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REPORT OF THE ARCTIC FISHERIES WORKING GROUP

Copenhagen, 22 September - 2 October 1986

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*General Secretary
ICES
Palægade 2-4
DK-1261 Copenhagen K
DENMARK

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1 PARTICIPANTS

W.R. Bowering	Canada
O.R. Godø	Norway
A. Hylen	Norway
T. Jakobsen (Chairman)	Norway
B.W. Jones	UK (England)
K. Nedreaas	Norway
K. Sunnanå	Norway
B. Vaske	German Democratic Republic
A. Vazquez	Spain

Dr E.D. Anderson, ICES Statistician, also assisted in the meeting.

2 INTRODUCTION

2.1 Terms of Reference

At the 73rd Statutory Meeting of ICES in 1985, it was decided (C.Res.1985/2:3:19) that the Arctic Fisheries Working Group (Chairman: Mr T. Jakobsen) will meet at ICES headquarters from 22 September - 2 October 1986 to assess the status of and provide catch options for 1987 for the stocks of cod, haddock, saithe, redfish and Greenland halibut in Sub-areas I and II inside safe biological limits.

2.2 Failure to Meet the Terms of Reference

Data from major fisheries of North-East Arctic cod and haddock, Sebastes mentella, and Greenland halibut were not available at the meeting of the Working Group.[1] The Working Group, therefore, concluded that there was no reliable basis for an assessment of these stocks. For Sebastes marinus, the data base as a whole is of poor quality and although a VPA was made, no prediction was attempted. Thus, a full assessment was carried out only for the North-East Arctic saithe and a limited assessment was made for S. marinus. For the other stocks, only some updated tables with corresponding sections of text are presented. A more detailed description of the deficiencies in the data base and the reason for not making an assessment is given at the end of each stock section.

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[1] Shortly after the meeting, it was discovered that data sufficient for completing the assessment of cod, haddock, and Sebastes mentella had been mailed to the Working Group chairman personally but did not arrive until after he had left for the meeting. In view of information received at the meeting, the Working Group did not consider this possibility.

3 NORTH-EAST ARCTIC COD

3.1 Status of the Fisheries

3.1.1 Landings prior to 1986 (Tables 3.1-3.3)

Final reports of landings in 1984 amounted to 277,651 t and were virtually unchanged from the provisional figures used in last year's assessment. Landings provisionally reported for 1985 were 302,819 t which was well in excess of the agreed TAC of 220,000 t, but was below the figure of 326,000 t, which was used last year by the Working Group for calculating catch options for 1986. Landings from Sub-area I have decreased from 723,489 t in 1974 to 54,317 t in 1984, but in 1985, this trend was reversed and the 114,512 t reported were just over twice the 1984 value. Landings from Divisions IIa and IIb in 1985 fell by 15% and 24%, respectively, compared with 1984 (Table 3.1).

Table 3.3 gives landings by country, and the main changes from 1984 to 1985 have been a 10% decline in Norwegian landings and an increase of 180% in landings by the USSR. The increase in landings by the USSR is also reflected in the much higher catches by trawlers in Sub-area I (Table 3.2).

3.1.2 Expected landings in 1986 (Agreed TAC of 400,000 t)

Tables 3.1 and 3.2 give the landings expected in 1986 based on reports of landings in the first half of the year. These estimates are for the catches of all countries except the USSR for which no data were provided. If the USSR landings in 1986 were equal to the national quota (150,000 t), the total catch for all areas combined would be expected to be about 420,000 t. The main contribution to the increased level of landings is expected to come from the recruitment to the fishery of the abundant 1983 year class.

3.1.3 Effort and catch per unit effort

Catch-per-unit-effort data for each area separately are given in Table 3.4, and data for the Vestfjord fishery at Lofoten are given in Table 3.5.

3.2 Catch in Numbers at Age

The age compositions for 1984 were changed in accordance with revised figures for landings and complete age distributions for Norwegian landings. Age compositions for the USSR, Spain and the Federal Republic of Germany were the same as those presented at the 1985 meeting. Catch in numbers at age for other countries was determined by combining catches and age compositions as was done at the 1985 meeting.

For 1985, the data available for calculating catch in numbers were:

a) landings by areas from each country for the whole year, and

b) age compositions from the catches by the Federal Republic of Germany, Norway, Spain, and the Faroes. Catch in numbers at age for other countries (except the USSR) was determined by combining catches and age compositions as follows:

Area	Country	Age composition
Sub-area I	Other countries except the Faroes	Norwegian trawler age composition
Division IIa	All other countries	Norwegian trawler age composition
Division IIb	Portugal	Spanish age composition
	All other countries	Federal Republic age composition

For the Faroe Islands catch in Sub-area I, the USSR age composition was intended to be used. However, lacking USSR age compositions for 1985, no total age composition could be calculated.

For 1986, age compositions were provided by Norway for all components in its fishery for the first half year. The Federal Republic of Germany provided age and length compositions for its fishery in January-April in Division IIa. No attempts were made to calculate a total age composition for the expected landings in 1986.

3.3 Survey Results

Survey results which have become available since the 1985 Working Group meeting were:

1) the joint Norwegian-USSR 0-group survey in August-September 1986 (Anon.,1986),

2) the Barents Sea acoustic and bottom trawl surveys in January-March 1986 (Hylen et al., 1986),

3) the spawning ground acoustic surveys in March 1986 (Raknes and Sunnanå, 1986), and

4) the Svalbard bottom trawl survey in September 1985 (Godø and Nedreaas, 1986).

3.3.1 O-group surveys (Table 3.6)

The abundance index for the 1986 year class is smaller than any of those from the period 1983-1985, but larger than those from the period 1976-1982.

3.3.2 Bottom trawl surveys (Tables 3.7-3.8)

A decline in the total abundance index was observed from 1984 to 1985 in the Norwegian bottom trawl survey in the Barents Sea. This reduction was caused by a drop in the abundance indices for the 1982 and 1983 year classes, which is not in conformity with the tendency observed for the preceding year classes. It is believed that this is caused by a change in the vertical distribution of the fish, which led to significantly lower bottom trawl indices for the youngest age groups in 1985.

In 1986, the total abundance index was nearly doubled from 1985. This was caused by higher abundance indices for the 1982, 1983, and 1984 year classes.

The total abundance index in the Norwegian bottom trawl survey in the Svalbard region has been steadily increasing since 1983. From 1984 to 1985, it more than doubled. A large part of the increase was due to contributions from the 1981-1984 year classes. In general, there may have been an overall increase in availability of cod resulting in higher indices in 1985 compared with earlier years. There is, however, no known reason for such an increase (Godø and Nedreaas, 1986).

3.3.3 Acoustic surveys

Details of the acoustic surveys are given in the respective survey reports. Before 1985, the acoustic estimates were made on the basis of the total echo abundance which was split between cod and haddock on the basis of samples from bottom and midwater trawls combined. In 1985 and 1986, however, estimates were also made using midwater trawl samples for the pelagic echo abundance and bottom trawl samples for the echo abundance in the bottom layer. The latter method is considered the more reliable (Hylen et al., 1986).

The acoustic abundance estimates from the 1985 and 1986 surveys supported the findings from earlier years indicating a vast improvement in the recruitment to the stock, while the number of older fish was considerably reduced as compared with previous years.

3.3.4 Evaluation of the surveys

In 1986, an overall increase in the abundance indices for the 1982-1984 year classes of cod and an overall decline for all age groups of haddock was observed in the bottom trawl survey. This may have been caused by a shift in the vertical distribution of cod relative to haddock. This is in conformity with the observations made in the acoustic survey (Tables 3.9 and 4.7), in

which the echo abundance estimates of cod and haddock combined were unchanged from 1985 to 1986, both in total echo abundance and in the bottom layer (Hylen et al., 1986).

Hylen and Nakken (1982, 1983, 1984,1985) have evaluated the Norwegian survey results for 1985 and previous years. They were particularly concerned with the high acoustic estimate of the 1981 year class in 1985. According to all previous observations, this year class should be relatively weak (Tables 3.6-3.9). The higher estimates could be due to inadequate sampling, wrong ageing, or incorrect establishing and/or application of age/length keys. No correction was made for the 1981 year class in the 1985 survey. The results for the 1985 and previous surveys are given in Table 3.9 together with the evaluation of the 1986 surveys (Hylen, unpublished). The estimate of the 1982 year class in 1983 is much lower than in 1985, while it has increased from 1985 to 1986 for the 1983 and 1984 year classes. The relative increases are comparable to those observed for the preceding year classes over the first 3-5 years of life.

3.4 Recruitment (Tables 3.6-3.8)

A summary of the information available from the surveys for the 1982-1986 year classes is given below:

Year class	Age	Survey: 0-group (index)	Survey: Acoustic (millions)	Survey: Bottom trawl: Norway (millions): Barents Sea	Survey: Bottom trawl: Norway (millions): Svalbard	Survey: Bottom trawl: USSR (no./hr)
1982	0	0,6	-	-	-	-
	1	↓	-	45	15	4
	2		506	127	43	10
	3	(400)[1]	817	90	74	9
1983	0	1.7	-	-	-	-
	1	↓	2,382	355	52	6
	2		1,534	169	133	9
	3	(1,100)[1]	1,717	356	-	-
1984	0	1.6	-	-	-	-
	1	↓	118	7	27	1
	2		361	93	-	-
	3	(1,000)[1]	-	-	-	-
1985	0	2.5	-	-	-	-
	1	↓	435	83	-	6
	2		-	-	-	-
	3	(1,600)[1]	-	-	-	-
1986	0	1.4	-	-	-	-
	1	↓	-	-	-	-
	2		-	-	-	-
	3	(900)[1]	-	-	-	-

[1] Estimated from the regression equation (Anon., 1986b): year-class strength at age 3 (millions) = 38.02 + 633.85 x 0-group survey index.

The 1982 year class appears to be the largest in a number of years. The estimate first used in the assessment of this stock was 400 million at age 3 based on the 0-group survey. This estimate was revised last year on the basis of the acoustic survey (results now revised) to 800 million. The estimate from bottom trawl surveys, however, is lower than this value. Landings of cod from Sub-area I almost doubled in 1985 compared with 1984 and, although there may have been some increase in fishing effort, it is probable that the recruitment of the 1982 year class to the fishery has made a substantial contribution to the landings. In the absence of complete age composition data for the landings, this contribution is impossible to evaluate and no attempt will be made to revise the estimate of year-class strength before the age compositions of the landings are available. However, it appears possible that the estimate of 800 million may be a bit optimistic.

The 1983 year class appeared to be very abundant in both the 0-group survey and the acoustic surveys but, in absolute terms, less abundant in the trawl surveys. In relative terms, however, it could be more than double the size of the 1982 year class.

The 1984 year class, as estimated from the 0-group survey, appeared to be almost equal in abundance to the 1983 year class, but the evidence presently available from acoustic and trawl surveys suggests a lower abundance, perhaps about equal in size to the 1982 year class.

The 1985 year class was estimated as equal to the largest ever recorded in the series of 0-group surveys. Data from other surveys are rather limited at present but those available do not indicate such a large year class.

For the 1986 year class, the only estimate at present is from the 0-group survey which indicates it to be another abundant year class.

3.5 Assessment

The USSR increased its catches in Sub-area I from 8,839 t in 1984 to 55,742 t in 1985, accounting for 18% of the total catches of North-East Arctic cod. There was no information about the distribution of the USSR fishery in Sub-area I in 1985, and in the absence of USSR data, no age composition was available which could be assumed to be representative of the USSR catches. To make an assessment, it would, therefore, be necessary to construct an age composition for the USSR catches. However, the size of the 1982 and 1983 year classes is crucial for the assessment, and the evidence from the surveys is to some extent conflicting. Data from the USSR fishery in 1985 and 1986 are, therefore, needed as an aid to estimate the year-class strength. In addition, information on changes in fishing effort by USSR vessels is essential to be able to estimate mortality rates on the recruiting year classes.

The Working Group concluded that, in the absence of the USSR data, an assessment would give little significant new information about the stock situation and that the likelihood of making serious errors would be high.

4 NORTH-EAST ARCTIC HADDOCK

4.1 Status of the Fisheries

4.1.1 Landings prior to 1986 (Tables 4.1-4.3)

The final figure for landings in 1984 was 17,318 t which was effectively unchanged from the preliminary data used in last year's assessment and was the lowest value recorded for this stock. Provisional figures for 1985 show an increase in landings to 41,471 t which is below the agreed TAC of 50,000 t but well in excess of the expected catch (23,000 t) when last year's assessment was made. Landings in Sub-area I increased from 4,000 t in 1984 to 30,142 t in 1985, but in Division IIa, the declining trend in landings continued in 1985 and the 11,206 t reported were 2,041 t below the 1984 level. Landings reported from Division IIb remained at a very low level (Table 4.1).

