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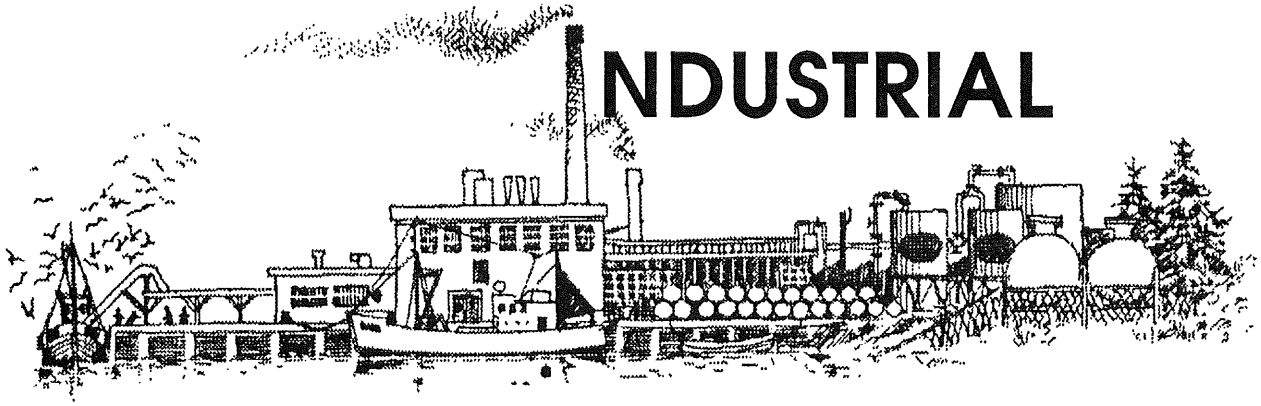
REPORT OF

INDUSTRIAL



FISHERIES WORKING GROUP

COPENHAGEN, 20-27 MARCH 1991

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1 INTRODUCTION

1.1 Participation

H. Gislason (Chairman)	Denmark
J. Lahn Johannessen	Norway
P. Lewy	Denmark
K. Popp Madsen	Denmark
S. Reeves	UK (Scotland)
D. Skagen	Norway

1.2 Terms of Reference

At the 78th Statutory Meeting it was decided (C.Res.1990/2:5:10) that the Industrial Fisheries Working Group should meet at ICES Headquarters from 20-27 March 1991 to:

a) assess the status of the stocks of the target species in the industrial fisheries, ie., sprat in Sub-area IV and Divisions IIIa, VIa, and VIId,e and Norway pout and sandeel in Sub-area IV and Divisions IIIa and VIa, and advise on the need for any management measures;

b) consider the report of the Multispecies Assessment Working Group and provide the data requested by that Working group;

c) estimate quarterly quantities and geographical distribution of by-catches of blue whiting, herring, cod, haddock, whiting, mackerel, and saithe taken in the fisheries for Norway pout, sandeel, and sprat in the North Sea and adjacent waters.

In addition, ACFM at its May and November meetings in 1990 asked the Group to consider sandeel stock/recruitment relationships, 'safe' levels of SSB/R for sandeel, the evidence for the separation of the sandeel in the North Sea into northern and southern stocks, and the biological basis for future scientific advice on North Sea sandeel stocks.

1.3 Sources of Data

In the minutes from the meeting of ACFM in May 1990, a question was raised concerning the disparity between total landings as reported in Tables 2.2 and 3.2. The difference was due to other species, such as horse mackerel, mackerel, dab, argentine etc., caught as a by-catch in the fisheries. These species were included in the total in Table 3.2 in last year's report. This year they have been removed completely from the table.

Another difference which has caused misunderstandings in the past is the difference between data as officially reported to ICES and data provided by Working Group members. The data officially reported to ICES are total landings and have not been sub-divided into landings of target species and by-catch. The Norway pout landings officially reported to ICES are thus likely to contain a considerable amount of blue whiting. The data provided by Working Group members usually refer to individual species.

1.4 Data Deficiencies

In 1990, both the Danish and the Norwegian sampling of the industrial landings in the North Sea decreased to an unacceptably low level. This decrease was par-

ticularly serious in the sampling for age composition. If the Working Group is supposed to provide reliable assessments of the North Sea stocks of sprat, sandeel and Norway pout it is absolutely necessary that the sampling effort is increased considerably.

In Denmark the problems are due to different causes: reorganisation of the sampling scheme, cuts in staff at the Danish Fisheries Institute fishermen refusing to have their catch sampled. The fisheries inspectors employed by the Ministry of Fisheries have in recent years been responsible for collecting most of the samples used for determining the species composition of the landings, while assistants employed by the Danish Fisheries Institute have collected the samples used for determining age compositions. From 1991, the fisheries inspectors are supposed to take over all sampling of the industrial fishery. In 1990, the number of samples collected by the Ministry and used to determine the species composition was at the same level as in previous years (approximately 1,000 samples). However, the total number of samples collected in the North Sea by the Danish Fisheries Institute for age composition declined from approximately 100 in 1989 to 38 in 1990. The number of samples available for sprat, Norway pout and sandeel in 1990 are shown in Table 1.4.1.

In Norway the sampling scheme is also being reorganised. From 1991 people employed by the Institute of Marine Research will collect the samples used to determine both the species, length and age compositions of the catch. Previously these samples were collected and analyzed with respect to species composition by employees from the Directorate of Fisheries. Due to the reorganisation, only very few samples for species, length and age composition were collected in the second half of 1990 (Table 1.4.1).

1.5 Re-Arrangement of ICES Assessment Working Groups

Due to the biological and technical interactions, the Industrial Fisheries Working Group considers the move towards area-orientated assessment working groups to be a step in the right direction.

The members of the Group do not, however, agree on whether the inclusion of its terms of reference into a future Sub-area IV Demersal Stocks Assessment Working Group would be an advantage. Some members consider the overlap between the Roundfish Working Group and the Industrial Fisheries Working Group in terms of industrial by-catch to be important, while others consider this to be a minor point and emphasize that the industrial fleet as such does not target on catching roundfish species. The latter members also fear that the agenda of an assessment working group which had to deal with roundfish, flatfish and industrial species would be so large that industrial species would receive less attention than necessary.

If ACFM nevertheless decides to incorporate the Industrial Fisheries Working Group into a future Sub-area IV Demersal Stocks Assessment Working Group, it was felt that the terms of reference relating to sprat should be incorporated into the terms of the proposed Herring (Clupeoid?) Assessment Working Group rather than into those of a Demersal group.

The Industrial Fisheries Working Group has never been able to produce short-term management advice due to the short lifespan of the species considered. The major part of the catch usually consists of 1-year-old fish which enter the fishery at about the time of the Working Group meeting, making it impossible to predict the catches more than at most one year ahead. The need for having annual updates of the assessments is, therefore, limited, and it may be considered to change to a schedule of meetings every second year. The danger of this approach could be that individual laboratories would give even less priority to collecting a sufficient number of samples. We would strongly warn against this possibility.

When considering the future schedule, ACFM should also consider the needs of other working groups, such as the Multispecies or the proposed Technical Measures Groups.

If the Industrial Fisheries Working Group is to continue its existence, the terms of reference of the Group should be directed towards performing assessment of historic stock sizes rather than on long-term management objectives. The industrial species are all important as food for other commercially-important fish stocks and suffer from a high level of predation mortality. The effect of long-term changes in fishing may only be predicted if species interaction is taken into account. It seems doubtful whether the proposed Demersal Working Group would be the appropriate one to perform such predictions as its terms of reference would not include mackerel and herring. It should, therefore, be considered to include long-term predictions in the terms of reference of the proposed Technical Measures Assessment Working Group.

2 TRENDS IN THE INDUSTRIAL FISHERIES FOR SANDEEL, SPRAT AND NORWAY POUT IN DIVISION IIIA, THE NORTH SEA AND DIVISION VIA

2.1 Division IIIa

The annual landings from the industrial fisheries for the years 1974-1990 are presented in Table 2.1. The total landings have fluctuated between 92,000 and 229,000 t. They increased from a minimum of 92,000 t in 1989 to 112,000 t in 1990.

In the four most recent years the landings have been well below the long-term mean of 172,000 t. In 1990, sprat landings continued to be at a very low level, whereas those of Norway pout increased from 6,000 t in 1989 to 27,000 t.

2.2 North Sea

The annual landings from the industrial fisheries for the years 1974-1990 are given in Table 2.2. For 1990, the landings have been broken down by quarters to indicate the seasonality of the various fisheries. The total landings have varied between 1 million and 1.9 million t with a long-term mean of 1.5 million t. The landings decreased from 1.5 million t in 1989 to a minimum of 1 million t in 1990. This was mainly due to a steep decline in sandeel landings from 1,035,000 t to 590,000 t, but the landing figures for sprat and Norway pout in 1990 were also rather low compared with the long-term means.

2.3 Division VIa

The annual landings from the industrial fisheries for the years 1974-1990 are presented in Table 2.3. The total landings have fluctuated widely between 10,000 t and 54,000 t, without any particular trend. The landings decreased from 47,000 t in 1989 to 18,000 t in 1990, which is 2/3 of the long-term mean of 27,000 t. Over the past decade the fishery for sandeel has been comparatively stable, yielding an average of 52% of the annual industrial landings. However, the landings of Norway pout have been fluctuating widely, yielding an average of 40% of the annual industrial landings over the last 10 years. In the same period, sprat landings have only contributed an average of 8%.

3 BY-CATCHES IN THE INDUSTRIAL FISHERIES IN THE NORTH SEA

The annual landings of by-catches of the major protected species (haddock, whiting and saithe) in the industrial fisheries are given in Table 3.1. After a

steady decline between 1979 and 1986 to a figure of 24,000 t in 1987, the annual by-catch has more than doubled in the most recent years due to an increase in the landings of whiting.

Maps showing the geographical distribution of industrial by-catches of protected species are available for 1990. They are not published in the present report, but are retained in the files of the Working Group.

The areal distribution of the industrial landings by target species and associated by-catches of herring, haddock, whiting and saithe are shown in Table 3.2 for 1990. By-catches in the sandeel fishery are rather small. By-catches of herring have mainly been associated with the sprat fishery. By-catches in the Norway pout fishery consist of a mixture of herring and protected species. The category 'mixed' indicates that none of the target species was dominating in the landings. In the previous report (Anon., 1990), Table 3.2 included by-catches of other species in the totals. The Working Group was not in a position to revise the figures for 1988 and 1989 during the present meeting and, for this reason, Table 3.2 contains only data for 1990.

4 NORWAY POUT IN DIVISION IIIa

4.1 Landings

Total landings as officially reported to ICES are shown in Table 4.1. In 1990, the landings were about 42,000 t, which is at the same level as in 1987 and 1988 but significantly more than in 1989.

5 NORWAY POUT IN THE NORTH SEA

5.1 Landings

Landings by country are shown in Table 5.1.1 for the period 1957 to 1990. The landings in 1990 were 119,000 t which is a 17% decrease compared to 1989. Landings by month and country are given in Table 5.1.2 for the years 1988 to 1990. The proportion landed in the first half of 1990 (46%) was considerably higher than in 1989 (19%).

5.2 Fishing Effort and Catch per Unit Effort

Danish CPUE

Table 5.2.1 shows Danish CPUE data by vessel category for the period 1983 to 1990. CPUE data for 1990 are very similar to 1989 except for the smallest vessel category for which the 1990 figure decreased by 34% compared to 1989.

Norwegian Effort

Number of days fished and mean GRT of the fishing vessels involved in the Norwegian directed Norway pout fishery are shown in Table 5.2.2. Total effort in 1990 increased by 76% compared to 1989, mainly due to an increase in the first half of the year.

Total Danish and Norwegian Effort

Danish and Norwegian effort data for 1989 and 1990 were standardized to a vessel size of 200 GRT using methods outlined in last year's report (Anon., 1990).

The Danish CPUE and GRT data were fitted to a GLM of the form

$$CPUE = A(year) * (GRT-G0)^{b}$$

where A is a year-dependent parameter and b is a constant. G0 equal to 50 was selected as in previous years. The results for 1989 and 1990 were:

$$CPUE(89) = 4.238 * (GRT - 50)^{0.358}$$

$$CPUE(90) = 3.686 * (GRT - 50)^{0.358}$$

The model explained 82% of the variation (R-squared = 0.82). The results for 1990 are shown in Figure 5.2.

The model was used to standardize effort data for 1989 and 1990 to a vessel category of 200 GRT, using quarterly Danish and Norwegian effort data. As the Norwegian data for 1988 to 1990 include effort directed towards blue whiting, the Norwegian catch was used to estimate a standardized effort figure by dividing the Norwegian catch by the standardized Danish CPUE. The standardized effort data are given in Table 5.2.3.

In 1990, the total standardized effort was 13% lower than in 1989. Effort in the first half year was higher than in 1989 but in the second half it was lower.

5.3 Catch at Age

Catch-at-age data for 1989 were updated (Table 5.3.1). For 1990, very few Danish and Norwegian samples for age composition were available for the first three quarters, and no data were available for the fourth quarter during which 35% of the landings were taken.

The Danish and Norwegian biological samples are summarized in Tables 5.3.2 and 5.3.3. Quarterly length compositions of catches are shown in Annex 1. The estimated catch in numbers at age for the three first quarters are given in Table 5.3.4. However, as the age compositions are based on an insufficient number of samples, the figures are subject to a large uncertainty and the Working Group, therefore, decided not to proceed with a VPA.

5.4 Weight at Age

Mean weight at age in the combined Danish and Norwegian catches are shown by quarter in Table 5.4 for the period 1986 to 1990.

5.5 Research Vessel Surveys

Updated research vessel indices are given in Table 5.5. The preliminary IYFS 1-group index for the 1990 year class is more than twice that of the 1989 year class. The EGFS 0-group index also indicates that the 1990 year class is stronger than the 1989 year class.

5.6 VPA

No analytical assessment was performed due to lack of appropriate catch-at-age data for 1990.

5.7 Catch Prediction

A SHOT prediction was performed using recruitment at age 1 from last year's VPA and the RCRTINX2 estimate of the 1989 and 1990 year classes at age 1 (Tables 5.7.1 and 5.7.2). The yield/biomass ratio for 1989 and 1990 was chosen to be at the same level as in 1987 in order to correspond to the estimated level of effort. Table 5.7.2 and Figure 5.7 show that the estimated landings for 1990 are considerably higher than the actual landings. In order to obtain a reasonable agreement between the estimated and actual landings in 1990, the Y/B ratio has to be reduced to 0.3. However, the drop in the Y/B ratio from 0.45 in 1989 to 0.30 in 1990 is not justified by the effort data shown in Table 5.2.3. The problem seems to be that the standardized CPUE decreases from 25.5 t per fishing day in 1988 to 20.4 t per fishing day in 1990, while the index of recruitment at age 1 at the same time increases from 120 to 450. Given the discrepancy between the increasing recruitment and the decreasing CPUE and the discrepancy between the actual landings in 1990 and the landings estimated by the SHOT method, there seems to be little justification for any confidence in the predicted landings for 1991.

6 NORWAY POUT IN DIVISION VIa

6.1 Landings

Landings of Norway pout from Division VIa for the period 1974-1990 are given in Table 6.1. The figures are those officially reported to ICES. In 1990, a total of 3,316 t was landed from Division VIa, a substantial drop from the 1989 landings of 28,180 t, and the lowest total on record. The average amount landed annually from 1974 to 1989 was 13,704 t.

7 SANDEEL IN DIVISION IIIA

7.1 Landings

Estimated landings decreased again from 17,200 t in 1989 to 15,800 t in 1990 (Table 7.1). The major part - 15,100 t - was taken in the Skagerrak.

8 SANDEEL IN THE NORTH SEA

8.1 Landings in 1990

Total landings were heavily reduced in 1990 as compared with the peak year 1989. With a total catch of about 590,000 t, the reduction was about 43% and the 1990 figure is the lowest since 1984.

Table 8.1.1 shows nominal landings by country. The decline is seen in all national landings. Norwegian landings declined by 49% while the Danish catches went down by about 40%. By areas the reductions are 54% and 30% for the Northern and Southern sandeel areas, respectively (Table 8.1.4).

As in the two preceding years, the fishery started in strength in early March due to a mild winter. As shown in Tables 8.1.2 and 8.1.3, the landings peaked in May and then declined to a very low level in July.

An appreciable increase followed in August together with an increase in CPUE. This seems to indicate that a new year class (0-group) became the object of the fishery, and according to Table 8.1.3, this took place in sandeel areas 2B and 3 (Figure 8.1).

8.2 Sandeel in the Northern North Sea

8.2.1 Fishing effort and CPUE

Fishing effort data were available for Danish and Norwegian vessels based on log books covering 100% of the fishing operations.

The Danish CPUE data by half year and vessel category for 1982-1990 are shown in Table 8.2.1.1.

In 1989 and 1990 a power function was fitted to each half year separately:

$$CPUE\ (\text{half year}, GRT) = a * GRT^{b}$$

The parameters are shown in the text table below and the Danish CPUE standardized to a 200 GRT vessel in the first and second half of the year are shown in Table 8.2.1.3.

		R-square	a	b
1989	I	0.99	3.19	0.50
	II	0.68	10.34	0.22
1990	I	0.92	6.03	0.29
	II	0.77	7.87	0.28

Fishing days and mean GRT for the Norwegian fleet were available for the years 1976-1990 (Table 8.2.1.2).

The standardized international CPUE was then calculated as the average of Danish and Norwegian means weighted by catch. Finally, standardized international effort was estimated as total international catch divided by the standardized international CPUE.

The results presented in Table 8.2.1.3 show a drastic reduction in the total effort in the first half year of more than 50%, while an increase of about 10% took place in the second half of 1990 as compared with 1989.

8.2.2 Catch at age

Due to the breakdown of the Danish sampling system, insufficient data on age composition were available from the Danish fishery (see Section 1.4).

In the first half of 1990, the Danish fleet was responsible for 56% of the landings. The fishery generally took place further to the east and south than the Norwegian fishery. The catches in number at age presented in Table 8.2.2 were estimated by applying the Norwegian data to the entire catch. However, the coverage of the Norwegian fishery by sampling, in particular for age determination, was poorer than in previous years. Due to the difference in fishing areas, it is also highly questionable to what extent the Norwegian samples may be applied to the Danish fishery. The data presented in Table 8.2.2.1 are, therefore, insufficiently supported by samples and may be seriously in error.

8.2.3 Weight at age

The mean weight at age in the Norwegian catch is shown in Table 8.2.3.1. The mean weight at age in the stock (Table 8.2.3.2) is unchanged from previous years.

8.2.4 VPA

Due to the lack of age data and since it is by no means evident that the two fisheries will have the same age distribution, the Working Group decided that the available data were insufficient for an analytical assessment.

8.3 Sandeel in the Southern North Sea

8.3.1 Fishing effort and CPUE

Danish CPUE data were available and are shown by half year and vessel category in Table 8.3.1.1.

Effort and CPUE were standardized to a vessel of 200 GRT using the same procedure as described for the northern North Sea in Section 8.2.1.

The parameters of the power curve are shown below, and the results are shown in Table 8.3.1.2. Compared to 1989, there is little change in the total fishing effort recorded in 1990. A noteworthy feature is the low CPUE in the first half year of 1990 - in fact the lowest on record - and the comparatively high value for the second half year. The same pattern was observed in the northern North Sea and indicates a shift to fishing on the early recruits of the 1990 year class. A more detailed description of the CPUE and effort data is given in Section 8.6.

		R-square	a	b
1989	I	0.92	3.50	0.51
	II	0.44	16.72	0.13
1990	I	0.84	7.03	0.30
	II	0.91	12.85	0.23

8.3.2 Catch at age

Only two biological samples were available from this fishery. The age distribution and mean weight at age in these two samples are listed in the text table below.

Area	Quarter	Age	0	1	2	3	4	5	6	Total
2A	2nd	N	0	14	89	1	0	0	0	104
		W		8.2	13.2	17.3				12.6
6	2nd	N	0	0	10.3	14	8	3	1	129
		W			19.0	21.4	21.7	23.4	24.0	19.6

The Working Group decided that this is far from sufficient to convert the catches to numbers at age.

8.3.2 Weight at age

The only data available are those presented in the text table in Section 8.3.2.

8.3.3 VPA

Due to insufficient data for catch at age and weight at age, no analytical assessment could be done on this stock.

8.4 Sandeel in the Shetland Area

8.4.1 Fishing effort and CPUE

Fishing effort data for the Shetland area over the period 1977-1990 are given in Table 8.4.1.1. As in 1989, no effort was applied to the stock during the second half of the year due to the closure of the fishery within the 6 miles UK limit.

Using the procedure first used in 1990, the effort data from 1982 onwards were once again standardized to a vessel size of 40 GRT. The revised values for standardized effort are given in Table 8.4.1.2. Relative to the first half of 1989, the 1990 figures show a reduction of 23% in nominal effort and 39% in standardized effort. These effort figures are the lowest recorded in the fishery and reflect the fact that only two boats fished the stock for the whole season.

8.4.2 Catch at age

Catch-at-age data from the Shetland sandeel fishery are given in Table 8.4.2. In 1990, the timing of the recruitment of 0-group fish was such that very few were caught before the closure of the fishery during the second half of the year. 1-group fish predominate in the landings, making up more than 47% of the total numbers. This suggests that the 1989 year class may be of reasonable strength, at least compared with other recent years. This is apparent from the relatively low numbers of 2- and 3-group fish in the catch. Numbers of 4-group fish, originating from the apparently strong 1986 year class, are still quite high in the catches. However, even with the further reduction in effort during 1990, it is possible that effort may have been concentrated in areas where older fish predominate, thus compounding recent problems of changing exploitation pattern.

8.4.3 Weight at age

Mean weights at age of sandeels in the Shetland catch are given in Table 8.4.3.1. This year for the first time, the stock weights at age used to calculate biomass totals were semi-annual catch weights at age rather than long-term means. These are given in Table 8.4.3.2.

8.4.4 VPA

A semi-annual VPA was performed with input fishing mortalities in the most recent year estimated using the semi-annual tuning program available to the Working Group. Natural mortality rates and proportions mature were the same as those used in preceding reports (Anon., 1989).

In selecting input values for F at the oldest age, the convention used previously (i.e., a value of F = 0.5) was used. It is recognized that this value may be artificially high, but using values chosen from average F over a particular age range produces stock and biomass estimates which are greatly in excess of previous Working Group estimates. Thus, unless further information becomes available, it seems reasonable to continue with the current procedure, and thus ensure consistency in estimates between years.

The closure of the Shetland fishery during the second half of the year was a measure designed to protect the incoming 0-group fish, which used to form the bulk of the catch after the beginning of June. Thus, most effort directed at 1-group and older fish took place during the first half of the year, so the VPA has been tuned to catch and effort during the first half of the year. Effort data of sufficient detail to permit standardization are only available for the years from 1982 onwards, so the tuning uses standardized effort data for the period 1982-1990. The closure of the fishery during the second half of 1989 and 1990 meant that no F at age 0 was estimated for these years.

The tuning procedure used the mean log catchabilities at age to estimate F in the most recent years. Mean log catchability was estimated as a weighted value with linear down-weighting of older values. Input catch-at-age data are given in Table 8.4.4.1, and the log catchabilities at age and the tuning statistics are given in Table 8.4.4.2.

Estimated fishing mortalities at age are given in Table 8.4.4.3, and values averaged over ages 1 to 3 are shown in Figure 8.4.4.1. These values are plotted against standardized effort over the period 1982-1990 in Figure 8.4.4.2. The estimated numbers of fish in the sea and stock biomass totals are shown in Table 8.4.4.4. The numbers of 0-group recruits (on 1 July) are shown in Figure 8.4.4.3, and the corresponding biomass totals are shown in Figure 8.4.4.4.

The current VPA has resulted in a considerable downward revision of the strength of the 1986 year class, although it still appears quite strong compared to most year classses of the last five years. This revision has also removed the peak in total biomass corresponding to the entry of the 1986 year class, although it should be noted that all historical biomass totals have been revised due to the use of annual measured weights at age rather than long-term mean values. The estimate of the strength of the 1989 year class suggests that it is stronger than the two preceding year classes, but at 25.3 thousand million it corresponds to approximately 81% of the long-term mean. However, it remains necessary to treat the estimates from VPA with extreme caution due to continuing problems with low fishing effort resulting in slow convergence of the VPA, and with the results largely driven by the values of natural mortality used. Furthermore, doubts over the validity of the assumption of constant exploitation pattern (Section 8.4.2) give further cause to treat the analysis with great caution.

8.4.5 Critical size of spawning stock

To give an indication of the critical size of the spawning stock of sandeels at Shetland, the method proposed by Serebryakov (1990a) and investigated by the Roundfish Working Group (Anon., 1991) was used. The method is based on a graph of the type shown in Figure 8.4.5. Starting with the basic stock-recruitment scatter plot, lines are superimposed representing high recruitment (R_{high}, 10% of the recruitment values fall above this line), medium recruitment (R_{med}, 50% of the recruitment values fall on either sider of the line), high survival (S_{high}, 10% of the points above the line), and medium survival (S_{med}, 50% of the points fall on either side of the line). The method as used here assumes that egg production is proportional to spawning stock biomass. Using this method, the critical point is the spawning stock at which high survival of eggs and larvae is required in order to produce a high recruitment. This point occurs at the

intersection of the lines corresponding to S_{high} and R_{high}. In the case of sandeels at Shetland, the critical point appears to be a biomass of around 20,000 t. The current VPA suggests that the spawning stock has now fallen below this level, and with continuing low recruitment seeems unliklely to recover immediately. It should be stressed that this critical point should not be regarded as a "magic number", but should be considered in the context of other aspects of the fishery. In the case of sandeels at Shetland, the stock declining below this critical point, when viewed against a background of declining stock and continuing low recruitment, led to the closure of the fishery.

8.5 The Separation between a Northern and Southern Sandeel Stock

At last year's meeting it was discussed to what extent recruitment in the northern North Sea depended upon transport of larvae from the southern part. A working document by Berntsen et al. (1990) considered whether the current system in the North Sea would support such a transport.

Berntsen et al. used a 3-D barocline circulation model as described by Slagstad (1987) to model the current system. The water mass was divided into rectangles of 20 by 20 km and vertically stratified into 13 different depth layers. Using the flow of water through the English Channel, Skagerrak and across the northern boundaries of the North Sea as forcing functions, the current field in each depth layer was estimated from the observed changes in temperatures and salinities given by Damm (1989). In the absence of data on wind speed and wind direction, wind forcing was neglected.

Assuming sandeel larvae to be found in the upper 10 m of the water column, the model was used to predict the larval drift from 1 April to 1 July. A number of different hatching areas was considered. In most of these areas (east coast of England, western Dogger Bank, eastern Dogger Bank, Inner Shoal, west coast of Denmark and Lingbank/English Klondyke/West Bank) the larvae remained within the same area throughout the period. The main exceptions were the Shetland area and the Viking Bank where currents transported a major part of the larvae away from the hatching area.

The main drawback of the above model seems to be the lack of wind-generated currents, which are known to be a major factor in determining the current field in the North Sea (Backhaus, 1989). However, realistic modelling of the influence of wind forcing on larval transport necessitates detailed information about the vertical distribution of sandeel larvae. This information does not exist.

Berntsen et al. also tried to use stepwise regression analysis to correlate recruitment in the northern area with the following biological variables: SSB, Spawning stock numbers (SPN) and numbers at age 2, 3 and 4 in the northern North Sea from Table 8.2.4.3 of last year's report and SSB in the southern North Sea from Table 8.3.4.2 of last year's report. In addition, a number of environmental variables were included: Monthly mean wind stress components at Utsira in April, May and June, together with an index of influx of Atlantic water north of 57^0N in June.

The initial results showed that the stock numbers at age 3, together with environmental variables, explained a major part of the variations in recruitment. However, as no reasonable biological explanation could be given for the importance of the 3-group in particular, Berntsen et al. decided to exclude this time series from further analysis.

After excluding the 3-year-olds, the most important among the remaining variables were the N/S component of the wind in May and the spawning stock numbers in the northern North Sea, which together had an R-square of 0.66. The R-square of any of the other time series were all below 0.10, and the spawning stock bio-

mass, which takes the recent decline in growth rate into account, was not significant.

