COOPERATIVE RESEARCH REPORT

No. 137

REPORTS OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1985

Copenhagen, 13 - 24 May 1985
Copenhagen, 31 October - 7 November 1985

https://doi.org/10.17895/ices.pub.5559

International Council for the Exploration of the Sea
Palægade 2-4, 1261 Copenhagen K
Denmark

April, 1986

ISSN [redacted] 2707-7144
ISBN 978-87-7482-494-7

TABLE OF CONTENTS

ctd.

Page

ctd.

ctd.

ctd.

PREFACE

This volume of the Cooperative Research Report contains the reports of the Advisory Committee on Fishery Management in 1985.

After the first meeting, ICES issued the complete report to the International Baltic Sea Fishery Commission (IBSFC), Part I of the report to the North-East Atlantic Fisheries Commission (NEAFC), and Part I of the report to the North Atlantic Salmon Conservation Organisation (NASCO). The second part of the reports to the NEAFC and NASCO was issued after the October-November meeting. In order to distribute the advice to managers as fast as possible, the reports were issued in chapters and sections and distributed immediately after the chapters had been completed.

The two reports to NEAFC have been edited into one report, placing the stocks in logical sequence and including all advice on each stock in one place.

The report to NEAFC is followed by the reports to IBSFC and NASCO.

A report to the Government of Norway is also included on harp and hooded seals in the Greenland Sea.

Stock summary sheets, included for the benefit of managers in the reports for some of the stocks issued immediately after the ACFM meetings, have not been included in this volume.

Copenhagen, April 1986
Emory D. Anderson
Secretary to ACFM

MEMBERS OF THE ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1984/85

Mr Ø Ulltang	Chairman
Mr B Vaske	Chairman, Demersal Fish Committee
M A Maucorps	Chairman, Pelagic Fish Committee
Dr. J Netzel	Chairman, Baltic Fish Committee

Dr. V C Anthony (Alternate: Dr. R L Edwards)
*Mr E Cadima (Alternate: Ms A M Caramelo)**
Dr. R De Clerck (Alternate: Dr. F Redant)
Dr. J Guéguen (Alternate: Dr. J Dardignac)
Dr. W G Doubleday (Alternate: Dr. R G Halliday)
Mr D J Garrod (Alternate: Dr. R S Bailey)
Mr D de G Griffith
Mr O Nakken (Alternate: Mr G Sætersdal)
Mr N A Nielsen (Alternate: Mr K Popp Madsen)
Dr. V Nikolaev (Alternate: Dr. J Efimov)
M J A Pereiro (Alternate: M J Fernández)
Prof. J Popiel
Mr K H Postuma (Alternate: Dr. R Boddeke)
Dr. O Rechlin
Dr. S A Schopka (Alternate: Mr O Halldórsson)
Prof. A Schumacher (Alternate: Mr H P Cornus)
*Prof. V Sjöblom (Alternate: Mr R Parmanne)
Mr B Sjöstrand (Alternate: Mr J Modin)

Mr K Hoydal, ICES Statistician, Secretary to ACFM

---

* Unable to attend the May 1985 Meeting.
** Participated in the May 1985 Meeting in place of the regular member.

MEMBERS OF THE ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1985/86

Mr Ø Ulltang	Chairman
Mr B Vaske	Chairman, Demersal Fish Committee
Dr. R S Bailey	Chairman, Pelagic Fish Committee
*Dr. J Netzel	Chairman, Baltic Fish Committee

*Dr. V C Anthony (Alternate: Dr. F M Serchuk)**
M E Cadima (Alternate: Ms A M Caramelo)
Dr. R De Clerck (Alternate: Dr. F Redant)
Dr. J Guéguen (Alternate: Dr. J Dardignac)
Mr D J Garrod
Mr D de G Griffith
Mr O Nakken (Alternate: Mr G Sætersdal)
Mr N A Nielsen (Alternate: Mr K Popp Madsen)
*Dr. V Nikolaev (Alternate: Dr. J Efimov)**
M J A Pereiro (Alternate: M A Astudillo)
Prof. J Popiel
Mr K H Postuma (Alternate: Dr. R Boddeke)
Dr. O Rechlin
*Dr. S A Schopka (Alternate: Mr O Halldórsson)**
Prof. A Schumacher (Alternate: Mr H P Cornus)
Prof. V Sjöblom (Alternate: Mr R Parmanne)
Mr B Sjöstrand (Alternate: Mr J Modin)
Mr R Wells (Alternate: Dr W G Doubleday)

Dr. E D Anderson, ICES Statistician, Secretary to ACFM

---

* Unable to attend the November 1985 Meeting.
** Participated in the November 1985 Meeting in place of the regular member.

REPORTS OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT, MAY AND OCTOBER/NOVEMBER 1985

INTRODUCTION

In 1982, it was decided to change the time-table for the ACFM meetings. Instead of having one main meeting in July, dealing with most of the stocks, with an additional minor one in November taking care of a few stocks, the work has now been more equally divided between the two meetings, one in mid-May and one in late October/early November.

The time-table of the assessment working groups had to be changed accordingly, and the advice on the different stocks has been distributed between the two meetings, taking into account various factors such as the deadlines set by the management authorities for receiving advice, timing of surveys and collection of other scientific data, etc.

Basis of the Biological Advice Provided

There has been no change in the last three years in the basic criteria on which ACFM bases its advice. The ACFM still considers that the biological advice provided should not be seen in isolation from economic considerations, and would welcome a continuing dialogue with the other parties in the management process in order to tailor the biological advice to best suit the needs of the subsequent stages in the process of creating viable management.

As described in earlier reports, the stocks are grouped for the purpose of providing management advice into

1. Stocks which are rapidly depleted and suffering from recruitment failure. In these cases, ACFM shall not calculate options but shall recommend a single figure.

2. Stocks which are fished at levels largely in excess of the levels indicated by biological reference points. In these cases, ACFM shall give options inside safe biological limits and shall recommend one of these options according to the general principles of aiming at more stable levels of stock and catch.

3. Stocks which are fished at levels not very different from the biological reference points. In these cases, ACFM shall give options inside safe biological limits, but shall not recommend any particular one of these. It shall only indicate a preference which is in line with the general principles mentioned above.

4. Stocks where at present it is not possible to carry out any analytical assessment with an acceptable reliability. In these cases, ACFM shall indicate precautionary TAC's to reduce the danger of excessive effort being exerted on these stocks.

5. In cases where fisheries on a stock are not subject to TAC regulation, there may be a danger of catches taken from stocks of the same species in adjacent areas being misreported as having been taken in areas of unregulated fisheries. To reduce the risk of this happening, ACFM, on occasion of the request of management bodies, has advised an implementation of TAC's and their levels on this basis. Since, in the majority of cases, the data on these stocks are inadequate for analytical assessment, they too will generally be recommended as precautionary TAC's based on historic catch levels.

In order to allow more flexibility to the management authorities, the type of recommendation given for a Category 2 stock is that <u>fishing mortality should be reduced to one of the biological reference points</u> ($F_{0.1}$ or F_{max}) <u>as quickly as possible, or</u> (in some cases) <u>towards these points.</u>

REPORT TO THE NORTH-EAST ATLANTIC FISHERIES COMMISSION

1. REVIEW OF NOMINAL CATCHES IN NEAFC AREA, 1973-84

In the assessments, the working groups try to estimate discards, landings which are not officially reported, and the composition of the industrial by-catches. These amounts of different species, which have to be included in the estimates of what has been taken from a given stock in order for the assessments to be correct, thus appear in the tables and figures produced by the working groups. These levels of discards, unreported landings and industrial by-catches vary considerably between different stocks and fisheries, being in some cases negligible, in others constituting important parts of the total removal from a stock.

The catch data used in the assessments are given in the table section. In all cases where there might be doubt, it has been indicated if discards, by-catches and eventual estimates of unreported landings are included in the assessments, and how they come out in the predictions. Generally it can be said that, wherever the data allow it, discards are included in the assessments, but are not included in the catch options, which are the basis of the TAC's. Estimates of catches landed as by-catches, especially from the industrial fisheries, are included, wherever data allow it, in the assessments and are included in the catch options.

It should be noted that, as a general rule, catches of protected species above the minimum landing size, which are sorted out and landed for human consumption, are included in the estimates of human consumption landings, both in the catch input data and in the projected catch options. Estimates of industrial by-catches cover, in most cases, that part of the by-catch which is used for reduction purposes.

The assessments presented in this report are carried out using the best catch data available to the working groups and to ACFM. These data are not necessarily identical with the official statistics but, where appropriate, include estimates of unreported landings as well as corrections for misallocation of catches by area and species. Despite considerable effort exerted to this problem, there is no guarantee that all instances of misreporting were discovered.

2. NEAFC REGION 1 STOCKS

2.1 North-East Arctic Cod and Haddock

2.1.1 North-East Arctic cod

Recommended TAC's, total quotas and catches (in '000 tonnes) in recent years are shown in the following text table:

	1982	1983	1984	1985
Rec. TAC	-	-	150	170
Total quota	300	300	220	220
Actual catch	364	290	278[1]	326[2]

[1] Preliminary.
[2] Expected.

Total landings by fishing areas and by countries are given in Tables 2.1.1.1 and 2.1.1.2. The figures indicated a slight decline in total landings from 1983 to 1984, mainly due to a reduction of the trawl catches in Sub-area I and Division IIa. The Norwegian catches by conventional gears increased slightly.

Preliminary landing figures for the first half of 1985 indicated that the total landings in 1985 will be significantly higher than in 1984. The increase, which is about 50,000 tonnes, is due to higher availability of fish in Sub-area I and Division IIb. In Division IIa, the declining trend will continue in 1985. In 1985 and in following years it is expected that the fisheries will be directed towards the abundant year classes of young fish which are distributed in the central, eastern and northern parts of the Barents Sea, and accordingly, a larger proportion of the total landings will be taken by trawls than in the preceding years.

State of the stock

Fishing mortalities for 1984 were chosen so that the stock numbers generated from catch data agreed with the stock numbers estimated from surveys in the period 1982-85. The stock biomass has declined from a level of about 3 million tonnes in 1974 to 0.8 million tonnes in 1984, which is the lowest figure on record. The average fishing mortality has been reduced significantly from 1978 to 1984 but is still about twice the level of F_{max}. The main main results of the assessment are shown in Figure 2.1.1.

Results from a series of surveys were used to estimate the number of 3-year-old recruits of the 1982, 1983, 1984 and 1985 year classes. Although there were discrepancies between the results from these surveys as to the absolute abundance of some of these year classes, the survey results confirmed previous years' observations, indicating that the recruitment to the stock will be good in the period 1985-88. The 1982-85 year classes were estimated to be 800, 1,500 1,000 and 1,500 individuals, respectively, at age 3. All these figures are well above the average for the period 1960-80 of about 650 million fish, although the figures for the 1984 and 1985 year classes are uncertain and should be used with caution.

In recent years,an increased growth and earlier maturation have been observed in the stock. It is believed that this trend will change when the abundant 1983-85 year classes enter the fisheries, and these year classes are expected to grow and mature at rates similar to the long term average figures used in the assessments and projections prior to 1983.

Management advice

The projections of stock biomass and catch are shown in the text table below for 4 alternative management strategies up to 1988. For 1989, only projections of spawning stock biomass are given:

Management strategy									
	F_{max} = 0.30			F = 0.45			F_{85} = 0.59		
Year	TSB	SSB	Catch	TSB	SSB	Catch	TSB	SSB	Catch
1985							1,024	346	327
1986	1,837	268	244	1,837	268	354	1,837	268	446
1987	2,673	392	409	2,547	344	557	2,442	305	664
1988	3,773	772	582	3,430	616	743	3,162	502	838
1989	-	1,871	-	-	1,424	-	-	1,115	-

Example of a management strategy				
Year	$\bar{F}_{(5-10)}$	STB	SSB	Catch
1985	0.59	1,024	346	327
1986	0.50	1,837	268	388
1987	0.40	2,508	330	493
1988	0.30	3,465	619	527
1989	-	-	1,624	-

Weights in '000 tonnes.

For the F_{max} alternative, catches will be reduced in 1986, but all alternatives show rapidly increasing stock sizes and catches from 1986 to 1988. The spawning stock biomass will, for all alternatives, reach its lowest level in 1986 and will increase to more than 1 million tonnes in 1989. In last year's report, ACFM was concerned about the spawning stock size in 1986-88. The 1985 survey data indicated that the 1982 year class is considerably more abundant than estimated in 1984. In addition, the individuals of that year class have grown faster than those of any of the preceding year classes. It is,therefore, expected that the 1982 year class will mature at a high rate, similar to that of the 1978-80 year classes or faster,and thus contribute to the spawning stock in significant numbers as 5-year olds in 1987.

Although the recruitment figures for the 1984 and 1985 year classes are uncertain, there is no doubt that the stock biomass will increase considerably in the coming years due to the contributions from the 1982 and 1983 year classes.

<u>ACFM recommends a reduction in fishing mortality towards F_{max}.</u> The present situation offers the possibility to rebuild the spawning stock while increasing catch quotas and, at the same time, reducing fishing mortality gradually towards F_{max}. The example of a management strategy shown in the text table illustrates one way to attain the recommended objective.

2.1.2 <u>North-East Arctic haddock</u>

Total landings by fishing areas and by countries are given in Tables 2.1.2.1 and 2.1.2.2. In 1984, the landings continued to decline in all areas. This trend will be reversed in 1985 when the total catches are expected to amount to 23,000 tonnes due to an increased availability of young fish in Sub-area I. Yet, the catch in 1985 will be well below the agreed quota and the recommended TAC. The main reason for this is that, in 1985, 3- and 2-year-old haddock have occurred in a mixture on the fishing grounds, so that it has been difficult to obtain catches of legally-sized 3-year olds without having considerable amounts of undersized fish, mainly 2-year olds. It is expected that this situation will change in 1986 when the individuals of the abundant 1983 year class become of fishable size. It is also expected, as for cod, that a larger proportion of the landings in coming years will be from trawl catches in Sub-area I.

<u>State of the stock</u>

Fishing mortalities for 1984 were estimated, as in last year's assessment, assuming that the ratio between the catches of cod and haddock in the total international trawl fishery is a linear function of the ratios between the two stock biomasses. The computed numbers at age, as well as the survey estimates, indicated a very low 1984 stock level, but the discrepancies between the two sets of estimates were considerably larger than for cod, and the relative errors in the estimated stock numbers are probably large. There is,however,no doubt that the stock biomass in 1983-84 of fish age 3 and older was at a lower level than experienced during any of the past 25 years. The average fishing mortality has been reduced considerably after 1977 and is now close to $F_{0.1}$. The results of the assessment are shown in Figure 2.2.1.

The latest survey results supported earlier findings showing that both the 1982 and 1983 year classes were strong, but the size of the 1984 year class is still uncertain. For prediction purposes, the abundance of the 1982-85 year classes was estimated at 300, 400, 75 and 50 million individuals, respectively, as 3-year olds.

Management advice

Projections of stock biomass and catch are given in the text table below. It was expected that the fishery in 1986-88 will concentrate on the abundant 1982 and 1983 year classes.

Management strategy						
F_{max} = 0.35				F_{85} = 0.19 (F0.1)		
Year	TSB	SSB	Catch	TSB	SSB	Catch
1985	-	-	-	290	73	27
1986	581	76	103	581	76	59
1987	656	122	180	719	140	117
1988	609	202	166	767	270	123
1989	-	266	-	-	411	-

Weights in '000 tonnes.

Both alternatives show a rapidly increasing stock in the period 1985-88. The spawning stock will increase significantly in 1987-89 when the abundant 1982-83 year classes become mature. The development of the stock after 1988 depends largely on the recruitment figures for the year classes 1984 and 1985 which are highly uncertain, and the rate of exploitation in 1986-87. ACFM prefers that the TAC to be set for 1986 should not exceed 100,000 tonnes.

Normally a large portion of the haddock landings has been taken as by-catch in the trawl fisheries for cod. Hence, there ought to be correspondence between the catch quotas for the two species. In previous periods where abundant year classes entered the fishery, the ratios between the landings of the two species have fluctuated between 2 and 4. It is, however, difficult to judge what ratio is likely to emerge in the present situation.

2.2 Redfish in the North-East Arctic Region (Sub-Areas I and II

2.2.1 Recent catches and TAC's

	1980		1981		1982		1983		1984	
Stock	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[2]
Golden redfish *S. marinus*	19	23	19	20	14	15	15[1]	20	15[1]	25
Beaked redfish *S. mentella*	81	79	70	81	70	115	70	105	70	70

[1] Precautionary.
[2] Preliminary.
Weights in '000 tonnes.

The redfish catches in Sub-areas I and II increased from 102,372 tonnes in 1981 to 131,527 tonnes in 1982 and decreased to 124,517 and to about 95,000 tonnes in 1983 and 1984, respectively. The preliminary landing figures for 1984 were almost 10,000 tonnes above the level of 85,000 tonnes recommended for 1984 by ACFM (se Table 2.2.1).

In Sub-area I, the total catch increased from 2,565 tonnes in 1982 to 4,864 tonnes and decreased to 2,083 tonnes in 1984. In Division IIa, the total catch increased from 79,151 tonnes in 1982 to 99,934 tonnes in 1983 and decreased to 86,060 tonnes in 1984. In Division IIb, the catch decreased from 49,811 tonnes in 1982 to 19,719 tonnes and 6,864 tonnes in 1983 and 1984, respectively.

2.2.2 Sebastes marinus in Sub-area I and II

The landings of S marinus increased from 19,500 tonnes in 1983 to 25,300 tonnes in 1984. This is 10,000 tonnes above the precautionary TAC of 15,000 tonnes recommended by ACFM for 1984 (Table 2.2.2).

2.2.3 Sebastes mentella in Sub-area I and II

The landings decreased from 1983 to 1984 by about 35,000 tonnes (i.e., from 105,000 tonnes to 70,000 tonnes), and the reduction took place in all three fishing areas. The catch in 1984 is at the same level as the TAC of 70,000 tonnes advised for 1984, but 20,000 tonnes below the agreed TAC of 90,000 tonnes which was used in projections for 1985 and 1986 (see Table 2.2.2).

2.3 Greenland Halibut in Sub-Areas I and II

2.3.1 Recent catches and TAC's

1980		1981		1982		1983		1984	
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[1]
14	13	12	15	12	16	17	22	17	22

[1] Preliminary.
Weights in '000 tonnes.

The total landings in 1982 were 16,733 tonnes (i.e., 39% above the TAC of 12,000 tonnes for that year). In 1983, the total landings were 22,126 tonnes [i.e., 5,126 tonnes (30%) above the TAC of 17,000 tonnes]. The landings in 1984 were 22,855 according to preliminary figures [i.e., 4,855 tonnes (29%) above the TAC of 17,000 tonnes which was the catch in 1984 assumed for projections (see Table 2.3.1)].

2.4 Redfish in Sub-Areas V and XIV

2.4.1 Recent catches and TAC's

Stock	1980		1981		1982		1983		1984	
	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[2]
Golden redfish *S. marinus*	58	88	60	101	60	123	60	106	80	94
Beaked redfish *S. mentella*	7	27	25	44	12	46	12[1]	58	25[1]	44

[1] Precautionary.
[2] Preliminary.
Weights in '000 tonnes.

The total landings from the Irminger Sea redfish stock complex increased from 145,000 tonnes in 1981 to 229,000 tonnes in 1982, and decreased slightly to 225,000 tonnes in 1983. The landings decreased in 1984 to 207,000 tonnes. The higher landings in 1982 compared to 1984 originated from a new fishery on the stock of *S. mentella* "type oceanic" (see Table 2.4.1).

The total landings of redfish, apart from the figures from the new fishery, decreased slightly from 1982 to 1983 (i.e., from 169,000 tonnes to 164,000 tonnes) and decreased by about 19% to 138,000 tonnes in 1984. Landings in Division Va decreased further by about 15,000 tonnes, whereas the landings in Division Vb increased by 4,500 tonnes. In Sub-area XIV, the landings dropped from 31,000 tonnes to 14,000 tonnes.

The fishery on the S. mentella "type oceanic" stock took place outside the 200-nautical-mile national fisheries zone in Sub-areas XII and XIV. The catches amounted to 60,582, 60,079 and 68,300 tonnes in 1982 to 1984, respectively. These catches are not included in the present assessment.

2.4.2 Sebastes marinus in Sub-areas V and XIV

The landings in Division Va decreased from 87,457 tonnes in 1983 to 82,414 tonnes in 1984. In Division Vb, the landings increased from 3,437 tonnes in 1983 to 6,381 tonnes in 1984. The landings in Sub-area XIV decreased from 15,783 tonnes in 1983 to 4,944 tonnes in 1984. For Sub-areas V and XIV combined, the landings decreased from 106,677 tonnes in 1983 to 93,739 tonnes in 1984. The landings are 13,739 tonnes higher than the TAC of 80,000 tonnes recommended by ACFM for 1984. This is about 30,000 tonnes below the 1984 catch level assumed for the projections for 1985 and 1986.

2.4.3 Sebastes mentella in Sub-areas V and XIV

In Division Va, the landings decreased from 37,070 tonnes in 1983 to 27,140 tonnes in 1984. The landings in Division Vb increased from 5,957 tonnes in 1983 to 7,597 tonnes in 1984. In Sub-area XIV, the landings decreased from 15,333 tonnes in 1983 to 9,065 tonnes in 1984. The combined landings in Sub-areas V and XIV decreased from 58,340 tonnes in 1983 to 43,803 tonnes in 1984, which is 18,800 tonnes above the TAC recommended by ACFM of 25,000 tonnes for 1984.

2.4.4 Note on the mentella "type oceanic" stock in Sub-areas V, XII and XIV

No new information about that stock is available. In 1981-83, USSR research vessels carried out cruises in the open part of the Irminger Sea and collected biological information, which will be analysed at the next meeting of the Working Group.

2.5 Greenland Halibut in Sub-Areas V and XIV

2.5.1 Recent catches and TAC's

1980		1981		1982		1983		1984	
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[1]
15	31	15	20	19	32	24	30	23	34

[1]Preliminary.
Weights in '000 tonnes.

The landings of Greenland halibut in Division Va increased from 28,392 tonnes in 1983 to 30,125 tonnes in 1984. The landings increased in Division Vb from 1,428 tonnes in 1983 to 3,098 tonnes in 1984. In Sub-area XIV, the landings remained at the same level from 1983 to 1984 (i.e., 1,060 tonnes). In Sub-areas V and XIV, the total landings increased from 30,880 tonnes in 1983 to 34,284 tonnes in 1984; 88% of the total catch in 1984 was taken by Iceland.

2.6 ACFM Advice for 1986 for Redfish and Greenland Halibut

In all redfish stocks for which the ACFM advice for 1985 and 1986 is based on an analytical assessment, the reported catches for 1984 are below the level assumed for that year in the projections. ACFM, therefore, states that the advice given for 1986 in 1984 would not have adverse effects on the respective stocks (i.e., *Sebastes mentella* in Sub-areas I and II and *Sebastes marinus* in Sub-areas V and XIV).

For the stocks of *Sebastes marinus* in Sub-areas I and II and *Sebastes mentella* in Sub-areas V and XIV, precautionary TAC's of 15,000 tonnes and 25,000 tonnes, respectively, have been recommended for 1986. For the stock of Greenland halibut in Sub-areas V and XIV, a precautionary TAC based on historic catch levels was recommended for 1986. ACFM reiterates its advice previously given for these stocks.

The situation is different in the stock of Greenland halibut in Sub-areas I and II. The catch in 1984 exceeds the catch level used in the projection for 1986 by about 6,000 tonnes. The 1984 catch of about 23,000 tonnes generates a fishing mortality of 0.25. This is higher than the fishing mortality assumed in the projections for 1983 and 1984 (F = 0.18), but still somewhat below the 1983 level.

A projection on the same basis as the 1984 assessment, but using the reported 1984 catches, indicates only small deviations (5% or less) from the figures given in the 1984 ACFM report. Therefore, and in view of the increasing trend in both total biomass and spawning stock biomass estimated in 1984, ACFM states that its advice on this stock previously given for 1986 is still valid.

2.7 Stocks off East Greenland

2.7.1 Cod stocks off East Greenland

The Working Group on Cod Stocks off East Greenland met at ICES headquarters from 16-21 January 1985 to analyse the results of the 1984 autumn groundfish survey carried out by the Federal Republic of Germany and to assess catch options for East Greenland cod for 1985.

The fishery in East Greenland waters

Recent catches and recommended TAC's

1980		1981		1982		1983		1984		1985
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC
-	12[1]	-	16[1]	12[2]	27[1]	-[3]	13	6	8	

[1] Including estimates of marketable discards.
[2] Revised.
[3] ACFM advised no directed cod fishery for the remainder of 1983 (June-December), assuming that a catch of 6,000 tonnes has been taken at the time of the ACFM meeting in May.

The major part of cod catches from East Greenland waters is obtained by trawlers either from directed cod fishery or as by-catch in the redfish fishery. The fishery takes place on the offshore banks and along the slopes of the Greenland shelf from Dohrn Bank southwards to Cape Farewell.

Total catches from Sub-Area XIV (Table 2.7.1), which include estimates of unreported catches in 1977-79 and discards in 1980-82, fluctuated without trend during the period 1975-82. From 1982, the catches have decreased from 27,000 tonnes to 8,000 tonnes in 1984.

In 1984, about 90% of the trawler catches were taken during the first half of the year, 650 tonnes were taken by long-liners and 20 tonnes were taken with pound nets inshore in the Angmagssalik district.

Groundfish biomass survey results

As the information available from the commercial fishery does not adequately reflect the situation and the development of the East and West Greenland cod stocks and hence does not allow valid assessments based on fishery data, the existing groundfish survey programs off East and West Greenland conducted by the Federal Republic of Germany were continued in order to obtain reasonable estimates of the trawlable biomass in both areas. The survey estimates indicate that there is no reduction in stock size in terms of numbers from the 1982 survey to the 1984 survey. However, due to the considerable and variable migration which takes place in the East Greenland area, the survey stock cannot be used directly for projection purposes.

Tagging experiments carried out at Greenland and Iceland show that mature cod at West Greenland migrate to East Greenland and some of them further to Iceland (Figure 2.7.1). Survey results and catch figures from both West and East Greenland indicate migrations far in excess of what has earlier been used in the assessments. Based on this information, the Working Group decided to use an emigration coefficient at West Greenland of E = 0.15 in the present assessment. Migration of cod from Icelandic to Greenland waters hardly occurs and, therefore, the migrations from Greenland waters to Iceland can be regarded as a one-way emigration.

There is also a larval drift with currents from Iceland via East Greenland waters to West Greenland banks. The magnitude of this drift and the survival rate of the larvae seem to vary much from year to year. In some years the drift seems negligible, while in other years (e.g., in 1963 and 1973 and again in 1984), considerable numbers of larvae seem to have drifted from Iceland to Greenland.

In order to arrive at an estimate of population size which could serve as the basis for a projection, it was assumed that 14% of the West Greenland stock emigrates to the East Greenland area, and that 25% of the stock in the East Greenland area emigrates to Iceland, and corrections were made for the partial recruitment to the stock of 4- and 5-year-old fish.

State of the stock and management advice

The total stock estimates are shown in the text table below:

Year	Total stock no.	Total stock biom.	Spawn. stock no.[2]	Spawn. stock biom.[2]	$\bar{F}_{(5-10)}$	Catch no.	Catch weight
1980	25	67	14.3	51	0.21	3.7	12[3]
1981	23	70	13.6	55	0.21	3.9	16[3]
1982	15	54	8.6	44	1.40	7.7	27[3]
1983	13	34	5.4	21	0.53	4.7	13
1984	10	31	4.7	19	0.40	2.8	8
1985[1]	10	24	3.6	13			

Estimates of stock size refers to 1 January.
Weights in '000 tonnes, numbers in millions.
[1]Estimated using an emigration coefficient of 0.15 in the West Greenland population of age 6 and older.
[2]Different from previous assessment due to shift of the maturation ogive by one year.
ogive by one year.
[3]Including dicscards of marketable cod.

The estimated spawning stock size for 1985 as given in the text table above is much below the 1984 level and to some extent dependent on the estimate of the number of immigrants from West Greenland. The total stock in numbers estimated for 1985 is at the same level as in the preceding year, while spawning stock size and total biomass are reduced to about 3/4 of the 1984 level due to the fact that the stock now consists of younger fish compared to previous years.

Assuming different levels of fishing mortalities for 1985, catches in 1985 and resulting spawning stock biomass estimates in 1986 are shown in Figure 2.7.2. Management options are given in the text table below.

1984				1985				1986
Total stock biom.	Spawn. stock biom.	$\bar{F}_{(5-10)}$	Catch	Total stock biom.	Spawn. stock biom.	Management option $\bar{F}_{(5-10)}$	Catch	Spawn. stock biom.
31	19	0.40	8	24	13	$F_{85} = 0.5F_{84} = 0.2$	3.7	11.8
						$F_{85} = 0.8F_{84} = 0.32$	5.6	10.5
						$F_{85} = F_{84} = 0.40$	6.7	9.6

Estimates of stock size refer to 1 January.
Weights in '000 tonnes.

Resulting spawning stock biomass figures for 1986 do not include immigrants in 1986. The difference between the biomass values calculated without considering any immigration and those with an emigration coefficient of 0.15 at a level of fishing mortality of 0.4 is about 2,000 tonnes. By adding this quantity to the biomass values calculated for 1986, comparison with the corresponding figures might be possible to some extent.

The year classes of some importance at East Greenland are those from 1977 and 1979 which are, however, considerably smaller than the 1973 year class which supported the fishery for a number of years.

By maintaining the 1984 exploitation level in 1985, the spawning stock biomass will be at a very low level in 1986. As a yield-per-recruit approach is not meaningful due to migration, the management objective is to maintain a viable spawning stock. A further decline in the already low spawning stock biomass should, therefore, be prevented. By reducing the fishing mortality in 1985 to about 50% of the 1984 level, a further decline of the spawning stock can be halted.

<u>ACFM, therefore, recommends that the TAC for cod in Sub-area XIV in 1985 should not exceed 4,000 tonnes.</u>

Although this advice is based on the best data available, it should be noted that there are considerable uncertainties concerning the figures for both migration rates and partial recruitment. Possible errors in the survey estimates should also be borne in mind.

These considerations call for a cautious approach in the management of this stock.

<u>Advice from the November 1985 ACFM Meeting</u>

The catch of East Greenland cod in 1984 amounted to about 8,000 tonnes, which is 20% below the TAC of 10,000 tonnes. The 1985 catch up to the end of September is estimated to have been only about 2,000 tonnes as a result of reduced fishing activity at spawning time due to unfavourable environmental conditions.

Preliminary estimates of trawlable biomass from the 1985 Federal Republic of Germany trawl survey are already available and are given in the text table below together with the corresponding figures from the 1980 to 1984 surveys:

Year	Season	Ship	Biomass		Stock numbers	
			Tonnes	+/-%	('000)	+/-%
1980	Oct/Nov	"Karlsburg"	62,944	32.77	15,425	33.87
1981	Nov/Dec	"W. Herwig"	88,336	43.43	19,448	35.29
1982	Sep/Oct	"W. Herwig"	19,782	30.40	6,106	25.87
1983	Sep/Oct	"W. Herwig"	26,980	37.84	6,730	33.08
1984	Oct[1]	"A. Dohrn"	21,151	41.73	6,488	51.17
1985	Oct[2]	"W. Herwig"	21,753	26.5	7,763	27.3

[1] Only 36 valid hauls.
[2] Preliminary.
Confidence intervals are given at 95% significance level.

The preliminary results of the 1985 survey show no significant difference in trawlable biomass compared to the previous year, although the stock size in numbers increased by about 20%. This is probably due to the abundant 1979 year class as indicated by the length composition of the survey catches. It is thought that part of this year class has immigrated from West Greenland waters.

The advice given for 1985, when the biomass was estimated as 24,000 tonnes (including immigrants in 1985), was a TAC of 4,000 tonnes.

On these grounds ACFM advises a preliminary TAC of 4,000 tonnes for 1986.

The final advice for 1986 will be given in February when the report of the Working Group on Cod Stocks off East Greenland has been evaluated by ACFM.

2.7.2 Pandalus in East Greenland waters (Denmark Strait, Divisions XIVb - Va)

Recent catches (in tonnes):

1978	363
1979	1,285
1980	8,260
1981	4,792
1982	4,902
1983	4,175
1984[1]	6,352

[1]Provisional data.

This stock has been assessed by the Scientific Council of NAFO, and management advice for 1985 has been passed on to managing bodies in the Provisional Report of the Scientific Council, January 1985.

Although it was not possible in previous assessments to reach a conclusion on the reasons for the trends in catch rates, the inclusion of data for 1984 indicates stability of the stock. The Scientific Council of NAFO, therefore, advised that the TAC for 1985 should not exceed 5,000 tonnes.

2.8 Atlanto-Scandian Herring

2.8.1 Icelandic spring- and summer-spawning herring

The fishery in 1984

In 1984, there were no signs of recovery of the Icelandic spring-spawning herring, and the fishery was based almost entirely on the Icelandic summer spawners.

The landings in 1984 were about 50,000 tonnes (Table 2.8.1) mostly taken between 30 September and 17 December. This is equal to the TAC recommended by ACFM and adopted by the management body. The catch was dominated by the 1979 year class which made up 61% of the total catch in number.

Recent catches, TAC's and recommended TAC's

1981			1982			1983			1984			1985
Rec. TAC.	TAC	Catch	Rec. TAC	TAC	Catch	Rec. TAC	TAC	Catch	Rec. TAC	TAC	Catch	Rec. TAC
40	42.5	39.5	50	50	56.5	50	52.5	58.7	50	50	50	50

Weights in '000 tonnes.

Estimates of stock size and fishing mortality rate

As a result of bad weather, the acoustic survey in December 1984 was not completed and an additional survey was carried out in January 1985. During the latter survey, herring were distributed in almost all the fjords in eastern Iceland with the main concentrations in two of them. The biomass estimate was about 200,000 tonnes dominated by the 1979 year class.

Areas of juvenile distribution were incompletely surveyed, but their abundance in some areas indicates that the 1982 and 1983 year classes may be above average.

The acoustic survey estimates and catches in 1984 were used to estimate the fishing mortality rate on each age group in 1984. The average F on 5-10 ringers was 0.17 and lower on the oldest age groups. The estimate of F on 4-ringers was 0.25, possibly as a result of concentration of effort on the strong 1979 year class. The estimated F on 3-ringers, however, (0.29) is not consistent with that calculated from the acoustic survey in 1983 (0.09). In view of this discrepancy, the fishing mortality rate on this age group was taken to be the mean over the period 1975-83 (F = 0.15).

Management considerations

For projection purposes, a recruitment of 1-ringers of 400 million has been assumed for 1985. Projections to 1986 are given below in '000 tonnes.

1985				1986
Spawning stock biomass (1 July)	Management option	$\bar{F}_{(4+)}$	Catch	Spawning biomass (1 July)
262	$F_{85} = 0.5F_{83}$	0.15	35	294
	$F_{0.1}$	0.22	50	277
	$F_{85} = F_{83}$	0.30	66	263

The catch in 1985 corresponding to the preferred level of fishing mortality rate (F0.1) is 50,000 tonnes (Figure 2.8.1). The fishing mortality rate can, therefore, be held at the $F_{0.1}$ level in 1985 without any reduction in catch compared with 1984. For the 1986 season, a preliminary TAC of 50,000 tonnes can be set. This TAC should be revised when new data become available early in 1986.

2.8.2 Norwegian spring-spawning herring

Recommended TACs, quotas and catches in recent years are given below.

1982			1983			1984			1985		
Rec. TAC	Nat. quota	Catch	Rec. TAC	Nat. quota	Catch	Rec. TAC	Nat. quota	Catch	Rec. TAC	Nat. quota	Catch
0	12.0	16.7[1]	0	21.0	23.1[1]	0	38.0	53.3[1]	50.0	60.0	-

[1]Including unreported catches of approximately 5,000 tonnes.
Weights in '000 tonnes.

Trends in fishing

The catch in 1984 amounted to about 53,000 tonnes (Table 2.8.2). In addition to the national quota of 38,000 tonnes, 7,750 tonnes remained of a catch quota which was originally set for the period August 1983 - March 1984. The fishery was regulated with a quota per vessel and a minimum landing size of 25 cm, with allowance of 15% undersized fish (by weight).

State of the stock

As in previous years, data from tagging experiments constitute the main basis for the assessment of the stock. The Norwegian tagging project started in 1975, and 25,000 - 40,000 herring have since then been tagged annually. In the winter of 1985, a catch of 7.1 million herring was effectively screened for tags and 306 tags were recovered.

Based on the tagging data from 1984 and 1985, the average annual total mortality for the period 1975-83 was estimated at 0.17; the corresponding natural mortality was 0.13. The spawning stock biomass was estimated at 840,000 tonnes which is about 200,000 tonnes above the 1984 stock estimate obtained last year. The difference is partly due to recruitment, but also to a revision of the estimated total mortality (Z = 0.2 in the 1984 estimate).

The acoustic abundance estimate of O-group herring obtained in November-December 1984 shows that this year class has about an average strength compared to the 1975-82 year classes. The 1985 year class is abundant in the Barents Sea, but is probably subjected to high predation pressure from cod. The high abundance of the 1983 year class has been confirmed, and this year class will constitute the main recruitment to the adult stock in 1987-88.

Management advice for 1986

Management options for 1986 are given in the text table below.

1985				1986				1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-9)}$	Catch	Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-9)}$	Catch	Stock biom.	Spawn. stock biom.
2,454	805	0.07	60	2,416	851	0	0	2,853	1,446
						0.05	79	2,780	1,389
						0.07	94	2,766	1,378
						0.10	139	2,724	1,345
						0.15	216	2,652	1,288
					$F_{0.1}$ =	0.18	247	2,622	1,265

Weights in '000 tonnes.

According to this projection, the spawning stock will not change to any appreciable level from 1985 to 1986, but both the total stock biomass and the spawning stock biomass will increase in 1987 and in 1988, largely because of the presence of the 1983 year class. The 1983 year class is very strong and should greatly improve the recruitment to the spawning stock in 1987-88.

The present exploitation rate of F = 0.07 and even an F of 0.10 will have very little effect on this development.

In previous ACFM reports,it was suggested that herring stocks in general should be fished at the $F_{0.1}$ level, but at lower levels if they are still in the state of rebuilding. Therefore, ACFM recommends that the TAC in 1986 should not exceed 150,000 tonnes.

Additional management considerations

ACFM evaluated the merits of minimum landing sizes of 27 cm and 25 cm (presently in force in Norway) (Figure 2.8.2.2). From yield-per-recruit considerations, only marginal gains can be expected from a minimum landing size of 27 cm compared to 25 cm. If, however, the aim is to protect incoming year classes in order to provide higher recruitment to the spawning stock, then a minimum landing size of 27 cm would be more appropriate, particularly when the stock is in the state of rebuilding. Therefore, ACFM repeats its recommendation from 1983 and 1984 that a minimum landing size of 27 cm be introduced for herring in Sub-areas I, II, V and XIV.

2.8.3 NEAFC request

NEAFC requested ICES

(i) "to prepare an outline in time and space of the different life stages of Atlanto-Scandian spring-spawning herring based on the situation before the collapse of the stock in the late sixties"; and

(ii) "to develop appropriate studies to determine the distribution features of the stock during and following its period of recovery".

The following summary was made of the general life history and distribution of the Norwegian spring-spawning herring.

General biology

Spawning times and areas

From the beginning of this century and up to about 1955, the main spawning took place off the coast of western Norway, between Egernsund and Stadt. From 1955 onwards, the main spawning gradually shifted northwards off Møre and Trøndelag. However, spawning also took place off Helgeland and, especially in recent years, as far north as off Lofoten. Since 1955, the spawning time changed from January or February to March. In addition, there has been, at least since 1950, a considerable spawning of Norwegian spring-spawners off the Faroe Islands. The changes in spawning grounds during the period 1950-68 are shown in Figures 2.8.3.1, 2.8.3.2 and 2.8.3.3.

Larval, post-larval and juvenile fish distribution

The larvae from the Norwegian spawning grounds are transported northward with the coastal currents. The larval stage lasts for about 2 months, and during that time, some larvae drift into fjords and bays on the Norwegian coast, but others remain in the outer coastal areas until metamorphosis.

The 0-group in the coastal areas migrate into the fjords in autumn, but in years of high 0-group abundance, their distribution is very widespread and ranges from the fjords of western and northern Norway to the open ocean of the Norwegian Sea and the Barents Sea.

Distribution and migration of young and adult stock component

As 1- and 2-group, herring feed in Norwegian coastal areas and in the SW Barents Sea. During periods of exceptionally high abundance, these age groups have had a much wider distribution. Young herring from the southern coastal areas usually accumulate as 1- and 2-year-old fish in the Helgeland-Troms area. Young herring in Finnmark usually spend one more year in the coastal areas before they begin their migration to the Norwegian Sea to join the adult stock.

The traditional adult herring migration was from the spawning grounds on the Norwegian coast to the summer feeding grounds in the Iceland-Jan Mayen area. In the late 1960's, the main feeding grounds moved further north and east to the Jan Mayen-Bear Island area. During autumn, the adult herring concentrate in the area east of Iceland, where they remain until January when the migrations begin to the spawning areas at the Norwegian coast. The changes in migration pattern of the adult herring during the period 1958-68 are shown in Figures 2.8.3.1, 2.8.3.2 and 2.8.3.3.

Information on biology, fishery and management is given in the two following publications:

Anon.,1979. The biology, distribution and state of exploitation of fish stocks in the ICES area. Part II. ICES Coop.Res.Rep., No.86.

Dragesund, O, Hamre, J, Ulltang, Ø. 1980. Biology and population dynamics of the Norwegian spring-spawning herring. Rapp.P.-v. Réun. Cons.int.Explor.Mer, 177:43-71.

Future research

International Monitoring Programme for Atlanto-Scandian Herring

As a basis for discussion, the USSR has drafted a proposal for an international cooperative research programme to monitor the Atlanto-Scandian herring (a working paper submitted to the Atlanto-Scandian Herring and Capelin Working Group, available from the ICES Secretariat). These research proposals stressed the importance of an ecosystem approach. The Working Group discussed the timing and types of surveys that would be most appropriate to monitor the Atlanto-Scandian herring and concluded (a) that a reliable annual acoustic estimate of the adult stock is necessary and (b) that the most appropriate time may be during the overwintering period. ACFM endorses these views. To obtain an estimate of recruiting year classes, a survey in the Norwegian fjords and certain areas of the Barents Sea and Norwegian Seas during late autumn would be most appropriate, especially for 0-group herring. Future research should also be aimed at providing quantitative estimates of the distribution of all year classes, especially during the migration periods. The most appropriate time to provide these estimates would be during the spawning migrations (approximately December-February) and during the period between spawning and feeding (approximately April-June).

ACFM noted that the annual International Blue Whiting Survey conducted during August in the Norwegian Sea and adjacent areas would provide an opportunity to obtain additional information on the Atlanto-Scandian herring when they start to migrate into the Norwegian Sea. ACFM also noted that there is a lack of information on multispecies interactions in this area. ACFM, therefore, recommends that further research be carried out on multispecies interactions in the Norwegian Sea.

2.9 Capelin Stocks

2.9.1 Barents Sea capelin

The Barents Sea fishery has been regulated by bilateral fishery management agreements between the USSR and Norway since 1979. TAC's and catches from 1981-84 ('000 tonnes) are given in the text table below:

1981			1982			1983			1984			1985	
Rec. TAC	TAC	Catch	Rec. TAC	TAC	Catch	Rec TAC	TAC	Catch	Rec. TAC	TAC	Catch	Rec. TAC	TAC
1,900	1,900	1,987	1,600	1,700	1,759	2,300	2,300	2,309	1,100	1,400	1,434	1,000	1,100

For the year 1985, ACFM recommended that the TAC should not exceed 1.0 million tonnes and USSR, and Norway agreed to limit their total catch to 1.1 million tonnes.

State of the stock

The assessment of the Barents Sea capelin is based on acoustic surveys carried out jointly between USSR and Norway in September-October each year. The 1985 survey gave the following abundance estimates by year class:

Year class	Number	Mean weight	Biomass
1984 (1983)	35 (145)	4.3 (3.7)	0.15 (0.54)
1983 (1982)	47 (184)	8.2 (7.4)	0.39 (1.37)
1982 (1981)	21 (47)	13.0(18.2)	0.27 (0.87)
1981 (1980)	1 (3)	15.6(27.1)	0.01 (0.09)

The estimate of the same age groups in 1984 is shown in parentheses for comparison. The 1984 year class is 4 times lower by number than the 1-group measured last year. The 1983 year class is more than 3 times lower by number than the 2-group measured last year, thus confirming the lower number obtained in 1984 for this year class. The abundance of the 1982 year class is the lowest ever obtained. The weight of 1- and 2-year olds has improved from last year, but the 3-year-old capelin show a severe reduction in weight.

The total stock biomass is estimated to be 0.82 million tonnes in 1985, compared to 2.9 million tonnes in 1984.

ACFM discussed possible causes for this severe and abrupt decline of the stock. The decrease in the stock exceeds by far what can be explained by the fishery and is most likely connected to the changes in the ecosystem. Results from acoustic surveys carried out annually since 1971 have revealed large changes in the area of distribution, growth rate and maturation of the stock. In the early and mid-1970s, the stock was distributed over wide areas in the northern and eastern Barents Sea. During the period 1978-80, a pronounced west and southwest displacement of the distribution areas was observed, coinciding with a severe cooling of the eastern waters. The capelin maintained a westerly distribution in the years 1980-83, and in those years, a significant increase occurred in the growth and maturation rates. In 1984 and 1985, the stock was distributed more evenly again to the east and north, and it seems likely that the low mean weights observed in 1985 are associated with this displacement.

The rapidly increasing abundance of cod in 1984-85 may have caused an increase in the natural mortality of capelin due to predation by cod. It is also possible that the presence of juvenile herring in the Barents Sea since 1983 has influenced the survival of 0- and 1-group capelin.

The recent changes in the Barents Sea regime invalidates the model used hitherto for monitoring the capelin stock. More knowledge of the interspecies relation is needed.

In previous years, a target spawning stock level of 300,000-400,000 tonnes has been used. Even without any fishing, the estimated spawning stock in the winter of 1986 will be about 200,000 tonnes and should not be fished. <u>ACFM, therefore, recommends that catches during the winter season 1986 should be reduced to the lowest practicable level.</u>

The estimate of the 1984 year class in 1985 is very low and indicates that the recruitment to the stock in 1986 will be at a minimum. Consequently, the catches in the 1986/87 autumn-winter season should also be at a minimum. However, in some previous years, the acoustic abundance estimates of 1-group capelin have been very uncertain. ACFM, therefore, feels that the abundance of the 1984 year class ought to be checked by new surveys during spring 1986.

2.9.2 Capelin in the Iceland-East Greenland-Jan Mayen area

Catches and TAC's are shown for recent years in the text table below:

1981/81			1982/83			1983/84			1984/85		
Pred. TAC	Agreed TAC	Catch	Pred. TAC	Agreed TAC	Catch	Pred. TAC	Agreed TAC	Catch	Pred. TAC	Agreed TAC	Catch
700	-	626	-	0	0	375	640	570	-	920	892

Weights in '000 tonnes.

2.9.2.1 Advice from the May 1985 ACFM Meeting

At its meeting in October-November 1984, the Atlanto-Scandian Herring and Capelin Working Group was unable to advice on a TAC for the 1984/85 season due to the fact that the autumn stock assessment survey, which usually takes place in October, had been delayed.

However, on the basis of the results of an acoustic survey which had been carried out in August 1984, ACFM indicated that the preliminary TAC of 300,000 tonnes recommended in May 1984 could be increased by 50-100%.

The autumn 1984/winter 1985 fishery

The total international catch from 1964 onwards is shown in Table 2.9.2.

In 1984, the summer/autumn fishery began in the Jan Mayen area, where Norwegian vessels caught 104,600 tonnes in August. The EEC and Faroese catch, taken in August in the same area, amounted to about 18,700 tonnes.

The Icelandic autumn season started on 1 October and by the end of the season in the latter half of December the catch amounted to 425,200 tonnes. Most of the Icelandic autumn catch was taken off northwest and northeast Iceland.

The Icelandic winter season started in the first days of January off east and northeast Iceland. As usual, the fishery followed the spawning migration and, after the first week of February, all the catch was taken off the south and west coasts. Although no landings took place in the period 20 February to 5 March, the total Icelandic winter catch amounted to 348,500 tonnes.

The January/February 1985 stock abundance estimate
(Reykjavik Meeting)

In the latter half of January and the first week of February 1985, Iceland carried out an acoustic survey of the stock. This survey covered the distribution area of the mature stock off east and northeast Iceland as well as yielding information on the distribution and abundance of immature capelin in the northern and northwestern areas. The following total abundance estimate in number and weight by year classes was obtained.

Year class	Number in billions	Mean weight (g)	Biomass ('000 tonnes)
1983	59.0	4.7	274.8
1982	39.7	15.1	598.8
1981	11.6	27.0	313.6
1980	0.1	27.4	3.5

Around mid-February 1985, a second survey of the 1985 spawning migration was conducted in the shallow waters off the eastern south coast of Iceland. This survey was, however, carried out under difficult conditions. The distribution and abundance were both discontinuous and highly variable, and it was at times not possible to determine the distribution area accurately.

On 26 February 1985, scientists from Iceland and Norway met at the Marine Research Institute in Reykjavik to consider the 1984/1985 TAC as well as to discuss TAC's for the summer-autumn 1985/winter 1986 season.

The meeting accepted the results of the January/February acoustic survey as the basis for TAC calculations, but noted that, when assessing the juvenile component off north and northwest Iceland in the first week of February, weather and ice conditions were not entirely satisfactory.

Using the data from the acoustic survey off east and northeast Iceland in January 1985, allowing for a remaining spawning stock of 400,000 tonnes, the catch prior to the survey and a natural mortality M = 0.035/month, the meeting calculated a TAC of 920,000 tonnes for the autumn 1984/winter 1985 season.

In the past, preliminary TAC's for the coming autumn/winter season have been recommended on the basis of immature capelin abundance obtained during autumn and/or winter surveys. In the light of previous experience, it was suggested that the estimates of immature capelin should be used for assessing TAC for the autumn period only and that the TAC for the next winter season should be set when data on the maturing stock become available in late autumn or winter.

The 1985/1986 capelin fishery will be based on the 1983 year class and that part of the 1982 year class which did not mature to spawn in 1985. The meeting calculated that the February 1985 estimate of the abundance in numbers of immature fish belonging to these year classes corresponded to a TAC of 600-700,000 tonnes to be taken in the period 1 August - 30 November 1985. In the calculation, the following assumptions were made:

1) 400,000 tonnes will remain to spawn in 1986,

2) natural mortality of M = 0.04/month until 1 August and M = 0.035/month thereafter, and

3) a mean weight of 2- and 3-group capelin of about 17.5 g and 24.5 g, respectively, (average in mid-October for the 1978-83 period).

The meeting indicated that a TAC for the rest of the 1985/1986 season would be recommended when new data become available in the autumn of 1985 and/or winter 1986.

Advice for the autumn 1985/winter 1986 season

The lack of reliable estimates or indices of abundance of 0- and/or 1-group capelin makes it difficult to carry out stock projections and advise on a TAC in advance of the fishing season. The experience from the 1984/1985 season and from previous years shows that such a TAC has to be revised during the season when more reliable information on the abundance of the year classes actually fished becomes available. At present, the management of the fishery should, therefore, be based on frequent surveying of the stock and continuous evaluation of the survey results and the catches, as has been done in the past.

Because of the uncertainties involved regarding the abundance of the 1983 year class, ACFM is at present not in a position to advise on a TAC for the autumn 1985/winter 1986 season.

It should be pointed out that the annual catch is now close to the maximum level experienced in 1978-80 just prior to the stock breakdown in 1982-83 and that caution should, therefore, be exerted in the exploitation.

2.9.2.2 Advice from the November 1985 ACFM Meeting

Prior to the 1985 summer-autumn season, Iceland and Norway had agreed to a TAC of 700,000 tonnes for the 1 August - 31 November period. This was based upon results from an acoustic survey of immature capelin carried out in January 1985. The TAC for the remaining part of the 1985/86 season was to be set after the customary autumn acoustic survey was carried out in October 1985. When that survey was completed on 30 October, Norwegian and Icelandic capelin catches amounted to 190,000 and 350,000 tonnes, respectively. In addition, Faroese and Danish vessels had caught 72,000 tonnes and 16,000 tonnes, respectively.

State of the stock

The autumn 1985 acoustic survey gave the following abundance estimates by year class:

Year class	Number (billions)	Mean weight (g)	Biomass ('000 t)
1984	33.8	3.8	129.0
1983	53.3	14.1	754.8
1982	14.4	23.8	341.9
1981	0.4	29.5	12.0
Total	101.9	-	1,237.7

From this estimate, it was calculated that approximately 1,030,000 tonnes, comprising all of the 1981 and 1982 year classes and the larger part of the 1983 year class, will mature and spawn in March-April 1986.

The abundance estimate of the 1-group was considered an under-estimate.

Management advice for the November 1985 - March 1986 period

In order to insure recruitment, ACFM has previously considered that a minimum of 400,000 tonnes should be left to spawn.

Based on the acoustic estimate and assuming that 400,000 tonnes will be left to spawn, the evenly distributed catch over the 4-month period November 1985 - February 1986 is 680,000 tonnes.

At the time of the October survey, about 190,000 tonnes of the TAC for the August-November period remained to be taken. ACFM, therefore, recommends that the TAC for the December 1985 - February 1986 period be set at about 500,000 tonnes.

Management advice for the summer-autumn 1986 season

The main stock component in the fishery will be the present 1-group capelin (1984 year class).

Due to the large uncertainties concerning the abundance of the 1984 year class, ACFM could not recommend a TAC until additional information is available. It is recommended that results from additional surveys should be made available to the ACFM meeting in May 1986 as a basis for management advice for the autumn fishery.

2.10 North-East Arctic Saithe

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec TAC	Catch	Rec TAC	Catch		Catch		Catch	
123	175	130	178	130[1]	155	103[1]	150	85[1]

[1]Catch corresponding to F_{max} level.
Weights in '000 tonnes.

Landings amounted to 158,200 tonnes in 1983 and 150,300 tonnes in 1984, with more than 95% taken by the Norwegian fleet in both years (Table 2.10). Year-to-year variations in landings and catch composition results from variable fishing patterns of the seiners and trawlers with respect to seasonal and geographical distribution of their effort, and to the proportion of this effort directed towards saithe.

The data base was updated with the 1984 figures and the age composition from Norwegian landings in 1983 was revised. Catches by gear type show a sharp decrease of landings by seiners in 1984 compared to 1983, while trawlers increased their share, especially as an effect of increased activity in summer in the southern part of the area.

This change was felt responsible for the discrepancy between catches observed in 1984 and catches predicted for the same year during the 1984 meeting, especially on ages 3 and 4.

Immature fish (less than age 6) still make up a predominant part (86% in 1984) of the catch in number.

In the absence of effort and cpue data for 1984, the assessment was carried out on the same basis as last year (similar overall mortality level over 1980-1982) except for an increase of fishing mortalities at age 3 and 4 in 1984.

ACFM has some reservations on this procedure of selecting fishing mortalities in 1984, but finally accepted the assessment.

Results of the VPA indicate that the spawning stock biomass has been decreasing since 1970 and is estimated to be on a very low level in 1985. By assuming the same fishing mortality in 1985 as in 1984, the spawning stock biomass in 1986 will be at the lowest level ever recorded of only 115,000 tonnes. The 1978 year class is confirmed to be good, but was followed apparently by poor ones.

With the present exploitation pattern, the average fishing mortality on ages 3-8 (0.59) exceeds F_{max} = 0.30.

The need to improve the exploitation pattern by reducing the catches of young saithe has repeatedly been stressed by ACFM since 1980.

Regarding the purse seine fishery, there has been a significant reduction of this fishery in the most recent years. On the other hand, the number of 3- and 4-year-olds landed by trawlers has increased in the same period. Exploitation pattern, therefore, remains unchanged.

Significant improvements in the exploitation pattern can most effectively be achieved by increasing the minimum landing size, increasing the mesh size, or by closure of areas where young saithe are abundant.

Management options are given in the text table below and in Figure 2.10.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch	Stock biom.	Spawn. stock biom.
447	146	0.59	128	$F_{0.1}$	430	115	0.18	47	520	120
				F_{max}			0.30	74	485	110
				$F_{86} = F_{84}$			0.59	126	419	90

Weights in '000 tonnes.

Recruitment estimates used over the prediction period were conservatively taken from the low recent levels instead of the long-term average. The spawning stock will be, in 1985, at the lowest level ever and will decline even further in 1986. This development in spawning stock biomass gives cause for concern.

ACFM, therefore, recommends that the exploitation level should be reduced towards F_{max} as quickly as possible.

2.11 Icelandic Saithe (Division Va)

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec. TAC	Catch		Catch		Catch		Catch	
72	59	62[1]	69	66[1]	58	70[1]	63	60[1]

[1]Catch level preferred by ACFM.
Weights in '000 tonnes.

Landings of saithe from Division Va amounted to about 63,000 tonnes in 1984, 96% were taken by Icelandic vessels (Table 2.11).

At the 1984 May meeting, ACFM gave advice on this stock for both 1985 and 1986. No new assessment was made this year.

Management options from last year's report are given in the text table below.

1984				1985					1986			
Stock. biom.	Spawn. stock biom.	$\bar{F}_{(4-9)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-9)}$	Catch	Stock biom. 3+	Spawn. stock biom.	$\bar{F}_{(4-9)}$	Catch
296	156	0.37	60	$F_{0.1}$	300	143	0.16	25	346	182	0.16	31
				$F_{85} = F_{84}$			0.37	54	315	156	0.37	55
				F_{max}			0.42	59	309	151	0.42	58

Weights in '000 tonnes.

In recent years, the fishing mortality has been below the $F_{max} = 0.42$ level.

The 1984 catch of 63,000 tonnes implies that fishing mortality has been lower than the value of 0.46 which corresponds to the 1984 TAC (70,000 tonnes). ACFM considers that the maintenance of F at 0.4 is the appropriate level at which to exploit this stock and ACFM, therefore, reiterates its previous advice that it prefers that the TAC in 1985 and 1986 is not more than 60,000 tonnes.

2.12 Demersal Stocks at the Faroe Islands

At the 1984 Working Group meeting, an attempt was made to analyse catch and effort data for various categories of Faroese vessels fishing in mixed fisheries of saithe, cod and haddock at the Faroe Islands.

More detailed analyses were conducted this year to correct for seasonality and area/species preference by some of the fleet components, and detailed information was provided on recent changes in the fleet composition and on fishing pattern.

There is no doubt that the total demersal effort by these vessels has increased since 1977, especially by virtue of the increased number of single boat and pair trawlers, and this development is still continuing.

2.12.1 Faroe saithe

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec. TAC	Catch	Rec. TAC	Catch		Catch		Catch	
29	30	29	31	26[1]	39	20-25[2]	54	19[3]

[1]Catch level preferred by ACFM.
[2]Precautionary TAC.
[3]Catch corresponding to F_{max}.
Weights in '000 tonnes.

Advice from the May 1985 ACFM Meeting

Landings increased sharply to 54,400 tonnes in 1984, 39% above the 1983 landings of 39,200 tonnes, further continuing the trend shown since 1980 (Table 2.12.1 and Figure 2.12.1). A total of 39% of the landed weight in 1984 was due to the very good 1980 year class. Faroese vessels caught more than 99% of the total.

No quantitative effort data for 1984 were available for the fleet categories which fish for saithe. It was mentioned, however, that two large trawlers entered the fleet and five others are expected in 1985. Five Faroese trawlers, which had been fishing at Iceland, diversed their effort to saithe in Faroese waters in 1984.

Besides this overall increase in effort, there seems to have been some concentration of effort on the 1980 year class, resulting in a particular exploitation pattern in 1984. An average exploitation pattern would produce an unrealistically high recruitment for the 1980 year class. The VPA input values were chosen to reflect these changes.

ACFM was made aware of the results of the 1985 fishery, which seems to indicate that this stock is at a lower level than predicted by the Working Group. It was decided to ask the Working Group to look at it, and ACFM will give advice on this stock at its November meeting.

Advice from the November 1985 ACFM Meeting

At the ACFM meeting in May 1985, advice for Faroe saithe was postponed because information made available after the Working Group meeting seemed to indicate that the assessment given by the Working Group was too optimistic.

At this meeting, catch data for the first 8 months of 1985 and the age composition for the period January-June 1985 were available. No quantitative effort values have yet been worked out for 1984 and 1985, but based on the number of vessels participating in the demersal fisheries and their catches of saithe, it is possible to produce crude estimates of the trend in effort. These estimates indicate an increase in effort of 12% from 1983 to 1984 and of 17% from 1984 to 1985. In spite of this increase in effort, the catches in the first 8 months of 1985 were lower than in the corresponding period in 1984 and are not expected to exceed 46,000 tonnes for the whole year.

From the age samples taken in the first 6 months in 1985, it appears that the 1980 year class still dominates the catches in 1985.

However, even taking into account these new data, ACFM could not produce an analytical assessment because there are large uncertainties concerning the present overall level of fishing mortality and the current exploitation pattern which has obviously shifted since 1984, when the fishery started to concentrate on the 1980 year class. In spite of this, there is no doubt that the total effort exerted on the stock at present is too high.

<u>ACFM, therefore, recommends that the level of fishing effort should be reduced.</u>

2.12.2 <u>Faroe Plateau cod (Sub-division Vb1)</u>

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec. TAC	Catch		Catch		Catch		Catch	
14	23	20[1]	21	23[1]	38	25[1]	37	23[2]

[1] Catch level preferred by ACFM.
[2] Catch corresponding to F_{max} level.
Weights in '000 tonnes.

Catches in 1984 amounted to 37,300 tonnes, which is 820 tonnes above the 1983 level (Table 2.12.2). Faroese vessels caught more than 99% of this total. Weight-at-age data for 1983 were revised in the data base.

Due to the lack of effort data for the trawlers for 1984, catch and effort data for the long-liners were used to tune the VPA. Cpue appears to have been stable since 1976, although the total effort and fishing mortality have increased in recent years.

Recruitment has been highly variable, but the 1978, 1980, and 1981 year classes appear to be above average. Spawning stock biomass decreased sharply from a peak in 1977 until 1981, then increased again.

The yield-per-recruit curve is rather flat-topped with current $\bar{F}_{(3-8)}$ at 0.58 far in excess of F_{max} = 0.34.

Management options are given in the text table below and in Figure 2.12.2.

1985				1986						1987	
Stock biom	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch		Stock biom.	Spawn. stock biom.
127	58	0.58	35	$F_{0.1}$	119	60	0.16	12		138	76
				F_{max}			0.34	22		127	66
				$F_{86} = 0.8F_{84}$			0.47	25		119	59
				$F_{86} = F_{84}$			0.58	33		112	53

Weights in '000 tonnes.

Since the present level of fishing mortality ($\bar{F}_{(3-8)}$ = 0.58) exceeds F_{max} = 0.34, ACFM recommends a reduction of $\bar{F}_{(3-8)}$ towards Fmax.

2.12.3 Faroe Bank cod (Sub-division Vb2)

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec TAC	Catch	TAC	Catch	TAC	Catch	TAC	Catch	TAC
2	1.2	2	2.3	2	2.3	2	1.8	2

Weights in '000 tonnes.

Landings amounted to 2,300 tonnes in 1983 and 1,800 tonnes in 1984 (Table 2.12.3) and were reasonably close to the precautionary TAC of 2,000 tonnes based on historic catches. No data were available for carrying out an analytical assessment for this stock.

2.12.4 Faroe haddock (Division Vb)

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec TAC	Catch		Catch		Catch		Catch	
15	12	14[1]	10	10[1]	12	14[1]	12	12[1]

[1]Catch level preferred by ACFM.
Weights in '000 tonnes.

Landings in 1984 were 12,400 tonnes (Tables 2.12.4.1 and 2.12.4.2), which is 490 tonnes less than the 1983 figure. They were almost exclusively by Faroese vessels.

The VPA was tuned using a similar process as for cod, based on catch and effort data series for longliners. Cpue shows a sharp decrease since 1977 for the fleet categories mainly exploiting haddock. Fishing mortality has been decreasing since 1982.

Recruitment in this stock has been extremely variable, including a total failure of the 1977 year class. It improved slightly since that year but remains at low levels, except for the 1982 year class which is expected to be above average. The spawning stock biomass showed a peak in 1977 of 106,000 tonnes due to good recruitment in the years 1972-74. Since then, the spawning stock has been declining steadily and is now at the very low level of the mid-1960's at only 50,000 tonnes.

The yield-per-recruit curve based on the 1984 exploitation pattern is essentially flat-topped, with current $\bar{F}_{(3-8)} = 0.31$ which is above $F_{0.1} = 0.20$. In fact, the exploitation of this stock suffers more from adverse variations in recruitment than from growth overfishing.

Management options are given in the text table below and in Figure 2.12.3.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch	Stock biom.	Spawn. stock biom.
88	58	0.31	12	$F_{0.1}$	96	66	0.20	10	107	77
				$F_{86} = 0.8F_{84}$			0.25	12	105	75
				$F_{86} = F_{84}$			0.31	14	102	72
				F_{max}			0.62	25	90	60

Weights in '000 tonnes.

ACFM prefers that the exploitation rate should not rise above its present value, corresponding to catches not exceeding 14,000 tonnes in 1986.

2.13 Review of Fleets Fishing for Saithe in the Northeast Atlantic

This review has been prepared by members of the Saithe Working Group in April 1985.

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

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

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

England and Wales

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

The extension of national jurisdiction had the effect of reducing access to many of the distant-water fishing grounds and landings from these areas fell from 26,000 tonnes in 1973 to less than 1,000 tonnes by 1980. To a limited extent up to 1978, the reduction in distant-water landings was offset by increasing landings from middle waters. However, since 1978, there has been a decline in the middle-water fleet resulting in a progressive decline in saithe landings. By 1984, total saithe landings were 2,700 tonnes, of which 300 tonnes came from distant-water grounds.

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

Faroe Islands

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

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

1) Deep-waters trawlers: Vessels in this category (590 GRT, 2200 HP) have entered the fleet in the last 2-4 years. There were two in 1982 and six in 1984-85. They fish mainly for saithe, redfish and blue ling in deep waters with an annual effort of about 285 days at sea. They landed about 14,000 tonnes in 1984.

2) Trawlers >1000 HP, type I: These vessels (360 GRT, 1,600 HP) caught about 11,700 tonnes in 1984, with saithe accounting for 58% and redfish for 17%. There were four in 1982 and five in 1984-85. Up to 1983, they were allowed to fish a quota in Icelandic waters, but since 1984, they are fishing all year round in Faroese waters. Thus, they have contributed to the increase in effort exerted on saithe and redfish at Faroes (300 days at sea).

3) Trawlers >1000 HP, type II: The number of vessels in this class (310 GRT, 1,100 HP), which represents a great part of the Faroese home-water fishing fleet, has increased from 17 in 1982 to 26 in 1985. They caught about 23,000 tonnes in 1984 (260 days at sea), with saithe accounting for 69% and cod for 17%. Twelve of them operate as pair trawlers with catch rates similar to single trawlers.

4) Trawlers 700-999 HP and 400-699 HP: In the former group (11 in 1982, 16 in 1985), all vessels operated as single trawlers in 1984, and all of the latter group (10 in 1982, 20 in 1985) as pair trawlers. Despite this, the catch compositions of both groups were almost identical with 48% of saithe, 35% of cod and 10-13% of haddock, and landings of about 13,000 tonnes and 16,000 tonnes, respectively (260 and 225 days at sea).

5) Trawlers <400 HP: These vessels (4 in 1982, 6 in 1984-85, 50 GRT, 250 HP) fish mainly for cod (50%), saithe (19%) and flatfish (15%). There is a general ban on trawling within the 12-mile limit, but these vessels, however, are licensed to operate during summer in some limited areas in order to utilize such stocks as lemon sole, plaice and angler.

6) Longliners >110 GRT: Most vessels in this category of about 20 units (225 GRT, 540 HP, crew of 15 men) are licensed to fish a limited quota at Iceland during one part of the year. Cod (27%) and tusk (23%) are the main species caught, and saithe accounted for about 12% in 1984 out of total landings of 19,500 tonnes (245 days at sea).

7) Longliners 60-110 GRT: Some of the 14 vessels in this category also are licensed to fish at Iceland, mainly for saithe using automatic handline (crew of 5). They also practise this fishery at Faroes, but also operate partly as

longliners. In 1984, they landed about 5,600 tonnes with saithe accounting for 40% and cod for 36%.

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

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

France

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

The vessels landing regularly in Boulogne belong to three categories:

1) The numbers of the largest trawlers (50-60 m, most of them 54 m, 550-750 GRT, 1,800-2,000 HP, hold capacity of 400-550 cu.m or 180-200 tonnes of boxed fish) have been rather constant (18-20) from 1971 to 1980, but in the meantime, their characteristics have changed as side trawlers were progressively replaced by stern trawlers. Their number eventually decreased to 16 in 1983 and no new vessels in this category are expected.

2) An intermediate class includes stern trawlers of 45-50 m, 450-500 GRT, 1,500-1,800 HP, with hold capacity of about 500, cu.m. Like the larger ones, their crews are of 22 men (the catch is sorted,graded and boxed at sea). There were 8-10 of these vessels from 1972 to 1976, seven from 1977 to 1979 and five at present. Two new vessels are expected, with equipment for freezing the fish at sea, thus allowing longer trips.

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

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

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

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

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

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

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

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

Federal Republic of Germany

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

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

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

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

1) Ten freezer trawlers (3,000-3,500 GRT) built in the years 1972-75 have their main activities in fisheries for cod and redfish off Canada and East and West Greenland. They only occasionally fish for saithe in Eastern Atlantic waters.

2) Four of the seven wetfish trawlers (800-999 GRT) are older than 20 years, and the other three were built in 1977-78. These vessels also fish mainly for cod and redfish in Greenland waters. In winter and spring, they fish for saithe and other demersal species in Norwegian waters (mainly NW 1 Norway), starting in January and continuing until their catch quotas are filled (generally by May-June). Occasionally they fish in the North Sea, to the west of Scotland and off the Faroes. In the North Sea, they fish for spawning or pre-spawning saithe in the waters around Shetland in the first quarter, then for younger saithe in summer and autumn in the eastern part of northern and central North Sea. In 1983, their catches in Division IVa amounted to 2,800 tonnes of saithe.

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

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

4) More than 100 deep-sea cutters are working in the North Sea and in the Baltic. Of these, 17 are longer than 30 m. These large cutters and one lugger catch saithe and other demersal

species in the central and northern North Sea and in the Skagerrak, the lugger aiming more specifically at saithe than the cutters. In 1983, these vessels landed 10,600 tonnes of saithe from the North Sea.

Netherlands

Up to the late 1970's, saithe was taken by a small part of the Dutch fleet in a specific saithe fishery in the northern North Sea, especially in the first quarter of the year. Since then, there have been only minor landings of saithe in the Netherlands, and it is very unlikely that landings will increase substantially in the near future.

Norway

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

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

Before 1979, a large part of the Norwegian trawl catches of saithe were by small trawlers (<250 GRT) fishing in the area between 62^0 and 64^0 N. In the North Sea, there was very little directed trawling for saithe. From 1979, quotas for cod and haddock were reduced and the larger trawlers (>250 GRT) turned more of their effort towards saithe. The fleet of larger trawlers are now fishing for saithe on coastal banks along most of the Norwegian coast north of 62^0N. In the North Sea, they are fishing along the northern and eastern part of the plateau from Shetland to the entrance of the Skagerrak.

Gill net fishing for saithe is a seasonal fishery based on the spawning migration. In the North-East Arctic, most of the catches are taken at the end of the year in northern Norway, and in February-March on the spawning grounds further south. In the North Sea, the season was formerly February-March, but this has been extended and now starts in late autumn. The fishing area is largely the same as for the trawlers, but extends to the west of Shetland. There is not much saithe fishing south of the Viking Bank.

There are no quota restrictions on the Norwegian saithe fishery in the North-East Arctic, but separate quotas for purse seine and trawl have been suggested and may be introduced. There are currently three different minimum landing sizes: 35 cm between 62^0N and 64^0N, 37 cm from 64^0N to Lofoten Islands, and 40 cm further north. The basis for these regional differences is the size of the fish available for purse seine in the different areas. The minimum landing size, to some extent, restricts catches of 2-year-old saithe. The minimum legal mesh size in trawls is 135 mm and 100 mm, respectively, north and south of 64^0N.

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

Scotland

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

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

1) Motor trawl: Involves vessels of 80-120 ft using heavy ground gear. The number of these vessels has declined rapidly since the 1960's from over 100 to less than 20 at the present time. The remaining vessels are a mixture of side and stern trawlers. Most of them are based in Aberdeen and fish both the North Sea and the West of Scotland. The future of the fleet is uncertain, but older vessels are unlikely to be replaced. Trip length is about 10 days and a crew of 10 is typical.

2) Light trawl: Involves vessels of 40-80 ft using light ground gear. The number of vessels engaged in light trawling has increased over the last 10 years to approximately 350. Vessels are distributed in most Scottish fishing ports. Trip lengths vary from 1 day for smaller vessels to 10 days for larger ones. Similarly, crews vary from 3 to 10 men. This sector of the fleet is liable to increase in size.

3) Seine net: The characteristics of this fleet are essentially the same as those for light trawl with the exception of the gear type. There has been a small decline in this fleet to just under 300 vessels. This decline is mainly due to the replacement of smaller vessels by fewer larger ones so that the catching capacity of the fleet has not changed. This trend seems to be continuing.

4) Nephrops trawl: This fleet is similar to light trawl but generally involves smaller vessels fishing principally for Nephrops. The fleet is stable at present with approximately 300 vessels. These rarely fish for more than 2 days per trip. Crews are of 3 to 5 men.

3. NEAFC REGION 2 STOCKS

3.1 Herring Stocks South of 62^{0}N

The assessment and management of herring stocks was reviewed in great detail at the Aberdeen Symposium in 1978 (Saville, ed. 1980)[1]. The main conclusion of that thorough examination was that the experience throughout the two preceding decades had shown that herring stocks are more susceptible to collapse under excessive fishing pressure than most demersal ones. Therefore, it is imperative that they be exploited at a relatively low rate of fishing mortality. This is especially important while stocks are being rebuilt and their assessment is subject to large uncertainties. This management policy would not only safeguard against future collapse of these stocks but would also reduce the likelihood of excessive fluctuations in catch and the need for frequent radical changes in management action.

On this basis, fishing at or near the $F_{0.1}$ level of fishing mortality is the preferred option by ACFM for herring stocks in general, at least until they are firmly re-established and stabilised.

3.1.1 North Sea herring

ACFM advice, TAC's and catches for recent years

	1982			1983			1984			1985	
Division	ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch[1]	ACFM adv.	TAC
IVa	0	0	8.4	35	42.8	62.4	95	-	178.8[4]	166	-
IVb	0	0	158.5[2]	27	29.2	181.4[3]		-	93.1[5]		-
IVc + VIId	60	72	68.7	36	73.0	64.4	49	49	46.0[6]	62	90
Total North Sea			235.6[2]			308.2[3]			317.9[7]		

[1] Preliminary
[2] Including a catch of 153,000 tonnes of 0- and 1-ringers.
[3] Including a catch of 160,000 tonnes of 0- and 1-ringers.
[4] Including a catch of 5,700 tonnes of 0- and 1-ringers.
[5] Including a catch of 39,300 tonnes of 0- and 1-ringers.
[6] Including a catch of 100 tonnes of 0- and 1-ringers.
[7] Including a catch of 45,100 tonnes of 0- and 1-ringers.
Weights in '000 tonnes.

---

[1] Rapp.P.-v.Réun.Cons.int.Explor.Mer, 177, 1980.

The fishery in 1984

At its meeting in 1984, ACFM gave advice for both 1984 and 1985 for two management areas (Divisions IVa and IVb combined, and Divisions IVc and VIId) in the event no TAC's were adopted for North Sea herring in 1984.

The total North Sea catch in 1984 is estimated to have been 317,263 tonnes and the revised catch for 1983, 317,124 tonnes (Table 3.1.1). The proportion of catch not allocated to country dropped from 58% in 1983 to 22% in 1984.

The catches in each sub-division of the North Sea in each quarter divided into those of adult herring (2-ringers and older) and those of juvenile herring (0- and 1-ringers) are given in the text table below.

Division	Quarters 1	2	3	4	Total
Catches of adult herring					
IVa (W of 2^0E)	6.8	48.4	49.7	23.8	128.7
IVa (E of 2^0E)	-	31.3	11.6	1.1	44.4
IVb	15.0	6.6	23.7	8.5	53.8
IVc and VIId	10.0	0.7	+	35.1	45.9
Total	31.8	87.1	85.4	68.5	272.8
Catches of juvenile herring					
IVa (W of 2^0E)	-	+	0.3	0.5	0.8
IVa (E of 2^0E)	-	0.8	3.3	0.8	4.9
IVb	1.8	2.3	17.5	17.7	39.3
IVc and VIId	+	+	+	0.1	0.1
Total	1.8	3.1	21.1	19.1	45.1

+ = less than 100 tonnes.

Weights in '000 tonnes.

The total catch in Division IVa was 173,121 tonnes of adults and 5,711 tonnes of juveniles, a total of 178,832 tonnes. In Division IVb, the comparable figures were 53,778 tonnes of adults and 39,302 of juveniles, a total of 93,080 tonnes. For Divisions IVa and IVb combined, the total of 271,912 tonnes compares with a TAC preferred by ACFM of 95,000 tonnes.

In Divisions IVc and VIId, the total catch (almost entirely of adults) was 46,027 tonnes which compares with a TAC preferred by ACFM of 49,000 tonnes (less up to 20% transferable to Division IVb).

The salient features of the North Sea fisheries in 1984 were: 1) the major increase in catches of adult herring, particularly in Division IVa; 2) the re-emergence of catches in the eastern part of that division; and 3) the decrease in catches in Division IVb due primarily to a major reduction in catches of juveniles (39,302 tonnes in 1984 compared with 153,000 tonnes in 1982 and 160,000 tonnes in 1983) resulting from improved enforcement of existing regulations. The catches in Divisions IVc and VIId decreased.

The percentage contribution of 0- and 1-ring herring in 1984 (61% by number) compares with values of 92-95% in the preceding three years. Almost all the 0-ringers were taken in the industrial fishery in Division IVb during the third and fourth quarters, while 1-ringers were caught both in that division and in Division IVa.

The recruiting 1981 year class (2-ringers) contributed 56% by number to the catch of adults. It was well represented in all areas, but contributed most strongly in Division IVb where it made up 70% of the total catch.

<u>Estimates of stock size in 1984</u>

In 1984, acoustic surveys were carried out over most of Division IVa in July, in the spawning areas off the northeast English coast (Division IVb) in August-September and in Divisions IVc and VIId in November (and also January 1985). Larval surveys were carried out in each spawning area at the appropriate times.

In Division IVa, the biomass of maturing herring estimated by the acoustic survey was 466,000 tonnes distributed as follows: 1) Orkney-Shetland area 320,000 tonnes; 2) Buchan area 57,000 tonnes; and 3) the area east of 0^0 89,000 tonnes, mostly on the Fladen Ground. This represents a significant increase in the Orkney-Shetland area between 1983 (250,000 tonnes) and 1984. In contrast, the larval indices in the Orkney-Shetland and Buchan areas in 1984 were almost the same as those in 1983. From a regression between larval index and spawning stock size estimated by virtual population analysis (VPA), the spawning stock in 1984 is estimated to have been 280,000 tonnes.

In Division IVb, the acoustic survey gave a peak estimate of 208,000 tonnes of fish about to spawn. Adding a further quantity to account for spawning observed in the remainder of the area and at other times, the total spawning stock in this division, excluding the Buchan area, is estimated to have been 300,000 tonnes. This indicates a major increase over the estimated 63,000 tonnes in 1983.

The larval survey in Division IVb indicates an increase of about 50% between 1983 and 1984.

In Divisions IVc and VIId, the November acoustic survey gave an estimate of 186,000 tonnes, which is considerably lower than in 1983 (282,000 tonnes). The larval survey estimate was 222,000 tonnes, which is very close to that in the 1983-84 season (211,000 tonnes).

There was some indication from the mean size of the 2-ring herring caught in part of the area surveyed in Division IVa during the acoustic survey that a considerable proportion of this age group might be recruits to the Division IVb spawning population rather than to that spawning in Division IVa. This would find some support from the marked discrepancy between the estimates of spawning stock biomass in Division IVa from the larval data of 280,000 tonnes and the one obtained from a VPA calibrated to the results of the acoustic surveys of 394,000 tonnes. Observations from sampling during these surveys that 72% of the 2-ringers were likely to spawn in 1984, and observations from the fishery that about 80% of the 1984 fishing mortality was generated prior to spawning were incorporated in the VPA.

Assuming that the discrepancy between the two estimates is due to 2-ringers from the Division IVb spawning stock present in Division IVa at the time of the acoustic survey, one gets an estimate of Division IVb 2-ringers in Division IVa at that time of 660 million corresponding to 114,000 tonnes. This estimate is not incompatible with the estimate given for this age group in 1984 by the Division IVb VPA. It would imply that about 55% of the Division IVb recruit spawners were in Division IVa prior to its spawning in 1984.

Estimates of fishing mortality rate in Division IVb were made from the raised acoustic survey estimate and from the catches in number in the whole of Division IVb (Buchan included) reduced by 30% in the first half of the year to account for an assumed contribution of Downs stock likely to have been caught in Division IVb. Because of the low catches prior to 1982, a VPA was used to estimate the fishing mortality rate and stock size only in the most recent years.

On the above interpretation, the spawning stock in Division IVa decreased slightly from 320,000 tonnes to about 300,000 tonnes between 1983 and 1984, whereas that in Division IVb increased considerably from 63,000 tonnes to 300,000 tonnes during that period.

The fishing mortality rate in Divisions IVc and VIId in 1984 was estimated from the results of the November acoustic survey and from the catch reported from the Downs stock (i.e., catches in those divisions together with a contribution from catches in Division IVb). A VPA indicated a progressive increase in spawning stock since 1980 with a corresponding decrease in fishing mortality rate. It was impossible, however, to reconcile the results of this analysis with the acoustic and larval survey estimates which provide no evidence that the spawning stock has increased since 1981. Similarly, there is little evidence for a reduction in fishing effort. One explanation for this apparent anomaly is that the increasing catches in Divisions IVa and IVb may have contained a much higher proportion of Downs herring than assumed in the assessments. If so, then the fishing mortality rate on Downs herring in the most recent two years could have been much higher. Alternatively, doubts were expressed about the trend in stock size shown by the larval surveys because of possible overestimation in 1981 and 1982. Bearing in mind the conflicting interpretations, the Working Group accepted a spawning stock size at the end of 1984 of 200,000 tonnes.

Natural mortality on 0- and 1-ring herring

In the younger age groups, the values of predation mortality estimated by the Multispecies Working Group from the results of the ICES stomach sampling project are 0.52 on the 0-ringers (applicable to the latter half of the year) and 0.33 on the 1-ringers. To account for mortality other than generated by fishing or predation, a value of 0.1 has been added and the figures rounded to 0.6 and 0.4 for 0- and 1-ringers, respectively. These are still provisional estimates, and no use has been made of them in the projections for 1985 and 1986.

For the calculation of the yield/recruit curve, however, the new estimates of M were used for the 0- and 1-ringers since a higher natural mortality on this age group changes the shape and level of the curve as well as the position of $F_{0.1}$ and F_{max}.

Recruitment

1983 year class

The abundance index of the 1983 year class on the 1985 IYFS was the highest on record and 40% higher than the previous highest value. Assuming the conventional value of M = 0.1 on 1-ringers, a regression between VPA estimates of recruitment and the IYFS abundance index indicates the number of 1-ringers at 1 January 1985 to be 10,600 million. The distribution of this year class extended from the southeastern North Sea to the Kattegat with major concentrations off the Jutland coast and in the entrance to the Skagerrak.

To partition the 1983 year class into its component stocks, the length composition in each part of the North Sea was analysed by Cassie's method and component length groups identified. The small component with a mean length of less than 13 cm, which is likely to contain elements of Downs herring recruits, were limited in distribution mainly to the Southern Bight and German Bight, whereas the larger components were abundant along the Jutland coast and in areas adjacent to Dogger Bank.

It is clear from the above that the major part of the 1983 year class is likely to recruit in 1986 to the central and northern North Sea stocks, and only a small proportion to the Downs stock. Quantification of the expected division is difficult, however, because the meristic characters indicate that even the small component may not be predominantly Downs herring. Depending on which components are treated as potential Downs recruits, the proportion of this stock in the overall estimate lies between 6 and 29%. Rounded to approximate figures, the estimates of the number of 1-ringers are 1,000 million Downs recruits and 9,000 million non-Downs component.

1984 year class

The results of IKMT sampling during the 1985 IYFS provide the first indications of the strength of the 1984 year class. The high abundance of the larvae in 1985 (the highest in the series 1977-85) would indicate that this year class is likely to be another strong one in the Division IVa/IVb stocks. On this basis, this year class was set at the same level as the 1983 year class. Assuming the same distribution to the two management units as in 1983, a figure of 9,000 million 1-ringers was used in the projection for this year class as recruitment to the Divisions IVa,b management unit in 1986.

For the projection on the Downs stock, it is necessary to estimate recruitment of the 2-ringers in 1985 and 1986.

Owing to the doubts about the reliability of the partitioning based on length components, recruitment to the Downs stock in 1985 and 1986 was estimated from regressions of VPA estimates of 2-ringers on two independent survey indices of potential Downs recruits: the English 0-group survey and the IYFS. Estimates of 2-ringers from these regressions are as follows:

		Estimated numbers of 2-ring recruits (millions) based on indices of	
Year class	Year of recruitment	0-group (English survey)	1-group (IYFS)
1982	1985	750	1,070
1983	1986	270	120

For the 1982 year class, an intermediate value of 1,000 millions used in the 1984 assessment has been retained in the projections. For the 1983 year class, an intermediate value of 200 millions has been used. This is likely to be a conservative estimate, however, because the IYFS estimate of Downs recruits applied to the regression assumes that only those very small length components about whose identity there is no doubt are potential Downs recruits. For recruitment in 1987, the same value of 200 millions has been used.

Management of North Sea herring in 1986

As in 1985, ACFM advises that it is appropriate to manage the North Sea herring as two units in 1986: Divisions IVa and IVb combined, and Divisions IVc and VIId.

Divisions IVa and IVb

The inputs for a catch and stock projection for Divisions IVa and IVb combined were obtained from a VPA based on the combined catches in both divisions. The fishing mortality rate on 3-ringers and older in 1984 was estimated by taking the mean of the values used in the VPA's for the two stocks separately weighted by the respective stock sizes in number. Because of the mixing of 2-ringers from both stocks in Division IVa, the fishing mortality rate on the 2-group in 1984 was calculated so as to reproduce a spawning stock biomass equal to the combined spawning stock biomass in Divisions IVa and IVb of 600,000 tonnes.

The estimated size of the 1983 and 1984 year classes indicates that the spawning stock size in this area will increase significantly in both 1985 and 1986. In 1985, a catch of 300,000 tonnes has been assumed, being approximately the sum of the TAC agreed for the EC zone and an assumed catch of 75,000 tonnes in the Norwegian zone. It has been assumed that this TAC will consist entirely of 2-ringers and older.

In the years 1981-83, the catch of juvenile herring has been extremely high. Although it is noted that the catch of young herring in 1984 was considerably smaller than in the two preceding years, resulting in a reduction of fishing mortality by about 75% and 50% for 0- and 1-ringers, respectively, in that year, ACFM considers it necessary to include the 1-ringers in the projection. 0-ringers could not be included, since the strength of the year class in question is not known.

The 1-ringers are mainly taken in the industrial fishery in Division IVb. In addition to these catches, 1-ringers are caught in the fishery for adult herring. In order to evaluate the effect of primarily the first of these fisheries, ACFM has used three assumptions about fishing mortalities on 1-ringers in 1985-86:

1) no fishing on 1-ringers;

2) fishing mortality on 1-ringers is equal to the 1984 ratio (29%) of fishing mortality on 1-ringers to fishing mortality on adult herring; and

3) fishing mortality on 1-ringers is twice the 1984 ratio (57%) of fishing mortality on 1-ringers to fishing mortality on adult herring.

The results of the projection are given in the following text tables and are shown in Figure 3.1.1.1.

Fishing mortality on 1-ring herring = 0 (Assumption 1).

1984	1985						Management	1986					
SSB (2+)	Total Catch	F 1-ri.	Catch 1-ri.	F (2+)	Catch (2+)	SSB (2+)	option 1986	Total Catch	F 1-ri.	Catch 1-ri.	F (2+)	Catch (2+)	SSB (2+)
599	300	0	0	0.324	300	1,039	$F_{86}=F_{0.1}$	258	0	0	0.148	258	2,040
							$F_{86}=F_{84}$x0.8	458	0	0	0.280	458	1,868
							$F_{86}=F_{84}$	555	0	0	0.350	555	1,782

Weights in thousand tonnes

Fishing mortality on 1-ring herring = 29% of adult F (corresponding to F = 0.1 on 1-ring herring in 1984) (Assumption 2).

1984	1985						1986						
SSB (2+)	Total catch	F 1-ri.	Catch 1-ri.	F (2+)	Catch (2+)	SSB (2+)	Management option	Total catch	F 1-ri.	Catch 1-ri.	F (2+)	Catch (2+)	SSB (2+)
599	345	0.094	45	0.324	300	1,309	$F_{86} = F_{0.1}$	235	0.037	19	0.129	216	1,963
							$F_{86} = F_{max}$	454	0.077	37	0.265	417	1,792
							$F_{86} = F_{84}$	577	0.102	49	0.350	528	1,692

Weights in '000 tonnes.

Fishing mortality on 1-ring herring = 57% of adult F (corresponding to F = 0.2 on 1-ring herring in 1984) (Assumption 3).

1984	1985						1986						
SSB (2+)	Total catch	F 1-ri.	Catch 1-ri.	F (2+)	Catch (2+)	SSB (2+)	Management option	Total catch	F 1-ri.	Catch 1-ri.	F (2+)	Catch (2+)	SSB (2+)
599	385	0.185	85	0.324	300	1,039	$F_{86} = F_{0.1}$	220	0.066	32	0.116	188	1,887
							$F_{86} = F_{max}$	389	0.123	58	0.215	331	1,766
							$F_{86} = 0.8F_{84}$	493	0.160	75	0.280	418	1,691
							$F_{86} = F_{84}$	597	0.200	92	0.350	505	1,614

Weights in '000 tonnes.

The effect on yields and spawning stock biomass of the different levels of exploitation of 1-ringers is illustrated in management options with the same fishing mortality on adults. With increasing proportions of F on 1-ringers, the total catch increases as the result of increasing juvenile catch. The catch of adult fish, as well as spawning stock biomass, decreases with further losses in following years.

Yield-per-recruit and spawning stock biomass-per-recruit curves have been calculated for the different levels of fishing mortality on juvenile herring. The 0-ringers are included in these calculations on the grounds that the fishery exists and has its effects on the long-term level of yield and spawning potential. This cannot be ignored if management strategies should be based on reference levels of fishing mortality from the yield-per-recruit curve.

The same fishing mortality as on 1-ringers was also used for the 0-ringers in the calculations. Natural mortality as estimated by the Multispecies Working Group was used. The results are shown in Figure 3.1.1.1.

It is clear from the results that the potential yield and spawning stock biomass from a year class is highest if the 0- and

1-group herring are not fished. With increasing level of exploitation on juveniles, the level of $F_{0.1}$ and F_{max} decreases.

On the grounds explained in the introduction to the herring section and since the herring in the management area is not yet firmly re-established, it is reiterated that fishing at $F_{0.1}$ is the level of exploitation on this stock preferred by ACFM.

In the present situation, if the relation of the fishing mortalities of the two components of the fishery does not change in 1985 and 1986 compared to 1984 (Assumption 2), $F_{0.1}$ of 0.13 should be used in the management of the stock.

This would result in a total catch of 235,000 tonnes in 1986 including 19,000 tonnes of 1-ringers; 0-ringers are not included. The spawning stock biomass at spawning time in 1986 is calculated to be slightly below 2 million tonnes.

A reduction in the exploitation of 1-ringers from the 1984 level would lead to an increase of the level of $F_{0.1}$ and thus to higher allowable catches in the fishery for adults.

No projections for spawning stock biomass in 1987 are given since these would largely depend on the size and distribution of the 1984 year class, for which only preliminary indications are available, and also on the level of exploitation before spawning in 1987.

Divisions IVc and VIId

Because of doubts about the validity of the stock size and recruitment estimates for Downs herring, the projections for 1986 are based on rather conservative values of recruitment. However, it is possible that the fishing mortality rate on this stock is being under-estimated both because of an unknown degree of exploitation further north and as a result of unquantified discarding due to burst cod-ends during the fishery on spawning shoals in Division VIId.

Projections of catches, stock biomasses and spawning stock biomasses for 1986 have been calculated for two different catch levels in 1985:

(A) The TAC adopted for 1985 is 90,000 tonnes. This catch will generate an estimated fishing mortality rate of 0.34 and the spawning stock biomass at the end of 1985 will be about 238,000 tonnes.

(B) In view of the higher availability of herring on the markets, it is, judged from last year's experience, highly unlikely that the catch in 1985 may reach the TAC. Therefore, a projection based on the assumption that the 1985 catch will be 50,000 tonnes has been calculated. This catch level is associated with a fishing mortality of 0.173 and the spawning stock biomass at spawning time (end of the year) in 1985 is estimated at 280,000 tonnes.

The results of the projections are given in the text tables below and, for Assumption (A), in Figure 3.1.1.2.

(A) The assumed catch in 1985 corresponds to a TAC of 90,000 tonnes.

1985				1986				
Stock[1] biom. (2+)	F (2+)	Catch (2+)	Spawn.[2] stock biom.	Management option	Stock[1] biom. (2+)	F (2+)	Catch (2+)	Spawn.[2] stock biom.
368	0.34	90	238	$F_{0.1}$	308	0.15	37	240
				$F_{86} = 0.8F_{84}$		0.25	58	217
				$F_{86} = F_{84}$		0.31	70	205

(B) The assumed catch in 1985 is 50,000 tonnes.

1985				1986				
Stock[1] biom. (2+)	F (2+)	Catch (2+)	Spawn.[2] stock biom.	Management option	Stock[1] biom. (2+)	F (2+)	Catch (2+)	Spawn.[2] stock biom.
368	0.17	50	280	$F_{0.1}$	358	0.15	42	279
				$F_{86} = 0.8F_{84}$		0.25	67	252
				$F_{86} = F_{84}$		0.31	81	238

Weights in '000 tonnes.
[1] Stock biomass calculated at 1 January.
[2] SSB calculated at spawning time, i.e., end of December.

Under assumption (A), at the level of fishing mortality preferred for 1984 by ACFM ($F_{0.1}$), the catch in that year from the Downs stock would be 37,000 tonnes. If recruitment to the Downs stock in 1986 is as low as estimated, then the spawning stock at the end of that year will decrease from the 1984 level at fishing mortality rates above $F_{0.1}$.

Under assumption (B), fishing at $F_{0.1}$ level in 1986 will result in a catch of 42,000 tonnes. Even with low recruitment in 1986, the 1984 level of spawning stock biomass can be maintained under all options given in the table above.

No estimates of what proportion of this catch is likely to be taken in Divisions IVa and IVb are available, but it could be appropriate for up to 20% of the TAC in Divisions IVc and VIId to be transferable to Division IVb. It was pointed out in the 1984 ACFM report (Section D.1.1.7) that the extent at which the relative sizes of the stocks in Division IVb and Divisions IVc and VIId influence the proportion of catches of Downs herring in Division IVb is unknown. The level of 20% was derived from catches in a period when the Downs stock was considerably smaller than estimated at present, and the relative sizes of the two stocks were different from the present situation.

Measures to control the exploitation of juvenile herring

As discussed previously in this report, the yield-per-recruit studies showed that the potential yield and spawning stock size from a year class are highest if the 0- and 1-ringed herring are not fished. In framing any new regulations to control the exploitation of juvenile herring, ACFM reiterates that it should be borne in mind that catches of these age groups result in a disproportionate reduction in adult catches.

In 1984, a number of inshore areas of the North Sea were closed to fishing for sprat, and in one case herring, over different periods to reduce the catches of 0- and 1-ringed herring that had been taken as a by-catch in the sprat fisheries in previous years.

In the western part of the North Sea, the closure off the northeast English coast is superfluous because no sprats have been recorded in this area for several years. In both this area and in the Moray Firth and Firth of Forth, existing by-catch regulations were already effective in reducing the by-catches of juvenile herring in the sprat fisheries and it is now not considered essential to maintain the closures.

On the other hand, the area in the eastern North Sea closed to both herring and sprat fishing from 1 July - 31 October appears to have had a considerable effect on the catches of juvenile (particularly 0-ringed) herring in 1984. Because of the restrictive effect this closure is reported to have had on fishing opportunities for small vessels that cannot fish further offshore, the Commission of the EC has asked ICES to consider alternative measures that would have the same conservation effect.

The total catch of herring and sprat combined taken in this area annually is estimated to have fluctuated between 60,000 and 100,000 tonnes in the years 1979-82 and of this an estimated 35-40% was taken by vessels of less than 40 GRT.

The herring component increased from 8-9% in 1979-80 to 60-65% in 1981-82.

An alternative to the present seasonal closure could be a year-round closure of an area larger than the present box in combination with a limited derogation. For this purpose, the present box could be extended to the north and to the south to cover areas which are known to be nursery grounds for herring and in which herring and sprat are caught (Anon. ICES C.M.1981/H:8).

However, the amount of catch which could be allowed to be taken under such a derogation cannot be defined by ACFM and should be specified by the management authorities.

New information on abundance and distribution of herring and sprat in the area under consideration is expected to become available from Danish acoustic surveys in the summer of 1985. This would allow for a more informed and up-to-date evaluation of the situation.

3.1.2 Division IIIa herring

3.1.2.1 Advice from the May 1985 ACFM Meeting

The fishery in 1983

Catches of herring in Division IIIa reported by Working Group members increased from 198,000 tonnes in 1983 to 205,000 tonnes in 1984, the highest level for over 10 years (Table 3.1.2). These catches have no official status, however, and are to be treated as provisional.

The provision of reliable catch data from Division IIIa presents a special problem caused by the erratic occurrence of industrial landings by a wide variety of vessels over a large number of small landing places, particularly on the Danish coast of the Kattegat. In 1984, sampling in that area was restricted mainly to small vessels landing in one port, and the raised total of Danish industrial landings of 61,000 tonnes used by the Working Group compares with 12,000 tonnes reported by the industry.

In terms of numbers at age, the catches in 1984 contained high numbers of 0- and 1-ringed herring (5,000 million and 2,900 million of the two age groups, respectively), but as explained above, the estimates are to be treated with caution. Of the estimated total, over 90% of the 0-ringers were taken in the Kattegat. A conspicuous feature in 1984 was the large increase in catch of 2-ringers (850 million).

Stock composition

Among adult herring (2-ringers and older), spring spawners are the predominant component. In the case of juveniles, the break-down of catches into a spring-spawning component of low mean length and low vertebral count (56.0) and an autumn-spawning component with a higher count (56.3) was complicated in 1984 by the appearance of a component with very low mean length (10-12 cm) and high numbers of vertebrae (56.2-56.6). The origin of this component is uncertain.

Sampling of catches of 1-ringers representative of 60% of the total was estimated to contain 26% autumn spawners, 17% spring spawners and 57% of the unidentified component. Less adequate sampling of catches of the 0-ringers suggested that the proportion of spring spawners in this age group was very low.

Population and recruitment estimates

The annual acoustic survey of Division IIIa in August-September 1984 was extended to cover Sub-divisions 22, 23, and 24 in the Baltic. The estimated biomass in Division IIIa of 533,000 tonnes was over 60% higher than in 1982 and 1983. The increase was due to a large increase in the adult stock (390,000 tonnes in 1984), while the estimated numbers of 0- and 1-ringers decreased, but these may not have been fully sampled as the survey does not cover shallow water adequately.

Despite extensive ice cover during the 1985 IYFS, most of the trawl hauls were completed except in the eastern part of the Kattegat. The index of abundance of 1-ringed herring was the highest recorded and slightly higher than that in 1984, but it may be too low owing to missing stations where high numbers are usually recorded.

The proportion of spring and autumn spawners in the 1-ringer index, as determined from an analysis of length compostions, was approximately equal, the two groups having mean lengths of 14.1-15.3 cm and 16.2-17.8 cm, respectively. The mean vertebral count in these components was rather high compared with previous years. The larger component which was abundant in the entrance to the Skagerrak had vertebral counts corresponding to those of North Sea herring. The high vertebral counts in the small-sized component could be due to the inclusion of autumn spawners in the spring-spawner index or to an increased recruitment of Skagerrak spring spawners.

The management of the Division IIIa herring fisheries

On previous occasions, close connections have been demonstrated between the spring-spawning stocks occurring in Division IIIa and the western Baltic. From a biological point of view, it is appropriate to treat this group of herring populations as a single management unit. A combined assessment of spring-spawning herring in these areas was attempted by the Working Group on Assessment of Pelagic Stocks in the Baltic. Because of uncertainties concerning the strength of recent year classes and remaining problems in the splitting of catches in Division IIIa, this assessment was not used as the basis for advice.

ACFM will give its advice on the 1986 TAC for the adult herring fishery in Division IIIa at its November 1985 meeting.

As pointed out above, the catches of herring in Division IIIa contain a substantial proportion of juveniles, and there is no doubt that the exploitation pattern in this division is far from optimal. In the 1970's, the industrial fishery for clupeoids took predominantly sprats, but with the decline of the Division IIIa sprat stock and the increase in recruitment to the North Sea herring stocks, the catches are now mainly 0-ringed herring.

As a result of the high levels of juvenile herring catches in Division IIIa and the difficulty of enforcing the existing regulations, ACFM has been asked by the three parties to the Consultations on Fishery Regulations in the Skagerrak and Kattegat to provide an early opinion on technical regulatory measures in the small-meshed trawl fishery for clupeoids in Division IIIa. In recent years, a number of technical measures have been introduced to reduce the catch of small herring:

1) Directed herring fisheries may only be carried out with a minimum mesh size of 32 mm. Because of severe meshing problems, this is probably the largest mesh size that can be used in practice. This mesh size is, however, not appropriate in the sprat fishery and its use in the herring fisheries appears to be an effective way of reducing the by-catch of juvenile herring.

2) A 10% by-catch limit was introduced when sprats were the predominant species in the catches in the sprat fishery. With a reversal of the herring-sprat ratio, this regulation is meaningless unless the aim is to bring the industrial fishery for clupeoids to a complete halt.

3) Rigorous enforcement of the minimum landing size in Division IIIa is likely to lead to discarding at a time when the abundance of juvenile herring is too high. The by-catch limit and the minimum landing size are inappropriate if small-meshed trawl fisheries for clupeoids are to continue in the present stock situation. ACFM is of the opinion that it would be preferable to aim at a more gradual reduction of juvenile catches by introducing enforcement measures which would not make a fishery by one entire section of the fleet impossible.

The retention and enforcement of a 32-mm minimum mesh size is practicable and effective in reducing catches of juvenile herring. If a fishery for sprats and small herring with a minimum mesh size of 16 mm is to be allowed, then it should be restricted to periods when 0-ringed herring are least abundant in the relevant areas. Landings in such a fishery, furthermore, could be restricted by a catch limit. If this comprised the total landings, regardless of species composition, enforcement would be facilitated.

More than 90% of the 0-ringer catch is taken in the third quarter of the year, July being the critical month when more than 40% of the annual catch of the 0-ringers in the Kattegat is taken. Introduction of a minimum mesh size of 32 mm in the third quarter in the fishery for herring and sprat would be an important step to curtail exploitation of 0-ringed herring, the most important months being July and August. Since over 50% of the sprat catch is also taken in these months, however, a combined quota of sprats and herring to be taken with small-mesh nets could be established if it were considered necessary to maintain some fishing opportunities for, say, small vessels working in inshore waters during this period. However, fishing for other species (as Norway pout, sandeels) is carried out in Division IIIa using trawls with mesh sizes below 32 mm. Advice on appropriate management for the sprat and juvenile herring fisheries within the overall small-meshed trawl fishery for these and other species is complex. Lack of relevant data prevented ACFM to from dealing with the subject at this meeting.

A Study Group will meet late in 1985 to deal with the subject and the ACFM will consider its report at its November 1985 meeting.

3.1.2.2 Advice from the November 1985 ACFM Meeting

Management of the small-meshed fishery in Division IIIa

Catches of juvenile herring in Division IIIa result in a reduction of the recruitment to the spawning stock and of adult catches in the North Sea, Division IIIa and possibly in the Baltic. If the management objective is to maximise the total catch of herring in these various areas, the catches of juvenile herring should be restricted as far as possible, ideally to zero.

From a management point of view, there may be some reasons for allowing a certain amount of juvenile herring to be taken by the small-meshed fishery and accepting the subsequent reduction in the catch of adult herring. One reason is that without taking some juvenile herring, it is impossible to exploit the sprat resource in the area. Another reason is that a sudden ban on catches of juvenile herring would create socio-economic problems for certain sectors of the fleet.

Under present circumstances, the first reason is not valid. Because juvenile herring make up about 80% of the small-mesh clupeoid catch, the reduction in catch of adult herring is likely to be greater than the combined catch of sprat and juvenile herring. The maximum catch of clupeoids would, therefore, be obtained after a complete closure of the small-meshed fishery for these species. This leaves the socio-economic argument as the only justification for taking a certain amount of juvenile herring.

It should be stressed that, on biological grounds only, it is impossible to advise on the quantity of juvenile herring that has to be set aside for this purpose. The regulatory measures currently in force (32-mm mesh size, 18-cm minimum landing size, ban on fishing herring for reduction purposes, 10% by-catch limitation) are all based on the policy to protect juvenile herring in order to maximise the total catch of herring and to increase the likelihood of good recruitment.

If it is necessary to allow some quantity of juvenile herring to be taken by a certain sector of the industry, the management authorities have to decide what loss in the adult herring fisheries they are willing to accept. If the existing management policy is maintained, that is to aim for a maximum catch of adult herring, steps should be taken to gradually reduce the amount of juvenile herring that is taken by the small-meshed fisheries.

The assessment of the negative effects of catches of O-group herring is critically dependent upon estimates of natural mortality both in juvenile and adult herring. The estimates presently available were derived from the international stomach sampling programme in the North Sea, and it has been assumed that these estimates also apply to Division IIIa. The scientific evaluation and the use of the data have been undertaken in recent years, but at present no firm conclusions have been reached.

Using the estimates of natural mortality which at present are considered to be in the range of possible values, the reduction 541 catch of older herring varies from 1.1 tonnes to 4.7 tonnes for each tonne of 0-group herring caught. ACFM realises that this information will be of little use as a quantitative basis for management, but it was not possible at this meeting to assess the quantitative effect of the juvenile herring fishery with satisfactory precision. However, the analysis of natural mortality is continuing, and ACFM will consider the results of the Multispecies Working Group and other relevant working groups at its meeting in May 1986.

ACFM considered a number of methods of achieving a gradual reduction in the catches of juvenile herring, including a maximum by-catch rate, a closed area or a closed season for small-meshed fisheries, and a mixed clupeoid quota for the small-meshed fisheries.

In Division IIIa, a maximum by-catch rule is not the most appropriate method. The fishermen in the small-meshed trawl fishery cannot direct their fishing activities specifically towards sprat, and the by-catch percentage will be governed entirely by the ratio between herring and sprat in the area. If the by-catch percentage is set too high, there is little restriction in the catch of juvenile herring. If it is set too low, the fishery has to be stopped completely.

Concerning a closed area, there are no biological data available to delimit smaller areas within Division IIIa for closures. With respect to a closed season, the closure would have to apply at least to the third quarter of the year, the season which is also the main fishing period for sprat in the small-meshed trawl fishery.

The last method considered involves setting a mixed clupeoid quota for the small-meshed trawl fishery. In combination with a licensing system, this method has the potential advantage of allocating the quota specifically to that sector of the industry that has no alternative employment. It also sets a ceiling on the maximum amount of juvenile herring that can be taken, and offers the possibility of a gradual reduction of this catch, for instance by a certain percentage each year. A disadvantage of the method is that all attempts to direct the fishery towards sprat are abandoned. Under present circumstances, the catch taken under a mixed quota will consist of about 80% of juvenile herring. The size of the mixed quota will, therefore, be determined mainly by the need to preserve juvenile herring and not by the availability of sprat.

The first trials with a mixed clupeoid quota in Denmark in 1985 have shown that regulatory measures can be designed to exclude catches of other species, taken by small-meshed trawl, from the mixed clupeoid quota. The small-meshed trawl fishery for species other than clupeoids must still be governed by the usual by-catch rules.

If directed sprat fisheries by purse seiners are also included in this mixed quota, the problem arises that these fisheries will be unnecessarily restricted by the gradual reduction of the mixed quota. It would be advisable, therefore, to maintain, in addition to the mixed clupeoid quota, a quota for directed sprat catches governed by earlier recommeded by-catch regulations. The size of this sprat TAC would depend on the abundance of sprat in this area.

ACFM reiterates that the biological rationale of the management regime is based on the requirements of individual stocks. The small-meshed clupeoid fishery in Division IIIa is based on a mixture of the sprat stock and several herring stocks, and a mixed TAC must be regarded only as an operationally-convenient method of ensuring control within the appropriate and overriding TAC constraint on each one.

ACFM will not be able to predict, in advance, the relative abundance of the relevant age groups of the different stocks concerned and will, therefore, be unable to estimate catch options before a fishery takes place. Nevertheless, appropriate sampling procedures must be maintained to enable the catches of each species to be recorded and to enable ACFM to estimate the impact of the fishery on future spawning stocks. Whilst recent concern for the spawning stocks of North Sea herring has receded, a series of weak year classes could again threaten them. Stringent regulation of the fishery for juvenile herring would again become a necessary measure to secure added protection. The effect on the parent stocks of catches taken in the mixed fishery should be continuously assessed.

It is ACFM's view that the adoption of a mixed fishery TAC depends on management judgement of the balance between the disadvantages of weakening the conservation regime and the advantages of achieving a measure of control, and at the same time minimising disruption of an existing fishery. Because the juvenile age groups of many other pelagic and demersal stocks follow a coastal distribution, similar questions may arise elsewhere. However, within Division IIIa, the management decision must also have due regard to the unique geographical position of the area, the apparent impracticability of other management proposals and the state of the stocks in question. Derogations from the conservation regime on the basis of the small size of fish available to particular sectors of a fishery would not be generally biologically acceptable and any exception, such as Division IIIa, must be subject to annual review of the state of the stocks.

If the management authorities decide to implement a mixed clupeoid TAC for the small-meshed fishery, the question of how to advise on TAC's for the directed sprat fishery, the directed herring fishery (using 32-mm meshes) and how to evaluate the effects of the mixed clupeoid fishery on each herring stock will need to be considered.

Evaluation of the 1985 acoustic survey in Division IIIa and Sub-divisions 22-24

A preliminary report from the 1985 acoustic survey was presented to ACFM. The survey was, as in 1984, extended to cover both Division IIIa and Sub-divisions 22-24 in order to cover the whole area of distribution of the stock fished in these areas.

The total biomass of herring was estimated at about 450,000 tonnes, equally split between Division IIIa and the Baltic parts.

Age distributions from acoustic surveys in Division IIIa from the three last years are given in the text table below:

Age (w.r.)	No. in millions		
	1983	1984	1985
0	1,605	1,004	6,515
1	3,559	1,992	1,111
2	1,125	2,069	1,070
3	400	756	72
4	79	126	11
5	6	34	2
6	-	2	-
7	-	-	-
Biomass ('000 t)	325	541	227

The most striking feature in the 1985 stock estimate is the very high number of 0-ringers. The 0-group is usually distributed mainly in the shallow waters and consequently is not covered adequately by the surveys. This year, the 0-ringers were distributed over the whole area, including the deeper parts, and were not concentrated in the Kattegat as in earlier years.

In contrast, the estimate of older herring ($\geq$ 3-ringers) was very low at 85 million fish, compared to 918 million in 1984 and 485 million in 1983.

The scarcity of old herring estimated could be influenced by the timing of the survey in relation to the migration pattern of herring in the area. The 1985 survey started on 14 August, whereas the 1984 survey began on 22 August.

Normally, the older and larger herring are found and fished in the western part of the Skagerrak during August. The schools at that time are moving eastward and remaining for a period along the Swedish Skagerrak coast before they pass southwards to the overwintering areas in the Sound and in the southwestern Baltic.

Comparing the proportion by weight of old (large) herring in the acoustic estimates with the proportion of large herring in the Swedish herring fishery (see text table below) indicates that the older herring were not present during the survey in August 1985, but appeared and were fished in September and October. It is thus possible that the older herring had penetrated into the eastern part of Division IVa during the time of the survey.

	Proportion of large[1] herring in Swedish catches		Proportion of $\geq$ 3-ringed herring in acoustic surveys (0-group excluded)
Year	September	October	August
1984	0.25	0.16	0.30
1985	0.30	0.21	0.06

[1] Commercial size group "0".

Management considerations

ACFM found it difficult to give a biologically meaningful TAC for Division IIIa alone, since it cannot quantify the migration rates for adult herring spawning in the SW Baltic and feeding in Division IIIa. The only way ACFM found to indicate a split of the total TAC for 1985 between the areas was to base it on the distribution of the stock at the time of the acoustic survey, thus following the same assessment procedure as in earlier years.

In order to predict the catches in the directed fisheries, a range of fishing mortalities was applied to the stock estimate in August 1985 for Division IIIa. ACFM calculated the expected catches at fishing mortality levels around $F_{0.1}$ (F = 0.15-0.20) giving catches in the range 25,000 - 35,000 tonnes.

In this calculation, the 0-ringers (1-ringers in 1986) were excluded. ACFM is, however, aware of the fact that a certain amount of these fish are caught in the 32-mm-mesh-trawl fishery, especially in the second half of the year. During 1982-84, this amount was roughly estimated to be 15,000-20,000 tonnes yearly. The 1-ringers (2-ringers in 1986) are known to contain both indigenous spring spawners and autumn spawners from the North Sea. The Herring Assessment Working Group for the Area South of 62^0N estimated that 49% of the 1-ringers caught during the IYFS in 1985 were spring spawners, whereas the preliminary analysis of some samples from the 1985 acoustic survey indicated that the 'third component' was dominant. These herring are characterized by medium length and by a mean number of vertebrae intermediate between spring and autumn spawners. Their origin is so far unknown.

In the calculation, ACFM included 49% of the 1-ringers and all the 2-ringers and older herring in 1985.

With no data presented on catch in numbers at age for 1985, ACFM could not estimate the present level of exploitation.

The basis for any advice on a TAC in this area is presently weak. The allocation of stock estimates and catches to stock components is uncertain. The possibility that the adult spring-spawning herring could have been fished in Division IVa increases the uncertainties about the amount of adult herring available for fishing in 1986. The acoustic survey and the preliminary data from the fishery in the autumn 1985 give different pictures in this respect.

<u>ACFM, therefore, as provisional advice, recommends that the catch of herring in the directed herring fisheries in Division IIIa should not exceed 50,000 tonnes for 1986</u>.

This TAC will be revised at the ACFM meeting in May 1986, when a further analysis will have been carried out by the appropriate working groups.

3.1.3 <u>Celtic Sea and Division VIIj herring</u>

<u>The fishery</u>

Recent catches (C) and recommended TAC's are shown in the text table below.

Up to 1982, Celtic Sea (1) and Division VIIj (2) were managed as separate areas. The two areas were then combined for management purposes.

78/79		79/80		80/81		81/82		82/83		83/84		84/85		85/86
C	TAC	C	TAC	C	TAC	C	TAC	C	TAC	C	TAC	C	TAC	TAC
	0(1)		0(1)		0(1)		0(1)							
7.6	6(2)	10.3	6(2)	13.1	6(2)	17.1	6(2)	13	-	21	6	22.5	13	13

Weights in '000 tonnes.

The catch from the Celtic Sea and Division VIIj combined in the period 1 April 1984 - 31 March 1985 was approximately 22,500 tonnes, which is slightly higher than in the previous season (Tables 3.1.3.1 and 3.1.3.2). This compares with a recommended TAC for the season of 13,000 tonnes which was adopted by the EEC for the calendar year 1984. Approximately 80% of the catch was taken during the period October-March by vessels fishing the spawning concentrations. In the Irish fishery, fish caught in excess of nightly quotas were occasionally slipped resulting in underestimation of the total catch.

Over 88% of the total catch was composed of 1- to 3-ringed herring. Two ringers (1981/82 year class) made up only 41% of the autumn spawners taken mainly in the western part of the Celtic Sea and Division VIIj, whereas they constituted over 70% of the winter spawning component taken in the eastern part of the Celtic Sea. Based on the age distributions of both components during the last three seasons, recruitment to the winter-spawning component has been considerably higher than to the autumn-spawning component.

Stock size estimates

Eleven larval surveys covering the entire spawning season were carried out in the Celtic Sea and Division VIIj during 1984/85. The abundance index (see text table below) was approximately 1.5 times higher than the 1983/84 index which was previously the highest. The increase was most marked in the winter-spawning component which has shown a marked recovery from the low levels prior to 1983/84.

	Standard area[1]		Total zone[2]
Season	Autumn spawners	Winter spawners	Autumn spawners
1978/79	7.2	1	10.8
1979/80	9.5	3.4	14.4
1980/81	7.6	8.9	11.5
1981/82	16.3	1.5	24.6
1982/83	14.6	5.2	22.0
1983/84	42.4	15.6	58.5
1984/85	34.2	53.4	56.3

[1]Standard area in Celtic Sea.
[2]Total zone including standard area and Division VIIj.

The state of the stock and recruitment

Because of the very different trends in the autumn- and winter-spawning populations, a single assessment for both combined is liable to be misleading. A comparison was made between the autumn-spawning larval index and the spawning stock biomasses estimated from a VPA based on catches of autumn spawners, approximated by those catches taken outside the period December-February. A value of F in 1984 of 0.30 corresponding to a spawning stock of 47,000 tonnes produced a VPA most consistent with the larval index.

It is likely that catches of winter spawners in the period 1978-81 were very small, and consequently a VPA was not carried out on this component. Assuming that conditions for larvae were the same in the autumn and winter spawning periods, a comparison of the ratio between spawning stock biomass and larval abundance index for the two components suggests that F on the winter spawners in 1984/85 was around 0.2, with a corresponding spawning stock biomass at the beginning of 1985 of around 50,000 tonnes.

Because separate assessments of the two spawning components were carried out, it was not possible to use the results of the young herring survey in the Irish Sea to estimate recruitment of 1-ringers. According to the VPA on autumn spawners, the 1979-81 year classes were considerably larger than those from 1975-78. In view of the uncertainties surrounding the assessment, however, the geometric mean of the 1975-81 year classes (77 million) was used for 1-ringers in all years from 1984-87 in the projection.

Recruitment to the winter-spawning component was very high in the last two years, and according to the young herring survey in the Irish Sea, the 1983/84 year class is larger than both of the previous two. Again, because of the uncertainities involved, a somewhat conservative value of 100 million 1-ringers was used in the projection in each of the years from 1984-86.

Management

To carry out projections into the 1986/87 season, a most likely catch of 20,000 tonnes has been assumed for the 1985/86 season, divided into 7,800 tonnes of autumn and 12,200 tonnes of winter spawners. The results of projections are given below for autumn and winter spawners separately and are also shown in Figures 3.1.3.1 and 3.1.3.2.

Autumn spawners

1985/86				1986/87					1987/88	
Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.	Manage- ment option	Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.	Stock[1] biom. (1+)	Spawn.[2] stock biom.
59.4	0.16	7.8	49.5	$F_{0.1}$	63	0.16	8.2	53	65	55
				$F_{86} = F_{84}$		0.30	14.0	51	59	47

Weights in '000 tonnes.
[1] Stock biomass calculated at 1 April.
[2] SSB calculated at spawning time, i.e., 1 October.

Winter spawners

1985/86				1986/87					1987/88	
Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.	Manage- ment option	Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.	Stock[1] biom. (1+)	Spawn.[2] stock biom.
71.0	0.22	12.2	60	$F_{0.1}$	73	0.15	9.0	62	78	67
				$F_{86} = F_{84}$		0.20	12.0	62	75	64

Weights in '000 tonnes.
[1] Stock biomass calculated at 1 April.
[2] SSB calculated at spawning time, i.e., 1 February

A fishery on both components in 1986/87 at the $F_{0.1}$ level would produce an estimated yield of about 17,000 tonnes. To avoid overexploitation of one of the other components, it would be advisable for any TAC to be divided into two parts, to be taken at times of year when the catches are predominantly autumn and winter spawners, respectively. If the option chosen is $F_{0.1}$, it is suggested that catches in the period April-November 1986 should not exceed 8,000 tonnes, leaving a further 9,000 tonnes of predominantly winter spawners to be taken in the period December 1986 - March 1987.

3.1.4 West of Scotland herring [Division VIa (north)]

ACFM advice, TAC's and catches for recent years

1982			1983			1984			1985	
ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch	ACFM adv.	TAC
70	70	92.4	58		63.5	53	64	74.3	30[1]	

[1]Preliminary.
Weights in '000 tonnes.

The fishery in 1984

The catch taken in Division VIa (north) in 1984 was approximately 74,300 tonnes, which is about 10,000 tonnes more than the agreed TAC and 20,000 tonnes higher than the level preferred by ACFM. Catches unallocated to country constituted 22% of the catch total (Table 3.1.4).

In 1982, 2-ringers (1981 year class) made up almost 60% of the total catch in number, giving some support to the prediction made on the basis of the Scottish recruitment survey in 1984. The 1982 year class was poorly represented in the catches, possibly as a result of a change in the geographical distribution of the Scottish fishery.

Stock size estimates

The index of larval abundance in 1984 was very much higher than that in 1983 and at about the same level as that in 1981 and 1982. It now appears that the 1983 index was biased downwards, but the reasons are not evident.

From a regression of spawning stock size estimates from VPA on larval index for the years 1973-80, the spawning stock biomass in 1984 is estimated to have been 262,000 tonnes. The value of fishing mortality rate corresponding to this was 0.28 (uniformly distributed over 2- to 8-ringers). A VPA based on this estimate indicated that fishing mortality rate had decreased from 0.47 in 1982 to 0.37 in 1983 and 0.28 in 1984, this being consistent with the diversion of Scottish fishing effort to the Shetland area of Division IVa in 1984. In 1984, the estimated spawning stock size increased by 51% as a result of the good recruitment of the 1981 year class.

Recruitment

For the projection, recruitment as 2-ringed herring in 1985 (1982 year class) was taken as 349 million, the geometric mean over the years 1973-82 from the VPA. The same value has also been used for the 1983 year class recruiting in 1986.

Management

The assessment made by the Working Group in 1984 was not accepted by ACFM partly because of the high variance in the regression between stock size and larval index. It now appears that the 1983 larval index and, correspondingly, the stock estimate for 1983 was considerably too low. The present assessment is based on a revised larval index and revised spawning stock biomass estimates with reduced variability in the spawning stock/larval index relationship.

The projections are made on the assumptions that the TAC of 56,000 tonnes will be taken in 1985 and that the catch is entirely of 2-ringers and older, since 1-ringers do not contribute significantly to the catch unless they are abundant. Projections have been made for catch and stock size in 1986 and for 1987 continuing the levels of fishing mortality rate in 1986 and are given below and are also shown in Figure 3.1.4.

1985				1986				
Stock biomass (1 Jan)	$\bar{F}_{(2-7)}$	Catch	Spawn.[1] stock biom.	Stock biomass (1 Jan)	Management option	$\bar{F}_{(2-7)}$	Catch	Spawn.[1] stock biom.
332	0.23	56.5	276	325	$F_{0.1}$	0.143	37	276
					$F_{86} = 0.8F_{84}$	0.224	56	261
					$F_{86} = F_{84}$	0.280	68	252

Weights in '000 tonnes.
[1]At spawning time, i.e., 1 September.

The catch in 1986 at the $F_{0.1}$ level is 37,000 tonnes. If the aim is to maintain the spawning stock biomass at the 1985 level, or to increase it, then the fishing mortality rate in 1986 will have to be reduced to a level 40% less than that in 1984, i.e., F = 0.17. This option is associated with a TAC of 45,000 tonnes in 1986.

3.1.5 Clyde herring

ACFM advice, TAC's and catches for recent years

1982			1983			1984			1985	
ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch[1]	ACFM adv.	TAC
2.5	2.5	2.52	2.5	2.5	2.8	P[2]	3.0	3.2	P[2]	3.0

[1]Preliminary.
[2]Precautionary TAC based on historic catches.
Weights in '000 tonnes.

Justification for separate assessment

In 1978, ACFM recommended that the population of herring in the Firth of Clyde should be treated as a separate unit for management purposes, while recognising that biologically it is a component of another stock or stocks. This population consists of a spring-spawning component that spawns in the Clyde and an autumn-spawning component that spawns in one or more of the adjacent areas. Since the late 1960's, autumn spawners have predominated in the catches, and there is no evidence for any recent change in the proportion of the two components, or of any recovery of the spring-spawning population.

Those herring tagged in the Firth of Clyde during the summer that have been recaptured outside the Clyde have been recaptured mainly in the Irish Sea and northwest of Ireland, with very few from the Minch. The overwhelming majority of returns, however, come from the Clyde itself, indicating a considerable measure of continuity in the Clyde herring population. Since only a small proportion of the tag returns have been made in herring fisheries outside the Clyde, a high proportion of the fishing mortality on Clyde herring is, therefore, due to exploitation in the Clyde itself. Since these herring do not form a significant component of any other fisheries, exploitation in the Clyde will not have any significant direct effect on the quantity of fish available in fisheries in adjacent areas. For these reasons, and because autumn-spawning herring caught in the Clyde cannot be identified as belonging to any single stock, ACFM considered that it is justifiable to carry out a separate assessment and to treat the Clyde herring as an individual management unit.

Clyde herring, nevertheless, contribute to the spawning potential of the stock or stocks of which they are a component, and it is, therefore, appropriate for them to be managed at a level of fishing mortality rate consistent with that in adjacent areas.

The fishery in 1984

The reported landings from the Firth of Clyde in Scottish ports in 1984 were 2,991 tonnes (Table 3.1.5), almost exactly the same as the precautionary TAC of 3,000 tonnes. In addition, an estimated 247 tonnes were landed at Irish Sea ports, and there was considerable discarding which was estimated to amount to almost 40% of the total catch. The estimated total catch in 1984 was 5,770 tonnes.

In 1984, both landings and discards were sampled and in the total catch, 2-ringers formed the most important single age group (41% of the total).

Estimates of fishing mortality rate, population size and recruitment

To estimate the fishing mortality rate in 1984, fishing effort data over the period 1974-84 were examined. Since 1980, nominal effort expressed as number of days absent from port has been considerably lower as a result of the introduction of restrictive TAC's. A value of fishing mortality rate in 1984 of 0.2 applied in a VPA produces an historic series that best fits the effort data. A VPA based on this value indicates that there was an increase in biomass in 1984.

Because 1-ringers were not adequately sampled until 1984, it is not possible to estimate a reliable recruitment series for this age group. For the purposes of projections, the median value of 2-ringers over the period 1970-82 (17 million) has been used for recruitment in 1985 and 1986.

Management considerations

If discarding in 1985 occurs on the same scale as in 1984, the total catch is likely to be the TAC of 3,000 tonnes with an additional 2,000 tonnes of discards. The latter will include 1-ringers not included in the projection and, assuming the proportion of this age group in the discards in 1985 is the same as in 1984, this age group will account for an estimated 460 tonnes, giving a total estimated catch of 2-ringers and older in 1985 of 4,540 tonnes. This would generate an estimated fishing mortality rate of 0.152 in 1985.

Projected catches for 1986 of 2-ring and older fish are split into landings and discards according to the corresponding 1985 proportions of 66% and 34%, respectively. The associated fishing mortality rates are also given.

1984	1985						
Biom. at sp. time (2+)	F total	Total catch	F land.	Land.	F disc.	Disc.	Biom. at sp. time (2+)
28.7	0.152	4.54	0.100	3.00	0.052	1.54	27.7

1986							
Management option	F total	Total catch	F land.	Land.	F disc.	Disc.	Biom.at spawn time (2+)
$F_{85} = F_{85}$	0.152	4.30	0.100	2.84	0.052	1.46	26.4
$F_{86} = F_{0.1}$	0.165	4.65	0.109	3.07	0.056	1.58	26.1
$F_{86} = F_{84}$	0.200	5.55	0.132	3.66	0.068	1.89	25.4

Weights in '000 tonnes.

At the preferred fishing mortality rate of $F_{0.1}$, an appropropriate level of TAC in 1986 might, therefore, be 3,070 tonnes.

3.1.6 Herring in Divisions VIa (south) and VIIb,c

ACFM advice, TAC's and catches for recent years

1982			1983			1984			1985	
ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch	ACFM adv.	TAC	Catch[1]	ACFM adv.	TAC
11		19.2	12	12	33.0	12	12	27.4	14	14

[1] Preliminary.
Weights in '000 tonnes.

The fishery in 1984

The catch decreased from 33,000 tonnes in 1983 to 27,500 tonnes in 1984 (Table 3.1.6). The proportion of the catch unallocated to country (40%) was again high, and the catch was over twice as high as the TAC (12,000 tonnes). The catches in 1984 were restricted for marketing reasons and because of diversion of effort to the winter mackerel fishery. Two-ring fish constituted about 50% of the catches by number, the highest percentage contribution by the recruiting year class since before 1970.

Estimates of stock size, fishing mortality rate and recruitment

Larval surveys were carried out in October-November 1984, and there was no survey in September, the index for that month being estimated from the mean ratio of the indices in September and October in previous years. The overall abundance index for 1984 is considerably higher than in any of the preceding three years, and a regression of spawning stock biomass against larval index indicates a spawning stock in 1984 of 104,000 tonnes with a corresponding fishing mortality rate in 1984 of 0.28. A VPA using this value in 1984 indicated a drop in fishing mortality rate from 0.42 in 1983. The present spawning stock biomass of 104,000 tonnes compares with the highest value of 166,000 tonnes in 1973.

The 1984 catch of 2-ringers (1981 year class) indicates that this may be the largest year class to enter the fishery for some time. The catch of 1-ringers does not give a realistic estimate of recruitment because vessels have in recent years tended to avoid areas where young fish are caught. For recruitment of 1-ringers in the projections, the geometric mean over the period 1973-82 (202 million) has been used in the years 1984-87.

Management considerations

Projections of catches, stock biomasses and spawning stock biomasses for 1986 have been calculated for two different catch levels in 1985:

(A) The TAC adopted for 1985 is 14,000 tonnes. This catch will generate an estimated fishing mortality rate of 0.14 and the spawning stock biomass in 1985 will be about 117,000 tonnes.

(B) Since the catch level in the last ten years has always been considerably higher than the TAC, ACFM considered it likely that the catch in 1985 may reach the level of the previous year of 27,000 tonnes. This catch level is associated with a fishing mortality of 0.28, the same as in 1984. The spawning stock biomass at spawning time in 1985 is estimated as 102,000 tonnes.

The results of the projections are given in the text tables below and in Figure 3.1.6.

(A) The assumed catch in 1985 corresponds to a TAC of 14,000 tonnes.

1985				1986				
Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.	Management option	Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.
164	0.14	14	117	$F_{0.1}$	177	0.15	17	126
				$F_{86} = F_{84}$		0.28	30	112

(B) The assumed catch in 1985 is 27,000 tonnes.

1985				1986				
Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.	Management option	Stock[1] biom. (1+)	$\bar{F}_{(2-7)}$	Catch (1+)	Spawn.[2] stock biom.
164	0.28	27	102	$F_{0.1}$	160	0.15	15	111
				$F_{86} = F_{84}$		0.28	27	99

Weights in '000 tonnes.
[1] Stock biomass calculated at 1 January.
[2] SSB calculated at spawning time, i.e., 1 October.

Under assumption (A), at the preferred level of fishing mortality ($F_{0.1}$), the catch in 1986 would be 17,200 tonnes with an increase in spawning stock in 1986 of about 22% from the 1984 level of 103,000 tonnes. Fishing at the same level as in 1984 would result in a catch of 30,000 tonnes and only a small increase in spawning stock in 1986 from the 1984 level.

Under assumption (B), fishing at the $F_{0.1}$ level in 1986 will result in a catch of 15,000 tonnes with an increase in spawning stock biomass of about 8% over the 1984 level. Maintaining the 1984-85 level of exploitation in 1986 would result in a catch of 27,000 tonnes and a small decrease in spawning stock in that year.

The average fishing mortality on this stock over the years 1975-83 of 0.31 is twice as high as considered advisable for the management of herring stocks in general (see introductory statement concerning herring stocks on page 44. Also, the estimate for 1984 (0.28) is of the same order.

<u>ACFM is concerned about this high level and advises that fishing mortality should be reduced.</u>

3.1.7 <u>Irish Sea herring (Division VIIa)</u>

<u>Catches</u>

Recent catches (C) and TAC's

1978		1979		1980		1981		1982		1983		1984		1985
C	TAC	C	TAC	C	TAC	C	TAC	C	TAC	C	TAC	C	TAC	TAC
1.1	9	12.3	11	10.6	10	4.4	3.8	4.9	3.8	3.8	3	4.1	4	5

Weights in '000 tonnes.

The reported landings from the northern Irish Sea in 1984 were 4,066 tonnes compared with a TAC of 4,000 tonnes (Table 3.1.7.1). Of the total, 430 tonnes were taken in a selective fishery on the Mourne spawning ground. The catches from the Manx and Mourne stocks were roughly equal (Table 3.1.7.2).The assessment has, as in 1984, been carried out on both stocks combined.

Estimates of fishing mortality rates, stock size and recruitment

As in 1984, United Kingdom fishing effort data were used to estimate the fishing mortality rate in 1984. Partitioning the annual estimates of fishing mortality rate into the components due to UK and other vessels, a regression of the UK component was made on the number of landings. Since there was a major change in the fishery in 1981 when the catch, effort and fishing mortality rate decreased, the change in mean F and fishing effort was compared for the periods 1979-80 and 1981-84. The fishing mortality rate in 1984 that produced a change corresponding most closely to the effort data was F = 0.15. This estimate was used in a VPA on 2-ringers and older.

The VPA indicates that there has been a steady recovery of the stock from the very low level of 1980.

For projection purposes, 1-ringer recruitment in 1984 (80 million) has been taken from a stock-recruitment relationship calculated from the VPA results. While the same approach indicates a higher value of recruitment in 1985, the same value of 80 million was used in the projection for that year also.

Management considerations

Projections to 1986 are based on a catch in 1985 of 5,000 tonnes corresponding to the agreed TAC. The results are given below and in Figure 3.1.7.

1985				1986				
Stock biomass (1 Jan)	F	Catch	Spawn. stock biom.	Stock biomass (1 Jan)	Management option	F	Catch	Spawn. stock biom.
45.9	0.14	5.0	31.9	52.4	$F_{0.1}$	0.15	6.3	36.8
					$F_{86} = F_{85}$	0.14	5.8	37.2

Weights in '000 tonnes.

At the preferred level of fishing mortality rate ($F_{0.1}$), the catch in 1986 would be 6,300 tonnes. At this level of exploitation, it is estimated that the spawning stock biomass would continue to increase.

Spawning area closures

EEC asked ICES if the objectives of the existing seasonal closure of the northern Irish Sea to protect the spawning shoals could still be achieved if the size of the closed area or the period of closure were reduced.

In this connection, ACFM points out that there was no evidence of any difficulty in taking the TAC in 1984.

The recorded limits of the spawning area of the Manx herring, as shown by the distribution of newly-hatched larvae, extend about 15 miles off the east and south coasts of the Isle of Man. The spawning grounds of Mourne herring are located approximately 2 miles off the east coast of Northern Ireland.

