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REPORT OF THE WORKING GROUP ON THE ASSESSMENT OF NORWAY POUT AND SANDEEL

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1 INTRODUCTION

1.1 Participation

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1.2 Terms of Reference

At the 81st Statutory Meeting it was decided (C.Res. 1993/2:6:12) that the Working Group on the Assessment of Norway Pout and Sandeel (Chairman: Mr D.W. Skagen, Norway) should meet at ICES Headquarters from 31 August-6 September 1994 to:

a) quantify the species composition of by-catches taken in the fisheries for Norway pout and sandeel in the North Sea and adjacent waters;

b) assess the status of Norway pout and sandeel stocks in Sub-area IV and Divisions IIIa and VIa and advise on the need for any management measures;

c) provide the data requested by the Multispecies Assessment Working Group (quarterly catches and mean weights at age in the catch and stock for 1993 by sub-division of the North Sea) for those species in the multispecies model that are assessed by this Working Group.

1.3 Sources of Data

1.3.1 Denmark

The present sampling scheme, its data bases and their use are described in detail in last year's report (Anon., 1994). Essentially it is the same concept as was introduced in the late 1950s and the main changes since then consist of:

(i) an increase in the number of landings covered especially concerning data on effort,

(ii) logbooks have replaced interviews and sophisticated computer software have, of course, made a much more efficient use of the data bases feasible.

(iii) the main difference being the procedure of the final estimation of the species composition in statistical squares from which catches are reported but where corresponding samples are not available. Until 1986 such landings were split according to the documented species composition in the nearest square with similar depth and bottom conditions. From 1986 such "vacant" squares are filled in with the average stock composition of the 8 surrounding squares.

1.3.2 Norway

The previous report defined the term "industrial fisheries" and described the monitoring sampling scheme in force as well as the classification system by codes of such landings. The description of the latter, however, was not quite precise and needs some further clarification. Up to and including 1992 two sets of catch data registrations for industrial landings were available. The first one derived from quality forms, monitored by the Directorate of Fisheries, and formed the basis for classification of landings containing at least 70% in weight of a certain species, or mixed landings as unspecified. It also gave the number of days fishing per trip and was suitable for calculations of CPUEs as well as indicating to which extent the biological sampling scheme had been representative. The other data set derives from sales-slips, employed by the Sales organization of industrial fishermen but is based upon the principle of fixed prices for different categories of industrial landings from certain areas. This simplified recording system has the effect that in the North Sea area east of 0° longitude all landings mainly containing Norway pout, blue whiting or a mixture of both are labelled Norway pout. It has no effect on the sandeel fishery where the by-catch levels are low. The landing figures from this data set are used in combination with the biological sampling scheme to estimate the species composition and catch in numbers at age of the target species.

From 1 January 1993, however, the quality form system was abandoned, leading to the loss of vital information on well classified landings of Norway pout as well as the number of days fishing per trip, thus affecting the calculations of CPUE.

In order to continue the time series of effort in number of days fishing, the following procedure was used: using data from the sales slips register, trip numbers were given to the sales slips, a new trip being recorded if more than 2 days had passed since last delivery. The gap of 2 days was chosen because the distribution of time gaps between sales dates dropped to almost zero there.

Using data from previous years, where both trips and number of days fishing were recorded, a linear regression was made for days as a function of number of trips, mean gross tonnage of the vessels, season and total catch. This regression function was used to convert the number of trips for 1993 into number of fishing days. The various regression functions are given with the data for each species.

1.4 Number of Samples

1.4.1 Denmark

The number of samples for the period 1989–1993 is given in Table 1.4.1.

1.4.2 Norway

The number of samples (50 kgs) from the North Sea collected to estimate the species composition in the fisheries for Norway pout and sandeel are shown in Table 1.4.2 together with the corresponding quarterly catches ('000 tonnes) of the target species. For comparison the actual figures for 1992 are also given. No landings were reported from Division IIIa.

1.5 Age Analyses

A recurrent problem for the Working Group is the reliability of age readings of the sandeel otoliths. Difficulties are both due to frequent secondary rings and to doubts about the termination of the hyaline winter ring in otherwise straightforward cases. A Danish test with 6 more or less experienced readers of otoliths gave average agreement within pairs of participants as low as 67% and 37% respectively in handling two samples from the Northern North Sea. Such a low level of conformity is unacceptable and strongly indicates a need for an age reading workshop on sandeel in order to improve matters both within and between the laboratories involved.

1.6 Assessment Strategies and Techniques

Norway Pout and Sandeel are short-lived species, and their fisheries can be highly seasonal in nature. In addition, past problems with catch sampling have led to problems in estimating catch at age in some years. This has led to the development of specific assessment methods which aim to overcome these problems. The methods used at present are Seasonal Extended Survivors Analysis (SXSA, Skagen 1993, 1994), and Seasonal Separable VPA (SSV, Cook, 1992; Cook & Reeves, 1993). In both cases these represent adaptations of other, well established assessment techniques; with SXSA being a development of XSA (Shepherd, 1992, Darby and Flatman, 1994), and SSV being similar to CAGEAN, (Deriso *et al*, 1985).

At present these seasonal assessment techniques are only used by the present WG. This limited application means that fully rigorous protocols for their use, taking in the choice of input parameters, interpretation of diagnostics etc., are not yet established. In addition, full testing of both methods would involve their use with established test data-sets such as the 'Reykjavik' data (Anon., 1988). Although both methods can use annual data, it would be more appropriate to test the methods with seasonal data sets. The Working Group is unaware of the existence of any such test data. The formal testing of assessment methods used by the Group would be greatly facilitated by the creation of such data sets.

In the absence of the opportunity for more formal testing of the methods, the approach used during the WG meeting was to run assessments with both methods for each of the major stocks and then to compare the results from the two. The two methods differ in a number of ways which are discussed below so, although agreement between the two methods does not necessarily indicate that both assessments are correct, it does give some level of confidence in the results. Where the results differ, the reasons for this are discussed.

Of the five stocks assessed analytically by this WG, the SXSA was used for the final assessment of the North Sea Norway pout, and sandeel in the Southern and Northern North Sea, whereas the SSV was used for the assessment of sandeels at Shetland and in Division VIa. This usage reflects past practice but, more specifically, it reflects the contexts in which the different methods were developed. The SXSA was developed as a means of overcoming the problems with missing catch-at-age data in the main North Sea stocks. The SSV was developed because the levels of catch and effort in the sandeel fisheries at Shetland and in Division VIa had fallen to such low levels that the *ad hoc* tuning used previously had become impracticable. The SSV is also the more appropriate method in the case of Shetland, where the fishery has been closed for a number of years, so recent assessments have had to be based largely on survey data. Although the SSV was developed in this context, it has since also been applied to the North Sea stocks (Cook and Reeves, 1993).

In terms of implementation, the two methods differ in that the SXSA at present is more flexible, e.g. it can handle more than one survey index, and a number of different assumptions about trends in catchability and relative weighting of ages/seasons can be made. The SSV allows different age groups to have different relative weightings, and survey and effort data can also be given separate weightings. All of these weights are supplied by the user. The SXSA allows for a greater range of weighting options, and these are more automated, and the results are less sensitive to the values used.

As well as implementation, the methods also differ in some theoretical aspects. In simple terms, the SXSA works by minimising the differences between population estimates derived from a VPA of the catch data, and from the inverse catchabilities of one or more CPUE series. This requires that certain assumptions are made about the year-to-year variation of catchability at age.

The SSV requires no explicit assumptions about annual/seasonal variation of catchability at age, but instead assumes that fishing mortality is separable, i.e., that the pattern of relative catchabilities across ages remains constant for a given season. The absolute catchability could thus vary from year to year. The SSV also requires the additional constraint that the selectivity at the oldest age is taken as a constant times the selectivity at some younger reference age. In addition, the SXSA regards the catches at age as exact, whereas this is not the case with the SSV.

2 TRENDS IN THE INDUSTRIAL FISHERIES

2.1 Division IIIa

The annual landings from the industrial fisheries for the years 1974–1993 are given in Table 2.1. The total landings have fluctuated around a long-term mean of 160,000 t without any particular trend. The figure for 1993 of 158,000 t was very close to the long-term mean. The landings of sandeel, herring and blue whiting were well above the long-term mean in 1993 whereas those of sprat and Norway pout were well below.

2.2 North Sea

The annual landings from the industrial fisheries for the years 1974–1993 are presented in Table 2.2. For 1993 the landings have been broken down by quarters to indicate the seasonality of the various fisheries. The total landings of 1.1 million t were close to the minimum level observed in 1989, mainly due to a decrease in the sandeel landings combined with an overall decrease in landings of sprat, herring and Norway pout.

2.3 Division VIa

The annual landings of Norway pout and sandeel as officially reported to ICES for the years 1974–1993 are given in Table 2.3. The landings of both species increased somewhat from 1992 to 1993 but remained at lower levels than the long-term means, particularly Norway pout yielding about half of the mean.

3 BY-CATCHES IN FISHERIES USING SMALL-MESHED TRAWL FOR REDUCTION PURPOSES IN THE NORTH SEA

The annual landings of the major protected species haddock, whiting and saithe are presented separately in Table 2.2. By-catches of these species combined were well above the long-term mean of 78,000 t up to 1978 but gradually decreased below that level to about half of the mean in the most recent years.

The distribution of industrial landings by fisheries and associated by-catches of selected species north and south of 57° N, based on Danish and Norwegian estimates, is given in Table 3.1. In the northern area the 1993 figures show a similar pattern as in the most recent years: a Norway pout fishery with a significant by-catch of blue whiting and protected species, a sandeel fishery with insignificant by-catches and a mixed fishery of various species. In the southern area a predominant sandeel fishery with insignificant by-catches took place as well as a sprat fishery with a significant by-catch of herring and a mixed fishery mainly consisting of herring, sprat and sandeel. The break-down of species "other" in the column "other" in Tables 2.2 and 3.1 respectively are presented in Table 3.2.

4 NORWAY POUT IN DIVISION IIIA

4.1 Landings

Total landings as officially reported to ICES are shown in Table 4.1. The amount of Norway pout landed, as estimated by the Working Group members appears in Table 2.1. In recent years, only a fraction of the officially reported landings has been Norway pout.

4.2 Biological data

4.2.1 Sampling

Samples for estimation of catch at age and weight at age in the Danish fishery are available from 1986 and onwards. The sampling coverage is indicated in Table 4.2.1. The sampling has been variable, and there are some years and quarters where the sampling is clearly insufficient or missing.

4.2.2 Catch in numbers at age

The data from the Danish sampling programme are given in Table 4.2.2. Since catches by other countries form a very small proportion of the total catch, and the species composition of these catches is poorly known, these catches have not been included in this table.

Comparing the age composition in the catches from Division IIIa with that from the North Sea reveals that the 1-groups dominate the catches of ages 1 and older in Division IIIa, while this varies according to the relative year class strengths in the North Sea.

4.2.3 Weight at age in the catch.

The data from the Danish sampling programme are shown in Table 4.2.3. These weights do not deviate systematically from those from the North Sea.

4.2.4 Effort data.

No effort data were available.

4.2.5 Survey data

Division IIIa is regularly covered by the IYFS surveys in the first quarter of the year. However, for Norway pout in this area, no index is produced on a routine basis. The data are mostly limited to numbers at length per haul, and are at present only available in the IYFS exchange format. Time did not permit the Working Group to explore further the possibility of using these data to obtain an index of abundance.

The quarterly IBTS surveys, which started in 1991 also cover this area. At present, this time series is too short for use in VPA tuning.

4.2.6 Stock assessment

There is some evidence that the Norway pout in Division IIIa should be regarded as a part of the North Sea stock, instead of being assessed as a separate unit. The fishing grounds are located along the edge of the Norwegian Deep, in continuity with those on the North Sea side of the division line. As seen form Tables 2.1 and 2.2, the catches in Division IIIa fluctuate synchronously with those in the North Sea, but with amplified fluctuations. The age distribution differs between the two areas in that fish aged 2 years and older are less common in the catches from Division IIIa. A possible explanation is that the fleet operating in Division IIIa mainly consists of smaller vessels, and tends to fish in shallower water closer to the shore, while the Norway pout tends to move to deeper water at higher age (Albert 1994) Finally, the weight at age does not seem to differ between these areas.

Therefore, the Working Group decided to make an exploratory assessment for the combined area, treating the catches from Division IIIa as belonging to a separate fleet. This assessment is included in section 10.4. The lack of much of the necessary data precludes a specific assessment for the Norway pout in Division IIIa. Taking the information mentioned above into account, the justification for a separate stock assessment for this area is also highly questionable.

5 NORWAY POUT IN THE NORTH SEA

5.1 Landings

Annual landings as provided by Working Group members are shown by country in Table 5.1.1. The total landings of 174,000 tonnes in 1993, were considerably lower than in 1992, but still above most other recent years. The Danish landings were reduced by nearly 50%, while there was only a minor reduction in the Norwegian landings. The landings by month for the last 3 years are shown in Table 5.1.2. The seasonal pattern this year was largely the same as in the latest years. The Danish landings are highest in the two last quarters of the year, and very low in the second quarter, corresponding to the peak in the sandeel fishery. The Norwegian landings are more evenly distributed throughout the year.

5.2 Fishing Effort and Catch per Unit of Effort

Danish effort

Danish CPUE (tonnes per day fishing) by vessel size category (Gross Register Tonnes) is shown in Table 5.2.1 for the period 1983 to 1993. Compared to 1992, the CPUE was reduced in all categories in 1993.

The effort for each vessel size category was standardized to the 151-200 GRT category by the procedure that was adopted last year (Anon., 1994a), i.e., by using the CPUE as an indication of the relative fishing power of each category. The total Danish effort, as shown in Table 5.2.2 was slightly above the 1992 level.

Norwegian effort

As described in section 1.3.2, effort measured in days fishing can no longer be obtained for the Norwegian industrial fisheries. The number of trips, which refer to trips where Norway pout has been landed, was derived as described in section 1.3.2. As explained in last year's report (Anon., 1994a), the number of fishing days was obtained by applying the CPUE in tonnes of Norway pout according to the sales slips register per day fishing, to the catch of the species Norway pout.

Using a linear regression model, there was a highly significant effect of number of trips, GRT and Catch on the estimated number of fishing days, while the effect of quarter was insignificant. Leaving out quarters, the number of fishing days could be expressed as:

Days = -273.7 + 2.437 * Trips + 2.258 * GRT + 8.283 * Catch (in '000 tonnes)

Combined Danish and Norwegian effort

The Danish and Norwegian efforts were combined after the Norwegian data had been standardized to a vessel size of 175 GRT. This was done using a log linear model for the CPUE, using the same parameters as last year. The combined effort is shown in Table 5.2.2. The total effort is reduced compared to 1992, due to a reduction in the Norwegian effort.

5.3 Catch in numbers at age

Catch in numbers at age were estimated from Danish and Norwegian samples (Table 5.3.1). The 1991 year class, which dominated the catches in 1992, was still well represented in the 1993 catches, contributing to 47% of the catch in weight.

5.4 Weight, maturity and natural mortality

The mean weight at age in the catch (Table 5.4.1) was estimated from Danish and Norwegian data. For the mean weight at age in the stock, maturity ogive and natural mortality, the same numbers as in previous years were used. These numbers are given in Table 5.4.2.

5.5 Research vessel surveys

Due to the timing of this year's meeting new data from the English Groundfish survey (EGFS) were not available. Recent data for the Scottish Groundfish survey (SGFS) and the International Young Fish Survey (IYFS) have been included. The numbers are shown in table 5.5.1.

5.6 Stock assessment

As discussed in section 1.4, the Working Group decided to use the SXSA as its tool for the standard assessment of this stock.

Two options for catchability estimation were tested: assuming a constant catchability at age, quarter and fleet across years, or by applying a cosine filter to the sequence of catchabilities across years. Furthermore, weighting the catchabilities at age, season and fleet according to the inverse standard error of the log estimate, or giving all catchabilities equal weight, were tested. The catchability at age 3 was assumed to be equal to that at age 2.

The stock number residuals did not show any particular trend when using the constant catchability assumption, and the residuals were not markedly reduced by applying the cosine filter. Using weighting of the catchability according to the standard error of their estimate gave somewhat higher weight to the commercial CPUE compared to each of the survey indices. Since the surveys include areas not normally exploited by the fishery, this seems reasonable.

On this background, it was decided to use the constant catchability option, and weighting by the inverse standard error for the assessment. The results from the various test runs did not deviate markedly from the one adopted.

The results are shown in Table 5.6.1 and Figures 5.6.1 and 5.6.2. The 1991 year class appears to be strong, while the 1992 year class seems to be at an intermediate level. The spawning stock biomasses both in 1992 and in 1993 are at a level not encountered since 1984. The fishing mortality has been reduced gradually during the last ten years, and seems to have stabilized around 0.5 in recent years. The correspondence between effort and fishing mortality is relatively good.

The age composition in the catches in 1990 were estimated the same way as by last year's Working Group, i.e., by using catchability and stock number to estimate the relative numbers at age in the catch, and adjusting the absolute catch numbers to give a SOP equal to the known yield. The intention of the Working Group is to update these catch estimates as long as the relevant cohorts are represented in new survey and CPUE indices.

5.7 Retrospective Analysis

Assessments were made taking each of the years 1987 to 1993 as the last year in the assessment. For the years 1990 to 1993 as the last year, estimation of the age composition in the catches in 1990 was included in the assessment. Figure 5.7.1 shows the results in terms of recruitment and spawning stock biomass. The estimate of the recruitment in the current year is clearly not reliable, in particular in 1990, when the age composition was estimated by the program, while the recruitment generally is quite well estimated when the year class has passed age 1. The spawning stock biomass is somewhat more variable. To some extent, this may be due to the estimation of the plus group, which cannot be expected to be precise.

6 NORWAY POUT IN DIVISION VIA

6.1 Landings

Landings of Norway pout as officially reported from Division VIa are given for the period 1974–1993 in Table 6.1. There has been considerable variation in the landings during this period but since 1990, the landings have remained at a comparatively low level.

7 SANDEEL IN DIVISION IIIA

7.1 Landings

The landings in 1993 are estimated at 45,000 t (Table 7.1) being an increase of 15% from the previous year. Two thirds were taken in the second quarter and the majority of the landings were recorded from the Skagerrak.

Landings in 1994 could not yet be estimated.

7.2 Biological Data

Sampling, which was initiated in 1992, was continued in 1994 and confirmed last year's observations of a significant admixture of the greater sandeel and the smooth sandeel. These seem to be most abundant in samples from inshore grounds.

8 SANDEEL IN THE NORTH SEA

8.1 General

8.1.1 Landings in 1993

The estimated total landings in 1993 amounted to 578,000 t or about two thirds of the 1992 figure (Table 8.1.1). This decline is entirely due to the development of the Danish fishery as the Norwegian landings even show a slight increase as compared to the previous year. Part of the Danish decline is due to the fishermen's strike in the last part of March and the early part of April (Table 8.1.2) but the major cause, by far, was the low availability of sandeel in the Southern Assessment Area and especially in Sandeel Area 1A (Tables 8.1.3 and 8.1.4 and Figure 8.1.1). Part of the landings from 1A derive from the new fishing place off the Firth of Forth (Figure 8.1.2) and these increased in 1993 to about 115,000 t or almost twice the amount in 1992. If the Firth of Forth catches are subtracted from those of the Southern North Sea the latter amounts to only about 187,000 t as compared with 604,000 t in 1992. The comparable 1993 figure for 1A is 73,000 t and both cases represent the lowest figures since 1975. Also Sandeel Area 2A shows a drastic reduction in 1993 and again the landings are the smallest since 1975. 2A has, however, always shown much more variation in catch figures from year to year and the recent decline is, perhaps, less remarkable than in the case of 1A.

In the Northern Assessment Area landings went up by about 100,000 t and fishing was taking place even into November.

8.2 Sandeel in the Northern North Sea

8.2.1 Fishing effort and CPUE

The sampling and treatment of the Danish effort data was described in last year's report and has not been changed as regards the 1993 material. The Danish CPUE figures are given in Table 8.2.1.1 and the CPUE of a standard vessel of 200 GRT in Table 8.2.1.4. The Norwegian effort has hitherto been given in number of days fishing but in 1993 this was not available any more and had to be replaced by the number of trips. In order to continue the time series the WG tried to estimate the number of fishing days by applying a GLM to the historic data as described in Section 1.3.2. The estimated Norwegian effort is shown in Table 8.2.1.2 and standard CPUE in Table 8.2.1.3 together with the standardised Danish CPUE. The latter Table also shows the mean of the two estimates and the derived international effort. It appears that the Danish and the Norwegian CPUEs indicate different trends in 1993. The former show a decrease in both half-years while the Norwegian figures indicate an increase compared with 1991. In 1992 the Norwegian landings in the second half of the year from the Northern North Sea were insignificant.

8.2.2 Catch at age

Data were available from both the major fisheries and the combined catches in number at age are given in Table 8.2.2.1.

The age analyses are still a matter of concern and the Working Group's reflections on this point are given in section 1.4.

8.2.3 Weight at age

Mean weights at age are shown in Table 8.2.3.1. Danish and Norwegian data were combined weighted by catches in number. Mean weights of the older age groups in the second half-year are rather uncertain mainly because of their scarcity in the biological samples.

8.2.4 Stock assessment

A semi annual SXSA was run using the catch at age, effort and weight at age data described above. Natural mortality and proportions mature at age were the same as in previous assessments (Tables 8.2.4.1 and 8.2.4.2). Runs in which the catchabilities were weighted automatically with the inverse variance produced very high weights to the estimate derived from the 4 year old fish resulting from an undesirable feedback in the estimation procedure. As in last year's report the catchabilities estimates were therefore weighted manually in order to give most weight to the data from the first half year. The weighting factors used in the assessment are given in Table 8.2.4.3.

Even so, the stock size estimates derived from manual and automatic weighting did not differ much.

The unknown catches in 1990 were estimated by the SXSA. The estimated catch in numbers were corrected for SOP discrepancies within the model in order to allow the estimated SOP to equal the total reported catch in tonnes. Figure 8.2.4.1 shows a comparison of the catch in numbers at age estimated at last year's meeting and those estimated with the present set of input data. Apart from some minor differences the two sets of catch at age data are in close agreement.

The results in terms of fishing mortality, spawning stock biomass and recruitment are given in Table 8.2.4.4 and Figure 8.2.4.2. Since 1986 fishing mortality has declined slightly from ca. 1 to the present level of around 0.8. The spawning stock biomass has been fluctuating around a level of 200 thousand t except in 1987 and 1988 when the good 1985 and 1986 year classes made the SSB increase to 700 thousand t. Recruitment has fluctuated without any particular trend, but with a tendency to producing alternating large and small year classes.

Average F over ages 1 and 2 are plotted against effort in Figure 8.2.4.3. The values from the first half of the year and those from the second fall into separate groups with little overlap. In the second half of the year fishing mortality increases with effort, while in the first half there is very little change in fishing mortality over a large range of effort values.

Trends in residual stock numbers as well as results from a retrospective analysis of spawning stock biomass and recruitment are shown in Figure 8.2.4.4. The difference between estimates of stock numbers derived from commercial cpue and estimates from VPA are moderate and show no definite trends which would suggest that catchability has changed over time. With the exception of the years from 1989 onwards, where the estimates differ due to the influence of the missing 1990 data, the estimates of SSB and recruitment derived by the SXSA converge rapidly and estimates of year class strengths vary little once data for the one year old fish have been entered.

8.3 Sandeel in the Southern North Sea

8.3.1 Fishing effort and CPUE

Danish CPUE figures by vessel size and half-year are shown in Table 8.3.1.1. Nearly all vessel groups indicate a marked decline in CPUE from 1992, a decline that would be even more marked if the fishery off the Firth of Forth was not included. The decline is, of course, also evident in the standard CPUE given in Tables 8.3.1.2 and 8.3.1.3. The international effort exerted in the Southern North Sea in 1993 was also markedly reduced.

8.3.2 Catch at age

Catch in numbers at age were available for both the Danish and the Norwegian fisheries. The combined figures are given in Table 8.3.2.1.

8.3.3 Weight at age

Weights at age were obtained from both fisheries (Table 8.3.3.1). Weights at age in the stock, natural mortality and maturity ogive were not changed from previous years.

8.3.4 Stock assessment

The SXSA was run on a half yearly basis with the catch and effort data described above. Natural mortality and maturity ogive are given in Tables 8.2.4.1 and 8.2.4.2 and are identical to the values used in previous reports. Survivor estimates were weighted manually as in last year's assessment in order to give least weight to survivor estimates derived from the second half of the year. However, results from runs with automatic and manual weighting showed only minor differences. The weighting factors used are given in Table 8.2.4.3.

The model was used to estimate the missing age distribution of the catches in 1990. The estimate of the catch in numbers was constrained to produce a SOP in each of the two seasons equal to the total reported catch in tonnes. Figure 8.3.4.1 shows a comparison of the catch in numbers at age estimated in the previous assessment and those estimated with the present set of input data. Apart from some minor differences the two sets of catch at age data are in close agreement.

Estimates of fishing mortality, spawning stock biomass and recruitment are given in Table 8.3.4.1 and plotted in Figure 8.3.4.2. Between 1987 and 1991 fishing mortality increased from a low of 0.3 to 0.6. In 1992 fishing mortality declined to 0.39 and in 1993 it decreased further to 0.24, the lowest value on record since 1982. After reaching 1.7 million t in 1987 the spawning stock declined to a level of 400 to 600 thousand t. According to the SXSA the spawning stock increased in 1993 to 1.2 million t as a result of the strong 1991 year class. As in the northern North Sea recruitment has fluctuated without any particular trend, but with a tendency to producing alternating large and small year classes.

Average F over ages 1 and 2 are plotted against effort in Figure 8.3.4.3. Contrary to the northern North Sea the relationship between effort and fishing mortality is approximately linear.

Trends in residual stock numbers as well as results from a retrospective analysis of spawning stock biomass and recruitment are shown in Figure 8.3.4.4. Except for the 0-group the difference between estimates of stock numbers derived from commercial cpue and estimates from VPA are moderate and show no definite trends which would suggest that catchability has changed over time. With the exception of 1990 and 1991 where the analysis is influenced by the unknown age composition of the 1990 catches the estimates of SSB and recruitment are fairly robust.

8.4 Sandeel in the Shetland Area

8.4.1 Catch and effort data

The sandeel fishery at Shetland remained closed during 1994. Standardised effort data for the years 1984 onwards are given in Table 8.4.1, and catch-at-age data for the same period are given in Table 8.4.2. Total landings are shown in Tables 8.1.3 and 8.1.4.

8.4.2 Research vessel survey data

Apart from 1987, sandeel surveys have been conducted at Shetland in August of every year since 1984. Details of the survey are given in Anon. (1992). Indices from the 1994 survey were available to the Working Group, and these are given in Table 8.4.3, along with the previous data. The 1991 and 1993 year-classes show strongly in the 1994 survey catches, but the index for the 1994 year-class is below the series average.

8.4.3 Weights at age

With no recent commercial catches from the stock, long-term average weights-at-age from the catch have been used to estimate biomass totals. These are given in Table 8.4.4.

8.4.4 Natural mortality and maturity

Natural mortality and maturity at age are given in Table 8.4.5. The values are as used previously.

8.4.5 Analytical Assessment

As previously, a semi-annual separable VPA (SSV) was used in this assessment. Initial runs used the same settings as the previous assessment, i.e., the survey data were given a weight of 0.5 relative to the catch and effort data, with similar down-weighting of commercial catches at age 0, and survey catches at ages 4 and older. With this configuration, with oldest age set at 7, the SSV did not converge. When the oldest age was changed to 5, again the SSV did not converge. However, when the oldest age was set at 6, the SSV did converge. In view of this, it is clearly necessary to treat the results of the assessment with some caution. Population numbers estimated by this SSV run are given in Table 8.4.6, with fishing mortalities in Table 8.4.7. The diagnostics from this run are summarised in Table 8.4.8.

The diagnostics indicate some quite marked year-effects in the research vessel data (Figure 8.4.1). For instance in 1985 and 1986, most of the RV residuals are positive, whereas in 1992 they are mostly negative. These year-effects indicate that catchability during the surveys is not completely constant from year to year. This is partly because a number of different vessels were used for the survey during the early years, but may also be due to year to year differences in the availability of sandeels (Reeves, 1994). This variation in catchability is accounted for to some extent in the down-weighting of the survey data. However, it is possible that the marked year-effects have led to the convergence problems encountered during the current assessment.

8.4.6 Trends in biomass and recruitment

Trends in recruitment and spawning biomass from 1984 to 1993, are given in Table 8.4.9 and Figure 8.4.2. The 1991 year-class is the strongest in the time series, with the 1993 year-class also being strong. The estimate of the 1994 year-class, although subject to very high uncertainty, indicates that the year-class is of below average strength. Spawning biomass increased markedly with the maturation of the 1991 year-class at the start of 1993, and should increase further with the maturation of the 1993 year-class at the start of 1995.

8.4.7 Quality of assessment

With no recent commercial catch data, the assessment of the current state of this stock is based wholly on survey data. Some diagnostics from the assessment indicate that there may be problems with variable catchability in the surveys. This represents an additional source of uncertainty in an assessment which, due to low or zero F and high M, is already subject to high uncertainty. Even so, there seems no reason to doubt the conclusion that both the 1991 and 1993 year-classes are strong.

8.4.8 Other issues

ACFM have previously noted that it may be possible to estimate natural mortality for this stock given that survey data are available for a period when the stock has been unexploited. Reeves (1994) uses monthly commercial CPUE-at-age data to examine seasonal and annual trends in catchability of sandeels and Shetland, and notes that it may be possible to extend the approach to the survey data and thus estimate natural mortality for the stock.

9 SANDEEL IN DIVISION VIA

9.1 Landings

Official landings of sandeel from Division VIa are given in Table 9.1 and Figure 9.1a. Landings in 1993 were just over 6,200 tonnes. This included 80 tonnes caught by Danish boats, with the remainder being caught by Scottish vessels. The total catch represents a slight increase compared to 1992, but landings are still at a low level compared to the mid-eighties.

9.2 Fishing Effort and CPUE

Fishing effort data, in days absent by month, for the period 1981 to 1993 are given in Table 9.2. In 1993, 56% of the Scottish catch was landed into the Faroes. As effort data are not available for this portion of the catch, or for the small Danish landings, the nominal effort by vessels landings into Scotland has been raised to the total international landings. Data from previous years have also been corrected in this way. These data are given in Table 9.3.

9.3 Catch at Age

Catch at age data by month for 1993 are given in Table 9.4, and catch at age data by half-year for 1983 to 1993 are given in Table 9.5. Sampling coverage of the Scottish landings was improved in 1993, and samples were obtained from all month/area combinations.

9.4 Weight-at-age

Following recent practice, long-term mean weights at age from the catch were used to calculate biomass totals. These are given in Table 9.6.

9.5 Natural Mortality and Maturity

Values used for natural mortality and proportion mature at age are as used previously. The values are given in Table 9.7.

9.6 Analytical Assessment

The assessment used a semi-annual separable VPA with equal weight given to the catch and effort data. Following previous practise, the catches at age 0 were given a relative weighting of 0.5. The diagnostics from the run are given in Table 9.8. The year/season effect residual for the second half of 1993 is large. This may be related to the deterioration in the effort data due to the increased landings into foreign ports. However, the residual mean-square associated with the effort data is similar to that associated with the catch data. This indicates that it is appropriate that the catch and effort data be given equal weighting despite the known problems with the latter.

9.7 Trends in Biomass, Fishing Mortality and Recruitment

Figures 9.1a-d show trends in landings, fishing mortality, recruitment and spawning stock. Population estimates from the SSV are given in Table 9.9, along with spawning biomass estimates, and fishing mortality is given in Table 9.10. Trends in biomass, recruitment, and fishing mortality are given in Table 9.11.

Fishing mortality, which has always been low, declined steadily from 1989 to 1992, and remained at a very low level in 1993. The 1991 year class appears to be the strongest of recent years, and the 1992 year class also appears to be above average. The estimate of the 1993 year class from the present assessment has been omitted from the graph because it is subject to particularly high uncertainty. Spawning biomass has increased to the highest observed level following the maturation of the 1991 year class, and should increase further with the maturation of the 1992 year class at the start of 1994.

9.8 Quality of Assessment

Relative to the previous assessment, the estimates of recruitment and fishing mortality have been revised downward. This has largely resulted from the revision of the effort series. At the present very low level of exploitation, fishing mortality is low relative to natural mortality. Hence the assessment is subject to particularly high uncertainty. Nonetheless, it is clear that recent recruitment has been strong and that fishing mortality is currently very low.

10 EXPLORATORY ASSESSMENTS

10.1 Comparative Assessments Using Different Methods

In addition to the exploratory and final assessments run for the main North Sea stocks, comparative assessments were also run using the SSV (see Section 1.5). The SSV requires the user to supply weights for effort and research vessel data relative to the catch data. The weighting should be such that the residual mean squares associated with each data source should be similar. In addition, the relative weights of data at each age should be specified. The approach used in selecting these weightings was to make an initial run with all ages given equal weight, then to down-weight ages which showed consistently large catch residuals. In all cases, the selection pattern for all seasons was assumed to be flat-topped, with selectivity at the oldest age generally assumed to be the same as that at the next oldest age.

The full outputs from these runs are retained in the Working Group files, and estimates of recruitment and spawning stock from these runs are compared with the results from the final SXSA runs in Figure 10.1a-c.

The final SSV run for Norway Pout had the catches at age 0 and 3 given a relative weight of 0.1, and the survey catches at these ages given weights of 0.1 and 0.5 respectively. The survey data used were derived from the three available series using factor analysis (Cook and Reeves, 1993). These combined indices are retained in the WG files. Catch, effort and survey data were all given equal weight. Selectivity at age 3 (the oldest age) was assumed to be the same as at age 2. The

trends in recruitment and spawning biomass from the SSV run are similar to those for the SXSA (Figure 10.1a), but the SSV estimates are consistently lower. The diagnostics from this run show some large Fs, particularly at the oldest age in the fourth quarter, when the catches at age are frequently zero. Fitting a flat-topped exploitation pattern may not be appropriate in this case given the very low catches at older ages, and it may be leading to the high Fs, which then lower the estimates of recruitment compared to the SXSA. The lower stock numbers and high Fs also lead to lower SSBs. The SSV diagnostics also show a clear trend in the log catchability residuals of the survey data for recent years, with residuals at all ages in 1992 and 1993 being positive.

For the final SSV run for Sandeel in the Northern North Sea, catches at age 0 and 4 (the oldest age) were given relative weights of 0.1. The effort data were given equal weight to the catch data. Selectivity at age 4 was assumed to be equal to that at age 3. Trends in SSB and recruitment from this run are similar to those from the SXSA (Fig. 10.1b), with the main differences being the strength of the 1988 and 1990 year-classes where the SXSA estimates are slightly larger than the SSV estimates. The year-season effects for the first half-year for years since 1990 are all negative. This may indicate that although nominal effort has decreased over this period, effective effort has not decreased to the same extent.

For Sandeel in the Southern North Sea, catches at ages 0 and 5 (the oldest age) were both given a relative weight of 0.5. Selectivity at age 5 was assumed to be the same as that at age 3. Catch and effort data were given equal weighting. The trends in recruitment and spawning stock from this run are similar to those from the SXSA (Fig 10.1c), with the greatest difference being in the strength of the 1983 year-class. The diagnostics do not show any evidence of any trends in the residuals.

In running these assessments, the SSV proved to be rather sensitive to the value used as the oldest age, and also to the relative weights given to the different ages. Nonetheless in all cases the stock trends indicated by the two methods are similar. Thus conclusions about the current state of these stocks are not sensitive to the choice of assessment methodology.

10.2 Combined Assessment of Northern and Southern Sandeel

Sandeel in the northern and southern part of the North Sea is presently assessed as two separate stocks. As discussed in section 11 the biological basis for this separation is questionable. Furthermore, since natural mortality is assumed to be the same in the two areas, and since growth in recent years has been almost the same, there are few biological reasons for maintaining the separation. Provided the terminal fishing mortalities are modified to produce the same terminal stock sizes a combined assessment would produce estimates of recruitment and spawning stock size which were identical to the sum of the two separate assessments. If the only aim of the North Sea assessment were to generate an overall estimate of sandeel abundance the only reason for retaining a separation in the assessment would be the possibility that geographical differences in year class abundance and fishing intensity could interfere with the tuning procedures.

An SXSA in which the data from the two assessment areas were combined produced the trends in fishing mortality, SSB and recruitment shown in Figure 10.2.1 and Table 10.2.1. In the analysis the fisheries in the northern and southern part of the North Sea were treated as two separate fleets. The combined assessment produced slightly higher sums of squares of residual log population numbers than the separate assessments did. In the combined assessment the fisheries in the northern and southern areas generated sum of squares of 0.63 and 0.48, respectively, while in the separate assessments the corresponding sums were 0.38 and 0.31, indicating that the fit of CPUE to the stock estimates was poorer in the combined than in the separate assessments. Compared to the sum of the estimates of SSB and recruitment from the separate assessments there are minor differences in the estimates of SSB and recruitment for the years from 1990 onwards, but further back in time the two assessments are virtually identical (Figure 10.2.2). A comparison of a retrospective analysis of the combined data and the sum of separate retrospective analyse for the two areas produced the results shown in Figure 10.2.3. There seems in general to be fair agreement between subsequent estimates of SSB but, estimates of 0-group abundance vary more in the combined assessment than in the separate assessments. Apart from the two most recent estimates of year class abundance, however, a combined assessment of the northern and southern stocks performs as well as the sum of the two current assessments.

10.3 Use of Natural Mortalities from the MSVPA

The standard assessments of Norway pout and sandeel use constant natural mortalities, which to some extent are based on the experience from the MSVPA. These two species are among the most important prey species for the fish in the North Sea. According to the MSVPA, the predation mortality for both species has fluctuated quite a lot during the 19 years which it covers.

Although the stock abundance of Norway pout and sandeel is estimated in the MSVPA, the MSVPA is not tuned to survey data. The purpose of the present exercise was to explore the effect of including the fluctuations in the natural mortality in a tuned VPA. The stock number residuals are created not only by noise in the CPUE and

survey data, but also by errors in the VPA due to the use of inappropriate natural mortalities. Therefore, one might expect that the residuals would be reduced if the fluctuations in natural mortality are taken into account. In addition, one might get a different picture of the historical development of the recruitment.

Natural mortalities were taken from a MSVPA using the data set used by the MSWG in 1993 (Anon. 1994b). The Western mackerel stock was included as a predator, without changing the residual natural mortalities. The total mortalities derived from the MSVPA are shown in Tables 10.3.1 and 10.3.2

SXSA runs were made covering the period 1974–92, with the same options as in the ordinary assessments. For the sandeel, the data set for the entire North Sea was used (see Section 10.2). Runs were made using both the fixed and the MSVPA-derived natural mortalities. The age composition in the catches in 1990 was estimated as a part of the assessments. The results are tabulated in Tables 10.3.3 for Norway pout and Table 10.3.4 for sandeel.

The total sums of squares are shown in the text table below:

	Natural mortalities	
	MSVPA	Constant
Norway Pout	0.472	0.469
Sandeel	0.593	0.560

Fig.10.3.1 shows the recruitment estimates resulting from these two assessments for Norway pout. The higher natural mortalities derived from the MSVPA lead to a generally higher level of recruitment, the difference being largest in the very first years, but the general trend is the same with both sets of natural mortalities. The residuals did not change to any large extent, and the total sums of squares were virtually equal. Using the MSVPA mortalities, the commercial fishery and the IYFS survey indices got a slightly higher weighting in the tuning than when using constant natural mortalities.

Fig 10.3.2. shows the recruitment estimates resulting from these two assessments for sandeel. Here, very high natural mortalities were generated by the MSVPA prior to 1980, leading to much larger recruitment estimates in those years. For the later years, the correspondence between the two assessments is remarkable. The residuals did not improve, and the total sum of squares was increased by introducing the MSVPA natural mortalities.

It should be noted that the absolute values of the recruitment are sensitive to the overall level of the natural mortality, which is not necessarily realistic in this study.

According to these results, the present assessments for both Norway pout and sandeel seem less sensitive to the fluctuations in natural mortalities than might be anticipated. The noise in the tuning data do not appear to be caused by the use of inadequate natural mortalities.

10.4 Inclusion of the Catches in Division IIIa in the Assessment of Norway Pout in the North Sea

As discussed in Section 4, a separate assessment for the Norway pout in Division IIIa is not possible with the present information, and it is questionable if it is appropriate to regard the Norway pout in Division IIIa as a separate stock. Given that it can be justified to treat the Norway pout in Division IIIa as a part of the North Sea stock, the impact of the fishery in Division IIIa can be estimated by treating the catches from Division IIIa as an additional fleet in the assessment of the North Sea stock. The data described in Chapter 4 were used. In those seasons where the sampling was poor (< 1 sample/1000 tonnes of catch), the age composition was estimated as part of the assessment, and the weights at age for the Norway pout in the North Sea used.

The assessment was made for the period 1986–1993, for which there were data from both areas. Since effort data were not available, the average fishing mortality across years was used as a source of the exploitation pattern when estimating the unknown catches at age instead of the catchabilities. When applied to the North Sea data set, these two options gave quite similar results, except for age 3, where the estimate was reduced using the average fishing mortalities, due to a dome-shaped exploitation pattern.

The results (Table 10.4.1) indicate that, provided the fisheries in Division IIIa and the North Sea exploit a common stock, the impact of that fishery in Division IIIa on the stock is modest, both in terms of partial fishing mortality and in terms of impact on the stock assessment.

11 STOCK IDENTITY IN NORTH SEA SANDEEL

Sandeel in the North Sea are at present regarded as three separate stocks: Northern North Sea, Southern North Sea and Shetland. The Northern and Southern North Sea have been regarded as separate stocks on the basis of marked differences in growth rate (Anon., 1977). More recently, data on the distribution of sandeel, both as catches (Anon., 1994a; this report, section 8.1.1; Jensen *et al.*, 1994) and as a component of predator diet (Anon., 1993; Jensen *et al.*, 1994) have been presented.

In addition, in a Working Paper to the WG, Wright (1994) has reviewed existing data on the distribution of sandeel in areas adjacent to the Scottish coast, and Berntsen *et al.* (1994) have modelled the transport of sandeel larvae in the North Sea.

The catch distribution data for 1986–1992 given by Jensen *et al.* (1994) show that over this period, the largest catches have come from two main areas: one in the southern North Sea, off the English East coast, and one in the northern North Sea off the approaches to the Skagerrak. The boundary line used by the WG to divide the southern and northern North Sea (Fig 8.1.1) falls between these two areas. However, the two areas are not completely separate; smaller catches have come from all statistical rectangles between them and also from either side of the boundary close to the Danish and Scottish coasts.

The Report of the previous WG meeting included distributions of sandeel based on stomach contents of cod and mackerel, and concluded that the mackerel data were potentially a better indicator of sandeel distribution, although the migratory nature of the mackerel stock limited this utility. Jensen *et al.* (1994) present sandeel distribution data from whiting stomachs, and it appears that these may be a more useful source of sandeel distribution information (Figure 11). The whiting stomach data consistently show concentrations of sandeel near the Scottish coast off the Firth of Forth and off Orkney; and in the Northern North Sea on banks off the approaches to the Skagerrak. The occurrence of sandeel in whiting stomachs in other areas is less consistent, although it is notable that in the second quarter of 1991, the distribution is wide and covers areas such as the Fladen Ground where most of the substrate is apparently unsuitable for sandeel. In this instance and in the third quarter of 1986, the distribution from the Firth of Forth grounds towards the centre of the northern area is apparently continuous. These distribution data again show that the distribution of sandeel close to the Scottish coast straddles the boundary between the northern and southern areas.

Wright (1994) reviews data on the distribution and population structure of sandeel off the Scottish coast. On the basis of larval distribution, and some preliminary genetic studies, he concludes that the concentrations of adult sandeels close to the Scottish coast are geographically discrete from the major offshore concentrations, and that there is little likelihood of inter-mixing of larvae and juveniles between the inshore and offshore concentrations. From growth rate information, Wright suggests that sandeels from the Scottish east coast more closely resemble fish from the Shetland stock than those from the main North Sea areas. Wright's conclusions are to some extent contradicted by data from the whiting stomachs which indicate a more continuous distribution of sandeels within the north-western North Sea, although Wright shows that sandeel larvae can be advected to areas which are apparently unsuitable for settlement.

The catch distribution data show that the current classification into northern and southern areas does divide the two most important fishing areas, although there appears to be no real barrier between the two areas. In addition, from recent weights at age in the catches in the two areas (Tables 8.2.3.1 and 8.3.3.1) it is clear that the differences in growth rate between the two areas are no longer apparent. Berntsen *et al.* (1994) demonstrate clear differences between the two areas in terms of their circulation characteristics, but they also demonstrate the potential for widespread dispersal of sandeel across the North Sea. From this evidence, it is apparent that the division of the North Sea into northern and southern areas is to some extent artificial.

Away from the traditional areas, the grounds close to the Scottish coast have become increasingly important in recent years. Further studies are necessary to show whether sandeel on these grounds may be part of a separate stock from fish in the northern and southern areas. It is certainly clear that the division of these grounds between the present areas is inappropriate. It is possible that similar comments also apply to the areas close to the Danish coast.

Wright and Bailey (1993) demonstrate that sandeel at Shetland do not constitute a completely discrete stock as, in years of good recruitment, the majority of recruits originate from spawning areas outwith Shetland. Berntsen *et al.* (1994) show that in the North Sea there is potential for wide dispersal of sandeel offspring. These studies indicate that current knowledge of sandeel stock identity and migration is far from complete. Genetic studies are planned which should shed more light on these areas. If current stock classifications are inappropriate, then assessments may not detect the depletion of small, localised stocks. This might not affect the overall availability of sandeels to fishing, but could affect their availability as a food supply for predators such as certain seabird species that are dependent upon localised concentrations of seabirds during the breeding season.

The assessments of the two areas do show rather different recruitment trends, although recruitment occurs rather later in the southern area. Also in the assessment context, it is the case that CPUE data from vessels concentrating on grounds in the northern area do not convey any information on stock abundance in the southern area. Adult sandeels are thought to be rather sedentary, and the vessels do not sample the whole North Sea at random. This has clear implications for tuning of any assessments. Thus although it is likely that the sandeel in the northern and southern areas are not discrete stocks, for assessment purposes it would seem desirable to retain at least the current level of area disaggregation.

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Table 1.4.1 Number of landings from the North Sea, Skagerrak and Kattegat sampled by Denmark in the period 1989–1993.

	1989	1990	1991	1992	1993
Species composition database	1,388	1,162	824	1,109	711
Biological database	178	64	307	422	402
Total number of samples	1,566	1,226	1,131	1,531	1,113
Landings ('000 tonnes)	1,322	960	1,207	1,376	1,061

Table 1.4.2 Number of samples for species and length composition collected by Norway, and corresponding catch ('000 t) 1992–1993.

North Sea						
1993	Norway pout		Sandeel		Total	
Quarter	Samples	Catch	Samples	Catch	Samples	Catch
1	5	12.6	3	8.0	8	20.6
2	22	26.9	28	58.6	50	85.5
3	14	25.9	11	17.3	25	43.2
4	10	11.3	12	11.5	22	22.8
Total	51	76.7	54	95.4	105	172.1
1992	63	105.5	27	89.3	90	194.8

Table 2.1 Species composition in the industrial fisheries in Division IIIa ('000 t), 1974-1993[1].

Year	Sandeel	Sprat[2]	Herring[3]	Norway pout	Blue whiting	Total
1974	8	71	76	13	-	168
1975	17	101	57	19	-	194
1976	22	59	38	42	-	161
1977	7	67	32	21	-	127
1978	23	78	16	25	-	142
1979	34	96	13	25	6	174
1980	39	84	25	26	14	188
1981	59	76	63	30	+	228
1982	25	40	54	44	5	168
1983	29	26	89	30	16	190
1984	26	36	112	46	15	235
1985	6	20	116	9	19	170
1986	73	11	65	6	9	164
1987	5	14	72	3	25	119
1988	23	9	97	8	15	152
1989	18	10	52	6	9	95
1990	16	10	51	27	10	114
1991	23	14	22	32	11	102
1992	39	2	47	42	18	148
1993[4]	45	2	71	8	32	158
Mean 1974-1993	27	41	58	23	14[5]	160

[1]Data from 1974-1984 from Anon. (1986), 1985-1993 provided by Working Group members.
[2]Total landings from all fisheries.
[3]For years 1974-1985, human consumption landings used for reduction are included in these data.
[4]Preliminary.
[5]Mean 1979-1993.

Table 2.2 Species composition in the landings ('000 t) from the industrial fisheries in the North Sea (data provided by Working Group members).

Year	Species composition									
	Sandeel	Sprat	Herring	Norway pout	Blue whiting	Haddock	Whiting	Saithe	Other	Total
1974	525	314	0	736	62	48	130	42		1857
1975	428	641	0	560	42	41	86	38		1836
1976	488	622	12	435	36	48	150	67		1858
1977	786	304	10	390	38	35	106	6		1675
1978	787	378	8	270	100	11	55	3		1612
1979	578	380	15	320	64	16	59	2		1434
1980	729	323	7	471	76	22	46	0		1674
1981	569	209	84	236	62	17	67	1		1245
1982	611	153	153	360	118	19	33	5	24	1476
1983	537	88	155	423	118	13	24	1	42	1401
1984	669	77	35	355	79	10	19	6	48	1298
1985	622	50	63	197	73	6	15	8	66	1100
1986	848	16	40	174	37	3	18	1	33	1170
1987	825	33	47	147	30	4	16	4	73	1179
1988	893	87	179	102	28	4	49	1	45	1388
1989	1039	63	146	162	28	2	36	1	59	1536
1990	591	71	115	140	22	3	50	8	40	1040
1991	843	110	131	155	28	5	38	1	38	1349
1992	854	214	128	252	45	11	27	0	30	1561
1993	578	153	102	174	17	11	20	1	27	1083
1993 q1	26	16	23	36	1	2	3	0	6	114
1993 q2	430	5	5	28	6	4	4	0	6	487
1993 q3	88	72	51	59	4	3	7	1	7	293
1993 q4	33	61	23	51	5	1	6		8	189
Mean 1974-93	690	214	72	303	55	16	52	10	44	1439

Table 2.3 Landings (t) from the fisheries for sandeel and Norway pout in Division VIa. (Data as officially reported to ICES.)

