International Council for the Exploration of the Sea

C.M.1990/Assess:20

PART 1

REPORT OF THE NORTH-WESTERN WORKING GROUP

Copenhagen, 1-8 May 1990

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1 INTRODUCTION

1.1 Participants

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The ICES Statistician, Dr R. Grainger, assisted the meeting on the first meeting day.

1.2 Terms of Reference

At the 77th Statutory Meeting it was decided (C.Res.1989/2:4:15) that the North Western Working Group should meet at ICES Headquarters from 1-8 May 1990 to:

a) assess the status of and provide catch options for 1991-1992 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 interaction;

b) provide information on the stock identity, spawning areas and state of exploitation of oceanic-type Sebastes mentella;

c) 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;

d) consider the Report of the Study Group on Oceanic type Sebastes mentella.

The Group has been able to address most of the questions referred to in the terms of reference, however, with variable success. The exceptions are biological and technical interactions. The Working Group is not at present aware of any existing data, which could throw light on the biological interactions in the three main areas off Greenland, Iceland, and the Faroes. There are data available for analysis of technical interaction, and the Group had at this meeting some data broken down by fleet.

1.3 Timing of Meeting and Participation

The Group noted with regret once again that French scientists did not have the possibility to attend the meeting. The Group, however, expressed its appreciation of 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 of achieving results, especially as regards blue ling.

1.4 Management Considerations

The Group has not much to add to the statements made in its first Report (Anon., 1987). The Group took note of the fact that since 1 January 1989, legal mesh sizes inside the Icelandic and Faroese fishery zones have been the same, i.e., 155 mm. It is, however, the general feeling that the increase in legal mesh size in the Faroes has not had any measurable effect because the fishing fleet responded by changing the shape of the cod-end. The design of the cod-end has now been determined precisely in an Executive Order, passed by the Home Government, and will enter into force 1 June 1990.

No new data were presented on the conflict between the prawn fisheries and the redfish fisheries. NAFO has been asked to supply more data from the prawn fisheries.

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 the tuning of the VPA based on the catch-at-age data and survey and/or effort data. Mostly only one set of fleet and/or survey data was available for each stock. With an estimate of the level of exploitation from the tuning, a separable VPA was started and the results were 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 VPA have been carried on into the predictions. The fishing mortality at age arrays given in the report are from the separable version, and the stock in numbers at age from the terminal population version.

No attempt to use indices of recruitment for any of the stocks, using the programs available at ICES Headquarters, has succeeded so far. 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.

2 REDFISH IN SUB-AREAS V, XIV, and XII

2.1 Landings and Trends in the Fisheries (Tables 2.1-2.3)

The total catch from the Irminger Sea redfish stock complex reached its highest level on record in 1986 with some 228,000 t. The catch declined to about 205,000 t in 1987, increased again to about 212,000 t in 1988, but dropped to 144,000 t in 1989, which is about 64,000 t below the average for the 5-year period from 1984-1988. The catches based on the oceanic-type *S. mentella* reached their maximum with 105,000 t in 1986 but have declined to about 91,000 t in 1987 and 1988, and to approximately 37,000 t in 1989. (For more information on oceanic-type *S. mentella* see Section 12.)

The total catch of redfish, excluding catch figures from the "oceanic" fishery, were somewhat higher in 1988 (120,300 t) than in 1987 (114,000 t), i.e., an increase of about 6%. But in 1989 the catches decreased to about 107,000 t, i.e., an 11% decrease.

The catches in Division Va increased about 6,000 t in 1988 but decreased about 4,000 t in 1989. In Division Vb, the catches decreased about 2,000 t in 1988, and about 600 t in 1989. In Sub-area XIV, the catches (excluding the oceanic-type S. mentella) increased about 2,000 t in 1988 but decreased about 7,000 t in 1989.

In Division Va (Iceland) (Table 2.1), the Icelandic fleet increased its fishing effort in 1988 compared to 1987, but it decreased in 1989 while the catch per unit effort was the same in both years but slightly lower than in 1987. The Icelandic catch thus increased from about 88,000 t in 1987 to 94,000 t and 89,000 t in 1988 and 1989, respectively.

In Division Vb (Faroes) (Table 2.2), the catches have decreased from about 21,000 t in 1986 to about 15,000 t in 1989. The decrease in the catches is due to a decrease in the catches by the Federal Republic of Germany fleet from 5,142 t in 1986 to 1,191 t in 1989 (about 4,000 t) and a decrease in the Faroese catches from 15,224 t in 1986 to 12,728 t in 1989 (about 2,500 t).

In Sub-area XIV (East Greenland) (Table 2.3A), the total catch (excluding the oceanic-type S. mentella) increased from 8,000 t in 1987 to 10,000 t in 1988, but declined to 2,700 t in 1989. The catches taken by the Federal Republic of Germany increased from 4,691 t in 1987 to 5,700 t in 1988 but decreased to 2,400 t in 1989, whereas the catches of the Japanese fleet (reported by Greenland) increased from 2,900 t in 1987 to 3,700 t in 1988 but decreased to 285 t in 1989. 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 12.1). The catches amounted to 90,787 t in 1987, 91,419 t in 1988, and declined to 37,183 t in 1989.

2.2 Effort Data (Table 2.4)

Effort data for the Icelandic fisheries were available for the period 1977-1989 (Table 2.4). These data are "redfish" effort data not split by species. In previous assessments, the Working Group used these data to calculate the total international effort on S. marinus only. In the present assessment, the Working Group decided to use the Icelandic CPUE data to calculate the total international effort on redfish (the oceanic stock excluded). This procedure was considered more suitable. From 1979 to 1983, there was an increase in the effort in the international redfish fishery with a maximum of 171,000 hours in 1983. International effort has decreased since 1983 to the 1977 level of about 99,000 hours.

The CPUE in Division Va was stable from 1979-1982 at the 1.160 kg/hr (average). The CPUE then declined to 959 kg/hr in 1984, and has since then increased to 1.072 kg/hr in 1987. In 1988 and 1989 the CPUE was 1.059 kg/hr.

2.3 Redfish Landings

2.3.1 The species split (Tables 2.5-2.7)

In Division Va (Table 2.5), the Icelandic catch was allocated to S. marinus and S. mentella in the proportion of 84.8% and 15.2% in 1988 and 64.9% and 35.1% in 1989, 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 (1988 and 1989).

In Division Vb (Table 2.6), the Faroese catches were allocated to S. marinus and S. mentella in the proportion of 38.1% and 61.9% in 1988 and 32.1% and 67.9% in 1989. The Federal Republic of Germany catch in both years was almost completely S. mentella. The allocation to species both for the Faroese and Federal Republic of Germany catches were based on observations of the landings and the type of vessels fishing redfish.

The French catches were allocated to S. mentella in both years in accordance with the nature of their fisheries.

In Sub-area XIV (Table 2.7), the catch of the Federal Republic of Germany was allocated to S. marinus and S. mentella in the proportion of 15.6% and 84.4% in 1988 and 14.4% and 85.6% in 1989. These figures are based on observations on the landings. The Greenland catch (Japanese vessels) were both years allocated to S. marinus and S. mentalla in the same proportion as the catch of the Federal Republic of Germany. The Faroese catches were allocated to S. marinus in both years.

2.3.2 By-catch of small redfish in the Denmark Strait's shrimp fishery

Apart from information about a shrimp trawl survey conducted in August-September 1989 by Greenland, no new information on the by-catch of small redfish has been obtained. The survey was carried out on the main fishing grounds in the Denmark Strait, and gave small shrimp catches with little by-catch of redfish (Kanneworff, pers. comm.). The trawl surveys in 1988 and 1989 undertaken 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, in 1990, a part of the "redfish box" (south of 66^0N and east of 33^0 10'W) has been opened to the shrimp fishery for one month (May).

2.4 Sebastes marinus

2.4.1 Age composition of catches (Table 2.8)

For 1988 and 1989, numbers at length were available from Iceland for Division Va, but no new numbers at age were provided. Numbers at length and age were available from the Federal Republic of Germany for both years from Sub-area XIV. Age composition data for Division Vb were not available.

Division Va

The average age at length for the years 1983-1987 was used to calculate the catch in numbers for the Icelandic catches in 1988 and 1989. The catches of Belgium, Faroes, and Norway were broken down in the same way as the Icelandic catches in 1988 and 1989.

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 from 1988 were used to calculate the catch in numbers for both years and also for the Faroese and Greenland catches in 1988 and 1989.

2.4.2 Weight at age (Table 2.9)

For 1988 and 1989, only Icelandic weight-at-age data were available. As the Icelandic catches dominate the total landings, these data were used for the total landings for calculation of the SOP.

The SOP check showed a deviation of 3% in 1988 and 1% in 1989.

2.4.3 Maturity

Maturity data were only available from Iceland. No pronounced differences could be seen from the average maturity for the years 1983-1987. The average maturity was, therefore, used in the assessment.

2.4.4 Estimates of fishing mortality (Tables 2.10 - 2.12)

The total international effort on redfish (Section 2.2) was used for tuning. Despite the fact that there were data for only one fleet, the hybrid method (explanatory variate "time") was used because of trends in effort and catches with time. A mean F of 0.163 was calculated for ages 14-21 (Table 2.10). This value was taken as the terminal F on age 14 (starting age of a range of age groups with relatively high catches), and a separable VPA was started followed by a conventional VPA (Tables 2.11-2.12).

2.4.5 Stock biomass (Table 2.13)

The results of the VPA are shown in Table 2.13. The Working Group discussed the results at length and decided not to accept the VPA, because the VPA did not converge. Also, the terminal F-values produced by both the tuning and the separable VPA were so low that the VPA is likely to give unrealiable results.

2.4.6 Catch predictions

As a consequence of the failed VPA, no catch predictions could be made on that basis. However, the Working Group felt that a precautionary TAC should be set for this stock, i.e., based on historical catch levels.

The mean annual catch in Divisions Va,b and in Sub-area XIV for the period 1980-1989 was 90,300 t.

2.4.7 Recruitment (Table 2.14)

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 ten-year period 1975-1984, the index was below average, particularly in 1976 and from 1979-1984. Values were high in 1985, 1987, and 1988, whereas the 1986 and 1989 indexes were slightly below average, indicating good recruitment after a period of poor recruitment.

2.5 Sebastes mentella

2.5.1 Age composition of the catches (Table 2.15)

For 1988 and 1989, only numbers at length were available from Iceland for Division Va. Age/length keys were available from the Federal Republic of Germany for 1988 and 1989 for Division Vb and Sub-area XIV.

Division Va

Only Icelandic catches were taken in 1988 and 1989. The average age at length for the years 1983-1987 was used to calculate the catch in numbers in 1988 and 1989.

Division Vb

Catches from Denmark (in 1988), Faroes, Federal Republic of Germany, France, and Norway were split using 1988 and 1989 data from the Federal Republic of Germany.

Sub-area XIV

The Federal Republic of Germany data from 1988 were used to calculate the catch in numbers to split the catches in 1988 and 1989 from Greenland, Faroes, Federal Republic of Germany, and United Kingdom.

2.5.2 Weight at age (Table 2.16)

Only Icelandic weight-at-age data were available, and they indicate that after a slight increases in the weight at age in the period 1985, the values have decreased again. Despite the fact, that a considerable part of the *S. mentella* is taken in Sub-area XIV and Division Vb, the Icelandic values had to be taken for calculation of the SOP.

The SOP check showed a deviation of 4% in 1988 and 7% in 1989.

2.5.3 Estimates of fishing mortality (Tables 2.17-2.19)

The total international effort on redfish (Section 2.2) was used for tuning. The hybrid method was used (see Section 2.4.4) to give a terminal F for the SVPA , despite the fact that there was some noise in the data for some age groups. A mean F of 0.159 was calculated for ages 18-22 (Table 2.17), and a separable VPA was

started followed by a conventional VPA (Tables 2.18-2.19).

2.5.4 Spawning stock biomass (Table 2.20)

As in the case of S. marinus, the Group did not accept the VPA, because it did not converge, and there are problems with the VPA method with such low F values.

2.5.5 Catch predictions

As a consequence of the failed VPA, no catch predictions could be made on that basis. However, the Group felt, that a precautionary TAC should be set for this stock, i.e., based on historical catch levels.

The mean annual catch of S. mentella in Divisions Va and Vb and Sub-area XIV for the period 1980-1989 was 41,780 t.

3 GREENLAND HALIBUT IN SUB-AREAS V and 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 1980-1989 (Tables 3.1-3.4). During the period 1980-1986, the catches were stable at about 31,000-34,000 t, except for 1981 when the catch was markedly lower, 19,239 t, due to ice partly covering the main fishing grounds in April-May. There was a sudden increase in total catch from 32,991 t in 1986 to 46,623 t in 1987. Since then the catch increased to about 51,000 t in 1988 and to about 63,000 t in 1989 (Table 3.5).

3.2 Effort Data (Table 3.8)

Estimates of CPUE from the Icelandic trawler fleet in the period 1980-1989 are presented in Table 3.8. These indices are estimated using the NAG-statistical package. The model takes into account the effects due to ship, statistical square, month and year, and provides a yearly CPUE index, which is then used to estimate the total effort. All hauls with a catch of Greenland halibut exceeding 80% of total catch in each trawl were included in estimating the CPUE indices shown in Table 3.8. The data are quite extensive and the Icelandic trawler fleet takes the bulk of the catch each year.

3.3 Catch at Age (Table 3.5)

The catch in numbers for each age were updated according to the final catch figures for the years 1988-1989. Catch at age for these years was estimated using the Icelandic catch-at-age estimates raised to the total 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 1988-1989 were used in the catch predictions.

3.5 Maturity at Age (Table 3.7)

The maturity at age for the years 1985-1989 was estimated by averaging data from the years 1982-1984.

3.6 Assessments and Predictions

3.6.1 Estimates of fishing mortalities (Tables 3.9-3.11 and Figure 3.1A)

Natural mortality was assumed to be 0.15. Estimates of total effort from Table 3.8 were used to tune the VPA, the results are shown in Table 3.9. As expected, the sigma on age 5 is very high, probably due to errors in sampling. All the other sigmas are low, especially for ages 8-10. These are usually the most numerous age classes in the catch (Table 3.5).

The tuning gives an average F level of 0.81 for the ages 8-13. This F level was used as an input in the separable VPA for age 10. A selection value of 1 was used for age 15, and in this run full weight was given to all years 1980-1989. The separable VPA seems to behave nicely as can be seen in Table 3.10. The matrix of residuals does not show any large values except for the youngest (5-6) and the oldest ages (14-15), and for ages 6-7 and 7-8 in the years 1987-1988. Nevertheless, the Working Group decided to present the results including these ages.

The separable F-at-age array is presented in Table 3.11A, and the population estimate from the terminal population version in Table 3.12. These results were then used to start the prediction.

3.6.2 Spawning stock biomass and recruitment (Table 3.12 and Figure 3.1B)

The assessment shows a stable spawning stock of 70,000 - 80,000 t in the years 1980-1985. In 1986, it increases to 93,000 t and reaches a maximum in 1988 of 105,000 t, decreasing to 100,000 t in 1989.

The recruitment shows a decrease from 1980-1983 from 39 million to about 23 million. Then the recruitment starts to increase again, and in 1986 and 1987 the recruitment is exceptionally good. In spite of some doubts about these estimates, especially in 1987, the Group decided to use these in the prediction. The recruitment in 1986 was probably very good. Data from yearly surveys in Icelandic waters for the period 1985-1990 show a peak in the length frequencies in the years 1985 and 1986 slightly below the length interval where the fish becomes fishable. It should be mentioned that these surveys do not cover the whole distribution area for Greenland halibut in Icelandic waters.

3.6.3 Catch predictions (Table 3.13-3.14 and Figures 3.1C and D)

The input data for the predictions are shown in Table 3.13. The Group decided to use the mean for the years 1980-1984 as an estimate of yearly recruitment. It was felt that including later years would give too optimistic estimates of recruitment. For the year 1990, the TAC of Greenland halibut is 45,000 t. It is impossible to give any likely estimate of this year's catch, since the fishery started shortly before the meeting of the Group. In the prediction it was decided to estimate a catch of 50,000 t in

1990, a little higher than the TAC already set. The reason is that in the last few years, this species has become in very important for the trawler fleet. The pressure on the stock will be very hard in 1990 and, therefore, it is unlikely that it will be possible to reduce the catch from about 63,000 to 45,000 t in one year.

Table 3.14 shows the results of the prediction. In the beginning of 1991, the total stock is estimated to be about 243,000 t and the spawning stock at about 90,000 t in 1991. To maintain the spawning stock biomass, the catch must be reduced to below 40,000 t. In spite of exceptionally high recruitment in recent years, the continuation of the present level of fishing mortality will lead to a drastic decline in the spawning stock biomass.

