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REPORT OF THE SAITHE (COALFISH) WORKING GROUP

Copenhagen, 23 - 29 April 1985

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1 INTRODUCTION

1.1 Participants

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T Jakobsen	Norway
B W Jones	U.K.
A Kristiansen	Faroes
B Mesnil (Chairman)	France
K Nedreaas	Norway
J B Perodou	France
H H Reinsch	Federal Republic of Germany

Mr. K. Hoydal attended the meeting as ICES Statistician.

1.2 Terms of Reference

At the 72nd Council Meeting it was decided (C.Res.1984/2:4:12) that the Saithe (Coalfish) Working Group should meet at ICES Headquarters from 23-29 April 1985 to assess catch options for 1986 and 1987 for the saithe stocks and for cod and haddock in Faroese waters inside safe biological limits.

In addition it was decided (C.Res.1984/4:13) that, as other North Sea stock Assessment Working Groups, the Group should:

- 1) provide quarterly catch at age and mean weight at age data as input for the Multispecies VPA for the period 1974 to 1984 and, as far as possible, for earlier years back to 1963 for the North Sea stocks,

- 2) evaluate the evidence of natural mortality for the oldest age groups,
- 3) assess the effects of applying the estimates of total natural mortality calculated by the Multispecies Working Group,
- 4) provide advice to the Multispecies Working Group on the geographical distribution of saithe by age group and quarter, and on the proportions of these which would be predators on North Sea prey species.

1.3 Landings of Saithe in the North East Atlantic

Historical record of catches from the saithe stocks dealt with by the Working Group are given in Table 1.1

2 NORTH-EAST ARCTIC SAITHE (Sub-areas I and II)

2.1 Landings (Table 2.1, Figure 2.1.A)

The provisional estimate of landings in 1984 is 150,315 tonnes which is 8,000 tonnes less than in 1983.

2.2 Age Composition (Table 2.2)

The age composition from Norwegian landings in 1983 was revised. There was an increase in the numbers for all age groups older than 5 years, which was caused mostly by redistribution of the trawl catches according to log-book data. Provisional age compositions for 1984 were available from the Federal Republic of Germany and

Norway, accounting for 99% of the landings.

2.3 Weight at Age (Table 2.3)

For 1960-79, a fixed set of weights at age are used both for catch and stock. For 1980-84, the annual weights at age in the catch for each year are used for catch and stock weights.

The weight at age data used in the yield per recruit and were derived by averaging the weights at age for the years 1982-84.

2.4 Fishing Mortality and Stock Size Estimate from VPA

2.4.1 Estimates of fishing mortality

The assessment of the 1984 Working Group was based on the assumption that fishing mortalities had been stable from 1980 to 1983. The background for this was the development in catches by different gear categories in recent years, (Figure 2.2) and a separable VPA which showed indication of a change in the exploitation pattern since 1980. The reported catches in 1984 were 24,000 tonnes in excess of the catches predicted by the 1984 Working Group. The prediction for 1984 split on gears showed that most of the difference was in the trawl catches, where the age groups 3 and especially 4 had been caught in much larger numbers than predicted. This is in good accordance with the distribution of the trawl catch by area and season which shows that the main increase had occurred in summer in the southern part of the area. Judging by the catch data and the discrepancies with the prediction, there seems to have been an increase rather than a shift in the effort by the trawlers. To account for this in the VPA, fishing mortality on age 3 and 4 in 1984 was increased substantially compared to the recent years.

Effort and cpue for the Norwegian trawlers (Table 2.6) have so far been of little use to the assessment. Data for 1984 were not available at the time of the Working Group meeting. The level of fishing mortalities on the other age groups were therefore kept approximately at the 1980-82 level.

There is evidence of lower fishing mortalities on the oldest age groups after 1980 (Table 2.4). A level of less than 0.2 is indicated, but in view of the large year to year variation in the level of these values in the past, fishing mortality at age 14 for 1981-84 was reduced only from 0.35 to 0.30.

2.4.2 Spawning stock biomass and recruitment

Estimates of spawning stock biomass are given in Table 2.5 and Figure 2.1.B. There is a decline from 1970 onwards, to 143,000 tonnes in 1981, the lowest observed spawning biomass in the time series. The values in recent years are somewhat higher than the 1984 Working Group estimates, and the main reason for this is the revision of the 1983 catch at age data.

Estimates of stock numbers at each age are given in Table 2.5, and recruitment at age 1 is plotted in Figure 2.1.B. The 1978 year class is as large as those in 1973 and 1966-68, however the more recent year classes, from 1979-81, are amongst the lowest in the period reported.

2.5 Yield per Recruit

The Y/R curve is given in Figure 2.2.C. It was calculated using the 1984 exploitation pattern and the 1982-84 average weight at age data (Table 2.7.). Current exploitation (F_{3-8} unweighted) at $F = 0.59$ is in excess of $F_{max} = 0.30$ and $F_{0-1} = 0.18$.

2.6 Catch Predictions

The data used for catch predictions are given in Table 2.7. It was decided to use recruitment approaching the recent low level ($R_1 = 200 \times 10^6$) rather than the long-term average ($R_1 = 318 \times 10^6$). The predicted catches for 1986 will to a large extent depend on the size of the year classes 1982-84 and possibly represent low estimates.

Any major changes in the exploitation will most likely be caused by the Norwegian trawlers. Effort on North-East Arctic saithe may be reduced if catch rates are higher in the North Sea or if they are given higher quotas on Arctic cod and haddock. However, such changes appear to be of less importance than recruitment for the prediction. In view of this, and lacking information indicating future changes in the exploitation, the 1984 fishing mortalities were used as basis for the prediction.

Predicted catches and stock biomasses for 1985 and for a range of exploitation levels in 1986 are given in Table 2.8. Predicted yield in 1986 and the spawning stock biomass for 1987 are shown in Figure 2.1.D. Assuming that exploitation continues at the 1984 level, catches in 1985 and 1986 are predicted to be 128,000 tonnes and 126,000 tonnes, respectively. The spawning stock will decline to a level of less than 100,000 tonnes in 1987, unless fishing in 1986 is reduced.

2.7 Comments on the Assessment

The problems concerning the assessment of North-East Arctic saithe are lack of recruitment estimates, useful effort data, and other fishing independent data, and inadequate sampling, especially of the older fish. Last year's log-books from trawlers will normally not be available at the time of the meeting. The log-books are used to reallocate catches to fishing areas and the changes from the preliminary statistics may be substantial. The current tendency of variation in the trawl fishery represents a source of

error in the predictions.

3 NORTH SEA SAI THE (Sub-area IV and Division IIIa)

3.1 Landings (Table 3.1)

Landings of saithe from the North Sea in recent years have been in the range 120,000-175,000 tonnes. Revised figures for 1983 indicate that the official landings were 157,000 tonnes, slightly lower than that estimated at the 1984 Working Group meeting. The Working Group estimate of landings for 1983 is 165,500 tonnes, however, and this figure has been used in assessments.

Provisional landings reported for 1984 including industrial by-catch amount to 172,000 t. The Working Group estimate for the same year is higher at 200,000 tonnes and has been used in the assessment.

3.2 Age Composition (Table 3.1.1)

Age compositions for 1983 were revised in line with updated national data. For 1984 age composition data were available for 99% of landings from the following countries: Denmark, England, France, Federal Republic of Germany, Norway, and Scotland.

The total international age composition was obtained by summing the human consumption compositions, raising this sum to total human consumption landings and then adding the industrial by-catch.

3.3 Weight at Age (Table 3.2)

Weight at age data were provided by all countries providing age composition data. Catch at age or weight at age were adjusted to eliminate SOP discrepancies as appropriate.

As noted in earlier reports weights at age prior to 1979 are unreliable and are simply average values.

Weight at age used in predictions are mean values for the years 1982-84.

3.4 Fishing Mortality and Stock Estimates from VPA

3.4.1 Estimates of fishing mortality

Trial runs of VPA using last year's input Fs indicated that the exploitation pattern changed after 1979 when the Norwegian fleet effort increased substantially (see Table 3.5). The VPA was therefore tuned by setting the input Fs to the mean value for the period 1980-1982. These values can be seen in Table 3.3, where the value for age group 1 has been adjusted to give recruitment at age 1 in 1984 of about 260 million fish which corresponds to mean recruitment for the years 1974-1982.

A cpue index of spawning stock biomass was available from French data. This index (Table 3.6) is plotted against spawning stock biomass from VPA (Fig. 3.2) and suggests the VPA value is too low. To overcome this would require lower input Fs. There is however no independent evidence to support such a change and the total international effort in French units (Table 3.5) is little changed from recent years. Partial fishing mortality for France plotted against effective French effort (Table 3.5 and Fig. 3.3) shows the input Fs are consistent with effort data.

The exploitation pattern chosen as input for 1984 generates an exploitation pattern for 1983 which is noticeably different for older fish. This change is probably due to the Norwegian catch in 1984 which unlike 1983 was taken predominantly in the latter part of the year and therefore took proportionately more young fish.

3.4.2 Spawning stock biomass and recruitment

Spawning stock biomass and recruitment are given in Table 3.4 and are plotted in Fig. 3.1B. Recruitment has been increasing following the 1978 year class. The value for the 1982 year class may be too high but indications from the Norwegian industrial by-catch suggest that the 1982 year class is above average. The results of Norwegian acoustic surveys in 1984 and 1985 suggest that the 1981 year class is also above average (Smedstad, unpublished data).

Spawning stock biomass has been in the region of 150-250 thousand tonnes in recent years and appears likely to increase due to improved recruitment in recent years.

3.5 Yield per Recruit

Input data for yield per recruit are shown in Table 3.7. The analysis in this report indicates that present fishing mortality rate is in excess of both F_{max} and $F_{0.1}$ (Table 3.8, 3.9 and Fig. 3.1C).

Yield per recruit analysis as applied to the North Sea stock has a history of being unreliable primarily due to the uncertainty of the position of current F in relation to F_{max} . In 1982 for example the assessment suggested that F was in excess of F_{max} . The 1983 and 1984 assessments imply that for the same years F was approximately equal to F_{max} . This change was partly responsible for the large change in the TAC between 1983 and 1984. The present assessment now implies that F is once again above F_{max} despite the

fact that there has been no major change in the level of exploitation as far as can be ascertained from effort data and mean F. It seems unlikely therefore, that the present analysis is capable of showing whether or not the stock is overfished in terms of yield per recruit.

3.6 Catch Predictions

Input data for catch predictions are given in Table 3.7. The input exploitation pattern is that for for the period 1980-1982. Assuming no change in fishing mortality rate in 1985 the predicted catches for 1985 will be 259 thousand tonnes which is above the agreed TAC of 200,000 tonnes. Table 3.8 shows the effect of this catch on the management options in 1986. Table 3.9 makes the equivalent predictions based on the catch in 1985 being restricted to the TAC figure. The effect on yields and SSB for these two predictions are given in Fig 3.1.D.

3.7 Quarterly Age Composition Data

There was insufficient time at the meeting to construct a catch at age matrix on a quarterly basis as requested by the Multispecies Working Group. It was agreed that national data would be sent to the Marine Laboratory, Aberdeen for processing along with other roundfish species, on the same basis described in the 1985 Roundfish Working Group report. The summary below shows the availability of data. It should be noted that for the earlier years the age composition data become increasingly unreliable and a large proportion of the catch was not sampled.

ENGLAND: Data are available for all quarters though the level of age sampling is rather too low to split the annual catches down to a quarterly level in some years.

FRANCE: Data are available by quarter from 1976 or 1977 onwards.

FEDERAL REPUBLIC of GERMANY: Catch data are available by quarter from 1974 onwards. No weight at age data are available by quarter.

NORWAY: Quarterly data are available from 1980 onwards and can be split down to fleet level though it is felt that the sample size is rather too small to do this adequately. It is possible to split catches prior to 1980 roughly by quarter by assuming seasonality in the catches by certain sub-fleets.

SCOTLAND: Data are available from 1972 onwards by quarter (or month) and can be disaggregated down to fleet level.

DENMARK and USSR: These countries have both taken large catches from the North Sea during the period in question. It is not known if quarterly data can be obtained from these nations.

3.8 Geographical distribution by age group of North Sea Saithe

O-group saithe are found pelagically in the North Sea in spring and early summer. The distribution is mainly north of 58°N and normally the highest concentrations are found along the eastern part of the North Sea plateau. On the Norwegian west coast O-group saithe are found in shallow waters from May and by the end of June most of the year class seems to have reached the coast. The pattern appears to be the same on the British side of the North Sea. After June, O-group saithe are normally not found in large concentrations outside the coastal areas, but exceptional years (e.g. 1967) are known.

The saithe stay on the Norwegian west coast, for 2-3 years. Purse-seine catches which are taken mostly at depths of 50-100 m, are usually dominated by 2-3 year old fish. Migration across the Norwegian deep mostly takes place when the fish is three years old. This is reflected in the saithe by-catches from the industrial trawl fishery, where 3 year old fish usually are much

more numerous than 2 year olds.

Immature saithe, mostly 3 and 4 year old fish, tend to be concentrated along the eastern side of the North Sea plateau between $57^{\circ}30'N$ and $61^{\circ}N$, and east of $2^{\circ}E$. Concentrations are also found in the Shetland area, but the fish there are usually somewhat larger. Immature saithe are also found more or less regularly all over the North Sea north of $57^{\circ}N$, but usually not further south.

The saithe in the North Sea mostly reach maturity when they are 5 years old. The spawning grounds are found near the edge of the shelf at about 200 m depth and extends more or less continuously from west of Shetland to the Viking Bank. There appears to be a northeastward spawning migration along the Shelf west of Shetland which may continue east and southeast as far as the Viking Bank. There may also be a spawning migration from the south in the eastern part of the North Sea. The behaviour of the mature fish outside the spawning season appears to be variable. The concentrations are probably less dense and there are no grounds where they occur regularly before towards the end of the year.

4 ICELANDIC SAITHE

Landings of saithe from Division Va amounted to about 63,000 tonnes in 1984, 96% of which being taken by Icelandic vessels (Table 4.1).

Age composition of Icelandic landings was communicated to the Working Group by telex and was used to update the datafiles (Tables 4.2 - 4.4).

In the absence of a representative from the country which is primarily concerned with monitoring and fishing this stock the Working Group was lacking the essential background information required for a reasonable assessment of the stock and fisheries. They were not in a position to discuss the trial assessment

carried out at the Icelandic Institute and thus felt unable to endorse it.

5 WEST OF SCOTLAND SAI THE (Sub-area VI)

5.1 Landings

Landings of saithe from Sub-area VI are given in Table 5.1 and are shown in Figure 5.4.

With a peak of 36,000 tonnes in the period 1974-76 the catches decreased to 20,000 tonnes in 1979, and then remained more stable around this value. Landings in 1984 are estimated to be 20,300 tonnes.

5.2 Age Composition (Table 5.2)

Age compositions for 1984 were provided by England, Scotland and France and they account for 93% of the total landings. Minor corrections were made to the catch at age data for 1982 and 1983.

5.3 Weight at Age (Table 5.3)

Weight at age data for 1984 were provided by England, France and Scotland. The estimated mean weights at age for 1984 shown in Table 5.3 are similar to previous years.

5.4 Effort and Cpue Data

Catch and effort data for the French fleet were used as in previous years to compute an index of effective catch per unit effort, by fitting a multiplicative model correcting for area and

month effects. This index is given in Table 5.6 and was used to derive an estimate of total international effort. In spite of a slight increase in 1983, the series shows a pronounced decreasing trend which is supported by information on the fleets given in the Appendix.

Another abundance index, computed in the same way, was fitted to the French catch and effort data in the first quarter of each year, when the fleet directs its effort towards adult saithe. This index (Table 5.6) should thus indicate the relative levels of spawning stock biomasses, although the value for 1975 is questionable.

5.5 Fishing Mortality Estimates

As already mentioned in previous reports, the general level of fishing mortality for this stock has decreased to such a degree that VPA estimates do not demonstrate any convergence and are thus highly dependent on input values.

To account for the decreasing trend in effort, input values for 1984 should be set still lower than the recent level, implying a further loss of reliability of the VPA results. Attempts to define a set of acceptable input values proved inconclusive.

Trial runs were made using SVPA with $S_{\text{terminal}} = 0.4$. (Fig. 5.1). Table 5.7 shows the log-catch-ratio residual table for the run which gave values of $F(I)$ which best reflected the trend in French effort data. The residuals for ages 10/11 and 11/12 in the years 1983/84 are particularly large and suggest problems in the data.

The problem was further complicated this year due to sampling or ageing deficiencies on age groups 11 and 12, and it was not considered possible to correct for this adequately.

Consequently, it was preferred not to rely on an analytical assessment and the VPA results (Tables 5.4 - 5.5) are given for indication only.

5.6 Yield per Recruit

Because of failure of the VPA to produce satisfactory estimates of F at age in relation with M values, and in the absence of any evidence on changes in the exploitation pattern, it has been felt useless to recalculate a yield-per-recruit curve. Reference is thus made to last year's report.

5.7 Catch Predictions

Since no reliable estimate of stock size at age is available for 1984, the usual catch forecast could not be computed.

Referring to the time series shown in Figure 5.4 (corrected from last year's report) for the last decade, when data are considered of acceptable reliance, it can be seen that since 1978 landings have fluctuated in the range 20,000-27,000 tonnes, and that recruitment is at comparatively high levels. Spawning stock biomass shows a slow decreasing trend in spite of a continuously decreasing fishing effort. This effect is partly due to the high sensitivity of a non-converging VPA to uncertain input terminal Fs, and partly to variable mixture with North Sea spawners, as explained in the next section.

Further indications are given in the time series plots of effort and CPUE based on French data (Fig. 5.2) which show that the reduction of fishing effort has occurred along with a pronounced increase of catch rates which were stable at high levels in the last three years.

All the available evidence suggest that this stock is not in any immediate danger.

In order to derive an estimate of status-quo catches, use was made of available CPUE data which are plotted vs. fishing effort in Figure 5.3. Assuming a linear relationship in the range of observed fishing efforts, one arrives at the regression equation: $Y = 0.12 \times f + 4.07$. If fishing effort is to remain at the 1984 level, which is likely to occur for the fleets presently engaged in this fishery, landings may be expected to amount to 20,000 tonnes. Using the equation fitted to the data, one may simulate the effects of slight variations of the fishing effort which should produce results in the range 18,000-20,000 tonnes.

5.8 Comments on the Assessment

If fishing pressure is to remain at the present low level in the near future, assessment of the West of Scotland saithe stock is likely to be subject to the acute problem encountered this year and already expected last year, namely that the usual analytical approach fails to provide reliable estimates of fishing mortalities and stock numbers at age. As a consequence, alternative methods should be used in order to try and forecast status-quo catches.

The absence of fishery independent data, particularly of abundance index at age time series, makes the use of some of the short-cut methods recommended by the Methodology Working Group of lesser interest, since they would imply mere averages. Solutions might be found in a more refined treatment of CPUEs by age group or over discrete ranges of age groups.

Another question arises from fishery indications that the adult concentrations of saithe along the shelf edge to the northwest of the British Isles are found in continuity from the west of Hebrides up to the northwest of Shetland, well apart the IVa-VIa limit, and no quantitative evidence is available on the relative

contribution of these spawners to the recruitment in the North Sea and in the West of Scotland respectively.

If there is evidence that the West of Scotland and North Sea spawning areas are not clearly separated then for assessment purposes, both stocks might thus be combined, which might eliminate some of the problems with VPA. There is no doubt however that for management purposes they should remain as separate units with, for example, regional TACs set.

6 DEMERSAL FISHERIES ON THE FAROE PLATEAU IN 1984

6.1 Introduction

ACFM concluded on the basis of last year's assessment (Coop.Res.Report 131) that...there is no doubt that the effort has increased since 1977, especially by virtue of the increased number of single boat and pair trawlers. In addition, technical improvements and improved knowledge of the grounds by new skippers are assumed to have increased the fishing power of the trawling fleets..... .Despite difficulties in splitting the effort between the three species (cod, haddock and saithe) it is evident that a major built up of overall fishing effort, especially in the trawl fisheries has taken place in the demersal fisheries at the Faroes.

6.2 Trends in 1984

Because of problems in connection with a change in computerisation of logbook data, no effort estimates for the larger vessels (trawlers with more than 400 HP and other vessels above 100 GRT) were available to the Working Group.

The following qualitative evidence about changes in 1984 is based on the analyses of the Faroese Board of Fisheries. Two new trawlers have entered the fishery in 1984 (class >2000 HP). In 1985 an expected number of 5 will enter (class 1000-1999). The two trawlers entering in 1984 have mainly been exploiting the deep waters (redfish, blue ling), whereas the 5 entering in 1985 are expected to fish for saithe and to a lesser extent for cod and haddock. Because of a cut-back in the quotas in Icelandic waters 5 trawlers in the >1000 HP class have been fishing in Faroe waters throughout the year in 1984, and thus increased the fishing pressure on the demersal stocks, especially saithe. Table 6.1 gives a review of the development in recent years and a more general description of the fishery at the Faroes is given in the Appendix.

Evidence from the fishery seems to indicate that the demersal trawl effort has been more directed towards saithe in 1984, compared with 1983.

It should be noticed, that the trawlers (and all other gears in principle) have been discouraged from fishing fish below certain size limits. For saithe this has been achieved by a system of closing areas with high percentages of young fish in the catches on short notice and by refusing to accept fish below 60 cm at the fish factories.

6.3 Further Analysis of the Detailed Effort Data for 1973-1983

The analysis of the detailed FISKHAG effort data bank has been continued. An attempt to correct for directivity was made by including an area factor. This attempt seems, however, not to have solved the problem. Previously, corrections for seasonality have been introduced. On the basis of statistical analysis of data disaggregated on 22 fleet units, the data were grouped in

long line boats	< 100 GRT
long line ships	> 100 GRT
Trawlers	< 400 HP
Trawlers	400-999
Trawlers	>1000
Pairtrawlers	

The variance of cpue estimates from gill-net and handline is very high, and this is also the case of the cpue estimates from the open boats and these series have not been treated any further. The pairtrawler series covers only 4 years and is therefore of limited use at present. The cpue was estimated from the multiplicative model:

$\ln(\text{cpue})$ is a function of rectangle
 vessel class
 season
 + error term

In Figure 6.1 some of the annual cpue indexes are plotted. These values have been backtransformed by the following equation.

$$\exp(\text{model} + \text{mean square divided by } 2)$$

are plotted against year.

Effort estimates can then be derived by dividing the catch by this cpue estimates. Table 6.2 summarises the cpue estimates for the main species exploited by different vessel categories.

It should be noted in Fig. 6.1 that there is an increase in haddock cpue for the trawlers in 1983. This is probably an indication of the change in directivity in 1983.