Year	Norway pout	Sandeel	Total
1974	6,721	+	6,721
1975	8,655	+	8,655
1976	19,933	17	19,950
1977	5,206	67	5,273
1978	23,250	+	23,250
1979	20,502	-	20,502
1980	17,870	211	18,081
1981	7,757	5,972	13,729
1982	4,911	10,873	15,784
1983	8,325	13,051	21,376
1984	7,794	14,166	21,960
1985	9,697	18,586	28,283
1986	5,832	24,469	30,301
1987	38,267	14,479	52,746
1988	6,742	24,465	31,207
1989	28,196	18,785	46,981
1990	3,316	16,515	19,831
1991	4,348	8,532	12,880
1992	5,147	4,985	10,132
1993[1]	7,338	6,236	13,574
Mean 1974-1992	12,519	9,220	21,739

[1]Preliminary.

Table 3.1 Distribution of landings and associated by-catches of selected species ('000 t) from industrial fisheries by Denmark and Norway by landing categories to the north and south of 57°N, respectively, in 1993. (Data provided by Working Group members)

Area	Fishery				Species composition						Total
north	(target species)										
		Norway pout	Sandeel	Sprat	Herring	Haddock	Whiting	Saithe	Blue whiting	Other	
	Norway pout	168	2	1	3	4	8		14	8	209
	Sandeel	1	191	1	3	3	1		0	3	203
	Sprat	0	0	0	0	0	0		0	0	0
	Other	4	6	0	8	1	1		3	5	29
	Sum	173	199	2	14	8	11	0	17	17	440

Area	Fishery				Species composition						Total
south	(target species)										
		Norway pout	Sandeel	Sprat	Herring	Haddock	Whiting	Saithe	Blue whiting	Other	
	Norway pout	0	0	0	0	0	0		0	0	0
	Sandeel	0	354	6	9	2	4		0	4	381
	Sprat	0	1	119	28	0	2		0	1	151
	Other	0	23	27	52	0	3		0	5	110
	Sum	1	378	152	88	3	9	0	0	10	642

North Sea

Table 3.2 Sum of Danish and Norwegian by-catch by species (excluding those species accounted for in Table 3.1) and year in tonnes.

Species	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Gadus morhua	4175	544	710	1092	1404	2988	2948	570	1044	1052
Scomber scombrus	1278	4	534	2663	6414	8013	5212	7466	4631	4386
Trachurus trachurus	133[3]	22789	16658	7391	18104	22723	14918	5704	6651	6169
Trigla sp.	2168	0	888[2]	45342[2]	5394[2]	9391[2]	2598[2]	5622[2]	4209	1593
Limanda limanda	149[3]	187	3209	4632	3781	7743	4706	5578	3986	4871
Argentina spp.	6977[3]	8714	5210	3033	1918	778	2801	3434	2024	2874
Hippoglossoides platessoides	170[3]	59	718	1173	946	2160	1673	1024	1694	1428
Pleuronectes platessa	0	34	119	109	372	582	566	1305	218	128
Merluccius merluccius[3]	546	349	165	261	242	290	429	28	359	109
Trisopterus minutus	0	0	68[3]	0	5[2]	48[2]	121[2]	79[2]	111	36
Molva molva[3]	528	51	1	40	39	37	13	65	10	28
Glyptocephalus cynoglossus	241[3]	236[3]	132	341	44	255[3]	251[3]	1439[3]	195[3]	246
Gadiculus argenteus[3]	2690	1210	729	3043	2494	741	476	801	0	0
Others	29261	31715[1]	3853	3604	3670	3528	3154	4444	4553	4106
Total	48316	65892	32994	72724	44827	59277	39866	37559	29685	27026

[1]Danish cod and mackerel included.
[2]Only Danish catches.
[3]Norwegian catches. Danish catches included in "Others".

Table 4.1 Norway pout. Annual landings (tonnes) in Division IIIa. (Data as officially reported to ICES.)

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984
Denmark	40,144	20,694	23,922	23,951	26,235	29,273	51,317	36,124	67,007
Norway	50[2]	104	362	1,182	141	752	1,265	990	947
Sweden	2,255	318	591[3]	32	39	60	60	52	+
Total	42,449	21,116	24,875	25,165	26,415	30,085	52,685	37,166	67,954

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993[1]
Denmark	85,082	32,056	47,527	45,034	16,873	41,215	49,341	83,866	37,197
Norway	831	400	1,680	1,178	309	40	23	221[1]	-
Sweden	-	+	-	-	+	+	3	5	-
Total	85,913	32,456	49,207	46,212	17,182	41,255	49,367	84,092	37,197

[1]Preliminary.
[2]Including by-catch.
[3]Includes North Sea.

Table 4.2.1 Norway pout in Div. IIIa. Landings in tonnes and number of samples by quarter and year.

Year		1. Quar.	2. Quar.	3. Quar.	4. Quar.	Total
1986	Tonnes	125	2,363	0	4,005	6,493
	No.samples	17	5	1	1	24
1987	Tonnes	281	35	1,502	669	2,487
	No.samples	0	0	6	3	9
1988	Tonnes	57	194	5,932	1,623	7,806
	No.samples	5	1	0	3	9
1989	Tonnes	260	305	2,207	2,682	5,454
	No.samples	1	0	4	3	8
1990	Tonnes	357	7,160	15,299	4,521	27,337
	No.samples	2	9	0	2	13
1991	Tonnes	191	2,572	27,199	8,306	38,268
	No.samples	2	6	49	28	85
1992	Tonnes	2,911	10,728	23,203	7,825	44,667
	No.samples	11	16	25	34	86
1993	Tonnes	350	1,129	4,160	2,133	7,772
	No.samples	20	8	37	22	87

Table 4.2.2 Norway pout in Div. IIIa. Catch in numbers.

Year	Quarter	Age 0	Age 1	Age 2	Age 3	Age 4 +
1986	1	0.0	10.43	1.38	0.08	0.0
1986	2	0.0	229.65	8.33	0.0	0.0
1986	3	0.0	0.0	0.0	0.0	0.0
(1986	4	135.53	343.91	12.61	0.08	0.0)
(1987	1	0.0	0.0	0.0	0.0	0.0)
(1987	2	0.0	0.0	0.0	0.0	0.0)
1987	3	0.0	41.63	5.56	0.33	0.0
1987	4	5.70	12.74	2.98	0.0	0.0
1988	1	0.0	2.57	0.92	0.10	0.0
1988	2	0.0	13.11	2.82	0.0	0.0
(1988	3	0.0	0.0	0.0	0.0	0.0)
1988	4	196.19	0.0	0.0	0.0	0.0
1989	1	0.0	25.30	0.0	0.0	0.0
(1989	2	0.0	29.68	0.0	0.0	0.0)
1989	3	11.82	18.18	59.97	6.67	0.0
1989	4	268.52	21.69	2.93	0.0	0.0
1990	1	0.0	15.11	1.89	3.78	0.0
1990	2	0.56	523.27	30.65	2.79	0.0
(1990	3	0.0	0.0	0.0	0.0	0.0)
(1990	4	555.22	0.0	0.0	0.0	0.0)
1991	1	0.0	22.47	0.0	0.0	0.0
1991	2	0.0	216.65	6.70	0.0	0.0
1991	3	657.85	509.44	148.42	21.39	0.0
1991	4	878.77	17.99	1.8	0.90	0.0
1992	1	0.0	216.46	19.14	0.71	0.0
1992	2	0.0	525.28	62.94	0.0	0.0
1992	3	776.04	855.13	16.48	0.0	0.0
1992	4	483.55	142.63	13.43	0.0	0.0
1993	1	0.0	17.21	6.58	0.66	0.17
1993	2	0.0	59.36	0.84	0.0	0.0
1993	3	85.07	106.82	23.47	0.0	0.0
1993	4	252.87	16.60	2.72	0.0	0.0

( ): Insufficient sampling

Table 4.2.3 Norway pout in Div. IIIa. Weight at age in catch.

Year	Quarter	Age 0	Age 1	Age 2	Age 3	Age 4 +
1986	1	0.0	8.4	24.1	46.3	0.0
1986	2	0.0	9.4	24.1	0.0	0.0
1986	3	0.0	0.0	0.0	0.0	0.0
(1986	4	5.2	30.6	45.8	0.0	0.0)
(1987	1	0.0	0.0	0.0	0.0	0.0)
(1987	2	0.0	0.0	0.0	0.0	0.0)
1987	3	0.0	28.9	50.5	56.4	0.0
1987	4	9.2	36.9	49.1	0.0	0.0
1988	1	0.0	9.6	29.8	50.0	0.0
1988	2	0.0	10.9	18.9	0.0	0.0
(1988	3	0.0	0.0	0.0	0.0	0.0)
1988	4	8.3	0.0	0.0	0.0	0.0
1989	1	0.0	10.3	0.0	0.0	0.0
(1989	2	0.0	10.3	0.0	0.0	0.0)
1989	3	6.1	22.7	26.0	31.2	0.0
1989	4	7.4	26.9	35.4	0.0	0.0
1990	1	0.0	13.5	20.0	30.5	0.0
1990	2	1.0	11.9	27.0	37.2	0.0
(1990	3	0.0	0.0	0.0	0.0	0.0)
(1990	4	8.1	0.0	0.0	0.0	0.0)
1991	1	0.0	8.5	0.0	0.0	0.0
1991	2	0.0	11.2	23.1	0.0	0.0
1991	3	6.3	30.5	43.4	49.2	0.0
1991	4	8.7	29.5	47.1	69.0	0.0
1992	1	0.0	10.4	32.5	58.0	0.0
1992	2	0.0	16.0	37.0	0.0	0.0
1992	3	3.5	23.0	47.0	0.0	0.0
1992	4	6.5	28.4	47.9	0.0	0.0
1993	1	0.0	7.8	27.0	45.5	50.0
1993	2	0.0	18.4	41.7	0.0	0.0
1993	3	3.6	26.1	45.3	0.0	0.0
1993	4	6.2	26.0	46.6	0.0	0.0

( ): Insufficient sampling

Table 5.1.1 Norway pout annual landings ('000 t) in Sub-area IV, the North Sea, by countries in 1958–1993. (Data provided by Working Group members).

Year	Denmark	Faroes	Norway	Sweden	UK (Scotland)	Others	Total
1957	-	-	0.2	-	-	-	0.2
1958	-	-	-	-	-	-	-
1959	61.5	-	7.8	-	-	-	69.3
1960	17.2	-	13.5	-	-	-	30.7
1961	20.5	-	8.1	-	-	-	28.6
1962	121.8	-	27.9	-	-	-	149.7
1963	67.4	-	70.4	-	-	-	137.8
1964	10.4	-	51.0	-	-	-	61.4
1965	8.2	-	35.0	-	-	-	43.2
1966	35.2	-	17.8	-	-	+	53.0
1967	169.6	-	12.9	-	-	+	182.6
1968	410.8	-	40.9	-	-	+	451.8
1969	52.5	19.6	41.4	-	-	+	113.5
1970	142.1	32.0	63.5	-	0.2	0.2	238.0
1971	178.5	47.2	79.3	-	0.1	0.2	305.3
1972	259.6	56.8	120.5	6.8	0.9	0.2	444.8
1973	215.2	51.2	63.0	2.9	13.0	0.6	345.9
1974	464.5	85.0	154.2	2.1	26.7	3.3	735.8
1975	251.2	63.6	218.9	2.3	22.7	1.0	559.7
1976	244.9	64.6	108.9	+	17.3	1.7	435.4
1977	232.2	50.9	98.3	2.9	4.6	1.0	389.9
1978	163.4	19.7	80.8	0.7	5.5	-	270.1
1979	219.9	21.9	75.4	-	3.0	-	320.2
1980	366.2	34.1	70.2	-	0.6	-	471.1
1981	167.5	16.6	51.6	-	+	-	235.7
1982	256.3	15.4	88.0	-	-	-	359.7
1983	301.1	24.5	97.3	-	+	-	422.9
1984	251.9	19.1[1]	83.8	-	0.1	-	354.9
1985	163.7	9.9	22.8	-	0.1	-	196.5
1986	146.3	6.6	21.5	-	-	-	174.4
1987	108.3	4.8	34.1	-	-	-	147.2
1988	79.0	1.5	21.1	-	-	-	101.6
1989	95.6	0.8	65.3	-	0.1	0.3	167.1
1990	61.5	0.9	77.1	-	-	-	139.5
1991	85.0	1.3	68.3	-	-	+	154.6
1992	146.9	2.6	105.5	-	0	0.1	255.1
1993	97.3	n/a	76.7	-	-	-	174.0

Table 5.1.2 Norway Pout, North Sea. National landings (t) by month, 1990-1993. (Data provided by Working Group members.)

Month	Denmark	Norway	Faroes	Total[1]
1991				
Jan	11,601	5,755		17,495
Feb	10,141	6,996		17,275
Mar	5,633	2,514		8,212
Apr	410	3,913		4,358
May	96	3,878		4,006
Jun	-	9,491		9,567
Jul	316	7,107		7,483
Aug	3,460	8,397		11,952
Sep	10,683	4,808		15,615
Oct	20,894	7,017		28,135
Nov	12,086	3,826		16,040
Dec	9,629	4,632		14,375
Total	84,949	68,334	1,230	154,513
1992				
Jan	12,442	8,180		20,622
Feb	13,880	9,362		23,242
Mar	13,337	2,588		15,925
Apr	1,626	3,687		5,313
May	321	7,526		7,847
Jun	1,456	5,175		6,631
Jul	3,228	10,846		14,074
Aug	10,677	13,970		24,647
Sept	36,521	9,977		46,489
Oct	34,605	19,160		53,765
Nov	18,801	10,895		29,696
Dec	31	4,093		4,124
Total	146,925	105,459	2,586	254,970
1993				
Jan	5,678	2,578		8,256
Feb	10,871	7,460		18,331
Mar	6,654	2,558		9,212
Apr	0	4,128		4,128
May	79	12,585		12,664
Jun	1,419	10,171		11,590
Jul	9,646	10,713		20,359
Aug	10,686	7,866		18,552
Sep	12,609	7,358		19,967
Oct	20,741	4,168		24,909
Nov	10,650	3,995		14,645
Dec	8,296	3,092		11,388
Total	97,329	76,672	N/A	174,001

[1]Monthly totals for 1991 and 1992 estimated assuming Faroes catch is distributed over months as the sum of the Danish and Norwegian landings.

Table 5.2.1 Norway pout. Danish CPUE data (tonnes/day fishing) by vessel category for 1983-1993.

Vessel GRT	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
51-100	11.37	12.53	11.60	10.83	11.73	20.26	14.64	9.68	12.56	-	-
101-150	24.51	21.35	17.98	19.49	20.70	19.83	19.93	18.21	24.14	26.43	23.72
151-200	29.00	24.17	20.76	22.97	22.20	23.91	24.06	25.62	28.22	34.20	27.36
201-250	32.71	27.82	24.80	25.20	27.51	30.50	27.43	25.34	29.45	37.50	28.44
251-300	32.05	26.59	22.86	25.12	25.58	24.03	26.10	21.87	28.15	31.90	32.05
301-	31.81	37.47	26.86	26.63	31.10	40.09	28.92	25.91	36.73	41.84	35.10

Table 5.2.2 Combined Danish and Norwegian fishing effort on North Sea Norway pout.

		q1	q2	q3	q4	Total
1982	Norway	505	1283	995	608	3391
	Denmark*	1922	502	3929	2234	8587
Total		2427	1785	4924	2842	11978
						Total
1983	Norway	286	1144	1942	546	3919
	Denmark	2318	505	3725	3620	10168
Total		2604	1649	5667	4166	14087
						Total
1984	Norway	452	1165	1396	322	3336
	Denmark*	1887	454	3783	4433	10557
Total		2339	1619	5179	4755	13893
						Total
1985	Norway	324	374	230	266	1194
	Denmark	2177	232	2044	3340	7793
Total		2501	606	2274	3606	8987
						Total
1986	Norway	418	484	192	245	1340
	Denmark	3198	126	2025	5835	11184
Total		3616	610	2217	6080	12524
						Total
1987	Norway	420	499	176	336	1431
	Denmark	1169	7	1333	1946	4455
Total		1589	506	1509	2282	5886
						Total
1988	Norway	316	130	76	634	1157
	Denmark	910	3	464	1957	3334
Total		1226	133	540	2591	4491
						Total
1989	Norway	146	425	1074	1624	3269
	Denmark	565	76	1323	2009	3973
Total		711	501	2397	3633	7242
						Total
1990	Norway	394	1907	1114	1150	4564
	Denmark	574	616	446	1167	2803
Total		968	2523	1560	2317	7367
						Total
1991	Norway	811	801	988	839	3438
	Denmark	979	18	517	1524	3038
Total		1790	819	1505	2363	6476
						Total
1992	Norway	1162	801	1625	1422	5010
	Denmark	1682	101	1213	1264	4260
Total		2844	902	2838	2686	9270
1993	Norway	671	1052	1153	656	3532
	Denmark	1210	35	1527	1650	4422
Total		1881	1087	2680	2306	7954

Table 5.3.1 NORWAY POUT in the North Sea. Catch in numbers at age by quarter (millions). + represents less than half a million. Data for 1990 only partly available and, therefore not included.

Year	1978				1979				1980			
Age	1	2	3	4	1	2	3	4	1	2	3	4
0	0	0	304	1,225	0	0	968	864	0	0	24	641
1	2,931	1,181	2,385	1,400	5,079	3,270	4,244	2,154	5,044	2,586	7,711	3,920
2	1,371	650	780	322	940	249	763	167	1,075	689	1,960	512
3	93	194	30	6	170	27	49	11	59	29	18	6
4+	4	+	0	0	3	1	0	0	2	5	0	0

Age Year	1981				1982				1983			
0	0	0	77	36,560	0	0	151	1,058	0	0	421	2,520
1	2,223	1,072	1,316	1,038	5,267	3,251	6,576	3,017	3,969	1,723	5,495	4,053
2	1,688	621	944	301	415	275	431	46	1,224	1,165	1,485	358
3	76	77	17	3	216	23	62	0	14	9	16	7
4+	6	2	0	0	0	0	0	0	0	0	1	1

Age Year	1984				1985				1986			
0	0	0	1	2,209	0	0	6	665	0	0	0	5,436
1	2,732	2,230	5,238	3,457	2,220	840	1,373	2,932	395	180	1,186	1,687
2	1,361	1,153	1,666	727	1,337	142	777	171	1,066	60	245	36
3	142	266	8	0	188	13	19	0	72	2	6	0
4+	0	0	0	0	1	0	0	0	3	0	0	0

Age Year	1987				1988				1989			
0	0	0	8	221	0	0	24	2,947	0	0	147	4,585
1	2,665	1,073	1,585	2,138	246	82	183	632	1,711	647	1,653	1,719
2	398	60	165	230	699	71	250	405	48	133	207	90
3	12	0	0	5	20	0	0	0	6	6	0	13
4+	1	0	0	0	0	0	0	0	0	0	0	0

Age Year	1990				1991				1992			
0					0	0	76	2,607	0	0	34	456
1					1,485	419	1,010	1,030	3,340	997	2,608	2,643
2					1,335	397	67	185	1067	230	372	254
3					93	19	1	17	117	20	1	2
4+					6	0	0	0	3	0	0	0

Age Year	1993			
0			11	929
1	1,925	754	1,040	1,033
2	692	472	889	442
3	14	58	19	2
4+	-	0	0	0

Table 5.4.1 Norway pout. North Sea 1986-1993. Mean weight at age by quarter. Danish and Norwegian catches combined (grams).

		Age Group				
Year	Quarter	0	1	2	3	4
1986	1	-	6.69	29.74	44.08	82.51
	2	-	14.49	42.92	55.39	-
	3	-	28.81	43.39	47.60	-
	4	7.20	26.90	44.00	-	-
1987	1	-	8.13	28.26	52.93	63.09
	2	-	12.59	31.51	-	-
	3	5.80	20.16	34.53	-	-
	4	7.40	23.36	37.32	46.60	-
1988	1	-	9.23	27.31	38.38	69.48
	2	-	11.61	33.26	-	-
	3	9.42	26.54	39.82	-	-
	4	7.91	30.60	43.31	-	-
1989	1	-	7.98	26.74	39.95	-
	2	-	13.49	28.70	44.39	-
	3	7.48	26.58	35.44	-	-
	4	6.69	26.76	34.70	46.50	-
1990	1	-	6.51	25.47	37.72	68.00
	2	-	13.75	25.30	40.35	-
	3	6.40	20.29	32.92	39.40	-
	4[1]	66.7	21.7	38.9	52.94	-
1991	1	-	7.85	20.54	35.43	44.3
	2	-	12.95	28.75	49.87	-
	3	6.06	30.95	44.28	67.25	-
	4	6.64	30.65	43.10	59.37	-
1992	1	-	8.12	25.73	41.80	43.9
	2	8.00	11.31	31.25	49.49	-
	3	6.70	26.52	42.42	50.00	-
	4	8.14	27.49	44.14	50.30	-
1993	1	-	9.32	24.94	46.50	-
	2	-	14.76	30.58	48.73	-
	3	4.40	25.03	35.19	55.40	-
	4	8.14	26.24	36.44	70.80	-

[1]Mean of 1989 and 1991 values.

Table 5.4.2 Norway pout. Mean weight at age in the stock, proportion mature and natural mortality.

Ae	w(g)				Matprop	M (per quarter)
	Q1	Q2	Q3	Q4		
0	-	-	4	6	0	0.4
1	7.0	15.0	25.0	23.0	0.1	0.4
2	22.0	34.0	43.0	42.0	1.0	0.4
3	40.0	50.0	60.0	58.0	1.0	0.4
4	56.0	56.0	-	-	1.0	0.4

Table 5.5.1 Research vessel indices for NORWAY POUT.

Year Class	IYFS[1] February			EGFS[2] August				SGFS[3] August			
	1-group	2-group	3-group	0-group	1-group	2-group	3-group	0-group	1-group	2-group	3-group
1968	-	6	-	-	-	-	-	-	-	-	-
1969	35	22	-	-	-	-	-	-	-	-	-
1970	1,556	653	-	-	-	-	-	-	-	-	-
1971	3,425	438	-	-	-	-	-	-	-	-	-
1972	4,207	399	-	-	-	-	-	-	-	-	-
1973	25,626	2,412	-	-	-	-	-	-	-	-	-
1974	4,242	385	-	-	-	-	25		-	-	-
1975	4,599	334	-	-	-	239	25		-	-	-
1976	4,813	1,215	-	-	770	119	-		-	-	-
1977	1,913	240	-	1,388	314	20	7		-	-	12.0
1978	2,690	611	-	1,209	600	60	25		-	346.0	9.0
1979	4,081	557	-	1,599	824	283	11		1,928.0	127.0	22.0
1980	1,375	403	9	151	385	13	1		185.0	43.9	1.0
1981	3,315	663	58	1,770	712	29	3		991.3	90.8	8.5
1982	2,331	802	71	1,818	517	93	2	8.0	489.5	68.8	5.4
1983	3,925	1,423	23	1,501	1,008	74	18	13.3	615.1	173.1	8.9
1984	2,109	384	65	160	300	47	-	1.9	635.7	53.8	1.1
1985	2,043	469	13	136	219	41	3	4.7	388.7	22.6	4.4
1986	3,023	760	178	109	152	34	5	38.4	337.9	209.2	14.3
1987	127	260	46	2	26	153	9	7.4	38.2	21.4	1.5
1988	2,079	773	129	45	350	45	2	13.7	381.7	51.0	6.2
1989	1,320	677	33	400	264	118	48[5]	1.5	206.2	42.3	24.0
1990	2,497	902	259	627	161	324[5]	34[4,5]	57.9	731.7	221.3	20.4
1991	5,121	2,644	67	401	1,877[5]	388[4,5]	-	9.7	1,714.6	329.1	5.8
1992	2,681	375		874[5]	1,095[4,5]	-		12.2	580.4	106.3	
1993	1,868			1,722[4,5]				1.7	387.2		
1994	1,868							136.0			

[1]International Bottom Trawl Survey, arithmetic mean catch in no./h in standard area.
[2]English groundfish survey, arithmetic mean catch in no./h, 22 selected rectangles within Roundfish areas 1, 2, and 3.
[3]Scottish groundfish surveys, arithmetic mean catch no./h.'
[4]Preliminary.
[5]GOV adjusted to Granton trawl by dividing by 3.3.

Table 5.6.1 Survivors Analysis of Norway Pout in the North Sea.

```
 The following parameters were used:

Year range: 1982 - 1993
Seasons per year:    4
The last season in the last year is season : 4
Youngest age:  0; Oldest age:  3; (Plus age:  4)
Recruitment in season: 3
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Commercial fishery
Fleet  2:  IYFS
Fleet  3:  EGFS
Fleet  4:  SGFS

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 2
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   2
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum.qrt
 Weight in catch:        weca.qrt
 Weight in stock:        west.qrt
 Natural mortalities:    natmor.qrt
 Maturity ogive:         matprop.qrt
 Tuning data (CPUE):     tuning.xsa
 Weighting for rhats:    rweigh.xsa
 Unknown catches:        uc90


 Stock numbers (at start of season)
 **********************************
```

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	239336.	160308.	*	*	156236.	104383.	*	*	81888.	54890.
1	107777.	67933.	42875.	23356.	106591.	68201.	44306.	25200.	67907.	43283.	27187.	13936.
2	2931.	1625.	864.	226.	13186.	7837.	4299.	1666.	13574.	7984.	4408.	1591.
3	886.	417.	261.	124.	114.	65.	36.	11.	824.	436.	74.	43.
4+	0.	0.	0.	0.	83.	56.	36.	24.	18.	12.	8.	5.
SSN	14595.				24042.				21206.			
SSB	175370.				373922.				380102.			
TSN	111594.	69975.	283336.	184014.	119974.	76158.	204912.	131284.	82322.	51715.	113566.	70465.
TSB	854366.	1095096.	2082020.	1515736.	1045448.	1295828.	1919621.	1276521.	807916.	943173.	1201251.	719192.

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	59458.	39851.	*	*	119941.	80399.	*	*	32314.	21654.
1	34985.	21634.	13814.	8136.	26168.	17218.	11394.	6667.	49442.	30960.	19875.	12025.
2	6511.	3270.	2076.	755.	3053.	1174.	738.	294.	3088.	1744.	1120.	616.
3	471.	162.	98.	50.	366.	187.	123.	78.	167.	102.	69.	46.
4+	33.	21.	14.	10.	40.	24.	16.	11.	59.	39.	26.	18.
SSN	10513.				6076.				8259.			
SSB	188408.				102368.				112567.			
TSN	42000.	25087.	75459.	48801.	29627.	18602.	132212.	87448.	52757.	32846.	53404.	34358.
TSB	408815.	444971.	678301.	460844.	267229.	308860.	803735.	652579.	424053.	531002.	678398.	435018.

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4

continued...

Table 5.6.1 (continued)

AGE												
0	*	*	92742.	62147.	*	*	98351.	65921.	*	*	97258.	65183.
1	14334.	9407.	6239.	4032.	39246.	24901.	16124.	9910.	40323.	25749.	15808.	9853.
2	6310.	3658.	2393.	1399.	2186.	1426.	836.	398.	5051.	2866.	1453.	792.
3	224.	134.	90.	60.	606.	401.	263.	176.	193.	110.	56.	30.
4+	39.	26.	17.	12.	48.	32.	22.	15.	118.	67.	45.	30.
SSN	8006.				6765.				9394.			
SSB	159983.				102513.				153657.			
TSN	20907.	13225.	101481.	67651.	42086.	26760.	115596.	76421.	45685.	28791.	114619.	75888.
TSB	250290.	273639.	635258.	527893.	349761.	443836.	848250.	650436.	407694.	492878.	850035.	652735.

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	190017.	127310.	*	*	96340.	64551.	*	*	75743.	50763.
1	42881.	27528.	18109.	11312.	83204.	53039.	34737.	21150.	42896.	27178.	17601.	10947.
2	5656.	2698.	1484.	940.	6739.	3644.	2254.	1207.	12013.	7486.	4631.	2377.
3	423.	208.	124.	82.	478.	225.	134.	89.	601.	392.	215.	129.
4+	36.	20.	13.	9.	47.	29.	19.	13.	67.	45.	30.	20.
SSN	10403.				15585.				16970.			
SSB	173412.				228250.				322087.			
TSN	48996.	30454.	209747.	139652.	90468.	56936:	133484.	87009.	55577.	35101.	98220.	64236.
TSB	443562.	516149.	1284020.	1068255.	752435.	932313.	1358779.	929612.	592334.	684282.	955065.	663669.

Catch in numbers for fleet: 1
Commercial fishery

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	151.	1058.	*	*	421.	2520.	*	*	1.	2209.
1	5267.	3251.	6576.	3017.	3969.	1723.	5495.	4053.	2732.	2230.	5238.	3457.
2	415.	275.	431.	46.	1224.	1165.	1485.	358.	1361.	1153.	1666.	727.
3	216.	23.	62.	0.	14.	9.	16.	7.	142.	266.	8.	0.
4+	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.
SOP	54639.	59265.	187257.	77671.	55271.	66017.	203874.	123781.	56228.	55972.	150783.	109843.

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.	665.	*	*	0.	5436.	*	*	8.	221.
1	2220.	840.	1373.	2932.	395.	180.	1186.	1687.	2665.	1073.	1585.	2138.
2	1337.	142.	777.	171.	1066.	60.	245.	36.	398.	60.	165.	230.
3	188.	13.	19.	0.	72.	2.	6.	0.	12.	0.	0.	5.
4+	1.	0.	0.	0.	3.	0.	0.	0.	1.	0.	0.	0.
SOP	56337.	15205.	61263.	90213.	37767.	5294.	45085.	86104.	33612.	15400.	37697.	60396.

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	24.	2947.	*	*	7.	4721.	*	*	13.	993.
1	246.	82.	183.	632.	1717.	693.	1097.	1945.	1564.	1773.	909.	1159.
2	699.	71.	250.	405.	48.	146.	198.	90.	635.	572.	222.	131.
3	20.	0.	0.	0.	7.	7.	0.	13.	24.	22.	8.	5.
4+	0.	0.	0.	0.	0.	0.	0.	0.	15.	0.	0.	0.
SOP	22097.	3327.	15056.	60181.	15272.	13838.	36211.	87352.	28283.	39730.	26158.	45253.

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	76.	2607.	*	*	34.	456.	*	*	11.	929.
1	1485.	419.	1010.	1030.	3340.	997.	2608.	2643.	1925.	754.	1040.	1033.
2	1335.	397.	67.	185.	1067.	230.	372.	254.	692.	472.	889.	442.
3	93.	19.	1.	17.	117.	20.	1.	2.	14.	58.	19.	2.
4+	6.	0.	0.	0.	3.	0.	0.	0.	0.	0.	0.	0.
SOP	42621.	17791.	34774.	57894.	61815.	19838.	85201.	87694.	35836.	28378.	58388.	50915.

Partial fishing mortality for fleet: 1
Commercial fishery

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												

continued...

Table 5.6.1 (continued)

0	*	*	.001	.008	*	*	.003	.030	*	*	.000	.050
1	.061	.060	.203	.169	.046	.031	.161	.214	.050	.064	.261	.349
2	.186	.226	.834	.278	.119	.196	.517	.296	.129	.190	.579	.741
3	.341	.069	.332	.000	.160	.182	.710	1.166	.231	1.114	.139	.000
4+	*	*	*	*	.000	.044	.000	.000	.000	.000	.000	.000
F (1- 2)	.124	.143	.519	.223	.082	.114	.339	.255	.089	.127	.420	.545

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.020	*	*	.000	.085	*	*	.000	.012
1	.080	.048	.128	.545	.018	.013	.134	.357	.067	.043	.101	.239
2	.281	.054	.572	.314	.524	.064	.493	.159	.168	.043	.195	.571
3	.620	.102	.264	.000	.267	.013	.061	.000	.090	.000	.000	.140
4+	.026	.000	.000	.000	.095	.000	.000	.000	.021	.000	.000	.000
F (1- 2)	.180	.051	.350	.430	.271	.038	.314	.258	.118	.043	.148	.405

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.059	*	*	.000	.090	*	*	.000	.019
1	.021	.011	.036	.208	.054	.034	.086	.267	.048	.087	.072	.153
2	.143	.024	.135	.418	.027	.132	.330	.314	.164	.272	.202	.221
3	.111	.000	.000	.000	.014	.020	.000	.091	.164	.272	.202	.221
4+	.000	.000	.000	.000	.000	.000	.000	.000	.164	.000	.000	.000
F (1- 2)	.082	.017	.085	.313	.041	.083	.208	.290	.106	.179	.137	.187

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.025	*	*	.000	.009	*	*	.000	.022
1	.043	.019	.070	.116	.050	.023	.095	.163	.056	.034	.074	.121
2	.329	.194	.056	.269	.210	.079	.220	.289	.072	.079	.260	.251
3	.303	.117	.014	.287	.344	.112	.008	.033	.028	.194	.111	.016
4+	.209	.000	.000	.000	.086	.000	.000	.000	.000	.000	.000	.000
F (1- 2)	.186	.106	.063	.192	.130	.051	.158	.226	.064	.057	.167	.186

Log inverse catchabilities, fleet no: 1
Commercial fishery

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	16.050	11.613	*	*	16.050	11.613	*	*	16.050	11.613
1	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510
2	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138
3	9.372	9.000	8.932	*	9.372	9.000	8.932	9.138	9.372	9.000	8.932	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	16.050	11.613	*	*	*	11.613	*	*	16.050	11.613
1	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510
2	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138
3	9.372	9.000	8.932	*	9.372	9.000	8.932	*	9.372	*	*	9.138

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	16.050	11.613	*	*	16.050	11.613	*	*	16.050	11.613
1	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510
2	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138
3	9.372	*	*	*	9.372	9.000	*	9.138	9.372	9.000	8.932	9.138

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	16.050	11.613	*	*	16.050	11.613	*	*	16.050	11.613
1	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510	10.598	10.142	9.965	9.510
2	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138
3	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138	9.372	9.000	8.932	9.138

Log inverse catchabilities, fleet no: 2

continued...

Table 5.6.1 (continued)

IYFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.934	*	*	*	2.934	*	*	*	2.934	*	*	*
2	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*
3	*	*	*	*	1.810	*	*	*	1.810	*	*	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.934	*	*	*	2.934	*	*	*	2.934	*	*	*
2	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*
3	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.934	*	*	*	2.934	*	*	*	2.934	*	*	*
2	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*
3	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.934	*	*	*	2.934	*	*	*	2.934	*	*	*
2	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*
3	1.810	*	*	*	1.810	*	*	*	1.810	*	*	*

Log inverse catchabilities, fleet no: 3

EGFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	5.753	*	*	*	5.753	*	*	*	5.753	*
1	*	*	3.781	*	*	*	3.781	*	*	*	3.781	*
2	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*
3	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	5.753	*	*	*	5.753	*	*	*	5.753	*
1	*	*	3.781	*	*	*	3.781	*	*	*	3.781	*
2	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*
3	*	*	2.789	*	*	*	2.789	*	*	*	*	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	5.753	*	*	*	5.753	*	*	*	5.753	*
1	*	*	3.781	*	*	*	3.781	*	*	*	3.781	*
2	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*
3	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	5.753	*	*	*	5.753	*	*	*	5.753	*
1	*	*	3.781	*	*	*	3.781	*	*	*	3.781	*
2	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*
3	*	*	2.789	*	*	*	2.789	*	*	*	2.789	*

Log inverse catchabilities, fleet no: 4

SGFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.968	*	*	*	6.968	*	*	*	6.968	*
1	*	*	1.235	*	*	*	1.235	*	*	*	1.235	*

continued...

Table 5.6.1 (continued)

2	*	*	.519	*	*	*	.519	*	*	*	.519	*
3	*	*	.519	*	*	*	.519	*	*	*	.519	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.968	*	*	*	6.968	*	*	*	6.968	*
1	*	*	1.235	*	*	*	1.235	*	*	*	1.235	*
2	*	*	.519	*	*	*	.519	*	*	*	.519	*
3	*	*	.519	*	*	*	.519	*	*	*	.519	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.968	*	*	*	6.968	*	*	*	6.968	*
1	*	*	1.235	*	*	*	1.235	*	*	*	1.235	*
2	*	*	.519	*	*	*	.519	*	*	*	.519	*
3	*	*	.519	*	*	*	.519	*	*	*	.519	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.968	*	*	*	6.968	*	*	*	6.968	*
1	*	*	1.235	*	*	*	1.235	*	*	*	1.235	*
2	*	*	.519	*	*	*	.519	*	*	*	.519	*
3	*	*	.519	*	*	*	.519	*	*	*	.519	*

Log residual stocknr. (nhat/n), fleet no: 1
Commercial fishery

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.374	-1.163	*	*	1.686	-.239	*	*	-3.622	.149
1	.006	-.165	-.130	-.222	-.343	-.737	-.501	-.366	-.156	.008	.071	-.011
2	-.102	.028	.249	-.095	-.624	-.035	-.369	-.415	-.435	-.049	-.167	.371
3	.503	-1.161	-.673	*	-.326	-.111	-.053	.957	.150	1.719	-1.596	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-.687	-.468	*	*	*	1.070	*	*	.621	-.506
1	.245	.701	.177	.713	-1.128	-.567	.682	.399	.530	.765	.355	.346
2	.278	-.326	.644	-.211	.992	-.099	.952	-.778	.220	-.384	-.024	.844
3	1.070	.309	-.130	*	.319	-1.684	-1.144	*	-.401	*	*	-.559

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.680	.926	*	*	-1.118	1.010	*	*	.051	-.026
1	-.374	.692	.355	.082	1.122	.525	-.273	-.010	.408	-.005	.051	-.026
2	.318	.362	.636	.407	-.804	.729	.043	-.221	.408	-.005	.051	-.026
3	.068	*	*	*	-1.450	-1.159	*	-1.457	.408	-.005	.051	-.026

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.194	.210	*	*	.338	-1.035	*	*	-.517	.072
1	-.133	-.559	.078	-.360	-.351	-.433	-.336	-.197	.173	-.226	-.531	-.347
2	.680	.643	-1.180	.105	-.136	-.338	-.529	.003	-.795	-.526	-.307	.015
3	.596	.139	-2.533	.172	.355	.011	-3.801	-2.170	-1.755	.371	-1.159	-2.710

Log residual stocknr. (nhat/n), fleet no: 2
IYFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	-.327	*	*	*	-.675	*	*	*	.299	*	*	*
2	.101	*	*	*	-.934	*	*	*	-.768	*	*	*
3	*	*	*	*	-.465	*	*	*	-.550	*	*	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												

continued...

Table 5.6.1 (continued)

0	*	*	*	*	*	*	*	*	*	*	*	*
1	.354	*	*	*	.586	*	*	*	.363	*	*	*
2	.603	*	*	*	.144	*	*	*	.193	*	*	*
3	.359	*	*	*	-.649	*	*	*	1.097	*	*	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	-1.589	*	*	*	.214	*	*	*	-.270	*	*	*
2	-.050	*	*	*	-.113	*	*	*	.198	*	*	*
3	-.795	*	*	*	.784	*	*	*	.640	*	*	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.303	*	*	*	.362	*	*	*	.380	*	*	*
2	.020	*	*	*	.084	*	*	*	.522	*	*	*
3	.944	*	*	*	-.525	*	*	*	1.174	*	*	*

Log residual stocknr. (nhat/n), fleet no: 3
EGFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.067	*	*	*	1.303	*	*	*	-.291	*
1	*	*	-.035	*	*	*	-.406	*	*	*	.792	*
2	*	*	-.893	*	*	*	-1.806	*	*	*	-.643	*
3	*	*	-.044	*	*	*	-.326	*	*	*	-.167	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-.134	*	*	*	-1.057	*	*	*	-3.743	*
1	*	*	.201	*	*	*	.082	*	*	*	-.854	*
2	*	*	-.121	*	*	*	.431	*	*	*	.995	*
3	*	*	-.795	*	*	*	1.085	*	*	*	*	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-1.684	*	*	*	.442	*	*	*	.903	*
1	*	*	-1.490	*	*	*	.183	*	*	*	-.086	*
2	*	*	-1.212	*	*	*	1.424	*	*	*	-.404	*
3	*	*	-.419	*	*	*	-.981	*	*	*	1.250	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-.214	*	*	*	1.244	*	*	*	2.163	*
1	*	*	-.717	*	*	*	1.099	*	*	*	1.230	*
2	*	*	.476	*	*	*	1.138	*	*	*	.615	*
3	*	*	-1.136	*	*	*	1.957	*	*	*	1.185	*

Log residual stocknr. (nhat/n), fleet no: 4
SGFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-.841	*	*	*	.095	*	*	*	-1.207	*
1	*	*	.052	*	*	*	-.703	*	*	*	.055	*
2	*	*	.356	*	*	*	-.632	*	*	*	-.912	*
3	*	*	.682	*	*	*	-.294	*	*	*	.883	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.019	*	*	*	1.418	*	*	*	.629	*
1	*	*	.709	*	*	*	.412	*	*	*	-.298	*
2	*	*	.761	*	*	*	.598	*	*	*	-.804	*
3	*	*	.230	*	*	*	.413	*	*	*	-1.119	*

Year	1988	1989	1990

continued...

Table 5.6.1 (continued)

Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.644	*	*	*	-1.626	*	*	*	2.038	*
1	*	*	-1.348	*	*	*	.026	*	*	*	-.576	*
2	*	*	.637	*	*	*	-.511	*	*	*	-.247	*
3	*	*	-.004	*	*	*	.102	*	*	*	-.510	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-.418	*	*	*	.490	*	*	*	-1.240	*
1	*	*	.554	*	*	*	.765	*	*	*	.352	*
2	*	*	-.518	*	*	*	.789	*	*	*	.482	*
3	*	*	.028	*	*	*	1.296	*	*	*	.707	*

Weighting factors for computing survivors:
Fleet no: 1
Commercial fishery

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.634	1.295	*	*	.634	1.295	*	*	.634	1.295
1	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830
2	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307
3	1.154	.967	.521	*	1.154	.967	.521	.583	1.154	.967	.521	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.634	1.295	*	*	*	1.295	*	*	.634	1.295
1	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830
2	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307
3	1.154	.967	.521	*	1.154	.967	.521	*	1.154	*	*	.583

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.634	1.295	*	*	.634	1.295	*	*	.634	1.295
1	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830
2	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307
3	1.154	*	*	*	1.154	.967	*	.583	1.154	.967	.521	.583

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.634	1.295	*	*	.634	1.295	*	*	.634	1.295
1	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830	1.705	1.761	2.603	2.830
2	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307	1.651	2.419	1.652	2.307
3	1.154	.967	.521	.583	1.154	.967	.521	.583	1.154	.967	.521	.583

Weighting factors for computing survivors:
Fleet no: 2
IYFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	1.543	*	*	*	1.543	*	*	*	1.543	*	*	*
2	2.134	*	*	*	2.134	*	*	*	2.134	*	*	*
3	*	*	*	*	1.190	*	*	*	1.190	*	*	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	1.543	*	*	*	1.543	*	*	*	1.543	*	*	*
2	2.134	*	*	*	2.134	*	*	*	2.134	*	*	*
3	1.190	*	*	*	1.190	*	*	*	1.190	*	*	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	1.543	*	*	*	1.543	*	*	*	1.543	*	*	*
2	2.134	*	*	*	2.134	*	*	*	2.134	*	*	*

continued...

Table 5.6.1 (continued)

3	1.190	*	*	*	1.190	*	*	*	1.190	*	*	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	1.543	*	*	*	1.543	*	*	*	1.543	*	*	*
2	2.134	*	*	*	2.134	*	*	*	2.134	*	*	*
3	1.190	*	*	*	1.190	*	*	*	1.190	*	*	*

Weighting factors for computing survivors:
Fleet no: 3
EGFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.600	*	*	*	.600	*	*	*	.600	*
1	*	*	1.199	*	*	*	1.199	*	*	*	1.199	*
2	*	*	.951	*	*	*	.951	*	*	*	.951	*
3	*	*	.906	*	*	*	.906	*	*	*	.906	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.600	*	*	*	.600	*	*	*	.600	*
1	*	*	1.199	*	*	*	1.199	*	*	*	1.199	*
2	*	*	.951	*	*	*	.951	*	*	*	.951	*
3	*	*	.906	*	*	*	.906	*	*	*	*	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.600	*	*	*	.600	*	*	*	.600	*
1	*	*	1.199	*	*	*	1.199	*	*	*	1.199	*
2	*	*	.951	*	*	*	.951	*	*	*	.951	*
3	*	*	.906	*	*	*	.906	*	*	*	.906	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.600	*	*	*	.600	*	*	*	.600	*
1	*	*	1.199	*	*	*	1.199	*	*	*	1.199	*
2	*	*	.951	*	*	*	.951	*	*	*	.951	*
3	*	*	.906	*	*	*	.906	*	*	*	.906	*

Weighting factors for computing survivors:
Fleet no: 4
SGFS

Year	1982				1983				1984			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.859	*	*	*	.859	*	*	*	.859	*
1	*	*	1.514	*	*	*	1.514	*	*	*	1.514	*
2	*	*	1.456	*	*	*	1.456	*	*	*	1.456	*
3	*	*	1.390	*	*	*	1.390	*	*	*	1.390	*

Year	1985				1986				1987			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.859	*	*	*	.859	*	*	*	.859	*
1	*	*	1.514	*	*	*	1.514	*	*	*	1.514	*
2	*	*	1.456	*	*	*	1.456	*	*	*	1.456	*
3	*	*	1.390	*	*	*	1.390	*	*	*	1.390	*

Year	1988				1989				1990			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.859	*	*	*	.859	*	*	*	.859	*
1	*	*	1.514	*	*	*	1.514	*	*	*	1.514	*
2	*	*	1.456	*	*	*	1.456	*	*	*	1.456	*
3	*	*	1.390	*	*	*	1.390	*	*	*	1.390	*

Year	1991				1992				1993			
Season	1	2	3	4	1	2	3	4	1	2	3	4

continued...

Table 5.6.1 (continued)

AGE												
0	*	*	.859	*	*	*	.859	*	*	*	.859	*
1	*	*	1.514	*	*	*	1.514	*	*	*	1.514	*
2	*	*	1.456	*	*	*	1.456	*	*	*	1.456	*
3	*	*	1.390	*	*	*	1.390	*	*	*	1.390	*

Table 6.1 Norway Pout. Annual landings (t) in Division VIa. (Data officially reported to ICES).

Country	1974	1975	1976	1977	1978	1979	1980	1981
Denmark	-	193	-	-	4,443	15,609	13,070	2,877
Faroes	1,581	1,524	6,203	2,177	18,484	4,772	3,530	3,540
Germany	179	-	8	-	-	-	-	-
Netherlands	-	322	147	230	21	98	68	182
Norway	144[3]	-	82[3]	-	-	-	-	-
Poland	75	-	-	-	-	-	-	-
UK (Scotland)[2]	4,702	6,614	6,346	2,799	302	23	1,202	1,158
Russia	40	2	7,147	-	-	-	-	-
Total	6,721	8,655	19,933	5,206	23,250	20,502	17,870	7,757

Country	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	751	530	4,301	8,547	5,832[4]	37,714[5]	5,849[5]	28,180[5]
Faroes	3,026	6,261	3,400	998	-	-	376	11
Germany	-	-	70	-	-	-	-	-
Netherlands	548	1,534	-	139	-	-	-	-
Norway	-		-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-
UK (Scotland)[2]	586	-	23	13	-	553	517	5
Russia	-	-	-	-	-	-	-	-
Total	4,911	8,325	7,794	9,697	5,832	38,267	6,742	28,196

Country	1990	1991	1992	1993[1]
Denmark	3,316[5]	4,348	5,147	7,338
Faroes	-	-	-	-
Germany	-	-	-	-
Netherlands	-	-	10	-
Norway	-	-	-	-
Poland	-		-	-
UK (Engl.& Wales)	-	-	2	-
UK (Scotland)	+	-	-	-
Russia	-	-	-	-
Total	3,316	4,348	5,148	7,338

[1]Preliminary.
[2]Amended using national data.
[3]Including by-catch.
[4]Includes Division VIb.
[5]Included in Division IVa.

Table 7.1 Sandeel, Division IIIa. Landings in tonnes. Official figures 1982-85, estimates provided by Working Group members 1986-1993.

Year	Denmark	Norway	Sweden
1982	25364	-	5
1983	29169	178	31
1984	26436	-	-
1985	5610	-	-
1986	73133	-	-
1987	5410	-	-
1988	23159	-	-
1989	18170	-	-
1990	15831	-	-
1991	22989	-	-
1992	38830	-	-
1993[1]	44804	-	-

Table 8.1.1 Landings ('000 t) of sandeel from the North Sea, 1952-1993. (Data provided by Working Group members.)

Year	Denmark	Germany	Faroes	Netherlands	Norway	Sweden	UK	Total
1952	1.6	-	-	-	-	-	-	1.6
1953	4.5	+	-	-	-	-	-	4.5
1954	10.8	+	-	-	-	-	-	10.8
1955	37.6	+	-	-	-	-	-	37.6
1956	81.9	5.3	-	+	1.5	-	-	88.7
1957	73.3	25.5	-	3.7	3.2	-	-	105.7
1958	74.4	20.2	-	1.5	4.8	-	-	100.9
1959	77.1	17.4	-	5.1	8.0	-	-	107.6
1960	100.8	7.7	-	+	12.1	-	-	120.6
1961	73.6	4.5	-	+	5.1	-	-	83.2
1962	97.4	1.4	-	-	10.5	-	-	109.3
1963	134.4	16.4	-	-	11.5	-	-	162.3
1964	104.7	12.9	-	-	10.4	-	-	128.0
1965	123.6	2.1	-	-	4.9	-	-	130.6
1966	138.5	4.4	-	-	0.2	-	-	143.1
1967	187.4	0.3	-	-	1.0	-	-	188.7
1968	193.6	+	-	-	0.1	-	-	193.7
1969	112.8	+	-	-	-	-	0.5	113.3
1970	187.8	+	-	-	+	-	3.6	191.4
1971	371.6	0.1	-	-	2.1	-	8.3	382.1
1972	329.0	+	-	-	18.6	8.8	2.1	358.5
1973	273.0	-	1.4	-	17.2	1.1	4.2	296.9
1974	424.1	-	6.4	-	78.6	0.2	15.5	524.8
1975	355.6	-	4.9	-	54.0	0.1	13.6	428.2
1976	424.7	-	-	-	44.2	-	18.7	487.6
1977	664.3	-	11.4	-	78.7	5.7	25.5	785.6
1978	647.5	-	12.1	-	93.5	1.2	32.5	786.8
1979	449.8	-	13.2	-	101.4	-	13.4	577.8
1980	542.2	-	7.2	-	144.8	-	34.3	728.5
1981	464.4	-	4.9	-	52.6	-	46.7	568.6
1982	506.9	-	4.9	-	46.5	0.4	52.2	610.9
1983	485.1	-	2.0	-	12.2	0.2	37.0	536.5
1984	596.3	-	11.3	-	28.3	-	32.6	668.6
1985	587.6	-	3.9	-	13.1	-	17.2	621.8
1986	752.5	-	1.2	-	82.1	-	12.0	847.8
1987	605.4	-	18.6	-	193.4	-	7.2	824.6
1988	686.4	-	15.5	-	185.1	-	5.8	892.8
1989	824.4	-	16.6	-	186.8	-	11.5	1039.1
1990	496.0	-	2.2	0.3	88.9	-	3.9	591.3
1991	701.4	-	11.2	-	128.8	-	1.2	842.6
1992	751.1	-	9.1	-	89.3	0.5	4.9	855.0
1993	482.2	-	-	-	95.5	-	0.2	577.9

+ = less than half unit.
- = no information or no catch.

