of biomass changes as they occur. Similarly, it is important to gather the information needed to evaluate the productivity of the stock. This includes information on recruitment, nursery areas, stock identification and biomass estimation. In particular, development of acoustic techniques to measure the abundance of the deep-sea *S. mentella* in the Irminger Sea should be considered.

Preliminary results from the ongoing genetic work support the hypothesis of two types of pelagic *S. mentella* in the Irminger Sea. However, the Working Group finds the evidence at present not sufficiently conclusive to determine whether the management of the pelagic *S. mentella* in the Irminger Sea should be changed from the present one management unit. The results show, however, the need for improved and more detailed scientific monitoring.

Elaboration and special comment: The pelagic fishery in the Irminger Sea is conducted only on the mature part (approximately 95% mature) of the stock. The fishery started in 1982. After decreasing from 1988-1991, landings increased. The decrease was mostly due to a reduction in Russian effort. The increase in the catches since 1991 is a direct consequence of increased fishing effort due to new fleets entering the fishery. The fishing season has the last years expanded to March-December and the fishery has expanded into deeper water.

Length, weight, data on maturity and some age reading experiments were available from both the survey and the fishery. Effort and CPUE series are available for four fleets and by depth levels for one fleet. Comparable acoustic estimates are available for a given area in 1991-1997.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

Catch data (Tables 3.2.5.d.1):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	No assessment	-		91
1988	No assessment	-		91
1989	TAC	90-100		38
1990	TAC	90-100		32
1991	TAC	66		27
1992	Preference for no major expansion of the fishery	-		66
1993	TAC	~50		114
1994	TAC	~100		148
1995	TAC	100		173
1996	No specific advice	-	153 ¹	177
1997	No specific advice	-	153-158 ¹	119 ²
1998	TAC not over recent (93-96) levels of 150 000 t		153 ¹	
1999	TAC to be reduced from recent (93-96) levels of 150 000 t			

¹Set by NEAFC. ²Preliminary. (Weights in '000 t).

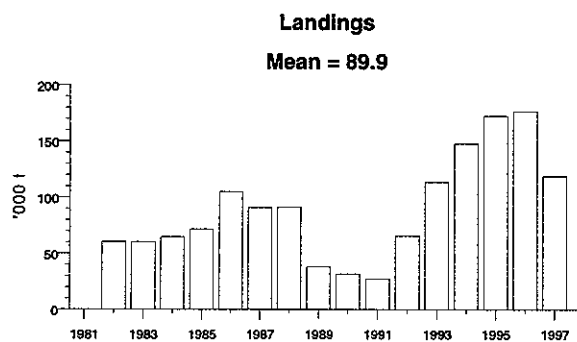


Table 3.2.5.d.1 Oceanic *S. mentella*. Landings (in tonnes) by area as used by the Working Group. Due to incomplete area reportings, the exact share in Divisions XII and XIV is just approximate in latest years.

Year	Va	Vb	VI	XII	XIV	Total
1978	0	0	0	0	0	0
1979	0	0	0	0	0	0
1980	0	0	0	0	0	0
1981	0	0	0	0	0	0
1982	0	0	0	39,783	20,798	60,581
1983	0	0	0	60,079	155	60,234
1984	0	0	0	60,643	4,189	64,832
1985	0	0	0	17,300	54,371	71,671
1986	0	0	0	24,131	80,976	105,107
1987	0	0	0	2,948	88,221	91,169
1988	0	0	0	9,772	81,647	91,419
1989	0	0	0	16,666	21,551	38,217
1990	0	0	0	7,039	24,477	31,516
1991	0	0	0	10,061	17,088	27,149
1992	1,968	0	0	23,249	40,745	65,962
1993	2,603	0	0	71,512	39,639	113,754
1994	15,472	0	0	93,741	39,028	148,241
1995	1,543	0	0	128,982	42,172	172,698
1996 ¹	4,610	0	0	38,828	133,163	176,601
1997 ¹	15,253	0	0	16,354	87,706	119,313

3.2.6 Icelandic summer-spawning herring (Division Va)

State of stock/fishery: The stock is at present considered to be harvested within safe biological limits based on the proposed precautionary reference points. The spawning stock biomass (SSB) is currently about 435 000 t, which is substantially above the proposed B_{pa} . Management has restricted exploitation rate at or near $F_{0.1}$ (0.22).

Management objectives: Based on previous management decisions ICES assumes that the management objective is to pursue $F = F_{0.1}$.

Advice on management: The current fishing mortality, close to $F_{0.1}$, is considered to be sustainable and in accordance with the precautionary approach. Medium-term forecasts in 1995 showed that there was low probability that the current harvest strategy will reduce the stock to low levels.

Proposed reference points: Examination of the stock recruitment data suggests that the probability of poor recruitment increases at SSB's below 200 000 t, which defines B_{lim} . In order to take into account uncertainty in estimating biomass, $B_{pa}=300\ 000\ t$ is proposed. This fishery has been successfully managed by using $F_{0.1}$ as a target for many years. Therefore $F_{pa}=F_{0.1}=0.22$.

Relevant factors to be considered in management: The part of the fishable stock east of Iceland in late 1997/early 1998 was concentrated in a cold, near bottom layer. As a result the herring were rarely available to the purse seine fleet. This also explains the high proportion of the catch that was taken by pelagic trawl in 1997/1998.

Catch forecast for 1998–1999: $F(97-98) = 0.154$, Catch (97–98) = 65, SSB(98)=485.

F (98-99)	Basis	Catch(98-99)	SSB(99)
0.18	0.8 $F_{0.1}$	75	495
0.22	1.0 $F_{0.1}$	90	480
0.25	1.2 $F_{0.1}$	105	465

Weights in '000 t.

Shaded scenario considered inconsistent with the precautionary approach.

The development of the SSB in the near future is very dependent on the strength of incoming year classes. The 1992, 1993 and 1995 year classes are estimated as below average strength, but the 1994 and 1996 year classes are both estimated to be above average.

Elaboration and special comment: The catches of Icelandic summer-spawning herring increased rapidly in the early 1960s due to the development of the purse seine fishery off the south coast of Iceland. This resulted in a rapidly increasing exploitation rate until the stock collapsed in the late 1960s. A fishing ban was enforced during 1972–1975. Thereafter the catches have increased gradually to over 100 000 t. In the most recent years a change in exploitation pattern has occurred with increased exploitation of 2- and 3- ringers.

Previously the fleet consisted of multi-purpose vessels, mostly below 300 GRT, operating purse seine and drift net. In recent years, larger vessels (up to 1500 GRT) have entered the fishery. These are highly specialised purse seiners operating in both the herring and capelin fisheries. In the past two seasons a considerable proportion of the catch has been taken with pelagic trawl.

Data and assessment: An analytical assessment based on catch, acoustic survey and catch-at-age data is considered reliable.

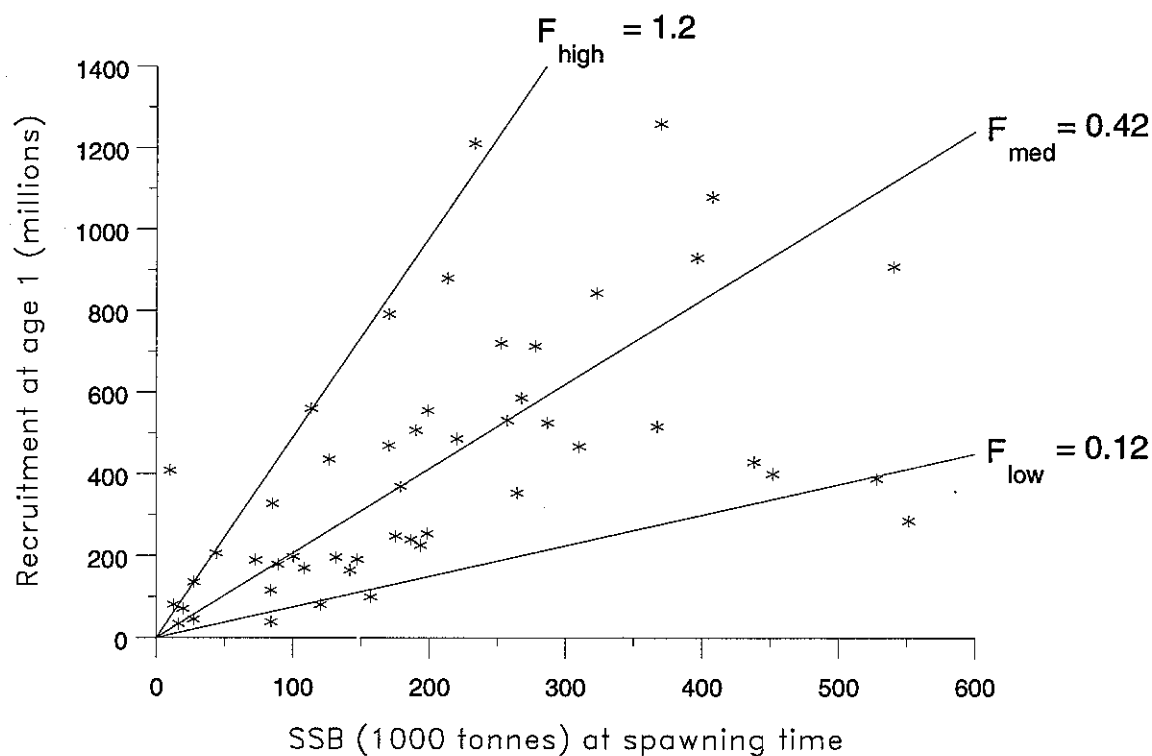
Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, April/May 1998 (ICES CM 1998/ACFM:18).

Catch data (Tables 3.2.6.1-2):

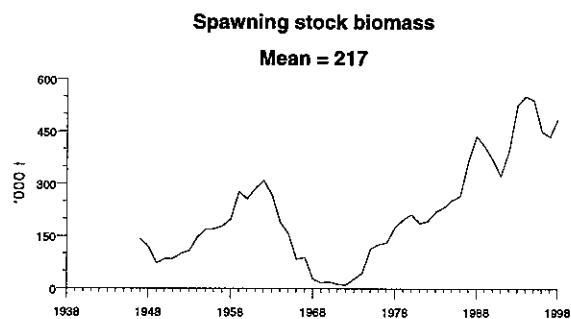
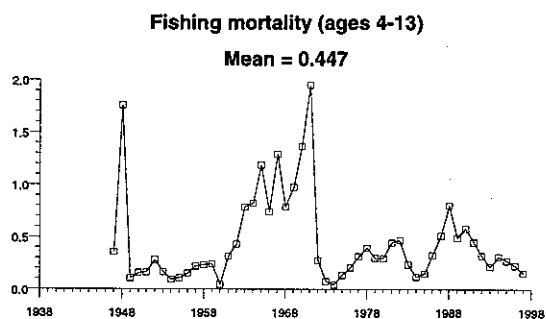
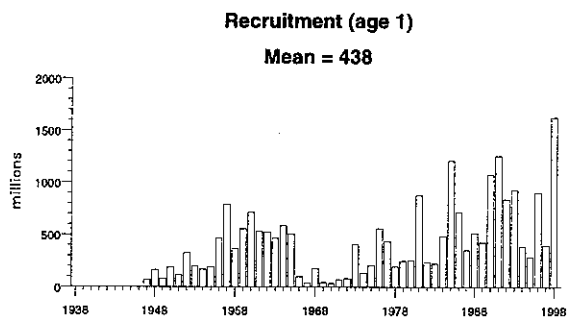
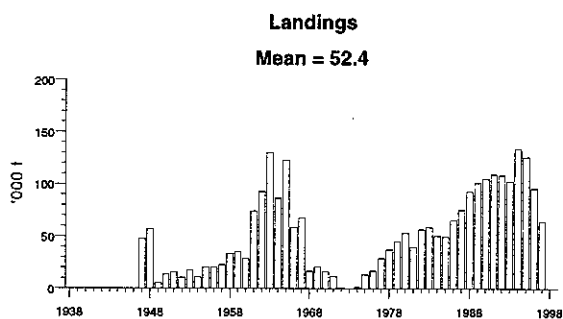
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	$F_{0.1}$	70	72.9	73
1988	$F_{0.1}$	~100	90	93
1989	$F_{0.1}$	95	90	101
1990/91 ²	Status quo F	90	100	105
1991/92 ²	$F_{0.1}$	79	110	110
1992/93 ²	$F_{0.1}$	6	110	109
1993/94 ²	No gain in yield by fishing higher than $F_{0.1}$	110 ¹	110	103
1994/95 ²	No gain in yield by fishing higher than $F_{0.1}$	83 ¹	130	134
1995/96 ²	No gain in yield by fishing higher than $F_{0.1}$	120 ¹	110	126
1996/97 ²	No gain in yield by fishing higher than $F_{0.1}$	97 ¹	110	96
1997/98	No gain in yield by fishing higher than $F_{0.1}$	90 ¹	100	65
1998/1999	No gain in yield by fishing higher than $F_{0.1}$	90 ¹	90	

¹⁾ Catch at $F_{0.1}$. ²⁾ Season starting in October of first year. Weights in '000 t.

Stock - Recruitment



(run: SVPAGB04)



Icelandic summer-spawning herring (Division Va)

Yield and Spawning Stock Biomass

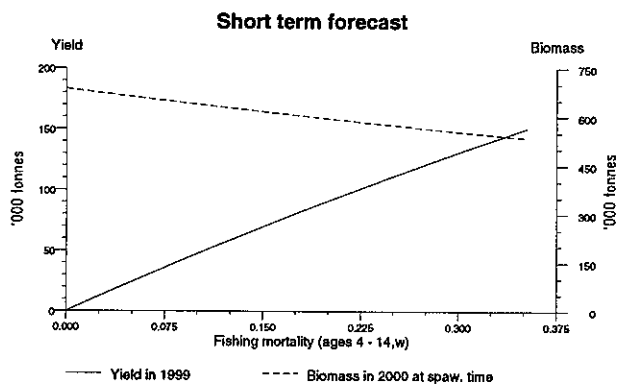


Table 3.2.6.1 Icelandic summer-spawning herring. landings and catch weight ('000 t) as used by the Working Group.

Year	Landings	Catches
1984	50.3	50.3
1985	49.1	49.1
1986	65.5	65.5
1987	73.0	73.0
1988	92.8	92.8
1989	97.3	101.0
1990/1991	101.6	105.1
1991/1992	98.5	109.5
1992/1993	106.7	108.5
1993/1994	101.5	102.7
1994/1995	132.0	134.0
1995/1996	125.0	125.9
1996/1997	95.9	95.9
1997/1998*	64.4	64.4

*Preliminary

Table 3.2.6.2 Icelandic summer-spawning herring (Division Va).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-13
1947	67.49	141.86	47.80	0.355
1948	164.66	120.43	56.80	1.756
1949	80.56	72.82	5.40	0.106
1950	189.41	83.94	13.60	0.156
1951	115.84	85.10	15.80	0.161
1952	327.45	100.26	10.50	0.278
1953	197.89	108.55	17.60	0.163
1954	170.06	147.39	11.00	0.093
1955	191.37	170.43	20.50	0.106
1956	469.40	170.57	20.40	0.150
1957	791.29	178.96	22.80	0.220
1958	369.34	199.06	33.50	0.232
1959	555.09	278.01	35.00	0.241
1960	712.85	257.28	28.50	0.045
1961	530.95	287.09	74.00	0.314
1962	525.36	310.16	92.90	0.430
1963	467.08	267.85	130.30	0.786
1964	585.84	190.13	86.50	0.820
1965	506.79	157.05	122.90	1.185
1966	99.72	84.07	58.40	0.739
1967	38.75	89.27	67.70	1.289
1968	178.51	27.34	16.80	0.786
1969	45.23	16.42	20.91	0.973
1970	33.99	19.55	16.45	1.364
1971	71.20	12.72	11.83	1.952
1972	81.21	10.09	0.37	0.274
1973	408.84	27.61	0.25	0.074
1974	135.93	44.00	1.28	0.041
1975	205.84	113.63	13.28	0.134
1976	560.42	126.71	17.17	0.207
1977	435.60	131.60	28.93	0.313
1978	196.24	175.30	37.33	0.394
1979	248.35	198.43	45.07	0.297
1980	254.05	213.17	53.27	0.295
1981	879.18	186.71	39.54	0.446
1982	239.34	193.51	56.53	0.470
1983	225.82	220.29	58.87	0.236
1984	486.01	233.21	50.30	0.117
1985	1,210.22	252.88	49.37	0.148
1986	719.92	264.62	65.50	0.325
1987	353.49	367.37	75.44	0.512
1988	515.70	438.07	92.83	0.801
1989	429.22	407.45	101.00	0.491
1990	1,077.81	369.82	105.10	0.581
1991	1,258.11	323.10	109.49	0.448
1992	842.71	396.49	108.50	0.319
1993	928.95	527.84	102.74	0.215
1994	388.20	551.54	134.00	0.308
1995	285.29	540.19	125.85	0.271
1996	906.85	451.66	95.88	0.224
1997	400.03	435.47	64.39	0.154
1998	1,629.00	485.60	.	.
Average	438.24	216.59	52.36	0.447
Unit	Millions	1000 tonnes	1000 tonnes	-

3.2.7

Capelin in the Iceland-East Greenland-Jan Mayen area (Sub-areas V and XIV and Division IIa west of 5°W)

State of stock/fishery: The stock is at present considered to be harvested within safe biological limits. SSB is highly variable due to dependence on only 2 age groups. The spawning stock fell below the minimum safe level of 400 000 t in the 1989/90 and 1990/91 seasons. The stock recovered quickly due to good recruitment and appears to be strong at present.

Management objective: The fishery is managed according to a two-part harvest control rule which allows for a minimum spawning stock biomass of 400 000 t by the end of the fishing season. The two-part harvest control rule, which has been in force since 1992, is believed to be in accordance with the precautionary approach.

Advice on management: In order to ensure a spawning stock biomass of 400 000 t in March 1999 ICES recommends in conformity with the harvest control rule that the preliminary TAC for the first half of the 1998/99 season should not exceed 946 667 t. This is two thirds of the total TAC of 1 420 000 t predicted for the whole season and is designed to reduce the risk of over exploitation. ICES recommends that the data from the surveys in October–November 1998 and/or January–February 1999 be used when the final TAC is set for the 1998/99 season. ICES recommends that areas of high juvenile abundance be closed to commercial fishery in order to prevent harvesting a high proportion of juveniles. In order to minimize possible deaths caused by loss of scales of fish escaping through the seine net, the 1998 summer/autumn season could be opened around 20 June and a closure of the fishery from mid-August until the end of September should be considered.

Proposed reference points: There are no specific reference points for this stock. This fishery has been managed by maintenance of a minimum spawning biomass of 400 000 t. This value has produced adequate recruitment over a long time period. A possible improvement of the harvest control rule, by adjusting the opening TAC in the event of either a very low or very high estimate of SSB, should be evaluated.

Relevant factors to be considered in management: In recent years, by far the largest capelin have been caught in July and the first half of August. After that, the average weight in the catches has declined drastically due to the presence of juvenile fish and not increased again until late autumn.

Catch forecast: The basis for the forecast are acoustic surveys and a regression-based prediction model. The model gives a predictive figure for the maturing 2 group capelin of 94.3 billion. For the maturing 3 year olds the predictive value is 30.8 billion individuals. From these predictions a catch of 1 420 million t for the 1998/99 season is expected to leave 400 000 t for spawning.

Elaboration and special comment: The fishery is mainly an industrial fishery based on maturing capelin, i.e. the 2- and 3-group in the autumn which spawn at age 3 and 4 in March of the following year.

After being low in the 1989/90 and 1990/91 seasons, catches have been increasing. A record catch of approximately 1 571 000 t was taken during the 1996/97 fishing season.

The fishery is managed by aiming at maintaining a residual spawning stock biomass of 400 000 t. A preliminary TAC of 2/3 of the catch forecast is set before the opening of the fishery to be revised as a final TAC on the basis of survey information becoming available during the fishing season.

The preliminary TAC computations are based on the method which was first used in 1992 (see Figure below). This involves the use of 1-group (N_1) indices from the October–November survey for predicting the mature 2-group (N_2^{mat}) in the following year. The total 2-group (N_2^{tot}) abundance from the same survey and the relationship between maturation ratios and year class abundance are used for predicting numbers of capelin in the 3-group (N_3^{mat}).

Since 1989 there has been a downward trend in weight at age of adult capelin in this stock. The weight at age shows a significant negative correlation to the adult stock in number. A regression-based predictive model using data from the period 1989–1997 results in predicted mean weights of 15.4 and 20.6 g for age groups 2 and 3 respectively.

The stock size is assessed using acoustic survey data.

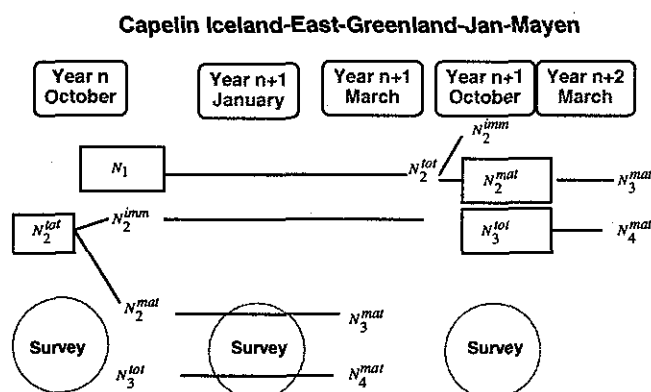
Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, April/May 1998 (ICES CM 1998/ACFM:18).

Catch data (Tables 3.2.7.1–3):

Year	ICES advice	Predicted catch ¹ corresp. to advice	Agreed TAC ²	ACFM catch ³
1986	TAC	1,100	1,290	1,333
1987	TAC ¹	500	1,115	1,116
1988	TAC ¹ (TAC for whole season)	500 (915)	1,065	1,037
1989	TAC ¹	900		808
1990	TAC ¹	500	250	314
1991	No fishery pending survey results ¹	0	740	677
1992	Precautionary TAC ¹	500	900	787
1993	TAC ¹	900	1,250	1,179
1994	Precautionary TAC ¹	950	850	864
1995	Precautionary TAC ¹	800	1,390	929
1996	Precautionary TAC ¹	1,100	1,600	1,571
1997	Precautionary TAC ¹	850	1,265	1,245
1998	Precautionary TAC ¹	950	1,420	

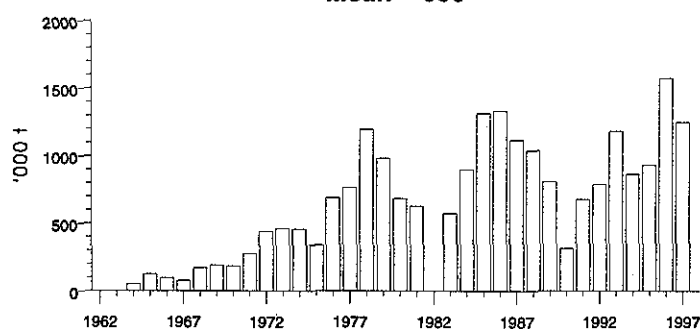
¹TAC advised for July–December part of the season. ²Final TAC recommended by national scientists for whole season.

³July–March of following year. (Weights in '000 t)



Landings

Mean = 660



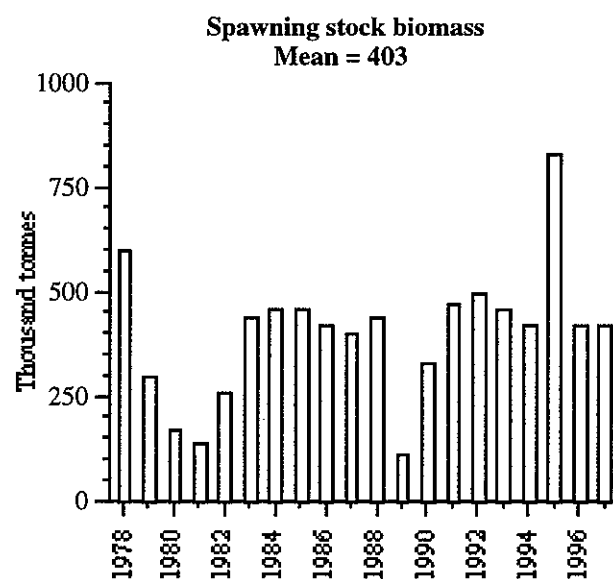
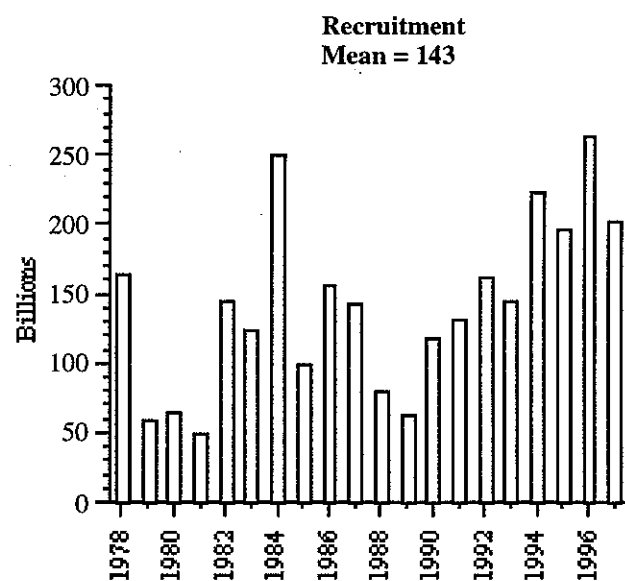
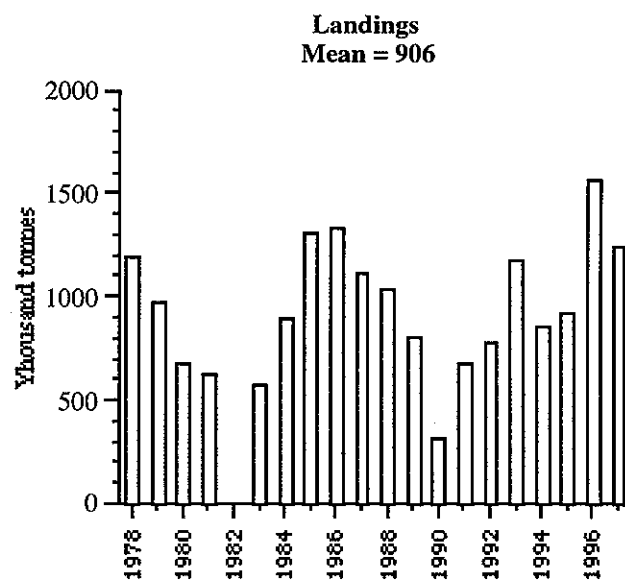


Table 3.2.7.1 The international capelin catch 1964–1998 (thousand tonnes). Iceland-East Greenland-Jan Mayen Area (V, XIV, IIa west 5°W).

Year	Winter season				Summer and autumn season							Total
	Iceland	Nor-way	Faroes	Green-land	Season total	Iceland	Nor-way	Faroes	Green-land	EU	Season total	
1964	8.6	-	-	-	8.6	-	-	-	-	-	-	8.6
1965	49.7	-	-	-	49.7	-	-	-	-	-	-	49.7
1966	124.5	-	-	-	124.5	-	-	-	-	-	-	124.5
1967	97.2	-	-	-	97.2	-	-	-	-	-	-	97.2
1968	78.1	-	-	-	78.1	-	-	-	-	-	-	78.1
1969	170.6	-	-	-	170.6	-	-	-	-	-	-	170.6
1970	190.8	-	-	-	190.8	-	-	-	-	-	-	190.8
1971	182.9	-	-	-	182.9	-	-	-	-	-	-	182.9
1972	276.5	-	-	-	276.5	-	-	-	-	-	-	276.5
1973	440.9	-	-	-	440.9	-	-	-	-	-	-	440.9
1974	461.9	-	-	-	461.9	-	-	-	-	-	-	461.9
1975	457.1	-	-	-	457.1	3.1	-	-	-	-	3.1	460.2
1976	338.7	-	-	-	338.7	114.4	-	-	-	-	114.4	453.1
1977	549.2	-	24.3	-	573.5	259.7	-	-	-	-	259.7	833.2
1978	468.4	-	36.2	-	504.6	497.5	154.1	3.4	-	-	655.0	1,159.6
1979	521.7	-	18.2	-	539.9	442.0	124.0	22.0	-	-	588.0	1,127.9
1980	392.1	-	-	-	392.1	367.4	118.7	24.2	-	17.3	527.6	919.7
1981	156.0	-	-	-	156.0	484.6	91.4	16.2	-	20.8	613.0	769.0
1982	13.2	-	-	-	13.2	-	-	-	-	-	-	13.2
1983	-	-	-	-	-	133.4	-	-	-	-	133.4	133.4
1984	439.6	-	-	-	439.6	425.2	104.6	10.2	-	8.5	548.5	988.1
1985	348.5	-	-	-	348.5	644.8	193.0	65.9	-	16.0	919.7	1,268.2
1986	341.8	50.0	-	-	391.8	552.5	149.7	65.4	-	5.3	772.9	1,164.7
1987	500.6	59.9	-	-	560.5	311.3	82.1	65.2	-	-	458.6	1,019.1
1988	600.6	56.6	-	-	657.2	311.4	11.5	48.5	-	-	371.4	1,028.6
1989	609.1	56.0	-	-	665.1	53.9	52.7	14.4	-	-	121.0	786.1
1990	612.0	62.5	12.3	-	686.8	83.7	21.9	5.6	-	-	111.2	798.0
1991	202.4	-	-	-	202.4	56.0	-	-	-	-	56.0	258.4
1992	573.5	47.6	-	-	621.1	213.4	65.3	18.9	0.5	-	298.1	919.2
1993	489.1	-	-	0.5	489.6	450.0	127.5	23.9	10.2	-	611.6	1,101.2
1994	550.3	15.0	-	1.8	567.1	210.7	99.0	12.3	2.1	-	324.1	891.2
1995	539.4	-	-	0.4	539.8	175.5	28.0	-	2.2	-	205.7	745.5
1996	707.9	-	10.0	5.7	723.6	474.3	206.0	17.6	15.0	60.9	773.8	1,497.4
1997	774.9	-	16.1	6.1	797.1	536.0	153.6	20.5	6.5	47.1	763.6	1,561.5
1998	457.0	-	14.7	9.6	481.3	-	-	-	-	-	-	-

Table 3.2.7.2**Capelin, Iceland-East Greenland-Jan Mayen Area (V, XIV, IIa west 5°W).**

Year	Landings
1964	50
1965	125
1966	97
1967	78
1968	171
1969	191
1970	183
1971	277
1972	441
1973	462
1974	457
1975	342
1976	688
1977	764
1978	1,195
1979	980
1980	684
1981	626
1982	0
1983	573
1984	897
1985	1,312
1986	1,333
1987	1,116
1988	1,037
1989	808
1990	314
1991	677
1992	788
1993	1,179
1994	864
1995	929
1996	1,571
1997	1,245
Average	660
Unit	1000 tonnes

Table 3.2.7.3 Capelin in the Iceland-East Greenland-Jan Mayen area. Recruitment of 1 year old fish (unit 10^3) and stock biomass ('000 t) given at 1 August, spawning stock ('000 t) at the time of spawning (March next year). Landings ('000 t) are the sum of the total landings in the season starting in the summer/autumn of the year indicated ending in March of the following year.

Year	Recruit- ment	Total stock biomass	Landings	Spawning stock biomass
1978	164	2832	1195	600
1979	60	2135	980	300
1980	66	1130	684	170
1981	49	1038	626	140
1982	146	1020	0	260
1983	124	2070	573	440
1984	251	2427	897	460
1985	99	2811	1312	460
1986	156	3106	1333	420
1987	144	2639	1116	400
1988	81	2101	1037	440
1989	64	1482	808	115
1990	118	1293	314	330
1991	133	1975	677	475
1992	163	2058	788	499
1993	145	2363	1179	460
1994	224	2287	864	420
1995	197	3174	929	830
1996	263	3310	1571	423
1997	203	3014	1245	423

3.3.1

Overview

The fisheries and management measures: In 1977 an EEZ was introduced in the Faroe area. The demersal fishery by foreign nations has since decreased and Faroese vessels now take most of the catches. The fishery may be considered a multi-fleet and multi-species fishery. The longliners fish mainly cod and haddock; in addition, some longliners fish in deep water for ling and tusk. Most of the trawlers fish cod, haddock and saithe, while some large trawlers fish in deeper waters for redfish, blue ling, Greenland halibut and occasionally grenadier and black scabbardfish. The jiggers fish mainly saithe and cod. Recently, gill net fisheries for Greenland halibut and anglerfish and a directed pair trawler fishery for Argentinians have been introduced. The total demersal catches decreased from 120 000 t in 1985 to 65 000 t in 1993 but have since increased again to 100 000 t in 1997. The decrease was mainly due to lower catches of cod, haddock and saithe. The cod catches (Faroe Plateau cod and Faroe Bank cod combined) increased considerably from 6 000 t in 1993 to more than 42 000 t in 1996 but declined in 1997 to 38 000 t. The catches of haddock also have increased considerably from 4 000 t in 1993 to almost 10 000 t and 18 000 t in 1996 and 1997, respectively. The catches of saithe, however, decreased from 33 000 t in 1993-94 to 20 000 t in 1996 with a slight increase in 1997 to 22 000 t.

During the 1980s and 1990s the Faroese authorities have attempted to regulate the fishery and the investment in fishing vessels. In 1987 a system of fishing licences was introduced. The demersal fishery at the Faroe Islands has been regulated by technical measures (minimum mesh sizes and closed areas). In order to protect juveniles and young fish, fishing is temporarily prohibited in areas where the number of small cod, haddock and saithe exceeds 30% in the catches; after 1-2 weeks the areas are again opened for fishing. A reduction of effort has been attempted through banning of new licences and a buy back of licences.

A new quota system, based on individual quotas, was introduced in 1994. The fishing year started on 1 September and ended on 31 August the following year. The aim of the quota system was, through restrictive TAC's for the period 1994-1998, to increase the SSB's of Faroe Plateau cod and haddock to 52 000 t and 40 000 t, respectively. As a kind of compensation, the TAC for saithe was set higher than the recommended scientific advice. It should be noted that cod, haddock and saithe are caught in a mixed fishery and any management measure should account for this. Species under the quota system were Faroe Plateau cod, haddock, saithe, redfish and Faroe Bank cod.

The catch quota management system introduced in the Faroese fisheries in 1994 was met with considerable criticism and resulted in discarding and in misreportings

of substantial portions of the catches. Reorganisation of enforcement and control did not solve the problems. As a result of the dissatisfaction with the catch quota management system, the Faroese Parliament discontinued the system as from 31 May 1996. In close co-operation with the fishing industry, the Faroese government has developed a new system based on within fleet category individual transferable effort quotas in days. The new system entered into force on 1 June 1996. The fishing year from 1 September to 31 August, as introduced under the catch quota system, has been maintained.

The individual transferable effort quotas apply to 1) the longliners less than 100 GRT, the jiggers, and the single trawlers less than 400 HP, 2) the pair trawlers and 3) the longliners greater than 100 GRT. The single trawlers greater than 400 HP do not have effort limitations, but they are not allowed to fish within the 12 nautical mile limit and the areas closed to them, as well as to the pair trawlers, have increased in area and time. Their catch of cod and haddock is limited by maximum by-catch allocation. The single trawlers less than 400 HP are given special licences to fish inside 12 nautical miles with a by-catch allocation of 30% cod and 10% haddock. In addition, they are obliged to use sorting devices in their trawls. One fishing day by longliners less than 100 GRT is considered equivalent to two fishing days for jiggers in the same gear category. Longliners less than 100 GRT could therefore double their allocation by converting to jigging. Table 3.3.1.1 shows the number of fishing days by fleet category for 1985-97 and the number of allocated days inside the outer thick line in Figure 3.3.1.1. Holders of individual transferable effort quotas who fish outside this line can fish for 3 days for each day allocated inside the line. Trawlers are generally not allowed to fish inside the 12 nautical mile limit. Inside the innermost thick line only longliners less than 100 GRT and jiggers less than 100 GRT are allowed to fish. The Faroe Bank shallower than 200 m is closed to trawling.

The effort quotas are transferable within fleet categories but not between fleets. The allocation of number of days by fleet categories was made in such a way that the fixed allocation of catches in tonnes under the present management regime was expected to be maintained. For the fishing season 1998/1999 the total number of allocated fishing days has been reduced by 12.5 % compared to the 1997/1998 season. The new effort quota system has resulted in more reliable catch and effort data.

The marine environment: The waters around the Faroe Islands are in the upper 500 m dominated by the North Atlantic Current, which to the north of the islands meets the East Icelandic current. Clockwise current systems

create retention areas on the Faroe Plateau and on the Faroe Bank. In deeper waters to the north and east is deep Norwegian Sea water and to the south and west is Atlantic water. From the late 1980s the intensity of the North Atlantic current passing the Faroe area decreased but it has increased again in the most recent years. The productivity of the Faroese waters has been very low since the middle of the 1980s. This applies also to the recruitment of many fish stocks, and the growth of the fish has been poor as well. Measurements of phyto- and zooplankton production show that the situation has gradually improved since 1991. Since 1992 the recruitment of important prey such as sandeels and Norway pout has been good and the growth of fish such as cod, haddock and saithe has improved considerably. The 1992–1993 year classes of cod and the 1993–1994 year classes of haddock are estimated to be at or above the long-term average.

State of stocks: As a result of the combined effect of poor recruitment in the last decade and high fishing effort the SSB's of Faroe Plateau cod and Faroe haddock were reduced to low levels. In the period 1993–1995 ICES considered them to be well below minimum biologically acceptable levels and consequently advised no fishing. Both stocks have since increased due to improved recruitment with SSB above the proposed precautionary SSB levels (B_{pa}). The fishing mortalities for both stocks are, however, above the proposed precautionary levels (F_{pa}). The Faroe Bank cod stock also seems to be at a high level. On contrary the SSB of Faroe saithe has been declining since the late 1980s and it is estimated to be at the lowest level on record in 1997. The saithe stock is considered to be outside safe biological limits concerning the proposed reference points.

Table 3.3.1.1 Effort (days) used by various fleet categories in Vb₁ 1985–1997. Also shown are the averages for 2 periods and the number of fishing days allocated in the law. A further 1000 fishing days are kept outside the system for use in special cases. For other fleets there is no effort limitation.

Year	Longliners 0-100GRT, jiggers trawlers<400HP	Longliners > 100 GRT	Pairtrawlers
1985	13449	2973	8582
1986	11399	2176	11006
1987	11554	2915	11860
1988	20736	3203	12060
1989	28750	3369	10302
1990	28373	3521	12935
1991	29420	3573	13703
1992	23762	2892	11228
1993	19170	2046	9186
1994	25291	2925	8347
1995	33760	3659	9346
1996	22333	3050	10778
1997	26281	3660	10362
Average (85-97)	22637	3074	10746
Average (91-97)	25717	3115	10421
Allocated days	27405	2660	7197

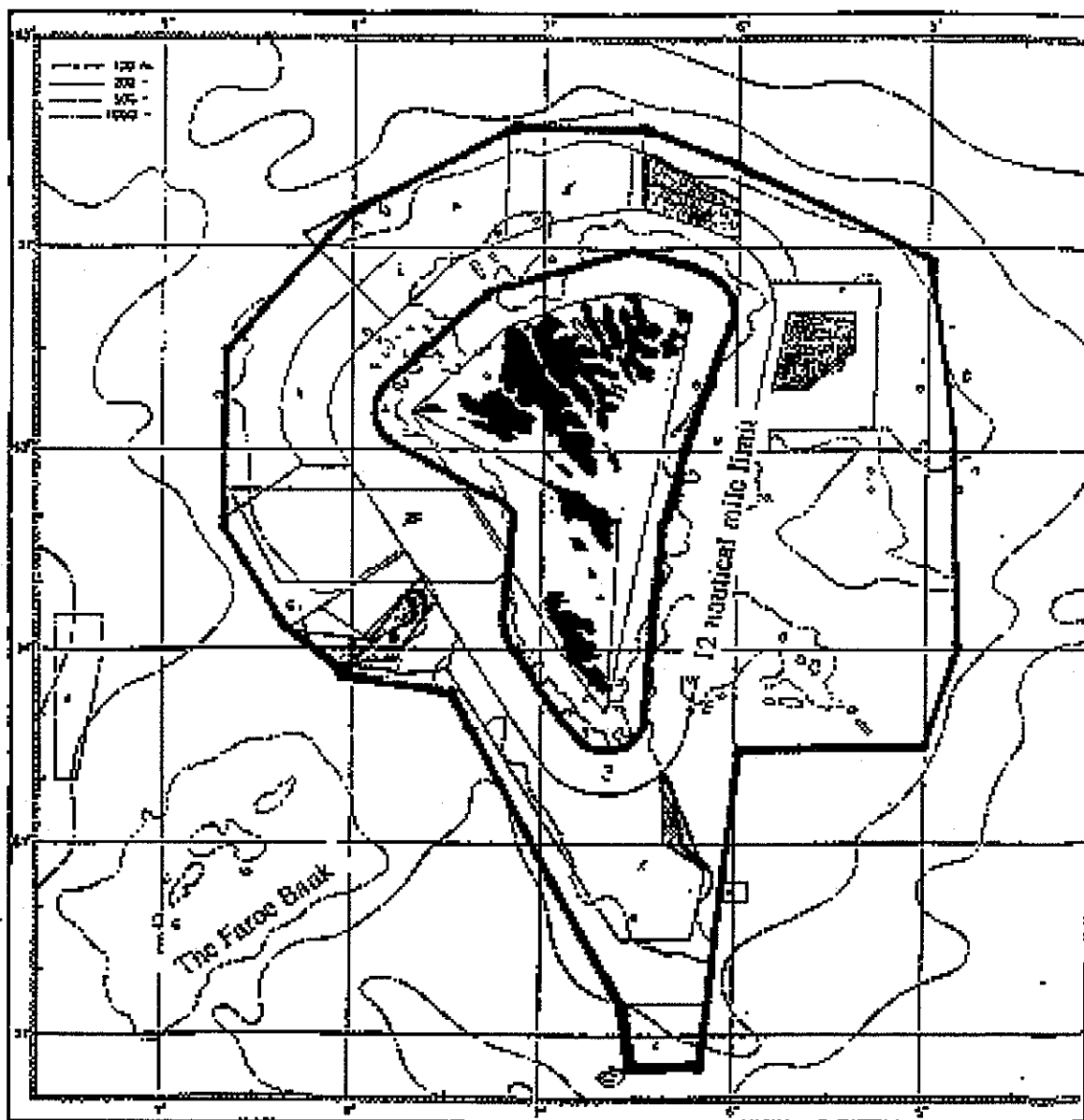


Figure 3.3.1.1 Fishing area regulations in Division Vb. Allocation of fishing days applies to the area inside the outer thick line. Holders of effort quotas who fish outside this line can triple their numbers of days. Trawlers are generally not allowed to fish inside the 12 nautical mile limit and only long liners < 100 GRT and jiggers < 100 GRT are allowed to fish inside the innermost thick line. Several areas are closed for parts of the year, to protect spawning areas, separate gears etc. The Faroe Bank shallower than 200 m is closed to trawling.

3.3.2

Faroe saithe

State of stock/fishery: The stock is at present considered to be harvested outside safe biological limits based on the proposed reference points, both in terms of exploitation rate and biomass level. Despite a high level of recruitment during the 1980s, the SSB has decreased significantly due to high fishing mortalities and is presently at a record-low. Fishing mortality peaked in 1991 and is still high ($F_{97} = 0.44$), well above F_{pa} ($= 0.28$) and even above F_{lim} ($= 0.40$). If the relatively low recruitment observed in the 1990s continues the fishery will not be sustainable.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends that fishing mortality be reduced below the proposed $F_{pa}=0.28$, corresponding to a catch of less than 14 000 t in 1999. Current practice under the effort management system, to triple the number of fishing days allowed when moving into deeper waters, should not be allowed until the saithe SSB is within safe biological limits. The present spawning closures should be maintained. Other measures to reduce direct effort on saithe should be introduced.

Proposed reference points: An analysis of stock recruitment data suggests B_{lim} be set at 85 000 t and correspondingly F_{lim} at 0.40. The values F_{pa} is proposed to be set at 0.28 which is consistent with both estimates derived from F_{lim} and F_{med} . $B_{pa} = 110\ 000$ t is proposed.

Relevant factors to be considered in management: Close monitoring should be carried out, to evaluate the effect of the effort regulations, in particular the possible changes in catchability and target species. In addition, it should be noted that saithe are partly caught in a mixed fishery together with haddock and cod and hence management measures taken in 1998/99 for cod and haddock should also ensure the greatest protection for the saithe stock.

There are indications of the 1991, 1992 and 1993 year classes being small.

Catch forecast for 1999: Basis: $F(98)= F(97)$, $Catch(98)=21$, $Landings(98) = 21$, $SSB(99) = 44$

F (99)	Basis	Catch (99)	Landings (99)	SSB (2000)
0.18	0.4 F(97)	9	9	51
0.27	0.6 F(97)	13	13	47
0.28	F_{pa}	14	14	46
0.35	0.8 F(97)	16	16	44
0.44	1.0 F(97)	20	20	41
0.53	1.2 F(97)	23	23	38

(Weights in 000 t)

Shaded scenarios considered inconsistent with the precautionary approach.

If the number of fishing days allocated is maintained there is a probability of about 30% that fishing mortality will not exceed F_{pa} (0.28) in 1998 and 1999, and an approximately 80% probability that the fishing mortality will not exceed 0.45 (Figure 3.3.2.1).

Elaboration and special comment: Saithe are taken in a mixed demersal fishery although they may be targeted with a small by-catch of other demersal species. The fishery was originally international, but for all practical purposes saithe has been fished only by Faroese vessels since the introduction of the 200 nm EEZ in 1977. The principal fleet consisting of large pair trawlers with engines larger than 1000 HP, accounted for 60% of the catches in 1994-97. In the same period the smaller pair trawlers (<1000 HP) caught 20%, jiggers 9% and large single trawlers 9%. All other vessels had only small catches of saithe as by-catch. Growth rates have increased from the low level observed in 1990-1991 to 1994-1996 and have decreased again in 1997.

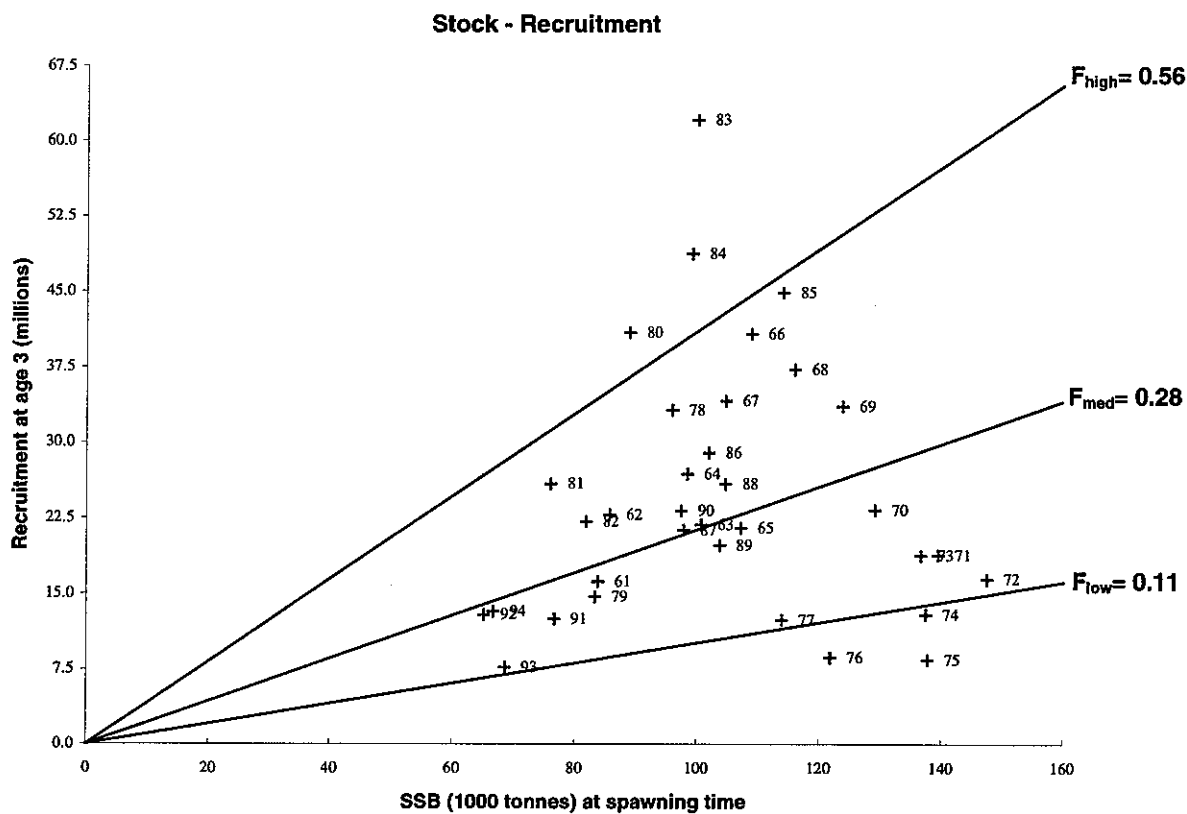
Assessment tuned with commercial pair trawler effort data. No recruitment indices are available.

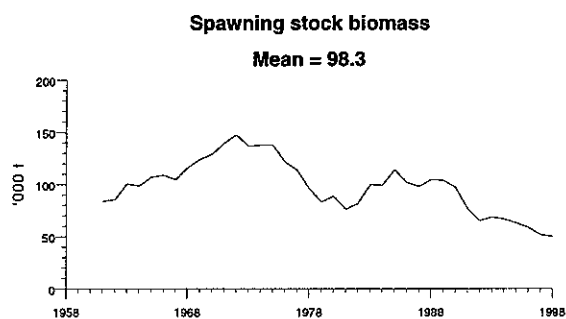
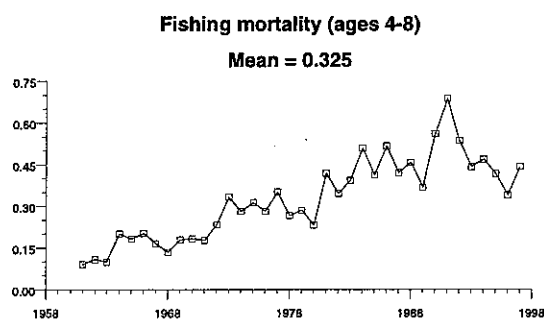
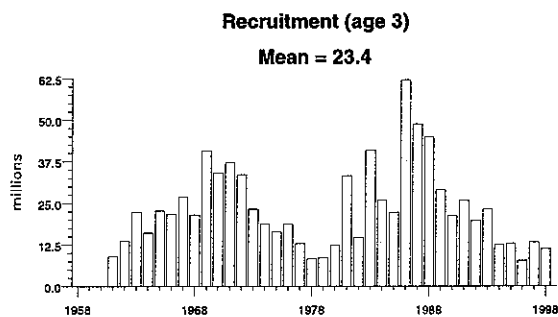
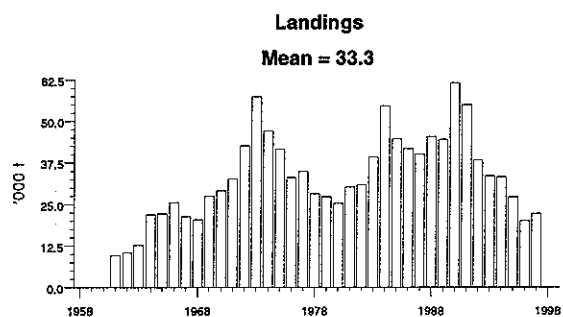
Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

Catch data (Tables 3.3.2.1-2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Landings
1987	No increase in F	32		40
1988	No increase in F	32		45
1989	Reduction in F	<40		44
1990	Reduction in F	41		62
1991	TAC	30		55
1992	Reduction in F	27		38
1993	Reduction in F	<37		34
1994	TAC	26	42 ¹	33
1995	TAC	22	39 ¹	27
1996	TAC	39	-	20
1997	20% reduction in F from 1995 level	21	-	22
1998	30% reduction in effort from 1996/97 level	-	-	
1999	F less than F _{pa} (0.28)	<14		

¹In the quota year 1 September-31 August the following year. Weights in '000 t





Faroe saithe

Yield and Spawning Stock Biomass

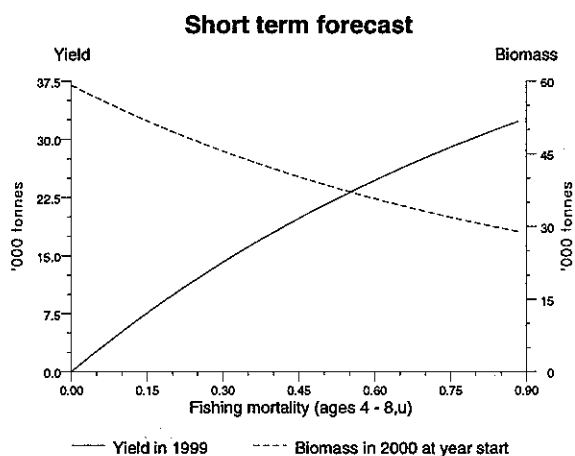
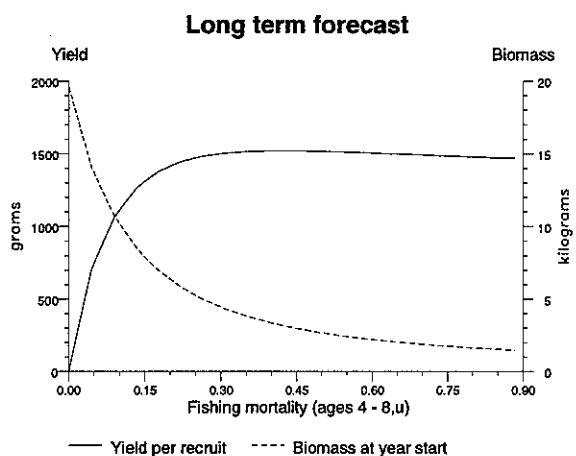


Table 3.3.2.1 Saithe in the Faroes. Nominal catches (t) by countries, 1984-97 as officially reported to ICES.

<i>Country</i>	1984	1985	1986	1987	1988	1989	1990
Denmark	-	-	21	255	94	-	2
Faroe Islands	54,344	42,874	40,139	39,301	44,402	43,624	59,821
France	243	839	87	153	313	-	-
German Dem.Rep.	-	31	-	-	-	9	-
German Fed. Rep.	73	227	105	49	74	20	15
Netherlands	-	-	-	-	-	22	67
Norway	5	-	24	14	52	51	46
UK (Eng. & W.)	-	4	-	108	-	-	-
UK (Scotland)	-	630	1,340	140	92	9	33
United Kingdom	-	-	-	-	-	-	-
USSR	-	-	-	-	-	-	30
<i>Total</i>	54,665	44,605	41,716	40,020	45,027	43,735	60,014
<i>Working Group estimate</i> ^{4,5}	54,665	44,605	41,716	40,020	45,285	44,477	61,628

<i>Country</i>	1991	1992	1993	1994	1995	1996	1997 ¹
Denmark	-	-	-	-	-	-	-
Faroe Islands	53,321	35,979	32,719	32,406	26,918	19,267	21,721
France ³	-	1,999	75	19	10	8	-
German Dem.Rep.	-	-	-	-	-	-	-
German Fed. Rep.	32	5	2	1	41	3	5
Netherlands	65	-	-	-	-	-	-
Norway	103	85	32	156	14	96	67
UK (Eng. & W.)	5	74	279	151	21	53	-
UK (Scotland)	79	98	425	438	200	580	-
United Kingdom	-	-	-	-	-	-	394
USSR/Russia ²	-	12	-	-	-	18	28
<i>Total</i>	53,605	38,252	33,532	33,171	27,204	20,025	22,215
<i>Working Group estimate</i> ^{4,5}	54,858	38,366	33,543	33,182	27,213	20,025	22,229

¹ Preliminary.

² As from 1991.

³ Quantity unknown 1989-91.

⁴ Includes catches from Sub-division Vb2 and Division IIa in Faroese waters.

⁵ Includes French catches from Division Vb, as reported to the Faroese coastal guard service.

Table 3.3.2.2

Saithe in the Faroe Grounds (Fishing Area Vb).

Year	Recruitment Age 3	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1961	9.05	83.79	9.59	0.091
1962	13.66	85.63	10.45	0.108
1963	22.43	100.62	12.69	0.100
1964	16.19	98.37	21.89	0.201
1965	22.80	107.20	22.18	0.183
1966	21.82	108.76	25.56	0.203
1967	26.87	104.61	21.32	0.166
1968	21.50	115.92	20.39	0.135
1969	40.79	123.75	27.44	0.179
1970	34.12	129.08	29.11	0.183
1971	37.25	139.42	32.71	0.177
1972	33.60	147.47	42.66	0.233
1973	23.27	136.57	57.43	0.333
1974	18.84	137.47	47.19	0.281
1975	16.44	137.72	41.58	0.313
1976	18.78	121.84	33.07	0.282
1977	12.93	113.95	34.84	0.351
1978	8.42	95.86	28.14	0.266
1979	8.66	83.30	27.25	0.285
1980	12.37	88.80	25.23	0.232
1981	33.21	76.03	30.10	0.418
1982	14.68	81.79	30.96	0.346
1983	40.93	99.80	39.18	0.393
1984	25.89	99.02	54.67	0.508
1985	22.16	114.01	44.61	0.412
1986	62.16	101.85	41.72	0.516
1987	48.80	97.76	40.02	0.420
1988	44.91	104.61	45.29	0.458
1989	28.97	103.73	44.48	0.367
1990	21.28	97.37	61.56	0.560
1991	25.85	76.66	54.86	0.688
1992	19.79	65.18	38.37	0.536
1993	23.21	68.58	33.54	0.441
1994	12.48	66.70	33.18	0.469
1995	12.91	63.02	27.21	0.417
1996	7.66	58.80	20.03	0.340
1997	13.23	51.59	22.23	0.442
1998	11.27	49.94	.	.
Average	23.40	98.33	33.32	0.325
Unit	Millions	1000 tonnes	1000 tonnes	-

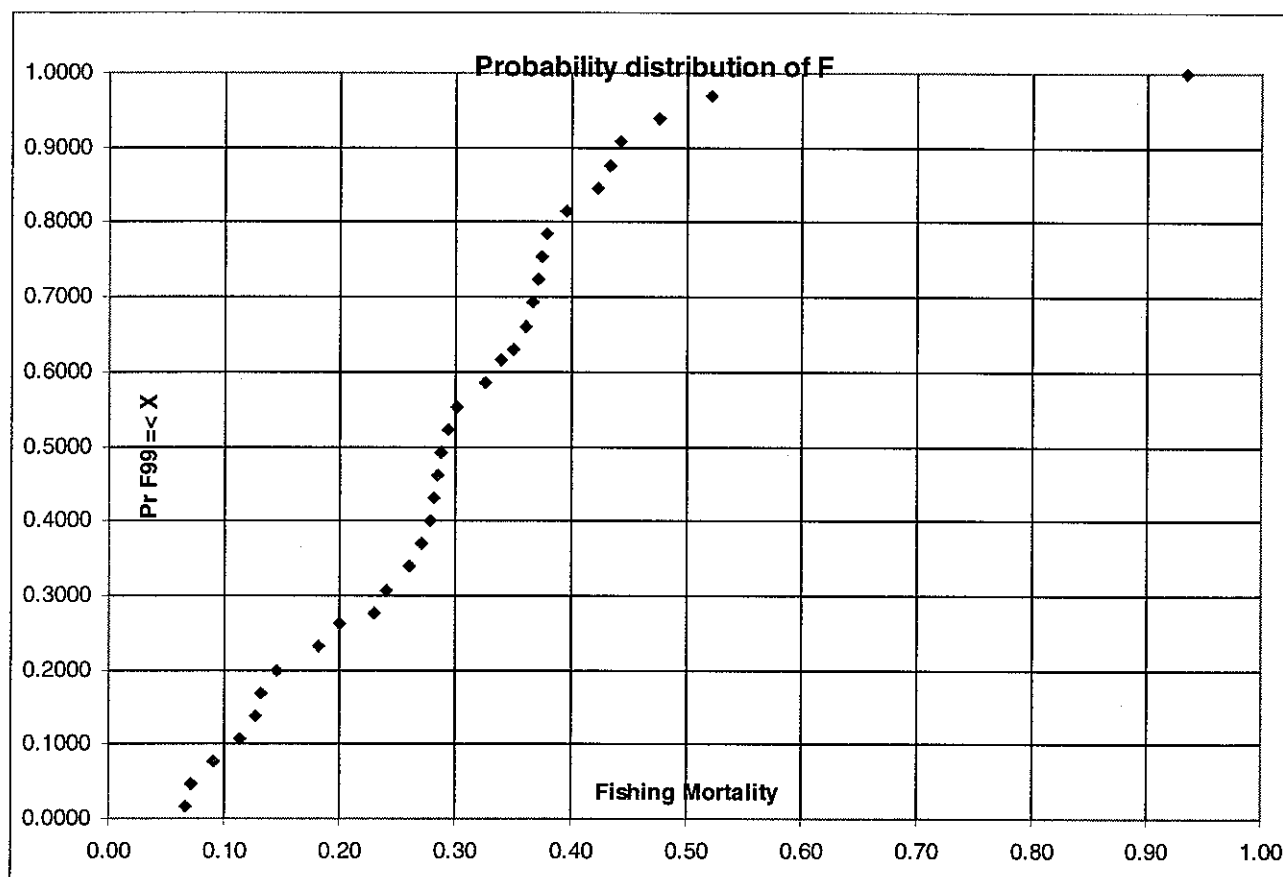


Figure 3.3.2.1 Saithe in the Faroes Grounds. Probability distribution of fishing mortalities (aged 4–8 years).

3.3.3 Cod

3.3.3.a Faroe Plateau cod (Sub-division Vb₁)

State of stock/fishery: The stock is at present considered to be harvested close to or outside safe biological limits as defined by the proposed reference points. Although the stock biomass is estimated to be above the proposed B_{pa} of 40 000 t, the fishing mortality appears to exceed the proposed F_{pa} (0.35) in 1996 and 1997 and may not be sustainable. Due to the combined effect of high fishing mortality and poor recruitment between 1984 and 1991, the SSB reached very low levels in the early 1990s. SSB increased in 1994–1996/1997 due to the recruitment of the 1992 and 1993 year classes which are estimated to be well above the long-term average.

Management objectives: There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends that fishing mortality be reduced below $F_{pa}=0.35$.

Proposed reference points: The lowest observed biomass of this stock is about 21 000 t, and B_{loss} and B_{lim} are both set to this value. B_{pa} is proposed to be 40 000 t and F_{pa} is set at 0.35 accordingly. The above defined reference points should be regarded as preliminary due to the uncertainty of the assessment.

Relevant factors to be considered in management: Close monitoring should be carried out in order to evaluate the effect of the effort regulation, in particular the possible changes in catchability and target species. It should be noted that cod are taken in a mixed fishery with saithe and haddock.

Catch forecast: A short-term prediction of catches is

not possible due to problems with the assessment, but if the number of days allocated is maintained there is an estimated 50% probability that fishing mortality will be between 0.36 and 0.50, and therefore exceed F_{pa} while there is an 80% probability that fishing mortality will be less or equal than the range 0.6 to 0.76 (Figure 3.3.3.a.1) depending on the actual utilisation by gear of the days allocated.

Elaboration and special comment: Cod are taken in a mixed demersal fishery which was initially international. Following the declaration of EEZs in the 1970s, the fishery became largely Faroese and fishing mortality declined briefly but it has increased since to former high levels. Most of the vessels involved are trawlers and longliners. An effort control system was adopted from 1 June 1996 as described in Section 3.3.1.

In 1995–1997 catch per unit effort increased considerably, both in the survey and for most fleets in the fishery. The CPUE increased for all age-groups compared to 1994, which suggests that the availability of the stock to both the fishery and the survey may have increased in 1995–1997, possibly because of a change in the behaviour or distribution of the stock. Such changes make analytical assessments difficult and uncertain.

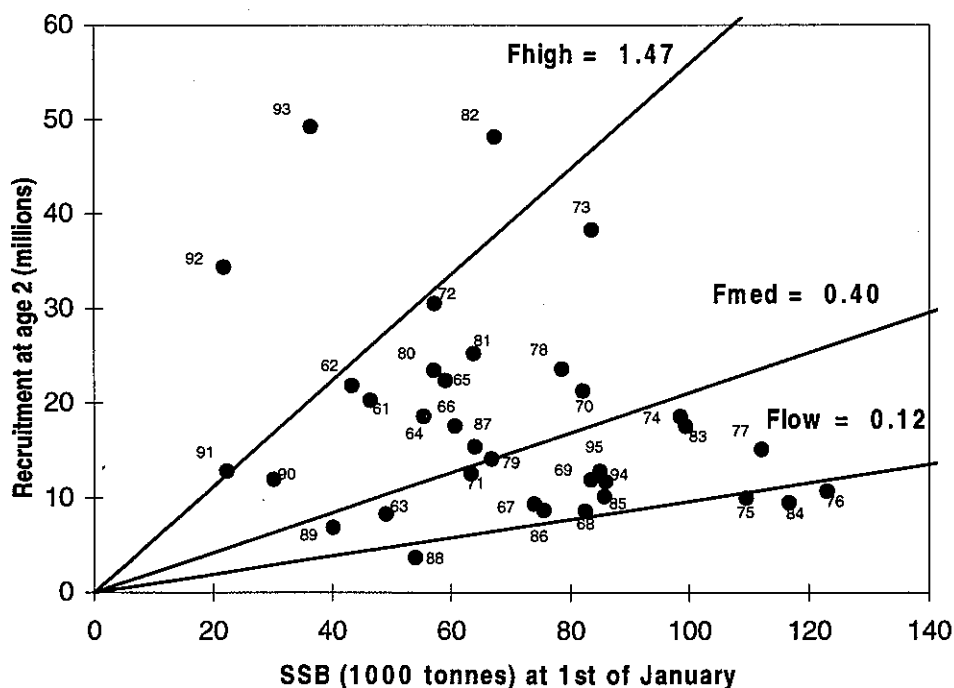
Analytical assessment presented to illustrate the development in the stock using catch at age data tuned with 2 commercial CPUE series. The growth rate of fish in the stock has shown a declining trend over the last three decades, with a short-term increase in recent years. However, in the last 2 years growth rate has declined again.

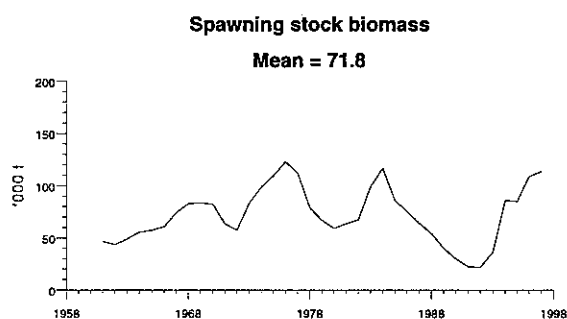
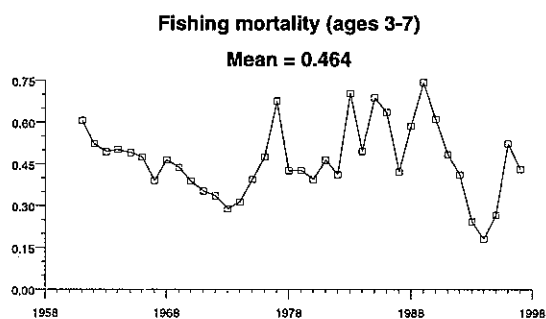
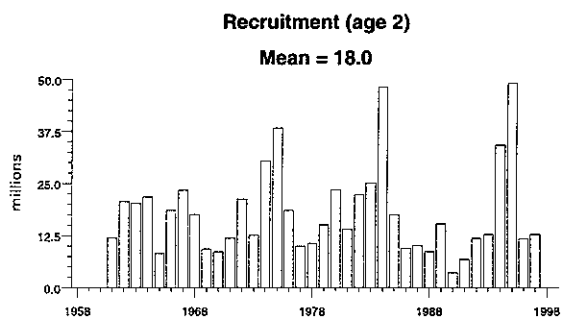
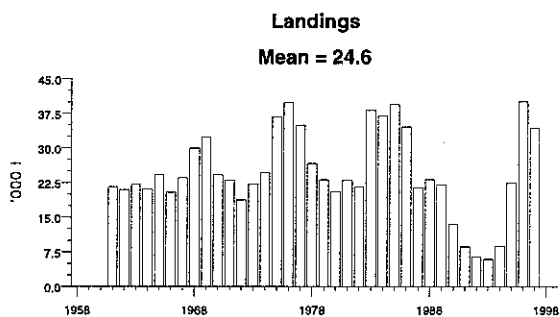
Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

Catch data (Tables 3.3.3.a.1–3):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	No increase in F	31		21.4
1988	No increase in F (Revised estimate)	29 (23)		23.2
1989	No increase in F	19		22.1
1990	No increase in F	20		13.5
1991	TAC	16		8.7
1992	No increase in F	20		6.5
1993	No fishing	0		6.0
1994	No fishing	0	8.5/12.5 ^{1,2}	8.8
1995	No fishing	0	12.5 ¹	23.0
1996	F at lowest possible level	-	20 ²	40.5
1997	80% of F(95)	24	-	34
1998	30% reduction in effort from 1996/97	-	-	
1999	F less than Fpa (0.35)	-		

¹ In the quota year 1 September–31 August the following year. ² The TAC was increased during the quota year. Weights in '000 t.