6.4 The Use of Effort Data to Tune VPAs of Cod and Haddock

As no effort data were available for most of the larger vessel-groups for 1984, it was decided to base an evaluation of the trend in effort on the long line (<100 GRT) only. This can be used for cod and haddock, but as this gear does not catch saithe, there is no way to use the 1984 data for saithe.

The long line data were used in the following way: Partial Fs for long line were calculated (Table 6.3 and 6.4) and the average F for ages 3-8 for the converged part of the VPA was regressed against the effort estimates derived from the model. A VPA was run, which brought the 1981, 1982, 1983 and 1984 points close to the line.

The results for cod and haddock are shown in Figures 6.2 and 6.3. and are the basis for the VPA finally accepted. It should be noted that the residuals are quite high and this probably precludes straightforward predictions based on the effort data.

7 FAROE SAITHE (Division Vb)

7.1 Landings (Table 7.1, Figure 7.1A)

Preliminary reports indicate that the landings in 1984 were 54,417 tonnes which represents an increase of 39% above the 1983 landings of 39,178 tonnes and continues the trend of increasing landings since 1980. The 1980 year class is very abundant and has dominated the landings in 1984 accounting for 39% of the landed weight.

7.2 Age Composition (Table 7.2)

Age composition data for 1983 from Faroes, France, Federal Republic of Germany, and Norway were updated and new data for 1984 were available for Faroes and the Federal Republic of Germany.

7.3 Weight at Age (Table 7.3)

Average weight-at-age data for fish in the catch were provided for 1983 and 1984, and these data were corrected for SOP discrepancies. Catch weight-at-age data were also used for stock weight at age for determining stock biomass. Weight-at-age data used in the catch predictions have been obtained by averaging the values for the years 1982-84.

7.4 Fishing Mortality and Stock Values from VPA

7.4.1 Estimates of Fishing Mortality

Recent developments in the Faroese fisheries have been described in Section 6. No fishing effort data were available for 1984 for the fleets which fish for saithe and therefore it was not possible to attempt any of the effort based VPA tuning methods. As mentioned in Section 6 there has been a trend of increasing fishing effort on saithe by the Faroese fleets due partly to an overall increase in fleet size and partly to a greater proportion of the available effort being directed towards saithe. In addition a reduction in fishing opportunities at Iceland has resulted in some diversion of effort from that area to Faroe.

In addition to an overall trend of increasing effort there appears to have been some concentration of fishing in 1984 on the very abundant 1980 year class resulting in a changed exploitation pattern in that year. The alternative explanation of the large

catches of 4-year-olds in 1984 would be that the 1980 year class is far larger than any other year class on record : using an average F value of 0.17 on age-group 4 in 1984 would give a year class strength at age 1 of 145 millions compared to an average abundance of 37 millions. The alternative of increased fishing mortality on age-group 4 is considered to be the more likely one.

The VPA input F values for 1984 have therefore been chosen to reflect these changes which are believed to have taken place in the fishery. These values and the back-calculated values for earlier years are given in Table 7.4 and Figure 7.1A.

7.4.2 Spawning Stock Biomass and Recruitment (Table 7.5 and Figure 7.1B)

After a succession of abundant year classes (1966-69) the subsequent year classes up to that of 1976 followed a declining trend. More recently the 1978 and 1980 year classes have been very abundant although the size of the 1980 year class cannot yet be accurately determined.

Spawning stock biomass increased following the trend of increasing recruitment in the 1960's reaching a peak level in the mid-1970's. Subsequently spawning stock biomass declined until 1982 after which the declining trend has halted with the recruitment of the 1978 and 1980 to the spawning stock. It should be noted that the recent abundant year classes are making less of a contribution to the spawning stock than those of comparable size in the 1960's due to the higher levels of fishing mortality now prevailing.

7.5 Equilibrium Yield

Data used in the calculation of equilibrium yield are given in Table 7.6. The exploitation pattern used is based on the average for the years 1980-82 but the F value for the three-year-olds has been reduced to take into account recent restrictions placed on

the landing of this age-group. This exploitation pattern differs from that used in the catch prediction (see below).

The curves of equilibrium yield and equilibrium spawning stock biomass for average recruitment at age 1 of 37 million are given in Figure 7.1C. The current fishing mortality level is assessed to be $F_{(4-8)} = 0.4$ which is close to the value of $F_{\max} = 0.42$. The value of $F_{(0.1)}$ is 0.19.

7.6 Catch Prediction

Input data for the catch prediction are given in Table 7.7. Year classes 1982 and later are assumed to be of average abundance (= 37 million for the years 1963-81).

The exploitation pattern in 1984 appears to have been distorted from the average pattern in recent years due to a concentration of fishing on the very abundant 1980 year class. It seems likely that this situation may continue, though probably to a lesser extent, into the prediction period. The exploitation pattern used for the prediction for 1985 and 1986 has been derived as follows: an average exploitation pattern for the years 1980-82 was calculated, the F on age-group 5 was increased from 0.19 to 0.3 to allow for some concentration of fishing on the 1980 year class, the resultant F array was then raised to give $F_{(4-8)} = 0.4$, and the F on age-group 3 was reduced to 0.03 in view of the restrictions on landings of this age group.

Results of the catch predictions are given in Table 7.8 and Figure 7.1D. For unchanged average fishing mortality in 1985 landings are expected to be 45,000 tonnes, and in 1986 44,000 tonnes. Spawning stock biomass is expected to increase in 1985 when the 1980 yearclass recruits to the spawning stock but in 1986-87 will decline again to just below the 1984 level.

8 FAROE COD

8.1 Faroe Plateau Cod

8.1.1 Landings (Table 8.1)

Preliminary catch figures indicate a total catch in 1984 of 37,318 tonnes from the Faroe Plateau stock. This is a decrease of 822 tonnes or 2.2% compared to 1983. Non-Faroese landings of cod from the Faroe Plateau were less than 1% of the total landings. The total landings in 1960-84 are shown graphically in Figure 8.1.A.

8.1.2 Age Compositions (Table 8.3)

Age compositions were provided only for the Faroese landings. The Norwegian and United Kingdom (England) catch at age was estimated using the age composition in the larger Faroese long liners' landing. The Federal Republic of Germany data were distributed according to the age composition of catches by large Faroese trawlers (more than 1,000 HP).

8.1.3 Weight at Age (Table 8.4)

Weight at age data for 1984 were provided by Faroese. They gave a SOP discrepancy of 2%. The weight at age data for 1983 used in past year's report were revised in accordance with new information provided by Faroese. These gave a SOP discrepancy for 1983 of 3% compared to 10% by the data used in last year's report. For the predictions the average weight at age data for the period 1981 - 1984 were used.

8.2 Results of VPA (Tables 8.5 og 8.6)

8.2.1 Fishing mortality

The fishing mortality for 1984 was estimated using the effort data for Faroese long liners. The procedure is described in Section 6.3. F_s for ages 1 and 2 were scaled to reflect the general increase in effort. Fishing mortalities as calculated from VPA are given in Table 8.5, together with input values for 1984 and for the oldest age group in each year. The trend in fishing mortality is shown graphically in Figure 8.1.A.

8.2.2 Spawning stock biomass and recruitment

Estimates of spawning stock biomass (age groups 4 to 10+) are given in Table 8.6 and shown graphically in Figure 8.1.B. The estimated number of recruits at age 1 for the year classes 1961-82 are given in Figure 8.1.B. The 1982 and earlier year classes were taken as calculated by the VPA. As no reliable information on the abundance of the 1983 and 1984 year classes is available these have been assumed to be equal to the average calculated for year classes 1961-81 (22.7 million at age 1). The current assessment confirm that the 1978 year class is above average and also that the 1981 and 1982 are above average.

8.3 Yield per Recruit

Curves of yield per recruit and spawning biomass per 1 year old recruit are plotted in Figure 8.1.C, using the data given in Table 8.7. The estimated fishing mortality in 1984 ($F_{(3-8)u} = 0.58$) is larger than $F_{max} = 0.34$ and $F_{0.1} = 0.16$.

8.4 Catch Predictions

Data used in the catch predictions are given in Table 8.7, and the results are given in Table 8.8 and plotted graphically in Figure 8.1.D. If fishing mortality is maintained at the 1984 level (F_{3-8}) = 0.58), landings of 35,000 tonnes are predicted in 1985 and of 33,000 tonnes in 1986.

8.5 Faroe Bank Cod (Table 8.2)

The landings of cod from the Faroe Bank are presented in Table 8.2. No attempt was made to assess this stock.

9 FAROE HADDOCK

The assessment was made for the stock of haddock for the total Faroe area (Division Vb).

9.1 Landings (Tables 9.1 and 9.2, Figure 9.1.A)

The total landings in Divisions Vb1 (Faroe Plateau) and Vb2 (Faroe Bank) were in 1984 12,400 tonnes. This is a decrease of 494 tonnes or 3.7% compared to 1983. The landings were almost exclusively by Faroese vessels.

9.2 Age Compositions (Table 9.3)

Age compositions data for the Faroese landings from the Faroe Plateau were provided. These were used to calculate the age composition for the total landings of Faroese vessels from the Faroe Plateau and Faroe Bank combined. The Norwegian and United Kingdom (Scotland) catch at age was estimated using the age composition in the larger Faroese long liners' landings. Because of minor updates to the 1982 and 1983 catch data there were also

minor revisions of the 1982 and 1983 catch at age arrays.

9.3 Weight at Age (Table 9.4)

Weight at age data for 1984 were provided by Faroese. They gave a SOP discrepancy of 6%. In the predictions the average weight at age data for 1981 - 1984 were used.

9.4 Results of VPA

9.4.1 Fishing mortality

The fishing mortality for 1984 was estimated in the same way as for cod in the Faroe area, using the effort data for Faroese long liners (See Section 6.3).

Estimates of fishing mortality in each year calculated by the VPA are given in Table 9.5, together with the input values for 1984 and for the oldest age in each year. The trend in fishing mortalities is shown graphically in Figure 9.1.C.

9.4.2 Spawning stock biomass and recruitment

Spawning stock biomass (Table 9.6, Figure 9.1.B) was relatively stable at about 60,000 tonnes up to 1974. Subsequently, the spawning stock benefitted from recruitment of the abundant 1972 and 1973 year classes, which increased the spawning stock to about 110,000 tonnes. By 1981, the spawning stock had returned to a lower level. The estimated numbers of recruits at age 1 are given in Table 9.6 and Figure 9.1.B.

9.5 Yield per Recruit

The yield per recruit curve given in Figure 9.1.C has been calculated using the exploitation pattern assumed for 1984 and the mean weight at age for the years 1981-84. The present level of $F_{(3-8)u} = 0.31$ is higher than $F_{0.1} = 0.2$.

It should be noted that the continuing depressed catch levels for this stock at present not is due to an excessive fishing mortality level, as judged from the Y/R curve, but is caused by the very low recruitment levels which have persisted since 1977. There are, however, signs that the 1982 year class is back to normal.

9.6 Catch Predictions

Catch predictions were made using a recruitment level of 37.2 million 1 year old fish (average of year classes 1966-80) for the year classes 1983-86. The stock estimate at 1 January 1985 for year classes 1982 and earlier was taken from the VPA. The input data are given in Table 9.7. The exploitation pattern assumed for 1985 and 1986 is based on the 1984 exploitation pattern. The results are given in Table 9.8 and Figure 9.1.C. If fishing mortality is maintained at the 1984 level ($F_{(3-8)} = 0.31$), landings of 12,000 tonnes are predicted in 1985 and of 14,000 tonnes in 1986.

10 OTHER ITEMS

10.1 The Problem of Single Nation Stocks

As a result of the introduction of exclusive fishing zones, some stocks dealt with at the Saithe Working Group are now exploited almost entirely by the coastal state and may be regarded as single nation stocks. The scope for broader scientific involvement in the

assessment of these stocks has as a consequence been much reduced because the source data required for the assessment and local knowledge of the fisheries reside in the hands of scientists from the coastal state. Working Group members from countries with this type of stock therefore find themselves somewhat isolated at the meeting in having to undertake the major share of the assessments for these stocks. Equally members from countries which no longer fish these stocks have little to contribute either in terms of data or knowledge of the present state of the fishery. When there is no Working Group member from the coastal state of a single nation stock the Working Group has had difficulty in carrying out the assessment.

The Working Group discussed the problems outlined above and expressed the view that:

- 1) because data for the assessment of single nation stocks come from a single fisheries institute, data could be presented to the Working Group at a more advanced stage of analysis or working papers could be circulated in advance of the meeting. This would keep the Working Group better informed and would afford more time for effective scientific discussion.
- 2) the catch prediction methods as applied to single nation stocks may not be adequate. In particular, since the TAC approach to fishery management is not normally applied to these stocks the traditional catch option prediction is perhaps redundant. The Working Group felt that because these single nation stocks are essentially part of a multispecies demersal fishery and given the inherent advantages of having single nation exploitation it is perhaps time to consider more sophisticated assessment techniques appropriate for multispecies management, particularly the technical interaction between subfleets.

As a result of the discussions of the problems of single nation stocks questions were raised as to the suitability of the grouping of the present stocks into a single Working Group. It may be more appropriate for example to assess the North Sea and West of Scotland stocks within the North Sea Roundfish Working Group and the North-East Arctic Stock within the Arctic Working Group. This would leave the Faroese and Icelandic stocks which could be dealt with in a new Working Group forum. If such a redistribution was adopted, it should be borne in mind that the broader scientific discussion of single-nation stocks would be reduced.

The meeting noted the somewhat anomalous situation that the Icelandic saithe stock is assessed in isolation from cod and haddock. Perhaps it would be desirable to consider assessing all the Icelandic demersal stocks together where they form part of the same multispecies fishery.

10.2 Suggestions for Assessment Programs

For a number of stocks the need has been expressed for computing partial F's at age for those fleets for which effort data are available. If fleet catch age compositions could be stored in the ICES database then a program to calculate the partial F's is viewed as a first priority.

Due to marked seasonal variations in the level of effort aimed at saithe and in the variation in the age composition of the catchable stock for some saithe fisheries, computation of fishing mortalities at age on a quarterly basis, for example, may prove desirable especially in cases when management bodies may wish to consider seasonal regulations. As for the partial F's this implies that the corresponding data are available, and also that quarterly parameters can be handled separately in, for example, prediction programs.

The software should enable basic national data to be stored in the database in a disaggregated form (e.g. by fleets and quarters). Programs would be required to process and aggregate the basic data with provision to store the processed data in separate files. The basic data as supplied should not be overwritten with any processed data.

The Working Group would also welcome software allowing for multispecies and technical interactions which would be of particular interest for the assessment of the Faroese stocks.

Availability of general purpose software (spreadsheets, word-processing, statistical analysis and graphics) is appreciated, although with infrequent use it is difficult to become familiar with their specific commands and to use them efficiently.

If standard figures for printing in the reports are to be prepared by computer graphics provision should be made for the assessment programs to output data files which could be directly accessed by the graphics software thus avoiding manual transcription and repunching of the data.

Table 1.1 Summary of total landings of SAITHE from the main fishing areas (in tonnes, whole weight). This table is based on the biological data supplied to the Working Group and used in the assessments. These figures differ to some extent from the official Bulletin Statistique data which are used for Tables 4.1, 5.1, 6.1, 7.1 and 9.1.

(IV + IIIa includes industrial fishery by-catch by Denmark and Norway).

Year	Fishing Area					Total
	I+II	IV+IIIa	Va	Vb	VI	
1960	136,006	31,515	48,120	11,845	8,349	235,835
1961	109,821	35,489	50,826	9,592	6,724	212,452
1962	122,841	24,559	50,514	10,454	7,159	215,527
1963	148,036	30,300	48,011	12,693	6,609	245,649
1964	198,110	58,669	60,257	21,893	13,596	352,525
1965	184,548	73,274	60,177	22,181	18,395	358,575
1966	201,860	96,353	52,003	25,563	18,534	394,313
1967	191,191	76,759	75,712	21,319	16,034	381,015
1968	107,181	98,179	77,549	20,387	12,787	316,083
1969	140,379	115,550	115,853	27,437	17,214	416,433
1970	260,404	222,100	116,601	29,110	14,539	642,754
1971	244,732	252,619	136,764	32,706	19,863	686,684
1972	210,508	245,801	111,301	42,186	29,225	639,021
1973	215,659	225,771	110,888	57,574	35,812	645,704
1974	262,301	272,944	97,568	47,188	36,298	716,299
1975	233,453	278,126	87,954	41,578	30,949	672,060
1976	242,486	319,758	82,003	33,067	41,807	719,121
1977	182,808	194,858	62,026	34,835	28,554	503,081
1978	154,465	142,077	49,672	28,135	31,535	405,884
1979	164,234	115,668	63,504	27,246	21,708	392,360
1980	154,379	123,445	58,347	25,230	22,102	383,503
1981	175,516	126,972	59,001	30,103	23,653	415,245
1982	170,903	160,430	68,923	30,964	21,900	453,120
1983	155,405	165,500	58,280	39,228	26,572	444,985
1984*	150,315	200,013	62,820	54,423	20,261	487,832

* Provisional

Table 2.1 Nominal catch (tonnes) of SAITHE in Sub-area I and Divisions IIa and IIb, 1975-84.

(Data for 1975-83 from Bulletin Statistique).

Country	1975	1976	1977	1978	1979
Belgium	47	1	-	-	-
Faroe Islands	28	20	270	809	1,117
France	3,156	5,609	5,658	4,345	2,601
German Dem. Rep.	28,517	10,266	7,164	6,484	2,4
Germany Fed. Rep.	41,260	49,056	19,985	18,190	14,820
Netherlands	-	64	-	-	-
Norway	122,598	131,675	139,705	121,069	141,346
Poland	3,860	3,164	1	35	-
Portugal	6,430	7,233	783	203	-
Spain	11,397	21,661	1,327	121	685
Sweden	8	-	-	-	-
U.K. (England & Wales)	2,623	4,651	6,853	2,790	1,170
U.K. (Scotland)	140	73	82	37	-
USSR	13,389	9,013	989	381	3
Total	233,453	242,486	182,817	154,464	164,180

Country	1980	1981	1982	1983	1984*
Belgium	-	-	-	-	-
Faroe Islands	532	236	339	539	503
France	1,016	194	82	537	51
German Dem. Rep.	-	-	-	-	6
Germany Fed. Rep.	12,511	8,413	7,224	4,931	4,531
Netherlands	-	-	-	-	-
Norway	128,878	166,139	169,936	150,741	144,714
Poland	-	-	-	-	-
Portugal	-	-	-	-	-
Spain	780	-	-	-	-
Sweden	-	-	-	-	-
U.K. (England & Wales)	794	395	731	1,252	3
U.K. (Scotland)	-	-	1	-	-
USSR	43	121	14	206	200
Total	144,554	175,498	178,327	158,206	150,315

* Preliminary

Table 2.2 Virtual Population Analysis
North-east Arctic SAITHE

	<u>Catch in numbers</u>									
	Unit: thousands									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	1	52	121	1711	907	486	127	137	464	0
2	81601	54151	31662	45758	28334	18226	10407	17225	11638	14230
3	60832	125030	99049	48969	61963	40796	85954	34733	17244	37541
4	11691	30576	34317	27685	23328	36644	21822	65052	23768	30364
5	16366	7947	10140	12476	14122	9211	21528	13060	32700	11101
6	4436	8712	2062	4534	4400	6379	3619	8212	3226	9983
7	7808	3435	4332	1468	2901	3260	2550	1054	3008	1130
8	6789	3212	1456	1848	963	1338	2008	1251	1177	1394
9	2914	2679	1606	936	1356	147	369	461	760	556
10	2350	1724	963	976	438	730	279	263	247	598
11	1937	1091	463	655	305	411	252	120	204	364
12	1245	852	244	681	281	454	89	112	123	158
13	459	489	211	284	168	257	144	76	161	116
14	260	140	58	231	222	239	95	97	94	153
15+	259	306	158	299	216	266	49	43	178	58
TOTAL	198928	240398	186842	148513	139904	118786	147352	141896	95012	108246

Table 2.3 Virtual Population Analysis

North-east Arctic SAITHE

Mean Weight at Age of the Stock

Unit: kilogramme

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.25	.25	.25	.25	.25	.16	.29	.36	.18	.18
2	.34	.34	.34	.34	.34	.45	.43	.51	.60	.55
3	.71	.71	.71	.71	.71	.79	.73	.77	1.05	.74
4	1.11	1.11	1.11	1.11	1.11	1.27	1.40	1.12	1.33	1.30
5	1.63	1.63	1.63	1.63	1.63	2.03	2.05	2.02	1.86	2.03
6	2.33	2.33	2.33	2.33	2.33	2.55	2.76	2.61	2.80	2.76
7	3.16	3.16	3.16	3.16	3.16	3.29	3.50	3.27	4.00	3.89
8	4.03	4.03	4.03	4.03	4.03	4.34	4.38	3.91	4.18	4.55
9	4.87	4.87	4.87	4.87	4.87	5.15	5.95	4.69	5.33	5.36
10	5.63	5.63	5.63	5.63	5.63	5.75	6.39	5.63	5.68	6.01
11	6.44	6.44	6.44	6.44	6.44	6.11	6.61	7.18	7.31	6.18
12	7.11	7.11	7.11	7.11	7.11	5.94	6.88	7.71	8.68	6.73
13	7.82	7.82	7.82	7.82	7.82	6.64	6.75	7.00	8.54	8.21
14	8.92	8.92	8.92	8.92	8.92	7.73	7.13	8.03	8.57	9.27
15+	9.50	9.50	9.50	9.50	9.50	9.47	7.66	9.44	10.57	7.43

Table 2.4 Virtual Population Analysis

North-east Arctic SAITHE

Fishing Mortality Coefficient

Unit: Year-1

Natural Mortality Coefficient = .20

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1980-82
1	.00	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
2	.27	.21	.21	.19	.21	.06	.09	.17	.12	.12	.10
3	.58	.86	.75	.59	.43	.52	.39	.45	.26	.65	.45
4	.41	.65	.62	.49	.67	.49	.58	.61	.63	1.00	.56
5	.42	.50	.47	.48	.50	.54	.60	.85	.72	.70	.66
6	.30	.42	.27	.39	.31	.44	.42	.48	.52	.50	.45
7	.50	.41	.38	.31	.47	.39	.32	.21	.53	.35	.30
8	.59	.40	.30	.27	.35	.42	.45	.25	.37	.35	.37
9	.37	.49	.35	.32	.33	.08	.19	.18	.24	.30	.15
10	.47	.38	.35	.37	.24	.30	.22	.20	.13	.30	.24
11	.53	.42	.17	.38	.19	.38	.16	.14	.24	.30	.23
12	.87	.47	.15	.39	.28	.48	.13	.10	.20	.30	.24
13	.63	1.10	.20	.27	.16	.45	.27	.16	.20	.30	.30
14	.40	.40	.35	.35	.35	.35	.30	.30	.30	.30	.32
15+	.40	.40	.35	.35	.35	.35	.30	.30	.30	.30	.32
(3- 8)0	.47	.55	.46	.42	.45	.46	.46	.47	.47	.59	

Table 2.5 Virtual Population Analysis

North-east Arctic SAITHE

Stock size in numbers Unit: thousands

Biomass Totals Unit: tonnes All values are given for 1 January

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	376659	222767	352212	205121	447123	172184	140555	143710	169780	0	0
2	376857	508382	182339	288257	166393	365254	140533	119874	117536	138567	0
3	151595	235165	203740	120786	194602	110725	282596	105617	82630	85738	100620
4	37725	69685	81182	78437	55081	103913	54115	156025	55328	52142	36646
5	52083	20398	29728	35782	39411	24238	52241	24781	69504	24051	15705
6	18661	27961	9587	15250	18115	19815	11598	23516	8655	27763	9778
7	21711	11291	15077	5995	8417	10877	10339	6249	11894	4197	13787
8	16672	10780	6162	8455	3589	4291	6033	6173	4167	7035	2422
9	10449	7576	5944	3737	5261	2074	2313	3139	3929	2355	4059
10	6837	5939	3803	3474	2216	3089	1565	1561	2155	2533	1428
11	5167	3491	3315	2246	1927	1421	1673	1030	1042	1542	1536
12	2323	2496	1380	2297	1253	1303	794	1306	735	669	935
13	1070	793	1280	1319	1269	773	660	570	969	491	406
14	864	465	215	858	825	888	402	411	398	648	298
15+	795	1024	537	1111	602	995	208	182	754	246	342
TOTAL NO	1079469	928214	897051	773076	946485	821640	711826	594146	529536	347977	
SPS NO	84549	71818	47850	44694	43674	45326	35765	44139	34098	47480	
TOT. BIOM	798770	713027	630661	565788	599633	634713	635137	574291	546752	434976	
SPS BIOM	342071	274919	197338	185354	167538	170711	143076	155288	155913	178711	

Table 2.6 North-East Arctic SAITHE
 Catch, effort and catch per unit
 of effort from Norwegian trawlers
 in Division IIa 1973-1983.