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 1978, landings have been fluctuating without a trend between 50,000 and 80,000 t. In 1989, the total landings amounted to about 82,000 t, of which 98% were taken by Iceland.

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 obtain a criterion which would define 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 1987 to account for revised total landings in that year. For 1988 and 1989, 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 1988 and 1989 (Table 4.4).

For both catch predictions and stock biomass calculations, the mean weights at age were averaged over the 1987 to 1989 period (Table 4.10).

4.5 Maturity at Age (Table 4.5)

Maturity-at-age data were available for the Icelandic catch in 1988 and 1989. For the spawning biomass projections, average values for the 1987-1989 period was used(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 0.41 as an input at age 6 and a selection value of S = 1 for age 13 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 terminal population version of the separable VPA was used to start an ordinary VPA. The results of this VPA are given in Tables 4.8 and 4.9 and Figures 4.1A and B.

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 1983. In 1985-1987 the spawning stock biomass was at the level of 170,000 - 190,00 t, but declined in 1988 and 1989 to 135,000 and 132,000 t, respectively.

Estimates of recruitment at age 3 are plotted in Figure 4.1B. Recruitment has fluctuated in recent years without any clear trend. The 1983 and 1984 year classes are well above the 1961-1985 long-term average (47 million). As no information is available for the younger year classes, the 1985-1989 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} = 0.44, the reference values for F_{max} and $F_{0.1}$ are 0.36 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} = 0.24 and F_{high} = 0.64 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. It is assumed that the agreed TAC of 90,000 will be taken in 1990. Based on these landings, options for 1991 and 1992 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)

Table 5.1 gives data on effort and yield for the Faroese fleet categories fishing for saithe, cod, and haddock. This is an update of a table given in the last Report of the Group. This year, a more detailed effort data set has been established for an important part of the fleet fishing for saithe. This data set is given in Table 5.2.

5.2 Research Vessel Surveys (Table 5.3 and 5.4)

Data from research vessels given in the last Report from the Group have been updated in Tables 5.3-5.4.

6 FAROE SAITHE

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

Since the record year of 1984, catches of saithe in the Faroe area, in spite of an increase in effort, decreased to around 40,000 t in 1986 and 1987, and have again increased to around 45,000 t in 1988 and 1989. No precise catch figures are available for the first months of 1990, but preliminary information indicates a decrease in catches in the spawning fishery from 1989 to 1990.

6.2 Catch at Age (Table 6.2)

Catch in numbers at age for 1986 and 1987 were revised according to final catch figures. Catch in number at age for 1988 and 1989 were 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. The bulk of the catches is made up of 4-6-year-old fish. In the first part of the 1980s, ages 7 and older constituted a major part of the catches in numbers (1980, 42 %), whereas in 1989 this part was only 4%.

6.3 Weight at Age in the Catch (Table 6.3)

The trend of decreasing weight at age in the catches of Faroe saithe levelled out in 1988 and 1989, and mean weights seem now to have stabilized at a lower level than in the first part of the 1980s. The sum of products discrepancy was 1% and 3% for the years 1988 and 1989, respectively.

6.4 Assessment and Predictions

6.4.1 Estimates of fishing mortality (Tables 6.4, 6.5, 6.6, and Figure 6.1A)

The groundfish survey cannot be used for tuning of 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.

This year a series of effort data (Table 5.2) has been established for a group of pair trawlers, which have specialised in fishing for saithe. The group consists of vessels of the same

size and horse power and accounts for a major part of effort in the pair trawler category of over 1,000 HP. Catch-age-data for this fleet component were available and were used in the tuning.

The estimates of fishing mortality derived from tuning with the effort series are presented in Table 6.4. It is seen that the tuning gives rather sensible results all the age groups and estimates the level of fishing mortality for age groups 4 to 8 at 0.57. This is 0.1 higher than the assessment in 1988.

A separable VPA with F = 0.47 for age group 5 and S = 1 was then run and resulted in the average level of mortality indicated by the tuning. The fishing mortality matrix from the separable version of that run is presented in Table 6.6A, and the extended analysis in Table 6.6B.

It was agreed to use the estimate in the prediction.

6.4.2 Population estimates (Tables 6.7 and Figure 6.1B)

The stock size in numbers and stock biomass as estimated in the terminal populations run of the separable VPA is given in Table 6.7. There was a slight increase in spawning stock biomass in 1988, because the above-average 1983 year class reached maturity. In 1989, however, there was again a decrease to the lowest level on record. There are no indices of recruitment available for saithe in the Faroe area.

6.4.3 Catch predictions (Tables 6.8 and 6.9 and Figures 6.1C and D)

As described in section 1.4, the Faroese Home Government passed legislation which, from 1 January 1989, increased the legal mesh in the cod end of all demersal trawls from 135 mm to 155 mm. The effect of this change is assumed to have been estimated by the separable analysis and is not measurably different from the former exploitation pattern. The input data for prediction are given in Table 6.8, and the catch option Table 6.9. With unchanged exploitation level and assuming average recruitment for the 1988 and subsequent year classes, the yield predicted from the Faroe Plateau in 1990, 1991, and 1992 are 35,000, 31,000, and 29,000 t, respectively.

7 FAROE COD

7.1 Landings and trends in the fishery (Tables 7.1, 7.2, and Figure 7.1A)

The decrease in landings of cod from both the Faroe Plateau (Vb1) and the Faroe Bank (Vb2), which started in 1985, continued in 1987, and landings from the Faroe Plateau went from 34,866 t in 1986 t to around 21,000 - 25,000 t in 1987-1989. From the Faroe Bank, the catches went down from 3,409 t in 1987 to an all time low of 461 t in 1989.

No precise catch data from Division Vb for the first half of 1990 were available to the Group.

The rest of the assessments refer to Faroe Plateau cod, as no data were available to undertake an analytical assessment of the Faroe Bank cod.

7.2 Catch at Age (Table 7.3)

Catch in numbers at age in 1988 and 1989 was provided for the Faroe fishery (Table 7.3). The total catch in number was raised, using the catch composition by age in the Faroe fishery. 1986 and 1987 data were revised according to final catch figures.

7.3 Weight at Age in the Catch (Table 7.4)

Data on mean weight at age in the catches in 1988 and 1989 were provided for the Faroe fishery (Table 7.4). They gave a difference in the sum products check in 1988 and 1989 of 1% and 2%,

7.4 Assessment and Predictions

7.4.1 Estimates of fishing mortality (Tables 7.5, 7.6, 7.7 and Figure 7.1A)

The survey data described in section 5.2 were used for the tuning of the VPA. The estimates of catch in number per age per unit time in the surveys of the different years were used as if they represented one fleet with the same effort for all the years in the tuning process. The estimates of fishing mortality derived from this are given in Table 7.5. It is seen that the level of fishing mortality for the fully recruited age groups (3-7) is about 0.64, which is about 0.2 higher than in the assessment in 1988.

A separable VPA with F = 0.638 for age group 4 and S = 1 was then run. The matrix of residuals and estimates of the exploitation pattern are given in Table 7.6. The fishing mortality matrix from the separable version run is given in Table 7.7A. The overall level of fishing mortality on Faroe Plateau cod has according to this assessment increased since 1985.

7.4.2 Population estimates (Table 7.8 and Figure 7.1B)

The stock size in numbers and stock biomass is given in Table 7.8. Total biomass and spawnings stock biomass has steadily decreased since 1986 and is now on a very low level compared to the historical series. The 1982 year class is confirmed to be the very strong in this assessment, the 1983 year class is sligthly above average, and there is no indication that subsequent year classes are above average. The 1987 year class is estimated to be almost as strong as the 1982 year class.

7.4.3 Catch predictions (Tables 7.9 and 7.10 and Figures 7.1C and D)

The input data for the prediction are given in Table 7.9. The change in legal mesh size has been handled in the same way as described in the section on Faroe saithe. With unchanged exploitation level, and assuming average recruitment for the 1988 and subsequent year classes, the yields predicted from the Faroe Plateau in 1990, 1991, and 1992 are 29,000 t, 30,000 t, and 28,000 t, respectively. It should be noted that the 1987 year class accounts for 48% of the total catch in 1990 and 1991, and 31% in 1992.

7.4.4 Faroe Bank cod (Table 7.2)

The dramatic decrease in cod catches on the Faroe Bank should be noted. No data on which to base an assessment of the Faroe Bank cod stock were available to the Group. It is, however, difficult to see any other cause for the rapid decline than the increased effort on the Faroe Bank, following the opening of the Bank to trawlers in the beginning of the 1980s. The similar decrease in the landings of Faroe Bank haddock (Table 8.2) points in the same direction. Limitation in the access to the Bank seems to be be the only way to rebuild the stocks.

8 FAROE HADDOCK

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

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 mid-1970s (Table 8.1). 1988 was somewhat down again, but in 1989, catches were above 14,000 t. Catches from Faroe Bank have gone down drastically to about 200 t in 1989 (Table 8.2).

8.2 Catch at Age (Table 8.3)

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 catch in numbers was raised to total landings from the Faroe area, including the Faroe Bank. 1986 and 1987 data were revised according to final catch figures.

8.3 Weight at Age in the Catch (Table 8.4)

Weight-at-age data were provided for the Faroese fishery (Table 8.4). The sum of products check showed a difference in 1988 of 3%, and of 0% in 1989.

8.4 Assessment and Predictions

8.4.1 Estimates of fishing mortality (Tables 8.5, 8.6 and 8.7 and Figure 8.1A)

The survey data described in Section 5.2 were used for the tuning of 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 8.5. The values of fishing mortality are so poorly determined that it was decided not to use the results. Two series of commercial effort and catch-at-age data were also used, but did not solve the problem of the lack of precision in the estimates. All evidence points to the fact that most factors in the fishery for haddock are rather stable. The fleets fishing directly for haddock (mainly longliners) have not changed. A separable VPA was, therefore, run that reproduced a stable level of F in recent years. The input value of terminal fishing mortality chosen was 0.25 and S was set at 1 (Table 8.6). The separable fishing mortality matrix from that run is presented in Table 8.7A and from the extended analysis in Table 8.7B.

8.4.2 Population estimates (Tables 8.8 and Figure 8.1B)

The stock size in numbers and stock biomass from the terminal population version of the separable VPA is given in Table 8.8. Total biomass steadily decreased from 1979 to 1987 because of low recruitment (22 million at 1-year-old on average from 1978 to 1984 compared with a long-term average of 1961-1984 of 37 million).

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

Spawning stock biomass increased form 1985 because of the contribution of the 1982 and 1983 year classes, but is now going down again.

8.4.3 Catch predictions (Tables 8.9 and 8.10 and Figures 8.1C and D)

The input data for the prediction are given in Table 8.9.

The change in legal mesh size was handled in the same way as described in the section on Faroe saithe.

With unchanged exploitation level and assuming the lower level of average recruitment for the 1988 and subsequent year classes, the yields predicted from the Faroe area in 1990, 1991, and 1992 are 12,000 t, 11,000 t, and 10,000 t, respectively.

9 BLUE LING IN SUB-AREAS V, VI, AND XIV

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

Total annual landings in the decade 1977-1986 averaged 20,300 t. In recent years they have stabilized around the long-term mean level. Total landings increased from 18,600 t in 1987 to 19,900 t in 1988. Landing figures for 1989 are incomplete but, provided that the missing ones are of the same magnitude as in previous years, estimated total landings would be about 18,200 t. In 1989, nearly half of the landings (48%) originated from Sub-area VI, about one third (34.5%) from Division Vb, 17% from Division Va, and only 0.5% from Sub-area XIV. Demersal trawlers from the Faroes and France conduct a directed fishery on blue ling, particularly during the first half of the year, whereas the species mainly occurs as by-catch in other fisheries.

9.2 Effort Data (Table 9.5)

A time series of effort data from the French trawl fishery for blue ling in Sub-area VI and Division Vb was available for the years 1974-1985. More detailed information was submitted to the present meeting for the years 1988 and 1989. Total international effort was estimated by raising the French catch and effort figures to total international catch in Sub-area VI and Division Vb (Table 9.5). Both landings and effort have fluctuated over the years without any particular trend. The same applies to catch per unit of effort.

9.3 Catch at Age (Tables 9.6-9.8 and Figure 9.1)

A time series was available from the Federal Republic of Germany for the years 1980-1989 concerning Division Vb and Sub-area XIV (Tables 9.6-9.7). French data from Division VIa were available for 1988 and 1989 (Table 9.8 and Figure 9.1). Comparison between the age distributions in the early and late 1980s indicates a trend towards younger fish in Division Vb and Sub-area VI.

9.4 Weight at Age (Table 9.9)

French data were available from Division VIa for 1988 and 1989 (Table 9.9).

9.5 Status of the Stock(s) (Figure 9.2)

The directed trawl fishery on local spawning populations has yielded exceptionally high catches at irregular intervals, succeeded by periods of comparatively low catches. The age composition indicates a trend towards younger fish.

The directed trawl fishery on local spawning populations has yielded exceptionally high catches at irregular intervals, succeeded by periods of comparatively low catches. The age composition indicates a trend towards younger fish.

These facts indicate a rather high rate of exploitation which apparently has been the case in recent years. It is further confirmed by the Faroese groundfish surveys (Figure 9.2). This may eventually prove harmful to the stock(s).

10 LING IN SUB-AREAS V, VI AND XIV

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

Total annual landings in the decade 1977-1986 averaged 22,500 t. The level has been above the mean since 1982 due to increased landings from Sub-area VI. Total landings decreased from 27,200 t in 1987 to 22,600 t in 1988. Landing figures for 1989 are rather incomplete, but, provided that the missing ones are of the same magnitude as in the previous year, estimated total landings would be about 25,400 t. In 1989, nearly half of the landings (45%) originated from Division VIa, approximately one quarter (24%) from Division Va, 16% from Division VIb, and 15% from Division Vb. Long-liners from the Faroes and Norway conduct a directed fishery on ling, with tusk as the major by-catch. It is assumed that a proportion of the French ling landings may derive from a directed fishery.

10.2 Efort data (Table 10.5 and Figures 10.1-10.3)

A time series of effort data from the Norwegian long-line fisheries in Division Vb, VIa and VIb was available for the years 1983-1989 (Table 10.5). The annual effort has fluctuated irregularly between 47 million hooks and 110 million hooks, averaging 69 million hooks. Catch per unit of effort has gradually decreased from a level of 165-168 kg per 1,000 hooks in 1983-1984 to 126 kg in 1988, and 111 kg in 1989. One should bear in mind, however, that an excessive rise in effort, as was experienced in Sub-area VI in 1986, reduces the CPUE considerably. This is due to the fact that the most profitable fishing grounds are of

limited extension.

10.3 Catch at Age

Norwegian data were available for 1989 from a survey covering some important fishing grounds in Division Vb, VIa, and VIb. These data are retained in the files of the Working Group.

10.4 Weight at Age

Norwegian data were available for 1989. Mean weight at age was calculated from mean length at age. These data are retained in the files of the Working Group.

10.5 Estimates of Total Mortality (Figures 10.4-10.5)

Total mortality (Z) has been estimated graphically by catch-curves from a Norwegian survey in Divisions Vb and VIa in 1989. In Division Vb, Z was estimated as 0.47 (Figure 10.4), and in Division VIa, the corresponding figure was 0.61 (Figure 10.5).

10.6 Status of the Stock(s) (Figure 10.6)

Norwegian CPUE figures from the long-line fishery suggest a decreasing trend with comparatively low levels in recent years, particularly in Divisions Vb and VIa. The Faroese groundfish surveys confirm this trend in Division Vb (Figure 10.6).

Apparently, the total international effort directed at ling has increased in recent years, which may eventually prove harmful to the stock(s).

11 TUSK IN SUB-AREAS V, VI AND XIV

11.1 Landings and Trends in the Fisheries (Tables 11.1-11.4)

Total annual landings in the decade 1977-1986 averaged 15,500 t. In recent years, they have stabilized around the long-term mean level. Total landings increased slightly from 15,400 t in 1987 to 15,500 t in 1988. Landing figures for 1989 are incomplete but, provided that the missing ones are of the same magnitude as in the previous year, estimated total landings would be about 16,400 t. In 1989, nearly 40% and 38% of the landings originated from Divisions Va and Vb, respectively, 14% from Division VIa, and the remaining 10% from Division VIb. Tusk mainly occurs as a by-catch in fisheries directed on other species.

11.2 Effort Data (Table 11.5 and Figures 11.1-11.3)

A time series of effort data from the Norwegian long-line fisheries in Divisions Vb and VIa,b, respectively, was available for the years 1983-1989 (Table 11.5). The annual effort data are the same as for ling. Catch per unit of effort has remained fairly stable except for 1986, when the effort in Sub-area VI was particularly high, ranging from 40 kg per 1,000 hooks to 84 kg per 1,000 hooks, and averaging 71 kg per 1,000 hooks.

11.3 Catch-at-Age Data

Some Norwegian data were available, but as age determination work is still in progress it was felt inappropriate to present them in this report.

