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International Council for the Exploration of the Sea

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REPORT OF THE NORTH-WESTERN WORKING GROUP

Copenhagen, 16-23 September 1988

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*General Secretary
ICES
Palægade 2-4
DK-1261 Copenhagen K
DENMARK

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1 INTRODUCTION

1.1 Participants

H.-P. Cornus	Federal Republic of Germany
N.R. Hareide	Norway
V. Helgason	Iceland
K. Hoydal (Chairman)	Faroe Islands
H. Hovgård	Greenland
A. Kristiansen	Faroe Islands
J. Lahn-Johannessen	Norway
K. Lehmann	Greenland
J. Magnusson	Iceland
A.I. Pavlov	USSR
J. Reinert	Faroe Islands
A.I. Ryazhskikh	USSR
S.A. Schopka	Iceland

The ICES Statistician, Dr E. Anderson, assisted the meeting on the first day.

1.2 Terms of Reference

At the 75th Statutory Meeting (C.Res.1987/2:3:15), it was decided that the North-Western Working Group should meet at ICES Headquarters from 28 April - 6 May 1988 to:

a) assess the status of and provide catch options for 1989-1990 within safe biological limits for the stocks of redfish and Greenland halibut in Sub-areas V and XIV, saithe in Division Va and Division Vb, and cod and haddock in Division Vb, and, if possible, consider the effects of technical and biological interactions;

b) continue to compile the data necessary for assessing the stocks of blue ling, ling, and tusk in Sub-areas V, VI, and XIV and evaluate the possibility for assessing these stocks.

In April, it became evident that an essential part of the Faroese data could not be processed in time for the meeting, and with the consent of the members of the Working Group, the meeting was rescheduled to 16-23 September 1988.

The Group has been able to address all the questions referred to in the terms of reference, however, with variable success. The exceptions are biological and technical interactions. The Group is not at present aware of any existing data which could throw light on the biological interactions in the three main areas Greenland, Iceland, and the Faroes. There are data available for analysis of technical interactions and for this and other reasons, the Group is aiming at organizing time series of catch-at-age and effort data by fleet categories before the next meeting of the Group in 1990.

1.3 Timing of the Meeting and Participation

The Group noted with regret once again that the French member did not have the possibility to attend the meeting. The Group, however, expressed its appreciation for the data and analysis of blue ling that were made available by IFREMER, but still retained its position that French participation would improve the possibilities to achieve results, especially regarding blue ling. The participation of USSR scientists this year was highly appreciated and resulted in rapid progress in establishing the basis for assessing the major fishery for "oceanic-type S. mentella".

The Group discussed the frequency and timing of meetings as seen by the members. The Group agreed to recommend that the meetings should remain biennial and that the meetings should take place in late April to make it possible to use the most up-to-date survey data in the assessments. It was pointed out that the fisheries administrations which are primary receivers of the advice on these stocks have to be asked before the final meeting schedule is decided by the Council.

1.4 Management Considerations

The Group has not much to add to the statements made in its last report (Anon., 1987). The Group took note of the fact that from 1 January 1989, mesh sizes inside the the Faroese fisheries zone will increase to 155 mm in the codend, and thus become the same as inside the Icelandic EEZ, where this mesh size is in force for all demersal species except redfish.

The Group noted the conflict between the prawn and the redfish fisheries. A summary of information on by-catch problems in the prawn fisheries in East Greenland, with special reference to the by-catch of small redfish, is given in Section 2.4.2.

1.5 Methodological Considerations

The Group has in all instances, where data were available, followed the recommendations of ACFM on how to treat the data.

The first step has been to attempt a tuning of the VPA based on the catch-at-age and effort or survey data. With the generally low level of disaggregation of data available at this meeting, the tunings really were not very sophisticated, but they are reproducible. With the estimate of the level of exploitation from the tuning, a separable VPA has been started and the results have been inspected. Where this process leads to sensible results, the estimates of population size estimated from the terminal populations version of the separable VPA and the exploitation pattern estimated from the separable version have been carried on into the predictions.

Attempts to use indices of recruitment for the stocks dealt with in this report, using the programs available at ICES Headquarters in the analysis, were not successful. Assumptions of average recruitment for incoming year classes are, therefore, generally used.

Descriptions of data and progress in solving problems are given individually for each stock in the respective stock chapters.

A small technical problem should be noted. The tuning and separable VPAs were run on the full data sets of catch-at-age data, most going back to the 1960s, although the early years have been down-weighted. However, for presentational purposes, runs based on only the last 10 years are sometimes preferred for inclusion in the report. These runs will differ slightly from the runs based on the full data set. It is recommended that the ICES VPA program have an option which allows the last 10 years to be printed even though the analysis may have been run on a longer series.

2 REDFISH IN SUB-AREAS V-XIV

2.1 Landings and Trends in the Fisheries

The total catch from the Irminger Sea redfish stock complex increased from 194,000 t in 1985 to 228,000 t in 1986 and decreased again to 205,000 t in 1987, which is slightly less than the average total catch from 1985 to 1987. The catches, based on the stock of the oceanic-type S. mentella, increased from about 72,000 t in 1985 to 105,000 t in 1986, but decreased again to 91,000 t in 1987.

The total catch of redfish, excluding catch figures from the "oceanic" fishery, remained at the same level in 1987 as in 1984 and 1985 with 123,000 t, but decreased to 114,000 t in 1987, i.e., about 7%.

The catches in Division Va decreased by about 5,000 t in 1986, but increased by about 2,000 t in 1987. In Division Vb, the catches increased by about 2,000 t in 1986 but decreased by about 4,000 t in 1987. In Sub-area XIV, the catches increased by about 4,000 t in 1986, but decreased by about 7,000 t in 1987.

In Division Va (Iceland) (Table 2.1), the Icelandic fleet decreased its fishing effort slightly in 1986 and 1987 compared with 1985, while the catch per unit effort increased during these two years. The Icelandic catch declined from about 91,000 t in 1985 to about 86,000 t in 1986 and increased again to about 88,000 t in 1987.

In Division Vb (Faroes) (Table 2.2), the catches increased from about 20,000 t in 1985 to about 22,000 t in 1986, but decreased again to about 18,000 t in 1987. The increase in the catches in 1986 was mainly because of increased Faroese catches from 12,600 t in 1985 to 15,300 t in 1986, while the decline in catches in 1987 was because of a decrease in catches by the Federal Republic of Germany fleet (by about 2,000 t) and the Faroes (by about 1,400 t). Denmark reported minor catches in Division Vb in 1986 and 1987 (36 and 176 t, respectively) for the first time. Catches of other nations in Division Vb decreased both in 1986 and 1987.

In Sub-area XIV (East Greenland) (Table 2.3A), the total catch (excluding the oceanic-type S. mentella) increased from 11,500 t

in 1985 to 15,100 t in 1986, but declined greatly by 8,000 t in 1987. The catches taken by the Federal Republic of Germany fleet decreased from 6,000 t in 1985 to 5,600 t and 4,700 t in 1986 and 1987, respectively, while the catches of the Japanese fleet (reported by Greenland) increased from 5,500 t in 1985 to 9,500 t in 1986 but decreased to about 2,900 t in 1987. The proportion of S. marinus in the catches remained at a very low level.

The fishery on the oceanic-type S. mentella stock took place outside the 200-nm zone in Sub-areas XIV and XII (Table 2.3B). The catches amounted to 72,000 t in 1985, 105,000 t in 1986, and 91,000 t in 1987. These catches are dealt with separately and are not included in the present assessment for Sub-area XIV and Divisions Va and Vb (see Section 12).

2.2 Effort Data

Effort data for the Icelandic fisheries were available for the period 1977-1987 (Table 2.4). From 1979-1983, there was an increase in effort in the international S. marinus fishery with a maximum of 110,500 hours in 1983.

International effort has decreased since 1983 mainly because of a shift from redfish to cod in the Icelandic area and a reduction of the Federal Republic of Germany distant water fleet.

The CPUE in Division Va was stable from 1979-1982 at a level of 1,160 kg/hr (average). The CPUE then declined to 959 kg/hr in 1984 and has since increased to 1,072 kg/hr in 1987.

2.3 Research Vessel Surveys (Figure 2.1, Tables 2.5 and 2.6)

Results from 1980-1987 from the Federal Republic of Germany groundfish survey in Sub-area XIV were available to the Working Group in terms of biomass and abundance estimates as well as abundance per age group (Tables 2.5 and 2.6). A regression was made of Sebastes marinus VPA stock size 11+ on Sebastes marinus survey stock size. A coefficient of correlation of 0.92 was calculated (Figure 2.1). In addition, results from a Japanese groundfish survey in 1987 in Sub-area XIV were available (Yatsu and Jørgensen, 1988). The biomass estimates of Sebastes marinus differ from those of the Federal Republic of Germany by about 37%, but length distributions show the same modes. The survey results were not used in the assessment because effort data were available, which give more reasonable results.

2.4 Redfish Landings

2.4.1 The species split (Tables 2.7 - 2.9)

In Division Va (Table 2.7), the Icelandic catch was allocated to S. marinus and S. mentella in the proportion of 78.0% and 22.0% in both 1986 and 1987, based on observations of the landings. The catches of Belgium, the Faroes, and Norway were, in accordance with the nature of their fisheries, allocated to S. marinus in

both years (1986 and 1987).

In Division Vb (Table 2.8), the Faroese catches were allocated to S. marinus and S. mentella in the proportion of 37.0% and 63.0% in 1986 and 36.0% and 64.0% in 1987. The Federal Republic of Germany catch was allocated to S. marinus and S. mentella in the proportion of 2.2% and 97.8% in 1986 and 19.8% and 80.2% in 1987. The allocation to species both for the Faroese and Federal Republic of Germany catches was based on observations of the landings.

The French catches were allocated to S. marinus and S. mentella in both years (1986 and 1987) as in 1983, i.e., 75.5% and 24.5%, respectively, since no new data were available. The catches of Denmark, Norway, and USSR were all allocated to S. mentella in both years in accordance with the nature of their fisheries.

In Sub-area XIV (Table 2.9), the catch of the Federal Republic of Germany was allocated to S. marinus and S. mentella in the proportion of 19.6% and 80.4% in 1986 and 14.1% and 85.9% in 1987. These figures are based on observations of the landings. The Greenland catch (Japanese vessels) was in both years allocated to S. marinus and S. mentella in the same proportion as the catch of the Federal Republic of Germany. The Faroese catches were allocated to S. marinus in both years.

2.4.2 By-catch of small redfish in the Denmark Strait shrimp fishery (Tables 2.10 and 2.11 and Figures 2.2-2.4)

The Dohrn Bank area is the main fishing ground for the shrimp fishery in the Denmark Strait (Figure 2.2) (Carlsson, 1986 and 1988).

Information on by-catches of redfish has been obtained by observers aboard commercial stern trawlers in March-April (Jacobsen and Torheim, 1983; Smedstad and Torheim, 1984, 1985, 1986, 1987, 1988) and in November (Bragason, pers. comm.).

The main part of the by-catch of redfish is fish between 10 and 25 cm in length, indicating that the Dohrn Bank area is a part of the nursery area for redfish (Figure 2.4).

The main fishery for shrimp takes place from December to May (Figure 2.3, Table 2.10). The by-catch of redfish as reported in logbooks in 1987 increased from January to June, with a pronounced peak in November which could indicate that a strong new year class of redfish is being recruited to the shrimp trawl.

Samples from the November observer program show a mode of redfish of 13 cm (Figure 2.4). The observed 37 tows in 10 days gave 30 t of shrimp and 15 t of redfish corresponding to 800,000 individuals with a mean weight of 18.9 g. A total of 4-7 other trawlers were fishing in the same area. A rough estimate would indicate that 5 million small redfish were caught in that period.

The observed by-catch in March-April 1982-1987, which covers the main fishing season, was used to estimate the total amount of by-catch of redfish in the total shrimp fishery in the Denmark

Strait (Table 2.11). The estimated number of redfish taken as by-catch was 0.4 million in 1982 increasing to 0.8 million in 1985. In 1986 and 1987, there was a large increase to 2.7 and 6.6 million, respectively. These figures are rather small compared with the estimated by-catch of 5 million redfish by a few trawlers in a few days. This high figure could be the result of a local concentration of small redfish.

The by-catches reported in the logbooks gave an overall by-catch percentage of 1.09 for 1987, and the observer program in March-April gave an estimate of 6.6 million individuals. Calculating the mean weight from these figures of different origin gives a figure of 19.6 g per individual which is rather close to the mean weight of 18.9 g obtained from the November observer program. This indicates that estimates from the March-April observer program are consistent with the logbook reported by-catch of redfish.

The trawl surveys in 1987 by research vessels from the Federal Republic of Germany and Japan confirm that the Denmark Strait is a nursery area for redfish that recruit to the stocks fished in the Irminger Sea complex. The "Redfish box" at the east coast of Greenland, in which trawl fishing is prohibited, is as important now as it was when it was recommended, and should not be reduced in any way. However, the results from the November 1987 observer program indicate that when great masses of small redfish are caught in the shrimp fishery in local areas or certain months or certain times of the day or night, fishing in these areas or times should also be prohibited or a selection trawl used to avoid decimating the recruitment.

2.5 Sebastes marinus

2.5.1 Age composition of catches (Table 2.12)

For 1986 and 1987, age-length keys, numbers at length, and numbers at age were available from Iceland for Division Va and from the Federal Republic of Germany for Sub-area XIV. Age composition data for Division Vb were not available.

Division Va

The catches of Belgium, Faroes, and Norway were broken down in the same way as the Icelandic catches in 1986 and 1987.

Division Vb

Icelandic data were used to split the catches of the Faroes, the Federal Republic of Germany, and France.

Sub-area XIV

The Federal Republic of Germany data were used to calculate the catch in numbers of the Faroese and Greenland catches in 1986 and 1987.

2.5.2 Weight at age (Table 2.13)

For 1986 and 1987, only Icelandic weight-at-age data were available. As the Icelandic catch dominates the total landings, these data were used for the total landings for calculation of the SOP.

The SOP check showed a deviation of 1% for 1986 catches, but none for 1987 catches.

2.5.3 Maturity at age (Table 2.14)

Icelandic data on maturity at age were presented for 1986 and 1987. No definite trend has been observed over the years and, therefore, the maturity ogive from the last assessment in 1986 was used in the present VPA (Table 2.14).

2.5.4 Estimates of fishing mortality (Tables 2.15 and 2.16)

The estimation of fishing mortality has been carried out as follows:

First, the results of the Federal Republic of Germany groundfish survey in Sub-area XIV were examined for correlation with VPA data (see Section 2.3). A good correlation encouraged the use of the tuning method with survey data which results in a mean F value of 0.24 for ages 14-23. This value was used as a terminal F value at age 16 to start a separable VPA. Using the resultant exploitation pattern, a conventional VPA was run. The result was an increased value of the mean $F_{(14-23)}$ of 0.435 and a serious reduction in the total stock number compared to the last assessment.

Therefore, the total international effort (Section 2.2) was used for tuning. A mean F of 0.163 was calculated for ages 14-23. This value was taken as the terminal F on age 18 (starting age of a range of age groups with relatively high Fs in comparison to ages 14-17 (see Table 2.19), and a separable VPA was started followed by a conventional VPA. Again, the result was an increased mean F of 0.239 and a seriously reduced stock size in numbers. The Group thought that variations in the size of single age groups from year to year, which may be an effect of inconsistencies in age readings, may appear as a change in exploitation pattern. Therefore, the assumptions in using separable VPA are not met. A conventional VPA was, therefore, run using the F values from the tuning procedure as terminal Fs and leaving out the separable VPA step. This run was accepted by the Group.

Mean fishing mortality at ages 14-23 declined from a maximum in 1982 (0.31) continuously to 0.22 in 1984, remained at a level of 0.17 in 1985 and 1986, and slightly decreased to 0.16 in 1987. This reflects the trend in effort and catches.

2.5.5 Spawning stock biomass (Table 2.17)

Spawning stock biomass declined from the 1967 value of about 520,000 t to the 1977 value of about 350,000 t. It then increased

to about 490,000 t in 1981. The trend then changed and it decreased to about 420,000 t in 1984. It has remained stable at a level of about 395,000 t since 1985.

2.5.6 Recruitment (Table 2.18)

Index figures for 0-group redfish in the Irminger Sea and at East Greenland are available from the Icelandic 0-group surveys since 1970. During 1972-1974, the index figures were well above the overall average of 14.8, indicating good year classes in those years. During the 10-year period 1975-1984, the index was below average, particularly from 1979 to 1984, followed by high values in 1985 and 1987, while the 1986 index was slightly below average, indicating good recruitment after a low period of poor recruitment.

The stock size at age 11 estimated from the Federal Republic of Germany survey was compared with age 11 from VPA and a linear regression computed. Although there was a good relationship, a long-term average of VPA age 11 (1967-1980) was used as input in the predictions because the time series of the survey (1980-1987) was too short in comparison with the lifetime of the species Sebastes marinus.

2.5.7 Biological reference points

A yield-per-recruit (age 11) curve was calculated based on the mean weight at age from 1984-1987 with the oldest age as a plus-group. The reference points of $F_{0.1}$ and F_{max} are 0.031 and 0.065, respectively.

2.5.8 Catch predictions (Tables 2.19 and 2.20 and Figure 2.5)

Basic input data are displayed in Table 2.19 assuming an average recruitment of 191 million fish at age 11 for the period of projection. The results of the catch projection are given in Table 2.20 with an estimated catch of about 77,000 t in 1988 based on the present catch level.

The options $F_{0.1}$ and F_{max} were not presented because they do not have any meaning as reference points for this stock.

2.6 Sebastes mentella

2.6.1 Age composition of the catches (Table 2.21)

For 1986 and 1987, age-length keys, numbers at length, and numbers at age were available from Iceland for Division Va and from the Federal Republic of Germany for Division Vb and Sub-area XIV.

Division Va

Only Icelandic catches were taken in 1986 and 1987.

Division Vb

Catches from Denmark, the Faroe Islands, France, Norway, and USSR were split using Federal Republic of Germany catch data in 1986 and 1987.

Sub-area XIV

Catches from Greenland and the Faroe Islands were split using Federal Republic of Germany catch data in 1986 and 1987.

2.6.2 Weight at age (Table 2.22)

Only Icelandic weight-at-age data were available, and they show a slight increase from 1984 onwards for ages 11-20. The SOP deviated from the nominal catch weight by 6% in 1986 and by 12% in 1987. For 1987, this could be explained by a concentration on older age groups in the exploitation in Division Va compared with Division Vb and Sub-area XIV. Catches in Division Va are 38% of the total and taking into account the use of mean weights at age from Division Va only, the higher SOP compared with nominal catch is not unexpected.

2.6.3 Maturity (Table 2.23)

Maturity data were only available from Iceland. No trend can be seen for the period 1984-1987.

2.6.4 Estimates of fishing mortality (Tables 2.24-2.27)

The following procedure was used:

The tuning procedure was run with total international effort data on redfish. A mean fishing mortality factor of 0.115 was calculated. This was used as the terminal F at age 19 to start a separable VPA followed by a conventional VPA. The VPA failed because it did not converge. Therefore, it was impossible to perform an analytical assessment of this stock.

3 GREENLAND HALIBUT IN SUB-AREAS V-XIV

3.1 Landings and Trends in the Fisheries (Tables 3.1-3.4)

The total annual catch figures for Divisions Va and Vb and Sub-area XIV are presented for the years 1978-1987 (Tables 3.1-3.4). During the period 1980-1986, the catches increased from 14,349 t in 1978 to 31,252 t in 1980. During the period 1980-1986, the catches were relatively stable at a level of 31,000-34,000 t, except for 1981 when they were markedly lower (19,239 t) due to ice covering part of the main fishing grounds in April-May. There was a sudden increase in total catch from 32,991 t in 1986 to 46,719 t in 1987, an increase of 13,455 t. About 95% of this increase took place in three age groups (6, 7, and 12) (Table 3.5). Apart from some increase in effort from 1986 to 1987, the trawler fleet fished on deeper waters in 1987 than before, there-

by expanding its fishing grounds. This pattern is continuing in 1988 giving high catches and similar catch composition as in 1987, judging by preliminary data at hand. Most of the total yearly catches are taken by Icelandic trawlers, 91% in 1986 and 96% in 1987.

3.2 Effort Data (Table 3.8)

Estimates of CPUE indices from the Icelandic trawler fleet in the period 1977-1987 are presented in Table 3.8. These indices are based on data from the trawler fleet when it is fishing directly for Greenland halibut. All hauls with a catch of Greenland halibut exceeding 80% of the total catch in each trawl were included in estimating the yearly CPUE indices shown in Table 3.8. The data are quite extensive, the 1987 index is *inter alia* based on 4,700 hauls.

3.3 Catch at Age (Table 3.5)

The catch in numbers for each age was updated according to the final catch figures for the years 1985-1987. Catch at age for these years was estimated using the Icelandic catch-at-age estimates raised proportionately to the final catch in each year. The Icelandic catch is usually over 90% of the total catch each year, and no age composition data or age/length relationship were available from other nations.

3.4 Weight at Age (Table 3.6)

The mean weights at age are shown in Table 3.6. These estimates were derived using Icelandic data. The mean weights for 1985-1987 were used in the catch predictions.

3.5 Maturity at Age (Table 3.7)

The maturity at age for the years 1986-1987 was estimated by averaging the data from the years 1982-1984. This was done because the data from these years were scarce and showed some irregularities. The same average is used in the catch predictions.

3.6 Assessments and Predictions

3.6.1 Estimates of fishing mortalities (Tables 3.9 - 3.11)

Natural mortality was assumed to be 0.15 as in former years. An attempt was made to use the Icelandic effort data to tune the VPA. The results from the tuning were then used to initiate a separable VPA, and finally a conventional VPA was run using the terminal population from the separable VPA. Two difficulties were encountered using this procedure. Firstly, the tuning did not model the change in the fishing pattern from 1986 to 1987, resulting probably in too low F values for ages 6 and 7 in 1987, given that the year classes do not fluctuate too greatly. Looking at Table 3.11, the year classes up to 1982 seem fairly stable.

The tuning gave relatively high F values in the older ages, thereby accounting for the increase in effort in 1987 (Table 3.8). The catch-at-age figures show that the largest change takes place in the younger age groups. Secondly, the separable VPA got into difficulties because of this change in the fishing pattern in 1987. The separable VPA gave even higher F values for the older ages and low F values for the younger ages.

It was decided not to use separable VPA, but go directly from the tuning into conventional VPA. It was concluded that, with the change in exploitation pattern from 1986 to 1987, the basic assumptions for using the separable VPA approach were not met.

3.6.2 Spawning stock biomass and recruitment (Table 3.11)

According to this assessment, total stock biomass (5+) increased from 170,000 t in 1978 to 20,600 t in 1982. It decreased to 184,000 t in 1983 and to 142,000 t in 1984..

In the period shown (1978-1987), the spawning stock slowly decreased from 75,000 t in 1978 to 57,000 t in 1985, but seems to have increased again in 1986 and 1987 (Table 3.11).

3.6.3 Catch predictions

The conventional VPA gave exceptionally high values for the number of 5-year-olds in 1985 and 1986, corresponding to the low values of F on ages 6 and 7 already mentioned in Section 3.6.1. Using these population numbers and the fishing pattern from the VPA would give unrealistically high catches. As no recruitment indices are available for Greenland halibut, the only possibility is to use a long-term average for 5-year-old fish. Doing this and again using the fishing pattern from the VPA, the prediction could not reproduce the catches already taken by the end of August 1988 without using an unrealistically high F.

Because of this, the Group was not able to present a prediction of catches at this stage. It was considered wiser to ask the scientists responsible for data collection to make a thorough investigation of the problem and, time allowing, present this analysis in a working paper for the November 1988 ACFM meeting.

4 ICELANDIC SAITHE

4.1 Landings and Trends in the Fisheries (Table 4.1 and Figure 4.1A)

Landings of saithe from Icelandic grounds (Division Va) are given in Table 4.1 and Figure 4.1A. Since 1977, landings have been fluctuating without a trend between 50,000 and 70,000 t. In 1987, the total landings amounted to about 80,650 t, of which 98% were taken by Iceland. Preliminary catch figures for the period January-August 1988 amounting to 48,500 t show a decline of 13,000 t compared to the same period in 1987.

4.2 Effort Data (Table 4.2)

Effort data for Icelandic trawlers are available since 1978. As the trawler fishery is a mixed fishery for different demersal species, these were analyzed in order to define a criterium on the effort directed towards saithe. CPUE and effort were only derived from those hauls in which the proportion of saithe in the catch exceeded 70% of the total catch. The total effort directed towards saithe was estimated by dividing the CPUE into the total landings (Table 4.2).

4.3 Catch at Age (Table 4.3)

Minor changes were made to the age composition of 1984 and 1985 to account for revised total landings in these years. For 1986 and 1987, age composition data were available for landings by Iceland which represented more than 98% of the total landings. These data were used to calculate the catch at age of the total landings used as input for the VPA (Table 4.3).

4.4 Weight at Age (Table 4.4)

Weight-at-age data were available for the Icelandic landings in 1986 and 1987 (Table 4.4). Preliminary weight-at-age data for the period January-May 1988 show a marked decline among some younger age groups compared to the same period in 1986 and 1987.

For both catch predictions and stock biomass calculations, therefore, the mean weights at age were smoothed in order to reflect these changes observed in 1988 (Table 4.10).

4.5 Maturity at Age (Table 4.5)

Only scarce maturity-at-age data were available for the Icelandic catch in 1986. Average maturity-at-age data for the years 1981-1985 were used for both 1986 and 1987. The same data set was also used for the spawning biomass projections (Table 4.9).

4.6 Assessment and Predictions

4.6.1 Tuning of VPA and estimates of fishing mortality (Tables 4.6-4.9)

It was decided by the Working Group to use the tuning module of the ICES VPA program to obtain initial VPA results. No disaggregated effort by age was available, so the available data were applied to all age groups.

The resulting fishing mortalities of the analysis are shown in Table 4.6. From these values, it was decided to use the average F for ages 4-9 of 0.34 as an input at age 6 and a selection value of S = 1 for age 14 in the separable VPA. The results of this are shown in Table 4.7. Full weight has been assigned to all years

for the period under review. The matrix of residuals does not show any large residuals that should cause rejection of the results.

Following the recommendation of ACFM, the final population of the separable VPA was used as an input to an ordinary VPA. The results of this VPA are given in Tables 4.8 and 4.9.

4.6.2 Spawning stock biomass and recruitment (Table 4.9 and Figure 4.1)

Spawning stock biomass is shown in Figure 4.1B and Table 4.9. After a decline from 1970-1980, the spawning stock biomass increased to 214,000 t in 1984. In 1985, the spawning stock biomass was 166,000 t, similar to the level of the mid-1960s, but the estimated size in 1987 is 178,000 t.

Estimates of recruitment at age 3 are plotted in Figure 4.1B. Recruitment has fluctuated in recent years without any clear trend. The 1983 year class is well above the 1961-1988 long-term average (46,500 thousand) and for the catch projections, this year class has been assumed to be double the size of an average year class. As no information is available for the younger year classes, the 1984-1987 year classes were set at the same level as the long-term average.

4.6.3 Biological reference points (Figures 4.1 and 4.2)

The yield- and spawning stock biomass-per-recruit (age 3) curves shown in Figure 4.1C have been calculated using the exploitation pattern from the separable VPA and weight-at-age data given in Table 4.10. Compared to the present fishing mortality of F_{4-9} = 0.42, the reference values for F_{max} and $F_{0.1}$ are 0.34 and 0.16, respectively. From Figure 4.2 showing the recruit/spawning stock relationship and Figure 4.1C showing the spawning stock biomass-per-recruit relationship, F_{med} = 0.22 and F_{high} = 0.80 were estimated.

4.6.4 Catch predictions (Table 4.11 and Figure 4.1)

The input data for catch projections are shown in Table 4.10. The estimated landings in 1988 and the fishing pattern generated by the separable VPA were used to predict the landings by age in 1988. The expected landings in 1988 will be about 75,000 t based on preliminary data on landings for the period January-August 1988. Based on these landings, options for 1989 and 1990 were calculated and are given in Table 4.11 and Figure 4.1D.

5 THE DEMERSAL STOCKS IN THE FAROE AREA

5.1 General Trends in the Demersal Fisheries in the Faroe Area (Tables 5.1 and 5.2)

Tables 5.1 and 5.2 give data on effort and yield for the Faroese fleet categories fishing for saithe, cod, and haddock. In the yield table, the catches for gears other than trawl are shown and in the catches for trawlers with horsepower above 1000 are included catches by deep-sea trawlers mainly fishing for redfish and blue ling. The effort table, however, gives only data for those trawlers which have saithe as their main target. Effort increased by 35% from 1982 to 1987 and it is thought that this index (fishing days x horsepower) gives a conservative estimate of the increase in fishing power.

The directivity of the effort is determined by the availability of cod and saithe, and it is seen from Table 5.1 that this can change considerably between years. Good recruitment in 1978 and 1980 for saithe and 1982 and 1983 for cod gave very high catches for one or two years, but catches have now decreased considerably. A higher number of vessels has to survive on catches which, for the cod and saithe stocks combined, have decreased from 91,000 t in 1984 to 62,000 t in 1987, or a reduction by one-third.

The steps taken by Faroese authorities to remedy the situation include a stop for new vessels, 10% cut in fishing power when new vessels are substituted for old ones, a programme of buying back fishing licenses, an increase in the mesh size from 135 to 155 mm from 1 January 1989, and a programme of providing access to fisheries outside the Faroese EEZ for some vessels. The final aim is to reduce the fleet fishing for demersal species by about 30%.

5.2 Research Vessel Surveys (Tables 5.3-5.5)

0-group surveys in the Faroe area have been carried out on an annual basis since 1972. In the first years, both England and France participated, but since 1980, only Faroese vessels have covered the area. The surveys are carried out in late June - early July. The main species caught are cod, haddock, Norway pout, and sandeel. In former years, the results were not used for assessment purposes of the demersal fish stocks at Faroes. Results from a recent analysis of the data from the surveys were made available at this meeting (Reinert, 1988). The results, which indicate a positive correlation between the 0-group survey indices and VPA abundance estimates of 1-year-old fish, were analyzed further at this meeting in order to attempt to use them for the prediction of the year classes not estimated in the VPA (Table 5.1).

In 1982, the Fisheries Laboratory at the Faroes started a series of stratified bottom trawl surveys inside the 500-meter depth contour in the Faroe area. These surveys have been carried out every year since in February and March. The surveys are designed and timed to coincide with the main spawning period for saithe, cod, and haddock. Results for these species from the surveys were made available to the Working Group (Tables 5.4 and 5.5)

(Kristiansen, 1988a). For some year classes of cod and haddock, a positive correlation seems to exist between the stratified mean catch at age and the VPA abundance estimates, whereas no correlation is apparent for saithe. The results from the surveys were used for tuning the VPAs for cod and haddock.

6 FAROE SAITHE

6.1 Landings and Trends in the Fishery (Tables 5.1, 5.2, and 6.1 and Figure 6.2)

Since the record year of 1984, catches of saithe in the Faroe area have decreased in spite of an increase in effort. The 1987 catches were 2,600 t lower than the 1986 catches. Catch data for the first half of 1988 are at hand and indicate a decrease in catches from 1987 to 1988 of about 2,000 t.

The changes in the percentage of the total catch taken by the different fleet categories (Table 5.1) are closely correlated with changes in effort (Table 5.2).

6.2 Catch at Age (Tables 6.2 and 6.3)

Catch in number at age for 1985 was revised according to final catch figures. Catch in number at age for 1986 and 1987 was provided only for the Faroese landings (Table 6.2). The total catch at age in numbers was raised using the catch-at-age distribution for the Faroese catches. In 1987, 4-year-old saithe (the 1983 year class) made up 25% of the catches in weight. Preliminary estimates for the catch at age in number in 1988 (Table 6.3) indicate that the catches in 1988 of this year class will account for 35%.

6.3 Weight at Age in the Catch (Table 6.4)

In a provisional assessment of saithe, cod, and haddock in the Faroe area carried out by the Fisheries Laboratory in Torshavn (Anon., 1988), a sum of products discrepancy for saithe of 12% in 1986 and 10% in 1987 was discovered. An analysis of weight at age (Kristiansen, 1988b) shows that the mean weight at age, found by direct weighing, was less than the mean weight at age estimated from the length-weight curve used in previous years for estimating the mean weight at age from the mean length at age obtained in the sampling of the catches. By using mean weights at age obtained from length-weight samples in 1986 and 1987, the sum of products discrepancy was reduced to 5% and 6% for the years 1986 and 1987, respectively.

6.4 Assessment and Predictions

6.4.1 Estimates of fishing mortality (Tables 6.5-6.7 and Figure 6.2)

The survey data described in Section 5.1 cannot be used for tuning the saithe VPA in the same way as described for cod in Section 7.5.1., as the survey does not give a good coverage of saithe.

The fleet categories for which effort data are given in Table 5.2 take most of the saithe fished in the Faroe area. It is known that they may change between cod and saithe, but in recent years saithe has been their main target. It was, therefore, felt that this effort series for the years 1982-1987 should reflect effort in the saithe fisheries rather well.

The data were used for tuning the VPA by treating the Faroese catches as one fleet represented by the effort series and the aggregated catch in number by age. The Group did not at this meeting have access to catch in number by fleet; therefore, this rather simplistic tuning. The Group intends at its next meeting to have age-structured data by fleet for Faroe saithe and probably also other stocks.

The estimates of fishing mortality derived from tuning with the effort series are presented in Table 6.5. It is seen that the level of fishing mortality for the fully-recruited age groups is around 0.35. It is seen that the tuning gives rather sensible results for all the age groups and estimates the level of fishing mortality for age groups 4-8 to be 0.46.

A separable VPA with F = 0.46 for age 4 and S = 1 was run (Table 6.6.). The fishing mortality matrix from the terminal populations version of that run is presented in Table 6.7. The average fishing mortality, according to this assessment, for age groups 4-8 is 0.72. This may be an indication of rather noisy age data. An inspection of the matrix of residuals (Table 6.6), where all the back years before 1978 have been weighted down, does not give any clear picture, which can explain why the fitting of the data to the terminal populations gives a fishing mortality level for age groups 4-8 57% higher than that indicated by the tuning. According to this assessment, the fishing mortality level has increased from a level of 0.42 in 1985 to 0.72 in 1987.

Having no basis for adjusting the results, it was agreed to carry on the analysis to the prediction stage.

6.4.2 Population estimates (Table 6.8 and Figure 6.2)

The stock size in numbers and stock biomass are given in Table 6.8. Both total and spawning stock biomasses decreased from 1985 to 1987. The latter is consistent with the information about the fishing on the spawning grounds which was very reduced in 1987 and 1988 compared with earlier years.

There are no indices of recruitment available for saithe in the Faroe area.

6.4.3 Catch predictions (Table 6.9)

As described in Section 5, the Faroese Home Government has passed legislation that, from 1 January 1989, increases the legal mesh in the codend of all demersal trawls from 135 to 155 mm. This means that the exploitation pattern changes next year and has to be taken into account in the predictions for 1989 and 1990. The prediction of catches thus had the following steps:

1) moving the stock at the beginning of 1988 to the beginning of 1989 with the old exploitation pattern,

2) carrying out the prediction for 1989 and 1990 with the new exploitation pattern.

The input data for the first step are given in Table 6.9. The catch predicted for 1988 was compared to the preliminary estimates of catch in number at age for 1988 given in Table 6.3. The catch in numbers estimated from sampling in 1988 and predicted by the prediction program are compared in the text table below (numbers in thousands).