Figure 8.5.1 shows the relation between recruitment and southerly wind stress in May. In accordance with expectations, recruitment decreases with northerly and increases with southerly winds. Figure 8.5.2 shows the relation between recruitment (adjusted for the effect of the wind) and spawning stock numbers. Most of the correlation is due to the 1988 point. As recruitment and spawning stock numbers in 1988 to a large extent depend on the choice of terminal fishing mortality in 1989, it may be discussed whether 1988 should be included in the analysis at all.

The Working Group agreed that larvae may, at least in some years, be transported from the southern part of the North Sea into the northern part. The extent of this transport is likely to vary from year to year depending on the strength and direction of wind-generated currents. There is no statistically significant correlation between the spawning stock of sandeel in the northern North Sea and the subsequent recruitment, even if the 1988 point is included (see also Section 8.6.3).

The identity of sandeel stocks in the North Sea is thus by no means certain. Samples from the Continuous Plankton Recorder indicate that sandeel larvae in different stages of development may be found over most of the southern and part of the northern North Sea in the period from April to June (Henderson, 1961; Hart, 1974). The mechanism of drifting and settling of larvae has not yet been described in detail from field observations.

8.6 Management Considerations

8.6.1 Biological features relevant to management

There are a number of aspects of the biology of the sandeel that are relevant to assessment and management considerations. The main biological features in this context are:

i) Habitat

The sandeel is confined to sandy bottoms, where it spends the major part of its life more or less burried in the substratum. Due to the burrowing habit it requires that the substratum is well aerated and the preferred bottom material is consequently rather coarse sand in areas with comparatively high current velocities.

Because of the habitat requirements, the distribution is mainly limited to the shallower areas of the North Sea and dense concentrations are typically found along ridges and edges of banks where tidal currents provide continuous water renewal.

ii) Availability

The burrowing habit of the sandeel makes it inaccessible to the fishery for periods of differing lengths according to age and size of the fish. Adult sandeel are mainly active in April-June when feeding takes place and in December-January for spawning. The juveniles are available from when they settle on the bottom after metamorphosis until about October. Likewise, the 1-group is the first to appear in the following spring apparently dependent on the temperature. In the mild winters of 1988 to 1990, the activity began early around the beginning of March and the fishery was well underway about a month later.

In some areas sandeel are available during the season outlined above but inaccessible to the fishery because the ground is too rough for the light commercial sandeel trawl. The total extent of these areas is unclear. Tagging experiments have shown that once settled the sandeel seems to be a quite sedentary fish (Popp Madsen, pers. comm.) These 'protected' components may be of importance for the stock, but their actual size is unknown.

8.6.2 The effect of fishing

The impact of fishing upon the sandeel in the North Sea is difficult to ascertain because of the discrete distribution, and the changing availability. Due to the sedentary habit of sandeel, the population within a certain area will be influenced by the local more than by the overall fishing effort. From an assessment point of view it may thus be an advantage to use a high spatial disaggregation.

There are indications that effort changes with CPUE. Changes in Danish CPUE and effort during the fishing seasons of 1989 and 1990 are shown in Figures 8.6.2.1 and 8.6.2.2. The upper curves show the average weekly CPUE in tonnes per fishing day while the lower curves show the weekly effort in number of fishing days.

In both years, CPUE increases rather rapidly from the beginning of March to reach a peak in May. Then follows a more or less drastic decline to a minimum in July. After a second maximum in August the fishery stops by the end of September. The maximum CPUE in May denotes the period when all age groups (except the 0-group) are available on the fishing grounds. The decline in June coincides with the disappearance of the older fish and the second maximum with the appearance of the 0-groups on the banks. The effort increases with increasing CPUE and reacts to decreases in CPUE with a decrease about one week later. Effort is reduced once CPUE starts to decline. In 1989 relatively little effort was expended once CPUE dropped below 25 t per day.

A closer look at the average weekly CPUE by statistical rectangle indicates that the same development takes place within individual rectangles although the development here occurs more rapidly. It is clear that effort is rapidly transferred from a rectangle of declining CPUE to other rectangles giving higher catches per day. The curves in Figures 8.6.2.1 and 8.6.2.2 are consequently giving a picture of the overall development on the fishable grounds. The reduction in effort exerted during the August maximum in CPUE is partly due to a reduction in the number of larger vessels participating in the fishery. In 1990 44% of the total effort in the first half of the year was due to vessels of more than 200 GRT against 29% in the second half.

Norwegian CPUE by individual landings in the Lingbank-English Klondyke area in the first half of 1990 are shown in Figure 8.6.2.3. These data only represent a limited fraction of the landings. The CPUE of the total fleet is not available with the same fine resolution in time. The CPUE sems to have developed in the same way as in the Danish fishery. It may be noted, however, that catches associated with a small CPUE appear throughout the whole season.

The year-to-year variations in CPUE and effort in the total international fishery are shown in Figures 8.6.2.4 to 8.6.2.7 for the northern and southern North Sea. In the northern North Sea the effort seems to some extent to be related to the CPUE. In the southern area no clear relation between mean effort and CPUE seems to be present. This indicates that other factors, such as the price of sandeel, may be important in determining the total international effort.

Due to the above-mentioned points it is reasonable to assume that a part of the

total sandeel stock may be protected from exploitation because:

- The ground is too rough for the use of the sandeel trawl.

- The abundance of sandeel is too low to secure a profitable CPUE.

The impact of the fishery on the stock as measured by the fishing mortality from the VPA will thus - all other assumptions alike - tend to be overestimated and the estimates of stock size will tend to be underestimated.

The main part of a year class appears to enter the spawning stock at 2 years of age and in most years this age group constitutes the major spawning component. The impact of the fishery on the abundance of this age group may be expressed by the exploitation rate of the 0- and 1-group (Table 8.6.2.1). Average fishing mortalities for the period 1976-1988 derived from the VPA give the following average exploitation rates at age 1:

Northern North Sea: $E = F/Z = 0.571/1.771 = 0.32$

Southern North Sea: $E = F/Z = 0.297/1.497 = 0.20$

From this it appears that fishing is a minor factor in determining the strength of the recruitment to the spawning stock in the southern North Sea, but may have a larger influence in the northern North Sea.

8.6.3 Stock/recruitment relationship

A plot of recruitment versus spawning stock size for the northern and southern North Sea combined is given in Figure 8.6.3.1. Excluding 1987, the figure may give the impression of a linear relationship between spawning stock size and recruitment. The correlation is, however, not statistically significant ($R = -0.8$, $df = 10$). A similar plot using the data from the MSVPA key run produced at the 1990 meeting of the Multispecies Assessment Working Group is shown in Figure 8.6.3.2. Again the correlation is non-significant ($R = -0.06$, $df = 10$). If the 1987 data point is excluded, the correlation becomes statistically significant ($R = 0.66$, $df = 9$, $P<0.05$). There is, however, no reason for excluding the 1987 point from the analysis. Plots of recruitment versus spawning stock size for the northern and southern assessment areas separately are shown in Figures 8.6.3.3 and 8.6.3.4. In neither of these is the correlation significant ($R = -0.38$ and $R = 0.01$, respectively, $df = 10$).

Therefore, in none of the cases is there any evidence of a significant linear relationship between spawning stock size and recruitment.

8.6.4 Management measures

In its reports of 1984 and 1989, the Industrial Fisheries Working Group estimated the Y/R and SSB/R at various levels of fishing mortality. The participants saw no point in repeating these calculations. In the North Sea, sandeel is subject to a high and variable natural mortality. If long-term predictions are needed, changes in natural mortality have to be taken into account. This may best be done by the Multispecies Assessment Working Group.

In the case of the Shetland sandeel, the size of the spawning stock has declined due to a series of low recruitments. However, the fishery does not seem to be implicated in the recruitment failure. The spawning stock has recently fallen to a level at which the historical evidence suggests that high egg and larval survival is required to produce a good year class (see Section 8.4.5) and the fishery has been closed.

In the case of the other North Sea stocks there are no signs of a development in either spawning stock size or in recruitment which gives reason for concern. The development is shown in Figures 8.6.4.1 and 8.6.4.2 based on the VPAs of last year's report. The recruitment in the southern area has fluctuated widely and more than in the northern area, but without any pronounced long-term trend. The spawning stock biomasses are less variable from year to year and, if anything, the trend is towards a slight increase.

As already mentioned in Section 1.5, the Working Group has no means of predicting next years' catches. There is no correlation between the catch of 0-groups in the second half of the year and the catch of 1-group in the following year (R-square = 0.02). Although there is no apparent need for introducing management measures or precautionary TACs in the main sandeel fisheries in the southern and northern North Sea, the fisheries should, however, be subjected to continuous monitoring and more research should be directed at the many unresolved problems concerning the biology of sandeel.

9 SANDEEL IN DIVISION VIa

9.1 Landings

Official landings of sandeel in Division VIa are given in Table 9.1. Landings in 1990 were 24% lower than in 1989.

9.2 Fishing Effort and CPUE

Fishing effort data by month for the sandeel fishery in Division VIa over the period 1980-1990 are given in Table 9.2.1. The total effort over 1990 shows a 17% reduction when compared to 1989. The 1990 season was also shorter than usual, with boats only fishing from May to August, and with most effort occurring during June.

Standardized effort data are now available for the Division VIa sandeel fishery. These are presented in Table 9.2.2. These values were calculated using the same procedure as that used for the Shetland effort data (Section 8.4.1). These data cover the period 1982-1990. The standardized effort figure for 1990 is 18% less than that for 1989.

9.3 Catch at Age

Catch-at-age data by month for 1990 are given in Table 9.3.

9.4 Weight at Age

The mean weights at age of sandeels in the Division VIa catch are given by month in Table 9.4.1. As in the case of the Shetland fishery, the stock weights at age used to calculate biomass totals were semi-annual catch weights at age, rather than long-term mean values which had been used previously (Table 9.4.2).

9.5 VPA

A semi-annual VPA was performed using the values of natural mortality, and proportion mature at age given in a previous Working Group report (Anon., 1989). The values used for input F at the oldest age were the same as those in the Shetland VPA (Section 8.4.4), and the comments on the method made there also apply in the case of Division VIa. Previously, the input values for F in the

most recent years have been estimated by tuning to catch and effort data during the second half of the year. However, when this was tried this year, it resulted in very high estimates of mean F for the most recent years. These values were inconsistent with the low effort figures for these years. This overestimation of F appears to be due to a shift in the seasonal pattern of fishing effort, with more effort now being expended during the first half of the year. Previously, distribution of effort between the two halves of the year tended to be fairly even, with slightly more occurring during the first half of the year. During 1990, however, 68% of the standardized effort occurred during the first half of the year. With this imbalance, tuning on the effort during the second half of the year appears to force an artificially high estimate for F during the first half of the most recent year, and the estimates of F at age in the immediately preceding years then consequently increase. Thus for this analysis, the input values for F at age were estimated by tuning to catch and standardized effort data during the first half of the year, with log catchabilities and linear down-weighting of older data. The use of effort data from the first half of the year for tuning purposes is not consistent with previous methodology, but is more appropriate in this case as it reflects the distribution of effort during 1990 more effectively. However, it is possible that this procedure may have slightly underestimated the F at age values in the most recent years.

Input catch-at-age data are given in Table 9.5.1, with the tuning statistics and log catchabilities at age given in Table 9.5.2. Estimated values of F at age are given in Table 9.5.3, with values of mean F (ages 1 to 3) plotted as a time series in Figure 9.5.1, and against standardized effort in Figure 9.5.2 (adjusted r^2 = 0.609). Estimated numbers in the sea and biomass totals are given in Table 9.5.4. Trends in recruitment and biomass totals are shown in Figures 9.5.3 and 9.5.4, respectively.

The addition of the 1990 catch data to the information available on the Division VIa sandeel stock has resulted in a downward revision of the estimate of the size of the 1986 year class. Even so, this still appears to be the strongest year class on record for this stock. The present assessment has also resulted in a revision of the estimate of the strength of the 1988 year class to more than twice its previous value. This is not surprising as this would have been the most uncertain of the estimates arising from the previous assessment. Similarly, the addition of an extra year's catch data for the 1989 year class has improved the very provisional estimate of recruitment made last year. The indications from this assessment are that the 1989 year class is quite strong, the VPA giving an estimate of around 51 billion fish, which compares with a long-term geometric average of about 33 billion. However, this estimate is still rather provisional, and with the possibility that F during the second half of recent years may have been underestimated, there are reasons for treating this estimate with some caution. In addition, tuning the VPA on effort data during the first half of the year, before the 0-group fish have entered the stock, means that the initial estimate of the strength of the 1990 year class is extremely unreliable and should be disregarded.

The use of measured stock weights at age rather than long-term means has resulted in some changes in the historic trends in biomass totals. This is largely due to relatively high measured weights at the younger ages in 1984 and 1987. These have resulted in a large increase in stock biomass relative to that calculated by the previous Working Group (Anon., 1990). In 1987, this increase has been sufficient to counterbalance the decrease in numbers suggested for that year by the current assessment. The current estimate of spawning stock biomass is about 79,000 t, a decline from the two preceding years, but still above the geometric mean of 49,000 t. The current assessment has resulted in a slight upwards revision of estimates of mean fishing mortality since 1983. The 1990 value appears to be one of the lowest recorded since the fishery began in 1980.

10 SPRAT IN DIVISION IIIa

10.1 Landings

The landings for the period 1974-1990, as provided by the Working Group members, are shown in Table 10.1. The Swedish data from 1982 onwards have been revised. Due to increasing difficulties in allocating the catches to areas, the revised Swedish data are only given for the whole of Division IIIa. The landings are still at a very low level, and slightly below those of the two previous years.

10.2 Research Vessel Surveys

The IYFS index for 1-group and total sprat for 1991, together with the indices from previous years, are shown in Table 10.2. This year's indices are still at a very low level.

10.3 State of the Stock and Catch Predictions

According to the IYFS indices, the stock is still at a low level, and there are no signs of improvement in the recruitment.

A SHOT estimate was performed using the IYFS index at age 1 as recruitment index, and a Y/B ratio of 0.772 up to and including 1985, and 0.6 for the more recent years. The estimated catch for 1991 is 9,200 t, which implies a minor increase from 1990 (Table 10.3).

11 SPRAT IN THE NORTH SEA

11.1 Landings

The preliminary figure of 76,100 t for the landings of sprat in 1990 is slightly above last year's figure. The landings reached a minimum in 1986. Since 1988, they have remained at around 80,000 t.

Table 11.1.1 shows the landings by area and country. Table 11.1.2 shows landings by area and quarter, but includes only landings where such data were available. The catches in the Norwegian fjords are included in Table 11.1.1 but not in 11.1.2. The main fishery (83%) took place in Division IVb east, and mostly in the third and fourth quarters.

11.2 Catch at Age

Quarterly catch-at-age data are shown in Table 11.2 for those quarters and areas where aged samples were available. The data are based on very few fish (376 and 121 for the first and third quarters, respectively).

11.3 Weight at Age

Danish data for weight at age in the catch are shown in Table 11.3. These data are partly based on measurements in research catches.

11.4 Research Vessel Surveys

11.4.1 Acoustic surveys

Acoustic surveys were carried out by Norway and Denmark in June-July in the northern and central North Sea, respectively. From the Danish survey, a biomass of 24,000 t was estimated. In the Norwegian survey, no sprat were found. As in previous years, these surveys are primarily directed towards herring and do not cover the distribution area of sprat sufficiently. Since the estimates are far below the actual catches, they were not used for an assessment.

11.4.2 International Young Fish Survey

Preliminary data from the IYFS in February 1991 for sprat <10 cm, based on a compilation of 425 hauls, are included in Table 11.4. The area distribution is shown in Figure 11.4. The preliminary index of 940 is higher than in most of the recent years.

11.5 Catch Predictions

The 1988 year class had an exceptionally large IYFS index as 1-year old in 1989. Neither the contribution of this year class in the catches, nor the IYFS index for age 2 in 1990 indicate that this year class should be exceptionally large. To find a substitute for this incredible value, an attempt was made to estimate an age 1 value for the 1988 year class index using the index for age 2. The correlation between the age 1 and 2 indices was not significant, however; ($r = 0.56$, $df = 5$, excluding the 1988 year class). As was the case last year, the Working Group found the data insufficient to allow any catch prediction.

12 SPRAT IN DIVISION VIa

The landings of sprat from Division VIa are shown in Table 12.1. The catch in numbers at age and the mean weight at age are shown in Table 12.2.

13 SPRAT IN DIVISIONS VIId,e

13.1 Landings

The nominal landings are shown in Table 13.1.1.

There was a slight upturn in the landings in the eastern Channel in the latter part of the year, with some catches being taken from the Poole area in December for the first time in many years. The incoming 1990 year class was predominant in that area, making up 76% of the samples taken.

In the western Channel, the 1990/1991 Lyme Bay season commenced in July and ended in March. The provisional catch for the 1990/1991 season was 1,562 t, which is only 334 t more than the very poor catch taken in the 1989/1990 season (Table 13.1.2). In the early part of the 1990/1991 season, the 1988 year class contributed about 62% to the catch, with the 1989 and 1987 year classes contributing 17% and 14%, respectively.

13.2 Catch at Age

The catch in numbers at age in the Lyme Bay fishery is shown in Table 13.2.1. The 1988 year class contributed up to 62% (in numbers) of the catch.

13.3 Weights at Age

The mean weight at age for the Lyme Bay fishery is shown in Table 13.3. The mean weight at age in all of the year class was above the long-term average.

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Table 1.4.1 Number of length (L) and age (A) samples available from Denmark and Norway for determining the age composition of the landings of Norway pout, sandeel and sprat in Sub-area IV in 1990. (Data provided by Working Group members.)

Quarter	Norway pout				Sandeel				Sprat	
	Denmark		Norway		Denmark		Norway		Denmark	
	L	A	L	A	L	A	L	A	L	A
1		5	5	2		1	28	2		4
2		1	42	3		3	48	3		
3		3		1		1	11			3
4							1			

Table 2.1 Industrial landings[1] from the fisheries for SANDEEL, SPRAT, and NORWAY POUT in Division IIIa ('000 t), 1974-1990.

Year	Major fisheries					Total
		Clupeoids		Gadoid species		
	Sandeel	Sprat[2]	Herring[3]	Norway pout	Blue whiting	
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	18	45	54	44	5	166
1983	28	27	89	30	16	190
1984	19	37	112	46	15	229
1985	14	22	116	9	19	180
1986	80	18	65	6	9	178
1987[4]	4	16	72	3	25	120
1988	22	9	97	8	15	151
1989[4]	17	10	52	6	9	92
1990[4]	16	8	51	27	10	112
Mean 1974-1989	26	51	61	22	12[5]	172

[1] Data 1974-1984 from Anon. (1986), 1985-1990 provided by Working Group members.
[2] Landings for human consumption included.
[3] For years 1974-1985, human consumption landings used for reduction are included in these data.
[4] Preliminary.
[5] Mean 1979-1988.

Table 2.2 Industrial landings from the fisheries for SANDEEL, SPRAT, and NORWAY POUT in the North Sea ('000 t), 1974-1990. (Data provided by Working Group members.)

Year	Major fisheries					By-catch protected species[1]	Total
		Clupeoids		Gadoid species			
	Sandeel	Sprat[3]	Herring	Norway pout	Blue whiting		
1974	525	314	-	736	62	220	1,857
1975	428	641	-	560	42	128	1,799
1976	488	622	12	435	36	198	1,791
1977	786	304	10	390	38	147	1,675
1978	787	378	8	270	100	69	1,612
1979	578	380	15	320	64	77	1,434
1980	729	323	7	471	76	69	1,675
1981	569	209	84	236	62	85	1,245
1982	611	153	153	360	118	57	1,452
1983	537	88	155	423	118	38	1,359
1984	669	77	35	355	79	35	1,250
1985	622	50	63	197	73	29	1,033
1986	848	16	40	174	37	22	1,140
1987	825	33	47	147	30	24	1,106
1988	893	92	179	102	28	54	1,348
1989[2]	1,035	66	135	142	56	47	1,481
1990[2]	590	76	115	119	46	57	1,003
1st Quarter	36.5	5.4	15.2	28.1	1.1	3.3	89.6
2nd Quarter	458.9	0.8	7.4	26.0	17.5	11.9	522.5
3rd Quarter	94.1	39.6	54.4	23.5	17.0	31.2	259.8
4th Quarter	0.5	30.2	38.3	41.3	9.9	10.7	130.9
Mean 1974-1989	683	234	59	332	64	81	1,453

[1] Haddock, whiting and saithe summarized from Table 3.1.
[2] Preliminary.
[3] Includes human consumption landings.

Table 2.3 Industrial landings ('000 t) from the fisheries for SANDEEL, SPRAT and NORWAY POUT in Division VIa.
(Data officially reported to ICES.)

Year	Sandeel	Sprat	Norway pout	Total
1974	+	7,026	6,721	13,747
1975	+	9,053	8,655	17,708
1976	17	8,042	19,933	27,992
1977	67	4,844	5,206	10,117
1978	+	12,401	23,250	35,651
1979	-	1,321	20,502	21,823
1980	211	5,202	17,870	23,283
1981	5,972	3,414	7,757	17,143
1982	10,873	3,524	4,911	19,308
1983	13,051	3,834	8,325	25,210
1984	14,166	2,648	7,794	24,608
1985	18,586	3,554	9,697	31,837
1986	24,469	870	5,832	31,171
1987	14,479	850	38,267	53,596
1988	24,465	4,208	6,366	35,039
1989[1]	17,619	1,146	28,185	46,950
Mean 1974-1988	8,424	4,719	12,739	25,882

[1] Preliminary.

Table 3.1 North Sea. Total reported by-catch ('000 t) of HADDOCK, WHITING, and SAITHE for reduction purposes.
(Data provided by Working Group members.)

Species	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990[1]
Haddock	16	22	17	19	13	10	6	3	4	4	3	2
Whiting	59	46	67	33	24	19	15	18	16	49	43	54
Saithe	2	-	1	5	1	6	8	1	4	1	2	1

[1] Preliminary.

Table 3.2 North Sea. Distribution of industrial landings ('000 t) by target species and associated by-catches of selected species to the north and south of 57°N, respectively in 1990. (Data provided by Working Group members.)

Year	Area	Target species	Total landings	By-catch			
				Herring	Haddock	Whiting	Saithe
1990	North	Sandeel	167	2	-	3	-
		Sprat	16	2	-	1	-
		Norway pout	152	21	2	9	1
		Others	4	2	-	2	-
		Sum	339	27	2	15	1
1990	South	Sandeel	442	6	-	8	-
		Sprat	153	69	-	21	-
		Norway pout	-	-	-	-	-
		Others	23	13	-	10	-
		Sum	618	88	-	39	-
1990		Total	957	115	2	54	1

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
Denmark	40,144	20,694	23,922	23,951	26,235	29,273	51,317	36,124
Norway	50[2]	104	362	1,182	141	752	1,265	990
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

Country	1984	1985	1986	1987	1988	1989	1990[1]
Denmark	67,007	85,082	32,056	47,527	45,034	16,873	41,705
Norway	947	831	400	1,680	843	306	-
Sweden	+	-	+	-	-	-	-
Total	67,954	85,913	32,456	49,207	45,877	17,179	41,705

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

Table 5.1.1 NORWAY POUT annual landings ('000 tonnes) in Sub-area IV by countries, North Sea, 1957-1990. (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	-	-	-	14.7
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	0.6	45.8	-	0.1	-	142.1
1990	61.5	0.9	56.6	-	-		119.0

[1] Including by-catch.

Table 5.1.2 NORWAY POUT, North Sea. National landings (tonnes) by months, 1988-1990. (Data provided by Working Group members.)

Month	Denmark	Norway	Faroes	Total[1]
1988				
Jan	7,605	2,457		10,212
Feb	8,013	1,698		9,856
Mar	403	1,667		2,101
Apr	-	512		520
May	-	1,888		1,916
Jun	71	882		967
Jul	2,148	495		2,682
Aug	7,383	528		8,029
Sep	4,007	310		4,381
Oct	15,983	1,886		18,135
Nov	23,868	7,497		31,833
Dec	9,481	1,283		10,925
Total	78,962	21,103	1,492	101,557
1989				
Jan	7,952	746		8,734
Feb	2,829	1,089		3,934
Mar	1,480	855		2,345
Apr	742	3,719		4,479
May	-	2,859		2,870
Jun	838	5,434		6,298
Jul	10,451	82		10,576
Aug	12,698	45		12,795
Sep	10,481	75		10,599
Oct	13,826	15,298		29,243
Nov	23,816	10,482		34,439
Dec	10,451	5,117		15,632
Total	95,564	45,801	576	141,941
1990				
Jan	8,049	1,167		9,282
Feb	8,436	4,246		12,773
Mar	4,892	1,082		6,017
Apr	1,730	5,948		7,733
May	385	5,482		5,909
Jun	4,620	7,697		12,406
Jul	4,080	3,978		8,116
Aug	1,335	7,868		9,269
Sep	3,016	3,046		6,106
Oct	6,085	3,687		9,842
Nov	12,043	7,625		19,810
Dec	6,802	4,787		11,672
Total	61,473	56,613	850	118,936

[1] Monthly totals estimated assuming Faroes catch is distributed monthly as the Danish and Norwegian catch.

Table 5.2.1 NORWAY POUT. Danish CPUE data (tonnes/day fishing) by vessel category for 1983-1990.

Vessel GRT	1983	1984	1985	1986	1987	1988	1989	1990
51-100	11.37	12.53	11.60	10.83	11.73	20.26	14.64	9.68
101-150	24.51	21.35	17.98	19.49	20.70	19.83	19.93	18.21
151-200	29.00	24.17	20.76	22.97	22.20	23.91	24.06	25.62
201-250	32.71	27.82	24.80	25.20	27.51	30.50	27.43	25.34
251-300	32.05	26.59	22.86	25.12	25.58	24.03	26.10	21.87
301-	31.81	37.47	26.86	26.63	31.10	40.09	28.92	25.91

Table 5.2.2 NORWAY POUT. Norwegian fishing effort in number of days and average vessel size (GRT). Landings with less than 70% Norway pout excluded, except for 1988 to 1990.

Year		Quarter			
		1	2	3	4
1982	Effort	733	2,240	1,934	740
	Ave. GRT	161.2	122.5	160.5	170.9
1983	Effort	302	1,671	2,302	811
	Ave. GRT	150.3	155.4	147.8	154.8
1984	Effort	473	1,633	1,622	282
	Ave. GRT	146.2	121.0	139.9	175.5
1985	Effort	600	805	595	443
	Ave. GRT	142.7	144.2	175.2	196.8
1986	Effort	503	294	693	261
	Ave. GRT	166.5	121.8	170.7	212.4
1987	Effort	715	599	290	431
	Ave. GRT	181.5	144.5	130.4	177.3
1988	Effort	237	224	695	576
	Ave. GRT	225.4	147.7	200.7	195.4
1989	Effort	200	548	1,318	1,253
	Ave. GRT	220.9	132.7	184.0	178.8
1990	Effort	821	1,951	1,487	1,574
	Ave. GRT	197.9	167.2	178.9	185.4

Table 5.2.3 NORWAY POUT. Danish and Norwegian effort (no. of fishing days) standardized to a vessel size of 200 GRT.