Landings by country are given in Table 4.3. Norwegian landings increased by 2,500 t in 1985, and landings by the USSR increased from 1,103 t in 1984 to 22,690 t in 1985. This latter increase is also reflected in the landings of trawlers in Sub-area I (Table 4.2)

4.1.2 Expected landings in 1986 (Agreed TAC of 100,000 t)

Expected catches for 1986 are given in Tables 4.1 and 4.2 for all countries except the USSR, for which no data were provided. These estimates were based on landings reported for the first half of the year. If the landings for the USSR were equal to the national quota (45,000 t), total landings in 1986 would be expected to be about 88,000 t which is more than double the level of 1985.

4.1.3 Effort and catch per unit effort

Catch-per-unit-effort data are given in Table 4.4. These data are now available only for the Norwegian trawl fisheries.

4.2 Catch in Numbers at Age

Age compositions for 1984 were revised in accordance with the final landings figures and the complete age distributions for Norwegian landings.

For 1985, the data available for calculating catch in numbers were:

a) landings by area for each country for the whole year, and

b) age compositions from catches of the Federal Republic of Germany and Norway.

In Sub-area I and Division IIa, the catch in numbers at age for the landings of other countries (except the USSR) was determined by using the age composition from Norwegian trawl catches. In Division IIb, an age composition from Norwegian trawlers in Sub-area I was used. Due to the lack of USSR age compositions, representing 55% of the total landings and 75% of the Sub-area I landings, a total age composition was not calculated.

For 1986, only Norway provided age compositions for catches in the first half of the year.

4.3 Survey Results (Tables 4.5-4.7)

The survey results used are from the same surveys as for cod (see Section 3.3).

4.3.1 0-group survey (Table 4.5)

The last five years have all shown high abundance indices for haddock. The 1983 and 1984 figures indicate strong year classes

and the 1982, 1985, and 1986 figures indicate average year classes.

4.3.2 Bottom trawl surveys (Table 4.6)

The figures from the Norwegian bottom trawl survey (Table 4.6) indicate that the 1983 year class is strong. The 1984 year class is, in contradiction with the O-group index, showing up weaker than the 1982 year class, but somewhat stronger than the 1985 year class. The survey, therefore, indicates the 1984 year class to be about average.

Of the year classes prior to 1982, only the 1981 year class contributed significantly to the abundance, indicating that all year classes prior to 1982 in the table are small compared to the year classes in 1982 and later.

4.3.3 Acoustic surveys (Table 4.7)

The figures for the 1985 survey given in Table 4.7 are revised figures taken from the survey report from 1986 (Hylen et al., 1986). The earlier figures are as previously presented, and the figures from 1986 are from the survey report of 1986.

The figures show that the 1983 year class is about twice the size of the 1982 year class, and the 1984 and 1985 year classes are somewhat less than half the size of the 1982 year class.

Concerning the year classes prior to 1982 in Table 4.7, there is evidence that the 1975, 1976, and 1977 year classes were of average size. The other year classes are contributing very little to the abundance.

4.3.4 Evaluation of the surveys

The overall impression from the bottom trawl survey in 1986 is of a decline in the abundance of haddock of all age groups compared to 1985. This decline is not reflected in the acoustic survey in 1986. In this survey, the same level is maintained in 1986 as in 1985, except for the 1981 year class (see Section 3.3.4 for further discussion).

The very high estimates of the 1982 and 1983 year classes at age 3 in the acoustic survey exceed the highest observed in the VPA, which is about 1,000 million individuals for the 1969 year class, and may indicate that haddock is overestimated in the survey. This is confirmed by information on trawl selectivity (Engås and Godø, 1986) and on factors for conversion of echo abundance to numbers (Sunnanå, pers. comm.). This knowledge is not yet incorporated into the calculation of the acoustic survey results, but will tend to transfer abundance from haddock to cod and reduce the overall level of older fish. The overall level of young fish may be kept, but there will be a lower abundance of young haddock.

4.4 Recruitment (Tables 4.5-4.7)

A summary of the information available from surveys for the 1982-1986 year classes is given below:

		Survey			
				Bottom trawl	
Year class	Age	0-group (index)	Acoustic (millions)	Norway (millions)	USSR (No./hr)
1982	0	0.38	-	-	-
	1	-	-	315	23
	2	-	1,002	356	59
	3	-	1,007	380	63
1983	0	0.62	-	-	-
	1	-	2,147	663	40
	2	-	1,724	616	79
	3	-	2,034	314	-
1984	0	0.78	-	-	-
	1	-	470	168	1
	2	-	352	135	-
	3	-	-	-	-
1985	0	0.27	-	-	-
	1	-	236	78	-
	2	-	-	-	-
	3	-	-	-	-
1986	0	0.39	-	-	-

As for cod, the indications for recruitment are encouraging in that the 1982-1986 year classes appear to be of average or above-average abundance. The acoustic surveys and Norwegian trawl surveys both give total stock size estimates. As for cod, the estimates from these two surveys differ in magnitude, but the data set for haddock is rather more consistent than that for cod in terms of year-class strength on a relative scale.

The 1982 year-class strength was estimated to be 300 million at age 3 at the 1985 meeting of the Working Group. It is certainly the largest year class for several years. Landings from Sub-area I increased from 4,000 t in 1984 to 30,000 t in 1985, and the 1982 year class must have contributed substantially to this increase. However, until full age composition data for the 1985 landings are available, this contribution cannot be quantified and no revision of the 1982 year-class strength will be made until the full data are available.

For the 1983 year class, the majority of the estimates indicate that it is larger than the 1982 year class, perhaps by a factor of about 1.7.

The 1984 year class was estimated in the 0-group survey to be the largest ever recorded by that survey. However, such high abundance is not supported by the acoustic and trawl survey results which indicate an abundance equivalent to about half of the 1982 year class.

For the 1985 year class, the limited information currently available suggests a year-class strength of approximately one fourth of the 1982 year class.

The 1986 year class is estimated by the 0-group survey to be equal in abundance to the 1982 year class.

4.5 Assessment

An assessment of the North-East Arctic haddock was not attempted for the same reasons as for the North-East Arctic cod (see Section 3.5). However, the USSR haddock catches in Sub-area I represent a higher proportion (54%) of the total catches in 1985 than the USSR cod catches.

5 NORTH-EAST ARCTIC SAITHE (SUB-AREAS I AND II)

5.1 Status of the Fisheries

5.1.1 Landings prior to 1986 (Table 5.1, Figure 5.2A)

Revised landings reported to Bulletin Statistique for 1984 were 158,786 t which is close to the average for the preceding five years. Preliminary figures indicate that landings in 1985 fell sharply to only 102,693 t. In the last five years, over 95% of the catch has been taken by Norway.

5.1.2 Expected landings in 1986

Landings reported by Norway for the first six months of 1986 were 32,000 t. In preceding years, about 50% of the annual catch was taken in the first half of the year. Landings for the whole of 1986 by all countries are, therefore, expected to be about 70,000 t.

5.1.3 Effort and catch per unit effort

Catch, effort, and catch per unit effort for Norwegian stern trawlers in the size class 250-500 GRT are given in Table 5.2. This vessel class is the most important one in the Norwegian trawl fisheries for saithe. These data are given for the northern and southern regions of Division IIa separately as there is a directed fishery for saithe in the southern part and a mixed fishery mainly with cod in the northern part. Taking 1980-1983 as a reference period, fishing effort in 1984 increased in both regions by about 18%. In 1985, fishing effort declined to about 86% of that in the reference period.

5.2 Catch in Numbers at Age (Table 5.4)

Age compositions of landings were available for Norway and the Federal Republic of Germany. Data for 1984 were revised and new data were added for 1985. Age compositions of other countries were assumed to be the same as for the Federal Republic of Germany.

5.3 Weight at Age (Table 5.5)

A constant set of catch weight-at-age data is used for all years in the period 1960-1979. Subsequently, annual estimates of weight at age are used. Data for 1984 have been revised and new data added for 1985. Weight at age in the stock is taken to be the same as weight at age in the catch. The weight-at-age data used in the catch predictions and in the yield-per-recruit calculations were average values for the period 1981-1985 (Table 5.8).

5.4 Age at Maturity

No maturity ogive is available for this stock of saithe. As in previous assessments, fish of age 6 and older are assumed to be mature for calculation of spawning stock biomass.

5.5 Survey Results

Up to the present time, no recruitment indices from surveys have been available that could be used as input for the assessments. Neither have there been any estimates of stock biomass from acoustic surveys. However, in 1985, an initial saithe 0-group survey was undertaken by Norway. The survey was made in May and covered an area off the Norwegian coast from approximately 65^0N to 70^0N. The results were very encouraging but indicated that the area surveyed would need to be extended south to fully cover the distribution of 0-group saithe. In 1986, a second survey was carried out with the southern limit of the survey extended to about 58^0N. Only a few saithe were recorded south of 61^0N. It is too early to say whether abundance indices from these surveys will provide reliable estimates of annual recruitment to the fishery, but the results so far look very promising.

5.6 Recruitment

As indicated above, no estimates of the strength of the recruiting year classes are available for this stock.

5.7 Fishing Mortalities - VPA

An initial trial VPA confirmed the observation made last year that both the exploitation pattern and the overall level of fishing mortality had remained stable during the period 1980-1983. It was also clear that there had been significant changes in the fishery in 1984 - in particular a substantial increase in fishing mortality on age groups 3 and 4. To estimate VPA input values of

F for 1985, there was a need to decide on the level of fishing mortality and also on the exploitation pattern. In addition, there was a problem of estimating the size of the 1983 year class, which would influence the choice of input F on age group 2.

Table 5.2 gives recent trends in catches and effort for the dominant class of Norwegian trawlers fishing for saithe. Landings for different gear categories are plotted in Figure 5.1. Compared to a reference period 1980-1983, fishing effort by Norwegian trawlers increased by about 18% in 1984 and then declined to about 14% below the reference period in 1985. Fishing effort data for purse seiners are less easy to quantify, but it has been estimated that saithe fishing by these vessels has declined in 1984 and 1985 to reach about 70% of the 1982-1983 level in 1985. Combining these estimates and allowing for the fact that purse seiners catch fish mainly in the age range 2-6, it was decided that the level of fishing mortality in 1985 was likely to be about 25% below the 1980-1983 level for age groups 3-6 and 10% below for the older age groups.

From the trial VPA, estimates of F were split into F due to fishing by purse seiners and F due to fishing by Norwegian trawlers. It became clear from this that the high level of F on age groups 3 and 4 in 1984 was due to high catches of these age groups by trawlers. This is illustrated in Table 5.3 (based on the final VPA run). There is no indication that the increased fishing by trawlers on age groups 3 and 4 was repeated in 1985 as the proportions of these age groups taken by trawlers and purse seiners has reverted to normal levels. As a result of these considerations it was decided to use an exploitation pattern for 1985 based on the average for 1980-1983 with some slight smoothing.

For the trial VPA, the input F for age group 2 in 1985 was based on an average value, and the calculated number in the stock indicated a very low abundance for the 1983 year class, well below the minimum value in the historic series. Examination of the catch data indicated that catches by trawlers of 2-year-olds were much higher than in the preceding four years. The purse seiners, which normally account for a high proportion of the 2-year-olds caught, had very low catches in 1985. Reports from along the Norwegian coast indicated that this year class was relatively abundant as 0-group in the coastal zone. The average size for the 2-year-old fish in 1985 was below average, and it is possible that slower growth has reduced their availability to capture. It is also possible that inadequate age sampling for some sectors of the fishery has contributed to an underestimate. On balance, the Group considers that the 1983 year-class strength is more likely to be close to the average level rather than being extremely poor.

In summary, VPA input F values for 1984 have been derived as follows:

Age group 2: F = 0.014 to give a year-class strength close to a recent average level.

Age groups 3-5: Average for the period 1980-1983 reduced by 25%.

Age groups 6-14: Average for the period 1980-1983 reduced by 10% (with some smoothing).

In addition, there have been some amendments to the VPA input F values on the oldest age groups for recent years to make them more consistent with back-calculated values for younger age groups.

The resultant F-at-age array from the VPA for the last ten years is given in Table 5.6, and the corresponding estimates of stock numbers and biomass in Table 5.7.

5.8 Projection of Stock Biomass and Catch (Figure 5.2D)

Yield- and spawning stock biomass-per-recruit curves have been calculated using the same exploitation pattern and weight-at-age data as are used for the prediction (see below). $F_{0.1}$ and F_{max} are 0.18 and 0.31, respectively (Figure 5.2C).

Input data for catch projections are given in Table 5.8. Stock size in 1986 is taken from the VPA. In the absence of information on the strengths of recruiting year classes, a value of 200 million, based on a recent average, was used for the 1984 and later year classes. The exploitation pattern was the same as that used for the 1985 input for the VPA with the exception that the F on age 2 for the prediction was set at 0.07, which was derived from the 1980-1983 average reduced by 25% to allow for the reduction in fishing effort. Weight at age in the catch and in the stock were averages for the period 1981-1985.