Faroe Plateau cod (Sub-division Vb₁)

Yield and Spawning Stock Biomass

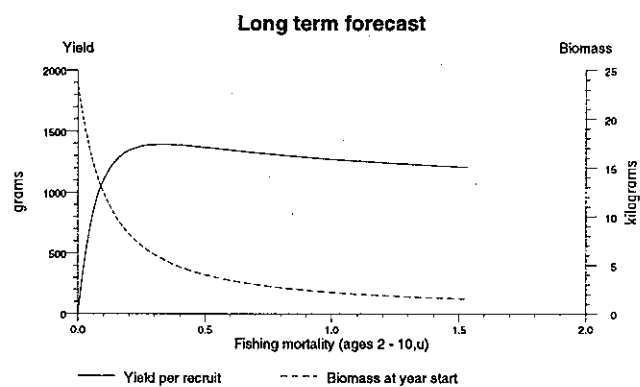


Table 3.3.3.a.1

Faroe Plateau (Sub-division Vb₁) COD. Nominal catches (tonnes) by countries, 1986-1997, as officially reported to ICES.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Denmark	8	30	10	-	-	-	-	-	-	-	-	-
Faroe Islands	34,492	21,303	22,272	20,535	12,232	8,203	5,938	5,744	8,724	19,079	39,406	33,556
France ¹⁾	4	17	17	-	-	- ²	318 ³	1 ³	-	2 ³	-	-
Germany	8	12	5	7	24	16	12	+	2 ³	2	+	+ ^A
Norway	83	21	163	285	124	89	39	57	36	38	574	410
UK (Engl. and Wales)	-	8	-	-	-	1	74	186	56	43	126	-
UK (Scotland) ²⁾	-	-	-	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	324 ³
Total	34,595	21,391	22,467	20,827	12,380	8,309	6,381	5,988	8,818	19,164	40,106	34,290

¹ Preliminary

¹⁾ Included in Vb2.

² Quantity unknown 1991.

³ Reported as Vb.

^A Reported to the Faroese Coastal Guard.

Table 3.3.3.a.2

Nominal catch (tonnes) of COD in sub-division Vb₁ (Faroe Plateau) 1986-1997, as used in the assessment.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Officially reported	34,595	21,391	22,467	20,827	12,380	8,309	6,381	5,988	8,818	19,164	40,106	34,290
Faroe catches in IIA within Faroe area jurisdiction			715	1,229	1,090	351	154					
Expected misreporting/discard										3330		
French catches as reported to Faroese authorities				12	17							
Total used in the assessment	34,595	21,391	23,182	22,068	13,487	8,660	6,535	5,988	8,818	22,494	40,106	34,290

¹ Preliminary

Table 3.3.3.a.3 Cod in the Faroe Plateau (Fishing Area Vb₁).

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-7
1961	12.02	46.44	21.60	0.606
1962	20.65	43.33	20.97	0.523
1963	20.29	49.05	22.22	0.494
1964	21.83	55.36	21.08	0.502
1965	8.27	57.06	24.21	0.491
1966	18.57	60.63	20.42	0.474
1967	23.45	73.93	23.56	0.390
1968	17.58	82.48	29.93	0.464
1969	9.33	83.49	32.37	0.438
1970	8.61	82.03	24.18	0.388
1971	11.93	63.31	23.01	0.353
1972	21.32	57.18	18.73	0.336
1973	12.57	83.55	22.23	0.289
1974	30.48	98.43	24.58	0.314
1975	38.32	109.57	36.78	0.395
1976	18.58	123.08	39.80	0.475
1977	10.00	112.07	34.93	0.676
1978	10.71	78.51	26.59	0.426
1979	15.14	66.72	23.11	0.427
1980	23.58	58.95	20.51	0.394
1981	14.07	63.70	22.96	0.464
1982	22.38	67.30	21.49	0.413
1983	25.22	99.37	38.13	0.704
1984	48.16	116.73	36.98	0.497
1985	17.57	85.72	39.48	0.688
1986	9.50	75.52	34.60	0.636
1987	10.17	63.89	21.39	0.423
1988	8.66	54.00	23.18	0.587
1989	15.39	40.15	22.07	0.744
1990	3.63	30.12	13.49	0.612
1991	6.87	22.23	8.66	0.485
1992	11.94	21.81	6.54	0.413
1993	12.83	36.50	5.99	0.244
1994	34.35	85.92	8.82	0.181
1995	49.22	84.98	22.49	0.268
1996	11.76	109.06	40.11	0.524
1997	12.81	113.51	34.29	0.432
Average	18.05	71.78	24.63	0.464
Unit	Millions	1000 tonnes	1000 tonnes	-

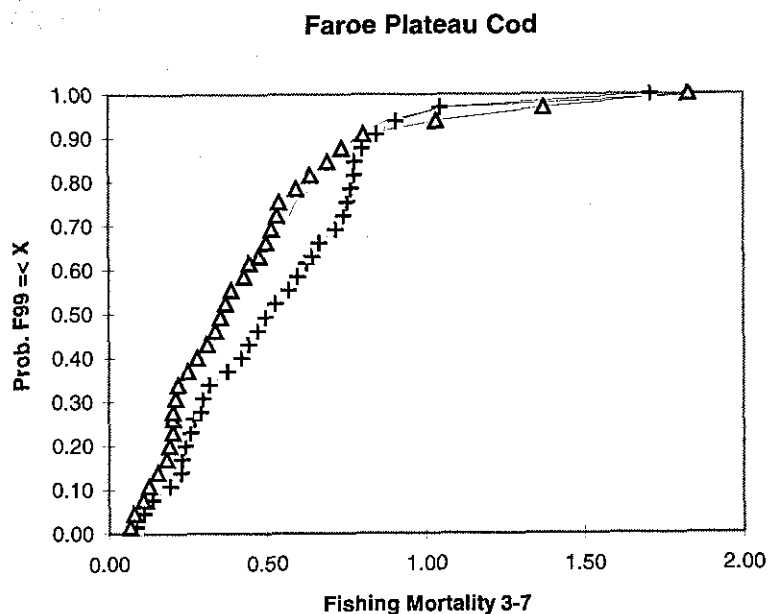


Figure 3.3.3.a.1 Faroe Plateau Cod. Cumulative probability distribution of the 1998 fishing mortalities under the current number of fishing days allocated for the LL<100, ST<400, PT>1000, LL>100, OPEN, and JIGGERS. Three options are presented where the 8155 days allocated to the LL<100, jiggers and ST<400 is either used intirely by the LL (solid line), the ST<400 (line with +) or by the jiggers (line with triangles, with 18640 days). The probability does not reach 1.0 on the graph because of a few very high catchabilities in 1985 for some of the fleets.

3.3.3.b Faroe Bank cod (Sub-division Vb₂)

State of stock/fishery: Stock biomass is not known precisely, but seems to be high. The Faroese groundfish surveys on the Bank indicate a steady decline from 1984 to 1990 after which a slight increase was observed from 1991 to 1995. The 1996–1998 surveys suggest a steep increase compared with previous years. CPUE data for the longliners fishing Faroe Bank cod indicate a similar trend with decreases until the early 1990s and increases since then. The survey and commercial CPUE data were not sufficient to carry out an analytical assessment (Figure 3.3.3.b.1).

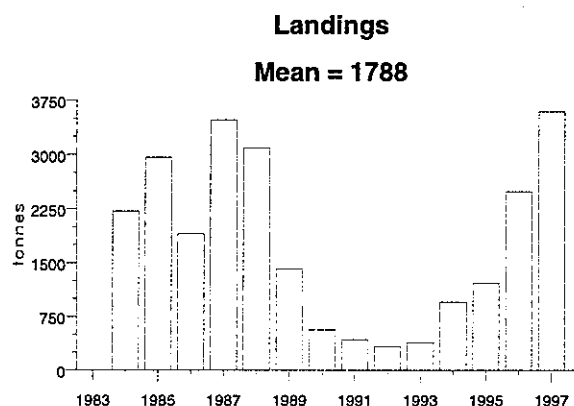
Management objectives: There are no explicit management objectives for this stock. However, for any management objective to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: In view of the uncertainties about the state of this stock ICES recommends that fishing effort in 1999 on the Faroe Bank should not exceed the 1996–1997 level.

Catch data (Tables 3.3.3.b.1–2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings
1987	No assessment	-		3.5
1988	No assessment	-		3.1
1989	Addition to Faroe Plateau TAC	~2.0		1.4
1990	Access limitation may be required	-		0.6
1991	Access limitation may be required	-		0.4
1992	No fishing	0.3		0.3
1993	TAC	0.5		0.4
1994	TAC	0.5		1.0
1995	Precautionary TAC	0.5		0.7
1996	Precautionary TAC	0.5	1.0	2.1
1997	Effort ≤ present levels	0.7		3.6
1998	Effort ≤ present levels	-		
1999	Effort ≤ 1996–1997 level	-		

Weights in '000 t.



Proposed reference points: Establishing a basis for precautionary limits is marred by the lack of estimates of stock size and mortality rates.

Elaboration and special comment: Close monitoring should be carried out, to evaluate the effect of the proposed effort regulation, in particular the possible changes in catchability and target species.

This was an international fishery until the declaration of EEZs since when the stock has largely been exploited by Faroese vessels. The stock was the subject of a summer trawl fishery but trawling is now banned. The fishery is mainly carried out by longliners.

Catch statistics should be improved in order to keep the catch series from the Faroe Bank and the Faroe Plateau separate.

Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

Table 3.3.3.b.1 Faroe Bank (Sub-division Vb₂) COD. Nominal catches (tonnes) by countries, 1986–1997.
As officially reported to ICES.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ^{*)}
Faroe Islands	1,836	3,409	2,960	1,270	289	297	122	264	717	561	2,051	3,459
Norway	6	23	94	128	72	38	32	2	8 *	105 *	57 *	138
UK (E/W/Ni)	-	-	-	-	-	-	+	1	1	-	- ²	- ³
UK (Scotland) ¹	63	47	37	14	205	90	176	118	227	551	382	- ³
Total	1,905	3,479	3,091	1,412	566	425	330	385	953	1,217	2,490	3,597

*) Preliminary.

1) Includes Vb1

2) Included in Vb1

3) See cod Vb1

Table 3.3.3.b.2 Faroe Bank cod (Fishing Area Vb₂).

Year	Landings
1984	2,216
1985	2,961
1986	1,905
1987	3,479
1988	3,091
1989	1,412
1990	566
1991	425
1992	330
1993	385
1994	953
1995	1,217
1996	2,490
1997	3,597
Average	1,788
Unit	tonnes

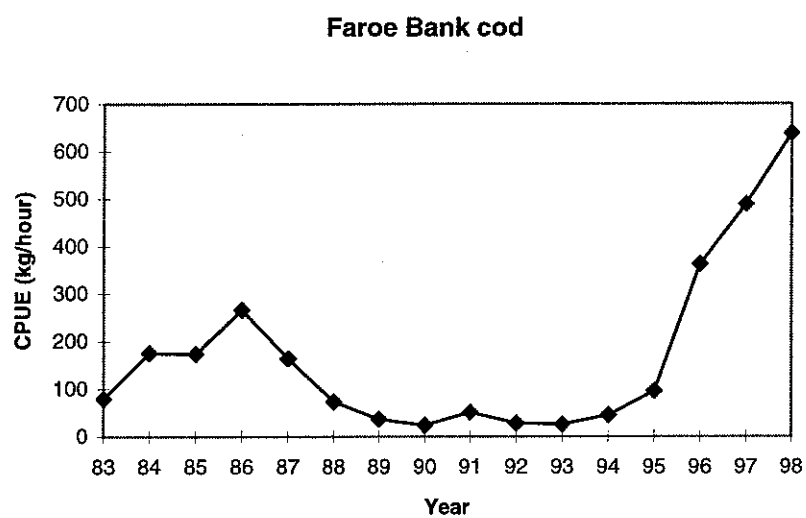


Figure 3.3.3.b.1 Catch per unit effort of Faroe Bank cod in the spring groundfish survey.

3.3.4 Faroe haddock

State of stock/fishery: The stock is at present considered to be harvested close to safe biological limits as defined by the proposed reference points. SSB is estimated to be above the proposed $B_{pa}=55\ 000$ t. Fishing mortality is currently slightly above the proposed F_{pa} (0.25). The SSB was below average in 1996, but has improved significantly by 1997–98 due to the recruitment of the strong 1993 year class and the average 1994 year class. However, there are no signs of other more recent good year classes, so the SSB is expected to decrease again in the short term.

Management objectives: There are no explicit management objectives for this stock. However, for any management objective to meet precautionary criteria, F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends that fishing mortality in 1999 should be decreased to below F_{pa} , corresponding to a catch of less than 9 000 t in 1999. It would be prudent to reduce the fishing mortality even further because the SSB is dominated by only two year classes and there are no signs of more recent good year classes.

Proposed reference points: It is proposed that B_{lim} be set at a previously established MBAL of 40 000 t above which the probability of good recruitment is high. A proposed B_{pa} of 55 000 t was calculated. It is proposed that $F_{pa} = F_{med} = 0.25$.

Relevant Factors to be considered in management: Close monitoring should be carried out, to evaluate the effect of the effort regulation, in particular the possible changes in catchability and target species. In addition, it should be noted that haddock are caught in a mixed fishery with cod and saithe.

Catch Forecast for 1999: Basis: $F(98)=F(97)$, $Catch(98)=14$, $Landings(98)=14$, $SSB(99)=42$

F (99)	Basis	Landings(98)	SSB(2000)
0	No catch	0	48
0.13	0.4F(97)	5	43
0.19	0.6F(97)	7	40
0.25	0.8F(97)	9	38
0.32	1.0F(97)	11	36
0.38	1.2F(97)	13	34

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

If the number of fishing days allocated is maintained there is a probability of about 80% that fishing mortality will not exceed $F(0.29)$ in 1998 and 1999 (Figure 3.3.4.1).

Elaboration and special comment: Haddock are part of a mixed demersal fishery which was initially international. Following the declaration of EEZs in the 1970s, the fishery became largely Faroese and fishing mortality declined in this period. Most of the vessels involved are trawlers and longliners.

The mean weights at age have been increasing since 1992, but are now decreasing again for most ages.

Analytical assessment using commercial trawl and longline data. Recruitment indices from bottom trawl surveys.

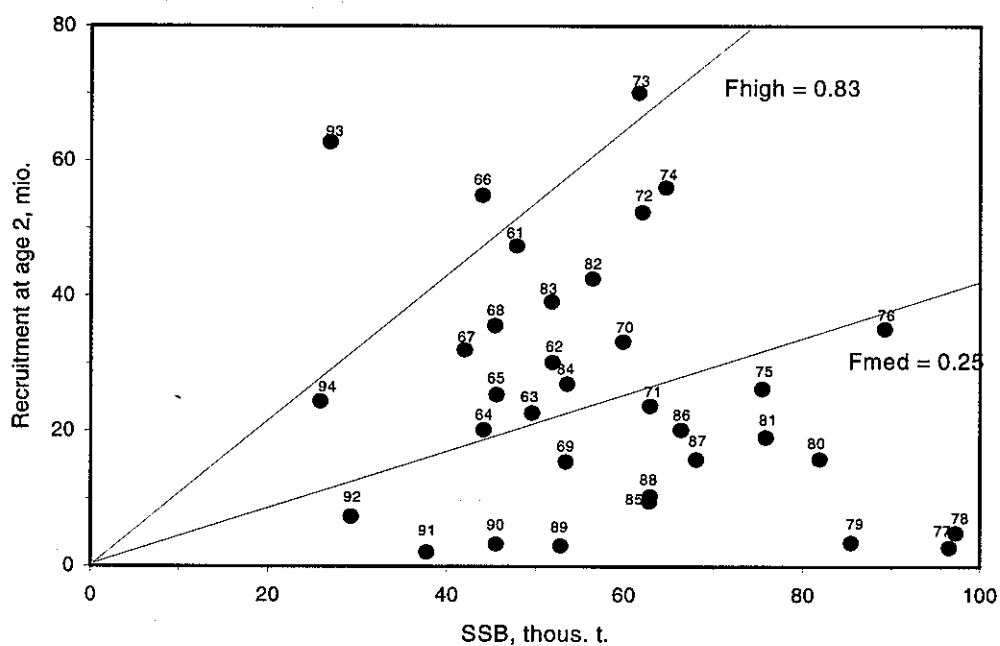
Source of information: Report of the North-Western Working Group, April/May 1998 (ICES CM 1998/ACFM:19).

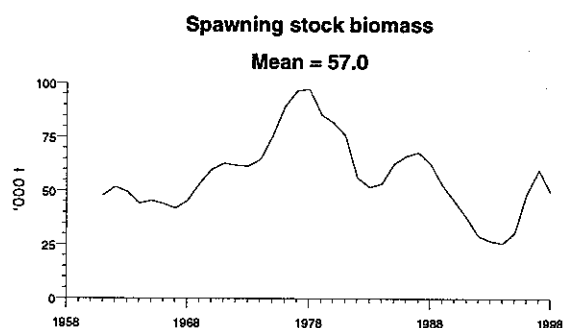
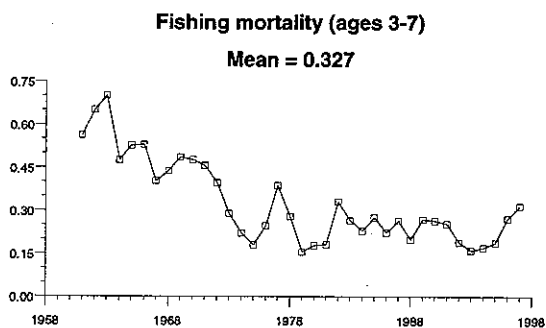
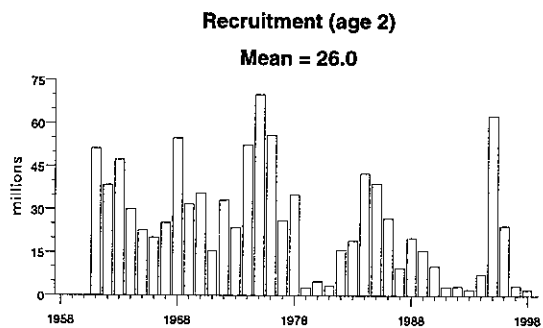
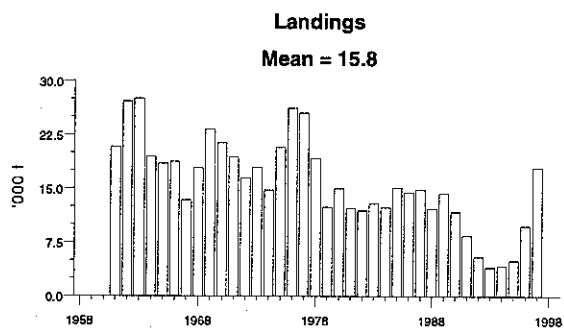
Catch data (Tables 3.3.4.1– 3):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	No increase in F	17		14.9
1988	No increase in F	18		12.2
1989	No increase in F	11		14.3
1990	No increase in F	11		11.7
1991	TAC	11		8.4
1992	TAC	13-15		5.5
1993	Reduction in F	<8		4.0
1994	No fishing	0	6.2	4.3
1995	No fishing	0	6.2	5.0
1996	TAC	8.3	12.6 ¹	9.8
1997	F ≤ F(95)	9.3		17.9
1998	F ≤ F(96)	≤16		
1999	F < F _{pa} (0.25) = 0.8 F(97)	<9		

¹For the period 1 September 1995 to 31 May 1996. Weights in '000 t.

Faroe haddock





Faroe haddock

Yield and Spawning Stock Biomass

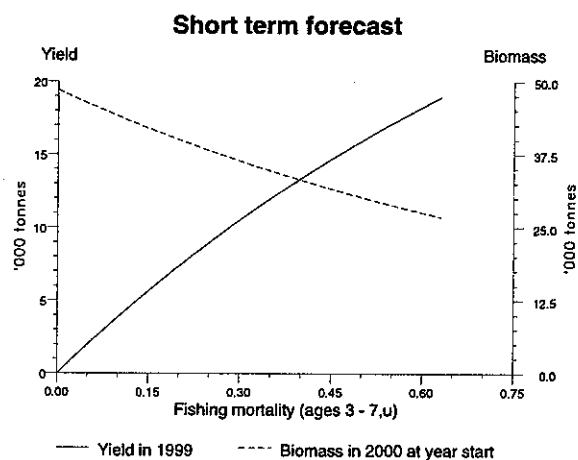
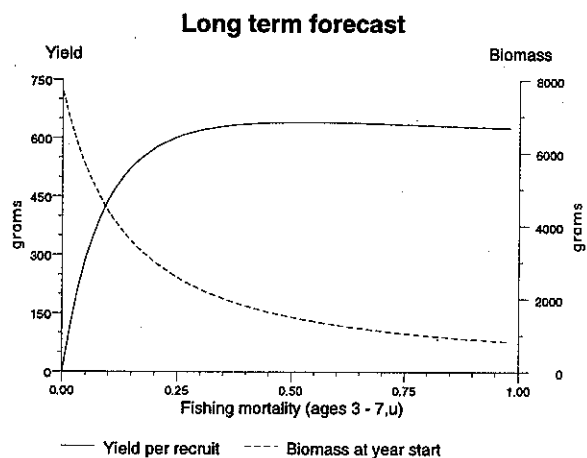


Table 3.3.4.1 Faroe Plateau (Sub-division Vb1) HADDOCK. Nominal catches (tonnes) by countries
1982-1997, as officially reported to ICES, and the total Working Group estimate in Vb.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	-	-	-	-	1	8	4	-
Faroe Islands	10,319	11,898	11,418	13,597	13,359	13,954	10,867	13,506
France ¹	2	2	20	23	8	22	14	-
Germany	1	+	+	+	1	1	-	+
Norway	12	12	10	21	22	13	54	111
UK (Engl. and Wales)	-	-	-	-	-	2	-	-
UK (Scotland) ³	1	-	-	-	-	-	-	-
United Kingdom								
Total	10,335	11,912	11,448	13,641	13,391	14,000	10,939	13,617
Working Group estimate ^{4,5}	11,937	12,894	12,378	15,143	14,477	14,882	12,178	14,325

Country	1990	1991	1992	1993	1994	1995	1996	1997 ²
Denmark	-	-	-	-	-	-	-	-
Faroe Islands	11,106	8,074	4,655	3,622	3,675	4,549	9,152	16,585
France ¹	-	-	164	-	-	-	-	-
Germany	+	+	-	-	-	5	-	-
Norway	94	125	71	28 ²	22 ²	28 ²	164	45
UK (Engl. and Wales)	7	-	54	81	31	23	5	...
UK (Scotland) ³	-	-	-	-	-	-	...	...
United Kingdom								156 ⁶
Total	11,207	8,199	4,944	3,731	3,728	4,605	9,321	16,786
Working Group estimate ^{4,5}	11,726	8,429	5,476	4,026	4,252	4,967	9,761	17,923

1) Including catches from Sub-division Vb2. Quantity unknown 1989-1991, 1993 and 1995-97.

2) Provisional data

3) From 1983 to 1996 catches included in Sub-division Vb2.

4) Includes catches from Sub-division Vb2 and Division IIa in Faroese waters.

5) Includes French catches from Division Vb, as reported to the Faroese coastal guard service

6) Reported as Division Vb.

Table 3.3.4.2 Faroe Bank (Sub-division Vb2) HADDOCK. Nominal catches (tonnes) by countries, 1982-1997, as officially reported to ICES.

Country	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	1,533	967	925	1,474	1,050	832	1,160	659
France ¹	-	-	-	-	-	-	-	-
Norway	1	2	5	3	10	5	43	16
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
UK (Scotland) ³	48	13	+	25	26	45	15	30
Total	1,582	982	930	1,502	1,086	882	1,218	705

Country	1990	1991	1992	1993	1994	1995	1996	1997 ²
Faroe Islands	325	217	338	185	353	303	338	1133
France ¹	-	-	-	-	-	-	-	-
Norway	97	4	23	8 ²	1 ²	20 ²	40	4
UK (Engl. and Wales)	-	-	+	+	... ¹	... ¹	... ¹	... ¹
UK (Scotland) ³	725	287	869	102	170	39	62	... ¹
Total	1,147	508	1,230	295	524	362	440	1,137

1) Catches included in Sub-division Vb1.

2) Provisional data

3) From 1983 to 1996 includes also catches taken in Sub-division Vb1 (see Table 2.4.1)

Table 3.3.4.3 Haddock in the Faroe Grounds (Fishing Area Vb).

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-7
1961	51.28	47.80	20.83	0.562
1962	38.54	51.88	27.15	0.651
1963	47.36	49.55	27.57	0.700
1964	30.11	44.13	19.49	0.475
1965	22.64	45.56	18.48	0.526
1966	20.21	43.95	18.77	0.529
1967	25.36	41.96	13.38	0.403
1968	54.84	45.38	17.85	0.438
1969	31.97	53.42	23.27	0.485
1970	35.58	59.86	21.36	0.476
1971	15.45	62.91	19.39	0.456
1972	33.18	61.97	16.49	0.396
1973	23.69	61.58	17.98	0.289
1974	52.33	64.63	14.77	0.221
1975	70.05	75.40	20.72	0.180
1976	55.97	89.22	26.21	0.248
1977	26.20	96.50	25.56	0.387
1978	35.06	97.23	19.20	0.278
1979	2.79	85.39	12.42	0.155
1980	4.94	81.89	15.02	0.178
1981	3.49	75.83	12.23	0.181
1982	15.86	56.40	11.94	0.331
1983	19.05	51.79	12.89	0.265
1984	42.50	53.57	12.38	0.229
1985	39.06	62.80	15.14	0.276
1986	26.94	66.33	14.48	0.223
1987	9.58	68.04	14.88	0.264
1988	20.14	62.89	12.18	0.199
1989	15.77	52.84	14.33	0.269
1990	10.32	45.53	11.73	0.265
1991	3.03	37.74	8.43	0.254
1992	3.28	29.25	5.48	0.188
1993	2.07	26.86	4.03	0.160
1994	7.36	25.83	4.25	0.170
1995	62.73	30.67	4.97	0.187
1996	24.39	48.61	9.76	0.271
1997	3.36	59.93	17.92	0.315
1998	1.97	49.52	.	.
Average	26.01	56.96	15.75	0.327
Unit	Millions	1000 tonnes	1000 tonnes	-

Faroe Haddock

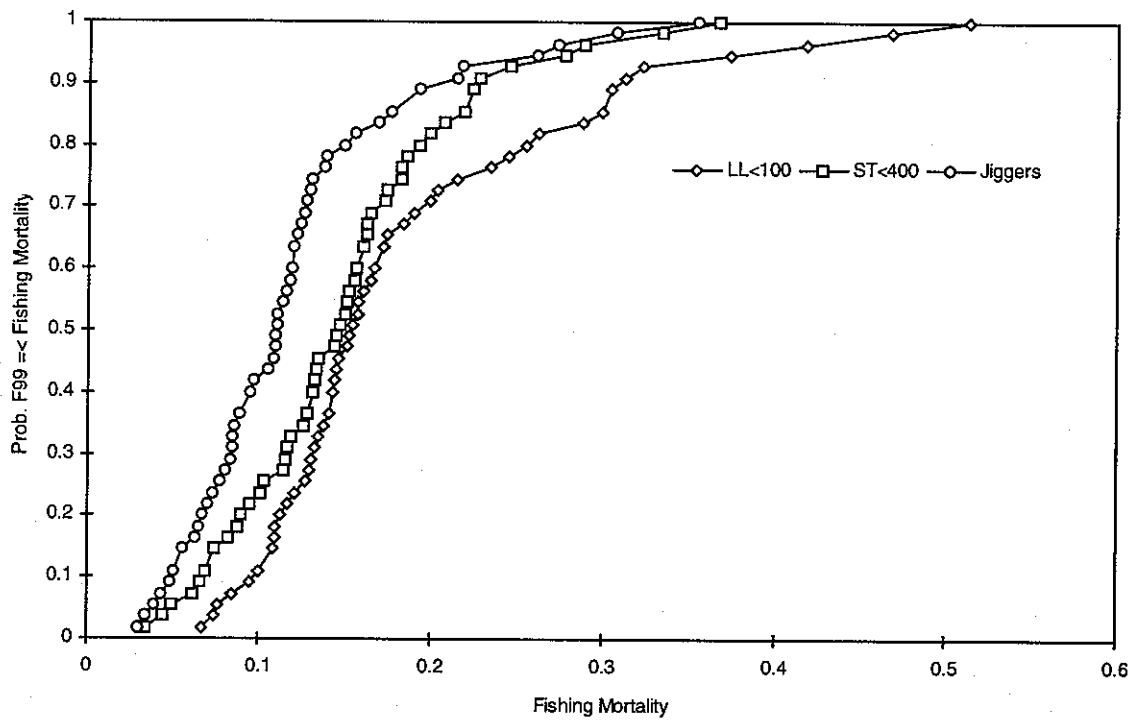


Figure 3.3.4.1 Faroe haddock. Cumulative probability distribution of the 1998-1999 fishing mortalities under the current number of fishing days allocated for the LL<100 GRT, ST<400 HP, PT400-1000 HP, PT>1000 HP and LL>100 GRT.

3.4 Stocks in the Skagerrak and Kattegat (Division IIIa)

3.4.1 Overview

Description of fisheries

The fleets operating in the Skagerrak and Kattegat (Division IIIa) include vessels targeting species for human consumption as well as vessels engaged in fisheries for reduction purposes. The human consumption fleets are diverse including gill netters and Danish seiners exploiting flatfish and cod and demersal trawlers involved in various human consumption fisheries (roundfish, flatfish, *Pandalus* and *Nephrops*). Demersal trawling is also used in the fisheries for Norway pout and sandeel which are landed for reduction purposes. Pelagic trawlers and purse seiners exploit herring, mackerel, horse mackerel and sprat.

The roundfish, flatfish and *Nephrops* stocks are mainly exploited by Danish and Swedish fleets consisting of bottom trawlers (*Nephrops* trawls with >70 mm meshes and bottom trawls with >90 mm mesh size), gill netters and Danish seiners. The number of vessels operating in Division IIIa has decreased in recent years. This is partly an effect of the EU withdrawal programme which until now has affected the Danish fleets only, but these fleets still dominate the fishery in Division IIIa. *Pandalus* is exploited by Danish, Swedish and Norwegian shrimp trawlers.

The industrial fishery is a small-mesh trawl fishery mainly carried out by vessels of a size above 20 m. This fleet component has also decreased over the last decade. The most important fisheries are those targeting sandeel and Norway pout. There is also a trawl fishery landing a mixture of species for reduction purposes. Landings in the industrial fisheries in Division IIIa are given in Table 3.4.1.1.

There are important technical interactions between the fleets. Most of the human consumption demersal fleets are involved in mixed fisheries and the Norway pout and the mixed clupeoid fisheries have by-catches of protected species.

Misreporting and non-reporting of catches have occurred in recent years, particularly for cod, but the amounts vary between years. There are no discard data available for assessments. The time series of age samples from landings for industrial purposes is short and there are gaps in this series.

Overview of resources

The Skagerrak-Kattegat area is to a large extent a transition area between the North Sea and the Baltic - both in terms of hydrography and topography and the identity of stocks in the area. The exchange of water

between the North Sea and the Baltic is the main hydrographic feature of the area.

Several of the stocks in the Skagerrak show close affinities to the North Sea stocks, in terms of both population dynamics (similar trends in recruitment and SSB) and biological indicators such as parasites or genetics. Tagging experiments have demonstrated extensive migration between the two areas for several species. Stocks which are believed to be closely associated between the North Sea and Skagerrak include saithe, hake, cod (except for coastal populations in fjords), haddock, whiting and Norway pout. Sandeel in the North Sea and Skagerrak is probably a complex of several local populations rather than separate populations in the two areas. The landings of sandeel from the Skagerrak area have had a different composition of sandeel species from that in the North Sea.

The main herring stocks exploited in the area are the North Sea autumn spawners and the stock of spring-spawners spawning in the western Baltic and the southern part of Division IIIa. Both stocks have important components migrating into Division IIIa at some time during their life cycle. The juvenile herring in Division IIIa are mainly of North Sea stock origin while the mature fish are predominantly spring-spawners. The major part of the Western Baltic spring spawners migrates into Division IIIa outside the spawning season and is found in the Skagerrak in summer.

Cod in the Kattegat and Belt area are also associated with the western Baltic stock. The structure and extent of migrations is, however, not clear.

Most of the stocks are now assessed in conjunction with the stocks in the neighbouring areas - cod in the Skagerrak, haddock, saithe, Norway pout and autumn-spawning herring are assessed with the North Sea stocks, spring spawning-herring with the western Baltic stock. The state of these stocks is considered in the sections concerning the North Sea and Baltic respectively.

The landings of cod in the Skagerrak in 1996 were 15 000 t in the human consumption fishery with a supplementary by-catch in the industrial fisheries of 200 t. The catch in the human consumption fishery was below the landings taken in 1996 (16 200 t) but very close to the human consumption landing for 1992-1994. The majority of catches were taken by Denmark and Sweden. This stock component is assessed together with cod in the North Sea and the Eastern Channel.

In Kattegat landings of cod in 1997, at 9 500 t, were the highest since 1987. The state of the cod in the Kattegat is uncertain, but indications are that since 1986 the spawning stock has varied without trend at a lower biomass than in earlier years. The present high fishing mortality is not sustainable.

The landings of haddock in Division IIIa in the human consumption fisheries amounted to 3 400 t in 1997 as compared to 3 200 t in 1996. To this must be added the catches from the industrial by-catch estimated at 600 t, a drop from over 2 000 t annually earlier in the 1990s. Most of the catches are taken in the Skagerrak. This stock component is assessed together with haddock in the North Sea.

The catches of whiting for human consumption were below 200 t in 1997 which is slightly lower than in 1996 and about one-third of the reported human consumption landings in 1995. Besides this the fisheries for reduction purposes took a by-catch of whiting of about 600 t. The by-catches are taken by the mixed-clupeid fisheries and in the fisheries targeting Norway pout and sandeel and mainly consist of small (age 0) whiting. Most of the catches are taken in the Skagerrak. No analytical assessment of the whiting in Division IIIa was possible.

The plaice catches in Division IIIa amounted to 10 100 t in 1997 which is very close to the catch in 1996. About 75% of the catch was taken in the Skagerrak. The spawning stock biomass is slightly higher and the exploitation rate is slightly lower than the average over the last 10 years.

The catches of sole in 1997 were slightly over 700 t, down from over 1 000 t in 1996. The stock size is not known precisely, but recruitment was exceptionally high in the period 1989–1994. Since 1995 year classes have been much weaker, comparable to those from 1983–1988, and the exceptionally high biomass is declining.

The industrial fisheries yielded a total catch of 141 000 t in 1997, the same catch as in 1996. Most of the catches consisted of sandeel and Norway pout, which are not regulated by quotas, and herring and sprat (Table 3.4.1.1) By-catches of cod, haddock and whiting in the industrial fisheries were all much reduced from 1996.

The landings of *Nephrops* and *Pandalus* from Division IIIa amounted to 4 200 t and 11 100 t respectively in 1997. The stocks seem to be able to sustain the present fishing mortality.

Table 3.4.1.1 Catches of the most important species in the industrial fisheries in Division IIIa ('000 t), 1974–1997¹.

Year	Sandeel	Sprat ²	Herring ³	Norway pout	Blue whiting	Total
1974	8	71	76	13	-	168
1975	17	101	57	19	-	194
1976	22	59	38	42	-	161
1977	7	67	32	21	-	127
1978	23	78	16	25	-	142
1979	34	96	13	25	6	174
1980	39	84	25	26	14	188
1981	59	76	63	30	+	228
1982	25	40	54	44	5	168
1983	29	26	89	30	16	190
1984	26	36	112	46	15	235
1985	6	20	116	9	19	170
1986	73	11	65	6	9	164
1987	5	14	72	3	25	119
1988	23	9	97	8	15	152
1989	18	10	52	6	9	95
1990	16	10	51	27	10	114
1991	23	14	22	32	11	102
1992	39	2	47	42	18	148
1993 ⁴	45	2	71	8	32	158
1994	55	58	30	7	12	162
1995	12	41	21	50	10	134
1996	54	10	26	36	15	141
1997	81	12	6	32	4	141
Mean						
1974–1997	31	39	52	24	14 ⁴	157

¹Data from 1974–1984 from Anon. (1986), 1985–1993 provided by Working Group members.

²Total landings from all fisheries.

³For years 1974–1985, human consumption landings used for reduction are included in these data.

⁴Mean 1979–1995.

3.4.2 Cod in the Kattegat

State of the stock/fishery: The stock is at present considered to be harvested outside safe biological limits as defined by the proposed reference points. Present exploitation $F(3-5)$ of 1.22 is substantially above the estimated F_{pa} (0.83). However, the estimated SSB (13 000 t) is above the B_{pa} (9 000 t).

The spawning stock declined steadily from 40 000 t in the early 1970s to about 10 000 t in the 1990s. The fishing mortality increased by about 50% over the same period to present values of the reference $F(3-5)$ exceeding 1 per year. In the present state the fishery is very dependent on the strength of incoming year classes. Survey results indicate that recruitment has been improving in the most recent years. There are indications that the 1997 year class is strong.

Management objectives: There are no management objectives set for this fishery.

Advice on management: ICES recommends that fishing mortality on this stock should be reduced to $F_{pa} = 0.6$, 55% of the 1995–1997 average. Management measures should be taken to avoid catch and discards of the 1997 year class.

In order to ensure a higher stability in the catches and recovery of SSB on a more permanent basis, a permanent reduction in fishing mortality is necessary.

Proposed reference points: B_{lim} is selected on the basis of the lowest observed spawning stock (6 400 t) and the proposed B_{pa} is 10 500 t, on the basis of $B_{pa} = B_{lim} * \exp^{(1.645 * 0.3)}$. The spawning stock has declined steadily since the early 1970s at fishing mortality rates averaging $F = 1.0$. F_{lim} is tentatively set equal to $F = 1.0$ and F_{pa} to 0.6 based on $F_{pa} = F_{lim} * \exp^{(-1.645 * 0.3)}$.

Relevant factors to be considered in management: Economically the most important species in the Kattegat are cod, *Nephrops* and sole which each account for about 25% of the total annual landing values. By-catches of cod are found in most of the fisheries targeting sole and *Nephrops*. Effort reductions need to take account of the mixed fishery in this area.

Forecast: A forecast based on *status quo* F indicates catches in 1998 of 8 400 t and 7 300 t in 1999. The catch at F_{pa} would be about 4 500 t in 1999.

Elaboration and special comment: The catch has decreased over the last two decades. During the years 1991–1994 an unknown but probably substantial amount has been either unreported or allocated to other areas. The quality of catches data from 1994 onward has improved, leading to improved reliability of the assessment and the programmes which led to the improvements should be continued.

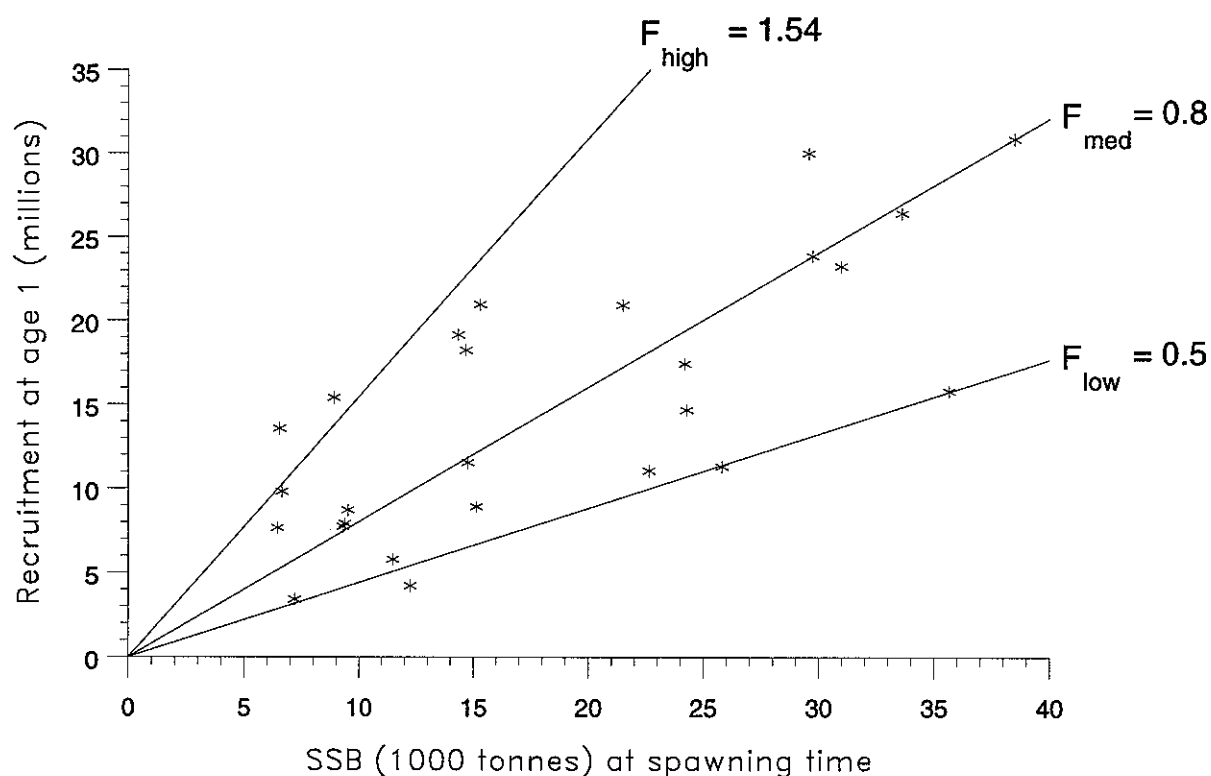
Source of information: Report of the Baltic Fisheries Assessment Working Group, April 1998 (ICES CM 1998/ACFM:16).

Catch data (Tables 3.4.2.1–2):

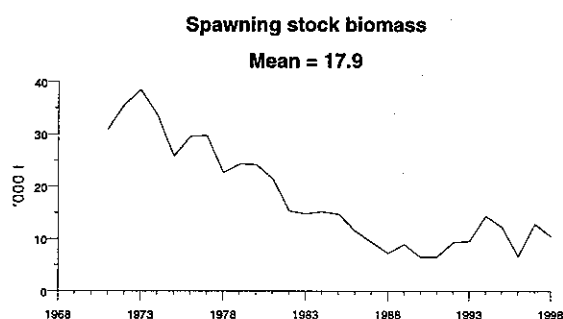
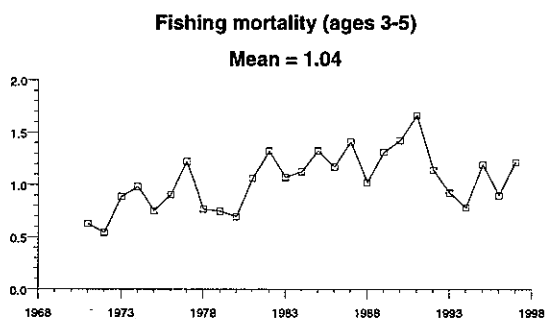
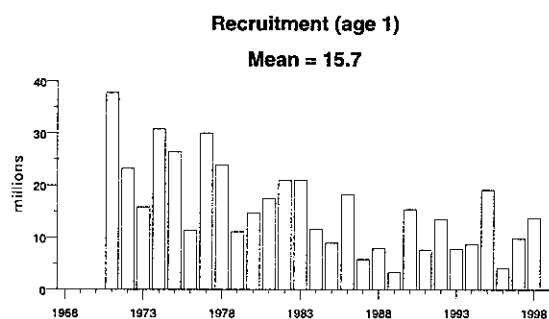
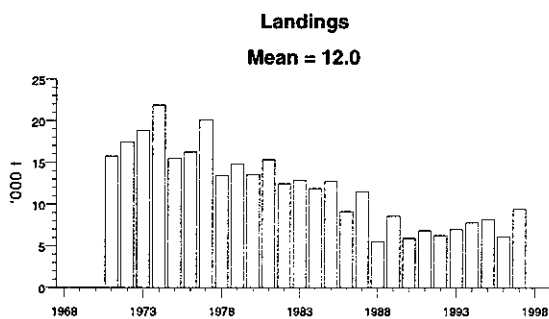
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	Reduction in F	< 13.0	15.5	11.5
1988	Reduction in F	< 15.0	15.0	5.5
1989	TAC	10.0	12.5	8.6
1990	TAC	7.0	8.5	5.9
1991	TAC	6.3	6.65	6.8
1992	30% reduction in fishing effort	-	6.65	6.3
1993	Limit fishing effort to 70% of 1991 effort	-	6.8	7.2
1994	Reduction in catch from 1991–1992	< 6.3–6.8	6.7	7.8
1995	Precautionary TAC based on recent catches	6–7	6.7	8.2
1996	30% Reduction in fishing effort from 1994 level	-	7.7	6.1
1997	Fishing effort should not exceed 70% of the 1994 level	-	8.5	9.5
1998	Fishing effort should not exceed 70% of the 1994 level	-	7.5	
1999	F = 0.6	4.5		

Weights in '000 t.

Stock - Recruitment



(run: XSAMAH02)



Cod in the Kattegat

Yield and Spawning Stock Biomass

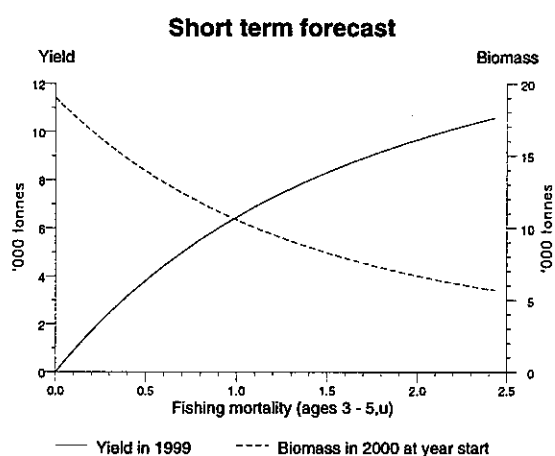
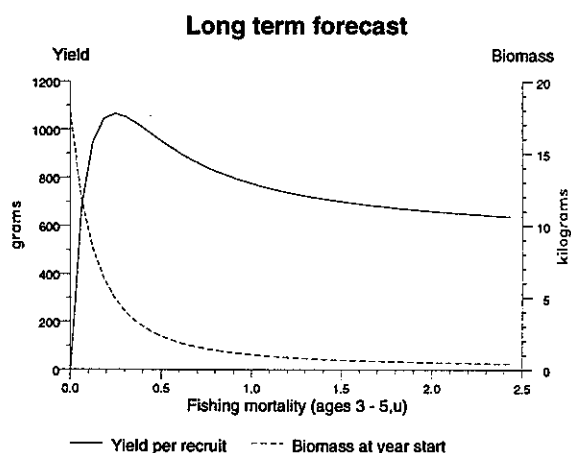


Table 3.4.2.1 Cod landings (in tonnes) from the Kattegat. 1971–1997.

Year	Kattegat			Total
	Denmark	Sweden	Germany ²	
1971	11,748	3,962	22	15,732
1972	13,451	3,957	34	17,442
1973	14,913	3,850	74	18,837
1974	17,043	4,717	120	21,880
1975	11,749	3,642	94	15,485
1976	12,986	3,242	47	16,725
1977	16,668	3,400	51	20,119
1978	10,293	2,893	204	13,390
1979	11,045	3,763	22	14,830
1980	9,265	4,206	38	13,509
1981	10,693	4,380	284	15,337
1982	9,320	3,087	58	12,465
1983	9,149	3,625	54	12,828
1984	7,590	4,091	205	11,886
1985	9,052	3,640	14	12,706
1986	6,930	2,054	112	9,096
1987	9,396	2,006	89	11,491
1988	4,054	1,359	114	5,527
1989	7,056	1,483	51	8,590
1990	4,715	1,186	35	5,936
1991	4,664	2,006	104	6,834
1992	3,406	2,771	94	6,271
1993	4,464	2,549	157	7,170
1994	3,968	2,836	98	7,802 ³
1995	3,789	2,704	71	8,164 ⁴
1996	4,028	2,334	64	6,126 ⁵
1997 ¹	6,099	3,303	58	9,460 ⁶

¹Preliminary.

²Landings statistics incompletely split on the Kattegat and Skagerrak.

The figures are estimated by the Working Group members.

³Including 900 t reported in Skagerrak.

⁴Including 1,600 t misreported by area.

⁵Excluding 300 t taken in Sub-divisions 22–24.

⁶Including 1,700t reported in Sub-division 23.

Table 3.4.2.2 Cod in the Kattegat (part of Fishing Area IIIa).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-5
1971	37.78	30.98	15.73	0.627
1972	23.22	35.66	17.44	0.542
1973	15.78	38.48	18.84	0.887
1974	30.83	33.63	21.88	0.983
1975	26.38	25.80	15.49	0.751
1976	11.29	29.56	16.28	0.905
1977	29.98	29.74	20.12	1.221
1978	23.84	22.63	13.39	0.765
1979	11.05	24.27	14.83	0.746
1980	14.66	24.19	13.51	0.694
1981	17.42	21.49	15.34	1.059
1982	20.92	15.31	12.47	1.323
1983	20.95	14.76	12.83	1.070
1984	11.53	15.15	11.89	1.124
1985	8.91	14.69	12.71	1.324
1986	18.22	11.49	9.10	1.169
1987	5.78	9.39	11.49	1.410
1988	7.90	7.19	5.53	1.019
1989	3.41	8.92	8.59	1.311
1990	15.40	6.46	5.94	1.421
1991	7.66	6.54	6.83	1.664
1992	13.56	9.30	6.27	1.142
1993	7.73	9.53	7.01	0.924
1994	8.71	14.36	7.80	0.781
1995	19.14	12.25	8.17	1.193
1996	4.21	6.64	6.13	0.899
1997	9.81	12.84	9.46	1.217
1998	13.80	10.46	.	.
Average	15.71	17.92	12.04	1.043
Unit	Millions	1000 tonnes	1000 tonnes	-

3.4.3 Whiting in Division IIIa

State of stock/fishery: Based on the available information it was not possible to assess the status of the stock or identify safe biological limits.

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

Reference points:

ICES considers that:	ICES proposes that:
There is not sufficient information to estimate appropriate reference points	

Relevant factors to be considered in management: Recent TACs are not restrictive and provide the potential for re-expansion of the fishery. Given the probable linkage to the North sea stock, which is currently low, this is of concern.

Elaboration and special comment: The major part of the catch is taken as a by-catch in small-mesh fisheries. As in the North Sea landings in 1997 were the lowest observed historically in all fleets. The reduction of landings in 1997 is mainly due to enforcement of the by-catch regulations

Advice on management: ICES advises a TAC of 6 000 t; the average of recent years' catches, 1993–1996.

in small-mesh fisheries. Whiting in Division IIIa are likely to be linked to the North Sea population. Age information is not available for all the historical time series and thus a combined assessment with the North Sea stock has not been made.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Table 3.4.3.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch ¹
1987	Precautionary TAC	-	17.0	16.7
1988	Precautionary TAC	-	17.0	11.8
1989	Precautionary TAC	-	17.0	13.3
1990	Precautionary TAC	-	17.0	19.4
1991	TAC	-	17.0	14.0
1992	No advice	-	17.0	12.3
1993	Precautionary TAC	-	17.0	4.6
1994	If required, precautionary TAC	-	17.0	6.0
1995	If required, precautionary TAC	-	15.2	9.6
1996	If required, precautionary TAC	-	15.2	2.9
1997	If required, TAC equal to recent catches.	-	15.2	0.7
1998	No advice	-	15.2	
1999	TAC, average period 1993–1996	6		

¹Includes by-catch in small-mesh industrial fishery. Weights in '000 t.

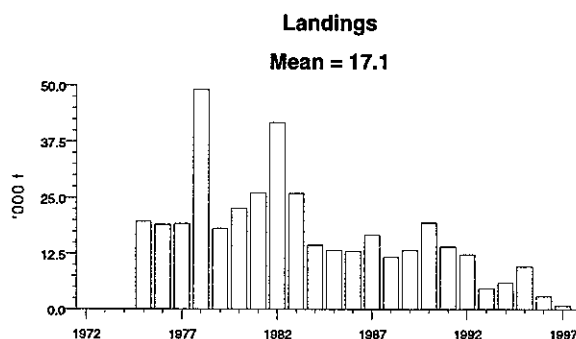


Table 3.4.3.1 Nominal landings (in tonnes) of WHITING from Division IIIa as supplied by the Study Group on Division IIIa Demersal Stocks (Anon., 1992b) and updated by the Working Group.

Year	Denmark		Norway	Sweden	Others	Total	
1975	19,018		57	611	4	19,690	
1976	17,870		48	1,002	48	18,968	
1977	18,116		46	975	41	19,178	
1978	48,102		58	899	32	49,091	
1979	16,971		63	1,033	16	18,083	
1980	21,070		65	1,516	3	22,654	
	Total consumption	Total industrial	Total				
1981	1,027	23,915	24,942	70	1,054	7	26,073
1982	1,183	39,758	40,941	40	670	13	41,664
1983	1,311	23,505	24,816	48	1,061	8	25,933
1984	1,036	12,102	13,138	51	1,168	60	14,417
1985	557	11,967	12,524	45	654	2	13,225
1986	484	11,979	12,463	64	477	1	13,005
1987	443	15,880	16,323	29	262	43	16,657
1988	391	10,872	11,263	42	435	24	11,764
1989	917	11,662	12,579	29	675	-	13,283
1990	1,016	17,829	18,845	49	456	73	19,423
1991	871	12,463	13,344	56	527	97	14,041
1992	555	10,675	11,230	66	959	1	12,256
1993	261	3,581	3,565	42	756	1	4,641
1994	174	5,391	5,391	21	440	1	6,027
1995	85	9,029	9,114	24	431	1	9,570
1996	55	2,668	2,723	21	182	-	2,926
1997	38	568	606	18	129		753

3.4.4 Plaice in Division IIIa

State of stock/fishery: The stock is considered to be within safe biological limits. The fishing mortality has remained at about 0.8 over the last ten years. In the same period the SSB has fluctuated between 23 000 and 40 000 t.

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} .

Advice on management: ICES recommends that fishing mortality should not be allowed to increase, corresponding to landings in 1999 of 11 000 t, and a high probability of keeping SSB above the proposed B_{pa} in the short term.

Reference points:

ICES considers that:	ICES proposes that:
There is currently no biological basis for defining B_{lim} or F_{lim} .	B_{pa} be set at 24 000 t, the lowest observed biomass, at which there is no indication of impaired recruitment.
	[There is currently no biological basis for proposing a value for F_{pa} .]

Technical Basis:

	B_{pa} : Smoothed B_{loss} (no sign of impairment): 24 000 t
	F_{pa} : Poor biological basis for definition

Elaboration and special comment: No reliable independent estimates of recruitment are available. About 60% and 90% of the expected landings in 1999 and SSB in 2000 respectively at *status quo* fishing mortality are originating from assumed average recruitment.

The fishing mortality is estimated to be higher than estimates for the North Sea. This may be caused by a migration of mature plaice out of the area or a higher natural mortality than assumed in the assessment. The

fishery is more directed to older fish than for most other plaice fisheries.

The major part of the plaice catches are taken in fisheries using seine, trawl and gill nets targeting mixed species for human consumption. The analytical assessment uses information from commercial fleets and one survey series.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch forecast for 1999:

Basis: $F(98) = \text{Mean } F(95-97) = 0.69$; Landings (98) = 10.9; SSB(99) = 36.5

F (99)	Basis	Catch(99)	Landings (99)	SSB (2000)	Medium term effect of fishing at given level
0.49	0.7 F_{sq}		8.3	39.5	n/a
0.56	0.8 F_{sq}		9.3	38.5	n/a
0.62	0.9 F_{sq}		10.2	37.5	n/a
0.69	1.0 F_{sq}		11.0	36.6	n/a

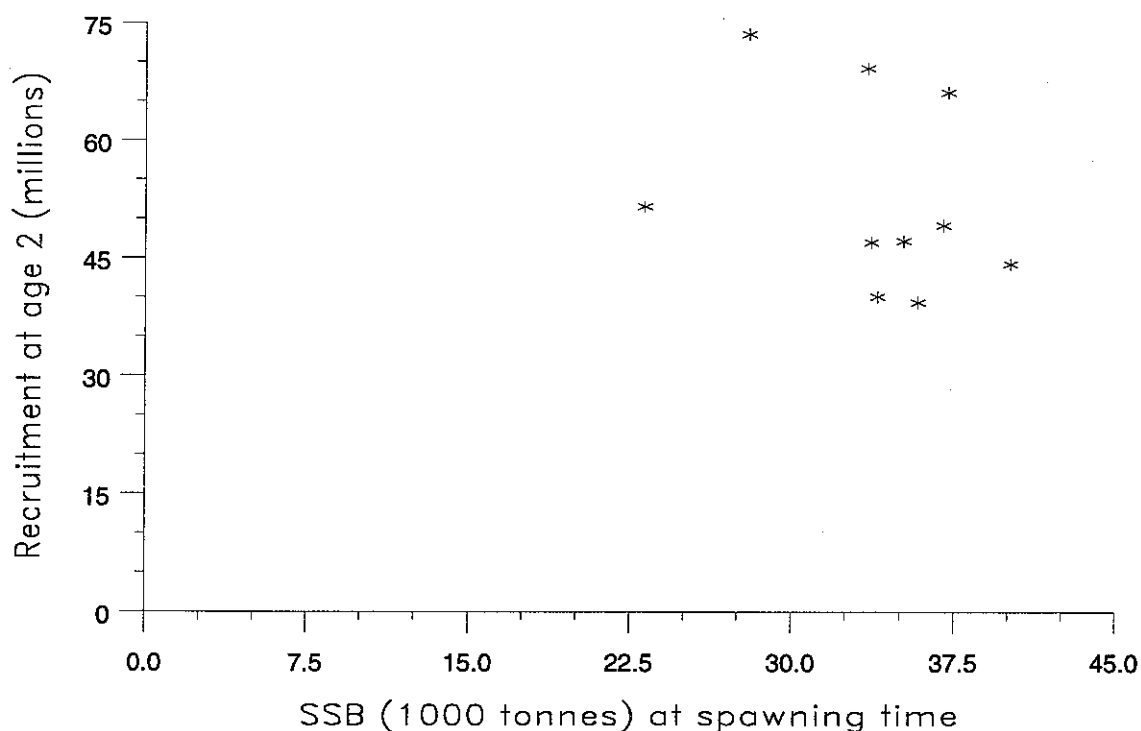
Weights in '000 t.

Catch data (Tables 3.4.4.1-2):

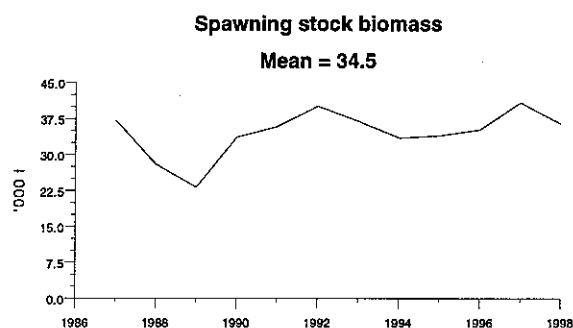
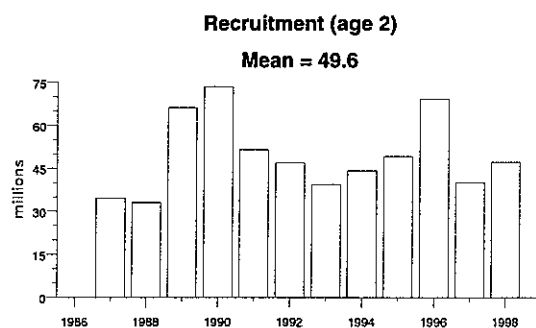
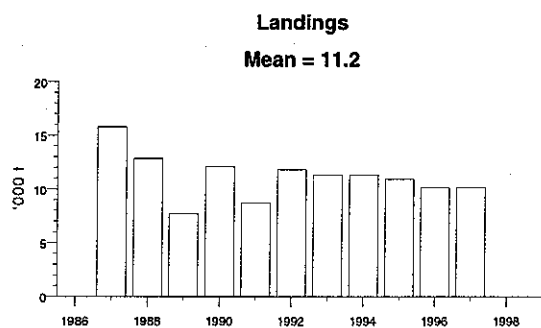
Year	ICES advice	Predicted catch corresp. to advice ¹		Agreed TAC:		ACFM landings
		Kattegat	Skagerrak	Kattegat	Skagerrak	
1987	Precautionary TAC	-	-	4.75	14.5	15.8
1988	No increase in F ³ ; precautionary TAC ⁴	3.7	-	4.75	15.0	12.9
1989	No increase in F ³ ; precautionary TAC ⁴	2.9	-	4.0	15.0	7.7
1990	80% of F(88) ³ ; TAC ³ ; TAC ⁴	1.3	10.0	2.0	11.0	12.1
1991	TAC	1.1 ²	10.0 ²	1.3	10.0	8.7
1992	TAC		14.0	2.8	11.2	11.8
1993	Precautionary TAC		-	2.8	11.2	11.3
1994	If required, precautionary TAC		-	2.8	11.2	11.3
1995	If required, precautionary TAC		-	2.8	11.2	10.9
1996	If required, precautionary TAC		-	2.8	11.2	10.1
1997	No advice		-	2.8	11.2	10.1
1998	No increase in F from the present level		11.9 ¹	2.8	11.2	
1999	No increase in F from the present level		11.0 ¹			

¹From 1992 onwards recommended TACs are combined. ²In May 1991 ACFM revised its advice to 12.0 for both areas combined. ³Kattegat. ⁴Skagerrak. Weights in '000 t.

Stock - Recruitment

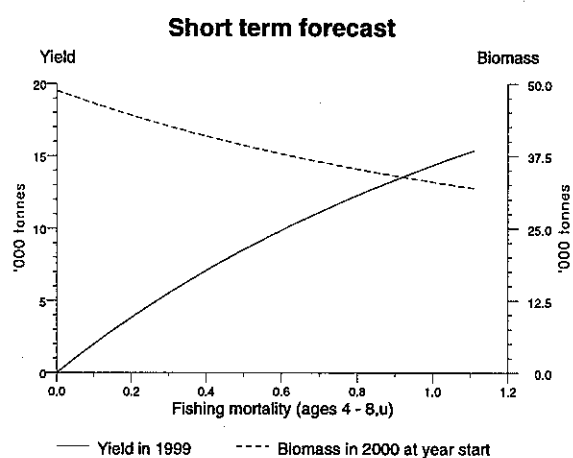
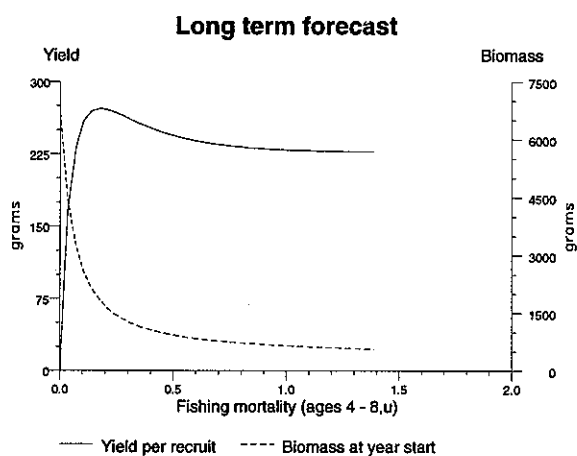


(run: XSAPAM05)



Plaice in Division IIIa

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Plaice, Kattegat and Skagerrak (Fishing Area IIIa)

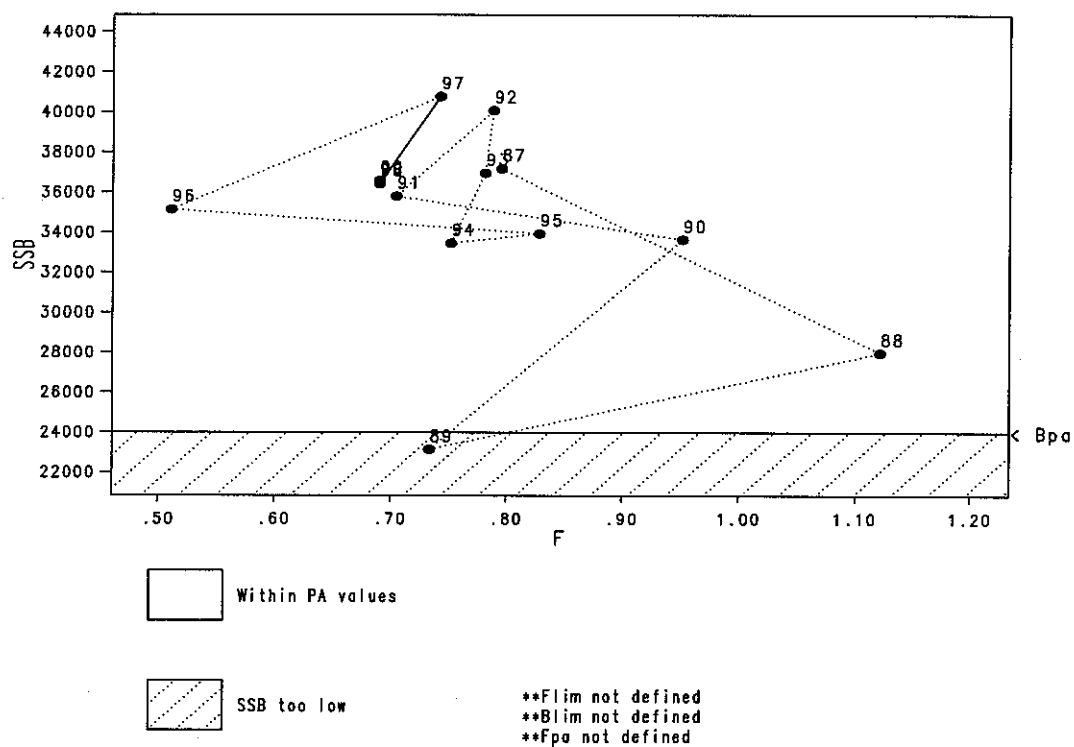


Table 3.4.4.1 Plaice landings from the Kattegat and Skagerrak (tonnes) 1972-1997. Official figures, excluding misreported landings in the period 1983-1988.

Year	Denmark		Sweden		Germany		Belgium	Norway	Total		Div. IIIa
	Kattegat	Skagerrak	Kattegat	Skagerrak	Kattegat	Skagerrak	Skagerrak	Skagerrak	Kattegat	Skagerrak	
1972	15,504	5,095	348	70					15,852	5,165	21,017
1973	10,021	3,871	231	80					10,252	3,951	14,203
1974	11,401	3,429	255	70					11,656	3,499	15,155
1975	10,158	4,888	369	77					10,527	4,965	15,492
1976	9,487	9,251	271	81					9,758	9,332	19,090
1977	11,611	12,855	300	142					11,911	12,997	24,908
1978	12,685	13,383	368	94					13,053	13,477	26,530
1979	9,721	11,045	281	105					10,002	11,150	21,152
1980	5,582	9,514	289	92					5,871	9,606	15,477
1981	3,803	8,115	232	123					4,035	8,238	12,273
1982	2,717	7,789	201	140					2,918	7,929	10,847
1983	3,280	6,828	291	170			133	14	3,571	7,145	10,716
1984	3,252	7,560	323	356	32		27	22	3,607	7,965	11,572
1985	2,979	9,646	403	296	4		136	18	3,386	10,096	13,482
1986	2,468	10,653	170	215			505	24	2,638	11,397	14,035
1987	2,868	11,370	283	222	104		907	25	3,255	12,524	15,779
1988	1,818	9,781	210	281	3		716	41	2,031	10,819	12,850
1989	1,596	5,387	135	320	4	0	230	33	1,735	5,970	7,705
1990	1,831	8,726	201	777	2	1	471	69	2,034	10,044	12,078
1991	1,756	5,849	267	472	6	4	315	68	2,029	6,708	8,737
1992	2,071	8,522	208	381			537	107	2,279	9,547	11,826
1993	1,289	9,128	287	175			339	78	1,576	9,720	11,296
1994	1,553	8,790	315	227	4	33	325	65	1,872	9,440	11,312
1995	1,555	8,479	132	338	6	42	302	76	1,693	9,237	10,930
1996	2,336	7,256	195	198	11	19	0	105	2,542	7,578	10,120
1997	2,198	7,307	261	251	25	15	0	93	2,484	7,665	10,149

Table 3.4.4.2 Plaice in the Kattegat and Skagerrak (Fishing Area IIIa).

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1987	34.60	37.18	15.78	0.795
1988	33.06	27.98	12.85	1.122
1989	66.19	23.14	7.71	0.734
1990	73.62	33.64	12.08	0.952
1991	51.57	35.80	8.74	0.705
1992	47.02	40.08	11.83	0.788
1993	39.36	36.96	11.30	0.781
1994	44.24	33.46	11.31	0.752
1995	49.17	33.94	10.93	0.828
1996	69.27	35.13	10.12	0.511
1997	40.08	40.78	10.15	0.742
1998	47.18	36.42	.	.
Average	49.61	34.54	11.16	0.792
Unit	Millions	1000 tonnes	1000 tonnes	-

3.4.5 Sole in Division IIIa

State of the stock/fishery: The stock is at present considered to be harvested inside safe biological limits as defined by the proposed reference points. Both the fishery and data from surveys indicate that the stock size was exceptionally high in the period 1988–1993, but is decreasing. Recruitment was below average for the last 3 years and in 1997 was the lowest in the time series, since 1984.

Fishing mortality is estimated to have decreased during the 1990s probably below F_{pa} in the last two years.

Management objectives: There are no stated management objectives for this fishery.

Advice on management: ICES advises that current fishing mortality can be maintained. However, further increase in fishing effort should be prevented.

Proposed reference points: The preliminary estimate of MBAL of 770 t presented previously is suggested as B_{lim} . In order to take into account uncertainty of the stock falling below B_{lim} , a $B_{pa}=1\ 060$ t is proposed. F_{med} , ignoring the abnormal years around 1990, is 0.47 per year and is taken as F_{lim} . Accounting for uncertainty suggests an F_{pa} around 0.3 per year. This value cannot be calculated with precision because of the variability in stock productivity.

Relevant factors to be considered in management: This stock supported catches at 250–450 t for 35 years, prior to the occurrence of several strong year classes

between 1989 and 1994. These recruitments led to large increases in SSB, yield and fishing effort, with a decline in F through the 1990s. Since 1995, recruitment has returned to the earlier, much lower values. Regardless of short-term management measures, biomass and yield will decline under the lower recruitment regime.

Other factors (e.g. temperature, eutrophication) appear important for recruitment and therefore contribute substantial uncertainty to medium-term projections and biological reference points.

Catch forecast: A tentative forecast based on an XSA suggests that catches in 1998 and 1999 will be in order of 800 t if fishing mortality is maintained at the *status quo* for 1995–1997 ($F=0.18$).