Year	Country	Quarter				Total
		1	2	3	4	
1982	Norway	654	1,699	1,722	682	4,757
	Denmark	1,922	502	3,929	2,234	8,587
Total		2,576	2,201	5,651	2,916	13,344
1983	Norway	259	1,461	1,957	708	4,385
	Denmark	2,317	510	3,739	3,602	10,168
Total		2,576	1,971	5,696	4,310	14,553
1984	Norway	400	1,229	1,335	263	3,227
	Denmark	1,887	454	3,783	4,433	10,557
Total		2,287	1,683	5,118	4,696	13,784
1985	Norway	500	675	556	439	2,170
	Denmark	2,179	208	2,009	3,290	7,686
Total		2,679	883	2,565	3,729	9,856
1986	Norway	457	222	638	269	1,586
	Denmark	1,645	0	1,397	3,332	6,374
Total		2,102	222	2,035	3,601	7,960
1987	Norway	689	529	273	412	1,903
	Denmark	1,271	7	1,335	1,790	4,403
Total		1,960	536	1,608	2,202	6,306
1988	Norway	234	132	54	429	849
	Denmark	645	3	545	1,986	3,178
Total		879	135	599	2,415	4,028
1989	Norway	106	471	8	1,213	1,798
	Denmark	659	108	1,802	2,265	4,834
Total		765	579	3,478	3,589	6,632
1990	Norway	293	863	672	726	2,554
	Denmark	977	80	524	1,706	3,287
Total		1,270	943	1,196	2,432	5,841

Table 5.3.1 NORWAY POUT in the North Sea.
Catch in numbers at age by quarter (millions).

N POUT: N SEA: CATCH AT AGE IN NUMBERS (+ REPRESENTS < HALF A UNIT)
UNITS = MILLIONS

	1978				1979				1980			
	1	2	3	4	1	2	3	4	1	2	3	4
0	0	0	304	1225	0	0	968	864	0	0	24	641
1	2931	1181	2385	1400	5079	3270	4244	2154	5044	2586	7711	3920
2	1371	650	786	322	940	249	763	167	1075	689	1960	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

	1981				1982				1983			
	1	2	3	4	1	2	3	4	1	2	3	4
0	0	0	77	36560	0	0	151	1058	0	0	421	2520
1	2223	1072	1316	1038	5267	3251	6576	3017	3969	1723	5495	4053
2	1688	621	944	301	415	275	431	46	1224	1165	1485	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

	1984				1985				1986			
	1	2	3	4	1	2	3	4	1	2	3	4
0	0	0	1	2209	0	0	6	665	0	0	0	5436
1	2732	2230	5238	3457	2220	840	1373	2932	395	180	1186	1687
2	1361	1153	1666	727	1337	142	777	171	1066	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

	1987				1988				1989			
	1	2	3	4	1	2	3	4	1	2	3	4
0	0	0	8	221	0	0	24	2947	0	0	7	4569
1	2665	1073	1585	2138	246	82	183	632	1695	682	1096	1693
2	398	60	165	230	699	71	250	405	47	143	198	90
3	12	0	0	5	20	0	0	0	6	7	0	13
4+	1	0	0	0	0	0	0	0	0	0	0	0

Table 5.3.2 The Danish Norway pout catch at age samples in the North Sea 1990. Number of fish.

Area	Quarter	Age					Total
		0	1	2	3	4	
4a east	1	-	613	107	8	2	750
4a east	2	-	64	35	3	-	102
4a east	3	-	107	253	2	-	362
4a west	3	2	-	86	8	-	96

Table 5.3.3 The Norwegian pout catch at age samples in the North Sea 1990. Number of fish.

Area	Quarter	Age					Total
		0	1	2	3	4	
4	1	-	75	52	5	1	133
4	2	-	73	117	2	-	192
4	3	10	41	5	-	-	56

Table 5.3.4 Norway pout in the North Sea 1990. Estimated catch in numbers at age for three quarters (millions).

Age	Quarters			
	1	2	3	4
0	-	-	21	-
1	2,277	623	666	-
2	456	645	292	-
3	35	15	6	-
4	6	-	-	-

Table 5.4 NORWAY POUT. North Sea 1986-1989. Mean weight at age by quarters. Danish and Norwegian catches combined (grams).

Year	Quarter	Age group				
		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	26.79	39.95	-
	2	-	13.60	28.70	44.39	-
	3	5.72	24.71	34.92	-	-
	4	6.69	26.75	34.70	46.50	-
1990	1	-	6.5	25.5	37.8	68.0
	2	-	14.4	25.8	39.5	-
	3	6.4	20.3	32.7	39.4	-
	4	-	-	-	-	-

Table 5.5 Research vessel indices for NORWAY POUT.

Year class	IYFS[1] February		EGFS[2] August				ENPS[3] November				SGFS[4] August		
	1-group	2-group	0-group	1-group	2-group	3-group	0-group	1-group	2-group	3-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	-	-	-	-	5	-	-	-
1977	1,913	240	1,388	314	20	7	-	-	222	82	-	-	12
1978	2,690	611	1,209	600	60	15	-	5,501	431	-	-	346	9
1979	4,081	557	1,599	824	283	11	6,449	4,519	123	36	1,928	127	16
1980	1,375	403	151	385	13	1	2,106	2,146	42	-[5]	185	37	1
1981	4,315	663	1,770	712	29	3	23,946	7,166	1,935[5]	74[5]	1,031	90	7
1982	2,331	802	1,818	517	93	2	19,567	7,603	132[5]	-	505	78	6
1983	3,925	1,423	1,501	1,008	74	18	21,852	6,524	-	-	597	186	12
1984	2,109	384	160	300	47	-	5,416	-	-	-	649	51	1
1985	2,043	469	136	219	41	3	-	-	-	-	412	24	5
1986	3,023	760	109	152	34	5	-	-	-	-	338	119	-
1987	127	260	2	26	153	9	-	-	-	-	128	25	3
1988	2,079	773	45	350	45	-	-	-	-	-	462	90	-
1989	1,320	-	400	264	-	-	-	-	-	-	308	-	-
1990	2,770[6]	-	627	-	-	-	-	-	-	-	-	-	-

[1] International Young Fish Survey, arithmetic mean catch in no/h.
[2] English groundfish survey, arithmetic mean catch in no./h, Roundfish Areas 1, 2, and 3.
[3] English Norway pout surveys, arithmetic mean catch in no./h, northern North Sea.
[4] Scottish groundfish surveys, arithmetic mean catch in no./h.
[5] 1984 figures for English survey (semi-pelagic trawl) October/November 1984. Average no./h. for Roundfish Areas 1, 2, and 3 (40 hours fishing).
[6] Preliminary.

Table 5.7.1 NORWAY POUT in the North Sea. Output from RCRTINX2.

Yearclass = 1989

Survey/ Series	Index Value	Slope	Inter- cept	Rsquare	No. Pts	Predicted Value	Sigma	Standard Error	Weight
IYFS1	7.1861	.811	-2.315	.6473	14	3.5117	.52685	.55713	.11546
IYFS2									
EGFS0	5.9940	.338	1.972	.9029	12	3.9989	.23442	.24763	.58443
EGFS1	5.5797	.746	-.463	.7325	13	3.6979	.43120	.45355	.17422
EGFS2									
SGFS1	5.7333	1.130	-3.142	.6832	10	3.3370	.49771	.53356	.12589
SGFS2									
MEAN						3.8168	.67149	.67149	.00000

Yearclass = 1990

Survey/ Series	Index Value	Slope	Inter- cept	Rsquare	No. Pts	Predicted Value	Sigma	Standard Error	Weight
IYFS1	7.9270	785	-2.128	.6483	14	4.0922	.53294	.56728	.15412
IYFS2									
EGFS0	6.4425	.333	2.005	.9117	12	4.1519	.22519	.24214	.84588
EGFS1									
EGFS2									
SGFS1									
SGFS2									
MEAN						3.7725	.67525	.67525	.00000

Yearclass		Weighted Average Prediction	Internal Standard Error	External Standard Error	Virtual Population Analysis		Ext.SE/ Int.SE
1980	3.76	42.95	.21	.14	3.38	29.29	.70
1981	4.31	74.13	.18	.23	4.65	104.09	1.24
1982	4.19	66.19	.18	.15	4.64	103.99	.83
1983	4.76	116.78	.21	.18	4.17	64.51	.84
1984	3.72	41.37	.22	.21	3.56	35.13	.95
1985	3.38	29.40	.23	.17	3.51	33.33	.74
1986	3.56	35.03	.21	.26	3.65	38.43	1.23
1987	2.26	9.55	.30	.60	2.56	12.96	1.99
1988	3.62	37.44	.19	.17	3.47	32.12	.88
1989	3.81	45.01	.19	.14			.76
1990	4.14	62.97	.22	.02			.10

Table 5.7.2 NORWAY POUT in the North Sea, spreadsheet used for SHOT prediction.

Norway pout SHOT forecast spreadsheet version 3
January 1989

Norway pout
running recruitment weights

older	.00	G-M =	.00
central	.80	exp(d)	1.00
younger	.20	exp(d/2)	1.00

Year	Land -ings	Recrt Index	W'td Index	Y/B Ratio	Hang -over	Act'l Prodn	Est'd Prodn	Est'd SQC.	Act'l Expl Biom	Est'd Expl Biom	Est'd Land -ings
1979	320	884		.70	.30				457		
1980	471	1016	869	.70	.30	536			673		
1981	236	283	433	.70	.30	135			337		
1982	360	1031	1031	.70	.30	413			514		
1983	423	1030	951	.70	.30	450	442	417	604	596	417
1984	355	635	576	.70	.30	326	269	315	507	450	315
1985	197	341	337	.50	.50	39	163	220	394	315	157
1986	174	323	333	.50	.50	151	151	174	348	348	174
1987	147	374	323	.45	.55	114	146	160	327	320	144
1988	102	120	158	.40	.60	35	71	113	255	250	100
1989	142	311	375	.45	.55	191	164	127	316	317	143
1990	119	450	486	.45	.55	91	216	175	264	389	175
1991		630	618	.45	.55		261	183		407	183
1992		571	571	.45	.55		238	208		462	208
1993		571									

Table 6.1 NORWAY POUT. Annual landings (tonnes) 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, Fed.Rep.	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
USSR	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[1]
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	-	-	-	-
Germany, Fed.Rep.	-	-	70	-	-	-	-	-
Netherlands	548	1,534	-	139	-	-	-	-
Norway	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-
UK(Scotland)[2]	586	-	23	13	-	553	517	5
USSR	-	-	-	-	-	-	-	-
Total	4,911	8,325	7,794	9,697	5,832	38,267	6,366	28,185

Country	1990[1]
Denmark	3,316[5]
Faroes	-
Germany	-
Netherlands	-
Norway	-
Poland	-
UK (Scotland)	-
USSR	-
Total	3,316

[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 as officially reported to ICES except where indicated.

Country	1982	1983	1984	1985
Denmark	21,540	34,286[1]	27,679[1]	14,058
Norway	-	178	-	-
Sweden	5	31	-	-

Country	1986	1987	1988	1989	1990[2]
Denmark	80,171	3,817	22,365	17,236[1]	15,791[1]
Norway	-	-	-	-	-
Sweden	2	-	-	-	-

[1] Estimate provided by Working Group members.
[2] Preliminary.

Table 8.1.1 Landings of SANDEEL from the North Sea, 1952-1990 ('000 t). (Data provided by Working Group members.)

Year	Denmark	Germany, Fed.Rep.	Faroes	Nether-lands	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	668.5
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	-	6.9	1034.7
1990[1]	496.0	-	2.2	0.3	88.9	-	2.5	589.9

[1] Preliminary.
+ = less than half unit.
- = no information or no catch.

Table 8.1.2 SANDEEL North Sea. Monthly landings (tonnes) by country, 1986-1990. (Data provided by Working Group members.)

Year	Month	Denmark	Faroes	Norway	Scotland	Total[1]
1986	Jan	-		-	-	-
	Feb	-		-	-	-
	Mar	12,694		252	-	12,946
	Apr	79,355		8,352	2,069	89,776
	May	153,501		11,395	4,771	169,667
	Jun	297,498	n/a	41,252	2,487	341,237
	Jul	150,737		5,508	686	156,931
	Aug	57,598		2,314	870	60,782
	Sep	1,074		1,743	763	3,580
	Oct	-		11,263	315	11,578
	Nov	-		-	-	-
	Dec	-		-	-	-
	Total	752,457	4,150	82,079	11,961	846,497[1]
1987	Jan	-	-	-	-	-
	Feb	-	-	-	-	-
	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	-	-	-	-	-
	Total	605,367	18,619	193,381	7,227	824,594
1988	Jan	-		-	-	-
	Feb	-		-	-	-
	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]

.....Cont'd

Table 8.1.2 (Cont'd)

Year	Month	Denmark	Faroes	Norway	Scotland	Total[1]
1989	Jan	-		-	-	-
	Feb	-		-	-	-
	Mar	62,927		23,117	106	86,150
	Apr	164,296		27,953	1,192	193,451
	May	300,524		61,764	2,303	364,591
	Jun	235,779	n/a	59,079	3,338	298,196
	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	186,842	6,939	1,018,215[1]
1990	Jan	-		-	-	
	Feb	-		-	-	-
	Mar	24,700		11,542	286	36,528
	Apr	94,670		13,673	1,450	109,793
	May	181,582		35,394	668	217,644
	Jun	121,981	n/a	6,660	92	128,733
	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	-		-	-	-
	Dec	-		-	-	-
Total		496,025	2,230	88,904	2,496	587,425[1]

[1]Excluding the Faroes.

Table 8.1.3 North Sea SANDEEL. Catch (tonnes) by month and area [Denmark, Norway, and UK (Scotland)] in 1986 - 1990 for areas in Figure 8.1.
(Data provided by Working Group members.)

Month	1A	1B	1C	2A	2B	2C	3	4	5	6	Shetland
1986											
Mar	403	376	1,893	2,282	6,911	-	178	-	255	265	375
Apr	22,648	20,623	1,971	6,951	26,234	622	7,019	376	-	1,263	2,069
May	92,298	2,345	154	19,553	22,952	555	20,123	1,502	1,147	4,269	4,771
Jun	158,538	2,533	692	17,656	61,493	134	44,534	1,655	367	50,804	2,841
Jul	20,466	1,911	1,344	4,714	79,976	11	10,465	18,046	2,263	19,049	686
Aug	413	6,404	2,239	3,169	38,368	555	1,923	944	14	4,601	2,152
Sep	309	347	209	638	566	84	588	5	-	61	773
Oct	160	1,183	-	295	9,620	-	5	-	-	-	315
Total	295,235	35,722	8,502	55,258	244,120	1,961	84,835	22,528	4,046	80,312	13,982
1987											
Mar	319	7,175	753	1,729	9,646	-	218	-	-	-	7
Apr	8,066	26,465	21	2,573	35,361	-	445	471	-	14	875
May	80,175	1,973	80	25,627	58,415	262	2,081	347	979	1,088	2,385
Jun	138,904	20,609	239	10,601	161,637	-	480	1,396	357	24,963	1,233
Jul	46,253	1,181	-	8,079	15,086	-	1,113	17,429	6,322	14,299	925
Aug	1,100	4,873	-	8,013	31,827	-	545	1,765	-	2,152	1,521
Sep	242	704	49	2,866	7,698	94	741	-	-	2,622	280
Oct	-	668	-	-	5,564	-	-	-	-	-	1
Nov	-	-	-	-	-	-	12	-	-	-	-
Dec	-	-	-	-	-	-	-	-	-	-	-
Total	275,059	63,648	1,142	53,488	325,234	356	5,635	21,408	7,658	45,138	7,227
1988											
Mar	-	25,627	-	234	43,482	-	1,005	-	-	-	4
Apr	58,156	26,432	525	6,288	83,185	-	8,237	1,689	495	538	993
May	178,614	3,192	625	21,750	62,602	-	13,224	8,295	206	24,053	1,932
Jun	48,998	1,968	126	11,767	31,143	205	14,385	18,341	7,459	68,129	744
Jul	9,548	21	38	2,346	66	-	7,913	6,967	1,853	9,472	633
Aug	1	593	721	2,468	4,619	133	15,860	-	1,971	1	196
Sep	231	500	-	1,336	12,254	-	4,013	-	-	1	181
Oct	536	103	-	825	19,135	2	2,993	-	-	-	36
Nov	-	-	-	-	-	-	-	-	-	-	-
Total	291,084	58,436	2,035	47,014	256,486	340	67,630	35,292	11,984	102,194	4,179
1989											
Mar	-	14,831	441	2,221	63,853	-	4,695	-	-	76	11
Apr	61,395	10,782	-	34,469	61,676	-	22,350	1,024	133	421	1,193
May	120,385	4,771	-	113,153	60,380	240	38,946	4,013	328	20,452	1,763
Jun	42,807	158	11	12,924	132,713	-	16,613	21,379	3,282	67,624	536
Jul	1,272	154	-	1,284	290	-	17,825	3,778	790	6,412	-
Aug	786	32	-	2,688	7,240	-	4,891	333	-	109	-
Sep	-	227	-	1,057	5,195	1,291	20,017	-	-	-	-
Oct	-	-	-	-	65	-	-	-	-	-	-
Total	226,645	30,955	452	167,796	331,412	1,531	125,337	30,527	4,533	95,094	3,503

Table 8.1.3 (cont'd)

Month	1A	1B	1C	2A	2B	2C	3	4	5	6	Shetland
1990											
Mar	1,566	368	119	230	33,271	136	529	-	-	18	286
Apr	37,010	167	-	37,794	22,908	56	6,379	2,049	51	1,909	1,450
May	84,824	147	-	18,501	39,258	-	18,343	11,555	3,185	41,163	608
Jun	15,337	418	-	7,895	13,574	-	12,728	28,437	10,564	39,688	-
Jul	1,478	218	-	28,934	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	140,644	1,361	119	80,272	156,091	570	61,043	45,481	13,800	85,548	2,344

Table 8.1.4 Annual landings ('000 t) of SANDEELS by area (see Figure 5.1) of the North Sea [Denmark, Norway, and UK (Scotland)]. (Data provided by Working Group members.)

Year	Area											Assessment areas[1]	
	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	227.1	31.0	0.5	167.8	331.4	1.5	125.3	30.5	4.5	95.1	3.5	489.7	525.0
1990	140.6	1.4	0.1	80.3	156.1	0.6	61.0	45.5	13.8	85.5	2.3	219.2	365.7

[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	40.7	66.5	67.5	86.7	83.0	102.5
1988	19.0	25.6	34.4	42.5	48.0	47.8	75.3
1989	16.3	25.2	36.8	41.0	49.1	51.4	76.0
1990	14.5	21.6	27.3	27.8	29.1	27.4	40.2
				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	51.0	50.0	77.9	74.0	80.7
1987	21.3	31.3	24.0	28.5	42.6	26.8	22.7
1988	16.8	21.3	30.0	32.4	38.0	33.1	43.9
1989	20.7	26.2	27.0	38.0	37.7	29.3	40.4
1990	17.6	32.5	29.4	34.0	40.4	32.6	55.3

Table 8.2.1.2 SANDEEL northern North Sea. Norwegian effort data.

Year	Fishing days		Mean gross register tonnage (GRT)	
	1	2	1	2
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	2,699	1,130	204.7	206.1
1981	1,780	414	212.6	189.0
1982	1,222	-	210.1	-
1983	324	66	267.8	208.0
1984	145	-	185.8	-
1985	366	-	212.8	-
1986	1,562	567	192.4	182.3
1987	2,123	1,584	210.5	193.0
1988	3,794	994	215.5	206.4
1989	4,843	667	187.5	186.6
1990	2,275	683	205.7	185.6

Note: 1 = Jan-Jun.
2 = Jul-Dec.

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				
	Standardized fishing days	Catch sampled for fishing effort ('000 t)	CPUE (t/day)	Catch sampled for fishing effort ('000 t)	CPUE (t/day)	Mean CPUE (t/day)	Total international catch ('000 t)	Derived international effort ('000 t)
				First half of year				
1976	593	11.1	18.7	-	-	18.7	110.3	5.9
1977	2,047	50.4	24.6	-	-	24.6	276.0	11.2
1978	1,762	44.9	25.5	-	-	25.5	109.7	4.3
1979	1,457	29.6	20.3	-	-	20.3	47.7	2.3
1980	2,732	112.8	41.3	-	-	41.3	220.9	5.3
1981	1,837	42.8	23.2	-	-	23.2	93.3	4.0
1982	1,254	27.0	21.5	13.5	34.9	21.8	62.3	2.9
1983	377	8.5	22.5	17.4	28.9	20.4	54.5	2.7
1984	140	3.5	25.0	54.1	41.2	26.1	74.1	2.8
1985	378	8.7	23.0	47.4	46.7	27.4	69.9	2.6
1986	1,531	59.2	38.6	154.1	54.7	35.5	221.3	6.2
1987	2,178	123.6	56.7	213.2	75.1	50.5	360.9	7.1
1988	3,926	155.5	39.6	158.1	42.7	41.2	332.0	8.1
1989	4,700	164.1	35.0	267.3	44.5	40.9	449.1	11.0
1990	2,275	66.0	29.0	94.9	28.0	28.4	148.4	5.2
				Second half of year				
1976	108	2.0	18.5	-	-	18.5	44.9	2.4
1977	439	11.8	26.9	-	-	26.9	110.0	4.1
1978	814	22.5	27.6	-	-	27.6	53.3	1.9
1979	1,670	53.2	31.9	-	-	31.9	147.7	4.6
1980	1,148	33.2	28.9	-	-	28.9	71.1	2.5
1981	402	7.9	19.6	-	-	19.6	44.9	2.3
1982	-	-	-	1.8	33.0	30.5	12.0	0.4
1983	67	2.4	35.8	12.3	37.4	37.0	23.7	0.6
1984	-	-	-	10.7	30.2	22.8	17.7	0.8
1985	-	-	-	16.4	38.8	34.9	16.8	0.5
1986	540	19.8	36.7	96.1	61.5	52.6	153.8	2.9
1987	1,555	68.2	43.9	5.5	33.9	42.7	76.9	1.8
1988	1,008	28.9	28.7	41.5	33.7	32.6	71.4	2.3
1989	647	12.3	19.0	44.9	32.8	29.8	57.2	1.9
1990	683	21.5	31.5	65.8	35.1	34.2	70.8	2.1

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

Age group	1976		1977		1978		1979		1980	
	1	2	1	2	1	2	1	2	1	2
0	237	6,126	3,686	3,067	-	7,820	-	44,203	17	8,349
1	5,697	648	24,307	2,856	6,127	1,001	2,335	1,310	13,394	1,173
2	1,130	84	2,351	913	2,338	307	1,328	433	8,865	214
3	445	368	516	142	573	39	242	66	1,050	19
4	101	19	124	99	78	1	5	10	645	4
5+	54	18	20	43	66	1	7	-	183	4

Age group	1981		1982		1983		1984		1985	
	1	2	1	2	1	2	1	2	1	2
0	17	9,128	2	6,530	-	7,911	-	-	1	349
1	5,505	346	3,518	65	5,684	303	11,692	1,207	2,688	109
2	4,109	94	2,132	-	1,215	316	1,647	121	3,292	239
3	904	14	556	-	89	19	153	43	1,002	89
4	128	6	76	-	8	-	5	-	377	7
5+	46	-	9	-	4	-	-	-	103	4

Age group	1986		1987		1988		1989		1990[1]	
	1	2	1	2	1	2	1	2	1	2
0	7	7,105	-	455	2,453	13,196	6,124	3,380	1,595	18,293
1	23,934	7,077	26,236	5,768	9,855	1,283	56,661	4,038	10,527	-
2	2,600	473	10,855	198	25,922	340	2,219	274	1,478	-
3	200	-	350	-	1,319	119	3,385	-	231	-
4	-	-	107	-	26	17	-	-	-	-
5+	-	-	48	-	-	-	-	-	-	-

[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 by quarter and half year for 1990. Data from Norway.

Age	Quarter				Half-year	
	1	2	3	4	1	2
0	-	4.9	3.9	4.2	4.9	3.9
1	6.5	11.9	-	-	10.8	-
2	10.8	21.1	-	-	18.7	-
3	17.4	28.4	-	-	27.1	-
4	-	-	-	-	-	-
5	-	-	-	-	-	-

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	23.2	34.8	53.1	68.6	81.0	76.2	98.0
1988	19.2	26.8	42.9	52.3	60.0	56.6	82.8
1989	19.4	24.4	43.2	52.3	58.6	55.2	75.3
1990	20.0	20.8	30.4	33.7	39.4	35.7	49.5
				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	14.9	23.4	39.7	47.9	52.6	43.1	65.2
1988	18.8	29.3	29.9	31.1	38.6	31.1	44.0
1989	26.7	26.2	27.0	38.0	37.7	29.3	40.4
1990	27.9	32.8	36.4	41.3	49.3	45.2	41.7

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

Year	Half year	CPUE (t/day)	Total international catch ('000 t)	Total international fishing effort ('000 days)
				Half year
1982	1	48.15	426.5	8.9
	2	35.74	52.6	1.5
1983	1	42.79	359.8	8.4
	2	33.86	59.3	1.8
1984	1	50.51	461.1	9.1
	2	32.93	71.1	2.2
1985	1	41.86	417.1	10.0
	2	33.59	110.6	3.3
1986	1	53.72	386.4	7.2
	2	44.05	75.5	1.7
1987	1	67.58	297.7	4.4
	2	44.71	105.1	2.4
1988	1	51.53	462.0	9.0
	2	36.14	33.4	0.9
1989	1	51.05	506.1	9.9
	2	32.95	18.5	0.6
1990	1	34.08	341.7	10.0
	2	43.10	24.0	0.6

Table 8.4.1.1 Fishing Effort (days absent) by month and year in the Shetland sandeel fishery, 1977-1990. UK (Scotland) data.

Month	1977	1978	1979	1980	1981	1982	1983
Jan	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-
Mar	77	12	-	-	-	-	-
Apr	191	116	38	95	234	242	83
May	217	316	134	156	289	355	295
Jun	305	250	161	229	299	359	386
Total	790	694	333	480	822	956	764
Jul	277	187	106	242	440	361	339
Aug	160	234	108	212	346	297	297
Sep	89	204	44	72	198	254	127
Oct	35	78	1	-	-	65	11
Nov	-	-	-	-	-	4	-
Dec	-	-	-	-	-	-	-
Total	561	703	259	526	984	981	774
Annual Total	1351	1397	592	1006	1806	1937	1538

Month	1984	1985	1986[1]	1987	1988	1989	1990
Jan	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-
Mar	-	-	12	1	1	3	-
Apr	227	57	66	53	55	34	11
May	385	146	138	111	84	45	48
Jun	303	158	117	87	42	25	23
Total	915	361	333	252	182	107	82
Jul	337	191	61	63	53	-	-
Aug	263	133	143	90	23	-	-
Sep	102	80	56	27	18	-	-
Oct	7	27	30	2	5	-	-
Nov	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-
Total	709	431	290	182	99	0	0
Annual Total	1624	792	623	434	281	107	82

[1]1986 data include an estimated 113 days of Danish fishing effort [calculated using UK(Scotland) CPUE data.]

Table 8.4.1.2 Standardised effort (days absent) by half-year in the Shetland sandeel fishery (1982-1990). UK(Scotland) data.

Year	I	II	Total
1982	934	866	1800
1983	768	642	1410
1984	852	539	1391
1985	358	302	660
1986[1]	404	157	561
1987	180	98	278
1988	200	72	272
1989	168	-	168
1990	102	-	102

[1]1986 figures incorporate an estimate of Danish effort.

Table 8.4.2 SANDEELS, Shetland
Numbers caught (millions), 1990
UK (Scotland) data.

Month	Age group								Total
	0	1	2	3	4	5	6	7+	
Mar	-	-	-	-	-	-	-	-	-
Apr	-	87	+	+	+	+	+	+	87
May	+	38	14	11	55	28	5	6	156
Jun	4	17	7	3	17	7	1	1	58
Jul	-	-	-	-	-	-	-	-	-
Aug	-	-	-	-	-	-	-	-	-
Sep	-	-	-	-	-	-	-	-	-
Oct	-	-	-	-	-	-	-	-	-
Total	4	142	21	15	72	35	6	7	301

Table 8.4.3.1 SANDEEL, Shetland. Mean weight (g) at age in the catch by month for 1990. UK (Scotland) data.