Year	<u>Side trawlers</u>			<u>Stern trawlers</u>		
	Catch (tonnes)	Effort (hours)	Cpue (kg/hour)	Catch (tonnes)	Effort (hours)	Cpue (kg/hour)
1973	10,920	31,487	347	3,602	54,159	67
1974	13,878	33,026	420	4,837	91,398	53
1975	10,545	24,636	428	3,009	82,274	37
1976	11,594	27,854	416	5,060	114,430	44
1977	13,609	32,801	415	8,004	138,597	58
1978	10,048	25,823	389	13,077	169,930	77
1979	13,566	28,306	479	14,364	202,702	71
1980	11,935	23,396	510	25,390	108,727	234
1981	14,581	24,098	605	43,241	124,896	346
1982	5,143	13,575	379	36,489	116,868	312
1983	10,248	22,148	463	46,114	113,114	408

Table 2.7 List of Input Variables for the ICES Prediction Programme

SAIPE-ARCTIC

The reference F is the mean F for the age group range from 3 to 8

The number of recruits per year is as follows:

Year	Recruitment
1985	200000.0
1986	200000.0
1987	200000.0

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 mean values for years 1982 - 1984 from file WECA
 Catch weight: tonnes mean values for years 1982 - 1984 from file WECA

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	200000.0	.00	.20	.00	.240	.240
2	163746.0	.12	.20	.00	.553	.553
3	100620.0	.65	.20	.00	.853	.853
4	36646.0	1.00	.20	.00	1.250	1.250
5	15705.0	.70	.20	.00	1.970	1.970
6	9778.0	.50	.20	1.00	2.723	2.723
7	13787.0	.35	.20	1.00	3.720	3.720
8	2422.0	.35	.20	1.00	4.213	4.213
9	4059.0	.30	.20	1.00	5.127	5.127
10	1428.0	.30	.20	1.00	5.773	5.773
11	1536.0	.30	.20	1.00	6.890	6.890
12	935.0	.30	.20	1.00	7.540	7.540
13	406.0	.30	.20	1.00	7.917	7.917
14	298.0	.30	.20	1.00	8.623	8.623
15+	542.0	.30	.20	1.00	9.080	9.080

Table 2.8 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

SAITHE - Arctic

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.59	447	146	128	.0	.00	430	115	0	580	136
					.1	.06			16	559	130
					.2	.12			32	539	125
					.4	.24			60	503	115
					.6	.35			84	471	106
					.8	.47			106	444	98
					1.0	.59			126	419	90
					1.2	.71			143	398	83
					1.4	.83			159	378	77
					1.6	.95			173	361	71
					1.8	1.06			186	346	66
					2.0	1.18			197	332	61
					F	.18			47	520	120
					0.1	.30			74	485	110
					E _{max}						

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

The reference F is the mean F for the age group range from 3 to 8

Table 3.1 Nominal catch (tonnes) of SAITHE in Sub-area IV and Division IIIa, 1975-1984 (Data for 1975 - 1983 from Bulletin Statistique)

Country	1975	1976	1977	1978	1979
Belgium	81	127	107	44	14
Denmark	10,149	15,111	17,334	10,372	10,461
Faroe Is.	287	425	318	213	407
France	24,396	32,552	41,022	38,122	40,983
German Dem.Rep.	5,882	2,088	2,430	2,404	1,504
Germany Fed. Rep.	18,622	38,698	26,860	25,982	18,780
Iceland	1	-	-	-	-
Ireland	-	119	126	88	-
Netherlands	8,917	6,101	7,270	5,135	1,466
Norway	12,483	17,856	14,949	17,627	17,575
Poland	35,304	35,819	12,378	5,661	6,104
Spain	249	-	-	-	-
Sweden	913	1,271	1,275	990	211
UK (Engl./Wales)	3,472	6,300	6,822	8,382	6,256
UK (Scotland)	8,898	13,034	11,366	14,330	8,257
USSR	110,743	83,669	46,385	10,161	2,015
Sub-total	240,397	253,170	188,642	139,511	114,033
By-catch from Industrial Fisheries:					
Denmark ^A	27,800	53,684	1,805	72	493
Norway ^A	9,878	13,082	4,392	2,494	1,142
TOTAL	278,075	319,936	194,839	142,077	115,668
Country	1980	1981	1982	1983	1984*
Belgium	13	12	4	7	34
Denmark	10,370	6,454	10,114	10,530	7,925
Faroe Is.	1,020	614	746	806	105
France	37,306	42,649	47,064	38,782	41,225
German Dem.Rep.	925	-	-	-	-
Germany Fed. Rep	11,095	8,246	13,517	13,649	25,273
Iceland	-	-	-	-	-
Ireland	-	-	-	-	-
Netherlands	245	123	36	112	100 ^B
Norway	47,959	55,882	70,464	78,135	82,194
Poland	2,404	698	793	415	413
Spain	-	-	-	-	-
Sweden	342	156	372	548	463
UK (Engl./Wales)	4,879	4,309	5,627	6,845	1,865
UK (Scotland)	6,525	6,529	8,136	6,321	6,903
USSR	-	-	-	-	-
Sub-total	123,083	125,672	156,873	156,150	166,500
By-catch from Industrial Fisheries:					
Denmark ^A	-	-	-	-	-
Norway ^A	363	1,280	5,003	1,445	5,616
TOTAL	123,446	126,952	161,876	157,595	172,116

* Preliminary ^A - Data from national Labs. ^B - W.G. Estimate

Table 3.1.1 Virtual Population Analysis

North Sea SAITHE (Fishing Area IV)

	<u>Catch in numbers</u>		Unit: thousands								
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	3670	311	228	2580	1237	894	974	5595	1462	101	11
2	14750	72546	23125	12993	16970	16959	17642	17674	22474	32260	40345
3	60680	51287	223680	22567	29504	10067	10498	18941	23656	21487	38056
4	31803	23585	51407	51801	27679	14756	11029	9079	33759	18337	33759
5	12431	9028	9652	12914	17251	12843	9011	7109	10654	25442	18097
6	29595	6717	5111	4684	3787	6878	6503	4413	6466	4524	17249
7	14504	12660	3309	3173	1102	2641	4512	3207	1816	4246	1454
8	5028	8656	4842	2902	1069	873	935	3269	1546	1205	1122
9	1427	3299	2978	3466	707	470	500	673	978	853	204
10	809	1100	1068	1895	736	282	406	293	294	280	153
11	412	616	420	875	640	402	303	389	108	194	69
12	222	254	253	342	415	343	254	345	129	70	58
13	132	275	121	341	213	157	216	297	98	84	11
14	30	77	161	123	95	154	147	253	146	33	19
15+	27	25	66	129	108	101	90	335	146	86	50
TOTAL	166520	190436	326621	120791	101573	67820	63660	71872	103512	109262	150657
A) SOP	251011	241869	327894	182120	129207	117881	113986	126137	161198	165374	199995
B)NOMIN.	272944	278126	319758	194858	142077	115668	123445	126972	160430	165500	200013
(B/A) %	109	115	98	107	110	98	108	101	100	100	100

Table 3.2 Sum of Products Check

North Sea SAITHE (Fishing Area IV)

Category: Total

	<u>Mean Weight at Age in the Stock</u>										
	Unit: kilogramme										
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.300	.300	.300	.300	.300	.430	.270	.280	.270	.390	.270
2	.450	.450	.450	.450	.450	.410	.390	.550	.550	.450	.400
3	.750	.750	.750	.750	.750	.930	.870	.890	1.100	.960	.730
4	1.160	1.160	1.160	1.160	1.160	1.560	1.750	1.620	1.530	1.710	1.540
5	1.790	1.790	1.790	1.790	1.790	2.240	2.350	2.470	2.300	2.130	2.250
6	2.480	2.480	2.480	2.480	2.480	3.060	2.960	3.340	3.020	3.070	2.780
7	3.380	3.380	3.380	3.380	3.380	3.920	4.040	4.370	4.010	3.560	4.040
8	4.200	4.200	4.200	4.200	4.200	5.120	5.000	5.300	4.920	4.560	4.780
9	4.910	4.910	4.910	4.910	4.910	6.070	5.690	6.290	5.800	5.370	6.020
10	5.650	5.650	5.650	5.650	5.650	6.470	6.550	7.220	6.570	6.270	7.420
11	6.450	6.450	6.450	6.450	6.450	6.970	7.480	7.460	7.580	6.940	8.090
12	7.160	7.160	7.160	7.160	7.160	7.590	7.610	7.910	7.900	7.690	7.810
13	8.070	8.070	8.070	8.070	8.070	8.260	7.960	8.670	8.180	9.220	9.550
14	9.000	9.000	9.000	9.000	9.000	8.140	8.150	8.590	8.490	7.730	9.160
15+	9.000	9.000	9.000	9.000	9.000	8.820	9.140	8.710	9.400	10.110	10.460

Table 3.3

Virtual Population Analysis

North Sea SAITHE (Fishing Area IV)

Fishing Mortality Coefficient

Unit: Year-1

Natural Mortality Coefficient = .20

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1980-82
1	.01	.00	.00	.02	.01	.00	.01	.02	.00	.00	.00	.000047 .01
2	.08	.16	.17	.13	.20	.23	.08	.12	.10	.12	.10	.10
3	.69	.41	1.02	.25	.47	.18	.22	.12	.24	.13	.20	.20
4	.68	.64	.94	.70	.55	.46	.30	.30	.33	.30	.31	.31
5	.41	.41	.61	.66	.53	.54	.62	.33	.71	.44	.55	.55
6	.45	.41	.44	.67	.41	.42	.58	.60	.56	.76	.60	.60
7	.46	.56	.37	.54	.34	.55	.54	.64	.63	.92	.60	.60
8	.41	.56	.43	.64	.35	.46	.41	1.00	.61	1.22	.67	.67
9	.28	.51	.38	.64	.32	.25	.53	.55	.98	1.04	.69	.69
10	.29	.37	.31	.44	.27	.20	.30	.69	.50	.87	.52	.52
11	.30	.38	.24	.45	.26	.23	.34	.69	.59	.74	.54	.54
12	.19	.31	.26	.31	.39	.22	.22	.82	.52	1.01	.52	.52
13	.38	.38	.24	.68	.32	.25	.21	.44	.59	.78	.41	.41
14	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40
15+	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40	.40
(3- 6)U	.56	.47	.75	.57	.49	.40	.43	.35	.46	.41	.41	
(5-10)U	.39	.47	.42	.60	.37	.40	.51	.64	.67	.87	.60	

Table 3.4 Virtual Population Analysis

North Sea SAITHE (Fishing Area IV)

Stock Size in Numbers Unit: thousands

Biomass Totals

Unit: tonnes

All values are given for 1 January

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	668314	198796	145858	126290	110452	298898	204301	325008	389413	570559	258232	0
2	221592	543854	162480	119212	101062	89313	243909	166437	261042	317504	466989	211413
3	132867	168117	379909	112196	85891	67465	57803	183781	120354	193455	230866	345954
4	70388	54588	91625	112306	71557	43877	46169	37926	133392	77256	139020	154754
5	40188	29220	23611	29287	45090	33809	22695	27887	22891	78881	40771	83481
6	61915	21751	15824	10521	12438	21961	16181	9997	16445	9229	41765	22093
7	42880	32227	11782	8372	4429	6785	11810	7430	4241	7077	3521	18766
8	16518	22105	15054	6675	4013	2582	3191	5630	3216	1849	2507	1582
9	6325	9012	10351	7983	2872	2326	1331	1729	1704	1429	446	1050
10	3509	3895	4423	5801	3438	1716	1481	642	813	525	413	183
11	1736	2145	2202	2662	3051	2153	1151	848	264	403	181	201
12	1411	1051	1204	1425	1395	1922	1401	670	347	120	156	86
13	457	955	632	758	859	769	1265	918	241	169	36	76
14	100	256	535	409	316	512	489	841	485	110	63	19
15+	90	83	219	429	359	336	299	1114	485	286	166	126
TOTAL NO	1263291	1088058	865709	544326	447821	574424	613598	770859	955315	1259452	1191132	
SFS NO	175130	122702	85838	74321	78359	74371	61295	57706	51134	100678	96025	
TOT. BIOM	993886	900183	803178	553802	446086	547381	499672	624153	750943	935311	897785	
SFS BIOM	517375	406400	295089	247847	220648	251046	218235	216605	165772	252091	258643	

Table 3.5 North Sea Saithe. Effort and catch per unit from Norwegian and French trawlers with partial F_s for the French fleet from VPA.

Year	Norwegian side trawlers		Norwegian stern trawlers		French cpue Index	Total effort in French units 10×10^{-3}
	cpue kg/h	Effort h	cpue kg/h	Effort h		
1974					.51	535.1
1975					.30	927.1
1976					.45	710.5
1977					.43	453.1
1978	542	194			.36	394.6
1979	721	368	446	5,324	.37	312.6
1980	607	1,355	704	16,918	.34	363.0
1981	619	2,974	782	25,102	.34	373.4
1982	731	3,047	918	42,286	.45	356.5
1983	672	7,025	1,172	37,961	.54	306.5
1984		No data		No data	.61	327.8

Year	Effective effort FRANCE $\times 10^{-3}$	Partial $F(5-10)$ FRANCE from VPA
1974	56.1	.035
1975	81.3	.042
1976	72.3	.070
1977	95.4	.139
1978	105.8	.127
1979	110.7	.149
1980	109.7	.146
1981	125.4	.166
1982	104.5	.187
1983	94.1	.098
1984	103.5	.147

TABLE 3.6 North Sea SAITHE. French catch per unit effort index of spawning stock biomass and the equivalent estimate from VPA

<u>Year</u>	<u>French cpue index of spawning stock</u>	<u>Spawning stock bio- mass x 10⁻³ from VPA</u>
1974	1.29	517
1975	0.96	406
1976	0.83	295
1977	0.81	247
1978	0.88	221
1979	0.87	251
1980	0.76	218
1981	0.52	217
1982	0.66	166
1983	0.83	252
1984	1.17	259

Table 3.7 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

North Sea SAITHE Prediction

Option 1

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.41	1090	343	259	.0	.00	1106	412	0	1404	860
					.1	.04			35	1361	822
					.2	.08			68	1320	786
					.4	.17			131	1242	720
					.6	.25			188	1171	660
					.8	.33			241	1106	605
					1.0	.41			289	1046	555
					1.2	.50			335	991	510
					1.4	.56			374	941	468
					1.6	.66			412	894	431
					1.8	.75			447	851	396
					2.0	.83			479	811	365

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

The reference F is the mean F for the age group range from 3 to 6

Table 3.8 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass

North Sea SAITHE Prediction

Option 2

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.41	1090	343	259	.0	.00	1100	412	0	1404	860
					F _{0.1}	.12			100	1280	752
					F _{max}	.23			174	1188	674
					1.0	.41			289	1046	555
					1.5	.62			393	917	449

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

The reference F is the mean F for the age group range from 3 to 6

Table 3.9 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass

SAITHE. North Sea Prediction with TAC

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
.7	.30	1090	343	200	.0	.00	1182	463	0	1488	937
					F _{0.1}	.12			110	1352	819
					F _{max}	.23			191	1252	732
					1.0	.41			315	1098	602
					1.5	.62			429	958	486

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

The reference F is the mean F for the age group range from 3 to 6

Table 4.1 Nominal catch (tonnes) of SAITHE in Division Va
1974-1984. (Data for 1974-1983 from Bulletin
Statistique)

Country	1974	1975	1976	1977	1978	1979
Belgium	2,371	1,638	1,615	1,448	1,092	980
Faroe Is.	1,712	1,366	3,267	3,013	4,250	5,457
France	94	32	51	-	-	-
Germany Fed.Rep	18,627	13,820	13,785	10,575	-	-
Iceland	65,169	61,430	56,811	46,973	44,327	57,066
Norway	-	6	5	4	3	1
UK (England & Wales)	8,845	8,643	6,024	13	-	-
UK (Scotland)	731	1,021	443	-	-	-
Total	97,549	87,956	82,001	62,026	49,672	63,504

Year	1980	1981	1982	1983	1984*
Belgium	980	532	203	224	269
Faroe Is.	4,930	3,545	3,582	2,138	2,044
France	-	-	23	-	-
Germany Fed.Rep	-	-	-	-	-
Iceland	52,436	54,921	65,124	55,904	60,401
Norway	1	3	1	33	105
UK (England & Wales)	-	-	-	-	-
UK (Scotland)	-	-	-	-	-
Total	58,347	59,001	68,933	58,299	62,819

* Preliminary

Table 4.2 Virtual Population Analysis

Icelandic SAITHE

	<u>Catch in numbers</u>										
	Unit: thousands										
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	111	16	29	5	0	0	0	0	0	0	0
3	1269	526	329	59	548	480	135	257	486	40	136
4	3404	2997	3234	2099	1145	3764	2303	1550	1221	1469	497
5	2348	2479	3045	2858	2435	1991	4634	4310	2526	1344	835
6	3164	1829	2530	1801	1556	3616	2551	5464	4317	2411	1554
7	3452	3496	2154	1036	1275	1566	2419	1504	4361	4366	2573
8	5384	2994	2567	1068	961	718	1612	1470	1375	2407	3404
9	1303	1434	1530	1528	537	292	482	589	1119	460	993
10	824	710	1064	958	575	669	245	192	343	346	322
11	351	325	295	538	476	589	132	67	65	71	252
12	141	176	191	166	279	489	102	175	37	36	229
13	43	100	94	71	139	150	59	130	38	11	139
14	13	36	68	12	91	72	29	136	37	24	174
15+	20	61	18	49	55	0	23	72	75	42	169
TOTAL	19827	17179	16948	12248	10072	14396	14726	15916	16500	13027	11277

Table 4.3 Virtual Population Analysis

Icelandic SAITHE

Mean weight at age of the stock

Unit: kilogramme

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
3	1.120	1.120	1.120	1.120	1.120	1.120	1.445	1.477	1.477	1.665	1.540
4	1.760	1.760	1.760	1.760	1.760	1.760	1.895	2.004	2.004	2.229	2.367
5	2.730	2.730	2.730	2.730	2.730	2.730	2.682	2.574	2.574	3.151	3.319
6	4.290	4.290	4.290	4.290	4.290	4.290	3.871	3.457	3.457	4.199	4.450
7	5.540	5.540	5.540	5.540	5.540	5.540	5.324	4.431	4.431	4.115	5.460
8	7.270	7.270	7.270	7.270	7.270	7.270	6.143	6.156	6.156	5.930	5.194
9	8.420	8.420	8.420	8.420	8.420	8.420	6.648	6.820	6.820	7.509	7.526
10	9.410	9.410	9.410	9.410	9.410	9.410	8.227	8.047	8.047	8.815	8.580
11	10.000	10.000	10.000	10.000	10.000	10.000	9.062	9.409	9.409	9.557	9.315
12	10.560	10.560	10.560	10.560	10.560	10.560	9.299	9.205	9.205	9.557	10.123
13	11.870	11.870	11.870	11.870	11.870	11.870	10.502	9.439	9.439	10.235	10.875
14	13.120	13.120	13.120	13.120	13.120	13.120	11.375	10.146	10.146	9.578	11.223
15+	14.000	14.000	14.000	14.000	14.000	13.120	11.672	10.756	10.756	11.256	13.268

Table 4.4 Virtual Population Analysis

Icelandic SAITHE

Proportions of Maturity

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
3	.000	.000	.000	.000	.000	.000	.000	.000	.000	.030	.080
4	.000	.000	.000	.000	.000	.000	.000	.060	.090	.270	.150
5	.000	.000	.000	.000	.000	.000	.000	.270	.360	.600	.520
6	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.630	.560	.550	.830
7	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.810	.980	.850	.950
8	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.970	.980	.980	.650
9	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.980	1.000
10	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.970	1.000
11	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	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	1.000
13	1.000	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	1.000
15+	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 5.1 Nominal catch (tonnes) of SAITHE in Sub-area VI from 1974-84 (Data for 1974-84 from Bulletin Statistique.)