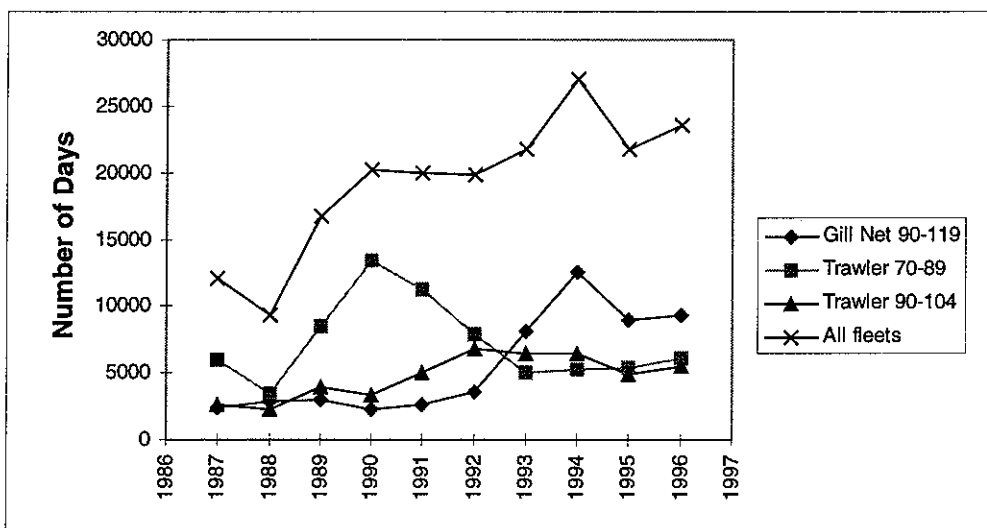
Elaboration and special comment: Assessment quality is believed to be improved this year, mainly due to a recent compilation of Kattegat effort and fleet data. This enabled the working group for the first time to tune VPA outputs in an XSA. In comparison with the (untuned) separable VPA done in the 1997 assessment, spawning stock levels and fishing mortalities are now estimated to be respectively higher and lower. Also, a bottom trawl survey in the area, not sole directed, indicate recruitment trends similar to those seen in XSA. However, the assessment remains uncertain because it is disputable whether the stock indicators (commercial CPUE and survey abundance) that are used in the assessment, are appropriate.

Source of information Report of the Baltic Fisheries Assessment Working Group, April 1998 (ICES CM 1998/ACFM:16).

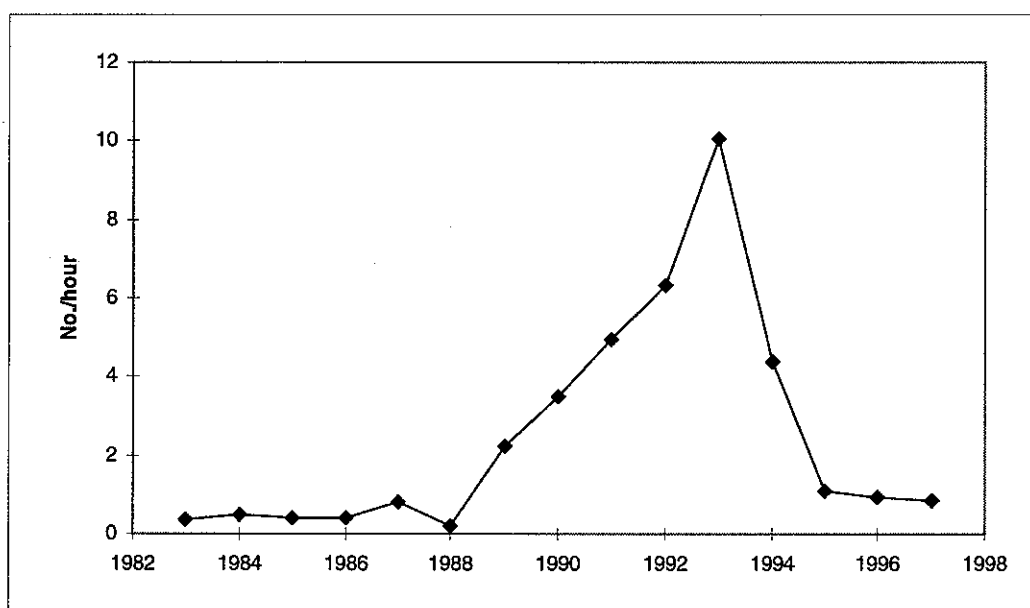
Catch data (Tables 3.4.5.1–2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	-	-	0.85	0.72
1988	-	-	0.95	0.71
1989	TAC	<0.8	0.80	0.82
1990	Precautionary TAC	0.6	0.50	1.05
1991	TAC	1.0	1.00	¹
1992	TAC	1.0	1.40	¹
1993	TAC at recent catch levels	1.0	1.60	¹
1994	No advice due to uncertain catches	-	2.10	1.20
1995	No advice	-	2.25	1.30
1996	No advice	-	2.25	1.10
1997	No advice	-	2.25	0.82
1998	No advice	-	2.25	
1999	No increase in F	0.8		

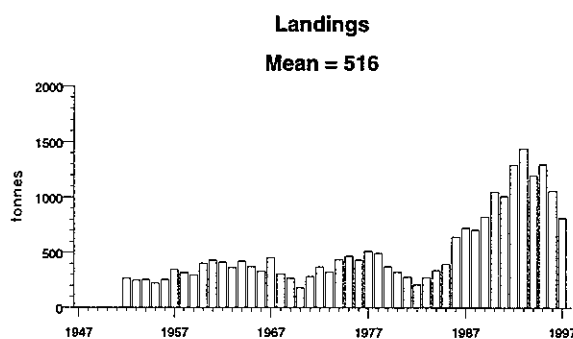
¹Uncertain. Weights in '000 t.



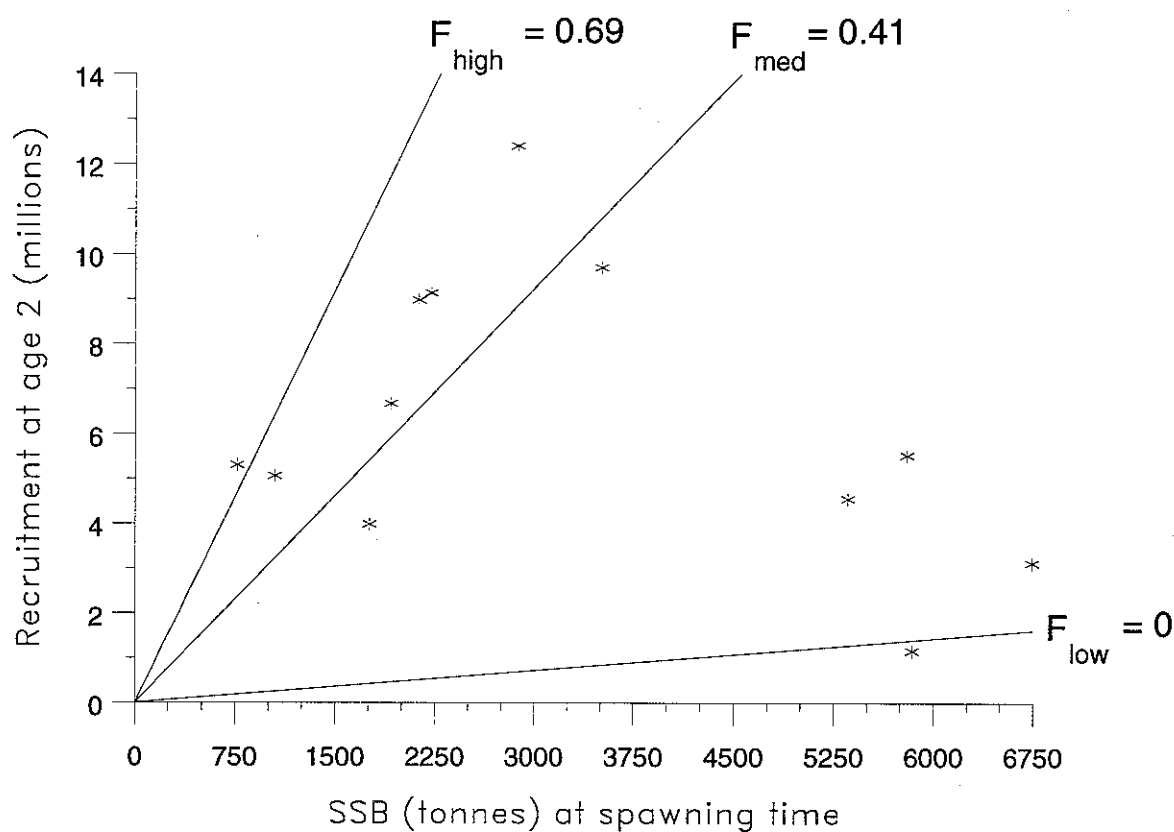
Standardised fishing effort for sole in the Kattegat. ("All fleets" include fleets additional to those indicated on the figure). Mesh sizes (mm) in gear is indicated in legends.



Abundances of 2-group sole recorded by IBTS surveys conducted in Kattegat and Skagerrak during February.



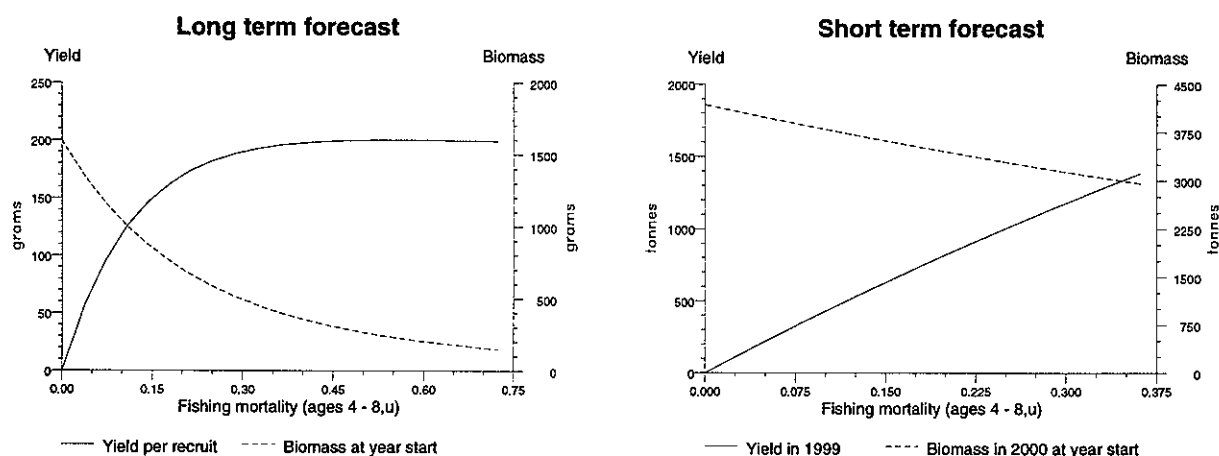
Stock - Recruitment



(run: XSABRM09)

Sole in the Kattegat and Skagerrak (Fishing Area IIIa)

Yield and Spawning Stock Biomass



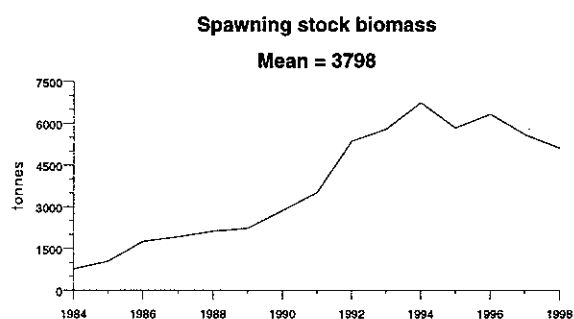
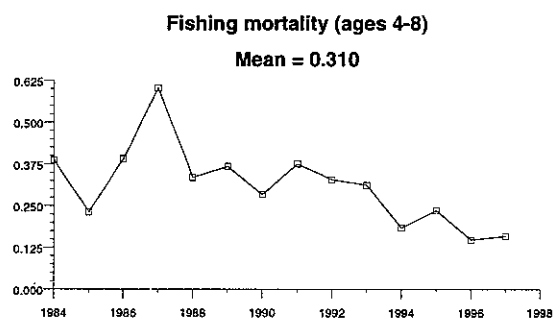
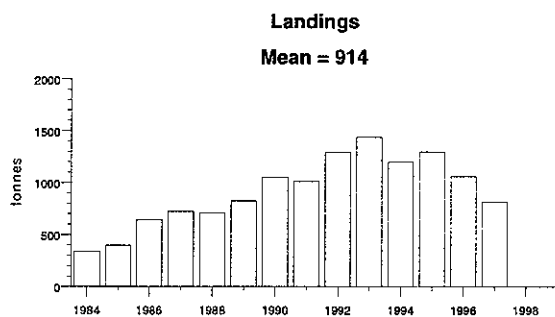


Table 3.4.5.1 Kattegat and Skagerrak Sole landings (tonnes) 1970–1997. Official statistics and Working Group corrections. Danish catches are given for Kattegat and Skagerrak combined 1952–1969. For Sweden there is no information 1962–1974.

Year	Denmark		Sweden	Germany	Belgium	Netherlands	Working Group	Total
	Kattegat	Skagerrak	Skag+Kat	Kattegat	Skagerrak	Skagerrak	Corrections	
1952	156		51	59				266
1953	159		48	42				249
1954	177		43	34				254
1955	152		36	35				223
1956	168		30	57				255
1957	265		29	53				347
1958	226		35	56				317
1959	222		30	44				296
1960	294		24	83				401
1961	339		30	61				430
1962	356			58				414
1963	338			27				365
1964	376			45				421
1965	324			50				374
1966	312			20				332
1967	429			26				455
1968	290			16				306
1969	261			7				268
1970	158	25						183
1971	242	32		9				283
1972	327	31		12				370
1973	260	52		13				325
1974	388	39		9				436
1975	381	55	16	16		9	-9	468
1976	367	34	11	21	2	155	-155	435
1977	400	91	13	8	1	276	-276	513
1978	336	141	9	9		141	-141	495
1979	301	57	8	6	1	84	-84	373
1980	228	73	9	12	2	5	-5	324
1981	199	59	7	16	1			282
1982	147	52	4	8	1	1	-1	212
1983	180	70	11	15		31	-31	276
1984	235	76	13	13		54	-54	337
1985	275	102	19	1	+	132	-132	397
1986	456	158	26	1	2	109	-109	643
1987	564	137	19		2	70	-70	722
1988	540	138	24		4			706
1989	578	217	21	7	1			824
1990	464	128	29	-	2		+427	1050
1991	746	216	38	+			+11	1011*
1992	856	372	54				+12	1294*
1993	1016	355	68	9			-9	1439*
1994	890	296	12	4			-4	1198
1995	850	382	65	6			-6	1297
1996	784	203	57	612			-597	1059
1997 ¹	560	200	52	2				814

*Considerable non-reporting assumed for the period 1991–1993.

¹Preliminary

Table 3.4.5.2 Sole in the Kattegat and Skagerrak (Fishing Area IIIa).

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1984	3.07	0.76	0.34	0.387
1985	6.20	1.05	0.40	0.231
1986	5.31	1.76	0.64	0.390
1987	5.06	1.92	0.72	0.602
1988	3.99	2.13	0.71	0.334
1989	6.67	2.22	0.82	0.367
1990	8.97	2.87	1.05	0.283
1991	9.13	3.50	1.01	0.375
1992	12.40	5.35	1.29	0.327
1993	9.70	5.80	1.44	0.311
1994	4.56	6.74	1.20	0.184
1995	5.52	5.84	1.30	0.236
1996	3.12	6.33	1.06	0.148
1997	1.16	5.60	0.82	0.159
1998	2.72	5.10	.	.
Average	5.84	3.80	0.91	0.310
Unit	Millions	1000 tonnes	1000 tonnes	-

3.4.6 *Pandalus borealis* in Division IIIa and Division IVa East (Skagerrak and Norwegian Deep)

State of stock/fishery: The stock is considered to be within safe biological limits. Good recruitment from the 1995 and 1996 year classes has led to high SSBs.

Management objectives: There are no explicit management objectives for this stock. However, for any management to meet precautionary criteria F should be less than F_{pa} and spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends that the SSB be kept above the proposed B_{pa} (12 000 t). Recent catches and fishing mortalities do not appear to have affected the productivity of this stock. Landings in 1999 corresponding to the current fishing mortality is 19 000 t.

Reference points:

ICES considers that:	ICES proposes that:
	B_{pa} be set at 12 000 t, the lowest observed SSB. Recruitment has not been observed to decline at SSB in that region under present environmental conditions.

Technical basis:

B_{lim} not identified	B_{pa} examination of stock-recruit data; lowest observed SSB
F_{lim} not identified	F_{pa} not identified

Additional Considerations: In *Pandalus* stocks production is strongly influenced by environmental conditions, which may vary on medium and long time scales. Also, natural mortality rates can be strongly influenced by predator abundance, which can be variable as well. In such cases it is particularly important that biomass reference points should consider the effects of environmental variation as well as SSB on recruitment, and mortality reference points should consider the effects of predation mortality as well as fishing mortality.

recruitment at lowest observed SSBs, the SSB at which recruitment is impaired is unknown. Therefore no biologically based B_{lim} can be identified.

Because of the potentially large impact of predation mortality on stock dynamics and total mortality rates, the biological consequences of any specific fishing mortality rate can be highly variable. At low predator abundance, even a relatively low F may be a high proportion of Z (total mortality), whereas at high predator abundance, a higher F may still be a small part of Z . It is not yet possible to identify appropriate precautionary fishing mortality reference points (F_{lim} , F_{pa}) for such circumstances, and reference points based on total mortality may be more biologically sound.

For this stock, recruitment at age 1 has varied by one order of magnitude since 1984, the beginning of the time series. Because of the lack of decline in

Catch forecast for 1999:

Basis: F_{sq} (average 1995-97) = 0.65 (0.06 discards), Catch(98) = 27.0, Landings(98) = 26.1, SSB(99) = 31

F(99)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium-term effect of fishing at given level
0.39	$0.6F_{sq}$	13.9	13.3	25.8	<10% probability for SSB < B_{pa}
0.52	$0.8F_{sq}$	17.3	16.4	23.2	<10% probability for SSB < B_{pa}
0.65	$1.0F_{sq}$	20.2	19.1	20.9	low probability for SSB < B_{pa}
0.78	$1.2F_{sq}$	22.7	21.4	19.0	
0.91	$1.4F_{sq}$	24.9	23.4	17.4	

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Relevant factors to be considered in management:

Sorting grids or other means facilitating the escape of small shrimps should be implemented in the management of this fishery.

The assessment is based on age-disaggregated catches and tuned with data on commercial catch per unit of effort and a trawl survey. Spawning stock biomass is in this assessment calculated per 1 January and not at spawning time as in earlier assessments. The numerical values of spawning stock are hence larger than in previous assessments.

Elaboration and special comments: *Pandalus borealis* is fished by bottom trawls at 150–400 m depth throughout the year by Danish, Norwegian and Swedish fleets.

Imprecision in landing data and commercial CPUE, uncertain discard estimates and biased samples of landings contribute to the uncertainties in the assessment.

The natural mortality, mainly from predation, has been assumed constant in the assessment. It is, however, known

to be variable. This makes the estimates of fishing mortalities uncertain and a poor basis for defining F_{pa} . Reference points based on total mortality (natural+fishing mortality) will therefore be considered.

Source of information: Report of the *Pandalus* Assessment Working Group, September 1998 (ICES CM 1999/ACFM:5).

Catch data (Tables 3.4.6.1–3):

Year	ICES advice	Predicted Catch corresp. to advice	Agreed TAC Skagerrak	Agreed TAC IIIa + IVaE	Disc. slip.	ACFM landings	ACFM catch
1987	Not assessed				0.8	14.3	15.1
1988	Catches significantly below 1985–1986 ³				0.8	12.0	12.8
1989	No advice		3.1 ¹		1.5	11.0	12.5
1990	F as F(pre-85) ³ ; TAC ³ ; No increase in F ⁴ ; TAC ⁴	10.0	2.75 ¹		1.7	10.2	11.9
1991	No increase in F; TAC	12.0	8.55		0.8	11.6	12.4
1992	Within safe biological limits	15 ²	10.50	15.0	0.7	13.0	13.7
1993	Within safe biological limits	13 ²	10.50	15.0	1.3	12.7	14.1
1994	Within safe biological limits	19 ²	12.60	18.0	0.4	11.7	12.1
1995	Within safe biological limits	13 ²	11.20	16.0	0.6	13.3	13.9
1996	No advice	11 ²	10.50	15.0	1.3	14.1	15.4
1997	No advice	13 ²	10.50	15.0	2.4	15.2	17.6
1998	No increase in F; TAC	19 ²		18.8			
1999	Maintain F	19 ²					

¹EU zone only. ²Catch at *status quo* F. ³IIIa. ⁴Norwegian Deep. Weights in '000 t.

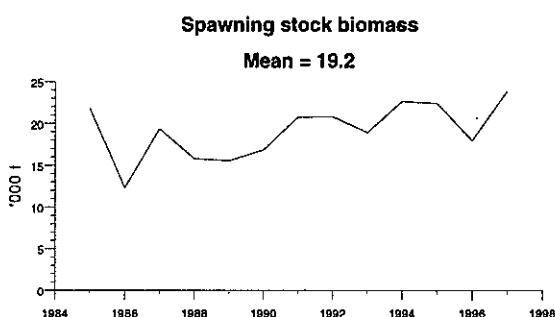
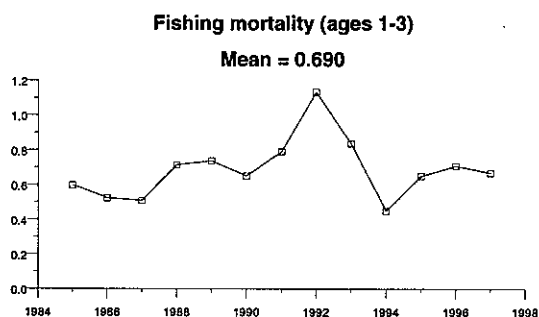
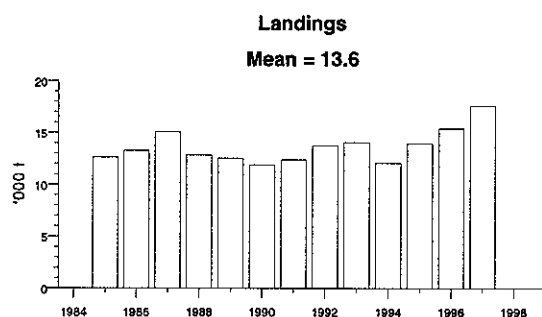


Table 3.4.6.1 Nominal landings (tonnes) of *Pandalus borealis* in ICES Division IIIa and Sub-area IV as officially reported to ICES.

Year	Division IIIa				Sub-area IV					
	Denmark	Norway	Sweden ²	Total	Denmark	Norway	Sweden	UK (Engl.) ¹	UK (Scotl.) ¹	Total
1970	757	982	2740	4479	3460	1107		14	100	4681
1971	834	1392	2906	5132	3572	1265			438	5275
1972	773	1123	2524	4420	2448	1216		692	187	4543
1973	716	1415	2130	4261	196	931		1021	163	2311
1974	475	1186	2003	3664	337	767		50	432	1586
1975	743	1463	1740	3946	1392	604	261		525	2782
1976	865	2541	2212	5618	1861	1051	136	186	2006	5240
1977	763	2167	1895	4825	782	960	124	265	1723	3854
1978	757	1841	1529	4127	1592	692	78	98	2044	4504
1979	973	2489	1752	5214	962	594	34	238	309	2137
1980	1679	3498	2121	7298	1273	1140	38	203	406	3060
1981	2593	3753	2210	8556	719	1435	31	1	341	2527
1982	2920	3877	1421	8218	1069	1545	92		354	3060
1983	1571	3722	988	6281	5752	1657	112	65	1836	9422
1984	1717	3509	933	6159	4638	1274	120	277	25	6334
1985	4105	4772	1474	10351	4582	1785	128	415	1347	8257
1986	4686	4811	1357	10854	3896	1681	157	458	358	6550
1987	4140	5198	1085	10423	9223	3145	252	526	774	13920
1988	2278	3047	1075	6400	2647	4614	220	489	109	8098
1989	2527	3156	1304	6987	3298	3418	122	364	579	7802
1990	2277	3006	1471	6754	2079	3146	137	305	365	6083
1991	3256	3441	1747	8444	750	2715	161	130	54	3810
1992	3296	4257	2057	9610	1881	2945	147	69	116	5158
1993	2490	4089	2133	8712	1985	3449	167	29	516	6146
1994	1973	4389	2553	8915	1352	2425	176	41	35	4029
1995	2494	5181	2512	10187	4698	2972	166	217	1324	9377
1996	3664	5143	2091	10898	4063	2772	85	97	1899	8916
1997	3617	5451	2103	11171	3117	3112	285	52	365	6931

¹Includes small amounts of other Pandalid shrimp

²1970 to 1974 includes subarea IV.

Total 1988 - 1990 includes 19, 21 AND 51 t. by the Netherlands

1997 figures are preliminary.

Table 3.4.6.2 *Pandalus borealis* landings from divisions IIIa (Skagerrak) and IVa (eastern part). (Norwegian Deep) as estimated by the Working Group.

Year	Denmark	Norway	Sweden	Total	Estimated discards	TAC	Catch
1970	1102	1729	2742	5573			
1971	1190	2486	2906	6582			
1972	1017	2477	2524	6018			
1973	755	2333	2130	5218			
1974	530	1809	2003	4342			
1975	817	2339	2003	5159			
1976	1204	3348	2529	7081			
1977	1120	3004	2019	6143			
1978	1459	2440	1609	5508			
1979	1062	3040	1787	5889			
1980	1678	4562	2159	8399			
1981	2593	5183	2241	10017			
1982	3766	5042	1450	10258			
1983	1567	5361	1136	8064			
1984	1747	4783	1022	7552			
1985	3827	6646	1571	12044	584		12628
1986	4834	6490	1463	12787	477		13264
1987	4599	8343	1321	14263	808		15071
1988	3068	7661	1278	12007	830		12837
1989	3150	6411	1433	10994	1548		12542
1990	2479	6139	1540	10158	1723		11881
1991	3583	6106	1908	11597	765		12362
1992	3725	7136	2154	13015	713	15000	13728
1993	2915	7504	2300	12719	1340	15000	14059
1994	2118	6813	2719	11650	426	18000	12076
1995	2465	8153	2678	13296	642	16000	13938
1996	3868	7883	2371	14122	1282	15000	15404
1997	3747	8865	2598	15210	2403	18000	17613
1998						18800	

Table 3.4.6.3 *Pandalus* in Divisions IIIa and IVa East (Skagerrak and Norwegian Deep).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 1-3
1985	11,473.00	21.83	12.63	0.598
1986	8,900.00	12.30	13.26	0.523
1987	8,106.00	19.34	15.07	0.509
1988	4,805.00	15.76	12.84	0.714
1989	8,035.00	15.53	12.54	0.737
1990	9,484.00	16.84	11.88	0.651
1991	9,191.00	20.79	12.36	0.790
1992	6,821.00	20.82	13.73	1.134
1993	12,139.00	18.94	14.06	0.837
1994	7,603.00	22.63	12.08	0.450
1995	6,671.00	22.38	13.94	0.650
1996	12,907.00	17.96	15.40	0.709
1997	22,587.00	23.86	17.61	0.669
Average	9,901.69	19.15	13.65	0.690
Unit	Millions	1000 tonnes	1000 tonnes	-

3.4.7

Herring in Sub-divisions 22–24 and Division IIIa (spring-spawners)

State of stock/fishery: The state of the stock is uncertain due to problems with splitting in proportion of spring and autumn spawners in the historical data and the lack of a coordinated comprehensive survey. Neglecting the precise levels of SSB and F the trends seen from 1991–1996 have changed. The SSB in 1997 is above the 1996 estimate and the F in 1997 is below that seen in recent years.

Herring of this stock are taken in Division IIIa and Sub-divisions 22–24. In Division IIIa there are directed fisheries by trawlers and purse seiners (fleet c). In Sub-divisions 22–24 there are directed trawl, gill-net and trap-net fisheries (fleet f). The herring by-catches taken in Division IIIa in the small mesh trawl fishery for Norway pout and sandeel (fleet e) and the “mixed clupeoid fishery” (until 1997) (fleet d) are mainly autumn spawners from the North Sea stock. After a period of high landings in the early 1980s the landings have decreased to below the long-term average.

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

Advice on management: ICES recommends that the fisheries on herring in Division IIIa should be managed in accordance with the management advice given on autumn-spawning herring in Section 3.5.8. If a catch limit is required in Sub-divisions 22–24, ICES advises that it should not exceed recent catches in that area.

Proposed reference points: None available.

Relevant factors to be considered in management: A considerable part of the landings of juvenile herring in Division IIIa originate from the North Sea stock.

Historical catch-at-age data are uncertain due to low sampling intensity but the intensity improved in 1997. It was assumed that all year classes > 3 ringers were spring spawners. In 1997 a new method (otolith microstructure analysis) to split autumn and spring spawners demonstrated a considerable number of autumn spawners in the catches of older age classes in Division IIIa and Sub-divisions 22–24.

The TACs in Division IIIa in 1997 were 1) for the directed fishery 80 000 t and 2) for by-catch in the mixed clupeoid fishery 10 000 t, and 3) for by-catch in other small mesh fisheries 20 000 t. The TAC comprises both the autumn- and spring-spawning stocks in the area. The spring-spawners are also fished in the Baltic, under the overall IBSFC herring TAC (Sub-divisions 22–29S and 32) 560 000 t.

The agreed TACs for 1998 are 80 000 t for directed fishery and a total of 17 000 t for by-catches in the small mesh fisheries. The “mixed clupeoid” TAC was deleted from the management agreement between Norway and EU.

In the Baltic the TAC for herring applies to several herring stocks including the component of this stock in Sub-divisions 22–24, and there is no specific instrument available that allows control over the exploitation of spring-spawning herring in Division IIIa and Sub-divisions 22–24. The herring TAC for the Baltic should be split and individual TACs applied on the stocks, i.e., Sub-divisions 22–24, 25–29 + 32, 30 and 31.

Catch forecast: No projection is available.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14).

Catch data: Catches of Baltic spring spawners are given in Table 3.4.7.1 and of autumn and spring spawners in Table 3.4.7.2.

Year	ICES Advice	Pred. cat corresp. to advice	Agreed TAC	ACFM catch of stock		
				22-24	IIIa	Total ¹
1987	Reduction in F	224		102	59	175
1988	No increase in F	196		99	129	251
1989	TAC	174		95	71	186
1990	TAC	131		78	118	204
1991	TAC	180		70	113	192
1992	TAC	180		85	75	168
1993	Increased yield from reduction in F; reduction in juvenile catches	188		81	81	171
1994	TAC	130-180		66	84	164
1995	If required, TAC not exceeding recent catches	168-192		74	90	173
1996	If required, TAC not exceeding recent catches	164-171		58	73	130
1997	IIIa: managed together with autumn spawners 22-24: if required, TAC not exceeding recent catches	66-85 ²		42	63	105
1998	Should be managed in accordance with North Sea autumn spawners	-				
1999	IIIa: managed together with autumn spawners 22-24: if required, TAC not exceeding recent catches	-				

¹Including catches of Baltic spring spawners in North Sea. ²Catch in Sub-divisions 22-24. Weights in '000 t.

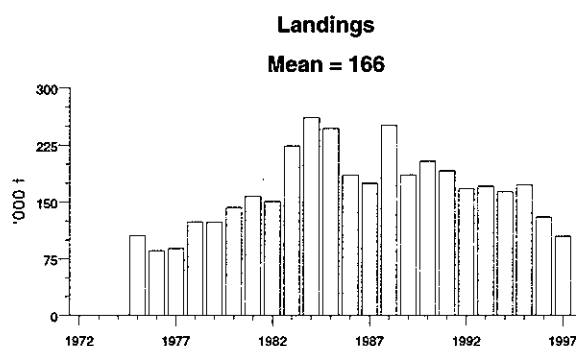


Table 3.4.7.1 Herring, Baltic spring-spawners in the North Sea, Division IIIa, and Sub-divisions 22–24.

Year	Landings
1975	106
1976	86
1977	89
1978	124
1979	124
1980	143
1981	158
1982	151
1983	224
1984	261
1985	247
1986	186
1987	175
1988	251
1989	186
1990	204
1991	192
1992	168
1993	171
1994	164
1995	173
1996	130
1997	105
Average	166
Unit	1000 tonnes

Table 3.4.7.2 Herring (Baltic spring spawners and North Sea autumn spawners) in Division IIIa and Sub-Divisions 22-24, 1985-1997. Landings in thousands of tonnes (Data provided by Working Group members).

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Skagerrak													
Denmark	88.2	94.0	105.0	144.4	47.4	62.3	58.7	64.7	87.8	44.9	43.7	28.7	14.3
Faroe Islands	0.5	0.5											
Norway	4.5	1.6	1.2	5.7	1.6	5.6	8.1	13.9	24.2	17.7	16.7	9.4	8.8
Sweden	40.3	43.0	51.2	57.2	47.9	56.5	54.7	88.0	56.4	66.4	48.5	32.7	32.9
Total	133.5	139.1	157.4	207.3	96.9	124.4	121.5	166.6	168.4	129.0	108.9	70.8	56.0
Kattegat													
Denmark	69.2	37.4	46.6	76.2	57.1	32.2	29.7	33.5	28.7	23.6	16.9	17.2	8.8
Sweden	39.8	35.9	29.8	49.7	37.9	45.2	36.7	26.4	16.7	15.4	30.8	27.0	18.0
Total	109.0	73.3	76.4	125.9	95.0	77.4	66.4	59.9	45.4	39.0	47.7	44.2	26.8
Sub. Div. 22+24													
Denmark	15.9	14.0	32.5	33.1	21.7	13.6	25.2	26.9	38.0	39.5	36.8	34.4	30.5
Germany	54.6	60.0	53.1	54.7	56.4	45.5	15.8	15.6	11.1	11.4	13.4	7.3	12.8
Poland	16.7	12.3	8.0	6.6	8.5	9.7	5.6	15.5	11.8	6.3	7.3	6.0	6.9
Sweden	11.4	5.9	7.8	4.6	6.3	8.1	19.3	22.3	16.2	7.4	15.8	9.0	14.5
Total	98.6	92.2	101.4	99.0	92.9	76.9	65.9	80.3	77.1	64.6	73.3	56.7	64.7
Sub. Div. 23													
Denmark	6.8	1.5	0.8	0.1	1.5	1.1	1.7	2.9	3.3	1.5	0.9	0.7	2.2
Sweden	1.1	1.4	0.2	0.1	0.1	0.1	2.3	1.7	0.7	0.3	0.2	0.3	0.1
Total	7.9	2.9	1.0	0.2	1.6	1.2	4.0	4.6	4.0	1.8	1.1	1.0	2.3
Grand Total	349.0	307.5	336.2	432.4	286.4	279.9	257.8	311.4	294.9	234.4	231.0	172.7	149.8

¹ Preliminary data.

3.4.8 Sprat in Division IIIa

State of stock/fishery: The state of the stock is unknown. Sprat is a short-lived species with natural fluctuations in stock biomass.

Management objectives: There are no management objectives.

Advice on management: As sprat is mainly fished together with juvenile herring the exploitation of sprat will be limited by the restrictions imposed on fisheries for juvenile herring, see Section 3.5.8. The small directed fishery of sprat should be kept at the level of recent years.

Proposed reference points: None available.

Relevant factors to be considered in management: Except for 1994 and 1995, the "mixed clupeoid" fishery has been dominated by herring catches. From 1998 this fishery will no longer exist.

The amount of sampling has been adequate in the last two years but the data series is too short to carry out an assessment.

Elaboration and special comment: Landings of sprat in Division IIIa averaged about 70 000 t in the 1970s but since 1982 have typically been in the region of 20 000 t, except in 1994–1995.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14).

Catch data (Table 3.4.8.1):

Year	ICES advice	Pred cat. corr. to adv.	Agreed TAC ¹	Official landgs. ²	ACFM catch
1987	-	-	80	68	14
1988	TAC for "mixed clupeoid" fishery	80 ¹	80	63	9
1989	Sprat catch lowest possible level; TAC for "mixed clupeoid fishery	80 ¹	80	62	10
1990	Sprat catch lowest possible level; TAC for "mixed clupeoid fishery	60 ¹	65	43	10
1991	Sprat catch lowest possible level; Zero TAC for "mixed clupeoid" fishery	-	50	44	14
1992	No advice for sprat; Zero TAC for "mixed clupeoid" fishery	-	50	40	11
1993	No advice for sprat	-	45	36	9
1994	Separate sprat TAC based on recent catches	10-14	43	67	96
1995	Separate sprat TAC based on recent catches	9-14	43	45	56
1996	No advice	-	43	28	18
1997	Reduce by-catch of herring	-	40	19	16
1998	Limited by restriction on juvenile herring catches	-	40		
1999	Limited by restriction on juvenile herring catches	-			

¹TAC applies to all species in "mixed clupeoid" catch. ²Includes other species in "mixed clupeoid" catches. Weights in '000 t.

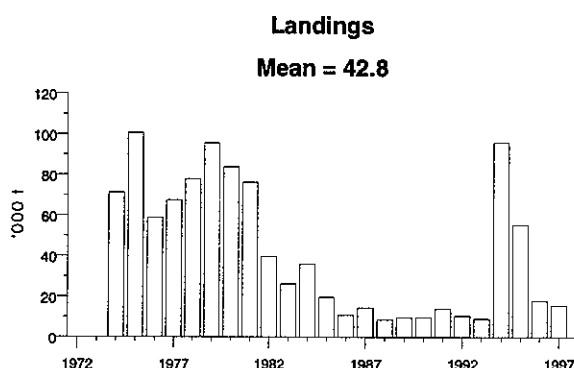


Table 3.4.8.1 Landings of SPRAT in Division IIIa Catch (in tonnes 10^{-3}). (Data provided by Working Group members). These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	Skagerrak				Kattegat			Div. IIIa total
	Denmark	Sweden	Norway	Total	Denmark	Sweden	Total	
1974	17.9	2.0	1.2	21.1	31.6	18.6	50.2	71.3
1975	15.0	2.1	1.9	19.0	60.7	20.9	81.6	100.6
1976	12.8	2.6	2.0	17.4	27.9	13.5	41.4	58.8
1977	7.1	2.2	1.2	10.5	47.1	9.8	56.9	67.4
1978	26.6	2.2	2.7	31.5	37.0	9.4	46.4	77.9
1979	33.5	8.1	1.8	43.4	45.8	6.4	52.2	95.6
1980	31.7	4.0	3.4	39.1	35.8	9.0	44.8	83.9
1981	26.4	6.3	4.6	37.3	23.0	16.0	39.0	76.3

Year	Skagerrak			Kattegat		Div. IIIa	Div. IIIa total
	Denmark	Sweden	Norway	Denmark	Sweden	Sweden	
1982	10.5	-	1.9	21.4	-	5.9	39.7
1983	3.4	-	1.9	9.1	-	13.0	26.4
1984	13.2	-	1.8	10.9	-	10.2	36.1
1985	1.3	-	2.5	4.6	-	11.3	19.7
1986	0.4	-	1.1	0.9	-	8.4	10.8
1987	1.4	-	0.4	1.4	-	11.2	14.4
1988	1.7	-	0.3	1.3	-	5.4	8.7
1989	0.9	-	1.1	3.0	-	4.8	9.8
1990	1.3	-	1.3	1.1	-	6.0	9.7
1991	4.2	-	1.0	2.2	-	6.6	14.0
1992	1.1	-	0.6	2.2	-	6.6	10.5
1993	0.6	4.7	1.3	0.8	1.7	-	9.1
1994	47.7	32.2	1.8	11.7	2.6	-	96.0
1995	29.1	9.7	0.5	11.7	4.6	-	55.6
1996	7.0	3.5	1.0	3.4	3.1	-	18.0
1997 ¹	7.0	3.1	0.4	4.6	0.7	-	15.8

¹Preliminary.

3.4.9 Sandeel in Division IIIa

State of stock/fishery: Based on the available information it was not possible to assess the status of the stock or identify safe biological limits.

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

Reference points:

ICES considers that:	ICES proposes that
There is not sufficient information to estimate appropriate reference points	

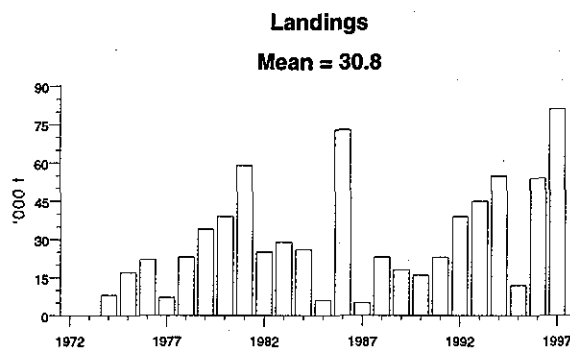
Elaboration and special comment: The fishery is an extension of the North Sea fishery into Division IIIa but with smaller vessels working closer inshore, mostly along the coast of Jutland. Like in the North Sea, landings in 1997 were the highest on record, due to the strong 1996 year class.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Table 3.4.1.1):

Year	ICES advice	ACFM catch
1987	No advice	5
1988	No advice	23
1989	No advice	18
1990	No advice	16
1991	No advice	23
1992	No advice	39
1993	No advice	45
1994	No advice	55
1995	No advice	12
1996	No advice	54
1997	No advice	81
1998	No advice	
1999	No advice	

Weights in '000 t.



3.5 Stocks in the North Sea (Sub-area IV)

3.5.1 Overview

Description of the fisheries

The fisheries in the North Sea can be grouped into demersal and pelagic human consumption fisheries and industrial fisheries which land their catch for industrial purposes. Demersal human consumption fisheries usually target a mixture of roundfish species (cod, haddock, whiting), or a mixture of flatfish species (plaice and sole) with a by-catch of roundfish. A fishery directed at saithe exists along the shelf edge. The catch of these fisheries is landed for human consumption. The pelagic fisheries mainly target herring, mackerel and horse mackerel. Although most of the landings of these species may be landed for human consumption purposes, part of the landings are used for fishmeal and fishoil. The catch of the industrial fisheries mainly consists of sandeel, Norway pout and sprat. The industrial catches also contain by-catches of other species including herring, haddock and whiting (Table 3.5.1.1 and Table 3.5.1.2). In addition to the demersal, pelagic and industrial fisheries for fish, smaller fleets exist which fish for crustaceans including *Nephrops*, *Pandalus* and brown shrimp (*Crangon crangon*).

Each fishery uses a variety of gears. Demersal fisheries: otter trawls, pair trawls, seines, gill nets, beam trawls. Pelagic fisheries: pelagic trawls and purse seines. Industrial fisheries: small-meshed otter trawls, pelagic trawls and purse seines.

Some major technological developments changed the fisheries in the North Sea during and after the 1960s such as the development of the beam trawl fishery for flatfish, purse seines in the industrial fishery and large pelagic trawls to replace driftnets. The introduction of power blocks in the 1960s has enormously increased the possibilities for the purse seiners. Also further development of electronic equipment such as satellite navigation, fish finders and sonar have increased fishing efficiency of the fleets.

The trends in landings of the most important species landed by these fleets during the last 25 years, together with the total international landings, are shown in Table 3.5.1.3 and in Figure 3.5.1.1. The demersal landings have steadily declined over the last 25 years. The pelagic landings, dominated by herring, decreased to a minimum in the late 1970s, when the fishery for herring was closed, but increased again up to 1988. Since then they have decreased again. The landings in the industrial fisheries increased to approximately 1.8 million t in the mid 1970s, and have fluctuated between 1 and 1.5 million t in recent years. These landings show the largest annual variations, due to the short life span of the species. The total landings reached 3 million t in 1974, and have been around 2.5 million t since the 1980s.

Most commercial species are managed by TAC/quota regulations that apply to Sub-area IV or a combination Sub-area IV with an adjacent area. The national management measures with regard to the implementation of the quota in the fisheries differ between species and countries. The industrial fisheries are subject to regulations for the by-catches of protected species.

Data

The data available from scientific sources for the assessment of roundfish, flatfish, herring and mackerel are relatively good. The level of biological sampling of most of the commercial landings has been maintained. Discard data are only used directly in assessments for haddock and whiting, but a historical series exists only for one country. However, discard data are now being collected on a recurrent basis by several countries. Data on landings, fishing effort and species composition are available from all industrial fisheries. In some recent years there was misreporting of roundfish landings associated with restrictive quotas.

Several series of research vessel survey indices are available for most species. Quarterly data were available from the International Bottom Trawl Survey for quarter 2 and 4 for a period of 5 years and these were used in the assessment of some stocks. For herring and mackerel the spawning stock sizes are estimated by annual larvae- and acoustic surveys (herring) or intermittent egg surveys (mackerel).

Analytical assessments were performed on cod, haddock, whiting, saithe, herring, mackerel, plaice, sole, sandeel and Norway pout.

Multispecies considerations are not incorporated in the assessments or the forecasts for the North Sea stocks. However, average natural mortalities estimated by multispecies assessments are incorporated in the assessments of cod, haddock, whiting, herring, sprat, sandeel and Norway pout.

Overview of resources

In the North Sea all stocks of roundfish and flatfish species have been exposed to high levels of fishing mortality. The present assessments indicate that the fishing mortality in the last three years has been reduced for cod, haddock and whiting. The decline is to some extent supported by a reduction in effort in some of the major fleets in the last few years and by a diversion of effort to *Nephrops* and anglerfish. All roundfish stocks have been outside or close to safe biological limits in recent years. Both plaice and sole stocks are outside safe

biological limits with high fishing mortalities that are unsustainable in the longer term and spawning stock biomasses below safe levels or declining towards critical levels.

Information from several recruit surveys indicate that a number of stocks in the North Sea simultaneously produced a strong year class in 1996. These stocks are cod, plaice, sole, Norway pout, sandeel and mackerel. The expected high recruitment to these stocks may help to rebuild them above minimum levels.

The herring stock in the North Sea collapsed in the mid-1970s due to heavy exploitation, but has recovered after a closure of the fisheries between 1977 and 1981. In the mid-1990s it declined again. In 1996, effective management measures have been implemented to reduce the catches in both the human consumption and industrial fishery. These measures resulted in a considerable reduction in the fishing mortality in 1996 and 1997. The stock has been outside safe biological limits for a number of years, but is recovering. The spawning stock of herring is expected to develop to near safe biological limits in the year 2000. The herring stock is exploited in the North Sea and English Channel (Downs herring) by human consumption fisheries. Also by-catches of juvenile North Sea herring are taken in the industrial fishery for sprat in the North Sea and Division IIIa (Skagerrak). The sprat stock fluctuates considerably between years. The actual state of the sprat stock is not precisely known, but is thought to be low presently. The North Sea component of the mackerel stock collapsed in the early seventies and shows no signs of recovery. Most of the mackerel catches taken in the northern North Sea in recent years originate from the western component.

Landings of **cod** in 1997 were 124 000 t. Recruitment has been well below average in most years since 1985, but the 1996 year class is abundant. The cod spawning stock has been low in recent years, but it has increased recently to about 140 000 t in 1998 and is expected to increase further when the 1996 year class matures. The present assessment indicates a decline in fishing mortality in the last few years.

The spawning stock of **saithe** is at a low level compared to the 1970s when it was lightly exploited and recruitment was higher. In recent years it has slightly increased. Landings in 1997 were 103 000 t. Fishing mortality has declined considerable as compared to the 1980s.

Human consumption landings of **haddock** in 1997 were 82 000 t. Historically, the stock size has shown large variation due to the occasional occurrence of a very strong year class. The present spawning stock size is close to safe biological limits, but is expected to decrease in the short term because of a string of poor year classes born in recent years.

The assessment of **whiting** has a lower precision than the assessment of other stocks. Total landings have been gradually decreasing since 1976 and the landings in 1997 are the lowest observed in the time series: 59 000 t. The present assessment indicates that SSB is on a historical low and is will to remain outside safe biological limits in the short term because expected recruitment is poor.

The spawning stock of **plaice** decreased in the early 1990s and was in 1996 at the lowest observed historically. Also landings decreased since 1990 and were 83 000 t in 1997. Fishing mortality remains high. At its present exploitation rate there is a high probability that it will remain below the levels observed in the 1970s and 1980s in the medium-term. An abundant 1996 year class is expected to increase the spawning stock in the short term.

Landings of **sole** declined to 15 000 t in 1997. The spawning stock in 1998 is close to the lowest observed historically and is outside safe biological limits. Fishing mortality has remained high. The good 1996 year class will return the spawning stock above safe limits in the short term.

The spawning stock of **Norway pout** in 1998, which include both the North Sea and the Skagerrak, was amongst the highest in the time series, due to the big 1996 year class. The 1997 year class, however, seems poor. Fishing mortality has generally been decreasing in 1974–1995 and remained low in 1996 and 1997.

Over the years, the spawning stock of **sandeel** has been fluctuating without a trend. There is a general pattern of large SSB being followed by a low SSB. The spawning stock in 1998 was the highest observed so far, due the strong 1996 years class. The 1997 year class is poor.

The **herring** is still considered to be outside safe biological limits, but has recently recovered from a low. Catches in the human consumption and industrial fisheries in the North Sea have been reduced considerably and were 250 000 t in 1997. Landings of **sprat** in 1997 were 103 000 t. The state of the sprat stock is not precisely known, but the stock seems to have declined recently.

The spawning stock of **mackerel** in the North Sea is still very small. Recruitment to this stock component has been very low for many years. In 1997 an abundant 1996 year class has been observed by the International Bottom Trawl Survey, which may originate from the North Sea stock component. The fisheries for mackerel in the North Sea rely on a much larger stock component, the western mackerel, which spawns outside the North Sea and which is present in the northern North Sea in the second half of the year.

The present state of the North Sea **horse mackerel** stock is not known. The last estimate from egg surveys in 1989–1991 indicates an SSB of about 240 000 t. The age composition of the relative small catches suggest that the exploitation rate may have been low.

The stock of *Pandalus borealis* in Division IVa (Norwegian Deep) and Division IIIa remains stable and is considered to be within safe biological limits. The state of the stocks in Division IVa (Fladen Ground) and Division IVb (Farn Deeps) is not known as no data for assessments were available. The fishery in the latter two areas is opportunistic, strongly influenced by stock abundance and market prices.

Management advice

Reductions in fishing mortalities have been advised for several stocks which are outside safe biological levels. Fishing mortality is generally high and reached for most stocks the highest historical values in recent decades. This is in itself a clear indication of excessive effort.

This, and the poor performance of TACs, as implemented, in reducing fishing mortality, leads ICES to reiterate that the required reductions in fishing mortality can only be achieved if reductions in effort are included in management.

Most fisheries on roundfish and flatfish in the North Sea are characterised by extensive discarding. Discarding and high-grading also take place in pelagic fisheries, but little and incomplete information on discarding practices in these fisheries is available. Management measures, which reduce the amount of discarding would contribute to the recovery of the spawning stock and greatly benefit the yields, which can be taken from the stocks. The measures contribute to an improvement of the exploitation patterns by a reduction of fishing mortality of the young fish. Improved information on the quantity and composition of discards would also improve ICES ability to evaluate the status of stocks and the impact of fisheries.

Specific advice is presented in the respective stock sections.

Table 3.5.1.1 Species composition in the Danish and Norwegian small meshed fisheries in the North Sea ('000 t).
(Data provided by Working Group members).

Year	Sandeel	Sprat	Herring	Norway pout	Blue whiting	Haddock	Whiting	Saithe	Other	Total
1974	525	314	-	736	62	48	130	42		1857
1975	428	641	-	560	42	41	86	38		1836
1976	488	622	12	435	36	48	150	67		1858
1977	786	304	10	390	38	35	106	6		1675
1978	787	378	8	270	100	11	55	3		1612
1979	578	380	15	320	64	16	59	2		1434
1980	729	323	7	471	76	22	46	-		1674
1981	569	209	84	236	62	17	67	1		1245
1982	611	153	153	360	118	19	33	5	24	1476
1983	537	88	155	423	118	13	24	1	42	1401
1984	669	77	35	355	79	10	19	6	48	1298
1985	622	50	63	197	73	6	15	8	66	1100
1986	848	16	40	174	37	3	18	1	33	1170
1987	825	33	47	147	30	4	16	4	73	1179
1988	893	87	179	102	28	4	49	1	45	1388
1989	1039	63	146	162	28	2	36	1	59	1536
1990	591	71	115	140	22	3	50	8	40	1040
1991	843	110	131	155	28	5	38	1	38	1349
1992	854	214	128	252	45	11	27	-	30	1561
1993	578	153	102	174	17	11	20	1	27	1083
1994	769	281	40	172	11	5	10	-	19	1307
1995	911	278	66	181	64	8	27	1	15	1551
1996	761	81	39	122	93	5	5	0	13	1119
1997	1091	99	15	126	46	7	7	3	21	1415
Mean 1974-1997	706	214	75	284	55	15	47	10	38	1424
1994 q1	2	19	2	34	3	1	2	-	3	66
1994 q2	643	11	3	15	4	2	1	-	4	683
1994 q3	124	175	22	51	4	1	4	-	7	388
1994 q4	+	76	13	72	+	1	3	-	5	170
1995 q1	18	20	1	36	-	2	2	-	2	81
1995 q2	752	6	1	17	4	1	3	-	2	786
1995 q3	132	157	49	48	48	2	16	1	7	460
1995 q4	8	96	15	79	11	3	6	1	4	223
1996 q1	3	34	5	21	4	0	1	0	0	68
1996 q2	479	3	1	7	28	1	1	0	1	521
1996 q3	256	7	11	54	30	2	1	0	1	362
1996 q4	22	37	22	41	31	1	1	0	1	156
1997 q1	37	7	1	11	4	0	1	0	2	63
1997 q2	802	1	2	7	11	3	2	0	4	832
1997 q3	238	28	5	59	16	3	2	2	11	364
1997 q4	13	63	7	49	14	1	1	0	5	153

Table 3.5.1.2 Distribution of landings and associated by-catches of selected species ('000 t) from industrial fisheries by Denmark and Norway by landing categories in the North Sea to the north and south of 57°N, respectively, in 1997. (Data provided by Working Group members.)

Area	Fishery (target species)	Species Composition									Total
		Norway pout	Sandeel	Sprat	Herring	Haddock	Whiting	Saithe	Blue whiting	Other	
Area north	Norway pout	119	1	+	2	4	3	3	31	3	166
	Sandeel	1	478	+	1	3	+		+	6	489
	Sprat	+	0	+	+		+			+	+
	Other	7	+	+	1	+	+	+	14	3	25
	Sum	127	479	+	4	6	3	3	45	12	679
Area south	Norway pout										
	Sandeel	+	608	6	3	+	2		+	4	623
	Sprat	+	4	92	7	+	+	+		1	104
	Other		+	1	+					+	1
	Sum	+	612	99	10	+	2	+	+	5	728

Table 3.5.1.3 Landings of demersal, pelagic and industrial species from the North Sea.

	cod	had	had	whit	whit	saithe	saithe	sole	plaice	N pout	sandeel	sprat	herring	mackerel	horse	demersal	pelagic	industrial	total
	hc	lb	hc	lb	hc	lb								(NS stock)	mackerel	total	total	total	
1970	226	525	180	83	115	163	59	20	130	238	191	51	563	323	12	1147	898	834	2879
1971	328	235	32	61	72	218	35	24	114	305	382	95	520	243	32	980	795	921	2696
1972	354	193	30	64	61	218	28	21	123	445	359	92	498	125	8	973	631	1015	2619
1973	239	179	11	71	90	195	31	19	130	346	297	228	484	226	42	833	752	1003	2588
1974	214	150	48	81	130	231	42	18	113	736	524	314	275	190	31	807	496	1794	3097
1975	205	147	41	84	86	240	38	21	108	560	428	641	313	138	10	805	461	1794	3060
1976	234	166	48	83	150	253	67	17	114	435	488	622	175	165	9	867	349	1810	3026
1977	209	137	35	78	106	190	6	18	119	390	786	304	46	188	1	751	235	1627	2613
1978	297	86	11	97	55	132	3	20	114	270	787	398	11	103	5	746	119	1524	2389
1979	270	83	16	107	59	113	2	23	145	329	578	380	25	66	1	741	92	1364	2197
1980	294	99	22	101	46	120	0	16	140	483	729	323	71	61	2	770	134	1603	2507
1981	335	130	17	90	67	121	1	15	140	239	569	209	175	60	7	831	242	1102	2175
1982	303	166	19	81	33	161	5	22	155	395	612	153	275	40	3	888	318	1217	2423
1983	259	159	13	88	24	167	1	25	144	451	537	88	387	43	4	842	434	1114	2390
1984	228	128	10	86	19	192	6	27	156	393	669	77	429	67	26	817	522	1174	2513
1985	213	159	6	62	15	192	8	24	160	205	623	50	614	35	24	810	673	907	2390
1986	196	166	3	64	18	163	1	18	165	178	848	16	670	25	21	772	716	1064	2552
1987	210	108	4	68	16	145	4	17	154	149	825	33	792	12	21	702	825	1031	2558
1988	176	105	4	56	49	104	1	22	154	109	893	87	888	24	63	617	975	1143	2735
1989	140	76	2	45	43	90	2	22	170	173	1039	63	788	33	112	543	933	1322	2798
1990	125	51	3	47	51	86	2	35	156	152	591	71	645	19	145	500	809	870	2179
1991	102	45	5	53	38	98	1	34	148	193	843	110	654	12	78	480	744	1190	2414
1992	114	70	11	52	27	92	0	29	125	300	855	124	717	15	114	482	846	1317	2645
1993	122	80	11	53	20	104	1	31	117	184	579	200	671	14	140	507	825	995	2327
1994	111	80	4	50	10	97	0	33	110	182	766	324	568	6	113	481	687	1286	2454
1995	139	75	8	47	27	114	0	30	98	241	918	357	639	17	98	503	754	1551	2808
1996	126	76	5	36	5	110	0	23	82	166	835	137	306	19	26	453	351	1148	1952
1997	124	79	7	31	6	103	0	18	83	201	1140	103	248	20	79	438	347	1457	2242

hc = human consumption, lb = industrial by-catch

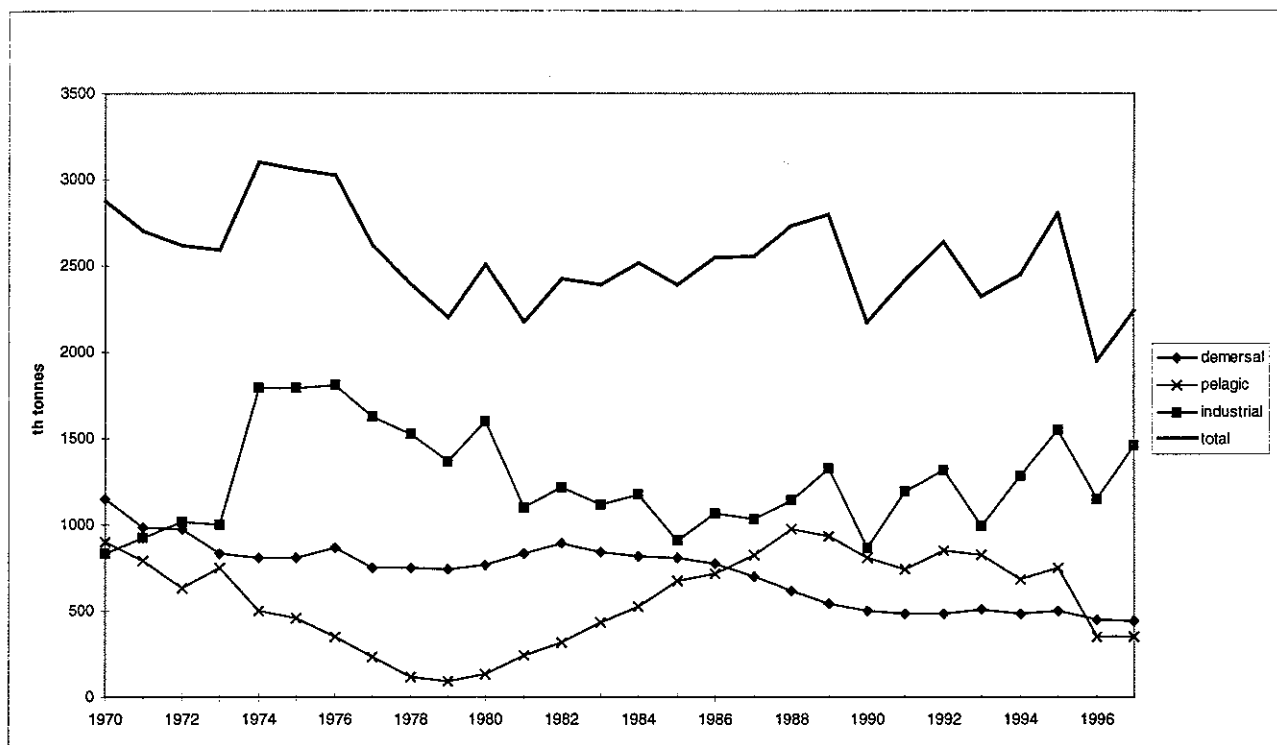


Figure 3.5.1.1 Landings from North Sea.

3.5.2

Cod in Sub-area IV (North Sea), Division VIIId (Eastern English Channel) and Division IIIa (Skagerrak)

State of stock/fishery: The stock is considered to be outside safe biological limits. Although fishing mortality has declined from a record high in 1992, F is slightly higher than the proposed F_{pa} . The spawning stock remains below the proposed B_{pa} and in a region where the probability of poor year classes is high. Except for the 1996 year class, recruitment has been below average since 1987. The 1997 year class appears to be one of the poorest on record.

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} .

Advice on management: ICES recommends that fishing mortality in 1999 should be reduced to $F = 0.60$ (below the proposed F_{pa}), corresponding to expected landings of 147 000 t in 1999 in order bring Spawning Stock Biomass above the proposed B_{pa} in the short term.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 70 000 t, the lowest observed biomass.	B_{pa} be set at 150 000 t. This is the previously agreed MBAL and affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments. Below this value the probability of below average recruitment increases.
F_{lim} is 0.86, the fishing mortality estimated to lead to potential stock collapse.	F_{pa} be set at 0.65. This F is considered to have a 95% probability of avoiding F_{lim} , taking into account the uncertainty of assessments.

Technical basis:

B_{lim} : Rounded B_{loss} : 70 000 t.	B_{pa} : Previous MBAL and signs of impaired R below: 150 000 t.
F_{lim} : F_{loss} : 0.86.	F_{pa} : Approx. 5 th percentile of F_{loss} ; implies an equilibrium biomass $> B_{pa}$ and a less than 10% probability that ($SSB_{MT} < B_{pa}$).

Relevant factors to be considered in management: The stock is showing signs of recovery from its historical low of a few years ago, although continued recovery in the

short term will depend on how much the above-average 1996 year class will contribute to the SSB.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.67$; Landings (98) = 182, $SSB(99) = 145$.

$F(99)$	Basis	Landings in combined area (99)	Lndgs in IIIa (99)	Lndgs in IV (99)	Lndgs in VIIId (99)	SSB (2000)	Medium-term effect of fishing at given level
0.40	0.6F	107	13.1	91.1	2.9	194	High probability of $SSB > B_{pa}$
0.54	0.8 F	134	16.4	114.3	3.6	169	High probability of $SSB > B_{pa}$
0.60	0.9 F	147	17.9	125.1	4.0	158	High probability of $SSB > B_{pa}$
0.67	1.0 F	158	19.3	134.5	4.3	148	Less than 10% probability of $SSB < B_{pa}$
0.80	1.2 F	179	21.9	152.4	4.8	129	High probability of $SSB < B_{pa}$

Weights in '000 t.

Shaded scenario considered inconsistent with the precautionary approach. Landings by Division or Sub-area are obtained by prorating to the combined area catch by 0.122 for IIIa, 0.851 for IV and 0.027 for VIIId. The factors are the ratio of the mean catches by area to the combined area for the period 1992-1996.

Elaboration and special comment: Cod are taken by towed gears in mixed roundfish fisheries which include haddock and whiting. They are also taken in directed fisheries using fixed gears. By-catches of cod occur in flatfish and shrimp fisheries especially in the Southern North Sea. These by-catches may be substantial when cod year classes are large.

The 1996 year class is the largest since 1985. In the catch forecast the 1996 year class contributes 54% of landings in 1999 and 45% of the SSB in the year 2000. However, the growth rate of this year class was on average lower than usual and sampling suggests that between 70 and 90% of 1 year old cod caught in 1997 were discarded. The small size at age and unusually high discard rates

mean that forecasts may overestimate the contribution this year class will make to 1999 yield and future SSBs. The 1997 year class is predicted as the lowest on record.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

The assessment is based on analysis of catch at age data calibrated with commercial fleet and survey data. No time series with discards are available to the assessment.

Landings for each of the three parts of this combined assessment area and for the combined area are given in Table 3.5.2.1 and Table 3.5.2.2.

North Sea (Sub-area IV)

Year	ICES advice	Predicted catch corresp. to	Agreed TAC	Official landings	ACFM landings
1987	SSB recovery; TAC	100–125	175	167	182
1988	70% of F(86); TAC	148	160	142	157
1989	Halt SSB decline; protect juveniles; TAC	124	124	110	116
1990	80% of F(88); TAC	113	105	99	105
1991	70% of effort (89)		100	86	89
1992	70% of effort (89)		100	98	97
1993	70% of effort (89)		101	94	105
1994	Significant effort reduction		102	88	95
1995	Significant effort reduction		120	112	120
1996	80% of F(94) = 0.7	141	130	104	106
1997	80% of F(95) = 0.65	135	115	100	102
1998	F(98) should not exceed F(96)	153	140		
1999	F = 0.60 to rebuild SSB	125			

Skagerrak (Division IIIa)

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	ACFM landings ¹
1987	F = F _{max}	<21	22.5	20.9
1988	Reduce F		21.5	16.9
1989	F at F _{med}	<23	20.5	19.6
1990	F at F _{med} ; TAC	21.0	21.0	18.6
1991	TAC	15.0	15.0	12.4
1992	70% of F(90)		15.0	14.8
1993	Precautionary TAC		15.0	15.3
1994	No long-term gain in increased F + precautionary TAC		15.5	13.9
1995	If required precautionary TAC; link to North Sea		20.0	12.1
1996	If required precautionary TAC; link to North Sea		23.0	16.4
1997	If required precautionary TAC; link to North Sea		16.1	14.9
1998	If required precautionary TAC; link to North Sea	21.9	20.0	
1999	F = 0.60 to rebuild SSB	17.9		

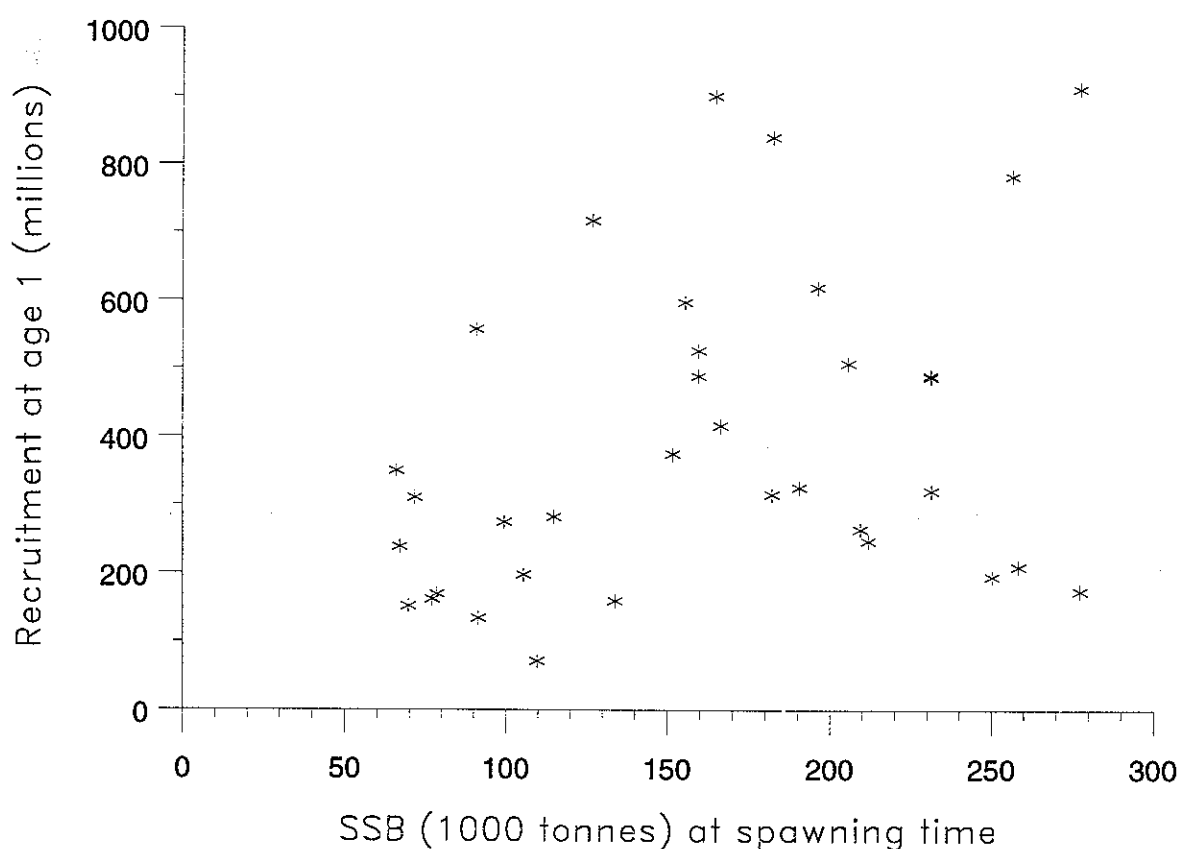
¹ Norwegian fjords not included. Weights in '000 t.