Table 8.1.2 Sandeel North Sea. Monthly landings (t) by country, 1987-1993. (Data provided by Working Group members).

Year	Month	Denmark	Faroes	Norway	Scotland	Total[1]
1987	Mar	15,159	-	4,681	7	19,847
	Apr	59,495	412	13,921	875	74,703
	May	143,719	1,141	27,308	2,385	174,553
	Jun	278,659	10,251	80,527	1,233	370,670
	Jul	94,532	6,815	15,230	925	117,502
	Aug	7,320	-	37,049	1,521	45,890
	Sep	6,471	-	8,451	280	15,202
	Oct	-	-	6,214	1	6,215
	Nov	12	-	-	-	12
	Dec	-	-	-	-	-
1988	Total	605,367	18,619	193,381	7,227	824,594
	Mar	48,766		21,582	4	70,352
	Apr	147,839		27,181	1,518	186,538
	May	246,852		65,160	2,481	314,493
	Jun	169,526		32,995	744	203,265
	Jul	33,120	n/a	104	633	33,857
	Aug	21,155		5,212	198	26,565
	Sep	9,224		9,111	181	18,516
	Oct	9,885		13,709	36	23,630
	Nov	-		-	-	-
	Dec	-		-	-	-
	Total	686,367	15,531	185,054	5,795	877,216[1]
1989	Mar	62,927		23,117	106	86,150
	Apr	164,296		27,953	1,345	193,594
	May	300,524		61,764	4,912	376,200
	Jun	235,779	n/a	59,079	5,124	299,982
	Jul	31,670		187	-	31,857
	Aug	6,533		9,581	-	16,114
	Sep	22,705		5,086	-	27,791
	Oct	-		65	-	65
	Nov	-		-	-	-
	Dec	-		-	-	-
	Total	824,434	16,612	186,832	11,487	1,022,753[1]

[1]Excluding the Faroes.

Table 8.1.2 (cont'd)

Table 8.1.2 (cont'd)

Year	Month	Denmark	Faroes	Norway	Scotland	Total[1]
1990	Mar	24,700		11,542	-	36,242
	Apr	94,670		13,673	906	109,249
	May	181,582		35,394	2,184	219,160
	Jun	121,981	n/a	6,660	797	129,438
	Jul	17,307		1,101	-	18,408
	Aug	48,992		17,519	-	66,511
	Sep	6,793		2,541	-	9,334
	Oct	-		474	-	474
	Nov	-		-	-	-
	Total	496,025	2,230	88,904	3,887	588,816[1]
1991	Mar	23,454		7,349	-	30,803
	Apr	78,374		12,582	30	90,986
	May	204,894	n/a	50,110	1,124	256,519
	Jun	217,334		13,176	-	230,509
	Jul	129,548		8,267	-	137,815
	Aug	43,024		16,955	-	59,979
	Sep	4,801		16,153	-	20,955
	Oct	-		4,242	-	4,242
	Nov	-		-	-	-
	Total	701,429		128,834	1,154	831,808[1]
1992	Mar	22,686		3,490	392	26,269
	Apr	148,866		10,998	2,975	160,256
	May	242,170		29,149	1,469	274,294
	Jun	265,879		44,197	-	311,545
	Jul	64,910	n/a	1,464	-	66,374
	Aug	6,574		-	-	6,574
	Sep	1		-	-	1
	Oct	16		-	-	16
	Nov	-		-	-	-
	Dec	-		-	-	-
	Total	751,102	9,139	89,298	4,836	854,462
1993	Mar	18,374		8,006	0	26,830
	Apr	49,794		22,169	0	71,963
	May	134,695		19,213	0	153,908
	Jun	186,936		17,242	204	204,382
	Jul	56,049		2,883	0	58,932
	Aug	10,552		8,017	0	18,569
	Sep	4,474		6,421	0	10,895
	Oct	13,145		9,392	0	22,537
	Nov	8,163		2,150	0	10,313
	Total	482,182		95,463	204	577,869

[1]Excluding the Faroes.

Table 8.1.3 Monthly landings of sandeels from each area in Figure 8.1.1, 1990–1993.

Month	1A	1B	1C	2A	2B	2C	3	4	5	6	Shetland
1990											
Mar	1,556	368	119	230	33,271	136	529	-	-	18	286
Apr	37,364	167	-	37,794	23,175	56	6,379	2,049	51	1,909	1,450
May	85,255	147	-	18,544	39,329	-	18,343	11,555	3,185	41,163	608
Jun	15,337	418	-	7,992	13,574	-	12,728	28,437	10,564	39,688	-
Jul	1,478	218	-	2,934	3,590	8	4,926	3,440	-	1,814	-
Aug	429	43	-	10,987	40,325	370	13,678	-	-	679	-
Sep	-	-	-	1,931	2,686	-	4,440	-	-	277	-
Oct	-	-	-	-	474	-	-	-	-	-	-
Nov	-	-	-	-	-	-	-	-	-	-	-
Total	141,419	1,361	119	80,412	156,424	570	61,023	45,481	13,800	85,548	2,344
1991											
Mar	902	494	-	1,582	26,528	737	548	-	4	8	-
Apr	8,443	356	680	27,611	34,413	418	18,032	138	-	892	3
May	86,975	4,631	-	9,615	106,294	615	39,939	4,038	660	3,144	-
Jun	91,485	1,005	-	26,522	12,671	-	34,263	10,261	115	54,187	-
Jul	30,976	411	-	43,619	15,253	-	13,174	8,195	215	25,972	-
Aug	4,624	223	-	4,631	37,052	-	4,567	-	-	8,882	-
Sep	4,789	-	-	391	15,762	-	13	-	-	-	-
Oct	-	-	-	-	4,242	-	-	-	-	-	-
Nov	-	-	-	-	-	-	-	-	-	-	-
Total	228,194	7,120	680	113,971	252,215	1,320	110,596	22,632	993	93,086	3
1992											
Mar	3,900	30	653	10,778	8,480	92	1,619	-	-	717	-
Apr	70,224	403	828	35,672	20,817	-	28,568	1,539	-	2,204	-
May	111,120	760	85	94,723	27,301	3	24,752	488	167	14,875	-
Jun	218,335	2,574	2,030	17,870	9,406	108	22,712	10,291	1,712	26,507	-
Jul	18,802	180	622	9,711	1,070	68	18,128	7,771	935	9,087	-
Aug	-	-	-	162	10	-	5,416	-	-	986	-
Sep	-	-	-	-	-	-	-	-	-	1	-
Oct	-	-	-	-	-	-	-	-	-	7	-
Nov	-	-	-	-	-	-	-	-	-	-	-
	422,381	3,948	4,218	168,916	67,083	271	101,204	20,089	2,834	54,381	
1993											
Mar	222	131	0	0	25,069	0	928	30	0	0	0
Apr	14,927	11,121	0	2,287	38,170	0	4,496	747	55	160	0
May	47,453	1,490	0	7,546	35,118	0	34,186	17,192	685	10,238	0
Jun	125,991	3,038	23	7,550	21,544	148	13,509	5,018	1,879	25,682	0
Jul	7,942	4,494	65	6,894	18,563	116	6,871	3,608	1,258	9,121	0
Aug	0	1,573	0	703	7,863	0	5,744	0	0	2,686	0
Sept	0	0	0	186	7,127	0	3,501	0	0	81	0
Oct	0	0	0	899	9,296	0	11,807	0	0	535	0
Nov	0	20	0	112	2,150	0	7,803	0	0	228	0
Total	196,535	21,867	88	26,177	164,900	264	88,845	26,595	3,877	48,731	0

Table 8.1.4 Annual landings ('000 t) of Sandeels by area of the North Sea [Denmark, Norway and UK (Scotland)]. (Data provided by Working Group members)(Figure 8.1.1).

	Area											Assessment areas[1]	
Year	1A	1B	1C	2A	2B	2C	3	4	5	6	Shetland	Northern	Southern
1972	98.8	28.1	3.9	24.5	85.1	0.0	13.5	58.3	6.7	28.0	0.0	130.6	216.3
1973	59.3	37.1	1.2	16.4	60.6	0.0	8.7	37.4	9.6	59.7	0.0	107.6	182.4
1974	50.4	178.0	1.7	2.2	177.9	0.0	29.0	27.4	11.7	25.4	7.4	386.6	117.1
1975	70.0	38.2	17.8	12.2	154.7	4.8	38.2	42.8	12.3	19.2	12.9	253.7	156.5
1976	154.0	3.5	39.7	71.8	38.5	3.1	50.2	59.2	8.9	36.7	20.2	135.0	330.6
1977	171.9	34.0	62.0	154.1	179.7	1.3	71.4	28.0	13.0	25.3	21.5	348.4	392.3
1978	159.7	50.2		346.5	70.3		42.5	37.4	6.4	27.2	28.1	163.0	577.2
1979	194.5	0.9	61.0	32.3	27.0	72.3	34.1	79.4	5.4	44.3	13.4	195.3	355.9
1980	215.1	3.3	119.3	89.5	52.4	27.0	90.0	30.8	8.7	57.1	25.4	292.0	401.2
1981	105.2	0.1	42.8	151.9	11.7	23.9	59.6	63.4	13.3	45.1	46.7	138.1	378.9
1982	189.8	5.4	4.4	132.1	24.9	2.3	37.4	75.7	6.9	74.7	52.0	74.4	479.2
1983	197.4	-	2.8	59.4	17.7	-	57.7	87.6	8.0	66.0	37.0	78.2	419.0
1984	337.8	4.1	5.9	74.9	30.4	0.1	51.3	56.0	3.9	60.2	32.6	91.8	532.8
1985	281.4	46.9	2.8	82.3	7.1	0.1	29.9	46.6	18.7	84.5	17.2	79.7	513.5
1986	295.2	35.7	8.5	55.3	244.1	2.0	84.8	22.5	4.0	80.3	14.0	375.1	457.4
1987	275.1	63.6	1.1	53.5	325.2	0.4	5.6	21.4	7.7	45.1	7.2	395.9	402.8
1988	291.1	58.4	2.0	47.0	256.5	0.3	37.6	35.3	12.0	102.2	4.7	384.8	487.6
1989	228.3	31.0	0.5	167.9	334.1	1.5	125.3	30.5	4.5	95.1	3.5	492.4	526.3
1990	141.4	1.4	0.1	80.4	156.4	0.6	61.0	45.5	13.8	85.5	2.3	219.5	366.7
1991	228.2	7.1	0.7	114.0	252.8	1.8	110.5	22.6	1.0	93.1	+	372.9	458.9
1992	422.4	3.9	4.2	168.9	67.1	0.3	101.2	20.1	2.8	54.4	0	176.7	668.6
1993	196.5	21.9	0.1	26.2	164.9	0.3	88.0	26.6	3.9	48.7	0	276.0	301.9

[1]Assessment areas: Northern - Areas 1B, 1C, 2B, 2C, 3.
Southern - Areas 1A, 2A, 4, 5, 6.

Table 8.2.1.1 Sandeel Northern North Sea. Danish CPUE data.

Year	Vessel size (GRT)						
	5-50	50-100	100-150	150-200	200-250	250-300	>300
	First half year						
1982	11.2	17.2	31.8	26.7	47.6	40.8	25.8
1983	11.1	17.1	23.6	23.9	31.6	36.4	41.3
1984	14.6	24.8	33.4	32.1	44.4	55.5	19.7
1985	12.1	17.2	35.7	51.2	57.9	67.2	55.8
1986	21.0	32.0	45.5	50.2	63.9	57.4	71.8
1987	23.7	37.8	67.0	66.5	78.6	79.9	113.0
1988	19.0	25.6	34.4	42.5	48.0	47.8	75.3
1989	16.3	25.2	36.7	41.0	49.6	51.4	76.2
1990	14.5	21.6	27.3	27.8	29.5	27.4	39.7
1991	16.7	25.5	38.4	42.5	47.6	47.5	72.2
1992	16.6	24.6	36.3	34.7	60.6	46.9	76.9
1993	14.9	19.3	33.5	36.6	46.8	51.0	51.9
	Second half year						
1982	-	17.7	33.6	46.7	19.9	-	-
1983	17.9	25.7	31.0	32.9	44.5	34.3	57.1
1984	113.2	22.0	21.5	35.2	-	28.3	24.0
1985	21.6	23.5	25.8	39.6	60.7	33.3	-
1986	17.1	27.5	50.2	50.0	77.9	74.0	80.7
1987	21.3	31.8	23.9	24.3	42.6	25.4	46.3
1988	16.8	21.3	30.0	32.4	38.0	33.1	43.9
1989	16.6	22.3	23.6	27.3	28.3	35.6	25.0
1990	17.6	32.5	29.4	34.1	40.4	32.6	53.3
1991	15.1	26.3	40.8	44.8	54.4	51.3	72.5
1992	20.4	25.4	35.2	38.2	53.6	50.9	52.1
1993	18.5	21.4	26.5	27.5	38.8	47.9	59.0

Table 8.2.1.2 Sandeel northern North Sea. Norwegian effort data.

Year	Fishing days		Mean gross register tonnage (GRT)	
	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
1976	595	-	198.8	-
1977	2,212	457	172.3	184.9
1978	1,747	806	203.4	203.7
1979	1,407	1,720	213.8	188.9
1980	2,642	1,099	215.5	210.3
1981	1,740	404	216.6	190.9
1982	1,206	-	209.1	-
1983	304	66	254.6	191.1
1984	145	-	182.6	-
1985	366	-	219.5	-
1986	1,562	567	201.1	187.4
1987	2,123	1,584	218.8	200.9
1988	3,571	925	203.3	198.2
1989	4,292	588	192.3	202.1
1990	2,275	683	207.9	185.6
1991	1,749	958	199.7	194.1
1992	1,202	23	204.5	212.7
1993[1]	1,451	744	257.7	232.3

[1]Estimated (see text).

Table 8.2.1.3 Fishing effort indices for SANDEEL in the Northern North Sea (days fishing multiplied by scaling factors for each vessel category to represent days fishing for a vessel of 200 GRT)

Year	Norwegian			Danish		Mean CPUE (t/day)	Total Intnat. catch ('000 t)	Derived Intnat. effort ('000 days)
	Standardized fishing days	Catch sampled for fishing effort ('000 t)	CPUE (t/day)	Catch sampled for fishing effort ('000 t)	CPUE (t/day)			
				First half of year				
1976	593	11.1	18.7	-	-	18.7	110.3	5.9
1977	2,061	50.4	24.4	-	-	24.5	276.0	11.2
1978	1,761	44.9	25.5	-	-	25.5	109.7	4.3
1979	1,451	29.6	20.4	-	-	20.4	47.7	2.3
1980	2,733	112.8	41.3	-	-	41.3	220.9	5.4
1981	1,804	42.8	23.7	-	-	23.7	93.3	3.9
1982	1,231	26.9	21.9	13.5	34.9	26.2	62.3	2.4
1983	338	8.7	25.7	17.4	28.9	27.8	54.5	2.0
1984	139	3.5	25.2	54.1	41.2	40.2	74.1	1.8
1985	382	8.7	22.8	47.4	46.7	43.0	69.9	1.6
1986	1,565	60.4	38.6	154.1	54.7	50.2	221.3	4.4
1987	2,212	122.9	55.6	213.2	72.5	66.3	360.9	5.4
1988	3,598	143.8	40.0	158.1	45.1	42.7	332.0	7.8
1989	4,214	146.9	34.9	267.3	45.9	42.0	435.2	10.4
1990	2,316	58.6	25.3	94.9	28.8	27.5	148.7	5.4
1991	1,748	67.7	38.7	210.6	45.0	43.5	282.2	6.5
1992	1,214	53.7	44.2	124.0	42.4	42.9	151.2	3.5
1993	1,495[1]	70.7	47.3	133.8	39.3	42.1	189.0	4.5
				Second half of year				
1976	108	2.0	18.5	-	-	18.5	44.9	2.4
1977	445	11.8	26.5	-	-	26.5	110.0	4.2
1978	811	22.5	27.6	-	-	27.8	53.3	1.9
1979	1,688	52.2	30.9	-	-	30.9	147.7	4.8
1980	1,117	33.1	29.6	-	-	29.5	71.1	2.4
1981	398	7.9	19.6	-	-	19.9	44.9	2.3
1982	-	-	-	1.8	32.3	33.0	12.0	0.4
1983	65	2.4	36.9	12.3	36.6	37.3	23.7	0.6
1984	-	-	-	10.7	29.6	30.2	17.7	0.6
1985	-	-	-	16.4	38.0	38.8	16.8	0.4
1986	555	21.8	39.3	96.1	60.2	57.4	153.8	2.7
1987	1,586	68.1	42.9	5.5	30.8	42.1	76.9	1.8
1988	922	26.9	29.2	41.5	32.4	31.6	71.4	2.3
1989	590	11.5	19.5	44.9	26.1	25.2	57.2	2.3
1990	667	22.8	34.2	65.8	35.7	35.9	70.8	2.0
1991	949	30.3	31.9	96.0	46.5	43.8	90.7	2.1
1992	23	1.5	64.0	48.0	41.5	42.2	25.5	0.6
1993	728[1]	30.7	42.2	59.4	36.6	38.5	87.0	2.3

[1]Estimated.

Table 8.2.1.4 Standard CPUE for a vessel of 200 GRT calculated from the data given in Table 8.2.1.1.

Northern North Sea

Half-year		R-square	a	b	CPUE
1987	I	0.97	4.108	0.5417	72.5
	II	0.40	11.070	0.1973	31.5
1988	I	0.96	3.837	0.4650	45.1
	II	0.94	5.482	0.3394	33.1
1989	I	0.99	2.817	0.5267	45.9
	II	0.67	9.197	0.2014	26.7
1990	I	0.94	5.421	0.3150	28.8
	II	0.84	6.650	0.3215	36.5
1991	I	0.98	3.302	0.4981	45.0
	II	0.98	2.656	0.5444	47.5
1992	I	0.92	3.036	0.5075	44.7
	II	0.91	5.709	0.3785	42.4
1993	I	0.93	2.810	0.4983	39.4
	II	0.85	4.087	0.4132	36.5

Table 8.2.2.1 Sandeels in the northern North Sea. Catch in numbers, half-year (millions).

Age group	1977		1978		1979		1980		1981	
	1	2	1	2	1	2	1	2	1	2
0	3,686	3,067	-	7,820	-	44,203	17	8,349	17	9,128
1	24,307	2,856	6,127	1,001	2,335	1,310	13,394	1,173	5,505	346
2	2,351	913	2,338	307	1,328	433	8,865	214	4,109	94
3	516	142	573	39	242	66	1,050	19	904	14
4	124	99	78	1	5	10	645	4	128	6
5+	20	43	66	1	7	-	183	4	46	-

Age group	1982		1983		1984		1985		1986	
	1	2	1	2	1	2	1	2	1	2
0	2	6,530	-	7,911	-	-	1	349	7	7,105
1	3,518	65	5,684	303	11,692	1,207	2,688	109	23,934	7,077
2	2,132	-	1,215	316	1,647	121	3,292	239	2,600	473
3	556	-	89	19	153	43	1,002	89	200	-
4	76	-	8	-	5	-	377	7	-	-
5+	9	-	4	-	-	-	103	4	-	-

Age group	1987		1988		1989		1990[1]		1991	
	1	2	1	2	1	2	1	2	1	2
0	-	455	2,453	13,196	6,163	3,380	1,599	18,293	-	13,616
1	26,236	5,768	9,855	1,283	57,002	4,038	10,551	-	41,855	866
2	10,855	198	25,922	340	2,233	274	1,481	-	2,342	28
3	350	-	1,319	119	3,406	-	232	-	908	8
4	107	-	26	17	-	-	-	-	225	3
5+	48	-	-	-	-	-	-	-	93	-

Age group	1992		1993	
	1	2	1	2
0	137	6,797	-	26,960
1	9,871	48	15,768	1,004
2	4,056	3	2,635	112
3	486	-	1,023	34
4	195	-	207	8
5+	110	-	439	14

[1]Based on Norwegian data only.
Note: 1 = Jan-Jun.
2 = Jul-Dec.

Table 8.2.3.1 SANDEEL North Sea. Northern area. Mean weight at age (g) in the catch for 1991 (revised), 1992 and 1993. Data from Denmark and Norway.

1991	Half-year	
Age	1	2
0	2.87	3.42
1	7.43	9.57
2	14.23	14.99
3	22.40	16.20
4	29.93	-
5+	33.15	-
1992		
Age	1	2
0	-	5.48
1	5.45	18.03
2	10.86	25.40
3	18.49	21.56
4	25.28	39.33
5+	38.15	-
1993		
Age	1	2
0	0.92	2.71
1	5.97	10.37
2	20.62	19.22
3	24.92	20.28
4	19.65	20.27
5 +	23.31	22.00

Table 8.2.4.1 SANDEEL Natural Mortality Coefficients.

Age	I	II
0		0.8
1	1.0	0.2
2	0.4	0.2
3	0.4	0.2
4	0.4	0.2
5	0.4	0.2
6	0.4	0.2
7 +	0.4	0.2

Table 8.2.4.2 SANDEEL, Proportion mature at age.

Age	
0	0
1	0
2	1
3	1
4	1
5	1
6	1
7 +	1

Table 8.2.4.3 VPA: Weighting factor for catchabilities (*100)

All years			
Season		1	2
Age	Fleet		
0	1	20	2
1	1	100	10
2	1	100	10
3	1	100	10
4	1	20	2
5	1	20	2
6	1	20	2

Table 8.2.4.4 Survivors Analysis of Sandeel Northern North Sea.

```
 The following parameters were used:

Year range: 1982 - 1993
Seasons per year:    2
The last season in the last year is season : 2
Youngest age:  0; Oldest age:  4; (Plus age:  5)
Recruitment in season: 2
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Commercial fishery

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 2
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   0
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum5.hyr
 Weight in catch:        weca.hyr
 Weight in stock:        west.hyr
 Natural mortalities:    natmor.hyr
 Maturity ogive:         matprop.hyr
 Tuning data (CPUE):     tuning5.xsa
 Weighting for rhats:    tweq.xsa
 Weighting for shats:    twred.xsa
 Unknown catches:        uc5.90


 Stock numbers (at start of season)
 **********************************
```

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	104188.	*	104554.	*	47306.	*	265642.	*	439666.	*	90696.
1	20999.	5591.	42438.	12164.	41676.	8240.	21256.	6189.	119127.	29308.	192792.	55011.
2	3206.	404.	4519.	2034.	9685.	5144.	5654.	1095.	4969.	1202.	17592.	2905.
3	1056.	252.	331.	149.	1380.	800.	4102.	1930.	680.	292.	556.	86.
4	269.	118.	207.	132.	105.	66.	616.	104.	1499.	1005.	239.	73.
5+	11.	0.	97.	61.	158.	106.	141.	10.	84.	56.	869.	543.
SSN	4542.		5153.		11328.		10514.		7232.		19256.	
SSB	106147.		111303.		196334.		211459.		142076.		330422.	
TSN	25541.	110553.	47590.	119095.	53004.	61663.	31770.	274971.	126359.	471529.	212048.	149314.
TSB	242639.	311269.	387147.	444833.	404716.	324768.	317740.	681153.	737710.	1282626.	1294382.	898612.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	326911.	*	82981.	*	242417.	*	95706.	*	141732.	*	496291.
1	40447.	8902.	138045.	16210.	35020.	7237.	99016.	11039.	33877.	6475.	59128.	12188.
2	39820.	5469.	6128.	2279.	9618.	2302.	5037.	1459.	8255.	2213.	5258.	1367.
3	2199.	394.	4170.	7.	1618.	448.	1637.	354.	1169.	386.	1809.	375.
4	71.	26.	215.	144.	6.	2.	293.	12.	283.	30.	316.	42.
5+	504.	338.	283.	189.	273.	183.	151.	25.	28.	0.	24.	0.
SSN	42594.		10796.		11515.		7118.		9734.		7407.	
SSB	708587.		213690.		201903.		133355.		169244.		137510.	
TSN	83041.	342041.	148841.	101811.	46535.	252589.	106134.	108596.	43611.	150835.	66535.	510263.
TSB	910824.	894330.	903915.	411528.	377002.	634950.	628433.	359813.	338627.	415738.	433150.	1172894.

```
 Catch in numbers for fleet:  1
Commercial fishery
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continued...

Table 8.2.4.4 (continued)

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	6530.	*	7911.	*	0.	*	349.	*	7105.	*	455.
1	3518.	65.	5684.	303.	11692.	1207.	2688.	109.	23934.	7077.	26236.	5768.
2	2132.	0.	1215.	316.	1647.	121.	3292.	239.	2600.	473.	10855.	198.
3	556.	0.	89.	19.	153.	43.	1002.	89.	200.	0.	350.	0.
4	76.	0.	8.	0.	5.	0.	377.	7.	0.	0.	107.	0.
5+	9.	0.	4.	0.	0.	0.	103.	4.	0.	0.	48.	0.
SOP	66478.	20646.	50871.	37464.	91792.	20871.	106277.	12946.	174378.	128325.	305979.	83202.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	13196.	*	3380.	*	14783.	*	13616.	*	6797.	*	26960.
1	9855.	1283.	57002.	4038.	9308.	982.	41855.	866.	9871.	48.	15768.	1004.
2	25922.	340.	2233.	274.	5063.	274.	2342.	28.	4056.	3.	2635.	112.
3	1319.	119.	3406.	0.	778.	82.	908.	8.	486.	0.	1023.	34.
4	26.	17.	0.	0.	3.	0.	225.	3.	195.	0.	207.	8.
5+	0.	0.	0.	0.	0.	0.	93.	0.	110.	0.	439.	14.
SOP	430970.	71479.	440192.	57222.	139923.	68367.	374466.	55404.	115957.	38189.	188262.	86785.

Partial fishing mortality for fleet: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.095	*	.115	*	.000	*	.002	*	.024	*	.007
1	.296	.013	.231	.028	.538	.175	.217	.020	.363	.305	.235	.122
2	1.272	.000	.383	.187	.228	.026	1.039	.272	.891	.547	1.133	.078
3	.900	.000	.383	.151	.143	.060	.342	.052	.426	.000	1.168	.000
4	.406	.000	.048	.000	.053	.000	1.118	.077	.000	.000	.720	.000
5+	1.807	*	.051	.000	.000	.000	1.476	.533	.000	.000	.069	.000
F (1- 2)	.784	.006	.307	.107	.383	.101	.628	.146	.627	.426	.684	.100

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.060	*	.061	*	.092	*	.226	*	.072	*	.082
1	.454	.172	.879	.316	.504	.161	.908	.090	.563	.008	.506	.095
2	1.230	.071	.553	.142	.899	.140	.758	.021	.817	.001	.839	.094
3	1.086	.396	1.799	.000	.793	.223	.968	.025	.654	.000	.996	.105
4	.560	1.097	.000	.000	.793	.223	1.617	.320	1.349	.000	1.242	.231
5+	.000	.000	.000	.000	.000	.000	1.131	.000	*	*	*	*
F (1- 2)	.842	.121	.716	.229	.701	.150	.833	.056	.690	.005	.673	.095

Log inverse catchabilities, fleet no: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	3.339	*	3.339	*	*	*	3.339	*	3.339	*	3.339
1	2.230	2.778	2.230	2.778	2.230	2.778	2.230	2.778	2.230	2.778	2.230	2.778
2	1.651	*	1.651	2.920	1.651	2.920	1.651	2.920	1.651	2.920	1.651	2.920
3	1.776	*	1.776	2.453	1.776	2.453	1.776	2.453	1.776	*	1.776	*
4	1.776	*	1.776	*	1.776	*	1.776	2.453	*	*	1.776	*

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	3.339	*	3.339	*	3.339	*	3.339	*	3.339	*	3.339
1	2.230	2.778	2.230	2.778	2.230	2.778	2.230	2.778	2.230	2.778	2.230	2.778
2	1.651	2.920	1.651	2.920	1.651	2.920	1.651	2.920	1.651	2.920	1.651	2.920
3	1.776	2.453	1.776	*	1.776	2.453	1.776	2.453	1.776	*	1.776	2.453
4	1.776	2.453	*	*	1.776	2.453	1.776	2.453	1.776	*	1.776	2.453

Log residual stocknr. (nhat/n), fleet no: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												

continued...

Table 8.2.4.4 (continued)

0	*	1.897	*	1.688	*	*	*	-2.005	*	-1.396	*	-2.167
1	.137	-.655	.072	-.292	1.022	1.547	.233	-.237	-.264	.598	-.904	.090
2	1.016	*	-.002	1.752	-.417	-.211	1.219	2.535	.054	1.324	.089	-.219
3	.795	*	.124	1.074	-.756	.158	.234	.416	-.559	*	.245	*
4	.000	*	-1.953	*	-1.740	*	1.418	.801	*	*	-.239	*

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	-.306	*	-.296	*	.260	*	1.110	*	1.215	*	.000
1	-.613	.185	-.247	.794	-.142	.260	.261	-.368	.403	-1.513	.044	-.408
2	-.196	-.559	-1.290	.132	-.142	.260	-.498	-1.667	.196	-3.073	-.028	-.273
3	-.195	.694	.015	*	-.142	.260	-.128	-1.968	.098	*	.268	-.633
4	-.857	1.713	*	*	-.142	.260	.385	.573	.823	*	.489	.157

Table 8.3.1.1 Sandeel. Southern North Sea. Danish CPUE data.

Year	Vessel size (GRT)						
	5-50	50-100	100-150	150-200	200-250	250-300	>300
				First half year			
1982	16.1	26.9	43.1	47.2	59.2	53/2	59.6
1983	17.0	20.6	36.3	44.4	49.1	51.2	50.9
1984	19.9	26.3	42.6	50.4	60.9	56.4	60.1
1985	13.8	21.2	35.5	43.4	49.8	49.1	56.3
1986	23.2	31.4	41.1	49.8	58.9	58.4	69.4
1987	23.9	33.9	53.9	67.4	76.1	76.4	115.5
1988	19.2	26.8	42.9	52.3	60.0	56.6	82.8
1989	19.4	24.5	43.3	52.3	58.9	55.2	74.3
1990	20.0	20.8	30.4	33.7	39.8	35.7	49.1
1991	27.0	30.0	49.5	50.3	62.8	60.7	92.8
1992	18.4	23.4	53.1	63.2	83.8	82.4	115.9
1993	17.2	18.1	38.1	40.2	58.6	60.9	89.5
				Second half year			
1982	-	20.3	37.5	40.5	-	27.9	-
1983	15.1	21.3	25.1	32.4	45.4	34.0	34.7
1984	12.7	16.4	26.9	34.2	36.5	40.2	40.9
1985	13.2	19.5	26.0	35.8	36.2	38.2	39.4
1986	18.4	25.2	32.5	44.5	45.8	51.8	55.5
1987	16.2	22.6	41.4	45.8	49.3	45.6	75.4
1988	18.8	29.3	29.9	31.1	38.6	31.1	44.0
1989	26.7	26.2	27.0	38.3	38.0	29.3	40.4
1990	27.9	32.8	36.4	41.3	48.3	45.2	42.7
1991	21.4	26.8	41.8	49.4	65.1	53.7	98.3
1992	21.3	28.7	36.7	42.6	44.8	39.1	58.3
1993	20.2	22.7	30.8	35.6	45.3	39.3	51.8

Table 8.3.1.2 SANDEEL Southern North Sea.
Standardized CPUE, based on Danish data. (Revised)

Year	Half-year	CPUE (t/day)	Total international ('000 t)	Total Int'l fishing effort ('000 days) Half-year
1982	1	48.2	426.5	8.9
	2	35.7	52.6	1.5
1983	1	42.8	359.8	8.4
	2	33.9	59.3	1.8
1984	1	50.5	461.1	9.1
	2	32.9	71.1	2.2
1985	1	41.9	417.1	10.0
	2	33.6	110.6	3.3
1986	1	53.7	386.4	7.2
	2	44.1	75.5	1.7
1987	1	69.1	297.7	4.3
	2	45.7	105.1	2.3
1988	1	52.7	462.0	8.8
	2	33.8	33.4	1.0
1989	1	50.7	506.1	10.0
	2	33.4	18.5	0.6
1990	1	35.1	341.7	9.7
	2	41.2	24.0	0.6
1991	1	57.2	326.6	5.7
	2	54.4	132.3	2.4
1992	1	67.2	621.1	9.2
	2	41.5	73.0	1.8
1993	1	49.0	267.7	5.5
	2	37.7	34.2	0.9

Table 8.3.1.3 Standard CPUE for a vessel of 200 GRT calculated from the data given in Table 8.3.1.1

Southern North Sea

Half-year		R-square	a	b	CPUE
1987	I	0.97	3.678	0.5536	69.1
	II	0.94	2.825	0.5256	45.7
1988	I	0.97	3.387	0.5181	52.7
	II	0.86	8.559	0.2593	33.8
1989	I	0.94	3.622	0.4983	50.7
	II	0.51	15.501	0.1448	33.4
1990	I	0.88	6.272	0.3249	35.1
	II	0.83	15.413	0.1855	41.2
1991	I	0.90	5.896	o.4290	57.2
	II	0.92	3.496	0.5182	54.4
1992	I	0.93	1.687	0.6956	67.2
	II	0.93	7.294	0.3283	41.5
1993	I	0.90	1.874	0.6159	49.0
	II	0.91	5.970	0.3476	37.7

Table 8.3.2.1 SANDEELS in the Southern North Sea. Catch in numbers, half-year (millions)

Age groups	1976		1977		1978		1979		1980		1981		1982	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	4	-	-	13,263	922	41,224	181	1,947	62	72	415	43,420	242	5,039
1	16,308	249	19,500	269	58,839	2,774	16,018	5,210	33,269	4,738	13,394	407	56,545	4,718
2	14,505	2,358	5,596	27	16,948	385	22,737	2,085	12,472	840	11,719	1,892	6,224	490
3	1,522	392	6,300	8	1,793	124	4,487	138	3,794	575	2,466	115	3,277	344
4	1,234	102	965	8	1,006	97	1,265	110	375	9	774	36	1,813	36
5	171	20	445	3	114	26	441	30	63	-	353	3	94	4
6	72	58	239	3	21	26	244	-	50	-	84	-	24	-
7+	1	16	159	-	39	9	35	-	+	-	21	-	8	-

Age groups	1983		1984		1985		1986		1987		1988		1989	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	955	9,298	20	-	6,573	11,940	-	112	-	298	1,420	-	29	1
1	2,232	240	62,517	9,423	7,790	1,896	43,629	5,350	4,351	3,095	2,349	-	44,444	1,619
2	35,029	2,806	2,257	92	39,301	3,229	7,333	293	22,771	6,664	10,074	234	405	165
3	934	513	13,272	577	2,490	2,234	1,604	241	1,158	196	17,914	2,084	957	35
4	234	2	267	44	233	163	30	9	141	45	1,920	63	3,350	122
5	122	-	109	-	18	77	-	9	24	6	617	5	18	1
6	25	-	66	-	7	30	-	-	-	-	146	-	-	-
7+	6	-	-	-	7	28	-	-	-	-	86	-	-	-

Age groups	1990		1991		1992		1993	
	1	2	1	2	1	2	1	2
0			-	12,115	2	134	-	838
1			20,058	11,411	60,337	3,903	3,581	1,037
2			9,224	344	10,021	382	14,659	953
3			1,320	111	1,002	157	3,707	266
4			454	-	427	25	451	60
5+			-	-	69	2	375	17
6					103	5	186	10
7+					22	2		

Note: 1 = January–June
2 = July–December

Table 8.3.3.1 SANDEEL, North Sea. Southern area. Mean weight at age (g) in the catch for 1993.

1993	Half-year	
Age	1	2
0	-	3.08
1	6.08	10.13
2	11.54	15.66
3	15.09	17.04
4	19.18	21.84
5	20.02	22.43
6	22.46	23.10
7 +	23.63	21.89

Table 8.3.4.1 Survivors Analysis of Sandeel Southern North Sea

```
 The following parameters were used:

Year range: 1982 - 1993
Seasons per year:    2
The last season in the last year is season : 2
Youngest age:  0; Oldest age:  5; (Plus age:  6)
Recruitment in season: 2
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Commercial fishery

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 2
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   0
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum6.hyr
 Weight in catch:        weca6.hyr
 Weight in stock:        west.hyr
 Natural mortalities:    natmor.hyr
 Maturity ogive:         matprop.hyr
 Tuning data (CPUE):     tuning6.xsa
 Weighting for rhats:    tweq.xsa
 Weighting for shats:    twred.xsa
 Unknown catches:        uc6.90