If the closure of a smaller area than the present closure could be effectively enforced, the objective of the present regulations could be achieved by reducing the closures to the following two areas:

1) To the east of the Isle of Man within a zone bounded by a line running from the Isle of Man eastwards along 54°20'N to 3°40'W, then SSW to 53°50'N, 3°50'W, thence due west 53°50'N, 4°50'W and thence due north to the most westerly point of the Calf of Man.

2) To the east of the coast of Northern Ireland and the Irish Republic within a zone bounded by a line running from the coast of County Down, eastwards along 54°15'N to 5°15'W, thence southwards to 53°50'N, 5°50'W and thence westwards along 53°50'N to the coast of the Republic of Ireland.

Herring spawning east of the Isle of Man extends from the first week of September into November, with a peak in the period late September to early October. The main Mourne spawning season extends from mid-September to late October, with a peak in late September-early October. <u>Acccordingly, the existing period of closure from 21 September to 16 November should not be reduced.</u>

<u>Nursery area closures</u>

In 1984, the Working Group recommended that further information be collected on the distribution of juvenile and adult herring in the northwestern Irish Sea in order to re-assess the existing nursery area closures. For this purpose, trawl and echo surveys were carried out between latitudes 53°50' and 54°45'N inside the 12-mile limit in the period June-December 1984. The results of the survey and contemporaneous samples from commercial fisheries further offshore indicate that adult 2- and 3-ringed herring predominated in the northern part of the area and in the commercial catches, while 1-ringers made up the highest proportion (36%) of the survey catches in the southern area. In addition, young herring surveys carried out since 1979 indicate that 1-ring herring in the northwestern Irish Sea are not confined to the 12-mile limit, and that they are mainly distributed in the mid-channel area between the Isle of Man and the Irish coast.

On the basis of these surveys, the present ban on herring fishing within 12 miles of the coasts of the Irish Republic and Northern Ireland between 53°50' and 55°N excludes the fishery from an important adult distribution area. Since juvenile herring are not concentrated within the 12-mile limit, <u>it is not necessary to continue the present prohibition on fishing for herring in this zone.</u> No information was available to the Working Group on the distribution of adults and juveniles in the eastern half of the Irish Sea.

3.2 Industrial Fisheries in the North Sea and Adjacent Waters

3.2.1 Recent trends in the industrial fisheries

Recent trends in the industrial fishery are shown in Table 3.2.1.1. Total landings for reduction purposes from the North Sea have decreased from a level of 1.6 million tonnes in the period 1974-80 to 1.3 million tonnes in the period 1981-84.

Landings of target species: Norway pout, sandeel and sprat

The total landings of the target species, Norway pout and sandeel, have fluctuated without trend around the average level of 1 million tonnes. In contrast to this, a gradual reduction in sprat landings has been observed, and the landings in 1984 (80,000 tonnes) make up only 23% of the average of the preceding decade.

Landings of herring for reduction

In previous reports, the landings of herring have been reported as by-catch, mainly in the sprat fishery. However, since 1981, large catches of herring have been landed for reduction, and the fishery is, in fact, a directed fishery.

The landings by area in the period 1977-84 are shown in Table 3.2.1.2

The total herring landings for reduction purposes from the North Sea decreased from about 155,000 tonnes in 1982 and 1983 to 114,000 tonnes in 1984. As shown in Table 3.2.1.2, this development covers a marked decrease in landings from Division IVb and a significant increase in landings from Division IVa.

Landings of herring from Division IVb declined sharply from about 150,000 tonnes in 1982 and 1983 to about 50,000 tonnes in 1984. Adult herring contributed to the catches for reduction purposes from Division IVb in 1984, but the juvenile herring still form the largest part of the catches. The landings for reduction purposes from Division IVa have increased from 3,000 tonnes in 1983 to 61,000 tonnes in 1984 as a result of a fishery on adult herring for this purpose.

Catch of protected species (haddock, whiting, saithe)

Landings of protected species (Table 3.2.1.1) decreased substantially in recent years, now being at the lowest level since 1974. The percentages by species in 1984 were 53%, 26% and 21% for whiting, haddock and saithe, respectively.

Detailed by-catch data for the fourth quarter of 1984 were available to the Working Group, and these are summarized in its report. The Working Group concluded that the estimated by-catches were similar over a wide area of the northern North Sea. However, having only data for one quarter at its disposal, the Working Group did not analyse the material any further.

3.2.2 Norway pout

Landings

The landings of Norway pout from the North Sea are shown in Table 3.2.2.1. The landings decreased from 420,000 tonnes in 1983 to 355,000 tonnes in 1984.

Landings of Norway pout from Divisions IIIa and VIa by country are given in Tables 3.2.2.2 and 3.2.2.3, the provisional 1984 landings being about 67,000 tonnes and 8,000 tonnes, respectively.

In the previous decade, the spawning stock size has been fluctuating around 400,000 tonnes, and the stock size around 1.3 million tonnes with no apparent trend.

At its meeting in May 1984, ACFM predicted the catch in 1984 using IYFS recruitment data and historic catches. The predicted catch was only 9% higher than the actual 1984 catch (Figure 3.2.2). Estimates based on past catches and recruitment give a predicted catch in 1985 of 320,000 tonnes on the assumption that fishing mortality in 1985 remains at the same level as in previous years.

If the IYFS estimate is an overestimate, as suggested by the English groundfish survey, the predicted catch will also be an overestimate.

3.2.3 Sandeel

The landings of sandeel from the North Sea are shown in Table 3.2.3.1. Landings increased from 540,000 tonnes in 1983 to 670,000 tonnes in 1984. The landings in 1984 were 10% higher than the average for the years 1974-83.

The text table below, giving the catches by assessment area, shows that the catches in the Shetland area declined from 37,000 tonnes in 1983 to 32,600 tonnes in 1984. Despite this reduction, catches in this area are still above the catch level in the 1970s.

The major increase in catches occurred in the southern area. Catches increased from 419,000 tonnes in 1983 to 532,800 tonnes in 1984. The catches in 1984 are close to the highest catch level on record.

Catches in the northern area increased to 91,800 tonnes from 78,200 tonnes in 1983, but even so, the catches are low compared to catches in the 1970's.

Sandeel catches from the North Sea

Year	Shetland	Assessment Area	
		Northern	Southern
1975	12.9	253.7	156.5
1976	20.2	135.0	330.6
1977	21.5	384.4	392.3
1978	28.1	163.0	577.2
1979	13.4	195.3	355.9
1980	25.4	292.0	401.2
1981	46.7	138.1	378.9
1982	52.0	74.4	479.2
1983	37.0	78.2	419.0
1984	32.6	91.8	532.8

Weights in '000 tonnes.

Catches from Division IIIa are shown in Table 3.2.3.2 .The catches in 1984 were 28,000 tonnes.

Catches from Division VIa are shown in Table 3.2.3.3. Catches increased further to 14,000 tonnes in 1984 from 13,000 tonnes in 1983. Before 1981, virtually no catches were taken in this area.

The Working Group carried out assessments for three areas in the North Sea using the available effort information. Because of the short time-series available for the northern and southern areas, and because of uncertainties about the assumed value of natural mortality, ACFM did not accept these assessments.

Catches of O-group sandeel do not give information on the recruitment to the fishery, and no other recruitment information is available for these stocks. Therefore, ACFM is not in a position to give predictions for the catches in 1985 for any of the sandeel fisheries in the North Sea.

In its May 1983 report, ACFM advised that considerable gains in yield per recruit could be obtained by avoiding the exploitation of O-group sandeels, particularly in the northern area. In the same report, ACFM further advised that, if the fishery were to be confined to May and June, it would effectively avoid the catch of O-group fish and would also reduce the high level of exploitation of 1-group fish in March-April. In recent years, about 70% of the annual sandeel catches have been taken in the May-June period.

This advice is given on a biological basis, since ACFM is not in a position to evaluate the economic aspects of the problem. The differences in possible benefits between areas suggest that there may be an advantage in adopting an area-based management policy for sandeel stocks.

At its meeting in May 1984, ACFM pointed to the possible improvement in advice on this question when more information became available on the predation mortality, since the yield-per-recruit calculations to a large extent depend on the assessment value of this parameter.

The problem in estimating the predation mortality has not yet been fully resolved, and until new estimates become available, ACFM repeats the advice given above.

3.2.4 Sprat

Sprat in Division IIIa

Landings of sprat in Division IIIa in 1984 were about 32,000 tonnes, the lowest since 1972. There are no effort data, and the catch-at-age data available are questionable. Catches by year and country are given in Table 3.2.4.1.

The IYFS survey in February 1985 indicates that the 1984 year class is poor.

A prediction of the yield based on IYFS indices indicates a catch in 1985 in the order of 30,000 - 40,000 tonnes (Figure 3.2.4).

Sprat in the North Sea

Landings of sprat from the North Sea are given in Table 3.2.4.2 for the years 1974-84. Landings in 1984 were 80,000 tonnes and thus lower than the 91,000 tonnes landed in 1983. Landings in recent years are well below the average of the annual landings in the preceding decade.

In the absence of an analytical assessment, it is difficult to assess the state of the stock accurately. Catch, total biomass and spawning stock biomass have all declined since the high levels in the mid-1970's. The reduction in spawning stock size, which appears to be particularly marked in 1983/84, corresponds to the reduced recruitment in recent years. 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 slight improvement in recruitment (1-group). Estimates based on past catch levels and recruitment indicate a catch in 1985 of about 120,000 tonnes, assuming the same level of fishing in 1985 as in previous years.

It is not clear to what extent the recent decline in the sprat stock is due to biological factors or to the effects of high fishing in earlier years. But the stock is certainly at a very low level, and for other stocks in a similar situation, ACFM has recommended that the fishery should be closed. ACFM is aware of the practical difficulties of such a recommendation but, nevertheless, considers that action must be taken in order to protect any new recruiting year class. ACFM, accordingly, recommends that the catch in 1985 be reduced from the 1984 level to the lowest practicable level, and ACFM prefers a TAC = 0.

Sprat in Division VIa

Landings from Division VIa in 1984 by the United Kingdom are shown in Table 3.2.4.3. Catch data from other countries were not available.

Channel sprat

The provisional landings for Divisions VIId,e for 1984 were about 4,000 tonnes. The catch taken by the United Kingdom in the Lyme Bay fishery was reduced to about 2,000 tonnes and has reverted to the level prior to the period 1980-83. Catches are given in Table 3.2.4.4.

The relationship between the Lyme Bay sprat population and those further offshore in the Western Channel is not known. It is, therefore, not possible to use the stock size and mortality estimates for the Lyme Bay population as a basis for management advice for the total area.

ACFM concluded that it was reasonable to assume that the Division VIIe stock is at a lower level than recorded in 1979-81, but there are no obvious reasons to expect changes in catches at the present level of fishing in the Western Channel.

3.3 Demersal Stocks in Division IIIa

As noted in previous ACFM reports, the advice on the demersal stocks in Division IIIa is based on tentative assessments. The lack of effort data for the demersal fleet makes it difficult to use analytical assessments as a basis for the ACFM advice. In recent years, a data series on log book information has been building up, and it is expected that this information will improve the basis for advice in 1986.

3.3.1 Cod

Cod in the Kattegat

Landings as shown in Table 3.3.1.1 decreased from 13,000 tonnes in 1983 to 12,000 tonnes in 1984. The landings have decreased gradually since the high level in the mid-1970's. Without effort data, it is difficult to explain this development. A tentative assessment indicates that the spawning stock and the catch have decreased at a similar rate and that the fishing mortality is high.

ACFM recommends a precautionary TAC based on recent catches in order not to increase the fishing mortality.

Cod in the Skagerrak

The landings are shown in Table 3.3.1.2. The table shows that landings have been decreasing from the high 1981 catch of 30,700 tonnes to a catch of 21,000 tonnes in 1984. However, the landings in 1984 are close to the average landings in the second half of the 1970's.

A tentative assessment for the Skagerrak and Kattegat combined suggests that the fishing mortality is high in Division IIIa and that the spawning stock biomass has declined during several years. On this basis, ACFM can only advise a precautionary TAC set separately for the Skagerrak and for the Norwegian coastal area of the Skagerrak and based on recent catches.

3.3.2 Plaice

Plaice in the Kattegat

The landings are shown in Table 3.3.2.1. The landings in both 1983 and 1984 were 3,600 tonnes. Compared to the landings in the 1970's, the landings in recent years have been very low, having been reduced to 25% of that earlier level.

A tentative VPA using an average F level as input in 1984 has been run. This VPA indicates that recruitment has dropped significantly since 1976, and this observation is supported by recruitment survey data. The improved recruitment of the 1982 year class has been followed by a weak 1983 year class.

On this basis, ACFM recommends a precautionary TAC for this area based on catches in recent years.

Plaice in the Skagerrak

Preliminary catch data, shown in Table 3.3.2.1, show that catches of 9,600 tonnes in 1984 were at the same level as in 1983. There was no basis for an analytical assessment, and ACFM recommends a precautionary TAC based on recent catch data.

3.3.3 Haddock

The officially reported landings are shown in Table 3.3.3. Landings decreased from 9,400 tonnes in 1983 to 8,600 tonnes in 1984. No data were available to allow for an analytical assessment, and ACFM can only advise a precautionary TAC based on catch levels in recent years.

3.3.4 Whiting

The officially reported landings are shown in Table 3.3.4. Landings increased from 12,000 tonnes in 1983 to 13,900 tonnes in 1984. No data were available to allow for an analytical assessment, and ACFM can only advise a precautionary TAC based on catch levels in recent years.

3.4 Cod, Haddock, Whiting and Saithe Stocks in the North Sea, Sub-Area IV

Recent landings and TAC's

Species	1981		1982		1983		1984			1985	
	TAC	Actual landings	TAC	Actual landings	TAC	Actual landings	Rec. TAC	Agreed TAC	Actual landings[1]	Rec. TAC	Agreed TAC
Cod	220	290	235	251	240	232	215	215	185	<259	250
Haddock	140	133	180	174	181	164	172	170	131	209	207
Whiting	150	96	170	100	170	99	102	145	83	118	160

[1]Provisional.
Weights in '000 tonnes.

3.4.1 Cod in the North Sea

Advice from the May 1985 ACFM Meeting

The assessment is based on human consumption fishery landings and excludes discards and industrial fishery by-catches. Landings provisionally reported for 1984 amounted to 185,000 tonnes(Table 3.4.1) which were 30,000 tonnes below the agreed TAC.

The 1983 year class was assumed to be of average abundance (214 million at age 1) at last year's Working Group meeting. Subsequent evidence from groundfish surveys indicated a higher abundance, and advice from the November 1984 ACFM meeting was based on an abundance of 400 million. The current estimate is virtually unchanged at 393 million. The indications are that the 1984 year class is a poor one. The IYFS gives an estimate of 164 million, and this has been taken as a preliminary estimate, although catches as 0-group in 1984 groundfish surveys suggest this could be an overestimate.

The level of fishing mortality in 1984 was estimated to be $F_{(3-8)}$ = 0.85 which is similar to the VPA back-calculated values values for 1983 and 1982. Fishing mortality on age groups 2 and 3 appears to have increased in recent years. In the long term, there has been a trend of steadily increasing overall fishing mortality.

Spawning stock biomass, on the other hand, has been on a declining trend since 1971 and is estimated to have been 107,000 tonnes in 1984, which is the lowest recorded value. A further decline to 94,000 tonnes in 1985 is expected to remain at this low level through to 1987.

The agreed TAC for 1985 is 250,000 tonnes, which is virtually identical with the current catch prediction (F unchanged) of 248,000 tonnes. Management options for 1986 are given in the text table below.

1985					1986				1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Total landings	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Total landings	Stock biom.	Spawn. stock biom.
				$F_{0.1}$			0.12	37	708	231
				F_{max}			0.19	57	673	215
				$F_{86} = 0.6F_{85}$			0.51	149	515	141
				$F_{86} = 0.8F_{85}$			0.68	182	460	116
478	94	0.85	248	$F_{86} = F_{85}$	433	93	0.85	210	415	95

Weights in '000 tonnes.
Stock biomass = fish of age 1 and older.
Spawning stock biomass using maturity ogive.
Exploitation pattern 1985-86 based on 1979-84 average.

ACFM notes that the 20-year trend of increasing fishing mortality, has, in recent years, been associated with changes in the method of fishing and a reduction in the average age of first capture The fishing mortality is too high, and the spawning stock biomass has been decreasing almost continuously since 1971. It is now estimated to be at its lowest level ever and less than the annual catch with the prospect of declining further in the immediate future. This is an unsatisfactory situation which gives cause for concern. In 1984, ACFM recommended that the 1985 catch should be smaller than that corresponding to the catch expected with unchanged fishing mortality (250,000 tonnes) in order to reduce that mortality and to take advantage of the strong 1983 year class to arrest the decline in spawning stock. The agreed TAC is 250,000 tonnes. More recent evidence from the new assessment and the 1985 fishery suggests that the estimates of both the 1983 and 1984 year classes used for prediction in the catch option table may be too generous. These will be reviewed at the November meeting, but ACFM considers it imperative that the fishing mortality be reduced substantially in 1986.

Advice from the November 1985 ACFM Meeting

In the May 1985 ACFM report, the catch prediction table for North Sea cod assumed total landings of cod at 248,000 tonnes in 1985 leading to a catch of 210,000 tonnes in 1986 at the same level of fishing mortality. This prognosis depended on estimates of recruitment of the 1983 and 1984 year classes which, from the very early results of the fishery in 1985, were suspected to be too generous, and ACFM indicated the situation would be reviewed at the November meeting.

English 1985 groundfish survey estimates now indicate the 1983 year class at 2 years old to number 229 million, about 14% less than the previous estimate of 266 million for the same age. This is corroborated by CPUE data in the English commercial fishery.

The 1984 year class was previously estimated at 164 million 1-year-old cod using IYFS data. Catch rates from the IYFS showed that this year class at age 1 in 1985 was about 30% of the 1983 year class, whereas the English and Netherlands survey estimates in 1985 indicate this year class to be less than 10% of that year class. The current estimate of 56 million fish was derived from a comparison of the abundance of 1-year-old cod from the EGFS and the corresponding estimates from VPA and comprises about 15% of the 1983 year class.

A revised forecast leads to an expected catch in 1985 of 216,000 tonnes which also corresponds more closely to the currently expected catch of just over 200,000 tonnes based on the international fishery in January - July.

Management options based on the revised estimates of the 1983 and 1984 year classes are given in the table below and in Figure 3.4.1.

1985				1986					1987	
Stock biom. (1+)	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch (1+)	Management option	Stock biom. (1+)	Spawn. stock biom.	$\bar{F}_{(3-8)}$	Catch (1+)	Stock biom. (1+)	Spawn. stock biom.
380	92	0.85	216	F_{max}	347	85	0.19	48	541	173
				$F_{86} = 0.75\ F_{85}$			0.64	128	409	102
				$F_{86} = F_{85}$			0.85	154	370	81

Weights in '000 tonnes.
Stock biomass = fish of age 1 and older.
Spawning stock biomass using maturity ogive.
Exploitation pattern 1985-86 based on 1979-84 average.

1983 year class at age 2 in 1985 = 229 million
1984 year class at age 1 in 1985 = 56 million
1985 year class at age 1 in 1986 = 208 million

The English and Netherlands surveys both gave preliminary estimates for the 1983 and 1984 year classes as 0-group fish and gave warning of the sharp changes in stock and catches to be expected at the present time. The Netherlands survey in 1985 suggests the 1985 year class could be above average in the southeast North Sea. The English survey gives a slightly below-average figure for the North Sea as a whole. Using this to project forward, spawning stock size will fall to around 80,000 tonnes in 1986-89 if the present level of exploitation is maintained, and to less than 50,000 tonnes if the catch in 1986 is maintained at recent levels. This would require an increase of 60% in fishing mortality.

The level of fishing mortality on North Sea cod has increased steadily and is now four times F_{max}. The spawning stock size is at a historically low level (much lower than previously-recorded lows at 175,000 tonnes in 1963 and 1977-79) and the 1984 year class is estimated to be the smallest ever. As a result of the high level of mortality and the unfavourable exploitation pattern, over 80% of the catch in 1986 will come from immature fish. This dependence on two age groups, combined with the variability of recruitment, will continue to cause sharp fluctuations in the catch at a given level of fishing mortality.

ACFM is unable to judge whether the low level of spawning stock will affect recruitment, but to continue catches at the recent levels will result in further declines in spawning stock size and must be a biologically unacceptable risk. It is imperative that catches be reduced in 1986. This stock now falls into Category 2 of the criteria for management advice (see Introduction) which requires the recommendation by ACFM of a specific catch option. Accordingly, ACFM recommends that fishing mortality be reduced significantly below the level of 1985 and towards F_{max}, and that catches in 1986 should not exceed 130,000 tonnes.

A review of the exploitation pattern for the stock also emphasises the proportionally greater increase in the level of fishing mortality on 2- and 3-year-old cod compared to other age groups. This is related to the geographical distribution and balance of fishing between countries, and whilst the appropriate mesh size for cod is well in excess of 80 or 90 mm, nevertheless, in the present situation concerning the decline in spawning stock, the implementation and enforcement of 90-mm mesh presently under consideration would enable a small increase in the proportion of the stock that survives to spawn.

3.4.2 Haddock in the North Sea

Total landings provisionally reported for 1984 were 131,000 tonnes (Table 3.4.2) which is 39,000 tonnes below the TAC of 170,000 tonnes. The landings included 10,000 tonnes estimated to have been taken as by-catch in the industrial fisheries. In addition, 72,000 tonnes were estimated to have been discarded at sea.

Following the abundant 1979 year class, the 1980-82 year classes have been below average strength. The 1983 year class is estimated from IYFS data to be 3,027 million at age 1 (4,397 million at age 0), which is the most abundant since the 1974 year class. The preliminary IYFS data for the 1984 year class gives an estimate of 580 million at age 1 (767 million at age 0).

Fishing mortality in 1984 was estimated by the catchability analysis method for ages 2-10, and for age groups 0 and 1 from catch data and year-class strength as estimated from IYFS indices. This resulted in atypically low values for F on ages 0 and 1. This could arise from underestimation of the catches of these age groups or overestimation of the 1983 and 1984 year classes in the IYFS. There is no reason to expect major reduction in the F on 0- and 1-groups, and all the evidence confirms the 1983 year class to be a strong one. Recognising these uncertainties, ACFM accepted the assessment. Fishing mortality on age groups 0 and 1 in 1984 was, therefore, taken to be equal to the 1978-81 average for these age groups. These adjustments imply an increase in estimated catches (by-catches/discards) of 0- and 1-year-old haddock of som 37,000 tonnes.

The level of fishing in the human consumption fishery in 1984 was $F_{(2-6)} = 0.85$.

On the basis of fishing mortality in the human consumption fishery being unchanged in 1985, the above interpretation of the fishery leads to predicting landings of 216,000 tonnes in 1985, close to the 1985 TAC of 207,000 tonnes. Predictions for a range of management options in 1986 are given in the text table below and in Figure 3.4.2. The level of fishing mortality at F_{max} is about 40% of the present level of fishing mortality, and ACFM, therefore, recommends a reduction in fishing mortality in 1986 towards F_{max}.

1985				1986								1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-6)}$	Total landings	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-6)}$	Total landings	H.C. landings	Indust. landings	Discards	Stock biom.	Spawn. stock biom.
				F_{max}	612	295	0.35	141	110	31	31	-	381
				$F_{86} = 0.8F_{85}$			0.68	211	181	29	49	649	290
	261	0.85	216	$F_{86} = F_{85}$			0.85	239	210	28	58	600	253

Weights in '000 tonnes.

Recruitment R_0 = 2,455 million in 1985-86.

Stock biomass = fish of age 0 and older.

Spawning stock biomass using maturity ogive.

Exploitation pattern 1985-86 based on 1979-84 average.

F values relate to human consumption fishery (landings + discards) only.

3.4.3 Whiting in the North Sea

Landings provisionally reported for 1984 were 93,000 tonnes (Table 3.4.3), which is substantially lower than the TAC of 145,000 tonnes in the preceding years, had been set at an unrealistically high level. Landings included 19,000 tonnes taken as by-catch in industrial fisheries. In addition, 39,000 tonnes were estimated to have been discarded at sea.

The 1980-82 year classes were of low abundance. The 1983 year class has been estimated from IYFS data to be of about average abundance at 1,631 million at age 1 (2,724 million at age 0) and that of 1984 to be 1,392 million at age 1 (1,871 million at age 0).

Fishing mortality in 1984 was estimated by the catchability analysis method for age groups 2-7. For age groups 0 and 1, F values were determined from catch numbers and year-class strengths as derived from IYFS data. As with haddock, the resultant F values for age groups 0 and 1 are low compared with earlier years, most probably as a result of underestimation of the catches. On the basis of amended catch numbers and fishing mortality in age groups 0 and 1, the predicted landings for 1985 at the same fishing mortality are 117,000 tonnes (close to the prediction of 119,000 tonnes given last year).

This figure is substantially less than the TAC for that year (160,000 tonnes) which is considered unrealistically high.

Management options for 1986 are given in the text table below and in Figure 3.4.3. If the management objective is to maximize the yield of whiting, ACFM recommends that the fishing mortality be reduced towards F_{max}. It was noted by ACFM, however, that whiting prey heavily on other species, so this objective may be influenced by future ICES advice on possible multispecies approaches to management.

1985				1986								1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-6)}$	Total landings	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-6)}$	Total landings	H.C. landings	Indust. landings	Discards	Stock biom.	Spawn. stock biom.
				$F_{86} = 0.6F_{max}$	520	339	0.41	104	50	54	34	620	433
				$F_{86} = 0.8F_{85}$			0.64	124	72	51	50	579	395
470	308	0.80	117	$F_{86} = F_{85}$			0.80	135	85	50	61	553	370

Weights in '000 tonnes.

Recruitment R_o = 2,672 million in 1985-86.

Stock biomass = fish of age 0 and older.

Spawning stock biomass using maturity ogive.

Exploitation pattern 1985-86 based on 1979-84 average.

F values relate to human consumption fishery (landings + discards) only.

3.4.4 Comment on the exploitation pattern in North Sea roundfish

More generally, the younger age groups of cod, haddock and whiting are being too heavily exploited throughout the North Sea. For cod, this arises through changes in the fishery and the exploitation pattern and leads to a further deterioration in the situation summarised earlier. For haddock and whiting, it arises from a combination of the by-catch in the industrial fishery and discards of the youngest age groups in the human consumption fishery.

The loss of juvenile fish leads to a reduction in the yield per recruit of all three species. Management measures to improve the situation include increased mesh size. ACFM has considered this issue on several occasions and in its 1984 report advised that the present effective mesh size for the North Sea trawl fisheries as a whole is not known but an increase of 10 mm in the present effective mesh would have the following effect:

> "... for the haddock and whiting stocks in the North Sea as a whole there would be immediate losses in the human consumption fisheries of around one third for whiting and about one sixth for haddock. The major party of these losses would be offset by the third year, following effective implementation and thereafter ACFM would expect a longer term gain of the order of 10% for whiting and 20% for haddock. Discards in the first year would be reduced by 40- 50% for both species."[1]

ACFM also noted that 90-mm mesh size has already been implemented in the Norwegian zone of the North Sea.

The appropriate mesh size for cod and plaice is already known to be larger than 90 mm, so the exploitation pattern of these species which is also of concern would be improved. The longer-term benefits for sole are less certain, but for this species also the stock would benefit from an improved exploitation pattern which reduced the level of exploitation of the youngest age groups.

3.4.5 Saithe in the North Sea (Sub-area IV and Division IIIa)

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec. TAC	Catch	Rec. TAC	Catch	TAC	Catch	TAC	Catch	TAC
127	127	100	162	97[1]	157	160[1]	172	195[1]

[1]Catch corresponding to F_{max} level.
Weights in '000 tonnes.

[1]Coop.Res.Rep. No.131, p.67.

Advice from the May 1985 ACFM Meeting

Officially reported landings for 1983 and 1984 were 157,600 tonnes and 172,000 tonnes, respectively, including by-catches of 1,500 tonnes and 5,600 tonnes by industrial fisheries (Table 3.4.5). Working Group estimates of total catches of 165,000 tonnes in 1983 and 200,000 tonnes in 1984 were used in the assessment.

After a peak in 1976, landings of North Sea saithe decreased sharply, following the new jurisdiction, to 110,000-130,000 tonnes in 1979-81. They increased again in recent years as an effect of increased effort by Norwegian trawlers which, together with French and German trawlers, now make the largest part of catches in the North Sea.

The 1985 Working Group assessment was based on a VPA with input F's which were tuned to the mean F value for the period 1980-82. This was done to reflect changes in the exploitation pattern which have taken place since 1979. By adopting this method, the fishing mortalities in the recent years are substantially higher than in the 1984 assessment. That assessment was based on the relationship between fishing mortality and total fishing effort. Effort data for 1984 were available to the Working Group. A CPUE index plotted against spawning stock biomass from the VPA suggests that the VPA value is too low. To overcome this, lower input F's in 1984 were required. The Working Group, however, rejected this on the basis that "there was no independent evidence to suppoirt such a change".

ACFM felt that there were large uncertainties in this assessment.

ACFM will review this at its November meeting when there will be new data available from the fisheries and from 1984 and 1985 acoustic surveys on this stock carried out by Norway.

If the management bodies need a TAC before the November meeting, it can be set at the 1985 preferred level of 195,000 tonnes.

Advice from the November 1985 ACFM meeting

In reviewing the Working Group assessment of the saithe stock in the North Sea at the May meeting, ACFM felt that there were large uncertainties in this assessment. Therefore, ACFM intended to review this again at its November meeting when there would be new data available from the fisheries and from acoustic surveys on this stock carried out by Norway.

Catch and age composition data were available at this meeting for the first half of 1985 as well as the results of the Norwegian acoustic survey from July 1985.

The catch in this period amounted to about 95,000 tonnes, of which 75% was covered by age sampling. Using this information and based on the stock size estimated by the Working Group for the beginning of 1985, stock size and its age composition at the end of July 1985 was calculated.

The results of this calculation were consistent with the results of the acoustic survey and, in particular, with the estimate of the abundant 1982 year class. On this basis, ACFM now accepted the Working Group assessment.

Available information on the 1985 fishery indicates that the catch will not exceed the TAC of 200,000 tonnes, and it is likely to be slightly below that level. Therefore, projections of catches in 1986 and resulting biomasses for 1987 for various levels of fishing mortality were calculated assuming a 1985 catch corresponding to the TAC. Management options are given in the text table below and in Figure 3.4.5.

1985				1986					1987	
Stock biom. (1+)	Spawn. stock biom. (5+)	$\bar{F}_{3-6}$	Catch (1+)	Management option	Stock biom. (1+)	Spawn. stock biom. (5+)	$\bar{F}_{3-6}$	Catch (1+)	Stock biom. (1+)	Spawn. stock biom. (5+)
1,075	343	0.30	200	$F_{0.1}$	1,147	463	0.12	105	1,292	823
				F_{max}			0.23	191	1,187	731
				$F_{86} = F_{85}$			0.30	243	1,122	675
				$F_{86} = F_{84}$			0.41	310	1,039	605

Weights in '000 tonnes.

The very abundant 1982 year class offers the possibility to increase both the total stock biomass and the spawning stock biomass while maintaining the present level of catch and reducing fishing mortality to the F_{max} level. <u>ACFM, therefore, confirms the preliminary advice given in its May report that the preferred level of catch in 1986 is 195,000 tonnes.</u>

3.5 <u>Cod, Haddock, Whiting and Saithe Stocks in Sub-Areas VI and VII</u>

Recent landings and TAC's

Species	1981		1982		1983		1984			1985	
	TAC	Actual landings	TAC	Actual landings	TAC	Actual landings	Rec. TAC	Agreed TAC	Actual landings[1]	Rec. TAC	Agreed TAC
Cod VI	20.0	24.8	17.5	22.4	27.0	21.5	24.5	25.0	21.1	27.5	25.0
Haddock VIa	15.5	18.4	15.5	30.0		31.3	27.0		30.0	25.0	
					45.0			40.0			36.0
Haddock VIb	6.0	9.0	6.0	7.0		0.4	+		2.4	8.0	
Whiting	16.4	18.5	13.0	14.3	16.0	16.0	13.0	16.4	16.2	12.0	16.4

[1] Provisional

Weights in '000 tonnes.

Estimation of fishing mortality in 1984

F values for 1984 were taken as a 4-year average of reasonably converged VPA values for the period 1978-81. Where year-class strengths of recruiting year classes were available, these were used to tune the F values for the youngest age groups.

3.5.1 Cod in Division VIa

Landings provisionally reported for 1984 were 21,100 tonnes, which differs little from reported landings for the previous two years (Table 3.5.1).

No direct pre-recruit survey data are available and, unlike haddock and whiting, there is no correlation of West of Scotland year-class strength with year-class strength in the North Sea. Scottish seiner catch-per-unit-effort data have been used to provide an estimate of the 1983 year class of 19 million at age 1. The 1984 and later year classes have been assumed to be 12.5 million which is an average of the higher level of recruitment recorded in recent years (1977-81).

Fishing mortality level at about $\bar{F}_{(3-4)} = 0.8$ appears not to have changed greatly in recent years. If fishing mortality remains unchanged in 1985, the expected landings are 26,000 tonnes which is in reasonable accord with the TAC of 25,000 tonnes for the whole of Sub-area VI. Predicted landings for 1986 for a range of management options are given in the text table below and in Figure 3.5.1.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{3-4}$	Total landings	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{3-4}$	Total landings	Stock biom.	Spawn. stock biom.
				$F_{0.1}$			0.17	6	84	50
				F_{max}			0.30	10	79	46
				$F_{86} = 0.8F_{85}$			0.64	22	61	32
63	27	0.80	26	$F_{86} = F_{85}$	61	29	0.80	25	56	27

Weights in '000 tonnes.
Stock biomass = fish of age 1 and older.
Spawning stock biomass using maturity ogive.
Exploitation pattern 1985-86 based on 1979-84 average.

The expected fishing mortality rate in 1985 is still higher than F_{max}, and ACFM recommends that fishing mortality in 1986 is reduced towards F_{max}.

3.5.2 Cod in Division VIb

Only small quantities of cod are normally taken in Division VIb (Table 3.5.2). The TAC adopted on the basis of the assessment for Division VIa should be increased by 500 tonnes, to allow for catches from Division VIb, and applied to the whole of Sub-area VI.

3.5.3 Haddock in Division VIa

The assessment for this stock is based on the total catch including discards. Provisional reports indicate that landings in 1984 were 30,000 tonnes, maintaining the high level of landings recorded in the previous two years (Table 3.5.3).

Estimates of the size of the 1983 and 1984 year classes at age 1 have been derived from the North Sea IYFS via the North Sea/West of Scotland year-class strength correlation. The present estimate for the 1983 year class is 270 million at age 1 (332 million at age 0). The 1984 year class appears to be much smaller at 42 million at age 1 (51 million at age 0). The long-term average (excluding the very large 1967 year class) is 169 million at age 0 (124 million at age 1).

ACFM noted the acknowledged poor quality of the data base for this stock. Although a similar assessment was accepted in 1984, ACFM considers that the data for this stock be reviewed and the assessment confirmed by additional information. In the meantime, ACFM advises that a precautionary TAC be set based on the historic landings in Table 3.5.3 and including at least 1981-84.

3.5.4 Haddock in Division VIb

The earlier history of this fishery was reviewed by ACFM in 1984. In 1983, minimal fishing took place and only 400 tonnes were reported, but landings increased again to 2,400 tonnes in 1984 (Table 3.5.4).

The stock was monitored during the period 1981-83 by groundfish surveys which provided the basis of recent assessments.The 1980 and 1981 year classes were very abundant, but those of 1982 and 1983 appear to be virtual failures, as were those of 1975, 1978 and 1979. No survey was undertaken in 1984 and, as a result, the assessment cannot be updated. Limited monitoring of commercial landings during 1984 provides no indication of any significant recruitment since the 1981 year class, and the fishery is, therefore, expected to be dependent mainly on the 1980 and 1981 year classes, with some contribution from survivors of earlier abundant year classes. In the absence of an analytical assessment, a TAC of 5,000 tonnes is suggested.

3.5.5 Whiting in Division VIa

The assessment is based on human consumption landings only. Landings provisionally reported for 1984 were 16,000 tonnes which is about average for recent years (Table 3.5.5.1).

Estimates of the size of the 1983 and 1984 year classes at age 1 have been derived from North Sea IYFS data using a North Sea/West of Scotland year-class strength correlation. The abundance estimates were 78 million and 66 million for the 1983 and 1984 year classes, respectively. For subsequent year classes, average recruitment of 90 million was assumed.

Fishing mortality is currently estimated as $F_{(2-4)} = 0.59$. At At this level of fishing mortality, landings of 14,000 tonnes are predicted for 1985 (TAC for the whole of Sub-area VI is 16,400 tonnes). Predicted landings for a range of levels of fishing mortality in 1986 are given in the text table below and in Figure 3.5.5. The present level of fishing mortality in the stock is at or approaching the flat top of the yield-per-recruit curve and accordingly, <u>ACFM recommends that fishing mortality should not be increased above the 1984 level.</u>

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-4)}$	Total landings	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-4)}$	Total landings	Stock biom.	Spawn. stock biom.
				$F_{86} = 0.6F_{85}$			0.35	9	55	37
				$F_{86} = 0.8F_{85}$			0.47	11	52	34
44	31	0.59	14	$F_{86} = F_{85}$	47	29	0.59	13	50	32

Weights in '000 tonnes.
Stock biomass = fish of age 1 and older.
Spawning stock biomass using maturity ogive.
Exploitation pattern 1985-86 based on 1979-84 average.

3.5.6 <u>Saithe in Sub-area VI</u>

Recent landings and TAC's

1981		1982		1983		1984		1985
Rec. TAC	Catch	Rec. TAC	Catch	TAC	Catch	TAC	Catch	TAC
27	24	25	22	23[1]	27	27[1]	20	26[1]

[1] Catch level preferred by ACFM.
Weights in '000 tonnes.

Following a peak of 41,000 tonnes in 1976, landings decreased to a steady level of 20-27 thousand tonnes. They amounted to 20,300 tonnes in 1984 (Table 3.5.6).

As in recent years, French vessels took a major part of the catches, and the annual fluctuations reflect changes in the amount of their effort aimed at saithe, which shows a decreasing trend.

As a consequence of decreased fishing efforts in this area since 1976, the current levels of fishing mortality are so low that VPA fails to provide reliable results.

Reference was thus made to the available time series of catches, fishing mortalities, recruitment, spawning biomass and French cpue (Figure 3.5.6). They all indicate that the stock is not in any immediate danger on biological grounds.

As a first trial to introduce cpue-based approaches, status quo catches were estimated from a relationship between catches and total effort in the last decade. With the current fishing effort, they should lie in the 18,000- to 20,000-tonne range for 1986.

3.5.7 Cod, haddock and whiting stocks in Sub-area VII

Cod:	Divisions VIId,e; VIIb,c,g-k
Haddock:	Divisions VIId,e; VIIb,c,g-k
Whiting:	Divisions VIId,e; VIIb,c,g-k.

The data do not yet permit analytical assessments for these stocks. Historical landings data are given in Tables 3.5.7.1-3.5.7.6.

3.6 Irish Sea/Bristol Channel and Celtic Sea Stocks

Review of the 1984 and 1985 catch and TAC levels

Concern has been expressed about the quality of catch data for several stocks. There are problems of allocating catches between Divisions VIIa and VIIg because many vessels split their trips between the two areas. There is likely to be more underreporting of landings as catch quotas are enforced more rigorously or, alternatively, the proportion of fish which is discarded may increase. There is also evidence that the area of landing is being misreported. The advent of log books may help to some extent.

The text table below shows the TAC's and actual catches for 1984, together with the predicted catch. The catches predicted for 1985 from this year's assessment assume, in every case, that fishing mortality in 1985 will remain unchanged.

The TAC's for cod and whiting in the Irish Sea are far higher than the actual catches and so could, in theory, allow fishing mortality to rise. ACFM does not, however, regard this as a matter for concern, because the high TAC's are partly to allow for allocation problems arising from the Hague preference. Also in the case of cod, there is uncertainty about the best management objective, given the biological interaction with Nephrops. If a more positive regulation of the fishery for these two species is considered necessary, then conservation measures aimed at reducing the mortality on young fish should be instituted, rather than attempting to regulate fishing mortality through the TAC's.

For Irish Sea plaice and sole, the catches now being predicted for 1985 are considerably higher than the previous predictions (19% in both cases) and are very close to the TAC's for 1985. This means that the TAC's may act to restrain fishing mortality at the present level or possibly reduce it slightly in the case of plaice, because of the way in which the national allocations are made. For example, the United Kingdom fleet would be expected to take just over 3,000 tonnes of plaice in 1985 and the Irish fleet 1,700 tonnes, but their quota allocations are 2,550 and 2,000 tonnes, respectively, so that the overall TAC is unlikely to be taken unless there are swap agreements similar to last year.

Species	1984			1985	
	Agreed TAC	Pred. landings	Actual landings	Agreed TAC	Pred. landings
Division VIIa					
Cod	15,000	8,800	8,315	15,000	8,300
Whiting	18,170	9,400	11,694	18,170	15,700
Plaice	4,500	3,800	4,175	5,000	5,000
Division VIIf,g					
Whiting	-[1]	-	9,478	-[1]	9,000
Plaice	1,200	-	1,398	1,400	1,400
Sole	1,200	1,200	1,412	1,200	1,300

[1]TAC covers wider area.
Weights are in tonnes.

3.6.1 Irish Sea cod

Landings in 1984 fell by 17% to 8,315 tonnes and are back to the level of 1979 (Table 3.6.1). Fishing mortality dropped during 1983 and 1984, but it is twice the level corresponding to the maximum of the yield-per-recruit curve. The spawning stock biomass calculated for 1985 (9,000 tonnes) is also lower than it has been for four years and is just above the average for the period 1968-83 (8,900 tonnes).

From the evidence of young fish surveys and the high numbers of 1-year-old fish caught in 1984, it appears that fishing mortality on 1-year-olds was high in 1984. If the fishing mortality on 1-year-old cod were eliminated, then the yield per recruit would be 15% higher at the present level of exploitation (see Figure 3.6.1.1). This is a greater increase in yield per recruit than can be achieved by reducing the overall fishing mortality on cod. Enforcement of the existing 45-cm minimum landing size would help to reduce the mortality on 1-year-old cod, but in 1984, many were caught earlier in the year when the 45-cm regulation does not apply. If the high mortality on 1-year-old cod continues, then other ways of regulating directed fisheries on codling should be explored.

Recruitment of 1-year-old cod in 1982 and 1983 was below average, but the young fish survey in 1984 indicated the 1983 year class to be of average abundance. In the forecast, average recruitment has been assumed.

Catch options for 1986 are shown in the text table below and in Figure 3.6.1.2.

1985				1986						1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{1-6}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{1-6}$	Catch		Stock biom.	Spawn. stock biom.
22,700	8,900	0.52	8,300	$F_{0.1}$	24,700	11,700	0.16	3,400		35,200	19,400
				F_{max}		11,100	0.26	5,200		32,400	16,400
				$F_{86} = 0.8F_{85}$		10,100	0.42	7,800		28,500	12,500
				$F_{86} = F_{85}$		9,500	0.52	9,300		26,200	10,400

Weights are in tonnes.
Spawning stock at spawning time.

The maximum of the yield-per-recruit curve is at 50% of the estimated level of fishing mortality in 1984. <u>Fishing mortality should, therefore, not be allowed to rise, but interactions between cod and Nephrops should be taken into account when considering the management strategy for Irish Sea cod.</u>

3.6.2 <u>Irish Sea whiting</u>

Human consumption landings in 1984 rose by 16% and are slightly below the average for the period 1975-83 (Table 3.6.2). Problems with the whiting database are fully discussed in the Working Group Report (C.M.1985/Assess:10), and a decision was made to restrict the assessment to the years 1980-84 when data for Northern Ireland have been made available. Because of this, very little can be said about trends in stock biomass.

Similarly, information on discarding can only be used for the years 1980-84. The total weight of whiting discarded in the <u>Nephrops</u> fishery (mainly 0-group and 1-group fish) was 4,225 tonnes in 1984, which is the highest figure in the 5-year series.

The maximum of the conditional yield-per-recruit curve (including whiting discard mortality in the <u>Nephrops</u> fishery) is at about one-third of the present level of fishing mortality, which is 0.98.

Recruitment strength (as 0-group fish) in 1983 was double the average. In the forecast, average recruitment for the 1984 and subsequent year classes has been assumed, and this has a strong influence on the predicted spawning stock biomasses.

Catch options for 1986 are given in the text table below and in Figure 3.6.2.

1985				1986						1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-7)}$	Total landings	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-7)}$	Landings	Dis-cards	Stock biom.	Spawn. stock biom.
30	24	0.98	15.7	$F_{0.1}$	28	22	0.20	4	0.5	39	33
				F_{max}			0.33	7	0.8	36	30
				$F_{86} = 0.8F_{85}$			0.78	14	1.6	28	21
				$F_{86} = F_{85}$			0.98	16	2.0	25	18

Weights in '000 tonnes.
Spawning stock at 1 January.

On the basis of the present assessment, <u>the level of fishing mortality is much greater than that corresponding to the maximum of the yield-per-recruit curve, and should be reduced.</u>

<u>As a first step, however, the most beneficial management advice for this stock would be to reduce the whiting discards in the Nephrops fishery by increasing the Nephrops mesh size in use or by using separator trawls.</u>

3.6.3 <u>Irish Sea plaice</u>

Landings in 1984 rose by 15% and are above the average for the previous ten years (Table 3.6.3). Fishing mortality in 1984 is estimated to have been 0.44, which is slightly lower than the 1983 level. It is, however, four times the level corresponding to the $F_{0.1}$ reference value.

Spawning biomass at the beginning of 1985 (6,139 tonnes) is slightly below the average of the period 1964-84, but 25% above the average of the last ten years. The pre-recruit surveys do not provide a very good index of recruitment, but they are consistent in showing above average recruitment for the 1981, 1982 and 1983 year classes. Although spawning stock biomass can, therefore, be expected to increase, this forecast and the predicted catch levels depend to a large extent on the assumptions concerning recruitment strength.

Management options for 1986 are shown in the text table below and in Figure 3.6.3.

1985				1986						1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{3-12}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{3-12}$	Catch		Stock biom.	Spawn. stock biom.
10,600	6,100	0.44	5,000	$F_{0.1}$	10,600	7,100	0.11	1,500		13,400	10,000
				$F_{86} = 0.8F_{85}$		6,700	0.35	4,200		10,700	7,100
				$F_{86} = F_{85}$		6,600	0.44	5,000		10,000	6,700

Weight in tonnes.
Spawning stock at spawning time.

The yield-per-recruit curve for this stock is flat-topped, which indicates that, in the present situation, fishing mortality could be reduced without reducing the long-term yield. This would, at the same time, improve the biomass of the spawning stock and, therefore, catch rates in the fishery.

3.6.4 Irish Sea Sole

Advice from the May 1985 ACFM Meeting

Preliminary data on landings in 1984 showed a decrease of 11% to 1,041 tonnes, the lowest figure since 1968 and 25% below the average for the period 1975-84 (Table 3.6.4). The present level of fishing mortality (0.26) is close to the maximum of the yield-per-recruit curve.

Spawning biomass at the beginning of 1985 is higher than it has been since 1981, but is 15% below the average for the period 1975-84. The 1981 year class is estimated from commercial catch-per-unit-effort data to be above average; this year class will account for 45% of the 1986 catch.

Catch options for 1986 are as follows:

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{4-12}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{4-12}$	Catch	Stock biom.	Spawn. stock biom.
5,500	4,600	0.26	1,200	$F_{0.1}$	5,600	4,800	0.13	700	6,200	5,300
				$F_{86} = 0.8F_{84}$		4,800	0.21	1,100	5,800	4,900
				$F_{86} = F_{84}$		4,700	0.26	1,400	5,600	4,700
				$F_{86} = F_{max}$		4,700	0.31	1,600	5,400	4,500

Weight in tonnes.
Spawning stock at spawning time.

ACFM recommends that fishing mortality on this stock should not be allowed to rise.

The catch prediction may be adjusted in November 1985 when information about the abundance of the 1982 year class will be available from Belgian and United Kingdom fisheries data.

Advice from the November 1985 ACFM Meeting

In May 1985, ACFM advised that fishing mortality on this stock, being close to the F_{max} value, should not be allowed to rise. As also stated in that report, some adjustments have now been made to the forecasts of catch and stock in the light of up-to-date information on the strength of the 1982 year class in the 1985 landings.

Catch-per-unit-effort (CPUE) data from the Belgian fishery give estimates of this year class of 21-23 million 2-year-old fish, derived respectively from first and second quarter statistics. These values are about three times greater than the average value of 6.9 million, which had been used in the original assessment and on which ACFM's advice in May was based, and are considerably higher than any previously seen. ACFM felt it would be prudent to use a more cautious estimate, and adopted a value of 15 million fish, which is derived from 1985 Belgian first quarter data by a different method. This figure approaches the abundance of the 1975 year class (16.5 million) which is the highest in the time series.

The estimate for the 1981 year class of 14 million 2-year-old fish has been kept unchanged from the earlier assessment, and thus two good year classes appear to have recruited in successive years. No United Kingdom data, however, are currently available to help in estimating the strength of either the 1981 or the 1982 year class.

Sole of the 1981 and 1982 year classes will account for 31% and 26%, respectively, of the 1986 catch, according to the present calculations.

A management option table is given below and is illustrated in Figure 3.6.4. Compared with the figures in the corresponding table in the May 1985 ACFM report, the new information on the strength of the 1982 year class (raising it from 6.9 million recruits to 15 million) has resulted in an increase of 20-25% in the forecast catches for 1986, and an increase of 15-20% in the stock biomasses (both total stock and spawning stock) for 1986 and 1987.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-12)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-12)}$	Catch	Stock biom.	Spawn. stock biom.
6,500	5,500	0.26	1,350	$F_{0.1}$	6,600	5,700	0.13	900	7,100	6,200
				$F_{86} = 0.8F_{84}$		5,700	0.21	1,400	6,700	5,800
				$F_{86} = F_{84}$		5,600	0.26	1,650	6,400	5,500
				F_{max}		5,600	0.31	1,900	6,200	5,200

Weight in tonnes.
Spawning stock biomass at time of spawning.

Assuming that two good year classes have in fact entered the fishery, it is calculated that the spawning stock biomass will remain stable to 1987 if the 1984 level of fishing mortality is not exceeded. Even if the estimated abundance of the 1981 year class is reduced by 35% to 9 million recruits (as suggested by some of the Belgian CPUE data from 1984), the spawning stock biomass will remain stable at about 5,000 tonnes through to 1987. Catches in 1986 under either of these scenarios will be 1,400 - 1,600 tonnes. The present spawning stock biomass of 5,000 - 5,500 tonnes can be compared with the extremes in the time series: 4,200 tonnes in 1982 and 8,400 tonnes in 1970. Within this observed range, there is no indication that recruitment is reduced at low levels of spawning stock biomass.

On yield-per-recruit considerations, however, increasing the level of exploitation cannot be expected to lead to increased catches. <u>ACFM, therefore, reiterates its preference that fishing mortality, which is close to the F_{max} value, should not be allowed to rise.</u>

3.6.5 <u>Celtic Sea sole</u>

Preliminary data on landings in 1984 showed a small increase to 1,412 tonnes, which is the highest value ever recorded for this area and is 24% above the average for the period 1975-84 (Table 3.6.5).

The only available catch-per-unit-effort data (from Belgium) are not sufficiently representative to form the basis of an analytical assessment because of an enforced shift in the fishing grounds of the Belgian fleet from 1983 onwards. There are also indications that these beam trawlers might have directed their fishing onto species other than sole.

<u>ACFM, therefore, recommends a precautionary TAC for 1986, based on the catch levels of recent years.</u>

The abundance of the 1981 year class as 2-year-olds in 1983 was estimated from commercial catch-per-unit-effort data as being slightly above average, and the recruitment of subsequent year classes is assumed to be average.

3.6.6 Celtic Sea cod

To date, the TAC for this stock has included all of Sub-areas VII and VIII except Division VIIa, but the following advice applies only to Divisions VIIf+g. The preliminary catch figure for 1984 is 5,350 tonnes, which is close to that of 1983 (Table 3.6.6.1). France catches 90% of this, and the effort by the French fleet fishing for gadoids and demersal species fell by 21% in 1984 as they moved to grounds west of Ireland and Scotland.

Because of difficulties in deriving the current exploitation level, ACFM could not accept the basis for the analytical assessment carried out by the Working Group this year, and recommends a precautionary TAC based on the annual catches of recent years. A status quo catch (SQC) forecast indicates catches for both 1985 and 1986 as being between 5,000 and 6,000 tonnes (Table 3.6.6.2). ACFM recommends that the 1986 TAC should be within this range.

3.6.7 Celtic Sea whiting

To date, the TAC for this stock has included all of Sub-area VII except Division VIIa, but this assessment applies only to Divisions VIIf+g. Preliminary figures for landings in 1984 are 9,678 tonnes, an increase of 18% compared with 1983 (Table 3.6.7). France took 94% of the total landings, most of it in Division VIIg. Because of uncertainties in the age determination, French data were not available, but it is expected that the exchange of otoliths and experience in age reading will improve the data base in the future.

The inadequacy of available data prevents an analytical assessment from being carried out, and ACFM recommends a precautionary TAC based on the annual catches of recent years. The status quo catch forecast for 1986 is between 6,500 and 10,700 tonnes, but the most likely figure is in the range of 7,600 to 9,700 tonnes.

ACFM recommends a precautionary TAC for 1986 of 8,000-10,000 tonnes.

3.6.8 Celtic Sea plaice

Preliminary data on landings in 1984 show an increase of 19% to 1,398 tonnes, which is the highest figure since 1968 and 37% above the average of the last ten years (Table 3.6.8). Plaice is mainly caught as a by-catch of the directed fishery on sole by Belgian and UK beam trawlers, and as a by-catch of whiting and cod by French and Irish otter trawlers.

Although some data on age structure were available for Belgium and UK landings, this was inadequate for an analytical assessment.

The status quo catch method gives a forecast catch for 1986 in the range of 1,200 to 1,600 tonnes, allowing for the likely range of variability of recruitment.

Because plaice are mainly caught as a by-catch in this area, the enforcement of a TAC can lead to increased discarding and no reduction in fishing mortality. In the circumstances, it is questionable whether this TAC achieves any conservation purpose. Commercially, this stock is much less important than several others in the area (e.g., monk, megrim, rays, spurdog, hake), and a rigid management system on plaice as a by-catch of these valuable fisheries causes major disruption of the latter.

If managers, nevertheless, regard it as justifiable to manage the Celtic Sea plaice by TAC, a precautionary TAC could be set in the range of 1,200 - 1,600 tonnes.

3.6.9 Irish Sea mesh assessment

There are two proposals for mesh increases in the Irish Sea which may come into force in July 1986: 1) to increase the *Nephrops* mesh size from 60 mm to 70 mm and 2) to increase the whitefish mesh from 70 mm (75-mm double twine) to 80 mm. The effects of these two proposals have been considered separately.

The effects of the proposed increase in Nephrops mesh size

The effects of this increase have been assessed for *Nephrops* and for whitefish by-catch. The effect on *Nephrops* was assessed by 1) calculating critical age (and length), 2) length cohort analysis and 3) yield-per-recruit analysis.

The mean selection length using the present legal minimum mesh size of 60 mm is around 20 mm carapace length. The current minimum landing size is 25 mm carapace length. The critical length is around 35 mm carapace length for male *Nephrops* and 26 mm carapace length for females.The critical age is that at which an unfished population has attained its maximum biomass. Its value varies from stock to stock since it depends on the growth rate and the level of natural mortality. The critical length is merely the average length corresponding to the critical age.

Both length cohort analysis and yield-per-recruit analysis show very small long-term gains from increasing the mesh size to 70 mm, and the outcome is sensitive to values of poorly estimated parameters, particularly natural mortality. Since natural mortality is believed to include a large component of predation mortality due to cod, this means that the outcome of the *Nephrops* mesh assessment may be sensitive to the management policy adopted for the cod stock. Short-term losses of *Nephrops* from an increase to 70 mm would be about 18% in the first year, 11% in the second year and decreasing thereafter. The losses would obviously be less for fleets which are currently using mesh sizes at or above present minimum size.

Whiting is the fish species which would be most affected by an increase in the *Nephrops* mesh size. A total of 4,225 tonnes of whiting is estimated to have been discarded in 1984, and the length composition of the discards is shown in Figure 3.6.9. The effect of increasing the *Nephrops* mesh size to 70 mm would be to eliminate virtually all whiting discards. The yield per recruit of whiting would increase by 55% at the present level of exploitation. There is no short-term loss, since these fish are discarded at present.

The effects of the proposed increase in whitefish mesh size

Last year's mesh assessment was based upon an estimate of 75 mm for the current mesh size as recorded on vessels fishing in the United Kingdom sector of the Irish Sea by the United Kingdom Fisheries Inspectorate. ACFM, in November 1984, considered that this was likely to be an overestimate of the mesh size in use throughout the Irish Sea demersal fisheries as a whole. This may be true for whiting and cod, but for sole, where the majority of the catch is taken in the UK sector by Belgian and Dutch fishermen who tend to use a mesh size nearer 80 mm, last year's assessment is probably correct. It should be pointed out that the Belgian and Dutch beam trawl fisheries for sole on rough grounds use double twine, for which the minimum legal mesh size is 75 mm. To avoid problems during inspection at sea, the fishermen tend to use somewhat larger meshes (77 mm) in order to allow for possible shrinkage.

However, a mesh assessment has been done for sole, assuming the current mesh is the minimum permitted, 70 mm. For whiting, which is mainly caught by Irish and Northern Ireland vessels fishing in the western part of the Irish Sea, 75 mm is probably an overestimate of the current mesh in use. The whiting in these two fisheries are caught in unknown proportions by the small mesh Nephrops fishery and the larger mesh finfish fishery. The legal minimum permitted meshes are 60 mm and 70 mm, respectively.

However, it is believed that the mesh size actually used outside the UK sector is somewhat less than legal minimum, particularly in the Nephrops fishery. For the Nephrops fishery, a current mesh size of 55 mm has been assumed. The finfish fishery is possibly, on average, using a mesh of about 70 mm.

For sole, the effect of going from 70 mm to 80 mm is very similar to that calculated last year (going from 75 mm to 80 mm). The long-term gain in yield would be about 1% and the short-term loss would be about 16% in the first year. Since the actual mesh size in use for sole is probably close to 80 mm, this short-term loss is an overestimate.

For whiting, the effect of increasing the mesh size from 70 to 80 mm would be a long-term gain in yield per recruit of about 5% and a short-term loss of about 30% in the first year.

3.7 Sole and Plaice Stocks in the North Sea and English Channel

3.7.1 North Sea sole

Recent catches and TAC's

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Catch	18.0	20.3	22.6	15.8	15.4	21.6	24.9	26.4	-
Rec. TAC	6.7	8.0	13.0	15.0	15.0	15.0	20.0	20.0	22.0

Weights in '000 tonnes.

Advice from the May 1985 ACFM Meeting

Catch options for 1986 cannot yet be calculated for the following reasons:

1) Soles are known to be vulnerable to very cold winters. Natural mortality during 1963 was of the order of 0.9 and the spawning stock biomass was reduced from 153,000 tonnes to about 55,000 tonnes in that year. The 1961 and 1962 year classes were also severely reduced as their size was under 30 million recruits.

2) The strong winter of 1978/79 also generated a high natural mortality on the 1978 year class resulting in a survival of only 12 million recruits at age 1 from an estimated number of 140 million in the pre-recruit survey prior to that winter.

3) In January and February 1985, very low temperatures were recorded. The 1983 and 1984 year classes were estimated from pre-recruit surveys as above average, but may have been reduced by the effects of the strong winter.

4) A strong 1985 year class may be expected, as strong year classes in the past have followed cold winters. The pre-recruit survey to be carried out in September 1985 will provide quantitative information on this.

Therefore, ACFM must postpone its advice until its November 1985 meeting, when the effects of the winter on both the adult stock and the recruitment have been assessed by the members of the North Sea Flatfish Working Group.

Advice from the November 1985 ACFM Meeting

In 1984, the provisional international catch was 26,370 tonnes, which included 6,706 tonnes of unreported landings (Table 3.7.1). The total catch was 15% above the predicted catch.

The determination of the terminal fishing mortalities was severely hampered because indices for catch-per-unit-effort and total international effort were not available for the Netherlands fleet. The two remaining series for the UK and the Belgian fleets show opposite trends and do not correlate with fishing mortality and stock biomass. A level of terminal fishing mortality was assumed that gave a higher F in 1984 than in the previous years, which matched the estimated increase in the Netherlands beam trawl fleet.

From 1970, the mean fishing mortality rate slightly increased to $\bar{F}_{(3-10)} = 0.52$ in 1984. The yield/spawning biomass ratio increased from about 0.40 to 0.50. Spawning stock biomass decreased from a level of 60,000 tonnes around 1970 to 25,000 tonnes in 1981 (see Figure 3.7.1).

The information obtained from demersal young fish surveys carried out during 1985 indicated that the strong winter of 1984-85 had no effect on recent recruitment. The abundance of the 1983, 1984 and 1985 year classes was estimated from the surveys as average (91 million).

With unchanged exploitation, the catch in 1985 and 1986 will be 24,000 tonnes and 21,000 tonnes, respectively; the spawning stock biomass in 1986 and 1987 will then be 40,000 tonnes and 36,000 tonnes, respectively.

There is no evidence of a trend in recruitment at the low levels of spawning stock which have been observed in the late 1970's and early 1980's. However, the present level of spawning stock size is approaching the previously (ACFM, 1981)[1] advised minimum level (40,000 tonnes) and will decline further if the present level of fishing mortality is maintained.

The yield/spawning stock biomass ratio shows an increase from 0.11 in 1957 to a level of 0.50 in 1977. From 1977 onwards, the ratio fluctuated around 0.50 without a trend.

The present level of fishing mortality is about twice F_{max}.

Management options are given in the text table below and in Figure 3.7.1.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-10)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(3-10)}$	Catch	Stock biom.	Spawn. stock biom.
62	46	0.54	24	$F_{0.1}$	55	40	0.14	6	68	52
				F_{max}			0.27	12	62	46
				$F_{86} = F_{85}$			0.54	21	52	36

Weights in '000 tonnes.
The spawning stock biomass is given for 1 January.

[1] Coop.Res.Rep. No.114.

It should be noted that 14% of the predicted catch in 1986 will consist of 2-year-old fish and 27% will consist of 3-year-olds.

As the present level of F is above any biological reference points, ACFM recommends that the level of exploitation should be reduced to F_{max} as quickly as possible.

3.7.2 North Sea plaice

Recent catches and TAC's

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Catch	119	114	145	140	140	155	143	158	
Rec. TAC	71	115	120	112	105	140	164	150	130[1]
Agreed TAC	-	-	-	-	-	-	-	182	200

[1] Preferred level.
Weights in '000 tonnes.

In 1984, the provisional total international landings were 157,920 tonnes, of which 41,910 tonnes (26%) were unreported landings (Table 3.7.2). The total landings were 8% above the predicted catch and 13% below the recommended TAC. The 2- and 3-year-olds constituted 11% and 50%, respectively, of the 1984 catch weight.

The absence of an index of cpue and total effort for 1984 from the Netherlands gave difficulties in the determination of fishing mortalities in 1984. The two remaining series (United Kingdom and Belgian fleets) show opposite trends. The UK series is correlated with average fishing mortality and shows that effort in the most recent years is the highest level of the last 15 years. To match the estimated increase in the Netherlands beam-trawl fleet in the last 3 years, a level of terminal fishing mortalities was assumed which gave a slight increase in the mean fishing mortality in the last 3 years.

Since 1970, the mean fishing mortality for the most exploited age groups has increased from 0.30 to 0.45. The present level of fishing mortality is beyond F_{max} on the yield-per-recruit curve.

The yield/spawning stock biomass ratio increased from about 0.30 to 0.50. Spawning stock biomass decreased gradually from 390,000 tonnes to 293,000 tonnes in 1984, despite the above-average recruitment of the 1979 and 1981 year classes. The 1982 and 1983 year classes are estimated to be above average.

The catch prediction for 1986 depends on whether or not the level of fishing mortality in 1985 will increase to take the TAC of 200,000 tonnes for this year. The catch options have, therefore, been calculated on two assumptions. Assumption 1 is that the fishing mortality remains constant over the period 1984-86 at the 1984 level. The catch in 1986 is then expected to be 160,000 tonnes and the spawning stock 280,000 tonnes.

If fishing mortality does increase in 1985 to take the TAC of 200,000 tonnes and is maintained in 1986, the expected yield in 1986 is 170,000 tonnes and the spawning stock 230,000 tonnes (Assumption 2).

Management options are given in the text table below and in Figure 3.7.2.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-10)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-10)}$	Catch	Stock biom.	Spawn. stock biom.
Assumption 1: $F_{85} = F_{84}$										
491	316	0.42	167	$F_{0.1}$	448	298	0.12	50	520	390
				F_{max}			0.22	90	480	340
				$F_{86} = F_{84}$			0.42	160	410	280
Assumption 2: TAC taken in 1985										
491	316	0.54	200	$F_{0.1}$	413	266	0.12	50	490	350
				F_{max}			0.22	80	450	310
				$F_{86} = F_{84}$			0.42	140	380	260
				$F_{86} = F_{85}$			0.54	170	360	230

ACFM noted the increased trend in fishing mortality throughout the last decade, and in recent years this has been associated with increased exploitation of the younger age groups. The spawning stock has been maintained throughout this period by a number of strong year classes, and there is no evidence, so far, that recruitment has been reduced at the spawning stock levels observed. However, if the TAC of 200,000 tonnes for 1985 is taken, and the level of fishing mortality is maintained in 1986, then the spawning stock will fall to a much lower level (230,000 tonnes compared to around 400,000 tonnes in 1972). ACFM is concerned that these developments in 1985 could alter what has until now been a satisfactory outlook for the North Sea plaice stock, and, <u>accordingly, recommends that fishing mortality in 1986 should be reduced towards F_{max}, and should be lower than in 1984</u>

3.7.3 Sole in Division VIId

Recent catches and TAC's

	1978	1979	1980	1981	1982	1983	1984	1985
Catch	1.4	1.8	1.7	2.2	2.7	3.0	3.1	
Rec. TAC	1.2	2.2	1.7	1.4	-	-	2.5	2.2
Agreed TAC	-	-	-	-	-	-	-	2.7

Weights in '000 tonnes.

In 1984, the provisional international landings were 3,123 tonnes (Table 3.7.3). This catch is at a similarly high level to that of 1983 and is 24% higher than the TAC. Since 1971, the landings have tripled, attributable mainly to an increase in landings in France.

The Belgian catch-per-unit-effort remained stable from 1980 to 1983, and in 1984 decreased by about 8%. Several series of UK catch-per-unit-effort indicated opposite trends, however. It was felt that no valid total international effort index could be derived from these data.

Because of the uncertainties remaining in the landing statistics, the age composition and the stock distribution, no analytical assessment could be performed.

ACFM, therefore, recommends a precautionary TAC for 1986 on the basis of recent catch levels, viz. the period 1980-84.

3.7.4 Sole in Division VIIe

Recent catches and TAC's

	1978	1979	1980	1981	1982	1983	1984	1985
Catch	0.9	1.2	1.3	1.2	1.4	1.5	1.3	-
Rec. TAC	0.4	0.5	0.8	1.0	1.7	1.7	1.3	1.4

Weights in '000 tonnes.

Advice from the May 1985 ACFM Meeting

The catch level of 1984 of 1,321 tonnes was a reduction from the level observed in 1983 (1,498 tonnes) (Table 3.7.4). Quotas were enforced and the TAC was not exceeded.

Total international effort indices indicated a decline in effort of about 18% in 1984, and this is reflected by the decline of the estimate of the fishing mortality in 1984. Catch-per-effort indices show a decline since 1979.

Assuming that the TAC of 1,400 tonnes in 1985 is taken, the fishing mortality will increase by 20% and come close to the flat top of the yield-per-recruit curve. If this is maintained in 1986, the catch is expected to be 1,290 tonnes and the spawning stock in 1987 will be 4,460 tonnes.

Management options are given in the text table below and in Figure 3.7.4.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-10)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-10)}$	Catch	Stock biom.	Spawn. stock biom.
5,875	5,400	0.28	1,400	$F_{0.1}$	5,450	4,869	0.14	710	5,620	5,040
				$F_{86} = F_{85}$			0.28	1,290	5,050	4,460

Weights in tonnes.

Recruitment has steadily increased since 1969 with good year classes in 1975 and 1979. Most recent year classes appear to be of average strength, but the biomass has declined as a result of of the increased fishing mortality and is now at the lowest level since 1971.

ACFM, therefore, recommends that fishing mortality on this stock should not be allowed to increase above the expected 1985 level. However, the predicted levels of yield and biomass could be revised in November 1985, when the 1985 United Kingdom catch rates of the 1982 year class become available.

Advice from the November 1985 ACFM Meeting

The most recent information based on United Kingdom beam cpue of 3-year-olds in the first quarter of 1985 was examined and the results confirmed the average value of the 1982 year class as was used in the ACFM May 1985 advice. The advice given in May by ACFM remains, therefore, unchanged.

3.7.5 Plaice in Divisions VId and VIIe

The landings increased in 1984 to a record of 7,210 tonnes, mainly due to an increase in the landings in France (Table 3.7.5). In numbers, the recent year classes (1981-83) accounted for about 80% of the catch.

The data base is still very poor and, consequently, no analytical assessment was carried out.

Therefore, ACFM can only advise a precautionary TAC. This TAC could be based on catch levels during 1980-84.

4. STOCKS IN NEAFC REGIONS 2 AND 3

4.1 Hake in Sub-Areas IV and VI-IX

Hake landings by country and sub-area are given in Table 4.1.

4.1.1 Hake - Northern stock (Sub-areas IV, VI, and VII and Divisions VIIIa,b)

Recent landings and precautionary TAC's recommended by ACFM are shown below.

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Prec. TAC	-	-	43	30	30	30	30	30	30
Landings	51	48	50	58	57	57	59	63	-

Weights in '000 tonnes.

The fishery

Landings amounted to 59,000 tonnes in 1983 and 63,000 tonnes in 1984, continuing the upward trend maintained since 1978, when landings decreased to a minimum in the historical series (47,500 tonnes)(Table 4.1.1).

The Spanish trawl fleet has been reduced by 60% in number since 1977, with a consequent reduction in fishing effort. Simultaneously, longline fishing by this country has been increasing very rapidly; it amounted to approximately 2,000 tonnes up to 1979, increasing gradually to approximately 14,000 tonnes in 1984. Spanish longliners all come from a part of the pre-1977 trawl fleet.

French "hauturier" effort was reduced by more than 40% since 1977 in Sub-area VII, and this fleet has also stopped fishing in Divisions VIIIa,b; this decreasing trend started in 1968.

The larger class of French "artisan" vessels has tended to increase in size and fish more in Sub-area VII and less in Sub-area VIII. Small French trawlers (10-m length), for which 2-group hake constitute a significant part of their catch, have increased their average fishing power.

Enforcement activities have resulted in much better observance of minimum mesh-size regulations in Sub-area VII. In addition, the cited conversion of a part of the Spanish trawl fleet to long-liners is expected to have a beneficial effect on the exploitation pattern.

However, the use of small-mesh trawls continues both by the French "artisans" Nephrops fleet working on grounds which are also hake nursery grounds and by a part of the Spanish bakas trawling in Divisions VIIIa,b.

Discards during the period 1977-79 were estimated previously to be much higher than for 1980-84. It is believed now, however, that discards for those years were overestimated.

The assessment

Catch-at-age data do not exist for this stock due to technical difficulties in ageing. An *ad hoc* meeting will be held next year to resolve these problems. The lack of catch-at-age data made it impossible to perform a short-term forecast.

Preliminary estimates of fishing mortality derived from length cohort analysis suggest that the present level of fishing mortality is above F_{max} and generates an inappropriate exploitation pattern in the present fishery. It must be remembered that hake do not mature until they are 6 years old.

The results of this assessment should be confirmed after a revision of the estimates of catches of undersized individuals and the resolution of the technical problems for ageing hake individuals from this stock.

Management

Although changes in the fisheries on the Northern stock of hake have improved the exploitation pattern relative to that corresponding to the early 1970's, there is still room for considerable improvement. An increase in the length at first capture to 27 cm, corresponding to a mesh size of about 80 mm, would improve yield per recruit at the current level of fishing mortality. The fishery gave a yield in the range between 70,000 and 90,000 tonnes during the period 1953-62, and this catch level could constitute a long-term yield target.

Therefore, ACFM recommends that the legal mesh size of 80 mm be enforced in the directed hake fisheries, and a minimum landing size of 27 cm, corresponding to the 25% point of the selection curve, be implemented.

Since the present assessment does not permit an analytical estimate of catch options for 1986, a TAC should be based on recent landings.

4.1.2 Hake - Southern stock (Divisions VIIIc and IXa)

Recent catches and precautionary TAC's recommended by ACFM are shown below.

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Prec. TAC	-	-	20	10	8.5	8.5	8.5	8.5	8.5
Catches	15.5	14.4	17.5	20.4	19.5	20.4	24.7	21.0	-

Weights in '000 tonnes.

The earlier recommended TAC's of 8,500 tonnes were based on incomplete data.

Catch estimates for 1972-84 are given in Table 4.1.2.

Complete catch-at-age data for the period 1978-84 are now available for the assessment of this stock, but it was not possible to tune the VPA results with other information from either the fishery or surveys on research vessels (trawl CPUE, recruitment indices). The main reason for this failure of the assessment could be related with the existence of important quantities of uncontrolled trawl landings, which would make it impossible to estimate reliably the fishing mortality on young ages, considered to be high, and the strength of year classes.

The very inappropriate exploitation pattern generated by the fishery is a cause for deep concern with regard to the state of the stock.

In the Spanish part of Division IXa and for the period 1976-84, the catches of the Spanish artisanal small-mesh gill-netters, which are mainly composed of 2-3-year-old hake, showed a good correlation with the recruitment indices from the Spanish bottom-trawl surveys two years before.

The low levels of recruitment indices in 1975-79 indicate that year classes recruiting as spawners from 1981 to 1985 have resulted in a decline in the spawning stock.

<u>ACFM reiterates its advice of previous years to increase mesh size in the trawl fishery to 80 mm. A minimum landing size (27 cm), associated with the recommended minimum mesh size for the trawl fleet, should also be introduced and enforced. These measures should be brought into effect immediately</u>. Complementary measures (closed areas and seasons) should be actually enforced on the hake nursery grounds during the part of the year when heavy fishing on juveniles takes place.

In view of the likely present low level in spawning stock, fishing mortality on the smallest hake needs to be reduced to allow more fish to mature. The relatively high recruitment indices during 1981 to 1984 suggest that these year classes, if they were not heavily exploited during the immature stage, may contribute to an increase in spawning stock in 1987. A precautionary TAC set for this purpose should discount the weight of undersized fish caught in the fishery. These factors cannot be precisely calculated from the present information, but ACFM would prefer a precautionary TAC for 1986 in the region of 15,000 tonnes.

4.2 Fisheries Units in Sub-Areas VII and VIII

4.2.1 Geographical area

It seems, at present, possible to delineate zones in Sub-areas VII and VIII where fisheries units can be defined in terms of gear, area, season and species; they correspond to Divisions VIIb,c,e-k and the northwestern part of Division VIIIa on one hand, and the rest of Division VIIIa and Division VIIIb on the other hand (Figure 4.2.1).

4.2.2 Definition of fisheries units

In the absence of any guidelines in terms of management of fisheries, these can only be defined in terms of exploitation and assessment.

Due to their complex nature, i.e., number of boats and gears involved, flexibility of the exploitation, multiplicity of landing points and overall quality of the data, artisanal inshore fisheries cannot be considered in a first approach.

Taking into account the behaviour of the target species leads to the identification of the following fisheries.

Pelagic fisheries

Offshore pelagic fisheries (mackerel scad, herring) operate in Sub-areas VII and VIII, but the activity of the vessels involved is not limited to these areas and also depends on pelagic or demersal stocks outside (e.g., North Sea, west of Scotland). Such fisheries cannot be assessed independently and cannot be taken into account in a first approach.

Related pelagic fisheries in which vessels are fishing seasonally for sprat, sardine, anchovy or tuna and turn to demersal fishing the rest of the year.

Demersal fisheries

Demersal fisheries which can be divided into large crustacea fisheries dedicated to working crustacean traps and finfish plus Nephrops fisheries. The latter involves the largest number of boats, mainly trawlers, and can itself be divided further, according to the area fished, into western approaches fisheries and Bay of Biscay fisheries.

The western approaches fisheries may be sub-divided into those vessels for which Nephrops forms an important part of the catch (Nephrops fisheries) and an alternative group (non-Nephrops fisheries) for which Nephrops represents no more than another component of catch or is not caught; this group includes trawlers, offshore gill-netters and long-liners.

In the Bay of Biscay fisheries, the fleets are not grouped with reference to Nephrops, but simply by gear: trawl, gill-net and long-line.

A more detailed definition of fisheries units can be achieved with reference to the depth of operation. Some vessels concentrate their effort in relatively shallow water (below 100 m), while others operate in waters around 200 m or deeper or in an intermediate zone.

The fisheries units defined constitute a starting point for the collation and examination of assessment data. This examination will enable an objective decision on the suitability of the units for assessment purposes.

Figure 4.2.2 presents the dendrogram of the units proposed.

4.2.3 Assessment methods

Review of the state of stocks

A summary of the state of data on the species exploited in the western approaches and the Bay of Biscay is given in Table 4.2.3. The deficiencies can thus be identified.

Assessments based on commercial catch statistics

Species of greatest commercial interest are identified: hake, megrims, monks, Nephrops and sole. For some of these, sampling of commercial catches has been initiated only recently, and there are no suitable data yet to establish classical VPA-based assessments. In the interim, it might be possible to make length-based assessments, provided that growth parameters and data on discards are available.

The use of abundance indices based on CPUE data may become difficult since the implementation of regulatory measures based on quota allocations. Fishery independent data are, therefore, needed.

Assessments based on surveys

Acoustic surveys on hake (in these waters), megrims, monks, sole and Nephrops would not appear to be feasible in the present state of the technology.

Annual groundfish surveys offer the best prospect of providing abundance indices. Initially, this would imply not less than three research vessels operating simultaneously for a 4-week period.

The feasibility of such surveys is at present being evaluated at the national level in England, France and Spain and, if the answer is positive, a programme could be initiated in 1987.

4.2.4 Recommendations

Single-species assessments on hake and on cod, whiting and sole in Divisions VIIe,f,g will continue to be done by the existing working groups.

ACFM proposes that the Working Group on Fisheries Units in Sub-areas VII and VIII should not undertake any assessment of pelagic fisheries, large crustacea fisheries and fisheries in Division VIIIc.

ACFM urges all ICES member nations with fisheries in the Bay of Biscay, Celtic Sea, Western Channel and West of Ireland to continue or initiate biological sampling programmes for hake, megrims,, monks, sole and Nephrops for each of the appropriate "fishery units" defined above. Particular attention should be devoted to estimating growth parameters and discards.

ACFM requests ICES member nations with interests in Divisions VIIb,e-k and VIIIa,b to consider implementing groundfish surveys, commencing in 1987.

5. STOCKS IN NEAFC REGION 3

5.1 Sardine in Divisions VIIIc and IXa

ACFM advice, TAC's and catches for recent years

1983			1984			1985	
ACFM advice	TAC	Catch	ACFM advice	TAC	Catch	ACFM advice	TAC
200	-	181	120	-	203	-	-

Weights in '000 tonnes.

The May 1983 meeting of ACFM stressed that the 1983 TAC of 200,000 tonnes might be too high considering the poor 1982 year class

5.1.1 The fishery

The catch of the sardine stock (Divisions VIIIc and IXa) in 1984 was 203,000 tonnes (Table 5.1.1). The average level of catches in 1980-84 was about 200,000 tonnes, a level which was also reached during 1958-67, with maximum catches of about 250,000 tonnes in 1961 and 1964. The minimum catch was 67,000 tonnes in 1949.

The percentage contribution of 0- and 1-groups in 1984, 69% by number of the total catch, was comparable with those in 1976-81. For the years 1982 and 1983, the percentages were lower: 21% and 42%, respectively.

The catch in 1985 should be about 150,000 tonnes if the proportion of catches in the first and second halves of recent years is maintained.

There was no indication of a change in the fishing pattern from 1984 to 1985.

5.1.2 The state of the stock

Data from acoustic surveys were available from Portugal and Spain during 1982-85. This information indicates a continued decline in recruitment (age 0) and in total stock biomass since 1983.

Values of fishing mortality rates for ages 2 and older in 1984 were obtained from the catches divided by the biomass estimates from the acoustic surveys for the years 1982-84 and applied to VPA runs. The values of F at age 0 and 1 were chosen to maintain the same exploitation pattern during 1984 as in recent years.

Results of the VPA indicate a 35% decrease in the spawning stock biomass from 1981 to 1983 and a slight (15%) increase in 1984. This increase is due to the relatively high level of recruitment in 1983 which supported the high catch of fish at age 1 in 1984.

5.1.3 Management

Projections of catches for 1986 and 1987 were calculated assuming low recruitment in 1985, 1986 and 1987 of 2,000 million fish. The results of the projections are given in the text table below and in Figure 5.1.3.

1985					1986				1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-5)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-5)}$	Catch	Stock biom.	Spawn. stock biom.
490	370	0.40	147	$F_{86} = F_{84}$	316	230	0.40	86	204	141
				$F_{0.1}$		224	0.52	104	187	124

Spawning stock biomass is given for the time of spawning (1 April).
Weights in '000 tonnes.

If F in 1986 is the same as in 1984, the predicted catch in 1986 will be 86,000 tonnes. This represents a decrease in catch of about 115,000 tonnes from 1984 and a spawning stock biomass decrease of about 60% from 1985 to 1987.

The catch level in 1984 was considerably higher than the ACFM advice. No effective management (TAC) has been implemented by Portugal or Spain.

Taking this into account, the fishing mortality should not be allowed to increase in 1986 above the 1984 level and, therefore, ACFM recommends that the 1986 catch should not be higher than 90,000 tonnes.

5.2 Horse Mackerel in Sub-Areas IV and VI-IX

In previous years, ACFM has not given any advice about catch levels for horse mackerel.

Total catch in these sub-areas in 1984 was 158,000 tonnes, the highest since 1979 (Table 5.2.1). However, the highest total catch during the period 1974-84 was taken in 1976 (375,000 tonnes). There are no estimates of the amounts of discards, although they are considered to be "high" in northern divisions.

The catch in Sub-area IV increased from 4,000 tonnes in 1983 to 26,000 tonnes in 1984 (Table 5.2.2).

An increase was also observed in the catches of Sub-areas VI (Table 5.2.3) and VIII (Table 5.2.5) from 1983 to 1984 (respectively, 28% and 20%). Sub-area VII had practically the same catch in 1983 and 1984 (40,000 tonnes)(Table 5.2.4).

In 1984, the catch of Sub-area IX was the lowest on record (24,000 tonnes) and 48% of the 1983 catch (Table 5.2.5).

In the mackerel egg surveys carried out in Sub-area VII and Divisions VIIIa,b in 1977, 1980 and 1983, there are some data on horse mackerel which suggest a possible decrease in the spawning biomass from 1980 until 1983 in Sub-area VII and a stable spawning biomass in Divisions VIIIa,b during 1980 and 1983.

The 1983 year class seems to be very strong in Divisions VIIj, VIIIc and IXa (data from the trawl surveys). In 1984, the 0-group had a sharp decrease in Divisions VIIIc and IXa (Spanish waters). Immature fish in 1983 and 1984 constituted a very large proportion of the catch in Divisions VIIIc and IXa, caught primarily by trawlers and purse seiners.

The heavy exploitation of this component of the stock seriously reduces recruitment to the spawning stock. The recommended minimum mesh size of 80 mm in the trawl fishery in the area will contribute to a more appropriate exploitation pattern. The minimum landing size corresponding to an 80-mm mesh size should be 21 cm (based on a 25% retention length).

Information concerning mortality, spawning biomass and total biomass, fecundity and recruitment is very limited and is insufficient to assess the horse mackerel in the different areas. The use of groundfish surveys and acoustic surveys should be explored for assessing horse mackerel. Data are also required to identify and separate different stocks of horse mackerel in Sub-areas IV and VI-IX.

5.3 Mackerel in Divisions VIIIc and IXa

In previous years, ACFM did not give any management advice for mackerel in this area because the biological information and catch statistics were insufficient.

In Division VIIIc, the catches declined in 1980 to about half of the 1975 level, followed by a slight increase until 1982. In 1984, the estimated catch was about 14,000 tonnes (Table 5.3.1). In Division IXa (Portuguese coast only), the catches have stayed at the same level between 2,000-3,000 tonnes during the period 1975-84 (Table 5.3.2). In this area, the Portuguese trawlers have caught about 80% of the total catch. Age groups 0-2 represent 93% of the total landed.

No assessment was made for mackerel in this area, but it is expected that the necessary data will be available next year.

6. STOCKS IN NEAFC REGIONS 1, 2 AND 3

6.1 Mackerel

6.1.1 Introduction

The text table below shows the advice on catches given by ACFM, the TAC's which have been set and the actual catches in recent years for both stocks.

1982			1983			1984			1985	
ACFM advice	Agreed TAC	Catch	ACFM advice	Agreed TAC	Catch	ACFM advice	Agreed TAC	Catch	ACFM advice	Agreed TAC
North Sea area[1]										
0	-	35	0	30	40	0	31	39	0	27
Western area[2]										
270	-	733	330	-	706	500	-	639	340	-

[1] Advice, TAC and catches for Division IIIa and Sub-Area IV.
[2] Agreed TAC for Sub-areas VI, VII and VIII. Catch and advice also includes Division IIa.
Weights in '000 tonnes.

The nominal catches are given in Tables 6.1.1.1, 6.1.1.2 and 6.1.1.3.

In order to evaluate data on mixing rates between the two stocks, the Mackerel Working Group had reviewed information relating to stock identification, distribution and mixing. Information on growth characteristics, biological tags and external tag returns indicates that the stocks are separate, that there is no significant mixing at spawning time, but that the separation has not yet been shown to be genetic. Shifts in distribution of the Western stock and fishery from the 1960's to the present were described which tend to explain the annual changes observed in mixing rates in recent years. Information was also presented demonstrating a northward shift in distribution in the last several years of Western stock juveniles.

The assessments of both stocks were based, as in the past, on estimates of spawning stock size or biomass from egg survey results.

Estimates of recruitment for both stocks continued to be based only on qualitative evidence. Although this information is not suitable for estimating the specific size of particular year classes, it appears to be sufficiently reliable and consistent to classify them as "poor", "average" or "strong".

6.1.2 Stock mixing rates in Divisions IIa, IVa and VIa

The Norwegian tag return data were used to estimate mixing rates in 1984. In Division IIa, 10% of the catch was calculated to be from the North Sea stock, the same proportion as used for 1981-83. This proportion was applied only to ages 3 and older, as all age 1-2 fish were assumed to be from the North Sea stock. A catch of 920 tonnes in Division Vb was also split on the above basis.

In Division VIa north of 58^{0}N in the first and fourth quarters, 10% of the catch of age 5 and older fish was assumed to be from the North Sea stock (the same as in 1981-83). This was based on estimates of 10%, 9%, and 12% from tag returns in Scottish and Norwegian fisheries in the first and fourth quarters of 1984. All age 1-2 fish were assumed to be from the Western stock.

A catch of 3,000 tonnes taken in Division IVa north of 59^{0}N was also split into North Sea and Western stock components based on tag return data in that area. In addition, the age composition of this catch was closer to that of Division IIa catches than to catches in the southern part of Division IVa. Tag return data indicated that 7% of this catch was from the North Sea stock, but the Working Group used an estimate of 10% as for Division IIa. This proportion also applied only to age 3 and older fish; all age 1-2 fish were assigned to the North Sea. In previous years, all catches in Division IVa were assumed to be from the North Sea stock since most had been taken in the southern part of Division IVa where mixing would not be expected.

6.1.3 North Sea stock

The total catch from the stock in 1984 was 72,400 tonnes, the highest since 1980 and 50% higher than in 1983 (48,100 tonnes). In spite of a recommended zero TAC for 1984, the EEC and Norway agreed to a TAC of 31,300 tonnes for Sub-area IV and Division IIIa, which was exceeded by about 25%. The catch in Division IIa in 1984 was nearly 94,000 tonnes, the highest on record and over 90% higher than in 1983. Of this amount, 9,300 tonnes was estimated to be from the North Sea stock. The remainder of the North Sea stock catch was about 26,400 tonnes from Division VIa.

Catch mean weights at age for 1984 determined from data provided by the various countries were used in the prognosis. Stock mean weights at age were unchanged from those used in the previous assessment.

Results of the 1984 egg survey in the North Sea indicated that egg production was about half of that in 1983. Since the 95% confidence limits for the 1984 estimate were about 30%, the drop in the egg production estimate does not necessarily imply a 50% decrease in spawning stock biomass. None of the egg survey estimates of spawning stock biomass for 1982, 1983, or 1984 were considered to be more reliable than the others.

The mean fishing mortality for 1984 was, therefore, selected so that the deviations between the spawning stock estimates based on catch data and the estimates based on egg surveys in 1982-84 were minimised. This procedure resulted in spawning stock estimates of 162,000, 168,000 and 159,000 tonnes, respectively, for 1982, 1983 and 1984, all within the 95% confidence limits of the egg survey estimates.

The apparent leveling-off of the decline in spawning stock biomass during 1982-84 at an average of 163,000 tonnes was due to the recruitment of the relatively-strong 1980 and 1981 year classes. However, the 1982 and 1983 year classes appear to be very poor.

The management options for 1986 are given below and are shown in Figure 6.1.3.

1984		1985				1986				
Catch	$\bar{F}_{3-8}$	Stock biom.	Spawn. stock biom.	$\bar{F}_{3-8}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{3-8}$	Catch
72	0.69	94	90	1.43	75(TAC)	$F_{86} = F_{85}$	31	26	1.43	23
						$F_{86} = F_{0.1}$		30	0.18	5
			(F_{84})	0.69	43	$F_{86} = F_{85}$	56	57	0.69	27
						$F_{86} = F_{0.1}$		60	0.18	11

Weights in '000 tonnes.
Stock biomass at 1 January and spawning stock biomass at 1 June.

Catch and stock prognoses were made assuming the average exploitation pattern for 1977-84. The 1983-86 year classes were all assumed to be weak, 20 million fish at age 1, equivalent to the weak 1978 and 1982 year classes. An estimated catch in 1985 of 75,000 tonnes ($\bar{F}_{3-8}$ = 1.43) results in a spawning stock biomass of 90,000 tonnes in 1985 and a total stock biomass at the beginning of 1986 of only 31,000 tonnes. A fishing mortality in 1985 equivalent to that in 1984 ($\bar{F}_{3-8}$ = 0.69) will result in a catch of 43,000 tonnes in 1985 and a total stock biomass of 56,000 tonnes in 1986.

Although there are uncertainties in these projections, particularly regarding the recruitment and the estimated catch in 1985, there is no doubt that the stock is at a very low level and that it will continue to decrease in 1986 below the level of catches in recent years. ACFM, therefore, recommends that no fishing be allowed in Sub-area IV and Division IIIa in 1986. In these areas, about 50% of the catch from the stock was taken in 1984.

6.1.4 Western stock

The Western stock catch in 1984 was 555,300 tonnes, a 10% decline from 1983 and the lowest catch since 1978. The amount of discards and unallocated catches declined from previous years, but still accounted for 12,100 and 62,900 tonnes, respectively, in 1984.

New catch and stock mean weights at age determined for 1984 from sampling data provided by various countries were used in the prognosis.

A mean fishing mortality for the age groups 3-8 of 0.24 in 1984 was used on the catch data (VPA) to produce a spawning stock size of about 2.1 million tonnes in 1983, comparable to that estimated by the 1983 egg survey.

This resulted in a spawning stock size of 1.8 million tonnes in 1984, a 21% decrease from 1983. The consistency between VPA estimates of spawning stock size and those based on egg survey results is quite good. The 1980 VPA estimate was only 6% higher than the 1980 egg survey estimate, and the 1977 VPA estimate was only 5% lower than the 1977 egg survey estimate.

The mean fishing mortality of age groups 3-8 in 1984 of 0.24 was about 11% higher than in 1983 and was the highest on record for the Western stock. The fishing mortality has exceeded $F_{0.1}$ throughout the period 1979-84. Spawning stock biomass has declined steadily from 3.9 million tonnes in 1974 to an estimated 1.8 milion tonnes in 1984, the lowest on record.

The 1982 and 1983 year classes appear to be very poor, as is the case with the North Sea stock. Based on the increased presence of 1984 year-class fish in both research vessel and commercial catches, this year class is considered to be stronger than the previous two.

The management options for 1986 are given in the text table below and shown in Figure 6.1.4.

1984		1985				1986				
Catch	$\bar{F}_{3-8}$	Stock biom.	Spawn. stock biom.	$\bar{F}_{3-8}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{3-8}$	Catch
555	0.24	2,100	1,500	0.26	500	$F_{86} = F_{85}$	2,000	1,318	0.26	446
						$F_{86} = F_{0.1}$		1,367	0.17	290
						$F_{86} = 0.2F_{85}$		1,425	0.05	98

Weights in '000 tonnes.
Stock biomass at 1 January.
Spawning stock biomass at 1 June.

Catch and stock prognoses were made assuming the average exploitation pattern determined for 1978-84, which is virtually the same as assumed in the prognosis in the previous assessment. The 1984-86 year classes were set at 2,770 million fish at age 1, which is the geometric mean value for the period 1972-83, and which is 2.77 times the value used by the Mackerel Working Group.

The estimated catch in 1985 of 500,000 tonnes would generate a fishing mortality ($\bar{F}_{3-8}$) of 0.26 which is slightly higher than that in 1984. Fishing at the same level of exploitation in 1986 would result in a catch of about 440,000 tonnes.

Given this set of conditions, the spawning stock biomass, which has been declining from 3.8 million tonnes in 1974 to 1.8 million tonnes in 1984, will drop to 1.5 million tonnes in 1985 and further to 1.3 - 1.4 million tonnes in 1986, depending on the actual fishing mortality in 1985 and the first half of 1986. Catch options of 100,000 tonnes and 440,000 tonnes in 1986 will generate spawning stock levels in 1987 of 1.6 and 1.2 million tonnes, respectively.

ACFM is concerned about the decline in the spawning stock biomass.

The present fishery is dependent on the strong 1979-81 year classes. Those of 1982 and 1983 are weak, and the projected status of the Western mackerel stock and the maintenance of the already-reduced spawning stock at 1.5 million tonnes depends on the assumed average level of the 1984 and 1985 year classes and the rate at which they mature.

ACFM also notes that the predicted catch of 290,000 tonnes in 1986 at the $F_{0.1}$ level includes 70,000 tonnes of 1- and 2-year-old mackerel of the 1985 and 1984 year classes. It is not yet certain that these age groups in 1986 will be available to the fishery, as in former years, because of the changed geographical distribution of the stock and the fishery. The potential catch at the $F_{0.1}$ level on the established fishery may, therefore, be less than 290,000 tonnes. But even if all age groups are available, ACFM reiterates its previous advice that catches of these young mackerel should, so far as possible, be avoided to increase the yield per recruit and offset the decline in spawning stock. ACFM recommends that the TAC for 1986 should be set below 290,000 tonnes to take account of these two factors.

6.1.5 Management of the mackerel fisheries

ACFM is concerned about the management of the mackerel fisheries. The North Sea stock is now at an extremely low level and the Western stock is declining. The future yield from these two stocks is largely dependent on a rational exploitation and effective management of the fisheries. No area where fish of either of the two stocks are caught should be excluded from the TAC regulations.

6.1.6 Closed area off southwest England

ICES was asked to specify what data would be required to assess the effect of the Cornish "Box", in preparation for review of the regulations in 1986. Three major problems were identified with regard to evaluating the effectiveness of the "Box": 1) the "Box" has been in force for a short period, 2) consequences of weak 1982 and 1983 year classes, and 3) the apparent northerly shift in distribution of young fish. Aside from the catch and sampling data normally reported by countries fishing or conducting research in that area, the Working Group felt that it could best contribute by describing the total Western stock distribution of juvenile fish. To do this, the Working Group members agreed to focus some of the research vessel time available to them during 1985 towards the quantitative mapping of juvenile mackerel distribution.

6.2 Blue Whiting

As in previous years, the Working Group recognised the existence of two blue whiting stocks, one in the northern area (Sub-areas I and II, Divisions IIIa and IVa-c, Sub-area V, Divisions VIa,b and VIIb,c and Sub-area XIV) and one in the southern area (Divisions VIId,e,g-k and Sub-areas VIII and IX).

Recent catches and recommended TAC's are given in the text table below.

Stock	1979	1980	1981	1982		1983		1984		1985
	Catch	Catch	Catch	Catch	TAC[2]	Catch	TAC	Catch[1]	TAC	TAC
Northern area	1,091	1,093	871	545	1,000	539	570-780[3]	587	No advice	783[3]
Southern area	27	30	39	31	-	29	-	37	-	-

Weights in '000 tonnes.
[1]Preliminary.
[2]Precautionary.
[3]Preferred by ACFM.

6.2.1 Blue whiting in the northern area

Total catches of blue whiting from the northern area increased in 1984 by 48,000 tonnes compared to 1983 (Tables 6.2.1.1-6.2.1.5). The increase was caused by a 10% increase in the catches in the spawning fisheries and a 20% increase in catches in the Norwegian Sea fisheries. Catches in the mixed industrial fisheries in 1984 were at the same level as in 1983.

State of the stock

The fourth ICES-coordinated acoustic survey of the Norwegian Sea and adjacent waters carried out in August-September 1985 gave a total biomass estimate of 4.9 million tonnes of blue whiting. In addition, estimates of the spawning stock were obtained during the spawning season from a Faroese survey (6.4 million tonnes) and from a USSR survey (2.8 million tonnes). The USSR survey was carried out late in the spawning season when a significant part of the stock is likely to have left the area.

Although there were discrepancies between the surveys in the estimates of each age component, the best available estimate of the old component (1981 year class and older) was that obtained from the Faroese spawning survey (1.9 million tonnes). For the more recent 1982 and 1983 year classes, the estimate from the summer survey was used (4.1 million tonnes at 1 August). A virtual population analysis using these estimates indicated that the total biomass of the blue whiting stock decreased by about 40% from 1975 to 1982 and that it has subsequently increased as a result of recruitment by the 1982 and 1983 year classes, which are the largest on record. These changes in stock biomass are reflected in catch-per-unit-effort indices from the Norwegian Sea fisheries. The adult stock size estimates from the VPA also show a considerable measure of agreement with estimates from the acoustic surveys in 1981, 1983 and 1984. The results of the analysis are, therefore, considered to provide a sufficiently sound basis for providing management advice in the northern area.

Management considerations

For prediction purposes, recruitment at age 0 for the 1984 and 1985 year classes was assumed to be the average over the period 1970-81 (15,400 million), as there are no signs that these year classes are above average strength. It has also been assumed in the prediction that the fishing mortality rate on the 0- and 1-groups in 1985 and 1986 will be the same as those in 1984. For the older age groups, there are indications that the Norwegian fleet will increase its effort on blue whiting in the latter part of 1985 (November-December) and that the USSR fleet will reduce its effort on blue whiting in the Norwegian Sea fisheries owing to diversion to other fisheries. ACFM was unable to quantify the expected changes and, in the predictions, the fishing mortality rates on these age groups in 1985 were assumed to be the same as in 1984. This would correspond to a total catch in 1985 of 719,000 tonnes.

Catch projections for 1986 based on two levels of fishing mortality rate are given in the text table below and in Figure 6.2.1.

1985			1986					1987	
Stock at 1 Jan	SSB	Catch	Stock at 1 Jan	SSB	Management option	$F_{(3+)}$	Catch	Stock at 1 Jan	SSB
6,605	4,080	719	6,606	4,833	$F_{0.1}$	0.21	1,000	6,230	4,730
					$F_{86} = F_{85}$	0.16	774	6,490	4,966

In accordance with previous advice for this stock, ACFM prefers that the value of fishing mortality rate in 1986 should not exceed that corresponding to $F_{0.1}$, associated with a catch of 1 million tonnes.

Effects of an increase in the minimum mesh size in the blue blue whiting fishery to 40 mm

In 1984, the Working Group pointed out that, in the directed blue whiting fisheries, all countries are using mesh sizes of from 36 to 50 mm, and, therefore, no assessment of an increase to 40 mm was attempted. In the mixed industrial fisheries for Norway pout and blue whiting, however, mesh sizes of 22-24 mm are used, and the Working Group was requested by ACFM to reconsider the question again for this fleet category in 1985.

Earlier studies indicate that the selection factor for blue whiting lies in the range 3.9-4.8. For a 22-mm mesh, this gives a 50% retention length of 8.6-10.6 cm. In all mixed industrial fisheries, the blue whiting catch consists mainly of 0-1-group fish with a length range of 12-24 cm. A change in mesh size to 40 mm in these fisheries associated with a 50% retention length of 15.6-17.6 cm could, therefore, considerably reduce exploitation of these age groups. In Figure 6.2.1, the yield and spawning stock biomass per recruit are plotted both with and without fishing on the 0- and 1-group and assuming the same exploitation pattern for the older age groups as in 1984. When comparing these curves, it is evident that little would be gained by a reduction in exploitation on the 0- and 1-group while the fishing mortality rate is at its present low level in the industrial as well as the adult fisheries.

6.2.2 Blue whiting in the southern area

Landings of blue whiting from the southern area increased by almost 29% in 1984 compared to 1983 (Table 6.2.2). The Working Group had insufficient data to make any assessment of this stock.

If assessments of the state of exploitation on this stock are to be made in the future, it is essential that more information be provided on the composition of the catches (including both landings and blue whiting by-catches discarded in other fisheries). In addition, it is recommended that acoustic surveys be carried out over a wider area than hitherto, both to widen knowledge of the seasonal distribution and biology of blue whiting in this area and to provide stock size estimates for the entire area of distribution.

6.2.3 Distribution in time and space of different life history stages of blue whiting

At its meeting in November 1984, NEAFC requested ICES to provide information on the distribution of catches and stock biomass of different life history stages of blue whiting (northern stock) within and beyond the areas under the fisheries jurisdiction of the Contracting Parties. In addition, at the same meeting, the Portuguese Delegate requested that ICES should provide the Commission with similar information on the southern stock.

The information presented in this report was obtained from a number of scientific papers by different authors, and it is not possible to refer to each one. The available knowledge is summarised, however, in two extensive papers by Bailey (1982) and Zilanov (1984) which include most of the references to earlier studies. New information can also be found in the reports of the Blue Whiting Assessment Working Group (Anon., 1981, 1983, 1984, 1985).

Spawning areas (Figure 6.2.3.1)

The main spawning area of the blue whiting extends from west of Ireland northwards along the continental slope west of the British Isles and along the slope of Rockall Bank. In addition, some other spawning areas of less importance are known, mainly around the Faroe Islands, off the west coast of Norway and the south-southwest coast of Iceland.

The spawning stock in the main spawning area has been monitored acoustically every year since 1972 during March-April. No such abundance estimates have been made of the spawning populations in other areas.

From the information available on the spawning distribution, it can be concluded that the main bulk of the stock spawns in March-April to the west of the British Isles. Any spawning outside this area is thought to be of only minor importance.

Nursery areas (Figure 6.2.3.2)

The planktonic drift of blue whiting eggs and larvae is not fully understood, but it seems likely that most larvae from the major spawning area are carried north and northeast in the North Atlantic Drift Current.

There are numerous records in the literature of the O-group after metamorphosis, but surveys at the appropriate time and of sufficient scope have not been undertaken to provide a clear picture of the distribution of the fish at that stage in the life history.

In June and July, the most numerous records of O-group blue whiting are from the area west of Scotland, the Faroes and the northern North Sea.

In 1961 and 1979, small O-group blue whiting were caught off northwestern Norway in significant numbers. During the O-group surveys in 1983 and 1984, O-group blue whiting were recorded in the Barents Sea over a wider area than previously.

The O-group blue whiting recorded in the northern North Sea in June-July and around the Faroe Islands in July probably originate from the main spawning grounds west of the British Isles. On the other hand, the fish recorded to the west of Iceland and off northwest and northern Norway are more likely to originate from a spawning area north of the main area.

In the industrial bottom trawl fishery in the northern North Sea, immature blue whiting (mostly ages 0 and 1) make up a considerable proportion of the fish caught. The same is the case with similar fisheries off the west coast of Norway, north and northwest coast of Scotland, south coast of Iceland and in a newly-started fishery at the Faroe Islands.

A considerable amount of valuable information on the quantitative distribution of immature blue whiting and year-class strengths has come from the international blue whiting acoustic surveys in August in the Norwegian Sea and adjacent waters initiated in 1982. In these surveys, the main concentrations were found in the southern Norwegian Sea, around the Faroe Islands, south and west of Iceland, in the Norwegian Deep and along the west coast of Norway. During Icelandic surveys in 1983-85 in June in the area between southeast Iceland and the Faroes, immature blue whiting were recorded in considerable quantities, especially over the Faroe-Iceland Ridge; there is some evidence that the immature fish stay in this area throughout the year (Sveinbjörnsson et al., 1984). Similarly, during a Norwegian survey off the west coast of Norway in April 1985, immature blue whiting (ages 1-3) were found to be predominant throughout the area (Monstad, 1985). Furthermore, during a bottom trawl survey for demersal fish species in Icelandic waters in March 1985, immature blue whiting (mainly age 2) were caught in the outer part of the continental shelf from southeast to northwest Iceland (Sveinbjörnsson, 1985).

It seems clear from the different records that the nursery areas for blue whiting extend through a number of national zones, but it is difficult at present to quantify the percentage in each zone. In addition, the proportion of any year class in any nursery area will depend on the prevailing current regime during the egg and larval drift.

Adult distribution and migration (Figure 6.2.3.3)

Spawning season

During the spawning season in February-May, adult blue whiting congregate to the west of the British Isles, the largest concentrations being found along the edge of the continental shelf and around the slopes of the Porcupine Bank and, to a lesser extent, over the slopes of Rockall Bank.

The period of peak abundance in the area west of Scotland extends from late March to mid-April, with some evidence that older fish reach the spawning grounds before the younger ones. By early May, the spent fish have largely migrated from the area west of the British Isles and, during the remainder of the year, the residual population consists largely of immature fish in that area.

Post-spawning and pre-spawning migrations

There is a massive northward migration of post-spawning fish from the main spawning area west of the British Isles in April-May.

In the late 1970's and until 1981, large concentrations of post-spawning blue whiting were found in late April and early May southwest and west of the Faroes indicating that this was the main route taken then during the post-spawning migration. In later years, however, the main route has been through the Faroe-Shetland Channel. North of the Faroe Islands, these concentrations disperse over the entire Norwegian Sea and into the Norwegian Deep for feeding. The main directions and extent of this feeding migration are most probably governed by the hydrographic conditions, available food and the stock structure. In June-July, post-spawning concentrations are regularly recorded east of Iceland, but the magnitude may vary considerably. These concentrations are sometimes known to move inside the continental shelf where they stay during the summer, such as during 1977-79. A successful blue whiting fishery took place in July-August 1977-79 along the northern part of the east coast of Iceland. Since 1979, no post-spawning migration has been recorded to the east coast of Iceland. From June to August, large concentrations have been found north and northeast of Iceland and, in the same season, records have been made of fish west of Spitsbergen (80^{0}N) and, in some years, as far east as 45^{0}E in the Barents Sea. In September and October, the distribution in the Norwegian Sea, appears to be very wide. The most likely interpretation of the available evidence is that the summer dispersal from the main spawning ground takes place over the entire Norwegian Sea with some local aggregations depending on the environmental conditions.

In August 1980 and 1981, Norwegian research vessels covered a major part of the Norwegian Sea during an acoustic survey of the blue whiting stock. International acoustic surveys, coordinated by ICES since 1982, have taken place in the Norwegian Sea and adja cent waters in the same period. In the text table below, the percentages of the total biomass estimates during these surveys are shown within and beyond the areas of national fisheries jurisdiction of the NEAFC contracting parties (Figure 6.2.3.4).

Area	1980	1981	1982	1983	1984	1985
International Zone	18.9	26.0	14.7	5.6	4.8	8.2
Svalbard[1]	5.4	2.0	1.1	1.1	0.1	-
Jan Mayen	16.8	8.8	5.9	3.4	0.6	2.5
Norway	40.7	38.7	45.9	38.2	39.2	22.7
Iceland	8.6	14.2	10.8	25.0	18.4	13.7
Greenland	0.1	-	-	-	-	0.9
Faroes	4.7	8.3	16.9	19.4	25.9	37.4
EEC	4.8	2.0	7.7	7.2	11.1	14.7

[1] Spitsbergen, Bear Island and Hopen Island.

During these surveys, the area covered has varied quite extensively, and the figures given in the table should, therefore, be treated with caution. In some years, such as 1980, the Svalbard area was surveyed adequately giving a fairly reasonable percentage, whereas in other years, the coverage was not adequate and resulted in extremely low percentages. Similarly, the Faroe zone was surveyed well in 1985 giving a high percentage, whereas in 1980, it was only partially surveyed. The same applies to all the other zones. During 1980-85, however, great changes have taken place both in the stock structure and in the hydrography of the Norwegian Sea, which have affected the distribution of blue whiting significantly.

The available evidence indicates clearly that the largest fish have a more northerly distribution in the summer than the smaller fish. From 1980 to 1981, the stock consisted mainly of older fish with a more northerly distribution, whereas during 1983-85, the stock has been dominated by the young 1982 and 1983 year classes with a more southerly distribution.

By October, a reverse migration begins with concentrations forming in the Faroe-Iceland region; in winter, they are distributed over wide areas of the southern Norwegian Sea, especially in the area between the Faroe Islands and Iceland. In November-December, pre-spawners begin to move into the Faroe zone in fishable concentrations and by late January and early February, they are found as far south as the Faroe-Shetland Channel. From surveys and the fishery, it appears that the most regular route of the pre-spawning migration is east of the Faroe Islands, although there are some recent records of concentrations west of the Faroes in February.

During its annual cycle, the adult population migrates and disperses from the EEC zone into the Faroese, Icelandic and Norwegian zones and later further north also into the international, Jan Mayen and Svalbard zones, and then returns through the Faroese zone into the EEC zone to spawn.

Residual populations

Although the major part of the adult population spawns west of the British Isles and migrates to the feeding areas further north, there are residual populations in much of the area of distribution throughout the year, such as west and southwest of Ireland, over Rockall Bank, over the Faroe-Iceland Ridge, along the Norwegian coast and in the Barents Sea. This indicates a considerable degree of complexity in the stock structure of blue whiting.

Considerable quantities of adult and immature fish have been found in the Irminger Sea between Iceland and Greenland, and there is a record of blue whiting spawning over the Reykjanes Ridge southwest of Iceland. The relationship between these groups and the main stock is not clear, and the pattern of distribution throughout the year is not well known.

Most records from East Greenland and the Irminger Sea area (Dohrn Bank) are from May to September, and a decrease in catch rates has been reported in the Dohrn Bank area between September and November, indicating a movement of the fish out of the area.

Distribution of catches of blue whiting

The main fishing areas for the different blue whiting fisheries are shown in Figure 6.2.3.5. In Table 6.2.3, the total landings during 1978-84 are divided into national fishery zones. The table was derived from data brought by the Working Group members and some assumptions had to be made. For this reason, the totals for each year deviate somewhat from the official total.

Seasonal distribution of the southern blue whiting stock

The available information on the seasonal distribution of the southern blue whiting stock is very limited. The Working Group was not, therefore, able to present a valid seasonal distribution pattern.

References

Anon. 1981. Blue Whiting Assessment Working Group Report 1981. ICES Doc. C.M.1981/H:12 (mimeo).

Anon. 1983. Report of the Blue Whiting Assessment Working Group 1982. ICES Doc. C.M.1983/Assess:3 (mimeo).

Anon. 1984. Report of the Blue Whiting Assessment Working Group 1983. ICES Doc. C.M.1984/Assess:2 (mimeo).

Anon. 1985. Report of the Blue Whiting Assessment Working Group 1984. ICES Doc. C.M.1985/Assess:3 (mimeo).

Bailey, R. S. 1982. The population biology of blue whiting in the North Atlantic. Adv. Mar. Biol., 19:257-335.

Monstad, T. 1985. Norwegian blue whiting observations April 1985. Working paper brought to the Working Group 1985.

Sveinbjörnsson, S. 1985. Icelandic blue whiting acoustic surveys to the area between Iceland and the Faroes in June 1983-85. Working paper brought to the Working Group in 1985.

Sveinbjörnsson, S., Astthorsson, O. S. and Malmberg, S. A., 1984. Blue whiting feeding migration in relation to environmental conditions in the area between Iceland and the Faroes in June 1983. ICES Doc. C.M.1984/H:24 (mimeo).

Zilanov, V. K. 1984, "Blue whiting of the North-East Atlantic", in Russian. "Pischevaya prom", Moscow 1984.

7. RESPONSE TO THE NEAFC REQUEST FOR INFORMATION ON MINIMUM MESH SIZES AND MINIMUM FISH SIZES

The following is a response to the NEAFC 4-point request for further information and scientific comment on this subject.

7.1 Provide more information on the practice of joint use of minimum trawl mesh size and minimum allowable fish landing size (alternatively catch size) in the North-East Atlantic area.

Some queries have been made concerning the apparent discrepancy between the selection factor for cod and haddock in the north-east Arctic and the same species at Iceland. These differences can almost certainly be attributed to differences in the fishing gear used. The background to the Icelandic regulation can be found in an ICES paper by Thorsteinsson (1980), the findings of which can be summarised in Table 7.1. It may be seen that the experimental results for trawl gear have a range of selection factors: cod 2.5-3.24, haddock 2.5-3.24 and redfish 1.8-2.61. The observed selection factors depended on whether or not a chafer was used, its mesh size relative to that of the cod-end, how it was attached to the cod-end, and how many fish were in the trawl.

The lowest selection factors in the Icelandic experiments were obtained for all three species with a chafer having a mesh size twice that of the cod-end (which nevertheless masked some of the cod-end meshes). The highest selection factors for cod and haddock (i.e., the most escapement) were seen when no chafer was used. There are no redfish data for the chaferless experiment, but there is no reason to doubt that the same phenomenon would have been observed if chaferless tows had been made on the redfish grounds.

These Icelandic data are far from being unique in illustrating the extent to which many different factors influence the selection of fish by the trawl meshes. Considerable information on this subject has been available for the last 25 years or so from many different research workers, but largely through the work of Bohl in the Federal Republic of Germany. Thorsteinsson's paper is cited in this regard because the discussion concerns selection factors as the basis of relevant Icelandic fisheries regulations.

Further information on selection factors, associated fish sizes and regulations in Portuguese and Spanish waters was provided to the ACFM meeting in May 1985. This has been used to update the material presented in Griffith's information paper to the 1984 meeting of the NEAFC *ad hoc* Committee on Technical Conservation Measures (see Table 7.2). More data on *Nephrops* in NEAFC Regions 2 and 3 are also included, as are selection figures for redfish and plaice in Icelandic waters.

As before, the selection lengths for each entry in Table 7.3 (which except for *Nephrops* have been rounded to the nearest centimetre) are given in the same sequence as the minimum legal mesh size to which they refer.

7.2 Provide more information on the use of minimum mesh size, in gears other than trawl, in management in the North-East Atlantic.

Beam trawls

Selectivity experiments with beam trawls have been carried out in recent years. The results showed no practical differences from those obtained using otter trawls, and so no distinction is made between these two gears in scientific mesh assessments.

Danish seines (Table 7.3)

At the end of Table 7.1 and in Table 7.3 may be found some Icelandic selectivity data for the Danish seine; plaice was the main species of interest in the experiment, although cod were also caught. Table 7.3 also contains some Norwegian figures for cod and haddock.

The literature on the comparative selectivity of trawl and Danish seines shows that, for a given mesh size, the seines release relatively larger fish than the trawl. One early paper (Lucas *et al*.,1954) suggested that, for haddock and whiting, the cod-end mesh of the trawl should be 10-15 mm greater than that of the seine in order to achieve equivalent selection. These early investigations of seine selectivity compared with trawls (Lucas *et al*., op.cit.; Graham *et al*.,1954; Graham, 1954) used nets made of natural fibre, and so the results are not appropriate to include in Table 7.3.

Robertson (1984) obtained selection factors for haddock and whiting using seine nets of double braided polyethylene and cod ends having, respectively, diamond meshes and square meshes. The selection factors for the diamond mesh (the traditional design), as determined for a 79-mm mesh, are shown in Table 7.3. The selection factors for the Danish seine, as with the experiments using natural fibres in the 1950's, were all higher than for comparable trawl meshes.

Similar work is continuing at other fisheries research institutes.

Gill nets

Gill nets tend to catch fish of a limited size range, although their selectivity depends not only on the mesh size, but also on twine material and the construction of the net. Stewart (1984) investigated the selectivity of monofilament, multi-filament and twisted multi-filament gill nets of 152-mm nominal mesh size. For cod off northeast Scotland, he found that the size range of the monofilament catch peaked at 60-65 cm, while that of the twisted multi-filament gear peaked at 40-45 cm. In the multi-monofilament nets, the size range had two peaks, one at 40-45 cm (tangled fish) and one at 60-65 cm (gilled fish).

Olsen (1959) found selection peaks for herring as follows (rounded values):

Mesh size (mm)	Selection peak (cm)
60	29
65	31
73	35

German investigations on herring, using gill nets of cotton and artificial fibre, obtained the following average values (Bohl and Schumacher, 1960a; 1960b; and von Brandt et al., 1959):

Area	Material	Mesh size (mm)	Herring average length (cm)
SE Ireland 1959	Cotton	26-27	27.4
		30	28.6
Norway 1960	Cotton	26.4	32.4
(Atl.Scandian		30.2	34.0
spring	Knotless Trevira	30.1	33.9
spawners)	Menlon	30.9	34.3
Norway 1959	Cotton	26.4	31.6
(Atl.Scandian		30.3	33.5
spring spawners)	Knotless Trevira	26.8	31.3

Trammel nets

Watson et al., (1979) found that 48% of the soles caught with trammel nets with an inner net mesh of 60 and 88 mm were below marketable size (i.e., below 26-27 cm). In contrast, the catch of nets having inner meshes of 119 mm and 144 mm and fished on the same ground at the same time had less than 4% unmarketable.

7.3 Evaluate how the joint use of minimum trawl mesh size and minimum allowable landing size (alternatively catch size) can best contribute to obtaining a desired exploitation pattern.

In general, minimum fish sizes are established in order to protect young fish from being caught and thus to contribute to an optimal exploitation pattern. There are several means by which this objective can be achieved:

1) Area and/or time closures.

   a) Permanent or seasonal closure of important nursery grounds.

   b) Real-time closure based on monitoring of the young (undersized) fish distribution.

2) Minimum mesh sizes in gears used in directed fisheries.

3) Maximum allowable by-catches of undersized fish in all types of fisheries.

Although the square mesh cod-ends in trawls and Danish seines are still at the experimental stage, they seem to have clear advantages over diamond mesh. Their smaller selection range when used in seines (Robertson, 1984) and trawls (Robertson, 1983; 1984) indicates that they can select more "cleanly" and retain fewer of the fish below the 50% retention size. This would reduce the mortality on younger fish and also reduce discarding.

7.4 Evaluate how the waste through discard in using these two regulation measures can be minimised.

When discussing minimum mesh sizes and landing sizes as methods of regulating an exploitation pattern, it is necessary, for two reasons, to take full account of the problem of discarding undersized fish which have unavoidably been caught even with a legal mesh. Firstly, some (or many) of the discarded fish die; the proportion varies with species and with the operational and environmental conditions. Discarding, thus, contributes to the overall mortality rate and, therefore, has a direct and obvious bearing on the exploitation pattern. Secondly, a fishery which has a significant level of discarding will experience little or no short-term loss following the introduction of a larger mesh size. This is because the calculated short-term losses include (or consist of) the fish which would have been discarded anyway using the old mesh size.

In order to minimise the amount of discarding which might otherwise have to be done in order to comply with management regulations, ACFM recommended in 1978 "that the minimum landing size should be fixed at the 25% selection length for the minimum mesh size enforced, except when this minimum landing size is less than that currently in force" (Anon., 1979).

Discarding can be further reduced by a ban on trawling in areas where large quantities of young fish would be unavoidably caught. Such regulations are usually seasonal, the periods of closure depending on what species are involved, their spawning times and their growth rates, but they can also be implemented on a "real time" basis.

When formulating mesh size and fish size regulations, biological considerations (which should always be taken into account) are sometimes more relevant than the straightforward selection parameters because the shape of some species of fish (plaice, for example) makes the younger ones more vulnerable to capture than other species which can escape more easily. In order to protect the young fish, therefore, and at the same time avoid having to use a mesh so large that it would be impractical to use it to fish for other species, the minimum legal fish size has to be larger than that suggested purely by the selection parameters. A knowledge of growth rates is thus essential.

There is evidence that the use of square meshes in the cod-end of trawls and Danish seines can reduce the amount of discarding (see Section 7.3).

7.5 References

Anon. 1979. Reports of the ICES Advisory Committee on Fishery Management, 1978. ICES, Coop. Res. Rep., No.85, 158 p.

Bohl, H. and Schumacher, A. 1960a. Versuche der Motorlogger 'Brandenburg' und 'G.M. Daneker' mit grossmaschigen Treibnetzen vor der Südostküste Irlands vom 23/24.11 bis 21.12.1959. Protokolle zur Fischereitechnik, 6(27/28):254: 272.

Bohl, H. and Schumacher, A. 1960b. Versuche der Motorlogger 'Paderborn' - BV 107 - und 'G.M. Daneker'- AE1 - mit grossmaschigen Treibnetzen vor der Norwegen-Küste von 19.1- 17. bzw. 14.2.1960. Protokolle zur Fischereitechnik, 6(27/28): 273-295.

Brandt, A. von, Schärfe, J., Bohl, H. and Schumacher, A. 1959. Versuche zur Fangausweitung durch Änderung der Fangtechnik 1958/59. Protokolle zur Fischereitechnik, 6(25).

Graham, M. 1954. Trial of mesh selection in trawls and seines. J. Cons. int. Explor. Mer, 20(1):62-71.

Graham, B., Beverton, R.J.H., Margetts, A.R. and Gulland, J.A. 1954. A note on published trawler/seiner comparisons. J. Cons. int. Explor. Mer, 20(1):51-55.

Lucas, C. E., Ritchie, A., Parrish, B. B. and Pope, J. A. 1954. Mesh selection in the roundfish seine. J. Cons. int. Explor. Mer, 20(1):35-50.

Olsen, S. 1959. Mesh selection in herring gill nets. J. Fish. Res. Bd. Canada, 16(3):339-349.

Robertson, J. H. B. 1983. Square mesh cod-end selectivity experiments on whiting (Merlangius merlangus (L.)) and haddock (Melanogrammus aeglefinus (L.)). ICES, Doc. C.M.1983/B:25 (mimeo.).

Robertson, J. H. B. 1984. Square mesh cod-end selectivity for haddock (Melanogrammus aeglefinus (L.)) and whiting (Merlangius merlangus (L.)) in a Scottish seine net. ICES, Doc. C.M.1984/B:30 (mimeo.).

Stewart, Peter A. M. 1984. Gill net selectivity in the northeast Scottish inshore cod fishery" ICES, Doc. C.M.1984/B:29 (mimeo.).

Thorsteinsson, G. 1980. Icelandic bottom trawl and Danish seine cod-end selection experiments on cod, haddock, redfish and plaice in 1972-76. ICES, Doc. C.M.1980/B:3 (mimeo.).

Watson, A., Millner, R. and Mumford, B. 1979. Selection of sole (Solea solea (L.)) by trammel nets and the effect of mesh size on catches. ICES, Doc. C.M.1979/B:12 (mimeo.).

8. GENERAL MANAGEMENT CONSIDERATIONS

8.1 Possibilities for Alternative TAC Advice

A request from the EC Commission (letter of 5 July 1985) asked ACFM "to investigate the possibilities of giving more objective advice on TAC's as an alternative to those based on average catch levels".

ACFM dealt with this question at its November 1985 meeting and based its discussion on the STCF Discussion Paper: "Use of Approximate Methods for Catch Forecasts" (STCF 9th Meeting).

The advice concerning exploitation of fish stocks given by ACFM should preferably be based on a full analytical assessment using data of high validity. This would not only enable more precise catch forecasts, but also form the basis for advice concerning management of the fishery both in respect to the level of fishing mortality and the technical measures.

It should be stressed that the approximate short-cut methods assume a constant level of exploitation and provide no possibility to detect a trend in fishing mortality. Further, the assumption of constant fishing effort is fundamental for the use of catch data as a measure of abundance, and for stocks which are effectively regulated by a TAC, this assumption may not be valid.

However, ACFM noted that, if a full assessment is not possible for a stock, the present management system still requires a precise catch forecast as a basis for setting a TAC. Especially when all TAC's in a mixed fishery are enforced irrespective of the precision in the catch forecasts, problems are encountered if one of the predictions is in great error.

ACFM decided that, in its future reports, alternative methods to those based on average catch data will be attempted in case the analytical assessment is rejected. Estimates of recruitment and other available information from the fishery could be used.

As base-line methods for "simple" catch predictions, the short-cut methods are likely to be applicable for several stocks. These have proved to be a useful prediction of the catch of Norway pout in the North Sea. ACFM agreed to ask the assessment working groups, where they find it appropriate, to explore the possibilities of applying other approximate short-cut methods to each particular stock.

Concerning the catch forecast given in the STCF Discussion Paper, time did not allow ACFM to deal with the stocks in detail, but the question will be referred to the assessment working groups. For most of the stocks presented in the paper, data on recruitment are scarce. Such data will greatly improve the assessments, and until information on recruitment is more extensively available, predictions by these methods will strongly depend on the "hangover" coefficient and consequently on catches in the most recent year.

8.2 The Management of Short-Lived Species

Stocks of short-lived species are characterised by a high natural mortality rate, with the corollary that the stock is composed of only a small number of age groups. For this reason, fluctuations in recruitment have dramatic effects on spawning stock size. In addition, since few individuals survive to spawn more than once, high rates of exploitation can be expected to exacerbate the effect of poor recruitment. If recruitment itself is affected at low spawning stock sizes, then these stocks may be particularly vulnerable to overexploitation.

While effort control may be of some use in the management of these species, the potential for catching efficiency to increase is high, and management by control of catch levels is likely to remain the most appropriate method. The catches are composed mainly of one or two age groups, however, and forecasting catches and managing the fishery is thus essentially a problem of estimating recruitment. This implies the need for surveys shortly before the management period, and a readiness on the part of the management body to implement advice rapidly. In some stocks, this can be facilitated by changing the management time unit, (e.g., 1 July to 30 June instead of by calendar year). ACFM also recognised that the existence of by-catch species in some fisheries for short-lived species is a relevant consideration in the management of the latter.

The problems of assessment and evaluating the effects of exploitation in short-lived species are greater than in other species, and the first indications are that interactions with other species may be of particular importance. Understanding of these problems will only be achieved by intensified research.

8.3 The Use of $F_{0.1}$ as a Management Objective

In response to a request by the European Community, ACFM considered the biological merits of fishing at $F_{0.1}$ as a management objective.

$F_{0.1}$[1] is a level of fishing mortality below Fmax and has no has no special biological basis. It may be calculated from any yield-per-recruit curve, and is especially useful where F_{max} either is undefined or is calculated to be within a wide range of fishing mortality values on a flat-topped curve.

---

[1] This is the fishing mortality rate at which the slope of the yield-per-recruit curve is 1/10 of the slope of the origin, i.e., the value at which the marginal yield per recruit (the yield per recruit produced by adding one extra unit of effort) is one-tenth of the yield per recruit produced by the first unit of effort introduced to the unexploited stock (ICES Coop. Res. Rep., No.62).

For the target species, exploitation at the $F_{0.1}$ results in yield per recruit close to that available at F_{max}, but at considerably lower fishing effort. The number of year classes and the average size of fish in the stock is increased at $F_{0.1}$ as are also the total biomass and spawning stock biomass. The expected advantages are higher catch rates, greater stability in yields, reduced sensitivity of the stock to recruitment fluctuations and more reliable scientific advice. Many of these results have been observed on the cod stock in NAFO Divisions 2J, 3KL which has been managed at the $F_{0.1}$ level since 1977. Exploitation at a target fishing mortality of $F_{0.1}$ is the management strategy preferred by ACFM for certain stocks, such as herring.

ACFM notes that, at the larger long-term equilibrium biomass levels implied by the $F_{0.1}$ strategy, growth rates of the target species would be expected to decline while consumption of prey species would increase.

Table 2.1.1.1 North-East Arctic COD
Total nominal catch (tonnes) by fishing areas
(landings of Norwegian coastal cod not included).
(Data provided by Working Group members)

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*	58,197	194,205	25,854	278,256

*Provisional figures

Expected Catches

1985	111,000	166,000	49,000	326,000

Table 2.1.1.2
North-East Arctic COD.
Nominal catch (tonnes, whole weight) by countries (landings of Norwegian coastal cod not included, landings of Murman cod included). (Sub-area I and Divisions IIa and IIb combined). (Data provided by Working Group members).

Year	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Norway	Poland	United Kingdom	U.S.S.R.	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	100	686	1,010	231,330	8,608	3,592	22,256	-	278,256

*Provisional figures

Table 2.1.2.1 North-East Arctic HADDOCK.
Total nominal catch (tonnes) by fishing areas.
(Data provided by Working Group members).

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*	4,118	13,469	74	17,661

*Provisional figures.

Expected Catches

1985	11,000	12,000	+	23,000

Table 2.1.2.2

North-East Arctic HADDOCK.
Nominal catches (tonnes) by countries. (Norwegian coastal haddock not included, Murman haddock included. (Sub-area I and Divisions IIa and IIb combined). (Data provided by Working Group members).

Year	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Norway	Poland	United Kingdom	U.S.S.R	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	-	1,682	13,400	-	77,153
1982	496	53	-	1,258	41,421	-	827	2,900	-	46,955
1983	428	-	1	729	19,371	-	259	680	139	21,607
1984*	297	-	4	400	15,586	-	234	1,103	37	17,661

*Provisional figures.

Table 2.2.1 **Nominal catch of REDFISH (in tonnes) by countries (Sub-area I, Divisions IIa and IIb combined). (As reported officially to ICES).**

Country	1974	1975	1976	1977	1978
Belgium	30	28	2	1	-
Faroe Islands	6	67	137	8	1
France	1 116	-	-	660	3 608
German Dem. Rep.	28 275	28 020	22 636	17 614	16 165
Germany, Fed. Rep.	6 597	5 182	7 894	7 231	11 483
Netherlands	-	-	127	-	-
Norway	7 055	4 966	7 305	7 381	7 802
Poland	1 269	4 711	4 137	175	2 957
Portugal	-	331	3 463	1 480	378
Spain	-	1 194	3 398	-	-
U.K.	3 509	2 746	4 961	6 330	3 390
USSR	48 787	230 950	263 546	144 993	78 092
Total	96 644	278 195	317 606	185 873	124 172 1)

Country	1979	1980	1981	1982	1983	1984 x)
Belgium	-	-	-	-	-	-
Faroe Islands	-	-	206	-	-	-
France	1 142	1 297	537	841	1 692	-
German Dem. Rep.	16 162	8 448	4 614	4 463	2 500	4 167 2)
Germany, Fed. Rep.	11 913	7 992	4 688	3 182	3 395	3 286 2)
Netherlands	-	-	-	-	-	-
Norway	9 025	8 472	9 249	10 020 2)	11 067 2)	18 618 2)
Poland	261	87	26	-	-	-
Portugal	1 100	271	-	-	...	-
Spain	1 375	1 965	930	...	222	-
U.K.	1 756	1 307	470	336	182	336
USSR	70 451	72 802	81 652	112 685	105 459	68 600
Total	113 620 1)	102 765 1)	102 372	131 527	124 517	95 007

x) Provisional data
1) The total figure used by the Working Group for assessments (including catches by non-members)
2) National statistics.

Table 2.2.2 Nominal catch of Sebastes marinus and Sebastes mentella in Sub-area I and Divisions IIa and IIb combined (in tonnes).

Year	1974	1975	1976	1977	1978
S. marinus	27 272	39 125	48 584	39 508	31 695
S. mentella	69 372	239 070	269 022	146 365	92 477
Total	96 644	278 195	317 606	185 873	124 172

Year	1979	1980	1981	1982	1983	1984 x)
S. marinus	26 475	23 411	20 826	16 341	19 581	25 338
S. mentella	87 145	79 354	81 546	115 186	104 936	69 669
Total	113 620	102 765	102 372	131 527	124 517	95 007

x) Provisional data.

Table 2.3.1 **GREENLAND HALIBUT.**
Nominal catch (tonnes) in Sub-areas I and II, 1974-1984 (data for 1974-1982 from Bulletin Statistique).

Country	1974	1975	1976	1977	1978
Faroe Islands	-	-	2	21	-
German Dem. Rep.	5 914	8 472	8 955	8 176	4 611
Germany, Fed. Rep.	88	94	31	148	321
Norway:					
trawl catch[1]	4 656	1 686	4 030	2 564	2 302
long-line catch and gill net[2]	4 135	3 172	1 975	1 653	1 780
Poland	5 146	3 645	3 566	224	544
U.K. (Eng.+ Wales)	866	731	935	1 059	407
USSR	16 958	20 372	16 580	15 045	14 651
Others	-	-	-	-	1
Total	37 763	38 172	36 074	28 890	24 617

Country	1979	1980	1981	1982	1983	1984[x]
Faroe Islands	24	-	8	-	-	
France					67	-
German Dem. Rep.	3 488	2 080	1 358	1 153	1 913	2 089
Germany, Fed. Rep.	481	303	128	18	130	68
Norway:						
trawl catch[1]	921	1 559	2 949	1 746		
long-line catch and gill net[2]	1 992	1 598	1 252	1 404	4 882[3]	4 374[3]
Poland	106	-	-	-	-	
U.K. (Eng.+ Wales)	59	26	9	10	2	22
USSR	10 311	7 670	9 276	12 394	15 152	15 300
Others	5	48	38	8	-	
Total	17 312	13 284	15 018	16 733	22 146	21 853

x) Provisional data
1) From national statistics (incl. shrimp trawl)
2) From national statistics.
3) Norway total.

Table 2.4.1 **Nominal catch (in tonnes) of REDFISH in Sub-area XIV, Divisions Va and Vb, by species for Sub-area XIV and Sub-area V combined. (As reported officially to ICES).**

Year	Division Va	Division Vb	Sub-area XIV	Total	S.marinus	S.mentella
1974	69 129	7 765	13 978	90 872	49 845	41 027
1975	70 734	8 591	25 329	104 654	60 980	43 674
1976	69 864	5 364	113 656	188 884	93 605	95 279
1977	61 525	7 402	14 433	83 360	52 752	30 608
1978	35 202	9 806	20 880 1)	65 888	47 791	18 097
1979	64 310	12 674	20 918 1)	97 902	75 056	22 846
1980	72 249	10 039	32 609 1)	114 897	88 085	26 812
1981	95 517	7 145	42 999 1)	145 661	101 285	44 376
1982	116 391	9 441 2)	103 323 1)3)	229 155 3)	123 165	105 990 3)
1983	124 527	9 374	91 350 1)4)	225 251 4)	106 677	118 574 4)
1984 x)	109 555	13 978	83 537 1)	207 070 5)	93 739	113 331 5)

x) Privisional data
1) Catches updated for Sub-area XII included
2) Catches updated for Sub-area VI included
3) Including 60 508 tonnes from the Oceanic Stock not included in the assessments
4) Including 60 234 tonnes from the Oceanic Stock not included in the assessments
5) Including 69 528 tonnes from the Oceanic Stock not included in the assessments

Table 2.5.1 **GREENLAND HALIBUT. Nominal catch (tonnes) in Sub-areas V and XIV, 1974-1984. (Data for 1974 to 1982 from Bulletin Statistique).**

Country	1974	1975	1976	1977	1978
Faroe Islands	48	8	375	1 251	258
France	-	-	-	-	12
German Dem. Rep.	25 801	16 963	-	-	-
Germany, Fed. Rep.	1 949	1 388	2 219	5 207	2 726
Greenland	2	1	1	4	6
Iceland	2 843	1 212	1 689	10 090	11 319
Norway	-	7	7	7	19
Poland	1 542	1 072	-	-	-
U.K.(Eng.+ Wales)	2 323	1 209	1 680	19	9
USSR	1 772	1 634	74	-	-
Total	36 280	23 494	6 045	16 578	14 349

Country	1979	1980	1981	1982	1983	1984 x)
Faroe Islands	150	1 042	767	1 532	1 145	2 501 2)
France	70	51	8	27	236	551 2)
German Dem. Rep.	-	-	-	-	-	
Germany, Fed. Rep.	6 461	2 318	3 007	2 581	1 132	1 151
Greenland	-	-	+	1	5	+
Iceland	16 934	27 838	15 455	28 300	28 360	30 080
Norway	1	3	2	+	2	1
Poland	-	-	-	-	-	
U.K.(Eng.+ Wales)	-	-	-	-	-	
USSR	-	-	-	-	-	
Total	23 616	31 252	19 239	32 441	30 880	34 284

x) Provisional data
1) From national statistics
2) From Faroese authorities

Table 2.6.1. Nominal catches (in tonnes) of COD in Sub-area XIV, 1974-84. (Data for 1974-81 broken down by countries are from Bull.Stat.)