Eastern English Channel (Division VIIId)

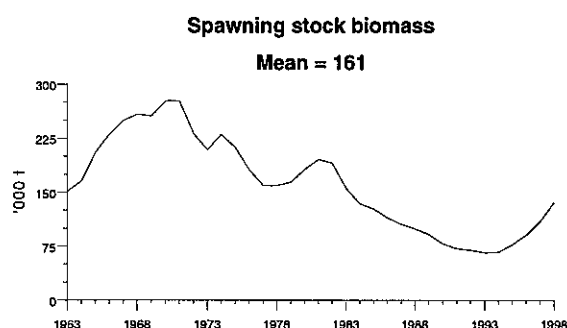
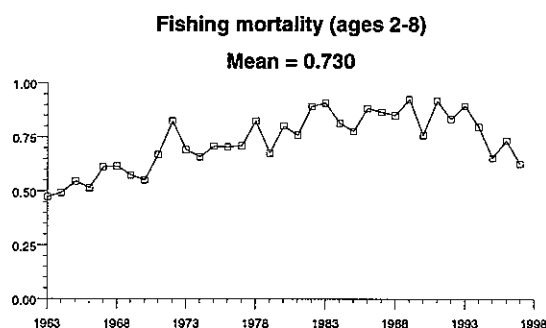
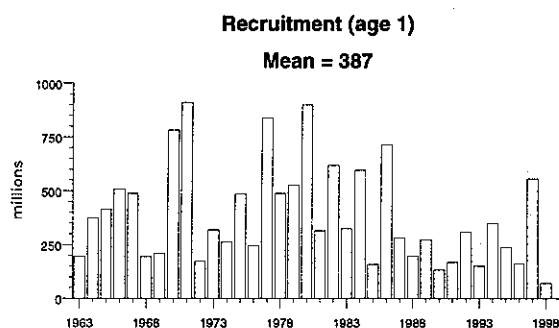
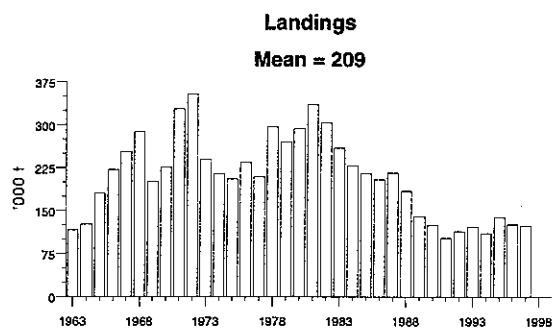
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings
1987	Not assessed	-	-	9.4	14.2
1988	Precautionary TAC	-	-	10.1	10.7
1989	No increase in F; TAC	10.0 ²	-	n/a	5.5
1990	No increase in F; TAC	9.0 ²	-	n/a	2.8
1991	Precautionary TAC	3.0 ²	-	n/a	1.9
1992	If required, precautionary TAC	5.5 ²	-	2.7	2.7
1993	If TAC required, consider SSB decline	-	-	n/a	2.4
1994	Reduce F+ precautionary TAC	-	-	n/a	2.9
1995	Significant effort reduction; link to North Sea	-	-	n/a	4.0
1996	Reference made to North Sea advice	-	-	n/a	3.5
1997	No advice	-	-	n/a	7.0
1998	Link to North Sea	4.9	-	n/a	
1999	F = 0.60 to rebuild SSB	4.0	-		

¹Included in TAC for Sub-area VII (except Division VIIa). ²Including VIIe. Weights in '000 t.

Stock - Recruitment

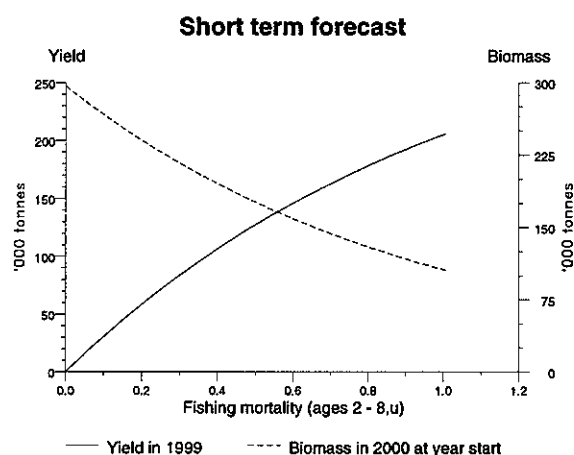
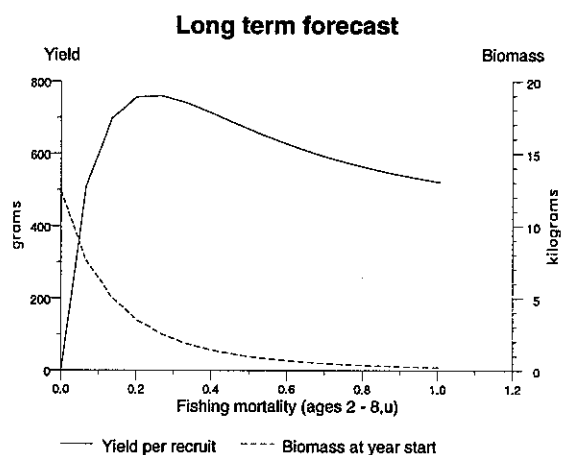


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Cod in the North Sea

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Cod, Fishing Areas IV, Skagerrak and VIId

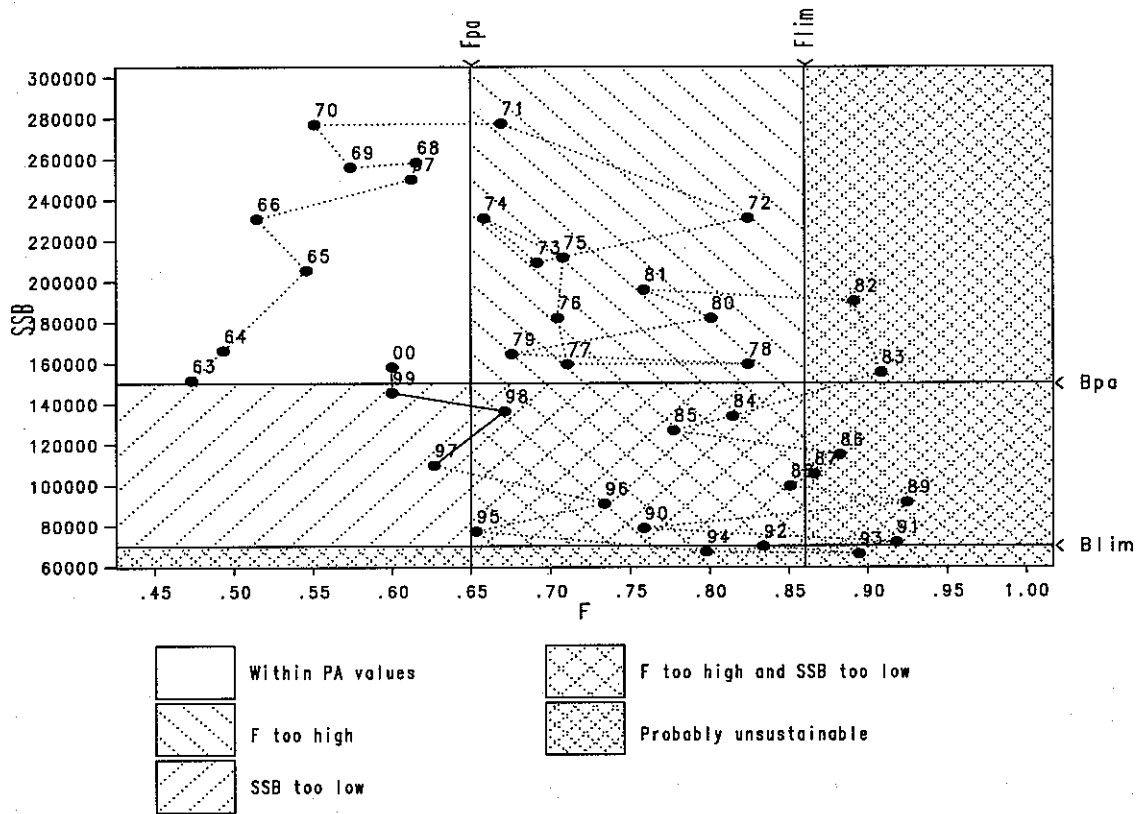


Table 3.5.2.1 Nominal catch (in tonnes) of COD in IIIa (Skagerrak), IV and VIId, 1984–1997 as officially reported to ICES and as used by the Working Group.

Sub-area IV														
Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	5,804	4,815	6,604	6,693	5,508	3,398	2,934	2,331	3,356	3,374	2,648	4,827	3,458	4,642
Denmark	46,751	42,547	32,892	36,948	34,905	25,782	21,601	18,998	18,479	19,547	19,234	24,067	23,573	21,870
Faroe Islands	-	71	45	57	46	35	96	23	109	46	80	219	44	40
France	8,129	4,834	8,402	8,199	8,323	2,578	1,641	975	2,146	1,868	1,868	3,040	1,920	3,779
Germany	13,453	7,675	7,667	8,230	7,707	11,430	11,725	7,278	8,446	6,800	5,974	9,457	8,344	5,179
Netherlands	25,460	30,844	25,082	21,347	16,968	12,028	8,445	6,831	11,133	10,220	6,512	11,199	9,271	11,807
Norway	7,005	5,766	4,864	5,000	3,585	4,813	5,168	6,022	10,476	8,742	7,707	7,358	5,884	5,829
Poland	7	-	10	13	19	24	53	15	-	-	-	-	18	31
Sweden	575	748	839	688	367	501	620	784	823	646	630	709	617	774
UK (E/W/NI)	35,605	29,692	25,361	29,960	23,496	18,375	15,622	14,249	14,462	14,940	13,941	14,991	15,930	13,413
UK (Scotland)	54,359	60,931	45,748	49,671	41,382	31,480	31,120	29,060	28,677	28,197	28,854	35,848	35,349	32,344
Total Nominal Catch	197,148	187,923	157,514	166,806	142,306	110,444	99,025	86,566	98,107	94,380	87,448	111,715	104,408	99,708
Unallocated landings	7,723	6,772	11,292	15,287	14,252	5,256	5,726	1,967	-758	10,200	7,075	8,308	2,129	2,454
WG estimate of total landings	204,871	194,695	168,806	182,093	156,558	115,700	104,751	88,533	97,349	104,580	94,523	120,023	106,537	102,162
Agreed TAC	215,000	250,000	170,000	175,000	160,000	124,000	105,000	100,000	100,000	101,000	102,000	120,000	130,000	115,000

Division VIId														
Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	331	501	650	815	486	173	237	182	187	157	228	377	321	310
Denmark	-	-	4	-	+	+	-	-	1	1	9	-	-	-
France	2,492	2,589	9,938	7,541	8,795	n/a	n/a	n/a	2,079	1,771	2,338	3,261	2,788	n/a
Netherlands	-	-	-	-	1	1	-	-	2	-	-	-	+	-
UK (E+W)	282	326	830	1,044	867	562	420	341	443	530	312	336	414	478
UK (Scotland)	-	-	-	-	-	-	7	2	22	2	+	+	4	3
Total Nominal Catch	3,105	3,416	11,422	9,400	10,149	n/a	n/a	n/a	2,734	2,461	2,887	3,974	3,527	n/a
Unallocated landings	419	-111	3,722	4,819	580	-	-	-	-65	-29	-37	-10	-24	-
WG estimate of total landings	3,524	3,305	15,144	14,219	10,729	5,538	2,763	1,886	2,669	2,432	2,850	3,964	3,503	7,043

Division IIIa (Skagerrak)														
Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	17,443	14,521	18,424	17,824	14,806	16,634	15,788	10,396	11,194	11,997	11,953	8,948	13,573	12,164
Sweden	1,981	1,914	1,505	1,924	1,648	1,902	1,694	1,579	2,436	2,574	1,821	2,658	2,208	2,303
Norway	311	193	174	152	392	256	143	72	270	75	60	169	265	348
Germany	-	-	-	-	-	12	110	12	-	-	301	200	203	81
Others	156	-	-	-	106	34	65	12	102	91	25	134	-	-
Norwegian coast *	1,187	990	917	838	769	888	846	854	923	909	760	846	748	911
Danish industrial by-catch *	1,084	1,751	997	491	1,103	428	687	953	1,360	511	666	749	676	205
Total Nominal Catch	19,891	16,628	20,103	19,900	16,952	18,838	17,800	12,071	14,002	14,737	14,160	12,109	16,249	14,896
Unallocated landings	235	983	1,039	955	-7	810	789	370	792	587	-250	0	134	50
WG estimate of total landings	20,126	17,611	21,142	20,855	16,945	19,648	18,589	12,441	14,794	15,324	13,910	12,109	16,383	14,946
Agreed TAC	28,000	29,000	29,000	22,500	21,500	20,500	21,000	15,000	15,000	15,000	15,500	20,000	23,000	16,100

Sub-area IV, Divisions VIId and IIIa (Skagerrak) combined														
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Total Nominal Catch	220,144	207,967	189,039	196,106	169,407	n/a	n/a	n/a	114,843	111,578	104,495	127,798	124,184	n/a
Unallocated landings	8,377	7,644	16,053	21,061	14,825	-	-	-	-31	10,758	6,788	8,298	2,239	-
WG estimate of total landings	228,521	215,611	205,092	217,167	184,232	140,886	126,103	102,860	114,812	122,336	111,283	136,096	126,423	124,151

* The Danish industrial by-catch and the Norwegian coast catches are not included in the (WG estimate of) total landings of Division IIIa (Skagerrak)

Table 3.5.2.2 Cod in Fishing Areas IV, Skagerrak and VIId.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-8
1963	195.11	151.52	116.46	0.473
1964	374.09	166.13	126.04	0.493
1965	415.44	205.38	181.04	0.546
1966	506.86	230.74	221.34	0.515
1967	488.81	250.05	252.98	0.613
1968	194.60	258.25	288.37	0.616
1969	209.06	255.98	200.76	0.574
1970	781.99	276.92	226.12	0.551
1971	910.80	277.31	328.10	0.669
1972	173.51	231.10	353.98	0.824
1973	319.65	209.19	239.05	0.692
1974	263.66	230.87	214.28	0.659
1975	486.38	211.63	205.25	0.708
1976	246.44	182.07	234.17	0.704
1977	839.21	159.36	209.15	0.711
1978	488.19	159.40	297.02	0.824
1979	525.44	164.33	269.97	0.676
1980	899.77	181.95	293.64	0.801
1981	314.83	195.87	335.50	0.759
1982	618.51	190.38	303.25	0.891
1983	324.88	155.26	259.29	0.909
1984	596.34	133.85	228.29	0.815
1985	158.66	126.76	214.63	0.777
1986	716.25	114.81	204.05	0.882
1987	281.95	105.42	216.21	0.866
1988	197.09	99.41	184.24	0.851
1989	274.33	91.44	139.94	0.924
1990	133.94	78.64	125.31	0.758
1991	169.32	71.74	102.48	0.918
1992	310.31	69.76	114.02	0.834
1993	151.53	66.02	121.75	0.894
1994	349.92	67.07	110.63	0.798
1995	238.29	77.14	138.62	0.653
1996	161.38	90.77	126.45	0.734
1997	557.00	109.64	124.15	0.627
1998	71.00	136.22	.	.
Average	387.35	160.62	208.76	0.730
Unit	Millions	1000 tonnes	1000 tonnes	-

3.5.3 Haddock in Sub-area IV (North Sea) and Division IIIa

State of stock/fishery: The stock in 1998 is considered to be close to safe biological limits. SSB is above the proposed B_{pa} and F is close to the proposed 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 F_{pa} .

and to increase or maintain spawning stock biomass above B_{pa} .

Advice on management: ICES recommends that fishing mortality in 1999 should be reduced to $F = 0.63$, below the proposed F_{pa} , in order to maintain SSB above the proposed B_{pa} in the short term, corresponding to expected human consumption landings of 75 000 t in 1999.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 100 000 t, the bootstrapped median estimate of the lowest observed biomass.	B_{pa} be set at 140 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments.
F_{lim} is 1.0, a fishing mortality historically associated with stock decline.	F_{pa} be set at 0.7. This F is considered to provide approximately 90% probability of avoiding a fishing mortality associated with stock collapse.

Technical basis:

B_{lim} : Smoothed B_{loss} .	B_{pa} : $1.4 \cdot B_{lim}$.
F_{lim} : F_{loss} poorly defined; $1.4 F_{pa}$ which historically has led to decline: 1.0.	F_{pa} : F_{lpg}^{-1} implies an equilibrium biomass $> B_{pa}$ and a less than 10% probability that ($SSB_{MT} < B_{pa}$).

¹ F_{lpg} is defined as the F value having a 10% probability of giving a replacement line above G_{loss} , which is the slope in the stock recruitment plot associated with the lowest observed SSB.

Relevant factors to be considered in management: In the North Sea haddock are taken in a mixed-species fishery along with cod and whiting, and management should also take the advice on these stocks into account. Although recruitment is highly variable, there

is some evidence of poor year classes occurring in sequence.

The recent reductions in fishing mortality correspond to observed reductions in effort in some of the major fleets exploiting haddock.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.68$, Catch (98) = 150, Landings¹ (98) = 102, $SSB(99) = 171$.

F (99 onwards)	Basis	Catch (99)	Human Consump. Lndgs (99)	Discards (99)	Industrial Bycatch IV + IIIa (99)	HC Ldngs IIIa	HC Lndgs IV	SSB (2000)	Medium-term effect of fishing at given level
0.41	0.6 F(95-97)	85	55	21	8.8	2.5	53	172	Low prob. $SSB < B_{pa}$
0.54	0.8 F(95-97)	105	69	27	8.6	3.1	66	153	Low prob. $SSB < B_{pa}$
0.63	0.9 F(95-97)	114	75	30	8.5	3.4	72	144	Low prob. $SSB < B_{pa}$
0.68	F(95-97)	122	81	32	8.5	3.7	78	136	ca 10% prob. $SSB < B_{pa}$
0.82	1.2 F(95-97)	137	92	37	8.3	4.1	88	122	> 10% prob. $SSB < B_{pa}$

Weights in '000 t, F is for Human consumption/discard fleet only; bycatch F assumed constant at 0.03. The landings in Division IIIa are calculated as 4.5% of the combined area total. The figure 4.5% is the long-term average of the Division IIIa landings expressed as a percentage of the combined IIIa-IV (human consumption) landings.

¹North Sea + IIIa human consumption.

Shaded scenario considered inconsistent with the precautionary approach.

Elaboration and special comment: The large majority of the catch is taken by Scottish trawlers, seiners and pair trawlers. Smaller quantities of haddock are taken by other vessels including *Nephrops* trawlers which use 70 mm

mesh. In Division IIIa catches are taken by trawl, seine and gill net in mixed fisheries.

Landings and SSB have varied considerably in response

to large variation in year class strength. Analytical assessment based on long time-series of catch-at-age data and using CPUE data from both commercial and survey fleets.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.3.1–3):

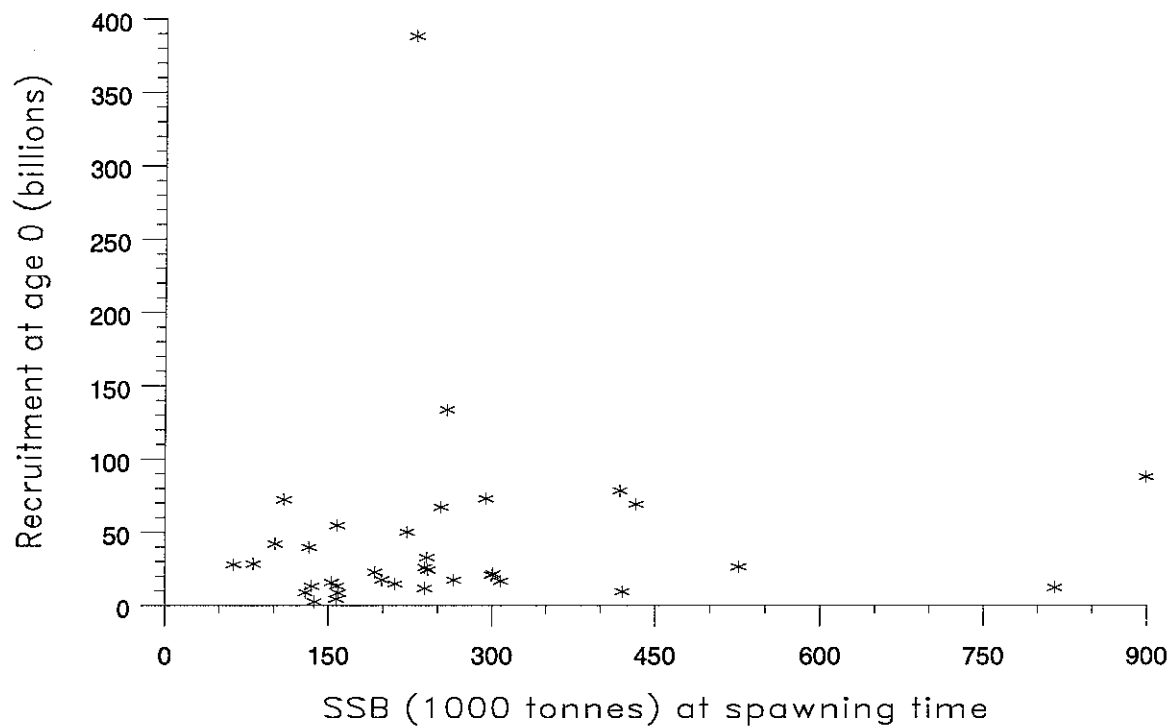
Sub-area IV								
Year	ICES advice	Predicted Indgs corresp. to advice ¹	Agreed TAC	Off. Indgs.	ACFM catches			Total
					Hum. Cons.	Disc. slip.	Indust. by-catch	
1987	80% of F(85)	105	140	109	108	59	4	172
1988	77% of F(86); TAC	185	185	105	105	62	4	171
1989	Reduce decline in SSB; TAC; protect juveniles	68	68	64	76	26	2	104
1990	80% of F(88); TAC	50	50	43	51	33	3	87
1991	70% of effort (89)		50	45	45	40	5	90
1992	70% of effort (89)		60	51	70	48	11	129
1993	70% of effort (89)		133	80	80	80	11	170
1994	Significant reduction in effort; mixed fishery		160	87	81	65	4	150
1995	Significant reduction in effort; mixed fishery		120	75	75	57	8	140
1996	Mixed fishery to be taken into account		120	75	76	73	5	154
1997	Mixed fishery to be taken into account		114	73	79	52	7	138
1998	No increase in F	100.3	115					
1999	Reduction of 10% F(95–97)	72						

¹Only pertaining to the North Sea. Weight in '000 t.

Division IIIa						
Year	ICES advice	Predicted Indgs corresp. to advice	Agreed TAC	ACFM landings		Total
				Hum. Cons.	Indust. bycatch	
1987	Precautionary TAC	-	11.5	3.8	1.4	5.3
1988	Precautionary TAC	-	10.0	2.9	1.5	4.3
1989	Precautionary TAC	-	10.0	4.1	0.4	4.5
1990	Precautionary TAC	-	10.0	4.1	2.0	6.1
1991	Precautionary TAC	4.6	4.6	4.1	2.6	6.7
1992	TAC	4.6	4.6	4.4	4.6	9.0
1993	Precautionary TAC	-	4.6	2.0	2.4	4.4
1994	Precautionary TAC	-	10.0	1.8	2.2	4.0
1995	If required, precautionary TAC; link to North Sea	-	10.0	2.2	2.2	4.4
1996	If required, precautionary TAC; link to North Sea	-	10.0	3.1	2.9	6.1
1997	Combined advice with North Sea	-	7.0	3.4	0.6	4.0
1998	Combined advice with North Sea	4.7	7.0			
1999	Combined advice with North Sea	3.4				

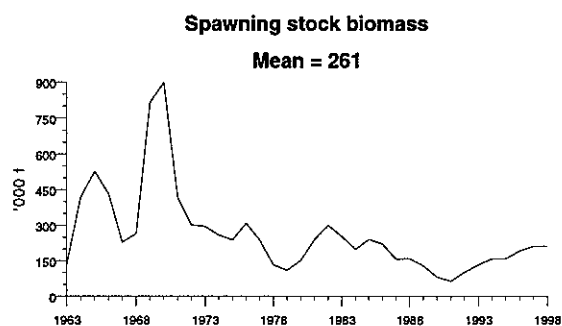
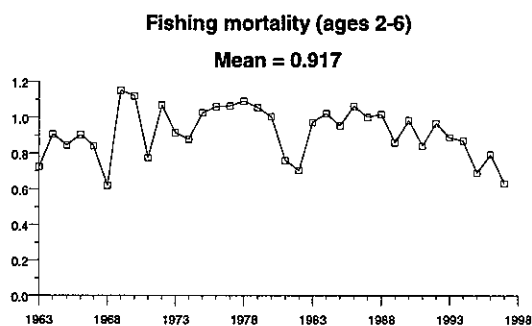
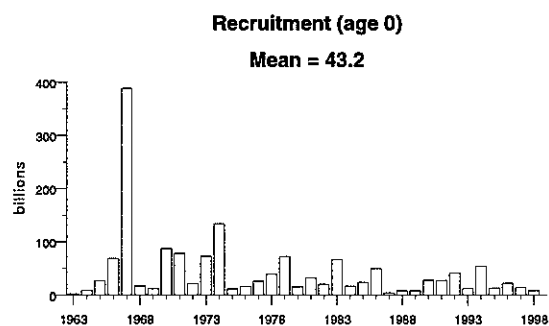
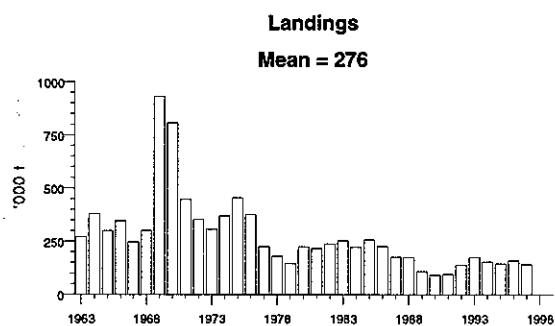
Weight in '000 t.

Stock - Recruitment



(run: XSASAR01)

Haddock in Sub-area IV (North Sea) and Division IIIa



Precautionary Approach Plot

Haddock, Fishing Area IV and IIIa

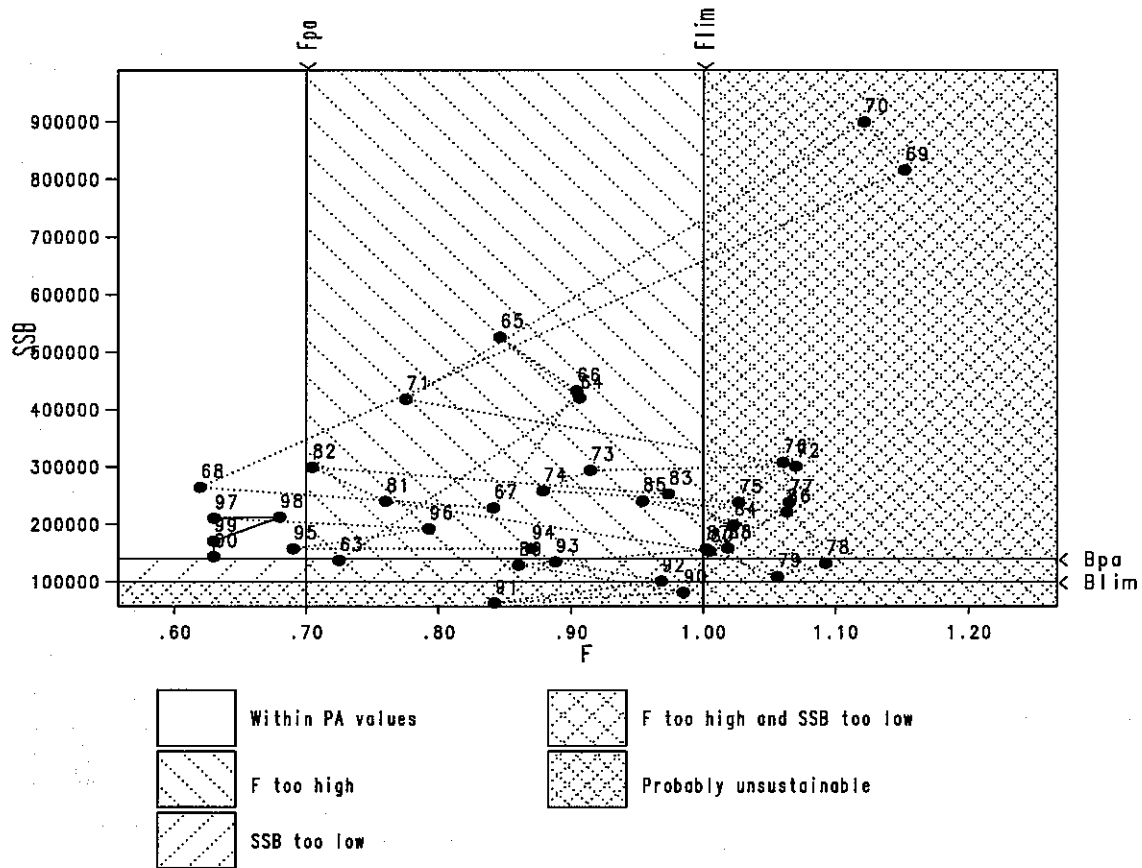


Table 3.5.3.1 Nominal catch (t) of HADDOCK in Division IIIa, 1988–1997, as officially reported to ICES.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	19	5	13	4	14	9	4	18	-	-
Denmark	2558	3895	3885	2339	3812	1600	1458	1576	2523	2501
Germany	-	-	3	-	-	+	1	1	5	5
Netherlands	8	-	-	-	-	-	-	-	-	-
Norway	245	84	100	110	184	153	142	134	114	187
Sweden	64	66	84	69	744	436	408	498	536	807
UK (Engl. & Wales)	-	-	-	-	-	+	-	-	-	-
Total	2894	4050	4085	2522	4754	2198	2013	2227	3178	3500
WG estimate of H.cons. landings	2852	4098	4100	4086	4396	1959	1833	2191	3142	3401
WG estimate of industrial bycatch	1480	360	1968	2593	4604	2415	2180	2162	2925	610
WG estimate of total catch	4332	4458	6068	6679	9000	4374	4013	4353	6067	4011
Unallocated landings	-42	48	15	1564	-358	-239	-168	-36	-36	-99

Nominal catch (t) of HADDOCK in Sub-Area IV, 1988-1997, as officially reported to ICES.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	220	145	192	168	415	292	306	407	215	436
Denmark	9174	2789	1993	1330	1476	3582	3208	2902	2520	2722
Faroe Islands	35	16	6	15	13	25	43	49	13	9
France	2193	1702	1115	631	508	960	678	441	368	804
Germany	802	447	749	535	764	348	1829	1284	1769	1462
Netherlands	894	328	102	100	148	192	96	147	110	480
Norway	1590	1697	1572	2069	3273	2655	2355	2443	2297	2353
Poland	-	-	-	-	-	-	-	-	18	8
Sweden	614	1051	900	957	1289	908	551	722	689	654
UK (Engl. & Wales)	5537	2507	2019	2173	2926	4259	4043	3616	3379	3330
UK (Isle of Man)	-	-	-	-	11	-	-	-	-	-
UK (N. Ireland)	-	137	11	48	73	18	9	-	-	-
UK (Scotland)	84104	53587	34567	36474	39896	66799	73793	63411	63542	61098
Total	105163	64406	43226	44500	50792	80038	86911	75422	74920	73356
WG estimate of H.cons. landings	105126	76190	51458	44645	70218	79580	80897	75313	76034	79094
WG estimate of discards	62062	25713	32603	40276	47967	79601	65392	57360	72522	52104
WG estimate of industrial bycatch	3995	2410	2591	5421	10816	10741	3561	7747	5048	6689
WG estimate of total catch	171183	104313	86652	90342	129001	169922	149850	140420	153604	137887
Unallocated landings	-37	11784	8232	145	19426	-458	-6014	-109	1114	5738

North Sea + Division IIIa

WG estimate of Total Catch	175515	108771	92720	97021	138001	174296	153863	144773	159671	141898
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Table 3.5.3.2 Catches ('000t) of Haddock from the North Sea and Division IIIa, 1963–1997.
Figures are Working Group estimates.

	North Sea				Division IIIa			Total
Year	H.cons	Disc	Ind. BC	Total	H. cons.	Ind. BC	Total	
1963	68.4	189.0	13.7	271.0	0.4	0.1	0.5	271.5
1964	130.5	160.3	88.6	379.4	0.4	0.3	0.7	380.2
1965	161.6	62.2	74.6	298.4	0.7	0.3	1.0	299.5
1966	225.8	73.6	46.7	346.0	0.6	0.1	0.7	346.7
1967	147.4	78.1	20.7	246.1	0.4	0.1	0.4	246.6
1968	105.4	161.9	34.2	301.5	0.4	0.1	0.5	302.0
1969	330.9	260.2	338.4	929.5	0.5	0.5	1.1	930.5
1970	524.6	101.4	179.7	805.7	0.7	0.2	0.9	806.7
1971	235.4	177.5	31.5	444.4	2.0	0.3	2.2	446.6
1972	192.9	128.1	29.6	350.6	2.6	0.4	3.0	353.6
1973	178.6	114.7	11.3	304.6	2.9	0.2	3.1	307.7
1974	149.6	166.8	47.8	364.2	3.5	1.1	4.6	368.8
1975	146.6	260.4	41.4	448.4	4.8	1.3	6.1	454.5
1976	165.6	154.3	48.2	368.1	7.0	2.0	9.1	377.1
1977	137.3	44.3	35.0	216.6	7.8	2.0	9.8	226.4
1978	85.8	76.9	10.8	173.5	5.9	0.7	6.6	180.1
1979	83.1	41.7	16.4	141.2	4.0	0.8	4.8	146.0
1980	98.6	94.7	22.3	215.7	6.4	1.5	7.9	223.6
1981	129.6	60.1	17.1	206.8	9.1	1.2	10.4	217.2
1982	165.8	40.5	19.4	225.8	10.8	1.3	12.1	237.8
1983	159.3	65.9	13.1	238.4	8.0	7.2	15.2	253.6
1984	128.1	75.3	10.1	213.5	6.4	2.7	9.1	222.6
1985	158.5	85.4	6.0	250.0	7.2	1.0	8.1	258.1
1986	165.5	52.2	2.6	220.4	3.6	1.7	5.3	225.7
1987	108.0	59.2	4.4	171.6	3.8	1.4	5.3	176.9
1988	105.1	62.1	4.0	171.2	2.9	1.5	4.3	175.5
1989	76.2	25.7	2.4	104.3	4.1	0.4	4.5	108.8
1990	51.5	32.6	2.6	86.7	4.1	2.0	6.1	92.7
1991	44.6	40.3	5.4	90.3	4.1	2.6	6.7	97.0
1992	70.2	48.0	10.8	129.0	4.4	4.6	9.0	138.0
1993	79.6	79.6	10.7	169.9	2.0	2.4	4.4	174.3
1994	80.9	65.4	3.6	149.9	1.8	2.2	4.0	153.9
1995	75.3	57.4	7.7	140.4	2.2	2.2	4.4	144.8
1996	76.0	72.5	5.0	153.6	3.2	2.9	6.1	159.7
1997	79.1	52.1	6.7	137.9	3.4	0.6	4.0	141.9
Min	44.6	25.7	2.4	86.7	0.4	0.1	0.4	92.7
Mean	140.6	94.9	34.9	270.4	3.8	1.4	5.2	275.6
Max	524.6	260.4	338.4	929.5	10.8	7.2	15.2	930.5

Table 3.5.3.3 Haddock in Fishing Areas IV and IIIa.

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1963	2,338.28	137.27	271.53	0.725
1964	9,172.05	420.02	380.16	0.906
1965	26,336.30	525.93	299.46	0.846
1966	68,992.30	432.38	346.73	0.904
1967	388,112.00	228.95	246.59	0.841
1968	17,102.50	264.74	302.04	0.620
1969	12,195.50	815.88	930.54	1.152
1970	87,763.90	899.32	806.67	1.121
1971	78,284.80	417.86	446.63	0.776
1972	21,539.20	300.94	353.61	1.070
1973	72,898.30	294.26	307.69	0.915
1974	133,493.00	258.43	368.80	0.879
1975	11,542.30	238.19	454.54	1.027
1976	16,483.50	308.02	377.12	1.060
1977	25,751.40	238.41	226.41	1.065
1978	39,549.00	132.11	180.14	1.092
1979	72,155.00	109.27	146.00	1.056
1980	15,653.90	152.96	223.61	1.005
1981	32,479.70	240.27	217.15	0.760
1982	20,614.40	299.67	237.84	0.705
1983	66,978.10	252.91	253.59	0.974
1984	17,269.10	198.91	222.56	1.023
1985	24,047.30	240.93	258.12	0.954
1986	49,887.10	221.68	225.70	1.063
1987	4,205.10	157.23	176.88	1.002
1988	8,444.44	159.02	175.52	1.019
1989	8,709.18	129.07	108.77	0.860
1990	28,242.90	81.25	92.72	0.985
1991	27,738.40	63.37	97.02	0.842
1992	41,907.40	101.32	138.00	0.968
1993	12,945.80	134.75	174.30	0.888
1994	54,510.80	158.08	153.86	0.870
1995	13,058.30	157.69	144.77	0.690
1996	22,543.00	192.53	159.67	0.793
1997	14,613.00	210.95	141.90	0.630
1998	8,475.70	212.68	.	.
Average	43,223.14	260.76	275.62	0.917
Unit	Millions	1000 tonnes	1000 tonnes	-

3.5.4

Whiting in Sub-area IV (North Sea) and Division VIIId (Eastern English Channel)

State of stock/fishery: The stock is considered to be outside safe biological limits. The assessment indicates that SSB has declined over the last 20 years and is now the lowest observed and below the proposed B_{pa} . Fishing mortality is uncertain, but remains at a level where SSB continues to decline. Incoming year classes are expected to be poor.

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} .

Advice on management: ICES recommends that fishing mortality should be reduced to bring SSB above the proposed B_{pa} in the medium term. As a first step ICES recommends a reduction in fishing mortality of at least 20%. This corresponds to human consumption landings of no more than 33 800 t and industrial by-catch of 10 500 t in 1999.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 225 000 t, the lowest observed biomass.	B_{pa} be set at 315 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments. Below this value the probability of below-average recruitment increases.
F_{lim} is 0.90, the fishing mortality estimated to lead to potential stock collapse.	F_{pa} be set at 0.65. This F is considered to provide approximately 95% probability of avoiding F_{lim} , taking into account the uncertainty of the assessment.

Technical basis:

$B_{lim}=B_{loss}=225\ 000\ t.$	$B_{pa}\ 1.4*B_{lim}$, apparent impaired recruitment below this value: 315 000 t.
$F_{lim}=F_{loss}=0.9.$	$F_{pa} \sim 0.7\ F_{lim}=0.65.$

Relevant factors to be considered in management: SSB cannot be rebuilt to B_{pa} in the short term, even if fisheries were closed. At the advised F , SSB will rebuild to above B_{pa} in the medium term, although the period of rebuilding will depend on the strength of future year classes. However, greater reductions in F will shorten the rebuilding period.

Since whiting is caught in a mixed fishery with cod and haddock, advice on these stocks should be taken into consideration when managing whiting. Large quantities of whiting (about 60% in weight) are discarded, or taken as industrial by-catch, and reduction in either of these will contribute to the required reduction in F and shorten the rebuilding period.

Catch forecast for 1999:

Basis: $F(98) = F(96-97) = 0.65$; $SSB(99) = 205$, HC landings IV (98) = 39, HC landings VIIId (98) = 5; Discards (98) = 23, Industr. by-catch (98) = 8.7.

F (99)	Basis	Catch (99)	Human Consump. Lndngs (99)	Discards (99)	Industrial By-catch (99)	HC Indgs IV (99)	HC Indgs VIIId (99)	SSB (2000)	Medium-term effect of fishing at given level
0.26	0.4 F (95-97)	41	18.6	11.6	10.8	16.5	2.1	270	SSB increases above B_{pa}
0.39	0.6 F (95-97)	54.2	26.5	17.0	10.7	23.4	3.1	258	SSB increases above B_{pa}
0.52	0.8 F (95-97)	66.4	33.8	22.1	10.5	29.9	3.9	247	SSB increases above B_{pa}
0.65	1.0 F (95-97)	77.8	40.4	27.1	10.3	34.7	4.7	237	SSB increases slowly

Weights in '000 t. F is for the human consumption/discard fleet only, by-catch F assumed constant at 0.02. The HC landings in Division VIIId are calculated as 11.5% of the HC landings forecast for the area combined, 11.5% being the average of the VIIId HC landings relative to the HC landings from the combined area for the years 1992-1996.

Shaded scenario considered inconsistent with the precautionary approach.

Elaboration and special comment: The fishery for whiting is part of a mixed trawl fishery targeted at cod and haddock. In most years a significant part of the landings have been taken as a by-catch in the industrial fishery, particularly the fishery for Norway pout.

The assessment of this stock has a history of overestimating biomass and underestimating fishing mortality. It is possible the same problem exists with the present assessment.

The short-term prediction of SSB in 2000 is heavily influenced by the assumed mean recruitment for the 1997 year class and subsequent year classes (84% of SSB in 2000 at *status quo*). Catch in 1999 is also heavily

influenced by this assumption (27% of catch in 1999 at *status quo*).

Analytical assessment based on long time-series of catch-at-age data and using CPUE data from both commercial and survey fleets. The assessment reveals some inconsistencies between information from commercial catch data and survey information. Incomplete information on discards, based only on one nation's samples in some years, and poor industrial bycatch figures cause difficulties with the analytical assessment and in estimating reference points.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.4.1–3):

North Sea (Sub-area IV)

Year	ICES advice	Predicted Landings corresp. to advice	Agreed TAC	Off. Indgs.	ACFM figures			
					Hum. Cons.	Indust. by-catch	Disc. slip.	Total catch
1987	Reduce F towards F_{max}	120	135	65	64	16	54	134
1988	No increase in F; TAC	134	120	66	52	49	28	129
1989	Protect juveniles	-	115	40	41	43	36	120
1990	80% of F(88); TAC	130	125	41	43	51	56	150
1991	70% of effort (89)	-	141	47	47	38	34	119
1992	70% of effort (89)	-	135	47	46	27	31	104
1993	70% of effort (89)	-	120	47	48	20	43	111
1994	Significant reduction in effort; mixed fishery	-	100	43	43	10	33	86
1995	Significant reduction in effort; mixed fishery	-	81	41	42	27	31	99
1996	Mixed fishery; take into account cod advice	-	67	35	36	5	28	69
1997	Mixed fishery; take into account cod advice	-	74	31	31	6	17	54
1998	No increase from 1996 level	54	60					
1999	at least 20% reduction of F(95–97)	40.4						

Weights in '000 t.

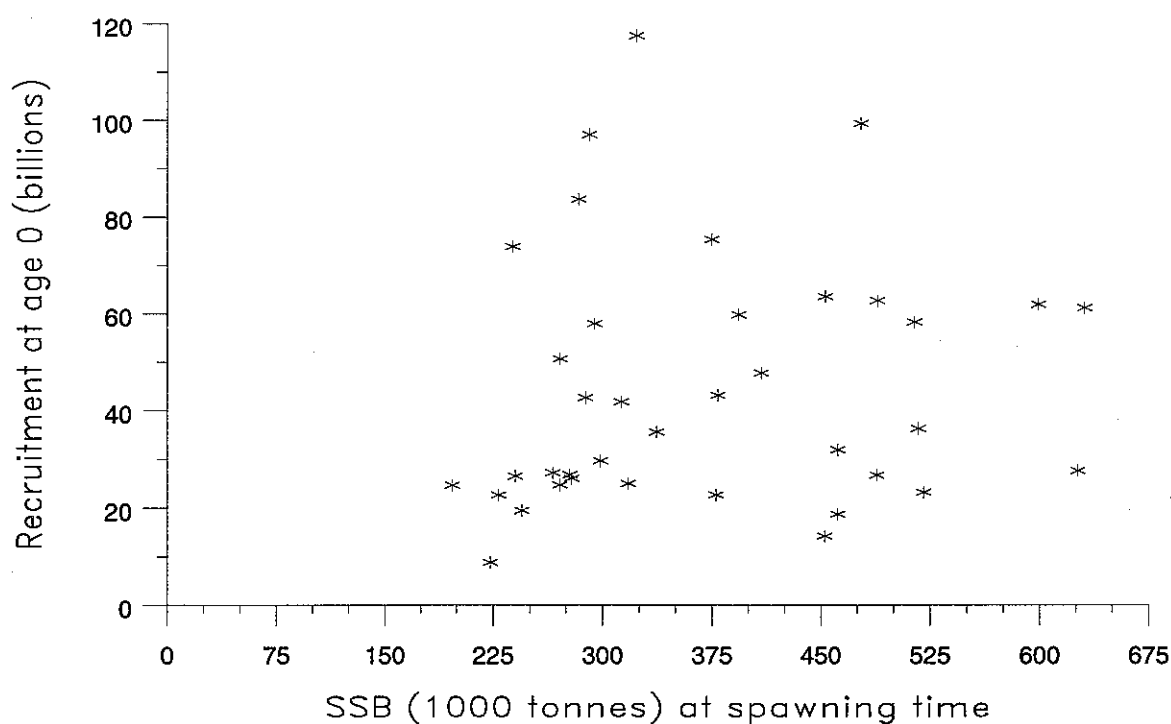
Eastern English Channel (Division VIIId)

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM catch
1987	Not assessed	-	-	7.2	4.7
1988	Precautionary TAC	-	-	7.8	4.4
1989	Precautionary TAC	-	-	n/a	4.2
1990	No increase in F; TAC	8.0 ²	-	n/a	3.5
1991	F _{sq} ; TAC	5.1	-	n/a	5.7
1992	If required, precautionary TAC	6.0 ²	-	5.9	5.7
1993	No basis for advice	-	-	5.4	5.2
1994	No long-term gains in increasing F	-	-	n/a	6.6
1995	Significant reduction in effort; link to North Sea	-	-	5.6	5.4
1996	Reference made to North Sea advice	-	-	5.1	5.0
1997	Reference made to North Sea advice	-	-	n/a	4.6
1998	Reference made to North Sea advice	5.8	-		
1999	Reference made to North Sea advice	3.9			

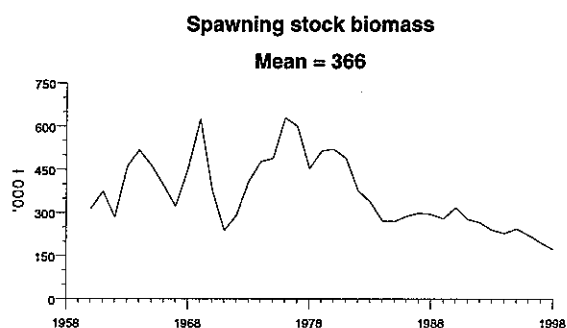
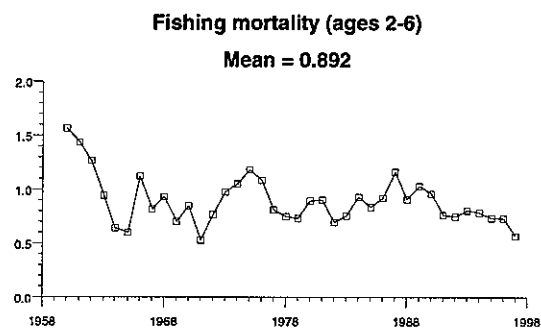
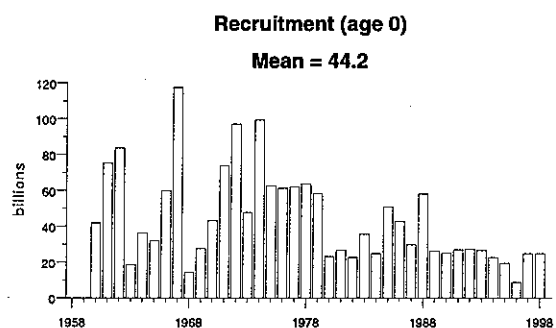
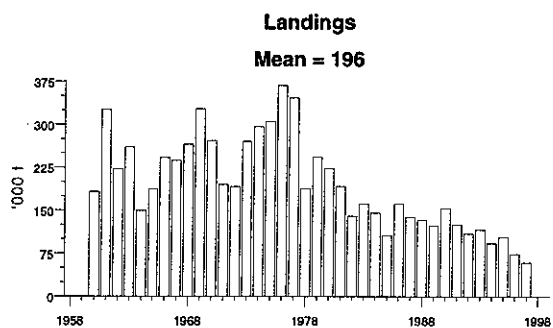
¹Included in TAC for Sub-area VII (except Division VIIa). ²Including VIIe. Weights in '000 t.
n/a=Not available.

Whiting in Sub-area IV and Division VIIId

Stock - Recruitment

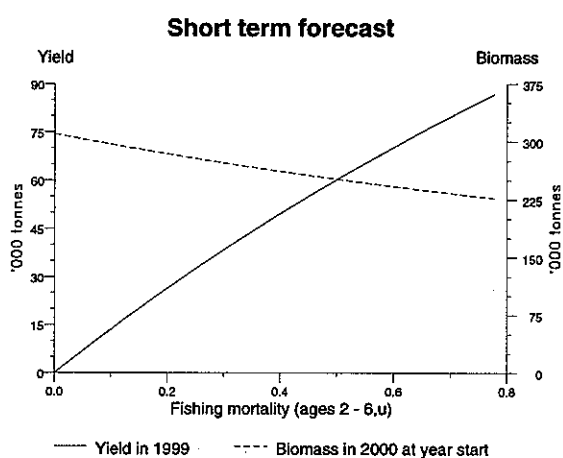
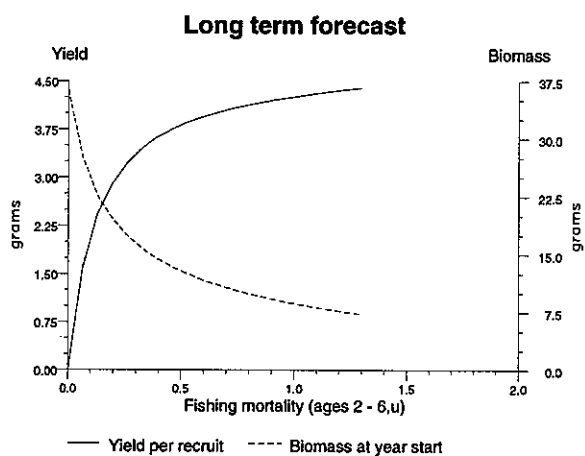


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Whiting in Sub-area IV and Division VIIId

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Whiting, Fishing Areas IV and VIId

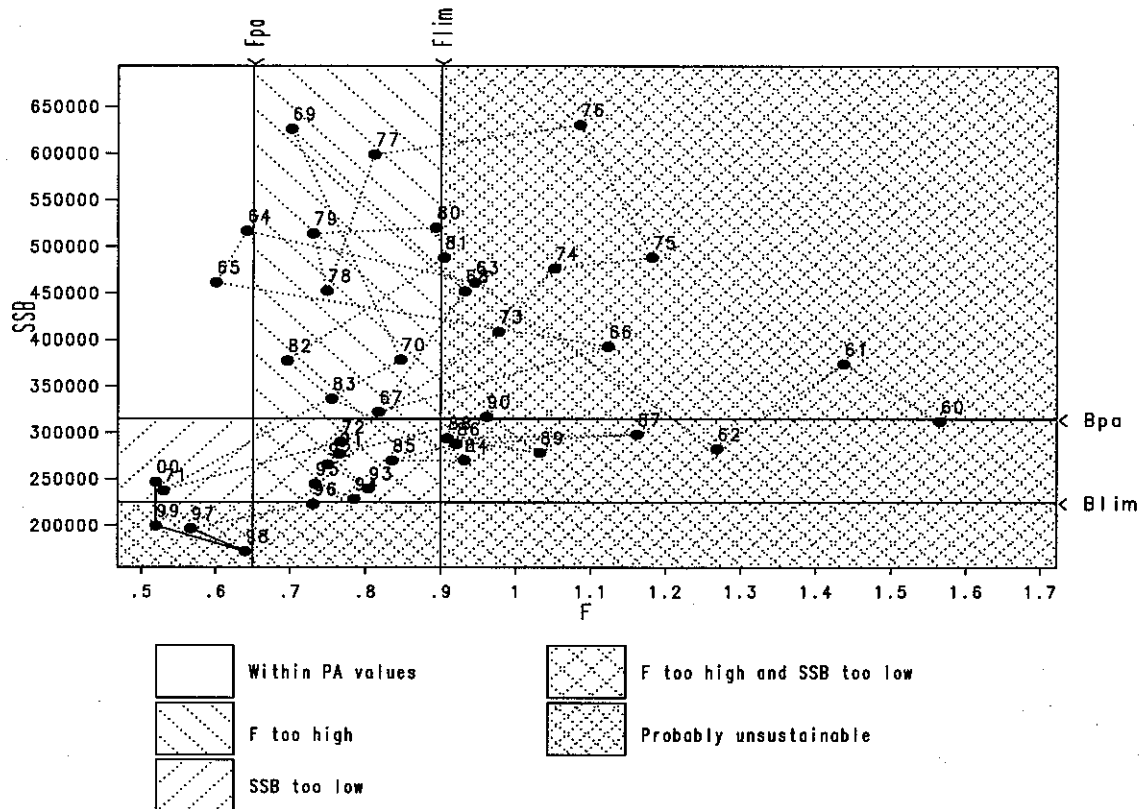


Table 3.5.4.1 Nominal catch (in tonnes) of WHITING in Sub-area IV, 1983–1997, as officially reported to ICES.

Country	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	2,864	2,798	2,177	2,275	1,404	1,984	1,271	1,040	913	1,030	944	1,042	880	843	391
Denmark	18,054	19,771	16,152	9,076	2,047	12,112	803	1,207	1,529	1,377	1,418	549	368	189	103
Faroe Islands	18	-	6	-	12	222	1	26		16	7	2	21	-	6
France	21,263	19,209	10,853	8,250	10,493	10,569	5,277 ^{1,2}	4,951 ¹	5,188 ^{1,2}	5,115 ¹	5,502 ^{1,2}	4,735	5,963 ^{1,2}	4,704 ^{1,2}	3,574
Germany, Fed.Rep.	317	286	226	313	274	454	415	692	865	511	441 ¹	239	124	187	196
Netherlands	10,935	8,767	6,973	13,741	8,542	5,087 ³	3,860	3,272 ¹	4,028 ¹	5,390	4,799	3,864	3,640	3,388	2,539
Norway	39	88	103	103	74	52	32	55	103	232	130 ¹	79	114	65	75
Poland	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweden	44	53	22	33	17	5	17	16	48	22	18	10	1	1	1
UK (Engl.& Wales) ³	4,366	5,017	5,024	3,805	4,485	4,008	2,178	2,338	2,676	2,528	2,774	2,722	2,477	2,329	2,638
UK (Scotland)	41,248	42,967	30,398	29,113	37,630	31,804	26,271	27,486	31,257	30,821	31,268	28,974	27,811	23,409	22,098
Total	99,149	98,958	71,934	66,709	64,978	66,294	40,125	41,084	46,607	47,042	43,301	42,216	41,399	35,115	31,621
Total h.c. catch used by Working Group	81,000	79,000	55,000	59,000	64,000	52,000	41,000	43,000	47,000	46,000	48,000	43,000	41,000	36,000	31,000
Total discards	50,000	41,000	29,000	80,000	54,000	28,000	36,000	56,000	34,000	31,000	43,000	33,000	31,000	28,000	17,000
Total Ind. By-catch	24,000	19,000	15,000	18,000	16,000	49,000	43,000	51,000	38,000	27,000	20,000	10,000	27,000	5,000	6,000

¹Preliminary.²Includes Division IIa (EC).

n/a = Not available.

³1989–1994 revised. N. Ireland included with England and Wales.

Table 3.5.4.2 WHITING in Division VIIId. Nominal landings (tonnes) as officially reported to ICES, 1982 to 1997.

Year	Belgium	France	Netherlands	UK (E+W)	UK (S)	Total	Unreported landings	Total as used by Working Group
1982	93	7,012	2	170	-	7,277	633	7,911
1983	84	5,057	1	198	-	5,340	1,600	6,936
1984	79	6,914	-	88	-	7,081	289	7,373
1985	82	7,563	-	186	-	7,831	491	7,390
1986	65	4,551	-	180	-	4,796	704	5,498
1987	136	6,730	-	287	-	7,153	2,463	4,671
1988	69	7,501	-	251	-	7,821	3,391	4,428
1989	38	n/a	-	231	-	n/a	-	4,156
1990	83	n/a	-	237	1	n/a	-	3,483
1991	83	n/a	-	292	1	n/a	-	5,718
1992	66	5,414	-	419	24	5,923	-	5,745
1993	74	5,032	-	321	2	5,429	-	5,215
1994	61	n/a	-	293	-	7,088	-	6,623
1995	68	5,202	-	280	1	5,551	-	5,390
1996	84	4,772	1	199	1	5,057	-	4,955
1997 ¹	98	n/a	1	147	1	n/a	-	4,623

¹Preliminary

Table 3.5.4.3 Whiting in the North Sea (Fishing Areas IV and VIId).

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1960	41,866.20	312.31	182.36	1.566
1961	75,340.90	374.06	326.09	1.437
1962	83,666.90	282.76	222.43	1.269
1963	18,702.20	461.53	260.77	0.945
1964	36,340.40	516.70	149.96	0.642
1965	31,960.40	461.50	186.76	0.601
1966	59,813.60	392.83	242.23	1.123
1967	117,546.00	322.22	236.99	0.817
1968	14,216.50	452.27	265.27	0.931
1969	27,644.80	626.24	327.62	0.702
1970	43,188.10	378.66	271.65	0.847
1971	73,887.00	237.69	195.36	0.530
1972	97,034.90	290.17	191.32	0.767
1973	47,783.00	408.50	270.53	0.977
1974	99,343.80	476.72	296.20	1.051
1975	62,707.80	488.46	305.01	1.182
1976	61,197.70	630.56	368.24	1.085
1977	61,944.70	598.82	347.06	0.811
1978	63,527.10	452.47	188.19	0.749
1979	58,279.40	513.93	243.85	0.730
1980	23,201.70	520.49	223.52	0.893
1981	26,743.10	488.17	192.05	0.904
1982	22,669.30	377.50	140.20	0.696
1983	35,646.10	336.57	161.21	0.755
1984	24,724.60	270.47	145.74	0.931
1985	50,718.20	270.22	106.36	0.835
1986	42,697.40	287.94	161.74	0.920
1987	29,709.20	298.27	138.78	1.162
1988	57,986.20	294.02	133.47	0.909
1989	26,126.00	278.57	123.75	1.032
1990	25,038.90	317.29	153.45	0.961
1991	26,800.00	277.34	124.98	0.765
1992	27,260.30	265.67	109.70	0.750
1993	26,546.80	240.07	116.17	0.804
1994	22,667.30	228.72	92.61	0.785
1995	19,456.60	244.72	103.27	0.733
1996	8,785.75	223.19	73.96	0.730
1997	24,691.00	196.68	59.10	0.567
1998	24,691.47	172.25	.	.
Average	44,157.73	365.81	195.73	0.892
Unit	Millions	1000 tonnes	1000 tonnes	-

3.5.5

Saithe in Sub-area IV (North Sea) and Division IIIa (Skagerrak)

State of stock/fishery: The stock is considered to be outside safe biological limits. In the last 14 years the SSB has been below B_{pa} and the fishing mortality has been higher than F_{pa} . Spawning stock biomass shows a continuous downward trend until 1990 when it reached an historical low. The present assessment indicates a slight improvement of the stock since then. The SSB is at present below the proposed B_{pa} of 150 000 t. Fishing mortality has shown a decreasing trend since 1986.

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} .

Advice on management: ICES recommends that the fishing mortality in 1999 should be reduced to the proposed F_{pa} in order to rebuild the SSB above the proposed B_{pa} in the short term. The landings in 1999 corresponding to this reduction are 104 000 t.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 82 000 t, the lowest observed biomass.	B_{pa} be set at 150 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments. Below this value the probability of below average recruitment increases.
F_{lim} is 0.60, the fishing mortality estimated to lead to potential stock collapse.	F_{pa} be set at 0.40. This F is considered to provide approximately 95% probability of avoiding F_{lim} , taking into account the uncertainty of the assessment.

Technical basis:

$B_{lim}=B_{loss}=82\ 000\ t.$	B_{pa} Impaired recruitment at SSB less than 150 000 t.
$F_{lim}=F_{loss}=0.6.$	F_{pa} 5 th % of F_{loss} (0.45) implies that $B_{eq} < B_{pa}$. $F = 0.4$ implies that $B_{eq} > B_{pa}$ and $P(SSB_{MT} < B_{pa}) < 10\%$.

Relevant factors to be considered in management: This stock is associated with the West of Scotland stock, both in terms of stock distribution and in terms of some of the

major exploiting fleets. Trends in SSB and recruitment are similar in both stocks. The West of Scotland stock is also considered to be outside safe biological limits.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.50$, Landings (98) = 111, SSB(99) = 125.

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB(2000)	Medium-term effect of fishing at given level
0.30	0.6 $F(95-97)$		82	170	High probability SSB > B_{pa}
0.35	0.7 $F(95-97)$		93	160	High probability SSB > B_{pa}
0.40	F_{pa}		104	151	High probability SSB > B_{pa}
0.45	0.9 $F(95-97)$		113	142	10% probability of SSB < B_{pa}
0.50	1.0 $F(95-97)$		123	134	High probability SSB < B_{pa}

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: Saithe are mainly taken in a directed trawl fishery during the spawning season in deep water near the northern shelf edge and the Norwegian Deep. The main fishery developed in the beginning of the 1970s.

The assessment is analytical based on catch-at-age analysis using information from commercial fisheries and surveys. This assessment is consistent with previous assessments of fishing mortality and SSB. Lack of recruitment indices for recent and incoming year classes

makes catch predictions imprecise. About 50% of the landings and SSB forecasted for 1999 and 2000 respectively originate from assumed recruitment.

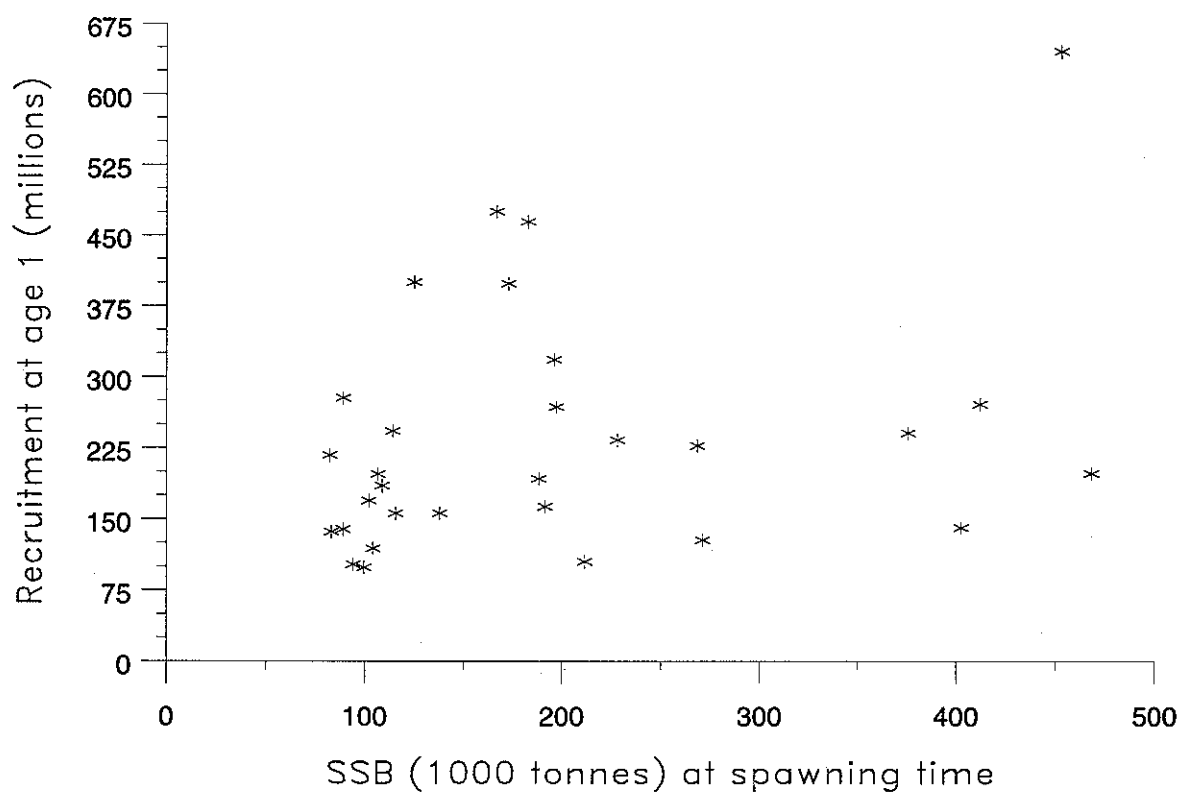
Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.5.1–2):

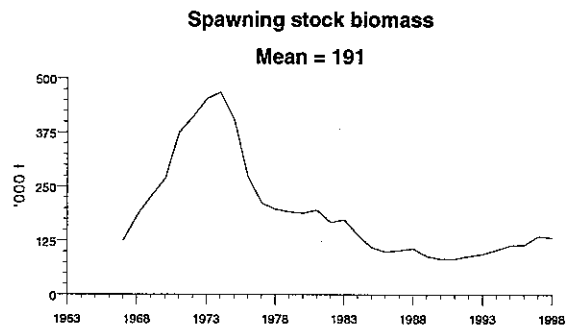
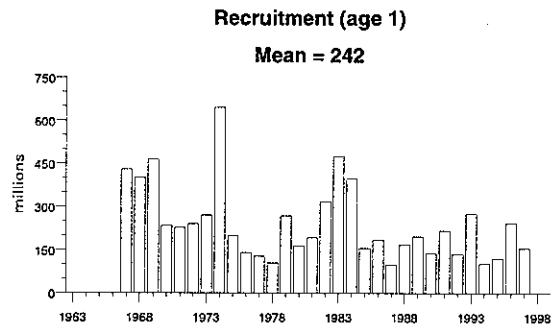
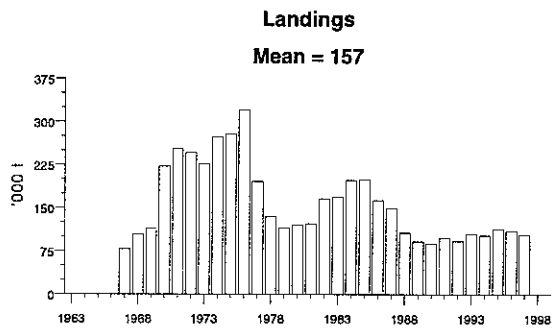
Year	ICES advice	Predicted landings corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Reduce F	<198	173	154	149
1988	60% of F(86); TAC	156	165	113	107
1989	No increase in F; TAC	170	170	92	92
1990	No increase in F; TAC	120	120	85	88
1991	No increase in F; TAC	125	125	93	99
1992	No increase in F; TAC	102	110	92	92
1993	70% of F(91) ~ 93 000 t	93	93	99	105
1994	Reduce F by 30%	72	97	98	103
1995	No increase in F	107	107	96	114
1996	No increase in F	111	111	95	110
1997	No increase in F	113	115	95	103
1998	Reduce F by 20%	97	97		
1999	Reduce F to F_{pa}	104			

Weights in '000 t.