Age	Sampling 1988	Predicted
3	123	1737
4	1786	1626
5	6490	3584
6	2922	1152
7	1445	937
8	1010	901
9	296	179
10	268	196
11	60	49
12	113	23
13	-	11
14	-	11
15+	-	65

It is clearly seen that the correspondence between the two sets of figures is very poor. Actually, the preliminary figures for catches in numbers by age generally are more than double those expected from the assessment. The problem may lie in sampling, age reading, migration, or in something else, but it was not possible in the Working Group to reconcile the two sets of data and resolve where the problems were. It was felt wiser to ask the scientists responsible for the data collection to make a thorough investigation of the problem and, time allowing, present this analysis in a working paper for the November 1988 ACFM meeting.

Because of this, the Working Group was not able to present a prediction of catches at this stage. For convenience in later work, the modification of the exploitation pattern necessary in a future prediction, when the problems with the fishing mortality and stock estimates have been resolved, is outlined below.

The exploitation pattern in 1989 and onwards was modified in the following way. Selection curves for the present legal mesh size of 135 mm and the new legal mesh size of 155 mm were constructed (Figure 6.1). The percentage decrease in the retention of the different age groups was read from the curves and gave the following results:

Age	Percentage decrease in retention
1	3
2	15
3	28
4	24
5	8
6	4
7	no change

Since about 99% of the saithe catches in the Faroe area are taken by trawl, catches from other gears need not to be taken into account.

7 FAROE COD

7.1 Landings and Trends in the Fishery (Tables 7.1 - 7.3 and Figure 7.2)

The decrease in landings of cod from both the Faroe Plateau (Sub-division Vb1) and the Faroe Bank (Sub-division Vb2), which started in 1985, continued in 1987. Landings from the Faroe Plateau went from 34,866 t in 1986 to 24,413 t in 1987. From the Faroe Bank, the catches went down from 1,905 t in 1986 to 1,786 t in 1987.

It can be seen from Table 5.1 that the decrease is evenly distributed between the different fleet categories, with the exception of the larger longliners (>100 GRT) which had a small increase in cod catches in 1987.

Landings from Sub-division Vb1 for the first half of 1988 (Table 7.3) indicate that catches are around the same level in 1988 as in 1987.

7.2 Catch at Age (Tables 7.3 and 7.4)

Catch in numbers at age in 1986 and 1987 was provided for the Faroe fishery (Table 7.4). The total catch in number was raised using the catch composition by age in the Faroe fishery. Preliminary catch-at-age data estimates for 1988 are given in Table 7.3. Ages 1 and 2 are absent, while the estimates of 3-year-olds are higher than in 1987.

7.3 Weight at Age in the Catch (Table 7.5)

Data on mean weight at age in the catches in 1986 and 1987 were provided for the Faroe fishery (Table 7.5). They gave a difference in the sum of products check in 1986 and 1987 of 4%, which was found acceptable by the Group.

7.4 Assessment and Predictions

7.4.1 Estimates of fishing mortality (Tables 7.6 - 7.8 and Figure 7.2)

The survey data described in Section 5.2 were used for tuning the VPA. The estimates of catch in number per age per unit time in the surveys of the different years were assumed from one fleet with the same effort for all years and then used in the tuning process. The estimates of fishing mortality derived from this are given in Table 7.6. It is seen that the level of fishing mortality for the fully-recruited ages (4-8) is about 0.4.

A separable VPA with F = 0.4 at age 4 and S = 1 was run. The matrix of residuals and estimates of the exploitation pattern are given in Table 7.7. The fishing mortality matrix from the terminal populations run is given in Table 7.8. The overall level of fishing mortality on Faroe Plateau cod has, according to this assessment, decreased since 1985.

7.4.2 Population estimates (Table 7.9 and Figure 7.2)

The stock size in numbers and stock biomass are given in Table 7.9. Total biomass has been steadily decreasing since 1985 and is now on a very low level compared to the historical series. Spawning stock biomass has increased somewhat because of the contribution from the strong 1982 year class, which is confirmed to be the strongest on record. The 1983 year class is slightly above average, but all of the subsequent year classes (1984, 1985, and 1986) seem to be below average.

This is indicated by the groundfish surveys, which were used in tuning the VPA (Tables 5.5 and 5.6). This seems also to be borne out by the results from the 0-group survey (Table 5.4). It should, however, be pointed out that an attempt to estimate recruitment from the 0-group data, using the RCRTINX2 program, failed.

7.4.3 Catch predictions (Tables 7.10 - 7.12 and Figure 7.2)

As described in Section 5, the Faroese Home Government has passed legislation that, from 1 January 1989, increases the legal mesh in the codend of all demersal trawls from 135 to 155 mm. This means that the exploitation pattern changes next year and has to be taken into account in the predictions for 1989 and 1990. The prediction of catches thus had the following steps:

1) moving the stock at the beginning of 1988 to the beginning of 1989 with the old exploitation pattern,

2) carrying out the prediction for 1989 and 1990 with the new exploitation pattern.

The input data for the first step are given in Table 7.10 and the input data for the second step in Table 7.11. The catch predicted for 1988 was compared to the preliminary estimates of catch in numbers at age for 1988 given in Table 7.4. The catch in numbers estimated from sampling in 1988 and predicted by the prediction program are compared in the text table below (numbers in thousands).

Age	Sampling 1988	Predicted
1	-	10
2	-	702
3	2355	419
4	2449	687
5	1733	1654
6	2812	2088
7	613	463
8	185	147
9	24	39
10+	36	45

It is seen that there is acceptable correspondence between the two sets of figures for the fully-recruited ages (5+), but there obviously is something wrong with the estimates at age 3 (1985 year class) and age 4 (1984 year class). Age 2 is derived from average recruitment in the prediction, but ages 3 and 4 are as estimated in the final separable VPA run.

In view of the indications from the groundfish surveys and the 0-group survey that the 1984 and 1985 year classes are well below average, no attempt was made to modify the stock size in the prediction according to the information from the catch in numbers in the 1988 catches. It was felt wise to have these preliminary figures fully confirmed at the end of the year before any modification based on them was attempted.

The exploitation pattern in 1989 and onwards was modified in the following way. Selection curves for the present legal mesh size of 135 mm and the new legal mesh size of 155 mm were constructed (Figure 7.1). The percentage decrease in the retention of the different age groups was read from the curves and gave the following results:

Age	Percentage decrease in retention
1	11
2	23
3	27
4	15
5	8
6	no change
7	no change

An average of 31% of the cod catches on the Faroe Plateau are taken by gears other than trawl, mainly longlines. Thus, the percentage decrease was reduced by this amount and then applied to the present exploitation pattern, as estimated by the separable VPA.

The two exploitation patterns are given in the text table below. The old pattern was that from the separable VPA (Table 7.7), but scaled so that the mean for ages 4-8 corresponded to the mean F in 1987 from the VPA (Table 7.8). The new pattern was obtained by correcting the old pattern, as described in the previous paragraph, and then again scaling the results so that the mean for ages 4-8 corresponded to the mean F in 1987.

Age	Exploitation pattern	
	Old	New
1	0.00047	0.00044
2	0.042	0.036
3	0.216	0.181
4	0.335	0.308
5	0.386	0.375
6	0.431	0.443
7	0.465	0.478
8	0.423	0.435
9	0.335	0.344
10+	0.335	0.344

The new exploitation pattern gives an $F_{0.1}$ value of 0.19 and an F_{max} value of 0.41. In the last assessment, the values were 0.19 and 0.42, respectively. It should be noted that the mean weights at age used in this assessment are lower than those used in 1986. F_{med} and F_{high} are plotted in Figure 7.3.

With an unchanged exploitation level and the new exploitation pattern and assuming average recruitment for the 1986 and subsequent year classes, the yields predicted from the Faroe Plateau in 1989 and 1990 are 19,000 and 20,000 t, respectively.

Approximately 2,000 t from the Faroe Bank have to be added to obtain the total yield from the Faroe area.

8 FAROE HADDOCK

8.1 Landings and Trends in the Fishery (Tables 8.1 and 8.2 and Figure 8.2)

Catches of haddock from the Faroe Plateau have been increasing since the low level in 1982, but have still not recovered to the high levels in the middle 1970s (Table 8.1). Catches from Faroe Bank have been close to 1,000 t in recent years (Table 8.2). Catch data for the first half of 1988 indicate a decrease in catches from the Plateau from 1987 to 1988 of about 2,000 t (Table 5.3).

It can be seen from Table 5.2 that catches have been rather stable from 1986 to 1987 for all fleet categories except open boats, which have had an increase from 93 to 1,665 t.

8.2 Catch at Age (Tables 8.3 and 8.4)

For the Faroese landings, catch-at-age data were only provided from the Faroe Plateau. The catches by other nations were split using the age distribution from the Faroese fishery on the Faroe Plateau (Table 8.3). The preliminary age distribution for the Faroese catches in 1988 is given in Table 8.4. Except for ages 2 and 3, the trend in catch in numbers is similar to that in 1987. The catch in numbers was raised to total landings from the Faroe area, including the Faroe Bank.

8.3 Weight at Age in the Catch (Table 8.5)

Weight-at-age data were provided for the Faroese fishery (Table 8.5). The sum of products check showed a difference of 1% in 1986 and 0% in 1987, which was acceptable to the Group.

8.4 Assessment and Predictions

8.4.1 Estimates of fishing mortality (Tables 8.6 - 8.8 and Figure 8.2)

The survey data described in Section 5.2 were used for tuning the VPA in the same way as described for cod in Section 7.4.1.

The estimates of fishing mortality derived from this are given in Table 8.6. It is seen that the level of fishing mortality for the fully-recruited age groups is around 0.35. It is seen that the tuning gives very peculiar results for the oldest age groups and there are no data to tune age group 1. These age groups, however, do not play any significant role in the catches, and the tuning results were accepted.

A separable VPA with F = 0.35 at age 4 and S = 1 was run (Table 8.7). The fishing mortality matrix from that run is presented in Table 8.8. The fishing mortality has, according to this assessment, fluctuated between about 0.25 and 0.35 since 1982 without a clear trend.

8.4.2 Population estimates (Table 8.9 and Figure 8.2)

The stock size in numbers and stock biomass are given in Table 8.9. Total biomass steadily decreased from 1979 to 1987 because of low recruitment, (an average of 22 million at age 1 from 1978-1984 compared with a long-term average from 1961-1984 of 37 million). Spawning stock biomass has increased somewhat because of the contribution from the 1982 and 1983 year classes, which were both above average although not comparable to the very high recruitment in 1972-1974. All the subsequent year classes (1984, 1985, and 1986) seem to be below average.

No indices of future recruitment from 0-group or groundfish surveys have been of use to estimate future recruitment of Faroe haddock up to now.

8.4.3 Catch predictions (Tables 8.10 - 8.12 and Figure 8.2)

As described in Section 5, the Faroese Home Government has passed legislation that, from 1 January 1989, increases the legal mesh in the codend of all demersal trawls from 135 to 155 mm. This means that the exploitation pattern changes next year and has to be taken into account in the predictions for 1989 and 1990. The prediction of catches thus had the following steps:

1) moving the stock at the beginning of 1988 to the beginning of 1989 with the old exploitation pattern,

2) carrying out the prediction for 1989 and 1990 with the new exploitation pattern.

The input data for the first step are given in Table 8.10 and the input data for the second step in Table 8.11. The catch predicted for 1988 was compared to the preliminary estimates of catch in numbers at age for 1988 given in Table 5.3. The catch in numbers estimated from sampling in 1988 and predicted by the prediction program are compared in the text table below (numbers in thousands).

Age	Sampling 1988	Predicted
1	-	7
2	7	280
3	460	467
4	2146	1428
5	3034	3373
6	2094	1867
7	799	496
8	298	382
9	62	35
10+	207	323

It is seen that there is acceptable correspondence between the two sets of figures for most age groups, but obviously there is something wrong with the estimates at age 2 (1986 year class). Age 2 is derived from average recruitment in the prediction.

The exploitation pattern in 1989 and onwards was modified in the following way. Selection curves for the present legal mesh size of 135 mm and the new legal mesh size of 155 mm were constructed (Figure 8.1). The percentage decrease in the retention of the different age groups was read from the curves and gave the following results:

Age	Percentage decrease in retention
1	0
2	0
3	27
4	63
5	27
6	no change
7	no change

On average, 55% of the hadddock catches in the Faroe area are taken by gears other than trawl, mainly longlines. Thus, the percentage decrease was reduced accordingly and then applied to the present exploitation pattern, as estimated by the separable VPA.

The two exploitation patterns are given in the text table below. The old pattern was that from the separable VPA (Table 8.7), but scaled so that the mean for ages 4-8 corresponded to the mean F in 1987 from the VPA (Table 8.8). The new pattern was obtained by correcting the old pattern, as described in the previous paragraph, and then again scaling the results so that the mean for ages 4-8 corresponded to the mean F in 1987.

	Exploitation pattern	
Age	Old	New
1	0.00035	0.00038
2	0.017	0.018
3	0.163	0.155
4	0.349	0.272
5	0.396	0.378
6	0.387	0.421
7	0.314	0.341
8	0.389	0.423
9	0.349	0.379
10+	0.349	0.379

The new exploitation pattern gives an $F_{0.1}$ value of 0.24 and an F_{max} value of 0.67. In the last assessment, the value for $F_{0.1}$ was 0.2 and the value for F_{max} could not be found. F_{med} and F_{high} are plotted in Figure 8.3.

With an unchanged exploitation level and the new exploitation pattern and assuming average recruitment for the 1985 and subsequent year classes, the yields predicted from the Faroe area in 1989 and 1990 are 12,300 and 11,200 t, respectively.

9 BLUE LING IN SUB-AREAS V-XIV

9.1 Landings and Trends in the Fisheries (Tables 9.1 - 9.4 and Figure 9.1)

Total landings in the decade 1977-1986 fluctuated between 13,000 t and 31,000 t and averaged 20,000 t. The landings in 1987 are underestimates due to missing figures from certain sub-areas. On average, 21% of the landings originated from Division Va, 33% from Division Vb, 42% from Sub-area VI, and only 4% from Sub-area XIV. Trends in the different divisions and sub-areas have varied considerably (Figure 9.1) due to directed demersal trawling on concentrations of blue ling on spawning localities which were discovered from 1973 onwards. The experience achieved by this fishing strategy has inevitably proved that the local spawning stocks exploited decreased rapidly within a few years time. The development of the trawl fishery has been described by Magnusson (1982) from Icelandic waters (Division Va), by Ehrich and Reinsch (1985), from the Hebrides, Rockall, and the southern part of the Faroes (Sub-area VI and Division Vb), and by Moguedet (1988) (working document) from the Hebrides and Rockall (Sub-area VI).

9.2 Effort Data

References are made to Ehrich and Reinsch (1982) and Moguedet (1988). Effort data are also available from Divisions Va and Vb, but mainly covering fisheries where blue ling occurs as by-catch and, therefore, these may be of limited value.

9.3 Catch at Age

Basic data may be retrieved from the same sources as mentioned in Section 9.2 for the years 1980-1983 (Ehrich and Reinsch, 1982) and prior to 1986 (Moguedet, 1988). In addition, there are data for the period 1978-1981 (Magnusson, 1982). Data for 1986 and 1987 were available from Division Vb and Sub-area XIV. Similar data have been processed for Division Va, but were not available to the present Working Group due to technical problems. Shortage of time, however, did not allow for further examination and analysis of catch-at-age data to be entered into the data base.

9.4 Weight at Age

Reference is made to the sources mentioned in Section 9.3. Additional information may be retrieved from Thomas (1987) by converting age-at-length data to weight at age. These data originate from Divisions Vb and VIa during the years 1977-1979. Females grow faster than males after age 1 in Division Va, after age 4 in Division Vb, and after ages 6-7 in Sub-area VI.

9.5 Maturity at Age

Magnusson (1982) found that males mature at about 9 years old and females about 11 years old in Icelandic waters. Thomas (1987) found males maturing when about age 6 and females when about 8 years old in Faroese waters.

9.6 Estimates of Mortality

Thomas (1987) found the total mortality northeast of the Faroes to be $Z = 0.22$ for males and $Z = 0.26$ for females. South of the Faroes the corresponding figures were 0.29 and 0.37, respectively.

9.7 Status of the Stock(s)

The directed trawl fishery on local spawning populations yielded exceptionally high catches during a few years time, but rapidly resulted in poor catches. The age composition simultaneously changed towards younger fish.

These facts indicate a rather high rate of exploitation on accumulated populations previously exposed to a low fishing mortality. This may eventually prove harmful to the stock(s).

10 LING IN SUB-AREAS V-XIV

10.1 Landings and Trends in the Fisheries (Tables 10.1 - 10.4 and Figure 10.1)

Total landings in the decade 1977-1986 varied between 17,000 and 25,000 t and averaged 22,500 t. The landings in 1987 are underestimates due to missing figures from some sub-areas. On average,

more than half of the landings (56%) originated from Sub-area VI, particularly from Division VIa (42%), with 23% from Division Vb, 20% from Division Va, and less than 1% from Sub-area XIV. Trends in annual landings by divisions indicate a slight decrease in Division Va, stability in Division Vb, and a significant increase in Divisions VIa and Vb, yielding total landings figures above average in the period 1982-1986.

10.2 Effort Data

Two long-term data sets are available. Moguedet (1988) (unpublished) has calculated the international effort in the demersal trawl and longline fisheries, respectively, for the period 1974-1984. The time series indicates a decreasing trend, particularly in the longline fishery. The French trawl data show a substantial increase in CPUE since 1981, indicating a more directed fishery for ling. The corresponding Faroese longline data indicate a similar trend.

Hareide and Grotnes (1988) (working document) present effort and catch-per-unit-effort data derived from the Norwegian longline fishery for ling in the years 1971-1987. The time series indicate a pronounced increasing trend in effort, a significant decrease in CPUE, and long-term increase in landings from this fishery. The recent low CPUE figures (from one vessel only) are reflected in the CPUE figures derived from approximately 60 longliners for the years 1983, 1984, and 1986.

10.3 Catch at Age

Basic data may be obtained from Moguedet (1988) for the years 1974-1985 and Norwegian data collected in 1976. Age determination of the latter is, however, not quite reliable. Data from Division Va have been processed for 1986 and 1987, but unfortunately were not available at the present Working Group.

10.4 Weight at Age

Reference is made to Joenses (1961), Molander (1956), and Moguedet (1988). Data are also available from Division Vb in 1986 and 1987.

10.5 Maturity at Age

No data were available to the Working Group.

10.6 Length Frequency Distributions

Data are available from Division Va since 1979, from Division Vb since 1984, and from Sub-area VI since 1976.

10.7 Estimates of Mortality

Moguedet (1988) has calculated total mortality (Z) by sex and age from the trawl and longline fisheries, respectively, based on catch curve analysis.

10.8 Status of the Stock(s)

Norwegian CPUE figures from the fairly stable longline fishery suggest a decreasing trend with comparatively low values in recent years. The total international effort directed at ling has apparently increased in recent years.

11 TUSK IN SUB-AREAS V-XIV

11.1 Landings and Trends in the Fisheries (Table 11.1 - 11.4 and Figure 11.1)

Total landings in the decade 1977-1986 have varied between 13,000 and 19,000 t and averaged 15,400 t. The landings in 1987 have been underestimated due to a few missing figures in certain divisions. The long-term average figures show that 42% of the landings came from Division Va, 39% from Division Vb, 19% from Sub-area VI, and less than 1% from Sub-area XIV. No particular trend is apparent in the fisheries apart from landings from Sub-area VI being above average in 1982. By and large, tusk occur as by-catch in other fisheries and the increased landings from Sub-area VI may likely be associated with the increased effort and landings in the ling fishery.

11.2 Effort Data

The most consistent data set may probably be derived from the Norwegian and Faroese longline fisheries. The relative proportion of tusk in the recent Norwegian longline fishery appears to be rather stable. This has to be verified by further processing of historic data.

11.3 Catch at Age

Basic data have been processed and were partly available to the Working Group from 1986 and 1987 from Divisions Va and Vb.

11.4 Weight at Age

Reference is made to Section 11.3. Apart from that, data are available from Division Va (Joenoes, 1961).

11.5 Maturity at Age

Joenoes (1961) found that both sexes mature simultaneously at an age of 11 years or older.

11.6 Length Frequency Distributions

Data are available from Division Va since 1978, from Division Vb for 1976 (Norwegian), and for 1986 and 1987. There are also data from Division VIa dating back to 1976.

11.7 Estimates of Fishing Mortality

No data were available to the Working Group.

11.8 Status of the Stock(s)

Apart from the CPUE curve presented by Hareide and Grotnes (1988), which is based on the combined catches of ling and tusk, there are no apparent signs of the level of exploitation being too high. The CPUE figures in recent years also imply an increase in effort, which may temporarily affect the availability of tusk. The species is believed to be rather stationary.

12 OCEANIC-TYPE MENTELLA

12.1 Nominal Catches and Trends in the Fishery (Table 12.1)

The total annual catches of oceanic-type mentella in Sub-areas XII and XIV are presented in Table 12.1. After slightly increasing catches from 1982 to 1984, the catch in 1985 increased to about 72,000 t (11%) and in 1986 to about 105,000 t (47%); in 1987, the catch decreased again to about 91,000 t.

Vessels from four countries participate in the fishery; however, the vessels from the USSR account for about 80% of the catches.

12.2 Effort Data (Table 12.2)

Effort data were available for the USSR fishery for the period 1982-1987 (Table 12.2). There has been an increase in the effort throughout the period from about 30,000 trawl hours to the present level of about 60,000 trawl hours; however, there was a drop in 1985 to about 26,000 trawl hours.

The CPUE generally declined throughout the period from 1.99 t/hour in 1982 to 1.1 t/hour in 1987.

No effort data are available for the other countries participating in the fishery, but from the increase in the total catches, it can be concluded that the total international effort in this fishery has been increasing.

12.3 Research Vessel Surveys (Tables 12.3. and 12.4)

The USSR has conducted comprehensive research work on *S. mentella* in the Irminger Sea since 1981, with a particular emphasis on stock assessment of the species by means of trawl-acoustic and ichthyoplankton surveys. On the basis of the USSR investigations

from 1981-1987 on the biology of S. mentella, it is concluded that there exists a common Reykjanes Ridge population for the Irminger Sea and the adjacent areas, the spawning stock of which is mainly distributed in the pelagic part of the sea.

In 1982-1985 and in 1987, the surveys were carried out in the open part of the area from 52^0-62^0N with Bongo net, while in 1986, the whole spawning area from 52^0-65^0N was covered (Figure 12.1). It was determined that the intensive extrusion of prolarvae occurs over the Reykjanes Ridge in April-May in a vast area of about 170,000 sq. miles at depths of 300-500 m. The major concentrations of larvae are distributed along the temperature front of 5.5-6.5^{0}C over the western slope of the Ridge. The abundance and biomass of beaked redfish estimated from the ichthyoplankton survey data are shown in Table 12.3. The stock was assessed using the following major indices: individual fecundity equal to 35,800 specimens and coefficient of larval mortality equal to 89.3%. Since the ichthyoplankton surveys in 1982-1985 and in 1987 did not cover the whole spawning area, it appears that the 1986 estimate of the biomass of S. mentella (1.69 million t) is most complete.

Trawl-acoustic surveys were conducted by the USSR every year in June-July. Major concentrations of S. mentella (densities over 30 t/sq. mile) were observed from 57^0-62^0N between 30^0 and 43^0W (Figure 12.2) at depths of about 70-200 m. The 1982-1985 surveys covered only a part of the S. mentella habitat (the open part of the sea). In 1986-1987, the area of trawl-acoustic surveys has been extended to cover the 200-mile zone of Greenland. Therefore, the results from 1986-1987 (1.2 million t) are considered to be most complete. Trawl-acoustic survey data are presented in Table 12.4.

On the whole, the results of the surveys accomplished by the USSR research vessels suggest that the biomass of S. mentella in the pelagic zone of the Irminger Sea might be estimated to be in the order of 1.2 million t.

12.4 Catch at Age (Table 12.5)

Age-length keys, number at length, and number at age for 1982-1987 were available for the USSR catches. The catches of Bulgaria, the German Democratic Republic, and Poland were split on age according to the USSR catches (Table 12.5).

12.5 Weight at Age (Table 12.6)

Weight-at-age data were available for the USSR catches for 1982-1987 (Table 12.6). The SOP check showed a deviation of 11% from the landed weight in 1984 and no deviation in the other years.

12.6 Maturity at Age (Table 12.7)

Maturity-at-age data were available for the USSR catches (Table 12.7). The bulk of the fish mature at the age of 13-17 years.

12.7 Estimates of Fishing Mortality (Figure 12.3)

A catch curve over the years 1982-1987 was calculated for ages 8-22+ (Figure 12.3). From age 15 onwards, fish were fully recruited, and the decline of the curve seems linear. A regression over the ages 15-21 gave a slope of -0.55. With natural mortality (M) for redfish being 0.1, the fishing mortality (F) is 0.45.

The Working Group did not use this estimation of F for an analytical assessment because of the uncertain status of the pelagic mentella. However, if there is a common mentella stock for Sub-areas V, XII, and XIV, this F value most likely is too high, because it is estimated in a short time period when a part of the stock is concentrated in the open Irminger Sea and at least most of the males are at their usual habitats.

12.8 Future Assessment Work

At present, the data series regarding the oceanic-type mentella is too short for making an analytical assessment based upon a VPA. However, alternative assessment methods based upon the abundance of newly-extruded larvae and acoustic surveys have been carried out (see also Section 12.3).

Two views were presented with regard to the stock identity. If it is a part of the common mentella stock in Sub-areas V, XII, and XIV, the relevant assessment data have to be combined with the existing data base. However, if the oceanic-type mentella is a separate stock, data have to be accumulated for a longer period to make a separate analytical assessment possible.

12.9 Future Requirements

The Working Group felt that it is expedient to seek an implementation of an international research programme on biological aspects and stock status of *S. mentella* in the Irminger Sea and adjacent areas focusing on the following:

- identification of the stock,
- unification of age determination methods,
- additional surveys of juvenile redfish to estimate year-class strength,
- continuation of regular acoustic and ichthyoplankton surveys by research vessels,
- perfection of methods to assess the stock on the basis of ichthyoplankton surveys,
- application of mathematical modelling in stock assessment.

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Table 2.1 Nominal catch of REDFISH (in tonnes) by countries in Division Va (Iceland) as reported officially to ICES.

Country	1976	1977	1978	1979	1980	1981
Belgium	1,522	1,395	1,549	1,385	1,381	924
Faroe Islands	211	292	242	629	1,055	1,212
Germany,Fed.Rep.	32,948	31,632	-	-	-	-
Iceland	34,028	28,119	33,318	62,253	69,780	93,349
Norway	31	87	93	43	33	32
UK	1,124	+	-	-	-	-
Total	69,864	61,525	35,202	64,310	72,249	95,517

Country	1982	1983	1984	1985	1986	1987[1]
Belgium	283	389	291	400	423	398
Faroe Islands	1,046	1,357	686	291	253	332
Germany, Fed.Rep.	-	-	-	-	-	-
Iceland	115,051	122,749	108,270	91,381	85,992	87,768
Norway	11	32	12	8	2	7
UK	-	-	-	-	-	-
Total	116,391	124,527	109,259	92,080	86,670	88,505

[1] Provisional data.

Table 2.2 Nominal catch of REDFISH (in tonnes) by countries in Division Vb (Faroe Islands) as reported officially to ICES.

Country	1976	1977	1978	1979	1980	1981
Denmark	-	-	-	-	-	-
Faroe Islands	33	54	1,525	5,693	5,509	3,232
France	-	1,368	448	862	627	59
Germany, Fed.Rep.	5,255	5,854	7,767	6,108	3,891	3,841
Iceland	-	-	-	-	-	-
Netherlands	-	-	+		-	-
Norway	17	10	9	11	12	13
UK	59	116	57	+	-	-
USSR	-	-	-	-	-	-
Total	5,364	7,402	9,806	12,674	10,039	7,145

Country	1982	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-	36	176
Faroe Islands	3,999	4,642	8,770	12,634	15,331	13,942
France	204	439	559	1,157	752	622
Germany, Fed.Rep.	5,230[2]	4,300	4,460	5,091	5,142	3,051
Iceland	1	-	-	-	-	-
Netherlands	-	-	-	-	-	-
Norway	7	3	1	4	2	4
UK	-	-	-	-	-	-
USSR	-	-	142	868	320[3]	111[3]
Total	9,441	9,384	13,932	19,754	21,583	17,906

[1] Provisional data. [2] Including 570 t from Sub-area VI.
[3] According to the Faroe Coast Guard.

Table 2.3A Nominal catch of REDFISH (in tonnes) by countries in Sub-area XIV (East Greenland) as reported officially to ICES.

Country	1976	1977	1978	1979	1980	1981
Canada	420	-	-	-	-	-
Greenland	129	1	3	-	-	1
Faroe Islands	3	19	-	-	-	18
France	-	-	-	490	-	-
German Dem. Rep.	-	-	-	-	-	-
Germany, Fed.Rep.	4,403	13,347	20,711[2]	20,428[2]	32,520[2]	42,980[2]
Iceland	7,410	81	151	-	89	-
Norway	5	112	2	-	-	-
Poland	-	-	-	-	-	-
UK	286	622	13	-	-	-
USSR	101,000	251	-	-	-	-
Total	113,656	14,433	20,880	20,918	32,609	42,999

Country	1982	1983	1984	1985	1986	1987[1]
Bulgaria	-	-	2,961[3]	5,825[3]	11,385[3]	12,270[3]
Canada	-	-	-	-	-	-
Greenland	+	1	10	5,519[4]	9,542[4]	2,912[4]
Faroe Islands	-	27	-	-	5	382[1]
France	-	-	-	-	-	-
German Dem.Rep.	-	155[3]	989[3]	5,438[3]	8,574[3]	7,023[3]
Germany, Fed.Rep.	42,815[2]	30,815[2]	14,141	5,974	5,584	4,688
Iceland	17[3]	-	-	+	-	-
Norway	-	-	15	-	-	-
Poland	581[3]	-	239[3]	135[3]	149[3]	25[3]
UK	-	-	-	-	-	-
USSR	20,217[3]	-	-	42,973[3]	60,863[3]	68,521[3]
Total	63,630	31,036	18,355	65,864	96,102	95,778
Total used in the Assessment	42,815	30,853	14,166	11,493	15,131	7,982

[1] Provisional data.
[2] Catches updated for Sub-area XII included.
[3] Catches from the oceanic stock not included in the assessments.
[4] Fished mainly by the Japanese fleet.

Table 2.3B Nominal catch of REDFISH (in tonnes) by country in Sub-area XII as reported officially to ICES.

Country	1982	1983	1984	1985	1986	1987
USSR	39,783	60,079	60,643	17,300	24,131	2,948

Table 2.4 Total international effort values for S. marinus in ICES Sub-areas V and XIV estimated from the total international catch of S. marinus by using the Icelandic CPUE values from that part of the fishery in which 70% or more of the catches were redfish (S. marinus + S. mentella).

Year	Icelandic CPUE (kg/h)	Total international catch S. marinus (t)	Total international effort S. marinus (hr)
1977	835	52,752	63,176
1978	956	47,791	49,991
1979	1,147	75,056	65,437
1980	1,164	88,085	75,674
1981	1,177	101,285	86,054
1982	1,144	123,165	107,662
1983	962	106,317	110,517
1984	959	96,023	100,128
1985	981	78,460	79,980
1986	1,003	77,070	76,839
1987	1,072	76,415	71,283

Table 2.5 Federal Republic of Germany groundfish survey results in Sub-area XIV.

	S. marinus		S. mentella	
Year	Biomass (t)	Abundance ('000)	Biomass (t)	Abundance ('000)
1980	446,100 ± 42.6%	654,193 ± 42.7%	244,380 ± 57.6%	576,185 ± 71.6%
1981	504,658 ± 45.1%	669,739 ± 42.6%	74,117 ± 51.0%	199,047 ± 46.8%
1982	239,221 ± 52.9%	325,018 ± 53.1%	86,027 ± 44.5%	189,761 ± 44.8%
1983	269,333 ± 64.2%	284,880 ± 54.9%	68,970 ± 26.5%	120,092 ± 24.6%
1984	53,804 ± 68.9%	63,346 ± 65.5%	102,208 ± 76.3%	185,229 ± 70.6%
1985	97,512 ± 121.2%	161,248 ± 87.4%	10,053 ± 61.1%	29,256 ± 63.5%
1986	164,493 ± 36.2%	276,171 ± 49.2%	73,359 ± 27.2%	145,215 ± 27.6%
1987	204,956 ± 39.5%	397,584 ± 40.1%	41,920 ± 37.1%	155,032 ± 61.1%

Table 2.6 East Greenland Sebastes marinus. Age composition of survey stock size estimates.

Year class	1980	1981	1982	1983	1984	1985	1986	1987
	R<5	R<9	R<6	R<5	R<6	R<6	R<5	R<5
Recruitment	148	62,397	1,891	626	884	67,697	10,860	8,055
1982	-	-	-	-	-	-	-	224
1981	-	-	-	-	-	-	2,263	954
1980	-	-	-	-	-	-	5,765	9,514
1979	-	-	-	-	-	-	14,347	48,436
1978	-	-	-	172	808	8,672	37,010	51,044
1977	-	-	-	582	2,625	8,213	24,829	75,752
1976	-	-	301	1,015	3,273	7,301	21,471	39,777
1975	138	-	1,884	4,256	4,578	14,800	21,270	48,221
1974	762	-	3,087	7,135	3,097	4,169	35,992	24,691
1973	1,005	-	9,009	12,824	3,896	10,580	6,798	12,186
1972	2,624	30,520	21,289	15,624	8,189	3,050	10,281	7,882
1971	16,410	32,464	24,305	30,300	1,750	4,983	7,922	4,614
1970	33,886	31,184	60,429	14,274	5,562	4,483	5,588	3,907
1969	60,557	133,384	30,565	18,603	4,005	2,369	5,085	5,953
1968	166,502	62,175	25,992	24,317	2,651	3,583	10,860	7,157
1967	112,350	62,458	24,616	16,222	2,693	4,427	7,253	5,102
1966	66,169	62,985	16,485	13,506	4,595	4,348	7,616	10,895
1965	52,512	28,201	9,975	36,411	3,618	2,675	11,841	6,712
1964	27,033	8,465	16,732	23,455	1,742	2,955	5,416	11,430
1963	9,520	22,105	10,569	17,287	2,668	2,119	7,927	10,049
1962	24,876	14,501	15,409	15,841	1,178	2,601	6,655	+5,029
1961	15,589	15,579	18,877	8,047	1,851	885	3,454	-
1960	6,546	28,515	9,200	11,736	976	875	2,368	-
1959	17,639	17,290	12,737	5,913	345	255	1,411	-
1958	7,185	19,528	6,731	3,773	589	69	+1,889	-
1957	6,208	21,316	2,408	2,189	496	+146	-	-
1956	10,958	8,091	1,476	385	+277	-	-	-
1955	7,289	5,767	842	+387	-	-	-	-
1954	4,708	1,402	+207	-	-	-	-	-
1953	2,489	+1,412	-	-	-	-	-	-
1952	+1,090	-	-	-	-	-	-	-
Total	654,193	669,739	325,018	284,880	62,346	161,248	276,171	397,584
Recruitment	54,973	125,381	37,461	26,610	15,265	106,683	116,545	193,979
Stock size 11+	99,220	544,358	287,557	258,270	47,081	54,565	159,626	203,605

Table 2.7 Nominal catch of REDFISH ('000 tonnes) in Division Va by countries. Separation into the species components according to the method used by the Redfish Working Group.

