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REPORT OF THE INDUSTRIAL FISHERIES WORKING GROUP

Copenhagen, 6-12 March 1985

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TABLE OF CONTENTS

Section	Page
1 INTRODUCTION	1
1.1 Participants	1
1.2 Terms of Reference	1
1.3 Timing and Participation	2
1.4 The Format of the Data Reported to the other Working Groups	3
2 TRENDS IN THE INDUSTRIAL LANDINGS FROM THE NORTH SEA	4
3 BY-CATCHES IN THE INDUSTRIAL FISHERIES IN THE NORTH SEA AND DIVISION IIIa	5
3.1 By-Catch of Protected Species in the North Sea	5
3.2 By-Catches in Division IIIa	5
3.3 By-Catch Regulations	5
4 NORWAY POUT	7
4.1 Landings 1957-1984	7
4.2 Fishing Effort	8
4.3 Catch at Age and VPA Results	10
4.4 Research Vessel Surveys	11
4.5 Weight at Age	12
4.6 Predation Mortality	12

Section	Page
4.7 Catch Prediction	13
5 SANDEEL	14
5.1 Landings in 1984	14
5.2 Fishing Effort	15
5.3 Catch at Age and VPA	17
5.3.1 Catch at age	17
5.3.2 VPA Results	18
5.4 Research Vessel Surveys	22
5.5 Weight at age	22
5.6 Predation Mortality	23
5.7 Catch Prediction	25
5.8 Yield per Recruit	25
6 SPRAT IN DIVISION IIIA	28
6.1 Landings	28
6.2 Fishing Effort	28
6.3 Catch at Age and VPA	28
6.4 Research Vessel Surveys	29
6.5 Prediction	29
7 NORTH SEA SPRAT	30
7.1 Landings	30
7.2 Fishing Effort	30
7.3 Catch at Age Data and VPA	30

Section	Page
7.4 Research Vessel Surveys	31
7.4.1 Acoustic surveys	31
7.4.2 International Young Fish Surveys	31
7.5 Weight at Age	32
7.6 Predation Mortality	32
7.7 State of the Stock and Catch Prediction	32
8 CHANNEL SPRAT (ICES DIVISIONS VIId,e)	34
8.1 Landings	34
8.2 Fishing Effort	35
8.3 Catch at Age and VPA	35
8.4 Research Vessel Surveys	36
8.5 Weight at Age - Lyme Bay Fishery	36
8.6 Predation Mortality	36
8.7 Equilibrium Yield and Catch Prediction	36
9 SPECIAL QUESTIONS	37
9.1 The Ban on Fishing for Sprat and Herring in Certain Areas of the North Sea	37
9.2 Regulatory Measures in Division IIIa	38
10 THE USE OF IYFS DATA	38
11 DATA REQUIREMENTS	40

Section	Page
12 REFERENCES	41
Tables	42
Figures	118

1 INTRODUCTION

1.1 Participants

R S Bailey	United Kingdom (Scotland)
J Casey	United Kingdom (England)
D J Garrod	United Kingdom (England)
J Lahn-Johannessen	Norway
N A Nielsen (Chairman)	Denmark
K Popp Madsen	Denmark
H Sparholt	Denmark

Mr K Hoydal attended the meeting as ICES Statistician.

1.2 Terms of Reference

At the 72nd Statutory Meeting of ICES it was decided (C.Res.1984/2:4:4) that the Industrial Fisheries Working Group (Chairman: Mr N A Nielsen) should meet at ICES headquarters 6-12 March 1985 to:

i) estimate monthly quantities and quarterly geographical distribution and size composition of by-catches of herring, cod, haddock, whiting, mackerel and saithe in the North Sea and adjacent waters and report them to the relevant Stock Assessment Working Groups,

ii) assess the state of the stocks of the target species for industrial fisheries, i.e., sprat in Sub-area IV, Divisions IIIa and VIId,e and Norway pout and sandeel in Sub-area IV. Data should be made available to allow assessments of Norway

pout and sandeel in Sub-area VI and Division IIIa.

In addition to the specific terms of reference for this Working Group, C.Res.1984/4:13 asked the Assessment Working Groups to:

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

ii) evaluate the evidence of natural mortality for the oldest age groups,

iii) assess the effects of applying the estimates of total natural mortality calculated by the Multispecies Working Group.

With reference to Item (i) in the terms of reference, H Sparholt offered to coordinate and collect the data for the Multispecies Working Group.

1.3 Timing and Participation

In previous years, and also in 1984, the meeting of the Industrial Fisheries Working Group has been held before the meetings of other Assessment Working Groups. This timing has been used because the Industrial Fisheries Working Group should report by-catch data to the other Assessment Working Groups. However, in practice, these data are reported from the national laboratories via their national members of the Working Group. Thus, there seems to be no need for the meeting of the Industrial Fisheries Working Group to be held in advance of the other Assessment Working Groups.

It is noted, however, that the meeting of the Industrial Fisheries Working Group cannot be held earlier than the second week of March. The data from the IYFS are essential for this Working Group, and they need to be available to the Working Group. For the

use of IYFS data, reference is made to Chapter 10.

1.4 The Format of the Data Reported to the other Working Groups

The terms of reference ask the Working Group to report data on by-catch species to the relevant ICES Working Groups. This year, the terms of reference specifies a more disaggregated format of the by-catch data and the Working Group discussed the need for a presentation of this detailed information in the Working Group report.

The Roundfish Working Group and the Working Group on Assessment of Herring South of 62^0N in general use the data in an aggregated form, i.e., annual catch in numbers for the North Sea. These data are reported from the national laboratories via their national members of the Working Group, and this Working Group found it only of little use to include these data in the report of the Industrial Fisheries Working Group.

The disaggregated data are intended to improve the available description of the industrial fisheries and their by-catch. However, this involves a large volume of data and the Working Group found it difficult to choose an appropriate format for the tables.

The Working Group decided to report data on the catch composition in a relative aggregated form in order to describe the industrial fishery in general (see Section 3). The detailed data are available to the Working Group and in the Working Group file, and can be reported and analysed if the purpose and methods are identified.

All data on by-catches were provided by Working Group members and have no official status.

2 TRENDS IN THE INDUSTRIAL LANDINGS FROM THE NORTH SEA

The long-term trend over the past decade (1974-83) suggests an overall decrease in the total annual landings (Table 2.1). Total landings in 1984 amounted to 80% of the average of 1,590,000 tonnes during this period. Inspection of the predominant species shows a recent continuous decline in the sprat landings, reaching a minimum of 80,000 tonnes in 1984, or 23% of the previous average figure. Contrary to this, herring catches rapidly increased since 1980 to a level of more than 150,000 tonnes in both 1982 and 1983. Preliminary figures for 1984, however, went down to 114,000 tonnes.

Herring landings in the central North Sea (Division IVb) declined in 1984 to a level lower than that in 1981, whereas a fishery for adults has developed in the northern North Sea (Table 2.2). Annual landings for Norway pout, sandeel and blue whiting have fluctuated rather irregularly without presenting any regular trend, except possibly for blue whiting where recent landings have increased. Those of 1982 and 1983 reached a maximum level of 118 000 tonnes. Landings of protected species (haddock, whiting and saithe) have substantially decreased in recent years, reaching a level of 34,000 tonnes in 1984, the lowest level since 1974.

The present Working Group previously used the term: target species to indicate the relative importance of these in contrast to the so-called by-catch species. In the most recent years, however, this picture has changed and the distinction between target and by-catch species is no longer obvious, and the landings in Table 2.1 are, therefore, not grouped in these categories.

3 BY-CATCHES IN THE INDUSTRIAL FISHERIES IN THE NORTH SEA AND DIVISION IIIa

3.1 By-Catch of Protected Species in the North Sea

Table 3.1.1 presents the major by-catch species in the industrial fisheries. Data available from Working Groups have been updated and those from 1984 have been provided by members of the present Working Group. By-catches of both haddock and whiting indicate a decreasing trend, whereas those of saithe fluctuate rather irregularly.

Tables 3.1.2 and 3.1.3 give the estimated species compositions in the Norwegian Norway pout and sandeel fisheries, respectively. Table 3.1.2 presents an updated version for the years 1979-83. The species composition in 1984 follows roughly the same pattern as in recent years. Table 3.1.3 indicates that by-catches in the sandeel fishery were particularly small in 1984, possibly as a result of inadequate sampling.

3.2 By-Catches in Division IIIa

Incomplete data from Division IIIa in 1984 amount to 2.707 tonnes of haddock and 12 102 tonnes of whiting and 450 tonnes of herring.

3.3 By-Catch Regulations

At its 1984 meeting the Working Group was asked to comment on the effect of variations in relative stock abundance in the proportion of by-catch species in a total catch. The Group provided general comments based on annual statistics for the 'industrial' fisheries (Doc. C.M.1984/Assess:9, para. 3.5).

The present Working Group was provided with catch and by-catch data by ICES rectangle for the Norway pout fishery in the last quarter of 1984 by Denmark with supporting data from Norway and from U.K. inspections of Danish vessels fishing for Norway pout. These are summarised in Figure 3.3.1. showing the unsorted part of the by-catch of cod, haddock, whiting, and saithe as a percentage of the total catch of these species with Norway pout. The total catches from October to December were as follows:

	Tonnes	% a)
Norway Pout	94 344	93
Cod	277	+
Haddock	1 968	2
Whiting	4 868	5
Saithe	86	+
SUB TOTAL	101 543	
Blue Whiting	2 942	
Other species	4 113	
TOTAL	108 598	

The number of rectangles in which each by-catch proportion was recorded by Denmark was as follows:

By-catch %	1	2	3	4	5	6	7	8	9	10	10+
N^0 of Rectangles	2	3	3	1	8	7	15	3	3	2	2

Data from the Norwegian Norway pout fishery cover a similar range, and the U.K. inspection data correspond with the mode of the Danish data. Despite uncertainties that arise through the allocation of fishing trips to single rectangles, and the

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a) Proportion calculated on range of species for which rectangle data were available (Norway pout, cod, haddock, whiting, saithe).

aggregation over three months, the estimated by-catch has been consistent over a wide area of the fishery in the central northern North Sea. Considering these figures the Working Group recalled that the by-catch regulation refers to single landing including that part of the catch which has been sorted for human consumption. It would be expected therefore that the real distribution of percentage by-catch would include trips with a by-catch proportion excess of 10%. It was not possible to go further with data from only one quarter of one year.

4 NORWAY POUT

4.1 Landings 1957-1984

Landings of Norway Pout from the North Sea by country for the years 1957-84 are shown in Table 4.1.1. The total landings have in the last 15 years varied between 300,000 and 500,000 tonnes, except for some few years. The total landings in 1984 were 355 000 tonnes.

The monthly landings by country in the years 1980-1984 are given in Table 4.1.2. The table shows that the largest catches are taken in the period August-November.

Division VIa

Landings of Norway pout from Division VIa by country are given in Table 4.1.3.

Division IIIa

Landings of Norway pout from Division IIIa by country are given in Table 4.1.4.

4.2 Fishing Effort

Danish effort data

Danish effort and cpue data for each size group of vessels participating in the Norway pout fishery were available for the years 1982-84 (Table 4.2.1). To condense these into usable summary statistics, cpue (tonnes/day) figures for the whole of each year were plotted against the mean tonnage of each vessel category (Figure 4.2.1), and the resulting plot of all three years fitted by one power regression of the form

$$y = ax^b$$

where y = tonnage/days fishing, x = mean tonnage of each vessel category minus 50 tonnes to force the curve through the point (50, 0) which by eye was judged to be the starting point of the curve. The resulting values of the parameters are a = 2.3, b = 0.48 (r = 0.93).

The level of sampling for Danish effort data can be seen from Table 4.2.2 where the percentage of catches (in weight) sampled is shown. Generally, more than half of the Danish Norway pout catches have been sampled.

Norwegian effort data

Norwegian effort data are available from 1976 and onwards. The cpue (hectolitres per days fishing per GRT) by quarters are presented for the combined Norwegian Norway pout and blue whiting fishery in Table 4.2.3. The cpue for the directed Norway pout fishery, defined as containing more than 70% Norway pout, are given in Table 4.2.4 and Figure 4.2.2. The weighted annual means for these two cpue series are shown in Figure 4.2.3.

Figure 4.2.2 shows considerable quarterly changes in catch rates. Figure 4.2.3 indicates rather stable weighted annual mean catch rates. The two cpue indices were closely related in all years except 1984, thus demonstrating the importance of Norway pout in this mixed Norwegian fishery in the previous years. As appearing from the by-catch table (Table 3.1.2) the blue whiting has in recent years become more important.

Faroese effort data

No Faroese effort data are available to the Working Group for 1984.

Total Danish and Norwegian effort

With the purpose of tuning the VPA, a total Danish and Norwegian effort index was attempted. The Norwegian effort data were available as quarterly number of fishing days not separated into vessel categories, but with the mean vessel GRT recorded (Table 4.2.5). To scale the Danish effort data which are available as number of fishing days per vessel category to the Norwegian data, the model described above, $y = ax^b$ was used. By this model the fishing days on a quarterly basis of each vessel category were converted to fishing days by a vessel equal in size to the mean Norwegian vessel in the quarter. Summing over the vessel categories and raising the fishing days to the total Danish catch by using the percentage from Table 4.2.2 were then done. The resulting fishing efforts are shown in Table 4.2.5.

The annual Norwegian fishing effort was 36%, 30% and 25% of the annual Danish and Norwegian effort in 1982, 1983 and 1984. The corresponding Norwegian catches in percentages of the sum of the total Danish and Norwegian catches were 25%, 24% and 25%, thus indicating that the scaling of the Danish effort data to the Norwegian effort data are rather good (the cpue assumed approximately equal for the two countries).

It also appears from Table 4.2.5 that the quarterly distribution of the Danish fishing effort is different from the Norwegian distribution. The Danish effort in the second quarter is only about one third of the effort in the other quarters, because the Danish industrial fleet is fishing sandeel in this quarter. The Norwegian fishing effort is low in the first and fourth quarter.

4.3 Catch at Age and VPA Results

Table 4.3.1 shows the catch in numbers by quarter for the years 1974-84. Catch at age data were available in 1984 for the Danish, Norwegian and Scottish landings. These samples were raised to give an age distribution of the total catch.

The catch at age in Table 4.3.1 was used as an input to a quarterly VPA. In the 1983 Working Group report the total mortality, Z, in Norway pout was estimated to be in the range of 1.5-2.5 $year^{-1}$ on the basis of IYFS indices for 1- and 2-groups of Norway pout. This was in last year's report compared to the number of Norway pout eaten by the predators cod, whiting, saithe and mackerel according to data from the International ICES Stomach Sampling Project, and it was concluded that a natural mortality of 0.4 per quarter for all age groups was a reasonable assumption. This is in broad agreement with estimates from catch curves from lightly exploited Norway pout stocks (Bailey et al., 1984).

The effort data (Section 4.2) was used as a basis for selecting input F-values in the VPA. The effort in the fourth quarter increased by 25% from 1982 to 1984. The 1982 fishing mortality on 1- and 2-group, increased by 25%, was then used as an input F for the fourth quarter in 1984 in an initial VPA run.

The resulting VPA output gave a poor relation between F and effort in the years considered. In the final run the relation between F and effort was improved by decreasing fishing mortality on 1-group and increasing it on 2-group in a way that kept the mean F 25% higher in 1984 than in 1982 corresponding to the increase in

effort.

The time series of effort data is rather short and only longer time series will show whether the above procedure is valid. However, it seems possible to estimate fishing mortalities which by quarter match the effort fairly well.

The output from the final VPA run is shown in Tables 4.3.2 and 4.3.3.

The total stock biomass and spawning stock biomass from the VPA are shown in Figure 4.3.1.

VPA Stock in Numbers and Survey Indices

Figure 4.3.2 shows the IYFS 1-group index and the English November 1-group index against the VPA number of 1-group Norway pout at 1 January. The chosen terminal F for 2-group in the fourth quarter in 1984 in the final VPA run is too low to bring the number of 1-group at 1 January 1983 in line with the IYFS index. However, even a value of this F equal 1.2 $year^{-1}$ would only reduce the number of 1-groups to 100 x 10^9, which is still out of line with the IYFS index. It thus seems impossible to tune the VPA to the IYFS index in a proper way. As the relation between the IYFS index and the VPA numbers is usually rather poor, it is probably not unrealistic to assume that the IYFS index underestimates the 1982 year class. This assumption is supported by the English 1-group survey which shows that the 1982 year class is approximately equal to the 1981 and 1983 year classes.

4.4 Research Vessel Surveys

The series of research vessel recruitment indices are given in Table 4.4.1. The time series of abundance on pelagic 0-group surveys and of 0 and 1-groups in the northwestern North Sea in Scottish autumn surveys have ended in 1983 and no further such surveys will be done.

The IYFS 1-group index indicates a recruitment below average for the 1984 year class. The English November survey showed a recruitment of about 25% of the previous three years. Contrary to the IYFS index the English index did not show that the 1982 year class should be smaller than the 1981 and 1983 year classes.

The sampling areas for the IYFS and the English surveys are indicated in Figure 4.4.1.

During the second half of July in 1984 a Norwegian acoustic survey covered the potential area of pelagic 0-group Norway pout in the northern North Sea and the Shetland-Orkney area. The results will be reported to the Statutory Meeting.

4.5 Weight at Age

Mean weight at age by quarters are shown in Table 4.5.1.

Table 4.5.2 shows the quarterly and annual landings in weight by age as a percentage of the annual landings.

The importance of the age groups varies with the year class strengths, but in general the 1-group makes up 70% of the catches and the 2-group comprises 25% of the annual landings.

4.6 Predation Mortality

No definitive new values of predation mortalities have come up from the Multi-Species VPA Working Group. Therefore, the natural mortalities used this year are the same as those used last year (see Section 4.3).

4.7 Catch Prediction

At the Working Group meeting in 1983, a prediction was given based on results from the IYFS. The catch of Norway pout in a given year was correlated with the sum of IYFS 1-group and IYFS 2-group indices. However, the IYFS 2-group indices for 1983, 1984 and 1985 were not available to the Working Group this year, and therefore an alternative method, introduced in 1984, was used again this year.

A SHOT estimate (see Appendix A, Doc. C.M.1984/Assess:9) was calculated using the formula.

$$Y(t) = 0.30\ Y(t-1) + 0.078\ R1$$

where Y is yield and R1 is the 1-group IYFS index. A "hangover" coefficient of 0.30 was chosen because this is the average proportion of the 2-group and older (by weight) of the catch (see Section 4.5). A regression of Y(t) - 0.30 Y(t-1) on R1 through the origin gave the recruitment multiplier of 0.078.

Figure 4.7.1 shows the predicted catch from the model versus the observed catch. In 1984, the catch was only 9% less than that predicted.

The predicted catch using this method in 1985 is 322 000 tonnes, assuming fishing levels to be similar to those prevailing in recent years.

If the strength of the 1984 year class is lower than that used in the prediction, as indicated by the English groundfish survey indices, the present estimate will be an overestimate.

5 SANDEEL

5.1 Landings in 1984

North Sea

Landings increased from 536,000 tonnes in 1983 to 668,000 tonnes in 1984 (Table 5.1.1). Landings by Denmark, Faroe Islands and Norway increased whereas those in Scotland decreased.

Monthly landings are given in Table 5.1.2. The seasonal pattern of landings was similar to that in previous years, most (84%) being caught in the second quarter of the year. The Norwegian fishery ended by the end of June.

Monthly landings in each of the areas in Figure 5.1 are given in Table 5.1.3 for Denmark, Norway and the United Kingdom. In most areas the seasonal pattern of landings followed that of total landings, although in the coastal areas 3, 4, 6 and Shetland, a significant proportion of the annual total was taken in the third quarter (29%, 69%, 20% and 38% respectively).

Annual totals for each Sub-area given in Table 5.1.4 show the overiding importance of area Ia (the area north of Dogger Bank) in 1984 (54% of the total North Sea catch). Otherwise there were no major changes in the distribution of landings. Increases took place in both the northern andsouthern assessment areas whereas the catch from the Shetland area decreased.

Division VIa

Scottish landings from Division VIa increased from 13,100 in 1983 to 14,200 tonnes in 1984 (Table 5.1.5).

Division IIIa

Provisional data from Working Group participants indicated a decrease in catch from 34,300 tonnes in 1983 to 27,700 tonnes in 1984 (Table 5.1.6).

5.2 Fishing Effort

Norwegian effort and catch per unit effort data were available to update the series given in the 1984 report (Table 5.2.1). These data, however, apply to only a small proportion of the total international landings.

Monthly Danish effort data for each size group of vessels participating in the sandeel fishery were available for the years 1982-84. To condense these into summary statistics, cpue (tonnes/day) figures for the whole of each year were plotted against the mean tonnage of each vessel category,and the resulting plots fitted by a power regression of the form

$$y = a\chi^b$$

where y = tonnes/days fishing, χ = mean tonnage of vessel category. The resulting values of these parameters are as follows:

		a	b
Southern assessment area	1982	6.12	0.385
	1983	5.08	0.394
	1984	6.33	0.381
Northern assessment area	1982	3.60	0.383
	1983	6.66	0.231
	1984	4.44	0.353

Since the data for the southern area are based on a much larger number of samples than those taken for the northern area, and since the values of b were very similar for the southern area in

the three years, the mean of the three southern area values was used to provide scaling factors for each vessel size. The resulting effort data raised to the total international catch are given in Table 5.2.2.

The level of sampling for effort can also be seen in Table 5.2.2 by comparing the catch to which the effort data apply with the total international catch. This shows that while the 1982 data applied to only a small part of the total international catch, the sampling level in 1983 and 1984 was very much higher. The comparable figures are given below in terms of the percentage of the total international catch accounted for by effort sampling:-

	Southern area (%)	Northern area (%)
1982	31	17
1983	60	37
1984	78	61

The data in Table 5.2.2 indicate that effort in the southern area remained constant from 1982 to 1983, and increased to a small extent in 1984. In the northern area, effort increased in 1983 and remained at the 1983 level in 1984.

In the Shetland fishery. the number of hours fishing and days absence were available for the period 1975-84 on a monthly basis. Examination of the number of hours fished per day's absence, however, indicated that up to 1983 a more or less constant factor had been applied. In 1984, the mean number of hours fishing recorded per day's absence rose significantly and while the value for 1984 may be correct, there is no basis to re-evaluate the data from previous years. The number of days absence is therefore likely to be a more objective measure of fishing effort even though it may conceal annual differences in the amount of fishing carried out per day. Effort expressed in days fishing for each month is given in Table 5.2.3.

5.3 Catch at Age and VPA

5.3.1 Catch at age

Catch in numbers at age were compiled for the three assessment areas in Figure 5.1.1. Appropriate monthly data were supplied by Denmark, Norway and the United Kingdom. In the absence of Norwegian catches after June, Danish catches in the northern area in the second half of the year (17,677 t) were allocated to age on the basis of Danish samples taken in June. Faroese catches (11,254 t) were assumed to have been taken in the area of the main Danish fishery during the first half of the year and have been allocated on the basis of Danish catches in the Southern area from May-July.

The catches in numbers at age for 1984 are given by month in Tables 5.3.1-5.3.3. In the southern area, the catches were predominantly of 1-group sandeels. As in the previous year, the 1982 year class (2-group in 1984) were very poorly represented, while 3-group were six times as abundant in the catches as 2-group. A feature of the 1984 catches in this area, however, was the almost total absence of 0-group. In the northern area 87% of the catches were 1-group and no sandeels older than 4-group were reported in the samples. No samples were obtained in the second half of the year, and so the representation of the 0-group is not known.

In the Shetland area 0-group constituted 62% of the total catch with a steady decrease in the contributions made by progressively older age groups.

Division VIa

Catch at age for Division VIa sandeel were supplied by UK (Scotland) for the period 1980-84. These are tabulated by quarter in Table 5.3.14. Because of the short time series the data have not been used in a VPA. Instead the age compositions transformed to natural logarithms were plotted against age to obtain catch curves. For the years 1982-84, a regression line was calculated for age-group 1-6 and the following estimates of Z obtained:

1982	0.62
1983	0.70
1984	0.75

This method of estimating Z is sensitive to variations in recruitment but the mean of several years' values when a fishery is in its early stages gives some indication of the likely value of M. On this basis the value of M on fully recruited age groups in this area is likely to be around 0.6 - 0.7.

5.3.2 VPA Results

VPAs were made on a half-yearly basis separately for the southern and northern assessment areas and for Shetland (see Figure 5.1.1).

In previous years a value of M of 0.5 $year^{-1}$ has been used on all age groups. As pointed out in the 1984 report, however, this value is not consistent with preliminary results from the 1981 stomach sampling project, especially for the first two age groups. The Working Group therefore examined the outputs from the trial runs of the MSVPA given in the report of the ad hoc Multi-Species Assessment Working Group (C.M. 1984/Assess: 20). These indicate considerable changes in fish predation mortality over the period 1974-83, but for the period 1979-83, most of the trial runs based on alternative assumptions have a measure of agreement and indicate predation mortality to be around 0.5 yeare on 0- and 1-group sandeels, 0.4 on 2-group and around 0.2 on older sandeels.

At the present meeting, however, it was felt that the value of residual natural mortality rate 0.1 used in the MSVPA (i.e., that due to causes other than predation by the four species of predator included in the MSVPA) was too low. In particular several other predators are known to feed on sandeels including haddock. For the present VPA the following values of M were chosen :

0-group	2.0 $year^{-1}$	(applied to second half of year only, i.e., 1.0 half $year^{-1}$)
1-group	0.75 $year^{-1}$	
>2-group	0.5 $year^{-1}$	

The validity of these values is discussed further in the section on predation mortality.

The input catch in number data are given in Tables 5.3.4, 5.3.7, and 5.3.10. For the southern area the Danish fishing effort indices for the years 1982-84 (see Table 5.2.2) were used to choose the most appropriate values of input F. In this area fishing effort in the first half of the year was almost constant in the three years and there was a small increase over the same period in effort in the second half of the year. Input values of F in the second half of the year above 0.1 result in an increasing trend in F in the first half of the year from 1982-84 while values less than 0.05 result in a decreasing trend. The value of 0.08 chosen for the definitive VPA matched both sets of effort figures as closely as was possible (Table 5.3.13). A comparison with the longer series of Norwegian cpue data is given in Figure 5.3.1, but it should be noted that these data apply to a very small proportion of the total catch in this area. It should also be noted, that three years' data are insufficient to tune the level of input F very finely, particularly because the Danish effort data indicate stable F whereas the respective VPA estimates of F are variable. The results should therefore be treated with caution.