As indicated in Section 5.1.2, landings in 1986 are expected to be about 70,000 t. This implies a reduction of about 50% in the level of fishing mortality in 1986 compared to 1985, and in the catch prediction, $\bar{F}$ for that year has been set to 0.19. For 1987, projections have been made for a range of values of fishing mortality:

1986				1987				1988	
Stock biom. (1+)	SSB	$\bar{F}_{(3-8)}$	Catch	Management option	Stock biom. (1+)	SSB	$\bar{F}_{(3-8)}$	Catch	Stock biom. (1+)	SSB
588	157	0.19	70	$F_{0.1}$	681	171	0.18	87	764	292
				F_{86}			0.19	89	754	291
				$1.2F_{86}$			0.22	105	734	279
				F_{max}			0.31	137	700	257
				$2F_{86}$			0.37	163	661	239

Weight in '000 t.

Figure 5.2A shows how fishing mortality increased during the 1970s and was maintained at a high level until 1984. Spawning stock biomass (Figure 5.2B) declined sharply from almost 600,000 t in 1970 to less than 200,000 t in 1981. Since then, it has remained at about this low level. If the estimated level of fishing mortality in 1986 is maintained, a recovery in spawning stock biomass is to be expected. Amendments to the VPA input F values on the oldest age groups for some recent years resulted in some changes to the spawning stock biomass estimates from those given in last year's report.

6 REDFISH IN SUB-AREAS I AND II

6.1 Status of the Fisheries

6.1.1 Landings prior to 1986 (Tables 6.1-6.5)

The redfish landings in Sub-areas I and II have decreased from 131,749 t in 1982 to a provisional catch figure of 89,702 t in 1985 (Table 6.1). This decrease is mainly caused by a decrease in the USSR fishery, especially in Division IIb.

In Sub-area I, the total catch decreased from 4,651 t in 1983 to 2,027 t in 1984 (Table 6.2). The catch in 1985 increased to 3,031 t. In Division IIa, the total catch decreased from 100,163 t in 1983, the highest catch since 1977, to 85,438 t in 1985, which is 95% of the total redfish catch in 1985 (Table 6.3). In Division IIb, there has been a strong decline in the catches in recent years from 49,883 t in 1982 to 1,233 t in 1985 (Table 6.4).

National landings statistics of redfish do not distinguish between the species. The Working Group has, therefore, split the catch into Sebastes mentella and Sebastes marinus on an area basis. The procedure was almost the same as used previously by the Working Group on Redfish and Greenland Halibut in Region 1 (Anon., 1984). In Sub-area I, all of the USSR catches and 40% of the Norwegian catches in 1984 and 1985 were assumed to be S. mentella. The percentage for Norway was based on surveys on the main fishing grounds. All catches taken by other countries were assumed to be S. marinus. In Division IIa, the entire catch of the German Democratic Republic, 95% of the USSR catches, and

76.6% of the Portuguese catches were recorded as S. mentella, while all catches taken by other countries were assumed to be S. marinus. All catches taken in Division IIb were recorded as S. mentella.

The total landings of S. marinus increased from 16,366 t in 1982 to 28,114 t in 1984, and declined to 27,236 t in 1985 (Table 6.5). The increase since 1982 was due to USSR redfish catches in 1983 in Division IIa (5% S. marinus) and the Norwegian fishery for S. marinus in 1984 and 1985 in Division IIa and Sub-area I. The total landings of S. mentella decreased from 115,383 t in 1982 to 62,466 t in 1985 (Table 6.5). This decrease was mainly due to the USSR fishery in Division IIb. The agreed TAC for S. marinus in 1984 of 17,000 t was overfished by more than 11,000 t (65%), while the catch of S. mentella was almost at the recommended TAC level, which was 20,000 t below the agreed TAC.

The recommended TACs for S. marinus and S. mentella in 1985 were 15,000 t and 85,000 t, respectively, which also became the agreed TACs. The provisional catch figure for S. marinus in 1985 shows that the TAC was overfished by more than 12,000 t (80%). For S. mentella, the provisional catch in 1985 was 22,534 t below the TAC.

6.1.2 Expected landings in 1986

Only catch data from Norway for the first half of 1986 and from the Faroe Islands up to 1 September (29 t) were available. In 1985, 59% of the Norwegian redfish catches were taken during the first half of the year. Assuming the same seasonal pattern in the fishing in 1986, the expected Norwegian landings in 1986 will be about 22,000 t, of which about 20,000 t are expected to be S. marinus, giving a slight increase compared to 1985.

6.1.3 Effort and catch per unit effort (Table 6.6)

Catch-per-hour-trawling data were available for the USSR S. mentella fishery for the period 1965-1983 for side trawlers (RT) and for 1980-1983 for stern trawlers (PST) (Table 6.6). From these data, the total effort was derived. For 1984 and 1985, the Working Group has not received any effort data or catch-per-unit-effort data from the USSR.

For the German Democratic Republic S. mentella fishery, catch-per-unit-effort data for the category "freezer trawlers" were available for 1981-1985 (Table 6.6). The catch per day decreased from 17.12 t in 1983 to 9.89 t in 1985, but the German Democratic Republic fishery accounts for only 3.2-5.8% of the total catch of S. mentella in Sub-areas I and II.

No data on effort and catch per unit effort were available for S. marinus.

6.2 Catch in Numbers at Age

For 1982 and 1983, the catch in numbers per age group for both S. marinus and S. mentella were adjusted to the revised total catch figures.

For 1984 and 1985, age distributions of the S. marinus catches in Division IIa were only available from the Federal Republic of Germany. This accounts for 12% and 11%, respectively, of the landings from Sub-areas I and II in 1984 and 1985.

The total age compositions were calculated by applying the Federal Republic of Germany age composition from Division IIa to the total S. marinus catch in Sub-areas I and II (Table 6.7).

Age compositions of S. mentella for 1984 and 1985 were only available from the German Democratic Republic and account for only 5-6% of the total landings.

6.3 Survey Results

Since 1981, a stratified random bottom trawl survey has been carried out by Norway during the winter in the Barents Sea. Due to problems in distinguishing the redfish species, only the results from 1986 can be taken as fully reliable. However, the total redfish biomass increased by 37% from 1985 to 1986, but there was a decrease in numbers of 19%.

Since 1981, a stratified random bottom trawl survey has also been carried out by Norway in September in the Svalbard and Bear Island regions. For the same reasons as in the Barents Sea survey, reliable data for S. marinus and S. mentella separately do not exist before 1984. For both species, there was a decrease in the number and biomass indices from 1984 to 1985.

These surveys are expected to cover the most important young fish areas. A time-series presentation of the survey results for both species less than 20 cm may, therefore, give valuable and reliable indications of this part of the stocks.

The German Democratic Republic has carried out a bottom trawl survey during the summer in the Svalbard and Bear Island regions every year since 1981, with the exception of 1985. The input effort in these surveys (24-30 tows each year) may be too low to give reliable indications about changes in the stocks.

Each year the international 0-group survey seems to cover satisfactorily the distribution area of redfish. Nevertheless, the use of these indices is limited due to the fact that the redfish species have not been separated.

6.4 Recruitment (Table 6.8)

In the international 0-group survey which started in the Barents Sea in 1965, only the 1967 and 1968 year classes have been estimated as very poor. The recruitment indices have been highest in

the most recent years with the 1979-1986 year classes being the most abundant ever observed in the 0-group survey.

6.5 Assessment of Sebastes marinus

No effort data were available on which to base the terminal F. However, a separable VPA was run and this indicated a fairly constant fishing pattern in 1979-1984. In 1985, there seems, however, to have been a change in the fishing pattern towards younger ages. All catch-at-age data for 1984 and 1985 are based upon the age distribution of the Federal Republic of Germany catches, but there is no evidence that such a change has occurred in the fishing patterns of other countries. In a trial VPA, the average pattern for 1979-1984 was assumed to be valid also for the fishery in 1985, and runs were made until the input Fs in 1985 were equal to the average values for 1979-1984.

6.5.1 Fishing mortalities and stock size

Estimates of fishing mortality from VPA are given in Table 6.9. Estimates of stock size in numbers from VPA, total stock biomass, and spawning stock biomass are given in Table 6.10. The results show a continuous increase in the total biomass from 276,000 t in 1978 to 480,000 t in 1985. The spawning stock biomass has also increased from about 180,000 t in 1978-1981 to 280,000 t in 1985.

The recruitment shows an increasing trend. However, trial VPAs assuming changes in the fishing pattern and in the level of fishing mortality, show that both the trend in and the level of recruitment are extremely sensitive to the input, e.g., a change of the fishing pattern in 1985 can easily reverse the trend in recruitment. With the generally low values of F in the VPA, there will be little convergence in back calculation towards true values. As a result of uncertainties about the exploitation pattern and the overall level of fishing mortality and with no information on recruiting year-class strengths, no catch predictions were made.

6.6 Assessment of Sebastes mentella

For 1984 and 1985, age and length compositions of S. mentella were available only from the German Democratic Republic, accounting for 5-6% of the landings. The Working Group concluded that this was not a sufficient basis for an assessment.

7 GREENLAND HALIBUT IN SUB-AREAS I AND II

7.1 Status of the Fisheries

7.1.1 Landings prior to 1986 (Tables 7.1 - 7.4)

Nominal catch by country for Sub-areas I and II is given in Table 7.1. The nominal catches in Sub-area I and Divisions IIa and IIb are given separately in Tables 7.2 - 7.4. The total catches in 1984 and 1985 were 21,883 and 19,745 t, respectively, compared to

the recommended TACs of 17,000 t and 20,000 t, respectively. The fishery in 1984 was distributed by nations and areas roughly as in previous years. In Division IIb, there was a reduction in the USSR catch from 9,641 t in 1984 to 3,221 t in 1985, while the German Democratic Republic catches nearly doubled.

7.1.2 Expected catch in 1986

Preliminary catch figures for 1986 are reported only from Norway. These catches show an increasing tendency and indicate a Norwegian catch for 1986 of 7,300 t, compared to 5,482 t in 1986. Large variations in the USSR fishery during the last years, and the fact that most of the catches normally are taken during the second part of the year, make it impossible to make a reliable prognosis of total catches in 1986.

7.1.3 Effort and catch per unit effort

The USSR catch-per-unit-effort data were not available at this meeting. The time series on CPUE was updated with the Norwegian observations from 1983, 1984, and 1985. The data were analyzed with the statistical package GLIM (NAG), as described in the previous report of the Working Group on Redfish and Greenland Halibut in Region 1 (Anon., 1984), and the results are presented in Table 7.5. The revised figure for 1983 is slightly reduced, and the CPUE increased during 1984 and 1985.

7.2 Catch in Numbers at Age

The USSR catch made up 70% and 52% of the total catch in 1984 and 1985, respectively. No catch-at-age data were available from these catches. The German Democratic Republic did not supply data for their catch in 1984 (10% of the total catch). The Norwegian data, being also rather limited, were from age samples from gill-net and longline catches. No significant difference between the age compositions from the two gears was found, and the pooled samples were applied to the entire Norwegian fishery (except trawl). The catch in numbers at age from previous years was adjusted according to revised catch figures. Total age distributions for 1984 and 1985 were not calculated because of the lack of sampling data from the USSR.

7.3 Survey Results

Norway has conducted yearly stratified random trawl surveys in the Barents Sea and the Svalbard area since 1981 (Godø and Nedreaas, 1986; Hylen et al., 1986). The Svalbard survey covers the main nursery area of Greenland halibut in Sub-areas I and II. The two surveys do not cover the total area of distribution of the stock. Also the Svalbard surveys do not cover depths exceeding 600 m which (probably) are an important area for adult Greenland halibut. It is, however, believed that the survey results may give valuable information on the immature part of the stock. Special attention should be paid to the possibility of using the Svalbard survey results as recruitment indices. Total

abundance indices and indices of fish less than 20 cm are given in Table 7.6. These results indicate an increasing stock size in the period 1981-1985.

7.4 Recruitment

Fish less than 20 cm in the survey are almost exclusively age 1. The indices in Table 7.6 of fish less than 20 cm may, therefore, possibly serve as an early recruitment index. A relatively high recruitment in 1983 and a substantial drop in recruitment in the last two years is indicated. Norway is requested to supply age distributed indices from the Svalbard survey. These data would make it possible to study the abundance of a year class at ages 1-3, i.e., before it is fully recruited to the commercial trawl fishery.

7.5 Assessment

For 1984 and 1985, no age or length compositions of Greenland halibut were available from the USSR fishery, which accounted for 70% and 52%, respectively, of the total landings. The German Democratic Republic provided age data for 1985 but not for 1984. The Working Group concluded that the deficiencies in the data base were much too large to allow any reliable assessment to be made.