Year		Belgium	Faroe Islands	German Dem.Rep.	Germany, Fed.Rep.	Iceland	Norway	Poland	UK	Total
1976	Total	1.5	0.2	-	32.9	34.0	+	-	1.1	69.7
	S.mar.	1.5	0.2		4.3	33.3			1.1	40.4
	S.ment.	-	-		28.6	0.7			-	29.3
1977	Total	1.4	0.3	-	31.6	28.1	0.1	-	-	61.5
	S.mar.	1.4	0.3		9.2	27.5	0.1			38.5
	S.ment.	-	-		22.4	0.6	-			23.0
1978	Total	1.5	0.2	-	-	33.3	0.1	-	-	35.1
	S.mar.	1.5	0.2			29.4	0.1			31.2
	S.ment.	-	-			3.9	-			3.9
1979	Total	1.4	0.6	-	-	62.3	0.1	-	-	64.4
	S.mar.	1.4	0.6			54.6	0.1			56.7
	S.ment.	-	-			7.7	-			7.7
1980	Total	1.4	1.1	-	-	69.8	+	-	-	72.3
	S.mar.	1.4	1.1			59.6				62.1
	S.ment.	-	-			10.2				10.2
1981	Total	0.9	1.2	-	-	93.4	+	-	-	95.5
	S.mar.	0.9	1.2			73.7				75.8
	S.ment.	-	-			19.7				19.7
1982	Total	0.3	1.0	-	-	115.1	+	-	-	116.4
	S.mar.	0.3	1.0			96.6	+			97.9
	S.ment.	-	-			18.5	-			18.5
1983	Total	0.4	1.4	-	-	122.7	+	-	-	124.5
	S.mar.	0.4	1.4			85.6				87.4
	S.ment.	-	-			37.1				37.1
1984	Total	0.3	0.7	-	-	108.3	+	-	-	109.3
	S.mar.	0.3	0.7			83.8	+			84.8
	S.ment.	-	-			24.5	-			24.5
1985	Total	0.4	0.3	-	-	91.4	+	-	-	92.2
	S.mar.	0.4	0.3			66.7	+			67.4
	S.ment.	-	-			24.8	-			24.8
1986	Total	0.4	0.3	-	-	86.0	+	-	-	86.7
	S.mar.	0.4	0.3			67.1	+			67.8
	S.ment.	-	-			18.9	-			18.9
1987	Total[1]	0.4	0.3	-	-	87.8	+	-	-	88.5
	S.mar.	0.4	0.3			68.5				69.2
	S.ment.	-	-			19.3				19.3

[1] Preliminary.

Table 2.8 Nominal catch of REDFISH ('000 tonnes) in Division Vb by countries. Separation into the species components according to the method used by the Redfish Working Group.

Year		Denmark	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Netherlands	Norway	UK	USSR	Total
1976	Total	-	+	-	-	5.3	-	+	0.1	-	5.4
	S.mar.					-			0.1		0.1
	S.ment.					5.3			-		5.3
1977	Total	-	0.1	1.4	-	5.9	-	+	0.1	-	7.5
	S.mar.		0.1	0.6		-			0.1		0.8
	S.ment.		-	0.8		5.9			-		6.7
1978	Total	-	1.5	0.4	-	7.8	-	+	0.1	-	9.8
	S.mar.		1.5	0.4		-			0.1		2.0
	S.ment.		-	-		7.8			-		6.7
1979	Total	-	5.7	0.9	-	6.1	-	+	-	-	12.7
	S.mar.		4.8	-		-					4.8
	S.ment.		0.9	0.9		6.1					7.9
1980	Total	-	5.5	0.6	-	3.9	-	+	-	-	10.0
	S.mar.		4.9	-		-		+			4.9
	S.ment.		0.6	0.6		3.9		-			5.1
1981	Total	-	3.2	+	-	3.9	-	+	-	-	7.1
	S.mar.		2.5	-		-		+			2.5
	S.ment.		0.7	+		3.9		-			4.6
1982	Total	-	4.0	0.2	-	5.2	-	+	-	-	9.4
	S.mar.		1.7	0.1		-		+			1.8
	S.ment.		2.3	+		5.2		-			7.5
1983	Total	-	4.7	0.4	-	4.3	-	-	-	-	9.4
	S.mar.		3.1	0.3		-					3.4
	S.ment.		1.6	0.1		4.3					6.0
1984	Total	-	8.8	0.5	-	4.5	-	+	-	0.1	13.9
	S.mar.		5.8	0.4		-				-	6.2
	S.ment.		3.0	0.1		4.5				0.1	7.7
1985	Total	-	12.6	1.2	-	5.1	-	+	-	0.9	19.8
	S.mar.		8.3	0.9		-				-	9.2
	S.ment.		4.3	0.3		5.1				0.9	10.6
1986	Total	+	15.4	0.8	-	5.1	-	+		0.3	21.6
	S.mar.	-	5.7	0.6		0.1		-		-	6.4
	S.ment.	+	9.7	0.2		5.0		+		0.3	15.2
1987	Total[1]	0.2	13.9	0.6	-	3.1	-	+		0.1	17.9
	S.mar.	-	5.0	0.5		0.6		-		-	6.1
	S.ment.	0.2	8.9	0.1		2.4		+		0.1	11.8

[1] Preliminary.

Table 2.9 Nominal catch of REDFISH ('000 tonnes) in Sub-area XIV by countries. Separation into the species components according to the method used by the Redfish Working Group.

Year		Bul-garia	Canada	Denmark (G)	Faroe Isl.	German Dem.Rep.	Germany, Fed.Rep.	Ice-land	Norway	Poland	UK	USSR	Green-land	Total
1976	Total	-	0.4	0.1	+	-	4.4	7.4	+	-	0.3	101.0	-	113.6
	S.mar.	-	0.4	0.1			4.4	7.4			0.3	41.3		53.9
	S.ment.	-	-	-			-	-			-	59.7		59.7
1977	Total	-	-	+	+	-	13.3	0.1	0.1	-	0.6	0.3	-	14.4
	S.mar.	-				13.3	0.1	0.1		0.6	0.3			14.4
	S.ment.	-				-	-	-		-	-			-
1978	Total	-	-	+	-	-	20.7	0.2	+	-	+	-	-	2
	S.mar.	-					15.3	0.2						15.
	S.ment.	-					5.4	-						5.4
1979	Total	-	-	-	+	-	21.1	-	-	-	-	-	-	21.1
	S.mar.	-					15.8							15.8
	S.ment.	-					5.3							5.3
1980	Total	-	-	-	-	-	32.5	0.1	-	-	-	-	-	32.6
	S.mar.	-					22.1	0.1						22.2
	S.ment.	-					10.4	-						10.4
1981	Total	-	-	-	+	-	43.0	-	-	-	-	-	-	43.0
	S.mar.	-					23.6							23.6
	S.ment.	-					19.4							19.4
1982	Total	-	-	+	-	-	42.8	+	-	0.6[2]	-	20.2[2]		63.6[2]
	S.mar.	-					23.5			-		-		23.5
	S.ment.	-					19.3			0.6		20.2[2]		40.1[2]
1983	Total	-			+	0.1[2]	30.8					-[2]	-	30.9[2]
	S.mar.	-	-	-		-	15.6	-	-	-	-	-		15.7
	S.ment.	-				0.1	15.2					-[2]		15.2[2]
1984	Total	3.0[2]	-	-	-	1.0[2]	14.1	+	-	0.2[2]	-	-[2]	+	18.3[2]
	S.mar.	-				-	5.0			-		-		5.0
	S.ment.	3.0[2]				1.0	9.1			0.2			-	13.3[2]
1985	Total	5.8[2]	-	-	+	5.4[2]	5.9	+	-	0.1[2]	-	43.0[2]	5.5	65.7[2]
	S.mar.	-				-	1.1			-		-	1.0	
	S.ment.	5.8[2]				5.4	4.8			0.1		43.0	4.5	6
1986	Total	11.4[2]	-	-	+	8.6[2]	5.6	-	-	0.1[2]	-	60.9[2]	9.6	96.2[2]
	S.mar.	-			+	-	1.1					-	1.9	3.0
	S.ment.	11.4[2]			+	8.6	4.5			0.1		60.9	7.7	93.2[2]
1987	Total[1]	12.3[2]	-	-	0.4	7.0[2]	4.7	-	+	+[2]	-	68.5[2]	2.9	95.9[2]
	S.mar.	-			0.1	-	0.7		-			-	0.4	1.2
	S.ment.	12.3[2]			0.3	7.0[2]	4.0		+			68.5[2]	2.5	94.7

[1] Preliminary.
[2] Catches of the oceanic stock included.

Table 2.10 Shrimp catch and by-catch of redfish reported in logbooks from the Denmark Strait shrimp fishery in 1987 (Carlsson, 1988).

Month	Shrimp catch (t)	Redfish %
1	2,107	0.24
2	2,356	1.44
3	1,819	0.93
4	1,617	1.66
5	572	1.94
6	-	-
7	-	-
8	40	-
9	495	-
10	378	0.07
11	461	3.18
12	728	1.48
Total	10,573	1.09

Table 2.11 Total nominal catches of shrimp in the Denmark Strait and mean catch per tow and numbers of redfish per tow and estimated total by-catch of redfish in numbers from March-April observer program (Smedstad and Torheim, 1988).

Year	Shrimp catch (t)	March-April mean shrimp catch per tow (t)	Observer program mean number of redfish per tow	Number of tows	Total number redfish ('000)
1982	4,902	608	53	37	427
1983	4,175	346	47	21	567
1984	6,731	880	87	19	665
1985	8,100	732	74	40	819
1986	11,074	410	103	19	2,782
1987	11,944	528	293	24	6,628

Table 2.12 SUM OF PRODUCTS CHECK

SEBASTES MARINUS IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
11	1039	1049	1723	2284	2136	2449	3344	2217	2574	3244
12	5957	2607	7306	9562	8299	7088	8841	6301	5974	3893
13	5667	2839	9238	8422	9968	11251	9505	4910	4686	2715
14	8023	6192	14052	10313	14054	11603	12346	6547	7908	6212
15	6451	6260	18617	15916	17880	14267	10538	8878	7519	4533
16	5702	10174	13521	10299	14531	13033	12378	8685	7115	4595
17	2188	9134	4620	11042	11159	11782	11806	10565	8838	5680
18	3173	10300	9586	9019	15254	15530	11362	9910	7981	6538
19	2959	5635	5563	7807	10336	12076	9055	9274	7103	5911
20	3186	4777	2123	5145	13947	9553	8701	7985	6625	5593
21	3401	5672	5516	9010	9751	5709	6312	5946	5790	7778
22	1511	3216	2297	4113	5090	3235	3337	3836	3722	6517
23	1746	3912	1943	2825	4796	4016	3696	2337	4696	5689
24	1474	2368	2395	3762	2751	2143	2350	2513	2520	3460
25	827	2212	1430	1929	992	1394	868	1231	1260	1654
26	611	2125	750	1079	449	541	277	287	429	33
27	378	1272	461	518	209	287	22	113	120	1
28	156	747	249	136	17	28	3	47	106	21
29	99	452	33	41	1	1	0	0	0	0
30+	37	263	68	7	78	81	0	0	0	0
TOTAL	54585	81206	101491	113229	141698	126067	114741	91582	84966	74067

Table 2.13 SUM OF PRODUCTS CHECK

SEBASTES MARINUS IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
11	.486	.486	.486	.486	.387	.387	.399	.420	.429	.475
12	.536	.536	.536	.536	.424	.424	.487	.489	.509	.475
13	.591	.591	.591	.591	.533	.533	.521	.540	.571	.627
14	.652	.652	.652	.652	.601	.601	.604	.609	.642	.735
15	.720	.720	.720	.720	.654	.654	.661	.663	.690	.754
16	.794	.794	.794	.794	.714	.714	.718	.721	.753	.744
17	.876	.876	.876	.876	.760	.760	.788	.783	.813	.758
18	.966	.966	.966	.966	.857	.857	.872	.847	.885	.961
19	1.066	1.066	1.066	1.066	.938	.938	.981	.937	.968	1.094
20	1.176	1.176	1.176	1.176	1.025	1.025	1.020	1.011	1.031	1.119
21	1.297	1.297	1.297	1.297	1.147	1.147	1.164	1.109	1.149	1.120
22	1.431	1.431	1.431	1.431	1.296	1.296	1.393	1.253	1.308	1.334
23	1.579	1.579	1.579	1.579	1.473	1.473	1.530	1.421	1.516	1.559
24	1.742	1.742	1.742	1.742	1.647	1.647	1.816	1.652	1.862	1.776
25	1.922	1.922	1.922	1.922	1.903	1.903	2.063	1.909	2.051	2.234
26	2.120	2.120	2.120	2.120	2.313	2.313	2.306	2.156	2.061	2.100
27	2.339	2.339	2.339	2.339	2.810	2.810	3.145	2.938	2.900	2.900
28	2.580	2.580	2.580	2.580	3.629	3.629	3.333	3.719	3.500	4.658
29	2.846	2.846	2.846	2.846	4.000	4.000	.000	.000	.000	.000
30+	3.905	3.905	3.905	3.905	5.631	5.631	.000	.000	.000	.000

Table 2.14 Sebastes marinus in Division Va, maturity at age.

Age	1983	1984	1985	1986	1987
7	-	-	-	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	-	-	-	-
11	-	0.005	0.050	-	-
12	0.06	0.055	0.021	0.06	0.01
13	0.13	0.054	0.083	0.13	0.08
14	0.26	0.162	0.161	0.26	0.39
15	0.44	0.284	0.293	0.44	0.41
16	0.65	0.471	0.474	0.69	0.68
17	0.84	0.655	0.616	0.84	0.80
18	0.90	0.801	0.715	0.90	0.91
19	0.93	0.888	0.806	0.93	0.87
20	0.97	0.905	0.849	0.97	0.98
21	1.00	0.955	0.911	1.00	0.93
22	1.00	0.975	0.939	1.00	0.93
23	1.00	0.928	0.934	1.00	0.94
24	1.00	0.978	0.932	1.00	0.94
25	1.00	1.000	0.946	1.00	1.00
26	1.00	1.000	0.949	1.00	1.00
27	1.00	1.000	0.975	1.00	1.00
28	1.00	1.000	1.000	1.00	1.00
29	1.00	1.000	1.000	1.00	1.00
30	1.00	1.000	1.000	1.00	1.00

Table 2.15

Module run at 20.51.56 22 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet 1 ,only 1 fleet for red, has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **

Regression weights
, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of predictions
Fishing mortalities

Age,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,
11,	.002,	.004,	.005,	.009,	.012,	.017,	.022,	.023,	.025,	.021,	.010,
12,	.015,	.027,	.013,	.038,	.058,	.050,	.064,	.091,	.051,	.078,	.037,
13,	.029,	.027,	.014,	.051,	.051,	.071,	.079,	.104,	.060,	.044,	.041,
14,	.059,	.049,	.033,	.082,	.066,	.102,	.100,	.105,	.087,	.117,	.068,
15,	.051,	.057,	.044,	.119,	.114,	.141,	.128,	.112,	.092,	.122,	.082,
16,	.083,	.064,	.109,	.114,	.081,	.129,	.130,	.140,	.114,	.089,	.092,
17,	.046,	.036,	.124,	.059,	.115,	.106,	.132,	.149,	.153,	.146,	.086,
18,	.129,	.072,	.212,	.166,	.142,	.206,	.188,	.163,	.162,	.149,	.137,
19,	.128,	.092,	.157,	.152,	.177,	.214,	.223,	.143,	.174,	.150,	.141,
20,	.063,	.147,	.189,	.074,	.184,	.480,	.279,	.222,	.163,	.163,	.152,
21,	.237,	.226,	.372,	.308,	.442,	.546,	.327,	.268,	.207,	.153,	.260,
22,	.244,	.127,	.308,	.225,	.353,	.427,	.310,	.288,	.231,	.174,	.229,
23,	.403,	.241,	.487,	.276,	.420,	.785,	.622,	.613,	.299,	.433,	.386,
24,	.433,	.279,	.524,	.553,	1.124,	.822,	.887,	.814,	1.006,	.535,	.580,
25,	.250,	.192,	.759,	.616,	1.062,	.932,	1.244,	1.019,	1.290,	2.964,	.719,
26,	.302,	.179,	.913,	.556,	1.225,	.669,	2.493,	.786,	1.040,	5.065,	.777,
27,	.326,	.204,	.599,	.445,	.837,	.727,	1.111,	.704,	.773,	1.834,	.538,

Table 2.16 VIRTUAL POPULATION ANALYSIS

SEBASTES MARINUS IN FISHING AREAS V AND XIV

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1980-85
11	.004	.005	.009	.012	.017	.022	.024	.025	.022	.010	.018
12	.027	.013	.038	.058	.049	.064	.091	.051	.077	.037	.059
13	.027	.014	.051	.051	.071	.079	.104	.060	.044	.041	.069
14	.049	.033	.082	.066	.102	.100	.105	.087	.117	.068	.090
15	.057	.044	.119	.114	.141	.128	.112	.092	.122	.082	.118
16	.064	.109	.114	.080	.129	.130	.140	.114	.089	.092	.118
17	.036	.124	.059	.115	.106	.132	.150	.153	.145	.086	.119
18	.072	.212	.166	.142	.206	.188	.163	.162	.149	.137	.171
19	.092	.157	.152	.177	.214	.223	.143	.174	.150	.141	.180
20	.147	.189	.074	.184	.480	.279	.222	.162	.163	.152	.233
21	.226	.372	.308	.442	.546	.327	.268	.208	.152	.260	.350
22	.127	.308	.225	.353	.427	.310	.288	.231	.174	.229	.306
23	.241	.487	.276	.420	.785	.622	.613	.299	.433	.386	.503
24	.279	.524	.553	1.124	.822	.887	.814	1.006	.535	.580	.868
25	.192	.759	.616	1.062	.932	1.244	1.019	1.290	2.964	.719	1.027
26	.179	.913	.556	1.225	.669	2.493	.786	1.040	5.065	.777	1.128
27	.111	.599	.445	.837	.727	1.111	.704	.773	1.834	.538	.766
28+	.111	.599	.445	.837	.727	1.111	.704	.773	1.834	.538	.766
(14-23)U	.111	.204	.158	.209	.314	.244	.220	.168	.169	.163	

Table 2.17 VIRTUAL POPULATION ANALYSIS

SEBASTES MARINUS IN FISHING AREAS V AND XIV

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
11	243639	226135	198520	202070	134221	120539	150802	95979	127133	342569	0
12	237692	219466	203618	177990	180669	119417	106740	133272	84738	112588	306885
13	225812	209409	196103	177296	151964	155589	101317	88182	114601	70998	98173
14	177088	198936	186782	168661	152420	128031	130092	82646	75124	99241	61661
15	121299	152610	174119	155655	142810	124563	104824	105983	68560	60464	83894
16	97033	103625	132138	139865	125724	112239	99158	84838	87462	54894	50402
17	64824	82381	84099	106719	116769	99958	89180	77967	68514	72379	45304
18	48222	56575	65865	71705	86074	95056	79255	69482	60514	53601	60095
19	35261	40618	41414	50495	56316	63404	71267	60924	53459	47176	42291
20	24489	29094	31402	32190	38278	41146	45909	55886	46321	41627	37073
21	17614	19133	21790	26396	24242	21427	28169	33283	42985	35623	32354
22	13318	12710	11936	14485	15349	12705	13974	19500	24471	33396	24853
23	8541	10616	8451	8620	9207	9066	8428	9479	14004	18609	24033
24	6343	6071	5901	5803	5123	3800	4405	4129	6360	8222	11446
25	4958	4342	3252	3072	1707	2037	1416	1766	1366	3370	4165
26	3903	3701	1838	1590	962	608	531	463	440	64	1486
27	3777	2951	1344	953	423	446	45	219	148	3	27
28+	2918	3392	1020	339	194	171	6	91	131	53	29
TOTAL NO	1336733	1381766	1369592	1343907	1242452	1110203	1035518	924088	876334	1054874	
SPS NO	425757	479795	508490	536198	542074	511586	481966	453942	426600	398898	
TOT.BIOM	877149	931200	932957	935332	815945	745651	717581	655337	652335	760629	
SPS BIOM	397331	445224	459675	490742	447159	426126	419152	395438	398399	397802	

Table 2.18 Number of O-group REDFISH$_2$ (millions)/nautical mile^2 from the Icelandic O-group survey.

Year	Number
1970	8.6
1971	12.6
1972	31.1
1973	74.0
1974	23.6
1975	12.6
1976	5.8
1977	13.0
1978	6.5
1979	1.3
1980	3.0
1981	9.0
1982	2.7
1983	0.7
1984	4.3[1]
1985	22.6[1]
1986	12.1[1]
1987	22.9[1]

[1] Reduced area.

Table 2.19

List of input variables for the ICES prediction program.

SEBASTES MARINUS IN SUB-AREAS V-XIV

The reference F is the mean F for the age group range from 14 to 23

The number of recruits per year is as follows:

Year	Recruitment
1988	191000.0
1989	191000.0
1990	191000.0
1991	191000.0

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
11	191000.0	.01	.10	.00	.431	.431
12	169798.0	.04	.10	.06	.490	.490
13	150455.0	.04	.10	.13	.565	.565
14	61661.0	.07	.10	.26	.658	.658
15	83894.0	.08	.10	.44	.692	.692
16	50402.0	.09	.10	.69	.734	.734
17	45304.0	.09	.10	.84	.786	.786
18	60095.0	.14	.10	.90	.891	.891
19	42291.0	.14	.10	.93	.995	.995
20	37073.0	.15	.10	.97	1.045	1.045
21	32354.0	.26	.10	1.00	1.136	1.136
22	24853.0	.23	.10	1.00	1.322	1.322
23	24033.0	.39	.10	1.00	1.507	1.507
24	11446.0	.58	.10	1.00	1.777	1.777
25	4165.0	.72	.10	1.00	2.064	2.064
26	1486.0	.78	.10	1.00	2.156	2.156
27	27.0	.54	.10	1.00	2.971	2.971
28+	29.0	.54	.10	1.00	3.803	3.803

Table 2.20 Management options for 1988 and 1989 for Sebastes marinus in Sub-areas V-XIV.

1988				Management option for 1988 and 1989	1989				1990			1991	
Stock biom. (11+)	SSB	$F_{(14-23)}$	Catch (11+)		Stock biom. (11+)	SSB	$F_{(14-23)}$	Catch (11+)	Stock biom. (11+)	SSB	Catch (11+)	Stock biom. (11+)	SSB
694	370	0.163	77	$F_{89} = F_{87}$	703	358	0.16	77	711	349	76	720	349
				$F_{89} = 0.8F_{87}$			0.13	64	726	361	65	746	371
				$F_{89} = 1.2F_{87}$			0.20	90	697	337	85	696	329

Weights in '000 t.

Table 2.21 SUM OF PRODUCTS CHECK

SEBASTES MENTELLA IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
11	908	647	1359	5651	582	1223	409	341	284	87
12	1521	1517	7256	10626	3118	5217	3510	1433	1070	398
13	664	1373	5989	5031	3132	7216	2821	1382	1046	1079
14	816	2622	3811	3045	3579	5516	3319	2049	2669	1899
15	1206	2726	3685	6513	4796	9353	6254	4444	3872	4037
16	1577	1980	2422	4812	5833	5181	5489	5222	4669	3563
17	882	1035	1344	1873	3131	2828	2777	3428	3672	2930
18	1581	1565	1405	2856	3652	5427	4453	3675	4536	3592
19	1371	2022	1256	2445	4425	3278	4493	4446	6452	4460
20	1089	915	1252	1539	4671	4637	4753	4763	5237	4169
21	1688	3133	3398	3003	6140	6193	4434	4736	6520	5596
22	1264	1937	2070	2215	3447	3920	2437	3377	3035	3083
23	2070	1741	2024	2162	4321	4175	2614	3389	4329	3550
24	1388	1449	1419	2151	2415	2546	1192	2707	1468	2921
25	823	842	590	1238	975	2095	589	1390	1026	433
26	506	297	225	472	97	1255	135	439	225	102
27	104	54	121	110	132	289	30	238	95	121
28+	0	0	0	272	0	45	96	72	26	0
TOTAL	19458	25855	39626	56014	54446	70394	49805	47531	50231	42020

Table 2.22 SUM OF PRODUCTS CHECK

SEBASTES MENTELLA IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
11	.327	.327	.327	.327	.327	.327	.442	.414	.441	.479
12	.367	.367	.367	.367	.367	.367	.529	.486	.529	.531
13	.410	.410	.410	.410	.410	.410	.551	.539	.566	.559
14	.461	.461	.461	.461	.461	.461	.623	.610	.622	.656
15	.516	.516	.516	.516	.516	.516	.660	.662	.689	.708
16	.578	.578	.578	.578	.578	.578	.691	.711	.742	.769
17	.648	.648	.648	.648	.648	.648	.735	.782	.811	.827
18	.726	.726	.726	.726	.726	.726	.803	.845	.876	.897
19	.813	.813	.813	.813	.813	.813	.886	.915	.931	.953
20	.912	.912	.912	.912	.912	.912	.997	.983	1.000	1.019
21	1.022	1.022	1.022	1.022	1.022	1.022	1.081	1.082	1.131	1.124
22	1.145	1.145	1.145	1.145	1.145	1.145	1.242	1.206	1.198	1.254
23	1.284	1.284	1.284	1.284	1.284	1.284	1.387	1.353	1.410	1.416
24	1.438	1.438	1.438	1.438	1.438	1.438	1.614	1.470	1.458	1.732
25	1.614	1.614	1.614	1.614	1.614	1.614	1.610	1.614	1.825	1.721
26	1.809	1.809	1.809	1.809	1.809	1.809	1.821	1.730	1.977	1.735
27	2.028	2.028	2.028	2.028	2.028	2.028	2.028	1.833	2.129	1.848
28+	2.028	2.028	2.028	2.028	2.028	2.028	1.772	1.872	2.129	.000

Table 2.23 VIRTUAL POPULATION ANALYSIS

SEBASTES MENTELLA IN FISHING AREAS V AND XIV

PROPORTIONS OF MATURITY

UNIT:

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
11	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
12	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
13	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
14	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
15	.080	.080	.080	.080	.080	.080	.080	.080	.080	.080
16	.160	.160	.160	.160	.160	.160	.160	.160	.160	.160
17	.260	.260	.260	.260	.260	.260	.260	.260	.260	.260
18	.470	.470	.470	.470	.470	.470	.470	.470	.470	.470
19	.650	.650	.650	.650	.650	.650	.650	.650	.650	.650
20	.780	.780	.780	.780	.780	.780	.780	.780	.780	.780
21	.870	.870	.870	.870	.870	.870	.870	.870	.870	.870
22	.940	.940	.940	.940	.940	.940	.940	.940	.940	.940
23	.980	.980	.980	.980	.980	.980	.980	.980	.980	.980
24	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
25	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
26	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
27	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
28+	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 2.24 Sebastes mentella, Sub-areas V-XIV.

Module run at 11.13.45 23 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet 1 ,only 1 fleet for red, has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **

Regression weights
, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of predictions
Fishing mortalities

Age,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,
11,	.000,	.006,	.004,	.011,	.045,	.007,	.018,	.005,	.006,	.004,	.000,
12,	.001,	.010,	.011,	.056,	.096,	.028,	.076,	.059,	.018,	.022,	.006,
13,	.003,	.004,	.011,	.051,	.046,	.033,	.076,	.048,	.027,	.015,	.025,
14,	.017,	.008,	.020,	.033,	.030,	.037,	.068,	.041,	.041,	.060,	.031,
15,	.026,	.016,	.031,	.032,	.066,	.054,	.116,	.093,	.064,	.091,	.108,
16,	.068,	.035,	.030,	.032,	.047,	.069,	.069,	.083,	.094,	.080,	.102,
17,	.071,	.020,	.026,	.023,	.028,	.036,	.039,	.043,	.062,	.079,	.059,
18,	.120,	.045,	.041,	.040,	.056,	.063,	.072,	.072,	.066,	.098,	.094,
19,	.115,	.053,	.067,	.038,	.082,	.103,	.067,	.071,	.086,	.143,	.118,
20,	.047,	.043,	.041,	.049,	.054,	.199,	.135,	.117,	.090,	.125,	.116,
21,	.262,	.119,	.152,	.189,	.143,	.279,	.390,	.165,	.147,	.153,	.171,
22,	.128,	.090,	.175,	.127,	.162,	.216,	.257,	.233,	.164,	.119,	.090,
23,	.382,	.272,	.154,	.249,	.170,	.476,	.389,	.244,	.514,	.290,	.178,
24,	.279,	.199,	.277,	.162,	.403,	.260,	.505,	.163,	.379,	.389,	.289,
25,	.220,	.145,	.160,	.155,	.186,	.286,	.335,	.184,	.259,	.215,	.169,

Table 2.25

Title : SEBASTES MENTELLA IN FISHING AREAS V AND XIV
At 11.17.24 23 SEPTEMBER 1988
from 67 to 87 on ages 11 to 25
with Terminal F of .115 on age 19 and Terminal S of 1.000

Initial sum of squared residuals was 784.057 and
final sum of squared residuals is 490.108 after 150 iterations

Matrix of Residuals

Years / Ages	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77		
11/12	-3.454	-4.606	-5.234	-4.245	-3.371	-5.752	-2.125	-5.363	-8.463	4.612		
12/13	-.185	-2.205	-1.471	-.140	-.540	-2.829	-.326	-1.198	-5.228	3.615		
13/14	-.669	-2.174	-1.495	-.414	-.852	-2.039	-.562	-1.426	-3.341	2.550		
14/15	1.159	.062	.484	1.384	.952	.529	.650	.447	-.460	2.544		
15/16	-.554	-1.289	-1.013	-.276	-.895	-.728	-1.055	-.997	-.929	.110		
16/17	-.077	-.436	-.377	.152	-.404	.113	-.449	-.311	-.132	-.401		
17/18	.239	.167	.107	.435	-.012	.545	.033	.237	.387	-.289		
18/19	.058	.276	.199	.214	-.057	.440	.069	.439	.592	-.414		
19/20	1.337	1.849	1.596	1.383	1.389	1.769	1.531	1.833	1.852	.683		
20/21	-1.292	-.698	-1.022	-1.360	-1.123	-.883	-.997	-.830	-.763	-1.954		
21/22	.650	1.377	1.138	.455	1.038	.991	1.048	1.071	1.404	.296		
22/23	-.895	-.158	-.401	-1.282	-.387	-.802	-.566	-.630	-.184	-1.353		
23/24	.421	.899	.894	-.032	.871	.274	.697	.556	1.064	-.087		
24/25	.211	.790	.847	-.183	.636	.039	.627	.406	.984	-.224		
	-.004	-.004	-.003	-.003	-.002	-.002	-.002	-.001	-.001	.000		
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001		
Years / Ages	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87		WTS
11/12	-5.603	.811	-1.291	-.705	1.927	-.992	-.274	-.099	.031	.636	.000	.078
12/13	-2.219	.128	-1.547	.417	1.252	-.944	.086	.782	.182	-.344	.000	.140
13/14	-1.106	-.966	-.813	1.109	.752	-.290	.630	.551	-.410	-.551	.000	.193
14/15	.209	-.473	.192	.217	.272	-.374	.043	.252	-.079	-.059	.000	.352
15/16	-.693	-.319	.092	-.073	.274	-.058	.130	.158	-.061	-.134	.000	.502
16/17	.375	.147	-.089	.003	.149	.302	-.224	.005	-.100	-.193	.000	.988
17/18	.517	.038	.104	-.124	-.065	-.088	-.411	.139	.152	.251	.000	1.000
18/19	.632	.090	.352	-.204	-.120	.279	-.060	.132	-.423	-.049	.000	.844
19/20	.669	.622	.493	.027	-.452	-.001	-.747	-.052	-.150	.244	.000	.294
20/21	-.634	-.249	-.712	-.067	-.625	.317	.234	.569	.250	.293	.000	.372
21/22	.501	-.278	.061	.284	-.336	.081	.139	-.128	.040	.127	.000	.450
22/23	-.738	.099	.164	.369	-.312	-.004	.179	-.173	-.098	-.217	.000	.529
23/24	.208	.228	-.138	-.196	-.302	.165	.463	-.431	.434	-.227	.000	.556
24/25	-.186	.054	.244	-.303	.310	-.498	.394	-.832	.295	.331	.000	.529
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	-48.677	
WTS	.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	67
F-values	.0025

	68	69	70	71	72	73	74	75	76	77
F-values	.0033	.0053	.0077	.0074	.0134	.0183	.0273	.0395	.0671	.0523

	78	79	80	81	82	83	84	85	86	87
F-values	.0347	.0462	.0507	.0699	.0952	.1142	.0897	.1026	.1201	.1150

Selection-at-age (S)

	11	12	13	14	15
S-values	.1314	.4140	.3573	.4524	.8008

	16	17	18	19	20	21	22	23	24	25
S-values	.8180	.5293	.8313	1.0000	1.0745	2.1353	1.6574	2.2622	1.7852	1.0000

Table 2.26 VIRTUAL POPULATION ANALYSIS

SEBASTES MENTELLA IN FISHING AREAS V AND XIV

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
11	.000	.000	.000	.000	.000	.000	.000	.000	.000	.046	.000	.007
12	.000	.000	.001	.001	.000	.000	.001	.001	.001	.207	.001	.012
13	.001	.000	.002	.003	.001	.001	.003	.002	.003	.200	.004	.006
14	.004	.003	.009	.013	.005	.004	.007	.011	.017	.186	.017	.010
15	.002	.003	.007	.014	.006	.007	.006	.010	.017	.081	.022	.016
16	.005	.005	.016	.028	.018	.026	.019	.025	.041	.076	.059	.029
17	.004	.004	.008	.023	.015	.032	.021	.030	.032	.052	.059	.018
18	.005	.006	.009	.017	.022	.045	.040	.048	.054	.058	.088	.037
19	.007	.008	.009	.013	.015	.053	.050	.070	.054	.062	.084	.038
20	.002	.002	.002	.003	.003	.008	.013	.017	.017	.015	.026	.031
21	.012	.020	.016	.017	.020	.038	.049	.111	.116	.124	.166	.063
22	.004	.006	.006	.006	.008	.010	.015	.020	.043	.037	.054	.053
23	.010	.018	.016	.019	.027	.029	.041	.053	.073	.118	.148	.102
24	.005	.007	.009	.008	.015	.016	.024	.024	.034	.032	.077	.064
25	.002	.003	.003	.003	.005	.008	.012	.010	.013	.012	.016	.034
26+	.002	.003	.003	.003	.005	.008	.012	.010	.013	.012	.016	.034

	1979	1980	1981	1982	1983	1984	1985	1986	1987
11	.004	.009	.046	.007	.016	.010	.012	.023	.015
12	.012	.053	.085	.029	.074	.054	.038	.042	.037
13	.012	.055	.042	.029	.079	.047	.024	.032	.049
14	.026	.037	.032	.034	.060	.043	.039	.054	.068
15	.039	.042	.075	.058	.107	.080	.066	.087	.097
16	.029	.040	.064	.080	.075	.076	.080	.083	.097
17	.022	.023	.035	.048	.046	.047	.056	.067	.062
18	.035	.033	.055	.080	.100	.084	.073	.088	.078
19	.055	.032	.067	.102	.087	.101	.102	.158	.105
20	.029	.039	.046	.159	.133	.156	.133	.151	.131
21	.106	.129	.113	.230	.290	.163	.206	.241	.214
22	.086	.085	.105	.164	.202	.158	.161	.177	.154
23	.087	.109	.108	.272	.272	.180	.306	.284	.288
24	.087	.085	.146	.152	.227	.104	.256	.188	.281
25	.045	.042	.090	.082	.172	.068	.152	.131	.070
26+	.045	.042	.090	.082	.172	.068	.152	.131	.070

Table 2.27 VIRTUAL POPULATION ANALYSIS

SEBASTES MENTELLA IN FISHING AREAS V AND XIV

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
11	109187	97408	113225	104392	108306	113862	118021	149721	140005	152611	150903	147162
12	97897	98796	88139	102450	94458	98000	103027	106788	135473	126680	131878	136540
13	113014	88550	89383	79707	92628	85451	88660	93107	96558	122498	93166	119193
14	125707	102179	80086	80747	71908	83750	77275	79967	84060	87120	90792	83956
15	240439	113329	92218	71847	72105	64712	75476	69400	71594	74795	65437	80785
16	331049	217103	102267	82866	64136	64878	58160	67906	62152	63678	62407	57942
17	452736	298165	195469	91036	72878	57019	57214	51610	59931	53971	53407	53226
18	513269	408208	268630	175449	80536	64936	49991	50717	45325	52520	46346	45572
19	533547	462034	367213	240820	156152	71265	56149	43452	43760	38840	44822	38399
20	537215	479589	414801	329416	215033	139121	61157	48348	36666	37503	33026	37275
21	737020	485084	432870	374525	297263	193905	124938	54596	42991	32602	33419	29120
22	836043	659162	430181	385423	333168	263642	168908	107592	44207	34650	26056	25602
23	1142925	753438	592684	386762	346739	299059	236192	150573	95424	38304	30220	22328
24	1141982	1024245	669552	527606	343445	305326	262841	205119	129213	80303	30812	23585
25	1054019	1028232	920621	600169	473792	306238	271799	232256	181225	113026	70377	25816
26+	1272019	1238970	1423302	891012	584762	423507	379259	334787	283274	177612	115356	19134
TOTAL NO	9238066	7554494	6280640	4524230	3407309	2634669	2189067	1845938	1551858	1286712	1078423	945635
SPS NO	7214672	6061080	5139926	3626179	2657093	1962084	1552297	1189586	877466	580542	407325	246521
TOT.BIOM	10903508	9229710	7967572	5569080	4091142	3070125	2522818	2035709	1595292	1142439	851813	591709
SPS BIOM	9594970	8263100	7244846	5021892	3660427	2709762	2201898	1722504	1280877	817676	543659	272531

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
11	165263	152765	131760	86023	79367	44664	30680	13113	6097	0
12	132295	148921	136935	113850	77284	70651	40025	27436	11595	5434
13	122100	118263	127853	113808	100052	64972	60592	34854	23808	10114
14	107219	109175	101317	110904	100000	83674	56107	53512	30543	20517
15	75191	94523	95164	88781	96948	85242	72557	48821	45883	25831
16	71950	65444	82026	79919	75774	78837	71188	61429	40496	37681
17	50929	63221	56914	69647	66771	63640	66119	59451	51147	33257
18	47323	45098	55927	49718	60043	57729	54944	56569	50304	43495
19	39732	41332	39471	47891	41516	49174	48004	46224	46876	42104
20	33442	34029	36204	33391	39129	34451	40226	39212	35698	38178
21	32692	29390	29601	31296	25778	31002	26659	31874	30507	28341
22	24745	26605	23365	23932	22491	17451	23841	19627	22654	22293
23	21964	20550	22106	19038	18381	16630	13476	18366	14877	17570
24	18236	18220	16672	17949	13127	12671	12566	8980	12512	10094
25	20022	15124	15138	13042	13947	9461	10333	8801	6731	8550
26+	8346	8869	10442	3063	10579	4193	5568	2968	3467	8604
TOTAL NO	971450	991530	980895	902251	841188	724440	632883	531235	433194	
SPS NO	226897	224188	229375	223192	224202	209618	211187	202407	191141	
TOT.BIOM	576211	581913	584261	546551	527781	548398	499895	453021	397552	
SPS BIOM	237237	230329	234314	219780	224225	218771	222055	218899	214048	

Table 3.1 GREENLAND HALIBUT. Nominal catches (tonnes) in Sub-areas V and XIV, 1978-1987, as reported to ICES.