In the northern assessment area, no sampling was carried out in the second half of 1984, and because of the major effect that age misallocation would have in the input half-year period, this period has not been included in the VPA. Danish data given in Table 5.2.2 indicate that effort in the first half of the year increased slightly over the period 1982-84. Only input values of F of more than 1.0 half year^{-1} give an increasing trend in F over this period (Table 5.3.13).

A VPA carried out using an input F of 1.2, however, indicates a decrease in stock size from 1976-80 to 1981-84 which is incompatible with Norwegian cpue data (Figure 5.3.1). A much lower input F value matches the Norwegian cpue data most closely and, to calculate an appropriate value, biomass calculated by VPA was plotted against Norwegian cpue data (Fig. 5.3.2). On this basis a value of 0.6 was used for the definitive run of the VPA.

As in the case of the southern North Sea, however, VPA estimates of F are not closely matched by effort data and the results should be treated with caution.

For the Shetland area fishing effort expressed as number of days fishing was used to choose the appropriate input value of F in the second half of 1984. Plotting the weighted mean F on the 1-4 groups against fishing effort for the first half of the year indicated that an input F value in the second half of the year of around 0.3 would be appropriate for ages 1 and older (Figure 5.3.3). The number of hours fishing reported for 1984, however, indicated that effective effort may have increased to a greater extent than is suggested by the number of days fishing. Since this cannot be quantified (see Section 5.2) a slightly higher value of 0.4 was chosen for the VPA. The regression of F on the 0-group against days fishing in the second half of the year indicated that an input F of 0.4 was appropriate for this age group also (Figure 5.3.3).

Estimates of fishing mortality rate from VPA are given in Tables 5.3.5, 5.3.8 and 5.3.11, and the estimated stock size in numbers at 1 January and 1 July in Tables 5.3.6, 5.3.9 and 5.3.12.

Southern area of the North Sea

The results of the VPA support the earlier conclusion that the 1981 year class was a strong one and indicate that the 1982 year class is the weakest on record. The earlier diagnosis that the 1983 year class might be a poor one, however, does not appear to have been correct and if the effort data are a reliable indicator of fishing mortality rate, this year class is now estimated to be the largest on record. The last few years have therefore seen very large fluctuations in recruitment.

In last year's report, a weak correlation was identified between catches of 0-group in the second half of the year and year class strength. On this basis the virtual absence of 0-group in the catches in 1984 would tend to indicate the likelyhood that the 1984 year class is poor. The fishing mortality rate on the 0-group, however, is variable and in the years prior to 1977 was effectively zero. A new relationship between catch of 0-group and year class strength is given in Figure 5.3.4, but it is clear that it only gives in the broadest terms an indication of whether the year class strength is likely to be above or below average.

Although the sampling level of Norwegian catch per unit effort is relatively poor, comparison of the annual values with stock biomass estimates from VPA (Figure 5.3.1) show considerable similarity. These data thus add some support to the validity of the VPA for this area.

Northern area of the North Sea

The VPA results from the northern North Sea are particularly diffult to interpret because they do not match to the available effort data at all closely.

On the basis of the results given in Table 5.3.9, there appears to have been a run of rather low recruitments from 1980 to 1982 with some increase in 1983. There is no information about the 1984 year class.

Shetland area

The VPA for the Shetland sandeel assessment area indicates that after the two good year classes of 1981 and 1982 there have been two rather poor year classes, the 1983 year class being the lowest on record. In consequence, the stock biomass in 1984 was the lowest since 1974 and, despite some increase in effort, the total catch decreased.

5.4 Research Vessel Surveys

No surveys currently carried out provide information of use in sandeel assessments.

5.5 Weight at age

Data for 1984 were provided by Denmark for the southern and northern assessment areas and by the UK for Shetland. These are tabulated by month and assessment unit in Table 5.5.1. The values for the northern area are rather low compared with the long-term mean given in Table 5.5.2 of the 1984 report, whereas those for Shetland are slightly higher. In view of the need for stability, however, any subsequent calculations have been based on mean values given in the previous report. Summary mean weights at age for each half of the year are included in the stock size in number (Tables 5.3.6, 5.3.9 and 5.3.12) for ease of reference when calculating stock biomass.

Table 5.2.2 gives percentage weight of landings by age updated for 1984. In the southern area, 1- and 3-group contributed most to the catches. In the northern area, the catches were predominantly 1-group, while at Shetland the first three age groups together contributed 82% of the total catch.

5.6 Predation Mortality

In attempting to assess the effects of applying the estimates of total natural mortality coefficient calculated by the Multispecies Working Group (C.M.1984/Assess:20), problems were experienced because the range of possible values was high and because there was an indication that M had changed dramatically over the period 1974-83. To examine this problem in a relatively simple way, the Working Group attempted to calculate the number of sandeels of each age group eaten by the three main predators (cod, whiting and saithe) in 1981 using data reported by the Coordinator of the 1981 Stomach Sampling Project (C.M.1984/G:37). For this purpose, stock size in numbers of the three predators at 1 January 1981, and annual values of Z at age were taken from the reports of the 1984 Roundfish and Saithe Assessment Working Groups (C.M.1984/Assess:10 and C.M.1984/Assess:7, respectively).

The number of sandeels of each age eaten by cod, whiting and saithe in each quarter of 1981 was calculated from the following data:

1) the total weight of food consumed by individuals of each age group of each predator in each quarter;

2) the proportion that sandeels of each group made of the total stomach contents of each age group of predator in each quarter;

3) the mean ingested weight of individuals of each age group of sandeels found in the stomachs of each age group of predator in each quarter;

4) estimates of the mean number of each age group of predator in the sea at the mid-point of each quarter.

A comparison between the estimated number of sandeels eaten in each half year and the number dying naturally from the VPAs given in the present report is given in Table 5.7.1, based on values of M of

0-group (second half year)	1.0 half-year $^{-1}$
1-group	0.75 year $^{-1}$
Greater than or equal to 2-group	0.50 year $^{-1}$

From this it is clear that there are major discrepancies between the two series. VPA appears to have overestimated the number of 0-group eaten, whereas it has grossly underestimated the number of 1-group (and to a lesser extent 2-group).

Another factor to be considered, however, is the fact that other predators on sandeels are not taken into account. In particular, the preliminary data on haddock stomach contents indicate that a significant proportion of their diet consisted of sandeels. Mackerel also contained considerable numbers of sandeels in their stomachs.

On such a rough and ready basis it is quite impossible to draw firm conclusions. It seems likely, however, that the values of M used by the present Working Group are not overestimates of the true values, and may indeed be underestimates, particularly for 1-group sandeels.

The Working Group would encourage further analysis of the stomach data with a view to providing more refined estimates of number eaten, if possible broken down by area of the North Sea.

5.7 Catch Prediction

Because of the lack of reliable estimates of the strength of the 1984 year class in all the assessment areas, no catch predictions have been made for 1985.

5.8 Yield per Recruit

At its meeting in May 1984, ACFM decided not to use the Industrial Fisheries Working Group's Y/R calculations to evaluate the effects of seasonal closures in the sandeel fisheries because these calculations were done on a half yearly rather than a monthly basis. To evaluate this question further, the Working Group carried out an analysis on a monthly basis to evaluate the expected changes in Y/R and SSB/R resulting from seasonal closures. Yield per recruit calculations are essentially ways of comparing yield assuming constant recruitment for different arrays of fishing mortality at age. In this exercise, the standard for comparison is the status quo, defined as the mean monthly values of fishing mortality at age in each assessment unit for the years 1979-83. Since the effect of exploitation is felt on spawning stock biomass as well as on yield per recruit, the latter is also calculated for 2-group and older at 1 January which is approximately the spawning date of Ammodytes marinus.

Calculations were done using two values of M (0.5 and 1.0) on all age groups and for the purpose of calculation it has been assumed that natural mortality is equally divided between all months of the year. For the calculations based on M = 0.5 recent values of F in each half year were taken from the VPA in the 1984 Working Group report, and as an approximation, monthly values of F were calculated b allocating the half yearly values of F in proportion

to the catch in number of the respective age group in each month.

For the calculations based on M = 1.0, a new annual VPA was run prior to the meeting using an input value of F of 0.2 on all ages in 1983 and on the oldest age group in all years, and monthly values of F were calculated by allocating the annual value in proportion to catches in number at age in each month.

For all combinations of assessment area and value of M, the matrix of monthly M against age was examined and mean values of F calculated for all age groups between which there were no consistent differences. The resulting values of F used in the calculations are given in Tables 5.8.1 and 5.8.2.

For the Y/R calculations mean monthly weights at age were taken from Table 5.5.2 in the 1984 Working Group report. For the SSB/R values for the first half of the year in Table 5.5.3 of that report were used.

In all calculations recruitment was assumed to take place at 1 June as 0-group, and each year class was assumed to become extinct at the end of the 7-group. For each area a standard calculation was carried out using the F values in Tables 5.8.1 and 5.8.2.

In addition to the standard calculation, calculations were made assuming

1) no fishing mortality each year after the end of June, and

2) fishing only in the months of May and June.

In all cases no compensatory changes in the values of F were made to allow for loss of fishing mortality in the months of closure.

Since the Working Group used age-dependent values of M, a further calculation was done assuming

M 0-group = 0.167 $month^{-1}$ from 1 July
M 1-group = 0.0625 $month^{-1}$
M 2-group = 0.0417 $month^{-1}$

with recruitment defined at 1 July of the 0-group. The matrix of monthly F values taken from VPAs carried out in 1985 is given in Table 5.8.3.

Results

The results of the calculations are given in Table 5.8.4.

If one assumes an M of 0.5, the two closures considered have a relatively small effect in the southern North Sea because in that area exploitation is already mostly confined to the first half of the year. Much larger gains in yield per recruit are calculated for both closures in the northern North Sea, whereas the effect in the Shetland area is negligible. If one assumes an M of 1.0, then the closures in all areas result in a reduction in Y/R. Using the age-dependent values of M the northern North Sea is the only area in which any increase in Y/R would be expected (17%), but only by a closure in both Mar-Apr as well as after June.

Expected changes in SSB/R also vary between areas. They are most pronounced in the northern North Sea and in all areas less pronounced with an M of 1.0 than with an M of 0.5.

The results of the Y/R calculations indicate that the likely gains to be expected are highly dependent on the values of M used. Using the values of M and F from the VPAs carried out by the Working Group, however, the only area in which gains are likely to be made are in the northern area (Shetland excluded), and then only by a combination of both closures.

In addition to changes in Y/R, there would be more pronounced changes in SBB/R. These are only relevant, however, if recruitment itself is affected by a decrease in stock size.The implication of this is that seasonal closures would be a powerful tool in the conservation of sandeel stocks if any of the stocks show any evidence of sustained decreases in recruitment. There is no evidence of this in any of the North Sea stocks at the present time.

6 SPRAT IN DIVISION IIIA

6.1 Landings

Landings by areas and country from 1969 to 1983 are shown in Table 6.1.1 based upon data provided by Working Group members. For 1984 only Danish and Norwegian landing figures were available and nothing definite can be said about the latest development in the Division IIIa sprat fisheries.

6.2 Fishing Effort

No data were available to the Working Group.

6.3 Catch at Age and VPA

Without information on the Swedish landings, which are at least half of the totals, no catch at age figures could be calculated.

6.4 Research Vessel Surveys

Acoustic surveys

A joint acoustic survey was carried out in July/August by Denmark and Sweden. The survey was directed at herring and the shallow, major part of the Kattegat, which is an important part of the distribution area of the sprat is poorly covered. In 1984 large masses of jellyfish made any attempts of echo-survey in this area impractible.

Trawl surveys

Swedish indices of 1-group sprat from IYFS in 1980-85 are shown below:

1980	1981	1982	1983	1984	1985
4 960	2 809	1 577	1 173	4 141	2 077

The year class 1984 would thus appear to be weaker than the previus one. Without complete data on 0-group catches in 1984 there is no evidence to corroborate this estimate.

6.5 Prediction

A regression of sprat yields in Division IIIa on IYFS indices of 1-groups over a 10-year-period is shown in Figure 6.1. Even though $r = 0.68$ the intercept is so large as to render the 1-group index rather useless as a predictor. According to the regression the 1985 index would indicate a catch of about 62,000 tonnes. Considering the large intercept, a catch possibility of 40-50,000 tonnes would appear more likely.

7 NORTH SEA SPRAT

7.1 Landings

Landings of North Sea sprat (nations, areas) 1975-84 are given in Table 7.1.1. and reporting areas in Figure 7.1.1. The landings in 1984 (80,000 tonnes) were slightly lower than the 91,000 tonnes landed in 1983. Landings in both years were well below the average of 465,000 tonnes recorded in the five years 1975-79. Landings in 1984 show a marked reduction in Division IVb (west) partly offset by a small increase in landings in Division IVb (east), but the overall pattern of landings remained much the same (Table 7.1.3).

Landings of sprat reported in Division VIa by the United Kingdom (Scotland) for 1984 show some recovery from the low 1982 level (Table 7.1.2).

7.2 Fishing Effort

No effort data were available.

7.3 Catch at Age Data and VPA

All countries reporting landings in 1984 provided sampling data. Age composition of the catches by area and quarter are given for 1983 and 1984 in Table 7.3.1. As in former years, 1-group sprat provided the major part of catches in the third and fourth quarters and continued to dominate catches as 2-group fish in the first quarter of the following year.

Input catch-at-age data for quarterly VPA are given in Table 7.3.2, but in the absence of any data to judge variation in terminal F or exploitation pattern, the VPA was conducted using the same terminal F values as in 1984. The resulting fishing

mortalities are shown in Table 7.3.3 and the stock composition in Table 7.3.4. The estimates of biomass show the stock remaining at a low level in 1984, with some further reduction in spawning stock biomass following the reduced recruitment of recent years.

7.4 Research Vessel Surveys

7.4.1 Acoustic surveys

Scotland conducted an acoustic survey of sprat off the north-east coast in December 1985. This showed a slight recovery from the very low abundance recorded in 1983/4 with some variation in the local distribution of sprat within the area. The results are summarised in Table 7.4.1 (note that the survey was conducted in December 1984 so that 0-group sprat are to be compared with 1-group of previous years). There are indications of a slight improvement from the very low levels of 1983/84 in the north-western coastal area of the North Sea.

There are no acoustic survey estimates for other areas.

7.4.2 International Young Fish Surveys

It has not yet been possible to carry out a comprehensive review of IYFS data for aged sprat from either the GOV or IKMT trawl surveys. The index for 1-group sprat 1985 was therefore estimated from the number of sprat <10 cm length as in previous years. This gave a preliminary index for 1985 of 512 1-group sprat in Division IVb for comparison with the revised index of 349 for 1984 (Table 7.4.2, Figure 7.4.2).

The Scottish November midwater trawl survey has been discontinued.

7.5 Weight at Age

All countries reporting landings of North Sea sprat recorded mean weight at age by quarter except for the third quarter. Using the average weight at age 1982/83 for that quarter gave the annual average weighted mean weight at age given in Table 7.5.1. This combined with the catch numbers (Table 7.5.2) showed an increase in the proportion of the catch weight provided by 1-group sprat following reduced recruitment in recent years.

7.6 Predation Mortality

The ad hoc Multispecies Assessment Working Group (1984) gave preliminary estimates of predation mortality in sprat as: 0-group 0.21 - 0.57, 1-group 0.62 - 0.97, 2-group 1.14 - 1.95 (Table 3.3.1). The Industrial Fisheries Working was not convinced of the increasing trend in M with age indicated by these estimates but noted that the range of values for 1-group, with the addition of non-predation mortality, spans the assumption of $M = 0.8$ year $^{-1}$. This value was therefore retained for the present assessment in conformity with earlier analyses of M in fully recruited older age groups (Bailey, 1980; Johnson, 1970).

7.7 State of the Stock and Catch Prediction

There is no independent estimate of the terminal fishing mortality used to initiate the VPA which largely determines the assessment of the present state of the stock. With that reservation, the updated key stock characteristics (Table 7.7.1) show the sharp reduction in stock size both in 1983 and 1984. The reduction in spawning stock size which appears to be particularly marked in 1984 follows from the reduction in yearclass strength 1981/82. The broad trend is confirmed from widespread observation of the

fishery itself, with the landings in 1984 dominated by 1-group sprat of the slightly improved 1983 year class.

It is clear that in 1984 the North Sea sprat stock has remained at the low level recorded in 1983. The preliminary estimates of the 1984 year class as 1-group in the 1985 IYFS indicate a modest improvement in recruitment for the 1985/86 season. SHOT estimates carried out as for 1984 indicate a prospective catch in 1985 of 120 000 tonnes at the present level of fishing (Figure 7.7.1).

In its previous report which confirmed the sharp decline of the North Sea sprat stock first seen in 1981/82, the Working Group noted that the reduced spawning stock may be capable of generating a strong year class under especially favourable environmental conditions. The stock and recruitment data are shown in Figure 7.7.2 with limits passing through the origin enclosing the observed distribution of recruitment. The upper line corresponds to recruitment arising from 'good' survival, the lower one reflects 'poor' survival. Under average survival that has so far been observed the recovery of the stock could be slow at the present reduced stock size. The Working Group cannot forecast when a 'good' survival will occur but the slight improvement in the 1984 year class is not regarded as a sufficient basis for recovery at the present level of fishing mortality.

Whilst the recent decline of the stock could reflect an adverse environmental trend leading to a succession of poor year classes in recent years as well as an effect of fishing, it is not certain that a reduction in fishing mortality would ensure rapid recovery. A gradual recovery, based on average survival from a stock slowly increasing in response to a reduced fishery, could be dwarfed by the beneficial effect of a good survival from a very small stock which has not been protected.

In other stocks that have declined to such a low level, Working Groups have recommended closure of the fishery. For sprat, because of the high level of M, this would not be expected to promote a much more rapid recovery of the spawning stock under average environmental conditions and on balance, the Working Group considers that catches should be held at the lowest practicable level. The rate of recovery under a continued low level of fishing on a reduced stock (however that may have been caused) would help to resolve the scientific controversy as to whether the closure of a fishery under these circumstances is or is not beneficial. But certainly unless a very strong year class does appear (either as a result of 'good' survival on a small stock, or 'average' survival on an improved stock), the North Sea sprat stock will remain a cause for concern by comparison with production from the stock in earlier years.

8 CHANNEL SPRAT (ICES DIVISIONS VIId,e)

8.1 Landings

Table 8.1.1 shows the nominal catches for Divisions VIId,e in 1975-84. Denmark reported an increase in landings in 1984 but their location is not known and details of catches by the Netherlands were unavailable to the Working Group. Hence, as in previous years, a detailed description is only possible for the United Kingdom component. The UK catches are taken mainly in a directed fishery in the Lyme Bay area between September and February. In the 1984-85 season, the English catch was about half that in 1983-84, the bulk of which (66%), was taken in October and November (Table 8.1.2). Due to a scarcity of shoals in the area, the fishery had fallen away by the end of December, although some vessels continued fishing at a low level up to the end of February. It would appear that the Lyme Bay fishery has reverted to the level experienced prior to the relatively high catches in the period 1980-81 - 1981-82, but with the majority of the catch

being taken in the early months of the season.

8.2 Fishing Effort

There is no time series of consistent fishing effort data, and in the absence of any acoustic estimate for the 1984-85 season, a guideline to trends in the resource is dependent upon the age composition of the Lyme Bay catches only.

8.3 Catch at Age and VPA

Table 8.3.1 shows the age composition of the catches for 1966-67 to 1984-85. In contrast to the seasons 1982-83 and 1983-84, when the bulk of th catch consisted of 2/3 and 3/4 group sprat, the catch in the 1984-85 season appears to have reverted to the pattern of earlier years with a larger proportion of 1 to 2 year old individuals present, now that the strong 1978-79 year classes have passed out of the adult stock.

As in previous years a value of M = 0.85 on all ages was assumed for input to VPA. A separable VPA was used, and in the absence of any information on fishing effort the same values of F and S as last year were assumed. The age of unit selection was again taken as age 2/3. Estimates of fishing mortality are given in Table 8.3.2 and biomass and numbers in the stock are summarised in Table 8.3.3. The apparently increased fishing mortality on 3/4 and 4/5 year old sprat in the 1983/84 season may be an overestimate due to the terminal F value but the Working Group had no alternative independent data with which to tune the parameters and select an alternative value.

8.4 Research Vessel Surveys

No research vessel surveys were conducted during 1984-85.

8.5 Weight at Age - Lyme Bay Fishery

Average weight-at-age by quarters and by seasons for the period 1973-85 are presented in Table 8.5.1. The overall average weight in the fourth quarter is considerably less than in the same quarter in the 1982-83 and 1983-84 seasons. This is a reflection of both the lower average weights in the 2-3 and 3-4 year olds and the relatively higher proportion of 1 to 2 year olds in the 1984-85 catches. The mean weight of 0 to 1 year old fish in the fourth quarter is higher than in 1983-84 and is about the same as that for the 1981-82 and 1982-83 averages.

8.6 Predation Mortality

No predation mortality estimates were available for this stock.

8.7 Equilibrium Yield and Catch Prediction

The relationship between the Lyme Bay sprat populations and those further offshore in the western Channel (Division VIIc), and the relationship between sprat populations in Division VIIe with those in Division VIId is not known. It is therefore not possible to use the stock estimates for Lyme Bay sprat in any wider context and the apparent stock sizes and levels of fishing mortality are not necessarily a reliable guide to the state of the stock as a whole. It is, however, reasonable to conclude that the stock in Division VIIe has returned to much lower levels than those recorded in 1979-80 - 1981-82, and there is no obvious reason to expect much change in catches at the present level of fishing in the western Channel.

9 SPECIAL QUESTIONS

9.1 The Ban on Fishing for Sprat and Herring in Certain Areas of the North Sea

The EEC Commission has asked ICES, whether alternative management measures to the so called sprat boxes could be envisaged without reducing the potential conservation effects. The background for this question is, that the ban on fishing for sprat and herring within these areas affect small vessels far more than large vessels, which can fish further offshore.

The present boxes are defined as follows (EEC regulations of 19.12.1984):

Fishing for sprat shall be prohibited:

a) from 1 July to 31 October 1985 within the area bounded by the following coordinates:

- the west coast of Denmark at $55^0 30'N$,
- latitude $55^0 30'N$ longitude $07^0 00'E$,
- latitude $57^0 00'N$ longitude $07^0 00'E$,
- the west coast of Denmark at $57^0 00'N$;

b) in ICES statistical rectangle 39E8 from 1 January to 31 March 1985 and from 1 October to 31 December 1985. For the purposes of this Regulation, this ICES rectangle is bounded by a line running due east from the east coast of England along latitude $55^0 00'N$ to longitude $1^0 00'W$, due north to latitude $55^0 30'N$ and due west to the English coast;

c) in the inner waters of the Moray Firth west of longitude $3^0 30'W$ and in the inner waters of the Firth of Forth west of longitude $3^0 00'W$ from 1 January to 31 March 1985 and from 1 October to 31 December 1985.

As the sprat is regulated by TACs,the closures were introduced in 1983 in order to protect 0-group herring, which were caught in increasing amounts in the sprat fisheries as the sprat stock declined and strong herring year classes appeared. Consequently, the question raised by EEC lies outside the competence of the present Working Group.

9.2 Regulatory Measures in Division IIIa

ICES has also been asked to consider the merits of different regulatory measures in the sprat fisheries in the Skagerrak and the Kattegat. Protection of 0-group herring is again the main aim of regulations and thus outside the scope of the Industrial Fisheries Working Group. It may be stated, however, that any regulatory measure aimed at 0-group herring will encompass problems for the small vessels and to an even higher degree than in the North Sea.

10 THE USE OF IYFS DATA

The Working Group on the International Young Fish Surveys decided at its meeting in January 1985 to exchange length distributions on tape immediately after the survey had finished. The standard tapeformat is used and each country submit preliminary length distributions. When the biological information has been analysed the final tapes are exchanged.

Preliminary tapes were available from England, The Netherlands, and Denmark. These length distributions could be used in combination with the preliminary index of the 1-group Norway pout and sprat, which were available as in previous years. The preliminary indices are based on an estimated 1-group catch, where the 1-group is determined as fish beneath a given length (Norway pout < 15 cm, sprat < 10 cm). In previous years this approximation has shown to overestimate the number of 1-group

fish, however, the bias is varying from year to year.

This year, preliminary age-length keys were available from Norway, Scotland, and Denmark. These were used to identify a more appropriate separation length between the 1-group fish and older.

Norway Pout

Length (cm)	11	12	13	14	15
Proportion of 1-group (%)	100	100	66	0	0

The use of this age/length key compared to the rough "less than 15 cm" age/length key reduces the number of 1-group fish by 20%. This decrease can be excpected to be an overestimate, because only age-length keys from the northeastern area were available.

Sprat

Area

	Length (cm)	8.5	9	9.5	10	10.5
North 55^0N, East 4^0E	Proportion 1-group (%)		100	40	33	0
North 55^0N, West 4^0E	Proportion 1-group (%)		100	16	0	
South 55^0N, West 4^0E	Proportion 1-group (%)		100	100	40	0
South 55^0N, East 4^0E	Proportion 1-group (%)	100	88	50	8	0

The use of the above age/length key compared to the rough "less than 10 cm" age-length key reduces the number of 1-group in Division IVb with 3%

The Working Group consider the preliminary length distributions very useful and in future years hopefully all participating countries will be able to submit the preliminary exchange tapes. In addition to the preliminary data the Working Group will have access to data from earlier years, and it will be possible to calculate rather precise preliminary indices and analyse changes in the distribution.

This year the exchange of preliminary tapes were intended to test whether the quick exchange was possible in practice. The conclusion from this Working Group was that the exchange was succesful and the data were very useful for the analyses of Norway pout and sprat.

11 DATA REQUIREMENTS

The Working Group noted that for some stocks the collection of catch data and biological data was insufficient to provide a basis for an analytical assessment.

Division IIIa Sprat

The lack of biological data and catch data divided into Skagerrak and Kattegat for the Swedish landings hampered the analysis of sprat in Division IIIa.

Channel Sprat

Biological data on the catches taken by Denmark and the Netherlands need to be available for this area.

Sandeel, Norway Pout

The Working Group made use of the effort data from the Danish fishery, and expected it to be even more useful in future as the time series increase.