Country	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Canada	-	-	2	-	-						
Faroe Isl.	652	581	440	1 407	6	-	-	292	-	368	-
German Dem. Rep.	15	326	-	-	-	-	-	-	-	-	-
Germany, Fed. Rep.	2 309	1 552	7 075	3 564	3 936	1 062	3 193	7 367	8 940	8 237	6 987
Greenland	68	224	372	1 833	1 347	2 755	1 778	890	893	438	1 047
Iceland	3 009	785	3 133	25	13	3	19	1	-	-	-
Norway	-	1 864	364	537	17	-					
Poland	1	18	-	-	-	-					
UK (Engl. & Wales)	499	575	1 514	1 393	41						
UK (Scotl.)	-	-	-	-	2						
USSR	-	-	127	16	-	-					
Total	6 553	5 925	13 027	8 775	5 362	3 820	4 990	8 550	9 833	9 043	8 034
Working Group Total				18 000 c)	26 000 c)	34 000 c)	12 000 a)b)	16 000 a)b)	27 000 a)b)	13 377 b)	8 068 b)

* Preliminary.
a) Including estimates of discards.
b) Including catches reported from ICES Sub-area XII and Division Vb.
c) Including estimates of unreported catches.

Table 2.8.1 Catch in numbers, millions and catch in weights, tonnes. Icelandic summer-spawning herring.

AGE	1969	1970	1971	1972	1973	1974	1975
1	4.520	2.003	8.774	0.147	0.001	0.001	1.518
2	78.410	22.344	13.071	0.322	0.159	3.760	2.049
3	8.274	33.965	5.439	0.131	0.678	0.832	31.975
4	5.178	4.500	13.688	0.163	0.104	0.993	6.493
5	10.015	2.734	3.040	0.264	0.017	0.092	7.905
6	2.841	4.419	1.563	0.047	0.013	0.046	0.863
7	1.389	1.145	3.276	0.028	0.006	0.002	0.442
8	1.179	0.531	0.748	0.024	0.006	0.001	0.345
9	0.609	0.604	0.250	0.013	0.003	0.001	0.114
10	0.424	0.195	0.103	0.009	0.003	0.001	0.004
11	0.286	0.103	0.120	0.003	0.001	0.001	0.001
12	0.139	0.076	0.001	0.001	0.001	0.001	0.001
13	0.109	0.061	0.001	0.003	0.001	0.001	0.001
14	0.074	0.051	0.001	0.001	0.001	0.001	0.001
JUVENILE	78.943	23.167	16.899	0.376	0.065	3.285	3.973
ADULT	34.504	49.564	33.176	0.780	0.929	2.448	47.739
TOTAL CATCH	20.913	15.779	10.975	0.310	0.255	1.274	13.280

AGE	1976	1977	1978	1979	1980	1981	1982
1	0.614	0.705	2.634	0.929	3.147	2.283	0.454
2	9.848	18.853	22.551	15.098	14.347	4.629	19.187
3	3.908	24.152	50.995	47.561	20.761	16.771	28.109
4	34.144	10.404	13.846	69.735	60.728	12.126	38.280
5	7.009	46.357	8.738	16.451	65.329	36.871	16.623
6	5.481	6.735	39.492	8.003	11.541	41.917	38.308
7	1.045	5.421	7.253	26.040	9.285	7.299	43.770
8	0.438	1.395	6.354	3.050	19.442	4.863	6.813
9	0.296	0.524	1.616	1.869	1.796	13.416	6.633
10	0.134	0.362	0.926	0.494	1.464	1.032	10.457
11	0.092	0.027	0.400	0.439	0.698	0.884	2.354
12	0.001	0.128	0.017	0.032	0.001	0.760	0.594
13	0.001	0.001	0.025	0.054	0.110	0.101	0.075
14	0.001	0.001	0.051	0.006	0.079	0.062	0.211
JUVENILE	9.573	22.321	35.502	33.011	18.438	12.764	22.889
ADULT	53.439	92.744	119.396	156.750	190.290	130.250	188.979
TOTAL CATCH	17.168	28.924	37.333	45.072	53.269	39.544	56.528

AGE	1983	1984
1	1.470	0.418
2	22.422	17.904
3	151.198	32.045
4	30.181	140.481
5	21.525	16.937
6	8.637	7.069
7	14.017	3.892
8	13.666	4.087
9	3.715	4.489
10	2.373	1.817
11	3.424	0.201
12	0.552	0.253
13	0.100	0.258
14	0.003	0.003
JUVENILE	78.323	23.911
ADULT	194.960	205.943
TOTAL CATCH	58.665	49.993

Table 2.8.2 Catches north of 62^{0}N of Norwegian spring-spawning HERRING (tonnes) since 1972.

Year	Catches of adult herring in winter	Mixed herring fishery in autumn*	By-catches of 0- and 1-group herring in the sprat fishery	Total
1972	-	9,895	3,266**	13,161
1973	139	6,602	276	7,017
1974	906	6,093	620	7,619
1975	53	3,372	288	3,713
1976	-	247	189	436
1977	374	11,834	498	12,706
1978	484	9,151	189	9,824
1979	691	1,866	307	2,864
1980	878	7,634	65	8,577
1981	844	7,814	78	8,736
1982	983	10,447	225	11,655
1983	3,857	13,290	907	18,054
1984	18,730	29,463	339	48,532
1985	33,230			

* Includes also by-catches of adult herring in other fisheries.

** In 1972, there was also a directed herring 0-group fishery.

Table 2.9.1 International catch of Barents Sea CAPELIN ('000 tonnes) in the years 1965-84.

Year	Norway	USSR	Other	Total
1965	217	7	-	224
1966	380	9	-	389
1967	403	6	-	409
1968	522	15	-	537
1969	679	1	-	680
1970	1,301	13	-	1,314
1971	1,371	21	-	1,392
1972	1,556	37	-	1,593
1973	1,291	45	-	1,336
1974	987	162	-	1,149
1975	943	431	43	1,417
1976	1,949	596	-	2,545
1977	2,116	822	2	2,940
1978	1,122	747	25	1,894
1979	1,109	669	5	1,783
1980	999	641	9	1,649
1981	1,238	721	28	1,987
1982	1,158	596	5	1,759
1983	1,421	812	-	2,233
1984	810*	624	-	1,434

* Preliminary figure.

Table 2.9.2 The total annual and seasonal catch of CAPELIN in the Iceland-East Greenland-Jan Mayen area (in '000 tonnes) during 1964-85.

	Winter season		Summer and autumn season				Total
Year	Iceland	Faroes	Iceland	Norway	Faroes	EEC	
1964	8.6	-	-	-	-	-	8.6
1965	49.7	-	-	-	-	-	49.7
1966	124.5	-	-	-	-	-	124.5
1967	97.2	-	-	-	-	-	97.2
1968	78.1	-	-	-	-	-	78.1
1969	170.6	-	-	-	-	-	170.6
1970	190.8	-	-	-	-	-	190.8
1971	182.9	-	-	-	-	-	182.9
1972	276.5	-	-	-	-	-	276.5
1973	440.9	-	-	-	-	-	440.9
1974	461.9	-	-	-	-	-	461.9
1975	457.6	-	3.1	-	-	-	460.7
1976	338.7	-	114.4	-	-	-	453.1
1977	549.2	25.0	259.7	-	-	-	833.9
1978	468.4	38.4	497.5	154.1	-	-	1,158.4
1979	521.7	17.5	441.9	126.0	2.5	-	1,109.6
1980	392.0	-	367.2	118.6	24.4	14.3	916.5
1981	156.0	-	484.6	91.4	16.2	20.8	769.0
1982	13.0	-	0.0	0.0	0.0	0.0	13.0
1983	0.0	-	133.3	0.0	0.0	0.0	133.3
1984	439.6	-	425.2	104.3	6.2	8.0	983.0
1985	348.5		*	188.7	72.0	16.0	

* Autumn season in progress.

Table 2.10 Nominal catch (tonnes) of SAITHE in Sub-area I and Divisions IIa and IIb, 1975-84.

(Data for 1975-83 from Bulletin Statistique).

Country	1975	1976	1977	1978	1979
Belgium	47	1	-	-	-
Faroe Islands	28	20	270	809	1,117
France	3,156	5,609	5,658	4,345	2,601
German Dem. Rep.	28,517	10,266	7,164	6,484	2,435
Germany Fed. Rep.	41,260	49,056	19,985	18,190	14,823
Netherlands	-	64	-	-	-
Norway	122,598	131,675	139,705	121,069	141,346
Poland	3,860	3,164	1	35	-
Portugal	6,430	7,233	783	203	-
Spain	11,397	21,661	1,327	121	685
Sweden	8	-	-	-	-
U.K.(England & Wales)	2,623	4,651	6,853	2,790	1,170
U.K. (Scotland)	140	73	82	37	-
USSR	13,389	9,013	989	381	3
Total	233,453	242,486	182,817	154,464	164,180

Country	1980	1981	1982	1983	1984*
Belgium	-	-	-	-	-
Faroe Islands	532	236	339	539	503
France	1,016	194	82	537	51
German Dem. Rep.	-	-	-	-	6
Germany Fed. Rep.	12,511	8,413	7,224	4,931	4,531
Netherlands	-	-	-	-	-
Norway	128,878	166,139	169,936	150,741	144,714
Poland	-	-	-	-	-
Portugal	-	-	-	-	-
Spain	780	-	-	-	-
Sweden	-	-	-	-	-
U.K.(England & Wales)	794	395	731	1,252	310
U.K. (Scotland)	-	-	1	-	-
USSR	43	121	14	206	200
Total	144,554	175,498	178,327	158,206	150,315

* Preliminary

Table 2.11

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

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

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

* Preliminary

Table 2.12.1 Nominal catch (tonnes) of SAITHE in Division Vb, 1974-1984

(Data for 1974-83 from Bulletin Statistique).

Country	1975	1976	1977	1978	1979
Belgium	-	6	-	-	-
Faroe Islands	2,517	2,560	5,153	15,892	22,003
France	23,980	15,367	17,038	8,128	2,974
German Dem. Rep.	26	-	-	-	-
Germany Fed. Rep.	5,229	2,605	3,806	1,088	581
Netherlands	491	232	58	-	-
Norway	486	2,232	1,279	1,124	1,137
Poland	815	1,007	-	-	-
Spain	654	117	-	-	-
U.K.(England & Wales)	2,428	3,063	2,613	557	190
U.K. (Scotland)	4,950	5,860	5,608	1,349	361
USSR	-	16	-	-	-
Total	41,576	33,065	34,835	28,138	27,246

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

* Preliminary

Table 2.12.2 Faroe Plateau COD. Nominal catches by countries 1974-1984 (tonnes) (Data for 1974-1983 from Bulletin Statistique).

Year	Faroe Islands	France	Germany Fed. Rep.	Norway	Poland	UK England	UK Scotland	Others	Total
1974	12,541	567[A]	292	446	320	2,879	7,516	20	24,581
1975	22,608	1,531	408	1,353	432	2,538	7,815	90	36,775
1976	28,502	1,535	247	1,282	496	2,179	5,491	67	39,799
1977	28,177	1,450	332	864	-	811	3,291	2	34,927
1978	24,076	213[A]	71[C]	245	-	518	1,460	2	26,585
1979	21,774	117[A]	23[C]	274	-	263	661	-	23,112
1980	19,966	40[A]	-[C]	127	-	13	367	-	20,513
1981	22,616	47	-[C]	240	-	-	60	-	22,963
1982	21,387	10	-	90	-	-	2	-	21,489
1983	37,916	13	128	83[B]	-	-	-[d]	-	38,140
1984[B]	37,265	-	8	43[A]	-	2[A]	-[C]		37,318

[A] Division Vb2 included

[B] Preliminary

[C] Working Group Data

[d] Included in Division Vb2

Table 2.12.3 Faroe Bank COD. Nominal catches by countries, 1974-84 (tonnes).
(Data for 1974-1983 from Bulletin Statistique)

Year	Faroe Islands	France	Germany Fed.Rep.	Norway	Poland	UK England	UK Scotland	Others	Total
1974	696	*	-	-	-	829	503	40	2,068
1975	378	81	50	-	-	749	804	55	2,117
1976	457	72	+	1	-	877	912	11	2,330
1977	851	219	-	99	-	9	780	-	1.958
1978	4,194	*	-	183	-	2	1,071	-	5,450
1979	1,273	*	-	33	-	-	677	-	1,983
1980	724	*	-	54	-	85	340	-	1,203
1981	975	-	-	120	-	-	134	-	1,229
1982	2,184	-	-	16	-	-	152	-	2,352
1983	2,284	-	-	17**		-	66***		2,367
1984**	1,838	-	*	-*		-*	21***		1,859

* Catches included in Vb_1

** Preliminary

*** Catches including Vb_1

Table 2.12.4.1 Faroe Plateau HADDOCK. Nominal catches by countries, 1974-84 (tonnes).
(Data for 1974-1983 from Bulletin Statistique)

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

* Catches including Vb_2

** Preliminary

*** Catches included in Vb_2

Table 2.12.4.2 Faroe Bank HADDOCK. Nominal catches by countries, 1974-84 (tonnes).
(Data for 1974-1983 from Bulletin Statistique)

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

* Catches included in Vb_1

** Preliminary

*** Catches including Vb_1

Table 3.1.1 HERRING. Catch in tonnes 1974-84 North Sea. Sub-area IV and Division VIId by country. (National catches as officially reported. Unallocated catches provided by Working Group members).

Country	1974	1975	1976	1977	1978
Belgium	603	2,451	2,451	57	-
Denmark	61,728	115,616	34,841	12,769	4,359
Faroe Islands	26,161[1]	25,854	14,378	8,078	40
Finland	-	-	1,034	-	-
France	12,548	20,391	14,468	1,613	2,119
German Dem.Rep.	3,268	2,689	2,624	2	-
Germany,Fed.Rep.	12,470	6,953	1,654	221	24
Iceland	29,017	16,286	9,412	-	-
Netherlands	35,106	38,416	20,146	4,134	18
Norway	40,975	34,183	27,386	4,065	1,189
Poland	9,850	7,069	7,072	2	-
Sweden	3,561	6,858	4,777	3,616	-
UK (England)	5,699	6,475	9,662	3,224	2,843
UK(Scotland)[3]	15,034	8,904	15,015	8,159	437
USSR	18,096	20,653	10,935	78	4
Total North Sea	275,116	312,798	174,834	46,010	11,033

Country	1979	1980	1981	1982	1983	1984*
Belgium	-	-	-	9,700	5,969	5,080
Denmark	10,546	4,431	21,146	67,851	10,468	38,777
Faroe Islands	10	-	-	-	-	-
Finland	-	-	-	-	-	-
France	2,560	5,527	15,099	15,310	16,353	20,320
German Dem.Rep.	-	-	-	-	-	-
Germany, Fed.Rep.	10	147	2,300[2]	349[2]	1,837	12,092
Iceland	-	-	-	-	-	-
Netherlands	-	509	7,700	22,300	40,045	45,665
Norway	3,617	2,165	70	680	32,512	96,250
Poland	-	-	-	-	-	-
Sweden	-	-	-	-	284	884
UK (England)	2,253	77	303	3,730	111	1,622
UK (Scotland)[3]	-	610	45	1,780	17,260	27,234
USSR	162	-	-	-	-	-
Total North Sea	19,158	13,466	46,663	122,056	133,794	247,924
Total including un-allocated catches	25,148	60,994	140,972	235,925	317,124	317,263

*) Preliminary
1 Supplied by Fiskirannsóknarstovan
2 From Federal Republic of Germany national statistics compiled by Federal Research Board for Fisheries, Hamburg
3 Catches of juveniles from Moray Firth not included

Table 3.1.2 HERRING in Division IIIa.
Landings in tonnes 1974-84.
(Data mainly provided by Working Group members).

Skagerrak	1974	1975	1976	1977	1978
Denmark	35,732	29,997	7,326	19,889	6,425
Faroe Islands	7,132	8,053	1,553	10,064	1,041
Germany, Fed.Rep.	36	108	6	32	28
Iceland	231	1,209	123	-	-
Norway (Open sea)	698	196	-	-	1,860
Norway (Fjords)	1,720	1,459	2,304	1,837	2,271
Sweden	11,683	12,348	6,505	8,109	11,551
Total	57,232	53,370	17,817	39,931	23,176
Kattegat					
Denmark	54,540	48,974	41,749	38,205	29,241
Sweden	39,779	23,769	30,263	37,160	35,193
Total	94,319	72,743	72,012	75,365	64,434
Division IIIa Total	151,551	126,113	89,829	115,296	87,610

Skagerrak	1979	1980	1981	1982	1983	1984*
Denmark	5,153	5,180	18,001	22,881	54,102	36,776
Faroe Islands	817	526	990	715	1,980	891
Germany, Fed.Rep.	181	-	199	43	40	-
Iceland	-	-	-	-	-	-
Norway (Open sea)	2,460	1,350	6,330	10,140	500	-
Norway (Fjords)	2,259	2,795	950	1,560	2,834	1,494
Sweden	8,140	10,701	30,274	24,859	35,176	59,195
Total	18,974	20,552	56,744	60,198	94,632	98,356
Kattegat						
Denmark	21,337	25,380	18,721	12,366	62,901	71,359
Sweden	25,272	18,260	38,871	38,892	40,463	35,027
Total	46,609	43,640	57,592	51,258	103,364	106,386
Division IIIa Total	65,583	64,192	114,336	111,456	197,996	204,742
Unallocated	8,117	20,053	57,000	35,344	-	-
Grand Total	73,700	84,245	171,336	146,800	197,996	204,742

*Preliminary

Table 3.1.3.1
Annual Celtic Sea and Division VIIj HERRING, 1975-84
(Data provided by Working Group members)

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether-lands	Poland	UK	USSR	Un-allocated	Total
1975	1,924	-	361	10,587	2,825	512	24	1,054	-	17,287
1976	1,919	147	28	5,986	1,627	324	-	826	-	10,857
1977	106	-	96	5,533	1,455	-	-	-	-	7,190
1978	8	-	220	6,249	1,002	-	-	-	850	15,519
1979	584	-	20	7,019	850	-	-	-	3,705	12,178
1980	9	-	2	8,849	393	-	-	-	-	9,253
1981	123	-	-	15,562	1,150	-	-	-	-	16,835
1982	+	-	-	9,501	-	-	-	-	-	9,501
1983	495	-	-	10,000	1,500	-	-	-	10,187	22,187
1984*	680	-	-	7,000	890	-	-	-	11,148	19,718

*Provisional

Table 3.1.3.2
Celtic Sea and Division VIIj HERRING by season (1 April to 31 March)
(Data provided by Working Group members)

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether-lands	Poland	UK	USSR	Un-allocated	Total
1974/75	2,150	-	435	13,939	2,462	954	-	-	-	19,940
1975/76	2,451	-	399	8,640	2,441	579	24	1,054	-	15,588
1976/77	1,317	147	36	5,864	1,324	257	-	826	-	9,771
1977/78	95	-	96	6,264	1,378	-	-	-	-	7,833
1978/79	8	-	220	8,239	1,002	-	-	-	-	7,559
1979/80	584	-	20	7,932	850	-	-	-	935	10,321
1980/81	9	-	2	9,024	292	-	-	-	3,803	13,130
1981/82	123	-	-	15,830	1,150	-	-	-	-	17,103
1982/83	+	-	-	13,042	-	-	-	-	-	13,042
1983/84	495	-	-	10,000	1,500	-	-	-	9,186	21,181
1984/85*	680	-	-	7,000	890	-	-	-	14,009	22,579

* Provisional

Table 3.1.4 HERRING.
Catch in weight, Division VIa (North) 1975-1984.

Country	1975	1976	1977	1978	1979
Denmark	374	249	626	128	-
Faroes	3,895	4,017	3,564	-	-
France	1,244	1,481	1,548	1,435	3
German Dem. Rep.	600	279	-	-	-
Germany, Fed. Rep.	5,582	4,084	-	26	-
Iceland	2,633	3,273	-	-	-
Netherlands	12,024	16,573	8,705	5,874	-
Norway	509	5,183	1,098	4,462	-
Poland	376	390	-	-	-
Sweden	-	2,206	261	-	-
UK (England)	125	20	301	134	54
UK (Scoland)	85,395	53,351	25,238	10,097	3
USSR	1,244	2,536	-	-	-
Unallocated	-	-	-	-	-
TOTAL	114,001	93,642	41,341	22,176	60

Country	1980	1981	1982	1983	1984*
Denmark	-	1,580	-	-	96
Faroes	-	-	74	834	954
France	2	1,243	2,069	1,313	-
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	256	3,029	8,453	6,283	5,507
Iceland	-	-	-	-	-
Netherlands		5,602	11,317	20,200	7,729
Norway		3,850	13,018	7,336	5,980
Poland		-	-	-	-
Sweden		-	-	-	-
UK (England)	33	1,094	90	-	-
UK (Scoland)	15	30,389	38,381	31,616	37,431
USSR	-	-	-	-	-
Unallocated	-	4,633	18,958	-4,059	16,588
TOTAL	306	51,420	92,360	63,523	74,285

*preliminary

Table 3.1.5 Monthly landings (tonnes) of HERRING from the Firth of Clyde (all fishing methods combined). (Data provided by the Working Group).

Month	1975	1976	1977	1978	1979	1980	1981
January	*	*	*	4*	4*	6*	15*
February	68*	7*	*	6*	8*	3*	15*
March	85	69*	*	7*	13*	8*	14*
April	369	521	530	246	12*	4*	32*
May	283	436	544	245	4*	2*	25*
June	203	281	640	238	336	114	429
July	354	332	494	376	466	656	982
August	240	473	601	587	450	645	511
September	515	541	559	581	374	559	106
October	811	598	556	653	263	79	*
November	571	595	560	647	1*	3*	2*
December	120	236	328	272	-*	2*	4*
Not known	44	50	35				
TOTAL	3,663	4,139	4,847	3,862	1,951	2, 081	2,135

Month	1982	1983	1984
January	2*	+ *	- *
February	16*	1*	- *
March	1*	1*	- *
April	2*	- *	- *
May	615	1*	554
June	850	265	847
July	757	519	944
August	262	681	276
September	- *	604	246
October	- *	457	124
November	- *	1*	*
December	1*	- *	- *
Not known		273**	247**
TOTAL	2,506	2,803	3,238

*Subject to closure of directed fishery
** Landed in Northern Ireland and Isle of Man.

Table 3.1.6 HERRING.

Estimated catches in weight in Divisions VIa (south) and VIIb,c, 1975-84

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	-	12	-	-	-	-	-	-	-	-
France	68	47	-	-	-	-	-	353	19	-
German Dem.Rep.	1,394	890	-	-	-	-	-	-	-	-
Germany Fed.Rep.	4,431	924	221	100	5	-	2,687	265	-	-
Ireland	12,465	10,895	15,916	19,128	18,910	27,499	19,443	16,856	15,000	10,000
Netherlands	15,208	16,546	4,423	481	1,939	1,514	2,790	1,735	5,000	6,400
Poland	2,558	2,778	6	-	-	-	-	-	-	-
United Kingdom (N Ireland)	6	1	1	6	2	1	2	-	-	-
USSR	2,634	674	-	-	-	-	-	-	-	-
Unallocated	-	-	-	-	1,752	1,110	-	-	13,000	11,000
Total	38,764	32,767	20,567	19,715	22,608	30,124	24,922	19,209	33,019	27,400

* Provisonal

Table 3.1.7.1 HERRING. Total catches (tonnes) in North Irish Sea (Division VIIa), 1975-84.

Country	1975	1976	1977	1978	1979	1980	1981
France	813	651	85	174	455+	1	-
Ireland	4,790	3,205	3,331	2,371	1,805	1,340	283
Netherlands	630	989	500	98	-	-	-
U.K.	18,244	16,401	11,498	8,432**	10,078++	9,272	4,094
Other	26*	-	-	-	-	-	-
TOTAL	24,503	21,246	15,414	11,075	12,338	10,613	4,377

Country	1982	1983	1984***
France	-	48+	-
Ireland	300	860	1,084
Netherlands	-	-	-
U.K.	3,375	3,025	2,982
Other	1,180+++	-	-
TOTAL	4,855	3,933	4,066

* USSR
** Includes 68.5 tonnes of spring-spawned herring
+ No data basis for allocation to stock
++ Additional unrecorded catch of 106 tonnes estimated
+++ Unallocated
*** Preliminary

Table 3.1.7.2

HERRING. Total catch by stock in Northern Irish Sea, 1975-1984.

Country	1975		1976		1977		1978	
	1	2	1	2	1	2	1	2
France	813	-	651	-	85	-	87	87
Ireland	2,406	2,384	1,816	1,389	2,009	1,322	610	1,761
Netherlands	630	-	989	-	500	-	98	-
U.K.	15,408	2,836	12,831	3,570	9,837	1,661	7,663	700
Unallocated	-	-	-	-	-	-	-	-
Total Manx	19,283		16,287		12,431		8,458	
Total Mourne	5,220		4,959		2,983		2,548	

Country	1979		1980		1981		1982	
	1	2	1	2	1	2	1	2
France	-	-	1	-	-	-	-	-
Ireland	748	1,054	762	578	100	183	198	102
Netherlands	-	-	-	-	-	-	-	-
U.K.	9,382	696	7,897	1,375	2,837	1,257	2,120	1,255
Unallocated	-		-	-	-	-	779	401
Total Manx	10,130 -		8,660		2,937		3,097	
Total Mourne	1,753		1,953		1,440		1,758	

Country	1983		1984*	
	1	2	1	2
France	-	-	-	-
Ireland	346	514	385	699
Netherlands	-	-	-	-
U.K.	1,759	1,266	1,587	1,395
Unallocated	-	-	-	-
Total Manx	2,105		1,972	
Total Mourne	1,780		2,094	

1) Manx stock, 2) Mourne stock

* preliminary

Table 3.2.1.1 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[4]
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
1984[5])	355	669	80	79	114	34	1,335

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 average range from 20,000 to 40,000 tonnes;

5 Preliminary

Table 3.2.1.2 HERRING catches for reduction purposes (tonnes) by year and Division in the North Sea.

Division	1977	1978	1979	1980	1981	1982	1983	1984
IVa, West	502	27	443	705	7 933	331	546	13 595
IVa, East	186	-	2	48	-	491	2 574	47 854
IVb	8 790	7 545	14 882	6 008	75 533	150 357	155 361	52 307
IVc	-	223	1	494	702	1 699	11	53
Total	9 478	7 795	15 328	7 255	84 168	152 878	158 492	113 809

Table 3.2.2.1 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 3.2.2.2 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 3.2.2.3 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 3.2.3.1 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 3.2.3.2 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 3.2.3.3 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 3.2.4.1 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 3.2.4.2 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 3.2.4.2 (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	1984A
					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 3.2.4.3 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 3.2.4.4 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 3.3.1.1 Cod landings from the Kattegat 1971-84 (tonnes)

Year	Denmark	Sweden	Germany 1) Fed.Rep.of	Total
1971	11 748	3 962	22	15 732
1972	13 451	3 957	34	17 442
1973	14 913	3 850	74	18 837
1974	17 043	4 717	120	21 880
1975	11 749	3 642	94	15 485
1976	12 986	3 242	47	16 275
1977	16 668	3 400	51	20 119
1978	10 293	2 893	204	13 390
1979	11 045	3 763	22	14 830
1980	9 265	4 206	38	13 509
1981	10 673	4 380	284	15 337
1982	9 320	3 087	58	12 465
1983	9 149	3 625	54	12 828
1984	7 699	4 091	205	11 995

1) Landing statistics incompletely split on the Kattegat and the Skagerrak. The figures are estimated by the Working Group.

Table 3.3.1.2 Cod landings from the Skagerrak 1971-84.

Year	Denmark	Sweden	Norway*	Others	Total
1971	5 914	2 040	1 355	13	9 322
1972	6 959	1 925	1 201	22	10 107
1973	6 673	1 690	1 253	27	9 643
1974	6 694	1 380	1 197	92	9 363
1975	14 171	917	1 190	52	16 330
1976	18 847	873	1 241	466	21 427
1977	18 618	560	979	675	20 832
1978	23 614	592	1 442	260	25 908
1979	14 007	1 279	1 745	213	17 244
1980	21 551	1 712	1 982	341	25 586
1981	25 498	2 835	2 073	294	30 700
1982	23 377	2 378	1 730	41	27 526
1983	18 467	2 803	1 765	163	23 198
1984	17 432	1 981	1 458	156	21 027

*) Mainly landings from Norwegian fiords.

Table 3.3.2.1 Plaice landings from the Skagerrak (tonnes).

Year	Denmark	Sweden	The Netherlands	Belgium	Norway	Total
1972	5 095	70	-	-	-	5 165
1973	3 871	80	-	-	-	3 951
1974	3 429	70	-	-	-	3 499
1975	4 888	77	-	-	-	4 965
1976	9 251	81	-	-	-	9 332
1977	12 855	142	-	-	-	12 997
1978	13 383	94	-	-	-	13 477
1979	11 045	105	-	-	-	11 150
1980	9 514	92	-	-	-	9 606
1981	8 115	123	-	-	-	8 238
1982	7 789	140	-	-	-	7 929
1983	6 828	170	2 393	-	-	9 391
1984	7 558	356	1 500**)	133	22	9 569

**) TAC. No information available.

Table 3.3.2.2 Plaice landings from the Kattegat (tonnes)

Year	Denmark	Sweden	Germany	Total
1972	15 504	348	-	15 852
1973	10 021	231	-	10 252
1974	11 401	255	-	11 656
1975	10 158	369	-	10 527
1976	9 487	271	-	9 758
1977	11 611	300	-	11 911
1978	12 685	368	-	13 053
1979	9 721	281	-	10 002
1980	5 582	289	-	5 871
1981	3 803	232	-	4 038
1982	2 717	201	-	2 717
1983	3 280	291	-	3 571
1984	3 236	323	32	3 591

Table 3.3.3 Nominal landings of HADDOCK from Division IIIa (Bulletin Statistique).

Year	Denmark	Norway	Sweden	Others	Total
1975	5,015	122	921	57	6,115
1976	7,488	191	1,075	301	9,055
1977	6,907	156	2,485	215	9,763
1978	4,978	168	1,435[2]	56	6,637
1979	4,120	248	361	56	4,785
1980	7,172	288	373	57	7,890
1981	9,568	271	391	120	10,350
1982	11,151	196	396	329	12,072
1983[1]	8,670	226	509	10	9,415
1984[1]	7,837	321	499	30	8,687

[1] Preliminary.
[2] Divisions IVa and VIb included.

Table 3.3.4 Nominal landings of WHITING from Division IIIa (Bulletin Statistique).

Year	Denmark	Norway	Sweden	Others	Total
1975	19,018	57	611	4	19,690
1976	17,870	48	1,002	48	18,968
1977	18,116	46	975	41	19,178
1978	48,102	58	899	32	49,091
1979	16,971	63	1,033	16	18,083
1980	21,070	65	1,516	3	22,654
1981	22,880	70	1,054	7	24,011
1982	13,380	40	670	13	14,103
1983	11,519	43	476	23	12,061
1984[1]	12,694	42	1,158	1	13,895

[1] Preliminary.

Table 3.4.1 Nominal catch (in tonnes) of COD in Sub-area IV, 1975-84 (Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979
Belgium	7,566	7,483	10,346	17,473	12,576
Denmark	46,344	53,277	42,582	41,858	48,509
Faroe Islands	732	448	260	56	113
France	8,667	8,079	7,511	11,944	12,559
German Dem.Rep.	223	69	21	75	84
Germany, Fed.Rep.	16,457	24,445	22,663	37,040	20,411
Ireland	-	98	136	174	1
Netherlands	23,263	21,835	29,903	48,817	34,752
Norway[1])	1,528	1,877	1,449	2,747	3,575
Poland	2,991	2,961	381	115	142
Spain	63	14	-	-	-
Sweden	900	597	36	...[2])	298
UK (England & Wales)	33,615	46,475	35,424	59,127	54,923
UK (Scotland)	37,308	39,597	34,406	41,984	42,811
USSR	6,796	6,187	-	17	17
Total IV	186,453	213,442	185,118	261,427	230,771
Total IVa	58,343	68,352	55,623	43,357	41,118
Total IVb	107,227	126,218	100,191	164,388	147,313
Total IVc	20,883	18,872	29,304	53,682	42,340
W.G. Total	184,974	209,914	181,121	260,890	248,051

Country	1980	1981	1982	1983	1984*)
Belgium	9,630	8,744	6,604	6,704	5,792
Denmark	56,404	64,968	61,454	48,828*)	37,528
Faroe Islands	150	38	65	361	73
France	10,910	11,369	8,399	7,159	6,355
German Dem.Rep.	63	-	-	-	-
Germany, Fed.Rep.	26,343	29,741	18,525	20,333	14,220
Ireland	-	-	-	-	-
Netherlands	45,400	51,281	36,490	28,651*)	25,679
Norway[1])	4,506	6,766	12,163	6,537*)	6,419
Poland	28	7	62	75	7
Spain	-	-	-	-	-
Sweden	293	321	453	423	491
UK (England & Wales)	49,951	59,856	54,277	53,860	33,938
UK (Scotland)	45,044	53,921	57,308	58,581	54,098
USSR	-	-	-	-	-
Total IV	248,722	287,012	255,800	231,512	184,600
Total IVa	48,467	55,109	60,917	63,858	57,115
Total IVb	161,767	194,283	168,170	161,304	119,462
Total IVc	38,488	37,620	26,713	6,350	8,023
W.G. Total	260,278	300,599	255,934	229,499	196,944

*)Provisional
[1])Figures from Norway do not include cod caught in Rec.2 fisheries
[2])Included in Division IIIa

Table 3.4.2. Nominal catch (in tonnes) of HADDOCK in Sub-area IV, 1975-84
(Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	2,209	2,166	2,293	1,295	732	1,414	1,217	966	985	508
Denmark	32,930	46,899	20,069	8,093	8,248	12,928	13,198	22,704	25,653*	16,320
Faroe Isl.	267	183	385	12	7	27	46	6	51	23
France	4,646	5,500	6,914	5,122	7,208	7,407	11,966	15,988	11,250	7,111
German Dem.Rep.	44	20	8	37	12	36	-	-	-	-
Germany Fed.Rep.	2,396	3,433	3,744	2,589	2,549	2,354	3,387	4,510	3,654	2,573
Ireland	-	31	53	101	-	-	-	-	-	-
Netherlands	1,901	1,728	1,598	857	955	1,557	2,279	1,021	1,213*	1,060
Norway a)	331	367	374	609	968	1,191	2,283	2,888	3,718*	3,405
Poland	1,485	1,155	485	62	106	59	31	317	150	17
Sweden	2,083	2,455	113	-b)	907	1,165	1,301	1,874	1,360*	1,515
UK (England & Wales)	11,499	17,238	17,167	12,200	10,774	12,195	14,570	16,403	15,476	11,725
UK (Scotland)	64,686	80,576	89,465	58,406	54,119	64,058	82,798	107,773	100,390	87,241
USSR	49,686	42,852	8,010	54	18	-	-	-	-	-
TOTAL Sub-area IV	174,163	204,603	150,678	89,437	86,603	104,391	133,076	174,450	163,900	131,498
Division IVa	110,848	138,591	116,577	57,886	51,741	64,886	82,996	109,341	101,918	87,250
Division IVb	62,761	65,594	34,030	31,457	34,361	39,072	49,197	64,833	61,852	44,210
Division IVc	554	418	71	94	501	433	833	276	130	38
Working Group Total incl. Discards	448,582	368,327	207,788	163,890	141,858	217,107	206,930	225,789	232,203	205,854

* Provisional
a) Figures from Norway do not include haddock caught in Rec.2 fisheries
b) Included in Division IIIa

Table 3.4.3 Nominal catch (in tonnes) of WHITING in Sub-area IV, 1975-84. (Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979
Belgium	3,279	2,640	3,275	3,304	3,941
Denmark	61,941	116,973	46,479	15,741	41,965
Faroe Islands	764	1,262	472	42	581
France	20,079	19,557	17,592	22,525	27,590
German Dem.Rep.	3	18	-	22	5
Germany, Fed.Rep.	446	302	461	348	1,280
Ireland	-	4	9	38	-
Netherlands	14,078	12,274	9,406	11,030	13,417
Norway[1]	55	71	33	64	49
Poland	888	509	445	8	3
Spain	65	18	-	-	-
Sweden	255	153	341	...[2]	31
U.K. (England & Wales)	5,246	5,112	6,185	7,542	7,581
U.K. (Scotland)	27,969	26,167	33,017	42,779	44,841
USSR	5,098	5,612	2,413	-	-
Total Sub-area IV	140,166	190,672	120,128	103,443	141,284
Total Division IVa	75,444	100,001	61,499	42,837	48,554
Total Division IVb	41,930	69,908	42,911	40,943	68,775
Total Division IVc	22,792	20,763	15,718	19,663	23,955
WG total incl.discards	299,798	358,161	345,537	179,192	236,712

Country	1980	1981	1982	1983	1984*
Belgium	3,153	2,623	2,272	2,864	2,779
Denmark	17,916	16,430	27,043	18,054*	19,735
Faroe Islands	21	12	57	18	8
France	23,626	24,744	23,780	21,263	13,775
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep.	1,267	601	223	317	291
Ireland	-	-	-	-	-
Netherlands	14,389	14,600	12,218	10,372*	8,770
Norway[1]	27	27	17	40*	77
Poland	1	-	-	1	2
Spain	-	-	-	-	
Sweden	16	9	11	44*	52
U.K. (England & Wales)	6,778	5,964	4,743	4,366	4,853
U.K. (Scotland)	42,218	31,399	29,640	41,248	42,918
USSR	-	-	-	-	-
Total Sub-area IV	109,412	96,409	100,004	98,587	93,260
Total Division IVa	42,529	33,799	35,665	46,992	44,839
Total Division IVb	41,156	40,145	45,311	41,947	40,062
Total Division IVc	25,727	22,465	19,028	9,648	8,359
WG total incl.discards	215,979	182,272	131,881	154,236	132,883

*Provisional figures
[1] Figures from Norway do not include whiting caught in Rec.2 fisheries
[2] Included in Division IIIa

Table 3.4.5 Nominal catch (tonnes) of SAITHE in Sub-area IV and Division IIIa, 1975-1984 (Data for 1975 - 1983 from Bulletin Statistique)

Country	1975	1976	1977	1978	1979
Belgium	81	127	107	44	14
Denmark	10,149	15,111	17,334	10,372	10,461
Faroe Is.	287	425	318	213	407
France	24,396	32,552	41,022	38,122	40,983
German Dem.Rep.	5,882	2,088	2,430	2,404	1,504
Germany Fed. Rep.	18,622	38,698	26,860	25,982	18,780
Iceland	1	-	-	-	-
Ireland	-	119	126	88	-
Netherlands	8,917	6,101	7,270	5,135	1,466
Norway	12,483	17,856	14,949	17,627	17,575
Poland	35,304	35,819	12,378	5,661	6,104
Spain	249	-	-	-	-
Sweden	913	1,271	1,275	990	211
UK (Engl./Wales)	3,472	6,300	6,822	8,382	6,256
UK (Scotland)	8,898	13,034	11,366	14,330	8,257
USSR	110,743	83,669	46,385	10,161	2,015
Sub-total	240,397	253,170	188,642	139,511	114,033
By-catch from Industrial Fisheries:					
Denmark[A]	27,800	53,684	1,805	72	493
Norway[A]	9,878	13,082	4,392	2,494	1,142
TOTAL	278,075	319,936	194,839	142,077	115,668

Country	1980	1981	1982	1983	1984*
Belgium	13	12	4	7	34
Denmark	10,370	6,454	10,114	10,530	7,925
Faroe Is.	1,020	614	746	806	105
France	37,306	42,649	47,064	38,782	41,225
German Dem.Rep.	925	-	-	-	-
Germany Fed. Rep	11,095	8,246	13,517	13,649	25,273
Iceland	-	-	-	-	-
Ireland	-	-	-	-	-
Netherlands	245	123	36	112	100[B]
Norway	47,959	55,882	70,464	78,135	82,194
Poland	2,404	698	793	415	413
Spain	-	-	-	-	-
Sweden	342	156	372	548	463
UK (Engl./Wales)	4,879	4,309	5,627	6,845	1,865
UK (Scotland)	6,525	6,529	8,136	6,321	6,903
USSR	-	-	-	-	-
Sub-total	123,083	125,672	156,873	156,150	166,500
By-catch from Industrial Fisheries:					
Denmark[A]	-	-	-	-	-
Norway[A]	363	1,280	5,003	1,445	5,616
TOTAL	123,446	126,952	161,876	157,595	172,116

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

Table 3.5.1 **Nominal catch (in tonnes) of COD in Division VIa, 1975-84.**
(Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	49	71	-	-	4	57	30	35	21	22
Denmark	7	-	-	-	-	27[1]	-	3	-	-
Faroe Islands	3	39	43	-	40	3	-	2	-	-
France	3,546	5,611	3,583	4,499	4,590	5,495	7,601	7,160	8,140	8,397
German Dem.Rep.	2	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	12	1	3	31	40	1	21	8	205	36[1]
Ireland	1,141	1,341	984	1,214	2,237	2,331	2,725	3,527	2,695	2,326
Netherlands	5	11	5	3	20	1	-	-	-	
Norway	17	22	29	40	32	48	40	238	274*	273
Poland	68	18	-	-	-	-	-	-	-	-
Spain	180	15	20[1]	108[1]	-	-	-	41	52	
Sweden	-	-	-	-	-	-	-	1	-	
UK (England & Wales)	2,217	2,742	2,434	2,082	2,348	2,302	3,187	2,948	1,141	569
UK (Scotland)	5,806	7,475	5,513	5,539	6,929	7,603	10,339	7,969	8,933	9,452
UK (Northern Ireland)	3	13	5	5	2	2	7	33	37	32
USSR	107	46	-	-	-	-	-	-	-	
Total Division VIa	13,163	17,405	12,619	13,521	16,242	17,870	23,950	21,965	21,498	21,107

*Provisional

[1] Includes Division VIb

Table 3.5.2 Nominal catch (in tonnes) of COD in Division VIb, 1975-84. (Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	-	1	-	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	..a)	-	-	-	-
Faroe Islands	3	22	40	10	92	75	2	77	112	18
France	4	4	3	1	2	1	4	27	97	5
Germany, Fed.Rep.	-	-	-	-	111	136	443	+	195	..a)
Ireland	-	-	-	3	-	-	-	-	-	-
Norway	-	8	3	69	138	80	134	51	462*	341
Spain	-	-	..a)	..a)	-	33	70	58	42	
UK (England & Wales)	28	77	89	285	129	1	67	3	163	160
UK (Scotland)	98	61	33	384	198	370	143	157	35	221
USSR	110	1,398	-	-	-	-	-	-	-	-
Total	243	1,571	168	752	670	696	863	373	1,106	745

* Provisional

a) Included in Division VIa

Table 3.5.3 Nominal catch (in tonnes) of HADDOCK in Division VIa, 1975-84. (Data for 1975-83 as officially reported to ICES).

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	23	45	-	-	2	3	1	2	1	6
Denmark	-	13	-	-	37	-	-	+	-	-
Faroe Isl.	-	-	-	-	2	-	-	-	-	-
France	2,328	3,026	3,401	4,255	4,786	2,808	3,403	3,760	4,520	6,948
German Dem.Rep.	9	-	-	-	-	-	-	-	-	-
Germany Fed.Rep.	3	30	+	20	2	3	7	71	65	15a)
Ireland	599	1,115	616	441	877	726	1,891	4,402	3,450	3,704
Netherlands	19	30	28	13	2	2	3	391	-*	
Norway	-	3	7	13	9	16	29	37	72*	49
Poland	20	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	97	201	
UK (England & Wales)	1,214	1,971	3,827	2,805	1,654	1,279	1,052	2,035	1,376	840
UK (Scotland)	8,973	11,992	11,422	9,629	7,459	8,198	12,051	19,249	21,593	18,412
UK (N Ireland)	-	-	-	-	-	+	-	1	4	5
USSR	495	533	-	-	-	-	-	-	-	
Total Div.VIa	13,683	18,758	19,301	17,176	14,830	13,935	18,437	30,045	31,282	29,979
WG Total incl. discards	46,635	34,071	23,657	19,510	28,847	17,478	33,306	39,681	37,630	45,956

* Provisional

a) Includes Division VIb

Table 3.5.4 Nominal catch (in tonnes) of HADDOCK in Division VIb, 1975-84. (Data for 1975-83 as officially reported to ICES).

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	-	33	-	-	-	-	-	-	-	
Faroe Isl.	1	8	3	11	20	5	1	21	3	3
France	21	4	4	3	4	1	10	32	48	10
Germany Fed.Rep.	-	-	-	-	-	17	-	4	1	..a)
Ireland	-	-	-	61	-	-	-	-	-	-
Norway	-	-	+	4	16	2	10	3	20	42
Spain	-	-	-	-	-	6	88	121	79	
UK (England & Wales)	5	2,111	2,694	2,365	1,654	6,261	9,005	3,736	113	719
UK (Scotland)	71	640	297	2,060	548	1,051	27	5	136	1,654
USSR	49,830	40,474	-	-	-	-	-	-	-	-
Total Div.VIb	49,928	43,243	2,998	4,504	2,242	7,343	9,141	3,922	400	2,428

* Provisional

a) Included in Division VIa

Table 3.5.5.1 Nominal catch (in tonnes) of WHITING in Division VIa, 1975-84 (Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979
Belgium	1	14	-	-	-
Denmark	-	-	-	119	92
Faroe Islands	30	2	-	-	770
France	2,763	3,655	3,395	3,610	2,779
German, Dem.Rep.	-	31	-	-	-
Germany, Fed.Rep.	62	1	1	2	4
Ireland	2,429	3,255	2,752	2,080	2,791
Netherlands	85	255	78	23	17
Norway	-	1	-	-	-
Spain	1,871	821	763[1]	-	-
U.K. (England & Wales)	132	244	520	669	320
U.K. (Scotland)	12,668	16,658	9,873	8,174	10,613
U.K. (N. Ireland)	-	-	-	-	-
Total Division VIa	20,041	24,937	17,382	14,677	17,386
W.G. Total	20,043	24,937	17,411	14,677	17,081

Country	1980	1981	1982	1983	1984*
Belgium	+	-	2	-	-
Denmark	32[1]	-	+	-	-
Faroe Islands	-	-	-	-	-
France	2,609	1,637	1,798	2,029	1,373
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep.	1	49	53	43	5
Ireland	4,407	8,148	3,406	3,578	3,397
Netherlands	2	6	285	- *	
Norway	-	-	-	-	-
Spain	-	-	99	76	
U.K. (England & Wales)	227	145	166	157	125
U.K. (Scotland)	7,386	8,519	8.419	10,019	11,255
U.K. (N. Ireland)	-	-	7	52	36
Total Division VIa	14,664	18,504	14,235	15,954	16,191
W.G. Total	12,816	12,203	13,871	15,971	15,902

*Provisional
[1] Includes Division VIb

Table 3.5.5.2 Nominal catch (in tonnes) of WHITING in Division VIb, 1975-84. (Data for 1975-83 as officially reported to ICES).

Country	1975	1976	1977	1978	1979
Denmark	-	-	-	-	-
France	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-
Ireland	-	-	-	1	-
Spain	-	-	...[1]	-	-
U.K. (England & Wales)	-	3	2	5	1
U.K.(Scotland)	12	15	5	24	2
Total Division VIb	12	18	7	30	3

Country	1980	1981	1982	1983	1984*
Denmark	...[1]	-	-	-	-
France	3	-	-	-	2
Germany, Fed.Rep.	-	-	-	-	-
Ireland	-	-	-	-	
Spain	-	196	112	88	
U.K. (England & Wales)	+	-	-	-	2
U.K. (Scotland)	59	+	-	5	25
Total Division VIb	62	196	112	93	29

*Provisional

[1] Included in Division VIa

Table 3.5.6 Nominal catch (tonnes) of SAITHE in Sub-area VI from 1974-84 (Data for 1974-84 from Bulletin Statistique.)

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

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

* Preliminary

Table 3.5.7.1 Nominal catch (in tonnes) of COD in Divisions VIId and VIIe, 1975-84.
(Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	59	65	53	435	699	163	363	293	389	345
Denmark	2,718	1,506	1,120	2,160	2,052	660[1]	-	-	-	-
France	2,143	1,646	5,185	8,044	4,848	4,001	4,486	3,349	3,369	3,209
Netherlands	+	2	1	+	-	-	4	1	-	
UK (England & Wales)	159	142	581	654	485	365	428	568	650	498
UK (Scotland)	-	-	-	-	+	-	-	-	-	-
USSR	3	4	-	-	-	-	-	-	-	-
Total Div. VIId,e	5,082	3,365	6,940	11,293	8,084	5,189	5,281	4,211	4,408	4,052

*Provisional

[1] Includes Divisions VIIb,c

Table 3.5.7.2 Nominal catch (in tonnes) of COD in Divisions VIIb,c and VIIg-k, 1975-84. (Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	116	159	85	52	51	110	198	97	113	144
Denmark	-	-	-	-	18	...b)	-	-	-	-
France	2,877	3,196	1,972	2,192	2,918	4,475	6,803	5,041	4,668	3,704
Germany,Fed.Rep.	-	-	-	3a)	-	7	-	-	-	-
Ireland	474	506	315	323	552	1,028	1,542	1,906	1,466	1,419
Netherlands	54	46	291	279	-	5	-	+	304*	
Norway	1	-	+	-	-	-	-	-	1*	-
Poland	19	40	6	-	2	-	-	-	-	-
Spain	588	1,140	51	11	-	17	37	29	28	
U.K. (England & Wales)	73	44	33	28	33	83	288	419	103	372
U.K. Scotland	-	-	-	2	1	12	+	-	-	45
USSR	134	203	-	-	-	-	-	-	-	-
Total Divs.VIIb,c,g-k	4,336	5,234	2,753	2,890	3,575	5,737	8,868	7,492	6,683	5,684

* Provisional

a)Catch in Division VIIg only

b)Included in Division VIIe

Table 3.5.7.3 Nominal catch (in tonnes) of HADDOCK in Divisions VIId and VIIe, 1975-84. (Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	+	+	1	-	1	+	2	1	1	-
Denmark	-	-	2	22	21	15	-	-	-	-
France	868	405	438	356	333	298	421	344	231	-
Germany Fed.Rep.	+	-	-	-	-	-	-	-	-	-
Ireland	-	-	4	-	-	+	-	-	-	-
Netherlands	1	-	-	-	-	-	-	94	-*	
UK (England & Wales)	99	45	29	22	51	59	119	60	41	26
USSR	3	-	-	-	-	-	-	-	-	-
Total Divs.VIId & VIIe	971	450	474	400	406	372	542	499	273	26

* Provisional

Table 3.5.7.4 Nominal catch (in tonnes) of HADDOCK in Divisions VIIb,c & VIIg-k, 1975-84. (Data for 1985-83 as officially reported to ICES).

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	33	19	13	5	2	2	3	3	1	-
Denmark	-	-	-	-	1	-	-	-	-	-
France	4,583	3,726	2,244	1,479	1,931	2,219	2,571	2,005	2,588	1,594
Germany Fed.Rep.	+	3	-	-	-	-	-	-	-	-
Ireland	507	287	153	111	155	274	679	904	941	647
Netherlands	4	14	1	-	16	-	-	7	- *	
Norway	-	-	-	-	-	-	-	-	54*	-
Spain	-	-	294	-	-	5	277	248	167	
UK (England & Wales)	46	24	18	13	19	50	92	182	23	300
UK (Scotland)	-	-	-	8	22	56	4	-	-	63
USSR	1,290	183	-	-	-	-	-	-	-	-
Total Divs.VIIb,c & VIIg-k	6,463	4,256	2,273	1,616	2,146	2,606	3,626	3,349	3,774	2,604

* Provisional

Table 3.5.7.5 Nominal catch (in tonnes) of WHITING in Division VIId & VIIe in 1975-84.
(Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	70	103	36	85	92	85	102	101	94	83
Denmark	-	18	-	1	2,585	6	2	-	-*	-
France	10,060	8,390	8,886	8,010	5,352	7,690	8,842	8,051	5,708	6,346
Germany Fed.Rep.	1	-	-	-	-	-	-	-	-	-
Ireland	-	-	11	12	-	13	-	-	-	-
Netherlands	14	5	1	2	1	2	2	70	-*	
UK (England & Wales)	1,255	1,504	1,342	1,038	930	839	1,136	1,222	1,210	800
Total Divs.VIId,e	11,400	10,020	10,276	9,148	8,960	8,635	10,084	9,444	7,012	7,229

* Provisional

Table 3.5.7.6 Nominal catch (in tonnes) of WHITING in Divisions VIIb,c & VIIg-k in 1975-84
(Data for 1975-83 as officially reported to ICES)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	83	97	60	37	26	31	61	28	47	71
France	3,637	4,731	3,962	3,868	4,127	5,603	5,922	4,767	5,218	3,890
Germany Fed.Rep.	2	-	1	45	-	+	-	-	-	-
Ireland	2,562	1,980	1,201	1,172	2,674	3,710	3,612	4,073	2,714	2,087
Netherlands	66	112	86	63	3	4	21	78	216*	
Spain	2,974	2,772	-	-	-	-	-	85	91	
UK (England & Wales)	61	21	26	38	23	60	257	153	68	19
UK (Scotland)	-	-	2	1	1	80	1	-	-	112
USSR	64	2	-	-	-	-	-	-	-	-
Total Divs.VIIb,c & g-k	9,449	9,715	5,338	5,224	6,854	9,488	9,874	9,184	8,354	6,179

* Provisional

Table 3.6.1 Nominal catch (tonnes) of COD in Division VIIa, 1975-1984 as reported to ICES, 1983-1984 as used by the Working Group

Country	Year									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	282	257	135	144	174	246	395	269	139	133
Denmark	-	-	-	-	-	-	6	-	-	-
France	2,623	1,938	1,370	1,022	1,125	1,009	1,178	1,066	315	846
Ireland	3,477	4,815	3,862	3,128	3,755	4,421	6,552	4,758	3,671*	2,786
Netherlands	53	87	32	15	11	36	94	48	82	-
UK (England & Wales)	2,132	1,815	1,186	875	980	1,918	2,712	2,544	1,405	1,200
UK (Isle of Man)	-	-	-	-	297	232	221	161	103	94
UK (N. Ireland)	1,153	1,175	1,409	1,064	1,898	2,591	3,360	3,852	3,463	2,587
UK (Scotland)	70	91	60	79	118	286	376	583	336	669
Total	9,790	10,178	8,054	6,328	8,358	10,739	14,894	13,281	9,514	8,315
Total figures used by Working Group for stock assessment	9,863	10,247	8,054	6,271	8,371	10,776	14,907	13,381	10,015	8,315

*Reported to ICES as 4,032 tonnes but corrected to 3,671 tonnes.

Table 3.6.2

Nominal catch (tonnes) of WHITING in Division VIIa, 1975-1984.
(Data for 1975 to 1983, human consumption, as officially reported)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	99	68	63	51	42	45	85	45	78	99
France	2 784	2 985	1 952	2 098	1 897	1 616	1 254	1 375	1 021	767
Ireland	3 946	5 055	4 821	4 562	3 847	5 546	5 362	4 204	2 734	4 051
Netherlands	52	56	24	12	11	10	12	14	17	0
UK (England + Wales)	617	635	1 008	1 105	842	1 000	816	1 195	1 200	1 181
UK (N. Ireland)	2 280	3 290	2 692	3 089	2 946	3 954	9 052	9 927	5 218	5 194
UK (Scotland)	54	104	161	152	154	251	102	189	120	275
UK (Isle of Man)	...	...	...	...	372	243	346	268	127	127
Total human consumption	9 835	12 193	10 721	11 069	10 111	12 665	17 029	16 989	10 515	11 694
Total human consumption figures used by the W. Group for stock assessm.	9 275	11 651	10 204	10 404	9 892	12 665	17 029	17 219	10 071	11 694
Estimated industrial catches (Ireland only) Denmark	353	425	760	927	-	-	-	-	-	-
Estimated discards from *Nephrops* fishery						3 302	3 577	893	1 837	4 225

*preliminary

Table 3.6.3

Nominal landings (tonnes) of PLAICE in Division VIIa, 1975-1984
(Data for 1975-1983 as officially reported to ICES)

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	248	136	110	109	151	214	231	130	195	120
France	134	126	141	110	152	104	51	60	99	58
Ireland	884	1 032	953	1 025	1 032	1 086	1 243	923	1 384	1 417
Netherlands	75	73	24	15	18	60	40	29	59*	n.a.
UK (England + Wales)	2 544	1 945	1 422	1 792	1 817	2 139	2 117	1 868	1 666	2 289
UK (Isle of Man)	...	...	...	...	52	20	27	12	11	11
UK (N. Ireland)	125	120	165	173	161	139	132	159	183	194
UK (Scotland)	53	52	89	89	106	141	64	47	42	86
Others	-	-	-	-	-	-	1	-		
Total	4 063	3 484	2 904	3 313	3 489	3 903	3 906	3 228	3 639	4 175
Total figures used by Working Group for stock assessment	4 063	3 473	2 904	3 231	3 428	3 903	3 906	3 237	3 639	4 175

* Preliminary

n.a. Not available

Table 3.6.4 Irish Sea SOLE. Nominal catches ('000) 1975-84 (Data used by the Working Group)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	805	674	566	453	779	1,002	892	670	437	437
Denmark	-	-	-	-	-	-	15	-	-	-
France	59	72	39	65	48	41	13	9	30	8
Ireland	24	74	84	127	134	229	157	159	203	172
Netherlands	233	381	227	177	247	176	186	138	237	131
UK (England & Wales)	281	195	161	189	290	367	311	277	219	230
UK (N. Ireland)	24	49	49	57	47	44	41	31	31	34
UK (Scotland)	15	18	21	30	42	68	45	44	29	19
UK (Isle of Man)	...	...	...	...	30	18	7	10	10	10
Total	1,441	1,463	1,147	1,098	1,617	1,945	1,667	1,338	1,196	1,041

*Preliminary

Table 3.6.5 Celtic Sea SOLE (Divisions VIIf and VIIg). 1974-84 by country

Country	1974	1975	1976	1977	1978	1979
Belgium	914	663	1,053	779	506	693
France	75	133	181	80	160	153
Ireland	2	5	10	2	2	7
Netherlands	15	2	7	7	-	-
UK (Engl.& Wales)	99	116	99	93	112	101
Total	1,105	919	1,350	961	780	954

Country	1980	1981	1982	1983	1984*
Belgium	981	938	819	871	786
France	141	91	100	124	143
Ireland	14	8	3	48	26
Netherlands	-	-	-	-	-
UK (Engl.& Wales)	178	175	206	330	457
Total	1,314	1,212	1,128	1,373	1,412

* Preliminary

Table 3.6.6.1

Nominal catch (tonnes) of COD in Divisions VIIf and VIIg, 1975-1984

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	377	226	107	88	110	172	285	172	244	23
France	2 472	3 351	2 088	2 567	3 244	5 036	7 473	5 984	4 602	4 795
Germany Fed. Rep.	-	-	-	-	-	7	-	-	-	-
Ireland	15	13	17	30	72	246	108	142	274	246
Netherlands	-	-	-	-	-	-	-	-	-	-
UK (England + Wales)	127	92	59	67	81	199	299	302	188	286
U.S.S.R.	30	1	-	-	-	-				
Total	3 021	3 683	2 271	2 752	3 507	5 660	8 165	6 600	5 308	5 350

Table 3.6.6.2 Status quo catch (SQC) forecast for Celtic Sea COD.

Time series	r	Inter-cept	Slope	Recruitment factor 1.88	1.44	1.0	0.6	0.12
			1985 SQC forecast					
1975-84	0.7112[1]	1,693	0.6848	6,847	6,102	5,357	4,612	3,867
			1986 SQC forecast					
1975-85	0.7144[1]	1,693	0.6848	6,851	6,106	5,361	4,616	3,871

[1] Significant at the 5% level.
Coefficient of variation of mean recruitment index = 44%.

Table 3.6.7

Nominal catch (tonnes) of WHITING in Divisions VIIf and VIIg (1975-84)

Division VIIg	Year									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	60	65	52	37	26	31	61	28	47	58
Ireland	23	27	10	12	85	211	62	62	124	169
France	3,033	4,226	3,626	3,449	3,683	4,947	5,406	4,563	5,852	6,498
Netherlands	54	21	61	63	2	3	0	0	0	
UK (England & Wales)	57	21	25	38	23	60	190	104	39	85
Total	3,227	4,360	3,774	3,599	3,819	5,252	5,719	4,757	6,062	6,810

Division VIIf	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	156	97	45	29	74	41	41	42	73	90
France	1,488	1,655	2,111	3,171	1,983	2,986	2,587	2,609	2,228	2,450
Netherlands	1	4	4	1	2	0	0	0	0	0
UK (England & Wales)	107	109	141	143	124	141	119	83	123	128
Total	1,752	1,865	2,301	3,344	2,183	3,168	2,747	2,734	2,424	2,668
Total Div. VIIg + f	4,979	6,225	6,075	6,943	6,002	8,420	8,466	7,491	8,486	9,478

*Preliminary

Table 3.6.8

PLAICE in Divisions VIIf and VIIg. Nominal catches (tonnes) 1975-84

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	195	307	214	196	171	372	365	341	314	314
France	413	360	365	527	467	706	697	568	532	646
Ireland	50	49	28	-	49	61	64	198	48	72
UK (England + Wales)	227	153	150	152	176	227	251	196	276	366
Others	3	-	-	-	-	7	-	-	-	-
Total	888	869	757	875	863	1 373	1 377	1 303	1 170	1 398

* Preliminary

Breakdown of international landings by Division

Division	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
VIIg	420	555	424	483	478	769	798	755	640	823
VIIf	468	314	333	392	385	604	579	548	530	575
VIIf + g	888	869	757	875	863	1 373	1 377	1 303	1 170	1 398

* Preliminary

Effort and cpue of Belgian beam trawlers

Years	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Effort (hours)	none available					49 518	60 032	54 098	49 115	47 806
Cpue (kg/hour)						6.67	5.29	5.51	5.18	5.21

Table 3.7.1 Nominal catch (tonnes) of SOLE in Sub-area IV, 1975-1984

Country/Year	1975	1976	1977	1978	1979
Belgium	1,392*	1,456	1,671*	1,727*	2,044*
Denmark	682	574	348	465	313*
France	297	598	308	346	309*
German Fed.Rep.	233	192	310	467	242*
Netherlands	15,242	11,044	10,873	6,749	7,646*
United Kingdom (Eng.+ Wales)	426	455	491*	625*	649
Other Countries	-	7	2	1	40
Total	18,272	14,326	14,003	10,380	11,243
Unreported landings	2,500	3,000	4,000	9,900	11,354
Grand Total	20,772	17,326	18,003	20,281	22,597

Country/Year	1980	1981	1982	1983	1984**
Belgium	1,378	1,363	1,927	1,861	1,860
Denmark	710*	720	522	694	582
France	232*	144	686	332	580
German Fed.Rep.	338*	346	290	619	1,033
Netherlands	12,695*	12,400	17,749	16,057	15,050
United Kingdom (Eng.+ Wales)	452*	381	403	433	559
Other Countries	2	-	-	-	-
Total	15,807	15,354	21,578	19,996	19,664
Unreported Landings				4,943	6,706
Grand Total	15,807	15,405	21,579	24,939	26,370

* Figures revised by ad hoc Flatfish Working Group 1982
** Provisional Working Group estimates

Table 3.7.2 North Sea PLAICE. Nominal catch (tonnes) in Sub-area IV, 1974-84

Country	1974	1975	1976	1977	1978	1979
Belgium	6,198*	6,162*	5,286*	7,321*	6,231*	7,687*
Denmark	19,814	22,731	25,612	20,900	21,285	27,497
Faroe Isl.	-	1	-	1	-	-
France	519	536	497	598	750	856
Federal Rep. of Germany	3,231*	4,041*	3,649*	5,414*	4,595*	4,315*
Ireland	-	-	-	-	-	19
Netherlands	54,438	51,293	46,457	42,307	28,219	38.295
Norway	13	13	20	16	13	13
Poland	-	153	40	-	-	-
Sweden	431	35	28	-	-	7
UK (Engl. and Wales)	23,855*	20,291*	23,772*	27,625*	27,862	25,825*
UK(Scotland)	4,002	3,230	3,310	3,622	3,877	4,126
USSR	39	50	-	-	-	-
Total	112,540	108,536	108,671	107,804	92,832	108,640
Unreported Catches	-	-	4,999	11,384	21,152	36,707
GRAND TOTAL	112,540	108,536	113,670	119,188	113,984	145,347

Country	1980	1981	1982	1983	1984[1]
Belgium	7,005*	6,346*	6,755*	9,716	11,393
Denmark	27,057	22,026	24,532	18,749	22,154
Faroe Isl.	-	-	-	-	-
France	711*	586*	1,046	1,185	604
Federal Rep. of Germany	4,319*	3,449*	3,626	2,397	5,000
Ireland	-	+	-	-	-
Netherlands	39,782	40,049	41,208	51,328	60,000
Norway	15	18	17	15	16
Poland	-	-	-	-	-
Sweden	7	3	6	22	13
UK (Engl. and Wales)	18,687*	17,129*	16,385	13,241	12,658
UK(Scotland)	4,345	4,390	4,355	4,159	4,172
USSR	-	-	-	-	
Total	101,928	93,996	112,439	100,812	
Unreported catches	38,023	45,751	56,619	43,223	41,910
GRAND TOTAL	139,951	139,747	154,551	144,035	157,920

* = Figure revised by ad hoc Flatfish Working Group 1982
1) Preliminary

Table 3.7.3 ENGLISH CHANNEL SOLE - Division VIId
Nominal catch (in tonnes), 1974-83.
1984 preliminary.

Year	Belgium	France	Netherlands	U.K.	Total
1974	159	706(1)	3	309	(940)
1975	132	464	1	244	841
1976	203	599	-	404	1,206
1977	225	737	-	315	1,277
1978	241	782	-	366	1,389
1979	311	1,129	-	402	1,842
1980	302	1,075	-	279	1,656
1981	491	1,513	-	210	2,214
1982	526	1,828	4	379	2,737
1983	541*	2,077*	-	419	3,038
1984	654	1,965	-	504	3,123

* revised from Bulletin Statistique

(1) Divisions VIId and VIIe

( ) estimated

Table 3.7.4 Western Channel SOLE - Division VIIe. Nominal catches (in tonnes), 1975-84.

Year	Belgium	Denmark	France	Netherlands	Ireland	U.K.	TOTAL
1975	3	-	271	1	-	217	491
1976	4	-	352	-	-	260	616
1977	3	-	331	-	-	272	606
1978	4	20	384	-	-	453	861
1979	1		515	-	-	665	1,181
1980	45	-	447	-	13	764	1,269
1981	16	-	415	-	-	784	1,215
1982	97	-	321	-	-	1,012	1,446
1983	50	-	405	-	-	1,043	1,498
1984*	48	-	384	-	-	889	1,321

*Provisional data.

Table 3.7.5 English Channel PLAICE

Nominal catch (tonnes) in Divisions VIId and VIIe, 1974-84.

	BELGIUM		DENMARK		FRANCE		NETHERLANDS		U.K. (ENGLAND & WALES)		TOTAL	
Year	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe
74	148	4	-	-	2,180		13		564	248	3,157	
1975	153	8	-	-	1,802	288	-		293	279	2,248	575
1976	147	5	1[2]	-	1,439	323	-		376	312	1,963	640
1977	149	3	81[2]	156[3]	1,714	336	-		302	363	2,246	702
1978	161	3	-	-	1,810	314	-		349	467	2,320	940
1979	217	2	28	-	2,094	458	-		278	515	2,617	975
1980	435	22	-	-	2,346	440	-		517*	606	3,298	1,068
1981	850		-	-	3,968		-		1,643		6,461	
1982	819		-	-	3,867		-		1,643		6,351	
1983	1,033		-	-	3,490		-		1,743		6,266	
1984	998[1]		-	-	4,521[1]		-		1,691[1]		7,210[1]	

*Raised for under-reporting

[1] Provisional

[2] Includes Division VIIe

[3] Includes Division VIId

NOTE: All figures up to 1979 are from Bulletin Statistique.

All other figures from national statistics.

Table 4.1 Nominal HAKE landings (thousands of tonnes) as reported to ICES by country and area, 1961-1984

Years	Total	France					Portugal	Spain[1]					U.K.			Others		
		Total	IV+VI	VII	VIII	IX	IX	Total	IV+VI	VII	VIII	IX	Total	IV+VI	VII	Total	IV+VI	VII
1961	(133.4)[1]	35.0[2]	1.5	18.0	12.3	3.1	13.0	(72.4)[1]	-	-	40.6	31.8[3]	11.8	10.5	1.3	1.2	1.0	0.2
1962	(128.3)	39.5[2]	0.7	19.4	14.8	3.1	6.4	(67.8)	-	-	32.0	35.8[3]	13.7	12.3	1.4	0.9	0.6	0.3
1963	(132.5)	33.4[2]	1.5	14.9	12.4	3.2	6.9	(79.1)	-	-	39.3	39.8[3]	11.9	10.7	1.2	1.2	1.0	0.2
1964	(129.7)	30.7[2]	3.2	11.3	13.0	2.9	9.0	(79.8)	-	-	34.0	45.8[3]	9.2	8.7	0.5	1.0	0.8	0.2
1965	(120.0)	26.2[2]	3.7	11.7	10.7	-	10.4	(74.7)	-	21.0	7.1	46.6[3]	7.7	7.3	0.4	1.0	0.8	0.2
1966	(106.6)	18.1	3.0	7.6	5.5	2.0	8.3	(73.2)	-	-	27.5	45.7[3]	5.9	5.3	0.6	1.1	0.9	0.2
1967	(116.5)	25.9	2.9	9.6	11.0	2.4	7.6	(76.7)	-	-	31.6	45.1[3]	4.9	4.1	0.8	1.4	0.9	0.5
1968	(106.4)	22.5	2.5	7.8	10.2	2.0	7.2	(69.7)	-	-	32.2	37.5[3]	5.4	4.5	0.9	1.6	1.3	0.3
1969	(99.6)	21.3	2.9	7.9	8.8	1.7	6.6	(65.7)	-	-	27.1	38.6[3]	4.3	3.9	0.4	1.7	0.5	1.2
1970	(116.4)	25.7	1.5	9.8	12.8	1.5	9.3	(76.1)	-	-	34.3	41.8[3]	3.2	2.7	0.5	2.1	1.9	0.2
1971	(61.6)	23.6	0.8	9.1	13.1	0.6	8.0	(24.8)	0.9	7.8	14.0	2.1[3]	2.6	2.2	0.4	2.6	2.1	0.5
1972	108.8[4]	21.8	0.4	8.8	12.6	-	8.7	73.2[4]	1.1	4.8	32.4	17.3	2.9	2.4	0.5	2.2	2.2	-
1973	108.6	24.2	2.2	10.7	11.3	-	15.3	63.0	0.5	4.7	37.0	20.8	2.8	2.2	0.6	3.3	2.9	0.4
1974	96.5	21.7	2.5	11.8	7.3	0.1	7.8	61.7	7.1	21.9	18.5	14.1	2.7	2.1	0.6	2.6	2.3	0.3
1975	101.4	22.2	3.2	11.0	7.9	0.1	9.4	63.9	6.4	20.5	18.0	19.0	2.6	2.3	0.3	3.3	2.4	0.9
1976	90.7	19.1	3.8	10.4	4.8	0.1	7.9	58.8	4.1	20.8	20.2	13.7	2.3	1.7	0.6	2.6	1.8	0.8
1977	64.9	15.3	2.6	6.1	6.6	-	5.5	41.0	1.6	5.3	16.6	17.5	1.9	1.6	0.3	1.2	0.8	0.3
1978	49.6	18.4	2.2	7.3	8.8	-	4.4	21.7	1.3	5.0	6.6	8.8	2.0	1.6	0.3	3.1	-	-
1979	62.8	22.4	2.5	9.2	10.7	-	5.3	32.0	1.1	6.1	16.7	8.1	1.7	1.5	0.2	1.4	1.0	0.4
1980	61.6	24.1	2.8	8.5	12.8	-	6.3	26.6	0.9	2.8	15.1	7.8	2.5	1.9	0.6	2.1	1.2	0.9
1981	62.9	24.3	2.2	9.2	12.9	-	5.4	25.2	0.7	2.6	16.3	5.6	5.6[7]	2.6	2.6	2.4	1.3	1.1
1982	59.1	16.0	1.5	7.7	6.8	-	7.3	31.8	2.0	2.9	14.8	12.1	3.7	1.3	2.4	1.6	0.3	1.3
1983	66.2	20.1	2.3	7.0	10.8	-	6.8	29.0	1.8	3.1	14.8	9.3	3.3	1.3	2.0	1.7	0.2	1.5
1984[5,6]		17.0	0.5	7.3	9.2	-							2.7	1.6	1.1	1.7	0.3	1.4

[1]Numbers in brackets include unknown African catches for Spain (see footnote [3])

[2]Includes small amounts unreported by area

[3]Data refer to port of landing, not area at capture (Includes African catches)

[4]Includes 17.6 thousand tonnes for Spain which were not reported by area

[5]Spanish and Portuguese landings not reported

[6]Preliminary

[7]Includes Area VIII = 0.4

Table 4.1.1

Revised estimates of landings (thousands of tonnes) for the northern HAKE stock (ICES Division IVa, Sub-Areas VI and VII, and Divisions VIIIa and b) by country and area as determined by the HAKE Working Group, 1961-1984

Years	Total	France				Spain[1]				U.K.			Others		
		Total	IVa+VI	VII	VIIIa,b	Total	IVa+VI	VII	VIIIa,b	Total	IVa+VI	VII	Total	IVa+VI	VII
1961	95.6	42.0	5.3	20.7	16.0	40.6	-	-	40.6	11.8	10.5	1.3	1.2	1.0	0.2
1962	86.3	39.7	4.9	19.3	15.5	32.0	-	-	32.0	13.7	12.3	1.4	0.9	0.6	0.3
1963	86.2	33.8	4.0	16.2	13.6	39.3	-	-	39.3	11.9	10.7	1.2	1.2	1.0	0.2
1964	76.8	32.6	4.6	15.2	12.8	34.0	-	-	34.0	9.2	8.7	0.5	1.0	0.8	0.2
1965	64.7	27.9	3.3	13.0	11.6	28.1	-	21.0	7.1	7.7	7.3	0.4	1.0	0.8	0.2
1966	60.9	26.4	3.2	13.0	10.2	27.5	-	-	27.5	5.9	5.3	0.6	1.1	0.9	0.2
1967	62.1	24.2	3.2	9.9	11.1	31.6	-	-	31.6	4.9	4.1	0.8	1.4	0.9	0.5
1968	62.0	22.8	2.5	9.2	11.1	32.2	-	-	32.2	5.4	4.5	0.9	1.6	1.3	0.3
1969	54.9	21.8	3.5	10.9	7.4	27.1	-	-	27.1	4.3	3.9	0.4	1.7	0.5	1.2
1970	64.9	25.3	4.3	11.5	9.5	34.3	-	-	34.3	3.2	2.7	0.5	2.1	1.9	0.5
1971	51.3	23.4	3.3	10.7	9.4	22.7	0.9	7.8	14.0	2.6	2.2	0.4	2.6	2.1	0.5
1972	65.5	22.1	3.7	9.6	8.8	38.3	1.1	4.8	32.4	2.9	2.4	0.5	2.2	2.2	-
1973	79.5	24.0	3.2	12.3	8.5	49.4	2.4	17.9	29.1	2.8	2.2	0.6	3.3	2.9	0.4
1974	74.2	21.3	2.8	11.9	6.6	47.6	3.6	16.1	27.9	2.7	2.1	0.6	2.6	2.3	0.3
1975	74.5	22.2	3.3	12.1	6.8	46.4	4.9	15.8	25.7	2.6	2.3	0.3	3.3	2.4	0.9
1976	67.3	18.3	3.8	10.3	4.2	44.1	4.2	15.6	24.3	2.3	1.7	0.6	2.6	1.8	0.8
1977	51.2	17.2	2.8	7.6	6.8	31.0	1.6	13.0	16.4	1.9	1.6	0.3	1.1	0.8	0.3
1978	47.5	17.4	2.2	7.3	7.9	27.4	1.4	12.4	13.6	1.9	1.6	0.3	0.8	0.5	0.3
1979	49.9	20.5	2.5	7.1	10.9	(27)	(2)	(10)	(15)	1.7	1.5	0.2	0.7	0.3	0.4
1980	57.6	24.4	2.8	8.5	13.1	(30)	(2)	(12)	(16)	2.4	1.8	0.6	0.8	0.3	0.5
1981	57.1	22.2	2.2	9.2	10.8	28.4	(1)	12.6	14.8	5.1	2.5	2.6	1.4	0.3	1.1
1982	57.1	22.8	1.6	9.3	11.9	28.3	0.8	12.5	15.0	4.6	1.2	3.4	1.6	0.3	1.3
1983[2]	59.0	22.1	2.1	7.8	12.2	32.0	0.7	14.9	16.5	3.2	1.2	2.0	1.7	0.2	1.5
1984[2]	63.0	21.4	4.9	6.9	9.6	35.8	0.4	22.0	13.5	4.1	1.4	2.7	1.7	0.3	1.4

[1] Data for 1961-72 not revised; revised figures for Sub-area VIII for 1973-78 include data for Divisions VIIIa and b only. Data for 1979-81 are revised based on French surveillance data and supplemental catch information.

[2] Preliminary

Table 4.1.2 HAKE - Southern Stock
Revised catch estimates ('000 tonnes) for the southern hake stock (ICES Divisions VIIIc and IXa), by country and gear, as determined by the Working Group, 1972-1984

	SPAIN						PORTUGAL				
Year	Gill-net	Small Gill-net	Long-line	Total Artis-anal	Trawl	Total	Artis-anal	Trawl	Total	France Total	Total
1972				7.1	10.2	17.3	4.7	4.1	8.8	0.0	26.1
1973				8.5	12.3	20.8	6.5	7.3	13.8	0.2	34.8
1974	2.6*	1.0*	2.2*	5.8	8.3	14.1	5.1	3.5	8.6	0.1	22.8
1975	3.5*	1.3*	3.0*	7.8	11.2	19.0	6.1	4.3	10.4	0.1	29.5
1976	3.1*	1.2*	2.6*	6.9	10.0	16.9	6.0	3.1	9.1	0.1	26.1
1977	1.5*	0.6*	1.3*	3.4	5.8	9.2	4.5	1.6	6.1	0.2	15.5
1978	1.4	0.1	2.1	3.6	5.9[1]	9.5	3.4	1.4	4.8	0.1	14.4
1979	1.7	0.2	2.1	4.0	7.7[2]	11.7	3.9	1.9	5.8	0.0	17.5
1980	2.2	0.2	5.0	7.3	6.3[3]	13.6	4.5	2.3	6.8	0.0	20.4
1981	1.5	0.3	4.6	6.4	7.1[4]	13.5	4.1	1.9	6.0	0.0	19.5
1982	1.3	0.4	5.3	7.0	5.9[5]	12.9	5.0	2.5	7.5	0	20.4
1983	1.5	0.9	7.2	9.6	7.0	16.6	5.2	2.9	8.1	0	24.7
1984	1.6	0.8	8.2	10.6	4.9	15.5	4.3	1.2	5.5	0	21.0

*Estimated

[1] An estimate of 1.0 thousand tonnes of catches of undersized hake not officially reported is included.

[2] An estimate of .5 thousand tonnes of catches of undersized hake not officially reported is included

[3] Id. for 1.0 thousand tonnes

[4] Id. for 3.0 thousand tonnes

[5] Id. for 1.5 thousand tonnes

Table 4.2.3 STATE OF DATA ON PRINCIPAL SPECIES EXPLOITED IN ICES SUB AREAS VII AND VIII

	Growth parameter	Length weight relationship	Selectivity SF	Selectivity Δ 25-75	M	First Matur.	Maturity ogive	Sampling program, by fleet monthly, or quarterly	Cpue series	Discards	observations
hake	Y	Y	Y	Y	Y	Y	Y	SP : VII and VIII F : VII and VIII	+ +	F : VIIe, f,g,h VIIIa	ICES Working Group Problems arise for interpretation of otoliths Rejects are not well known
megrim	SP : VIIc, j,k F : VIIh ENG : VIIe	Y Y Y	SP : VIIIc	SP : Y	Y	SP : VIIc,j, k F : VIIh	Y Y	SP : VIIc,j, k VIIIa, b,c F : VIIe,g, h VIIIa	+ +	F : VIIe, f,g,h VIIIa	Data mainly related to <u>L. whiffiagonis</u>
monk	F : VIIh VIIIa ENG : VIIe,g	Y Y Y				Y	Y	SP : VIIc,j, k VIIIa, b,c F : VIIe,g,h VIIIa ENG : VII	+ +	negligible	works are now begining in most countries
nephrops	Y	Y	Y	Y	Y	Y	Y	F : VII and VIII SP : VII	+ +	F : VIIc,g	ICES Nephrops Working Group
sole	BEL : VII F : VIII ENG : VII	Y Y Y	Y Y	Y Y	Y Y	Y Y	Y Y	BEL : VIIf,g F : VIII	+ beam-trawl +	F : VIII	
cod	Y	Y	Y	Y	Y	Y	Y	F : VIIf,g	+	F : VII	ICES Irish Sea Bristol Chan.WG
Whiting	F : VII	Y	Y	Y	Y	Y	Y	F : VIIf,g	+	F : VII	ICES Irish Sea Bristol Chan.WG

(cont'd)

	Growth para-meter	Length weight relation ship	Selectivity SF	Selectivity Δ 25-75	M	First Matur.	Matu-rity ogive	Sampling program, by fleet monthly, or quar-terly	Cpue series	Discards	observations
Ling									+		
Rays <u>Raya naevus</u>	F : VIIh	Y				Y	Y	F : VIIh		F : VIIh	
dogs	ENG : Y	Y							+	F : VII	
pollack	F : VIIe VIIIa	Y							+	negli-gible	
witch	F : VIIg	Y							+	F : VIIgh	
Lemon sole	Y	Y							+	F : VII	
squid									+		
cuttlefish						Y	Y				
saithe									+	negli-gible	stock to be rela-ted with VIa and VIb
phycis									+		
haddock									+	F : VIIg,h	
bass	F : VIII ENG :VIIe,f	Y Y			Y	Y	Y Y	ENG : Y			
red sea bream	Y	Y				Y		SP : VII and VIII	+ +		SP : selectivity of hooks
black sea bream	F : VIIe VIII	Y			Y	Y			+		

Y = Values are generally accepted or exist in bibliography. Recent improvements are indicated by country.

+ = séries of mean value ++ = good series

BEL : Belgium F : France ENG : England

Table 4.2.3 (cont'd)

Table 5.1.1 Total nominal catch of SARDINE by countries in Divisions VIIIc and IXa (Unit: tonnes)

YEAR	PORTUGAL	SPAIN			TOTAL
	IXa	VIIIc	IXa	Total	VIIIc+IXa
1940	98,212	66,816	-	66,816	165,028
1941	76,486	27,801	-	27,801	104,287
1942	81,667	47,208	-	47,208	128,875
1943	132,924	46,348	-	46,348	179,272
1944	128,221	76,147	-	76,147	204,368
1945	109,030	67,998	-	67,998	177,028
1946	107,454	32,280	-	32,280	139,734
1947	97,967	43,459	21,855	65,314	163,281
1948	78,001	10,945	17,320	28,265	106,266
1949	35,986	11,519	19,504	31,023	67,009
1950	74,618	13,201	27,121	40,322	114,940
1951	82,527	12,713	27,959	40,672	123,199
1952	88,948	7,765	30,485	38,250	127,198
1953	96,848	4,969	27,569	32,538	129,386
1954	112,474	8,836	28,816	37,652	150,126
1955	92,330	6,851	30,804	37,655	129,985
1956	99,827	12,074	29,614	41,688	141,515
1957	112,554	15,624	37,170	52,794	165,348
1958	131,088	29,743	41,143	70,886	201,974
1959	121,025	42,005	36,055	78,060	199,085
1960	138,846	38,244	60,713	98,957	237,703
1961	139,067	51,212	59,570	110,782	249,849
1962	130,236	28,891	46,381	75,272	205,508
1963	118,567	33,796	51,979	85,775	204,342
1964	163,294	36,390	40,897	77,287	240,581
1965	137,762	31,732	47,036	78,768	216,530
1966	124,831	32,196	44,154	76,350	201,181
1967	114,696	23,480	45,595	69,075	183,771
1968	79,526	24,690	51,828	76,518	156,044
1969	64,103	38,254	40,732	78,986	143,089
1970	69,158	28,934	32,306	61,240	130,398
1971	84,408	41,691	48,637	90,328	174,736
1972	87,528	33,800	45,275	79,075	166,603
1973	100,825	44,768	18,523	63,291	164,116
1974	75,071	34,536	13,894	48,430	123,501
1975	95,877	50,260	12,236	62,496	158,373
1976	79,649	51,901	10,140	62,041	141,690
1977	79,819	36,149	9,782	45,931	125,750
1978	83,553	43,522	12,915	56,437	139,990
1979	91,294	18,271	43,876	62,147	153,441
1980	106,302	35,787	49,593	85,380	191,682
1981	113,253	35,550	65,330	100,880	214,133
1982	100,859	31,756	71,889	103,645	204,504
1983	85,922	32,374	62,843	95,217	181,149
1984	95,110	27,970	79,606	107,576	202,686

Table 5.2.1 Landings of HORSE MACKEREL by Sub-area (tonnes)

Sub-area	1974	1975	1976	1977	1978	1979
IV	30,548	9,933	8,668	1,326	4,920	1,412
VI	3,480	3,272	4,194	670	408	7,791
VII	116,901	117,599	177,010	28,855	26,060	43,525
VIII	66,238	86,738	129,558	124,906	83,804	47,155
IX	51,059	48,725	55,471	67,125	45,371	37,619
TOTAL	268,266	266,267	374,901	222,882	160,563	137,502

Sub-area	1980	1981	1982	1983	1984
IV	2,151	6,825	5,115	4,420	26,328
VI	8,724	11,134	5,036	24,881	31,753
VII	45,697	34,749	33,478	40,527	41,777
VIII	37,495	40,073	22,684	28,223	33,964
IX	36,903	35,873	39,726	48,740	23,891
TOTAL	130,970	128,654	106,039	146,791	157,713

Table 5.2.2 Landings of HORSE MACKEREL in Sub-area IV by country (tonnes)

Country	1974	1975	1976	1977	1978	1979
Belgium	34	23	15	14	15	9
Denmark	-	-	-	63	1,543	496
Faroe Islands	772	156	116	130	3	0
France	582	140	147	325	182	221
German Dem. Rep.	-	-	4	-	-	-
Germany, Fed. Rep.	686	696	162	2	1,993	376
Ireland	-	-	-	-	-	-
Netherlands	576	173	82	223	106	88
Norway	20,713	2,174	4,842	450	1,037	199
Poland	62	-	11	6	-	-
Sweden	2[a)]	+	-	-	-	+
U.K. (Engl. & Wales)	5	3	11	22	36	23
U.K. (Scotland)	1,222	2	+	4	5	+
USSR	5,894	6,566	3,278	87	-	-
TOTAL	30,548	9,933	8,668	1,326	4,920	1,412

Country	1980	1981	1982	1983	1984*
Belgium	8	34	7	55	20
Denmark	199	3,576	1,612	1,590	23,309
Faroe Islands	260	0	2,327	0	0
France	292	2	567	366	(400)
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	+	139	30	52	+
Ireland	1,161	412	-	-	-
Netherlands	101	355	559	2,029	2,000
Norway	119	2,292	7	322	105
Poland	-	-	-	2	-
Sweden	-	-	-	-	-
U.K. (Engl. & Wales)	11	15	6	4	(5)
U.K. (Scotland)	-	-	-	-	489
USSR	-	-	-	-	-
TOTAL	2,151	6,825	5,115	4,420	26,328

*Preliminary

a) Includes Division IIIa

() Estimated from 1983 catch level

Table 5.2.3

Landings of HORSE MACKEREL
in Sub-area VI by country (tonnes)

Country	1974	1975	1976	1977	1978	1979
Denmark	-	-	-	-	-	443
Faroe Islands	342	2	2	-	-	-
France	-	-	293	113	91	151
Ireland	-	-	-	-	59	-
Germany, Fed. Rep.	209	263	5	-	-	155
Netherlands	-	106	69	19	114	6,910
Norway	627	869	90	-	-	-
Poland	1,067	479	48	-	-	-
Spain	400	150	175	147	91	20
U.K. (Engl. & Wales)	14	6	37	40	44	73
U.K. (Scotland)	41	187	85	105	9	39
USSR	780	1,210	3,390	246	-	-
TOTAL	3,480	3,272	4,194	670	408	7,791

Country	1980	1981	1982	1983	1984*
Denmark	734	341	2,785	7	(10)
Faroe Islands	-	-	1,248	-	-
France	45	454	4	10	(10)
Ireland	-	-	-	15,086	13,858
Germany, Fed. Rep.	5,550	10,212	2,113	4,146	130
Netherlands	2,385	100[a)]	50[a)]	5,500[a)]	17,500[a)]
Norway	-	5	-	94	31
Poland	-	-	-	-	-
Spain	-	-	-	-	-
U.K. (Engl. & Wales)	9	5	+	-	-
U.K. (Scotland)	1	17	83	38	214
USSR	-	-	-	-	-
TOTAL	8,724	11,134	5,036	24,881	31,753

*Preliminary

a)Estimated from biological sampling

()Estimated from 1983 catch level

Table 5.2.4 Landings of HORSE MACKEREL in Sub-area VII by country

	1974	1975	1976	1977	1978	1979
Belgium	3	4	2	1	1	3
Denmark	-	-	-	-	2,104	4,287
France	2,466	2,443	3,800	2,448	3,564	4,407
German Dem. Rep.	8	-	92	45	-	-
Germany, Fed. Rep.	825	521	3	308	2,923	5,333
Ireland	-	-	-	1,133	3,388	-
Netherlands	-	41	280	2,088	10,556	25,174
Norway	16	-	-	-	29	959
Poland	4,643	1,869	2,967	640	61	-
Spain	13,315	10,890	17,124	483	516	676
U.K. (Engl.& Wales)	675	438	2,014	1,343	2,918	2,686
U.K. (Scotland)	-	-	-	-	-	-
U.S.S.R.	95,650	101,393	150,728	20,366	-	-
TOTAL	116,901	117,599	177,010	28,855	26,060	43,525

	1980	1981	1982	1983	1984*
Belgium	+	1	1	-	-
Denmark	5,045	3,099	877	994	732
France	1,983	2,800	2,314	1,834	(2,000)
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	2,289	1,079	12	1,977	228
Ireland	-	16	-	-	-
Netherlands	23,002	25,000[a)]	27,500[a)]	34,350[a)]	38,700[a)]
Norway	394	-	-	-	-
Poland	-	-	-	-	-
Spain	50	234	104	142	(100)
U.K. (Engl.& Wales)	12,933	2,520	2,670	1,230	216
U.K. (Scotland)	1	-	-	-	1
U.S.S.R.	-	-	-	-	-
TOTAL	45,697	34,749	33,478	40,527	41,777

*Provisional

[a)]Estimated from biological sampling

()Estimated from 1983 catch level

Table 5.2.5 Landings of HORSE MACKEREL in Sub-areas VIII and IX by country (tonnes).

Country	1974	1975	1976	1977	1978	1979
Sub-area VIII						
Denmark	-	-	-	-	-	127
France	2,477	2,386	3,380	4,881	3,643	4,240
German Dem.Rep.	-	-	14	-	-	-
Netherlands	-	-	-	-	19	-
Spain	62,836	72,916	95,401	104,812	80,139	42,766
UK (Engl. & Wales)	-	-	-	-	-	22
USSR	925	11,436	30,763	15,213	3	-
Total	66,238	86,738	129,558	124,906	83,804	47,155
Sub-area IX						
Poland	-	-	-	168	-	-
Portugal	48,105	46,421	51,488	51,078	30,203	24,489
Spain	2,954	1,882	3,339	981	14,787	12,880
USSR	-	422	644	14,898	381	250
Total	51,059	48,725	55,471	67,125	45,371	37,619

Country	1980	1981	1982	1983	1984[1]
Sub-area VIII					
Denmark	-	-	-	-	-
France	3,361	3,711	3,073	2,643	3,000[2]
German Dem.Rep.	-	-	-	-	-
Netherlands	-	-	-	-	-
Spain	34,134	36,362	19,610	25,580	30,944
UK (Engl. & Wales)	-	+	1	-	-
USSR	-	-	-	-	20
Total	37,495	40,073	22,683	28,223	33,964
Sub-area IX					
Poland	-	-	-	-	-
Portugal	25,224	23,753	30,886	30,951	18,020
Spain	11,679	12,120	8,840	17,782	5,871
USSR	-	-	-	7	-
Total	36,903	35,873	39,726	48,740	23,891

[1] Preliminary.
[2] Estimated from 1983 catch level.

Table 5.3.1 Landings (tonnes) of **MACKEREL** in Division VIIIc, 1975-1984

Country	1975	1976	1977	1978	1979
Spain	23,408	18,480	19,852	18,543	15.013
Total	23,408	18,480	19,852	18,543	15,013

Country	1980	1981	1982	1983	1984
Spain	11,316	12,834	15,621	10,390	13,852
Total	11,316	12,834	15,621	10,390	13,852

Table 5.3.2 Landings (tonnes) of **MACKEREL** in Sub-area IX, 1975-1984

Country	1975	1976	1977	1978	1979
Portugal	2,224	2,595**	1,743**	1,555**	1,071**
Spain	3,345	2,520	2,935	6,221	6,280
France	1	-	-	-	-
Poland		-	8	-	-
USSR	44	466	2,879	189	111
Total	5,614	5,581	7,565	7,965	7,462

Country	1980	1981	1982	1983	1984*
Portugal	1,929**	3,108**	3,018**	2,239**	2,250
Spain	2,719	2,111	2,437	2,224	4,206
France	-	-	-	-	-
Poland	-	-	-	-	-
USSR	-	-	-	-	-
Total	4,460	5,219	5,455	4,463	6,456

*Preliminary
**Working Group estimate

Table 6.1.1.1 Nominal catch (tonnes) of MACKEREL in the North Sea, Skagerrak and Kattegat (IV and IIIa) 1975-1984 (Data for 1975-1976 as officially reported to ICES. Data from 1977 onwards were submitted by Working Group members).

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Belgium	292	49	10	10	5	55	102	93	67
Denmark	27,986	21,833	18,068	19,171	13,234	9,982	2,034	11,285	*10,088
Faroe Islands	63,476	42,836	33,911	28,118	1,770	-	720	-	-
France	2,607	2,529	3,452	3,620	2,238	3,755	3,041	2,248	-
German, Dem.Rep.	259	41	233	-	-	-	-	-	-
Germany, Fed.Rep.	284	-	284	211	56	59	28	10	87
Iceland	302	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	738	733	-	-	-
Netherlands	2,163	2,673	1,065	1,009	853	1,706	390	96	* 340
Norway	197,351	180,800	82,959	90,720	44,781	28,341	27,612	24,464	27,311
Poland	2,020	298	-	-	-	-	-	-	-
Sweden	6,448	4,012	4,501	3,935	1,666	2,446	692	1,903	1,151
UK (Engl.& Wales)	89	105	142	95	76	6,520	28	16	2
UK (Scotland)	1,199	1,590	3,704	5,272	9,514	10,575	28	4	13
USSR	1,231	2,765	488	162	-	-	-	-	-
Unallocated + discards	-	-	-	500	-	3,216	450	96	202
Total	305,709	259,531	148,817	152,823	87,931	67,388	35,125	40,215	39,261

* Preliminary

Note: In contrast to the corresponding tables in Working Group reports for years prior to 1982, the catches do not include catches taken in Division IIa.

Table 6.1.1.2 Nominal catch (tonnes) of MACKEREL in the western area (VI, VII and VIII) (Data for 1975-77 as officially reported to ICES)

Country \ Year	1975	1976	1977	1978 **	1979 **	1980 **	1981 **	1982 **	1983 **	1984* **
Belgium	17	10	1	1	3	3	-		+	-
Denmark	-	3	698	8 677	8 535	14 932	13 464	15 100	15 000	200
Faroe Islands	1 760	5 539	3 978	15 076	10 609	15 234	9 070	10 500	9 500	9 200
France	25 818	33 556	35 702	34 860	31 510	23 907	14 829	12 300	11 000	12 500
German Dem. Rep.	9 693	4 509	431	-	-	-	-	-	-	-
Germany, Fed.Rep.	1 941	391	446	28 873	21 493	21 088	29 221	11 200	23 000	11 200
Iceland	21	10	-	-	-	-	-	-	-	-
Ireland	11 567	14 395	23 022	27 508	24 217	40 791	92 271	109 700	110 000	84 100
Netherlands	13 263	15 007	35 766	50 815	62 396	91 081	88 117	67 200	83 100	54 100
Norway	1 907	4 252	362	1 900	25 414	25 500	21 610	19 000	19 900	34 700
Poland	21 573	21 375	2 240	-	92	-	1	-	-	-
Spain+	23 408	18 480	21 853	19 142	15 556	15 000	11 469	15 600	10 400	15 000
Sweden	-	38	-	-	-	-	-	-	-	-
UK (England + Wales)	31 546	57 311	132 320	213 344	244 293	150 598	75 722	82 900	62 000	30 000
UK (N. Ireland)	30	95	97	46	25	-	4 153	9 600	800	1 100
UK (Scotland)	16 174	28 399	52 662	103 671	103 160	108 372	109 153	147 400	120 100	167 200
USSR	309 666	262 384	16 396	-	-	-	-	-	-	-
Unallocated					54 000	98 258	140 322	97 300	96 000	62 900
Total, ICES Members	468 384	465 754	325 974	503 913	601 303	604 761	609 402	597 800	560 800	482 200
Bulgaria	20 830	28 195	-	-	-	-	-	-	-	-
Rumania	2 166	13 222	-	-	-	-	-	-	-	-
Discard	-	-	-	50 700	60 600	21 600	42 300	24 900	11 300	12 100
GRAND TOTAL	491 380	507 178	325 974	554 613	661 903	626 361	651 702	622 700	572 100	494 300

* Preliminary
**) Working Group Estimate
\+ Includes S japonicus

Table 6.1.1.3 Nominal catches (tonnes) of MACKEREL in the Norwegian Sea (Division IIa), 1975-1984.

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Denmark[2]						-	801	1,008	10,427[3]	11,787[4]
Faroe Islands[1]	-	-	-	283	6	270	-	180	-	138
France[2]	7	8	-	2	-	-	6	8	-	-
Fed. Rep. of Germany[2]	-	-	-	-	-	-	51	-	5	-
German Dem. Rep.[2]	-	-	-	53	174	2	-	-	-	-
Netherlands[2]	-	2	-	-	-	-	-	-	-	-
Norway[1]	34,662	10,516	1,400	3,867	6,887	6,618	12,941	34,540	38,453	82,005
Poland	-	-	-	-	-	-	-	231	-	-
UK (England & Wales)[1]	+	+	+	1	-	-	255	-	-	-
UK (Scotland)[2]	-	-	-	-	-	296	968	-	-	-
USSR[3]	-	-	-	-	5	1,450	3,640	1,641	65	5
Total	34,669	10,526	1,400	4,206	7,072	8,340	18,662	37,608	48,950	93,935

[1] Data provided by Working Group members

[2] Data reported to ICES

[3] Includes 1,497 tonnes caught in Division Vb

[4] Includes 920 tonnes caught in Division Vb

* Preliminary

Table 6.2.1.1 Landings (tonnes) of BLUE WHITING from the main fisheries 1974-84

A r e a	1974	1975	1976	1977	1978	1979
Norwegian Sea Fishery (Sub-areas I+II and Divisions Va, XIVa+XIVb)	146	6,746	3,336	56,999	236,226	741,042
Spawning Fishery (Divisions Vb, VIa, VIb and VIIb + VIIc)	15,207	30,335	81,362	136,787	229,228	284,547
Icelandic Industrial Fishery (Division Va)	4,230	1,294	8,220	5,838	9,484	2,500
Industrial Mixed Fishery (Divisions IVa-c, IIIa)	62,197	41,955	36,024	38,389	99,874	63,333
Southern Fishery (Sub-areas VIII + IX, Divisions VIId,e + VIIg-k)	25,733	31,715	35,035	30,723	33,898	27,176
Total	107,513	112,045	163,977	268,736	608,710	1,118,598

A r e a	1980	1981	1982	1983	1984*
Norwegian Sea Fishery (Sub-areas I+II and Divisions Va, XIVa+XIVb)	766,798	520,738	110,685	52,961	65,932
Spawning Fishery (Divisions Vb, VIa, VIb and VIIb + VIIc)	250,693	288,316	361,656	361,537	403,680
Icelandic Industrial Fishery (Division Va)	-	-	-	7,000	-
Industrial Mixed Fishery (Divisions IVa-c, IIIa)	75,129	61,754	117,578	117,737	116,892
Southern Fishery (Sub-areas VIII + IX, Divisions VIId,e + VIIg-k)	29,944	38,749	30,971	28,798	37,044
Total	1,122,564	909,557	620,890	568,033	623,548

*Preliminary

Table 6.2.1.2 Landings (tonnes) of BLUE WHITING from the Norwegian Sea (Sub-areas I and II, Divisions Va, XIVa and XIVb) fisheries 1974-84, as estimated by the Working Group

Country	1974	1975	1976	1977	1978	1979
Denmark	-	-	-	-	-	-
Faroes	-	-	-	593	2,810	762
France	-	-	-	-	-	-
German Democratic Republic	-	-	90	2,031	7,301	22,502
Federal Republic[2] of Germany	2	35	33	6,777	8,421	1,157
Iceland	119	3	569	4,768	17,756	12,428
Norway	20	31	737	-	-	33,588[3]
Poland	-	-	95	1,536	5,083	4,346
United Kingdom (England and Wales)	-	-	60	165	11	-
United Kingdom (Scotland)	-	-	-	-	-	-
USSR	5	6,677	1,752	41,129	194,844	666,259
Total	146	6,746	3,336	56,999	236,226	741,042

Country	1980	1981	1982	1983	1984[1]
Denmark	-	-	473	-	93
Faroes	-	11,131	-	11,316	-
France	-	5,093	2,067	2,890	-
German Democratic Republic	14,234	15,607	3,042	5,553	8,193
Federal Republic[2] of Germany	8,919	17,385	890	2	35
Iceland	4,562	4,808	-	-	105
Norway	902	187	-	5,061	689
Poland	11,307	2,434	443	-	-
United Kingdom (England and Wales)	-	-	-	-	-
United Kingdom (Scotland)	-	-	-	-	-
USSR	726,874	464,093	103,770	28,141	56,817
Total	766,798	520,738	110,685	52,961	65,932

[1] Preliminary.

[2] Including catches off East Greenland (Division XIVb) (327 tonnes in 1977, 896 tonnes in 1978, 204 tonnes in 1979, and 8,757 tonnes in 1980).

[3] Including purse-seine catches of 29,162 tonnes of juvenile blue whiting.

Table 6.2.1.3 Landings (tonnes) of the BLUE WHITING from the spawning fishery (Divisions Vb, VIa,b and VIIb,c) 1974-84 as estimated by the Working Group

Country	1974	1975	1976	1977	1978	1979
Denmark	-	-	-	18,745	23,498	21,200
Faroes	1,527	-	12,826	29,096	39,491	35,780
France	-	-	-	-	-	-
German Dem. Rep.	-	-	4,971	1,094	1,714	172
Germany, Fed.Rep.	2,655	-	85	3,260	6,363	3,304
Iceland	-	-	-	5,172	7,537	4,864
Ireland	-	-	160	-	-	-
Netherlands	-	-	-	-	1,172	154
Norway	3,247	7,301	24,853	38,214	116,815	186,737
Poland	116	4,704	10,950	3,996	2,469	4,643
Spain	6,484	8,153	5,910	183	14	-
Sweden	-	-	-	6,391	6,260	-
UK (England & Wales)	-	455	341	1,475	5,287	4,136
UK (Scotland)	-	279	1,488	3,001	1,599	1,466
USSR	1,178	9,443	19,778	26,160	17,009	22,091
Total	15,207	30,335	81,362	136,787	229,228	284,547

Country	1980	1981	1982	1983	1984*
Denmark	19,272	11,361	23,164	28,680	24,229
Faroes	37,488	23,107	38,958	56,168	60,022
France	-	-	1,212	3,600	3,882
German Dem. Rep.	181	6,562	7,771	3,284	1,171
Germany, Fed.Rep.	709	935	701	825	640
Iceland	5,375	10,213	1,689	1,176	-
Ireland	-	-	-	-	-
Netherlands	-	222	200	150	-
Norway	133,754	166,168 1)	169,790 2)	185,646 3)	205,024
Poland	-	2,279	-	-	-
Spain	-	-	-	318	-
Sweden	3,185	-	-	-	-
UK (England & Wales)	3,878	6,000	-	-	-
UK (Scotland)	6,819	2,611	-	-	-
USSR	40,032	58,858	73,171	81,690	108,712
Total	250,693	288,316	316,656	361,537	403,680

*Preliminary
1) Including 28,466 tonnes from directed fisheries in Division IVa
2) Including 35,001 tonnes from directed fisheries in Division IVa
3) Including 32,043 tonnes from directed fisheries in Division IVa

Table 6.2.1.4 Landings (tonnes) of BLUE WHITING from the Icelandic mixed industrial trawl fisheries in Division Va 1974-84

Country	1974	1975	1976	1977	1978	1979
Iceland	4,230	1,294	8,220	5,838	9,484	2,500

Country	1980	1981	1982	1983	1984*
Iceland	-	-	-	7,000	-

*Preliminary

Table 6.2.1.5 Landings (tonnes) of BLUE WHITING from the mixed industrial fisheries and caught as by-catch in ordinary fisheries in the North Sea (Divisions IVa-c and IIa), 1974-84, as estimated by the Working Group

Country	1974	1975	1976	1977	1978	1979
Denmark	-	-	-	16,071	54,804	28,932
Faroes	2,610	428	1,254	-	1,177	1,489
France	-	-	-	-	-	-
German Dem. Rep.[2)]	-	-	-	-	988	49
Germany, Fed. Rep.[2)]	-	-	-	76	1,514	13
Ireland	-	-	-	-	-	-
Norway	59,151	40,210	34,600	20,737	39,989	30,930
Poland[2)]	55	-	45	838	601	-
Spain	318	195	47	-	-	-
Sweden[4)]	-	-	-	639	648	1,249
UK (England & Wales)[2)]	-	-	-	3	+	-
UK (Scotland)	-	414	58	25	153	37
USSR[2)]	63	708	20	-	-	634
Total	62,197	41,955	36,024	38,389	99,874	63,333

Country	1980	1981	1982	1983	1984*
Denmark	49,947	35,066	34,463	38,290	54,376
Faroes	1,895	3,133	27,269	12,757	9,740
France	-	-	1,417	249	-
German Dem. Rep.[2)]	-	-	-	-	-
Germany, Fed. Rep.[2)]	252	-	93	-	-
Ireland	-	2,744	-	-	-
Norway	21,962[3)]	18,627	47,856	62,591	52,776
Poland[2)]	-	229	550	-	-
Spain	-	-	-	-	-
Sweden[4)]	1,071	1,955	1,241	3,850	-
UK (England & Wales)[2)]	-	-	4,689	-	-
UK (Scotland)	2	-	-	-	-
USSR[2)]	-	-	-	-	-
Total	75,129	61,754	117,578	117,737	116,892

1)Preliminary
2)Reported landings in human consumption fisheries
3)Including mixed industrial fishery in the Norwegian Sea
4)Reported landings assumed to be from human consumption fisheries

Table 6.2.2 Landings (tonnes) of BLUE WHITING from the Southern Areas (Sub-areas VIII and IC and Divisions VIIg-k and VIId,e) 1974-84 as estimated by the Working Group

Country	1974	1975	1976	1977	1978	1979
German Dem. Rep.	-	-	-	-	-	-
Germany, Fed. Rep.	-	-	-	-	25	-
Ireland	-	-	-	-	-	1
Netherlands	-	-	-	-	7	-
Poland	170	-	385	169	53	-
Portugal	-	-	-	1,557	2,381	2,096
Spain 1)	24,627	30,790	29,470	25,259	31,428	
UK (England & Wales)	-	-	-	+	-	-
UK (Scotland)	-	-	-	-	-	63
USSR	936	925	5,180	3,738	4	-
Total	25,733	31,715	35,035	30,723	33,898	27,176

Country	1980	1981	1982	1983	1984*
German Dem. Rep.	-	-	-	-	301
Germany, Fed. Rep.	-	-	-	50	-
Ireland	-	-	-	-	-
Netherlands	31	633	200	-	-
Poland	-	-	-	-	-
Portugal	6,051	7,387	3,890	4,748	5,252
Spain 1)	23,862	30,728	27,500	24,000	25,900
UK (England & Wales)	-	-	-	-	-
UK (Scotland)	-	-	-	-	-
USSR	-	-	-	-	5,591
Total	29,944	38,748	31,590	28,798	37,044

*Preliminary

1)Significant quantities taken in Divisions VIIg-k not included in the Table are discarded every year.

Table 6.2.3 Total catches of BLUE WHITING (tonnes) divided into areas within and beyond areas of national fisheries jurisdiction of NEAFC contracting parties. Percentages in parentheses.

Year	International	Svalbard	Jan Mayen	Norway	Iceland	Greenland	Faroes	EEC	Total (t)	Total from official data (t)	%
1978	136,504 (25.52)	-	-	67,391 (12.60	26,444 (4.94)	6,580 (1.23)	195,361 (36.53)	102,523 (19.17)	534,803	574,812	93.0
1979	614,734 (56.18)	-	-	75,545 (6.90)	15,117 (1.38)	204 (0.02)	224,201 (20.49)	164,388 (15.02)	1,094,189	1,091,422	100.3
1980	567,693 (55.23)	-	-	152,095 (14.80)	4,562 (0.44)	8,757 (0.85)	164,342 (15.99)	130,417 (12.69)	1,027,866	1,092,620	94.1
1981	168,681 (19.76)	-	123,000 (14.41)	215,004 (25.18)	7,751 (0.91)	-	174,801 (20.48)	164,475 (19.27)	853,712	870,808	98.0
1982	22,993 (4.32)	-	-	130,435 (24.51)	5,797 (1.09)	-	125,072 (23.50)	247,884 (46.58)	532,181	544,919	97.7
1983	15,203 (2.93)	-	-	109,675 (21.15)	7,000 (1.35)	-	91,804 (17.70)	294,981 (56.87)	518,663	539,235	96.2
1984	18,407 (3.19)	-	-	150,603 (26.13)	105 (0.02)	-	124,905 (21.67)	282,418 (48.99)	576,438	586,504	98.3

Table 7.1 Icelandic mesh selection (Thorsteinsson, 1980).

Braided polyethylene in all trawls.

Gear	Cod-end mesh (90 mm)	Selection factor		Comments
1. Polish chafer having a mesh size of 280 mm	140	Cod Haddock Redfish	2.5 2.5 1.8	Chafer sewn to c/e along some bars but each chafer mesh did not completely cover 4 c/e meshes
2. Side trawler chafer same c/e as no.1, 50% slack rel. to c/e	140	Cod Redfish	3.03 2.44	
3. Polish chafer, mesh 264 mm + length of one c/e knot	132	Cod Haddock Redfish	2.97 3.00 2.61	Chafer sewn to c/e along some bars so that each chafer mesh covered 4 c/e meshes as accurately as as possible
4a. Twin cod-ends. Polish chafer, mesh 302/303 mm + length of one c/e knot. Cod catch 1 t/hour	151 151.5	Cod Haddock	3.08 2.97	Large stern trawler Modal length of all cod: 53 cm.
4b. Cod catch 4 t/hour	150.4	Cod	2.79	Same vessel Modal length of all cod: 36 cm.
5. Same gear as no.4, but one half of twin c/e made 4 meshes broader and used as single c/e Small side-trawler.	151	Cod Haddock	2.98 2.60	Fish girth increased by having eaten large quantities of capelin.
6a. No chafer	166	Plaice Cod Haddock	2.0 3.24 3.24	
6b. Danish seine	166	Plaice Cod	2.0 3.48	Plaice selection curve much steeper than with trawl

Table 7.2 Information on trawl mesh selection and technical conservation measures in NEAFC Regions 1-3.

No.	Region stock	Selection factor	Minimum legal mesh size (mm) in cod-end of trawls	25% retention length (cm)	50% retention length (cm)	Present minimum legal fish size (cm)
	NEAFC Region 1 NE-Arctic (Sub-areas I and II) (including Jan Mayen)					
1	Cod	3.96	145 135 125	52 49 45	57 53 50	42
2	Haddock	3.63	145 135 125	47 44 41	53 49 45	39
3	Saithe	3.8	145 135 130 120	51 48 46 42	55 51 49 46	40,37,35
4	Redfish (*S. marinus*)	2.9	145 135 130 120 100	35 32 31 29 24	42 39 38 35 29	-
5	Redfish (*S. mentella*)	2.9	145 135 130 120 100	35 32 31 29 24	42 39 38 35 29	-
	Iceland (Div. Va)					
6	Cod	3.08	155	38	48	50
7	Haddock	2.97	155	35	46	45
8	Saithe	3.8	155	54	59	50
9	Redfish	2.61	135	30	34	500 g (= 33 cm)[1]
10	Plaice	2.0	155	30	33	34
11	Nephrops	0.5	80	2.7 CL[2]	4.0 CL[2]	6 g tail wt. (=3 cm CL =6 cm tail l.)
	East Greenland, Faroes (Sub-areas V and XIV)					
12	Redfish (*S. marinus*)	2.9	155 145 135 130	37 35 32 31	45 42 39 38	-
13	Redfish (*S. mentella*)	2.7	155 145 135 130	35 32 30 20	42 39 36 35	-
	Faroes (Div. Vb)					
14	Cod	3.68	145 135	44 41	53 50	34
15	Haddock	3.1	145 135	42 39	45 42	31
16	Saithe	3.8	145 135 120	51 48 42	55 51 46	-

ctd

Table 7.2 (ctd)

No.	Region stock	Selection factor	Minimum legal mesh size (mm) in cod-ends of trawls	25% retention length (cm)	50% retention length (cm)	Present minimum legal fish size (cm)
	NEAFC Region 2					
17	Cod	3.6	100 90 80 70	33 30 26 23	36 32 29 25	30
18	Haddock	3.4	100 90 80 70	31 28 25 22	34 31 27 24	27
19	Whiting	3.8	100 90 80 70	34 31 28 24	38 34 30 27	27,23
20	Saithe	3.0	100 90 80 70	33 29 26 23	38 34 30 27	32,30
21	Sole	3.3	100 90 80 70	31 28 25 21	33 30 26 23	24
22	Plaice	2.2	100 90 80 70	21 19 17 15	22 20 18 15	29,27,25
23	Nephrops (Div.VIIa)	0.35	70[3] 60	2.05 1.75 CL[2]	2.45 2.10 CL[2]	2.5 CL[2]
24	Nephrops (Div.VIIc)	0.33 0.32	70[3] 60	1.66 1.43 CL	2.32 1.89 CL	2.5 CL
25	Nephrops (Div.VIIg)	0.50	70[3] 60	2.76 2.36 CL		2.5 CL
	NEAFC Regions 2 and 3					
26	Hake (northern)	3.75	100 90 80	34 30 27	38 34 30	30
	NEAFC Region 3					
27	Hake (southern)	4.1	80 60	27 20	33 25	30
28	Nephrops	0.5	60	2.36 CL[2]	3.0 CL[2]	2.0 CL[2]
	Portuguese waters					
29	Hake	4.1	80[4] 60 45	28 20 13	33 25 18	30
30	Horse mackerel	3.4	80[4] 60 45	24 17 12	27 20 15	20-25[4]
31	Nephrops	0.35	80[4] 60 45	2.0 1.3 0.8	2.8 2.1 1.6 CL[2]	2.0 CL[2]
	Danish waters					
32	Hake	4.04	60	20	24	24 (since 1984)
33	Horse mackerel	4.80	60	23	29	11
34	Blue whiting	5.0	60	25	30	18
35	Megrim (*L. boscii*)	2.1	60	10	13	13 (since 1984)
36	Megrim (*L. whiffiagonis*)	2.3	60	10	14	13 (since 1984)
37	Nephrops	0.49	60	2.2 CL[2]	3.0 CL[2]	2.0 CL[2]

[1] Icelandic size limit is 500 g. Using the length/weight relationship given in the 1978 ICES Redfish Working Group report (G:14) this is equivalent to 33 cm.
[2] CL = Carapace length.
[3] To be introduced 1 July 1986.
[4] Proposed.

Sources of Selection Parameters in Table 7.2

Stock No.	Reference
1- 2	Report of the Arctic Fisheries Working Group, ICES, C.M.1979/G:20.
3	Same as saithe in Icelandic waters (8).
4- 5	Report of the Working Group on Redfish and Greenland Halibut. ICES, C.M.1980/G:4.
6-7, 9-10	Icelandic bottom trawl and Danish seine cod-end selection experiments on cod, haddock, redfish and plaice in 1972-76. G. Thorsteinsson, C.M. 1980/B:3.
8	Report of the Saithe Working Group. ICES, C.M. 1973/F:10.
11	H. Eiriksson, Marine Research Institute, Reykjavik (pers. comm.).
12-13	Report of the Working Group on Redfish and Greenland Halibut. ICES, C.M. 1982/Assess:5
14-15	Report of the Working Group on Fish Stocks at the Faroes. ICES, C.M. 1979/G:5.
16	Same as saithe in Icelandic waters (8).
17-19	Report of the North Sea Roundfish Working Group. ICES, C.M. 1984/Assess:10
20	Report of the Saithe Working Group. ICES, C.M. 1975/F:2.
21	Report of the North Sea Flatfish Working Group. ICES, C.M. 1982/Assess:3.
22	Report of the North Sea Flatfish Working Group. ICES, C.M. 1974/F:4.
23,25	Report of *Nephrops* experts' meeting, Brest 1982. Comm. of the European Communities (DG XIV).
24	Report of the Irish Sea and Bristol Channel Working Group, ICES C.M. 1985/Assess:10
26,27	Report of the Working Group on Assessment of Hake. ICES, C.M. 1982/Assess:14
29	A.M. Caramelo (pers. comm.) and Report of the Working Group on Assessment of Hake. ICES, C.M. 1982/Assess:14

30 A.M. Caramelo (pers. comm.) and Mesh Selection of Hake and Horse Mackerel on the Portuguese coast, F. Cardador and M.F. Borges. ICES, C.M. 1982/B:34.

32-37 J.A. Pereiro (pers. comm.) from unpublished Spanish data and Mesh selection of hake, blue whiting, horse mackerel, megrim, sole and Nephrops in nylon cod-ends on Galicia and Portugal shelf, R. Robles, A. Fernandez and F.J. Pereiro. ICES, C.M. 1980/B:12.

Table 7.3 Information on Danish seine mesh selection and technical conservation measures in NEAFC Regions 1 and 2.

No.	Region stock	Selection factor	Minimum legal mesh size (mm) in cod-end of Danish seine	25% retention length (cm)	50% retention length (cm)	Present minimum legal fish size (cm)
	NEAFC Region 1					
	NE-Arctic (Sub-area I and II) (incl.Jan Mayen)					
1	Cod	3.6	145 135 110	47 43 34	52 49 40	42
2	Haddock	3.3	145 135 110	44 40 32	48 45 36	39
	Iceland (Div.Va)					
3	Cod	3.48	155	48	54	50
4	Plaice	2.0	155	29	31	34
	NEAFC Region 2					
5	Haddock	3.26[1]	100 90 80 70	29 26 23 20	33 29 26 23	27
6	Whiting	4.12[1]	100 90 80 70	38 34 30 26	41 37 33 29	27,23

[1] Diamond mesh, 79.1 mm.

Sources of Selection Parameters in Table 7.3

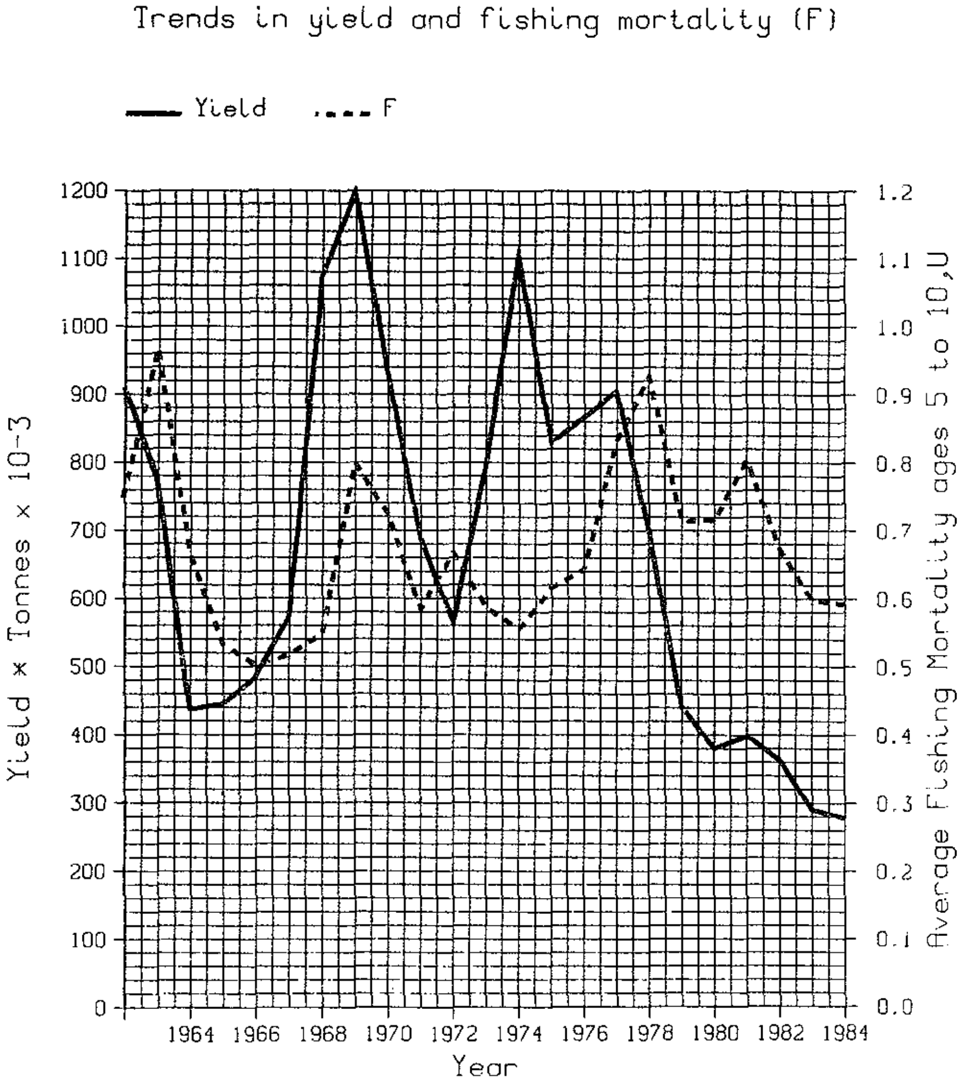
Stock No.	Reference
1-2	Selectivity experiments with Danish seine on cod and haddock in northern Norway in 1982, T. Jakobsen. ICES, C.M. 1983/B:18.
3-4	Icelandic bottom trawl and Danish seine cod-end selection experiments on cod, haddock, redfish and plaice in 1972-76, G. Thorsteinsson, ICES, C.M. 1980/B:3.
5-6	Square mesh cod-end selectivity for haddock and whiting in a Scottish seine net, J.H.B. Robertson, ICES, C.M. 1984/B:30

FISH STOCK SUMMARY

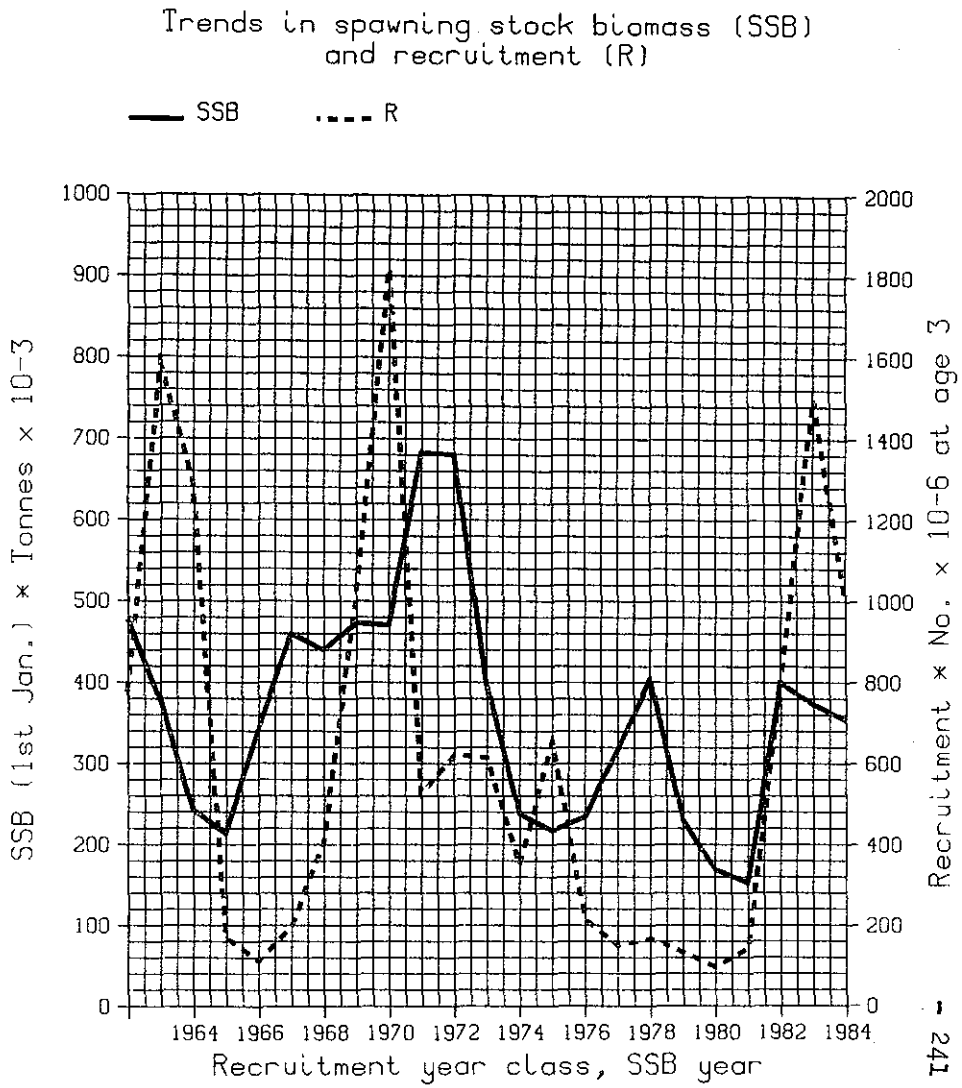
STOCK: NE Arctic Cod

20-10-1985

Figure 2.1.1



A



B

ctd.

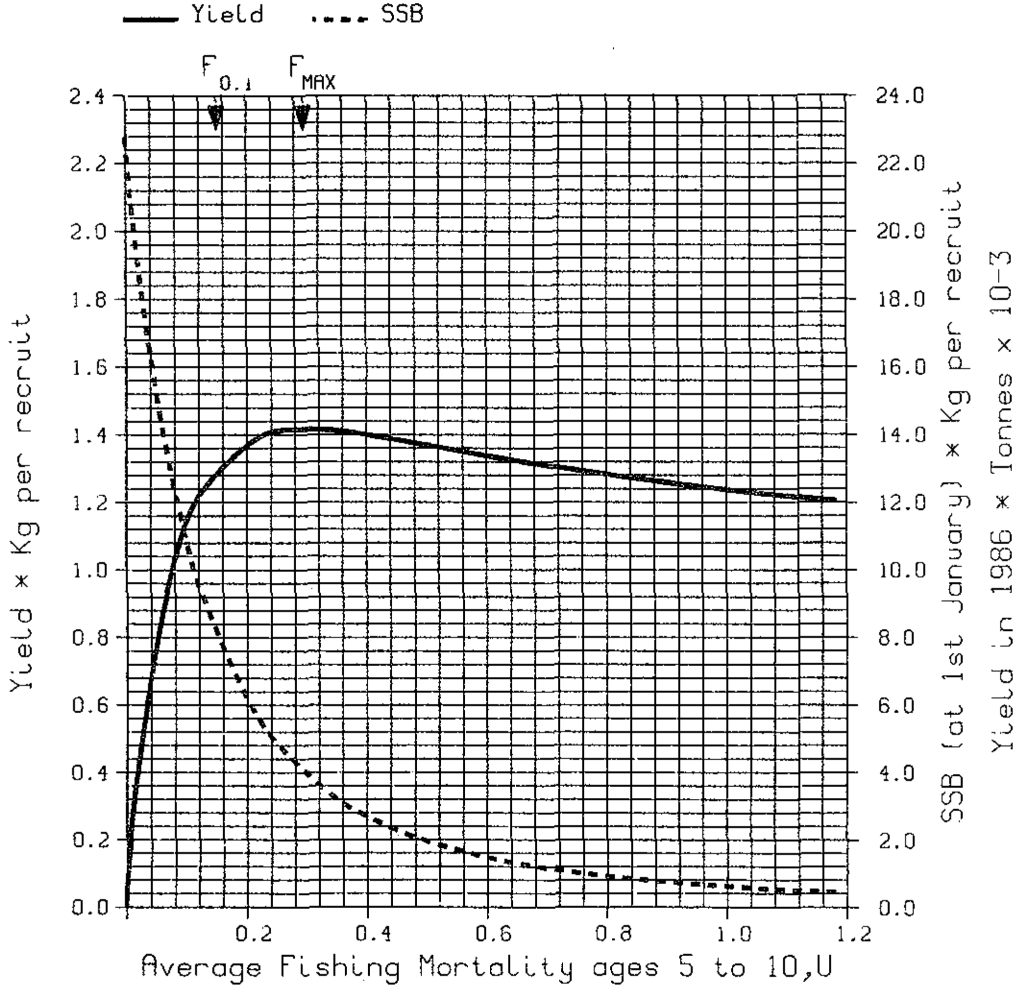
FISH STOCK SUMMARY

STOCK: NE Arctic Cod

20-10-1985

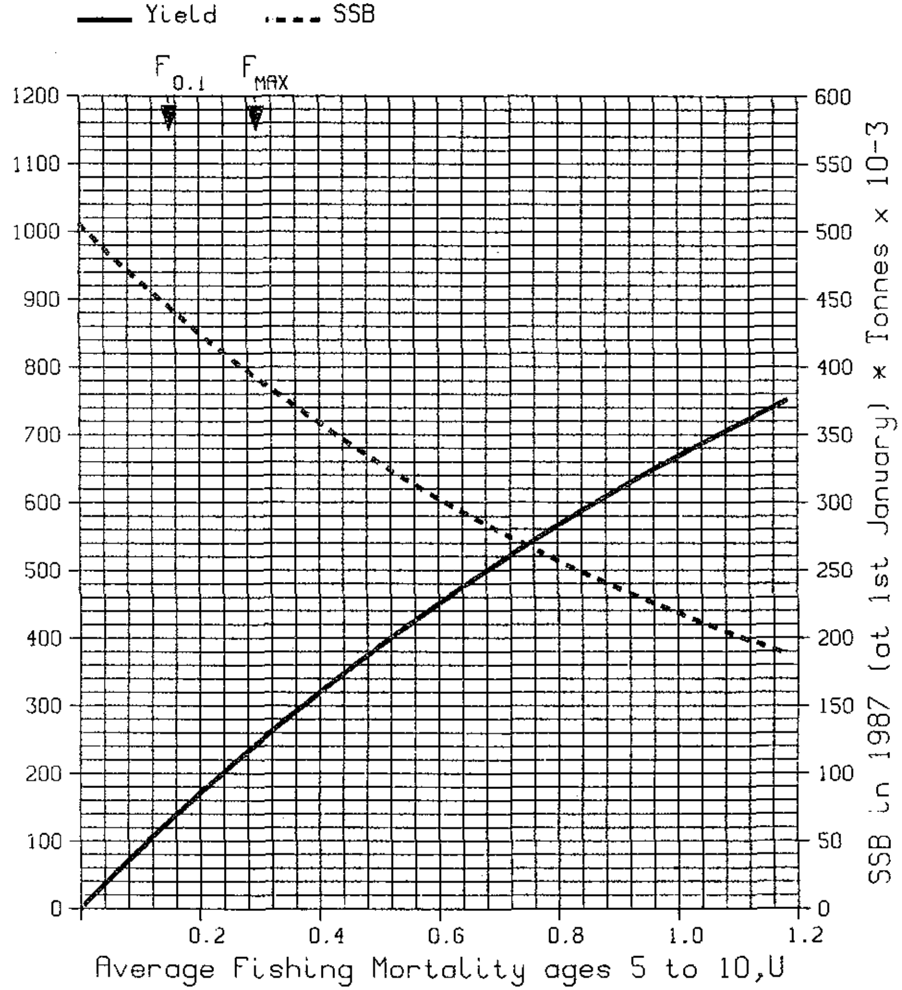
Figure 2.1.1 cont'd

Long term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



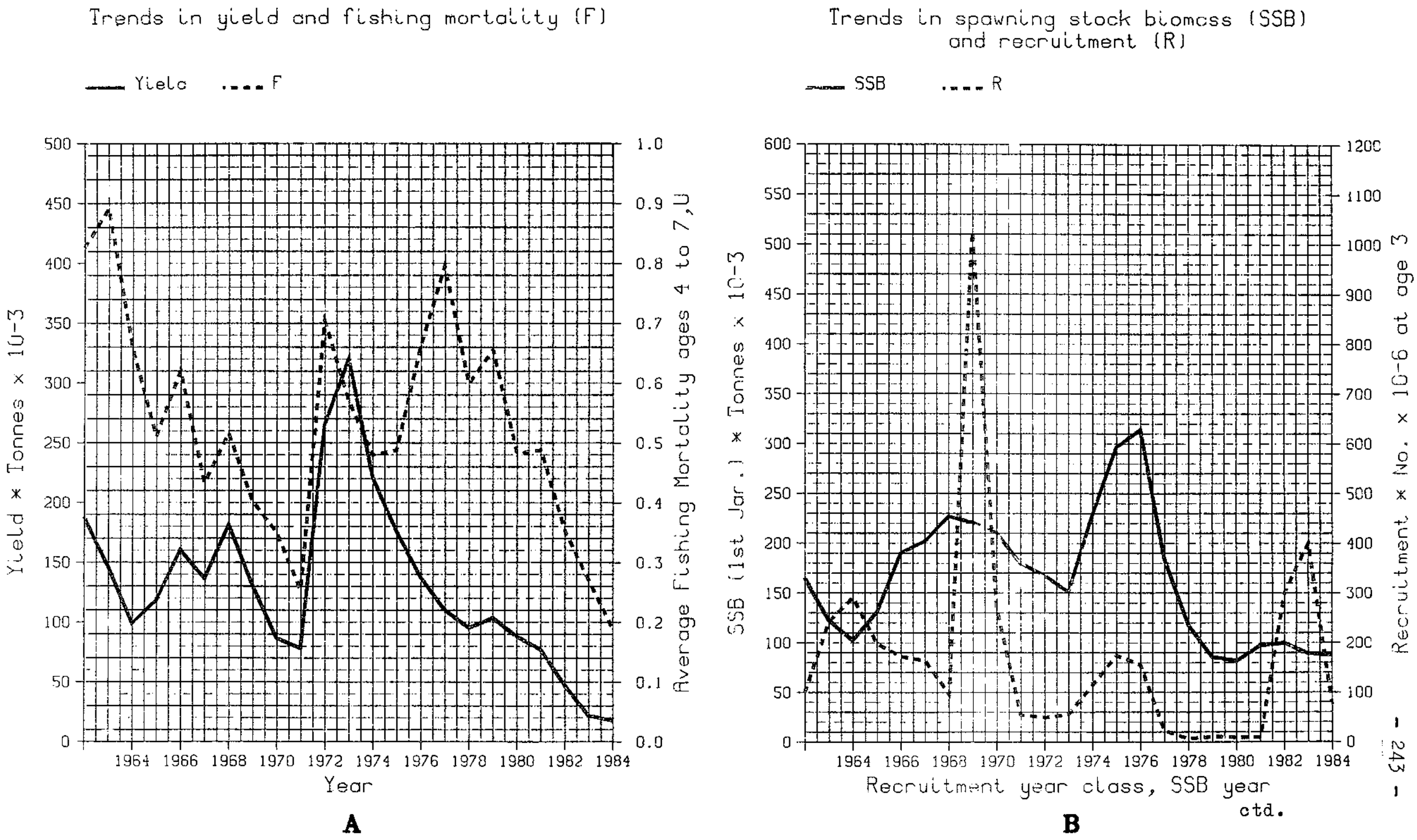
D

FISH STOCK SUMMARY

STOCK: NE Arctic Haddock

20-10-1985

Figure 2.2.1



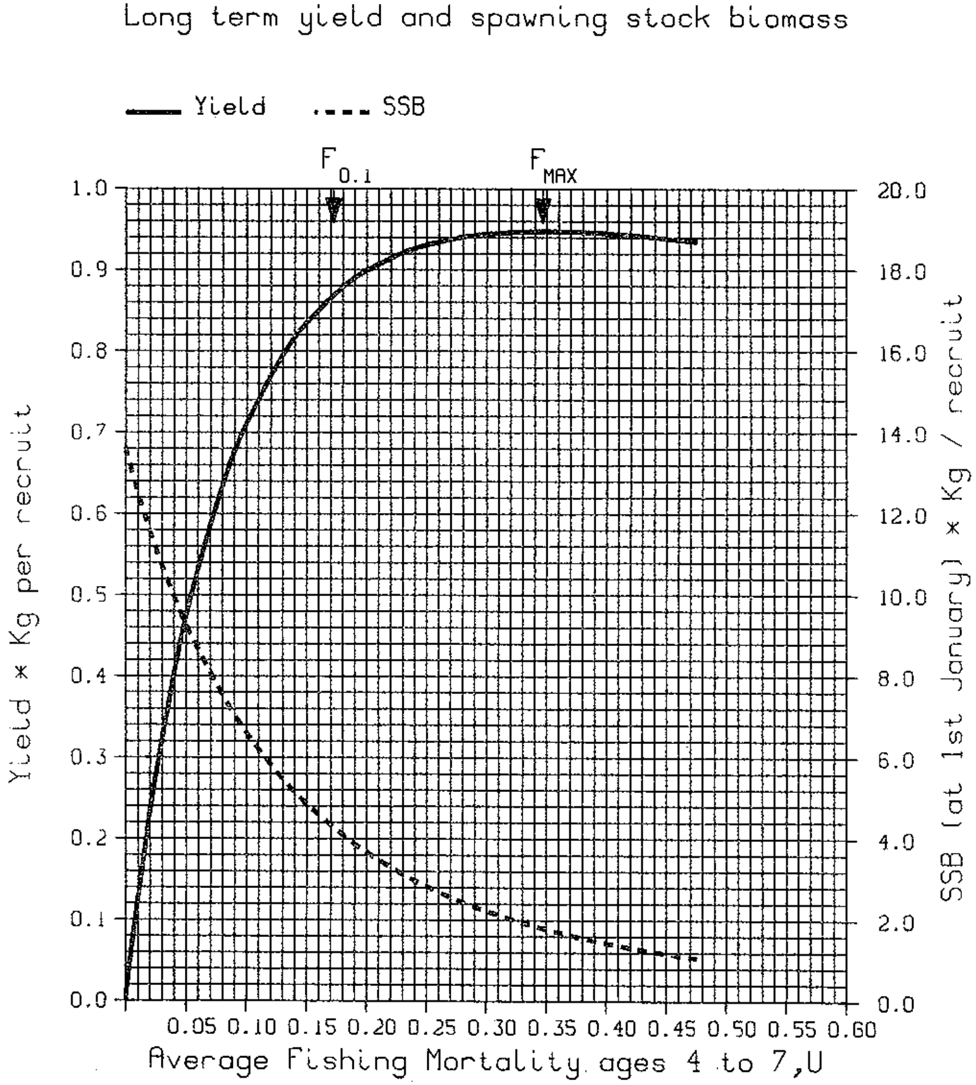
ctd.