Country	1978	1979	1980	1981	1982
Denmark	-	-	-	-	-
Faroe Islands	258	150	1,042	767	1,532
France	12	70	51	8	27
Germany, Fed.Rep.	2,726	6,461	2,318	3,007	2,581
Greenland	6	-	-	+	1
Iceland	11,319	16,934	27,838	15,455	28,300
Norway	19	1	3	2	+
UK (Engl.& Wales)	9	-	-	-	-
USSR	-	-	-	-	-
Total	14,349	23,616	31,252	19,239	32,441

Country	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-	6
Faroe Islands	1,146	2,502	1,052	857	1,087
France	236	489	845	52	4
Germany, Fed.Rep	1,142	936	863	859	564
Greenland	5	15	81	177[1]	273
Iceland	28,360	30,080	29,231	31,044	44,780
Norway	2	2	3	2	2
UK (Engl.& Wales)	-	-	-	-	-
USSR	-	-	-	-	2
Total	30,888	34,024	32,075	32,991	46,719

[1] Preliminary data.

Table 3.2 GREENLAND HALIBUT. Nominal catches (tonnes) in Division Vb, 1978-1987, as reported to ICES.

Country	1978	1979	1980	1981	1982
Denmark	-	-	-	-	-
Faroe Islands	2	108	951	442	863
France	12	66	51	8	27
Germany, Fed.Rep.	570	234	172	114	142
Norway	3	1	3	2	+
UK (Engl.& Wales)	8	-	-	-	-
USSR	-	-	-	-	-
Total	595	566	1,177	566	1,032

Country	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-	6
Faroe Islands	1,112	2,456	1,052	779	1,013
France	236	489	845	52	4
Germany, Fed.Rep.	86	118	227	114	110
Norway	2	2	2	2	2
UK (Engl.& Wales)	-	-	-	-	-
USSR	-	-	-	-	2
Total	1,436	3,065	2,126	947	1,137

[1] Preliminary data.

Table 3.3 GREENLAND HALIBUT. Nominal catches (tonnes) in Division Va, 1978-1987, as reported officially to ICES.

Country	1978	1979	1980	1981	1982
Faroe Islands	256	42	91	325	669
Iceland	11,319	16,934	27,836	15,455	28,300
Norway	13	+	-	+	-
Total	11,588	16,976	27,927	15,780	28,969

Country	1983	1984	1985	1986	1987[1]
Faroe Islands	33	46	-	-	-
Iceland	28,359	30,078	29,195	31,027	44,644
Norway	+	+	1	-[1]	-
Total	28,392	30,124	29,196	31,027	44,644

[1] Preliminary data.

Table 3.4 GREENLAND HALIBUT. Nominal catches (tonnes) in Sub-area XIV, 1978-1987, as reported to ICES.

Country	1978	1979	1980	1981	1982
France	-	4	-	-	-
Germany, Fed.Rep.	2,156	6,227	2,146	2,893	2,439
Greenland	6	-	-	+	1
Iceland	-	-	2	-	-
Norway	3	-	-	-	-
UK (Engl.& Wales)	1	-	-	-	-
Total	2,166	6,231	2,148	2,893	2,440

Country	1983	1984	1985	1986	1987[1]
France	-	-	-	-	-
Germany, Fed.Rep.	1,054	818	636	745[1]	454
Greenland	5	15	81	177[1]	273
Iceland	1	2	36	17[1]	136
Norway	-	+	-	-[1]	-
UK (Engl.& Wales)	-	-	-	-	-
Total	1,060	835	935	939	863

[1] Preliminary data.

Table 3.5 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
5	23	29	47	26	8	10	83	128	247	178
6	91	197	502	158	300	240	275	451	616	3065
7	347	1605	1536	580	1140	1611	886	1039	1039	4768
8	1037	2253	2630	1160	2451	2651	2126	2350	1954	2536
9	1214	3090	3126	1430	2646	3060	3547	3535	3001	2114
10	848	1693	2324	1764	2456	2443	2783	2819	3115	3408
11	567	880	1739	1299	1803	1693	1814	1490	1693	1811
12	312	394	849	664	963	978	1127	640	825	1793
13	232	246	578	435	609	424	584	434	553	877
14	218	189	306	252	331	174	361	141	203	238
15	114	147	143	176	195	37	91	37	59	31
16+	204	125	116	159	132	47	20	47	34	5
TOTAL	5207	10848	13896	8103	13034	13368	13697	13111	13339	20824

Table 3.6 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
5	.968	.911	1.125	1.071	1.010	.984	.942	.995	1.030	1.030
6	1.199	.942	1.283	1.257	1.368	1.338	1.275	1.230	1.238	1.218
7	1.423	1.278	1.487	1.440	1.618	1.577	1.592	1.630	1.499	1.533
8	1.854	1.676	1.756	1.660	1.905	1.848	1.817	1.951	1.937	1.824
9	2.256	2.072	2.053	1.967	2.187	2.159	2.240	2.367	2.363	2.187
10	2.607	2.333	2.279	2.258	2.516	2.434	2.461	2.637	2.631	2.666
11	3.081	2.723	2.498	2.515	2.761	2.603	2.835	2.829	2.848	2.996
12	3.591	3.297	3.059	2.950	3.129	3.034	3.262	3.353	3.335	3.595
13	4.604	3.985	3.783	3.450	3.785	3.784	3.962	4.006	4.039	4.431
14	4.695	4.668	4.507	4.033	4.475	4.446	4.936	4.792	4.925	5.140
15	5.151	4.792	5.139	4.652	4.985	4.751	5.230	5.231	5.466	5.764
16+	5.893	5.229	5.633	4.714	5.610	6.209	6.968	6.323	5.764	5.764

Table 3.7 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

PROPORTIONS OF MATURITY

UNIT:

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
5	.000	.000	.000	.000	.000	.037	.000	.000	.040	.040
6	.030	.030	.030	.030	.047	.075	.080	.060	.070	.070
7	.100	.100	.100	.100	.200	.153	.190	.310	.190	.190
8	.350	.350	.350	.350	.326	.280	.320	.270	.310	.310
9	.770	.770	.770	.770	.503	.381	.420	.290	.430	.430
10	.960	.960	.960	.960	.702	.605	.640	.560	.650	.650
11	1.000	1.000	1.000	1.000	.852	.854	.750	.720	.830	.830
12	1.000	1.000	1.000	1.000	.943	.984	.930	.860	.960	.960
13	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.990	1.000	1.000
14	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
15	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
16+	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 3.8 GREENLAND HALIBUT. Effort and catch per unit effort for Icelandic trawlers.

Year	CPUE (t/hr)	Total catch (t)	Total effort (hr)
1977	1.009	16,578	16,430
1978	1.218	14,349	11,781
1979	1.592	23,616	14,834
1980	2.218	31,252	14,090
1981	2.017	19,239	9,538
1982	2.501	32,441	12,971
1983	1.189	30,887	25,977
1984	1.099	34,024	30,959
1985	1.218	32,075	26,334
1986	1.354	32,991	24,366
1987	1.438	46,719	32,489

Table 3.9 Greenland halibut, Sub-areas V-XIV.

Module run at 12.35.43 21 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet 1 ,Icelandic series. , has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **

Regression weights
, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of predictions
Fishing mortalities

Age,	77,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,
5,	.000,	.001,	.001,	.002,	.001,	.000,	.001,	.005,	.002,	.001,	.002,
6,	.002,	.004,	.010,	.022,	.006,	.013,	.012,	.024,	.033,	.013,	.022,
7,	.042,	.020,	.095,	.094,	.030,	.051,	.087,	.051,	.113,	.093,	.123,
8,	.163,	.080,	.166,	.211,	.090,	.162,	.153,	.149,	.177,	.303,	.321,
9,	.365,	.156,	.338,	.344,	.161,	.287,	.295,	.298,	.371,	.339,	.587,
10,	.226,	.211,	.320,	.432,	.313,	.426,	.439,	.449,	.385,	.613,	.753,
11,	.187,	.223,	.332,	.594,	.433,	.571,	.553,	.644,	.435,	.397,	.842,
12,	.332,	.196,	.225,	.581,	.448,	.626,	.664,	.841,	.464,	.432,	.908,
13,	.157,	.289,	.221,	.561,	.632,	.912,	.590,	1.051,	.892,	.891,	1.086,
14,	.177,	.283,	.381,	.440,	.480,	1.477,	.685,	1.542,	.743,	1.499,	1.259,
15,	.216,	.240,	.296,	.522,	.461,	.802,	.586,	.906,	.584,	.767,	.970,

Table 3.10 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .15

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1983-87
5	.001	.001	.002	.001	.000	.001	.005	.002	.002	.002	.002
6	.004	.010	.022	.006	.013	.012	.024	.033	.013	.022	.021
7	.020	.095	.094	.030	.051	.087	.051	.113	.093	.123	.093
8	.080	.166	.211	.090	.162	.153	.149	.177	.303	.321	.221
9	.156	.338	.344	.161	.287	.295	.298	.371	.339	.587	.378
10	.211	.320	.432	.313	.426	.439	.449	.385	.612	.753	.528
11	.223	.332	.594	.433	.571	.553	.644	.435	.397	.842	.574
12	.196	.225	.581	.448	.626	.664	.841	.464	.432	.908	.662
13	.289	.221	.561	.632	.912	.590	1.052	.892	.891	1.086	.902
14	.283	.381	.440	.480	1.477	.685	1.542	.743	1.499	1.259	1.146
15	.240	.296	.522	.461	.802	.586	.906	.584	.767	.970	.763
16+	.240	.296	.522	.461	.802	.586	.906	.584	.767	.970	.763
(8-13)U	.193	.267	.454	.346	.497	.449	.572	.454	.496	.749	
(10-16)U	.240	.296	.522	.461	.802	.586	.906	.584	.767	.970	

Table 3.11 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
5	25211	29046	33310	28620	25969	14425	17698	60702	176450	95935	0
6	22147	21678	24973	28627	24609	22345	12407	15156	52128	151643	82407
7	18751	18978	18476	21029	24493	20903	19010	10424	12627	44296	127680
8	14536	15817	14848	14480	17563	20025	16500	15541	8010	9906	33713
9	9014	11551	11530	10349	11389	12849	14783	12235	11203	5090	6185
10	4788	6635	7090	7039	7585	7359	8234	9449	7269	6873	2436
11	3045	3337	4148	3960	4430	4264	4082	4522	5532	3391	2786
12	1885	2097	2060	1970	2211	2153	2111	1845	2518	3200	1258
13	992	1334	1440	992	1084	1017	954	783	999	1407	1111
14	949	640	921	708	454	375	486	287	276	353	409
15	574	616	376	510	377	89	163	89	118	53	86
16+	1026	523	305	461	255	113	36	114	68	9	20
TOTAL NO	102918	112252	119478	118745	120418	105918	96463	131147	277198	322156	
SPS NO	27636	31895	32729	31357	30882	27716	28026	23284	33601	40304	
TOT.BIOM	171587	167048	192807	183801	205565	183991	171849	204907	356900	429010	
SPS BIOM	74717	75595	76489	70049	72755	62128	65848	57123	71575	79960	

Table 3.12

List of input variables for the ICES prediction program.

GREENLAND HALIBUT IN SUBAREAS V IN XIV.
The reference F is the mean F for the age group range from 8 to 13

The number of recruits per year is as follows:

Year	Recruitment
1988	28400.0
1989	28400.0
1990	28400.0
1991	28400.0

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
5	28400.0	.01	.15	.04	1.018	1.018
6	24285.0	.09	.15	.07	1.229	1.229
7	28504.0	.18	.15	.19	1.554	1.554
8	22156.0	.32	.15	.31	1.904	1.904
9	6185.0	.59	.15	.43	2.306	2.306
10	2436.0	.75	.15	.65	2.645	2.645
11	2786.0	.84	.15	.83	2.891	2.891
12	1258.0	.91	.15	.96	3.428	3.428
13	1111.0	1.09	.15	1.00	4.159	4.159
14	409.0	1.26	.15	1.00	4.952	4.952
15	86.0	.97	.15	1.00	5.487	5.487
16+	20.0	.97	.15	1.00	5.950	5.950

Table 4.1 Nominal catch (tonnes) of SAITHE in Division Va, 1976-1987, as reported to ICES.

Country	1976	1977	1978	1979	1980	1981
Belgium	1,615	1,448	1,092	980	980	532
Faroe Islands	3,267	3,013	4,250	5,457	4,930	3,545
France	51	-	-	-	-	-
Germany, Fed.Rep.	13,785	10,575	-	-	-	-
Iceland	56,811	46,973	44,327	57,066	52,436	54,921
Norway	5	4	3	1	1	3
UK (Engl.& Wales)	6,024	13	-	-	-	-
UK (Scotland)	443	-	-	-	-	-
Total	82,001	62,026	49,672	63,504	58,347	59,001

Country	1982	1983	1984	1985	1986	1987[1]
Belgium	203	224	269	158	218	217
Faroe Islands	3,582	2,138	2,044	1,778	2,291	2,139
France	23	-	-	-	-	-
Germany, Fed.Rep	-	-	-	-	-	-
Iceland	65,124	55,904	60,406	55,185	63,867	78,203
Norway	1	+	-	1	-	-
UK (Engl.& Wales)	-	-	-	29	-	-
UK (Scotland)	-	-	-	-	-	-
Total 1	68,933	58,266	62,719	57,101	66,376	80,559

[1] Preliminary.

Table 4.2 Icelandic SAITHE. Calculation of total effort during 1978-1987.

Year	CPUE (t/hr trawling)	Total landings	Total effort (hrs)
1978	1.05	49,672	47,672
1979	1.16	63,504	54,934
1980	1.40	58,347	41,558
1981	1.57	59,001	37,652
1982	1.34	68,933	51,328
1983	1.23	58,266	47,371
1984	1.07	62,719	58,836
1985	1.24	57,101	46,012
1986	1.23	66,376	54,052
1987	1.36	80,559[1]	59,409

[1] Preliminary.

Table 4.3 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
3	548	480	135	257	486	40	135	197	3060	924
4	1145	3764	2303	1550	1221	1469	492	2929	1394	4983
5	2435	1991	4634	4310	2526	1343	826	3432	3722	4327
6	1556	3616	2551	5464	4817	2410	1537	1818	2382	5348
7	1275	1566	2419	1504	4361	4364	2456	1719	1386	2987
8	961	718	1612	1470	1375	2406	3367	1530	1170	1412
9	537	292	482	589	1119	460	982	1604	695	679
10	575	669	245	192	343	346	318	627	1809	494
11	476	589	132	67	65	71	249	185	266	507
12	279	489	102	175	37	36	227	100	69	58
13	139	150	59	130	38	11	137	96	44	26
14	91	72	29	136	37	24	172	85	21	47
15+	55	0	23	72	75	42	167	232	135	18
TOTAL	10072	14396	14726	15916	16500	13022	11065	14554	16153	21810

Table 4.4 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
3	1.120	1.120	1.445	1.477	1.540	1.865	1.540	1.526	1.381	1.516
4	1.760	1.760	1.893	2.004	2.148	2.229	2.367	2.087	2.132	1.717
5	2.730	2.730	2.682	2.574	2.951	3.151	3.319	2.880	2.953	2.670
6	4.290	4.290	3.871	3.457	3.044	4.199	4.450	3.722	4.350	3.832
7	5.540	5.540	5.324	4.431	5.013	4.115	5.460	4.719	5.482	5.080
8	7.270	7.270	6.143	6.156	6.031	5.930	5.194	6.162	6.431	6.179
9	8.420	8.420	6.848	6.820	7.249	7.509	7.526	5.650	7.614	7.310
10	9.410	9.410	8.227	8.047	8.070	8.815	8.580	8.314	6.477	8.023
11	10.000	10.000	9.062	9.409	8.920	9.357	9.315	9.640	9.625	7.945
12	10.560	10.560	9.299	9.205	10.581	9.557	10.123	10.401	10.487	9.609
13	11.870	11.870	10.502	9.439	10.144	10.235	10.875	11.055	11.781	12.250
14	13.120	13.120	11.373	10.146	11.093	9.578	11.223	11.443	12.088	12.562
15+	14.000	13.120	11.672	10.756	10.146	11.256	13.268	11.974	12.200	12.562

Table 4.5 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

PROPORTIONS OF MATURITY

UNIT:

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
3	.000	.000	.000	.000	.000	.030	.080	.020	.020	.020
4	.060	.060	.060	.060	.090	.270	.150	.250	.140	.140
5	.270	.270	.270	.270	.360	.600	.520	.350	.370	.370
6	.630	.630	.630	.630	.560	.550	.830	.580	.680	.680
7	.810	.810	.810	.810	.980	.850	.950	.760	.830	.830
8	.970	.970	.970	.970	.980	.980	.650	.900	.890	.890
9	1.000	1.000	1.000	1.000	1.000	.980	1.000	.760	.940	.940
10	1.000	1.000	1.000	1.000	1.000	.970	1.000	.970	.950	.950
11	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.980	.980
12	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
13	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
14	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
15+	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 4.6 Icelandic saithe.

Module run at 09.01.18 21 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet 1 ,only one fleet for s, has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **

Regression weights
, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of predictions
·hing mortalities

Age,	78,	79,	80,	81,	82,	83,	84,	85,	86,	87,
3,	.012,	.008,	.005,	.013,	.025,	.001,	.003,	.005,	.036,	.010,
4,	.069,	.106,	.050,	.072,	.078,	.100,	.020,	.079,	.041,	.076,
5,	.138,	.165,	.183,	.123,	.162,	.115,	.075,	.193,	.136,	.170,
6,	.183,	.312,	.329,	.341,	.197,	.229,	.187,	.234,	.199,	.293,
7,	.314,	.284,	.356,	.330,	.504,	.276,	.384,	.330,	.282,	.410,
8,	.343,	.293,	.529,	.381,	.570,	.581,	.355,	.440,	.392,	.516,
9,	.262,	.165,	.328,	.374,	.562,	.378,	.500,	.285,	.367,	.416,
10,	.332,	.604,	.203,	.210,	.390,	.337,	.490,	.702,	.601,	.484,
11,	.268,	.672,	.224,	.078,	.102,	.129,	.434,	.595,	.748,	.333,
12,	.522,	.486,	.229,	.520,	.057,	.075,	.759,	.310,	.464,	.354,
13,	.487,	.598,	.097,	.507,	.201,	.021,	.447,	.882,	.218,	.318,
14,	.374,	.505,	.216,	.338,	.262,	.188,	.526,	.555,	.480,	.381,

Log catchability estimates

Table 4.7
Title : ICELANDIC SAITHE
At 09.34.54 21 SEPTEMBER 1988
from 78 to 87 on ages 3 to 14
with Terminal F of .340 on age 6 and Terminal S of 1.000

Initial sum of squared residuals was 117.076 and
final sum of squared residuals is 37.884 after 82 iterations

Matrix of Residuals

Years / Ages	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87		WTS
3/ 4	.099	.081	-.640	.201	.354	-.402	-.934	-.208	1.449	.000	.327
4/ 5	.145	.113	-.149	-.050	.057	1.375	-1.128	.173	-.536	.000	.337
5/ 6	-.025	-.257	-.009	.008	-.104	.362	-.302	.438	-.112	.000	.894
6/ 7	.033	.056	.358	.022	-.360	.177	.045	-.004	-.327	.000	1.000
7/ 8	.426	-.569	.145	-.294	-.028	.298	.444	-.095	-.327	.000	.630
8/ 9	.594	-.610	.195	-.570	.007	.493	.269	-.157	-.222	.000	.522
9/10	-.456	-.457	.478	.068	.464	.325	.332	-.693	-.060	.000	.507
10/11	-.797	.433	.304	.057	.297	-.257	-.105	-.266	.334	.000	.564
11/12	-.396	.986	-.868	-.026	-.289	-1.372	.664	.291	1.009	.000	.273
12/13	.070	1.163	-1.015	.719	.134	-1.740	.433	-.052	.289	.000	.254
13/14	.568	1.165	-1.141	.915	-.151	-2.700	.507	1.121	-.284	.000	.178
	.000	.000	.000	.000	.000	.000	.000	.000	.000	-.001	
WTS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	78	79	80	81	82	83	84	85	86	87
F-values	.2391	.2983	.2542	.2517	.2388	.1664	.2228	.3128	.2962	.3400

Selection-at-age (S)

	3	4
S-values	.0335	.2590

	5	6	7	8	9	10	11	12	13	14
S-values	.5709	1.0000	1.4034	1.8171	1.5258	1.8438	1.2572	1.1755	.8702	1.0000

Table 4.8 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .20

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1982-87
3	.011	.009	.005	.014	.028	.002	.003	.007	.021	.011	.012
4	.068	.101	.051	.074	.084	.110	.025	.095	.059	.044	.069
5	.137	.160	.175	.128	.166	.125	.083	.242	.167	.260	.174
6	.177	.308	.317	.320	.206	.236	.206	.264	.264	.384	.260
7	.328	.271	.349	.313	.458	.291	.402	.374	.330	.616	.412
8	.435	.310	.495	.371	.525	.496	.383	.471	.473	.660	.501
9	.258	.227	.354	.337	.540	.333	.387	.317	.407	.558	.424
10	.303	.591	.301	.232	.336	.316	.405	.459	.716	.570	.467
11	.271	.580	.217	.125	.114	.107	.395	.438	.360	.446	.310
12	.389	.492	.183	.497	.094	.086	.574	.272	.289	.123	.240
13	.278	.375	.099	.374	.188	.037	.531	.512	.184	.168	.270
14	.239	.227	.114	.345	.172	.174	1.204	.754	.198	.306	.468
15+	.239	.227	.114	.345	.172	.174	1.204	.754	.198	.306	.468
(4- 9)U	.234	.230	.290	.257	.330	.265	.248	.294	.283	.420	

Table 4.9 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
3	53126	62546	29320	20651	19564	26888	43703	33068	159260	93173	0
4	19315	43001	50775	23883	16676	15578	21978	35659	26896	127628	75449
5	20955	14781	31812	39492	18155	12552	11430	17550	26554	20762	99995
6	10558	14962	10308	21872	28449	12589	9066	8613	11281	18387	13107
7	5009	7243	9000	6147	12997	18955	8138	6039	5417	7094	10254
8	2987	2955	4522	5196	3681	6732	11596	4459	3401	3190	3137
9	2591	1584	1774	2258	2935	1782	3356	6472	2280	1736	1350
10	2418	1638	1034	1020	1319	1401	1046	1866	3857	1243	813
11	2205	1463	743	626	662	772	836	571	966	1543	575
12	949	1377	671	489	452	484	568	461	302	552	809
13	629	527	690	457	244	337	363	262	287	185	399
14	470	390	296	511	258	165	266	175	129	196	128
15+	284	0	235	271	522	289	258	477	826	75	163
TOTAL NO	121497	152467	141179	122874	105914	98524	112605	115672	241454	275763	
SPS NO	29969	31708	35248	41527	46705	47329	42223	37992	40267	53975	
TOT.BIOM	339714	381167	386377	361267	346718	341068	360400	336454	526152	587916	
SPS BIOM	183813	178499	166675	177457	209856	214333	205893	166040	186266	193761	

Table 4.10
List of input variables for ICES prediction program.

ICELANDIC SAITHE
The reference F is the mean F for the age group range from 4 to 9

The number of recruits per year is as follows:

Year	Recruitment
1988	46500.0
1989	46500.0
1990	46500.0
1991	46500.0

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
3	46500.0	.01	.20	.03	1.500	1.500
4	37236.0	.10	.20	.16	1.800	1.800
5	55586.0	.22	.20	.41	2.300	2.300
6	13091.0	.38	.20	.64	3.200	3.200
7	10246.0	.54	.20	.86	4.800	4.800
8	3136.0	.70	.20	.90	6.200	6.200
9	1351.0	.59	.20	.95	7.500	7.500
10	813.0	.71	.20	.98	8.400	8.400
11	575.0	.48	.20	1.00	8.800	8.800
12	809.0	.45	.20	1.00	9.400	9.400
13	400.0	.33	.20	1.00	11.000	11.000
14	128.0	.38	.20	1.00	12.000	12.000
15+	163.0	.38	.20	1.00	12.500	12.500

Table 4.11 Management options for 1989 and 1990 for ICELANDIC SAITHE in Division Va.

1988				Management option for 1989 and 1990	1989				1990			1991	
Stock biom. (3+)	SSB	$F_{(4-9)}$	Catch (3+)		Stock biom. (3+)	SSB	$F_{(4-9)}$	Catch (3+)	Stock biom. (3+)	SSB	Catch (3+)	Stock biom. (3+)	SSB
413	189	0.37	75	$F_{0.1}$	423	208	0.16	41	479	267	53	516	302
				$F_{89} = 0.8F_{88}$			0.30	70	445	239	80	448	244
				F_{max}			0.34	79	434	230	87	429	228
				$F_{89} = F_{88}$			0.37	84	427	225	91	418	218
				$F_{89} = 1.2F_{88}$			0.45	98	411	211	99	391	195

Weights in '000 t.

Table 5.1 Catches of saithe, cod, and haddock in Division Vb (Faroes area) in 1981-1987 by fleet category.

Category	1981			1982			1983		
	Saithe	Cod	Haddock	Saithe	Cod	Haddock	Saithe	Cod	Haddock
Open boats	62	3,092	511	88	1,864	313	8	99	233
Longliners (< 100 GRT)	105	8,247	5,127	24	6,016	2,946	19	3,975	3,319
Longliners (>100 GRT)	42	3,078	1,272	20	1,440	902	28	2,987	1,250
Trawlers (4-1000 HP)	7,373	3,023	1,836	3,760	3,807	1,729	6,981	7,967	1,272
Trawlers (>1000 HP)	11,750	2,353	1,323	8,850	2,027	1,068	11,870	4,791	748
Pair trawlers (4-1000 HP)	4,346	837	626	5,527	1,405	1,149	6,435	5,358	2,662
Pair trawlers (>1000 HP)	4,435	522	295	4,961	989	774	8,450	3,550	1,198
Others	2,567	1,464	1,004	7,578	3,839	2,991	5,172	9,189	2,183
Total	29,682	22,616	11,994	30,808	21,387	11,872	38,963	37,916	12,865

Category	1984			1985			1986			1987		
	Saithe	Cod	Haddock	Saithe	Cod	Haddock	Saithe	Cod	Haddock	Saithe	Cod	Haddock
Open boats	75	75	235	94	5,960	944	110	3,203	93	235	2,345	1,665
Longliners (< 100 GRT)	27	6,884	3,579	22	8,351	4,771	62	5,113	6,170	46	3,434	5,932
Longliners (>100 GRT)	19	2,825	1,406	44	2,562	1,547	14	1,778	1,667	31	2,359	1,611
Trawlers (4-1000 HP)	9,820	4,908	906	3,186	2,838	678	1,211	2,150	350	1,536	1,580	627
Trawlers (>1000 HP)	17,759	4,392	886	13,963	4,300	904	10,717	2,798	526	7,763	1,879	284
Pair trawlers (4-1000 HP)	8,556	4,454	1,917	11,203	4,754	1,927	11,112	9,634	2,428	9,371	6,359	2,243
Pair trawlers (>1000 HP)	11,259	2,131	637	11,015	1,994	686	13,791	4,595	1,264	16,689	3,334	1,264
Others	6,829	11,085	2,777	4,664	10,250	4,359	3,396	5,255	2,808	1,723	3,052	1,756
Total	54,344	36,914	12,343	44,191	41,009	15,816	40,413	34,526	15,306	37,394	24,342	15,382

Table 5.2 Demersal effort in Division Vb$_1$. Trawlers 400-1800 HP. Effort = fishing days x average horsepower/1000.

Trawler HP	1982	1983	1984	1985	1986	1987
400-699	1,989	2,320	2,169	2,257	2,374	2,260
700-999	2,048	2,840	2,628	2,208	2,379	2,351
1000-1499	4,931	6,500	8,179	7,140	8,155	8,581
1500-1799	2,031	2,093	1,820	1,614	2,011	1,620
Total	10,981	13,753	14,796	13,219	14,919	14,812

Table 5.3 Indices for 0-group cod from the Faroes 0-group surveys, 1974-1988 (Reinert, 1988).

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Index	85	67	-	62	158	60	158	-	220	109	25	27	14	184	122

Table 5.4 Stratified mean catch by age in number per trawl hour of COD in the Faroese groundfish surveys, 1982-1988 (from Kristiansen, 1988).

Age	1982	1983	1984	1985	1986	1987	1988
1	-	0.9	0.9	-	-	-	0.1
2	5.9	12.6	24.5	9.7	3.1	2.9	5.5
3	10.5	71.6	46.4	108.4	72.3	44.7	63.5
4	55.2	48.2	33.9	46.5	262.8	89.3	82.3
5	42.2	45.3	12.3	17.1	69.2	132.7	60.0
6	17.6	15.5	8.1	3.6	25.1	22.8	61.5
7	6.5	4.2	3.4	3.9	12.1	2.9	11.8
8	7.6	1.3	0.3	1.6	5.5	2.4	1.8
9	2.8	0.6	-	0.2	0.8	0.4	0.7
10	-	1.8	0.4	0.2	-	0.5	0.6

Table 5.5 Stratified mean catch by age in numbers per trawl hour of HADDOCK in the Faroese groundfish surveys, 1982-1988 (from Kristiansen, 1988).

Age	1982	1983	1984	1985	1986	1987	1988
1	-	143.4	199.0	417.3	40.9	66.0	69.3
2	-	154.7	180.4	134.8	223.5	16.7	166.6
3	52.9	60.2	38.7	72.0	73.9	41.8	21.4
4	16.8	5.3	19.1	11.0	34.9	28.4	39.9
5	2.9	4.6	0.7	3.5	6.2	16.2	22.1
6	54.1	-	1.0	-	1.5	2.9	8.3
7	18.5	16.1	-	0.7	-	-	2.6
8	41.3	7.2	3.3	0.3	0.1	-	0.2
9	12.5	9.9	1.2	1.6	0.4	0.1	0.2
10	9.1	3.6	2.9	0.3	0.7	0.1	-

Table 6.1 Nominal catch (t) of SAITHE in Division Vb, 1978-1987, as reported to ICES.

Country	1978	1979	1980	1981	1982
Faroe Islands	15,892	22,003	23,810	29,682	30,808
France	8,128	2,974	1,110	258	130
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep.	1,088	581	197	20	19
Netherlands	-	-	-	-	-
Norway	1,124	1,137	62	134	15
UK (England & Wales)	557	190	13	-	-
UK (Scotland)	1,349	361	38	9	1
Total	28,138	27,246	25,230	30,103	30,973

Country	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	21	255
Faroe Islands	38,963	54,344	42,874	40,413	39,823
France	180	243	839	87	69
German Dem.Rep.	-	-	31	-	-
Germany, Fed.Rep.	28	73	227	106	48
Netherlands	-	-	-	-	-
Norway	5	5	-	26	16
UK (England & Wales)	-	-	4	-	108
UK (Scotland)	-	-	630	1,340	140
Total	39,176	54,665	44,605	41,993	40,459

[1] Preliminary.