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Table 2.1. Total Industrial Landings (tonnes x 10^{-3}) from the North Sea.

Year	Norway pout	Sandeel	Sprat	Blue whiting[1]	Herring[2]	Protected species[3]	Total
1974	736	525	314	62		220	1 857
1975	560	428	641	42		128	1 799
1976	435	488	622	36	12	198	1 791
1977	390	786	304	38	10	147	1 675
1978	270	787	378	100	8	68	1 611
1979	320	578	380	64	15	77	1 434
1980	471	729	323	76	7	69	1 675
1981	236	569	209	62	84	85	1 245
1982	360	620	153	118	153	57	1 461
1983	423	537	91	118	159	38	1 366
Average 1974-83	420	605	342	72	45	109	1 591
Per cent of total	26.4	38.0	21.5	4.5	2.8	6.8	100.0
1984[5]	355	669	80	79	114	34	1 335
Per cent of total	26.7	50.3	6.0	5.9	8.6	2.6	100.0
Per cent of average	84.5	110.6	23.3	109.7	254.5	31.2	83.7

[1]) C.M.1985/Assess:3;
[2]) C.M.1984/Assess:12;
[3]) C.M.1984/Assess:7 and 10 (Saithe, haddock, whiting);
[4]) Does not include other species which on an average range from 20 000 to 40 000 tonnes;
[5]) Preliminary;

Table 2.2. North Sea. HERRING catches for reduction purposes (tonnes) by year and Division.

Division	1977	1978	1979	1980	1981	1982	1983	198
IVa, West	502	27	443	705	7 933	331	546	13 59
IVa, East	186	-	2	48	-	491	2 574	47 85
IVb	8 790	7 545	14 882	6 008	75 533	150 357	155 361	52 30
IVc	-	223	1	494	702	1 699	11	5
Total	9 478	7 795	15 328	7 255	84 168	152 878	158 492	113 80

Table 3.1.1. North Sea. Total reported by-catch (tonnes) of HADDOCK, WHITING and SAITHE for reduction purposes.[1])

Species	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984[2]
Haddock	41 380	48 204	34 993	9 659	16 380	22 461	16 985	19 378	13 075	9 216
Whiting	86 376	149 759	106 104	55 274	59 021	45 747	66 595	32 990	23 637	18 214
Saithe	37 678	66 766	6 197	2 566	1 635	363	1 280	5 003	1 445	6 166

[1]) C.M.1984/Assess:7 and 10

[2]) Preliminary

Table 3.1.2. North Sea. Species composition in Norwegian NORWAY Pout Landings (tonnes) for reduction purposes.

Year	Quarter	Landings	Norway Pout	Blue Whiting	Cod	Haddock	Whiting	Saithe	Herring	Mackerel	Others
1975	1-4	297 222	218 900	40 210	1 188	9 840	13 243	4 330			9 511
1976	1-4	200 777	108 937	34 600	783	3 133	6 744	12 850			33 730
1977	1-4	143 001	98 291	20 737	661	920	2 707	4 390			15 300
1978	1-4	136 455	80 755	39 989	659	766	1 462	2 494			10 351
1979	1-4	117 803	75 350	31 111	479	1 549	1 659	876	3	9	6 767
1980	1	14 469	10 569	913	195	306	759	107			1 620
	2	36 896	18 473	14 093	207	359	312	130			3 322
	3	42 900	32 532	6 499	136	346	42	87			3 258
	4	13 794	8 614	1 247	12	214	86	18			3 603
	1-4	108 059	70 188	22 752	550	1 225	1 199	342			11 803
1981	1	8 565	6 996	363	58	106	359	75		1	607
	2	28 700	17 276	7 826	111	392	221	72		25	2 777
	3	30 127	20 001	6 214	64	365	69	1 024		12	2 378
	4	9 217	7 342	777	26	239	150	50		4	629
	1-4	76 609	51 615	15 180	259	1 102	799	1 221		42	6 391
1982	1	8 555	7 468	175	58	129	306	41			378
	2	48 017	33 659	9 949	135	467	59	176			3 572
	3	68 498	29 383	27 937	78	321	120	4 368		17	6 274
	3	30 191	17 459	10 065	11	97	180	418			1 961
	1-4	155 261	87 969	48 126	282	1 014	665	5 003		17	12 185
1983	1	8 631	6 018	1 652	71	133	168	303			286
	2	82 562	32 367	38 569	386	431	141	406		57	10 205
	3	74 000	45 493	20 157	254	240	133	603	3	19	7 098
	4	17 627	13 429	2 693	29	129	170	133			1 044
	1-4	182 820	97 307	63 071	740	933	612	1 455	3	76	18 623
1984	1	15 282	8 932	4 302	141	102	225	357			1 223
	2	81 039	36 876	31 134	595	900	690	3 839	6		6 999
	3	50 448	31 786	14 445	90	289	35	590	6	2	3 205
	4	11 028	6 169	2 779	36	83	231	830		1	899
	1-4	157 797	83 763	52 660	862	1 374	1 181	5 616	12	3	12 326

Table 3.1.3. North Sea. Species composition in Norwegian SANDEEL landings 1979-1984 (tonnes)

Year	Landings	Sandeel	Cod	Haddock	Whiting	Saithe	Herring	Mackerel	Others
1979	103 273	101 420	231	520	208	250	-	-	644
1980	147 748	144 752	54	1 118	382	-	-	-	1 442
1981	53 370	52 641	29	504	68	4	6	6	112
1982	47 647	46 514	86	703	107	-	8	-	229
1983	12 376	12 179	34	100	8		3	2	.50
1984	23 479	23 383	-	10	16	-	-	-	70

Table 4.1.1 NORWAY POUT Annual Landings (in thousand tonnes) in Sub-area IV by countries North Sea 1957-1984.

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		0		359.7
1983	301.1	24.5	97.3		+		422.9
1984	251.9	19.1*	83.8		0.1		354.99

*including by-catch

Table 4.1.2 NORWAY POUT. North Sea. National landings (tonnes) by months 1980-1984 (Denmark, Norway, United Kingdom (Scotland)

Month	Denmark	Norway	Faroes	United Kingdom (Scotland)	TOTAL
1980					
Jan	14 792	5 065	2 299	193	22 340
Feb	18 620	3 530	3 534	315	25 999
Mar	11 653	19 974	2 010	-	15 637
Apr	7 233	2 125	158	8	9 524
May	7 853	8 088	2 249	-	18 190
Jun	3 114	8 260	2 104	-	13 478
Jul	55 385	8 695	3 001	-	67 081
Aug	66 255	10 519	2 325	-	79 099
Sep	71 144	13 318	7 846	87	92 395
Oct	60 474	1 378	3 976	-	65 828
Nov	28 749	6 426	3 279	-	38 454
Dec	20 938	810	1 282	-	23 100
TOTAL	366 210	70 188	34 063	603	471 064
1981					
Jan	11 782	2 822	784		15 388
Feb	20 632	2 892	1 601		25 125
Mar	10 923	1 282	1 577	-	13 782
Apr	6 103	3 119	2 147	-	11 369
May	1 414	6 733	2 291	-	10 438
Jun	4 541	7 424	1 726	-	13 691
Jul	7 471	5 569	2 817	-	15 857
Aug	25 715	10 335	724	-	36 774
Sep	16 465	4 097	-	-	20 561
Oct	23 721	2 534	958	-	27 213
Nov	17 174	1 431	1 136	-	19 741
Dec	21 540	3 377	610	-	25 727
TOTAL	167 481	51 615	16 371	0	235 666
1982					
Jan	13 072	3 981	223	-	17 276
Feb	12 998	1 775	641	-	15 414
Mar	12 117	1 712	1 379	-	15 208
Apr	10 162	6 056	1 098	-	17 316
May	542	7 741	1 068	-	9 351
Jun	0	19 862	1 160	-	21 022
Jul	32 488	11 132	2 225	-	45 845
Aug	38 939	8 826	1 891	-	49 656
Sep	66 734	9 425	1 608	-	77 767
Oct	25 223	8 128	2 072	-	35 423
Nov	23 888	4 957	1 330	-	30 175
Dec	20 060	4 374	675	-	25 109
TOTAL	256 223	87 969	15 370	0	359 562

Month	Denmark	Norway	Faroes	United Kingdom (Scotland)	TOTAL
1983					
Jan	10 343	856		–	11 887
Feb	19 621	2 939		–	23 941
Mar	19 720	2 223		–	23 290
Apr	7 628	4 795		–	13 181
May	1 851	15 205		–	18 084
Jun	5 563	12 367		–	19 016
Jul	20 217	12 655		–	34 889
Aug	39 145	20 446		–	63 250
Sep	70 668	12 392		–	88 172
Oct	47 949	4 948		–	56 157
Nov	30 630	6 369		–	39 279
Dec	27 801	2 112		–	31 757
TOTAL	301 136	97 306	24 463	0	422 903
1984					1)
Jan	14 176	2 639			17 770
Feb	18 691	2 455			22 347
Mar	5 696	3 838			10 076
Apr	6 000	6 949			13 685
May	7 097	19 861			28 489
Jun	1 057	10 066			11 755
Jul	16 598	6 948			24 884
Aug	40 362	13 909		89	57 443
Sep	49 925	10 929			64 311
Oct	37 469	5 100			44 987
Nov	36 525	366			38 987
Dec	18 290	703			20 072
TOTAL	251 886	83 763	19 067	89	354 806

1) estimated, assuming Faroes catch is distributed monthly as the Danish and Norwegian catch.

Table 4.1.3 NORWAY POUT. Annual Landings (tonnes) in Division VIa (for 1971-84 data officially reported to ICES).

Country	1971	1972	1973	1974	1975	1976	1977
Belgium	1	-	-	-	-	-	-
Denmark	363	186	42	-	193	-	-
Faroes	-	-	1 743	1 581	1 524	6 203	2 177
Germany,Fed. Rep.	-	-	-	179	-	8	-
NetherLands	-	-	-	-	322	147	230
Norway	-	-	-	144+	-	82+	-
Poland	-	-	-	75	-	-	-
UK (Scotland)**	1 622	3 760	9 282	4 702	6 614	6 346	2 799
USSR	-	-	-	40	2	7 147	-
TOTAL	1 986	3 946	11 067	6 721	8 655	19 933	5 206

Country	1978	1979	1980	1981	1982	1983	1984*
Belgium	-	-	-	-	-	-	-
Denmark	4 443	15 609	13 070	2 877	751	530	4 301
Faroes	18 484	4 772	3 530	3 540	3 026	6 261	3 400
Germany,Fed.Rep.	-	-	-	-	-	-	70
NetherLands	21	98	68	182	548	1 040	***
Norway	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-
UK(Scotland)**	302	23	1 202	1 158	586	+	23
USSR	-	-	-	-	-	-	-
Total	23 250	20 502	17 870	7 757	4 911	7 831	7 794

* preliminary
** amended using national data
*** data not available
\+ including by-catch

Table 4.1.4 NORWAY POUT Annual Landings (tonnes) in Division IIIa (for 1971-84 data officially reported to ICES).

Country	1971	1972	1973	1974	1975	1976
Denmark	25 800	17 259	23 152	10 669	15 666	40 144
Faroes			643			
Norway	296			62**	925**	50**
Sweden		1)	1)	1)		2 255
Total	26 096	17 259	23 795	10 731	19 863	42 449

Country	1977	1978	1979	1980	1981	1982	1983	1984*
Denmark	20 649	23 922	23 951	26 235	29 273	51 317	36 124	66 895
Faroes								
Norway	104	362	1 182	141	752	1 265	990	-
Sweden	318	591+	32	39	60	0103	52	-
Total	21 116	24 875	25 165	26 415	30 085	52 685	37 166	66 895

* preliminary
** including by-catch
+ includes North Sea
1) included in the North Sea

Table 4.2.1 Norway POUT. Danish cpue data (tonnes/days fishing) by vessel category for 1982-84.

Vessel GRT	1982	1983	1984	Scaling *factor**
51-100	12.81	8.90	8.44	1.00
101-150	22.84	22.44	19.52	1.69
151-200	27.39	28.43	23.36	2.15
201-250	29.31	32.28	26.01	2.53
251-300	29.22	30.96	26.20	2.85
301-	26.46	33.37	31.07	3.00

* According to the model in Figure 4.2.1.

Table 4.2.2 Norway POUT. Percentage of the Danish catches (by weight) sampled for fishing effort in the Danish fishery.

Year	1Q	2Q	3Q	4Q	Whole year
1982	79%	48%	33%	50%	46%
1983	60%	52%	68%	81%	70%
1984	84%	62%	57%	70%	66%

Table 4.2.3 Norway POUT, Catch per unit effort, hectolitres per days fishing per mean GRT, by quarters in the Norwegian fishery.

Quarter	1	2	3	4	Weighted mean all year
Year					
1976	1.458	1.401	1.010	1.214	1.221
1977	1.299	1.346	1.304	1.413	1.346
1978	0.916	1.251	1.631	1.427	1.353
1979	1.192	1.276	1.512	1.656	1.364
1980	1.000	2.198	1.648	1.518	1.658
1981	1.050	1.383	1.120	1.032	1.186
1982	0.841	1.693	1.674	1.571	1.559
1983	1.454	1.677	1.441	1.569	1.566
1984	1.229	1.469	1.406	1.217	1.394

Table 4.2.4 Norway POUT. Cpue as in Table 4.2.3, except that those catches with less than or equal to 70% Norway pout in weight are excluded.

Quarter	1	2	3	4	Weighted mean all year
Year					
1976	1.435	1.451	0.992	1.200	1.223
1977	1.302	1.397	1.304	1.450	1.362
1978	0.926	1.254	1.527	1.447	1.306
1979	1.272	1.217	1.559	1.676	1.425
1980	0.989	2.351	1.734	1.592	1.634
1981	1.068	1.429	1.194	1.055	1.218
1982	0.841	1.676	1.681	1.603	1.548
1983	1.381	1.703	1.466	1.555	1.556
1984	1.243	2.151	1.461	1.163	1.668

Table 4.2.5 Norway POUT. Danish and Norwegian fishing effort (no. of fishing days). The mean Norwegian vessel size in each quarter is shown. The Danish effort data have been scaled to this vessel size in each quarter. The Norwegian landings with less than or equal to 70% Norway pout have been excluded.

Quarters	Q1	Q2	Q3	Q4
1982				
Norwegian av. GRT	161.2 GRT	122.5 GRT	160.5 GRT	170.9 GRT
Norwegian effort	733	2240	1934	740
Danish effort	2283	764	4565	2468
Total	3016	3004	6499	3208
1983				
Norwegian av. GRT	150.3 GRT	155.4 GRT	147.8 GRT	154.8 GRT
Norwegian effort	302	1671	2302	811
Danish effort	3077	934	4546	4237
Total	3379	2605	6848	5048

cont.

1984				
Norwegian av. GRT	146.2 GRT	121.0 GRT	139.9 GRT	175.5 GRT
Norwegian effort	473	1633	1622	282
Danish effort	2587	1077	4752	3759
Total	3060	2710	6374	4041

Table 4.3.1 Norway POUT. Input data for quarterly VPA. Catch at age (no x 10^{-5})

		Age Groups				
Year	Quarter	0	1	2	3	4
1974	1*	-	13 450	414	26	1
	2*	-	7 873	193	26	1
	3*	846	9 966	489	145	-
	4*	5 720	7 809	140	4	-
1975	1*	-	3 742	1 726	13	-
	2	-	7 206	383	2	-
	3	889	7 117	349	-	-
	4	9 968	2 027	461	1	-
1976	1	-	4 950	589	91	-
	2	-	7 580	645	58	-
	3	197	5 349	590	2	-
	4	5 986	3 157	320	15	-
1977	1	-	9 171	950	33	3
	2	-	3 577	367	8	-
	3	61	3 580	861	45	-
	4	1 655	3 540	236	5	-
1978	1	-	2 931	1 371	93	4
	2	-	1 181	650	194	-
	3	304	2 385	786	30	-
	4	1 225	1 400	322	6	-
1979	1	-	5 079	940	170	3
	2	-	3 270	249	27	1
	3	968	4 244	763	49	-
	4	864	2 154	167	11	-
1980	1	-	5 044	1 075	59	2
	2	-	2 586	689	29	5
	3	24	7 711	1 960	18	-
	4	641	3 920	512	6	-
1981	1	-	2 223	1 688	76	6
	2	-	1 072	621	77	0
	3	77	1 316	944	17	1
	4	36 560	1 038	301	3	1

* Not used in VPA

contd....

Table 4.3.1 contd.

Year	Quarter	Age Groups 0	1	2	3	4
1982	1	–	5 267	415	216	0
	2	–	3 251	275	23	0
	3	151	6 576	431	62	0
	4	1 058	3 017	46	0	0
1983	1	–	3 969	1 224	14	0
	2	–	1 723	1 165	9	0
	3	421	5 495	1 485	16	1
	4	2 520	4 053	358	7	1
1984	1	–	2 732	1 361	142	0
	2	–	2 230	1 153	266	0
	3	1	5 238	1 666	–	0
	4	2 209	3 457	727	–	0

Table 4.3.2 Norway POUT. Quarterly VPA fishing mortality ($Quarter^{-1}$)

		Age Groups				
Year	Quarter	0	1	2	3	4
1976	3	0.001	0.24	0.45	0.04	-
	4	0.06	0.27	0.60	0.58	-
1977	1		0.14	0.15	0.14	0.2
	2		0.09	0.10	0.06	-
	3	0.001	0.16	0.43	0.63	-
	4	0.03	0.29	0.25	0.15	-
1978	1		0.08	0.21	0.18	0.20
	2		0.05	0.19	0.95	-
	3	0.002	0.16	0.45	0.46	-
	4	0.01	0.17	0.43	0.19	-
1979	1		0.07	0.20	0.55	0.20
	2		0.08	0.09	0.19	-
	3	0.005	0.17	0.58	0.82	-
	4	0.007	0.15	0.30	0.54	-
1980	1		0.06	0.12	0.20	0.20
	2		0.05	0.13	0.18	-
	3	-	0.27	0.91	0.20	-
	4	0.02	0.26	0.86	0.12	-
1981	1		0.10	0.21	0.37	0.20
	2		0.08	0.14	1.09	
	3	-	0.16	0.42	1.09	
	4	0.25	0.24	0.29	0.85	
1982	1		0.064	0.173	0.446	
	2		0.063	0.206	0.095	
	3	0.001	0.217	0.745	0.500	
	4	0.008	0.181	0.197	-	
1983	1		0.046	0.128	0.105	-
	2		0.031	0.216	0.112	
	3	0.002	0.161	0.601	0.373	
	4	0.020	0.213	0.355	0.350	
1984	1		0.033	0.127	0.292	-
	2		0.042	0.187	2.234	
	3	-	0.162	0.575	0.500	
	4	0.026	0.190	0.700	-	-

Table 4.3.3 Norway POUT. Quarterly VPA. Stock in number x 10^{-6}

		Age Groups				
Year	Quarter	0	1	2	3	4
1976	3	197 354	30 693	1 963	67	
	4	132 130	16 258	843	43	
1977	1		83 710	8 353	310	17
	2		48 689	4 831	181	
	3	110 491	29 737	2 941	115	
	4	74 015	17 037	1 281	41	
1978	1		48 269	8 568	668	24
	2		29 978	4 636	372	
	3	196 582	19 136	2 582	97	
	4	131 519	10 966	1 116	37	-
1979	1		87 164	6 218	490	20
	2		54 307	3 409	192	
	3	222 405	33 750	2 083	107	
	4	148 295	19 191	787	33	
1980	1		98 703	11 120	393	13
	2		62 069	6 584	216	
	3	63 388	39 506	3 855	121	
	4	42 471	20 266	1 037	67	
1981	1		27 948	10 424	290	40
	2		16 932	5 625	134	
	3	294 360	10 481	3 268	29	
	4	197 253	5 961	1 433	6	
1982	1		102 736	3 158	718	-
	2		64 592	1 781	308	
	3	240 983	40 659	972	182	
	4	161 413	21 944	309	-	
1983	1		107 338	12 271	170	-
	2		68 728	7 234	103	
	3	230 697	44 670	3 908	62	
	4	154 299	25 498	1 436	28	
1984	1		101 381	13 818	675	-
	2		65 738	8 161	338	
	3	155 657	42 255	4 538	24	
	4	104 339	24 087	1 712	-	

Table 4.4.1. Norway POUT
Recruitment indices from 1970-85 as shown by number per hour's fishing on research vessel surveys

	IYFS		English surveys				
	Arithmetic means as		August North Sea 2)	Norway pout survey November			
Year class	1-group	2-group	0-group (entire North Sea)	0-group	1-group	2-group	3-group
1968		6		(main Norway pout distribution area)			
1969	35	22					
1970	1 556	653					
1971	3 425	438					
1972	4 207	399					
1973	25 626	2 412					
1974	4 242	385					
1975	4 599	334					
1976	4 813	1 215					5
1977	1 913	240	1 387			222	82
1978	2 690	611	1 210		5 501	431	-
1979	4 081	557	1 607	6 449	4 519	123	36
1980	1 375	403	151	2 106	2 146	42	-
1981	4 315	n/a	1 770	23 946	7 166	1 935	74[1]
1982	2 612*	n/a	1 817	19 567	7 603	132[1]	
1983	3 587*	n/a	1 501	21 852	6 524[1]		
1984	2 764*		177	5 416[1]			

* Preliminary

[1])1984 Figures for English survey (semi-pelagic trawl) October/November 1984. Average No/hr for Roundfish Areas 1.2.3 (40 hours fishing in total).

2)Groundfish survey

Table 4.5.1 Norway POUT. North Sea 1984.
Mean weight at age by quarters, Danish and Norwegian catch combined (grammes).

Quarters	Age Groups				
1984	0	1	2	3	4
1	-	6.55	24 04	39.54	-
2	-	8.97	22.66	37.00	-
3	-	17.83	34.28	34.10	-
4	6.54	20.22	35.07	46.23	-

Table 4.5.2 Norway POUT. North Sea. Quarterly and annual landings in weight by age as a percentage of the overall landings.

		Age Groups				
Year/Quarter		0	1	2	3	4
1979	1	0	11%	6%	2%	-
	2	0	10%	2%	0.3%	0
	3	1%	32&	10%	-	0
	4	2%	19%	3%	-	0
Total		3%	72%	21%	3%	-
1980	1	0	8%	4%	-	-
	2	0	5%	3%	-	-
	3	-	38%	17%	-	-
	4	1%	19%	4%	-	-
Total		1%	70%	28%	1%	-
1981	1	0	7%	16%	1%	-
	2	0	6%	6%	1%	0
	3	-	16%	16%	-	-
	4	10%	14%	6%	-	0
Total		10%	43%	44%	3%	-
1982	1	-	10%	3%	2%	
	2		7%	1%	1%	
	3	1%	42%	5%	1%	
	4	2%	24%	1%		
Total		3%	83%	10%	4%	-
1983	1	-	7%	6%	-	
	2	-	4%	7%	-	
	3	1%	29%	13%	-	
	4	4%	25%	3%		
Total		5%	65%	29%	1%	-
1984	1	-	5%	9%	2%	
	2	-	6%	1%	3%	
	3	0	26%	16%	-	
	4	4%	20%	7%	-	
Total		4%	57%	33%	5%	-

Table 5.1.1 Landings of SANDEEL from the North Sea 1952-84 in '000 tonnes

Year	Denmark	Germany,Fed.Rep.	Faroes	Netherland	Norway	Sweden	U.K.	TOTAL
1952	1.6	0	0	0	-	0	0	1.6
1953	4.5	+	0	0	-	0	0	4.5
1954	10.8	+	0	0	-	0	0	10.8
1955	37.6	+	0	0	-	0	0	37.6
1956	81.9	5.3	0	+	1.5	0	0	88.7
1957	73.3	25.5	0	3.7	3.2	0	0	105.7
1958	74.4	20.2	0	1.5	4.8	0	0	100.9
1959	77.1	17.4	0	5.1	8.0	0	0	107.6
1960	100.8	7.7	0	+	12.1	0	0	120.6
1961	73.6	4.5	0	+	5.1	0	0	83.2
1962	97.4	1.4	0	0	10.5	0	0	109.3
1963	134.4	16.4	0	0	11.5	0	0	162.3
1964	104.7	12.9	0	0	10.4	0	0	128.0
1965	123.6	2.1	0	0	4.9	0	0	130.6
1966	138.5	4.4	0	0	0.2	0	0	143.1
1967	187.4	0.3	0	0	1.0	0	0	188.7
1968	193.6	+	0	0	0.1	0	0	193.7
1969	112.8	+	0	0	0	0	0.5	113.3
1970	187.8	+	0	0	+	0	3.6	191.4
1971	371.6	0.1	0	0	2.1	0	8.3	382.1
1972	329.0	+	0	0	18.6	8.8	2.1	358.5
1973	273.0	0	1.4	0	17.2	1.1	4.2	296.9
1974	424.1	0	6.4	0	78.6	0.2	15.5	524.8
1975	355.6	0	4.9	0	54.0	0.1	13.6	428.2
1976	424.7	0	-	0	44.2	-	18.7	487.6
1977	664.3	0	11.4	0	78.7	5.7	25.5	785.6
1978	647.5	0	12.1	0	93.5	1.2	32.5	786.8
1979	449.8	0	13.2	0	101.4	0	13.4	577.8
1980	542.2	0	7.2	0	144.8	0	34.3	728.5
1981	464.4	0	4.9	0	52.6	0	46.7	568.6
1982	506.9	0	4.9	0	46.5	0.4	52.2	610.9
1983	485.1	0	2.0	0	12.2	0.2	37.0	536.5
1984	596.3	0	11.3	0	28.3	-	32.6	668.5

- = no information
+ = less than half unit

Table 5.1.2 SANDEEL. North Sea. Monthly Landings ('000) by country 1981-84

Year/Month	Denmark	Faroes	Norway	Scotland	Total
1981 Jan	4	-	-	-	4
Feb	-	-	172	-	172
Mar	8 758	268	4 731	-	13 757
Apr	42 875	415	5 356	5 018	53 664
May	120 410	439	27 179	7 430	155 458
Jun	109 175	96	6 100	10 032	125 403
Jul	118 130	1 300	5 575	10 403	135 408
Aug	30 724	1 162	1 455	7 107	40 448
Sep	16 836	1 181	-	5 968	23 985
Oct	17 502	74	2 031	710	20 317
Nov	-	-	-	-	-
Total	464 414	4 935	52 599	46 668	568 616
1982 Jan	-		-	-	-
Feb	-		-	-	-
Mar	844		3 306	-	4 150
Apr	83 948		8 895	5 953	98 796
May	168 551		16 797	9 349	194 697
Jun	188 963	n/a	17 516	10 011	216 490
Jul	55 240		-	10 889	66 129
Aug	7 310		-	8 017	15 327
Sep	2 060		-	6 458	8 518
Oct	-		-	1 329	1 329
Nov	-		-	-	-
Total	506 916	4 903	46 514	52 006	605 436*
1983 Jan	-		-	-	-
Feb	-		-	-	-
Mar	-		210	-	210
Apr	59 388		1 055	2 431	62 874
May	162 952		6 363	7 477	176 792
Jun	182 159	n/a	2 141	10 074	194 374
Jul	59 709		2 410	8 397	70 516
Aug	14 253		-	6 769	21 022
Sep	5 089		-	1 729	6 818
Oct	1 548		-	124	1 672
Nov	3		-	-	3
Dec	-		-	-	-
Total	485 101	2 000	12 179	37 001	534 281*

* Excl. Faroese

.../contd.