11.4 Weight at Age

Some Norwegian data were available, but presentation has to be postponed until the age data have been worked up.

11.5 Status of the Stock(s) (Figure 11.4)

The CPUE of tusk seems to be more strongly associated with fishing effort than ling.

It is difficult to judge the rate of exploitation, as tusk is believed to be rather stationary, and, therefore, may be vulnerable to local over-exploitation. In recent years, however, the Norwegian long-line fishery has tended to be directed more towards tusk due to decreasing availability of ling. CPUE data from the Faroese groundfish surveys may indicate a possible decline in the stock(s) of tusk in Division Vb (Figure 11.4).

12 OCEANIC-TYPE MENTELLA

12.1 Review of Report of the Study Group on Oceanic-Type Sebastes mentella (Anon., 1990)

The Working Group considered the report of the Study Group on Oceanic-Type Sebastes mentella.

Since 1982, there has been a commercial fishery on the oceanic-type S. mentella in the open Irminger Sea, and the total effort in this fishery has increased greatly. This has naturally caused a need for an assessment of this type of S. mentella. There are, however, some problems in making such an assessment.

12.1.1 Stock identification

First of all, there have been two points of view regarding the status of this type of S. mentella. One states that the oceanic-type is a separate stock, and the other that it is a part of the stock of the common S. mentella at East Greenland, Iceland, and the Faroes. Although the oceanic-type redfish have morphological characteristics closely resembling S. mentella, the former can be distinguished easily by abnormal coloration of the skin (dark and/or orange red patches). Also, specimens are heavily infested by the parasitic copepod Shyrion lumpi. The newly extruded oceanictype larvae are somewhat larger than those of the common S. mentella. Finally, they are separated by spawning depth, but may overlap to some extent in the area of their distributions. This leads to the conclusion that both types are clearly separated by depth as the fishery takes place in April-May at depths of 350-450 m, in the second half of June at 50-150 m, and in July at 50-100 m, where true S. mentella is not found. Although a few S. mentella proper might now and then appear in the catches, this is of minor or no importance to the assessment work.

The Working Group endorsed the findings of the Study Group that that there are two different stocks of S. mentella, even if, to a

minor extent, some mixing takes place. The Working Group also endorsed the recommendation that more work was needed on the identification of the two stocks.

12.1.2 Age readings

The Working Group further discussed the problems of verifying the correctness of the age readings in redfish. The correctness of the age reading by the scale method used within ICES has so far not been verified and there is no direct method to test it. Attempts to verify the ageing method should be applied to scales from fish species where the age reading of scales/otoliths is considered to yield reliable results, e.g., for cod and haddock.

The Working Group endorsed the recommendation of the Study Group that, for the moment, age readings should be continued by the scale method.

12.1.3 Assessments

The Working Group noted the failure of several assessment methods, which are not based on age structure data. Therefore, the Working Group chose to continue the attempts to undertake assessments based on age-structured data. Assessments based on echo surveys seem to be promising for the assessment of this stock.

12.1.4 Coordination of national research programmes

The Working Group felt that a coordination of national research programmes is urgently needed. The USSR will work in the area in April-August 1991. The Icelandic member mentioned that ship time is available in April-May or June-July. The German Democratic Republic and the Federal Republic of Germany plan a joint cruise in May 1991. The Working Group endorsed the recommendation of the Study Group but left it to the Demersal Fish Committee to decide on the establishment of a special coordinating group.

12.2 Nominal Catches and Trends in the Fishery (Table 12.1 and Figure 12.1A)

The total annual catches of oceanic-type mentella in Sub-areas XII and XIV are presented in Table 12.1 and Figure 12.1A. From 1982-1986, catches increased from around 60,000 t to over 100,000 t. In 1987 and 1988, catches were around 90,000 t, and in 1989 they decreased to 37,000 t. The drop in catches in 1989 is ascribed to unfavourable hydrographical conditions. In 1989, vessels from seven countries participated in the fishery and USSR vessels took about 61% of the catches.

12.3 Effort Data (Table 12.2)

CPUE data were available for USSR vessels for the period 1982 to 1989 and for Bulgarian vessels for the period 1984 to 1989 (Table 12.2). USSR catch rates have been decreasing but have now stabilized around 1 t/hour.

Because of differences in type of vessels between the USSR and Bulgarian fleets, total international effort was calculated in two ways (Table 12.2): A - based on Bulgarian and USSR weighted

(by-catches) CPUEs; B - based on USSR CPUE. A first estimate served as an effort index for tuning VPA.

12.4 Research Vessel Surveys (Tables 12.3 and 12.4)

In 1988 and 1989, the USSR has conducted research work with R/V "Pinro" with particular emphasis on biomass assessment of the species by means of acoustic and ichthyoplankton surveys. The ichthyoplankton method is not considered to be very reliable since one might be dealing with larvae from two or more stock units. The Study Group on Oceanic-Type S. mentella (Anon., 1990) felt that the acoustic method is promising for the assessment of the oceanic-type S. mentella stock (Reykjanes Ridge population), the spawning stock of which is mainly distributed in the pelagic zone of the Irminger Sea.

In 1988-1989, the surveys were carried out in the pelagic zone of the area from 53^0-62^0N with Bongo nets. The intensive extrusion of pro-larvae occurs over the Reykjanes Ridge and to the west of it in April-May in a vast area of about 175-190 thousand square miles at depths of 300-500 m. As in previous years, a major portion of larvae was registered in the southern section of the area. The abundance and biomass of oceanic-type S. mentella estimated from the ichthyoplankton surveys and subsequent estimation of stock are given in detail in Neskov et al.(1984) and Pavlov et al.(1989). The index of individual fecundity was taken to be equal to 35,800 larvae/female, and the coefficient of larvae mortality obtained by observation of juveniles in aquaria onboard ship and on the stations in the Irminger Sea made up approximately 89.3% in 1987-1988 (after 10 days) (Pavlov, Jorelov, et al., 1989) and 85% in 1989 after 14 days. In 1989, the commercial biomass of redfish (oceanic-type S. mentella and S. mentella), based on these investigations, was estimated to be about 870,000 t.

Acoustic surveys were conducted by the USSR in June-July 1988 and 1989. The area surveyed made up 175,000 sq.miles in 1988 and 148,000 sq.miles in 1989. An echosounder EK-420 (SIMRAD) and echointegrator SIORS (USSR) were used in the survey. The underlying methodology has been given in a Working Document presented to the Working Group (Pavlov et al., 1989). The main oceanic redfish concentration (densities over 30 t/sq.mile) were distributed along the 200-mile zone off Greenland, including the eastern part of the Labrador Sea between 55-64^0N and 31-45^0W at depths of about 50-200 m. Acoustic survey data are presented in Table 12.4. Based on this methdology, an estimate of redfish biomass in 1989 of around 900,000 t was obtained (Table 12.4).

12.5 Catch at Age (Table 12.5)

Age composition in catches taken by different fleets were similar for the years 1982-1989, with the exception of 1987.

Catch in numbers for total international catch was obtained by raising the total number of the Bulgarian, German Democratic Republic, and USSR catches to the total catch (Table 12.5).

12.6 Weight-at-Age (Table 12.6)

Weight-at-age data presented in Table 12.6 and used during the assessment were only from USSR catches. The SOP check showed a deviation of 11% in 1984 and only small deviations in other years.

12.7 Maturity at Age (Table 12.7)

The same maturity ogive was used for all years in the assessment. It was estimated from USSR data and is presented in Table 12.7.

12.8 Assessment and Prediction

12.8.1 Estimates of fishing mortality (Tables 12.8-12.10 and Figure 12.1A)

It was decided by the Working Group to use the tuning module of the ICES VPA program to obtain preliminary estimates of fishing mortalities. It was decided to tune VPA by using the combined effort index (effort A in Table 12.2) for 1984-1989.

The tuning resulted in an estimate of an average F on age groups 13-17 of 0.363. This average level of F was achieved from a separable VPA with F = 0.41 on age groups 15, and S = 1.2.

It can be seen from Table 12.10 that in 1987 the fishing mortalities were higher than in other years. This is because of the high Bulgarian catch in 1987.

12.8.2 Estimates of the stock size (Table 12.11 and Figure 12.1B)

The stock size from the terminal population version of the separable VPA shows that the total stock biomass was rather stable from 1982 to 1989.

12.8.3 Catch predictions (Tables 12.12 and 12.13 and Figure 12.1D)

The estimates of the fishing mortality from the separable VPA and stock size were used in a prediction.

The input data for the prediction are given in Table 12.12. Two assumptions were made on the catch level in 1990. Results are shown in Table 12.13 and Figure 12.1D.

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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	1978	1979	1980	1981	1982	1983
Belgium	1,549	1,385	1,381	924	283	389
Faroe Islands	242	629	1,055	1,212	1,046	1,357
Germany, Fed.Rep.	-	-	-	-	-	-
Iceland	33,318	62,253	69,780	93,349	115,051	122,749
Norway	93	43	33	32	11	32
UK	-	-	-	-	-	-
Total	35,202	64,310	72,249	95,517	116,391	124,527

Country	1984	1985	1986	1987	1988	1989[1]
Belgium	291	400	423	398	372	190
Faroe Islands	686	291	253	332	372[2]	374
Germany, Fed.Rep.	-	-	-	-	-	-
Iceland	108,270	91,381	85,992	87,768	93,995	88,778
Norway	12	8	2	7	7	1
UK	-	-	-	-	-	-
Total	109,259	92,080	86,670	88,505	94,746	89,363

[1] Provisional data.
[2] Working Group figure.

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

Country	1978	1979	1980	1981	1982	1983
Denmark	-	-	-	-	-	-
Faroe Islands	1,525	5,693	5,509	3,232	3,999	4,642
France	448	862	627	59	204	439
Germany, Fed.Rep.	7,767	6,108	3,891	3,841	5,230[2]	4,300
Iceland	-	-	-	-	1	-
Netherlands	+		-	-	-	-
Norway	9	11	12	13	7	3
UK	57	+	-	-	-	-
USSR	-	-	-	-	-	-
Total	9,806	12,674	10,039	7,145	9,441	9,384

Country	1984	1985	1986	1987	1988	1989[1]
Denmark	-	-	36	176	8	-
Faroe Islands	8,770	12,634	15,224	13,478	13,318	12,728
France	559	1,157	752	819	582	928[3]
Germany, Fed.Rep.	4,460	5,091	5,142	3,060	1,595	1,191
Iceland	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-
Norway	1	4	2	5	5	20
UK	-	-	-	-	-	-
USSR	142	868	320[3]	-	-	-
Total	13,932	19,754	21,476	17,538	15,508	14,867

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

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

Country	1978	1979	1980	1981	1982	1983
Bulgaria	-	-	-	-	-	-
Greenland	3	-	-	1	+	1
Faroe Islands	-	-	-	18	-	27
France	-	490	-	-	-	-
German Dem. Rep.	-	-	-	-	-	155[3]
Germany, Fed.Rep.	20,711[2]	20,428[2]	32,520[2]	42,980[2]	42,815[2]	30,815[2]
Iceland	151	-	89	-	17[3]	-
Norway	2	-	-	-	-	-
Poland	-	-	-	-	581[3]	-
UK	13	-	-	-	-	-
USSR	-	-	-	-	20,217[3]	-
Total	20,880	20,918	32,609	42,999	63,630	31,036
Total used in the Assessment[6]	-	-	-	-	42,815	30,853

Country	1984	1985	1986	1987	1988	1989[1]
Bulgaria	2,961[3]	5,825[3]	11,385[3]	12,270[3]	8,455[3]	4,546[3]
Greenland	10	5,519[4]	9,542[4]	2,912[4]	3,751[4]	285[4]
Faroe Islands	-	-	5	382	1,634[5]	41
France	-	-	-	-	-	-
German Dem.Rep.	989[3]	5,438[3]	8,574[3]	7,023[3]	16,848[3]	6,444[3]
Germany, Fed.Rep.	14,141	5,974	5,584	4,691	5,734	2,372
Iceland	-	+	-	-	-	2,722[3]
Japan	-	-	-	-	-	307[3]
Norway	15	-	-	-	-	-
Poland	239[3]	135[3]	149[3]	25[3]	-	-
UK	-	-	-	-	-	4
USSR	-	42,973[3]	60,863[3]	68,521[3]	55,254[3]	7,200[3]
Total	18,355	65,864	96,102	95,824	91,676	23,921
Total used in the Assessment[6]	14,166	11,493	15,131	7,985	10,029	2,702

[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.
[5] 1,090 t from the oceanic stock not included.
[6] Excluding oceanic stock of S. mentella.

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

Country	1982	1983	1984	1985	1986	1987	1988	1989[1]
German Dem. Rep.	-	-	-	-	-	-	-	352
Poland	-	-	-	-	-	-	-	112
USSR	39,783	60,079	60,643	17,300	24,131	2,948	9,772	15,500
Total	39,783	60,079	60,643	17,300	24,131	2,948	9,772	15,964

[1] Provisional.

Table 2.4 Total international effort values for Redfish in ICES Sub-areas V and XIV estimated from the total international catch of Redfish by using Icelandic CPUE values. Catches from the oceanic stock not included.

Year	Icelandic CPUE (kg/h)	Total international catch of Redfish	Total international effort Redfish (hr)
1977	835	83,360	99,832
1978	956	65,888	68,921
1979	1,147	97,902	85,355
1980	1,164	114,897	98,709
1981	1,177	145,661	123,376
1982	1,144	168,647	147,419
1983	962	164,764	171,262
1984	959	137,357	143,229
1985	981	123,327	125,716
1986	1,003	123,384	123,015
1987	1,072	114,393	106,710
1988	1,059	120,700	113,975
1989	1,059	104,900	99,056

Table 2.5 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
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	0.4	0.3	-	-	87.8	+	-	-	88.5
	S.mar.	0.4	0.3			68.5				69.2
	S.ment.	-	-			19.3				19.3
1988	Total	0.4	0.4	-	-	94.0	+	-	-	94.8
	S.mar.	0.4	0.4			79.8	+			81.6
	S.ment.	-	-			14.2	-			14.2
1989[1]	Total	0.2	0.7	-	-	88.8	+	-	-	89.7
	S.mar.	0.2	0.7			57.6	+			58.5
	S.ment.	-	-			31.2	-			31.2

[1] Preliminary.

Table 2.6 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.	Nether-lands	Norway	UK	USSR	Total
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	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
1988	Total	-	13.3	1.0	-	1.6	-	+	-	-	15.9
	S.mar.		5.0	-		-		+		-	5.0
	S.ment.		8.3	1.0		1.6		-		-	10.9
1989[1]	Total	-	12.7	0.6	-	1.2	-	+	-	-	14.5
	S.mar.		4.1	-		-		+		-	4.1
	S.ment.		8.6	0.6		1.2		-		-	10.4

[1] Preliminary.