Table 6.2 VIRTUAL POPULATION ANALYSIS

FAROE SAITHE

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	0	0	0	0	0	0	0	0	0	0
2	20	1	424	0	221	0	0	77	6	10
3	611	287	996	411	387	2483	368	1224	1175	1599
4	1743	933	877	1804	4076	1103	11067	3990	2050	5857
5	1736	1341	720	769	994	5052	2359	5583	4502	3869
6	548	1033	673	932	1114	1343	4093	1182	3754	2815
7	373	584	726	908	380	575	875	1898	959	1001
8	479	414	284	734	417	339	273	273	1084	538
9	466	247	212	343	296	273	161	103	247	336
10	473	473	171	192	105	98	52	38	105	82
11	407	368	196	92	88	98	65	26	67	44
12	211	206	156	128	56	99	59	72	33	5
13	146	136	261	176	49	25	18	41	56	11
14	95	98	133	310	110	127	25	8	7	15
15+	83	251	236	407	687	289	151	154	62	67
TOTAL	7391	6372	6065	7206	8980	11904	19566	14669	14107	16249

Table 6.3 Estimated catch of saithe by age in number (thousands) in the Faroese fishery in Division Vb, 1988.

Age	3	4	5	6	7	8	9
Number	123	1,786	6,490	2,922	1,445	1,010	296

Age	10	11	12	13	14	15	Total
Number	268	60	113	-	-	-	14,513

Estimated catch in 1988: 38,178 t.

Table 6.4 VIRTUAL POPULATI NALYSIS

FAROE SAITHE

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
2	.448	.000	.000	.450	.850	.000	.000	1.075	1.221	1.886
3	1.493	1.220	1.230	1.310	1.337	1.208	1.431	1.401	1.718	1.609
4	2.324	1.880	2.210	2.130	1.851	2.029	1.953	2.032	1.986	1.835
5	3.068	2.620	3.320	3.000	2.951	2.965	2.470	2.965	2.618	2.395
6	3.746	3.400	4.280	3.810	3.577	4.143	3.850	3.596	3.277	3.182
7	4.913	4.180	5.160	4.750	4.927	4.724	5.177	5.336	4.186	4.067
8	4.368	4.950	6.420	5.250	6.243	5.901	6.347	7.202	5.289	5.149
9	5.276	5.690	6.870	5.950	7.232	6.811	7.825	6.966	6.050	5.501
10	5.832	6.380	7.090	6.430	7.239	7.051	6.746	9.862	6.150	6.626
11	6.053	7.020	7.930	7.000	8.346	7.248	8.636	10.670	9.536	6.343
12	6.706	7.620	8.070	7.470	8.345	8.292	8.467	10.461	9.823	10.245
13	7.686	8.150	8.590	8.140	8.956	9.478	8.556	10.202	7.303	8.491
14	7.219	8.640	9.790	8.550	9.584	10.893	11.127	9.644	11.869	11.634
15+	10.000	10.000	10.340	10.100	10.330	10.340	10.748	13.232	12.875	10.220

Table 6.5 Faroe saithe.

```
Module run at 09.24.11  23 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet  1 ,DAYS *HP            , has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **

Regression weights
      , 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of prediction
Fishing mortalities

   Age,    82,    83,    84,    85,    86,    87,

     1,  .000,  .000,  .000,  .000,  .000, 1.000,
     2,  .005,  .000,  .000,  .002,  .000,  .000,
     3,  .031,  .071,  .016,  .059,  .032,  .040,
     4,  .185,  .114,  .506,  .231,  .134,  .222,
     5,  .192,  .365,  .379,  .521,  .442,  .397,
     6,  .477,  .429,  .570,  .332,  .817,  .552,
     7,  .354,  .486,  .554,  .571,  .492,  .534,
     8,  .524,  .618,  .451,  .333,  .768,  .571,
     9,  .418,  .796,  .685,  .306,  .570,  .578,
    10,  .295,  .236,  .336,  .336,  .585,  .375,
    11,  .396,  .493,  .243,  .280, 1.829,  .523,
    12,  .367, 1.081,  .631,  .463,  .687,  .664,
    13,  .131,  .278,  .573, 1.340,  .813,  .516,
    14,  .321,  .577,  .494,  .545,  .897,  .531,
```

Table 6.6

Title : FAROE SAITHE
At 09.01.56 21 SEPTEMBER 1988
from 60 to 87 on ages 1 to 14
with Terminal F of .460 on age 5 and Terminal S of 1.000

Initial sum of squared residuals was 1826,183 and
final sum of squared residuals is 1351.676 after 97 iterations

Matrix of Residuals

Years	60/61	61/62	62/63	63/64	64/65	65/66	66/67						
Ages													
1/ 2	-7.882	-3.298	-6.822	-2.427	-7.021	-6.642	-7.688						
2/ 3	4.669	3.486	2.920	3.107	2.662	3.398	2.474						
3/ 4	2.326	.318	2.058	.423	1.259	.914	.639						
4/ 5	-.588	-.286	.815	-1.150	.356	-.238	.006						
5/ 6	-.373	.038	.602	-.409	.529	-.048	.134						
6/ 7	.008	.203	.198	-.345	.057	-.103	-.159						
7/ 8	-.088	.350	.337	-.081	.191	.001	.010						
8/ 9	-.224	-.244	-.389	-.011	.081	-.073	-.070						
9/10	-.360	-.415	-.502	-.173	-.546	-.180	-.370						
10/11	-.140	-.004	.179	.433	-.168	-.021	.250						
11/12	-.770	.166	-.996	-.023	-.433	.109	.110						
12/13	.657	.414	-.914	1.094	-.356	.406	.250						
13/14	2.751	-1.131	.481	.691	.332	.703	1.070						
	-.001	-.001	.000	.000	.001	.002	.003						
WTS	.001	.001	.001	.001	.001	.001	.001						

Years	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77		
Ages												
1/ 2	-5.011	-6.132	-9.249	-6.365	-7.147	-9.966	-3.916	-4.058	-7.625	-4.892		
2/ 3	3.307	3.486	1.425	3.211	4.194	2.277	3.821	1.823	1.843	2.531		
3/ 4	.138	.418	-.493	.175	2.446	.337	.539	1.081	.705	1.477		
4/ 5	-.390	.097	.207	-.121	.965	-1.505	.196	-.139	.576	.615		
5/ 6	.007	-.001	.179	.035	1.250	-.621	.491	.328	.850	.279		
6/ 7	-.064	-.004	-.037	-.048	-.104	-.055	.225	.348	.308	.257		
7/ 8	.151	-.073	-.084	.005	-.161	.190	.227	.021	-.015	-.035		
8/ 9	.076	.025	.013	.062	-.574	.159	-.181	-.003	-.180	-.094		
9/10	-.205	-.215	.089	-.275	-.791	.055	-.506	-.284	-.484	-.203		
10/11	.331	.132	.545	.259	-.367	.695	.053	-.052	-.169	-.422		
11/12	-.055	-.213	.272	-.281	-.071	.496	-.237	-.296	.096	-.257		
12/13	.041	.365	.145	.526	.844	.983	.017	-.111	.106	-.197		
13/14	-.147	.328	.418	.331	-.412	-.221	-1.197	-.504	-.293	-.157		
	.004	.004	.004	.003	.003	.002	.002	.001	.001	.000		
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001		

Years	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87		WTS
Ages												
1/ 2	-5.561	-2.412	-8.532	.141	-7.928	.020	-.190	-6.882	-3.820	-4.914	-34.628	.076
2/ 3	3.133	2.216	-2.095	5.155	-3.505	2.580	-3.422	-4.668	2.515	-.925	-2.095	.082
3/ 4	1.129	.934	.168	.985	-1.086	.388	-.276	-1.206	1.110	-.562	.472	.233
4/ 5	.489	.375	.294	.449	.521	-.070	-.851	.552	.174	-.972	.472	.343
5/ 6	1.106	.463	.552	-.124	-.642	-.358	-.095	.346	.457	-.130	.473	.441
6/ 7	.809	-.343	-.011	-.395	.384	.360	-.131	.168	.010	.430	.473	.779
7/ 8	.022	-.403	.337	-.130	.238	-.216	.153	.532	.322	-.362	.473	.939
8/ 9	-.129	.266	.187	-.405	.266	-.007	.048	.238	-.239	.119	.472	1.000
9/10	-.679	-.592	-.294	-.287	.373	.514	.803	.547	-.496	-.089	.472	.542
10/11	-.607	-.019	.528	.542	.291	-.204	-.115	.127	-.719	.039	.472	.599
11/12	-.291	.288	.382	.228	-.116	-.511	-.140	-.791	-.506	1.641	.472	.418
12/13	-.702	.014	-.744	-.345	.325	.394	1.042	-.341	-.022	.146	.472	.398
13/14	-.577	.145	-.312	-.225	.013	-1.188	-.482	.288	1.673	.559	.472	.247
	.000	-.001	-.001	.000	.000	.000	.000	.000	.000	.000	-70.307	
WTS	.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	60	61	62	63	64	65	66	67							
F-values	.1159	.0737	.0810	.1046	.1367	.1671	.1811	.1562							
	68	69	70	71	72	73	74	75	76	77					
F-values	.1411	.2060	.1874	.1424	.2971	.2813	.2277	.1817	.1604	.1823					
	78	79	80	81	82	83	84	85	86	87					
F-values	.1713	.1877	.1916	.2694	.2622	.3270	.3303	.3190	.5127	.4600					

Selection-at-age (S)

	1	2	3	4						
S-values	.0010	.0010	.1475	.6888						
	5	6	7	8	9	10	11	12	13	14
S-values	1.0000	1.2933	1.3852	1.4805	1.4433	1.1396	1.1949	1.1047	.9693	1.0000

Table 6.7 VIRTUAL POPULATION ANALYSIS

FAROE SAITHE

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .20

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
2	.025	.009	.003	.006	.004	.005	.002	.006	.005	.001	.017	.018
3	.163	.023	.047	.032	.052	.051	.027	.024	.028	.031	.040	.082
4	.056	.051	.087	.037	.133	.084	.105	.057	.089	.124	.227	.121
5	.099	.092	.110	.073	.224	.168	.164	.127	.105	.169	.128	.324
6	.139	.119	.129	.100	.182	.219	.249	.155	.143	.188	.156	.114
7	.111	.093	.116	.148	.195	.225	.287	.280	.153	.212	.175	.123
8	.116	.079	.075	.112	.227	.207	.259	.272	.245	.244	.208	.130
9	.108	.086	.106	.135	.137	.254	.227	.233	.230	.356	.200	.135
10	.104	.075	.113	.183	.165	.225	.270	.225	.210	.352	.245	.151
11	.105	.078	.086	.130	.169	.258	.273	.197	.156	.295	.205	.152
12	.137	.134	.066	.302	.162	.313	.244	.204	.177	.263	.193	.192
13	.346	.039	.088	.193	.128	.262	.217	.147	.160	.156	.185	.073
14	.116	.016	.139	.072	.137	.112	.151	.065	.160	.173	.090	.103
15+	.116	.016	.139	.072	.137	.112	.151	.065	.160	.173	.090	.103
(4- 8)U	.104	.087	.103	.094	.192	.181	.213	.178	.147	.187	.179	.162
(1-15)W	.068	.030	.040	.035	.068	.061	.063	.043	.040	.056	.076	.092

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
2	.008	.074	.007	.009	.010	.013	.002	.000	.012	.000	.005	.000
3	.088	.123	.222	.147	.197	.146	.085	.038	.092	.014	.033	.069
4	.067	.300	.303	.343	.357	.281	.233	.181	.154	.238	.184	.124
5	.131	.408	.321	.505	.295	.401	.267	.283	.207	.196	.199	.363
6	.261	.260	.278	.253	.308	.377	.178	.252	.224	.449	.481	.451
7	.253	.245	.158	.159	.173	.315	.177	.292	.282	.532	.333	.493
8	.289	.174	.143	.113	.138	.206	.331	.304	.225	.513	.501	.559
9	.457	.190	.132	.093	.100	.152	.204	.285	.252	.464	.401	.731
10	.513	.330	.172	.094	.092	.098	.210	.328	.326	.380	.250	.224
11	.508	.271	.266	.139	.093	.154	.164	.252	.219	.292	.300	.391
12	.309	.292	.248	.272	.095	.115	.172	.117	.161	.217	.291	.649
13	.144	.087	.200	.195	.201	.107	.184	.160	.212	.274	.121	.204
14	.222	.153	.217	.282	.251	.298	.179	.181	.232	.418	.275	.517
15+	.222	.153	.217	.282	.251	.298	.179	.181	.232	.418	.275	.517
(4- 8)U	.200	.277	.240	.275	.254	.316	.237	.263	.219	.386	.340	.398
(1-15)W	.102	.193	.159	.153	.157	.170	.121	.075	.073	.068	.079	.119

	1984	1985	1986	1987	1982-85
1	.000	.000	.000	.000	.000
2	.000	.003	.001	.005	.002
3	.018	.097	.061	.247	.054
4	.489	.276	.234	.481	.268
5	.420	.492	.571	.920	.369
6	.564	.386	.734	.881	.470
7	.601	.561	.625	.438	.497
8	.462	.379	.740	.896	.475
9	.570	.317	.706	.539	.505
10	.291	.252	.619	.540	.254
11	.227	.231	.942	.578	.287
12	.433	.421	.512	.156	.448
13	.229	.613	.682	.319	.292
14	.323	.150	.196	.388	.316
15+	.323	.150	.196	.388	.316
(4- 8)U	.507	.419	.581	.723	
(1-15)W	.213	.196	.285	.538	

Table 6.8 VIRTUAL POPULATION ANALYSIS

FAROE SAITHE

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1	20140	31949	22410	32864	29931	40683	37162	64072	60855	60841	53664	36012
2	11162	16490	26155	18347	26899	24505	33308	30426	52456	49824	49812	43935
3	12064	8910	13376	21348	14934	21936	19962	27209	24771	42747	40742	40084
4	7814	8393	7130	10444	16924	11610	17060	15903	21740	19727	33923	32053
5	5341	6052	6530	5348	8244	12136	8738	12579	12302	16275	14270	22125
6	3758	3960	4519	4790	4072	5394	8398	6072	9069	9065	11259	10279
7	2547	2678	2879	3254	3547	2778	3548	5359	4258	6439	6149	7886
8	2118	1866	1997	2099	2298	2389	1816	2180	3316	2992	4265	4225
9	1698	1545	1412	1517	1536	1500	1590	1148	1360	2125	1920	2835
10	892	1248	1160	1039	1085	1097	953	1037	744	885	1219	1288
11	321	658	948	848	709	753	717	596	678	494	510	781
12	241	237	498	712	609	490	477	447	400	475	301	340
13	120	172	170	382	431	424	293	306	298	275	299	203
14	161	70	136	127	257	311	267	193	216	208	192	203
15+	282	3337	398	573	120	476	354	281	439	166	295	169
TOTAL NO	68660	87564	89716	103692	111598	126482	134643	167808	192902	212538	218821	202418
SPS NO	17480	21822	20646	20689	22910	27749	27150	30198	33081	39400	40680	50334
TOT.BIOM	129931	170007	153665	173980	183900	193875	208939	206064	236855	258707	272372	270255
SPS BIOM	89652	124917	100767	108334	110459	124699	119993	117015	119631	132191	135112	153627

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	31116	25005	29444	19612	12471	12819	18704	49960	19609	61436	33748	21673
2	29484	25476	20469	24102	16057	10210	10495	15314	40903	16054	50300	27631
3	35318	23944	19369	16638	19562	13012	8247	8575	12537	33106	13144	40982
4	30241	26468	17336	12705	11764	13155	9204	6201	6761	9366	26734	10412
5	23253	23158	16050	10485	7383	6743	8130	5967	4237	4746	6045	18217
6	13096	16705	12612	9536	5180	4498	3695	5095	3680	2821	3193	4054
7	7510	8256	10549	7823	6063	3117	2527	2532	3242	2407	1474	1616
8	5710	4773	5290	7374	5463	4174	1863	1733	1548	2002	1158	865
9	3036	3502	3284	3754	5394	3895	2780	1095	1047	1012	981	574
10	2027	1574	2372	2357	2801	3994	2740	1857	674	666	521	538
11	906	994	927	1636	1756	2092	2965	1818	1095	398	373	332
12	550	446	621	581	1165	1311	1468	2061	1157	720	244	226
13	230	330	273	397	363	867	957	1012	1502	807	475	149
14	155	163	248	183	267	243	638	652	706	995	502	344
15+	116	287	293	299	381	273	557	1670	1252	1306	3138	784
TOTAL NO	182748	161081	139135	117481	96070	80404	74971	105540	99950	137841	142029	128398
SPS NO	56589	60189	52517	44425	36216	31208	28321	25490	20140	17879	18103	27699
TOT.BIOM	285387	254432	246514	227052	208739	195781	173718	151355	149600	164201	211053	179432
SPS BIOM	176813	168644	173384	169400	157254	149938	135314	129236	119237	93658	101240	108800

	1984	1985	1986	1987	1988	1960-87
1	32616	11988	2670	0	0	31195
2	17745	26704	9815	2186	0	25938
3	22622	14528	21794	8031	1780	21410
4	31313	18189	10791	16783	5136	16434
5	7530	15720	11304	6990	8492	10925
6	10379	4049	7868	5226	2280	6869
7	2115	4834	2254	3092	1773	4312
8	808	949	2259	988	1634	2804
9	405	417	532	882	330	1885
10	226	187	249	215	422	1273
11	352	139	119	110	103	858
12	184	230	90	38	50	583
13	97	98	124	44	27	396
14	100	63	43	51	26	275
15+	601	1214	383	228	155	703
TOTAL NO	127093	99310	70295	44864		
SPS NO	22797	27900	25226	17865		
TOT.BIOM	185851	206127	160743	109541		
SPS BIOM	92324	120106	89887	61701		

Table 6.9

List of input variables for the ICES prediction program.

FAROE SAITHE: MOVING 1988 STOCK TO 1989
The reference F is the mean F for the age group range from 4 to 8

The number of recruits per year is as follows:

Year	Recruitment
1988	22000.0
1989	22000.0

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
3	22000.0	.09	.20	.00	1.540	1.540
4	5136.0	.43	.20	.00	1.952	1.952
5	8492.0	.62	.20	1.00	2.612	2.612
6	2280.0	.80	.20	1.00	3.476	3.476
7	1773.0	.86	.20	1.00	4.692	4.692
8	1634.0	.91	.20	1.00	5.997	5.997
9	330.0	.89	.20	1.00	6.585	6.585
10	422.0	.70	.20	1.00	7.346	7.346
11	103.0	.74	.20	1.00	8.796	8.796
12	50.0	.68	.20	1.00	9.749	9.749
13	27.0	.60	.20	1.00	8.638	8.638
14	26.0	.62	.20	1.00	11.069	11.069
15+	155.0	.62	.20	1.00	11.769	11.769

Table 7.1 Faroe Plateau COD. Nominal catches (t) by countries, 1974-1987, as reported to ICES.

Year	Faroe Islands	France	Germany Fed.Rep.	Norway	Poland	UK England	UK Scotland	Denmark	Others	Total
1974	12,541	567[1]	292	446	320	2,879	7,516	-	20	24,581
1975	22,608	1,531	408	1,353	432	2,538	7,815	-	90	36,775
1976	28,502	1,535	247	1,282	496	2,179	5,491	-	67	39,799
1977	28,177	1,450	332	864	-	811	3,291	-	2	34,927
1978	24,076	213[1]	71[3]	245	-	518	1,460	-	2	26,585
1979	21,774	117[1]	23[3]	274	-	263	661	-	-	23,112
1980	19,966	40[1]	-[3]	127	-	13	367	-	-	20,513
1981	22,616	47	-[3]	240	-	-	60	-	-	22,963
1982	21,387	10	-	90	-	-	2	-	-	21,489
1983	37,916	13	128	76	-	-	-[4]	-	-	38,133
1984	36,914	34	9	22	-	-	-[4]	-	-	36,979
1985	39,422	29	5	28	-	-	-[4]	-	-	39,484
1986	34,642	4	8	204[2]	-	-	-[4]	8[1]	-	34,866
1987	24,342	2[5]	11[2]	20[2]	-	8	-[4]	30[2]	-	24,413

[1] Sub-division Vb_2 included.
[2] Preliminary.
[3] Working Group Data.
[4] Included in Sub-division Vb_2.
[5] Catches as reported to the Faroese Coastal Guard Service.

Table 7.2 Faroe Bank COD. Nominal catches (t) by countries, 1974-1987, as reported to ICES.

Year	Faroe Islands	France	Germany Fed.Rep.	Norway	UK England	UK Scotland	Denmark	Others	Total
1974	696	-[1]	-	-	829	503	-	40	
1975	378	81	50	-	749	804	-	55	2,117
1976	457	72	+	1	877	912	-	11	2,330
1977	851	219[1]	-	99	9	780	-	-	1.958
1978	4,194	-[1]	-	183	2	1,071	-	-	5,450
1979	1,273	-[1]	-	33	-	677	-	-	1,983
1980	724	-[1]	-	54	85	340	-	-	1,203
1981	975	-	-	120	-	134	-	-	1,229
1982	2,184	-	-	16	-	152[3]	-	-	2,352
1983	2,284	-	-	17	-	66[3]	-	-	2,367
1984	2,189	-	-	11	-	16[3]	-	-	2,216
1985	2,913	-	-	23	-	25[3]	-	-	2,961
1986	1,836	-	-	6[2]	-	63[3]	-[1]	-	1,905
1987	1,710	-	-	29[2]	-	47[3]	-[2]	-	1,786

[1] Catches included in Sub-division Vb_1.
[2] Preliminary.
[3] Catches including Sub-division Vb_1.

Table 7.3 Estimated catch of cod by age in number (thousands) in the Faroese fishery in Sub-division Vb1 in 1988.

Age	1	2	3	4	5	6
Number	-	-	2,355	2,449	1,733	2,812

Age	7	8	9	10	Total
Number	613	185	24	38	10,209

Estimated catch in 1988: 25,112 t.

Table 7.4 VIRTUAL POPULATION ANALYSIS

COD IN THE FAROE PLATEAU

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	160	19	41	16	5	80	37	0	0	12
2	555	575	1129	646	1139	2149	4396	998	211	294
3	1219	1732	2263	4137	1965	5771	5234	9484	3614	1554
4	2643	1673	1461	1981	3073	2760	3487	3795	8529	2980
5	3216	1601	895	947	1286	2746	1461	1669	2391	3519
6	1041	1906	807	582	471	1204	912	770	914	927
7	268	493	832	487	314	510	314	872	238	256
8	201	134	339	527	169	157	82	309	148	77
9	66	87	42	123	254	104	34	65	47	79
10+	56	38	18	55	122	102	66	80	38	30
TOTAL	9425	8258	7827	9501	8798	15583	16023	18042	16130	9728

Table 7.5 VIRTUAL POPULATION ANALYSIS

COD IN THE FAROE PLATEAU

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	.394	.493	.430	.750	.715	.690	.743	.743	.743	.489
2	1.112	.897	.927	1.080	1.280	1.338	1.195	.905	1.099	1.093
3	1.385	1.682	1.432	1.470	1.413	1.950	1.888	1.658	1.459	1.517
4	2.140	2.211	2.220	2.180	2.138	2.403	2.980	2.626	2.046	2.160
5	3.125	3.052	3.105	3.210	3.107	3.107	3.679	3.400	2.936	2.766
6	4.363	3.642	3.539	3.700	4.012	4.110	4.470	3.752	3.786	3.908
7	5.927	4.719	4.392	4.240	5.442	5.020	5.488	4.220	4.899	5.461
8	6.348	7.272	6.100	4.430	5.563	5.601	6.466	4.739	5.893	6.341
9	8.715	8.368	7.603	6.690	5.216	8.013	6.628	6.511	9.699	8.509
10+	12.299	13.042	9.668	10.000	6.707	8.031	10.981	10.981	8.815	9.811

Table 7.6 Faroe Plateau cod.

Module run at 08.29.47 23 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet 1 ,Magnus Heinasson , has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **
Terminal populations from weighted Separable populations
Regression weights
, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of predictions
Fishing mortalities

Age,	82,	83,	84,	85,	86,	87,
1,	.000,	.001,	.001,	.000,	.000,	.001,
2,	.060,	.088,	.077,	.038,	.010,	.034,
3,	.210,	.477,	.318,	.237,	.189,	.100,
4,	.351,	.509,	.599,	.402,	.348,	.235,
5,	.384,	.612,	.559,	.652,	.479,	.236,
6,	.399,	.761,	.420,	.657,	.947,	.344,
7,	.681,	1.027,	.454,	.929,	.434,	.780,
8,	.538,	.902,	.439,	1.150,	.386,	.243,
9,	.471,	.762,	.494,	.758,	.519,	.368,

Table 7.7

Title : COD IN THE FAROE PLATEAU
At 10.33.40 21 OCTOBER 1988
from 61 to 87 on ages 1 to 9
with Terminal F of .400 on age 4 and Terminal S of 1.000

Initial sum of squared residuals was 479.141 and
final sum of squared residuals is 120.697 after 113 iterations

Matrix of Residuals

Years	61/62	62/63	63/64	64/65	65/66	66/67						
Ages												
1/ 2	2.838	2.425	3.556	2.276	2.001	.811						
2/ 3	1.286	1.137	1.415	.772	1.013	.562						
3/ 4	.298	.199	.201	-.027	.169	-.014						
4/ 5	-.529	-.316	-.087	-.143	-.053	-.354						
5/ 6	-.320	.015	-.273	-.184	.043	-.192						
6/ 7	-.327	-.342	-.424	-.014	-.285	-.061						
7/ 8	-.050	-.724	-.242	.187	-.675	.215						
8/ 9	-.156	-.258	-1.066	-.818	-.746	.387						
	.000	.000	.000	.000	.000	.000						
WTS	.001	.001	.001	.001	.001	.001						

Years	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77		
Ages												
1/ 2	1.795	1.048	2.182	1.981	1.737	1.467	1.883	2.253	1.568	1.362		
2/ 3	.590	.615	.729	.648	-.052	.064	.713	.592	.868	.742		
3/ 4	-.071	-.076	-.027	.269	-.195	-.308	.476	-.327	.363	-.386		
4/ 5	-.593	.043	-.135	.048	-.199	-.257	.076	-.382	-.004	-.291		
5/ 6	-.266	.077	-.189	-.411	-.371	-.033	-.308	-.128	-.107	.144		
6/ 7	-.053	-.152	-.319	-.247	.215	.642	-.769	.306	-.351	-.298		
7/ 8	.225	-.067	-.304	-.048	.348	.249	-.041	.359	-.721	.276		
8/ 9	.856	-.781	.302	-.360	.596	-.540	-.378	-.340	-.395	.001		
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001		

Years	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87		WTS
Ages												
1/ 2	.999	2.963	.094	1.515	-.115	-1.267	-.111	1.063	-1.918	-2.255	.000	.122
2/ 3	-.135	.150	-.139	.025	.098	.172	.028	.610	-.129	-.828	.000	.336
3/ 4	-.295	-.408	.027	.088	.141	.057	-.026	.297	-.148	-.027	.000	.734
4/ 5	-.201	.002	.076	-.014	-.126	.099	-.351	.291	-.222	.249	.000	.797
5/ 6	.208	-.068	.044	-.106	.052	-.047	.001	.094	-.185	.216	.000	1.000
6/ 7	-.081	.076	.109	-.109	-.106	-.277	.142	-.589	.298	.458	.000	.546
7/ 8	.408	-.152	-.520	-.330	.160	.336	.440	-.789	.719	.138	.000	.426
8/ 9	-.103	-.067	.204	.165	-.234	.088	.105	-.619	.782	-.420	.000	.358
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	31.321	
WTS	.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	61	62	63	64	65	66	67
F-values	.7994	.7232	.5988	.5219	.5128	.4509	.4434

	68	69	70	71	72	73	74	75	76	77
F-values	.4628	.4920	.3695	.3596	.3274	.3336	.3176	.4139	.4408	.5898

	78	79	80	81	82	83	84	85	86	87
F-values	.4118	.4113	.3851	.3960	.3598	.6342	.4489	.5062	.4518	.4000

Selection-at-age (S)

	1	2	3	4	5	6	7	8	9
S-values	.0014	.1246	.6428	1.0000	1.1524	1.2845	1.3872	1.2605	1.0000

Table 7.8 VIRTUAL POPULATION ANALYSIS

COD IN THE FAROE PLATEAU

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .20

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
1	.053	.036	.049	.013	.008	.002	.007	.003	.007	.003	.003	.003
2	.332	.273	.251	.111	.120	.086	.080	.101	.112	.054	.031	.046
3	.516	.492	.418	.296	.259	.194	.249	.234	.306	.213	.136	.147
4	.508	.486	.506	.460	.441	.265	.264	.416	.385	.364	.229	.210
5	.620	.728	.517	.504	.576	.436	.361	.518	.453	.347	.382	.258
6	.593	.641	.573	.573	.616	.524	.548	.480	.542	.419	.570	.596
7	1.033	.506	.626	.742	.543	.827	.560	.645	.574	.595	.562	.488
8	.931	.821	.536	.532	.527	.887	.716	.374	.686	.510	.624	.328
9	.790	.757	.688	1.313	1.130	.865	.606	.250	.661	.305	.660	.266
10+	.790	.757	.688	1.313	1.130	.865	.606	.250	.661	.305	.660	.266
(4- 8)U	.737	.637	.551	.562	.541	.588	.490	.487	.528	.447	.473	.376
(1-10)U	.617	.550	.485	.586	.535	.495	.400	.327	.439	.311	.386	.261

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.006	.006	.005	.002	.003	.010	.001	.003	.001	.000	.001	.002
2	.065	.082	.078	.093	.048	.059	.043	.054	.051	.057	.094	.096
3	.231	.156	.318	.173	.299	.188	.260	.236	.285	.217	.451	.347
4	.301	.203	.430	.364	.475	.419	.423	.364	.334	.356	.535	.545
5	.287	.290	.408	.542	.737	.430	.486	.422	.427	.378	.624	.610
6	.264	.389	.442	.505	.695	.469	.492	.487	.538	.392	.737	.435
7	.364	.565	.364	.720	1.043	.541	.426	.415	.619	.632	.989	.429
8	.347	.297	.495	.679	.691	.498	.576	.588	.506	.453	.770	.407
9	.459	.378	.406	.679	.871	.412	.418	.355	.439	.490	.563	.370
10+	.459	.378	.406	.679	.871	.412	.418	.355	.439	.490	.563	.370
(4- 8)U	.313	.349	.428	.562	.728	.471	.481	.455	.485	.442	.731	.485
(1-10)U	.278	.274	.335	.444	.573	.344	.354	.328	.364	.347	.533	.361

	1985	1986	1987	1982-87
1	.000	.000	.001	.001
2	.053	.038	.106	.074
3	.306	.277	.423	.337
4	.456	.498	.387	.463
5	.550	.587	.394	.524
6	.776	.673	.476	.581
7	.995	.588	.400	.672
8	1.016	.441	.381	.578
9	.663	.401	.449	.489
10+	.663	.401	.449	.489
(4- 8)U	.759	.557	.408	
(1-10)U	.548	.390	.347	

Table 7.9 VIRTUAL POPULATION ANALYSIS

COD IN THE FAROE PLATEAU

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .250
PROPORTION OF ANNUAL M BEFORE SPAWNING: .330

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
1	26205	25709	27226	10285	21996	28296	21517	11173	10412	14647	26105	15431
2	11999	20351	20313	21225	8310	17862	23119	17502	9117	8463	11960	21302
3	7294	7046	12684	12933	15545	6036	13418	17477	12951	6673	6566	9496
4	3657	3566	3528	6834	7873	9822	4068	8566	11319	7811	4416	4694
5	2520	1802	1795	1742	3533	4147	6171	2557	4624	6306	4445	2877
6	566	1110	712	876	862	1626	2194	3520	1247	2407	3649	2484
7	627	256	479	329	404	381	788	1038	1783	594	1296	1689
8	140	183	126	210	128	192	137	369	446	822	268	605
9	58	45	66	61	101	62	65	55	208	184	404	118
10+	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NO	53065	60067	66929	54495	58752	68423	71477	62257	52108	47907	59110	58695
SPS NO	6094	5632	5504	8320	10663	13902	11434	13442	16472	15435	12239	10722
TOT.BIOM	66145	71815	81971	86901	93068	99848	113514	120130	113704	100412	99642	101904
SPS BIOM	23650	21846	21376	29675	38243	49836	46917	53498	63013	62201	54034	47309

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	37339	46680	22899	12274	13180	18601	28834	17412	27523	32131	64883	25857
2	12594	30378	37974	18660	10033	10763	15085	23590	14219	22519	26302	53049
3	16651	9658	22922	28759	13927	7831	8311	11831	18295	11058	17409	19596
4	6715	10821	6767	13655	19801	8453	5314	5246	7650	11259	7285	9079
5	3114	4069	7229	3606	7769	10078	4550	2850	2984	4484	6459	3493
6	1819	1914	2491	3935	1717	3042	5366	2290	1530	1593	2517	2833
7	1121	1144	1061	1311	1943	702	1558	2686	1152	732	882	986
8	849	637	532	604	522	561	335	833	1453	508	318	269
9	357	491	388	266	251	214	279	154	379	717	264	121
10+	288	317	493	412	17	182	122	66	169	344	259	234
TOTAL NO	80846	106110	102757	83482	69160	60426	69753	66959	75354	85346	126578	115517
SPS NO	12363	16968	15982	19902	25873	19502	14609	11911	12932	16704	14415	13963
TOT.BIOM	121171	146742	174414	174210	105876	104820	100614	93586	110357	124679	172235	182695
SPS BIOM	53715	68184	69243	79017	61995	62583	49053	39737	39823	48466	46490	51963

	1985	1986	1987	1988	1961-87
1	7649	3935	23175	0	23014
2	21136	6263	3222	18963	18419
3	39468	16404	4937	2373	13895
4	11343	23790	10181	2648	8649
5	4312	5884	11836	5661	4638
6	1554	2036	2679	6533	2169
7	1501	585	851	1362	1033
8	526	454	266	467	455
9	146	156	239	149	217
10+	180	126	91	173	122
TOTAL NO	87816	59634	57476		
SPS NO	15926	27124	22142		
TOT.BIOM	152284	115567	96802		
SPS BIOM	50091	67078	62980		

Table 7.10
List of input variables for the ICES prediction program.

FAROE PLATEAU COD: MOVING 1988 STOCK TO 1989
The reference F is the mean F for the age group range from 4 to 8

The number of recruits per year is as follows:

Year	Recruitment
1988	23000.0
1989	23000.0

Proportion of F (fishing mortality) effective before spawning: .2500
Proportion of M (natural mortality) effective before spawning: .3300

Data are printed in the following units:

Number of fish: thousands
Weight by age group in the catch: kilogram
Weight by age group in the stock: kilogram
Stock biomass: tonnes
Catch weight: tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	23000.0	.00	.20	.00	.679	.679
2	18831.0	.04	.20	.00	1.073	1.073
3	2373.0	.22	.20	.00	1.631	1.631
4	2648.0	.33	.20	1.00	2.453	2.453
5	5661.0	.39	.20	1.00	3.195	3.195
6	6533.0	.43	.20	1.00	3.979	3.979
7	1362.0	.46	.20	1.00	5.017	5.017
8	467.0	.42	.20	1.00	5.860	5.860
9	149.0	.33	.20	1.00	7.837	7.837
10+	173.0	.33	.20	1.00	10.147	10.147

Table 7.11
List of input variables for the ICES prediction program.