Table 5.1.2 Contd.

Year/Month	Denmark	Faroes	Norway	Scotland	Total
1984 Jan	–		–	–	–
Feb	–		–	–	–
Mar	1 334		20	–	1 354
Apr	62 510		20	5 499	68 029
May	210 598		2 167	8 134	220 899
Jun	232 497	n/a	26 123	6 413	265 033
Jul	67 590		–	6 349	73 939
Aug	18 373		–	5 005	23 378
Sep	3 364		–	1 134	4 498
Oct	5		–	44	49
Nov	–		–	–	–
Dec	–		–	–	–
Total	596 271	11 254	28 330	32 578	657 179*

* Excl. Faroese

Table 5.1.3 SANDEEL North Sea. Catch ('000 tonnes) by month and area (Denmark, Norway, UK(Scotland)).

Year/Month		AREA IA	IB	IC	2A	2B	2C	3	4	5	6	Shetland-
1979	Mar			351			682					
	Apr	11 476	49	3 602	2 067	1 130	1 536	534	4 090			906
	May	47 648	+	4 099	23 149	2 044	642	5 992	38 584	867	8 848	2 985
	Jun	119 632	281	12 556	4 316	5 886	333	7 978	24 277	1 645	21 598	3 907
	Jul	15 700	454	2 149	1 253	17 593	1 997	6 408	12 493	2 859	12 266	2 413
	Aug		143	14 883		86	63 574	7 043			11	2 518
	Sep			8 868	1 490	112	1 306	542			764	649
	Oct		+	14 455		173	2 262	5 630			764	26
	Nov							5				
Total		194 456	927	60 963	32 275	27 024	72 332	34 132	79 444	5 371	44 251	13 404
1980	Mar	581		6 048	1 938	605	9 433				1	
	Apr	6 797	1 031	6 374	5 043	4 208	13 179		1 956			1 803
	May	108 561	821	30 256	27 870	21 595	808	20 477	10 676	991	8 422	3 219
	Jun	81 909	1 404	44 828	48 682	23 865	247	35 706	11 399	6 146	26 316	6 845
	Jul	17 249	74	9 140	5 978	2 079	102	18 076	6 812	1 516	18 240	6 920
	Aug			2 833		16		10 290				5 311
	Sep			3 100		19		5 213			2 617	1 346
	Oct			15 995			3 218	242			1 463	
	Nov			716								
Total		215 097	3 330	119 290	89 511	52 387	26 987	90 004	30 843	8 653	57 059	25 444
1981	Feb	-	-	172	-	-	-	-	-	-	-	
	Mar	-	-	4 703	-	-	7 364	-	-	-	1 422	-
	Apr	18 116	-	5 257	4 535	-	9 132	4 863	2 238	678	3 412	5 019
	May	63 193	19	25 712	16 685	2 840	5 445	4 953	19 111	852	8 779	7 430
	Jun	22 388	1	4 631	8 477	990	1 699	15 475	27 018	11 184	23 429	10 018
	Jul	-	90	906	87 721	5 111	227	6 001	15 074	584	7 991	10 406
	Aug	-	-	1 455	8 304	-	-	22 420	-	-	-	7 107
	Sep	-	-	-	12 081	453	-	4 302	-	-	-	5 968
	Oct	1 466	-	-	14 063	2 310	-	1 596	-	-	98	710
	Nov	-	-	-	-	-	-	-	-	-	-	-
Total		105 163	110	42 836	151 866	11 704	23 867	59 610	63 441	13 298	45 131	46 652

..../contd.

Table 5.1.3 ctd.

Year/Month	AREA										
	IA	IB	IC	2A	2B	2C	3	4	5	6	Shetland
1982 Mar	-	-	502	844	2 130	674	-	-	-	-	-
Apr	42 046	4 981	3 153	23 007	6 071	1 150	2 891	1 905	-	7 639	5 953
May	67 920	34	139	67 822	14 837	370	20 265	2 066	-	11 895	9 349
Jun	73 654	349	586	31 521	756	139	3 278	41 203	5 916	49 077	10 011
Jul	6 167	-	-	8 901	1 058	-	2 124	30 512	956	5 522	10 889
Aug	-	-	-	-	-	-	6 742	-	-	568	8 017
Sep	-	-	-	-	-	-	2 060	-	-	-	6 456
Oct	-	-	-	-	-	-	-	-	-	-	1 329
Nov	-	-	-	-	-	-	-	-	-	-	-
Total	189 787	5 364	4 380	132 095	24 852	2 333	37 360	75 686	6 872	74 701	52 008
1983 Mar	-	-	186	-	24	-	-	-	-	-	-
Apr	32 375	-	465	6 059	3 235	-	17 427	1 439	-	353	2 431
May	111 701	-	627	16 287	8 588	-	11 015	7 378	-	13 719	7 477
Jun	50 096	-	1 571	16 667	4 395	-	7 892	57 004	-	46 675	10 074
Jul	3 265	-	-	20 359	2 410	-	3 520	21 576	8 000	2 809	8 397
Aug	-	-	-	-	-	-	11 245	-	-	3 008	6 769
Sep	-	-	-	-	-	-	5 018	-	-	71	1 729
Oct	-	-	-	-	-	-	1 548	-	-	-	124
Nov	-	-	-	3	-	-	-	-	-	-	-
Total	197 437	-	2 849	59 375	17 742	-	57 665	87 577	8 000	66 635	37 001
1984 Mar	-	-	20	-	-	-	1 334	-	-	-	-
Apr	42 543	-	3 195	4 340	4 052	-	6 330	1 852	-	218	5 499
May	120 832	2 672	77	21 352	23 029	-	21 058	8 483	2 510	12 752	8 134
Jun	157 551	-	2 654	46 192	2 124	86	7 506	7 095	376	35 036	6 413
Jul	16 520	-	-	2 684	833	-	3 772	37 953	1 032	4 796	6 349
Aug	370	1 437	-	292	331	-	8 574	657	-	6 712	5 005
Sep	-	-	-	-	-	-	2 728	-	-	636	1 134
Oct	-	-	-	1	1	-	1	-	-	2	44
Total	337 816	4 109	5 946	74 861	30 370	86	51 303	56 040	3 918	60 152	32 578

Table 5.1.4. Annual landings ('000 tonnes) of SANDEELS by Sub-area of the North Sea [Denmark, Norway, United Kingdom (Scotland)].

	Sub-areas											Assessment Areas*	
Year	1a	1b	1c	2a	2b	2c	3	4	5	6	Shetland	Northern	Southern
1972	98.8	28.1	3.9	24.5	85.1	0.0	13.5	58.3	6.7	28.0	0.0	130.6	216.3
1973	59.3	37.1	1.2	16.4	60.6	0.0	8.7	37.4	9.6	59.7	0.0	107.6	182.4
1974	50.4	178.0	1.7	2.2	177.9	0.0	29.0	27.4	11.7	25.4	7.4	386.6	117.1
1975	70.0	38.2	17.8	12.2	154.7	4.8	38.2	42.8	12.3	19.2	12.9	253.7	156.5
1976	154.0	3.5	39.7	71.8	38.5	3.1	50.2	59.2	8.9	36.7	20.2	135.0	330.6
1977	171.9	34.0	62.0	154.1	179.7	1.3	71.4	28.0	13.0	25.3	21.5	348.4	392.3
1978	159.7	50.2		346.5	70.3		42.5	37.4	6.4	27.2	28.1	163.0	577.2
1979	194.5	0.9	61.0	32.3	27.0	72.3	34.1	79.4	5.4	44.3	13.4	195.3	355.9
1980	215.1	3.3	119.3	89.5	52.4	27.0	90.0	30.8	8.7	57.1	25.4	292.0	401.2
1981	105.2	0.1	42.8	151.9	11.7	23.9	59.6	63.4	13.3	45.1	46.7	138.1	378.9
1982	189.8	5.4	4.4	132.1	24.9	2.3	37.4	75.7	6.9	74.7	52.0	74.4	479.2
1983	197.4	0	2.8	59.4	17.7	0	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

*Assessment areas: Northern - Sub-areas 1b, 1c, 2b, 2c, 3
Southern - Sub-areas 1a, 2a, 4, 5, 6

Table 5.1.5. SANDEEL, Division VIa.
Landings in tonnes 1975-1984 as officially reported to ICES.

Country/Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Denmark						109				
Norway		17	54							
United Kingdom (Scotland)	+	+	13	+		211	5 972	10 873	13 051	14 166

Table 5.1.6. SANDEEL, Division IIIa.
Landings in tonnes as officially reported to ICES except where indicated.

Country	Year													
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Denmark	21 567	7 919	9 878	7 912	16 421	21 418	6 082	21 731	33 305	39 357	59 408	21 540	34 286*	27 679**
Faroes								2						
Sweden		(1)	(1)	(1)	79	67	432	1 121 (2)	3	9	44	5	31	n/a

(1) Included in the North Sea
(2) Includes North Sea
* Final data for Denmark not yet available
** Preliminary estimate from Working Group members
n/a Not available

Table 5.2.1. Fishing effort in the SANDEEL fisheries - Norwegian data.

Year	Fishing Days Norwegian vessels FD	Mean gross registered tonnage GRT	Fishing Effort FD x GRT x 10^{-3}	Sandeel Landings (t x 10^{-3}) Norwegian	Sandeel Landings (t x 10^{-3}) Total international	Fishing effort raised to total catch
			Northern assessment area			
			1st half of year			
1976	595	198.8	118.3	11.1	110.3	1 175.5
1977	2 212	172.3	381.1	50.4	276.0	2 087.0
1978	1 747	203.4	355.3	44.9	109.7	868.0
1979	1 407	213.8	300.8	29.6	47.7	484.4
1980	2 699	204.7	552.5	112.8	220.9	1 081.7
1981	1 780	212.6	378.4	42.8	93.3	824.2
1982	1 222	210.1	256.7	27.0	62.3	591.7
1983	324	267.8	86.8	8.5	54.5	556.4
1984	145	185.8	26.9	3.5	74.1	569.5
			2nd half of year			
1976	119	165.5	19.7	2.0	44.9	442.3
1977	457	184.9	84.5	11.8	110.0	787.7
1978	806	203.7	164.2	22.5	53.3	388.2
1979	1 720	188.9	324.9	53.2	147.7	902.2
1980	1 130	206.1	232.9	33.2	71.1	499.6
1981	414	189.0	78.2	7.9	44.9	446.0
1982	0	-	-	-	12.0	-
1983	66	208.0	13.7	2.4	23.7	133.1
1984	-	-	-	-	17.7	-
			Southern assessment area - all year			
1976	1 488	237.8	353.8	30.7	330.6	3 808
1977	537	185.2	99.5	14.0	392.3	2 780
1978	1 044	222.2	232.0	24.3	577.2	5 508
1979	765	240.1	183.7	18.2	355.9	3 595
1980	3	208.0	0.6	0.1	401.2	2 407
1981	72	199.5	14.4	1.4	378.9	2 826
1982	607	236.1	143.3	20.3	479.2	3 386
1983	40	280.5	11.2	1.2	419.2	3 786
1984	504	246.6	124.3	22.2	532.8	2 983

Table 5.2.2. Danish fishing effort indices
(days fishing multiplied by scaling factors for each vessel category), 1982-1984

	Southern area				Northern area			
	Fishing effort index	Catch sampled for fishing effort t	Total international catch t	Derived total international effort index	Fishing effort index	Catch sampled for fishing effort t	Total international catch t	Derived total international effort index
1982								
1st half	22 408	141 565	426 515	67 512	2 925	10 792	62 305	16 887
2nd half	2 272	9 209	52 626	12 984	529	2 043	11 984	3 103
Total				80 596				19 990
1983								
1st half	39 894	220 983	359 753	64 946	5 580	16 391	54 515	18 559
2nd half	7 627	29 538	59 268	15 304	2 490	12 224	23 741	4 836
Total				80 250				23 395
1984								
1st half	51 629	353 669	461 132	67 317	11 710	45 372	74 137	19 134
2nd half	14 675	59 577	71 655	17 650	3 145	10 992	17 677	5 058
Total				84 967				24 192

Table 5.2.3. Fishing effort (days absence) by month and year in the Shetland Sandeel Fishery 1975-1984. U.K. (Scotland) data

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Jan	-	6	-	-	-	-	-	-	-	-	-
Feb	-	1	-	-	-	-	-	-	-	-	-
Mar	-	22	6	77	12	-	-	-	-	-	-
Apr	-	85	132	191	116	38	95	234	242	83	227
May	5	104	127	217	316	134	156	289	355	295	385
Jun	142	112	222	305	250	161	229	299	359	385	303
Σ	147	330	487	790	694	333	480	822	956	763	915
Jul	165	205	312	277	187	106	242	440	361	339	337
Aug	116	219	241	160	234	108	212	346	297	297	263
Sep	117	80	79	89	204	44	72	198	254	127	102
Oct	88	13	65	35	78	1	-	-	-	11	7
Nov	16	-	4	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-	-	-	-
Σ	502	517	701	561	703	259	526	1 024	977	774	709
Annual total	649	847	1 188	1 351	1 397	592	1 006	1 846	1 933	1 537	1 624

Table 5.3.1 SANDEELS. No.caught x 10^{-6}. Southern area of North Sea 1984

	Age Group									
Month	0	1	2	3	4	5	6	7	8	Σ
Jan	–	–	–	–	–	–	–	–	–	–
Feb	–	–	–	–	–	–	–	–	–	–
Mar	–	–	–	–	–	–	–	–	–	–
Apr	–	9221.1	394.6	4280.4	30.4	7.6	–	–	–	13 934.1
May	4.6	16462.3	897.9	6320.5	214.9	91.4	64.0	–	–	24 055.6
Jun	15.3	35384.9	918.4	2438.4	15.3	7.6	–	–	–	38 779.9
Jul	–	8302.1	80.2	554.4	43.8	–	–	–	–	8 980.5
Aug	–	1037.8	10.6	21.2	–	–	–	–	–	1 069.6
Sep	–	82.2	0.8	1.7	–	–	–	–	–	84.7
Oct	–	0.4	–	–	–	–	–	–	–	0.4
Nov	–	–	–	–	–	–	–	–	–	–
Dec	–	–	–	–	–	–	–	–	–	–
Σ	19.9	70490.8	2302.5	13616.6	304.4	106.6	64.0	–	–	86 904.8

Excluding Faroese – allocated to 2nd quarter

Table 5.3.2 SANDEEL. No. caught x 10^{-6}. Northern area of North Sea 1984

Month	0	1	2	3	4	5	6	Σ
Jan	–	–	–	–	–	–	–	–
Feb	–	–	–	–	–	–	–	–
Mar	–	9.2	394.3	0.1	–	–	–	403.6
Apr	–	3664.6	451.9	36.8	–	–	–	4153.3
May	–	7173.7	716.1	86.0	4.5	–	–	7980.3
Jun	–	844.7	84.4	29.8	–	–	–	958.9
Jul*)								
Aug*)	–	1207.1	120.6	42.6	–	–	–	1370.3
Sep*)								
Oct	–	0.1	–	–	–	–	–	0.1
Nov	–	–	–	–	–	–	–	–
Dec	–	–	–	–	–	–	–	–
Σ	–	12899.4	1767.3	195.3	4.5	–	–	14866.5

* Allocated in same proportion as June catches

Table 5.3.3 SANDEELS. Shetland. No.caught x 10^{-6} 1984

	Age Group									
Month	0	1	2	3	4	5	6	7	8	Σ
Apr	-	867.6	448.7	101.8	16.2	2.4	2.1	2.1	-	1 440.8
May	1.7	654.2	419.5	237.7	89.1	29.0	10.6	3.9	1.4	1 447.1
Jun	1 938.5	321.0	195.4	61.7	28.7	6.4	1.5	0.9	0.5	2 554.6
Jul	3 005.3	366.2	99.9	27.4	7.9	7.9	1.1	1.2	-	3 516.8
Aug	1 532.6	100.9	51.2	8.6	2.1	1.2	-	-	-	1,696.7
Sep	284.4	13.0	2.3	0.3	0.1	0.1	0.1	-	-	300.3
Oct	11.1	0.5	0.1	-	-	-	-	-	-	11.7
Σ	6 773.5	2 323.3	1 217.2	437.6	144.1	47.1	15.3	8.0	1.9	10 968.1

Table 5.3.4 SANDEELS in the southern North Sea. VPA catch in numbers, half year ($\times 10^{-6}$)

Age Group	Year 1972		1973		1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	0	0	13	0	670	76	0	0	4	0	0	13 263	922	41 224
1	2 839	86	14 497	206	5 989	226	11 458	480	16 308	249	19 500	269	58 839	2 774
2	15 695	1 148	2 515	53	3 930	10	1 694	1 046	14 505	2 358	5 596	27	16 948	385
3	418	35	3 832	151	497	0	2 838	170	1 522	392	6 300	8	1 793	125
4	128	24	183	5	1 968	3	529	253	1 234	102	965	8	1 006	97
5	94	16	89	3	205	0	666	0	171	20	445	3	114	26
6	20	0	31	2	22	0	91	0	72	58	239	3	21	26
7	3	0	7	1	11	0	2	0	1	16	124	0	14	7
8	29	-	53	-	73	-	3	-	0	-	36	-	26	-
TOTAL	19 225	1 308	21 221	423	13 363	315	17 280	1 949	33 817	3 195	33 204	13 581	79 684	44 665

Age Group	Year 1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	181	1 947	62	72	415	43 420	242	5 039	955	9 298	20	0
1	16 018	5 210	33 269	4 738	13 394	407	56 545	4 718	2 232	240	62 517	9 422
2	22 737	2 085	12 472	840	11 719	1 892	6 224	490	35 029	2 806	2 257	92
3	4 487	138	3 794	575	2 466	115	3 277	344	934	513	13 272	577
4	1 265	110	375	9	774	36	1 813	36	234	2	267	44
5	441	30	63	0	353	3	94	4	122	0	109	0
6	244	0	50	0	84	0	24	0	25	0	66	0
7	3	0	0	0	16	0	8	0	0	0	0	0
8	32	-	0	-	5	-	0	-	6	-	0	0
TOTAL	45 409	9 520	50 086	6 234	29 226	45 873	68 227	10 631	39 537	12 859	78 508	-

Table 5.3.5 SANDEELS in the southern North Sea. VPA fishing mortality per half year.

M = 0-group 2.0 $year^{-1}$ (used for 2nd half only)
1-group 0.75 $year^{-1}$
> 2-group 0.5 $year^{-1}$

Age Group	Year 1972		1973		1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	-	0	-	0	-	0	-	0	-	0	-	0.05	-	0.24
1	0.13	0.006	0.39	0.01	0.23	0.01	0.16	0.01	0.46	0.01	0.30	0.007	0.57	0.06
2	0.57	0.08	0.28	0.009	0.30	0.001	0.16	0.14	0.56	0.17	0.51	0.004	0.92	0.05
3	0.15	0.02	0.41	0.03	0.11	0	0.54	0.06	0.34	0.15	0.99	0.003	0.44	0.05
4	0.39	0.12	0.13	0.004	0.57	0.002	0.23	0.18	0.78	0.14	0.68	0.01	0.60	0.11
5	0.50	0.16	0.96	0.06	0.29	0	0.57	0	0.18	0.03	1.56	0.03	0.21	0.07
6	0.04	0	0.54	0.05	1.17	0	0.28	0	0.15	0.18	0.65	0.01	0.38	1.22
7	0.01	0	0.02	0.002	0.56	0	(0.50)	-	0.004	0.13	0.76	0	0.09	0.06
8	(0.50)	-	(0.50)	-	(0.50)	-	(0.50)	-	-	-	(0.50)	-	(0.50)	-
Weighted mean 1-4	0.38	0.04	0.37	0.01	0.26	0.008	0.18	0.03	0.50	0.09	0.40	0.007	0.62	0.06

Age Group	Year 1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	-	0.01	-	0.001	-	0.09	-	0.22	-	0.02	-	0
1	0.25	0.14	0.50	0.15	0.43	0.02	0.30	0.04	0.25	0.05	0.30	0.08
2	0.99	0.23	0.70	0.09	0.75	0.27	0.71	0.11	0.61	0.09	0.90	0.08
3	1.15	0.09	0.89	0.33	0.46	0.04	1.11	0.33	0.34	0.34	0.86	0.08
4	1.10	0.26	0.40	0.02	1.10	0.13	1.27	0.07	0.41	0.006	0.31	0.08
5	1.06	0.18	0.24	0	1.46	0.04	0.62	0.05	0.37	0	(0.50)	-
5	2.06	0	0.56	0	0.92	0	(0.50)	-	(0.50)	-	(0.50)	-
7	(0.50)	-	0.005	0	(0.50)	-	0.28	0	-	-	-	-
8	(0.50)	-	0.	-	(0.50)	-	-	-	(0.50)	-	-	-
Weighted mean 1-4	0.53	0.16	0.56	0.14	0.54	0.09	0.35	0.05	0.56	0.10	0.35	0.08

Table 5.3.6 SANDEELS in the southern North Sea. VPA. Stock size in numbers x 10^{-6}

Age Group	Year	1972		1973		1974		1975	
		1	2	1	2	1	2	1	2
0		-	145 293	-	95 973	-	257 802	-	143 344
1		28 022	16 929	53 450	24 930	35 307	19 365	94 796	55 754
2		40 317	17 746	11 565	6 805	16 964	9 774	13 123	3 734
3		3 372	2 260	12 812	6 634	5 253	3 655	7 603	3 451
4		441	232	1 729	1 186	5 033	2 208	2 847	1 754
5		264	124	160	48	920	537	1 717	758
6		603	452	83	38	35	8	418	246
7		254	195	352	268	28	12	7	-
		82	-	152	-	208	-	10	
Sp.St. biom.*		477		333		345		320	
Total biom.*		632		628		539		842	

*(1 000 tonnes)

Age Group	Year	1976		1977		1978		1979	
		1	2	1	2	1	2	1	2
0		-	244 357	-	452 613	-	298 607	-	274 201
1		52 733	22 990	89 894	45 860	158 818	61 510	86 327	46 231
2		37 924	16 914	15 596	7 273	31 297	9 733	39 993	11 534
3		5 884	32 252	11 104	3 213	5 640	2 8219	7 2422	1 781
4		2 538	908	2 189	867	2 495	1 068	2 093	541
5		1 144	741	618	101	668	420	747	202
6		591	396	560	228	76	41	304	30
7		192	149	258	94	175	125	9	-
8		-	-	101	-	73	-	91	-
Sp.St. biom.*		535		372		448		553	
Total biom.*		825		867		1 323		1 028	

* (1 000 tonnes)

continued .....

Table 5.3.6 (contd)

Age Group	Year	1980		1981		1982		1983	
		1	2	1	2	1	2	1	2
0		-	123 672	-	764 517	-			796 415
1		99 741	41 552	45 455	20 347	256 173	129 899	12 031	64 443
2		27 500	10 597	24 671	9 057	13 649	5 231	85 395	36 059
3		7 156	2 294	7 515	3 702	5 397	1 383	3 643	2 021
4		1 266	658	1 283	333	2 782	611	776	401
5		325	198	504	91	228	96	444	239
6		131	58	154	48	68	-	71	-
7		24	18	45	-	37	22	-	-
8		-		14	-	-	-	17	-
Sp. St. biom.*		401		383		261		923	
Total biom.*		951		633		1 673		989	

*(1 000 tonnes)

Age Group	Year	1984		Mean weight (g)	
		1	2	1st half	2nd half
0		-	-	-	2.42
1		287 528	146 602	5. 51	7.50
2		4 231	1 344	9. 96	10.75
3		25 618	8 472	13 74	14012
4		1 126	643	16. 3	17.71
5		310	-	17. 6	19.80
6		186	-	18. 5	-
7		-	-	18. 9	-
8		-	-	19. 1	-
Sp.St. biom.*		421			
Total biom.*		2 006			

*(1 000 tonnes)

Table 5.3.7 SANDEELS in the northern North Sea (Shetland excluded). VPA, catch in numbers, half year ($\times 10^{-6}$)

	1972		1973		1974		1975		1976		1977		1978	
Age Group	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
0	0	4 930	0	337	472	9 979	99	9 282	237	6 126	3 686	3 067	0	7 820
1	3 398	846	4 057	143	19 850	384	7 186	74	5 697	648	24 307	2 856	6 127	1 001
2	2 045	0	1 657	68	1 347	53	5 249	105	1 130	84	2 351	913	2 338	307
3	115	0	836	20	1 424	11	1 508	1	445	368	516	142	573	39
4	79	0	89	0	276	7	248	0	101	19	124	99	78	1
5	62	0	58	1	73	5	87	0	39	10	17	28	45	1
6	60	0	1	0	2	0	0	0	15	8	3	15	21	0
TOTAL	5 759	5 776	6 698	570	23 444	10 439	14 377	9 463	7 664	7 262	31 007	7 119	9 181	9 169

	1979		1980		1981		1982		1983		1984	
Age Group	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul Dec
0	0	44 203	17	8 349	17	9 128	2	6 530	0	7 911	0	0
1	2 335	1 310	13 394	1 173	5 505	346	3 518	65	5 684	303	11 692	1 207
2	1 328	433	8 865	214	4 109	94	2 132	0	1 215	316	1 647	121
3	242	66	1 050	19	904	14	556	0	89	19	153	43
4	5	10	645	4	128	6	76	0	8	0	4	0
5	2	0	144	3	19	0	9	0	0	0	0	0
6	5	0	38	1	27	0	0	0	4	0	0	0
TOTAL	3 917	46 022	24 155	9 762	10 709	9 588	6 293	6 595	7 000	8 549	13 496	1 370

Table 5.3.8 SANDEELS in the northern North Sea (Shetland excluded). VPA fishing mortalities per half year.