Table 2.7 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
1978	Total	-	-	+	-	-	20.7	0.2	+	-	+	-		- 20.9
	S.mar.	-					15.3	0.2						15.5
	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	2.1
	S.ment.	5.8[2]				5.4	4.8			0.1		43.0	4.5	63.6[2]
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	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
1988	Total	8.5[2]	-	-	1.6[2]	16.8[2]	5.7	-	-	-	-	55.2[2]	3.8	91.6[2]
	S.mar.	-			-	-	0.8					-	3.2	4.0
	S.ment.	8.5[2]			1.6[2]	16.8[2]	4.9					55.2[2]	0.6	87.6
1989[1]	Total	4.5[2]	-	-	+	6.4[2]	2.4	2.7[2]	-	-	+	4.9[2]	0.3	21.2[2]
	S.mar.	-				-	0.4	-				-	0.3	0.7
	S.ment.	4.5[2]				6.4[2]	2.0	2.7[2]				4.9[2]	+	21.2

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

Table 2.8 SUM OF PRODUCTS CHECK

SEBASTES MARINUS IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
11	1723	2284	2136	2449	3344	2217	2574	3244	2966	2536
12	7306	9562	8299	7088	8841	6301	5974	3893	5890	4885
13	9238	8422	9968	11251	9505	4910	4686	2715	5585	4296
14	14052	10313	14054	11603	12346	6547	7908	6212	8343	5714
15	18617	15916	17880	14267	10538	8878	7519	4533	8488	5504
16	13521	10299	14531	13033	12378	8685	7115	4595	8781	5550
17	4620	11042	11159	11782	11806	10565	8838	5680	9664	6187
18	9586	9019	15254	15530	11362	9910	7981	6538	10142	6662
19	5563	7807	10336	12076	9055	9274	7103	5911	8871	6023
20	2123	5145	13947	9553	8701	7985	6625	5593	8138	5726
21	5516	9010	9751	5709	6312	5946	5790	7778	6059	4688
22	2297	4113	5090	3235	3337	3836	3722	6517	4308	3366
23	1943	2825	4796	4016	3696	2337	4696	5689	4898	3698
24	2395	3762	2751	2143	2350	2513	2520	3460	3552	2375
25	1430	1929	992	1394	868	1231	1260	1654	2026	1438
26	750	1079	449	541	277	287	429	33	0	0
27	461	518	209	287	22	113	120	1	0	0
28	249	136	17	28	3	47	106	21	0	0
29	33	41	1	1	0	0	0	0	0	0
30+	68	7	78	81	0	0	0	0	0	0
TOTAL	101491	113229	141698	126067	114741	91582	84966	74067	97711	68648
A) SOP	89349	106619	119113	104400	95297	78576	77918	76093	88628	62238
B)NOMIN.	88085	101285	123165	106317	96023	78460	77070	76415	86239	62694
(B/A) %	99	95	103	102	101	100	99	100	97	101

Table 2.9 SUM OF PRODUCTS CHECK

SEBASTES MARINUS IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
11	.486	.486	.387	.387	.399	.420	.429	.475	.420	.421
12	.536	.536	.424	.424	.487	.489	.509	.475	.501	.499
13	.591	.591	.533	.533	.521	.540	.571	.627	.552	.547
14	.652	.652	.601	.601	.604	.609	.642	.735	.629	.624
15	.720	.720	.654	.654	.661	.663	.690	.754	.679	.677
16	.794	.794	.714	.714	.718	.721	.753	.744	.736	.736
17	.876	.876	.760	.760	.788	.783	.813	.758	.799	.800
18	.966	.966	.857	.857	.872	.847	.885	.961	.879	.880
19	1.066	1.066	.938	.938	.981	.937	.968	1.094	.965	.968
20	1.176	1.176	1.025	1.025	1.020	1.011	1.031	1.119	1.030	1.034
21	1.297	1.297	1.147	1.147	1.164	1.109	1.149	1.120	1.143	1.146
22	1.431	1.431	1.296	1.296	1.393	1.253	1.308	1.334	1.316	1.322
23	1.579	1.579	1.473	1.473	1.530	1.421	1.516	1.559	1.487	1.488
24	1.742	1.742	1.647	1.647	1.816	1.652	1.862	1.776	1.727	1.717
25	1.922	1.922	1.903	1.903	2.063	1.909	2.051	2.234	2.114	2.114
26	2.120	2.120	2.313	2.313	2.306	2.156	2.061	2.100	.000	.000
27	2.339	2.339	2.810	2.810	3.145	2.938	2.900	2.900	.000	.000
28	2.580	2.580	3.629	3.629	3.333	3.719	3.500	4.658	.000	.000
29	2.846	2.846	4.000	4.000	.000	.000	.000	.000	.000	.000
30+	3.905	3.905	5.631	5.631	.000	.000	.000	.000	.000	.000

Table 2.10

DISAGGREGATED Qs
LOG TRANSFORMATION
Explanatory variate TIME
Fleet 1 ,only 1 fleet for red, has terminal q estimated from trend
FLEETS COMBINED BY ** VARIANCE **
erminal Fs estimated using Hybrid method
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
Fishing mortalities

Age,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89,	
11,	.009,	.013,	.014,	.021,	.028,	.019,	.026,	.029,	.031,	.039,	
12,	.038,	.060,	.056,	.055,	.088,	.061,	.058,	.046,	.060,	.060,	
13,	.053,	.050,	.074,	.090,	.087,	.058,	.053,	.030,	.077,	.051,	
14,	.086,	.070,	.100,	.104,	.121,	.072,	.112,	.083,	.110,	.095,	
15,	.128,	.119,	.148,	.125,	.117,	.107,	.100,	.078,	.139,	.089,	
16,	.105,	.087,	.136,	.138,	.137,	.120,	.106,	.073,	.191,	.114,	
17,	.048,	.105,	.116,	.140,	.160,	.148,	.154,	.104,	.194,	.179,	mean F = 0,163
18,	.128,	.113,	.186,	.209,	.174,	.176,	.143,	.147,	.242,	.179,	
19,	.096,	.131,	.165,	.196,	.162,	.188,	.165,	.135,	.270,	.199,	
20,	.047,	.109,	.323,	.202,	.190,	.188,	.178,	.170,	.248,	.250,	
21,	.183,	.258,	.276,	.189,	.178,	.172,	.181,	.292,	.250,	.198,	
22,	.119,	.181,	.203,	.124,	.145,	.141,	.139,	.284,	.232,	.192,	
23,	.072,	.188,	.295,	.218,	.183,	.128,	.228,	.290,	.319,	.285,	
24,	.104,	.173,	.252,	.186,	.172,	.163,	.178,	.234,	.264,	.225,	

Log catchability estimates

Age 11

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-16.16,	-16.04,	-16.14,	-15.92,	-15.45,	-15.72,	-15.35,	-15.13,	-15.11,	-14.75

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-14.88 ,	.173,	.0342 ,	.0342,	.155E+00,	.164E-01,	-16.432,	.102

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.034	.173	0.000	.173	0.000

cont'd.

Table 2.10 cont'd.

Age 12

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.78	-14.54	-14.79	-14.95	-14.31	-14.54	-14.57	-14.66	-14.46	-14.32

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-14.42	.213	.0539	.0539	.375E-01	.202E-01	-14.799	.125

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.054	.213	0.000	.213	0.000

Age 13

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.44	-14.72	-14.50	-14.46	-14.31	-14.59	-14.66	-15.08	-14.20	-14.48

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-14.56	.296	.0471	.0471	-.305E-02	.281E-01	-14.528	.175

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.047	.296	0.000	.296	0.000

Age 14

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.96	-14.39	-14.21	-14.31	-13.99	-14.37	-13.91	-14.07	-13.85	-13.86

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.92	.221	.0891	.0891	.378E-01	.210E-01	-14.300	.130

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.089	.221	0.000	.221	0.000

cont'd.

Table 2.10 cont'd.

Age 15

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.55	-13.86	-13.81	-14.13	-14.02	-13.97	-14.03	-14.13	-13.61	-13.93

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.98	.235	.0839	.0839	-.173E-01	.223E-01	-13.809	.138

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.084	.235	0.000	.235	0.000

Age 16

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.75	-14.16	-13.90	-14.03	-13.86	-13.86	-13.97	-14.19	-13.30	-13.67

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.72	.293	.1090	.1090	.335E-01	.278E-01	-14.055	.173

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.109	.293	0.000	.293	0.000

Age 17

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.53	-13.98	-14.06	-14.02	-13.70	-13.65	-13.59	-13.84	-13.28	-13.23

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.27	.208	.1711	.1711	.115E+00	.197E-01	-14.421	.122

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.171	.208	0.000	.208	0.000

cont'd.

Table 2.10 cont'd.

Age 18

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.56	-13.90	-13.59	-13.62	-13.62	-13.48	-13.66	-13.50	-13.06	-13.23

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.27	.196	.1715	.1715	.565E-01	.186E-01	-13.832	.116

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.171	.196	0.000	.196	0.000

Age 19

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.84	-13.76	-13.71	-13.68	-13.69	-13.41	-13.52	-13.58	-12.95	-13.12

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.16	.180	.1911	.1911	.817E-01	.171E-01	-13.975	.106

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.191	.180	0.000	.180	0.000

Age 20

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.55	-13.94	-13.03	-13.65	-13.53	-13.41	-13.44	-13.35	-13.04	-12.89

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.93	.388	.2406	.2406	.124E+00	.368E-01	-14.164	.228

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.241	.388	0.000	.388	0.000

cont'd.

Table 2.10 cont'd.

Age 21

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.20	-13.08	-13.19	-13.71	-13.60	-13.50	-13.43	-12.81	-13.03	-13.13

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.16	.337	.1904	.1904	.234E-01	.320E-01	-13.396	.199

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.190	.337	0.000	.337	0.000

Age 22

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.63	-13.43	-13.50	-14.14	-13.80	-13.70	-13.69	-12.84	-13.10	-13.15

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.19	.395	.1850	.1850	.686E-01	.375E-01	-13.876	.232

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.185	.395	0.000	.395	0.000

Age 23

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.13	-13.40	-13.12	-13.57	-13.57	-13.79	-13.20	-12.82	-12.79	-12.76

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.80	.372	.2747	.2747	.115E+00	.354E-01	-13.950	.219

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.275	.372	0.000	.372	0.000

Table 2.11 Sebastes marinus in fishing areas V and XIV.

from 80 to 89 on ages 11 to 24
with Terminal F of .163 on age 14 and Terminal S of 1.000

Initial sum of squared residuals was 37.421 and
final sum of squared residuals is 11.607 after 121 iterations

Matrix of Residuals

Years / Ages	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89		WTS
11/12	-.599	-.036	-.316	-.411	.121	-.064	.373	.756	.176	.000	.358
12/13	-.067	.169	-.473	-.473	.289	.172	.523	-.060	-.079	.000	.451
13/14	.332	.061	.041	.088	.436	-.240	-.186	-.470	-.062	.000	.532
14/15	.033	-.267	-.118	-.018	.097	-.196	.357	.043	.068	.000	.816
15/16	.577	.203	.041	-.146	-.213	-.009	.120	-.476	-.098	.000	.508
16/17	.343	.187	.091	-.032	-.090	-.091	.010	-.404	-.013	.000	.723
17/18	-.394	.074	-.322	.032	.054	.334	.214	-.121	.128	.000	.625
18/19	.193	-.028	-.050	.242	-.212	.095	-.081	-.136	-.024	.000	1.000
19/20	.195	-.343	-.075	.161	-.158	.228	-.011	-.022	.025	.000	.820
20/21	-1.268	-.345	.794	.302	.152	.268	-.356	.266	.187	.000	.253
21/22	-.012	.389	.526	-.054	-.212	-.063	-.794	.473	-.254	.000	.357
22/23	-.008	.170	.173	-.209	.163	-.221	-.584	.677	-.159	.000	.422
23/24	-.752	.062	.452	.169	-.099	-.384	-.146	.578	.119	.000	.367
	.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)

	80	81	82	83	84	85	86	87	88	89
F-values	.0602	.0768	.1144	.1183	.1213	.1102	.1190	.1117	.1892	.1630

Selection-at-age (S)

	11	12	13	14
S-values	.2613	.7144	.6998	1.0000

	15	16	17	18	19	20	21	22	23	24
S-values	1.0885	.9967	1.0658	1.3189	1.2301	1.3056	1.4854	1.0314	1.1750	1.0000

Table 2.12 Sebastes marinus in Sub-areas V and XIV.
Separable fishing mortalities.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
11	.016	.020	.030	.031	.032	.029	.031	.029	.049	.043
12	.043	.055	.082	.085	.087	.079	.085	.080	.135	.116
13	.042	.054	.080	.083	.085	.077	.083	.078	.132	.114
14	.060	.077	.114	.118	.121	.110	.119	.112	.189	.163
15	.065	.084	.124	.129	.132	.120	.130	.122	.206	.177
16	.060	.076	.114	.118	.121	.110	.119	.111	.189	.162
17	.064	.082	.122	.126	.129	.117	.127	.119	.202	.174
18	.079	.101	.151	.156	.160	.145	.157	.147	.250	.215
19	.074	.094	.141	.146	.149	.136	.146	.137	.233	.200
20	.079	.100	.149	.154	.158	.144	.155	.146	.247	.213
21	.089	.114	.170	.176	.180	.164	.177	.166	.281	.242
22	.062	.079	.118	.122	.125	.114	.123	.115	.195	.168
23	.071	.090	.134	.139	.143	.129	.140	.131	.222	.192
24	.060	.077	.114	.118	.121	.110	.119	.112	.189	.163
$F_{(14-21)u}$	.071	.091	.136	.140	.144	.131	.141	.133	.225	.193

Table 2.13 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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
11	196592	172966	133795	115025	99237	76173	68464	69678	58635	63890	0
12	204666	176246	154335	119032	101750	86615	66817	59502	59964	50236	55400
13	197023	178245	150386	131761	100969	83668	72385	54783	50140	48662	40815
14	201529	169494	153278	126603	108533	82330	71040	61044	46989	40064	39950
15	183970	168998	143564	125340	103532	86478	68275	56768	49334	34598	30825
16	165469	148778	137796	112921	99861	83669	69815	54636	47059	36582	26080
17	117209	136876	124833	110880	89796	78603	67457	56412	45071	34247	27831
18	101855	101664	113359	102352	89136	70039	61090	52644	45648	31612	25115
19	75103	83055	83421	88086	77867	69863	53964	47697	41425	31682	22283
20	59112	62670	67735	65666	68236	61857	54408	42083	37544	29066	22951
21	56422	51469	51818	48054	50346	53480	48387	42938	32767	26250	20866
22	39512	45813	38018	37632	38059	39560	42742	38283	31469	23898	19302
23	43482	33569	37546	29567	30977	31267	32151	35139	28454	24384	18428
24	43092	37498	27690	29418	22939	24519	26071	24633	26394	21096	18552
25+	53816	36979	17574	32013	11421	16372	19812	12167	15055	12773	27025
TOTAL NO	1738853	1604319	1435148	1274349	1092661	944492	822877	708407	615947	509041	
SPS NO	839045	804663	749723	697808	609907	552494	493872	422344	364535	283499	
TOT.BIOM	1400650	1297722	1064530	982629	866150	761263	716662	641522	533402	431053	
SPS BIOM	896306	845945	697801	672313	598619	540000	523414	465235	391357	307257	

Table 2.14 Number of O-group REDFISH (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]
1988	17.0[1]
1989	14.3[1]

[1] Reduced area.

Table 2.15 SUM OF PRODUCTS CHECK

SEBASTES MENTELLA IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
11	1359	5651	582	1223	409	341	284	87	99	151
12	7256	10626	3118	5217	3510	1433	1070	398	373	495
13	5989	5031	3132	7216	2821	1382	1046	1079	515	824
14	3811	3045	3579	5516	3319	2049	2669	1899	843	1231
15	3685	6513	4796	9353	6254	4444	3872	4037	1561	4407
16	2422	4812	5833	5181	5489	5222	4669	3563	1866	4220
17	1344	1873	3131	2828	2777	3428	3672	2930	1987	3487
18	1405	2856	3652	5427	4453	3675	4536	3592	3004	5522
19	1256	2445	4425	3278	4493	4446	6452	4460	3802	5434
20	1252	1539	4671	4637	4753	4763	5237	4169	4312	5722
21	3398	3003	6140	6193	4434	4736	6520	5596	3527	5269
22	2070	2215	3447	3920	2437	3377	3035	3083	3093	3812
23	2024	2162	4321	4175	2614	3389	4329	3550	2989	3240
24	1419	2151	2415	2546	1192	2707	1468	2921	2545	1967
25	590	1238	975	2095	589	1390	1026	433	1263	1569
26	225	472	97	1255	135	439	225	102	874	670
27	121	110	132	289	30	238	95	121	0	0
28+	0	272	0	45	96	72	26	0	0	0
TOTAL	39626	56014	54446	70394	49805	47531	50231	42020	32653	48020
A) SOP	26762	37136	43912	54472	42711	45359	49100	43232	34449	47506
B)NOMIN.	26812	44376	45482	58376	41334	44619	46314	37979	33202	44238
(B/A) %	100	119	104	107	97	98	94	88	96	93

Table 2.16 SUM OF PRODUCTS CHECK

SEBASTES MENTELLA IN FISHING AREAS V AND XIV
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
11	.327	.327	.327	.327	.442	.414	.441	.479	.421	.419
12	.367	.367	.367	.367	.529	.486	.529	.531	.508	.517
13	.410	.410	.410	.410	.551	.539	.566	.559	.547	.555
14	.461	.461	.461	.461	.623	.610	.622	.656	.635	.639
15	.516	.516	.516	.516	.660	.662	.689	.708	.682	.685
16	.578	.578	.578	.578	.691	.711	.742	.769	.736	.739
17	.648	.648	.648	.648	.735	.782	.811	.827	.799	.801
18	.726	.726	.726	.726	.803	.845	.876	.897	.856	.858
19	.813	.813	.813	.813	.886	.915	.931	.953	.929	.931
20	.912	.912	.912	.912	.997	.983	1.000	1.019	.992	.994
21	1.022	1.022	1.022	1.022	1.081	1.082	1.131	1.124	1.103	1.108
22	1.145	1.145	1.145	1.145	1.242	1.206	1.198	1.254	1.207	1.208
23	1.284	1.284	1.284	1.284	1.387	1.353	1.410	1.416	1.362	1.358
24	1.438	1.438	1.438	1.438	1.614	1.470	1.458	1.732	1.512	1.523
25	1.614	1.614	1.614	1.614	1.610	1.614	1.825	1.721	1.634	1.671
26	1.809	1.809	1.809	1.809	1.821	1.730	1.977	1.735	1.588	1.593
27	2.028	2.028	2.028	2.028	2.028	1.833	2.129	1.848	.000	.000
28+	2.028	2.028	2.028	2.028	1.772	1.872	2.129	.000	.000	.000

Table 2.17

DISAGGREGATED Qs
LOG TRANSFORMATION
Explanatory variate TIME
Fleet 1 ,fleet-name , has terminal q estimated from trend
FLEETS COMBINED BY ** VARIANCE **
erminal Fs estimated using Hybrid method
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
Fishing mortalities

Age,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89,	
11,	.009,	.039,	.003,	.007,	.002,	.001,	.001,	.000,	.000,	.001,	
12,	.053,	.082,	.025,	.033,	.023,	.007,	.004,	.002,	.001,	.001,	
13,	.056,	.042,	.028,	.066,	.020,	.010,	.006,	.004,	.003,	.002,	
14,	.043,	.033,	.035,	.057,	.035,	.016,	.022,	.012,	.004,	.007,	
15,	.050,	.086,	.060,	.107,	.077,	.055,	.035,	.039,	.011,	.021,	
16,	.039,	.077,	.093,	.076,	.076,	.077,	.068,	.037,	.020,	.034,	
17,	.024,	.035,	.059,	.054,	.048,	.056,	.064,	.050,	.024,	.043,	
18,	.042,	.060,	.079,	.125,	.101,	.075,	.088,	.074,	.060,	.076,	
19,	.041,	.087,	.111,	.085,	.130,	.125,	.164,	.106,	.094,	.131,	
20,	.053,	.059,	.213,	.146,	.152,	.177,	.190,	.136,	.127,	.180,	0.159 **mean F**
21,	.197,	.156,	.311,	.426,	.182,	.200,	.346,	.283,	.146,	.201,	
22,	.135,	.171,	.241,	.297,	.263,	.184,	.171,	.243,	.223,	.208,	
23,	.260,	.183,	.510,	.453,	.294,	.619,	.336,	.275,	.350,	.342,	
24,	.172,	.428,	.284,	.568,	.200,	.496,	.529,	.354,	.289,	.363,	
25,	.163,	.199,	.312,	.378,	.218,	.335,	.314,	.258,	.227,	.259,	

Log catchability estimates

Age 11

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-16.20,	-14.96,	-17.63,	-16.98,	-18.15,	-18.60,	-18.49,	-20.07,	-22.01,	-20.99

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-21.40 ,	.962,	.0001 ,	.0004,	-.665E+00,	.913E-01,	-14.753,	.567

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.000	.962	0.000	.962	0.000

cont'd.