Stock - Recruitment

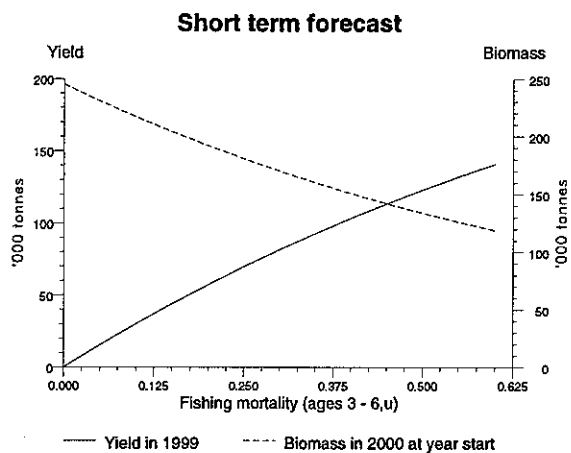
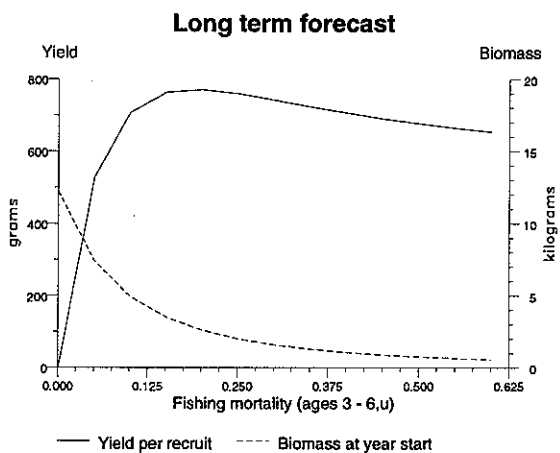


(run: XSACMM03)



Saithe in the North Sea

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Saithe, North Sea Area (Fishing Areas IV and IIIa)

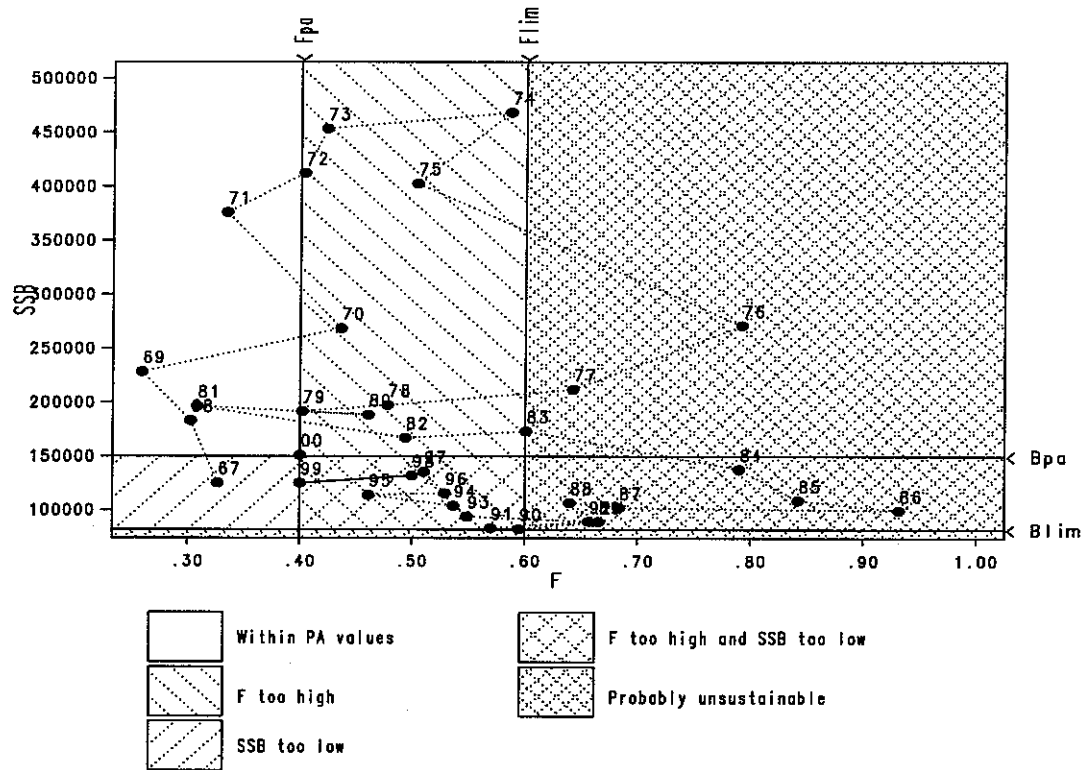


Table 3.5.5.1 Nominal catch (in tonnes) of Saithe in Sub-area IV and Division IIIa, 1986-1997, as officially reported to ICES.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	16	4	60	13	23	29	70	113	130	228	157	254
Denmark	10,343	7,928	6,868	6,550	5,800	6,314	4,669	4,232	4,305 ¹	4,388	4,705	4,513
Faroe Islands	224	691	276	739	1,650	671	2,480	2,875	1,780 ¹	3,808	617	158
France	43,958	38,356	28,913	30,761 ^{1,2}	29,892 ^{1,2}	14,795 ^{1,2}	9,061 ¹	15,258 ¹	18,220 ^{1,2}	11,224 ¹	12,227	19,658 ^{1,2}
Germany	22,277	22,400	18,528	14,339	15,006	19,574	13,177	14,814	10,013	12,093	11,567	12,581
Netherlands	134	334	345	257	206	199	180	79	18	9	17	40
Norway	67,341	66,400	40,021	24,737	19,122	36,240	48,205	47,669	47,042	53,293 ¹	55,382	46,484 ¹
Poland	495	832	1,016	809	1,244	1,336	1,238	937 ¹	151	592	365	822
Sweden	1,987	1,732	2,064	797	838	1,514	3,302	4,955	5,366	1,891	1,771	1,592
UK (E&W)	4,480	3,233	3,790	4,012	3,397	4,070	2,893	2,429	2,354	2,522	2,864	2,556
UK (Scot.)	15,520	11,911	10,850	9,190	7,703	8,602	6,881	5,929	5,566	6,341	5,848	6,329
USSR	-	-	-	-	-	116 ³	-	-	-	-	-	-
Total reported to ICES	166,775	153,821	112,731	92,204	84,881	93,460	92,156	99,290	90,337	96,389	95,520	94,987
Unreported landings	-3,882	-4,414	-6,132	-172	3,199	5,093	343	5,316	12,256	17,171	14,826	8,339
Landings as used by WG	162,873	149,407	106,599	92,032	88,080	98,553	92,499	104,606	102,593	113,560	110,346	103,326
TAC	240,000	173,000	165,000	170,000	120,000	125,000	110,000	93,000	97,000	107,000	111,000	115,000

¹Preliminary.

²Includes IIa(EC), IIIa-d(EC).

³Includes Estonia.

Table 3.5.5.2 Saithe in the North Sea (Fishing Areas IV and IIIa).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1967	429.60	125.02	78.48	0.326
1968	400.31	182.94	104.00	0.302
1969	464.40	228.20	114.76	0.259
1970	233.13	268.55	222.10	0.436
1971	227.10	375.96	252.62	0.334
1972	240.33	412.25	245.88	0.403
1973	270.66	453.31	225.77	0.423
1974	645.45	468.27	273.47	0.587
1975	197.84	402.59	278.13	0.504
1976	140.41	271.09	319.93	0.792
1977	127.75	211.63	196.19	0.642
1978	104.80	197.33	134.83	0.478
1979	268.15	191.55	114.36	0.402
1980	162.91	188.33	120.29	0.461
1981	192.12	196.25	122.52	0.308
1982	318.11	166.88	165.98	0.494
1983	475.19	172.92	168.88	0.601
1984	398.77	137.80	198.00	0.790
1985	155.92	108.76	199.53	0.842
1986	184.92	99.50	162.87	0.932
1987	98.83	102.03	149.41	0.683
1988	169.07	106.59	106.60	0.640
1989	197.21	88.94	92.03	0.665
1990	138.97	82.21	88.08	0.595
1991	217.15	83.07	98.55	0.570
1992	136.26	89.09	92.50	0.656
1993	277.54	93.99	104.61	0.549
1994	101.89	104.00	102.59	0.537
1995	118.92	114.00	113.56	0.461
1996	242.54	115.53	110.35	0.529
1997	155.80	135.45	103.33	0.511
1998	.	132.00	.	.
Average	241.68	190.81	156.78	0.539
Unit	Millions	1000 tonnes	1000 tonnes	-

3.5.6 Plaice in Sub-area IV

State of stock/fishery: The stock is considered to be outside safe biological limits. SSB is below the proposed B_{pa} and fishing mortality is above the proposed F_{pa} . Spawning stock biomass has declined rapidly in recent years as the strong 1985 year class was fished out. Fishing mortality increased up to the 1980s and has fluctuated around 0.4 since then with no trend.

Management objectives: The Agreed Record of the 1997 EC/Norway consultation (Brussels, 2 December 1997) states:

"In light of the current serious stock situation for plaice, the Parties agreed to continue to apply a multi-annual management strategy to achieve the objective of reaching

a level of spawning stock biomass defined by ICES as the minimum biologically acceptable level (MBAL). For 1999, the Parties agreed to adopt a TAC consistent with a fishing mortality rate of 0.3 unless future scientific advice requires modification of this agreement, and to request ICES for appropriate advice on this matter. The Parties agreed that, to provide increased security and greater potential yield, the stock needs to be rebuilt to progressively higher levels." ICES considers that the agreed fishing mortality of $F = 0.30$ is consistent with the precautionary approach.

Advice on management: ICES advises that fishing mortality be reduced to $F = 0.3$ corresponding to landings of 106 000 t in 1999.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 210 000 t, the lowest observed biomass.	B_{pa} be set at 300 000 t. This is the previously agreed MBAL and affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments.
F_{lim} is 0.6.	F_{pa} be set at 0.30. This F is considered to provide approximately 95% probability of avoiding F_{lim} , taking into account the uncertainty of the assessment.

Technical basis:

$B_{lim}=B_{loss}=210\ 000\ t.$	B_{pa} Approximately 1.4 B_{lim} , previous MBAL.
$F_{lim}=F_{loss}=0.6.$	$F_{pa} = 5^{th}\ \% \text{ of } F_{loss} (0.6) \text{ is } 0.36 \text{ which implies that } B_{eq} < B_{pa}. \text{ Therefore a lower value is required. } F = 0.3 \text{ implies } B_{eq} > B_{pa} \text{ and a less than } 10\ \% \text{ probability that } (SSB_{MT} < B_{pa}).$
[NB: As F increases above 0.3, $P(SSB_{MT} < B_{pa})$ increases rapidly]	

Relevant factors to be considered in management:

Although survey data indicate that the 1996 year class is strong, the year class has not been observed as a strong one in the landings in 1998 yet, and the weight at age 1 of the year class in 1997 is the second lowest in the time series. These observations suggest that growth of the year class may be lower than average. If this year class has slower growth than average, this will result in higher mortality and a later age of maturity than would otherwise be expected. This means that future yield from these fish will be lower and they will contribute less to the spawning stock than would occur from fish with

average growth rates. Essentially the advantages of the stronger year class are potentially negated by poor growth rate and there is a danger of over-fishing the stock even if management follows advice corresponding to landings of 106 kt in 1999.

As it is unlikely that the recommended reduction in fishing mortality can be achieved by the application of technical measures and/or TACs/quotas alone, ICES is of the opinion that it can only be achieved by a reduction in effort in the directed fishery for plaice and in the mixed flatfish fisheries which take a large plaice component.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.43$, Landings(98) = 115, SSB(99) = 288.

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium-term effect of fishing at given level
0.26	0.6 F(95-97)		93	353	High probability SSB > B_{pa}
0.30	0.7 F(95-97)		106	339	0.1 probability of SSB < B_{pa}
0.34	0.8 F(95-97)		118	328	High probability of SSB < B_{pa}
0.43	1.0 F(95-97)		142	305	High probability of SSB < B_{pa}
0.51	1.2 F(95-97)		163	285	High probability of SSB < B_{pa}

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: North Sea plaice is taken mainly in a mixed flatfish fishery by beam trawlers in the southern and south-eastern North Sea. Directed fisheries are also carried out with seine and gill net, and by beam trawlers in the central North Sea. Due to the minimum mesh size (80 mm) in the mixed beam trawl fishery, large numbers of (undersized) plaice are discarded.

Since 1989, an area with high concentrations of small plaice ("Plaice Box") was closed to beam trawl fisheries with vessels > 300 hp during the second and third quarter and, since 1994, during the fourth quarter as well. Since 1995, the plaice box has been closed for the whole year. Beam trawlers < 300 hp are allowed to fish inside the box. Effort reductions have mainly been effective since 1994 when the fourth quarter was closed and when effort levels in the box decreased to around 10% of the pre-box level.

As yet, no quantitative estimate can be given of the effects of the plaice box on recruitment. The proposed precautionary reference points therefore do not take into account the effect of the plaice box. The effect of the plaice box will be evaluated in 1999 by a study group and may result in a revision of these reference points next year.

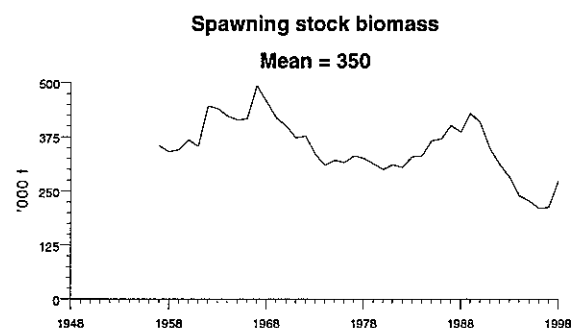
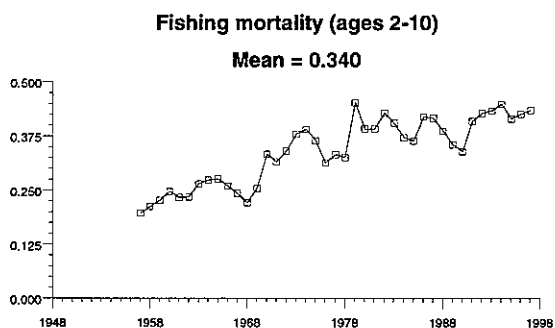
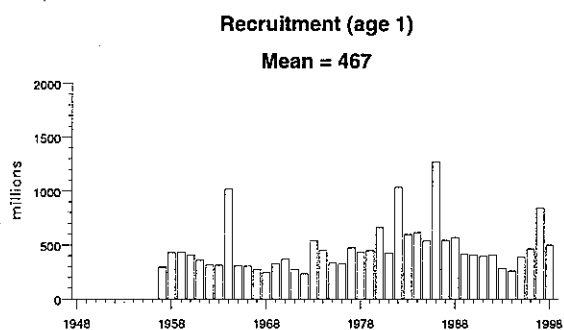
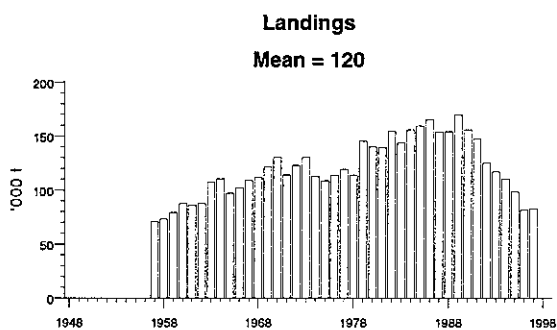
Analytical assessment uses catch-at-age and CPUE data from commercial fleets and surveys. Forecasts use indices from 1998 surveys. No discards are used in the assessment.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.6.1–2):

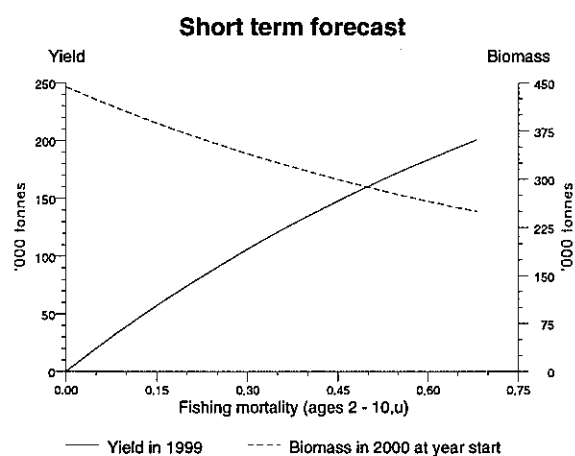
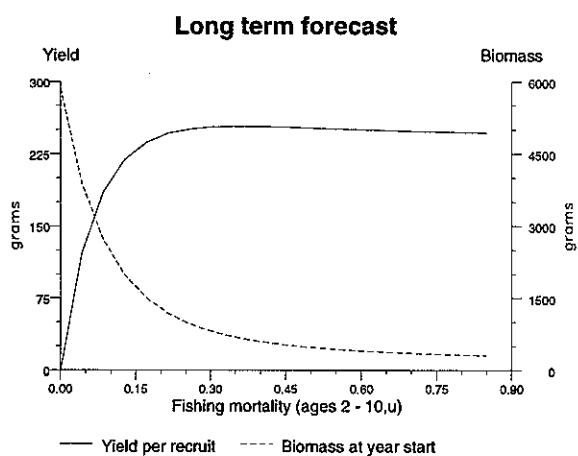
Year	ICES advice	Predicted landings corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	F < F(84); TAC	120	150	131	154
1988	70% of F(85); TAC	150	175	138	154
1989	Reduce F; buffer SSB	<175	185	152	170
1990	Status quo F; TAC	171	180	156	156
1991	No increase in F; TAC	169	175	144	148
1992	No long-term gains in increasing F	- ¹	175	123	125
1993	No long-term gains in increasing F	170 ¹	175	115	117
1994	No long-term gains in increasing F	- ¹	165	110	110
1995	Significant reduction in F	87 ²	115	97	98
1996	Reduction in F of 40%	61	81	80	82
1997	Reduction in F of 20%	80	91 ³	82	83
1998	Fish at F = 0.3	82	87		
1999	Fish at F = 0.3	106			

¹ Catch at status quo F. ² Catch at 20% reduction in F. ³ After revision from 77 000 t. Weights in '000 t.

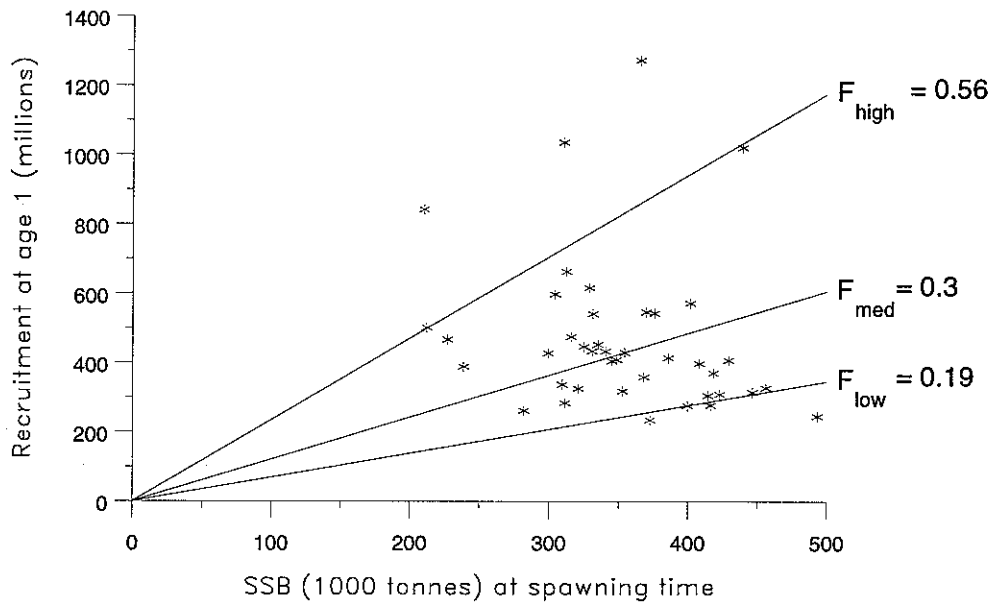


Plaice North Sea

Yield and Spawning Stock Biomass



Stock - Recruitment



(run: XSALJB04)

Precautionary Approach Plot

Plaice, North Sea (Fishing Area IV)

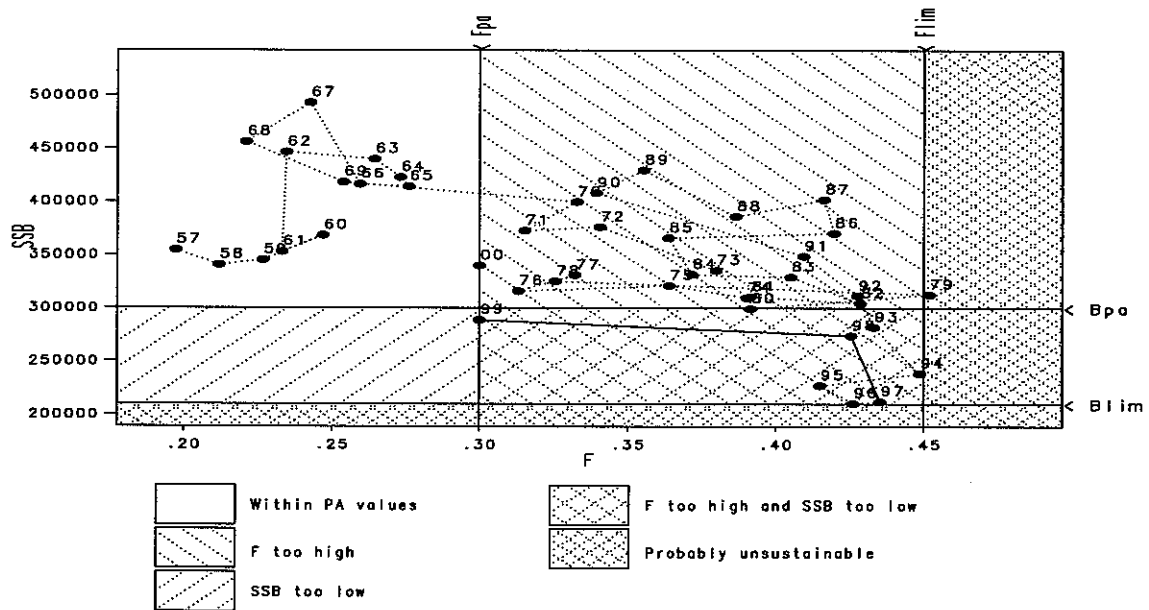


Table 3.5.6.1 North Sea plaice. Nominal landings in Sub-area IV as officially reported to ICES, 1986–1997.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	7,232	8,554	11,527	10,939	13,940	14,328	12,006	10,814	7,951	7,093	5,765	5,223
Denmark	26,332	21,597	20,259	23,481	26,474	24,356	20,891	16,452	17,056	13,358	11,776	13,940
France	751	1,580	1,773	2,037	1,339	508	537	603	438	442	379	587
Germany	1,809	1,794	2,566	5,341	8,747	7,926	6,818	6,895	5,697	6,329	4,780	4,159
Netherlands	74,447	76,612	77,724	84,173	78,204	67,945	51,064	48,552	50,289	44,263	35,419	34,143
Norway	21	12	21	321	1,756	560	836	827	524	674	1,242	1,775
Sweden	16	7	2	12	169	103	53	7	6	3	5	4
UK (E/W/Nl)	12,428	14,891	17,613	20,413	18,810	18,267	21,049	20,586	17,806	15,801	13,541	13,789
UK (Scot)	4,866	5,747	6,884	5,691	6,822	9,572	10,228	10,542	9,943	8,594	7,451	8,345
Others			43									
Total	127,902	130,794	138,412	152,408	156,261	143,565	123,482	115,278	109,710	96,557	80,358	81,965
Unallocated	37,445	22,876	16,063	17,410	-21	4,438	1,708	1,835	682	1,799	1,315	1,212
WG estimate	165,347	153,670	154,475	169,818	156,240	148,003	125,190	117,113	110,392	98,356	81,673	83,177
TAC	180,000	150,000	175,000	185,000	180,000	175,000	175,000	175,000	165,000	115,000	81,000	91,000

Table 3.5.6.2 Plaice in the North Sea (Fishing Area IV).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-10
1957	296.18	354.64	70.56	0.197
1958	430.00	340.65	73.35	0.212
1959	433.47	345.21	79.30	0.227
1960	405.36	368.34	87.54	0.247
1961	359.42	352.91	85.98	0.233
1962	318.87	446.62	87.47	0.235
1963	315.22	440.04	107.12	0.264
1964	1,022.18	423.01	110.54	0.273
1965	309.63	414.45	97.14	0.276
1966	305.51	416.51	101.83	0.259
1967	277.34	493.18	108.82	0.243
1968	245.71	456.30	111.53	0.221
1969	327.75	418.51	121.65	0.254
1970	370.68	399.87	130.34	0.333
1971	275.85	372.73	113.94	0.315
1972	235.24	376.31	122.84	0.340
1973	543.14	335.33	130.43	0.380
1974	452.91	309.62	112.54	0.390
1975	337.49	321.16	108.54	0.364
1976	326.21	315.94	113.67	0.313
1977	475.02	331.07	119.19	0.332
1978	433.86	325.14	113.98	0.326
1979	446.50	312.63	145.35	0.452
1980	663.35	299.41	139.95	0.391
1981	427.90	310.70	139.75	0.392
1982	1,035.93	304.44	154.55	0.429
1983	598.23	329.05	144.04	0.405
1984	616.66	331.62	156.15	0.372
1985	541.47	365.94	159.84	0.364
1986	1,273.33	370.30	165.35	0.420
1987	546.83	402.05	153.67	0.416
1988	572.44	386.10	154.48	0.387
1989	414.36	429.71	169.82	0.355
1990	407.79	408.23	156.24	0.339
1991	397.77	348.67	148.00	0.409
1992	409.06	311.35	125.19	0.428
1993	284.28	282.00	117.11	0.433
1994	262.17	238.63	110.39	0.449
1995	388.44	227.26	98.36	0.415
1996	466.72	210.44	81.67	0.426
1997	842.00	212.31	83.18	0.435
1998	501.00	274.08	.	.
Average	466.51	350.30	119.79	0.340
Unit	Millions	1000 tonnes	1000 tonnes	-

3.5.7 North Sea sole

State of stock/fishery: The stock is considered to be outside safe biological limits. SSB is below the proposed B_{pa} and fishing mortality is above the proposed F_{pa} . The stock in 1998 is near the lowest observed historically. The fishing mortality is high, and has increased recently.

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} .

Advice on management: ICES recommends that fishing mortality on North Sea sole be reduced to below the proposed F_{pa} of 0.4 corresponding to catches less than 20 300 t in 1999. This gives a high probability that SSB will remain above the proposed B_{pa} in the medium term.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 25 000 t, the lowest observed biomass.	B_{pa} be set at 35 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments.
F_{lim} is 0.55, the 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 a greater than 95% probability of avoiding F_{lim} , taking into account the uncertainty of the assessment.

Technical basis:

$B_{lim}=B_{loss}=25\ 000\ t.$	$B_{pa}=1.4\ B_{lim}$
$F_{lim}\ F_{loss}$ poorly defined, arbitrary setting of $1.4\ F_{pa}$. NB: SSB declines at this value: 0.55.	F_{pa} 5 th percentile (0.49) of F_{loss} implies $B_{eq} < \sim B_{pa}$, $F = 0.4$ implies $B_{eq} > B_{pa}$ and $P(SSB_{MT} < B_{pa}) < 10\%$.

Relevant factors to be considered in management: The strong 1996 year class is expected to increase SSB in 1999 to above B_{pa} .

The advised reduction in fishing mortality is consistent with the advice for plaice, which is partly taken in a mixed fishery with sole.

Catch forecast for 1999:

Basis: $F(98) = F(97) = 0.51$, Landings(98) = 20.4, SSB(99) = 51.1.

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium-term effect of fishing at given level
0.30	0.6 F(97)		15.9	55.8	High probability of SSB > B_{pa}
0.35	0.7 F(97)		18.2	53.5	High probability of SSB > B_{pa}
0.40	0.8 F(97)		20.3	51.3	Less than 10% probability of SSB < B_{pa}
0.45	0.9 F(97)		22.4	49.1	Less than 20% probability of SSB < B_{pa}
0.51	1.0 F(97)		24.4	47.1	Around 30% probability of SSB < B_{pa}
0.61	1.2 F(97)		28.1	43.4	Very high probability of SSB < B_{pa}

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

Elaboration and special comment: Sole is mainly taken by beam trawl fleets in a mixed fishery for sole and plaice in the southern part of the North Sea. The minimum mesh size permitted when fishing for sole is 80 mm. Beam trawl fleets started to develop in the mid-1960s, and have expanded up to the 1990s. A relatively small part of the catch is taken in a directed fishery by gill-netters in coastal areas, mostly in the 2nd quarter of the year. Since 1989, the distribution pattern of the beam trawl fleets > 300 HP has changed due to the introduction of the 'Plaice Box' in the south-eastern part of the North Sea.

stock has a high probability of decreasing below B_{pa} under the current rate of exploitation. Occasionally, sole produces very large year classes. These can produce yields and SSBs above the equilibrium values and last for a few years.

Medium-term analyses suggest a temporary increase of SSB above the proposed B_{pa} in the next few years, but the

The catch forecast is sensitive to the estimate of the abundant 1996 year class. At *status quo* F this year class is expected to contribute 58% to the expected landings in 1999 and 70% and 53% to the SSB in 1999 and 2000.

The cold winter of 1995/1996 caused additional mortality which could not be quantified. This also may have been reflected in a decline of the catches in 1997. The estimates

of fishing mortality and SSB in the 5 years preceding 1997 may be somewhat overestimated and underestimated respectively because no effect of the additional winter mortality has been taken account in the assessment.

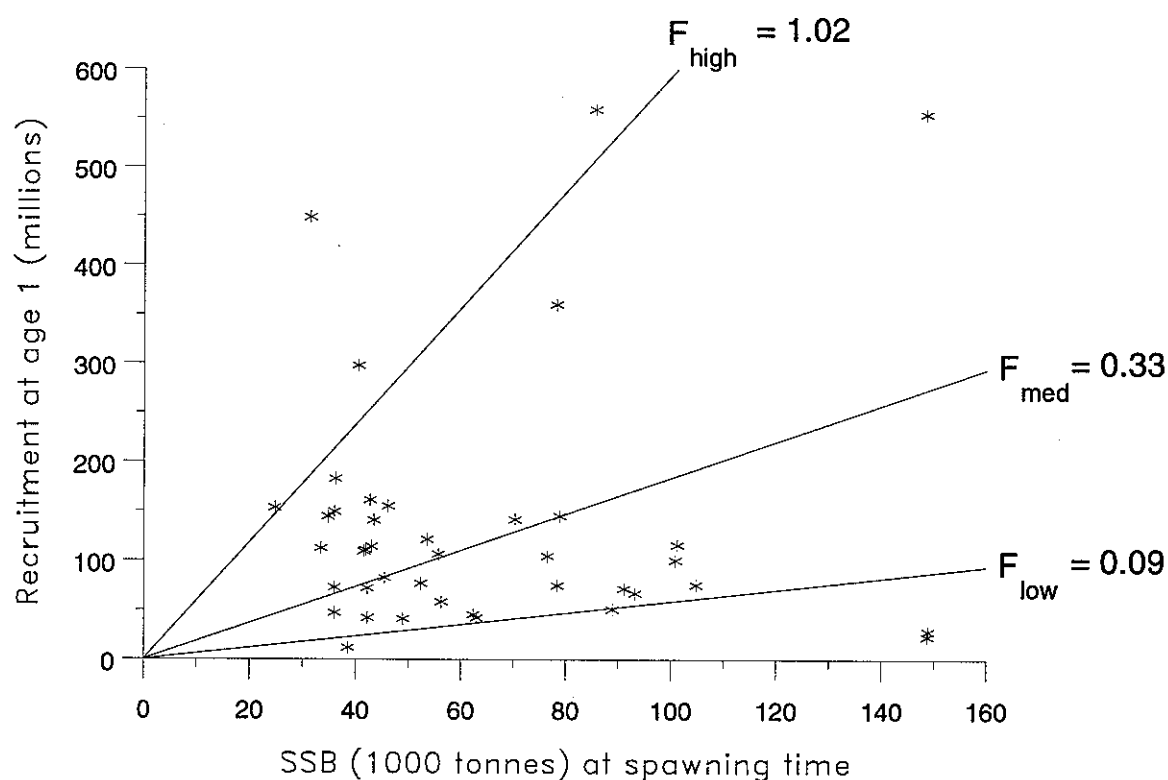
Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.7.1–2):

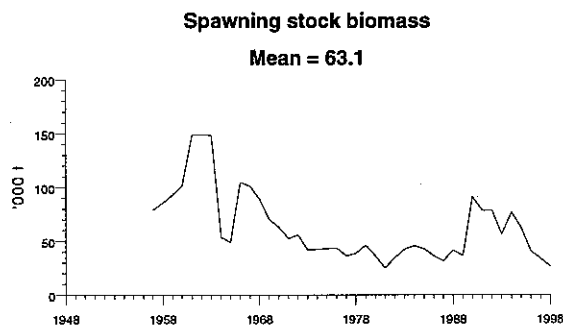
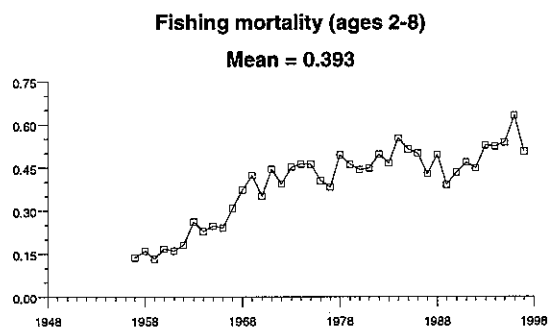
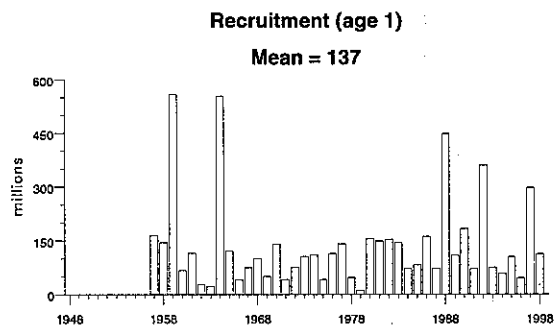
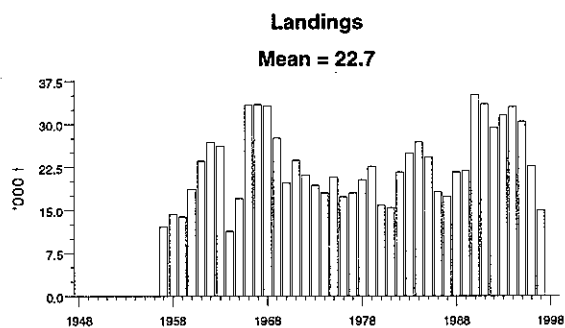
Year	ICES advice	Predicted landings corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Rebuild SSB to 40 000 t; TAC	11.0	14.0	13.8	17.4
1988	Increase SSB towards 50 000 t; TAC	11.0	14.0	13.4	21.6
1989	Increase SSB towards 50 000 t; TAC	14.0	14.0	14.5	21.8
1990	80% of F(88); TAC	25.0	25.0	26.5	35.1
1991	SSB>50 000 t; TAC	27.0	27.0	27.6	33.5
1992	TAC	21.0	25.0	26.0	29.3
1993	No long-term gains in increased F	29.0 ¹	32.0	29.8	31.5
1994	No long-term gains in increased F	31.0 ¹	32.0	31.3	33.0
1995	No long-term gains in increased F; link to plaice	28.0 ¹	28.0	28.8	30.5
1996	Mixed fishery, link plaice advice into account	23.0 ¹	23.0	21.2	22.7
1997	<80% of F(95)	14.6	18.0	14.0	14.9
1998	75% of F(96)	18.1	19.1		
1999	80% of F(97)	20.3			

¹Catch *status quo* F. Weights in '000 t.

Stock - Recruitment

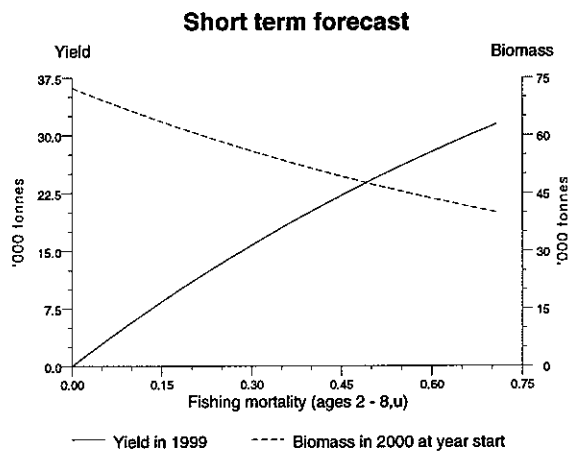
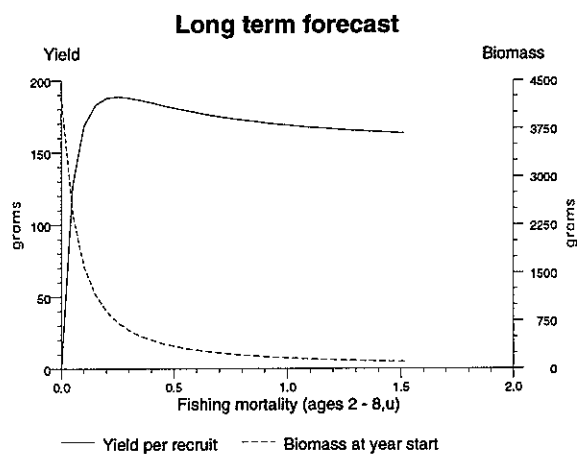


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Sole North Sea

Yield and Spawning Stock Biomass



Precautionary Approach Plot

Sole, North Sea (Fishing Area IV)

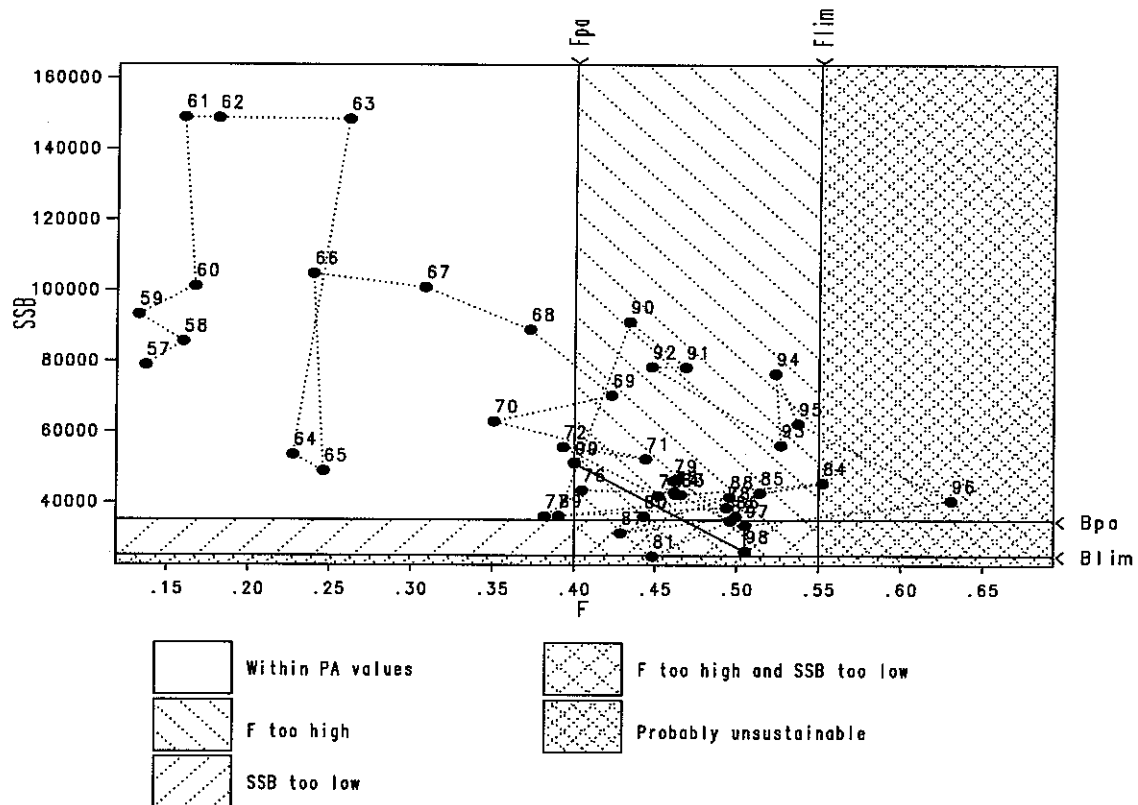


Table 3.5.7.1 Nominal catch (tonnes) of SOLE in Sub-area IV and landings as estimated by the Working Group, 1982–1997.

Year	Belgium	Denmark	France	Germany Fed. Rep.	Netherlands	UK (Engl. & Wales)	Other countries	Total reported	Unallocated landings	WG Total	TAC
1982	1,927	522	686	290	17,749	403		21,577	2	21,579	20,000
1983	1,740	730	332	619	16,101	435		19,957	4,970	24,927	20,000
1984	1,771	818	400	1,034	14,330	586	1	18,940	7,899	26,839	20,000
1985	2,390	692	875	303	14,897	774	3	19,934	4,313	24,247	22,000
1986	1,833	443	296	155	9,558	647	2	12,934	5,267	18,201	20,000
1987	1,644	342	318	210	10,635	676	4	13,829	3,539	17,368	14,000
1988	1,199	616	487	452	9,841	740	28	13,363	8,227	21,590	14,000
1989	1,596	1,020	312	864	9,620	1,033	50	14,495	7,311	21,806	14,000
1990	2,389	1,428	352	2,296	18,202	1,614	263	26,544	8,576	35,120	25,000
1991	2,977	1,307	465	2,107	18,758	1,723	271	27,608	5,905	33,513	27,000
1992	2,058	1,359	548	1,880	18,601	1,281	277	26,004	3,337	29,341	25,000
1993	2,783	1,661	486	1,379	22,015	1,149	298	29,771	1,720	31,491	32,000
1994	2,935	1,804	498	1,744	22,874	1,137	298	31,290	1,712	33,002	32,000
1995	2,624	1,673	640	1,564	20,927	1,040	312	28,780	1,687	30,467	28,000
1996	2,555	1,018	535	670	15,344	848	229	21,199	1,452	22,651	23,000
1997	1,519	689	315	510	10,241	479	205	13,958	1,023	14,981	18,000

All landings reported to ICES

Unreported landings estimated by the Working Group

1997 data are provisional

French data are provisional

No data on discards available

N-Ireland included with England & Wales

Table 3.5.7.2 Sole in the North Sea (Fishing Area IV).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-8
1957	165.50	78.90	12.07	0.137
1958	144.95	85.57	14.29	0.160
1959	559.00	93.19	13.83	0.132
1960	66.86	101.24	18.62	0.167
1961	115.73	148.95	23.57	0.160
1962	28.35	148.78	26.88	0.181
1963	23.01	148.40	26.16	0.261
1964	554.35	53.58	11.34	0.228
1965	121.49	48.95	17.04	0.246
1966	41.18	104.78	33.34	0.240
1967	75.33	100.87	33.44	0.308
1968	100.10	88.92	33.18	0.373
1969	50.59	70.37	27.56	0.423
1970	141.48	62.94	19.69	0.351
1971	41.93	52.38	23.65	0.444
1972	76.95	55.73	21.09	0.393
1973	106.42	41.86	19.31	0.452
1974	110.81	42.27	17.99	0.463
1975	41.89	43.01	20.77	0.462
1976	114.21	43.47	17.33	0.405
1977	140.65	36.03	18.00	0.382
1978	47.08	38.55	20.28	0.494
1979	11.84	46.17	22.60	0.461
1980	155.10	36.02	15.81	0.443
1981	149.68	24.72	15.40	0.448
1982	153.49	34.82	21.58	0.496
1983	144.56	42.24	24.93	0.466
1984	72.01	45.50	26.84	0.552
1985	82.37	42.76	24.25	0.514
1986	161.25	35.99	18.20	0.499
1987	72.81	31.36	17.37	0.429
1988	448.90	41.58	21.59	0.496
1989	109.43	36.19	21.81	0.390
1990	182.90	91.13	35.12	0.434
1991	71.59	78.28	33.51	0.468
1992	359.92	78.41	29.34	0.448
1993	74.79	56.28	31.49	0.527
1994	58.20	76.54	33.00	0.523
1995	104.52	62.37	30.47	0.537
1996	45.25	40.55	22.65	0.631
1997	297.81	33.46	14.98	0.505
1998	112.38	26.42	.	.
Average	136.59	63.08	22.69	0.393
Unit	Millions	1000 tonnes	1000 tonnes	-

3.5.8 Herring in Sub-area IV, Division VIId and Division IIIa (autumn spawners)

State of stock/fishery: The stock is being harvested close to the agreed target fishing mortality but SSB is below the agreed reference point of 1.3 million t. The stock is still estimated to be below MBAL of 800 000 t but is increasing. In 1996 the fishing mortality was halved for the adult part of the stock and reduced by 75% for the juveniles. In 1997 the fishing mortality for adults was strongly reduced to 0.25 and for juveniles to less than 0.1. If the fishing mortality rates aimed for 1998 are effective SSB may increase up to 1.1 million t in 1998.

Management objectives: According to the EU-Norway agreement (December 1997) efforts will be made to maintain the SSB above the MBAL (800 000 t). An SSB reference point of 1.3 million t has been set above which the TACs will be based on an $F = 0.25$ for adult herring and $F = 0.12$ for juveniles. If the SSB falls below 1.3 million t other measures will be agreed and implemented taking account of scientific advice. The agreement is consistent with the precautionary approach.

Advice on management: ICES recommends that the management measures proposed for 1998 should also be applied in 1999 to ensure the rebuilding of the spawning stock biomass. These measures consist of adoption of a F_{2-6} of 0.2 and a $F_{0-1} < 0.1$ until the spawning stock biomass is rebuilt to a precautionary level of 1.3 million t.

Proposed reference points: See management objectives.

Relevant factors to be considered in management: The 1995 year class seems to be above average. Other recruiting year classes are average. First indications of the 1997 year class show that it may be below average. Short-term forecasts indicate that a low (0.2) fishing mortality is compatible with the objective of attaining a high probability of SSB being above MBAL in the short term.

There is large scale misreporting of catches in several parts of the North Sea into adjacent areas, but misreporting apparently decreased in 1997 compared to the estimated high level in 1996. The uncertainty about the misreporting and the catch data in general may lead to an overly optimistic perception of the rebuilding of the spawning stock biomass. Catch figures have been reconstructed on the basis of information from Divisions VIa and IIIa.

Forecast for 1999: The catch forecast assumes a TAC catch for 1998, which is also very similar to assuming a *status quo* F in 1998. Catch options are given for 1999 which reflect the EU-Norway agreement for limits on fishing mortality rate. All the options shown predicts the SSB will increase above the 1.3 million t limit contained in the EU-Norway agreement.

NORTH SEA HERRING SHORT-TERM PREDICTIONS											
Predictions for 1998, based on TAC in 1998										('000t)	
	F_{juv} (0-1 ring)	F_{ad} (2-6 ring)	Fleet F's $F_{B-E,0-1}$ $F_{A,2-6}$		Fleet Yields in '000t A B C D				TOTAL Yield	SSB 1998	
	0.047	0.246	0.046	0.215	254	22	24	6	5	311	1145
Prediction summary: Yields for 1999 assuming TAC in 1998											
Scenario	F_{juv} (0-1 ring)	F_{ad} (2-6 ring)	Fleet F's $F_{B-E,0-1}$ $F_{A,2-6}$		Fleet Yields in '000t A B C D				TOTAL Yield	SSB 1999	
I	0.039	0.200	0.039	0.174	270	19	21	7	3	320	1518
II	0.047	0.200	0.047	0.172	265	24	21	9	4	322	1518
III	0.048	0.246	0.048	0.215	325	24	25	9	4	386	1471
IV	0.060	0.250	0.059	0.215	324	30	25	11	5	395	1467
V	0.090	0.250	0.089	0.204	309	46	24	17	8	403	1468
VI	0.120	0.250	0.121	0.193	292	62	23	22	11	410	1469
VII	0.048	0.250	0.048	0.219	331	23	26	9	4	392	1467

* Catches of 3 ringers and older in Division IIIa now included in projections;

* $F_{A,2-6}$ is the F for fleet A, averaged over 2-6-ringers;

* $F_{B-E,0-1}$ is the average F for 0-1 ringers, fleets B,C,D and E.

Scenario I: Decrease F on all fleets in the same proportion to bring $F_{adult} = 0.2$ and $F_{juv} < 0.1$;

Scenario II: Decrease F on fleets A and C to bring $F_{adult} = 0.2$ and $F_{juv} < 0.1$;

- Scenario III: *Status quo* F on all fleets;
- Scenario IV: Increased F_{bde} until $F_{adult} = 0.25$ Fleet A and C *status quo*, Fleets B, D and E increased;
- Scenario V: Increased F_{bde} until $F_{juv} = 0.09$ Fleet A and C reduced until $F_{adult} = 0.25$, Fleets B, D and E increased;
- Scenario VI: Increased F_{bde} until $F_{juv} = 0.12$ Fleet A and C reduced until $F_{adult} = 0.25$, Fleets B, D and E increased;
- Scenario VII: Increased F_{ac} until $F_{adult} = 0.25$ Fleet A and C increased until $F_{adult} = 0.25$, Fleets B, D and E *status quo*.

Shaded scenarios considered inconsistent with the precautionary approach.

The split of fishing effort between fleets under the EU-Norway agreement may have a number of solutions. These are the scenarios selected:

- Scenario I complies with ICES advice (SSB below 1 300 000 t) equal reduction on all fleets;
- Scenario II complies with ICES advice (SSB below 1 300 000 t) reduction on adult fisheries A and C;
- Scenario III is *status quo* F which is below EU-Norway agreement (SSB above 1 300 000 t);
- Scenario IV is to maintain F for Fleet A and C, maximise Fleet B, D and E within EU-Norway agreement (SSB above 1 300 000 t);
- Scenario V is an option between IV and VI (SSB above 1 300 000 t);
- Scenario VI is to maximise Fleet B D and E and reduce Fleet A and C to be within EU-Norway agreement (SSB above 1 300 000 t);
- Scenario VII is to maximise Fleet A and C and maintain *status quo* on Fleet B, D and E to be within EU-Norway agreement (SSB above 1 300 000 t).

The 1997 agreement between EU and Norway operates with a single TAC for small mesh fisheries in Division IIIa. This corresponds to the combination of fleets D and E.

Continued fishing at *status quo* fishing mortality (Scenario III above) leads to an increase in SSB to 1 471 000 t in 1999.

Elaboration and special comment: Stock depletion in the 1970s resulted in a four year closure of the directed fishery. The stock recovered during the 1980s and following the re-opening of the fishery, the fishing mortality rate steadily increased. By the 1990s this rate was no longer sustainable and the SSB fell below the MBAL of 800 000 t. Emergency regulations were

introduced to reduce TACs which successfully reduced the fishing mortality rate substantially.

The stock is exploited by two groups of fleets: One harvesting mainly the adult part of the stock in a human consumption fishery and the other exploiting the juvenile part of the stock (as by-catch in the small mesh industrial fishery). The by-catch of herring in the small mesh fisheries decreased in 1997 compared with 1996.

The total catch of North Sea autumn spawners, taken in all areas in 1997, comprises about 45% immature fish (in numbers), which is significantly lower than the 80% in 1995 and earlier years (Figure 3.5.8.1).

Juveniles of North Sea autumn-spawning herring are also taken in the Kattegat and Skagerrak. The directed fisheries (fleet A in the North Sea and fleet C in the Skagerrak/Kattegat area) have been managed by TACs since the reopening in 1981. Fleet D has also been managed by TAC. Fleets B and E, landing herring as by-catch, have been managed by a catch ceiling since 1996. The catch of Fleet A has been higher than the agreed TAC and in 1997 was about 1.3 times the agreed TAC of 159 000 t.

This stock complex also includes Downs herring (herring in Division IVc and VIIId) which has shown independent trends in exploitation rate and recruitment but cannot be assessed separately. Larvae surveys suggest that SSB in 1995 reached its lowest level since 1980. Surveys in 1996 and 1997 indicate the SSB has now increased above the long-term average.

The Downs fishery is concentrated on the spawning aggregations in a restricted area, which makes this stock component particularly vulnerable to excessive fishing pressure. In response to ICES advice in May 1996, the TAC was reduced by 50% in line with reductions for the whole North Sea stock complex. However, TACs for this component have been significantly exceeded in all years.

Catches for recent years from Divisions IVc and VIIId are found in Table 3.5.8.5.

The fleet definitions have been changed in 1997. The fleets can now be described by:

- A: Directed herring fisheries with purse seiners and trawlers in the North Sea;
- B: All other vessels which take herring as by-catch in the North Sea;
- C: Directed fisheries with purse seiners and trawlers in Division IIIa;
- D and E: Vessels fishing in Division IIIa for herring and sprat and other vessels participating in fisheries where herring is taken as by-catch in Division IIIa.

Analytical assessment based on landings and surveys. No, or incomplete, discard data are available.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14).

Catch data (Tables 3.5.8.1–3.5.8.7):

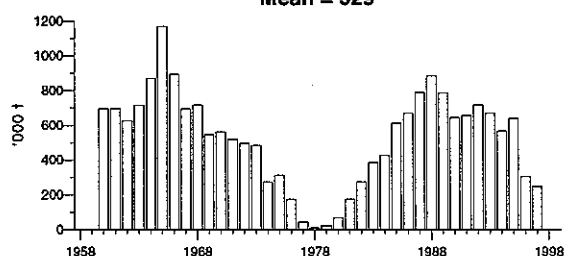
Catch data for Sub-area IV and Division VIIId:

Year	ICES advice	Predicted catch, corresp. to advice	Agreed TAC ¹	ACFM Indgs.	ACFM catch
1987	TAC	610	600	625	625
1988	TAC	515	530	698	698
1989	TAC	514	514	696	700
1990	TAC	403	415	544	553
1991	TAC	423	420	561	566
1992	TAC	406	430	544	549
1993	No increase in yield at $F > 0.3$	340 ¹	430	521	524
1994	No increase in yield at $F > 0.3$	346 ¹	440	465	468
1995	Long-term gains expected at lower F	429 ¹	440	534	534
1996	50% reduction of agreed TAC ²	156 ¹	156 ³	263	265
1997	$F = 0.2$	159 ¹	159	203	209
1998	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	254 ¹	254		
1999	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	265 ¹			

¹Catch in directed fishery in IV and VIIId. ²Revision of advice given in 1995. ³Revised in June 1996, down from 263. Weights in '000 t.

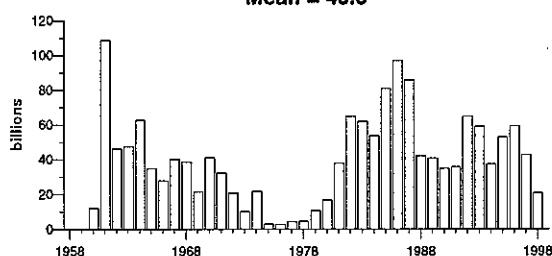
Landings

Mean = 529



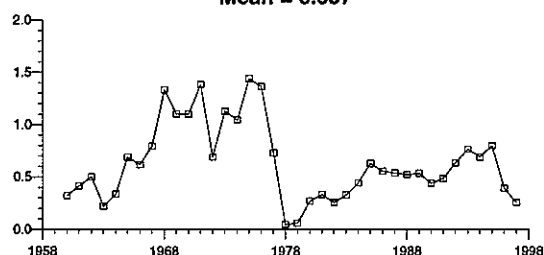
Recruitment (age 0)

Mean = 40.6



Fishing mortality (ages 2-6)

Mean = 0.637



Spawning stock biomass

Mean = 742

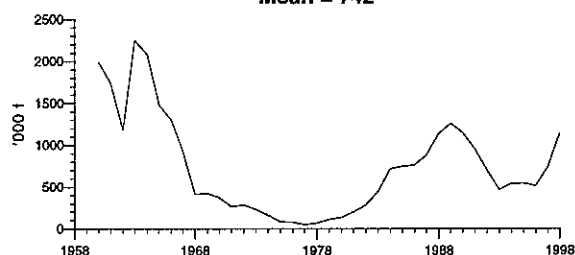


Table 3.5.8.1 North Sea HERRING (Sub-area IV and Division VIIId). Catch in tonnes by country, 1986-1997. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1986	1987	1988	1989	1990	1991
Belgium	414	39	4	434	180	163
Denmark	121,631	138,596	263,006	210,315 ²	159,280 ²	194,358 ²
Faroe Islands	623	2,228	810	1,916	633	334
France	9,729	7,266	8,384	29,085	23,480	24,625
Germany, Fed.Rep.	3,934	5,552	13,824	38,707	43,191	41,791
Netherlands	85,998	91,478	82,267	84,178	69,828	75,135
Norway ⁴	223,058	241,765	222,719	221,891 ²	157,850 ²	124,991 ²
Sweden	1,872	1,725	1,819	4,774	3,754	5,866
UK (England)	1,404	873	8,097	7,980	8,333	11,548
UK (Scotland)	77,459	76,413	64,108	68,106	56,812	57,572
UK (N.Ireland)	-	-	-	-	-	92
Unallocated landings	21,089	58,972	33,411	26,749 ²	21,081	24,435
Total landings	547,211	624,907	698,449	694,135 ²	544,422	560,910
Discards ³	-	-	-	4,000	8,660	4,617
Total catch	547,211	624,907	698,449	698,135	553,082	565,527
Estimates of the parts of the catches which have been allocated to spring spawning stocks						
IIIa type	17,386	19,654	23,306	19,869	8,357	7,894
Coastal type	905	490	250	2,283	1,136	252 ⁵

Country	1992	1993	1994	1995	1996 ¹	1997
Belgium	242	56	144	12	-	-
Denmark	193,968 ²	164,817	121,559	153,361	67,496	38,431
Faroe Islands	-	-	-	-	-	-
France	16,587	12,627	27,941	29,504	12,500	14,524
Germany	42,665	41,669	38,394	43,798	14,215	13,381
Netherlands	75,683	79,190	76,155	78,491	35,276	35,129
Norway ⁴	116,863	122,815	125,522	131,026	43,739	38,745
Russia	-	-	-	-	-	1,619
Sweden	4,939	5,782	5,425	5,017	3,090	2,253
UK (England)	11,314	19,853	14,216	14,676	6,881	3,421
UK (Scotland)	56,171	55,531	49,919	44,802	17,473	22,914
UK (N.Ireland)	-	-	-	-	-	-
Unallocated landings	25,867	18,410	5,749	33,594	62,729	32,622
Total landings	544,299	520,550	465,024	534,281	263,399	203,040
Discards ³	4,950	3,470	2,510	-	1,469	6,005
Total catch	549,249	524,020	467,534	534,281	264,868	209,045
Estimates of the parts of the catches which have been allocated to spring spawning stocks						
IIIa type	7,854	8,928	13,228	10,315	855	979
Coastal type	202 ⁵		215 ⁵	203 ⁵	168 ⁵	
		20				
		1 ⁵				

¹Preliminary.

²Working Group estimates.

³Any discards prior to 1989 were included in unallocated landings.

⁴Catches of Norwegian spring spawners removed (taken under a separate TAC).

⁵Landings from the Thames estuary area.

Table 3.5.8.2 HERRING, catch in tonnes in Division IVa West. 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
Denmark	25,268	29,298	9,037	5,980	10,751
Faroe Islands	810	1,916	633	334	-
France	266	- ¹	2,581	3,393	4,714 ⁴
Germany, Fed.Rep.	9,308	26,528	20,422	20,608	21,836
Netherlands	32,639	24,600	29,729	29,563	29,845
Norway	30,657	41,768	24,239	37,674	39,244
Sweden	1,197	742	-	1,130	985
UK (N.Ireland)	-	-	-	92	-
UK (England)	4,820	5,104	3,337	4,873	4,916
UK (Scotland)	48,791	58,455	46,431	42,745	39,269
Unallocated landings	-	3,173	4,621	5,492	4,855
Total Landings	153,751	191,584	141,030	151,884	156,415
Discards ²	-	900	750	883	850
Total catch	153,751	192,484	141,780	152,767	157,265

Country	1993	1994	1995	1996 ³	1997
Denmark	10,604	20,017	17,748	3,237	2,667
Faroe Islands	-	-	-	-	-
France	3,362	11,658	10,427	3,177	361
Germany	17,342 ⁴	18,364	17,095	2,167	-
Netherlands	28,616	16,944	24,696	2,978	6,304
Norway	33,442	56,422	56,124	22,187	16,485
Sweden	1,372	2,159	1,007	2,398	1,617
Russia	-	-	-	-	1,619
UK (N.Ireland)	-	-	-	-	-
UK (England)	4,742	3,862	3,091	2,391	-
UK (Scotland)	36,628 ⁴	44,687	40,159	12,762	17,120
Unallocated landings	-8,271 ⁵	2,944	26,018	48,213	12,613
Total Landings	127,837	177,327	196,365	99,510	59,386
Discards ²	825	550	-	356	1,138
Total catch	128,662	177,877	196,365	99,866	60,524

¹Included in Division IVb.

²Any discards prior to 1989 were included in unallocated.

³Preliminary.

⁴Including IVa East.

⁵Negative unallocated catches due to misreporting from other areas.

Table 3.5.8.3 HERRING, catch in tonnes in Division IVa East. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1986	1987	1988	1989	1990	1991
Denmark	4,540	7,101	47,183	44,269	44,364	48,875
Faroe Islands	-	2,126	-	-	-	-
France	-	159	45	-	892	-
Netherlands	-	-	200	-	-	-
Norway ¹	118,408	145,843	153,496	168,365	121,405	77,465
Sweden	-	957	622	612	2,482	114
UK (Scotland)	-	-	-	-	-	173
Germany, Fed.Rep.	-	-	-	-	5,604	- ⁴
Unallocated landings	-	-	-	-	-	-
Total landings	122,348	156,186	201,546	213,246	174,747	126,627
Discards ²	-	-	-	-	-	-
Total catch	122,948	156,186	201,546	213,246	174,747	126,627

Country	1992 ³	1993	1994	1995 ³	1996	1997
Denmark	53,692	43,224	43,787	45,257	19,166	22,882
Faroe Islands	-	-	-	-	-	-
France	- ⁴	4	14	+	-	3
Netherlands	-	-	-	-	-	-
Norway ¹	61,379	56,215	40,658	62,224	18,256	18,490
Sweden	508	711	1,010	2,081	693	427
UK (Scotland)	196	- ⁴	-	-	-	-
Germany	- ⁴	- ⁴	-	-	-	4,576
Unallocated landings	-	-	-	-	-	-
Total landings	115,775	100,154	85,469	109,562	38,115	46,378
Discards ²	-	-	-	-	-	-
Total catch	115,775	100,154	85,469	109,562	38,115	46,378

¹Catches of Norwegian spring spawners herring removed (taken under a separate TAC).

²Any discards prior to 1989 would have been included in unallocated.

³Preliminary.

⁴Included in IVa West.

Table 3.5.8.4 HERRING, catch in tonnes in Division IVb. 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
Denmark	190,555	136,239	105,614	138,555	125,229
Belgium	-	-	-	3	13
France	617	14,415 ⁵	10,289	4,120	2,313
Faroe Islands	-	-	-	-	-
Germany, Fed.Rep.	4,516	11,880	17,165	20,479	20,005
Netherlands ⁴	37,192	47,388	28,402	26,266	26,987
Norway	38,566	11,758	12,207	9,852	16,240
Sweden	-	3,420	1,276	4,622	3,446
UK (England)	2,011	957	3,200	2,715	3,026
UK (Scotland)	15,317	9,651	10,381	14,587	16,707
Unallocated landings	1,969	-23,947 ⁷	-15,616 ⁷	3,180	-13,637 ⁷
Total landings	290,743	211,711	172,914	224,376	200,329
Discards ⁴	-	1,900	2,560	1,072	1,900
Total catch	290,743	213,611	175,474	225,448	202,229

Country	1993	1994	1995	1996 ⁶	1997
Denmark	109,994	55,060	87,917	43,749	11,636
Belgium	-	-	-	-	-
France	2,086	5,492	7,639	2,373	6,069
Faroe Islands	-	-	-	-	-
Germany	23,628	14,796	21,707	11,052	7,456
Netherlands ⁴	31,370	39,052	30,065	18,474	14,697
Norway	33,158	28,442	12,678	3,296	3,770
Sweden	3,699	2,256	1,929	-	209
UK (England)	3,804	7,337	9,688	2,757	2,033
UK (Scotland)	18,904	5,101	4,654	4,449	5,461
Unallocated landings	-16,415 ⁷	-26,988 ⁷	10,831 ⁷	-8,826 ⁷	-1,615 ⁷
Total landings	210,228	130,548	165,355	77,324	49,716
Discards ⁴	245	460-	-	592	1,855
Total catch	210,473	131,008	165,455	77,916	51,571

¹Includes catches misreported from Division IVc.

²Includes Division IVa catches.

³Included in Division IVa.

⁴Any discards prior to 1989 were included in unallocated.

⁵Includes catch in Division IVa.

⁶Preliminary.

⁷Negative unallocated catches due to misreporting from other areas.

Table 3.5.8.5 HERRING, catch in tonnes in Divisions IVc and VIId. 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
Belgium	4	434	180	163	229
Denmark	-	509	265	948	4,296
France	7,456	14,670	9,718	17,112	9,560
Germany, Fed.Rep.	-	299	-	704	824
Netherlands	12,236	12,240	11,697	19,306	18,851
Norway	-	-	-	-	-
UK (England)	1,266	1,919	1,796	3,960	3,372
UK (Scotland)	-	-	-	67	-
Unallocated landings	31,442	47,523	32,076	15,763	34,649
Total landings	52,404	77,594	55,732	58,023	71,781
Discards ¹	-	1,200	5,350	2,662	2,200
Total catch	52,404	78,794	61,082	60,685	73,981
Coastal spring spawners included above	250	2,283	1,136	252	202

Country	1993	1994	1995	1996 ²	1997
Belgium	56	144	12	-	1
Denmark	995	2,695	2,441	1,344	1,246
France	7,171	10,777	11,433	6,950	8,091
Germany	649	4,964	4,996	997	1,349
Netherlands	19,204	20,159	23,730	13,824	13,528
Norway	-	-	-	-	-
UK (England)	11,307	3,016	1,896	1,733	1,388
UK (Scotland)	-	131	-	262	333
Unallocated landings	43,096	29,792	18,397	23,934	21,624
Total landings	82,478	71,678	62,905	49,044	47,559
Discards ¹	2,400	2,400	-	521	3,012
Total catch	84,878	74,078	62,905	49,565	50,571
Coastal spring spawners included above	201	215	203	168	

¹Any discards prior to 1989 would have been included in unallocated.

²Preliminary.

Table 3.5.8.6 Herring in Sub-area IV, Division VIIId and Division IIIa.

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
TAC (IV and VIIId)	<i>Sub-Area IV and Division VIIId</i>										
Recommended Divisions IVa, b ¹	500	484	373/32	363 ⁶	352	290 ⁷	296 ⁷	389 ¹¹	156	159	254
Recommended Divisions IVc, VIIId	15	30	30	50-60 ⁶	54	50	50	50	¹⁴	¹⁴	¹⁴
Expected catch of spring spawners					10	8					
Agreed Divisions IVa,b ²	500	484	385	370 ⁶	380	380	390	390	263/131 ¹	134	229
Agreed Div. IVc, VIIId	30	30	30	50 ⁶	50	50	50	50	50/ ¹³ 25 ¹³	25	25
CATCH (IV and VIIId)											
National landings Divisions IVa,b ³	644	639	499	495	481	463	421	456	176	144	
Unallocated landings Divisions IVa,b	2	-21	-11	8	-9	-25	-24	15	39	11	
Discard/slipping Divisions IVa,b ⁴		3	4	2	3	1	1	0	1	3	
Total catch Divisions IVa,b ⁵	646	621	492	505	475	439	394	471	216	158	
National landings Divisions IVc, VIIId ³	21	30	24	42	37	40	42	45	25	26	
Unallocated landings Divisions IVc, VIIId	31	48	32	16	35	43	30	18	24	22	
Discard/slipping Divisions IVc, VIIId		1	5	3	2	2	2	-	1	3	
Total catch Divisions IVc, VIIId	52	79	61	61	74	85	74	63	50	51	
Total catch IV and VIIId as used by ACFM ⁵	698	700	553	566	549	524	468	534	265	209	
CATCH BY FLEET/STOCK (IV and VIIId) ¹⁰											
North Sea autumn spawners directed fisheries (Fleet A)	Not available			443	441	438	439	506	226	195	
North Sea autumn spawners industrial (Fleet B)	Not available			134	124	101	38	65	38	13	
North Sea autumn spawners total (Fleets A+B)	687	697	568	577	565	539	477	571	265	208	
Baltic-IIIa-type spring spawners	23	20	8	8	8	9	13	10	0.9	0.9	
Coastal-type spring spawners	0.3	2.3	1.1	0.3	0.2	0.2	0.2	0.2	0.2	-	
TAC (IIIa)	<i>Division IIIa</i>										
Predicted catch of autumn spawners					96	153	102	77	98	48	35
Recommended spring spawners	99	84	67	91	90	93-113	⁹	¹²	¹²	¹³	
Recommended mixed clupeoids	80	80	60	0	0	0	-	-	-	-	
Agreed herring TAC	138	138	120	104.5	124	165	148	140	120	80	80
Agreed mixed clupeoid TAC	80	80	65	50	50	45	43	43	43	40	40
CATCH (IIIa)											
National landings	333	192	202	188	227	214	168	157	115	83	
Catch as used by ACFM	330	162	195	191	227	214	168	157	115	83	
CATCH BY FLEET/STOCK (IIIa)											
Autumn spawners human consumption (Fleet C)	Not available			26	47	44	42	21	23	34	
Autumn spawners mixed clupeoid (Fleet D)	Not available			13	23	25	12	6	12	4	
Autumn spawners other industrial landings (Fleet E)	Not available			38	82	63	32	43	7	2	
Autumn spawners total	201	91	77 ⁸	77	152	132	86	70	42	40	
Spring spawners human consumption (Fleet C)	Not available			68	53	68	59	59	69	34	
Spring spawners mixed clupeoid (Fleet D)	Not available			5	2	1	1	2	1	1	
Spring spawners other industrial landings (Fleet E)	Not available			40	20	12	24	29	3	1	
Spring spawners total	129	71	118	113	75	81	84	90	73	37	
North Sea autumn spawners	888	788	645	654	717	671	563	641	307	248	
Total as used by ACFM											

¹Includes catches in directed fishery and catches of 1-ringers in small mesh fishery up to 1992. ²IVa,b and EC zone of IIa. ³Provided by Working Group members. ⁴One country only. ⁵Includes spring spawners not included in assessment. ⁶Revised during 1991. ⁷Based on F=0.3 in directed fishery only; TAC advised for IVc, VIIId subtracted. ⁸Estimated. ⁹130-180 for spring spawners in all areas. ¹⁰Based on sum-of-products (number x mean weight at age). ¹¹Status quo F catch for fleet a. ¹²The catch should not exceed recent catch levels. ¹³During the middle of 1996 revised to 50% of its original agreed TAC. ¹⁴Included in IVa,b. ¹⁵Managed in accordance with autumn spawners. Weights in '000t.

Table 3.5.8.7 Herring in Sub-area IV, Divisions VIIId and IIIa (autumn-spawners).