Age Group	Year 1972		1973		1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	-	0.16	-	0.005	-	0.30	-	0.22	-	0.08	-	0.09	-	0.14
1	0.26	0.12	0.34	0.02	0.79	0.04	0.72	0.02	0.38	0.08	0.97	0.34	0.49	0.16
2	0.54	0	0.40	0.03	0.33	0.02	1.09	0.05	0.42	0.05	0.52	0.42	0.60	0.15
3	0.26	0	0.66	0.03	1.21	0.02	1.26	0.003	0.35	0.58	0.52	0.28	0.55	0.07
4	0.56	0	0.48	0	0.73	0.04	1.18	0	0.34	0.10	0.42	0.75	0.26	0.003
5	3.37	0	2.07	0.19	1.68	(0.50)	0.86	0	0.88	0.65	0.13	0.34	1.06	0.7
6	(0.50)	-	(0.50)	-	(0.50)	-	-	-	(0.50)	-	(0.50)	-	0.50	-
Weighted mean 1-4	0.33	0.09	0.38	0.02	0.76	0.03	0.89	0.02	0.38	0.11	0.90	0.36	0.	0.15

Age Group	Year 1979		1980		1981		1982		1983		1984
	1	2	1	2	1	2	1	2	1	2	1
0	-	0.60	-	0.32	-	0.44	-	0.21	-	0.14	-
1	0.09	0.08	0.75	0.16	0.73	0.11	0.58	0.02	0.55	0.06	0.60
2	0.39	0.22	1.56	0.13	1.57	0.12	2.37	0	0.81	0.55	0.60
3	0.18	0.07	1.45	0.08	1.29	0.06	2.83	0	1.15	0.91	0.60
4	0.01	0.03	2.13	0.06	1.26	0.17	(0.50)	-	(0.50)	-	0.60
5	0.01	0	0.80	0.04	(0.50)	-	0.43	0	-	-	-
6	(0.50)	-	(0.50)	-	(0.50)	-	-	-	(0.50)	-	-
Weighted mean 1-4	0.13	0.10	1.02	0.15	1.02	0.11	1.05	0.02	0.59	0.12	0.60

Table 5.3.9. SANDEELS in the Northern North Sea (Shetland excluded) VPA. Stock size in numbers x 10^{-6}

Age group	1972		1973		1974		1975	
	1	2	1	2	1	2	1	2
0	-	52 576	-	115 880	-	60 089	-	72 943
1	17 464	9 225	16 510	8 038	42 434	13 197	16 436	5 503
2	5 485	2 492	5 646	2 951	5 407	3 034	8 754	2 298
3	560	336	1 941	785	2 238	520	2 316	510
4	207	92	262	126	594	223	395	94
5	68	2	72	7	98	14	167	55
6	172	-	1	-	5	-	0	-
Biom. tx10^{-3} SSB	108		141		162		202	
Biom. tx10^{-3} Total stock	206		234		401		295	

	1976		1977		1978		1979	
0	-	133 465	-	55 663	-	96 715	-	147 544
1	21 528	10 155	45 556	11 860	18 705	7 882	31 078	19 441
2	3 721	1 912	6 447	2 974	5 822	2 502	4 597	2 421
3	1 697	933	1 416	653	1 519	685	1 679	1 095
4	396	220	406	208	384	231	499	385
5	74	24	155	106	76	21	179	138
6	43	-	10	-	59	-	15	-
Biom. tx10^{-3} SSB	117		148		140		136	
Biom. tx10^{-3} Total stock	238		405		246		311	

	1980		1981		1982		1983	
0	-	46 671	-	39 477	-	53 250	-	95 300
1	29 765	9 669	12 436	4 111	9 395	3 609	15 854	6 291
2	12 285	2 003	5 684	920	2 541	185	2 427	838
3	1 506	275	1 372	293	634	29	144	35
4	795	74	197	44	216	0	23	0
5	291	102	54	0	29	15	0	0
6	107	-	77	-	0	-	11	-
Biom. tx10^{-3} SSB	255		127		61		37	
Biom. tx10^{-3} Total stock	423		197		114		127	

	1984	Mean weight (g) 1st half	2nd half
0	-	-	3.03
1	30 507	5.64	13.23
2	4 074	13.05	27.84
3	378	27.30	36.20
4	11	42.23	44.00
5	0	47.51	65.75
6	0	53.00	-
Biom. tx10^{-3} SSB	64		
Biom. tx10^{-3} Total stock	236		

Table 5.3.10 SANDEELS in the Shetland area.
VPA. Catch in numbers, half year x 10^{-6}.

	1974		1975		1976		1977		1978		1979	
Age Group	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
0	0	953	0	36	86	4,486	464	5,644	99	5,430	0	1,310
1	6	834	117	4,256	1,690	527	2,830	525	4,406	651	1,488	480
2	53	34	552	63	294	152	664	153	1,020	168	388	137
3	11	14	79	39	115	40	40	12	71	46	68	22
4	7	20	12	13	13	15	44	26	21	7	12	14
5	5	0	7	0	11	3	6	2	20	3	8	7
6	+	1	4	3	4	2	7	1	3	0	2	0
7	6	0	2	0	2	0	3	+	+	0	1	0
8	0	-	2	-	+	-	+	-	1	-	0	-

	1980		1981		1982		1983		1984	
Age Group	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
0	77	7,134	105	13,605	717	16,283	592	4,073	1,940	4,833
1	569	242	1 917	568	5,216	416	2,914	1,035	1,843	481
2	368	104	1,424	92	1,184	77	661	121	1,064	154
3	273	29	399	28	494	35	199	28	401	36
4	96	13	113	6	190	9	85	17	134	10
5	80	6	53	3	86	6	23	6	38	9
6	37	+	26	+	29	1	14	+	14	1
7	14	0	3	+	9	+	4	+	7	1
8	0	-	3	-	10	-	1	-	2	-

Table 5.3.11. SANDEELS in the Shetland Area. VPA.
Fishing mortalities per half year

Age	1974		1975		1976		1977		1978	
	1	2	1	2	1	2	1	2	1	2
0	-	0.06	-	0.003	-	0.24	-	0.25	-	0.35
1	0.001	0.31	0.01	1.34	0.32	0.19	0.43	0.16	0.62	0.21
2	0.11	0.11	0.40	0.08	0.32	0.29	0.44	0.18	0.61	0.20
3	0.07	0.12	0.40	0.37	0.20	0.11	0.12	0.05	0.12	0.12
4	0.08	0.38	0.14	0.26	0.21	0.44	0.17	0.15	0.13	0.06
5	0.18	0	0.25	0	0.38	0.20	0.34	0.19	0.18	0.04
6	0.04	0.14	0.31	0.46	0.34	0.22	0.85	0.43	0.42	0
7	(0.50)	-	(0.50)	-	(0.50)	-	0.73	(0.50)	(0.50)	-
F_{1-4}	0.01		0.08		0.31		0.42		0.59	

Age	1979		1980		1981		1982		1983		1984	
	1	2	1	2	1	2	1	2	1	2	1	2
0	-	0.09	-	0.40	-	0.53	-	0.68	-	0.40	-	0.40
1	0.27	0.16	0.08	0.06	0.32	0.18	0.83	0.16	0.47	0.38	0.62	0.40
2	0.21	0.11	0.20	0.08	0.63	0.08	0.80	0.11	0.49	0.16	1.01	0.40
3	0.12	0.06	0.35	0.06	0.56	0.07	0.77	0.12	0.49	0.12	1.33	0.40
4	0.04	0.07	0.38	0.08	0.37	0.03	0.98	0.11	0.46	0.17	1.47	0.40
5	0.09	0.12	0.72	0.10	0.61	0.06	0.85	0.12	0.48	0.22	0.72	0.40
6	0.04	0	1.70	0.15	0.97	0.03	1.27	0.15	0.53	0.05	1.38	0.40
7	(0.50)	-	(0.50)	-	1.18	(0.50)	2.25	(0.50)	1.68	(0.50)	0.90	0.40
F_{1-4}	0.24		0.14		0.42		0.82		0.48		0.80	

Table 5.3.12. SANDEELS in the Shetland Area. VPA.
Stock size in numbers x 10^{-6}

Age	1974		1975		1976		1977		1978		1979	
	1	2	1	2	1	2	1	2	1	2	1	2
0	-	28 192	-	19 953	-	32 851	-	39 286	-	28 564	-	24 646
1	5,408	3 711	9 819	6 652	7 319	3 651	9 524	4 245	11 234	4 154	7 436	3 894
2	552	384	1 870	975	1 202	679	2 078	1 040	2 487	1 051	2 325	1 471
3	193	140	269	140	704	447	395	272	676	464	671	463
4	97	70	97	65	75	48	313	205	201	138	321	239
5	34	22	37	22	39	21	24	13	137	89	102	72
6	13	10	17	10	17	10	13	4	9	4	67	50
7	18	0	7	0	5	0	6	2	2	0	3	0
Bio-{SSB	6 532		13 992		13 952		18 273		22 941		23 792	
mass{Total												
(t) {Stock	21 513		41 190		34 226		44 655		54 059		44 390	

Age	1980		1981		1982		1983		1984		Mean weight (g)	
	1	2	1	2	1	2	1	2	1	2	1st half	2nd half
0	-	33 498	-	50 112	-	49 233	-	18 960	-	22 454	-	1.69
1	8 310	5 244	8 302	4 142	10 849	3 265	9 140	3 916	4 680	1 727	2.77	4.87
2	2 283	1 455	3 405	1 415	2 381	829	1 903	906	1 848	522	5.23	7.25
3	1 025	560	1 042	464	1 021	368	578	277	600	123	8.51	9.64
4	341	181	411	221	337	99	255	125	191	34	10.97	12.17
5	174	66	130	55	167	55	69	33	82	31	13.2	14.7
6	50	7	47	14	40	9	38	17	21	4	15.0	16.5
7	39	0	5	1	10	1	6	1	13	4	16.4	17.7
Bio-{SSB	28 090		33 687		27 807		19 248		18 477			
mass{Total	51 109		56 684		57 858		44 566		31 441			
(t) {Stock												

Table.5.3.13 Comparison of trend in F (weighted mean for ages 1-4 with trend in fishing effort in southern and northern SANDEEL assessment areas.

Southern Area

Input F (>1-group) (second half year)	F_{1-4} first half year			F_{1-4} second half year		
	1982	1983	1984	1982	1983	1984
0.05	0.32	0.48	0.24	0.04	0.08	0.05
0.08	0.35	0.56	0.35	0.05	0.10	0.08
0.10	0.36	0.59	0.42	0.05	0.10	0.10
0.20	0.39	0.68	0.70	0.06	0.13	0.20
Danish effort index	67.5	64.9	67.3	13.0	15.3	17.6

Northern Area

Input F (>1-group) (first half year)	F_{1-4} first half year		
	1982	1983	1984
0.4	0.99	0.47	0.40
0.6	1.05	0.59	0.60
0.8	1.08	0.67	0.80
1.0	1.09	0.73	1.00
1.2	1.11	0.78	1.20
1.4	1.11	0.81	1.40
Danish effort index	16.9	18.6	19.1

Table 5.3.14 Weight landed (t) and number of SANDEELS at age 10^6 landed by Scottish vessels from Division VIa by quarter, 1980-1984

		Weight landed (t)	0	1	2	3	4	5	6	≥7
1980	Jan-Mar	-	-	-	-	-	-	-	-	-
	Apr-Jun	-	-	-	-	-	-	-	-	-
	Jul-Sep	180	3.4	2.8	0.8	2.4	1.3	1.4	0.2	0.2
	Oct-Dec	-	-	-	-	-	-	-	-	-
	Σ	180	3.4	2.8	0.8	2.4	1.3	1.4	0.2	0.2
1981	Jan-Mar	-	-	-	-	-	-	-	-	-
	Apr-Jun	63	-	0.1	4.2	2.1	0.9	0.1	0.1	0.01
	Jul-Sep	5,881	486.4	306.3	212.2	27.9	5.3	-	1.2	-
	Oct-Dec	28	2.3	1.5	1.0	0.1	0.03	-	0.01	-
	Σ	5,972	488.7	307.9	217.4	30.1	6.2	0.1	1.3	0.01
1982	Jan-Mar	-	-	-	-	-	-	-	-	-
	Apr-Jun	5,858	360.1	253.3	189.5	201.0	66.9	27.6	3.2	0.8
	Jul-Sep	4,905	546.9	47.1	65.9	100.6	35.8	26.0	9.5	2.2
	Oct-Dec	24	1.2	0.2	0.7	0.6	0.2	0.03	0.01	-
	Σ	10,737	908.2	300.6	256.1	302.2	102.9	53.6	12.7	3.0
1983	Jan-Mar	-	-	-	-	-	-	-	-	-
	Apr-Jun	7,031	390.5	520.1	134.5	82.1	100.5	25.4	10.4	1.2
	Jul-Sep	6,020	2,256.0	105.9	28.7	19.7	20.0	3.9	2.5	0.8
	Oct-Dec	-	-	-	-	-	-	-	-	-
	Σ	13,051	2,646.5	626.0	163.2	101.8	120.5	29.3	12.9	2.0
1984	Jan-Mar	-	-	-	-	-	-	-	-	-
	Apr-Jun	8,105	185.8	858.1	219.6	134.7	65.9	27.4	7.8	1.4
	Jul-Sep	6,061	1,751.0	99.0	66.6	114.8	38.3	26.4	8.0	3.2
	Oct-Dec	-	-	-	-	-	-	-	-	-
	Σ	14,166	1,936.8	957.1	286.2	249.5	104.2	53.8	15.8	4.6

Table 5.5.1 SANDEEL North Sea. Mean weight (g) at age by month 1984

Southern area (Danish data)

Age	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
0	-	-	1.00 (1)	1.00 (2)	-	-	-	-
1	-	3.25 (1215)	5.48 (3579)	6.77 (4363)	6.67 (1138)	7.43 (98)	-	-
2	-	6.57 (52)	9.43 (195)	12.15 (115)	12.07 (11)	10.67 (1)	-	-
3	-	8.83 (564)	11.03 (1382)	15.16 (318)	12.29 (76)	10.33 (2)	-	-
4	-	16.88 (4)	16.90 (47)	19.57 (2)	15.36 (6)	-	-	-
5	-	25.00 (1)	16.33 (20)	13.00 (1)	-	-	-	-
6	-	-	17.27 (14)	-	-	-	-	-

Northern area (Danish data)

0	-	-	-	-	-	-	-	-
1	1.19 (4)	3.47 (1095)	5.52 (1573)	- -	- -	- -	- -	- -
2	3.32 (236)	6.17 (135)	11.92 (158)	- -	- -	- -	- -	- -
3	-	9.09 (11)	21.34 (19)	- -	- -	- -	- -	- -
4	-	-	35.00 (1)	-	-	-	-	-

Shetland area (Scottish data)

0	-	-	0.2	0.5	1.2	2.4	2.9	2.7
1	-	2.3	3.2	6.0	5.9	6.5	7.0	6.4
2	-	4.3	5.4	8.2	8.8	8.5	9.4	8.6
3	-	5.1	6.9	10.3	9.7	10.4	13.2	12.1
4	-	7.7	8.0	11.4	13.0	9.8	12.0	11.0
5	-	9.8	12.1	18.1	19.1	12.3	17.2	15.8
6	-	14.7	13.5	24.7	23.5	-	20.8	19.1
7	-	13.8	16.7	25.0	22.8	-	-	-
8	-	-	17.2	22.4	-	-	-	-

Table 5.5.2 SANDEEL North Sea percentage annual landings by weight by age

		A G E								
Stock	Year	0	1	2	3	4	5	6	7	8
Southern North Sea	1979	1	28	47	16	6	2	1	-	-
	1980	-	61	25	12	2	-	-	-	-
	1981	42	17	29	8	3	1	-	-	-
	1982	2	67	14	10	7	-	-	-	-
	1983	5	5	84	5	1	-	-	-	-
	1984	-	70	4	25	1	+	+	-	-
Northern North Sea	1979	61	16	17	6	-	-	-	-	-
	1980	12	35	21	15	13	3	1	-	-
	1981	27	23	24	18	5	1	1	-	-
	1982	21	25	32	18	4	1	-	-	-
	1983	21	44	30	4	1	-	-	-	-
	1984	-	77	18	4	+	-	-	-	-
Shetland	1979	11	37	45	4	2	1	-	-	-
	1980	45	16	12	11	6	6	3	1	-
	1981	34	31	22	7	3	2	1	-	-
	1982	48	25	13	8	4	2	1	+	+
	1983	25	48	16	5	3	1	1	+	+
	1984	30	29	23	10	4	2	1	+	+

Table 5.8.1 Mean monthly values of F 1979-82, based on M = 0.5

	Age	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Southern North Sea	0	0	0	0	.006	.171	.003	.005	.004
	1	.009	.062	.133	199	.093	0	.003	.002
	2-5	.006	.114	.484	.305	.164	.001	.001	.001
Northern North Sea	0	0	0	0	.058	.062	.315	.066	.072
	1	.111	.224	.268	.127	.065	.017	.001	.007
	2	.182	.662	.584	.162	.104	.006	0	.007
	3-4	.011	.056	.261	.465	.052	0	0	0
Shetland	0	0	0	0	.007	.316	.187	.097	.013
	1	0	.237	.117	.099	.095	.046	.014	.003
	2-5	0	.068	.222	.225	.049	.037	.010	.001

Table 5.8.2 Mean monthly values of F 1979-82, based on M = 1.0

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Southern North Sea								
Age								
0	0	0	0	.002	.038	.001	.001	.001
1	.004	.024	.055	088	.022	0	.001	0
2 + older	.002	.051	.213	.137	.028	0	0	0
Northern North Sea								
Age								
0	0	0	0	0	.019	.126	.025	.031
1	.047	.073	.120	.069	.021	.006	0	.002
2	.115	.316	.259	.095	.029	.002	0	.002
3 + older	.009	.075	.254	.306	.012	0	0	0
Shetland								
Age								
0	0	0	0	.004	.088	.050	.028	.004
1	0	.083	.038	.032	.017	.008	.003	.001
2 + older	0	.021	.070	.064	.007	.005	.002	0

Table 5.8.3 Mean monthly values of F 1980-83, based on M values in VPAs

Area	Age	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Southern	0	-	-	-	-	.08	-	-	-
	1	.01	.06	.12	.19	.06	-	-	-
	≥2	.01	.10	.34	.28	.14	.01	-	-
Northern	0	-	-	-	-	0.07	0.15	0.05	0.05
	1	0.13	0.26	0.30	0.18	0.09	0.02	-	0.02
	2	0.31	0.68	0.58	0.33	0.35	-	-	0.02
	3	0.05	0.41	1.17	1.10	0.38	-	-	-
	≥4	-	0.03	0.44	1.92	0.13	-	-	-
Shetland	0	-	-	-	-	.28	.13	.08	.01
	1	-	.20	.13	.10	.12	.06	.02	-
	2	-	.13	.23	.18	.05	.05	.01	-
	≥3	-	.07	.25	.22	.05	.04	.01	-

Table 5.8.4 Yield per recruit and spawning stock biomass per recruit (2-7 group at 1 January) at recent levels of F assuming closures for different periods of the year

YIELD PER RECRUIT (g)

	M = 0.5			M = 1.0		
	Standard Run	No.fishing aft. June	Fishing only May-June	Standard Run	No.fishing aft. June	Fishing only May-June
Southern North Sea	2.57	2.65	2.76	0.54	0.47	0.42
Northern North Sea	2.96	3.34	4.30	1.28	1.14	1.06
Shetland	1.36	1.35	1.40	0.35	0.21	0.17

SPAWNING STOCK BIOMASS PER RECRUIT (g)

Southern North Sea	2.54	3.59	4.09	1.71	1.85	1.96
Northern North Sea	1.62	3.09	6.11	1.51	1.93	2.59
Shetland	1.07	2.50	3.37	0.90	1.11	1.23

	Y/R			SSB/R		
Southern area	1.39	1.28	1.32	1.54	1.91	2.19
Northern area	1.97	1.74	2.30	0.69	1.14	2.19
Shetland	0.99	0.68	0.68	0.54	1.19	1.59

Table 6.1.1 Landings of SPRAT in Division IIIa and in Norwegian fjords in Division IVa (10^{-3} tonnes). (Data provided by Working Group members).

Year	SKAGERRAK				KATTEGAT			IIIa TOTAL	Fjords of Western Norway (IVa E)	GRAND TOTAL
	Denmark	Sweden	Norway	Total	Denmark	Sweden	Total			
1969	0.8	1.9	1.7	4.4	0.8	1.6	2.4	6.8	11.8	18.6
1970	1.1	2.4	2.4	5.9	3.1	6.0	9.1	15.0	6.4	21.4
1971	0.7	2.4	2.9	6.0	1.5	9.6	11.1	17.1	4.4	21.5
1972	0.8	3.3	2.4	6.5	1.4	17.9	19.3	25.8	6.9	32.7
1973	19.4	2.5	3.2	25.1	19.3	16.2	35.5	60.6	8.8	69.4
1974	17.3	2.0	1.2	20.5	31.6	18.6	50.2	70.7	3.3	74.0
1975	14.9	2.1	1.9	18.9	69.7	20.9	90.6	109.5	2.9	112.4
1976	12.8	2.6	2.0	17.4	30.4	13.5	43.9	61.3	0.6	61.9
1977	7.2	2.2	1.2	10.6	53.3	9.8	63.1	73.7	5.4	79.1
1978	23.1	2.2	2.7	28.0	36.1	9.4	45.5	73.5	5.2	78.7
1979	17.3	8.1	1.8	27.2	45.8	6.4	52.2	79.4	5.0	84.4
1980*	43.1	-	3.4	46.5	35.8	-	35.8	102.4	2.9	105.3
1981	26.4	13.4	4.6	44.4	23.8	15.8	39.6	84.0	3.1	87.1
1982	11.0	6.7	1.8	19.5	15.4	4.8	20.2	39.7	6.0	45.7
1983**	3.4	6.7	1.5	11.6	9.1	13.2	22.3	33.9	3.0	36.9
1984**	5.4	5.4	1.7	12.5	10.0	5.2	15.2	27.7	3.6	31.3

* Sweden 20 124 tonnes in Div. IIIa. Included in total but allocation to Skagerrak and Kattegat not possible.
** Preliminary figures.

Table 7.1.1 SPRAT catches in the North Sea ('000 tonnes) 1975-84 (data provided by Working Group Members)

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984[A]
					IVa West					
Denmark	0.5	0.6	0.1	-	-	-	2.8	-	-	-
Faroe Islands	12.9	2.5	0.4	-	-	-	-	-	-	-
France	-	-	+	-	-	-	-	-	-	-
German Dem. Rep.	-	-	+	-	-	-	-	-	-	-
Germany, Fed. Rep.	-	+	0.6	-	-	0.1	-	-	-	-
Netherlands	+	+	+	-	-	-	-	-	-	-
Norway	1.5	29.9	16.0	1.3	0	-	-	-	-	-
Poland	0.3	-	-	-	-	-	-	-	-	-
Sweden	11.0	+	0	-	-	-	-	-	-	-
U.K. (England)	-	-	0	-	-	-	-	-	-	-
U.K. (Scotland)	9.4	12.7	26.9	16.9	6.8	3.8	1.0	+	-	+
USSR	1.3	1.2	+	-	-	-	-	-	-	-
Total	36.9	46.9	44.0	18.2	6.8	3.9	3.8	+	0	+
					IVa East (North Sea) Stock					
Denmark	-	0.2	0.11	-	-	-	-	+	-	-
Norway	-	1.9	0.7	0.1	+	0.4	-	-	3.0	3.6
U.K. Scotland	-	+	0	-	-	-	-	-	-	-
Total	-	2.1	0.8	0.1	...	0.4	0	+	3.0	3.6
					IVb West					
Belgium	-	+	0	-	-	-	-	-	-	-
Denmark	106.6	104.4	57.5	44.1	75.3[B]	76.7[B]	53.6	23.1	32.6	5.6
Faroe Islands	30.0	42.9	1.8	-	2.8[B]	2.8[B]	-	-	-	-
France	-	-	+	-	-	-	-	-	-	-
German Dem. Rep.	4.5	6.4	0.7	-	-	-	-	-	-	-
Netherlands	-	-	0	-	-	-	-	-	-	-
Norway	145.7	73.0	5.5	56.2	47.8	18.3	0.2	8.6	-	-
Poland	9.1	10.5	0	-	-	-	-	-	-	-
Sweden	-	7.9	0	-	-	-	-	-	-	-
U.K. (England)	32.5	49.7	51.9	53.9	12.9	2.4	-	-	-	-
U.K. (Scotland)	4.9	18.1	10.9	14.8	5.0	2.5	0.7	0.2	+	-
USSR	47.8	50.4	1.6	-	-	-	-	-	-	-
Total	381.1	362.3	123.9	169.0	143.8	102.7	54.5	31.9	32.6	5.6

[A]) Preliminary figures as reported
[B]) Division IVb East and West
+ = less than 0.1
- = magnitude known to be nil

/Continued

Table 7.1.1 (Continued)

SPRAT catches in the North Sea ('000 tonnes) 1975-84 (data provided by Working Group Members

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	A) 1984
					IVb East					
Denmark	215.2	201.1	126.8	161.0	191.5	149.0	127.5	91.2	39.2	62.1
German Dem. Rep.	0.4	-	0.7	-	-	-	-	-	-	-
Germany, Fed. Rep.	0.5	1.7	4.3	-	1.8	6.1	4.8	1.5	-	-
Norway	-	5.1	0	29.8	27.4	33.7	0.2	7.2	12.0	2.9
Sweden	-	-	1.5	-	-	0.6	-	-	-	-
Total	216.1	207.9	133.3	190.8	222.7	189.4	132.5	99.9	51.2	65.0
					IVc					
Belgium	+	-	0	-	-	-	-	-	-	-
Denmark	3.9	0.3	1.4	-	1.5	6.5	4.3	2.4	1.0	0.5
France	0.1	-	+	-	-	-	-	-	-	-
German Dem. Rep.	-	0.1	+	-	-	-	-	-	-	-
Germany, Fed. Rep.	-	-	0.4	-	-	-	-	-	-	-
Netherlands	0.2	-	0	-	-	-	-	-	-	-
Norway	-	-	-	0.2	3.1	16.2	-	3.7	-	3.5
U.K. England	2.9	0.7	0.2	0.0	1.4	4.3	14.0	14.9	3.6	0.9
USSR	+	0.2	-	-	-	-	-	-	-	-
Total	7.1	1.3	2.0	0.2	6.0	27.0	18.3	21.0	4.6	4.9
					Total North Sea					
Belgium	+	+	+	+	+	-	-	-	-	-
Denmark	326.2	306.6	179.9	205.1	268.3	232.2	188.2	116.6	72.6	68.1
Faroe Islands	42.9	45.4	2.2	-	2.8	2.8	-	-	-	-
France	0.1	-	+	-	-	-	-	-	-	-
German Dem. Rep.	4.9	6.5	1.4	-	-	-	-	-	-	-
Germany, Fed. Rep.	0.5	1.7	5.3	-	3.8	6.2	4.8	1.5	-	+
Netherlands	0.2	+	+	-	-	-	-	-	-	-
Norway	147.2	109.9	22.2	87.6	78.6	68.6	0.4	19.5	15.0	10.0
Poland	9.4	10.5	+	-	-	-	-	-	-	-
Sweden	11.0	7.9	1.5	-	-	0.6	-	-	-	-
U.K. (England)	35.4	50.4	52.1	53.9	14.3	6.7	14.0	14.9	3.6	0.9
U.K. (Scotland)	14.3	30.8	37.8	31.7	11.8	6.3	1.7	0.2	+	+
USSR	49.1	51.8	1.6	-	-	-	-	-	-	-
Total	641.2	621.5	304.0	378.3	379.6	323.4	209.1	152.7	91.2	79.0

A) Preliminary figures as reported

+ = less than 0.1
- = magnitude known to be nil

Table 7.1.2 SPRAT in Division VIa
Landings in tonnes.