Age	Mar	Apr	May	Jun	Jul	Aug	Sep
0	-	-	0.1	0.3	-	-	-
1	-	2.4	3.1	6.1	-	-	-
2	-	5.2	5.7	9.4	-	-	-
3	-	4.6	7.2	11.8	-	-	-
4	-	11.3	9.5	12.7	-	-	-
5	-	9.2	10.7	14.6	-	-	-
6	-	9.0	13.5	16.4	-	-	-
7	-	13.4	12.2	21.9	-	-	-

Table 8.4.3.2

SANDEEL: SHETLAND: WEIGHT AT AGE (+ REPRESENTS < 0.0005 UNIT)
UNITS = GRAMMES

	1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2
0	1.092	2.209	1.092	1.821	.900	1.348	.600	1.222	.990	1.800
1	1.892	3.939	2.669	5.881	2.399	4.785	1.991	3.028	2.082	4.070
2	3.284	5.771	5.202	9.035	5.645	7.173	3.941	5.460	3.323	6.754
3	13.637	11.964	9.761	9.524	9.164	10.930	7.803	9.500	8.973	8.859
4	11.245	12.063	16.149	13.003	14.581	14.639	11.855	10.777	11.243	8.522
5	17.321	15.700	17.400	11.197	14.229	19.964	15.607	16.100	12.021	14.432
6	18.301	22.464	19.800	18.991	16.300	17.700	14.928	17.000	17.010	18.991
7+	.000	22.600	22.325	.000	21.608	31.200	20.239	20.800	18.282	.000

	1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	1.092	1.595	.876	1.393	.899	1.347	.800	1.319	.600	1.658	.500	1.684
1	2.620	3.925	4.015	5.709	2.863	5.276	1.996	4.387	3.324	4.898	3.264	6.056
2	4.281	6.311	6.096	6.911	5.151	7.853	5.103	7.166	5.423	8.910	5.450	8.709
3	7.347	8.649	8.759	8.928	7.710	9.524	7.949	9.970	6.741	12.172	6.967	9.897
4	8.970	13.263	11.565	12.299	11.216	14.514	10.268	13.669	9.820	12.813	8.693	12.329
5	13.617	12.400	16.448	16.803	12.865	17.778	11.734	14.939	10.700	15.810	12.974	18.162
6	13.158	18.991	18.499	18.700	14.191	17.051	13.015	20.199	13.229	20.370	14.847	23.241
7+	15.285	.000	19.425	.000	23.318	30.177	19.027	15.400	17.142	20.801	17.250	22.800

	1985		1986		1987		1988		1989		1990	
	1	2	1	2	1	2	1	2	1	2	1	2
0	.499	1.578	.500	1.783	.800	2.226	.898	1.529	.236	1.497	.300	1.497
1	3.166	6.108	4.081	6.523	2.856	7.505	5.432	6.434	4.921	3.691	3.038	3.691
2	6.457	8.378	6.194	9.604	6.779	10.834	7.285	11.815	5.361	6.556	6.973	6.556
3	8.432	11.109	8.010	12.402	9.618	11.930	9.023	12.582	7.846	9.751	8.205	9.751
4	11.084	15.098	10.726	15.116	10.979	14.821	10.869	16.407	9.922	13.003	10.245	13.003
5	14.570	16.077	12.781	14.226	13.281	17.180	13.381	15.375	12.585	16.121	11.477	16.121
6	15.727	21.509	15.745	18.667	16.918	17.760	14.906	21.414	14.692	18.991	14.025	18.991
7+	20.454	26.529	18.158	26.422	14.391	24.194	17.126	23.300	16.617	.000	13.844	.000

Table 8.4.4.1

SANDEEL: SHETLAND: CATCH AT AGE IN NUMBERS (+ REPRESENTS < HALF A UNIT)
UNITS = MILLIONS

	1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2
0	0	929	0	4309	45	4223	737	5233	80	5373
1	612	705	177	65	1439	490	3028	480	4203	691
2	64	84	668	41	219	180	645	123	1114	102
3	4	30	88	34	70	55	35	9	85	29
4	9	27	13	0	9	19	36	20	24	4
5	1	6	10	4	8	3	4	1	27	1
6	0	1	6	0	3	2	5	1	4	0
7+	0	1	6	0	2	5	3	1	3	0

	1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	0	1403	57	6375	157	13086	545	16306	668	4936	1940	4833
1	2222	443	515	225	2284	678	5780	402	2610	818	1843	481
2	232	133	379	108	1109	107	981	83	687	85	1064	154
3	18	26	311	32	358	31	349	36	221	22	401	36
4	4	17	104	14	136	7	98	10	96	15	134	10
5	1	9	64	5	50	5	76	5	28	5	38	9
6	+	0	33	1	24	1	25	1	17	1	14	1
7+	+	0	18	0	7	3	13	+	7	1	9	1

	1985		1986		1987		1988		1989		1990	
	1	2	1	2	1	2	1	2	1	2	1	2
0	153	2039	898	1328	19	400	52	478	33	0	14	0
1	1076	252	522	94	873	111	30	3	8	0	162	0
2	313	157	352	25	53	16	151	3	7	0	22	0
3	166	83	327	24	35	10	107	1	199	0	14	0
4	55	20	141	11	38	8	48	1	96	0	60	0
5	17	11	58	3	16	7	26	2	34	0	29	0
6	6	3	14	1	4	1	15	+	14	0	5	0
7+	2	1	6	+	1	+	4	+	4	0	6	0

Table 8.4.4.2

LOG CATCHABILITY AT AGE:

AGE	INTERVAL	1982
1	1	-.7349E+01
2	1	-.7496E+01
3	1	-.7516E+01
4	1	-.7449E+01
5	1	-.6857E+01
6	1	-.6087E+01

AGE	INTERVAL	1983	1984	1985	1986	1987	1988	1989	1990
1	1	-.7942E+01	-.8037E+01	-.7092E+01	-.8150E+01	-.7147E+01	-.8608E+01	-.1040E+02	-.8411E+01
2	1	-.7709E+01	-.7405E+01	-.7588E+01	-.6858E+01	-.8571E+01	-.7915E+01	-.8910E+01	-.7997E+01
3	1	-.7655E+01	-.7212E+01	-.7246E+01	-.6568E+01	-.7426E+01	-.7270E+01	-.6737E+01	-.7101E+01
4	1	-.7424E+01	-.7087E+01	-.7129E+01	-.6217E+01	-.6836E+01	-.6359E+01	-.6404E+01	-.6664E+01
5	1	-.7255E+01	-.7191E+01	-.7044E+01	-.5722E+01	-.6242E+01	-.6392E+01	-.5395E+01	-.6252E+01
6	1	-.6163E+01	-.6354E+01	-.6594E+01	-.5546E+01	-.5802E+01	-.4330E+01	-.5817E+01	-.5646E+01

LOG CATCHABILITY STATISTICS

AGE	TUNED INTERVAL	PRED F	PRED q	SE q	SLOPE	SE SLOPE	INTRCPT	SE INTRCPT	INPUT F
1	1	.2269E-01	-.8411E+01	.9196E+00	.0000E+00	.0000E+00	-.8411E+01	.3754E+00	.2269E-01
2	1	.3433E-01	-.7997E+01	.5372E+00	.0000E+00	.0000E+00	-.7997E+01	.2193E+00	.3433E-01
3	1	.8410E-01	-.7101E+01	.2652E+00	.0000E+00	.0000E+00	-.7101E+01	.1083E+00	.8410E-01
4	1	.1301E+00	-.6664E+01	.3038E+00	.0000E+00	.0000E+00	-.6664E+01	.1240E+00	.1301E+00
5	1	.1965E+00	-.6252E+01	.4993E+00	.0000E+00	.0000E+00	-.6252E+01	.2038E+00	.1965E+00
6	1	.3604E+00	-.5646E+01	.5535E+00	.0000E+00	.0000E+00	-.5646E+01	.2260E+00	.3604E+00

Table 8.4.4.3

SANDEEL: SHETLAND: F AT AGE (+ REPRESENTS < 0.0005 UNIT)

	1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2
0	.000	.116	.000	.224	.000	.161	.000	.177	.000	.239
1	.120	.328	.059	.044	.227	.182	.354	.140	.456	.206
2	.099	.204	.666	.083	.222	.324	.431	.152	.619	.115
3	.028	.314	.377	.277	.221	.307	.105	.038	.165	.087
4	.079	.433	.239	.000	.114	.448	.377	.424	.158	.041
5	.028	.226	.321	.246	.366	.266	.175	.092	2.246	.660
6	.000	.500	.500	.000	.356	.500	.957	.500	.500	.000
7+	.000	.500	.500	.000	.356	.500	.957	.500	.500	.000
F 1- 3	.082	.282	.367	.135	.223	.271	.296	.110	.413	.136
F 2- 5	.059	.294	.401	.152	.231	.336	.272	.177	.797	.226

	1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	.000	.069	.000	.239	.000	.359	.000	.477	.000	.237	.000	.390
1	.312	.152	.065	.058	.266	.192	.601	.121	.273	.211	.275	.174
2	.109	.094	.209	.094	.493	.088	.519	.083	.345	.073	.518	.145
3	.029	.059	.367	.065	.568	.097	.509	.098	.364	.061	.629	.116
4	.016	.102	.397	.096	.468	.042	.543	.102	.458	.132	.713	.115
5	.016	.183	.776	.145	.628	.124	.983	.168	.543	.182	.642	.361
6	.500	.000	2.419	.500	2.194	.500	2.122	.500	1.618	.500	1.482	.500
7+	.500	.000	2.419	.000	2.194	.500	2.122	.500	1.618	.500	1.482	.500
F 1- 3	.150	.102	.214	.072	.442	.126	.543	.101	.327	.115	.474	.145
F 2- 5	.043	.109	.437	.100	.539	.088	.638	.113	.427	.112	.625	.184

	1985		1986		1987		1988		1989		1990	
	1	2	1	2	1	2	1	2	1	2	1	2
'	.000	.163	.000	.080	.000	.176	.000	.113	.000	.000	.000	.000
1	.298	.171	.117	.044	.142	.038	.037	.007	.005	.000	.023	.000
2	.181	.146	.425	.053	.034	.014	.073	.002	.023	.000	.034	.000
3	.255	.222	.567	.082	.107	.047	.139	.002	.199	.000	.084	.000
4	.287	.180	.806	.145	.193	.061	.346	.007	.278	.000	.130	.000
5	.312	.416	1.323	.258	.350	.316	.335	.042	.763	.000	.197	.000
6	.490	.500	1.577	.500	.544	.500	2.633	.500	.500	.000	.360	.000
7+	.490	.500	1.577	.500	.544	.500	2.633	.500	.500	.000	.360	.000
F 1- 3	.245	.180	.370	.059	.094	.033	.083	.004	.076	.000	.047	.000
F 2- 5	.259	.241	.780	.134	.171	.110	.223	.013	.316	.000	.111	.000

Table 8.4.4.4

SANDEEL: SHETLAND: STOCK AT AGE IN NUMBERS (+ REPRESENTS < HALF A UNIT)
PROPORTION OF F (INTERVAL 1) BEFORE SPAWNING = .00 PROPORTION OF M (INTERVAL 1) BEFORE SPAWNING = .00
O-GROUP NOT ACCOUNTED FOR IN TOTAL NUMBER OR BIOMASS
UNITS = MILLIONS

	1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2
0	0	12200	0	30701	0	40831	0	46439	0	36177
1	8475	2765	4880	1693	11023	3233	15619	4033	17490	4077
2	826	502	1630	561	1327	713	2206	962	2870	1036
3	187	122	335	154	423	227	422	255	676	384
4	136	84	73	39	96	57	137	63	201	115
5	46	30	45	22	32	15	30	17	34	2
6	3	2	20	0	14	7	9	2	13	0
7+	0	2	17	0	9	13	5	1	10	0
TOT	9673		6999		12923		18428		21293	
T	23685		27498		40082		45412		55080	
SPN	1198		2119		1900		2809		3803	
SSB	7651		14473		13639		14315		18665	

	1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	0	30464	0	42850	0	61518	0	60576	0	33410	0	21212
1	12803	3449	12777	4402	15157	4275	19298	3894	16900	4731	11840	3307
2	2715	1632	2425	1319	3401	1392	2890	1153	2826	1342	3138	1253
3	756	492	1216	565	983	373	1044	421	869	405	1022	365
4	288	190	380	171	433	182	277	108	312	132	312	102
5	90	60	141	43	127	46	143	36	80	31	95	34
6	1	0	41	2	31	2	33	3	25	3	21	3
7+	1	0	23	0	8	9	16	1	10	3	13	3
TOT	16654		17001		20141		23701		21021		16440	
TBM	54561		84627		75623		66825		81776		67344	
?	3852		4225		4984		4403		4122		4600	
SSB	21018		33330		32230		28307		25601		28700	

	1985		1986		1987		1988		1989		1990
	1	2	1	2	1	2	1	2	1	2	1
0	0	19473	0	24924	0	3550	0	6440	0	25327	0
1	6455	1763	7433	2433	10337	3301	1337	474	2584	946	11380
2	2275	1272	1216	533	1907	1235	2602	1621	386	253	774
3	887	461	900	342	414	249	997	581	1325	728	207
4	266	134	302	90	258	143	195	92	475	241	596
5	75	37	92	16	64	30	110	53	75	23	197
6	19	8	20	3	10	4	18	1	41	0	19
7+	7	3	8	1	2	+	5	+	12	0	23
TOT	9984		9971		12993		5264		4898		13197
TBM	47089		49947		50323		39160		31642		50626
SPN	3529		2538		2656		3927		2314		1816
SSB	26651		19614		20800		31895		18928		16053

Table 8.6.2.1 Exploitation rates (F/Z) of immature Sandeels in the Northern and Southern North Sea for 1984-1988.

Year	Northern North Sea		Southern North Sea	
	Age 0	Age 1	Age 0	Age 1
1984	.000	.379	.000	.280
1985	.002	.171	.017	.125
1986	.029	.369	.001	.121
1987	.012	.235	.006	.171
1988	.071	.464	0	.076

Table 9.1 SANDEEL, Division VIa.
Landings in tonnes, 1983-1989, as officially reported to ICES.

Country	1983	1984	1985	1986	1987	1988	1989	1990[1]
UK (Scotland)	13,051	14,166	18,586	24,469	14,479	24,465	18,785	14,360

[1] Preliminary.

Table 9.2.1 Fishing effort (days absent) by month and year in the Division VIa SANDEEL fishery, 1980-1990, UK (Scotland) data.

Month	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Jan	-	-	-	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-
Apr	-	4	54	21	11	7	7	3	26	13	-
May	-	4	121	112	119	131	104	22	87	50	29
Jun	-	-	168	112	128	124	117	79	139	99	138
Total	-	8	343	245	258	262	228	104	252	162	167
Jul	26	90	118	126	125	101	126	93	108	110	75
Aug	-	132	89	76	63	76	94	67	59	22	5
Sep	-	70	34	-	-	28	67	26	28	3	-
Oct	-	3	4	-	-	8	15	-	8	-	-
Nov	-	-	-	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-	-	-	-
Total	26	295	245	202	188	213	302	186	203	135	80
Annual Total	26	303	588	447	446	475	530	290	455	297	247

Table 9.2.2 Standardized effort (days absent) by half year in the Division VIa sandeel fishery fishery (1982-1990). UK (Scotland) data.

Year	I	II	Total
1982	378	271	649
1983	315	244	559
1984	323	241	564
1985	355	285	640
1986	337	389	726
1987	153	245	398
1988	420	328	748
1989	282	256	538
1990	300	141	441

Table 9.3 SANDEELS. Division VIa. Numbers caught (millions), 1990, UK (Scotland) data.

Month	Age group								Total
	0	1	2	3	4	5	6	7+	
Apr	-	-	-	-	-	-	-	-	-
May	-	132	23	15	43	10	+	+	223
Jun	20	375	177	90	241	57	16	2	978
Jul	353	103	5	11	51	19	1	1	544
Aug	40	18	+	-	+	-	-	-	58
Sep	-	-	-	-	-	-	-	-	-
Oct	-	-	-	-	-	-	-	-	-
Total	412	629	206	116	335	85	17	3	1,802

Table 9.4.1 SANDEEL Division VIa.
Mean weight (g) at age in the catch by month 1990.
[UK (Scotland) data.]

Age	Apr	May	Jun	Jul	Aug	Sep
0	-	-	2.0	1.7	1.7	-
1	-	1.9	5.1	4.5	3.7	-
2	-	6.1	9.4	9.8	8.5	-
3	-	9.0	11.8	14.0	-	-
4	-	10.8	14.6	15.1	12.0	-
5	-	11.5	15.6	14.9	-	-
6	-	13.0	13.4	15.0	-	-
7	-	16.9	21.8	23.0	-	-
8	-	-	-	19.1	-	-

Table 9.4.2 SANDEEL. Division VIa
Measured stock weights-at-age (g) used to calculate biomass totals.

SANDEEL: VIa: WEIGHT AT AGE (+ REPRESENTS < 0.0005 UNIT)
UNITS = GRAMMES

	1980		1981		1982		1983		1984	
	1	2	1	2	1	2	.1	2	1	2
0	1.934	1.900	1.934	2.257	1.700	1.656	.995	1.529	7.194	7.000
1	4.586	4.100	3.536	5.896	3.114	6.079	3.134	6.318	10.417	12.211
2	7.772	6.500	5.567	8.160	6.328	9.248	7.061	9.430	12.925	14.885
3	11.035	12.600	7.597	10.739	8.611	12.584	12.438	13.905	14.236	15.660
4	14.086	13.400	10.280	13.843	10.360	17.157	13.076	18.051	15.259	16.431
5	16.781	17.700	11.069	17.391	11.801	16.076	13.342	23.066	16.425	17.045
6	19.076	24.100	19.403	18.691	18.013	17.398	14.912	20.880	16.831	17.234
7+	.000	23.750	.000	.000	21.418	21.328	17.511	18.084	18.311	17.552

	1985		1986		1987		1988		1989		1990	
	1	2	1	2	1	2	1	2	1	2	1	2
0	1.369	1.155	.792	1.740	1.200	1.977	.597	1.000	1.100	1.520	2.000	1.700
1	3.426	6.360	3.578	4.849	5.694	5.747	3.341	6.472	6.219	8.272	4.267	4.381
2	7.059	10.246	6.365	8.384	9.919	8.187	8.272	9.172	9.629	11.055	9.019	9.793
3	11.061	12.073	10.086	13.426	14.463	12.074	10.446	11.810	11.532	13.107	11.403	14.000
4	12.712	13.707	15.259	15.907	14.652	13.943	12.865	14.481	13.628	14.988	14.030	15.097
5	16.381	17.101	30.087	18.433	18.762	16.241	16.765	18.030	14.860	15.663	15.013	14.900
6	17.185	18.359	19.700	21.483	20.208	20.251	17.058	19.742	17.578	20.624	13.392	15.000
7+	19.555	15.271	24.255	20.820	23.570	23.310	22.552	21.576	15.933	19.341	21.595	19.625

Table 9.5.1 SANDEEL. Division VIa
Catch at Age in numbers (millions).

SANDEEL: VIa: CATCH AT AGE IN NUMBERS (+ REPRESENTS < HALF A UNIT)
UNITS = MILLIONS:

	1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2
0	0	27	0	462	360	525	391	2253	186	1751
1	0	20	+	281	268	64	521	106	863	99
2	0	2	5	205	200	76	136	29	226	67
3	0	1	2	34	198	91	86	21	138	115
4	0	+	1	14	62	34	111	18	67	38
5	0	1	+	0	26	24	29	3	28	26
6	0	+	+	2	4	9	12	3	8	8
7+	0	+	0	0	1	2	2	1	1	3

	1985		1986		1987		1988		1989		1990	
	1	2	1	2	1	2	1	2	1	2	1	2
0	53	3207	368	2702	105	595	795	173	170	275	20	392
1	139	13	859	996	521	676	187	72	205	20	508	121
2	437	163	140	68	97	232	1216	548	128	60	200	5
3	181	117	171	219	17	37	235	131	535	278	105	11
4	139	73	58	103	45	31	41	28	127	71	284	51
5	55	28	38	40	23	20	52	45	22	22	66	19
6	27	12	9	12	4	7	21	24	18	11	16	1
7+	7	1	6	6	1	4	3	8	6	8	2	1

Table 9.5.2 SANDEEL. Division VIa
Output from tuning.

LOG CATCHABILITY AT AGE:

AGE	INTERVAL	1982
1	1	-.9089E+01
2	1	-.8193E+01
3	1	-.7646E+01
4	1	-.7347E+01
5	1	-.7148E+01
6	1	-.8108E+01

AGE	INTERVAL	1983	1984	1985	1986	1987	1988	1989	1990
1	1	-.8512E+01	-.8067E+01	-.9314E+01	-.8517E+01	-.9034E+01	-.9537E+01	-.9246E+01	-.9030E+01
2	1	-.8579E+01	-.8337E+01	-.7755E+01	-.8256E+01	-.8752E+01	-.8148E+01	-.8519E+01	-.8343E+01
3	1	-.8100E+01	-.7886E+01	-.7920E+01	-.7806E+01	-.8844E+01	-.8127E+01	-.7767E+01	-.8064E+01
4	1	-.7094E+01	-.7610E+01	-.6998E+01	-.8161E+01	-.7328E+01	-.8264E+01	-.7502E+01	-.7639E+01
5	1	-.6793E+01	-.7614E+01	-.6909E+01	-.6997E+01	-.7345E+01	-.7310E+01	-.7647E+01	-.7295E+01
6	1	-.6118E+01	-.7155E+01	-.6582E+01	-.7375E+01	-.6922E+01	-.7522E+01	-.6591E+01	-.6998E+01

LOG CATCHABILITY STATISTICS

AGE	TUNED INTERVAL	PRED F	PRED q	SE q	SLOPE	SE SLOPE	INTRCPT	SE INTRCPT	INPUT F
1	1	.3592E-01	-.9030E+01	.3450E+00	.0000E+00	.0000E+00	-.9030E+01	.1408E+00	.1674E-01
2	1	.7144E-01	-.8343E+01	.2262E+00	.0000E+00	.0000E+00	-.8343E+01	.9236E-01	.2737E-02
3	1	.9445E-01	-.8064E+01	.2908E+00	.0000E+00	.0000E+00	-.8064E+01	.1187E+00	.1388E-01
4	1	.1444E+00	-.7639E+01	.3453E+00	.0000E+00	.0000E+00	-.7639E+01	.1410E+00	.3873E-01
5	1	.2037E+00	-.7295E+01	.2191E+00	.0000E+00	.0000E+00	-.7295E+01	.8944E-01	.9036E-01
6	1	.2741E+00	-.6998E+01	.3544E+00	.0000E+00	.0000E+00	-.6998E+01	.1447E+00	.3421E-01

Table 9.5.3 SANDEEL. Division VIa
Semi-annual fishing mortalities from VPA.

SANDEEL: VIa: F AT AGE (+ REPRESENTS < 0.0005 UNIT)

	1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2
0	.000	.002	.000	.029	.000	.025	.000	.099	.000	.151
1	.000	.006	+	.099	.043	.020	.063	.026	.101	.024
2	.000	.003	.002	.121	.105	.058	.059	.018	.077	.033
3	.000	.003	.004	.085	.181	.133	.096	.034	.121	.158
4	.000	.005	.004	.097	.244	.231	.262	.068	.160	.145
5	.000	.056	.002	.000	.297	.553	.353	.060	.159	.251
6	.000	.500	.012	.500	.114	.500	.694	.500	.252	.500
7+	.000	.500	.000	.000	.114	.500	.694	.500	.252	.500
F 1- 3	.000	.004	.002	.102	.109	.071	.073	.026	.100	.072
F 2- 5	.000	.017	.003	.076	.207	.244	.192	.045	.130	.147

	1985		1986		1987		1988		1989		1990	
	1	2	1	2	1	2	1	2	1	2	1	2
0	.000	.096	.000	.038	.000	.038	.000	.009	.000	.008	.000	1.000
1	.032	.006	.067	.167	.018	.046	.030	.023	.027	.005	.036	.017
2	.152	.087	.088	.063	.024	.082	.122	.083	.056	.038	.071	.003
3	.129	.129	.137	.295	.022	.067	.124	.106	.119	.094	.094	.014
4	.324	.320	.096	.277	.100	.103	.108	.113	.156	.138	.144	.039
5	.354	.353	.308	.713	.099	.132	.281	.476	.135	.216	.204	.090
6	.492	.500	.211	.500	.151	.500	.227	.500	.387	.500	.274	.034
7+	.492	.500	.211	.500	.151	.500	.227	.500	.387	.500	.274	.034
F 1- 3	.104	.074	.097	.175	.022	.065	.092	.070	.068	.046	.067	.011
F 2- 5	.240	.222	.157	.337	.061	.096	.159	.194	.117	.121	.129	.036

Table 9.5.4 SANDEEL. Division VIa
Stock size at age (millions) from VPA.

SANDEEL: VIa: STOCK AT AGE IN NUMBERS (+ REPRESENTS < HALF A UNIT)
PROPORTION OF F (INTERVAL 1) BEFORE SPAWNING = .00 PROPORTION OF M (INTERVAL 1) BEFORE SPAWNING = .00
0-GROUP NOT ACCOUNTED FOR IN TOTAL NUMBER OR BIOMASS
UNITS = MILLIONS:

	1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2
0	0	19899	0	23183	0	30458	0	34525	0	17980
1	9919	3649	8924	3283	10116	3566	13344	4607	14051	4671
2	1257	843	2970	1986	2435	1470	2862	1808	3676	2281
3	456	306	688	459	1441	806	1135	692	1454	863
4	140	94	250	167	345	181	578	298	547	313
5	16	11	76	51	124	62	118	56	228	130
6	+	+	8	6	42	25	29	10	43	22
7+	0	+	0	0	10	6	4	3	8	9
TOT	11788		12916		14513		18069		20008	
TBM	62532		56886		65331		85774		227555	
SPN	1869		3992		4397		4726		5957	
SSB	17044		25333		33830		43955		81181	

	1985		1986		1987		1988		1989		1990		1991
	1	2	1	2	1	2	1	2	1	2	1	2	1
0	0	50733	0	105150	0	22848	0	27091	0	50897	0	846	0
1	6947	2475	20716	7124	45488	16431	9879	3526	12060	4318	22690	8053	140
2	3735	2150	2014	1237	4935	3229	12843	7623	2822	1788	3516	2195	6484
3	1807	1065	1614	943	951	624	2434	1441	5747	3419	1410	860	1792
4	603	293	766	466	575	348	478	287	1062	609	2549	1479	694
5	221	104	174	86	290	176	257	130	210	123	434	238	1165
6	83	34	60	33	34	20	126	67	66	30	81	41	178
7+	23	3	36	17	12	12	15	21	23	22	9	27	54
TOT	13420		25380		52285		26033		21990		30690		10506
TBM	83322		122200		336552		177627		187570		188173		109816
SPN	6473		4664		6797		16154		9930		8000		10366
SSB	59520		48079		77545		144621		112567		91354		109220

Table 10.1 Landings of SPRAT in Division IIIa (tonnes 10^{-3}).
(Data provided by Working Group members.)

Year	Skagerrak				Kattegat			Div. IIIa total
	Denmark	Sweden	Norway	Total	Denmark	Sweden	Total	
1974	17.9	2.0	1.2	21.1	31.6	18.6	50.2	71.3
1975	15.0	2.1	1.9	19.0	60.7	20.9	81.6	100.6
1976	12.8	2.6	2.0	17.4	27.9	13.5	41.4	58.8
1977	7.1	2.2	1.2	10.5	47.1	9.8	56.9	67.4
1978	26.6	2.2	2.7	31.5	37.0	9.4	46.4	77.9
1979	33.5	8.1	1.8	43.4	45.8	6.4	52.2	95.6
1980	31.7	4.0	3.4	39.1	35.8	9.0	44.8	83.9
1981	26.4	6.3	4.6	37.3	23.0	16.0	39.0	76.3

Year	Skagerrak		Kattegat	Division IIIa	Total
	Denmark	Norway	Denmark	Sweden	
1982	10.5	1.8	21.4	5.9	39.6
1983	3.4	1.9	9.1	13.0	26.4
1984	13.2	1.8	10.9	10.2	36.1
1985	1.3	2.5	4.6	11.3	19.7
1986	0.4	1.1	0.9	8.4	10.8
1987	1.4	0.4	1.4	11.2	14.4
1988	1.7	0.3	1.3	5.4	8.7
1989	0.9	1.2	3.0	4.8	9.9
1990[1]	1.3	+	1.1	5.9	8.3

[1] Preliminary.