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1960	12,111.30	1,990.81	696.20	0.323
1961	108,894.00	1,742.42	696.70	0.414
1962	46,283.20	1,183.75	627.80	0.501
1963	47,657.70	2,255.55	716.00	0.221
1964	62,793.20	2,084.46	871.20	0.339
1965	34,899.20	1,493.63	1,168.80	0.690
1966	27,864.30	1,306.78	895.50	0.618
1967	40,261.30	930.68	695.50	0.796
1968	38,700.70	416.97	717.80	1.334
1969	21,585.50	425.91	546.70	1.104
1970	41,087.20	375.45	563.10	1.101
1971	32,330.70	266.91	520.10	1.385
1972	20,867.70	289.01	497.50	0.692
1973	10,151.30	234.37	484.00	1.129
1974	21,760.60	163.09	275.10	1.046
1975	2,933.53	83.49	312.80	1.442
1976	2,783.70	80.67	174.80	1.364
1977	4,392.88	51.76	46.00	0.730
1978	4,663.47	70.12	11.00	0.048
1979	10,647.70	113.03	25.10	0.061
1980	16,808.20	137.69	70.76	0.272
1981	37,973.90	203.23	174.88	0.332
1982	64,965.70	286.75	275.08	0.257
1983	61,994.90	444.54	387.20	0.329
1984	53,656.80	718.99	428.63	0.444
1985	80,977.10	751.30	613.78	0.628
1986	97,012.40	768.18	671.49	0.555
1987	85,711.30	884.25	792.06	0.537
1988	42,252.10	1,138.63	887.69	0.522
1989	40,816.20	1,266.24	787.90	0.533
1990	35,027.40	1,151.07	645.23	0.439
1991	35,777.70	957.44	658.01	0.486
1992	64,929.30	702.22	716.80	0.635
1993	59,095.30	470.70	671.40	0.766
1994	37,354.10	543.29	568.23	0.692
1995	52,989.60	549.67	639.15	0.799
1996	59,444.80	518.58	306.16	0.394
1997	42,835.90	745.55	247.91	0.257
1998	20,870.00	1,145.00	.	.
Average	40,593.89	742.11	528.53	0.637
Unit	Millions	1000 tonnes	1000 tonnes	-

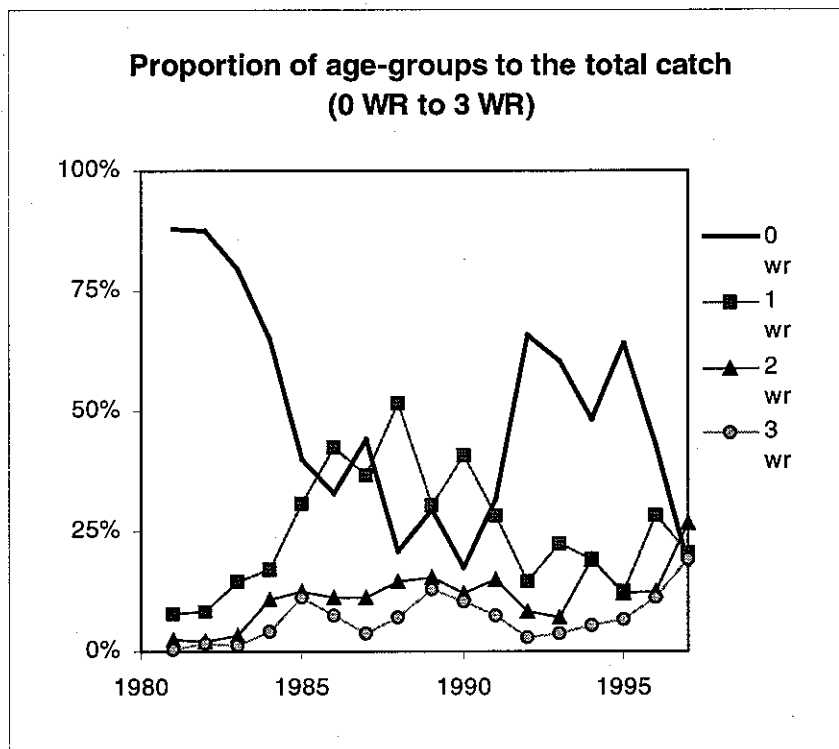


Figure 3.5.8.1 Proportion of age-groups in the total catch of North Sea herring.

State of stock/fishery: There are indications that stock biomass is low. Catches have decreased, although the trawl survey (February) total index is the fourth highest for the period 1984–1998. Sprat is a short-lived species with natural fluctuations in stock biomass.

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

Advice on management: As the sprat fishery has a by-catch of juvenile herring, the exploitation of sprat will be limited by the restrictions imposed on fisheries catching juvenile herring (see Section 3.5.8). The directed sprat fishery for human consumption should be kept at the level of recent years.

Proposed reference points: None available.

Catch forecast: No reliable catch forecast is available but the IBTS index of abundance in 1998 gives a high value indicating the possibility for high catches.

Elaboration and special comment: The catches of sprat are heavily influenced by juvenile fish, particularly those

aged one. This means that catch prognoses under the present assessment and TAC setting regime, which requires a two year ahead forecast, are not reliable. However, abundance indices from surveys in February each year are good predictors of the catch in the same year (see Figure 3.5.9.1). It would be possible to provide information early in the year on which a TAC for the remainder of the year could be based. Two alternatives might be considered. Firstly a provisional TAC could be set for the period January-March which is then updated at the beginning of March based on contemporary survey data. Secondly, the TAC year could run March-February, with an annual TAC being set in March of the year in question using the survey data. This might require some change in the process of setting TACs for sprat but would overcome the problem of the absence of appropriate data at the time ICES advice is given and would provide TACs which more adequately reflected the true size of the sprat stock.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14).

Catch data (Tables 3.5.9.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM catch
1987	Catch at lowest practical level	0	57	78	33
1988	TAC < recent catches, preferably zero	0	57	93	87
1989	No advice	-	59	50	63
1990	No advice	-	59	49	71
1991	No advice	-	55	92	110
1992	No advice	-	55	72	124
1993	No advice	-	114	127	200
1994	No advice for sprat; maintain by-catch regulations	-	114	184	324
1995	No advice	-	175	190	357
1996	No advice	-	200	141	137
1997	Enforce by-catch regulations	-	150	123	103
1998	Limited by restrictions on juvenile herring	-	150		
1999	Limited by restrictions on juvenile herring	-			

¹EU zone.

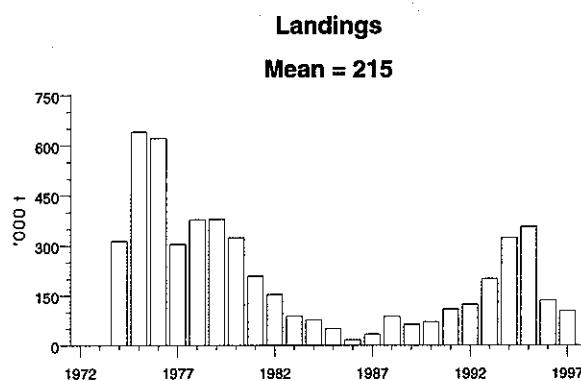


Table 3.5.9.1 Sprat catches in the North Sea ('000 t) 1984-1997. Catch in fjords of western Norway excluded (Data provided by Working Group members except where indicated). These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Division IVa West														
Denmark	-	0.9	0.6	0.2	0.1	+	-			0.6	-	-	-	-
Germany	-	-	-	-	-	-	-		-	-	-	-	-	-
Netherlands	-	6.7	-	-	-	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-
UK (Scotland)	+	6.1	+	+	-	-	+	-	-	-	0.1	+	-	-
Total	+	13.7	0.6	0.2	0.1	+	+	0.1	0.26	0.6	0.1	+	-	-
Division IVa East (North Sea) stock														
Denmark	-	+	0.2	+	+	+	-	-	-	+	+	+	0.3	+
Norway	-	-	-	-	-	-	-	-	-	2.5	+	+	-	-
Sweden	-	-	-	-	-	-	-	2.5	-	-	-	-	-	-
Total	-	+	0.2	+	+	+	+	2.5	0.64	2.5	+	+	0.3	+
Division IVb West														
Denmark	5.6	1.8	0.4	3.4	1.4	2.0	10.0	9.4		13.0	19.0	26.0	1.8	82.2
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	0.5	-	-	-	3.5	0.1	1.2		18.4	16.8	12.6	21.0	1.9	2.3
UK (England & Wales)	+	-	-	-	-	-	-	-	-	0.5	-	+	+	-
UK (Scotland)	+	-	-	0.1	-	-	-	-	-	0.5	-	-	-	-
Total	6.1	1.8	0.4	3.5	4.9	2.1	11.2	13.8	38.26	30.5	31.6	47.0	3.7	84.5
Division IVb East														
Denmark	62.1	36.6	10.3	28.0	80.7	59.2	59.2	67.0		136.2	251.7	283.2	74.7	10.9
Germany	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-
Norway	3.1	-	-	-	0.6	-	0.6	25.1		24.1	19.1	14.7	50.9	0.8
Sweden	-	-	-	-	-	-	-	-	-	-	-	0.2	0.5	-
Total	65.8	37.2	10.9	28.0	81.3	59.2	59.8	92.1	76.49	160.3	270.8	298.1	125.9	11.7
Division IVc														
Belgium	-	+	+	+	-	-	-	-	-	-	-	-	-	-
Denmark	0.5	+	0.1	+	0.1	0.5	1.5	1.7		3.5	-	11.4	3.9	5.7
France	-	-	+	-	-	-	-	-	-	+	+	+	-	-
Netherlands	0.1	-	-	-	0.4	-	-	-	-	-	-	-	-	-
Norway	3.4	-	-	-	-	-	-	-	-	0.4	4.6	0.4	-	0.1
UK (England and Wales)	0.9	3.4	4.1	0.7	0.6	0.9	0.2	1.8		2.0	2.9	0.2	2.6	1.4
Total	4.9	3.4	4.3	0.7	1.1	1.8	1.7	3.5	8.61	5.9	21.2	12.0	6.5	7.2
Total North Sea														
Belgium	-	+	+	+	-	+	-	-	-	-	-	-	-	-
Denmark	68.1	39.5	11.7	31.7	82.3	61.9	69.2	78.1		153.3	284.4	320.6	80.7	98.8
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France	-	-	+	-	-	+	-	-	-	+	-	+	-	-
Germany	0.6	-	0.6	-	-	-	-	-	-	-	-	-	-	-
Netherlands	0.1	0.6	-	0.5	0.4	0.4	-	-	-	-	-	-	-	-
Norway	7.0	6.1	-	-	4.1	0.1	1.8	29.6	28.5	43.8	36.3	36.2	54.8	3.2
Sweden	-	-	-	-	-	-	-	-	-	0.1	-	0.2	0.5	-
UK (England and Wales)	0.9	3.4	4.1	0.7	0.6	0.9	0.2	1.8		2.6	2.9	0.2	2.6	1.4
UK (Scotland)	+	-	+	0.2	-	-	+	-	-	0.5	0.1	+	-	-
Total	76.7	49.6	16.4	33.1	87.4	63.3	71.2	109.5	124.2	200.3	323.7	357.2	136.6	103.4

¹Preliminary.

²Official statistics.

³Includes Division IV a-c.

+Catch recorded, but amount not precisely known.

Table 3.5.9.2 Sprat in the North Sea (Fishing Area IV).

Year	Landings
1974	314
1975	641
1976	622
1977	304
1978	378
1979	380
1980	323
1981	209
1982	154
1983	88
1984	77
1985	50
1986	16
1987	33
1988	87
1989	63
1990	71
1991	110
1992	124
1993	200
1994	324
1995	357
1996	137
1997	103
Average	215
Unit	1000 tonnes

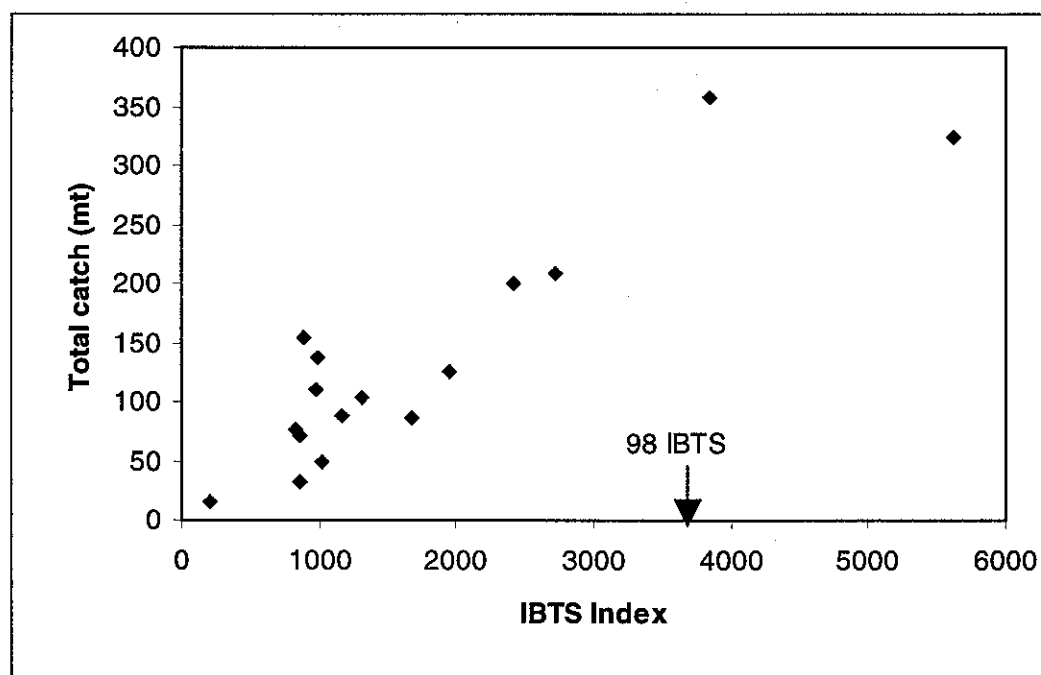


Figure 3.5.9.1 Sprat North Sea. Total catch in '000 t vs. IBTS abundance index 1981–1997.

3.5.10 Mackerel (North Sea Component)

Evaluation of the North Sea mackerel component is given in Section 3.12.3 dealing with the combined mackerel assessment.

3.5.11 North Sea horse mackerel (*Trachurus trachurus*) (Division IIIa (eastern part), Divisions IVb,c, VIIId)

State of stock/fishery: The state of the stock is not known. There is no recent quantitative information on stock size. Egg surveys from 1989 to 1991 indicated a spawning stock biomass of about 240 000 t. The age composition of the relatively small catches and past biomass estimates, suggest that the exploitation rate may have been low.

Management objectives: No explicit management objectives have been established 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} .

Advice on management: Consistent with a precautionary approach, ICES recommends that a management plan including monitoring of the development of the stock and of the fishery with corresponding regulations should be developed and implemented.

Reference points:

ICES considers that:	ICES proposes that:
There is not sufficient information to estimate appropriate reference points.	

Relevant factors to be considered in management: This stock migrates out of the North Sea to areas where it mixes with the Western horse mackerel. The present agreed TAC area (for the North Sea and IIa) does not correspond to the distribution of the stock. It should apply to all those areas where the North Sea horse mackerel are predominantly fished, i.e. Divisions IIIa, IVb,c and VIIId.

Elaboration and special comment: In earlier years the majority of the catch was taken as by-catch in the small-mesh industrial fishery. Only a small proportion of the catch has been sampled.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, September 1998 (ICES CM 1999/ACFM:6).

Catch data (Tables 3.5.11.1–2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	ACFM landings ²
1987	Not assessed	-	30	12
1988	No advice	-	50	24
1989	No advice	-	45	33
1990	No advice	-	40	19
1991	No advice	-	45	12
1992	No advice	-	55	15
1993	No advice	-	60	14
1994	No advice	-	60	6
1995	No advice	-	60	17
1996	No advice	-	60	19
1997	No advice	-	60	20
1998	No advice	-	60	
1999	Develop and implement management plan	-		

¹Division IIa and Sub-area IV (EU waters only). ²Catch of North Sea stock (See Table 3.5.11.2). Weights in '000 t.

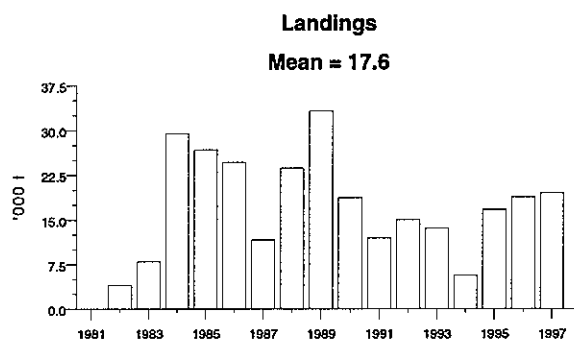


Table 3.5.11.1 Landings and discards of HORSE MACKEREL (t) by year and division, for the North Sea, Western and Southern horse mackerel. (Data submitted by Working Group members.)

	North Sea horse mackerel					Western horse mackerel							Southern horse mackerel			Total	
	IIIa		IVb,c	Dis-cards	VIIId	Total	Iia	IVa	VIa	VIIa-c,e-k	VIIIa,b,d,e	Dis-cards	Total	VIIIc	IXa	Total	All stocks
1982	-	2,788 ³	-		1,247	4,035	-	-	6,283	32,231	3,073	-	41,587	19,610	39,726	59,336	104,958
1983	-	4,420 ³	-		3,600	8,020	412	-	24,881	36,926	2,643	-	64,862	25,580	48,733	74,313	147,195
1984	-	25,893 ³	-		3,585	29,478	23	94	31,716	38,782	2,510	500	73,625	23,119	23,178	46,297	149,400
1985	1,138		22,897		2,715	26,750	79	203	33,025	35,296	4,448	7,500	80,551	23,292	20,237	43,529	150,830
1986	396		19,496		4,756	24,648	214	776	20,343	72,761	3,071	8,500	105,665	40,334	31,159	71,493	201,806
1987	436		9,477		1,721	11,634	3,311	11,185	35,197	99,942	7,605	-	157,240	30,098	24,540	54,638	223,512
1988	2,261		18,290		3,120	23,671	6,818	42,174	45,842	81,978	7,548	3,740	188,100	26,629	29,763	56,392	268,163
1989	913		25,830		6,522	33,265	4,809	85,304 ²	34,870	131,218	11,516	1,150	268,867	27,170	29,231	56,401	358,533
1990	14,872 ¹		17,437		1,325	18,762	11,414	112,753 ²	20,794	182,580	21,120	9,930	373,463	25,182	24,023	49,205	441,430
1991	2,725 ¹		11,400		600	12,000	4,487	63,869 ²	34,415	196,926	25,693	5,440	333,555	23,733	21,778	45,511	391,066
1992	2,374 ¹		13,955	400	688	15,043	13,457	101,752	40,881	180,937	29,329	1,820	370,550	24,243	26,713	50,955	436,548
1993	850 ¹		3,895	930	8,792	13,617	3,168	134,908	53,782	204,318	27,519	8,600	433,145	25,483	31,945	57,428	504,190
1994	2,492 ¹		2,496	630	2,503	5,689	759	106,911	69,546	194,188	11,044	3,935	388,875	24,147	28,442	52,589	447,153
1995	240		7,948	30	8,666	16,756	13,133	90,527	83,486	320,102	1,175	2,046	510,597	27,534	25,147	52,681	580,034
1996	1,657		7,558	212	9,416	18,843	3,366	18,356	81,259	252,823	23,978	16,870	396,652	24,290	20,400	44,690	460,185
1997	2,037 ¹		15,504 ³	10	5,452	19,540	2,617	63,647	40,145	318,101	11,677	2,921	442,571	29,129	27,642	56,771	518,882

¹Norwegian and Danish catches are included in the Western horse mackerel.

²Norwegian catches in Division IVb included in the Western horse mackerel.

³Divisions IIIa and IVb,c combined.

⁴Included in Western horse mackerel (Danish and Swedish catches).

⁵Norwegian catches in IVb (1,426 t) included in Western horse mackerel.

Table 3.5.11.2 Landings (t) of HORSE MACKEREL in Sub-area IV by country.
(Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984
Belgium	8	34	7	55	20
Denmark	199	3,576	1,612	1,590	23,730
Faroe Islands	260	-	-	-	-
France	292	421	567	366	827
Germany, Fed.Rep.	+	139	30	52	+
Ireland	1,161	412	-	-	-
Netherlands	101	355	559	2,029 ⁴	824
Norway	119	2,292	7	322	⁴
Poland	-	-	-	2	94
Sweden	-	-	-	-	-
UK (Engl. + Wales)	11	15	6	4	-
UK (Scotland)	-	-	-	-	3
USSR	-	-	-	-	489
Total	2,151	7,245	2,788	4,420	25,987

Country	1985	1986	1987	1988	1989	1990
Belgium	13	13	9	10	10	13
Denmark	22,495	18,652 ²	7,290 ²	20,323 ²	23,329 ²	20,605 ²
Estonia	-	-	-	-	-	-
Faroe Islands	-	-	-	-	-	942
France	298	231 ³	189 ³	784 ³	248	220
Germany, Fed.Rep.	+	-	3	153	506	2,469 ⁶
Ireland	-	-	-	-	-	687
Netherlands	160 ⁴	600 ⁴	850 ⁴	1,060 ⁴	14,172	1,970
Norway ²	203	776	11,728 ⁵	34,425 ⁵	84,161	117,903
Poland	-	-	-	-	-	²
Sweden	-	2 ²	-	-	-	-
UK (Engl. + Wales)	71	3	339	373	10	102
UK (N. Ireland)	-	-	-	-	-	10
UK (Scotland)	998	531	487	5,749	2,093	-
USSR	-	-	-	-	-	458
Unallocated + discards	-	-	-	-	-12,482 ⁵	-
						-317 ⁵
Total	24,238	20,808	20,895	62,877	112,047	145,062

Country	1991	1992 ⁷	1993	1994	1995	1996	1997 ¹
Belgium	-	+	74	57	51	28	-
Denmark	6,982 ²	7,755	6,120	3,921	2,432	1,433	648
Estonia	-	293	-	-	17	-	-
Faroe Islands	340	-	360	275	-	-	296
France	174	162	302	-	-	-	-
Germany, Fed.Rep.	5,995	2,801	1,570	1,014	1,600	7	7,603
Ireland	2,657	2,600	4,086	415	220	1,100	8,152
Netherlands	3,852	3,000	2,470	1,329	5,285	6,205	37,778
Norway ²	50,000 ²	96,000	126,800	94,000	84,747	14,639	45,314
Poland	-	-	-	-	-	-	-
Sweden	953 ²	800	697	2,087	-	95	232
UK (Engl. + Wales)	132	4	115	389	478	40	242
UK (N. Ireland)	350	-	-	-	-	-	-
UK (Scotland)	7,309	996	1,059	7,582	3,650	2,442	10,511
USSR	-	-	-	-	-	-	-
Unallocated + discards	-750 ⁵	-278	-3,270	1,511	-28	136	-31,615
Total	77,994	114,133	140,383	112,580	98,452	26,125	79,161

¹Preliminary. ²Includes Division IIIa. ³Includes Division IIa. ⁴Estimated from biological sampling.

⁵Assumed to be misreported. ⁶Includes 13 t from the German Democratic Republic.

⁷Includes a negative unallocated catch of -4,000 t.

3.5.12 Norway pout in Sub-area IV and Division IIIa

State of stock/fishery: The stock in 1998 is considered to be within safe biological limits. Recruitment is highly variable and influences SSB rapidly due to the short life span of the species. Fishing mortality has generally been lower than the natural mortality and has decreased in recent years.

Management objectives: There is no management objective set for this stock. With historical and present fishing mortality levels the status of the stock is mainly

determined by natural processes and less by the fishery. However, there is a need to ensure that the stock remains high enough to provide food for a variety of predator species.

Advice on management: The stock can on average sustain current F. However, in managing this fishery, by-catches of other species should be taken into account. Existing measures to protect other species should be maintained.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 90 000 t, the lowest observed biomass.	B_{pa} be established at 150 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments. Below this value the probability of below average recruitment increases.
NOTE: With historical and present fishing mortality levels the status of the stock is mainly determined by natural processes and less by the fishery. It may be more appropriate to formulate reference points based on total mortality for use within management procedures using surveys and real time monitoring of catches.	

Technical basis:

$B_{lim}=B_{loss}=90\ 000\ t.$	B_{pa} Below-average recruitment below: 150 000 t.
F_{lim} None advised.	F_{pa} None advised.

Relevant factors to be considered in management: The fishing mortality is very low compared to the natural mortality, and this stock is important as food source for other species, which means that the population dynamics for Norway pout in the North Sea and in Skagerrak is mainly dependent on changes caused by recruitment variation and predation mortality and less by the fishery.

The stock size and catch possibilities are largely dependent on the size of a few year classes. The size of the year classes cannot be predicted with the precision required for traditional catch prediction for traditional TAC based management. Alternative management approaches are required, and ICES considers that management procedures using surveys and "real time" monitoring of the fishery should be explored.

Catch forecast: No forecast is given for this stock. Deterministic catch forecasts as given for most other stocks are not considered appropriate due to the few year classes contributing to the catch, the large dependence of

the forecast on the size of year classes which are poorly known and the added uncertainty in the forecast arising from variations in natural mortality. The assessment indicates a relatively strong 1996 year class followed by a very weak 1997 year class. As a consequence, it is expected that the spawning stock in 1999 will be reduced from its present high level and this should be taken into account when setting a TAC.

Elaboration and special comment: The fishery is mainly by Danish and Norwegian vessels using small mesh trawls in the northern North Sea. The fishery targets both Norway pout and blue whiting. The assessment is analytical using catch-at-age analysis based on quarterly catch and cpue data. The assessment is considered appropriate to indicate trends in the stock.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.12.1–2):

North Sea (Sub-area IV)

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings ²
1987	No advice	-	200	215	149
1988	No advice	-	200	187	110
1989	No advice	-	200	276	173
1990	No advice	-	200	212	152
1991	No advice	-	200	223	193
1992	No advice	-	200	335	300
1993	No advice	-	220	241	184
1994	No advice	-	220	214	182
1995	Can sustain current F	-	180	289	241
1996	Can sustain current F; take by-catches into consid.	-	220	197	166
1997	Can sustain current F; take by-catches into consid.	-	220	155	201
1998	Can sustain current F; take by-catches into consid.	-	220		
1999	Can sustain current F; take by-catches into consid.	-			

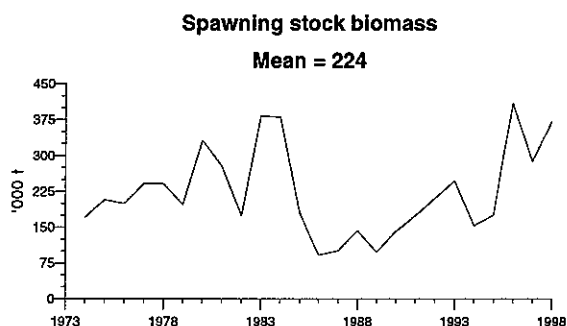
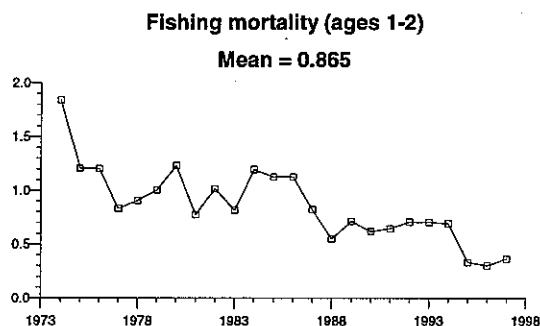
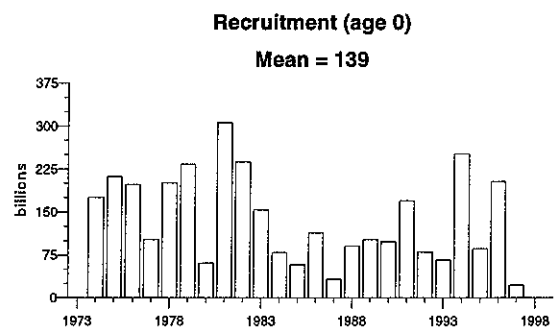
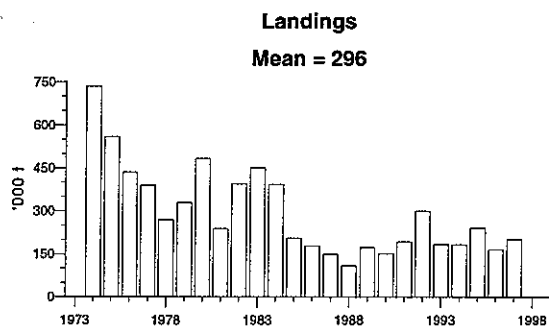
¹ IIa(EU), IIIa, IV(EU). ² IVa, IVb and IIIa. Weights in '000 t.

Skagerrak (Division IIIa)

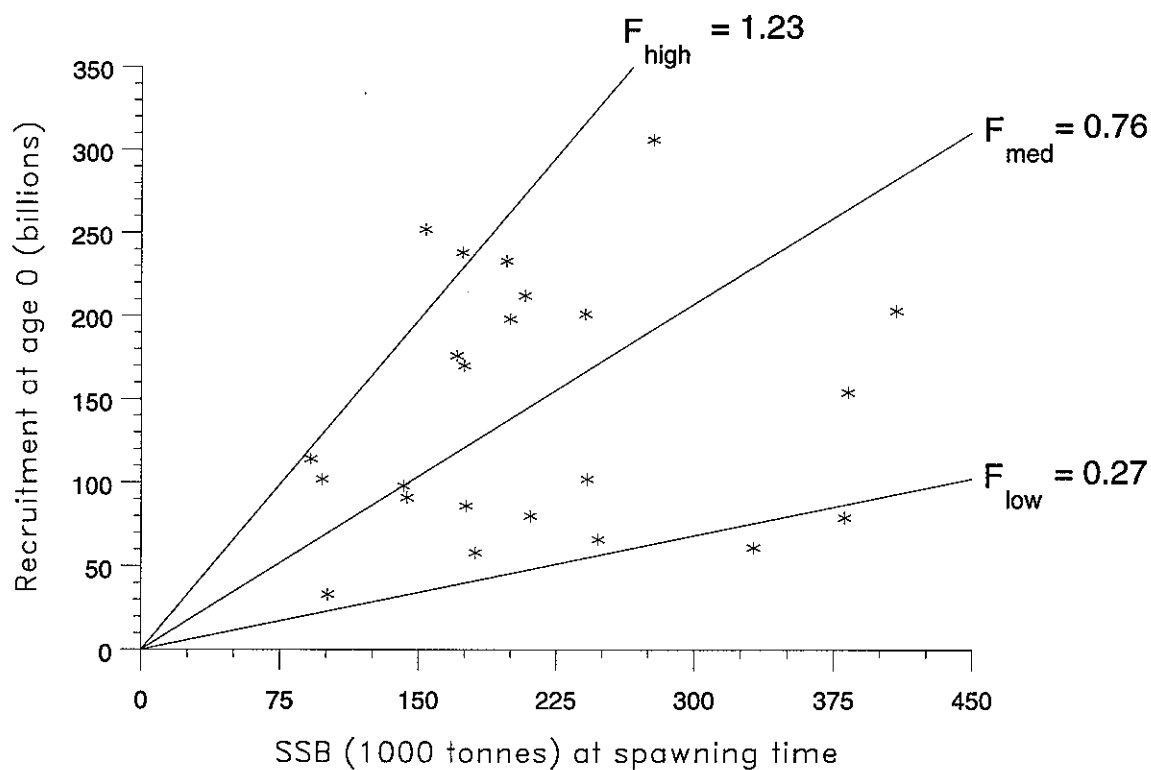
Year	ICES advice	Official landings	ACFM catch
1987	No advice		2
1988	No advice		8
1989	No advice	17	5
1990	No advice	41	12
1991	No advice	49	38
1992	No advice	84	45
1993	No advice	37	8
1994	No advice	24	7
1995	No advice	68	50
1996	No advice	58	36
1997	See advice for North Sea	35	29
1998	See advice for North Sea		
1999	See advice for North Sea		

Weights in '000 t.

Norway pout in the North Sea (Fishing Area IV and Division IIIa)



Stock - Recruitment



(run: ICA)

Precautionary Approach Plot

Norway pout, Fishing Area IV and IIIa

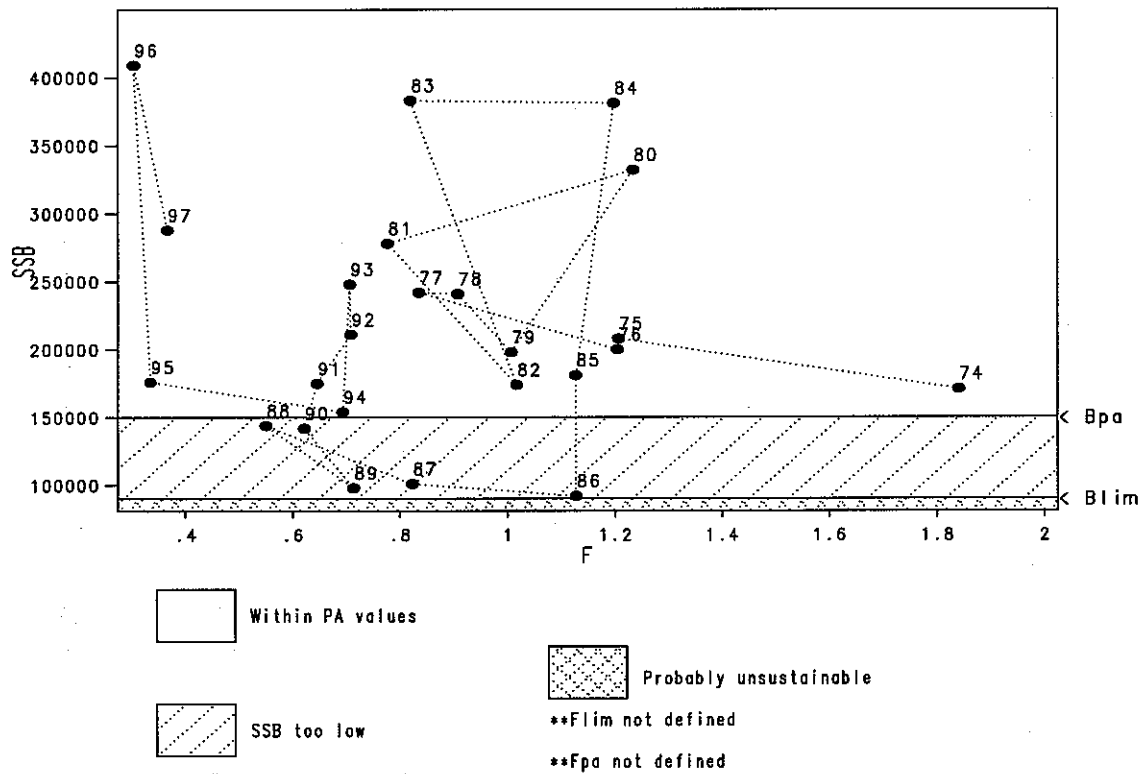


Table 3.5.12.1 Norway pout annual landings (000 t) in the North Sea and Division IIIa, by country, for 1957–1997.
(Data provided by Working Group members).

Year	Denmark		Faroes	Norway	Sweden	UK (Scotland)	Others	Total
	North Sea	Div. IIIa						
1957	-	-	-	0.2	-	-	-	0.2
1958	-	-	-	-	-	-	-	-
1959	61.5	-	-	7.8	-	-	-	69.3
1960	17.2	-	-	13.5	-	-	-	30.7
1961	20.5	-	-	8.1	-	-	-	28.6
1962	121.8	-	-	27.9	-	-	-	149.7
1963	67.4	-	-	70.4	-	-	-	137.8
1964	10.4	-	-	51.0	-	-	-	61.4
1965	8.2	-	-	35.0	-	-	-	43.2
1966	35.2	-	-	17.8	-	-	+	53.0
1967	169.6	-	-	12.9	-	-	+	182.6
1968	410.8	-	-	40.9	-	-	+	451.8
1969	52.5	-	19.6	41.4	-	-	+	113.5
1970	142.1	-	32.0	63.5	-	0.2	0.2	238.0
1971	178.5	-	47.2	79.3	-	0.1	0.2	305.3
1972	259.6	-	56.8	120.5	6.8	0.9	0.2	444.8
1973	215.2	-	51.2	63.0	2.9	13.0	0.6	345.9
1974	464.5	-	85.0	154.2	2.1	26.7	3.3	735.8
1975	251.2	-	63.6	218.9	2.3	22.7	1.0	559.7
1976	244.9	-	64.6	108.9	+	17.3	1.7	435.4
1977	232.2	-	50.9	98.3	2.9	4.6	1.0	389.9
1978	163.4	-	19.7	80.8	0.7	5.5	-	270.1
1979	219.9	9.0	21.9	75.4	-	3.0	-	329.2
1980	366.2	11.6	34.1	70.2	-	0.6	-	482.7
1981	167.5	2.8	16.6	51.6	-	+	-	238.5
1982	256.3	35.6	15.4	88.0	-	-	-	395.3
1983	301.1	28.5	24.5	97.3	-	+	-	451.4
1984	251.9	38.1	19.1 ¹	83.8	-	0.1	-	393.0
1985	163.7	8.6	9.9	22.8	-	0.1	-	205.1
1986	146.3	4.0	6.6	21.5	-	-	-	178.4
1987	108.3	2.1	4.8	34.1	-	-	-	149.3
1988	79.0	7.9	1.5	21.1	-	-	-	109.5
1989	95.6	5.4	0.8	65.3	+	0.1	0.3	172.5
1990	61.5	12.1	0.9	77.1	+	-	-	151.6
1991	85.0	38.3	1.3	68.3	+	-	+	192.9
1992	146.9	44.7	2.6	105.5	+	-	0.1	299.8
1993	97.3	7.8	2.4	76.7	-	-	+	184.2
1994	97.9	6.6	3.6	74.2	-	-	+	182.3
1995	138.4	50.3	8.9	43.1	0.1	-	0.2	241.0
1996	74.3	36.2	7.6	47.8	0.2	0.1	+	166.2
1997	125.8	29.3	7.0	39.1	+	+	0.1	201.3

Table 3.5.12.2 Trends in Yield, Annual fishing mortality for 1- and 2-group, SSB (beginning of year) and Recruitment (0-group, beginning of Q3) for Norway Pout in North Sea and Skagerrak¹.

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 1-2
1974	176,000.00	171.00	735.80	1.840
1975	212,000.00	208.00	559.70	1.206
1976	198,000.00	200.00	435.40	1.204
1977	102,000.00	242.00	389.90	0.835
1978	201,000.00	241.00	270.10	0.907
1979	233,000.00	198.00	329.20	1.006
1980	61,000.00	332.00	482.70	1.233
1981	306,000.00	278.00	238.50	0.777
1982	238,000.00	174.00	395.30	1.016
1983	154,000.00	383.00	451.40	0.819
1984	79,000.00	381.00	393.00	1.197
1985	58,000.00	181.00	205.10	1.126
1986	114,000.00	92.00	178.40	1.127
1987	33,000.00	101.00	149.30	0.823
1988	91,000.00	144.00	109.50	0.550
1989	102,000.00	98.00	172.50	0.714
1990	98,000.00	142.00	151.60	0.622
1991	170,000.00	175.00	192.90	0.646
1992	80,000.00	211.00	299.80	0.709
1993	66,000.00	248.00	184.20	0.707
1994	252,000.00	154.00	182.30	0.694
1995	86,000.00	176.00	241.00	0.334
1996	203,000.00	409.00	166.20	0.303
1997	22,000.00	288.00	201.30	0.366
1998		371.00		
Average	138,958.33	223.92	296.46	0.865
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ The estimates before 1983 are based on previous assessment runs which do not include data from the Skagerrak.

3.5.13 Sandeel

Catches for the whole of the North Sea are given by country in Table 3.5.13.1 and by the Sub-areas shown in Figure 3.5.13.1 in Table 3.5.13.2.

3.5.13.a Sandeel in Sub-area IV

State of stock/fishery: The stock is considered to be within safe biological limits. SSB appears to be at an historically high level in 1998. Fishing mortality fluctuates considerably between years with no trend. For the last 20 years, SSB, recruitment and fishing mortality have fluctuated without any particular trend.

Management objectives: There is no management objective set for this stock. There is a need to develop management objectives which ensure that the stock remains high enough to provide food for a variety of predator species.

Advice on management: The stock can sustain current fishing mortality. The fishing mortality should not be allowed to increase because the consequences of removing a larger fraction of the food-biomass for other biota are unknown. Sandeels are important prey for many marine predators. Management of fisheries should try to prevent local depletion of sandeel aggregations, particularly in areas where wildlife (predators) congregate.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 430 000 t, the lowest observed biomass.	B_{pa} be set at 600 000 t. This affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of the assessment. B_{pa} does not take species interaction considerations into account.
NOTE: With historical and present fishing mortality levels the status of the stock is mainly determined by natural processes and less by the fishery. It may be more appropriate to formulate reference points based on total mortality for use within management procedures using surveys and real time monitoring of catches.	

Technical basis:

$B_{lim}=B_{loss}=430\ 000\ t.$	B_{pa} Rounded $1.4\ B_{lim}$.
F_{lim} : None advised.	F_{pa} None advised.

Relevant factors to be considered in management: The stock size and catch possibilities are largely dependent on the size of a few year classes. The size of the year classes cannot be predicted with the precision required for traditional catch prediction for traditional TAC based management. Alternative management approaches are required, and ICES considers that management procedures using surveys and "real time" monitoring of the fishery should be explored.

Catch forecast: Because of the high natural mortality and few year classes in the fishery, traditional deterministic forecasts are not considered appropriate. The SSB in 1998 was high due to a very strong 1996 year class. However, the 1997 and 1998 landings indicate that the 1997 year class is poor.

Elaboration and special comment: Sandeel is taken by trawlers using small mesh gear. The fishery is seasonal, taking place mostly in the spring and summer. Most of the catch consists of *Ammodytes marinus* and there is little by-catch of protected species. Sandeels are largely stationary after settlement and the North Sea sandeel must be considered as a complex of local populations. Recruitment to local areas may not only be related to the local stock as interchange between areas seems to take place during the early phases of life before settlement. The Shetland sandeel stock is still assessed as a separate unit.

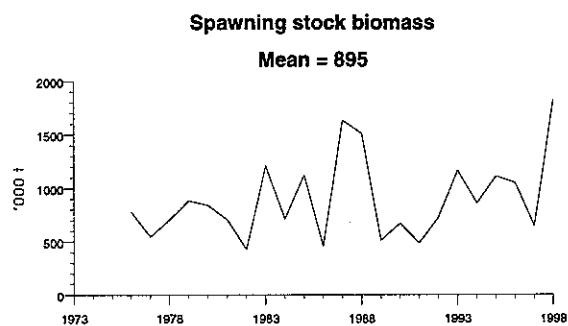
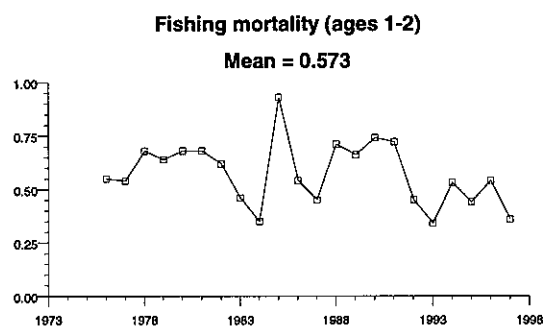
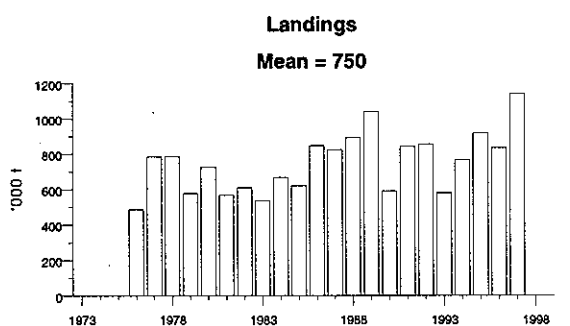
Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.5.13.1-3):

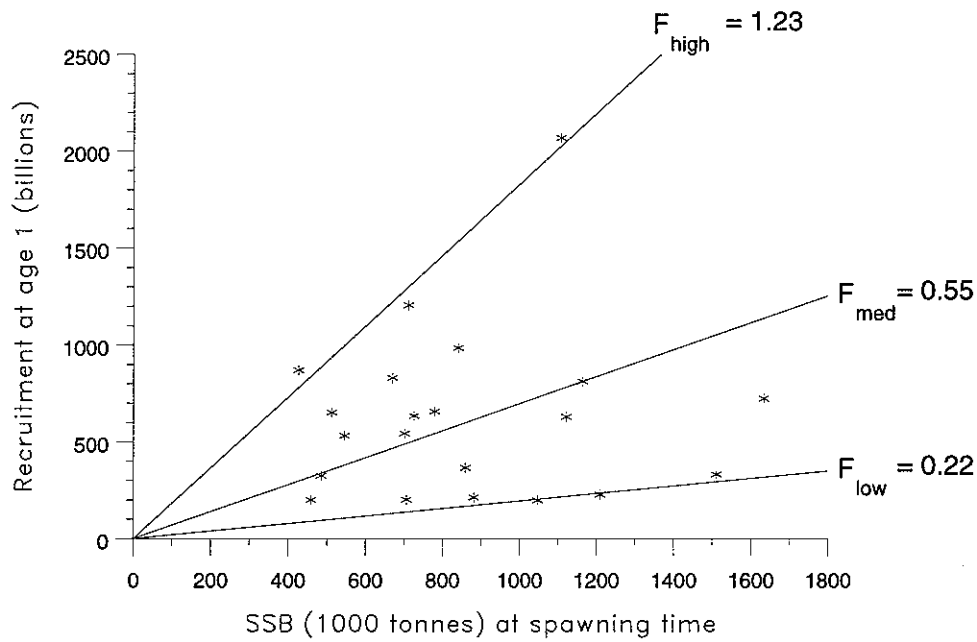
Year	ICES advice	TAC	ACFM catch
1987	No advice ¹ ; No advice ²		825
1988	No advice ¹ ; No advice ²		893
1989	No advice ¹ ; No advice ²		1039
1990	No advice ¹ ; No advice ²		591
1991	No advice ¹ ; No advice ²		843
1992	No advice ¹ ; No advice ²		855
1993	No advice ¹ ; No advice ²		579
1994	No advice ¹ ; No advice ²		766
1995	Can sustain current F ¹ ; No advice ²		918
1996	Can sustain current F		835
1997	Can sustain current F		1140
1998	Can sustain current F	1000	
1999	Can sustain current F		

¹Southern stock component. ²Northern stock component Weights in '000 t.

Sandeel in Sub-area IV



Stock - Recruitment



(run: ICA)

Precautionary Approach Plot

Sandeel, North Sea (Fishing Area IV)

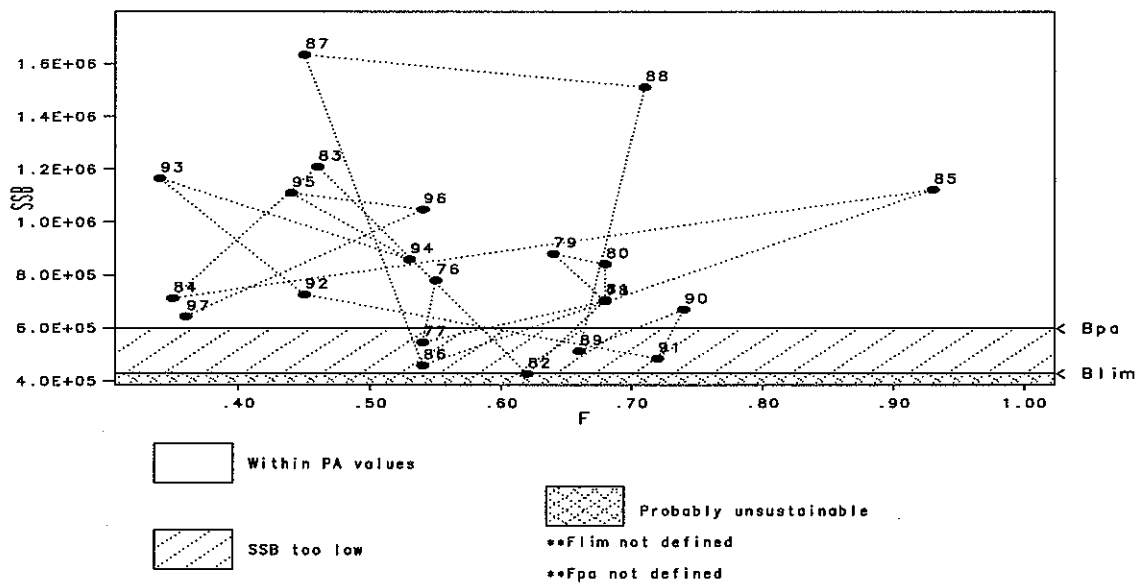


Table 3.5.13.1 Landings ('000 t) of sandeel from the North Sea, 1952-1997.
(Data provided by Working Group members.)

Year	Denmark	Germany	Faroes	Netherlands	Norway	Sweden	UK	Total
1952	1.6	-	-	-	-	-	-	1.6
1953	4.5	+	-	-	-	-	-	4.5
1954	10.8	+	-	-	-	-	-	10.8
1955	37.6	+	-	-	-	-	-	37.6
1956	81.9	5.3	-	+	1.5	-	-	88.7
1957	73.3	25.5	-	3.7	3.2	-	-	105.7
1958	74.4	20.2	-	1.5	4.8	-	-	100.9
1959	77.1	17.4	-	5.1	8.0	-	-	107.6
1960	100.8	7.7	-	+	12.1	-	-	120.6
1961	73.6	4.5	-	+	5.1	-	-	83.2
1962	97.4	1.4	-	-	10.5	-	-	109.3
1963	134.4	16.4	-	-	11.5	-	-	162.3
1964	104.7	12.9	-	-	10.4	-	-	128.0
1965	123.6	2.1	-	-	4.9	-	-	130.6
1966	138.5	4.4	-	-	0.2	-	-	143.1
1967	187.4	0.3	-	-	1.0	-	-	188.7
1968	193.6	+	-	-	0.1	-	-	193.7
1969	112.8	+	-	-	-	-	0.5	113.3
1970	187.8	+	-	-	+	-	3.6	191.4
1971	371.6	0.1	-	-	2.1	-	8.3	382.1
1972	329.0	+	-	-	18.6	8.8	2.1	358.5
1973	273.0	-	1.4	-	17.2	1.1	4.2	296.9
1974	424.1	-	6.4	-	78.6	0.2	15.5	524.8
1975	355.6	-	4.9	-	54.0	0.1	13.6	428.2
1976	424.7	-	-	-	44.2	-	18.7	487.6
1977	664.3	-	11.4	-	78.7	5.7	25.5	785.6
1978	647.5	-	12.1	-	93.5	1.2	32.5	786.8
1979	449.8	-	13.2	-	101.4	-	13.4	577.8
1980	542.2	-	7.2	-	144.8	-	34.3	728.5
1981	464.4	-	4.9	-	52.6	-	46.7	568.6
1982	506.9	-	4.9	-	46.5	0.4	52.2	610.9
1983	485.1	-	2	-	12.2	0.2	37	536.5
1984	596.3	-	11.3	-	28.3	-	32.6	668.6
1985	587.6	-	3.9	-	13.1	-	17.2	621.8
1986	752.5	-	1.2	-	82.1	-	12	847.8
1987	605.4	-	18.6	-	193.4	-	7.2	824.6
1988	686.4	-	15.5	-	185.1	-	5.8	892.8
1989	824.4	-	16.6	-	186.8	-	11.5	1039.1
1990	496.0	-	2.2	0.3	88.9	-	3.9	591.3
1991	701.4	-	11.2	-	128.8	-	1.2	842.6
1992	751.1	-	9.1	-	89.3	0.5	4.9	855.0
1993	482.2	-	-	-	95.5	-	1.5	579.2
1994	603.5	-	10.3	-	165.8	-	5.9	765.5
1995	647.8	-	-	-	263.4	-	6.7	917.9
1996	669.1	-	5	-	160.7	-	9.7	834.8
1997	751.9	-	11.2	-	350.1	-	26.6	1139.8

+ = less than half unit.

- = no information or no catch.

Table 3.5.13.2 Annual landings ('000 t) of Sandeels by area of the North Sea (Denmark, Norway and UK (Scotland)).
Data provided by Working Group members (Figure 3.5.13.1).

Year	Area										Assessment Areas ¹		
	1A	1B	1C	2A	2B	2C	3	4	5 ²	6	Shetland	Northern	Southern
1972	98.8	28.1	3.9	24.5	85.1	0.0	13.5	58.3	6.7	28.0	0.0	130.6	216.3
1973	59.3	37.1	1.2	16.4	60.6	0.0	8.7	37.4	9.6	59.7	0.0	107.6	182.4
1974	50.4	178.0	1.7	2.2	177.9	0.0	29.0	27.4	11.7	25.4	7.4	386.6	117.1
1975	70.0	38.2	17.8	12.2	154.7	4.8	38.2	42.8	12.3	19.2	12.9	253.7	156.5
1976	154.0	3.5	39.7	71.8	38.5	3.1	50.2	59.2	8.9	36.7	20.2	135.0	330.6
1977	171.9	34.0	62.0	154.1	179.7	1.3	71.4	28.0	13.0	25.3	21.5	348.4	392.3
1978	159.7	50.2		346.5	70.3		42.5	37.4	6.4	27.2	28.1	163.0	577.2
1979	194.5	0.9	61.0	32.3	27.0	72.3	34.1	79.4	5.4	44.3	13.4	195.3	355.9
1980	215.1	3.3	119.3	89.5	52.4	27.0	90.0	30.8	8.7	57.1	25.4	292.0	401.2
1981	105.2	0.1	42.8	151.9	11.7	23.9	59.6	63.4	13.3	45.1	46.7	138.1	378.9
1982	189.8	5.4	4.4	132.1	24.9	2.3	37.4	75.7	6.9	74.7	52.0	74.4	479.2
1983	197.4	-	2.8	59.4	17.7	-	57.7	87.6	8.0	66.0	37.0	78.2	419.0
1984	337.8	4.1	5.9	74.9	30.4	0.1	51.3	56.0	3.9	60.2	32.6	91.8	532.8
1985	281.4	46.9	2.8	82.3	7.1	0.1	29.9	46.6	18.7	84.5	17.2	79.7	513.5
1986	295.2	35.7	8.5	55.3	244.1	2.0	84.8	22.5	4.0	80.3	14.0	375.1	457.4
1987	275.1	63.6	1.1	53.5	325.2	0.4	5.6	21.4	7.7	45.1	7.2	395.9	402.8
1988	291.1	58.4	2.0	47.0	256.5	0.3	37.6	35.3	12.0	102.2	4.7	384.8	487.6
1989	228.3	31.0	0.5	167.9	334.1	1.5	125.3	30.5	4.5	95.1	3.5	492.4	526.3
1990	141.4	1.4	0.1	80.4	156.4	0.6	61.0	45.5	13.8	85.5	2.3	219.5	366.7
1991	228.2	7.1	0.7	114.0	252.8	1.8	110.5	22.6	1.0	93.1	+	372.9	458.9
1992	422.4	3.9	4.2	168.9	67.1	0.3	101.2	20.1	2.8	54.4	0	176.7	668.6
1993	196.5	21.9	0.1	26.2	164.9	0.3	88.0	26.6	3.9	48.7	0	276.0	301.9
1994	157.0	108.6	-	61.7	203.4	2.7	175.0	16.0	2.8	42.0	0	489.7	279.5
1995	322.4	43.9	147.4	86.7	169.5	1.0	59.4	26.6	5.3	55.8	1.2	421.2	496.8
1996	310.5	18.6	31.2	40.8	153.0	4.5	134.1	12.7	3.0	52.5	1.0	341.2	419.5
1997	352.0	53.3	8.9	92.8	390.5	1.2	112.9	18.1	4.7	88.6	2.1	566.8	535.8
1998 ²	270.4	55.4	2.0	85.3	254.3	1.0	35.2	24.9	2.9	38.4	-	347.9	421.9

¹Assessment areas: Northern - Areas 1B, 1C, 2B, 2C, 3.
 Southern - Areas 1A, 2A, 4, 5, 6.

²Only January-June included.

Table 3.5.13.3 Sandeel in the North Sea (Fishing Area IV).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 1-2
1976	487,000.00	780.00	487.60	0.550
1977	657,000.00	546.00	785.60	0.540
1978	532,000.00	701.00	786.80	0.680
1979	543,000.00	881.00	577.80	0.640
1980	213,000.00	841.00	728.50	0.680
1981	985,000.00	706.00	568.60	0.680
1982	201,000.00	427.00	610.90	0.620
1983	870,000.00	1,210.00	536.50	0.460
1984	228,000.00	712.00	668.60	0.350
1985	1206000.00	1,123.00	621.80	0.930
1986	630,000.00	459.00	847.80	0.540
1987	200,000.00	1,634.00	824.60	0.450
1988	724,000.00	1,511.00	892.80	0.710
1989	332,000.00	513.00	1,039.10	0.660
1990	652,000.00	670.00	591.30	0.740
1991	830,000.00	485.00	842.60	0.720
1992	325,000.00	726.00	855.00	0.450
1993	634,000.00	1,165.00	579.20	0.340
1994	812,000.00	859.00	765.50	0.530
1995	366,000.00	1,110.00	917.90	0.440
1996	2069000.00	1,048.00	834.80	0.540
1997	198,000.00	643.00	1,139.80	0.360
1998	.	1,829.00	.	.
Average	622,454.55	894.74	750.14	0.573
Unit	Millions	1000 tonnes	1000 tonnes	-

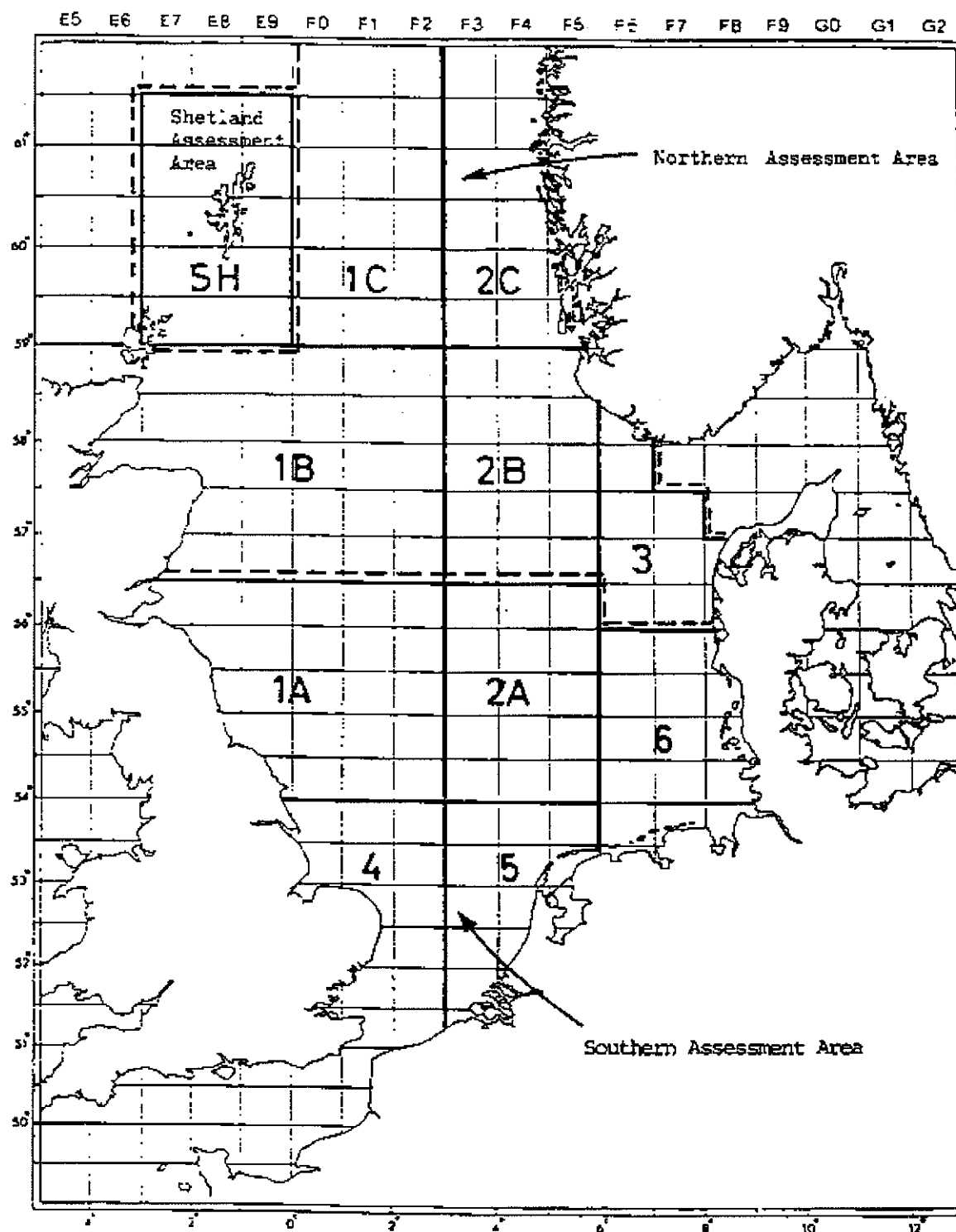


Figure 3.5.13.1 Danish Sandeel areas and assessment areas used by Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak.

3.5.13.b Sandeel in the Shetland area

State of stock/fishery: The exploitation rate is very low and the stock variations are largely driven by natural processes.

Management objectives: The Shetland sandeel fishery was re-opened at the start of the 1998 season subject to a new multi-annual regime. This consists of an annual

TAC of 7 000 t and closure during the months of June and July. The seasonal closure is to avoid any possibility of direct competition between the fishery and seabirds during the chick-rearing season. There is also a limit on vessel size to boats of 20 m or less. These arrangements are intended to stay in place for the next three years.

Reference points:

ICES considers that:	ICES proposes that
There is not sufficient information to estimate appropriate reference points.	

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. For some seabird species the availability of 0-group sandeels is the most important consideration. In some years most of the recruitment comes from spawning areas away from Shetland. The availability of 0-group sandeels is, therefore, not closely linked to the local spawning population. The sandeel population is also an important food source for other predator species in the Shetland area.

Elaboration and special comment: No new assessment has been carried out in 1998. SSB reached its highest level in the early 1980s following a sustained period of high recruitment. Subsequently, recruitment declined, leading to a decline in SSB to its lowest level in 1991, when the fishery was closed. Recruitment since 1991 has

shown more year to year variation than in the early 1980s, but the stock has recovered due to a few strong year classes. Fishing mortality has been very low since the fishery was re-opened in 1995. The survey index for the 1997 year class indicates that it is very strong; in contrast this year class appears weak in the rest of the North Sea.

The assessment is based largely on survey data, and is highly uncertain, but is probably indicative of overall trends in the stock. The sandeel population at Shetland is not a unit stock, but forms part of a larger complex of sub-populations. Estimates of the consumption of sandeels by seabirds and other predators greatly exceeds the quantities taken by the fishery in recent years.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catches in the total North Sea are given in Table 3.5.13.1.

Year	ICES advice	Predicted Catch corresp. to advice	Agreed TAC	ACFM catch
1987	No advice	-		7.2
1988	No advice	-		4.7
1989	No advice	-		3.5
1990	No advice	-		2.3
1991	Low fishing	-		+
1992	No fishing prudent	-		-
1993	No fishing prudent	-		-
1994	TAC	3		-
1995	TAC	3		1.2
1996	No advice	-	3	1.0
1997	No advice	-		2.1
1998	No advice	-		
1999	No advice	-		

Weights in '000 t.

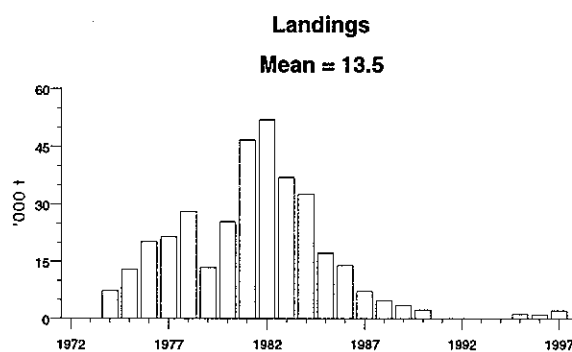


Table 3.5.13.1 Landings ('000 t) of sandeel from the North Sea, 1952–1997. (Data provided by Working Group members.)

Year	Denmark	Germany	Faroes	Netherlands	Norway	Sweden	UK	Total
1952	1.6	-	-	-	-	-	-	1.6
1953	4.5	+	-	-	-	-	-	4.5
1954	10.8	+	-	-	-	-	-	10.8
1955	37.6	+	-	-	-	-	-	37.6
1956	81.9	5.3	-	+	1.5	-	-	88.7
1957	73.3	25.5	-	3.7	3.2	-	-	105.7
1958	74.4	20.2	-	1.5	4.8	-	-	100.9
1959	77.1	17.4	-	5.1	8.0	-	-	107.6
1960	100.8	7.7	-	+	12.1	-	-	120.6
1961	73.6	4.5	-	+	5.1	-	-	83.2
1962	97.4	1.4	-	-	10.5	-	-	109.3
1963	134.4	16.4	-	-	11.5	-	-	162.3
1964	104.7	12.9	-	-	10.4	-	-	128.0
1965	123.6	2.1	-	-	4.9	-	-	130.6
1966	138.5	4.4	-	-	0.2	-	-	143.1
1967	187.4	0.3	-	-	1.0	-	-	188.7
1968	193.6	+	-	-	0.1	-	-	193.7
1969	112.8	+	-	-	-	-	0.5	113.3
1970	187.8	+	-	-	+	-	3.6	191.4
1971	371.6	0.1	-	-	2.1	-	8.3	382.1
1972	329.0	+	-	-	18.6	8.8	2.1	358.5
1973	273.0	-	1.4	-	17.2	1.1	4.2	296.9
1974	424.1	-	6.4	-	78.6	0.2	15.5	524.8
1975	355.6	-	4.9	-	54.0	0.1	13.6	428.2
1976	424.7	-	-	-	44.2	-	18.7	487.6
1977	664.3	-	11.4	-	78.7	5.7	25.5	785.6
1978	647.5	-	12.1	-	93.5	1.2	32.5	786.8
1979	449.8	-	13.2	-	101.4	-	13.4	577.8
1980	542.2	-	7.2	-	144.8	-	34.3	728.5
1981	464.4	-	4.9	-	52.6	-	46.7	568.6
1982	506.9	-	4.9	-	46.5	0.4	52.2	610.9
1983	485.1	-	2	-	12.2	0.2	37	536.5
1984	596.3	-	11.3	-	28.3	-	32.6	668.6
1985	587.6	-	3.9	-	13.1	-	17.2	621.8
1986	752.5	-	1.2	-	82.1	-	12	847.8
1987	605.4	-	18.6	-	193.4	-	7.2	824.6
1988	686.4	-	15.5	-	185.1	-	5.8	892.8
1989	824.4	-	16.6	-	186.8	-	11.5	1039.1
1990	496.0	-	2.2	0.3	88.9	-	3.9	591.3
1991	701.4	-	11.2	-	128.8	-	1.2	842.6
1992	751.1	-	9.1	-	89.3	0.5	4.9	855.0
1993	482.2	-	-	-	95.5	-	1.5	579.2
1994	603.5	-	10.3	-	165.8	-	5.9	765.5
1995	647.8	-	-	-	263.4	-	6.7	917.9
1996	669.1	-	5	-	160.7	-	9.7	834.8
1997	751.9	-	11.2	-	350.1	-	26.6	1139.8

+ = less than half unit.

- = no information or no catch.

3.5.14 *Pandalus borealis*

3.5.14.a *Pandalus borealis* in Division IVa Fladen Ground

State of stock/fishery: Not known.

Reference point:

ICES considers that:	ICES proposes that:
	B_{pa} be set at 12 000 t, the lowest observed SSB. Recruitment has not been observed to decline at SSB in that region under present environmental conditions.

Technical basis:

B_{lim} not identified	B_{pa} examination of stock-recruit data; lowest observed SSB
F_{lim} not identified	F_{pa} not identified

Additional Considerations: In *Pandalus* stocks production is strongly influenced by environmental conditions, which may vary on medium and long time scales. Also, natural mortality rates can be strongly influenced by predator abundance, which can be variable as well. In such cases it is particularly important that biomass reference points should consider the effects of environmental variation as well as SSB on recruitment, and mortality reference points should consider the effects of predation mortality as well as fishing mortality.

For this stock recruitment at age 1 has varied by one order of magnitude since 1984, the beginning of the time series. Because of the lack of decline in recruitment at lowest observed SSBs, the SSB at which recruitment is impaired is unknown. Therefore no biologically-based B_{lim} can be identified.

Because of the potentially large impact of predation mortality on stock dynamics and total mortality rates, the biological consequences of any specific fishing mortality rate can be highly variable. At low predator abundance, even a relatively low F may be a high proportion of Z (total mortality), whereas at high predator abundance, a higher F may still be a small part of Z . It is not yet possible to identify appropriate precautionary fishing mortality reference points (F_{lim} , F_{pa}) for such circumstances, and reference points based on total mortality may be more biologically sound.

Relevant factors to be considered in management: The fishery is highly dependant on year class strength. Only age groups I and II are caught.

Source of information: Report of the *Pandalus* Assessment Working Group, September 1998 (ICES CM 1999/ACFM:5).

Catch data (Table 3.5.14.a.1):

Year	ICES advice	ACFM landings
1987	Not assessed	8.0
1988	Large fluctuations of stock at current F and mesh size	1.2
1989	Large fluctuations of stock at current F	3.0
1990	No advice	2.1
1991	No advice	0.5
1992	No advice	1.6
1993	No advice	2.1
1994	No advice	1.2
1995	No advice	5.3
1996	No advice	5.7
1997	No advice	3.3
1998	No advice	
1999	No advice	

Weights in '000 t.

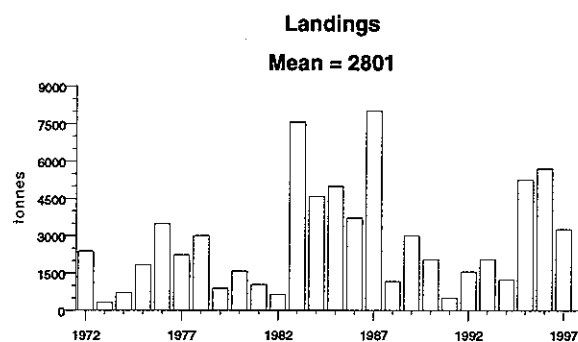


Table 3.5.14.a.1 Landings in tonnes of *Pandalus borealis* from the Fladen Ground (Division IVa) as estimated by the Study Group

Year	Denmark	Sweden	Norway	UK (Scotland)	Total
1972	2204			187	2391
1973	157			163	320
1974	282			434	716
1975	1308			525	1833
1976	1552			1937	3489
1977	425		112	1692	2229
1978	890		81	2027	2998
1979	565		44	268	877
1980	1122		76	377	1575
1981	685		1	347	1033
1982	283			352	635
1983	5729		8	1827	7564
1984	4553		13	25	4591
1985	3649			1341	4990
1986	3416			301	3717
1987	7326			686	8012
1988	1077		2	84	1163
1989	2438		25	547	3010
1990	1681	4	3	365	2053
1991	422		31	53	506
1992	1448			116	1564
1993	1521		38	509	2068
1994	1207		0	35	1242
1995	4578		30	657	5265
1996	3858		32	1823	5713
1997	2892		9	365	3266

3.5.14.b *Pandalus borealis* in Division IVb Farn Deep

State of stock/fishery: Not known.

Reference point:

ICES considers that:	ICES proposes that:
	B_{pa} be set at 12 000 t, the lowest observed SSB. Recruitment has not been observed to decline at SSB in that region under present environmental conditions.