Table 2.17 cont'd.

Age 12

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.44	-14.22	-15.60	-15.47	-15.63	-16.66	-17.33	-17.91	-18.58	-18.43

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-18.73	.428	.0007	.0007	-.512E+00	.407E-01	-13.610	.252

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.001	.428	0.000	.428	0.000

Age 13

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.38	-14.89	-15.47	-14.77	-15.78	-16.32	-16.84	-17.08	-17.62	-17.55

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-17.77	.376	.0019	.0019	-.378E+00	.357E-01	-13.988	.221

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.002	.376	0.000	.376	0.000

Age 14

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.65	-15.14	-15.27	-14.91	-15.21	-15.85	-15.52	-16.00	-17.29	-16.50

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-16.66	.484	.0057	.0057	-.229E+00	.459E-01	-14.373	.285

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.006	.484	0.000	.484	0.000

cont'd.

Table 2.17 cont'd.

Age 15

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.49	-14.18	-14.72	-14.28	-14.44	-14.65	-15.07	-14.83	-16.15	-15.38

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-15.50	.458	.0184	.0184	-.151E+00	.435E-01	-13.986	.270

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.018	.458	0.000	.458	0.000

Age 16

Fleet	80	81	82	83	84	85	86	87	88	89
1	-14.75	-14.28	-14.27	-14.62	-14.45	-14.31	-14.41	-14.87	-15.54	-14.89

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-14.98	.398	.0310	.0310	-.747E-01	.377E-01	-14.229	.234

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.031	.398	0.000	.398	0.000

Age 17

Fleet	80	81	82	83	84	85	86	87	88	89
1	-15.22	-15.09	-14.72	-14.97	-14.90	-14.62	-14.47	-14.58	-15.39	-14.65

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-14.71	.351	.0405	.0405	.336E-01	.334E-01	-15.046	.207

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.041	.351	0.000	.351	0.000

cont'd.

Table 2.17 cont'd.

Age 18

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-14.66,	-14.54,	-14.44,	-14.13,	-14.16,	-14.33,	-14.15,	-14.18,	-14.47,	-14.08

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-14.13	.195	.0726	.0726	.418E-01	.185E-01	-14.544	.115

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.073	.195	0.000	.195	0.000

Age 19

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-14.68,	-14.16,	-14.10,	-14.52,	-13.92,	-13.82,	-13.53,	-13.83,	-14.01,	-13.54

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.58	.295	.1256	.1256	.961E-01	.280E-01	-14.539	.174

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.126	.295	0.000	.295	0.000

Age 20

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-14.43,	-14.55,	-13.45,	-13.97,	-13.75,	-13.47,	-13.38,	-13.57,	-13.71,	-13.22

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.25	.360	.1737	.1737	.111E+00	.342E-01	-14.361	.212

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.174	.360	0.000	.360	0.000

cont'd.

Table 2.17 cont'd.

Age 21

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-13.13,	-13.58,	-13.07,	-12.90,	-13.58,	-13.35,	-12.78,	-12.84,	-13.57,	-13.11

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-13.13 ,	.379,	.1956 ,	.1956,	.122E-01,	.360E-01,	-13.257,	.223

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.196	.379	0.000	.379	0.000

Age 22

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-13.50,	-13.49,	-13.32,	-13.26,	-13.21,	-13.44,	-13.49,	-12.99,	-13.14,	-13.07

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-13.10 ,	.165,	.2028 ,	.2028,	.428E-01,	.157E-01,	-13.527,	.097

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.203	.165	0.000	.165	0.000

Age 23

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-12.85,	-13.42,	-12.57,	-12.84,	-13.09,	-12.22,	-12.81,	-12.87,	-12.69,	-12.58

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-12.60 ,	.362,	.3326 ,	.3326,	.425E-01,	.344E-01,	-13.029,	.213

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.333	.362	0.000	.362	0.000

cont'd.

Table 2.17 cont'd.

Age 24 Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.26	-12.57	-13.16	-12.62	-13.48	-12.44	-12.36	-12.62	-12.89	-12.52

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.55	.428	.3528	.3528	.546E-01	.407E-01	-13.092	.252

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.353	.428	0.000	.428	0.000

Table 2.18 **Sebastes mentella in Sub-areas V and XIV.**

from 80 to 89 on ages 11 to 25
with Terminal F of .159 on age 18 and Terminal S of 1.000

Initial sum of squared residuals was 68.599 and
final sum of squared residuals is 20.863 after 112 iterations

Matrix of Residuals

Years / Ages	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89		WTS
11/12	-.750	1.904	-.955	-.269	-.138	.045	.621	-.552	.095	.000	.214
12/13	.338	1.194	-.940	.056	.707	.163	-.394	-.698	-.426	.000	.268
13/14	.856	.521	-.458	.428	.304	-.601	-.772	.017	-.296	.000	.327
14/15	.155	.234	-.348	.034	.199	-.075	-.085	.472	-.587	.000	.574
15/16	-.143	.229	-.039	.115	.098	-.063	-.166	.471	-.502	.000	.670
16/17	.044	.214	.431	-.129	.055	.007	-.115	-.050	-.456	.000	.754
17/18	-.156	-.074	-.034	-.391	.115	.184	.254	.155	-.054	.000	.916
18/19	-.181	-.074	.388	.015	.163	-.336	.009	-.114	.129	.000	.869
19/20	.129	-.329	.182	-.596	.054	.011	.375	-.076	.250	.000	.611
20/21	-.360	-.892	.111	-.012	.284	.021	.032	.223	.593	.000	.436
21/22	.220	-.370	.114	.135	-.177	.051	.110	-.089	.005	.000	1.000
22/23	.290	-.358	.017	.162	-.234	-.098	-.245	-.100	.565	.000	.625
23/24	-.260	-.333	.205	.467	-.474	.454	-.234	-.338	.514	.000	.456
24/25	-.346	.297	-.441	.417	-.857	.332	.340	-.091	.348	.000	.403
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
WTS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	80	81	82	83	84	85	86	87	88	89
F-values	.0405	.0534	.0712	.0889	.0704	.0776	.0924	.0875	.0781	.1590

Selection-at-age (S)

	11	12	13	14	15
S-values	.1950	.6151	.5139	.5277	.9128

	16	17	18	19	20	21	22	23	24	25
S-values	.9019	.6316	1.0000	1.2832	1.6026	2.4743	1.8581	2.4025	1.8152	1.0000

Table 2.19 Sebastes mentella in Sub-areas V and XIV.
Separable fishing mortalities.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
11	.008	.010	.014	.017	.014	.015	.018	.017	.015	.031
12	.025	.033	.044	.055	.043	.048	.057	.054	.048	.098
13	.021	.027	.037	.046	.036	.040	.048	.045	.040	.082
14	.021	.028	.038	.047	.037	.041	.049	.046	.041	.084
15	.037	.049	.065	.081	.064	.071	.084	.080	.071	.145
16	.036	.048	.064	.080	.064	.070	.083	.079	.070	.143
17	.026	.034	.045	.056	.044	.049	.058	.055	.049	.100
18	.040	.053	.071	.089	.070	.078	.092	.087	.078	.159
19	.052	.069	.091	.114	.090	.100	.119	.112	.100	.204
20	.065	.086	.114	.143	.113	.124	.148	.140	.125	.255
21	.100	.132	.176	.220	.174	.192	.229	.216	.193	.393
22	.075	.099	.132	.165	.131	.144	.172	.163	.145	.295
23	.097	.128	.171	.214	.169	.186	.222	.210	.188	.382
24	.073	.097	.129	.161	.128	.141	.168	.159	.142	.289
25	.040	.053	.071	.089	.070	.078	.092	.087	.078	.159
$F_{(18-22)u}$	.066	.088	.117	.146	.116	.128	.152	.144	.128	.261
$F_{(14-23)u}$	.055	.073	.097	.121	.096	.106	.126	.119	.106	.216

Table 2.20 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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
11	154386	134566	99023	80227	49312	38625	17381	9779	6525	5197	0
12	139992	138402	116389	89046	71430	44230	34625	15457	8766	5810	4559
13	112173	119774	115135	102349	75614	61296	38659	30313	13607	7577	4787
14	106893	95807	103594	101201	85753	65737	54149	33986	26403	11823	6073
15	93632	93098	83795	90333	86328	74437	57534	46460	28947	23089	9528
16	73720	81219	78050	71263	72852	72170	63131	48379	38203	24709	16709
17	70433	64403	68917	65080	59559	60704	60340	52686	40390	32794	18351
18	49118	62452	56493	59383	56199	51251	51669	51109	44888	34658	26361
19	44456	43108	53795	47647	48576	46620	42882	42443	42832	37762	26117
20	36090	39031	36682	44471	39998	39685	37960	32675	34167	35144	29009
21	34524	31466	33854	28755	35835	31677	31385	29374	25607	26821	26367
22	30951	28011	25619	24805	20143	28213	24166	22211	21268	19821	19268
23	24753	26039	23241	19907	18723	15911	22321	18984	17170	16307	14317
24	24840	20474	21507	16928	14051	14459	11182	16089	13808	12699	11681
25	15628	21127	16483	17166	12900	11582	10514	8724	11785	10079	9623
26+	9165	14574	3871	13020	5716	6241	3545	4493	8155	4304	10888
TOTAL NO	1020754	1013551	936447	871583	752988	662840	561443	463162	382522	308593	
SPS NO	252890	262320	247484	246099	226075	221899	210378	197275	187891	167838	
TOT.BIOM	618440	628341	579576	558864	577386	524233	478528	423814	354034	295954	
SPS BIOM	262141	275741	248494	252210	241876	237450	232333	226091	209870	188343	

Table 3.1 GREENLAND HALIBUT. Nominal catches (tonnes) in Sub-areas V and XIV, 1980-1988, as reported to ICES.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989[1]
Denmark	-	-	-	-	-	-	-	6	+	-
Faroe Islands	1,042	767	1,532	1,146	2,502	1,052	857	1,096	469	2,249
France	51	8	27	236	489	845	52	19	25	17
Germany, Fed.Rep.	2,318	3,007	2,581	1,142	936	863	859	566	637[1]	488
Greenland	-	+	1	5	15	81	177	154	37	13
Iceland	27,838	15,455	28,300	28,360	30,080	29,231	31,044	44,780	49,040	59,450
Norway	3	2	+	2	2	3	2	2	1	3
Total	31,252	19,239	32,441	30,888	34,024	32,075	32,991	46,623	51,209	62,220

[1] Preliminary.
Working Group total 62,834 in 1989.

Table 3.2 GREENLAND HALIBUT. Nominal catches (tonnes) in Division Vb, 1980-1989, as reported to ICES.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989[1]
Denmark	-	-	-	-	-	-	-	6	+	-
Faroe Islands	951	442	863	1,112	2,456	1,052	779	1,007	1,055	1,515
France	51	8	27	236	489	845	52	19	25	17
Germany, Fed.Rep.	172	114	142	86	118	227	114	10	42	75
Norway	3	2	+	2	2	2	2	2	1	3
Total	1,177	566	1,032	1,436	3,065	2,126	947	1,044	1,123	1,610

[1] Preliminary data.
Working Group total 1,610 in 1989.

Table 3.3 GREENLAND HALIBUT. Nominal catches (tonnes) in Division Va, 1980-1989, as reported officially to ICES.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989[1]
Faroe Islands	91	325	669	33	46	-	-	150	379	719
Iceland	27,836	15,455	28,300	28,359	30,078	29,195	31,027	44,644	49,000	59,450
Norway	-	+	-	+	+	1	-	-	-[1]	-
Total	27,927	15,780	28,969	28,392	30,124	29,196	31,027	44,659	49,379	60,169

[1] Preliminary data.
Working Group total - 60,719 in 1989.

Table 3.4 GREENLAND HALIBUT. Nominal catches (tonnes) in Sub-area XIV, 1980-1989, as reported to ICES.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989[1]
Faroe Islands	-	-	-	-	-	-	78	74	35	15
France	-	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	2,146	2,893	2,439	1,054	818	636	745	456	595[1]	413
Greenland	-	+	1	5	15	81	177	154	37	13
Iceland	2	-	-	1	2	36	17	136	40	-
Norway	-	-	-	-	+	-	-	-	-	-
UK (Engl.& Wales)	-	-	-	-	-	-	-	-	-	-
Total	2,148	2,893	2,440	1,060	835	753	1,017	820	707	441

[1] Preliminary data.
Working Group total 505 in 1989.