FISH STOCK SUMMARY

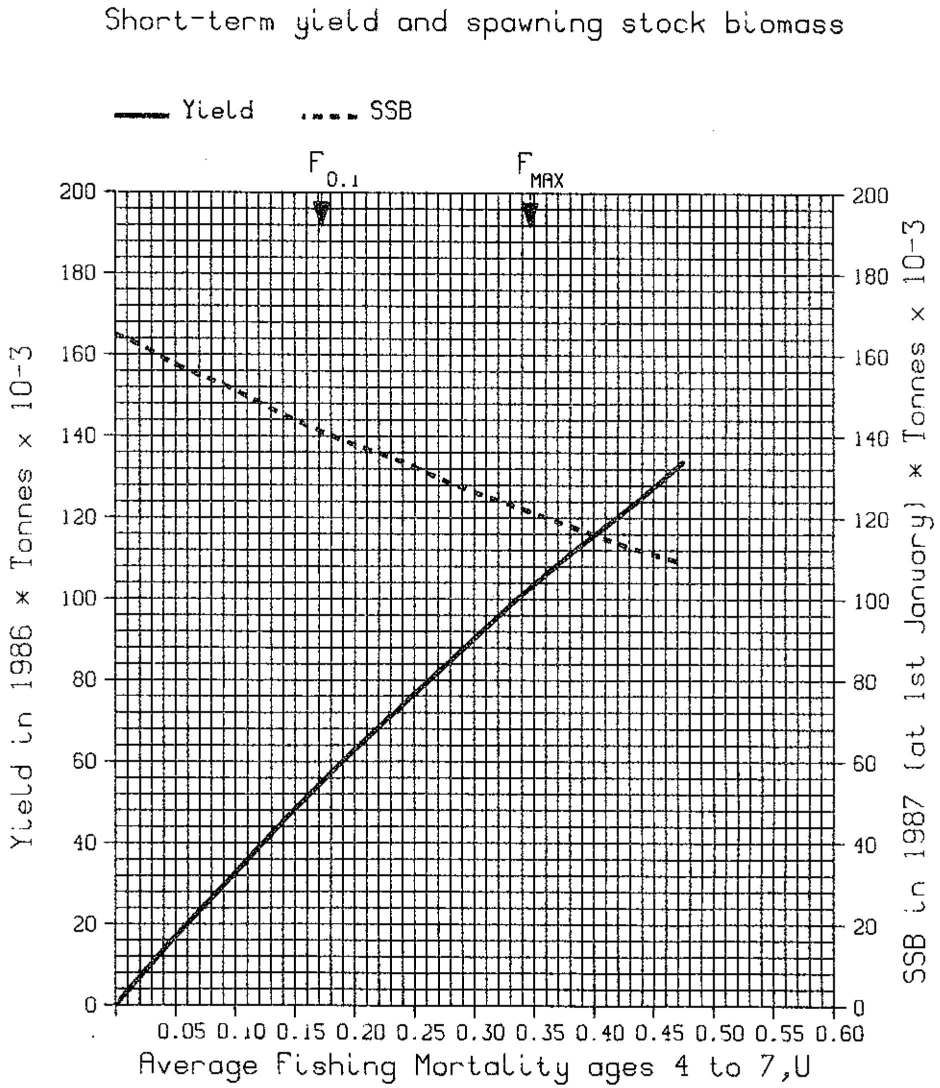
STOCK: NE Arctic Haddock

15-10-1985

Figure 2.2.1 cont'd



C



D

Figure 2.7.1 Main spawning grounds, migrations of mature fish and larval drift of the cod stocks at West Greenland, East Greenland, and Iceland.

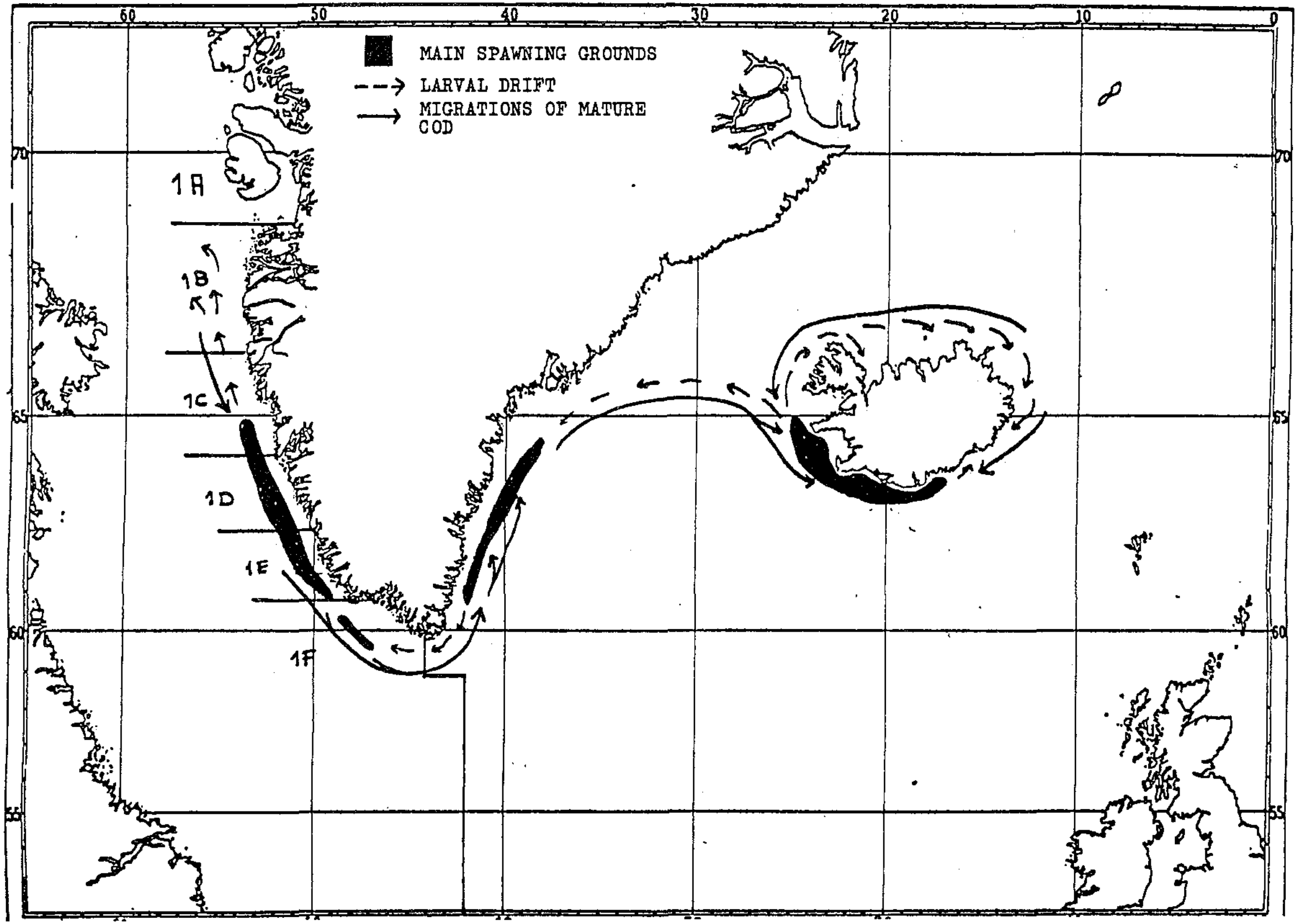


Figure 2.7.2 East Greenland COD. Catch 1985 and spawning stock biomass at the beginning of 1986 for different levels of fishing mortality in 1985.

The calculated SSB does not include estimates of immigrants from West Greenland in 1986.

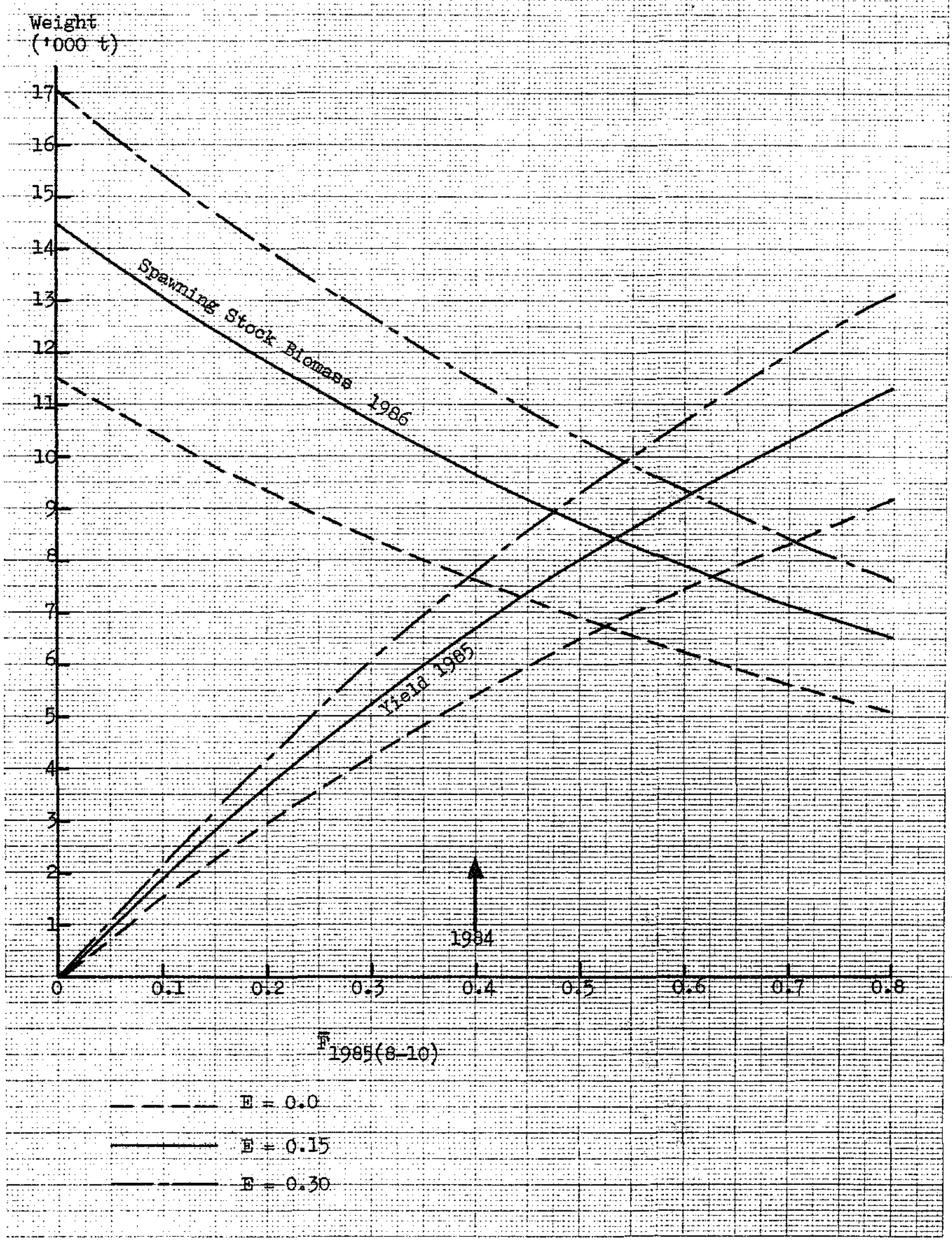
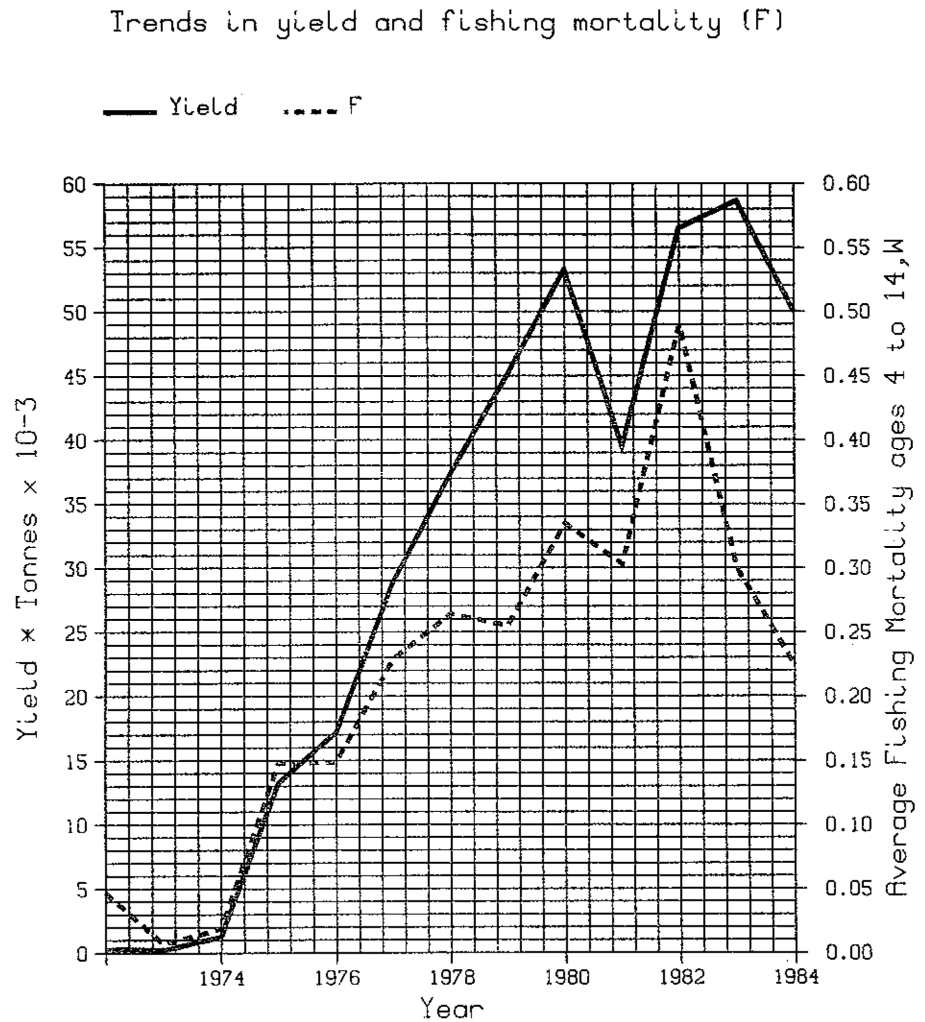


Figure 2.8.1

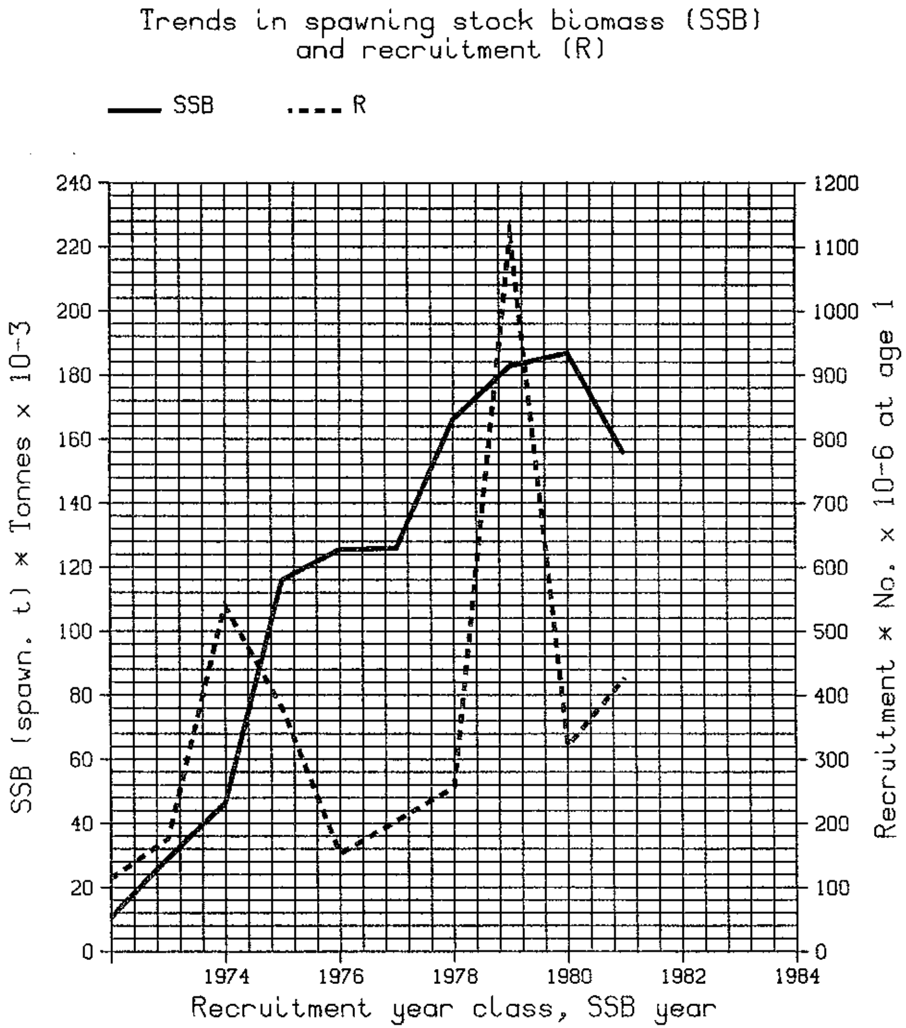
FISH STOCK SUMMARY

STOCK: Herring - Va (Summer)

26-03-1985



A

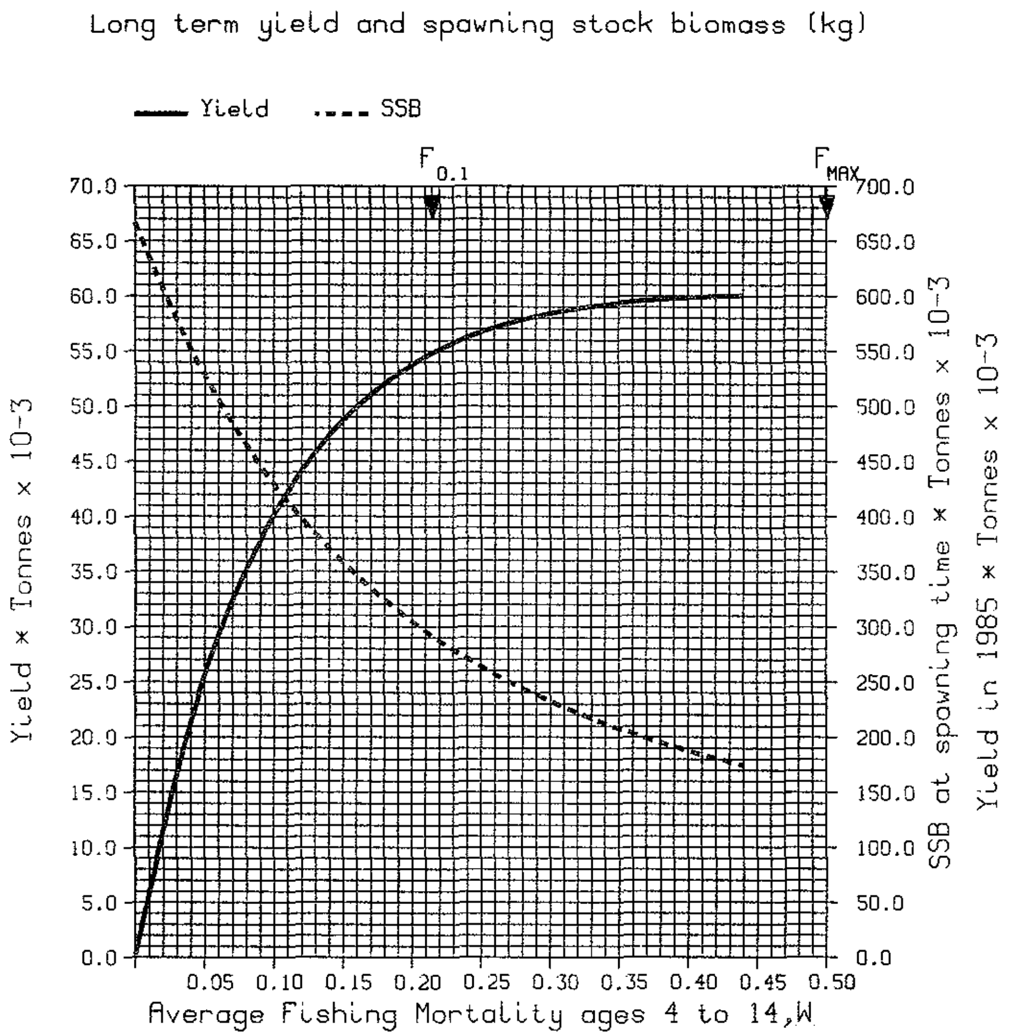


B

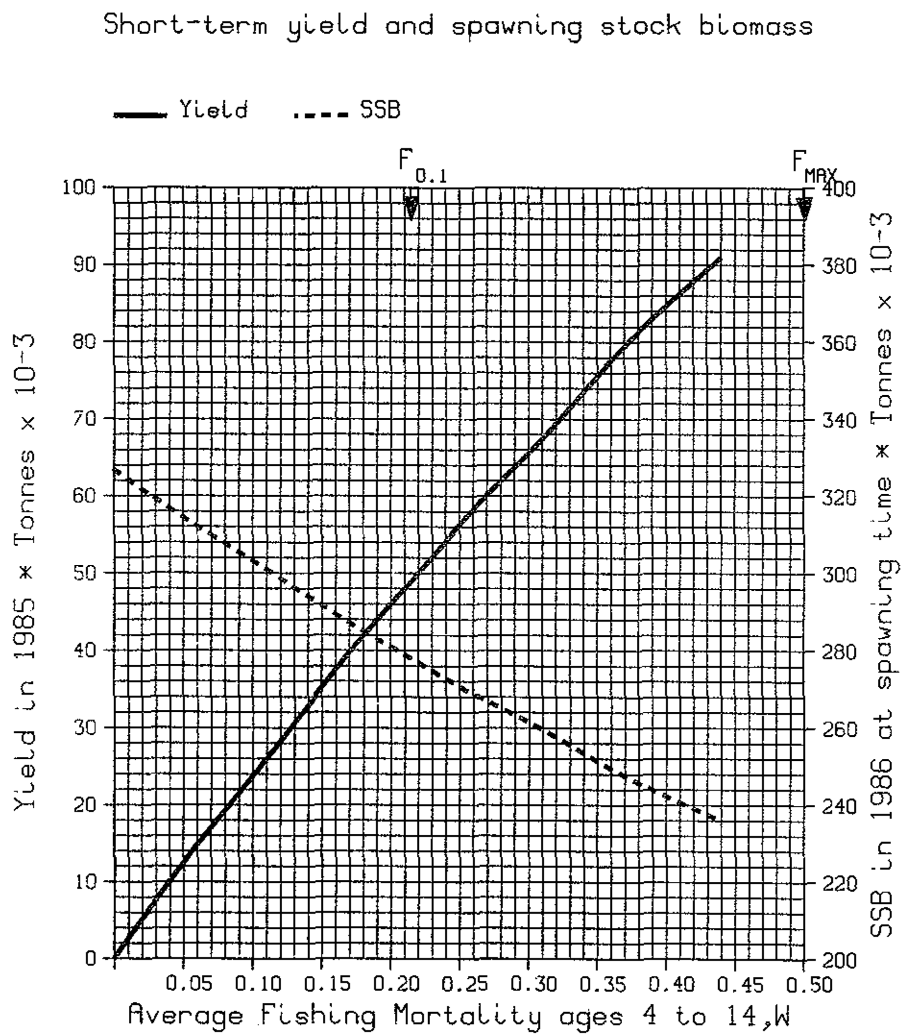
(cont'd)

Figure 2.8.1 cont'd

FISH STOCK SUMMARY
STOCK: Herring - Va (Summer)
26-03-1985



C



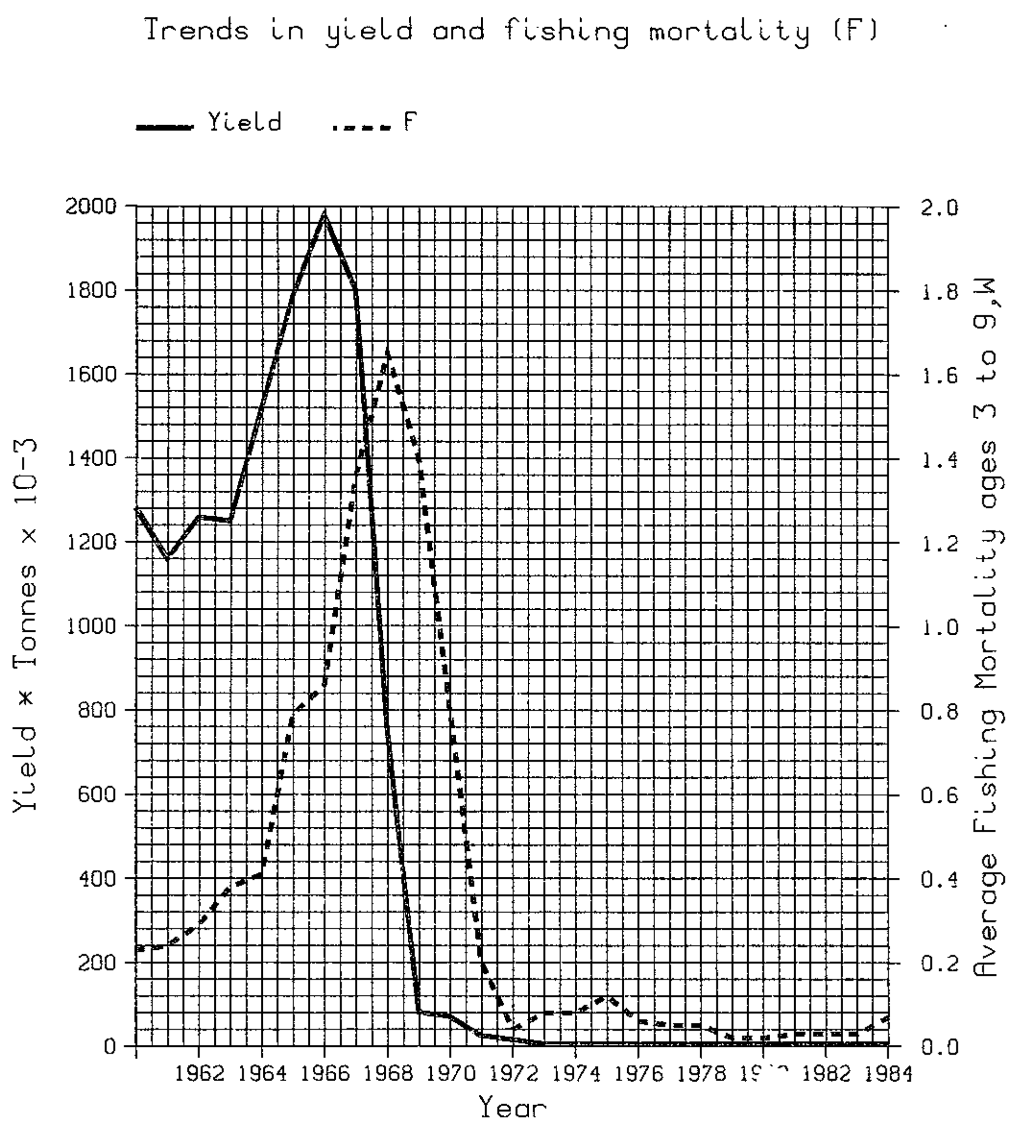
D

Figure 2.8.2.1

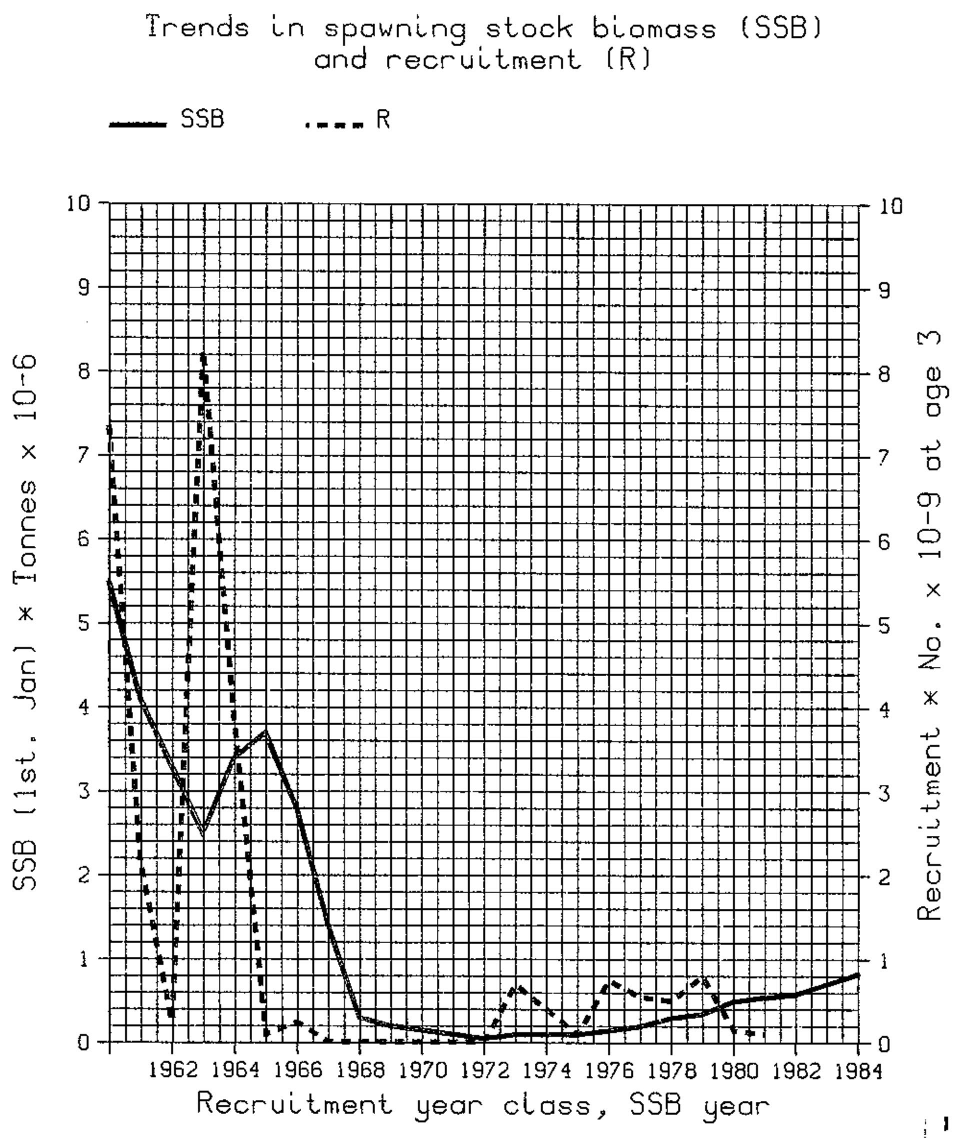
FISH STOCK SUMMARY

STOCK: NORWEGIAN SPRING SPAWNING HERRING

05-11-1985



A



B

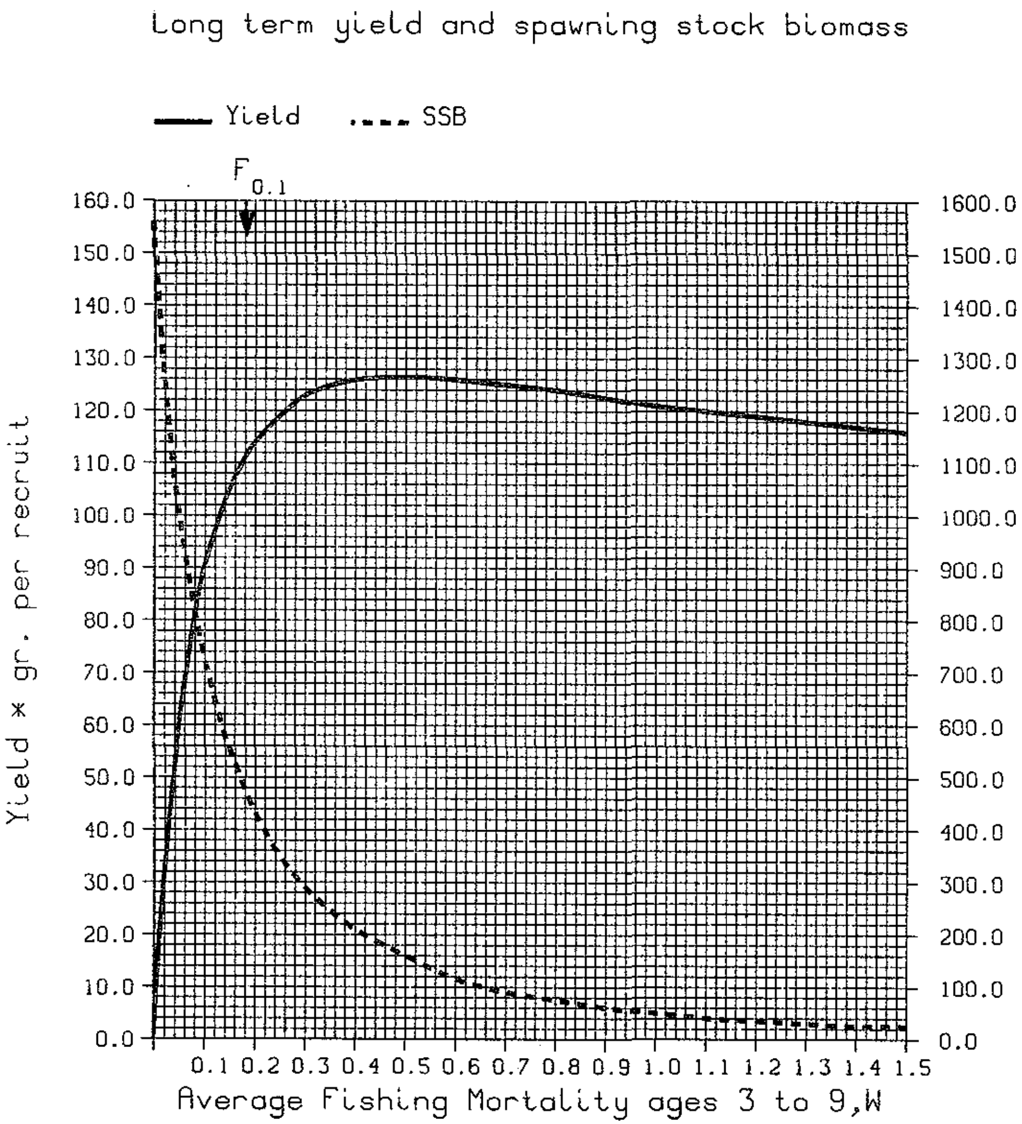
ctd.

Figure 2.8.2.1 cont'd

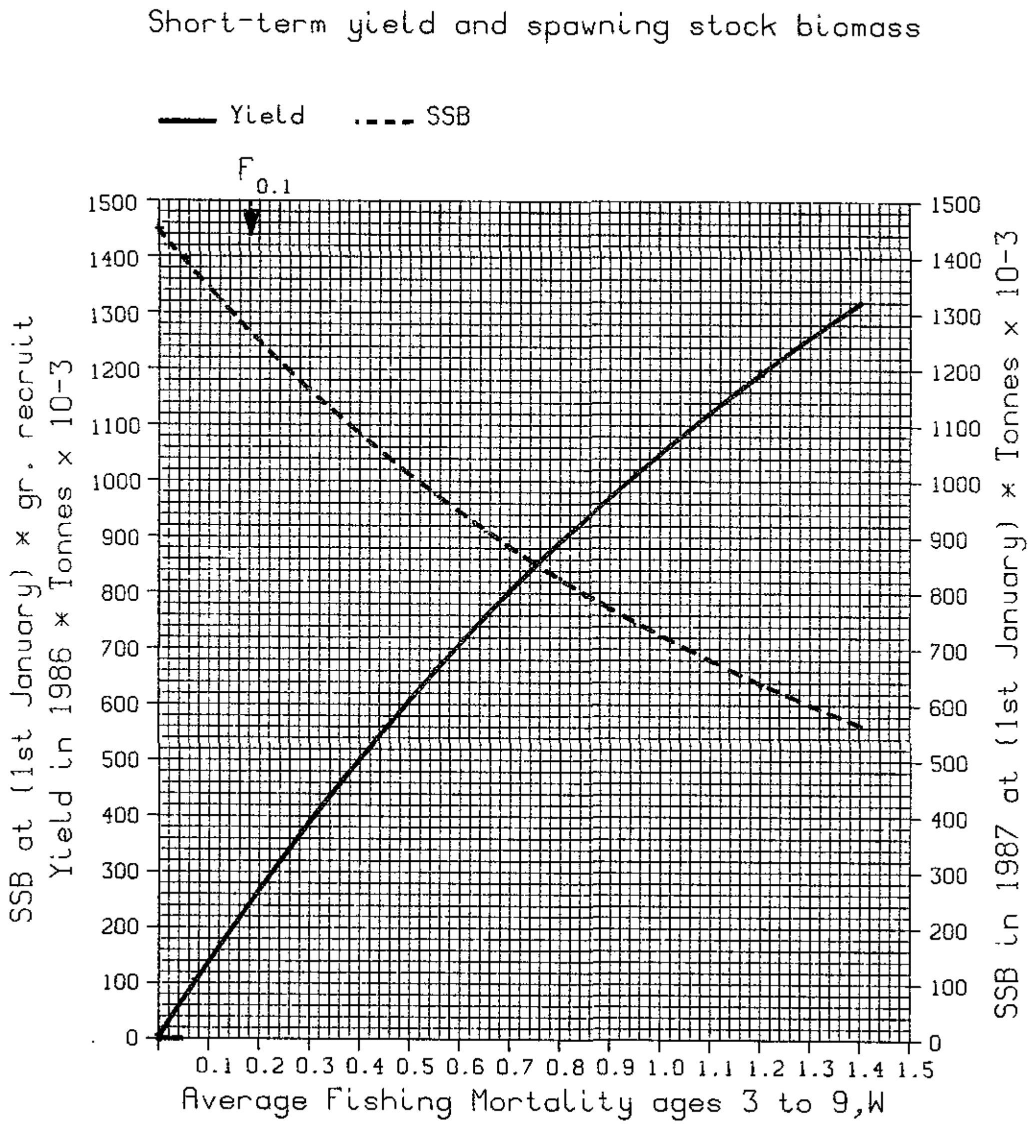
FISH STOCK SUMMARY

STOCK: NORWEGIAN SPRING SPAWNING HERRING

05-11-1985

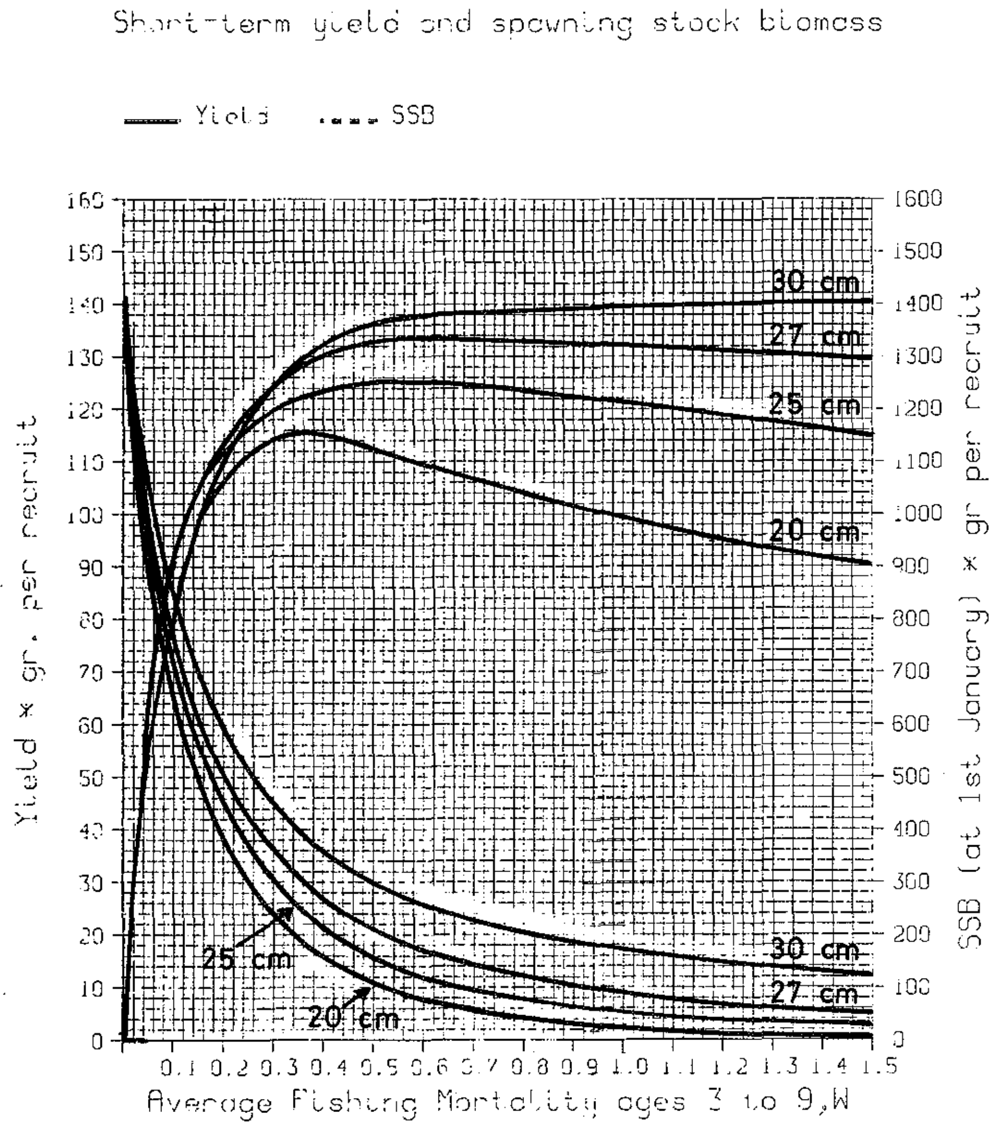


C



D

Figure 2.8.2.2 Yield per recruit and corresponding spawning stock biomass per recruit for 20 cm, 25 cm, 27 cm, and 30 cm minimum landing size.



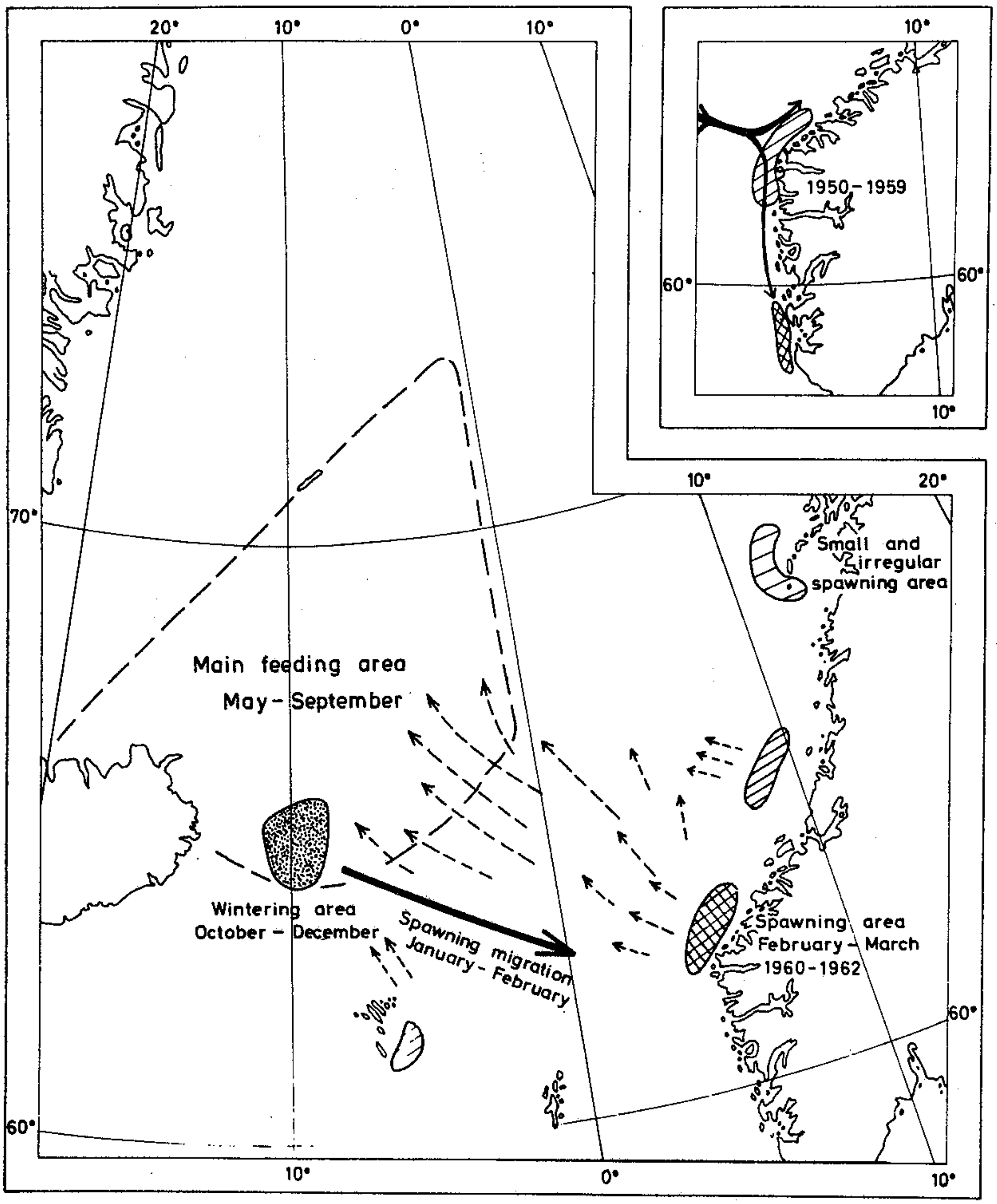


Figure 2.8.3.1 Migration routes of Norwegian spring-spawning herring, 1950-62.

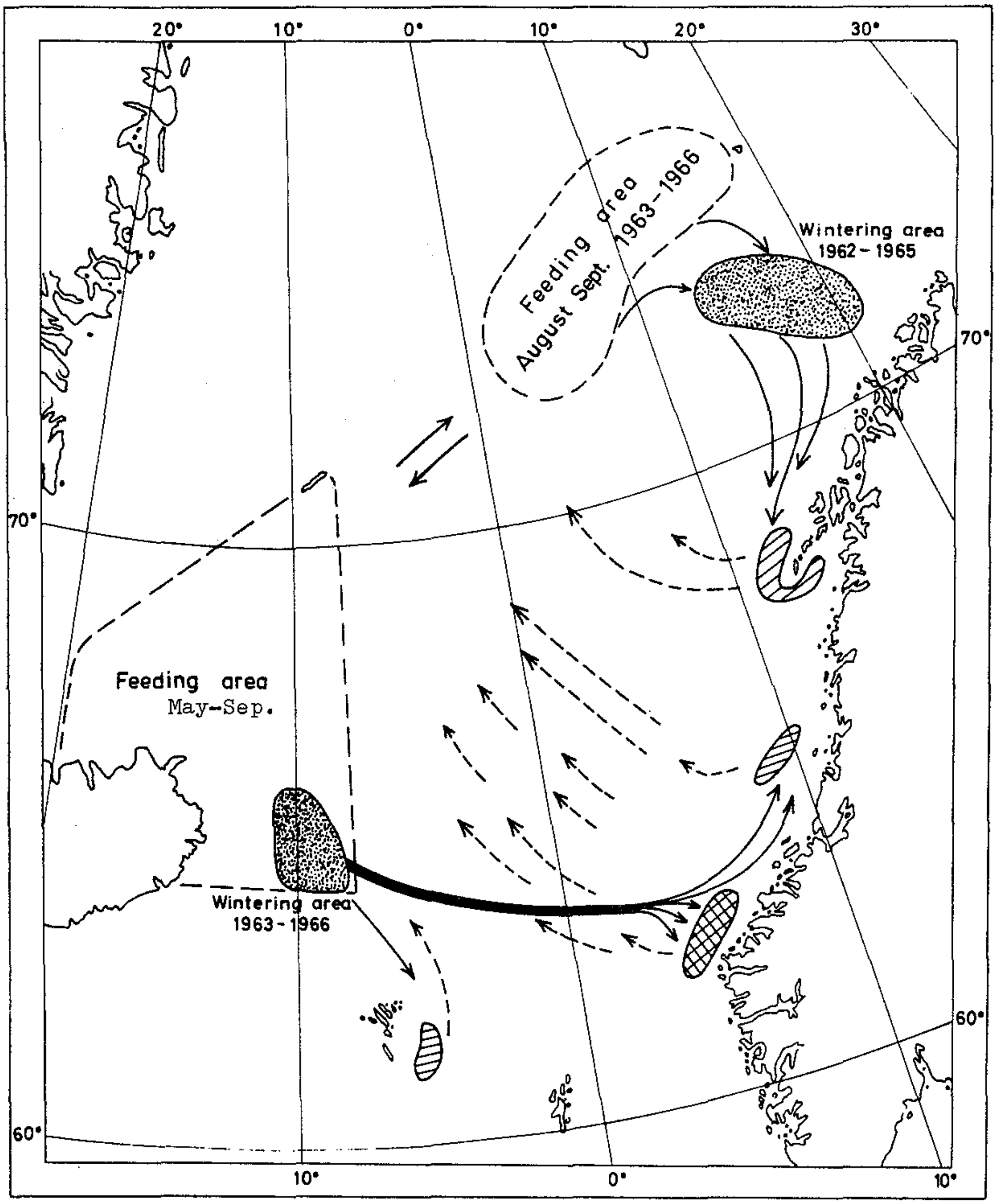


Figure 2.8.3.2 Migration routes of Norwegian spring-spawning herring, 1963-66. It should be noted that the feeding and wintering areas in the Bear Island area during 1962-65 were occupied by only a portion of the 1959 year class.

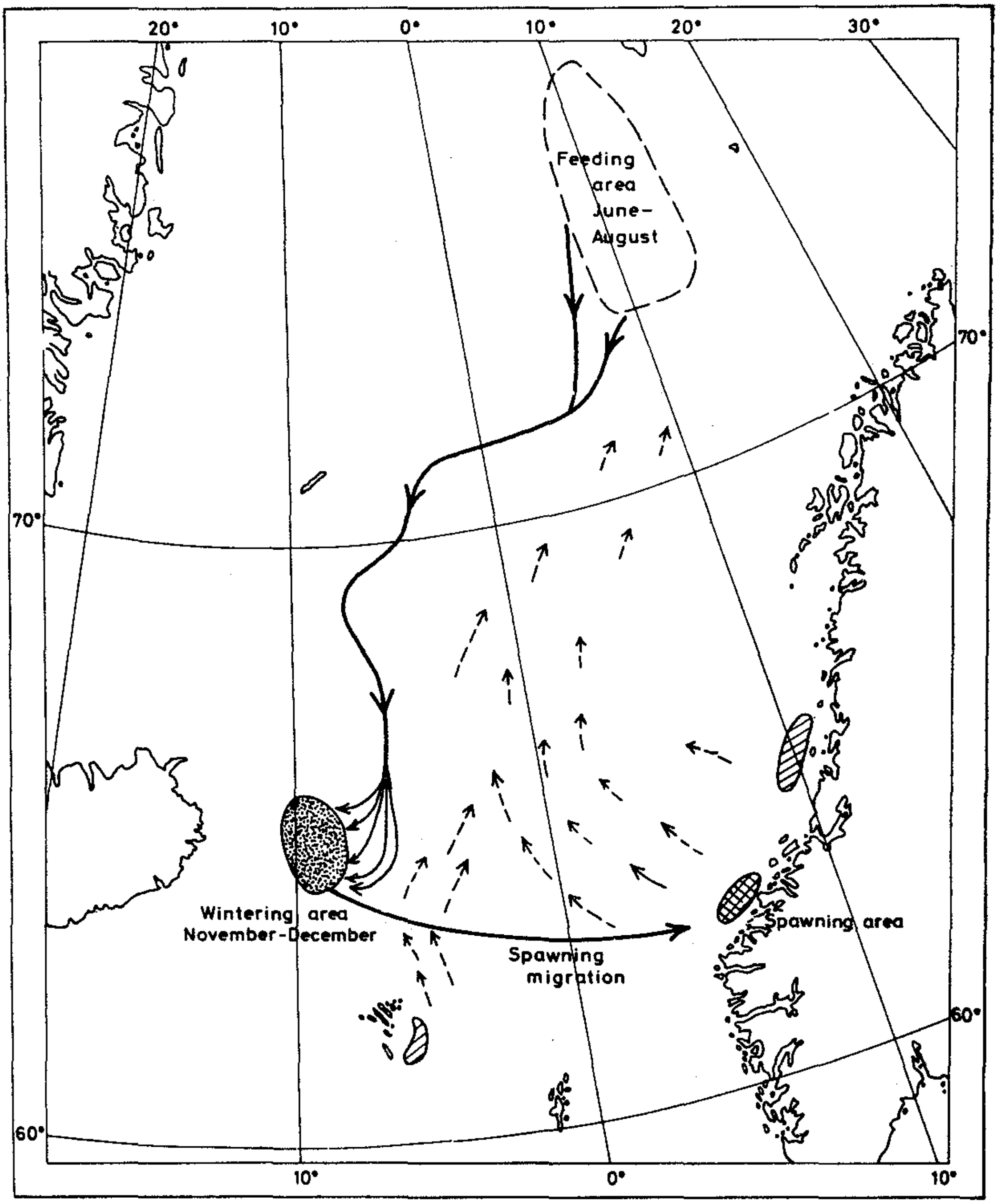


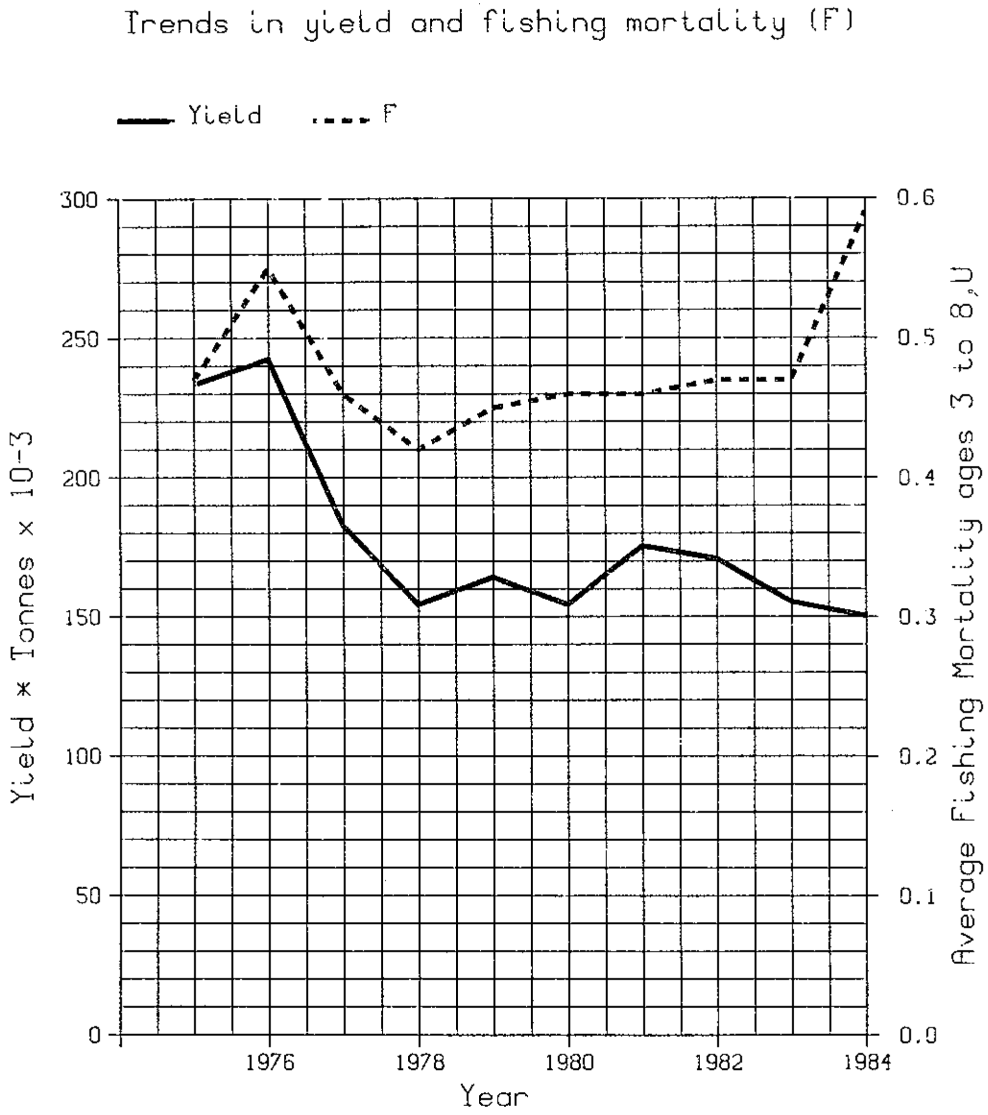
Figure 2.8.3.3 Migration routes of Norwegian spring-spawning herring, 1967-68.

Figure 2.10

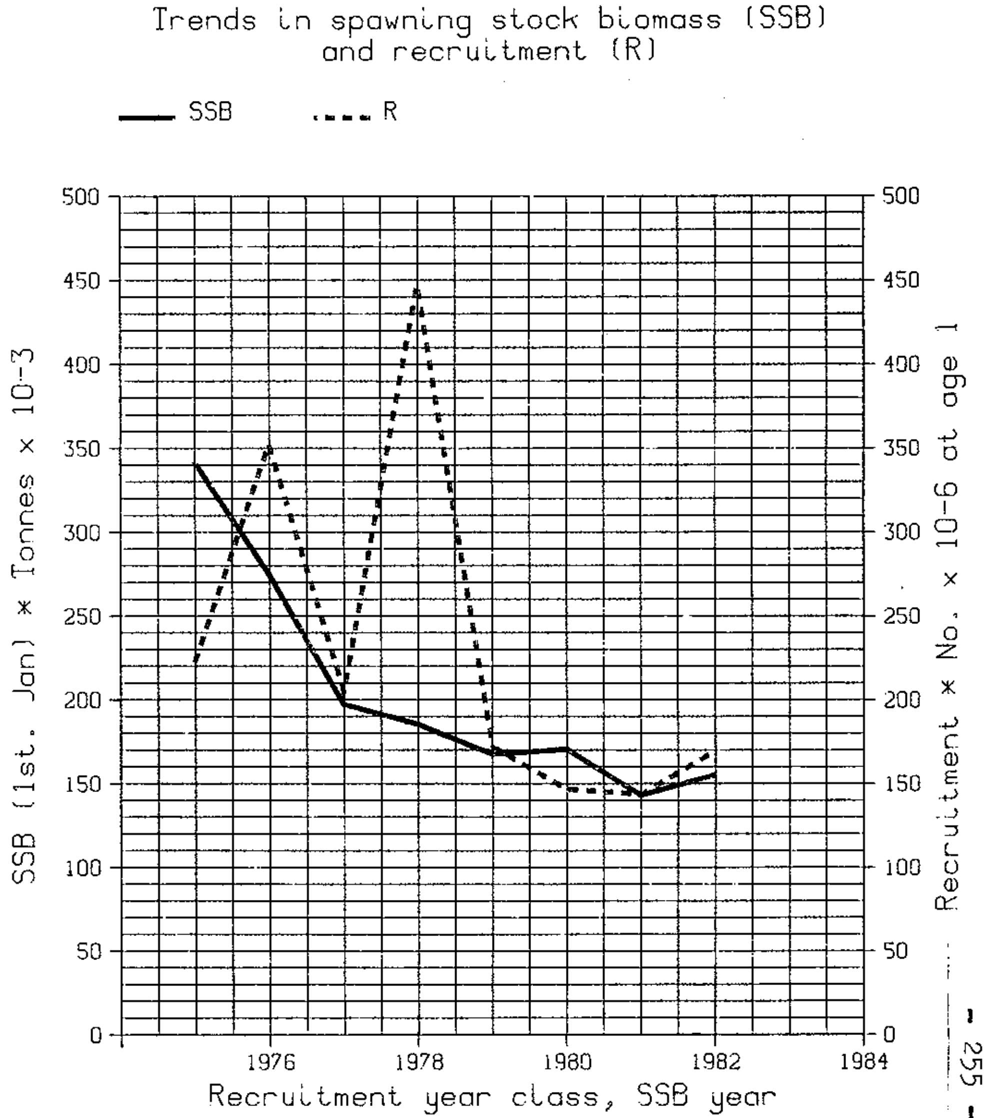
FISH STOCK SUMMARY

STOCK: Saithe - Arctic

05-05-1985



A

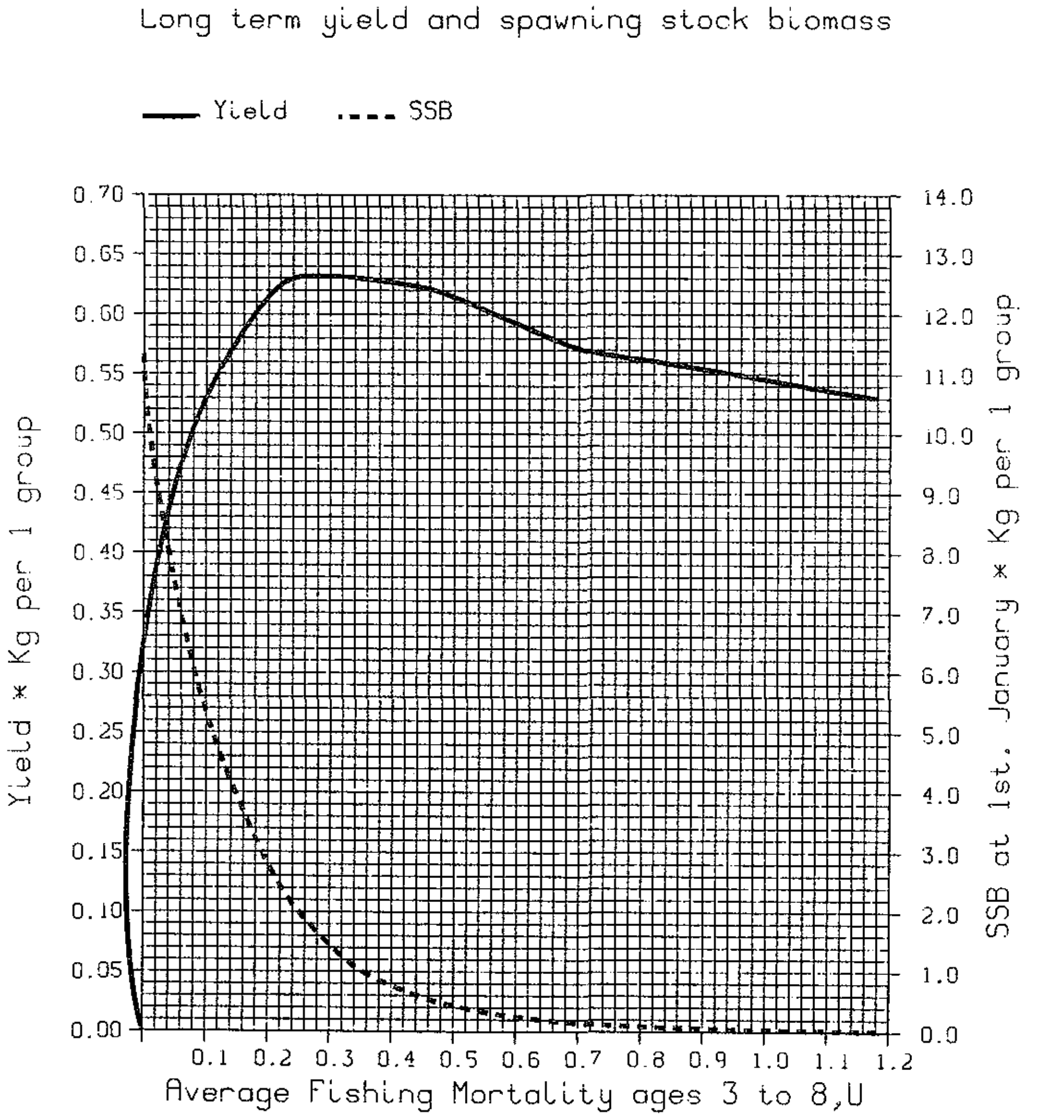


B

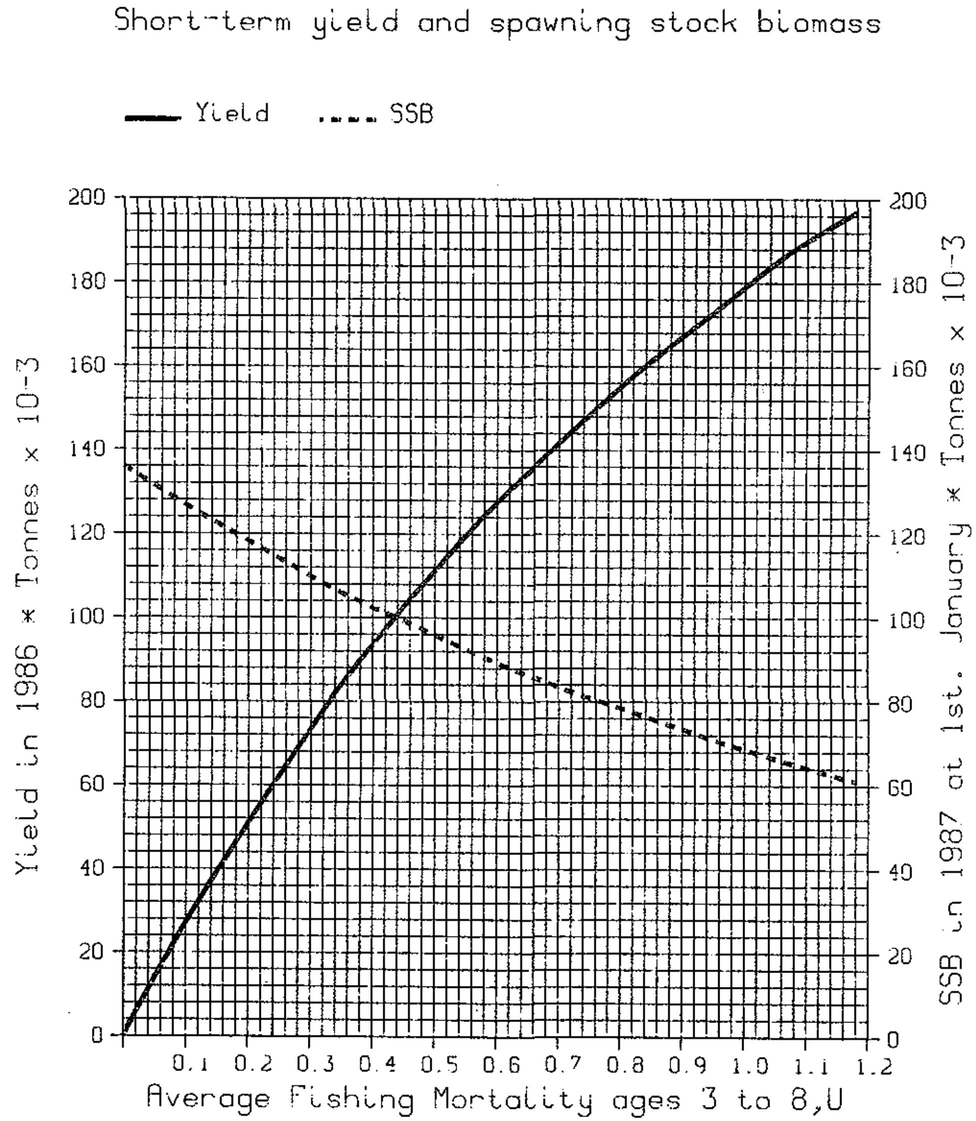
Contd.

Figure 2.10 cont'd.

FISH STOCK SUMMARY
STOCK: Saithe - Arctic
05-05-1985



C



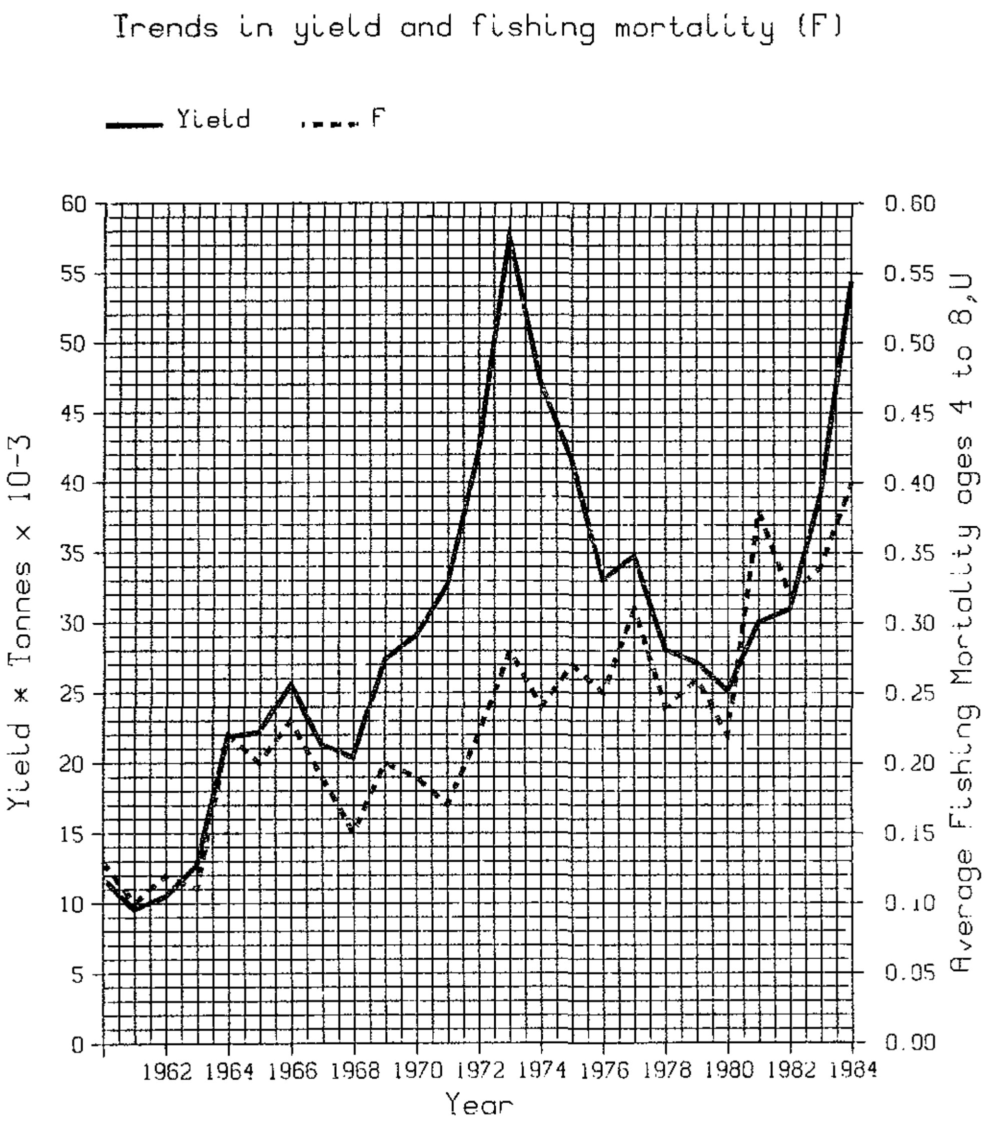
D

Figure 2.12.1

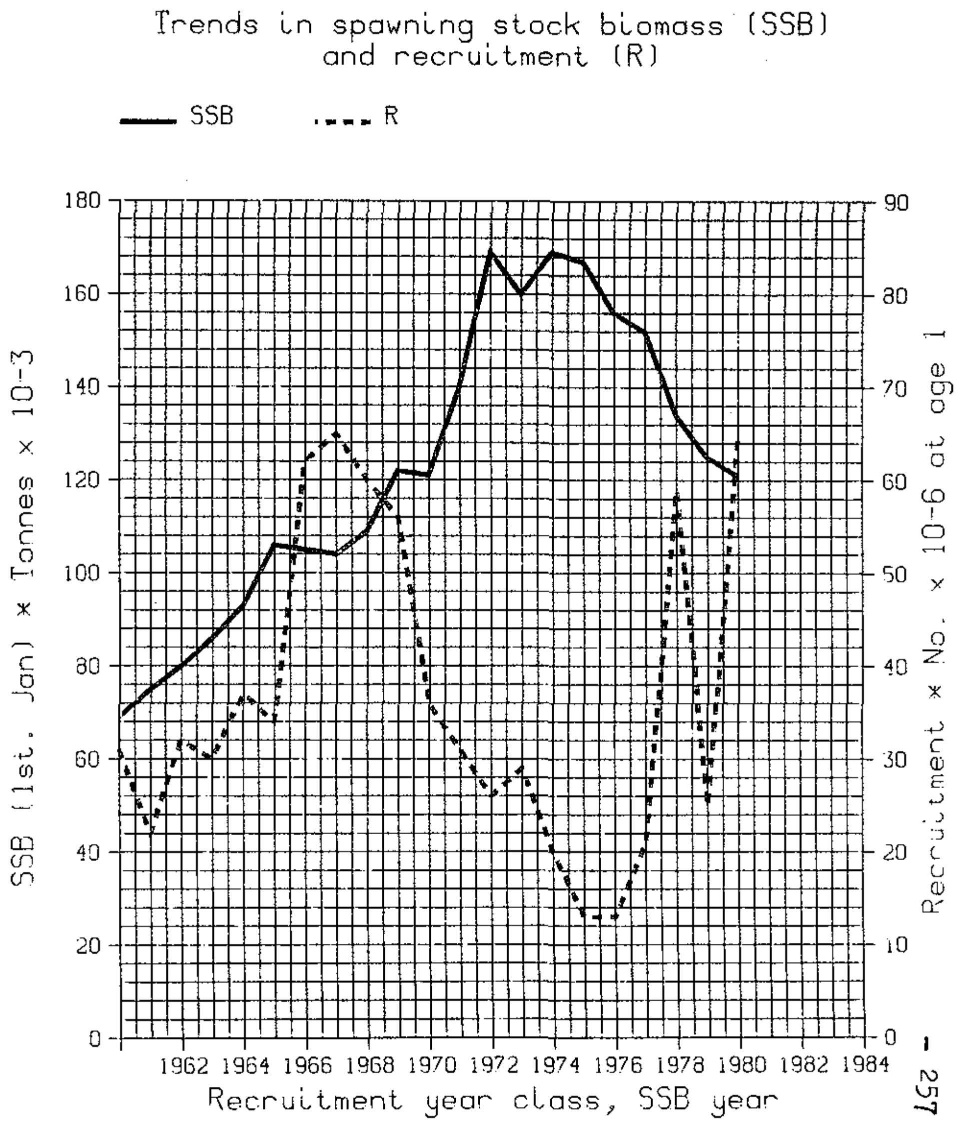
FISH STOCK SUMMARY

STOCK: Saithe - Faroe

05-05-1985



A



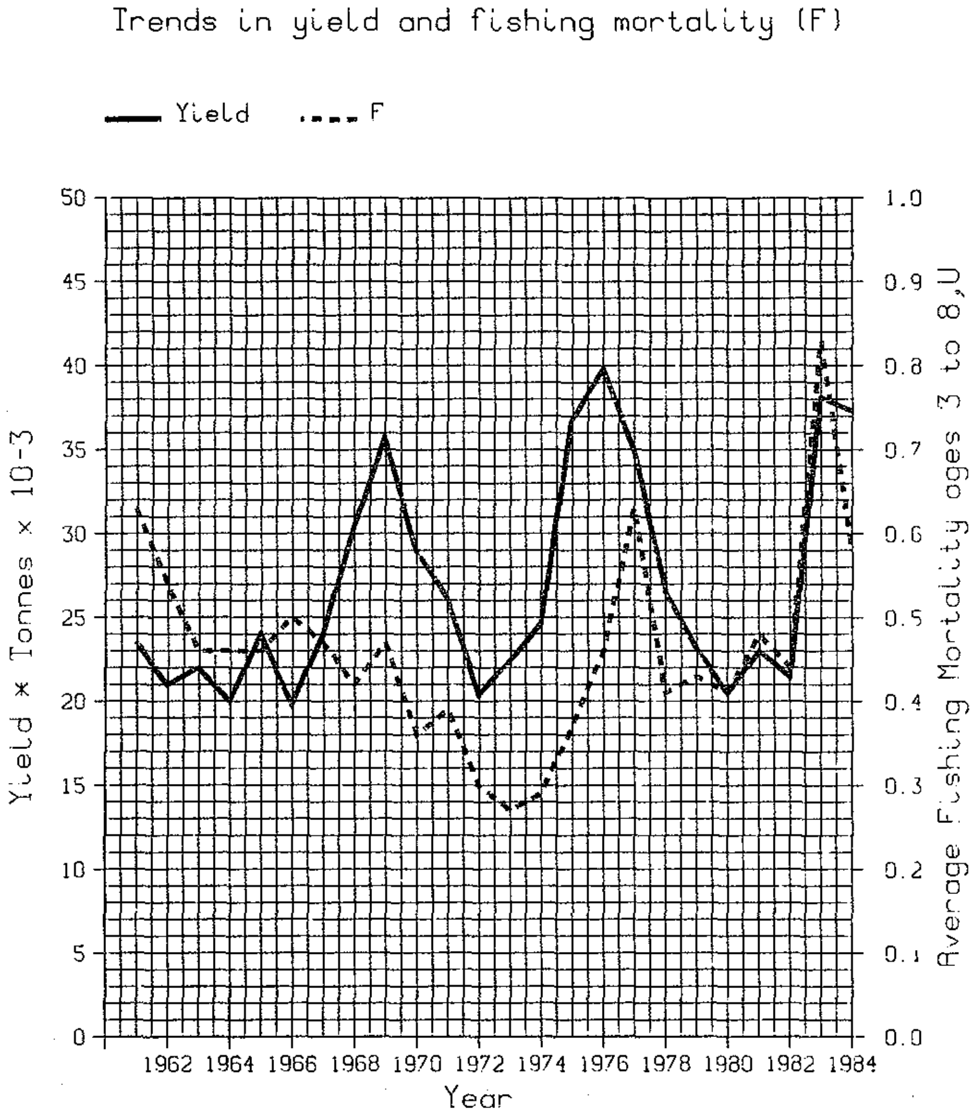
B

Figure 2.12.2

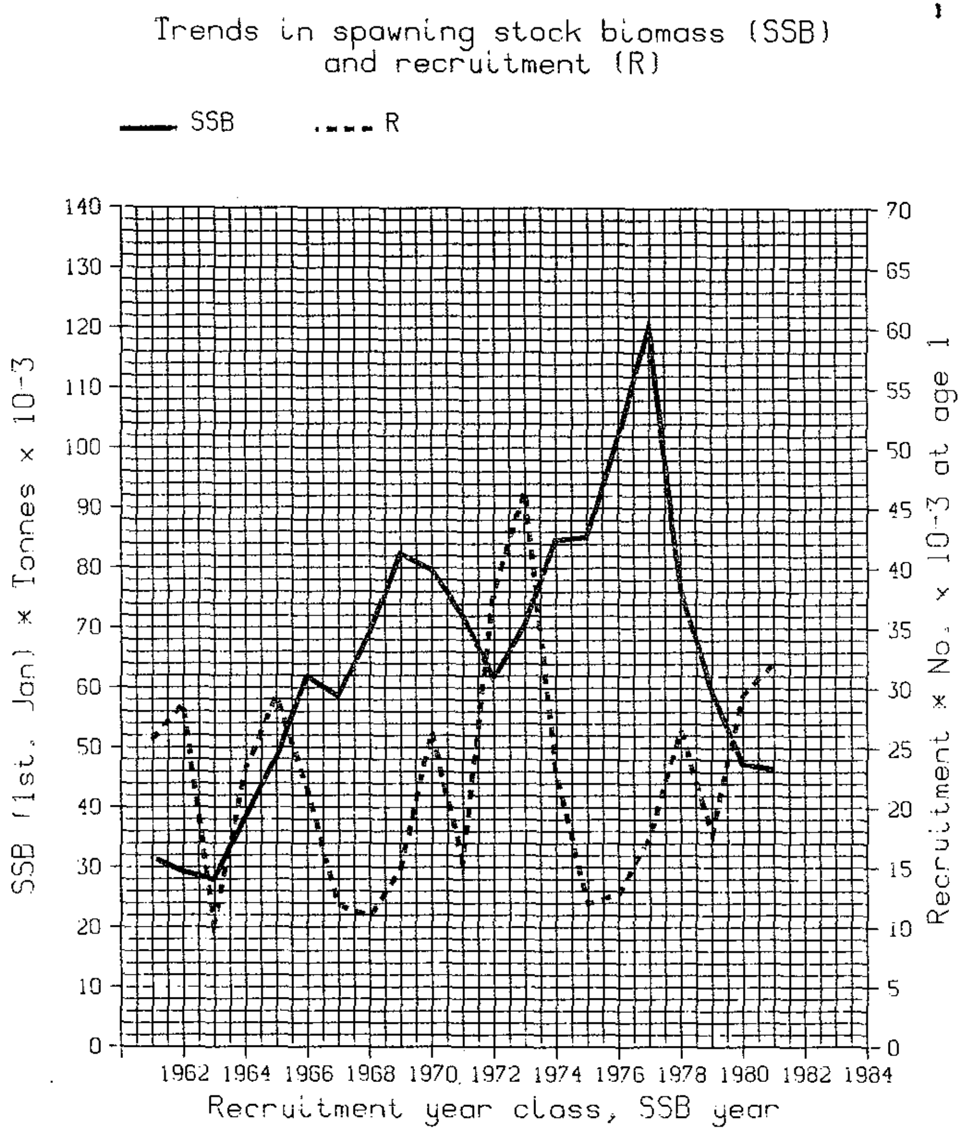
FISH STOCK SUMMARY

STOCK: Cod - Faroe Pl.

05-05-1985



A



B

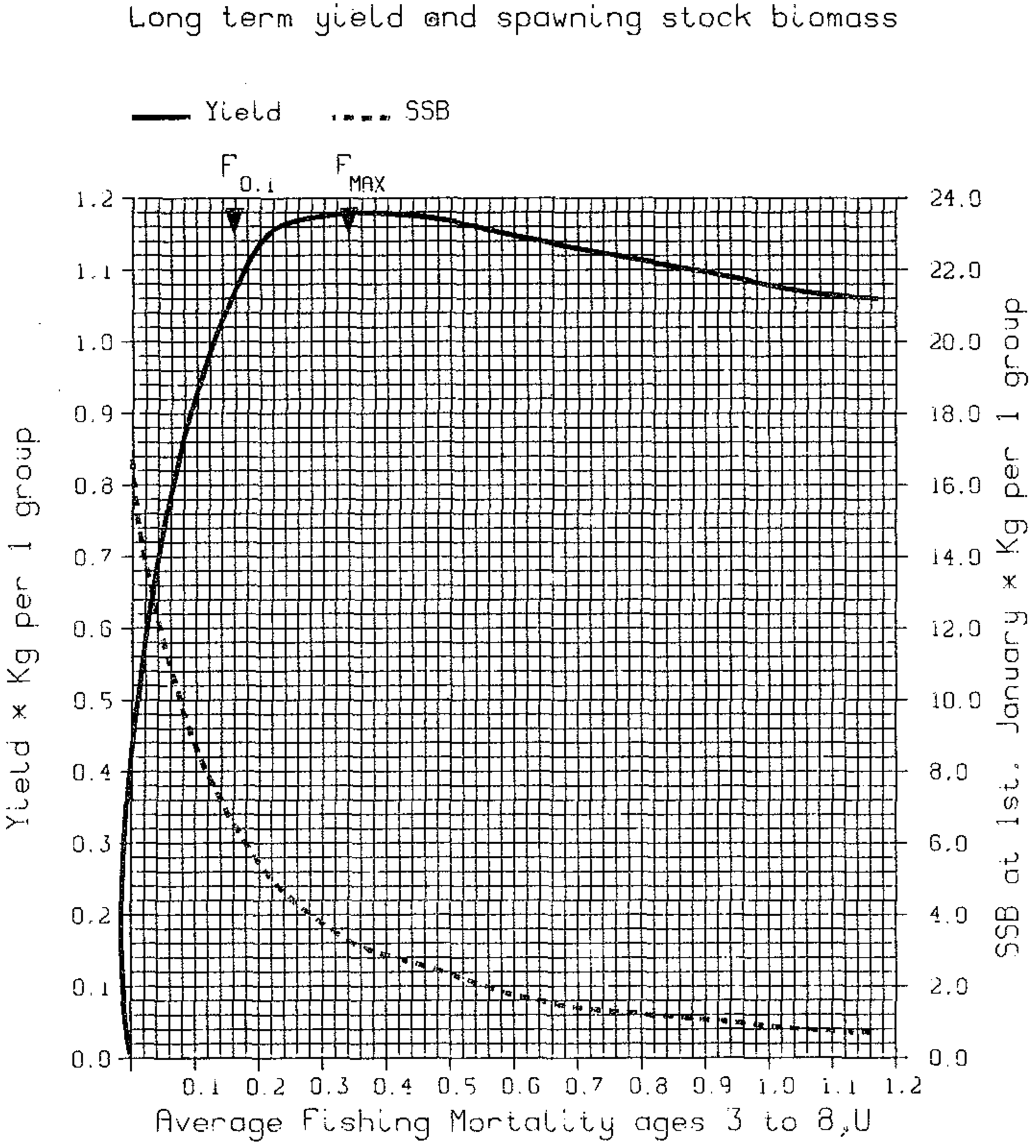
Contd.

Figure 2.12.2 cont'd

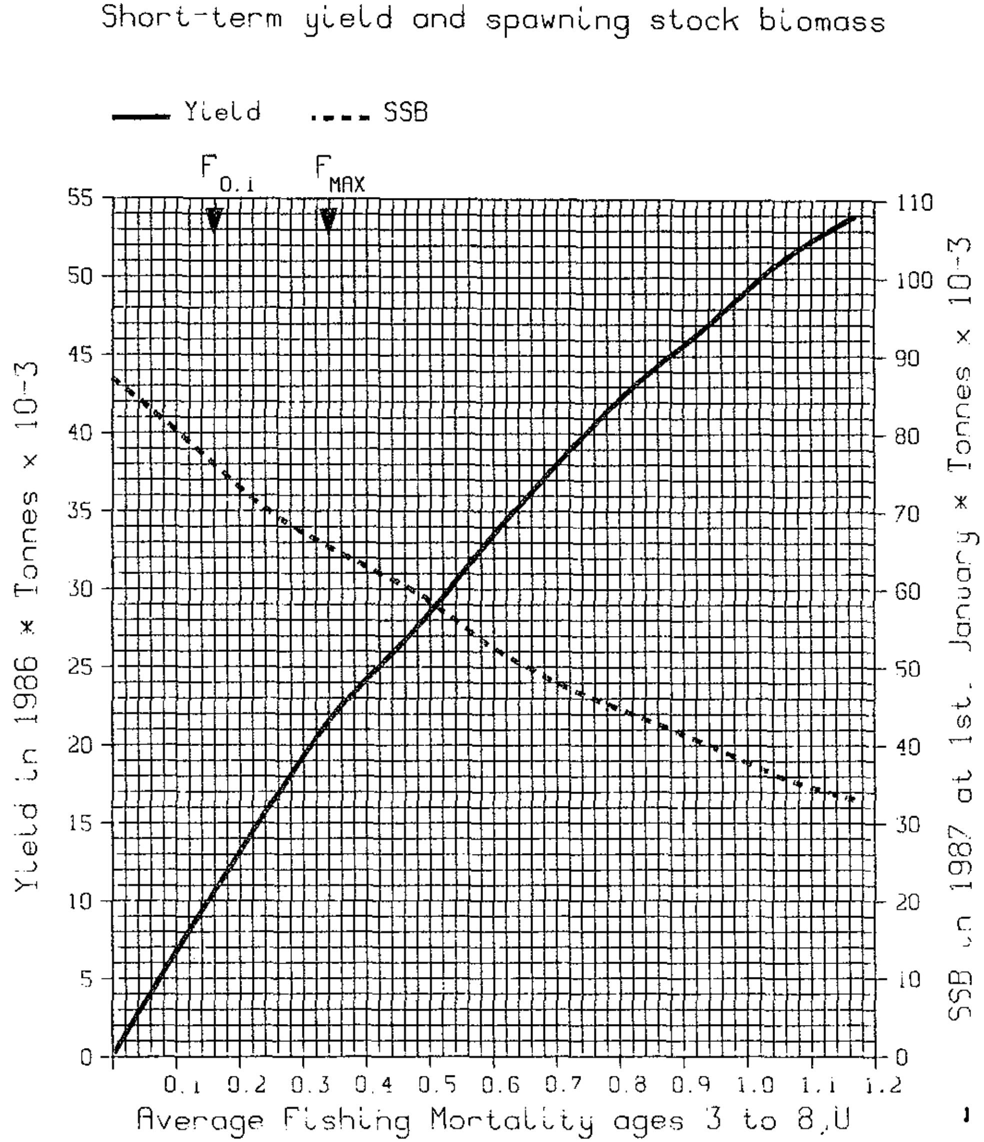
FISH STOCK SUMMARY

STOCK: Cod - Faroe Pl.

05-05-1985



C



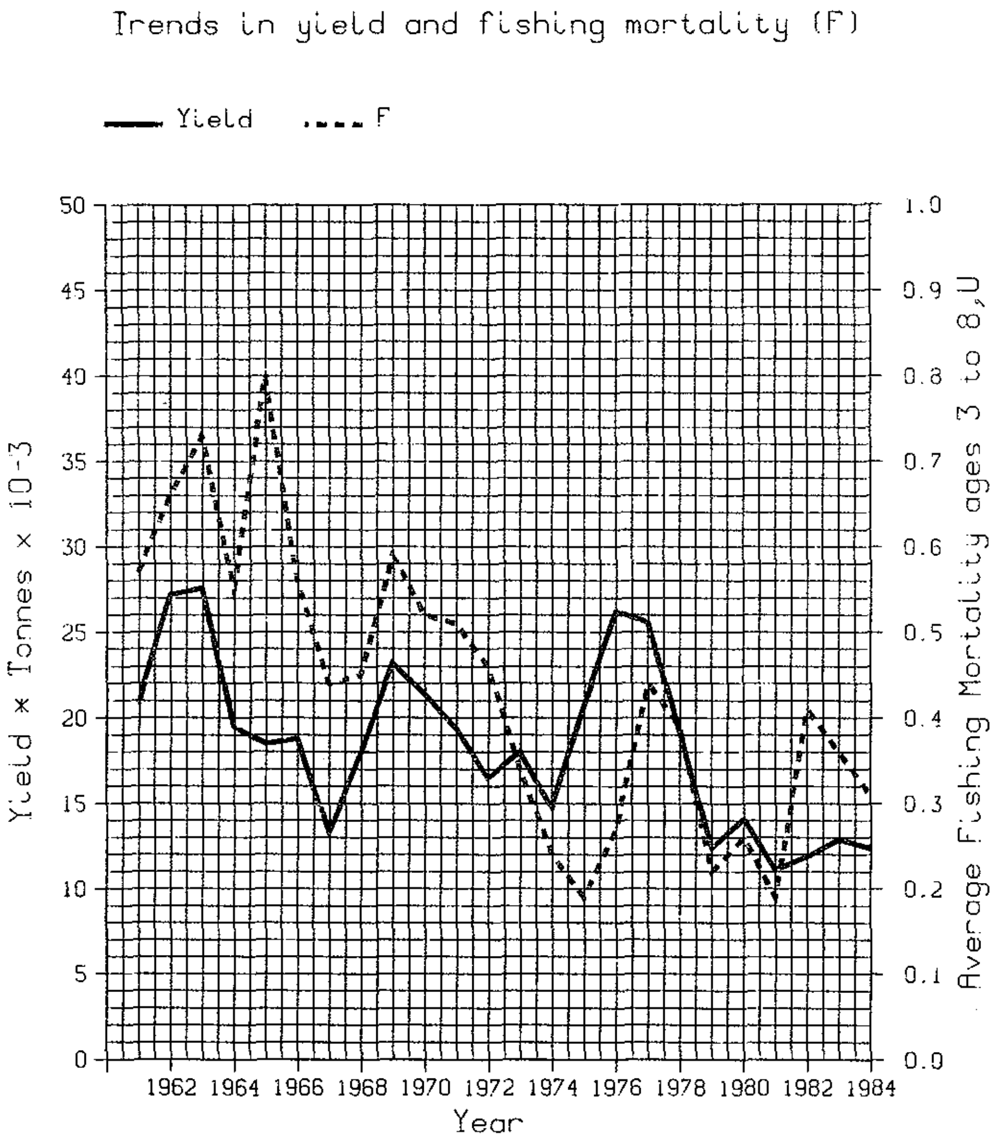
D

Figure 2.12.3

FISH STOCK SUMMARY

STOCK: Haddock - Faroe Pl.

05-05-1985



A

B

Contd.

Figure 2.12.3 cont'd

FISH STOCK SUMMARY

STOCK: Haddock - Faroe Pl.

05-05-1985

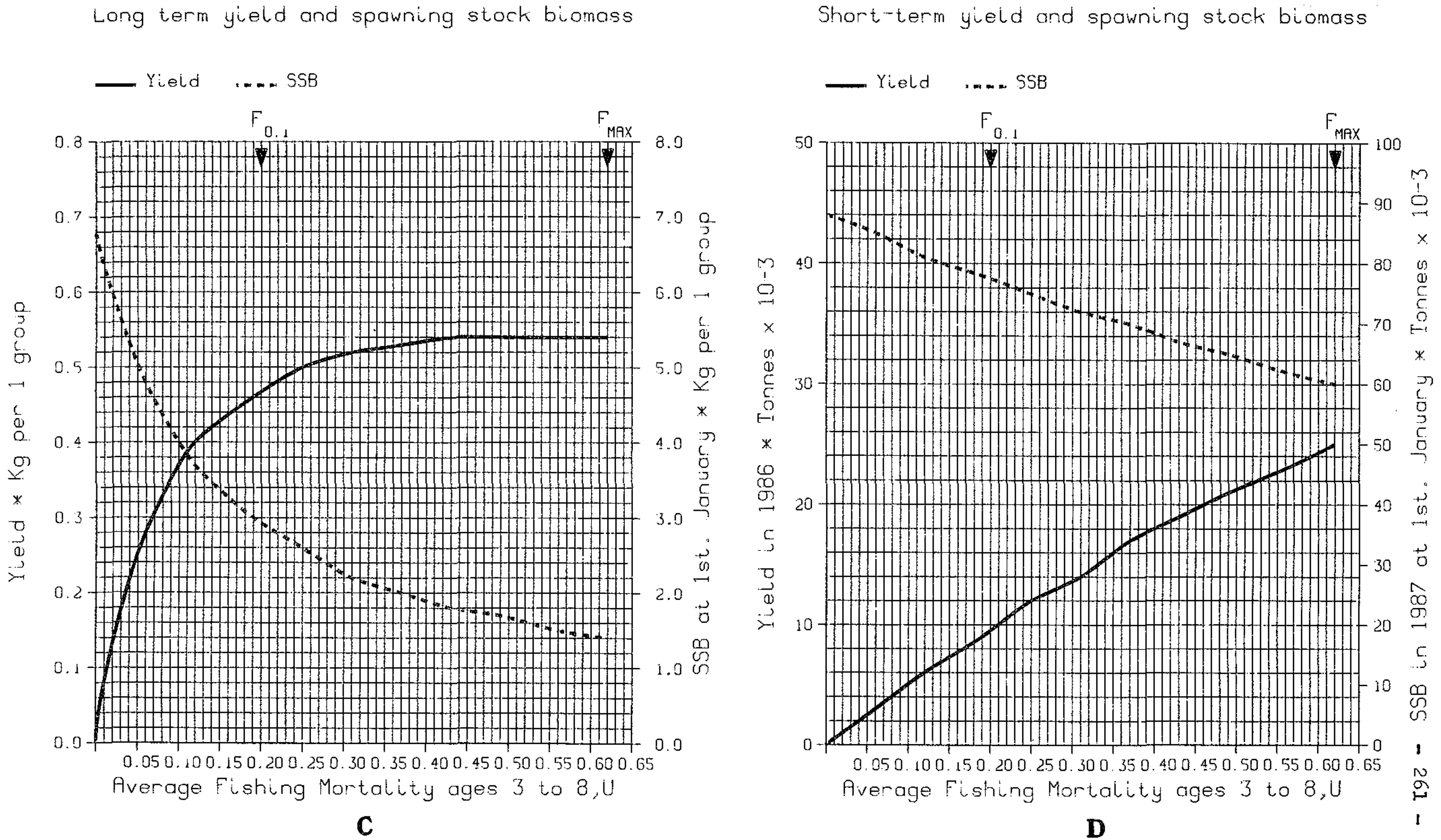
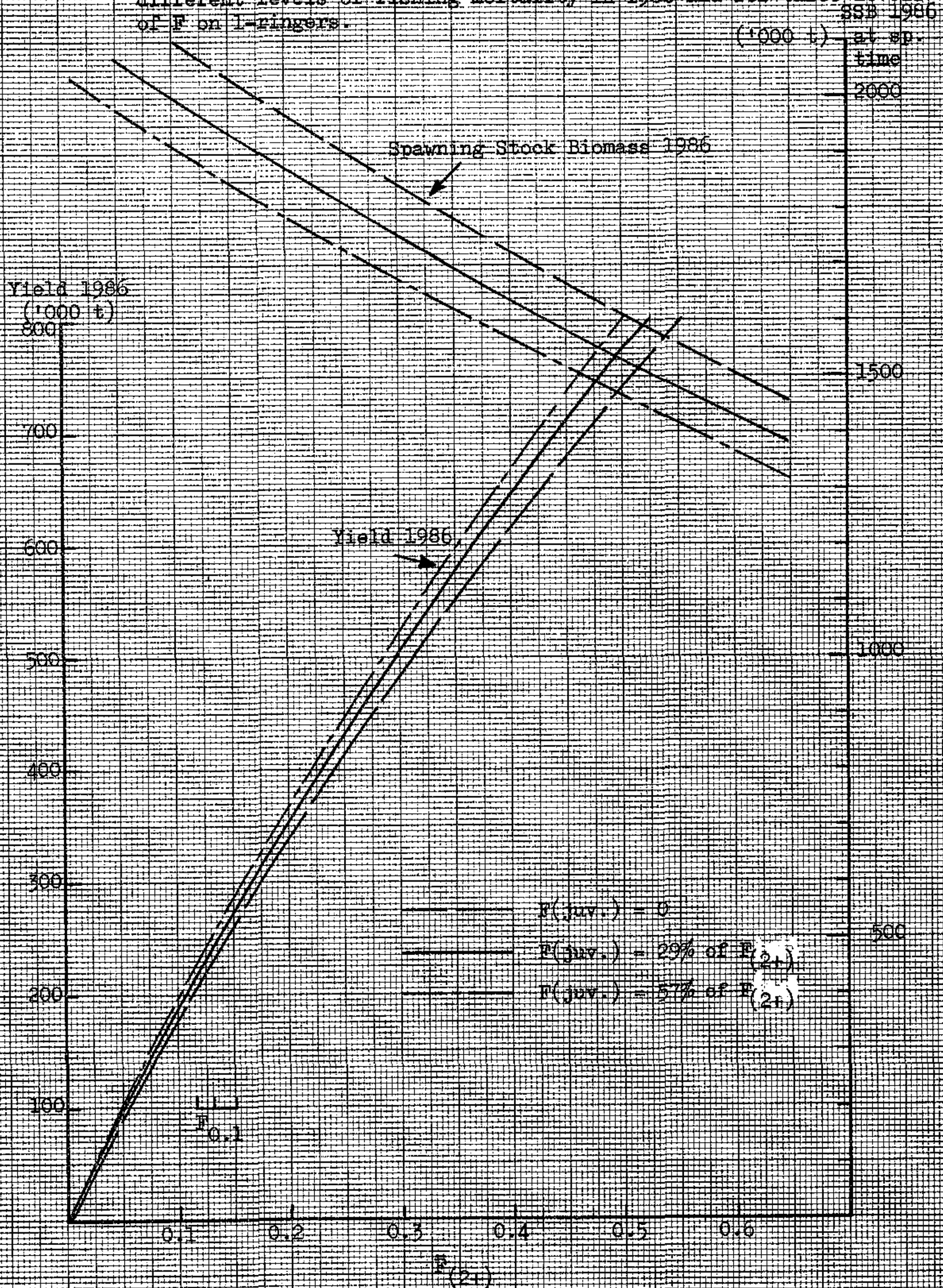


Figure 3.1.1.1 North Sea HERRING, Divisions IVa and IVb combined. Yield in 1986 & spawning stock biomass in 1986 at spawning time (1 Sept) for different levels of fishing mortality in 1986 and for three levels of F on 1-ringers.



.....Contd.

Figure 3.1.1.1 contd. North Sea HERRING, Divs. IVa and IVb combined. Yield per recruit and spawning stock biomass (SSB) per recruit for different levels of fishing mortality on 0- and 1-ringers.

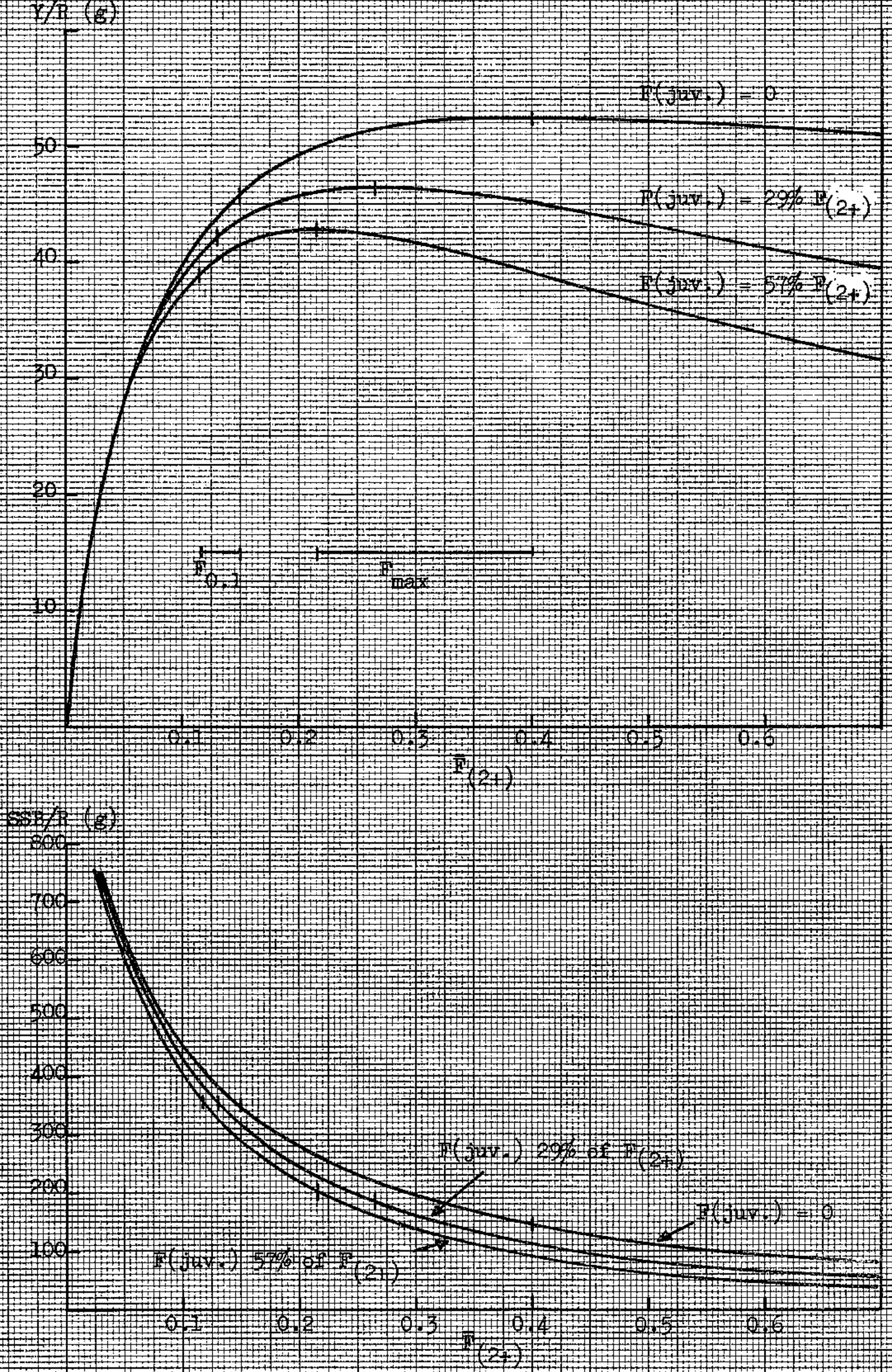
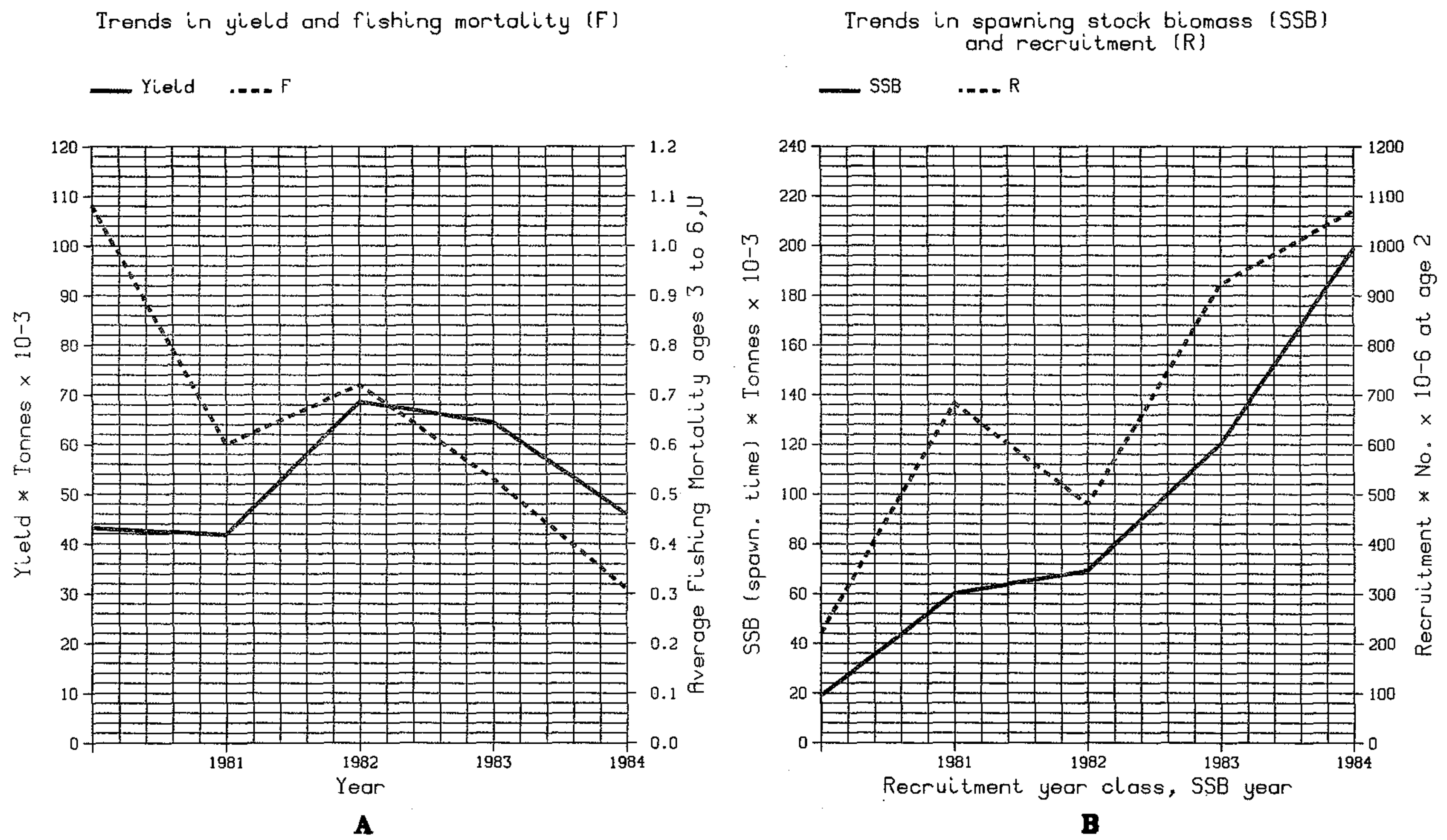


Figure 3.1.1.2

FISH STOCK SUMMARY
STOCK: Herring - IVc and VIId
10-04-1985

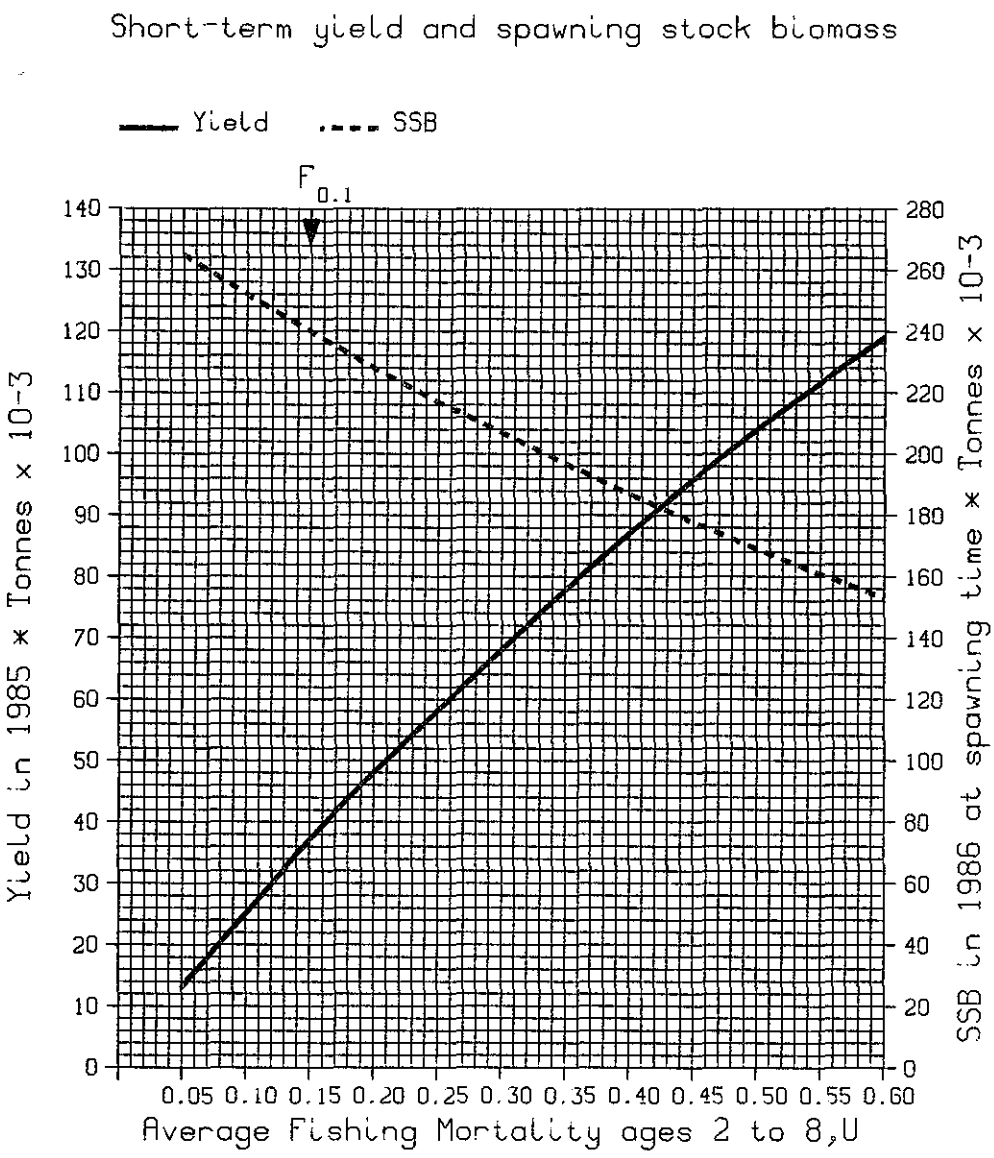


ctd.

Figure 3.1.1.2 (ctd) **FISH STOCK SUMMARY**

STOCK: Herring - IVc and VIId

10-04-1985



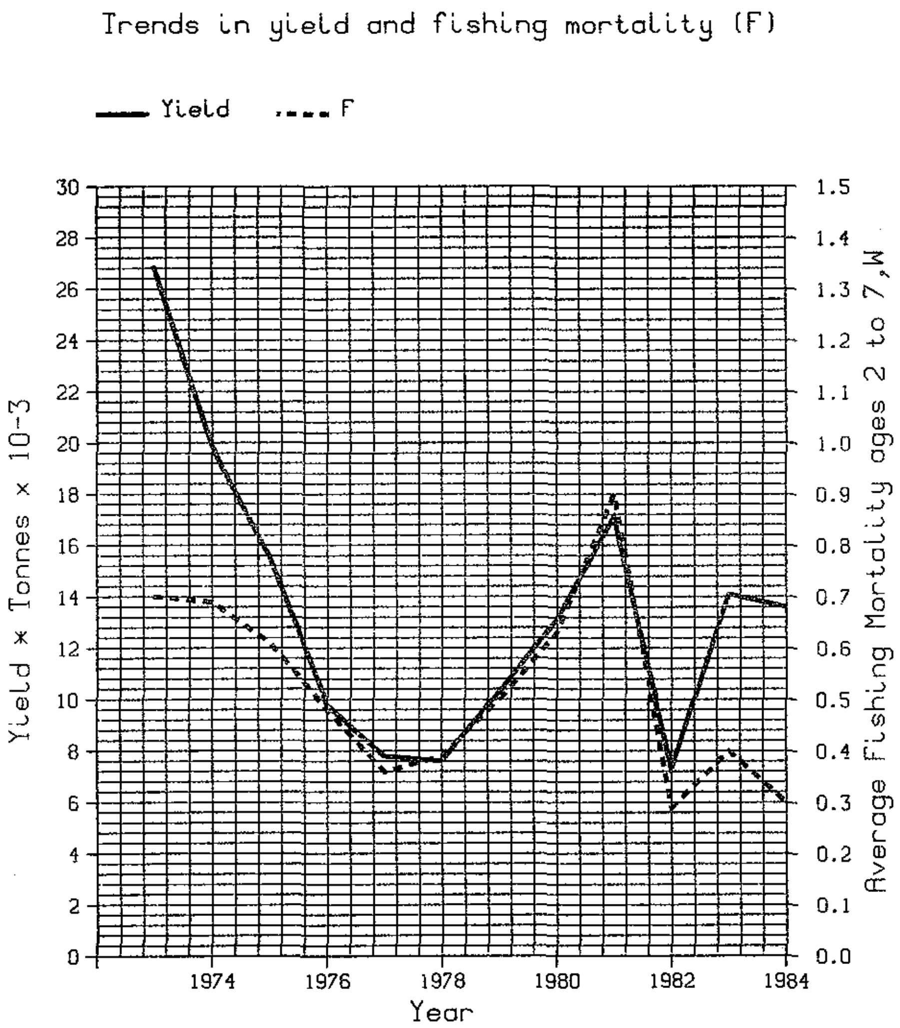
D

Figure 3.1.3.1

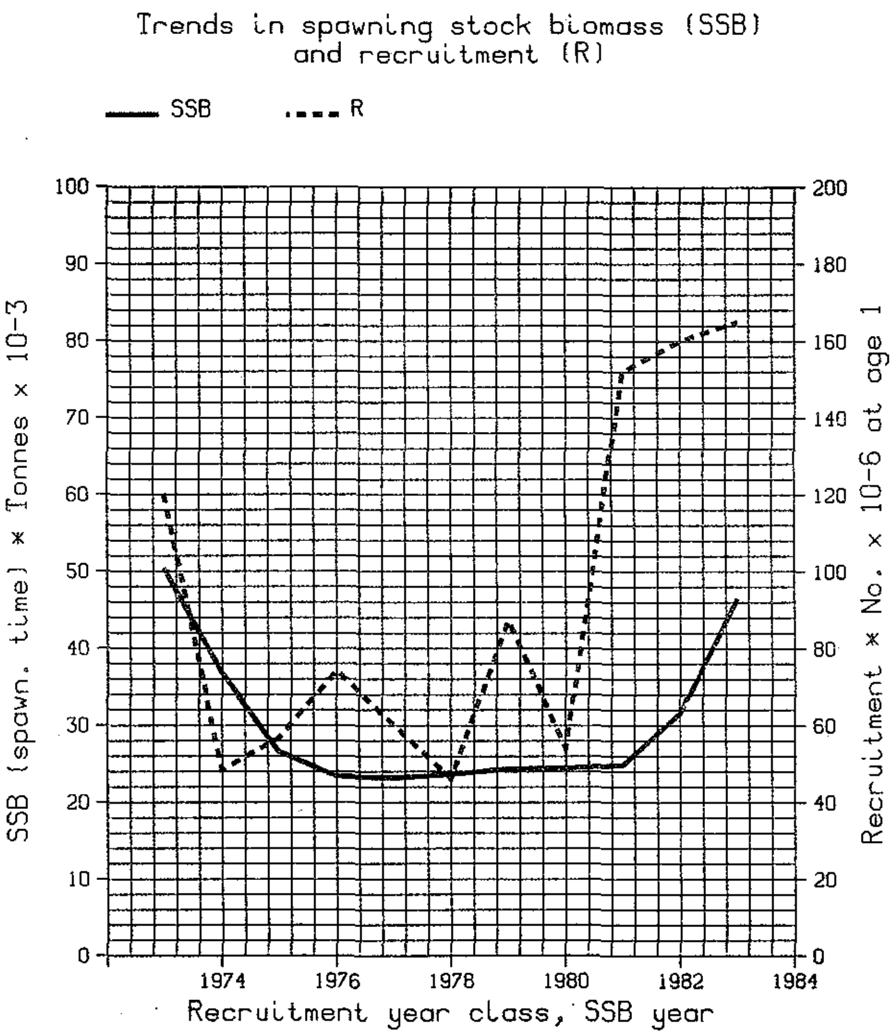
FISH STOCK SUMMARY

STOCK: Autumn Spawners - Celtic Sea VIIJ

10-04-1985



A



B

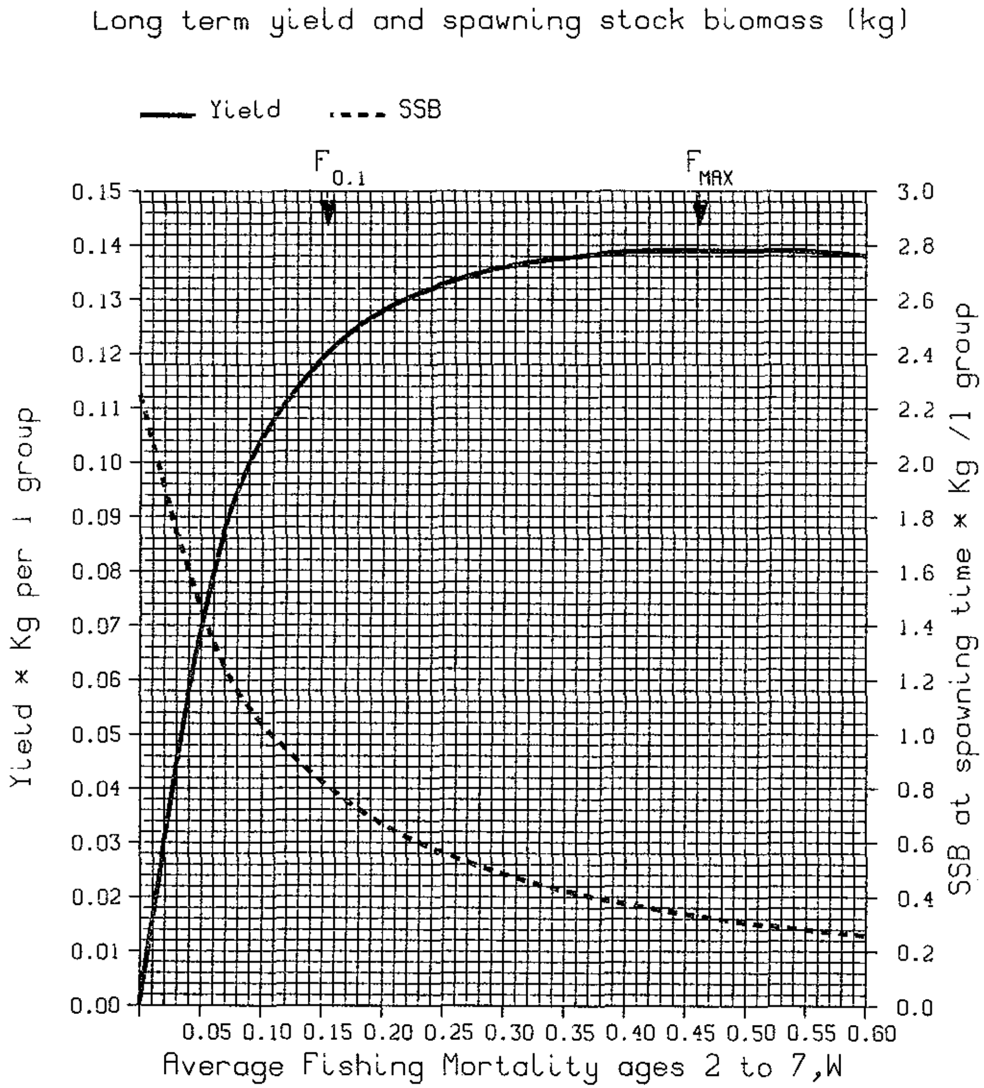
cont'd

Figure 3.1.3.1 (ctd.)