Country	1974	1975	1976	1977	1978	1979
Belgium	209	21	95	-	-	1
Denmark	-	-	3	-	-	-
Faroe Is.	6	6	7	11	-	14
France	22,802	19,946	29,216	19,686	21,519	15,662
German Dem. Rep.	-	8	3	-	-	-
Germany Fed. Rep.	16	481	511	254	604	131
Ireland	-	-	375	240	266	246
Iceland	-	+	-	-	-	-
Netherlands	124	702	547	531	623	256
Norway	22	10	17	91	122	20
Poland	125	164	91	-	-	-
Spain	1,862	1,882	1,012	346	-	-
UK (England & Wales)	1,333	1,571	1,560	2,758	3,193	1,765
N. Ireland	3	12	13	9	27	11
UK (Scotland)	9,527	6,131	5,807	4,628	5,181	3,602
USSR	269	15	2,550	-	-	-
TOTAL	36,298	30,949	41,807	28,554	31,535	21,708

Country	1980	1981	1982	1983	1984*
Belgium	2	2	-	-	-
Denmark	-	-	4	-	-
Faroe Is.	4	3	5	2	-
France	15,427	16,654	16,833	22,027	15,172
German Dem. Rep.	-	-	-	-	-
Germany Fed. Rep.	49	581	441	190	713
Ireland	295	250	329	698	551
Iceland	-	-	-	-	-
Netherlands	91	-	-	-	-
Norway	62	25	19	215	61
Poland	-	-	-	-	-
Spain	-	120	243	330	-
UK (England & Wales)	1,594	1,364	1,966	798	516
N. Ireland	9	10	7	12	48
UK (Scotland)	2,902	3,117	2,141	2,642	3,248
USSR	-	-	-	-	-
TOTAL	20,435	22,126	21,988	26,914	20,309

* Preliminary

Table 5.2 Virtual Population Analysis

SAITHE in Fishing Area VIa (NW Coast of Scotland, N. Ireland)

	<u>Catch in numbers</u>			Unit: thousands						
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	23	36	154	36	9	44	143	39	29	152
2	2322	2641	1216	3927	964	994	2395	1311	2727	2269
3	5994	8004	4467	4050	1640	5353	3667	4064	3905	4943
4	2399	2631	2680	2348	1200	738	1932	1555	2253	2404
5	1331	1302	1675	1301	1148	676	591	1256	797	653
6	867	1124	740	703	707	630	413	503	760	648
7	1031	665	563	291	370	468	344	372	494	278
8	723	524	383	245	156	194	223	235	153	124
9	297	588	295	162	192	91	154	121	98	49
10	39	378	295	304	154	113	122	81	85	42
11	68	472	275	382	165	173	127	50	54	10
12	37	121	101	266	133	140	116	40	64	4
13	46	180	55	210	152	189	126	66	58	11
14	14	189	103	84	111	84	91	64	93	19
15+	25	102	107	85	62	119	91	119	126	42
TOTAL	13301	19397	13103	14402	7343	3186	10807	10476	11656	11348

Table 5.3 Virtual Population Analysis

SAITHE in Fishing Area VIa (NW Coast of Scotland, N. Ireland)

Mean weight at age of the stock Unit: kilogramms

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.458	.444	.487	.412	.512	.417	.400	.432	.432	.472
2	.739	.691	.686	.500	.699	.651	.679	.904	.749	.756
3	.957	1.030	.870	1.135	1.324	1.166	1.100	1.035	1.366	1.143
4	1.528	1.476	1.428	1.678	1.982	1.955	1.763	1.685	1.977	1.809
5	2.585	2.345	2.284	2.606	2.410	2.654	2.969	2.587	3.187	2.724
6	3.523	3.300	3.295	3.831	3.373	3.573	4.050	3.764	3.758	3.546
7	4.782	4.271	4.377	4.691	4.615	4.566	5.120	5.077	5.093	4.770
8	5.593	5.040	5.178	5.279	5.833	5.534	6.255	5.901	6.402	5.932
9	6.523	5.913	5.988	5.982	6.974	6.528	7.235	7.334	7.100	7.907
10	7.138	6.554	6.739	6.855	7.561	7.912	8.304	8.734	8.367	9.280
11	8.107	7.108	7.132	7.692	8.391	8.684	8.489	8.899	8.871	9.840
12	9.031	8.008	8.328	9.080	9.193	9.486	9.321	9.796	9.838	10.845
13	9.071	8.776	9.025	10.037	10.160	9.757	10.176	10.047	11.400	11.777
14	10.655	9.700	9.951	10.972	11.094	10.780	11.030	10.191	12.090	12.300
15+	11.280	10.532	10.863	9.354	11.739	11.962	12.370	11.459	13.268	13.129

Table 5.4 Virtual Population Analysis

SAITHE in Fishing Area VIa (NW Coast of Scotland, N. Ireland)

Fishing Mortality Coefficient Unit: Year-1 Natural Mortality Coefficient = .20

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1980-82
1	.02	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00
2	.14	.10	.12	.08	.20	.04	.05	.06	.03	.04	.04	.05
3	.40	.47	.58	.32	.38	.14	.17	.17	.22	.10	.10	.19
4	.21	.29	.38	.39	.28	.19	.09	.14	.10	.15	.08	.11
5	.11	.17	.37	.45	.33	.21	.15	.08	.13	.07	.08	.12
6	.05	.07	.21	.26	.35	.30	.17	.13	.09	.10	.07	.13
7	.09	.12	.07	.16	.15	.31	.35	.15	.17	.12	.05	.21
8	.14	.10	.08	.05	.09	.11	.27	.26	.13	.10	.04	.22
9	.09	.04	.11	.06	.03	.10	.09	.35	.22	.07	.04	.22
10	.16	.02	.09	.07	.08	.03	.08	.17	.31	.24	.04	.19
11	.08	.05	.12	.10	.12	.06	.05	.12	.10	.36	.04	.09
12	.04	.05	.12	.04	.14	.06	.06	.04	.05	.17	.04	.05
13	.18	.02	.13	.05	.11	.09	.11	.08	.03	.09	.04	.07
14	.10	.10	.10	.10	.10	.08	.08	.07	.05	.05	.04	.07
15+	.10	.10	.10	.10	.10	.08	.06	.07	.05	.05	.04	.07
(3- 6)0	.19	.25	.39	.35	.34	.21	.15	.13	.13	.10	.08	

Table 5.5 Virtual Population Analysis

SAITHE in Fishing Area VIa (NW Coast of Scotland, N. Ireland)

150

<u>Stock size in numbers</u>		Unit: thousands										
<u>Biomass Totals</u>		Unit: tonnes										
		All values are given for 1 January										
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	35721	30269	22474	29250	36883	41518	42046	71118	89070	77962	167787	0
2	24657	26931	24761	18367	23809	30163	33984	34876	58098	72889	63604	137235
3	18862	17605	19901	17892	13941	15958	23825	26926	26593	46383	57215	50190
4	14083	10388	9041	9132	10635	7773	11407	16504	18544	17411	34453	42386
5	20239	9391	6348	5041	5072	6596	5234	8493	11726	13780	12225	26039
6	13012	14843	6490	3580	2625	2983	4367	3717	6420	8468	10563	9239
7	11651	10092	11370	4301	2265	1518	1807	3008	2671	4803	6284	8064
8	7386	8665	7333	8709	3014	1592	910	1059	2153	1851	3487	4894
9	6367	5245	6442	5531	6780	2247	1163	571	667	1551	1378	2743
10	3157	4767	4112	4744	4264	5405	1667	670	329	437	1181	1084
11	2302	2199	3822	3071	3620	3217	4286	1263	603	197	281	929
12	3468	2117	1721	2767	2266	2619	2485	3353	919	448	112	221
13	238	2723	1654	1246	2174	1616	2020	1908	2640	716	309	88
14	428	182	2186	1192	972	1591	1204	1483	1447	2102	534	243
15+	660	289	1181	1239	984	889	1705	1483	2690	2848	1181	1349
TOTAL NO	160711	145685	128838	116063	119305	125684	138759	176632	224368	251846	360795	
SPS NO	69388	60492	52661	41421	34037	30273	26897	27208	32264	37202	37536	
TOT. BIOM	370496	374597	356921	289273	270825	273231	267528	281224	325159	361422	420253	
SPS BIO	303479	308111	275990	233821	209913	194355	177569	171656	184257	195257	173506	

Table 5.6 West of Scotland SAITHE. Calculation of international fishing effort.

Year	Effective CPUE (France)	Total landings	Effective inter- national effort	Effective CPUE 1st Quarter
1974	.16	36,298	227	.25
1975	.14	30,949	221	.10
1976	.17	41,809	246	.35
1977	.12	28,554	238	.21
1978	.12	31,535	263	.17
1979	.12	21,708	181	.28
1980	.11	20,435	186	.31
1981	.12	22,003	183	.31
1982	.17	21,988	129	.32
1983	.17	26,914	158	.28
1984	.16	20,309	127	.22

Table 5.7 SAITHE. West of Scotland

Separable VPA

NATURAL MORTALITY = .200
 TERMINAL F = .100
 TERMINAL S = .400

REFERENCE AGE (FOR UNIT SELECTION) IS 3

NO. OF ITERATIONS CHOSEN IS 60

MINIMUM DIFFERENCE BETWEEN ITERATIONS IS 10⁻⁵

ITERATION SSW

1 179.1740
 6.) 21.4858

APPROX. COEFF. VARIATION OF CATCH DATA = 35.6 %

YFAR	1976	1977	1978	1979	1980	1981	1982	1983	1984
F(I)	.3461	.2591	.2859	.1987	.2231	.2486	.1839	.2050	.1000

AGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
S(J)	.0049	.2906	1.0000	.8045	.7328	.7143	.6952	.5586	.4559	.5121	.5157	.3616	.3904	.4000

LOG CATCH RATIO RESIDUALS

76/77 77/78 78/79 79/80 80/81 81/82 82/83 83/84

1/2	.024	.689	.257	-.744	-.048	1.333	-.291	-1.216	.004
2/3	.040	-.250	1.300	-.224	-.371	-.057	-.072	-.356	.008
3/4	.097	.072	.217	.183	-.002	-.005	.244	-.797	.010
4/5	-.375	.312	-.124	.235	.096	-.306	.335	-.162	.008
5/6	.147	.538	-.150	.339	.205	-.524	.300	-.849	.005
6/7	-.048	.697	-.115	.153	.320	-.578	-.237	-.103	.000
7/8	-.406	.301	-.344	.177	.249	-.514	.423	.109	-.005
8/9	-.236	.463	-.603	.184	-.145	-.167	.520	-.026	-.008
9/10	.171	-.160	-.506	.461	-.383	.153	.284	-.028	-.008
10/11	-.469	-.506	-.064	-.301	-.322	.280	.222	1.150	-.005
11/12	.392	-.549	-.005	-.367	-.150	.200	-.778	1.257	-.001
12/13	.695	-.806	.130	-.401	-.014	.058	-.459	.662	.005
13/14	-.033	-.652	.009	.309	.570	.130	-.486	.161	.009
	-.002	-.001	.002	.004	.005	.005	.004	.002	.020

Table 6.1 Fishing Fleets in Faroe Waters
Data on the different fleet categories

Category Number	GRT		Horse	Days at	Crew	Catch	Number			
		Power	Sea				1984 (ton)	1984	1985	1983
Trawlers deeper w.	590	2,245	285	13	13,730	6	6	4	2	
Trawlers > 1000 HP type I	360	1,570	300	13	11,676	5	5	4	4	
Trawlers > 1000 HP type II	310	1,070	260	7	22,727	21	26	20	17	
Trawlers 700-999 HP	175	845	260	7	12,276	14	16	13	11	
Trawlers 400-699 HP	120	540	225	6	15,666	19	20	19	10	
Trawlers < 400 HP	50	250	---	3	6,021	6	6	6	4	
Longliners > 110 GRT	225	540	245	15	19,521	19	20	20	16	
Longliners 60-110 GRT	90	315	---	5	5,581	14	14	14	14	
Longliners < 60 GRT	25	160	---	5	17,344	125	125	125	125	

Table 6.2 Catch and Catch per unit effort for four Vessel Categories in the Faroese Fishing Fleet. Sub-division Vbl. Main species only.

CATCH AND CPUE * LONGLINE VESSELS				1973'1983		
CATCH				CPUE		
YEAR	COD	HADDOCK SUM	COD	HADDOCK SUM		
YEAR	CATCH	CATCHH	SUMC	CPUE	CPUEH	SUMCP
1973	2816	3037	5853	207	110	317
1974	2469	3205	5674	253	194	447
1975	4716	5907	10623	290	278	568
1976	8509	8279	16788	315	334	649
1977	8567	13447	22014	327	349	676
1978	6018	10220	16238	329	327	656
1979	5258	6932	12190	324	234	608
1980	6437	3210	9647	317	236	553
1981	7430	4619	12049	310	194	504
1982	6526	3191	9717	308	164	472
1983	4878	3278	8156	314	146	459
1984	6202	3224	9426	331	142	473

CATCH AND CPUE * LONGLINE STEEL SHIPS				1973'1983		
CATCH				CPUE		
YEAR	COD	HADDOCK SUM	COD	HADDOCK SUM		
YEAR	CATCH	CATCHH	SUMC	CPUE	CPUEH	SUMCP
1973	120	39	159	128	10	138
1974	211	154	365	138	35	173
1975	1282	816	2098	138	79	217
1976	2120	1409	3529	129	127	256
1977	1929	2133	4062	117	157	274
1978	1682	1617	3299	105	161	264
1979	1057	1128	2165	91	147	233
1980	1891	1035	2926	82	126	210
1981	2773	1146	3919	76	114	191
1982	1603	988	2591	76	113	189
1983	1765	1126	2891	81	133	214

continued....

(Table 6.2, continued)

CATCH AND CPUE * TRAWL <1000 HP					1973-1983				
YEAR	CATCH				SUM	CPUE			
	COD	HADDOCK	SAITHE	SUM		COD	HADDOCK	SAITHE	SUM
YEAR	CATCH	CATCHH	CATCHU	SUMC	CPUE	CPUEH	CPUEU	SUMCP	
1973	155	43	0	198	13	9	1496	1518	
1974	557	111	0	668	69	19	157	244	
1975	1879	326	0	2205	177	32	43	252	
1976	2732	408	0	3140	258	43	26	327	
1977	3322	754	456	4532	249	48	28	326	
1978	6366	1537	3866	11769	188	49	43	280	
1979	4985	1232	7204	13421	129	47	80	256	
1980	2318	2299	3786	8403	95	45	145	286	
1981	2723	1654	6644	11021	88	46	213	347	
1982	3430	1725	4432	9587	121	52	206	379	
1983	7909	1272	6617	15858	288	71	108	466	

CATCH AND CPUE * TRAWL >1000 HP					1973-1983				
YEAR	CATCH				SUM	CPUE			
	COD	HADDOCK	SAITHE	SUM		COD	HADDOCK	SAITHE	SUM
YEAR	CATCH	CATCHH	CATCHU	SUMC	CPUE	CPUEH	CPUEU	SUMCP	
1973	0	0	0	0	13	9	1496	1518	
1974	88	6	0	94	69	19	157	244	
1975	761	75	0	836	177	32	43	252	
1976	650	218	0	868	258	43	26	327	
1977	1127	391	915	2433	249	48	28	326	
1978	1352	790	6595	8737	188	49	43	280	
1979	1997	876	10206	13079	129	47	80	256	
1980	2078	1728	10065	13871	95	45	145	286	
1981	2120	1192	10586	13898	88	46	213	347	
1982	1929	1022	6581	11532	121	52	206	379	
1983	4791	742	11573	17112	288	71	108	466	

Table 6.3

USING EFFORT DATA FROM FARDESE LONGLINE VESSELS FOR CALIBRATING A VPA COD VB1. EFFORT DATA CORRECTED FOR SEASONALITY.

Year	Effort Longl	Age									
		1	2	3	4	5	6	7	8	9	10
Nos. at age in longline fishery, * 10-3											
1973	14	3	38	251	239	84	58	53	43	30	23
1974	10	0	57	109	196	152	63	48	25	24	1
1975	16	0	12	630	295	213	105	49	28	19	25
1976	27	0	279	893	750	286	434	181	79	38	63
1977	26	0	140	513	1802	883	211	424	150	65	4
1978	18	32	137	313	593	817	280	67	62	20	21
1979	16	14	418	587	432	431	419	102	23	18	4
1980	20	39	822	819	479	324	279	254	69	7	6
1981	24	16	489	1844	608	238	142	162	140	31	8
1982	21	4	368	875	1049	282	126	61	51	69	15
1983	16	60	483	757	317	305	122	56	17	9	11
1984	19	32	1725	859	506	190	166	53	17	8	13

Nos. at age all gears, * 10-3

1973	213	723	3124	1590	707	384	312	227	120	97
1974	271	2161	1266	1811	934	563	452	149	141	91
1975	97	2584	5689	2157	2211	813	295	190	118	150
1976	18	1497	4158	3799	1380	1427	617	273	120	186
1977	31	425	3282	6844	3718	788	1160	239	134	9
1978	160	555	1219	2643	3216	1041	268	201	66	56
1979	19	575	1732	1673	1601	1906	493	134	87	38
1980	41	1129	2263	1461	895	807	832	339	42	18
1981	16	646	4137	1981	947	582	487	527	123	55
1982	5	1139	1965	3073	1286	471	314	169	254	122
1983	80	2149	5772	2760	2746	1204	510	157	104	102
1984	37	4437	5279	3476	1467	908	346	113	38	67

CATCH IN NUMBERS BY UNIT EFFORT BY AGE GROUP, LONGLINE, COD VB1

	1	2	3	4	5	6
1973	0.21	2.71	17.93	17.07	6.00	4.14
1974	0.00	5.70	10.90	19.60	15.20	6.30
1975	0.00	0.75	39.38	18.44	13.31	6.56
1976	0.00	10.33	33.07	27.78	10.59	16.07
1977	0.00	5.38	19.73	69.31	33.96	8.12
1978	1.78	7.61	17.39	32.94	45.39	15.56
1979	0.88	26.13	36.69	27.00	26.94	26.19
1980	1.95	41.10	40.95	23.95	16.20	13.95
1981	0.67	20.38	76.83	25.33	9.92	5.92
1982	0.19	17.52	41.67	49.95	13.43	6.00
1983	3.75	30.19	47.31	19.81	19.06	7.63
1984	1.68	90.79	45.21	26.63	10.00	8.74

(Table 6.3, continued)

PARTIAL FS FROM LONGLINE FISHERY (C(11)/C(tot)*F(tot), COD VB1.

Year	1	2	3	4	5	6	7	8	9	10	Av. F(3-8)u
1973	0.00	0.00	0.02	0.05	0.03	0.03	0.06	0.05	0.08	0.07	0.04
1974	0.00	0.00	0.01	0.02	0.05	0.04	0.05	0.05	0.04	0.00	0.04
1975	0.00	0.00	0.03	0.06	0.04	0.06	0.05	0.05	0.06	0.07	0.05
1976	0.00	0.02	0.04	0.07	0.11	0.15	0.20	0.15	0.13	0.14	0.12
1977	0.00	0.02	0.05	0.12	0.17	0.18	0.37	0.40	0.26	0.24	0.21
1978	0.00	0.01	0.05	0.09	0.10	0.12	0.13	0.14	0.11	0.13	0.11
1979	0.00	0.04	0.09	0.11	0.13	0.11	0.08	0.09	0.08	0.04	0.10
1980	0.00	0.04	0.09	0.12	0.16	0.17	0.13	0.10	0.05	0.11	0.13
1981	0.00	0.04	0.14	0.11	0.12	0.14	0.20	0.14	0.08	0.05	0.14
1982	0.00	0.02	0.09	0.14	0.09	0.12	0.14	0.14	0.15	0.07	0.12
1983	0.00	0.02	0.05	0.06	0.09	0.10	0.14	0.11	0.05	0.06	0.09
1984	0.00	0.04	0.06	0.07	0.08	0.13	0.11	0.11	0.15	0.14	0.09

TOTAL FISHING MORTALITY FROM FINAL VPA RUN.

1973	0.01	0.07	0.23	0.30	0.26	0.23	0.36	0.26	0.30	0.30	0.27
1974	0.01	0.08	0.16	0.20	0.28	0.35	0.46	0.29	0.25	0.25	0.29
1975	0.00	0.08	0.31	0.43	0.40	0.43	0.31	0.36	0.40	0.40	0.37
1976	0.00	0.09	0.17	0.36	0.54	0.50	0.68	0.53	0.40	0.40	0.46
1977	0.00	0.05	0.30	0.46	0.71	0.68	1.00	0.63	0.54	0.54	0.63
1978	0.01	0.06	0.19	0.42	0.40	0.43	0.52	0.46	0.35	0.35	0.40
1979	0.00	0.05	0.27	0.44	0.48	0.51	0.37	0.54	0.37	0.37	0.44
1980	0.00	0.06	0.26	0.38	0.44	0.48	0.43	0.47	0.32	0.32	0.41
1981	0.00	0.05	0.32	0.37	0.46	0.58	0.61	0.54	0.31	0.31	0.48
1982	0.00	0.05	0.21	0.41	0.43	0.44	0.73	0.45	0.55	0.55	0.45
1983	0.00	0.09	0.41	0.52	0.80	0.94	1.26	1.06	0.55	0.55	0.83
1984	0.00	0.10	0.35	0.48	0.58	0.70	0.70	0.70	0.70	0.70	0.59

Table 6.4.

USING EFFORT DATA FROM FAROESE LONGLINE VESSELS FOR CALIBRATING A VPA HADDOCK VB. EFFORT DATA CORRECTED FOR SEASONALITY.

Year	Effort Longl.	Age									
		1	2	3	4	5	6	7	8	9	10
Nos. at age in longline fishery, * 10-3											
1973	28	48	656	1258	218	452	119	238	36	6	6
1974	17	12	581	441	852	90	207	191	174	11	60
1975	21	32	1286	1881	683	406	101	121	73	179	76
1976	25	0	19	1540	2345	492	502	83	375	97	117
1977	38	0	22	1438	2487	2361	1338	418	183	456	553
1978	31	0	9	594	2124	2090	1020	407	342	149	188
1979	24	1	1	877	1190	1902	907	338	65	54	22
1980	14	0	96	39	1528	880	1021	636	219	36	31
1981	24	0	65	337	119	1177	489	553	226	51	14
1982	20	0	326	297	333	98	570	182	186	71	22
1983	22	0	239	523	85	88	20	337	167	244	215
1984	23	18	779	392	896	26	50	22	176	71	213

NOS. AT AGE ALL GEARS, * 10-3

1973	709	3300	8388	1236	2786	916	1051	150	68	11
1974	221	5633	2899	3970	451	976	486	535	68	147
1975	110	7337	7952	2097	1371	247	352	237	419	187
1976	38	4396	7858	6798	1251	1189	298	720	258	318
1977	0	255	4039	5168	4918	2128	946	443	731	855
1978	0	32	1022	4248	4054	1841	717	635	243	312
1979	1	1	1161	1754	3341	1850	772	212	155	74
1980	0	143	58	3724	2383	2496	1568	660	99	86
1981	0	74	455	202	2586	1354	1559	608	177	36
1982	0	539	934	784	298	2182	973	1166	1283	214
1983	0	441	1968	383	422	93	1444	740	947	795
1984	25	1194	1557	2455	147	233	42	858	386	628

CATCH IN NUMBERS BY UNIT EFFORT BY AGE GROUP, LONGLINE. HADDOCK VB.