Table 3.5 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

CATCH IN NUMBERS UNIT: thousands

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
5	47	26	8	10	84	128	247	182	130	514
6	502	158	300	240	277	451	616	3123	745	1695
7	1536	580	1140	1611	891	1039	1039	4863	2076	4589
8	2630	1160	2451	2651	2139	2350	1954	2586	2997	6101
9	3126	1430	2646	3060	3568	3535	3001	2156	3179	5896
10	2324	1764	2456	2443	2800	2819	3115	3476	2978	3323
11	1739	1299	1803	1693	1825	1490	1693	1847	1856	1637
12	849	664	963	978	1134	640	825	1829	1768	1493
13	578	435	609	424	588	434	553	886	1859	1264
14	306	252	331	174	363	141	203	213	704	520
15	143	176	195	37	92	37	59	31	217	370
16+	116	159	132	47	20	47	34	5	247	147
TOTAL	13896	8103	13034	13368	13781	13111	13339	21197	18756	27549
A) SOP	31249	19192	32452	30551	34240	32053	32979	47490	51011	62836
B)NOMIN.	31252	19239	32441	30560	34054	32075	32991	46719	51203	62834
(B/A) %	100	100	100	100	99	100	100	98	100	100

Table 3.6 VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
5	1.125	1.071	1.010	.984	.942	.995	1.030	1.030	1.129	.840
6	1.283	1.257	1.368	1.338	1.275	1.230	1.238	1.218	1.304	1.048
7	1.487	1.440	1.618	1.577	1.592	1.630	1.499	1.533	1.541	1.425
8	1.756	1.660	1.905	1.848	1.817	1.951	1.937	1.824	1.770	1.726
9	2.053	1.967	2.187	2.159	2.240	2.367	2.363	2.187	2.236	2.125
10	2.279	2.258	2.516	2.434	2.461	2.637	2.631	2.666	2.683	2.637
11	2.498	2.515	2.761	2.603	2.835	2.829	2.848	2.996	3.082	3.219
12	3.059	2.950	3.129	3.034	3.262	3.353	3.335	3.595	3.624	3.733
13	3.783	3.450	3.785	3.784	3.962	4.006	4.039	4.431	4.312	4.142
14	4.507	4.033	4.475	4.446	4.936	4.792	4.925	5.140	5.098	5.383
15	5.139	4.652	4.985	4.751	5.230	5.231	5.466	5.764	5.213	6.570
16+	5.633	4.714	5.610	6.209	6.968	6.323	5.764	5.764	5.764	6.506

Table 3.7 VIRTUAL POPULATION ANALYSIS

GREENLAND IBUT IN FISHING AREAS V AND XIV

PROPORTION OF MATURITY

UNIT:

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
5	.000	.000	.000	.037	.000	.000	.040	.040	.040	.040
6	.030	.030	.047	.075	.080	.060	.070	.070	.070	.070
7	.100	.100	.200	.153	.190	.310	.190	.190	.190	.190
8	.350	.350	.326	.280	.320	.270	.310	.310	.310	.310
9	.770	.770	.503	.381	.420	.290	.430	.430	.430	.430
10	.960	.960	.702	.605	.640	.560	.650	.650	.650	.650
11	1.000	1.000	.852	.854	.750	.720	.830	.830	.830	.830
12	1.000	1.000	.943	.984	.930	.860	.960	.960	.960	.960
13	1.000	1.000	1.000	1.000	1.000	.990	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
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	1.000	16,578	16,578
1978	0.969	14,349	14.808
1979	1.025	23,616	23.040
1980	1.917	31,252	16.303
1981	1.276	19,239	15.078
1982	1.492	32,441	21.743
1983	2.078	30,887	14.864
1984	2.244	34,024	15.162
1985	2.942	32,075	15.707
1986	1.690	32,991	19.521
1987	1.630	46,623	28.603
1988	1.261	51,202	40.604
1989	1.604	62,834	39.173

Table 3.9

DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet 1 ,Greenland halibut, I, 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
Fishing mortalities

Age,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89,
5,	.001,	.001,	.000,	.000,	.003,	.003,	.006,	.003,	.002,	.003,
6,	.019,	.005,	.010,	.010,	.015,	.022,	.019,	.085,	.016,	.032,
7,	.088,	.026,	.044,	.067,	.043,	.067,	.060,	.191,	.071,	.126,
8,	.209,	.084,	.140,	.128,	.113,	.143,	.165,	.198,	.164,	.288,
9,	.339,	.159,	.264,	.246,	.239,	.260,	.258,	.262,	.374,	.519,
10,	.429,	.308,	.419,	.391,	.350,	.285,	.362,	.503,	.649,	.795,
11,	.589,	.428,	.557,	.538,	.536,	.300,	.262,	.358,	.520,	.872,
12,	.579,	.441,	.614,	.633,	.805,	.342,	.256,	.470,	.648,	1.006,
13,	.557,	.628,	.887,	.570,	.953,	.798,	.526,	.450,	1.211,	1.388,
14,	.437,	.474,	1.446,	.645,	1.410,	.591,	1.084,	.371,	.741,	1.442,
15,	.518,	.456,	.785,	.555,	.811,	.463,	.498,	.430,	.754,	1.101,

Log catchability estimates

Age 5

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-16.35,	-16.79,	-18.19,	-17.29,	-15.31,	-15.37,	-15.08,	-16.79,	-16.77,	-16.44

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-16.44 ,	1.015,	.0028 ,	.0028,	.000E+00,	.000E+00,	-16.438,	.306

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.003	1.01	0.000	1.01	0.000

Age 6

Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-13.65,	-14.91,	-14.56,	-14.25,	-13.84,	-13.49,	-13.85,	-12.75,	-14.72,	-14.00

cont'd.

Table 3.9 cont'd.

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-14.00	.673	.0325	.0325	.000E+00	.000E+00	-14.003	.203

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.032	.673	0.000	.673	0.000

Age 7

Fleet	80	81	82	83	84	85	86	87	88	89
1	-12.13	-13.26	-13.12	-12.31	-12.79	-12.36	-12.69	-11.94	-13.26	-12.65

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.65	.490	.1257	.1257	.000E+00	.000E+00	-12.650	.148

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.126	.490	0.000	.490	0.000

Age 8

Fleet	80	81	82	83	84	85	86	87	88	89
1	-11.27	-12.10	-11.95	-11.66	-11.81	-11.61	-11.68	-11.90	-12.42	-11.82

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.82	.324	.2875	.2875	.000E+00	.000E+00	-11.822	.098

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.288	.324	0.000	.324	0.000

Age 9

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.78	-11.46	-11.32	-11.01	-11.06	-11.01	-11.23	-11.62	-11.59	-11.23

cont'd.

Table 3.9 cont'd.

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.23	.287	.5187	.5187	.000E+00	.000E+00	-11.232	.087

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.519	.287	0.000	.287	0.000

Age 10

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.54	-10.80	-10.86	-10.54	-10.68	-10.92	-10.89	-10.97	-11.04	-10.81

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-10.81	.177	.7947	.7947	.000E+00	.000E+00	-10.806	.053

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.795	.177	0.000	.177	0.000

Age 11

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.23	-10.47	-10.57	-10.23	-10.26	-10.86	-11.22	-11.31	-11.27	-10.71

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-10.71	.456	.8725	.8725	.000E+00	.000E+00	-10.712	.137

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.872	.456	0.000	.456	0.000

Age 12

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.25	-10.44	-10.47	-10.06	-9.85	-10.73	-11.24	-11.04	-11.05	-10.57

cont'd.

Table 3.9 cont'd.

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-10.57	.473	1.0055	1.0055	.000E+00	.000E+00	-10.570	.143

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
1.006	.473	0.000	.473	0.000

Age 13

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.28	-10.09	-10.11	-10.17	-9.68	-9.89	-10.52	-11.07	-10.42	-10.25

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-10.25	.396	1.3884	1.3884	.000E+00	.000E+00	-10.248	.119

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
1.388	.396	0.000	.396	0.000

Age 14

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.53	-10.37	-9.62	-10.04	-9.29	-10.19	-9.80	-11.14	-10.91	-10.21

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-10.21	.593	1.4424	1.4424	.000E+00	.000E+00	-10.209	.179

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
1.442	.593	0.000	.593	0.000

Table 3.10 Greenland HALIBUT in Sub-areas V and XIV.

from 80 to 89 on ages 5 to 15
with Terminal F of .811 on age 10 and Terminal S of 1.000

Initial sum of squared residuals was 212.675 and
final sum of squared residuals is 20.034 after 115 iterations

Matrix of Residuals

Years / Ages	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89		WTS
5/ 6	.472	.187	-1.258	-.979	.273	.556	-.178	.941	-.015	.000	.179
6/ 7	.507	-.382	-.579	-.015	-.410	.254	-.750	1.708	-.333	.000	.170
7/ 8	.357	-.428	-.331	.418	-.650	-.128	-.187	1.178	-.229	.000	.229
8/ 9	.385	-.114	-.028	.077	-.507	-.054	.305	.147	-.211	.000	.474
9/10	.098	-.079	.003	.182	-.048	.055	-.016	-.268	.072	.000	1.000
10/11	-.339	.020	-.154	-.065	-.115	-.006	.211	.221	.227	.000	.661
11/12	.054	.351	.090	.045	.304	.082	-.386	-.367	-.173	.000	.489
12/13	-.137	.229	.380	.223	.295	-.275	-.304	-.371	-.041	.000	.446
13/14	-.395	.038	.399	-.539	.332	-.071	.318	-.544	.462	.000	.314
14/15	-.950	-.233	1.089	-.290	.940	-.215	1.004	-1.010	-.335	.000	.158
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
WTS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	80	81	82	83	84	85	86	87	88	89
F-values	.4178	.2574	.4103	.4008	.4790	.3874	.3723	.4523	.5456	.8110

Selection-at-age (S)

	5
S-values	.0044

	6	7	8	9	10	11	12	13	14	15
S-values	.0448	.1671	.3691	.6531	1.0000	1.0681	1.1894	1.5829	1.5037	1.0000

Table 3.11a Greenland HALIBUT in Sub-areas V and XIV.

Separable fishing mortalities

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
5	.002	.001	.002	.002	.002	.002	.002	.002	.002	.004
6	.019	.012	.018	.018	.021	.017	.017	.020	.024	.036
7	.070	.043	.069	.067	.080	.065	.062	.076	.091	.136
8	.154	.095	.151	.148	.177	.143	.137	.167	.201	.299
9	.273	.168	.268	.262	.313	.253	.243	.295	.356	.530
10	.418	.257	.410	.401	.479	.387	.372	.452	.546	.811
11	.446	.275	.438	.428	.512	.414	.398	.483	.583	.866
12	.497	.306	.488	.477	.570	.461	.443	.538	.649	.965
13	.661	.407	.649	.634	.758	.613	.589	.716	.864	1.284
14	.628	.387	.617	.603	.720	.582	.560	.680	.820	1.220
15	.418	.257	.410	.401	.479	.387	.372	.452	.546	.811

Table 3.11b VIRTUAL POPULATION ANALYSIS

GREENLAND HALIBUT IN FISHING AREAS V AND XIV

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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
5	.001	.001	.000	.000	.003	.003	.004	.003	.002	.004
6	.019	.005	.010	.010	.015	.021	.018	.062	.016	.037
7	.089	.027	.043	.067	.043	.067	.059	.177	.050	.124
8	.204	.085	.142	.127	.113	.144	.165	.192	.150	.193
9	.331	.154	.267	.249	.239	.261	.261	.260	.360	.458
10	.411	.297	.403	.398	.357	.284	.364	.511	.643	.743
11	.551	.401	.528	.506	.550	.309	.260	.360	.534	.856
12	.501	.395	.552	.576	.716	.356	.265	.466	.656	1.064
13	.490	.489	.722	.474	.781	.627	.559	.474	1.188	1.438
14	.412	.387	.812	.435	.917	.403	.642	.409	.816	1.346
15	.417	.416	.551	.179	.408	.198	.276	.175	.904	1.447
16+	.417	.416	.551	.179	.408	.198	.276	.175	.904	1.447
(8-13)U	.415	.304	.436	.388	.459	.330	.312	.377	.588	.792

Table 3.12 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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1980-84
5	39249	36426	31118	23571	27048	44293	65659	58108	59142	156227	0	31482
6	28183	33738	31328	26776	20279	23203	38005	56284	49846	50784	133990	28061
7	19446	23792	28892	26686	22824	17197	19553	32140	45552	42212	42140	24328
8	15317	15315	19941	23812	21477	18819	13840	15867	23166	37284	32085	19172
9	11903	10752	12108	14896	18042	16506	14024	10105	11266	17167	26449	13540
10	7383	7359	7932	7977	9993	12231	10941	9298	6705	6763	9342	8129
11	4392	4211	4705	4562	4613	6018	7924	6543	4801	3033	2769	4497
12	2307	2180	2427	2390	2367	2290	3804	5256	3927	2423	1109	2334
13	1597	1203	1264	1202	1157	995	1381	2512	2839	1755	720	1284
14	971	842	635	528	644	456	458	679	1345	745	359	724
15	450	554	492	243	294	222	262	207	388	512	167	406
16+	365	500	333	308	64	282	151	33	442	203	145	314
TOTAL NO	131562	136873	141174	132951	128801	142512	176000	197033	209419	319108		
SPS NO	34485	33586	34454	32660	34624	31688	38914	41586	43663	49219		
TOT.BIOM	210199	208375	237986	225774	222245	242497	278107	308010	338849	398044		
SPS BIOM	81168	75337	81284	73544	80908	77641	93882	101558	105409	100383		

Table 3.13

List of input variables for the ICES prediction program.

PREDICTION OF GREENLAND HALIBUT IN AREAS V AND XIV IN THE YEARS 1991-1993.
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
1990	31500.0
1991	31500.0
1992	31500.0
1993	31500.0

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	31500.0	.00	.15	.04	1.000	1.000
6	27004.0	.04	.15	.07	1.190	1.190
7	22443.0	.14	.15	.19	1.500	1.500
8	32085.0	.30	.15	.31	1.773	1.773
9	26449.0	.53	.15	.43	2.183	2.183
10	9362.0	.81	.15	.65	2.662	2.662
11	2769.0	.87	.15	.83	3.099	3.099
12	1109.0	.97	.15	.96	3.651	3.651
13	720.0	1.28	.15	1.00	4.295	4.295
14	359.0	1.22	.15	1.00	5.207	5.207
15	167.0	.81	.15	1.00	5.849	5.849
16+	145.0	.81	.15	1.00	6.011	6.011

Table 3.14 Management options for 1991 and 1992 for GREENLAND HALIBUT in Division V + XIV.

1990				Management option for 1991 and 1992	1991				1992			1993	
Stock biom. (5+)	SSB	F(8-13)	Catch (5+)		Stock biom. (5+)	SSB	F(8-13)	Catch (5+)	Stock biom. (5+)	SSB	Catch (5+)	Stock biom. (5+)	SSB
256	86	0.56	50	$F_{0.1}$	243	89	0.15	20	265	113	20	283	134
				$F = 0.8F_{89}$			0.63	56	221	82	50	206	72
				F_{max}			0.40	39	240	95	40	235	95
				$F = F_{89}$			0.79	67	210	74	53	197	61
				$F = 1.2F_{89}$			0.95	76	200	67	55	179	53

Weights in '000 t.

Table 4.1 Nominal catch (tonnes) of SAITHE in Division Va, 1978-1989, as reported to ICES.

Country	1978	1979	1980	1981	1982	1983
Belgium	1,092	980	980	532	203	224
Faroe Islands	4,250	5,457	4,930	3,545	3,582	2,138
France	-	-	-	-	23	-
Germany, Fed.Rep.	-	-	-	-	-	-
Iceland	44,327	57,066	52,436	54,921	65,124	55,904
Norway	3	1	1	3	1	+
UK (Engl.& Wales)	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-
Total	49,672	63,504	58,347	59,001	68,933	58,266

Country	1984	1985	1986	1987	1988	1989[1]
Belgium	269	158	218	217	268	369
Faroe Islands	2,044	1,778	2,291	2,139	2,596	2,246
France	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-	-
Iceland	60,406	55,185	63,867	78,175	74,383	79,446
Norway	-	1	-	-	-	-
UK (Engl.& Wales)	-	29	-	-	-	-
UK (Scotland)	-	-	-	-	-	-
Total	62,719	57,101	66,376	80,531	77,247	82,061

[1] Preliminary.

Table 4.2 Icelandic SAITHE. Calculation of total effort during 1978-1989.

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	80,531	59,388
1988	1.28	77,247	60,256
1989[1]	1.17	82,061	69,899

[1] Preliminary.

Table 4.3 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

CATCH IN NUMBERS UNIT: thousands

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	135	257	486	40	135	197	3060	924	861	364
4	2303	1550	1221	1469	492	2929	1394	4983	6044	3584
5	4634	4310	2526	1343	826	3432	3722	4327	7719	6986
6	2551	5464	4817	2410	1537	1818	2382	5348	3767	5726
7	2419	1504	4361	4364	2456	1719	1386	2987	2484	2143
8	1612	1470	1375	2406	3367	1530	1170	1412	1650	2211
9	482	589	1119	460	982	1604	695	679	720	1030
10	245	192	343	346	318	627	1809	494	205	362
11	132	67	65	71	249	185	266	507	227	301
12	102	175	37	36	227	100	69	58	101	206
13	59	130	38	11	137	96	44	26	19	170
14+	52	208	112	66	339	317	156	65	4	31
TOTAL	14726	15916	16500	13022	11065	14554	16153	21810	23801	23114

Table 4.4 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	1.445	1.477	1.540	1.865	1.540	1.526	1.381	1.516	1.403	1.307
4	1.893	2.004	2.148	2.229	2.367	2.087	2.132	1.717	2.050	1.921
5	2.682	2.574	2.951	3.151	3.319	2.880	2.953	2.670	2.433	2.126
6	3.871	3.457	3.044	4.199	4.450	3.722	4.350	3.832	3.374	3.135
7	5.324	4.431	5.013	4.115	5.460	4.719	5.482	5.080	4.815	4.662
8	6.143	6.156	6.031	5.930	5.194	6.162	6.431	6.179	5.937	5.941
9	6.848	6.820	7.249	7.509	7.526	5.650	7.614	7.310	7.538	7.253
10	8.227	8.047	8.070	8.815	8.580	8.314	6.477	8.023	8.598	8.988
11	9.062	9.409	8.920	9.357	9.315	9.640	9.625	7.945	8.714	10.689
12	9.299	9.205	10.581	9.557	10.123	10.401	10.487	9.609	9.580	10.635
13	10.502	9.439	10.144	10.235	10.875	11.055	11.781	12.250	11.145	13.334
14+	11.373	10.146	11.093	9.578	11.223	11.443	12.088	12.562	14.098	12.134

Table 4.5 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

PROPORTIONS OF MATURITY

UNIT:

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	.000	.000	.000	.030	.080	.020	.020	.020	.010	.000
4	.060	.060	.090	.270	.150	.250	.140	.140	.020	.050
5	.270	.270	.360	.600	.520	.350	.370	.370	.230	.120
6	.630	.630	.560	.550	.830	.580	.680	.680	.410	.390
7	.810	.810	.980	.850	.950	.760	.830	.830	.810	.660
8	.970	.970	.980	.980	.650	.900	.890	.890	.860	.960
9	1.000	1.000	1.000	.980	1.000	.760	.940	.940	1.000	1.000
10	1.000	1.000	1.000	.970	1.000	.970	.950	.950	1.000	1.000
11	1.000	1.000	1.000	1.000	1.000	1.000	.980	.980	1.000	1.000
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

Table 4.6 ICELANDIC SAITHE. Tuning analysis.