FAROE PLATEAU COD
The reference F is the mean F for the age group range from 4 to 8

The number of recruits per year is as follows:

Year	Recruitment
1989	23000.0
1990	23000.0
1991	23000.0

Proportion of F (fishing mortality) effective before spawning: .2500
Proportion of M (natural mortality) effective before spawning: .3300

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	23000.0	.00	.20	.00	.679	.679
2	18822.0	.04	.20	.00	1.073	1.073
3	14783.0	.18	.20	.00	1.631	1.631
4	1565.0	.31	.20	1.00	2.453	2.453
5	1551.0	.38	.20	1.00	3.195	3.195
6	3151.0	.44	.20	1.00	3.979	3.979
7	3476.0	.48	.20	1.00	5.017	5.017
8	700.0	.44	.20	1.00	5.860	5.860
9	250.0	.34	.20	1.00	7.837	7.837
10+	189.0	.34	.20	1.00	10.147	10.147

Table 7.12

Effects of different levels of fishing mortality on
catch, stock biomass and spawning stock biomass.

FAROE PLATEAU COD

Year 1989					Year 1990					Year 1991	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.5	.19	107	42	10	.5 1.0	.19 .41	126	59 56	12 23	146 132	77 62
1.0	.41	107	39	19	.5 1.0	.19 .41	115	50 47	10 20	136 125	68 55

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1991 has been calculated with the same fishing mortality as for 1990.
The reference F is the mean F for the age group range from 4 to 8

Table 8.1 Faroe Plateau HADDOCK. Nominal catches (t) by countries, 1974-1987, as reported to ICES.

Year	Faroe Islands	France	Germany Fed.Rep.	Norway	Poland	UK England	UK Scotland	Denmark	Others	Total
1974	4,538	1,461[1]	70	5	685	1,044	5,572	-	30	13,405
1975	8,625	2,173	120	56	544	1,505	4,896	-	383	18,302
1976	12,670	2,472	22	20	448	1,551	6,671	-	181	24,035
1977	19,806	623[1]	49	46	5	707	3,278	-	26	24,540
1978	15,539	71[1]	8	91	-	48	367	-	-	16,124
1979	11,259	50[1]	2	39	-	35	212	-	-	11,597
1980	13,633	31[1]	4	9	-	6	434	-	6	14,123
1981	10,891	113	+	20	-	-	85	-	-	11,[illegible]
1982	10,319	2	1	12	-	-	1[3]	-	-	10,[illegible]
1983	11,898	2	+	12	-	-	-[3]	-	-	11,912
1984	11,418	20	+	10	-	-	-[3]	-	-	11,448
1985	13,597	23	+	21	-	-	-	-	-	13,641
1986	13,359[2]	8	1	37[2]	-	-	-	2[2]	-	13,407
1987	14,435[2]	8[4]	4[4]	13[2]	-	2	-[3]	8[2]	-	14,470

[1] Catches including Sub-division Vb_2.
[2] Preliminary.
[3] Catches included in Sub-division Vb_2.
[4] Catches as reported to the Faroese Coastal Guard Service.

Table 8.2 Faroe Bank HADDOCK. Nominal catches (t) by countries, 1974-1987, as reported to ICES.

Year	Faroe Islands	France	Germany Fed.Rep.	Norway	UK England	UK Scotland	Denmark	Others	Total
1974	273	-[1]	-	-	573	500	-	22	1,368
1975	132	125	53	-	921	1,182	-	-	2,413
1976	44	70	+	-	733	1,329	-	-	2,176
1977	273	77[1]	-	11	4	650	-	-	1,015
1978	2,643	-[1]	-	39	-	394	-	-	3,076
1979	716	-[1]	-	-	-	105	-	-	821
1980	690	-[1]	-	8	152	43	-	-	893
1981	1,103	-	-	7	-	14	-	-	1,124
1982	1,553	-	-	1	-	48[3]	-	-	1,602
1983	967	-	-	2	-	13[3]	-	-	982
1984	925	-	-	5[2]	-	+[3]	-	-	930
1985	1,474	-	-	3[2]	-	25[3]	-	-	1,502
1986	1,050	-	-	10[2]	-	26[3]	-[2]	-	1,086
1987	947	-	-	14[2]	-	45[3]	-[2]	-	1,006

[1] Catches included in Sub-division Vb_1.
[2] Preliminary.
[3] Catches including Sub-division Vb_1.

Table 8.3 VIRTUAL POPULATION ANALYSIS

HADDOCK IN THE FAROE REGION

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	0	1	0	0	0	0	25	0	0	0
2	32	1	143	74	539	441	1195	985	231	295
3	1022	1161	58	455	934	1969	1561	4553	2562	1786
4	4248	1754	3724	202	784	383	2462	2196	4474	4019
5	4054	3341	2583	2586	298	422	147	1242	1530	3091
6	1841	1850	2496	1354	2182	93	234	169	742	1158
7	717	772	1568	1559	973	1444	42	91	39	550
8	635	212	660	608	1166	740	861	61	130	86
9	243	155	99	177	1283	947	388	503	71	50
10+	312	74	86	36	214	795	968	973	716	348
TOTAL	13104	9321	11417	7051	8373	7234	7883	10773	10495	11383

Table 8.4 Estimated catch of haddock by age in number (thousands) in the Faroese fishery in Division Vb, 1988.

Age	1	2	3	4	5	6
Number	-	2	177	2,146	3,034	2,094

Age	7	8	9	10	Total
Number	799	288	62	209	8,816

Estimated catch in 1988: 12,028 t.

Table 8.5 VIRTUAL POPULATION ANALYSIS

HADDOCK IN THE FAROE REGION

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	.300	.300	.300	.300	.000	.300	.359	.359	.359	.359
2	.357	.357	.643	.452	.700	.470	.681	.528	.608	.605
3	.790	.672	.713	.725	.896	.740	1.011	.859	.887	.831
4	1.035	.894	.941	.957	1.150	1.010	1.255	1.391	1.175	1.126
5	1.398	1.156	1.157	1.237	1.444	1.320	1.812	1.777	1.631	1.462
6	1.870	1.590	1.493	1.651	1.498	1.660	2.061	2.326	1.984	1.941
7	2.350	2.070	1.739	2.053	1.829	2.050	2.059	2.440	2.519	2.173
8	2.597	2.525	2.095	2.406	1.887	2.260	2.137	2.401	2.583	2.347
9	3.014	2.696	2.465	2.725	1.961	2.540	2.368	2.532	2.570	3.118
10+	2.920	3.519	3.310	3.250	2.856	3.040	2.686	2.686	2.922	2.933

Table 8.6 Faroe haddock.

```
Module run at 08.35.08  23 SEPTEMBER 1988
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet  1 ,Magnus Heinasson     , has terminal q estimated as the mean
FLEETS COMBINED BY ** VARIANCE **

Regression weights
      , 1.000, 1.000, 1.000, 1.000, 1.000, 1.000,
Oldest age F = 1.000*average of 5 younger ages. Fleets combined by variance of predictions
Fishing mortalities

   Age,    82,    83,    84,    85,    86,    87,

     1,  .000,  .000,  .001,  .000,  .000, 1.000,
     2,  .047,  .022,  .040,  .053,  .025,  .030,
     3,  .540,  .239,  .101,  .207,  .190,  .270,
     4,  .434,  .445,  .528,  .202,  .323,  .508,
     5,  .376,  .441,  .306,  .559,  .211,  .387,
     6,  .321,  .192,  .471,  .690,  .785,  .244,
     7,  .298,  .365,  .124,  .337,  .331,24.831,
     8,  .270,  .389,  .387,  .266, 1.173, 5.735,
     9,  .340,  .366,  .363,  .411,  .565, 6.341,
```

Table 8.7

Title : HADDOCK IN THE FAROE REGION
At 13.29.13 21 OCTOBER 1988
from 61 to 87 on ages 1 to 9
with Terminal F of .350 on age 4 and Terminal S of 1.000

Initial sum of squared residuals was 927.065 and
final sum of squared residuals is 224.308 after 123 iterations

Matrix of Residuals

Years	61/62	62/63	63/64	64/65	65/66	66/67
Ages						
1/ 2	1.462	.882	1.493	.303	.258	.676
2/ 3	1.401	1.976	2.164	1.285	.930	.898
3/ 4	.396	.589	.489	.444	-.137	.150
4/ 5	-.095	-.168	-.172	.176	-.275	.038
5/ 6	-.758	-.803	-.844	-.348	-.853	-.506
6/ 7	-.767	-.829	-.899	-.620	-.740	-.712
7/ 8	.405	.353	.308	-1.295	.543	.504
8/ 9	.073	.018	.078	.466	2.055	.040
	.000	.000	.000	.000	.000	.001
WTS	.001	.001	.001	.001	.001	.001

Years	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77
Ages										
1/ 2	-.651	-.025	.650	1.122	.999	-.740	1.089	-.322	.003	1.744
2/ 3	.977	1.840	1.080	.966	.212	-.551	1.596	1.171	1.960	2.072
3/ 4	.108	.172	.111	.131	.131	1.206	.508	.212	.585	.807
4/ 5	-.022	.022	.130	-.047	-.206	-.328	-.037	.218	.247	.014
5/ 6	-.583	-.725	-.978	-.709	.072	.162	-.183	-.414	-.288	-1.002
6/ 7	-.432	-.647	-.923	-.592	-.463	-.944	-.707	-.162	-.786	-.411
7/ 8	.577	.457	.554	.982	.933	.927	-.249	-.062	-.884	-.605
8/ 9	.271	-.096	.564	-.192	-.332	-.002	-.506	-.845	-.591	-.561
	.001	.001	.001	.001	.001	.001	.001	.000	.000	-.001
WTS	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001

Years	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87		WTS
Ages												
1/ 2	-2.295	1.151	-.780	-2.968	-4.269	-4.844	-5.841	-.028	-4.054	-3.999	-25.625	.087
2/ 3	.432	-1.784	-1.538	.821	.095	.564	.604	.632	1.058	.250	.722	.197
3/ 4	.180	-.306	-.229	-.870	.449	1.087	.000	-.005	.400	.191	.722	.456
4/ 5	-.220	-.207	-.128	.045	-.101	.064	.445	.297	.023	.284	.722	1.000
5/ 6	.359	.178	.395	.165	.299	.438	-.091	-.693	.012	.029	.722	.413
6/ 7	.293	.088	.101	-.179	.306	-.469	-.045	.230	.803	-.102	.722	.420
7/ 8	.036	.869	.513	.729	.680	-.170	.113	-.655	-.590	-.770	.722	.306
8/ 9	-.100	.725	.789	.760	-.685	-.587	-.106	-.087	-.726	.639	.722	.306
	-.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	-3.088	
WTS	.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	61	62	63	64	65	66	67
F-values	.8249	.9295	.9924	.7195	.7362	.6703	.5274

	68	69	70	71	72	73	74	75	76	77
F-values	.5852	.7052	.6225	.6089	.5704	.5280	.3135	.1892	.1901	.1830

	78	79	80	81	82	83	84	85	86	87
F-values	.1478	.1169	.1922	.1833	.3481	.3041	.2653	.2554	.2571	.3500

Selection-at-age (S)

	1	2	3	4	5	6	7	8	9
S-values	.0010	.0483	.4679	1.0000	1.1356	1.1104	.8987	1.1155	1.0000

Table 8.8 VIRTUAL POPULATION ANALYSIS

HADDOCK IN THE FAROE REGION

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .20

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
1	.022	.015	.011	.002	.002	.003	.001	.001	.003	.003	.001	.001
2	.189	.326	.380	.090	.072	.063	.066	.153	.092	.059	.041	.023
3	.420	.589	.569	.372	.241	.246	.195	.275	.298	.272	.208	.311
4	.425	.605	.729	.527	.474	.465	.312	.367	.561	.461	.463	.313
5	.439	.354	.571	.543	.378	.497	.314	.305	.359	.397	.439	.530
6	.594	.668	.412	.633	.598	.563	.533	.484	.548	.624	.637	.277
7	.959	1.060	1.216	.349	1.033	.939	.740	.807	.930	1.063	1.068	.876
8	.949	1.001	1.145	1.104	2.455	.898	.710	.670	.967	.695	.637	.671
9	.814	.894	.880	.698	.771	.765	.723	.574	.857	.448	.803	.802
10+	.814	.894	.880	.698	.771	.765	.723	.574	.857	.448	.803	.802
(4- 8)U	.673	.738	.814	.631	.988	.672	.522	.527	.673	.648	.649	.534
(1-10)U	.563	.641	.679	.501	.679	.521	.432	.421	.547	.447	.510	.461

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.011	.003	.002	.001	.000	.000	.000	.000	.000	.000	.000	.001
2	.150	.116	.131	.091	.011	.001	.000	.031	.023	.035	.028	.038
3	.370	.190	.237	.201	.114	.055	.047	.036	.130	.434	.170	.131
4	.159	.300	.204	.327	.197	.168	.125	.207	.168	.343	.319	.331
5	.355	.080	.160	.181	.417	.234	.193	.274	.217	.399	.314	.194
6	.342	.202	.057	.203	.525	.270	.159	.215	.226	.287	.207	.288
7	.429	.293	.104	.091	.246	.336	.173	.197	.203	.251	.313	.136
8	.464	.406	.238	.319	.190	.260	.156	.220	.109	.230	.308	.312
9	.584	.397	.647	.440	.623	.151	.093	.101	.084	.350	.295	.263
10+	.584	.397	.647	.440	.623	.151	.093	.101	.084	.350	.295	.263
(4- 8)U	.350	.256	.153	.224	.315	.254	.161	.223	.185	.302	.292	.252
(1-10)U	.345	.238	.243	.229	.295	.163	.104	.138	.124	.268	.225	.196

	1985	1986	1987	1982-87
1	.000	.000	.000	.000
2	.035	.024	.075	.039
3	.199	.119	.264	.220
4	.275	.307	.277	.309
5	.278	.313	.361	.310
6	.356	.266	.415	.303
7	.173	.129	.322	.221
8	.299	.397	.460	.334
9	.302	.677	.260	.358
10+	.302	.677	.260	.358
(4- 8)U	.276	.282	.367	
(1-10)U	.222	.291	.270	

Table 8.9 VIRTUAL POPULATION ANALYSIS

HADDOCK IN THE FAROE REGION

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY; THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .330
PROPORTION OF ANNUAL M BEFORE SPAWNING: .330

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
1	47435	58312	36271	26687	23728	29929	55874	36654	40729	23992	45459	31986
2	50648	37987	47034	29375	21808	19391	24422	45683	29965	33260	19592	37169
3	23420	34324	22448	26343	21990	16621	14901	18710	32103	22383	25671	15393
4	16241	12599	15599	10408	14873	14148	10635	10034	11634	19507	13960	17063
5	5970	8692	5635	6163	5030	7577	7277	6372	5691	5438	10071	7192
6	3185	3151	4996	2607	2933	2823	3775	4354	3847	3254	2995	5316
7	1476	1440	1323	2710	1133	1320	1316	1814	2197	1820	1427	1297
8	418	463	408	321	1565	330	423	514	662	710	515	402
9	115	133	139	106	87	110	110	170	216	206	290	223
10+	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NO	148908	157101	133853	104721	93147	92248	118733	124304	127044	110570	119981	116042
SPS NO	40961	47080	38541	39355	38797	35135	32525	35003	46141	43678	45617	38976
TOT.BIOM	94076	99476	90319	75236	71120	67948	74528	82230	87068	83030	84622	84123
SPS BIOM	44656	49548	43526	42822	42025	40027	38494	40890	48724	48372	50151	46995

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	70185	80829	67844	31928	41831	2712	6334	4433	21406	21453	42908	38768
2	26149	56823	65978	55446	26106	34248	2220	5185	3630	17526	17564	35130
3	29754	18436	41444	47405	41431	21144	28011	1817	4116	2905	13862	13982
4	9238	16830	12483	26776	31737	30279	16389	21886	1435	2960	1541	9576
5	10215	6450	10211	8333	15815	21331	20964	11837	14566	993	1719	917
6	3465	5861	4874	7125	5695	8536	13816	14155	7368	9598	546	1028
7	3299	2014	3920	3768	4763	2757	5333	9645	9343	4814	5896	363
8	442	1759	1230	2892	2816	3048	1613	3671	6485	6246	3066	3530
9	168	227	960	794	1721	1906	1925	1130	2412	4761	4064	1845
10+	27	492	428	979	2013	2448	919	982	491	794	3412	4604
TOTAL NO	152944	189721	209372	185445	173927	128410	97524	74740	71251	72050	94579	109744
SPS NO	47447	45237	66009	84913	92013	80857	79958	56847	40737	28019	29415	31094
TOT.BIOM	97949	117128	138462	150427	139648	134156	105906	91881	85552	66282	75829	92803
SPS BIOM	54072	57293	76273	99186	101428	106336	92339	76213	68483	45867	46736	47428

	1985	1986	1987	1988	1961-87
1	12924	5499	0	0	33560
2	31718	10581	4502	0	29227
3	27683	25079	8454	3420	22216
4	10041	18566	18224	5316	14617
5	5628	6246	11180	11306	8426
6	619	3491	3739	6378	4932
7	631	355	2191	2022	2902
8	259	435	255	1300	1647
9	2116	158	240	132	975
10+	4094	1589	1667	1203	924
TOTAL NO	95714	71999	50452		
SPS NO	44211	48525	38851		
TOT.BIOM	89092	76647	64868		
SPS BIOM	58272	58517	52395		

Table 8.10
List of input variables for the ICES prediction program.

FAROE HADDOCK: MOVING 1988 STOCK TO 1989
The reference F is the mean F for the age group range from 4 to 8

The number of recruits per year is as follows:

Year	Recruitment
1988	22000.0
1989	22000.0

Proportion of F (fishing mortality) effective before spawning: .3300
Proportion of M (natural mortality) effective before spawning: .3300

Data are printed in the following units:

Number of fish: thousands
Weight by age group in the catch: kilogram
Weight by age group in the stock: kilogram
Stock biomass: tonnes
Catch weight: tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	22000.0	.00	.20	.00	.359	.359
2	18342.0	.02	.20	.00	.605	.605
3	3420.0	.16	.20	1.00	.897	.897
4	5316.0	.35	.20	1.00	1.237	1.237
5	11306.0	.40	.20	1.00	1.670	1.670
6	6378.0	.39	.20	1.00	2.078	2.078
7	2022.0	.31	.20	1.00	2.298	2.298
8	1300.0	.39	.20	1.00	2.367	2.367
9	132.0	.35	.20	1.00	2.647	2.647
10+	1203.0	.35	.20	1.00	2.807	2.807

Table 8.11
List of input variables for the ICES prediction program.

FAROE HADDOCK
The reference F is the mean F for the age group range from 4 to 8

The number of recruits per year is as follows:

Year	Recruitment
1989	22000.0
1990	22000.0
1991	22000.0

Proportion of F (fishing mortality) effective before spawning: .3300
Proportion of M (natural mortality) effective before spawning: .3300

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	22000.0	.00	.20	.00	.359	.359
2	18342.0	.02	.20	.00	.605	.605
3	14764.0	.16	.20	1.00	.897	.897
4	2379.0	.27	.20	1.00	1.237	1.237
5	3070.0	.38	.20	1.00	1.670	1.670
6	6230.0	.42	.20	1.00	2.078	2.078
7	3546.0	.34	.20	1.00	2.298	2.298
8	1209.0	.42	.20	1.00	2.367	2.367
9	721.0	.38	.20	1.00	2.647	2.647
10+	771.0	.38	.20	1.00	2.807	2.807

Table 8.12

Effects of different levels of fishing mortality on
catch, stock biomass and spawning stock biomass.

FAROE HADDOCK

Year 1989					Year 1990					Year 1991	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.7	.24	68	43	8	.7	.24	72	46	8	76	50
					1.0	.37		45	12	72	45
					1.8	.67		41	20	63	35
1.0	.37	68	42	12	.7	.24	68	43	8	73	47
					1.0	.37		41	11	69	43
					1.8	.67		38	18	61	34
1.8	.67	68	38	20	.7	.24	60	36	6	67	42
					1.0	.37		35	9	64	38
					1.8	.67		32	15	58	31

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for the time of spawning.
The spawning stock biomass for 1991 has been calculated with the same fishing mortality as for 1990.
The reference F is the mean F for the age group range from 4 to 8

Table 9.1 Nominal catch (tonnes) of Blue Ling in Division Va, 1977-1987, as reported to ICES.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Faroe Islands	39	38	85	183	220	224	1,195	353	59	69	50[1]
Germany, Fed.Rep.	1,253	-	-	-	-	-	-	-	-	-	-
Iceland	700	1,237	2,019	8,133	7,952	5,945	5,117	3,122	1,407	1,774	1,693
Norway	317	156	98	229	64	402	402	31	7	8	8[1]
UK (England & Wales	8	-	-	-	-	-	-	-	-	-	-
Total	2,317	1,431	2,202	8,399	8,401	6,233	6,714	3,506	1,473	1,851	1,751

[1] Preliminary.

Table 9.2 Nominal catch (tonnes) of Blue Ling in Division Vb, 1977-1987, as reported to ICES.

BLUE LING Vb_1

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Faroe Islands	23[2]	423[2]	1,072[2]	1,187[2]	1,481	2,761	3,933	6,453	4,038	4,830	3,361
France	6,977[2]	3,369[2]	2,683[2]	2,427[2]	371	843	668	515	1,193	2,578	NA
Germany, Fed.Rep.	870	744	691	5,905	2,867	2,538	222	214	217	197[1]	142[1]
Norway	858	237	331	304	167	121	256	105	140	93[1]	81[1]
UK (Engl. and Wales)	4	35	-	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	1	-	-	-	-	-	-	-
Total	8,732	4,808	4,777	9,824	4,886	6,263	5,079	7,287	5,588	7,798	3,584

[1] Preliminary.
[2] Includes Sub-division Vb_2.

BLUE LING Vb_2

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Faroe Islands	+[2]	7[2]	14[2]	36	48	128	463	757	396	81	209
France	-[2]	-[2]	-[2]	-	-	-	-	-	-	-	NA
Germany, Fed.Rep.	-	-	-	-	-	-	1	-	+	-	-
Norway	86	83	87	159	93	66	182	50	70	41[1]	90[1]
UK (Scotland)	-	-	-	1	-	-	-	-	-	-	-
Total	86	90	101	196	141	194	646	807	466	122	299

[1] Preliminary.
[2] Included in Sub-division Vb_1.

Table 9.3 Nominal catch (tonnes) of Blue Ling in Sub-area VI, 1977-1987, as reported to ICES.

BLUE LING VIa

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Faroe Islands	-	-	-	-	-	-	-	-	56	-	-
France	7,940	5,495	3,064	2,124	3,338	3,430	5,233	3,653	5,670	7,628	NA
Germany, Fed.Rep.	470	2,498	993	773	335	79	11	183	5	7	45
Norway	16	19	2	10	11	16	118	45	75	47[1]	51
UK (Engl.& Wales)	556	21	279	-	-	99	13	5	2	2	1
UK (Scotland)	-	-	-	-	1	+	-	-	-	1	+
Total	8,982	8,033	4,338	2,907	3,685	3,624	5,375	3,886	5,808	7,685	51

[1] Preliminary.

BLUE LING VIb

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Faroe Islands	6	3	4	-	-	-	-	133	11	1,845	350
France	36	58	652	3,827	534	263	243	3,281	7,263	2,141	NA
Germany, Fed.Rep.	-	-	187	5,526	3,944	554	38	-	31	39	356
Norway	7	8	28	8	5	13	50	43	38	66[1]	76[1]
UK (Engl.& Wales)	+	0	-	-	-	-	-	-	+	7	3
UK (Scotland)	-	-	-	+	-	1	2	-	-	1	10
Total	49	69	871	9,361	4,483	831	333	3,457	7,343	4,099	795

[1] Preliminary.
[2] Includes Division VIa.

Table 9.4 Nominal catch (tonnes) of Blue Ling in Sub-area XIV, 1977-1987, as reported to ICES.

BLUE LING XIVb

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Germany, Fed.Rep.	491[3]	933[2]	1,026[2]	746[2]	1,206[2]	1,946[2]	621[2]	537	315	150	199
Norway	-	4	-	-	-	-	-	-	-	-	-
UK (Engl.& Wales)	-[4]	-	-	-	-	-	-	-	-	-	-
Total	491	937	1,026	746	1,206	1,946	621	537	315	150	199

[1] Preliminary.
[2] Includes Division XIVa.
[3] Reported in Bull.Stat. in Division XIVa.
[4] 6 t in Division XIVa.

Table 10.1 Nominal catch (tonnes) of Ling in Division Va, 1977-1987, as reported to ICES.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Belgium	442	541	508	445	196	116	128	103	59	88	157
Faroe Islands	613	534	536	607	489	524	644	450	384	556	527
France	-	-	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	254	-	-	-	-	-	-	-	-	2,946	4,161[1]
Iceland	3,433	3,439	3,759	3,149	3,348	3,733	4,256	3,304	2,980	4[1]	6[1]
Norway	506	484	399	423	415	612	115	21	17	-	-
UK (England & Wales)	-	-	-	-	-	-	-	+	+	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-	-	-
Total	5,248	4,998	5,202	4,624	4,448	4,985	5,143	3,878	3,440	3,594	4,851

[1] Preliminary.

Table 10.2 Nominal catch (tonnes) of Ling in Division Vb, 1977-1987, as reported to ICES.

LING Vb_1

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Denmark	-	-	-	-	-	-	-	-	-	4[2]	16[1]
Belgium	-	-	-	-	-	-	-	-	-	-	2,875
Faroe Islands	1,568[2]	1,549[2]	1,919[2]	1,734	1,274	2,099	2,365	2,666	2,911[3]	2,406	n.a.
France	780[2]	625[2]	304[2]	49	13	16	155	11	40	123	-
German, Dem.Rep.	-	-	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	72	27	18	12	1	3	5	6	3	6	-
Norway	2,162	1,745	2,716	1,538	1,135	2,495	1,580	935	1,317	1,770[1]	943[1]
Poland	-	-	-	-	-	-	-	-	-	-	-
UK (Engl.& Wales)	60[2]	26[2]	23[2]	1	-	-	-[3]	-[3]	-[3]	-	
UK (Scotland)	413[2]	220[2]	279[2]	90	4	-					
Total	5,056	4,192	5,259	3,424	2,427	4,613	4,105	3,618	4,448	4,309	3,835

LING Vb_2

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Faroe Islands	107[2]	394[2]	205[2]	87[2]	126	271	140	155	279[2]	177	346
France	-[2]	-[2]	-[2]	-[2]	-	-	-	-	-	-	-
German, Dem.Rep.	-	-	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-	-	-
Norway	398	1,208	734	873	1,641	1,119	1,166	631	638	636[1]	959[1]
UK (Engl.& Wales)	3[2]	2[2]	-[2]	5	-	-	-[3]	-[3]	-[3]	-[3]	-[3]
UK (Scotland)	-[2]	-[2]	-[2]	121	24	94	48[3]	4[3]	2[3]	1[3]	1[3]
Total	508	1,604	939	1,086	1,791	1,484	1,354	790	919	814	1,306

[1] Preliminary.
[2] Included in Sub-division Vb_1.
[3] Includes Sub-division Vb_1.

Table 10.3 Nominal catch (tonnes) of Ling in Sub-area VI, 1977-1987, as reported to ICES.

LING VIa

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Belgium	-	-	-	-	-	4	-	1	4	-	4
Denmark	-	-	-	44[2]	-	1	-	-	-	-	1[1]
Faroe Islands	2	1	4	-	-	20	-	-	-	-	-
France	2,627	3,176	2,990	3,092	3,820	5,049	5,362	5,757	6,061	4,620	n.a.
Germany, Fed.Rep.	2	7	5	1	-	-	-	14	8	6	-
Ireland	165	39	40	34	44	34	62	49[1]	81	255	n.a.
Netherlands	1	1	-	-	-	-	-	-	-	-	-
Norway	3,566[2]	5,937[2]	2,778[2]	2,932	2,150	4,499	5,943	4,667	4,777	5,314[1]	3,842[1]
Spain	422[2]	793[2]	566[2]	-	-	461	604	720	338	620	n.a.
Sweden	-	-	-	3	-	3	-	-	-	-	-
UK (Engl.& Wales)	122	227	73	85	123	201	78	101	130	151	507
UK (N.Ireland)	-	-	-	-	-	-	+	+	-	+	7
UK (Scotland)	190	286	234	207	379	188	236	341	510	284	574
Total	7,097	10,467	6,690	6,398	6,516	10,460	12,285	11,650	11,961	11,250	4,935

[1] Preliminary.
[2] Includes Division VIb.

LING VIb

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-[2]	-	-	-	-	-	-	-
Faroe Islands	481	219	368	236	4	123	204	153	24	6	39
France	2	3	7	3	5	13	8	34	140	24	n.a.
Germany, Fed.Rep.	-	-	-	-	+	-	-	-	-	-	-
Ireland	-	20	-	-	-	-	-	-	-	-	-
Norway	447[2]	781[2]	1,776[2]	1,096	1,083	1,711	2,315	2,345	1,973	2,157[1]	1,933[1]
Spain	-[2]	-[2]	-[2]	620	590	1,911	1,889	986	2,381	2,762	n.a.
UK (Engl.& Wales)	56	49	39	+	8	4	26	28	75	109	151
UK (Scotland)	195	236	203	235	184	80	4	29	127	127	164
Total	1,181	1,308	2,393	2,190	1,874	3,842	4,446	3,575	4,720	5,185	2,287

[1] Preliminary.
[2] Includes Division VIb.

Table 10.4 Nominal catch (tonnes) of Ling in Sub-area XIV, 1977-1987, as reported to ICES.

LING XIVb

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Faroe Islands	6	-	-	-	13	-	-	-	-	17	-
Germany, Fed.Rep.	5[3]	15[2]	952[2]	208[2]	298[2]	8[2]	1[2]	6	1	-[2]	-[2]
Norway	1	5	-	-	-	-	-	-	-	-	-
UK (Engl.& Wales)	-[4]	-	-	-	-	-	-	-	-	-	-
Total	12	20	952	208	311	8	1	6	1	17	-

[1] Preliminary.
[2] Includes Division XIVa.
[3] Reported in Bull. Stat. in Division XIVa.
[4] 11 t in Division XIVa.

Table 11.1 Nominal catch (tonnes) of Tusk (Cusk) in Division Va, 1977-1987, as reported to ICES.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Faroe Islands	2,818	2,168	2,050	2,873	2,624	2,410	4,046	2,008	1,885	2,811	2,734
Germany, Fed.Rep.	212	-	-	-	-	-	-	-	-	-	-
Iceland	3,122	3,352	3,558	3,089	2,827	2,804	3,469	3,430	3,068	2,549	2,984
Norway	1,796	812	845	928	1,025	666	772	254	111	21[1]	19[1]
UK (England & Wales)	-	-	-	-	-	-	-	-	+	-	-
Total	7,948	6,332	6,453	6,890	6,476	5,880	8,287	5,692	5,964	5,381	5,737

[1] Preliminary.

Table 11.2 Nominal catch (tonnes) of Tusk (Cusk) in Division Vb, 1977-1987, as reported to ICES.

TUSK Vb_1

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-	-	-	-	-	-	+[2]	2[1]
Faroe Islands	3,003	2,043[2]	3,652	4,629	2,028	4,056	3,416	4,355	4,994	3,531	4,358
France	-	25[2]	34	24	14	14	15	25	34	24	-
Germany	68	39	36	23	7	12	11	16	10	15	142
Norway	1,526	1,230	1,943	1,713	1,472	1,432	1,074	897	1,200	1,033[1]	865[1]
UK (Engl.& Wales)	12	3	1	+	-	-	-[3]	-[3]	-[3]	-	-
UK (Scotland)	381[2]	222[2]	252[2]	145	-	-	-[3]	-[3]	-[3]	-	-
Total	4,990	3,562	5,918	6,534	3,521	5,514	4,516	5,293	6,238	4,603	5,36

[1] Preliminary.
[2] Includes Sub-division Vb_2.
[3] Included in Sub-division[2] Vb_2.

TUSK Vb_2

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-	-	-	-	-	294	-[2]	-[1]
Faroe Islands	59	454[2]	225[2]	88[2]	38	92	34	39	-	94	411
France	-	-[2]	-[2]	-[2]	-	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	+	-	-
Norway	261	731	422	975	1,276	660	861	640	775	590[1]	1,257[1]
UK (Engl.& Wales)	+	-	-	+	-	-	-[3]	-[3]	-	-[3]	-[3]
UK (Scotland)	-	-	-	213	15	125	73[3]	2[3]	+	+[3]	+[3]
Total	320	1,185	647	1,276	1,329	877	968	681	1,069	684	1,668

[1] Preliminary.
[2] Included in Sub-division Vb_1.
[3] Includes Sub-division Vb_1.

Table 11.3 Nominal catch (tonnes) of Tusk (Cusk) in Sub-area VI, 1977-1987, as reported to to ICES.

TUSK VIa

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	1[2]	-	+	-	-	-	-	-
Faroe Islands	-	-	3	-	-	-	-	-	-	-	-
France	-	344	296	241	322	355	418	514	767	608	NA
Germany, Fed.Rep.	4	-	3	4	1	-	-	1	1	+	-
Netherlands	-	-	-	-	-	-	-	1[1]	-	-	-
Norway	914	996	460	652	802	1,052	1,733	1,305	1,609	1,859[1]	1,238[1]
Spain	-	-	-	-	-	414	250	-	-	-	NA
Sweden	-	-	-	-	-	2	-	-	-	-	-
UK (Engl.& Wales)	19	6	4	+	1	7	1	5	1	2	9
UK (Scotland)	3	5	8	14	94	+	2	1	1	4	7
Total	940	1,352	774	912	1,220	1,830	2,404	1,826	2,379	2,473	1,254

[1] Preliminary.
[2] Includes Division VIb.

TUSK VIb

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Denmark	-	-	-	-[2]	-	-	-	-	-	-	-
Faroe Islands	318	80	282	196	1	159	188	53	48	106	26
France	-	-	5	-	1	3	3	4	3	9	NA
Germany, Fed.Rep.	-	-	-	-	1	+	-	-	-	-	-
Norway	70	332	680	503	568	468	1,080	960	944	952[1]	1,384[1]
Spain	-	-	-	-	-	2,098	1,902	-	-	-	NA
UK (Engl.& Wales)	6	5	30	-	+	-	3	+	6	8	6
UK (Scotland)	133	148	178	214	181	101	22	+	14	16	15
Total	527	565	1,175	913	752	2,829	3,198	1,017	1,015	1,091	1,431

[1] Preliminary.
[2] Included in Division VIa.

Table 11.4 Nominal catch (tonnes) of Tusk (Cusk) in Sub-area XIV, 1977-1987, as reported to ICES.

TUSK XIVb

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
Faroe Islands	166	-	-	-	110	-	74	-	-	33	-
Germany, Fed.Rep.	16[3]	47[2]	27[2]	13[2]	10[2]	10[2]	11[2]	5	4	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	-
Norway	40	38	-	-	-	-	-	58	-	-	-
UK (Engl.& Wales)	-[4]	+[2]	-	-	-	-	-	-	-	-	-
Total	222	85	27	13	120	10	85	63	4	33	-

[1] Preliminary.
[2] Includes Division XIVa.
[3] Reported in Bull. Stat. in Division XIVa.
[4] 1 t in Division XIVa.