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Denmark				259			242			
Faroes	56	181								
France										
Germany, Fed. Rep.	123	37	+		97		2			
Ireland	517	673	282	533	12	1 787	790	287		
Netherlands	140	661	49	46	125	428	892	2 156	1 447	
Norway		35	267					24		
Poland								-		
UK (Scotland)**	8 127	6 455	4 246	11 563	1 087	2 987	1 488	1 057	1 971	2 438
Total	9 053	8 042	4 844	12 401	1 321	5 202	3 414	3 524	3 418	2 438

Source: ICES Statistician

* preliminary figures

** amended from national data

Table 7.1.3 SPRAT catches in thousand tonnes (Denmark, Norway and United Kingdom) in Sub-divisions of the North Sea (1981-1984).

1981

Month	AREAS				
	1	2	3	4	5
1	0.6	-	12.7	3.0	10.3
2	-	-	14.4	9.1	6.9
3	-	-	+	3.1	+
4	-	-	+	0.2	+
5	-	-	1.5	0.4	0.2
6	-	-	0.4	0.6	0.2
7	-	-	-	20.5	-
8	-	-	1.4	26.3	-
9	2.8	-	2.9	35.9	-
10	+	-	-	20.1	-
11	0.1	-	13.3	8.3	-
12	0.3	-	8.0	-	0.7

1982

Month	AREAS				
	1	2	3	4	5
1	+	-	23.7	17.9	13.5
2	-	-	1.8	1.0	7.1
3	-	-	0.8	0.1	+
4	-	+	+	-	-
5	-	-	+	0.1	-
6	-	-	0.1	0,1	-
7	-	-	-	4.7	-
8	-	-	-	15.1	-
9	-	-	-	21.2	-
10	-	-	0.7	27.3	
11	-	-	1.2	4.3	-
12	-	-	3.5	6.5	-

Table 7.1.3 (continued)

1983

Month	AREAS				
	1	2	3	4	5
1	-	-	1.0	13.0	2.9
2	-	-	0.3	0.5	0.7
3	-	-	-	+	0.1
4	-	-	+	0.1	+
5	-	-	+	0.2	-
6	-	-	0.3	0.6	+
7	-	-	-	4.5	+
8	-	-	+	15.8	-
9	-	-	-	5.6	-
10	-	-	-	3.2	-
11	-	-	21.1	5.7	-
12	-	-	9.7	1.8	0.9

1984

Month	AREAS				
	1	2	3	4	5
1	+	-	1.2	3.0	2.3
2	-	-	-	+	2.3
3	-	-	-	-	0.1
4	-	-	+	+	-
5	-	-	0.1	+	-
6	-	-	-	+	-
7	-	-	+	2.1	+
8	-	-	-	19.3	-
9	-	-	1.6	12.0	+
10	+	-	1.2	12.0	-
11	+	-	1.5	16.4	-
12	-	-	-	+	0.1

Table 7.3.1 North Sea SPRAT in 1983-1984.
Numbers caught per age group x 10^{-6}

Divisions	Months	Age Groups					
		0	1	2	3	4	5
IVa W	Jan-Mar	-	-	-	-	-	-
	Apr-Jun	-	-	-	-	-	-
	Jul-Sep	-	-	-	-	-	-
	Oct-Dec	-	-	-	-	-	
	Total	-	-	-	-	-	-
IVa E (excl. Norweg. fjord catch	Jan-Mar	-	-	-	-	-	-
	Apr-Jun	-	-	-	-	-	-
	Jul-Sep	-	-	-	-	-	-
	Oct-Dec	-	-	-	-	-	-
	Total	-	-	-	-	-	-
IVb W	Jan-Mar	-	118.2	59.8	39.1	0.8	-
	Apr-Jun	-	4.4	15.2	4.0	-	-
	Jul-Sep	-	7.1	-	-	-	-
	Oct-Dec	49.6	1 605.5	443.2	20.6	-	-
	Total	49.6	1 735.2	518.2	63.7	0.8	-
IVb E	Jan-Mar	-	231.6	716.9	304.7	20.7	3.0
	Apr-Jun	1.1	18.5	40.6	1.3	-	-
	Jul-Sep	10.1	2 648.6	341.0	27.0	-	-
	Oct-Dec	75.0	351.6	306.8	24.6	0.1	-
	Total	86.2	3 250.3	1 405.3	357.6	20.8	3.0
IVc	Jan-Mar	-	7.5	156.2	139.2	16.6	-
	Apr-Jun	0.6	2.5	0.3	-	-	-
	Jul-Sep	0.2	0.7	0.1	-	-	-
	Oct-Dec	6.1	59.5	11.4	1.5	-	-
	Total	6.9	70.2	168.0	140.7	16.6	-
TOTAL NORTH SEA	Jan-Mar	-	357.3	932.9	483.0	38.1	3.0
	Apr-Jun	1.7	25.4	56.1	54.3	-	-
	Jul-Sep	10.3	2.656.4	341.1	27.0	-	-
	Oct-Dec	130.7	2 016.6	761.4	46.7	0.1	-
	Total	142.7	5 055.7	2 091.5	562.0	389.2	3.0

.../contd.

Table 7.3.1 contd.

		Age Groups					
Divisions	Months	0	1	2	3	4	5
IVa W	Jan-Mar	-	0.9	0.1	-	-	-
	Apr-Jun	-	-	-	-	-	-
	Jul-Sep	-	-	-	-	-	-
	Oct-Dec	6.7	+	-	-	-	-
	Total	6.7	0.9	0.1	-	-	-
IVa E	Jan-Mar						
	Apr-Jun						
	Jul-Sep						
	Oct-Dec						
	Total						
IVb W	Jan-Mar	-	6.8	40.6	47.9	8.4	-
	Apr-Jun	-	1.0	3.7	2.9	-	-
	Jul-Sep	-	12.9	27.4	36.5	3.0	-
	Oct-Dec	-	15.1	45.4	63.5	5.0	-
	Total		35.8	117.1	150.9	16.4	-
IVb E	Jan-Mar	-	22.4	255.6	32.3	2.6	-
	Apr-Jun	-	21.4	1.2	0.1	-	-
	Jul-Sep	-	4,081.2	313.8	-	-	-
	Oct-Dec	84.7	2,180.7	100.5	-	-	-
	Total	84.7	6,305.8	671.1	32.4	2.6	-
IVc	Jan-Mar	-	104.0	284.2	126.6	23.8	0.3
	Apr-Jun	-	-	-	-	-	-
	Jul-Sep	-	0.4	0.1	0.1	-	-
	Oct-Dec	-	8.4	5.9	0.9	-	-
	Total	-	112.8	290.2	127.6	23.8	0.3
Total North Sea	Jan-Mar	-	134.1	580.5	206.8	34.8	0.3
	Apr-Jun	-	22.4	4.9	3.0	-	-
	Jul-Sep	-	4,094.5	341.3	36.6	3.8	-
	Oct-Dec	91.4	2,204.2	151.8	64.4	5.0	-
	Total	91.4	6,455.2	1,078.5	310.8	42.8	0.3

Table 7.3.2 North Sea SPRAT catch in 1976-84. Numbers caught per age group x 10^{-6} in each three-month period.

Year	Months	Age group						
		0	1	2	3	4	5	6
1976	Jan-Mar	-	9,360.9	9,997.0	6,678.0	373.0	6.2	1.4
	Apr-Jun	-	2,017.2	964.6	740.1	40.9	0.8	-
	Jul-Sep	79.6	16,536.4	599.5	40.1	-	-	-
	Oct-Dec	2,780.4	8,443.7	2,659.4	612.7	37.3	-	-
1977	Jan-Mar	-	4,197.2	11,962.6	962.9	104.7	12.0	-
	Apr-Jun	-	540.3	670.9	52.7	1.5	-	-
	Jul-Sep	57.3	2,803.1	3,248.4	165.9	11.1	-	-
	Oct-Dec	1,060.8	4,705.0	3,049.5	311.2	1.5	-	-
1978	Jan-Mar	-	2,461.9	2,839.3	3,770.1	344.5	-	-
	Apr-Jun	-	1,077.5	123.8	3.2	0	-	-
	Jul-Sep	6.3	17,785.5	216.5	14.7	0.7	-	-
	Oct-Dec	636.8	6,932.7	3,955.8	1,159.0	214.9	-	-
1979	Jan-Mar	-	2,770.0	6,422.2	2,670.6	131.2	0.7	-
	Apr-Jun	-	203.6	452.0	14.0	1.1	-	-
	Jul-Sep	-	25,379.1	388.3	2.1	0	-	-
	Oct-Dec	433.0	8,394.8	1,494.6	122.4	34.9	-	-
1980	Jan-Mar	-	1,448.0	12,764.4	1,323.2	103.7	0.7	-
	Apr-Jun	-	134.0	84.5	2.4	0.3	-	-
	Jul-Sep	15.1	10,143.3	811.6	4.7	-	-	-
	Oct-Dec	515.7	4,518.5	2,767.4	111.8	19.5	-	-
1981	Jan-Mar	-	2,249.3	5,218.6	1,055.5	22.1	1.5	-
	Apr-Jun	23.0	87.0	189.2	29.1	-	1.7	-
	Jul-Sep	192.2	7,626.5	1,140.8	46.1	3.0	-	-
	Oct-Dec	158.0	2,326.8	1,448.9	69.9	0.7	0.4	-
1982	Jan-Mar	-	1,020.7	5,877.8	595.1	166.4	5.0	-
	Apr-Jun	-	3.4	31.2	5.5	0.7	-	-
	Jul-Sep	20.8	4,813.2	60.8	2.1	-	-	-
	Oct-Dec	34.8	2,700.7	623.9	10.5	0.6	1.2	-
1983	Jan-Mar	-	357.3	932.9	483.0	38.1	3.0	-
	Apr-Jun	1.7	25.4	56.1	5.3	-	-	-
	Jul-Sep	10.3	2,656.4	341.1	27.0	-	-	-
	Oct-Dec	130.7	2,016.6	761.4	46.7	0.1	-	-
1984	Jan-Mar	-	134.1	580.5	206.8	34.8	0.3	-
	Apr-Jun	-	22.4	4.9	3.0	-	-	-
	Jul-Sep	-	4 094.5	341.3	36.6	3.0	-	-
	Oct-Dec	91.4	2,204.2	151.8	64.4	5.0	-	-

Table 7.3.3 North Sea SPRAT. Fishing mortality by quarters (VPA). M = 0.8 year^{-1}. Input fishing mortalities are in brackets. 1974-77 from previous report.

Year/Quarter		Age Groups 0	1	2	3	4
1974	1	-	.052	.30	.59	1.41
	2	-	.003	.13	.13	.69
	3	.0003	.053	.15	.05	.44
	4	.0141	.087	.10	.14	(1.00)
1975	1	-	.046	.31	.92	.84
	2	-	.005	.035	.034	.046
	3	.000	.156	.245	.047	.028
	4	.004	.132	.446	.706	(1.000)
1976	1	-	.072	.315	1.339	1.213
	2	-	.020	.045	.488	.386
	3	.001	.224	.035	.043	.000
	4	.039	.170	.217	1.597	(1.000)
1977	1	-	.077	.386	.114	1.720
	2	-	.013	.033	.008	.086
	3	.001	.084	.220	.032	1.568
	4	.012	.198	.332	1.287	(1.000)
1978	1	-	0.03	0.18	0.89	0.44
	2	-	0.02	0.01	-	-
	3	-	0.48	0.02	0.01	-
	4	-	0.35	0.69	1.61	(1.0)
1979	1	-	0.03	0.63	1.68	0.83
	2	-	-	0.08	0.03	0.01
	3	-	0.46	0.09	0.01	-
	4	0.01	0.27	0.58	0.49	(1.0)
1980	1	-	0.03	0.83	1.75	1.04
	2	-	-	0.01	0.01	0.01
	3	-	0.37	0.14	0.03	-
	4	0.01	0.28	0.9	1.43	(1.0)
1981	1	-	0.06	0.62	1.15	1.48
	2	-	-	0.04	0.08	-
	3	0.01	0.39	0.34	0.17	1.17
	4	0.01	0.20	0.99	0.41	(1.0)
1982	1	-	0.05	1.10	1.84	3.79
	2	-	-	0.01	0.06	0.40
	3	-	0.42	0.03	0.03	-
	4	-	0.44	0.53	0.21	(1.0)
1983	1	-	0.03	0.27	1.06	4.85
	2	-	-	0.02	0.03	-
	3	-	0.44	0.19	0.18	-
	4	-	0.70	0.82	0.53	(1.0)
1984	1	-	0.01	0.45	0.56	1.01
	2	-	-	0.01	0.01	-
	3	-	0.27	0.68	0.22	0.26
	4	(0.01)	(0.22)	(0.76)	(0.76)	(0.9)

Table 7.3.4 North Sea SPRAT. Number in stock, N x 10^{-9} at the beginni of each quarter and biomass, tonnes x 10^{-3} at the beginning of each year(VPA) M=0.8 $year^{-1}$ 1974-77 from previous report.

		Age Groups					Biomass	
Year	Quarter	0	1	2	3	4	Total	Adult
1974	1	-	166	31	2.5	.3	598	432
	2	-	129	19	1.2	+		
	3	148	105	14	.8	+		
	4	121	82	9.6	.6	+		
1975	1	-	98	61	7.1	.4	702	576
	2	-	99	37	2.3	.2		
	3	222	81	29	1.8	.1		
	4	182	57	19	1.4	.1		
1976	1	-	148	41	9.8	.6	613	465
	2	-	113	24	2.1	.1		
	3	97	91	19	1.1	.1		
	4	79	59	15	.8	.1		
1977	1	-	62	41	9.9	.1	522	460
	2	-	47	23	7.2	+		
	3	122	38	18	5.8	+		
	4	100	29	12	4.6	*		
1978	1		81	19	7.0	1.1	354	273
	2		64	13	2.3	0.6		
	3	174	51	11	1.9	0.5		
	4	143	26	9	1.6	0.4		
1979	1	-	116	15	3.5	0.3	288	172
	2	-	93	.6.6	0.5	0.1		
	3	83	76	5.0	0.4	0.1		
	4	68	39	3.7	0.3	+		
1980	1	-	55	24.5	1.7	0.2	268	213
	2	-	44	8.7	0.2	+		
	3	62	36	7.1	0.2	+		
	4	51	20	5.1	0.2	+		
1981	1	-	41	12	1.7	+	160	118
	2	-	31	5.5	0.4	+		
	3	36	26	4.3	0.3	+		
	4	30	14	2.5	0.2	+		
1982	1	-	14	9.5	0.8	0.1	173	92
	2	-	19	2.6	+	+		
	3	19	15.4	2.1	+	+		
	4	16	8.3	1.7	+	+		
1983	1	-	13	4.5	0.8	+	92	50
	2	-	10	2.7	0.2	-		
	3	43	8.2	2.2	0.2	-		
	4	35	4.4	1.5	0.1	-		
1984	1	-	28	1.8	0.5	0.1	98	24
	2	-	23	0.9	0.2	+		
	3	16	19	0.8	0.2	+		
	4	13	12	0.3	0.1	+		

Table 7.4.1 Acoustic estimate of North Sea SPRAT biomass (t x 10^{-3}) standardised to the target strength - length relationship given in Section 7.4

		1980		1981		1982		1983		Jun 1984		Dec 1984	
Area		1-Group/Older		1-Group/Older		1-Group/Older		1-Group/Older		1-group/Older		0-Group/Older	
Norway	IVa E	2.5	-	No survey		No survey		No survey		No survey		-	
	IVb	125.9	59.6	10.0	5.7	9.0	4.0	No survey		12.0	25.1	-	
	IVb W	8.5	2.0	-	0.8	0.9	0.3	No survey		No survey		-	
	IVc	8.3	15.4	0.4	4.3	No survey		No survey		No survey		-	
Scotland													
	IVa W	2.0	0.4	2.9	0.8	3.2	0.1	1.3	0.2	1.8	0.3	7.6	3.1
	IVb W	2.0	0.4	12.5	0.1	2.8	0.5	2.5	<0.1	0.8	0.3	2.6	0.2
(56^0-$57^0$30'N)													
(54^0-56^0N)		0.2	<0.1	6.0	5.0	5.3	0.3	1.9	0.1	0.3	2.3	3.6	0.9
Total by Norway, England & Scotland	IVa W	2.0	0.4	2.9	0.8	3.2	0.1	1.3	0.2	1.8	0.3	-	
	IVb W	11.7	7.5	21.5	66.1	15.8	20.9	4.6	7.3	1.1	2.6	-	
	IVb E	125.9	59.6	10.0	5.7	9.8	4.2	-	-	12.0	25.1	-	
	IVc	8.3*	15.4*	7.1	46.8	3.1	81.0	1.8	52.5	-	-	-	

* Excluding Wash and Thames Estuary

Table 7.4.2 North Sea SPRAT.Research vessel surveys.

	SURVEYS						Commercial Fisheries	
Year of Observ.	IYFS N.sea No/hr all ages	IYFS Div. IVb 1-gr.	IYFS IVb E IKMT 1-gr.	IYFS IVb E Bottom trawl 1-gr.	Mid-water surveys Nov. 0-gr.	1-gr.	NE Engl fishery winter $\times 10^{-6}$ 1-gr.	N Sea $\times 10^{-6}$ Catches 1 qrt. 1-gr.
1970							1,172	
1971							730	
1972	873	90					218	
1973	713	123					1,022	
1974	2,631	481					1,517	7,620
1975	-	-					339	4,097
1976	2,127	1,186					557	9,361
1977	3,031	136					361	4,197
1978	2,208	1,474					732	2,462
1979	569[A]	248[A]					330	2,770
1980	3,770	1,402	328	1,916	2,831	81	59	1,448
1981	2,107	886	107	1,146	1,075	60	-	2,249
1982	602	183	47	512	1,044	38	-	1,021
1983	852	399	12	730	1,536	84		357
1984		349						134
1985	638	512						

[A] Low figures due to abnormal conditions on the survey

Table 7.5.1 North Sea SPRAT. Mean weights at age by quarters, 1983 and 1984 (in grams)

YEAR	AGE / QUARTER	0	1	2	3	4	5
1	JAN-MAR	-	3.3	8.7	13.5	32.0	-
9	APR-JUN	(1)	6.8	13.8	21.0	-	-
8	JUL-SEP	2.6	7.0	13.2	14.5	-	-
3	OCT-DEC	3.9	12.4	18.5	25.4	19.0	-
	YEAR	3.8	8.9	16.0	17.6	31.1	-
1	JAN-MAR	-	2.6	9.3	12.9	15.4	21.4
9	APR-JUN	-	3.8	9.1	16.1	-	-
8	JUL-SEP	(3.1)	(7.1)	(16.0)	(20.0)	(25.0)	-
4	OCT-DEC	3.4	12.9	21.1	25.5	22.5	-
	YEAR	3.4	9.1	15.8	18.7	18.2	21.4

Table 7.5.2 Percentage contribution of each age group to the landing weight.

Year	Age groups 0	1	2	3	4	5	
1974-77	1.0	32.7	51.2	13.6	1.4	0.2	%
1978-81	0.5	56.0	29.9	12.4	1.3	+	%
1982	0.2	52.7	46.7	0.2	+	+	%
1983	0.6	54.5	33.3	10.0	1.5	+	%
1984	0.4	80.3	13.8	4.8	0.6	+	%

Table 7.7.1 Yield and stock characteristics of North Sea SPRAT.

A. 1967-73 (Anon., 1977, based on annual VPA)

Year	Catch ('000 t)	Total biomass ('000 t)	Spawning biomass ('000 t)	$R_1 \times 10^{-9}$ (year class)
1967	81		416	129
1968	79		626	76
1969	83		762	86
1970	69		632	46
1971	90		556	42
1972	115		331	100
1973	271		200	194
B. 1974-83 (based on quarterly VPA)				
1974	314	598	432	98
1975	614	702	576	148
1976	621	613	465	62
1977	384	522	460	81
1978	378	354	273	117
1979	380	289	172	55
1980	323	273	213	41
1981	209	160	118	24
1982	153	173	92	13
1983	91	92	50	28
1984	80	98	24	

Spawning stock and R_1 1967-73 from Doc. C.M.1977/H:3, where

$R_1 = R_0 e^{-0.5M}$, R_0 being estimated at 1st July

Table 8.1.1 Nominal catch (tonnes) of SPRAT in Divisions VIId, e, 1975-1984 (data for 1975-1983 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	-	-		-	-	-	-	-	3	-
Denmark	-	447	74	1 796	9 981	7 483	b)	286	638**	1 417
Faroe Islands	-	6	-	-	-	-		-		-
France	147	115	120	225	2 373	1 867	146	44	60	-
German Dem. Rep.						-	-	-	-	-
Germany, Fed. Rep.	-	-	-	34	6	52	1			-
Netherlands	109	49	115	826	441	1 401	1 015	1 533	2 350	-
Norway	-	-	-	-		65	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-	-
UK (England + Wales)	1 315	3 107	2 928	2 118	2 032	6 864	10 183	4 749	4 756	2 288
Total	1 571	3 724	3 237	4 999	14 833	17 732	13 890	6 612	7 807	3 705

*preliminary

**Landings in foreign ports Jul-Dec not included

Table 8.1.2. Lyme Bay area fishery - Monthly catches (tonnes). (United Kingdom vessels only)

Season	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Season Total
1961-62				1	27	4	427	428	35	922
1962-63				309	238	131	148	187	58	1 071
1963-64				263	53	82	385	276	24	1 083
1964-65				25	56	20	242	465	8	816
1965-66				47	81	165	610	302	17	1 222
1966-67				3	152	368	703	355	1	1 583
1967-68			18	76	238	422	560	43	3	1 360
1968-69	11	-	4	122	142	298	373	123	1	1 074
1969-70				140	131	276	915	283	76	1 821
1970-71		7	38	90	184	549	553	106	20	1 547
1971-72			369	101	232	228	410	70		1 410
1972-73			107	209	132	87	404	165	49	1 153
1973-74			313	186	194	350	311	96	40	1 490
1974-75	184	451	209	533	838	405	157	30		2 807
1975-76			66	649	289	111	204	6		1 325
1976-77	289	440	1 039	123	594	347	234	103	5	3 174
1977-78	31	680	768	725	115	84	201	54		2 658
1978-79		252	368	545	450	209	58	37	28	1 947
1979-80			90	674	706	337	150	38	2	1 997
1980-81			458	815	1 423	1 872	2 069	138	54	6 829
1981-82			11	475	1 854	4 311	855	265	100	7 871
1982-83			54	844	1 017	641	522	90	31	3 199
1983-84			82	477	706	1 772	157	101	55	4 350
1984-85*			331	834	643	166	172	90		2 236*

Period Mean Values (indicated by first year of seasonal pair)

1961-65				129	91	81	362	332	29	1 024
1966-70	2	1	12	86	170	383	621	182	20	1 477
1971-75	37	90	213	336	337	236	297	73	18	1 637
1976-80	64	274	545	577	658	570	542	74	18	3 322
1981-83			49	599	1 526	2 241	511	157	62	5 140
1984			331	834	643	166	172	90		2 236*

*Provisional

Table 8.3.1. Lyme Bay SPRAT fishery, 1966-83.
Numbers caught per age group x 10^{-6}

	Age group					
Season	0/1	1/2	2/3	3/4	4/5	5/6
1966-67	0.55	11.67	44.00	18.56	11.67	3.60
1967-68	2.28	46.79	33.10	5.08	0.66	0.39
1968-69	0.08	29.99	29.24	4.03	0.44	0.10
1969-70	0.13	17.53	62.78	18.60	2.73	0.35
1970-71	0.01	4.12	46.03	26.94	1.57	0.54
1971-72	0.80	20.22	28.01	22.96	4.12	0.34
1972-73	1.51	32.20	22.20	10.20	3.96	0.38
1973-74	0.50	22.91	46.12	9.08	5.06	2.42
1974-75	0.30	40.77	82.73	12.67	8.84	3.55
1975-76	0.16	13.33	25.25	23.28	6.39	1.47
1976-77	0.73	40.34	108.52	34.87	6.56	0.37
1977-78	0.12	19.48	69.33	43.89	7.50	0.48
1978-79	9.20	41.71	44.64	18.97	5.72	0.01
1979-80	1.17	26.97	55.45	7.58	4.07	0.33
1980-81	0.76	51.33	220.79	55.35	6.15	0.26
1981-82	1.08	52.00	161.91	131.28	20.94	0.55
1982-83	1.16	4.81	49.74	58.89	25.41	0.25
1983-84	7.19	13.18	47.05	74.09	40.61	9.16
1984-85*	0.77	34.84	41.23	26.82	9.07	1.15

*Provisional

Table 8.3.2. Lyme Bay SPRAT.
Annual fishing mortalities (traditional analysis, using terminal populations generated by separable VPA).
Annual $M = 0.85^{-1}$; S = 0.3; F = 0.5;
% Z applied in estimation of biomass = 0.0

	Age group					Fc	Fp
Season	1/2	2/3	3/4	4/5	5/6		
1967-68	0.07	0.19	0.17	0.09	0.05	0.13	0.11
1968-69	0.03	0.14	0.06	0.03	0.02	0.10	0.06
1969-70	0.02	0.15	0.25	0.11	0.08	0.16	0.07
1970-71	0.01	0.11	0.18	0.06	0.05	0.12	0.05
1971-72	0.03	0.10	0.14	0.07	0.02	0.09	0.06
1972-73	0.06	0.09	0.10	0.06	0.02	0.08	0.07
1973-74	0.04	0.24	0.10	0.13	0.10	0.17	0.10
1974-75	0.09	0.40	0.20	0.25	0.25	0.27	0.17
1975-76	0.02	0.15	0.39	0.29	0.12	0.23	0.09
1976-77	0.07	0.41	0.67	0.37	0.05	0.37	0.19
1977-78	0.05	0.37	0.64	0.65	0.09	0.34	0.17
1978-79	0.04	0.29	0.34	0.33	0.03	0.25	0.13
1979-80	0.01	0.12	0.14	0.23	0.05	0.13	0.66
1980-81	0.08	0.20	0.36	0.33	0.04	0.22	0.11
1981-82	0.06	0.26	0.37	0.48	0.10	0.24	0.14
1982-83	0.01	0.15	0.29	0.23	0.02	0.19	0.07
1983-84	0.06	0.39	0.80	0.75	0.24	0.43	0.19

Fc and Fp - see Shepherd 1982

Table 8.3.3 Lyme Bay SPRAT. Number in stock (millions) at beginning of 1st year of each season (traditional analysis using terminal popoulation generated by VPA) Annual M = 0.85 year^{-1}; S = 0.3; F=0.5; %Z applied in estimation of biomass = 0.0.