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Table 3.1 North-East Arctic COD.
Total nominal catch (t) by fishing areas (Norwegian coastal cod not included). (As officially reported to ICES.)

Year	Sub-area I	Division IIa	Division IIb	Total catch
1960	357,327	115,116	91,599	622,042
1961	409,694	153,019	220,508	783,221
1962	548,621	139,848	220,797	909,266
1963	547,469	117,100	111,768	776,337
1964	206,883	104,698	126,114	437,695
1965	241,489	100,011	103,430	444,983
1966	292,253	134,805	56,653	483,711
1967	322,798	128,747	121,060	572,605
1968	642,452	162,472	269,254	1,074,084
1969	679,373	255,599	262,254	1,197,226
1970	603,855	243,835	85,556	933,246
1971	312,505	319,623	56,920	689,048
1972	197,015	335,257	32,982	565,254
1973	492,716	211,762	88,207	792,685
1974	723,489	124,214	254,730	1,102,433
1975	561,701	120,276	147,400	829,377
1976	526,685	237,245	103,533	867,463
1977	538,231	257,073	109,997	905,301
1978	418,265	263,157	17,293	698,715
1979	195,166	235,449	9,923	440,538
1980	168,671	199,313	12,450	380,434
1981	137,033	245,167	16,837	399,037
1982	96,576	236,125	31,029	363,730
1983	64,803	200,279	24,910	289,992
1984	54,317	197,573	25,761	277,651
1985[1]	114,512	168,793	19,514	302,819

[1] Provisional figures.

Expected catches

1986[2]	92,000	150,000	27,000	269,000

[2] USSR catches not included. The USSR quota for all areas combined is 150,000 t.

Table 3.2 North-East Arctic COD.
Total nominal catch ('000 t) by trawl and other gear for each area.

Year	Sub-area I		Division IIa		Division IIb
	Trawl	Others	Trawl	Others	Trawl
1967	238.0	84.8	38.7	90.0	121.1
1968	588.1	54.4	44.2	118.3	269.2
1969	633.5	45.9	119.7	135.9	262.3
1970	524.5	79.4	90.5	153.3	85.6
1971	253.1	59.4	74.5	245.1	56.9
1972	158.1	38.9	49.9	285.4	33.0
1973	459.0	33.7	39.4	172.4	88.2
1974	677.0	46.5	41.0	83.2	254.7
1975	526.3	35.4	33.7	86.6	147.4
1976	466.5	60.2	112.3	124.9	103.5
1977	471.5	66.7	100.9	156.2	110.0
1978	360.4	57.9	117.0	146.2	17.3
1979	161.5	33.7	114.9	120.5	8.1
1980	133.3	35.4	83.7	115.6	12.5
1981	91.5	45.1	77.2	167.9	17.2
1982	44.8	51.8	65.1	171.0	21.0
1983	36.6	28.2	56.6	143.7	24.9
1984	24.5	29.8	46.9	150.7	25.6
1985[1]	74.2	40.3	56.6	112.2	19.2

[1] Provisional.

Expected catches

1986[2]	40.0	52.0	60.0	90.0	27.0

[2] USSR catches not included. The USSR quota for all areas combined is 150,000 t.

Table 3.3 North-East Arctic COD.
Nominal catch (t) by countries (Norwegian coastal cod not included) (Sub-area I and Divisions IIa and IIb combined). (As officially reported to ICES.)

Year	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Norway	Poland	United Kingdom	USSR	Others	Total all countries
1960	3,306	22,321	-	9,472	231,997	20	141,175	213,400	351	622,042
1961	3,934	13,755	3,921	8,129	268,377	-	158,113	325,780	1,212	783,221
1962	3,109	20,482	1,532	6,503	225,615	-	175,020	476,760	245	909,266
1963	-	18,318	129	4,223	205,056	108	129,779	417,964	-	775,577
1964	-	8,634	297	3,202	149,878	-	94,549	180,550	585	437,695
1965	-	526	91	3,670	197,085	-	89,962	152,780	816	444,930
1966	-	2,967	228	4,284	203,792	-	103,012	169,300	121	483,704
1967	-	664	45	3,632	218,910	-	87,008	262,340	6	572,605
1968	-	-	225	1,073	255,611	-	140,387	676,758	-	1,074,084
1969	29,374	-	5,907	5,543	305,241	7,856	231,066	612,215	133	1,197,226
1970	26,265	44,245	12,413	9,451	377,606	5,153	181,481	276,632	-	933,246
1971	5,877	34,772	4,998	9,726	407,044	1,512	80,102	144,802	215	689,048
1972	1,393	8,915	1,300	3,405	394,181	892	58,382	96,653	166	565,287
1973	1,916	17,028	4,684	16,751	285,184	843	78,808	387,196	276	792,686
1974	5,717	46,028	4,860	78,507	287,276	9,898	90,894	540,801	38,453	1,102,434
1975	11,309	28,734	9,981	30,037	277,099	7,435	101,843	343,580	19,368	829,377
1976	11,511	20,941	8,946	24,369	344,502	6,986	89,061	343,057	18,090	867,463
1977	9,167	15,414	3,463	12,763	388,982	1,084	86,781	369,876	17,771	905,301
1978	9,092	9,394	3,029	5,434	363,088	566	35,449	267,138	5,525	698,715
1979	6,320	3,046	547	2,513	294,821	15	17,991	105,846	9,439	440,538
1980	9,981	1,705	233	1,921	232,242	3	10,366	115,194	8,789	380,434
						Spain				
1981	12,825	3,106	298	2,228	277,818	14,500	5,262	83,000	-	399,037
1982	11,998	761	302	1,717	287,525	14,515	6,601	40,311	-	363,730
1983	11,106	126	473	1,243	234,000	14,229	5,840	22,975	-	289,992
1984	10,674	11	686	1,010	230,743	8,608	3,663	22,256	-	277,651
1985[1]	12,770	10	1,019	4,395	208,365	7,846	3,335	62,489	2,590	302,819

[1] Provisional figures.

Table 3.4 North-East Arctic COD. Catch per unit effort.

Year	Sub-area I			Division IIb			Division IIa		
	Norway[2]	UK[3]	USSR[4]	Norway[2]	UK[3]	USSR[4]	Norway[2]	UK[3]	Norway[5]
1960	-	0.075	0.42	-	0.105	0.31	-	0.067	3.0
1961	-	0.079	0.38	-	0.129	0.44	-	0.058	3.7
1962	-	0.092	0.59	-	0.133	0.74	-	0.066	4.0
1963	-	0.085	0.60	-	0.098	0.55	-	0.066	3.1
1964	-	0.056	0.37	-	0.092	0.39	-	0.070	4.8
1965	-	0.066	0.39	-	0.109	0.49	-	0.066	2.9
1966	-	0.074	0.42	-	0.078	0.19	-	0.067	4.0
1967	-	0.081	0.53	-	0.106	0.87	-	0.052	3.5
1968	-	0.110	1.09	-	0.173	1.21	-	0.056	5.1
1969	-	0.113	1.00	-	0.135	1.17	-	0.094	5.9
1970	-	0.100	0.80	-	0.100	0.80	-	0.066	6.4
1971	-	0.056	0.43	-	0.071	0.16	-	0.062	10.6
1972	0.90	0.047	0.34	0.59	0.051	0.18	1.08	0.055	11.5
1973	1.05	0.057	0.56	0.43	0.054	0.57	0.71	0.043	6.8
1974	1.75	0.079	0.90	1.94	0.106	0.77	1.19	0.028	3.4
1975	1.82	0.077	0.85	1.67	0.100	0.43	1.36	0.033	3.4
1976	1.69	0.060	0.66	1.20	0.081	0.30	1.69	0.035	3.8
1977	1.54	0.052	0.50	0.91	0.056	0.25	1.16	0.044	5.0
1978	1.37	0.062	0.37	0.56	0.044	0.08	1.12	0.037	7.1
1979	0.85	0.046	0.36	0.62	-	0.06	1.06	0.042	6.4
1980	1.47	-	0.36	0.41	- Spain[6]	0.16	1.27	USSR	5.0
1981	1.42	-	0.41	(0.96)	-	0.07	1.02	0.35	6.2
1982	1.30	-	0.35	-	0.86	0.26	1.01	0.34	6.4
1983	1.58	-	0.31	(1.31)	0.90	0.36	1.05	0.38	7.6
1984	1.40	-	0.45	1.20	0.78	0.35	0.73	0.27	7.0
1985[1]	1.59	-	-	1.56	1.37	-	0.91	-	5.1

[1] Preliminary figures.

[2] Norwegian data - t per 1,000 t/hrs fishing.

[3] United Kingdom data - t per 100 t/hrs fishing.

[4] USSR data - t per hr fishing.

[5] Norwegian data - t per gill net boat week in Lofoten.

[6] Spanish Data - t per hr fishing.

Table 3.5 North-East Arctic COD.
Catch per unit effort in the Lofoten fishery (gutted weight with head off).

Year	Norwegian vessels		
	Catch [kg per man per day worked in the Lofoten fishery (Division IIa)]		
	Gillnet	Longline	Handline
1960	77.8	148.3	56.7
1961	101.5	141.1	75.5
1962	94.9	134.4	57.8
1963	80.8	116.3	56.2
1964	104.5	62.1	51.5
1965	81.8	78.3	68.4
1966	121.8	131.9	72.6
1967	107.9	245.4	120.7
1968	158.0	184.6	61.5
1969	170.6	200.4	142.8
1970	180.3	304.3	127.6
1971	334.3	510.7	192.7
1972	318.7	400.1	110.2
1973	189.7	366.5	112.1
1974	96.3	146.4	63.9
1975	122.0	188.3	96.1
1976	131.4	258.4	134.8
1977	173.2	279.6	143.5
1978	237.6	381.7	134.6
1979	201.3	306.0	125.1
1980	169.9	207.8	100.9
1981	217.0	327.9	109.6
1982	199.1	753.4	252.0
1983	308.0	348.8	134.0
1984	301.0	208.4	95.6
1985	204.7	178.3	75.6
1986	173.7	198.0	61.9

Table 3.6 North-East Arctic COD. Year-class strength.

Year class	USSR survey No. at age 3 per hour trawling			USSR assessment	0-group survey index (logarithmic) All areas	Virtual population[1] No. at age 3 ($\times 10^{-6}$) M=0.2
	Sub-area I	Division IIb	Mean			
1957	12	16	13	- Average	-	791
1958	16	24	19	+ Average	-	919
1959	18	14	16	+ Average	-	731
1960	9	19	13	Poor	-	474
1961	2	2	2	Poor	-	339
1962	7	4	6	Poor	-	778
1963	21	120	76	Rich	-	1,584
1964	49	45	46	Rich	-	1,293
1965	<1	<1	<1	Very poor	+	170
1966	2	<1	1	Very poor	0.02	112
1967	1	<1	1	Very poor	0.04	197
1968	7	1	5	Poor	0.02	405
1969	11	6	9	Poor	0.25	1,016
1970	74	86	76	Rich	2.51	1,819
1971	37	24	32	Average	0.77	524
1972	53	17	40	Average	0.52	622
1973	74	5	46	Rich	1.48	615
1974	6	1	4	Poor	0.29	350
1975	93	4	62	Rich	0.90	654
1976	4	<1	3	Poor	0.13	214
1977	2	1	1	Poor	0.49	150
1978	1	3	2	Poor	0.22	168
1979	<1	8	3	Poor	0.40	133
1980	1	8	4	Poor	0.13	96
1981	4	4	4	Poor	0.10	144
1982	8	10	9	Average	0.59	-
1983	-	-	-	-	1.69	-
1984	-	-	-	-	1.55	-
1985	-	-	-	-	2.46	-
1986	-	-	-	-	1.37	-

[1] Figures from the previous Working Group assessment.

Table 3.7 North-East Arctic COD.
Results from the Norwegian bottom trawl survey in the Barents Sea. Index of number of fish in each year class.

Year	Year class												Total[1]
	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	
1981	-	-	-	-	-	0.7	11.0	8.6	16.9	34.1	37.9	4.8	115.3
1982	-	-	-	-	0.1	0.9	16.1	20.4	21.4	16.0	15.8	1.4	92.3
1983	-	-	-	44.6	5.9	10.8	28.0	31.9	14.3	4.7	3.0	0.6	143.8
1984	-	-	355.3	126.6	60.2	19.2	15.6	9.4	3.0	0.4	0.2	-	589.9
1985	-	7.3	168.9	90.3	78.1	15.7	6.3	2.5	0.2	+	0.1	-	369.4
1986	82.5	93.0	356.0	119.0	62.6	8.3	2.1	0.3	0.1	0.1	-	-	724.0

[1] Includes year classes older than the 1974 year class.