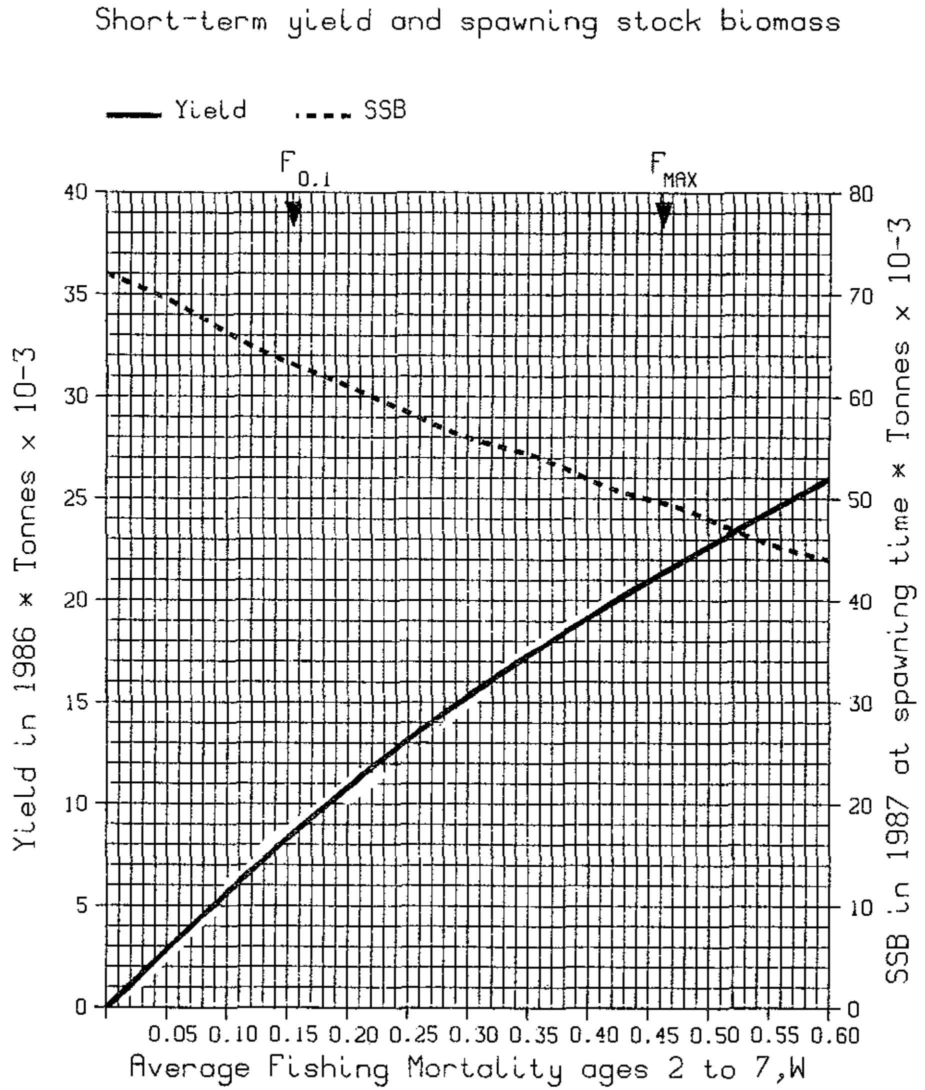
FISH STOCK SUMMARY

STOCK: Autumn Spawners - Celtic Sea VIIJ

10-04-1985



C



D

Figure 3.1.3.2

FISH STOCK SUMMARY

STOCK: Winter Spawners - Celtic Sea VIIJ

10-04-1985

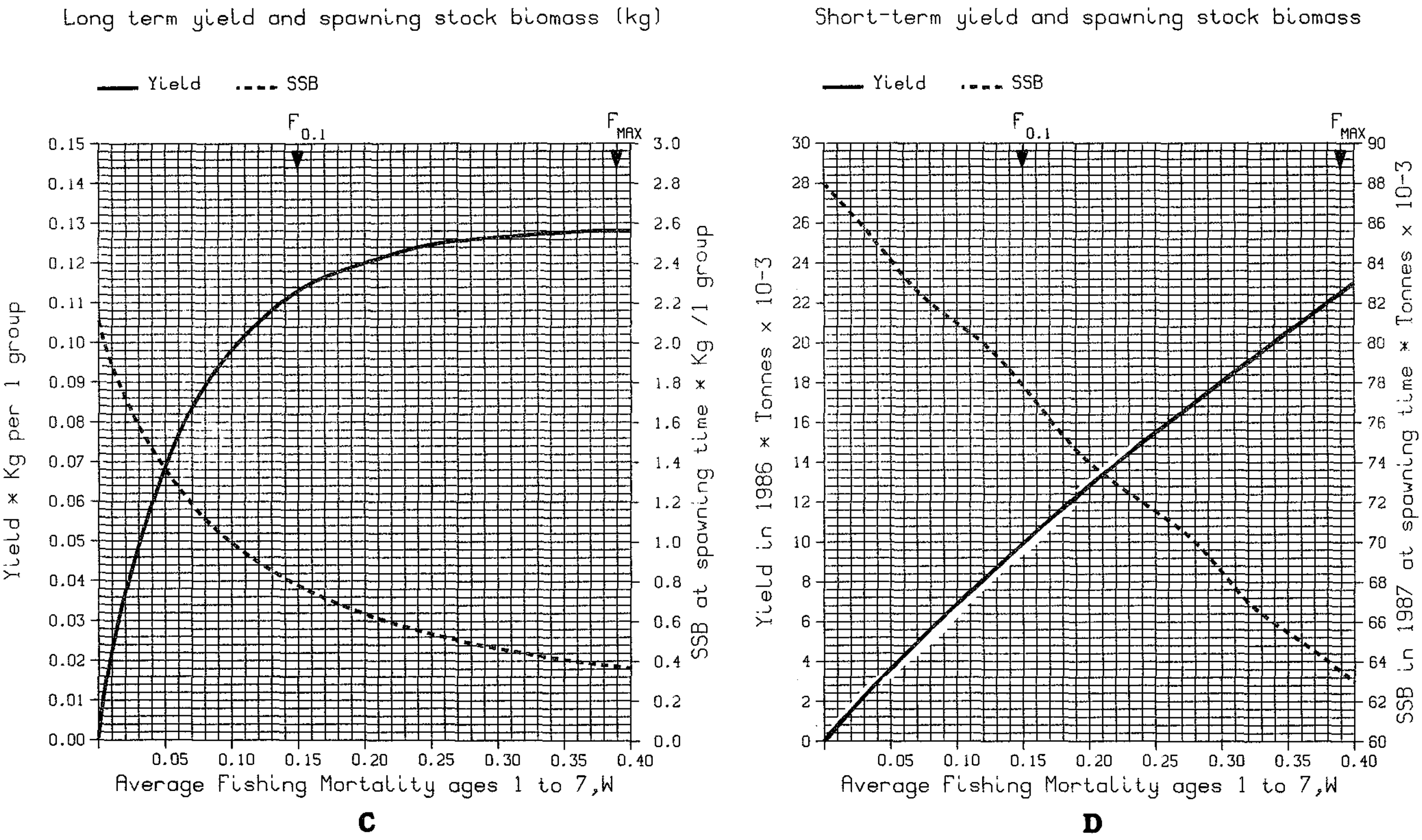


Figure 3.1.4

FISH STOCK SUMMARY
STOCK: Herring - VIa North
22-03-1985

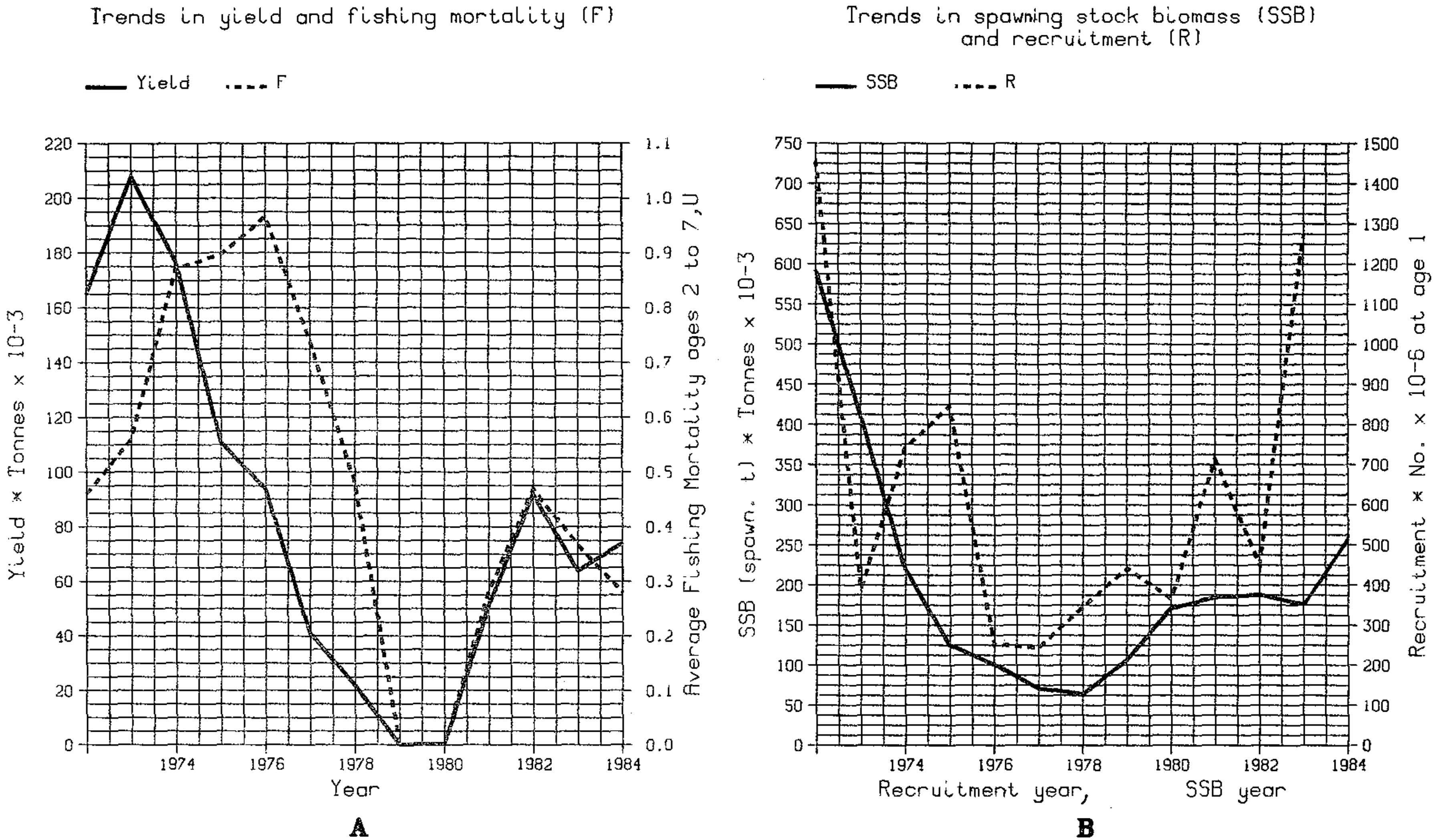


Figure 3.1.4 (ctd.) HERRING in Division VIa North

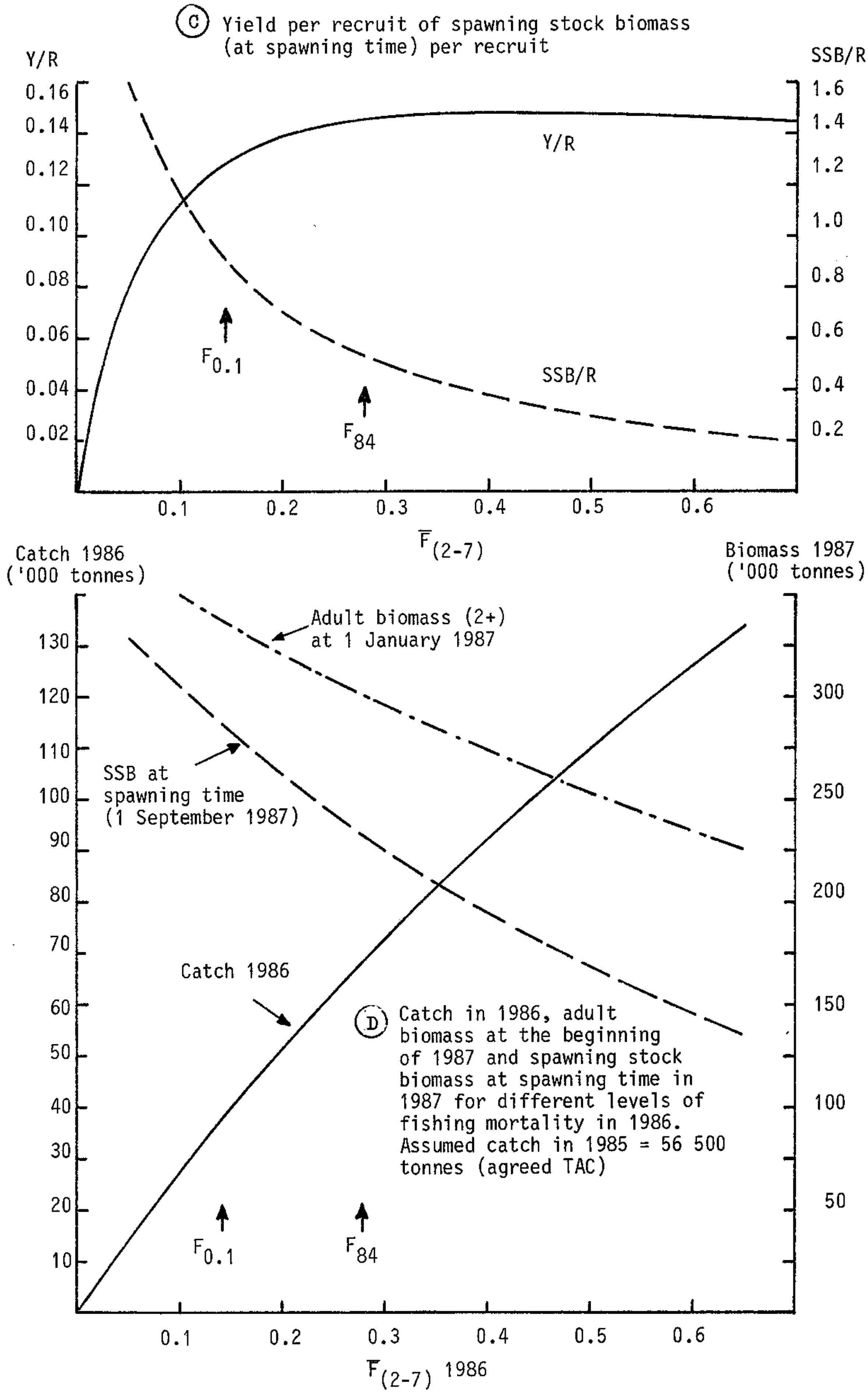
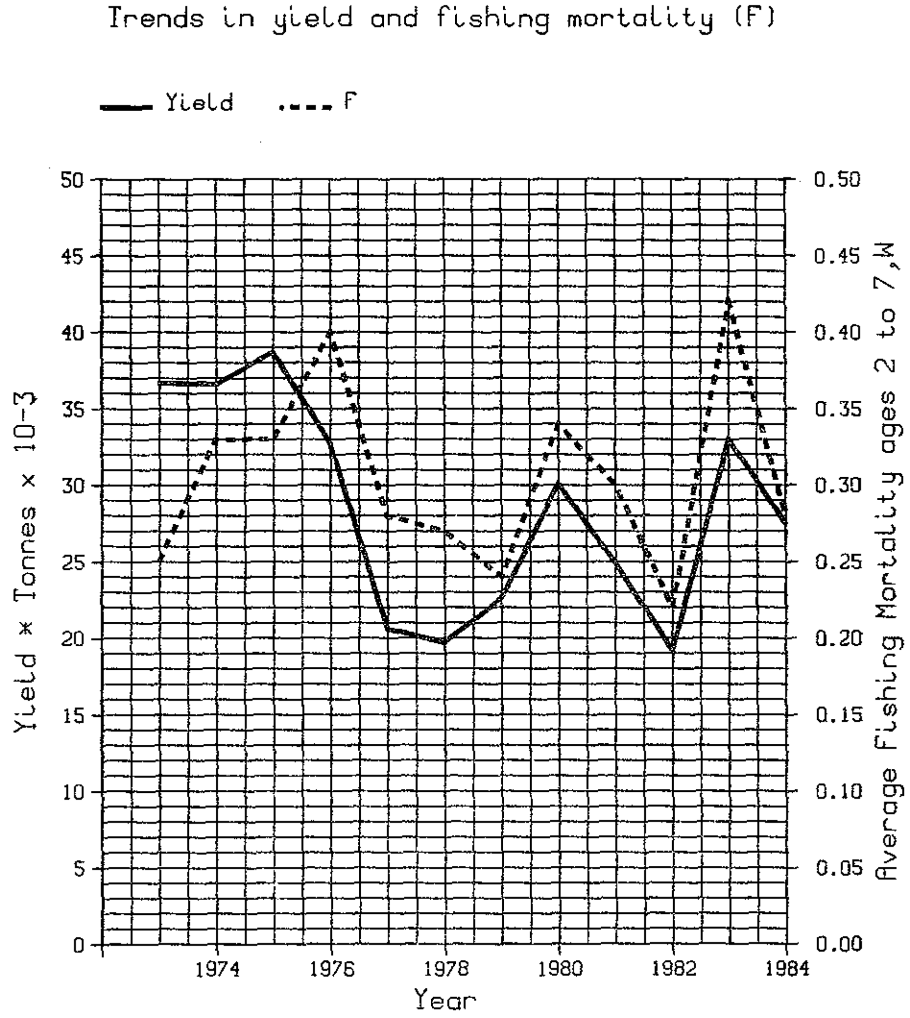


Figure 3.1.6

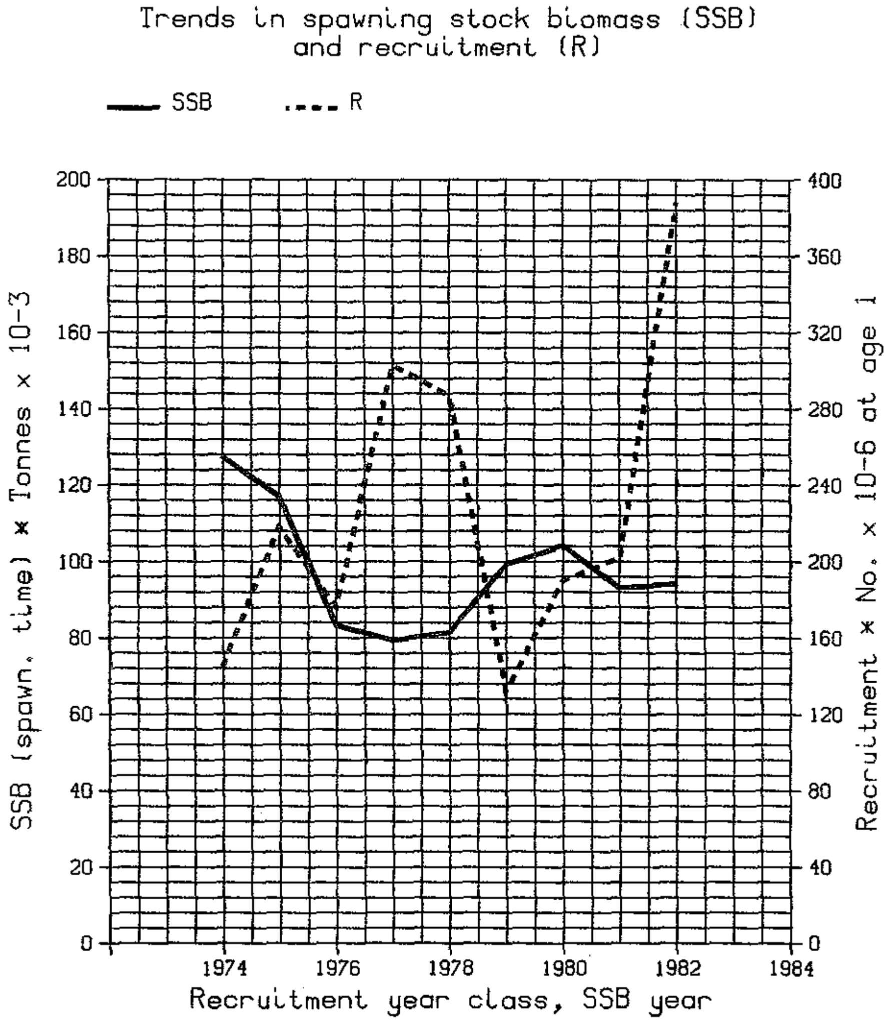
FISH STOCK SUMMARY

STOCK: Herring - VIa S and VIIb,c

10-04-1985



A



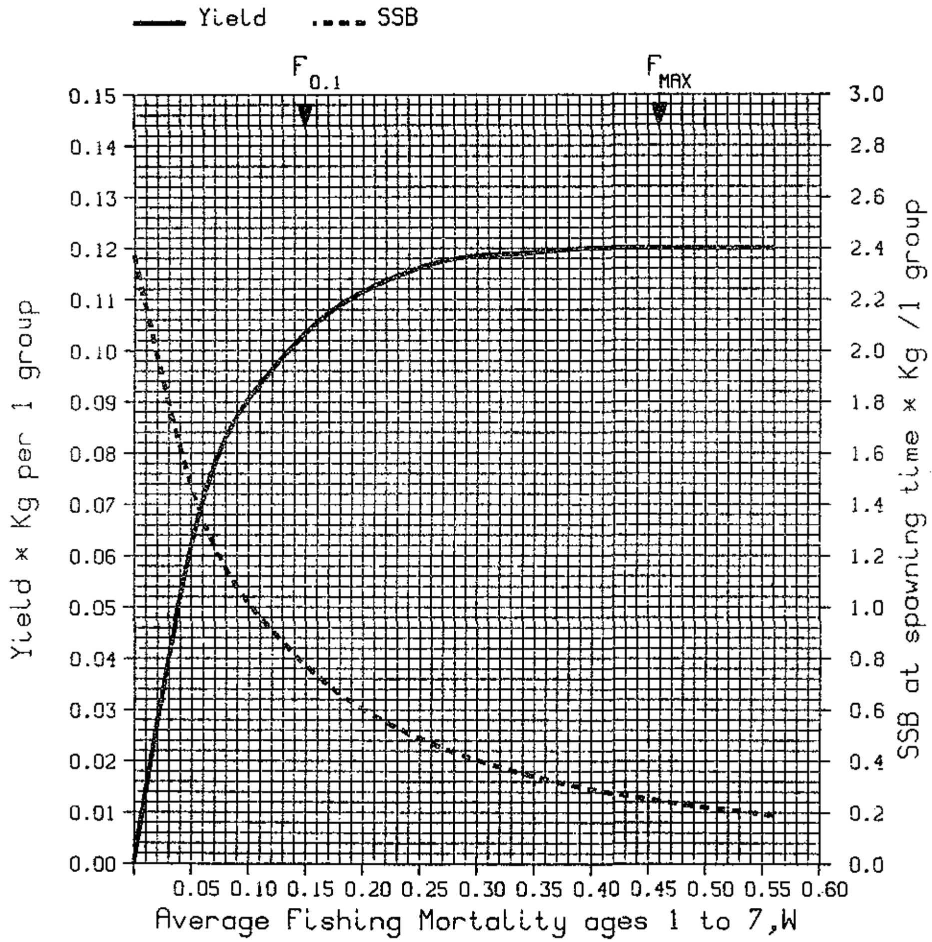
B

continued

Figure 3.1.6 (ctd.)

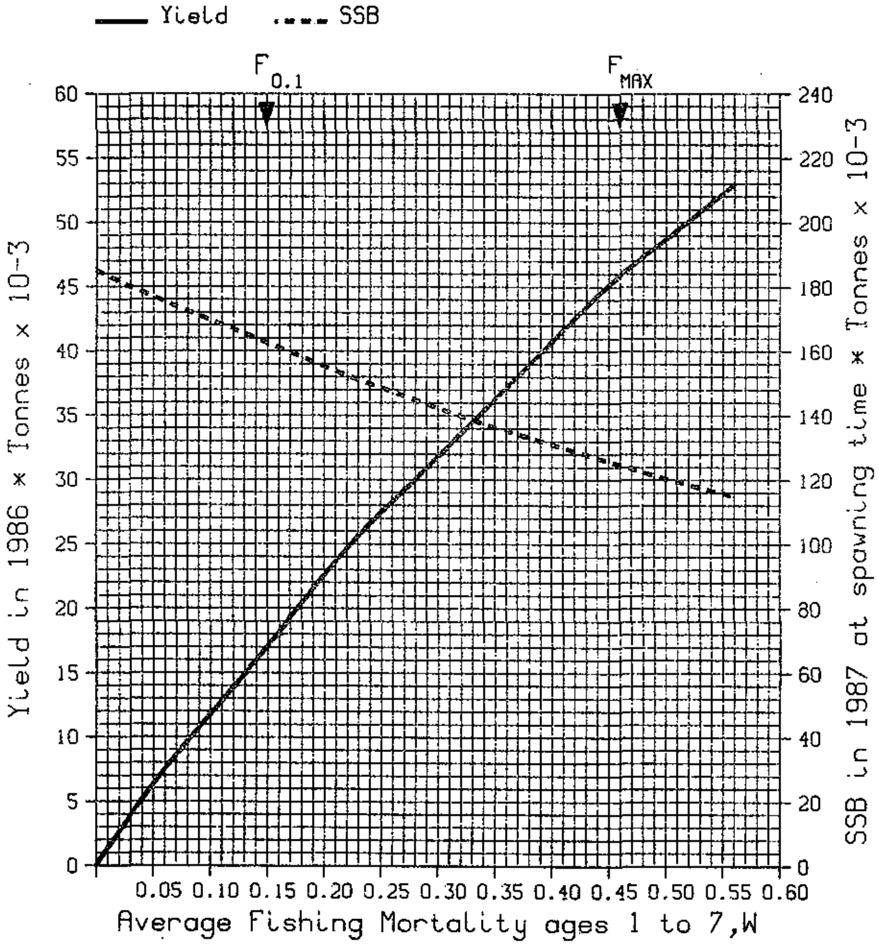
FISH STOCK SUMMARY
STOCK: Herring - VIa S and VIIb
10-04-1985

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



D

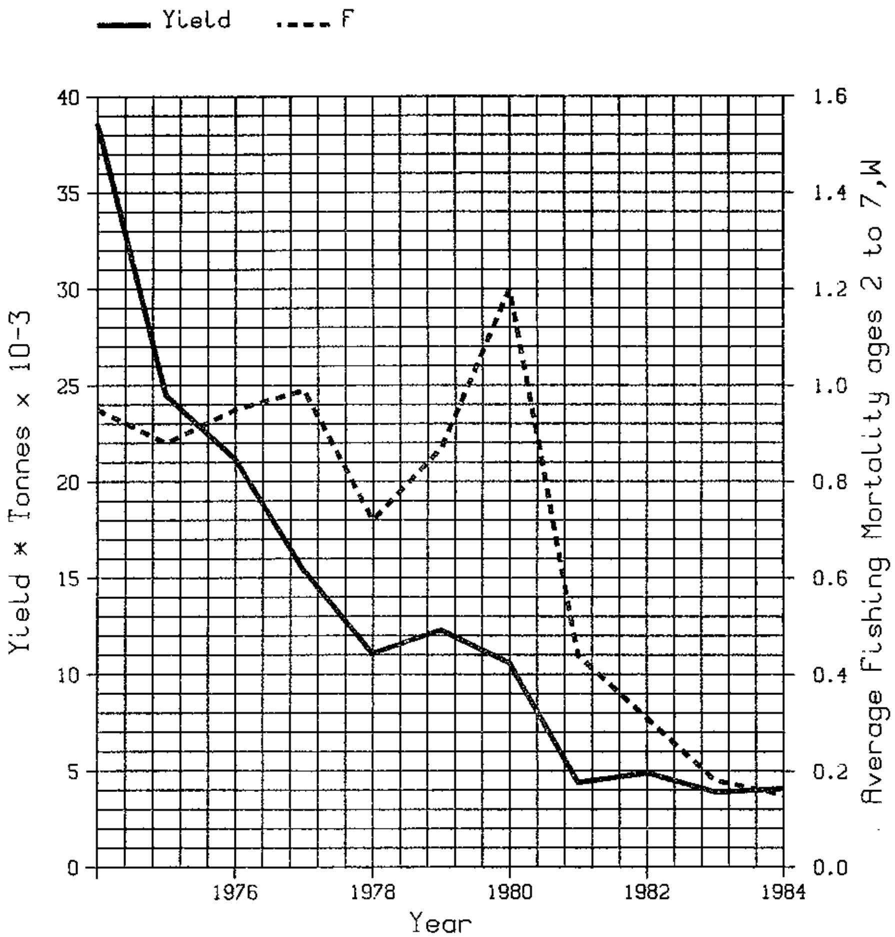
Figure 3.1.7

FISH STOCK SUMMARY

STOCK: Herring - North Irish Sea

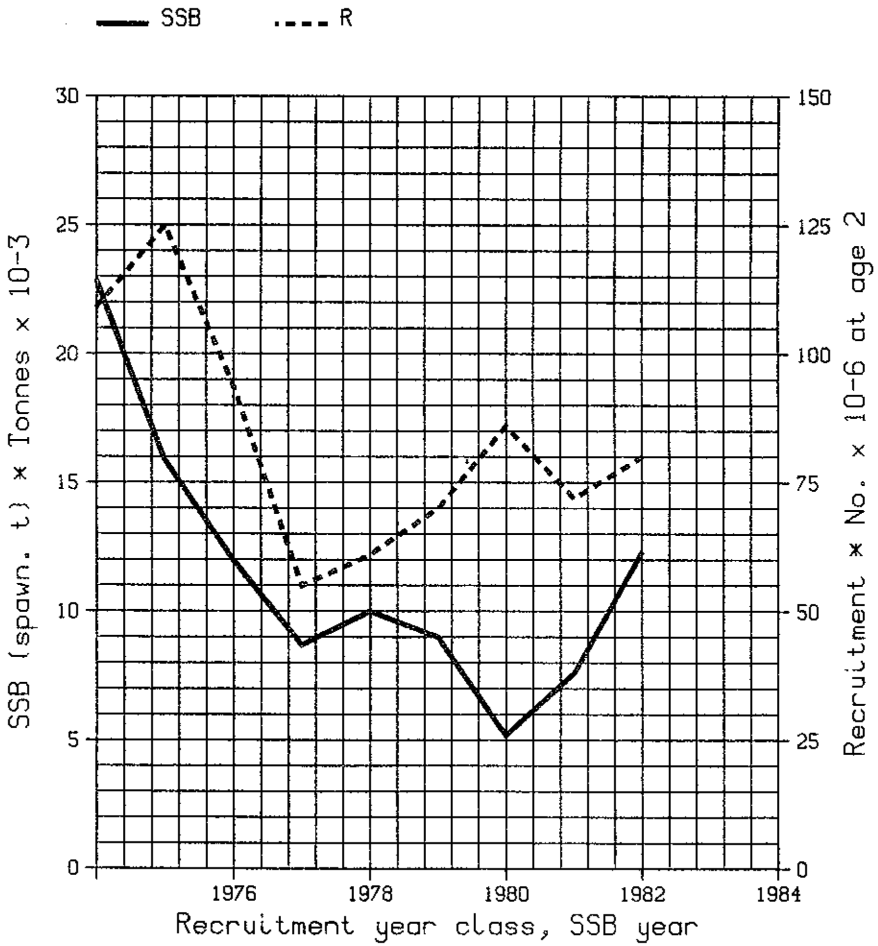
28-03-1985

Trends in yield and fishing mortality (F)



A

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

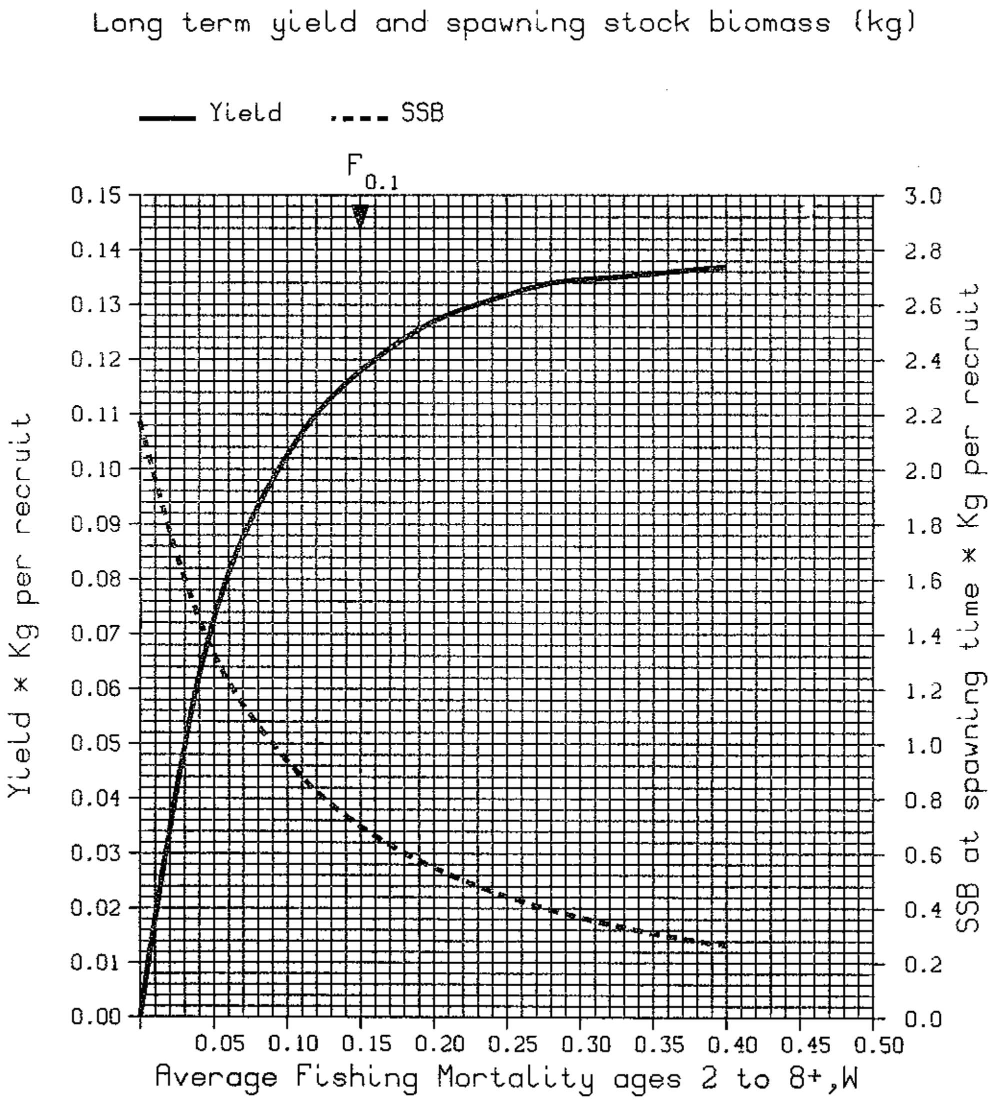


B

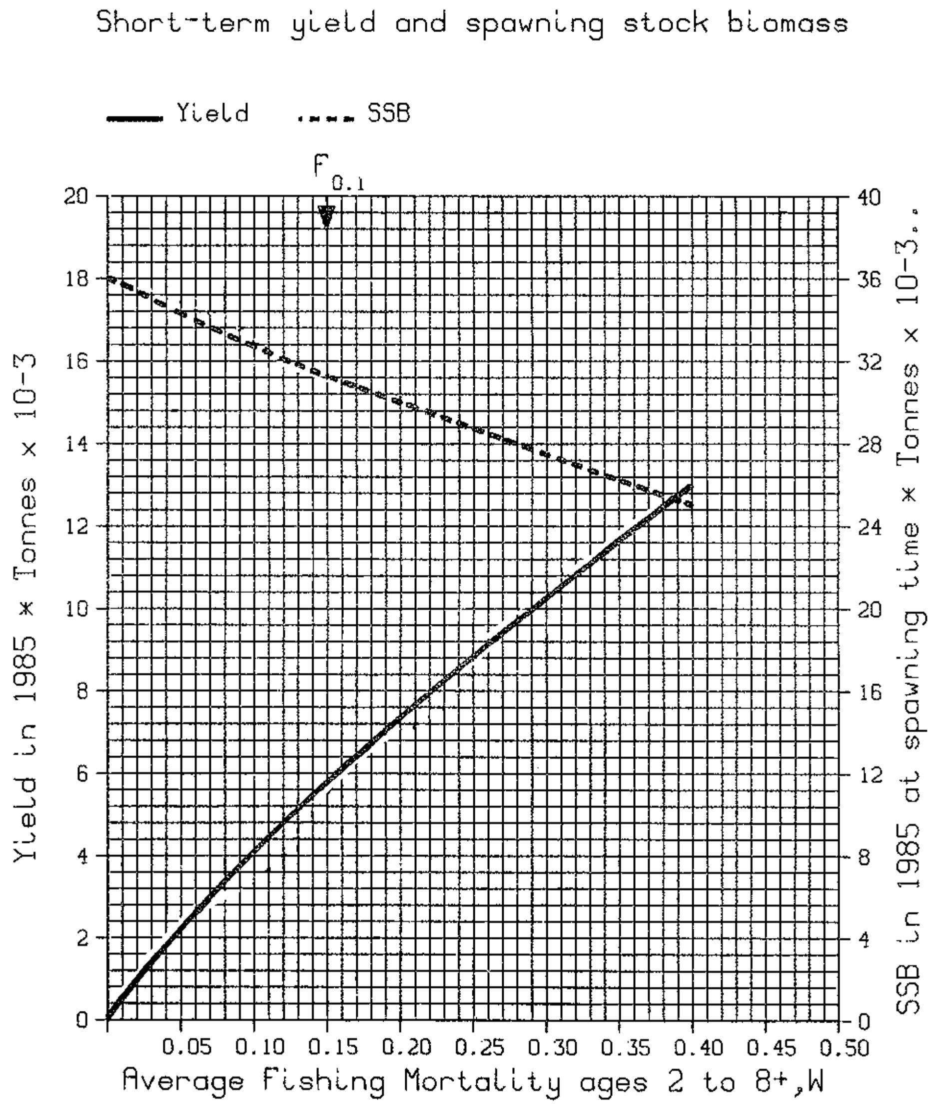
(cont'd)

Figure 3.1.7 (ctd.)

FISH STOCK SUMMARY
STOCK: Herring - North Irish Sea
28-03-1985



C



D

Figure 3.2.2 Norway POUT. Prediction of the catch.

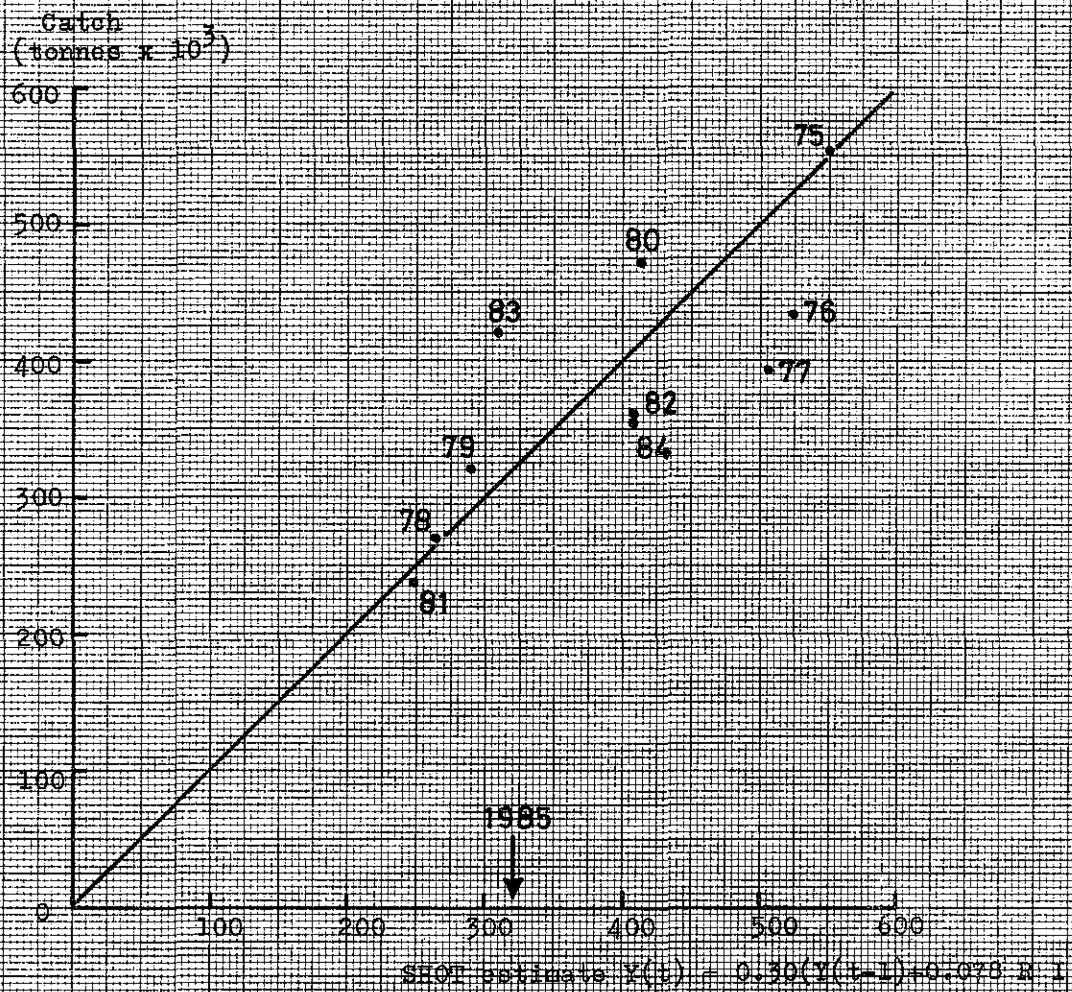
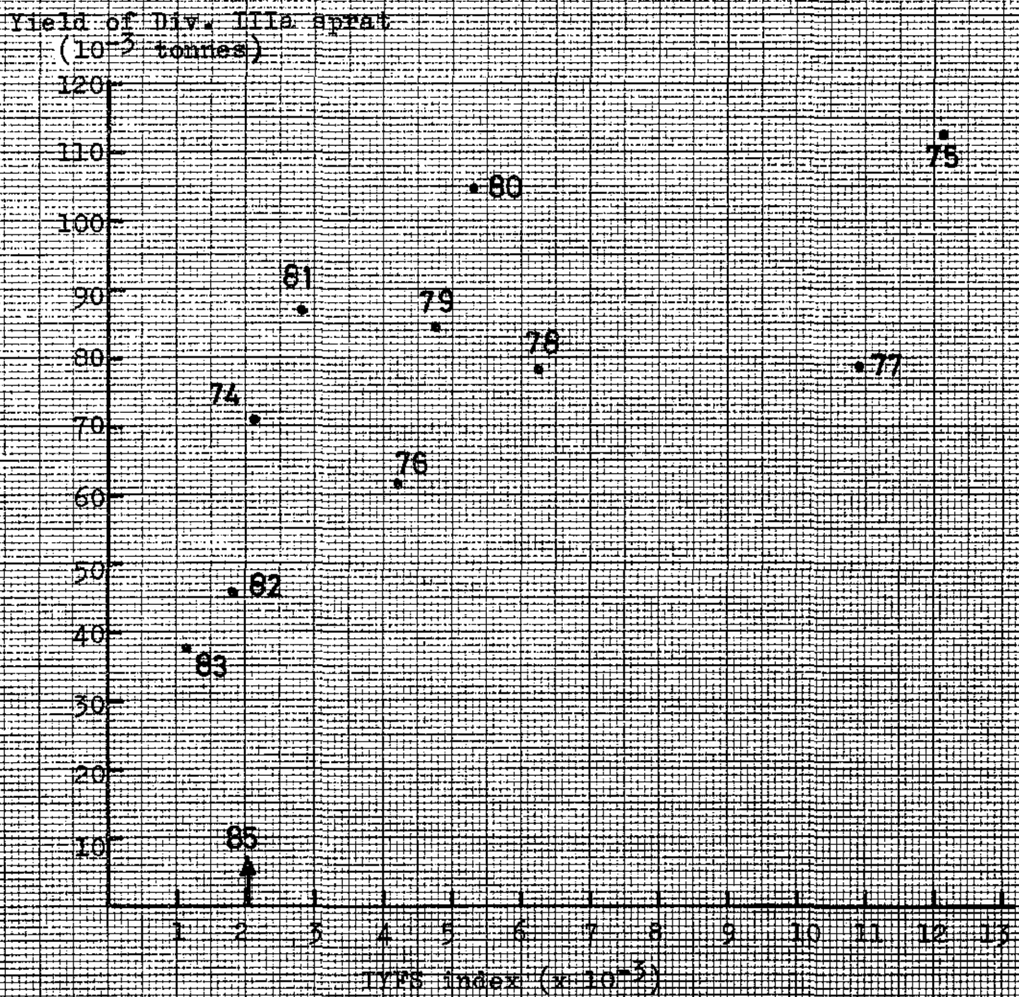


Figure 3.2.4 Division IIIa SPRAT. Relation between IYFS indices for 1-group sprat and total catch in Division IIIa and the fjords of western Norway.

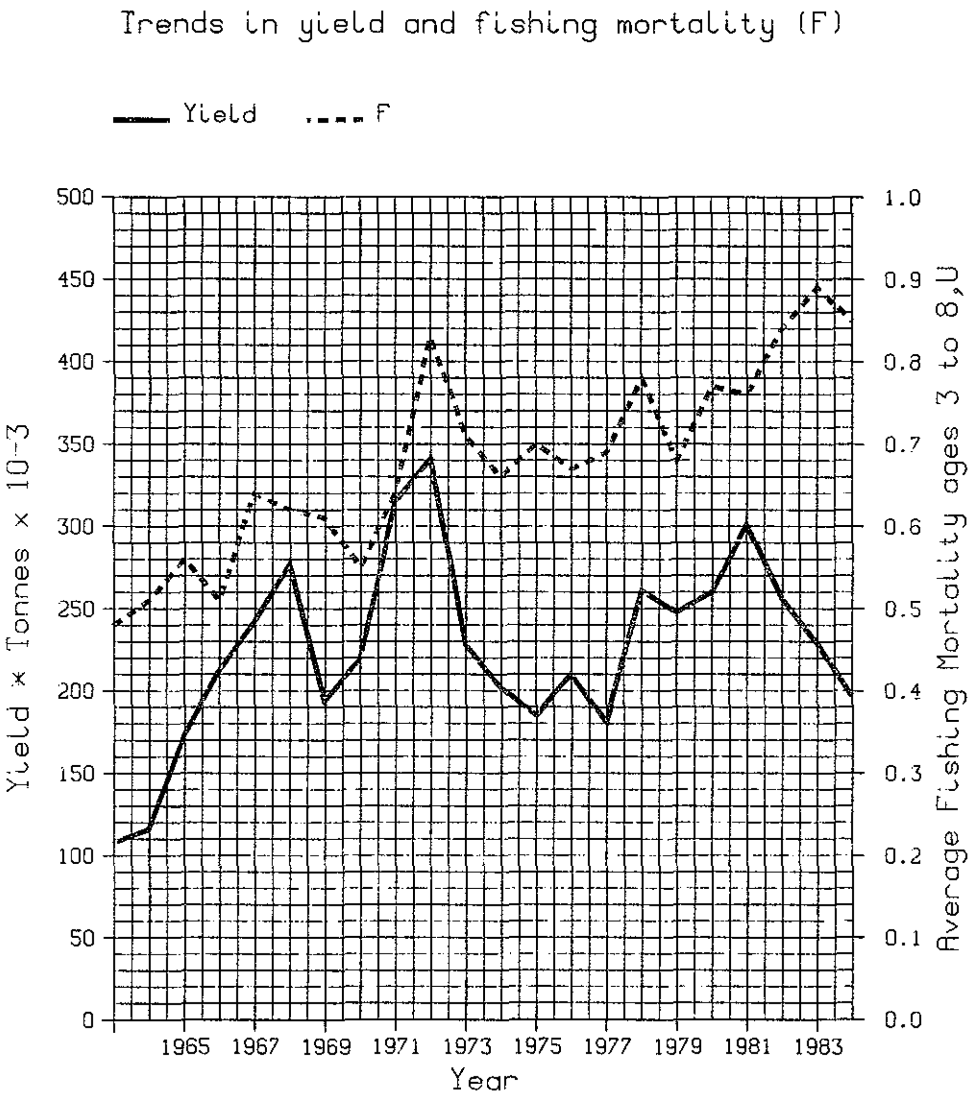


FISH STOCK SUMMARY

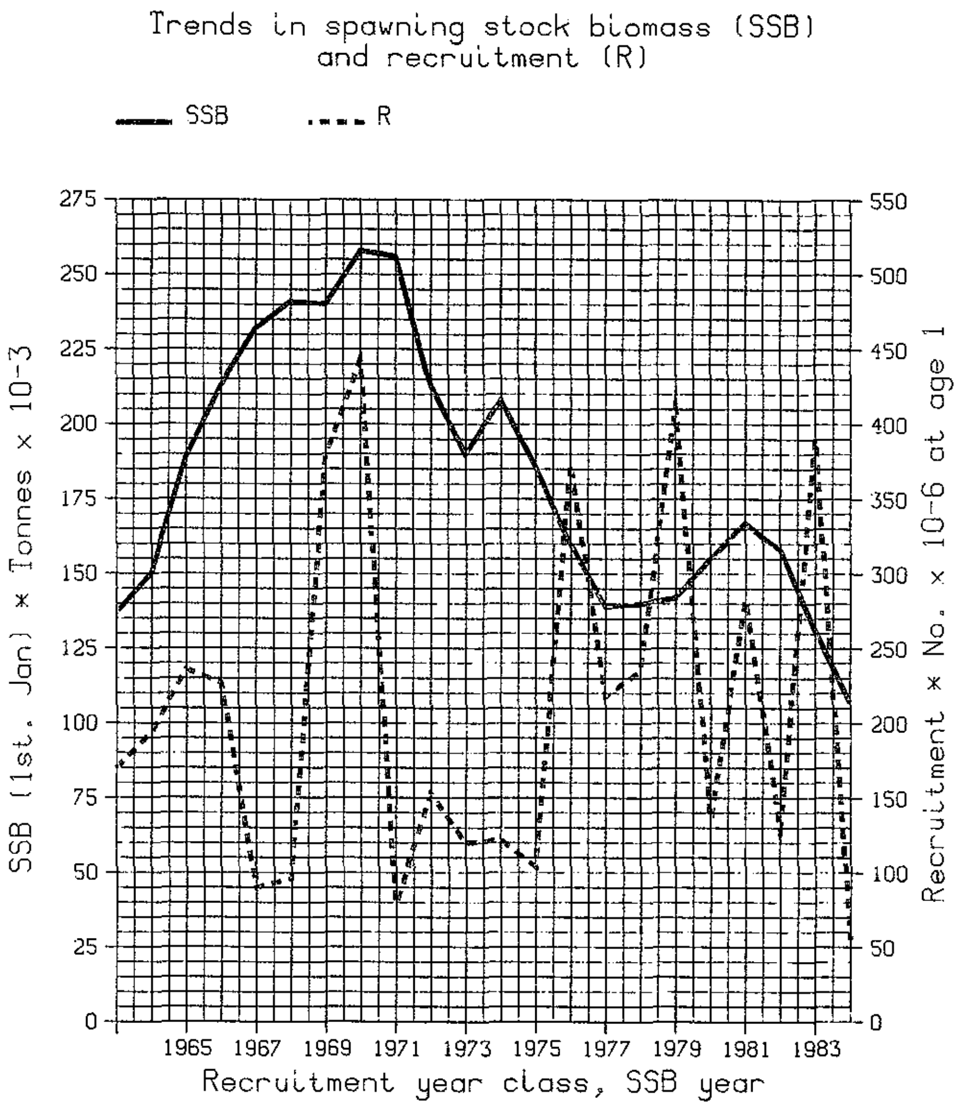
STOCK: Cod - North Sea

20-3-1985

Figure 3.4.1



A

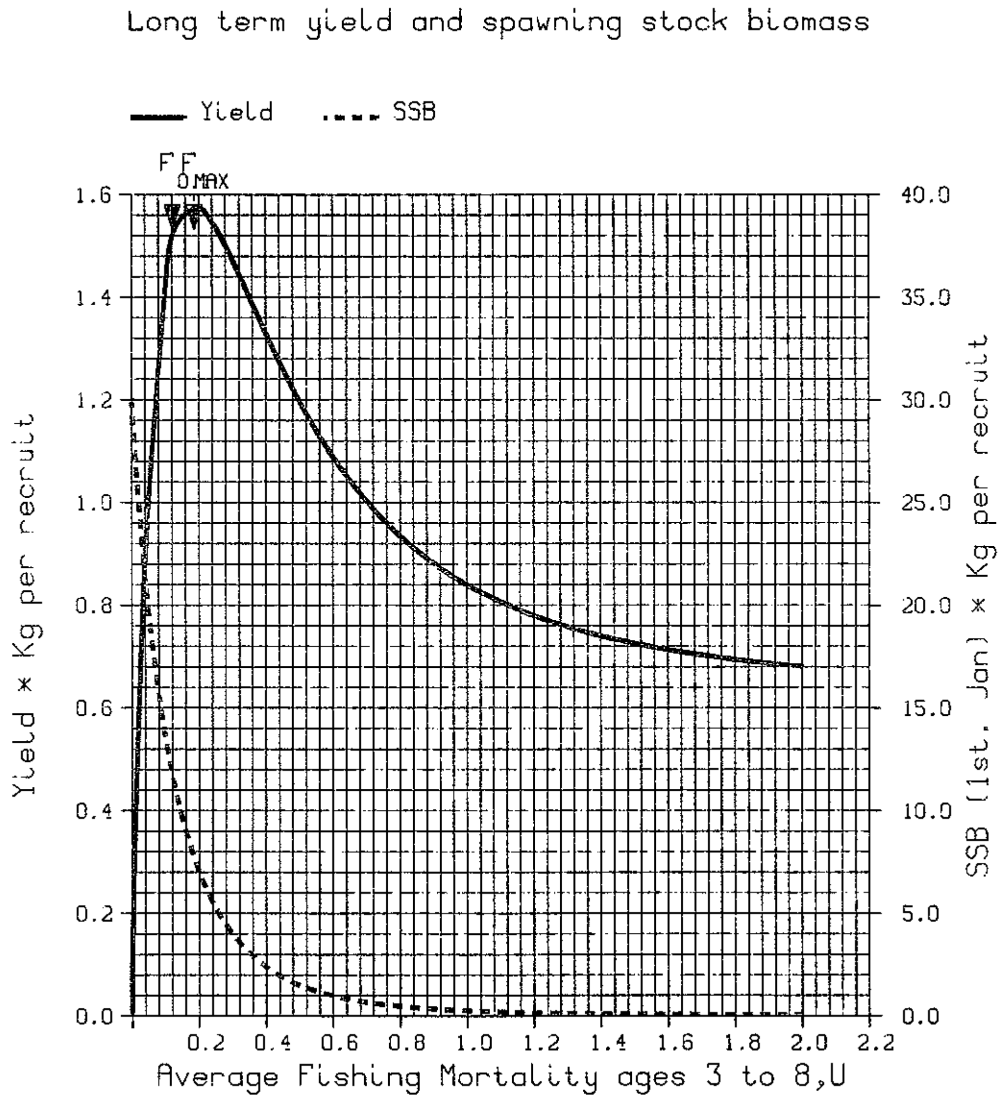


B

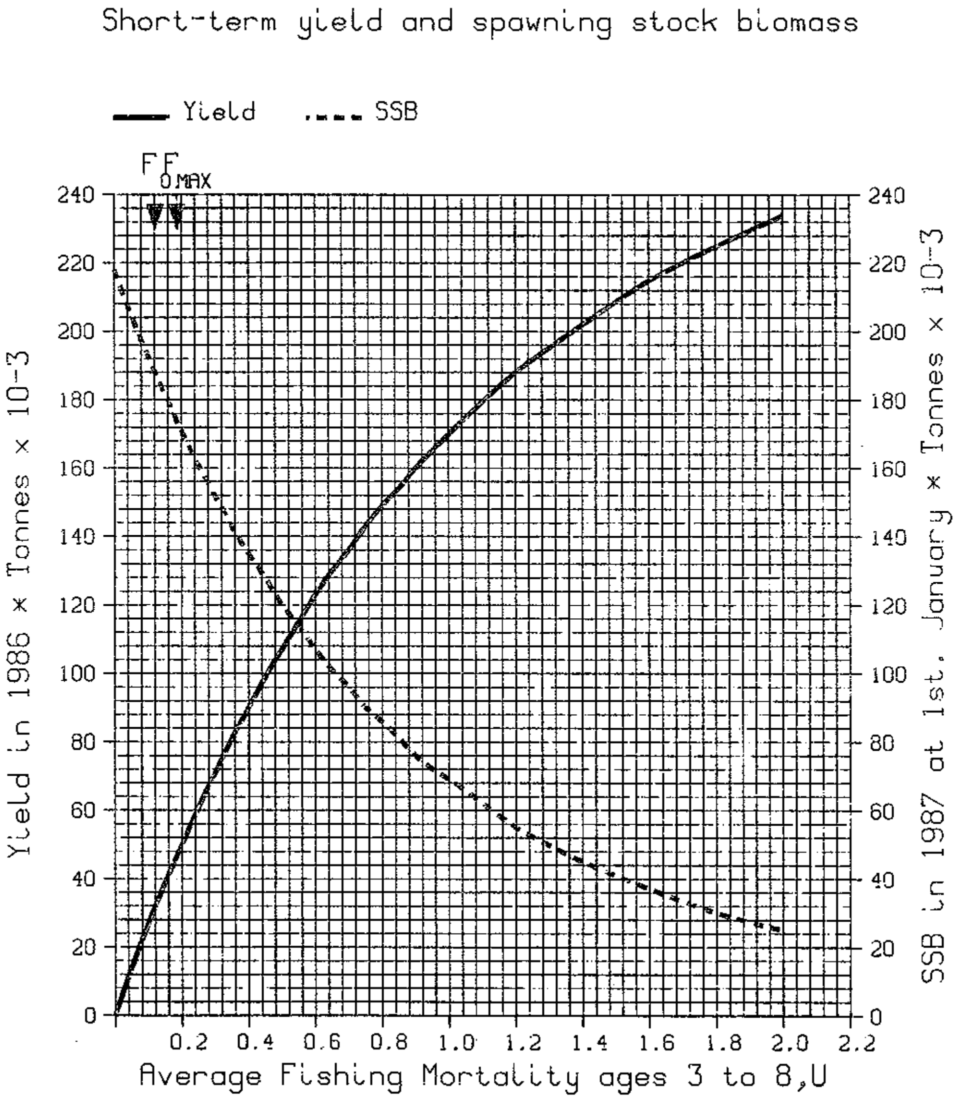
ctd.

Figure 3.4.1 cont'd

FISH STOCK SUMMARY
STOCK: Cod - North Sea
20-3-1985



C

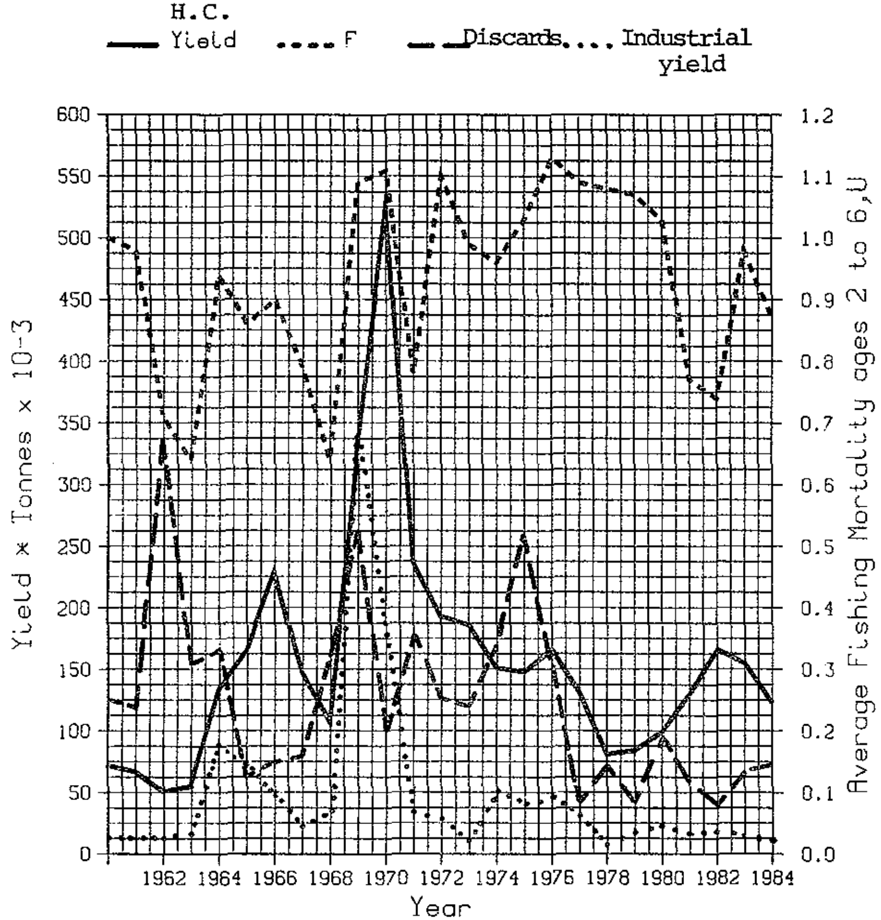


D

Figure 3.4.2

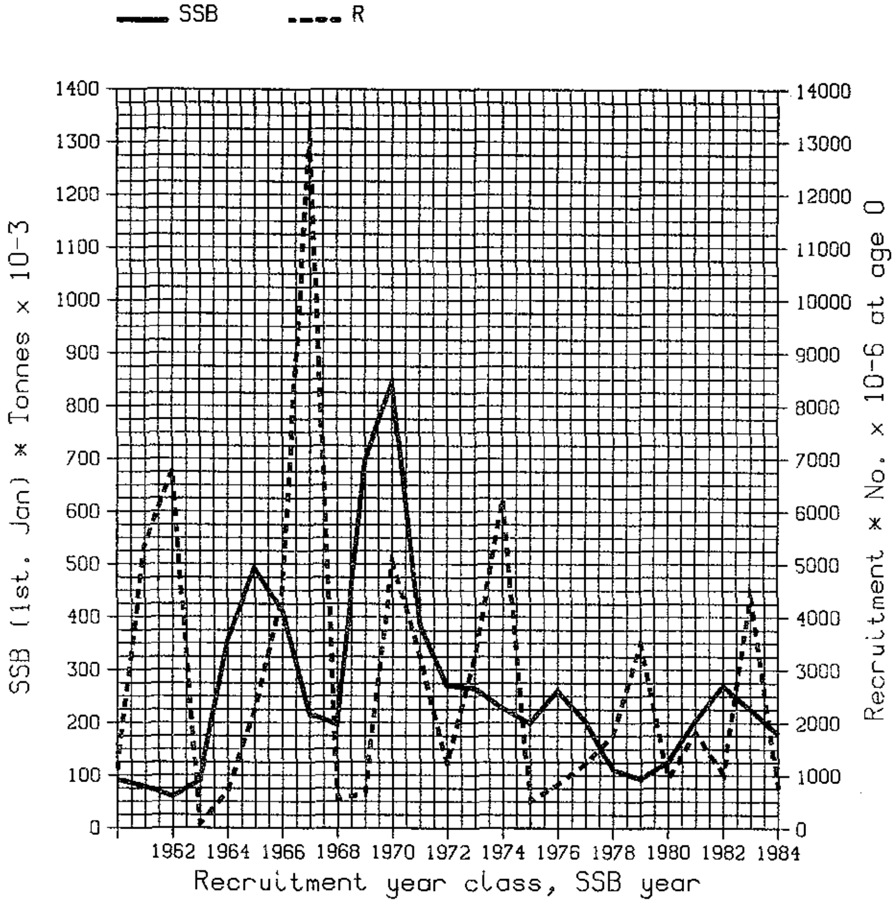
FISH STOCK SUMMARY
STOCK: Haddock - North Sea
21-03-1985

Trends in yield and fishing mortality (F)



A

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



B

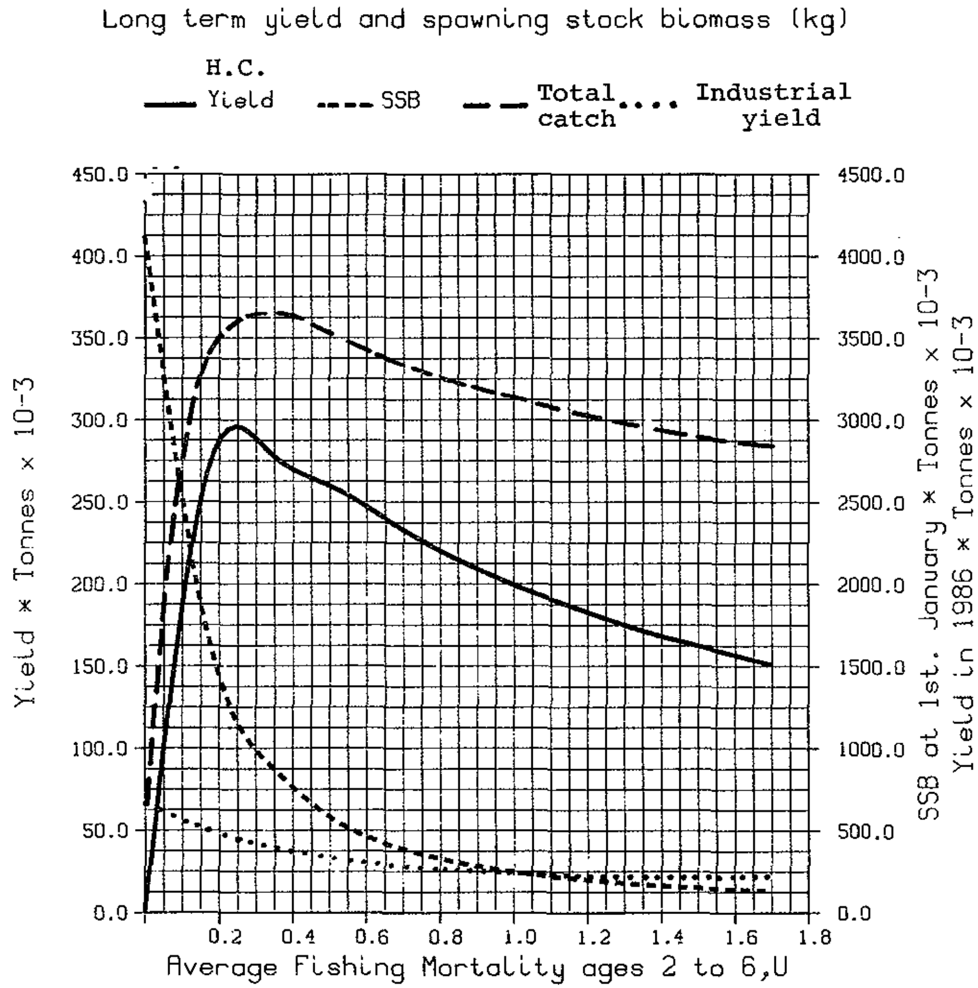
(cont'd)

Figure 3.4.2 (cont'd)

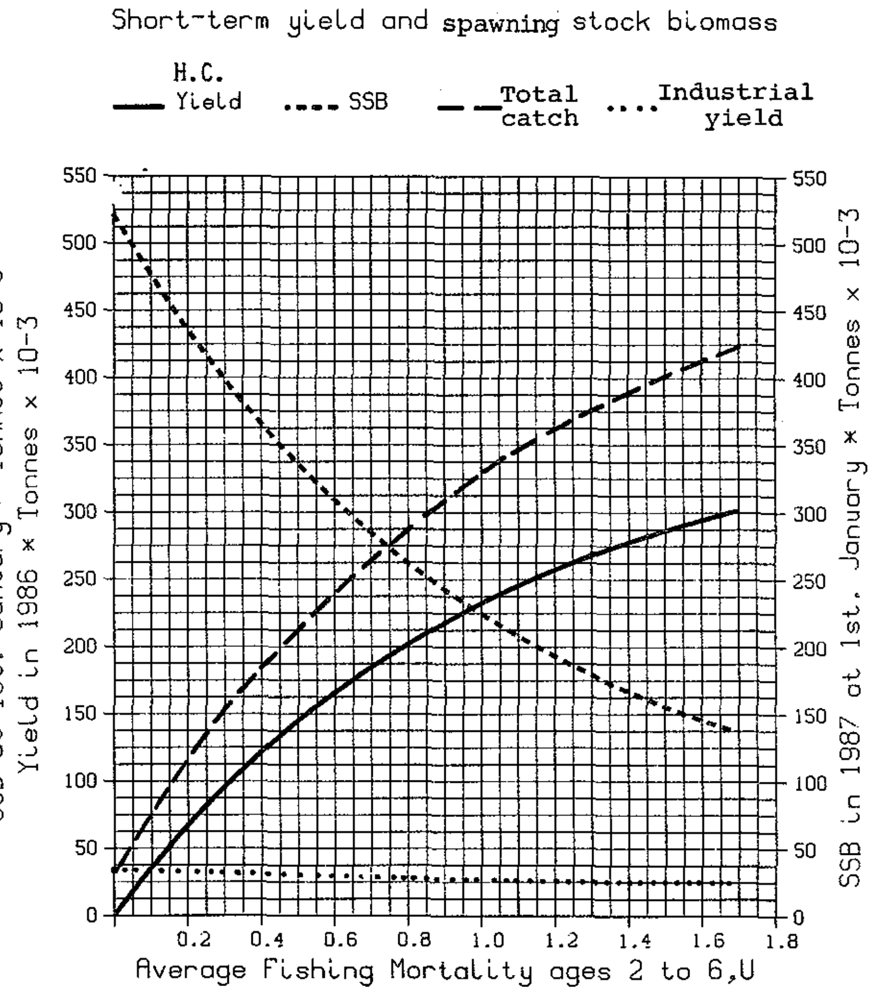
FISH STOCK SUMMARY

STOCK: Haddock - North Sea

21-03-1985



C



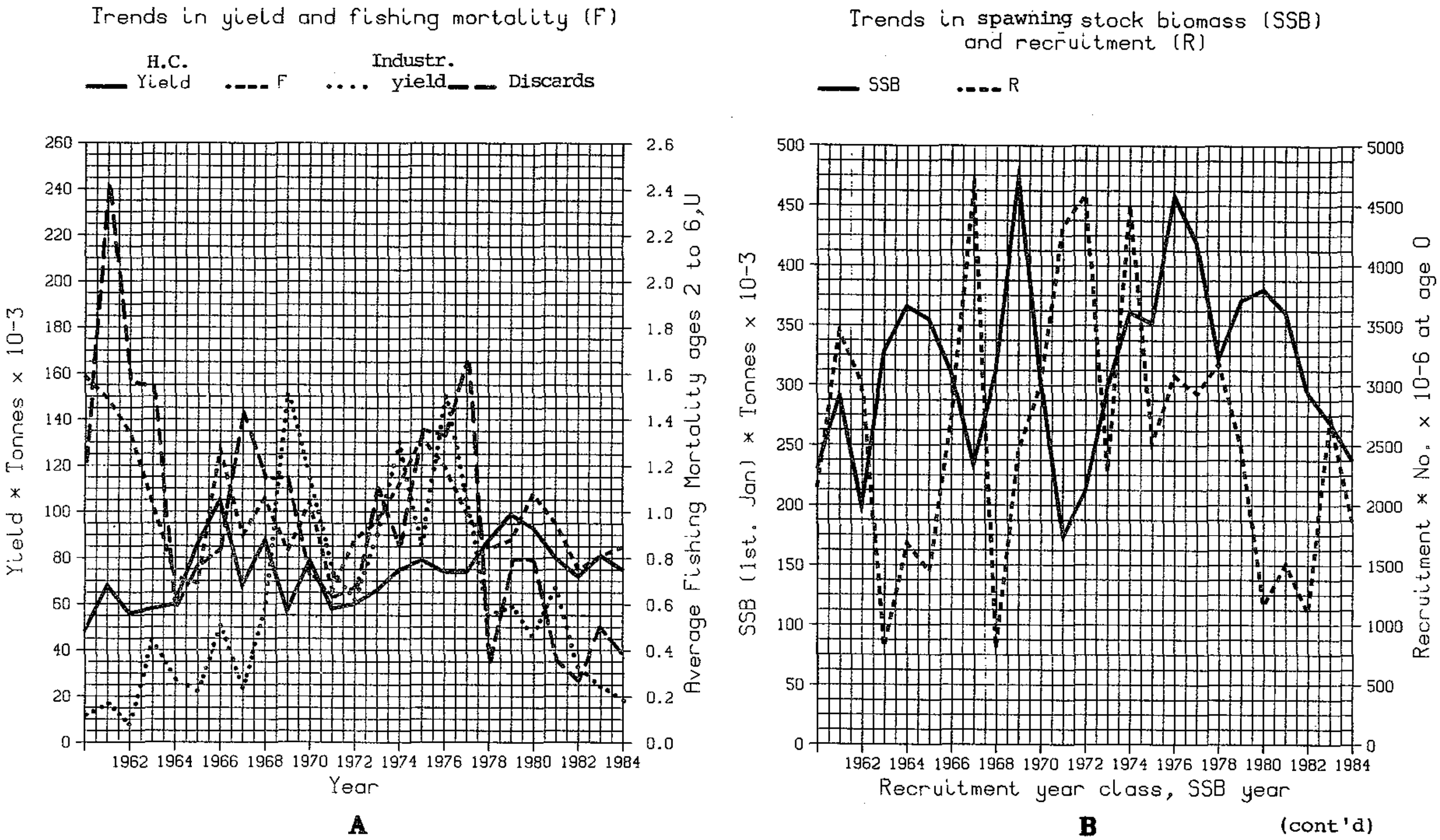
D

Figure 3.4.3

FISH STOCK SUMMARY

STOCK: Whiting - North Sea

21-03-1985



(cont'd)

Figure 3.4.3 (cont'd)

FISH STOCK SUMMARY
STOCK: Whiting - North Sea
21-03-1985

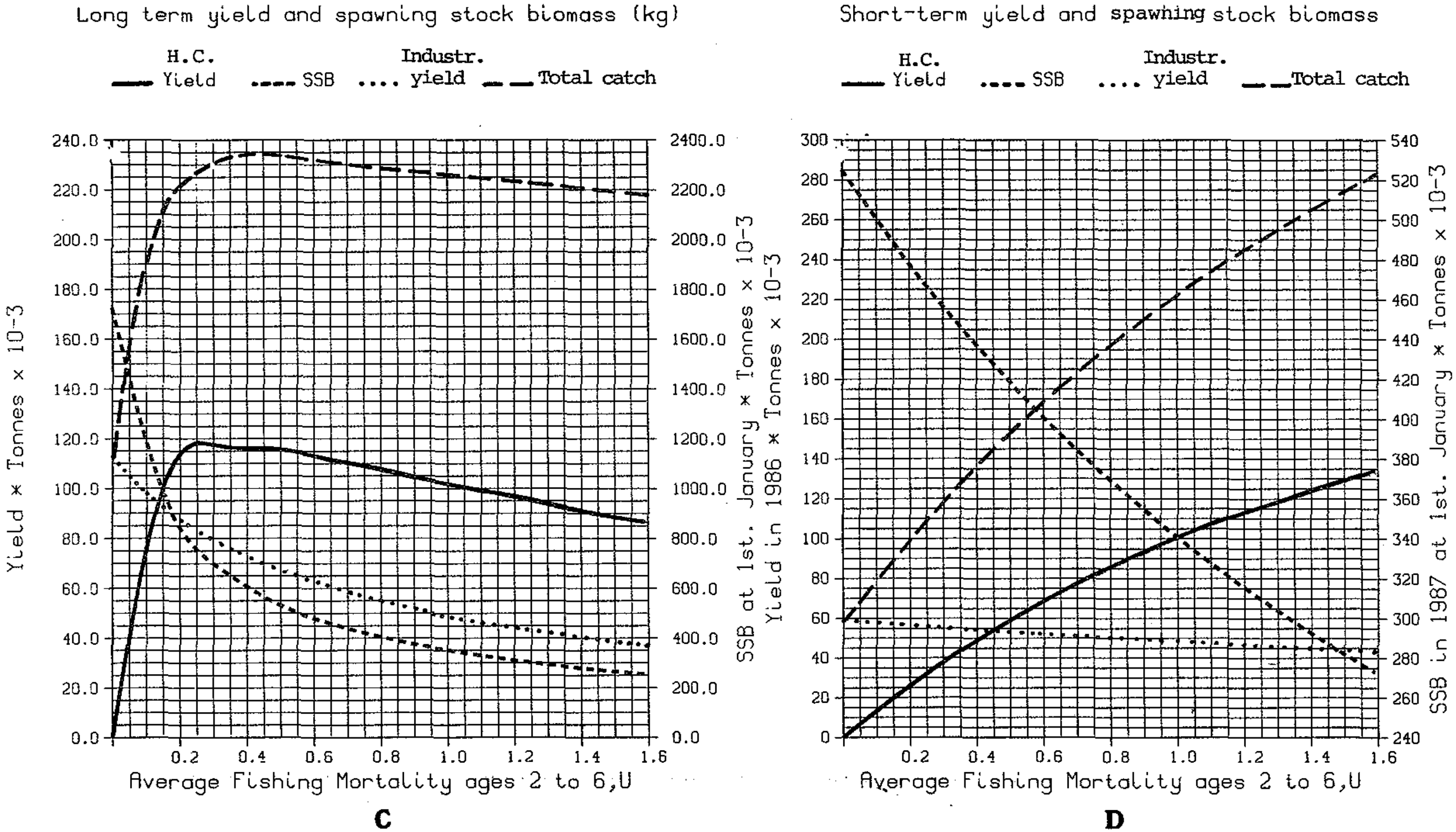
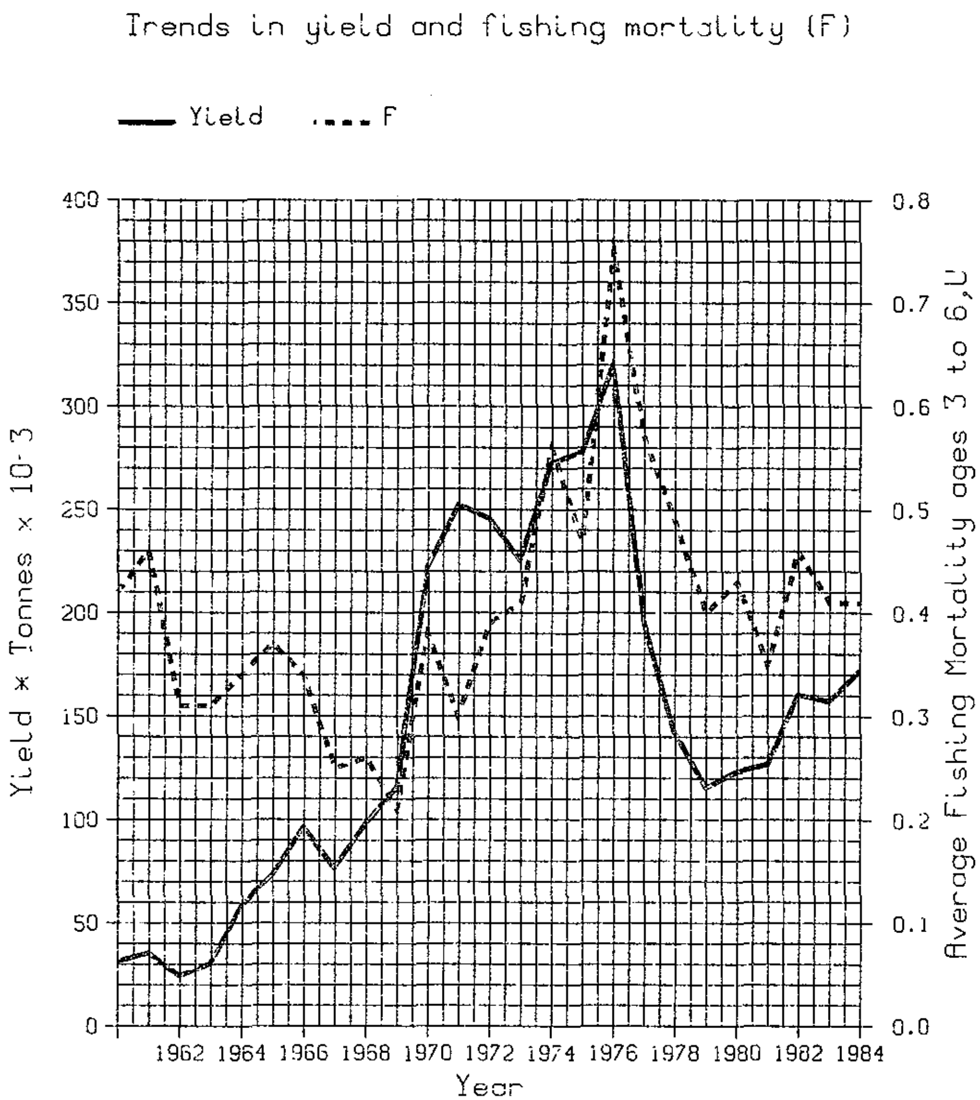


Figure 3.4.5

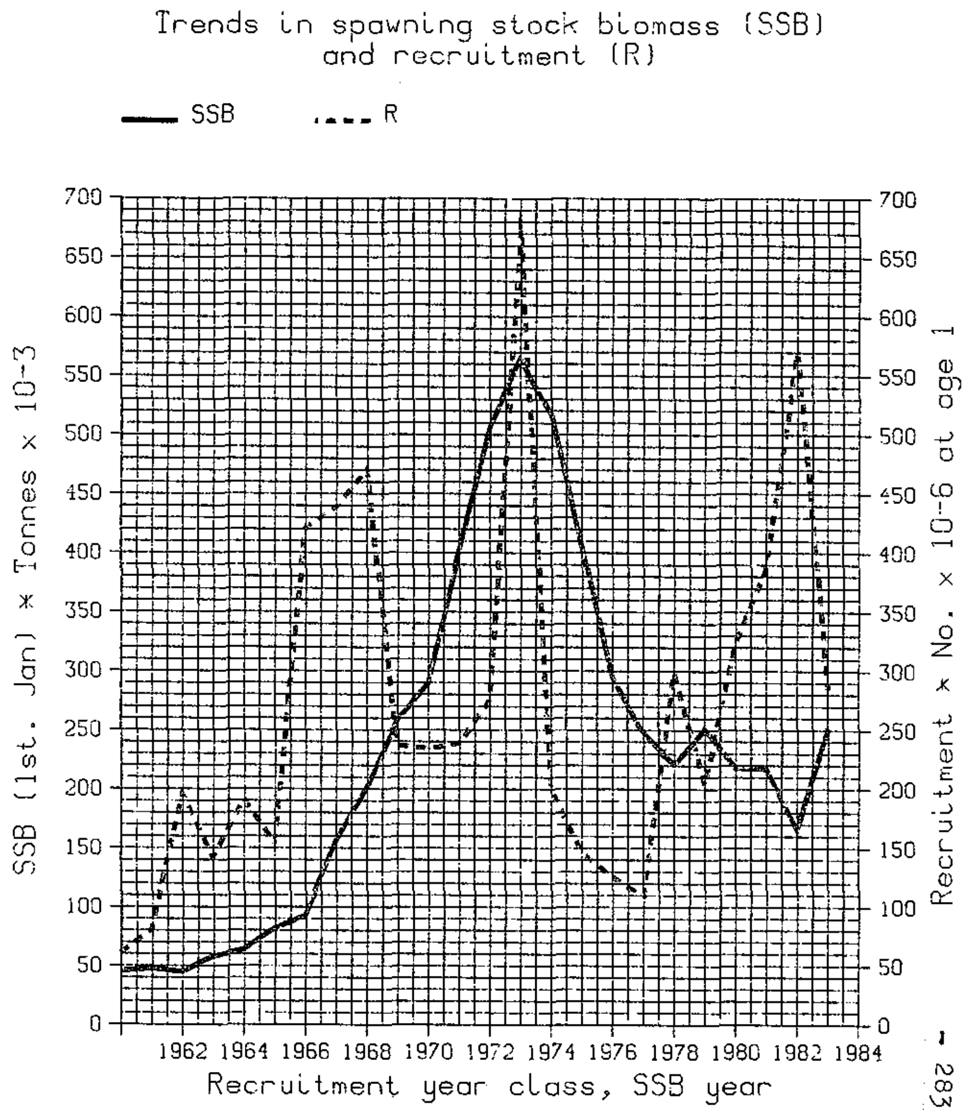
FISH STOCK SUMMARY

STOCK: Saithe - North Sea

07-11-1985



A

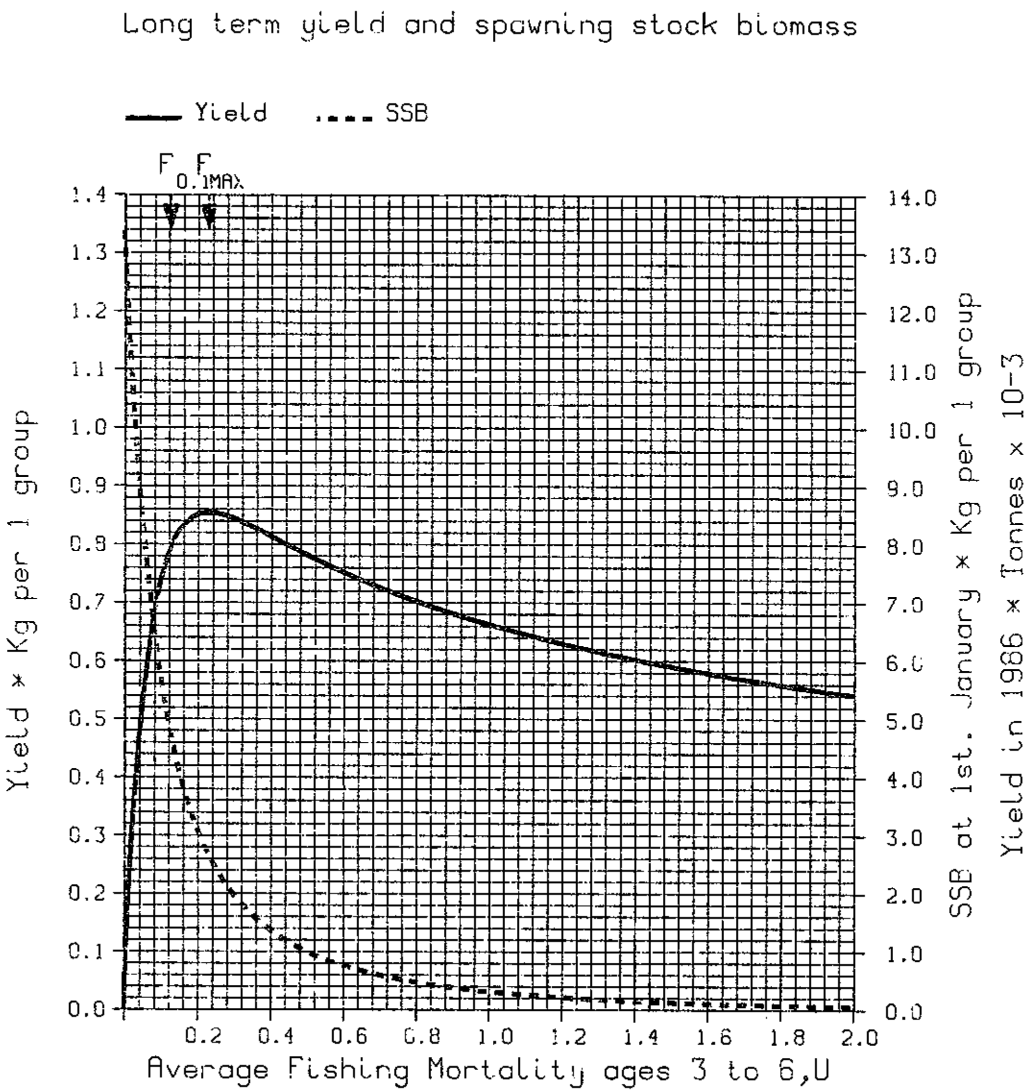


B

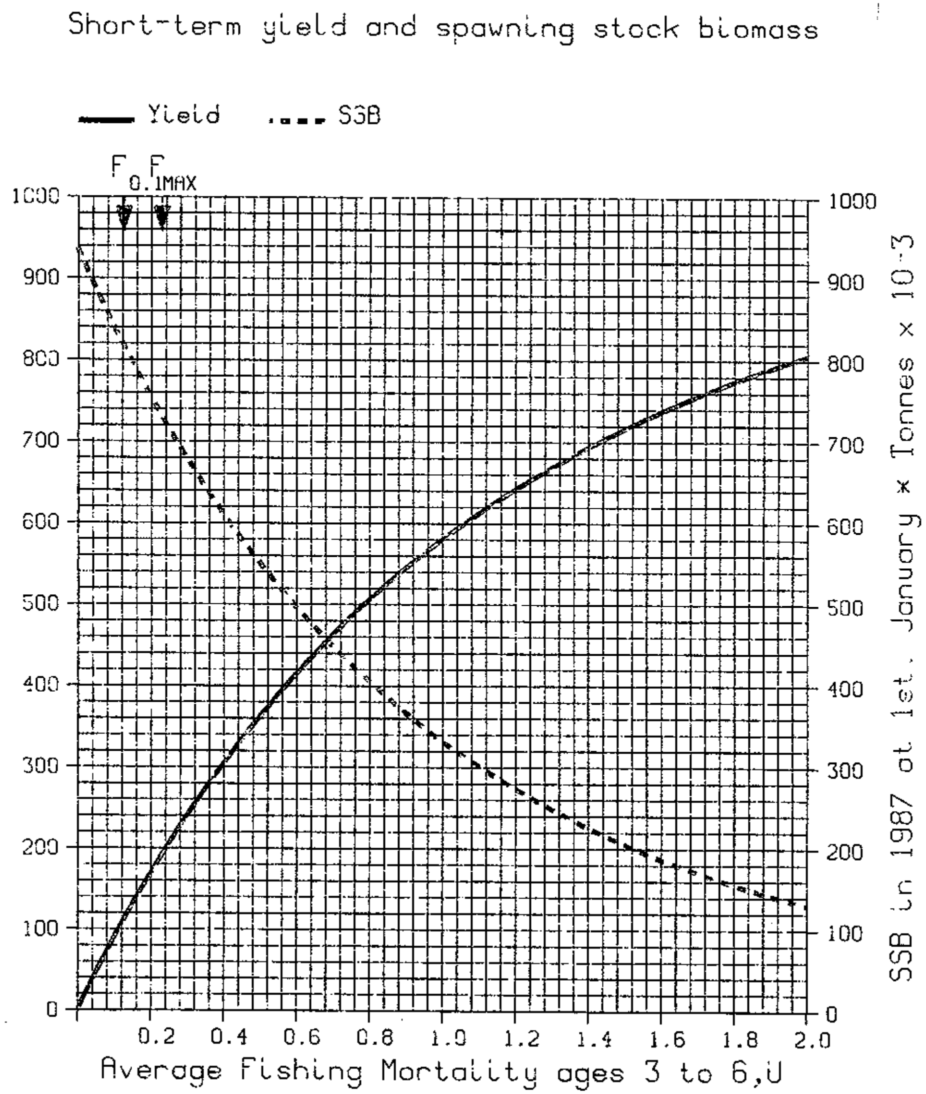
ctd.

Figure 3.4.5 cont'd

FISH STOCK SUMMARY
STOCK: Saithe - North Sea
07-11-1985



C



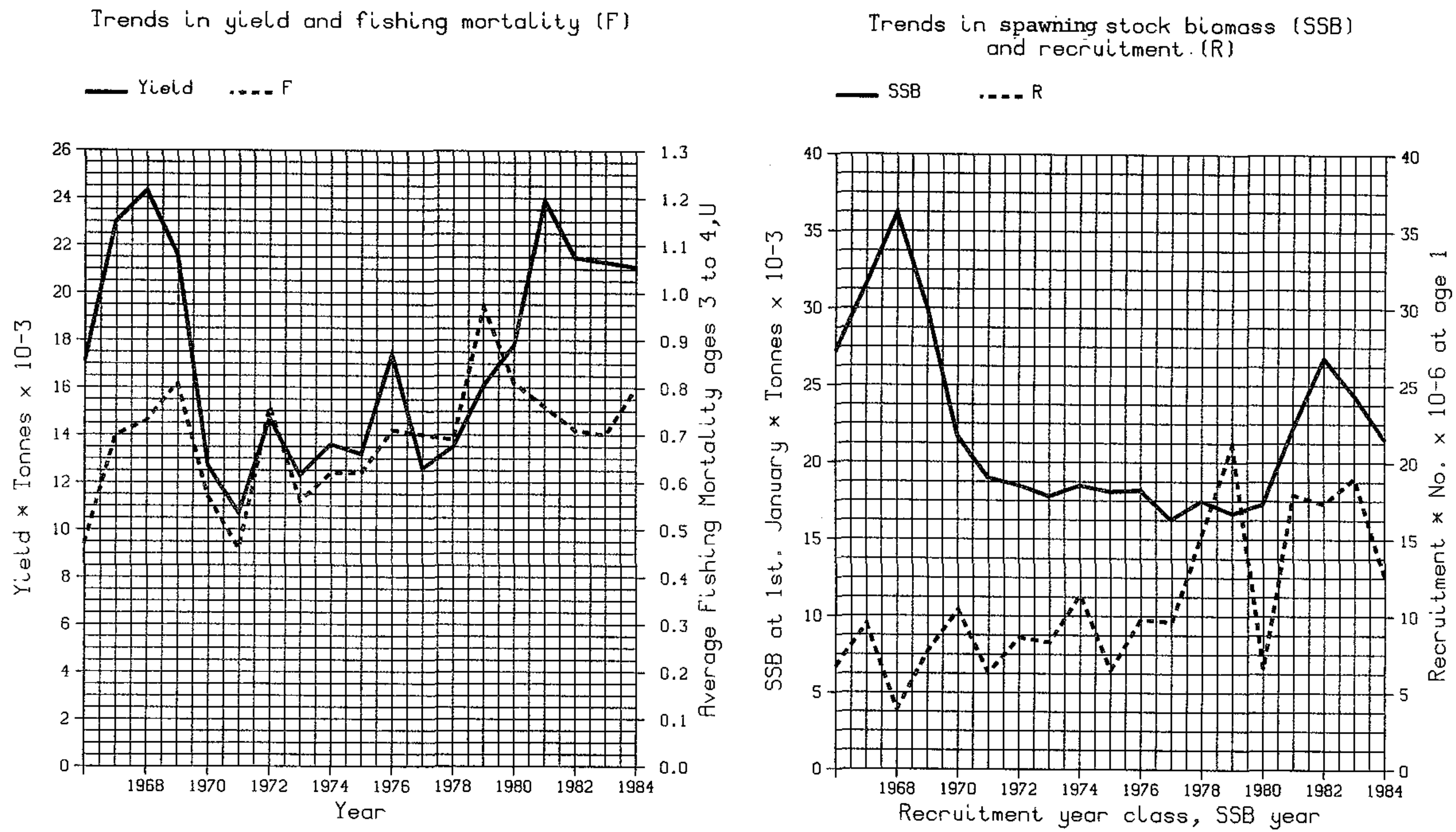
D

Figure 3.5.1

FISH STOCK SUMMARY

STOCK: Cod – West of Scotland

20-3-1985



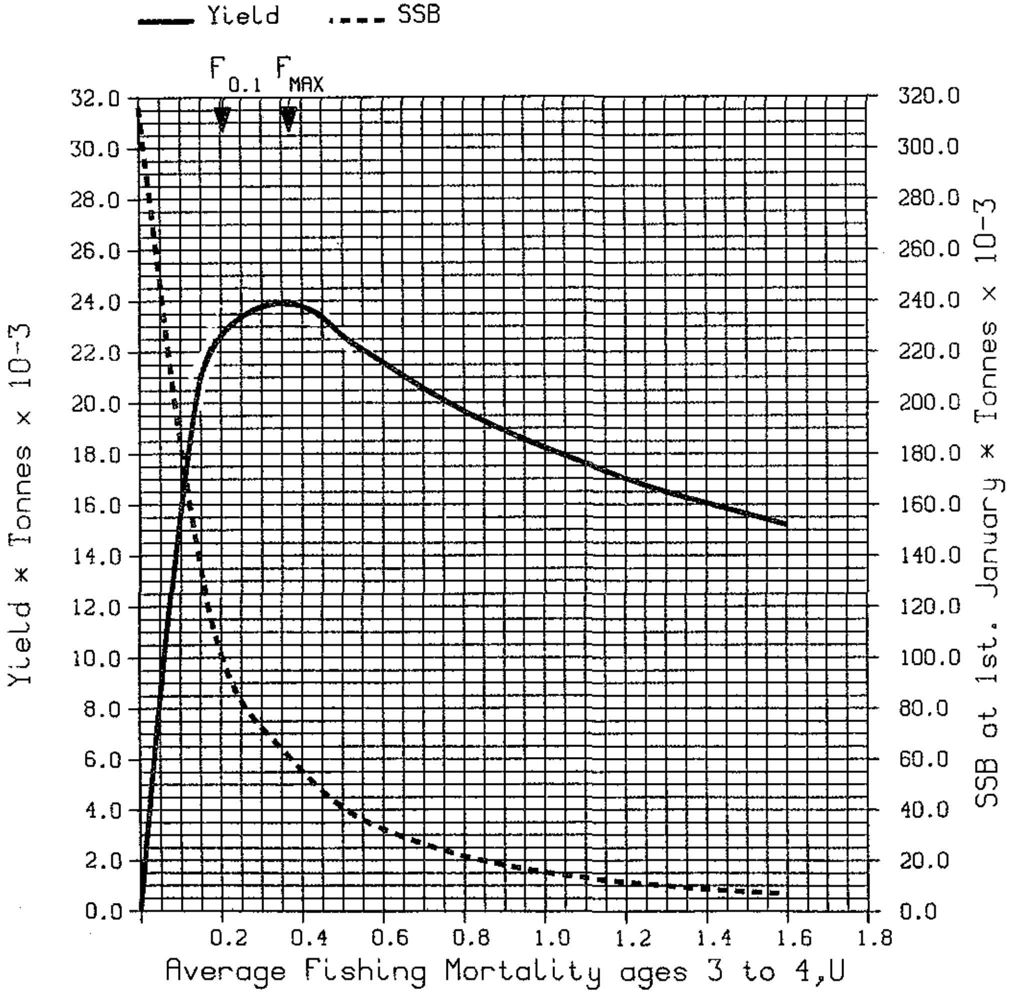
A **B**

(cont'd)

Figure 3.5.1 cont'd

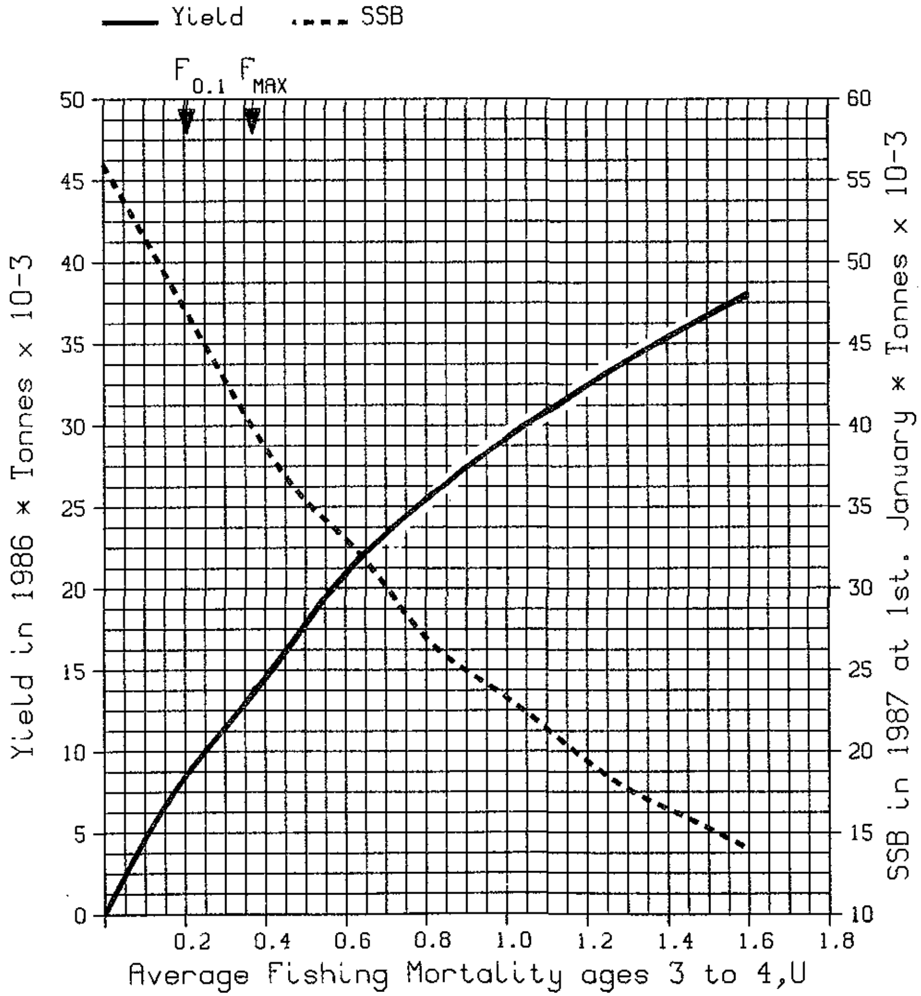
FISH STOCK SUMMARY
STOCK: Cod - West of Scotland
20-3-1985

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



D

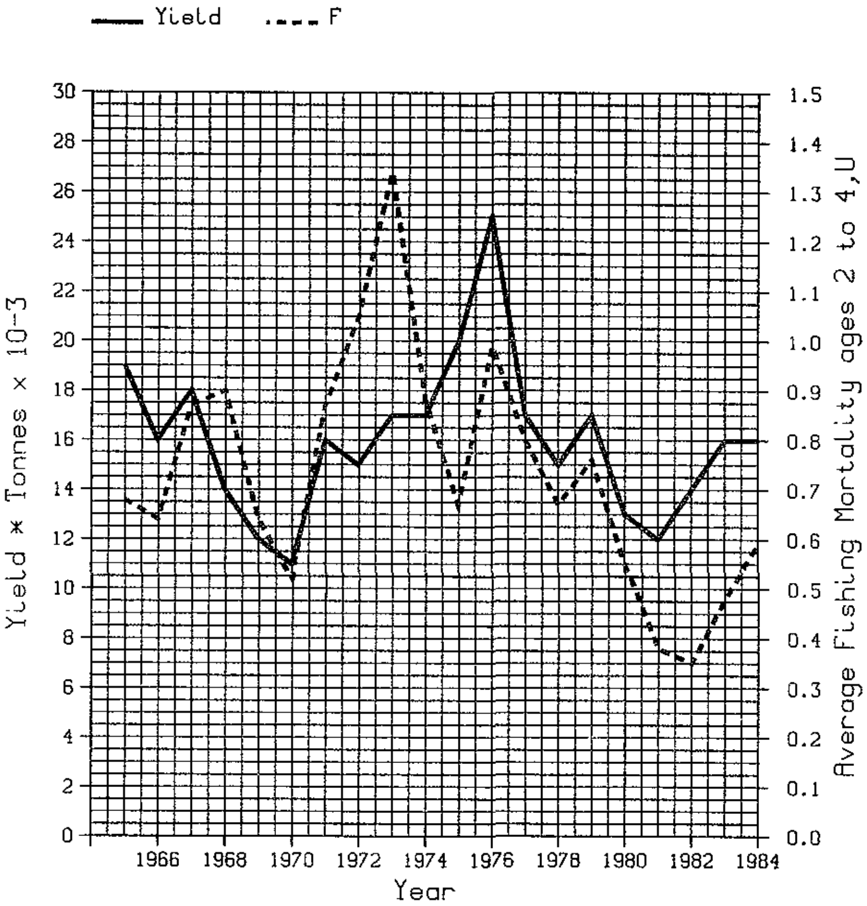
Figure 3.5.5

FISH STOCK SUMMARY

STOCK: Whiting – West of Scotland

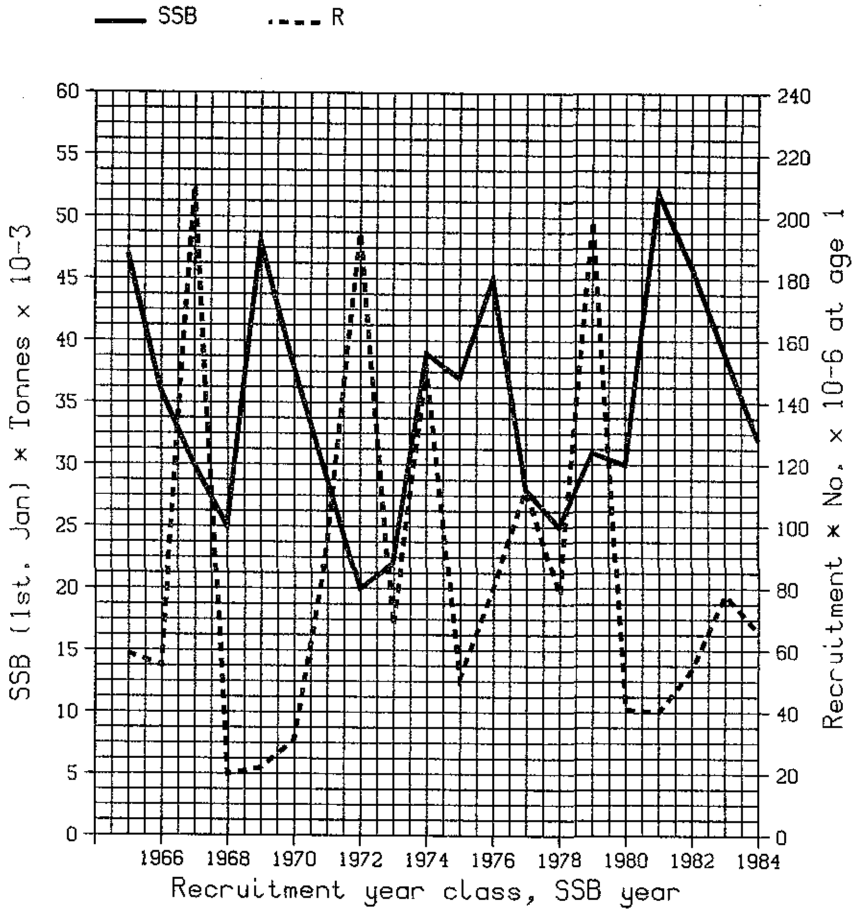
21-03-1985

Trends in yield and fishing mortality (F)



A

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



B

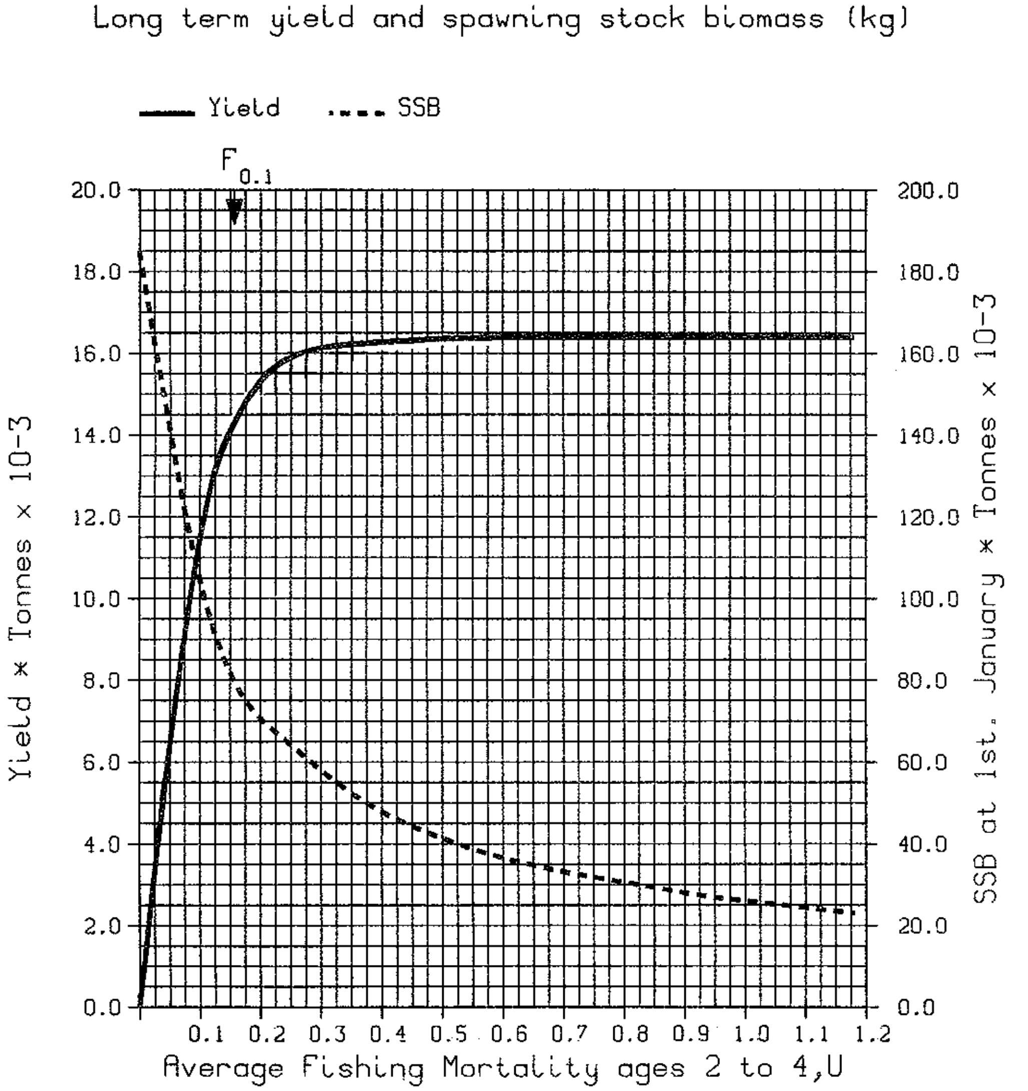
(cont'd)

Figure 3.5.5 cont'd

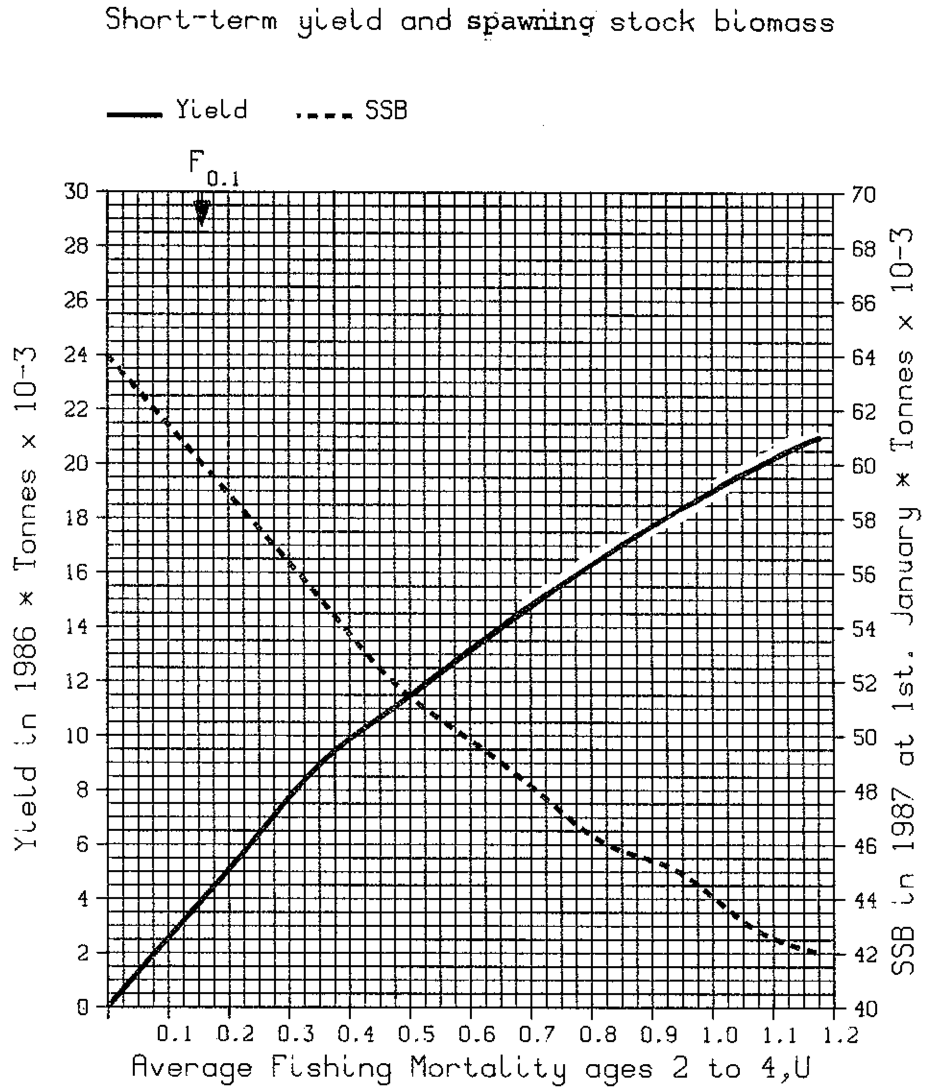
FISH STOCK SUMMARY

STOCK: Whiting - West of Scotland

21-03-1985



C

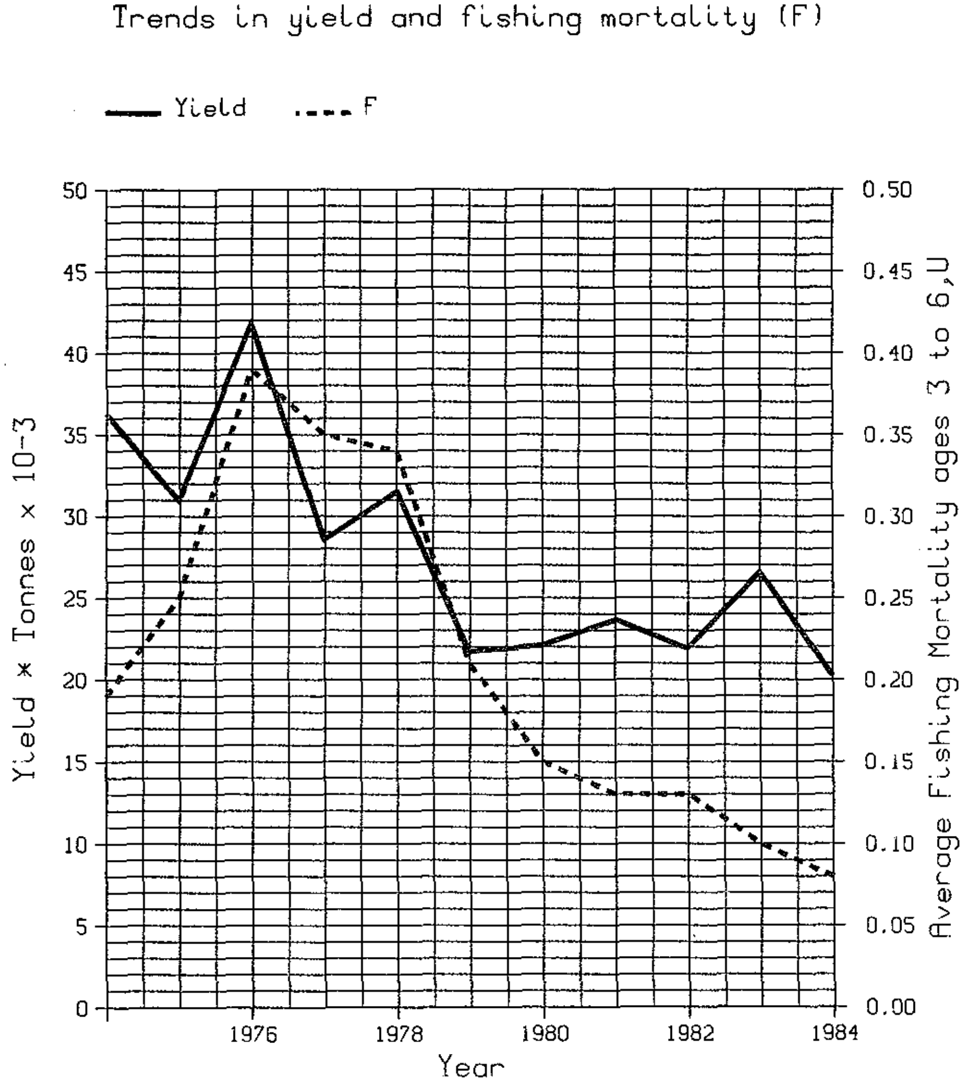


D

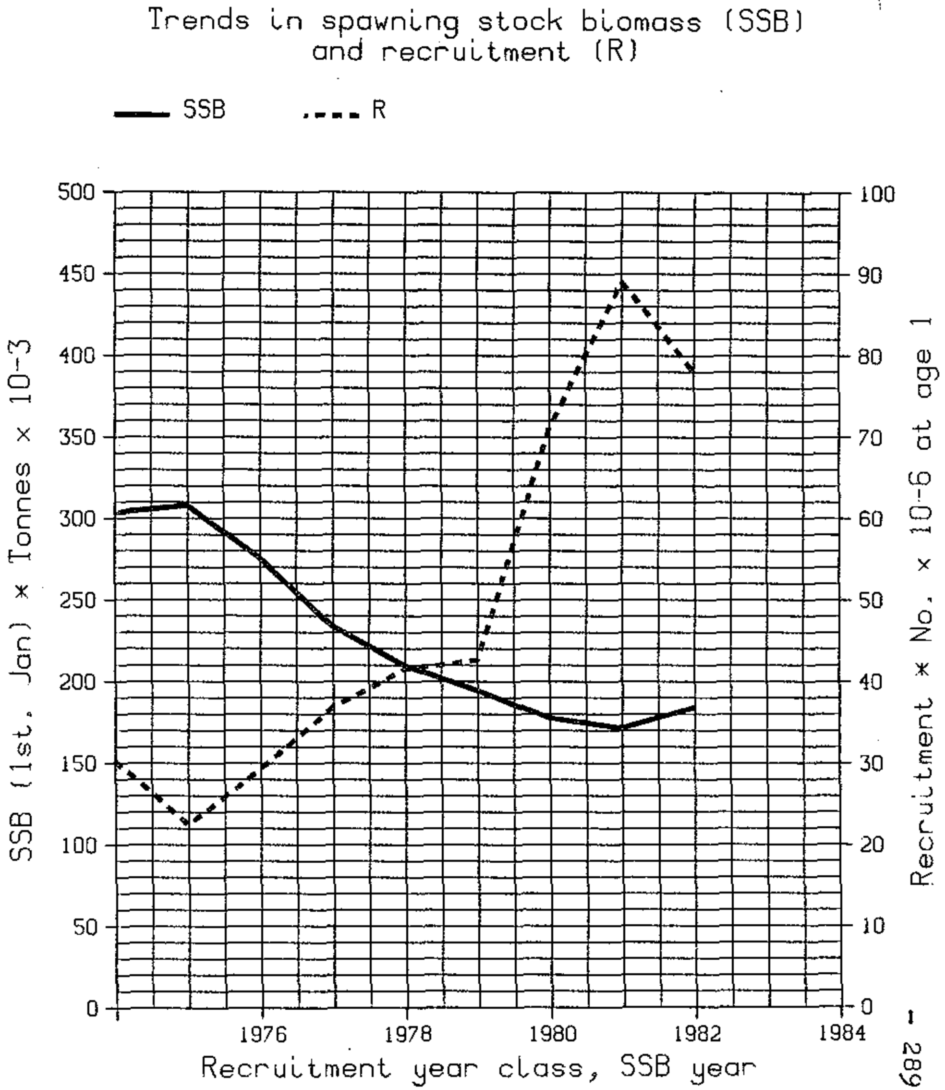
Figure 3.5.6

FISH STOCK SUMMARY
STOCK: Saithe - SCOW
West of Scotland.

05-05-1985

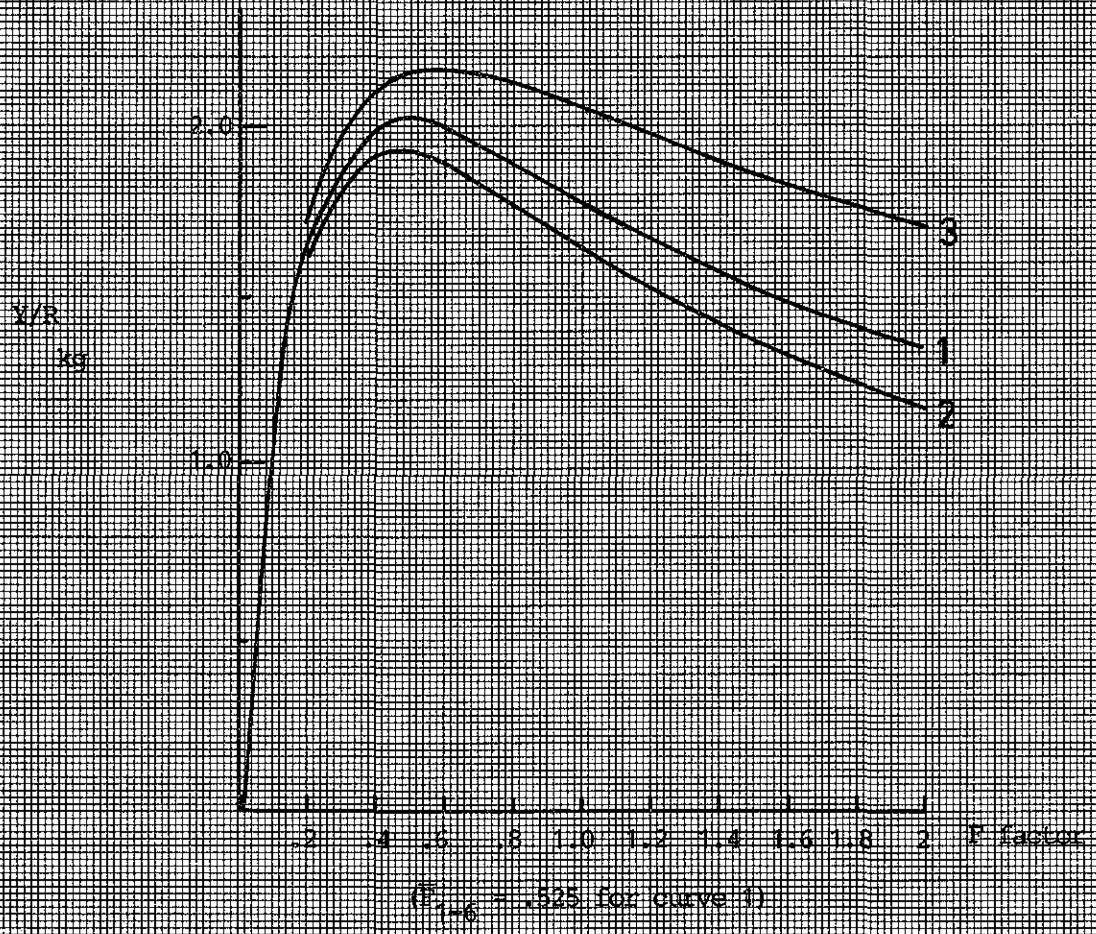


A



B

Figure 3.6.1.1 Irish Sea COD.
Yield per recruit.



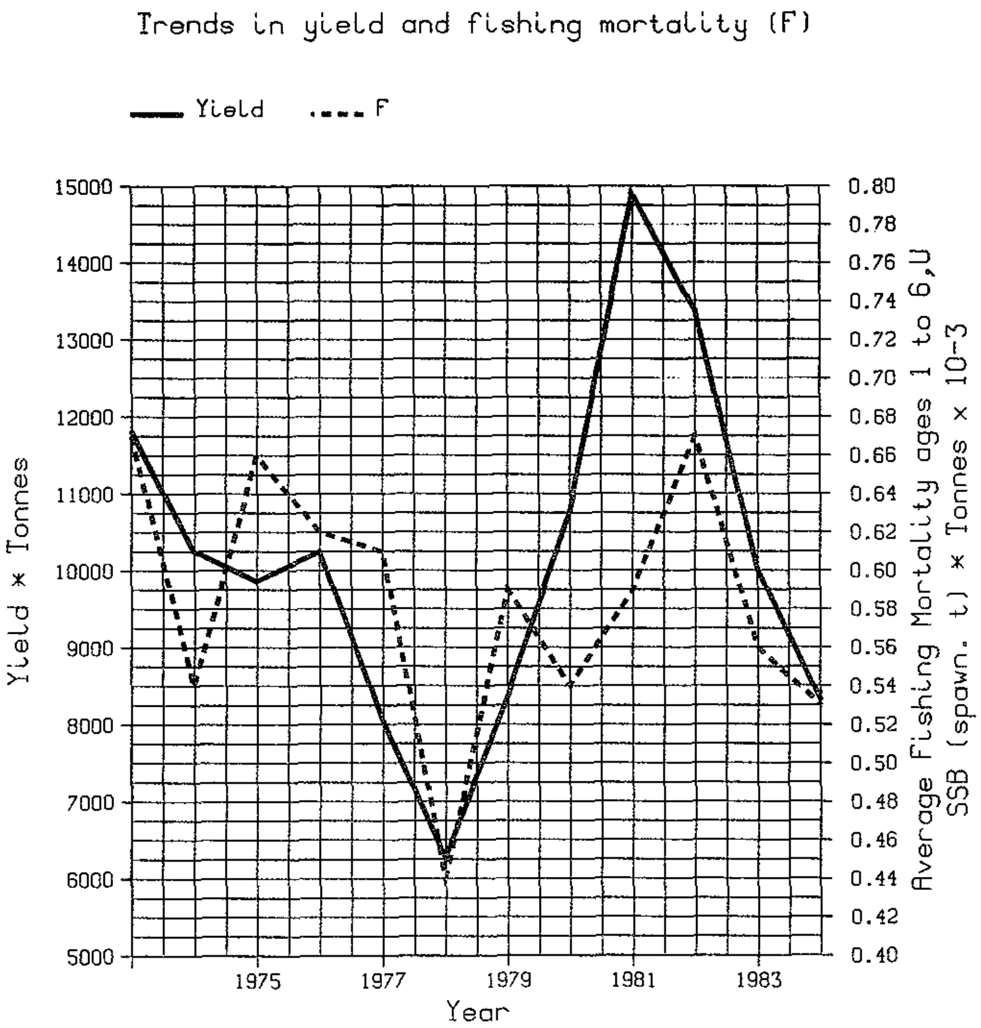
Curve 1 uses the historical exploitation pattern
Curve 2 uses the historical pattern but with a higher F on 1-year olds as in 1984.
Curve 3 uses the historical pattern but with no F on 1-year olds.