 Stock numbers (at start of season)
 **********************************
```

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	134313.	*	784454.	*	197277.	*	1162245.	*	171184.	*	119436.
1	386279.	107808.	56973.	19605.	346245.	89458.	88642.	27885.	514227.	162711.	76843.	25630.
2	14266.	4467.	83997.	27625.	15834.	8766.	64716.	11204.	21115.	8150.	128376.	67410.
3	6472.	1655.	3214.	1390.	20079.	2593.	7094.	2717.	6251.	2877.	6407.	3347.
4	3223.	676.	1044.	508.	674.	233.	1601.	882.	203.	111.	2137.	1317.
5	283.	112.	521.	249.	414.	188.	151.	86.	575.	385.	83.	36.
6+	39.	0.	88.	34.	232.	102.	238.	148.	70.	47.	345.	232.
SSN	24283.		88864.		37233.		73800.		28213.		137349.	
SSB	343129.		1130843.		534430.		955731.		377432.		1751400.	
TSN	410562.	249031.	145837.	833866.	383478.	298617.	162442.	1205167.	542440.	345466.	214192.	217407.
TSB	1888246.	1372127.	1358734.	1416186.	1919411.	1313866.	1310301.	1679782.	2434340.	2053675.	2058772.	1419927.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	406215.	*	206404.	*	419327.	*	800201.	*	116921.	*	621115.
1	53466.	18244.	182524.	40190.	92743.	25214.	187871.	56948.	351432.	92689.	52446.	17122.
2	18184.	3941.	14937.	6308.	31440.	8099.	19510.	5526.	36300.	16128.	72355.	36499.
3	49160.	18286.	3015.	1237.	5015.	1383.	6282.	3130.	4213.	2004.	12859.	5585.
4	2563.	146.	13086.	6029.	981.	324.	1000.	299.	2462.	1301.	1499.	635.
5	1038.	190.	63.	27.	4826.	1594.	249.	167.	245.	108.	1043.	392.
6+	214.	0.	151.	102.	104.	70.	1283.	860.	841.	461.	457.	154.
SSN	71158.		31252.		42367.		28324.		44061.		88213.	
SSB	1060655.		473423.		587111.		391172.		585925.		1161187.	
TSN	124624.	447024.	213776.	260298.	135110.	456012.	216196.	867131.	395493.	229611.	140659.	681503.
TSB	1274520.	970502.	1203520.	855041.	958083.	861325.	1142657.	1556323.	1991655.	1386848.	1370972.	1430247.

continued...

Table 8.3.4.1 (continued)

Catch in numbers for fleet: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	5039.	*	9298.	*	0.	*	11940.	*	112.	*	298.
1	56545.	4718.	2232.	240.	62517.	9423.	7790.	1896.	43629.	5350.	4351.	3095.
2	6224.	490.	35029.	2806.	2257.	92.	39301.	3229.	7333.	293.	22771.	6664.
3	3277.	344.	934.	513.	13272.	577.	2490.	2234.	1604.	241.	1158.	196.
4	1813.	36.	234.	2.	267.	44.	233.	163.	30.	9.	141.	45.
5	94.	4.	122.	0.	109.	0.	18.	77.	0.	9.	24.	6.
6+	32.	0.	31.	0.	66.	0.	14.	58.	0.	0.	0.	0.
SOP	450381.	58421.	380559.	61745.	556795.	80581.	472950.	113782.	335960.	47286.	296759.	105111.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	0.	*	1.	*	812.	*	12115.	*	134.	*	838.
1	2349.	0.	44444.	1619.	14680.	1253.	20058.	11411.	60337.	3903.	3581.	1037.
2	10074.	234.	4525.	165.	15849.	385.	9224.	344.	10021.	382.	14659.	953.
3	17914.	2084.	957.	35.	2416.	146.	1320.	111.	1002.	157.	3707.	266.
4	1920.	63.	3350.	122.	408.	18.	454.	0.	427.	25.	451.	60.
5	617.	5.	18.	1.	2004.	88.	0.	0.	69.	2.	375.	17.
6+	232.	0.	0.	0.	0.	0.	0.	0.	125.	7.	186.	10.
SOP	464846.	40004.	309832.	22244.	341700.	24000.	345866.	123092.	618474.	47520.	267429.	34453.

Partial fishing mortality for fleet: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.056	*	.017	*	.000	*	.015	*	.001	*	.004
1	.255	.049	.064	.014	.322	.123	.147	.078	.142	.037	.093	.142
2	.696	.128	.657	.118	.188	.012	1.106	.375	.521	.040	.238	.115
3	.851	.257	.420	.505	1.260	.278	.528	1.596	.362	.097	.243	.067
4	.988	.060	.310	.004	.616	.231	.192	.226	.195	.093	.083	.038
5	.494	.040	.326	.000	.374	.000	.155	1.851	.000	.026	.417	.201
6+	1.807	*	.527	.000	.406	.000	.074	.545	.000	.000	.000	.000
F (1- 2)	.476	.089	.360	.066	.255	.067	.627	.226	.331	.039	.166	.129

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.000	*	.000	*	.003	*	.022	*	.002	*	.002
1	.071	.000	.454	.045	.278	.056	.181	.247	.304	.048	.113	.069
2	.967	.068	.441	.029	.846	.054	.775	.071	.395	.026	.277	.029
3	.553	.134	.467	.032	.795	.123	.288	.040	.332	.090	.416	.054
4	1.546	.616	.361	.023	.653	.063	.734	.000	.233	.021	.438	.110
5	1.072	.029	.415	.041	.653	.063	.000	.000	.405	.021	.544	.049
6+	*	*	.000	.000	.000	.000	.000	.000	.196	.017	.635	.074
F (1- 2)	.519	.034	.448	.037	.562	.055	.478	.159	.349	.037	.195	.049

Log inverse catchabilities, fleet no: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	6.129	*	6.129	*	*	*	6.129	*	6.129	*	6.129
1	3.831	3.134	3.831	3.134	3.831	3.134	3.831	3.134	3.831	3.134	3.831	3.134
2	2.717	3.178	2.717	3.178	2.717	3.178	2.717	3.178	2.717	3.178	2.717	3.178
3	2.779	2.349	2.779	2.349	2.779	2.349	2.779	2.349	2.779	2.349	2.779	2.349
4	2.976	3.021	2.976	3.021	2.976	3.021	2.976	3.021	2.976	3.021	2.976	3.021
5	2.976	3.021	2.976	*	2.976	*	2.976	3.021	*	3.021	2.976	3.021

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	6.129	*	6.129	*	6.129	*	6.129	*	6.129
1	3.831	*	3.831	3.134	3.831	3.134	3.831	3.134	3.831	3.134	3.831	3.134
2	2.717	3.178	2.717	3.178	2.717	3.178	2.717	3.178	2.717	3.178	2.717	3.178
3	2.779	2.349	2.779	2.349	2.779	2.349	2.779	2.349	2.779	2.349	2.779	2.349
4	2.976	3.021	2.976	3.021	2.976	3.021	2.976	*	2.976	3.021	2.976	3.021
5	2.976	3.021	2.976	3.021	2.976	3.021	*	*	2.976	3.021	2.976	3.021

continued...

Table 8.3.4.1 (continued)

Log residual stocknr. (nhat/n), fleet no: 1
Commercial fishery

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	2.836	*	1.486	*	*	*	.736	*	-1.360	*	-.323
1	.277	-.279	-1.054	-1.752	.489	.250	-.389	-.614	-.097	-.696	-.005	.351
2	.169	.720	.168	.456	-1.165	-2.068	.515	1.002	.090	-.561	-.175	.183
3	.432	.586	-.218	1.078	.801	.281	-.163	1.623	-.210	-.518	-.093	-1.192
4	.778	-.190	-.323	-3.004	.284	.766	-.977	.339	-.631	.116	-.971	-1.072
5	.085	-.603	-.273	*	-.216	*	-1.191	2.443	*	-1.155	.642	.585

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	-5.225	*	.767	*	1.445	*	-.364	*	.000
1	-.983	*	.738	.553	.278	.767	.381	.861	.421	-.008	-.056	.566
2	.508	.484	-.405	.157	.278	.767	.722	-.343	-.432	-.549	-.273	-.250
3	.011	.337	-.286	-.593	.278	.768	-.206	-1.749	-.543	-.153	.196	-.467
4	1.237	2.537	-.344	-.259	.278	.767	.926	*	-.702	-.917	.445	.916
5	.871	-.506	-.206	.348	.278	.767	*	*	-.147	-.950	.663	.111

Table 8.4.1 Sandeel at Shetland.
Standardised Effort, (days absent), by half-year, 1984–1994. UK (Scotland) data.

Year	1	2
1984	852	539
1985	358	302
1986	404	157
1987	180	98
1988	200	72
1989	168	0
1990	102	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0

Table 8.4.2 Sandeel at Shetland.
Commercial catch at age, (millions), 1984–1994.

	1984		1985		1986		1987	
	1	2	1	2	1	2	1	2
0	1940	4833	153	2039	898	1328	19	400
1	1843	481	1076	252	522	94	873	111
2	1064	154	313	157	352	25	53	16
3	501	36	166	83	327	24	35	10
4	134	10	55	20	141	11	38	8
5	38	9	17	11	58	3	16	7
6	14	1	6	3	14	1	4	1
7	9	1	2	1	6	0	1	0

	1988		1989		1990		1991	
	1	2	1	2	1	2	1	2
0	52	478	33	0	14	0	0	0
1	30	3	8	0	162	0	0	0
2	151	3	7	0	22	0	0	0
3	107	1	199	0	14	0	0	0
4	48	1	96	0	60	0	0	0
5	26	2	34	0	29	0	0	0
6	15	0	14	0	5	0	0	0
7	4	0	4	0	6	0	0	0

	1992		1993		1994	
	1	2	1	2	1	2
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0

Table 8.4.3 Sandeel at Shetland.
Survey indices, Mean No. fish per 30 minute tow. 1984–1994.

	Year										
Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
0	345774	121905	681869	-	73371	813752	90148	1009024	199301	635331	98653
1	47590	74509	49816	-	898	9059	30118	10001	465958	18180	135158
2	34613	38843	11399	-	7189	977	3771	1925	1215	73176	14272
3	9921	23455	15376	-	4843	3820	1346	1694	347	2176	41299
4	3999	10872	7049	-	4612	3893	1736	750	168	361	3369
5	1369	1959	2893	-	3031	2017	1142	53	43	150	296
6	856	962	1210	-	1619	462	444	21	10	72	12
7	258	119	191	-	20	86	329	5	12	23	17

Table 8.4.4 Sandeel at Shetland. Mean Weights at age (g) in catch by half-year, 1974–1990.

Age	1	2
0	0.746	1.618
1	3.095	5.053
2	5.409	7.87
3	8.585	10.483
4	11.143	13.255
5	13.705	15.787
6	15.605	19.472
7	21.254	24.482

Table 8.4.5 Sandeel at Shetland. Natural Mortality and proportion mature at age.

Age	Natural Mortality		Proportion Mature
	1	2	
0	0	0.8	0
1	1	0.2	0
2	0.4	0.2	1
3	0.4	0.2	1
4	0.4	0.2	1
5	0.4	0.2	1
6	0.4	0.2	1
7	0.4	0.2	1

Table 8.4.6 Sandeel at Shetland. Estimated population.

		1984		1985		1986		1987
	1	2	1	2	1	2	1	2
0	0	27265	0	20552	0	21681	0	1688
1	16546	4696	7884	2611	5655	1712	8013	2784
2	4013	2021	3355	2003	1837	994	1320	831
3	1403	583	1555	859	1531	717	792	477
4	464	197	445	248	651	310	569	345
5	178	73	151	83	188	87	246	148
6	44	19	52	29	58	28	67	41

		1988		1989		1990		1991
	1	2	1	2	1	2	1	2
0	0	1809	0	4879	0	2333	0	69756
1	649	218	787	268	2192	741	1048	386
2	2172	1320	177	109	220	134	607	407
3	665	379	1076	627	89	51	110	74
4	381	219	308	181	513	297	42	28
5	276	156	178	103	148	85	243	163
6	115	66	126	74	85	49	69	46

		1992		1993		1994
	1	2	1	2	1	2
0	0	8269	0	30933	0	3850
1	31343	11531	3716	1367	13899	5113
2	316	212	9440	6328	1119	750
3	333	223	173	116	5181	3473
4	60	40	183	123	95	64
5	23	15	33	22	100	67
6	133	89	13	8	18	12

Table 8.4.7 Sandeel at Shetland. Total fishing mortality.

		1984		1985		1986		1987
	1	2	1	2	1	2	1	2
0	0.038	0.441	0.016	0.49	0.029	0.195	0.008	0.156
1	0.259	0.136	0.105	0.151	0.195	0.06	0.057	0.048
2	0.286	0.062	0.116	0.069	0.215	0.028	0.063	0.022
3	0.478	0.07	0.194	0.078	0.359	0.031	0.105	0.025
4	0.456	0.069	0.185	0.076	0.342	0.03	0.101	0.024
5	0.492	0.139	0.199	0.154	0.369	0.061	0.108	0.049
6	0.456	0.069	0.185	0.076	0.342	0.03	0.101	0.024

		1988		1989		1990		1991
	1	2	1	2	1	2	1	2
0	0.013	0.032	0.011	0	0.013	0	0	0
1	0.089	0.01	0.076	0	0.084	0	0	0
2	0.098	0.005	0.084	0	0.093	0	0	0
3	0.164	0.005	0.14	0	0.156	0	0	0
4	0.156	0.005	0.133	0	0.148	0	0	0
5	0.168	0.01	0.144	0	0.16	0	0	0
6	0.156	0.005	0.133	0	0.148	0	0	0

		1992		1993		1994
	1	2	1	2	1	2
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0

Table 8.4.8 Sandeel at Shetland. Diagnostics from SSV.

SHETLAND SANDEEL 1984-1994 WG data.

weight for effort data = 1.000
weight for RV data = 0.500
RV catchability constant above age = 3

IFAIL on exit from E04FDF = 5
IFAIL on exit from E04YCF = 0

Initial sum of squares = 332.8409
Final sum of squares = 26.6756
Residual mean square = 0.2223

Coeficient of determination = .9199
Adj. Coeff. of determination = .8898

Number of observations = 166
Number of parameters = 46

RMS for catch data = 0.3887
RMS for effort data = 0.3901
RMS for RV data = 0.1518

No.	parameter	s.d.				
1	-0.3193	0.2792	Year/season effect	1984	1	
2	-0.6916	0.2859		1984	2	
3	-1.2239	0.2614		1985	1	
4	-0.5849	0.2703		1985	2	
5	-0.6062	0.2439		1986	1	
6	-1.5053	0.2661		1986	2	
7	-1.8315	0.2448		1987	1	
8	-1.7303	0.2685		1987	2	
9	-1.3911	0.248		1988	1	
10	-3.3078	0.2816		1988	2	
11	-1.5486	0.2595		1989	1	
12	-1.4427	0.2761		1990	1	
13	-2.9386	0.4999	Selectivity at age	0	1	
14	-0.1276	0.4864		0	2	
15	-1.0299	0.398		1	1	
16	-1.3026	0.4294		1	2	
17	-0.9326	0.4097		2	1	
18	-2.0862	0.4409		2	2	
19	-0.4184	0.4193		3	1	
20	-1.9694	0.4649		3	2	
21	-0.4658	0.4824		4	1	
22	-1.9869	0.5415		4	2	
23	-0.3909	0.4813		5	1	
24	-1.2846	0.5558		5	2	
25	8.2558	1.0516	Est. Population	1994	2	0
26	8.5396	0.7838		1994	2	1
27	6.6203	0.6725		1994	2	2
28	8.1528	0.6123		1994	2	3
29	4.1548	0.5719		1994	2	4
30	4.2084	0.5262		1994	2	5
31	2.4992	0.5084		1994	2	6
32	2.9381	0.5377		1984	2	6
33	3.3674	0.5271		1985	2	6
34	3.3196	0.6432		1986	2	6
35	3.7064	0.6198		1987	2	6
36	4.1916	0.6292		1988	2	6
37	4.3068	0.6283		1989	2	6
38	3.8906	0.6463		1990	2	6
39	3.8381	0.6092		1991	2	6
40	4.4928	0.5688		1992	2	6
41	2.1375	0.5324		1993	2	6
42	-3.6637	0.4654	RV catchability, Age	0		
43	-3.8547	0.468		1		
44	-4.486	0.4739		2		
45	-4.332	0.4918		3		
46	-4.7091	0.5825		4		

Year/season effects

year	1	2
1984	0.7267	0.5008
1985	0.2941	0.5572
1986	0.5454	0.2219
1987	0.1602	0.1772
1988	0.2488	0.0366
1989	0.2125	0
1990	0.2363	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0

Residuals

1	2
0.3193	0.2338
0.3569	-0.4523
-0.1399	-0.186
0.2768	-0.4323
-0.0582	0.8369
-0.075	0
-0.6799	0
0	0
0	0
0	0
0	0

Selectivities at age

age	1	2
0	0.0529	0.8802
1	0.3571	0.2718
2	0.3935	0.1242
3	0.6581	0.1395
4	0.6276	0.1371
5	0.6764	0.2768
6	0.6276	0.1371

RV catchabilities

age	logQ
0	-3.6637
1	-3.8547
2	-4.486
3	-4.332
4	-4.7091
5	-4.7091
6	-4.7091

Log RV Residuals

1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
-0.3521	-0.7102	0.1021	0	0.2471	0.9362	0.2049	-0.2862	-0.0309	-0.1109	0
-0.3695	0.1503	0.1525	0	-0.7916	0.2299	0.3254	0.1012	0.323	-0.2321	0.1109
0.2346	0.2773	-0.0043	0	-0.3558	-0.1187	0.4609	-0.4351	-0.335	0.0131	0.263
0.1282	0.3645	0.2295	0	-0.0076	-0.387	0.3284	0.2788	-1.0631	0.1783	-0.0499
0.1966	0.3961	0.2263	0	0.2173	0.218	-0.1133	0.271	-0.1905	-0.2802	0.4423
0.1888	0.2337	0.3264	0	0.1893	0.1909	0.0916	-0.8449	-0.3118	-0.0718	-0.1758
0.4021	0.3252	0.395	0	0.25	-0.0936	-0.0006	-0.7602	-1.0972	-0.0219	-0.5988

Log catch residuals

	1984		1985		1986		1987		1988		1989		1990
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	0.2976	-0.1769	-0.373	-0.5106	0.1729	-0.3515	0.1392	0.4291	0.3868	1.2461	-0.2576	0	-0.3706	0
1	-0.2811	-0.121	0.7643	-0.2801	-0.2079	0.033	1.1269	-0.0677	-0.1578	0.4256	-1.52	0	0.3611	0
2	0.2478	0.3316	0.0312	0.2563	0.1779	0.0205	-0.2283	-0.0242	-0.1039	-0.5924	-0.5174	0	0.3106	0
3	0.1151	0.0084	-0.3128	0.3532	-0.1633	0.1916	-0.6267	-0.056	0.2507	-0.5584	0.5371	0	0.2721	0
4	-0.0591	-0.1712	-0.123	0.1889	-0.1088	0.2675	-0.1688	0.0637	0.0495	0.0078	1.1024	0	0.0235	0
5	-0.4214	0.0474	-0.2824	0.0232	0.1803	-0.4519	-0.2667	0.0859	-0.3078	0.3384	0.5429	0	0.4699	0
6	0.0277	-0.1282	-0.1924	0.438	-0.0025	0.2856	-0.2834	0.1209	0.0824	-1.0987	0.0682	0	-0.6592	0

	1991		1992		1993		1994	
	1	2	1	2	1	2	1	2
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0

Table 8.4.9 Sandeels at Shetland. Stock summary.

Year	SSB	Recruits	Mean F	Landings
1984	42153	27265	0.43	32.6
1985	39461	20552	0.24	17.2
1986	33955	21681	0.30	14
1987	24857	1688	0.11	7.2
1988	27555	1809	0.12	4.7
1989	18334	4879	0.10	3.5
1990	11229	2333	0.11	2.3
1991	9268	69756	0.00	+
1992	7946	8269	0.00	0
1993	55272	30933	0.00	0
1994	53285	3850	0.00	0

SSB in tonnes
Recruits (miilions) at age 0 on 1 July
Mean F, annual, ages 1-3
Landings in '000t.

Table 9.1 Sandeel, Division VIa. Landings in tonnes, 1981–1993, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	80[1]
UK (Scotland)	5,972	10,786	13,051	14,166	18,586	24,469	14,479	24,465	18,785	16,515	8,532	4.935	6,156
Total	5,972	10,786	13,051	14,166	18,586	24,469	14,479	24,465	18,785	16,515	8,532	4,985	6,236

[1]Preliminary

Table 9.2 Fishing effort (days absent) by month and year in the Division VIa SANDEEL fishery, 1981–1993, UK (Scotland).

Month	1981	1982	1983	1984	1985	1986	1987	1988	1989[1]	1990[1]	1991[1]	1992[1]	1993[1]
Jan	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	4	54	21	11	7	7	3	26	13	-	-	-	-
May	4	121	112	119	131	104	22	87	50	29	5	-	-
Jun	-	168	112	128	124	117	79	139	99	138	54	24	31
Total	8	343	245	258	262	228	104	252	162	167	59	24	31
Jul	90	118	126	125	101	126	93	108	110	75	31	32	45
Aug	132	89	76	63	76	94	67	59	22	5	18	13	19
Sep	70	34	-	-	28	67	26	28	3	-	-	-	-
Oct	3	4	-	-	8	15	-	8	-	-	-	-	-
Nov	-	-	-	-	-	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	295	245	202	188	213	302	186	203	135	80	49	45	64
Annual Total	303	588	447	446	475	530	290	455	297	247	108	69	95

[1]Vessels landing in Scotland only.

Table 9.3 **Nominal Effort (days absent) by half-year in the Division VIa Sandeel Fishery 1983 - 1993, UK (Scotland) Data.**

Year	I	II	Total
1983	245	202	447
1984	258	188	446
1985	262	213	475
1986	228	302	530
1987	104	186	290
1988	252	203	455
1989[1]	173	142	315
1990[1]	187	94	281
1991[1]	67	49	116
1992[1]	24	59	83
1993[1]	55	79	134

[1] Raised to total international landings

Table 9.4 **Sandeel, Division VIa**
Numbers caught (millions), by month, 1993, UK Scotland data.

Age	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
0	-	-	552	677	137	-	-	1366
1	-	-	134	52	24	-	-	210
2	-	-	186	63	4	-	-	253
3	-	-	31	4	+	-	-	35
4	-	-	22	16	+	-	-	38
5	-	-	8	2	0	-	-	10
6	-	-	5	0	0	-	-	5
7+	-	-	6	+	0	-	-	6

Table 9.5 Sandeel, Division VIa. Catch at age (millions), 1983–1993.

	1983		1984		1985		1986		1987	
	1	2	1	2	1	2	1	2	1	2
0	391	2253	186	1751	53	3207	368	2702	105	595
1	521	106	863	99	139	13	859	996	521	676
2	136	29	226	67	437	163	140	68	97	232
3	86	21	138	115	181	117	171	219	17	37
4	111	18	67	38	139	73	58	103	45	31
5	29	3	28	26	55	28	38	40	23	20
6	12	3	8	8	27	12	9	12	4	7
7	2	1	1	3	7	1	6	6	1	4

	1988		1989		1990		1991		1992	
	1	2	1	2	1	2	1	2	1	2
0	795	173	185	284	21	588	673	94	122	578
1	187	72	211	21	602	158	423	52	226	177
2	1216	548	136	64	229	6	158	66	29	26
3	235	131	569	294	122	11	10	39	8	22
4	41	28	135	76	324	52	15	23	5	10
5	52	45	228	23	75	19	27	37	1	5
6	21	24	19	12	18	1	10	12	4	7
7	3	8	6	8	2	1	1	0	1	3

	1993	
	1	2
0	552	814
1	134	76
2	186	67
3	31	5
4	21	16
5	8	2
6	5	1
7	5	1

Table 9.6 Sandeel, Division VIa. Mean weight at age (g) in catch, 1981–1993.

Age	1	2
0	1.38	1.61
1	4.29	5.70
2	8.32	9.27
3	11.56	12.79
4	14.05	15.33
5	17.12	17.45
6	18.20	17.78
7+	22.21	22.22

Table 9.7 Sandeel, Division VIa. Natural mortality and proportion mature at age.

Age	Natural Mortality		Proportion Mature
	1	2	
0	0	0.8	0
1	1	0.2	0
2	0.4	0.2	1
3	0.4	0.2	1
4	0.4	0.2	1
5	0.4	0.2	1
6	0.4	0.2	1
7+	0.4	0.2	1

Table 9.8 Sandeel in Division VIa. Diagnostics from semi-annual Separable VPA.

weight for effort data = 1.0000

Initial sum of squares = 534.3511
Final sum of squares = 46.1620
Residual mean square = 0.3228

RMS for catch data = 0.4504
RMS for effort data = 0.4101

Coefficient of determination = 0.9136
Adj. Coeff. of determination = 0.8816

Number of observations = 197
Number of parameters = 54

IFAIL on exit from E04FDF = 5
IFAIL on exit from E04YCF = 0

No	paramete	s.d			Season
1	-0.0825	0.2802	Year/season effect	1983	1
2	-0.9102	0.2895		1983	2
3	-0.306	0.2788		1984	1
4	-0.2011	0.2829		1984	2
5	0.0884	0.2735		1985	1
6	-0.2594	0.2791		1985	2
7	-0.1915	0.2706		1986	1
8	0.4969	0.2699		1986	2
9	-1.1447	0.2661		1987	1
10	-0.2017	0.2661		1987	2
11	-0.0476	0.259		1988	1
12	0.1513	0.2575		1988	2
13	0.2833	0.253		1989	1
14	0.0205	0.2561		1989	2
15	0.1715	0.2636		1990	1
16	-1.0932	0.2757		1990	2
17	-1.0887	0.283		1991	1
18	-0.8278	0.2916		1991	2
19	-2.5387	0.2983		1992	1
20	-1.453	0.2977		1992	2
21	-1.6571	0.3159		1993	1
22	-2.2426	0.3149		1993	2
23	-5.355	0.4452	Selectivity at age	0	1
24	-3.5269	0.4429		0	2
25	-2.9993	0.3042		1	1
26	-3.3703	0.3076		1	2
27	-2.1142	0.2879		2	1
28	-2.7226	0.2948		2	2
29	-2.0989	0.2796		3	1
30	-2.0858	0.2837		3	2
31	-1.7795	0.2723		4	1
32	-1.5803	0.2834		4	2
33	-1.2611	0.2693		5	1
34	-1.282	0.2835		5	2
35	-1.1794	0.2868		6	1
36	-1.1499	0.2971		6	2
37	13.1693	0.9419	Est. Population	1993	2
38	9.8312	0.5387		1993	2
39	9.0712	0.453		1993	2
40	6.9284	0.4054		1993	2
41	6.4679	0.3791		1993	2
42	4.5313	0.3677		1993	2
43	3.8332	0.3696		1993	2
44	4.8176	0.383		1993	2
45	2.4236	0.4345		1983	2
46	2.752	0.3004		1984	2
47	2.6982	0.2722		1985	2
48	3.2075	0.272		1986	2
49	2.9592	0.2941		1987	2
50	3.128	0.2861		1988	2
51	3.1494	0.3307		1989	2
52	3.0955	0.4004		1990	2
53	2.9151	0.4211		1991	2
54	3.9226	0.4007		1992	2

Year/season effects

year	1	2
1983	0.9208	0.4024
1984	0.7364	0.8178
1985	1.0925	0.7715
1986	0.8257	1.6436
1987	0.3183	0.8173
1988	0.9535	1.1633
1989	1.3275	1.0207
1990	1.187	0.3352
1991	0.3366	0.437
1992	0.079	0.2339
1993	0.1907	0.1062

Residuals

1	2
0.0825	0.7173
0.3577	-0.0637
-0.0214	0.1194
0.1196	-0.2877
0.2878	-0.0738
0.0758	-0.3394
-0.6312	-0.5659
-0.4416	0.1352
-0.2078	-0.7816
0.2155	0.0293
0.1632	1.1108

Selectivities at age

age	1	2
0	0.0047	0.0294
1	0.0498	0.0344
2	0.1207	0.0657
3	0.1226	0.1242
4	0.1687	0.2059
5	0.2833	0.2775
6	0.3075	0.3167
7	0.1687	0.2059

Age
0
1
2
3
4
5
6
7
7
7
7
7
7
7
7
7
7
7

Log catch residuals

Age	1983		1984		1985		1986		1987		1988	
	1	2	1	2	1	2	1	2	1	2	1	2
0	0.1588	0.8081	0.3232	0.7539	-1.096	0.4915	-0.2148	-0.1952	0.5005	0.2579	1.0678	-0.4299
1	-0.0784	0.3601	0.5804	-0.4857	-0.7721	-1.5804	0.1343	0.8128	0.1462	0.6559	-0.2558	-0.1938
2	-0.6368	-0.3746	-0.1207	-0.4606	0.1041	0.4681	0.107	-0.2915	-0.5078	0.3754	0.4757	0.4851
3	-0.1268	-0.3386	0.3137	0.4091	0.0111	0.3258	0.1987	0.1935	-0.2843	-0.0943	-0.0064	-0.3731
4	0.3443	-0.4248	0.2957	-0.1308	0.4426	0.4198	-0.3342	-0.1175	0.3806	-0.7271	-0.023	-0.3056
5	0.2027	-0.7251	-0.4652	-0.1063	0.1629	0.4228	-0.1268	-0.1098	0.2306	-0.3779	-0.1683	0.103
6	0.2046	0.1283	0.0133	0.4203	0.1154	0.2174	-0.3506	-0.1087	-0.2794	-0.2203	-0.029	0.503
7	-0.1047	0.2523	-0.8861	0.3531	0.6868	-0.6379	0.3275	-0.0301	-0.2171	0.4341	-0.4415	0.6381

Age	1989		1990		1991		1992		1993	
	1	2	1	2	1	2	1	2	1	2
0	-0.3599	-0.6503	-1.2465	0.4116	0.3678	-1.3876	0.425	0.0177	0.0779	-0.0779
1	-0.239	-1.0597	-0.1517	0.9849	1.0077	-0.1623	0.3275	0.1742	-0.7089	0.4875
2	-0.2754	0.2589	0.5823	-0.8001	0.3229	0.1324	0.2943	0.0202	-0.24	0.2483
3	0.1836	0.2191	0.5329	-0.2246	-0.5863	0.848	-0.5709	-0.3392	0.0956	-0.838
4	-0.3003	-0.2935	0.3196	-0.005	0.1235	0.4632	0.5334	0.2714	-0.1575	0.2842
5	1.9414	0.5658	-0.2097	0.2279	-0.6027	-0.1202	-0.9224	-0.0353	0.2842	-0.1533
6	-0.3331	0.111	0.6869	-0.4213	-0.1232	0.1884	-0.3608	-0.5686	0.4281	-0.2785
7	-0.1348	0.7341	-1.0549	-0.2433	-0.2306	0	0.2348	0.3783	0.0577	-0.8381

Table 9.9 Sandeel in Division VIa. Fitted populations (millions)

		1983		1984		1985		1986
	1	2	1	2	1	2	1	2
0	0	65282	0	27959	0	91689	0	144666
1	18202	7812	19431	8416	8221	3498	26997	11642
2	2821	1870	3462	2347	3677	2387	1531	1026
3	1056	699	1349	913	1647	1067	1681	1126
4	630	400	492	322	611	377	719	463
5	119	68	273	164	202	110	238	140
6	46	25	45	26	97	51	66	38
7	18	11	24	16	24	15	38	25
SSB	47805.18		57337.01		63974.88		48398.1	

		1987		1988		1989		1990
	1	2	1	2	1	2	1	2
0	0	25638	0	20808	0	60404	0	45175
1	41517	18361	7539	3230	6056	2547	17656	7478
2	4944	3524	8022	5296	1395	880	1105	709
3	683	486	2474	1631	3635	2288	610	391
4	680	477	325	205	1046	619	1493	906
5	245	166	299	169	120	61	372	197
6	66	44	98	54	91	45	34	17
7	27	19	36	23	39	23	36	22
SSB	64574.95		107606.1		72915.27		45015.14	

		1991		1992		1993		*1994*
	1	2	1	2	1	2		*1*
0	0	202618	0	139747	0	524035		*0*
1	13473	5953	60248	26965	41803	18606		*234759*
2	3321	2363	2635	1934	12019	8701		*15172*
3	514	365	1701	1248	1411	1021		*7074*
4	278	194	256	187	898	644		*825*
5	626	422	132	95	132	93		*516*
6	133	89	277	200	66	46		*74*
7	26	18	69	51	172	124		*36*
SSB	51189.57		54019.55		136194.3			*230590.5*

Table 9.10 Sandeel in Division VIa. Total fishing mortality.

		1983		1984		1985		1986
	1	2	1	2	1	2	1	2
0	0.004	0.012	0.003	0.024	0.005	0.023	0.004	0.048
1	0.046	0.014	0.037	0.028	0.054	0.027	0.041	0.057
2	0.111	0.026	0.089	0.054	0.132	0.051	0.1	0.108
3	0.113	0.05	0.09	0.102	0.134	0.096	0.101	0.204
4	0.155	0.083	0.124	0.168	0.184	0.159	0.139	0.338
5	0.261	0.112	0.209	0.227	0.31	0.214	0.234	0.456
6	0.283	0.127	0.226	0.259	0.336	0.244	0.254	0.52
7	0.155	0.083	0.124	0.168	0.184	0.159	0.139	0.338
Mean F(1-3)	0.090	0.030	0.072	0.061	0.107	0.058	0.081	0.123

		1987		1988		1989		1990
	1	2	1	2	1	2	1	2
0	0.002	0.024	0.005	0.034	0.006	0.03	0.006	0.01
1	0.016	0.028	0.048	0.04	0.066	0.035	0.059	0.012
2	0.038	0.054	0.115	0.076	0.16	0.067	0.143	0.022
3	0.039	0.102	0.117	0.144	0.163	0.127	0.146	0.042
4	0.054	0.168	0.161	0.24	0.224	0.21	0.2	0.069
5	0.09	0.227	0.27	0.323	0.376	0.283	0.336	0.093
6	0.098	0.259	0.293	0.368	0.408	0.323	0.365	0.106
7	0.054	0.168	0.161	0.24	0.224	0.21	0.2	0.069
Mean F(1-3)	0.031	0.061	0.093	0.087	0.130	0.076	0.116	0.025

		1991		1992		1993
	1	2	1	2	1	2
0	0.002	0.013	0	0.007	0.001	0.003
1	0.017	0.015	0.004	0.008	0.01	0.004
2	0.041	0.029	0.01	0.015	0.023	0.007
3	0.041	0.054	0.01	0.029	0.023	0.013
4	0.057	0.09	0.013	0.048	0.032	0.022
5	0.095	0.121	0.022	0.065	0.054	0.029
6	0.104	0.138	0.024	0.074	0.059	0.034
7	0.057	0.09	0.013	0.048	0.032	0.022
Mean F(1-3)	0.033	0.033	0.008	0.017	0.019	0.008

Table 9.11 Sandeel, Division VIa, Stock Summary.

Year	SSB	Recruits	Mean F	Landings
1983	47805	65	0.060	13.0
1984	57337	28	0.067	14.2
1985	63974	92	0.082	18.6
1986	48398	145	0.102	24.5
1987	64575	26	0.046	14.5
1988	107606	21	0.090	24.5
1989	72915	60	0.103	18.8
1990	45015	45	0.071	16.5
1991	51190	203	0.033	8.5
1992	54020	140	0.013	4.9
1993	136194	[524]	0.013	6.2

SSB in tonnes
Recruits, millions on 1 July
Mean F, annual, ages 1-3.
Landings in '000t
[recruits] value set aside.

Table 10.2.1 Survivors Analysis of Sandeel in the Total North Sea.

```
 The following parameters were used:

Year range: 1982 - 1993
Seasons per year:    2
The last season in the last year is season : 2
Youngest age:  0; Oldest age:  4; (Plus age:  5)
Recruitment in season: 2
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Fishery in the Northern North Sea
Fleet  2:  Fishery in the Southern North Sea

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 2
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   0
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum5.hyr
 Weight in catch:        weca5.hyr
 Weight in stock:        west5.hyr
 Natural mortalities:    natmor.hyr
 Maturity ogive:         matprop.hyr
 Tuning data (CPUE):     tuning5.xsa
 Weighting for rhats:    tweq.xsa
 Weighting for shats:    twred.xsa
 Unknown catches:        uc5.90


 Stock numbers (at start of season)
 **********************************
```

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	199703.	*	855482.	*	243349.	*	1227384.	*	632849.	*	279079.
1	403285.	111930.	81977.	25357.	372857.	92156.	109344.	33870.	543261.	158876.	279519.	84278.
2	16633.	4308.	87313.	28853.	20269.	10390.	65833.	9257.	25916.	9240.	118832.	52125.
3	6640.	1313.	3084.	1230.	20798.	2951.	8315.	2715.	4441.	1500.	6872.	3372.
4	3162.	573.	764.	314.	525.	130.	1855.	744.	121.	56.	1010.	474.
5+	264.	63.	485.	196.	416.	136.	178.	8.	455.	305.	280.	129.
SSN	26700.		91645.		42008.		76180.		30933.		126993.	
SSB	415614.		1208510.		638433.		1041021.		428722.		1660648.	
TSN	429984.	317891.	173623.	911432.	414866.	349111.	185524.	1273978.	574195.	802825.	406513.	419455.
TSB	2081179.	1586966.	1620857.	1711906.	2167149.	1500660.	1499171.	2034724.	2699555.	2953311.	2974389.	2157588.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	759361.	*	311636.	*	633485.	*	678224.	*	309205.	*	1248530.
1	124893.	38544.	332358.	60737.	137761.	32460.	273253.	62972.	287498.	63181.	134289.	37666.
2	60981.	11406.	30396.	14842.	44609.	8229.	24061.	6659.	40449.	15588.	48153.	18119.
3	36467.	8698.	8819.	2339.	11754.	1963.	6145.	2295.	5115.	2211.	12414.	4449.
4	2583.	138.	5128.	695.	1884.	315.	1257.	286.	1772.	678.	1668.	579.
5+	447.	0.	41.	13.	468.	0.	201.	59.	280.	0.	533.	0.
SSN	100478.		44384.		58715.		31664.		47615.		62768.	
SSB	1538380.		677339.		843864.		452493.		657118.		859467.	
TSN	225372.	818147.	376741.	390262.	196475.	676451.	304918.	750495.	335113.	390863.	197057.	1309343.
TSB	2087911.	1868599.	2139712.	1340624.	1430724.	1381144.	1624750.	1569277.	1830107.	1429829.	1463766.	2556775.

```
 Catch in numbers for fleet:  1
```


continued...

Table 10.2.1 (continued)

Fishery in the Northern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	6530.	*	7911.	*	0.	*	349.	*	7105.	*	455.
1	3518.	65.	5684.	303.	11692.	1207.	2688.	109.	23934.	7077.	26236.	5768.
2	2132.	0.	1215.	316.	1647.	121.	3292.	239.	2600.	473.	10855.	198.
3	556.	0.	89.	19.	153.	43.	1002.	89.	200.	0.	350.	0.
4	76.	0.	8.	0.	5.	0.	377.	7.	0.	0.	107.	0.
5+	9.	0.	4.	0.	0.	0.	103.	4.	0.	0.	48.	0.
SOP	66478.	20646.	50871.	37464.	91792.	20871.	106277.	12946.	174378.	128325.	305979.	83202.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	13196.	*	3380.	*	16021.	*	13616.	*	6797.	*	26960.
1	9855.	1283.	57002.	4038.	12808.	1154.	41855.	866.	9871.	48.	15768.	1004.
2	25922.	340.	2233.	274.	5499.	193.	2342.	28.	4056.	3.	2635.	112.
3	1319.	119.	3406.	0.	1136.	85.	908.	8.	486.	0.	1023.	34.
4	26.	17.	0.	0.	182.	14.	225.	3.	195.	0.	207.	8.
5+	0.	0.	0.	0.	0.	0.	93.	0.	110.	0.	439.	14.
SOP	430970.	71479.	440192.	57222.	182697.	72839.	374466.	55404.	115957.	38189.	188262.	86785.

Catch in numbers for fleet: 2
Fishery in the Southern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	5039.	*	9298.	*	0.	*	11940.	*	112.	*	298.
1	56545.	4718.	2232.	240.	62517.	9423.	7790.	1896.	43629.	5350.	4351.	3095.
2	6224.	490.	35029.	2806.	2257.	92.	39301.	3229.	7333.	293.	22771.	6664.
3	3277.	344.	934.	513.	13272.	577.	2490.	2234.	1604.	241.	1158.	196.
4	1813.	36.	234.	2.	267.	44.	233.	163.	30.	9.	141.	45.
5+	126.	4.	153.	0.	175.	0.	32.	135.	0.	9.	24.	6.
SOP	450381.	58421.	380559.	61745.	556795.	80581.	472950.	114930.	335960.	47286.	296759.	105111.

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	0.	*	1.	*	971.	*	12115.	*	134.	*	838.
1	2349.	0.	44444.	1619.	17231.	1626.	20058.	11411.	60337.	3903.	3581.	1037.
2	10074.	234.	4525.	165.	20973.	461.	9224.	344.	10021.	382.	14659.	953.
3	17914.	2084.	957.	35.	6090.	303.	1320.	111.	1002.	157.	3707.	266.
4	1920.	63.	3350.	122.	976.	48.	454.	0.	427.	25.	451.	60.
5+	849.	5.	18.	1.	2098.	117.	0.	0.	194.	9.	561.	27.
SOP	464842.	40004.	309832.	22244.	485017.	32957.	345866.	123092.	618474.	47520.	267431.	34453.

Partial fishing mortality for fleet: 1
Fishery in the Northern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.049	*	.014	*	.000	*	.000	*	.016	*	.002
1	.015	.001	.117	.013	.057	.015	.041	.004	.076	.051	.159	.080
2	.215	.000	.022	.013	.110	.013	.094	.035	.154	.059	.131	.005
3	.149	.000	.043	.022	.014	.018	.190	.066	.070	.000	.070	.000
4	.043	.000	.015	.000	.015	.000	.301	.012	.000	.000	.149	.000
5+	.055	.000	.012	.000	.000	.000	1.209	*	.000	.000	.243	.000
F (1- 2)	.115	.000	.069	.013	.083	.014	.068	.020	.115	.055	.145	.042

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.026	*	.016	*	.037	*	.030	*	.032	*	.032
1	.133	.037	.335	.077	.170	.041	.282	.017	.064	.001	.204	.030
2	.764	.034	.102	.021	.222	.027	.161	.005	.150	.000	.083	.007
3	.062	.017	.644	.000	.177	.053	.224	.004	.137	.000	.126	.009
4	.021	.195	.000	.000	.177	.053	.309	.012	.166	.000	.192	.016
5+	*	*	.000	.000	*	*	.751	.000	*	*	*	*
F (1- 2)	.448	.036	.218	.049	.196	.034	.221	.011	.107	.001	.143	.019

continued...

Table 10.2.1 (continued)

Partial fishing mortality for fleet: 2
Fishery in the Southern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.038	*	.016	*	.000	*	.014	*	.000	*	.002
1	.244	.048	.046	.011	.303	.120	.120	.064	.138	.039	.026	.043
2	.627	.133	.631	.114	.151	.010	1.124	.479	.435	.037	.275	.152
3	.877	.335	.449	.596	1.200	.243	.472	1.649	.564	.194	.233	.066
4	1.036	.072	.450	.007	.863	.453	.186	.275	.349	.192	.196	.110
5+	.767	.073	.466	.000	.663	.000	.376	*	.000	.033	.121	.053
F (1- 2)	.436	.091	.338	.062	.227	.065	.622	.271	.286	.038	.151	.097

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.000	*	.000	*	.002	*	.027	*	.001	*	.001
1	.032	.000	.261	.031	.229	.058	.135	.223	.392	.070	.046	.031
2	.297	.023	.206	.012	.847	.064	.632	.059	.372	.027	.460	.060
3	.839	.305	.181	.017	.950	.190	.325	.055	.283	.081	.458	.068
4	1.540	.722	1.237	.213	.950	.190	.624	.000	.362	.041	.419	.122
5+	*	*	.707	.091	*	*	.000	.000	*	*	*	*
F (1- 2)	.164	.012	.233	.022	.538	.061	.384	.141	.382	.049	.253	.046

Log inverse catchabilities, fleet no: 1
Fishery in the Northern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	4.491	*	4.491	*	*	*	4.491	*	4.491	*	4.491
1	3.651	4.396	3.651	4.396	3.651	4.396	3.651	4.396	3.651	4.396	3.651	4.396
2	3.385	*	3.385	4.815	3.385	4.815	3.385	4.815	3.385	4.815	3.385	4.815
3	3.610	*	3.610	4.141	3.610	4.141	3.610	4.141	3.610	*	3.610	*
4	3.610	*	3.610	*	3.610	*	3.610	4.141	*	*	3.610	*

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	4.491	*	4.491	*	4.491	*	4.491	*	4.491	*	4.491
1	3.651	4.396	3.651	4.396	3.651	4.396	3.651	4.396	3.651	4.396	3.651	4.396
2	3.385	4.815	3.385	4.815	3.385	4.815	3.385	4.815	3.385	4.815	3.385	4.815
3	3.610	4.141	3.610	*	3.610	4.141	3.610	4.141	3.610	*	3.610	4.141
4	3.610	4.141	*	*	3.610	4.141	3.610	4.141	3.610	*	3.610	4.141

Log inverse catchabilities, fleet no: 2
Fishery in the Southern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	6.605	*	6.605	*	*	*	6.605	*	6.605	*	6.605
1	4.198	3.363	4.198	3.363	4.198	3.363	4.198	3.363	4.198	3.363	4.198	3.363
2	2.890	3.255	2.890	3.255	2.890	3.255	2.890	3.255	2.890	3.255	2.890	3.255
3	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176
4	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	6.605	*	6.605	*	6.605	*	6.605	*	6.605
1	4.198	*	4.198	3.363	4.198	3.363	4.198	3.363	4.198	3.363	4.198	3.363
2	2.890	3.255	2.890	3.255	2.890	3.255	2.890	3.255	2.890	3.255	2.890	3.255
3	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176	2.775	2.176
4	2.775	2.176	2.775	2.176	2.775	2.176	2.775	*	2.775	2.176	2.775	2.176

Log residual stocknr. (nhat/n), fleet no: 1
Fishery in the Northern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	2.396	*	.704	*	*	*	-2.379	*	-.611	*	-2.141
1	-1.411	-2.018	.809	.589	.192	.732	-.005	-.297	-.414	.431	.128	1.281
2	.972	*	-1.131	.968	.592	.979	.552	2.392	.034	.992	-.332	-1.176

continued...

Table 10.2.1 (continued)

3	.830	*	-.233	.837	-1.260	.629	1.480	2.334	-.525	*	-.731	*
4	-.402	*	-1.257	*	-1.209	*	1.940	.617	*	*	.018	*

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	-.011	*	-.486	*	.510	*	.237	*	1.571	*	.210
1	-.422	.276	.209	1.000	.193	.510	.513	-.426	-.350	-2.144	.557	.065
2	1.061	.594	-1.251	.104	.193	.510	-.316	-1.270	.238	-3.119	-.612	-.975
3	-1.227	-.743	.822	*	.193	.510	.242	-2.135	.371	*	.039	-1.432
4	-2.314	1.672	*	*	.193	.510	.564	-1.056	.559	*	.458	-.813

Log residual stocknr. (nhat/n), fleet no: 2
Fishery in the Southern North Sea

Year	1982		1983		1984		1985		1986		1987	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	2.928	*	1.881	*	*	*	1.158	*	-2.185	*	-.695
1	.603	-.088	-1.013	-1.775	.795	.455	-.226	-.583	.241	-.418	-.894	-.619
2	.238	.836	.301	.494	-1.208	-2.156	.705	1.325	.083	-.584	.142	.535
3	.458	.677	-.153	1.070	.749	-.029	-.277	1.482	.229	.003	-.142	-1.373
4	.624	-.866	-.151	-3.366	.420	.596	-1.209	-.310	-.250	-.003	-.314	-.862

Year	1988		1989		1990		1991		1992		1993	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	-5.154	*	1.024	*	2.101	*	-.848	*	-.210
1	-1.429	*	.553	.398	.451	1.024	.456	.986	1.041	.616	-.579	.003
2	-.500	-.506	-.994	-.620	.451	1.024	.691	-.455	-.319	-.438	.409	.545
3	.425	.988	-1.237	-1.410	.451	1.024	-.088	-1.603	-.707	-.428	.290	-.401
4	1.032	1.850	.685	1.142	.451	1.024	.563	*	-.459	-1.102	.200	.175

Table 10.3.1 N. pout. Natural mortality from MSVPA.

Year	Quarter	age 0	age 1	age 2	age 3	age 4
1974	1	0.0000	0.5787	0.7497	0.8892	0.1600
1974	2	0.0000	0.3192	0.4010	0.2016	0.1600
1974	3	0.5968	0.4789	0.4287	0.1989	0.1600
1974	4	0.5540	0.6512	0.2691	0.1428	0.1600
1975	1	0.0000	0.5911	0.7739	0.8553	0.1600
1975	2	0.0000	0.3124	0.3726	0.1919	0.1600
1975	3	0.8191	0.5212	0.4573	0.1974	0.1600
1975	4	0.5886	0.7069	0.2624	0.1446	0.1600
1976	1	0.0000	0.6291	0.8378	0.8529	0.1600
1976	2	0.0000	0.3226	0.3717	0.1889	0.1600
1976	3	0.5157	0.5207	0.4653	0.2044	0.1600
1976	4	0.5414	0.5683	0.2584	0.1431	0.1600
1977	1	0.0000	0.5243	0.6604	0.6860	0.1600
1977	2	0.0000	0.2977	0.3231	0.1749	0.1600
1977	3	0.4334	0.5016	0.4331	0.2111	0.1600
1977	4	0.5810	0.5732	0.2729	0.1438	0.1600
1978	1	0.0000	0.5461	0.6819	0.7508	0.1600
1978	2	0.0000	0.2982	0.3318	0.1776	0.1600
1978	3	0.4476	0.5078	0.4406	0.2172	0.1600
1978	4	0.5298	0.6124	0.2788	0.1442	0.1600
1979	1	0.0000	0.4935	0.5892	0.6682	0.1600
1979	2	0.0000	0.2852	0.3152	0.1735	0.1600
1979	3	0.4879	0.4160	0.3687	0.2047	0.1600
1979	4	0.5084	0.5346	0.2509	0.1408	0.1600
1980	1	0.0000	0.4189	0.4647	0.4998	0.1600
1980	2	0.0000	0.2695	0.2766	0.1625	0.1600
1980	3	0.5648	0.4097	0.3616	0.2154	0.1600
1980	4	0.6235	0.6365	0.2703	0.1406	0.1600
1981	1	0.0000	0.6149	0.7440	0.7658	0.1600
1981	2	0.0000	0.3086	0.3313	0.1755	0.1600
1981	3	0.4977	0.4723	0.4428	0.2289	0.1600
1981	4	0.5741	0.7221	0.2763	0.1421	0.1600
1982	1	0.0000	0.5065	0.6519	0.6399	0.1600
1982	2	0.0000	0.2800	0.2946	0.1693	0.1600
1982	3	0.5640	0.4515	0.3842	0.2154	0.1600
1982	4	0.5404	0.6349	0.2456	0.1393	0.1600
1983	1	0.0000	0.4507	0.5433	0.5570	0.1600
1983	2	0.0000	0.2718	0.2845	0.1669	0.1600
1983	3	0.5343	0.3916	0.3454	0.1923	0.1600
1983	4	0.5449	0.6310	0.2278	0.1383	0.1600
1984	1	0.0000	0.4671	0.6060	0.5737	0.1600
1984	2	0.0000	0.2677	0.2783	0.1656	0.1600
1984	3	0.6685	0.4409	0.3880	0.1920	0.1600
1984	4	0.6672	0.7444	0.2297	0.1393	0.1600
1985	1	0.0000	0.6534	0.9248	0.8348	0.1600
1985	2	0.0000	0.2891	0.3059	0.1717	0.1600
1985	3	0.6006	0.4988	0.4601	0.1976	0.1600
1985	4	0.7684	0.7661	0.2555	0.1416	0.1600
1986	1	0.0000	0.7753	1.1685	1.0602	0.1600
1986	2	0.0000	0.2961	0.3188	0.1767	0.1600
1986	3	0.5734	0.5175	0.4529	0.1954	0.1600
1986	4	0.7760	0.8552	0.2396	0.1409	0.1600
1987	1	0.0000	0.5283	0.7320	0.6925	0.1600
1987	2	0.0000	0.2655	0.2755	0.1653	0.1600
1987	3	0.6984	0.5550	0.4500	0.2053	0.1600
1987	4	0.9088	1.1372	0.2757	0.1411	0.1600
1988	1	0.0000	0.5625	0.7242	0.7668	0.1600
1988	2	0.0000	0.2725	0.2880	0.1680	0.1600
1988	3	0.5207	0.4844	0.4153	0.2102	0.1600
1988	4	0.7935	1.0189	0.2683	0.1401	0.1600
1989	1	0.0000	0.4666	0.5758	0.5962	0.1600
1989	2	0.0000	0.2545	0.2605	0.1614	0.1600
1989	3	0.5037	0.4059	0.3385	0.1946	0.1600
1989	4	0.6928	0.8316	0.2349	0.1381	0.1600
1990	1	0.0000	0.4684	0.5732	0.5530	0.1600
1990	2	0.0000	0.2579	0.2547	0.1582	0.1600
1990	3	0.5949	0.3857	0.3376	0.1896	0.1600
1990	4	0.8012	1.0023	0.2398	0.1385	0.1600
1991	1	0.0000	0.4923	0.6657	0.6187	0.1600
1991	2	0.0000	0.2531	0.2554	0.1597	0.1600
1991	3	0.4878	0.3890	0.3354	0.1826	0.1600
1991	4	0.6740	0.8266	0.2181	0.1382	0.1600
1992	1	0.0000	0.3851	0.4773	0.4732	0.1600
1992	2	0.0000	0.2394	0.2387	0.1559	0.1600
1992	3	0.4534	0.3325	0.2770	0.1679	0.1600
1992	4	0.6199	0.7661	0.2101	0.1373	0.1600

Table 10.3.2 Sandeel. Natural mortality from MSVPA.

Year	Halfyear	age 0	age 1	age 2	age 3	age 4	age 5	age 6
1974	1	0.00	2.33	0.71	0.40	0.48	0.47	0.38
1974	2	1.22	0.30	0.28	0.30	0.51	0.58	0.74
1975	1	0.00	1.54	0.65	0.44	0.49	0.50	0.39
1975	2	1.59	0.33	0.30	0.31	0.50	0.59	0.63
1976	1	0.00	1.56	0.66	0.44	0.51	0.51	0.41
1976	2	0.92	0.30	0.30	0.31	0.46	0.54	0.57
1977	1	0.00	1.34	0.61	0.41	0.46	0.46	0.39
1977	2	0.80	0.30	0.31	0.31	0.44	0.51	0.52
1978	1	0.00	1.15	0.54	0.36	0.38	0.38	0.37
1978	2	0.88	0.30	0.31	0.30	0.41	0.49	0.46
1979	1	0.00	1.09	0.53	0.35	0.36	0.37	0.31
1979	2	1.01	0.31	0.30	0.30	0.38	0.45	0.40
1980	1	0.00	1.12	0.52	0.35	0.36	0.37	0.31
1980	2	1.16	0.33	0.34	0.33	0.43	0.53	0.40
1981	1	0.00	1.12	0.55	0.36	0.38	0.39	0.33
1981	2	0.86	0.30	0.29	0.28	0.35	0.39	0.34
1982	1	0.00	0.82	0.43	0.31	0.31	0.32	0.29
1982	2	0.98	0.30	0.29	0.27	0.33	0.38	0.33
1983	1	0.00	0.95	0.43	0.30	0.31	0.32	0.28
1983	2	0.95	0.29	0.27	0.26	0.30	0.33	0.30
1984	1	0.00	0.83	0.39	0.28	0.27	0.28	0.24
1984	2	1.21	0.31	0.29	0.27	0.32	0.35	0.29
1985	1	0.00	0.85	0.39	0.27	0.27	0.27	0.24
1985	2	1.02	0.30	0.28	0.27	0.30	0.33	0.24
1986	1	0.00	0.64	0.35	0.26	0.24	0.24	0.22
1986	2	0.99	0.30	0.29	0.26	0.29	0.32	0.22
1987	1	0.00	0.66	0.34	0.24	0.22	0.22	0.20
1987	2	1.25	0.32	0.30	0.28	0.30	0.35	0.22
1988	1	0.00	0.74	0.39	0.26	0.25	0.26	0.22
1988	2	0.92	0.30	0.28	0.27	0.29	0.33	0.23
1989	1	0.00	0.64	0.37	0.25	0.24	0.24	0.21
1989	2	0.90	0.30	0.30	0.28	0.27	0.36	0.22
1990	1	0.00	0.75	0.39	0.26	0.25	0.25	0.22
1990	2	1.02	0.30	0.28	0.26	0.29	0.32	0.22
1991	1	0.00	0.62	0.34	0.25	0.24	0.23	0.21
1991	2	0.82	0.28	0.26	0.24	0.26	0.28	0.22
1992	1	0.00	0.65	0.34	0.25	0.24	0.23	0.21
1992	2	0.85	0.29	0.27	0.24	0.27	0.29	0.23

Table 10.3.3 Survivors Analysis of Norway Pout in the North Sea

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 The following parameters were used:

Year range: 1974 - 1992
Seasons per year:    4
The last season in the last year is season : 4
Youngest age:  0; Oldest age:  3; (Plus age:  4)
Recruitment in season: 3
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Commercial fishery
Fleet  2:  IYFS
Fleet  3:  EGFS
Fleet  4:  SGFS

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 2
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   2
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum.qrt
 Weight in catch:        weca.qrt
 Weight in stock:        west.qrt
 Natural mortalities:    natmor.msv
 Maturity ogive:         matprop.qrt
 Tuning data (CPUE):     tuning.xsa
 Weighting for rhats:    rweigh.xsa
 Unknown catches:        uc90

Final SSQ: 0.472

 Stock numbers (at start of season)
 **********************************
```

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	482863.	265223.	*	*	661860.	291177.	*	*	399568.	238423.
1	373656.	199410.	138206.	77770.	148073.	79206.	51791.	25270.	154207.	78589.	50468.	25861.
2	4013.	1612.	921.	206.	34912.	14929.	9967.	6032.	11038.	4388.	2491.	1097.
3	608.	233.	167.	6.	35.	6.	3.	3.	4236.	1745.	1392.	1133.
4+	2.	1.	0.	0.	1.	0.	0.	0.	1.	1.	0.	0.
SSN	191451.				108985.				92379.			
SSB	1420513.				1287775.				952058.			
TSN	378279.	201256.	622157.	343204.	183021.	94142.	723622.	322481.	169482.	84724.	453920.	266514.
TSB	2728308.	3057634.	5436249.	3389031.	1806031.	1696031.	4371017.	2581742.	1491782.	1415362.	3050631.	2137118.

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	188740.	122312.	*	*	280830.	179252.	*	*	348783.	213364.
1	134180.	72374.	50657.	27890.	67176.	36678.	26204.	13920.	104590.	59882.	42188.	24383.
2	12274.	5659.	3784.	1761.	13064.	5631.	3491.	1616.	6514.	2914.	1913.	689.
3	566.	261.	212.	131.	1134.	471.	217.	148.	943.	361.	279.	183.
4+	968.	823.	701.	597.	618.	523.	446.	380.	447.	378.	321.	274.
SSN	80898.				48404.				60198.			
SSB	816501.				602510.				572083.			
TSN	147988.	79117.	244094.	152691.	81992.	43304.	311188.	195316.	112493.	63535.	393484.	238893.
TSB	1286131.	1337139.	2196821.	1456913.	837626.	794499.	1941542.	1472134.	938148.	1036526.	2548846.	1880560.

Year	1980	1981	1982

continued...

Table 10.3.3 (continued)

Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	140326.	79754.	*	*	454975.	276532.	*	*	371406.	211190.
1	127659.	79880.	58749.	32718.	42284.	21228.	14673.	8110.	128308.	73230.	52520.	28191.
2	12638.	7088.	4776.	1691.	14461.	5708.	3572.	1538.	3216.	1376.	788.	181.
3	389.	190.	135.	92.	843.	340.	215.	156.	904.	320.	249.	145.
4+	382.	324.	271.	231.	272.	226.	191.	162.	271.	231.	197.	168.
SSN	77238.				36717.				68545.			
SSB	761770.				515057.				571165.			
TSN	141068.	87482.	204257.	114486.	57859.	27502.	473625.	286498.	132699.	75157.	425159.	239874.
TSB	1208578.	1466815.	2243454.	1307394.	663050.	542157.	2353217.	1919341.	1020244.	1174162.	2847433.	1931535.

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	324112.	189633.	*	*	284496.	145797.	*	*	239160.	131171.
1	122214.	74704.	55421.	32945.	108049.	65564.	48215.	26823.	73232.	36500.	26609.	15089.
2	12744.	6469.	3857.	1481.	14573.	6944.	4254.	1514.	10359.	3266.	2284.	824.
3	101.	47.	32.	12.	860.	378.	75.	55.	555.	117.	87.	54.
4+	269.	229.	193.	165.	144.	123.	105.	89.	124.	105.	89.	76.
SSN	74221.				69601.				47654.			
SSB	727217.				741228.				513335.			
TSN	135328.	81450.	383615.	224236.	123626.	73009.	337146.	174278.	84270.	39988.	268229.	147214.
TSB	1154965.	1355716.	2849721.	1958415.	1119400.	1245342.	2530815.	1558472.	769649.	670270.	1725262.	1171804.

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	401096.	226060.	*	*	127674.	63497.	*	*	185352.	110100.
1	60378.	27540.	20327.	11199.	100355.	57124.	42864.	23406.	25449.	14315.	10829.	6528.
2	5015.	964.	650.	218.	3662.	1485.	1075.	554.	6296.	2565.	1862.	1025.
3	488.	127.	104.	80.	140.	61.	52.	42.	220.	89.	75.	61.
4+	112.	92.	79.	67.	127.	107.	91.	78.	98.	84.	71.	61.
SSN	35803.				54106.				19339.			
SSB	347409.				444491.				241896.			
TSN	65992.	28723.	422256.	237625.	104283.	58777.	171756.	87577.	32064.	17053.	198189.	117775.
TSB	558732.	457391.	2146756.	1627753.	795732.	916418.	1631647.	945037.	330969.	311089.	1096686.	857334.

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	214462.	129592.	*	*	239070.	131866.	*	*	385111.	236389.
1	47812.	28624.	21582.	13486.	61480.	37236.	27143.	17670.	58613.	34665.	26544.	17158.
2	1977.	1075.	701.	332.	4588.	2139.	1193.	688.	5761.	2003.	1203.	804.
3	430.	232.	191.	157.	183.	87.	53.	36.	430.	163.	122.	100.
4+	105.	89.	76.	65.	180.	128.	109.	93.	104.	83.	71.	60.
SSN	26418.				35691.				35601.			
SSB	233902.				333523.				354875.			
TSN	50324.	30021.	237012.	143633.	66431.	39590.	267568.	150353.	64907.	36914.	413050.	254511.
TSB	401244.	482514.	1438986.	1110825.	548702.	642764.	1689375.	1228587.	560021.	600905.	2263042.	1852516.

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	249363.	158434.
1	118618.	77951.	60471.	41157.
2	6826.	3395.	2470.	1549.
3	480.	206.	158.	133.
4+	122.	101.	86.	74.
SSN	66737.			
SSB	591386.			
TSN	126046.	81654.	312549.	201347.
TSB	1006551.	1300688.	2624926.	1969973.

Catch in numbers for fleet: 1
Commercial fishery

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	846.	5720.	*	*	889.	9968.	*	*	197.	5986.
1	13450.	7873.	9966.	7809.	3742.	7206.	7117.	2027.	4950.	7580.	5349.	3157.
2	414.	193.	489.	140.	1726.	383.	349.	461.	589.	645.	590.	320.
3	26.	26.	145.	4.	13.	2.	0.	1.	91.	58.	2.	15.
4+	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

continued...