Technical Basis:

B_{lim} not identified	B_{pa} examination of stock-recruit data; lowest observed SSB
F_{lim} not identified	F_{pa} - not identified

Additional Considerations: In *Pandalus* stocks production is strongly influenced by environmental conditions, which may vary on medium and long time scales. Also, natural mortality rates can be strongly influenced by predator abundance, which can be variable as well. In such cases it is particularly important that biomass reference points should consider the effects of environmental variation as well as SSB on recruitment, and mortality reference points should consider the effects of predation mortality as well as fishing mortality.

For this stock recruitment at age 1 has varied by one order of magnitude since 1984, the beginning of the time series. Because of the lack of decline in recruitment at lowest observed SSBs, the SSB at which recruitment is impaired is unknown. Therefore no biologically-based B_{lim} can be identified.

Because of the potentially large impact of predation mortality on stock dynamics and total mortality rates, the biological consequences of any specific fishing mortality rate can be highly variable. At low predator abundance, even a relatively low F may be a high proportion of Z (total mortality), whereas at high predator abundance, a higher F may still be a small part of Z . It is not yet possible to identify appropriate precautionary fishing mortality reference points (F_{lim} , F_{pa}) for such circumstances, and reference points based on total mortality may be more biologically sound.

Source of information: Report of the *Pandalus* Assessment Working Group, September 1998 (ICES CM 1999/ACFM:5).

Catch data (Table 3.5.14.b.1):

Year	ICES advice	ACFM landings
1987	Not assessed	0.39
1988	Not assessed	0.50
1989	Not assessed	0.25
1990	No advice	0.15
1991	No advice	0.00
1992	No advice	0.00
1993	No advice	0.00
1994	No advice	0.00
1995	No advice	0.17
1996	No advice	0.06
1997	No advice	0.01
1998	No advice	
1999	No advice	

Weights in '000 t.

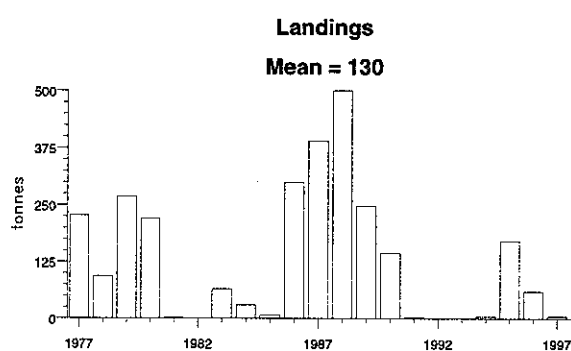


Table 3.5.14.b.1 Landings (t) of *Pandalus borealis* from Division IVb, the Farn Deeps as estimated by the Working Group.

Year	UK (England)	UK (Scotland)	Denmark	Total
1977	227		No data	
1978	91	2	-	93
1979	235	34	-	269
1980	203	17	-	220
1981	1		-	1
1982			-	0
1983	65		-	65
1984	30		-	30
1985	2	6	-	8
1986	137	57	106	300
1987	212	86	92	390
1988	91	25	384	500
1989	168	8	72	248
1990	144	+	1	145
1991	3			3
1992	1			1
1993				0
1994	4			4
1995	171			171
1996	58	2		60
1997	5			5

3.6 Stocks in the Eastern English Channel (Division VIId)

3.6.1 Overview

Major fleets

A large proportion of the Eastern Channel is in the coastal zone (12 miles zone) which is 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. It is a by-catch in the 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 stabilised.

There are no separate TACs for cod and whiting in Division VIId but they are part of a total TAC for the whole of Sub-area VII excluding Division VIIa. Sole is managed by a TAC for the Division and plaice is managed by a TAC, which includes Division VIIe. 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.

In plaice, the spawning stock has been constant since 1992 and the fishing mortality varies considerable in recent years but seems to have declined from the eighties. The stock is considered close to safe biological limits. Although the spawning biomass of the sole stock is above average, the exploitation rate is considered 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 VIIId (Eastern English Channel)

State of stock/fishery: The stock is considered to be outside safe biological limits. The SSB is above the proposed B_{pa} , but the fishing mortality is considered to be unsustainable. Fishing mortality has increased in recent years and is high although there is uncertainty about the precise level as a result of inconsistencies in the data. The observed increase in fishing mortality, since 1993, is in line with the increase in effort in the main fleets.

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} .

Advice on management: ICES recommends that F be reduced to the proposed F_{pa} , corresponding to landings in 1999 of 3 800 t.

Reference points:

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} , taking into account the uncertainty of the assessment.

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.

Relevant factors to be considered in management: A large 1996 year class is predicted from recruit surveys. It

may maintain the SSB above 9 000 t up to the year 2000, providing fishing mortality does not increase.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.45$; Landings(98) = 4.1; SSB(99) = 9.7

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium-term effect of fishing at given level
0.36	$0.8 F_{98}$		3.5	9.9	high probability of $SSB > B_{pa}$
0.40	F_{pa}		3.8	9.5	high probability of $SSB > B_{pa}$
0.45	$1.0 F_{98}$		4.2	9.2	
0.49	$1.1 F_{98}$		4.5	8.9	

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

Elaboration and special comment: There are 5 main commercial fleets fishing for sole in Division VIIId: Belgian and English offshore beam trawlers (> 300 HP) which fish mainly for sole and also take plaice; French offshore trawlers targeting roundfish and taking sole as by-catch; and numerous inshore < 10 m boats on the English and French coasts using mainly fixed nets and targeting sole in the spring and autumn. The minimum mesh size for trawls was increased from 75 mm to 80 mm in 1989.

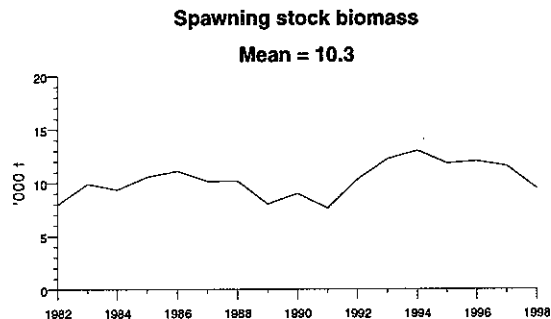
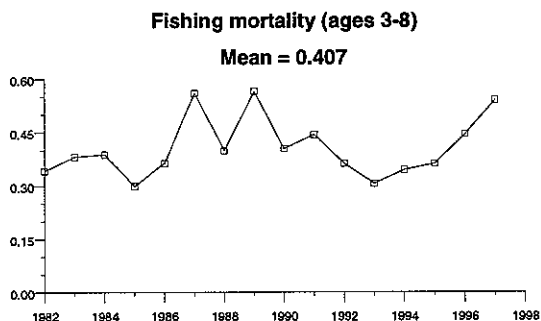
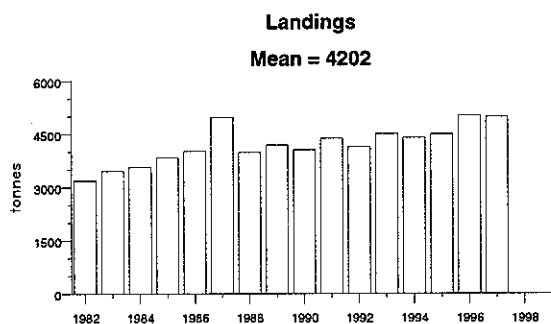
Analytical assessment using catch-at-age and CPUE data from commercial fleets and surveys, but considered uncertain due to lack of historical perspective in the data and noise in the catch and effort series for the fleets.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Table 3.6.2.1-2):

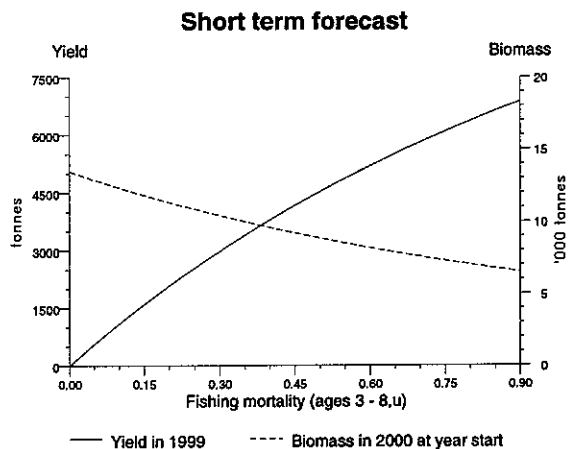
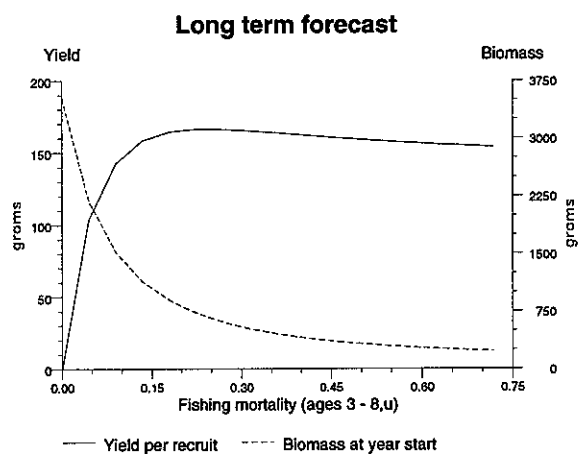
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Precautionary TAC	3.1	3.85	3.8	5.0
1988	<i>Status quo</i> (Shot) TAC	3.4	3.85	3.3	4.0
1989	<i>Status quo</i> (Shot) TAC	3.8	3.85	2.9	4.2
1990	No effort increase; TAC	3.7	3.85	3.0	4.1
1991	<i>Status quo</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	4.4
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		
1999	Reduced F to F _{pa}	3.8 ¹			

Weights in '000 t. ¹Catch *status quo* F.

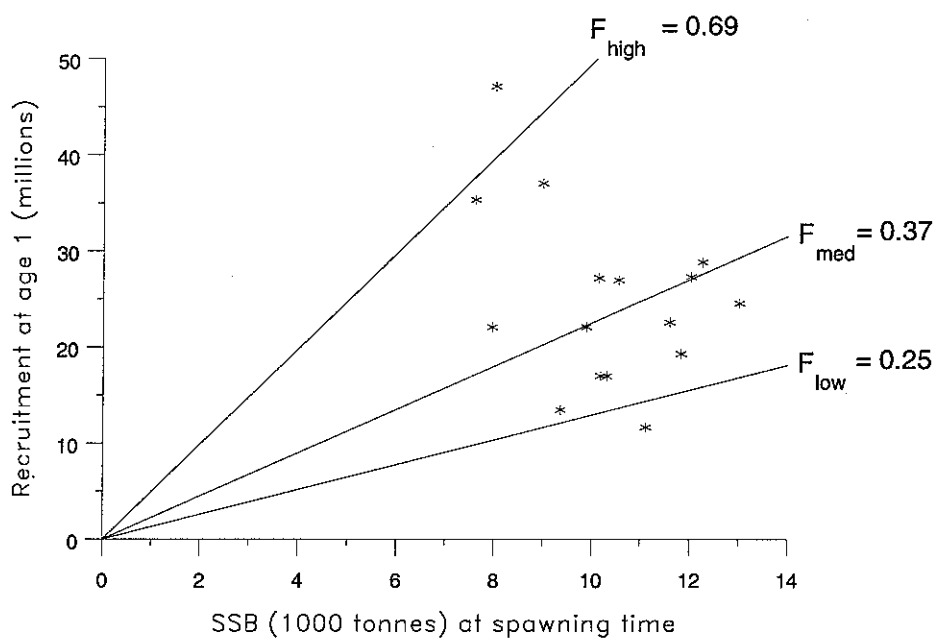


Sole in Division VIIId

Yield and Spawning Stock Biomass



Stock - Recruitment



(run: XSARIC02)

Precautionary Approach Plot

Sole, Eastern English Channel (Fishing Area VIId)

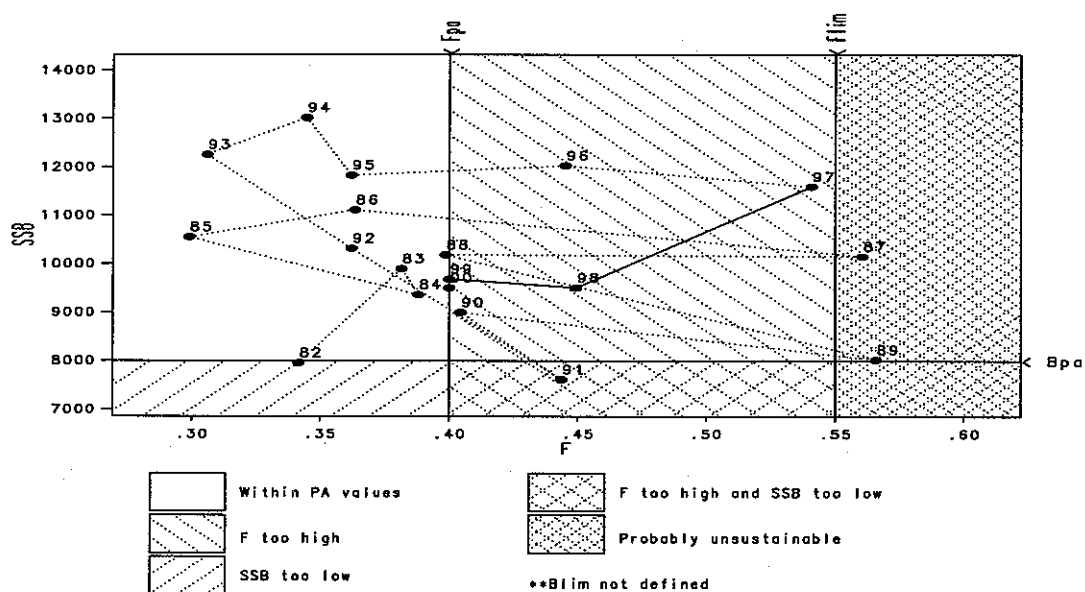


Table 3.6.2.1 Sole in VIId. Nominal landings (tonnes) as officially reported to ICES and used by the WG.

Year	Belgium	France	UK (E&W)	Others	Total reported	Unallocated ¹	Total used by WG
1974	159	469	309	3	940	-56	884
1975	132	464	244	1	841	41	882
1976	203	599	404	.	1206	99	1305
1977	225	737	315	.	1277	58	1335
1978	241	782	366	.	1389	200	1589
1979	311	1129	402	.	1842	373	2215
1980	302	1075	159	.	1536	387	1923
1981	464	1513	160	.	2137	340	2477
1982	525	1828	317	4	2674	516	3190
1983	502	1120	419	.	2041	1417	3458
1984	592	1309	505	.	2406	1169	3575
1985	568	2545	520	.	3633	204	3837
1986	858	1528	551	.	2937	1087	4024
1987	1100	2086	655	.	3841	1133	4974
1988	667	2057	578	.	3302	680	3982
1989	646	1610	689	.	2945	1242	4187
1990	996	1255	742	.	2993	1067	4060
1991	904	2054 ²	826	-	3784	598	4382
1992	891	2187 ²	706	10	3794	348	4142
1993	917	2322 ²	610	13	3862	649	4511
1994	940	2382 ²	701	14	4037	366	4403
1995	817	2248 ²	669	9	3743	760	4503
1996	899	2335 ²	877	-	4111	914	5025
1997 ²	1306	1609 ²	933	-	3848	1135	4983

¹Unallocated mainly includes official landings reported late by some countries²Provisional

Table 3.6.2.2 Sole in the Eastern English Channel (Fishing Area VIId).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-8
1982	13.13	7.95	3.19	0.342
1983	22.09	9.89	3.46	0.382
1984	22.10	9.36	3.58	0.388
1985	13.47	10.55	3.84	0.299
1986	26.97	11.11	4.02	0.363
1987	11.65	10.15	4.97	0.560
1988	27.19	10.18	3.98	0.399
1989	17.01	8.02	4.19	0.566
1990	47.11	8.99	4.06	0.404
1991	37.06	7.61	4.38	0.444
1992	35.33	10.32	4.14	0.362
1993	16.99	12.25	4.51	0.306
1994	28.84	13.02	4.40	0.345
1995	24.56	11.83	4.50	0.362
1996	19.31	12.02	5.03	0.445
1997	27.30	11.59	4.98	0.541
1998	22.60	9.50	.	.
Average	24.28	10.26	4.20	0.407
Unit	Millions	1000 tonnes	1000 tonnes	-

3.6.3 Plaice in Division VIIId (Eastern English Channel)

State of stock/fishery: The state of the stock is uncertain but is probably close to safe biological limits. SSB has remained constant since 1992 near 9 000 t above the proposed B_{pa} . Fishing mortality is estimated to be slightly 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 F_{pa} and to increase or maintain spawning stock biomass above B_{pa} .

Advice on management: ICES recommends that fishing mortality should not be allowed to increase. The expected landings in 1999 corresponding to F at F_{pa} are 6 300 t.

Reference points:

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.

Relevant factors to be considered in management:
The TAC is set for Divisions VIIId and VIIe

combined. The Division VIIe stock is considered to be outside safe biological limits.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.47$; Landings(98) = 6.5; SSB(99) = 10.5.

F(99 onwards)	Basis	Catch (99)	Landings (99)	SSB (2000)	Medium-term effect of fishing at given level
0.37	0.8 $F(95-97)$		5.4	11.8	Low probability of SSB < B_{pa}
0.45	F_{pa}		6.3	11.0	Low probability of SSB < B_{pa}
0.50	1.1 $F(95-97)$		6.9	10.5	Low probability of SSB < B_{pa}
0.56	1.2 $F(95-97)$		7.5	9.9	High probability of SSB < B_{pa}

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

Elaboration and special comments: In the Channel, plaice are taken mainly in a mixed flatfish fishery by otter and beam trawlers. French offshore otter trawlers have a directed fishery in winter. Large numbers of plaice are discarded.

SSB is now estimated to have been fairly stable through the 1990s and recent fishing mortalities are now thought to be lower than in last year's assessment. The high estimate of F in 1997 is considered to be uncertain.

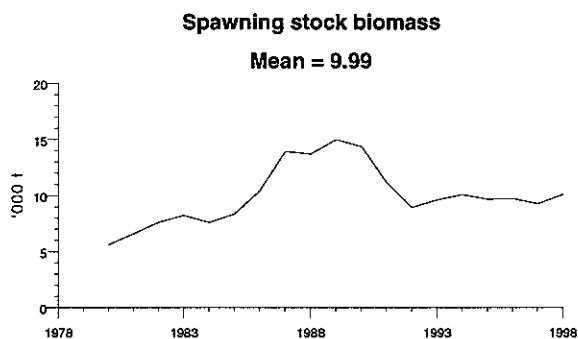
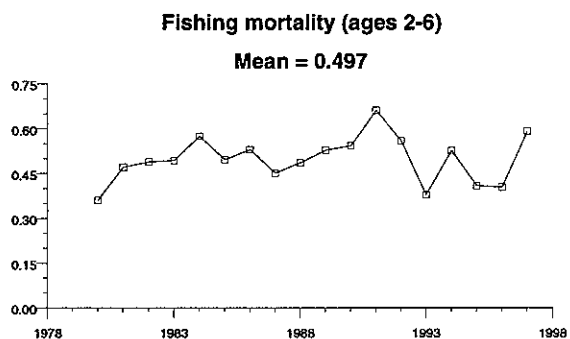
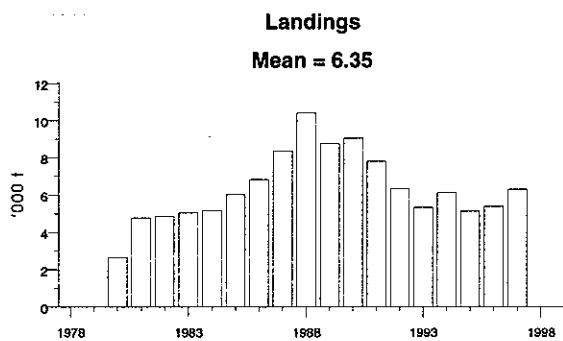
Analytical assessment using CPUE data from 3 commercial fleets and 4 surveys. The time series is short and data prior to 1985 are considered to be unreliable. Discards are not included in the assessment. The fishing mortality and SSB are poorly estimated.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998 (ICES CM 1999/ACFM:8).

Catch data (Tables 3.6.3.1–2):

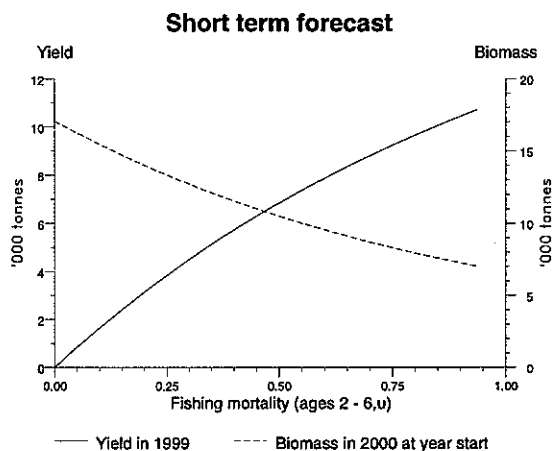
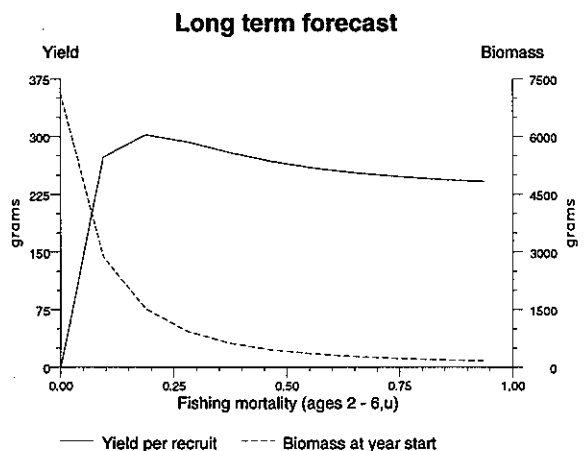
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings ²	ACFM landings
1987	Precautionary TAC ¹	6.8 ¹	8.3	7.9	8.4
1988	Precautionary TAC ¹	6.9 ¹	9.96	9.1	10.4
1989	No increase in effort ¹	11.7 ¹	11.7	6.7	8.8
1990	No increase in F; TAC	10.7	10.7	7.8	9.0
1991	TAC	8.8	10.7	7.4	7.8
1992	Status quo F gives mean SSB	7.6 ³	9.6	6.2	6.3
1993	Within safe biological limits	6.4 ³	8.5	4.8	5.3
1994	No long-term gains in increased F	-	9.1	5.2	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	5.2	6.3
1998	Reduce F in 98 by 30% from 96 value	4.3	5.7		
1999	Fishing at F_{pa}	6.3			

¹TACs for Divisions VII d,e. ²For France Division VII d landings are estimated by ACFM. ³Catch at *status quo* F. Weights in '000 t.

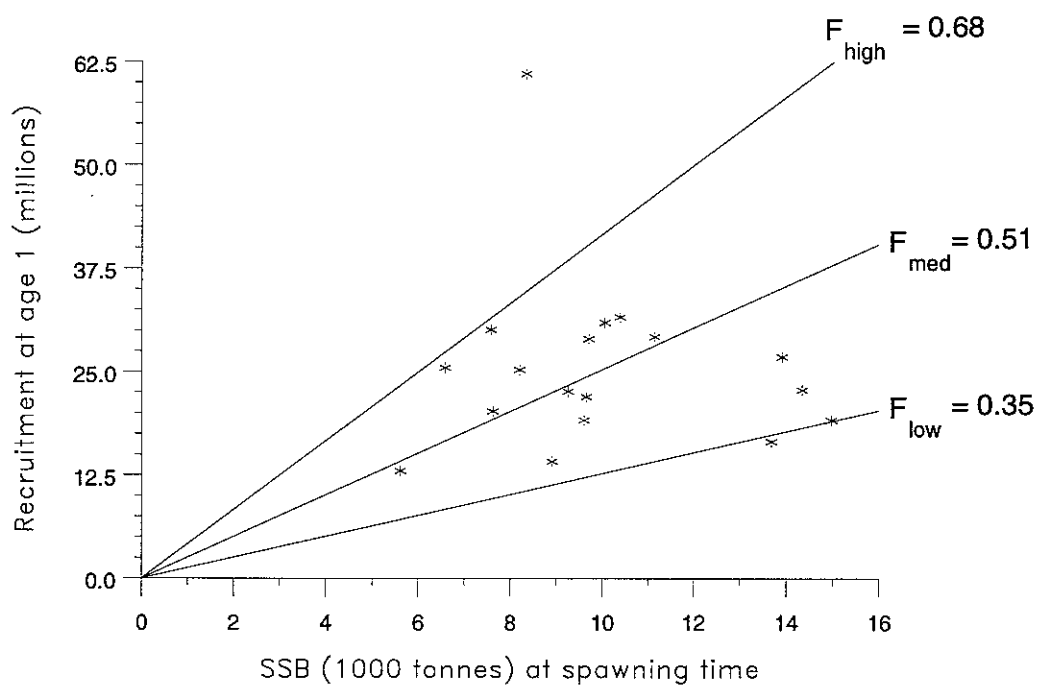


Plaice in Division VIIId

Yield and Spawning Stock Biomass



Stock - Recruitment



(run: XSAATT03)

Precautionary Approach Plot

Plaice, Eastern English Channel (Fishing Area VIId)

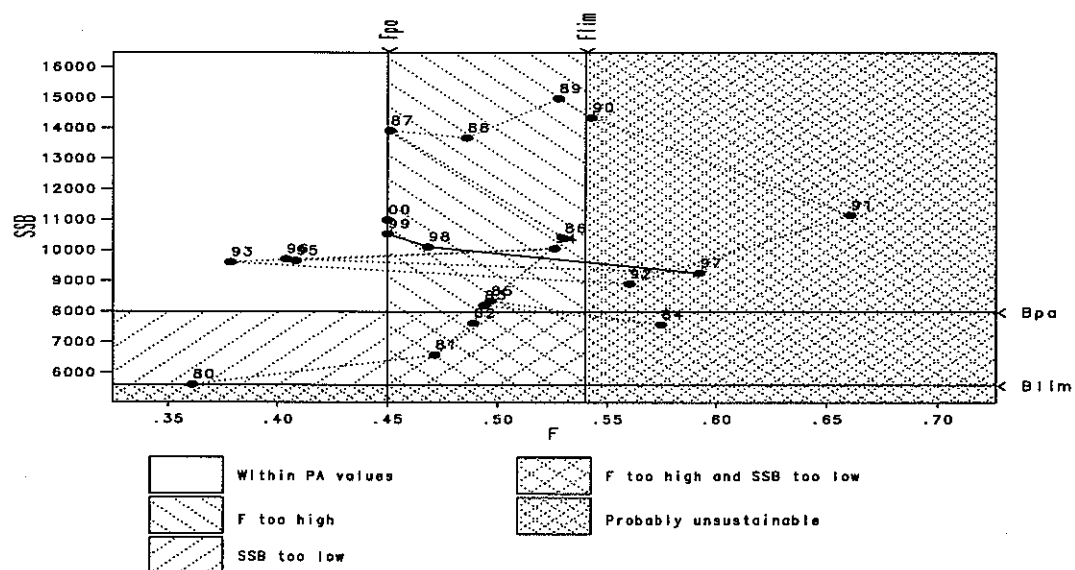


Table 3.6.3.1 Plaice in Division VIId. Nominal landings (tonnes) as officially reported to ICES, 1976–1997.

Year	Belgium	Denmark	France	UK (E+W)	Others	Total reported	Unallocated	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 ^{1,3}	1,383	-	6,667	2,091	8,758
1990	2,149	-	4,170 ^{1,3}	1,479	-	7,798	1,249	9,047
1991	2,265	-	3,606 ^{1,3}	1,566	-	7,437	376	7,813
1992	1,560	1	3,099 ³	1,553	19	6,232	105	6,337
1993	0,877	+ ²	2,792 ³	1,075	27	4,771	560	5,331
1994	1,418	+	3,199 ³	993	23	5,633	488	6,121
1995	1,157	-	2,598 ³	796	18	4,569	561	5,130
1996	1,112	-	2,631 ³	856	+	4,599	794	5,393
1997	1,161	-	3,002 ^{1,3}	1,078	+	5,241	1,066	6,307

¹Estimated by the Working Group from combined Division VIId+e.²Includes Division VIIe.³Provisional.**Table 3.6.3.2** Plaice in the Eastern English Channel (Fishing Area VIId).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1980	25.65	5.61	2.65	0.361
1981	12.98	6.59	4.77	0.471
1982	25.48	7.62	4.87	0.489
1983	20.23	8.21	5.04	0.494
1984	25.24	7.58	5.16	0.575
1985	30.09	8.35	6.02	0.497
1986	61.03	10.40	6.83	0.530
1987	31.63	13.92	8.37	0.451
1988	26.80	13.69	10.42	0.486
1989	16.54	14.98	8.76	0.528
1990	19.14	14.35	9.05	0.543
1991	22.79	11.16	7.81	0.661
1992	29.25	8.91	6.34	0.560
1993	14.15	9.61	5.33	0.379
1994	19.14	10.07	6.12	0.526
1995	30.95	9.66	5.13	0.408
1996	21.96	9.72	5.39	0.404
1997	28.98	9.27	6.31	0.592
1998	22.61	10.11	.	.
Average	25.51	9.99	6.35	0.497
Unit	Millions	1000 tonnes	1000 tonnes	-

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. These trawlers use mesh sizes of 80–100 mm depending on area and may at times discard considerable amounts of young haddock and whiting. The majority of these vessels 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 which 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. Although young saithe are caught by coastal trawlers, 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, using 70 mm mesh with 80 mm square mesh panel. 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 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 in 1997. 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, Hebrides and Faroe. By-catches in this fishery are very small. The Norway pout fishery is conducted mainly by Danish vessels.

State of stocks

This year, ICES introduced a new definition of safe biological limits, with reference to precautionary biomass and fishing mortality reference points.

The assessments of demersal and herring stocks in Sub-area 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, haddock, 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 depletion of the saithe stock in Area VI is closely mirrored by the trends in the North Sea stock, whilst the pattern of haddock recruitment in the two areas is very similar.

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

The stock of saithe and cod in 1998 remain at or close to their lowest recorded spawning stock levels. They are considered to be outside safe biological limits and subject to rates of fishing mortality that are not sustainable in the longer term. The saithe stock has been depleted to a level at which recruitment has been impaired on average, and all year classes since 1984 have been close to or below average.

The haddock spawning stock in Division VIa remained in 1998 at about double the low values recorded in 1991, and was thus above B_{pa} . Although fishing mortality on this stock has decreased in recent years, it

still exceeds F_{pa} . The spawning biomass in Division VIb in 1996 was slightly below the proposed B_{pa} for this stock, and fishing mortality was slightly in excess of F_{pa} .

This year's assessment of the whiting stock in Division VIa used a methodology designed to address the problems with discard and survey data for this stock. The resultant assessment indicates that this stock is outside safe biological limits, with spawning biomass in 1998 below B_{pa} , and fishing mortality above F_{pa} .

Concerns that catch-rates of megrim and anglerfish are being sustained by continual expansion into new areas mean that assessments of these species are not considered sufficiently reliable to be used as the basis of advice. However, 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. Adult anglerfish which previously found a refuge in deep water are now being exploited in a directed fishery. The expansion of this fishery has been further accelerated by diversion of fishing effort from other stocks subject to more restrictive quotas in recent years and by market opportunities. Fishing mortality on megrim appears to be sustainable. However this may not remain the case if the fishery expands further into deeper water.

The assessment of the stock of herring in Division VIa North, after correction of landings for misreporting, indicates that, following a period of light exploitation, catches and fishing mortality have increased abruptly in 1997. The spawning stock increased progressively

during the 1980s and stabilized in the 1990s, but is likely to decline under current rate of exploitation. The state of the herring stock in Division VIa South is more 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 very 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 during June and July, in order to reduce the interaction with breeding seabirds.

The fisheries for mackerel and horse mackerel exploit the western components of these stocks seasonally. These widely distributed stocks are presented in Section 3.12.4. The mackerel stock is considered to be outside safe biological limits: the spawning biomass is close to B_{pa} , but fishing mortality exceeds the proposed F_{pa} . Following the outstanding 1982 year class, which still contributes a large part of the catches, recruitment of horse mackerel has been weak. SSB is bound to decline as this year class is fished out at the current high exploitation rate.

The *Nephrops* stocks are now 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/fishery: This stock is considered to be outside safe biological limits. At current fishing mortality, SSB is likely to remain low in the medium term.

SSB declined to its lowest recorded value in 1992, and following a slight recovery fell again to that level in 1997. Fishing mortality increased progressively over the period 1966 to 1987, rising significantly between 1982 and 1985, and has since remained high, although it may have decreased in recent years. Occasional recent year classes have been of above average strength, but have had no sustained impact on the SSB because of the high fishing mortality. The 1996 year class is considered to be above average.

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} .

Advice on management: ICES recommends that fishing mortality on cod in Division VIa be reduced below the proposed $F_{pa} = 0.6$ corresponding to landings less than 9 700 t in 1999. This implies a high probability that SSB will increase above B_{pa} in the medium term.

Reference points:

ICES considers that:	ICES proposes that
B_{lim} is 14 000 t, the lowest observed biomass.	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}	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 early 1980's	F_{pa} = consistent with long term B_{pa}

Relevant factors to be considered in management: Cod is taken with whiting and haddock in a mixed demersal

fishery and management needs to take this into account.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.81$; Landings (98)=10.9; SSB(99)= 17.0

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium term effect of fishing at given level
0.32	0.4 F(95-97)	5.9	5.9	26.5	Very high probability of SSB > B_{pa}
0.49	0.6 F(95-97)	8.3	8.3	23.0	Very high probability of SSB > B_{pa}
0.60	F_{pa}	9.7	9.7	20.9	5% probability of SSB < B_{pa} ; F at F_{pa}
0.65	0.8 F(95-97)	10.3	10.3	20.0	20% probability of SSB < B_{pa} ; $F > F_{pa}$
0.81	1.0 F(95-97)	12.0	12.0	17.5	High probability of SSB < B_{pa} ; $F > F_{pa}$
0.97	1.2 F(95-97)	13.5	13.5	15.3	Very high probability of SSB < B_{pa} ; $F > F_{pa}$

Weights in '000 t.

Shaded scenarios considered inconsistent with a precautionary approach.

Elaboration and special comment: The forecast assumes that the 1998 fishing mortality will be equal to the average for 1995–1997, an assumption found to be reasonable for predictions of fisheries in a steady state. There is some evidence from the assessment, and from analyses of related fisheries that fishing mortality has declined in the past two years. A forecast based on the

assumption that F in 1998 is the same as in 1997 (ie $F=0.66$) would suggest landings in 1998 equal to the TAC. In this scenario the landings corresponding to the advice for 1999 would be 10 800 t.

The fishery consists mainly of Scottish vessels using towed gears. A by-catch of cod is taken by French vessels

fishing for saithe. Since 1976, Scottish heavy trawl and seine effort has reduced greatly, whilst that of light trawlers has generally increased, particularly in more offshore areas. Scottish *Nephrops* trawlers take a by-catch of cod. Catch restrictions in first half of the 1990s led to considerable misreporting.

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

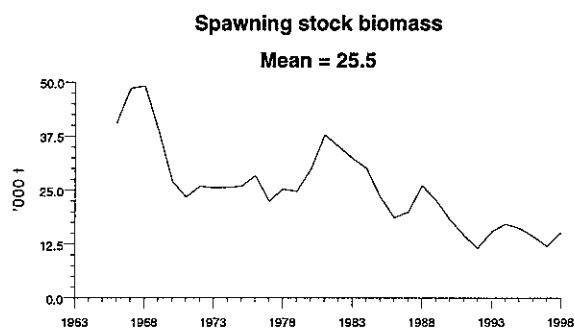
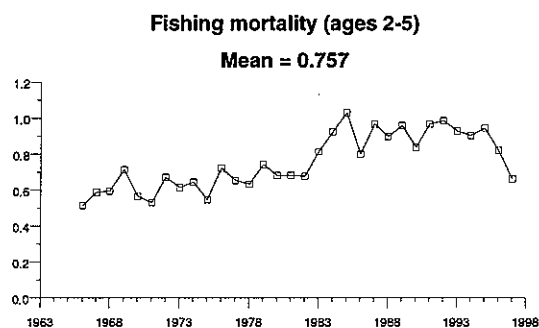
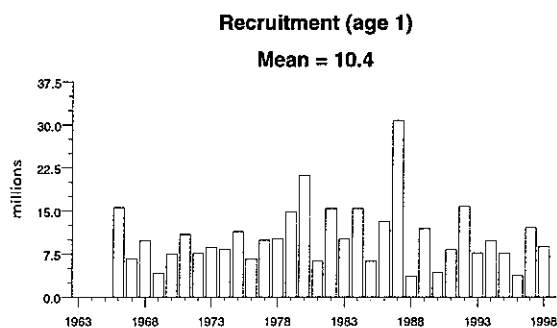
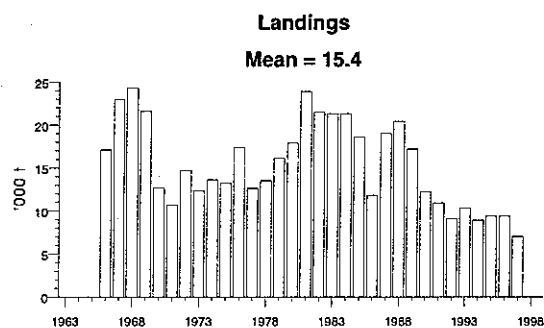
Analytical assessment based on landings-at-age and survey CPUE data. The quantities of fish misreported during 1992–1995 are implicitly estimated in the assessment, but the true quantities caught in those years remain uncertain.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1)

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

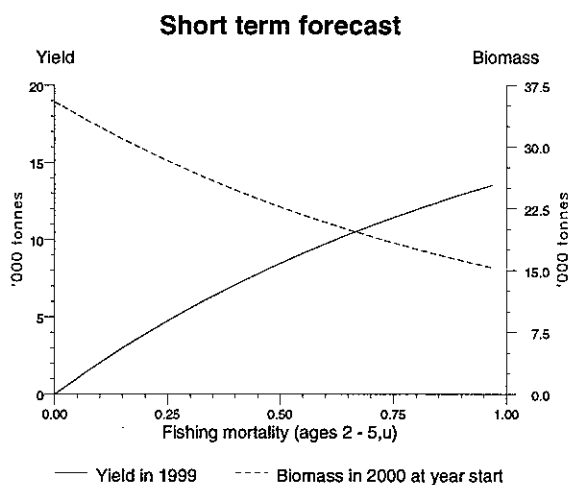
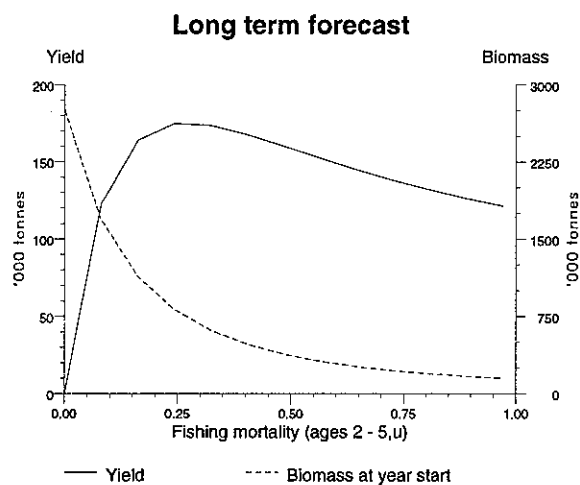
Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings
1987	Reduce F towards F_{max}	18.0	22.0	19.2	19.0
1988	No increase in F; TAC	16.0	18.4	19.2	20.4
1989	80% of F(87); TAC	16.0	18.4	15.4	17.2
1990	80% of F(88); TAC	15.0	16.0	11.8	12.2
1991	70% of effort (89)	-	16.0	10.6	10.9
1992	70% of effort (89)	-	13.5	9.0	10.4 ³
1993	70% of effort (89)	-	14.0	10.5	13.0 ³
1994	30% reduction in effort	-	13.0	9.8	13.1 ³
1995	Significant reduction in effort	-	13.0	9.7 ⁴	12.2 ³
1996	Significant reduction in effort	-	13.0	9.4 ⁴	9.4
1997	Significant reduction in effort	-	14.0	6.3 ⁴	7.0
1998	20% reduction in F	9.5 ⁵	11.0		
1999	F reduced to below F_{pa}	<9.7 ⁵			

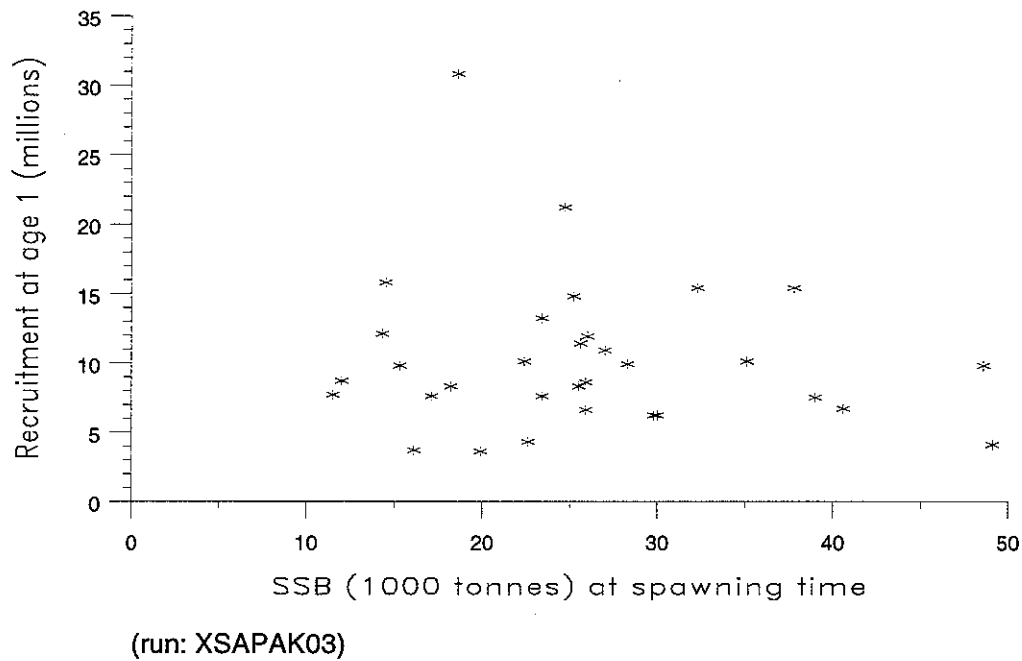
¹ TAC is for the whole of Sub-area Vb1, VI, XII and XIV. ² Not including misreporting. ³ Including ACFM estimates of misreporting. ⁴ incomplete data. ⁵ For VIa only. Weights in '000 t.



Cod in Division VIa

Yield and Spawning Stock Biomass





Precautionary Approach Plot

Cod, NW Coast of Scotland and North Ireland (Fishing Area VIa)

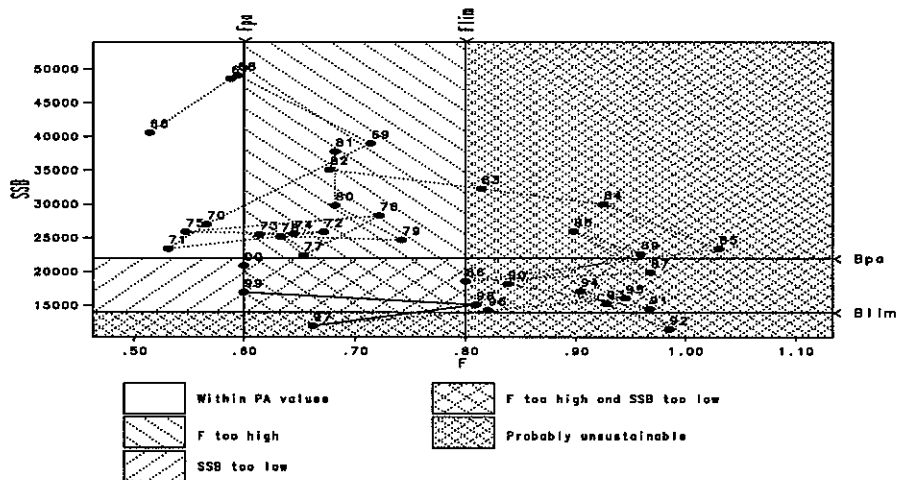


Table 3.7.2.a.1 Nominal catch (in tonnes) of COD in Division VIa, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	22	48	88	33	44	28	-	6	+	22	1	2	+ ⁴	1
Denmark	-	-	-	4	1	3	2	2	3	2	+	4	2	-
Faroe Islands	-	-	-	-	11	26	-	-	-	-	-	-	n/a	n/a
France	7,637	7,411	5,096	5,044	7,669	3,640 ^{1,2}	2,220 ^{1,2}	2,503 ^{1,2}	1,962 ^{1,2}	3,047 ¹	3,117 ^{1,2}	2,533 ^{1,2}	2,057 ²	981
Germany, Fed Rep	75	66	53	12	25	281	586	60	5	94	100	18	63	4
Ireland	2,316	2,564	1,704	2,442	2,551	1,642	1,200	761	761	645	825	1,054	1,286	n/a
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Norway	231	204	174	77	186	207	150	40	171	72	51 ¹	130 ¹	137	36
Spain	64	28	-	-	-	85	-	-	-	-	n/a	n/a	n/a	n/a
UK (England & Wales) ³	692	243	106	306	184	278	230	505	577	524	419	450	...	...
UK (N.Ireland)	32	17	54	138	46	-	-	6	-	-	-	-	-	-
UK (Isle of Man)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UK (Scotland)	9,483	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543	6,069	5,247	5,522	-	-
UK													5,839	5,274
Total	20,552	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,022	10,475	9,760	9,713	9,384	6,298
Unallocated	719	-5	294	-224	1,231	1,745	399	292	1,353	2,567	3,351	2,491	41	735
WG Estimate	21,271	18,608	11,820	18,975	20,413	17,171	12,176	10,926	10,375 ⁵	13,042 ⁵	13,111 ⁵	12,204 ⁵	9,425	7,033

¹Preliminary.²Includes Divisions Vb(EC) and VIb.³1989–1995 N. Ireland included with England and Wales.⁴Final Statlant 27a data.⁵Includes estimates of misreporting from time-series analysis.

n/a = not available.

Table 3.7.2.a.2 Cod in the N-W Coast of Scotland and N. Ireland (Fishing Area VIa)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-5
1966	15.60	40.60	17.10	0.514
1967	6.70	48.60	23.00	0.588
1968	9.80	49.10	24.30	0.594
1969	4.10	39.00	21.60	0.714
1970	7.50	27.00	12.70	0.566
1971	10.90	23.40	10.70	0.531
1972	7.60	25.90	14.70	0.672
1973	8.60	25.50	12.30	0.614
1974	8.30	25.60	13.60	0.645
1975	11.40	25.90	13.20	0.547
1976	6.60	28.30	17.40	0.722
1977	9.90	22.40	12.60	0.654
1978	10.10	25.20	13.50	0.633
1979	14.80	24.70	16.10	0.742
1980	21.20	29.80	17.90	0.682
1981	6.20	37.80	23.90	0.682
1982	15.40	35.10	21.50	0.677
1983	10.10	32.30	21.30	0.814
1984	15.40	30.00	21.30	0.925
1985	6.20	23.40	18.60	1.030
1986	13.20	18.60	11.80	0.800
1987	30.80	19.90	19.00	0.968
1988	3.60	26.00	20.40	0.898
1989	11.90	22.60	17.20	0.959
1990	4.30	18.20	12.20	0.838
1991	8.30	14.50	10.90	0.967
1992	15.80	11.50	9.10	0.985
1993	7.70	15.30	10.30	0.928
1994	9.80	17.10	8.90	0.904
1995	7.60	16.10	9.40	0.945
1996	3.70	14.30	9.40	0.820
1997	12.10	12.00	7.00	0.662
1998	8.70	15.10	.	.
Average	10.42	25.48	15.40	0.757
Unit	Millions	1000 tonnes	1000 tonnes	-

3.7.2.b Cod in Division VIb (Rockall)

Catch data in Table 3.7.2.b.1.

Special comments: There is no information on the status of Division VIb cod and recent catches are considered unreliable due to misreporting. Official catch data are also incomplete. If a TAC is required for this Division, to be combined with management measures agreed for Division VIa, it should be based on the more reliable catches reported earlier which were about 1 000 t per year.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

Table 3.7.2.b.1 Nominal catch (in tonnes) of COD in Division VIb, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Faroe Islands	18	-	1	-	31	5	-	-	-	1	-	-	n/a	n/a
France	9	17	5	7	2	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²
Germany, Fed Rep	-	3	-	-	3	+	-	126	2	-	-	-	10	21
Ireland					-	-	400	236	235	472	280	477	436	n/a
Norway	373	202	95	130	195	148	119	312	199	199	120 ¹	92 ¹	91	55
Spain	241	1,200	1,219	808	1,345	-	64	70	-	-	n/a	n/a	n/a	n/a
UK (England & Wales)	161	114	93	69	56	131	8	23	26	103	25	90	...	...
UK (Scotland)	221	437	187	284	254	265	758	829	714	322	236	370	...	...
UK													233	722
Total	1,023	1,973	1,600	1,298	1,886	549	1,349	1,596	1,176	1,097	661	1,029	770	798

¹Preliminary.

²Included in Division VIa.

n/a = Not available.

3.7.3 Haddock

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

State of stock/fishery: This stock is considered to be outside safe biological limits. Although the SSB is above B_{pa} , the fishing mortality is considered unsustainable.

Spawning stock biomass has fluctuated widely in response to large variations in year class strength and reached the lowest observed value of 22 000 t in 1991 following the recruitment of two very weak year classes. The SSB subsequently increased, and has fluctuated around 40 000 t since 1993. Fishing mortality has also fluctuated widely with no long-term trend. Recent recruitment has been near average and there is no evidence that it is reduced at low spawning stock size. At current F , the stock will decline in the absence of further strong year classes.

Management objectives: No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and the spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends that fishing mortality on Division VIa haddock in 1999 should be reduced below the proposed $F_{pa} = 0.50$ corresponding to landings in 1999 of less than 14 300 t. This implies a high probability of SSB remaining above B_{pa} in the medium and long term.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 22 000 t, the lowest observed spawning stock.	B_{pa} be set at 30 000 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 0.5. This F is considered to have a high probability of avoiding SSB below B_{pa} in the long term.

Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} = B_{lim} * 1.4$
$F_{lim} =$ not defined, but F_{loss} estimated to be in the range of 1.2-1.3	$F_{pa} =$ see above

Relevant factors to be considered in management: Haddock are taken with cod and whiting in a mixed demersal fishery and management needs to take account of this. The different trends in fishing mortality in these species over time indicate that the stocks can to some extent be managed independently. However, the ICES advice for a reduction in fishing mortality on Division VIa cod would be beneficial to the stock, and would contribute

to the recommended reduction in fishing mortality on haddock.

A high proportion (up to 47% in weight, 1987-1997) of the total haddock catch is discarded, and any measures to reduce discards would be beneficial to the stock, and would contribute to the recommended reduction in F .

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.57$; Catch(98) = 26; Landings(98) = 15, SSB(99) = 47.

F(99 onwards)	basis	Catch(99)	Landings(99)	SSB (2000)	Medium term effect of fishing at given level
0.34	0.6F(95-97)	16.7	10.5	52.7	Low probability of SSB < B_{pa}
0.46	0.8F(95-97)	21.2	13.3	47.4	5% probability of SSB < B_{pa}
0.50	F_{pa}	22.8	14.3	46.9	10% probability of SSB < B_{pa}
0.57	1.0F(95-97)	25.2	15.8	42.7	20% probability of SSB < B_{pa}
0.68	1.2F(95-97)	28.8	18.0	38.4	40% probability of SSB < B_{pa}

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach

Elaboration and special comment: The fishery is dominated by Scottish light trawlers. Effort by Scottish seiners and heavy trawlers declined since 1976. Haddock in Division VIa are fully exploited by age group 3, and also reach full maturity at that age. Immature fish in

younger age classes are also subject to comparatively high fishing mortality, and comprise a large fraction of the discarded catch. High fishing mortality on immature haddock increase the susceptibility of the stock to over-exploitation.

Analytical age-based assessment using landings-at-age data, discard-at-age data, CPUE from commercial fleets and indices from research vessel surveys. Some misreporting of landings in recent years, but not considered to have significantly affected results of current assessment.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

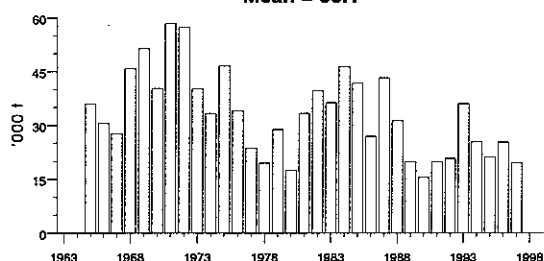
Catch data (Tables 3.7.3.a.1-2):

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	10	14.2 ²	11.2 ²	25.4 ²
1995	Significant reduction in effort	-	21.0	13	12.4	8.8	21.1
1996	Significant reduction in effort	-	22.9	13	13.4	11.8	25.3
1997	Significant reduction in effort	-	20.0	12	12.9	6.6	19.5
1998	No increase in F	20.8 ³	25.7				
1999	F reduced to F_{pa}	14.3 ³					

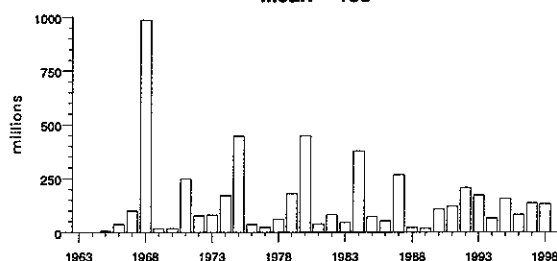
¹TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on quantity that can be taken in VIa from 1990. ²Adjusted for misreporting. ³For VIa only. Weights in '000 t.

Landings in graph below includes discards.

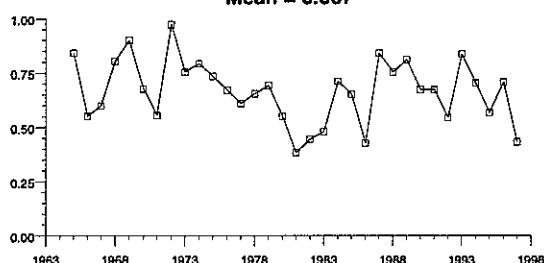
Landings
Mean = 33.1



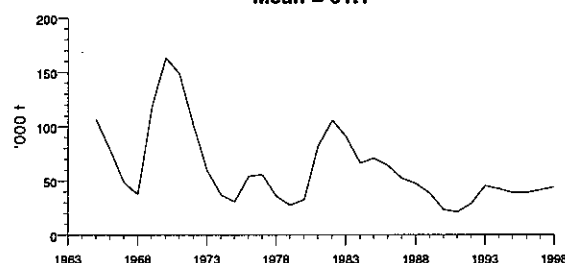
Recruitment (age 1)
Mean = 150



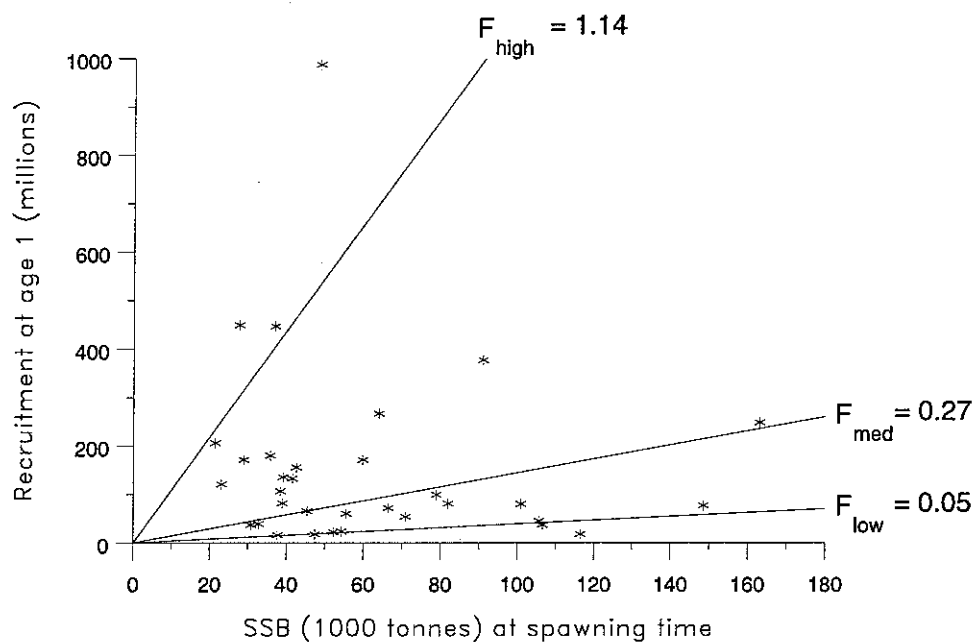
Fishing mortality (ages 2-6)
Mean = 0.667



Spawning stock biomass
Mean = 61.1



Stock - Recruitment



(run: XSAMJA01)

Precautionary Approach Plot

Haddock, NW Coast of Scotland and North Ireland (Fishing Area VIa)

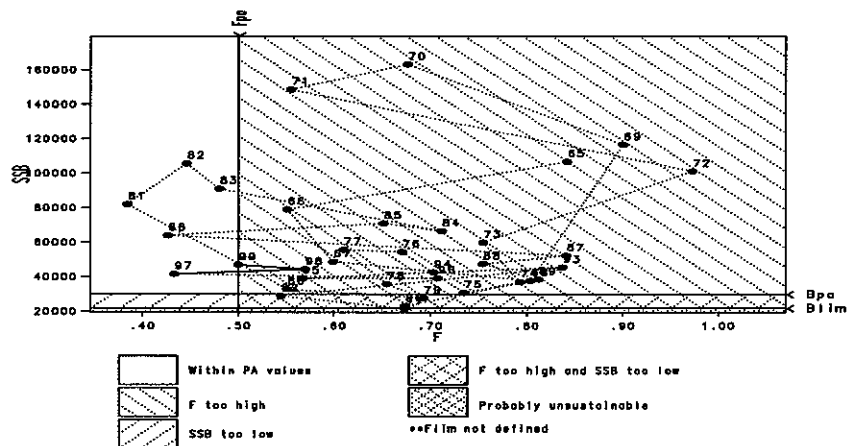


Table 3.7.3.a.1 Nominal catch (tonnes) of HADDOCK in Division VIa, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	6	7	-	29	8	9	-	9	1	7	1	+	1 ⁴	3
Denmark	+	+	+	+	+	+	+	+	1	1	-	1	1	-
Faroe Islands	-	-	1	-	-	13	-	1	-	-	-	-	-	-
France	4,240	5,930	4,956	5,456	3,001	1,335 ^{1,2}	863 ^{1,2}	761 ^{1,2}	762 ¹	1,132 ¹	1,099 ^{1,2}	671 ^{1,2}	445 ¹	824 ²
Germany, Fed.Rep.	83	38	25	21	4	4	15	1	2	9	19	14	2	1
Ireland	3,932	3,512	2,026	2,628	2,731	2,171	773	710	700	911	746	1,406	1,399	n/a
Norway	33	76	45	13	54	74	46	12	72	40	7 ¹	22 ¹	16	21
Spain	129	166	-	-	-	-	-	-	-	-	n/a	n/a	n/a	n/a
UK (England & Wales) ³	1,042	348	222	425	114	235	164	137	132	155	254	322	448	...
UK (N. Ireland)	5	-	155	1	35								...	...
UK (Scotland)	18,472	15,036	12,955	18,503	15,151	19,940	10,964	8,434	5,263	10,423	7,421	10,367	10,790	...
UK (total)														10,840
Total	27,942	25,113	20,385	27,076	21,098	23,781	12,825	10,065	6,933	12,678	9,547	12,803	13,102	11,689
Landings as used by WG	30,019	24,385	19,574	27,004	21,137	16,693	10,136	10,560	11,353	19,067	14,243	12,372	13,452	12,866
Discards	16,345	17,451	7,352	16,218	10,164	3,178	5,406	9,192	9,398	16,904	11,192	8,794	11,838	6,623
Unallocated landings	2,077	-728	-811	-72	39	-7,088	-2,689	495	4,420	6,389	4,696	-431	350	1,177
Total as used by WG	46,364	41,836	26,926	43,222	31,301	19,871	15,542	19,752	20,752 ¹	35,971	25,435	21,167	25,290	19,489

¹Preliminary.

²Includes Divisions Vb(EC) and VIb.

³1989–1995 N. Ireland included with England and Wales.

⁴Final Statlant 27a data.

n/a = Not available.

Table 3.7.3.a.2 Haddock in N-W Coast of Scotland and Northern Ireland (Fishing Area VIa).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1965	5.16	106.67	35.89	0.842
1966	36.93	78.91	30.59	0.551
1967	99.36	48.61	27.69	0.599
1968	986.63	37.75	45.80	0.804
1969	16.01	116.45	51.49	0.901
1970	17.91	163.13	40.33	0.677
1971	248.46	148.54	58.48	0.555
1972	77.10	101.00	57.46	0.973
1973	80.26	59.84	40.20	0.755
1974	171.42	37.03	33.34	0.793
1975	446.73	30.82	46.63	0.735
1976	37.08	54.36	34.07	0.671
1977	23.45	55.60	23.66	0.610
1978	60.33	35.79	19.51	0.655
1979	180.39	27.69	28.85	0.693
1980	449.25	32.79	17.48	0.551
1981	39.33	82.01	33.31	0.384
1982	81.34	105.67	39.68	0.446
1983	45.49	91.02	36.29	0.480
1984	376.99	66.45	46.36	0.712
1985	72.08	70.87	41.84	0.652
1986	54.26	63.95	26.93	0.427
1987	267.29	52.26	43.22	0.841
1988	22.55	47.44	31.30	0.754
1989	17.84	38.48	19.87	0.812
1990	106.57	23.12	15.54	0.674
1991	120.61	21.48	19.75	0.673
1992	206.16	28.90	20.75	0.545
1993	171.67	45.40	35.97	0.837
1994	65.69	42.59	25.44	0.704
1995	156.11	38.97	21.17	0.567
1996	81.74	39.19	25.29	0.708
1997	135.90	41.59	19.49	0.433
1998	132.92	44.30	.	.
Average	149.74	61.14	33.14	0.667
Unit	Millions	1000 tonnes	1000 tonnes	-

3.7.3.b Haddock in Division VIIb (Rockall)

State of stock/fishery: The stock is considered to be outside safe biological limits. Fishing mortality is above the proposed F_{pa} and SSB is below the proposed B_{pa} in 1998.

A large 1984 year class of haddock in Division VIIb was followed by four comparatively weak year classes, causing a decline in SSB during the 1980s. A series of stronger year classes over 1989–1992 resulted in a subsequent increase in SSB.

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} .

Advice on management: ICES recommends that fishing mortality should be reduced below the proposed $F_{pa} = 0.4$, corresponding to landings in 1999 of less than 3 800 t.

Reference points:

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:

$B_{lim} = B_{loss}$	$B_{pa} = B_{loss} \times 1.4$
F_{lim} = could not be defined, due to uninformative stock recruitment data	F_{pa} = adopted by analogy with other haddock stocks.

Relevant factors to be considered in management: The fishery in Division VIIb is linked with fisheries in Division VIIa. The fishery is to an extent opportunistic, making it difficult to predict actual fishing mortality as fleet behaviour will be dependent on fishing opportunities

elsewhere. It is largely a haddock fishery, with relatively little catch of other species.

The 1993 and 1995 year classes appear to be weak and there is a high probability that SSB would decrease again below B_{pa} at current fishing mortalities.

Catch forecast for 1999:

Basis $F(98)$ $F(95-97) = 0.50$; Landings(98)=4.2; SSB(99)=9.1

F(99 onwards)	Basis	Catch(99)	Landings (99)	SSB (2000)	Medium term effect of fishing at given level
0.20	0.4F(95-97)	2.1	2.1	13.7	Time series too short to estimate S/R relationship
0.30	0.6F(95-97)	3.0	3.0	12.8	"
0.40	0.8F(95-97)	3.8	3.8	11.9	"
0.50	1.0F(95-97)	4.6	4.6	11.1	"
0.60	1.2F(95-97)	5.3	5.3	10.4	"

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

of landings limits the precision of the assessment. The time series is too short to estimate the stock recruitment relationship for medium-term projections and estimation of fishing mortality reference points. Biological parameters of the stock are uncertain. Full maturity is assumed to be attained in age group 3.

Elaboration and special comment: The Rockall fishery is presently dominated by Scottish vessels and takes place 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.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

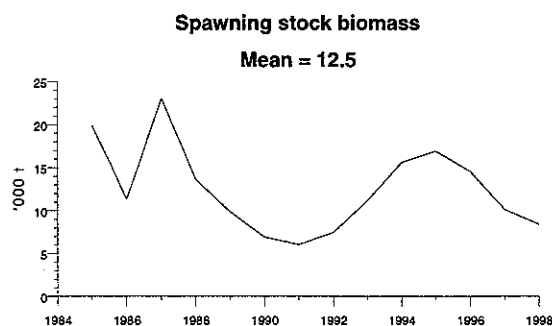
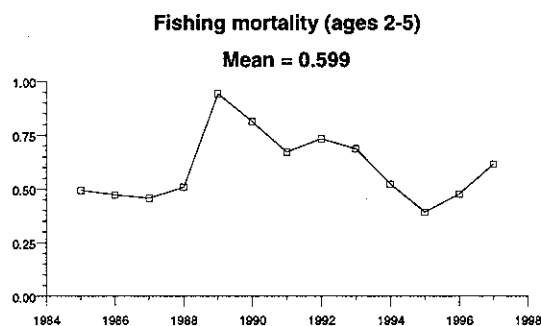
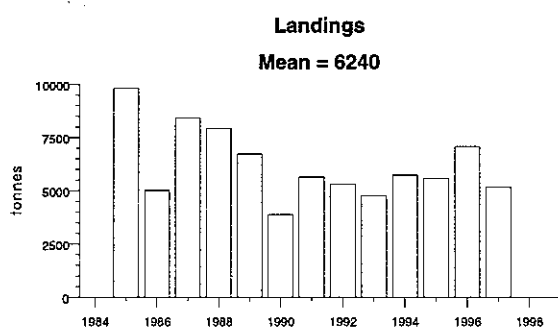
Analytical, age-based assessment using landings at age data, research vessel survey data and commercial CPUE data. Although no discard data are available, there is likely to be substantial discarding of younger fish. The short time series, variable fishing effort and misreporting

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

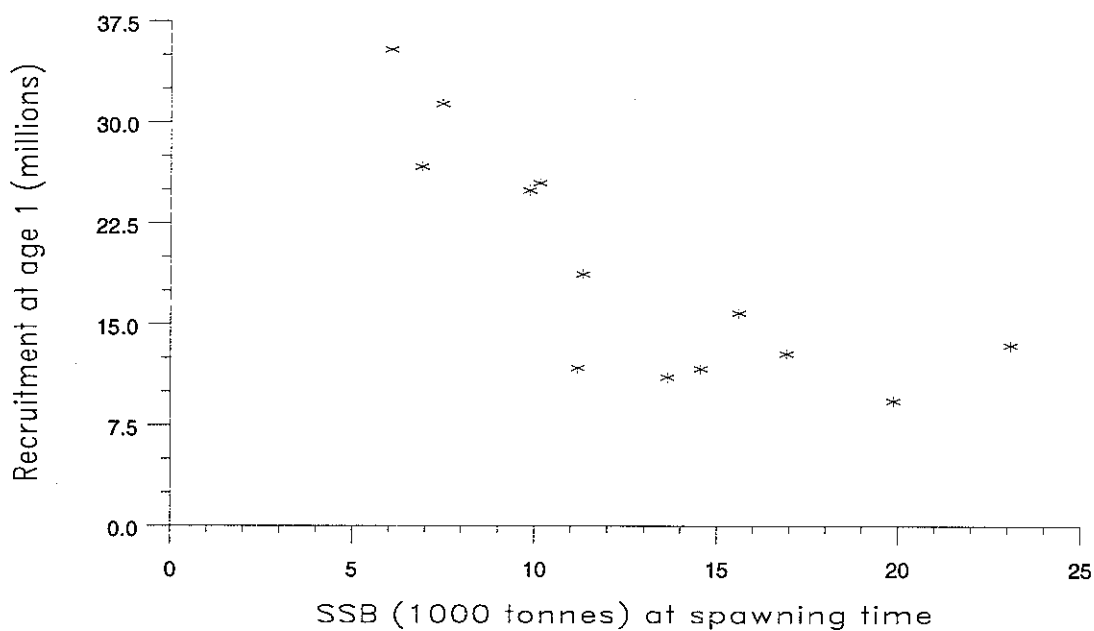
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official Landings	ACFM landings
1987	Precautionary TAC	10.0		8.0	8.4
1988	Precautionary TAC	10.0		7.6	7.9
1989	<i>Status quo</i> F; TAC	18.0		6.6	6.7
1990	Precautionary TAC	5.5		8.2	3.9
1991	Precautionary TAC	5.5		5.9	5.7
1992	Precautionary TAC	3.8		4.5 ⁴	5.3
1993	80% of F(91)	3.0		4.1 ⁴	4.8
1994	If required, precautionary TAC	-		3.7 ⁴	5.7 ²
1995	No long-term gain in increasing F	5.1 ³		5.5 ⁴	5.6
1996	No long-term gains in increasing F	6.9 ³		6.8 ⁴	7.1
1997	No advice given	4.9 ³		4.3 ⁴	5.2
1998	No increase in F	4.9			
1999	Reduce F below F _{pa}	3.8			

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 misreporting. ³Landings at *status quo* F. ⁴Incomplete data. Weights in '000 t.