FISH STOCK SUMMARY

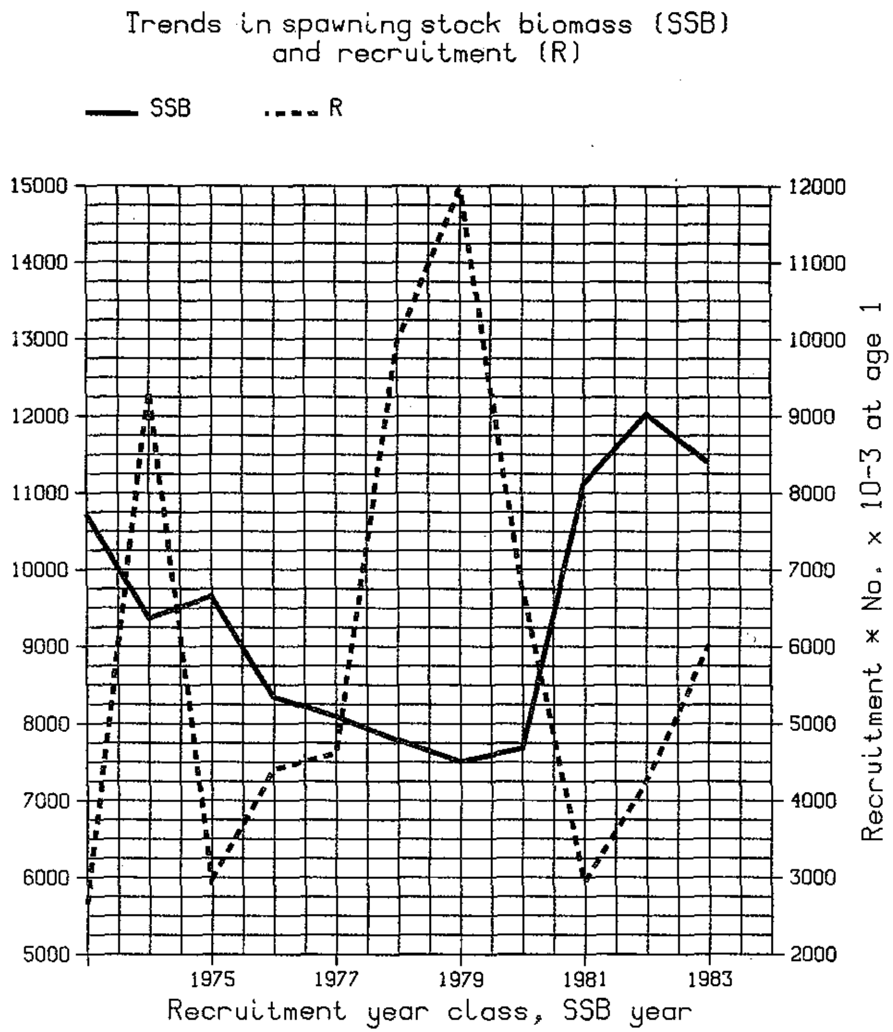
STOCK: Cod – Irish Sea

20-3-1985

Figure 3.6.1.2



A



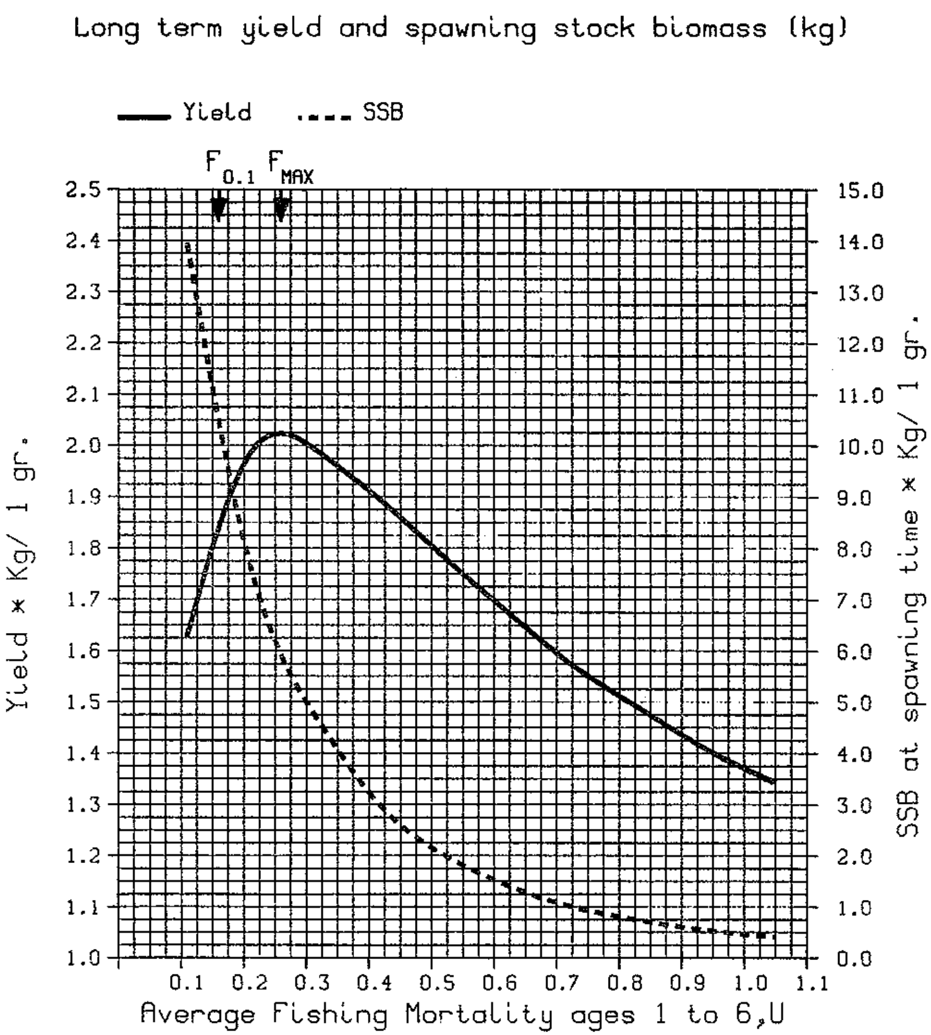
B (cont'd)

Figure 3.6.1.2 cont'd

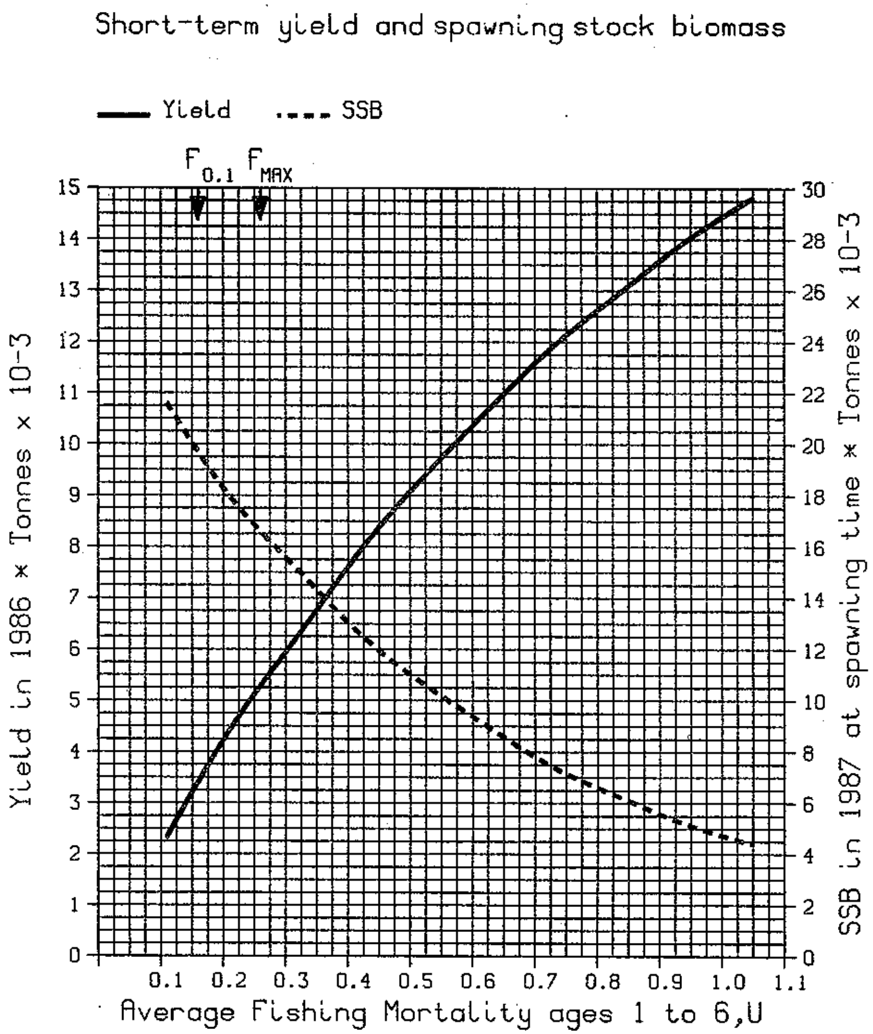
FISH STOCK SUMMARY

STOCK: Cod - Irish Sea

20-3-1985



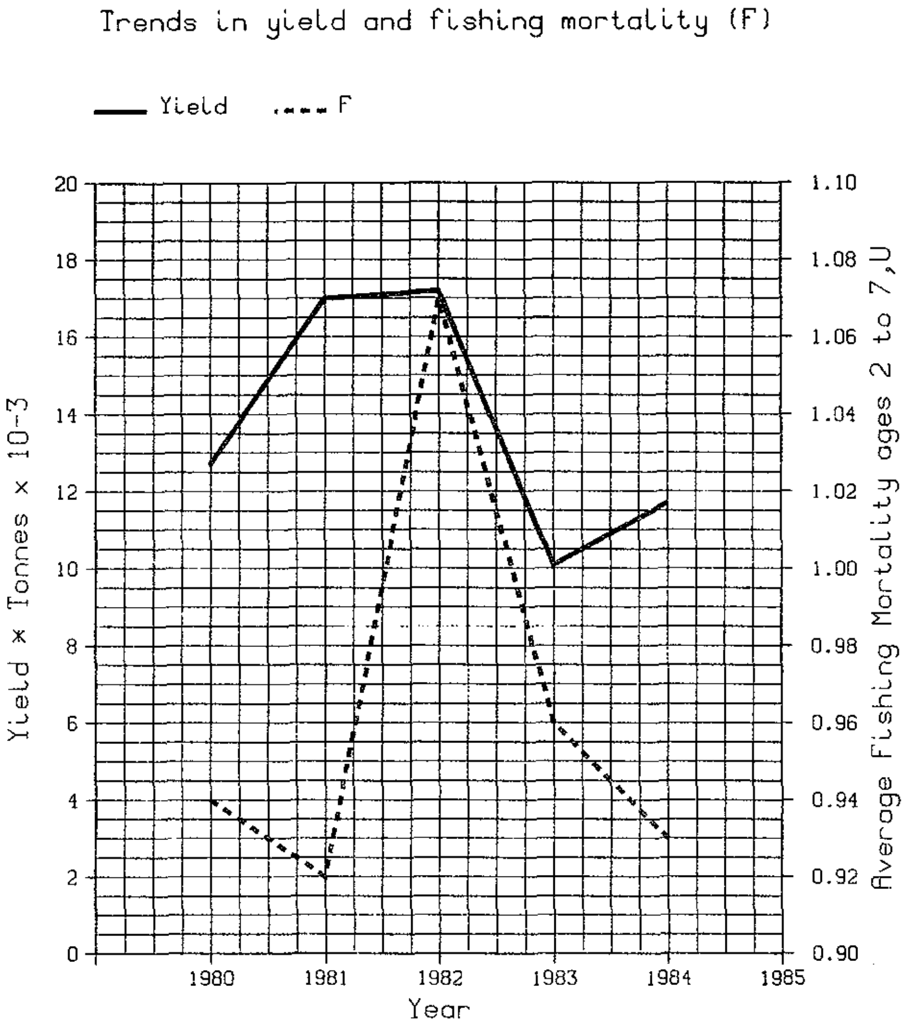
C



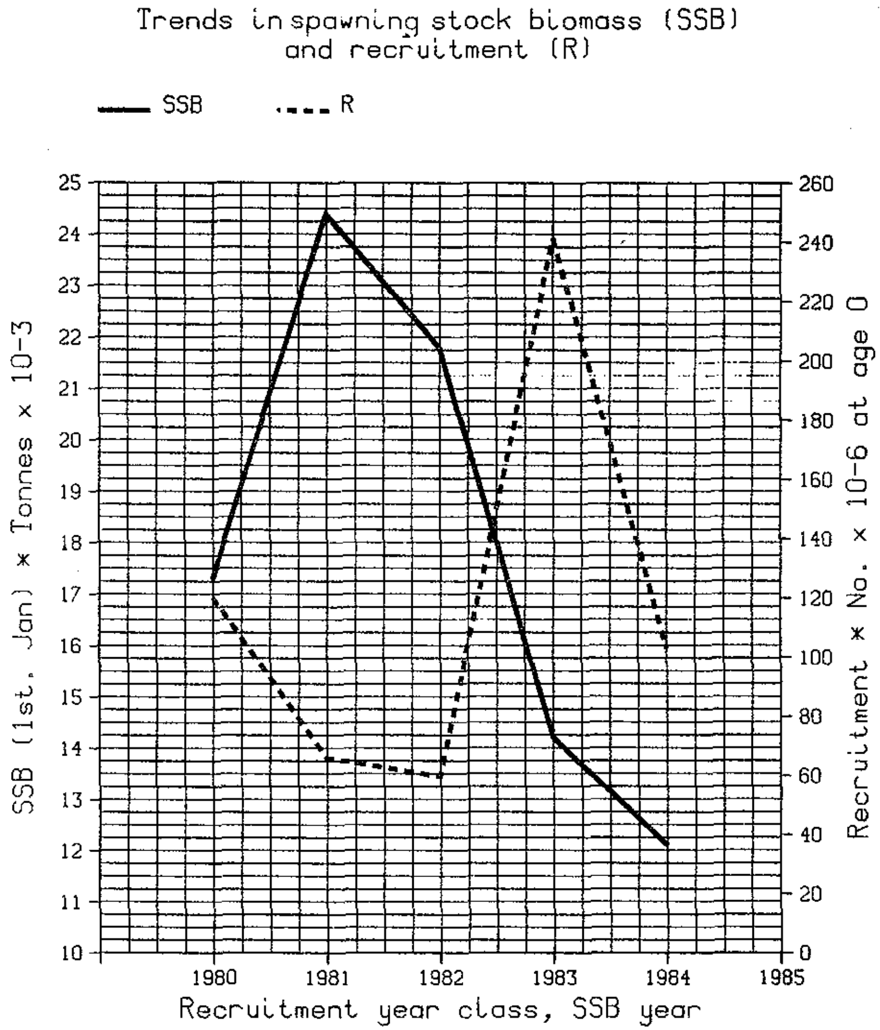
D

Figure 3.6.2

FISH STOCK SUMMARY
STOCK: Whiting - Irish Sea
13-3-1985



A



B

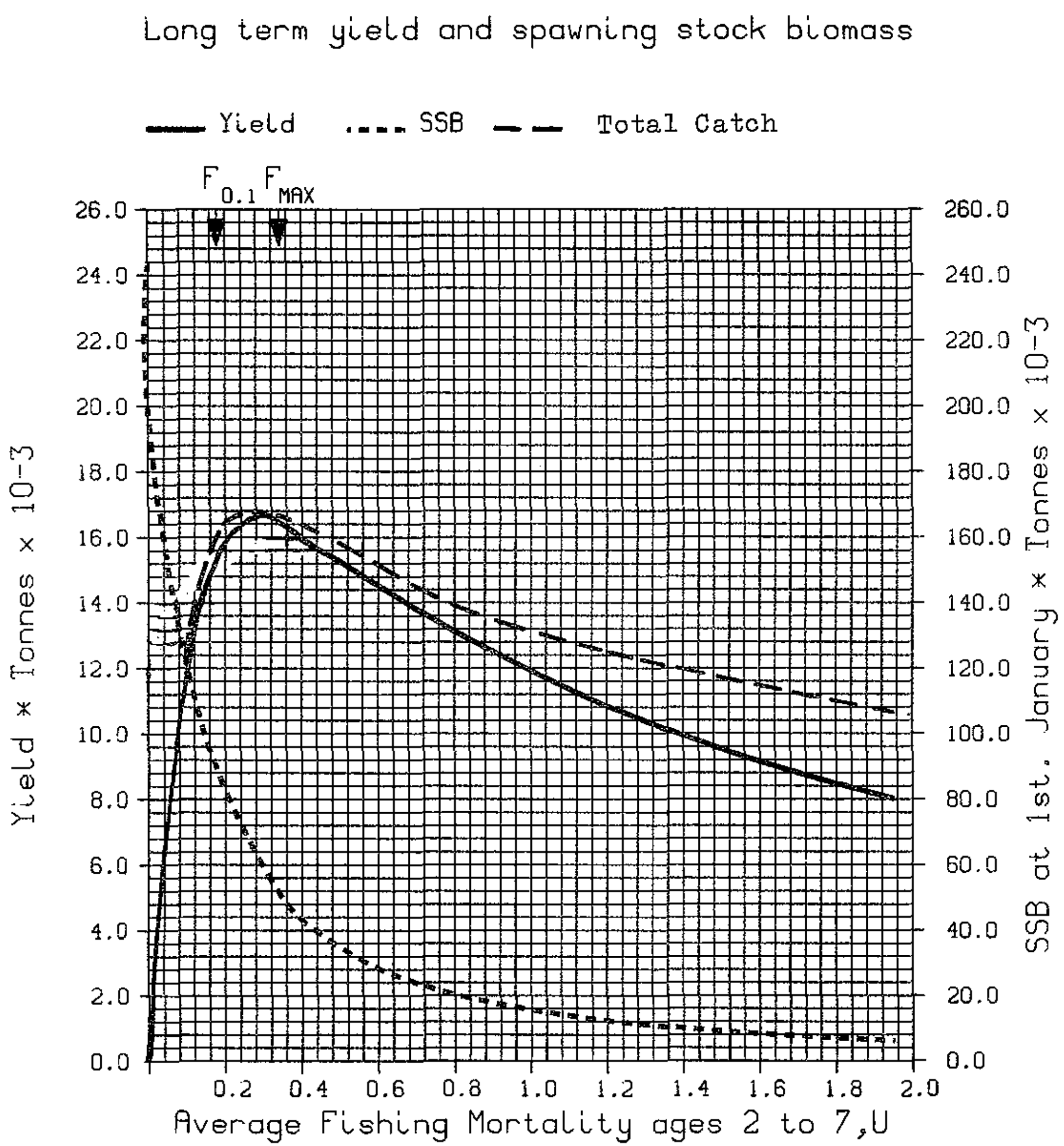
(cont'd)

FISH STOCK SUMMARY

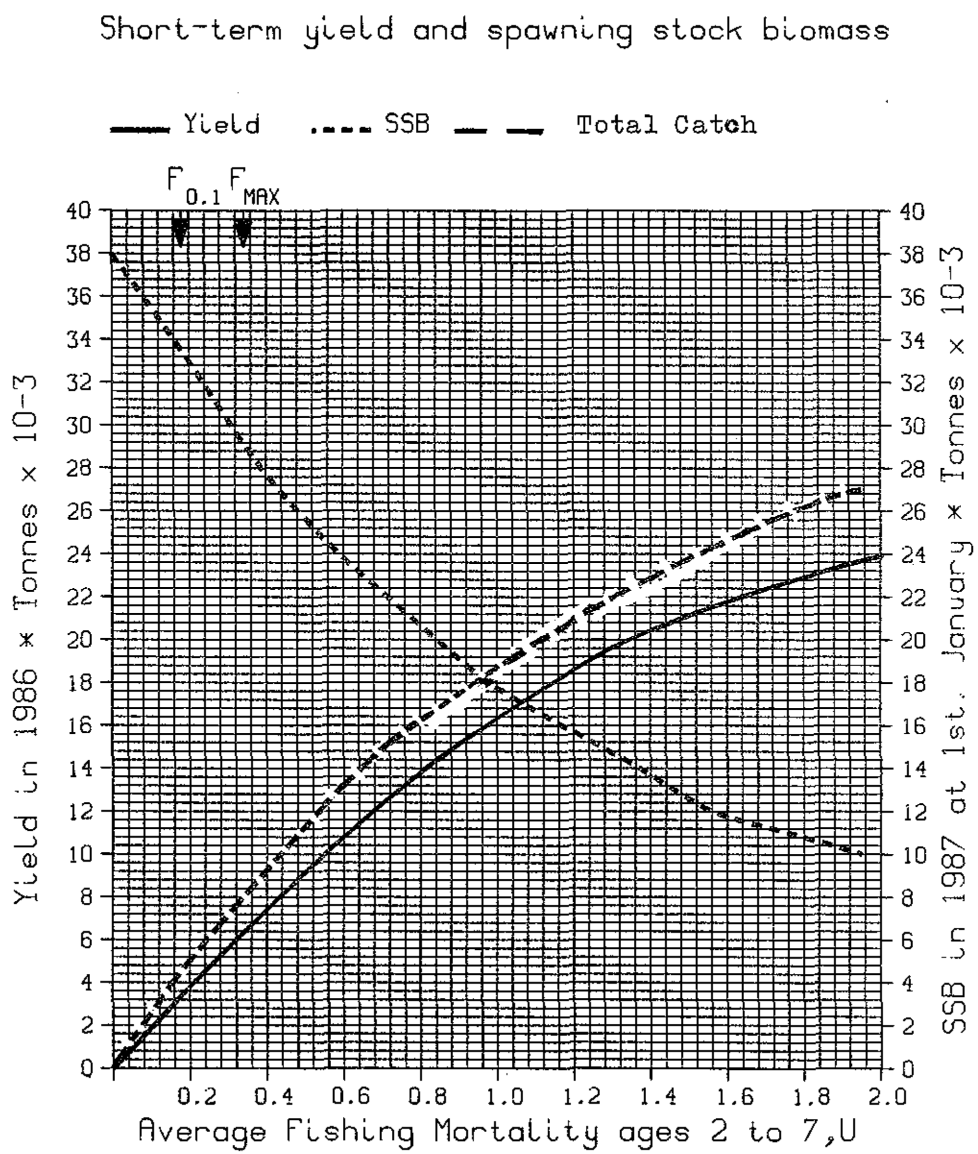
STOCK: Whiting - Irish Sea

13-3-1985

Figure 3.6.2 cont'd



C



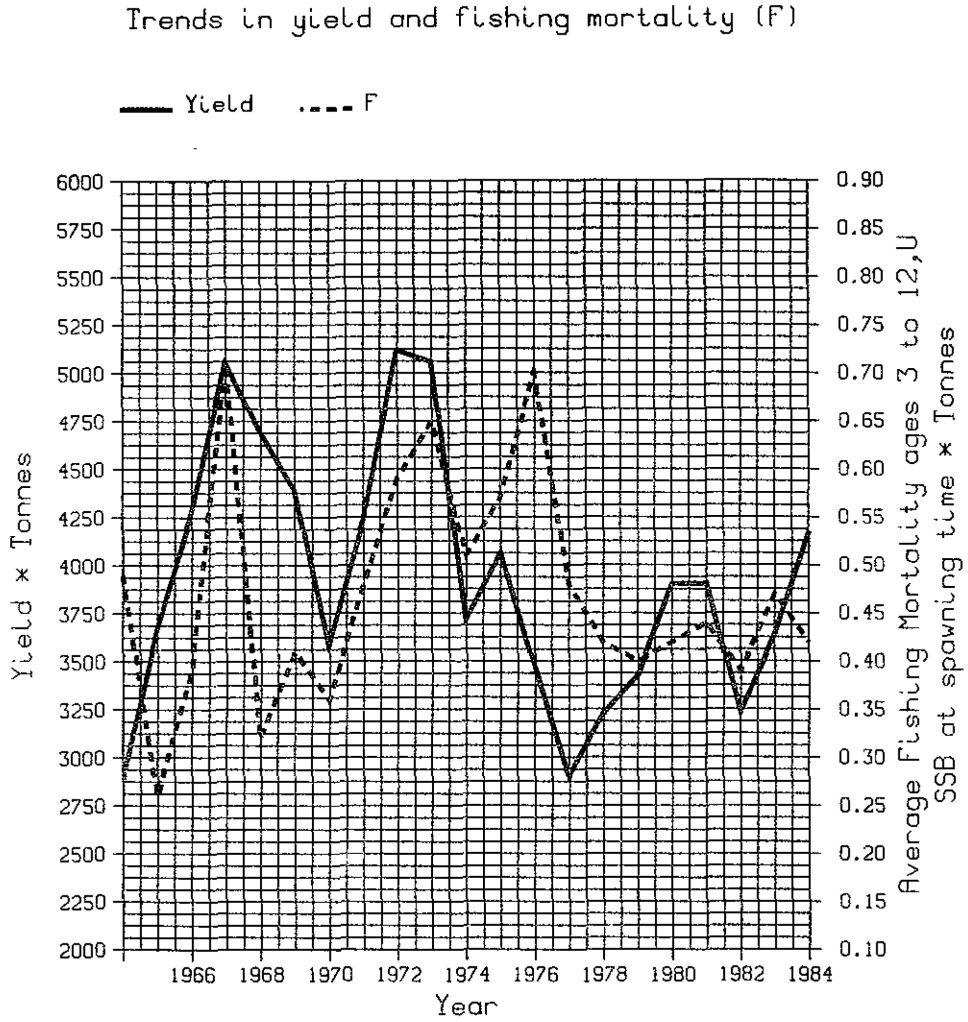
D

Figure 3.6.3

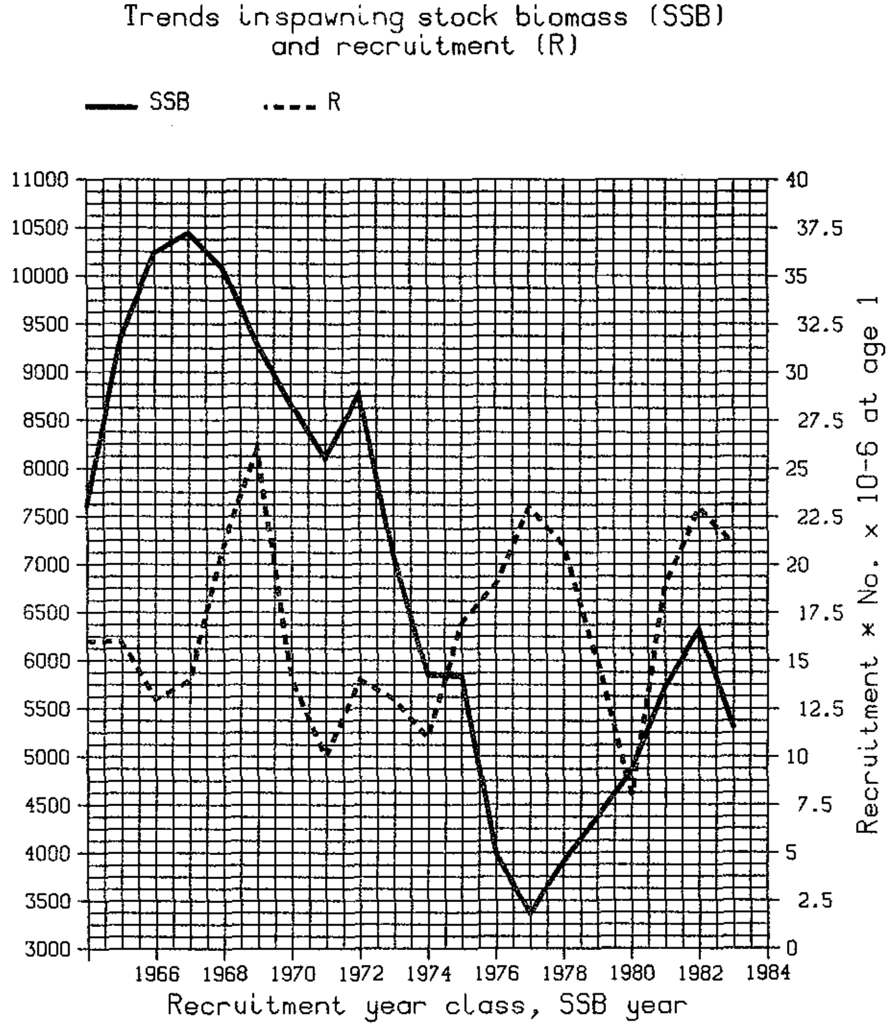
FISH STOCK SUMMARY

STOCK: Plaice - Irish Sea

20-3-1985



A



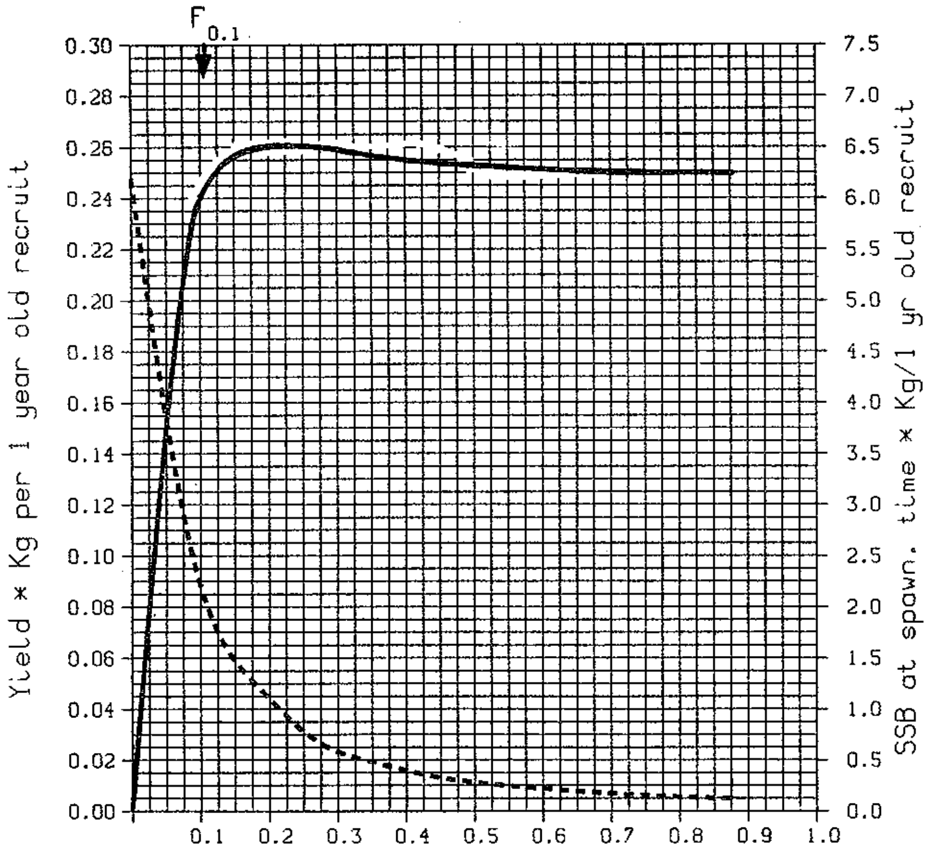
B

(cont'd)

Figure 3.6.3 cont'd

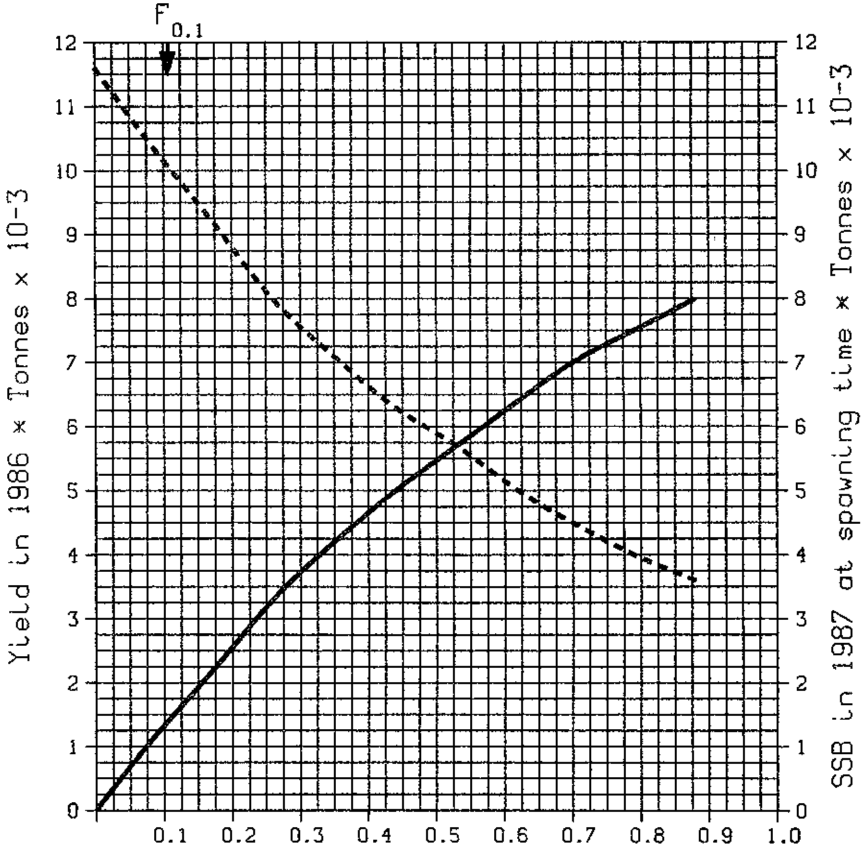
FISH STOCK SUMMARY
STOCK: Plaice - Irish Sea
20-3-1985

Long term yield and spawning stock biomass (kg)



C

Short-term yield and spawning stock biomass



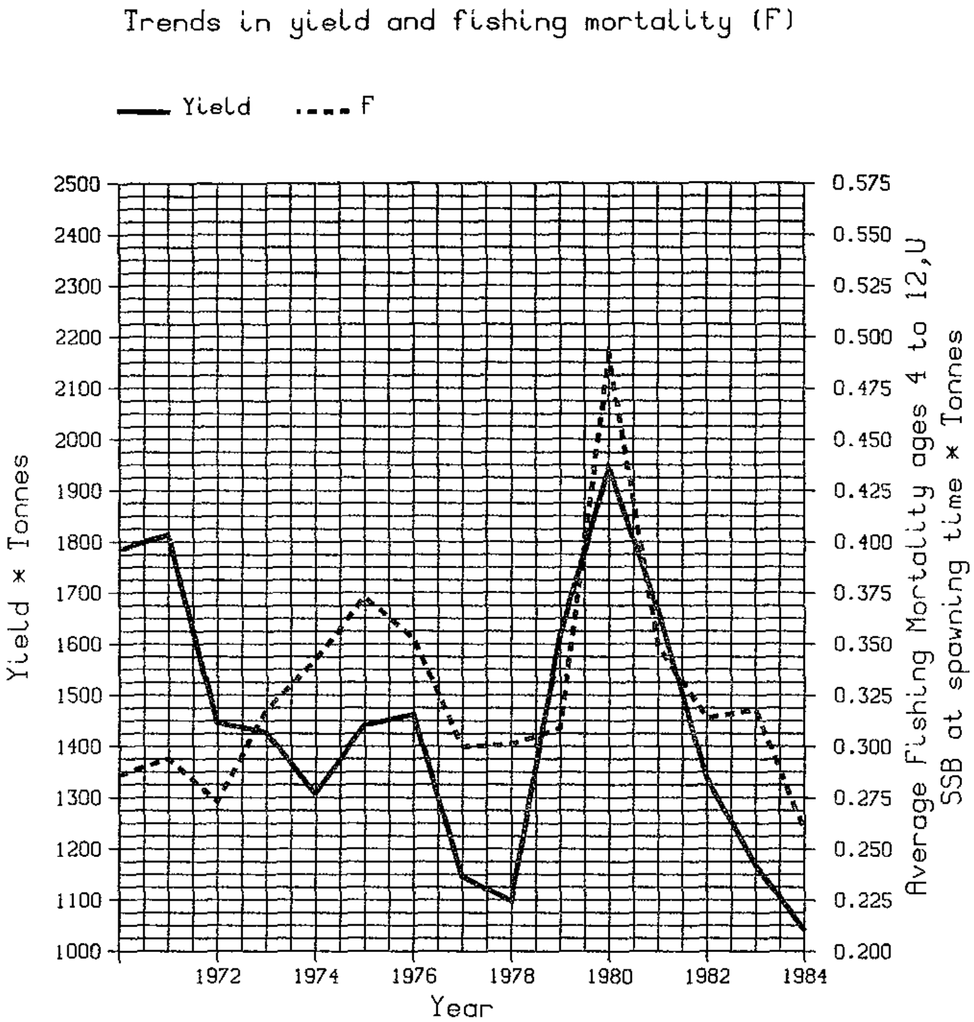
D

Figure 3.6.4

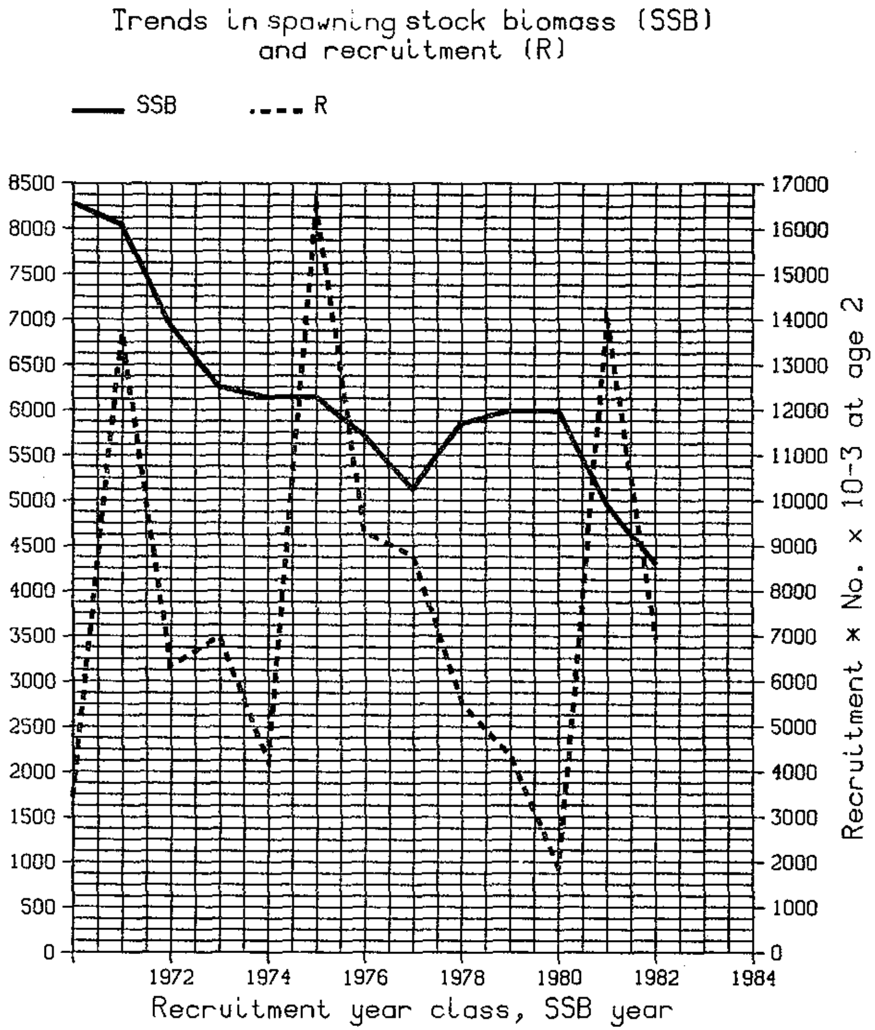
FISH STOCK SUMMARY

STOCK: Sole - Irish Sea

20-3-1985



A



B

(cont'd)

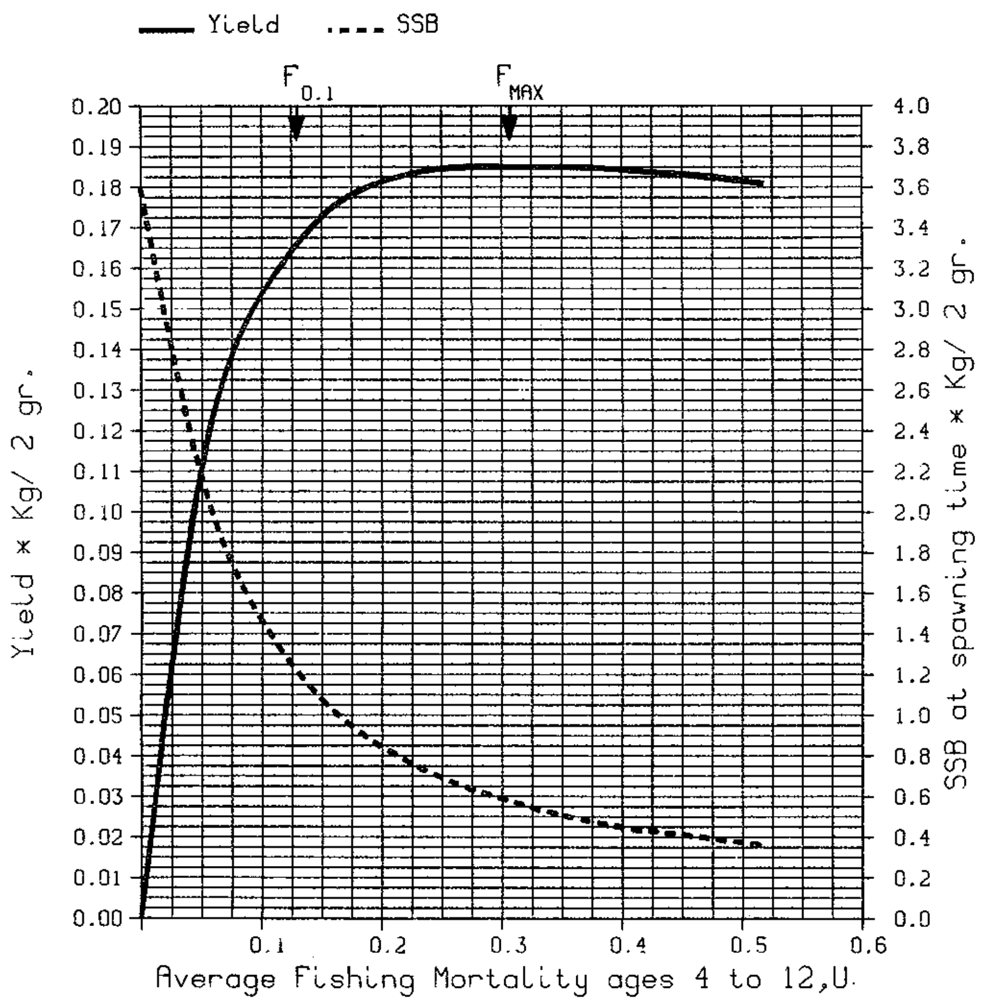
Figure 3.6.4 cont'd

FISH STOCK SUMMARY

STOCK: Sole - Irish Sea

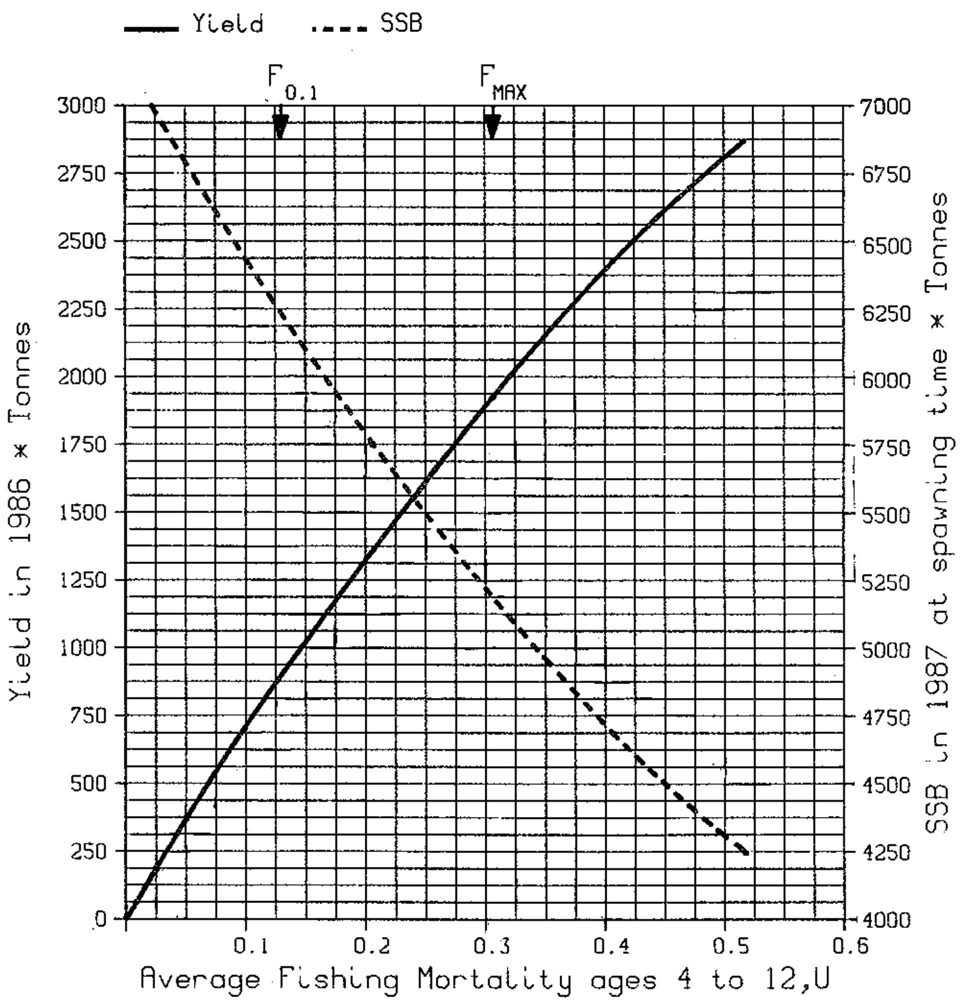
20-3-1985

Long term yield and spawning stock biomass (kg)



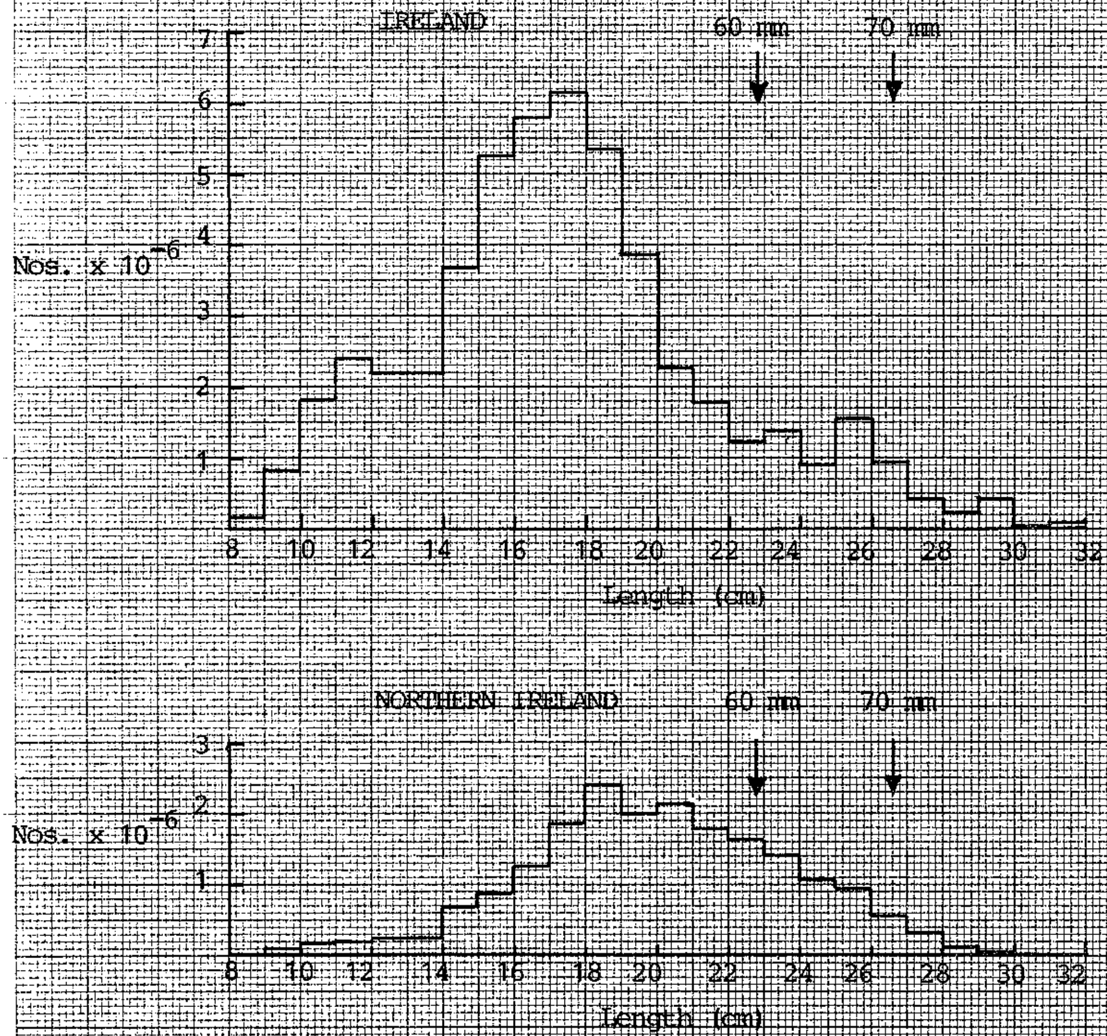
C

Short-term yield and spawning stock biomass



D

Figure 3.6.9 1984 Whiting discards in the Irish Sea *Nephrops* fishery, with mesh mean selection lengths indicated.

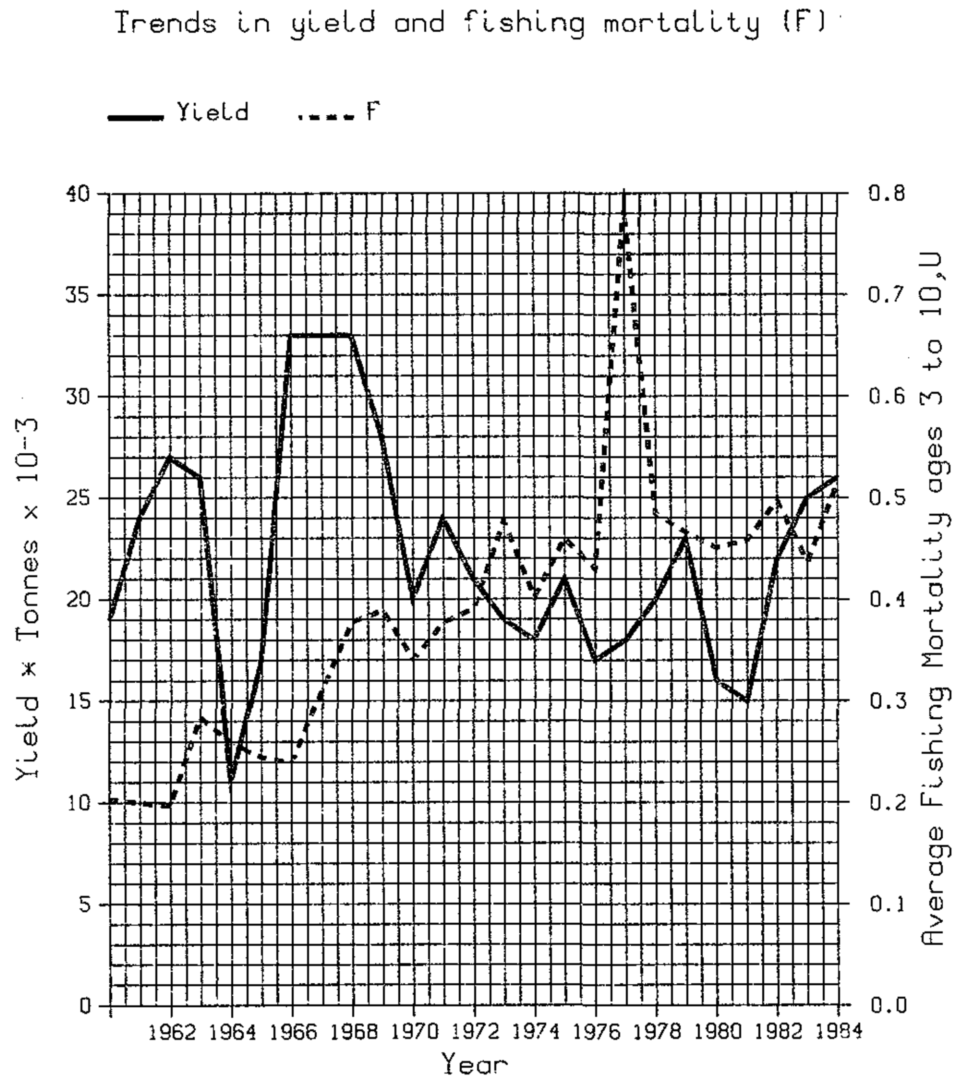


FISH STOCK SUMMARY

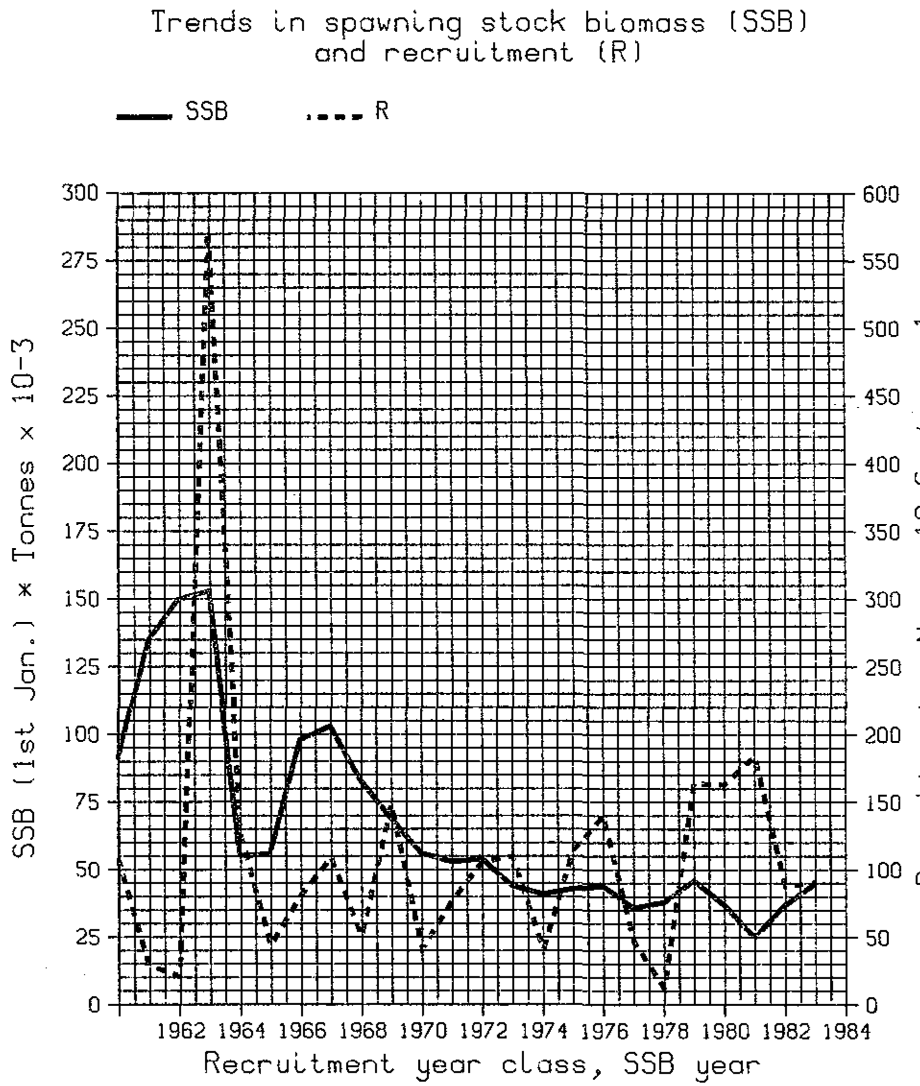
STOCK: Sole - North Sea

05-11-1985

Figure 3.7.1



A



B

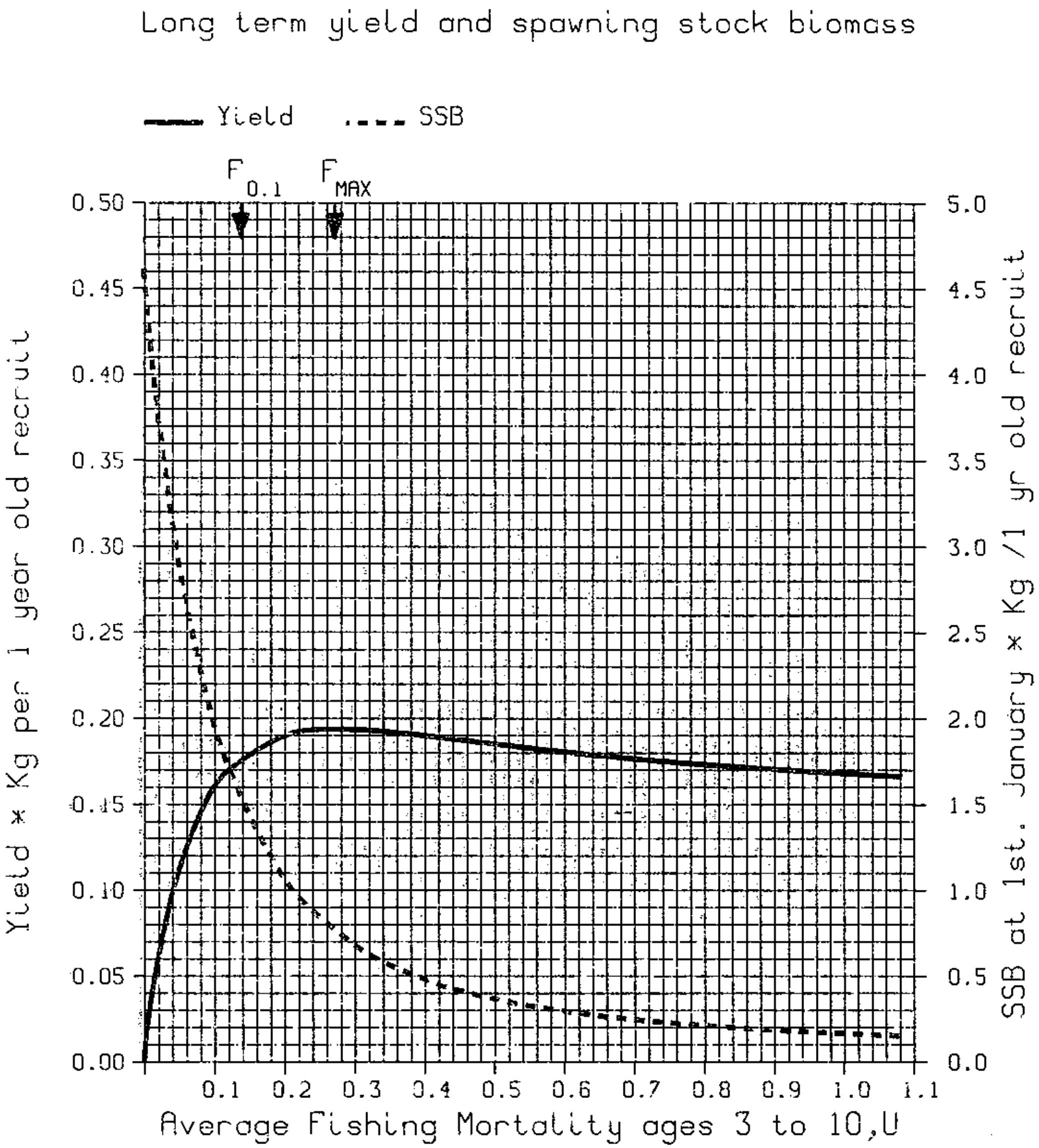
ctd.

FISH STOCK SUMMARY

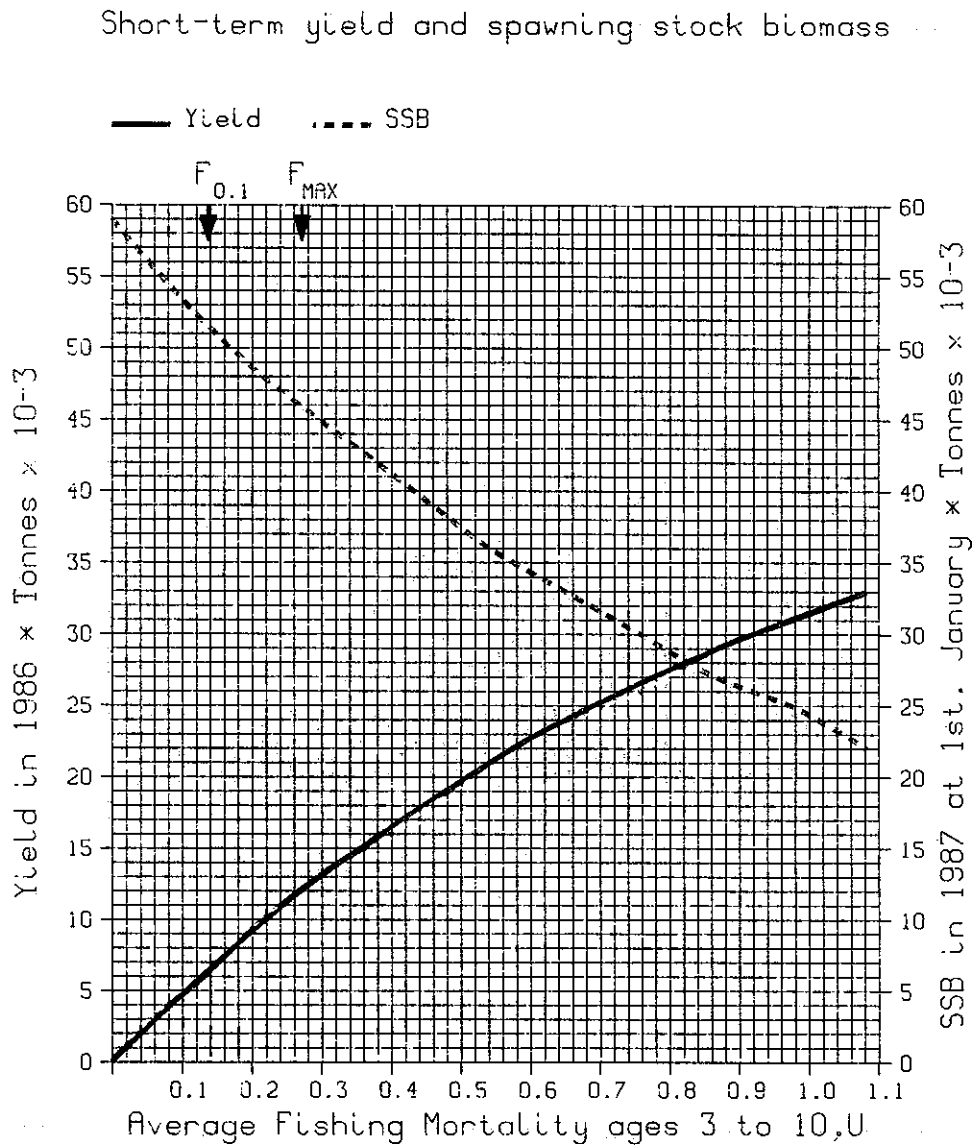
STOCK: Sole – North Sea

05-11-1985

Figure 3.7.1 cont'd



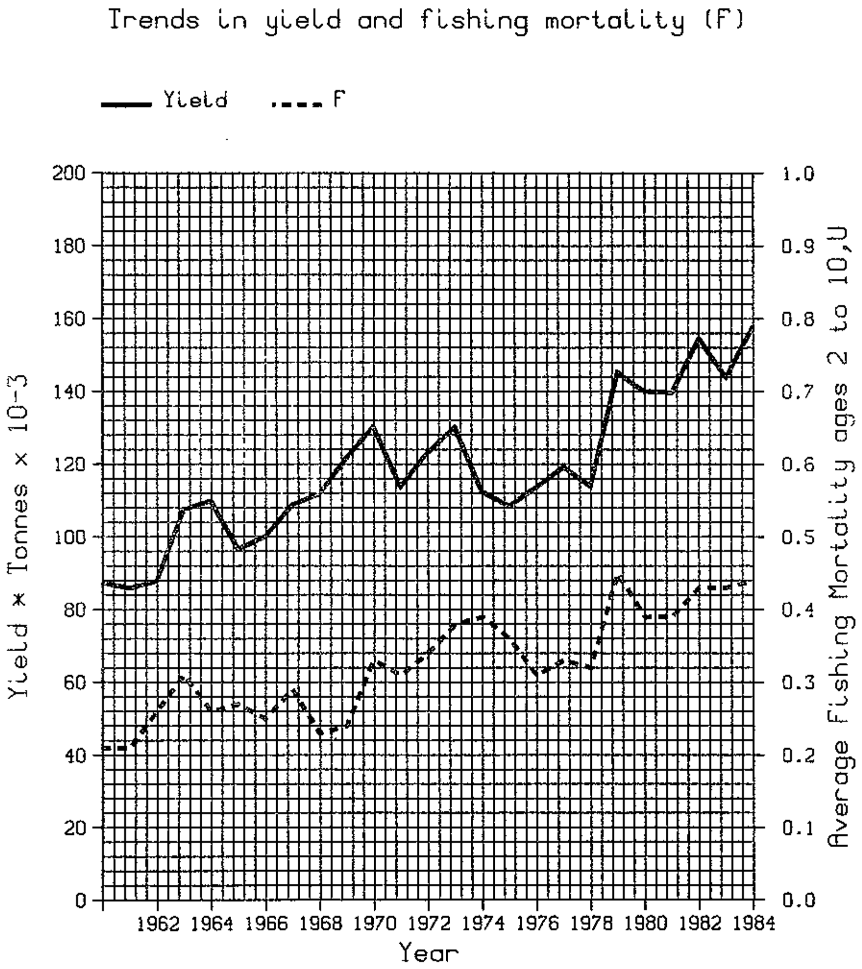
C



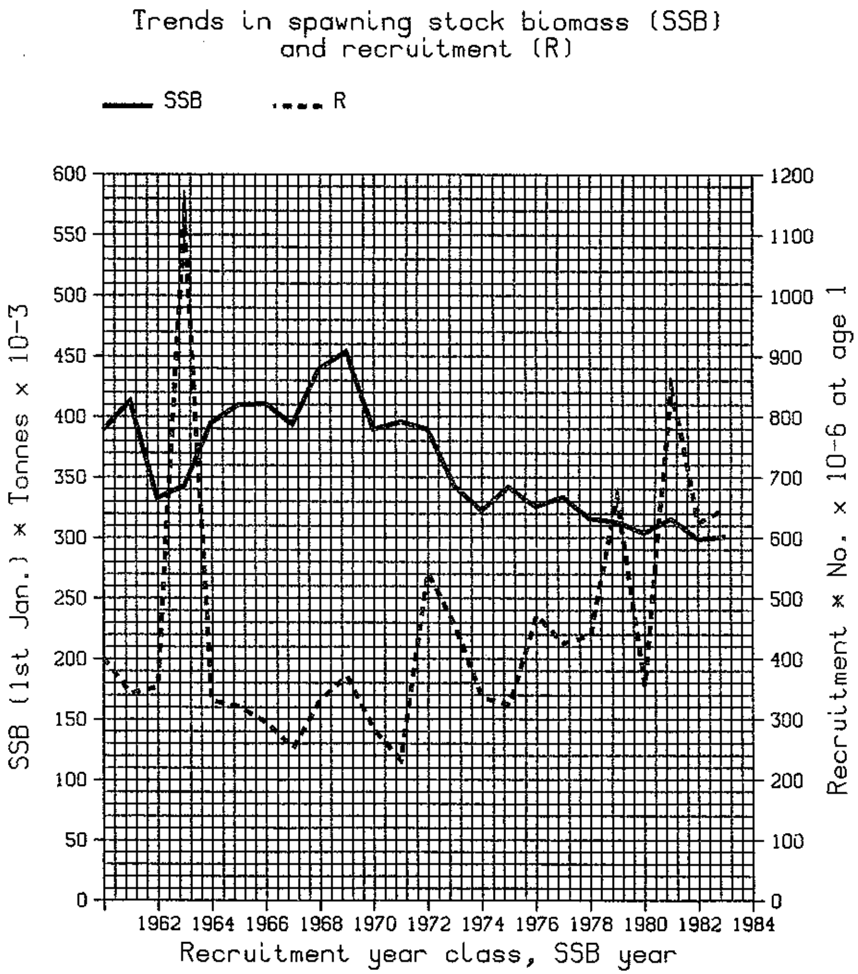
D

Figure 3.7.2

FISH STOCK SUMMARY
STOCK: Plaice - North Sea
12-04-1985



A

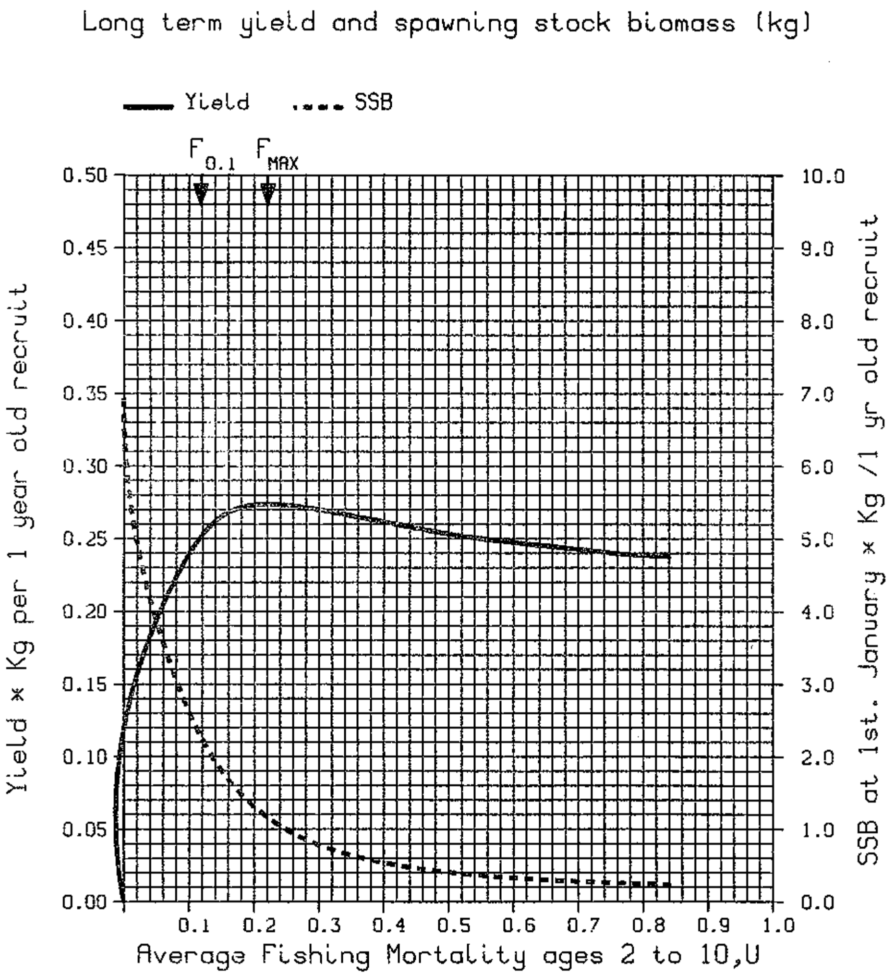


B

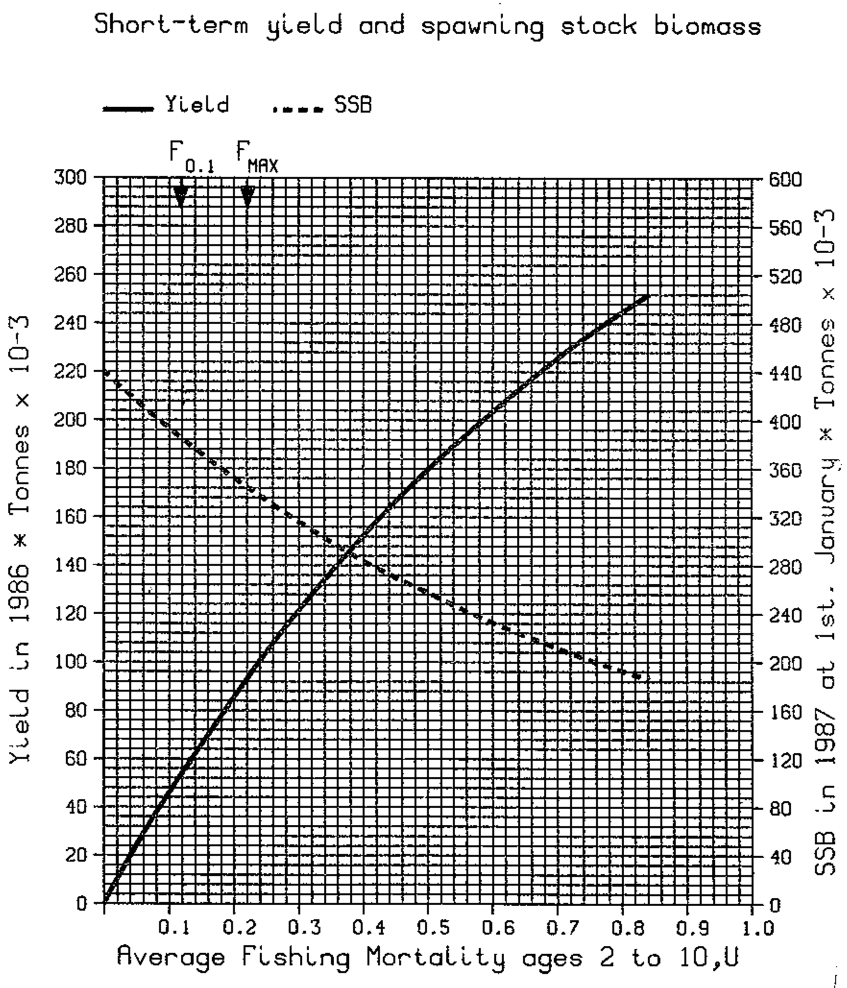
(cont'd)

Figure 3.7.2 cont'd

FISH STOCK SUMMARY
STOCK: Plaice - North Sea
12-04-1985



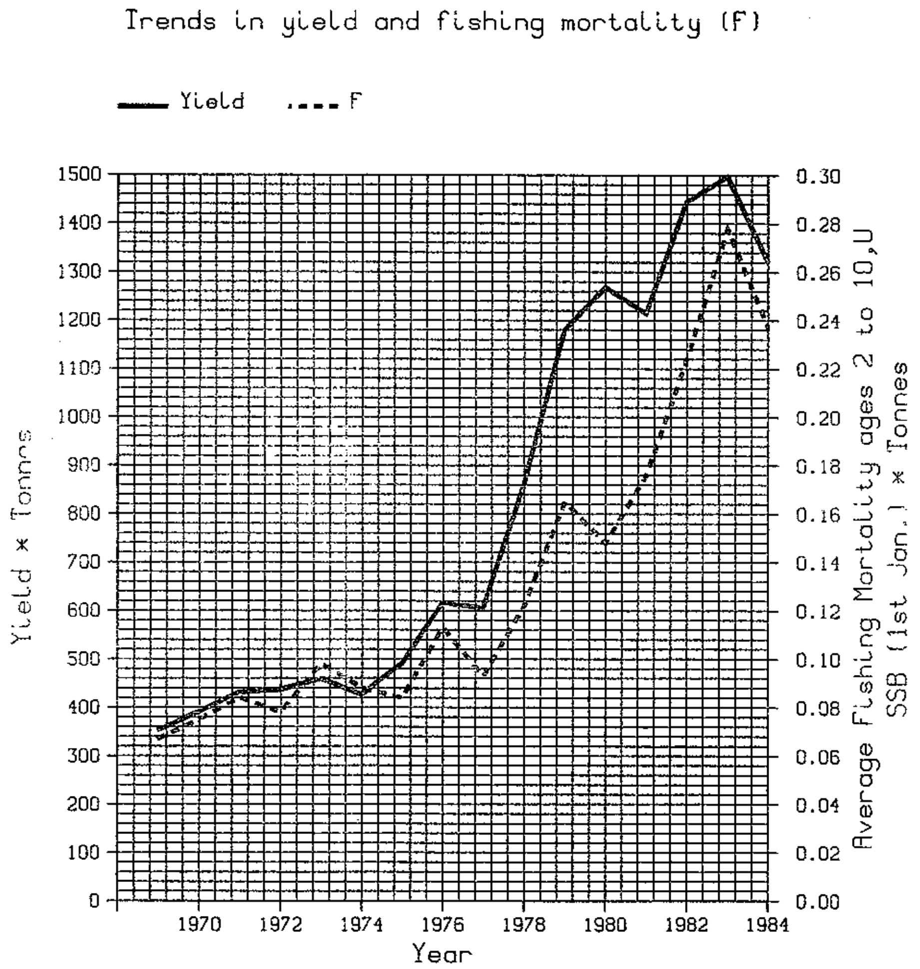
C



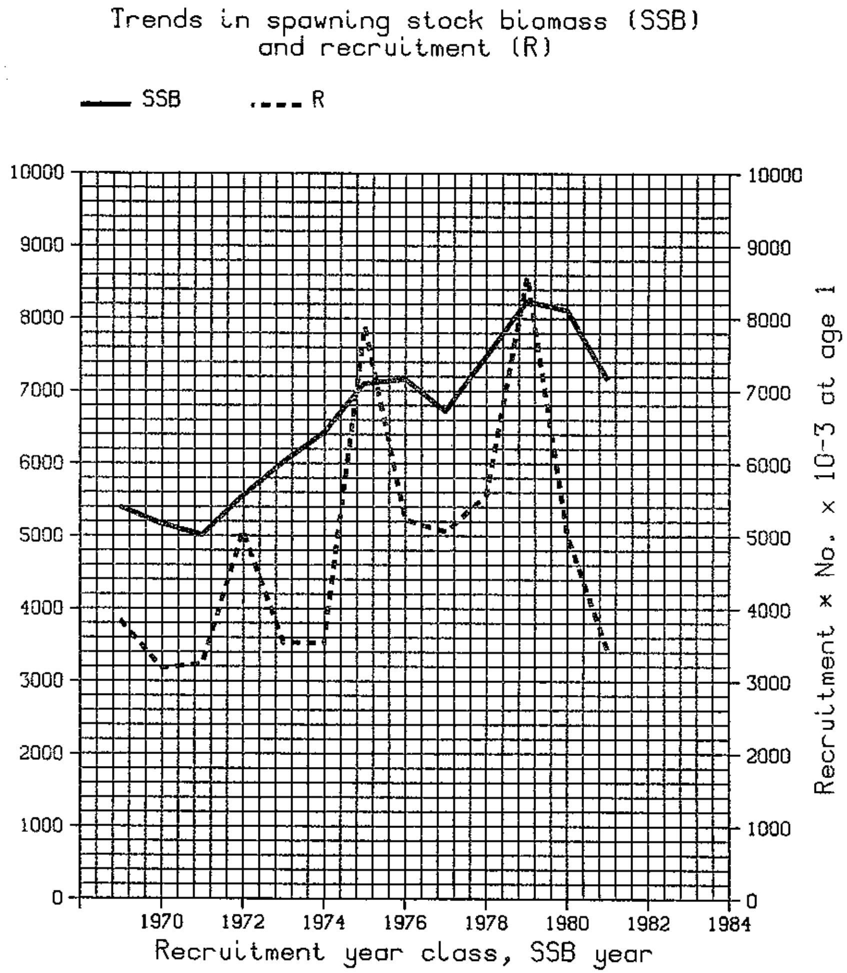
D

Figure 3.7.4

FISH STOCK SUMMARY
STOCK: Sole - VIIE
12-04-1985



A



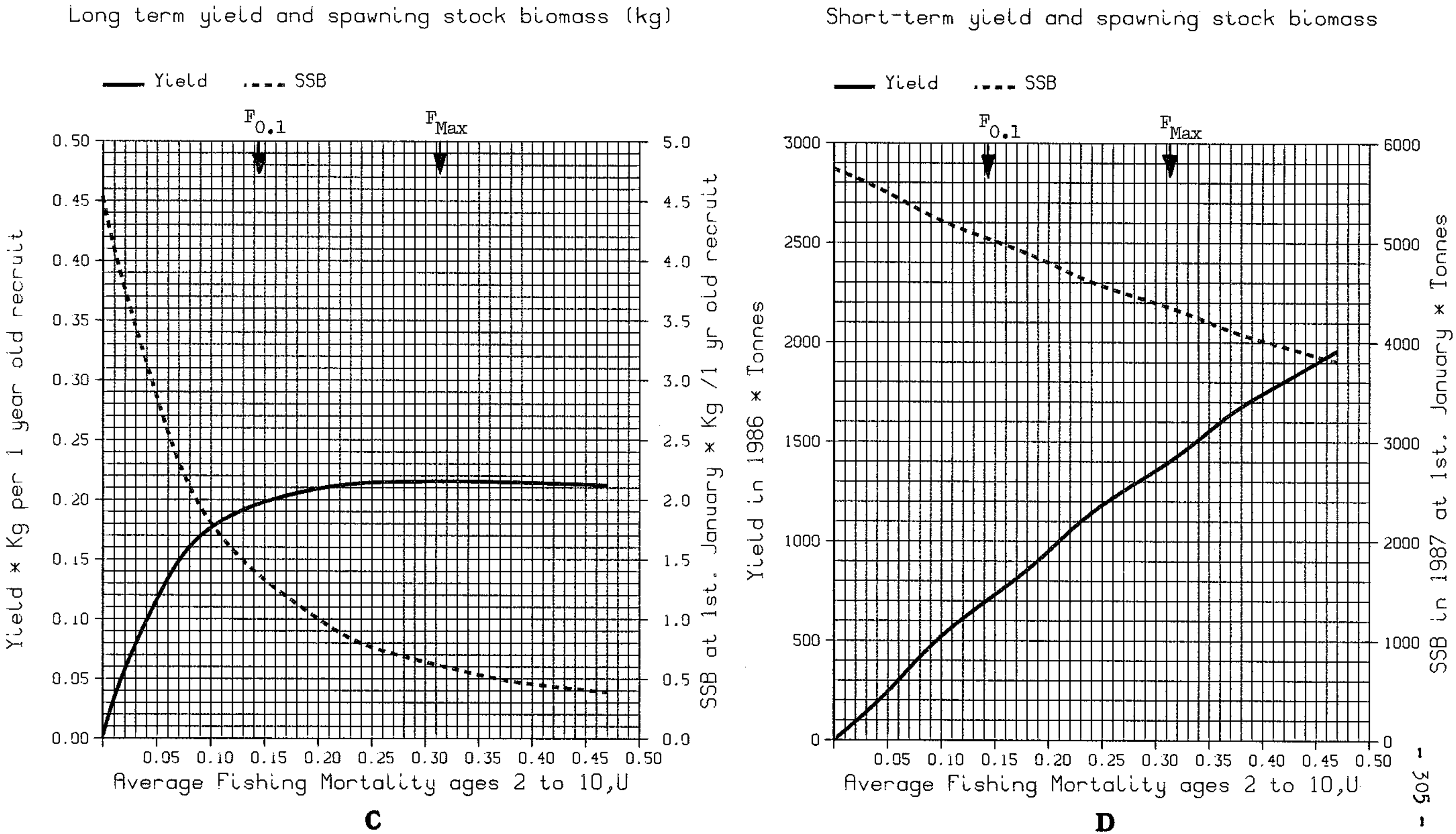
B (cont'd)

Figure 3.7.4 cont'd

FISH STOCK SUMMARY

STOCK: Sole - VIIE

12-04-1985



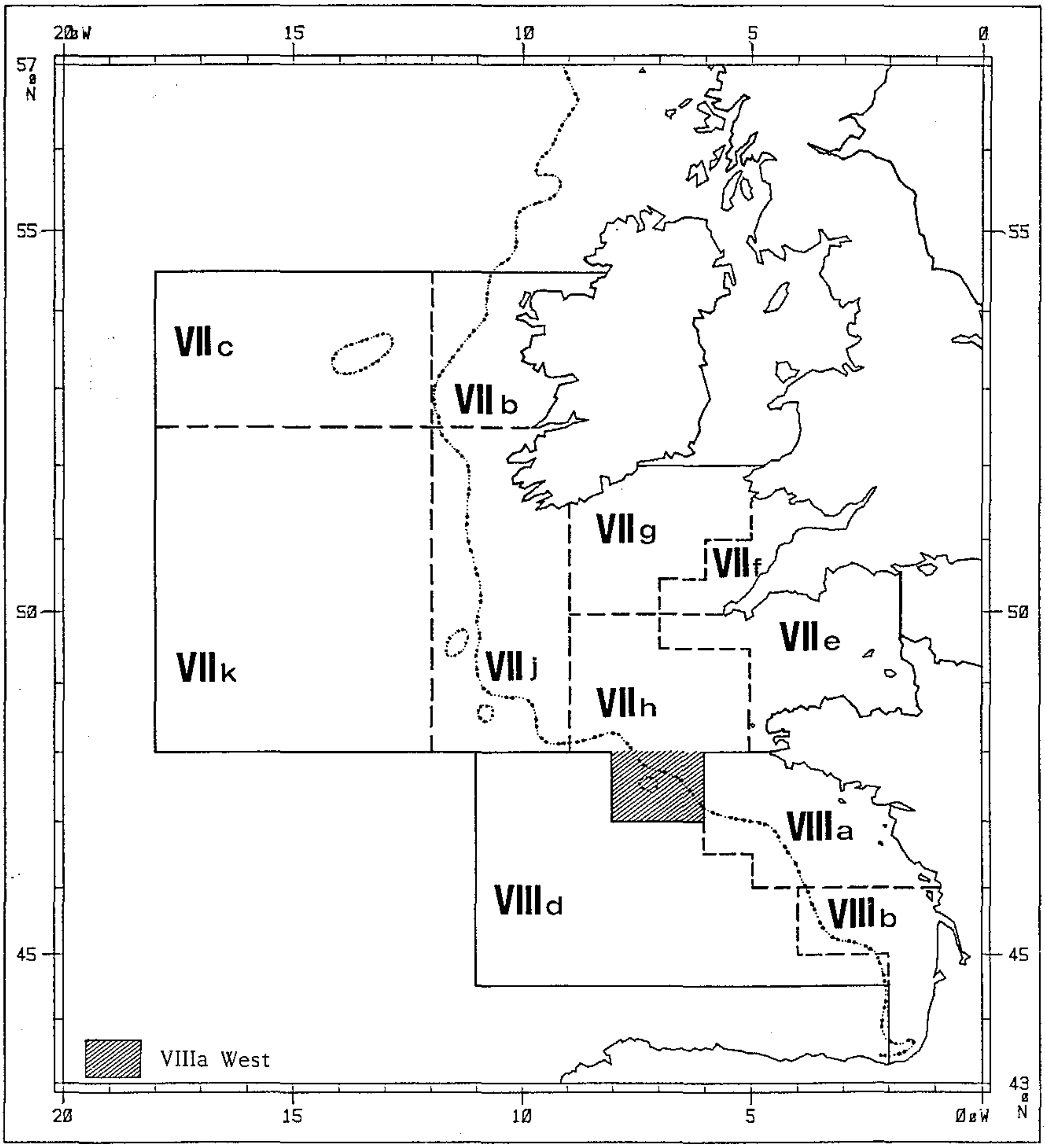


Figure 4.2.1 Proposed limits for the area of competence of the Working Group with approximate contour of the continental shelf (200 m).

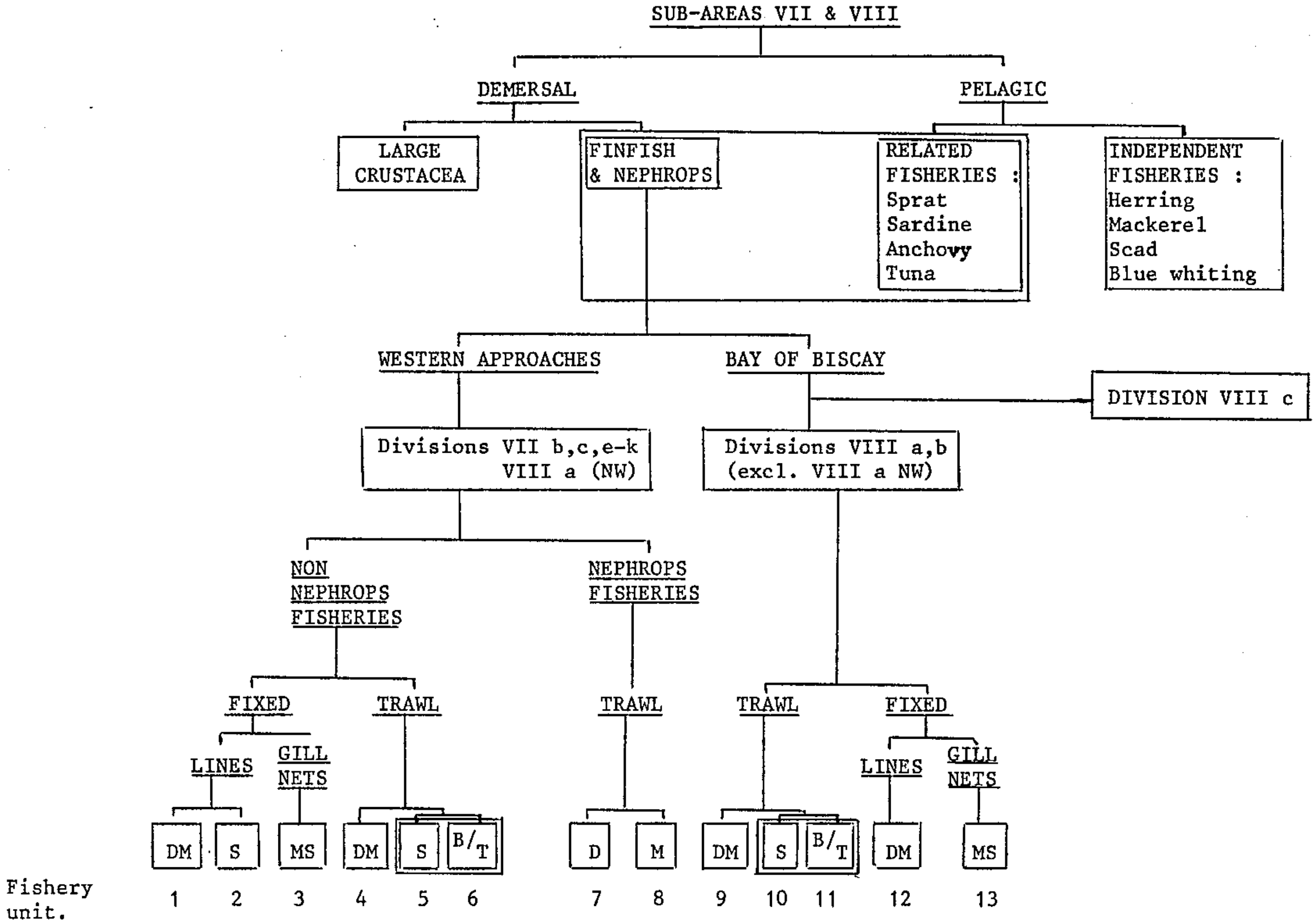
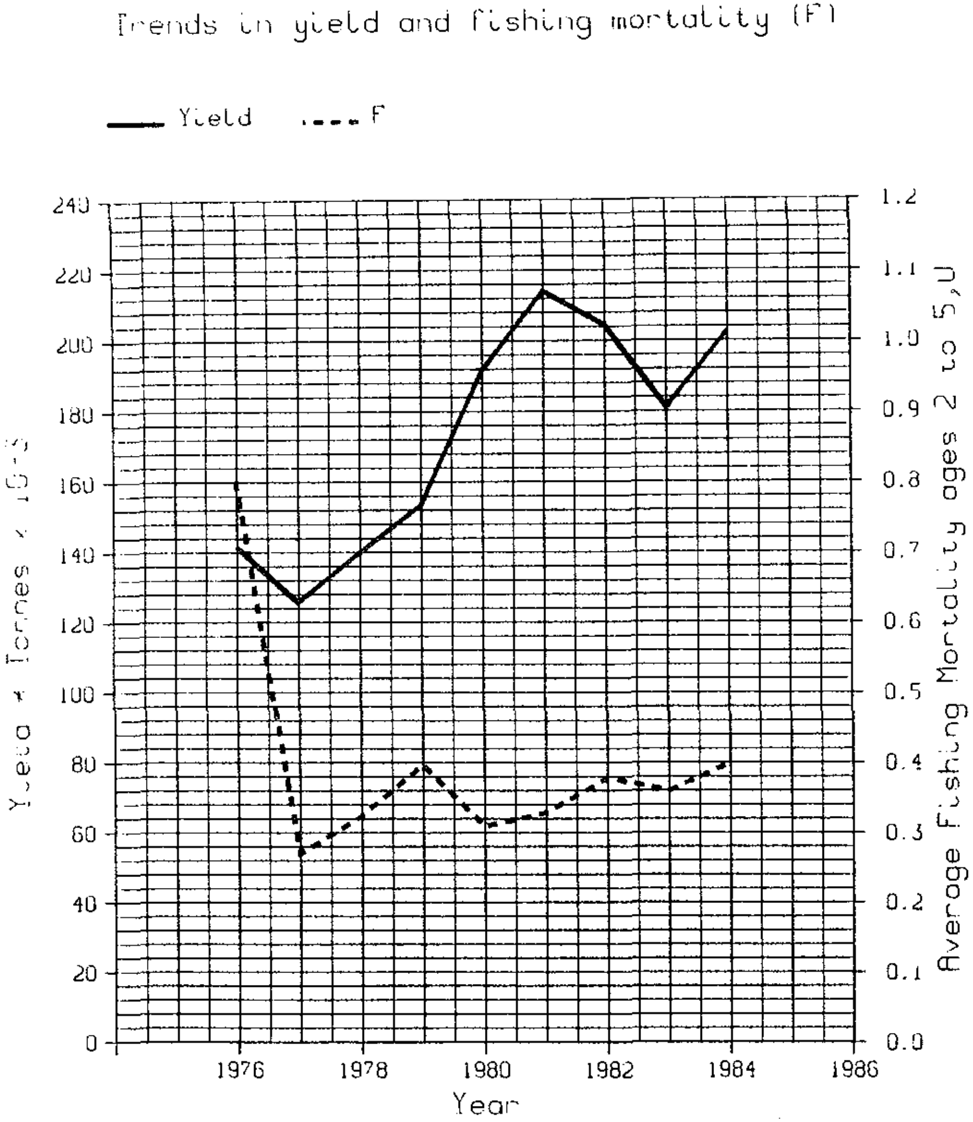


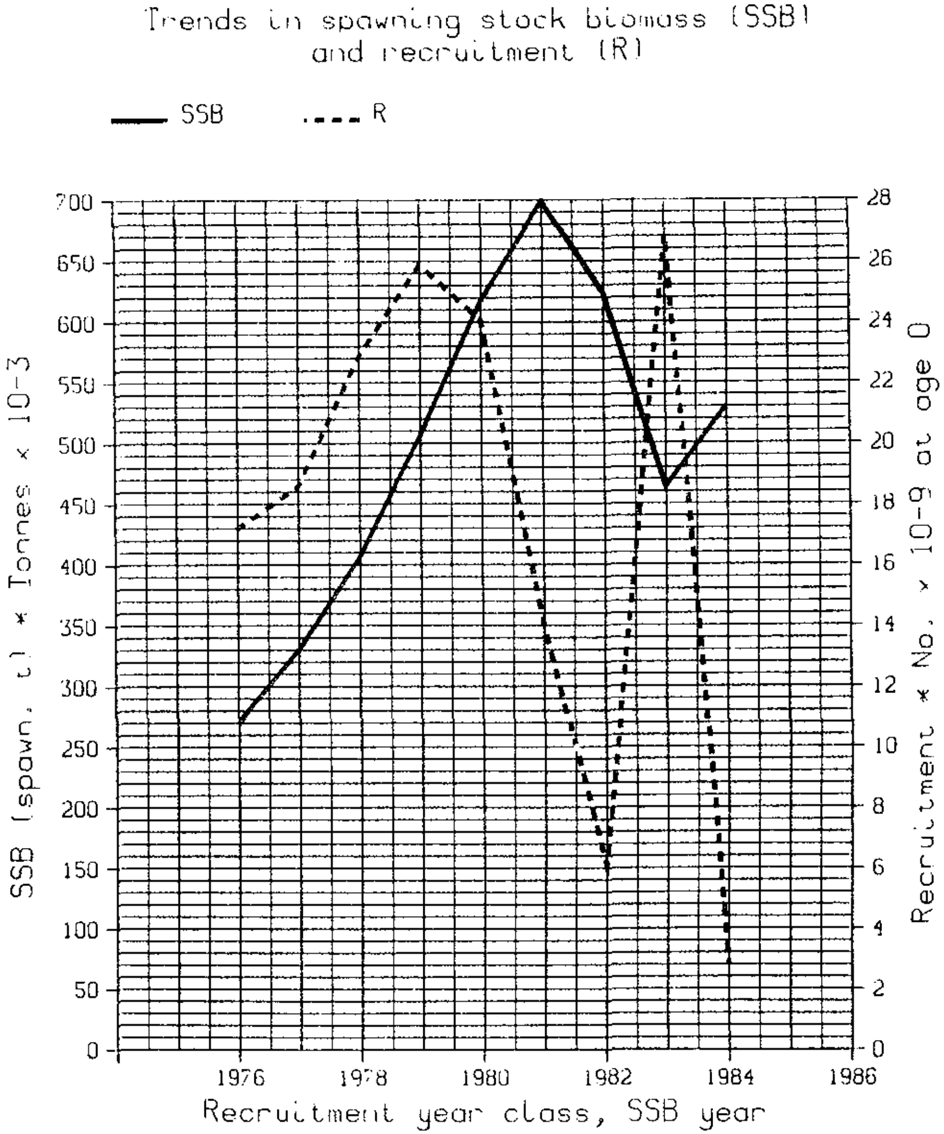
Figure 4.2.2 Summary of fishery units defined in Section 4.2.2. Each closed box represents an identifiable "operational unit of exploitation" which may form an "operational unit of management" also. The first approach to "operational units of assessment" are the units labelled D, M, S and B/T. Double boxes identify units which are very closely related. Abbreviations: B/T=beamtrawl, D=predominantly deeper than 200 m, S=predominantly less than 100m, M=predominantly between D and S.

FISH STOCK SUMMARY
STOCK: SARDINE VIIIC AND IXA
23-09-1985

Figure 5.1.3



A

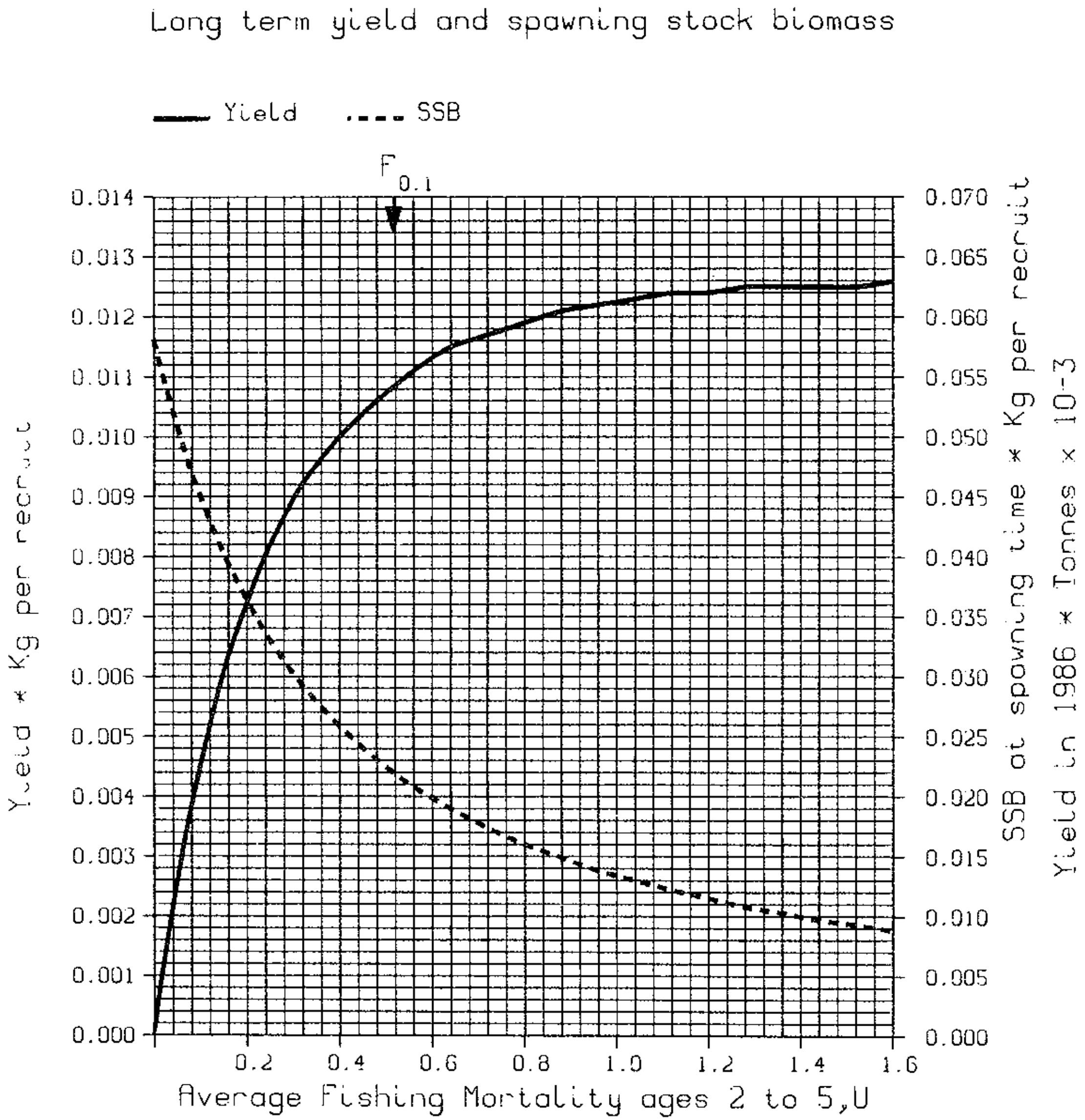


B

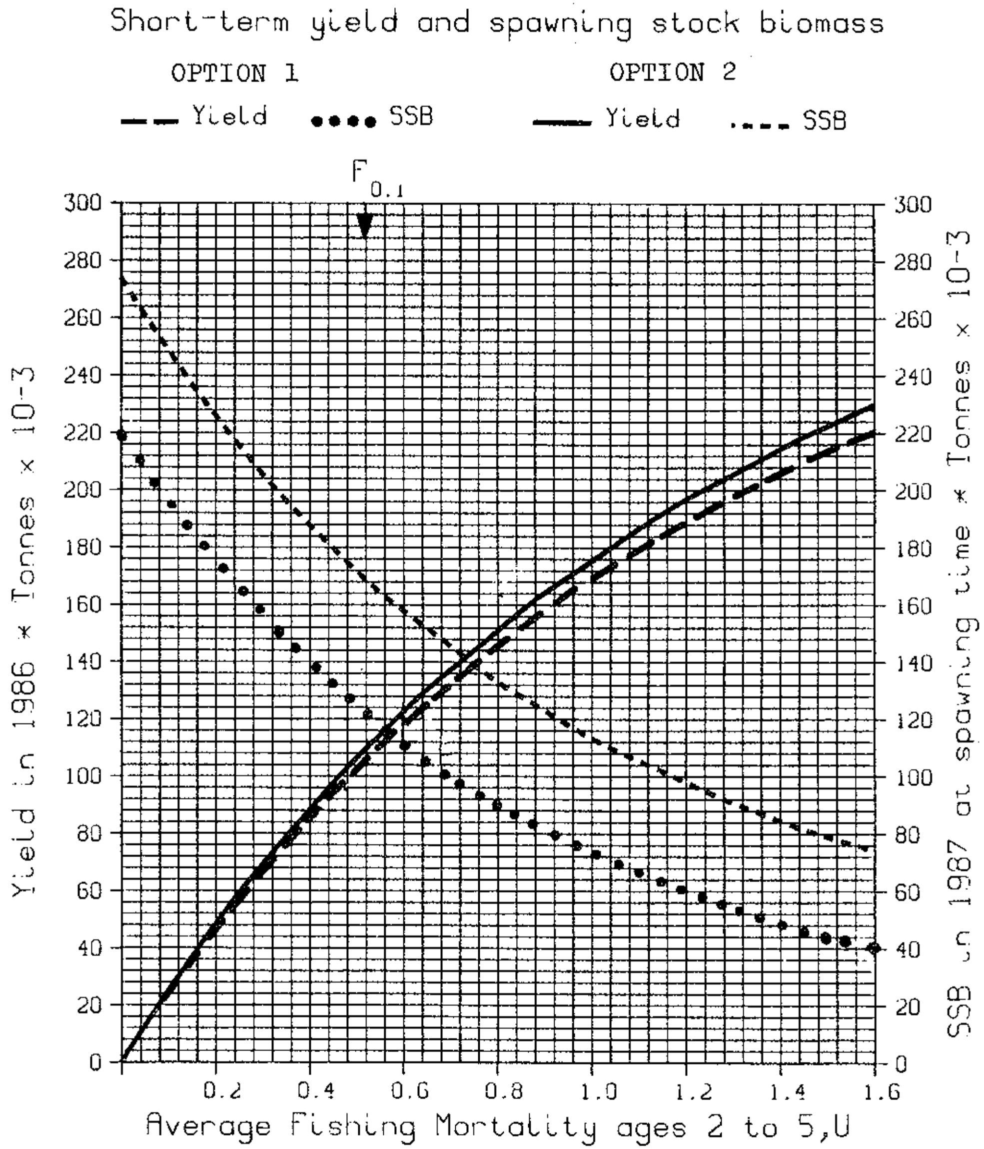
Contd.

Figure 5.1.3 cont'd

FISH STOCK SUMMARY
STOCK: SARDINE VIIIC AND IXA
23-09-1985



C



D

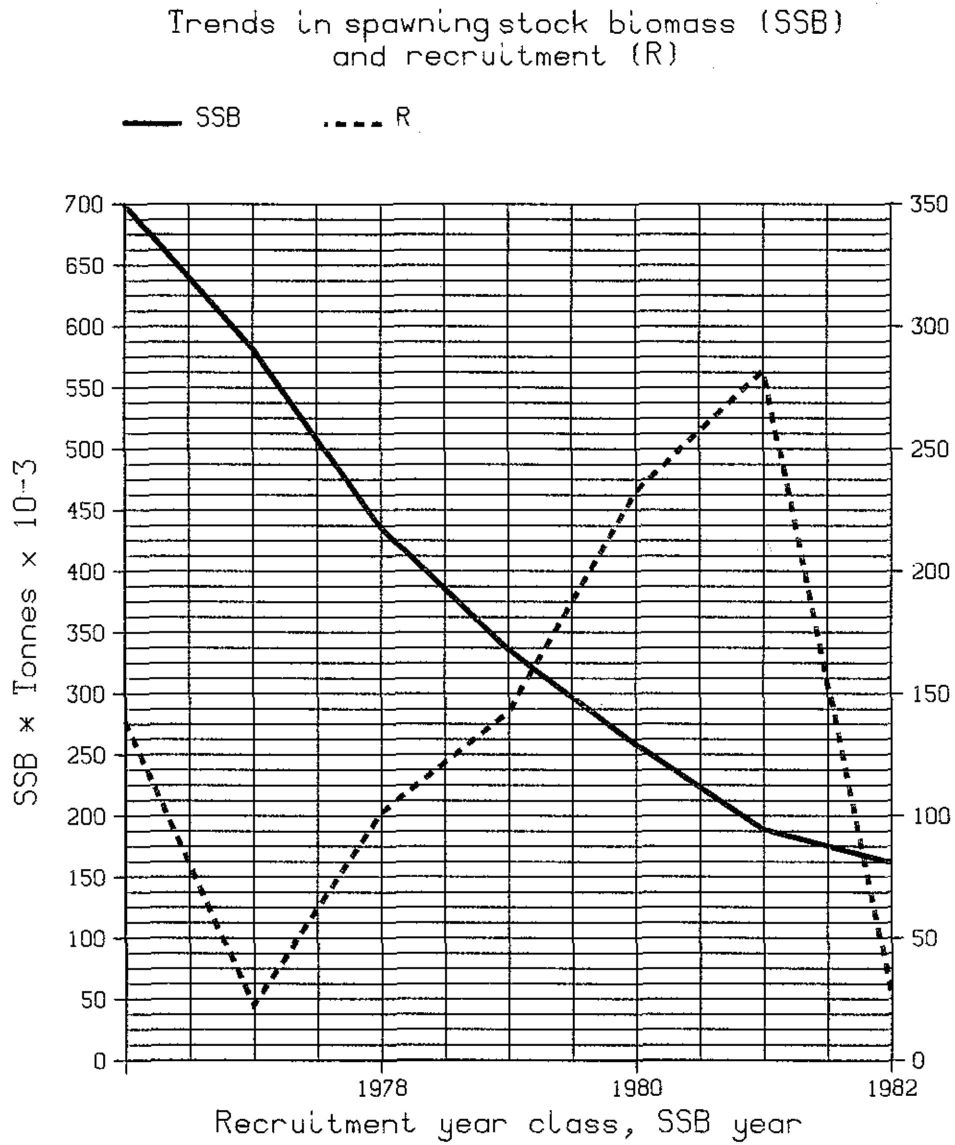
FISH STOCK SUMMARY

STOCK: Mackerel North Sea

6-3-1985

Figure 6.1.3

A



B

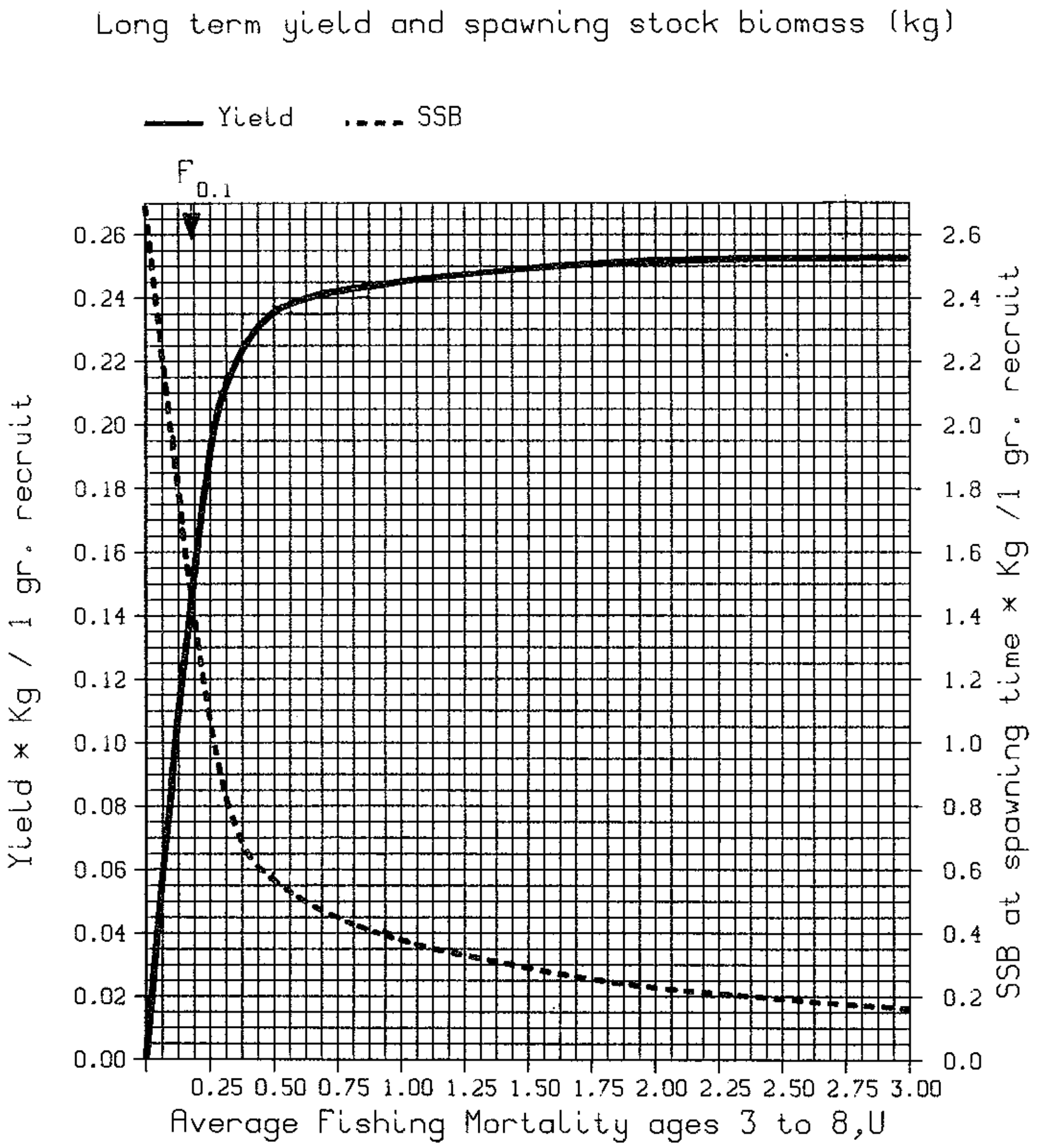
Continued..

FISH STOCK SUMMARY

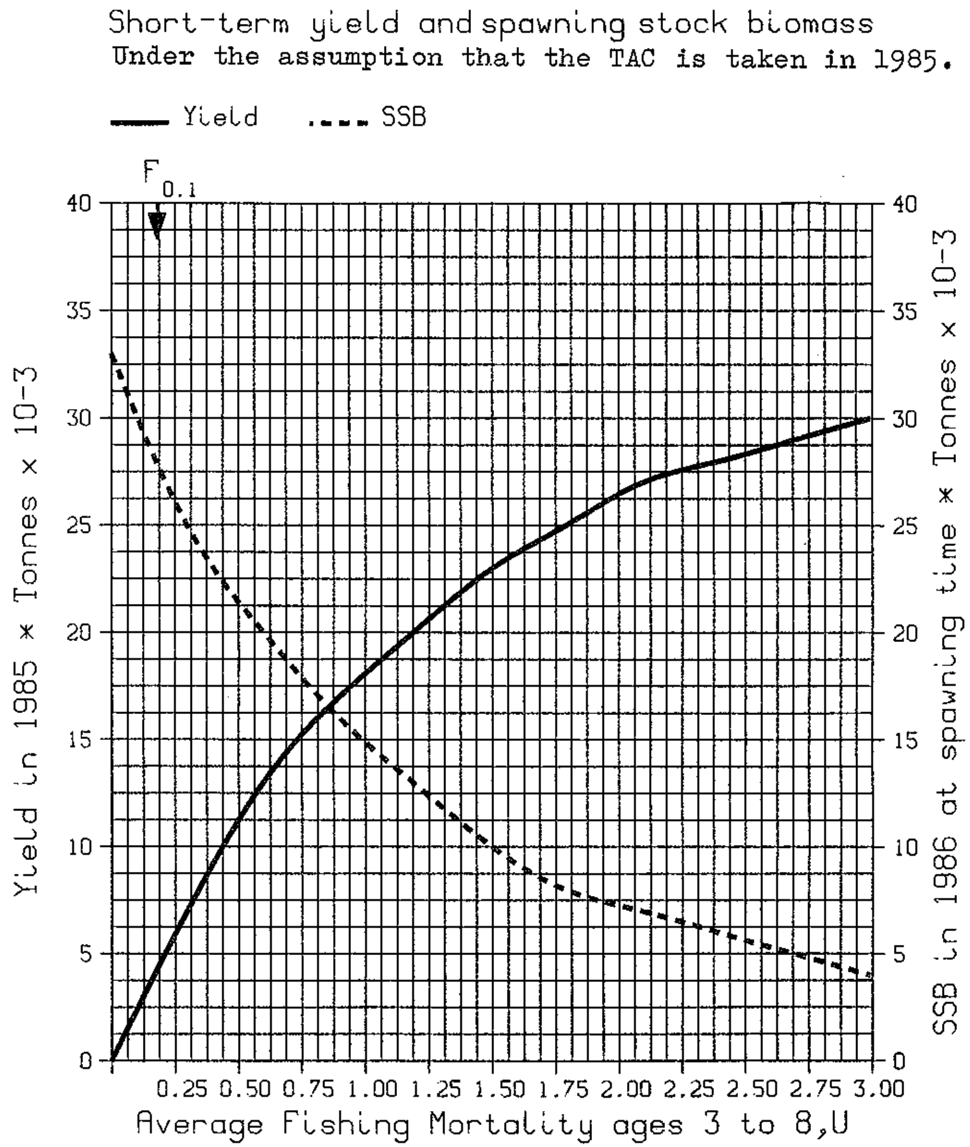
STOCK: Mackerel North Sea

6-3-1985

Figure 6.1.3 cont'd



C

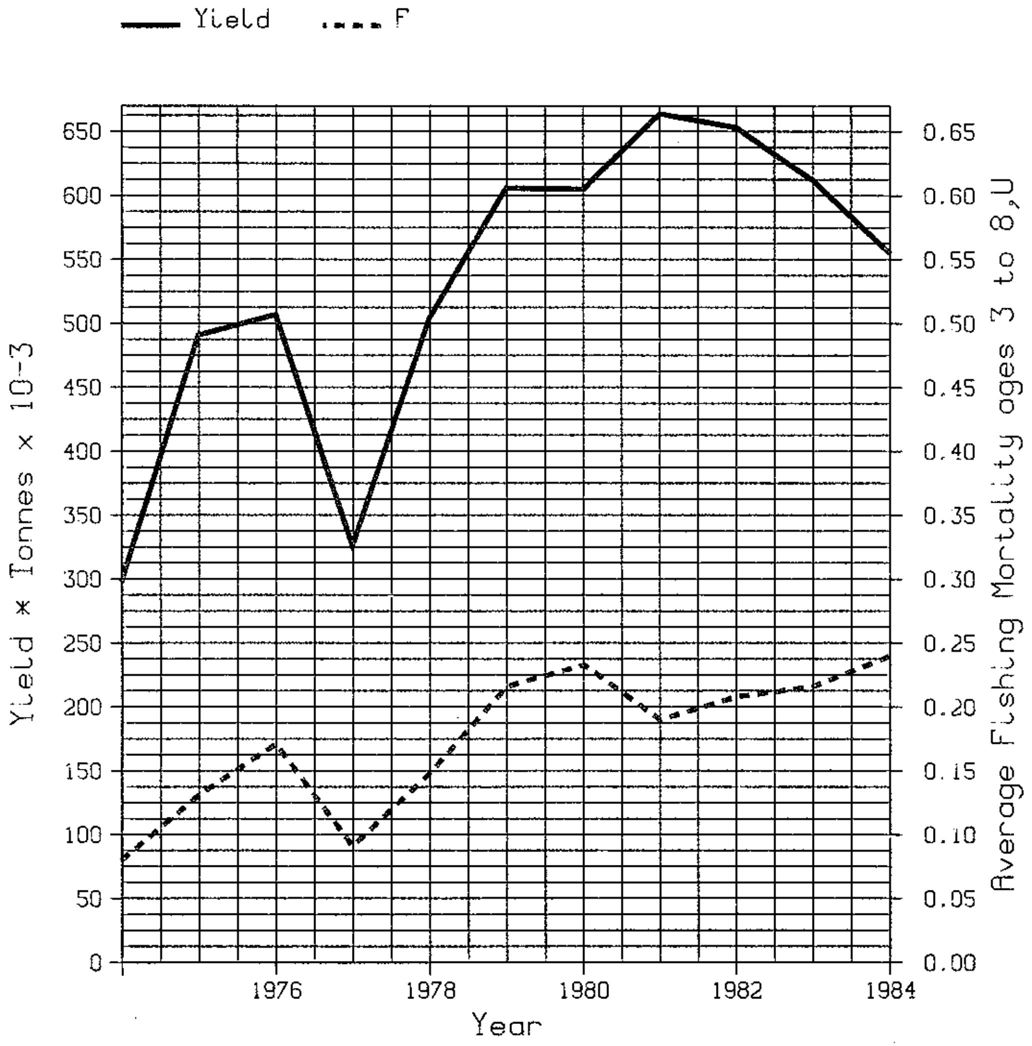


D

FISH STOCK SUMMARY
STOCK: Western Mackerel
5-3-1985

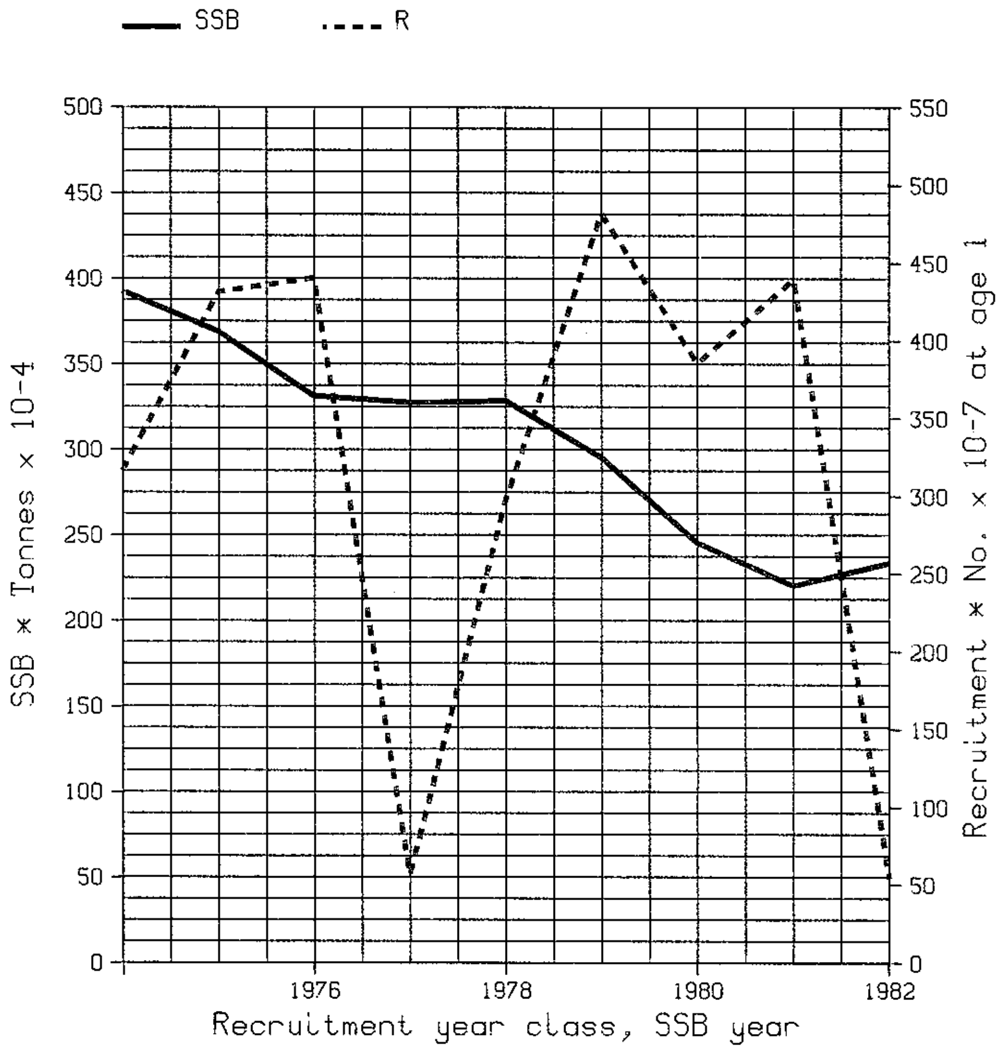
Figure 6.1.4

Trends in yield and fishing mortality (F)



A

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



B

/Continued

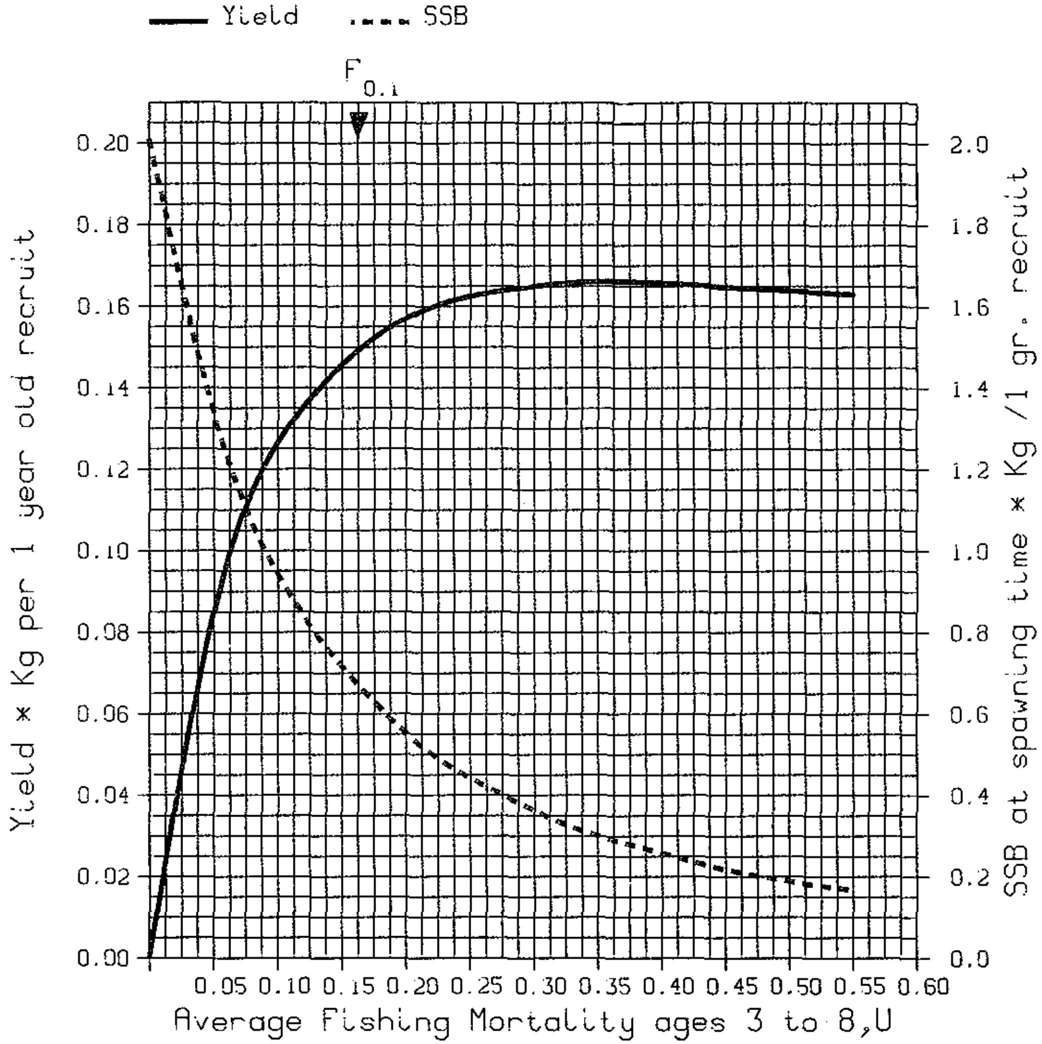
FISH STOCK SUMMARY

STOCK: Western Mackerel

5-3-1985

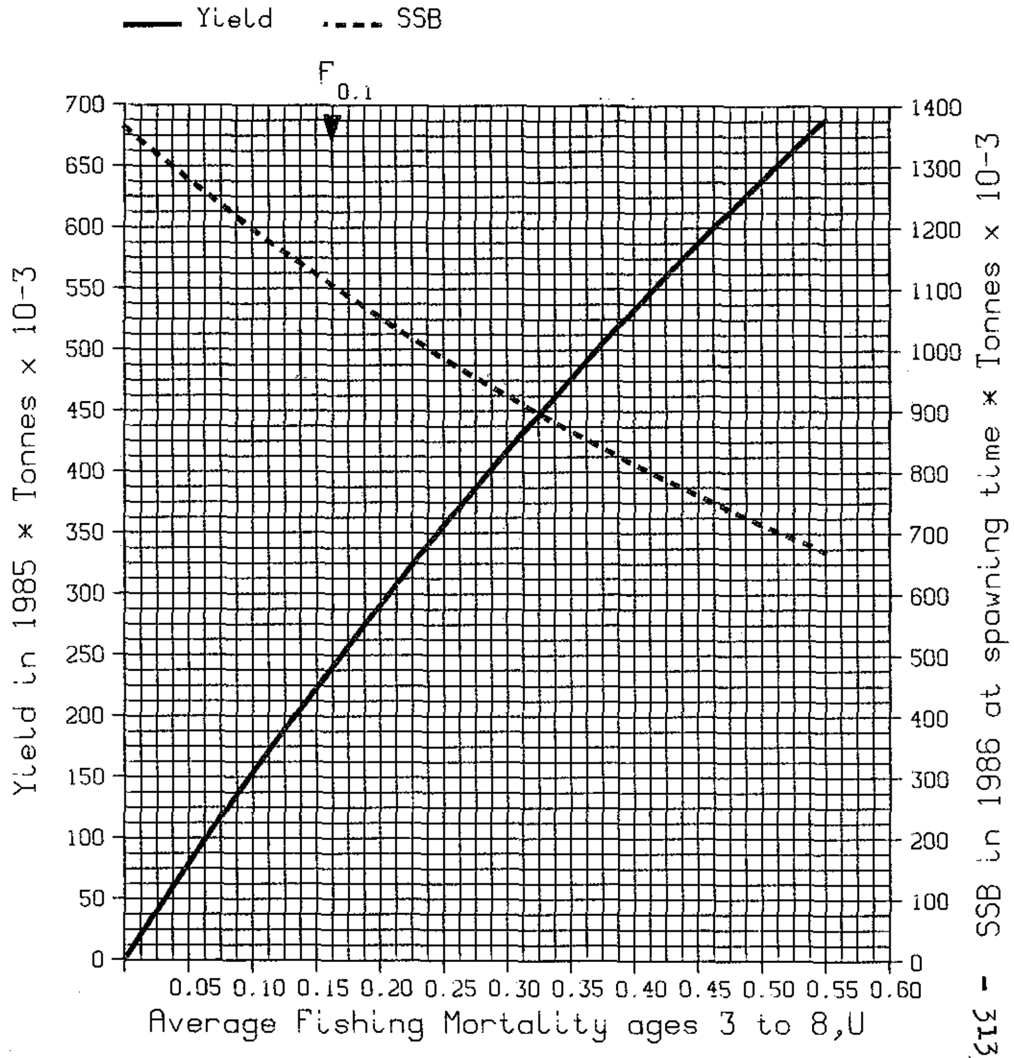
Figure 6.1.4 cont'd

Long term yield and spawning stock biomass (kg)



C

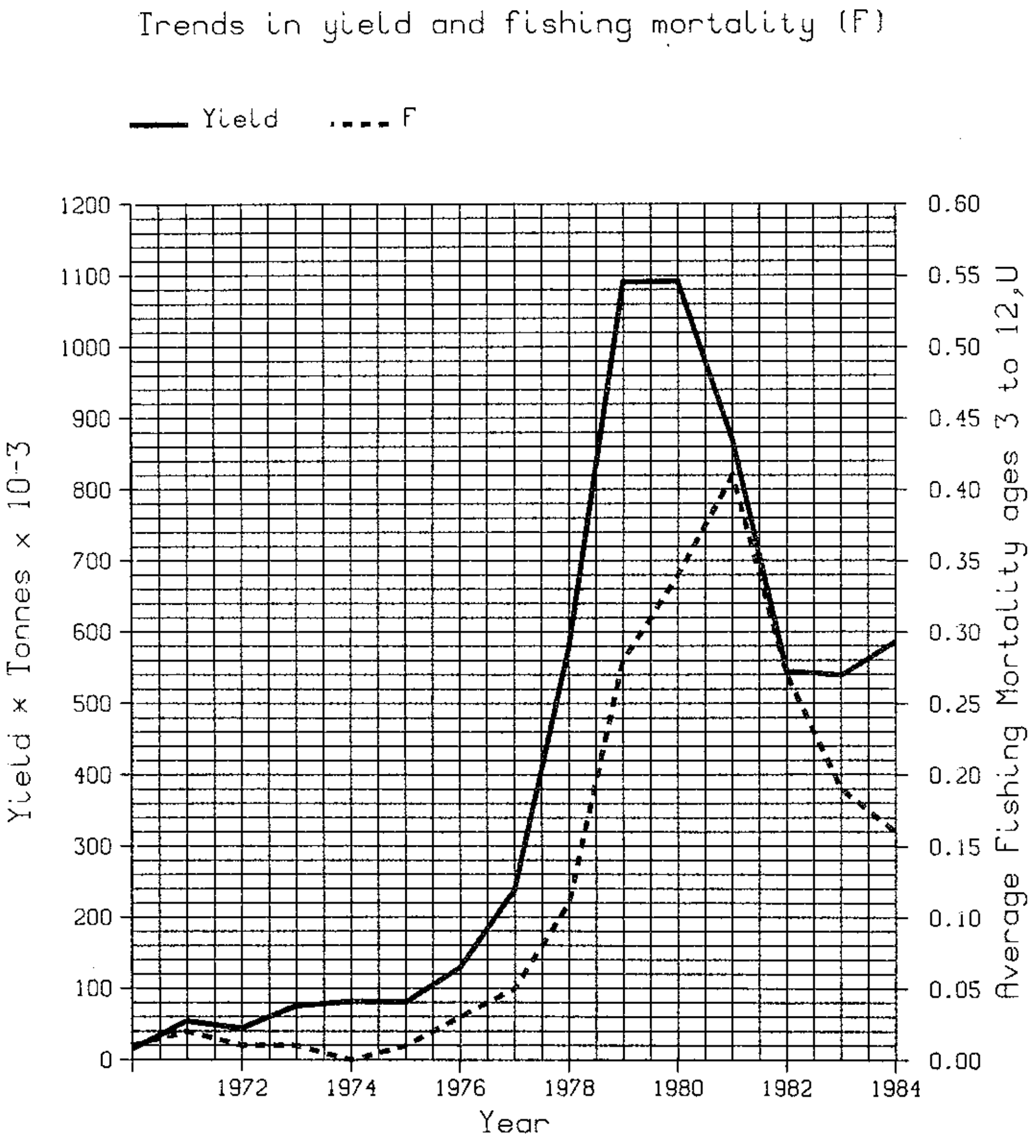
Short-term yield and spawning stock biomass



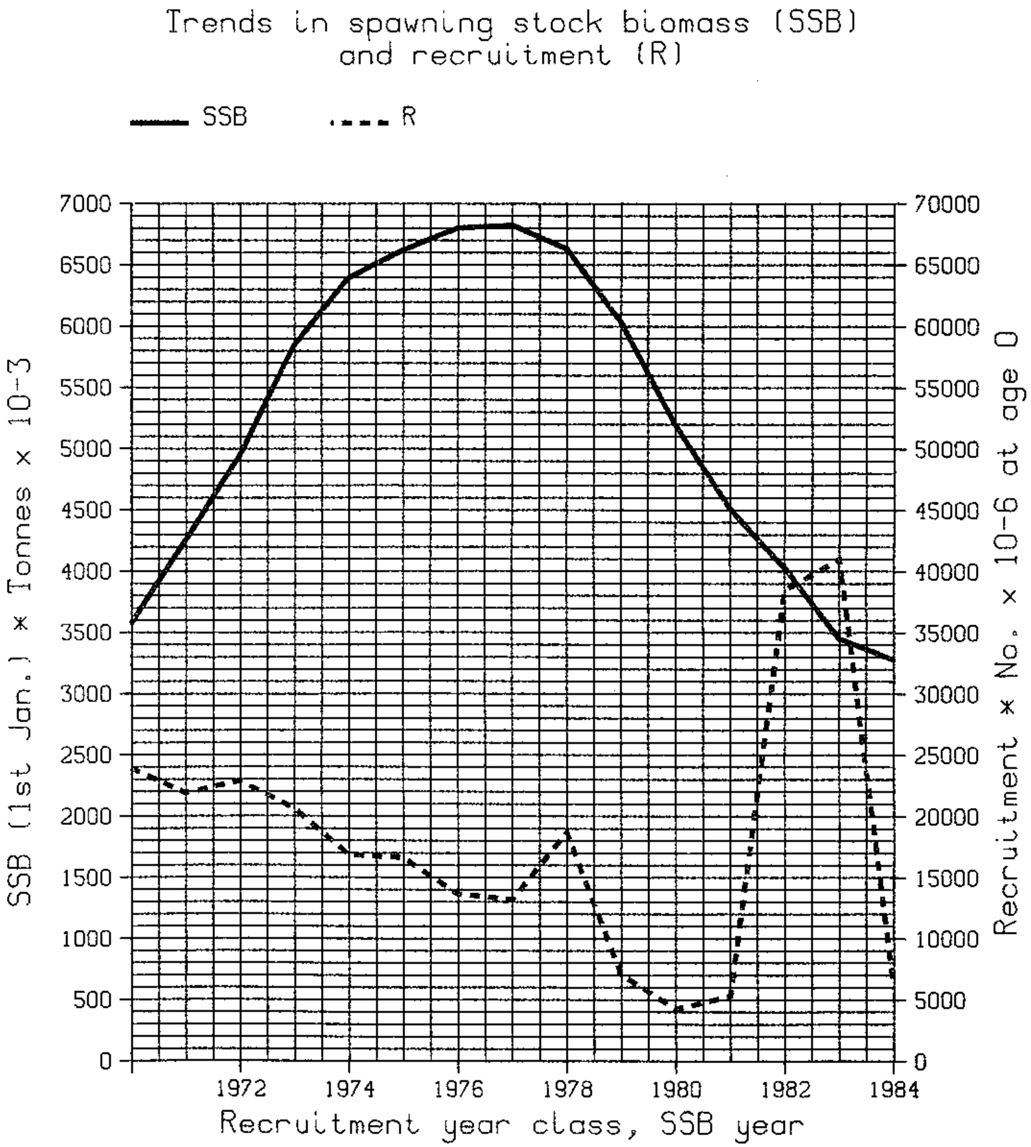
D

Figure 6.2.1

FISH STOCK SUMMARY
STOCK: BLUE WHITING - NORTHERN
10-10-1985



A

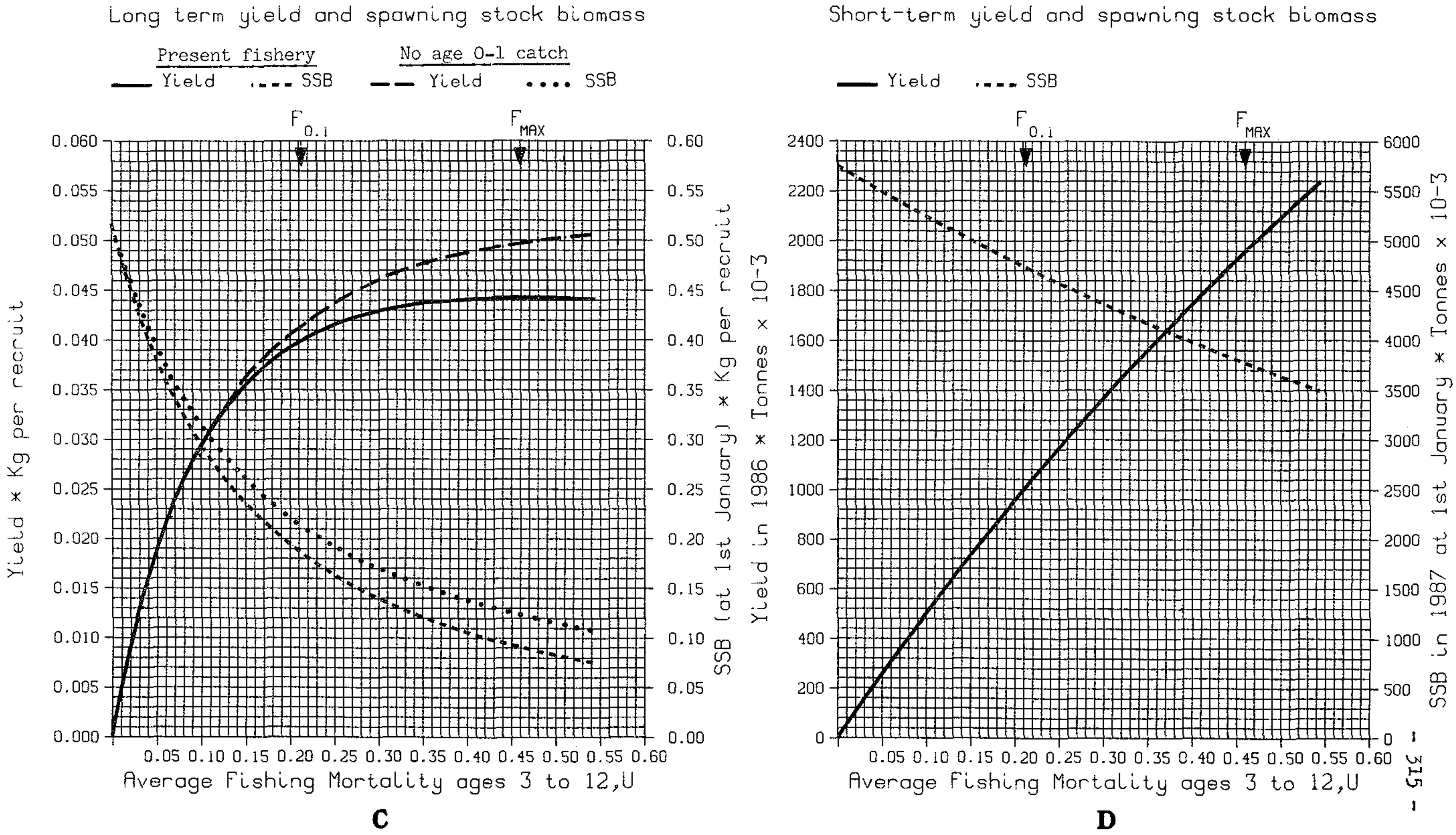


B

(cont'd)

FISH STOCK SUMMARY
STOCK: BLUE WHITING - NORTHERN
10-10-1985

Figure 6.2.1 cont'd



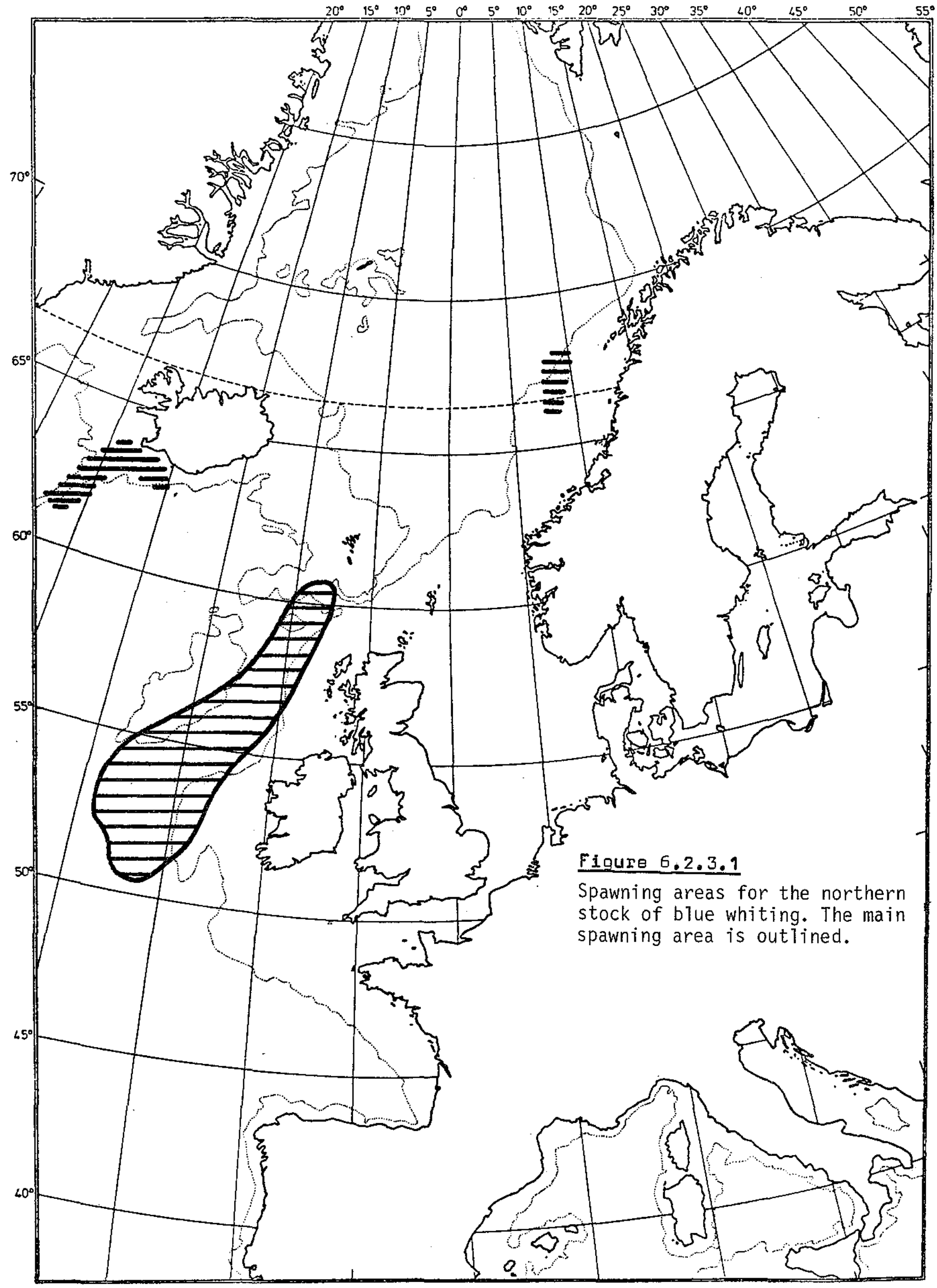


Figure 6.2.3.1

Spawning areas for the northern stock of blue whiting. The main spawning area is outlined.

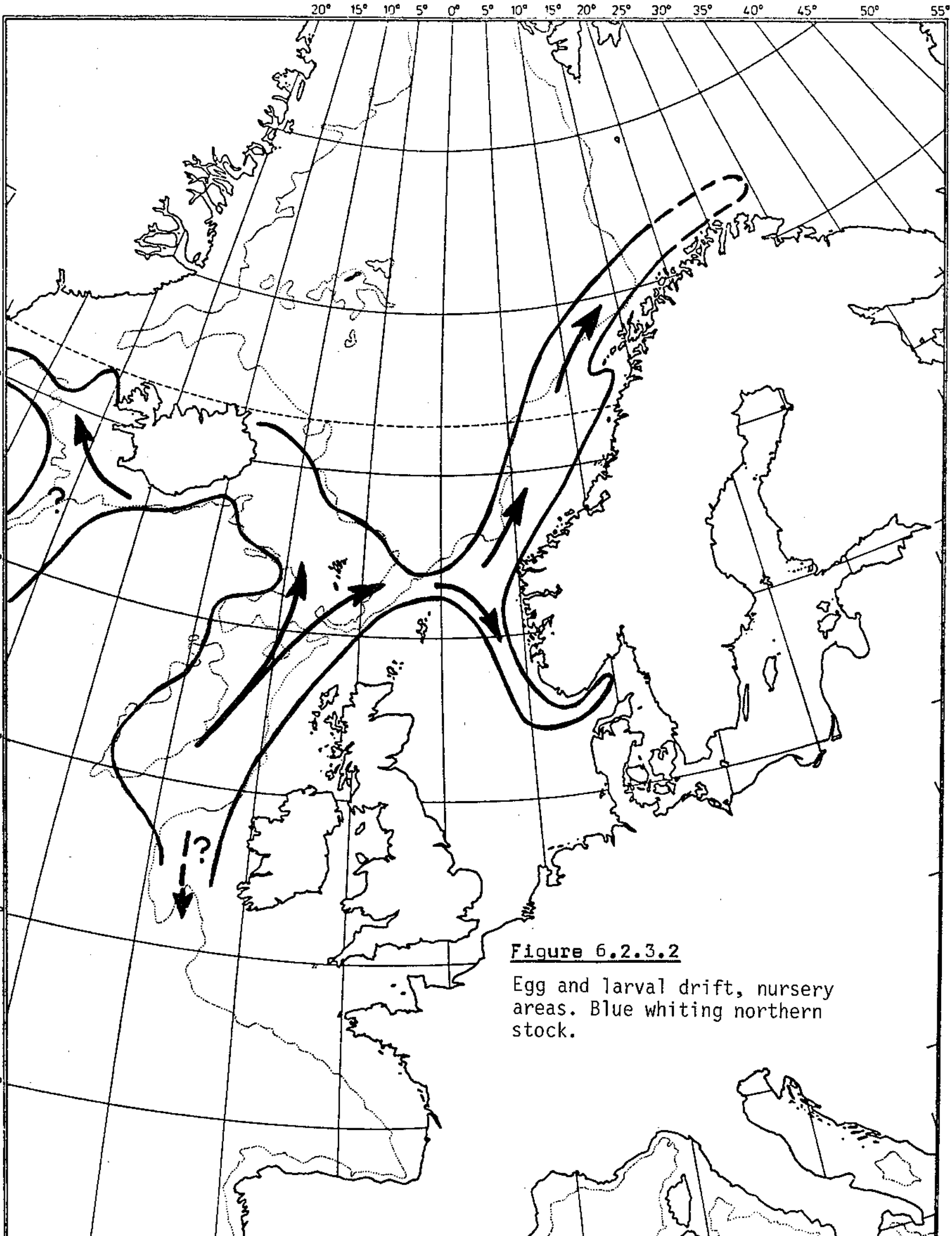


Figure 6.2.3.2

Egg and larval drift, nursery areas. Blue whiting northern stock.