Table 10.3.3 (continued)

SOP	104346.	125974.	282226.	220055.	64728.	121215.	196494.	125860.	51277.	138528.	159991.	122841.
Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	61.	1655.	*	*	304.	1225.	*	*	968.	864.
1	9171.	3577.	3580.	3540.	2931.	1181.	2385.	1400.	5079.	3270.	4244.	2154.
2	950.	367.	861.	236.	1371.	650.	786.	322.	940.	249.	763.	167.
3	33.	8.	45.	5.	93.	194.	30.	6.	170.	27.	49.	11.
4+	3.	0.	0.	0.	4.	0.	0.	0.	3.	1.	0.	0.
SOP	86564.	66547.	129438.	101558.	54611.	49508.	96426.	53431.	63201.	58922.	145721.	62378.
Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	24.	641.	*	*	77.	36560.	*	*	151.	1058.
1	5044.	2586.	7711.	3920.	2223.	1072.	1316.	1038.	5267.	3251.	6576.	3017.
2	1075.	689.	1960.	512.	1688.	621.	944.	301.	415.	275.	431.	46.
3	59.	29.	18.	6.	76.	77.	17.	3.	216.	23.	62.	0.
4+	2.	5.	0.	0.	6.	2.	0.	0.	0.	0.	0.	0.
SOP	61430.	63946.	278231.	115858.	56073.	41156.	74820.	256050.	54639.	59265.	187257.	77671.
Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	421.	2520.	*	*	1.	2209.	*	*	6.	665.
1	3969.	1723.	5495.	4053.	2732.	2230.	5238.	3457.	2220.	840.	1373.	2932.
2	1224.	1165.	1485.	358.	1361.	1153.	1666.	727.	1337.	142.	777.	171.
3	14.	9.	16.	7.	142.	266.	8.	0.	188.	13.	19.	0.
4+	0.	2.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
SOP	55271.	66017.	203874.	123781.	56228.	55972.	150783.	109843.	56337.	15205.	61263.	90213.
Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	0.	5436.	*	*	8.	221.	*	*	24.	2947.
1	395.	180.	1186.	1687.	2665.	1073.	1585.	2138.	246.	82.	183.	632.
2	1066.	60.	245.	36.	398.	60.	165.	230.	699.	71.	250.	405.
3	72.	2.	6.	0.	12.	0.	0.	5.	20.	0.	0.	0.
4+	3.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
SOP	37767.	5294.	45085.	86104.	33612.	15400.	37697.	60396.	22097.	3327.	15056.	60181.
Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	7.	4721.	*	*	12.	846.	*	*	76.	2607.
1	1717.	693.	1097.	1945.	1581.	1853.	954.	1196.	1485.	419.	1010.	1030.
2	48.	146.	198.	90.	596.	528.	193.	126.	1335.	397.	67.	185.
3	7.	7.	0.	13.	24.	22.	9.	7.	93.	19.	1.	17.
4+	0.	0.	0.	0.	28.	0.	0.	0.	6.	0.	0.	0.
SOP	15272.	13838.	36211.	87352.	28283.	39730.	26158.	45253.	42621.	17791.	34774.	57894.
Year	1992											
Season	1	2	3	4								
AGE												
0	*	*	34.	456.								
1	3340.	997.	2608.	2643.								
2	1067.	230.	372.	254.								
3	117.	20.	1.	2.								
4+	3.	0.	0.	0.								
SOP	61815.	19838.	85201.	87694.								

Partial fishing mortality for fleet: 1
Commercial fishery

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.002	.028	*	*	.002	.046	*	*	.001	.033
1	.048	.047	.095	.145	.034	.111	.191	.117	.044	.119	.145	.172
2	.156	.156	.923	1.219	.073	.031	.044	.091	.081	.191	.341	.392

continued...

Table 10.3.3 (continued)

	3	.068	.129	1.753	1.308	.732	.379	.114	.739	.032	.037	.002	.015
	4+	.089	1.921	*	*	.692	.531	.000	.000	.231	.504	.000	.000
F (1- 2)		.102	.101	.509	.682	.054	.071	.118	.104	.063	.155	.243	.282
Year		1977				1978				1979			
Season		1	2	3	4	1	2	3	4	1	2	3	4
AGE													
	0	*	*	.000	.018	*	*	.001	.009	*	*	.004	.005
	1	.091	.059	.094	.180	.058	.038	.122	.143	.063	.065	.130	.120
	2	.111	.079	.321	.165	.154	.145	.318	.256	.208	.104	.610	.315
	3	.084	.035	.265	.039	.123	.572	.163	.043	.276	.085	.214	.066
	4+	.003	.000	.000	.000	.006	.001	.000	.000	.007	.003	.000	.000
F (1- 2)		.101	.069	.207	.173	.106	.091	.220	.199	.136	.085	.370	.217
Year		1980				1981				1982			
Season		1	2	3	4	1	2	3	4	1	2	3	4
AGE													
	0	*	*	.000	.011	*	*	.000	.188	*	*	.001	.007
	1	.049	.038	.172	.174	.073	.060	.118	.194	.054	.052	.167	.154
	2	.112	.117	.630	.412	.178	.136	.383	.250	.190	.258	.941	.332
	3	.211	.180	.160	.072	.136	.280	.092	.021	.375	.081	.318	.000
	4+	.006	.017	.000	.000	.024	.010	.000	.000	.000	.000	.000	.000
F (1- 2)		.081	.077	.401	.293	.125	.098	.251	.222	.122	.155	.554	.243
Year		1983				1984				1985			
Season		1	2	3	4	1	2	3	4	1	2	3	4
AGE													
	0	*	*	.002	.017	*	*	.000	.021	*	*	.000	.007
	1	.041	.027	.127	.179	.032	.039	.143	.198	.042	.027	.067	.315
	2	.132	.229	.576	.310	.132	.209	.602	.720	.215	.052	.524	.264
	3	.197	.230	.759	.950	.240	1.206	.124	.000	.628	.128	.273	.000
	4+	.000	.009	.000	.000	.000	.000	.000	.000	.006	.000	.000	.000
F (1- 2)		.086	.128	.351	.244	.082	.124	.372	.459	.128	.039	.296	.289
Year		1986				1987				1988			
Season		1	2	3	4	1	2	3	4	1	2	3	4
AGE													
	0	*	*	.000	.035	*	*	.000	.005	*	*	.000	.039
	1	.009	.008	.077	.247	.035	.022	.049	.162	.013	.007	.022	.164
	2	.417	.075	.593	.204	.164	.047	.208	.611	.167	.033	.178	.570
	3	.264	.017	.065	.000	.126	.000	.000	.135	.135	.000	.000	.000
	4+	.029	.000	.000	.000	.009	.000	.000	.000	.000	.000	.000	.000
F (1- 2)		.213	.041	.335	.225	.099	.034	.129	.387	.090	.020	.100	.367
Year		1989				1990				1991			
Season		1	2	3	4	1	2	3	4	1	2	3	4
AGE													
	0	*	*	.000	.052	*	*	.000	.009	*	*	.000	.015
	1	.046	.028	.064	.233	.033	.058	.043	.112	.033	.014	.047	.092
	2	.032	.166	.393	.355	.184	.322	.209	.228	.367	.251	.067	.292
	3	.022	.031	.000	.090	.184	.322	.209	.228	.331	.135	.013	.201
	4+	.000	.000	.000	.000	.184	.000	.000	.000	.061	.000	.000	.000
F (1- 2)		.039	.097	.228	.294	.108	.190	.126	.170	.200	.132	.057	.192
Year		1992											
Season		1	2	3	4								
AGE													
	0	*	*	.000	.004								
	1	.034	.014	.052	.096								
	2	.215	.079	.187	.199								
	3	.355	.109	.006	.019								
	4+	.029	.000	.000	.000								
F (1- 2)		.125	.047	.120	.147								

Log inverse catchabilities, fleet no: 1
Commercial fishery

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*

continued...

Table 10.3.3 (continued)

1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	16.852	12.287
1	*	*	*	*	*	*	*	*	11.011	10.524	10.397	9.806
2	*	*	*	*	*	*	*	*	9.281	8.810	8.819	9.092
3	*	*	*	*	*	*	*	*	9.281	8.810	8.819	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	16.852	12.287	*	*	16.852	12.287	*	*	16.852	12.287
1	11.011	10.524	10.397	9.806	11.011	10.524	10.397	9.806	11.011	10.524	10.397	9.806
2	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092
3	9.281	8.810	8.819	9.092	9.281	8.810	8.819	*	9.281	8.810	8.819	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	12.287	*	*	16.852	12.287	*	*	16.852	12.287
1	11.011	10.524	10.397	9.806	11.011	10.524	10.397	9.806	11.011	10.524	10.397	9.806
2	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092
3	9.281	8.810	8.819	*	9.281	*	*	9.092	9.281	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	16.852	12.287	*	*	16.852	12.287	*	*	16.852	12.287
1	11.011	10.524	10.397	9.806	11.011	10.524	10.397	9.806	11.011	10.524	10.397	9.806
2	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092
3	9.281	8.810	*	9.092	9.281	8.810	8.819	9.092	9.281	8.810	8.819	9.092

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	16.852	12.287
1	11.011	10.524	10.397	9.806
2	9.281	8.810	8.819	9.092
3	9.281	8.810	8.819	9.092

Log inverse catchabilities, fleet no: 2
IYFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	3.366	*	*	*	3.366	*	*	*	3.366	*	*	*
2	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	3.366	*	*	*	3.366	*	*	*	3.366	*	*	*
2	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	3.366	*	*	*	3.366	*	*	*	3.366	*	*	*

continued...

Table 10.3.3 (continued)

2	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	3.366	*	*	*	3.366	*	*	*	3.366	*	*	*
2	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*
3	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	3.366	*	*	*	3.366	*	*	*	3.366	*	*	*
2	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*
3	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	3.366	*	*	*	3.366	*	*	*	3.366	*	*	*
2	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*
3	1.833	*	*	*	1.833	*	*	*	1.833	*	*	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	*	*
1	3.366	*	*	*
2	1.833	*	*	*
3	1.833	*	*	*

Log inverse catchabilities, fleet no: 3
EGFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.822	*	*	*	6.822	*	*	*	6.822	*
1	*	*	4.378	*	*	*	4.378	*	*	*	4.378	*
2	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*
3	*	*	2.747	*	*	*	2.747	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.822	*	*	*	6.822	*	*	*	6.822	*
1	*	*	4.378	*	*	*	4.378	*	*	*	4.378	*
2	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*
3	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.822	*	*	*	6.822	*	*	*	6.822	*
1	*	*	4.378	*	*	*	4.378	*	*	*	4.378	*
2	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*
3	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.822	*	*	*	6.822	*	*	*	6.822	*
1	*	*	4.378	*	*	*	4.378	*	*	*	4.378	*
2	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*

continued...

Table 10.3.3 (continued)

3	*	*	2.747	*	*	*	*	*	*	*	2.747	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.822	*	*	*	6.822	*	*	*	6.822	*
1	*	*	4.378	*	*	*	4.378	*	*	*	4.378	*
2	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*
3	*	*	2.747	*	*	*	2.747	*	*	*	2.747	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	6.822	*
1	*	*	4.378	*
2	*	*	2.747	*
3	*	*	2.747	*

Log inverse catchabilities, fleet no: 4
SGFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	7.728	*
1	*	*	1.752	*	*	*	1.752	*	*	*	1.752	*
2	*	*	.465	*	*	*	.465	*	*	*	.465	*
3	*	*	.465	*	*	*	.465	*	*	*	.465	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	7.728	*	*	*	7.728	*	*	*	7.728	*
1	*	*	1.752	*	*	*	1.752	*	*	*	1.752	*
2	*	*	.465	*	*	*	.465	*	*	*	.465	*
3	*	*	.465	*	*	*	.465	*	*	*	.465	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	7.728	*	*	*	7.728	*	*	*	7.728	*
1	*	*	1.752	*	*	*	1.752	*	*	*	1.752	*
2	*	*	.465	*	*	*	.465	*	*	*	.465	*
3	*	*	.465	*	*	*	.465	*	*	*	.465	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	7.728	*	*	*	7.728	*	*	*	7.728	*
1	*	*	1.752	*	*	*	1.752	*	*	*	1.752	*
2	*	*	.465	*	*	*	.465	*	*	*	.465	*
3	*	*	.465	*	*	*	.465	*	*	*	.465	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	7.728	*
1	*	*	1.752	*
2	*	*	.465	*
3	*	*	.465	*

continued...

Table 10.3.3 (continued)

Log residual stocknr. (nhat/n), fleet no: 1
Commercial fishery

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	.812	-.701
1	*	*	*	*	*	*	*	*	.290	.083	.107	-.017
2	*	*	*	*	*	*	*	*	-.174	-.030	.256	.037
3	*	*	*	*	*	*	*	*	.507	-1.188	-.827	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.820	-.101	*	*	-3.943	-.046	*	*	-1.185	-.825
1	-.046	-.508	-.311	-.252	-.185	-.098	-.101	-.282	.017	.499	-.028	.459
2	-.611	-.072	-.376	-.414	-.504	-.146	-.242	.297	-.081	-.560	.443	-.429
3	-.208	-.065	-.100	.706	.095	1.608	-1.825	*	.991	.350	-.208	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	.856	*	*	.184	-.684	*	*	1.845	1.195
1	-1.386	-.706	.564	.326	.279	.462	.066	.255	-.465	.592	.268	.141
2	.673	-.125	1.023	-.579	.101	-.469	-.069	.866	.381	.479	.799	.673
3	.215	-1.590	-1.183	*	-.165	*	*	-.644	.167	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-1.048	1.123	*	*	-.028	-.040	*	*	1.330	.385
1	1.364	.697	-.139	.148	.434	-.027	-.028	-.040	.005	-.478	.112	-.304
2	-.713	.772	.104	-.141	.434	-.027	-.028	-.040	.698	.709	-1.108	.144
3	-1.105	-.909	*	-1.510	.434	-.027	-.028	-.040	.596	.087	-2.732	-.230

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	.214	-1.161
1	-.306	-.515	-.508	-.434
2	-.203	-.532	-.803	-.415
3	.297	-.210	-4.190	-2.746

Log residual stocknr. (nhat/n), fleet no: 2
IYFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.983	*	*	*	.109	*	*	*	.171	*	*	*
2	-.060	*	*	*	-.447	*	*	*	-1.100	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.329	*	*	*	.094	*	*	*	-.030	*	*	*

continued...

Table 10.3.3 (continued)

2	-1.413	*	*	*	-.157	*	*	*	-1.101	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.148	*	*	*	.263	*	*	*	-.024	*	*	*
2	-.924	*	*	*	-1.003	*	*	*	.143	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	-.358	*	*	*	.290	*	*	*	.146	*	*	*
2	-.807	*	*	*	-.724	*	*	*	.358	*	*	*
3	-.233	*	*	*	-.491	*	*	*	.394	*	*	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.347	*	*	*	.132	*	*	*	-1.660	*	*	*
2	-.061	*	*	*	.188	*	*	*	.127	*	*	*
3	-.640	*	*	*	1.447	*	*	*	-.582	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.476	*	*	*	-.235	*	*	*	.461	*	*	*
2	.093	*	*	*	.402	*	*	*	.152	*	*	*
3	1.244	*	*	*	.796	*	*	*	1.057	*	*	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	*	*
1	.426	*	*	*
2	.130	*	*	*
3	-.470	*	*	*

Log residual stocknr. (nhat/n), fleet no: 3
EGFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	2.119	*	*	*	1.590	*	*	*	1.673	*
1	*	*	.472	*	*	*	.249	*	*	*	.383	*
2	*	*	.328	*	*	*	-.286	*	*	*	-1.389	*
3	*	*	.832	*	*	*	.767	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.257	*	*	*	1.512	*	*	*	1.772	*
1	*	*	.384	*	*	*	1.015	*	*	*	.366	*
2	*	*	-1.201	*	*	*	.584	*	*	*	-.815	*
3	*	*	-.030	*	*	*	.751	*	*	*	-.126	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.703	*	*	*	-.345	*	*	*	-.365	*
1	*	*	-.052	*	*	*	.784	*	*	*	.161	*
2	*	*	-1.741	*	*	*	-.646	*	*	*	-.251	*

continued...

Table 10.3.3 (continued)

3	*	*	-.302	*	*	*	-.325	*	*	*	-.802	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-1.115	*	*	*	-3.913	*	*	*	-1.252	*
1	*	*	.128	*	*	*	-.978	*	*	*	-1.412	*
2	*	*	.574	*	*	*	1.021	*	*	*	-.978	*
3	*	*	1.117	*	*	*	*	*	*	*	-.370	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.779	*	*	*	1.161	*	*	*	.189	*
1	*	*	.480	*	*	*	-.049	*	*	*	-.518	*
2	*	*	1.556	*	*	*	-.275	*	*	*	.619	*
3	*	*	-.801	*	*	*	1.153	*	*	*	-1.264	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	1.387	*
1	*	*	1.090	*
2	*	*	.935	*
3	*	*	1.640	*

Log residual stocknr. (nhat/n), fleet no: 4
SGFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	-.446	*
1	*	*	.911	*	*	*	-.041	*	*	*	.374	*
2	*	*	.571	*	*	*	-.198	*	*	*	.422	*
3	*	*	.529	*	*	*	-.250	*	*	*	.587	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.185	*	*	*	-1.571	*	*	*	-.522	*
1	*	*	-.429	*	*	*	-.033	*	*	*	.589	*
2	*	*	-.579	*	*	*	-.928	*	*	*	.619	*
3	*	*	-.282	*	*	*	.713	*	*	*	.211	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.049	*	*	*	.150	*	*	*	.767	*
1	*	*	.379	*	*	*	-.503	*	*	*	-1.351	*
2	*	*	.729	*	*	*	-.789	*	*	*	.859	*
3	*	*	.433	*	*	*	-.987	*	*	*	.033	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-1.599	*	*	*	1.987	*	*	*	-.325	*
1	*	*	.244	*	*	*	-.619	*	*	*	.673	*
2	*	*	-.391	*	*	*	-.130	*	*	*	-.387	*
3	*	*	.270	*	*	*	-.618	*	*	*	-.112	*

continued...

Table 10.3.3 (continued)

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	.323	*
1	*	*	.677	*
2	*	*	.574	*
3	*	*	.967	*

Weighting factors for computing survivors:
Fleet no: 1
Commercial fishery

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	.548	1.181
1	*	*	*	*	*	*	*	*	1.431	1.890	3.376	3.287
2	*	*	*	*	*	*	*	*	1.916	2.047	1.507	2.042
3	*	*	*	*	*	*	*	*	1.681	.978	.452	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.548	1.181	*	*	.548	1.181	*	*	.548	1.181
1	1.431	1.890	3.376	3.287	1.431	1.890	3.376	3.287	1.431	1.890	3.376	3.287
2	1.916	2.047	1.507	2.042	1.916	2.047	1.507	2.042	1.916	2.047	1.507	2.042
3	1.681	.978	.452	.630	1.681	.978	.452	*	1.681	.978	.452	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	1.181	*	*	.548	1.181	*	*	.548	1.181
1	1.431	1.890	3.376	3.287	1.431	1.890	3.376	3.287	1.431	1.890	3.376	3.287
2	1.916	2.047	1.507	2.042	1.916	2.047	1.507	2.042	1.916	2.047	1.507	2.042
3	1.681	.978	.452	*	1.681	*	*	.630	1.681	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.548	1.181	*	*	.548	1.181	*	*	.548	1.181
1	1.431	1.890	3.376	3.287	1.431	1.890	3.376	3.287	1.431	1.890	3.376	3.287
2	1.916	2.047	1.507	2.042	1.916	2.047	1.507	2.042	1.916	2.047	1.507	2.042
3	1.681	.978	*	.630	1.681	.978	.452	.630	1.681	.978	.452	.630

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	.548	1.181
1	1.431	1.890	3.376	3.287
2	1.916	2.047	1.507	2.042
3	1.681	.978	.452	.630

Weighting factors for computing survivors:
Fleet no: 2
IYFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												

continued...

Table 10.3.3 (continued)

0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.083	*	*	*	2.083	*	*	*	2.083	*	*	*
2	3.222	*	*	*	3.222	*	*	*	3.222	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.083	*	*	*	2.083	*	*	*	2.083	*	*	*
2	3.222	*	*	*	3.222	*	*	*	3.222	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.083	*	*	*	2.083	*	*	*	2.083	*	*	*
2	3.222	*	*	*	3.222	*	*	*	3.222	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.083	*	*	*	2.083	*	*	*	2.083	*	*	*
2	3.222	*	*	*	3.222	*	*	*	3.222	*	*	*
3	1.096	*	*	*	1.096	*	*	*	1.096	*	*	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.083	*	*	*	2.083	*	*	*	2.083	*	*	*
2	3.222	*	*	*	3.222	*	*	*	3.222	*	*	*
3	1.096	*	*	*	1.096	*	*	*	1.096	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.083	*	*	*	2.083	*	*	*	2.083	*	*	*
2	3.222	*	*	*	3.222	*	*	*	3.222	*	*	*
3	1.096	*	*	*	1.096	*	*	*	1.096	*	*	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	*	*
1	2.083	*	*	*
2	3.222	*	*	*
3	1.096	*	*	*

Weighting factors for computing survivors:
Fleet no: 3
EGFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.697	*	*	*	.697	*	*	*	.697	*
1	*	*	1.590	*	*	*	1.590	*	*	*	1.590	*
2	*	*	1.158	*	*	*	1.158	*	*	*	1.158	*
3	*	*	1.179	*	*	*	1.179	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												

continued...

0	*	*	.697	*	*	*	.697	*	*	*	.697	*
1	*	*	1.590	*	*	*	1.590	*	*	*	1.590	*
2	*	*	1.158	*	*	*	1.158	*	*	*	1.158	*
3	*	*	1.179	*	*	*	1.179	*	*	*	1.179	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.697	*	*	*	.697	*	*	*	.697	*
1	*	*	1.590	*	*	*	1.590	*	*	*	1.590	*
2	*	*	1.158	*	*	*	1.158	*	*	*	1.158	*
3	*	*	1.179	*	*	*	1.179	*	*	*	1.179	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.697	*	*	*	.697	*	*	*	.697	*
1	*	*	1.590	*	*	*	1.590	*	*	*	1.590	*
2	*	*	1.158	*	*	*	1.158	*	*	*	1.158	*
3	*	*	1.179	*	*	*	*	*	*	*	1.179	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.697	*	*	*	.697	*	*	*	.697	*
1	*	*	1.590	*	*	*	1.590	*	*	*	1.590	*
2	*	*	1.158	*	*	*	1.158	*	*	*	1.158	*
3	*	*	1.179	*	*	*	1.179	*	*	*	1.179	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	.697	*
1	*	*	1.590	*
2	*	*	1.158	*
3	*	*	1.179	*

Weighting factors for computing survivors:
Fleet no: 4
SGFS

Year	1974				1975				1976			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1977				1978				1979			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980				1981				1982			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	.897	*
1	*	*	1.610	*	*	*	1.610	*	*	*	1.610	*
2	*	*	1.600	*	*	*	1.600	*	*	*	1.600	*
3	*	*	1.762	*	*	*	1.762	*	*	*	1.762	*

Year	1983				1984				1985			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.897	*	*	*	.897	*	*	*	.897	*
1	*	*	1.610	*	*	*	1.610	*	*	*	1.610	*
2	*	*	1.600	*	*	*	1.600	*	*	*	1.600	*
3	*	*	1.762	*	*	*	1.762	*	*	*	1.762	*

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												

continued...

Table 10.3.3 (continued)

0	*	*	.897	*	*	*	.897	*	*	*	.897	*
1	*	*	1.610	*	*	*	1.610	*	*	*	1.610	*
2	*	*	1.600	*	*	*	1.600	*	*	*	1.600	*
3	*	*	1.762	*	*	*	1.762	*	*	*	1.762	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.897	*	*	*	.897	*	*	*	.897	*
1	*	*	1.610	*	*	*	1.610	*	*	*	1.610	*
2	*	*	1.600	*	*	*	1.600	*	*	*	1.600	*
3	*	*	1.762	*	*	*	1.762	*	*	*	1.762	*

Year	1992			
Season	1	2	3	4
AGE				
0	*	*	.897	*
1	*	*	1.610	*
2	*	*	1.600	*
3	*	*	1.762	*

continued...

Table 10.3.3 (continued)

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	.000	-1.239	*	*	-.583	.139
1	-.376	-.452	-.374	-.148	.238	-.155	-.491	-.234
2	-.250	-.376	-.470	-.079	-.875	-.554	-.251	-.078
3	.486	.327	-3.389	-1.974	-1.600	.618	-.759	-2.485

Log residual stocknr. (nhat/n), fleet no: 2
IYFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.517	*	*	*	.392	*	*	*	-1.585	*	*	*
2	.034	*	*	*	.057	*	*	*	-.059	*	*	*
3	-.417	*	*	*	1.403	*	*	*	-.675	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	.087	*	*	*	-.394	*	*	*	.242	*	*	*
2	-.192	*	*	*	-.068	*	*	*	-.179	*	*	*
3	1.080	*	*	*	1.164	*	*	*	.965	*	*	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	*	*	*	*	*	*
1	.316	*	*	*	.424	*	*	*
2	-.033	*	*	*	.440	*	*	*
3	-.396	*	*	*	1.327	*	*	*

Log residual stocknr. (nhat/n), fleet no: 3
EGFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-.800	*	*	*	-3.490	*	*	*	-1.562	*
1	*	*	.125	*	*	*	-.714	*	*	*	-1.384	*
2	*	*	.074	*	*	*	.501	*	*	*	-1.563	*
3	*	*	1.071	*	*	*	*	*	*	*	-.660	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.569	*	*	*	1.075	*	*	*	-.022	*
1	*	*	.145	*	*	*	-.084	*	*	*	-.658	*
2	*	*	1.074	*	*	*	-.972	*	*	*	-.024	*
3	*	*	-1.027	*	*	*	1.618	*	*	*	-1.238	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	1.520	*	*	*	2.710	*
1	*	*	1.180	*	*	*	1.389	*
2	*	*	.718	*	*	*	.192	*
3	*	*	1.890	*	*	*	1.107	*

Log residual stocknr. (nhat/n), fleet no: 4
SGFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.189	*	*	*	.397	*	*	*	.282	*
1	*	*	.401	*	*	*	-.213	*	*	*	-1.297	*
2	*	*	.620	*	*	*	-.918	*	*	*	.666	*
3	*	*	.778	*	*	*	-.780	*	*	*	.134	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												

continued...

Table 10.3.3 (continued)

0	*	*	-1.984	*	*	*	1.725	*	*	*	-.712	*
1	*	*	-.066	*	*	*	-.630	*	*	*	.558	*
2	*	*	-.481	*	*	*	-.435	*	*	*	-.639	*
3	*	*	.436	*	*	*	.238	*	*	*	.305	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	.280	*	*	*	-1.178	*
1	*	*	.791	*	*	*	.456	*
2	*	*	.748	*	*	*	.439	*
3	*	*	1.609	*	*	*	1.008	*

Log residual stocknr. (nhat/n), fleet no: 5
Division IIIa fishery

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*

Weighting factors for computing survivors:
Fleet no: 1
Commercial fishery North Sea

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	1.319	*	*	1.025	1.319	*	*	1.025	1.319
1	1.403	1.634	2.284	3.234	1.403	1.634	2.284	3.234	1.403	1.634	2.284	3.234
2	1.495	1.964	1.334	2.317	1.495	1.964	1.334	2.317	1.495	1.964	1.334	2.317
3	1.129	1.216	.410	*	1.129	*	*	.560	1.129	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	1.025	1.319	*	*	1.025	1.319	*	*	1.025	1.319
1	1.403	1.634	2.284	3.234	1.403	1.634	2.284	3.234	1.403	1.634	2.284	3.234
2	1.495	1.964	1.334	2.317	1.495	1.964	1.334	2.317	1.495	1.964	1.334	2.317
3	1.129	1.216	*	.560	1.129	1.216	.410	.560	1.129	1.216	.410	.560

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	1.025	1.319	*	*	1.025	1.319
1	1.403	1.634	2.284	3.234	1.403	1.634	2.284	3.234
2	1.495	1.964	1.334	2.317	1.495	1.964	1.334	2.317
3	1.129	1.216	.410	.560	1.129	1.216	.410	.560

Weighting factors for computing survivors:
Fleet no: 2
IYFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	1.346	*	*	*	1.346	*	*	*	1.346	*	*	*

continued...

Table 10.3.3 (continued)

2	4.748	*	*	*	4.748	*	*	*	4.748	*	*	*
3	.884	*	*	*	.884	*	*	*	.884	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	1.346	*	*	*	1.346	*	*	*	1.346	*	*	*
2	4.748	*	*	*	4.748	*	*	*	4.748	*	*	*
3	.884	*	*	*	.884	*	*	*	.884	*	*	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	*	*	*	*	*	*
1	1.346	*	*	*	1.346	*	*	*
2	4.748	*	*	*	4.748	*	*	*
3	.884	*	*	*	.884	*	*	*

Weighting factors for computing survivors:
Fleet no: 3
EGFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.486	*	*	*	.486	*	*	*	.486	*
1	*	*	1.000	*	*	*	1.000	*	*	*	1.000	*
2	*	*	1.078	*	*	*	1.078	*	*	*	1.078	*
3	*	*	.673	*	*	*	*	*	*	*	.673	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.486	*	*	*	.486	*	*	*	.486	*
1	*	*	1.000	*	*	*	1.000	*	*	*	1.000	*
2	*	*	1.078	*	*	*	1.078	*	*	*	1.078	*
3	*	*	.673	*	*	*	.673	*	*	*	.673	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	.486	*	*	*	.486	*
1	*	*	1.000	*	*	*	1.000	*
2	*	*	1.078	*	*	*	1.078	*
3	*	*	.673	*	*	*	.673	*

Weighting factors for computing survivors:
Fleet no: 4
SGFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.768	*	*	*	.768	*	*	*	.768	*
1	*	*	1.346	*	*	*	1.346	*	*	*	1.346	*
2	*	*	1.383	*	*	*	1.383	*	*	*	1.383	*
3	*	*	1.096	*	*	*	1.096	*	*	*	1.096	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.768	*	*	*	.768	*	*	*	.768	*
1	*	*	1.346	*	*	*	1.346	*	*	*	1.346	*
2	*	*	1.383	*	*	*	1.383	*	*	*	1.383	*
3	*	*	1.096	*	*	*	1.096	*	*	*	1.096	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	.768	*	*	*	.768	*
1	*	*	1.346	*	*	*	1.346	*
2	*	*	1.383	*	*	*	1.383	*
3	*	*	1.096	*	*	*	1.096	*

Weighting factors for computing survivors:

continued...

Table 10.3.3 (continued)

Fleet no: 5
Division IIIa fishery

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*

Table 10.3.4 Survivors Analysis of Sandeel in the Total North Sea.

```
 The following parameters were used:

Year range: 1974 - 1992
Seasons per year:    2
The last season in the last year is season : 2
Youngest age:  0; Oldest age:  5; (Plus age:  6)
Recruitment in season: 2
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Fishery in the Northern North Sea
Fleet  2:  Fishery in the Southern North Sea

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 2
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   0
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum6.hyr
 Weight in catch:        weca6.hyr
 Weight in stock:        west6.hyr
 Natural mortalities:    natmor.msv
 Maturity ogive:         matprop.hyr
 Tuning data (CPUE):     tuning6.xsa
 Weighting for rhats:    tweq.xsa
 Weighting for shats:    twred.xsa
 Unknown catches:        uc6.90

Final SSQ: 0.593

 Stock numbers (at start of season)
 **********************************
```

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	1587477.	*	1521106.	*	1070159.	*	978203.	*	952662.	*	1076518.
1	770277.	66885.	463208.	90671.	306001.	54214.	422612.	88243.	428588.	99150.	363561.	111593.
2	49660.	20715.	49024.	20576.	64716.	22208.	39391.	15546.	62682.	21805.	70203.	22859.
3	16812.	9697.	15602.	6561.	14252.	7601.	14350.	3971.	10597.	5417.	15400.	6882.
4	5482.	1627.	7174.	3787.	4665.	1767.	4924.	2243.	2784.	1007.	3873.	1641.
5	365.	8.	969.	2.	2100.	1098.	1019.	277.	1359.	797.	589.	39.
6+	130.	0.	1.	0.	1.	0.	617.	87.	181.	58.	476.	105.
SSN	72449.		72770.		85733.		60302.		77603.		90541.	
SSB	1112615.		1130772.		1307373.		948225.		1161306.		1359086.	
TSN	842726.	1686410.	535978.	1642702.	391734.	1157047.	482914.	1088569.	506191.	1080897.	454102.	1219638.
TSB	4802241.	3719110.	3349537.	3879552.	2773117.	2815263.	2972535.	2881680.	3214245.	3087544.	3100545.	3456114.

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	483978.	*	1149336.	*	349607.	*	1072170.	*	399024.	*	1554922.
1	364237.	92189.	147006.	37170.	452173.	159290.	124124.	43081.	403950.	127139.	118988.	44007.
2	76264.	28889.	61265.	23324.	26888.	10751.	113888.	44853.	31766.	18295.	84146.	21925.
3	14767.	6340.	19673.	10910.	15735.	8258.	7621.	4765.	31512.	12146.	13506.	7259.
4	4922.	2582.	4054.	2026.	8134.	4348.	6003.	4196.	3207.	2211.	8730.	6132.
5	1023.	535.	1669.	824.	1393.	924.	3095.	2144.	3107.	2253.	1568.	1113.
6+	71.	0.	312.	113.	636.	448.	950.	688.	2051.	1555.	2751.	2130.
SSN	97048.		86973.		52785.		131558.		71643.		110702.	
SSB	1454540.		1337727.		864512.		1827720.		1134443.		1608600.	
TSN	461285.	614512.	233979.	1223704.	504957.	533626.	255682.	1171897.	475593.	562623.	229690.	1637488.
TSB	3199234.	2462236.	2041885.	2819700.	2731985.	2660963.	2452064.	2628004.	2790639.	2498811.	2107159.	3009879.

continued...

Table 10.3.4 (continued)

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	739886.	*	360316.	*	796842.	*	331667.	*	800313.	*	993935.
1	553318.	242699.	270525.	117832.	102829.	40631.	309226.	89388.	132690.	48303.	280004.	105216.
2	30875.	13419.	169100.	91991.	78011.	23199.	28996.	14412.	61351.	22996.	33842.	14330.
3	13555.	8868.	9379.	6040.	62243.	31104.	17034.	9416.	10299.	5487.	16625.	10981.
4	3512.	2736.	6626.	5095.	4394.	1705.	21819.	14192.	7086.	4720.	4015.	2556.
5	4396.	3458.	2039.	1587.	3736.	2339.	1207.	933.	10728.	7145.	3474.	2678.
6+	2355.	1890.	4020.	3277.	3743.	2796.	3898.	3160.	3186.	2557.	7199.	5836.
SSN	54694.		191164.		152127.		72955.		92650.		65156.	
SSB	875049.		2647629.		2383085.		1232180.		1411355.		1030921.	
TSN	608012.	1012957.	461689.	586137.	254956.	898616.	382181.	463168.	225339.	891520.	345160.	1135532.
TSB	3187916.	4453098.	3919097.	3500737.	2835533.	2687089.	2592776.	2141621.	1976613.	2361892.	2232136.	2873181.

Year	1992	
Season	1	2
AGE		
0	*	639754.
1	420684.	168889.
2	68848.	37128.
3	10723.	7038.
4	8533.	6160.
5	1968.	1404.
6+	6707.	5324.
SSN	96778.	
SSB	1444619.	
TSN	517462.	865697.
TSB	3161009.	3719121.

Catch in numbers for fleet: 1
Fishery in the Northern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	9979.	*	9282.	*	6126.	*	3067.	*	7820.	*	44203.
1	19850.	384.	7186.	74.	5697.	648.	24307.	2856.	6127.	1001.	2335.	1310.
2	1347.	53.	5249.	105.	1130.	84.	2351.	913.	2338.	307.	1328.	433.
3	1424.	11.	1508.	1.	445.	368.	516.	142.	573.	39.	242.	66.
4	276.	7.	248.	0.	101.	19.	124.	99.	78.	1.	5.	10.
5	73.	5.	87.	0.	39.	10.	17.	28.	45.	1.	2.	0.
6+	2.	0.	0.	0.	15.	8.	3.	15.	21.	0.	5.	0.
SOP	183622.	37819.	164803.	32085.	65941.	44266.	188059.	83802.	87210.	47012.	37674.	166139.

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	8349.	*	9128.	*	6530.	*	7911.	*	0.	*	349.
1	13394.	1173.	5505.	346.	3518.	65.	5684.	303.	11692.	1207.	2688.	109.
2	8865.	214.	4109.	94.	2132.	0.	1215.	316.	1647.	121.	3292.	239.
3	1050.	19.	904.	14.	556.	0.	89.	19.	153.	43.	1002.	89.
4	645.	4.	128.	6.	76.	0.	8.	0.	5.	0.	377.	7.
5	144.	3.	19.	0.	9.	0.	0.	0.	0.	0.	78.	3.
6+	38.	1.	27.	0.	0.	0.	4.	0.	0.	0.	25.	1.
SOP	255970.	47836.	117085.	35623.	66478.	20646.	50893.	37464.	91792.	20871.	106415.	12880.

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	7105.	*	455.	*	13196.	*	3380.	*	13640.	*	13616.
1	23934.	7077.	26236.	5768.	9855.	1283.	57002.	4038.	7828.	1116.	41855.	866.
2	2600.	473.	10855.	198.	25922.	340.	2233.	274.	5017.	375.	2342.	28.
3	200.	0.	350.	0.	1319.	119.	3406.	0.	537.	77.	908.	8.
4	0.	0.	107.	0.	26.	17.	0.	0.	172.	34.	225.	3.
5	0.	0.	32.	0.	0.	0.	0.	0.	261.	0.	93.	0.
6+	0.	0.	16.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SOP	174378.	128325.	306067.	83202.	430970.	71479.	440192.	57222.	143935.	70800.	374466.	55404.

Year	1992	
Season	1	2
AGE		
0	*	6797.

continued...

Table 10.3.4 (continued)

1	9871.	48.
2	4056.	3.
3	486.	0.
4	195.	0.
5	110.	0.
6+	0.	0.
SOP	115957.	38189.

Catch in numbers for fleet: 2
Fishery in the Southern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	76.	*	0.	*	0.	*	13263.	*	41224.	*	1947.
1	5989.	226.	11458.	480.	16308.	249.	19500.	269.	58839.	2774.	16018.	5210.
2	3930.	10.	1694.	1046.	14505.	2358.	5596.	27.	16948.	385.	22737.	2085.
3	497.	0.	2838.	170.	1522.	392.	6300.	8.	1793.	125.	4487.	138.
4	1968.	3.	529.	253.	1234.	102.	965.	8.	1006.	97.	1265.	110.
5	205.	0.	666.	0.	171.	20.	445.	3.	114.	26.	441.	30.
6+	106.	0.	97.	0.	73.	74.	399.	3.	61.	35.	280.	0.
SOP	116644.	2042.	141118.	21733.	279711.	34947.	280752.	34717.	537202.	128701.	409950.	70698.

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	72.	*	43420.	*	5039.	*	9298.	*	0.	*	11940.
1	33269.	4738.	13394.	407.	56545.	4718.	2232.	240.	62517.	9423.	7790.	1896.
2	12472.	840.	11719.	1892.	6224.	490.	35029.	2806.	2257.	92.	39301.	3229.
3	3794.	575.	2466.	115.	3277.	344.	934.	513.	13272.	577.	2490.	2234.
4	375.	9.	774.	36.	1813.	36.	234.	2.	267.	44.	233.	163.
5	63.	0.	353.	3.	94.	4.	122.	0.	109.	0.	18.	77.
6+	50.	0.	105.	0.	32.	0.	31.	0.	66.	0.	14.	58.
SOP	367820.	53026.	245186.	130789.	450381.	58421.	380559.	61745.	556795.	80581.	472950.	113782.

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	112.	*	298.	*	0.	*	1.	*	657.	*	12115.
1	43629.	5350.	4351.	3095.	2349.	0.	44444.	1619.	13089.	1140.	20058.	11411.
2	7333.	293.	22771.	6664.	10074.	234.	4525.	165.	17517.	494.	9224.	344.
3	1604.	241.	1158.	196.	17914.	2084.	957.	35.	2257.	169.	1320.	111.
4	30.	9.	141.	45.	1920.	63.	3350.	122.	733.	32.	454.	0.
5	0.	9.	24.	6.	617.	5.	18.	1.	1110.	48.	0.	0.
6+	0.	0.	0.	0.	232.	0.	0.	0.	0.	0.	0.	0.
SOP	335960.	47286.	296759.	105111.	464846.	40004.	309832.	22244.	341700.	24000.	345866.	123092.

Year	1992	
Season	1	2
AGE		
0	*	134.
1	60337.	3903.
2	10021.	382.
3	1002.	157.
4	427.	25.
5	69.	2.
6+	125.	7.
SOP	618474.	47520.

Partial fishing mortality for fleet: 1
Fishery in the Northern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.011	*	.012	*	.009	*	.005	*	.013	*	.067
1	.068	.007	.031	.001	.039	.014	.112	.038	.027	.012	.011	.014
2	.040	.003	.159	.006	.028	.005	.090	.071	.058	.017	.030	.023
3	.110	.001	.141	.000	.042	.059	.059	.042	.073	.008	.022	.011
4	.082	.005	.047	.000	.033	.014	.036	.056	.043	.001	.002	.007
5	.436	1.175	.203	.000	.025	.012	.027	.135	.043	.002	.007	.000
6+	.027	1.653	*	*	*	*	.010	.242	.180	.000	.019	.000
F (1- 2)	.054	.005	.095	.004	.033	.009	.101	.054	.043	.014	.021	.019

continued...

Table 10.3.4 (continued)

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.029	*	.012	*	.030	*	.012	*	.000	*	.000
1	.067	.015	.068	.011	.012	.000	.074	.008	.048	.012	.035	.003
2	.177	.009	.102	.005	.118	.000	.016	.008	.067	.008	.065	.014
3	.103	.004	.060	.001	.047	.000	.015	.005	.007	.004	.098	.017
4	.176	.002	.043	.004	.012	.000	.002	.000	.002	.000	.051	.001
5	.190	.007	.016	.000	.008	.000	.000	.000	.000	.000	.059	.003
6+	*	*	.132	.000	.000	.000	.005	.000	.000	.000	.010	.001
F (1- 2)	.122	.012	.085	.008	.065	.000	.045	.008	.058	.010	.050	.008

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.015	*	.002	*	.026	*	.016	*	.027	*	.020
1	.063	.035	.142	.060	.146	.037	.308	.054	.092	.027	.230	.010
2	.121	.042	.085	.003	.537	.017	.106	.022	.124	.019	.100	.002
3	.018	.000	.046	.000	.029	.005	.262	.000	.069	.016	.066	.001
4	.000	.000	.018	.000	.009	.012	.000	.000	.029	.008	.069	.001
5	.000	.000	.018	.000	.000	.000	.000	.000	.029	.000	.030	.000
6+	.000	.000	.004	.000	.000	.000	.000	.000	.000	.000	.000	.000
F (1- 2)	.092	.038	.113	.031	.342	.027	.207	.038	.108	.023	.165	.006

Year	1992	
Season	1	2
AGE		
0	*	.016
1	.035	.000
2	.078	.000
3	.055	.000
4	.027	.000
5	.066	.000
6+	.000	.000
F (1- 2)	.057	.000

Partial fishing mortality for fleet: 2
Fishery in the Southern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.000	*	.000	*	.000	*	.020	*	.067	*	.003
1	.021	.004	.050	.006	.111	.005	.090	.004	.256	.033	.075	.056
2	.118	.001	.051	.061	.356	.131	.215	.002	.424	.021	.518	.112
3	.038	.000	.266	.031	.143	.063	.725	.002	.229	.027	.415	.024
4	.586	.002	.099	.088	.403	.075	.279	.005	.552	.124	.474	.084
5	1.223	.000	1.548	.000	.110	.024	.729	.013	.108	.043	1.519	1.658
6+	1.774	.000	*	*	*	*	1.214	.045	.531	1.134	1.009	.000
F (1- 2)	.069	.002	.051	.033	.233	.068	.152	.003	.340	.027	.296	.084

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.000	*	.058	*	.023	*	.014	*	.000	*	.012
1	.165	.063	.165	.013	.199	.035	.029	.006	.256	.090	.103	.051
2	.249	.035	.291	.098	.344	.054	.459	.074	.092	.006	.781	.184
3	.371	.112	.165	.012	.279	.049	.153	.130	.625	.056	.244	.423
4	.102	.004	.261	.021	.296	.010	.046	.001	.100	.023	.032	.031
5	.082	.000	.291	.004	.082	.005	.047	.000	.041	.000	.014	.085
6+	*	*	.512	.000	.060	.000	.038	.000	.037	.000	.006	.031
F (1- 2)	.207	.049	.228	.055	.272	.044	.244	.040	.174	.048	.442	.118

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.000	*	.001	*	.000	*	.000	*	.001	*	.018
1	.115	.026	.024	.032	.035	.000	.240	.022	.155	.028	.110	.133
2	.341	.026	.178	.087	.209	.012	.214	.013	.432	.025	.395	.028
3	.145	.031	.152	.038	.391	.079	.073	.004	.291	.036	.097	.011
4	.010	.004	.024	.010	.646	.044	.188	.010	.125	.008	.140	.000
5	.000	.003	.013	.004	.206	.003	.017	.001	.125	.008	.000	.000
6+	.000	.000	.000	.000	.071	.000	.000	.000	.000	.000	.000	.000

continued...

Table 10.3.4 (continued)

F (1- 2)	.228	.026	.101	.060	.122	.006	.227	.018	.293	.027	.252	.080

Year	1992	
Season	1	2
AGE		
0	*	.000
1	.216	.027
2	.193	.012
3	.114	.025
4	.059	.005
5	.041	.002
6+	.021	.001
F (1- 2)	.205	.019

Log inverse catchabilities, fleet no: 1
Fishery in the Northern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	*	*	4.927	*	4.927	*	4.927	*	4.927
1	*	*	*	*	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929
2	*	*	*	*	3.940	5.293	3.940	5.293	3.940	5.293	3.940	5.293
3	*	*	*	*	4.520	5.451	4.520	5.451	4.520	5.451	4.520	5.451
4	*	*	*	*	5.375	6.113	5.375	6.113	5.375	6.113	5.375	6.113
5	*	*	*	*	5.375	6.113	5.375	6.113	5.375	6.113	5.375	*

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	4.927	*	4.927	*	4.927	*	4.927	*	*	*	4.927
1	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929
2	3.940	5.293	3.940	5.293	3.940	*	3.940	5.293	3.940	5.293	3.940	5.293
3	4.520	5.451	4.520	5.451	4.520	*	4.520	5.451	4.520	5.451	4.520	5.451
4	5.375	6.113	5.375	6.113	5.375	*	5.375	*	5.375	*	5.375	6.113
5	5.375	6.113	5.375	*	5.375	*	*	*	*	*	5.375	6.113

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	4.927	*	4.927	*	4.927	*	4.927	*	4.927	*	4.927
1	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929	4.231	4.929
2	3.940	5.293	3.940	5.293	3.940	5.293	3.940	5.293	3.940	5.293	3.940	5.293
3	4.520	*	4.520	*	4.520	5.451	4.520	*	4.520	5.451	4.520	5.451
4	*	*	5.375	*	5.375	6.113	*	*	5.375	6.113	5.375	6.113
5	*	*	5.375	*	*	*	*	*	5.375	*	5.375	*

Year	1992	
Season	1	2
AGE		
0	*	4.927
1	4.231	4.929
2	3.940	5.293
3	4.520	*
4	5.375	*
5	5.375	*

Log inverse catchabilities, fleet no: 2
Fishery in the Southern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*
4	*	*	*	*	*	*	*	*	*	*	*	*
5	*	*	*	*	*	*	*	*	*	*	*	*

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	*	*	6.870	*	6.870	*	*	*	6.870
1	*	*	*	*	4.369	3.819	4.369	3.819	4.369	3.819	4.369	3.819
2	*	*	*	*	3.343	3.928	3.343	3.928	3.343	3.928	3.343	3.928
3	*	*	*	*	3.737	3.572	3.737	3.572	3.737	3.572	3.737	3.572

continued...

Table 10.3.4 (continued)

4	*	*	*	*	4.579	5.089	4.579	5.089	4.579	5.089	4.579	5.089
5	*	*	*	*	4.579	5.089	4.579	*	4.579	*	4.579	5.089

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	6.870	*	6.870	*	*	*	6.870	*	6.870	*	6.870
1	4.369	3.819	4.369	3.819	4.369	*	4.369	3.819	4.369	3.819	4.369	3.819
2	3.343	3.928	3.343	3.928	3.343	3.928	3.343	3.928	3.343	3.928	3.343	3.928
3	3.737	3.572	3.737	3.572	3.737	3.572	3.737	3.572	3.737	3.572	3.737	3.572
4	4.579	5.089	4.579	5.089	4.579	5.089	4.579	5.089	4.579	5.089	4.579	*
5	*	5.089	4.579	5.089	4.579	5.089	4.579	5.089	4.579	5.089	*	*

Year	1992	
Season	1	2
AGE		
0	*	6.870
1	4.369	3.819
2	3.343	3.928
3	3.737	3.572
4	4.579	5.089
5	4.579	5.089

Log residual stocknr. (nhat/n), fleet no: 1
Fishery in the Northern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	*	*	-.683	*	-1.890	*	-.078	*	.655
1	*	*	*	*	-.797	-.218	-.383	.229	-.853	-.141	-1.122	-.901
2	*	*	*	*	-1.419	-.959	-.891	1.207	-.358	.557	-.392	-.035
3	*	*	*	*	-.430	1.754	-.728	.856	.447	.036	-.113	-.599
4	*	*	*	*	.190	.949	-.378	1.796	.764	-1.548	-1.844	-.383
5	*	*	*	*	-.091	.832	-.661	2.677	.759	-.773	-.436	*

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	.527	*	-.314	*	2.334	*	.976	*	*	*	-2.087
1	-.165	-.115	.179	-.423	-1.036	-1.796	.932	.631	.604	.980	.420	.016
2	.522	-.303	.298	-.866	.926	*	-.892	1.018	.651	.929	.743	1.915
3	.556	-1.001	.351	-1.897	.593	*	-.402	.626	-1.002	.469	1.729	2.285
4	1.951	-1.100	.873	-.361	.111	*	-1.766	*	-1.604	*	1.933	.415
5	2.025	.344	-.142	*	-.346	*	*	*	*	*	2.069	1.313

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	-.252	*	-1.773	*	.428	*	-.070	*	.640	*	.292
1	-.015	.575	.591	1.522	.252	.804	.706	1.180	.164	.640	.889	-.411
2	.346	1.127	-.213	-1.249	1.265	.387	-.656	.660	.164	.640	-.232	-1.546
3	-.977	*	-.248	*	-1.081	-.777	.831	*	.164	.640	-.063	-2.392
4	*	*	-.309	*	-1.419	.839	*	*	.164	.640	.833	-1.249
5	*	*	-.344	*	*	*	*	*	.164	*	.010	*

Year	1992	
Season	1	2
AGE		
0	*	1.295
1	-.365	-2.572
2	.138	-3.482
3	.372	*
4	.501	*
5	1.400	*

Log residual stocknr. (nhat/n), fleet no: 2
Fishery in the Southern North Sea

Year	1974		1975		1976		1977		1978		1979	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*
4	*	*	*	*	*	*	*	*	*	*	*	*
5	*	*	*	*	*	*	*	*	*	*	*	*

continued...