Haddock in Division VIb



Stock - Recruitment



(run: XSASAR04)

Precautionary Approach Plot

Haddock, Rockall (Fishing Area VIb)

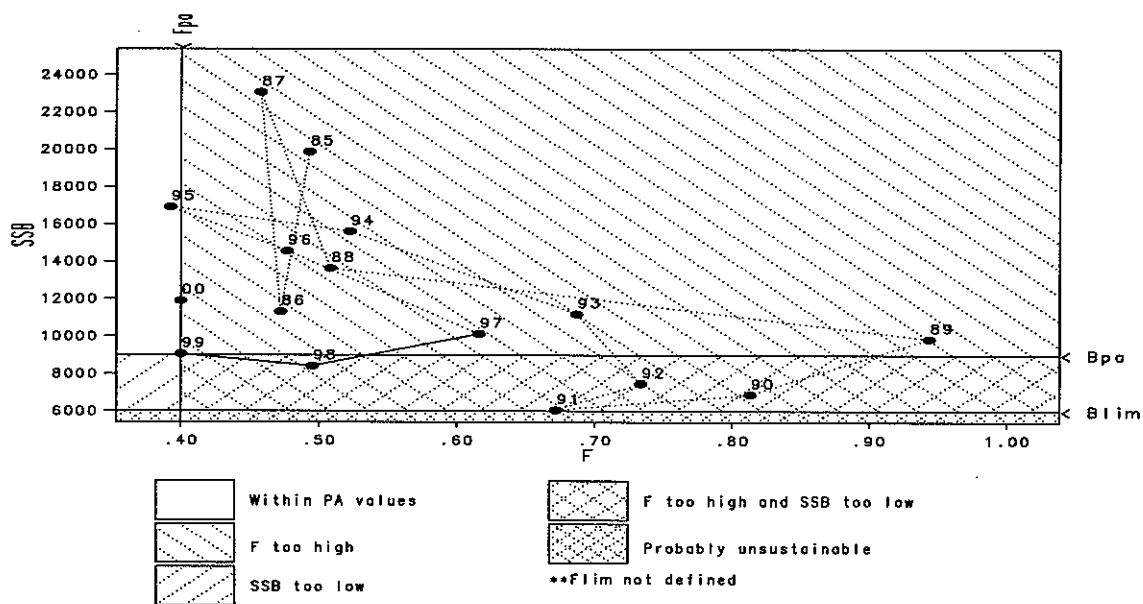


Table 3.7.3.b.1 Nominal catch (tonnes) of HADDOCK in Division VIb, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Faroe Islands	3	1	-	-	5	-	-	-	-	-	-	-	-	-
France	12	116	103	99	5	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²
Germany, Fed. Rep.	-	4	-	-	4	1	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	620	640	571	692	956	677	747	n/a
Norway	45	31	83	33	20	47	38	69	47	68	75 ¹	29 ¹	24	24
Spain	128	892	756	371	245	337	178	187	51	-	n/a	n/a	n/a	n/a
UK (England & Wales) ³	788	1,876	703	1,271	753	272	238	165	74	308	169	318	...	...
UK (N. Ireland)	-	-	157	-	-	-	-	-	-	-	-	-	...	...
UK (Scotland)	1,654	6,397	2,961	6,221	6,542	5,986	7,139	4,792	3,777	3,045	2,535	4,439	...	...
UK (total)													6,046	4,251
Total	2,630	9,317	4,763	7,995	7,574	6,643	8,213	5,853	4,520	4,113	3,735	5,463	6,817	4,275
Unallocated catch	-	493	251	437	355	85	-4,329	-198	800	671	1,998	124	258	891
Working Group estimate	-	9,810	5,014	8,432	7,929	6,728	3,884	5,655	5,320	4,784	5,733	5,587	7,075	5,166

¹Preliminary.²Included in Division VIa.³1989–1995 N. Ireland included with England and Wales.

n/a = Not available.

Table 3.7.3.b.2 Haddock off Rockall (Fishing Area VIb).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2–5
1985	78.98	19.87	9.81	0.493
1986	9.29	11.32	5.01	0.472
1987	18.71	23.07	8.43	0.458
1988	13.44	13.64	7.93	0.509
1989	11.05	9.86	6.73	0.944
1990	24.92	6.89	3.88	0.813
1991	26.68	6.06	5.66	0.672
1992	35.36	7.47	5.32	0.734
1993	31.33	11.18	4.78	0.687
1994	11.75	15.60	5.73	0.523
1995	15.82	16.92	5.59	0.392
1996	12.80	14.55	7.08	0.477
1997	11.68	10.13	5.17	0.616
1998	25.47	8.41	.	.
Average	23.38	12.50	6.24	0.599
Unit	Millions	1000 tonnes	1000 tonnes	-

3.7.4 Whiting

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

State of stock/fishery: This stock is considered to be outside of safe biological limits. Current fishing mortality exceeds the proposed F_{pa} and spawning stock is below the proposed B_{pa} .

Large fluctuations in recruitment, SSB and fishing mortality occurred prior to the mid-1980s. Greater stability has been evident since then, although SSB has varied around a much lower level than recorded for the earlier period and reached an historic low in 1989. Strong year-classes have not occurred during the 1990s.

Management objectives: No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and the spawning stock biomass should be greater than B_{pa} .

Advice on management: ICES recommends that fishing mortality should be reduced below the proposed F_{pa} of 0.6 corresponding to landings in 1999 of less than 4 300 t.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 16 000 t, the lowest observed spawning stock.	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:

$B_{lim} = B_{loss} = 16\ 000\ t$	$B_{pa} = B_{lim} \times 1.4$
$F_{lim} = \text{see above}$	$F_{pa} = 0.6 \times F_{lim}$

Relevant factors to be considered in management:

Whiting are taken with cod and haddock in a mixed demersal fishery and management needs to take account of advice for those stocks. The different trends in fishing mortality in these species over time indicates that the stocks can to some extent be managed independently. However, ICES advice for a reduction in fishing mortality

on Division VIa cod and haddock would, if implemented effectively, contribute to the recommended reduction in fishing mortality on whiting.

Substantial discarding of whiting takes place in the different trawl fisheries, and any measures to reduce discards would be beneficial to the stock.

Catch forecast for 1999:

Basis $F(98) = F(95-97) = 0.87$; Catch(98)= 12.9, Landings(98)= 8.2, SSB(99)= 19.9.

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium term effect of fishing at given level
0.35	0.4 F(95-97)	6.1	2.8	29.4	Low probability SSB $< B_{pa}$
0.52	0.6 F(95-97)	8.5	3.9	26.1	Low probability SSB $< B_{pa}$
0.60	F_{pa}	9.5	4.3	24.8	approx. 5% probability SSB $< B_{pa}$
0.69	0.8 F(95-97)	10.7	4.8	23.3	10% probability SSB $< B_{pa}$
0.87	1.0 F(95-97)	12.6	5.5	20.9	50% probability SSB $< B_{pa}$
1.04	1.2 F(95-97)	14.2	6.2	18.7	> 50% probability SSB $< B_{pa}$

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment: Whiting in Division VIa are caught mainly by Scottish trawlers. Since 1976, Scottish heavy trawl and seine effort has reduced greatly, whilst that of light trawlers has generally increased. Approximately 50% of the total catch in weight is discarded.

The medium term projections have been calculated using the complete stock and recruitment series. However the stock has not produced strong year-classes since the early

1980s. If the stock continues to produce only average or below average recruitment, the projections will be optimistic.

Analytical age-based assessment, using landings-at-age data, discard-at-age data and indices from research vessel surveys.

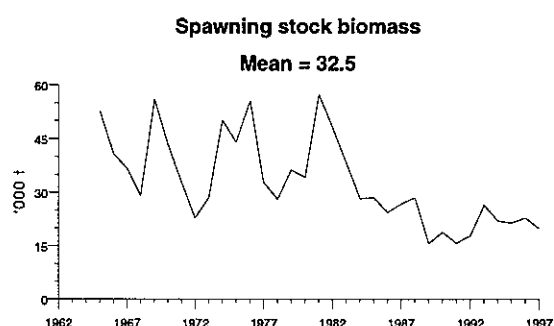
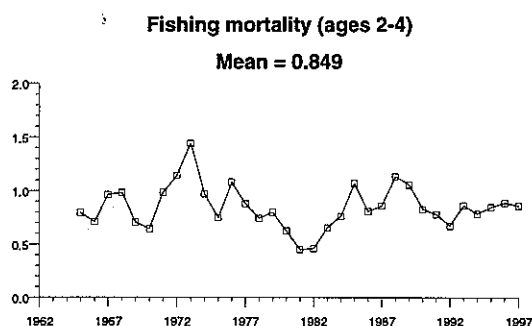
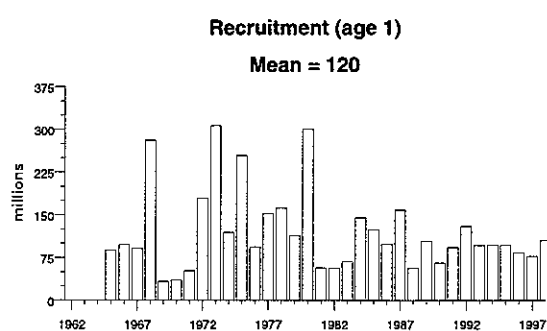
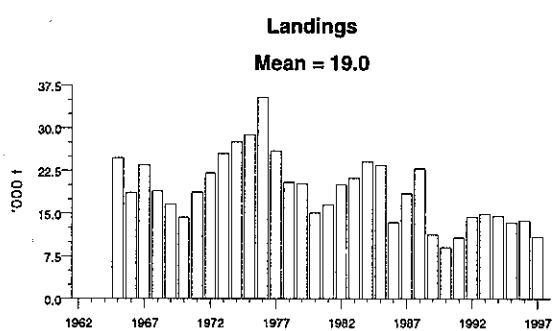
Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

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

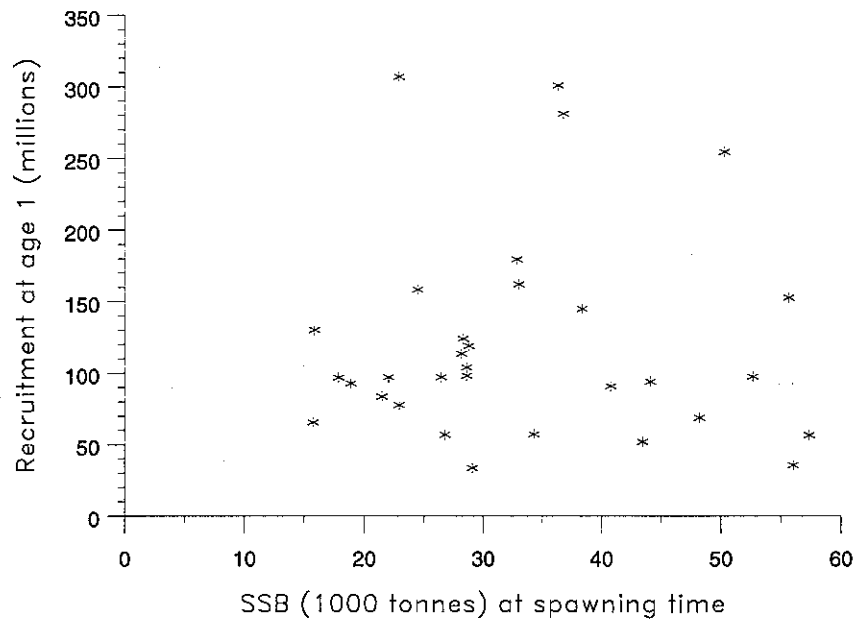
Year	ICES Advice	Predicted landing corresp. to advice	Agreed TAC ¹	Official Landings	ACFM landings	Discards slip	ACFM catch
1987	No increase in F	15.0	16.4	12.4	11.5	6.9	18.4
1988	No increase in F; TAC	15.0	16.4	11.9	11.4	11.5	22.9
1989	No increase in F; TAC	13.0	16.4	7.7	7.5	3.7	11.3
1990	No increase 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
1993	70% of effort (89)	-	8.7	6.8	6.9	8.0	14.9
1994	30% reduction in effort	-	6.8	6.0	5.9	8.6	14.5
1995	Significant reduction in effort	-	6.8	6.4	6.1	7.3	13.4
1996	Significant reduction in effort	-	10.0	5.9	7.2	6.6	13.7
1997	Significant reduction in effort	-	13.0	5.6 ²	6.3	4.6	10.9
1998	No increase in F	6.5	9.0				
1999	Reduce F below F_{pa}	4.3					

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

Landings graph below includes discards



Stock - Recruitment



(run: XSAMJA07)

Precautionary Approach Plot

Whiting, NW Coast of Scotland and N. Ireland (Fishing Area VIa)

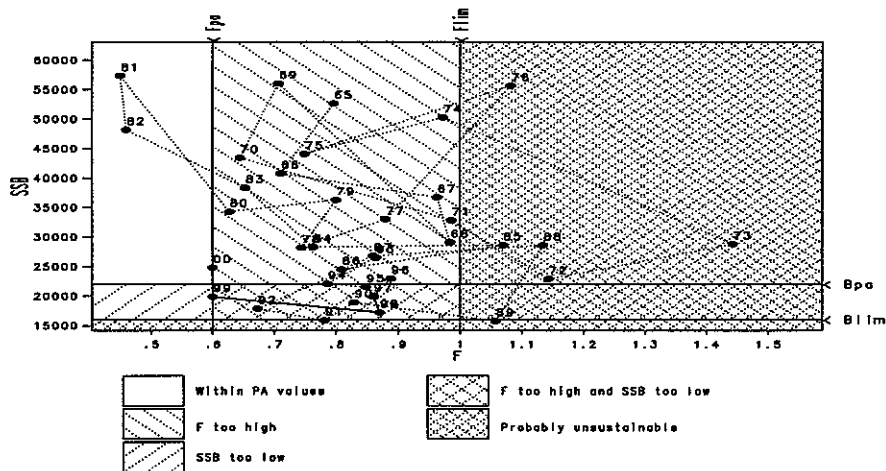


Table 3.7.4.a.1 Nominal catch (tonnes) of WHITING in Division VIa, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	-	3	-	4	3	1	-	+	-	+	+	+	-	1
Denmark	-	-	-	5	-	1	+	3	1	1	+	+	+	+
France	1,887	1,502	829	1,644	1,249				105 ¹		435 ^{1,2}	436 ^{1,2}	613 ¹	519 ¹
Germany, Fed.Rep.	6	9	1	+	4	199 ^{1,2}	180	352 ^{1,2}	1	149 ¹	+	-	-	-
Ireland	3,454	1,917	1,683	2,868	2,640	+	+	+	1,377	1	1,213	1,448	1,182	n/a
Netherlands	-	14	-	-	-	1,315	977	1,200	-	1,192	-	-	-	-
Spain	40	61	-	-	-	-	-	-	-	-	n/a	n/a	n/a	n/a
UK (Engl. & Wales) ³	162	63	26	62	30	-	-	-	196	-	233	204	237	...
UK (N. Ireland)	40	17	5	13	89	44	50	218		184				...
UK (Scotland)	11,270	9,051	5,848	7,803	7,864				4,330		4,149	4,263	5,021	...
UK (all)						6,109	4,819	5,135		5,224				5,083
Total	16,859	12,637	8,392	12,399	11,879	7,669	6,026	6,908	6,010	6,751	6,030	6,351	7,053	5,604
Unallocated landings	-371	1169	98	-857	-530	-142	-382	-234	-5	122	-67	-272	116	687
Discards	7,548	10,379	4,895	6,875	11,460	3,713	3,356	4,044	8,360	8,017	8,570	7,272	6,568	4,571
Landings as used by Working Group	16,488	13,806	8,490	11,542	11,349	7,527	5,644	6,674	6,005	6,873	5,963	6,079	7,169	6,291

¹Preliminary.

²Includes Divisions Vb (EC) and VIb.

³1989–1996 N. Ireland included with England and Wales.

n/a = Not available.

Table 3.7.4.a.2 Whiting N-W Coast of Scotland and N. Ireland (Fishing Area VIa).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-4
1965	87.63	52.63	24.73	0.796
1966	97.45	40.74	18.62	0.710
1967	90.77	36.71	23.56	0.963
1968	280.97	29.08	18.92	0.984
1969	33.51	56.00	16.61	0.707
1970	35.52	43.43	14.31	0.645
1971	51.88	32.82	18.65	0.986
1972	179.29	22.88	22.04	1.143
1973	306.81	28.77	25.48	1.443
1974	118.86	50.23	27.53	0.972
1975	254.28	44.06	28.75	0.749
1976	93.96	55.61	35.38	1.082
1977	152.69	32.97	25.93	0.880
1978	161.89	28.17	20.44	0.744
1979	113.52	36.26	20.16	0.800
1980	300.82	34.26	15.10	0.627
1981	57.11	57.34	16.46	0.450
1982	56.59	48.18	20.03	0.460
1983	68.72	38.32	21.15	0.653
1984	144.83	28.28	24.01	0.763
1985	123.89	28.60	23.39	1.069
1986	98.09	24.48	13.37	0.809
1987	158.35	26.78	18.45	0.860
1988	56.73	28.59	22.85	1.134
1989	103.78	15.74	11.25	1.057
1990	65.46	18.90	8.98	0.829
1991	92.53	15.86	10.74	0.781
1992	130.05	17.86	14.33	0.673
1993	96.79	26.47	14.88	0.864
1994	96.96	22.05	14.53	0.786
1995	96.97	21.50	13.37	0.848
1996	83.55	22.93	13.71	0.888
1997	77.63	19.92	10.86	0.860
1998	105.09	17.20	.	.
Average	119.79	32.46	19.05	0.849
Unit	Millions	1000 tonnes	1000 tonnes	-

3.7.4.b Whiting in Division VIb (Rockall)

Catch data in Table 3.7.4.b.1.

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, June 1998 (ICES CM 1999/ACFM:1).

Table 3.7.4.b.1 Nominal catch (tonnes) of WHITING in Division VIb, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
France	3	2	-	-	-	...	...	...	...	...	...	...	...	...
Ireland	-	-	-	-	-	-	-	-	-	32	10	4	23	n/a
Spain	16	123	-	-	-	-	-	-	-	-	n/a	n/a	n/a	n/a
UK (Engl.& Wales) ³	2	+	5	4	-	16	6	1	5	10	2	5	26	...
UK (N. Ireland)	-	-	-	-	-	-	-	-	-	-	-	-	-	...
UK (Scotland)	25	6	13	108	23	18	482	459	283	86	68	53	36	...
UK (all)														103
Total	46	131	18	112	23	34	488	460	288	128	80	62	85	103

¹Preliminary.

²Included in Division VIa.

³1989–1996 N. Ireland included with England and Wales.

n/a = not available.

3.7.5

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

State of stock/fishery: This stock is considered to be outside safe biological limits. Current spawning stock biomass is below the proposed B_{pa} and close to B_{lim} , the lowest observed. The current fishing mortality is about twice the proposed F_{pa} and, if maintained, has a high probability of depleting the spawning stock biomass even further.

SSB declined steadily from a peak value in 1974. A sharp increase in fishing mortality after 1985 accelerated this decline and since 1989 the SSB has been so depleted that recruitment has also been impaired. All year classes since then have been below average, and declining steadily to the lowest observed.

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} .

Advice on management: ICES advises that fishing mortality be reduced by 60% to no more than $F=0.19$, below the proposed F_{pa} , corresponding to landings less than 4 800 t in 1999, in order to rebuild SSB above the proposed B_{pa} in the medium term.

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 11 000 t, the lowest observed spawning stock.	B_{pa} be set at 35 000 t. This is the previously agreed MBAL below which the probability of below average recruitment increases.
F_{lim} is 0.51. This is the fishing mortality estimated to lead to potential stock collapse.	F_{pa} be set at 0.25. This F is considered to have a high probability of avoiding F_{lim} . It is also the threshold above which the stock has declined in the mid 1980's.

Technical basis:

$B_{lim} = B_{loss}$	B_{pa} = previously defined MBAL below which recruitment has been reduced
$F_{lim} = F_{loss}$	F_{pa} = see above.

Relevant factors to be considered in management: ICES advised also last year a 60% reduction in fishing mortality, but F did not decrease. It substantially exceeds the proposed F_{pa} and SSB is close to the lowest observed. A phased recovery plan should be implemented to rebuild SSB, but an immediate and significant reduction in fishing mortality is required in 1999.

This stock is associated with the North Sea stock, both in terms of stock distribution and in terms of some of the fisheries exploiting the stocks. The North Sea stock is also considered to be outside safe biological limits. Management of the SA-VI component should not be considered in isolation of the North Sea stock component.

Catch forecast for 1999:

Basis: $F(98) = F(95-97) = 0.48$; $SSB(99) = 11.6$, $Landings(98) = 10.3$.

F(99 onwards)	Basis	Catch(99)	Landings(99)	SSB (2000)	Medium term effect of fishing at given level
0.00	0.0F(95-97)		0.0	19.1	
0.10	0.2F(95-97)		2.5	17	Increase in SSB to values recorded in mid 1970s
0.19	0.4F(95-97)		4.8	15	<10% probability of $SSB < B_{pa}$
0.25	F_{pa}		6.2	14.2	<10% probability of $SSB < B_{pa}$
0.29	0.6F(95-97)		6.9	13.6	50% probability of $SSB < B_{pa}$
0.38	0.8F(95-97)		8.8	12.2	High probability of $SSB < B_{pa}$
0.48	1.0F(95-97)		10.5	10.9	High probability of $SSB < B_{pa}$

Weights in '000 t.

Shaded scenarios considered inconsistent with a precautionary approach

Elaboration and special comment: The fishery consists largely of a directed French deep water fishery operating on the shelf edge and a Scottish fishery operating inshore. The directed fishery started in the early 1970s. The number of French deep-sea trawlers participating in this fishery has declined in recent years. In more recent years smaller French vessels have joined the deep water fishery.

There are no indices of recruitment for this stock. Population numbers for the youngest ages for the forecast are therefore not well-estimated, and the catch predictions may be optimistic because of the assumptions of average recruitment for the 1996–1997 year classes.

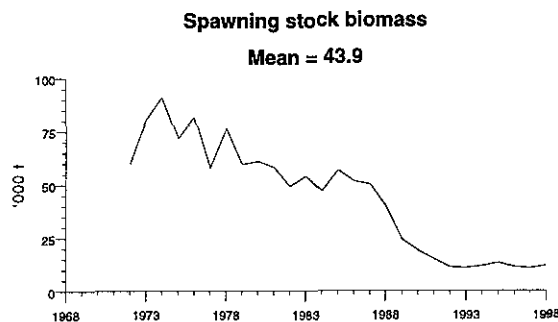
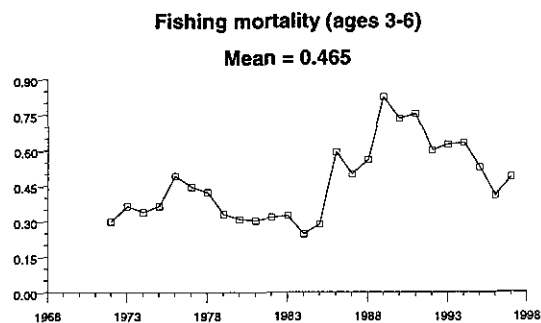
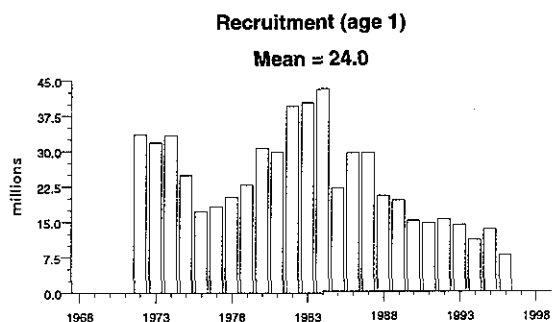
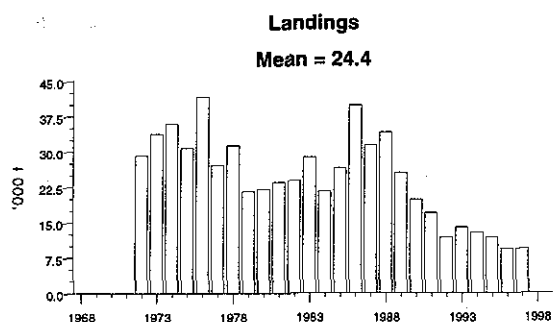
Future assessments will consider this stock and the North Sea stock as a single stock.

Source of information: Report of the Working group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

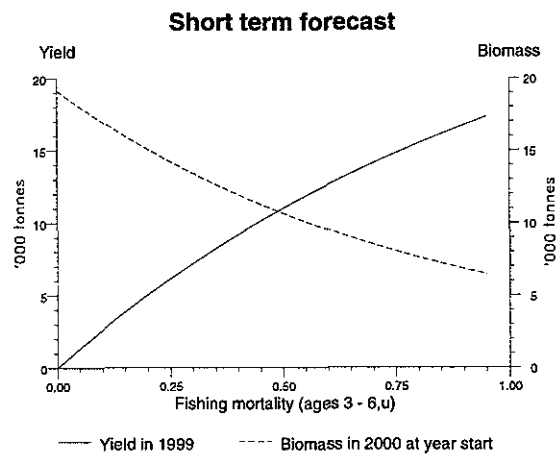
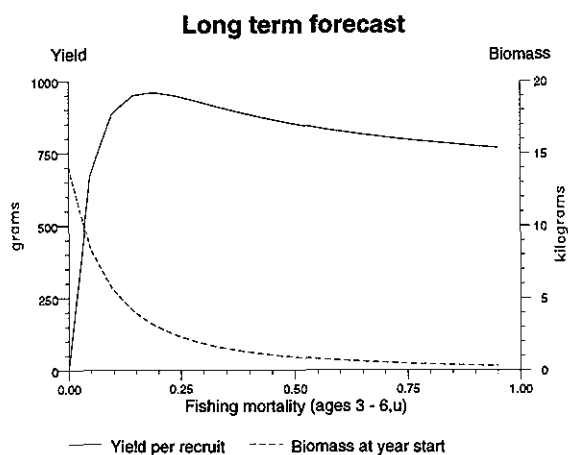
Catch data (Tables 3.7.5.1-2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	F reduced towards F_{max}	19	27.8	32.5	31.4
1988	80% of F(86); TAC	35	35	32.8	34.2
1989	$F < 0.3$; TAC	20	30	22.4	25.6
1990	80% of F(88); TAC	24	29	18.0	19.9
1991	Stop SSB decline; TAC	21	22	17.9	17.0
1992	Avoid further reduction in SSB	<19	17	11.1	11.8
1993	$F = 0.21$	6.3	14	15.5	13.9
1994	Lowest possible F		14	14.3 ²	12.8
1995	Significant reduction in effort	-	16	11.7 ²	11.8
1996	No increase in F	10.2 ¹	13	9.0 ²	10.8
1997	Significant reduction in F		12	9.5 ²	9.4
1998	60% Reduction in F	4.8	10.9		
1999	60% reduction in F	4.8			

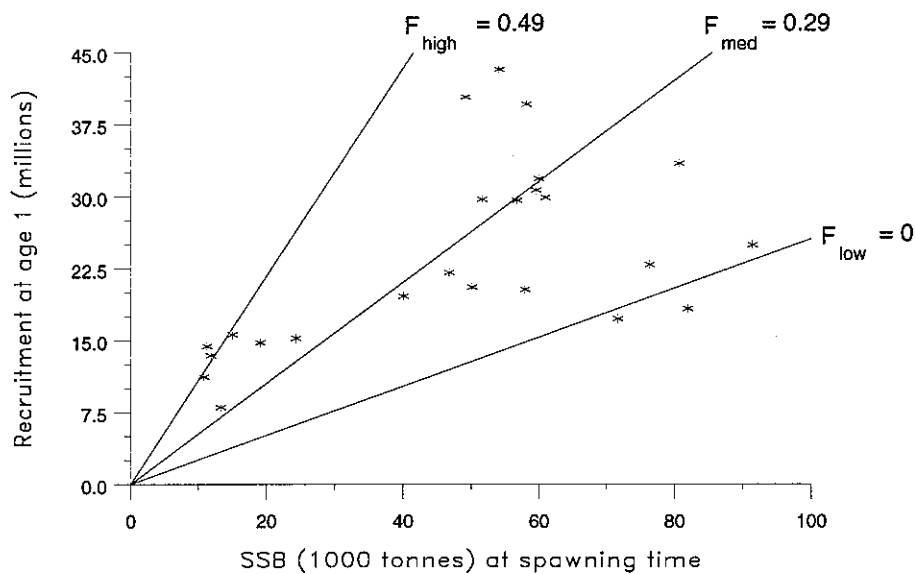
¹Status quo catch. ²Incomplete data. Weights in '000 t.



Yield and Spawning Stock Biomass



Stock - Recruitment



(run: XSAIP05)

Precautionary Approach Plot

Saithe, (Fishing Area VI)

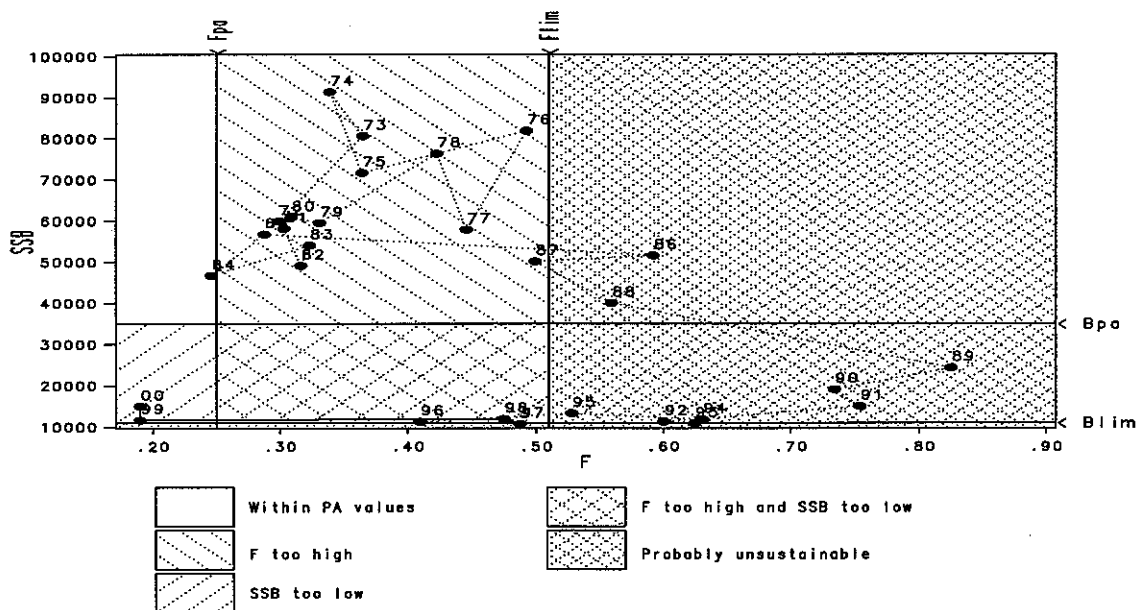


Table 3.7.5.1 Nominal catch (tonnes) of SAITHE in Sub-area VI, 1984–1997, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	-	2	-	12	14	15	-	6	2	2	+	-	- ⁴	-
Denmark	-	-	-	7	+	2	-	+	1	2	+	+	1	-
Faroe Islands	-	-	-	-	8	-	-	24	1	-	-	-	3	n/a
France	19,706	19,120	26,521	24,581	24,656						9,672 ²	7,221 ²	4,411 ¹	5,978 ¹
Germany, Fed.Rep.	713	838	2,345	1,486	1,584	17,106 ²	12,961 ²	12,423 ²	6,777 ²	11,142 ²	524	321	1,012	492
Ireland	599	670	660	704	544	1,116	275	590	685	222	438	530	419	n/a
Norway	66	51	72	38	50	593	520	260	278	317	74 ¹	38 ¹	34	26
Spain	882	624	824	533	857	72	64	31	67	59	n/a	n/a	n/a	n/a
UK (Engl. & Wales) ³	1,800	1,349	1,259	1,708	1,193	65	70	49	-	-	744	317	...	...
UK (N. Ireland)	49	15	21	26	13	462	855	593	540	799			708	n/a
UK (Scotland)	3,170	3,118	3,697	3,442	3,925						2,828	3,279	2,435	n/a
UK (total)						2,971	3,258	3,885	2,708	2,903			3,143	2,961
Total	26,985	25,787	35,399	32,537	32,844	22,402	18,003	17,861	11,059	15,446	14,280	11,706	7,976	9,457
Unallocated	-5,344	808	4,487	-1,168	1,334	3,175	1,862	-866	745	-1,503	-1,459	64	1,457	-39
Total figures used by WG	21,641	26,595	39,886	31,369	34,178	25,577	19,865	16,995	11,804	13,943	12,821	11,770	9,433	9,418

¹Preliminary.

²Includes Division Vb (EC).

³1989–1995 N. Ireland included with England and Wales.

⁴Final Statlant 27a data.

n/a = not available.

Table 3.7.5.2 Saithe N-W Coast of Scotland, N. Ireland & Rockall (Fishing Area VI).

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1972	33.55	59.89	29.22	0.299
1973	31.86	80.58	33.83	0.365
1974	33.43	91.36	35.97	0.339
1975	24.93	71.65	30.80	0.364
1976	17.26	81.90	41.75	0.493
1977	18.31	57.89	27.21	0.446
1978	20.32	76.31	31.37	0.423
1979	22.88	59.54	21.60	0.331
1980	30.66	60.91	22.10	0.309
1981	29.87	58.14	23.57	0.303
1982	39.61	49.14	23.88	0.317
1983	40.37	54.07	28.89	0.323
1984	43.23	46.73	21.64	0.246
1985	22.07	56.74	26.60	0.288
1986	29.59	51.57	39.89	0.592
1987	29.69	50.13	31.37	0.499
1988	20.54	40.05	34.18	0.559
1989	19.62	24.35	25.58	0.825
1990	15.23	19.07	19.87	0.734
1991	14.76	15.02	17.00	0.754
1992	15.61	11.26	11.80	0.600
1993	14.39	10.81	13.94	0.625
1994	11.19	11.83	12.82	0.631
1995	13.45	13.27	11.77	0.528
1996	8.03	11.24	9.43	0.409
1997	.	10.68	9.42	0.487
1998	.	11.92	.	.
Average	24.02	43.93	24.44	0.465
Unit	Millions	1000 tonnes	1000 tonnes	-

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

State of stock/fishery: The stock is considered to be within safe biological limits. Although the current exploitation rate for megrim is considered sustainable, this species is a by-catch in a targeted fishery for anglerfish, for which the current exploitation rate is considered unsustainable.

The historical perspective of SSB, fishing mortality and recruitment is not well estimated, although it is likely that fishing mortality has increased in recent years as the fishery for anglerfish has expanded into progressively

deeper water with an associated increase in landings of megrim.

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} .

Advice on management: ICES advises that the current TAC be maintained.

Reference points:

ICES considers that:	ICES proposes that:
There is not sufficient information to estimate appropriate reference points.	

Relevant factors to be considered in management:

Megrim are caught as part of a targeted anglerfish fishery which has expanded rapidly in recent years. The megrim in Sub-area VI consist of two species, *Lepidorhombus whiffiagonis* and *L. boscii*. The large majority of the landings are *L. whiffiagonis*. Current management is by a TAC set in accordance with historical landings of megrim. Although total landings are less than the TAC, some national quotas are restrictive and this has led to misreporting. Previously, the adjacent fishery in the North Sea was not subject to a TAC for megrim, and catch controls on anglerfish in Sub-area VI have led to misreporting of landings, including the megrim component, into the North Sea.

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 that area, where they are now caught as a by-catch in the targeted anglerfish fishery.

A separable VPA was employed to estimate the exploitation pattern and fishing mortality. The state of the stock was then evaluated on a yield per recruit basis and, although providing qualitatively similar results to the previous assessments, is not considered sufficiently reliable to make a catch forecast.

Length frequency and age composition data are only available for 1992–1997. Incomplete data were available for 1990 and 1991.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

Catch data (Table 3.7.6.1):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings ²
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	3.3
1995	No advice	-	4.84	2.6 ³	3.8
1996	No advice	-	4.84	2.3 ³	4.4
1997	No advice	-	4.84	1.5 ³	3.6
1998	Adequate catch controls	-	4.84		
1999	Maintain current TAC	-			

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

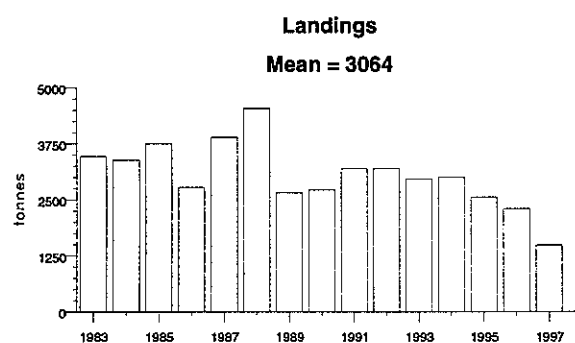


Table 3.7.6.1

MEGRIM in Sub-area VI. Nominal landings (tonnes) as officially reported to ICES, 1984–1997.

A. Division VIa

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
Belgium	-	-	-	1	1	1	-	1	-	+	1	-	- ⁴	190
Denmark	-	-	-	-	-	1	-	-	+	-	-	-	-	
France	1,398	1,411	777	997	1,295	457 ^{1,2}	398 ^{1,2}	455 ^{1,2}	504 ¹	517 ¹	469 ^{1,2}	459 ^{1,2}	420 ¹	n/a
Germany, Fed.Rep.	1	+	-	-	2	+	+	-	+	-	+	-	-	
Ireland	134	151	243	403	685	474	317	260	317	329	304	535	460	n/a
Spain	310	422	137	102	121	43	91	48	25	7	n/a	n/a	n/a	n/a
UK (Engl. & Wales) ³	14	84	55	369	284	122	25	167	392	298	327	322	...	
UK (N. Ireland)	-	-	+	11	70								...	
UK (Scotland)	862	919	660	991	1,068	1,169	1,093	1,223	887	896	866	952	...	
UK													1,100	1,075
Total	2,719	2,987	1,872	2,874	3,526	2,267	1,924	2,154	2,125	2,047	1,967	2,268	1,980	1,265
Discards							13	19	118	153	109	258	812	392
Unallocated							1,000	518	1,595	1,356	1,313	1,558	2,445	2,324
Landings as used by Working Group							2,924	2,672	3,720	3,403	3,280	3,826	4,425	3,589

¹Preliminary.²Includes Divisions Vb (EC) and VIb.³1989–1995 N. Ireland included with England and Wales.⁴Final Statlant 27a data.

n/a = Not available.

B. Division VIb

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 ¹
France	9	6	11	2	1	... ^{1,2}	... ^{1,2}	... ^{1,2}	- ¹	- ¹	... ^{1,2}	... ^{1,2}	... ²	
Ireland					-	-	196	240	139	128	176	117	124	n/a
Spain	640	646	730	583	751	205	363	587	683	594	574	n/a	n/a	n/a
UK (Engl. & Wales) ³	6	32	88	261	77	18	19	14	53	56	38	27	...	
UK (Scotland)	10	82	79	174	185	178	226	204	198	147	258	152	...	
UK													202	227
Total	665	766	908	1,020	1,014	401	804	1,045	1,073	925	1,046	296	326	227

¹Preliminary.²Included in Division VIa.³1989–1995 N. Ireland included with England and Wales.

n/a = Not available.

C. Total for Sub-area VI

1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
3,384	3,753	2,780	3,894	4,540	2,668	2,728	3,199	3,198	2,972	3,013	2,564	2,306	1,492

3.7.7

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

State of stock/fishery: The stock is considered to be outside safe biological limits. Even though the historical perspective of SSB, fishing mortality and recruitment is not well estimated, it is likely that fishing mortality has increased in recent years as the fishery has expanded into deeper water with an associated increase in catches. The fishery has now expanded into areas which are 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} and to increase or maintain spawning stock biomass above B_{pa} .

Advice on management: ICES recommends that fishing effort on anglerfish in Sub-area VI be reduced, corresponding to an effective implementation of a TAC in 1999 no greater than the TAC for 1998.

Reference points:

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} .

The assessment indicates that the recent F 's have been above 0.5 and F_{pa} is likely to entail a significant reduction (at least 50%) in fishing mortality.

Relevant factors to be considered in management:

Formerly, the lack of TAC regulation in the adjacent Sub-area IV encouraged mis-reporting of landings into that area and undermined management for Sub-area VI. The agreed TAC in 1998 for Sub-area IV based on recent landings reported from that area is unlikely to prevent mis-reporting.

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

Elaboration and special comment: Until the early 1990s, 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. Other protected species (cod, haddock, whiting) are also caught in the targeted anglerfish fishery, and, on the basis of yield and SSB per recruit, diversion of effort from the mixed demersal fishery to the anglerfish fishery does not alleviate fishing pressure on cod in Division VIa.

A separable VPA was employed to estimate the exploitation pattern and fishing mortality. The state of the stock was then evaluated on a yield per recruit basis.

Length frequency and age composition data are only available for 1992–1997. Incomplete data were available for 1990 and 1991.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 1998 (ICES CM 1999/ACFM:1).

Catch data (Table 3.7.7.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings ²
1987	Not assessed	-	7.8	5.2	-
1988	Not assessed	-	8.6	7.7	-
1989	Not assessed	-	8.6	6.0	-
1990	Not assessed	-	8.6	6.4	5.8
1991	No advice	-	8.6	6.0	5.4
1992	No advice	-	8.6	6.6	8.1
1993	No long-term gain in increased F	-	8.6	6.2	9.4
1994	No long-term gain in increased F	-	8.6	6.4	8.0
1995	A precautionary TAC not exceeding recent catch levels	-	8.6	6.3 ³	11.5
1996	A precautionary TAC not exceeding recent catch levels	-	8.6	6.6 ³	17.5
1997	Reduction in fishing effort	-	8.6	4.6 ³	12.8
1998	Reduction in fishing effort	-	8.6		
1999	Reduce fishing effort, effective implementation of the TAC	-			

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

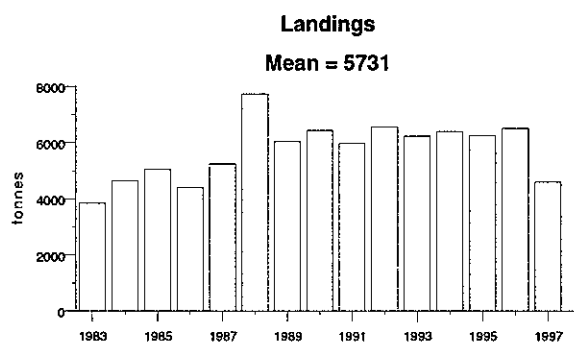


Table 3.7.7.1 ANGLERFISH in Sub-area VI. Nominal landings (tonnes) as officially reported to ICES, 1984–1997.**A. Division VIa**

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996 ¹	1997
Belgium	-	4	2	15	2	8	-	3	2	9	6	5	+ ⁴	3
Denmark	-	-	-	4	+	34	+	1	3	4	5	10	4	1
Faroe Islands	-	-	-	-	-	1	-	-	-	-	-	-	n/a	
France	1,723	2,036	1,505	1,601	2,329	1,901 ^{1,2}	2,182 ^{1,2}	1,910 ^{1,2}	2,308 ¹	2,467 ^{1,2}	2,724 ^{1,2}	2,051 ^{1,2}	2,669 ²	1,653
Germany, Fed.Rep.	4	24	3	4	9	10	+	1	2	60	67	77	35	43
Ireland	172	119	295	187	324	556	398	250	403	428	303	720	717	n/a
Norway	6	5	6	3	8	27	8	6	14	8	6 ¹	4 ¹	4	1
Spain	355	281	142	130	269	15	35	7	11	8	1	n/a	n/a	n/a
UK (Engl. & Wales) ³	56	52	36	241	403	153	71	270	351	223	370	320	...	
UK (N. Ireland)	2	-	2	2	30								...	
UK (Scotland)	1,617	1,522	1,099	1,768	2,629	3,024	2,921	2,613	2,385	2,346	2,133	2,533	...	
UK													2,716	2,471
Total	3,935	4,043	3,090	3,955	6,003	5,729	5,615	5,061	5,479	5,553	5,615	5,720	6,145	4,172
Discards							66	597	1532	1,886	1,405	3,031	4,121	747
Unallocated							184	296	2,638	3,816	2,424	5,746	11,411	8,664
Landings as used by Working Group							5,799	5,357	8,117	9,369	8,039	11,466	17,556	12,836

¹Preliminary.²Includes Divisions Vb(EC) and Vlb.³1989–1995 N. Ireland included with England and Wales.⁴Final Statlant 27a data.

n/a = Not available.

B. Division VIb

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996 ¹	1997
Faroe Islands	5	4	-	-	6	1	-	-	2	-	-	-	15	
France	35	13	19	4	4	... ^{1,2}	... ^{1,2}	... ^{1,2}	... ^{1,2}	29 ¹	... ²	... ²	... ²	
Germany, Fed. Rep.	-	-	-	-	-	-	-	-	-	103	73	83	78	56
Ireland	-	-	-	-	-	-	400	272	417	96	135	133	90	
Norway	14	7	9	11	7	13	16	18	10	17	24 ¹	14 ¹	11	4
Spain	598	642	990	730	1,340	81	138	333	263	178	214	n/a	n/a	n/a
UK (Engl. & Wales) ³	20	85	112	253	123	17	19	99	173	76	50	105	...	
UK (Scotland)	35	262	196	296	250	201	249	201	224	182	281	199	...	
UK													212	369
Total	707	1,013	1,326	1,294	1,730	313	822	923	1,089	681	777	534	406	429

¹Preliminary.²Included in Division VIa.³1989–1995 N. Ireland included with England and Wales.

n/a = Not available.

C. Total Reported Landings for Sub-area VI

1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
4,642	5,056	4,416	5,249	7,733	6,042	6,437	5,984	6,568	6,234	6,392	6,254	6,551	4,601

3.7.8 Herring West of Scotland

3.7.8.a Herring in Division VIa (North)

State of stock/fishery: The present state of the stock is not known precisely, but recent historic exploitation levels have been low and within safe biological limits.

Advice on management: The stock seems able to sustain the fishing mortality estimated prior to 1997, but it is not known to what extent catches and fishing mortality have increased. **ICES advises that an improved evaluation be provided in October 1998 when new survey information will be available.**

Relevant factors to be considered in management: In the past there has been substantial misreporting primarily of North Sea herring into this area, and that is potentially detrimental to the North Sea stock if this continues. Recent licensing restrictions are thought to have decreased opportunities for misreporting and so have resulted in increased catches from the area. The TACs for 1997 and 1998 are three times higher than the Working Group's estimates of mean annual catch in the period 1994–1997. Assessments are based on uncertain catches, acoustic

surveys and larval surveys. Misreporting may be up to 59% of reported catches.

Catch forecast: A catch forecast will be provided in October 1998.

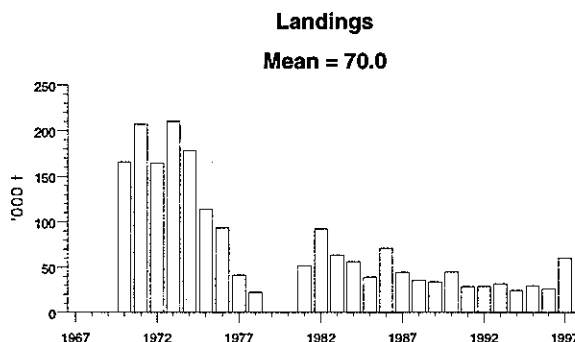
Elaboration and special comment: Herring is fished in this area by several countries. Exploitation has decreased since the mid-1980s, with reported catches remaining approximately constant during a period of good recruitment. In recent years an increasing proportion of the officially reported catches is due to misreported landings from Division IVa into this area. The current state of the stock is highly uncertain because of uncertainty in catches and the absence of a consistent survey for 1997.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14).

Catch data (Table 3.7.8.a.1):

Year	ICES advice	Predicted catch Corresp. to advice	Agreed TAC	Disc. slip.	ACFM catch ¹
1987	Reduce F to $F_{0.1}$ /status quo F	38-55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at status quo F	54-58	62	0.8	32
1994	Catch at status quo F	50-60	62	0.7	24
1995	No specific advice	60 ²	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at status quo F		83.57	0.1	60
1998	Catch at status quo F	30	80.57		
1999	Advice in October 1998	30			

¹Adjusted for misreporting. ²Catch at status quo F. Weights in '000 t.



3.7.8.a.1 Herring in Division VIa (North) updated October 1998

State of stock/fishery: The state of the stock is uncertain because indicators of stock status provide conflicting signals and catch data are unreliable. However all indicators show that the increased catches estimated in 1997 have resulted in a very large increase in fishing mortality which is unlikely to be sustainable.

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

management objectives to meet the precautionary criteria F should be less than F_{pa} and spawning stock should be greater than B_{pa} .

Advice on management: ICES considers that the 1997 fishing mortality is unlikely to be sustainable and recommends that catches in 1999 should not exceed the average of the 1991–1996 period which is about 28 000 t.

Reference points:

ICES considers that	ICES proposes that:
No biological reference points have been calculated for this stock because of the uncertainties about the historical catch data, the size of the biomass and estimates of recruitment and fishing mortality.	

Relevant factors to be considered in management: In the past there has been substantial misreporting of catches, primarily of North Sea herring, into this area. This has introduced errors into the assessments of both the North Sea stock and the stock in VIa North. Although recent UK licensing restrictions are thought to have decreased opportunities for misreporting in 1997, misreporting is considered to have been high in preceding years.

The TACs for 1996 to 1998 are approximately 2.5 times higher than the Working Group's estimates of the mean annual catch for the preceding years and are therefore not restrictive. ICES has previously advised that the TACs for this stock should be fixed at the level of the actual catches.

Catch forecast: No catch forecast has been made for this stock because of doubts about the current stock size.

Elaboration and special comment: There are three main fleets operating, 1) the Scottish inshore paired midwater trawl fleet which operates in the Minches and around the Isle of Barra in the south of the area, 2) the Scottish and Norwegian purse-seine fleets which operates in the northern part of VIa and also in the northern part of IVa and 3) the offshore (mainly Dutch and German freezer trawlers) fleet which operate in the deeper waters near the edge of the continental shelf.

In 1997 ICES considered the stock in this area to be within safe biological limits and to be relatively lightly

exploited although the size of the stock was not known precisely. Exploitation had decreased on the stock since the mid-1980s, with reported catches remaining approximately constant during a period of good recruitment. However the dramatic increase in the 1997 total catch (estimated by the Working Group to have increased from 26 000 t in 1996 to 60 000 t in 1997) has resulted in an increase in the 1997 fishing mortality by a factor of approximately four. The 1997 acoustic survey, (the only tuning index currently available), was moved forward by one month in 1997 and gave a very low estimate of abundance and the results have not been used in the current assessment. The 1998 acoustic survey gave an estimate of spawning stock biomass which was consistent with that obtained in 1996, but which indicated that the numbers of old fish in the stock were very low and thus implying a substantial increase in fishing mortality. The numbers of old fish in the acoustic survey estimate of stock size were also considerably different than those indicated from the sampling of catches from the off shore fleets.

Assessments are based on uncertain catches, acoustic surveys and larval surveys.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14) and the updated assessment presented in Working Document "1998 Assessment of Herring in ICES area VIa North".

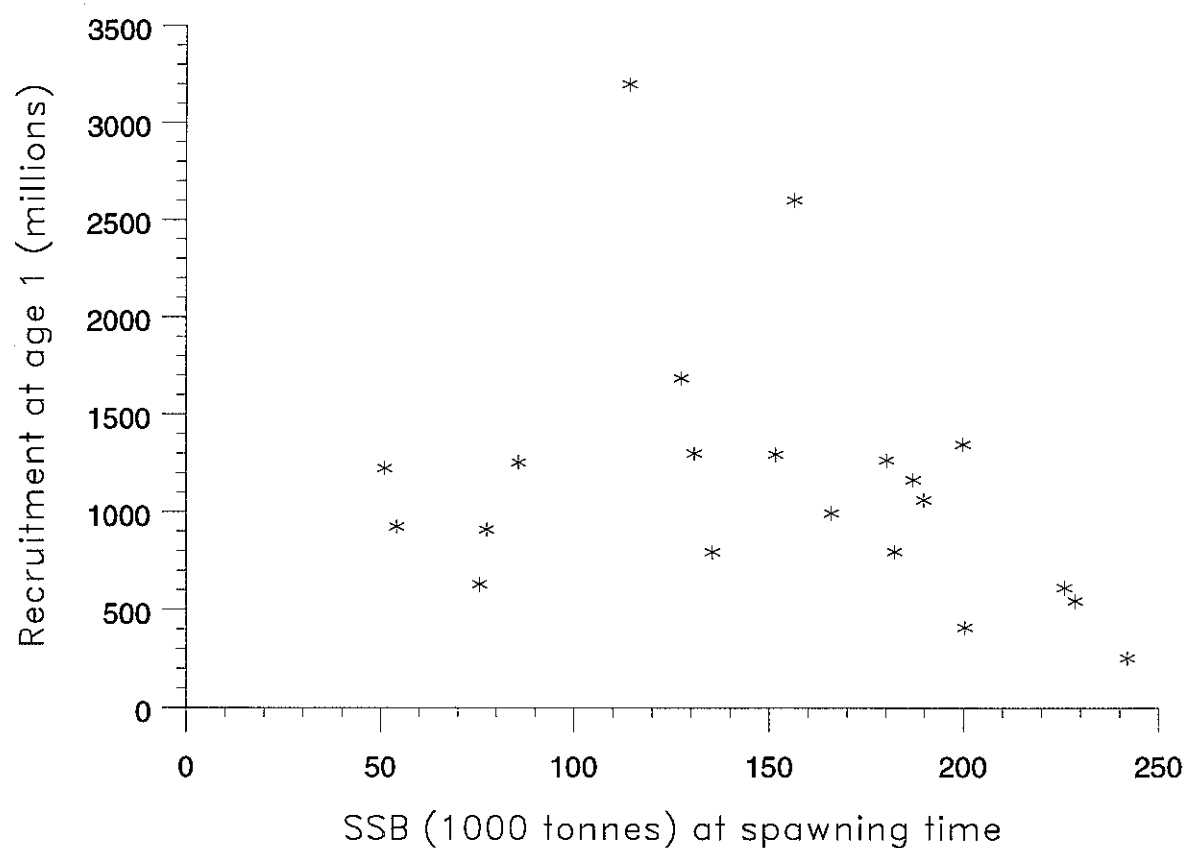
Catch data (Table 3.7.8.a.1-2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Disc. shp.	ACFM Catch ¹
1987	Reduce F to $F_{0.1}$ /status quo F	38-55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at status quo F	54-58	62	0.8	32
1994	Catch at status quo F	50-60	62	0.7	24
1995	No specific advice	60 ²	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at status quo F		83.57	0.1	60
1998	Catch at status quo F	59	80.37		
1999	Average catches, 1991-1996	28			

¹Adjusted for misreporting. ²Catch at status quo F. Weights in '000 t.

Herrring in Division VIa

Stock - Recruitment



(run: ICAMVI09)

Herring in Division VIa

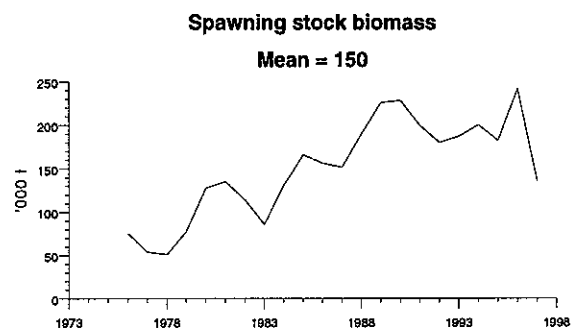
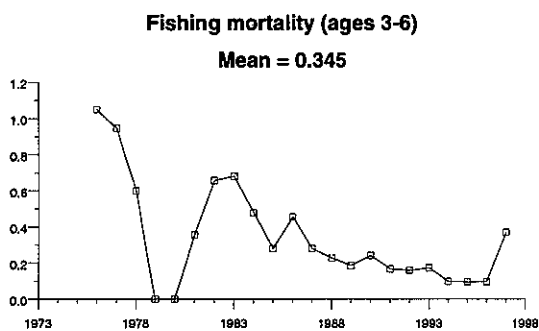
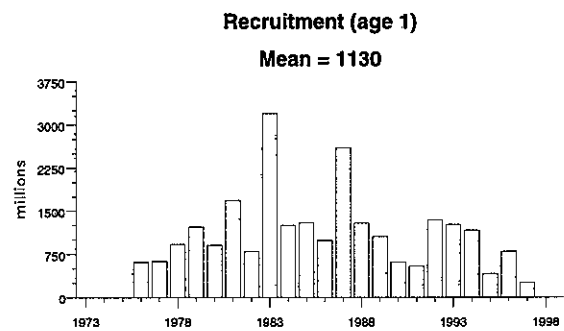
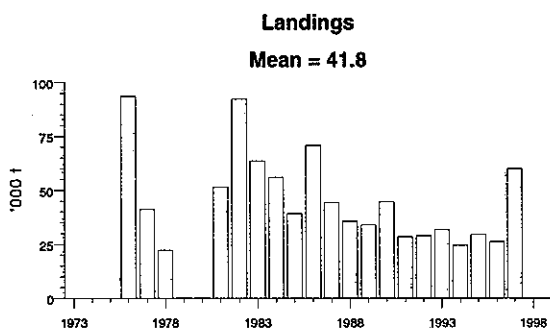


Table 3.7.8.a.1 HERRING in Division VIa (North). Catch in tonnes by country, 1970-1997. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1970	1971	1972	1973	1974	1975
Denmark	0	554	150	932	0	374
Faroes	15100	8100	8094	10003	5371	3895
France	1293	2055	680	2441	411	1244
Germany	11768	6444	3376	9914	8887	6182
Iceland	5595	5416	2066	2532	9566	2633
Netherlands	464	8340	22673	27892	17461	12024
Norway	27250	76721	17400	32557	26218	509
UK	103530	99537	107638	120800	107520	85520
Other	930		2679	3199	2726	1620
Unallocated						
Discards						
Total	165930	207167	164756	210270	178160	114001
Area-Misreported						
WG Estimate	165930	207167	164756	210270	178160	114001
Source (WG)	1982	1982	1982	1982	1982	1982
Country	1976	1977	1978	1979	1980	1981
Denmark	249	626	128	0	0	1580
Faroes	4017	3564	0	0	0	0
France	1481	1548	1435	3	2	1243
Germany	4363	0	26	0	256	3029
Iceland	3273	0	0	0	0	0
Netherlands	16573	8705	5874	0	0	5602
Norway	5183	1098	4462	57	0	3850
UK	53371	25539	10231	0	48	31483
Other	5132	261				
Unallocated						4633
Discards						
Total	93642	41341	22156	60	306	51420
Area-Misreported						
WG Estimate	93642	41341	22156	60	306	51420
Source (WG)	1982	1982	1982	1982	1982	1983
Country	1982	1983	1984	1985	1986	1987
Denmark	0	0	96	0	0	0
Faroes	74	834	954	104	400	0
France	2069	1313	0	20	18	136
Germany	8453	6283	5564	5937	2188	1711
Ireland	0	0	0	0	6000	6800
Netherlands	11317	20200	7729	5500	5160	5212
Norway	13018	7336	6669	4690	4799	4300
UK	38471	31616	37554	28065	25294	26810
Other						
Unallocated	18958	-4059	16588	-502	37840	18038
Discards	0	0	0	0	0	0
Total	92360	63523	75154	43814	81699	63007
Area-Misreported			-19142	-4672	-10935	-18647
WG Estimate	92360	63523	56012	39142	70764	44360
Source (WG)	1984	1985	1986	1987	1988	1989

Table 3.7.8.a.1 continued

Country	1988	1989	1990	1991	1992	1993
Denmark	0	0	0	0	0	0
Faroes	0	0	326	482	0	0
France	44	1342	1287	1168	119	818
Germany	1860	4290	7096	6450	5640	4693
Ireland	6740	8000	10000	8000	7985	8236
Netherlands	6131	5860	7693	7979	8000	6132
Norway	456	0	1607	3318	2389	7447
UK	26894	29874	38253	32628	32730	32602
Other						
Unallocated	5229	2123	2397	-10597	-5485	-3753
Discards	0	1550	1300	1180	200	
Total	47354	53039	69959	50608	51578	56175
Area-Misreported	-11763	-19013	-25266	-22079	-22593	-24397
WG Estimate	35591	34026	44693	28529	28985	31778

Source (WG)	1990	1991	1992	1993	1994	1995
Country	1994	1995	1996	1997		
				(preliminary)		
Denmark	0	0	0	0		
Faroes	0	0	0	0		
France	274	3672	2297	3093		
Germany	5087	3733	7836	8873		
Ireland	7938	3548	9721	1875		
Netherlands	6093	7808	9396	9873		
Norway	8183	4840	6223	4962		
UK	30676	42661	46639	44273		
Other						
Unallocated	-4287	-4541	-17753	-8015		
Discards	700			62		
Total	54664	61721	64359	64995		
Area-Misreported	-30234	-32146	-38254	-5039		
WG Estimate	24430	29575	26105	59957		

Source (WG)	1996	1997	1997 New data			
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* In the 1995 WG report, the minus sign on the unallocated catch was omitted. This error was repeated in subsequent reports.

Other: Official catches by countries other than those named. Unallocated: Catches for which the Working Group has specific reports of an under- or over-reporting of catches. Discards: Estimates of fish discarded or slipped, usually from observer records. Area-Misreported: Catches reported in the area between 4 and 5 W and reallocated to IVa.

Table 3.7.8.a.2 Herring in the Northern part of VIa.

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1976	614.02	75.61	93.64	1.050
1977	629.20	54.16	41.34	0.946
1978	923.94	51.07	22.18	0.600
1979	1,223.32	77.47	0.06	0.001
1980	908.54	127.55	0.31	0.000
1981	1,685.04	135.46	51.42	0.357
1982	795.08	114.19	92.36	0.657
1983	3,197.12	85.77	63.52	0.681
1984	1,253.35	130.85	56.01	0.479
1985	1,298.85	165.95	39.14	0.280
1986	993.51	156.48	70.76	0.456
1987	2,599.68	151.73	44.36	0.281
1988	1,293.11	189.89	35.59	0.227
1989	1,059.79	225.89	34.03	0.186
1990	611.43	228.57	44.69	0.242
1991	543.69	199.89	28.53	0.167
1992	1,345.25	180.26	28.99	0.159
1993	1,263.69	187.12	31.78	0.172
1994	1,163.14	200.39	24.43	0.098
1995	409.54	182.33	29.58	0.095
1996	795.26	241.99	26.11	0.096
1997	253.49	135.78	59.96	0.369
Average	1,130.00	149.93	41.76	0.345
Unit	Millions	1000 tonnes	1000 tonnes	-

3.7.8.b Clyde herring (Division VIa)

State of stock/fishery: In the absence of surveys, and no stock separation of catches, little is currently known about the state of the spring-spawning stock or the immigrant autumn-spawning component. There is a greater number of aged 1 fish in 1994 and 1996, but due to the lack of stock separation and surveys their year class cannot be determined. The fishing mortality is not known.

Advice on management: ICES recommends that until new evidence is obtained on the state of the local spring-spawning component, existing restrictions on the fishery should be continued.

Proposed reference points: None available.

Relevant factors to be considered in management: An assessment of the Clyde herring is complicated by the mixture of a spring-spawning component and autumn-spawners from adjacent areas. Nothing is currently known about the proportions of these two components in the catches or in the stock. Traditionally the fishery has taken place in October and November. In 1997 the major fishery took place in the third and

fourth quarter.

No assessment possible. Catch at age data are available but not separately by stock component. No independent survey data are available in recent years.

Elaboration and special comments: There are two stock components present on the fishing grounds, resident spring-spawners and immigrant autumn-spawners. The spring-spawning stock supported a strong and locally-important fishery from 1955–1974 at catch levels ranging from 4 000 to 15 000 t. A TAC of 3 000 t was set in 1984 increasing to a maximum of 3 500 t in 1987 subsequently reducing to 1 000 t by 1993. Estimated catches, including discards, exceeded the TAC for the first four years. Since then catches have declined to below the TAC. Recent TACs have not been taken, despite the increase in fishing by non-Scottish vessels.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 1998 (ICES CM 1998/ACFM:14).

Catch data (Table 3.7.8.b.1):

Year	ICES advice	Predicted catch Corresp. to advice	Agreed TAC	Disc. slip.	ACFM catch
1987	Fishing at $F_{0.1}$	3.5	3.5	0.4	3.6
1988	TAC	3.2	3.2	0.2	1.9
1989	Stabilise catch at recent levels	2.9–3.4	3.2		2.3
1990	TAC	2.6	2.6		2.3
1991	TAC	2.9	2.9		0.7
1992	TAC	1.6	2.3		0.9
1993	Lowest possible level	-	1.0		0.9
1994	Lowest possible level	-	1.0		0.6
1995	Lowest possible level	-	1.0		0.4
1996	Lowest possible level	-	1.0		0.9
1997	Lowest possible level	-	1.0		0.5
1998	Continue existing restrictions	-	1.0		
1999	Continue existing restrictions	-			

Weights in '000 t.

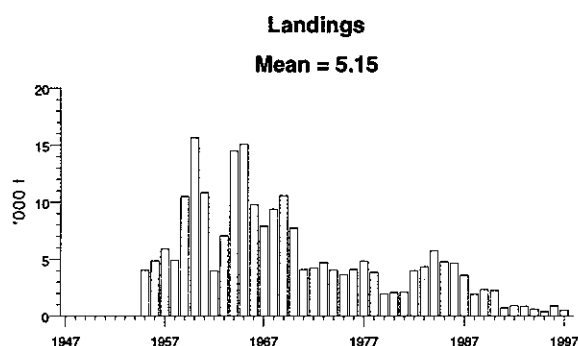


Table 3.7.8.b.1 Catches of HERRING from the Firth of Clyde. Spring and autumn-spawners combined. Catch in tonnes by country, 1955–1997.

Year	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Total	4,050	4,848	5,915	4,926	10,530	15,680	10,848	3,989	7,073	14,509	15,096
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Total	9,807	7,929	9,433	10,594	7,763	4,088	4,226	4,715	4,061	3,664	4,139
Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Scotland						2,506	2,530	2,991	3,001	3,395	2,895
Other UK						-	273	247	22	-	-
Unallocated ¹						262	293	224	433	576	278
Discards						1,253	1,265	2,308 ³	1,344 ³	679 ³	439 ⁴
Agreed TAC								3,000	3,000	3,100	3,500
Total	4,847	3,862	1,951	2,081	2,135	4,021	4,361	5,770	4,800	4,650	3,612
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	
Scotland	1,568	2,135	2,184	713	929	852	608	392	598	371	
Other UK	-	-	-	-	-	-	-	-	283	119	
Unallocated ¹	110	208	75	18	-	-	-	-	-	-	
Discards	245 ⁴	- ²	- ²	- ²	- ²	- ²	- ²	- ²	-	-	
Agreed TAC	3,200	3,200	2,600	2,900	2,300	1,000	1,000	1,000	1,000	1,000	
Total	1,923	2,343	2,259	731	929	852	608	392	881	490	

¹Calculated from estimates of weight per box and in some years estimated by-catch in the sprat fishery

²Reported to be at a low level, assumed to be zero.

³Based on sampling.

⁴Estimated assuming the same discarding rate as in 1986.

3.7.9 Norway pout in Division VIa

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

Reference points:

ICES considers that:	ICES proposes that
There is not sufficient information to estimate appropriate reference points	

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 to base scientific advice on. By-catches in this fishery should be quantified and made available.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998(ICES CM 1999ACFM:8).

Catch data (Table 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	
1999	No advice	

Weights in '000 t.

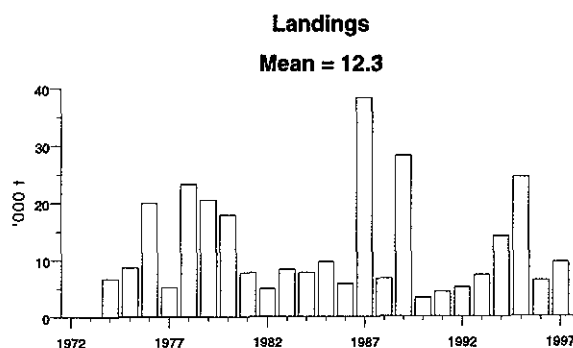


Table 3.7.9.1 Norway pout. Annual landings (t) in Division Via (Data officially reported to ICES).

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	37714	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)	553	517	5	-	-	-	-	+	-	140	13
Total	38267	6742	28196	3316	4348	5158	7338	14148	24439	6322	9562

Table 3.7.9.2 Norway pout N-W Coast of Scotland and N. Ireland (Fishing Area VIa).

Year	Landings
1974	6,721
1975	8,655
1976	19,933
1977	5,206
1978	23,250
1979	20,502
1980	17,870
1981	7,757
1982	4,911
1983	8,325
1984	7,794
1985	9,697
1986	5,832
1987	38,267
1988	6,742
1989	28,196
1990	3,316
1991	4,348
1992	5,158
1993	7,338
1994	14,148
1995	24,439
1996	6,322
1997	9,562
Average	12,262
Unit	tonnes

3.7.10 Sandeel in Division VIa

Management objectives: The current management regime uses a multi-annual TAC of 12 000 t with the

fishery closed from 31 July. Access is limited to vessel with a track record. These arrangements took effect in 1998 and will run for 3 years.

Reference points:

ICES considers that:	ICES proposes that
There is not sufficient information to estimate appropriate reference points	

Elaboration and special comment: There have only been minor revisions of the data base for this stock since it was assessed in 1996 and a new assessment has not been made. At that time it was considered to be within safe biological limits.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 1998(ICES CM 1999/ACFM:8)

Catch data (Table 3.7.10.1):

Year	ICES advice	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		
1999	No advice		

Weights in '000 t.

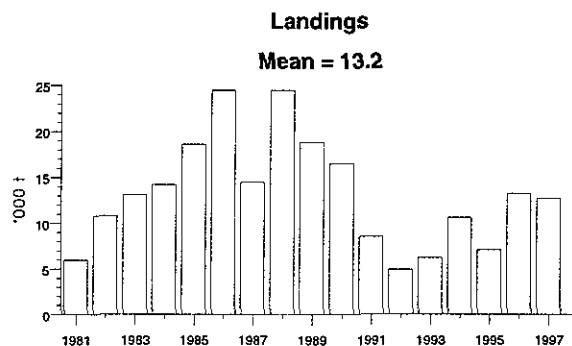


Table 3.7.10 Sandeel, Division Via. Landings (tonnes), 1981–1997, as officially reported to ICES.

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
Denmark	-	-	80	-	-	-	-
UK, Scotland	8532	4935	6156	10627	7111	13257	12679
Total	8532	4935	6236	10627	7111	13257	12679