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
Fishing mortalities

Age,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89,
3,	.005,	.013,	.026,	.001,	.004,	.007,	.059,	.016,	.019,	.014,
4,	.052,	.070,	.078,	.101,	.021,	.103,	.065,	.130,	.138,	.104,
5,	.185,	.131,	.156,	.115,	.076,	.201,	.183,	.295,	.303,	.235,
6,	.334,	.346,	.211,	.219,	.186,	.237,	.209,	.433,	.452,	.387,
7,	.380,	.337,	.514,	.301,	.362,	.327,	.286,	.437,	.368,	.505,
8,	.502,	.421,	.590,	.601,	.401,	.403,	.387,	.527,	.461,	.657,
9,	.358,	.345,	.662,	.399,	.530,	.339,	.323,	.408,	.566,	.591,
10,	.774,	.236,	.347,	.440,	.534,	.782,	.802,	.401,	.206,	.629,
11,	.308,	.497,	.117,	.111,	.662,	.693,	.949,	.549,	.325,	.526,
12,	.217,	.864,	.569,	.087,	.608,	.617,	.608,	.553,	.198,	.551,
13,	.432,	.473,	.457,	.328,	.547,	.567,	.614,	.488,	.351,	.591,

Log catchability estimates

Age 3 Fleet,	80,	81,	82,	83,	84,	85,	86,	87,	88,	89
1 ,	-15.97,	-14.89,	-14.51,	-17.34,	-16.59,	-15.66,	-13.72,	-15.12,	-14.95,	-15.42

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q),	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTRCPT,	SE Intrcpt
1 ,	-15.42 ,	1.090,	.0141 ,	.0141,	.000E+00,	.000E+00,	-15.417,	.329

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.014	1.09	0.000	1.09	0.000

(cont'd)

Table 4.6 (cont'd)

Age 4

Fleet	80	81	82	83	84	85	86	87	88	89
1	-13.59	-13.19	-13.40	-13.06	-14.84	-13.01	-13.62	-13.03	-12.98	-13.41

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.41	.581	.1044	.1044	.000E+00	.000E+00	-13.415	.175

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.104	.581	0.000	.581	0.000

Age 5

Fleet	80	81	82	83	84	85	86	87	88	89
1	-12.32	-12.57	-12.70	-12.93	-13.56	-12.34	-12.59	-12.21	-12.20	-12.60

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.60	.429	.2347	.2347	.000E+00	.000E+00	-12.604	.129

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.235	.429	0.000	.429	0.000

Age 6

Fleet	80	81	82	83	84	85	86	87	88	89
1	-11.73	-11.60	-12.40	-12.29	-12.66	-12.18	-12.46	-11.83	-11.80	-12.11

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.11	.372	.3865	.3865	.000E+00	.000E+00	-12.105	.112

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.387	.372	0.000	.372	0.000

(cont'd)

Table 4.6 (cont'd)

Age 7

Fleet	80	81	82	83	84	85	86	87	88	89
1	-11.60	-11.62	-11.51	-11.97	-12.00	-11.85	-12.15	-11.82	-12.01	-11.84

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.84	.214	.5055	.5055	.000E+00	.000E+00	-11.837	.065

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.505	.214	0.000	.214	0.000

Age 8

Fleet	80	81	82	83	84	85	86	87	88	89
1	-11.32	-11.40	-11.37	-11.27	-11.90	-11.65	-11.85	-11.63	-11.78	-11.57

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.57	.234	.6569	.6569	.000E+00	.000E+00	-11.575	.071

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.657	.234	0.000	.234	0.000

Age 9

Fleet	80	81	82	83	84	85	86	87	88	89
1	-11.66	-11.60	-11.26	-11.68	-11.62	-11.82	-12.03	-11.89	-11.58	-11.68

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.68	.217	.5906	.5906	.000E+00	.000E+00	-11.681	.065

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.591	.217	0.000	.217	0.000

(cont'd)

Table 4.6 (cont'd)

Age 10

Fleet	80	81	82	83	84	85	86	87	88	89
1	-10.89	-11.98	-11.90	-11.59	-11.61	-10.98	-11.12	-11.91	-12.58	-11.62

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.62	.543	.6289	.6289	.000E+00	.000E+00	-11.619	.164

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.629	.543	0.000	.543	0.000

Age 11

Fleet	80	81	82	83	84	85	86	87	88	89
1	-11.81	-11.23	-13.00	-12.96	-11.40	-11.10	-10.95	-11.59	-12.13	-11.80

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.80	.752	.5259	.5259	.000E+00	.000E+00	-11.797	.227

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.526	.752	0.000	.752	0.000

Age 12

Fleet	80	81	82	83	84	85	86	87	88	89
1	-12.16	-10.68	-11.41	-13.20	-11.48	-11.22	-11.40	-11.59	-12.63	-11.75

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-11.75	.767	.5506	.5506	.000E+00	.000E+00	-11.751	.231

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.551	.767	0.000	.767	0.000

Table 4.7

Title : ICELANDIC SAITHE
At 16.20.46 05 MAY 1990
from 80 to 89 on ages 3 to 13
with Terminal F of .410 on age 6 and Terminal S of 1.000

Initial sum of squared residuals was 101.269 and
final sum of squared residuals is 25.503 after 80 iterations

Matrix of Residuals

Years / Ages	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89		WTS
3/ 4	-.701	.275	.345	-.529	-1.005	-.151	1.483	-.273	.556	.000	.284
4/ 5	-.201	.030	.052	1.256	-1.188	.237	-.503	-.174	.491	.000	.320
5/ 6	-.154	-.007	-.209	.150	-.450	.410	-.178	-.046	.485	.000	.712
6/ 7	.235	.026	-.152	-.018	-.075	-.004	-.372	.244	.416	.000	.761
7/ 8	.114	-.200	-.036	.187	.418	.004	-.282	-.050	-.154	.000	1.000
8/ 9	.235	-.401	.071	.450	.310	.015	-.110	-.380	-.191	.000	.720
9/10	.250	-.033	.250	.017	.116	-.788	-.205	.258	.135	.000	.645
10/11	.421	.306	.436	-.234	.010	-.006	.541	-.355	-1.119	.000	.411
11/12	-.887	.085	-.280	-1.472	.645	.403	1.077	.779	-.350	.000	.259
12/13	-.798	1.068	.391	-1.600	.642	.290	.583	.338	-.914	.000	.243
	.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)

	80	81	82	83	84	85	86	87	88	89
F-values	.2728	.2601	.2727	.1931	.2330	.3117	.3202	.3920	.3305	.4100

Selection-at-age (S)

	3
S-values	.0373

	4	5	6	7	8	9	10	11	12	13
S-values	.2834	.6248	1.0000	1.2916	1.6621	1.5059	1.4685	1.1116	1.0364	1.0000

Table 4.8 VIRTUAL POPULATION ANALYSIS

ICELANDIC SAITHE

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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	.005	.014	.026	.001	.004	.007	.049	.015	.017	.015
4	.052	.071	.082	.102	.022	.105	.064	.106	.129	.090
5	.178	.129	.159	.122	.077	.214	.188	.286	.237	.216
6	.318	.329	.208	.224	.200	.242	.227	.449	.434	.277
7	.348	.314	.475	.296	.374	.360	.293	.491	.388	.473
8	.471	.370	.528	.527	.391	.423	.446	.549	.557	.718
9	.392	.314	.536	.335	.425	.327	.346	.507	.607	.834
10	.568	.266	.304	.313	.409	.532	.753	.444	.280	.717
11	.219	.297	.135	.094	.389	.445	.453	.488	.377	.856
12	.181	.503	.265	.103	.485	.267	.295	.166	.167	.703
13	.272	.367	.191	.117	.692	.390	.180	.173	.075	.466
14+	.272	.367	.191	.117	.692	.390	.180	.173	.075	.466
(4- 9)U	.293	.254	.331	.268	.248	.279	.261	.398	.392	.435

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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
3	30409	21091	20831	29866	39723	30552	70158	68130	56996	26459	0
4	50335	24775	17036	16616	24416	32401	24836	54678	54946	45887	21334
5	31252	39132	18885	12846	12280	19546	23886	19076	40273	39538	34336
6	10289	21413	28154	13186	9307	9309	12913	16205	11728	26028	26083
7	9023	6131	12623	18714	8627	6236	5985	8429	8472	6224	16161
8	4698	5215	3668	6426	11399	4858	3562	3655	4225	4707	3175
9	1631	2402	2950	1772	3107	6311	2605	1867	1728	1982	1880
10	618	903	1437	1413	1038	1663	3726	1509	921	771	705
11	737	287	566	868	846	564	800	1436	792	569	308
12	679	484	174	405	647	469	296	416	722	445	198
13	272	464	240	109	299	326	294	180	289	500	180
14+	240	743	707	657	740	1077	1043	451	61	91	304
TOTAL NO	140182	123040	107272	102880	112429	113312	150106	176033	181152	153200	
SPS NO	33982	40850	46138	47695	43233	38909	39044	42988	30748	30174	
TOT.BIOM	374593	357538	345660	348876	365728	340280	403120	424644	434869	385257	
SPS BIOM	155169	172671	205196	213749	210644	173705	189571	179311	135260	132206	

Table 4.10

List of input variables for the 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
1990	47000.0
1991	47000.0
1992	47000.0
1993	47000.0

Proportion of F (fishing mortality) effective before spawning: .0000
Proportion of M (natural mortality) effective before spawning: .0000

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	47000.0	.02	.20	.01	1.409	1.409
4	38154.0	.12	.20	.07	1.896	1.896
5	27638.0	.26	.20	.24	2.410	2.410
6	26083.0	.41	.20	.49	3.447	3.447
7	16161.0	.53	.20	.77	4.852	4.852
8	3175.0	.68	.20	.90	6.019	6.019
9	1880.0	.62	.20	.98	7.367	7.367
10	705.0	.60	.20	.98	8.536	8.536
11	308.0	.46	.20	.99	9.116	9.116
12	198.0	.43	.20	1.00	9.941	9.941
13	180.0	.41	.20	1.00	12.243	12.243
14+	304.0	.41	.20	1.00	12.931	12.931

Table 4.11 Management options for 1991 and 1992 for ICELANDIC SAITHE in Division Va.

1990				Management option for 1991 and 1992	1991				1992			1993	
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
423	174	0.39	90	$F_{0.1}$	418	180	0.16	44	463	217	52	500	250
				$F=0.8F_{89}$			0.35	85	416	181	84	414	180
				F_{max}			0.36	87	414	180	86	410	177
				F_{89}			0.44	101	397	166	94	393	155
				$F=1.2F_{89}$			0.52	117	397	153	101	357	135

Weights in '000 t.

Table 5.1 Catches of saithe, cod, and haddock in Division Vb (Faroes area) in 1981-1989 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		
	Saithe	Cod	Haddock	Saithe	Cod	Haddock	Saithe	Cod	Haddock
Open boats	75	75	235	94	5,960	944	110	3,203	93
Longliners (< 100 GRT)	27	6,884	3,579	22	8,351	4,771	62	5,113	6,170
Longliners (>100 GRT)	19	2,825	1,406	44	2,562	1,547	14	1,778	1,667
Trawlers (4-1000 HP)	9,820	4,908	906	3,186	2,838	678	1,211	2,150	350
Trawlers (>1000 HP)	17,759	4,392	886	13,963	4,300	904	10,717	2,798	526
Pair trawlers (4-1000 HP)	8,556	4,454	1,917	11,203	4,754	1,927	11,112	9,634	2,428
Pair trawlers (>1000 HP)	11,259	2,131	637	11,015	1,994	686	13,791	4,595	1,264
Others	6,829	11,085	2,777	4,664	10,250	4,359	3,396	5,255	2,808
Total	54,344	36,914	12,343	44,191	41,009	15,816	40,413	34,526	15,306

Category	1987			1988			1989		
	Saithe	Cod	Haddock	Saithe	Cod	Haddock	Saithe	Cod	Haddock
Open boats	235	2,345	1,665	29	2,745	74	533	1,903	898
Longliners (< 100 GRT)	46	3,434	5,932	-	2,745	4,598	38	6,047	7,696
Longliners (>100 GRT)	31	2,359	1,611	-	3,080	2,018	52	3,887	2,301
Trawlers (4-1000 HP)	1,536	1,580	627	2,958	1,764	466	2,392	1,277	436
Trawlers (>1000 HP)	7,763	1,879	284	9,118	1,558	268	7,737	1,218	208
Pair trawlers (4-1000 HP)	9,371	6,359	2,243	9,680	6,475	1,259	10,021	2,285	837
Pair trawlers (>1000 HP)	16,689	3,334	1,264	18,172	3,674	983	18,298	1,901	821
Others	1,723	3,052	1,756	4,765	5,545	2,486	5,406	4,471	1,104
Total	37,394	24,342	15,382	44,722	25,075	12,152	44,477	22,989	14,301

Table 5.2 Effort (days at sea) and catch-at-age data by group of pair trawlers in the category >1000 HP.

Age/Gear	1982	1983	1984	1985	1986	1987	1988	1989
1	-	-	-	-	-	-	-	-
2	-	-	-	6	3	2	-	-
3	-	225	77	93	170	239	129	96
4	984	231	1,780	518	324	943	539	1,096
5	275	1,052	328	1,196	891	798	1,706	931
6	516	312	762	249	638	633	599	1,178
7	107	116	182	313	177	237	244	133
8	47	85	49	41	188	125	102	79
9	37	73	19	16	45	65	67	26
10	34	15	3	3	17	15	16	15
11	14	31	8	6	9	10	2	10
12	12	32	17	12	6	1	2	2
13	9	2	2	4	16	3	4	0
14	17	36	5	1	1	4	-	2
15+	119	41	23	32	7	11	-	3
Effort	2,227	2,224	2,182	1,566	1,749	2,212	2,149	1,917
Catch (t)	6,194	6,530	8,814	6,865	6,846	7,397	7,549	6,864

Table 5.3 Stratified mean catch by age in number per trawl hour of COD in the Faroese groundfish surveys, 1982-1989.

Age	1982	1983	1984	1985	1986	1987	1988	1989
1	-	0.9	0.9	-	-	-	0.1	0.0
2	5.9	12.6	24.5	9.7	3.1	2.9	5.5	13.5
3	10.5	71.6	46.4	108.4	72.3	44.7	63.5	14.3
4	55.2	48.2	33.9	46.5	262.8	89.3	82.3	28.2
5	42.2	45.3	12.3	17.1	69.2	132.7	60.0	26.0
6	17.6	15.5	8.1	3.6	25.1	22.8	61.5	14.4
7	6.5	4.2	3.4	3.9	12.1	2.9	11.8	22.7
8	7.6	1.3	0.3	1.6	5.5	2.4	1.8	3.3
9	2.8	0.6	-	0.2	0.8	0.4	0.7	0.2
10	-	1.8	0.4	0.2	-	0.5	0.6	0.3

Table 5.4 Stratified mean catch by age in numbers per trawl hour of HADDOCK in the Faroese groundfish surveys, 1982-1989.

Age	1982	1983	1984	1985	1986	1987	1988	1989
1	-	143.4	199.0	417.3	40.9	66.0	69.3	71.3
2	-	154.7	180.4	134.8	223.5	16.7	166.6	199.1
3	52.9	60.2	38.7	72.0	73.9	41.8	21.4	156.1
4	16.8	5.3	19.1	11.0	34.9	28.4	39.9	10.9
5	2.9	4.6	0.7	3.5	6.2	16.2	22.1	32.1
6	54.1	-	1.0	-	1.5	2.9	8.3	52.3
7	18.5	16.1	-	0.7	-	-	2.6	34.2
8	41.3	7.2	3.3	0.3	0.1	-	0.2	3.6
9	12.5	9.9	1.2	1.6	0.4	0.1	0.2	0.0
10	9.1	3.6	2.9	0.3	0.7	0.1	-	0.0

Table 6.1 Nominal catch (t) of SAITHE in Division Vb, 1979-1989, as reported to ICES.