Table 3.8 North-East Arctic COD.
Results from the Norwegian bottom trawl survey in the Svalbard area. Index of number of fish in each year class.

Year	Year class												Total[1]
	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	
1981	-	-	-	-	0.1	22.2	9.0	5.5	1.6	6.1	3.8	0.7	49.8
1982	-	-	-	1.5	4.0	22.3	9.6	2.8	1.9	2.9	0.4	0.1	45.6
1983	-	-	14.6	5.1	6.2	9.5	3.0	2.5	1.3	1.6	0.4	0.2	44.4
1984	-	52.2	42.7	5.6	4.2	5.3	2.2	0.5	0.5	0.4	0.2	-	113.8
1985	27.0	131.1	74.3	27.9	6.5	7.7	1.4	1.4	0.1	0.3	-	-	279.7

[1] Includes year classes older than the 1973 year class.

Table 3.9 North-East Arctic COD.
Stock numbers in millions at 1 January.

Year	Year class												
	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
1982[1]	-	-	-	-	1	4	81	105	103	95	154	23	12
1983[1]	-	-	-	-	27	29	81	99	58	43	50	13	5
1984[1]	-	-	2,382	506	121	58	59	54	30	19	12	4	-
1985[2]	-	118	1,534	817	631	100	51	38	8	6	2	-	-
1986[2]	435	361	1,717	462	271	56	18	5	2	2	-	-	-

[1] From Hylen and Nakken (1982, 1983, 1984, 1985).

[2] Estimates by Hylen (unpublished).

Table 4.1 North-East Arctic HADDOCK.
Total nominal catch (t) by fishing areas (Norwegian coastal haddock not included). (As officially reported to ICES.)

Year	Sub-area I	Division IIa	Division IIb	Total
1960	125,657	27,925	1,854	155,434
1961	165,165	25,642	2,427	193,234
1962	160,972	25,189	1,727	187,888
1963	124,774	21,031	939	146,744
1964	79,056	18,735	1,109	98,900
1965	98,505	18,640	939	118,079
1966	124,115	34,892	1,614	160,621
1967	108,066	27,980	440	136,486
1968	140,970	40,031	725	181,726
1969	88,960	40,208	1,341	130,509
1970	59,493	26,611	497	86,601
1971	56,300	21,567	435	78,302
1972	221,183	41,979	2,155	265,317
1973	283,728	23,348	2,989	320,065
1974	159,037	47,033	5,068	221,138
1975	121,686	44,330	9,726	175,742
1976	94,065	37,566	5,649	137,279
1977	72,159	28,452	9,547	110,158
1978	63,965	30,478	979	95,422
1979	63,841	39,167	615	103,623
1980	54,205	33,616	68	87,889
1981	36,834	39,864	455	77,153
1982	17,948	29,005	2	46,955
1983	7,550	13,872	185	21,607
1984[1]	4,000	13,247	71	17,318
1985[1]	30,142	11,206	123	41,471

[1] Provisional figures.

	Expected catches			
1986[2]	20,000	22,000	1,000	43,000

[2] USSR catches not included. The USSR quota for all areas combined is 45,000 t.

Table 4.2 North-East Arctic HADDOCK.
Total nominal catch ('000 t) by trawl and other gear for each area.

Year	Sub-area I		Division IIa		Division IIb
	Trawl	Others	Trawl	Others	Trawl
1967	73.8	34.3	20.5	7.5	0.4
1968	98.1	42.9	31.4	8.6	0.7
1969	41.3	47.7	33.1	7.1	1.3
1970	36.7	22.8	20.2	6.4	0.5
1971	27.3	29.0	15.0	6.6	0.4
1972	193.4	27.8	34.4	7.6	2.2
1973	241.2	42.5	13.9	9.4	13.0
1974	133.1	25.9	39.9	7.1	15.1
1975	103.5	18.2	34.6	9.7	9.7
1976	77.7	16.4	28.1	9.5	5.6
1977	57.6	14.6	19.9	8.6	9.5
1978	53.9	10.1	15.7	14.8	1.0
1979	47.8	16.0	20.3	18.9	0.6
1980	30.5	23.7	14.8	18.9	0.1
1981	19.0	17.9	21.8	18.7	0.5
1982	9.0	8.9	18.5	10.5	-
1983	3.7	3.8	7.6	6.3	0.2
1984	1.6	2.4	6.4	6.9	0.1
1985[1]	24.1	6.1	4.9	6.3	0.1

[1] Provisional.

Expected catches

1986[2]	6.0	14.0	11.0	11.0	1.0

[2] USSR catches not included. The USSR quota for all areas combined is 45,000 t.

Table 4.3 North-East Arctic HADDOCK.
Nominal catch (t) by countries (Norwegian coastal haddock not included) (Sub-area I and Divisions IIa and IIb combined). (As officially reported to ICES.)

Year	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Norway	Poland	United Kingdom	USSR	Others	Total
1960	172	-	-	5,597	46,263	-	45,469	57,025	125	155,651
1961	285	220	-	6,304	60,862	-	39,650	85,345	558	193,234
1962	83	409	-	2,895	54,567	-	37,486	91,910	58	187,438
1963	17	363	-	2,554	59,955	-	19,809	63,526	-	146,224
1964	-	208	-	1,482	38,695	-	14,653	43,870	250	99,158
1965	-	226	-	1,568	60,447	-	14,345	41,750	242	118,578
1966	-	1,072	11	2,098	82,090	-	27,723	48,710	74	161,778
1967	-	1,208	3	1,705	51,954	-	24,158	57,346	23	136,397
1968	-	-	-	1,867	64,076	-	40,129	75,654	-	101,726
1969	2	-	309	1,490	67,549	-	37,234	24,211	25	130,820
1970	541	-	656	2,119	37,716	-	20,423	26,802	-	87,257
1971	81	-	16	896	45,715	43	16,373	15,778	3	78,905
1972	137	-	829	1,433	46,700	1,433	17,166	196,224	2,231	266,153
1973	1,212	3,214	22	9,534	86,767	34	32,408	186,534	2,501	322,626
1974	925	3,601	454	23,409	66,164	3,045	37,663	78,548	7,348	221,157
1975	299	5,191	437	15,930	55,966	1,080	28,677	65,015	3,163	175,758
1976	536	4,459	348	16,660	49,492	986	16,940	42,485	5,358	137,265
1977	213	1,510	144	4,798	40,118	-	10,878	52,210	287	110,158
1978	466	1,411	369	1,521	39,955	1	5,766	45,895	38	95,422
1979	343	1,198	10	1,948	66,849	2	6,454	26,365	454	103,623
1980	497	226	15	1,365	61,886	-	2,948	20,706	246	87,889
1981	381	414	22	2,398	58,856	Spain	1,682	13,400	-	77,153
1982	496	53	-	1,258	41,421	-	827	2,900	-	46,955
1983	428	-	1	729	19,371	139	259	680	-	21,607
1984	297	15	4	400	15,186	37	276	1,103	-	17,318
1985[1]	442	5	20	395	17,659	77	153	22,690	30	41,471

[1] Provisional figures.

Table 4.4 North-East Arctic HADDOCK. Catch per unit effort.

Year	Sub-area I		Division IIb		Division IIa	
	Norway[2]	UK[3]	Norway[2]	UK[3]	Norway[2]	UK[3]
1960	-	33	-	2.8	-	34
1961	-	29	-	3.3	-	36
1962	-	23	-	2.5	-	42
1963	-	13	-	0.9	-	33
1964	-	18	-	1.6	-	18
1965	-	18	-	2.0	-	18
1966	-	17	-	2.8	-	34
1967	-	18	-	2.4	-	25
1968	-	19	-	1.0	-	50
1969	-	13	-	2.0	-	42
1970	-	7	-	1.0	-	31
1971	-	8	-	3.0	-	25
1972	0.06	14	0.02	23.0	0.09	18
1973	0.35	22	0.18	20.0	0.39	20
1974	0.27	20	0.09	15.0	0.51	74
1975	0.26	15	0.06	4.0	0.44	60
1976	0.27	10	+	3.0	0.24	38
1977	0.11	4	+	0.2	0.14	16
1978	0.13	5	+	4.0	0.14	15
1979	0.36	-	0.07	-	0.18	-
1980	0.45	-	+	-	0.22	-
1981	0.64	-	-	-	0.37	-
1982	0.51	-	-	-	0.38	-
1983	0.27	-	0.04	-	0.17	-
1984[1]	0.13	-	0.01	-	0.12	-
1985[1]	0.20	-	+	-	0.11	-

[1] Preliminary figures.
[2] Norwegian data - t per 1,000 t/hrs fishing.
[3] United Kingdom data - t per 100 t/hrs fishing.

Table 4.5 North-East Arctic HADDOCK. Year-class strength.

Year class	USSR Survey No.per hour trawling			O-group survey index (logarithmic) All areas	Virtual population[1] No. at age 3 ($\times 10^{-6}$)
	Age 1	Age 2	Age 3		
1957	38	9	14	-	242
1958	2	4	5	-	109
1959	7	14	33	-	241
1960	30	40	72	-	274
1961	32	50	34	-	320
1962	5	3	4	-	100
1963	16	9	12	-	243
1964	11	12	15	-	291
1965	<1	<1	<1	0.01	20
1966	<1	<1	<1	0.01	17
1967	3	13	8	0.08	164
1968	<1	<1	3	+	97
1969	31	69	120	0.29	1,025
1970	10	33	31	0.64	270
1971	3	3	9	0.26	54
1972	2	9	3	0.16	49
1973	13	8	5	0.26	56
1974	15	35	14	0.51	115
1975	163	96	59	0.60	175
1976	6	13	4	0.38	156
1977	1	1	<1	0.33	23
1978	<1	<1	<1	0.12	7
1979	<1	<1	<1	0.20	11
1980	<1	<1	-	0.15	9
1981	<1	(<1)	8	0.03	10
1982	23	59	63	0.38	-
1983	40	79	-	0.62	-
1984	1	-	-	0.78	-
1985	-	-	-	0.27	-
1986	-	-	-	0.39	-

[1] Figures from the previous Working Group assessment.

Table 4.6 North-East Arctic HADDOCK.
Results from the Norwegian bottom trawl survey in the Barents Sea in February. Index of number of fish in each year class.

Year	Year class												Total[1]
	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	
1981	-	-	-	-		0.3	4.8	2.3	9.5	2.0	6.1	0.5	25.7
1982	-	-	-	-	0.5	0.0	1.8	2.1	2.2	5.5	2.7	0.2	15.9
1983	-	-	-	314.5	5.7	4.1	3.8	1.9	2.3	3.9	1.6	-	379.0
1984	-	-	663.2	355.8	15.2	1.6	0.7	0.2	0.3	0.4	1.8	-	1,037.4
1985	-	167.8	616.2	380.2	7.2	0.4	0.2	0.3	0.3	-	-	-	1,172.6
1986	77.9	135.0	314.0	123.0	0.4	0.1	0.1	0.2	-	-	-	-	651.5

[1] Includes year classes older than the 1974 year class.

Table 4.7 North-East Arctic HADDOCK.
Results from the Norwegian acoustic survey in the Barents Sea. Stock numbers in millions.

Year	Year class												Total[1]
	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	
1981	-	-	-	-	-	2	25	14	66	160	50	2	320
1982	-	-	-	-	3	4	7	10	12	29	14	1	80
1983	-	-	-	-	10	7	9	5	4	10	5	-	50
1984	-	-	2,148	1,002	53	15	7	2	2	2	-	-	3,231
1985	-	470	1,724	1,007	48	2	2	1	3	+	-	-	3,254
1986	236	352	2,034	1,133	4	4	4	2	+	1	-	-	3,770

[1] Includes year classes older than the 1974 year class.

Table 5.1 North-East Arctic SAITHE.
Nominal catch (tonnes) by countries in Sub-area I and Divisions IIa and IIb combined. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Belgium	1	-	-	-	-
Faroe Islands	20	270	809	1,117	532
France	5,609	5,658	4,345	2,601	1,016
German Dem.Rep.	10,266	7,164	6,484	2,435	-
Germany, Fed.Rep.	49,056	19,985	18,190	14,823	12,511
Netherlands	64	-	-	-	-
Norway	131,675	139,705	121,069	141,346	128,878
Poland	3,164	1	35	-	-
Portugal	7,233	783	203	-	-
Spain	21,661	1,327	121	685	780
Sweden	-	-	-	-	-
UK (Engl.& Wales)	4,651	6,853	2,790	1,170	794
UK (Scotland)	73	82	37	-	-
USSR	9,013	989	381	3	43
Total	242,486	182,817	154,464	164,180	144,554

Country	1981	1982	1983	1984	1985[1]
Belgium	-	-	-	-	-
Faroe Islands	236	339	539	503	490
France	194	82	418	431	85
German Dem.Rep.	-	-	-	6	11
Germany, Fed.Rep.	8,413	7,224	4,933	4,532	1,837
Netherlands	-	-	-	-	-
Norway	166,139	159,643	149,556	152,818	100,002
Poland	-	-	-	-	-
Portugal	-	-	-	-	15
Spain	-	-	33	-	-
Sweden	-	-	-	-	-
UK (Engl.& Wales)	395	731	1,251	335	202
UK (Scotland)	-	1	-	-	-
USSR	121	14	206	161	51
Total	175,498	168,034	156,936	158,786	102,693

[1] Provisional figures.