	1	2	3	4	5	6
1973	1.71	23.43	44.93	7.79	16.14	4.25
1974	0.71	34.18	25.94	50.12	5.29	12.18
1975	1.52	61.24	89.57	32.52	19.33	4.81
1976	0.00	0.76	61.60	93.80	19.68	20.08
1977	0.00	0.58	37.84	65.45	62.13	35.21
1978	0.00	0.29	19.16	68.52	67.42	32.90
1979	0.04	0.04	36.54	49.58	79.25	37.79
1980	0.00	6.86	2.79	109.14	62.86	72.93
1981	0.00	2.71	14.04	4.96	49.04	20.38
1982	0.00	16.30	14.85	16.65	4.90	28.50
1983	0.00	10.86	23.77	3.86	4.00	0.91
1984	0.78	33.87	17.04	38.96	1.13	2.17

(Table 6.4, continued).

PARTIAL FS FROM LONGLINE FISHERY (C(11)/C(tot)*F(tot). HADDOCK VB.

Year/ Age	1	2	3	4	5	6	7	8	9	10	Av(3-8)u
1973	0.00	0.03	0.07	0.04	0.05	0.04	0.07	0.09	0.04	0.22	0.06
1974	0.00	0.01	0.03	0.09	0.03	0.04	0.09	0.08	0.05	0.12	0.06
1975	0.00	0.02	0.07	0.08	0.07	0.04	0.03	0.06	0.13	0.12	0.06
1976	0.00	0.00	0.04	0.14	0.09	0.14	0.05	0.15	0.11	0.11	0.10
1977	0.00	0.00	0.04	0.09	0.28	0.47	0.22	0.17	0.31	0.32	0.21
1978	0.00	0.00	0.03	0.09	0.11	0.25	0.35	0.40	0.25	0.24	0.21
1979	0.00	0.00	0.04	0.09	0.11	0.07	0.15	0.11	0.14	0.12	0.10
1980	0.00	0.03	0.03	0.09	0.12	0.09	0.07	0.19	0.11	0.14	0.10
1981	0.00	0.03	0.10	0.14	0.10	0.09	0.07	0.04	0.09	0.12	0.09
1982	0.00	0.02	0.18	0.16	0.21	0.08	0.06	0.04	0.02	0.03	0.12
1983	0.00	0.02	0.04	0.11	0.08	0.09	0.08	0.09	0.08	0.08	0.08
1984	0.00	0.03	0.03	0.11	0.06	0.08	0.19	0.07	0.07	0.12	0.09

TOTAL FISHING MORTALITY FROM FINAL VPA RUN

1973	0.01	0.17	0.46	0.25	0.33	0.29	0.29	0.38	0.40	0.40	0.33
1974	0.00	0.13	0.22	0.41	0.14	0.18	0.23	0.24	0.30	0.30	0.24
1975	0.00	0.13	0.28	0.25	0.24	0.11	0.09	0.18	0.30	0.30	0.19
1976	0.00	0.09	0.19	0.41	0.23	0.34	0.19	0.28	0.30	0.30	0.27
1977	0.00	0.01	0.11	0.19	0.59	0.75	0.50	0.40	0.50	0.50	0.42
1978	0.00	0.00	0.06	0.17	0.22	0.46	0.62	0.74	0.40	0.40	0.38
1979	0.00	0.00	0.05	0.14	0.19	0.15	0.35	0.37	0.40	0.40	0.21
1980	0.00	0.04	0.05	0.22	0.32	0.22	0.18	0.58	0.30	0.40	0.26
1981	0.00	0.03	0.14	0.24	0.23	0.26	0.20	0.10	0.30	0.30	0.20
1982	0.30	0.04	0.58	0.38	0.65	0.31	0.30	0.23	0.30	0.30	0.41
1983	0.30	0.03	0.15	0.50	0.37	0.44	0.35	0.39	0.30	0.30	0.37
1984	0.00	0.04	0.12	0.29	0.36	0.36	0.36	0.36	0.36	0.36	0.31

Table 7.1 Nominal catch (tonnes) of SAITHE in Division Vb, 1974-1984

(Data for 1974-83 from Bulletin Statistique).

Country	1975	1976	1977	1978	1979
Belgium	-	6	-	-	-
Faroe Islands	2,517	2,560	5,153	15,892	22,003
France	23,980	15,367	17,038	8,128	2,974
German Dem. Rep.	26	-	-	-	-
Germany Fed. Rep.	5,229	2,605	3,806	1,088	58
Netherlands	491	232	58	-	-
Norway	486	2,232	1,279	1,124	1,137
Poland	815	1,007	-	-	-
Spain	654	117	-	-	-
U.K. (England & Wales)	2,428	3,063	2,613	557	190
U.K. (Scotland)	4,950	5,860	5,608	1,349	361
USSR	-	16	-	-	-
Total	41,576	33,065	34,835	28,138	27,246

Country	1980	1981	1982	1983	1984*
Belgium	-	-	-	-	-
Faroe Islands	23,810	29,682	30,808	38,963	54,344
France	1,110	258	130	180	-
German Dem. Rep.	-	-	-	-	-
Germany Fed. Rep.	197	20	19	28	73
Netherlands	-	-	-	-	-
Norway	62	134	15	7	-
Poland	-	-	-	-	-
Spain	-	-	-	-	-
U.K. (England & Wales)	13	-	-	-	-
U.K. (Scotland)	38	9	1	+	-
USSR	-	-	-	-	-
Total	25,230	30,103	30,973	39,178	54,417

* Preliminary

Table 7.2 Virtual Population Analysis

Faroe SAI THE

	<u>Catch in numbers</u>		Unit: thousands							
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	0	1	0	0	0	0	0	0	0	0
2	189	148	124	20	1	424	0	221	0	0
3	2062	3178	1609	611	287	996	411	387	2484	367
4	3361	3217	2937	1743	933	877	1804	4076	1104	11001
5	3801	1720	2034	1736	1341	720	769	994	5057	2346
6	1939	1250	1288	548	1033	673	932	1114	1345	4072
7	1045	877	767	573	584	726	908	380	576	870
8	714	641	708	479	414	284	734	417	339	271
9	302	468	498	466	247	212	343	296	273	161
10	192	223	338	473	473	171	192	105	98	52
11	193	141	272	407	368	196	92	88	98	65
12	126	96	129	211	206	156	126	56	99	59
13	64	60	30	146	136	261	176	49	25	18
14	41	54	57	95	98	133	310	110	127	25
15+	67	77	64	83	251	236	407	687	290	150
TOTAL	14096	12151	10905	7391	6372	6065	7206	8980	11915	19457

Table 7.3 Virtual Population Analysis

Faroe SAITHE

Mean weight at age of the stocks

Unit: kilogrammes

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
2	.749	.653	.817	.448	.000	.000	.450	.850	.000	.000
3	1.114	1.086	1.223	1.493	1.220	1.230	1.310	1.337	1.208	1.431
4	1.658	1.676	1.641	2.324	1.880	2.210	2.130	1.851	2.029	1.953
5	2.260	2.878	2.660	3.068	2.620	3.320	3.000	2.951	2.965	2.470
6	3.120	3.081	3.790	3.746	3.400	4.280	3.810	3.577	4.143	3.850
7	3.557	4.287	4.239	4.915	4.180	5.160	4.750	4.927	4.724	5.177
8	4.096	4.352	5.597	4.368	4.950	6.420	5.250	6.243	5.901	6.347
9	5.128	4.790	5.350	5.276	5.690	6.870	5.950	7.232	6.811	7.825
10	6.094	5.912	5.912	5.832	6.380	7.090	6.430	7.239	7.051	6.746
11	7.196	6.619	6.837	6.053	7.020	7.930	7.000	8.346	7.248	8.636
12	7.732	6.619	6.727	6.706	7.620	8.070	7.470	8.345	8.292	8.467
13	8.602	7.311	6.946	7.686	8.150	8.590	8.140	8.956	9.478	8.556
14	8.810	7.806	8.424	7.219	8.640	9.790	8.550	9.584	10.893	11.127
15+	10.000	10.000	10.000	10.000	10.000	10.340	10.100	10.330	10.340	10.748

Table 7.4 Virtual Population Analysis

Faroe SAITH

Fishing Mortality Coefficient

Unit: Year-1

Natural Mortality Coefficient = .20

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1980-82
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.01	.01	.01	.00	.00	.01	.00	.00	.00	.00	.00
3	.14	.20	.15	.08	.04	.08	.01	.03	.07	.03	.04
4	.35	.34	.29	.23	.17	.15	.20	.15	.10	.45	.17
5	.50	.30	.38	.28	.28	.20	.20	.16	.29	.30	.19
6	.23	.31	.39	.17	.26	.23	.42	.48	.35	.40	.37
7	.16	.15	.31	.18	.27	.30	.54	.30	.49	.40	.36
8	.10	.14	.18	.33	.32	.20	.56	.51	.49	.45	.42
9	.10	.09	.16	.17	.28	.27	.40	.47	.74	.45	.38
10	.12	.10	.08	.22	.26	.32	.41	.21	.28	.30	.31
11	.19	.12	.16	.14	.26	.16	.26	.33	.30	.30	.26
12	.27	.14	.16	.20	.09	.17	.15	.28	.77	.30	.20
13	.22	.20	.16	.27	.20	.16	.29	.08	.19	.30	.18
14	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30
15+	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30
(4- B)U	.27	.25	.31	.24	.26	.22	.38	.32	.34	.40	

Table 7.5 Virtual Population Analysis
Faroe SAITHE

Stock size in numbers Unit: thousands

Biomass Totals

Unit: tonnes

All values are given for 1 January

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1975-81
1	19573	12880	12809	21301	58578	24908	84901	20429	0	0	0	30733
2	25631	16025	10545	10536	17440	47960	20442	53186	16726	0	0	20940
3	17043	19170	12987	8521	8008	14277	38885	16737	43545	13094	0	17071
4	12577	12095	12839	9183	6425	6789	10791	31464	13354	33247	10880	10100
5	10524	7279	7013	7671	5950	4420	4708	7211	22038	9937	17356	6832
6	10500	5211	4413	3916	4384	3606	2971	3211	5008	13538	6027	5080
7	7674	6852	3143	2457	2713	3069	2395	1596	1631	2892	7430	4043
8	8434	5342	4820	1884	1676	1690	1860	1148	905	819	1587	3673
9	3306	6261	3790	3300	1112	1000	1135	800	507	487	428	2654
10	1829	2484	4704	2059	2289	689	628	620	444	220	254	2183
11	1206	1324	1832	3540	1751	1448	410	342	413	275	134	1645
12	579	814	957	1255	2537	1103	1009	253	201	250	167	1179
13	350	361	530	067	338	1891	702	711	157	76	152	778
14	174	229	241	402	415	563	1313	466	538	106	46	477
15+	234	320	271	352	1063	1000	1724	2910	1228	635	450	717
TOTAL NO	117744	96659	81010	77860	116278	114539	154052	141150	106664	70176		
SFS NO	44919	36482	31771	28319	25227	20545	18974	19534	33239	29236		
TOT. BIOM	224892	207733	197102	172301	148010	153889	185923	230234	210789	199810		
SFS BIOM	167353	156133	151535	135518	125428	121324	102803	104410	131334	115283		

Table 7.6 List of Input Variables for Equilibrium Yield Calculation

Faroe SAITHE

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

Data are printed in the following units:

Number of fish: thousands
 weight by age group in the catch: kilogram mean values for years 1982 - 1984
 weight by age group in the stock: kilogram mean values for years 1982 - 1984
 stock biomass: tonnes
 catch weight: tonnes

age	fishing* pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	.00	.20	.00	.000	.000
2	.00	.20	.00	.850	.850
3	.03	.20	.00	1.325	1.325
4	.17	.20	.00	1.944	1.944
5	.19	.20	1.00	2.795	2.795
6	.37	.20	1.00	3.857	3.857
7	.38	.20	1.00	4.943	4.943
8	.42	.20	1.00	6.164	6.164
9	.38	.20	1.00	7.289	7.289
10	.31	.20	1.00	7.012	7.012
11	.26	.20	1.00	8.077	8.077
12	.20	.20	1.00	8.368	8.368
13	.18	.20	1.00	8.997	8.997
14	.30	.20	1.00	10.535	10.535
15+	.30	.20	1.00	10.473	10.473

*Average exploitation pattern

Table 7.7 List of Input Variables for the ICES Prediction Program

Faroe SAITHE

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

The number of recruits is as follows:

Year	Recruitment
1985	37000.0
1986	37000.0
1987	37000.0

Data are printed in the following units:

Number of fish:	thousands	
Weight by age group in the catch:	kilogram	mean values for years 1982 - 1984
Weight by age group in the stock:	kilogram	mean values for years 1982 - 1984
Stock biomass:	tonnes	
Catch weight:	tonnes	

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1:	37000.0	.00	.20	.00	.000	.000
2:	30295.0	.00	.20	.00	.850	.850
3:	24802.0	.03	.20	.00	1.325	1.325
4:	10880.0	.21	.20	.00	1.944	1.944
5:	17356.0	.36	.20	1.00	2.795	2.795
6:	6027.0	.45	.20	1.00	3.857	3.857
7:	7430.0	.46	.20	1.00	4.943	4.943
8:	1587.0	.51	.20	1.00	6.164	6.164
9:	428.0	.46	.20	1.00	7.289	7.289
10:	254.0	.38	.20	1.00	7.012	7.012
11:	134.0	.32	.20	1.00	8.077	8.077
12:	167.0	.24	.20	1.00	8.368	8.368
13:	152.0	.22	.20	1.00	8.997	8.997
14:	46.0	.36	.20	1.00	10.535	10.535
15+:	450.0	.36	.20	1.00	10.473	10.473

Table 7.8 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass

Faroe SAITHE

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.40	212	132	45	.0	.00	209	112	0	257	159
					.1	.04			5	251	153
					.2	.08			10	245	147
					.4	.16			20	234	137
					.6	.24			28	224	127
					.8	.32			36	215	118
					1.0	.40			44	207	110
					1.2	.48			51	199	102
					1.4	.56			57	192	95
					1.6	.64			63	185	89
					1.8	.72			68	179	83
					2.0	.80			73	173	77

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

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

Table 8.1 Faroe Plateau COD. Nominal catches by countries
1974-1984 (tonnes) (Data for 1974-1983 from
Bulletin Statistique).

Year	Faroe	France	Germany	Norway	Poland	UK	UK	Others	Total
	Islands		Fed. Rep.			England	Scotland		
1974	12,541	567 ^A	292	446	320	2,879	7,516	20	24,500
1975	22,608	1,531	408	1,353	432	2,538	7,815	90	36,775
1976	28,502	1,535	247	1,282	496	2,179	5,491	67	39,799
1977	28,177	1,450	332	864	-	811	3,291	2	34,927
1978	24,076	213 ^A	71 ^C	245	-	518	1,460	2	26,585
1979	21,774	117 ^A	23 ^C	274	-	263	661	-	23,112
1980	19,966	40 ^A	- ^C	127	-	13	367	-	20,513
1981	22,616	47	- ^C	240	-	-	60	-	22,963
1982	21,387	10	-	90	-	-	2	-	21,489
1983	37,916	13	128	83 ^B	-	-	- ^d	-	38,140
1984 ^B	37,265	-	8	43 ^A	-	2 ^A	- ^c	-	37,318

^A Division Vb2 included

^B Preliminary

^C Working Group Data

^d Included in Division Vb2

Table 8.2 Faroe Bank COD. Nominal catches by countries,
1974-84 (tonnes).
(Data for 1974-1983 from Bulletin Statistique)

Year	Faroe	France	Germany		Poland	UK		Others	Total
	Islands		Fed.Rep.	Norway		England	Scotland		
1974	696	*	-	-	-	829	503	40	2,068
1975	378	81	50	-	-	749	804	55	2,117
1976	457	72	+	1	-	877	912	11	2,330
1977	851	219	-	99	-	9	780	-	1,958
1978	4,194	*	-	183	-	2	1,071	-	5,450
1979	1,273	*	-	33	-	-	677	-	1,983
1980	724	*	-	54	-	85	340	-	1,203
1981	975	-	-	120	-	-	134	-	1,229
1982	2,184	-	-	16	-	-	152	-	2,352
1983	2,284	-	-	17**	-	-	66***	-	2,367
1984***	1,838	-	*	-*	-	-*	21***	-	1,859

* Catches included in Vb₁

** Preliminary

*** Catches including Vb₁

Table 8.3 Virtual Population Analysis

COD in the Faroe Plateau

Catch in numbers

Unit: thousands

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	97	18	31	160	19	41	10	5	30	37
2	2564	1497	425	555	575	1129	646	1139	2149	4437
3	5039	4156	3282	1219	1732	2265	4137	1965	5772	5282
4	2157	3799	6344	2643	1673	1461	1931	3073	2760	3517
5	2211	1380	3718	3210	1801	395	947	1286	2746	1474
6	813	1427	788	1041	1906	807	522	471	1204	920
7	295	617	1160	266	493	332	467	314	510	317
8	190	273	239	201	134	339	527	169	157	83
9	113	120	134	66	67	42	123	254	104	34
10+	150	186	9	56	38	18	55	122	102	36
TOTAL	14304	13475	16630	9425	6258	7827	9501	8793	15564	16137

Table 8.4 Virtual Population Analysis

COD in the Faore Plateau

Mean weight at age of the stock

Unit: kilogrammes

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.380	.380	.380	.394	.493	.430	.750	.715	.690	.743
2	1.060	1.060	1.060	1.112	.697	.927	1.030	1.280	1.538	1.195
3	1.890	1.890	1.890	1.385	1.682	1.432	1.470	1.413	1.950	1.888
4	2.920	2.920	2.920	2.140	2.211	2.220	2.160	2.138	2.403	2.980
5	4.070	4.070	4.070	3.125	3.052	3.105	3.210	3.107	3.107	3.679
6	5.500	5.500	5.500	4.563	5.642	3.539	3.700	4.012	4.110	4.470
7	6.580	6.580	6.580	5.927	4.719	4.392	4.240	5.442	5.020	5.438
8	7.850	7.850	7.850	6.348	7.272	6.160	4.430	5.505	5.001	6.466
9	9.080	9.080	9.080	8.715	8.568	7.603	6.690	5.216	8.013	6.628
10+	10.270	10.270	10.270	12.299	13.042	9.668	10.000	6.707	8.051	10.981

Table 8.5 Virtual Population Analysis

COD in the Faroe Plateau

Fishing Mortality Coefficient

Unit: Year-1

Natural Mortality Coefficient = .20

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.00	.00	.00	.01	.00	.00	.00	.00	.00	.002
2	.08	.09	.05	.06	.05	.06	.05	.05	.09	.20
3	.31	.17	.30	.19	.27	.25	.32	.21	.41	.35
4	.43	.35	.48	.42	.44	.38	.37	.41	.52	.48
5	.40	.54	.70	.44	.48	.44	.46	.43	.60	.58
6	.43	.50	.68	.45	.51	.48	.58	.44	.94	.70
7	.51	.68	1.00	.52	.57	.43	.61	.73	1.26	.70
8	.56	.53	.63	.46	.54	.47	.54	.45	1.06	.70
9	.40	.40	.54	.35	.37	.32	.31	.55	.55	.70
10+	.40	.40	.54	.35	.37	.32	.31	.55	.55	.70
(3-6)H	.57	.46	.65	.41	.43	.41	.48	.44	.63	.58

Table 8.6 Virtual Population Analysis

COD in the Faroe Plateau

<u>Stock size in numbers</u>	Unit: thousands										
<u>Biomass Totals</u>	Unit: tonnes										
	All values are given for 1 January										
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	22922	12034	12808	17590	26524	17735	29387	32167	32965	20451	0
2	37723	18679	9636	10459	14257	21699	14524	24046	26331	26917	16694
3	23355	28554	13943	7669	8062	11154	16746	11308	18659	19620	18043
4	6807	14009	19633	6466	5182	5043	7096	9993	7490	10098	11520
5	7297	3638	3053	9940	4560	2742	2817	4031	5425	3660	5116
6	2549	3990	1743	3277	5254	2299	1442	1456	2147	1993	1678
7	1212	1353	1988	723	1750	2595	1159	660	771	687	810
8	696	728	560	597	352	990	1373	513	260	180	279
9	392	399	351	245	303	168	507	656	269	74	73
10+	499	618	24	206	155	72	226	315	264	78	62
TOTAL NO	103452	84006	68945	59175	66384	64546	75236	85149	94581	83739	
SPS NO	19451	24740	32357	23457	17541	13908	14626	17627	16025	16770	
TOT. BIOM.	178043	179818	161921	105433	99191	90969	103666	121483	147633	145134	
SPS BIOM.	85204	101479	127275	76250	59666	47255	46522	51726	53276	58745	

Table 8.7 List of input variables for the ICES prediction program

COD, Faroe Plateau (VB₁)

The reference F is the mean F for the age group range from 3 to 8

The number of recruits per year is as follows :

Year	recruitment
1985	22722.0
1986	22722.0
1987	22722.0
1988	22722.0
1989	22722.0
1990	22722.0

Data are printed in the following units:

Number of fish: thousands
 weight by age group in the catch: kilogram mean values for years 1981 - 1984
 weight by age group in the stock: kilogram mean values for years 1981 - 1984
 Stock biomass: tonnes
 catch weight: tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	22722.0	.02	.20	.00	.724	.724
2	18418.0	.20	.20	.00	1.223	1.223
3	18043.0	.35	.20	.00	1.680	1.680
4	11320.0	.48	.20	1.00	2.425	2.425
5	5118.0	.53	.20	1.00	3.276	3.276
6	1678.0	.70	.20	1.00	4.073	4.073
7	310.0	.70	.20	1.00	5.047	5.047
8	279.0	.70	.20	1.00	5.515	5.515
9	73.0	.70	.20	1.00	6.637	6.637
10+	62.0	.70	.20	1.00	8.930	8.930

Table 8.8 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass

COD, Faroe Plateau (VB₁), Prediction

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.53	127	58	35	.0	.00	119	60	0	152	87
					.1	.06			4	147	83
					.2	.12			8	142	79
					.4	.23			15	133	71
					.6	.35			22	126	65
					.8	.47			25	119	59
					1.0	.58			35	112	53
					1.2	.70			36	106	48
					1.4	.82			43	101	44
					1.6	.94			47	96	40
					1.8	1.05			51	92	36
					2.0	1.17			54	88	33

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

The reference F is the mean F for the age group range from 3 to 8

Table 9.1 Faroe Plateau HADDOCK. Nominal catches by countries,
1974-84 (tonnes).
(Data for 1974-1983 from Bulletin Statistique)