Country	1979	1980	1981	1982	1983	1984
Denmark	-	-	-	-	-	-
Faroe Islands	22,003	23,810	29,682	30,808	38,963	54,344
France	2,974	1,110	258	130	180	243
German Dem.Rep.	-	-	-	-	-	-
Germany, Fed.Rep.	581	197	20	19	28	73
Norway	1,137	62	134	15	5	5
UK (England & Wales)	190	13	-	-	-	-
UK (Scotland)	361	38	9	1	-	-
USSR	-	-	-	-	-	-
Total	27,246	25,230	30,103	30,973	39,176	54,665

Country	1985	1986	1987	1988	1989[1]
Denmark	-	21	255	94	-
Faroe Islands	42,874	40,139	39,301	43,000[1]	42,500
France	839	87	153	313	-
German Dem.Rep.	31	-	-	-	9
Germany, Fed.Rep.	227	105	49	74	22
Norway	-	24	14	52[1]	49
UK (England & Wales)	4	-	108	-	20
UK (Scotland)	630	1,340	140	92	-
USSR	-	-	-	-	-
Total	44,605	41,716	40,020	43,625	42,600

[1] Preliminary.

Working Group figures (t):

1987 39,931
1988 45,347
1989 45,050

Table 6.2 SUM OF PRODUCTS CHECK

FAROE SAITHE
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0	0	0	0	0	0	0	0	0	0
2	424	0	221	0	0	77	6	10	0	0
3	996	411	387	2483	368	1224	1167	1577	867	458
4	877	1804	4076	1103	11067	3990	1997	5780	2954	6009
5	720	769	994	5052	2359	5583	4473	3818	9568	5378
6	673	932	1114	1343	4093	1182	3730	2779	2788	7242
7	726	908	380	575	875	1898	953	988	1302	804
8	284	734	417	339	273	273	1077	531	622	554
9	212	343	296	273	161	103	245	332	363	187
10	171	192	105	98	52	38	104	81	159	84
11	196	92	88	98	65	26	67	43	27	56
12	156	128	56	99	59	72	33	5	43	10
13	261	176	49	25	18	41	56	11	15	2
14	133	310	110	127	25	8	7	15	0	11
15+	236	407	687	289	151	154	62	66	0	16
TOTAL	6065	7206	8980	11904	19566	14669	13977	16036	18708	20811
A) SOP	25470	31475	32336	39188	54714	47459	43973	41531	45623	46368
B)NOMIN.	25230	30103	30964	39176	54665	44605	41716	39931	45347	45050
(B/A) %	99	96	96	100	100	94	95	96	99	97

Table 6.3 VIRTUAL POPULATION ANALYSIS

FAROE SAITHE

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	1.230	1.310	1.337	1.208	1.431	1.401	1.718	1.609	1.500	1.309
4	2.210	2.130	1.851	2.029	1.953	2.032	1.986	1.835	1.975	1.735
5	3.320	3.000	2.951	2.965	2.470	2.965	2.618	2.395	1.978	1.907
6	4.280	3.810	3.577	4.143	3.850	3.596	3.277	3.182	2.937	2.373
7	5.160	4.750	4.927	4.724	5.177	5.336	4.186	4.067	3.798	3.810
8	6.420	5.250	6.243	5.901	6.347	7.202	5.289	5.149	4.419	4.567
9	6.870	5.950	7.232	6.811	7.825	6.966	6.050	5.501	5.115	5.509
10	7.090	6.430	7.239	7.051	6.746	9.862	6.150	6.626	6.712	5.972
11	7.930	7.000	8.346	7.248	8.636	10.670	9.536	6.343	8.040	6.939
12	8.070	7.470	8.345	8.292	8.467	10.461	9.823	10.245	9.364	8.543
13	8.590	8.140	8.956	9.478	8.556	10.202	7.303	8.491	9.142	9.514
14	9.790	8.550	9.584	10.893	11.127	9.644	11.869	11.634	.000	11.730
15+	10.340	10.100	10.330	10.340	10.748	13.232	12.875	10.220	.000	9.627

Table 6.4 FAROE SAITHE. Tuning analysis.

```
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet  1 ,CUBATRAWLERS         , 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,
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,    88,    89,

     3,  .029,  .072,  .016,  .070,  .026,  .062,  .020,  .010,
     4,  .185,  .109,  .513,  .245,  .157,  .172,  .157,  .192,
     5,  .205,  .366,  .357,  .532,  .477,  .501,  .475,  .471,
     6,  .482,  .469,  .572,  .305,  .845,  .622,  .860,  .818,   0.57
     7,  .314,  .496,  .643,  .574,  .431,  .565,  .679,  .658,
     8,  .556,  .512,  .466,  .423,  .768,  .457,  .869,  .704,
     9,  .438,  .895,  .491,  .320,  .853,  .573,  .657,  .713,
    10,  .294,  .252,  .415,  .203,  .622,  .786,  .603,  .307,
    11,  .397,  .493,  .265,  .377,  .655,  .572,  .667,  .441,
    12,  .361, 1.084,  .629,  .525, 1.204,  .089, 2.494,  .562,
    13,  .134,  .271,  .577, 1.330, 1.051, 2.683,  .414, 1.033,
    14,  .325,  .599,  .475,  .551,  .877,  .941,  .967,  .611,

Log catchability estimates

 Age  3
 Fleet,    82,    83,    84,    85,    86,    87,    88,    89
_______,______,______,______,______,______,______,______,______
     1 ,-21.37,-15.35,-16.00,-15.23,-15.59,-15.00,-16.03,-16.37

                        SUMMARY STATISTICS
 Fleet , Pred.  , SE(q),Partial,Raised,   SLOPE   ,    SE     ,INTRCPT,  SE
       ,   q    ,      ,   F   ,   F   ,          ,  Slope   ,       ,Intrcpt
_______,________,______,_______,_______,__________,__________,_______,_______
     1 ,-16.37  , 2.200, .0022 , .0103,  .000E+00,  .000E+00,-16.368,  .733
    Fbar      SIGMA(int.)     SIGMA(ext.)     SIGMA(overall)  Variance ratio
    .010         2.20             0.000          2.20             0.000
```

(cont'd)

Table 6.4 (cont'd)

Age 4

Fleet	82	83	84	85	86	87	88	89
1	-13.39	-14.09	-12.82	-13.45	-13.68	-13.90	-13.79	-13.59

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.59	.411	.0350	.1918	.000E+00	.000E+00	-13.587	.137

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.192	.411	0.000	.411	0.000

Age 5

Fleet	82	83	84	85	86	87	88	89
1	-13.15	-12.89	-13.32	-12.18	-12.36	-12.58	-12.71	-12.74

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.74	.404	.0816	.4714	.000E+00	.000E+00	-12.740	.135

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.471	.404	0.000	.404	0.000

Age 6

Fleet	82	83	84	85	86	87	88	89
1	-11.78	-12.53	-12.56	-12.75	-11.94	-12.28	-11.92	-12.25

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.25	.369	.1330	.8176	.000E+00	.000E+00	-12.252	.123

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.818	.369	0.000	.369	0.000

(cont'd)

Table 6.4 (cont'd)

Age 7

Fleet	82	83	84	85	86	87	88	89
1	-12.70	-12.61	-12.33	-12.36	-12.54	-12.32	-12.30	-12.45

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.45	.160	.1088	.6579	.000E+00	.000E+00	-12.452	.053

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.658	.160	0.000	.160	0.000

Age 8

Fleet	82	83	84	85	86	87	88	89
1	-13.05	-12.36	-12.80	-12.76	-12.02	-12.56	-12.18	-12.53

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.53	.359	.1004	.7038	.000E+00	.000E+00	-12.533	.120

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.704	.359	0.000	.359	0.000

Age 9

Fleet	82	83	84	85	86	87	88	89
1	-13.18	-11.74	-13.17	-13.00	-11.86	-12.51	-12.35	-12.55

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.55	.589	.0991	.7130	.000E+00	.000E+00	-12.545	.196

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.713	.589	0.000	.589	0.000

(cont'd)

Table 6.4 (cont'd)

Age 10

Fleet	82	83	84	85	86	87	88	89
1	-12.63	-13.56	-14.05	-14.14	-12.30	-12.25	-13.04	-13.14

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-13.14	.780	.0548	.3067	.000E+00	.000E+00	-13.139	.260

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.307	.780	0.000	.780	0.000

Age 11

Fleet	82	83	84	85	86	87	88	89
1	-13.04	-12.17	-13.74	-12.45	-12.44	-12.34	-13.24	-12.78

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.78	.567	.0788	.4412	.000E+00	.000E+00	-12.775	.189

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.441	.567	0.000	.567	0.000

Age 12

Fleet	82	83	84	85	86	87	88	89
1	-12.84	-11.36	-12.03	-12.44	-11.53	-14.35	-12.39	-12.42

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.42	.981	.1124	.5620	.000E+00	.000E+00	-12.420	.327

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
.562	.981	0.000	.981	0.000

(cont'd)

Table 6.4 (cont'd)

Age 13

Fleet	82	83	84	85	86	87	88	89
1	-13.98	-14.14	-13.07	-12.05	-11.21	-10.64	-12.44	-12.50

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE Slope	INTRCPT	SE Intrcpt
1	-12.50	1.302	.1033	1.0329	.000E+00	.000E+00	-12.504	.434

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
1.033	1.30	0.000	1.30	0.000

Table 6.5

Title : FAROE SAITHE
At 17.28.46 08 MAY 1990
from 80 to 89 on ages 3 to 14
with Terminal F of .470 on age 5 and Terminal S of 1.000

Initial sum of squared residuals was 99.600 and
final sum of squared residuals is 45.039 after 62 iterations

Matrix of Residuals

Years / Ages	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89		WTS
3/ 4	1.186	-1.098	.527	-.156	-1.270	1.231	-.489	.861	-.792	.000	.186
4/ 5	.741	.601	.162	-.644	.583	.375	-.799	-.279	-.738	.000	.293
5/ 6	.088	-.649	-.216	.011	.283	.567	-.029	.181	-.235	.000	.524
6/ 7	-.414	.127	.265	-.276	-.150	-.111	.280	.105	.175	.000	.736
7/ 8	-.041	.096	-.199	.123	.333	.317	-.381	-.115	-.134	.000	.764
8/ 9	-.253	.185	.067	.072	.095	-.195	.147	-.261	.143	.000	1.000
9/10	-.304	.105	.412	.644	.208	-.631	-.270	-.227	.064	.000	.459
10/11	.591	.107	-.231	-.188	-.120	-.788	-.042	.565	.106	.000	.432
11/12	.461	-.114	-.361	-.037	-.857	-.412	1.717	-.493	.097	.000	.244
12/13	-.348	.071	.296	.885	-.674	-.184	-.067	-1.862	1.883	.000	.176
13/14	-.489	-.501	-1.536	-.881	-.295	1.281	.112	3.210	-.901	.000	.127
	.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)

	80	81	82	83	84	85	86	87	88	89
F-values	.1938	.3073	.2711	.3565	.3738	.3077	.4853	.4126	.5253	.4700

Selection-at-age (S)

	3	4
S-values	.1147	.5763

	5	6	7	8	9	10	11	12	13	14
S-values	1.0000	1.4899	1.4705	1.6062	1.7546	1.3037	1.3533	1.5443	1.3450	1.0000

Table 6.6a

Title : FAROE SAITHE
At 10.32.18 07 MAY 1990
SEPERABLE FISHING MORTALITIES

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	.022	.035	.031	.041	.043	.035	.056	.047	.060	.054
4	.112	.177	.156	.205	.215	.177	.280	.238	.303	.271
5	.194	.307	.271	.356	.374	.308	.485	.413	.525	.470
6	.289	.458	.404	.531	.557	.458	.723	.615	.783	.700
7	.285	.452	.399	.524	.550	.452	.714	.607	.773	.691
8	.311	.494	.435	.573	.600	.494	.779	.663	.844	.755
9	.340	.539	.476	.625	.656	.540	.851	.724	.922	.825
10	.253	.401	.353	.465	.487	.401	.633	.538	.685	.613
11	.262	.416	.367	.482	.506	.416	.657	.558	.711	.636
12	.299	.475	.419	.550	.577	.475	.749	.637	.811	.726
13	.261	.413	.365	.479	.503	.414	.653	.555	.707	.632
14	.194	.307	.271	.356	.374	.308	.485	.413	.525	.470
$F_{(4-8)}{}^{u}$	.238	.378	.333	.438	.459	.378	.596	.507	.646	.577

Table 6.6b VIRTUAL POPULATION ANALYSIS

FAROE SAITHE

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

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
3	.093	.014	.031	.071	.017	.070	.026	.067	.036	.054
4	.153	.243	.186	.116	.511	.248	.155	.174	.173	.363
5	.204	.195	.205	.369	.384	.529	.485	.494	.480	.539
6	.229	.441	.478	.468	.579	.337	.835	.640	.838	.837
7	.290	.548	.324	.488	.642	.588	.501	.552	.718	.622
8	.235	.533	.527	.537	.454	.422	.804	.583	.829	.787
9	.273	.493	.426	.804	.532	.309	.849	.627	1.067	.645
10	.373	.424	.273	.243	.342	.228	.586	.779	.712	.780
11	.264	.353	.351	.442	.252	.286	.789	.516	.655	.593
12	.203	.276	.378	.852	.525	.488	.715	.117	1.666	.544
13	.199	.371	.161	.289	.358	.876	.901	.555	.602	.286
14	.194	.383	.419	.793	.523	.266	.349	.654	.000	1.312
15+	.194	.383	.419	.793	.523	.266	.349	.654	.000	1.312
(4- 8)U	.222	.392	.344	.396	.514	.425	.556	.489	.608	.630

Table 6.7 VIRTUAL POPULATION ANALYSIS

FAROE SAITHE

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1980-87
3	12314	32732	14022	39701	24761	20013	50015	26751	27394	9623	0	27539
4	6787	9183	26428	11131	30264	19941	15281	39895	20479	21646	7465	19864
5	4286	4766	5896	17967	8119	14865	12737	10711	27457	14106	12326	9918
6	3606	2861	3210	3932	10174	4530	7171	6420	5349	13906	6734	5238
7	3171	2347	1506	1630	2015	4668	2647	2548	2772	1895	4932	2566
8	1490	1944	1109	892	819	868	2123	1313	1201	1107	833	1320
9	976	964	934	534	427	426	466	778	600	429	412	688
10	602	609	482	499	194	205	256	163	340	169	184	376
11	928	339	326	300	321	112	134	117	61	137	63	322
12	933	583	195	188	158	204	68	50	57	26	62	297
13	1590	623	362	110	66	76	103	27	36	9	12	370
14	831	1067	352	253	67	38	26	34	0	16	5	333
15+	1475	1401	2199	575	406	723	231	150	0	24	9	895
TOTAL NO	38988	59420	57022	77710	77790	66668	91257	88956	85747	63092		
SPS NO	19887	17504	16572	26879	22765	26715	25961	22310	37875	31823		
TOT.BIOM	148639	153719	154823	173691	183819	179112	205800	188223	174106	127375		
SPS BIOM	118494	91279	87157	103148	89280	110555	89527	71973	92569	77223		

Table 6.8

List of input variables for the ICES prediction program.

FAROE SAITHE - FINAL
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
1990	22000.0
1991	22000.0
1992	22000.0
1993	22000.0
1994	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	.05	.20	.00	1.473	1.473
4	7465.0	.27	.20	.00	1.848	1.848
5	12326.0	.47	.20	1.00	2.093	2.093
6	6734.0	.70	.20	1.00	2.831	2.831
7	4932.0	.69	.20	1.00	3.892	3.892
8	833.0	.75	.20	1.00	4.712	4.712
9	412.0	.83	.20	1.00	5.375	5.375
10	184.0	.61	.20	1.00	6.437	6.437
11	63.0	.64	.20	1.00	7.107	7.107
12	62.0	.73	.20	1.00	9.384	9.384
13	12.0	.63	.20	1.00	9.049	9.049
14	5.0	.47	.20	1.00	11.682	11.682
15+	9.0	.47	.20	1.00	9.924	9.924

Table 6.9 Management options for 1991 and 1992 for FAROE SAITHE in Division VB.

1990				Management option for 1991 and 1992	1991				1992			1993	
Stock biom. (3+)	SSB	$F_{(4-8)}$	Catch (3+)		Stock biom. (3+)	SSB	$F_{(4-8)}$	Catch (3+)	Stock biom. (3+)	SSB	Catch (3+)	Stock biom. (3+)	SSB
119	73	0.58	35	$F_{0.1}$	115	52	0.17	11	137	72	13	156	91
				$F = 0.8F_{89}$			0.46	26	120	55	26	124	60
				F_{max}									
				F_{89}			0.58	31	114	50	29	115	51
				$F = 1.2F_{89}$			0.69	36	109	46	31	108	45

Weights in '000 t.