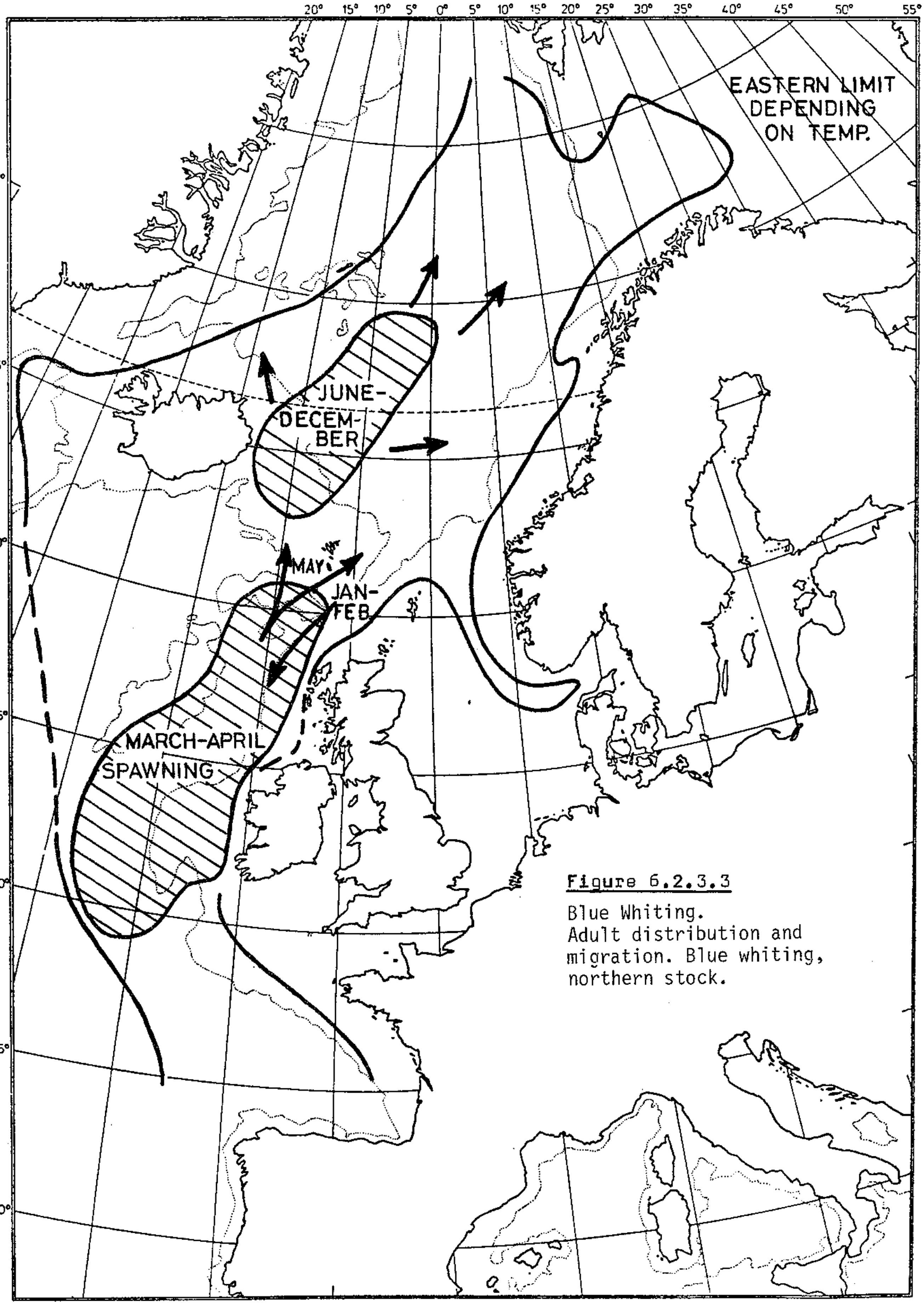
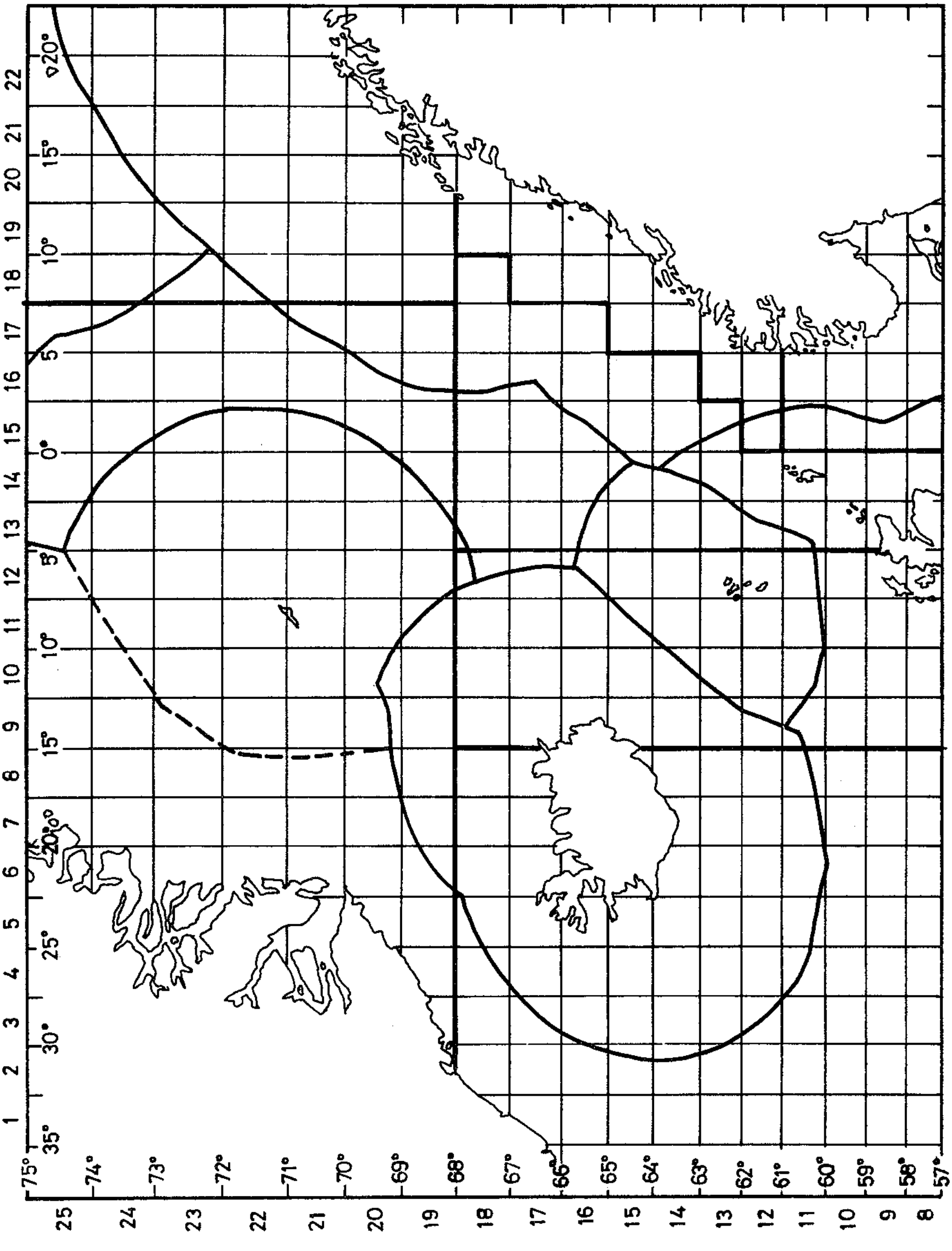


Figure 6.2.3.3

Blue Whiting.
Adult distribution and migration. Blue whiting, northern stock.

Figure 6.2.3.4 Approximate areas of national fisheries jurisdiction of NEAFC contracting parties assumed by the Blue Whiting Assessment Working Group. This chart does not purport to represent an agreed or definitive illustration of such areas and is not to be taken as having any legal status.



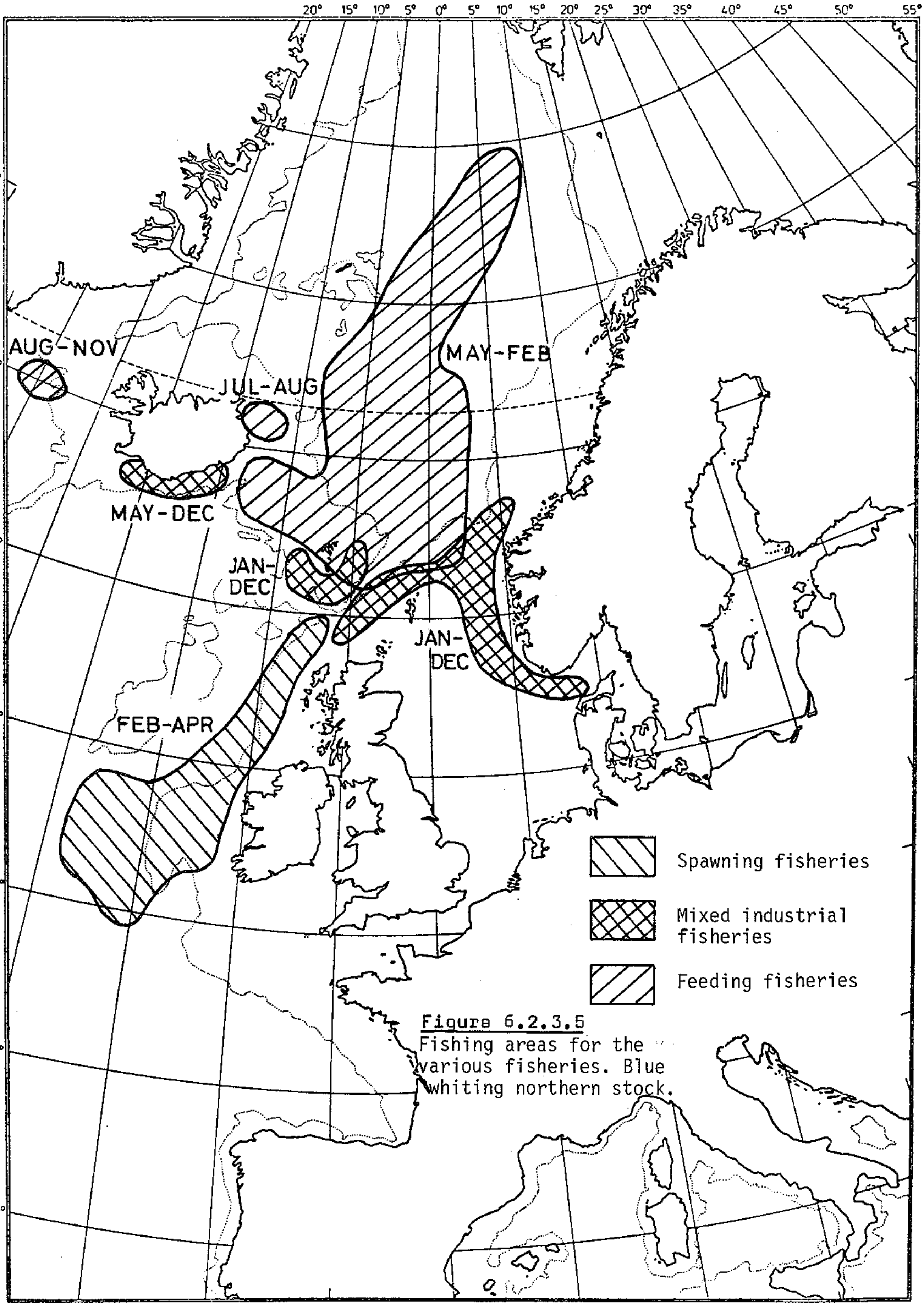
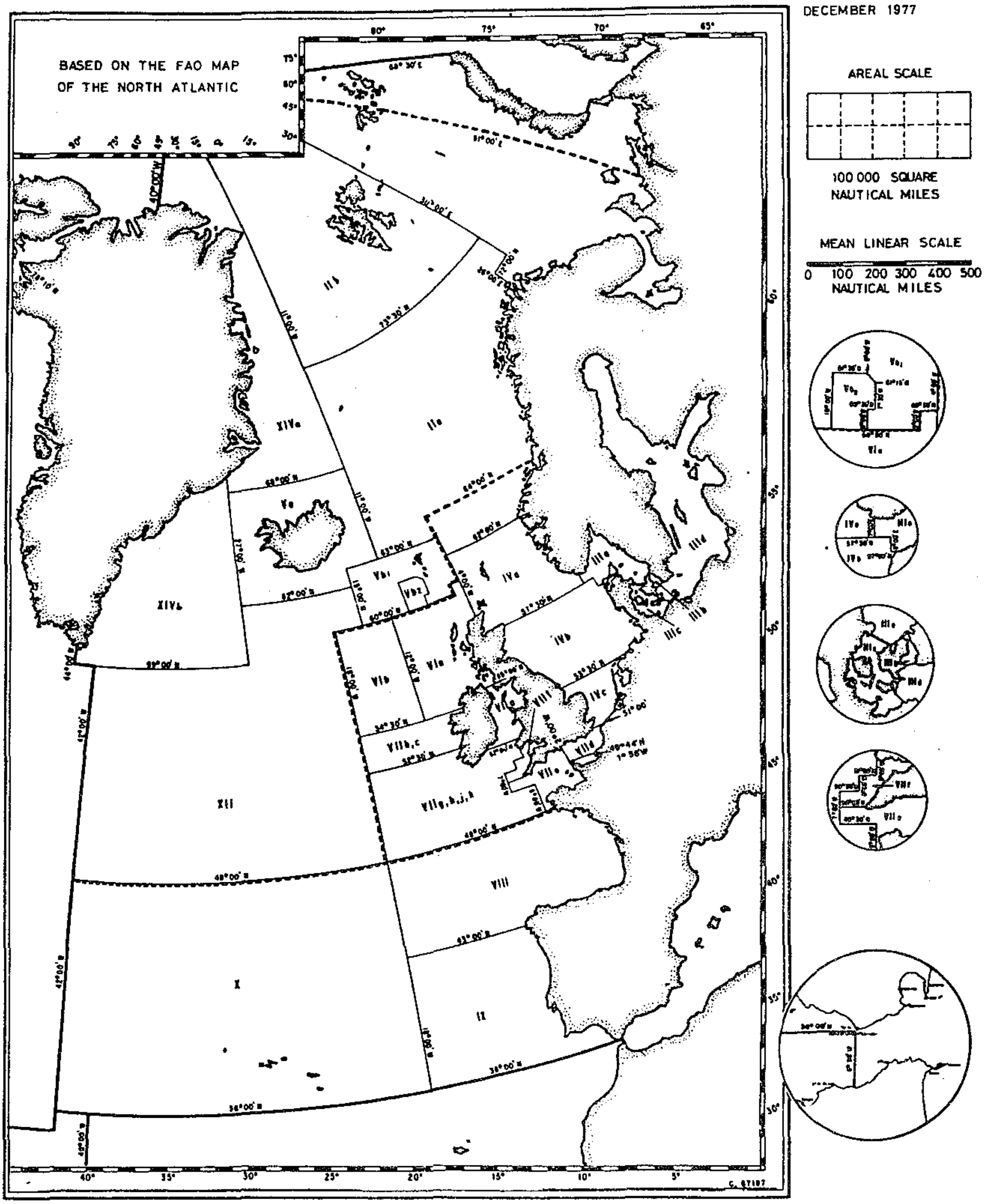


Figure 6.2.3.5
Fishing areas for the various fisheries. Blue whiting northern stock.



ICES FISHING AREAS

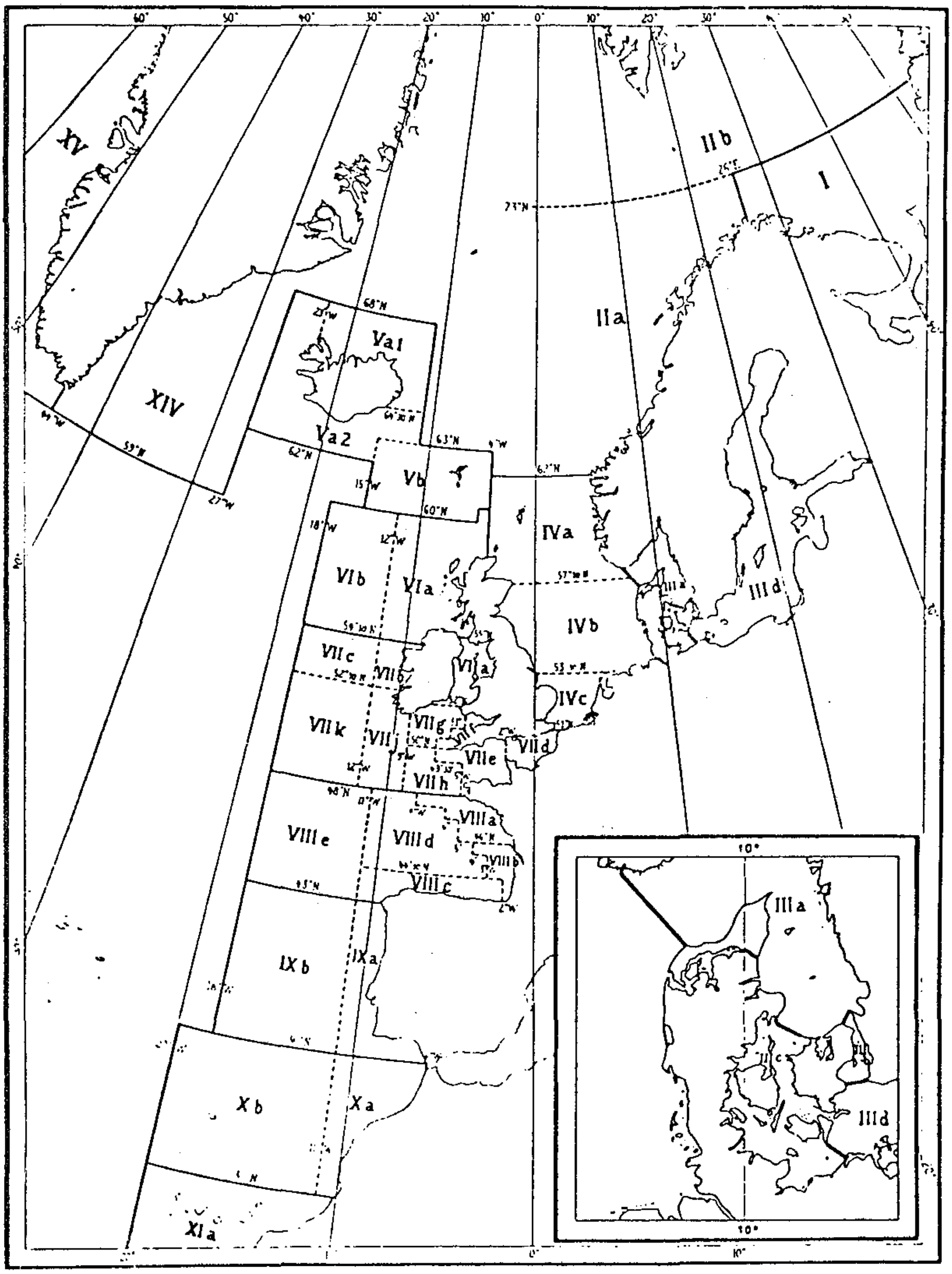


CHART OF FORMER ICES DIVISIONS

REPORT TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

1. REVIEW OF NOMINAL CATCHES IN THE BALTIC AREA, 1973-84

A general review of officially reported catches in the Baltic is given in Tables 1.1-1.5. These are the catches officially reported to ICES by national statistical offices for publication in the Bulletin Statistique.

In the assessments, the working groups try to estimate discards (landings which are not officially reported) and the composition of by-catches. These amounts are included in the estimates of total catch for each stock and are used in the assessments; thus, they appear in the tables and figures produced by the working groups. These estimates vary considerably between different stocks and fisheries, being in some cases negligible, in others constituting important parts of the total removals from the stock. Further, the catches used by the working groups are broken down into Sub-divisions, whereas the officially reported figures are reported by the larger Divisions IIIb,c, and d.

The trends in Tables 1.1-1.5 may not, therefore, correspond with those on which assessments have been based, and are presented for information to managers only, without any comment from ACFM.

The catch data used in the assessments are given in the table section on pages 341-356.

2. THE BALTIC PELAGIC FISHERIES

2.1 Herring Stocks

2.1.1 General

Catch statistics presented to the Working Group for 1983 and 1984 include herring landings from mixed fisheries and exclude sprat in the directed herring fisheries (Table 2.1.1).

The final figure for the 1983 herring catches amounted to about 485,000 tonnes, which is the largest on record for the Baltic. However, according to preliminary figures, the yield in 1984 decreased by about 50,000 tonnes (10%). Compared with the previous year, the 1984 catch declined in most areas of the Western, Southern and Central Baltic (Sub-divisions 24 - 28). The decline was, presumably, mainly connected with a decrease in effort, especially in the Swedish herring fishery. A considerable decrease occurred also in Sub-divisions 29N and 32. Landings increased somewhat in the Sound (Sub-division 23) and in

Sub-divisions 29S, 30 and 31. In Sub-division 22, the yield was roughly equal to that of the previous year.

The herring catches in 1984 (434,012 tonnes) were less than the TAC agreed for that year by IBSFC (474,900 tonnes).

The percentage of autumn herring is, at present, insignificant. Therefore, in the assessment, the catches of autumn-spawning herring have been added to catches of spring-spawning herring.

2.1.2 State of the stocks and management advice

2.1.2.1 Sub-divisions 22-24

The catch in 1984 was 110,000 tonnes, almost unchanged compared with most recent years.

Herring from this area migrate, to some extent, into Division IIIa and return to the spawning grounds in the Western Baltic. Work has, therefore, been underway to study the features of an assessment of these two areas combined, assuming that the spring-spawning herring constitute a unit stock.

The data base for a combined assessment includes: catch in numbers by age group and two young fish trawl surveys, one in Sub-divisions 22 and 24 undertaken by the German Democratic Republic and the Young Fish Survey coordinated by ICES covering Division IIIa. Furthermore, Denmark and Sweden provide data from an acoustic survey which covers Division IIIa and which in 1984 was extended into Sub-divisions 22-24. Sub-divisions 24-29 are each year covered by a joint German Democratic Republic-Polish-Swedish acoustic survey.

The herring in the Western Baltic and Division IIIa are mainly spring-spawners, while the catch in Division IIIa includes a significant amount of autumn-spawning herring, most notably of 0- and 1-group, but also, to some extent, of 2-group in the first quarter of the year. Separation of the catches into spring-spawning and autumn-spawning components in Division IIIa has been a scientific issue for a long time and is a problem which cannot be considered as solved. Furthermore, the stock composition in Division IIIa is very variable at present.

The projection of the herring catch in Sub-divisions 22-24 was made in two ways:

1) the procedure applied in previous years in which the herring in Sub-divisions 22 and 24 are treated as of one unit stock with some emigration into Division IIIa (natural mortality assumed to be high to include this emigration) and adding an appropriate amount of catch to account for Sub-division 23, and

2) a combined assessment carried out for 2-group and older herring, adding 10,000 tonnes to account for the catch of 0- and 1-group in the Western Baltic.

Both assessments indicate high exploitation rates in the Western Baltic, i.e., around F_{max}. The exploitation pattern in Division IIIa reflects a fishery directed towards younger fish compared with the fishery in the Western Baltic. The major difference between the two assessments is the estimate of the 1983 year class, which is expected to dominate the catches in 1986 as 3-group. While the combined assessment suggests a year class-strength 2.5 times the average strength, the separate assessment does not estimate this year class to be more than 1.6 times the average strength. Generally, strong year classes in Division IIIa have been overestimated, or at least these strong year classes have not shown up as strong as expected in the fishery for older herring in this area.

Advice on management options has, therefore, again this year been based on procedure 1) above: the assessment of the Sub-divisions 22 and 24. This is considered prudent since the data base for the combined assessment, especially with respect to the catch split between herring of local origin and migrators from outside, is not entirely satisfactory. Further, the acoustic survey covering Sub-divisions 22 and 23 was undertaken for the first time. The young fish trawl surveys have been carried out for a longer time period.

The assessment indicates that the strengths of the year classes in the fishery in 1986 are average except for the 1983 year class, as discussed above. Fishing mortality may have decreased slightly, but is still around F_{max}, with $F_{0.1}$ being half of the present level. Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are given below and in Figure 2.1.2.1.

1985				1986					1987	
$\bar{F}_{(1-6)}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{(1-6)}$	Stock biom.	Spawn. stock biom.	Catch	Stock biom.	Spawn. stock biom.
0.51	406	165	104	$F_{86} = 0.8F_{85}$	0.41	421	181	98	437	195
				$F_{86} = F_{85}$	0.51		179	117	417	178
				$F_{0.1}$	0.23		185	60	478	230

Weights in '000 tonnes.
The spawning stock biomass is given for the time of spawning.

The yield in 1985 is expected to be almost unchanged compared with the 1983-84 level, i.e., around 110,000 tonnes in Sub-divisions 22 and 24 with unchanged exploitation.

<u>ACFM recommends that the exploitation level in 1986 for Sub-divisions 22-24 should be decreased towards the $F_{0.1}$ level.</u>

Since the assessment given does not include the Sound (Sub-division 23), an additional catch should be included when setting the TAC for the Western Baltic. The present catch level in the Sound is about 8,000 tonnes.

2.1.2.2 Sub-divisions 25, 26 and 27

The reported landings for 1984 (147,000 tonnes) were 16% lower than in the previous year. The major part of the decline is caused by diversion of effort into other areas and to other species. The exploitation level in 1984 was estimated from the 1981-84 acoustic surveys. The 1984 and 1985 year classes were assumed to be on the 1975-82 average level (6,817 million fish). The catch in 1985 was assumed to remain on the 1984 level. Trends in yield, fishing mortality, recruitment and stock size are shown in Figure 2.1.2.2.

The Working Group continued this year its attempts to make separate assessments of the coastal herring and the open sea herring. Because of a lack of data, the Working Group had to use the same crude method as earlier to split Danish and Swedish catches into these two components.

The separate assessments give the same picture as last year: the coastal herring is exploited at a level about twice $F_{0.1}$, while the open sea herring is exploited below the $F_{0.1}$ level.

ACFM would, therefore, have preferred to take the different state of the two stocks in Sub-divisions 25-27 into account when giving its advice, but since this would not have practical implications under the present international management regime, ACFM decided to base its advice on the combined assessment of the two stocks.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are given below and in Figure 2.1.2.2.

1985				1986						1987	
$\bar{F}_{1-8}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{1-8}$	Stock biom.	Spawn. stock biom.	Catch		Stock biom.	Spawn. stock biom.
0.14	1,179	707	142	$F_{86} = F_{85}$	0.14	1,186	646	145		1,201	659
				$F_{0.1}$	0.20		635	192		1,148	613

Weights in '000 tonnes.
The spawning stock biomass is given for the time of spawning.

ACFM recommends that the exploitation level for the combined stocks should be kept close to the $F_{0.1}$ level and the catch in 1986 not exceed 190,000 tonnes.

2.1.2.3 Sub-divisions 28 and 29S

Open sea stock

Catches decreased slightly from 47,600 tonnes in 1983 to 44,800 tonnes in 1984.

ACFM has had difficulties during recent years to reconcile the results of different assessments of this stock. It is now, however, possible to state that, based on the acoustic stock estimates in 1981-84, the spawning stock biomass has increased and the exploitation level is well below any biological reference point.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are shown below and in Figure 2.1.2.3.1.

1985				1986					1987	
$\bar{F}_{2-7}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{2-7}$	Stock biom.	Spawn. stock biom.	Catch	Stock biom.	Spawn. stock biom.
0.10	633	471	45	$F_{86} = F_{85}$	0.10	631	475	43	626	471
				$F_{86} = 1.2F_{85}$	0.12			54	615	461
				$F_{86} = 1.4F_{85}$	0.15			64	605	451

Weights in '000 tonnes.
The spawning stock biomass is given for 1 January.

There are, thus, indications that some increase in the yearly catch is justifiable. The catch corresponding to an unchanged fishing mortality level in 1986 is estimated at 43,000 tonnes and the catches corresponding to increases in fishing mortality level can be seen from the option table above and Figure 2.1.2.3.1.

Gulf of Riga stock

The 1984 catches remained on the 1983 level. In recent years, the effort on this stock has decreased, but the spawning stock biomass is still low and the fishing mortality considerably above the $F_{0.1}$ level. ACFM recommends that the fishing mortality during 1986 is reduced as far as possible towards the $F_{0.1}$ level.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are shown below and in Figure 2.1.3.2.2.

1985				1986						1987	
$\bar{F}_{4-7}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{4-7}$	Stock biom.	Spawn. stock biom.	Catch		Stock biom.	Spawn. stock biom.
0.48	62	42	13	$F_{0.1}$	0.24	62	39	7		70	46
				$F_{86} = F_{85}$	0.48			12		64	41

Weights in '000 tonnes.
The spawning stock biomass is given for 1 January.

2.1.2.4 Sub-divisions 29NE and 30E

The catch in 1984 was 55,880 tonnes, of which 34,580 tonnes were from Sub-division 29NE and 21,300 tonnes from Sub-division 30E. In Sub-division 29NE, the catches have increased since 1977, while in Sub-division 30E, catches have increased since 1981 after a sharp decline from 1978 to 1981.

Effort and cpue at age were used to estimate the 1984 exploitation level. Recruitment of the 1984 year class is assumed to be close to the average. The 1985 catch is predicted to be 50,000 tonnes at the 1984 level of fishing mortality. Trends in yield, fishing mortality, recruitment and stock size are shown in Figure 2.1.2.4.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are shown below and in Figure 2.1.2.4.

1985				1986					1987	
$\bar{F}_{3-8}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{3-8}$	Stock biom.	Spawn. stock biom.	Catch	Stock biom.	Spawn. stock biom.
0.16	418	287	50	$F_{86} = F_{85}$	0.16	409	264	49	408	258
				$F_{0.1}$	0.18		263	54	398	249

Weights in '000 tonnes.

The spawning stock biomass is given for the time of spawning.

<u>ACFM recommends that this stock is managed at the $F_{0.1}$ level, and that consequently the 1986 catch should not exceed 54,000 tonnes.</u>

2.1.2.5 Sub-division 31E

The catch in 1984 was 8,190 tonnes which is about the average level of the 1976-83 period. Effort and cpue at age were used to estimate the 1984 exploitation level. ACFM must, however, express its reservation as to the applicability of the method used, as the assumption of constant availability needed by this method seems not to be fulfilled.

ACFM, therefore, can only advise on a precautionary TAC based on the catch in recent years.

2.1.2.6 Sub-divisions 29N, 30 and 31W

The catches in this area decreased in 1984 to just below 7,000 tonnes. ACFM found that, although the catch data series for this stock now covers the period 1978-84 (Figure 2.1.2.6), there is very little additional information available on which to base an estimate of current exploitation level. ACFM, therefore, recommends that a precautionary TAC for 1986 is set based on catch levels in recent years.

2.1.2.7 Sub-division 32

The catch in 1984 was 46,000 tonnes which is about the average level of 1979-82 but less than in 1983 (56,000 tonnes). This catch reflects a continued, slightly increasing trend in the Finnish catches and a corresponding decreasing trend in the USSR catches.

The assessment of this stock is based on the catch and effort data for five different fisheries taking place in this area.

The most recent year classes (1982-84) are either at or below average strength. The exploitation rate is higher for the age groups 2-4, and the exploitation level is estimated to be around F_{max}, while $F_{0.1}$ is about half the current level of fishing mortality.

Unchanged fishing mortality level in 1985 is estimated to yield about 35,000 tonnes.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are shown below.

1985				1986					1987	
$\bar{F}_{5-8}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{5-8}$	Stock biom.	Spawn. stock biom.	Catch	Stock biom.	Spawn. stock biom.
0.30	155	77	35	$F_{86} = 0.8F_{85}$	0.24	163	80	32	178	93
				$F_{86} = F_{85} = F_{max}$	0.30			39	171	86
				$F_{0.1}$	0.16			23	190	102

Weights in '000 tonnes.

The spawning stock biomass is given for 1 January.

ACFM recommends that the fishing mortality in 1986 should be reduced towards the $F_{0.1}$ level.

2.2 Sprat Stocks

The total reported sprat landings increased to about 53,000 tonnes (Table 2.2.1). This is an increase of 47% as compared with 1983, and shows the first reversal of the declining catch trend which has been observed from 1977 to 1983 (Figure 2.2.1).

2.2.1 State of the stocks and management advice

2.2.1.1 Sub-divisions 22-25

The catches in this area remained, in 1984, at same low level (11,000 tonnes) that has been experienced since 1979.

An assessment based on the acoustic surveys in 1983 and 1984 shows a steadily increasing spawning stock size since the very low 1979 value. ACFM found, however, that the assessment of the 1984 stock level made by the Working Group could be too optimistic when taking the results of both the acoustic surveys into account.

Recruitment from the 1980-82 year classes is estimated to be at or above the long-term average. The 1985 catch is assumed to be 15,000 tonnes, corresponding to a low level of fishing mortality.

If it is an objective for the management of pelagic stocks in this area to restrict catches of juvenile herring in the mixed sprat and young herring fisheries, this could be achieved by a continuation of the 1984-85 fishing mortality on sprat in 1986, corresponding to a catch of sprat in 1986 of 15,000 tonnes (Figure 2.2.1.1).

2.2.1.2 Sub-divisions 26 and 28

Catches in 1984 increased to slightly above 30,000 tonnes and were dominated by the 1982 year class.

The exploitation level in 1984 was estimated from the results of the acoustic surveys (German Democratic Republic, Sweden). The increase in fishing mortality from 1983 to 1984 was corroborated by USSR effort data which increased substantially between these years.

The recruitment of the 1983 and 1984 year classes was, according to USSR and Polish Young Fish Surveys, about average.

The catch in 1985 was assumed to increase to 45,000 tonnes.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are shown below and in Figure 2.2.1.2.

1985				1986					1987	
$\bar{F}_{2-6}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{2-6}$	Stock biom.	Spawn. stock biom.	Catch	Stock biom.	Spawn. stock biom.
0.28	394	163	45	$F_{86} = 0.8F_{85}$	0.23	367	134	34	365	130
				$F_{86} = F_{85}$	0.28		131	42	359	123
				$F_{86} = 1.2F_{85}$	0.34		128	49	353	116

Weights in '000 tonnes.

The spawning stock biomass is given for 1 January.

The present exploitation level is far below any biological reference point. The catch predicted for 1986 with an unchanged level of fishing mortality is 42,000 tonnes.

2.2.1.3 Sub-divisions 27, 29-32

There was some increase in catches from 1983 (9,000 tonnes) to 1984 (10,300 tonnes). The stock shows some signs of recovery as the 1980, 1982 and probably 1984 year classes appear to be above the 1976-82 average. Their abundance is, however, still low as compared with the rich 1975 year class.

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass are shown below and in Figure 2.2.1.3.

1985				1986						1987	
$\bar{F}_{2-7}$	Stock biom.	Spawn. stock biom.	Catch	Management option	$\bar{F}_{2-7}$	Stock biom.	Spawn. stock biom.	Catch		Stock biom.	Spawn. stock biom.
0.12	119	88	9	$F_{86} = 0.8F_{85}$	0.10	116	88	8		112	86
				$F_{86} = F_{85}$	0.12			10		110	85
				$F_{86} = 1.2F_{85}$	0.15			12		108	83

Weights in '000 tonnes.

The spawning stock biomass is given for 1 January.

The catch in 1985 is assumed to be 9,000 tonnes, most of it taken in a mixed herring-sprat fishery. The predicted level of catch in 1986 with an unchanged fishing mortality is 10,000 tonnes.

2.2.2 Distribution of effort and cpue

Effort and catch-per-unit-effort data are continuously reported from a number of pelagic fisheries. The coverage and break-down by sub-divisions is still far from sufficient and prevents a general use of the data for assessment purposes.

3. THE BALTIC DEMERSAL FISHERIES

3.1 Cod in Sub-divisions 22 and 24

3.1.1 Recent catches

The total landings of cod at 50,000 tonnes (including 2,000 tonnes from Sub-division 23) in 1984 were close to the 1983 level of 49,000 tonnes (Table 3.1.2). The landings from Sub- division 22 increased from 25,000 tonnes in 1983 to 27,000 tonnes in 1984, whereas for Sub-division 24, a slight decrease from 23,000 tonnes in 1983 to 21,000 tonnes in 1984 was observed. Information on discards in Sub-division 22 was presented by Denmark and the Federal Republic of Germany. These data indicate that discarding was of less importance in 1984 than in previous years. As no data were available for Sub-division 24, discards were not included in the assessment of cod in Sub-divisions 22 and 24.

3.1.2 The 1985 assessment

Cpue data were available from the German Democratic Republic and Sweden for Sub-division 24 only. These indices were combined and estimates of the relative total effort for the period 1980-84 derived. According to this, the effort index increased by 40% in

1984 compared to the mean effort in 1980-83, and by 26% from 1983 to 1984. Age compositions of landings were submitted by Denmark, the German Democratic Republic and the Federal Republic of Germany, accounting for 100% of the landings in Sub-division 22 and for 70% of the landings in Sub-division 24. Recruitment estimates for 1-group cod were derived from Young Fish Surveys of the German Democratic Republic and the Federal Republic of Germany. Using these data series, the following year-class strengths at age 1 were predicted:

Year class	Number in millions
1982	65
1983	44
1984	33

From the assessment, it appears that after the good 1979 year class 1979 (97 million), a series of relatively weak year classes has followed. The terminal F's on age groups 0 and 1 in 1984 were calculated on the basis of the recruitment estimates of these year classes. For ages 2 and older, the F's were calibrated according to the trend in effort since 1980. The exploitation pattern was selected close to the one suggested by a separable VPA. For age group 2, this procedure gives an F of 1.12. To produce the 1982 year class in 1983 as predicted from survey data, an F of more than 1.6 is required. As a compromise, an F of 1.4 for age group 2 was finally chosen.

From the VPA, it appears that the exploitation rate on younger age groups has increased considerably in recent years. ACFM, therefore, reiterates its advice given in its 1983 report that an increase in minimum mesh size would contribute to the reduction of the fishing mortality on these young age groups and thus improve the current exploitation pattern.

According to the assessment, the spawning stock biomass decreased from about 45,000 tonnes in 1980 to a level of 27,000 tonnes in 1984. The present fishing mortality ($\bar{F}_{(2-7)}$ = 1.35) is far in excess of $F_{0.1}$(0.15) and F_{max}(0.24).

The 1985 and 1986 year classes are assumed to be average, e.g., 109 million at age 0. In view of the declining trend in the recruitment since 1979, this average recruitment level could be too optimistic. However, these figures have only a slight effect on the calculated catches in 1986 and the resulting spawning stock biomass in 1987.

For the projection of catches in 1986 and total biomass and spawning stock biomass in 1986 and 1987, it was assumed that fishing mortality in 1985 will be reduced by 20% compared with 1984. This assumption is based on qualitative information, which indicates that, because of the severe winter conditions in 1985, the effort level is expected to decrease by that percentage in 1985. The results of the projections are summarised below and in Figure 3.1.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-7)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(2-7)}$	Catch	Stock biom.	Spawn. stock biom.
38	17	1.08	28	$F_{0.1}$	37	15	0.15	5	76	33
				F_{max}			0.24	8	73	30
				$F_{86} = F_{85}$			1.08	24	52	15

Weights in '000 tonnes.

3.1.3 Management advice

The catch predictions show that the declining trend in spawning stock biomass in 1987 can only be reversed if the fishing mortality level estimated for 1985 is reduced in 1986. ACFM, therefore, recommends that fishing mortality is reduced towards the F_{max} level.

3.2 Cod in Sub-divisions 25-32

3.2.1 Recent catches

The total landings from Sub-divisions 25-32 increased from 326,000 tonnes in 1983 to 383,000 tonnes in 1984 (Table 3.2.1). Approximately 90% of the total catch was taken in Sub-divisions 25, 26 and 28 (Table 3.2.2).

Data on discards in 1984 were presented by Denmark and the Federal Republic of Germany. The Danish data from bottom trawling give an estimate of about 6,000 tonnes of discards in 1984. The annual discards of the Federal Republic of Germany were estimated to be about 0.1% of the landings in Sub-division 25. In Sub-divisions 26 and 28, the discards were even lower. Data on discards were not taken into account in the VPA.

3.2.2 The 1985 assessment

Effort and cpue data for recent years, including 1984, were submitted by Finland, the German Democratic Republic, the Federal Republic of Germany, Poland, Sweden and USSR. The cpue data were combined and relative estimates of the total effort for the period 1980-84 calculated. These relative effort indices show a steady increase from 1980 to 1984. Data on the age composition of landings were submitted by all fishing countries except the German Democratic Republic and Sweden. Data on recruitment were available from trawl surveys conducted by Denmark, Poland, Sweden and USSR. However, these data show great inconsistencies when following year classes in consecutive years and, therefore, they have not been used for tuning the VPA.

The terminal F's in the VPA were estimated from effort indices. However, it was not possible to construct a convincing relationship between mean F's and effort indices for the period 1980- 84. As a compromise, it was finally decided to set the F's in 1984 30% higher than the average F's for the years 1980-83 following the trend in effort.

According to the assessment, the spawning stock biomass increased from 500,000 tonnes in 1978 to about 900,000 tonnes in 1980 and remained fairly stable at this high level up to 1984. This was mainly a result of the strong 1976, 1979 and 1980 year classes. In 1985, however, a decline to 625,000 tonnes is estimated.

It should be noted that this assessment provides much higher stock sizes than those calculated last year when the fishing mortality level for 1983 and 1984 was overestimated. However, also from the present assessment, the current fishing mortality is estimated to be far above the F_{max} level. For the same reasons mentioned earlier, it was assumed that the F level in 1985 is reduced by 20% compared to 1984. The results of the predictions are summarised below and in Figure 3.2.

1985				1986					1987	
Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-7)}$	Catch	Management option	Stock biom.	Spawn. stock biom.	$\bar{F}_{(4-7)}$	Catch	Stock biom.	Spawn. stock biom.
899	625	0.74	251	$F_{0.1}$	894	625	0.19	71	1,113	843
				F_{max}			0.37	132	1,037	768
				$F_{86} = F_{85}$			0.74	232	915	646

Weights in '000 tonnes.

3.2.3 Management advice

From the prediction, it follows that, if fishing mortality in 1986 is the same as in 1985, the catch will be 232,000 tonnes and the spawning stock biomass in 1987 will remain close to the 1986 level. The present F is far above F_{max}. <u>ACFM, therefore, recommends that fishing mortality is reduced towards the F_{max} level</u>.

4. BALTIC SALMON STOCKS

4.1 Sub-divisions 24-31

The reported salmon catches in tonnes from 1975-84 are given below:

Year	Tonnes
1975	2,931
1976	2,966
1977	2,561
1978	1,965
1979	2,067
1980	2,437
1981	2,578
1982	2,024
1983	2,344
1984[1]	3,071

[1] Preliminary

The reduction of fishing effort due to the establishment of the national fishing zones in 1978 was followed by an increase in 1980 to a level somewhat below that of the mid-1970's and, except for 1982, when a drop was again observed, was held at that level up to, and including, 1984 (Figure 4.1.1 and Table 4.1). The annual yield has followed the same trend, except for 1984, when the catches in the Main Basin attained the peak size of the 1960's. In the Gulf of Bothnia, the catch also exceeded the level of recent years.

Drift nets are the predominant gear in the offshore fishery, yielding more than 75% of the total catch. Cpue in the Danish and Finnish offshore fisheries (both with drift net and longline) in the 1983-84 season were significantly above the average in virtually all offshore fishing areas.

Geographical distribution of the catch and cpue data is such that this situation cannot be totally ascribed to changes in catchability resulting from changes in the relative distribution of salmon and fishing effort. The high cpue could be explained in terms of increased recruitment to the fishery from the 1982 smolt year class. Natural smolt production has been stable or slightly declining in the past few years, and hatchery-reared smolt production has been stable. There has been no general or drastic change in the releasing techniques in 1982. Reasons for the success of this year class have to be sought in the environmental conditions that prevailed in the Baltic Sea in 1982-83 and 1983-84. However, at present, insufficient information is available to pinpoint the actual reasons. No prediction can, therefore, be made regarding the durability of the changes that occurred in 1983-84. Preliminary data on the autumn 1984 fishery in the Main Basin indicate the possibility of even higher cpue rates in the 1984-85 season.

Application of a technique of scale reading developed in 1983 (Antere and Ikonen, 1983)[1] to distinquish between salmon of wild and of hatchery-reared origin resulted in unexpected findings. The proportion of wild-origin salmon in the offshore catches was far below that expected from the production ratio (and age group A+, i.e., one-sea-winter salmon, were entirely absent in the samples) while, on the other hand, the proportion of salmon of wild origin in the spawning runs along the Finnish coast by far exceeded the expected one. These findings suggest that life histories of wild and of hatchery-reared salmon differ markedly, and this comes into conflict with one of the basic assumptions used in the assessment model.

The enlarged data base, the problems of non-reporting identified in the tagging programmes and the suspected invalidity of one of the basic assumptions in the assessment model would call for its thorough revision. Data taken from the Finnish coast indicate that salmon of wild origin appear to dominate the spawning runs, whilst showing up in a much smaller proportion in the offshore catches. Therefore, regulations on catch levels in the coastal and river fisheries might have a much more pronounced effect on achieving a desired escapement rate to maximise genetic variability rather than similar catch restrictions imposed on the offshore fishery. Data on the proportion of wild-origin salmon in the Swedish coastal and river fishery should be collected to confirm this.

On the basis of the new estimates of the proportion of wild and of hatchery-reared salmon at sea, last year's estimate for the 1984 production of salmon of wild origin has been revised from 1.2 million a.s.u. (artificial smolt unit) to 0.95 million a.s.u., and the 1985 wild production was estimated to be 0.9 million a.s.u. In 1984, about 3.2 million a.s.u. were released from hatcheries, and in 1985, the hatchery-reared smolt production is estimated to reach about 3.6 million a.s.u. The total production will be about 4.5 million a.s.u. Since the assessment model was calibrated in 1984 for the expected total production of 4.4 million a.s.u. in that year, the results of the assessment were virtually unaffected:

The 1986 catches, provided the fishery is unchanged, are expected to be about 2,700 tonnes with an escapement of 1%, while the target escapement of 2.4% will be met by a catch level in 1986 of about 1,700 tonnes and an annual long-term yield of about 2,600 tonnes.

---

[1] Antere, I. and Ikonen, E. 1983. A method of distinguishing wild salmon from those originating from fish farms on the basis of scale structure. ICES, Doc. C.M.1983/M:26.

Yield 1986 (tonnes)	Escapement 1987 (%)	Long-term yield (tonnes)	Long-term escapements (%)
1,398	2.8	1,928	3.6
1,698	2.5	2,207	3.1
2,134	2.0	2,628	2.3
2,562	1.3	2,688	1.4
2,695	1.0	2,695	1.0

A total of 0.34 million a.s.u. of the Finnish releases in Sub-division 30 in 1984 (the expected number in 1985 equals 0.5 million a.s.u.) are of Neva stock origin, and tagging has shown that these salmon migrate much less than the northern stocks released in the same area (90% of the Neva stock recaptures came from Sub-division 30). This Neva stock yield, therefore, is not included in the assessment model, but can be inferred directly from tagging results which suggest an average yield of about 250 kg/1,000 smolts. Thus, the expected yield from this stock in 1986 is estimated to be within a range of 70-120 tonnes.

4.2 Sub-division 32

The salmon stock in the Gulf of Finland is well separated from the stocks in the Gulf of Bothnia and the Main Basin (Sub-divisions 24-31), and is, therefore, assessed as a separate stock unit.

The reported landings from Sub-division 32 are given below in tonnes.

Year	Tonnes
1975	74
1976	95
1977	88
1978	75
1979	70
1980	69
1981	73
1982	133
1983	196
1984[1]	197

[1] Preliminary

In the Finnish rivers flowing to the Gulf of Finland, there is no natural smolt production. Spawning runs of salmon in the following rivers in the USSR were observed: Neva, Narva, Kunda, Loobu, Valgejoki, Pirita, Vasalemma and probably in some small rivers in the Leningrad area. The River Narva stock is totally based on artificial smolt production. In River Neva, natural smolt production is almost extinct. The smolt production in the other rivers is unknown.

In the Finnish coastal fisheries for spawning migrators, about 15% of the salmon are of wild origin. The home rivers of these salmon are unknown. The scale structure of these fish does not correspond to that of the salmon stocks in the USSR area. The offshore fishery for the feeding salmon is totally based on hatchery releases.

In Finland, the desired escapement level depends on the demand for breeding fish. The Finnish coastal fishery is regulated to secure the desired escapement. Therefore, in the River Kymi, the number of spawners is expected to be sufficient in 1986, but in the other rivers, the strength of spawning runs is unknown.

Application of the same calculation technique as for the Neva stock to the Gulf of Finland stock results in the estimated expected yield from the stock in 1986 within a range of 250-400 tonnes at the current exploitation level.

4.3 Sea Trout and Rainbow Trout

Catch statistics for the prevailing short-migrating sea trout are incomplete (Table 4.2), since in some countries these are mainly caught by part-time fishermen and anglers. The less common long-migrating sea trout are usually caught by the offshore salmon fisheries and included in the salmon catch statistics.

The knowledge of natural smolt production of sea trout is poor. The number of released hatchery-reared sea trout in the Baltic Sea and rivers has varied between 1.5 to 1.9 million annually. The catch of this species (estimated to be about 100 tonnes annually) taken in the Baltic salmon fisheries is considered to be relatively stable, thus not affecting the salmon assessments.

As most of the Baltic sea trout stocks are of the short-migrating type, they can be managed on national or local basis. With the present scarcity of information on catches, no assessment of the long-migrating stocks, which are exploited by fisheries of several nations, can be made.

Poland has released rainbow trout to the Baltic Sea since 1980. In recent years, the number of releases has been about 350,000. About 65-70% of the rainbow trout are caught in Sub-divisions 25-26, mainly in the Polish coastal area. A significant proportion regularly enter the offshore salmon fishery in the southern part of the Main Basin. Mature rainbow trout are caught in the rivers in Poland, Denmark, Sweden and GDR. Naturally-reproducing stocks have not been found in any river in the Baltic.

4.4 The Distribution of the Baltic Salmon Stocks and of the Corresponding Fishing Effort between National Fishing Zones

The distribution of Baltic salmon and of the fishing effort directed to it between NFZ's cannot be evaluated due to lack of information on the geographical distribution of effort from all countries (except for Denmark and Finland).

The distribution of recaptures by NFZ's from various tagging programmes is shown in Table 4.3. These data reflect the combined effects of fishing effort, availability of salmon to the fisheries, stock distribution of salmon and tag reporting efficiency of the fishermen.

Table 1.1 Nominal fish catches in the Baltic from 1973-84 (in '000 tonnes). Anadromous species, except salmon, not included. (Data as officially reported to ICES.)

Year	Species							Total
	Cod	Herring	Sprat	Flatfish	Salmon	Freshwater species	Others	
1973	189	404	213	18	2.7	23	55	905
1974	189	407	242	21	2.9	21	54	937
1975	234	415	201	24	2.9	20	60	957
1976	255	393	195	19	3.1	21	46	932
1977	213	413	211	22	2.4	22	42	925
1978	196	420	132	23	2.0	22	44	839
1979	273	459	78	24	2.3	20	47	903
1980	392	465	58	19	2.5	21	29	987
1981	383	432	47	17	2.4	19	31	931
1982	366	453	48	17	2.3	18	30	934
1983	380	474	31	16	2.6	18	20	942
1984[1]	447	437	54	10	2.8	19	13	983

[1] Preliminary.

Table 1.2 Nominal catch (tonnes) of HERRING in Divisions IIIb,c,d, 1963-84. (Data as officially reported to ICES)

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1963	14,991	48,632	10,900	16,588	28,370	27,691	78,580[1]	225,752
1964	29,329	34,904	7,600	16,355	19,160	31,297	84,956	223,601
1965	20,058	44,916	11,300	14,971	20,724	31,082[2]	83,265	226,216
1966	22,950	41,141	18,600	18,252	27,743	30,511	92,112	251,309
1967	23,550	42,931	42,900	23,546	32,143	36,900	108,154	310,124
1968	21,516	58,700	39,300	16,367	41,186	53,256	124,627	354,952
1969	18,508	56,252	19,100	15,116	37,085	30,167	118,974	295,202
1970	16,682	51,205	38,000	18,392	46,018	31,757	110,040	312,094
1971	23,087	57,188	41,800	16,509	43,022	32,351	120,728	334,685
1972	16,081	53,758	58,100	10,793	45,343	41,721	118,860	344,656
1973	24,834	67,071	65,605	8,779	51,213	59,546	127,124	404,172
1974	19,509	73,066	70,855	9,446	55,957	60,352	117,896	407,081
1975	18,295	69,581	71,726	10,147	68,533	62,791	113,684	414,757
1976	23,087	75,581	58,077	6,573	63,850	41,841	124,479	393,488
1977	25,467	78,051	62,450	7,660	60,212	52,871	126,000	412,711
1978	26,620	89,792	46,261	7,808	63,850	54,629	130,642	419,602
1979	33,761	83,130	50,241	7,786	79,168	86,078	118,655	458,819
1980	29,350	87,240	59,187	9,873	68,614	92,923	118,074	465,261
1981	28,424	78,049	56,643	9,124	64,005	84,500	110,782	431,527
1982	40,289	85,000	50,868	8,928	76,329	92,675	99,175	453,264
1983	32,657	98,390	51,991	9,273	82,329	86,561	112,370	473,571
1984	32,272[3]	97,408	50,073	8,166	78,326	65,519	105,577	437,341

1 Including Division IIIa.
2 Large quantity of herring used for industrial purposes is included with "Unsorted and Unidentified Fish".
3 Preliminary.

Table 1.3 Nominal catch (tonnes) of SPRAT in Divisions IIIb,c,d, 1963-84. (Data as officially reported to ICES)

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1963	2,525	1,399	8,000	507	10,693	101	45,820[1]	69,045
1964	3,890	2,111	14,700	1,575	17,431	58	55,753	95,518
1965	1,805	1,637	11,200	518	16,863	46	52,829	84,898
1966	1,816	2,048	21,200	366	13,579	38	52,407	91,454
1967	3,614	1,896	11,100	2,930	12,410	55	40,582	72,587
1968	3,108	-	10,200	1,054	14,741	112	55,050	84,265
1969	1,917	1,118	7,500	377	17,308	134	90,525	118,879
1970	2,948	1,265	8,000	161	20,171	31	120,478	153,054
1971	1,833	994	16,100	113	31,855	69	133,850	184,814
1972	1,602	972	14,000	297	38,861	102	151,460	207,294
1973	4,128	1,854	13,001	1,150	49,835	6,310	136,510	212,788
1974	10,246	1,035	12,506	864	61,969	5,497	149,535	241,652
1975	9,076	2,854	11,840	580	62,445	31	114,608	201,434
1976	13,046	3,778	7,493	449	56,079	713	113,217	194,775
1977	16,933	3,213	17,241	713	50,502	433	121,700	210,735
1978	10,797	2,373	13,710	570	28,574	807	75,529	132,360
1979	8,897	3,125	4,019	489	13,868	2,240	45,727	78,365
1980	4,714	2,311	151	706	16,033	2,388	31,359	57,662
1981	8,415	1,847	78	505	11,205	1,510	23,881	47,441
1982	6,663	4,550	1,086	581	14,188	1,890	18,866	47,824
1983	2,861	855	2,693	550	8,492	1,747	13,725	30,923
1984	3,447[2]	2,436	2,762	642	10,954	7,807	25,891	53,939

[1] Including Division IIIa.
[2] Preliminary.

Table 1.4 Nominal catch (tonnes) of COD in Divisions IIIb,c,d, 1963-84. (Data as officially reported to ICES)

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1963	35,851	12	7,800	10,077	47,514	22,827	30,550[1]	154,631
1964	34,539	16	5,100	13,105	39,735	16,222	24,494	133,211
1965	35,990	23	5,300	12,682	41,498	15,736	22,420	133,649
1966	37,693	26	6,000	10,534	56,007	16,182	38,269	164,711
1967	39,844	27	12,800	11,173	56,003	17,784	42,975	180,606
1968	45,024	70	18,700	13,573	63,245	18,508	43,611	202,731
1969	45,164	58	21,500	14,849	60,749	16,656	41,582	200,558
1970	43,443	70	17,000	17,621	68,440	13,664	32,248	192,486
1971	47,563	3	9,800	14 333	54,151	12,945	20,906	159,701
1972	60,331	8	11,500	13,814	56,746	13,762	30,140	186,301
1973	66,846	95	11,268	25,081	49,790	16,134	20,083	189,297
1974	58,659	160	9,013	20,101	48,650	14,184	38,131	188,898
1975	63,860	298	14,740	21,483	69,318	15,168	49,289	234,156
1976	77,570	278	8,548	24,096	70,466	22,802	51,516	255,276
1977	74,495	310	10,967	31,560	47,703	18,327	29,680	213,042
1978	50,907	1,446	9,345	16,918	64,113	15,996	37,200	195,925
1979	60,071	2,938	8,997	18,083	79,697	24,003	78,730	272,519
1980	76,015	5,962	7,406	16,363	123,486	34,089	124,359	391,831[2]
1981	93,155	5,681	12,938	15,082	120,942	44,300	87,746	382,609[3]
1982	98,230	8,126	11,368	19,247	92,541	44,807	86,906	365,525[4]
1983	108,862	8,927	10,521	22,051	76,474	54,876	92,248	380,024[5]
1984	121,267[7]	9,560[7]	9,886	39,632	93,429	65,788	100,761	446,677[6]

[1] Including Division IIIa.
[2] Includes catches by the Faroe Islands of 1,250 tonnes and United Kingdom (England & Wales) of 2,901 tonnes.
[3] Includes catches by the Faroe Islands of 2,765 tonnes.
[4] Includes catches by the Faroe Islands of 4,300 tonnes.
[5] Includes catches by the Faroe Islands of 6,065 tonnes.
[6] Includes catches by the Faroe Islands of 6,354 tonnes.
[7] Preliminary.

Table 1.5 Nominal catch (tonnes) of FLATFISH in Divisions IIIb,c,d, 1963-84. (Data as officially reported to ICES)

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1963	9,888	-	3,900	794	2,794	1,026	1,460[1]	19,862
1964	9,592	-	4,600	905	1,582	1,147	4,420	22,246
1965	8,877	-	2,300	899	2,418	1,140	5,471	21,105
1966	7,590	-	2,900	647	3,817	1,113	5,328	21,395
1967	8,773	-	3,400	786	2,675	1,077	4,259	20,970
1968	9,047	-	3,600	769	4,048	1,047	4,653	23,164
1969	8,693	-	2,800	681	3,545	953	4,167	20,839
1970	7,937	-	2,200	606	3,962	464	3,731	18,900
1971	7,212	-	2,500	553	4,093	415	4,088	18,861
1972	6,817	-	3,200	542	4,940	412	3,950	19,861
1973	6,181	-	3,419	655	4,278	724	2,550	17,807
1974	9,686	55[2]	2,390	628	4,668	653	2,515	20,595
1975	8,257	100	2,172	937	5,139	658	6,455	23,718
1976	7,572	194	2,801	836	4,394	582	3,018	19,397
1977	7,239	203	3,378	960	4,879	484	4,754	21,897
1978	9,184	390	4,034	1,106	5,418	396	2,500	23,028
1979	10,376	399	4,396	665	5,137	450	2,670	24,093
1980	8,276	428	3,286	460	3,429	427	2,305	18,611
1981	6,674	418	3,031	704	2,958	434	2,323	16,542
1982	5,818	421	3,608	543	4,214	250	2,596	17,450
1983	6,000	368	3,957	751	2,809	217	2,371	16,473
1984	-[4]	390[3]	3,173	662	3,865	176	1,859	-[4]

[1] Including Division IIIa.
[2] Excluding subsistence fisheries.
[3] Preliminary
[4] Not available

Table 2.1.1 HERRING catches in the Baltic Sea by countries and Sub-divisions, 1983 and 1984 (tonnes). By-catch of sprat in directed herring fisheries excluded and by-catch of herring in sprat fisheries included.

		SUB-DIVISIONS											
Country and year	Total catch	22	23	24	25	26	27	28	29S	29N	30	31	32
1983													
Denmark	40,908	17,941	4,583	7,901	10,483	-	-	-	-	-	-	-	-
Finland	95,890	-	-		-	-	-	-	44	41,200	18,229	7,376	29,041
German Dem.Rep.	51,991	1,268	-	49,471	880	-	372	-	-	-	-	-	-
Germany,Fed.Rep.	9,274	1,675	-	1,625	974	-	-	-	-	-	-	-	-
Poland	83,741	-		16,686	47,431	19,624	-	-	-	-	-	-	-
Sweden	90,615	-	2,416	6,536	26,592	168	37,811	6,117	1,489	6,393	2,397	696	-
USSR	112,370	-	-	-	3,024	26,020	-	30,413	25,118	-	-	-	27,795
TOTAL	484,789	25,884	6,999	82,219	89,384	45,812	38,183	36,530	26,651	47,543	20,626	8,072	56,836
1984													
Denmark	37,159[1]	16,997	6,935	6,765	6,462	-	-	-	-	-	-	-	-
Finland[1]	85,710	-	-	-	-	-	-	-	20	34,600	21,300	8,190	21,600
German Dem.Rep.	50,072	1,817	-	47,205	941	-	109	-	-	-	-	-	-
Germany,Fed.Rep.	7,116	6,498	-	584	31	-	-	-	-	-	-	-	-
Poland	80,025	-	-	14,250	45,403	20,372	-	-	-	-	-	-	-
Sweden[1]	68,353	-	800	7,689	24,031	166	23,455	5,043	357	3,817	2,401	594	-
USSR[1]	105,577	-	-	-	9,495[2]	16,213	-	27,645	27,532	-	-	-	24,692
TOTAL	434,012	25,312	7,735	76,496	86,363	36,751	23,564	32,688	27,909	38,417	23,701	8,784	46,292

[1] Preliminary
[2] Catches in Sub-div. 25+27.

Table 2.2.1 SPRAT catches in the Baltic Sea by countries and Sub-divisions, 1983 and 1984 (tonnes). By-catch of herring in directed sprat fisheries excluded and by-catch of sprat in herring fisheries included.

		Sub-Divisions										
Country and Year	Total catch	22	23	24	25	26	27	28	29	30	31	32
1983												
Denmark	6,202	61	-	-	6,141[1]	-	-	-	-	-	-	-
Finland	3,355	-	-	-	-	-	-	-	2,393	-	-	962
German Dem. Republic	2,692	154	-	2,538	-	-	-	-	-	-	-	-
Germany, Fed. Republic	619	619	-	-	-	-	-	-	-	-	-	-
Poland	7,088	-	-	9	2,777	4,302	-	-	-	-	-	-
Sweden	3,639	-	923	502	1,157	-	641	274	135	7	-	-
USSR	13,725	-	-	-	-	7,718	-	1,201	1,885	-	-	2,921
Total	37,320	834	923	3,049	10,075	12,020	641	1,475	4,413	7	-	3,883
1984												
Denmark	3,179	1,552	222	603	802	-	-	-	-	-	-	-
Finland[1]	2,775	-	-	-	-	-	-	-	2,035	-	-	740
German Dem. Republic	2,761	160	-	2,601	-	-	-	-	-	-	-	-
Germany, Fed. Republic	663	642	-	21	-	-	-	-	-	-	-	-
Poland	9,254	-	-	19	1,620	7,615	-	-	-	-	-	-
Sweden	8,397	-	-	936	2,296	457	696	3,723	289	-	-	-
USSR[1]	25,891	-	-	-	-	10,121	-	9,233	4,390	-	-	2,147
Total	52,920	2,354	222	4,180	4,718	18,193	696	12,956	6,714	-		2,887

Preliminary

1. Sub-divisions 24 and 25 together.

Table 3.1.1 Total catch of COD in Sub-divisions 22-32 (tonnes).

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1965	35,313	23	10,680	15,713	41,498	21,705	22,420	147,352
1966	37,070	26	10,589	12,831	56,007	22,525	38,270	177,318
1967	39,105	27	21,027	12,941	56,003	23,363	42,980	196,446
1968	44,109	70	24,478	16,833	63,245	24,008	43,610	216,353
1969	44,061	58	25,979	17,432	60,749	22,301	41,580	212,160
1970	42,392	70	18,099	19,444	68,440	17,756	32,250	198,451
1971	46,831	53	10,977	16,248	54,151	15,670	20,910	164,840
1972	59,717	76	13,720	15,516	57,093	16,471	30,140	192,733
1973	66,050	95	14,408	28,706	49,790	18,389	20,083	197,521
1974	57,810	160	10,970	22,224	48,650	16,435	38,131	194,386
1975	62,524	298	14,742	24,880	69,318	17,965	49,289	239,016
1976	77,570	287	8,552	26,626	70,466	20,188	49,047	252,736
1977	73,505	310	10,967	30,706	47,702	18,127	29,680	210,997
1978	50,611	1,437	9,345	15,122	64,113	16,793	37,200	194,621
1979	59,714	2,938	8,997	19,375	79,754	23,093	75,034	268,905
1980	75,529	5,962	7,406	17,637	123,486	33,201	124,350	387,571
1981	92,648	5,681	12,936	18,281	120,901	44,330	87,746	382,523
1982	91,594	8,126	11,368	21,860	92,541	46,548	86,906	365,063
1983	107,624	8,927	10,521	25,154	76,474	53,740	92,248	374,688
1984*	113,701	6,300	9,886	42,031	93,429	66,057	100,761	432,165

* provisional data

Table 3.1.2 Total Catch of COD in Sub-divisions 22, 23 and 24 (tonnes).

Year	Denmark			German Dem.Rep.		Germany Fed.Rep.		Sweden		Total			
	22	23	24	22	24	22	24	23	24	22	23	24	22 & 24
1965	13,863		5,594	3,494	6,211	10,510	3,020		2,182	27,867		17,007	44,874
1966	14,412		6,088	3,918	4,475	9,534	1,914		2,110	27,864		14,587	42,271
1967	13,266		5,915	4,188	5,819	11,421	1,463		1,996	28,875		15,193	44,068
1968	15,789		6,804	5,097	7,263	12,025	2,790		2,113	32,911		18,970	51,881
1969	14,690		5,912	4,177	3,342	10,215	2,502		1,413	29,082		13,169	42,251
1970	14,378		5,707	4,495	3,501	12,490	2,099		1,289	31,363		12,596	43,963
1971	16,831		6,884	3,602	4,405	11,686	1,796		1,419	32,119		14,504	46,623
1972	17,717		7,928	4,560	5,105	10,531	1,782		1,277	32,808		16,092	48,900
1973	21,400		9,195	4,004	4,370	12,833	900		1,655	38,237		16,120	54,357
1974	18,300		7,482	3,028	5,431	9,998	395		1,937	31,326		15,245	46,571
1975	15,891		7,500	3,471	2,571	12,415	497		1,932	31,867		12,500	44,367
1976	19,764	712	9,682	1,292	3,290	12,312	581		1,800	33,368	712	15,353	48,721
1977	17,726	1,166	10,213	977	2,471	10,807	879	550	1,516	29,504	1,716	15,079	44,583
1978	12,641	1,177	6,527	1,619	5,466	9,972	880	600	1,730	24,232	1,777	14,603	38,835
1979	16,093	2,029	7,232	1,024	6,570	8,910	688	700	1,800	26,027	2,729	16,290	42,317
1980	16,033	2,425	7,367	880	4,700	5,968	684	1,300	2,610	22,881	3,725	15,361	38,242
1981	15,502	1,473	7,152	1,743	9,916	9,095	2,165	900	5,700	26,340	2,373	24,933	51,273
1982	11,669	1,638	7,469	1,787	8,828	7,394	666	140	7,933	20,790	1,505	24,896	45,686
1983	14,100	1,257	7,861	1,441	7,656	8,937	323	120	6,910	24,478	1,377	22,750	47,228
1984*	13,867	1,703	8,042	1,774	6,319	11,340	208	228	6,014	26,981	1,931	20,583	47,564

*Provisional data

Table 3.2.1 Total catch of COD in Sub-divisions 25-32 (tonnes).

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1965	15,856	23	975	2,183	41,498	19,523	22,420	102,478
1966	16,570	26	2,196	1,383	56,007	20,415	38,270	134,867
1967	19,924	27	11,020	1,057	56,003	21,367	42,980	152,378
1968	21,516	70	12,118	2,018	63,245	21,895	43,610	164,472
1969	23,459	58	18,460	4,715	60,749	20,888	41,580	169,909
1970	22,307	70	10,103	4,855	68,440	16,467	32,250	154,492
1971	23,116	53	2,970	2,766	54,151	14,251	20,910	118,217
1972	34,072	76	4,055	3,203	57,093	15,194	30,140	143,833
1973	35,455	95	6,034	14,973	49,790	16,734	20,083	143,164
1974	32,028	160	2,517	11,831	48,650	14,498	38,131	147,815
1975	39,043	298	8,700	11,968	69,318	16,033	49,289	194,649
1976	47,412	287	3,970	13,733	70,466	18,388	49,047	203,303
1977	44,400	310	7,519	19,020	47,702	16,061	29,860	164,872
1978	30,266	1,437	2,260	4,270	69,319	14,463	37,200	154,009
1979	34,350	2,938	1,403	9,777	79,754	20,593	75,034	223,849
1980	49,704	5,962	1,826	11,750	123,486	29,291	124,350	346,369
1981	68,521	5,681	1,277	7,021	120,001	37,730	87,746	328,877
1982	71,151	8,126	753	13,800	92,541	38,475	86,906	311,752
1983	84,406	8,927	1,424	15,894	76,474	46,710	92,248	326,083
1984*	90,089	6,300	1,793	30,483	93,429	59,815	100,761	382,670

* provisional data

Table 3.2.2 Total catch of COD in Sub-divisions 22-32 (tonnes).

Area / Year	DENMARK 22	23	24	25-28	FINLAND 29	30[2]	31	32
1971	16,831		6,884	23,116		53		
1972	17,717		7,928	34,072		76		
1973	21,400		9,195	35,455		95		
1974	18,300		7,482	32,028		160		
1975	15,981		7,500	39,043	270	8		20
1976	19,764	712	9,682	47,412	81	24		182
1977	17,726	1,166	10,213	44,400	85	26		199
1978	12,641	1,177	6,527	30,266	249	323	6	859
1979	16,093	2,029	7,232	34,350	707	518	16	1,697
1980	16,033	2,425	7,367	49,704	2,163	880	45	2,874
1981	15,502	1,473	7,152	68,521	3,036	684	11	1,950
1982	11,669	1,638	7,469	71,151	4,557	1,368	42	2,159
1983	14,100	1,257	7,861	84,406	5,322	2,013	36	1,556
1984[1]	13,867	1,703	8,042	90,089	3,756	1,421	25	1,098

Area / Year	FEDERAL REPUBLIC OF GERMANY 22	24	25	26	28	GERMAN DEMOCRATIC REPUBLIC 22	24	25	26	27	28	29
1971	11,686	1,796	1,300	1,466		3,602	4,405	1,950	983		37	
1972	10,531	1,782	3,193	10		4,560	5,105	1,950	2,072		33	
1973	12,833	900	9,100	5,200	673	4,004	4,370	4,065	1,912		57	
1974	9,998	395	5,242	5,769	820	3,028	5,431	1,469	996	-	52	-
1975	12,415	497	8,809	1,975	1,184	3,471	2,571	3,320	5,250	50	60	20
1976	12,312	581	7,526	4,490	1,717	1,292	3,290	800	3,150	10	10	-
1977	10,807	879	3,649	13,803	1,668	977	2,471	324	5,996	73	1,119	7
1978	9,972	880	2,178	1,793	299	1,619	5,466	414	1,714	1	131	-
1979	8,910	688	7,616	2,149	12	1,024	6,570	54	1,301	1	46	1
1980	5,968	689	10,985	673	92	880	4,700	5	1,818	-	3	-
1981	9,095	2,165	7,021	-	-	1,743	9,916	2	1,275	-	-	-
1982	7,394	666	13,069	662	69	1,787	8,828	-	728	-	25	-
1983	8,937	323	14,179	1,599	116	1,441	7,656	-	1,402	-	22	-
1984[1]	11,340	208	21,048	7,926	603	1,774	6,319	-	1,793	-	-	-

continued......

Table 3.2.2 (continued)

Area / Year	POLAND 25[4]	POLAND 26	SWEDEN 23	SWEDEN 24	SWEDEN 25	SWEDEN 26	SWEDEN 27[3]	SWEDEN 28	SWEDEN 29	SWEDEN 30	SWEDEN 31
1971	27,581	26,570		1,419	13,132		833	240		46	
1972	24,926	32,167		1,277	13,842		876	440		36	
1973	29,010	20,780		1,655	15,224		971	485		54	
1974	25,221	23,429		1,937	11,950		1,682	825		41	
1975	35,373	33,945		1,932	12,511		2,052	1,367	103	-	
1976	26,082	44,384	-	1,800	14,109		1,979	2,180	115	5	
1977	18,172	29,530	550	1,516	11,775		2,584	1,560	120	22	
1978	31,161	32,952	600	1,730	9,017	26	3,207	1,740	417	55	1
1979	40,146	39,608	700	1,800	13,628	50	3,458	2,665	641	145	6
1980	50,832	72,654	1,300	2,610	18,694	88	6,014	3,185	790	516	4
1981	50,698	70,203	900	5,700	24,600	260	7,200	4,450	712	500	8
1982	41,830	50,711	140	7,933	20,429	2,279	4,109	9,264	687	1,669	38
1983	35,153	41,321	120	6,910	27,630	1,810	6,490	9,200	1,260	320	-
1984[1]	35,261	58,168	228	6,014	33,493	4,413	8,223	11,947	1,338	271	130

Area / Year	USSR 25	USSR 26	USSR 27	USSR 28	USSR 29	USSR 32	TOTAL
1971		16,115		4,795			164,840
1972		23,951		6,189			192,733
1973	-	8,768	1	11,250	50	14	197,521
1974	811	18,633	-	17,677	1,010	-	194,386
1975	946	17,884	3	28,677	1,735	44	239,016
1976	8,855	25,302	126	14,645	106	13	252,736
1977	390	17,880	4	11,304	91	11	210,997
1978	12	18,010	78	18,623	166	311	194,621
1979	13	30,776	-	39,875	1,575	2,795	268,905
1980	7	45,734	-	59,892	4,575	14,142	388,341
1981	2	44,254	-	32,195	3,733	7,562	382,523
1982	5	33,221	-	40,876	3,308	9,496	360,743[4]
1983	-	33,600	-	39,464	6,095	13,089	374,688
1984[1]	-	39,871	-	43,802	6,185	10,903	432,165[5]

[1] Provisional
[2] Finland 1971-1974 Sub-divisions 29-32 combined
[3] Sweden 1971-1974 Sub-divisions 27 and 29 combined
[4] Poland some by-catches from 24 included
[5] Sum of figures used in assessments.

Table 4.1 Annual nominal catches in tonnes of Baltic Salmon in 1975-84.
(S = Sea; C = Coastal; R = River)

	Baltic Main Basin Sub-divisions 24-29							
Year	Denmark S	Finland S	Finland C	Fed.Rep.of Germany S	Poland S	Sweden S	USSR S	USSR C/R
1975	1,112	211	-	67	10	352	43	194
1976	1,372	181	-	58	7	332	84	123
1977	951	134	-	77	6	317	68	96
1978	810	191	-	22	4	252	90	48
1979	854	199	-	31	4	264	167	29
1980	886	305	-	40	22	325	303	16
1981	838	302	-	43	45	401	299	-
1982	597	212	-	20	38	375	307	-
1983	691	189	-	25	76	370	467	-
1984*	1,034	220	7	32	72	549	450	-

	Gulf of Bothnia Divisions 30-31						Gulf of Finland Division 32				
Year	Denmark S	Finland S	Finland C	Sweden S	Sweden C	Sweden R	Finland S	Finland C	USSR S	USSR C/R	Total
1975	98	412		33	272	127	74		-		3,005
1976	38	271	155	22	229	80	81	-	-	14	3,061
1977	60	348	142	49	240	60	75	-	-	13	2,649
1978	0	127	145	18	212	40	68	1	-	6	2,040
1979	0	172	121	20	171	35	63	3	-	4	2,137
1980	0	162	148	23	172	35	51	2	9	7	2,506
1981	0	190	157	26	242	35	65	1	-	7	2,651
1982	0	177	133	-	135	30	102	27	-	4	2,157
1983	0	193	161	-	140	32	129	65	-	2	2,540
1984*	0	350	165	-	140	52	130	65	-	2*	3,268

*Preliminary data: total catches of USSR stated as 450 tonnes in the Main Basin and 2 tonnes in the Gulf of Finland. 5% of the Swedish catches stated for the Main Basin have been taken in Sub-division 30. (see notes on next page.)

Notes to Table 4.1

Data from Denmark, Federal Republic of Germany, Poland and Sweden have been converted from gutted to ungutted weight by the factor 1.1, an approximation to the equation: W ungutted = 1.0972 W gutted estimated by Thurow (1965).

Data from Denmark (before 1983), Federal Republic of Germany, Finland and the USSR include sea trout of an order of 3%, 3%, 10% and 3%, respectively.

The sea catches in the Main Basin consist almost exclusively of feeding salmon fished offshore by drifting gear.

About 50% of the Swedish and, since 1971, about 20% of the Finnish catches in the Gulf of Bothnia are fished in the northern part of the Gulf, generally on the coast and exclusively with fixed gear. Of the Finnish catches in the southern part, about 2/3 are taken by drifting gear, the remaining part in fixed gear.

In the Gulf of Finland, about 75% of the Finnish catches are obtained by drifting gear, while the USSR catches are exclusively coastal.

The main part of the coastal and river catches of Baltic salmon by the USSR is made in the Gulf of Riga by fixed gear in the estuaries and river mouths; only 6-10% enter the proper river fishery.

The Finnish landings from the Gulf of Bothnia and the Main Basin include 6% non-commercial catches. In the Gulf of Finland, such catches comprise about 20% of the total yield.

Table 4.2 Annual Nominal catches in tonnes of SEA TROUT and RAINBOW TROUT in the Baltic (Data of the Federal Republic of Germany, Sweden and the USSR are not available)

Year	Baltic Main Basin					Gulf of Bothnia	Gulf of Finland	Total
			Poland					
	Denmark[1])	Finland[1])[2])	Sea trout		Rainbow trout	Finland[1])[2])	Finland[1])[2])	
			Rivers	Coastal				
1979	3	8		81		144	38	274
1980	3	12		48		167	48	278
1981	6	18		45		159	87	315
1982	17	29		80	44	147	119	436
1983	19	42		108	30	128	137	464
1984	29**	40*	21	155	22	130*	140*	537

*Estimated

**Sea trout is also caught in the Western Baltic in Sub-division 22 by Federal Republic of Germany (10,200), Denmark and German Democratic Republic in 1984.

[1])Additional sea trout catches are included in the salmon statistics for Denmark until 1982 (Table 4.1).

[2])The Finnish landings include about 70% non-commercial catches.

Table 4.3 Distribution of salmon tag returns on fishing zones in percents of total number returns. Stocking year excluded.

	Releasing place (country and Sub-division), and stocking year							
		Finland						
	Sweden	30[1]	30[2]	31	31	32	USSR	Poland
National Zone	1969-72	1979-83	1979-83	1969-76	1977-80	1976-83	1970-76	1960-62
Denmark	4.6	2.5	31.1	4.0	11.8	5.3	8.8	16.7
Finland	6.2	88.7	44.8	37.0	40.8	90.4	21.8	8.3
German Dem. Rep.	0.8	-	0.6	0.1	0.6	0.1	-	-
Poland	9.0	-	1.9	4.2	2.2	-	2.6	33.3
Sweden	55.7	8.8	16.2	35.6	24.6	2.0	38.0	29.2
USSR	10.0	-	2.6	8.2	8.5	1.3	28.8	12.5
Grey zone	13.7	-	2.8	10.9	11.5	0.9	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

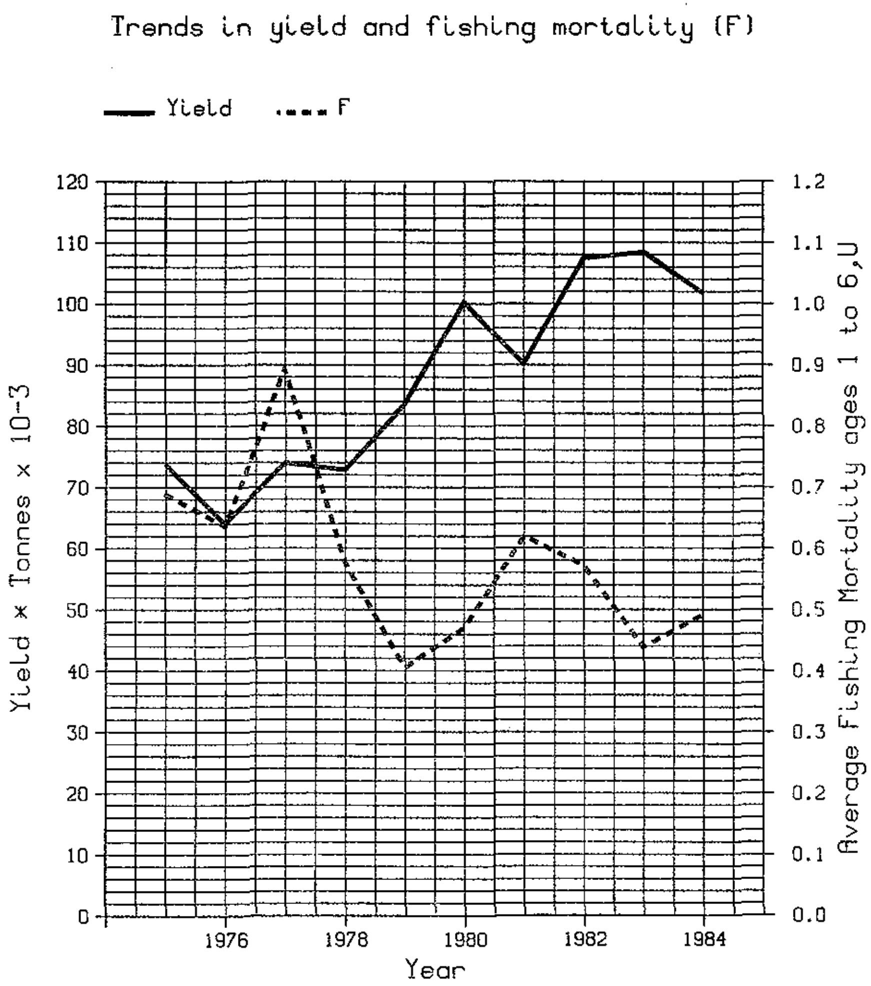
[1] River Neva stock
[2] River Iijoki stock

Figure 2.1.2.1

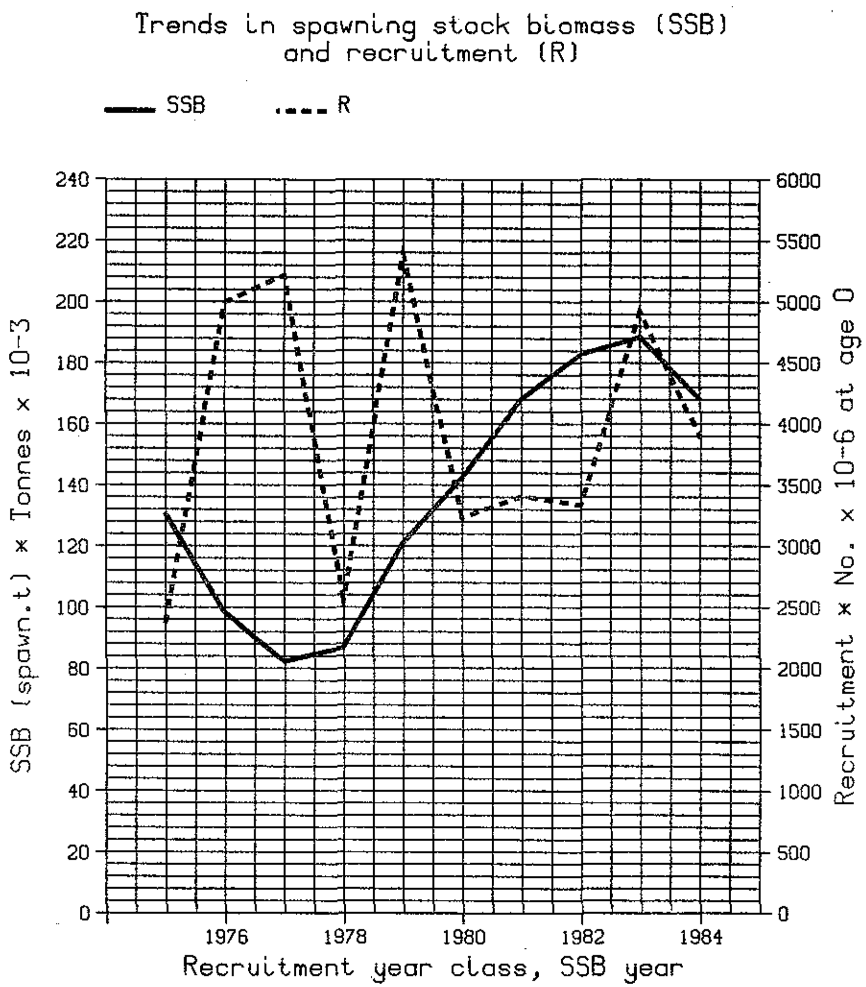
FISH STOCK SUMMARY

STOCK: Herring - 22 and 24

26-04-1985



A

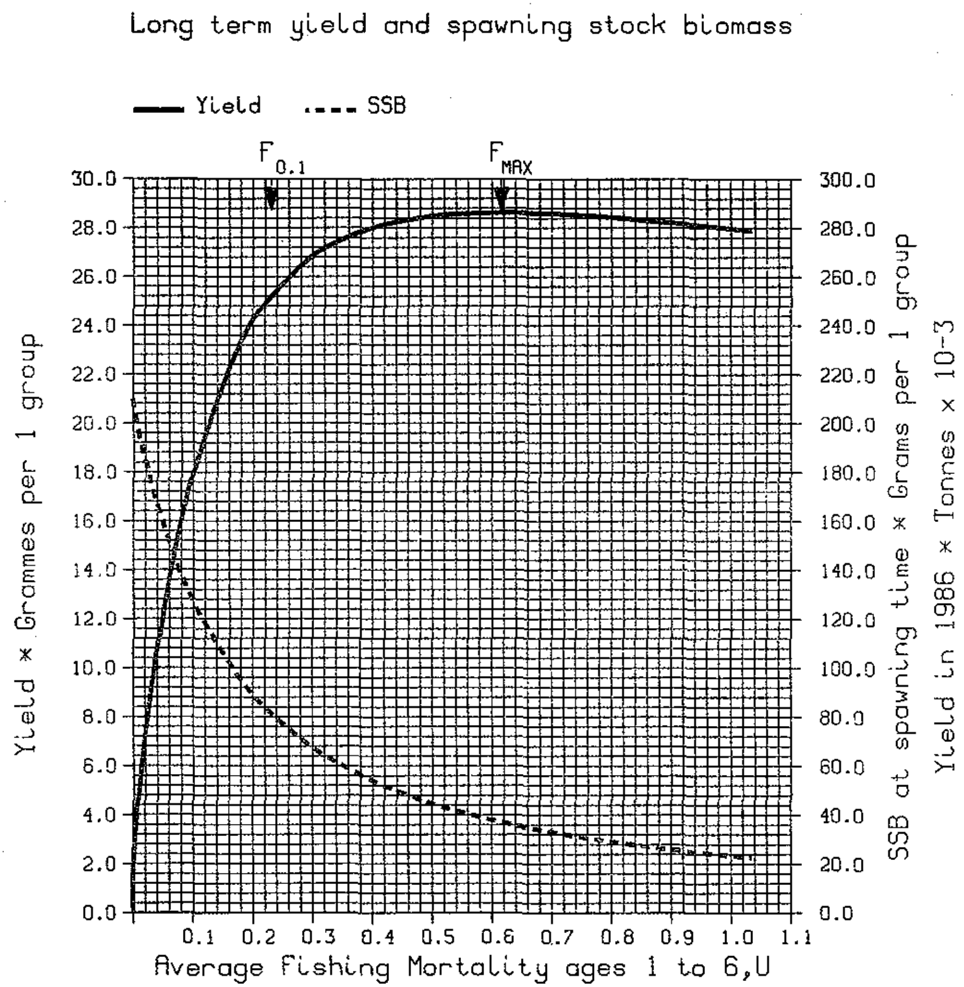


B

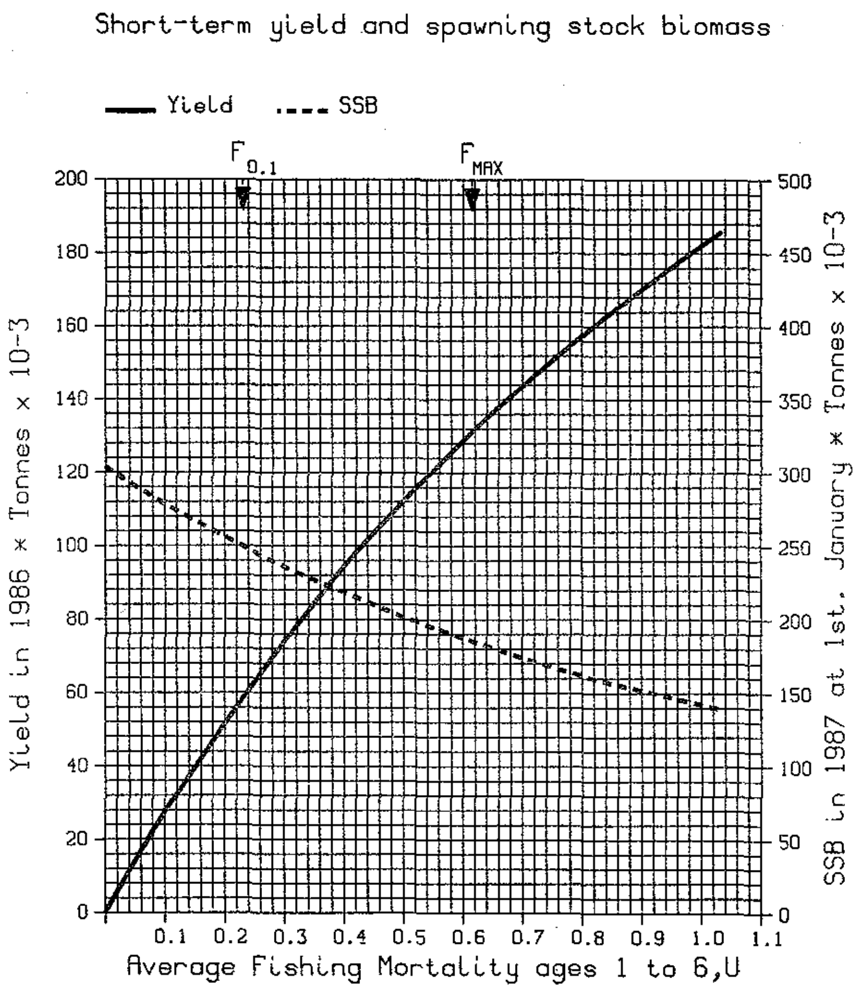
Contd.

Fig. 2.1.2.1 Contd.

FISH STOCK SUMMARY
STOCK: Herring - 22 and 24
26-04-1985



C



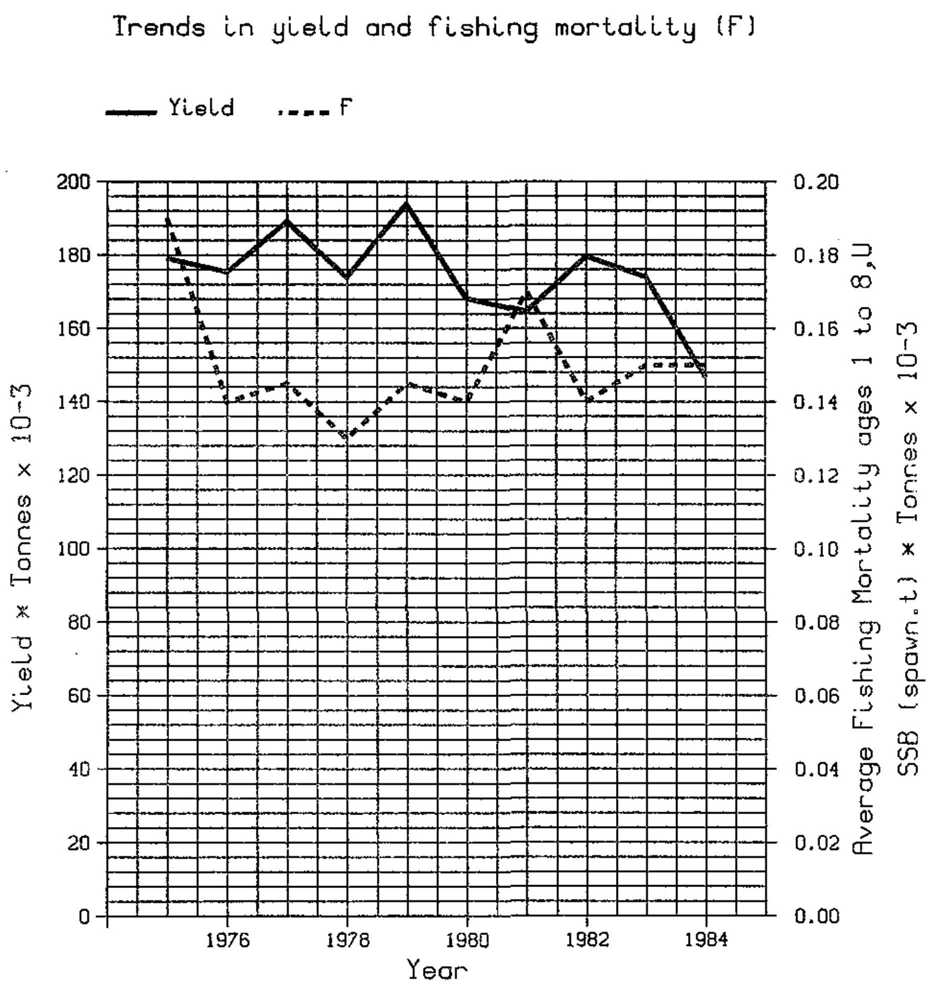
D

Figure 2.1.2.2

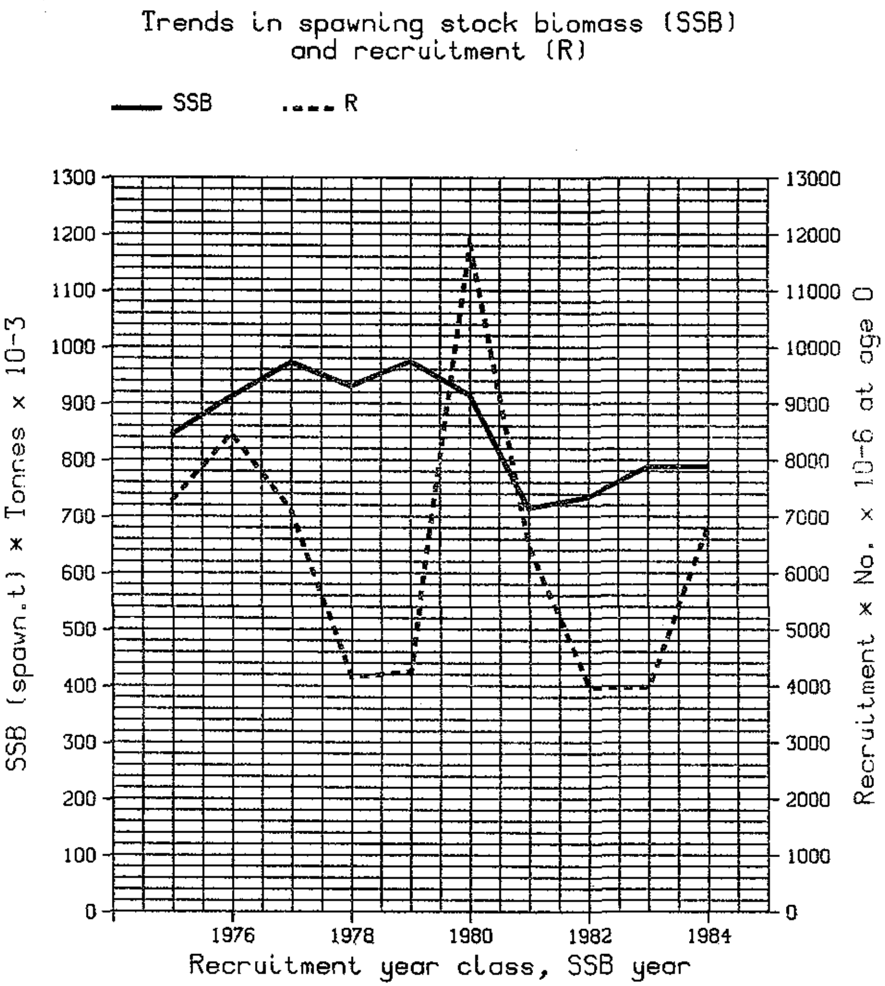
FISH STOCK SUMMARY

STOCK: Herring - Baltic (sub-divisions 25 to 27, combined)

26-04-1985



A



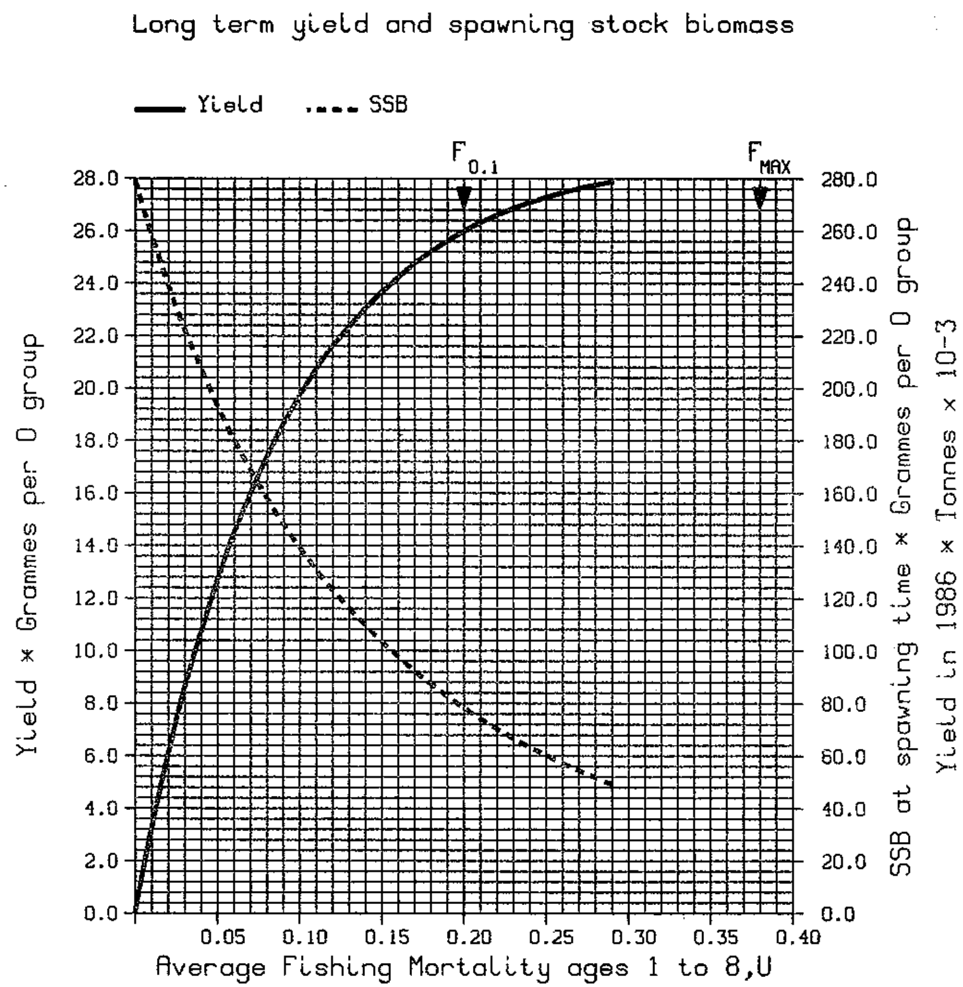
B

- 359 -

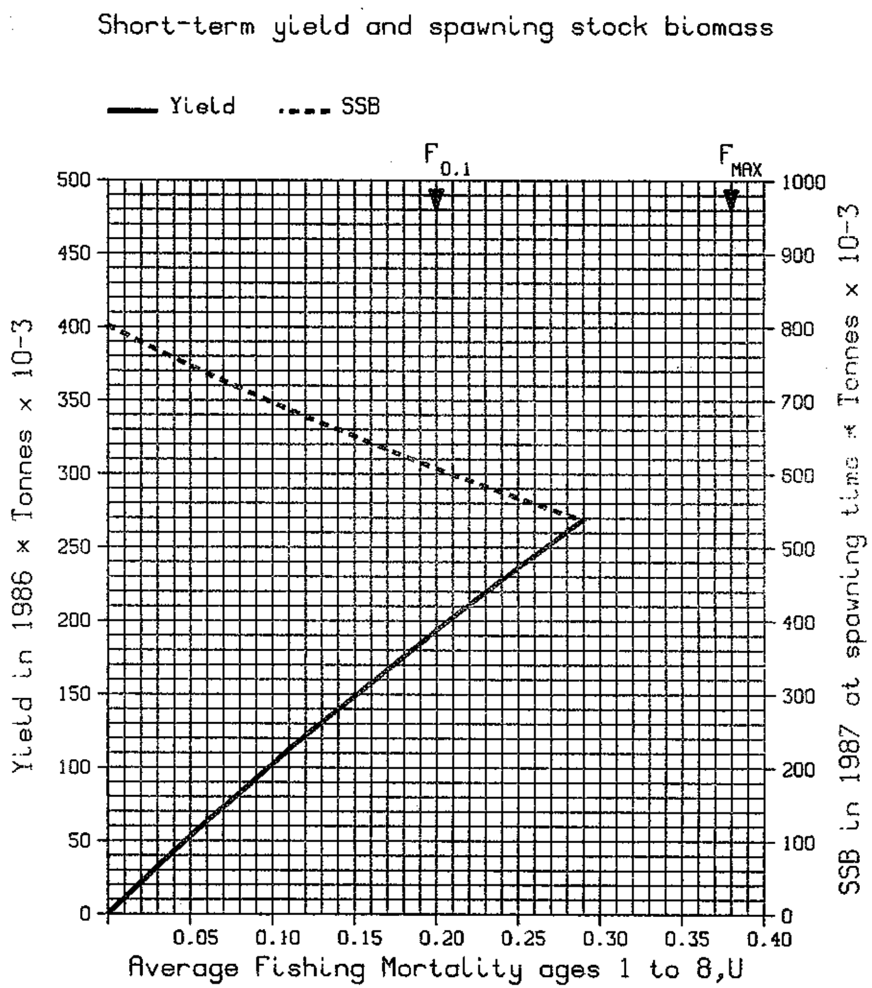
Figure 2.1.2.2 (cont.)

FISH STOCK SUMMARY
STOCK: Herring - Baltic
(sub-divisions 25 to 27, combined)

26-04-1985



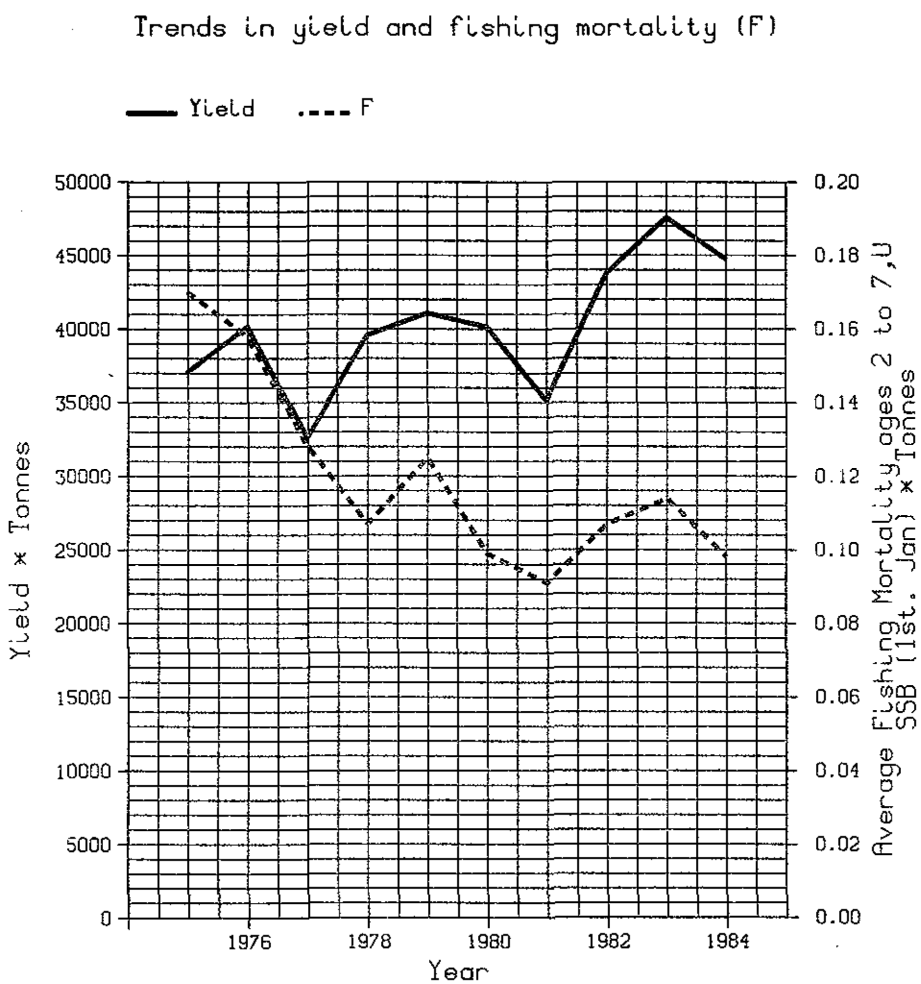
C



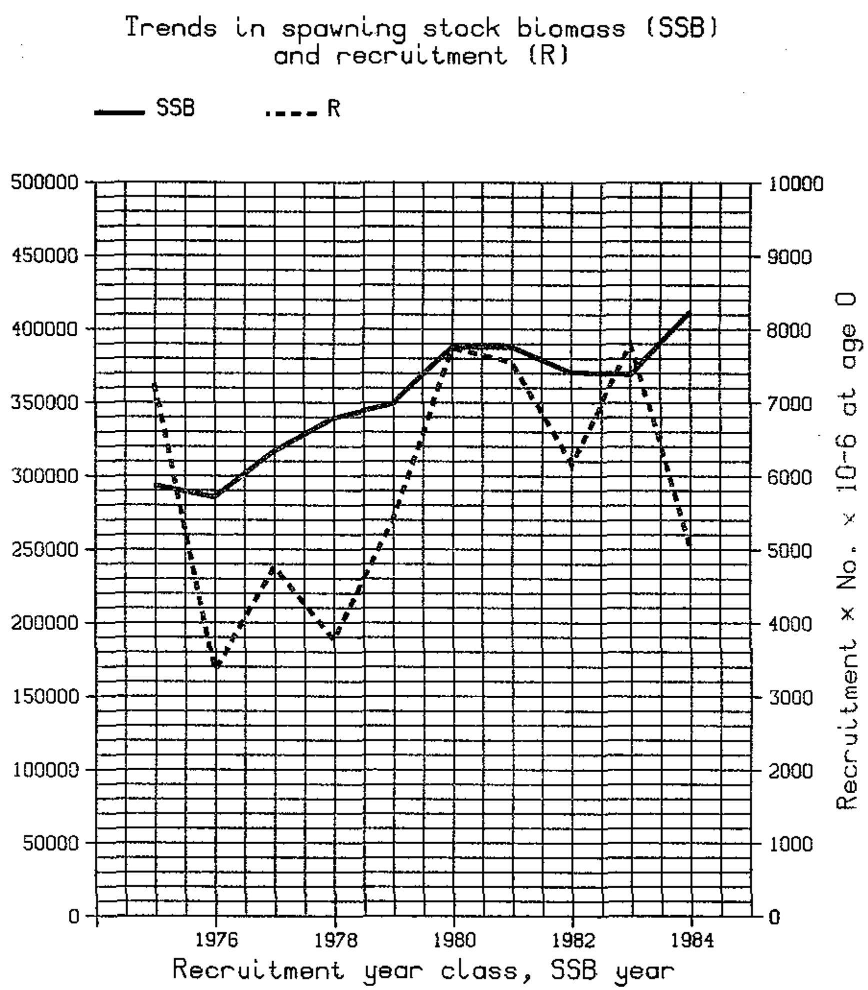
D

Figure 2.1.2.3.1

FISH STOCK SUMMARY
STOCK: Herring - 28 and 29S
25-04-1985



A



B

Contd.

Figure 2.1.2.3.1 (ctd)

FIST STOCK SUMMARY
STOCK: Herring - 28 and 29S
25-04-1985

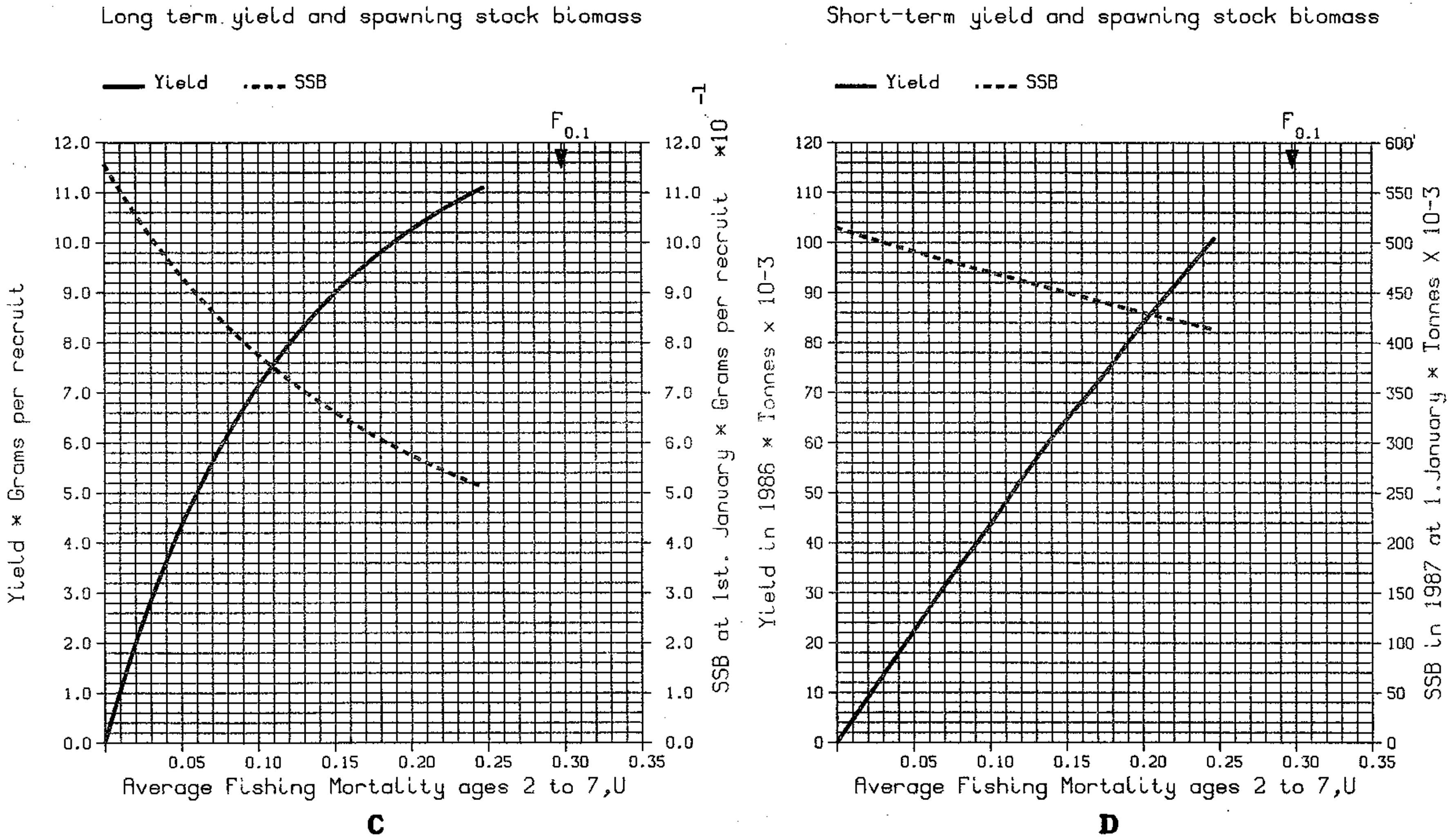
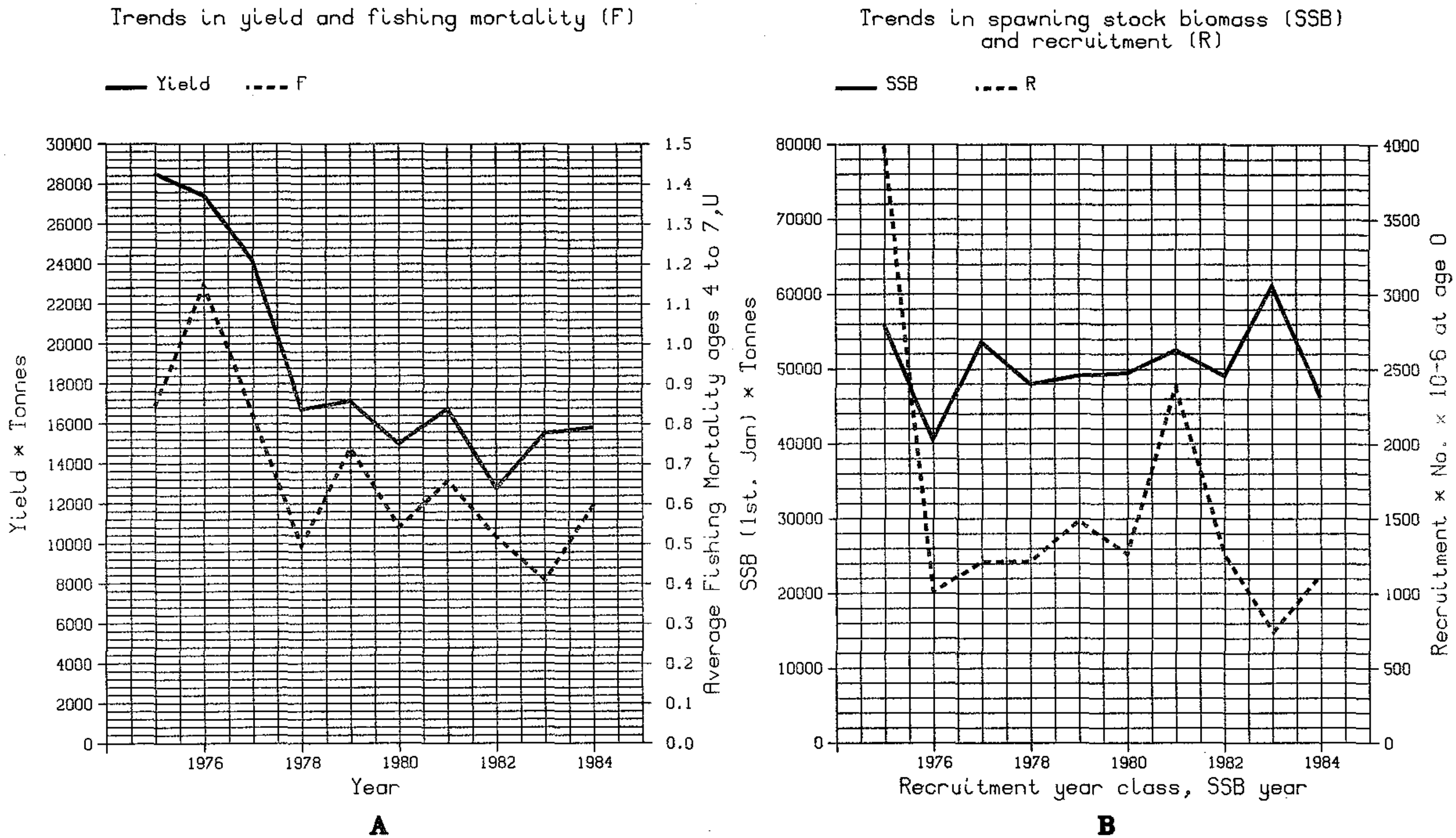


Figure 2.1.2.3.2

FISH STOCK SUMMARY
STOCK: Herring - Riga
24-04-1985



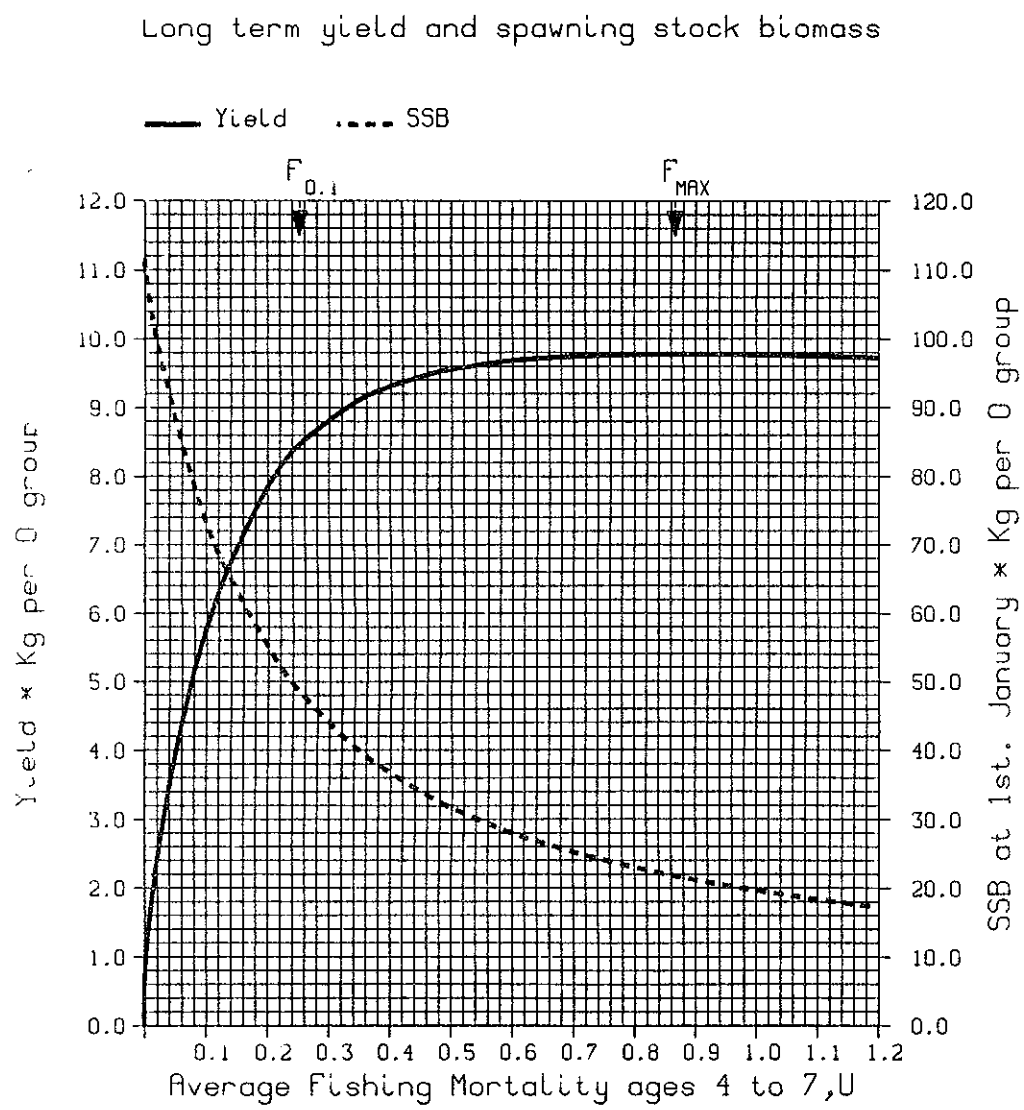
Contd.

Figure 2.1.2.3.2 (ctd)

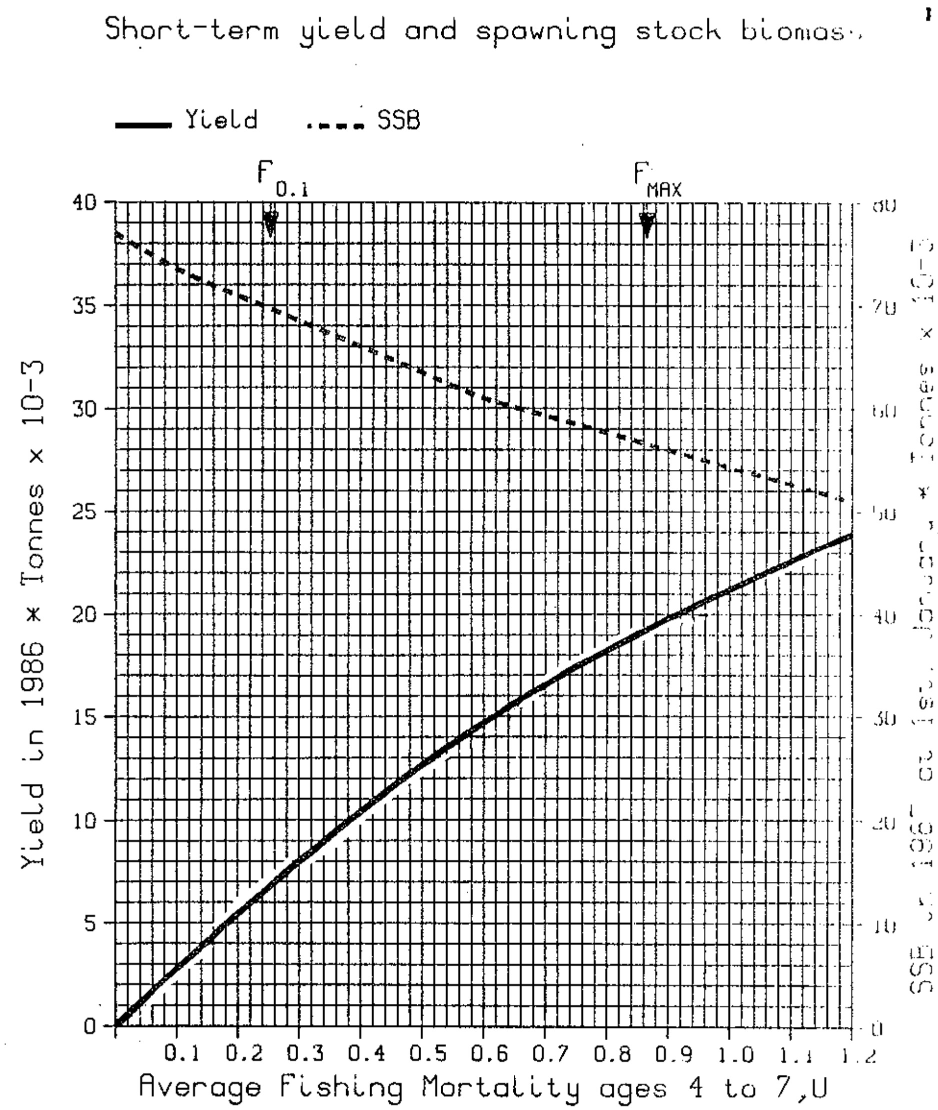
FISH STOCK SUMMARY

STOCK: Herring - Riga

24-04-1985



C



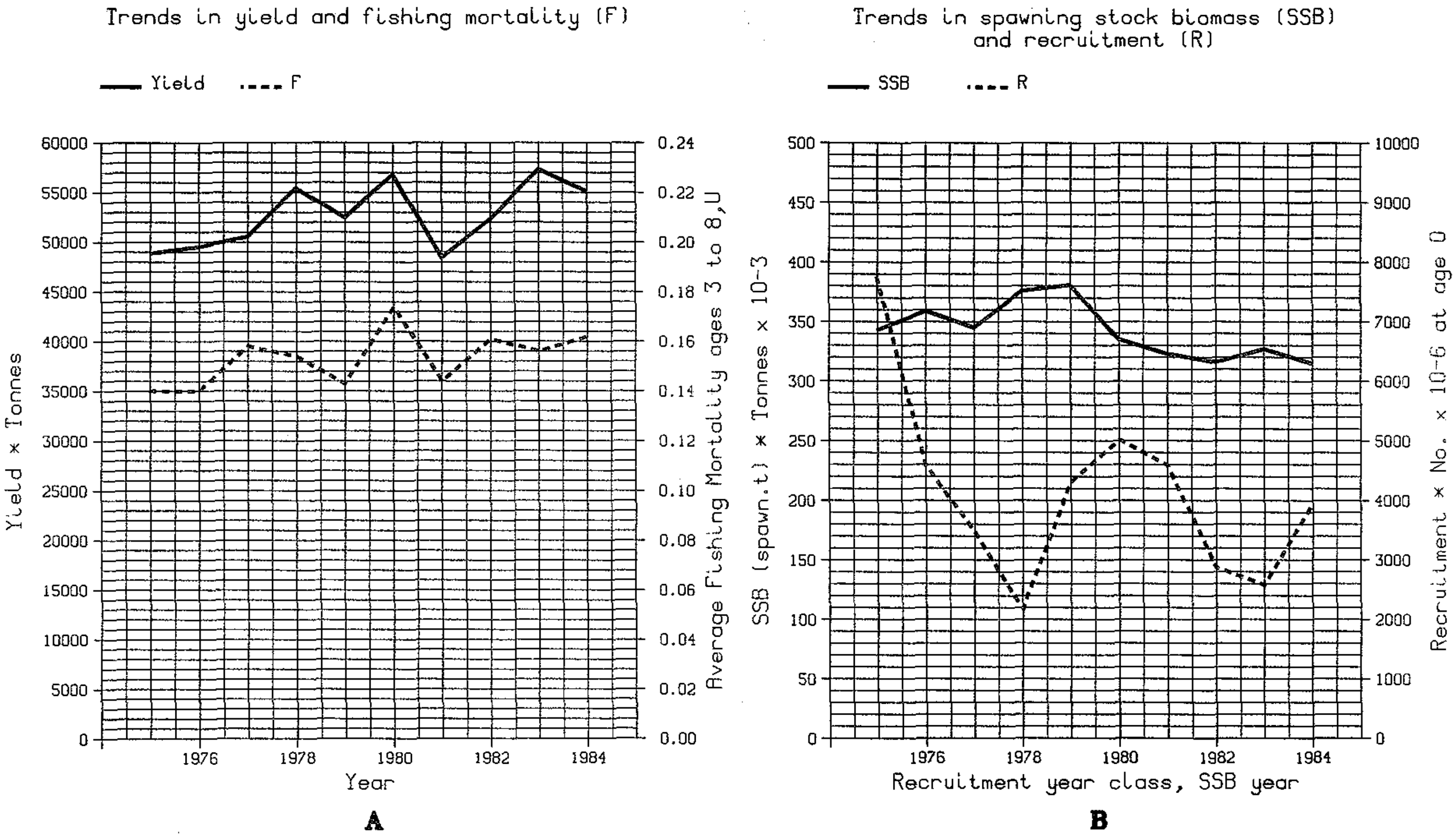
D

Figure 2.1.2.4

FISH STOCK SUMMARY

STOCK: Baltic Herring - 29NE and 30E

24-04-1985



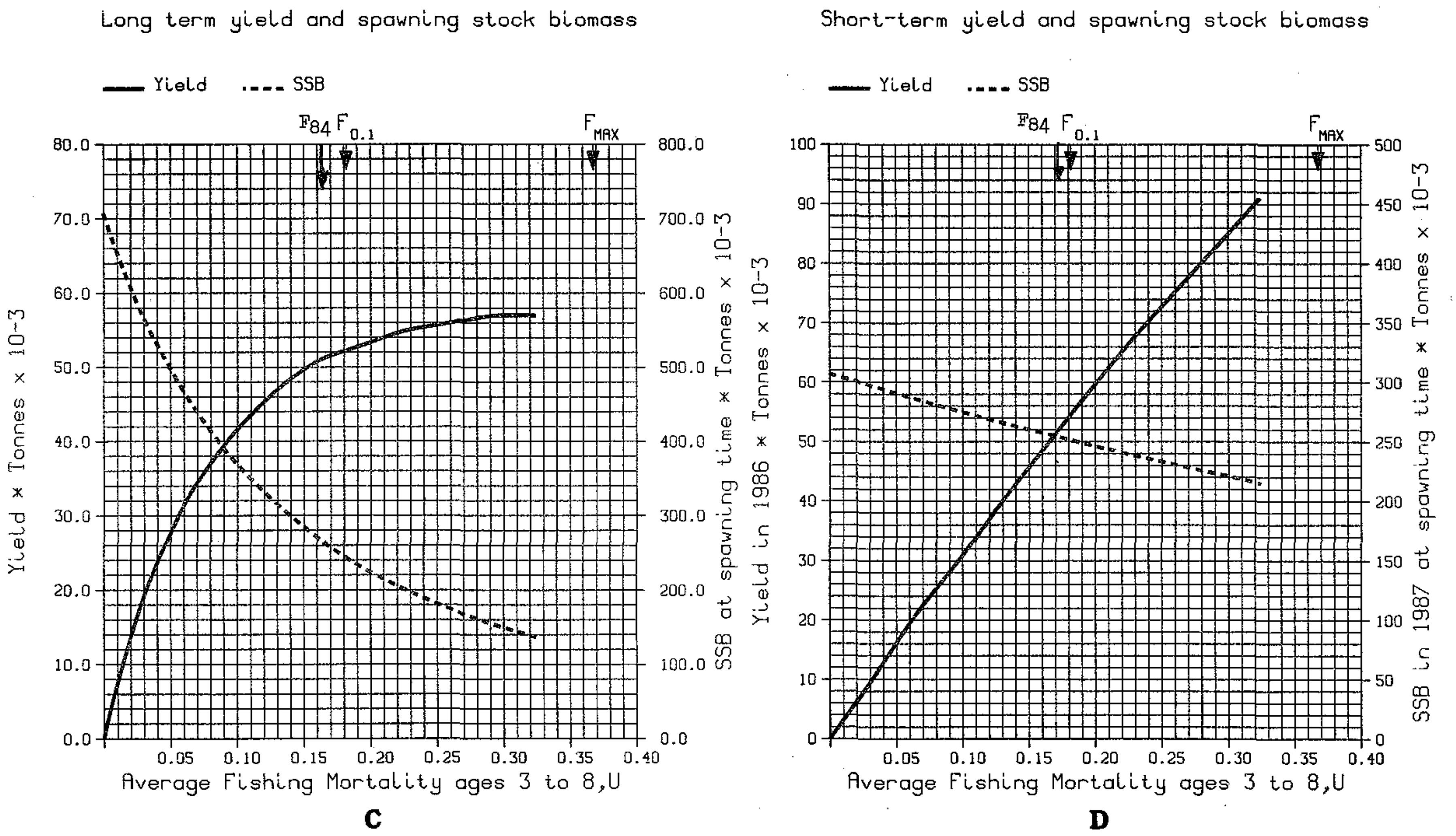
Contd.

Figure 2.1.2.4 Contd.

FISH STOCK SUMMARY

STOCK: Baltic Herring - 29NE and 30E

24-04-1985



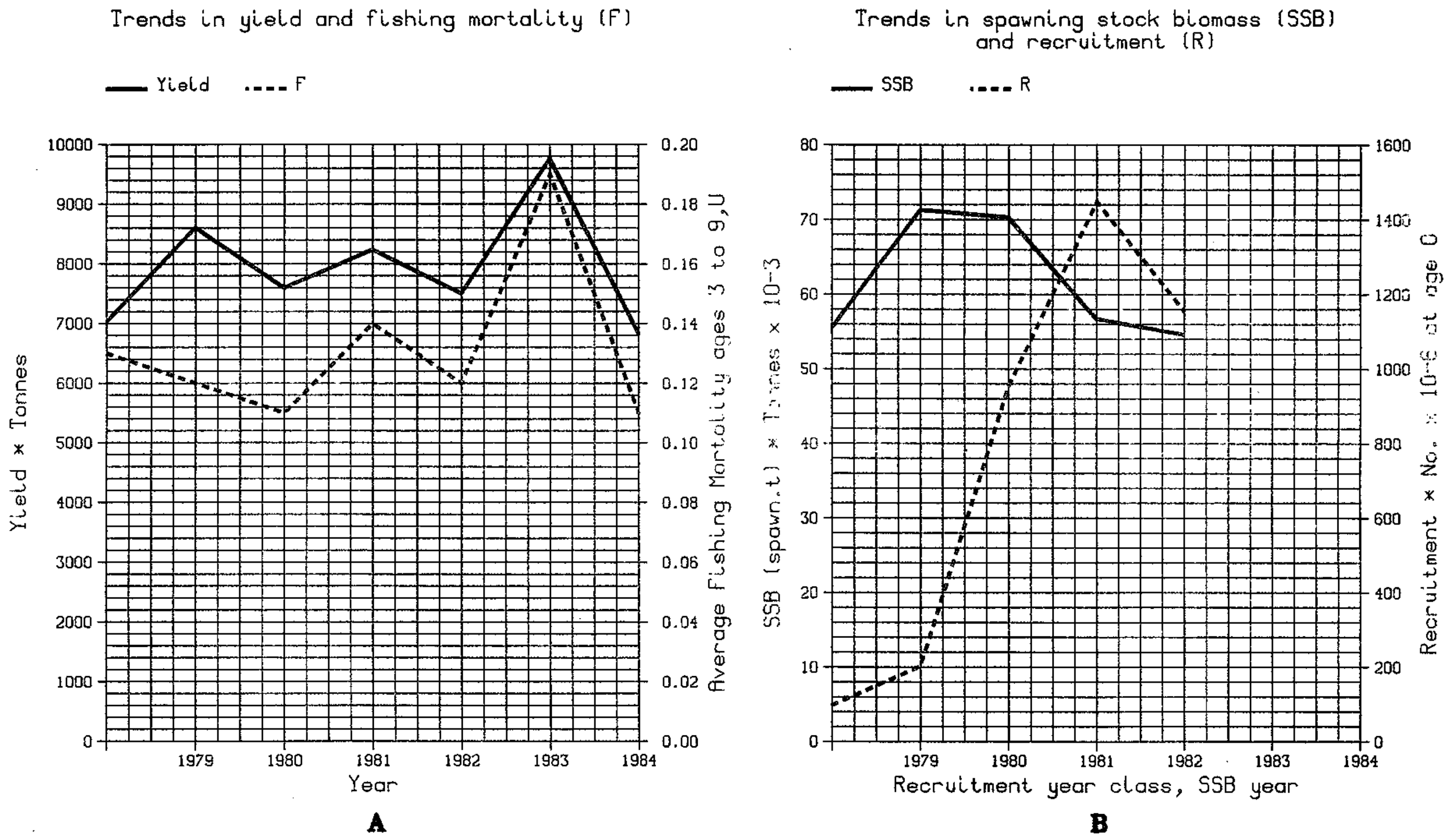
- 366 -

Figure 2.1.2.6

FISH STOCK SUMMARY

STOCK: Herring - BotnıAW (Western part of Sub-div. 29N, 30 and 31.)

26-04-1985



- 367 -

Figure 2.2.1 SPRAT catches ('000 tonnes) in 1965-84 (data from Working Group reports, corrections for by-catches taken into account).