Year	Faroe		Germany			UK		Others	Total
	Islands	France	Fed. Rep.	Norway	Poland	England	Scotland		
1974	4,538	1,461*	70	5	685	1,044	5,572	30	13,405
1975	8,625	2,173	120	56	544	1,505	4,896	383	18,302
1976	12,670	2,472	22	20	448	1,551	6,671	181	24,035
1977	19,806	623	49	46	5	707	3,278	26	24,540
1978	15,539	71*	8	91	-	48	367	-	16,124
1979	11,259	50*	2	39	-	35	212	-	11,597
1980	13,633	31*	4	9	-	6	434	6	14,123
1981	10,891	113	+	20	-	-	85	-	11,109
1982	10,319	2	1	12	-	-	1	-	10,335
1983	11,898	2	+	12**	-	-	...***	-	11,912
1984**	11,541		+#	15*	-	-	...***	-	11,556

* Catches including Vb₂

** Preliminary

*** Catches included in Vb₂

Table 9.2 Faroe Bank HADDOCK. Nominal catches by countries,
1974-84 (tonnes).
(Data for 1974-1983 from Bulletin Statistique)

Year	Faroe	France	Germany			UK		Others	Total
	Islands		Fed.Rep.	Norway	Poland	England	Scotland		
1974	273	*	-	-	-	573	500	22	1,368
1975	132	125	53	-	-	921	1,182	-	2,413
1976	44	70	+	-	-	733	1,329	-	2,176
1977	273	77	-	11	-	4	650	-	1,015
1978	2,643	*	-	39	-	-	394	-	3,076
1979	716	*	-	-	-	-	105	-	821
1980	690	*	-	8	-	152	43	-	893
1981	1,103		-	7	-	-	14	-	1,124
1982	1,553	-	-	1	-	-	48	-	1,602
1983	967	-	-	2**		-	13***		982
1984**	802		*	*		-	42***		844

* Catches included in Vb₁

** Preliminary

*** Catches including Vb₁

Table 9.3 Virtual Population analysis

HADDOCK in the Faroe Region

<u>Catch in numbers</u>	Unit: thousands									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	110	38	0	0	1	0	0	0	0	25
2	7337	4396	255	32	1	143	74	539	441	1198
3	7952	7858	4039	1022	1161	58	455	934	1969	1560
4	2097	6798	5106	4246	1754	3724	202	784	583	2463
5	1371	1251	4918	4054	3341	2583	2586	298	422	147
6	247	1189	2128	1841	1850	2496	1354	2182	93	234
7	352	293	946	717	772	1568	1559	973	1444	42
8	237	720	445	635	212	600	600	1100	740	862
9	419	258	731	243	155	99	177	1283	947	389
10+	187	318	855	312	74	86	56	214	795	970
TOTAL	20309	23124	19483	13104	9321	11417	7051	8373	7234	7890

Table 9.4 Virtual Population analysis

HADDOCK in the Faroe Region

Mean weight at age of the stock

Unit: kilogrammes

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.300	.300	.000	.000	.000	.000	.000	.000	.000	.359
2	.470	.470	.311	.357	.357	.643	.452	.700	.700	.631
3	.730	.730	.635	.790	.672	.713	.725	.890	.896	1.011
4	1.130	1.130	1.044	1.035	.894	.941	.957	1.150	1.150	1.255
5	1.550	1.550	1.420	1.393	1.156	1.157	1.237	1.444	1.444	1.812
6	1.970	1.970	1.852	1.870	1.590	1.493	1.651	1.498	1.498	2.061
7	2.410	2.410	2.241	2.350	2.070	1.739	2.053	1.829	1.829	2.059
8	2.760	2.760	2.205	2.597	2.525	2.095	2.406	1.387	1.887	2.137
9	3.070	3.070	2.570	3.014	2.690	2.465	2.725	1.961	1.961	2.368
10+	3.550	3.550	2.591	2.920	3.519	3.310	3.250	2.856	2.856	2.686

Table 9.5 Virtual Population Analysis

HADDOCK in the Faroe Region

Fishing Mortality Coefficient

Unit: Year-1

Natural Mortality Coefficient = .20

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.13	.09	.01	.00	.00	.03	.03	.03	.03	.04
3	.28	.19	.11	.06	.05	.05	.14	.58	.15	.12
4	.25	.41	.19	.17	.14	.22	.24	.38	.50	.29
5	.24	.24	.59	.22	.19	.30	.23	.65	.37	.36
6	.11	.34	.80	.46	.15	.22	.26	.31	.44	.36
7	.09	.19	.50	.70	.35	.18	.20	.30	.35	.36
8	.18	.26	.46	.74	.46	.58	.10	.23	.39	.36
9	.30	.30	.50	.50	.40	.40	.30	.30	.30	.36
10+	.30	.30	.50	.50	.40	.40	.30	.30	.30	.36
(3- 8)U	.19	.27	.44	.39	.27	.26	.19	.41	.36	.31
(3- 8)W	.25	.26	.25	.19	.13	.23	.20	.33	.25	.22

Table 9.6 Virtual Population Analysis

HADDOCK in the Faroe Region

<u>Stock size in numbers</u>		Unit: thousands									
<u>Biomass Totals</u>		Unit: tonnes									
		All values are given for 1 January									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	67531	29765	40189	20008	5844	3573	23534	23256	41146	27597	0
2	68718	55232	24335	32904	1644	4784	2925	19268	19040	33688	22572
3	35857	49648	41255	19694	26911	1345	3788	2528	15289	15191	26500
4	10277	22207	33572	30135	15202	20965	1049	2691	1070	10743	11031
5	7052	6527	12082	22832	20846	10865	13829	677	1500	533	6582
6	2627	4540	4219	5492	15045	14059	6574	8995	288	849	305
7	4386	1928	2649	1557	2846	10650	9264	4164	5404	152	485
8	1596	3274	1310	1522	634	1637	7306	6181	2535	3127	87
9	1775	1095	2033	676	515	329	750	5435	4011	1411	1786
10+	792	1347	2378	666	246	266	152	906	3367	3519	2616
TOTAL NO	200662	175561	164022	117487	39733	68513	69172	73902	93651	96810	
SPS NO	64362	90565	99496	32375	62244	60156	42713	31378	33464	35526	
TOTAL BIOM	129702	137107	113986	112345	90028	61051	72171	65647	63005	84195	
SPS BIOM	77130	102219	106418	100598	39441	77974	70849	52159	49677	51346	

Table 9.7 List of input variables for the ICES prediction program

HADDOCK, Faroe Region (Vb)

The reference F is the mean F for the age group range from 3 to 8

The number of recruits per year is as follows :

Year	Recruitment
1985	37159.0
1986	37159.0
1987	37159.0
1988	37159.0
1989	37159.0
1990	37159.0

Data are printed in the following units:

Number of fish: thousands
 Weight by age group in the catch: kilogram mean values for years 1981 - 1984
 Weight by age group in the stock: kilogram mean values for years 1981 - 1984
 Stock biomass: tonnes
 Catch weight: tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	37159.0	.00	.20	.00	.320	.320
2	30423.0	.04	.20	.00	.576	.576
3	26500.0	.12	.20	1.00	.843	.843
4	11031.0	.29	.20	1.00	1.093	1.093
5	6582.0	.36	.20	1.00	1.453	1.453
6	305.0	.36	.20	1.00	1.717	1.717
7	485.0	.36	.20	1.00	1.998	1.998
8	87.0	.36	.20	1.00	2.172	2.172
9	1730.0	.36	.20	1.00	2.398	2.398
10+	2816.0	.36	.20	1.00	2.958	2.958

Table 9.8 Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass

HADDOCK, Faroe Region (Vb)

Year 1985					Year 1986					Year 1987	
fac- tor	ref. F	stock biomass	sp.stock biomass	catch	fac- tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.31	38	58	12	.0	.00	96	66	0	118	88
					.1	.03			2	116	86
					.2	.06			3	114	85
					.4	.12			6	111	81
					.6	.18			9	108	78
					.8	.25			12	105	75
					1.0	.31			14	102	72
					1.2	.37			17	99	70
					1.4	.43			19	96	67
					1.6	.49			21	94	65
					1.8	.55			23	92	62
					F max	.62			25	90	60

The data unit of the biomass and the catch is 1000 tonnes.

The spawning stock biomass is given for 1 January.

The reference F is the mean F for the age group range from 3 to 8

Figure 2.1

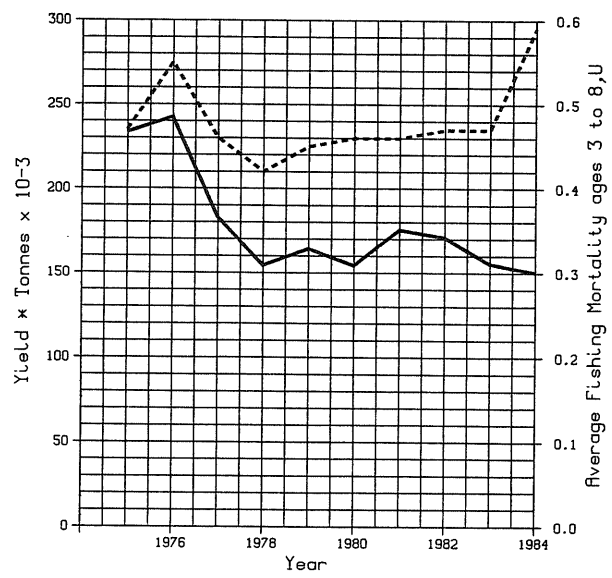
FISH STOCK SUMMARY

STOCK: Saithe - Arctic

05-05-1985

Trends in yield and fishing mortality (F)

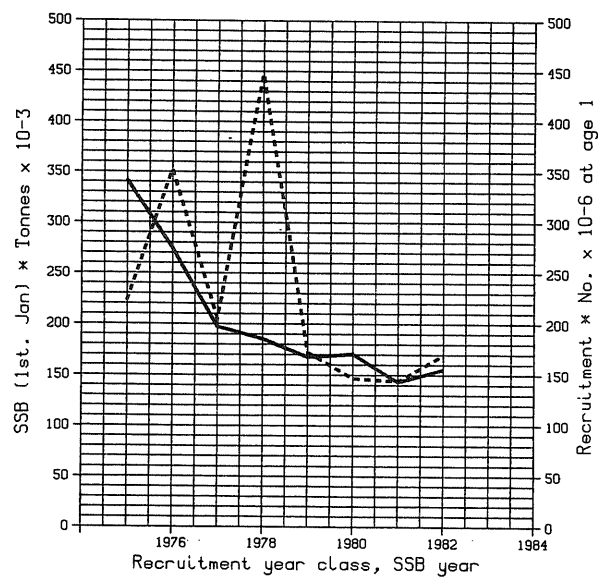
— Yield - - - F



A

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

— SSB - - - R



B

Contd.

Figure 2.1 Contd.

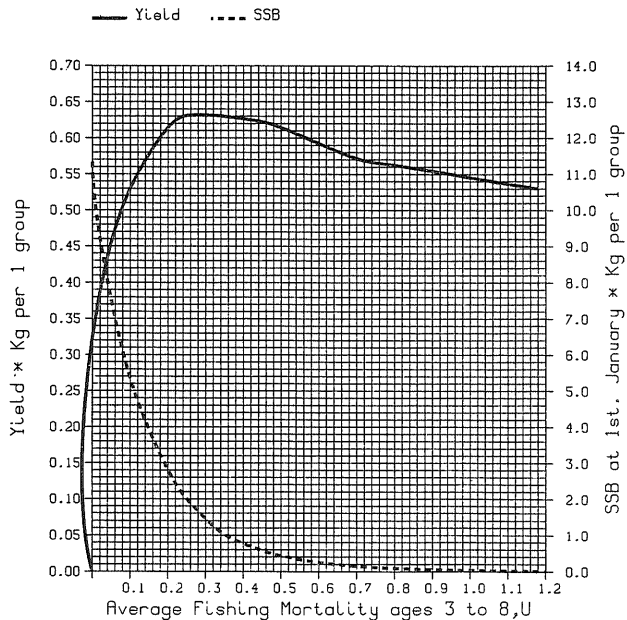
FISH STOCK SUMMARY

STOCK: Saithe - Arctic

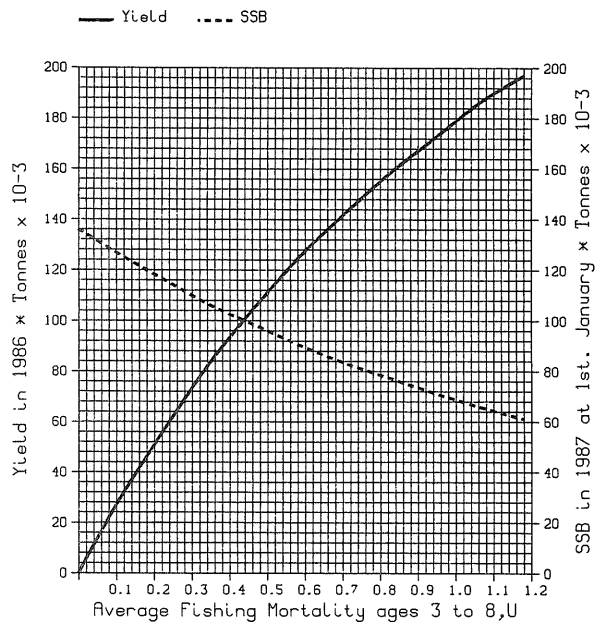
05-05-1985

Long term yield and spawning stock biomass

Short-term yield and spawning stock biomass



C



D

Figure 1212 NORTH EAST ARCTIC SAITHE.
Landings by gear categories
1977-84.

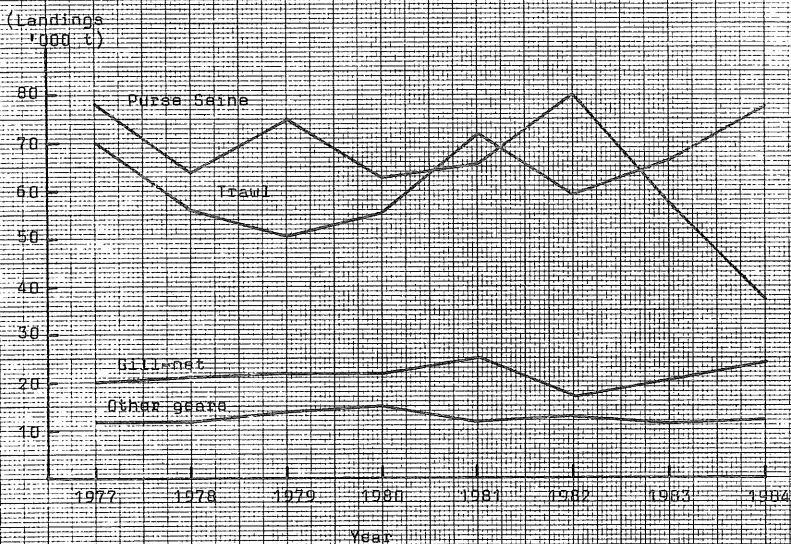


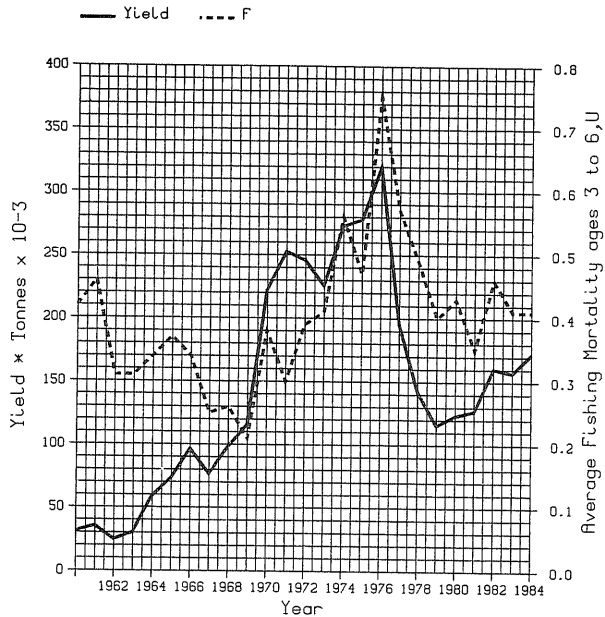
Figure 3.1

FISH STOCK SUMMARY

STOCK: Saithe - North Sea

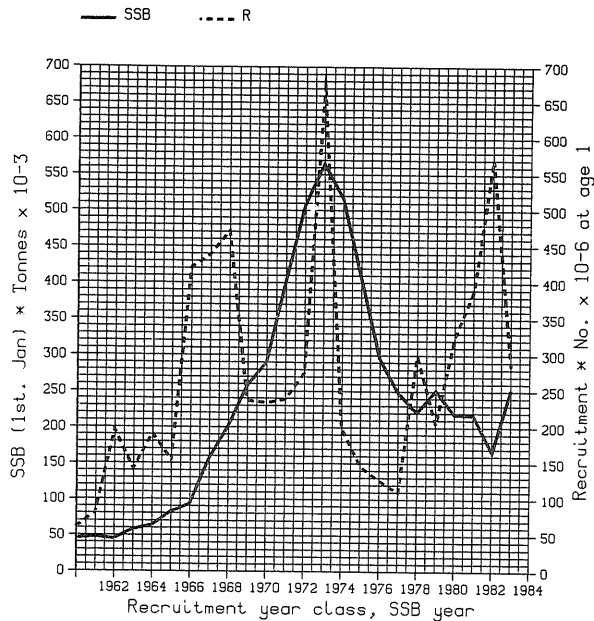
05-05-1985

Trends in yield and fishing mortality (F)



A

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



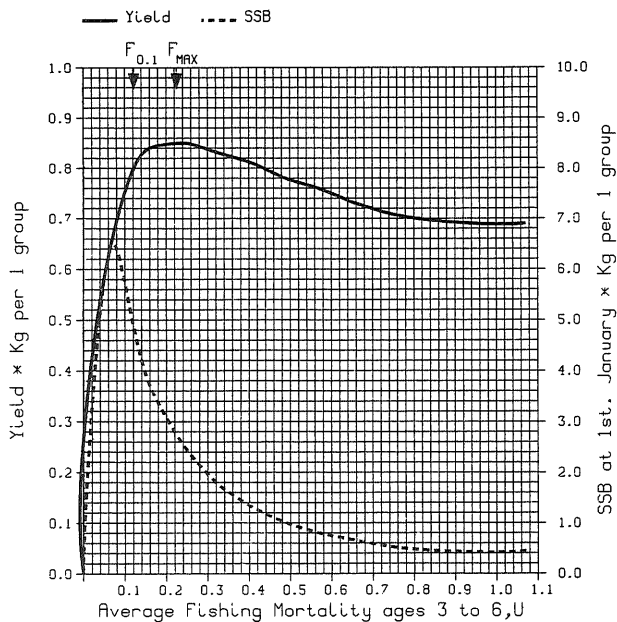
B

Contd.

Figure 3.1 Contd.

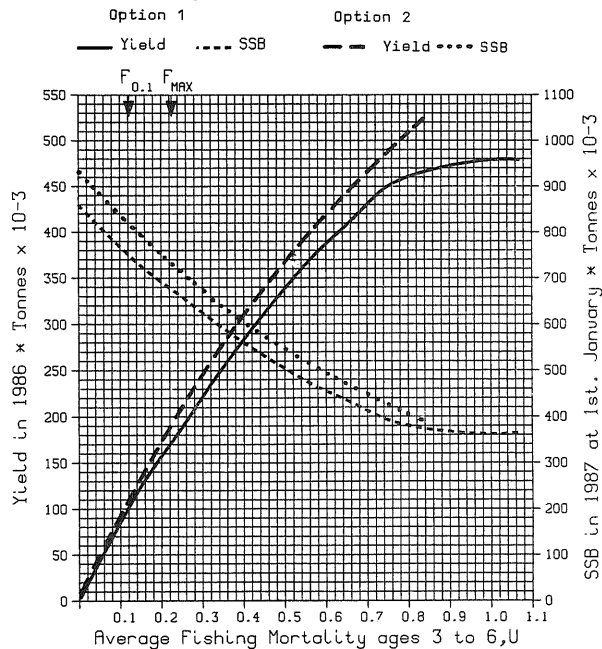
FISH STOCK SUMMARY
STOCK: Saithe - North Sea
05-05-1985

Long term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 3.2 North Sea SAITFC. Spawning stock from VPA plotted against French cope index of spawning stock.

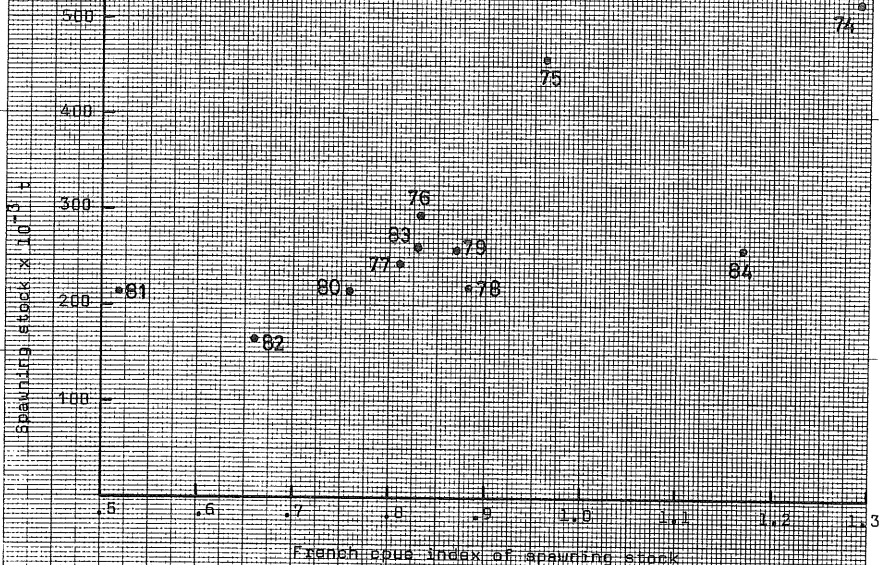


Figure 3.3 North Sea SAITFC. Partial fishing mortality by France plotted against effective French effort.

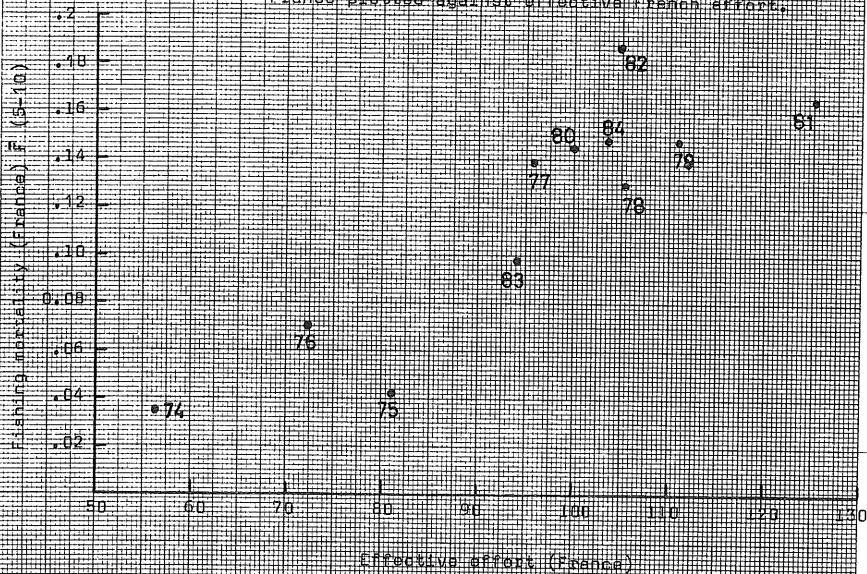


Figure 5.1 Separable VPA - Trends of annual F for a range of terminal F.