Table 5.2 North-East Arctic SAITHE.
Catch, effort, and catch per unit effort for Norwegian stern trawlers (250-500 GRT) fishing in northern and southern regions of Division IIa.

Year	Northern IIa			Southern IIa		
	Catch (t)	Effort (hrs x 10^{-3})	CPUE (t per '000 hrs)	Catch (t)	Effort (hrs x 10^{-3})	CPUE (t per '000 hrs)
1978	9,099	103	89	365	1	624
1979	9,357	123	76	1,172	2	627
1980	7,761	57	136	11,004	16	668
1981	14,070	69	203	19,789	23	861
1982	22,438	80	282	10,750	15	699
1983	27,283	73	374	11,708	11	1,046
1984	29,890	82	364	17,789	19	955
1985	17,043	62	277	9,179	14	657

Table 5.3 North-East Arctic SAITHE.
Fishing mortalities on age groups 2-6 in 1980-1985 for fishing by purse seiners and Norwegian trawlers. (Based on final VPA.)

Age	1980	1981	1982	1983	1984	1985
			Purse seiners			
2	0.04	0.08	0.13	0.08	0.04	0.01
3	0.29	0.31	0.31	0.17	0.34	0.19
4	0.20	0.15	0.39	0.20	0.11	0.10
5	0.21	0.06	0.02	0.23	0.09	0.09
6	0.11	0.02	0.01	0.07	0.06	0.03
$\bar{F}_{(3-5)}$	0.23	0.17	0.24	0.20	0.18	0.13
			Norwegian trawlers			
2	0.01	0.00	0.00	0.00	0.00	0.01
3	0.13	0.02	0.02	0.04	0.23	0.05
4	0.13	0.29	0.09	0.21	0.71	0.19
5	0.11	0.30	0.63	0.29	0.29	0.26
6	0.20	0.26	0.29	0.33	0.29	0.30
$\bar{F}_{(3-6)}$	0.14	0.22	0.26	0.22	0.38	0.20

Table 5.4 VIRTUAL POPULATION ANALYSIS.

NORTH-EAST ARCTIC SAITHE

CATCH IN NUMBERS UNIT: thousands

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	52	121	1711	907	486	127	137	484	24	0
2	54151	31662	45758	28354	18226	10467	17225	11638	14624	1961
3	125030	99049	48969	61963	40796	83954	34733	17244	41466	49412
4	30576	34317	27685	23528	36644	21822	65052	23768	33253	12130
5	7947	10140	12476	14122	9211	21528	13060	32700	12064	7155
6	3712	2062	4534	4400	6379	3619	8212	3226	11204	5135
7	3435	4332	1468	2901	3200	2550	1054	3008	1135	3660
8	3212	1456	1848	965	1538	2008	1251	1177	1772	765
9	2679	1606	958	1356	147	369	461	760	560	858
10	1724	963	976	438	730	279	265	247	357	130
11	1091	463	655	305	411	252	120	204	387	265
12	852	244	681	281	454	89	112	123	150	230
13	489	211	284	168	257	144	76	161	117	54
14	140	58	231	222	259	95	97	94	170	120
15+	308	158	299	216	268	49	43	178	73	6
TOTAL	240398	186842	148515	139904	118786	147352	141896	95012	117556	81881

Table 5.5 VIRTUAL POPULATION ANALYSIS.

NORTH-EAST ARCTIC SAITHE

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	.250	.250	.250	.250	.180	.290	.360	.180	.180	.180
2	.340	.340	.340	.340	.450	.450	.510	.600	.530	.380
3	.710	.710	.710	.710	.790	.730	.770	1.050	.710	.750
4	1.110	1.110	1.110	1.110	1.270	1.400	1.120	1.330	1.260	1.360
5	1.630	1.630	1.630	1.630	2.030	2.050	2.020	1.860	2.020	2.090
6	2.330	2.330	2.330	2.330	2.550	2.760	2.610	2.800	2.700	2.630
7	3.160	3.160	3.160	3.160	3.290	3.300	3.270	4.000	3.880	3.280
8	4.030	4.030	4.030	4.030	4.340	4.380	3.910	4.180	4.470	3.970
9	4.870	4.870	4.870	4.870	5.150	5.950	4.690	5.330	5.360	4.530
10	5.630	5.630	5.630	5.630	5.750	6.390	5.630	5.680	6.060	5.540
11	6.440	6.440	6.440	6.440	6.110	6.610	7.180	7.310	6.280	6.880
12	7.110	7.110	7.110	7.110	5.940	6.880	7.210	8.680	6.890	8.760
13	7.820	7.820	7.820	7.820	6.640	6.750	7.000	8.540	8.200	6.060
14	8.920	8.920	8.920	8.920	7.730	7.130	8.030	9.570	9.140	9.660
15+	9.500	9.500	9.500	9.500	9.470	7.660	9.440	10.370	6.470	13.460

Table 5.6 VIRTUAL POPULATION ANALYSIS.

NORTH-EAST ARCTIC SAITHE

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

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
2	.21	.22	.19	.21	.05	.08	.15	.11	.06	.014
3	.85	.75	.60	.42	.51	.38	.38	.23	.65	.30
4	.66	.60	.49	.66	.47	.57	.57	.49	.91	.40
5	.47	.48	.45	.50	.59	.56	.82	.63	.50	.50
6	.40	.21	.41	.28	.44	.49	.44	.48	.46	.41
7	.39	.36	.23	.50	.34	.31	.26	.28	.31	.27
8	.39	.29	.25	.24	.45	.37	.25	.51	.27	.36
9	.47	.34	.30	.30	.05	.21	.14	.24	.49	.20
10	.36	.31	.35	.23	.26	.13	.23	.10	.27	.20
11	.39	.16	.36	.18	.34	.13	.08	.28	.22	.20
12	.47	.14	.36	.26	.44	.12	.08	.10	.34	.20
13	1.10	.20	.24	.14	.40	.24	.14	.16	.14	.20
14	.40	.35	.35	.30	.30	.25	.25	.25	.25	.20
15+	.40	.35	.35	.30	.30	.25	.25	.25	.25	.20
(3- 8)U	.53	.45	.41	.43	.47	.45	.45	.44	.52	.37

Table 5.7 VIRTUAL POPULATION ANALYSIS.

NORTH-EAST ARCTIC SAITHE

STOCK SIZE IN NUMBERS UNIT: tnousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	218805	357449	206615	461637	193689	161676	156809	332461	190068	0	0
2	308597	179095	292546	167617	377157	158140	132255	128261	271759	155593	0
3	238165	203916	118132	198311	111726	292324	120031	92761	94516	209311	125618
4	69155	85606	73580	52921	106778	54950	163970	67095	60428	40327	126947
5	23030	29298	37754	39528	22482	54578	25445	76033	33656	19898	22132
6	28944	11735	14899	19724	19710	10168	25418	9195	33018	16730	9881
7	11573	15879	7750	8130	12193	10416	5082	13446	4635	16990	9090
8	11019	6392	9111	5024	4057	7108	6237	3215	8304	2775	10619
9	7768	6138	3924	5797	3247	2122	4017	3981	1576	5205	1585
10	6217	3958	3585	2570	3527	2526	1405	2873	2575	789	3489
11	3703	3542	2376	2057	1546	2231	1816	914	2130	1618	529
12	2496	2053	2483	1557	1409	897	1600	1379	565	1395	1078
13	793	1280	1461	1421	858	747	654	1209	1018	328	935
14	465	215	858	940	1012	472	482	467	344	728	220
15+	1024	587	1111	915	1135	243	214	884	363	36	512
TOTAL NO	931753	905142	781181	967749	860506	758578	645434	734168	705437	471703	
SPS NO	74001	51778	47555	47735	48695	36930	46924	37557	55028	46584	
TOT.BIOM	725944	645962	581540	620930	661161	670591	620502	637484	593420	484016	
SPS BIOM	282922	210369	197783	184557	187076	153521	169131	172628	203934	171483	

Table 5.8

List of input variables for the ICES prediction program.

NORTH-EAST ARCTIC SAITHE
The reference F is the mean F for the age group range from 3 to 8

The number of recruits per year is as follows:

Year	Recruitment
1986	200000.0
1987	200000.0
1988	200000.0

Data are printed in the following units:

Number of fish:	thousands
Weight by age group in the catch:	kilogram
Weight by age group in the stock:	kilogram
Stock biomass:	tonnes
Catch weight:	tonnes

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	200000.0	.00	.20	.00	.202	.202
2	164000.0	.07	.20	.00	.490	.490
3	125618.0	.30	.20	.00	.802	.802
4	126947.0	.40	.20	.00	1.294	1.294
5	22132.0	.50	.20	.00	2.008	2.008
6	9881.0	.41	.20	1.00	2.700	2.700
7	9090.0	.27	.20	1.00	3.546	3.546
8	10619.0	.36	.20	1.00	4.182	4.182
9	1585.0	.20	.20	1.00	5.172	5.172
10	3489.0	.20	.20	1.00	5.860	5.860
11	529.0	.20	.20	1.00	6.852	6.852
12	1078.0	.20	.20	1.00	7.684	7.684
13	935.0	.20	.20	1.00	7.310	7.310
14	220.0	.20	.20	1.00	8.506	8.506
15+	512.0	.20	.20	1.00	9.480	9.480

Table 6.1 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries (Sub-area I, Divisions IIa and IIb combined). (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Belgium	2	1	-	-	-
Faroe Islands	137	8	1	-	-
France	-	660	3,608	1,142	1,297
German Dem.Rep.	22,636	17,614	16,165	16,162	8,448
Germany, Fed.Rep.	7,894	7,231	11,483	11,913	7,992
Netherlands	127	-	-	-	-
Norway	7,305	7,381	7,802	9,025	8,472
Poland	4,137	175	2,957	261	87
Portugal	3,463	1,480	378	1,100	271
Spain	3,398	-	-	1,375	1,965
UK	4,961	6,330	3,390	1,756	1,307
USSR	263,546	144,993	78,092	70,451	72,802
Total	317,606	185,873	124,172[2]	113,620[2]	102,765[2]

Country	1981	1982	1983	1984	1985[1]
Belgium	-	-	-	-	-
Faroe Islands	206	-	-	-	45
France	537	841	798	2,970	1,182
German Dem.Rep.	4,614	4,463	3,394	4,168	3,260
Germany, Fed.Rep.	4,688	3,182	3,395	3,289	3,305
Netherlands	-	-	-	-	-
Norway	9,249	10,045	11,083	18,650	20,482
Poland	26	-	-	-	-
Portugal	-	-	-	-	1,280
Spain	930	72	222	25	38
UK	470	336	182	716	167
USSR	81,652	112,810	105,459	69,689	59,943
Total	102,372	131,749	124,533	99,507	89,702

[1] Provisional figures.

[2] The total figure used by the Working Group for assessments (including catches by non-members).

Table 6.2 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries in Sub-area I. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Belgium	2	1	-	-	-
France	-	149	27	7	1
German Dem.Rep.	90	-	-	-	-
Germany, Fed.Rep.	635	786	+	-	-
Norway	739	1,181	1,333	1,374	736
Poland	47	-	-	-	-
Portugal	478	55	8	-	170
Spain	301	-	-	-	-
UK	1,392	1,686	959	462	295
USSR	12,411	13,154	2,575	639	33
Total	16,095	17,012	4,902	2,482	1,235

Country	1981	1982	1983	1984	1985[1]
Belgium	-	-	-	-	-
France	16	-	-	-	-
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep.	7	10	-	1	143
Norway	543	732	580	1,472	2,477
Poland	-	-	-	-	-
Portugal	-	-	-	-	-
Spain	-	-	-	-	-
UK	61	77	48	22	43
USSR	1,220	1,750	4,023	532	368
Total	1,847	2,569	4,651	2,027	3,031

[1] Provisional figures.