	Age group					2 - 6
Season	1/2	2/3	3/4	4/5	5/6	Biomass (tonnes)
1968-69	1 584	331	93	19	8	24 993
1969-70	1 584	658	123	37	8	32 122
1970-71	995	666	242	41	14	29 459
1971-72	913	423	256	86	16	25 898
1972-73	776	377	163	95	34	22 220
1973-74	889	311	147	63	38	20 990
1974-75	704	365	104	57	24	18 496
1975-76	1 104	275	105	37	19	20 213
1976-77	821	463	102	31	12	20 306
1977-78	640	325	131	22	9	16 377
1978-79	1 707	261	96	29	5	25 244
1979-80	4 170	703	84	29	9	57 933
1980-81	2 490	1 765	266	31	10	64 627
1981-82	1 287	1 032	616	79	9	48 937
1982-83	502	517	340	182	21	28 273
1983-84	324	211	190	109	62	16 446
1984-85	653	130	61	37	22	12 074

Table 8.5.1. Lyme Bay area SPRAT
Mean weight/age

Season	Quarter	Age Groups						Overall Mean
		0/1	1/2	2/3	3/4	4/5	5/6	
1972-73	3	5.1	12.7	22.1	24.7	25.9	26.5	19.9
	4	5.3	11.3	21.9	24.9	26.5	27.2	20.3
	1	4.9	10.2	17.9	21.2	22.8	23.4	13.6
	Season	4.9	10.5	19.7	23.3	25.0	25.6	16.0
1973-74	3	6.4	15.6	18.2	23.5	24.7	25.1	19.5
	4	4.6	8.0	18.2	24.9	25.8	25.7	16.4
	1	6.2	10.0	15.5	23.3	24.4	24.4	15.0
	Season	4.8	9.2	17.3	24.2	25.2	25.2	16.5
1974-75	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
1975-76	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
1976-77	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
1977-78	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	218.1	22.4	28.7	9.8
	Season	6.4	6.2	16.7	22.3	25.5	31.3	17.5
1978-79	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
1979-80	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
1980-81	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
1981-82	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
1982-83	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
1983-84	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
1984-85	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

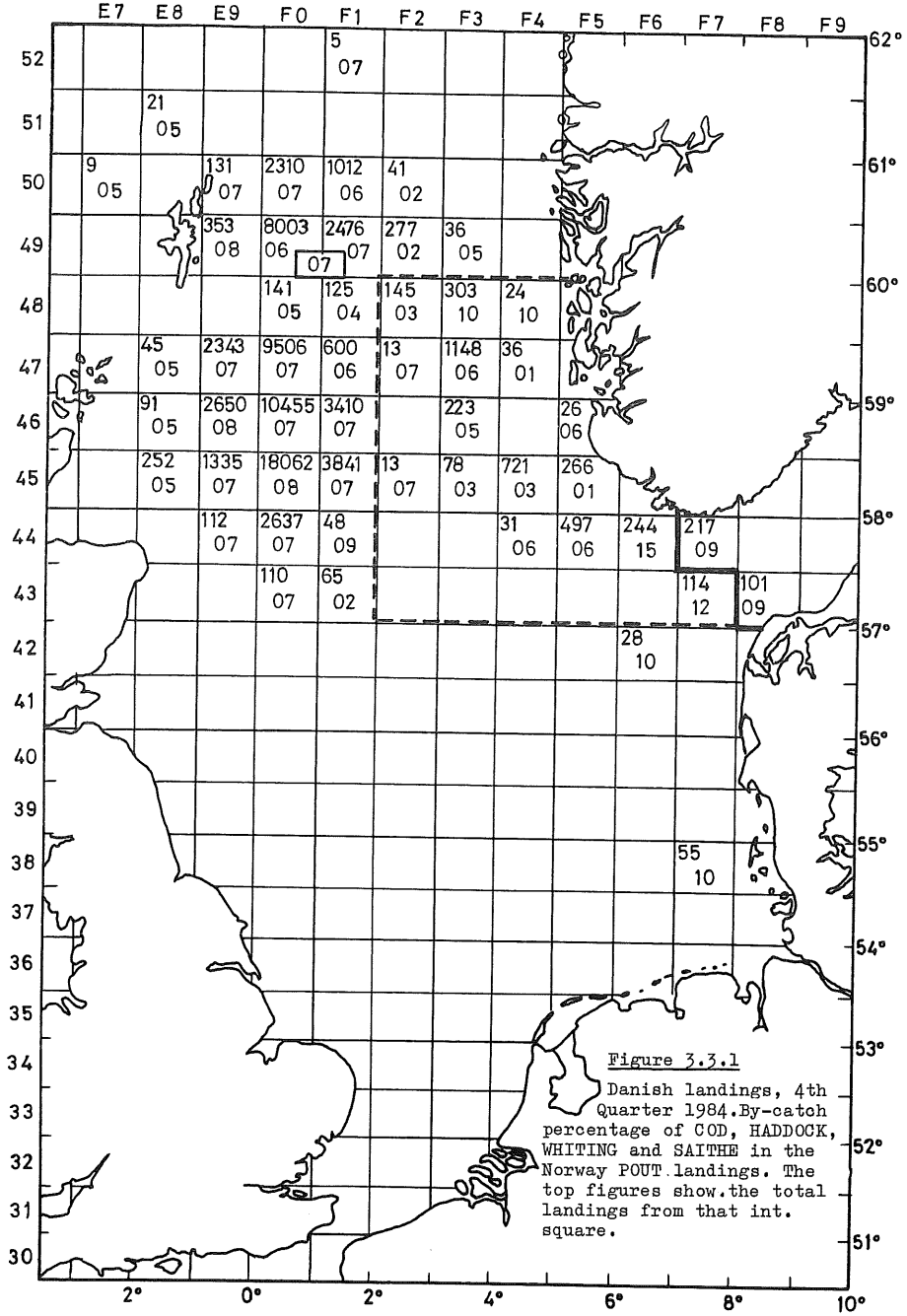


Figure 3.3.1

Danish landings, 4th Quarter 1984. By-catch percentage of COD, HADDOCK, WHITING and SAITHE in the Norway POUT landings. The top figures show the total landings from that int. square.

Figure 4.2.1 Norway POUT, Danish cpue plotted against mean tonnage of each vessel category.

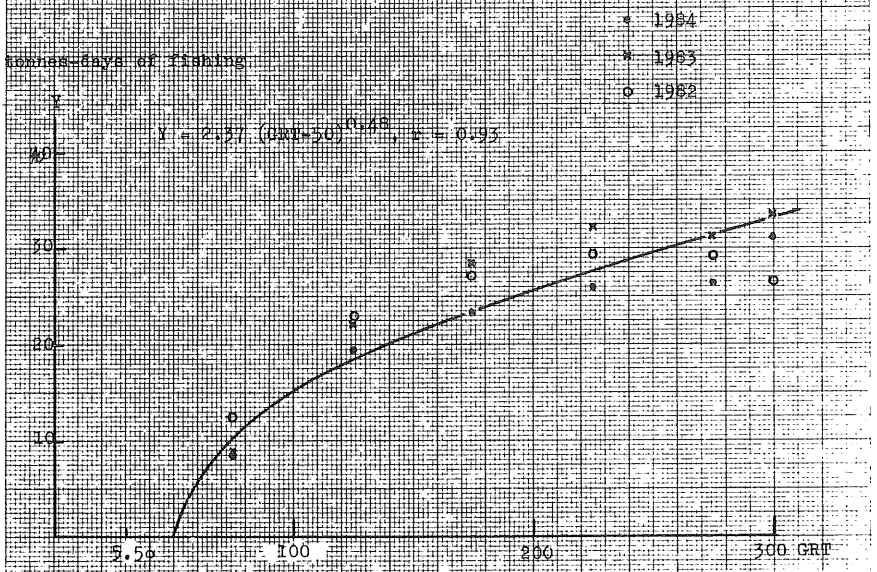


Figure 4.2.2 Norwegian cpue values for the Norway pout fishery by quarters (landings with <70% N.pout excluded).

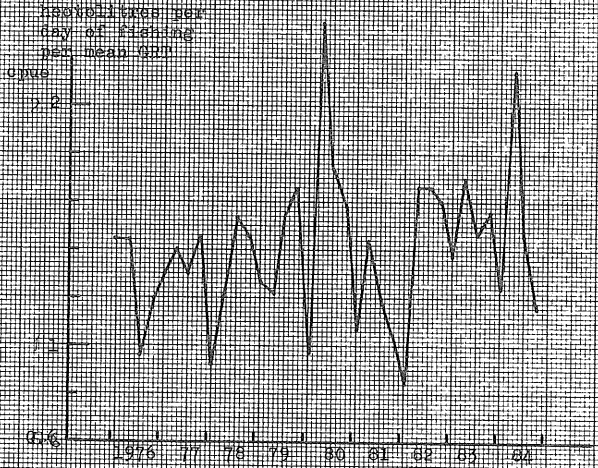


Figure 4.2.3 NORWAY POUT. Norwegian cpue values, weighted annual means.

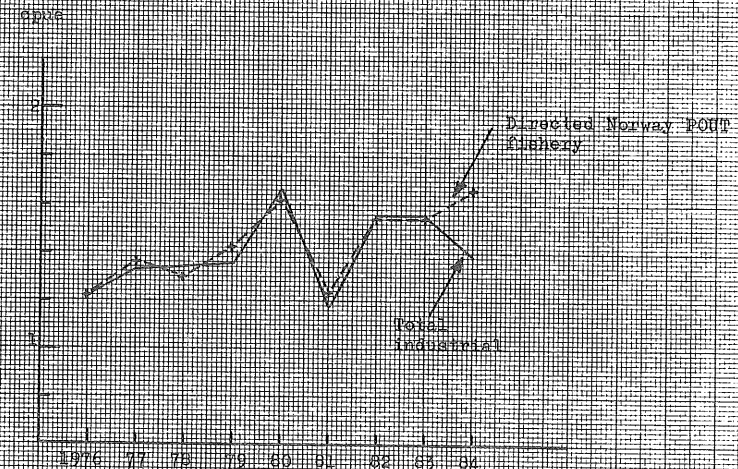


Figure 4.3.1 Norway POUT. Stock biomass and spawning biomass.

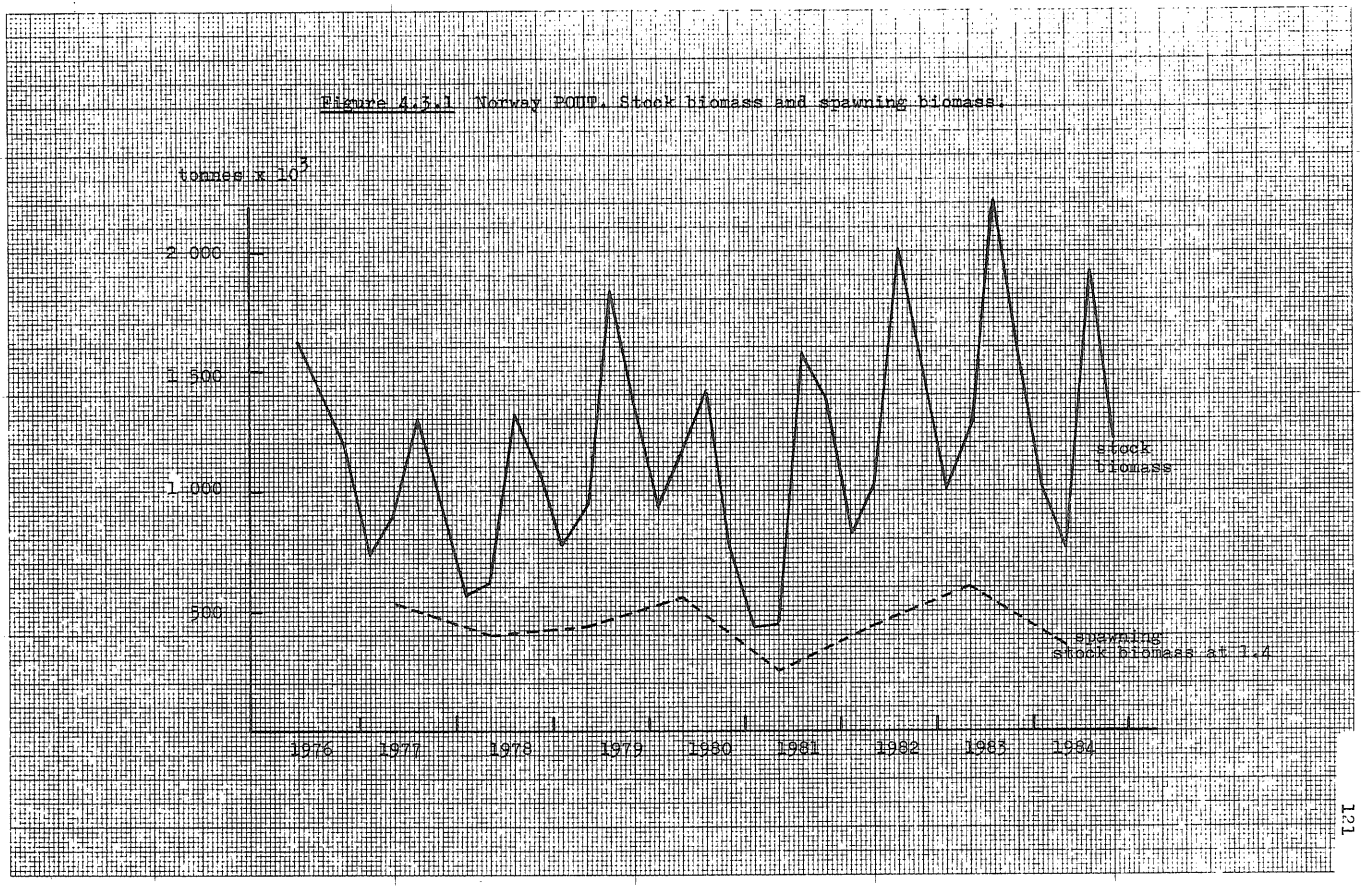


Figure 4.5.2 Norway ROUT. VPA 1-group plotted against research vessel indices.

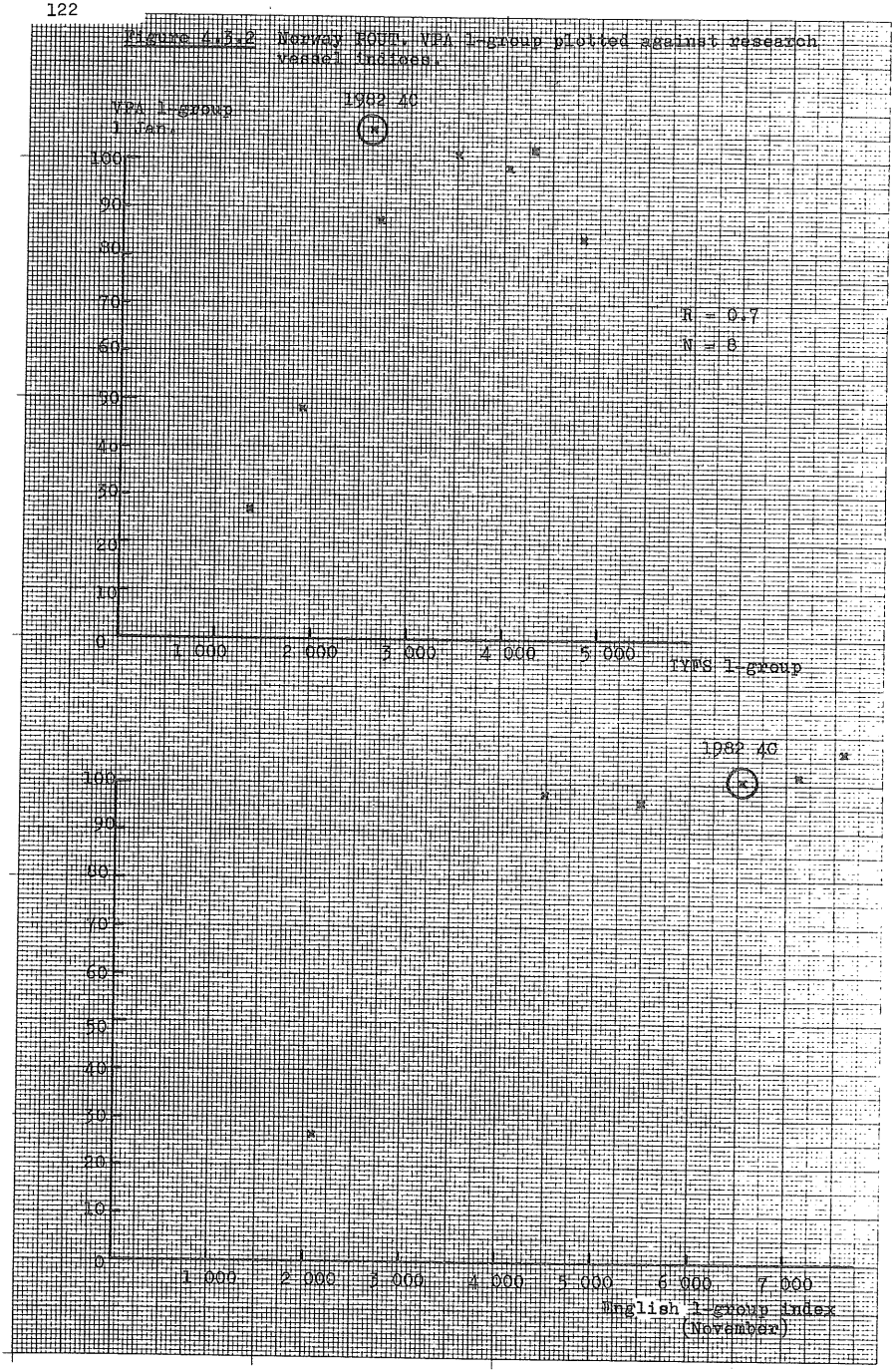


Figure 4.4.1 Sampling areas used for recruitment indices of Norway POUT shown in Table 4.4.1.

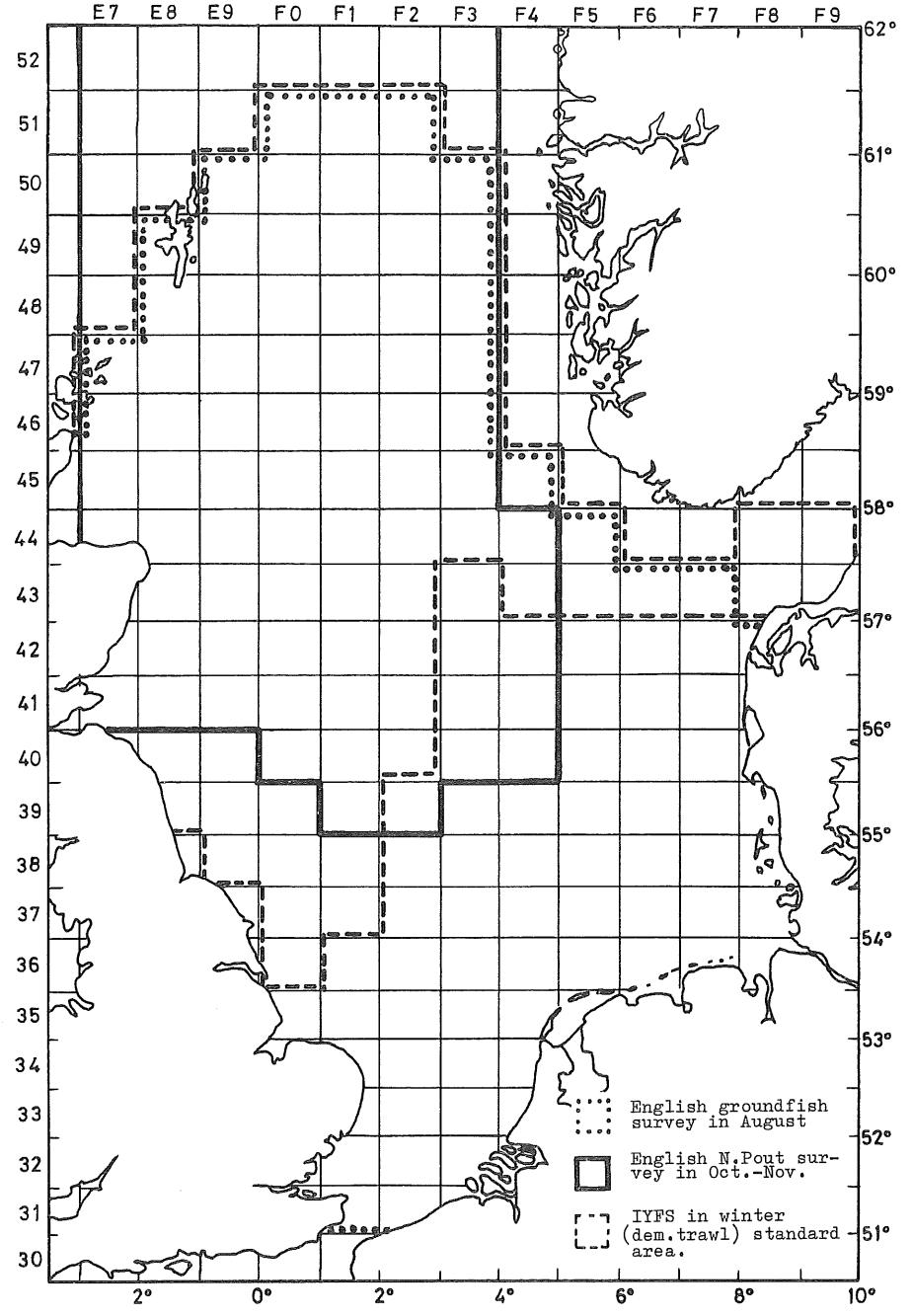


Figure A.7.1 Norway POUT. Prediction of the catch.

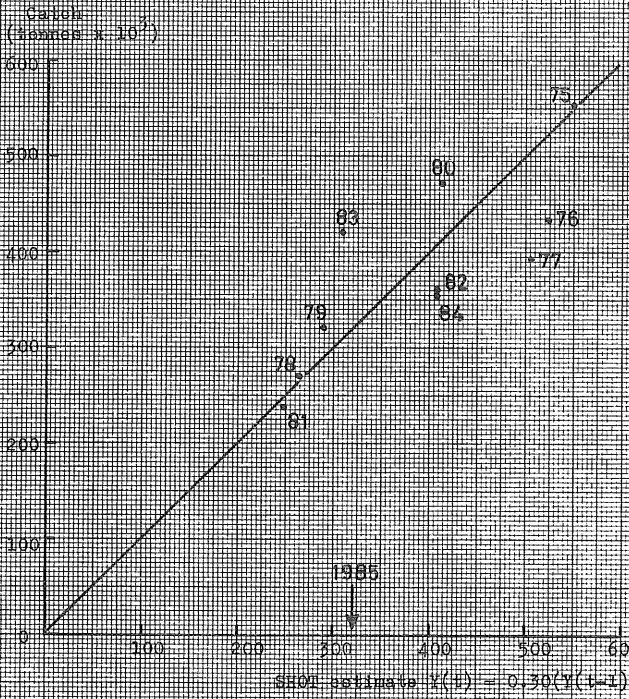
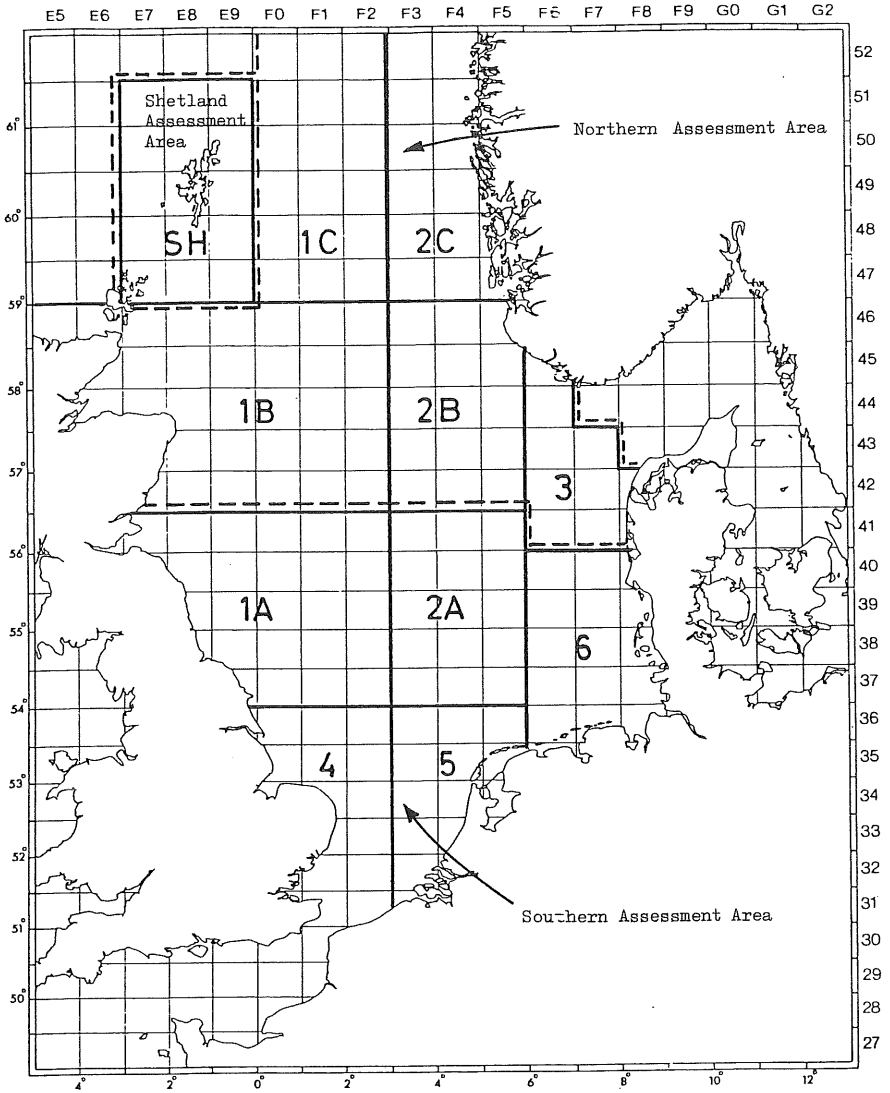


Figure 5.1.1. Danish SANDEEL areas and assessment areas used by the Working Group.