Table 10.3.4 (continued)

Year	1980		1981		1982		1983		1984		1985	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	*	*	*	*	2.696	*	1.982	*	*	*	1.279
1	*	*	*	*	.570	.056	-1.299	-1.811	.799	.625	-.210	-.349
2	*	*	*	*	.089	.600	.436	.738	-1.252	-2.010	.793	1.044
3	*	*	*	*	.274	.143	-.269	.944	1.060	-.103	.025	1.519
4	*	*	*	*	1.177	.054	-.621	-3.001	.065	.545	-1.177	.429
5	*	*	*	*	-.106	-.572	-.606	*	-.823	*	-2.026	1.424

Year	1986		1987		1988		1989		1990		1991	
Season	1	2	1	2	1	2	1	2	1	2	1	2
AGE												
0	*	-1.996	*	-.498	*	*	*	-4.908	*	.755	*	1.985
1	.231	-.352	-.839	-.456	-1.164	*	.641	.499	.231	.755	.423	.923
2	.293	-.254	.158	.657	-.398	-.519	-.502	.132	.231	.755	.672	-.536
3	-.170	-.422	.394	-.534	.624	1.040	-1.176	-1.373	.231	.755	-.340	-1.774
4	-2.036	-1.016	-.602	-.323	1.967	1.957	.605	.980	.231	.755	.870	*
5	*	-1.236	-1.199	-1.150	.823	-.898	-1.803	-1.064	.231	.755	*	*

Year	1992	
Season	1	2
AGE		
0	*	-1.295
1	.618	.110
2	-.521	-.607
3	-.653	-.196
4	-.478	-.380
5	-.829	-1.419

Table 10.4.1 Survivors Analysis of Norway pout in the North Sea and Division IIIa.

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 The following parameters were used:

Year range: 1986 - 1993
Seasons per year:    4
The last season in the last year is season : 4
Youngest age:  0; Oldest age:  3; (Plus age:  4)
Recruitment in season: 3
Spawning in season: 1

 The following fleets were included:
Fleet  1:  Commercial fishery North Sea
Fleet  2:  IYFS
Fleet  3:  EGFS
Fleet  4:  SGFS
Fleet  5:  Division IIIa fishery

 The following options were used:

 1: Inv. catchability:    2
   (1: Linear; 2: Log; 3: Cos. filter)
 2: Indiv. shats:         2
   (1: Direct; 2: Using z)
 3: Comb. shats:          2
   (1: Linear; 2: Log.)
 4: Fit catches:          0
   (0: No fit; 1: No SOP corr; 2: SOP corr.)
 5: Est. unknown catches: 3
   (0: No; 1: No SOP corr; 2: SOP corr; 3: Sep. F)
 6: Weighting of rhats:   0
   (0: Manual)
 7: Weighting of shats:   2
   (0: Manual; 1: Linear; 2: Log.)
 8: Handling of the plus group: 1
   (1: Dynamic; 2: Extra age group)


 Data were input from the following files:
 Catch in numbers:       canum.all
 Weight in catch:        weca.all
 Weight in stock:        west.qrt
 Natural mortalities:    natmor.qrt
 Maturity ogive:         matprop.qrt
 Tuning data (CPUE):     tuning.xsa
 Weighting for rhats:    rweigh.xsa
 Unknown catches:        ucall