Table 6.3 REDFISH in Sub-areas I and II. Nominal catch (t) by countries in Division IIa. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Faroe Islands	137	8	1	-	-
France	-	478	3,575	1,134	1,296
German Dem.Rep.	16,921	12,688	12,933	12,439	7,460
Germany, Fed.Rep.	6,722	4,764	11,482	11,913	7,992
Netherlands	127	-	-	-	-
Norway	6,515	6,050	6,369	7,637	7,734
Poland	217	47	2,477	261	78
Portugal	2,849	1,249	352	1,100	89
Spain	2,082	-	-	1,125	1,500
UK	2,919	4,064	2,067	1,195	967
USSR	20,307	94,639	31,783	29,519	46,762
Total	58,796	123,987	71,039	66,323	73,878

Country	1981	1982	1983	1984	1985[1]
Faroe Islands	206	-	-	-	45
France	521	841	798	2,970	1,182
German Dem.Rep.	2,205	2,760	2,500	2,570	2,800
Germany, Fed.Rep.	4,681	3,172	3,395	3,288	2,972
Netherlands	-	-	-	-	-
Norway	8,704	9,140	10,500	17,111	17,992
Poland	26	-	-	-	-
Portugal	-	-	-	-	1,280
Spain	620	-	-	-	-
UK	409	259	134	672	120
USSR	56,130	63,125	82,836	63,342	59,047
Total	73,502	79,297	100,163	89,953	85,438

[1] Provisional figures.

Table 6.4 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries in Division IIb. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Faroe Islands	-	-	+	-	-
France	-	33	6	1	-
German Dem.Rep.	5,625	4,926	3,232	3,723	988
Germany, Fed.Rep.	537	1,681	1	-	-
Norway	51	150	100	14	2
Poland	3,873	128	480	-	9
Portugal	136	176	18	-	12
Spain	1,015	-	-	250	465
UK	650	580	364	99	45
USSR	230,828	37,200	43,734	40,293	26,007
Non-members	-	-	296[2]	435[2]	124[2]
Total	242,715	44,874	48,231	44,815	27,652

Country	1981	1982	1983	1984	1985[1]
Faroe Islands	-	-	-	-	-
France	-	-	-	-	-
German Dem.Rep.	2,409	1,703	894	1,598	460
Germany, Fed.Rep.	-	-	-	-	190
Norway	2	173	3	67	13
Poland	-	-	-	-	-
Portugal	-	-	-	-	-
Spain	310	72	222	25	38
UK	+	+	-	22	4
USSR	24,302	47,935	18,600	5,815	528
Total	27,023	49,883	19,719	7,527	1,233

[1] Provisional figures.

[2] As reported to Norwegian authorities.

Table 6.5 REDFISH in Sub-areas I and II.
Nominal catch (t) of Sebastes marinus and Sebastes mentella in Sub-area I and Divisions IIa and IIb combined.

Species	1976	1977	1978	1979	1980
S. marinus	48,584	39,508	31,695	26,475	23,411
S. mentella	269,022	146,365	92,477	87,145	79,354
Total	317,606	185,873	124,172	113,620	102,765

Species	1981	1982	1983	1984	1985[1]
S. marinus	20,826	16,366	19,260	28,114	27,236
S. mentella	81,546	115,383	105,273	71,393	62,466
Total	102,372	131,749	124,533	99,507	89,702

[1] Provisional figures.

Table 6.6 *Sebastes mentella* in Divisions IIa and IIb. Catch per unit effort and calculated total international effort.

Year	USSR catch/hour trawling (t)		German Dem.Rep. catch/day (t) freezer trawlers	Total effort (USSR units)	
	RT[1]	PST[2]		RT[1]	PST[2]
1965	0.38	-	-	41,216	-
1966	0.39	-	-	26,008	-
1967	0.37	-	-	16,862	-
1968	0.45	-	-	12,029	-
1969	0.48	-	-	14,242	-
1970	0.46	-	-	49,817	-
1971	0.38	-	-	118,587	-
1972	0.38	-	-	75,953	-
1973	0.45	-	-	85,289	-
1974	0.69	-	-	100,539	-
1975	0.95	-	-	251,653	-
1976	0.99	-	-	271,653	-
1977	0.77	-	-	190,084	-
1978	0.63	-	-	147,002	-
1979	0.56	-	-	155,616	-
1980	0.70	0.91	-	113,363	87,202
1981	0.63	0.95	8.71	129,438	85,338
1982	0.63	1.05	9.58	182,835	109,701
1983	0.80	1.09	17.12	123,776	90,845
1984	-	-	13.62	-	-
1985	-	-	9.89	-	-

[1] Side trawlers.

[2] Stern trawlers.

Table 6.7 SUM OF PRODUCTS CHECK.

SEBASTES MARINUS IN FISHING AREAS I AND IIA
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	20	0	10	10	0	0	0	0
6	13	0	11	7	0	0	0	0
7	30	12	13	125	0	0	0	0
8	328	73	87	225	0	0	0	0
9	641	101	180	434	3	0	0	0
10	930	149	352	779	36	0	0	0
11	615	145	517	885	179	8	0	61
12	2003	723	768	1224	816	86	199	813
13	2788	914	571	952	814	249	101	932
14	5453	3422	2368	1704	1961	581	601	2491
15	6404	5276	3677	2502	2364	1358	1623	5284
16	5880	3554	3502	2485	2636	2186	1425	4896
17	2569	1726	1073	868	1333	831	701	2101
18	3669	2212	2341	2399	1989	2241	4572	4084
19	2719	2237	1364	1274	1174	1314	1624	2432
20	1538	1814	1330	1457	1509	1109	2124	1679
21	1716	2237	1829	1592	2121	1803	4551	2071
22	382	959	1040	734	927	804	1475	1079
23	491	946	1507	1007	715	643	2599	901
24	411	959	968	550	353	929	1651	930
25	241	673	519	407	129	656	825	149
26	175	630	383	273	48	924	702	148
27	155	541	341	41	18	330	225	0
28+	141	239	59	36	0	0	0	0
TOTAL	39312	27542	24790	21770	18925	16112	24998	30051

Table 6.8 REDFISH in Sub-areas I and II. Year-class strength.

Year class	Dragesund (1971)	International 0-group survey abundance indices	USSR Young fish surveys[1]
1961	poor	-	poor
1962	very poor	-	poor
1963	poor	-	strong
1964	strong	-	strong
1965	strong	159	strong
1966	strong	236	strong
1967	average	44	average
1968	average	21	average
1969	very strong	295	very strong
1970	strong	247	strong
1971	average	172	strong
1972	average	177	average
1973	strong	385	poor
1974	-	468	poor
1975	-	315	poor
1976	-	447	poor
1977	-	472	-
1978	-	460	-
1979	-	980	-
1980	-	651	strong
1981	-	861	strong
1982	-	694	strong
1983	-	851	strong
1984	-	732	-
1985	-	795	-
1986	-	702	-

[1] On the basis of the abundance of age group 0+ to 5 in the CPUE data of the surveys (published in "Annales Biologiques").

Table 6.9 VIRTUAL POPULATION ANALYSIS.

SEBASTES MARINUS IN FISHING AREAS I AND IIA

FISHING MORTALITY COEFFICIENT UNIT: Year-1 NATURAL MORTALITY COEFFICIENT = .10

	1978	1979	1980	1981	1982	1983	1984	1985	1979-84
12	.017	.017	.023	.037	.055	.017	.051	.089	.050
13	.049	.009	.016	.032	.028	.019	.022	.178	.021
14	.101	.071	.026	.053	.076	.023	.053	.921	.050
15	.103	.073	.091	.031	.087	.062	.074	.746	.070
16	.157	.069	.094	.074	.038	.097	.078	.295	.075
17	.077	.057	.024	.027	.046	.013	.037	.141	.034
18	.189	.079	.092	.062	.073	.092	.086	.277	.081
19	.195	.152	.058	.060	.035	.057	.081	.054	.074
20	.092	.173	.114	.073	.072	.058	.110	.101	.097
21	.110	.169	.236	.150	.130	.121	.195	.134	.167
22	.110	.074	.099	.126	.127	.064	.124	.058	.102
23	.107	.383	.144	.119	.156	.110	.250	.093	.193
24	.096	.280	.746	.065	.050	.277	.397	.119	.303
25	.047	.200	.215	.724	.017	.111	.376	.050	.274
26	.150	.150	.150	.150	.150	.150	.150	.095	.150
27+	.150	.150	.150	.150	.150	.150	.150	.095	.150
(13-18)0	.113	.060	.057	.047	.058	.051	.058	.426	
(19-24)0	.118	.205	.233	.099	.095	.111	.193	.093	

Table 6.10 VIRUTAL POPULATION ANALYSIS.

SEBASTES MARINUS IN FISHING AREAS I AND IIA

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986
12	121927	43844	36252	35248	16086	5480	6837	10025	0
13	61168	108420	38984	32054	30730	13780	4876	5997	8299
14	59611	52697	97234	34732	28098	27032	12252	4316	4542
15	63588	48758	44431	85729	29807	23561	23907	10497	1555
16	42428	55977	41005	36709	75193	24724	20028	20090	4504
17	36388	32807	47273	33775	30854	65532	20295	16768	13534
18	22299	30484	28045	41754	29736	26651	58506	17697	13177
19	16092	16694	25481	23152	35501	25016	21986	48594	12139
20	13296	11980	12981	21760	19738	31006	21387	18350	41658
21	17307	15094	9117	10482	18305	16616	27002	17334	15009
22	5844	14030	11534	6514	8163	14548	13522	20112	13717
23	5068	3116	11783	9448	5197	6506	12343	10653	17172
24	4737	4119	1923	9231	7592	4023	5276	8702	8783
25	5499	3895	2818	825	7850	6534	2759	3209	6991
26	1319	4747	2886	2057	362	6962	5289	1715	2762
27+	2230	5877	2863	580	136	2486	1695	0	1411
TOTAL NO	486802	452539	414588	384050	343528	300458	257740	214060	
SPS NO	244096	247578	242139	282017	268413	254167	233794	193721	
TOT.BIOM	369741	364023	343016	355158	335520	315419	281175	236621	
SPS BIOM	229934	243029	233833	288276	285546	282846	264785	223832	

Table 7.1 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries (Sub-area I, Divisions IIa and IIb combined). (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Faroe Islands	2	21	-	3	-
France	-	-	-	-	-
German Dem.Rep.	8,955	8,176	4,611	3,488	2,080
Germany, Fed.Rep.	31	148	321	481	303
Norway	6,005	4,217	4,082	2,843	3,157
Poland	3,566	224	544	106	-
UK (Engl.& Wales)	935	1,059	407	59	26
USSR	16,580	15,045	14,651	10,311	7,670
Others	-	-	1	21	48
Total	36,074	28,890	24,617	17,312	13,284

Country	1981	1982	1983	1984	1985[1]
Faroe Islands	8	-	-	-	21
France	-	8	67	138	-
German Dem.Rep.	1,358	1,153	1,913	2,089	3,807
Germany, Fed.Rep.	128	18	130	76	193
Norway	4,201	3,206	4,883	4,376	5,482
Poland	-	-	-	-	-
UK (Engl.& Wales)	9	10	2	23	5
USSR	9,276	12,394	15,152	15,181	10,237
Others	38	-	-	-	-
Total	15,018	16,789	22,147	21,883	19,745

[1] Provisional figures.

Table 7.2 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Germany, Fed.Rep.	2	1	-	-	-
Norway	1,203	1,371	1,148	727	490
UK (Engl.& Wales)	665	541	232	36	12
USSR	600	360	211	182	100
Others	9	-	-	-	-
Total	2,479	2,273	1,591	945	602

Country	1981	1982	1983	1984	1985[1]
Germany, Fed.Rep.	19	-	-	-	-
Norway	641	505	490	593	548
UK (Engl.& Wales)	5	8	1	17	1
USSR	564	200	196	81	122
Others	1	-	-	-	-
Total	1,230	713	687	691	671

[1] Provisional figures.

Table 7.3 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Division IIa. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
Faroe Islands	2	21	-	3	-
France	-	-	-	-	-
German Dem.Rep.	354	1,641	1,398	787	570
Germany, Fed.Rep.	17	22	321	481	303
Norway	3,490	1,446	2,084	2,051	2,529
Poland	31	95	197	4	-
UK (Engl.& Wales)	48	211	82	11	9
USSR	43	6,960	8,809	6,929	2,014
Others	-	-	1	21	48
Total	3,985	10,396	12,892	10,287	5,473

Country	1981	1982	1983	1984	1985[1]
Faroe Islands	8	-	-	-	21
France	-	8	67	138	-
German Dem.Rep.	18	73	14	189	82
Germany, Fed.Rep.	109	18	130	76	172
Norway	3,077	2,487	4,257	3,703	4,906
Poland	-	-	-	-	-
UK (Engl.& Wales)	4	2	1	1	2
USSR	2,031	2,459	5,031	5,459	6,894
Others	37	-	-	-	-
Total	5,284	5,047	9,500	9,566	12,077

[1] Provisional figures.

Table 7.4 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Division IIb. (As officially reported to ICES.)