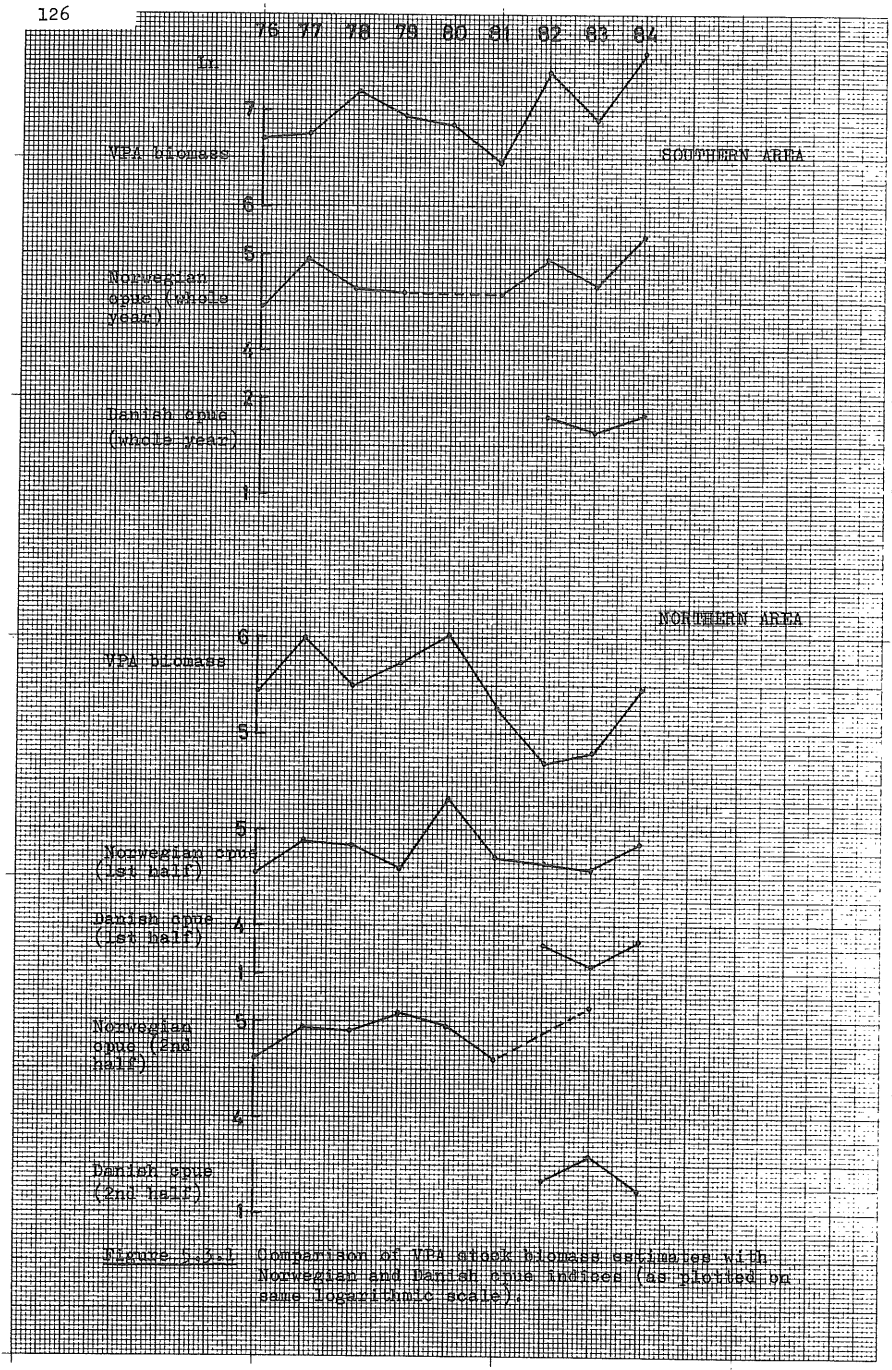


Figure 5.2.1 Comparison of VPA stock biomass estimates with Norwegian and Danish cpue indices (as plotted on same logarithmic scale).

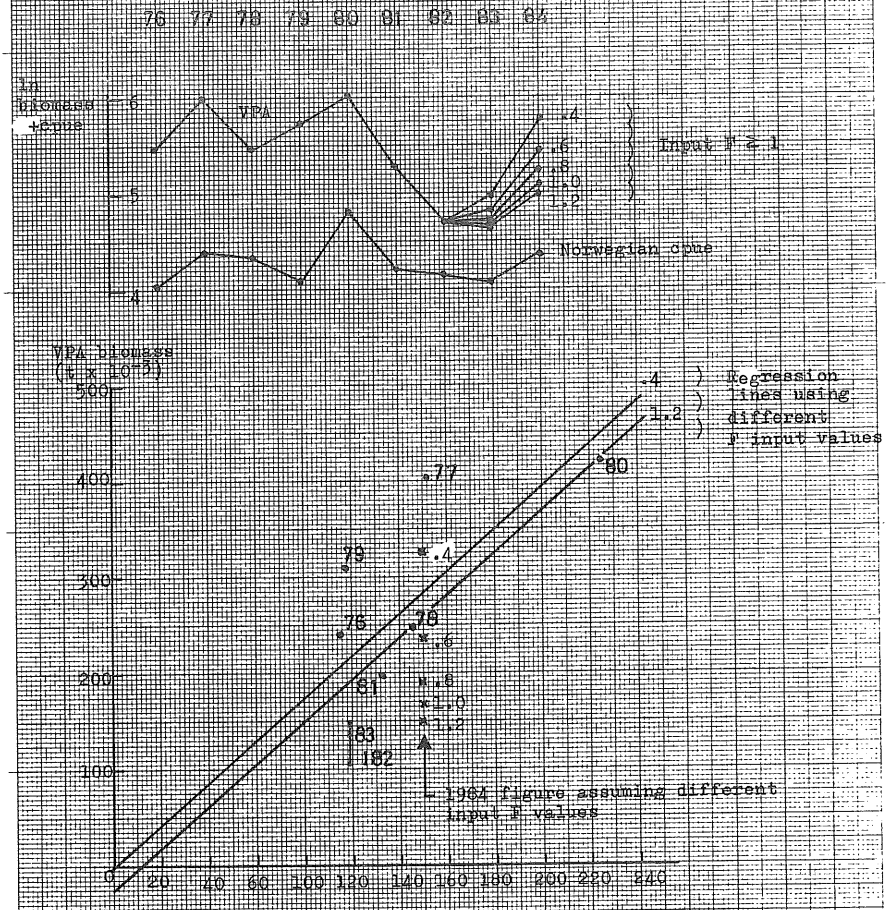


Figure 5.3.2 Comparison of biomass of northern SANDEEL from VPA with Norwegian cpue index.

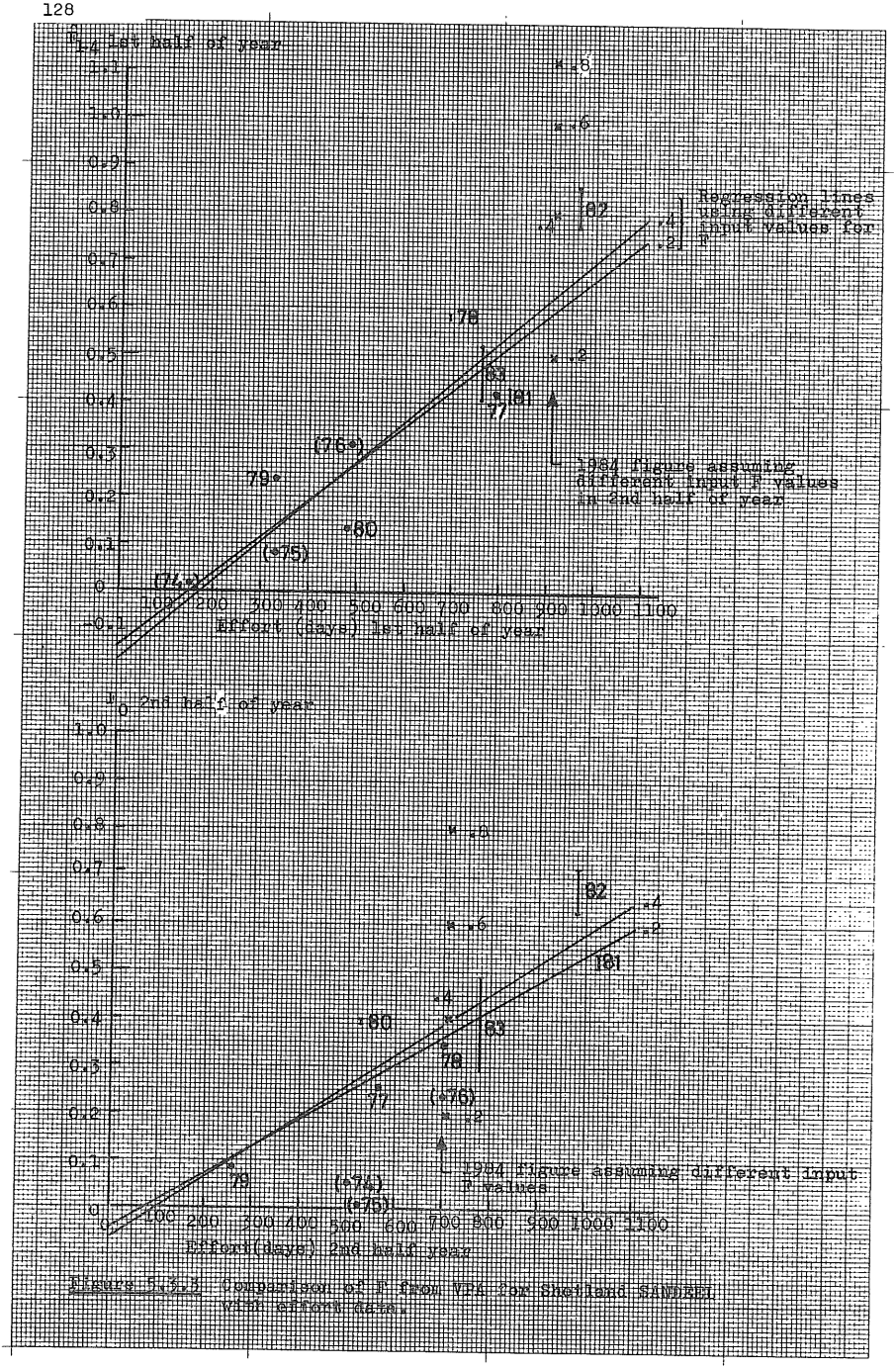


Figure 5.3.5 Comparison of P from VPK for Shetland SANDSAT with effort data.

Figure 5.3.4 SANDEEL. Year class strength in southern area plotted against catch of 0-group.

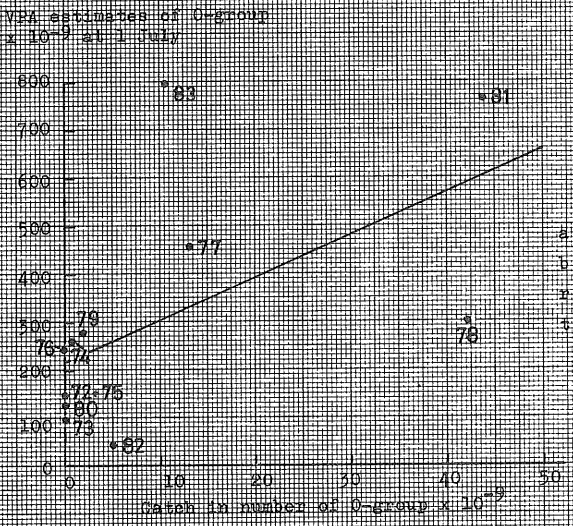


Figure 6.1 Division IIIa SPRAT. Relation between TVTS indices for 1-group sprat and total catch in Division IIIa and the Fjords of western Norway.

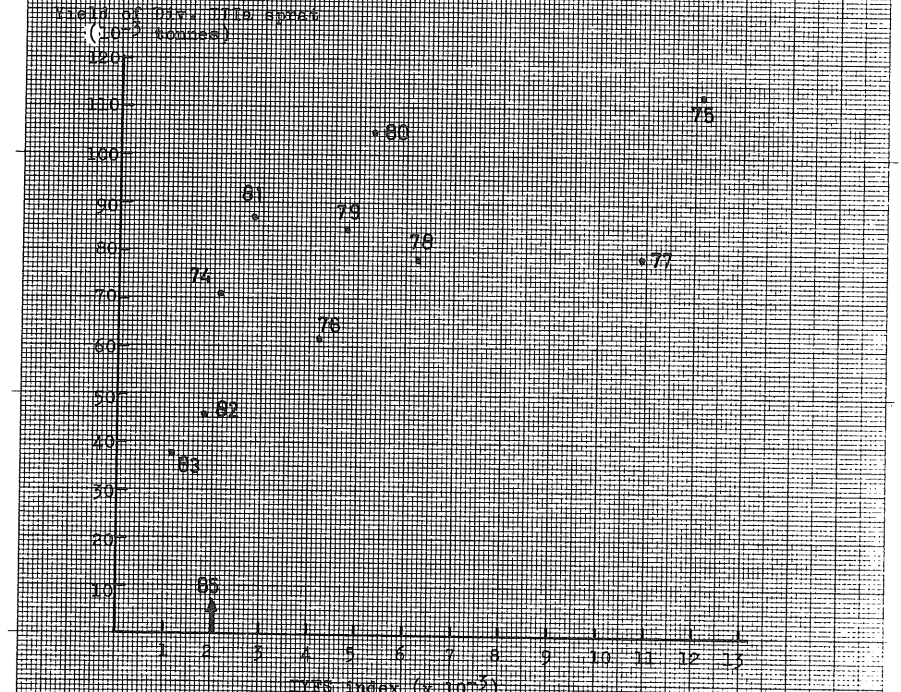


Figure 7.1.1 International SPRAT reporting areas.

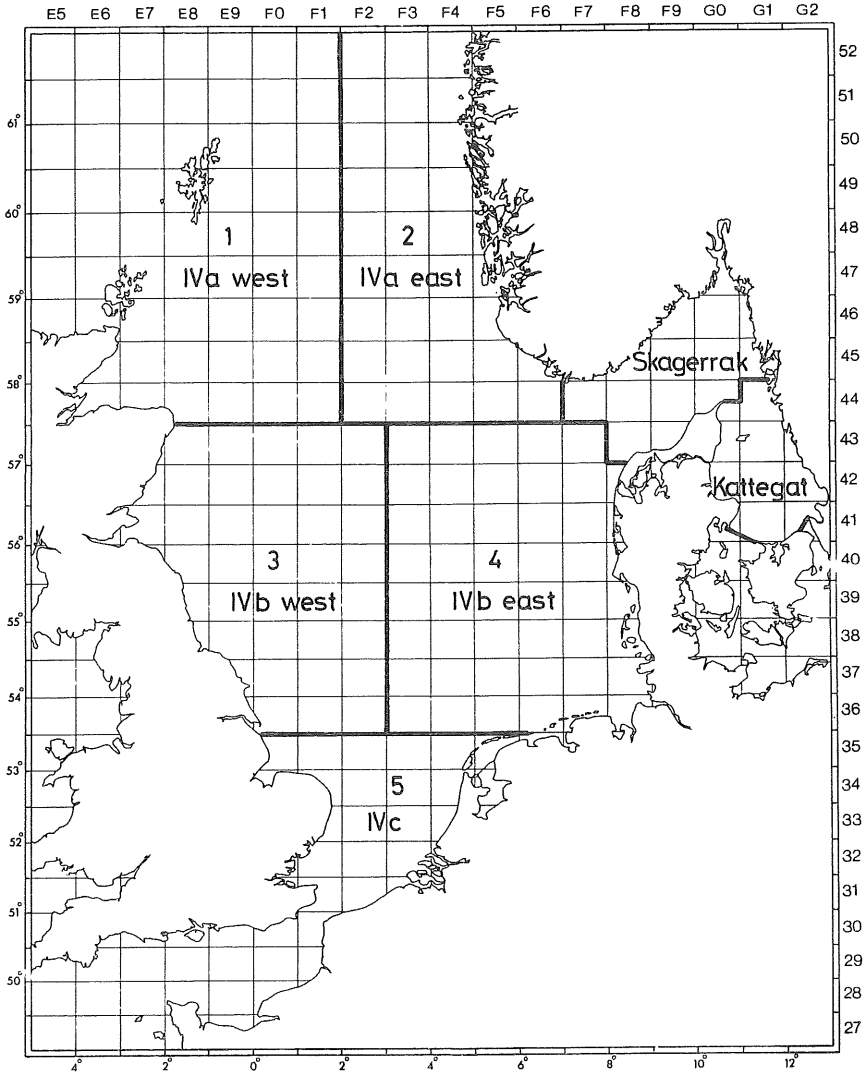


Figure 7.4.2 IYFS February 1985. Number/hour of SPRAT <10 cm. All countries.

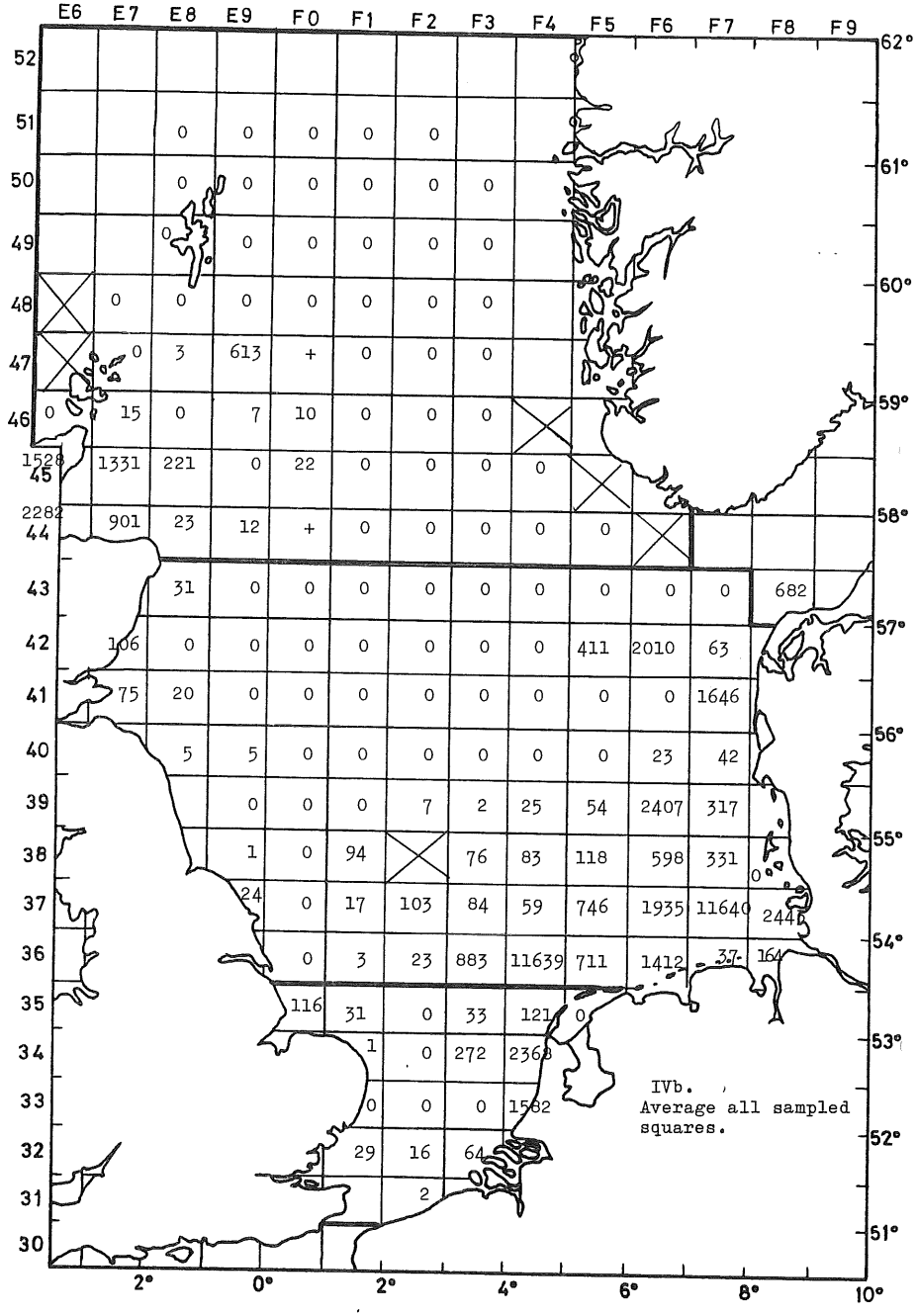


Figure 7.7.1 North Sea SPRAT: SMOT index versus total landings.

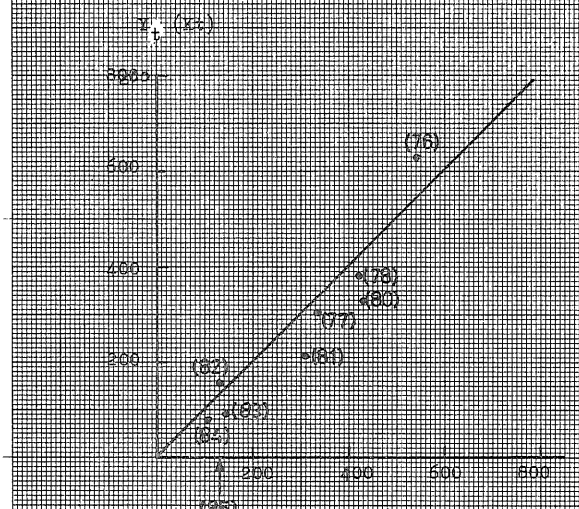
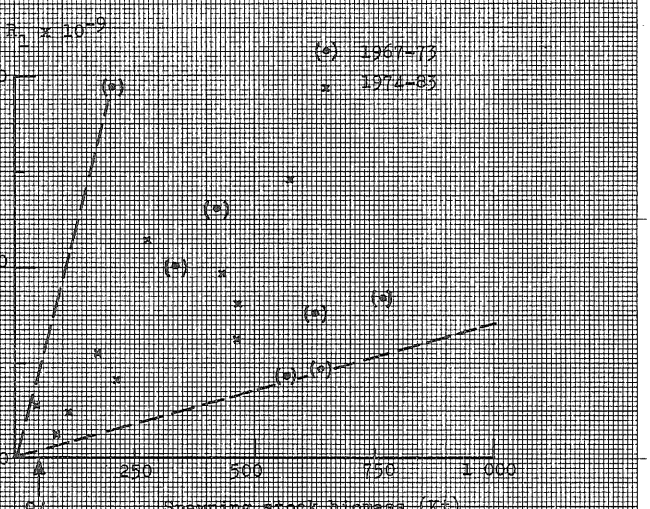


Figure 7.7.2 North Sea SPRAT: Stock and recruitment data.



Addendum to Doc. C.M.1985/Assess:8

Table 5.7.1 Estimates of total numbers of SANDEELS (all stocks combined) eaten by cod, whiting and saithe in 1981 No. x 10^{-6}

Sandeel Age Group	Period	Cod	Whiting	Saithe	Total	Estimated no. dying naturally From V P A			
						Total	Northern	Shetland	Southern
0	Jan-Jun	24,696	130,701	19,586	174,983	-	-	-	-
	Jul-Dec	6,795	43,357	124,280	174,432	472,668	18,058	-	454,610
1	Jan-Jun	10,577	166,044	155,395	332,016	21,694	6,214	2,436	13,044
	Jul-Dec	87	523	997	1,607	10,967	3,569	1,143	6,255
2	Jan-Jun	1,405	29,780	800	31,985	6,344	970	663	4,711
	Jul-Dec	236	716	906	1,858	2,037	186	196	1,655
3	Jan-Jun	235	514	239	988	1,956	242	203	1,511
	Jul-Dec	29	146	202	377	958	62	98	798
4	Jan-Jun	127	2,479	91	2,697	352	35	84	233
	Jul-Dec	18	54	87	159	108	9	32	67
5	Jan-Jun	48	1,003	48	1,099	129	10	22	87
	Jul-Dec	-	-	1	1	37	6	11	20
6	Jan-Jun	28	36	10	74	52	15	9	28
	Jul-Dec	-	-	-	0	20	8	1	11