Table 10.2 Indices of SPRAT, 1-group, ≥2-group, and all ages in Division IIIa from IYFS, 1974-1991.

Year	1-group	≥2-group	Total
1974	1,325	-	-
1975	5,339	-	-
1976	2,069	-	-
1977	5,713	984	6,697
1978	5,119	2,117	7,236
1979	3,338	1,482	4,820
1980	4,960	3,592	8,558
1981	2,809	3,068	5,877
1982	1,577	4,695	6,272
1983	1,173	1,685	2,858
1984	4,141	2,216	6,357
1985	2,077	2,667	4,744
1986	684	4,834	5,518
1987	1,830	16,543	18,373
1988	945	8,238	9,183
1989	442	2,891	3,333
1990	503	471	974
1991	693	1,245	1,938

Table 10.3 SPRAT in Division IIIa. Spreadsheet for SHOT prediction.

Running recruitment weights

older	.00	G-M =	.00
central	1.00	exp(d)	1.00
younger	.00	exp(d/2)	1.00

Year	Land-ings	Recrt Index	W'td Index	Y/B Ratio	Hang-over	Act'l Prodn	Est'd Prodn	Est'd S2C.	Act'l Expl Biom	Est'd Expl Biom	Est'd Land-ings
1979	956	3839		.77	.23				1239		
1980	639	4960	4960	.77	.23	804			1087		
1981	763	2809	2809	.77	.23	741			958		
1982	396	1577	1577	.77	.23	289			513		
1983	264	1173	1173	.77	.23	225	230	268	342	347	268
1984	361	4141	4141	.77	.23	399	810	686	468	888	686
1985	197	2077	2077	.60	.40	88	347	350	328	453	272
1986	108	684	684	.60	.40	49	104	141	180	235	141
1987	144	1830	1830	.60	.40	168	271	206	240	343	206
1988	87	945	945	.60	.40	49	135	139	145	231	139
1989	99	442	442	.60	.40	107	61	72	165	119	72
1990	82	503	503	.60	.40	72	71	82	138	137	82
1991		693	693	.60	.40		98	92		153	92
1992		693	693	.60	.40		103	99		164	99
1993		693									

Table 11.1.1 SPRAT catches in the North Sea ('000 tonnes), 1981-1990.
(Data provided by Working Group members except where indicated.)

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990[1]
Division IVa West										
Denmark	2.8	-	-	-	0.9	0.6	0.2	0.1	+	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	6.7	-	-	-	-	-
UK (Scotland)	1.0	+	-	+	-	+	+	-	-	+
Total	3.8	+	-	+	7.6	0.6	0.2	0.1	+	+
Division IVa East (North Sea) stock										
Denmark	-	+	-	-	+	0.2	+	+[4]	+[4]	-[4]
Norway	-	-	3.0	-	-	-	-	4.9[4]	2.2[4]	4.4[4]
Sweden	-	-	-	-	-	-	-	-	-	+[5]
Total	-	+	3.0	-	+	0.2	+	4.9	+	+
Division IVb West										
Denmark	53.6	23.1	32.6	5.6	1.8	0.4	3.4	1.4	2.0	10.0
Faroe Islands	-	-	-	-	-	-	-	-	-	-
Norway	0.2	8.6	-	-	-	-	-	4.2	0.1	1.2
UK (England)	-	-	-	+	-	-	-	-	-	-
UK (Scotland)	0.7	0.2	+	+	-	-	0.1	-	-	-
Total	54.5	31.9	32.6	5.6	1.8	0.4	3.5	5.6	2.1	11.2

[1] Preliminary.
[2] Official statistics.
[3] Includes Divisions IVa-c.
[4] Norwegian fjords.
[5] Includes Division IVb East.
+ = less than 0.1.
- = magnitude known to be nil.

(cont'd)

Table 11.1.1 (cont'd)

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990[1]
Division IVb East										
Denmark	127.5	91.2	39.2	62.1	36.6	10.3	28.0	80.7	59.2	59.2
Germany, Fed.Rep.	4.8	1.5	-	0.6	0.6	0.6[3]	-	-	-	-
Norway	0.2	7.2	12.0	3.9	-	-	-	-	-	0.6
Sweden	-	-	-	-	-	-	-	-	-	+[2]
Total	132.5	99.9	51.2	66.6	37.2	10.9	28.0	80.7	59.2	59.8
Division IVc										
Belgium	-	-	-	-	+	+	+	-	+[2]	+[2]
Denmark	4.3	2.4	1.0	0.5	+	0.1	+	0.1	0.5	1.5
France	-	-	-	-	-	+	-	-	+[2]	-
Netherlands	-	-	-	0.1	-	-	-	-	0.4[23]	-
Norway	-	3.7	-	3.5	-	-	-	-	-	-
UK (England)	14.0	14.9	3.6	0.9	3.4	4.1	0.7	0.6	0.9	0.2
Total	18.3	21.0	4.6	5.0	3.4	4.3	0.7	0.7	1.8	1.7
Total North Sea										
Belgium	-	-	-	-	+	+	+	-	+	+[2]
Denmark	188.2	116.6	72.6	68.1	39.5	11.7	31.7	82.3	61.9	69.2
Faroe Islands	-	-	-	-	-	-	-	-	-	-
France	-	-	-	-	-	+	-	-	+	-
Germany, Fed.Rep.	4.8	1.5	-	0.6	-	0.6	-	-	-	-
Netherlands	-	-	-	0.1	0.6	-	0.5	-	0.4	-
Norway	0.4	19.5	12.0	7.4	6.7	-	-	9.1	2.3	6.7
Sweden	-	-	-	-	-	-	-	-	-	+[2]
UK (England)	14.0	14.9	3.6	0.9	3.4	4.1	0.7	0.6	0.9	0.2
UK (Scotland)	1.7	0.2	+	+	-	+	0.2	-	-	+
Total	209.1	152.7	88.2	77.2	50.2	16.4	33.1	92.0	65.5	76.1

[1] Preliminary.
[2] Official statistics.
[3] Includes Divisions IVa-e.
[4] Norwegian fjords.
[5] Includes Division IVb East.
+ = less than 0.1.
- = magnitude known to be nil.

Table 11.1.2 SPRAT catches (tonnes) by quarter in 1985 (Denmark, Norway and the UK), 1986, 1987, 1988 (Denmark and the UK), 1989 (Denmark, Norway and the UK), and 1990 (Denmark and Norway). Catches in fjords of western Norway excluded.

Year	Quarter	Area					Total
		1	2	3	4	5	
1985	1	1	-	97	6,533	1,370	8,001
	2	-	-	149	659	-	808
	3	44	15	176	4,535	5	4,775
	4	7,550	9	1,407	24,913	1,547	35,426
Total		7,595	24	1,829	36,640	2,922	49,010
1986	1	282	123	104	2,899	4,134	7,542
	2	5	39	206	5,048	22	5,320
	3	3	10	6	389	9	417
	4	373	63	80	2,005	51	2,571
Total		663	235	396	10,341	4,216	15,851
1987	1	70	10	148	17	564	809
	2	-	7	118	3,297	57	3,479
	3	-	6	65	6,999	46	7,116
	4	98	-	3,191	16,456	17	19,762
Total		168	23	3,522	26,769	684	31,166
1988	1	-	-	5	206	529	740
	2	-	-	229	682	28	939
	3	-	11	4,682	72,317	73	77,083
	4	55	-	651	7,529	31	8,266
Total		55	11	5,567	80,734	621	87,028
1989	1	-	39	1,127	14,702	1,231	17,099
	2	-	-	241	242	14	497
	3	31	-	784	43,190	110	44,115
	4	10	-	2	1,092	101	1,205
Total		41	39	2,154	59,226	1,456	62,916
1990	1	-	-	222	4,896	-	5,118
	2	-	-	426	320	39	785
	3	-	-	6,759	31,054	10	37,823
	4	-	-	3,812	23,565	1,420	28,797
Total				11,219	59,835	1,469	72,523

Table 11.2 North Sea SPRAT. Catch in numbers (millions) taken by quarter in 1987 to 1990 by Denmark, Norway, and UK (England).

Country	Fishing area	Quarter	Age					
			0	1	2	3	4	5
			1987					
Denmark	North Sea	3	-	555.11	85.23	1.00	-	-
	(Sub-area IV)	4	28.79	1,546.19	319.81	8.44	-	-
UK (Engl.)	Thames (Division IVc)	1	-	1.01	37.18	12.14	0.76	-
			1988					
Denmark	North Sea	1		0.24	23.04	1.19	-	-
	(Sub-area IV)	2	-	1.05	101.47	5.23	-	-
		3	-	471.43	4,615.42	9.68	-	-
		4	-	37.63	461.13	2.36	-	-
UK (Engl.)	Thames (Division IVc)	1	-	7.53	34.24	6.89	1.66	0.14
Norway	North Sea	3	-	0.4	125.6	48.7	3.9	-
	(Division IVb)	4	0.7	11.0	13.2	6.2	-	-
			1989					
Denmark	North Sea	1	-	551.35	864.77	21.57	-	-
	(Sub-area IV)	2	-	12.00	18.81	0.47	-	-
		3	60.04	2,026.65	2,120.30	273.77	-	-
		4	1.52	51.31	53.69	6.93	-	-
UK (Engl.)	(Thames + Wash)	1	-	11.11	32.40	31.42	1.01	-
	(Division IVc)	4	0.08	5.84	0.80	0.50	-	-
Norway	(Division IVb)	2	-	0.11	0.60	4.70	0.05	-
			1990					
Denmark	(Division IVb)	1	-	537.96	225.91	28.26	2.05	0.13
		2			No samples			
		3	-	877.98	1,164.78	-	-	-
		4			No samples			
	(Division IVc)	2-4			No samples			
Norway	(Division IVb)	2-3			No samples			

Table 11.3 North Sea sprat weight at age (g) 1990 (Danish data).

	Age			
Age	1	2	3	4
0	-	-	-	-
1	4.2	-	16.5	-
2	10.8	-	18.7	-
3	15.6	-	-	-

Table 11.4 North Sea SPRAT.
IYFS research vessel indices (no./hr).

Year	North Sea all ages	Division IVb 1-group	Division IVb E 1-group
1970	-	-	-
1971	-	-	-
1972	873	90	-
1973	713	123	-
1974	2,631	481	-
1975	-	-	-
1976	2,127	1,186	-
1977	3,031	136	-
1978	2,208	1,474	-
1979	569[1]	248[1]	-
1980	3,770	1,402	1,916
1981	2,107	886	1,146
1982	602	183	512
1983	852	512	944
1984	-[2]	347	638
1985	638	659	1,187
1986	170	73	103
1987	1,248	807	1,446
1988	1,097	145	269
1989	5,020	4,246	7,532
1990	-[2]	177	288[3]
1991	-[2]	940	1,690[3]

[1] Low figures due to abnormal conditions on the survey.
[2] Not yet available.
[3] Preliminary.

Table 12.1 SPRAT in Division VIa.
Landings in tonnes as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990[1]
Denmark	242	-	-	-	-	-	268[2]	364	-	-
Germany, Fed.Rep.	2	-	-	-	-	-	-	-	-	-
Ireland	790	287	-	192	51	348	-	-	-	-
Netherlands	892	2,156	1,863	-	-	-	-	-	-	-
Norway	-	24	-	-	557	-	-	-	-	-
UK (Engl. & Wales)	-	-	-	-	-	2	-	-	-	-
UK (Scotland)[3]	1,488	1,057	1,971	2,456	2,946	520	582	3,844	1,146	813
Total	3,414	3,524	3,834	2,648	3,554	870	850	4,208	1,146	813

[1] Preliminary figures.
[2] Includes Division VIb.
[3] Amended from national data.

Table 12.2 Catch in numbers (millions) at age and mean weight at age (g) in the catch for sprat in Division VIa. [Data from UK (Scotland).]

Age		0		1		2		3		4		Total catch	
		Catch	$\bar{w}$	Catch	$\bar{w}$	Catch	$\bar{w}$	Catch	$\bar{w}$	Catch	$\bar{w}$	number	tonnes
						1989							
W. Scotland	4th q	-	-	5.47	9.3	3.51	14.4	8.24	14.2	-	-	17.22	253
Clyde	4th q	0.29	3.3	17.49	12.2	11.65	18.9	15.52	19.5	0.91	23.1	45.86	878
						1990							
W. Scotland	4th q	0.53	9.1	14.58	12.4	0.71	13.9	0.04	14.3	+	15.3	15.86	224
Clyde	1st q	-	-	0.24	4.2	2.02	11.8	1.59	18.5	2.86	19.6	6.71	121
Clyde	4th q	2.70	3.9	20.93	14.3	0.86	22.3	1.36	24.4	1.08	22.2	26.93	467

Table 13.1.1 Nominal catch of SPRAT in Divisions VIId,e, 1981-1990.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990[1]
Belgium	-	-	3	-	-	-	-	-	-	-
Denmark	-	286	638	1,417	-	15	250	2,529	2,092	608
France	146	44	60	47	14	-	23	2	10	-
Germany, Fed.Rep.	1	-	-	-	-	-	-	-	-	-
Netherlands	1,015	1,533	1,454	589	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-	-
UK (Engl. + Wales)	10,183	4,749	4,756	2,402	3,771	1,163	2,454	2,944	1,314	1,401
Total	13,890	6,612	6,911	4,455	3,785	1,178	2,714	5,475	3,416	2,009

[1] Preliminary.

Table 13.1.2 Lyme Bay area fishery. Monthly catches (tonnes) (United Kingdom vessels only).

Season	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
1961-1962	-	-	-	1	27	4	427	428	35	922
1962-1963	-	-	-	309	238	131	148	187	58	1,071
1963-1964	-	-	-	263	53	82	385	276	24	1,083
1964-1965	-	-	-	25	56	20	242	465	8	816
1965-1966	-	-	-	47	81	165	610	302	17	1,222
1966-1967	-	-	-	3	152	368	703	355	1	1,583
1967-1968	-	-	18	76	238	422	560	43	3	1,360
1968-1969	11	-	4	122	142	298	373	123	1	1,074
1969-1970	-	-	-	140	131	276	915	283	76	1,821
1970-1971	-	7	38	90	184	549	553	106	20	1,547
1971-1972	-	-	369	101	232	228	410	70	-	1,410
1972-1973	-	-	107	209	132	87	404	165	49	1,153
1973-1974	-	-	313	186	194	350	311	96	40	1,490
1974-1975	184	451	209	533	838	405	157	30	-	2,807
1975-1976	-	-	66	649	289	111	204	6	-	1,325
1976-1977	289	440	1,039	123	594	347	234	103	5	3,174
1977-1978	31	680	768	725	115	84	201	54	-	2,658
1978-1979	-	252	368	545	450	209	58	37	28	1,947
1979-1980	-	-	90	674	706	337	150	38	2	1,997
1980-1981	-	-	458	815	1,423	1,872	2,069	138	54	6,829
1981-1982	-	-	11	475	1,854	4,311	855	265	100	7,871
1982-1983	-	-	54	844	1,017	641	522	90	31	3,199
1983-1984	-	-	82	477	1,706	1,772	157	101	55	4,350
1984-1985	-	-	331	834	643	252	225	94	19	2,398
1985-1986	-	104	463	1,401	769	132	52	1	-	2,933
1986-1987	-	9	138	312	192	393	313	145	18	1,520
1987-1988	-	-	471	675	636	163	322	129	58	2,454
1988-1989	-	2	1,179	413	491	306	285	53	-	2,729
1989-1990	-	80	424	340	77	48	128	131	-	1,228
1990-1991[1]	6	221	227	497	84	93	------N/A----			1,128

[1] Provisional.

Table 13.2.1 Lyme Bay SPRAT fishery, 1966-1991.
Numbers caught per age group (millions).

Season	Age group					
	0/1	1/2	2/3	3/4	4/5	5/6
1966-1967	0.55	11.67	44.00	18.56	11.67	3.60
1967-1968	2.28	46.79	33.10	5.08	0.66	0.39
1968-1969	0.08	29.99	29.24	4.03	0.44	0.10
1969-1970	0.13	17.53	62.78	18.60	2.73	0.35
1970-1971	0.01	4.12	46.03	26.94	1.57	0.54
1971-1972	0.80	20.22	28.01	22.96	4.12	0.34
1972-1973	1.51	32.20	22.20	10.20	3.96	0.38
1973-1974	0.50	22.91	46.12	9.08	5.06	2.42
1974-1975	0.30	40.77	82.73	12.67	8.84	3.55
1975-1976	0.16	13.33	25.25	23.28	6.39	1.47
1976-1977	0.73	40.34	108.52	34.87	6.56	0.37
1977-1978	0.12	19.48	69.33	43.89	7.50	0.48
1978-1979	9.20	41.71	44.64	18.97	5.72	0.01
1979-1980	1.17	26.97	55.45	7.58	4.07	0.33
1980-1981	0.76	51.33	220.79	55.35	6.15	0.26
1981-1982	1.08	52.00	161.91	131.28	20.94	0.55
1982-1983	1.16	4.81	49.74	58.89	25.41	0.25
1983-1984	7.19	13.18	47.05	74.09	40.61	9.16
1984-1985	1.21	40.15	44.27	28.25	9.60	1.23
1985-1986	1.53	15.24	105.48	21.05	7.78	1.01
1986-1987	-	10.36	42.40	17.14	2.84	0.70
1987-1988	-	25.49	47.47	29.66	9.52	1.07
1988-1989	2.31	20.10	88.99	26.10	4.86	0.62
1989-1990	0.16	15.40	22.43	24.12	3.24	0.35
1990-1991[1]	0.53	8.67	30.80	7.08	2.78	0.04

[1] August-December only.

Table 13.3 Lyme Bay area SPRAT, 1974-1991. Mean weight at age.

Season	Quarter	Age group						Overall mean
		0/1	1/2	2/3	3/4	4/5	5/6	
1974-1975	3	4.4	11.0	17.6	24.4	29.0	30.7	15.9
	4	3.6	9.2	18.9	25.6	29.6	30.7	19.0
	1	4.7	8.6	14.8	20.6	23.3	24.8	12.3
	Season	3.9	9.8	18.1	25.2	29.4	30.6	17.4
1975-1976	3	-	15.4	17.1	22.1	28.6	27.0	19.1
	4	3.7	9.5	16.4	24.1	29.1	28.0	19.2
	1	2.5	9.6	15.7	23.0	28.9	26.7	17.7
	Season	3.1	9.7	16.3	23.8	29.0	27.8	18.9
1976-1977	3	-	12.8	16.8	20.4	27.2	26.2	17.3
	4	3.3	7.7	17.7	23.7	28.1	32.7	17.2
	1	2.6	8.2	15.1	21.0	27.2	-	12.3
	Season	2.9	9.3	16.8	22.0	27.7	28.1	16.5
1977-1978	3	-	8.2	16.3	22.4	26.4	32.4	18.6
	4	-	6.8	18.1	22.6	24.9	30.5	19.3
	1	6.4	5.2	14.5	21.8	22.4	28.7	9.8
	Season	6.4	6.2	16.7	22.3	25.5	31.3	17.5
1978-1979	3	3.5	15.4	19.2	25.4	29.6	-	20.9
	4	6.3	11.8	16.5	23.9	29.6	-	15.2
	1	4.9	10.1	13.1	19.9	28.3	-	10.6
	Season	5.7	12.1	16.8	24.5	29.6	-	16.2
1979-1980	3	3.0	18.2	23.6	25.8	32.9	30.7	23.1
	4	3.5	16.5	23.2	27.0	31.6	-	22.4
	1	4.0	9.7	19.2	22.1	20.7	-	12.5
	Season	3.9	14.3	22.9	26.8	30.7	31.0	21.0
1980-1981	3	-	17.4	24.3	25.6	29.9	34.5	24.4
	4	5.2	16.1	21.4	24.8	29.9	32.0	21.7
	1	3.1	11.8	17.1	21.0	28.6	34.5	16.3
	Season	3.1	13.5	19.9	23.6	29.7	32.9	19.7
1981-1982	3	-	17.3	19.5	21.4	33.0	-	19.6
	4	6.1	14.7	21.5	25.5	28.5	31.0	23.4
	1	6.4	12.1	16.5	20.2	-	-	14.7
	Season	6.4	12.9	20.3	25.2	28.5	31.0	21.4
1982-1983	3	-	16.0	18.9	24.9	27.5	32.9	23.9
	4	6.1	15.8	19.6	24.7	27.9	32.4	23.7
	1	-	13.0	18.8	22.5	26.1	-	20.0
	Season	6.1	14.1	19.3	24.4	27.8	32.4	22.9

(cont'd)

Table 13.3 (cont'd)

Season	Quarter	Age group						Overall mean
		0/1	1/2	2/3	3/4	4/5	5/6	
1983-1984	4	4.1	15.2	20.6	23.6	27.1	27.6	23.2
	1	-	16.2	19.9	23.3	26.9	28.7	23.3
	Season	4.1	15.3	20.5	23.5	27.0	27.5	23.2
1984-1985	3	-	12.5	17.3	22.9	25.7	-	18.7
	4	5.9	16.0	19.4	23.5	26.5	27.9	20.3
	1	5.9	11.5	17.2	22.8	26.7	30.7	13.9
	Season	5.9	14.0	18.7	23.4	26.4	28.1	18.8
1985-1986	3	-	16.1	19.2	22.6	22.0	-	19.3
	4	6.4	15.6	17.9	21.9	23.6	32.0	18.6
	1	5.7	15.9	19.0	22.9	28.3	-	17.5
	Season	6.3	15.7	18.2	22.0	23.4	32.0	18.7
1986-1987	4	-	18.1	20.9	24.6	27.8	29.6	22.4
	1	-	13.3	18.6	23.5	29.6	-	17.3
	Season	-	14.8	19.9	24.4	28.0	29.6	20.6
1987-1988	4	-	15.4	23.1	26.9	27.3	27.7	24.8
	1	-	14.0	17.4	19.4	-	-	15.3
	Season		14.2	21.5	26.3	27.3	27.7	21.7
1988-1989	3	-	13.9	18.7	24.3	26.8	25.0	20.0
	4	5.7	14.1	19.1	24.0	25.8	27.0	19.0
	1	4.8	13.5	17.6	23.9	24.6	-	16.7
	Season	5.7	13.9	18.7	24.2	26.2	25.7	19.1
1989-1990	3	1.9	13.0	18.4	21.6	25.7	-	19.3
	4	-	13.4	18.8	21.9	25.6	25.8	18.9
	1	No samples						
	Season	1.9	13.0	18.4	21.6	25.7	25.8	18.9
1990-1991	3	5.6	17.5	23.0	26.1	26.8	31.9	22.7
	4	4.9	16.3	22.4	25.1	26.8	-	22.0

Figure 5.2 Norway Pout. North Sea, Danish CPUE versus GRT for 1990.

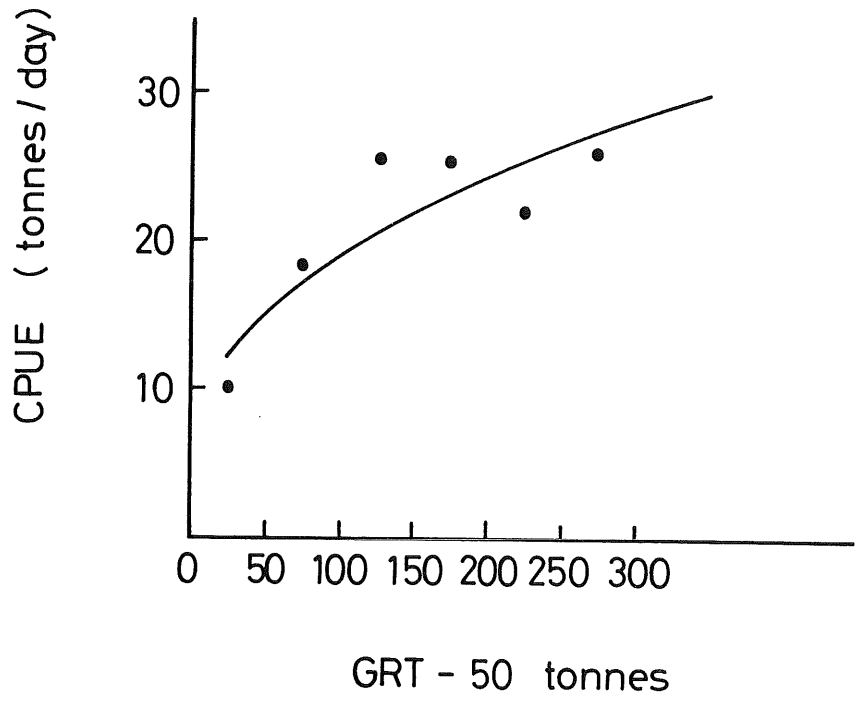


Figure 5.7 Actual and estimated landings of Norway Pout from SHOT prediction.

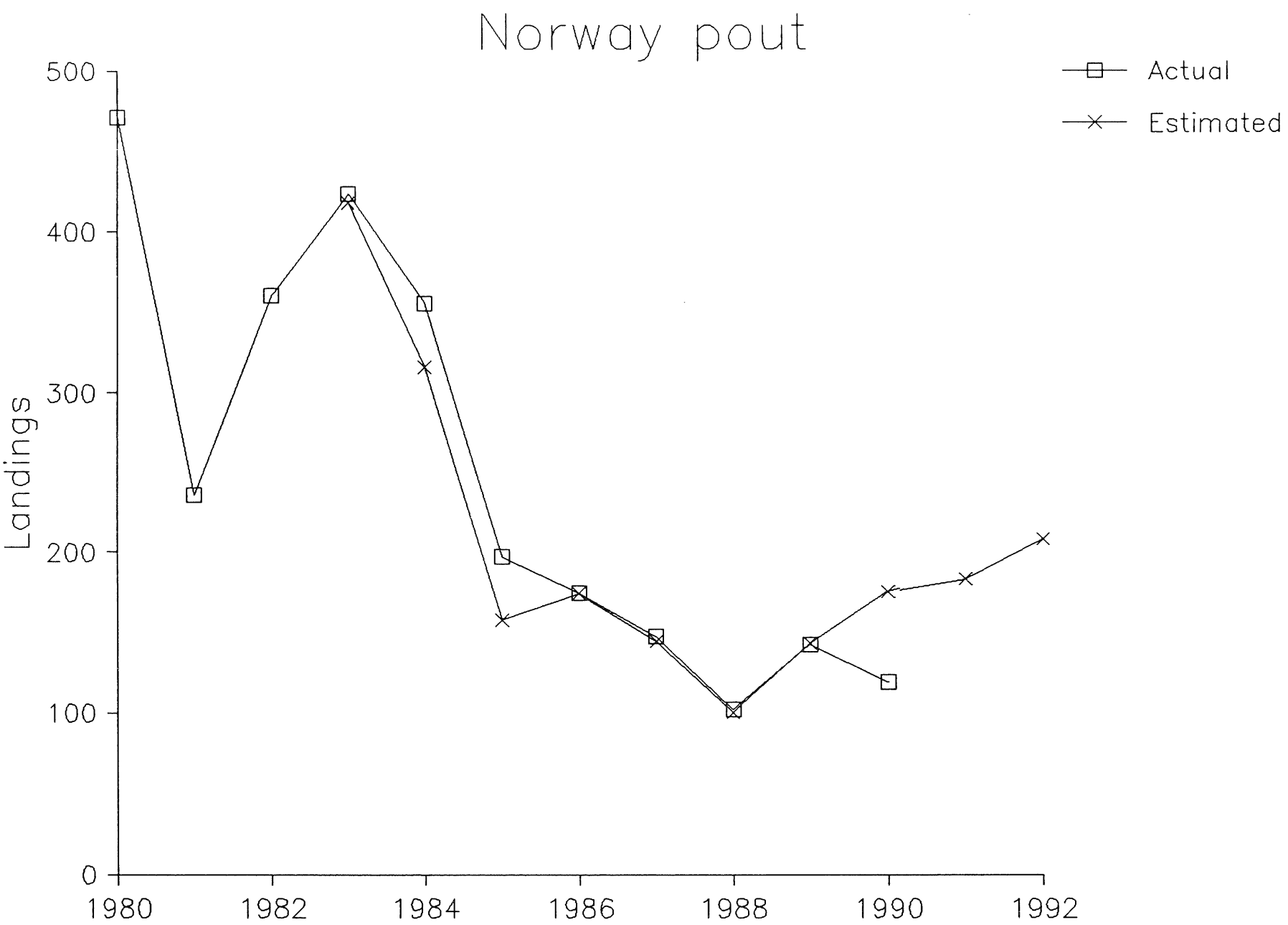


Figure 8.1 Danish SANDEEL areas and assessment areas by the Working Group.