Country	1976	1977	1978	1979	1980
German Dem.Rep.	8,601	6,535	3,213	2,701	1,510
Germany, Fed.Rep.	12	125	-	-	-
Norway	1,312	1,400	850	65	138
Poland	3,526	129	347	102	-
UK (Engl.& Wales)	222	307	93	12	5
USSR	15,937	7,725	5,631	3,200	5,556
Total	29,610	16,221	10,134	6,080	7,209

Country	1981	1982	1983	1984	1985[1]
German Dem.Rep.	1,340	1,080	1,899	1,900	3,725
Germany, Fed.Rep.	-	-	-	-	21
Norway	483	214	136	80	28
Poland	-	-	-	-	-
UK (Engl.& Wales)	-	+	+	5	2
USSR	6,681	9,735	9,925	9,641	3,221
Total	8,504	11,029	11,960	11,626	6,997

[1] Provisional figures.

Table 7.5 GREENLAND HALIBUT in Sub-areas I and II. Catch per unit effort and total effort.

Year	USSR catch/hour trawling (t)		Norway catch/hour trawling (t)	Average CPUE[4]	Total effort (in '000 hrs trawling)	CPUE 7+
	RT[2]	PST[3]				
1965	0.80	-	-	0.80	-	-
1966	0.77	-	-	0.77	-	-
1967	0.70	-	-	0.70	-	-
1968	0.65	-	-	0.65	-	-
1969	0.53	-	-	0.53	-	-
1970	0.53	-	-	0.53	169	0.50
1971	0.46	-	-	0.46	172	0.43
1972	0.37	-	-	0.37	116	0.33
1973	0.37	-	0.41	0.39	77	0.38
1974	0.40	-	0.34	0.36	105	0.33
1975	0.39	-	0.40	0.40	95	0.38
1976	0.40	-	0.34	0.37	97	0.34
1977	0.27	-	0.34	0.31	93	0.26
1978	0.21	-	0.22	0.22	112	0.18
1979	0.23	-	0.27	0.25	69	0.18
1980	0.24	0.33	0.33	0.29	46	0.25
1981	0.30	0.36	0.35	0.33	45	0.24
1982	0.26	0.45	0.40	0.33	51	0.29
1983	0.26	0.40	0.35	0.31	72	0.26
1984	-	-	0.32	-	-	-
1985[1]	-	-	0.37	-	-	-

[1] Provisional.

[2] Side trawlers.

[3] Stern trawlers.

[4] Arithmetic average of CPUE from USSR RT trawlers and Norwegian fresh fish trawlers.

Table 7.6 GREENLAND HALIBUT in Sub-areas I and II. Norwegian survey indices (numbers x 10^{-6}) in the Svalbard area (Division IIb).

Year	Total index	Index fish <20 cm
1981	20.1	2.1
1982	26.0	0.7
1983	26.7	5.9
1984	36.6	3.2
1985	39.5	1.6

Figure 5.1 North East Arctic SAITHE.
Landings by gear categories 1977-1985.

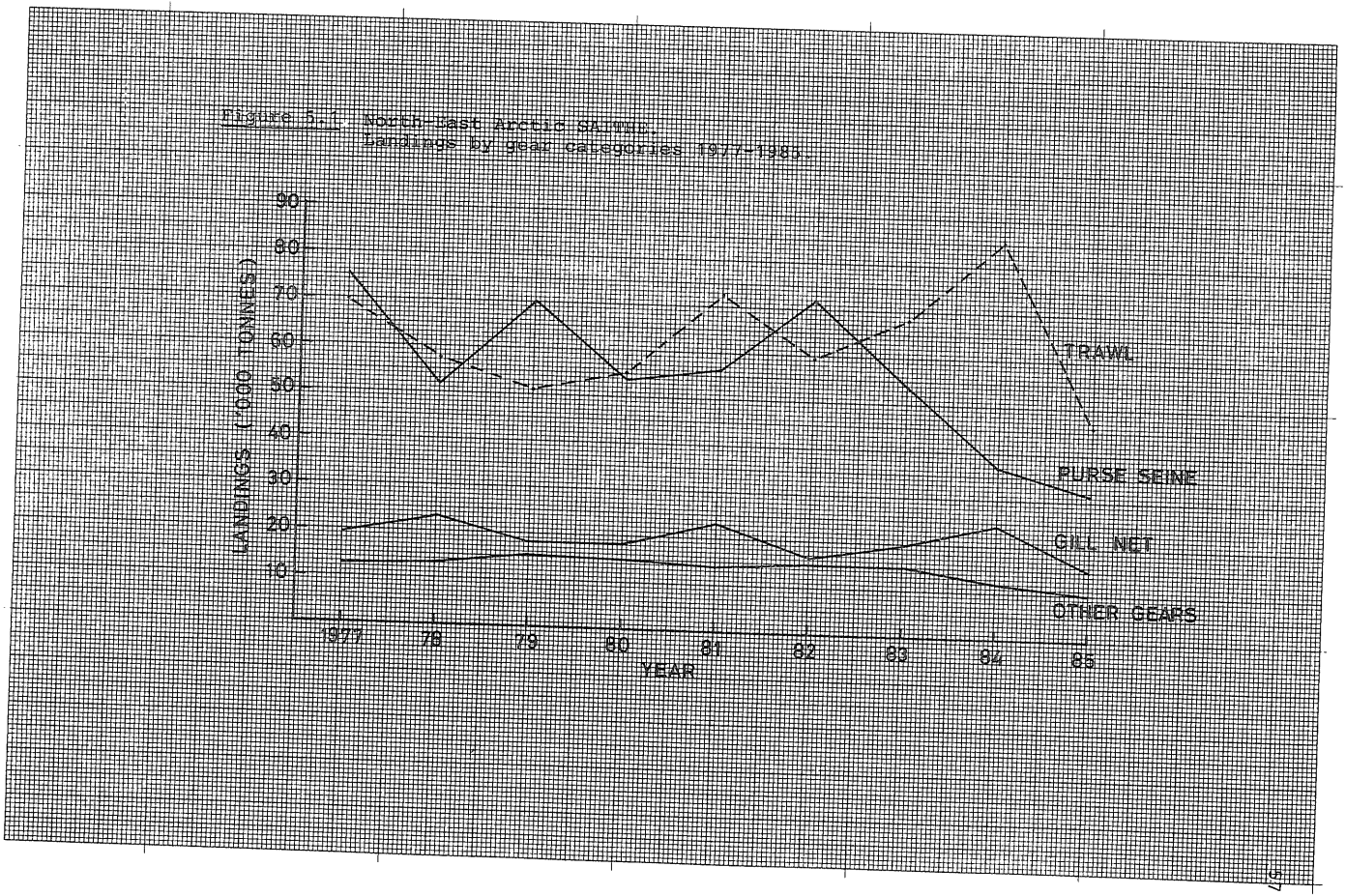
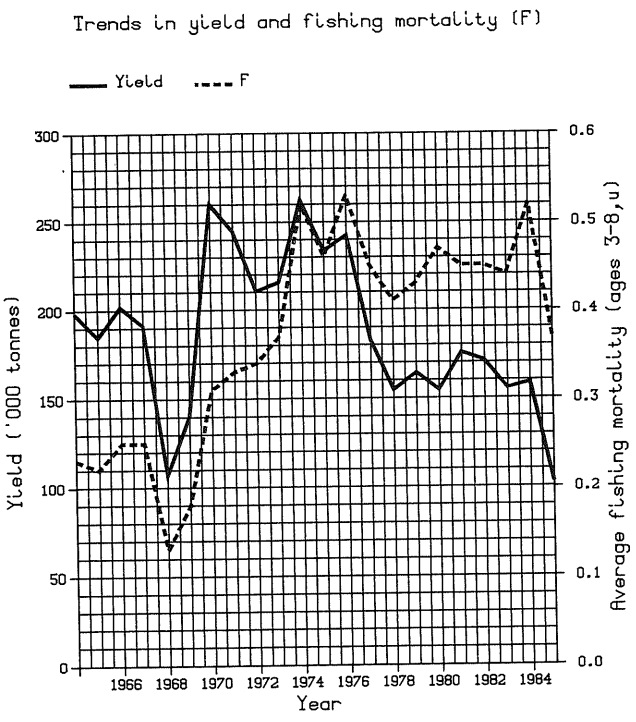


Figure 5.2

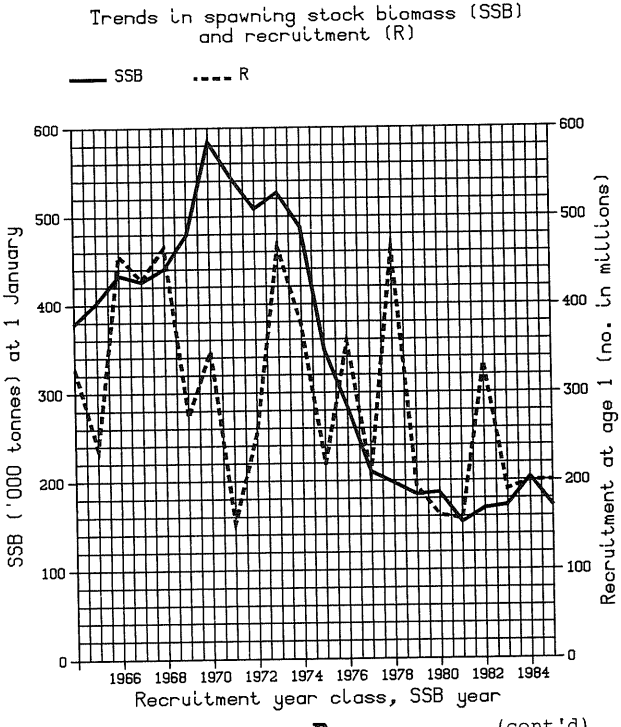
FISH STOCK SUMMARY

STOCK: NE Arctic Saithe

26-9-1986



A



B

(cont'd)

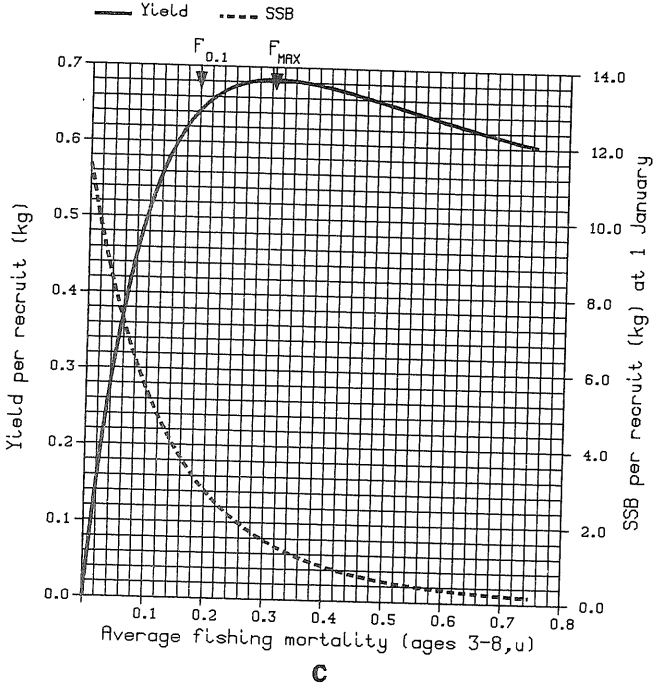
Figure 5.2 (cont'd)

FISH STOCK SUMMARY

STOCK: NE Arctic Saithe

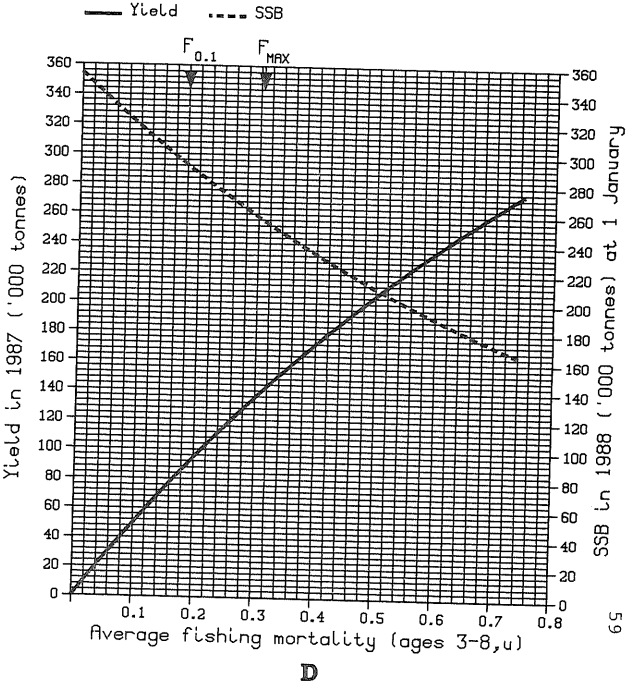
26-9-1986

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



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