Table 12.1 Nominal catches of oceanic Sebastes mentella in Sub-areas XII and XIV.

Country	1982	1983	1984	1985	1986	1987
Bulgaria	-	-	2,961	5,825	11,385	12,270
German Dem.Rep.	-	155	989	5,438	8,574	7,023
Poland	581	-	239	135	149	25
USSR	59,914	60,079	60,643	60,273	84,994	71,469
Total	60,495	60,234	64,832	71,671	105,102	90,787

Table 12.2 Average annual fishing efficiency of USSR vessels of BMRT type and total fishing effort in the fishery for oceanic-type mentella in Sub-areas XII and XIV.

Year	1982	1983	1984	1985	1986	1987
Catch per effort (t/hour)	1.99	1.60	1.48	1.68	1.35	1.10
Total effort (trawling hrs)	30,100	37,500	46,149	25,595	62,962	60,273

Table 12.3 S. mentella abundance and biomass estimates from ichthyoplankton surveys in April-May 1982-1987.

Year	Area surveyed ('000 sq. miles)	Abundance at actual sex ratio(millions)	Biomass at actual sex ratio ('000 t).
1982	88.0	662	421.3
1983	148.0	1,944	1,198.0
1984	96.0	1,428	957.0
1985	100.0	1,169	687.0
1986	170.0	2,834	1,692.2
1987	114.0	1,032	645.1

Table 12.4 S. mentella abundance and biomass estimates from trawl-acoustic surveys in June-July 1982-1987.

Year	Area surveyed ('000 sq.miles)	Abundance at actual sex ratio (millions)	Biomass at actual sex ratio ('000 t)
1982	40.0	790	560.0
1983	50.0	960	700.0
1984	40.0	660	526.0
1985	71.0	1,122	700.0
1986	74.3	2,003	1,180.0
1987	215.0	1,951	1,120.0

Table 12.5 SUM OF PRODUCTS CHECK

SEBASTES MENTELLA, OCEANIC TYPE
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1982	1983	1984	1985	1986	1987
8	35	473	121	23	119	14
9	1069	1022	463	348	340	126
10	2388	1901	1112	637	1908	530
11	5431	3062	4832	2675	4825	1569
12	9693	6763	12555	13197	26097	10210
13	10483	8765	20196	31247	54198	32204
14	11492	13130	20704	26613	33970	33949
15	15041	16372	26319	32182	36846	34292
16	13818	14463	14141	10466	12366	19000
17	11480	12471	4449	3592	4727	6943
18	8300	9515	2331	720	2107	2236
19	4912	4846	258	228	689	1805
20	3404	5617	363	42	84	987
21	921	2599	283	13	203	318
22+	223	224	106	75	132	159
TOTAL	98690	101223	108233	122058	178611	144342

Table 12.5 SUM OF PRODUCTS CHECK

SEBASTES MENTELLA, OCEANIC TYPE
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1982	1983	1984	1985	1986	1987
8	.245	.266	.282	.231	.270	.268
9	.341	.332	.309	.295	.325	.298
10	.376	.333	.356	.329	.348	.341
11	.413	.382	.425	.376	.385	.386
12	.452	.407	.477	.432	.432	.432
13	.498	.447	.561	.503	.509	.503
14	.545	.511	.649	.575	.597	.570
15	.590	.569	.747	.666	.697	.657
16	.650	.638	.873	.771	.822	.801
17	.732	.703	.953	.862	.900	.915
18	.788	.783	.978	.911	.960	.983
19	.843	.854	1.005	1.022	1.010	1.073
20	.896	.904	1.113	1.077	1.133	1.178
21	.953	.954	1.121	1.077	1.154	1.240
22+	1.053	1.140	1.223	1.077	1.102	1.305

Table 12.7 Oceanic-type S. mentella in Sub-areas XII and IV, maturity at age.

Age	Percentage of mature fish		
	Males	Females	Males and Females
6	-	-	-
7	-	-	-
8	-	-	-
9	25.2	2.2	18.1
10	43.6	26.7	34.6
11	76.5	35.8	60.2
12	93.8	53.7	76.4
13	94.4	97.4	96.1
14	96.7	98.9	98.1
15	96.6	98.8	98.0
16	98.0	98.9	98.5
17	100.0	99.1	99.3
18	100.0	100.0	100.0
19	100.0	100.0	100.0
20	100.0	100.0	100.0
21	100.0	100.0	100.0
22	100.0	100.0	100.0
23	100.0	100.0	100.0
24	100.0	100.0	100.0
25	100.0	100.0	100.0
No.of specimens analyzed	6,543	8,511	15,054

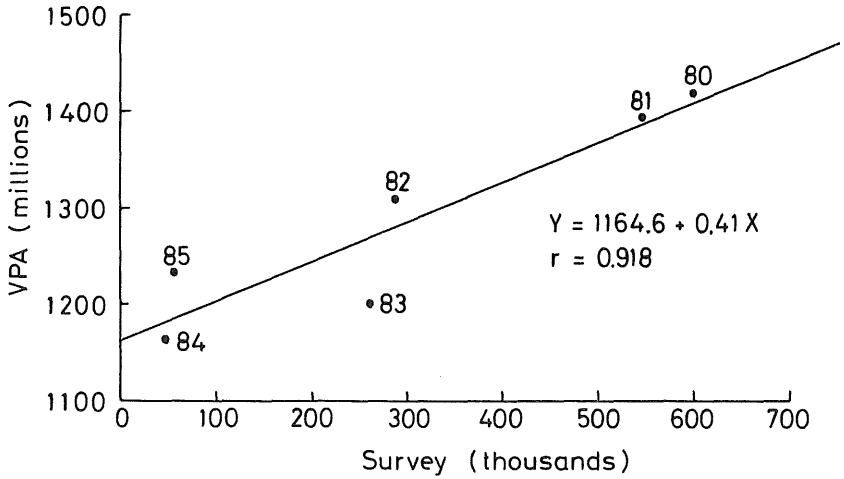


Figure 2.1 Relationship between VPA stock size for ages 11+ and survey stock size 0 for ages 11+ for S. marinus in Sub-areas V-XIV.

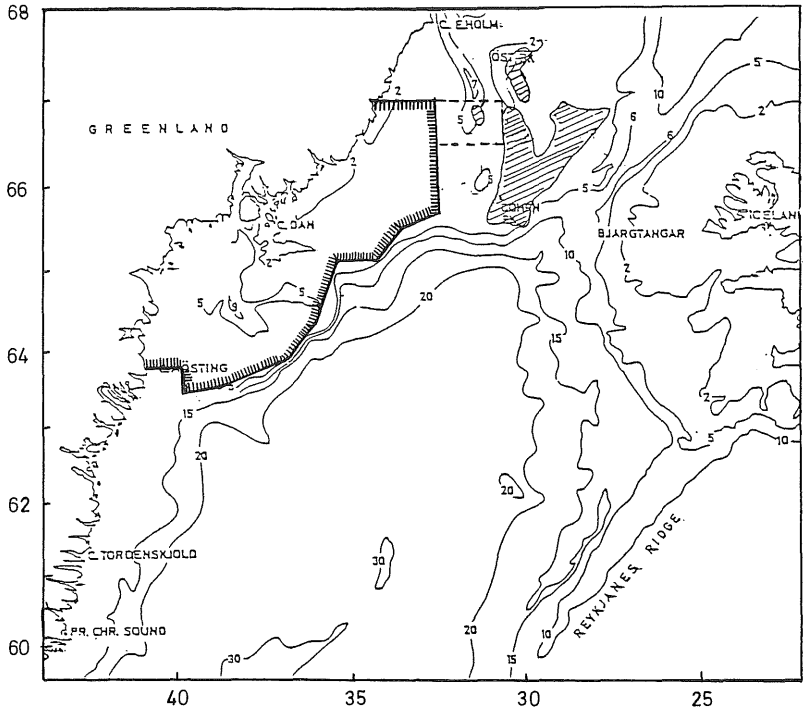


Figure 2.2 Shrimp fishing grounds in the Denmark Strait based on logbook recordings.

Figure 2.3 Catch of shrimp and by-catch of redfish as reported in logbooks from the Denmark Strait shrimp fishery in 1987.

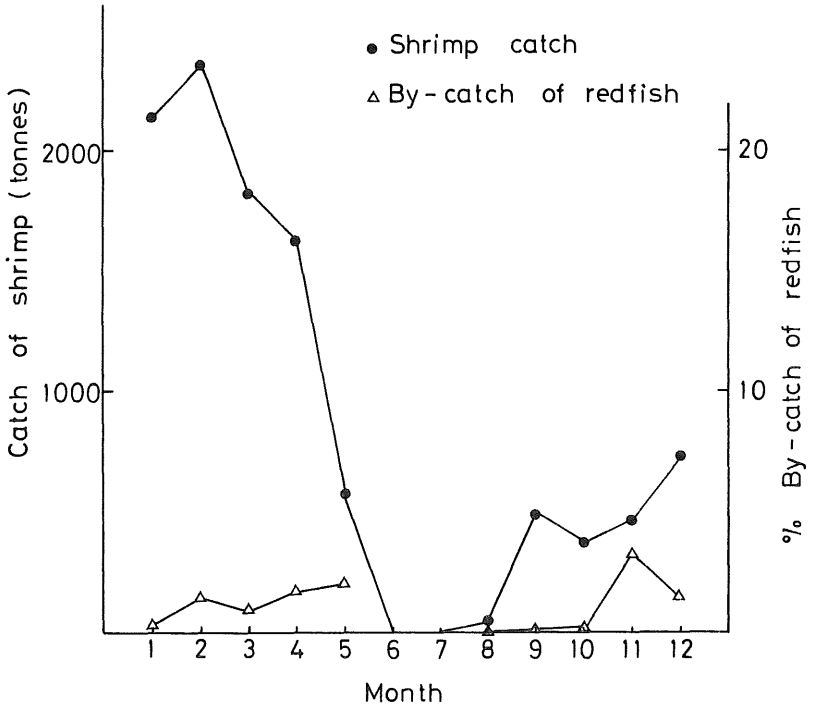
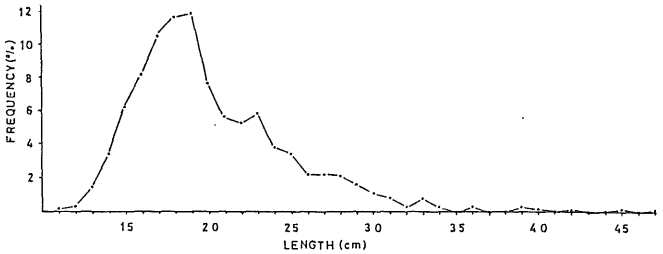
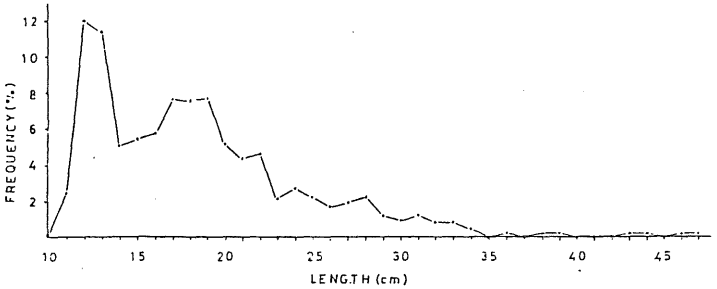


Figure 2.4

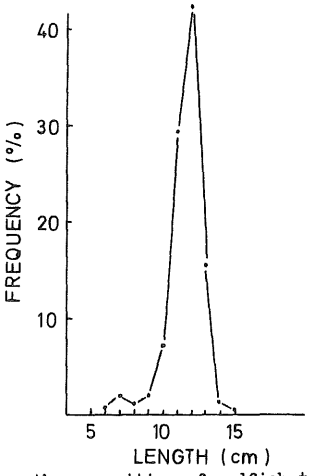


Length composition of redfish taken as by-catch with shrimp off East Greenland in April 1982.



Length composition of redfish taken as by catch with shrimp off East Greenland in April - May 1983.

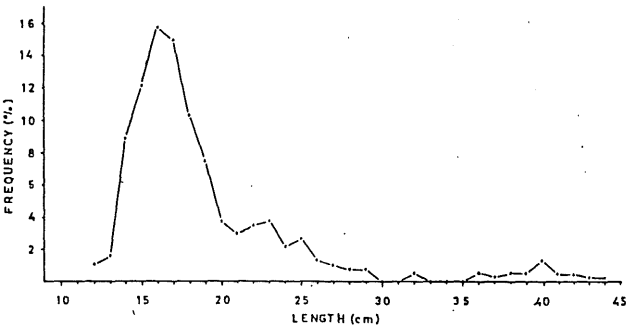
Length composition of red fish taken as by-catch with shrimp off East Greenland in April 1984.



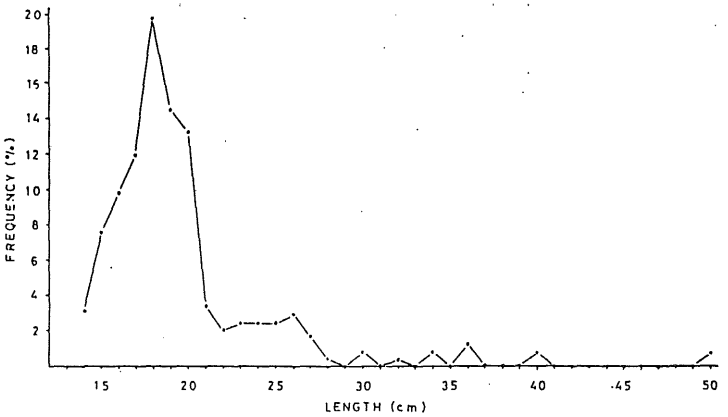
Length composition of redfish taken as by-catch with shrimp off East Greenland November 1987.

cont'd.

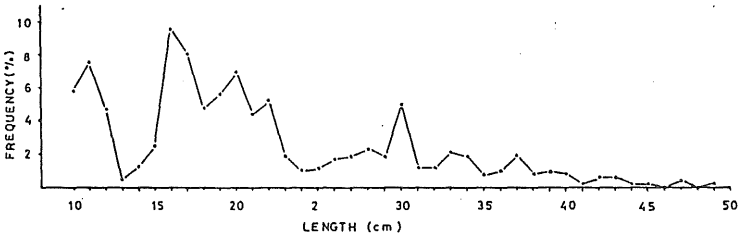
Figure 2.4 cont'd.



Length composition of red fish taken as by-catch with shrimp off East Greenland in March-April 1985.



Length composition of redfish taken as by-catch with shrimp off East Greenland in February-March 1986.



Length composition of red fish taken as by-catch with shrimp off East Greenland in March 1987.

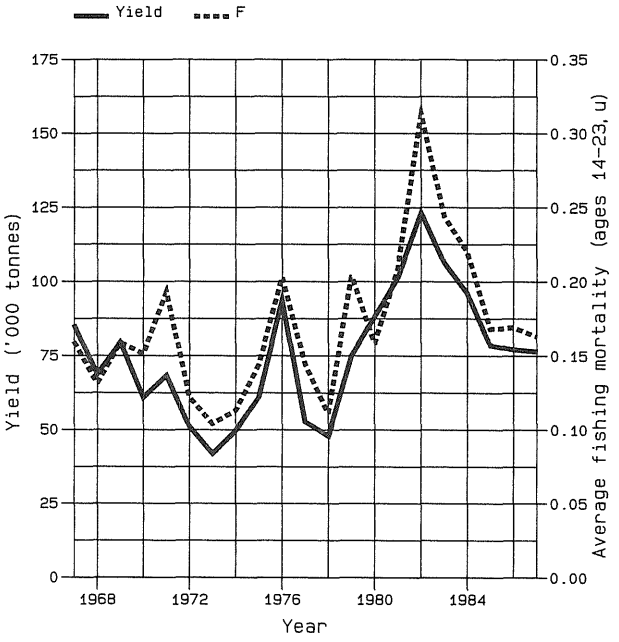
FISH STOCK SUMMARY

Figure 2.5

STOCK: Sebates Marinus in fishing areas V and XIV

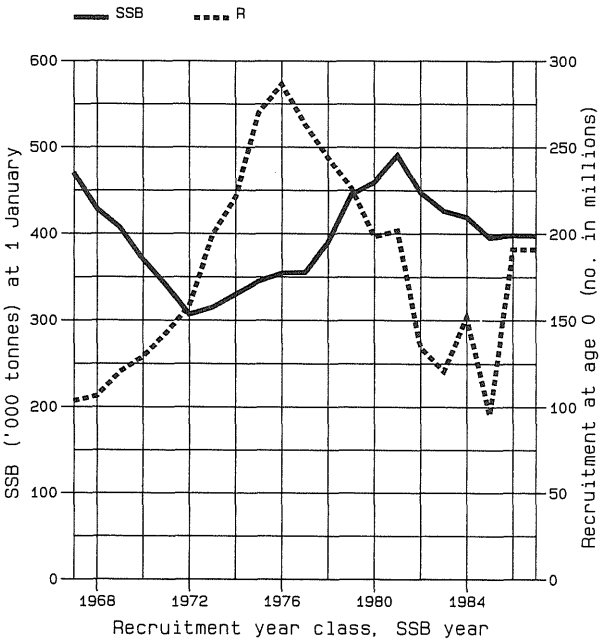
24-10-1988

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

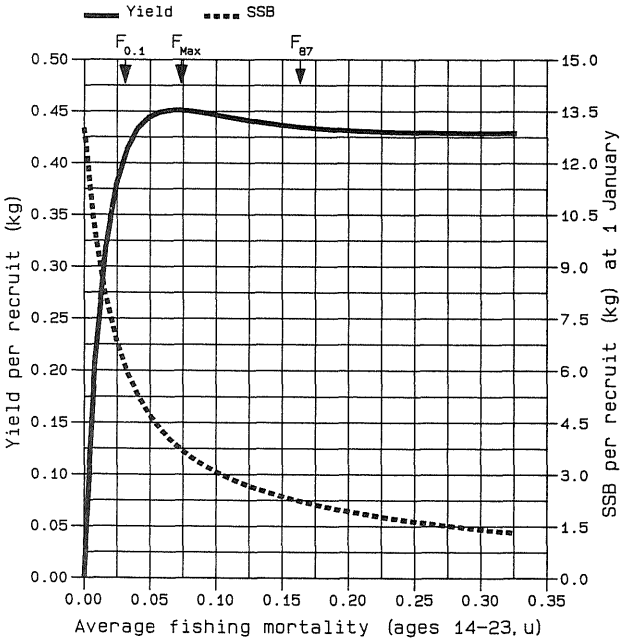
cont'd.

FISH STOCK SUMMARY

Figure 2.5 cont'd. STOCK: Sebates Marinus in fishing areas V and XIV

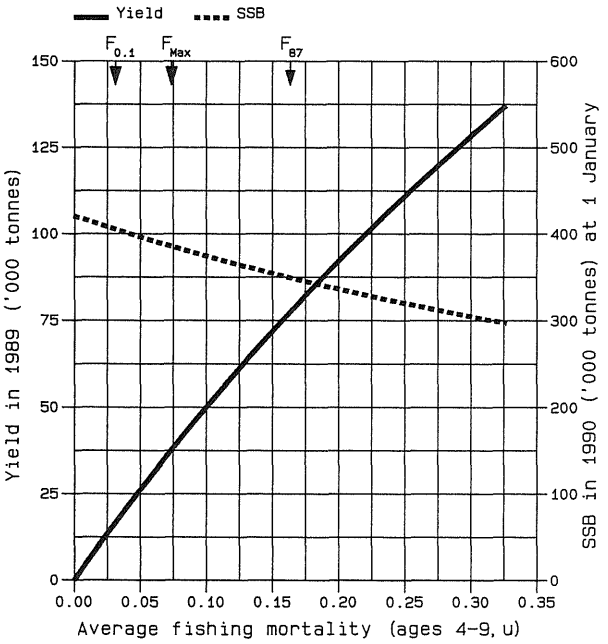
24-10-1988

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass

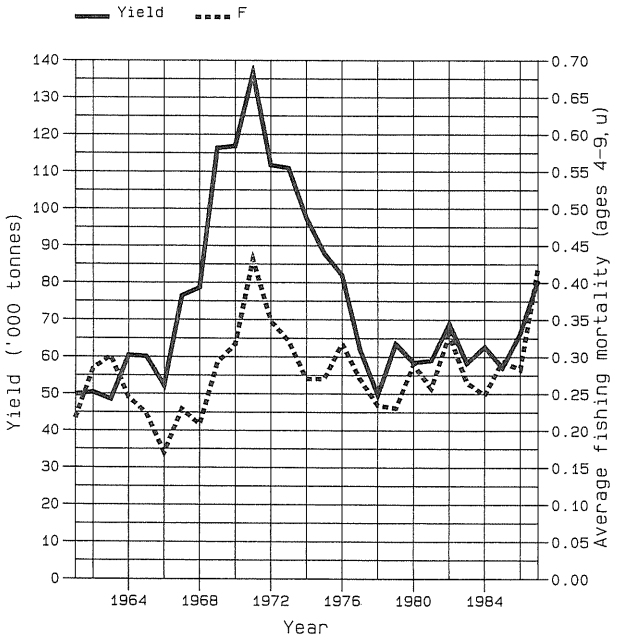


D

Figure 4.1

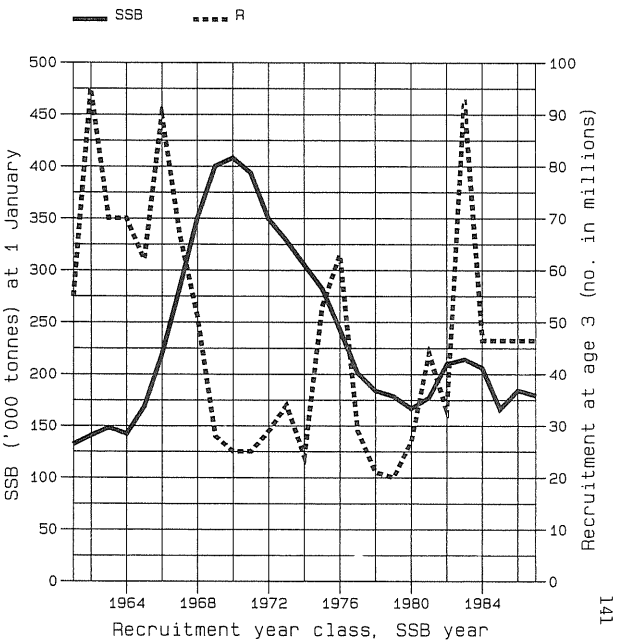
FISH STOCK SUMMARY
STOCK: Icelandic Saithe
23-09-1988

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



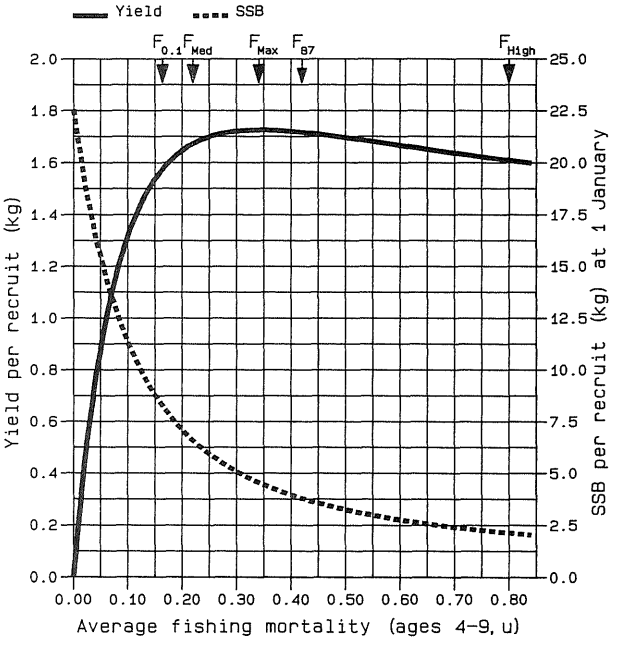
B

cont'd.

Figure 4.1 cont'd.

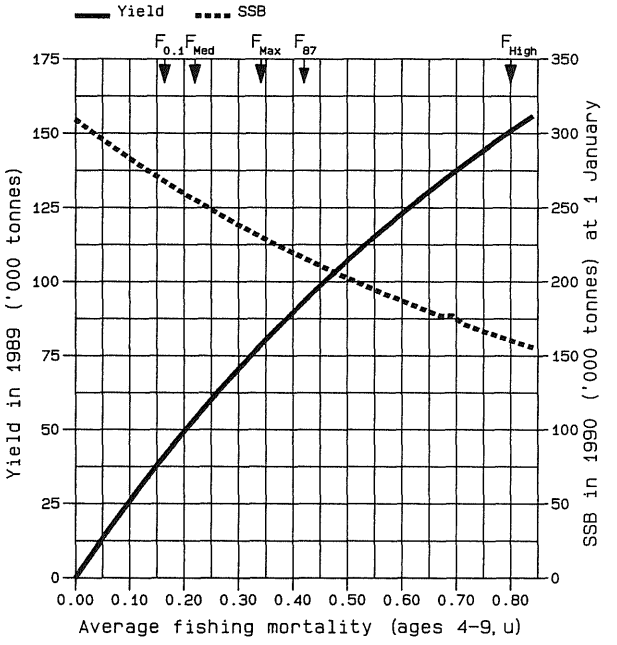
FISH STOCK SUMMARY
STOCK: Icelandic Saithe
23-09-1988

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 4.2 Stock-recruitment relationship for Icelandic saithe.

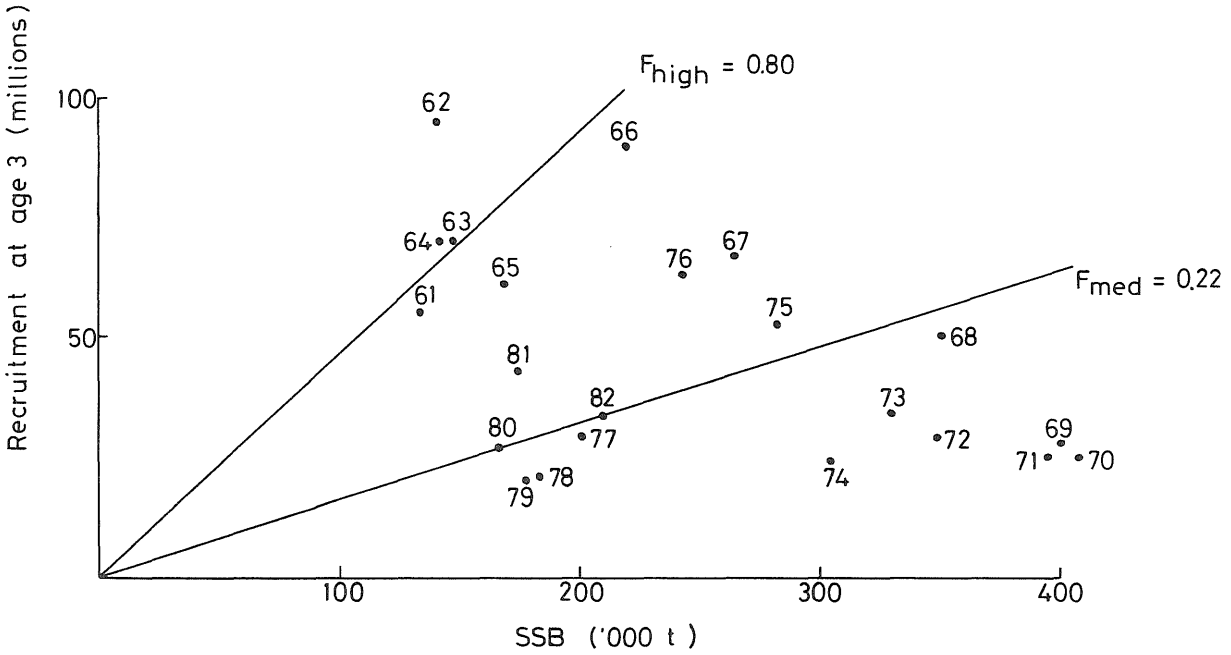


Figure 6.1 Faroe saithe. Selection curves for three mesh sizes.

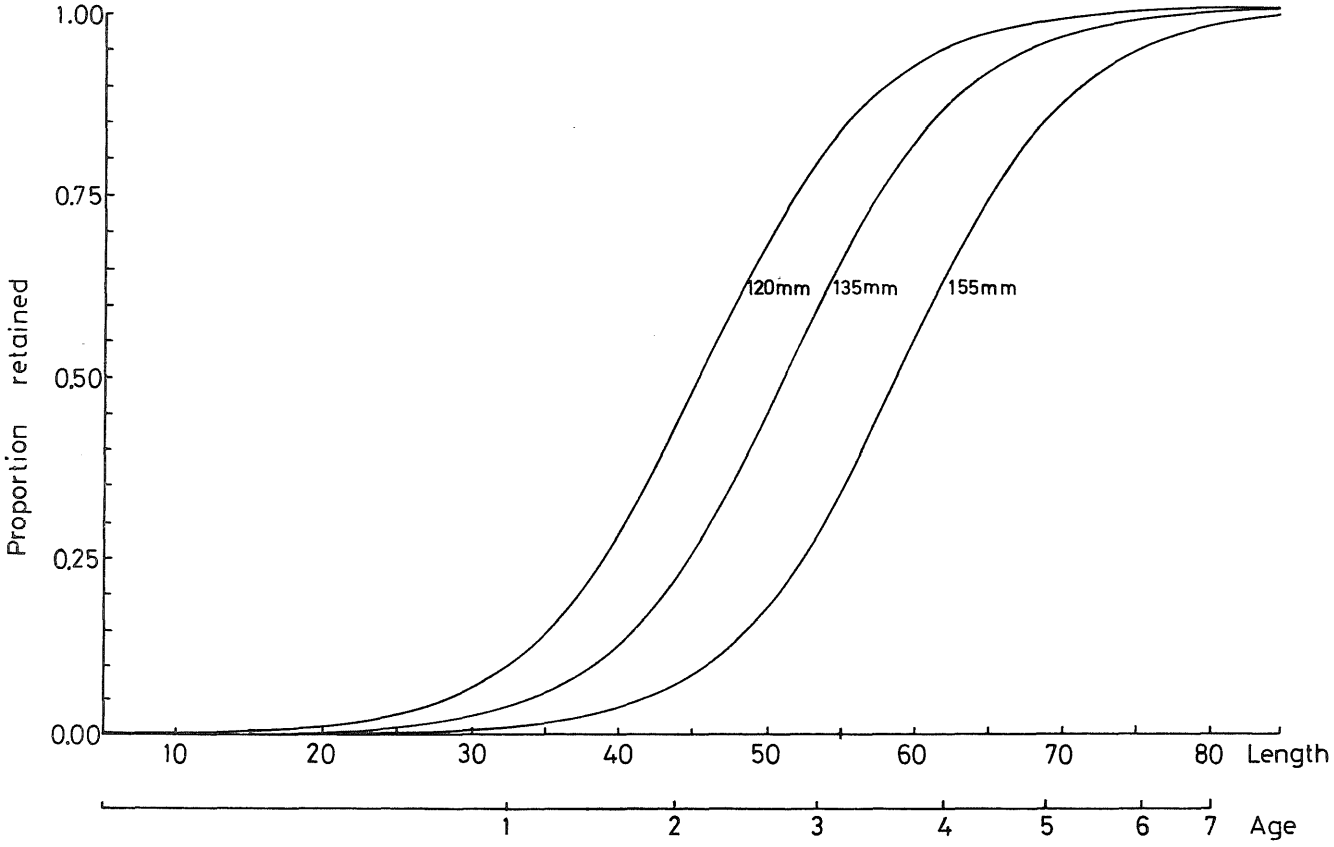
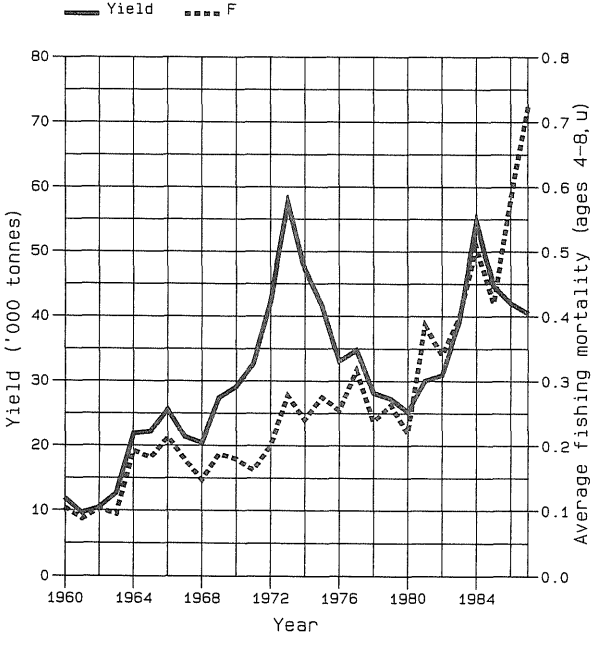


Figure 6.2

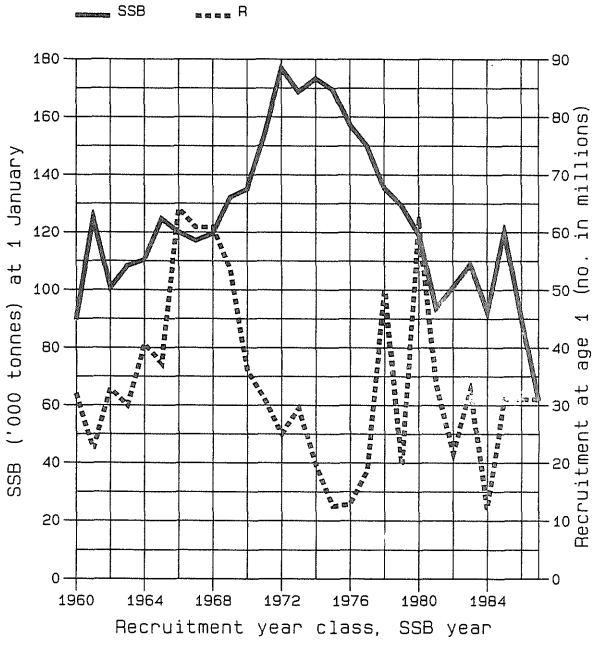
FISH STOCK SUMMARY
STOCK: Faroe Saithe
24-10-1988

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

Figure 7.1 Faroe cod. Selection curves for three mesh sizes.