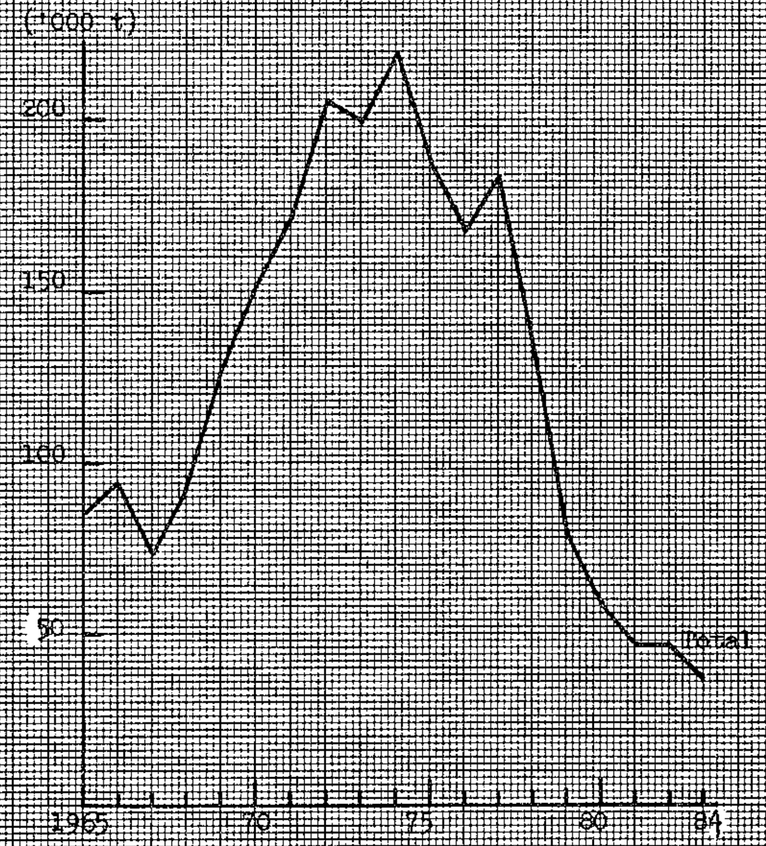
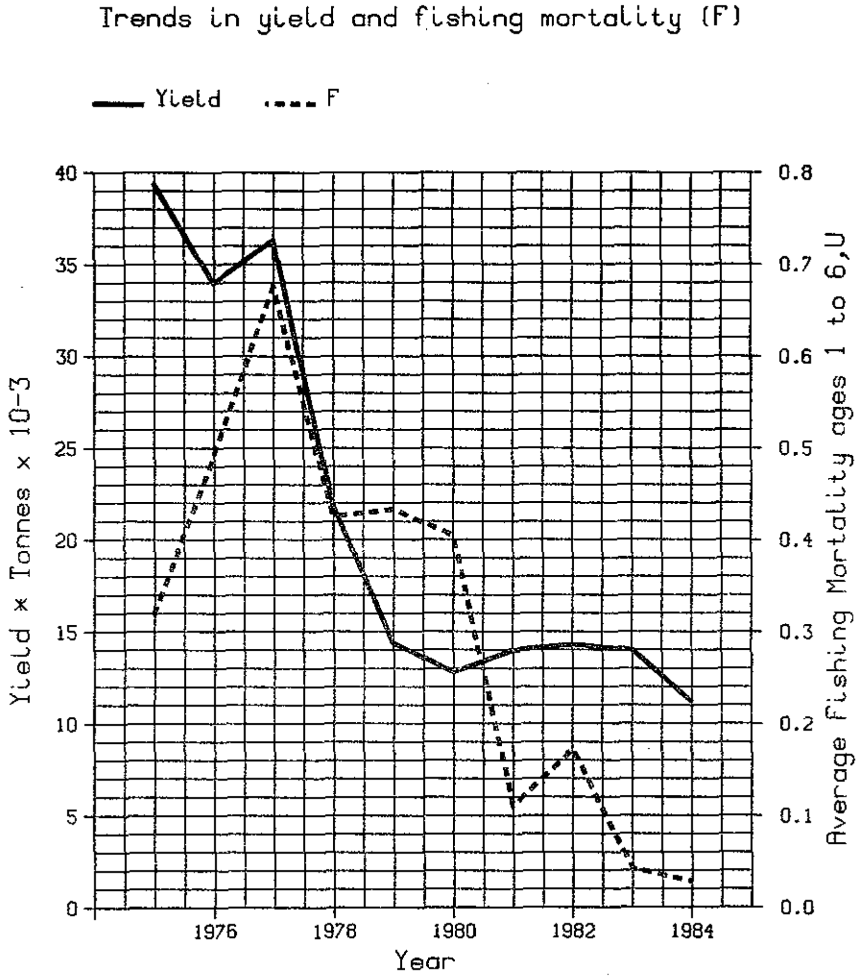
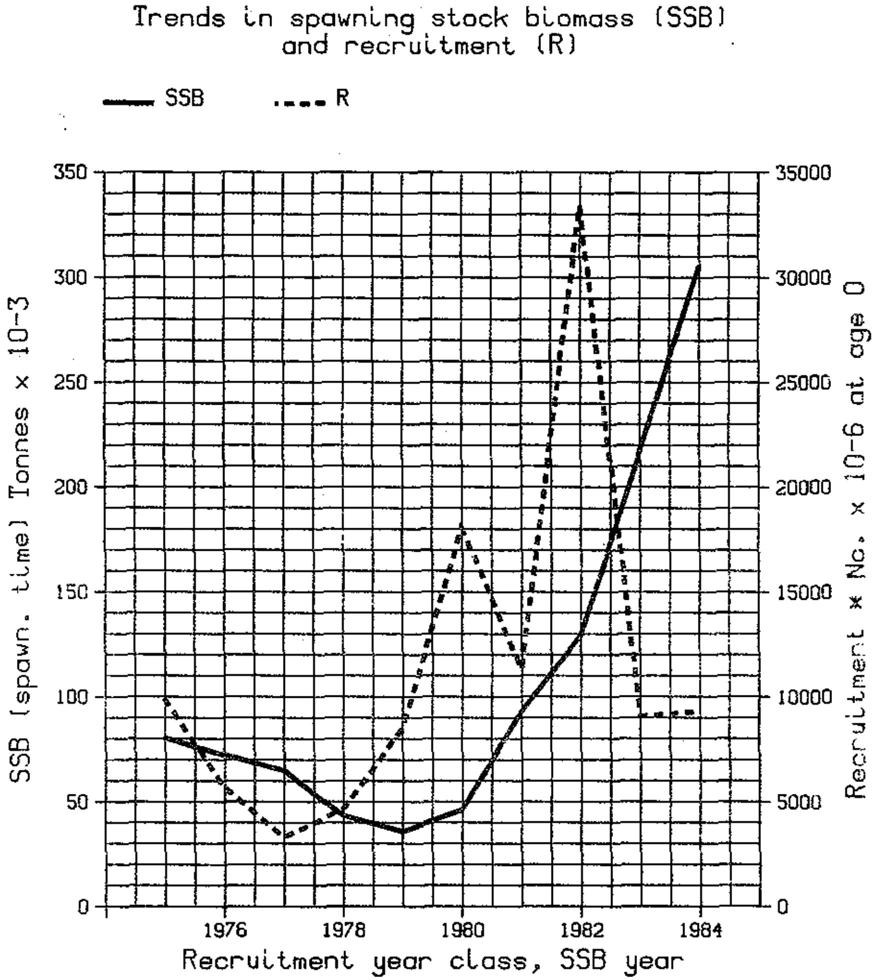


Figure 2.2.1.1

FISH STOCK SUMMARY
STOCK: Baltic Sprat - 22 to 25
25-04-1985



A



B

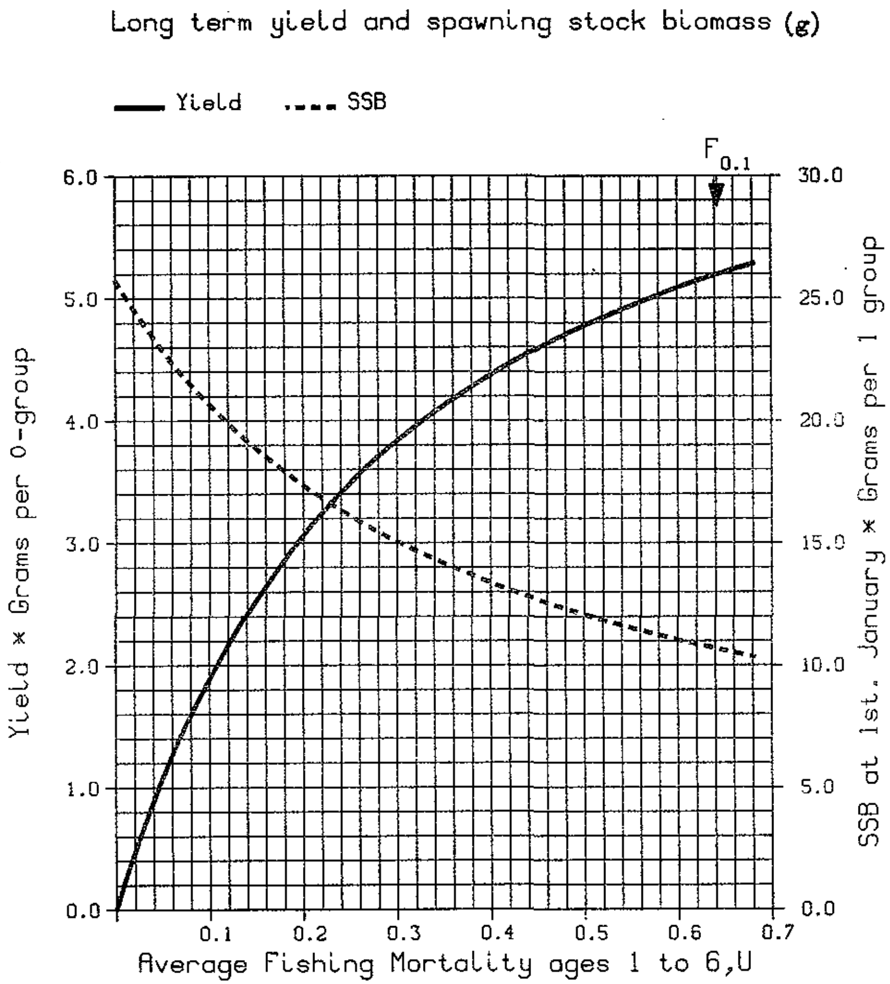
Contd.

Figure 2.2.1.1 Contd.

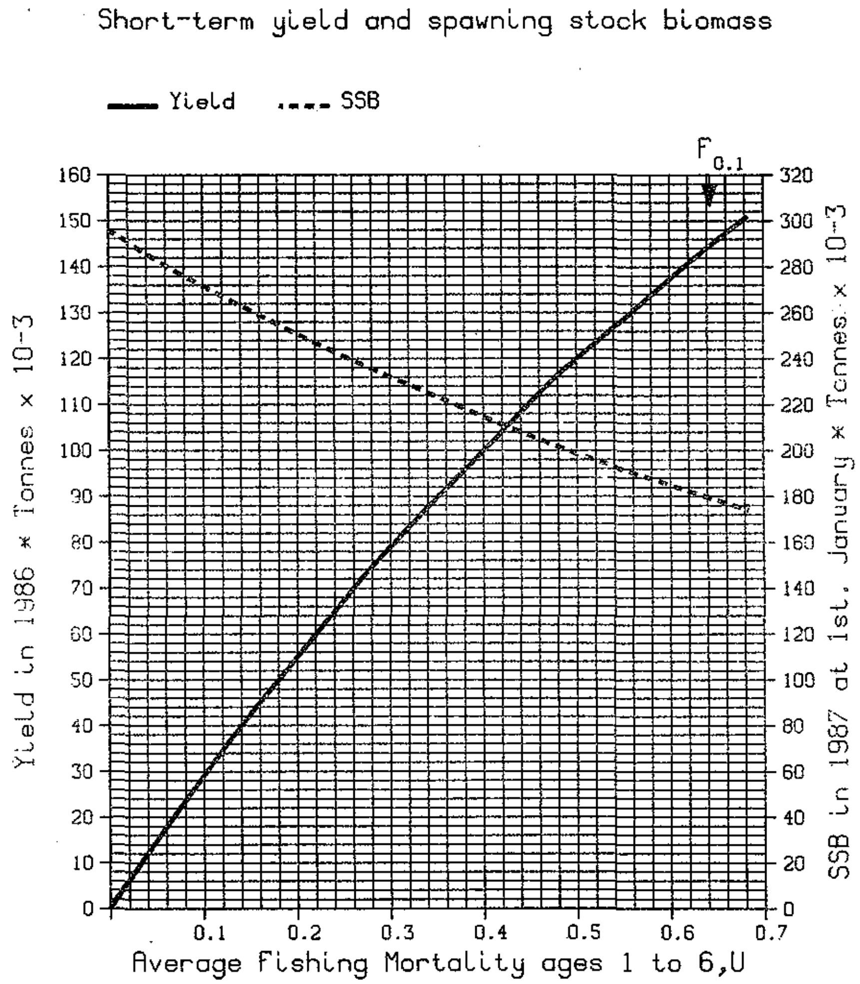
FISH STOCK SUMMARY

STOCK: Baltic Sprat - 22 to 25

25-04-1985



C



D

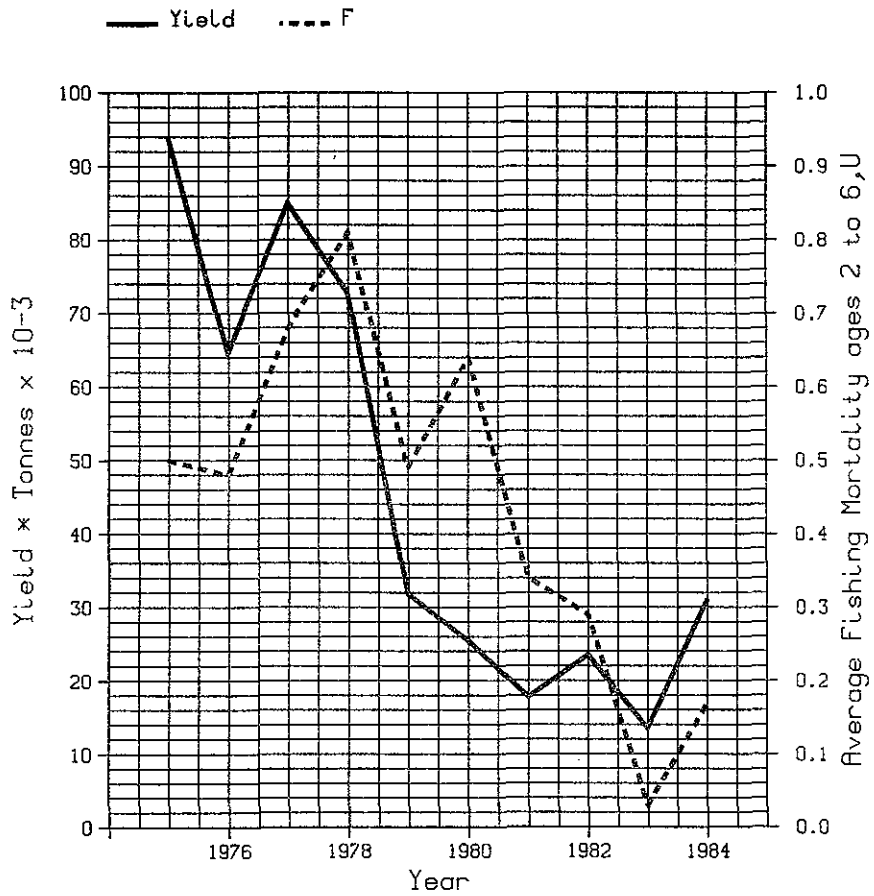
Figure 2.2.1.2

FISH STOCK SUMMARY

STOCK: Baltic Sprat - 26 and 28

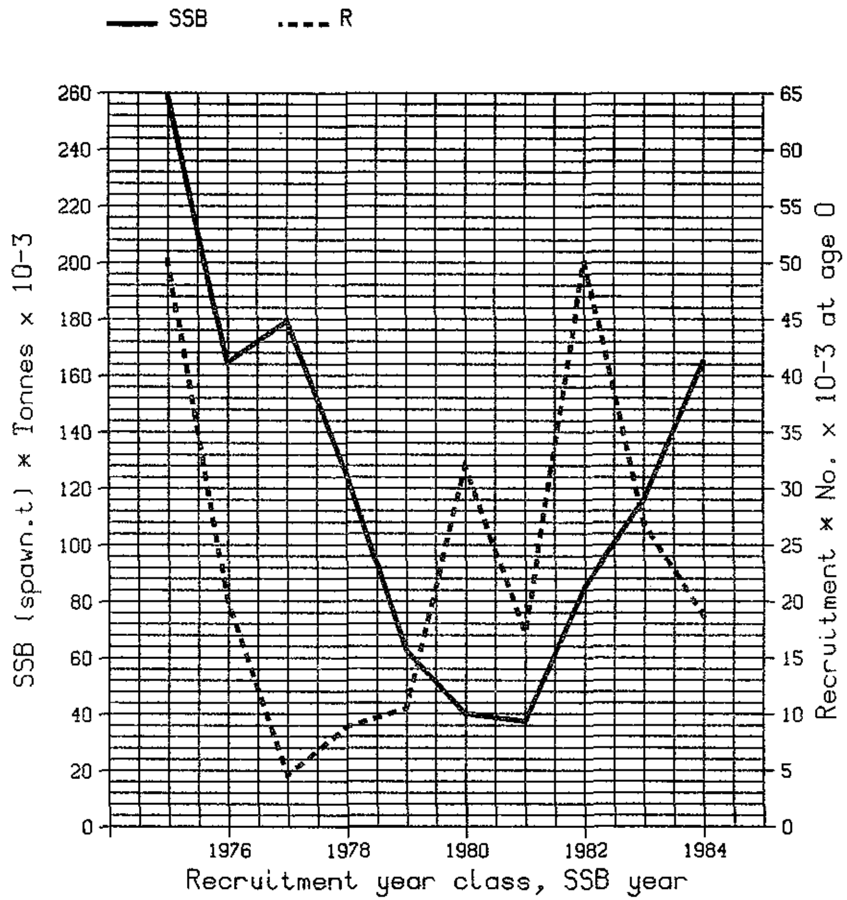
24-04-1985

Trends in yield and fishing mortality (F)



A

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

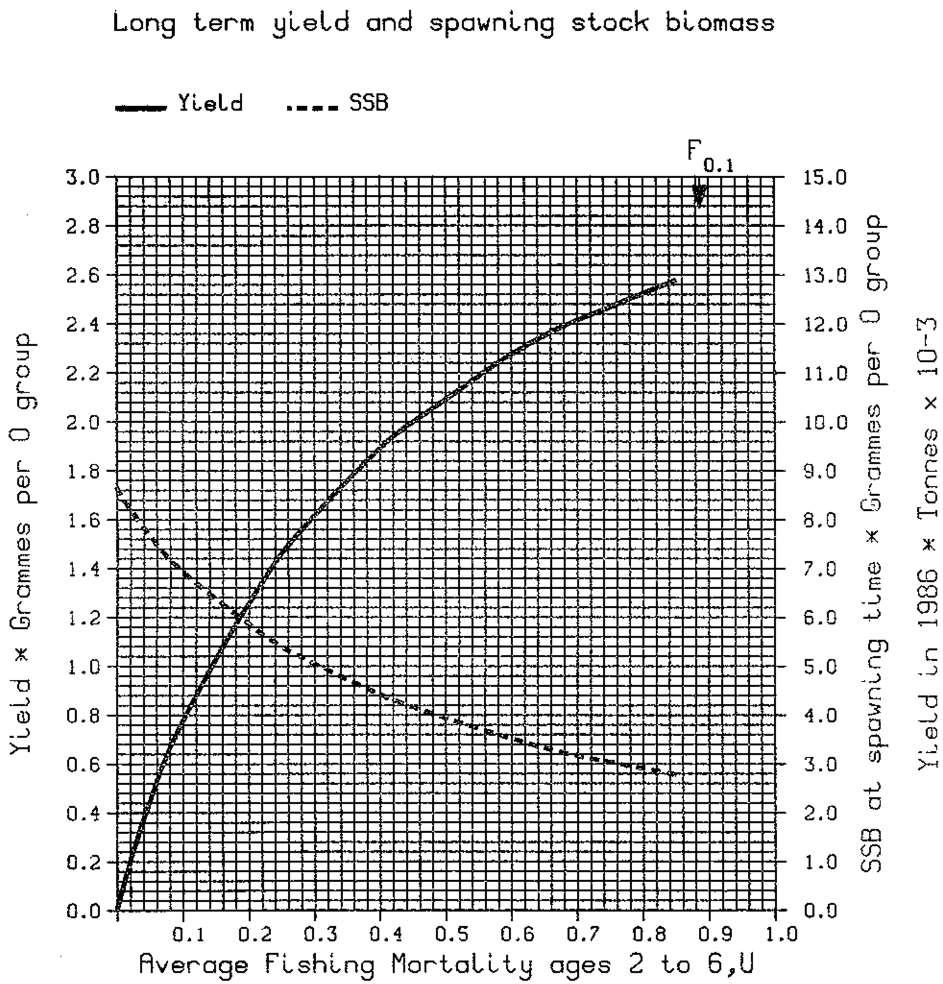


B

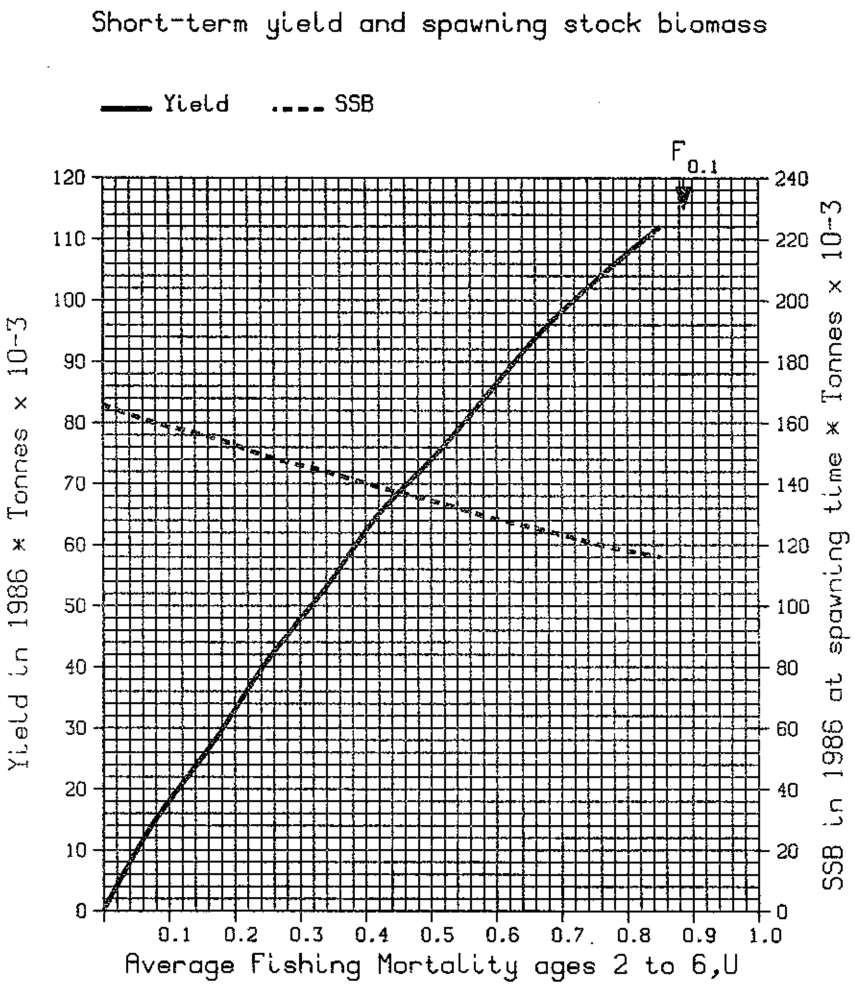
Contd.

Figure 2.2.1.2 Contd.

FISH STOCK SUMMARY
STOCK: Baltic Sprat - 26 and 28
24-04-1985



C



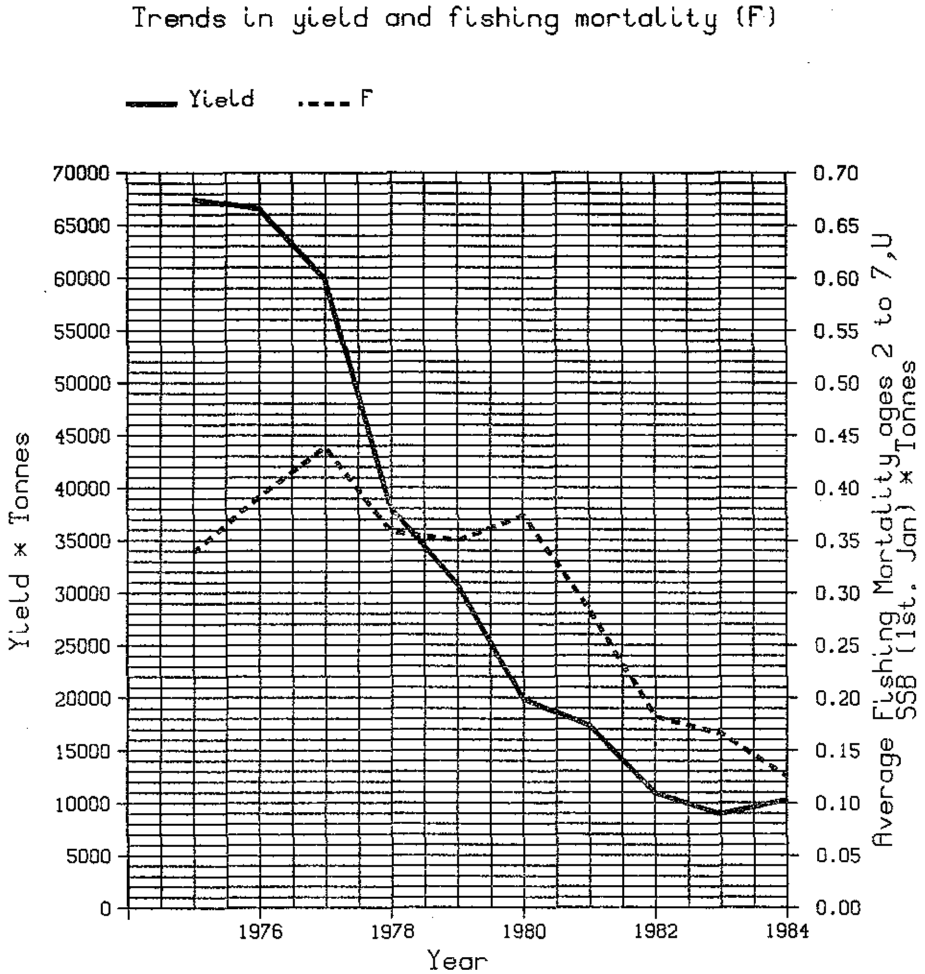
D

Figure 2.2.1.3

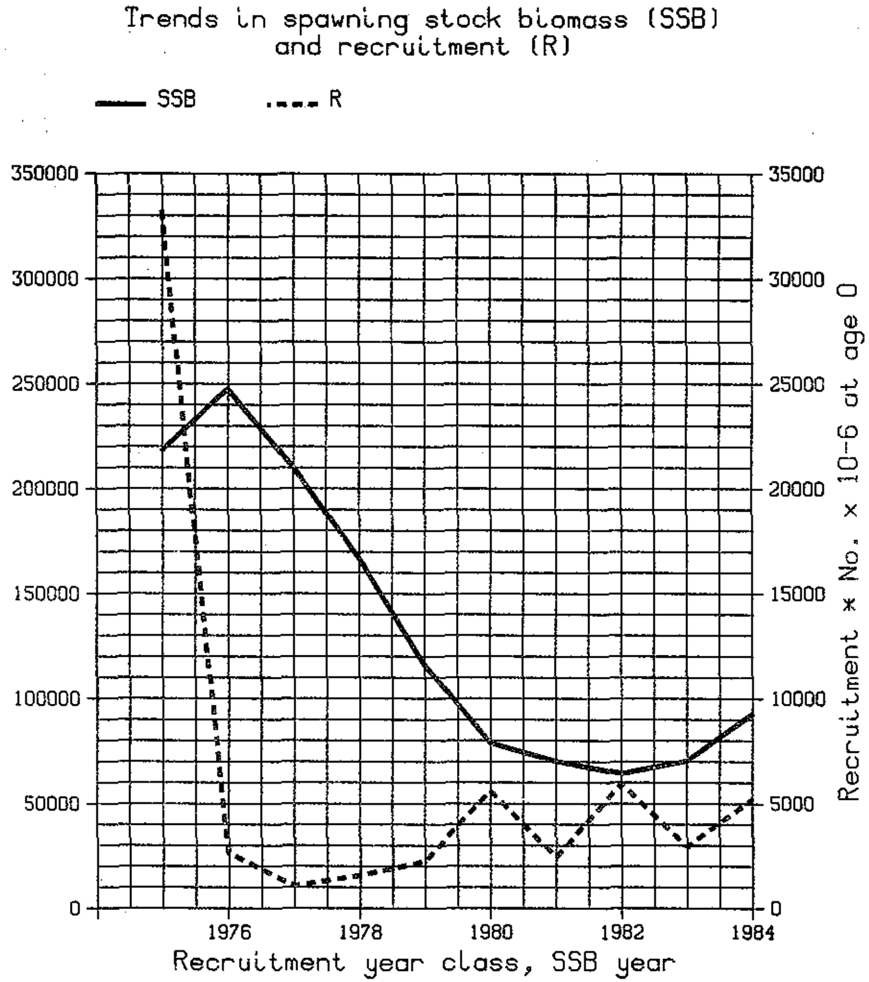
FISH STOCK SUMMARY

STOCK: Sprat - 27A29A32

26-04-1985



A

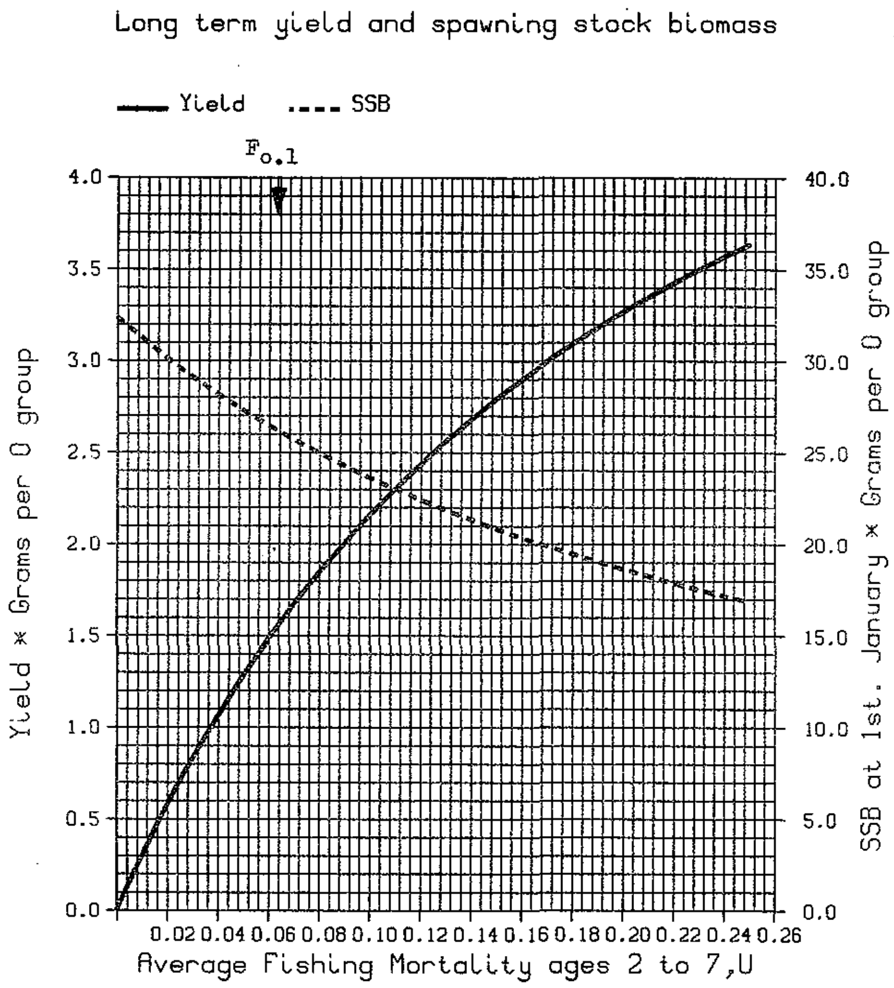


B

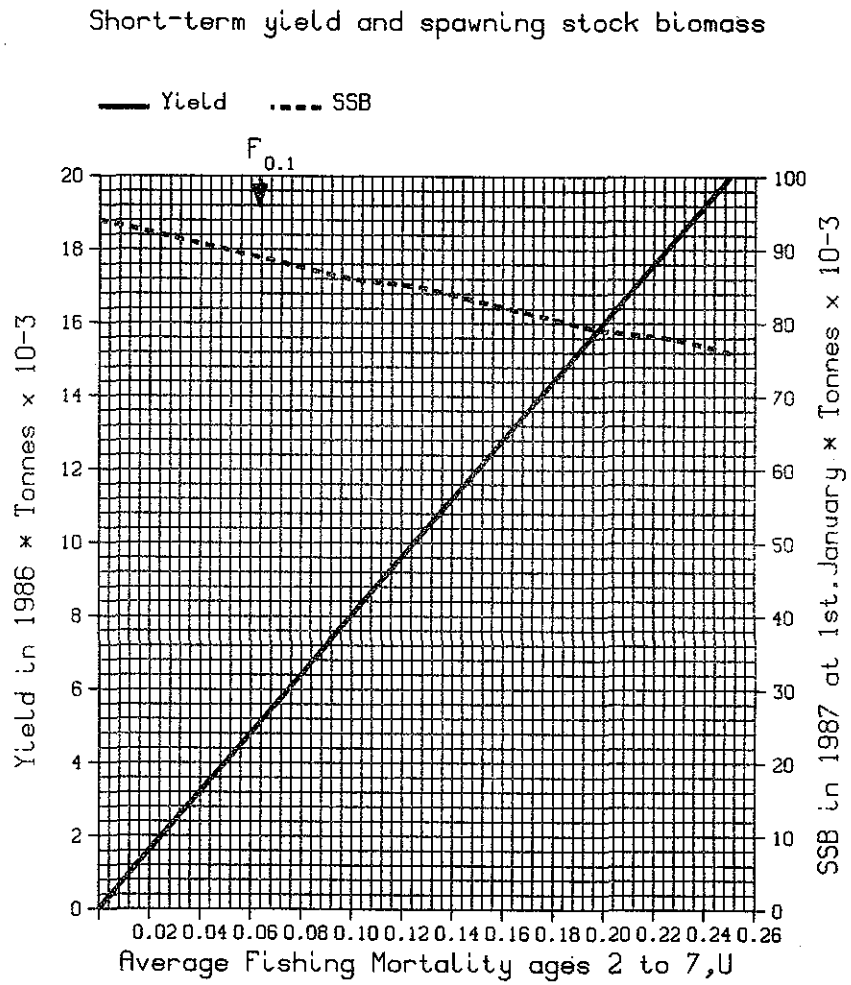
Contd.

Figure 2.2.1.3 Contd.

FISH STOCK SUMMARY
STOCK: Sprat - 27A29A32
26-04-1985



C



D

FISH STOCK SUMMARY
STOCK: Baltic Cod - 22 and 24
30-04-1985

Figure 3.1

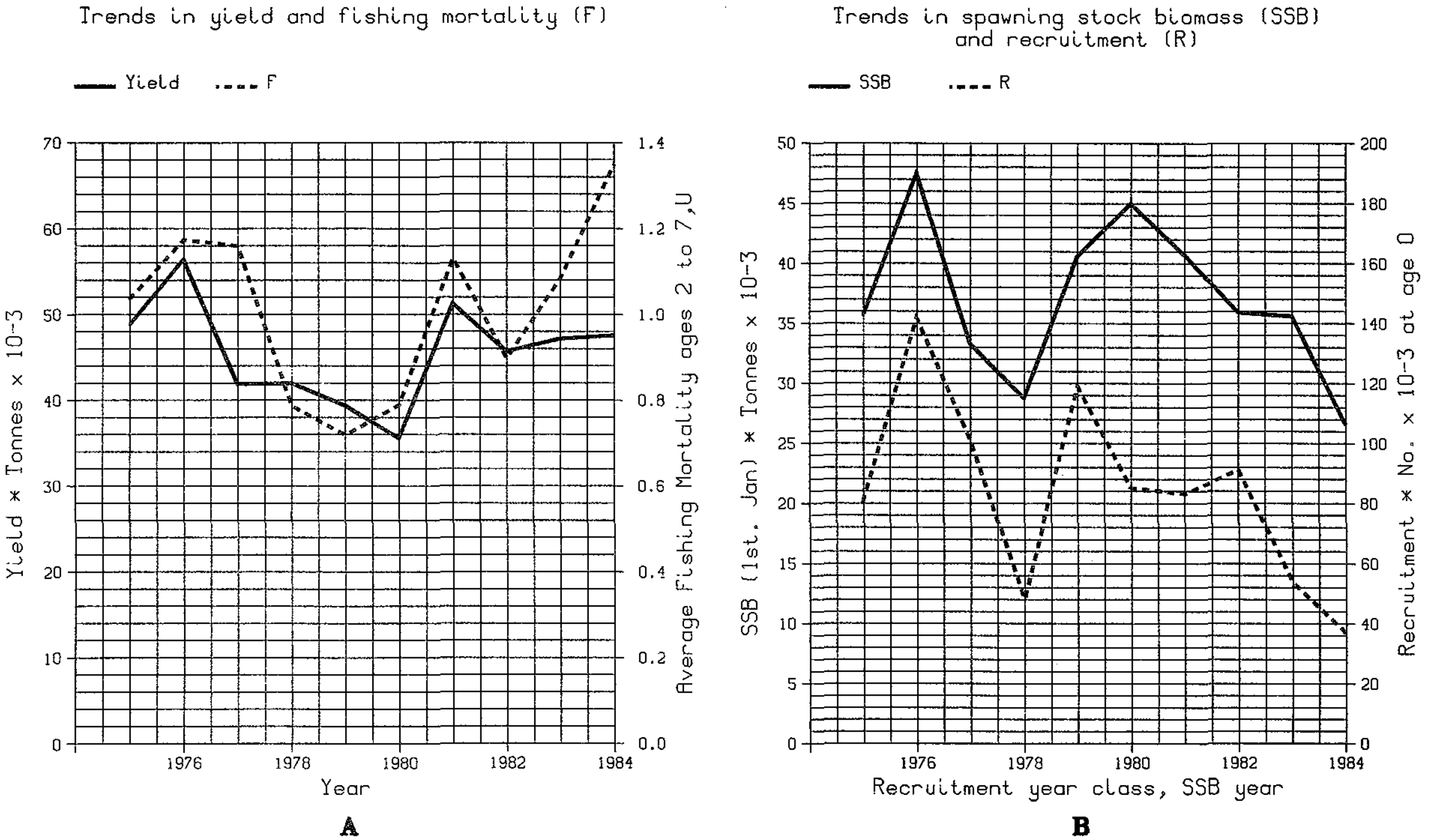


Figure 3.1 (continued)

FISH STOCK SUMMARY

STOCK: Baltic Cod - 22 and 24

30-04-1985

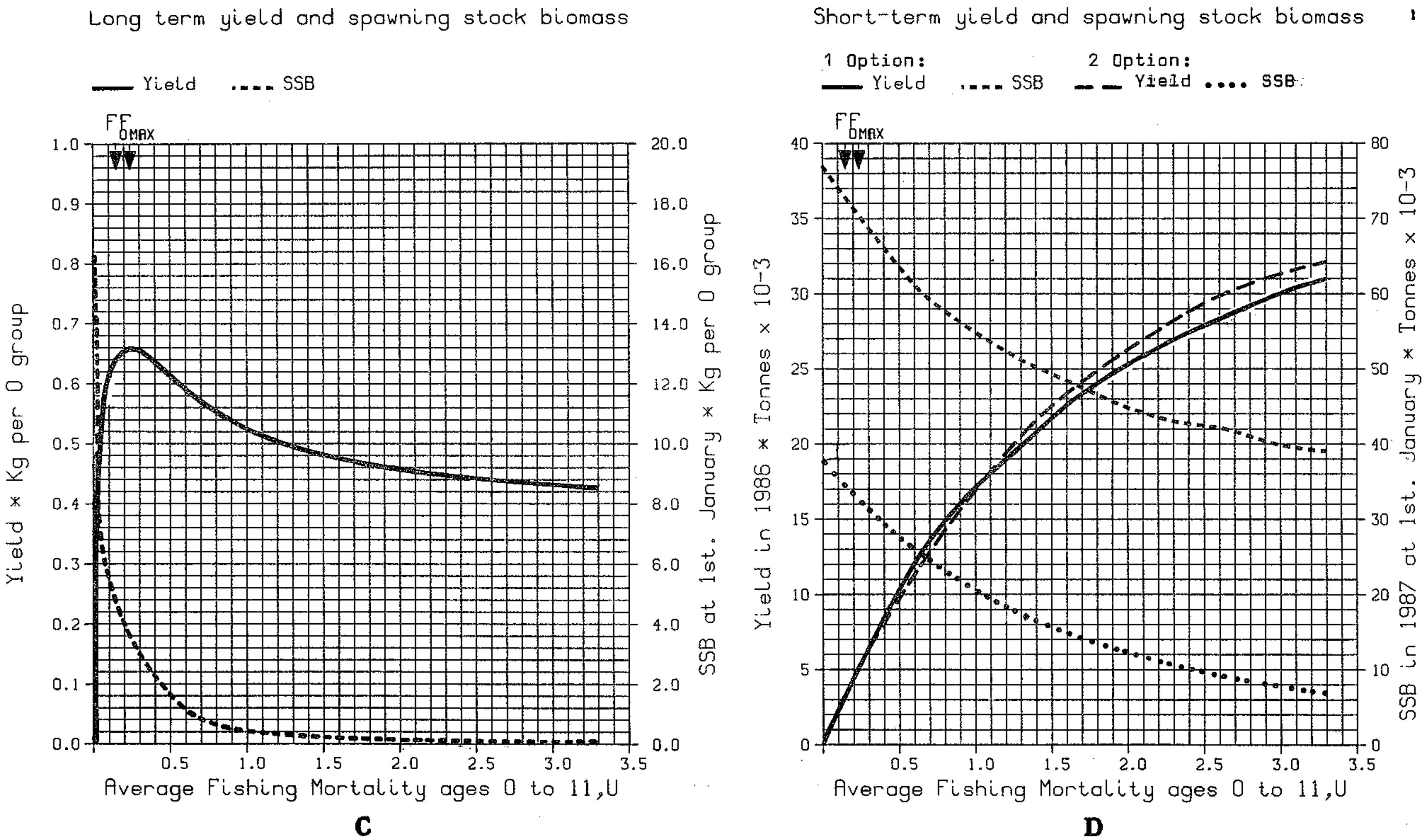
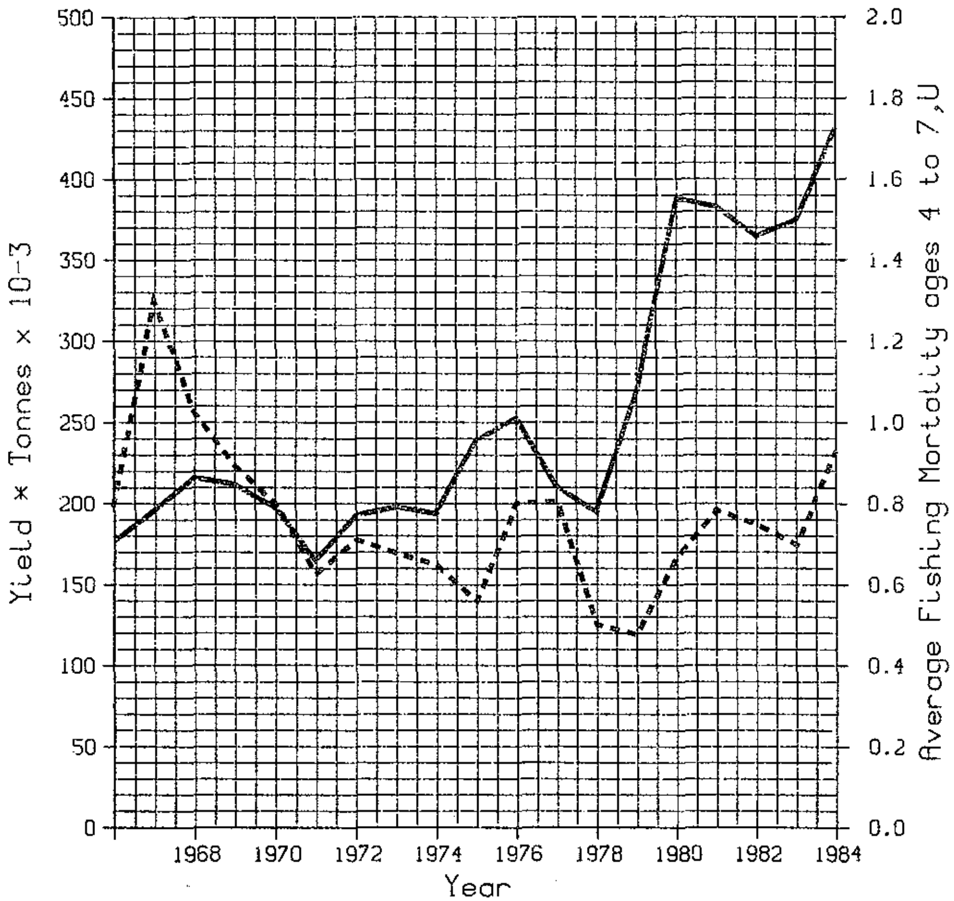
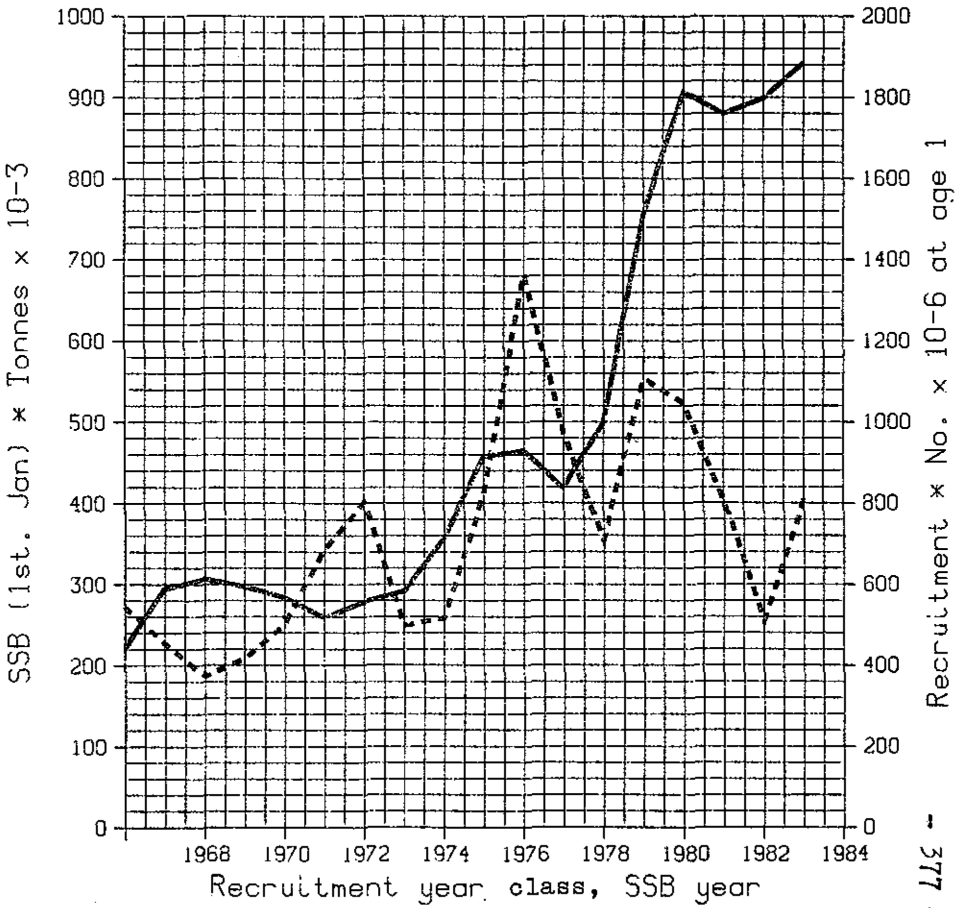


Figure 3.2

FISH STOCK SUMMARY
STOCK: Baltic Cod - 25 to 32
30-04-1985



A



B

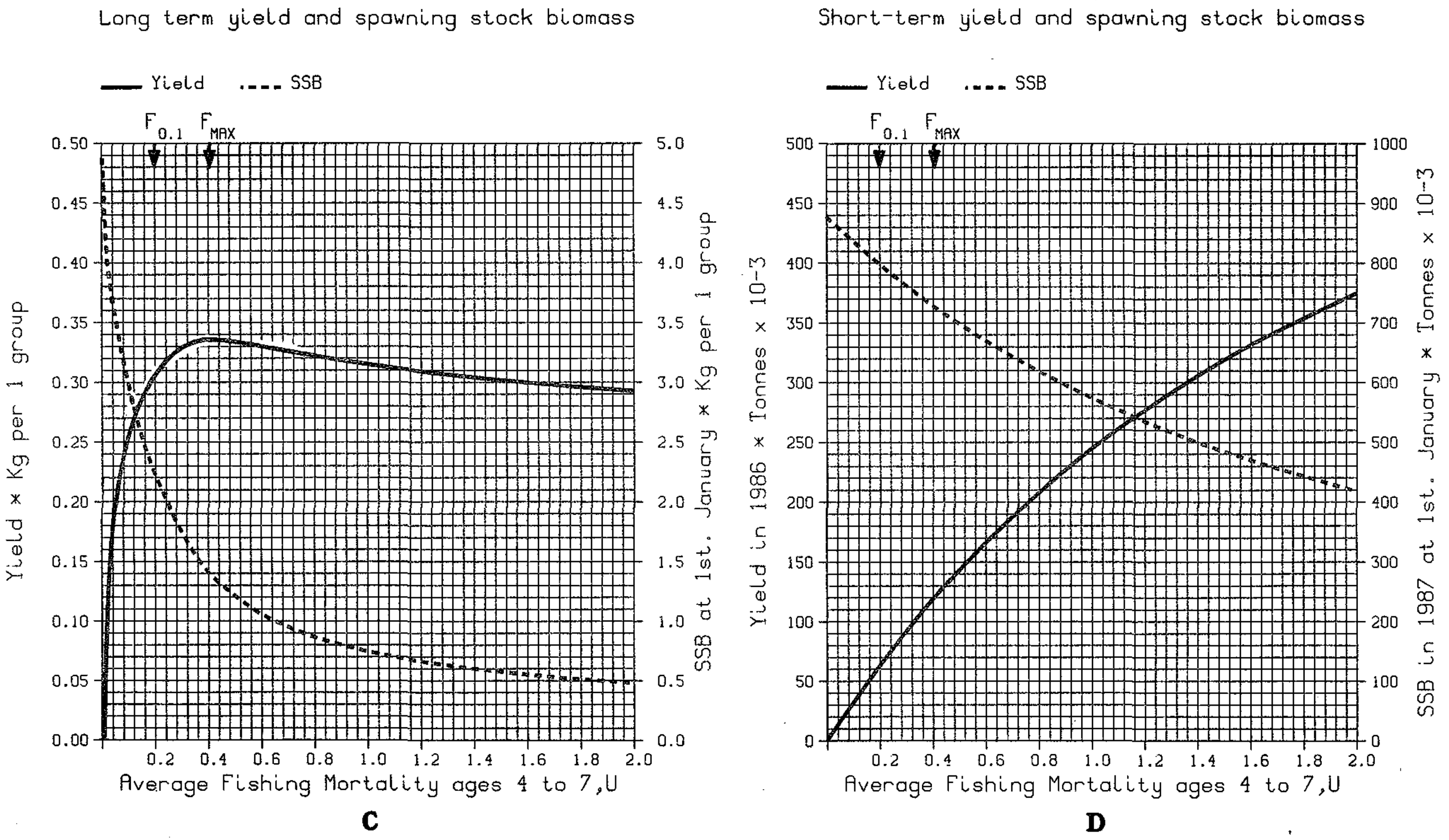
cont.

Figure 3.2 Contd.

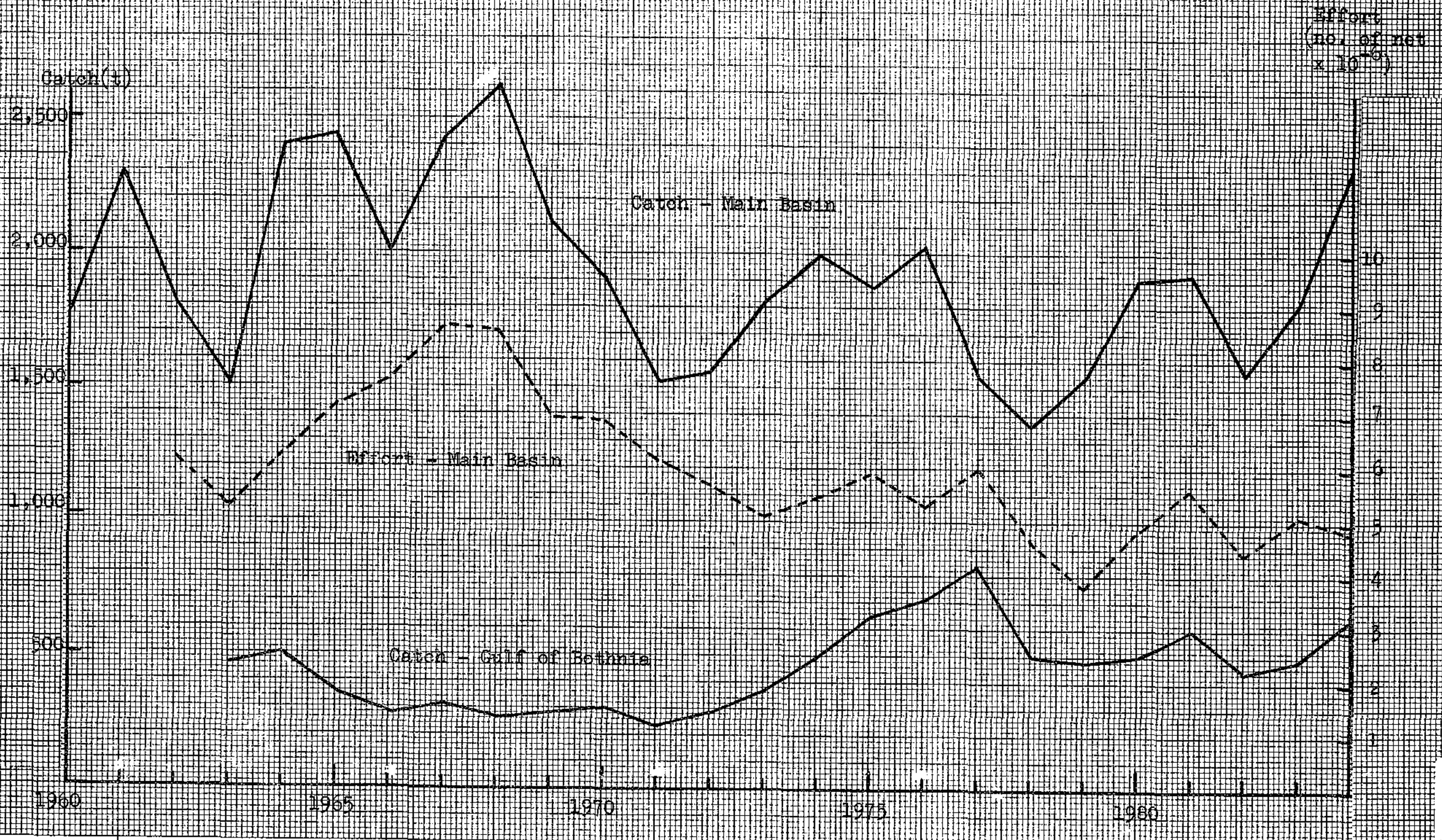
FISH STOCK SUMMARY

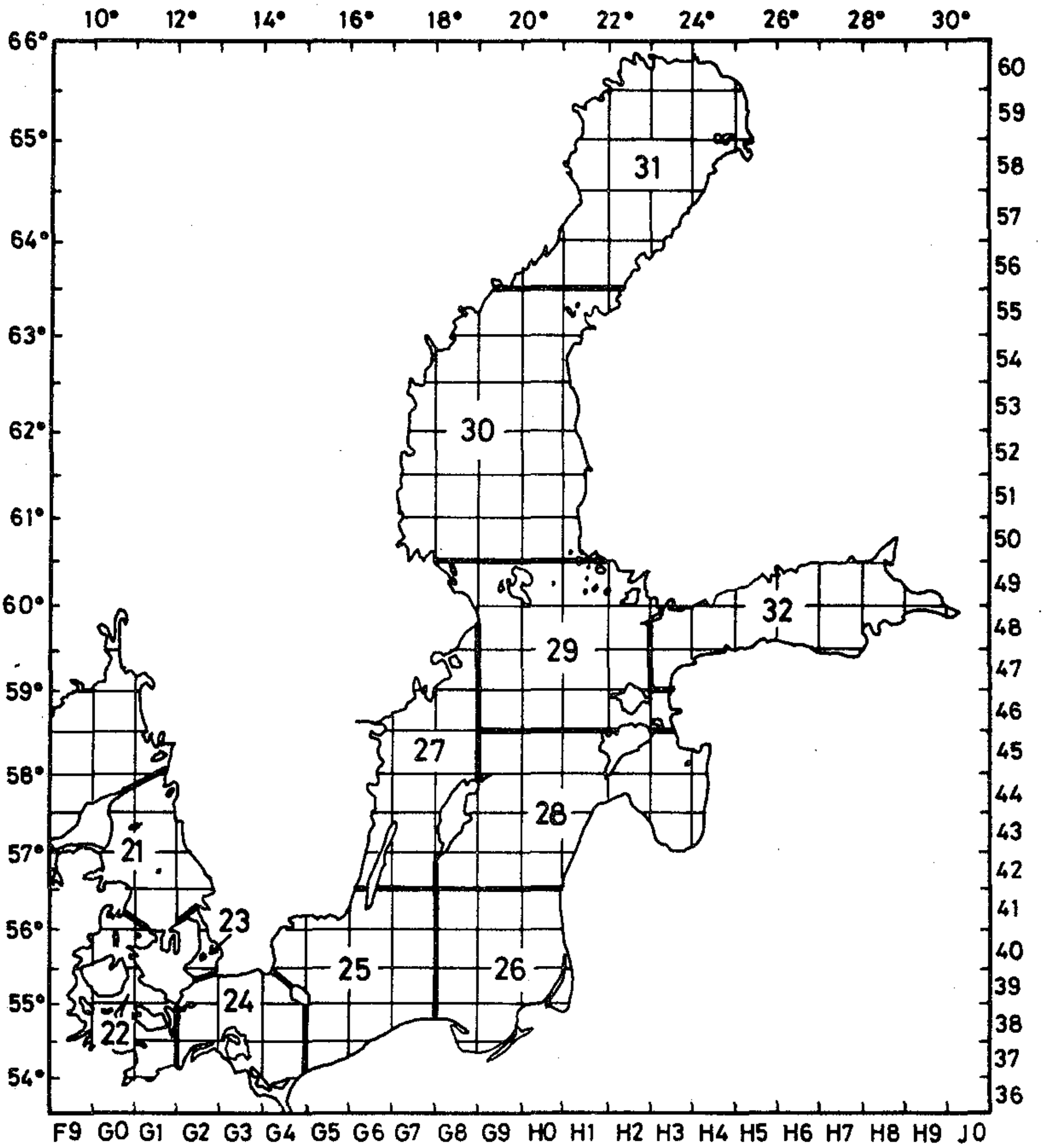
STOCK: Baltic Cod - 25 to 32

30-04-1985



<u>Figure 4.1.1</u> Nominal catch of salmon in the Baltic Main Basin and the Gulf of Bothnia, and effort of the offshore salmon fishery with drifting gear in the Main Basin (longline effort converted to drift net effort)





ICES 27.3.03.00 (Baltic)

REPORT TO THE NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION COUNCIL

1. REVIEW OF NORTH ATLANTIC SALMON CATCHES

Table 1.1 presents annual catches in home waters of North Atlantic salmon, 1960-84, the catches for 1984 being provisional. Total catches continued to decline to well below the 1980 level of 8,000 tonnes, with the 1984 catch of 5,600 tonnes being the lowest in the time series. Canadian catches experienced a sharp decline from 1,400 tonnes in 1983 to 1,100 tonnes in 1984.

2. SALMON IN THE NORTH-EAST ATLANTIC COMMISSION AREA

This advice responds to questions posed by the Council of the North Atlantic Salmon Conservation Organization (NASCO) in relation to the North-East Atlantic Commission of NASCO. The questions posed are found in Appendix I of the Report of Meeting of Working Group on North Atlantic Salmon, Copenhagen, 18-26 March 1985 (ICES, Doc. C.M.1985/Assess:11). The Report should be consulted for detailed responses to NASCO's request.

2.1 Exploitation and Fishing Mortality

Exploitation rates were defined as the number of fish caught in a fishery divided by the number of fish of the appropriate stocks and smolt classes extant when half the catch has been taken, plus the remaining half of the catch (see p.3 of the Working Group report).

High sea fisheries

Only one vessel from Finland reported catches (29 tonnes) in the northern Norwegian Sea in 1984 (Table 2.1.1). Nominal catches in the Faroes area longline fishery totaled 720 tonnes in 1984 (Table 2.1.2).

Norway

Analysis of recaptures of tagged fish from southwestern Norway indicated that, in general, exploitation of 1 sea-winter salmon at the Faroes is very low, while exploitation of 2 sea-winter fish is probably moderate. Exploitation of all sea-age groups of these tagged fish in Norwegian home waters exceeds 74% and is often over 90%.

Scotland

The estimated 1984 exploitation rate for the fixed-engine fishery of the Moray Firth, outside the river, was 0.13, and the corresponding rate for the net and coble fishery in the river was 0.11. Estimated exploitation rates in the North Esk net and coble fishery increased to 0.62 for 1 sea-winter fish and 0.44 for multi sea-winter fish in 1984 (Table 2.1.3). These ratios are overestimated since they were based only on returns to the river during the time of the commercial fishery.

Republic of Ireland

Exploitation rates for the Burrishoole River were estimated to be 73.4% and 79.9% in 1983 and 1984, respectively.

Conclusion

Exploitation rates in home-water fisheries in the North-East Atlantic appear to vary from a few percent to over 90%

Options for total catches within safe biological limits

New information on growth and stock composition were not adequate to vary the advice of the Working Group in 1982. It is not possible at the present time to estimate and advise on a single TAC which would maintain the home-water stocks and safeguard stocks within safe biological limits. A TAC applied to fisheries of mixed stocks does not ensure that the proper catch restrictions occur on any given stock. Even with a TAC of zero in sea fisheries, spawning escapement is not guaranteed as exploitation rates in some mixed-stock fisheries in home waters may exceed 90%.

There is no evidence that mixed-stock fisheries on the high seas poses a particularly serious threat to individual stocks of salmon, relative to other fisheries.

2.2 Distribution of Salmon Stocks

The pattern of distribution of salmon in the North-East Atlantic reported by ICES to NASCO in 1984 was confirmed. Recaptures in the Faroes fishery of salmon tagged as smolts from Sweden, Scotland and Norway were plotted by statistical rectangle of recapture (Figure 2.2). It appears that salmon originating from these countries are mixed within the Faroes fishery. The proportion of tagged fish in the catch appears to be higher towards the north and west, and the proportion of salmon originating in Norway, Finland, and the USSR appears to increase with latitude. The proportion of salmon of North American origin in the 1981/82 Faroes fishery was estimated to be 0% with confidence limits of 0% and 3%.

2.3 Salmon Biomass in the Faroes Fishing Zone

The Working Group was not able to assess the salmon biomass in the fisheries zone of the Faroe Islands nor estimate the average weight gained and the food consumed by salmon in the zone. Progress towards answering these questions is reviewed in the Working Group report (p. 12-13).

2.4 Effects of Harvesting Salmon at Different Stages of their Migration Routes

Revised calculations of relative weight gain lead to qualitatively similar results to those advised by ICES in 1984 (Table 2.4). Highest relative losses occur for young fish which would mature one year later, and lowest losses for harvesting older fish which would have matured in the same year. The calculations do not distinguish between spawners and fish caught in the home-water fishery.

2.5 Non-Catch Fishing Mortality

The non-catch fishing mortality in the Faroes fishery was estimated to be about 5% in 1983/84; however, preliminary estimates suggest a higher rate in 1984/85. No new information was available elsewhere in the North-East Atlantic.

2.6 Tagging Programs

On the subject of tagging as a means of assessing the interception fisheries, the Working Group discussed the advantages and disadvantages of both internal and external tagging of salmon at sea, as well as tagging smolts in home waters. Tagging at sea could provide answers which tagging smolts could not and vice versa. Smolt tagging in home waters is usually limited to a few locations, and many are restricted to hatchery-reared fish which may not be representative of larger populations of salmon either in pattern of migration or in rates of exploitation. Tagging at sea poses large, logistical problems, but the main problems are the necessary adjustments for uneven returns and variable reporting rates in home waters. Costs for tagging at sea and in home waters are provided in the Working Group report.

With regard to tagging programs designed to determine the composition of exploited stocks and of catches, the Working Group and ACFM wish to repeat their recommendation of 1982 that smolt tagging be expanded and that special emphasis should be given to the use of internal tags.

2.7 Specify Deficiences in Data and Sampling Programs Necessary

ACFM endorsed sampling programs recommended by the Working Group to remedy identified data deficiences.

These deficiences were related to:

1) estimation of exploitation rates,
2) distribution of salmon stocks,
3) effects of harvesting salmon at various stages of migration, and
4) post-smolt mortality.

2.8 Biological Characteristics of Catches at the Faroes

Catches and catch rates in the Faroes fishery in 1983/84 by statistical rectangle are shown in Figures 2.8.1 and 2.8.2. Both catches and catch rates were greatest between the latitudes of 64^0-66^0 trending northeasterly from 8^0 to 3^0 longitude. The age composition of catches is given in Table 2.8.1, and the monthly mean weights at age are given in Table 2.8.2. Two sea-winter salmon made up 87% of the catch while 3 sea-winter (10%) and 1 sea-winter salmon (3%) provided lesser amounts. For the period January - April, the mean weights of salmon caught were 1.54, 3.79, and 8.53 kg for 1 SW, 2 SW, and 3 SW, respectively. The sex composition position of the 1983/84 catches (Table 2.8.3) over all ages was 77% (females) and 23% (males) which generally existed for all three age groups.

3. SALMON IN THE WEST GREENLAND COMMISSION AREA

This advice responds to questions posed by the Council of NASCO in relation to the West Greenland Commission. The questions posed are found in Appendix I of the Report of Meeting of Working Group on North Atlantic Salmon, Copenhagen, 18-26 March 1985 (ICES, Doc.C.M.1985/Assess:11). The Report should be consulted for detailed reponses to NASCO's request.

3.1 The West Greenland Fishery in 1983 and 1984

Statistics and composition of the fishery and regulation in force

The fishery started on 10 August 1984 and ended on 8 December. The total catch was 297 tonnes, about the same as the 310 tonnes in 1983 and about one third of the quota of 870 tonnes.

Origin of salmon at West Greenland

The proportion of salmon of North American origin in samples from 1984 commercial catches was 51% (Table 3.1). No temporal trends or differences between NAFO divisions were detected.

Biological characteristics

North American origin 1 sea-winter salmon were significantly shorter and lighter than their European counterparts, as previously observed. The sea age composition of catch samples in 1984 was 87.6% 1 sea-winter, 11.6% multi sea-winter and 0.7% previous spawners. In 1983 and 1984, the numbers of multi sea-winter salmon landed were similar to previous years in spite of the almost fourfold decrease in total catch.

3.2 Possible Causal Factors Leading to the Very Low 1983 and 1984 Catches at West Greenland

At least four factors have contributed to the low catches of salmon at West Greenland in 1983 and 1984. These are listed below in no particular order of priority:

1) Adverse environmental factors.

2) Lower-than-normal sea survival rate of relevant smolt classes.

3) Reduced stock abundance in Canada and of the spring-run salmon component in Scotland.

4) Reduced fishing effort at Greenland for both years, at least during the important early part of the fishing season.

3.3 Future Research

ACFM endorsed the recommendations of the Working Group for future research.

4. SALMON IN THE NORTH AMERICAN COMMISSION AREA

4.1 Advice from the May 1985 ACFM Meeting

This advice responds to an urgent request by the North American Commission of the North Atlantic Salmon Conservation Organization (NASCO) to provide further advice on the areal and seasonal distribution of Canadian catches of salmon and catches of USA-origin salmon in Canadian fisheries [see Appendix 1 of the Report of Meeting of the Working Group on North Atlantic Salmon, Bangor, Maine USA, May 6-8, 1985 (ICES, Doc. C.M.1985/Assess:19)]. The Working Group report should be consulted for a detailed response to the question.

4.1.1 Areal and seasonal distribution of Canadian salmon catches and catches of USA-origin salmon in Canadian fisheries

Only Canadian catches from 1974-83 and tag returns from 1970-83 for USA-origin salmon in Newfoundland and Labrador were considered since these fisheries account for 80% of Canadian returns of USA salmon tags.

Tag data were summarized from the basic data cards stored at the Atlantic Sea-Run Salmon Commission in Bangor, Maine for 1970-83. A major concern regarding the summarization of the data was knowledge about the exact date of capture. The Working Group examined original coding sheets and tag return envelopes for smolts released in two randomly-selected years (1974 and 1981) and concluded that the non-recording of the tag recovery date was not an important error, especially for fish captured in the fall season.

Tables 4.1.1.1 and 4.1.1.2, respectively, show the distribution of tag recoveries and catches by month and Statistical Area for all years considered. Most of the recaptures (82%) and catches (73%) in Newfoundland and Labrador were in Statistical Areas A-D and O.

Area and month distribution of catches and tag recaptures are presented for each year in Tables 4.1.1.3 and 4.1.1.4. Inter-annual changes in geographical patterns are presented in Tables 4.1.1.5 and 4.1.1.6.. There was considerable inter-annual variation, particularly in the geographical distribution of the recoveries. An accurate description, however, of the inter-annual variation was difficult to make due to the small number of tags involved. Statistical Areas A, B and O usually had higher percentages of recoveries than did other areas. A total of 59% of the tag recoveries were of the 1973, 1974 and 1979 releases. Total returns per 1,000 marks varied widely from year to year (Table 4.1.1.7).

A preliminary examination of tag recoveries by Statistical Section in northeast Newfoundland gave no evidence that the catch of USA-origin salmon was mainly at headlands. Statistical sections, however, do not provide sufficient detail to draw conclusions regarding the relative importance of recoveries at headlands and bays.

An average of 0.84% of the total Newfoundland-Labrador salmon catch occurred from 1 September - 31 December in 1974-83, with fluctuations over a sixfold range (Figure 4.1.1). For the last four years, the total catch has declined while the autumn fishery has remained constant, so that the proportion taken in the fall has increased. The percent of tag recoveries during this period has varied from 7% to 48% with an average of about 28%.

4.1.2 Research needs

ACFM endorses research needs as identified in the Working Group report.

4.2 Advice from the November 1985 ACFM Meeting

This advice responds to a request to ICES for advice on matters relevant to the North American Commission discussed by NASCO at its June 1985 meeting. The formal request for advice had not been received by ICES before the Working Group meeting and, hence, ICES has responded to anticipated questions contained in the draft report of the North American Commission. The questions posed are found in Appendix I of the Report of Meeting of the Working Group on North Atlantic Salmon Working Group, Woods Hole, Massachusetts, USA, September 16-20, 1985 (ICES, Doc. C.M.1985/ Assess:8). The Report should be consulted for detailed responses.

4.2.1 Historical catches of salmon originating in rivers or artificial production facilities of another country

New estimates of the numbers of United States-origin salmon captured in Canadian fisheries were calculated. A detailed analysis, based on tag recaptures and allowing for tag loss, non-catch fishing mortality and incomplete reporting of tags, led to revisions of estimates of the number of United States-origin 1 sea-winter salmon taken in the Newfoundland-Labrador fisheries from 1971 to 1983. The annual harvest in the Newfoundland-Labrador fisheries ranged from about 200 to 4,600 fish (Table 4.2.1), using the lower tag retention rate, and 200 to 5,000 fish, using the higher retention rate. Except for 1975, these estimates are lower in all years than reported in the 1984 advice from ICES. The largest portion of the discrepancy between the estimates is due to changes in the estimate of total tag returns and run size in Maine rivers.

A sensitivity analysis showed that the estimated harvest in Newfoundland-Labrador fisheries was particularly dependent on the values adopted for the reporting rate for tags in those fisheries and for the exploitation rate in Maine rivers where there was no counting fence.

4.2.2 Description of fisheries catching salmon originating in another country's river or artificial production facility

Most salmon of the United States' origin taken in Newfoundland and Labrador fisheries were caught in gill-nets. Small numbers were taken from salmon traps, cod traps and mackerel nets, and one tag recovery was reported from a rod. The descriptions of fisheries provided in ICES' 1984 advice remain valid for those fisheries still in operation. In 1985, Canadian regulations were enacted to prohibit commercial salmon fishing in New Brunswick, Nova Scotia and Prince Edward Island, in addition to the 1984 regulations which prohibited the retention of salmon in non-salmon commercial fishing gear and the closure of part of southern Newfoundland to commercial salmon fishing.

4.2.3 By-catch and poaching of Atlantic Salmon

It is difficult to assess the extent of by-catch and poaching in Canadian and USA fisheries. It was noted that most poaching in the USA and Canada occurs in freshwater and would, therefore, have a small impact on the estimate of interception of USA-origin salmon. The extent of poaching in salt water is not known. Some salmon caught by poaching may be included in the catch statistics. Estimates provided by state and federal biologists suggest that by-catch in northeastern USA waters is in the order of 2% of Atlantic salmon returning to USA waters. Prior to 1984, by-catches in Newfoundland waters were included in Atlantic statistics, as they were in the Maritime Provinces before 1983. Since 1984, Canadian commercial fishermen have been required to release all Atlantic salmon taken as by-catches. The extent to which this has reduced mortality is unknown.

4.2.4 Tag reporting procedure and tag return data

Examination of tag reporting procedures revealed no major problem at the present time. Information reported with tag returns is frequently incomplete, however.

4.2.5 Expected impact of management measures taken by Canada in 1984 on Canadian harvest of USA-origin salmon

Season and area closures in Canadian salmon fisheries and a reduction in licenced fishing effort in Newfoundland and Labrador influenced the number of USA-origin salmon taken in Canadian fisheries. The impact of these measures was calculated relative to a base period of 1970 to 1982 smolt classes. The overall reduction in the Canadian harvest of USA salmon due to reductions in season and closures of areas during 1985 was estimated to be about 11% relative to that base (1970-82 smolt classes). Although licenced fishing effort has been reduced due to regulations by about 31% between the historical average and 1985, and catch in fact declined by more than 31%, the decline in catch was also influenced by reduced abundance of salmon. The amount of reduction in catch and interception attributed to reduced licenced fishing effort was expected to be less that 31% and could not be quantified. It was noted that 2% of the 11% estimated reduction of harvest of USA-origin salmon due to season changes and closures occurred at Newfoundland. Closures at Newfoundland, but not season changes, are implicitly included in the reduction of licenced fishing effort there; thus, the impacts of the two measures are not directly additive.

4.2.6 Data deficiencies and research programme

The Working Group report (Section 2.7) identifies data deficiencies, particularly in relation to statistics of catch and fishing effort, non-catch fishing mortalities and tag reporting rates. Remedial measures proposed are endorsed by the ACFM.

5. ABUNDANCE PROJECTION FOR SALMON STOCKS IN 1985

Salmon abundance in several areas in 1985 (and future years) is expected to be below average for several reasons. Poor grilse returns in 1984 suggest low returns of 2 sea-winter fish in 1985. Low egg deposition in Canadian rivers in 1978 and 1979 suggests that the return of 1 sea-winter fish in 1985 and 2 sea-winter fish in 1985 and 1986 will also be poor. Egg deposition has, in fact, been poor in most MSW salmon producing rivers in the Gulf of St. Lawrence and in the St John river during the past seven years. ACFM noted the reduced abundance of spring-run salmon at Scotland and the high exploitation rate in the River Ims in Norway. If these rivers are indicative of neighbouring rivers (and this is not known) and if river escapement has a bearing on the subsequent abundance of the next generation at sea, then catches everywhere are likely to be reduced in the next few years.The variability of smolt survival at sea might influence this.

Table 1.1 Nominal catch of SALMON in home waters (in tonnes round fresh weight) 1960-1983.

	France	Engl.& Wales	Scotland**			Ireland***			Northern Ireland***/+
Year	T	T	S	G	T	S	G	T	T
1960	50-100	283	927	509	1,436	-	-	743	139
1961	50-100	232	772	424	1,196	-	-	707	132
1962	50-100	318	808	932	1,740	-	-	1,459	356
1963	50-100	325	1,168	530	1,698	-	-	1,458	306
1964	50-100	307	913	1,001	1,914	-	-	1,617	377
1965	50-100	320	835	728	1,563	-	-	1,457	281
1966	50-100	387	788	836	1,624	-	-	1,238	287
1967	50-100	420	857	1,276	2,133	-	-	1,463	449
1968	50-100	282	783	780	1,563	-	-	1,413	312
1969	50-100	377	539	1,408	1,947	-	-	1,730	267
1970	50-100	527	503	826	1,329	-	-	1,787	297
1971	50-100	426	496	923	1,419	-	-	1,639	234
1972	34	442	588	1,105	1,693	200	1,604	1,804	210
1973	12	450	661	1,303	1,964	244	1,686	1,930	182
1974	13	383	578	1,063	1,631	170	1,958	1,128	184
1975	25	447	669	892	1,561	274	1,942	1,216	164
1976	9	208	328	682	1,010	109	1,452	1,561	113
1977	19	345	369	762	1,131	145	1,227	1,372	110
1978	20	349	781	542	1,323	147	1,082	1,230	148
1979	10	261	598	478	1,075	105	922	1,097	99
1980	30	360	851	283	1,134	202	745	947	122
1981	20	493	843	389	1,233	164	521	685	101
1982	20	286	596	496	1,092	63	930	993	132
1983	16	432	672	549	1,221	150	1,506	1,666	187
1984*	25	348	503	490	993	NA	NA	887	78

* Provisional figures

** Salmon & grilse figures for 1962-77 corrected for grilse error.

***Catch on River Foyle allocated 50% Ireland and 50% N. Ireland.

\+ Not including angling catch (mainly grilse).

S = Salmon (two or more sea winter fish), G = Grilse (one sea winter fish), T = S + G.

ctd.

Table 1.1 (continued)

Year	Norway++ S	Norway++ G	Norway++ T	Sweden (West Coast) T	Fin- land T	USSR+++ T	Iceland T
1960	-	-	1,659	40	-	1,100	100
1961	-	-	1,533	27	-	790	127
1962	-	-	1,935	45	-	710	125
1963	-	-	1,786	23	-	480	145
1964	-	-	2,147	36	-	590	135
1965	-	-	2,000	40	-	590	133
1966	-	-	1,791	36	-	570	106
1967	-	-	1,980	25	-	883	146
1968	-	-	1,514	20	-	827	162
1969	801	582	1,383	22	-	360	133
1970	815	356	1,171	20	-	448	195
1971	771	436	1,207	18	-	417	204
1972	1,064	514	1,568	18	32	462	250
1973	1,220	506	1,726	23	50	772	256
1974	1,149	484	1,633	32	76	709	225
1975	1,038	499	1,537	26	76	811	266
1976	1,063	467	1,530	20	66	NA	225
1977	1,018	470	1,488	10	59	NA	230
1978	668	382	1,050	10	37	NA	291
1979	1,150	681	1,831	12	26	430	225
1980	1,352	478	1,830	17	34	631	249
1981	1,189	467	1,656	26	44	450	163
1982	985	363	1,348	25	54	311	147
1983	957	593	1,550	NA	57	436	198
1984*	994	626	1,620	NA	44	354	152

*Provisional figures
++ Before 1966 sea trout and sea char included (5% total).
+++ USSR catch mainly salmon (2 or more sea winter fish).
S = Salmon (two or more sea winter fish), G = Grilse (one sea winter fish), T = S + G.

continued...

Table 1.1 (continued)

Year	Canada xx) S	G	T	USA T	Total*** all Countries T
1960	-	-	1,636	<2	7,212
1961	-	-	1,583	<2	6,403
1962	-	-	1,719	<2	8,483
1963	-	-	1,861	<2	8,148
1964	-	-	2,069	<2	9,268
1965	-	-	2,116	<2	8,576
1966	-	-	2,369	<2	8,475
1967	-	-	2,863	<2	10,417
1968	-	-	2,111	<2	8,279
1969	-	-	2,202	<2	8,496
1970	1,562	761	2,323	<2	8,173
1971	1,482	510	1,992	<2	7,631
1972	1,201	558	1,759	<2	8,273
1973	1,651	783	2,434	2.7	9,802
1974	1,589	950	2,539	0.9	9,553
1975	1,573	912	2,485	1.7	9,614
1976	1,721	785	2,506	0.8	7,188
1977	1,883	662	2,545	2.4	7,311
1978	1,225	320	1,545	4.1	6,007
1979	705	582	1,287	2.5	6,356
1980	1,763	917	2,680	5.5	8,040
1981	1,619	818	2,437	6.0	7,314
1982	1,082	716	1,798	6.4	6,212
1983	903	530	1,434	1.3	7,188
1984*	632	475	1,107	2.0	5,610

*Provisional figures

xx)Includes estimates of local sales and by-catch

***French catch taken as 75 tonnes from 1960-71 and USA catch as 1 tonnes from 1960-71.

S = Salmon (two or more sea winter fish), G = Grilse (one sea winter fish), T = S + G.

Table 2.1.1 Reported nominal catches in the northern Norwegian Sea long-line fishery north of lat.67^{0}N:1965-84 (tonnes round fresh weight).

Year	Denmark* No.of vessels	Denmark* Catch	Faroes No.of vessels	Faroes Catch	Finland No.of vessels	Finland Catch
1965	1-2	a)	0	0	0	0
1966	10	a)	0	0	0	0
1967	22	77	0	0	0	0
1968	28	177	-	b)	0	0
1969	40	413	0	0	0	0
1970	60	481	-	b)	0	0
1971	20	162	0	0	0	0
1972	20	182	0	0	0	0
1973	15	233	0	0	0	0
1974	10	148	0	0	0	0
1975	15	245	0	0	0	0
1976	20	264	0	0	0	0
1977	24	192	0	0	0	0
1978	13	124	0	0	0	0
1979	10	118	0	0	0	0
1980	7	127	?	28	0	0
1981	8	213	-	b)	0	0
1982	7	334	?	259	1	29
1983	9	383	0	0	1	21
1984d)	0	0	0	0	1	29

Year	Federal Republic of Germany No.of vessels	Federal Republic of Germany Catch	Norway No.of vessels	Norway Catch	Sweden No.of vessels	Sweden Catch	Total longline catch
1965	0	0	0	0	0	0	a)
1966	0	0	0	0	-	a)	a)
1967	0	0	-	a)	6	a)	77+
1968	0	0	-	100c	16	126	403c
1969	5	24	-	450c	2	24	911
1970	4	21	-	420c	1	24	946c
1971	2	9	-	300c	1	17	488c
1972	2	4	-	300c	1	20	506c
1973	0	0	-	250c	2	50	533c
1974	0	0	-	200c	2	25	373c
1975	0	0	-	200c	1	30	475c
1976	0	0	0	0	1	25	289
1977	0	0	0	0	0	0	192
1978	0	0	0	0	0	0	124
1979	0	0	0	0	0	0	118
1980	0	0	0	0	0	0	155
1981	0	0	0	0	0	0	213
1982	0	0	0	0	0	0	622
1983	0	0	0	0	0	0	404
1984	0	0	0	0	0	0	29

a) Catch not known. b) See footnote ** for Table 3) c) Estimated catch
d) Preliminary data
* Danish catches converted from gutted weight with a factor of 1.16

Table 2.1.2 Reported nominal catches in the Faroese Area long-line fishery 1968-1984 (tonnes round fresh weight)

Converted from gutted weight with a factor 1.11

Year	Denmark No. of vessels	Denmark Catch	Faroes No. of vessels	Faroes Catch	Total Long-line Catch
1968	0	0	2	5**	5
1969	0	0	4	7	7
1970	0	0	5	12**	12
1971	0	0	0	0	0
1972	0	0	2	9	9
1973	0	0	5	28	28
1974	0	0	5	20	20
1975	0	0	6	28	28
1976	0	0	9	40	40
1977	0	0	9	40	40
1978	2	14	8	37	51
1979	2	75	7	119	194
1980	6	150	22	568	718
1981	6	100	38	1,025**	1,125
1982	6	74	31	606	680
1983	6	62	25	678	740
1984*	6	72	29	648	720

* Preliminary data

** A small part of the catch taken more than 200 miles from the Faroese baseline.

Table 2.1.3 **Exploitation rates by North Esk net and coble fishery during the commercial netting season.**

Year	One sea-winter	Multi sea-winter
1976	0.52	0.55
1977	0.51	0.43
1978	0.44	0.51
1979	0.42	0.45
1980	0.39	0.39
1981	0.50	0.57
1982	0.50	0.63
1983	0.53	0.39
1984	0.62	0.44

Table 2.4 Assessment of relative effects of returns to home waters of harvesting salmon at different stages of their migration routes.

Age at catch	Age at home	wt at home / wt in fisheries	Non-catch adjustment 1/(1-N)	Per cent non-escapees	Survival	Relative loss
1	1	1.61[1]	1.11	.93	.97	1.61
1	2	3.07[1]	1.11	.93	.88	2.79
2	2	1.34[1]	1.11	.93	.97	1.34
2	3	2.24	1.11	.93	.88	2.04
3	3	1.3	1.11	.93	.97	1.30
3	4	1.5	1.11	.93	.88	1.36
1	1	1.61[1]	1.05	.93	.97	1.53
1	2	3.07[1]	1.05	.93	.88	2.64
2	2	1.34[1]	1.05	.93	.97	1.27
2	3	2.24	1.05	.93	.88	1.93
3	3	1.3	1.05	.93	.97	1.23
3	4	1.5	1.05	.93	.88	1.29

[1] Revised ratios based on average of values in Report of Meeting of the Study Group of the North Atlantic Salmon Working Group, Torshavn, 27-30 March 1984 (ICES, Doc. C.M.1984/M:9).

Table 2.8.1 Percentage catch in number by sea-age class by month in the Faroese salmon fishery. All areas combined.

	Sea-Age				
Month	1	2	3	4	5
November	2.0	96.1	2.1		
December	1.4	95.0	3.6		
January	1.3	88.8	9.9		
February	6.8	81.2	12.0		
March	2.4	83.9	13.6	0.1	
April	4.1	80.4	15.5		
Whole Season	3.2	86.7	10.1	+	

Table 2.8.2 Mean weights (kg) of SALMON sampled in the Faroese fishery by sea age and month

	Sea-Age		
Month	1sw	2 sw	3sw
January	1.32	3.44	8.22
February	1.11	3.68	8.50
March	1.45	3.85	9.16
April	2.27	4.17	8.24

Table 2.8.3 Sex composition of pooled samples

	Sea Age Groups (year)									
	1		2		3		4		Total	
Cruise	M	F	M	F	M	F	M	F	M	F
1	-	-	-	100.0(36)	-	100.0(4)	-	-	-	100.0(40)
2	54.2(13)	45.8(11)	17.6(16)	82.4(75)	50.0(3)	50.0(3)	-	-	26.4(32)	73.6(89)
3	-	100.0(2)	16.2(31)	83.8(160)	37.9(11)	62.1(18)	-	100.0(1)	18.8(42)	81.2(181)
4	36.4(4)	63.6(7)	24.3(131)	75.7(409)	32.8(22)	67.2(45)	-	-	25.4(157)	74.6(461)
Combined	45.9(17)	54.1(20)	20.7(178)	79.3(680)	34.0(36)	66.0(70)	-	100.0(1)	23.1(231)	76.9(771)

Figures in brackets are sample size.

Table 3.1 Percentage (by number) of North American and European salmon in research vessel catches at West Greenland 1969-82 and from commercial samples 1978-84.

		Sample Size		Continent of Origin (%)			
Source	Year	Length	Scales	N.A.	(95% C.L.)	E	(95% C.L.)
Research	1969	212	212	51	(57.44)	49	(56.43)
	1970	127	127	35	(43.26)	65	(74.57)
	1971	247	247	34	(40.28)	66	(72.50)
	1972	3,488	3,488	36	(37.34)	64	(66.63)
	1973	102	102	49	(59.39)	51	(61.41)
	1974	834	834	43	(46.39)	57	(61.54)
	1975	528	528	44	(48.40)	56	(60.52)
	1976	420	420	43	(48.38)	57	(62.52)
	1977	-	-	-	(-)	-	(-)
	1978*	606	606	38	(41.34)	62	(66.59)
	1978**	49	49	55	(69.41)	45	(59.31)
	1979	328	328	47	(52.41)	53	(59.48)
	1980	617	617	58	(62.54)	42	(46.38)
	1981	-	-	-	(-)	-	(-)
	1982	443	443	47	(52.43)	53	(58.48)
Commercial	1978	392	392	52	(57.47)	48	(53.43)
	1979	1,653	1,653	50	(52.48)	50	(52.48)
	1980	978	978	48	(51.45)	52	(55.49)
	1981	4,570	1,930	59	(61.58)	41	(42.39)
	1982	1,949	414	62	(64.60)	38	(40.36)
	1983	4,896	1,815	40	(41.38)	60	(62.59)
	1984	7,282	2,720	51	(54.48)	49	(52.46)

*During fishery

** Research samples after fishery closed.

Table 4.1.1.1 Recoveries by standardized month in Statistical Areas of Newfoundland and Labrador from the 1970-83 releases of tagged Atlantic salmon of Maine (USA) origin. Recoveries include all sea-ages.

Statistical Area	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Unk.	Total	% of Total
A	0	45	138	7	0	6	20	1	30	247	22.91
B	0	28	63	5	1	12	85	22	32	248	23.01
C	4	11	23	3	1	4	21	14	13	94	8.72
D	4	20	14	4	0	1	1	0	5	49	4.55
E	2	9	3	1	0	1	0	0	1	17	1.58
F	2	10	6	0	0	0	0	0	3	21	1.95
G	0	4	8	0	0	0	0	0	4	16	1.48
H	1	17	12	1	0	0	0	0	4	35	3.25
I	0	24	22	2	0	0	0	0	3	51	4.73
J	2	27	15	0	0	0	0	0	3	47	4.36
K	0	0	2	0	0	0	0	0	0	2	0.19
L	0	0	0	0	0	0	0	0	0	0	0.00
M	0	0	2	0	0	0	0	0	0	2	0.19
N	0	0	1	0	0	0	0	0	1	2	0.19
O	0	9	86	105	34	1	0	0	12	247	22.91
Total	15	204	395	128	36	25	127	37	111	1078	
% Total	1.4	18.9	36.6	11.9	3.3	2.3	11.8	3.4	10.3		100.00

Table 4.1.1.2 Average catch (tonnes) 1974-83 of Atlantic salmon of all sea ages in the Newfoundland-Labrador commercial fisheries by Statistical Area and month.

Statistical Area	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	% of Total
A	3.1	129.1	120.7	4.6	0.0	0.1	0.4	0.0	258.1	16
B	8.9	68.8	65.9	12.1	1.0	0.8	1.1	0.1	158.8	10
C	17.1	41.3	19.4	3.5	0.1	0.1	0.2	<0.1	81.7	5
D	16.4	34.0	19.2	3.5	<0.1	<0.1	<0.1	<0.1	73.2	4
E	27.0	21.4	8.6	0.4	0.0	<0.1	<0.1	0.0	57.4	3
F	22.2	26.8	11.4	0.4	<0.1	0.0	0.0	0.0	60.8	4
G	0.4	5.3	6.0	0.1	0.0	0.0	0.0	0.0	12.4	1
H	4.2	21.5	14.6	0.7	<0.1	0.0	0.0	0.0	41.0	2
I	2.4	13.5	6.1	1.3	0.0	0.0	0.0	0.0	23.4	1
J	61.9	105.0	15.0	1.3	0.0	0.0	0.0	0.0	183.1	11
K	2.7	19.1	6.0	0.4	0.0	0.0	0.0	0.0	28.1	2
L	0.5	8.0	3.4	0.1	<0.1	0.0	0.0	0.0	12.0	1
M	0.8	8.5	10.7	1.0	<0.1	0.0	0.0	0.0	20.9	1
N	<0.1	2.9	9.9	0.3	0.0	0.0	0.0	0.0	13.2	1
Insular Nfld.	167.6	505.2	317.0	30.0	1.2	1.1	1.8	0.2	1024.1	62
O (Lab)	0.5	128.4	410.2	81.3	8.5	0.3	<0.1	0.0	629.2	38
Total	168.1	633.6	727.2	111.3	9.7	1.4	1.8	0.2	1653.3	100

Table 4.1.1.3 Percentage of total Newfoundland and Labrador tag recoveries by Statistical Area and month for 1971-84

Year	1971							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	0.00	1.67	1.67	5.00	0.00	6.67	15.00	
July	6.67	8.33	1.67	0.00	8.33	3.33	28.33	
Aug	0.00	1.67	0.00	0.00	5.00	1.67	8.33	
Sept	0.00	0.00	0.00	0.00	10.00	0.00	10.00	
Oct	0.00	1.67	0.00	0.00	0.00	1.67	3.33	
Nov	1.67	16.67	10.00	0.00	0.00	0.00	28.33	
Dec	0.00	3.33	3.33	0.00	0.00	0.00	6.67	
Sum	8.33	33.33	16.67	5.00	23.33	13.33	100.00	(60)

Year	1972							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	0.00	0.00	0.00	8.70	8.70	
June	0.00	0.00	0.00	4.35	0.00	13.04	17.39	
July	0.00	0.00	0.00	0.00	0.00	13.04	13.04	
Aug	0.00	0.00	4.35	0.00	4.35	13.04	21.74	
Sept	0.00	0.00	0.00	0.00	26.09	0.00	26.09	
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nov	0.00	0.00	13.04	0.00	0.00	0.00	13.04	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	0.00	0.00	17.39	4.35	30.43	47.83	100.00	(23)

1. Years are (year + 1) where year is the release year and most returns are assumed to be of 1-SW salmon.

Numbers in parentheses are the total number of tag recoveries in Newfoundland and Labrador for the smolt class excluding those with unknown month or area.

ctd.

Table 4.1.1.3 continued

Year	1973							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	3.57	7.14	3.57	3.57	3.57	21.43	42.86	
July	10.71	0.00	0.00	0.00	3.57	10.71	25.00	
Aug	0.00	0.00	0.00	0.00	14.29	0.00	14.29	
Sept	0.00	0.00	0.00	0.00	7.14	0.00	7.14	
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nov	3.57	7.14	0.00	0.00	0.00	0.00	10.71	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	17.86	14.29	3.57	3.57	28.57	32.14	100.00	(28)

Year	1974							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	1.80	0.90	0.00	0.90	3.60	
June	0.00	0.00	0.90	5.41	0.00	10.81	17.12	
July	11.71	4.50	3.60	4.50	3.60	8.11	36.04	
Aug	0.00	0.90	0.90	0.00	0.90	0.00	2.70	
Sept	0.00	0.00	0.90	0.00	0.90	0.00	1.80	
Oct	0.90	0.90	1.80	0.00	0.00	0.00	3.60	
Nov	3.60	17.12	1.80	0.00	0.00	0.00	22.52	
Dec	0.00	8.11	4.50	0.00	0.00	0.00	12.61	
Sum	16.22	31.53	16.22	10.81	5.41	19.82	100.00	(111)

Year	1975							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	1.01	0.00	0.00	0.00	1.01	
June	0.00	4.04	3.03	2.02	0.00	3.03	12.12	
July	12.12	10.10	2.02	2.02	5.05	6.06	37.37	
Aug	1.01	1.01	0.00	2.02	8.08	0.00	12.12	
Sept	0.00	0.00	0.00	0.00	5.05	0.00	5.05	
Oct	0.00	5.05	1.01	0.00	0.00	0.00	6.06	
Nov	4.04	16.16	4.04	0.00	0.00	0.00	24.24	
Dec	0.00	0.00	2.02	0.00	0.00	0.00	2.02	
Sum	17.17	36.36	13.13	6.06	18.18	9.09	100.00	(99)

ctd.

Table 4.1.1.3 continued

Year	1976							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	1.16	0.00	0.00	0.00	1.16	
June	5.81	4.65	2.33	0.00	0.00	4.65	17.44	
July	24.42	3.49	4.65	2.33	10.47	3.49	48.84	
Aug	2.33	4.65	0.00	2.33	13.95	1.16	24.42	
Sept	0.00	0.00	0.00	0.00	2.33	0.00	2.33	
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nov	1.16	4.65	0.00	0.00	0.00	0.00	5.81	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	33.72	17.44	8.14	4.65	26.74	9.30	100.00	(86)

Year	1977					Other		
Month	A	B	C	D	O	(E-N)	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	13.33	6.67	0.00	0.00	0.00	13.33	33.33	
July	33.33	13.33	0.00	0.00	6.67	0.00	53.33	
Aug	0.00	0.00	0.00	0.00	6.67	0.00	6.67	
Sept	0.00	0.00	0.00	0.00	6.67	0.00	6.67	
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Nov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	46.67	20.00	0.00	0.00	20.00	13.33	100.00	(15)

Year	1978					Other		
Month	A	B	C	D	O	(E-N)	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
July	16.67	0.00	0.00	0.00	16.67	0.00	33.33	
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sept	0.00	0.00	0.00	0.00	33.33	0.00	33.33	
Oct	0.00	0.00	0.00	0.00	33.33	0.00	33.33	
Nov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	16.67	0.00	0.00	0.00	83.33	0.00	100.00	(6)

Year	1980							
Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	0.00	0.31	0.00	0.00	0.31	
June	10.06	4.40	0.63	0.63	0.94	2.52	19.18	
July	22.33	9.12	2.20	0.63	12.26	5.03	51.57	
Aug	0.94	0.63	1.57	0.00	11.64	0.00	14.78	
Sept	0.00	0.31	0.00	0.00	1.57	0.00	1.89	
Oct	1.26	0.63	0.00	0.31	0.00	0.00	2.20	
Nov	0.63	5.03	0.94	0.00	0.00	0.00	6.60	
Dec	0.00	2.20	1.26	0.00	0.00	0.00	3.46	
Sum	35.22	22.33	6.60	1.89	26.42	7.55	100.00	(318)

(ctd)

Table 4.1.1.3 continued

Year 1981 Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	0.00	2.08	0.00	2.08	4.17	
June	4.17	2.08	2.08	2.08	0.00	6.25	16.67	
July	0.00	6.25	0.00	4.17	4.17	4.17	18.75	
Aug	0.00	0.00	0.00	0.00	25.00	0.00	25.00	
Sept	0.00	0.00	0.00	0.00	2.08	0.00	2.08	
Oct	0.00	2.08	2.08	0.00	2.08	0.00	6.25	
Nov	0.00	12.50	10.42	2.08	0.00	0.00	25.00	
Dec	2.08	0.00	0.00	0.00	0.00	0.00	2.08	
Sum	6.25	22.92	14.58	10.42	33.33	12.50	100.00	(48)

Year 1982 Month	A	B	C	D	O	Other (E-N)	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	6.98	2.33	2.33	4.65	0.00	3.49	19.77	
July	10.47	12.79	3.49	2.33	5.81	10.47	45.35	
Aug	1.16	0.00	1.16	0.00	18.60	0.00	20.93	
Sept	0.00	0.00	0.00	0.00	1.16	0.00	1.16	
Oct	2.33	3.49	0.00	0.00	0.00	0.00	5.81	
Nov	2.33	3.49	1.16	0.00	0.00	0.00	6.98	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	23.26	22.09	8.14	6.98	25.58	13.95	100.00	(86)

Year 1983 Month	A	B	C	D	O	Other (E-N)	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	7.41	7.41	0.00	0.00	0.00	3.70	18.52	
July	18.52	3.70	0.00	0.00	3.70	0.00	25.93	
Aug	0.00	0.00	0.00	0.00	22.22	0.00	22.22	
Sept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Oct	7.41	0.00	0.00	0.00	3.70	0.00	11.11	
Nov	7.41	14.81	0.00	0.00	0.00	0.00	22.22	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	40.74	25.93	0.00	0.00	29.63	3.70	100.00	(27)

Year 1984 Month	A	B	C	D	O	Other	Sum	
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
June	0.00	0.00	0.00	2.78	0.00	2.78	5.56	
July	2.78	2.78	5.56	2.78	5.56	5.56	25.00	
Aug	5.56	0.00	2.78	0.00	27.78	0.00	36.11	
Sept	0.00	0.00	0.00	0.00	5.56	0.00	5.56	
Oct	2.78	2.78	0.00	0.00	0.00	0.00	5.56	
Nov	5.56	11.11	2.78	0.00	0.00	0.00	19.44	
Dec	0.00	2.78	0.00	0.00	0.00	0.00	2.78	
Sum	16.67	19.44	11.11	5.56	38.89	8.33	100.00	(36)

Table 4.1.1.4 Percentage (by weight) of Atlantic salmon of all sea ages caught in Newfoundland-Labrador commercial fisheries for 1974-83.

Year 1974

Month	A	B	C	D	O	E-N	Sum	
May	0.00	0.00	0.11	0.41	0.00	7.79	8.31	
June	0.02	0.09	1.38	4.28	0.35	20.59	26.72	
July	7.03	3.78	1.33	3.00	30.50	11.17	56.80	
Aug	0.44	1.07	0.40	0.66	3.82	0.53	6.93	
Sept	0.01	0.05	0.00	0.00	0.87	0.00	0.92	
Oct	0.00	0.10	0.02	0.01	0.00	0.00	0.12	
Nov	0.00	0.16	0.02	0.00	0.00	0.00	0.19	
Dec	0.00	0.01	0.00	0.00	0.00	0.00	0.01	
Sum	7.49	5.24	3.26	8.37	35.54	40.10	100.00	(2010)

Year 1975

Month	A	B	C	D	O	E-N	Sum	
May	0.01	0.19	1.73	1.59	0.00	9.40	12.92	
June	3.28	4.37	4.32	2.70	5.43	15.70	35.80	
July	8.18	6.28	1.42	0.84	23.27	3.22	43.21	
Aug	0.37	0.98	0.29	0.07	5.50	0.28	7.49	
Sept	0.00	0.03	0.02	0.00	0.30	0.00	0.35	
Oct	0.02	0.07	0.02	0.00	0.00	0.00	0.11	
Nov	0.00	0.08	0.02	0.00	0.00	0.00	0.10	
Dec	0.00	0.02	0.00	0.00	0.00	0.00	0.02	
Sum	11.86	12.02	7.82	5.20	34.50	28.60	100.00	(2043)

Numbers in parentheses are the total annual catch of salmon in kg in Newfoundland and Labrador.

ctd.

Table 4.1.1.4 Continued.

Year	1976						
Month	A	B	C	D	O	E-N	Sum
May	0.08	0.23	0.79	0.68	0.08	12.23	14.08
June	7.53	2.39	1.34	1.06	6.27	13.71	32.31
July	8.91	2.57	0.45	0.65	24.21	6.93	43.72
Aug	0.61	0.62	0.24	0.29	6.76	1.08	9.59
Sept	0.00	0.01	0.00	0.00	0.26	0.00	0.27
Oct	0.00	0.01	0.00	0.00	0.01	0.00	0.02
Nov	0.00	0.01	0.00	0.00	0.00	0.00	0.01
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	17.13	5.84	2.83	2.68	37.58	33.95	100.00 (2012)

Year	1977						
Month	A	B	C	D	O	E-N	Sum
May	0.01	0.67	1.66	1.53	0.01	8.35	12.24
June	11.25	5.04	3.23	2.19	7.76	11.76	41.22
July	7.49	3.20	1.32	0.87	24.43	3.60	40.91
Aug	0.05	0.35	0.37	0.07	3.98	0.14	4.97
Sept	0.00	0.00	0.00	0.00	0.57	0.00	0.57
Oct	0.01	0.03	0.00	0.00	0.00	0.00	0.03
Nov	0.00	0.03	0.01	0.00	0.00	0.00	0.05
Dec	0.00	0.01	0.00	0.00	0.00	0.00	0.01
Sum	18.82	9.32	6.59	4.66	36.75	23.85	100.00 (1938)

ctd.

Table 4.1.1.4 Continued.

Year	1978							
Month	A	B	C	D	O	E-N	Sum	
May	0.01	0.82	1.53	2.39	0.04	9.09	13.89	
June	6.19	4.97	3.81	2.51	9.16	12.39	39.02	
July	5.14	2.28	1.23	1.49	26.09	2.96	39.20	
Aug	0.06	0.57	0.26	0.05	6.13	0.21	7.27	
Sept	0.00	0.06	0.01	0.00	0.43	0.00	0.51	
Oct	0.00	0.10	0.00	0.00	0.00	0.00	0.10	
Nov	0.00	0.01	0.00	0.00	0.00	0.00	0.02	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	11.40	8.82	6.84	6.44	41.85	24.65	100.00	(1180)

Year	1979							
Month	A	B	C	D	O	E-N	Sum	
May	0.05	0.20	0.16	0.13	0.01	4.47	5.01	
June	10.36	2.91	1.49	1.80	3.56	14.86	34.96	
July	16.70	4.06	1.12	0.98	24.02	6.14	53.01	
Aug	0.47	0.69	0.10	0.02	4.75	0.23	6.25	
Sept	0.00	0.00	0.00	0.00	0.70	0.00	0.70	
Oct	0.00	0.00	0.00	0.00	0.01	0.00	0.01	
Nov	0.00	0.02	0.01	0.00	0.00	0.00	0.03	
Dec	0.00	0.01	0.01	0.00	0.00	0.00	0.01	
Sum	27.58	7.88	2.88	2.93	33.03	25.70	100.00	(987)

ctd.

Table 4.1.1.4 Continued.

Year	1980							
Month	A	B	C	D	O	E-N	Sum	
May	0.40	0.57	0.82	0.80	0.10	4.58	7.27	
June	10.44	6.23	1.99	1.21	12.65	15.58	48.10	
July	4.82	4.13	1.29	0.97	23.38	4.42	39.01	
Aug	0.16	0.57	0.01	0.04	4.12	0.19	5.10	
Sept	0.01	0.11	0.00	0.00	0.29	0.01	0.41	
Oct	0.01	0.04	0.01	0.00	0.00	0.00	0.06	
Nov	0.03	0.02	0.01	0.00	0.00	0.00	0.05	
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sum	15.87	11.67	4.12	3.01	40.55	24.77	100.00	(2103)

Year	1981							
Month	A	B	C	D	O	E-N	Sum	
May	1.04	2.01	2.06	1.38	0.01	6.85	13.34	
June	13.37	5.86	2.02	1.67	17.95	9.43	50.29	
July	3.64	2.76	0.71	0.60	20.86	2.63	31.20	
Aug	0.19	0.34	0.04	0.16	3.51	0.11	4.35	
Sept	0.00	0.05	0.00	0.00	0.34	0.00	0.38	
Oct	0.02	0.06	0.01	0.00	0.00	0.00	0.10	
Nov	0.14	0.16	0.03	0.00	0.00	0.00	0.33	
Dec	0.00	0.00	0.01	0.00	0.00	0.00	0.01	
Sum	18.40	11.25	4.87	3.81	42.66	19.02	100.00	(1909)

ctd.

Table 4.1.1.4 Continued.

Year	1982						
Month	A	B	C	D	O	E-N	Sum
May	0.02	0.25	0.31	0.23	0.01	2.93	3.75
June	7.90	5.64	2.34	1.45	6.34	11.55	35.22
July	6.40	5.57	1.73	1.29	28.52	8.70	52.21
Aug	0.15	0.88	0.13	0.24	5.62	0.53	7.56
Sept	0.00	0.15	0.00	0.00	0.90	0.01	1.06
Oct	0.00	0.02	0.01	0.00	0.05	0.00	0.09
Nov	0.02	0.05	0.02	0.00	0.00	0.00	0.10
Dec	0.00	0.02	0.00	0.00	0.00	0.00	0.02
Sum	14.49	12.58	4.54	3.22	41.45	23.72	100.00 (1321)

Year	1983						
Month	A	B	C	D	O	E-N	Sum
May	0.04	0.23	0.53	0.41	0.02	4.56	5.79
June	9.66	4.52	3.54	1.07	5.24	12.53	36.56
July	9.04	5.91	1.41	0.88	23.47	6.28	46.98
Aug	0.17	1.65	0.16	0.52	6.13	0.46	9.09
Sept	0.00	0.22	0.00	0.04	0.83	0.01	1.10
Oct	0.03	0.05	0.01	0.00	0.20	0.00	0.28
Nov	0.07	0.09	0.02	0.00	0.02	0.00	0.19
Dec	0.00	0.01	0.00	0.00	0.00	0.00	0.01
Sum	19.00	12.68	5.66	2.91	35.91	23.84	100.00 (1029)

Table 4.1.1.5 Percentage of total Newfoundland and Labrador tag recoveries by Statistical Area and year for 1971-84.

Release Year + 1	A	B	C	D	0	E to N	TOTAL RETURNS
1971	8.33	33.33	16.67	5.00	23.33	13.33	60
1972	0	0	17.39	4.35	30.43	47.83	23
1973	17.86	14.29	3.57	3.57	28.57	32.14	28
1974	16.22	31.53	16.22	10.81	5.41	19.82	111
1975	17.17	36.36	13.13	6.06	18.18	9.09	99
1976	33.72	17.44	8.14	4.65	26.74	9.30	86
1977	46.67	20.00	0	0	20.00	13.33	15
1978	16.67	0	0	0	83.33	0	6
1980	35.22	22.33	6.60	1.89	26.42	7.55	318
1981	6.25	22.92	14.58	10.42	33.33	12.50	48
1982	23.26	22.09	8.14	6.98	25.58	13.95	86
1983	40.74	25.93	0	0	29.63	3.70	27
1984	16.67	19.44	11.11	5.56	38.89	8.33	36

Table 4.1.1.6 Percentage (by weight) of Atlantic salmon of all sea ages caught in Newfoundland-Labrador commercial fisheries by Statistical Area for 1974-83.

Year	A	B	C	D	O	E to N	TOTAL CATCH (t)
1974	7.49	5.24	3.26	8.37	35.54	40.10	2010
1975	11.86	12.02	7.82	5.20	34.50	28.60	2043
1976	17.13	5.84	2.83	2.68	37.58	33.95	2012
1977	18.82	9.32	6.59	4.66	36.75	23.85	1938
1978	11.40	8.82	6.84	6.44	41.85	24.65	1180
1979	27.58	7.88	2.88	2.93	33.03	25.70	987
1980	15.87	11.67	4.12	3.01	40.55	24.77	2103
1981	18.40	11.25	4.87	3.81	42.66	19.02	1909
1982	14.49	12.58	4.54	3.22	41.45	23.72	1321
1983	19.00	12.68	5.66	2.91	35.91	23.84	1029

Table 4.1.1.7 Tag recapture rate of Maine-origin Atlantic salmon caught in homewaters and commercial fisheries of Newfoundland-Labrador and Greenland.

Year	1000's of tags applied	Home-waters	Tag returns per 1000 tags applied A	B	C	D	E-N	Insular Nfld.	O	Green-land
1970	48.2	5.83	0.10	0.41	0.21	0.06	0.19	0.56	0.29	8.36
1971	29.8	5.64	0.03	0.03	0.17	0.03	0.34	0.60	0.30	2.89
1972	48.5	3.86	0.12	0.08	0.02	0.02	0.19	0.43	0.19	2.31
1973	38.0	10.03	0.55	1.03	0.47	0.34	0.58	2.97	0.21	9.26
1974	41.8	3.83	0.43	0.89	0.31	0.14	0.22	1.99	0.50	3.01
1975	29.0	2.72	0.97	0.52	0.24	0.13	0.24	2.13	0.87	1.31
1976	25.0	3.80	0.28	0.12	0	0	0.08	0.48	0.12	0.44
1977	48.8	0.74	0.02	0	0	0	0	0.02	0.10	0.18
1978	0	0	-	-	-	-	-	-	-	-
1979	59.8	7.78	1.99	1.24	0.35	0.10	0.38	4.01	1.49	1.14
1980	49.8	5.12	0.06	0.22	0.14	0.10	0.14	0.66	0.32	0.76
1981	49.9	3.17	0.40	0.42	0.14	0.12	0.24	1.32	0.48	0.06
1982	50.0	1.10	0.22	0.14	0	0	0.02	0.38	0.18	0.04
1983*	100.0	-	0.06	0.07	0.04	0.02	0.03	0.22	0.14	0.10
1984	100.0									

* Recoveries incomplete.

Table 4.2.1 Estimated total harvest of 1-SW Maine-origin salmon in Newfoundland-Labrador commercial fisheries (year i) using a tag retention (L) = 0.90 and 0.99 for years 1971-1983. Ratio = tags to run size in Maine rivers.

	Newfoundland (year i)		
	Harvest		
Year i	L = 0.99	L = 0.90	Ratio
1971	372	338	.227
1972	231	210	.132
1973	321	292	.118
1974	891	810	.179
1975	1062	965	.133
1976	2613	2376	.046
1977	846	769	.025
1978	347	316	.021
1979	-	-	-
1980	5035	4578	.088
1981	1318	1198	.049
1982	1760	1600	.068
1983	1843	1676	.020

Figure 2.2 Numbers of Norwegian, Scottish and Swedish tags recovered at Faroes in the 1983-84 fishing season.

Legend:

Sweden	Norway N
Scotland	Norway S

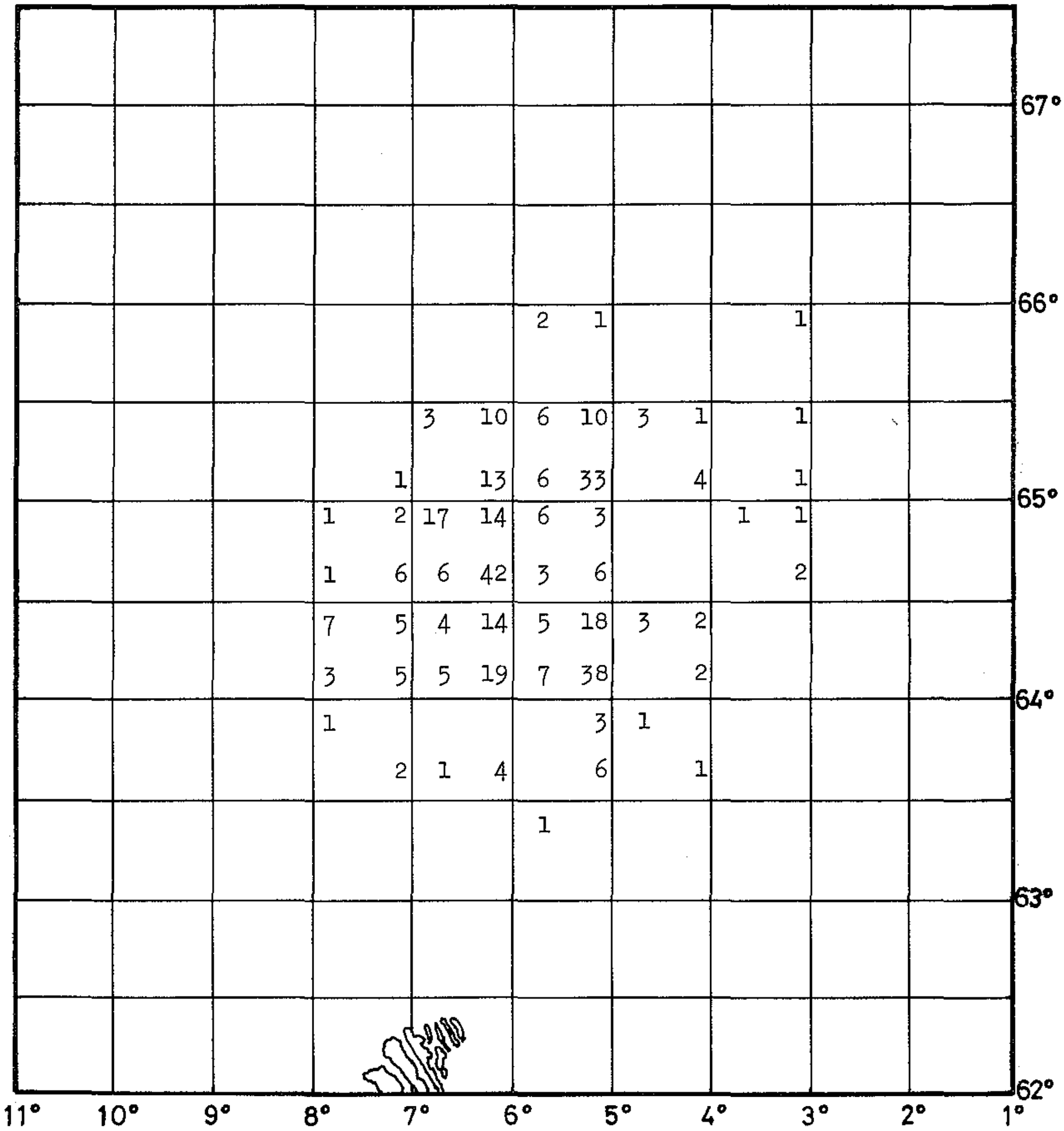


Figure 2.8.1 Catch in numbers x 10^{-1} by statistical rectangle from logbooks, 1983/84 season.

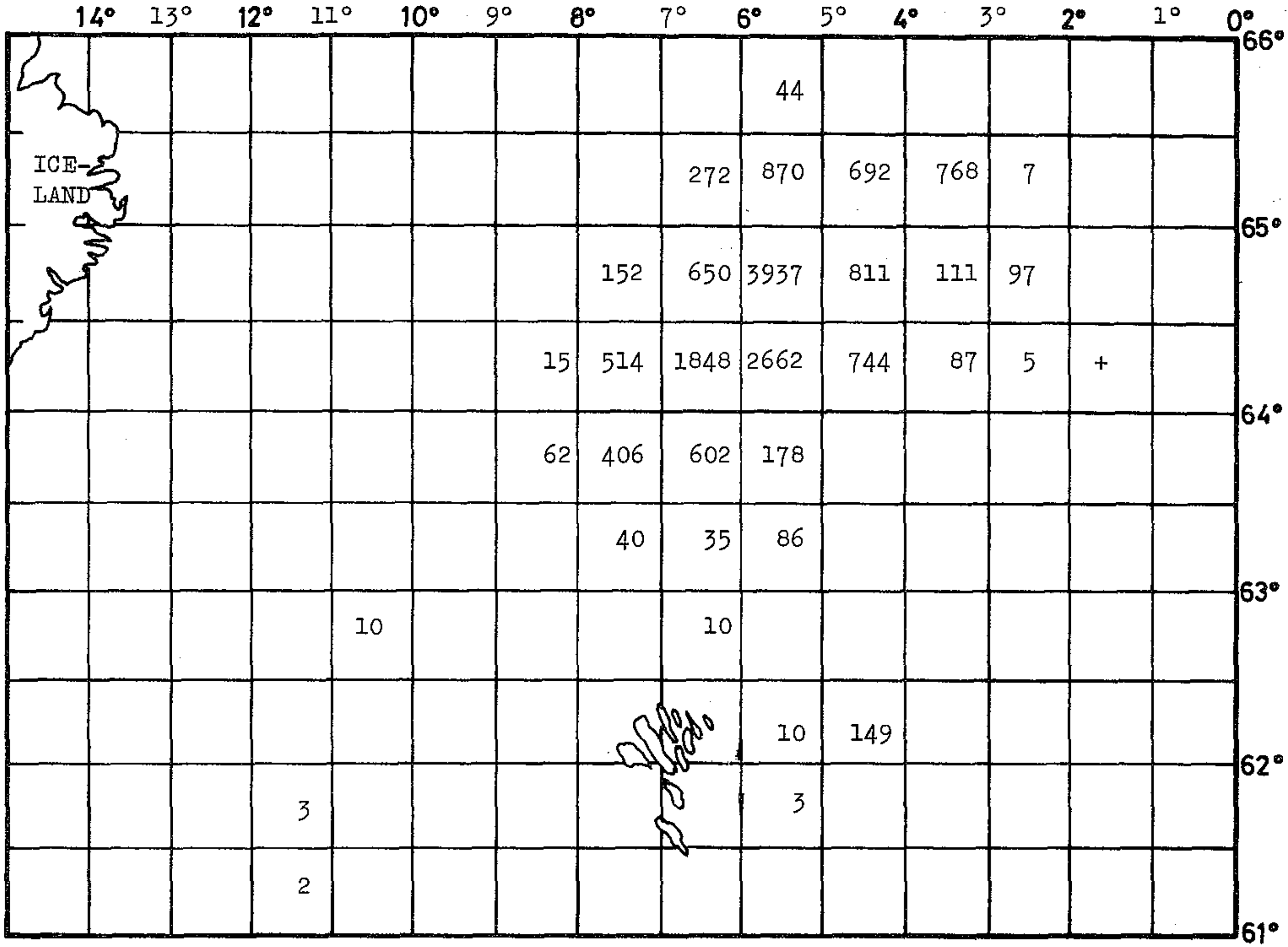


Figure 2.8.2 Catch in numbers per unit effort (1 000 hooks) by statistical rectangle from logbooks, 1983/84 season.

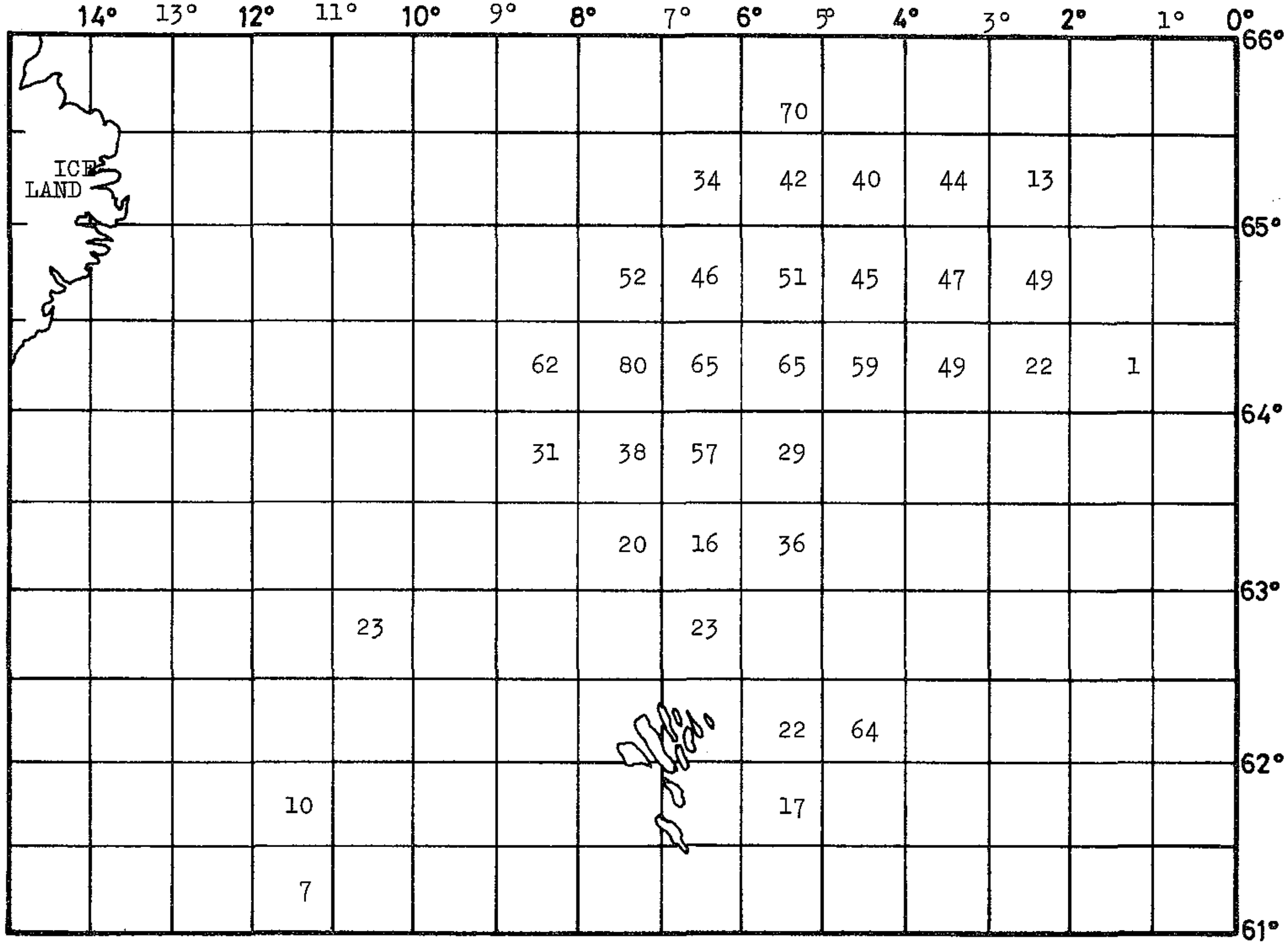
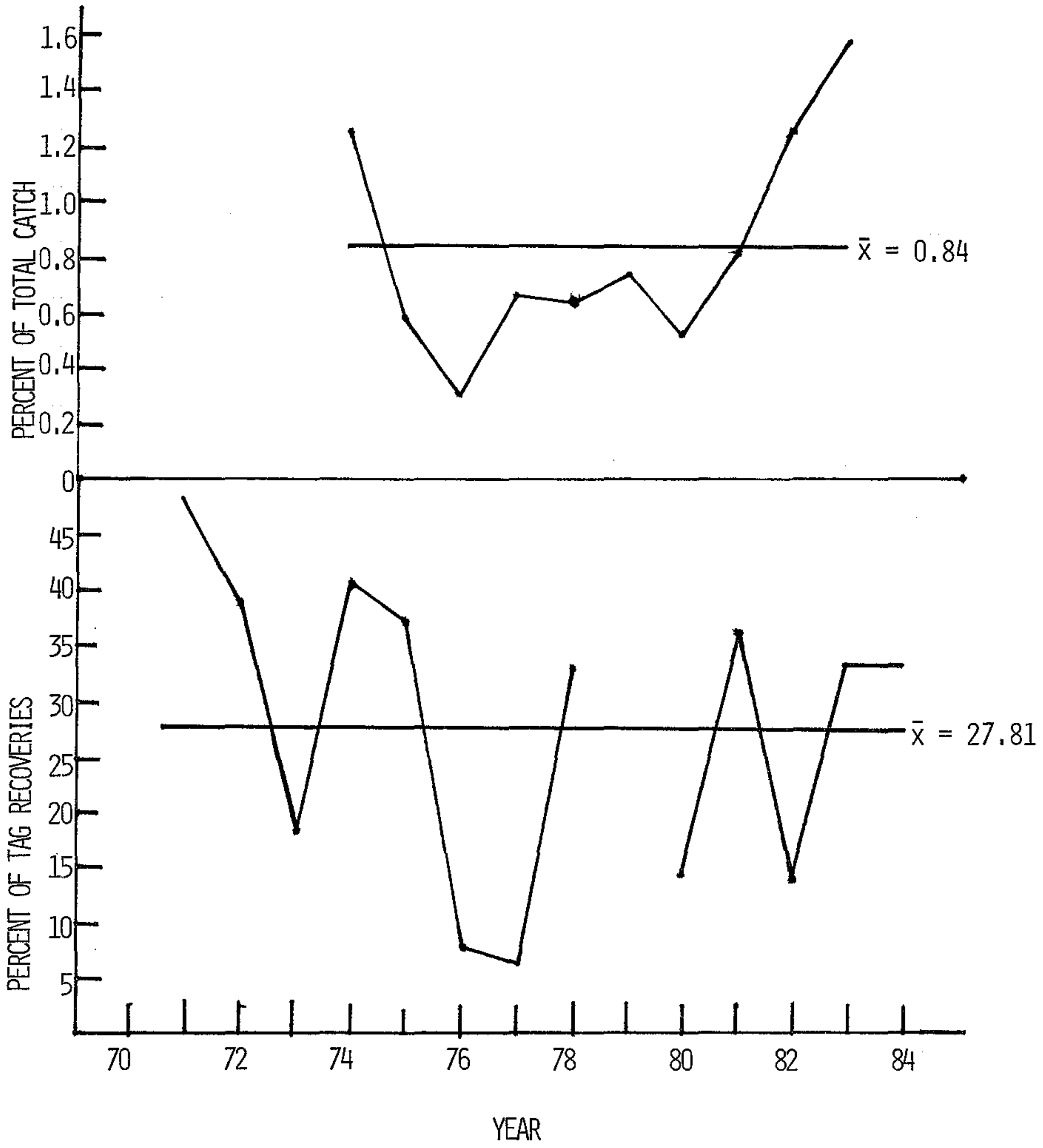


Figure 4.1.1 Percent of total catch (kg) in Newfoundland-Labrador during the period 1 September - 31 December (1974-83) and percent of annual tag recoveries of Maine hatchery-reared salmon during the period 1 September - 31 December (1974-83, excluding 1979).



REPORT TO THE GOVERNMENT OF NORWAY

1. HARP AND HOODED SEALS IN THE GREENLAND SEA

1.1 Terms of Reference

This advice and the Report of the Working Group on Harp and Hooded Seals in the Greenland Sea (ICES, Doc. C.M.1985/N:19) respond to questions posed by ICES at its 72nd Statutory Meeting in Copenhagen in 1984. The Report should be consulted for detailed questions and responses.

1.2 Status and Management of Seal Stocks

1.2.1 History of exploitation and regulatory measures

The history of exploitation of harp and hooded seals in the Greenland Sea ("West Ice") was reviewed by the Working Group as were the regulatory measures recommended by the Norwegian-Soviet Sealing Commission (1959-83) and the Joint Norwegian-Soviet Fisheries Commission) (1984-present). The scientific basis for quotas recommended by these Commissions could not be evaluated, however, since the reports of the scientific meetings of these Commissions were not available to the Working Group.

1.2.2 Catch and effort

Catches of hooded and harp seals from the Norwegian and Soviet fisheries in the West Ice were summarised for the period, 1976-85 (Tables 1.2.1.1 and 1.2.2.2). Norwegian sealing efforts for this time period were also summarised.

Recent catches and effort data are given in the text table below:

	1980	1981	1982	1983	1984
			Catch (numbers)		
Hooded seals	11,233	12,074	15,837	612	582
Harp seals	13,522	15,475	11,896	7,581	1,978
			Norwegian effort		
Number of trips	9	7	6	2	2

1.2.3 Stock identity and biological parameters

Historical and updated information pertaining to stock identity for both hooded and harp seals was reviewed. The Working Group found no reason to propose any revision in the current management units for either species.

Little information was available to the Working Group on either of the West Ice seal stocks. For hooded seals, age composition samples were collected from breeding females from the West Ice herd during 1961-84, but the most recent data (1979-84) were unavailable to the Working Group. No current estimates of natural mortality, total mortality, age at maturity and reproductive rate for West Ice harp and hooded seals were provided. The Working Group examined previous estimates of hooded seal natural mortality, mean age at maturity and pregnancy rates in the West Ice population and found these to be similar to estimates obtained from other hooded seal stocks.

For harp seals, no data on biological parameters were available to the Working Group, although the Working Group was informed of ongoing research.

1.2.4 Population assessment

The Working Group reviewed a variety of techniques to estimate pup production of hooded and harp seal stocks. However, no current estimates of pup production for either of the West Ice seal populations were presented and, hence, stock size calculations could not be performed.

Analyses of the time series of catch-per-unit-effort (CPUE) data were not conducted since the CPUE values were not standardised to account for the considerable changes in vessel size and power that have occurred during the 40-year time series. The Working Group had no basis for deriving correction factors for these effects.

Results of an aerial survey of West Ice whelping patches conducted by Soviet scientists in 1984 were not available to the Working Group.

1.3 Management Advice

The lack of biological and assessment data precluded calculation by the Working Group of sustainable or replacement yields of harp and hooded seals in the West Ice. In the absence of these data, the Working Group was unable to provide scientific advice on catch options for the 1986 sealing season.

1.4 Interactions Between Seals, Other Marine Resources and Commercial Fishing

The Working Group reviewed the available information on feeding biology and energetics of harp and hooded seals. Feeding data were insufficient to determine the extent of West Ice seal interactions with any commercial fishery.

1.5 Future Research

The Working Group listed eight research recommendations for improving the ICES basis for assessing the stock status of harp and hooded seals in the Greenland Sea. These address the submission of previously-collected data and analyses to the Working Group (Rec. 1-4, and 6), methods of assessing stock size and pup production (Rec. 5 and 7), and collection of data on seal feeding biology in relation to the relative importance and energy value of prey species and their commercial exploitation (Rec.8). ACFM endorses all of the research recommendations given in the Working Group report.

1.6 Future Working Group Activities and Recommendations

The Working Group should not meet again until the historical data bases for harp and hooded seals at the West Ice have been processed and analysed. ACFM considered that the establishment of a Joint ICES/NAFO Working Group on Seals would be of mutual benefit, and recommends that the present ICES Working Group on Harp and Hooded Seals in the Greenland Sea be replaced by a Joint ICES/NAFO Working Group, whose terms of reference would include those of the present Working Group (Rec. 2).

Table 1.2.2.1 Catches of hooded seals in the West Ice, 1946-85, including catches for scientific research.

	Norwegian catches			Soviet catches			Total catches		
Year	pups	1 year and older	total	pups	1 year and older	total	pups	1 year and older	total
1946	8482	3083	11565	-	-	-	8482	3083	11565
1947	26059	12535	38594	-	-	-	26059	12535	38594
1948	23392	9371	32763	-	-	-	23392	9371	32763
1949	48698	7728	56426	-	-	-	48698	7728	56426
1950	49130	18568	67698	-	-	-	49130	18568	67698
1951	47487	35893	83380	-	-	-	47487	35893	83380
1952	18098	21864	39962	-	-	-	18098	21864	39962
1953	21864	4160	26024	-	-	-	21864	4160	26024
1954	53321	12680	66001	-	-	-	53321	12680	66001
1955	45266	11511	56777	-	-	-	45266	11511	56777
1956	31564	9224	40788	-	-	-	31564	9224	40788
1957	13238	8951	22189	-	-	-	13238	8951	22189
1958	38636	19906	58542	-	-	-	38636	19906	58542
1959	22682	4536	27218	623	1246	1869	23305	5782	29087
1960	27572	5389	32961	641	642	1283	28213	6031	34244
1961	43681	29601	73282	3569	2169	5738	47250	31770	79020
1962	27183	18498	45681	2239	4900	7139	29422	23398	52820
1963	17958	4463	22421	2333	2993	5326	20291	7456	27747
1964	21987	6972	28959	1943	2435	4378	23930	9407	33337
1965	28154	10838	38992	633	1474	2107	28787	12312	41099
1966	33214	6762	39976	802	310	1112	34016	7072	41088
1967	21390	20351	41741	-	-	-	21390	20351	41741
1968	11795	2168	13963	-	-	-	11795	2168	13963
1969	15870	7057	22927	-	-	-	15870	7057	22927
1970	25208	12507	37715	-	-	-	25208	12507	37715
1971	19572	10678	30250	-	-	-	19572	10678	30250
1972	16052	4164	20216	-	-	-	16052	4164	20216
1973	22455	3994	26449	-	-	-	22455	3994	26449
1974	16595	9800	26395	-	-	-	16595	9800	26395
1975	18273	7683	25956	632	607	1239	18905	8290	27195
1976	4632	2271	6903	199	194	393	4831	2465	7296
1977	11626	3744	15370	2572	891	3463	14198	4635	18833
1978	13899	2144	16043	2457	536	2993	16356	2680	19036
1979	16147	4115	20262	2064	1219	3283	18211	5334	23545
1980	8375	1393	9768	1066	399	1465	9441	1792	11233
1981	10569	1169	11738	167	169	336	10736	1338	12074
1982	11069	2382	13451	1524	862	2386	12593	3244	15837
1983	0	86	86	419	107	526	419	193	612
1984	99	483	582	-	-	-	99	483	582
1985	254	84	338	?	?	?	254	84	338

Table 1.2.2.2 Catches of harp seals in the West ICE, 1946-85, including catches for scientific purposes.

Year	Norwegian catches pups	Norwegian catches 1 year and older	Norwegian catches total	Soviet catches pups	Soviet catches 1 year and older	Soviet catches total	Total catches pups	Total catches 1 year and older	Total catches total
1946	14795	1411	16206	-	-	-	14795	1411	16206
1947	28909	7534	36443	-	-	-	28909	7534	36443
1948	36076	23725	59801	-	-	-	36076	23725	59801
1949	29361	5168	34529	-	-	-	29361	5168	34529
1950	23887	9484	33371	-	-	-	23887	9484	33371
1951	39922	12851	52773	-	-	-	39922	12851	52773
1952	37348	7388	44736	-	-	-	37348	7388	44736
1953	27346	6550	33896	-	-	-	27346	6550	33896
1954	23845	5271	29116	-	-	-	23845	5271	29116
1955	23862	13564	37426	-	-	-	23862	13564	37426
1956	8983	6894	15877	-	-	-	8983	6894	15877
1957	4847	11801	16648	-	-	-	4847	11801	16648
1958	24372	7713	32085	1384	445	1829	25756	8158	33914
1959	27812	2901	30713	3527	3264	6791	31339	6165	37504
1960	28421	1544	29965	831	2377	3208	29252	3921	33173
1961	16487	2755	19242	3532	4563	~~8095~~	20019	7318	27337
1962	25738	3126	28864	1636	788	2424	27374	3914	31288
1963	11808	3045	14853	1137	840	1977	12945	3885	16830
1964	2908	3060	5968	2763	1720	4483	5671	4780	10451
1965	20445	3727	24172	4693	1580	6273	25138	5307	30445
1966	23814	2210	26024	6	236	242	23820	2446	26266
1967	19708	1450	21158	-	-	-	19708	1450	21158
1968	20227	1103	21330	-	-	-	20227	1103	21330
1969	3992	1694	5686	-	-	-	3992	1694	5686
1970	16346	1750	18096	-	-	-	16346	1750	18096
1971	11149	0	11149	-	-	-	11149	0	11149
1972	15100	82	15182	-	-	-	15100	82	15182
1973	11858	0	11858	-	-	-	11858	0	11858
1974	14628	74	14702	-	-	-	14628	74	14702
1975	3742	1080	4822	239	0	239	3981	1080	5061
1976	7019	5249	12268	253	34	287	7272	5283	12555
1977	13305	1541	14846	2000	250	2250	15305	1791	17096
1978	14424	57	14481	2000	0	2000	16424	57	16481
1979	11947	889	12836	2424	0	2424	14371	889	15260
1980	2336	7647	9983	3000	539	3539	5336	8186	13522
1981	8932	2850	11782	3693	0	3693	12625	2850	15475
1982	6602	3090	9692	1961	243	2204	8563	3333	11896
1983	742	2576	3318	4263	0	4263	5005	2576	7581
1984	199	1779	1978	-	-	-	199	1779	1978
1985	25	532	557	?	?	?	25	532	557

Indication of spine colours

Reports of the Advisory Committee on Fishery Management	Red
Reports of the Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

-o-o-o-