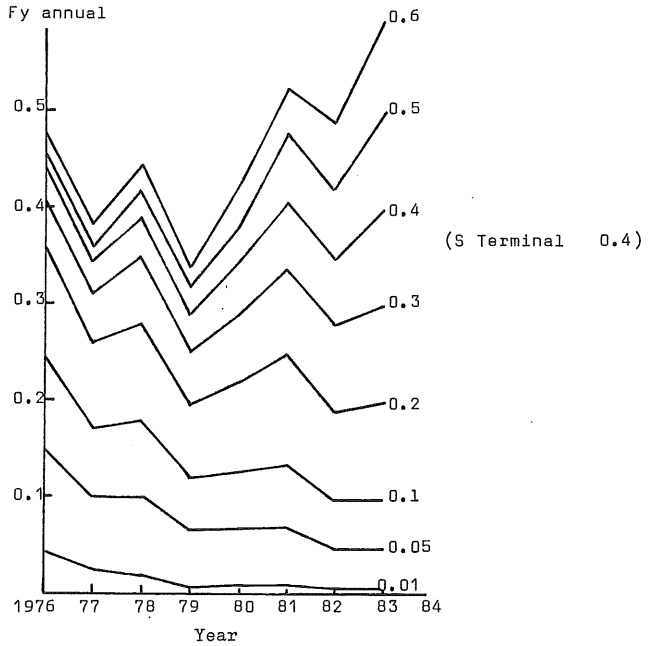


Figure 5.2 West of Scotland SAITHE. Trends of international fishing effort f and effective cpue.

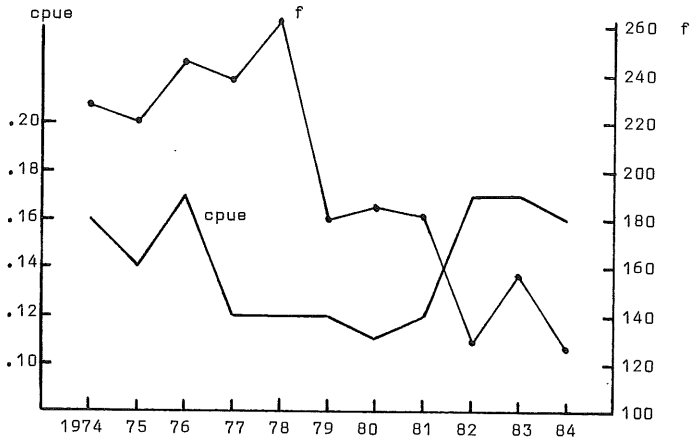


Figure 5.3 Catches versus fishing effort

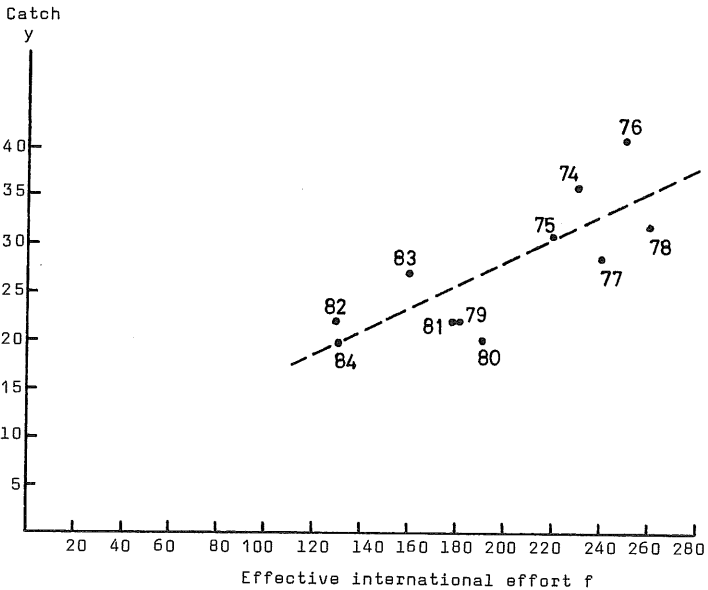


Figure 5.4

FISH STOCK SUMMARY

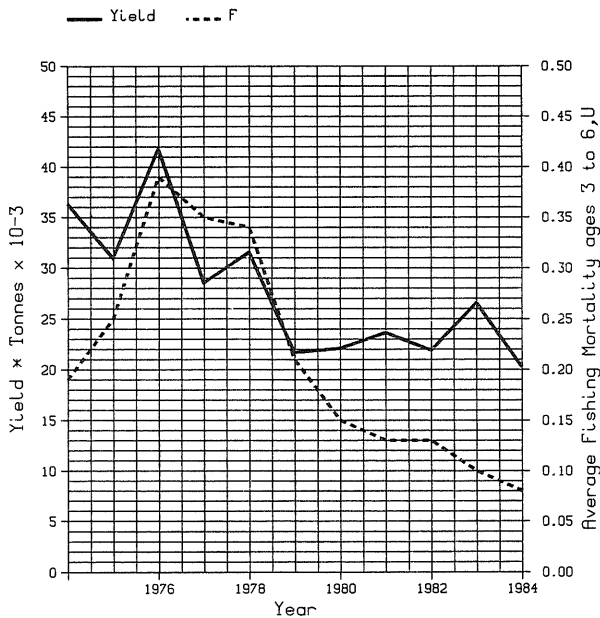
STOCK: Saithe - SCOW

West of Scotland.

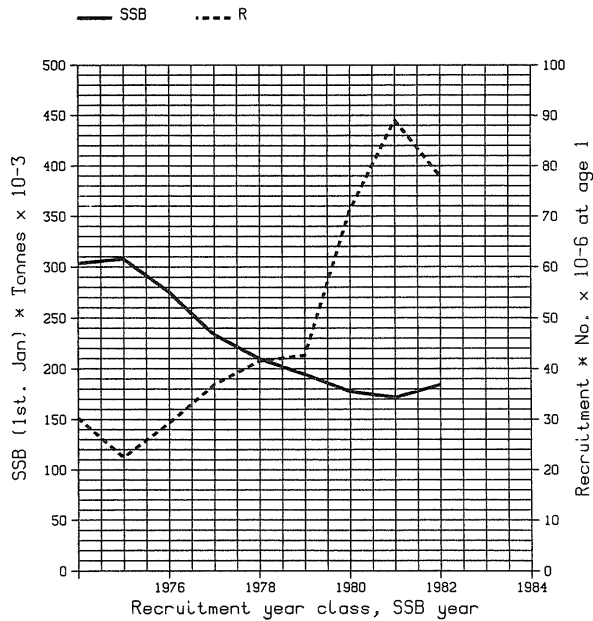
05-05-1985

Trends in yield and fishing mortality (F)

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

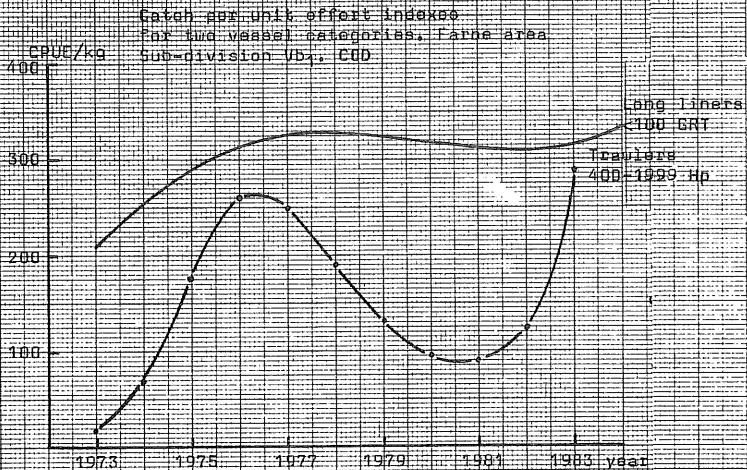


A



B

Figure 6.1



Catch per unit effort for two vessel
categories, Farne area Sub-division Vb,
HADDICK

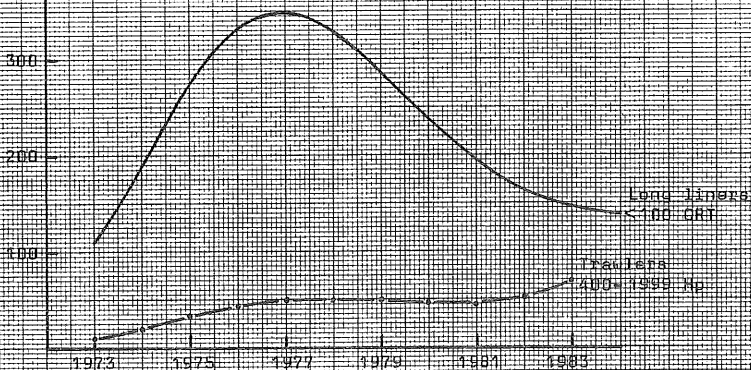


Figure 6.2 Calibrating the VPA for COD
Sub-division Vb₁ with longline effort data

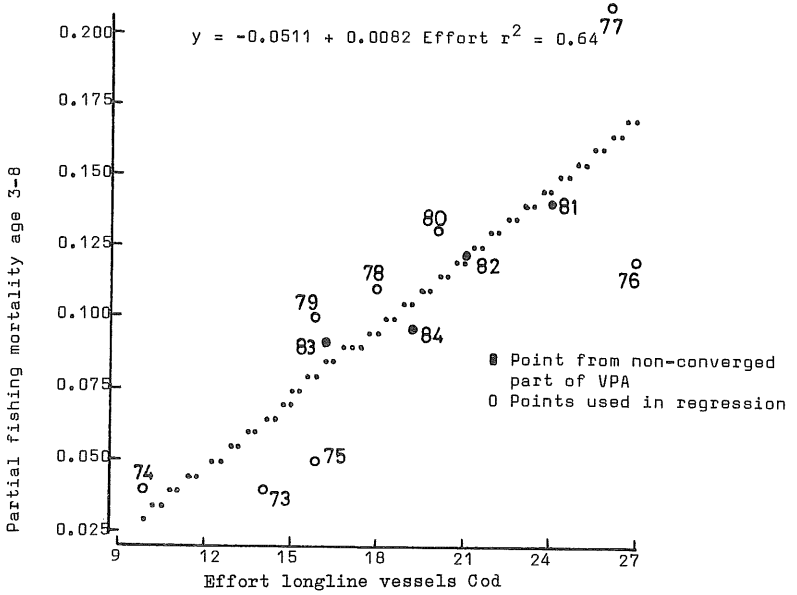


Figure 6.3 Calibrating the VPA for HADDOCK
Sub-division Vb₁ with longline effort data

Partial Fs vs corrected effort data HADDOCK Sub-div.Vb₁ 1973-84

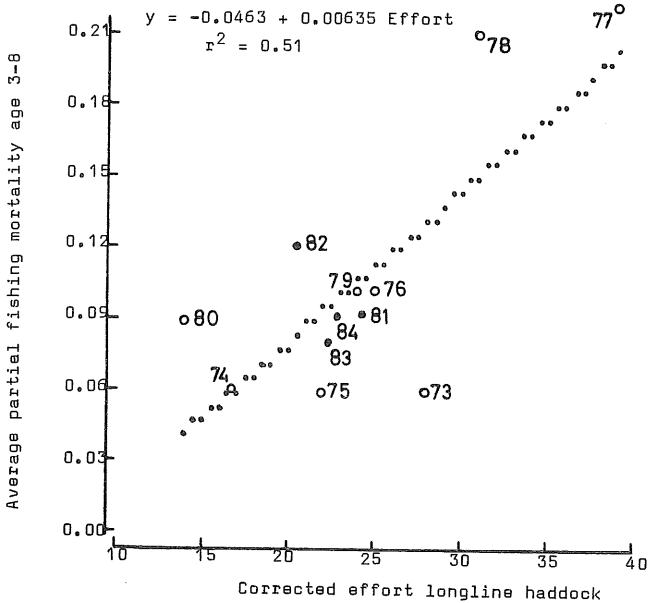


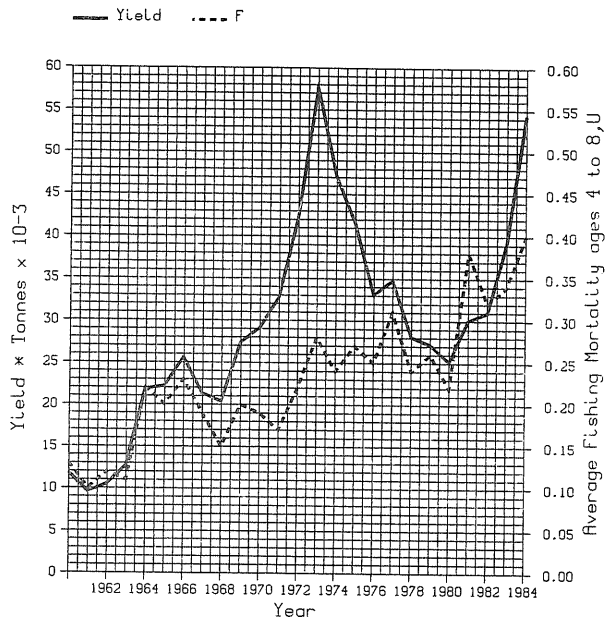
Figure 7.1

FISH STOCK SUMMARY

STOCK: Saithe - Faroe

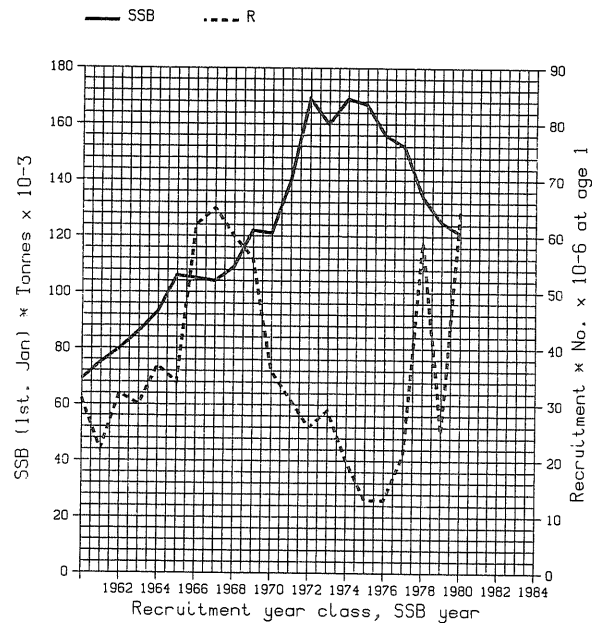
05-05-1985

Trends in yield and fishing mortality (F)



A

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



B

Contd.

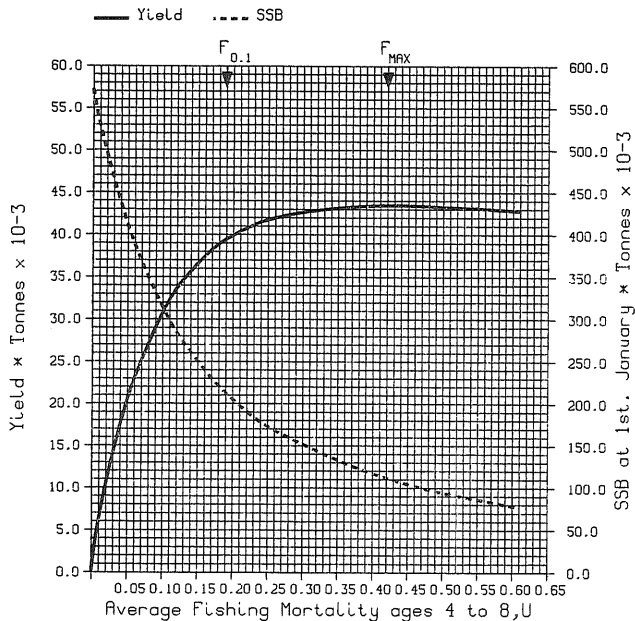
Figure 7.1 Contd.

FISH STOCK SUMMARY

STOCK: Saithe - Faroe

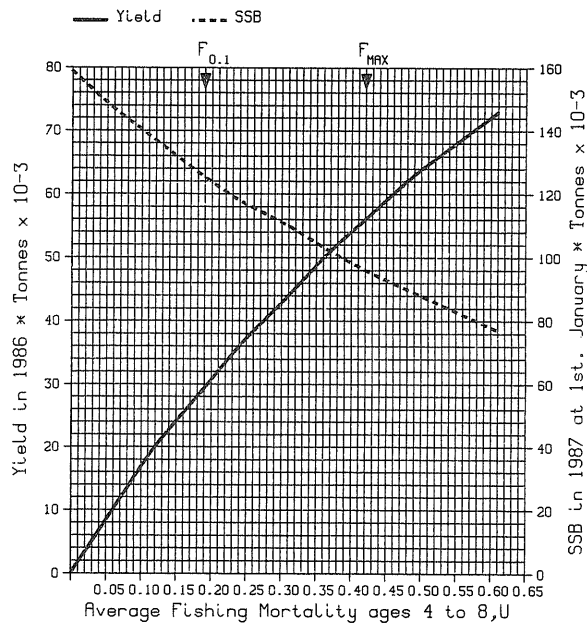
05-05-1985

Long term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

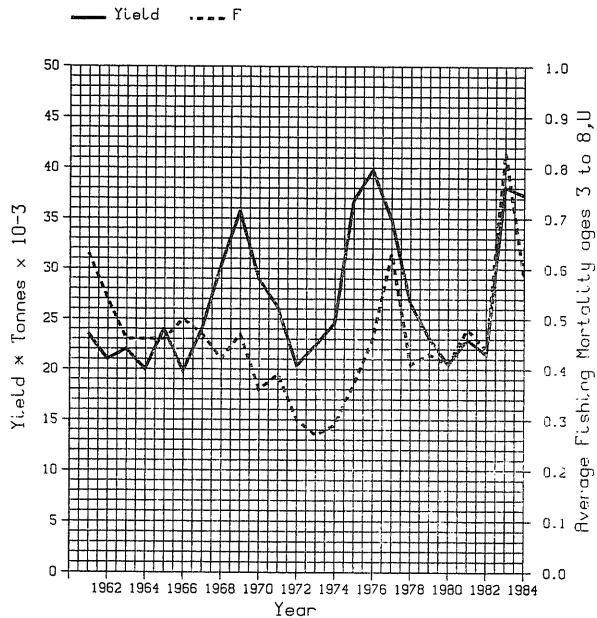
Figure 8.1

FISH STOCK SUMMARY

STOCK: Cod - Faroe Pl.

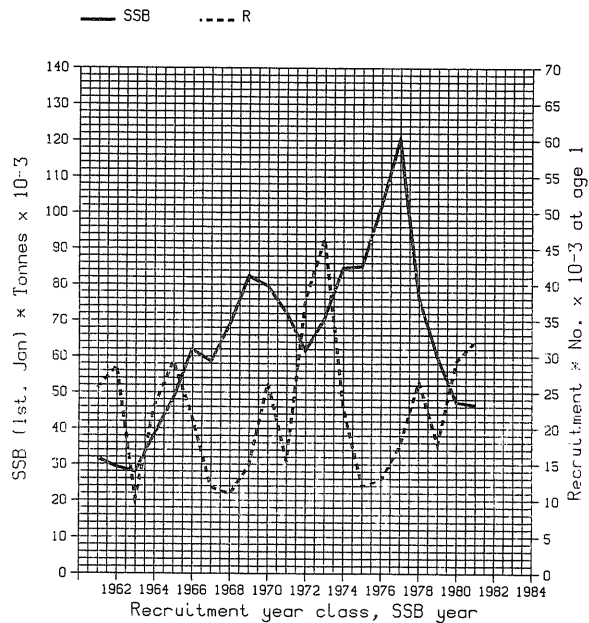
05-05-1985

Trends in yield and fishing mortality (F)



A

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



B

Contd.

FISH STOCK SUMMARY

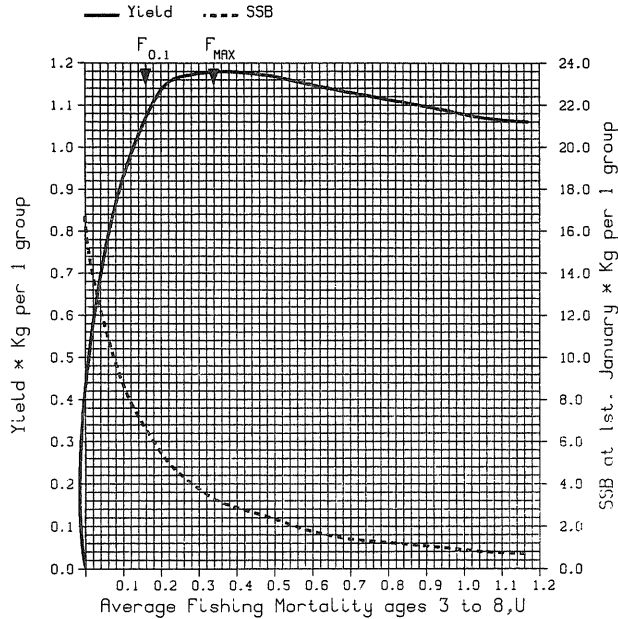
STOCK: Cod - Faroe Pl.

05-05-1985

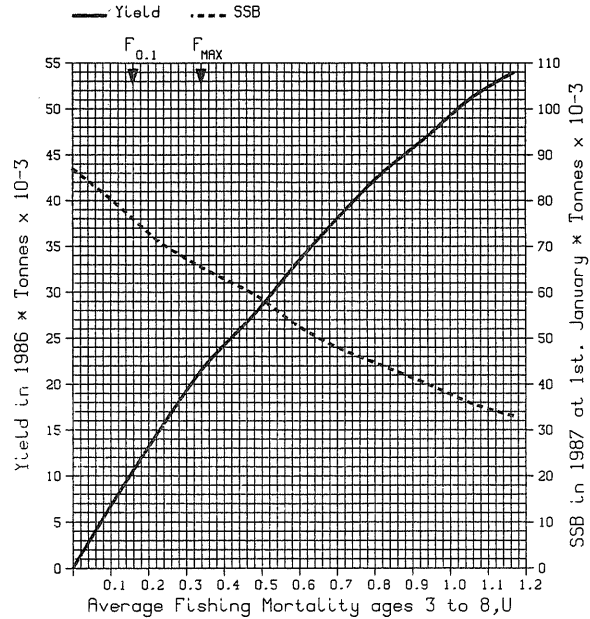
Figure 8.1 Contd.