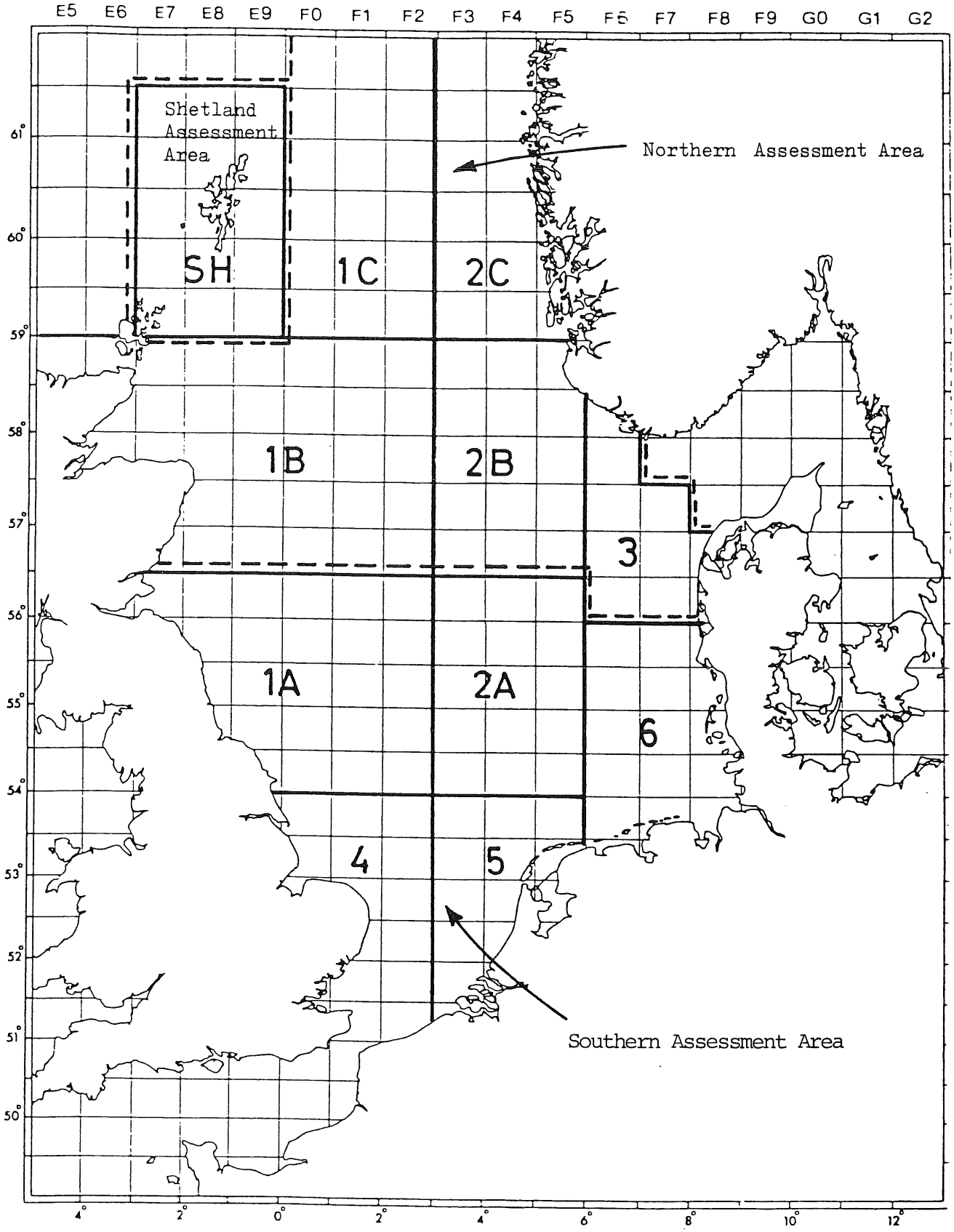


Figure 8.4.4.1; SANDEEL, Shetland

Mean F (1974-1990)

Figure 8.4.4.2; SANDEEL, Shetland.

Mean F and Standardised Effort (1982-1990)

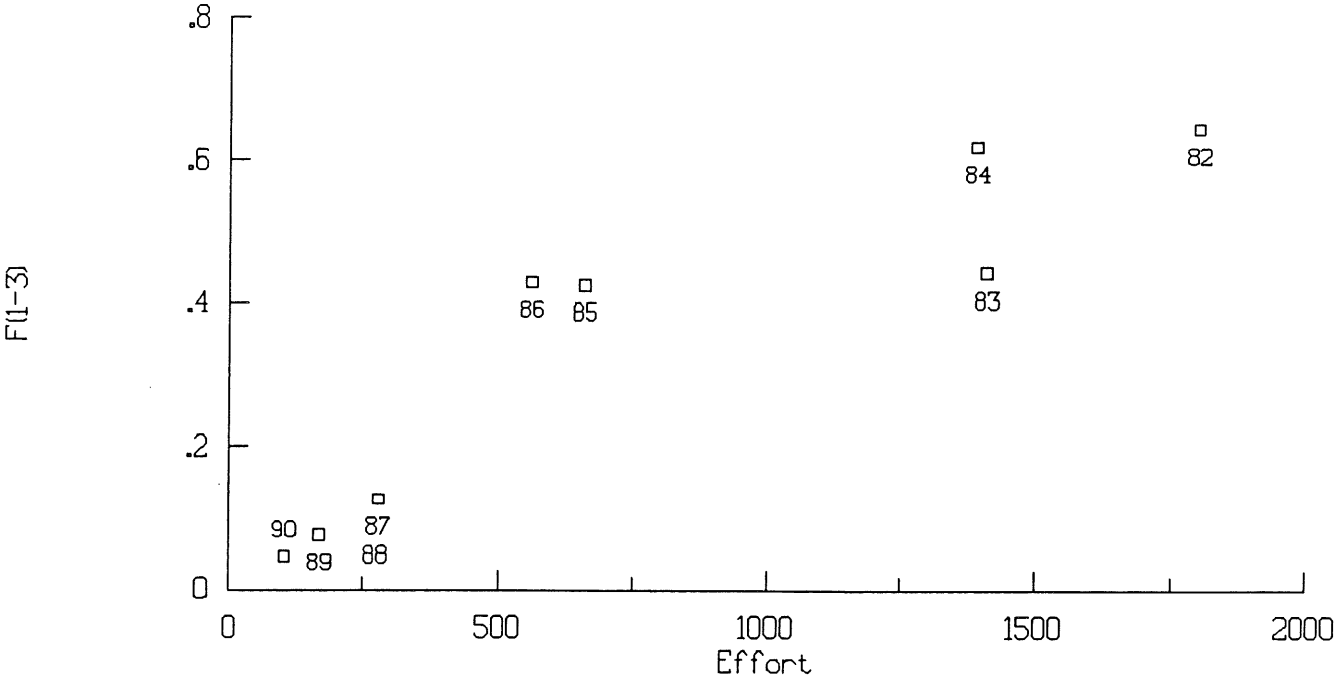


Figure 8.4.4.3; SANDEEL, Shetland.

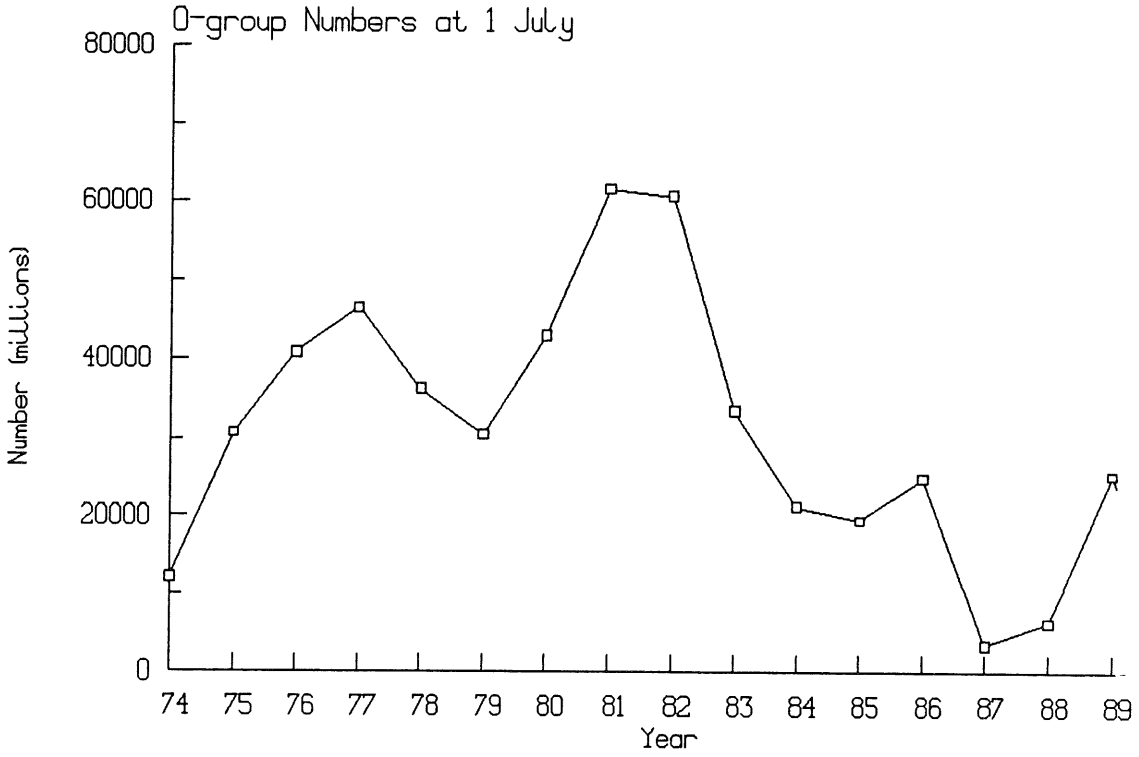


Figure 8.4.4.4; SANDEEL, Shetland.

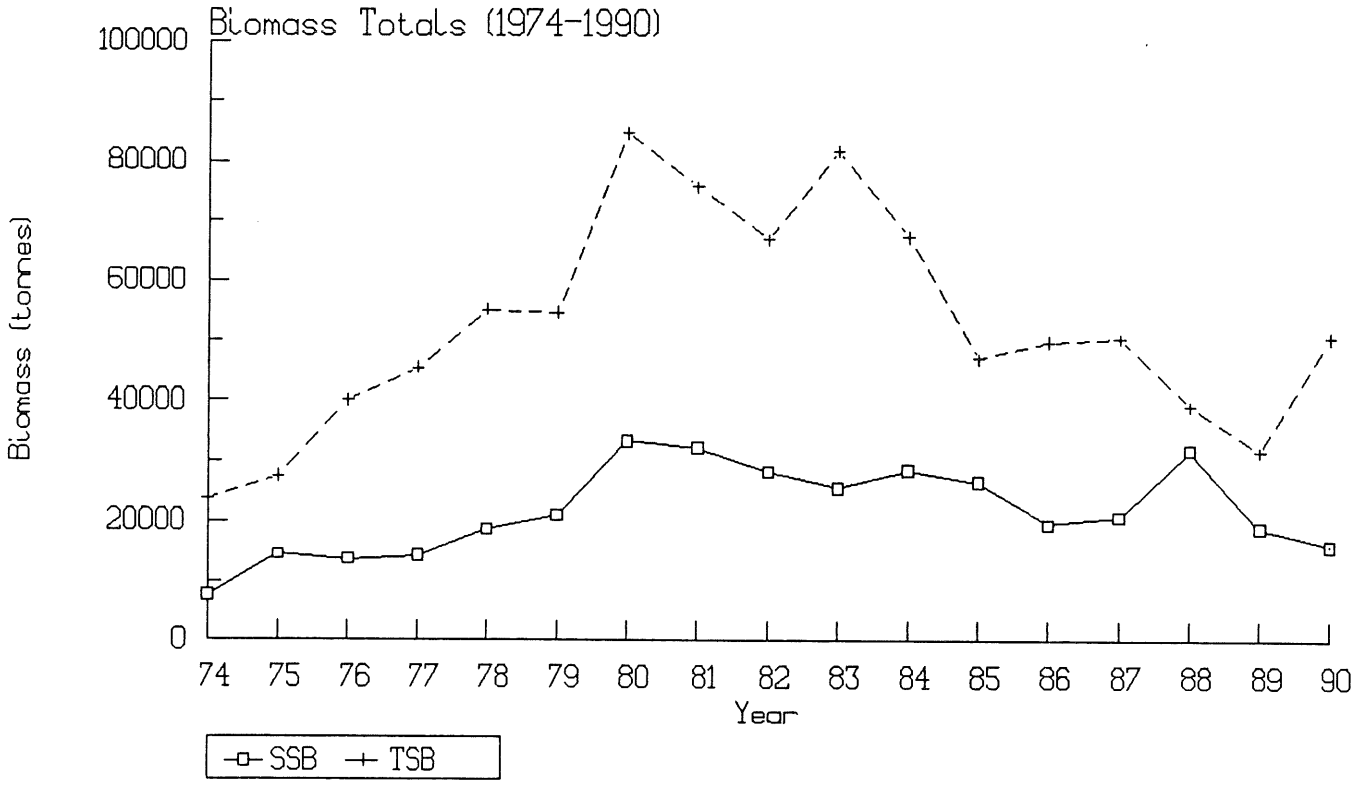


Figure 8.4.5; SANDEEL, Shetland.

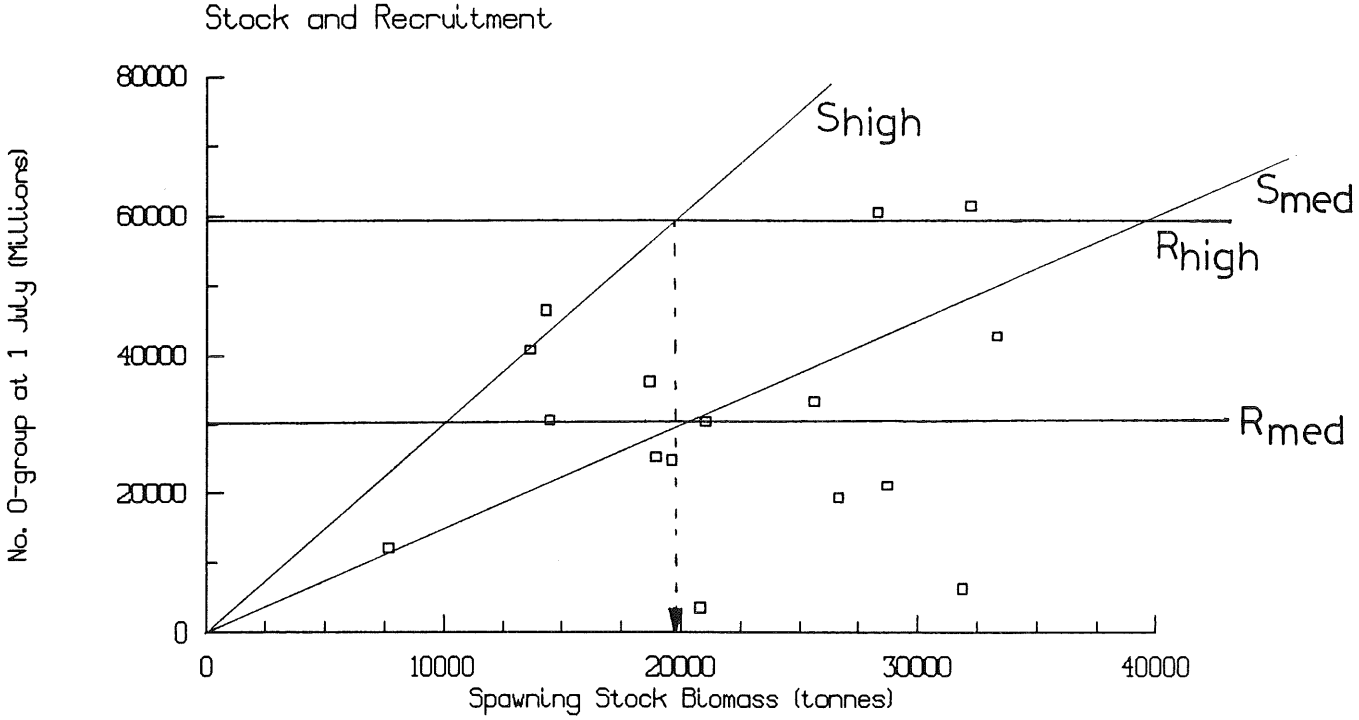


Figure 8.5.1 Observed (VPA) recruitment vs. southerly wind stress at Utsira in May.

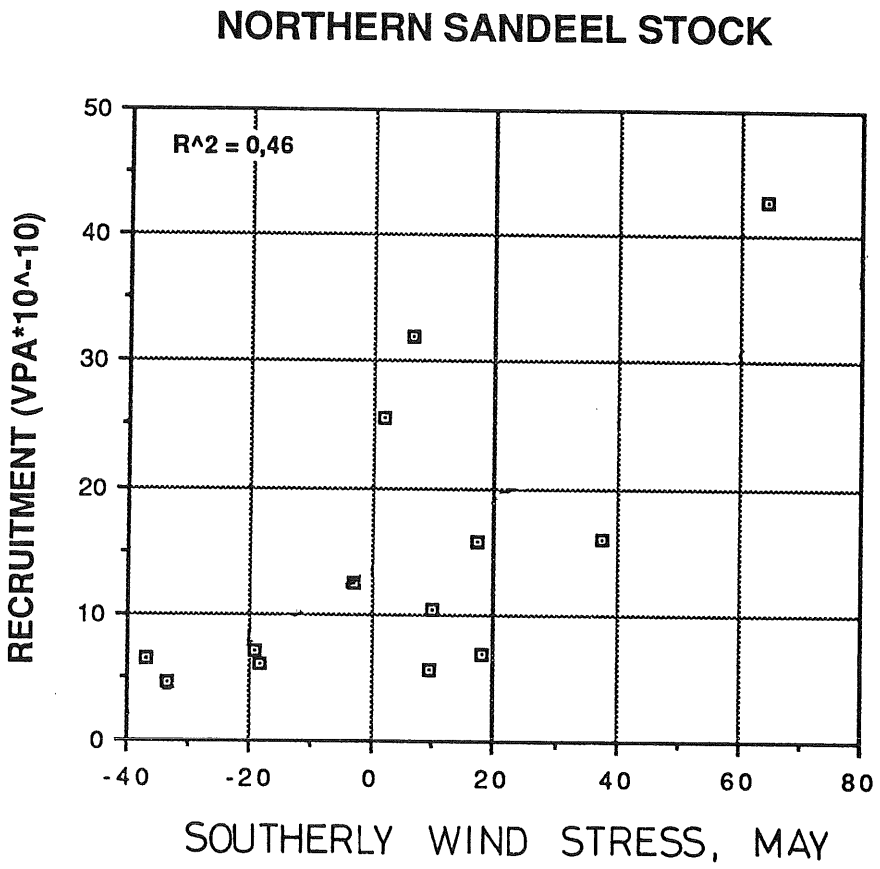


Figure 8.5.2 Recruitment adjusted for wind effects vs. spawning stock number.

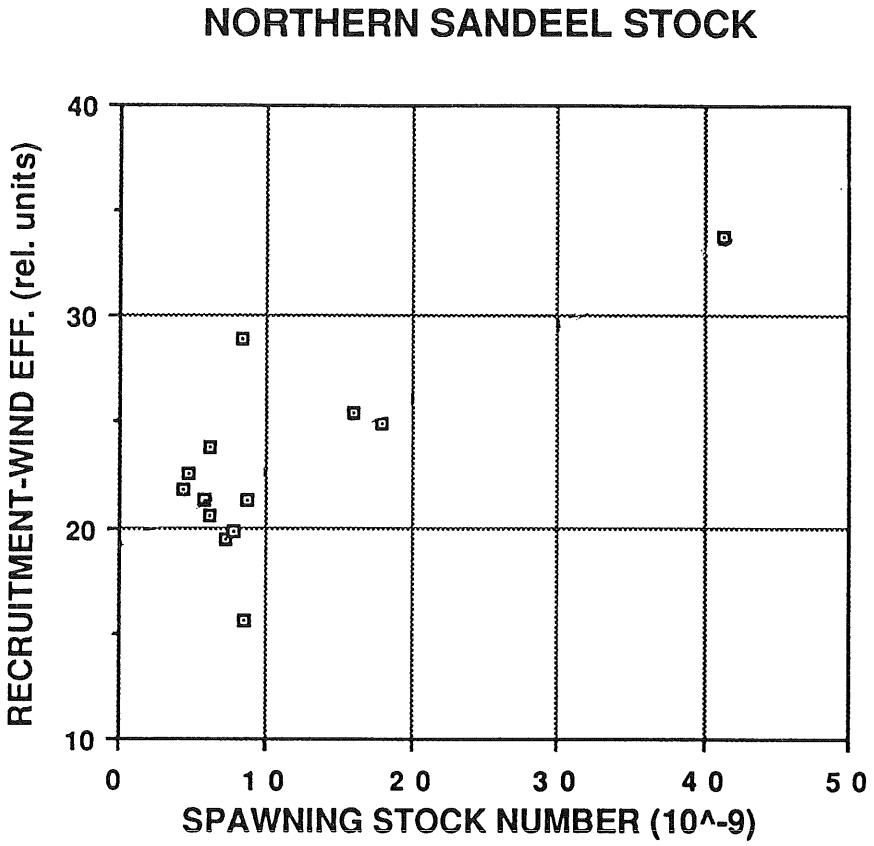


Figure 8.6.2.1 Sandeel North Sea.
Average CPUE (tonnes/fishing day) and number of fishing days per week in the Danish sandeel fishery in 1989.

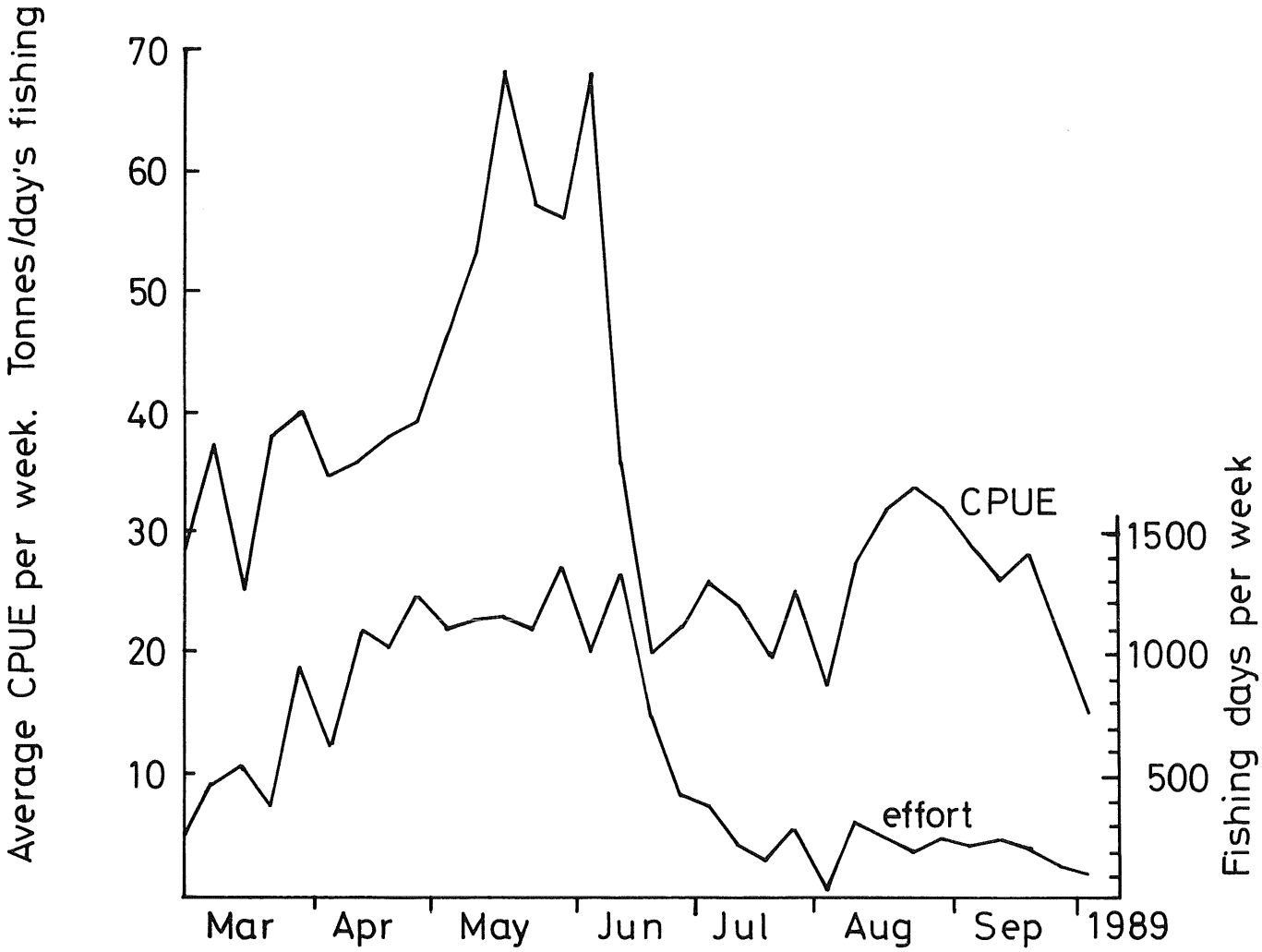


Figure 8.6.2.2 Sandeel North Sea.
Average CPUE (tonnes/fishing day) and number of fishing days per week in the Danish sandeel fishery in 1990.

Figure 8.6.2.3 Sandeel North Sea
CPUE in individual Norwegian landings, by rectangle. Data for 1990.