 Stock numbers (at start of season)
 **********************************
```

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	107760.	72234.	*	*	29116.	19510.	*	*	95428.	63753.
1	25280.	16614.	10801.	6269.	43512.	26964.	17194.	10194.	12893.	8439.	5579.	3542.
2	2744.	966.	591.	196.	2795.	1546.	987.	522.	5072.	2827.	1834.	1025.
3	243.	104.	68.	41.	100.	57.	38.	25.	159.	91.	61.	41.
4+	4.	0.	0.	0.	27.	17.	12.	8.	18.	12.	8.	5.
SSN	5518.				7273.				6539.			
SSB	87977.				97448.				127989.			
TSN	28270.	17683.	119220.	78739.	46434.	28584.	47346.	30259.	18142.	11369.	102910.	68366.
TSB	247241.	287217.	730562.	588167.	371575.	460833.	591039.	374905.	209213.	227916.	603706.	509390.

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	100554.	67388.	*	*	95387.	63440.	*	*	182561.	121774.
1	40162.	25494.	16506.	10152.	41087.	26327.	15810.	9514.	41175.	26367.	17153.	10254.
2	1857.	1206.	688.	250.	5195.	2908.	1420.	690.	5443.	2556.	1383.	751.
3	355.	232.	150.	95.	92.	49.	21.	11.	337.	150.	85.	38.
4+	31.	21.	14.	9.	59.	34.	23.	15.	17.	6.	4.	3.
SSN	6260.				9454.				9914.			
SSB	84917.				150032.				162964.			
TSN	42405.	26953.	117912.	77894.	46432.	29318.	112661.	73669.	46972.	29078.	201186.	132819.
TSB	337935.	436186.	853445.	653831.	408878.	498138.	839107.	629056.	422369.	490232.	1223617.	1000228.

Year	1992				1993			

continued...

Table 10.4.1 (continued)

Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	85392.	56577.	*	*	50951.	34075.
1	78773.	49892.	32197.	18747.	37155.	23316.	14963.	9091.
2	6015.	3143.	1867.	934.	10286.	6323.	3851.	1835.
3	350.	138.	76.	50.	407.	261.	128.	70.
4+	13.	6.	4.	3.	34.	22.	15.	10.
SSN	14255.				14442.			
SSB	202189.				270462.			
TSN	85151.	53179.	119536.	76311.	47882.	29922.	69908.	45081.
TSB	698461.	862471.	1231362.	812786.	504542.	579024.	751148.	494682.

Catch in numbers for fleet: 1
Commercial fishery North Sea

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	0.	5436.	*	*	8.	221.	*	*	24.	2947.
1	395.	180.	1186.	1687.	2665.	1073.	1585.	2138.	246.	82.	183.	632.
2	1066.	60.	245.	36.	398.	60.	165.	230.	699.	71.	250.	405.
3	72.	2.	6.	0.	12.	0.	0.	5.	20.	0.	0.	0.
4+	3.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
SOP	37767.	5294.	45085.	86104.	33612.	15400.	37697.	60396.	22097.	3327.	15056.	60181.

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	7.	4721.	*	*	19.	1215.	*	*	76.	2607.
1	1717.	693.	1097.	1945.	1468.	1721.	926.	1095.	1485.	419.	1010.	1030.
2	48.	146.	198.	90.	700.	616.	220.	146.	1335.	397.	67.	185.
3	7.	7.	0.	13.	11.	12.	1.	1.	93.	19.	1.	17.
4+	0.	0.	0.	0.	7.	0.	0.	0.	6.	0.	0.	0.
SOP	15272.	13838.	36211.	87352.	28273.	39730.	26158.	45253.	42621.	17791.	34774.	57894.

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	34.	456.	*	*	11.	929.
1	3340.	997.	2608.	2643.	1925.	754.	1040.	1033.
2	1067.	230.	372.	254.	692.	472.	889.	442.
3	117.	20.	1.	2.	14.	58.	19.	2.
4+	3.	0.	0.	0.	0.	0.	0.	0.
SOP	61815.	19838.	85201.	87694.	35836.	28378.	58388.	50915.

Catch in numbers for fleet: 5
Division IIIa fishery

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	0.	558.	*	*	0.	6.	*	*	238.	196.
1	10.	230.	0.	32.	26.	3.	42.	13.	3.	13.	58.	0.
2	1.	8.	0.	3.	2.	0.	6.	3.	1.	3.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4+	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SOP	125.	2359.	0.	4005.	277.	35.	1502.	669.	57.	195.	3770.	1628.

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	12.	269.	*	*	592.	434.	*	*	658.	879.
1	25.	19.	18.	22.	15.	523.	399.	46.	22.	217.	509.	18.
2	0.	0.	60.	3.	2.	31.	99.	8.	0.	7.	148.	2.
3	0.	1.	7.	0.	4.	3.	4.	0.	0.	0.	21.	1.
4+	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SOP	261.	305.	2252.	2674.	357.	7158.	15299.	4521.	191.	2581.	27176.	8323.

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	776.	484.	*	*	85.	253.
1	216.	525.	855.	143.	17.	59.	107.	17.

continued...

Table 10.4.1 (continued)

2	19.	63.	16.	13.	7.	1.	23.	3.
3	1.	0.	0.	0.	1.	0.	0.	0.
4+	0.	0.	0.	0.	0.	0.	0.	0.
SOP	2914.	10733.	23159.	7837.	350.	1127.	4157.	2126.

Partial fishing mortality for fleet: 1
Commercial fishery North Sea

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.096	*	*	.000	.014	*	*	.000	.058
1	.019	.013	.142	.384	.077	.049	.118	.288	.023	.012	.041	.240
2	.600	.078	.651	.250	.188	.048	.224	.708	.181	.031	.179	.613
3	.430	.024	.113	.000	.157	.000	.000	.270	.160	.000	.000	.000
4+	1.807	*	*	*	.046	.000	.000	.000	.000	.000	.000	.000
F (1- 2)	.309	.046	.396	.317	.132	.049	.171	.498	.102	.021	.110	.426

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.089	*	*	.000	.024	*	*	.001	.026
1	.053	.034	.084	.260	.044	.083	.074	.149	.045	.020	.075	.129
2	.032	.158	.439	.550	.177	.293	.214	.293	.344	.206	.064	.347
3	.024	.035	.000	.176	.159	.347	.044	.096	.395	.166	.025	.737
4+	.000	.000	.000	.000	.155	.000	.000	.000	.520	.000	.000	.000
F (1- 2)	.043	.096	.261	.405	.110	.188	.144	.221	.194	.113	.069	.238

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	.000	.010	*	*	.000	.034
1	.053	.025	.104	.186	.065	.040	.088	.147
2	.239	.094	.273	.391	.085	.094	.322	.338
3	.499	.189	.015	.059	.041	.305	.194	.030
4+	.355	.000	.000	.000	.000	.000	.000	.000
F (1- 2)	.146	.059	.189	.289	.075	.067	.205	.242

Partial fishing mortality for fleet: 5
Division IIIa fishery

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.010	*	*	.000	.000	*	*	.003	.004
1	.001	.017	.000	.007	.001	.000	.003	.002	.000	.002	.013	.000
2	.001	.011	.000	.018	.001	.000	.008	.009	.000	.001	.000	.000
3	.000	.000	.000	.002	.003	.000	.011	.000	.001	.000	.000	.000
4+	.000	*	*	*	.000	.000	.000	.000	.000	.000	.000	.000
F (1- 2)	.001	.014	.000	.013	.001	.000	.005	.005	.000	.002	.006	.000

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	.000	.005	*	*	.008	.008	*	*	.004	.009
1	.001	.001	.001	.003	.000	.025	.032	.006	.001	.010	.038	.002
2	.000	.000	.133	.018	.000	.015	.097	.015	.000	.003	.142	.003
3	.000	.005	.055	.000	.055	.082	.245	.020	.000	.000	.360	.039
4+	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
F (1- 2)	.000	.001	.067	.010	.000	.020	.064	.011	.000	.007	.090	.003

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	.011	.010	*	*	.002	.009
1	.003	.013	.034	.010	.001	.003	.009	.002
2	.004	.026	.012	.021	.001	.000	.009	.002
3	.003	.000	.000	.000	.002	.000	.000	.000
4+	.000	.000	.000	.000	.006	.000	.000	.000
F (1- 2)	.004	.019	.023	.015	.001	.002	.009	.002

continued...

Table 10.4.1 (continued)

Log inverse catchabilities, fleet no: 1
Commercial fishery North Sea

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	11.272	*	*	15.586	11.272	*	*	15.586	11.272
1	10.516	10.055	9.832	9.425	10.516	10.055	9.832	9.425	10.516	10.055	9.832	9.425
2	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751
3	9.131	8.796	8.776	*	9.131	*	*	8.751	9.131	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	15.586	11.272	*	*	15.586	11.272	*	*	15.586	11.272
1	10.516	10.055	9.832	9.425	10.516	10.055	9.832	9.425	10.516	10.055	9.832	9.425
2	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751
3	9.131	8.796	*	8.751	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	15.586	11.272	*	*	15.586	11.272
1	10.516	10.055	9.832	9.425	10.516	10.055	9.832	9.425
2	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751
3	9.131	8.796	8.776	8.751	9.131	8.796	8.776	8.751

Log inverse catchabilities, fleet no: 2
IYFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.831	*	*	*	2.831	*	*	*	2.831	*	*	*
2	1.567	*	*	*	1.567	*	*	*	1.567	*	*	*
3	1.567	*	*	*	1.567	*	*	*	1.567	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	2.831	*	*	*	2.831	*	*	*	2.831	*	*	*
2	1.567	*	*	*	1.567	*	*	*	1.567	*	*	*
3	1.567	*	*	*	1.567	*	*	*	1.567	*	*	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	*	*	*	*	*	*
1	2.831	*	*	*	2.831	*	*	*
2	1.567	*	*	*	1.567	*	*	*
3	1.567	*	*	*	1.567	*	*	*

Log inverse catchabilities, fleet no: 3
EGFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	5.903	*	*	*	5.903	*	*	*	5.903	*
1	*	*	3.768	*	*	*	3.768	*	*	*	3.768	*
2	*	*	2.154	*	*	*	2.154	*	*	*	2.154	*
3	*	*	2.154	*	*	*	*	*	*	*	2.154	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	5.903	*	*	*	5.903	*	*	*	5.903	*
1	*	*	3.768	*	*	*	3.768	*	*	*	3.768	*
2	*	*	2.154	*	*	*	2.154	*	*	*	2.154	*
3	*	*	2.154	*	*	*	2.154	*	*	*	2.154	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	5.903	*	*	*	5.903	*

continued...

Table 10.4.1 (continued)

1	*	*	3.768	*	*	*	3.768	*
2	*	*	2.154	*	*	*	2.154	*
3	*	*	2.154	*	*	*	2.154	*

Log inverse catchabilities, fleet no: 4
SGFS

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.633	*	*	*	6.633	*	*	*	6.633	*
1	*	*	1.167	*	*	*	1.167	*	*	*	1.167	*
2	*	*	.263	*	*	*	.263	*	*	*	.263	*
3	*	*	.263	*	*	*	.263	*	*	*	.263	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	6.633	*	*	*	6.633	*	*	*	6.633	*