Long term yield and spawning stock biomass

Short-term yield and spawning stock biomass



C



D

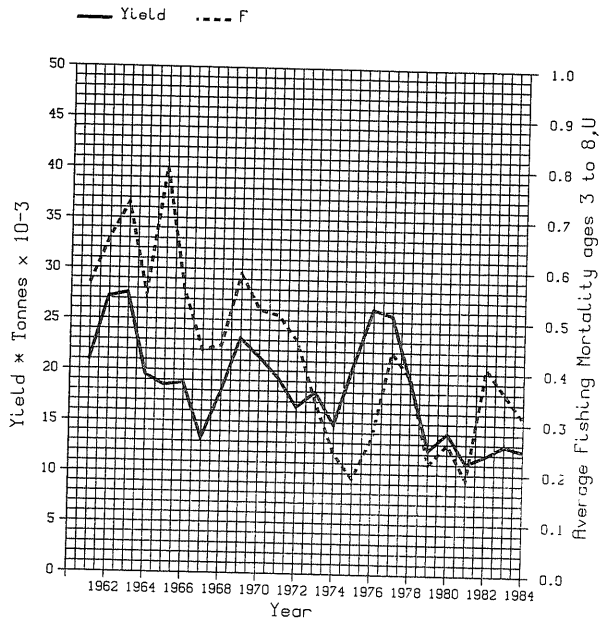
Figure 9.1

FISH STOCK SUMMARY

STOCK: Haddock - Faroe Pl.

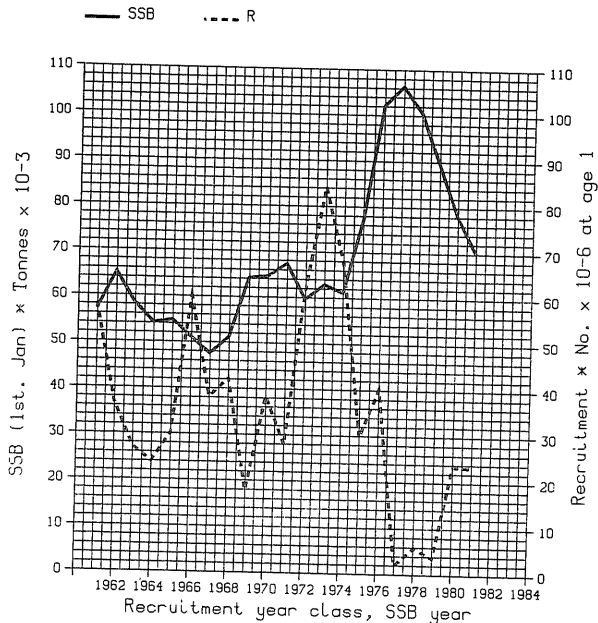
05-05-1985

Trends in yield and fishing mortality (F)



A

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



B

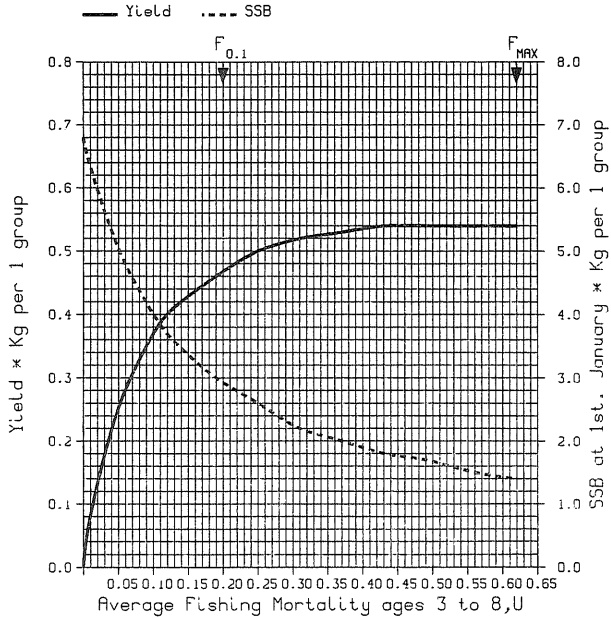
Contd.

Figure 9.1 Contd.

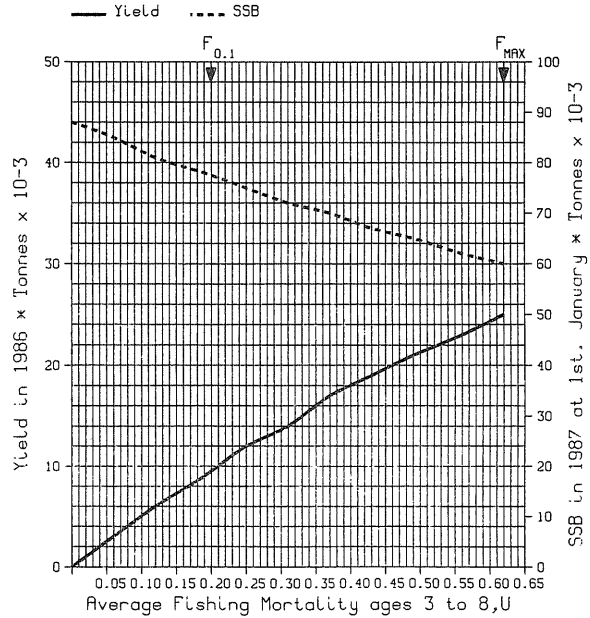
FISH STOCK SUMMARY
STOCK: Haddock - Faroe Pl.
05-05-1985

Long term yield and spawning stock biomass

Short-term yield and spawning stock biomass



C



D

APPENDIX

REVIEW OF FLEETS FISHING FOR SAI THE IN THE NORTHEAST ATLANTIC

In most countries demersal fisheries are aimed at mixed groundfish species and, depending on the seasons or grounds fished, the different components of each national fleet may have quite different fishing patterns.

In this review, an attempt is made to describe in broad terms the characteristics and behaviour of those fleets which, regularly or occasionally, direct their effort towards saithe in the North East Atlantic.

This information is intended to provide a concrete basis for discussions when effort data are used in assessments, and for estimating the likely trends in effort in predictions.

** ENGLAND and WALES:

In the years preceding the extension of national fisheries jurisdiction, annual landings of saithe in England and Wales were generally in the range 30 000-40 000 tonnes. The greater part of the catch was taken by vessels fishing in distant-water areas (IIa, Va, Vb) with a lesser quantity coming from middle-water grounds (IVa, VIa). There was very little directed fishing for saithe, and saithe were generally taken as part of a multispecies trawl fishery with cod and haddock as the principal objectives.

The extension of national jurisdiction had the effect of reducing access to many of the distant-water fishing grounds and landings from these areas fell from 26 000 tonnes in 1973 to less than 1,000 tonnes by 1980. To a limited extent up to 1978 the reduction in distant-water landings was offset by increasing landings from middle waters. However, since 1978 there has been a decline in the middle-water fleet resulting in a progressive decline in saithe

landings. By 1984 total saithe landings were 2 700 tonnes of which 300 tonnes came from distant-water grounds.

During the last decade the vessels typically working grounds at Faroe, West of Scotland and northern North Sea have been side-trawlers of about 40 m in length and about 350 tons GRT. The vessels working the distant-water grounds were the larger side-of freezer stern-trawlers of up to 70 m in length and 1 500 tons GRT.

** FAROES:

The Faroes fishery on demersal stocks at Faroes has increased from 21% of the total demersal landings in 1974 to 93% in 1984, with cod, saithe and haddock being the main species caught. In recent years however, redfish and blue ling have been of increased importance. All demersal fish caught at Faroes by local vessels are landed fresh. In 1984, 98.5% were landed at Faroes while the rest, mainly redfish, were landed in Federal Republic of Germany and United Kingdom.

The Faroese fleet fishing at Faroes is normally grouped into categories according to the engine power and gears used:

- Deep-waters trawlers: Vessels in this category (590 GRT, 2200 HP) have entered the fleet in the last 2-4 years. They were two in 1982, 6 in 1984-85. They fish mainly for saithe, redfish and blue ling in deep waters with an annual effort of about 285 days at sea. They landed about 14,000 tonnes in 1984.
- Trawlers > 1000 HP, type I: These vessels (360 GRT, 1,600 HP) caught about 11,700 tonnes in 1984, with saithe accounting for 58% and redfish for 17%. They were 4 in 1982, 5 in 1984-85. Up to 1983 they were allowed to fish a quota in Icelandic waters but since 1984 they are fishing all year round in Faroese waters. Thus, they have contributed to the increase in the effort exerted on saithe and redfish at Faroes (300 days at sea).

- Trawlers > 1000 HP, type II: The number of vessels in this class (310 GRT, 1100 HP), which represent a great part of the Faroese home water fishing fleet, has increased from 17 in 1982 to 26 in 1985. They caught about 23,000 tonnes in 1984 (260 days at sea), with saithe accounting for 69% and cod for 17%. 12 of them operate as pair-trawlers with catch rates similar to single trawlers.
- Trawlers 700-999 HP and 400-699 HP: In the former group (11 in 1982, 16 in 1985) all vessels operated as single trawlers in 1984, and all of the latter group (10 in 1982, 20 in 1985) as pair-trawlers. Despite this, the catch compositions of both groups were almost identical with 48% of saithe, 35% of cod and 10-13% of haddock, and landings of about 13,000 tonnes and 16,000 tonnes respectively (260 and 225 days at sea).
- Trawlers < 400 HP: These vessels (4 in 1982, 6 in 1984-85, 50 GRT, 250 HP) are fishing mainly for cod (50%), saithe (19%) and flatfish (15%). Trawling within the 12 mile limit is generally banned. These vessels however are licensed to operate during summer in some limited areas in order to utilize such stocks as lemon sole, plaice and angler.
- Longliners > 110 GRT: Most vessels in this category of about 20 units (225 GRT, 540 HP, crew of 15 men) are licensed to fish a limited quota at Iceland during one part of the year. Cod (27%) and tusk (23%) are the main species caught and saithe accounted for about 12% in 1984 out of total landings of 19,500 tonnes (245 days at sea).
- Longliners 60-110 GRT: Some of the 14 vessels in this category also are licensed to fish at Iceland, mainly for saithe using automatic handline (crew of 5). They also practise this fishery at Faroes but also operate partly as longliners. In 1984 they landed about 5,600 tonnes with saithe accounting for 40% and cod for 36%.

- Longliners <60 GRT: The vessels in this category represent the traditional fishery at Faroes and amount to about 125 units. They operate on daily trips to fish for cod (49%), haddock (17%) and saithe (18%). They landed about 17,000 tonnes in 1984.

The material presented in this section is based mainly on preliminary statistics for 1984, and includes catches from outside the Faroese waters. The grouping of vessels is according to that used by the Faroese Board of Fisheries, which monitors the economic results of the fishery. The catch compositions obviously can vary depending on the relative abundance of the species, as was the case for the good results on cod and saithe in 1983 and 1984. It is felt however that the figures given provide a fair description of the fleet components.

** FRANCE:

French fisheries for saithe are carried out in the North Sea and to the west of the British Isles by the deep-sea trawlers from the Boulogne area and from Brittany.

The vessels landing regularly in Boulogne belong to 3 categories:

- The largest trawlers (50-60 m, most of them 54 m, 550-750 GRT, 1800-2000 HP, hold capacity of 400-550 cu.m or 180-200 tonnes of boxed fish) have been in rather steady number (18-20) from 1971 to 1980, but their characteristics have changed in the meantime as side-trawlers were progressively replaced by stern-trawlers. Their number eventually decreased to 16 in 1983 and no new vessel in this category is expected.
- An intermediate class includes stern-trawlers of 45-50 m, 450-500 GRT, 1 500-1 800 HP, with hold capacity of about 500 cu.m. Like the larger ones, their crews are of 22 men (the

catch is sorted, graded and boxed at sea). There were 8-10 of these vessels from 1972 to 1976, 7 from 1977 to 1979 and 5 by now. Two new vessels are expected, with equipment for freezing the fish at sea thus allowing longer trips.

- In the last 10 years, 4-5 vessels of about 43 m, 350-400 GRT, 1 200-1 500 HP, with hold capacity of 300 cu. m and crews of 18 men have at times participated in the saithe fishery, especially in summer, but their regular target is mixed gadoid species in the central and southern North Sea.

By union's agreement, the normal trip duration is 12 days including sailing time which, to and from saithe fishing grounds, can amount to 4-5 days, each trip is followed by 3 days ashore. This results in potentially 22-24 trips over 11 months (about 250 days at sea per year). In recent years, landing limitations have been fixed by Producers' Organisations further restricting the effort directed towards saithe.

For these vessels, fishing for saithe has not been a long tradition: landings in Boulogne suddenly increased in 1964 from less than 20 000 tonnes to a steady production of 30,000-40,000 tonnes a year, and were in the past predominantly in the first 4 months. At present, the typical pattern is to search for (pre-) spawning concentrations along the shelf edge to the west of northern Scotland (in Division VIa) during the first quarter. These concentrations are fished while they move to the northwest of Shetland (in Division IVa) till May, when the large fish disperse in deep waters. In summer the fleets return to 'inner' North Sea (Bressay Bank) for mixed gadoid fisheries and, at times, fisheries for young saithe in the Ling Bank area when large concentrations can be found. In some years, due to restricted access to Canadian waters and Barents Sea, some long distance freezers joined the wet fish vessels in this summer fishery.

Vessels registered in Brittany (Lorient, Concarneau and Douarnenez) make a major part of the catches of West of Scotland saithe; they can be grouped into 2 classes:

- The large stern trawlers (40-60 m, 250-600 GRT, 1,800-2,000 HP) are very similar to those from Boulogne and have the same fishing pattern for saithe: they fish mainly from January to May on grounds to the west-northwest of Hebrides and Shetlands, on adult saithe concentrations. They make about 18 trips a year (240 days at sea on average, sailing time included). In Lorient, a specific scheme by which vessels (8 in 1981-1982, 6 in 1983) exchange their crews (16 men) in rotation allows longer time at sea (310 days on average). Fishing effort by these vessels has decreased as many have been laid up. In Lorient, their number decreased from 39 in 1974 to 31 in 1978, 26 in 1981 and 21 in 1983; they were 10 in Concarneau in 1978 but in 1983 all the vessels over 40 m had been decommissioned.

- The fleet of medium trawlers fishing to the west and southwest of the British Isles showed different evolutions in each of the 3 harbours. In Lorient, a fleet of old side trawlers has virtually disappeared and only 4 vessels (33-36 m, 450-800 HP) remained in 1983 as compared to 14 in 1974. In the other two harbours, a similar change happened but there, new types of modern stern-trawlers were built to maintain the fishing potential: 9 vessels (36-38m, 200-300 GRT, 1 100-1 400 HP) in Douarnenez and 16 vessels (30-39 m, most of them 34 m long and 800 HP) in Concarneau.

In fact, this class of vessels never had saithe as a main target and used to fish for mixed groundfish species on the shelf area to the south of Division VIa and in the Irish Sea. Although large saithe apparently can still be found in these areas in late spring, the fleet has totally redirected its effort towards closer grounds and more valuable species than traditional gadoids, and has been redesigned accordingly.

In summary, fishing effort on saithe by French trawlers has decreased significantly during the last decade, especially to the west of Scotland. This trend is likely to continue as the fleet is faced with 2 main constraints: - a larger distance to the fishing grounds as compared to other European fleets, - market problems and loss of profitability by the deep-sea fleet which is heavily dependent on gadoid species, hampering the purchase of new vessels fitted to the type of fishery considered here.

** FEDERAL REPUBLIC OF GERMANY:

The German fleet is fishing for saithe mainly in the North Sea. Additional catches are made off the Norwegian coasts (IIa) and to the West of Scotland (VIa). Small amounts are caught in Faroese waters where saithe is a by-catch in the fishery for redfish and blue ling.

The German fishery for saithe and other demersal species started as far back as the beginning of the German deep-sea fishery, at the end of the 19th century. At that time the main fishing grounds were off Norway and Iceland, in the central and northern North Sea and, occasionally, off the Hebrides.

Until the introduction of quotas and the closing of the Icelandic waters for foreign trawlers, the major part of saithe catches came from waters off Norway and Iceland. Afterwards, they came predominantly from the North Sea.

As of January 1st, 1985, the German fleet fishing for saithe consisted of the following categories, all using bottom trawls:

- 10 freezer-trawlers (3,000-3,500 GRT) built in the years 1972-1975 have their main activities in fisheries for cod and redfish off Canada and east- and west-Greenland. They only occasionally fish for saithe in Eastern Atlantic waters.

- 4 of the 7 wetfish-trawlers (800-999 GRT) are older than 20 years, and the other 3 were built in 1977-1978. These vessels also fish mainly for cod and redfish in Greenland waters. In winter and spring they fish for saithe and other demersal species in Norwegian waters (mainly NW Norway), starting in January, up to the exhaustion of their catch quotas (generally by May- June). Occasionally they fish in the North Sea, to the west of Scotland and off the Faroes. In the North Sea, they fish for spawning or pre-spawning saithe in the waters around Shetland in the first quarter, then for younger saithe in summer and autumn, in the eastern part of northern and central North Sea. In 1983, their catches in Division IVa amounted to 2 800 tonnes of saithe.

- In 1983, 2 large cutters (about 300 GRT) were built especially for the saithe fishery. During the spawning season they fish for adult saithe concentrated around the Shetland and off the Scottish north coast. During the rest of the year they work in the central and northern North Sea for saithe and other demersal species.

All the vessels described above are stern-trawlers. They land their catches in Bremerhaven and Cuxhaven, occasionally in Hamburg.

- More than 100 deep-sea cutters are working in the North Sea and in the Baltic. 17 of these are longer than 30 m. These large cutters and 1 lugger catch saithe and other demersal species in the central and northern North Sea and in the Skagerrak, the lugger aiming more specifically at saithe than the cutters. In 1983 these vessels landed 10,600 tonnes of saithe from the North Sea.

** THE NETHERLANDS:

Up to the late seventies saithe was taken by a small part of the Dutch fleet in a specific saithe fishery in the northern North Sea, especially in the first quarter of the year. Since then there were only minor landings of saithe in the Netherlands and it is very unlikely that landings will increase substantially in the next future.

** NORWAY:

The Norwegian saithe fisheries are restricted to the North East Arctic and the North Sea. Purse seine, trawl, and gill-net account for more than 90 per cent of the landings. In the North East Arctic, landings since 1970 have been fluctuating between 120,000 and 170,000 tonnes. In the North Sea there was a sudden increase from a level of about 17 000 tonnes in 1976-79 to 48 000 tonnes in 1980. The landings have continued to increase and were in 1984 (preliminary) 88 000 tonnes.

Purse seine fishing is carried out along most of the Norwegian coast, usually not far from the coast. The purse seiners are mostly small and about 70% of the catches are taken by 17-25 m long vessels. There are currently about 150 vessels of this size group, but most of them are fishing for saithe only part of the year. In northern Norway, the main season is July to October. South of the Lofoten Islands, purse seining is carried out all year.

Before 1979, a large part of the Norwegian trawl catches of saithe were by small trawlers (< 250 GRT) fishing in the area between 62⁰ and 64⁰ N. In the North Sea, there was very little directed trawling for saithe. From 1979, quotas for cod and haddock were reduced and the larger trawlers (> 250 GRT) turned more of their effort towards saithe. The fleet of larger trawlers are now fishing for saithe on coastal banks along most of the Norwegian coast north of 62⁰ N. In the North Sea, they are fishing along the northern and eastern part of the plateau, from Shetland to the

entrance of Skagerrak.

Gill net fishing for saithe is a seasonal fishery based on the spawning migration. In the North East Arctic, most of the catches are taken at the end of the year in northern Norway and in February-March on the spawning grounds further south. In the North Sea, the season which formerly was February-March has been extended and now starts in late autumn. The fishing area is largely the same as for the trawlers, but extends to the west of Shetland and there is little fishery south of the Viking Bank.

There are no quota restrictions on the Norwegian saithe fishery in the North East Arctic. Separate quotas for purse seine and trawl have been suggested and may be introduced. There are currently 3 different minimum landing sizes: 35 cm between 62° N and 64° N, 37 cm from 64° N to Lofoten Islands, and 40 cm further north. The basis for these regional differences is the size of the fish available for purse seine in the different areas. The minimum landing size to some extent restricts catches of 2 year old saithe. The mesh size in trawls is 135 mm and 100 mm respectively north and south of 64° N.

In the North Sea, a total quota for saithe is normally agreed by EEC and Norway. A permanent quota of 15 000 tonnes on purse seine is being introduced in Norway. If necessary to avoid overfishing the Norwegian quota, trawl fishing may be stopped towards the end of the year. Minimum landing size is 32 cm (30 cm in Skagerrak). Minimum legal mesh size in the Norwegian economical zone is 90 mm (80 mm in Skagerrak).

** SCOTLAND:

Scotland has no directed saithe fishery at present and saithe landings represent a by-catch from a fishery directed primarily at cod, haddock and whiting. Since little fishing is carried out in the deeper water of the continental shelf edge and there is a preponderance of small inshore vessels in the Scottish fleet, most of the saithe which are caught are young and immature.

There are 4 main sub-fleets which account for the majority of Scottish demersal fish landings including saithe. These are:

- Motor trawl: Involves vessels of 80-120 ft using heavy ground gear. The number of these vessels has declined rapidly since the 1960s from over 100 to less than 20 at the present time. The remaining vessels are a mixture of side- and stern-trawlers. Most of them are based in Aberdeen and fish both the North Sea and the West of Scotland. The future of the fleet is uncertain but older vessels are unlikely to be replaced. Trip length is about 10 days and a crew of 10 is typical.
- Light trawl: Involves vessels of @ 40-80 ft using light ground gear. The number of vessels engaged in light trawling has increased over the last 10 years to approximately 350. Vessels are distributed in most Scottish fishing ports. Trip lengths vary from 1 day for smaller vessels to 10 days for larger ones. Similarly crews vary from 3 to 10 men. This sector of the fleet is liable to increase in size.
- Seine net: The characteristics of this fleet are essentially the same as those for light trawl with the exception of the gear type. There has been a small decline in this fleet to just under 300 vessels. This decline is mainly due to the replacement of smaller vessels by fewer larger ones so that the catching capacity of the fleet has not changed. This trend seems to be continuing.
- Nephrops trawl: This fleet is similar to light trawl but generally involves smaller vessels fishing principally for Nephrops. The fleet is stable at present with approximately 300 vessels. These rarely fish for more than 2 days per trip. Crews are of 3 to 5 men.