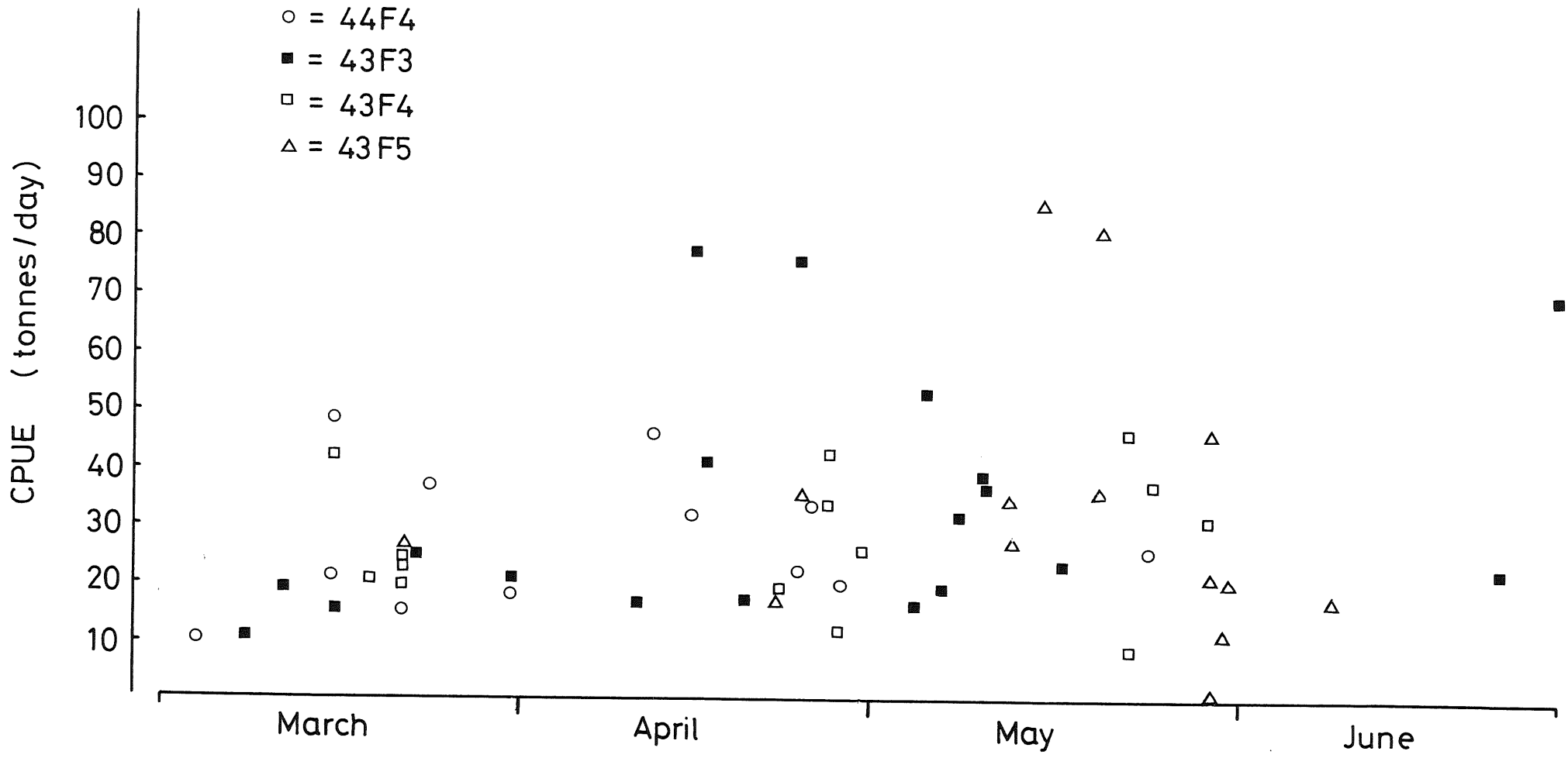


Figure 8.6.2.4 Sandeel. Southern North Sea. First half of year. CPUE and Effort 1982-1990.

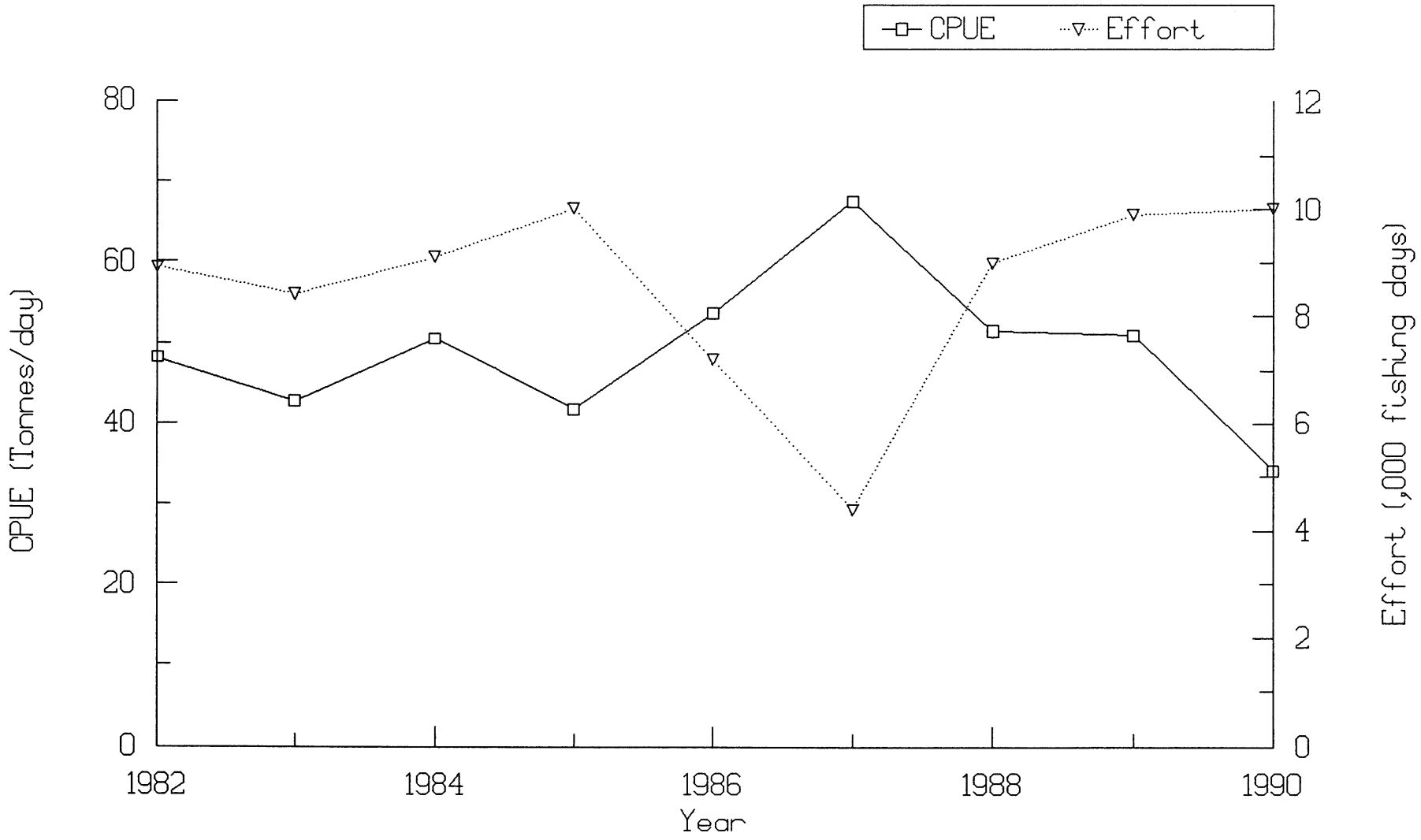


Figure 8.6.2.5 Sandeel, Southern North Sea.
Second half of year, CPUE and Effort 1982-1990.

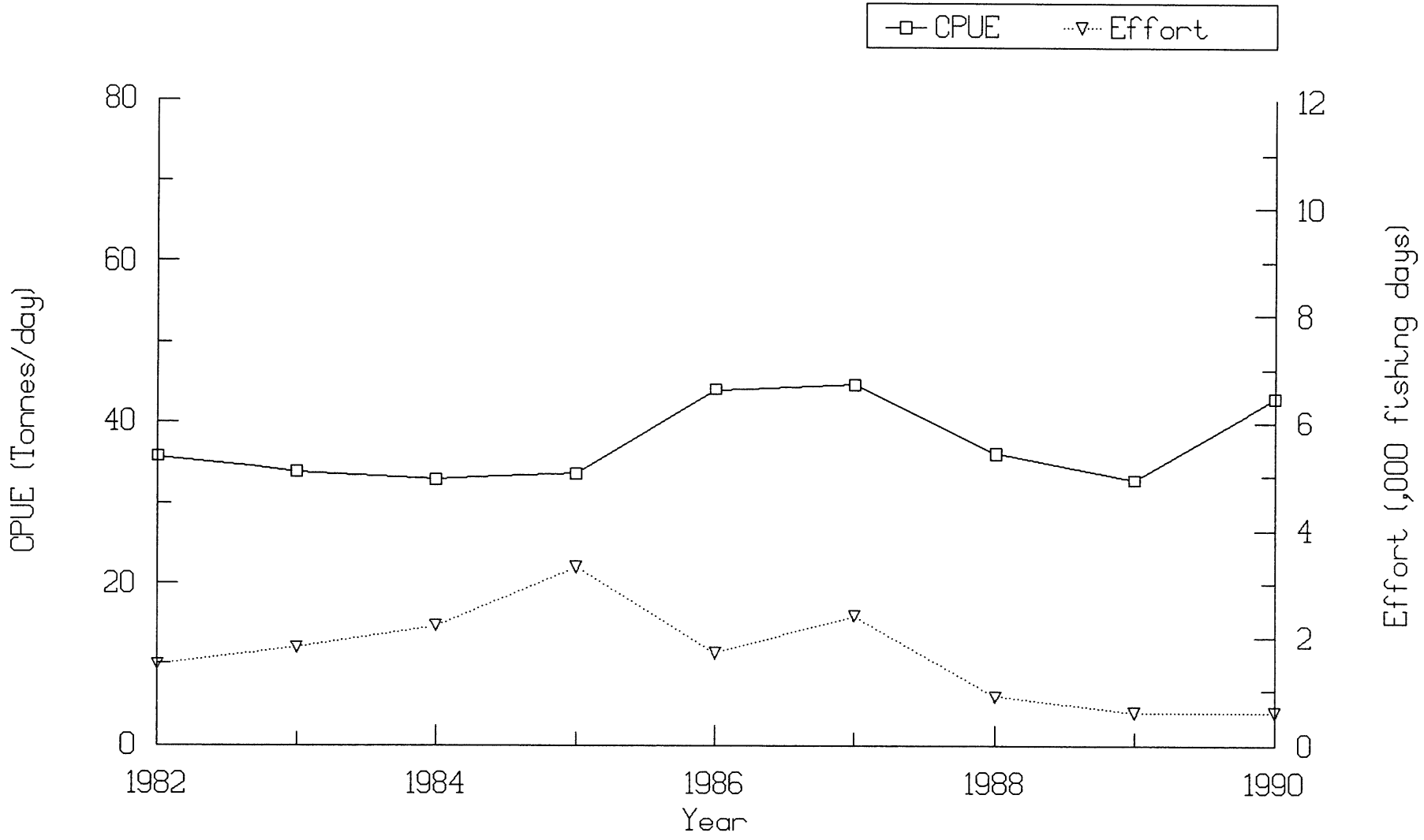


Figure 8.6.2.6 Sandeel. Northern North Sea.
First half of year, CPUE and Effort 1976-1990.

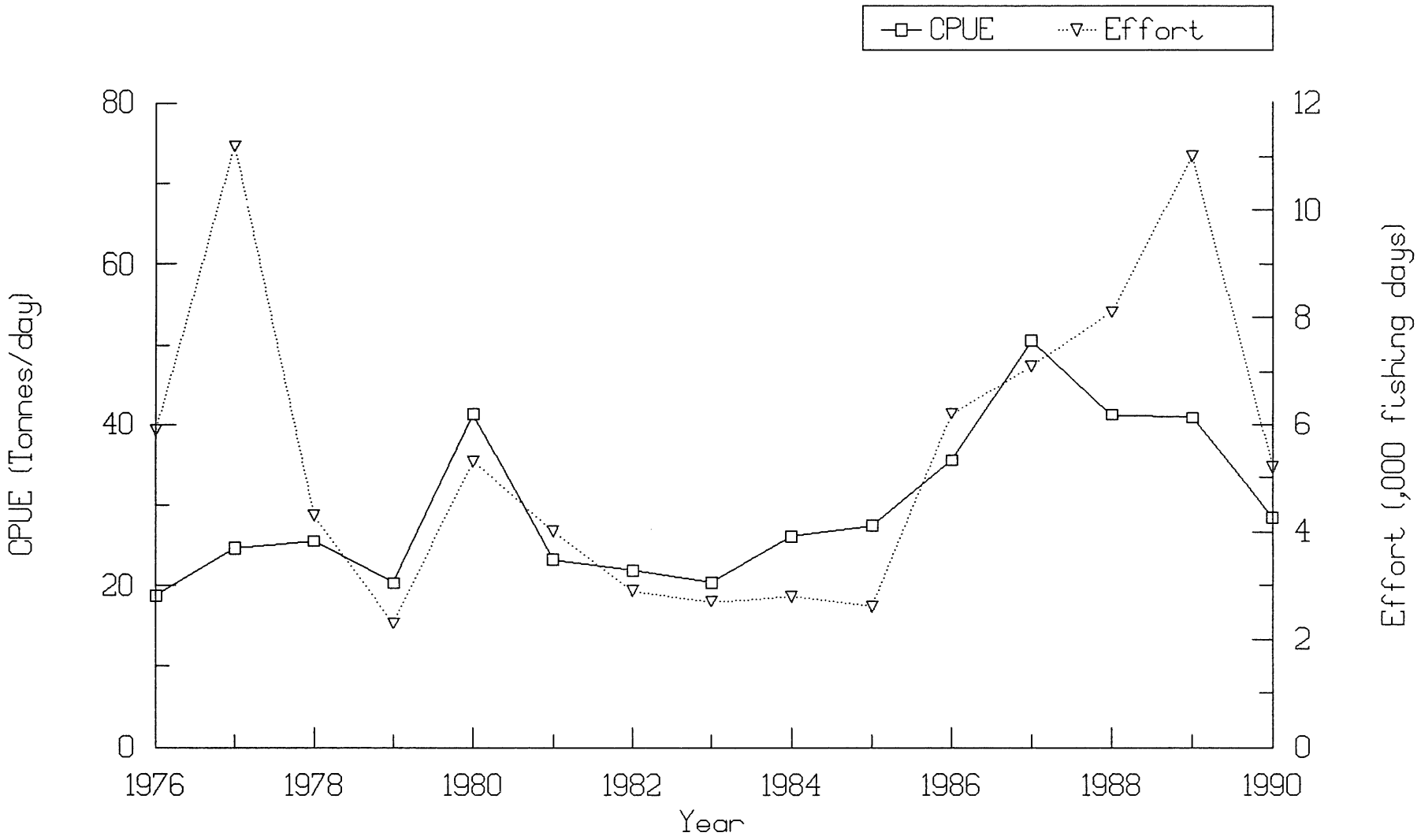


Figure 8.6.2.7 Sandeel Northern North Sea.
Second half of year, CPUE and Effort 1976-1990.

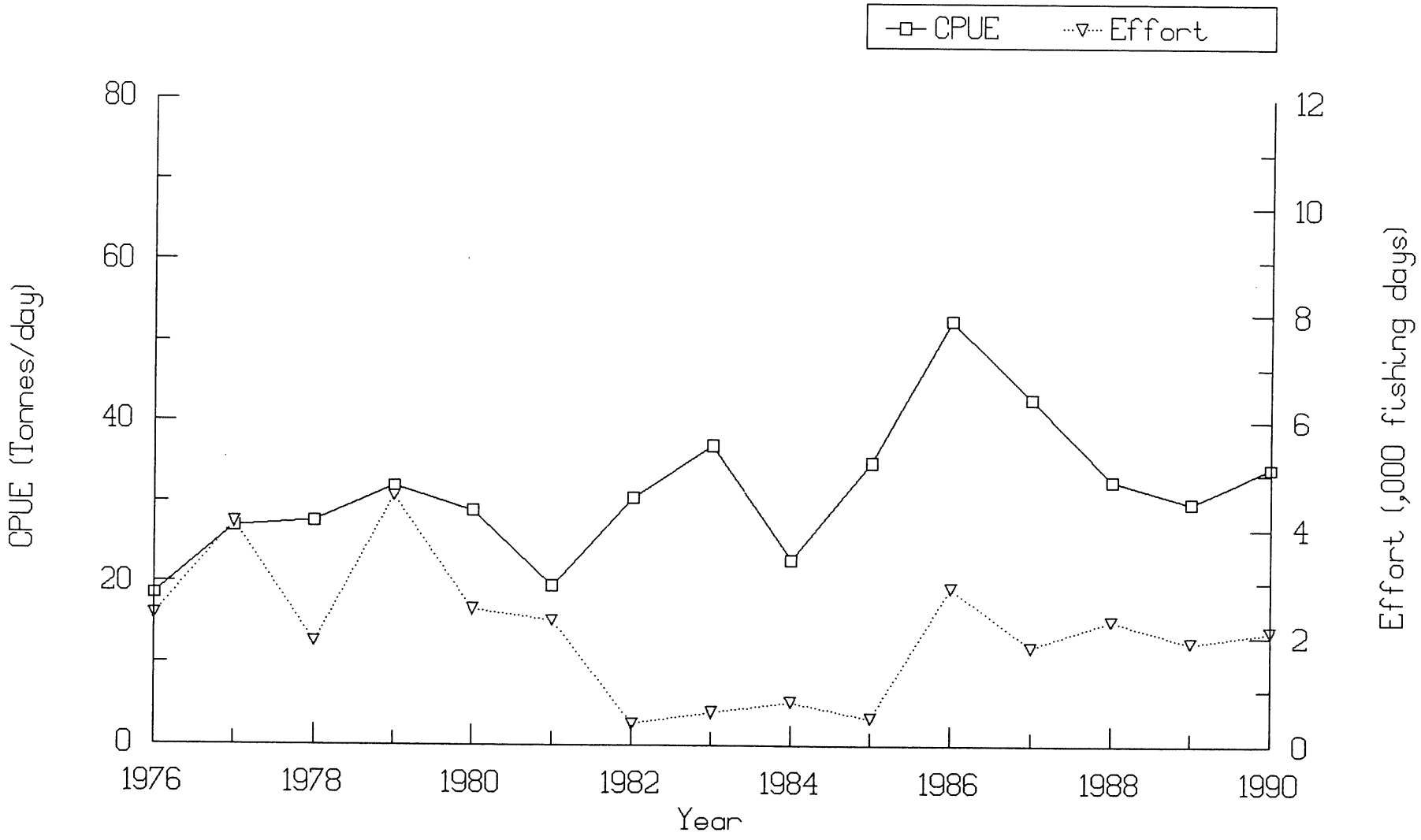


Figure 8.6.3.1 Sandeel total North Sea.
Recruitment versus SSB. Data compiled from single species VPA's (Anon. 1990).

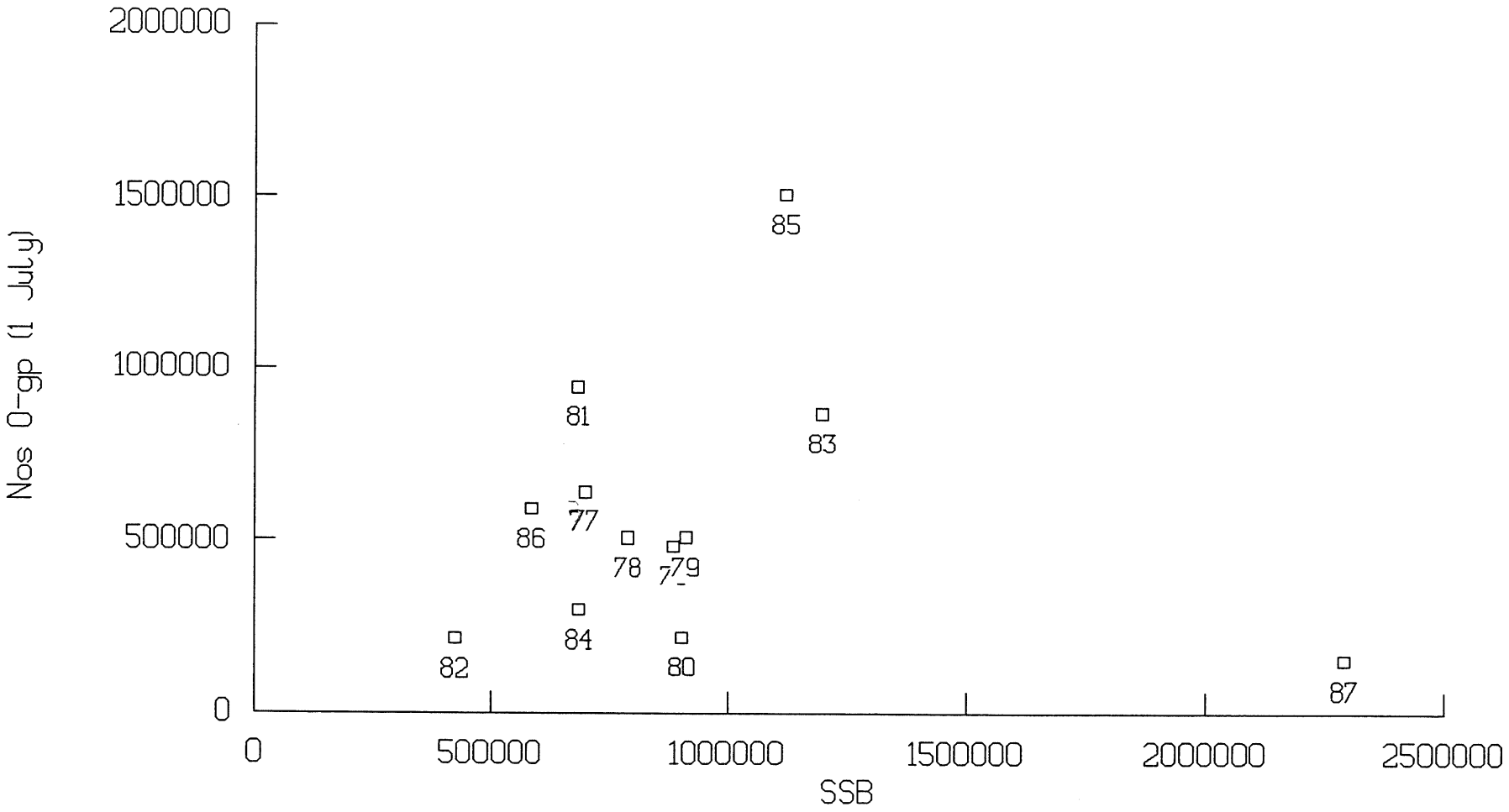


Figure 8.6.3.2 Sandeel total North Sea.
Recruitment versus SSB. Data from MSVPA (nov.1990).

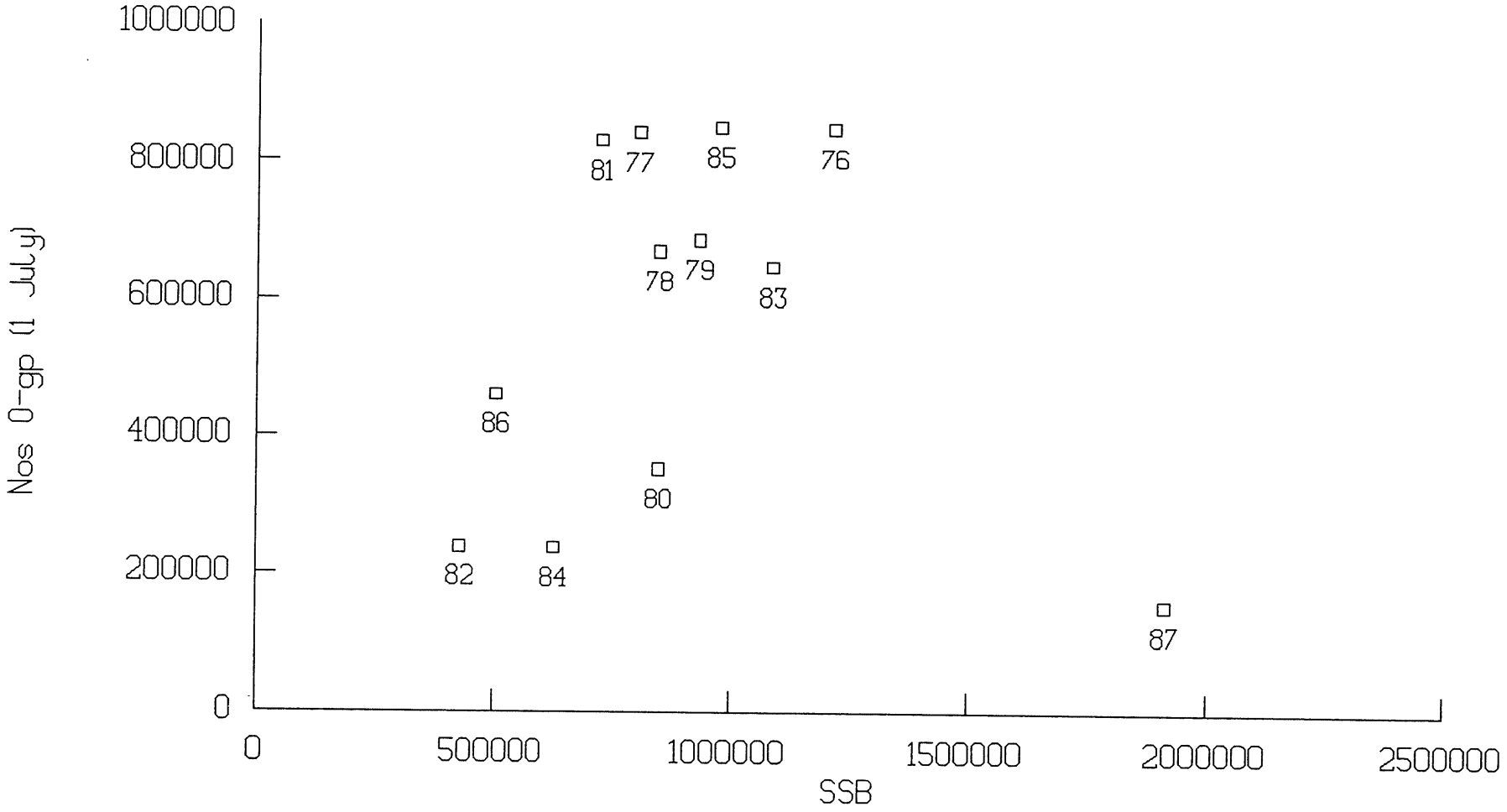


Figure 8.6.3.3. Sandeel Northern North Sea.
Recruitment versus SSB. Data from Anon. 1990.

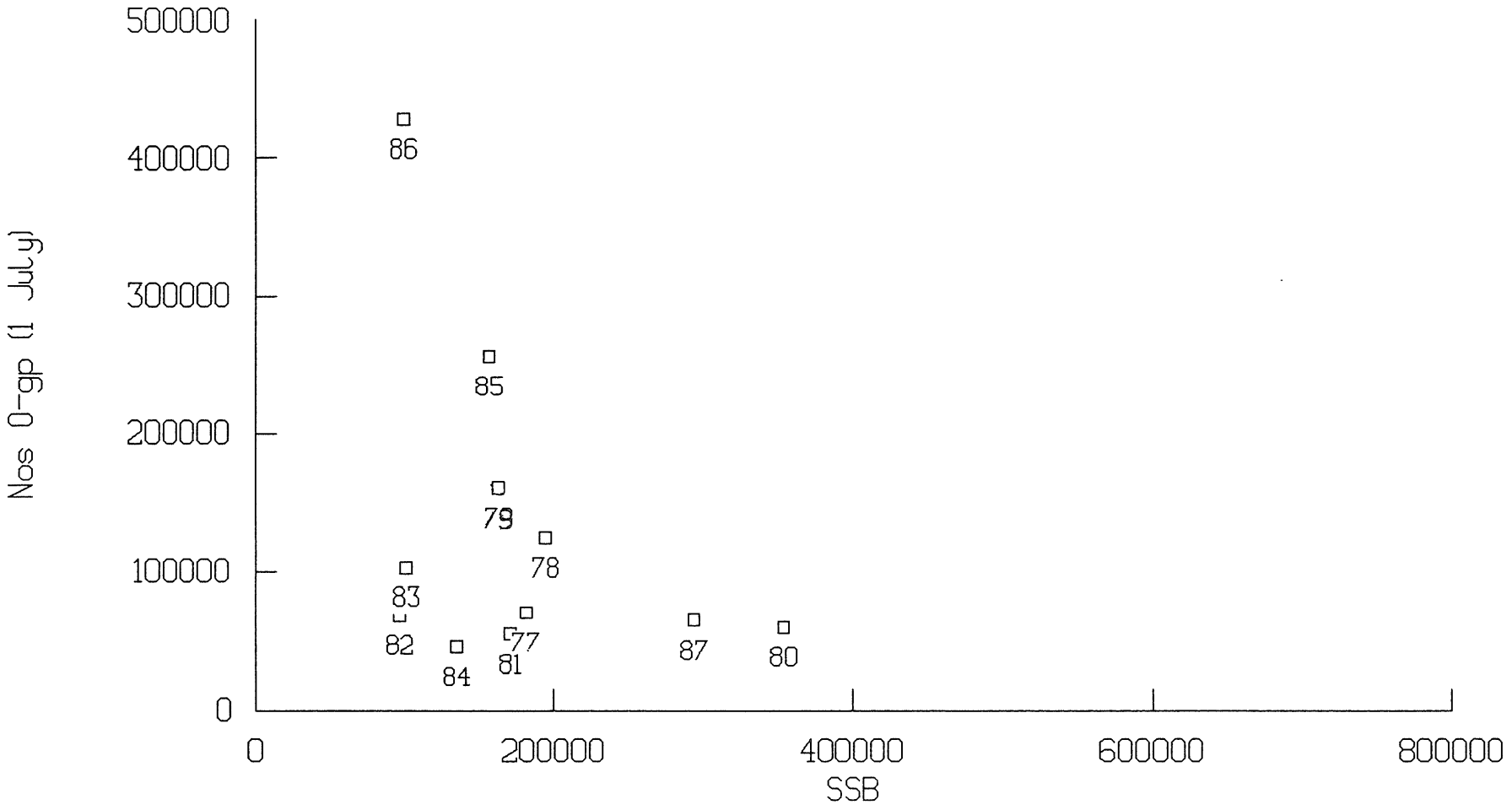


Figure 8.6.3.4 Sandeel southern North Sea.
Recruitment versus SSB. Data from Anon. 1990.