1	*	*	1.167	*	*	*	1.167	*	*	*	1.167	*
2	*	*	.263	*	*	*	.263	*	*	*	.263	*
3	*	*	.263	*	*	*	.263	*	*	*	.263	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	6.633	*	*	*	6.633	*
1	*	*	1.167	*	*	*	1.167	*
2	*	*	.263	*	*	*	.263	*
3	*	*	.263	*	*	*	.263	*

Log inverse catchabilities, fleet no: 5
Division IIIa fishery

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*

Year	1992				1993			
Season	1	2	3	4	1	2	3	4
AGE								
0	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*

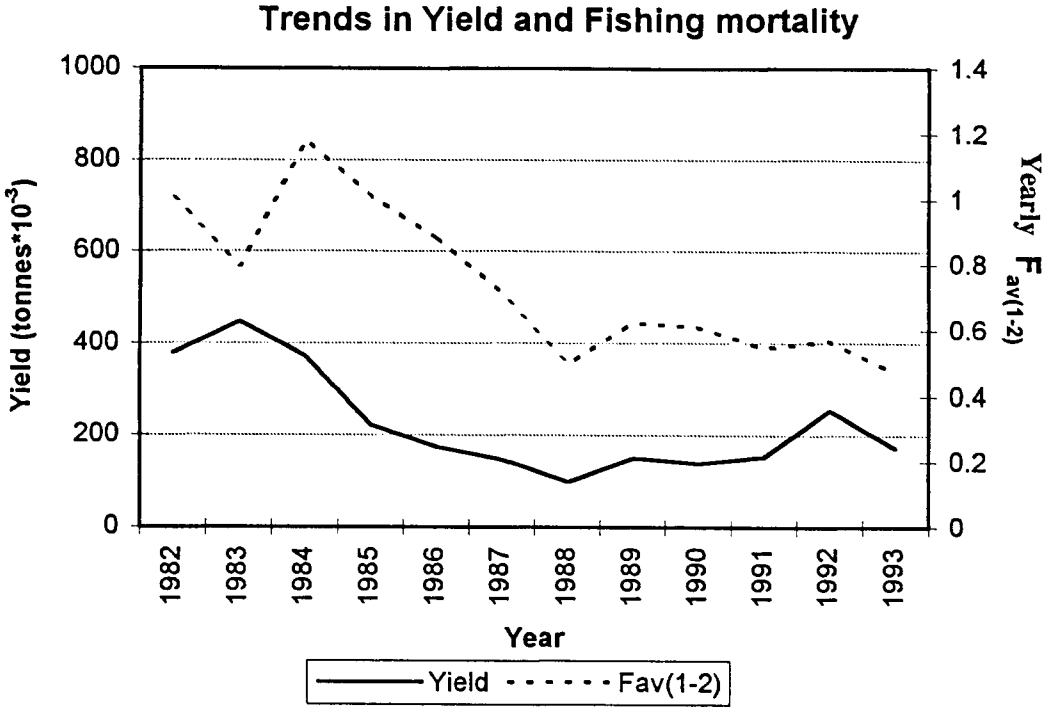
Log residual stocknr. (nhat/n), fleet no: 1
Commercial fishery North Sea

Year	1986				1987				1988			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	*	.845	*	*	.261	-.742	*	*	1.189	.560
1	-1.175	-.611	.606	.389	.580	.820	.376	.447	-.350	.715	.342	.139
2	.885	-.096	1.074	-.714	.086	-.464	-.039	.673	.311	.420	.764	.403
3	.554	-1.294	-.679	*	-.093	*	*	-.292	.190	*	*	*

Year	1989				1990				1991			
Season	1	2	3	4	1	2	3	4	1	2	3	4
AGE												
0	*	*	-1.605	.649	*	*	-.033	-.132	*	*	.772	-.082
1	1.016	.415	-.429	-.121	.241	-.134	-.048	-.132	-.174	-.597	.018	-.341
2	-.881	.704	.172	-.047	.241	-.134	-.048	-.132	.483	.500	-1.201	-.025
3	-1.152	-.808	*	-1.187	.133	.034	-1.621	-1.244	.620	.285	-2.156	.728

Figure 5.6.1

Norway pout in the North Sea



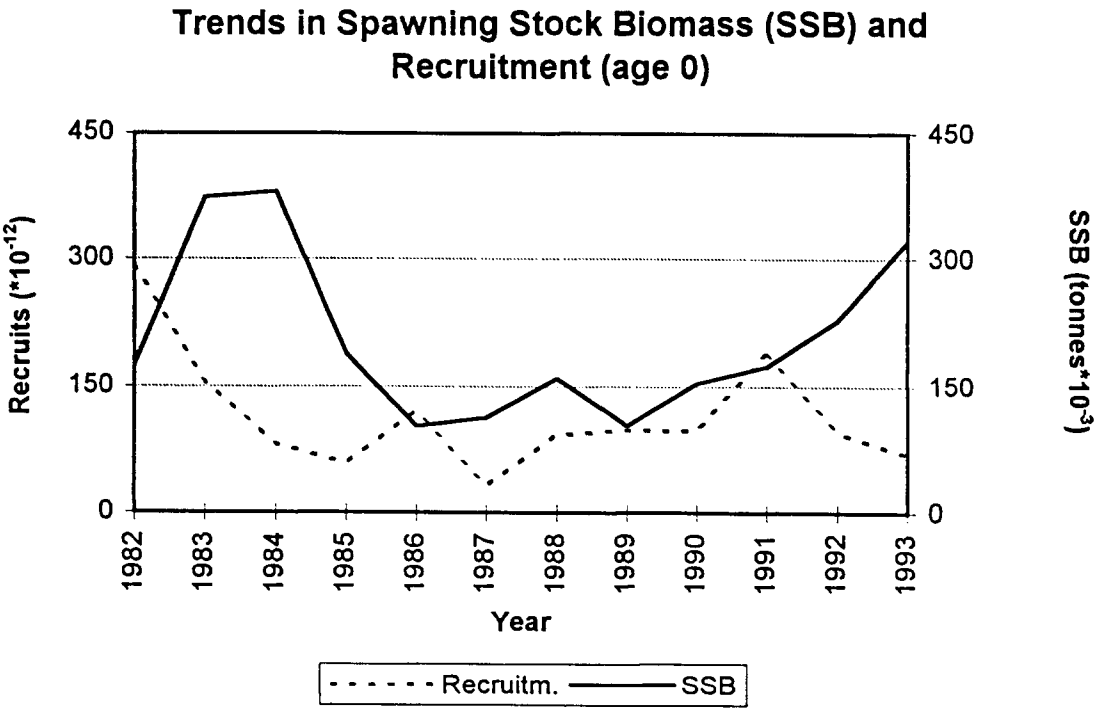


Figure 5.6.2 Norway pout in the North Sea. Quarterly Fishing mortality versus Effort.

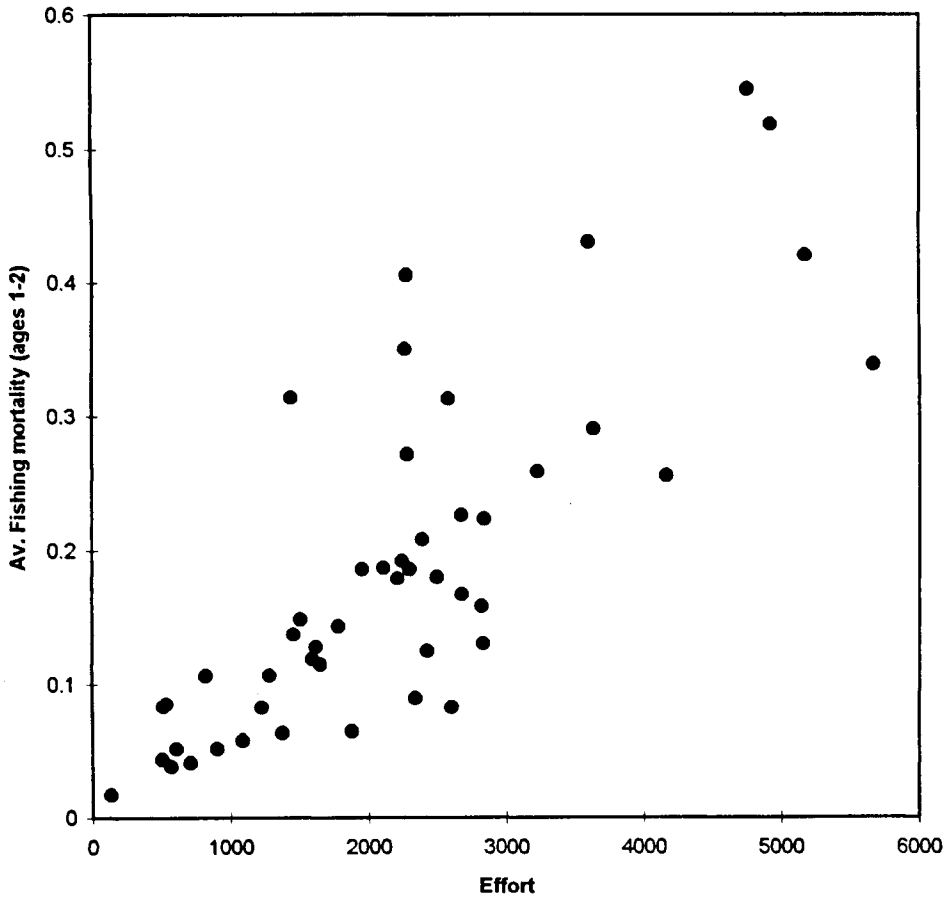


Figure 5.7.1

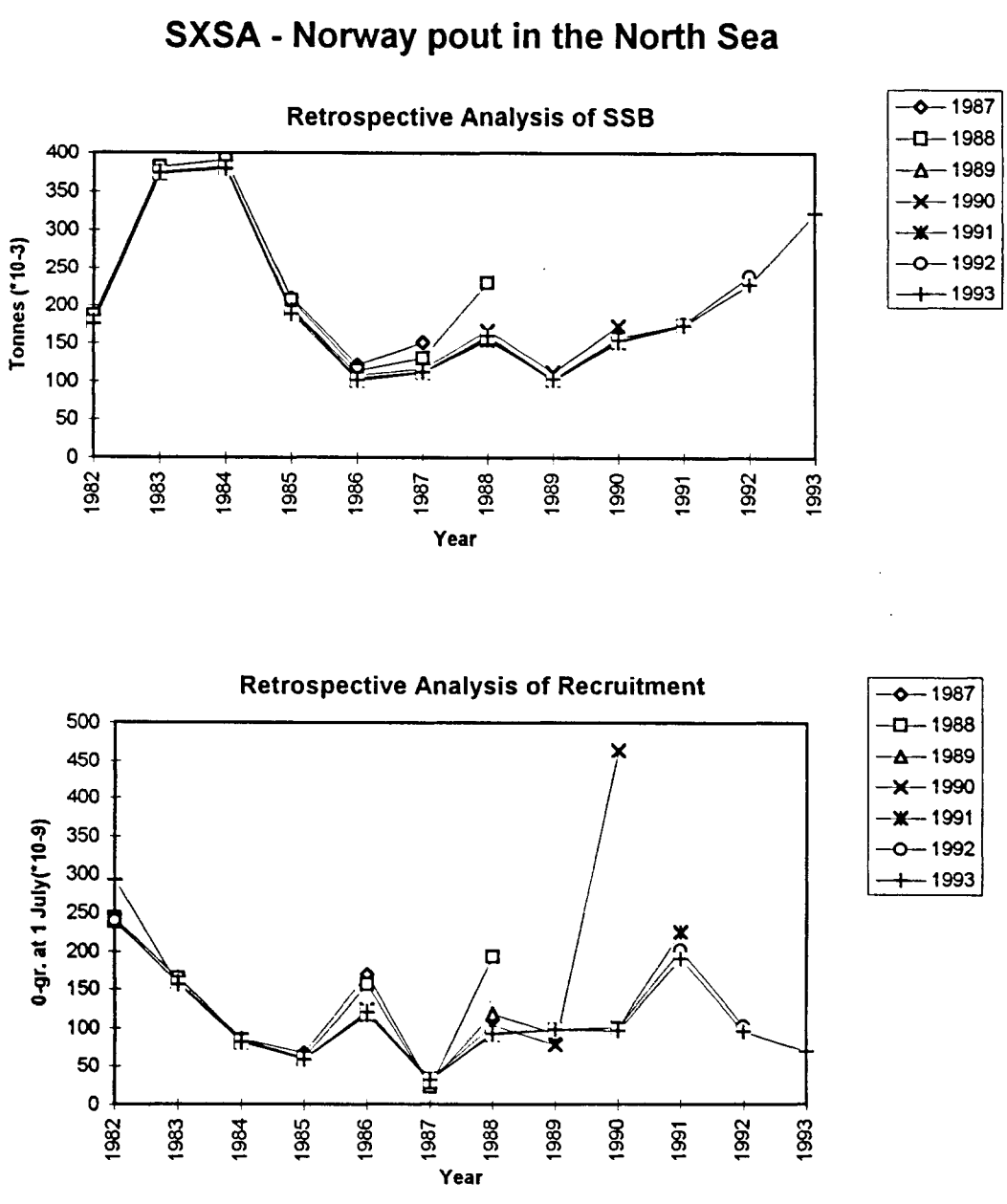

SXSA - Norway pout in the North Sea
Retrospective Analysis of SSB
Tonnes (*10-3)
Year
1987
1988
1989
1990
1991
1992
1993
Retrospective Analysis of Recruitment
0-gr. at 1 July(*10-9)
Year
1987
1988
1989
1990
1991
1992
1993

Figure 8.1.1 Danish sandeel areas and assessment areas by the Working Group.

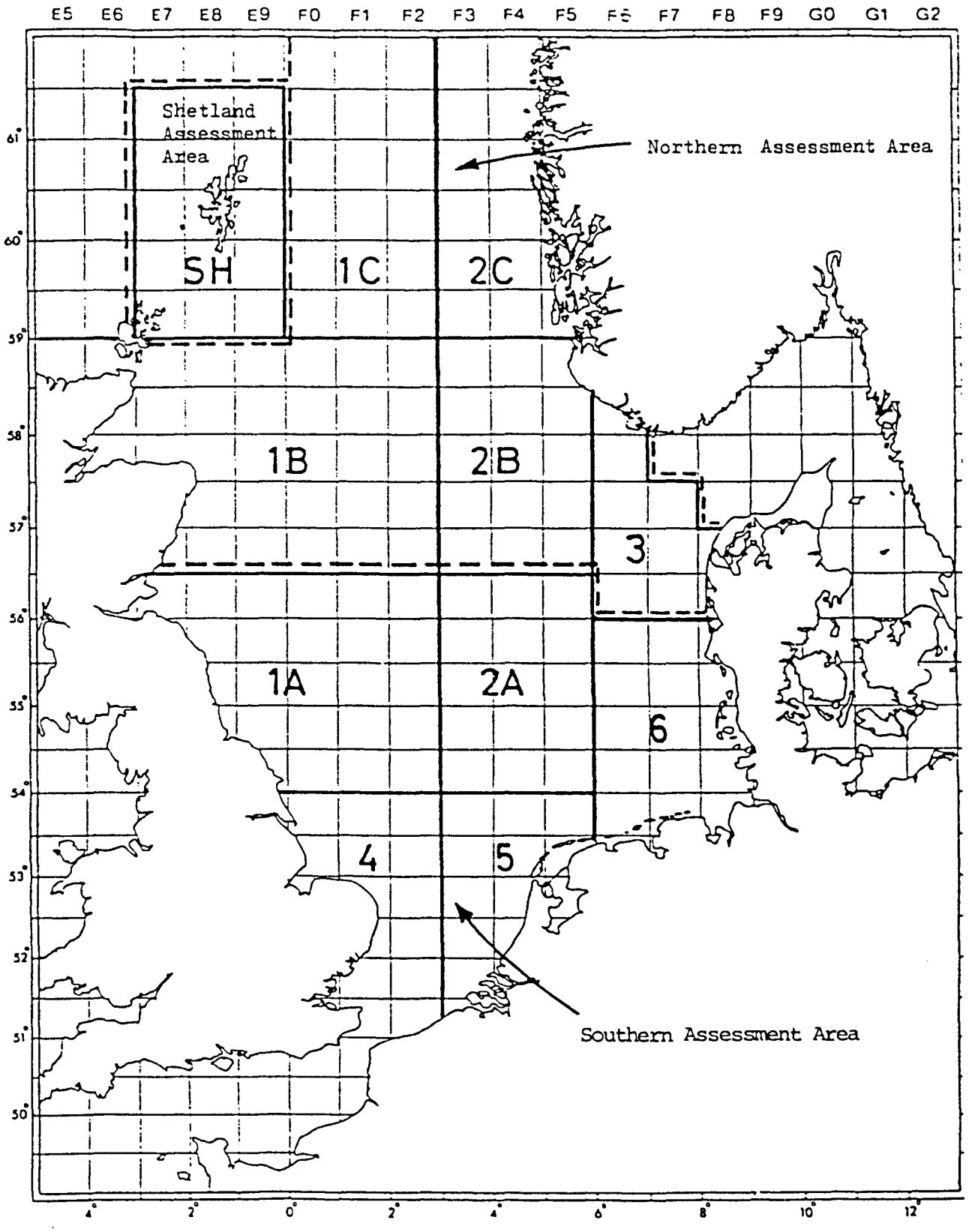


Figure 8.1.2

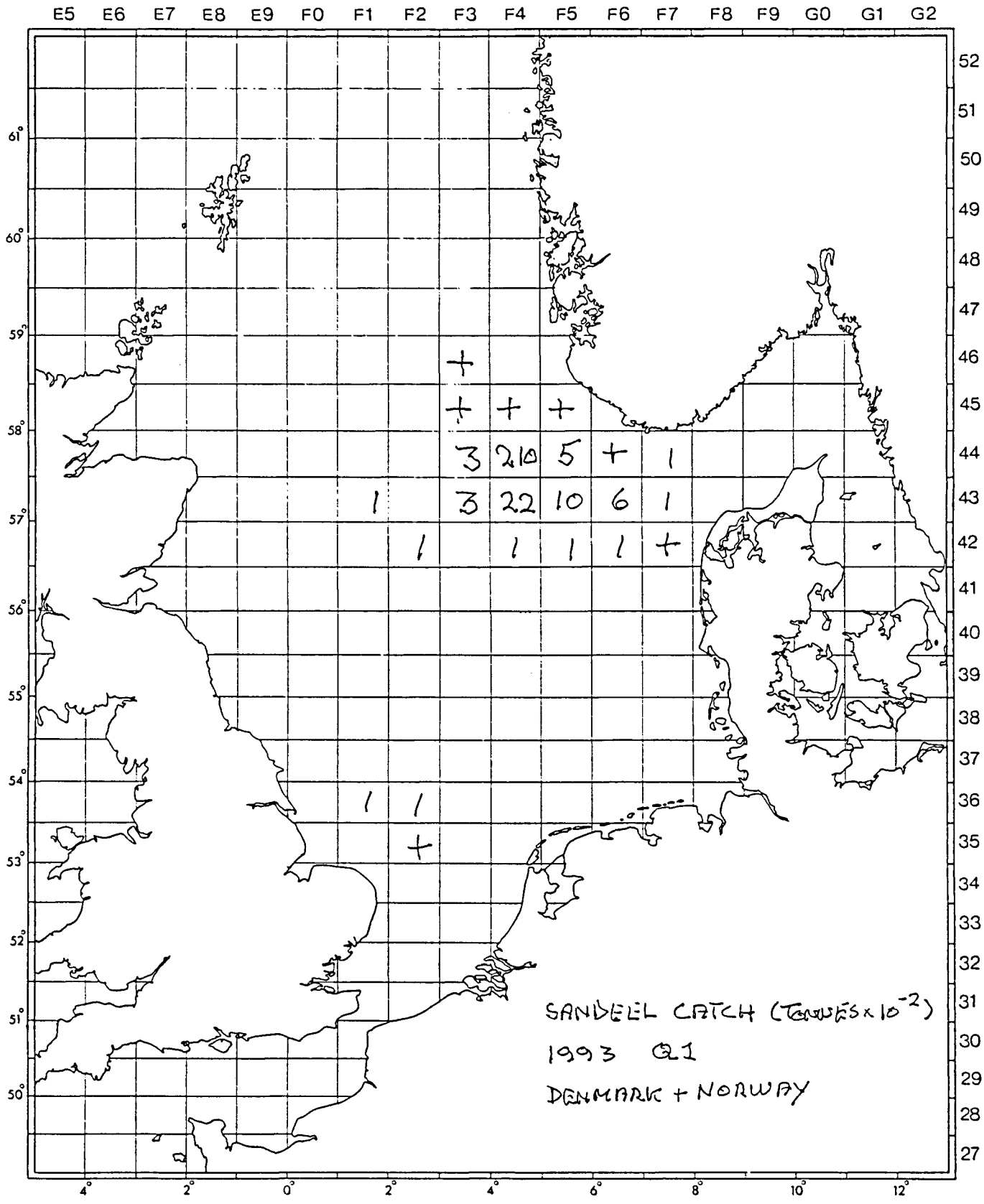


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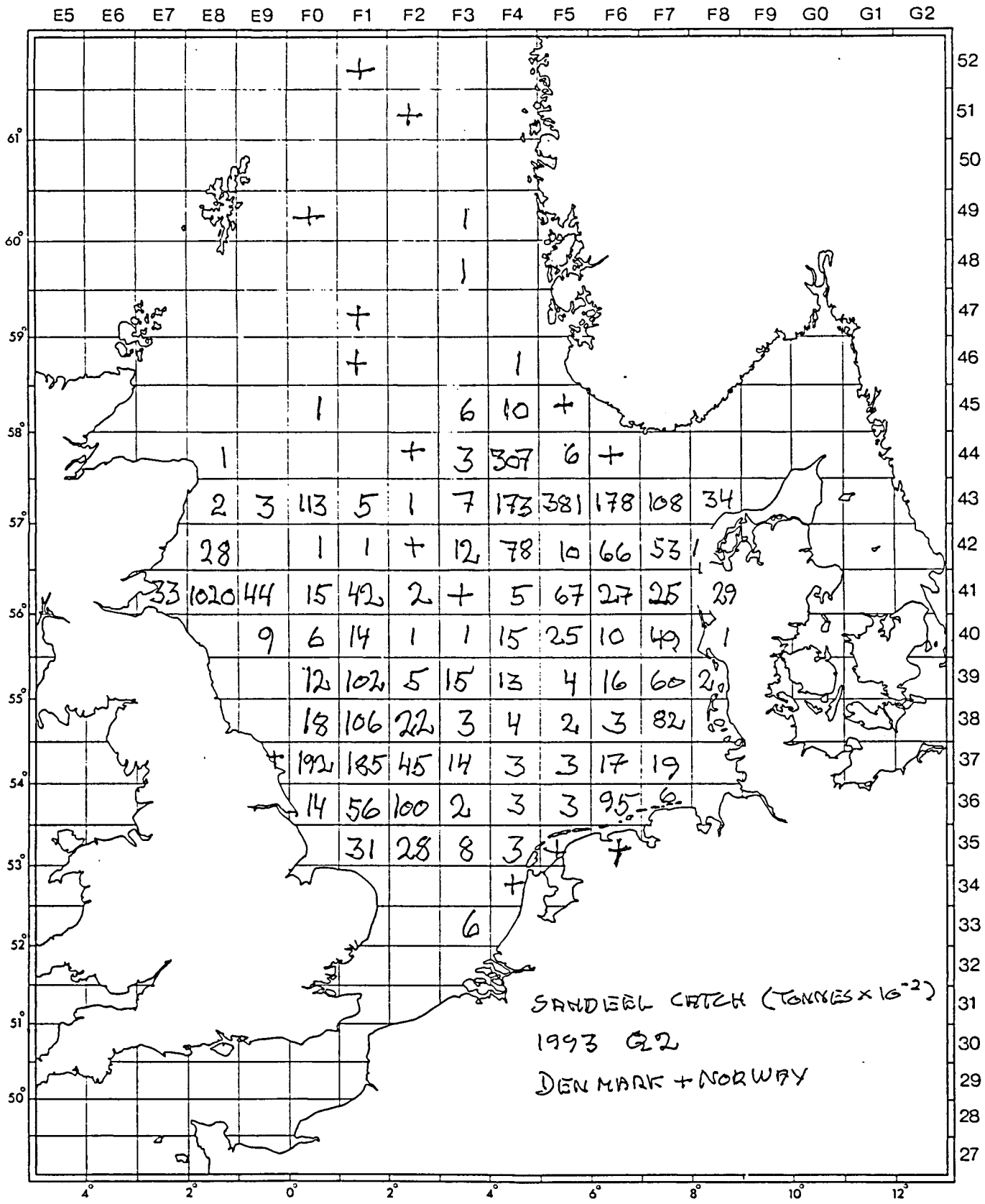
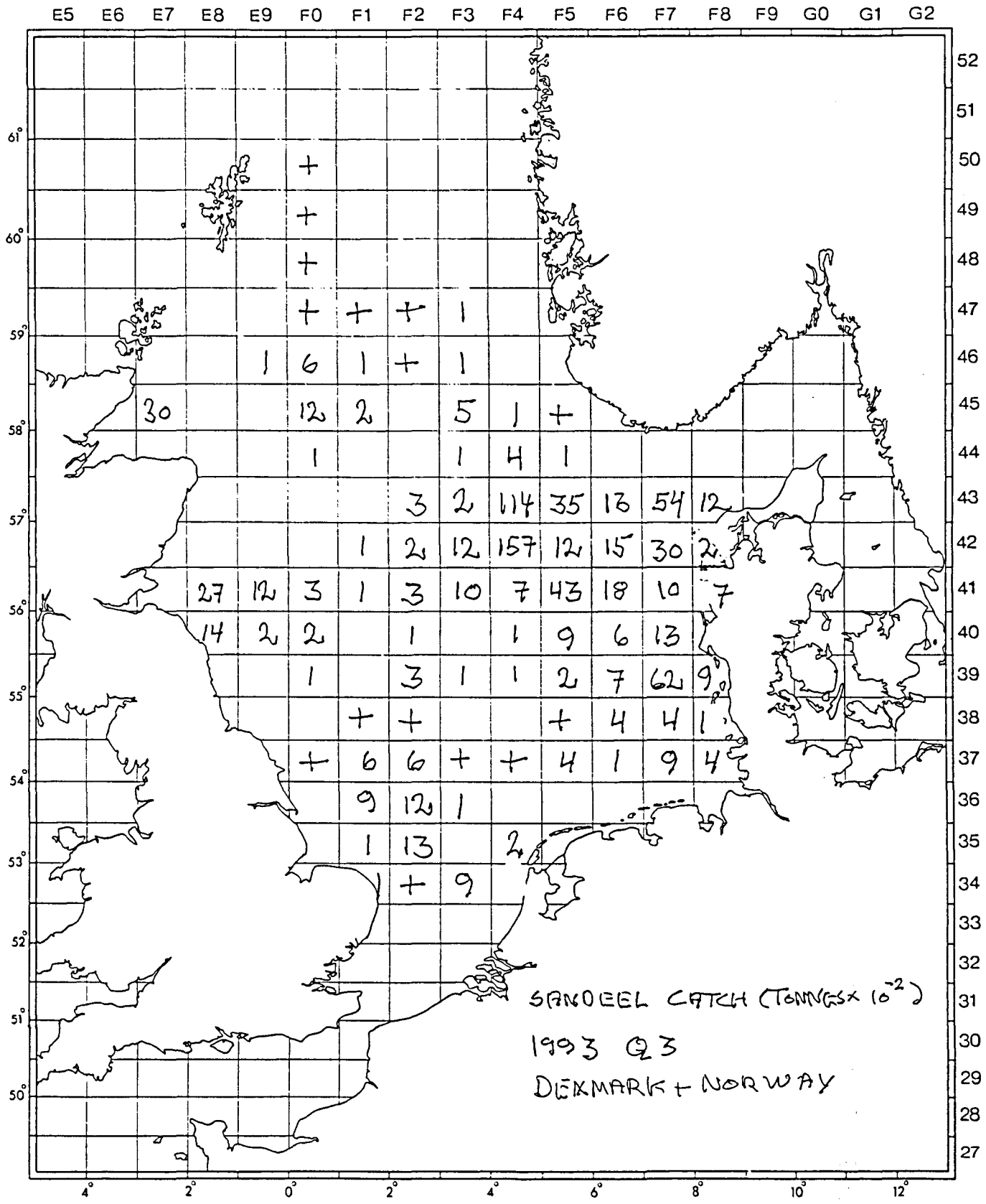
Figure 8.1.2 (continued)



continued...

Figure 8.1.2 (continued)



continued...

Figure 8.1.2

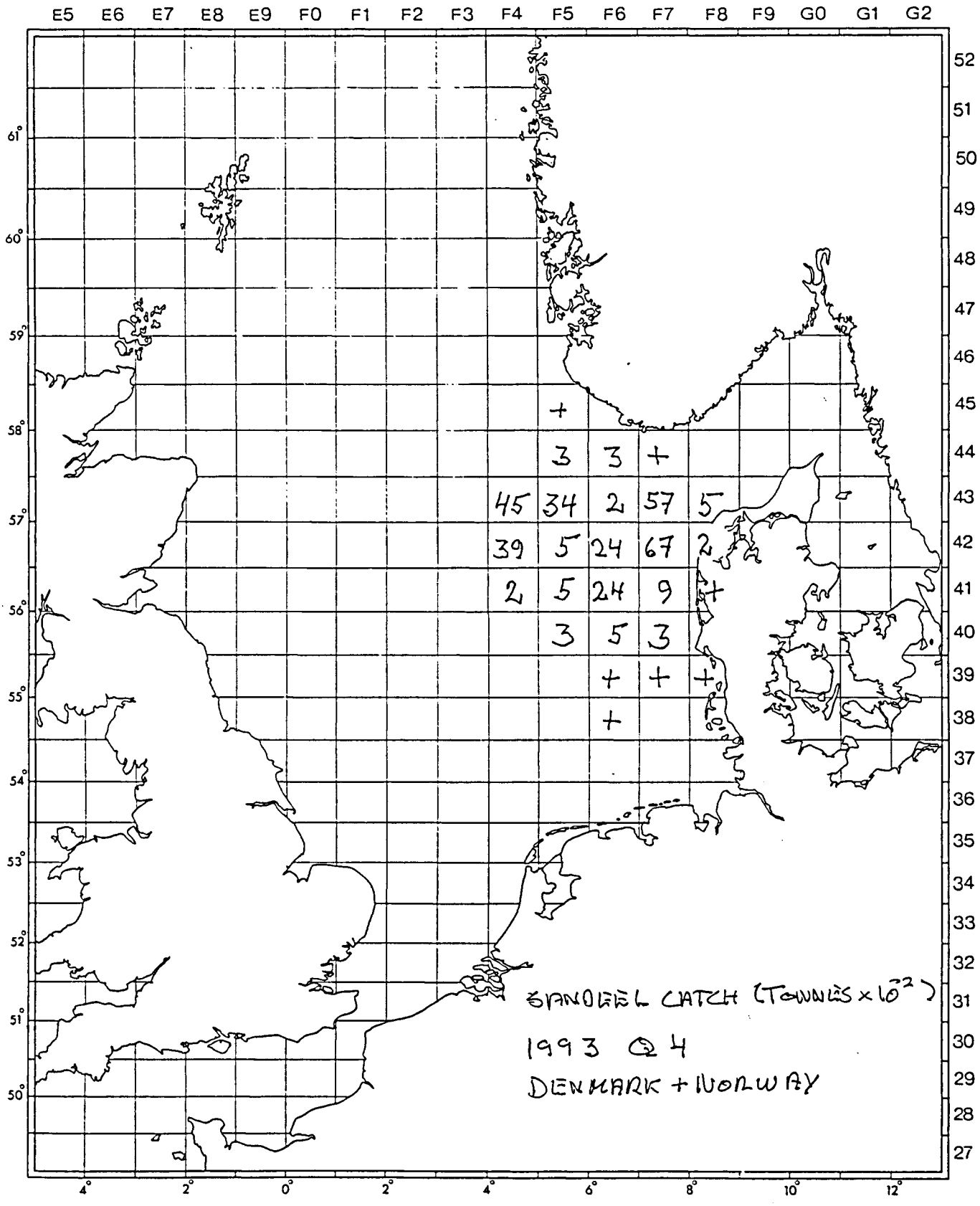

E5 E6 E7 E8 E9 F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 G0 G1 G2
61° 60° 59° 58° 57° 56° 55° 54° 53° 52° 51° 50°
52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27
4° 2° 0° 2° 4° 6° 8° 10° 12°
+
3 3 +
45 34 2 57 5
39 5 24 67 2
2 5 24 9 +
3 5 3
+ + +
+
STANDARD CATCH (TONNES x 10⁻²)
1993 Q4
DENMARK + NORWAY

Figure 8.2.4.1 Sandeel in the Northern North Sea. Comparison of catch-at-age in 1990 estimated in 1993 and in this year's assessment.

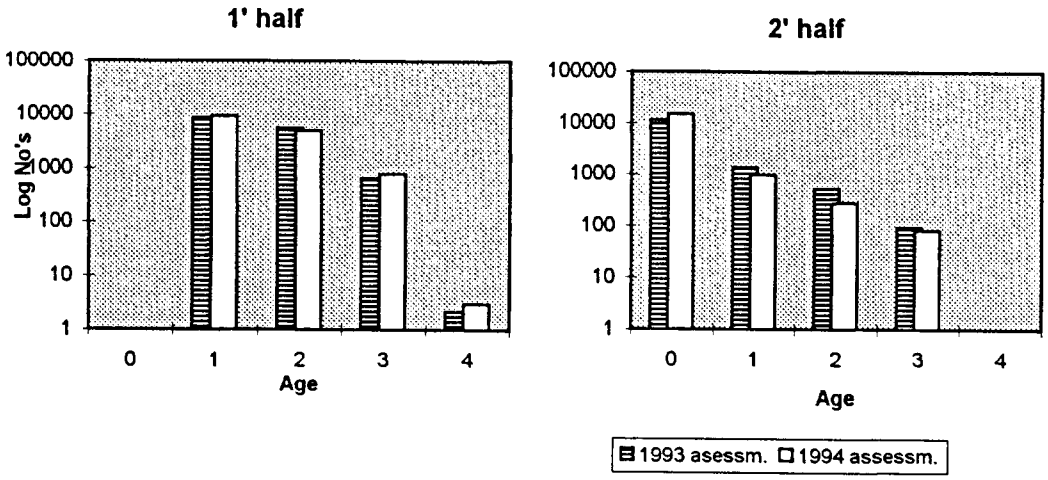
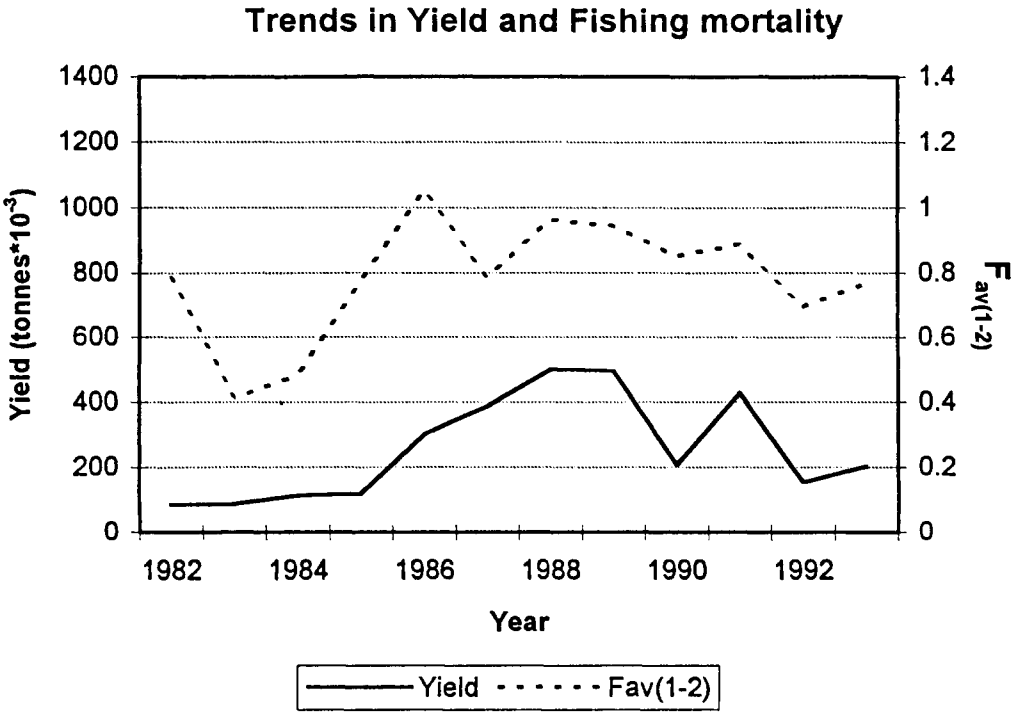


Figure 8.2.4.2

Sandeel Northern North Sea



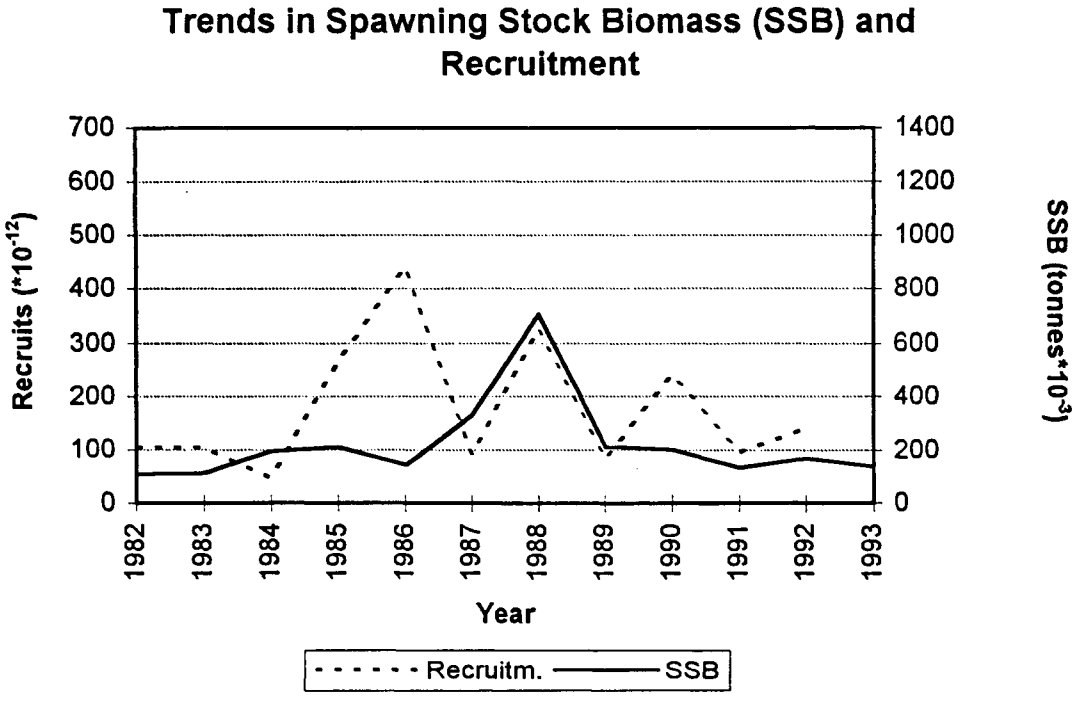


Figure 8.2.4.3

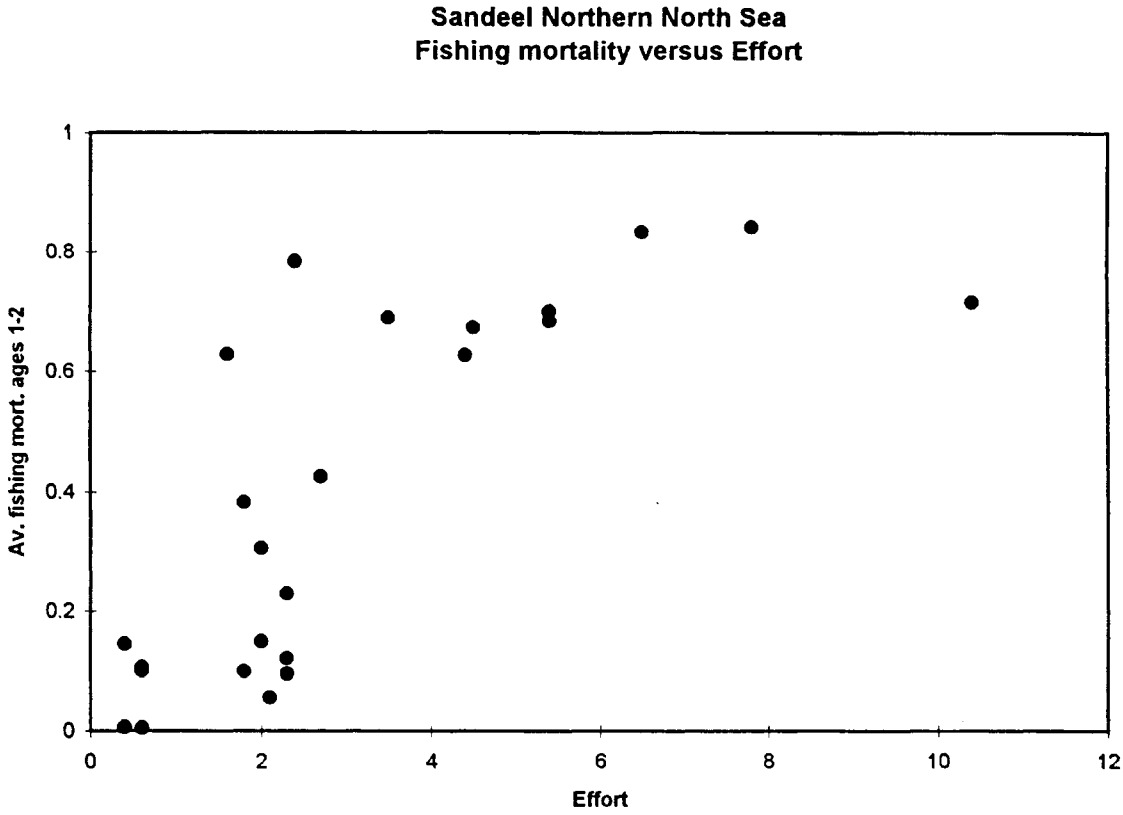
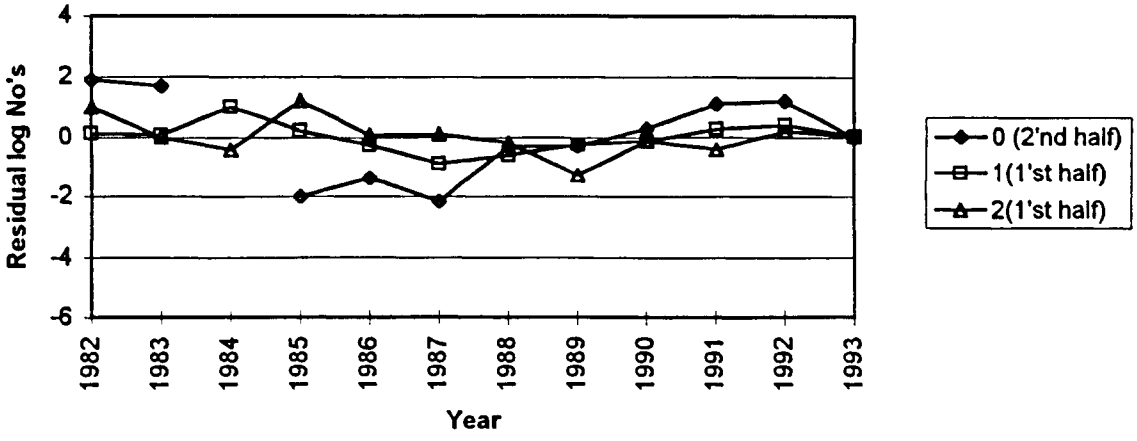

Sandeel Northern North Sea
Fishing mortality versus Effort
Av. fishing mort. ages 1-2
Effort
0
0.2
0.4
0.6
0.8
1
0
2
4
6
8
10
12

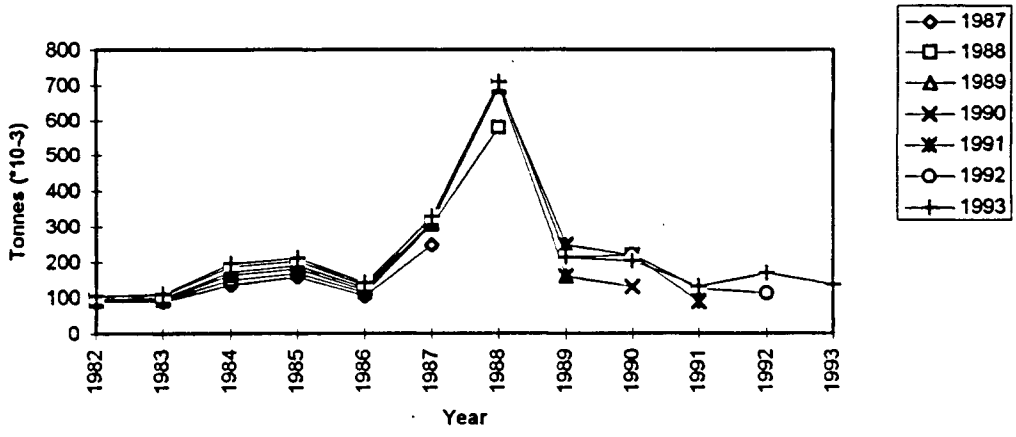
Figure 8.2.4.4

SXSA - Sandeel Northern North Sea

Trends in residual log stock No's



Retrospective Analysis of SSB



Retrospective Analysis of Recruitment

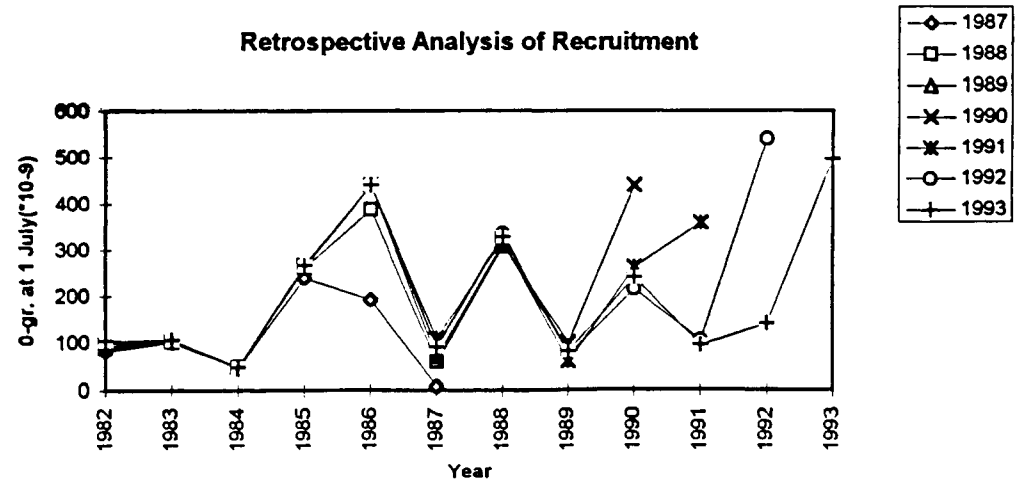


Figure 8.3.4.1 Sandeel in the Southern North Sea. Comparison of catch-at-age in 1990 estimated in 1993 and in this year's assessment.

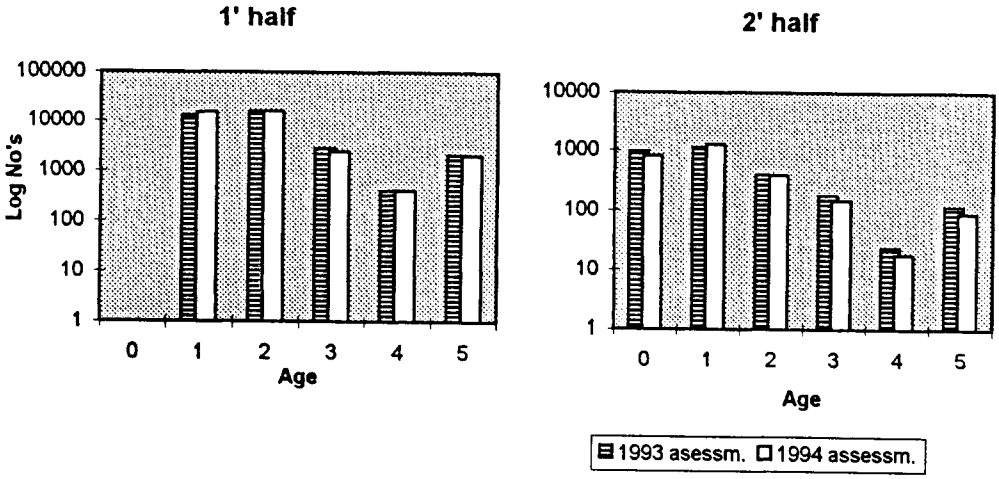
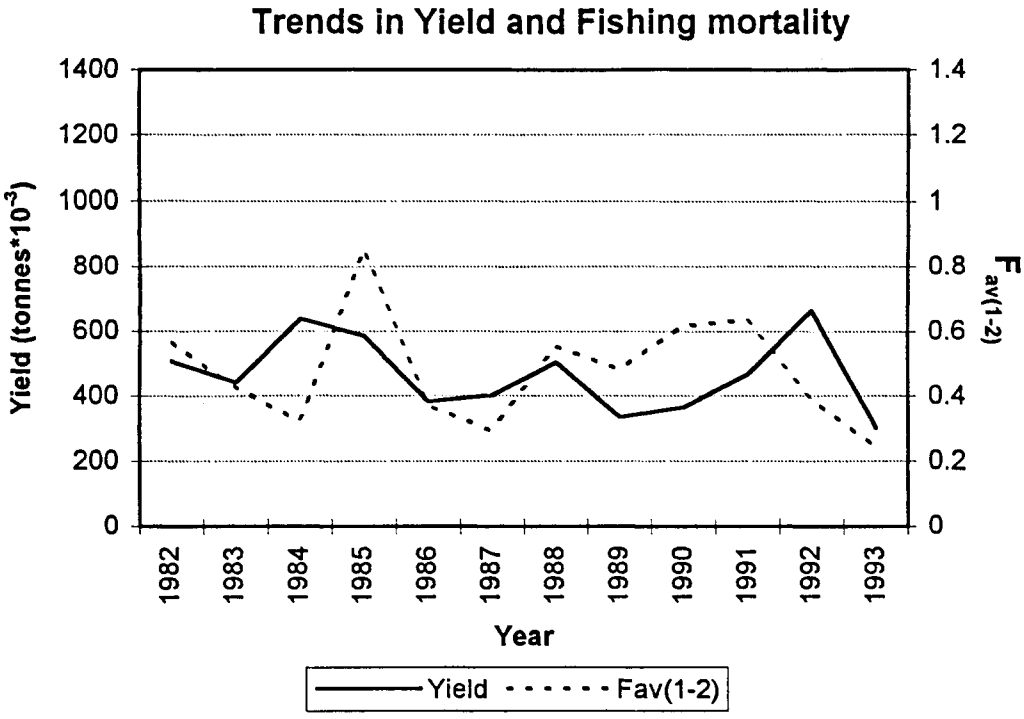


Figure 8.3.4.2

Sandeel Southern North Sea



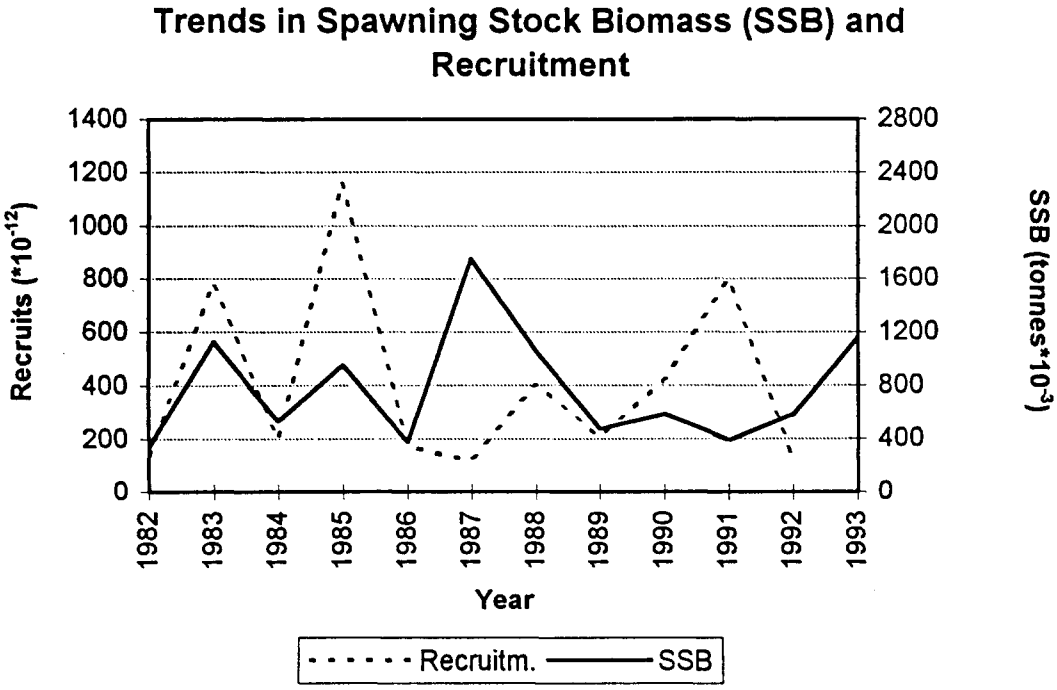


Figure 8.3.4.3

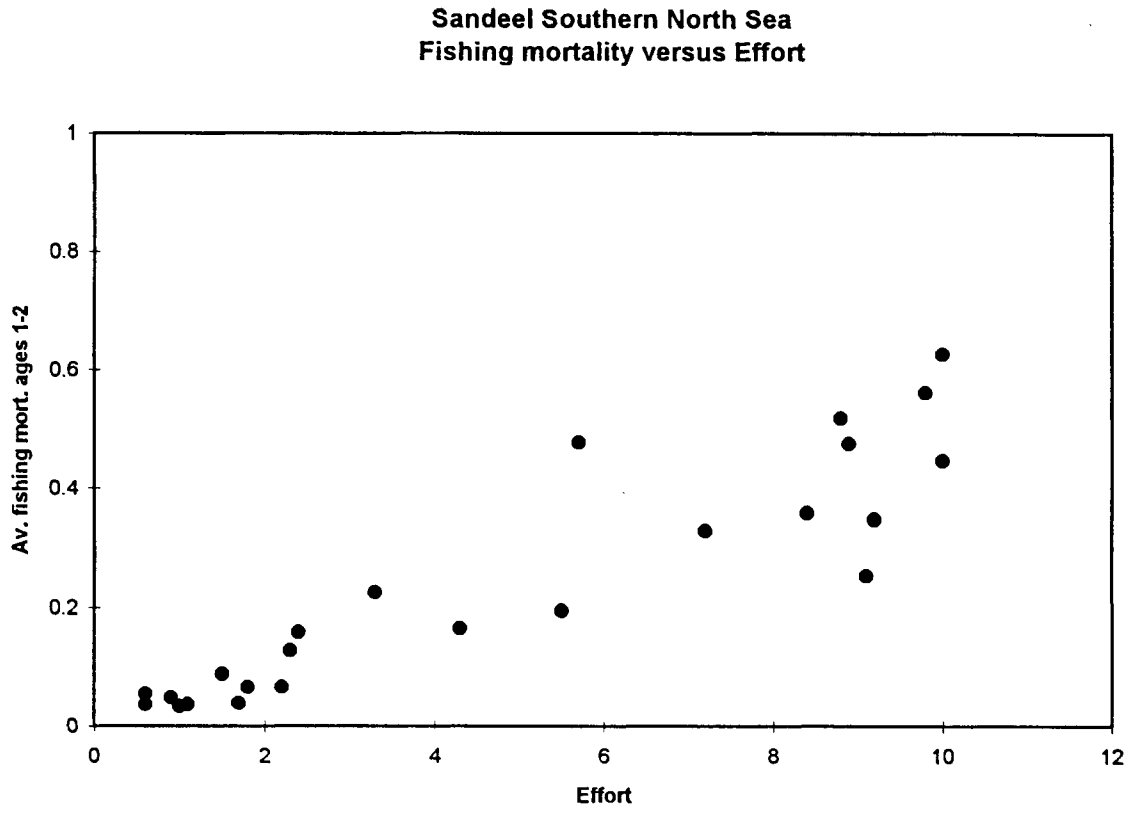
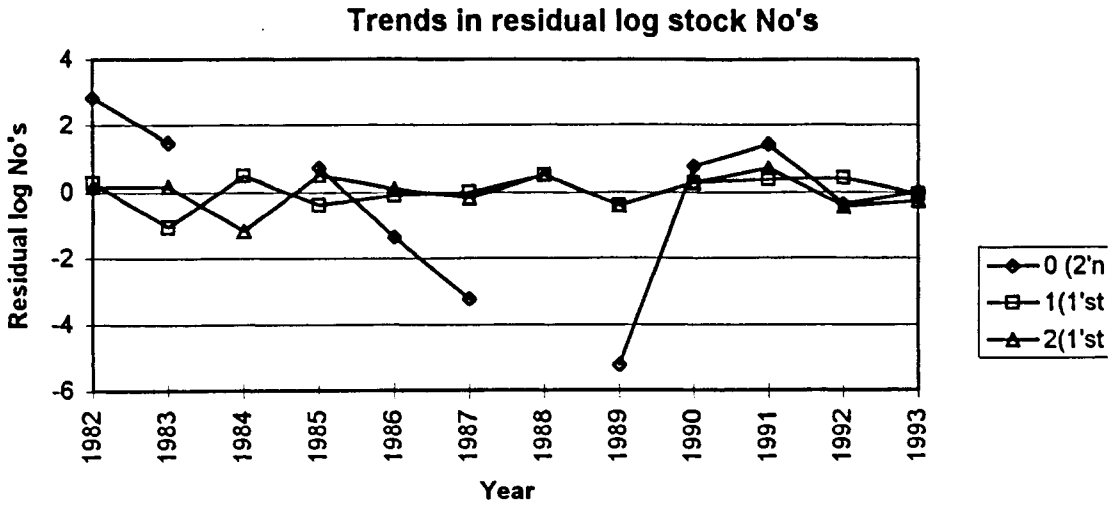
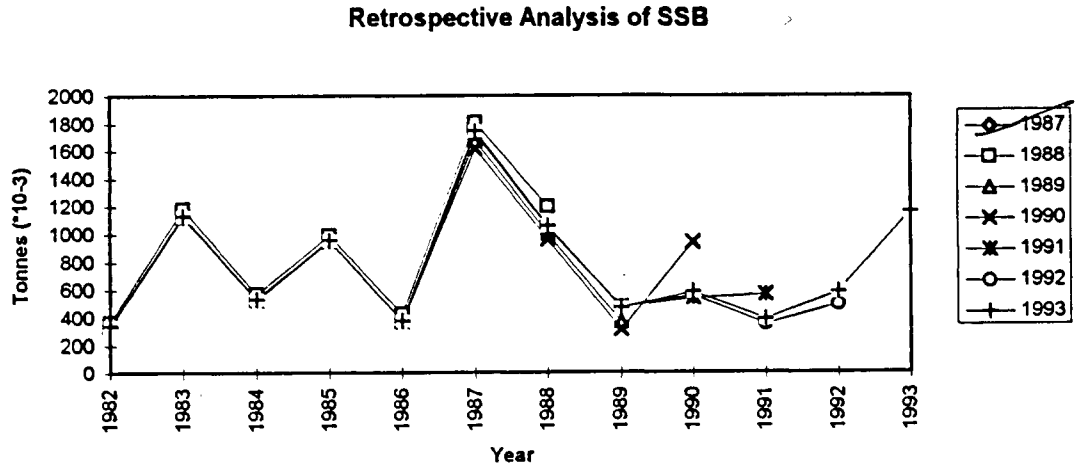

Sandeel Southern North Sea
Fishing mortality versus Effort
Av. fishing mort. ages 1-2
Effort
0
0.2
0.4
0.6
0.8
1
0
2
4
6
8
10
12

Figure 8.3.4.4

SXSA - Sandeel Southern North Sea





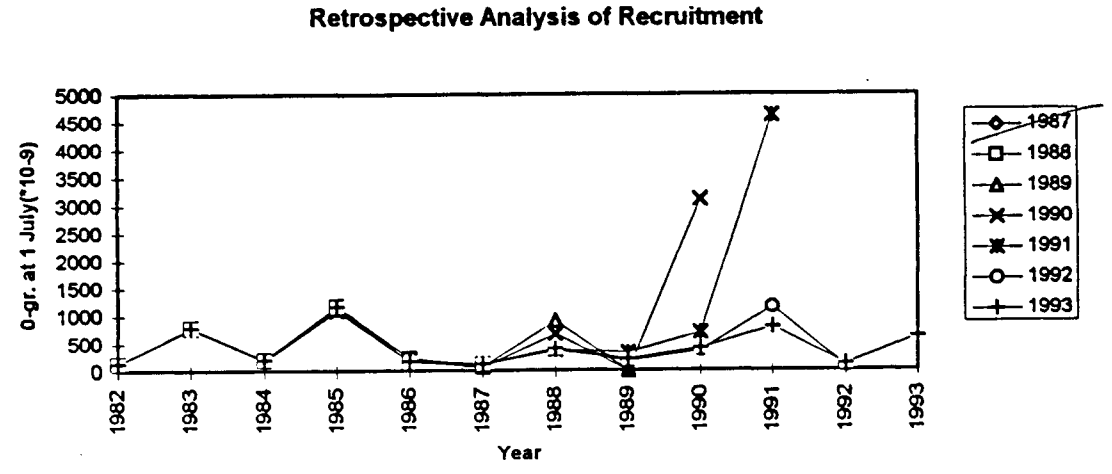


Figure 8.4.1 Sandeels at Shetland, Log RV residuals

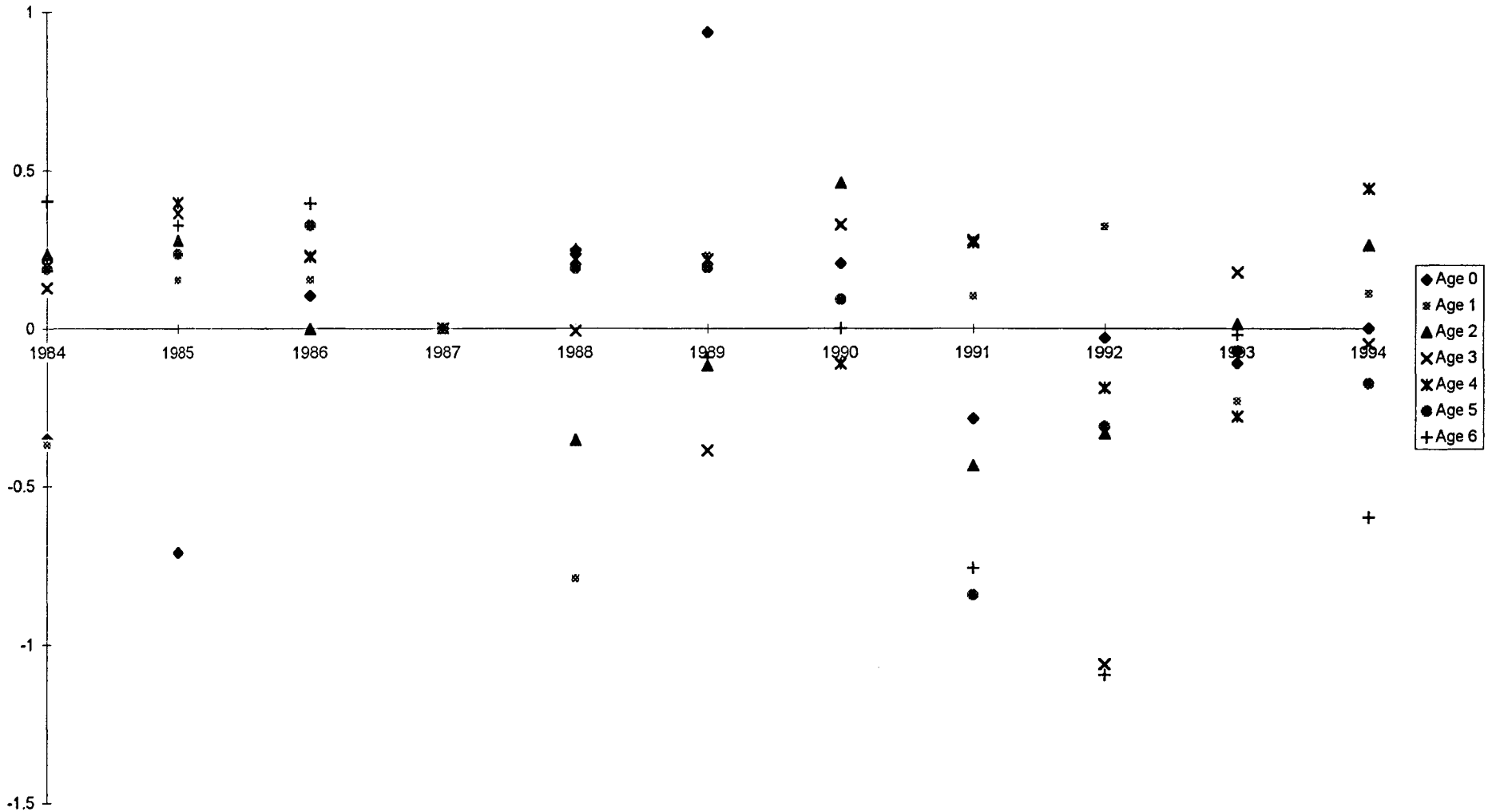
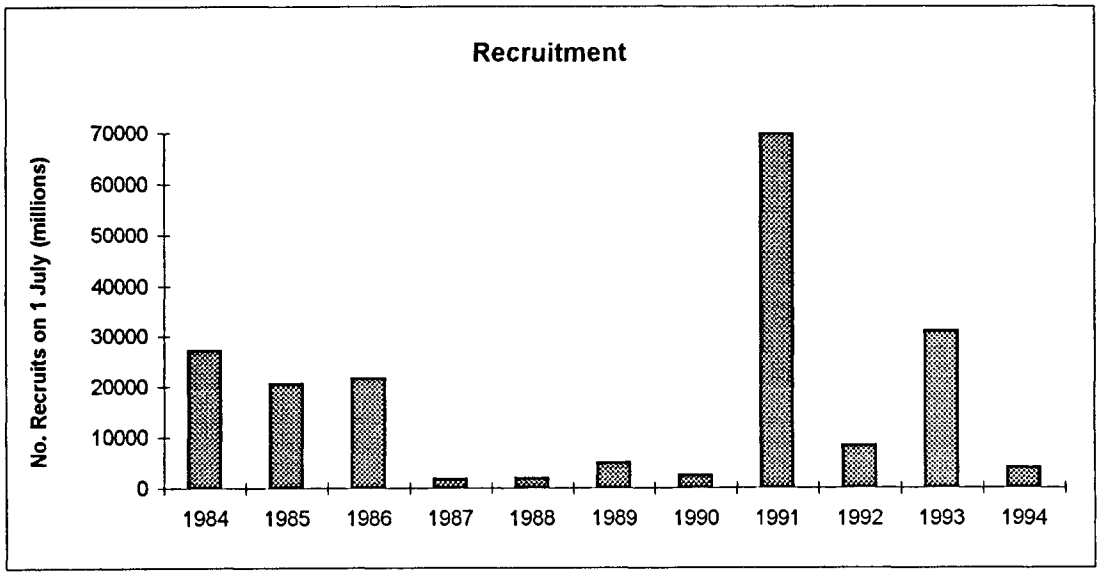


Figure 8.4.2 Sandeel at Shetland. Recruitment and Spawning Stock.



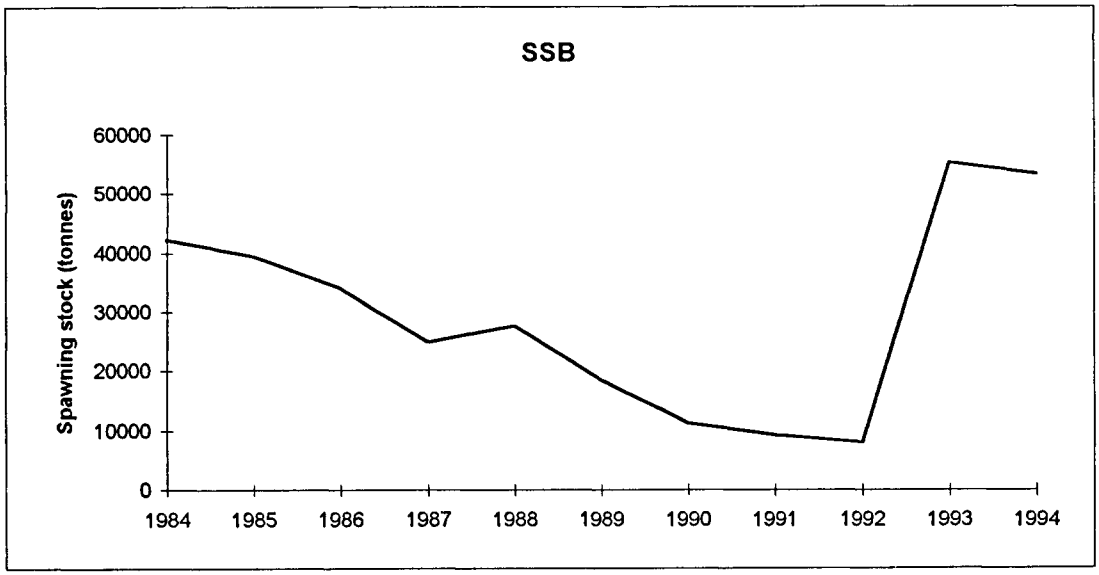
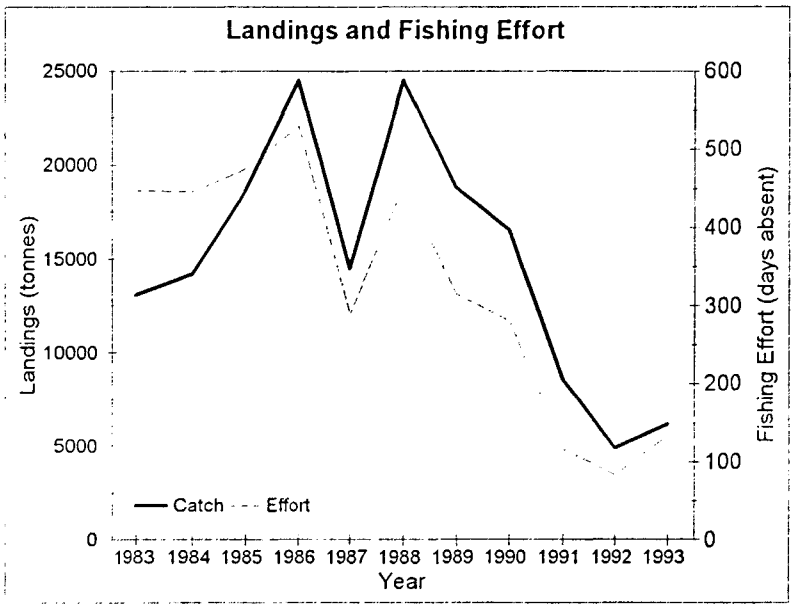
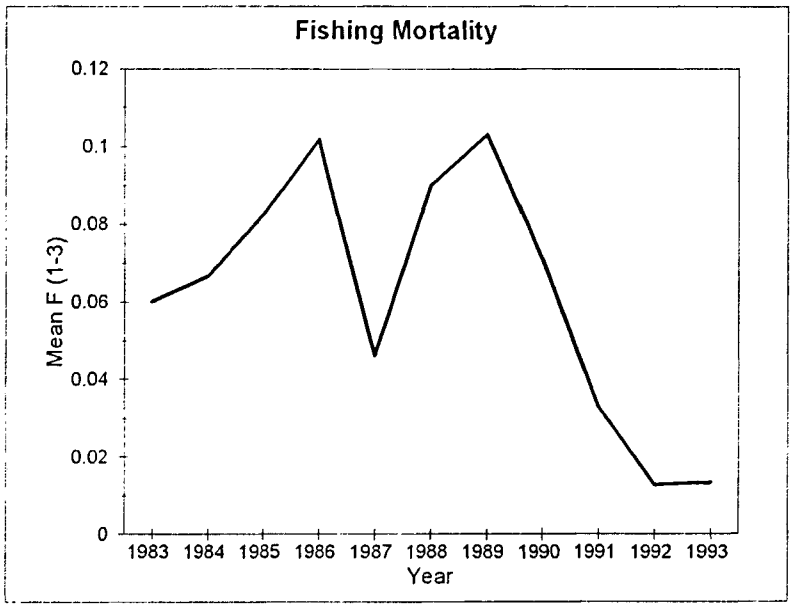


Figure 9.1 Sandeels, West of Scotland. Stock Summary.

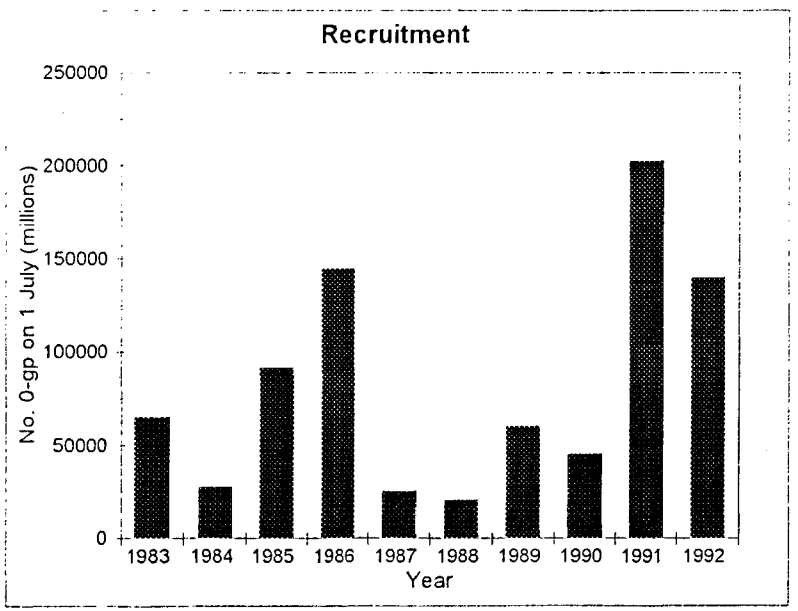
a)



b)



c)



d)

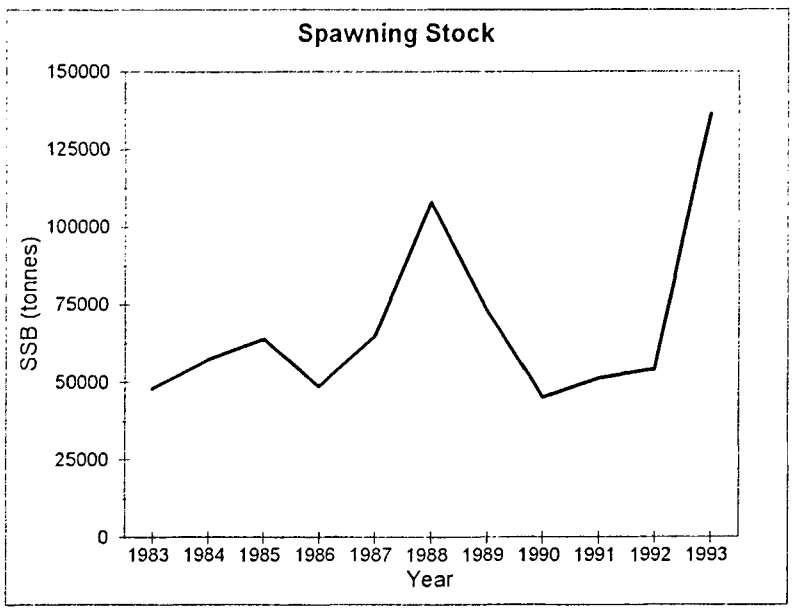
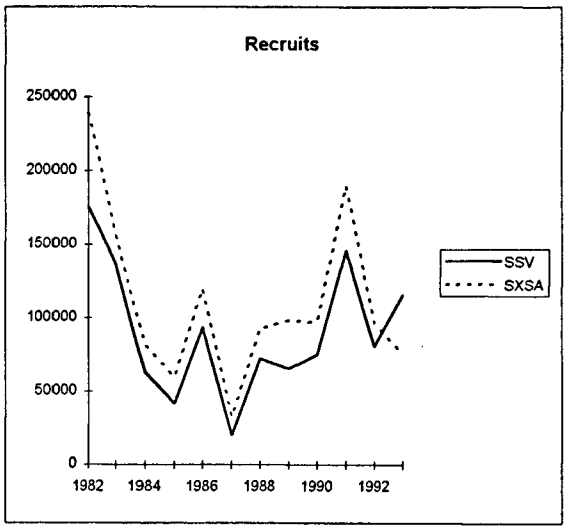
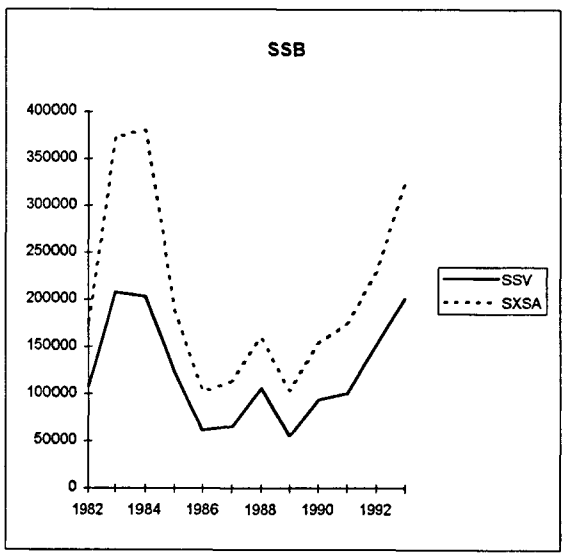


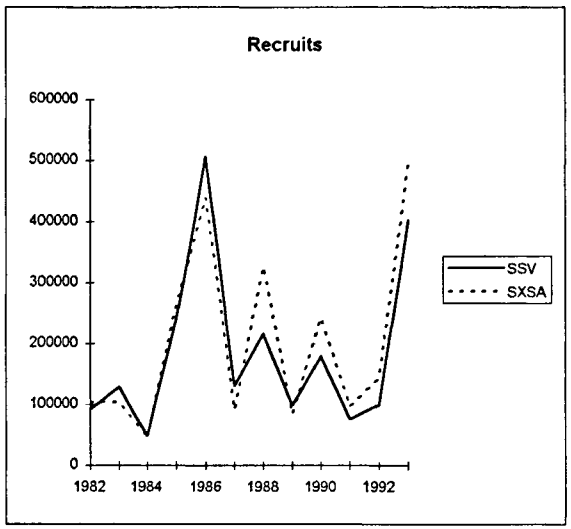
Figure 10.1a-c Results of comparative assessments with SXSA and SSV (revised maturities).

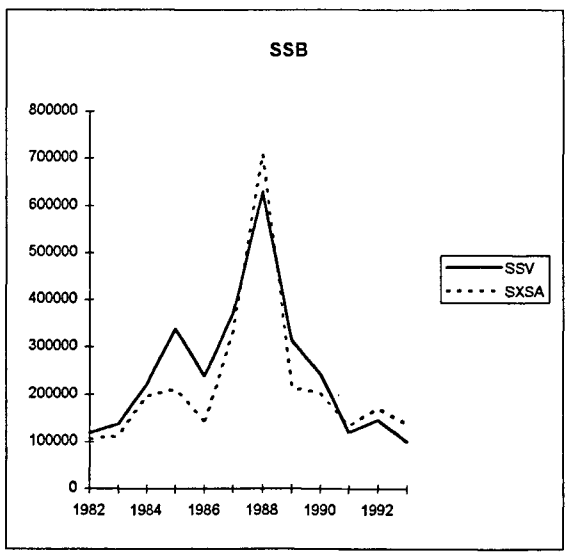
Norway Pout, North Sea



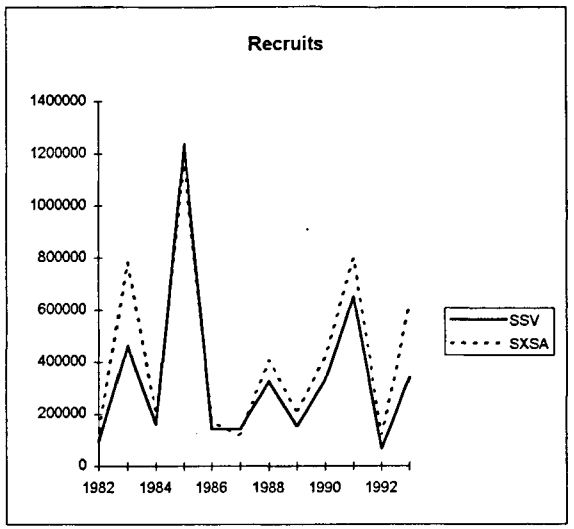


Sandeel, Northern North sea.





Sandeel, Southern North sea.



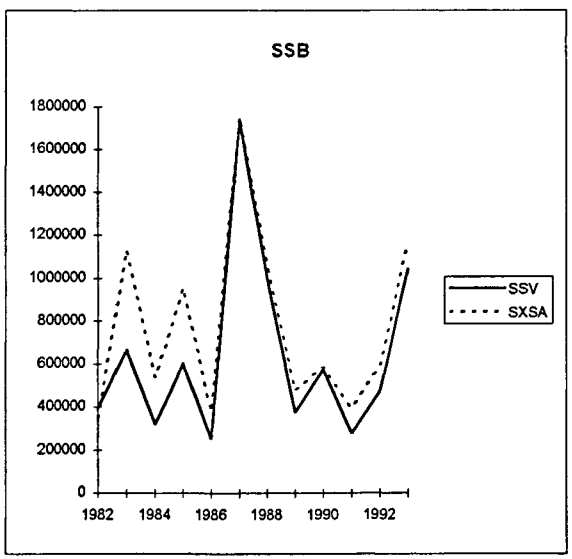
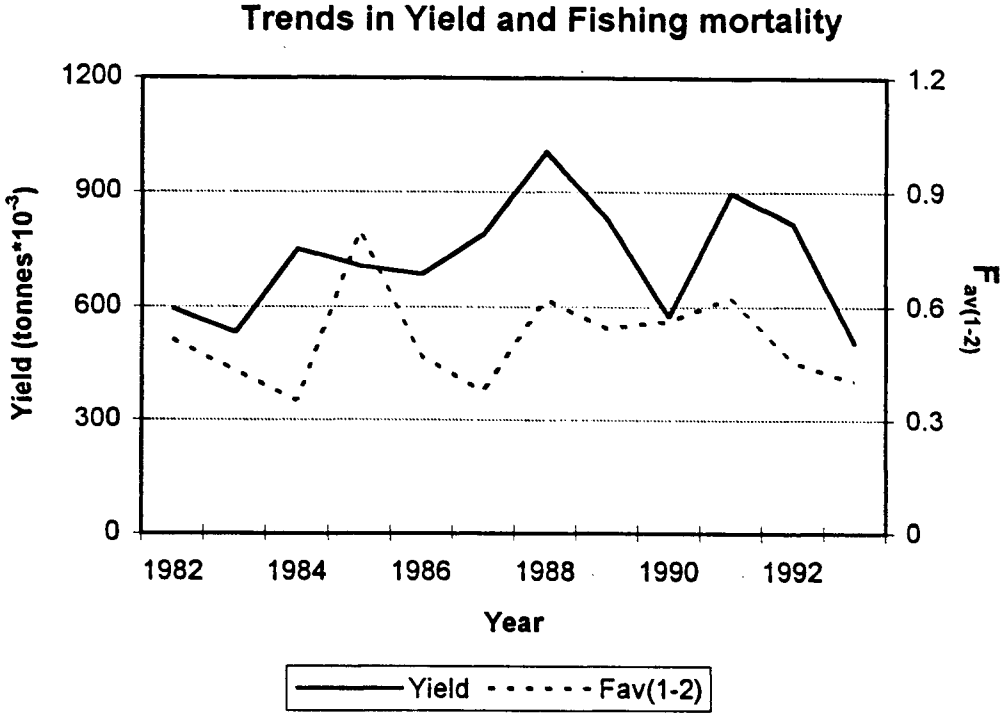


Figure 10.2.1

Sandeel Total North Sea



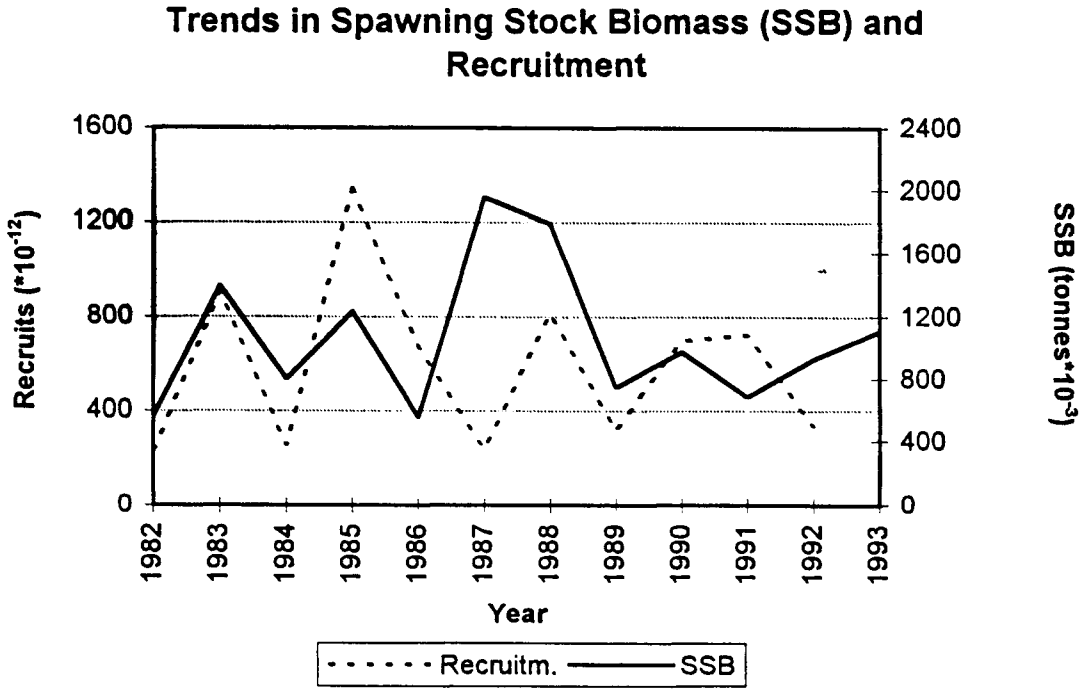


Figure 10.2.2

Trends in Spawning Stock Biomass (SSB) and Recruitment of North Sea Sandeel

Comparison of Total assessment and sum of separate assessments of the northern and southern stocks

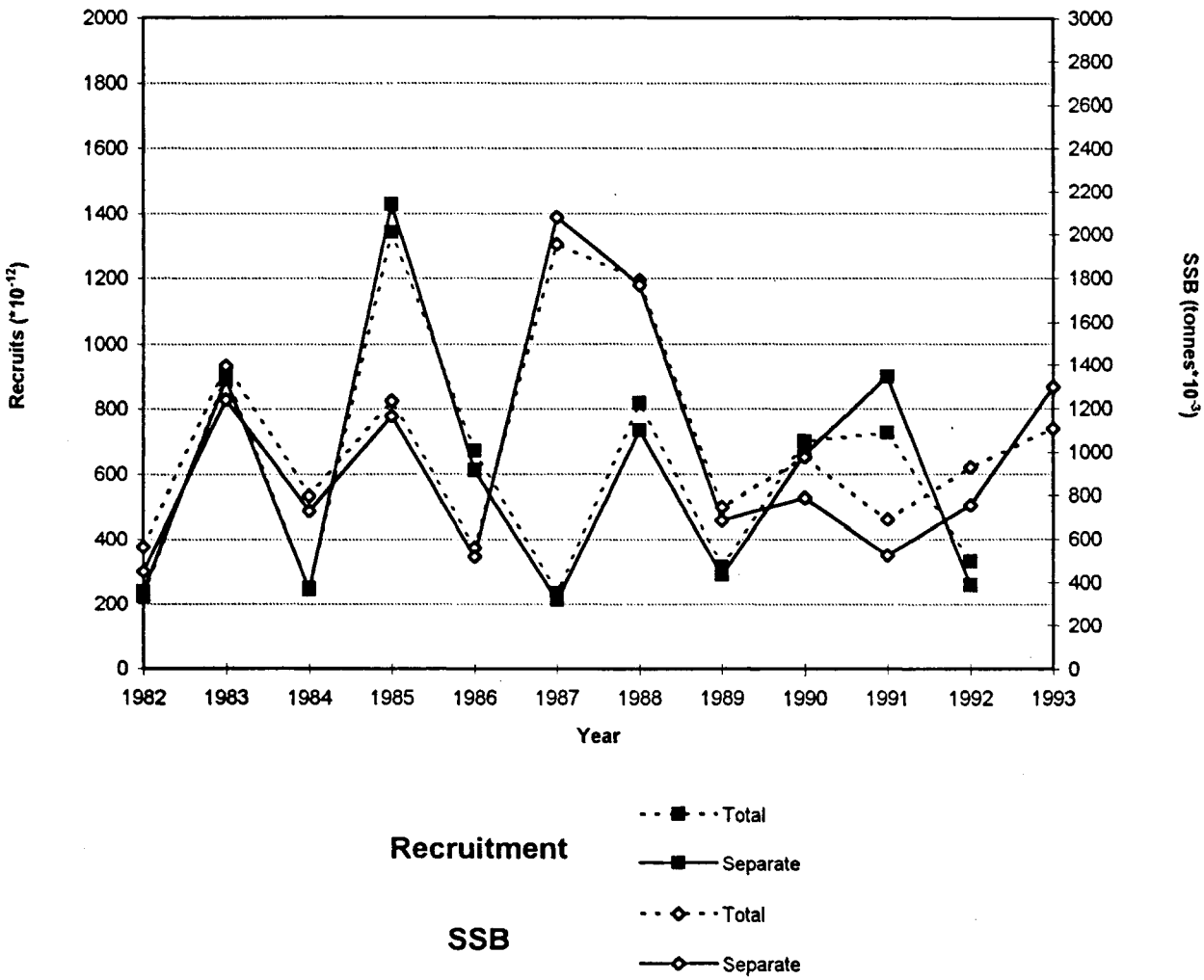
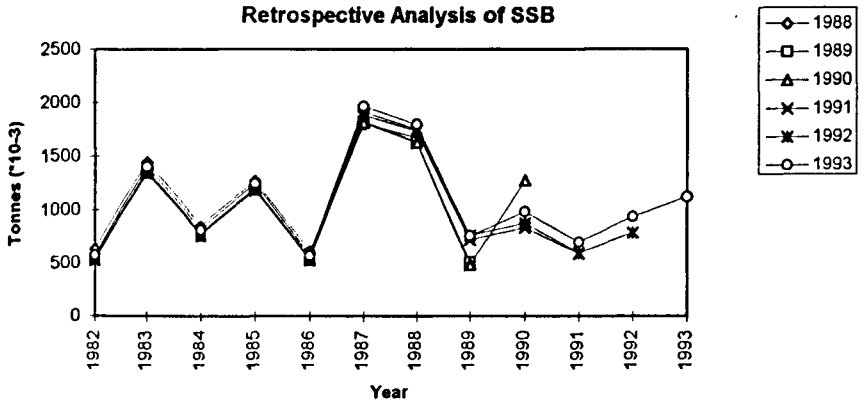
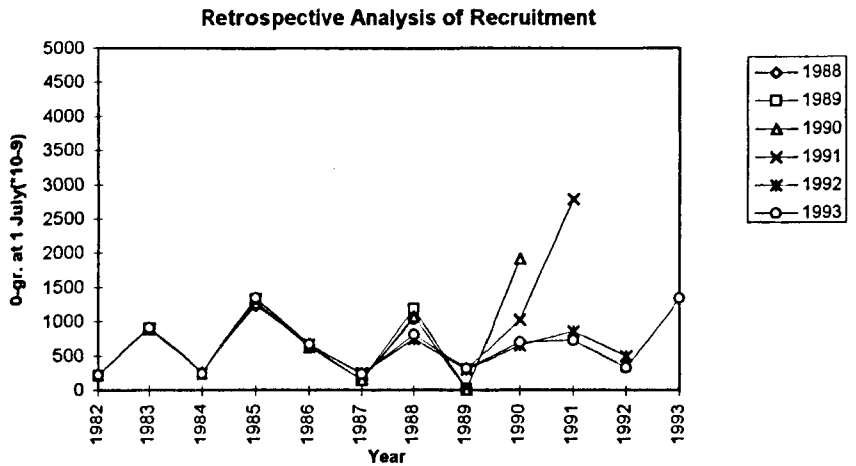


Figure 10.2.3

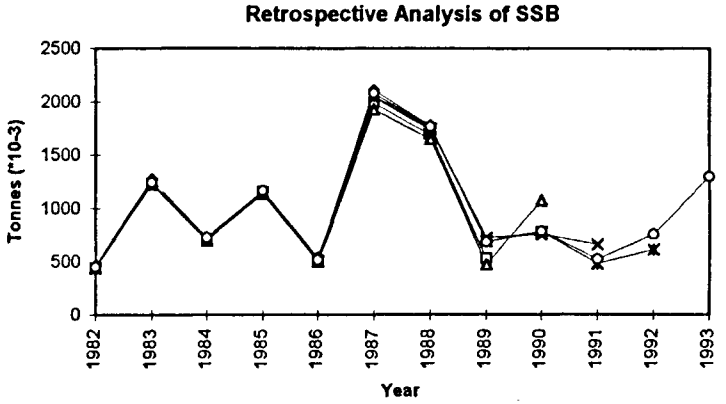
SXSA - Sandeel Total North Sea

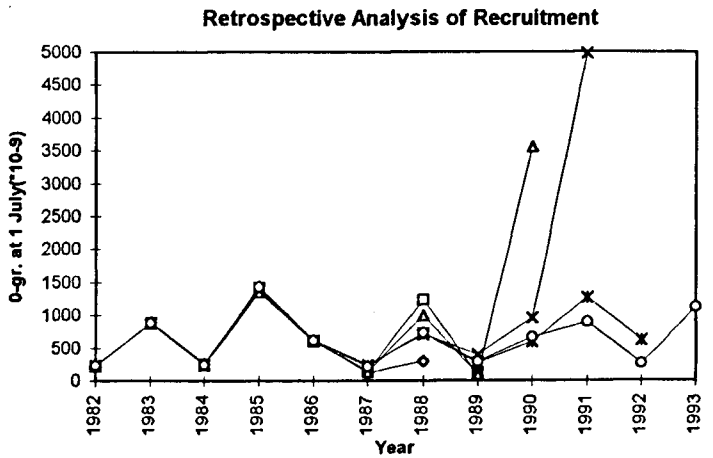
Separate Asessments of northern and southern areas





Combined Assessment





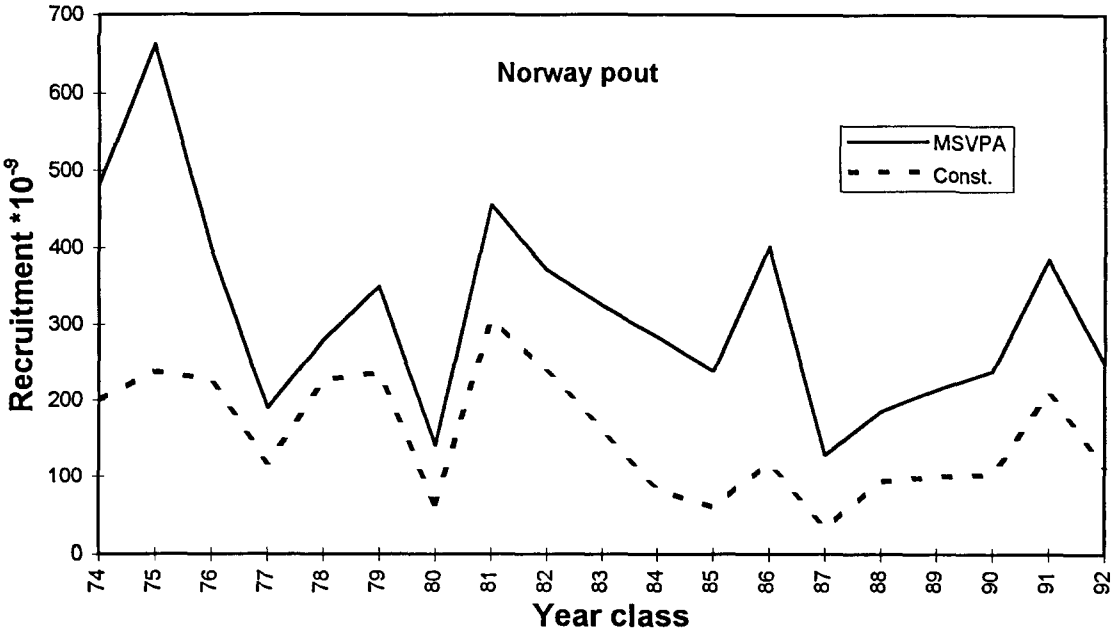


Figure 10.3.1. Recruitment estimates from SXSA using MSVPA or constant natural mortality.

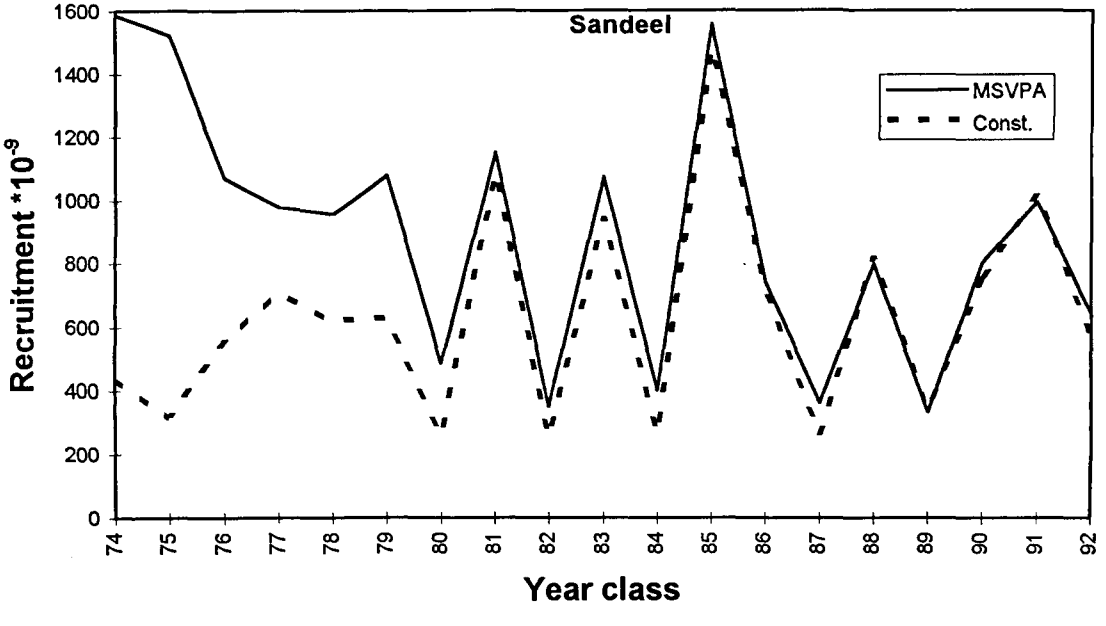
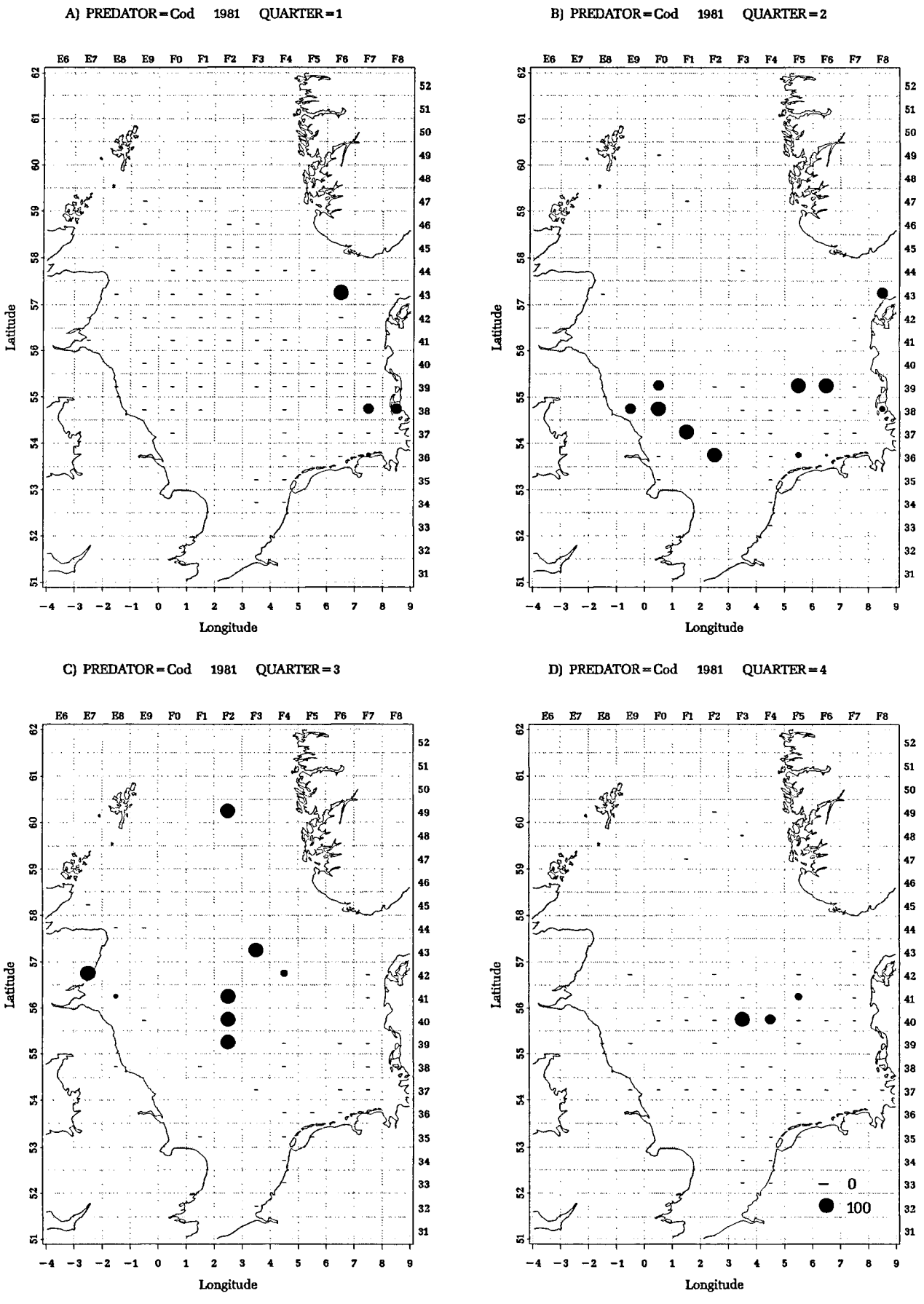


Figure 10.3.2. Recruitment estimates from SXSA using MSVPA or constant natural mortalities.

Figure 11 Spatial distribution of Sandeel as observed from stomach data. Mean fraction of sandeel (*Ammodytidae*) of total stomach content - given by predator, year, and quarter.

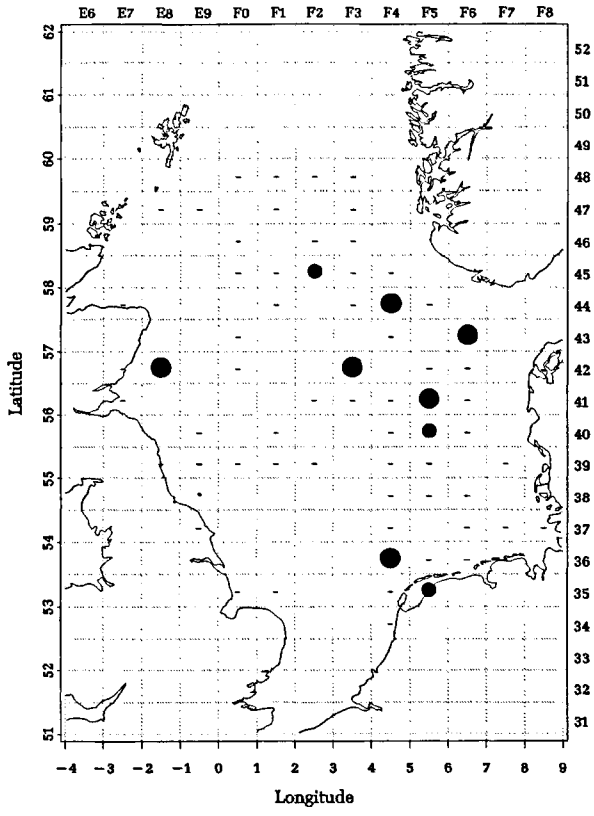


Scaling acording to squareroot of 100, which is max percentage of sandeel of total stomach content.

continued...

Figure 13 (continued)

E) PREDATOR=Cod 1985 QUARTER=1



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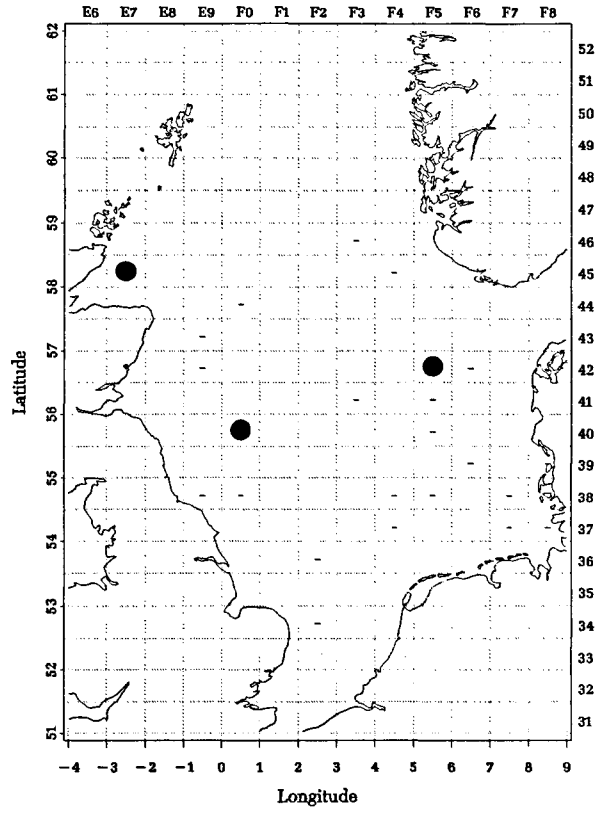

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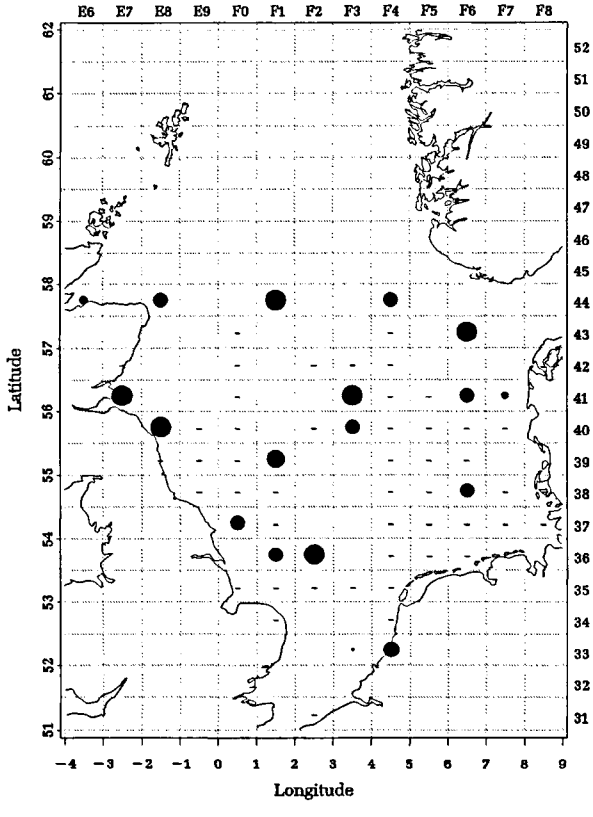

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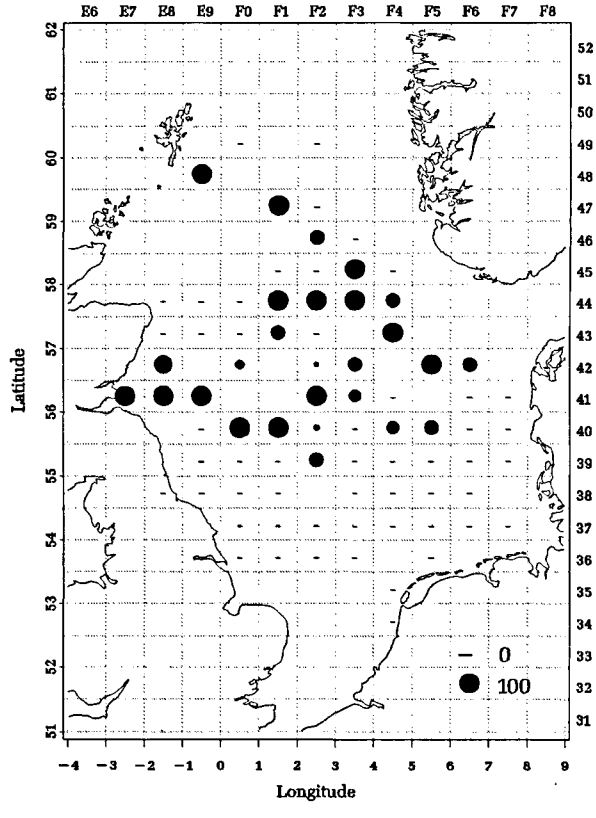
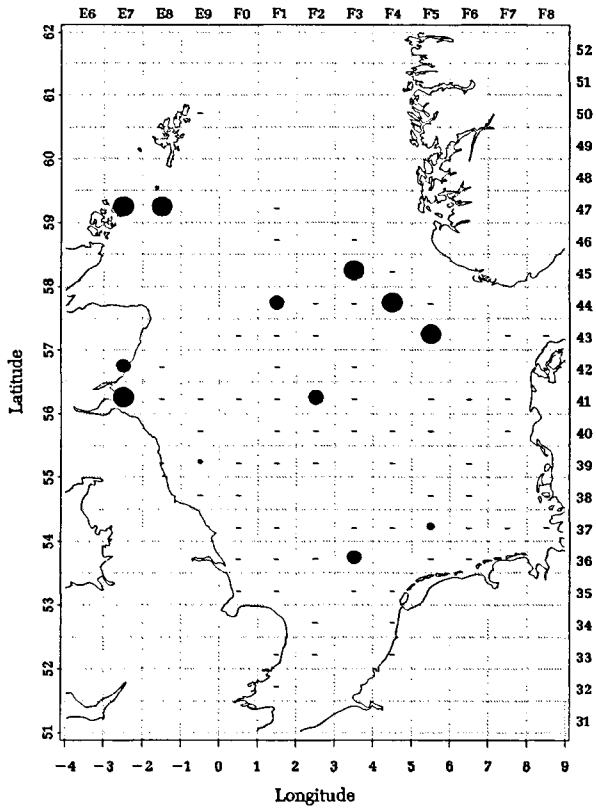


Scaling acording to squareroot of 100, which is max percentage of sandeel of total stomach content.

continued...

Figure 13 (continued)

I) PREDATOR=Cod 1987 QUARTER=1



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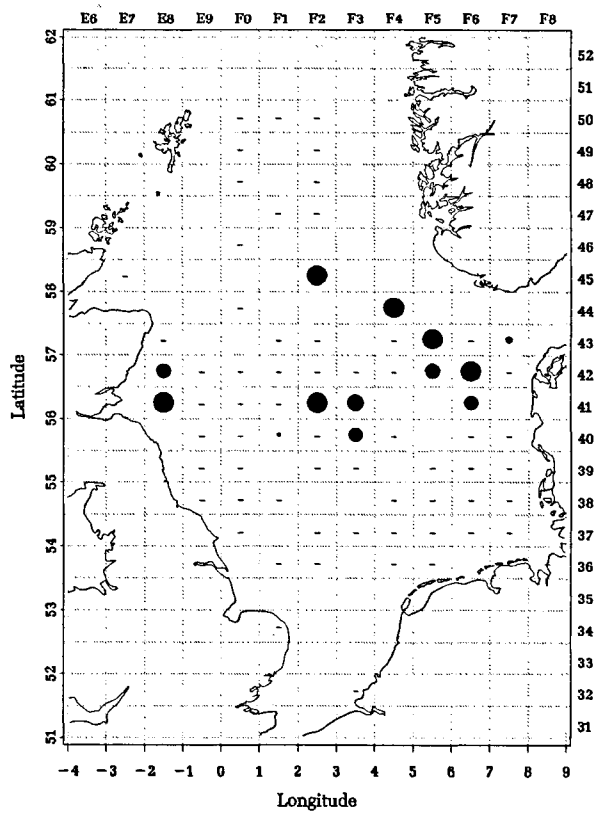

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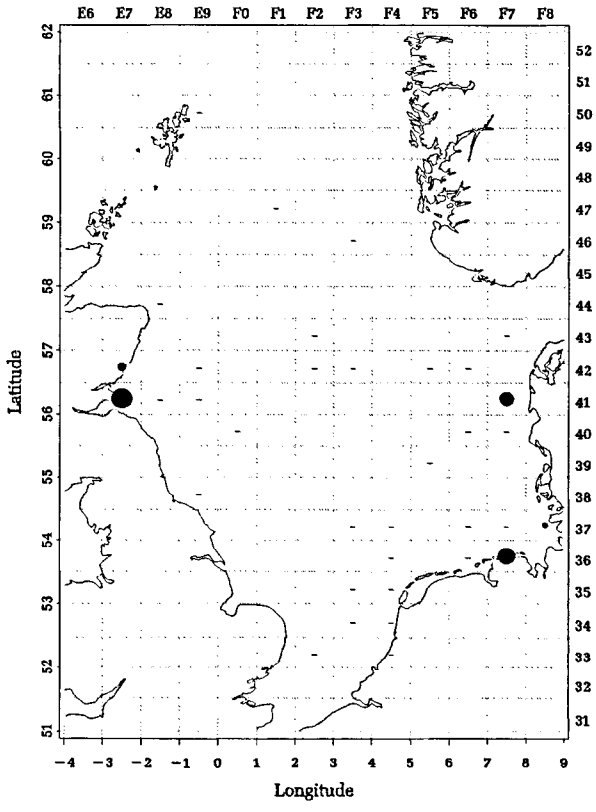

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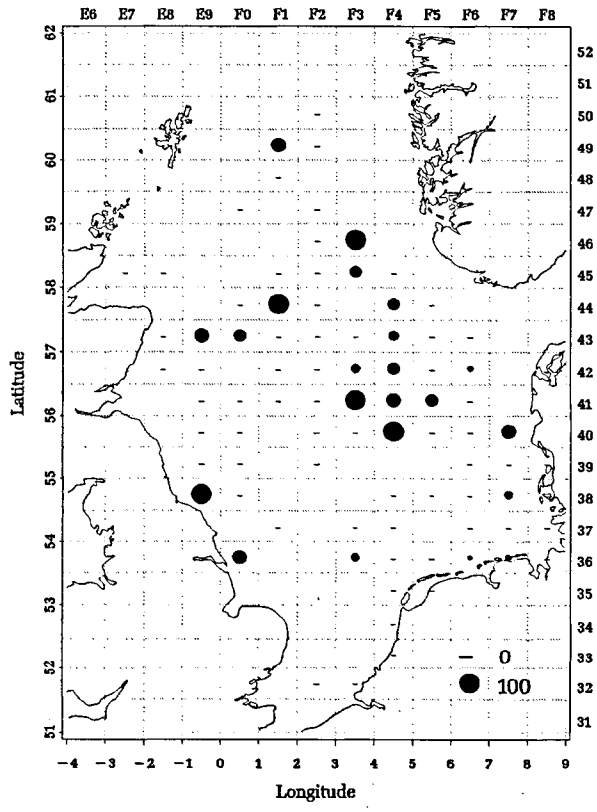
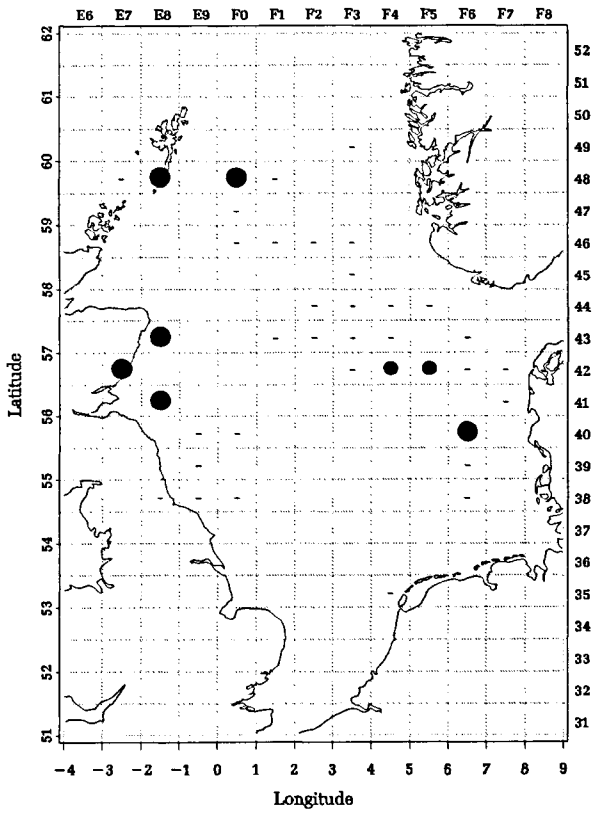


Scaling acording to squareroot of 100, which is max percentage of sandeel of total stomach content.

continued...

Figure 13 (continued)

M) PREDATOR=Cod 1991 QUARTER=3



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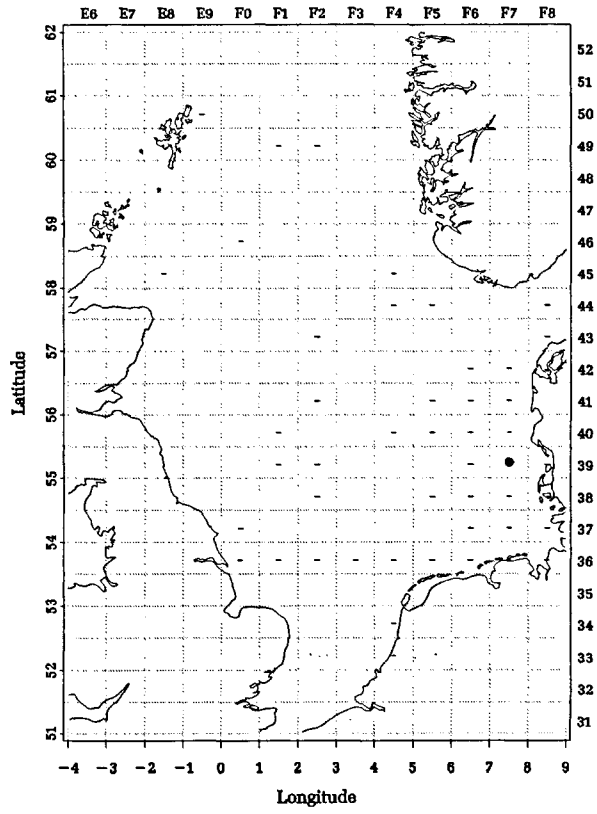
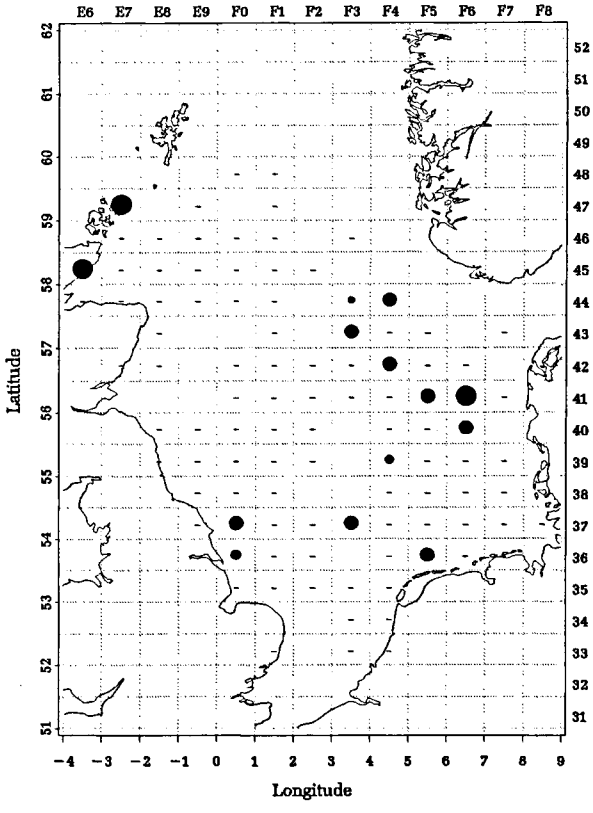


O) PREDATOR=Whiting 1985 QUARTER=1



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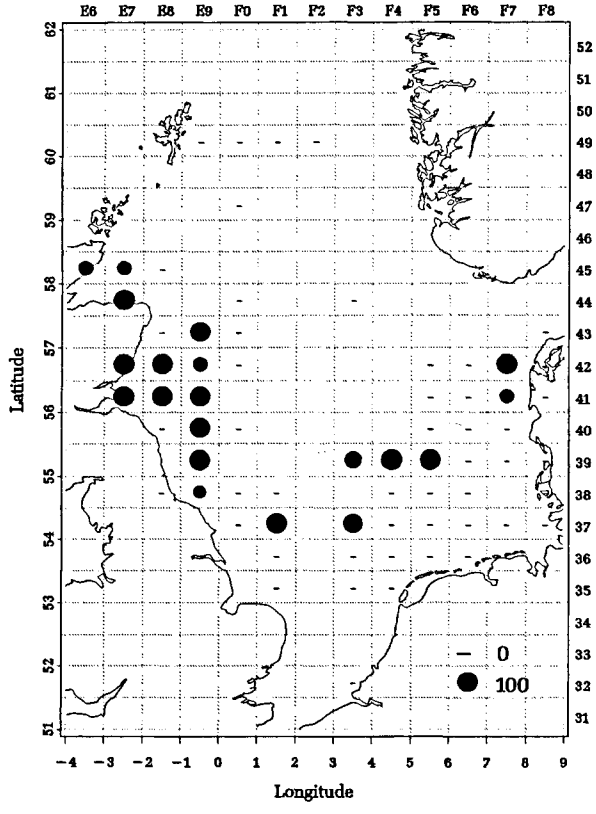
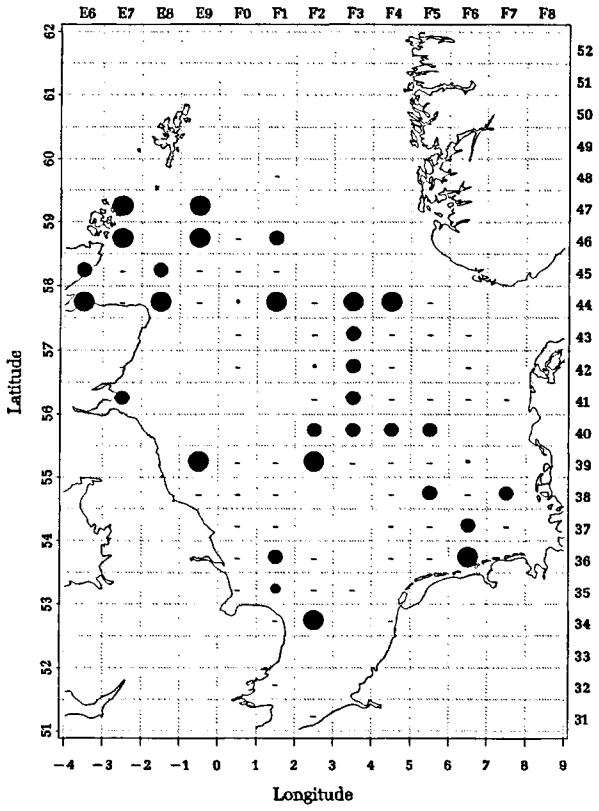


Scaling acording to squareroot of 100, which is max percentage of sandeel of total stomach content.

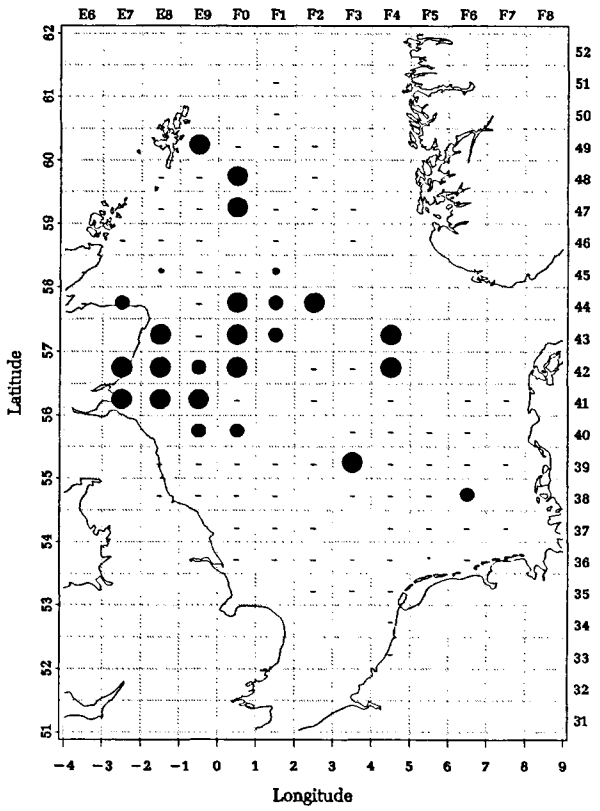
continued...

Figure 13 (continued)

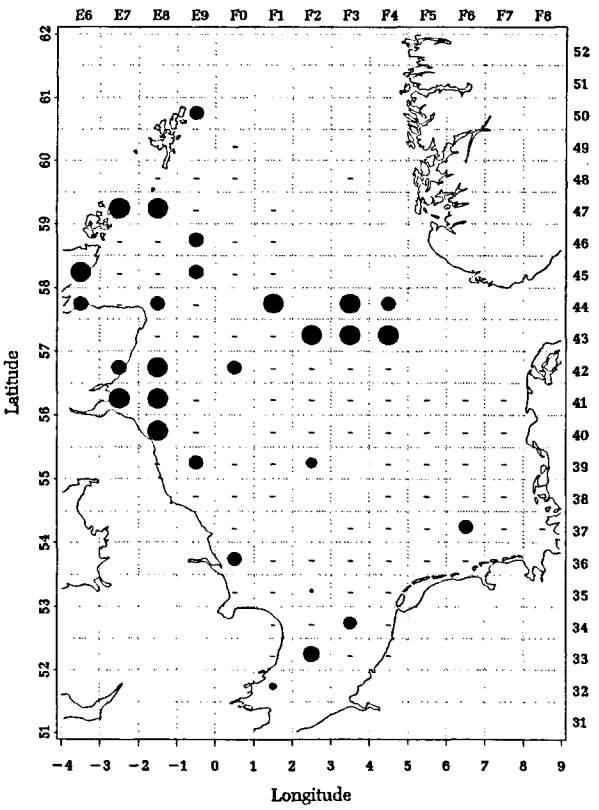
Q) PREDATOR = Whiting 1986 QUARTER = 1



R) PREDATOR = Whiting 1986 QUARTER = 3



S) PREDATOR = Whiting 1987 QUARTER = 1



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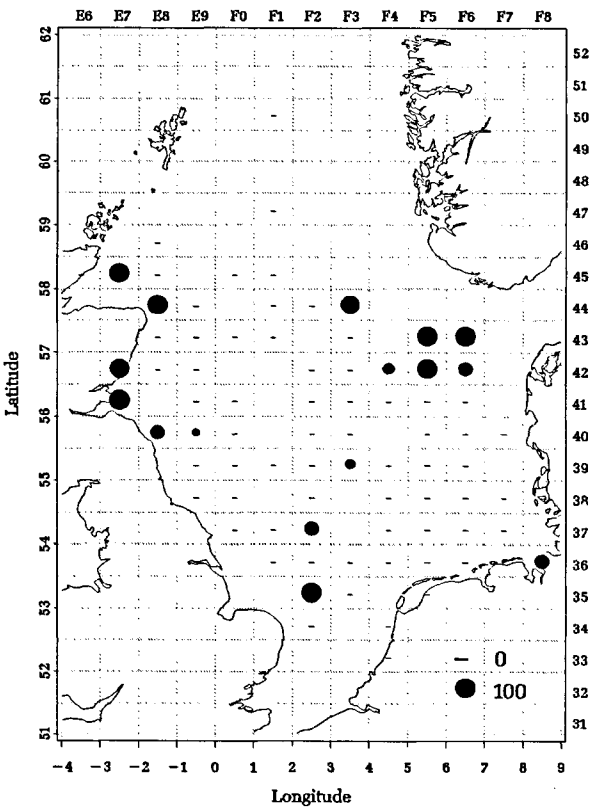
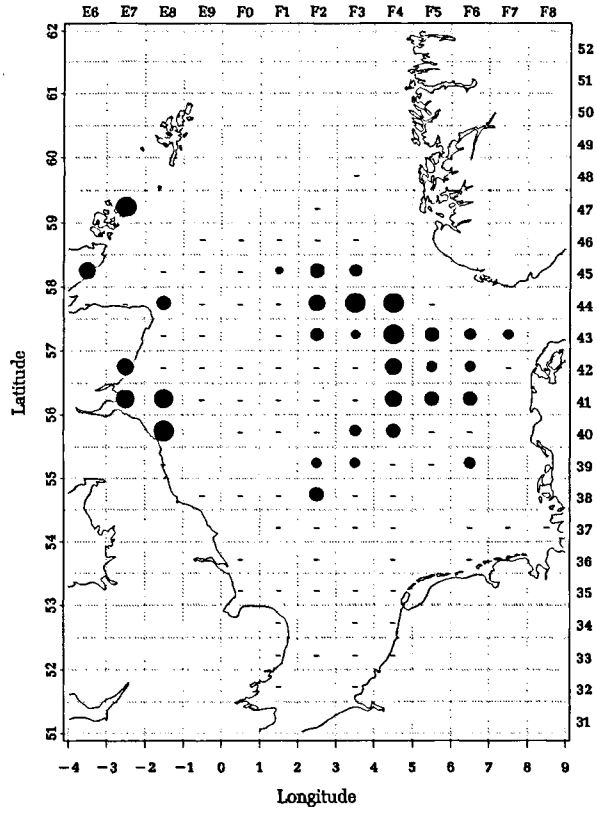


Scaling acording to squareroot of 100, which is max percentage of sandeel of total stomach content.

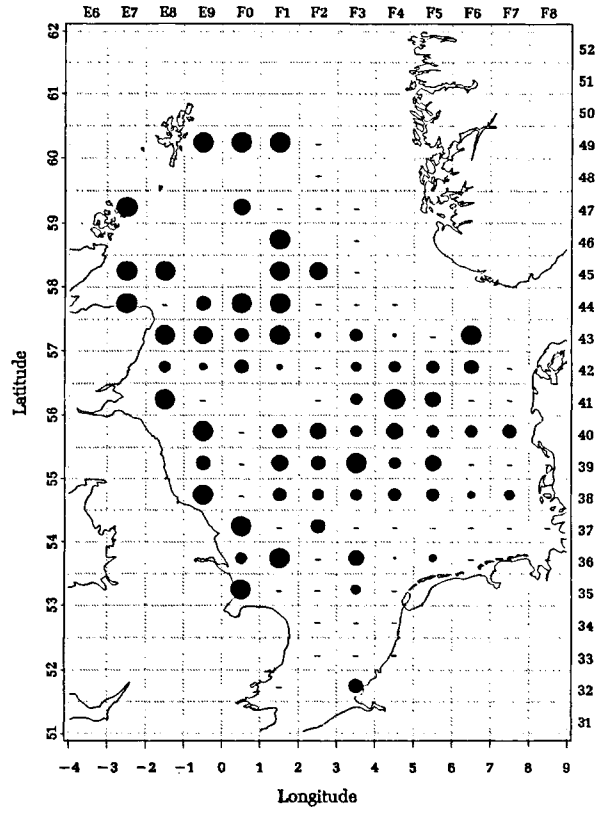
continued...

Figure 13 (continued)

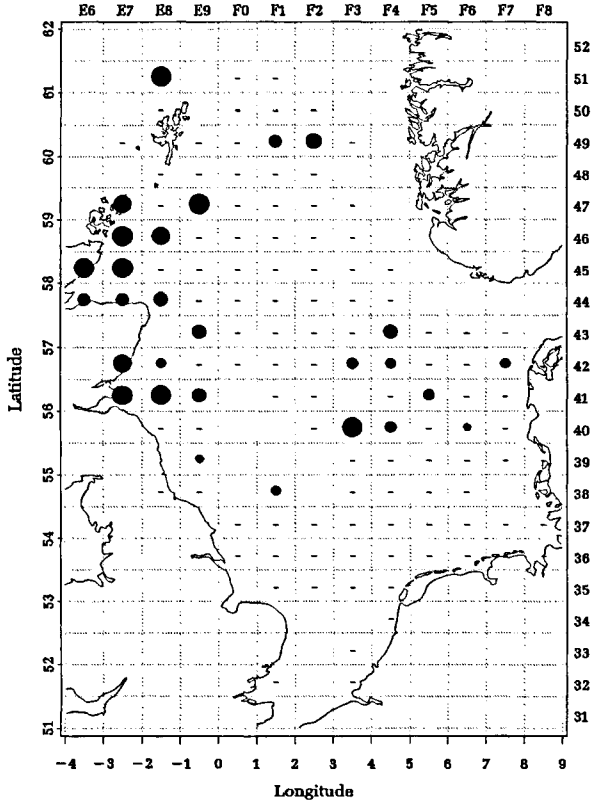
U) PREDATOR = Whiting 1991 QUARTER = 1



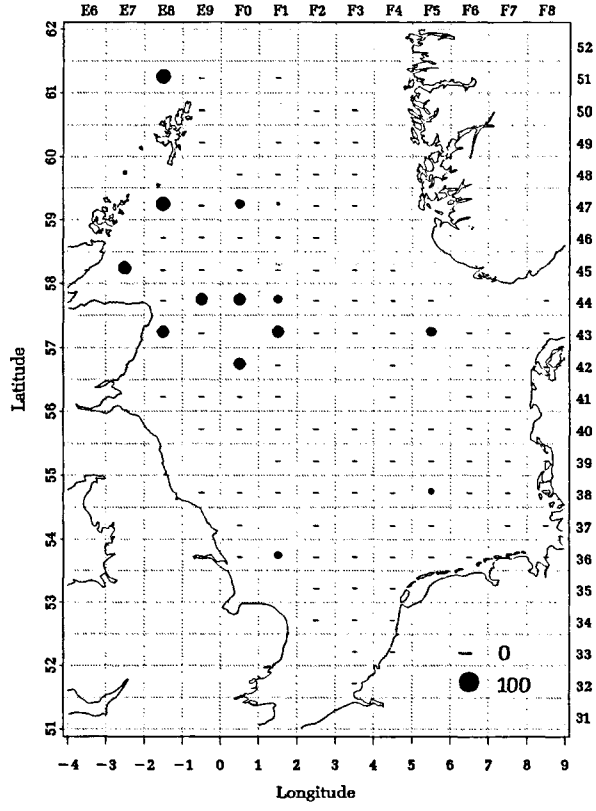
V) PREDATOR = Whiting 1991 QUARTER = 2



W) PREDATOR = Whiting 1991 QUARTER = 3



X) PREDATOR = Whiting 1991 QUARTER = 4



Scaling acording to squareroot of 100, which is max percentage of sandeel of total stomach content.