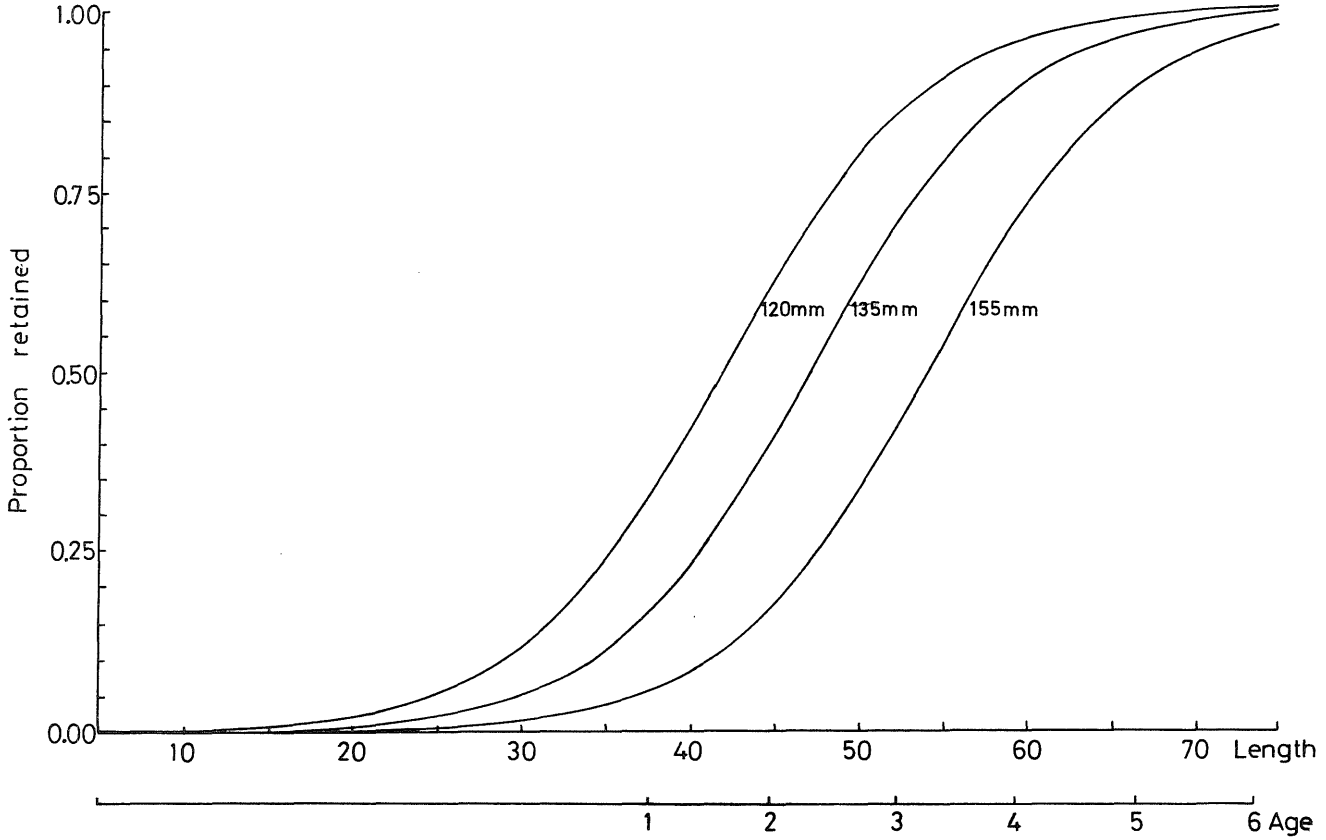
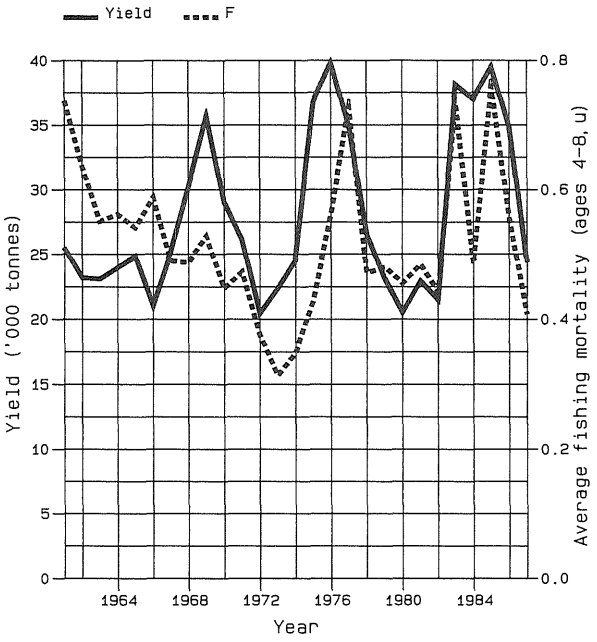


Figure 7.2

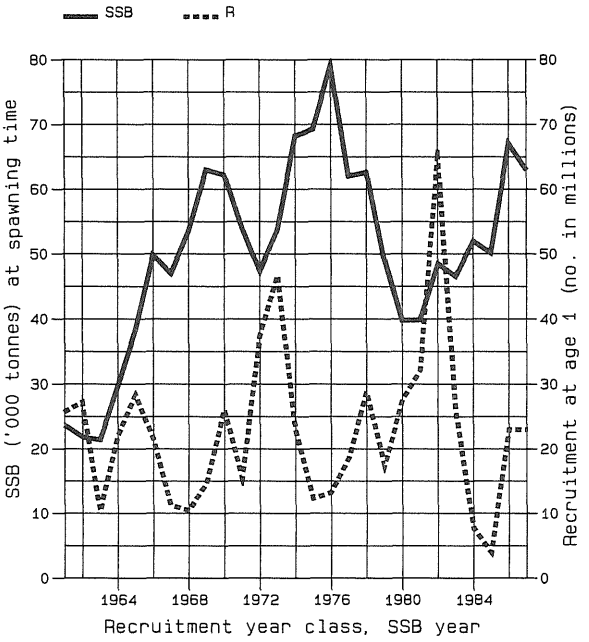
FISH STOCK SUMMARY
STOCK: Cod in the Faroe Plateau
24-10-1988

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



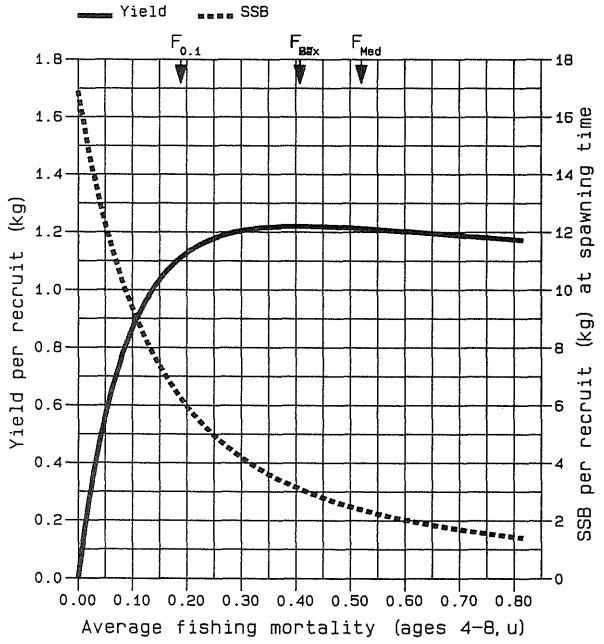
B

cont'd.

Figure 7.2 cont'd.

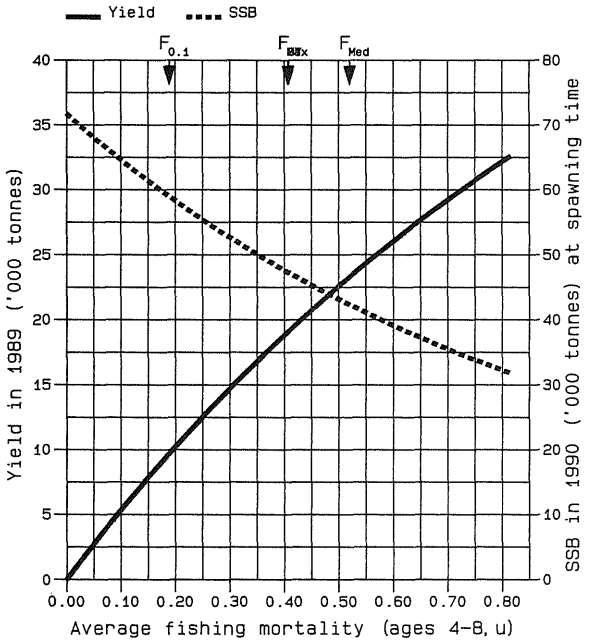
FISH STOCK SUMMARY
STOCK: Cod in the Faroe Plateau
24-10-1988

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 7.3 Faroe Plateau cod. Stock-recruitment relationship.

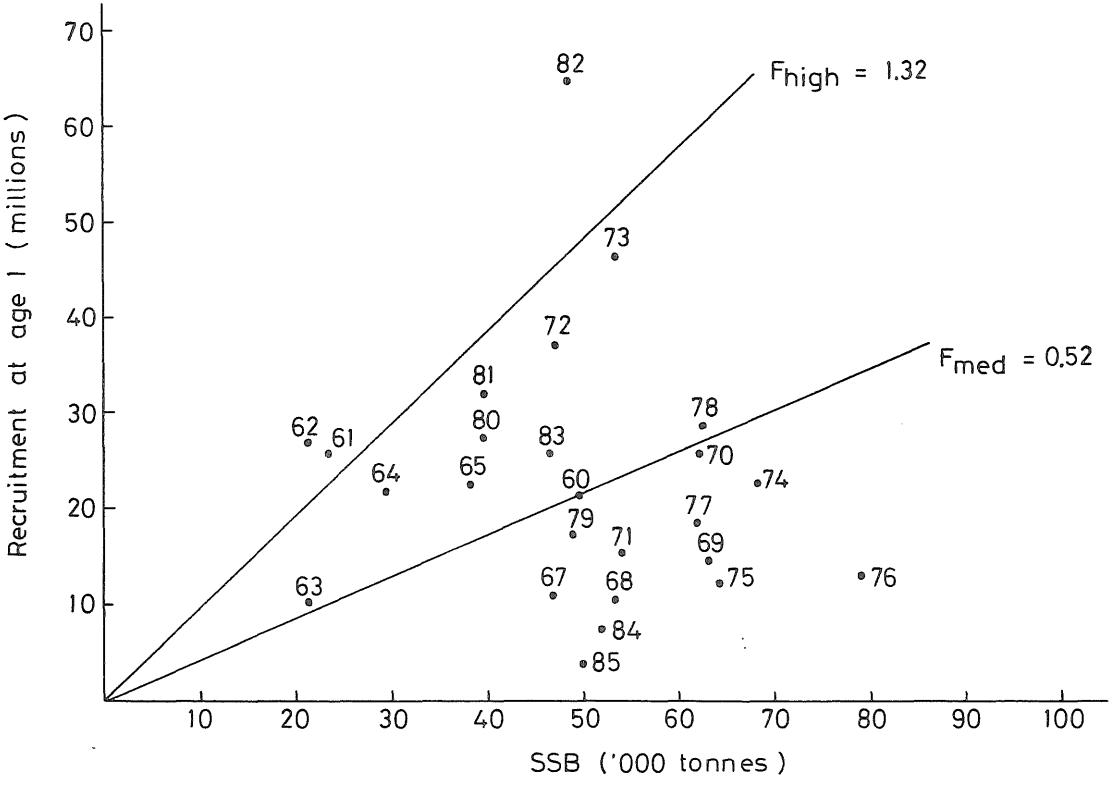


Figure 8.1 Faroe haddock. Selection curves for three mesh sizes.

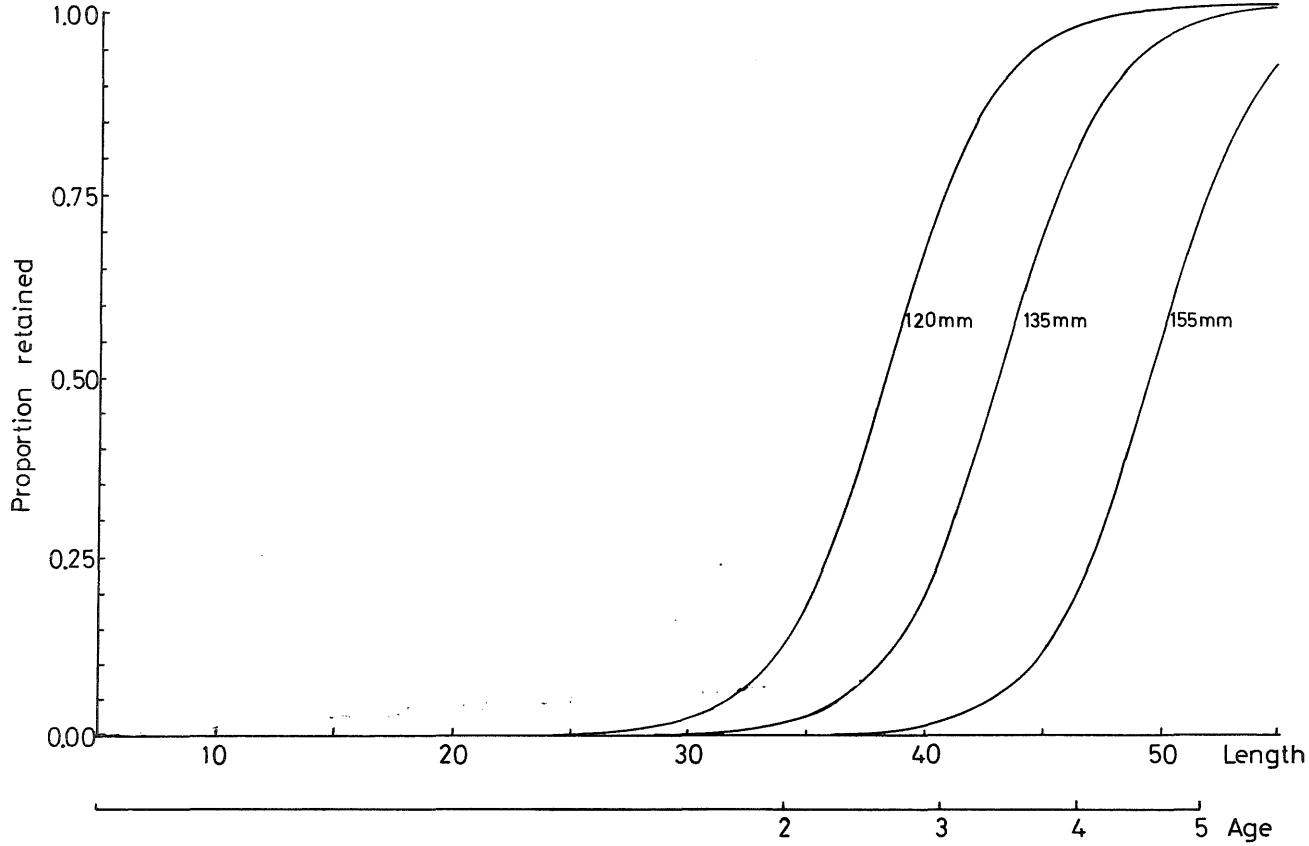
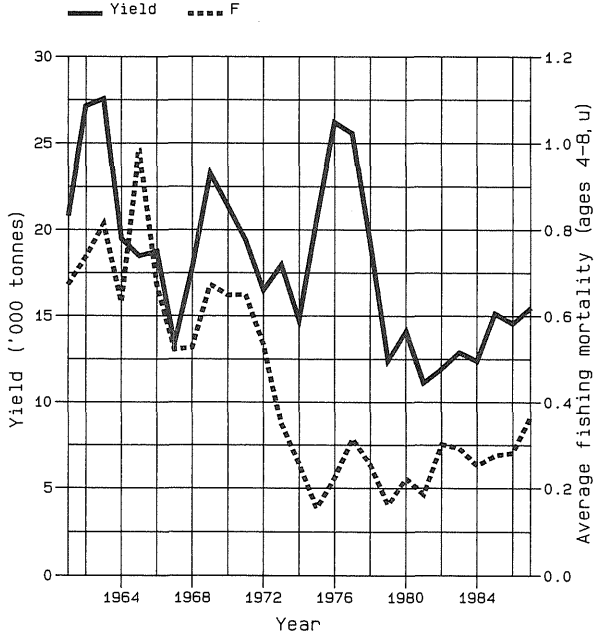


Figure 8.2

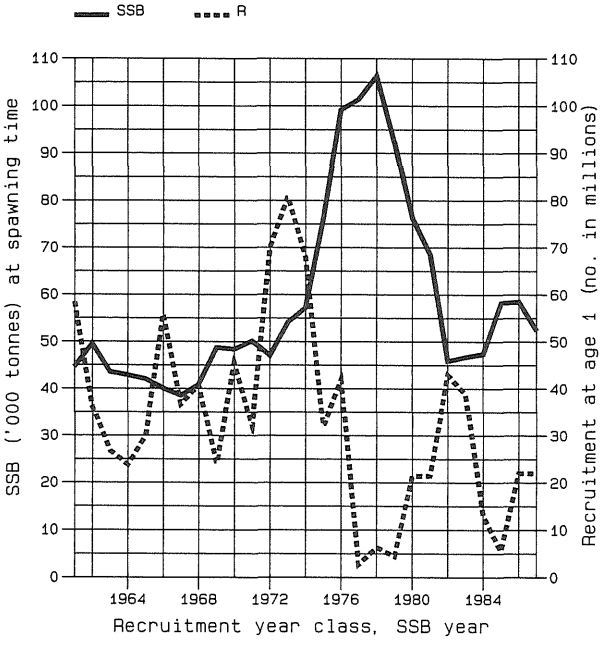
FISH STOCK SUMMARY
STOCK: Haddock in the Faroe Region
24-10-1988

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



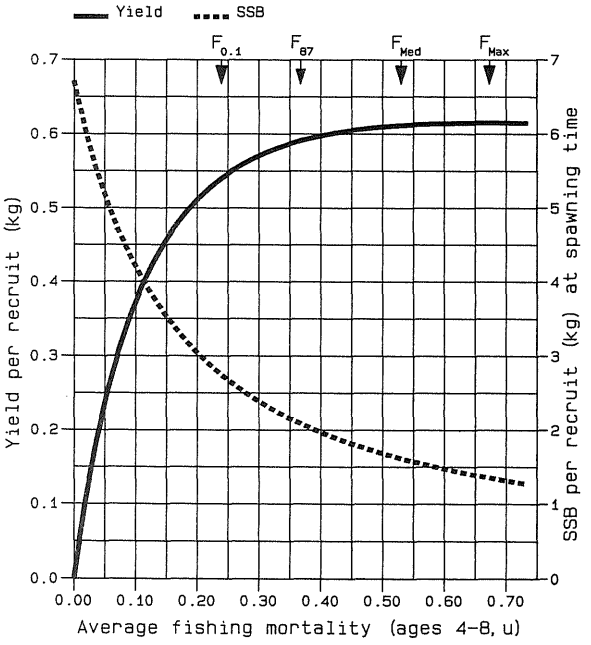
B

cont'd.

Figure 8.2 cont'd.

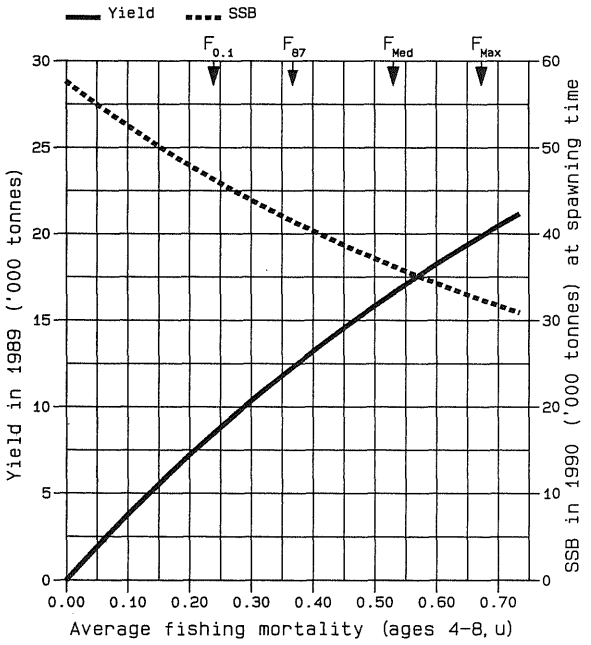
FISH STOCK SUMMARY
STOCK: Haddock in the Faroe Region
24-10-1988

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 8.3 Fare addock. Stock-recruitment relationship.

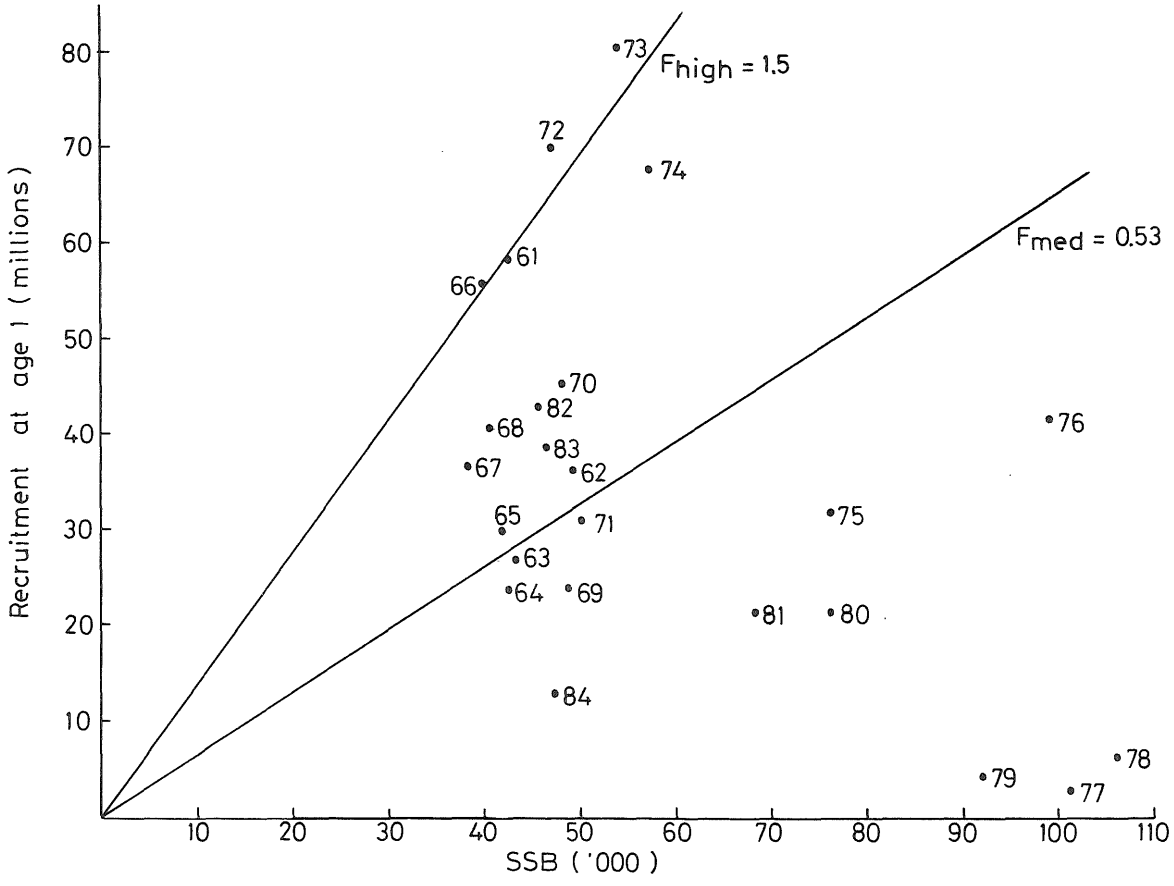
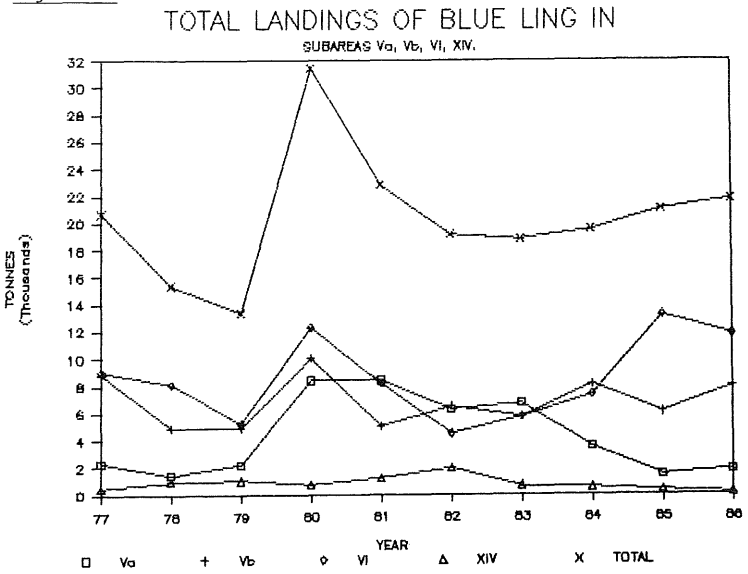


Figure 9.1


TOTAL LANDINGS OF BLUE LING IN
SUBAREAS Va, Vb, VI, XIV.
TONNES (Thousands)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
77
78
79
80
81
82
83
84
85
86
YEAR
Va
Vb
VI
XIV
TOTAL

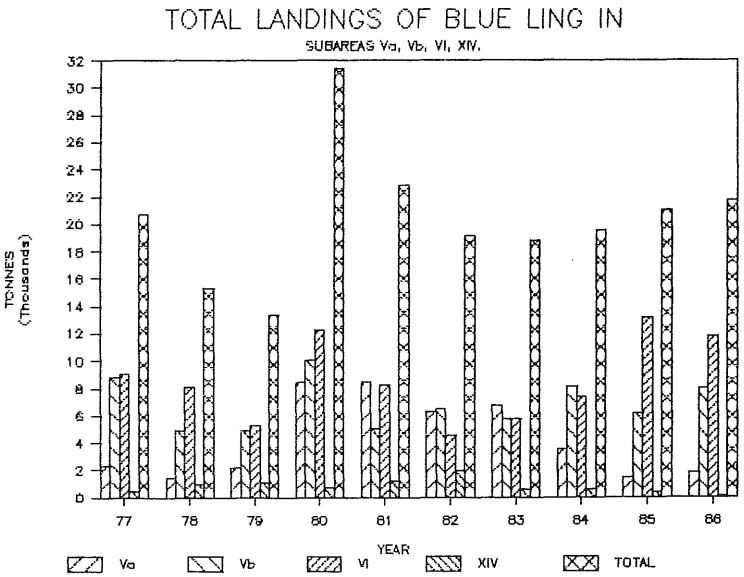
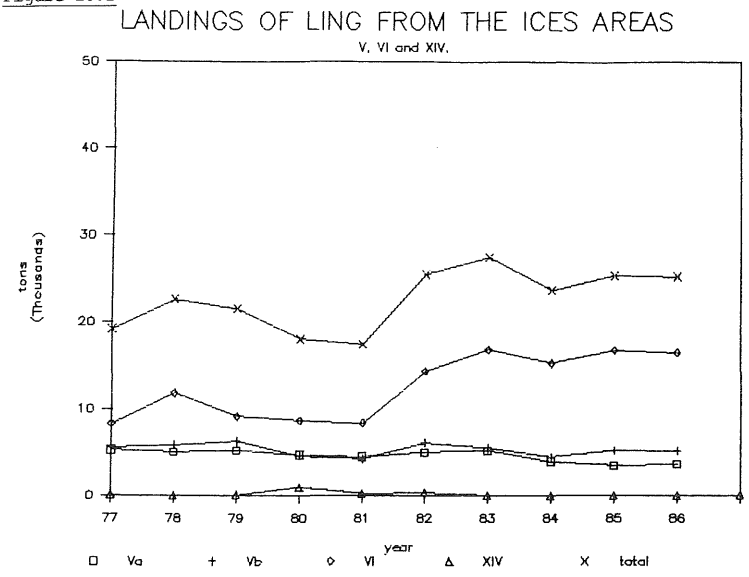

TOTAL LANDINGS OF BLUE LING IN
SUBAREAS Va, Vb, VI, XIV.
TONNES (Thousands)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
77
78
79
80
81
82
83
84
85
86
YEAR
Va
Vb
VI
XIV
TOTAL

Figure 10.1


LANDINGS OF LING FROM THE ICES AREAS
V, VI and XIV.
tons (Thousands)
50
40
30
20
10
0
77
78
79
80
81
82
83
84
85
86
year
Va
Vb
VI
XIV
total

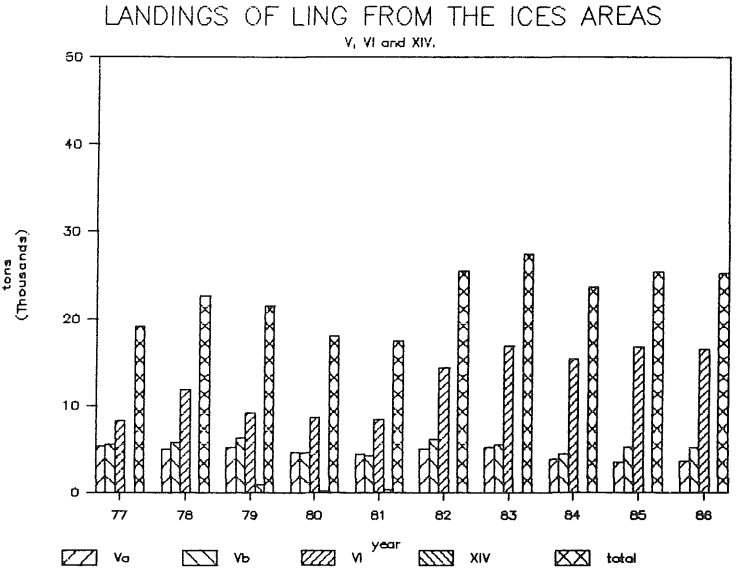
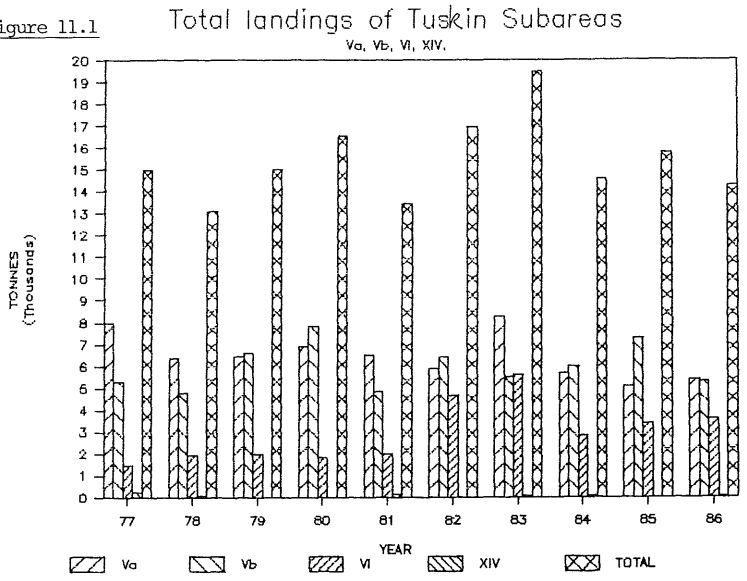

LANDINGS OF LING FROM THE ICES AREAS
V, VI and XIV.
tons (Thousands)
50
40
30
20
10
0
77
78
79
80
81
82
83
84
85
86
year
Va
Vb
VI
XIV
total

Figure 11.1


Total landings of Tuskin Subareas
Va, Vb, VI, XIV.
TONNES (Thousands)
YEAR
77 78 79 80 81 82 83 84 85 86
Va Vb VI XIV TOTAL

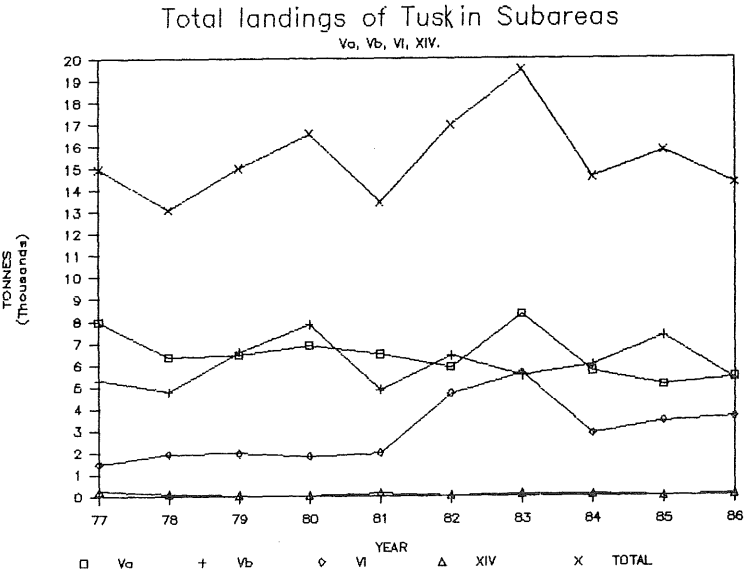

Total landings of Tuskin Subareas
Va, Vb, VI, XIV.
TONNES (Thousands)
YEAR
77 78 79 80 81 82 83 84 85 86
Va Vb VI XIV TOTAL

Figure 12.1 Distribution and density of beaked redfish larvae concentrations in April-May 1981-1987 from ichthyoplankton survey data.

0-10 spec./sq.m (1), 10-25 spec./sq.m (2), 25-30 spec./sq.m (3), over 50 spec./sq.m (4).

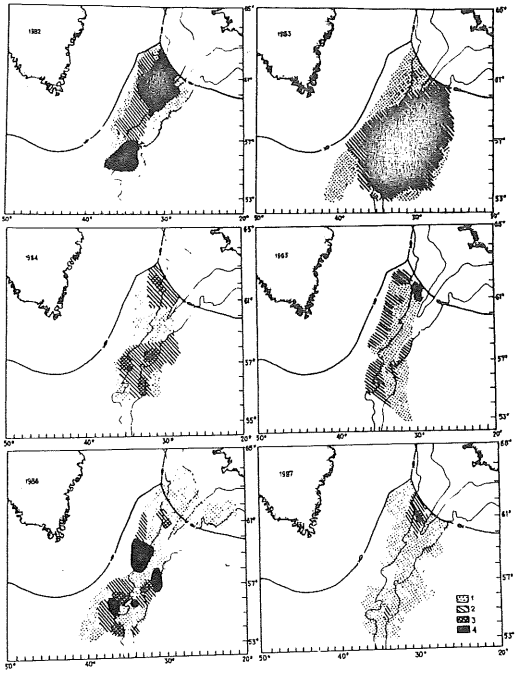


Figure 12.2 Distribution and density of pelagic beaked redfish concentrations from the data of trawl-acoustic surveys in 1982-1987:

1-5 t/sq. mile (1), 5-10 t/sq.mile (2), 10-30 t/sq.mile (3), over 30 t/sq.mile (4).

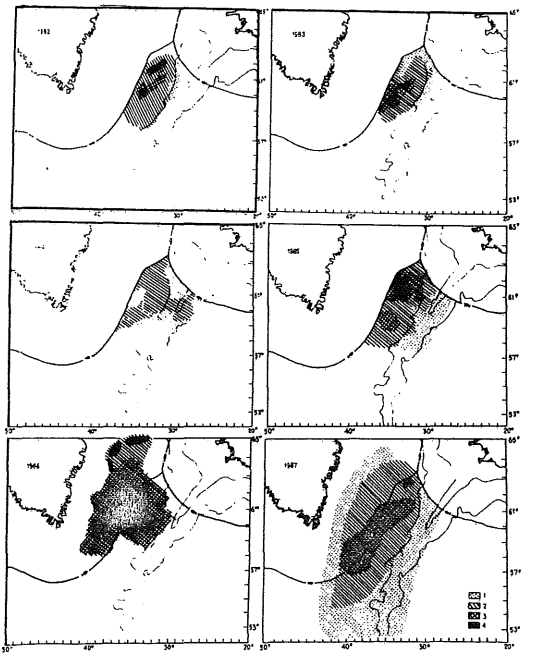


Figure 12.3 Sebastes mentella oceanic-type. Catch curve for the years 1982-1987.