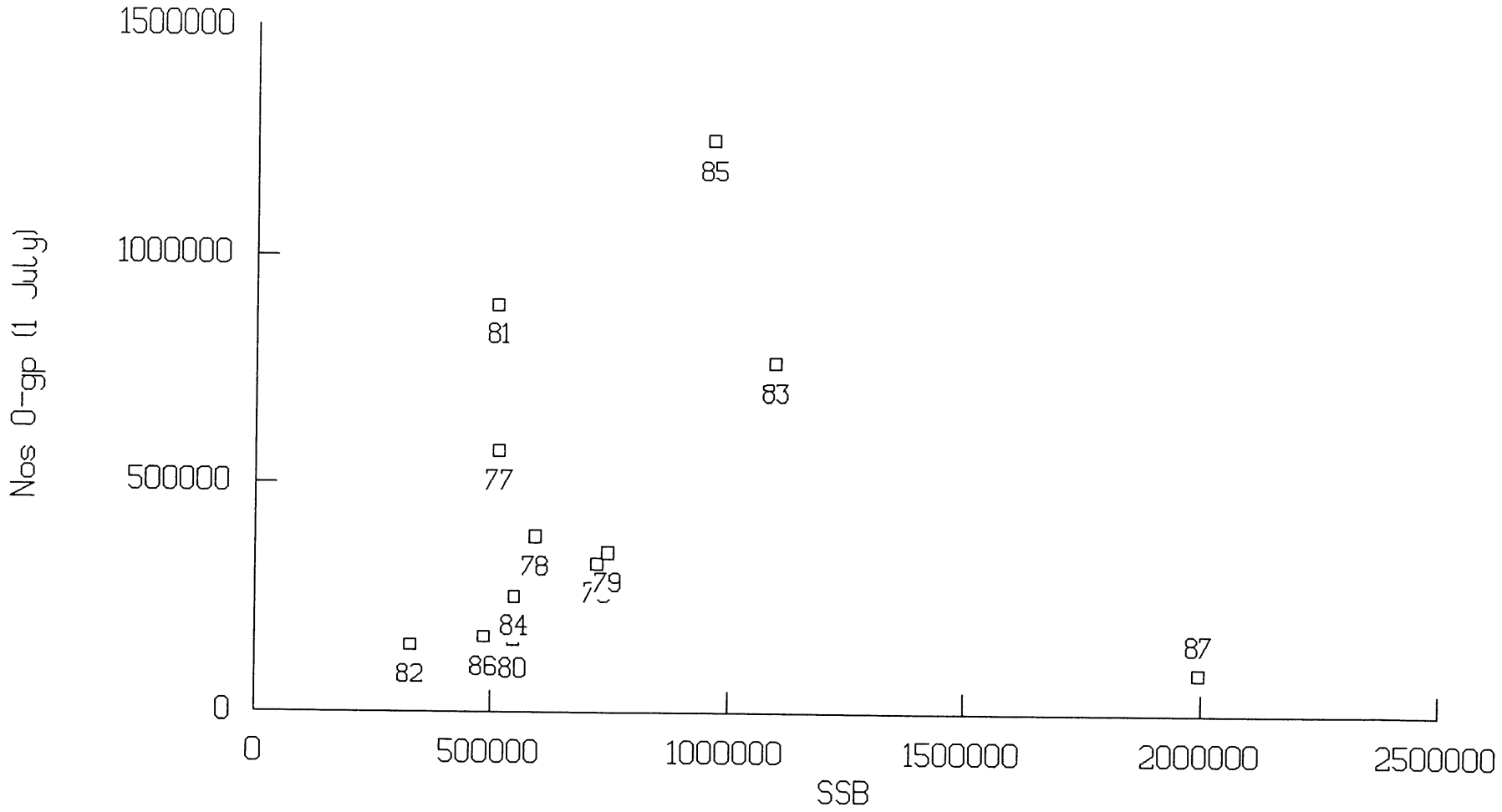


Figure 8.6.4.1 Sandeel North Sea.
Recruitment (0-gr, 1 July) in the northern (lower curve) and southern (upper curve) part of the North Sea. Data from Anon. 1990.

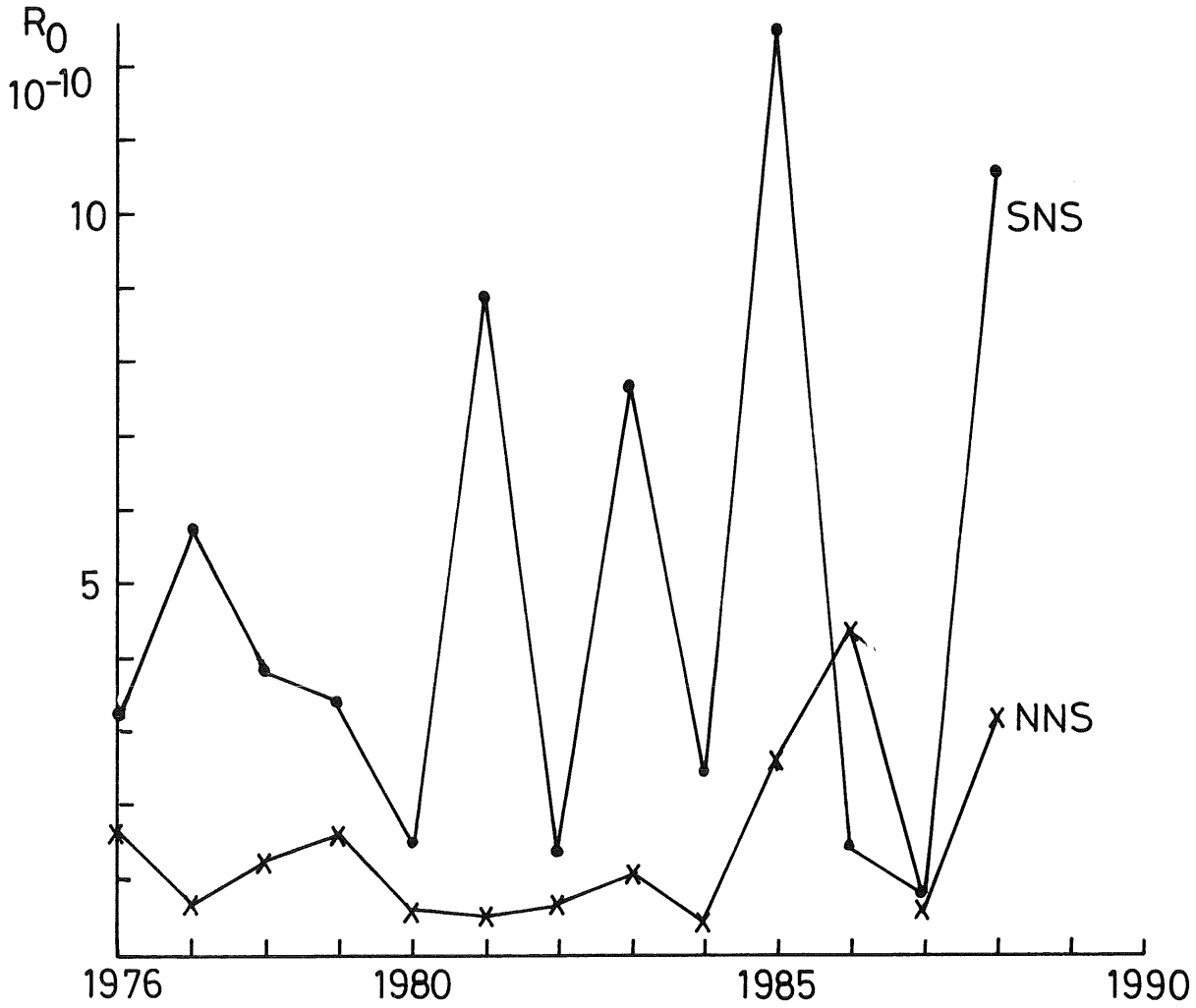


Figure 8.6.4.2 Sandeel North Sea.
Spawning stock in numbers in the northern (broken) and southern (fully drawn) part of the North Sea. Data from Anon. 1990.

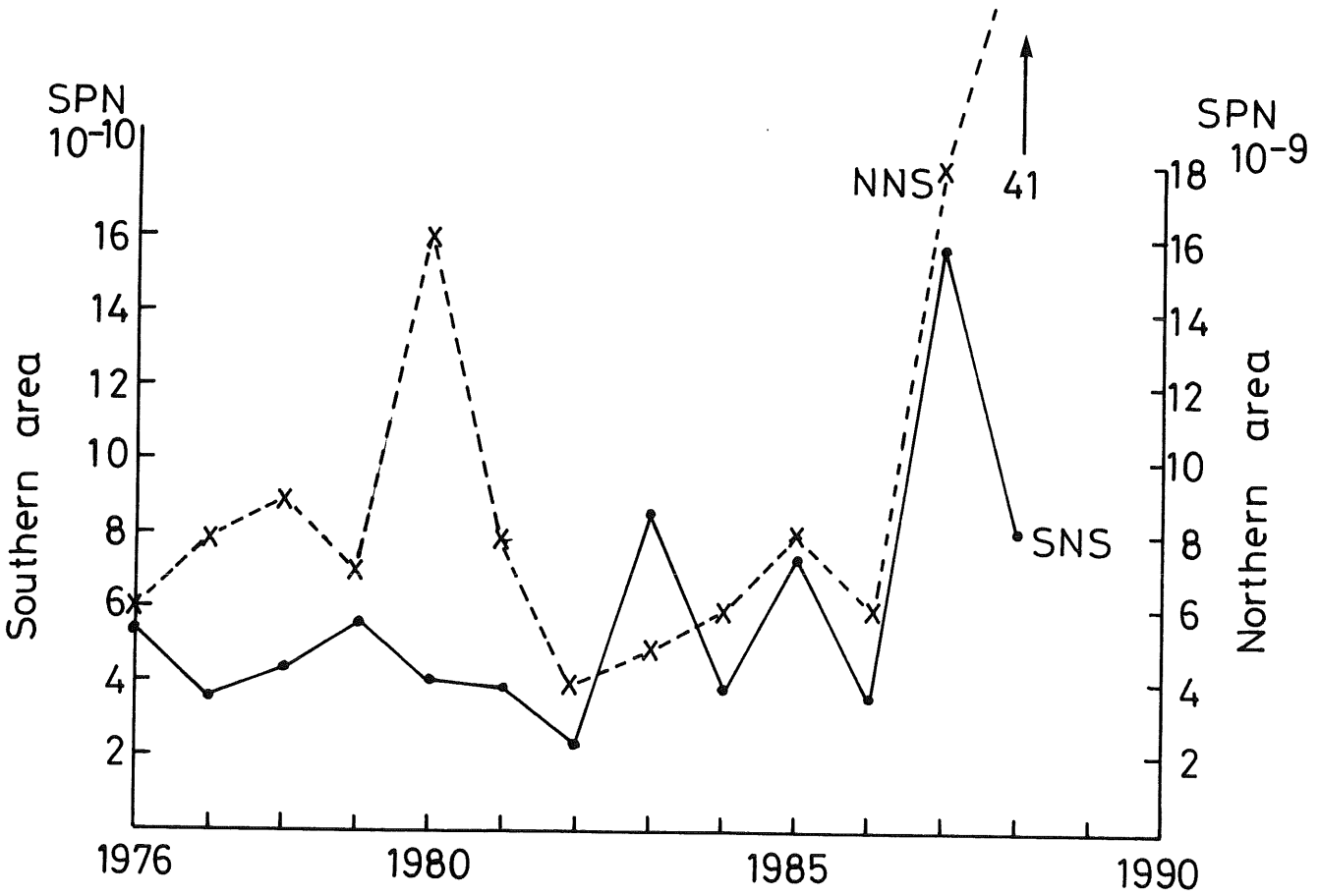


Figure 9.5.1; SANDEEL. Division VIa

Mean F (1980-1990)

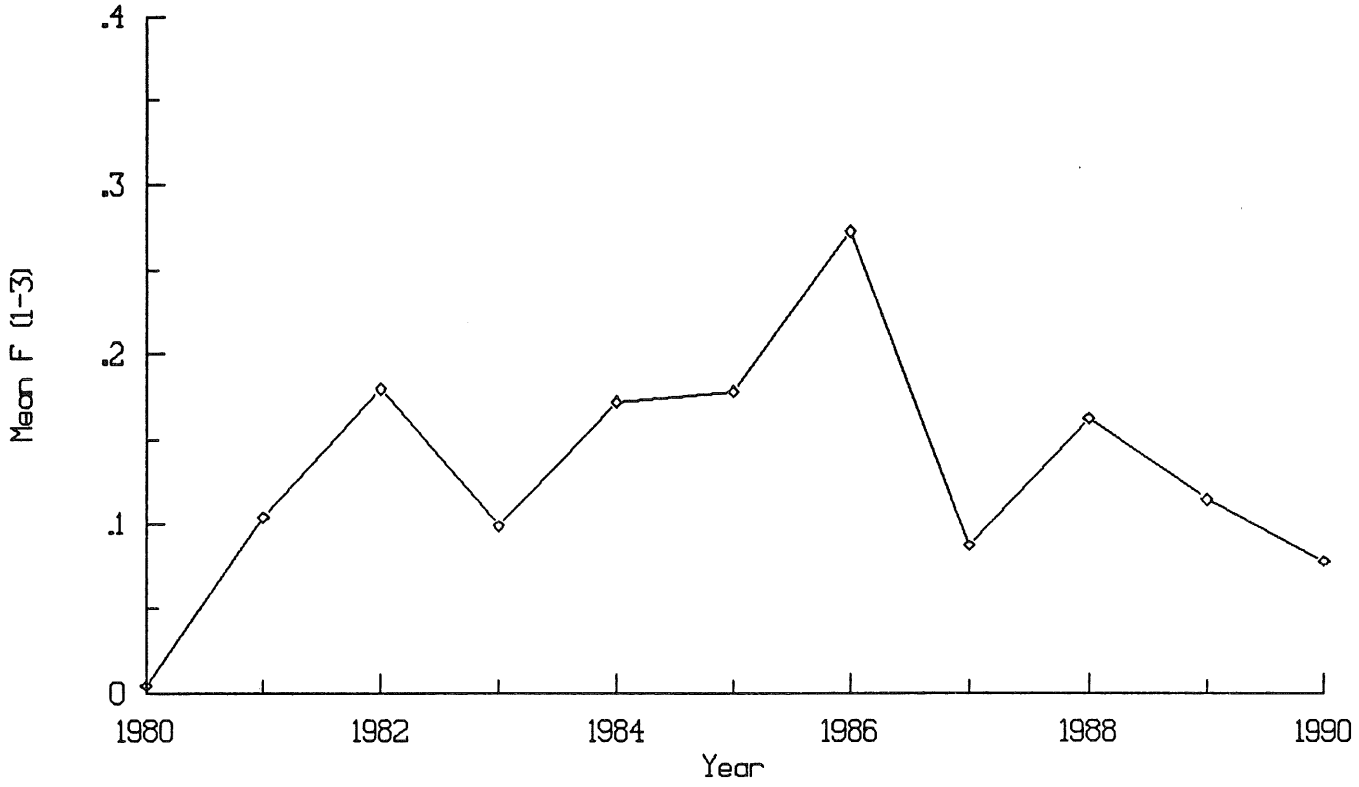


Figure 9.5.2; SANDEEL. Division VIa

Mean F and Standardised Effort (1982-1990)

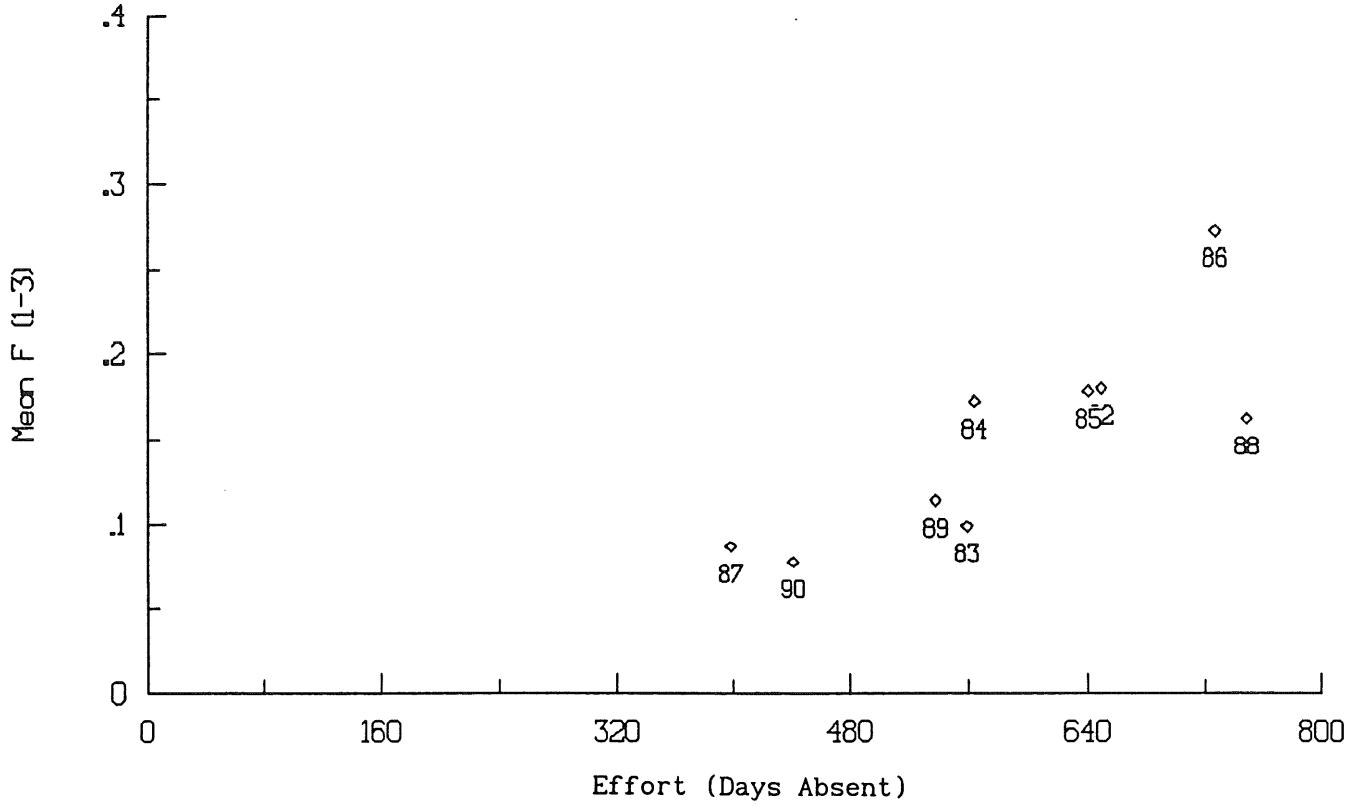


Figure 9.5.3; SANDEEL. Division VIa

0-Group Numbers at 1 July (1980-1989)

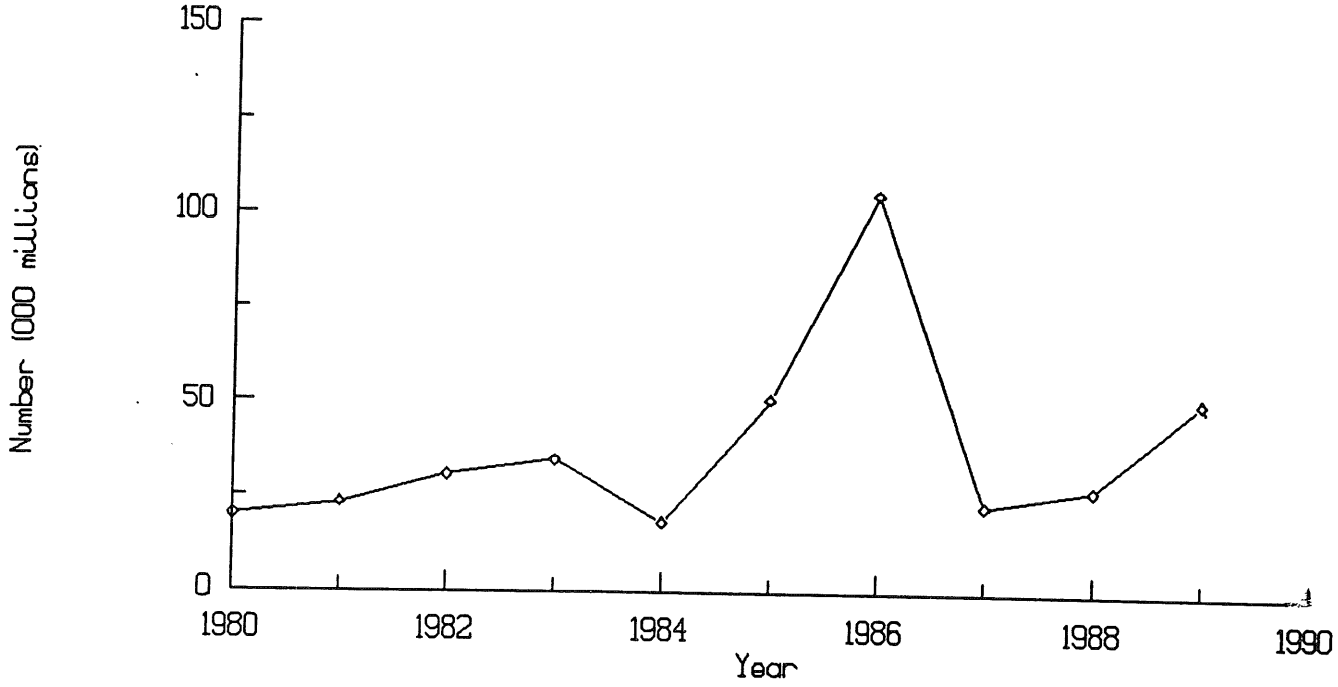
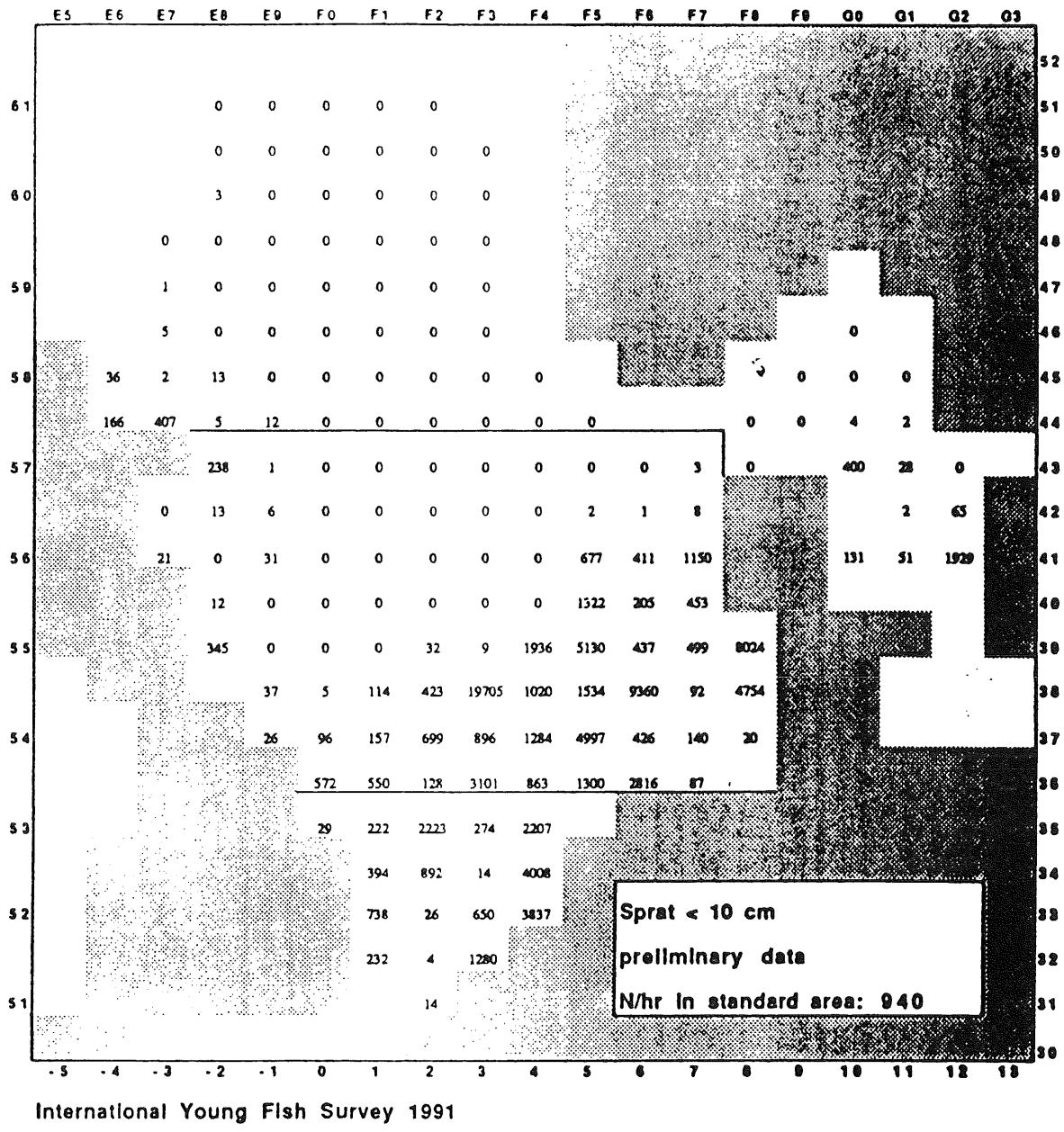


Figure 9.5.4; SANDEEL. Division VIa.

Biomass Totals (1980-1990)

Figure 11.4 Sprat.
International young fish survey 1991.



ANNEX 1

North Sea Norway pout. Length distribution of catch in numbers (millions) for 1990.

Length class (mean)	Quarter 1		2		3		4	
	Den.	Nor.	Den.	Nor.	Den.	Nor.	Den.	Nor.
8.5	8.4	4.5	-	-	-	-		
9.5	247.1	63.7	-	2.0	-	7.6		
10.5	937.7	233.8	-	31.8	-	9.6		
11.5	463.2	191.6	-	71.5	-	2.7		
12.5	59.0	43.5	16.6	126.0	1.3	20.6		
13.5	5.6	9.7	88.4	217.3	0.6	116.0		
14.5	50.5	20.1	58.0	203.4	9.6	205.3		
15.5	29.1	43.5	27.6	115.1	40.9	186.8		
16.5	37.6	27.3	35.9	106.2	55.6	64.5		
17.5	47.7	8.5	33.2	79.4	67.7	37.8		
18.5	8.4	3.3	13.8	32.7	61.4	24.7		
19.5	8.4	-	8.3	6.0	36.4	11.0		
20.5	-	-	-	1.0	17.3	-		
21.5	2.8	-	-	-	1.9	-		